

## **WORK PLAN FOR THE INSTALLATION OF TWO EXTRACTION WELLS UNIT E AQUIFER**

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### **INTRODUCTION**

This is a work plan for the installation of two extraction wells (Location 1 and 2, respectively) on the Pall Life Sciences (PLS) Property in Scio Township, Michigan (Site). These wells will further increase PLS' ability to remove more 1,4-dioxane mass on-Site. PLS currently operates two Unit E extraction wells (TW-11 and 12) on the PLS property. In addition, MW-64, also a Unit E well, is used as a temporary extraction well. These two wells will add to the existing on-site extraction wells that are currently in operation.

The proposed extraction well locations are shown on Figure 1. At each proposed extraction well location, test borings will be drilled to confirm the selected locations are suitable for extraction wells, and to collect the geologic information necessary to design the wells.

PLS proposes to initially install a test boring at each proposed location. If the geology at the location is consistent with previous interpretations, and 1,4-dioxane levels are sufficiently elevated, an extraction well will be installed at that location. If the conditions are not suitable for an extraction well, the boring will be abandoned, or possibly a monitoring well will be installed.

### **SUPPORTING INFORMATION**

The proposed location of the test borings and extraction wells are shown on Figure 1. The proposed locations are based on interpretations of aquifer geometry, 1,4-dioxane distribution, the location of existing extraction wells, and site logistics.

The proposed extraction wells will be located in an area of the site where the Unit E aquifer is interpreted to range in thickness from 100 to 150 feet, an area near the maximum known thickness of the aquifer. An isopach map showing the aquifer thickness is provided as Figure 2. A cross section of this area is provided as Figure 3.

1,4-Dioxane concentrations in the areas of the proposed extraction wells are expected to range from 500 to over 1,000 micrograms per liter ( $\mu\text{g/L}$ ). A 1,4-dioxane isoconcentration map for the Unit E prepared using July-August 2003 data is provided as Figure 4.

Data from TW-14 provides some indication regarding the vertical distribution of 1,4-dioxane in the proposed extraction well areas. The soil borehole log for TW-14 is provided as an attachment. Based on the geology encountered at TW-14 the Unit E aquifer is approximately 113 feet thick and consists of Sand, Gravel, and Cobbles. 1,4-Dioxane concentrations in the Unit E aquifer at TW-14 ranged from less than 100 to 7,000 µg/L. Water quality data was not obtained from the deeper portion of the Unit E aquifer during the drilling of TW-14 (due to heaving sands during drilling); therefore, the anticipated concentrations are unknown.

## **WORK PLAN**

### **Test Boring(s)**

The test boring(s) will be drilled using the hollow stem auger method and the proposed sampling methods are split spoon and Simulprobe for collection of soil and soil/groundwater samples, respectively. Split spoon sampling will be performed at a frequency of 10 feet starting at approximately 10 feet below ground surface (bgs) to a depth of approximately 100 feet bgs, or wherever the target aquifer is encountered. Split spoon sampling will be performed at a frequency of 5 feet throughout the aquifer and will terminate at the bedrock surface. Continuous soil sampling will extend throughout the aquifer and will revert to the 10-foot frequency beneath the aquifer, if applicable.

In water-bearing units, Simulprobe sampling will be performed at a maximum frequency of every 10'. Split spoon sampling will not be collected at the Simulprobe intervals, as soil sampling will be accounted for by the Simulprobe. If conditions warrant (coarse gravel or heaving sands), a temporary well screen with packer assembly will be used to collect groundwater samples. Selected soil samples will also be analyzed for grain size to aid in the selection of the test well screen.

Upon reaching the proposed target depth, the boring will be backfilled with sand through the target aquifer, and grouted with bentonite above the aquifer. This method will allow the borehole to be reentered for the installation of the test well.

The soil cuttings derived from the drilling and development water will be transported back to PLS.

### **Extraction Well(s)**

The extraction well(s) will be designed using the test boring data. From the test boring data, the screen zone and screen size will be determined. The extraction well(s) will be constructed of 8-inch diameter steel casing. Such a casing size should be sufficient to handle anticipated extraction rate at this well location. It is anticipated that the well screen(s) will be 15-feet in length and be completed toward the base of the aquifer. The well(s) may be gravel packed, depending on the grain size of the material in the proposed screen interval.

The extraction well(s) will be grouted in accordance with Michigan Water Well Construction and Pump Installation Code (Part 127, Act 368, PA 1978 and Administrative Rules).

Development of the well(s) will be performed using air lifting techniques. Groundwater generated during the development will be transported to PLS for treatment and discharge.

The wells will eventually be equipped with pitless adaptors and connected to the Red Pond by underground piping. It is anticipated that the combined flow rate for the on-Site Unit E extraction wells (total flow) will be approximately 400 gallons per minute (gpm).

## **SCHEDULE**

PLS proposes to the following schedule:

- Installation of wells - March 15 – April 15<sup>th</sup>
- Installation of pipeline – April 15 – June 15<sup>th</sup>
- Begin operation – approximately June 15, 2004

The ability to maintain this schedule will be dependent on site conditions encountered during drilling.