ARCADIS G&M of Michigan, LLC
10559 Citation Drive
Suite 100
Brighton
Michigan 48116
Tel 810 229 8594
Fax 810 229 8837

MEMO

To:
Pete Quackenbush, MDEQ

Copies:
Joe Rogers, MDEQ
John McCabe, MDEQ
Dave Favero, RACER Trust
Grant Trigger, RACER Trust
Amy Hoeksema, ARCADIS

From:
Patrick Curry
Project Geologist, ARCADIS

Date:
October 26, 2012

ARCADIS Project No.:
B0064479, 80, 81

Subject:
RFI Phase 2, Delineation Stage Scope of Work
Racer Lansing, Plants 2, 3 and 6

Introduction

The following technical memorandum summarizes the Investigation Areas at the RACER Lansing Site requiring additional investigation. Areas requiring additional investigation were determined in general accordance with the guidelines outlined in the RCRA Facility Investigation (RFI), Phase 2 Work Plan, approved by the MDEQ in May 2012. As discussed with the Michigan Department of Environmental Quality (MDEQ) at the Milestone Meeting on October 11, 2012, additional delineation of on-site soil and groundwater impacts will focus on areas that require further evaluation of risk. The Delineation Stage will consist of six (6) main components as outlined in the following table:

Deleted: four

Deleted: 4

Task	Objective
Additional Characterization	Delineate and characterize inhalation and direct contact exceedances on-site to limit property restrictions. Define off-site impacts to generic criteria.
Metals Delineation	Define the extent of metals in soil and groundwater within adjacent right-of-ways. Metals in soil and groundwater will be addressed on a site-wide basis.
Long Term Monitoring Well Installation	Install perimeter monitoring wells to provide permanent locations for monitoring long-term plume stability.
LNAPL Mobility Evaluation	Complete an evaluation to define an appropriate risk-based remedy for areas impacted with LNAPL.
Property Boundary Soil Gas Evaluation	Complete a limited assessment of soil gas conditions in areas that exceed generic indoor air criteria located near the property boundary.
Utility Corridor Migration Assessment	Complete additional sampling to confirm groundwater impacts are not migrating off-Site above criteria within utility corridors.

The attached Table 1 (Matrix) includes a summary of the soil and groundwater results by Investigation Area, and additional proposed work, if appropriate. Proposed delineation borings and well locations are shown on Figures 1 and 2. Figures 3 and 4 provide a comprehensive map of Plants 2 & 6 and Plant 3 (respectively) with soil boring and monitoring well names included. The enclosed DVD includes the following:

- A PDF version of this memo
- A PDF of Table 1 and Figures 1-4
- A PDF of Attachment 1,
- Excel versions of draft analytical tables for soil and groundwater
- 3D data summaries (EVS models) including:
    - Site-wide analytical results - VOCs, PCBs & SVOCs

  - Metals results – total metals
  - Metals results – Individual metals
  - Geology
- PDFs of all previous presentations made to the MDEQ
- Characterization Stage soil boring logs

Areas Requiring Additional Investigation

Using the risk-based approach, not all exceedances on-site require additional step outs during the Delineation Stage:

- Exceedances of non-residential soil vapor inhalation or direct contact criteria will be delineated;
- Exceedances of other generic criteria will be addressed on an area-by-area basis.

Exceedances of drinking water or GSI criteria are orders of magnitude lower in concentration, and evaluation of these areas will take into consideration applicable exposure pathways and analytical results within adjacent investigation areas. If there is an undefined exceedance of *any* generic criteria that is not defined at the property boundary, additional work will be completed to define the nature and extent of impacts, including off-site borings if necessary. Based on this approach, four (4) Investigation Areas require additional characterization borings:

- Investigation Area 2
- Investigation Area 5-7
- Investigation Area 7
- Investigation Area 16

Area 2

Additional borings were completed during the Characterization Stage in this area to define chlorinated volatile organic compounds (CVOCs) in soil. The results indicate that both soil and groundwater are impacted with CVOCs, as well as other VOCs, primarily BTEX (benzene, toluene, ethylbenzene, and xylenes). Currently, tetrachloroethene (PCE) is not defined in groundwater at the property boundary west of the area, and BTEX is not defined to criteria in soil or groundwater on the eastern part of the area. Additional borings are needed along the property boundary, off-site (if necessary), to delineate PCE in groundwater. To the east, one of the soil borings (SB-A2-PC76) exceeds the non-residential Soil Volatilization to Indoor Air Inhalation Criteria (VIAC) for benzene. Additional borings will be completed north and south of this boring to better define the area of VIAC impacts.

Area 5-7

Additional borings were added to this area during the Characterization Stage to define the extent of trichloroethene (TCE) in soil. The TCE was successfully defined, but additional work will be required off-site to define the extent of vinyl chloride in perched groundwater adjacent to the eastern Plant 6 property boundary. Once the extent of vinyl chloride is determined a monitoring well will be installed off-site for long-term monitoring.

Area 7

Additional investigation during the Characterization Stage indicated high concentrations of BTEX, primarily xylenes, in soil adjacent to the Plant 6 southern property boundary above the VIAC. In addition, metals in soil and groundwater are not defined to criteria on-site in this area. Additional work will include borings within the right-of-way to define the BTEX exceedances in soil, and two borings south of Michigan Road to define metals and SVOCs in groundwater. Once defined, a monitoring well will be installed off-site for long-term monitoring.

Area 16

The additional work during the Characterization Stage successfully defined the extent of SVOCs in soil in the area. However, lead above the non-residential Direct Contact Criteria was detected in soil on the eastern portion of the area. Additional work will include three shallow borings to define the lead impacts in soil.

Metals Delineation

Current soil and groundwater results indicate metals are above criteria on-site in soil and groundwater. Several borings completed during the Characterization Stage successfully defined metals in Areas 1, 5-8, 11 and Area 17. Additional borings are proposed to delineate metals in soil and groundwater up to or beyond the property boundary including off-site borings adjacent to Areas 2, 4, 7, 5-7, 18 and the northern portion of Plant 6.

Long-Term Monitoring Well Installation

Based on the groundwater analytical data and extent of constituents of concern at the Site (primarily 1,4-dioxane), the perched groundwater appears to generally flow from west to east on Plants 2 and 6. Monitoring wells will be installed around the perimeter of the primary plume, focused on the downgradient property boundary (Plant 6), as well as in areas were COCs are suspected to have migrated off-site (Areas 2, 5-7, and 7). Groundwater impacts at Plant 3 are relatively limited and exceed criteria in perched water in only four areas (Areas 11, 14, 15 and 17). The existing deep monitoring wells at Plant 3 do not

indicate impacts to the underlying regional deep overburden/aquifer. Two wells will be installed near the "coliseum" on the western portion of Plant 3 to verify the deep aquifer at this location has not been impacted by CVOCs detected in the shallow perched water in Area 11, or by the various metals and SVOC impacts detected in soil throughout the coliseum area. An additional well will be installed east of Area 17 to provide a permanent monitoring point for BTEX impacts.

The depth of monitoring wells will be selected so the well screen intersects the most likely portion of the aquifer to be impacted based on the surrounding groundwater sample data. Monitoring wells will be constructed with 2-inch 0.010-slot stainless steel screens with 2-inch PVC riser material. An appropriate sand pack will be placed around the well screen and then bentonite grout will be placed around the well casing to the ground surface. Monitoring wells will be developed using a surge block and pump until they are relatively free of fine grained material.

LNAPL Mobility Evaluation

The areas of light non-aqueous phase liquid (LNAPL) impacts at Plants 2 and 3 have been defined using a combination of soil borings and laser-induced fluorescence (LIF). The general approach that will be used to develop the LNAPL Conceptual Site Model (LCSM) for Plants 2 and 3 will be consistent with the LCSM flow chart currently under development by RACER and the MDEQ RRD. The LCSM flow chart is currently under review and will be made available to the RACER Lansing project team once final.

The LNAPL evaluation for the Site includes the installation of eight LNAPL test wells within the Plant 2 plume, and two test wells at Plant 3. These wells will allow testing to evaluate mobility and risk, consistent with the LCSM flow chart. The depth of test wells will be selected based on the LIF response and observations of LNAPL made during previous Phase 2 activities. The LNAPL test wells will be constructed with 2-inch 0.010-slot stainless steel screens with 2-inch PVC riser material. An appropriate sand pack will be placed around the well screen and then neat cement will be placed around the well casing to the ground surface. The neat cement will provide a better seal if the wells are to be used for either injection or extraction as part of a selected remedy. The LNAPL wells will be developed gently using a submersible pump until they are relatively free of fine grained material and/or until LNAPL is observed in the well.

Up to five (5) soil cores collected during the test well installation will be submitted for permeability and LNAPL mobility testing. Following the installation of the test wells, LNAPL baildown testing will be completed on wells that accumulate LNAPL. Analysis of the baildown tests will provide an estimate of LNAPL transmissivity and recoverability.

Property Boundary Soil Gas Evaluation

There are several areas of the Site that have indicated VOC soil impacts in excess of the Non-Residential Soil Volatilization to Indoor Air Inhalation Criteria (SVIIC). Most of these areas are located interior to the Site and will be managed with an appropriate remedy following completion of the investigation activities. Two of the areas are located relatively close to Site property boundaries and will be evaluated to determine if the potential for off-site migration of soil gas is a risk. Area 2, located on the western portion of Plant 2, has SVIIC exceedances for benzene. Area 7, located on the southern part of Plant 6, has SVIIC exceedances for xylenes. The location of the proposed soil gas samples are provided on Figure 1. Within each area two soil gas borings will be completed within 5 feet of the soil sample indicating an SVIIC exceedance.

Soil gas sampling will be completed consistent with the procedures outlined in the ARCADIS standard operating procedure (SOP) for collecting soil gas samples. The ARCADIS SOP is included as Attachment 1. In general, a direct push drilling rig will be utilized to advance a soil gas probe to a depth consistent with the unsaturated fill material located beneath the concrete slabs (if present), or otherwise a to a minimum depth of 3 feet below the concrete slab or ground surface. Soil gas samples will be extracted from the sealed gas probe utilizing 1-liter SUMMA canisters and submitted for analysis of TAL VOCs

Utility Corridor Contaminant Migration Assessment

Investigation Areas located near the Site perimeters and with groundwater impacts above generic Part 201 criteria were reviewed to determine if utility corridors present could potentially provide a preferential pathway for groundwater impacts to migrate off-Site. Site drawings depicting the location of existing utilities were compared to figures showing the locations of the known soil and groundwater impacts at each of the Plants. The assessment focused on areas with groundwater impacts that are located near to property boundaries. A complete summary of the findings, as well as figures depicting each of the areas, are included as Attachment 2.

Based on the review, only one corridor appears to provide a likely pathway for off-Site migration. Area 7, located on the southern part of Plant 6, has a storm sewer that passes through a former UST cavity near to the property boundary. Several existing borings straddle the storm sewer line as it exits the site (e.g. SB-A7-SZ209 and P6-SB-33) and did not indicate migration was occurring within the corridor. However, an additional boring is proposed within the W. Michigan Ave right-of way, south of the stormceptor before the storm line intersects the W. Michigan Ave main line. The sewer line will be located with ground penetrating radar and a boring will be advanced adjacent to the line to a depth consistent with the bottom of the sewer line (~10-12 feet). Soil and groundwater samples (if present) will be collected from the fill material surrounding the sewer line, or at a minimum, at a depth consistent with the sewer line invert depth (~10-12 feet bgs) and submitted for TAL VOCs, SVOCs and TEL metals.