Work Plan


# Remedial Work Plan
# Brownfield Cleanup Program
# South Hill Business Campus
# 950 Danby Road
# Ithaca, New York

BCP Site # C755012

March 2008

S&W REDEVELOPMENT

# REMEDIAL WORK PLAN
# BROWNFIELD CLEANUP PROGRAM
# SOUTH HILL BUSINESS CAMPUS
# 950 DANBY ROAD
# ITHACA, NEW YORK

Prepared for

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March 2008

Project No.B4001

S&W REDEVELOPMENT

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## SECTION 1 – INTRODUCTION

South Hill Business Campus, LLC is a Volunteer in the New York State Brownfield Cleanup Program (BCP). As part of a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC), the Volunteer has completed a Remedial Investigation (RI) at the South Hill Business Campus, located at 950 Danby Road, Ithaca, New York. See Figure 1-1 for the site location.

The history and environmental conditions at the site are described in the *Remedial Investigation Report* prepared by S&W Redevelopment of North America, LLC (SWRNA, January 2008). The Volunteer is prepared to proceed with the remedial action component of the BCA. This Remedial Work Plan (RWP) is based on the findings of the RI and the ongoing commercial use of the site.

### 1.1 – BACKGROUND

Previous site investigations, and those completed as part of the BCA, have determined that groundwater at the site has been impacted by historic site use. The principal groundwater contaminants are chlorinated organic compounds, including trichloroethene (TCE), and its degradation products dichloroethene (DCE) and vinyl chloride (VC). Groundwater contamination is evident outside the southwest corner of the former main plant building, in proximity to former plating operations at the site.

Two 9,000 gallon underground storage tanks (USTs) located outside the southwest corner of the building received rinse water that contained TCE from former plating and heat treating processes, via trench drains located in the southwest portion of the building (see Figure 1-2). These two USTs were reportedly decommissioned in place in 1986, at the same time that the heat treating and plating facilities were dismantled. According to the current building facilities manager, the two 9,000 gallon USTs were emptied and subsequently backfilled, but it is not known with what type of fill material.

A third UST that also contained TCE was located just north of the heat treating/plating area (Figure 1-2). This UST was removed from the site in 1986, and had a capacity of 6,000 gallons.

The area of dissolved phase groundwater contamination containing TCE, DCE, and VC, extends downgradient – to the west/northwest – from the southwest portion of the building, affecting the lower tiered parking area and the low-lying wooded area beyond it. Analytical data indicates TCE and DCE contamination levels decline by two orders of magnitude – from thousands of µg/L near the building source area (monitoring well MW06-24BR) to a few tens of µg/L at the most downgradient monitoring well (MW06-25BR):

| Parameter | MW06-24BR (source zone) | MW06-25BR (downgradient) |
|---|---|---|
| TCE | 2,200 µg/L | 57 µg/L |
| cis-1,2-DCE | 3,700 µg/L | 42 µg/L |

Downgradient monitoring well MW06-25BR is approximately 200 feet upgradient of the downgradient site boundary.

The RI Report compares analytical data from previous investigations to RI data, and indicates that chlorinated organic contaminants are being naturally attenuated in groundwater by degradation reactions. Eleven of the thirteen monitoring wells that were sampled during both the 2004 Source Area Investigation (ERM) and the 2006 RI (SWRNA) had lower levels of chlorinated organics in 2006. As indicated in the RI Report, the percent decrease in DCE between 2004 and 2006 was greater than that for TCE, which is evidence that the contamination is being naturally degraded, as opposed to being diluted (in which case the DCE and TCE levels would decline at the same rate).

Previous investigations and the RI have indicated no evidence of dense non-aqueous phase liquid (DNAPL) at the site related to the observed dissolved phase TCE and DCE contamination. The orientation of the dissolved groundwater plume with respect to past site operations indicates that the two decommissioned 9,000 gallon USTs, and the removed 6,000 gallon UST, were potential former sources of contamination. There is no evidence from the RI that groundwater contamination at the site is related to ongoing active sources of contamination, except perhaps for two decommissioned 9,000 gallon USTs at the southwest corner of the building that are reportedly still present. All other known potential sources (i.e. USTs in the former UST area) have been removed, and no other potential sources of contamination were identified by the RI.

The RI has also indicated soil vapor contamination exists, derived from the dissolved phase groundwater contamination. Soil vapor samples collected from vapor monitoring wells outside the building indicate elevated concentrations of VOCs near the groundwater contamination area on the west and southwest portion of the building. Elevated soil vapor levels appear to extend downgradient in the same direction as groundwater flow. An off-site soil vapor sample collected approximately 850 feet west of the downgradient site boundary also contained VOCs. Soil vapor samples collected laterally away from the groundwater plume, and also adjacent to a sanitary sewer line, contained noticeably lower levels of soil vapor than did vapor samples obtained from directly above the groundwater plume.

Soil vapor, sub-slab vapor, and indoor air data collectively indicate that soil vapors are present primarily below the southern portion of the building, near the groundwater contamination area, but are less evident to the north farther away from the potential source area. Sub-slab vapor samples that contained VOCs indicate that soil vapor intrusion is potentially possible. Two rounds of indoor air samples indicates that levels of organic compounds inside the building are below New York State Department of Health (NYSDOH) guidance values for compounds such as trichloroethene (TCE) and tetrachloroethene (PCE).

Soil sample analytical results from the RI indicate that sixteen of the seventeen soil samples analyzed meet commercial soil cleanup objectives (SCOs) for brownfield sites. One of the 17 soil samples, collected near the edge of the lower parking lot, contained a single SVOC – benzo(a)pyrene – above commercial SCOs, which may merely reflect the presence of asphalt pavement. In addition to the RI soil samples, fifty five soil samples were analyzed during previous investigations. All of the previous soil samples analyzed, including seven samples collected below the building, met commercial SCOs.

In recognition of the potential for future soil vapor intrusion, the Volunteer has constructed a sub-slab depressurization system (SSDS) as a precautionary Interim Remedial Measure (IRM), in August 2007. The SSDS currently operates in the main southern portion of the building, in the vicinity of the groundwater contamination area. Post-installation pressure field extension (PFE) testing indicates the SSDS negative pressure field reaches all but the northern-most portion of the building, and western rooms that jut out from the main building area. A positive pressure air exchange system will operate in the northern portion of the building away from the contaminant source area to prevent potential SVI in northern areas beyond the reach of the existing SSDS. Individual SSDSs will also be installed to prevent SVI in the individual western rooms that jut out from the main building area. As was done for the existing SSDS, Design Documents will be produced and submitted to NYSDEC for approval prior to implementing subsequent measures taken to address the western rooms. The SSDSs and positive air exchange systems will continue to operate in the future as necessary to prevent soil vapor intrusion.

The following sections of this Remedial Work Plan (RWP) set forth an approach to remove the potential source of contamination that remains at the site, and to address groundwater impacts. These actions, in turn, will mitigate soil vapor contamination by removing its principal source. This RWP is provided in accordance with 6 NYCRR Part 375-3, requirements of NYCRR Part 375 1.8(f)(1-9), the NYSDEC Draft Brownfield Cleanup Program Guide (May 2004), as well as DER-10 Technical Guidance for Site Investigation and Remediation (December 2002).

## SECTION 2 – CONTEMPLATED END USE

The contemplated end use cleanup track for this site is Restricted Use Track 4 Commercial, which is consistent with the site's past, current, and anticipated future use. The site is presently occupied by a split level two- and four-story office and manufacturing building consisting of approximately 265,000 square feet (Figure 2-1). The building currently houses a mix of commercial and light industrial and manufacturing businesses.

South Hill Business Campus, LLC will develop a portion of the existing office building into a multi-tenant professional office complex. The remaining portion of the existing structure (former manufacturing space) will be developed for use by light manufacturing businesses, and some non-manufacturing business start-ups.

A Track 4 remedy is proposed to support restricted commercial use for this site.

## SECTION 3 – SUMMARY OF REMEDIATION GOALS

The overall remediation objectives are to meet standards, criteria, and guidance, and be protective of human health and the environment. The remedial goals for this site are to:

- remove, contain, or treat, to the extent practicable, potential on-site sources of contamination;
- prevent, to the extent feasible, potential future off-site migration of on-site groundwater and/or soil vapor contamination;
- eliminate, to the extent feasible, potential on-site environmental or public health exposures to on-site contamination that may remain in groundwater and/or soil vapor.

The evaluation of remedial alternatives in this RWP includes an evaluation of feasible actions aimed at meeting the above stated objectives.

## SECTION 4 - REMEDIAL ACTION

This section reviews the proposed Track 4 remedial action for the site. An alternatives analysis that compares this proposed remedial action to a Track 1 cleanup is included in Section 5.

The proposed Track 4 remedial approach for this site includes two main elements:

1. **Contaminant source removal.** The remaining potential on-site source of contamination, as identified by previous investigations and the brownfield RI, will be removed from the site. This includes the two (2) 9,000 gallon USTs that were reportedly decommissioned in place adjacent to the southwest corner of the building. The two 9,000 gallon USTs along with soils that are identified to be impacted will be removed from the site. Another potential former source – the 6,000 gallon TCE UST – has already been removed from the site, in 1986 along with several other USTs that contained various petroleum-based products, so no further source removal action is warranted in that area.

2. **Groundwater remediation**. The groundwater remediation approach will include in-situ chemical oxidation (ISCO). The implementation of ISCO will utilize an approach determined to be appropriate based on the observed groundwater chemistry.

   The ISCO objective is to target the "core" of the groundwater contamination near the site building, including the 9,000 gallon UST area and the former UST area, and including the locations of monitoring wells where groundwater contamination is most apparent, such as overburden wells MW-5 and MW-7, and bedrock wells MW06-23BR and -24BR. Both overburden and bedrock groundwater will be targeted, near the site building (i.e. near the source area) and also the downgradient portion of the plume to reduce potential off-site migration. The ISCO system will be designed so that a single injection will apply and disperse enough oxidant to treat the groundwater contamination.

   The ISCO approach proposed in this work plan would be implemented to compliment naturally occurring degradation processes, based on RI data which indicates groundwater conditions are naturally aerobic and chemical oxidation is naturally occurring.

Following ISCO implementation, post-implementation groundwater sampling will occur, in accordance with a Site Management Plan (SMP), to monitor ISCO effectiveness.

The proposed groundwater remedy will minimize future off site transport of site contamination, and together with source removal will also remove the likely source of soil vapor contamination at the site. If it is determined based on a review of post-implementation monitoring data that ISCO has not met remediation goals set for this project, additional remedial measures will be evaluated for implementation, as will be stated in the SMP.

## 4.1 - SOURCE REMOVAL

The principal site contaminants are chlorinated organic compounds in groundwater within a discrete area. These compounds exist in groundwater mainly in areas where three solvent USTs had been located, and extend downgradient. A 6,000 gallon steel UST located in the former tank farm area was removed from the site in 1986 along with six other USTs in that area. Two other USTs were decommissioned in place in 1986, south of the tank farm adjacent to the southwest corner of the building. These two USTs are rectangular 9,000 gallon coated brick and concrete tanks that contained heat treat process waste.

The two 9,000 gallon USTs, and residual contamination that they may still contain, represent a potential source of chlorinated organic groundwater contamination identified by the RI. These two USTs will be removed from the site, to remove the remaining potential source of future groundwater contamination related to past site operations. The extent to which these USTs can be removed without impacting the structural integrity of the building will be further evaluated prior to initiating removal and reassessed during field activities.

During UST removal activities, SWRNA personnel will provide environmental oversight, monitoring, and sampling services. Prior to UST removal, soils overlying the USTs will be initially excavated to confirm the location and size of the USTs. The tanks will then be breached and their backfill contents will be removed. If any residual liquid is found in the USTs, it will be removed by a vacuum truck for proper disposal.

The brick and concrete floor and sidewalls of the USTs will be broken apart and staged on plastic as they are removed from the excavation. UST floor and sidewall debris will be visually examined for discoloration and staining, and screened with a photoionization detector (PID), for evidence of potential contamination. Debris with evidence of contamination will be staged separate from debris with no evidence of contamination, prior to proper off-site disposal. All materials will be staged on and covered with polyethylene sheeting. Debris with no evidence of contamination may be disposed of as construction and demolition (C&D) debris at a permitted facility authorized to accept C&D.

Visible piping associated with the USTs will be removed with reasonable care to prevent the release of product that may remain in the piping. If the piping extends under the building, any residual product it contains will be removed, and it will then be cut off and plugged with cement grout.

Following the removal of the USTs and piping, remaining soils will be visually inspected for signs of contamination and screened for volatile organic compounds (VOCs) using a PID. When soil from the sidewalls and bottom of the excavation are field determined to have no contamination (i.e. PID readings less than 25 ppm and no visible staining or odors), end-point soil samples will be collected from each location, in accordance with DER-10. All samples will be analyzed for VOCs (EPA Method 8260). Impacted soils will be excavated, staged on-site on and covered with polyethylene sheeting, to await off-site disposal at a permitted facility. A waste characterization sample will also be collected from the staged soil piles for disposal purposes. The waste characterization analytical requirements will be coordinated with the disposal facility. Prior to backfilling the extent of the excavation will be staked and surveyed to establish the limits.

Once removal activities are completed, excavation areas will be backfilled with clean granular fill, compacted, and graded to promote positive drainage. Any soil brought to the site from off-site sources for use as backfill will meet the requirements set forth under Part 375-6.7(d).

Chain of custody forms will be completed for all samples. Waste disposal manifests will be completed and collected for all materials transported off site for disposal.

## 4.2- ISCO GROUNDWATER TREATMENT

The ISCO approach proposed in this work plan will compliment naturally occurring degradation processes that RI data indicate are already occurring. There is an apparent decline in contaminant concentrations since 2004, which is not from simple dilution caused by advection and mechanical dispersion. This finding is based on the change in the ratio of DCE to TCE since 2004, as was noted in the RI Report (SWRNA, December 2007).

The most typical natural degradation process for TCE is reductive dechlorination, which occurs under anaerobic (i.e. reducing) conditions, producing DCE and subsequently VC:

$$\text{TCE} \rightarrow \text{DCE} \rightarrow \text{VC}$$

The presence of DCE and VC is evidence of the above anaerobic degradation reaction. Together with the observed decline in contaminant levels and the change in the DCE/TCE ratio, the collective evidence indicates natural degradation is a significant attenuation mechanism at the site.

The RI data seem to indicate that anaerobic conditions existed in the past, which has produced DCE and VC by reductive dechlorination of TCE, but that conditions at the site have more recently become aerobic. Although the presence of DCE and VC are indicative of anaerobic degradation, RI groundwater samples contained variable levels of dissolved oxygen, ranging from approximately 1 part per million (ppm) to 8 ppm, which indicates site groundwater is fairly well oxygenated. Positive Eh readings ranging from approximately 100 to 400 millivolts also suggest oxygenated (i.e. aerobic) conditions for site groundwater.

The change in DCE/TCE ratios since 2004 is further indication that aerobic degradation has occurred. Data from the majority of monitoring wells (11 of 13) sampled in both 2004 and 2006 indicate the DCE/TCE ratio has decreased, meaning that DCE has degraded more than TCE. Oxidation reactions are more likely to decrease the DCE/TCE ratio than reduction reactions, because as compounds become less chlorinated (i.e. more reduced), they become more resistant to reductive dechlorination reactions, and more likely to be oxidized. If reducing reactions were still predominant, TCE would tend to be reduced in favor of DCE, and the DCE/TCE ratio would tend to increase.

The overall nature of the data suggests that a combination of reduction and oxidation reaction mechanisms have degraded groundwater contaminants, but currently oxidation reactions appear to be more favorable. It is proposed that in-situ chemical oxidation (ISCO) be utilized to augment the degradation rate of groundwater contaminants.

### 4.2.1 - Cleanup Levels and End Point Goals

The remedial objective for groundwater per Part 375 is to meet applicable standards, and that the proposed ISCO technology utilizing potassium permanganate was selected because it is considered the best available technology to reach that objective.

The ISCO design will be aimed at destroying 100% of the contamination by a single injection of potassium permanganate solution, in order to reach the stated remedial objective. The effectiveness of ISCO will be measured, after implementation is complete, as a percentage of the contamination that is actually destroyed. A performance end point of 90 percent contaminant reduction or asymptotic conditions are typical, owing to practical limitations to ISCO as a best-available technology, as there are to any remedial approach. Ninety percent reduction is generally held as a readily attainable and satisfactory performance end point for ISCO under most circumstances if properly designed and implemented.

Exact treatment removal efficiency cannot be determined at this point of the project, however, magnitude reductions will be the target goal for this cleanup effort. The site-specific cleanup endpoint, by which the effectiveness of the Track 4 remedy will be measured, will be to decrease the contaminant mass by 90 percent or to asymptotic conditions, as determined by groundwater quality data.

### 4.2.2 - ISCO System Description

In-situ chemical oxidation (ISCO) is a remediation technology that involves the subsurface injection of oxidants for the in-place treatment of organic contaminants. The four oxidants most frequently used in ISCO include hydrogen peroxide (including Fenton's reagent), potassium and sodium permanganate, and ozone. Mineralization to carbon dioxide and water is the desired endpoint of an ISCO process.

Potassium permanganate ($KMnO_4$) has been used in drinking water and wastewater treatment for several decades to oxidize raw water contaminants. Within the past few years it has been used more frequently as an oxidant for ISCO and is the preferred technology for dry-cleaning solvent remediation programs. $KMnO_4$ is an extremely effective oxidant for chlorinated solvents such as PCE and TCE and can be used over a wide pH range. It is inherently more stable than hydrogen peroxide therefore, the oxidizing power can be maintained over a longer period of time increasing possibility of contact with contaminants. Unlike other oxidants, there is no significant volatile organic carbon off-gas produced when using permanganate, nor does permanganate oxidation produce as much excess heat that is prone to occur from other oxidants such as ozone or peroxide with fenton's reagent.

Oxidation using $KMnO_4$ involves cleavage of carbon-carbon bonds often facilitated by free-radical oxidation mechanisms. By-products from the reaction include carbon dioxide, manganese dioxide solids, potassium and chloride; these by-products are non-toxic at the levels produced. The following equation describes the overall chemical reaction for the oxidation of TCE, DCE, and VC using $KMnO_4$:

TCE: $2KMnO_4 + C_2HCl_3 \Rightarrow 2CO_2 + 2MnO_2(s) + 2K^+ + 3Cl^- + H^+$

DCE: $8KMnO_4 + 3C_2H_2Cl_2 + 2H^+ \Rightarrow 6CO_2 + 8MnO_2(s) + 8K^+ + 6Cl^- + 4H_2O$

VC: $10KMnO_4 + 3C_2H_3Cl \Rightarrow 6CO_2 + 10MnO_2(s) + 10K^+ + 3Cl^- + H_2O + 7OH^-$

Stoichiometrically, 2.4 pounds of $KMnO_4$ is required to oxidize one pound of TCE, 4.4 pounds of $KMnO_4$ is required to oxidize one pound of DCE, and 8.5 pounds of $KMnO_4$ is required to oxidize one pound of VC.

The volume of groundwater to be treated, and the mass of contamination for that volume, is estimated based on isoconcentration contours for TCE, DCE, and VC, respectively (see Figures 4-1 through 4-6). The area contained within each concentration interval is multiplied by the approximate saturated thickness to determine the volume of groundwater for each concentration interval. The average concentration within each interval is then multiplied by the volume to estimate the contaminant mass.

The saturated thickness of the overburden in the area of the groundwater plume is conservatively estimated to be 2 feet. For bedrock, the saturated zone of contamination is estimated to be approximately 10 feet. Combined, the treatment zone represents 12 feet of saturated thickness.

Table 4-1 presents calculation estimates of the mass of contamination, based on the respective concentrations of TCE, DCE, and VC in overburden and bedrock monitoring wells. The amount of potassium permanganate needed to oxidize the chlorinated organics is estimated based on the stoichiometric relationships noted above. It is estimated that approximately 160 pounds of potassium permanganate will be needed to oxide the chlorinated contaminants contained in overburden (approximately 9 lbs of permanganate) and shallow bedrock (approximately 151 lbs of permanganate) groundwater. On this basis, the ISCO approach is feasible.

### 4.2.3 - ISCO Remedial Design Process

The ISCO remedial approach for this site will apply all necessary oxidant mass in a single application. The design of the ISCO system will utilize oxidant demand results from bench-scale oxidation testing, together with empirical observations from a field-scale pilot test, so that one injection event is sufficient to meet remedial objectives.

Following NYSDEC approval of this RWP, and prior to implementation of the ISCO system, and a remedial design document will be prepared and submitted to NYSDEC for review. As previously noted, the ISCO objective is to target the "core" of the groundwater contamination near the site building, including the 9,000 gallon UST area and the former UST area, and including the locations of monitoring wells where groundwater contamination is most apparent, such as overburden wells MW-5 and MW-7, and bedrock wells MW06-23BR and -24BR. Both overburden and bedrock groundwater will be targeted, near the site building (i.e. near the source area) and also the downgradient portion of the plume to reduce potential off-site migration.

The effectiveness of ISCO will depend largely on how effectively the oxidant is dispersed to reach the contamination. Accordingly, an appropriate system of injection points will be introduced in the remedial design document to provide adequate dispersion and coverage of the target treatment zone. The anticipated approach will rely on the apparent connectivity between the overburden and shallow bedrock zones to disperse the oxidant. The objective will be to inject the oxidant such that it will naturally disperse along the same pathways by which the contaminants have migrated.

The design document will also specify a schedule for the injection event(s) and required potassium permanganate dosages. The following elements will also be described in the design document:

- System Layout and Injection Procedures – The construction characteristics, number, and spatial pattern of injection points and monitoring wells identified.
- Radius of influence – The estimated radius of influence around each of the injection points will be estimated.
- Injection rate – The rate of injection of permanganate solution at each injection point, and the duration of the injection(s) will be determined. The permanganate solution concentration will also be specified.
- Performance measurables – Specific procedures for measuring the effectiveness of the ISCO system will be identified.
- Potential performance issues – The design document will identify factors which could potentially affect the performance of the ISCO. It will be important to recognize these factors in advance of implementation so adjustments can be made if ISCO performance does not meet expectations.

The design and implementation of the above elements will be based on the results of bench and field scale testing, as described below.

a. **Bench Scale Tests.** Once introduced into the saturated zone, the chemical oxidant will spread by advection and dispersion to the target treatment zone. Ideally, the oxidant concentrations are sustained from the point of application until the oxidants contact the contaminants. However, the concentrations of oxidant may decrease by dilution through mixing with subsurface pore water, and also by consumption via chemical reactions that are not related to the degradation of the target constituents of concern. The loss of oxidant due to chemical reactions unrelated to contaminant oxidation is referred to as the natural oxidant demand (NOD).

As part of the remedial design effort, a bench test will be preformed to determine the permanganate soil/site groundwater oxidant demand (PSOD). The permanganate demand is the amount of permanganate consumed in a given amount of time. Natural soil and rock typically contain reduced minerals that may consume oxidants such as potassium permanganate that are injected into the aquifer matrix. The measured PSOD indicates the grams of permanganate consumed per Kg dry weight of soil/rock over a 48-hour bench-test period. Because the permanganate that reacts with aquifer soil/rock material is not available to destroy the target contaminants, more permanganate must be injected than is needed to destroy only the target contaminants (i.e. chlorinated VOCs). It is therefore essential to measure the oxidant demand of the aquifer matrix to estimate the proper potassium permanganate dose.

Soil, bedrock, and groundwater samples will be collected to measure the PSOD for the site, to determine the permanganate demand for the site. Groundwater samples will be taken from existing monitoring wells MW-7 (overburden) and MW06-24BR (bedrock). Rock and soil samples will be collected from soil borings completed for the installation of pilot test observation wells, as discussed in subsection b below. A rock sample will be collected from a core extracted from the closest observation well boring to MW06-24BR, and a soil sample will be collected from the closest observation well boring to MW-7. The estimated dosage of permanganate will take into account the oxygen demand that is exerted by non-contaminant electron donors in soil and groundwater.

**b. Pilot Test.** A pilot test will be conducted by injecting a small quantity (between 300 to 500 gallons) of 3 percent potassium permanganate solution into each of two existing monitoring wells, including overburden monitoring well MW-7 and bedrock monitoring well MW06-24BR. A Pilot Test Work Plan is included as Appendix A of this RWP.

MW-7 and MW06-24BR produced groundwater samples that contained the highest levels of dissolved organic contaminants in the overburden and bedrock, respectively. It is therefore anticipated that the ISCO system injection will include this target area, as well as overburden in proximity to existing monitoring well MW-5.

During introduction of the permanganate solution at MW-7 and MW06-24BR, water levels and field parameters (pH, Eh, DO, conductance, and temperature) will be measured at one-hour intervals in the eight (8) newly-installed pilot test observation wells and eleven (11) existing monitoring wells. The new pilot test observation wells will include four (4) overburden wells and four (4) bedrock wells, installed approximately 10 feet apart, along two approximately perpendicular lines projecting out from monitoring wells MW-7 and MW06-24BR, respectively. Proposed observation well locations are shown on Figure 4-7.

The eleven existing overburden and bedrock monitoring wells used during the pilot test will include MW-1, MW-5, MW-6, MW-11, MW-12, MW-15, MW06-23BR, MW06-25BR, MW07-28, BR-1S, and BR-1D (see Figure 4-7). Monitoring wells MW-12, MW-15, and MW07-28 are located inside the building.

In addition to measuring water levels and field parameters, the color of the groundwater will be observed for evidence of permanganate breakthrough. (Adequate permanganate concentrations to sustain chemical oxidation reactions are indicated by purple color).

A key objective will be to determine the effects of overburden injection at MW-7 on the upper bedrock zone. It is expected that overburden injection may potentially reach the upper bedrock, based on the presence of contamination in the upper bedrock which suggests connectivity with the overburden. A hydraulic connection between overburden and bedrock, if one exists, will be verified by breakthrough of purple permanganate solution in bedrock observation wells as injection at MW-7 takes place.

Prior to the start of the pilot test, water levels will be measured at the eleven (11) existing monitoring well indicated above and the eight (8) newly-installed observation wells. In addition, groundwater samples will be collected and analyzed for VOCs (8260) and field parameters (pH, Eh, dissolved oxygen, specific conductance, temperature), as a confirmatory measure.

Two weeks after the pilot test at MW-7 and MW06-24BR is completed, groundwater samples will be collected from those two injection wells plus the eight observation wells used for the pilot test, and analyzed for VOCs (8260). Field parameters and color will also be measured.

As previously noted, it is generally recognized that ISCO by potassium permanganate produces neither the gas evolution nor the heat generation that is apt to result from other ISCO applications such as ozone and peroxide/fenton's reagent. However, as a precautionary measure, two (2) air exhaust sample will be collected from the stack of the sub-slab depressurization system (SSDS) that currently operates at the site. One exhaust sample will be collected the day before the pilot test, and one immediately upon completion of the pilot test.

#### 4.2.4 - POST-IMPLEMENTATION ACTIVITIES

As previously noted, the ISCO system will be designed to apply all of the necessary oxidant mass to treat groundwater contamination in one injection event. The specific design and implementation approach will be presented in a Design Document, for NYSDEC approval.

After the ISCO injection event is completed, post-implementation groundwater monitoring will be conducted, as will be indicated in a Site Management Plan (see Section 4.4). Post-implementation groundwater monitoring will begin two weeks following the completion of the ISCO injection. Dedicated ISCO observation wells (numbers and locations to be identified in the design document) will be sampled for VOCs, chemical oxygen demand (COD), total organic carbon (TOC), and dissolved iron and manganese. A second and third post-implementation sampling event will occur one month and three months following the first sampling event, respectively, in accordance with the SMP. After the three post-implementation sampling events, a summary report of results will be presented to NYSDEC for review. The need for and duration/frequency of additional monitoring will be addressed in the summary report.

The post-implementation sampling will include weekly visual groundwater checks from the observation wells and site monitoring wells, beginning one week after ISCO implementation, for visual evidence of permanganate breakthrough (purple/pink color). The weekly checks will occur for the first month. The SMP will specify an appropriate frequency and duration (to be determined) for continued breakthrough monitoring.

## 4.3 - CONTROLS DURING REMEDIAL ACTION

### 4.3.1 ACCESS AND SAFETY

Barricades and caution markers will be installed and maintained to control access to the work area. Only authorized personnel will be allowed within the working area. Project oversight will be provided by a qualified environmental professional. A Health and Safety Plan (HSP) will is included as Appendix B of this RWP. During site remedial actions the HSP will be followed by SWRNA personnel. All contractors will be required to prepare and implement a HSP that conforms with OSHA requirements.

### 4.3.2 STORMWATER POLLUTION PREVENTION

Stormwater pollution prevention practices will be implemented at the site to ensure site activities do not impact adjacent properties. Because only portions of asphalt paving will be removed and soil boring and excavation will be below grade, sediment and erosion controls will likely not be needed relative to source removal excavation work and the installation of ISCO injection and observation wells. All on-site soil stockpiles will be underlain and covered by polyethylene sheeting that will shed precipitation and minimize the potential for erosion. Sorbent materials will be stored on site during site activities in case free-phase product is observed during excavation activities.

### 4.3.3 AIR MONITORING

During remedial actions at the site that disturb soils, a Community Air Monitoring Program (CAMP) will be implemented (Appendix C). The purpose of the CAMP is to monitor the potential for contamination in air, including particulates and VOCs, to migrate off-site and identify mitigating measures if action levels are reached.

## 4.4 – ENGINEERING CONTROLS

Based on soil analytical data from previous site investigations and the RI, the soils at the site meet the restricted commercial SCOs. Therefore, engineering controls are not required for soils. An IRM has been implemented that includes a sub-slab depressurization system (SSDS) in the site building, which mitigates potential soil vapor intrusion for the majority of the building footprint except the northern-most area and rooms that jut out to the west of the main building. Installation of a positive pressure air exchange system has commenced north of the fire wall, which will mitigate potential soil vapor intrusion from the Therm area to the northernmost building area. Smaller, individual SSDSs will be designed for installation in the western rooms. When these controls are fully implemented, test data will be provided to NYSDEC to verify their effectiveness. This will include indoor air pressure readings for the northern portion of the building to demonstrate that adequate indoor air pressure is maintained (+0.01 inWC), and sub-slab pressure field extension tests in the western rooms to demonstrate that adequate negative pressure (-0.002 inWC) has been achieved.

The SSDSs and positive air exchange system will continue to operate and be maintained as an engineering control until such time that NYSDEC/NYSDOH approve of terminating its operation.

The requirements for the operation, maintenance, and certification of engineering controls will be described in a Site Management Plan (SMP) that will be incorporated into the site Environmental Easement (EE) as required under the BCA. The SMP will also include a description of procedures to complete the post-implementation groundwater monitoring for ISCO effectiveness, and related reporting requirements to NYSDEC. The SMP will state that additional remedial measures and/or controls may be implemented in the future, if it is determined that the remedial goals established for this project are not met by the remedial actions and engineering controls under this RWP.

The Environmental Easement will require the on-going annual certification, unless otherwise provided in writing by the NYSDEC, of the engineering controls effectiveness. The annual certification will be signed by a professional engineer or by a qualified environmental professional as approved by the NYSDEC.

## 4.5 - INSTITUTIONAL CONTROLS

As required under the BCA for Track 4 cleanups, institutional controls will be implemented through recording of the Environmental Easement with the local municipalities, including Tompkins County and the Town of Ithaca. Institutional controls will include:

- Restricting the use of the site to commercial uses unless prior approval is received from the NYSDEC and NYSDOH; and
- Prohibiting the use of site groundwater without proper treatment and approval by the NYSDEC.

## SECTION 5 - ALTERNATIVES ANALYSIS

In accordance with the Draft Brownfield Cleanup Program Guide ( May 2004): " *The goal of the remedy selection process in the BCP is to select a remedy for a site that is fully protective of public health and the environment, taking into account the current intended and reasonably anticipated future land use of the site.*"

The Alternatives Analysis identifies and compares potential site remedies. In addition to the proposed remedy, which is Track 4 restricted commercial use (see Section 4), an alternative for Track 1 unrestricted use was evaluated (see Section 5.1).

The proposed remedy and the Track 1 alternative were each evaluated in terms of nine (9) specific criteria identified in 6 NYCRR Part 375-1.10:

- Compliance with standards, criteria, and guidance (SCGs)
- Protection of human health and the environment
- Short term effectiveness
- Long term effectiveness
- Reduction of toxicity, mobility, and volume of contamination
- Implementability
- Cost
- Land use
- Community Acceptance

The ninth criterion, community acceptance, will be further evaluated during public comment periods when feedback may be provided in relation to the proposed remedial alternative. The proposed remedial action is aimed at producing a tangible benefit to the local community by reducing site contamination consistent with the proposed end use for the site.

The following is a comparative review of the two (2) alternatives for the South Hill Business Campus site, with respect to the nine evaluation criteria.

## 5.1 UNRESTRICTED REUSE (TRACK 1)

A Track 1 remedy will maximize the range of potential land use scenarios for the site. This alternative would not permit any future restrictions to site use (i.e. the level of cleanup would permit all types of future reuse scenarios), nor the use of long term institutional/engineering controls to address exposure and achieve the remedial action objectives (RAOs). However, it would allow that groundwater use restrictions be placed on the site.

Track 1 cleanup requires that site remediation be completed to meet unrestricted soil cleanup objectives (SCOs), thereby meeting SCGs for soils. This would reduce the mass of contaminants that may exist at the site, and potentially require excavation of subsurface soils to bedrock to completely eliminate potential exposure and potential on-site sources of contamination to shallow groundwater.

To accomplish this, soil would need to be removed from the site from specific areas in which contaminants were detected above Track 1 unrestricted use SCOs. These areas are defined by analytical data from soil boring samples from the RI and previous site investigations. Discrete areas above Track 1 SCOs are located at the southwest corner of the building, adjacent to the former UST area, isolated areas in the former fill area southwest of the building, the northwest edge of the lower parking lot, and two isolated spots at the northern site boundary near the sanitary sewer, and near the northern building entrance, respectively.

Soil from each of the above specific areas would need to be removed to bedrock to meet Track 1 cleanup objectives. Bedrock in those areas varies from approximately two feet below ground surface (bgs) to approximately 14 feet bgs. Although Track 1 soil excavation could potentially reduce the risk of on-site contact with soil in the indicated areas, the site's current and future anticipated commercial use does not provide significant direct contact opportunity.

Measures would need to be implemented to collect, treat, and dispose of contaminated groundwater in the southwest corner of the building during soil excavation in that area.

Soil excavation from other areas would not require similar special measures for groundwater, since elevated groundwater contaminant levels exist primarily near the southwest corner of the building.

Track 1 soil removal may not initially meet groundwater SCGs, but it is likely that groundwater quality would improve by the Track 1 alternative by natural attenuation, after the sources of groundwater contamination are removed from the site.

If groundwater remediation was also undertaken as part of Track 1, it would not decrease the groundwater exposure risk relative to the current level of risk because groundwater is not used as a potable resource at the site. Groundwater remediation may reduce the potential for future off-site contaminant migration, but since there are no groundwater users immediately downgradient of the site it is doubtful that groundwater remediation would produce a measurable reduction in off-site exposure risk. Groundwater remediation would remove the principal source of soil vapor contamination at the site, but the completed construction and future continuous operation of the SSDS and positive air exchange system as an IRM effectively precludes potential exposure relative to soil vapor intrusion.

A Track 1 remedy would provide a benefit in relation to fish and wildlife exposure risk by removing potential contamination sources and soil that does not meet unrestricted SCOs from the site. However, potential exposure to fish and wildlife is limited to those areas outside the existing paved area and building footprint.

A Track 1 remedy would create a short-term risk associated with soil excavation and construction activity, and off site transport and disposal of soil. But this same risk would be avoided in the future if construction were to occur in the specific areas from which soil had been removed.

## 5.2 - ENGINEERING EVALUATION

The engineering evaluation compares the proposed remedy to a Track 1 unrestricted use alternative. A Track 4 restricted commercial use scenario is selected as the proposed remedy. This remedy will include:

- the removal of the remaining potential source of site contamination, which includes the two 9,000 gallon former storage tanks adjacent to the southwest corner of the building;
- implementation of ISCO to remediate groundwater;
- engineering controls to mitigate potential future soil vapor intrusion, which includes continued operation of a sub-slab depressurization system (SSDS) and a positive air exchange system that were constructed at the site in 2007 as an IRM;
- institutional controls relative to site management and groundwater use.

In accordance with BCP guidance, the selected remedy will provide protection to public health and the environment, taking into account the current intended and reasonably anticipated future land use of the site.

An engineering evaluation has been prepared to establish the suitability of the proposed remedial action in accordance with 6NYCRR Part 375 1.10 (c) (1-6). In the specific context of the contemplated end use of the property, the selected remedy is:

- Consistent with applicable standards, criteria, and guidance (SCGs).
- Protective of the public health and the environment.
- Effective for both short-term and long-term.
- Able to reduce toxicity, mobility, and volume of the hazardous constituents.
- Feasible from implementability and cost effective perspective.
- Reasonably anticipated to be acceptable to the local community.

### 5.2.1 - Compliance with Standards, Criteria, and Guidance (SCGs)

A review of the standards, criteria and guidance documents pertinent to site specific conditions have been completed. The SCGs for soil are the 6 NYCRR Part 375.6.8(b) commercial soil cleanup objectives (SCOs). Groundwater SCGs are based on 6NYCRR Part 703 and ambient water quality standards and guidance values.

A Track 1 remedy will meet soil SCGs (i.e. commercial SCOs) for soil within the site boundary. The proposed Track 4 approach discussed in Section 4 will also comply with soil SCGs within the site boundary, except for an isolated sample taken at the northwest corner of the lower asphalt paved parking lot, where a soil sample from soil boring SB06-01 exceeded the commercial SCO for benzo(a)pyrene, likely related to the asphalt paving.

Both the Track 1 and Track 4 alternatives will treat contaminated groundwater, with an objective to meet groundwater SCGs. The Track 1 alternative may not meet groundwater SCGs faster than Track 4, because both alternatives would remove the remaining potential contaminant source – the two decommissioned 9,000 gallon solvent USTs – located at the apparent source of the groundwater plume. The other former potential contamination source – the 6,000 gallon solvent UST – has already been removed from the site along with other former petroleum USTs.

Nor would Track 1 soil removal from other specific areas outside the 9,000 gallon UST area (as identified in Section 5.1) meet groundwater SCGs faster than the proposed Track 4. This is because the soils to be removed under a Track 1 soil excavation do not appear to be sources of groundwater contamination, so their removal would probably not result in a measurable benefit to site groundwater quality.

Since both Track 1 and Track 4 alternatives would prohibit groundwater use at the site, and thereby eliminate any potential human exposure to groundwater impacts, they are equally protective.

### 5.2.2 – Protection of Human Health and the Environment

Both Track 1 and Track 4 alternatives are protective of human health and the environment. Both actions prohibit groundwater use, remove a potential source of groundwater contamination, and provide groundwater treatment. Future migration potential for groundwater contaminants is reduced by both Track 1 and Track 4 alternatives. Both Track 1 and Track 4 will properly address issues relative to soil vapor intrusion, by addressing the soil vapor contaminant source (i.e. source removal and groundwater treatment) that was the basis for installing the existing SSDS and positive pressure air exchange in 2007 as an IRM.

### 5.2.3 – Short-Term Effectiveness

Track 1 would require soil excavation in specific isolated areas outside the 9,000 gallon UST area (to meet Track 1 unrestricted use SCOs), which is not necessary to meet the soil SCGs for this site (commercial SCOs). Track 4 would not require soil excavation, other than potentially related to the 9,000 gallon UST, and has less potential for exposure to workers and the community due to the reduced volume of soil excavation. The subsequent redevelopment of the site could involve excavation and disturbance of subsurface soils that are left in place under Track 4.

After remediation under the Track 1 alternative, the risk of exposure to future site construction workers would likely be lower than for Track 4. However, this is offset by a relatively greater exposure risk during the implementation of a Track 1 compared to a Track 4, since more soil would be removed under Track 1.

The proposed Track 4 approach would include a Health and Safety Plan to identify requirements for action levels, personal protective equipment and emergency procedures will address short-term impacts. The Site Management Plan will ensure that soils excavated from the site are properly characterized and managed, to address potential exposure issues to site soils.

The potential exists for airborne particulates to be released from the site under both Track 1 and Track 4 scenarios as excavation occurs in the 9,000 gallon UST area. The potential for airborne release is greater under a Track 1 remediation approach than the proposed Track 4 approach since the level of excavation would be more extensive and a longer duration for Track 1 than for Track 4.

Airborne release potentially includes dust and vapor-phase contaminants. During excavation and construction under either Track 1 or Track 4, potential airborne releases will be mitigated by dust control measures during site work. Dust control measures may include wetting of travel areas that are exposed to soil surfaces that are prone to produce airborne dust. Under both Track 1 and Track 4 scenarios, the implementation of a Community Air Monitoring Plan (CAMP) during construction activities would monitor

airborne dust that could potentially migrate off-site and provide a means to identify what controls need to be implemented.
In the short term the Track 1 scenario would require extensive stormwater controls to mitigate transport of sediment and erosion during the excavation activities.

Under Track 1, the extensive excavation, backfill, transport, and disposal of soils off site would require the consumption of fuel and valuable disposal facility space.

### 5.2.4 – Long-Term Effectiveness and Performance

Both the Track 1 alternative and the proposed Track 4 alternative provide a long-term and effective solution. Both alternatives will remove the principal sources of contamination from the site, and reduce exposure potential to the public and environment. Insofar as a Track 4 remedial action with engineering and institutional controls will run with the deed to the property in the context of the Environmental Easement, Track 4 is considered equally effective and permanent as Track 1 for this site. The Track 4 Site Management Plan will also be incorporated into the Environmental Easement and will require annual certifications of all controls and plan implementation.

### 5.2.5 – Reduction of Toxicity, Mobility, and Volume

Both alternatives will reduce overall toxicity, mobility, and volume of site contamination. Track 1 may result in a marginally greater reduction in the mobility and volume of contamination, but probably too slight to have a measurable effect on toxicity compared to Track 4, since both Track 1 and the proposed Track 4 will effectively mitigate exposure based on the site's current and future use.

### 5.2.6 - Implementability

Technical and administrative feasibility of implementing the remedial actions are all achievable. Under both alternatives, deed restrictions related to prohibitions of groundwater use and contemplated use will not prevent the productive end use of the property.

### 5.2.7 - Costs

The cost for implementing Track 1 would far exceed the cost for Track 4. It is likely that achieving a Track 1 cleanup for this site would be cost prohibitive for the intended end use of the site.

### 5.2.8 - Land Use

The Track 1 alternative and the proposed Track 4 remedy and end use are consistent with the local zoning and neighboring land uses, and approvals have been received from the local jurisdictions for intended end use.

### 5.2.9 - Community Acceptance

The proposed Track 4 remedy coupled with future site development is aligned with community redevelopment and revitalization interests. In order to obtain the necessary community acceptance, the selected remedy will be made available for public review and comment, in accordance with the approved Citizen Participation Plan.

## SECTION 6 – SCHEDULE

The proposed schedule for implementing this selected remedial action is included as Table 6-1.

## SECTION 7 – PROJECT ORGANIZATION

Figure 7-1 provides an outline of the project organization and contacts for each identified entity. Once the RWP is completed remediation contractors will be selected and the project organization chart can be updated with the new contact information.

## SECTION 8 - FINAL ENGINEERING REPORT

Within approximately 45-days of completing the remedial action construction and completion of the required engineering controls, a Final Engineering Report (FER) will be prepared and submitted to the NYSDEC/NYSDOH for review and acceptance. In general, the FER will provide a review of the remedial action work completed, field and laboratory analytical data, and substantiate that the remedial action was completed in accordance with the RWP. The FER will be prepared in accordance with 6 NYCRR Part 375-1.6(c)(6), certified, signed and sealed by a professional engineer.

The FER will include the following elements:

- Description of the remedial activities completed including analytical data, waste manifests, and other pertinent documentation
- Data Usability Summary Report certifying the data generated was useable and met the remedial requirements
- Boundary survey defining the site boundaries
- As-built drawings showing the pertinent location of elements of the remedial action
- Site Management Plan (SMP) describing engineering controls and pertinent actions relative to future site activities
- Description of institutional controls
- Copy of the recorded Environmental Easement, which incorporates the SMP and description of institutional controls
- Copy of the Fact Sheet for the FER and IC/EC controls, and issuance of the COC.

The selected remedy includes the continuous operation of SSDSs and a positive air exchange system installed as a precautionary measure to mitigate potential future soil vapor intrusion. Annual reports relative to the operation and maintenance of the SSDSs and air exchange will be prepared as required by New York State Department of Health *Guidance for Evaluating Indoor Air Intrusion in New York State* (October 2006). Any engineering controls will require annual certification as required by ECL 27-1415 and as will be outlined in the SMP in accordance with 6 NYCRR Part 375-1.8(h)(3).

Once the Environmental Easement has been approved it will be duly recorded with the County of Tompkins, and each municipality, County of Tompkins and Town of Ithaca, will be notified of the Environmental Easement. A copy of the recorded Environmental Easement will be provided with the FER.

Upon approval of the FER and recordation/notification of the Environmental Easement, the Certificate of Completion can be issued by the NYSDEC.

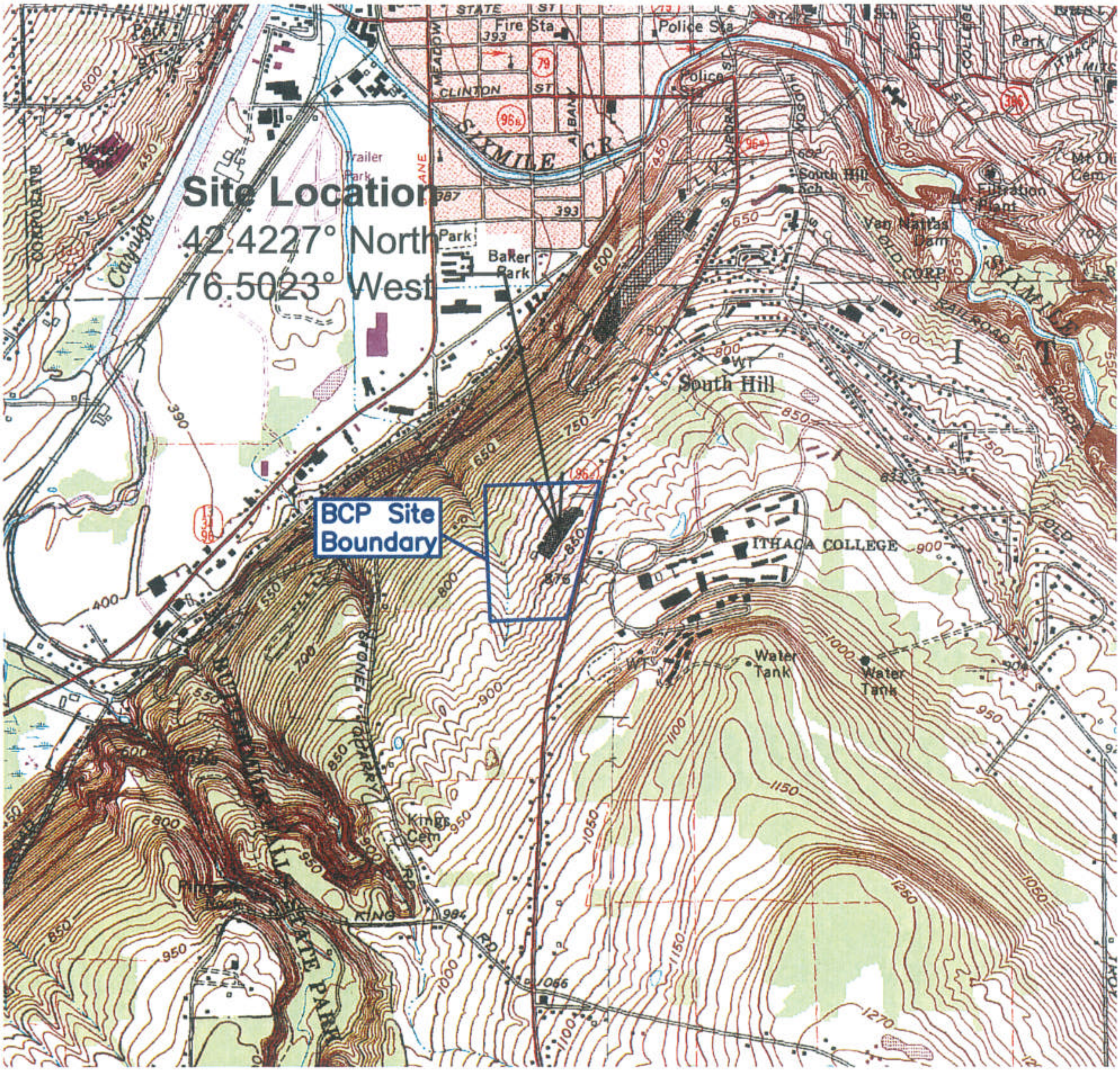
## SECTION 9 – CITIZEN PARTICIPATION

As part of the approved Citizen Participation Plan (CPP) a draft Fact Sheet associated with the submittal of the RI Report and RWP has been prepared and is included as Appendix D. A final Fact Sheet will be produced based on NYSDEC's review and comments.

NYSDEC will initiate a public comment period for the RWP which will run for 45 days from the date established by NYSDEC. Once the dates are established by NYSDEC, the final approved Fact Sheet will be distributed to the Brownfield Site Contact List (BSCL). The documents will be placed in the designated local repositories for public review. Upon completion of the public comment period and once NYSDEC approves the RIR/RWP, a subsequent Fact Sheet will be prepared regarding the start of the remedial action.

# FIGURES

S&W
REDEVELOPMENT




SCALE: 1" = 2,000'

1,000 0 1,000 3,000 5,000

Contour Interval: 10 Feet

Map Taken From: USGS 7.5 Minute Series
Topographic Quadrangles
Ithaca West (1969, Photorevised 1978) &
Ithaca East (1969, Photorevised 1978)
(www.nysgis.state.ny.us/quads/usgsdrg.htm)


QUADRANGLE LOCATION

| S&W Redevelopment<br>of North America, LLC.<br>Syracuse, New York<br>DATE:2/2008 JOB No.:B4001 | Brownfield Remedial Work Plan<br>950 Danby Road, BCP# C755012<br>Ithaca, Tompkins County, New York<br>Figure – 1–1<br>Site Location Map |
|---|---|

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2004/october/syracuse/jlk/revised/07/jcr
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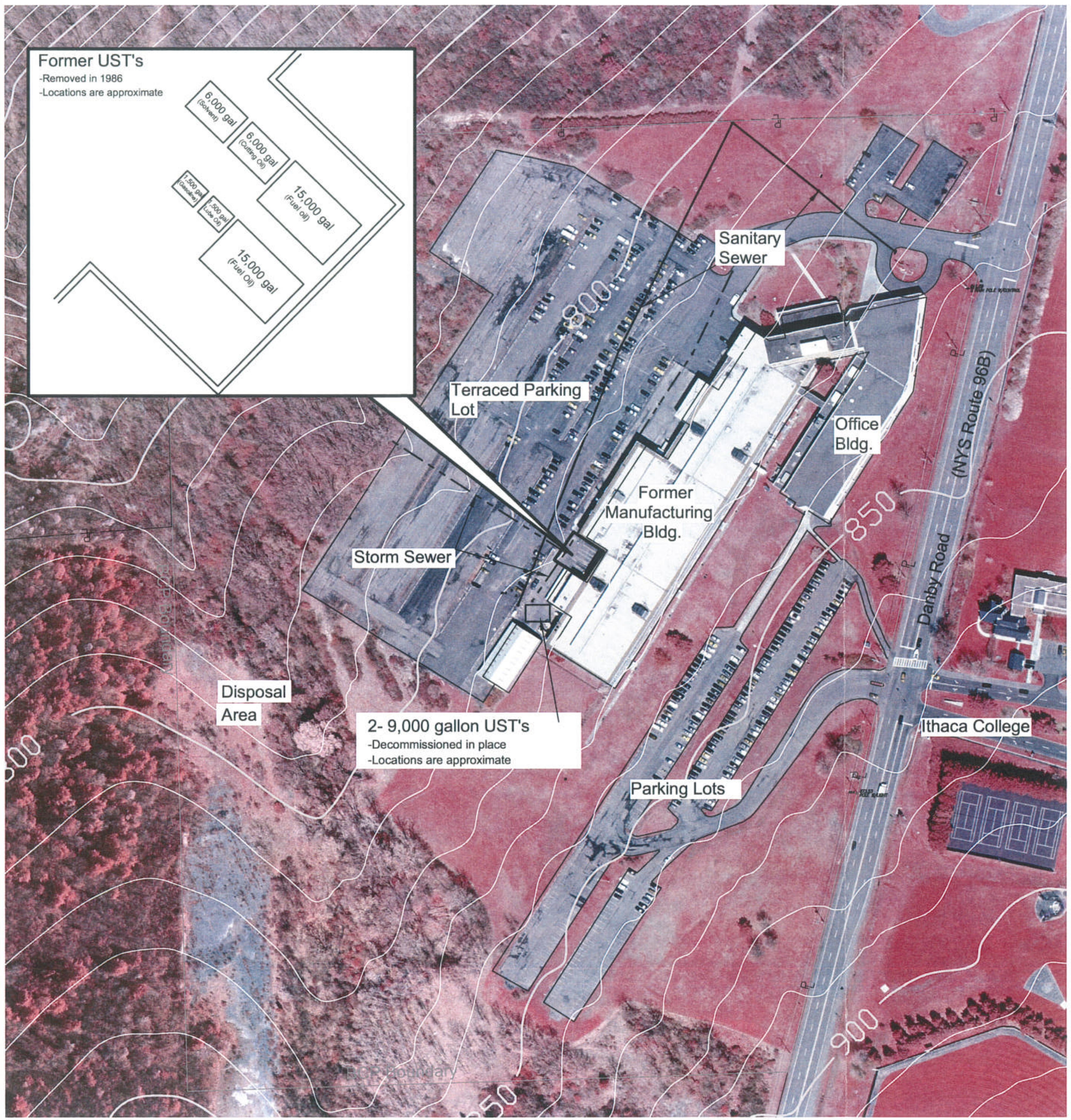


Topographic contours from USGS topographic maps Ithaca East & Ithaca West (1969, Photorevised 1978) NYSDOT & USGS Maps from (http://www1.nysgis.state.ny.us/gisdata/quads/drg24/u26htm & u27htm).

Contour interval 10 feet.

Aerial photo taken from http://www1.nysgis.state.ny.us/MainMap.cfm

SCALE IN FEET 50 0 25 50 100 200

Figure based on Survey by Bryant Assoc., P.C., Aug, 2006.

| | |
|---|---|
| **S&W Redevelopment** of North America, LLC. Syracuse, New York | Brownfield Remedial Work Plan<br>950 Danby Road Ithaca<br>Tompkins County, New York<br>BCP Site # C755012 |
| DATE:2/2008 JOB No: B4001 | Figure 1–2<br>Site Plan |

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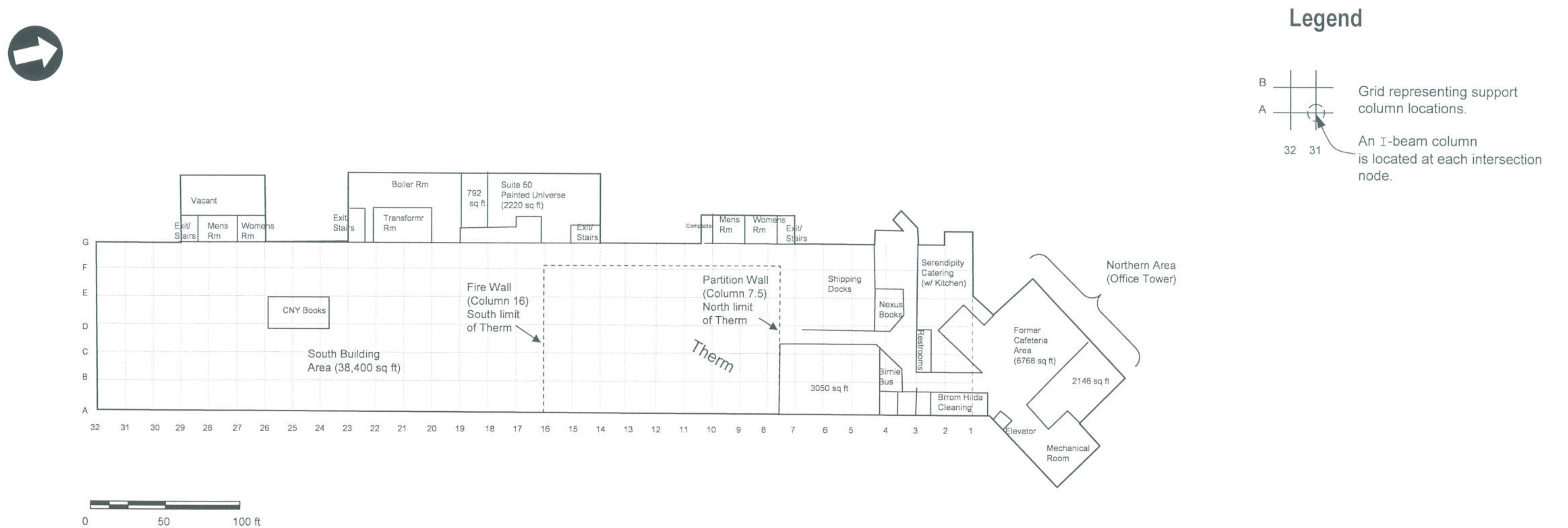


S&W Redevelopment
of North America, LLC
Syracuse, New York

DATE: 2/2008 Job No. B4001

Brownfield Remedial Work Plan
950 Danby Road Ithaca
Tompkins County, New York
(BCP Site # C755012)

Figure 2-1
Building Floor Plan (Lowest Level)

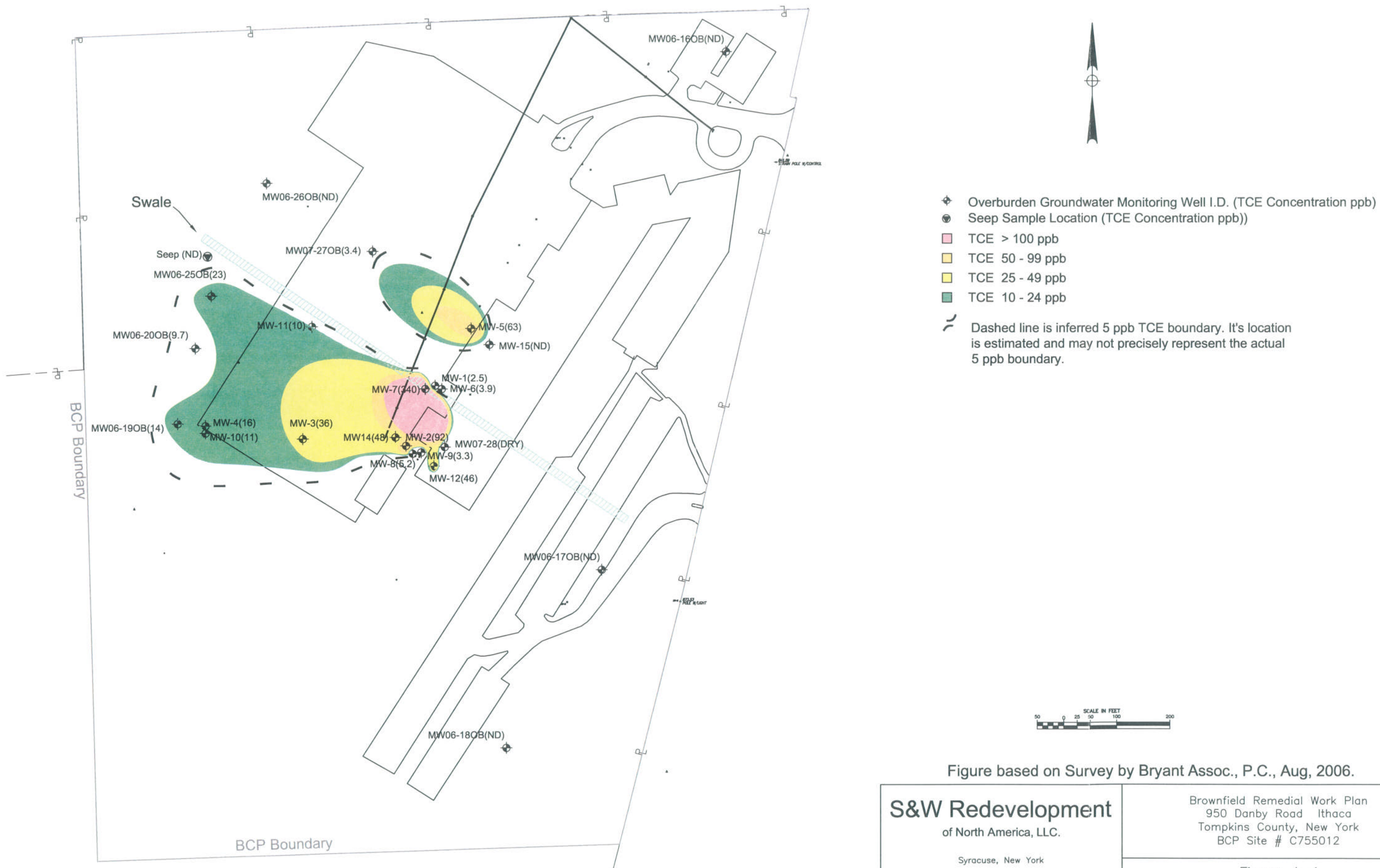


Figure based on Survey by Bryant Assoc., P.C., Aug, 2006.

| S&W Redevelopment of North America, LLC. Syracuse, New York | Brownfield Remedial Work Plan 950 Danby Road Ithaca Tompkins County, New York BCP Site # C755012 |
|---|---|
| DATE:2/2008 JOB No: B4001 | Figure 4-1 TCE in Overburden Groundwater |

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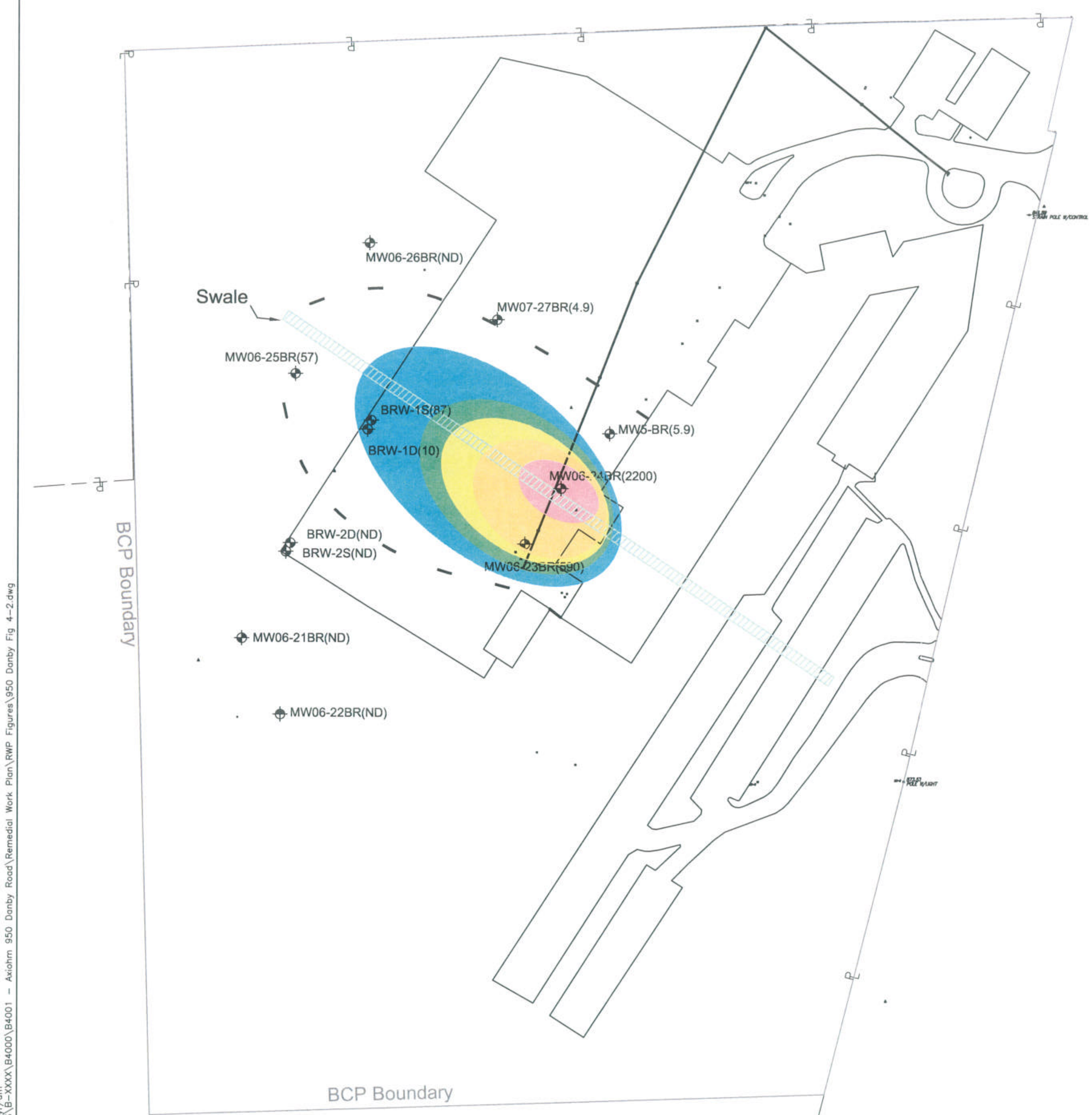


Bedrock Groundwater Monitoring Well I.D. (TCE Concentration ppb)
TCE > 1,000 ppb
TCE 500 - 999 ppb
TCE 250 - 499 ppb
TCE 125 - 249 ppb
TCE 75 - 124 ppb
Dashed line is inferred 5 ppb TCE boundary. It's location is estimated and may not precisely represent the actual 5 ppb boundary

Figure based on Survey by Bryant Assoc., P.C., Aug, 2006.

| | |
|---|---|
| **S&W Redevelopment** of North America, LLC. Syracuse, New York | Brownfield Remedial Work Plan<br>950 Danby Road Ithaca<br>Tompkins County, New York<br>BCP Site # C755012 |
| DATE:2/2008 JOB No: B4001 | Figure 4-2<br>TCE in Bedrock Groundwater |

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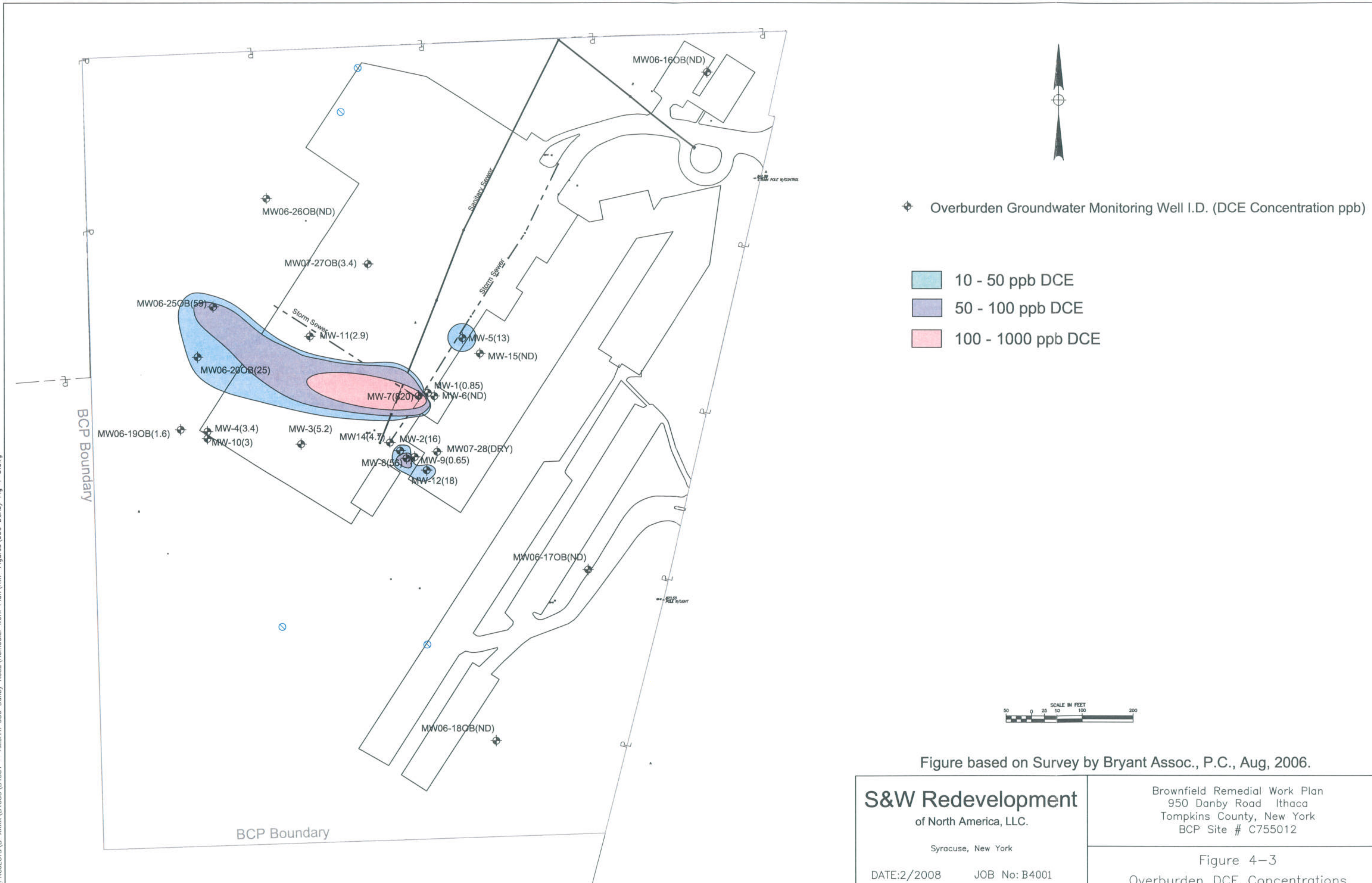


Figure based on Survey by Bryant Assoc., P.C., Aug, 2006.

| S&W Redevelopment of North America, LLC. Syracuse, New York | Brownfield Remedial Work Plan<br>950 Danby Road Ithaca<br>Tompkins County, New York<br>BCP Site # C755012 |
|---|---|
| DATE:2/2008 JOB No: B4001 | Figure 4–3<br>Overburden DCE Concentrations |

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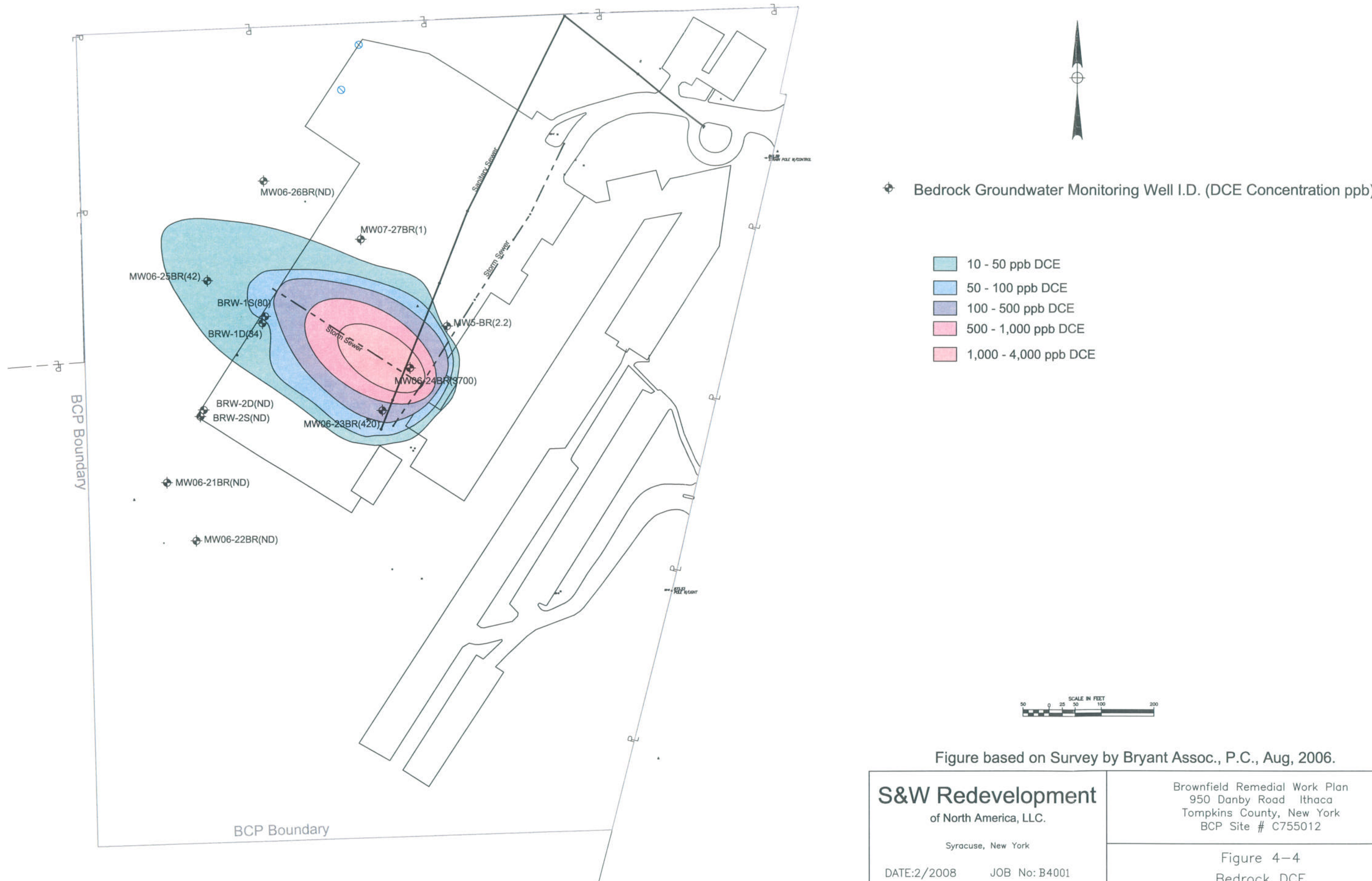


Figure based on Survey by Bryant Assoc., P.C., Aug, 2006.

**S&W Redevelopment**
of North America, LLC.

Syracuse, New York

DATE:2/2008 JOB No: B4001

Brownfield Remedial Work Plan
950 Danby Road Ithaca
Tompkins County, New York
BCP Site # C755012

Figure 4–4
Bedrock DCE

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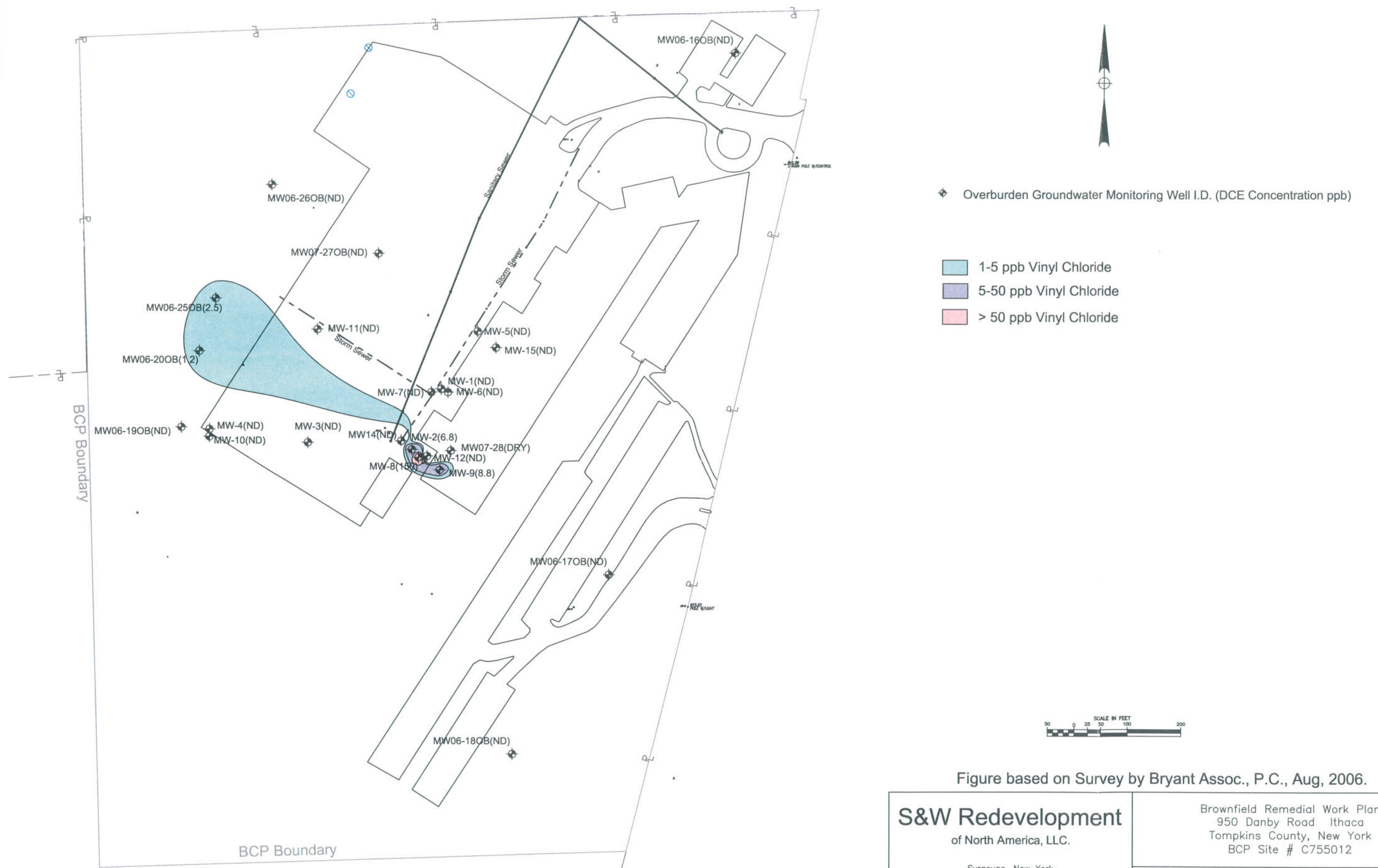


Figure based on Survey by Bryant Assoc., P.C., Aug, 2006.

**S&W Redevelopment**
of North America, LLC.
Syracuse, New York

DATE:2/2008 JOB No: B4001

Brownfield Remedial Work Plan
950 Danby Road Ithaca
Tompkins County, New York
BCP Site # C755012

Figure 4–5
Overburden Vinyl Chloride

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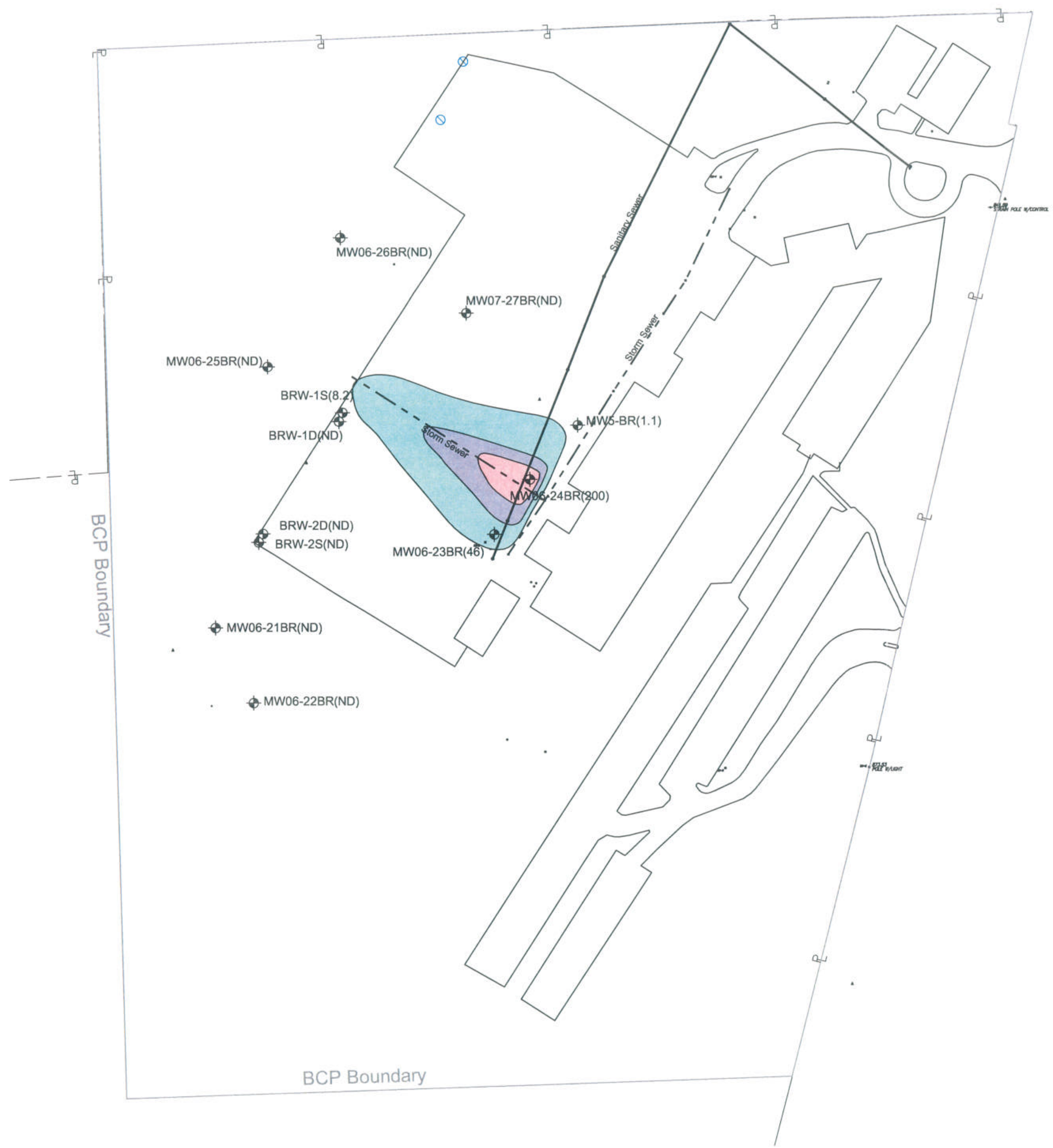


Bedrock Groundwater Monitoring Well I.D. (DCE Concentration ppb)

- 10 - 50 ppb Vinyl Chloride
- 50 - 100 ppb Vinyl Chloride
- 100 - 250 ppb Vinyl Chloride

SCALE IN FEET: 50 0 25 50 100 200

Figure based on Survey by Bryant Assoc., P.C., Aug, 2006.

| | |
|---|---|
| S&W Redevelopment of North America, LLC. Syracuse, New York | Brownfield Remedial Work Plan 950 Danby Road Ithaca Tompkins County, New York BCP Site # C755012 |
| DATE:2/2008 JOB No: B4001 | Figure 4-6 Bedrock Vinyl Chloride |

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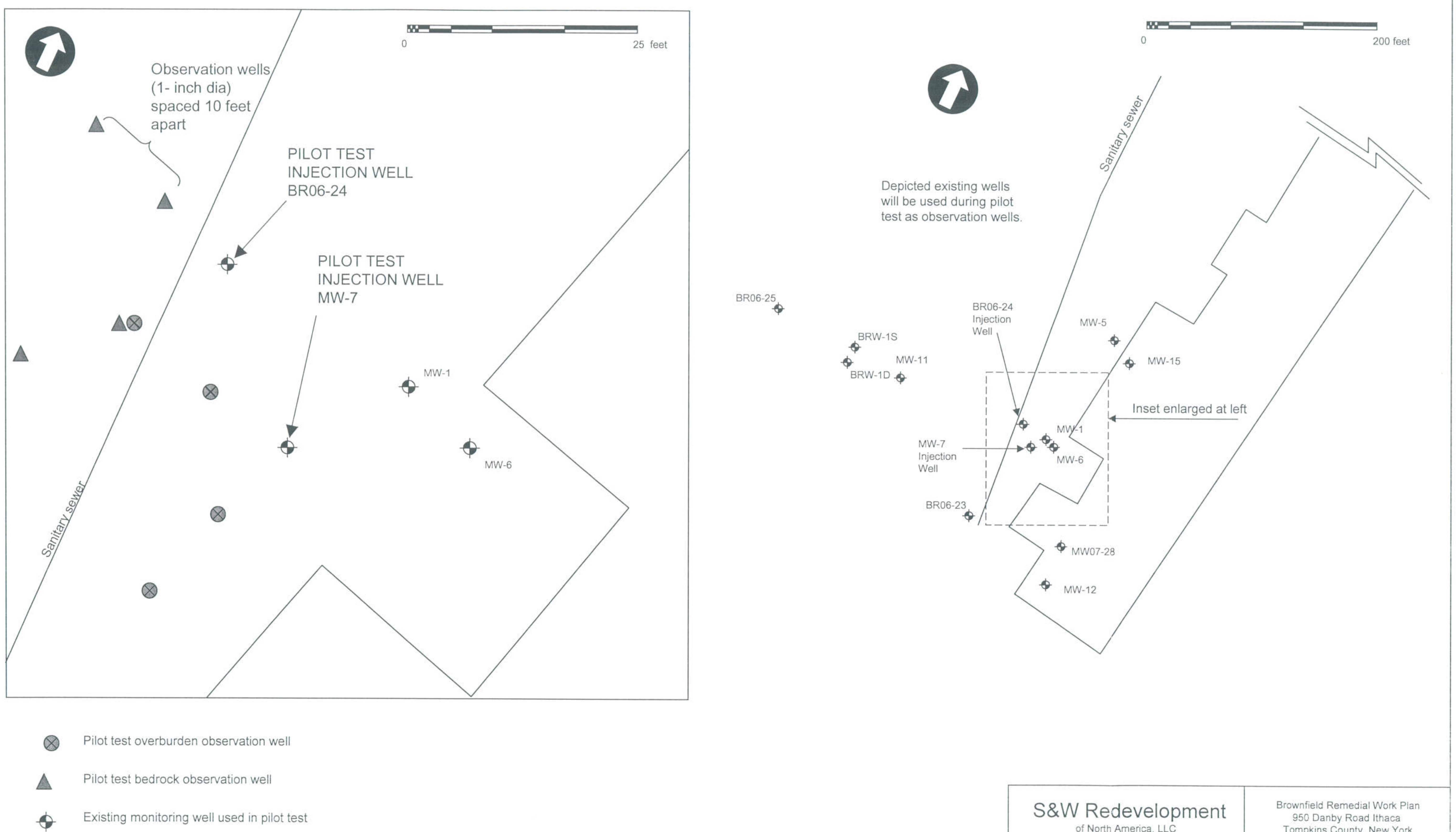


S&W Redevelopment
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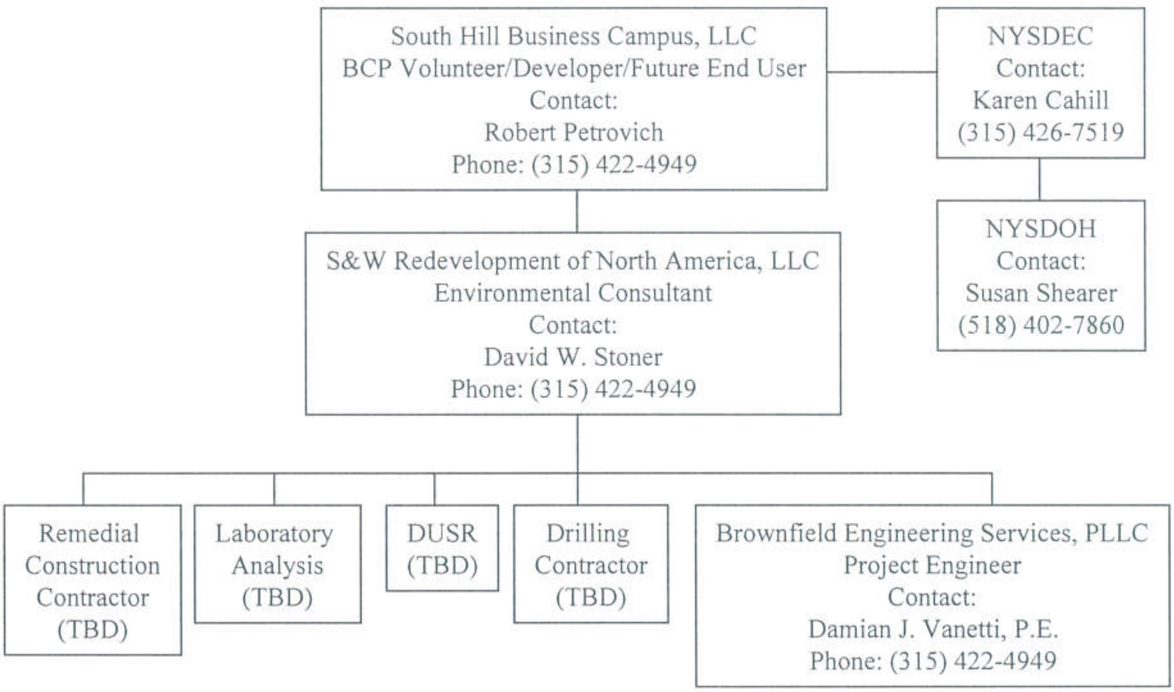
DATE: 2/2008 Job No. B4001

Brownfield Remedial Work Plan
950 Danby Road Ithaca
Tompkins County, New York
(BCP Site # C755012)

Figure 4-7
Pilot Test Plan

The following outline of project organization is provided. Following approval of the RWP, the project organization chart will be updated to include subcontractors that are selected for the remediation project.

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| S&W Redevelopment<br>of North America, LLC<br>Syracuse, New York | Brownfield Remedial Work Plan<br>950 Danby Road, Ithaca<br>Tompkins County, New York<br>BCP Site # C755012 |
| Feb 2008 Proj No B4001 | Figure 7-1<br>Project Organization |

# TABLES

S & W
Redevelopment

**Table 4-1. Contaminant Mass Estimates. Brownfield Remedial Work Plan, 950 Danby Road, Ithaca, NY.**

OVERBURDEN

| TCE Concentration Interval (µg/L) | Average Conc (µg/L) | Estimated Area ($ft^2$) | Approx Saturated Thickness (ft) | Estimated Groundwater Volume ($ft^3$) | Groundwater Volume (liters) | Estimed Mass (g) | Estimated Pounds of TCE | Estimated Pounds of Permanganate Needed to Degrade TCE |
|---|---|---|---|---|---|---|---|---|
| 10 - 24 | 17 | 73,000 | 2 | 146,000 | 4,171,429 | 71 | 0.16 | |
| 25 - 49 | 37 | 53,500 | 2 | 107,000 | 3,057,143 | 113 | 0.25 | |
| 50 - 99 | 75 | 9,800 | 2 | 19,600 | 560,000 | 42 | 0.09 | |
| 100 - 340 | 220 | 9,900 | 2 | 19,800 | 565,714 | 124 | 0.27 | |
| | | | TCE Totals | 292,400 | 8,354,286 | 350 | 0.8 | 1.9 |

| DCE Concentration Interval (µg/L) | Average Conc (µg/L) | Estimated Area ($ft^2$) | Approx Saturated Thickness (ft) | Estimated Groundwater Volume ($ft^3$) | Groundwater Volume (liters) | Estimed Mass (g) | Estimated Pounds of DCE | Estimated Pounds of Permanganate Needed to Degrade DCE |
|---|---|---|---|---|---|---|---|---|
| 10 - 49 | 29 | 80,700 | 2 | 161,400 | 4,611,429 | 134 | 0.29 | |
| 50 - 99 | 75 | 31,200 | 2 | 62,400 | 1,782,857 | 134 | 0.29 | |
| 100 - 820 | 460 | 11,300 | 2 | 22,600 | 645,714 | 297 | 0.65 | |
| | | | DCE Totals | 246,400 | 7,040,000 | 564 | 1.2 | 5.4 |

| VC Concentration Interval (µg/L) | Average Conc (µg/L) | Estimated Area ($ft^2$) | Approx Saturated Thickness (ft) | Estimated Groundwater Volume ($ft^3$) | Groundwater Volume (liters) | Estimed Mass (g) | Estimated Pounds of VC | Estimated Pounds of Permanganate Needed to Degrade VC |
|---|---|---|---|---|---|---|---|---|
| 2.5 - 150 | 53 | 28,200 | 2 | 56,400 | 1,611,429 | 85 | 0.19 | |
| | | | VC Totals | 56,400 | 1,611,429 | 85 | 0.2 | 1.6 |

| | |
|---|---|
| **Total Pounds Permanganate for Overburden** | **8.9** |

BEDROCK

| TCE Concentration Interval (µg/L) | Average Conc (µg/L) | Estimated Area ($ft^2$) | Approx Saturated Thickness (ft) | Estimated Groundwater Volume ($ft^3$) | Groundwater Volume (liters) | Estimed Mass (g) | Estimated Pounds of TCE | Estimated Pounds of Permanganate Needed to Degrade TCE |
|---|---|---|---|---|---|---|---|---|
| 75 - 124 | 99 | 27,600 | 10 | 276,000 | 7,885,714 | 781 | 1.72 | |
| 125 - 249 | 187 | 9,800 | 10 | 98,000 | 2,800,000 | 524 | 1.15 | |
| 250 - 499 | 375 | 13,800 | 10 | 138,000 | 3,942,857 | 1,479 | 3.25 | |
| 500 - 999 | 750 | 23,700 | 10 | 237,000 | 6,771,429 | 5,079 | 11.17 | |
| 1000 - 2200 | 1600 | 7,900 | 10 | 79,000 | 2,257,143 | 3,611 | 7.95 | |
| | | | TCE Totals | 828,000 | 23,657,143 | 11,473 | 25.2 | 60.6 |

| DCE Concentration Interval (µg/L) | Average Conc (µg/L) | Estimated Area ($ft^2$) | Approx Saturated Thickness (ft) | Estimated Groundwater Volume ($ft^3$) | Groundwater Volume (liters) | Estimed Mass (g) | Estimated Pounds of TCE | Estimated Pounds of Permanganate Needed to Degrade DCE |
|---|---|---|---|---|---|---|---|---|
| 10 - 49 | 29 | 64,700 | 10 | 647,000 | 18,485,714 | 536 | 1.18 | |
| 50 - 99 | 75 | 41,200 | 10 | 412,000 | 11,771,429 | 883 | 1.94 | |
| 100 - 499 | 300 | 27,300 | 10 | 273,000 | 7,800,000 | 2,340 | 5.15 | |
| 500 - 999 | 750 | 20,500 | 10 | 205,000 | 5,857,143 | 4,393 | 9.66 | |
| 1000 - 3700 | 2350 | 14,400 | 10 | 144,000 | 4,114,286 | 9,669 | 21.27 | |
| | | | DCE Totals | 1,537,000 | 43,914,286 | 8,152 | 17.9 | 78.2 |

| VC Concentration Interval (µg/L) | Average Conc (µg/L) | Estimated Area ($ft^2$) | Approx Saturated Thickness (ft) | Estimated Groundwater Volume ($ft^3$) | Groundwater Volume (liters) | Estimed Mass (g) | Estimated Pounds of TCE | Estimated Pounds of Permanganate Needed to Degrade VC |
|---|---|---|---|---|---|---|---|---|
| 10 - 49 | 29 | 32,400 | 10 | 324,000 | 9,257,143 | 268 | 0.59 | |
| 50 - 99 | 75 | 9,400 | 10 | 94,000 | 2,685,714 | 201 | 0.44 | |
| 100 - 200 | 150 | 4,300 | 10 | 43,000 | 1,228,571 | 184 | 0.41 | |
| | | | VC Totals | 461,000 | 13,171,429 | 654 | 1.4 | 12.2 |

| | |
|---|---|
| **Total Pounds Permanganate for Bedrock** | **151.0** |

# TABLE 6-1
## PROPOSED SCHEDULE
### REMEDIAL ACTION
### SOUTH HILL BUSINESS CAMPUS
### 950 DANBY ROAD, ITHACA, NY
### BCP SITE NO. C755012

| | |
|---|---|
| ➢ Submit RIR/RWP to NYSDEC and Distribute Fact Sheet | December 10, 2007 |
| ➢ Forty-five Day Comment Period | Ends January 24, 2008 |
| ➢ NYSDEC Approval of RIR and RWP | February 27, 2008 |
| ➢ 10 Day Notification | 10 days Prior to construction |
| ➢ ISCO Pilot Test | Begin March 12, 2008 (2 Week Duration) |
| ➢ Submit ISCO Remedial Design Document | March 24, 2008 |
| ➢ NYSDEC/NYSDOH Review and Acceptance | |
| ➢ Remedial Construction | |
| - Remove USTs / Impacted Soil | March 24 - April 4, 2008 |
| - Install ISCO Injection/Observation Wells | April 7 - April 18, 2008 |
| - Implement ISCO Injection | April 21 – May 2, 2008 |
| ➢ Submit Final Engineering Report with Site Management Plan (FER/SMP) | May 16, 2008 |
| ➢ NYSDEC Review / Comment on FER | June 6, 2008 |
| ➢ Respond to NYSDEC FER Comments | June 20, 2008 |
| ➢ Record Environmental Easement with County | June 30, 2008 |
| ➢ Distribute Fact Sheet that FER is Complete and COC will be issued | June 30, 2008 |
| ➢ NYSDEC Issues COC | July 7, 2008 |

# APPENDICES

S&W
Redevelopment

# Appendix A
# Pilot Test Work Plan

S&W Redevelopment

**APPENDIX A**
**ISCO PILOT TEST WORK PLAN**
**SOUTH HILL BUSINESS CAMPUS**
**950 DANBY ROAD**
**ITHACA, NEW YORK**

## INTRODUCTION

This Work Plan presents the approach to conduct a remediation pilot test at the South Hill Business Campus BCP site. S&W Redevelopment of North America, LLC (SWRNA) has submitted to NYSDEC a draft Remedial Work Plan (RWP – December 2007). As indicated in the RWP, in situ chemical oxidation (ISCO) was selected as the remedy for this site based on a review of groundwater analytical data. In order to provide additional site information needed to develop a detailed remedial design and implementation approach, a pilot scale test will be completed, following NYSDEC approval of this Plan. The specific objectives of the pilot test will be:

- to determine the radius of influence that results from fluid injection,
- to estimate travel time of the injected chemical oxidant (potassium permanganate)
- to estimate residence time (i.e. reaction life) of the chemical oxidant,
- to measure sustainable injection rates for fluid injection.

Following the completion of the pilot test a remedial design document will be prepared and submitted to NYSDEC for approval prior to implementing full scale ISCO injection.

## APPROACH

Potassium permanganate was selected as a chemical oxidant for this site for several reasons:

- It is a strong oxidant capable of destroying the target contaminants (chlorinated VOCs), yet it is a fairly stable chemical compared to other commercially available oxidants (ozone, peroxide)

- It comes in solid form making it reasonably safe to transport and handle provided reasonable caution is followed.
- It may persist after injection, up to several months, giving it more reaction time and dispersing it over greater distances than more "aggressive" oxidants (ozone, peroxide + fenton's reagent) that more quickly consume contaminants.
- It does not evolve gases, vapors, and heat as other oxidants are prone to.
- It has a proven ISCO track record.

The pilot test will precede the full scale implementation of the ISCO system, providing necessary information concerning the target injection area to develop a detailed system design and implementation approach.

### A. Injection Wells

The pilot test will inject a small quantity (between 300 to 500 gallons) of 3 percent potassium permanganate solution into each of two existing monitoring wells, including overburden monitoring well MW-7 and bedrock monitoring well MW06-24BR. MW-7 and MW06-24BR produced groundwater samples that contained the highest levels of dissolved organic contaminants in the overburden and bedrock, respectively. It is therefore anticipated that the ISCO system injection will include this target area.

### B. Observation Wells

One-inch diameter observation wells will be installed, approximately 10 feet apart, along two approximately perpendicular lines projecting out from monitoring wells MW-7 and MW06-24BR, respectively. Proposed observation well locations are shown on Figure 1, including four (4) overburden and four (4) bedrock observation wells.

The overburden observation wells will be installed using direct push methods to bedrock surface refusal, which in this area of the site is estimated to be approximately 10 to 15 feet below ground surface (bgs). One-inch diameter PVC wells will be installed with five-foot screens that extend from the bottom of the well (bedrock surface) to the water table. For this area if the site, the saturated thickness above bedrock is estimated to be less than 2 feet. The annular space of the borehole will be filled with #3 silica sand from the bottom of the borehole to at least 2 feet above the top of the well screen. At least two feet of bentonite pellets will be placed above the sand filter pack, and the remaining space will be backfilled with a grout/Portland cement mixture. The observation wells will be secured with locking stick-up protective iron casings.

Bedrock observation wells will be installed in similar fashion to bedrock wells installed during the Remedial Investigation, by advancing augers three to five (3 to 5) feet into bedrock, and then grouting four (4) inch inside diameter iron casing in place to form a watertight seal between overburden and bedrock. The grout will be allowed to cure a minimum of one day. Drilling will then resume by coring approximately seven feet into bedrock below the bottom of the 4-inch iron casing. One inch diameter PVC monitoring wells will be installed in the completed boring, with 2 to 4 feet of 0.01 inch slot screen. The well construction will include a sand filter pack and a bentonite seal. The remaining space will be backfilled with a Portland cement grout.

In addition to the four (4) overburden and four (4) bedrock observations wells installed for the pilot test, existing overburden and bedrock monitoring wells will also be used during the pilot test, including MW-1, MW-5, MW-6, MW-11, MW-12, MW-15, MW06-23BR, MW06-25BR, MW07-28, BR-1S, and BR-1D (see Figure 1). Monitoring wells MW-12, MW-15, and MW07-28 are located inside the building.

**B. Pre-Test Monitoring.** Prior to the start of the pilot test, water levels will be measured at the eleven (11) existing monitoring well indicated above and shown on Figure 1, plus the eight (8) newly-installed observation wells. In addition, groundwater samples will be collected and analyzed for VOCs (8760) and field parameters (pH, Eh, dissolved oxygen, specific conductance, temperature), as a confirmatory measure.

One overburden soil sample and one bedrock fragment sample will be analyzed to determine the permanganate soil oxidant demand (PSOD). This data will be used to formulate the dosage of the permanganate solution during the design of the final ISCO system. A rock sample will be collected from a core extracted from the closest observation well boring to MW06-24BR, and a soil sample will be collected from the closest observation well boring to MW-7.

An air sample will also be collected from the exhaust of the sub-slab depressurization system (SSDS) that currently operates at the site, at least one day prior to beginning the pilot test. The exhaust sample will be collected following applicable procedures for air sample collection described in the NYSDOH Soil Vapor Intrusion Guidance Document (October 2006). The pre-pilot test SSDS exhaust sample will be compared to a post-pilot test exhaust sample, as discussed below.

**C. Pilot Test**. A small quantity (approximately 300 - 500 gallons) of potassium permanganate solution (3%) will be introduced into each of wells MW-7 and MW06-24BR. The injection for MW-7 will occur first, and will be followed by the injection at MW06-24BR.

It is estimated that the introduction of the permanganate solution can be done in a single day for each location. During introduction of the permanganate solution in each well, water levels and field parameters (pH, Eh, DO, conductance, and temperature) will be measured at one-hour intervals in the eight overburden and bedrock observation wells. In addition, the color of the water will be examined for purple coloration. (Adequate permanganate concentrations to sustain chemical oxidation reactions are easily identified by purple color).

A key objective will be to determine the effects of overburden injection at MW-7 has on the upper bedrock zone. It is expected that overburden injection may potentially reach the upper bedrock, based on the presence of contamination in the upper bedrock which suggests connectivity with the overburden. A hydraulic connection between overburden and bedrock, if one exists, will be verified by breakthrough of purple permanganate solution in bedrock observation wells as injection at MW-7 takes place.

As previously noted, it is generally recognized that ISCO by potassium permanganate produces neither the gas evolution nor the heat generation that is apt to result from other ISCO applications such as ozone and peroxide/fenton's reagent (ITRC, 2005; Seigrist et al, 2001). However, as a precautionary measure, and at the request of NYSDEC, an air exhaust sample will be collected from the stack of the sub-slab depressurization system (SSDS) that currently operates at the site. This sample will be collected near or immediately after the conclusion of the pilot test, to determine whether VOC levels in the SSDS exhaust are significantly higher than were measured before the start of the pilot test.

**D. Post-Test Sampling.** Two weeks after the pilot test at MW-7 and MW06-24BR is completed, groundwater samples will be collected from those two injection wells plus the eight observation wells used for the pilot test, and analyzed for VOCs (8260). Field parameters and color will also be measured.

The data acquired by the above efforts will help us to determine an appropriate design for an ISCO delivery system. Our objective is to conduct the above pilot test and associated monitoring in March 2008, following NYSDEC approval.

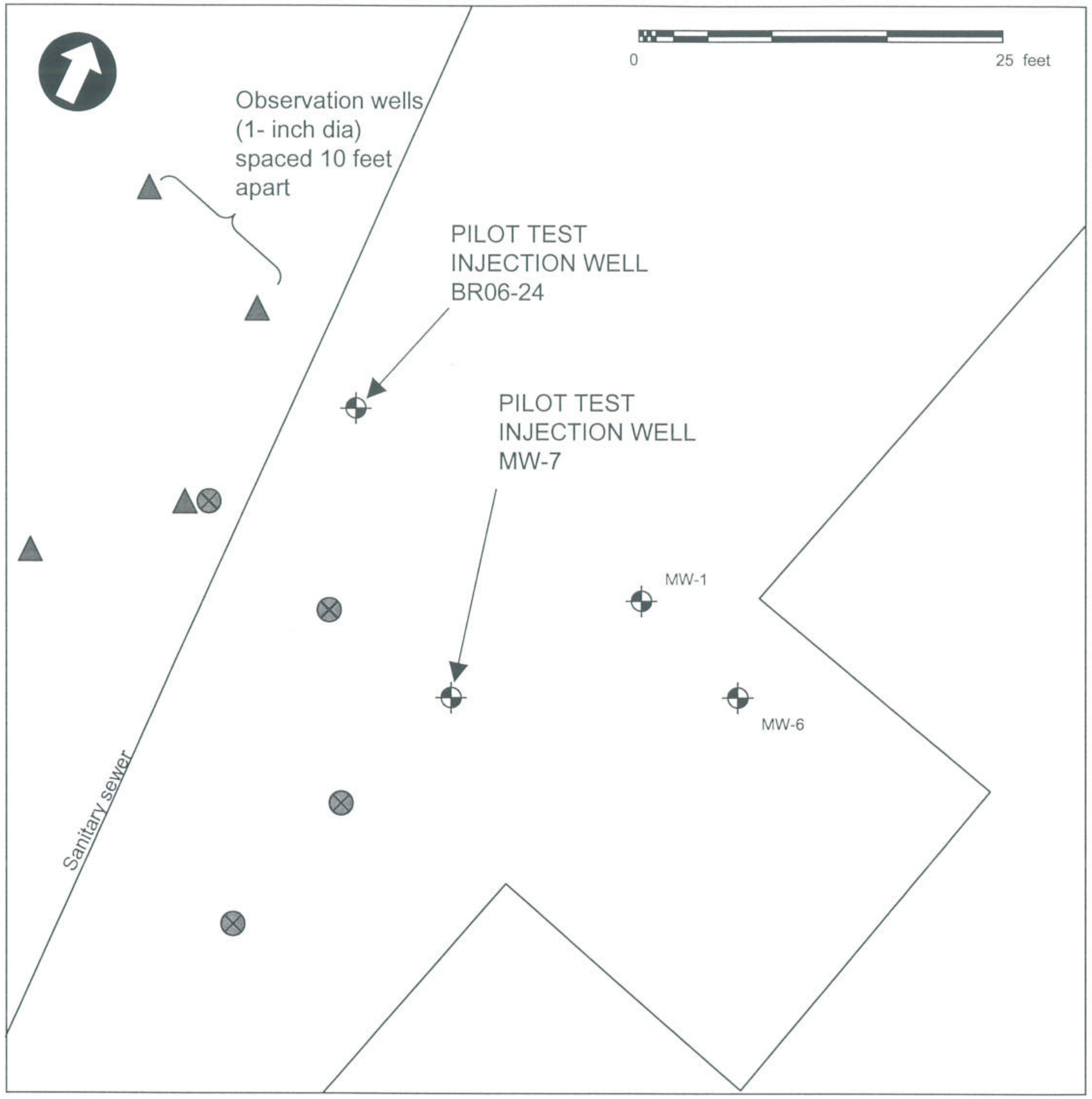
## REFERENCES

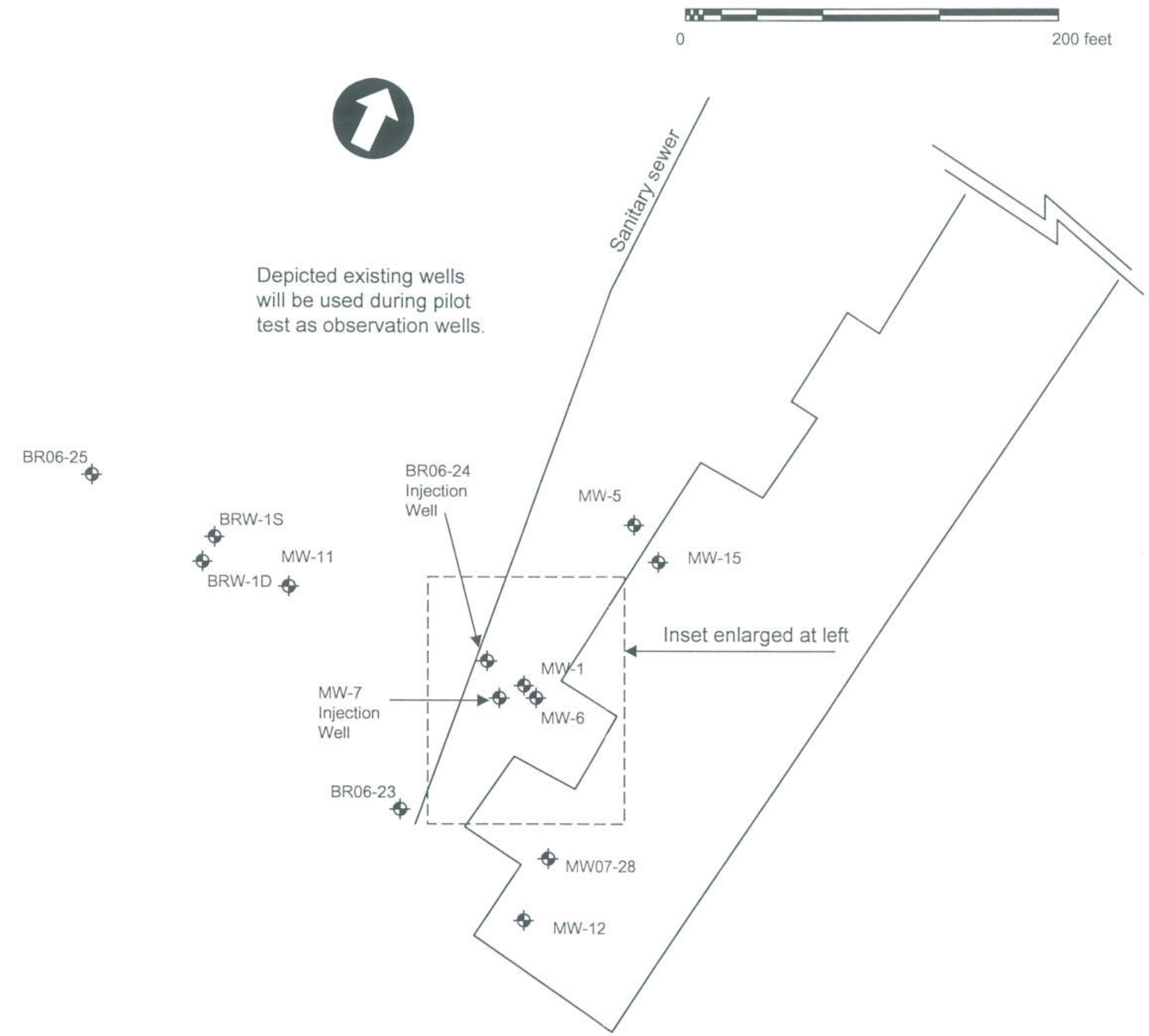
S&W Redevelopment of North America, LLC. December 2007. *Draft Remedial Work Plan, 950 Danby Road.*

Robert L. Siegrist, Michael A. Urynowicz, Olivia R. West, Michelle L. Crimi, Kathryn S. Lowe, 2001. *Principles and Practices of in situ Chemical Oxidation Using Permanganate* Battelle Press, Columbus, OH.

ITRC, January 2005. *Technical and Regulatory Guidance for In-Situ Chemical Oxidation of Contaminated Soil and Groundwater.*

Huling, S and B Pivetz, August 2006. In-Situ Chemical Oxidation, USEPA Engineering Issue. EPA/600/R-06/072.




Pilot test overburden observation well

Pilot test bedrock observation well

Existing monitoring well used in pilot test

S&W REDEVELOPMENT
Syracuse, New York

| | |
|---|---|
| Drawn by: DPO | Feb 2008 |
| Proj No. B4001 | |

South Hill Business Campus
950 Danby Road
Ithaca, New York
Brownfield Cleanup Program
(BCP Site # C755012)

Figure 1
Appendix A - Pilot Test Plan

Appendix B
Site Health and Safety Plan

S&W
REDEVELOPMENT

**APPENDIX B**
**SITE SPECIFIC HEALTH AND SAFETY PLAN**
**SOUTH HILL BUSINESS CAMPUS**
**950 DANBY ROAD, ITHACA, NY**
**REMEDIAL ACTION WORK PLAN**

## 1.0 SITE DESCRIPTION

Date ............................................................................Revised: December 2007
Location ........................................................................................950 Danby Road,
Ithaca, Tompkins County, NY
Possible Hazards ...........................................................Volatile organic compounds
in soil and groundwater. Physical hazards relating to soil excavation work.
Exposure to potassium permanganate.
Potential Area Affected ........................... Subsurface, surface soils, groundwater.
Surrounding Population .............................................Mixed residential/commercial
Topography ...................................................................................................Steep
Weather Conditions ......................... Usually partly sunny to overcast, south winds

The BCP site occupies 42 acres on the west side of New York State Route 96B (Danby Road) in the Town of Ithaca, Tompkins County, New York (Figure 1-2). It is located approximately 850 feet above mean sea level (amsl) on the west/northwest flank of South Hill. Site topography slopes steeply to the northwest towards the City of Ithaca, which is located approximately ½ mile north of the site at approximately 393 feet amsl. There is approximately 460 feet of topographic relief between the site and the City.

## 2.0 - ENTRY OBJECTIVES

The objective of site entry is to remove two (2) 9,000 gallon underground storage tanks (USTs) and associated contaminated soils, if any, and to install an in-situ groundwater remediation system.

An excavator will be used to expose and remove USTs and contaminated soil from the affected areas. The USTs will be temporarily staged on site prior to off site disposal. Impacted soils will be stock-piled on plastic at the site and covered with plastic at the end of each day.

A truck mounted drilling rig will be used to install in-situ injection and monitoring points. Some trenching, by backhoe, may also be required.

## 3.0 - TRAINING AND MEDICAL SURVEILLANCE REQUIREMENTS

All personnel conducting work at this site with a potential for exposure to site contaminants shall have completed the appropriate health and safety training commensurate to their job tasks/duties.

Work Crews conducting site excavation work shall be qualified and trained to perform such work. Such training should include, but not necessarily be limited to, the following:

- Hazard communication;
- 40-hour OSHA HAZWOPER Training and 8-hour refresher training (as necessary) in accordance with 29 CFR 1926.65;
- Excavation safety training;
- Personal protective equipment and decontamination; and
- Site-specific training on equipment to be used and the safety precautions.

## 4.0 – ON-SITE ORGANIZATION AND COORDINATION

S&W Redevelopment of North America, LLC (SWRNA), the South Hill Business Campus LLC, and subcontractors employed to conduct site work shall each designate personnel on their respective Work Crews, who shall be responsible for maintaining proper accident prevention and hazard communication measures for their respective Crews. At a minimum, each respective Work Crew should designate a Project Leader, a Field Leader, and a Site Safety Officer.

The following SWRNA personnel are designated to carry out the stated job functions on site for the SWRNA Work Crew. (Note: One person may carry out more than one job function.)

Project Leader:................................................ Daniel Ours, or designee (315)422-4949
Site Safety Officer: ....................................Thomas Byrnes, or designee (315)422-4949
Field Leader:............................................... Jeffrey Kiggins, or designee (315)422-4949
Field Members:................................................ Jayme Rapp, or designee (315)422-4949

## 5.0 - ON-SITE CONTROL

The owner (South Hill Business Campus, LLC) of the property is designated to coordinate access control and security on site. Control boundaries have been established as necessary. These boundaries will be identified as the site perimeter.

## 6.0 - HAZARD EVALUATION

The following contaminants are may be found on site, primarily in site soils and groundwater. The primary hazards of each are identified.

| SUBSTANCE | PRIMARY HAZARDS |
|---|---|
| ***Volatile Organics*** | |
| Trichlorethene | Eye & skin irritation, nausea, vomiting, headache |

| SUBSTANCE | PRIMARY HAZARDS |
|---|---|
| 1,2-dichloroethene (cis- and trans-) | Eye irritant, respiratory irrit. |
| Vinyl chloride | Abdom. Pain, weakness |

The above contaminants are similar with respect to the potential routes of exposure. The principal exposure route is via direct contact and inhalation of dust/particulate matter.

There are also potential chemical hazards associated with the handling and application of chemical oxidant – potassium permanganate – that will be used in the groundwater remediation system. A material safety data sheet for potassium permanganate is attached to this plan. The main exposure routes for potassium permanganate are direct contact with skin/eyes, and inhalation of dry permanganate as dust. There are also risks associated with accidental ingestion.

Because it is a reactive chemical oxidant, potassium permanganate may burn skin and eyes on contact. If inhaled in dust form, it may damage the respiratory tract. If ingested, it may cause severe burns to mucous membranes of the mouth, throat, esophagus, and stomach.

The main physical hazards associated with the project scope are close proximity to backing/moving heavy equipment and haul trucks, vehicle traffic, noise, excavation hazards, lifting, heat stress, and potential adverse weather conditions. SWRNA, and other subcontractors conducting site work will each be responsible for maintaining proper accident prevention and hazard communication measures appropriate for their respective Work Crews, based on the Crew's specific assignment, in relation to these potential hazards. In addition, each will be responsible for determining whether there are other ancillary physical hazards to which their respective Work Crews may be exposed, based on the Crew's specific assignment, and will communicate those risks, if any, to their respective Work Crews.

Basic safety guidelines for the above noted main physical hazards are included below.

A. **Excavation and Backfilling.** Site activities will involve excavation and trenching of impacted material. The estimated location of all underground utilities must be determined before digging begins. Necessary clearances must be observed. Appropriate engineering controls will be implemented during excavation to maintain road stability and protect the public.

B. **Utility Clearances.** Prior to any intrusive activities (e.g. drilling, excavating, probing) New York State Dig Safe shall be contacted to mark underground lines before any work is started.

Personnel directly involved in intrusive work shall determine the minimum distance from marked utilities which work can be conducted with the assistance of the locator line service.

C. **Heavy Lifting Method.** Personnel conducting work that may require lifting of heavy objects should use the following proper lifting techniques:

- Feet must be parted, with one foot alongside the object being lifted and one foot behind. When the feet are comfortably spread a more stable lift can occur and the rear foot is in a better position for the upward thrust of the lift.
- Use the squat position and keep the back straight. A straight back means the spine, back muscles, and organs of the body in correct alignment.
- To grip the item being lifted, the fingers and the hand are extended around the object being lifted, using the full palm. Fingers have very little power – use the strength of the entire hand.
- The load must be drawn close, and the arms and elbows must be tucked into the side of the body. Holding the arms away from the body increases the strain on the arms and elbows. Keeping the arms tucked in helps keep the body weight centered.

The body must be positioned so that the weight of the body is centered over the feet. This provides a more powerful line of thrust and also ensures better balance. Start the lift with a thrust of the rear foot. Do not twist.

D. **Slip/Trip/Hit/Fall.** These injuries are the most frequent of all injuries to workers. They occur for a wide variety of reasons, but can be minimized by the following practices:

- Spot-check the work area to identify hazards;
- Establish and utilize pathways that are most free of slip and trip hazards. Avoid pathways that are more hazardous;
- Beware of trip hazards such as wet floors, slippery floors, and uneven terrain;
- Carry only loads you can see over;
- Keep work areas clean and free of clutter, especially in storage areas and walkways;
- Communicate observed hazards to site personnel.

E. **Heat Stress.** All field personnel engaged in site work shall have completed training to recognize and avoid heat related illness. Proper training and preventive measures will aid in averting loss of worker productivity and serious illness. Heat stress prevention is particularly important because once a person suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat-related illness. To avoid heat stress, the following steps may be taken:

- Adjust work schedules.

    Modify work/rest schedules according to monitoring requirements.

    Mandate work slowdowns as needed.

    Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.

- Provide shelter (air conditioned, if possible) or shaded areas to protect personnel during rest periods.

- Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, i.e., eight fluid ounces (0.23 liters) of water must be ingested for approximately every eight ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:

- Members of each Work Crew shall be properly trained by each Crew's respective employer to recognize the symptoms of heat-related illnesses.

F. **Adverse Weather Conditions.** The Field Leader for each Work Crew will be responsible for deciding on the continuation or discontinuation of work for his/her Crew based on current and pending weather conditions. Electrical storms, tornado warnings, and strong winds are examples of conditions that would call for the discontinuation of work and evacuation of the site. Site operations should not be permitted during an electrical storm.

G. **Vehicle Traffic.** As the scope of work includes the transport and disposal of material, there is a potential to encounter a temporarily high volume of vehicular traffic. Project Work Crews that have the potential to be exposed to vehicle traffic should wear a high visibility safety vest. The excavation Work Crew will provide proper signage, flagging, and barricades to maintain a safe flow of traffic.

The following table summarizes potential physical hazards associated with the proposed site work, and basic preventative measures and controls.

| POTENTIAL HAZARD | PREVENTATIVE MEASURES |
|---|---|
| Slip/Trip/Falls | Use three points of contact to mount and dismount equipment. Continuously inspect work areas for slip, trip, & fall hazards. Be aware of surroundings. Practice good housekeeping. |
| Noise | Wear appropriate hearing protection. |
| Pinch Points | Keep hands, feet, & clothing away from moving parts/devices. |
| Utilities | Maintain proper utility clearances. All utilities should be properly located and marked out prior to start of work. |
| Heavy Lifting | Follow safe lifting practices. Lift items within your capabilities and assigned project role. Ask for assistance if necessary. |
| Proximity to Heavy Equipment and Vehicles | Maintain adequate distance from trucks/equipment. Obey barriers and/or signage |
| Heat/Cold Stress | Dress appropriately and follow HASP guidelines |
| Dangerous Weather Conditions | Consult local weather reports daily, watch for signs of severe weather, etc. Suspend or reduce work during severe weather. |
| Chemical hazards | Use PID as indicated in HASP. Wear specified PPE. No smoking. |
| Biological Hazards – Insects, Snakes, Poison Plants, etc. | Wear appropriate PPE and keep necessary first aid supplies readily available. Use insect repellant and snake chaps as needed. Learn to identify poisonous plants. |

## 7.0 - PERSONAL PROTECTIVE EQUIPMENT

Based on evaluation of potential hazards, the following levels of personal protection have been designated for the applicable work areas or tasks:

| LOCATION | JOB FUNCTION | LEVEL OF PROTECTION |
|---|---|---|
| Work zone | Site investigation | A B C <u>D</u> Other |

Specific protective equipment for each level of protection is as follows:

| | |
|---|---|
| Level A | Fully-encapsulating suit<br>SCBA (disposable coveralls) |
| Level B | Splash gear (saranax-coated Tyvek suit)<br>SCBA or airline respirators |
| Level C | Splash gear (Tyvek suit)<br>Full-face canister respirator<br>Boots<br>Gloves<br>Hard hat |
| **Level D** | Coveralls<br>Safety glasses<br>Boots<br>Gloves (rubber or plastic)<br>Hard hat |

**Action Levels**. The following criteria shall be used to determine appropriate action:

| VOLATILE ORGANICS IN BREATHING ZONE* | LEVEL OF RESPIRATORY PROTECTION |
|---|---|
| Less than 10 ppm | Level D |
| 10 - 50 ppm | Upgrade to Level C |
| > 50 ppm | Stop work and evacuate |

* sustained readings of 15 minutes or more above background levels, based on photoionization detector (PID) measurement.

The following protective clothing materials are required for the involved substances:

| SUBSTANCE | PPE |
|---|---|
| 1,2 dichloroethene | Level D |
| Trichlroethene | Level D |
| Potassium permanganate | Level D ** |

** Level D for potassium permanganate will be upgraded to also include a dust mask, to be worn when handling/mixing in solid (powdered) form, and a plastic or rubber apron.

## 8.0 - COMMUNICATION PROCEDURES

The Field Leader for each Work Crew should remain in communication with his/her respective Project Leader. Cellular phones should be used in the field for this purpose.

Continuous horn blast is the emergency signal to indicate that all personnel should leave the Work Zone.

In the event that radio communications are used, the following standard hand signals will be used in case of failure of radio communications:

Hand gripping throat........................................................ Out of air; can't breathe
Grip partner's wrist or both hands around waist.............. Leave area immediately
Hands on top of head ........................................................ Need assistance
Thumbs up ........................................................................ OK; I'm all right; I understand
Thumbs down ................................................................... No; negative

## 9.0 - SITE HEALTH AND SAFETY

A. **Emergency Medical Care.** The Cayuga Medical Center is located at 101 Dates Drive in the City of Ithaca, approximately 5 miles from the site. A map of the route to this facility will be available at the field vehicle.

First aid equipment is available on site at the following locations:

First aid kit    Field vehicle

List of emergency phone numbers:

| AGENCY/FACILITY | PHONE NUMBER |
|---|---|
| Police (Tompkins County Sheriff) | 911 |
| Fire | 911 |
| Ambulance | 911 |
| Cayuga Medical Center | (607) 274-4498 |

B. **Environmental Monitoring.** The following environmental monitoring instruments shall be used on site at the specified intervals:

- MiniRAE photoionization detector (PID). Continuous during installation of soil borings and soil gas monitoring probes.
- Dust (particulate) monitor. Continuous during installation of soil borings per Community Air Monitoring Plan (CAMP)

C. **Emergency Procedures.** The designated Site Safety Officer for each respective Work Crew shall inform his/her respective Crew members of proper emergency procedures. The following standard procedures will be used by SWRNA on-site personnel:

a. **Personnel Injury in the Work Zone.** Upon notification of an injury in the Work Zone, the designated emergency signal, a continuous horn blast, shall be sounded. A rescue team will enter the Work Zone (if required) to remove the injured person to safety. Appropriate first aid shall be initiated and contact should be made for an ambulance and with the designated medical facility (if required). No persons shall re-enter the Work Zone until the cause of the injury or symptoms is determined.

b. **Fire/Explosion.** Upon notification of a fire or explosion on site, the designated emergency signal, a continuous horn blast, shall be sounded and all site personnel assembled at the decontamination line. The fire department shall be alerted and all personnel moved to a safe distance from the involved area.

c. **Personal Protective Equipment Failure.** If any site worker experiences a failure or alteration of protective equipment that affects the protection factor, that person and his/her buddy shall immediately leave the Work Zone. Re-entry shall not be permitted until the equipment has been repaired or replaced.

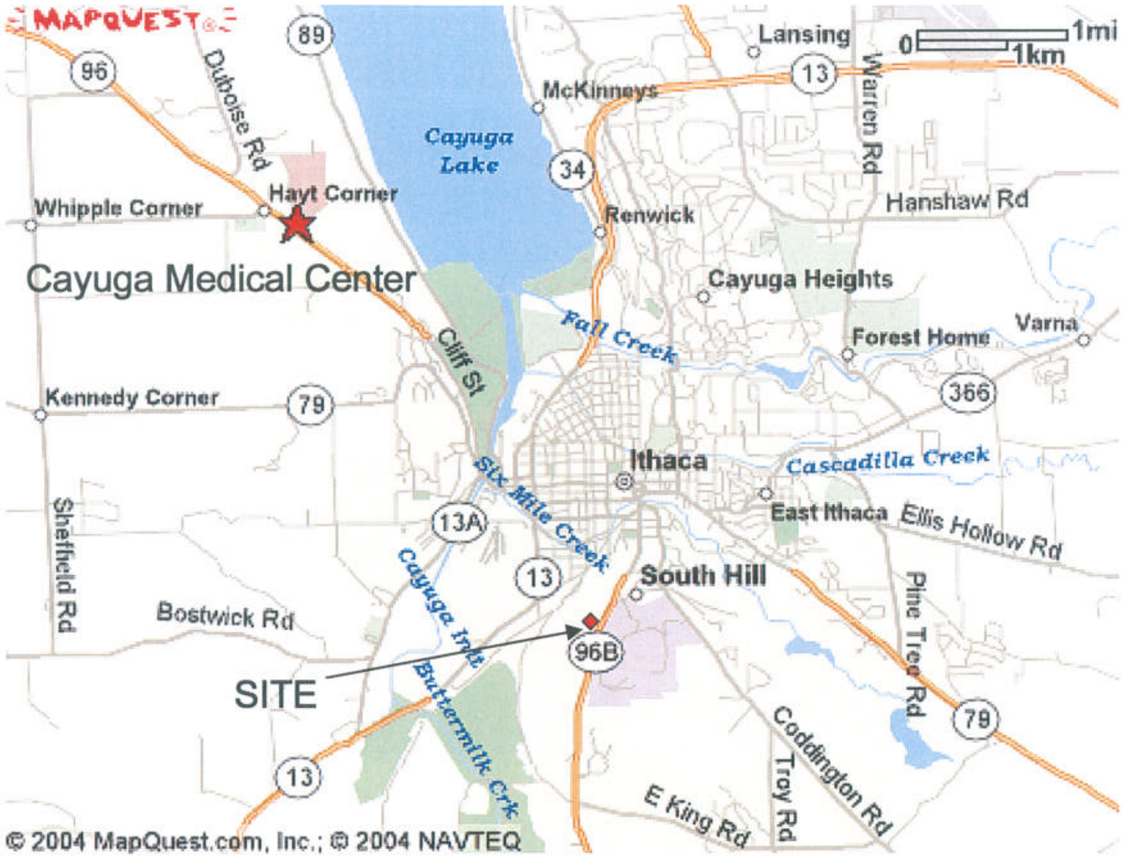
d. **Other Equipment Failure.** If any other equipment on site fails to operate properly, the designated equipment operator will notify his/her respective Project Leader and Site Safety Officer, who shall then determine the effect of this failure on continuing operations on site. If the failure affects the safety of personnel or prevents completion of the Work Plan tasks, all personnel shall leave the Work Zone until the situation is evaluated and appropriate actions taken.

In all situations, when an on-site emergency results in evacuation of the Work Zone, personnel shall not re-enter until:

- The conditions resulting in the emergency have been corrected.
- The hazards have been reassessed.
- The Site Health and Safety Plan has been reviewed.
- Site personnel have been briefed on any changes in the Site Health and Safety Plan.

D. **Personal Monitoring.** The following personal monitoring will be in effect on site:

- Personal exposure sampling: MiniRAE PID screening or organic vapor monitors.
- MiniRAM air particulate monitor to determine the presence of dust.




1. Go North on NY 96B/Danby Road (1.1 miles)
2. NY 96B becomes S Aurora Street (0.1 mile)
3. Turn Left onto NY 79 W/E Seneca St (0.8 mile)
4. Turn Right onto NY 89/NY 96/Taughannock Blvd (<0.1 mile)
5. Turn Left onto NY 96/W Buffalo St. Continue to follow NY 96 (2.3 miles)
6. Turn Right onto Harris B Dates Dr (<0.1 mile)

Total Distance 4.69 miles

| | |
|---|---|
| **S&W Redevelopment** of North America, LLC Syracuse, New York | 950 DANBY ROAD, LLC AXIOHM FACILITY ITHACA, NEW YORK |
| FEB 2006 Proj No. B4001 | FIGURE B-1 ROUTE TO HOSPITAL |

# Appendix C
# Community Air Monitoring Plan

S & W
Redevelopment

## APPENDIX C

## COMMUNITY AIR MONITORING PLAN

### C.1 - INTRODUCTION

As part of a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) (BCA No. C755012), South Hill Business Campus, LLC (the Applicant and Owner) has completed a Remedial Investigation (RI) at the site located at 950 Danby Road, in Ithaca, New York, and is prepared to proceed with the Remedial Action component of the BCA.

Under the terms of the BCP, the Volunteers must select an appropriate remediation strategy to support the site's contemplated future use. S&W Redevelopment of North America, LLC (SWRNA) will complete the Remedial Action on behalf of the Volunteers. This Community Air Monitoring Plan (CAMP) describes the measures that will be undertaken during field work to monitor ambient air at the downwind site perimeter.

### C.2 - OBJECTIVES

The objective of this CAMP is to provide a measure of protection for the downwind community from potential airborne contaminant releases that might arise as a result of the planned Remedial Action, which will include the excavations of two (2) underground storage tanks (USTs) and potentially impacted soils surrounding each tank.

### C.3 - METHODS

The CAMP will include monitoring for volatile organic compounds (VOCs) and particulate matter (e.g. airborne "dust"). Readings will be recorded and will be available for State (DEC and DOH) personnel to review, as requested.

#### A. VOC MONITORING

A MiniRAE photoionization detector (PID) will be used to measure volatile organic compounds (VOCs) in air. VOCs will be monitored at the downwind perimeter of the site, based on the prevailing wind direction as determined at the beginning of each workday. The site perimeter is defined as the existing property boundary.

Upwind concentrations of VOCs will be measured at the beginning of every workday to establish background conditions. VOC concentrations will be measured continuously at the property boundary directly downwind of the work area. Downwind data will be checked as needed to provide a measure of assurance that contaminants are not being spread off site through the air. The PID will continuously record and store VOC measurements such that a 15-minute running average can be computed for the data each time the PID is checked.

- If the ambient air concentration for total organic vapors at the downwind property boundary exceeds 5 parts per million (ppm) above background for a 15-minute average, work activity will be halted and monitoring will continue until levels decline to below 5 ppm over background. At this point, work will resume and monitoring will continue.

- If total organic vapor levels at the downwind property boundary persist at levels above 5 ppm over background but less than 25 ppm, work activities will be halted, the source of the vapors will be identified, and corrective actions will be taken to abate emissions. Work will resume after organic vapor levels fall to below 5 ppm over background at the downwind property boundary.

- If organic vapor levels exceed 25 ppm at the downwind property boundary activities will be shut down. An appropriate course of action to abate emissions in order to resume work will be discussed with NYSDEC personnel.

## B. PARTICULATE MONITORING

Particulate (e.g. "dust") emissions will be measured continuously at the upwind and downwind property boundaries. Real time monitoring equipment (e.g. MiniRAM or equivalent), with audible alarms and capable of measuring particulate matter less than 10 micrometers in size, will be used.

- If the downwind particulate level is 100 micrograms per cubic meter ($ug/m^3$) greater than background (upwind) for a 15-minute period, then dust suppression techniques will be employed. Work will continue with dust suppression provided that downwind particulate levels do not exceed 150 $ug/m^3$ above upwind levels and provided that no visible dust is migrating from the work area.

- If, after dust suppression techniques, downwind particulate levels are greater than 150 ug/m$^3$ above upwind levels, work will be stopped and a re-evalaution of activities will be initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing downwind particulate concentrations to within 150 ug/m$^3$ of the upwind level and in preventing visible dust migration.

Appendix D
Fact Sheet

S&W
Redevelopment

New York State Department of Environmental Conservation

# FACT SHEET

**Brownfield Cleanup Program**

**South Hill Business Campus**
**C755012**
**Town of Ithaca**
**Tompkins County, New York**

**March 2008**

## Remedial Action to Address Brownfield Site Contamination to Begin

Construction is about to begin at 950 Danby Road in the town of Ithaca, Tompkins County, under New York's Brownfield Cleanup Program (BCP). See map for the location of the site. South Hill Business Campus, LLC (SHBC) will soon begin remedial activities to address contamination at the site with oversight provided by the New York State Department of Environmental Conservation (NYSDEC).

NYSDEC previously accepted an application submitted by SHBC to participate in the BCP. The application proposes that the site will be used for commercial purposes.

**Highlights of the Upcoming Site Remedial Activities**
Remedial activities have several goals:

1) remediate contamination at the site to a level that is fully protective of public health and the environment, and
2) account for the intended or reasonably anticipated future use of the site.

*"Remedial activities"* and *"remediation"* refer to all necessary actions to address any known or suspected contamination associated with the site.

The remedial activities for the SHBC site will address the following items, as described in the NYSDEC-approved Remedial Work Plan (RWP):

- Remaining on-site sources of contamination, which include the two former 9,000 gallon underground storage tanks (USTs), will be removed along with contaminated soil surrounding them. This action will be taken to address potential sources of contamination that remain at the site in relation to past manufacturing operations.

**Brownfield Cleanup Program**: New York's Brownfield Cleanup Program (BCP) encourages the voluntary cleanup of contaminated properties known as "brownfields" so that they can be reused and redeveloped. These uses include recreation, housing and business.

A **brownfield** is any real property that is difficult to reuse or redevelop because of the presence or potential presence of contamination.

For more information about the BCP, visit: **www.dec.state.ny.us/website/der/bcp**

- Groundwater will be treated to reduce contaminant levels and prevent off-site migration of on-site groundwater contamination. In-Situ Chemical Oxidation (ISCO) will be used to remediate the groundwater contaminants, including trichloroethene (TCE), dichloroethene (DCE), and vinyl chloride (VC). The treatment will involve the injection of potassium permanganate in a series of injection points. The injection point array, the amount of potassium permanganate injected, and the number of injections will be determined based on field and laboratory pilot tests, and presented in a remedial design document that will be reviewed and accepted by NYSDEC prior to implementation.

- Institutional controls will be implemented, which will restrict future use of the site to commercial use, and prohibit the use of site groundwater without proper treatment.

- Engineering controls apply to the Interim Remedial Measure (IRM). The IRM included installation of a sub-slab depressurization system (SSDS) in 2007 to prevent soil vapor intrusion (SVI) in the southern portion of the building near the contaminant source. Sub-slab depressurization will also be applied to western rooms that jut-out from the main portion of the building, and an air exchange system will maintain positive indoor air pressure in the northern portion of the building outside the SSDS target area. The SSDS and positive pressure air system will operate continuously to prevent potential exposure of building occupants to soil vapor contamination. Any new buildings within the BCP site boundary may also be fitted with SSDS's and/or positive pressure air exchange systems if required to prevent future SVI.

- A Site Management Plan will be developed and implemented to maintain the institutional and engineering controls. This Plan will require periodic certification of the IRM.

The above remediation elements will be implemented on-site to meet the stated remedial action objectives for this site and support the intended end use. The IRM/engineering controls were begun in 2007 and will be fully implemented in 2008. Source removal and groundwater remediation are scheduled to begin in March 2008 and it is anticipated that they will be fully implemented by June 2008.

**Significant Threat Determination**
NYSDEC and the New York State Department of Health (NYSDOH) have determined that the SHBC site poses a significant threat to human health and the environment.

NYSDEC and NYSDOH have made the determination that the site poses a significant threat because:

- Elevated concentrations of trichloroethene (TCE) have been detected in soil vapor below the onsite building and parking lot, requiring actions to prevent potential exposures to building occupants via soil vapor intrusion;
- Offsite soil vapor data indicate that onsite contaminants may be migrating offsite (toward the west);
- Elevated concentrations of TCE have been detected in shallow bedrock adjacent to the building

The SHBC brownfield site will not be placed on the Registry of Inactive Hazardous Waste Disposal Sites, unless:
1. the project is not meeting the objectives of the Brownfield Cleanup Agreement executed by South Hill Business Campus and NYSDEC, or
2. South Hill Business Campus or NYSDEC terminates the Brownfield Cleanup Agreement.

**Next Steps**
South Hill Business Campus is expected to begin remedial activities at the SHBC brownfield site in early or mid March 2008. NYSDEC and NYSDOH will oversee the remedial activities.

Within 45 days of completing remedial activities, South Hill Business Campus must submit to NYSDEC a Final Engineering Report (FER). The FER will describe the remedial activities completed and certify that remediation requirements have been achieved or will be achieved.

When NYSDEC is satisfied that remediation requirements have been achieved or will be achieved for the site, it will approve the FER. NYSDEC then will issue a Certificate of Completion to South Hill Business Campus. Upon issuance of a Certificate of Completion, South Hill Business Campus:

- has no liability to the State for contamination at or coming from the site, subject to certain conditions; and
- is eligible for tax credits to offset the costs of performing remedial activities and for redevelopment of the site.

A fact sheet will be sent to the site contact list that describes the content of the Final Engineering Report. The fact sheet will identify any institutional controls (for example, deed restrictions) or engineering controls (for example, SSDS/positive pressure building controls) necessary at the site in relation to the issuance of the Certificate of Completion.

**Background**

The BCP site occupies 42 acres on the west side of New York State Route 96B (Danby Road) in the Town of Ithaca, Tompkins County, New York. It is located approximately 850 feet above mean sea level on the west/northwest flank of South Hill. Site topography slopes steeply to the northwest towards the City of Ithaca, which is located approximately ½ mile north of the site. There is approximately 460 feet of topographic relief between the site and the City.

The property had been vacant land and/or used for agricultural purposes before the National Cash Register Company (NCR) purchased the property from Ithaca College in 1953. NCR manufactured adding machines and cash registers, and also had an active Printer Business Unit on site. NCR's manufacturing activities included metal plating and heat treating operations. The use of solvents was associated with these operations. Records indicate that nine (9) underground storage tanks (USTs) were on site for over 30 years during NCR's period of operation. All but two of the tanks were removed in 1986.

Currently the site is used as a commercial office park, and includes the original two-story former manufacturing building. A four-story office building of approximately 38,000 square feet, and a two-story office building of approximately 65,000 square feet, have been added to the original manufacturing building. South Hill Business Campus LLC will continue to develop a portion of the existing office building into a multi-tenant professional office complex. The remaining portion of the existing structure (former manufacturing space) will be developed for use by light manufacturing businesses, and some non-manufacturing business start-ups.

A Remedial Investigation (RI) was completed at the site in 2006 and 2007, and a Remedial Investigation Report was approved by NYSDEC in January 2008. The RI Report addressed subsurface soil, groundwater, and soil vapor in proximity to and downgradient of known and/or suspected contamination sources at the site. These areas specifically included the former heat treating, plating, and underground storage tank (UST) areas associated with former manufacturing operations that occurred in the southernmost portion of the existing site building. An area of fill southwest of the building was also investigated for the presence of fill material that might potentially be a source of contamination. The RI indicated former manufacturing activities in the southern portion of the former manufacturing building resulted in groundwater and soil vapor contamination with respect to chlorinated organic solvents. Two former 9,000 gallon USTs that formerly contained used solvents are located at the southwest corner of the building are viewed as a potential source. Groundwater and soil vapor contamination extends in the direction of groundwater flow from the southwest corner of the building towards the west/northwest, into the lower parking lot area. The RI found no evidence of contamination sources associated with the fill area southwest of the building.

A Remedial Work Plan (RWP) was submitted to NYSDEC and approved in February 2008, which proposed a combination of contaminant source removal and groundwater remediation to remove contaminants from the site, and engineering/institutional controls to prevent exposure.

**FOR MORE INFORMATION**

**Document Repository**

A local document repository has been established at the following locations to help the public to review important project documents. These documents include the Draft Remedial Work Plan and the application to participate in the BCP accepted by NYSDEC:

NYSDEC Region 7 Office
615 Erie Boulevard West
Syracuse, NY 13204
Phone: (315) 426-7400
Hours: M-F 8:30 AM - 4:45 PM

Tompkins County Public Library
101 East Green Street
Ithaca, NY 14850
Phone: (607) 272-4557

**Whom to Contact**

Comments and questions are always welcome and should be directed as follows:

Project Related Questions
Karen Cahill
New York State Department of Environmental Conservation
615 Erie Blvd West
Syracuse, New York 13204
(315) 426-7551

Site-Related Health Questions
Susan Shearer
New York State Department of Health
Flanigan Square, Room 300
547 River Street
Troy, New York 12180-2216
(518) 402-7860 -or- (800) 458-1158 (x27860)

If you know someone who would like to be added to the project mailing list, have them contact the NYSDEC project manager above. We encourage you to share this fact sheet with neighbors and tenants, and/or post this fact sheet in a prominent area of your building for others to see.