WORK PLAN

SUPPLEMENTAL SITE MITIGATION
&
SYSTEMS OPTIMIZATION

FORMER MILLER CONTAINER PLANT
FULTON, NY

NYSDEC SITE # 7-38-029

Prepared for:
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APPENDICIES

1.0 INTRODUCTION ~~[REDUCE THE ENTIRE SECTION 1 TO 3 PARAGRAPHS]~~

This Work Plan for the Supplemental Mitigation and System Optimization Program for the former Miller Container Plant in Volney, NY was prepared by AECOM at the request of MillerCoors, LLC for submission to the New York State Department of Environmental Conservation (NYSDEC). A Site Location Map is included as **Figure 1-1**. A Facility Layout Map is included as **Figure 1-2**.

The remedial action goals for the Site have been specified in the Record of Decision dated March 1995. To date, on-site mitigation efforts have advanced achievement of those goals. However, ultimate achievement of all of the goals specified in the ROD has been demonstrated to be unobtainable within the design life of the existing system. Specifically, the reduction of on-site soil impacts to concentrations protective of groundwater, and the mitigation of on-site groundwater contamination to applicable Standards, Criteria, and Guidance cannot be accomplished within the 30-year design life of the treatment system without additional mitigation measures.

Based on the results of the Supplemental Site Investigation (SSI) performed by AECOM in April-May 2008, AECOM recommended the installation of a soil vapor extraction system in two areas of the site and changes to the existing groundwater recovery system. These recommendations were presented to NYSDEC in November 2008. The purpose of these systems is to mitigate residual soil impacts and accelerate groundwater mitigation at the site.

Two areas of residual soil impacts were identified and fully delineated in the SSI. Impacted soils were encountered above the water table and in the "smear zone" extending to approximately 22 ft below grade. The maximum areal extent of residually impacted soil was identified at 20 ft below grade. The limits of residual soil impacts are included as **Figure 1-3.**

The SSI also identified and delineated the dissolved phase plume emanating from the residual source area soil in one area of the site. The plume extends and plunges down gradient from the source area to the source area recovery well network. The approximate limits of the concentrated dissolved phase plume delineated in the SSI are included as **Figure 1-4**.

The delineation of soil vapor beneath the floor of the facility was conducted by O'Brien & Gere in 2008. The results of that SVI investigation were reported to NYSDEC. A copy of the delineation map from the report is included as **Figure 1-5**.

This work plan identifies the supplemental remedial systems to be installed, changes to the existing recovery well network, and the general procedures to be used for the start up, demonstration, operation and maintenance, reporting and shut down of these new systems. At the request of NYSDEC, detailed methods and procedures for work elements that have previously been approved and historically performed on-site will not be required. Consequently, detailed methods and procedures for the performance of each of those tasks will not be required. Design drawings and/or detailed specifications suitable for use as construction documents are not included and not required by NYSDEC.

The supplemental remedial action systems will be designed to address the potential for exposure from soil vapor intrusion into the on-site building.

2.0 SOIL VAPOR EXTRACTION SYSTEMS

Two Soil Vapor Extraction (SVE) systems will be installed at the above referenced site. The two areas of concern where the systems will be installed are designated as SVE-N (northern) and SVE-S (southern). These areas are depicted in **Figure 2-1.**

The number of extraction points for each of the two areas of concern and their anticipated radii of influence is based on the performance of the original SVE system that was successfully operated in the SOU. The actual system performance and radii of influence of the SVE points will be evaluated and reported to NYSDEC at the conclusion of the six month demonstration test along with any recommendations for corrective actions, if any, that may be required to affect complete containment of the source area vapors.

A detailed post-installation survey of the new systems (dual-phase wells, vapor extraction points, peizometers, vacuum gauges, and trenches) including key construction features will be performed. An overlay layer depicting each system will be generated and added to the existing AutoCAD files for the site. The survey map, and details concerning all equipment used in the construction, will be included in the final construction report to be submitted to NYSDEC at completion of the demonstration test.

Community air monitoring will be performed during the performance of intrusive activities required for the installation of these systems. Air monitoring will be performed in general accordance with NYSDOH guidance. One monitor will used to provide continuous measurement of air quality at the edge of the designated exclusion zone (or multiple monitors at the edge of each designated exclusion zone if multiple activities are being performed simultaneously), one monitor will be installed at the fence line adjacent to the existing treatment plant (estimated to be 100-250 feet down gradient of all work zones) at the limits of the site boundary in the down wind direction and used to continuously record and measure air quality at the facility property line. When the building is occupied, an additional monitor will be used in the occupied space(s) to measure and record air quality during the period of occupation. The results will be included in the construction report.

The following sections described the elements of proposed systems to be installed.

2.1 Dual-Phase Wells

A total of six (6) dual-phase (DP) groundwater depression wells (4 in SVE-N and 2 in SVE-S) will be used to lower the water table approximately seven (7) feet (from 17 feet below grade to 24 feet below grade) to expose impacted soils within the “smear zone” caused by the natural water table fluctuations. These water table depression wells will also be utilized as vapor extraction points. Recovered groundwater will be plumbed directly to the existing on-site water treatment system for treatment by the air-stripper prior to discharge. A schematic of a typical dual phase well is included as **Figure 2-2**.

Dual-phase wells installed inside the building will be advanced with an electrical tripod-mounted hollow-stem auger drilling apparatus. Wells installed outside the building will be installed with a conventional truck mounted rig. Wells will be installed utilizing 6.25-inch ID HSA augers.

During installation, continuous split spoon soil samples will be collected from grade to final depth. Each soil interval will be visually inspected, characterized, and screened with a photoionization detector. A detailed boring log will be prepared and included in the construction report.

One soil sample will be collected from each well and submitted for laboratory analysis. The sample will be collected from the interval representing the highest potential concentration of volatile organic compounds (VOCs) based on visual and olfactory evidence of impacts and the results of the PID screening. When the boring has achieved the required depth (approximately 38 feet below grade or refusal) a 4-inch recovery well will then be constructed through the hollow-stem auger flights.

The dual-phase wells would be constructed using the same procedures used for the existing groundwater recovery well network except that Schedule 40 PVC would be used for well screens and risers instead of the spun-steel wire screens and steel risers previously used. Since the duration of the required use of these wells is anticipated to be less than 10 years, PVC will be used in place of the more durable steel. The wells will be finished flush to grade with a locking steel access port grouted into the floor (interior) or concrete pad (exterior) with pitless adaptors for connection of the electrical, water, and air conduits. Detailed construction logs will be prepared for each DP well and included in the construction report.

Soil cuttings generated by DP well installations will be collected, containerized, and characterized for off-site disposal.

2.2 Soil Vapor Extraction Wells

To provide mitigation over the entire zone of impact in each area, the dual-phase wells will be augmented with a number of single-phase soil vapor extraction (SVE) points. These wells will be installed using the same methods and procedures for the recovery wells except these wells will be installed with 4.25-inch ID augers and constructed with 2-inch ID Schedule 20 PVC.

The SVE wells will be plumbed to the existing gas-phase activated carbon units located in the treatment building to mitigate the impacted vapor to the substantive requirements of the existing site-specific air discharge permit prior to discharge of treated air. Each vapor extraction (including dual-phase) well will be equipped with flow control valves to regulate the airflow from each well for balancing the system. A schematic diagram of a typical single-phase well is included as **Figure 2-3**.

A total of 18 SVE wells will be installed (12 in SVE-N and 6 in SVE-S) with an average total depth of 24 feet below ground surface. The construction depth of each well and the interval to be screened will be determined in the field during installation. Boring logs and construction logs will be prepared for each SVE well and included in the Construction Report.

Soil cuttings generated by SVE well installations will be collected, containerized, and characterized for off-site disposal.

2.3 Piping and Trenching

Air and water recovered from each of the DP and SVE wells will be independently plumbed to the existing treatment plant. To the extent practical, the number and total length of trenching will be minimized. For wells installed inside the building piping conduits will be trenched to the nearest available roof support beam, then extended vertically to the roof support rafters. Piping will be attached with support brackets to the rafters and extended along the rafters to the south wall of the building. Piping will be extended along the south wall to a common drop point, extended downward to an egress point prepared beneath the floor along the south wall of the facility, then pass through the foundation wall beneath the facility and trenched in from the building to the treatment plant. Cross sections of typical interior and exterior conduit trenches are included as **Figure 2-4 and Figure 2-5,** respectively.

All in-ground piping and conduits will be HDPE. Above ground piping will be Sch 20 PVC. Water lines will be 1.25-inch diameter, all vapor lines will be 1-inch diameter and all electrical conduits will be 1-inch. All above ground piping will be color coded with colored pipe wrap tape in accordance with ANSI standards; blue for water, yellow for air (gas), and red for electric lines. All conduits of different types sharing a common trench will be installed with water bearing pipes at the bottom, air above that and electrical lines at the top. Six-inch spacers and a six-inch thick separation layer of backfill would be installed between each type of conduit during pipe installation.

Trenching will be performed indoors by saw cutting the concrete flooring and excavating to the required depth (6-18 inches).

During trenching operations, any excavated soils (not including pea-stone fill) that must be removed will be screened with an FID and inspected for visual and/or olfactory evidence of contamination. Soils that appear impacted will be staged in roll-off containers, characterized, and transported for off-site disposal. Given the depth of residually impacted soils beneath the floor of the facility, it is anticipated that no soil from interior trenching operations in SVE-N will require off-site disposal. However, up to 10 yards of impacted soil are expected to be removed from SVE-S. Clean imported fill will be utilized to replace any soil removed for disposal.

Upon completion of installation of the interior piping, a woven geo-membrane barrier layer will be placed on top of the backfill and the remainder of the trench backfilled with structural sand to just above the base of the concrete floor slab. The floor will then be restored to its previous condition to the extent practical. Exterior trenching will be restored to its previous condition (concrete, asphalt, or grass) as is appropriate.

2.4 Well Pumping Systems and Treatment Plant

Each of the soil vapor extraction systems will require an independent vacuum pumping system and controls but will share common treatment systems. The above ground systems (except piping) will be housed in the existing groundwater treatment facility.

Submersible pumps will be installed in each of the dual phase extraction wells. For compatibility with existing electrical systems and control systems in the treatment plant, the pumps will be identical to those currently used on-site and will consist of 480 volt 3-phase Grundfos Model Redi-Flo4, nominal rated at 3 gpm pumping capacity.

Recovered groundwater will be plumbed directly to the existing on-site equalization tanks prior to treatment in the existing air-stripper tower. The capacity of the existing groundwater treatment plant is more than adequate to accommodate the maximum 18 gpm combined flow rate of the six new dual-phase groundwater recovery wells.

The two 10,000-pound capacity vapor phase carbon (VPC) treatment tanks will be placed on-line to treat the air-flow from the SVE systems and from the air stripper prior to discharge. Air flow from the stripper and each of the SVE systems will continue to be treated until the contaminant concentration in the air-influent to these tanks has declined to less than the permissible discharge limits established for the site for three consecutive monthly sampling events and the mass-loading to the stripper from the recovery wells has reduced to the existing Air-Guide 1 model for the site.

The two 10,000-pound capacity liquid phase carbon units (LPC) will be placed on-line to treat the liquid effluent from the air-stripper prior to discharge. These units will be utilized until it is demonstrated by three consecutive months of sampling that they are no longer necessary.

The 10 hp motor and blower from the former SVE system will be utilized for SVE-S. An additional pump and motor will be installed in the treatment building to provide vacuum pressure for the SVE-N system. Manufacturer's cut-sheets for any additional equipment added to the treatment building will be included in the Construction report.

A schematic of the approximate layout of proposed treatment systems is included as **Figures 2-6 through Figure 2-8**. Detailed flow and piping diagrams for the final system configuration will be included in the construction report.

2.5 Additional Monitoring Points

To facilitate monitoring of the groundwater depression systems, peizometers will be installed to measure the water table elevation at the approximate limits of the impacted zones. The peizometers will be installed using the same methods and procedures previously described for dual-phase wells except that the peizometers would be constructed with 1.25-inch diameter schedule 20 PVC, screened from a depth of 38 feet to approximately five (5) feet above the static water table elevation at 17 feet. A total of four (4) peizometers would be installed in SVE-N and two (2) in SVE-S.

Interstitial vacuum pressure gauging points will be installed to measure subsurface vacuum pressure(s) generated by the SVE systems. Two (2) vacuum pressure gauging points will be installed in each of the two (2) SVE areas. The gauging points will be installed using the same drilling techniques previously described.

The vacuum pressure monitoring points will be installed at interstitial nodes points located near the outer edge of the SVE grid. The purpose of these points is to demonstrate the effectiveness of the SVE systems at maintaining negative pressure and an inward flow of air at the limits of the impacted zones in the subsurface to control the potential for migration of soil vapor away from the source areas and/or the accumulation of vapor beneath the slab of the building. The locations of these gauging points are depicted on **Figure 2-6** and **Figure 2-7**.

Each point will consist of four (4) 1-inch diameter micro wells with short 2-foot screens set at different intervals to measure vacuum pressure with depth throughout the subsurface. The data collected from these points would be used to evaluate the effectiveness of the SVE systems and provide critical information that may prove necessary for maximizing system optimizations during both the start-up tests and long-term operations. A schematic diagram of a typical vacuum pressure gauging point is included as **Figure 11**.

2.6 Replacement Groundwater Recovery Well

One new groundwater recovery well will be installed between SVE-N and existing well RW-5. The location of this new well is depicted on **Figure 12**. The well will be screened to target the concentrated dissolved phase plume emanating from the source area soils in SVE-N. The well will be constructed using the same methods, materials, and procedures used for the exterior dual phase wells except that the final depth and screen interval will be determined in the field based on observations made during drilling.

The results of the MIP investigation indicate that there is a layer of colloidal soils located at approximately 27-33 feet below grade feet below grade at location MIP-7. The ECD data indicates that there is a concentrated dissolved phase plume preferentially flowing horizontally immediately below this interface in the direction of MW-5.

The intent is to locate this interface and install a well with a ten-foot screen interval across the observed plume to maximize contaminant mass recovery at this location. This well will simultaneously, significantly increase the mass-recovery from the NOU-N source area plume while providing additional hydraulic containment closer to the source area. This well should effectively reduce the flow of additional contaminants toward MW-5.

2.7 Waste Disposal

Residual soil cuttings generated by drilling operations and/or trenching will be containerized in a staged roll-off for off-site disposal. Approximately 10 cubic yards of cuttings will be generated by well installations and an additional 10 cubic yards by trenching in SVE-S. One waste characterization profile sample and the results of the laboratory analyses of soil samples collected from each boring will be used to determine disposal options.

3.0 INITIAL START-UP AND DEMONSTRATION TESTS

3.1 Initial Start-Up Test

Upon completion of installation, an initial start-up test of the SVE systems will be performed. The following procedures will be used to bring the system on line.

The DP wells will be brought on-line sequentially (one at a time) and a (baseline) groundwater sample collected from each well from a pre-installed in-line sampling port prior to discharge to the treatment plant equalization tank. These samples will be submitted to the laboratory for analysis of VOCs to establish the baseline conditions at start-up.

Groundwater recovery from the DP wells will continue until the composite cone of depression caused by the pumping action has exposed the screen intervals of the vapor extraction wells. During this phase, water level measurements will be collected and recorded from the SVE points and the peizometers to monitor the expanding cone of depression from the wells. An initial measurement will be made prior to activation of any of the pumping wells to establish base water level. Subsequent measurements will be made at least twice every twenty-four (24) hours until the change in water level in the peizometers appears to stabilize. Once the composite cone has stabilized, water levels in the SVE wells will be gauged to confirm the screens are exposed.

A hydraulic model of the DP wells for each SVE system will be developed based on the data collected during the start-up and demonstration test. This model will include the cone of depression, radius of influence, and capture zones of the individual DP wells and composite cone in each of the two SVE areas along with a comparison of the actual system performance to the predicted performance. The model will be included in the construction report.

Due to the significant variability of subsurface soils, there is a potential for water levels to remain within the screen intervals near the base of individual vapor extraction point particularly in SVE points on the outer fringe of the composite cone. This should not affect the usability of the well. However it could impact long-term results and goals. An analysis of residual water levels with potential impacts on long-term goals and any recommendations for corrective actions, if needed, will be included in the Construction Report. An additional work plan arising from these corrective actions will be submitted to the DEC.

Once the water levels in the peizometers have stabilized, the vapor extraction systems will be brought on-line. The SVE systems will be brought on-line sequentially. Utilizing the flow regulators installed for each SVE well, each well will be individually tested. Each well will be brought on-line individually, the maximum airflow monitored for approximately 15 minutes and a baseline air-sample collected for laboratory analysis. This process will continue until all of the SVE wells have been tested. Once the individual wells have been tested, the entire system will be brought on-line and the combined flow tested for both flow rate and air quality (sample). The individual wells will be balanced so that the airflow from each well is approximately equal.

Once all systems have been brought on-line, system operating parameters will be monitored and recorded on a daily basis for 14 consecutive days. During that time all connections, piping, fittings, etc. will be checked for tightness and any necessary and appropriate corrective actions taken for any noted deficiencies.

After 14 days of continuous system operation, one complete round of analytical samples will be collected from the in-line sample collection ports installed on the system. Samples will be collected and analyzed in accordance with the NYSDEC approved Field Sampling Plan (proposed plan attached to this document – Appendix A).

Sampling will consist of one (1) groundwater sample from each Dual-Phase recovery well (a total of 6), a combined influent sample from the equalization tank to the air stripper tower, an effluent sample from the air stripper tower to LPC-1, one effluent sample from LPC-1 to LPC-2, one effluent sample from LPC-2, one (1) air sample from the air-stripper off-gas, one combined flow air sample of the influent to the gas-phase carbon unit(s), and one effluent sample of the off-gas from the gas-phase carbon units. The results of the sampling will be compared to the discharge limits of the site SPDES permit and to the Air Guide 1 model and discharge limits established for the site.

A schematic flow chart with planned sampling points is included in the Field Sampling Plan in Appendix A.

3.2 SVE Demonstration Test

The demonstration test for the system will commence immediately after collection of the 14-day sampling event and last approximately 6 months. During the demonstration test, system operating parameters will be measured and recorded on a not-less than weekly basis. The operating parameters include, total ground water recovery (and calculated flow rates for each well) for each well for the period, air flow from each SVE and DP extraction point and the combined flow, Flame Ionization Detector (FID) measurements of the air quality from each extraction point, vacuum pressure readings from the gauging points, and water level measurements from the peizometers.

One round of sampling will be performed at approximately 30-day, 90-day, and 180-days, of continuous operation using the same methods and procedures used for the 14-day sampling event. The results of the analytical sampling and system performance will be analyzed and the results used to predict the duration of continuous system operations to achieve the remedial action objectives for the site and/or identify any deficiencies for corrective actions that may be necessary to achieve those goals.

At the end of the demonstration test, a detailed Construction Report will be generated and submitted to NYSDEC. The report will include a detailed report of the system installation, start-up and demonstration tests including construction logs, boring logs, diagrams, layout maps, manufacturers' specifications and cut sheets for installed systems, detailed drawings of installations, survey data and maps, sample results and analysis, conclusions and recommendation.

The existing site-specific OM&M plan will be reviewed and modified as needed to accommodate the new systems. The amended OM&M plan will be submitted with the Construction Report.

3.3 Soil Vapor Intrusion

Two permanent soil vapor intrusion monitoring points will be installed within occupied areas of the building. The locations of these sampling points will be determined in the field after review of the previously completed SVI study and consultation with the property owner.

One round of soil vapor intrusion samples will be collected approximately 30 days after all supplemental mitigation systems have been installed and brought on-line. One sample will be collected from each of the sub-slab locations and one from an occupied office area. These samples will be collected over a 24 hr period using 1-liter capacity Summa canisters and submitted to a qualified laboratory for analysis of VOCS using USEPA TO-15.

The results of the SVI sampling will be included in the construction/demonstration test report. The results will be compared to the results of the previously completed SVI study along with any conclusions and/or recommendations for additional sampling to be included in the OM&M plans.

4.0 LONG-TERM OPERATION, MONITORING, & MAINTENANCE

Upon completion of the demonstration test, daily operation and monitoring of the SVE system will be turned over to the on-site treatment plant operator. Routine monitoring of the system will be included in the monthly monitoring events and reported in the annual report. The existing approved OM&M plan will be amended detailing the operating and sampling requirements for the SVE systems. The amended OM&M plan will be submitted concurrent with the construction report.

5.0 ANNUAL GROUNDWATER MONITORING REPORT

Annual Groundwater Monitoring Reports will be prepared and submitted to NYDEC each year and include an evaluation of the SVE system.

At the completion of five years of system operation, a Five-Year Project Review Report (PRR) will be prepared. The PRR will be conducted in general accordance with NYSDEC internal guidance and policy for the review and reporting of mitigation systems at Inactive Hazardous Waste Disposal Sites. Based on our current understanding of the site, it is anticipated that the five-year PRR may also include a proposal to suspend or alter the recovery well systems at the site.

6.0 SVE SYSTEM OPERATIONS AND SHUT-DOWN

Upon completion of the SVE demonstration test, the SVE systems will continue to run in continuous mode until monthly air sampling data from the individual wells and from the combined flow have achieved a near asymptotic condition. Based on the performance of the previous on-site SVE system it is anticipated that 16-20 months of continuous operation will be required to achieve asymptotic conditions in the concentration of recovered soil gas. Once asymptotic conditions have been demonstrated for continuous operation of the SVE system(s), the system will be pulsed on a regularly scheduled basis to eliminate rebound effects.

Asymptotic conditions are defined as a reduction in the total contaminant mass recovery (mass x flow) equal to or greater than 95% of baseline conditions ($[C_i*cfm)_o]$) as determined from the start-up test, followed by three consecutive months of monitoring results (PID/FID measurements) indicating that the change in total mass recovery is less than 5% .

Condition 1 = $[(C_t*cfm)_t]/[(C_i*cfm)_o] < 0.05$; and,

Condition 2 = $[(C_t*cfm)_t + (C_{t+1}*cfm)_{t+1} + (C_{t+2}*cfm)_{t+2}]/[(C_i*cfm)_t] < 0.05$

Where:

C_t	=	influent concentration at time t
C_i	=	initial baseline influent concentration at time 0
cfm	=	measured flow rate at time of sampling in cubic feet per minute
$(C_i*cfm)_o$	=	contaminant mass recovery at time 0 (baseline)
$(C_t*cfm)_t$	=	contaminant mass recovery at time t

The system will be pulsed initially once per day at approximately the same time for two (2) hours each day. FID measurements of VOCs in the individual and combined airflow will be collected at start-up of each pulse phase not less than three times per week (assumed M-W-F). When the rebound effects observed from daily pulsing have achieved the asymptotic conditions (as described above) the frequency of pulsing will be altered to bi-weekly.

When asymptotic conditions are observed in the measured biweekly rebound spikes, samples of the individual and combined air-flow will be collected and submitted for analysis. Four confirmatory soil borings will then be advanced in each of the two (2) SVE system areas and post-remediation confirmatory soil samples collected to demonstrate that the systems have achieved their intended remedial action goals. The results of the pulse monitoring and final confirmatory sampling will then be submitted to NYSDEC with a request to permanently discontinue air-recovery operations and decommissioning of the SVE system(s).

Groundwater recovery from each individual dual-phase wells will continue until contaminant concentrations in that well have declined to NYSDEC approved action levels (assumed to be ambient water quality standards).

Once the SVE systems have demonstrated that they have achieved the limits of their usefulness and deactivated, a final round of SVI samples will be collected to determine if potential exposures to soil vapors have been mitigated in the occupied areas of the facility or if supplemental systems would be required.

7.0 SCHEDULE

Due to the current use of the facility for storage and access constraints required by the facility owner, a specific schedule of activities cannot be presented at this time. Periodic updates of the approximate start date will be included in the monthly monitoring report commencing with the first monthly report following NYSDEC's approval of the project plans and notice to proceed. A detailed schedule including work elements, significant milestones, and project deliverables will be submitted to NYSDEC 30 days prior to mobilization.

FIGURES

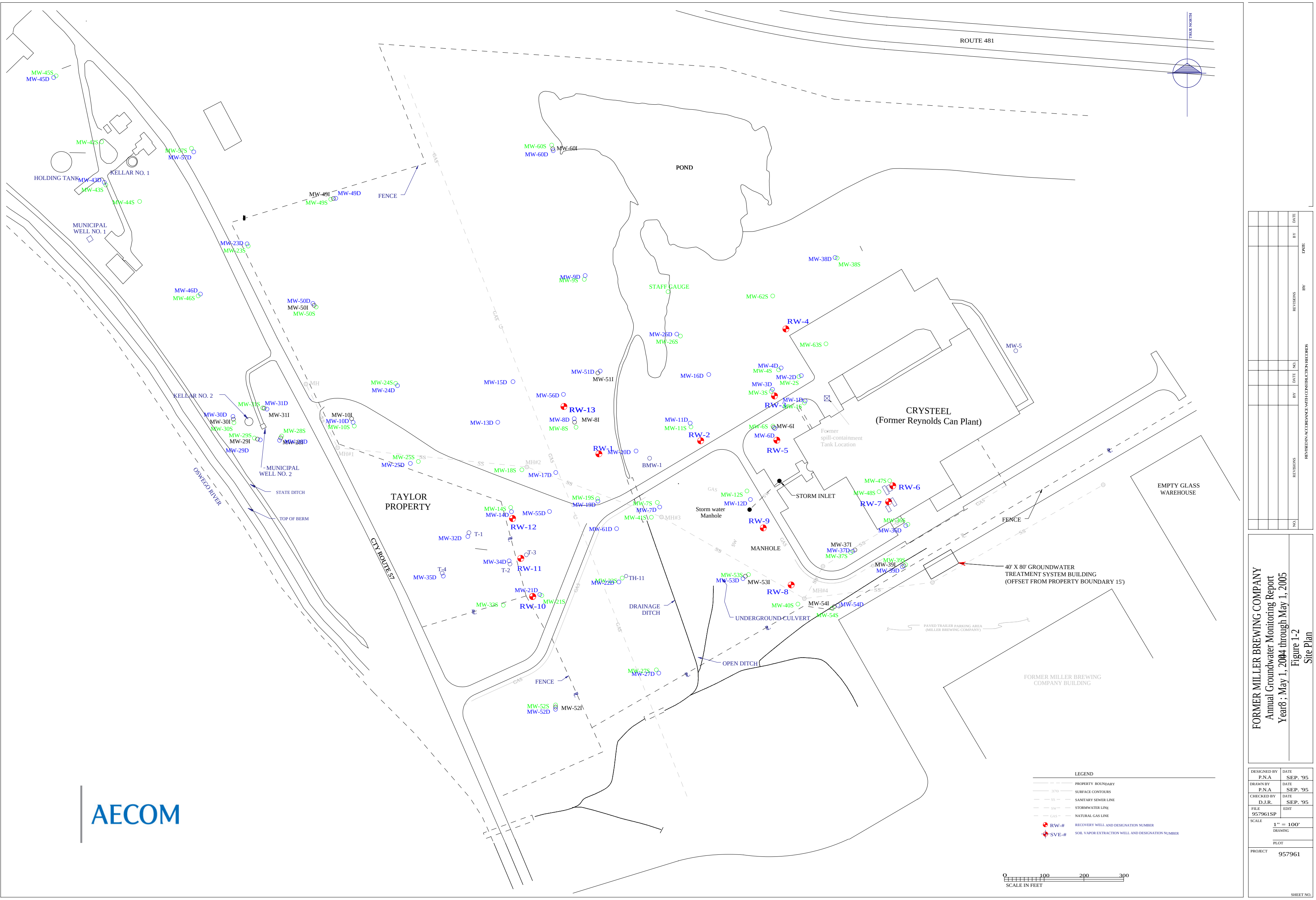
FORMER MILLER CONTAINER PLANT

SUPPLEMENTAL SITE MITIGATION PROGRAM

FIGURE 1-1

Site Location

AECOM


ROUTE 481
TRUE NORTH
POND
STAFF GAUGE
CRYSTEEL
(Former Reynolds Can Plant)
Former spill-containment Tank Location
STORM INLET
Storm water Manhole
MANHOLE
TAYLOR PROPERTY
CTY ROUTE 57
OSWEGO RIVER
STATE DITCH
TOP OF BERM
HOLDING TANK
KELLAR NO. 1
KELLAR NO. 2
MUNICIPAL WELL NO. 1
MUNICIPAL WELL NO. 2
FENCE
DRAINAGE DITCH
UNDERGROUND CULVERT
OPEN DITCH
EMPTY GLASS WAREHOUSE
40' X 80' GROUNDWATER TREATMENT SYSTEM BUILDING (OFFSET FROM PROPERTY BOUNDARY 15')
FORMER MILLER BREWING COMPANY BUILDING
RW-1
RW-2
RW-3
RW-4
RW-5
RW-6
RW-7
RW-8
RW-9
RW-10
RW-11
RW-12
RW-13
LEGEND
PROPERTY BOUNDARY
SURFACE CONTOURS
SANITARY SEWER LINE
STORMWATER LINE
NATURAL GAS LINE
RW-# RECOVERY WELL AND DESIGNATION NUMBER
SVE-# SOIL VAPOR EXTRACTION WELL AND DESIGNATION NUMBER
0 100 200 300
SCALE IN FEET
FORMER MILLER BREWING COMPANY
Annual Groundwater Monitoring Report
Year8 ; May 1, 2004 through May 1, 2005
Figure 1-2
Site Plan
DESIGNED BY P.N.A DATE SEP. '95
DRAWN BY P.N.A DATE SEP. '95
CHECKED BY D.J.R. DATE SEP. '95
FILE 957961SP
SCALE 1" = 100'
PROJECT 957961
SHEET NO.
AECOM

FORMER MILLER CONTAINER PLANT

SUPPLEMENTAL SITE MITIGATION PROGRAM

FIGURE 1-3

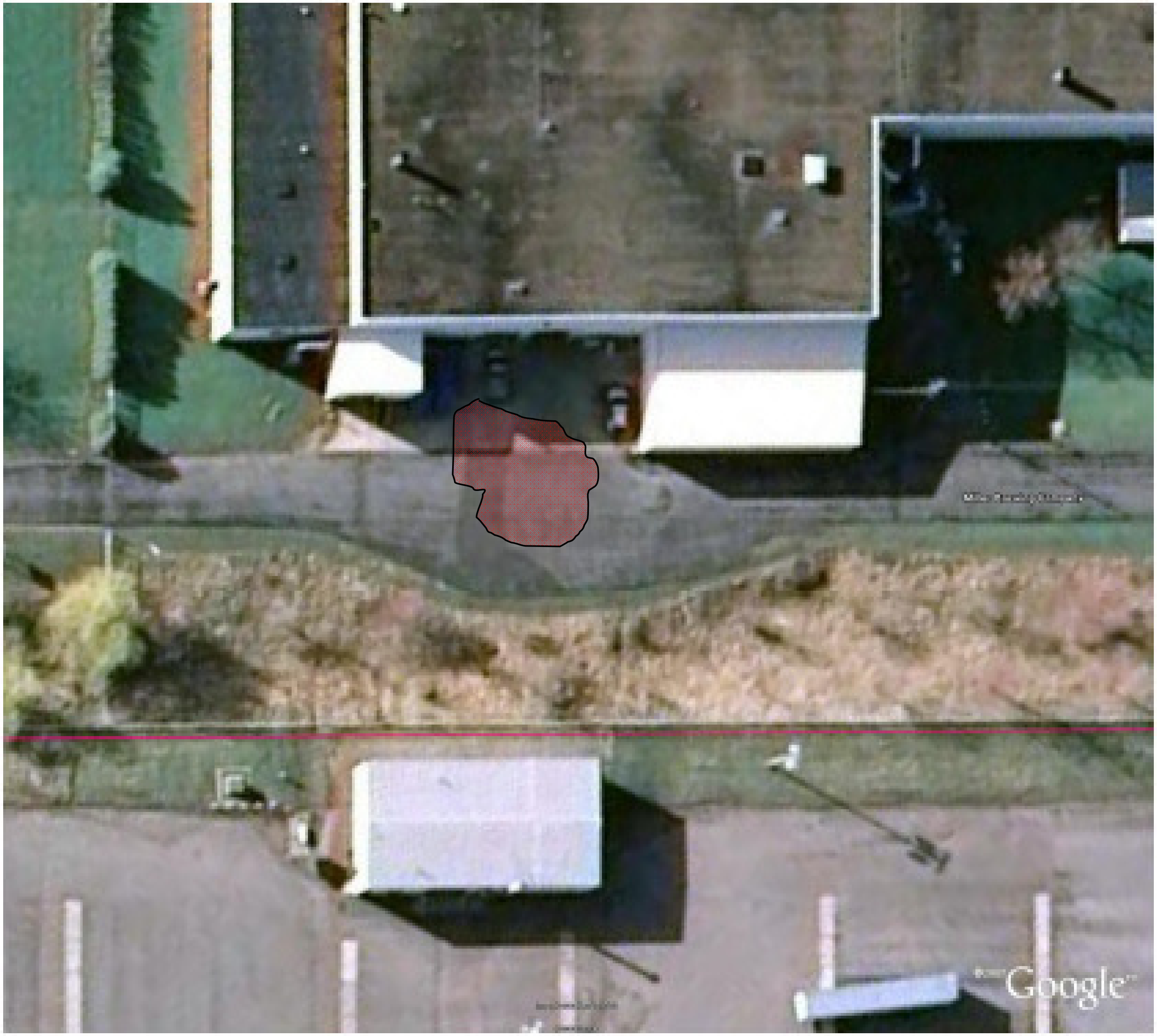
SVE-N Impacted Soils

Isocon for:

ECD>450,000 mV

[CVOCs] ~ 800+ mg/kg

Depth 14-22 ft bgs



FORMER MILLER CONTAINER PLANT

SUPPLEMENTAL SITE MITIGATION PROGRAM

FIGURE 1-4

SVE-2 Impacted Soils

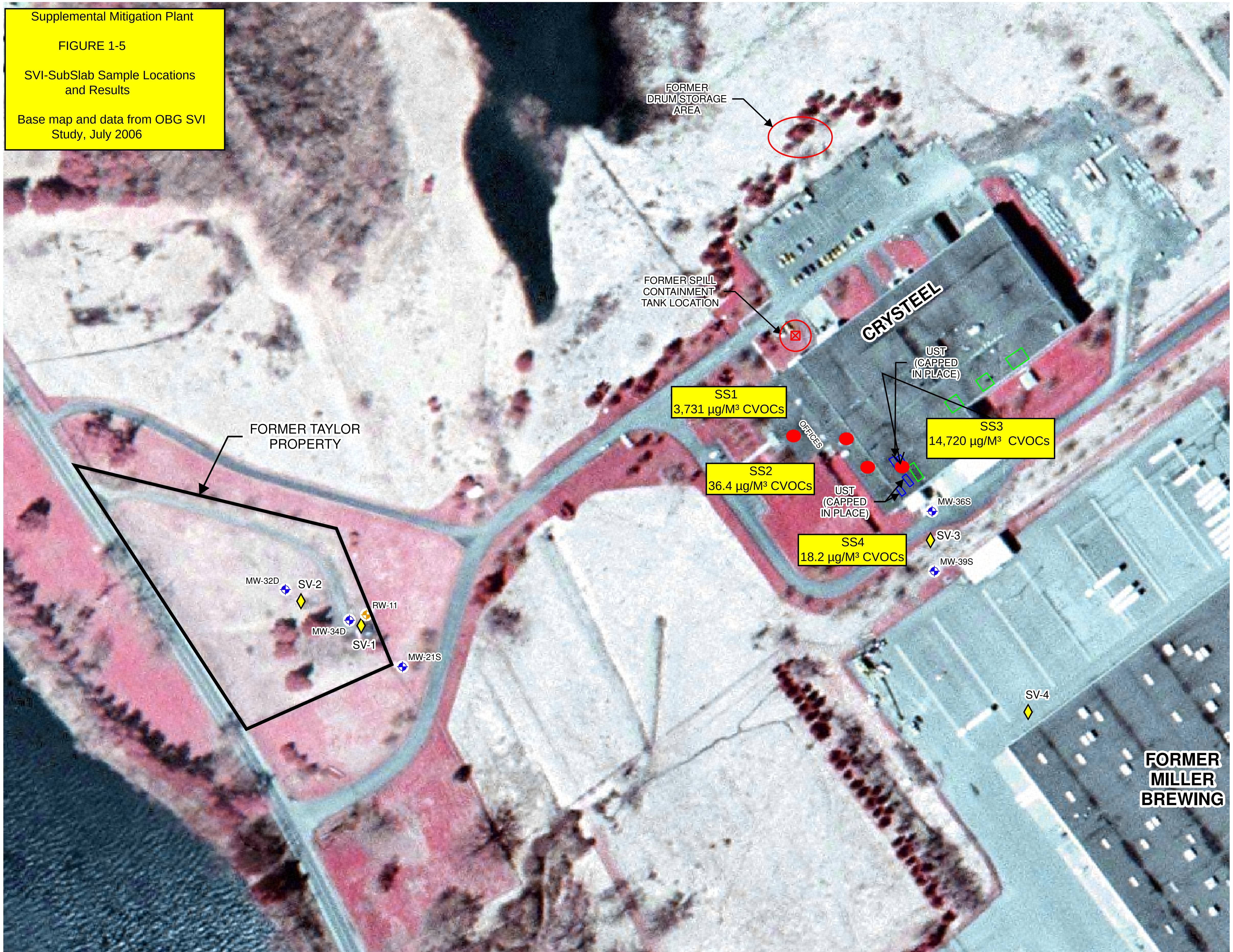
Isocon for:

ECD>450,000 mV

[CVOCs] ~ 800+ mg/kg

Depth 14 ft bgs

AECOM



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PLOT DATE: 07/06/06 DIV. 732 JPS

This document was developed in color. Reproduction in B/W may not represent the data as intended.

NOTE: ALL LOCATIONS ARE APPROXIMATE AND NOT SURVEYED.

FIGURE 2

LEGEND

SAMPLE TYPE

- MONITORING WELL*
- RECOVERY WELL*
- SOIL VAPOR SAMPLE
- SV-1 SAMPLE IDENTIFICATION

*SELECTED WELLS PROVIDED FOR LANDMARK PURPOSES ONLY

FORMER MILLER BREWING FACILITY
(CONTAINER PLANT)
FULTON, NEW YORK
SITE # 7-38-029

SOIL VAPOR SAMPLING LOCATIONS

0 100 200 400
Feet

JULY 2006
1669.38246

O'BRIEN & GERE

SVE- N

SVE-S

Figure 2-1

SVE-N and SVE-S
Approximate Limits of
Treatment Zones

Supplemental Mitigation Plan
Former Miller Container Plant
Fulton, New York

AECOM

April 2009

PROJECT NO:111909

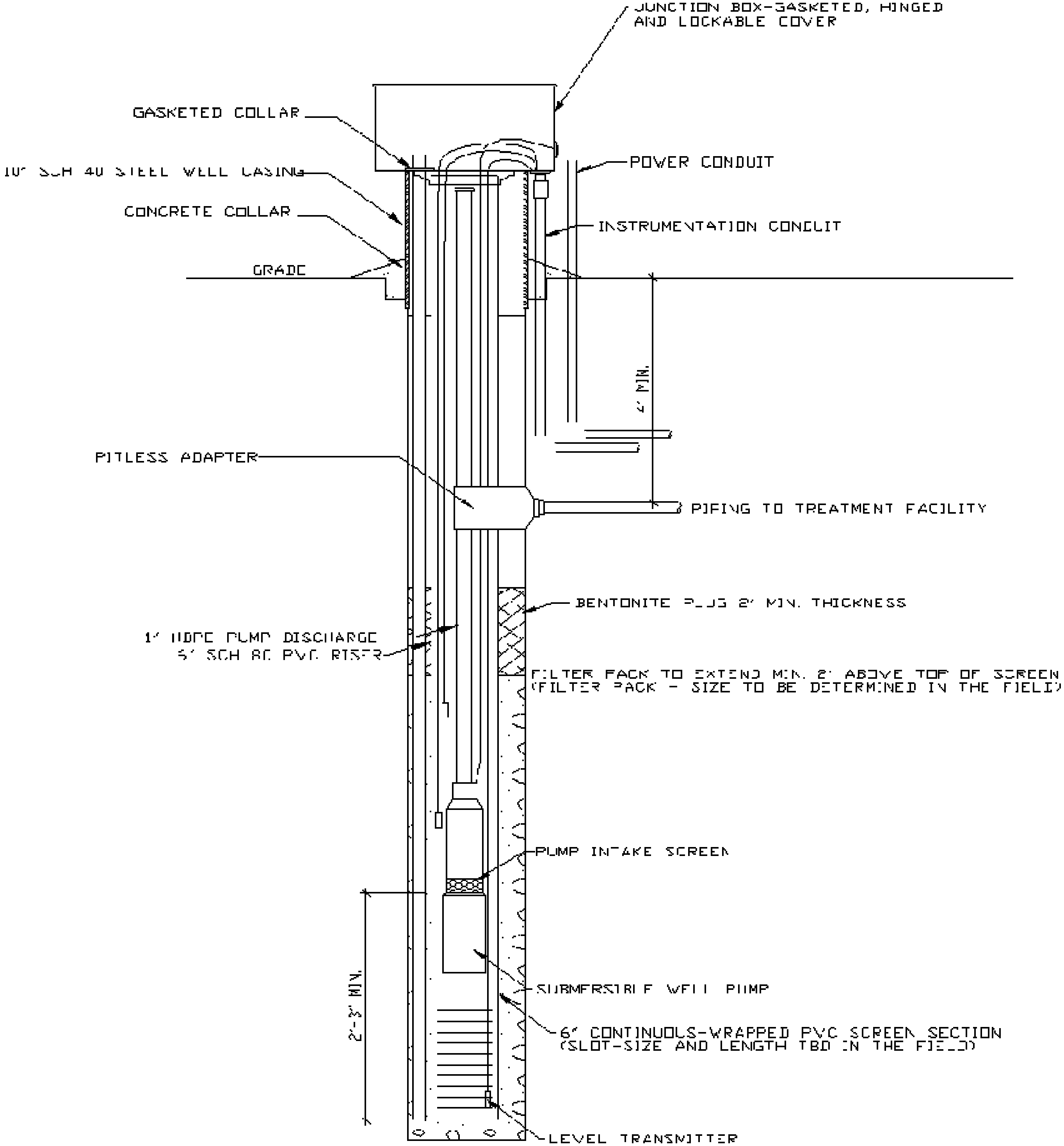

Figure 2-2

Dual Phase Well Detail

Supplemental Mitigation Plan
Former Miller Container Plant
Fulton, New York

AECOM

April 2009

PROJECT NO:111909

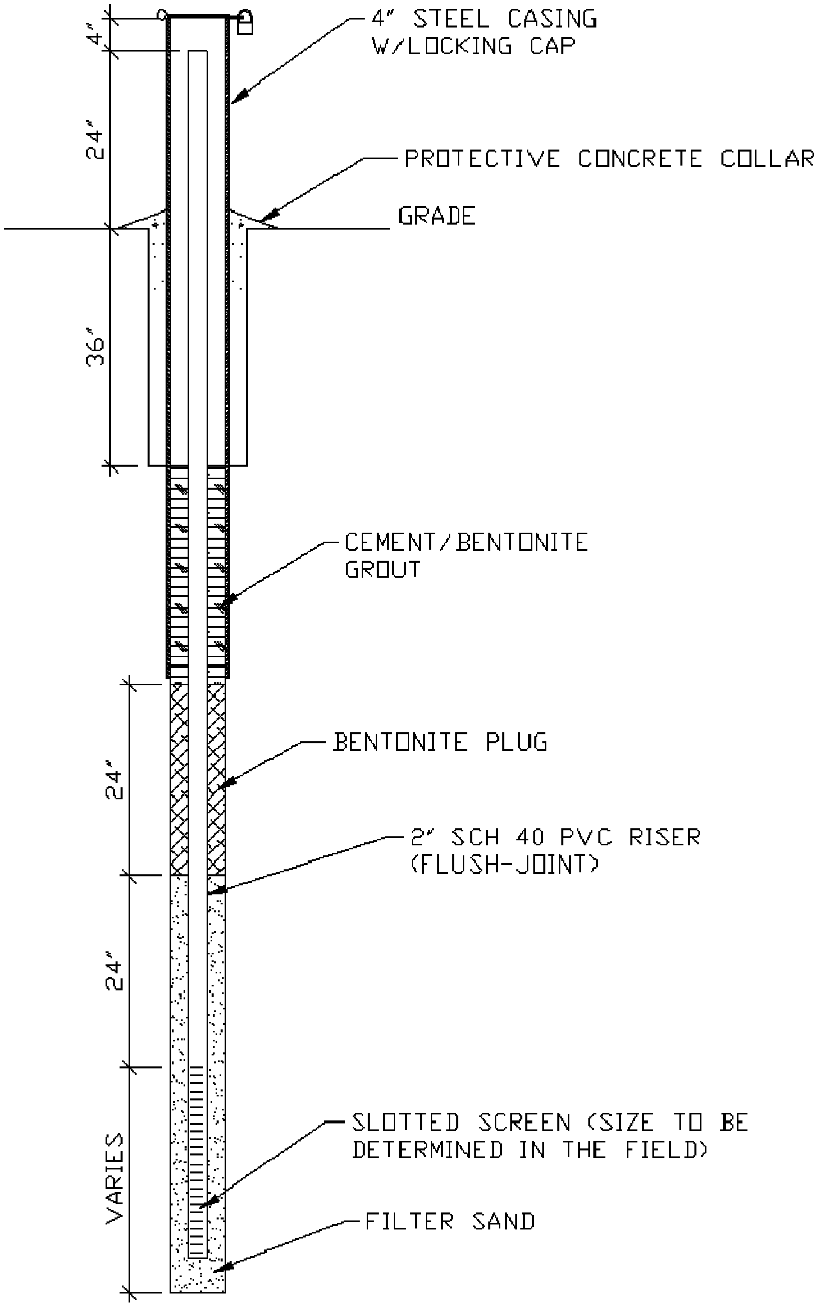

Figure 2-3

Single Phase Extraction Well Detail

Supplemental Mitigation Plan
Former Miller Container Plant
Fulton, New York

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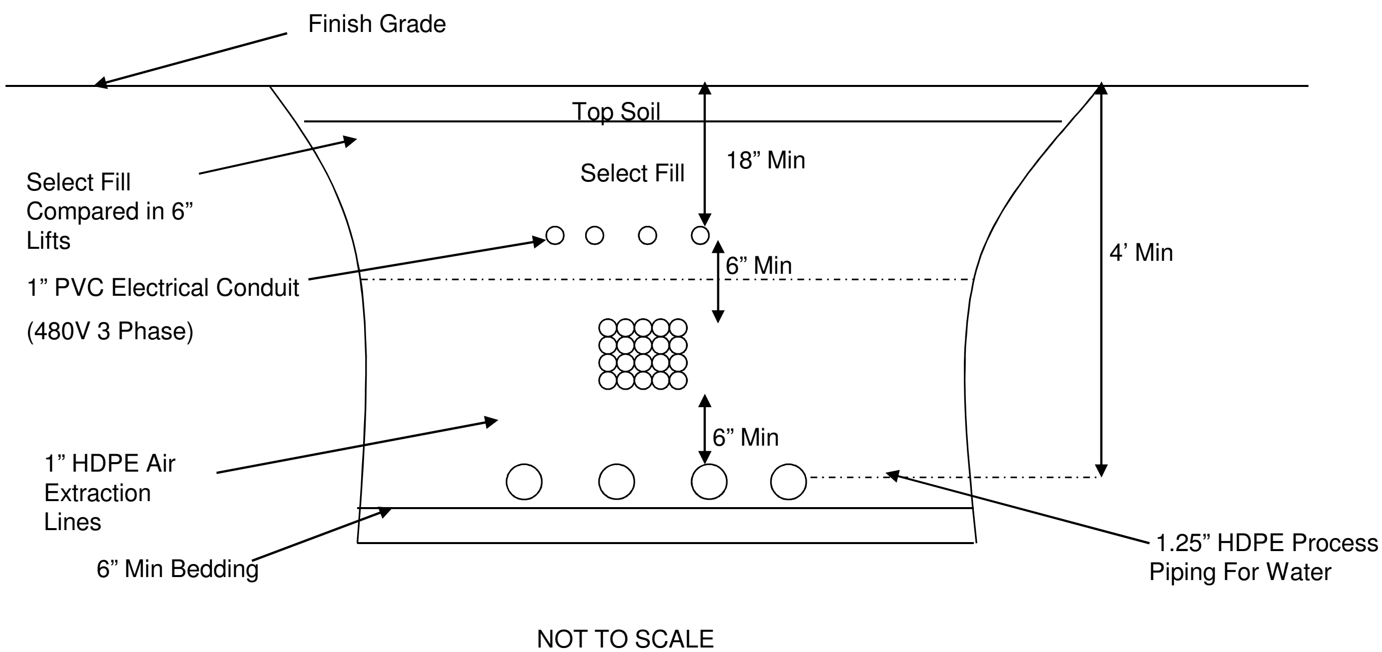

Figure 2-4

Trenching Detail

Supplemental Mitigation Plan
Former Miller Container Plant
Fulton, New York

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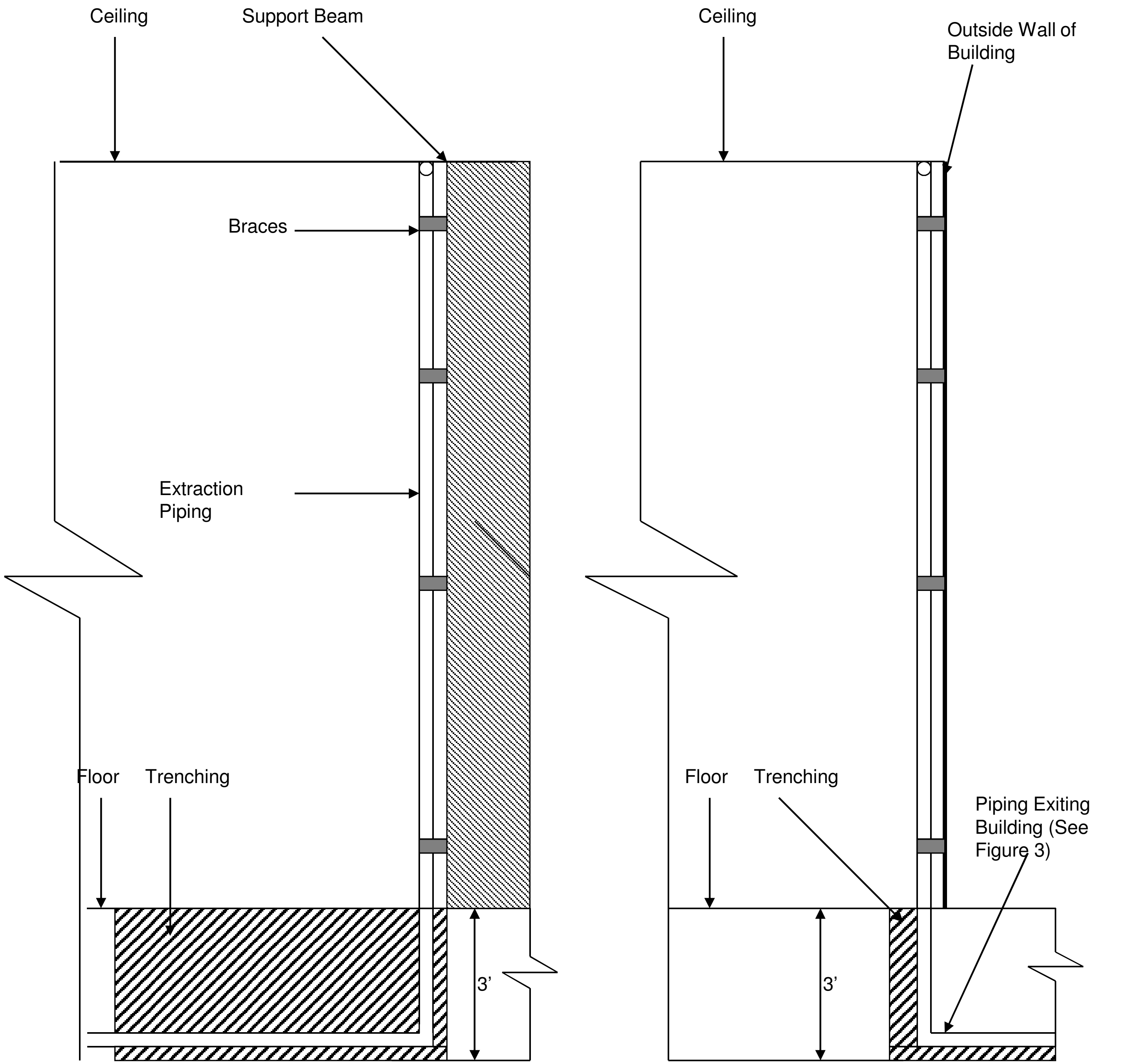

Figure 2-5

Aboveground Piping Detail

Supplemental Mitigation Plan
Former Miller Container Plant
Fulton, New York

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FORMER MILLER CONTAINER PLANT

SUPPLEMENTAL SITE MITIGATION PROGRAM

FIGURE 2-6

SVE-N System Area of Effect

AECOM

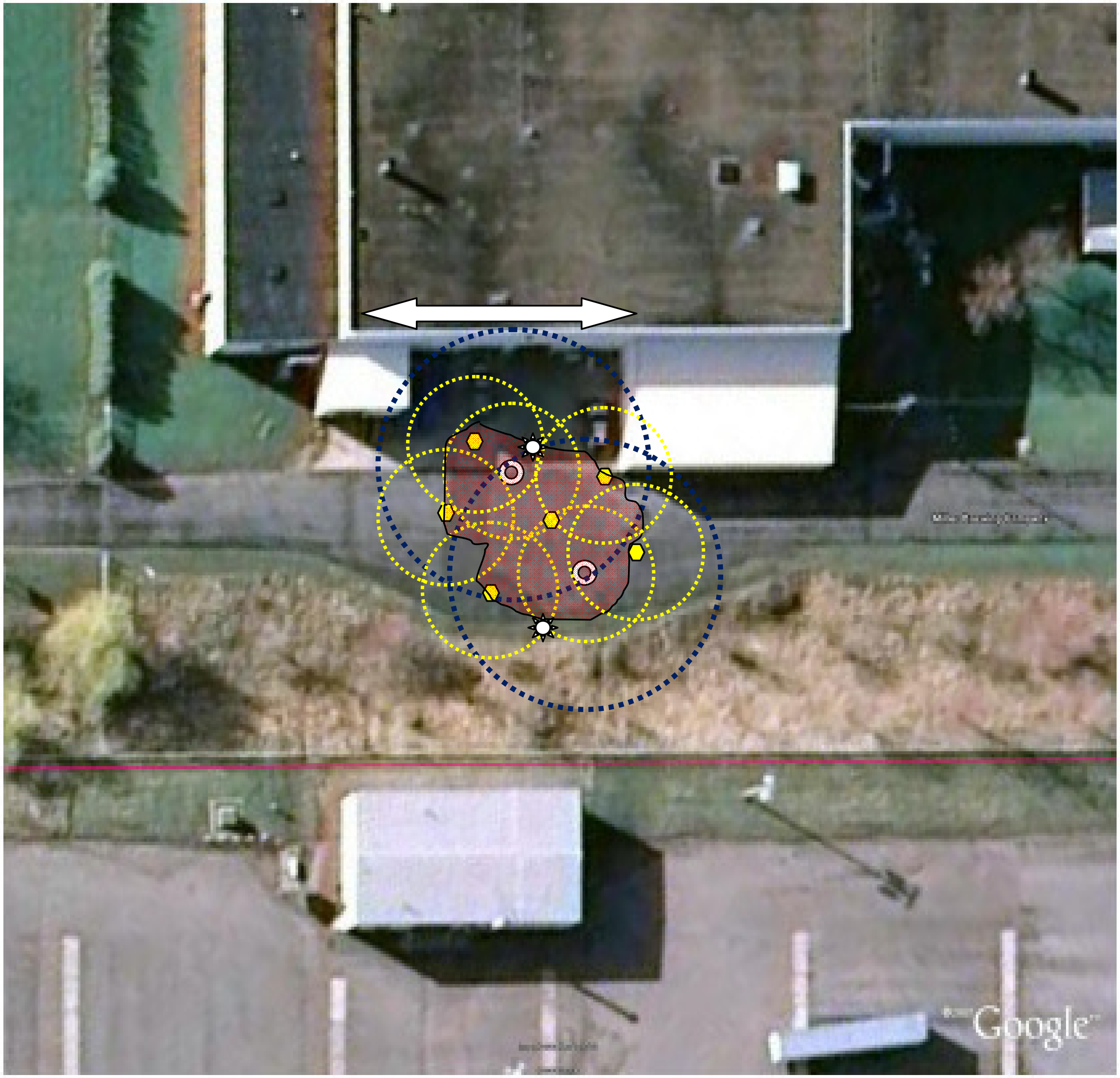
Dual Phase Well with Cone of Depression

SVE Well with Radius of Influence

Vacuum Pressure Gauge Point

Limits of Impacted Soils @ 14ft bgs

150 feet



FORMER MILLER CONTAINER PLANT

SUPPLEMENTAL SITE MITIGATION PROGRAM

FIGURE 2-7

SVE-S System Area of Effect

AECOM

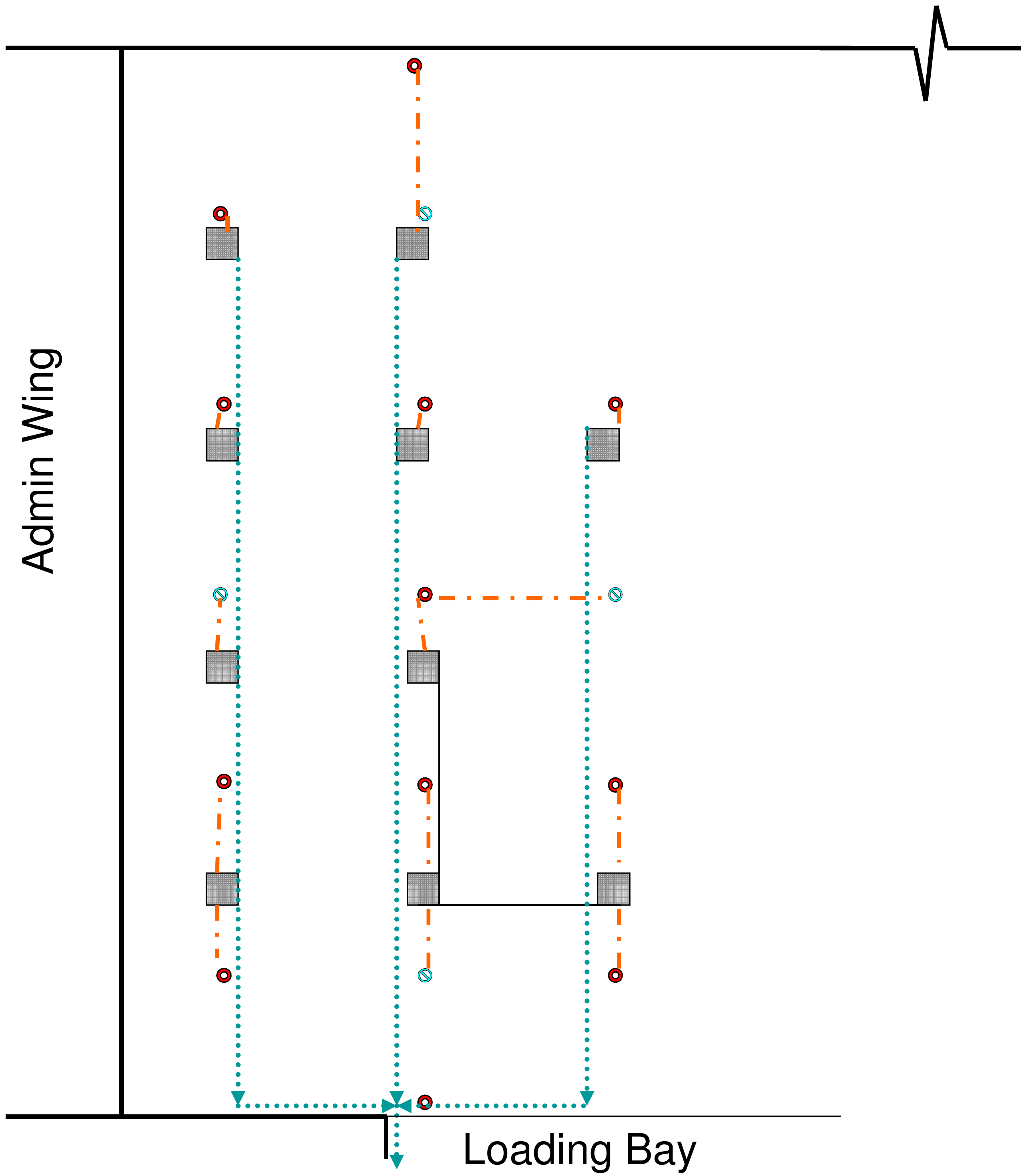
Dual Phase Well with Cone of Depression

SVE Well with Radius of Influence

Vacuum Pressure Gauge Point

Limits of Impacted Soils @ 14ft bgs

150 feet



Dual Phase Extraction Well
Soil Vapor Extraction Well
Trenching Location
Suspended Piping
Building Columns
Building Walls

NTS

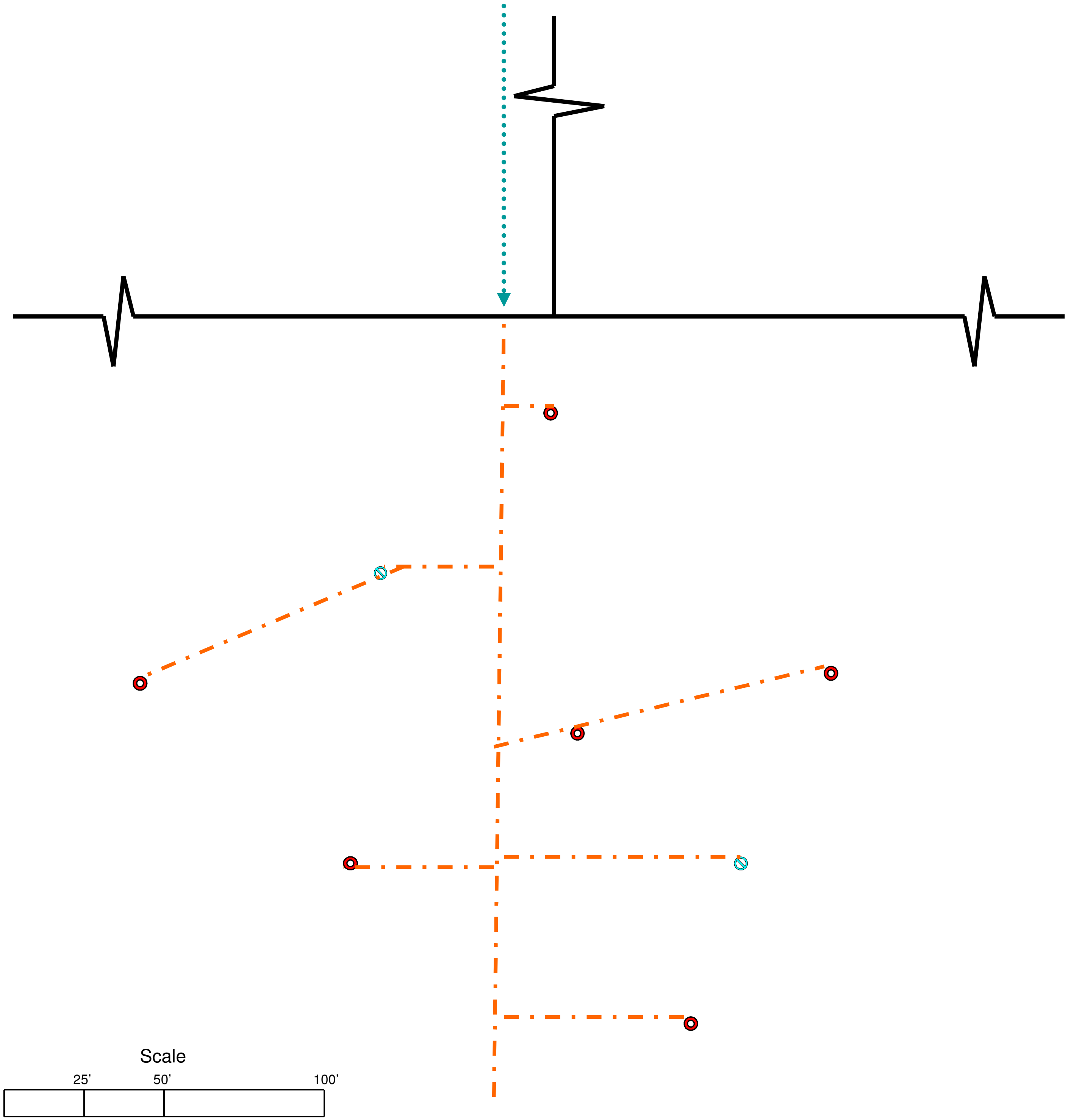
Figure 2-8

SVE- N Piping and Trenching
Layout Schematic

Supplemental Mitigation Plan
Former Miller Container Plant
Fulton, New York

April 2009

PROJECT NO:111909



Dual Phase Extraction Well

Soil Vapor Extraction Well

Trenching Location

Suspended Piping

Building Walls

Figure 2-9

SVE- S Piping and Trenching Layout Schematic

Supplemental Mitigation Plan
Former Miller Container Plant
Fulton, New York

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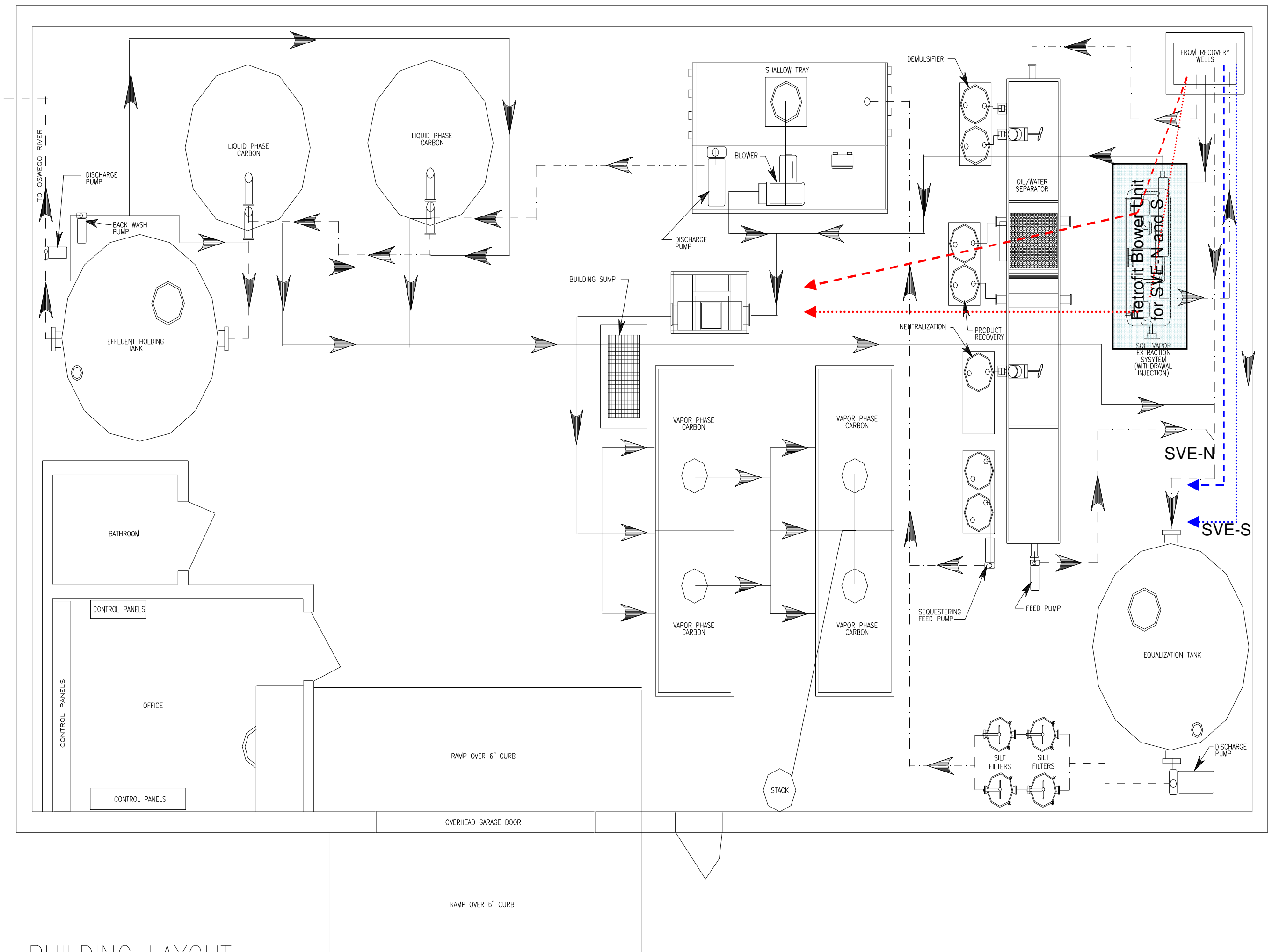

BUILDING LAYOUT

SCALE: = 1/4 " = 1'-0"

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Figure 2-10

Treatment Plant Schematic

Supplemental Mitigation Plan
Former Miller Container Plant
Fulton, New York

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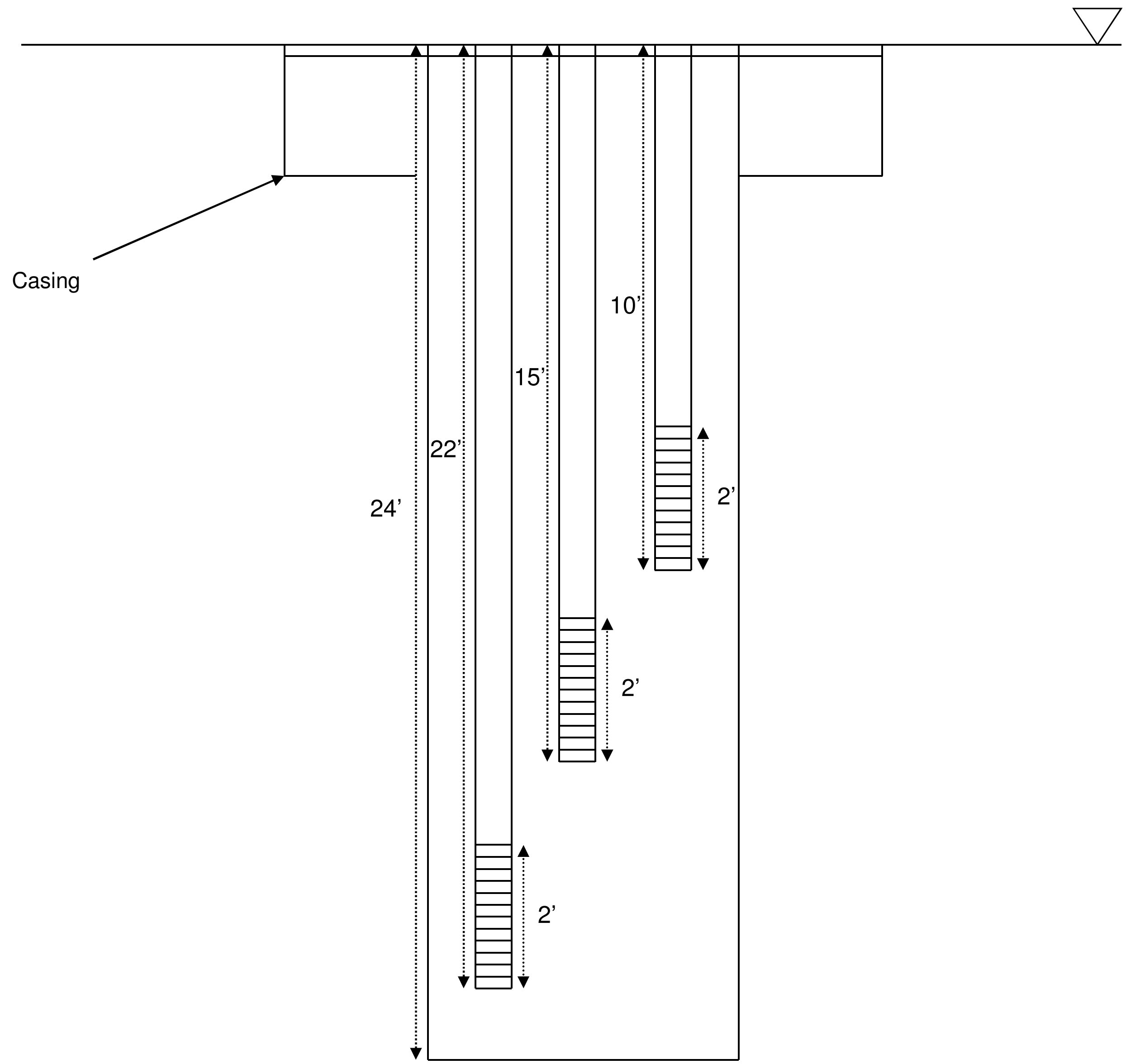

Figure 2-11

Vacuum Gauge Triplet Diagram

Supplemental Mitigation Plan
Former Miller Container Plant
Fulton, New York

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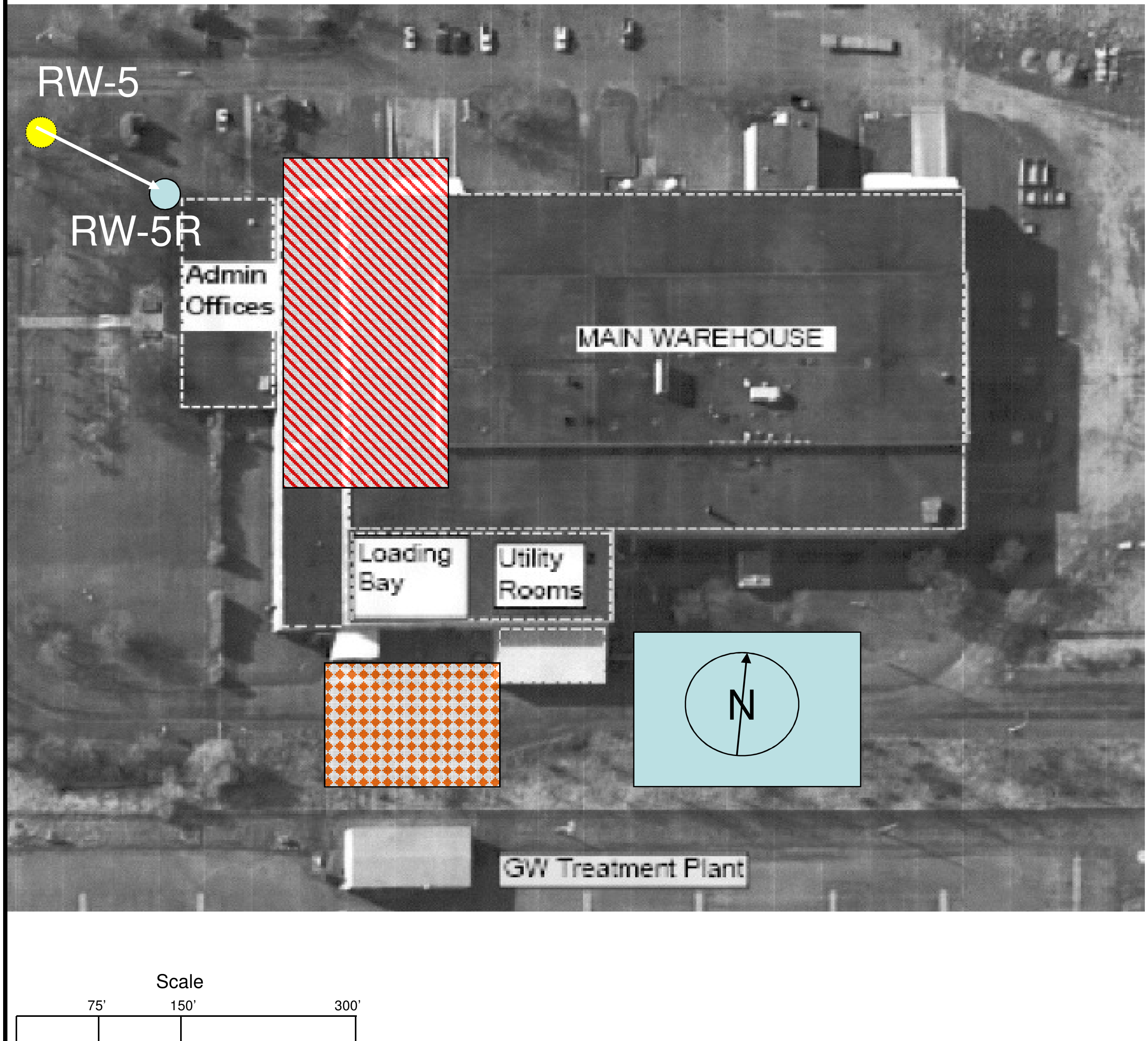

SVE- N

SVE-S

Figure 2-12

RW-5 Replacement Well Location

Supplemental Mitigation Plan
Former Miller Container Plant
Fulton, New York

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April 2009

PROJECT NO:111909

APPENDICIES

APPENDIX A
Field Sampling Plan

APPENDIX A

Field Activities Plan
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Section

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1.0 INTRODUCTION

This Field Sampling and Analysis Plan (FSP) was prepared by AECOM Technical Services, Inc. for the completion of a Supplemental Mitigation and System Optimization program for the existing groundwater recovery system at the former Miller Container Plant in Fulton, NY (the "Site"). A Site Location Map is included as Figure 1. A Site Layout Map is included as Figure 2.

This document provides the guidance for the performance of all field sampling activities. It defines in detail the methods and procedures to be used for all sampling and data gathering activities.

No design drawings or detailed specifications suitable for use as construction documents will be produced or included and none are required by NYSDEC.

1.1 OBJECTIVES

Field activities are planned and conducted in general accordance with NYSDEC Draft DER-10, Technical Guidance for Site Investigation and Remediation (NYSDEC, 2002) and the United States Environmental Protection Agency (USEPA) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, 1988), and New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, 2006).

This FSP is intended to be a companion document to the site-specific Work Plan prepared for the Site. This document specifies the methods, procedures, monitoring parameters and protocols, and laboratory sampling programs to be used to complete the scope specified in the Work Plan and to address site-specific conditions and project-specific requirements.

2.0 GENERAL AND PREPARATORY FIELD ACTIVITIES

The scope of work is specified in the site-specific Work Plan. The 2008 SSI redefined the extent of contamination and therefore this work is to implement a remedial strategy consistent with the ROD. The work includes the augmentation and optimization of the current recovery system.

The elements of this program include installation of a soil vapor extraction system consisting of both dual-phase (groundwater and vapor recovery) wells and vapor extractions points, piezometer monitoring points, and installation of a replacement groundwater recovery well. All groundwater recovery and vapor extraction wells will be piped to the existing treatment plant currently operating at the Site.

The work will also include a variety of activities intended to obtain data pertaining to the optimum operating parameters for the collection and treatment system. The immediate project objectives include:

- Assess the groundwater pumping rate for each recovery well;
- Assess the appropriate airflow from each soil vapor extraction point;
- Collect soil analytical samples during recovery well installation;
- Collect groundwater and soil vapor analytical samples during system startup; optimization; and over the operating life of the system.

The ultimate project objective is to mitigate residual soil impacts, eliminating the source generating the dissolved phase plume so that the residual groundwater impacts and potential soil vapor exposures will be can be mitigated.

To accomplish these objectives, the field subtasks described in this FSP will be utilized. Additional methodology information will be provided in the Quality Assurance Project Plan (QAPP).

2.1 SITE SURVEY

The locations of all sample points and existing monitoring wells will be surveyed. The horizontal and vertical positions will be tied in to the North American Datum 1983 and UTM Zone 18N coordinate system. The vertical positions will be tied to the North American Vertical Datum 1988 (NAVD88). The measuring point associated with the existing monitoring wells or other site reference features will be recorded to a vertical accuracy of 0.01 ft. The final survey data will be supplied in a digital CAD format (i.e., .dwg or .dxf files in the cited coordinate systems).

3.0 SOIL VAPOR EXTRACTION SYSTEM INSTALLATION TASKS

Soil Vapor Extraction System (SVE) activities will include the following;

- Dual-phase Well Installation
- Vapor Extraction Well Installation
- Replacement Recovery Well Installation
- Additional Monitoring Point Installation
- Well Development
- Submersible Pump Installation, Piping and Trenching

3.1 DUAL-PHASE WELLS

A total of six (6) of dual-phase wells will be installed at the Site, to lower the current water table. Continuous split spoon soil samples will be collected from grade to final depth and screened with a photoionization detector (PID). One soil sample will be collected from each well from the interval above the apparent water table at that location representing the highest potential concentration of VOCs based on visual and olfactory evidence of impacts and the results of the PID screening and submitted for laboratory analysis. When the boring has achieved the required depth a 4-inch recovery well will then be installed.

Notes will be kept in both bound field books and boring logs. The Unified Soil Classification System (USCS) will be used to describe the soil. Cuttings will also be screened for VOCs using a PID.

3.2 VAPOR EXTRACTION WELLS

A total of 18 soil vapor extraction wells will be installed. Soil sampling associated with these wells is described in Section 4.1.

3.3 REPLACEMENT RECOVERY WELL INSTALLATION

One new groundwater recovery (replacement) well will be installed. Soil sampling associated with this installation is described in section 4.1.

3.4 ADDITIONAL MONITORING POINT INSTALLATION

A total of four (4) piezometers will be installed. A total of four (4) vacuum pressure gauging points will be installed.. Soil sampling associated with this installation is described in section 4.1.

3.5 WELL DEVELOPMENT

After the grout has been allowed to set for at least eight hours, each new well will be developed to achieve hydraulic connection between the formation and the well screen. Each well will be developed until the criteria in the QAPP are achieved. During development, the field supervisor will record development information on the Well Development form. Periodic readings (every five to ten minutes) will include; depth to water, pumping rate, temperature, pH, conductivity and turbidity.

3.6 SAMPLING FROM NEW DUAL PHASE AND GROUNDWATER RECOVERY WELLS

Baseline groundwater samples will be collected for the six (6) dual-phase and one replacement well during the system startup tests. Sample will be collected in accordance with the procedures described in Section 5.1.

4.0 SUBSURFACE SOIL SAMPLING ACTIVITIES

Subsurface soil sampling will be conducted as a part of the well installation program. Procedures for these activities are described here. Borings will be advanced by hollow stem auger (HSA) drilling. Procedures for sampling from HSA borings, and soil logging are presented below.

4.1 SUBSURFACE SOIL SAMPLING FROM HSA BORINGS

Subsurface soil samples will be collected from borings advanced for the installation of wells. Most installations will employ 4-1/4 inch ID, dual phase wells will require 6-1/4 inch ID. Sampling from these borings will be consistent with ASTM D-1586-84 using a standard 2-ft long, 2-inch OD steel split spoon sampler with a 140-lb hammer. If necessary, and indicated in the Work Plan or FAP addendum, a 3-inch OD split spoon may be utilized to obtain sufficient soil for laboratory analysis.

The general procedure for subsurface sampling from split spoon samplers is described below.

- Identify the soil boring location and record the location on the soil boring log.
- Put on a new pair of disposable gloves.
- Prepare a clean surface (e.g., using a plastic sheet) onto which sampling equipment, meters, and the like can be placed; clean the equipment prior to placing on the clean surface.
- Retrieve the split spoon sampler from the borehole (or accept the split spoon sampler from the drilling subcontractor).
- Remove the shoe and head attachments from the split spoon sampler and place the split spoon sampler on a clean surface.
- Remove one-half of the split spoon sampler tube to expose the sample.
- Immediately, screen for organic vapors using a photoionization detector and record the results.
- Measure the recovery (in inches) of soil in the tube.
- If the sample is to be analyzed for VOCs, take an immediate grab sample and place into the designated container (4-oz glass jar) without homogenizing.
- The remainder of the soil from the split spoon sampler will be placed directly in a decontaminated stainless steel bowl for homogenization.
- Homogenize the sample using a decontaminated stainless-steel spoon or spatula. If possible, sufficient pre-cleaned equipment will be brought to the site. If this is not practical, stainless-steel bowls, spoons, and spatulas will be field-decontaminated prior to use and between uses, as described in Section 7 of the FSP. Homogenization will involve the thorough mixing in order to provide a well mixed, representative sample to the laboratory.

- Once homogenized, transfer the soil sample directly to the appropriate sample containers, slightly tamped-down, filled to near the top of the container, and sealed with the appropriate cap.
- After the last sample has been collected, record the date and time; place the sample bottles in the cooler, on ice.

4.2 SUBSURFACE SOIL LOGGING

Subsurface soil logging will be conducted for borings advanced by HSAs. Soil boring logs will be prepared in the field by a qualified, experienced geologist or engineer, as borings are drilled. Boring logs will be prepared on a standard drilling log form, an example of which is provided in Appendix A.

Soil borings will be logged, with each type of material encountered being described on the log form. All relevant information in the log heading and body will be completed. If surveyed horizontal control is not available at the time of drilling, location sketches referenced by distances to permanent surface features will be shown on or attached to the log.

Each material type encountered will be described on the log form. Descriptions of unconsolidated materials will include Unified Soil Classification System (USCS) in accordance with ASTM D-2487-00, consistency of cohesive materials or apparent density of non-cohesive materials, moisture content assessment, color, other descriptive features such as bedding characteristics, organic materials, macrostructure of fine-grained soils, and depositional type. A Summary Sheet will accompany the logger for easy reference to the USCS Soil Classification System; a copy of is provided in FSP Appendix A.

Depth information will be from direct measurements accurate to ±0.1 ft. Stratigraphic/lithologic changes will be identified by a solid horizontal line at the appropriate scale depth on the log that corresponds to changes at the measured borehole depth. Gradational changes identified from cuttings will be identified by a horizontal dashed line at the appropriate scale depth based on the best judgment of the logger. Lines will be drawn with a straight edge. Boring logs will clearly show the depth interval from which all samples are obtained. Logs will also indicate the presence or absence of water in boreholes, the depth at which water is first encountered, the depth to water at the completion of drilling, the stabilized water depth, and the time allowed for the levels to stabilize.

Boring logs will show drilling detail, including borehole and sample diameters, the depth at which changes occur in drilling or sampling methods or equipment, and the total depth of penetration and sampling. The bottom of the borehole will be identified by “Bottom of Borehole” clearly on the log. Any drilling or sampling problems will be noted on the logs, including descriptions of resolutions. Logs will include other information relevant to the investigation, including odors, field screening and test results, and any evidence of contamination of samples, cuttings, or drilling fluids. Boring logs will be submitted in the draft and final reports.

5.0 SOIL VAPOR EXTRACTION SYSTEM START-UP

The initiation of groundwater and soil vapor recovery from the system will consist of two separate stages: Initial system Start-up Test and a Demonstration Test. Details of these activities are presented below.

5.1 INITIAL START-UP TEST

Upon completion of installation, an initial start-up test of the SVE systems will be performed. The following procedures will be used to bring the systems on line individually.

The dual-phase wells will be brought on-line sequentially (one at a time) and a (baseline) groundwater sample collected from the in-line sampling port installed on each well. These samples will be submitted to the laboratory for analysis to establish baseline conditions at that location. In total, 7 groundwater samples will be collected (6 from dual phase wells and 1 from the replacement recovery well) and analyzed for volatile organic compounds (VOCs). For consistency with historical site related data and with the current groundwater monitoring program, groundwater samples will be analyzed via US SW-846 EPA Method 601/602.

Following sampling, groundwater recovery from the dual phase wells will continue until the composite cone of depression caused by the pumping action has exposed the screen intervals of the vapor extraction wells (average 24 feet below ground surface). During this phase, water level measurements will be collected and recorded from the piezometers to monitor the expanding cone of depression from the wells. The initial measurement will be made prior to activation of any of the pumping wells. Subsequent measurements will be made at least once every four (4) hours until the change in water level in the piezometers has stabilized, defined as a decrease of less than 0.1 feet in elevation between successive measurements. Once the composite cone has stabilized, water levels in the SVE wells will be gauged to confirm the screens are exposed.

Due to the significant variability of subsurface soils there is a potential for water levels to remain within the screen intervals near the base of individual vapor extraction point particularly in SVE points on the outer fringe of the composite cone. This should not affect the usability of the well. However it could impact long-term results and goals. An analysis of residual water levels with potential impacts and recommendations for corrective actions will be included in the demonstration test report, if needed,

Once the water levels in the piezometers have stabilized, the vapor extraction system will be brought on-line sequentially. Utilizing the flow regulators which will be installed on each extraction point, each well will be individually tested. The airflow from each well will be measured and recorded for subsequent system balancing as needed. As each well is brought on-line individually, airflow will be monitored for approximately 15 minutes and a baseline air-sample collected for laboratory analysis of VOCs by USEPA Method TO-15 from the in-line sampling port. This process will continue until all of the vapor extraction wells have been tested. Once the individual wells have been tested the entire system will be brought on-line and the combined flow tested for both flow rate and air quality from the in-line sampling port.

Once all systems have been brought on-line system operating parameters will be monitored and recorded on a daily basis for 14 consecutive days. Details of parameters to be monitored are in During that time all connections, piping, fittings, etc. will be checked for tightness and any necessary and appropriate corrective actions taken for any noted deficiencies. After 14 days of continuous system operation, one complete round of analytical samples will be collected from all in-line sample collection ports installed on the system. Approximately 30 days after system start-up is complete, three SVI samples will be collected to evaluate the effects on the sub-slab soil vapor concentrations of the SVE systems.

A schematic diagram with the sampling points utilized in the 14-day sampling event is included as Figure FSP-1 on the following page. The 14-day sampling event includes:

A total of 11 groundwater samples:

- One (1) sample from each of Dual-Phase recovery wells (a total of 6),
- One (1) combined influent sample from each SVE system (total of two (2)) to the AST;
- One (1) effluent sample from the AST to the LPC-1;
- One effluent sample from LPC-1 to LPC-2; and,
- One (1) effluent sample from LPC-2.

Groundwater samples will be submitted for laboratory analysis of volatile organic compounds (VOCs) utilizing US EPA SW-846 Method 601/602 with class A deliverables.

The results of these samples will be compared to the substantive of the SPDES permit.

A total of 27 Vapor Phase samples:

- One (1) air sample from each vapor extraction point (24);
- One (1) off-gas sample from the AST to VPC-1;
- One (1) off-gas sample from VPC-1 to VPC-2; and,
- One (1) off-gas sample from VPC-2.

Soil Vapor samples will be submitted for laboratory analysis utilizing US EPA method TO-15.

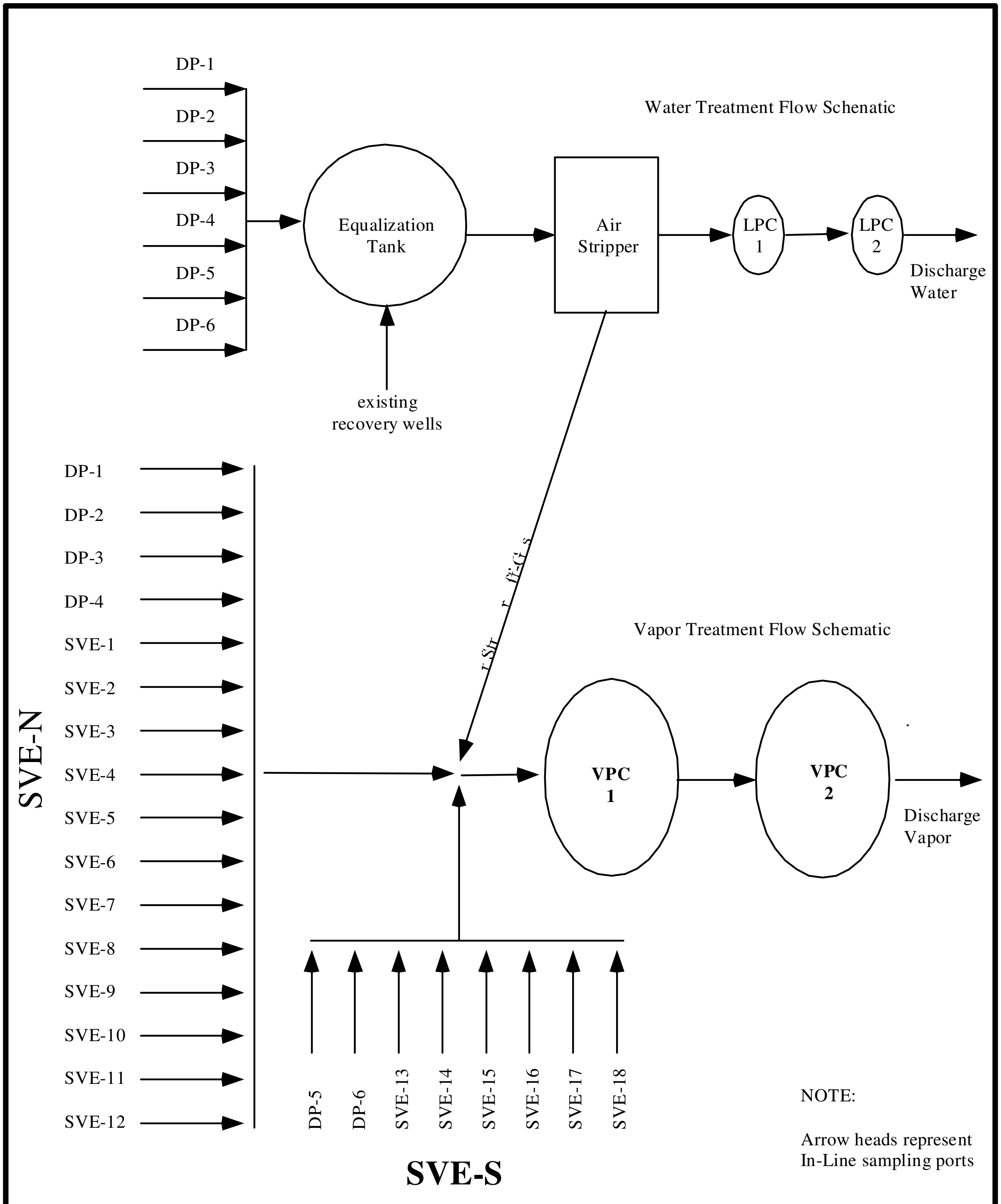
The results of the sampling will be compared to the Air Guide 1 model and discharge limits established for the site.

A total of three(3) SVI Air Quality Samples

One Occupied Space
Two sub-slab

Air Quality will be submitted for laboratory analysis utilizing US EPA method TO-15.

The laboratory Contract Required Quantitation Limits (CRQL) for all analyses will conform to ASP standards per the QAPP.



Former Miller Container Plant
Supplemental Mitigation Plan

Flow Schematic and System Monitoring Points

FIGURE FSP-1

5.2 SVE DEMONSTRATION TEST

The demonstration test for the systems will commence immediately after collection of the 14-day sampling event and continue for approximately six (6) months. During the demonstration test, system operating parameters will be measured and recorded on a weekly basis.

System operating parameters include:

- total ground water recovery for each DP well for the period;
- air flow from each SVE and DP point and the combined flow;
- representative air quality from each extraction point measured with a PID and an FID;
- vacuum pressure measurements from the interstitial gauging points; and,
- water level measurements from the piezometers.

One round of sampling will be performed at approximately 30-day, 90-day, and 180-days, of continuous operation. The same methods and procedures used for the 14-day sampling event will be utilized for the 30, 60 and 90 day sampling events except that air samples will not be collected from the individual vapor extraction points for the 30 or 60 day events. For these events, one combined sample will be collected for each of the two systems and the results of the PID/FID screening used to approximate the air quality in each of the individual extraction points. Air samples from the individual sampling points will be collected in the 180-day sampling event.

5.3 EXTENDED OPERATIONS

Extended operation of the SVE systems will be performed after completion of the demonstration test. An addendum to the existing Operations, Monitoring, & Maintenance Plan will be prepared and submitted to NYSDEC for approval. Long-term system monitoring and sampling requirements will be specified in that addendum based on the evaluation of the demonstration test results.

At this time, it is assumed that long-term system operations monitoring would consist of monitoring the system operations parameter on a not less than monthly basis with collection and analysis of groundwater and vapor samples on a quarterly basis. Quarterly sampling would be performed as specified for the 30-day and 60-day sampling events for the first and third quarters following the demonstration test and the 14-day sampling event for the second and fourth quarters.

6.0 DECONTAMINATION AND MANAGEMENT OF INVESTIGATION-DERIVED WASTE

6.1 EQUIPMENT DECONTAMINATION

To avoid cross contamination, sampling equipment (defined as any piece of equipment which may contact a sample) will be decontaminated according to the following procedures. Field equipment rinsate blanks are generated and analyzed to monitor the effectiveness of field decontamination procedures.

Cross contamination will be minimized by the use of vendor-decontaminated, dedicated, disposable equipment to the extent practical.

6.1.1 Decontamination Procedures

A decontamination pad will be constructed on the site. The pad will be sized to be large enough to handle the equipment used on site (e.g., drill rig). The pad will also be used for small equipment decontamination as well as personnel decontamination.

6.1.2 Small Equipment Decontamination

Small equipment decontamination for non-disposable equipment will be accomplished using the following procedures:

- Alconox (or equivalent) and potable water wash;
- Potable water rinse; and
- Distilled/deionized water rinse.

Solvents will not be used in the field decontamination of such equipment. Decontamination will include scrubbing/washing with a laboratory grade detergent (e.g. Alconox) to remove visible contamination, followed by potable (tap) water and analyte-free water rinses. Tap water may be used from any treated municipal water system; the use of an untreated potable water supply is not an acceptable substitute.

Equipment will be allowed to dry prior to use. Steam cleaning or high pressure hot water cleaning may be used in the initial removal of gross, visible contamination.

Electric submersible pumps (such as a Grundfos Redi-Flow II) will be decontaminated using the above steps followed by running a large volume (several gallons) of potable water through the pump, followed by an analyte-free water rinse. Tubing will not be re-used (new tubing will be used for each well).

If bladder pumps are used, the pump will be disassembled and cleaned after each used. A new bladder will be used for each sample. Small parts, such as screens and gaskets will be replaced after each use. Dedicated air line tubing and Teflon sample tubing will be used at each monitoring well. The pump will be cleaned using the following steps:

- Alconox (or equivalent) and potable water wash;
- Potable water rinse;

- Distilled/deionized water rinse;
- Solvent (reagent or pesticide grade) rinse if samples are collected for organic analysis;
- Dilute (10%) nitric acid rinse if samples are collected for metals analysis;
- Distilled/deionized rinse, air dry.
-

6.1.3 Heavy Equipment Decontamination

Drilling equipment will be decontaminated before the first use during this project, between boreholes and prior to demobilization using high-pressure steam. Decontamination will be conducted at a dedicated decontamination pad constructed for the project. Decontamination fluids will be containerized (drummed) for subsequent treatment at the on-site treatment plant.

6.1.4 Personnel Decontamination

Wash buckets and potable water will be set up at the decontamination pad. This includes washing hands and a boot wash.

6.2 MANAGEMENT OF INVESTIGATION DERIVED WASTE

The sampling methods and equipment will be selected to limit both the need for decontamination and the volume of investigation-derived waste (IDW). Personal protective equipment and disposable sampling equipment will be placed in plastic garbage bags for disposal as a solid waste.

Types of IDW typically generated include: soil cuttings from soil borings and monitoring well installation; soil from trench exactions, development and purge water from the wells; and decontamination water from the drill rigs.

Monitoring well purge water, and decontamination water will be containerized for subsequent treatment at the on-site treatment plant.

Temporary management of soils generated during well installation and trench excavations will be staged on site in lined roll off containers, characterized, and removed for off-site disposal at an appropriately permitted facility.

7.0 FIELD RECORDS AND DOCUMENTATION

The objective of this subsection is to provide consistent procedures and formats by which field records will be kept and activities documented, and a methodology by which field records will be managed. Field records and documentation to be used during field activities include Field Log Books and Standard Forms. Standard Forms include chain-of-custody (COC) forms, Drilling Logs, Well Installation Diagrams, Well Development Forms, Well Sampling Forms, Aquifer Testing Forms, Well Condition Forms, and investigation derived waste (IDW) Log Sheets. Example forms are provided in Appendix A.

7.1 FIELD LOG BOOKS

Field log books will be prepared and maintained throughout the course of the investigation. Only bound, weatherproof field log books will be used. The log books will be turned in for copying/filing/tracking when complete.

Each log book will be labeled on the front cover in indelible ink with the following designation: "Site Name/Project Type, AECOM Project Number zzzzz."

Log book entries will be recorded in indelible, waterproof ink. If errors are made in any field log book, field record (form), Chain-of-Custody Record, or any other field record document, corrections will be made by crossing a single line through the error, entering the correct information, and initialing and dating the correction.

Entries will be made in the following format. Documentation and reporting of events and activities will be made in chronological order on the right page of an open log book. The left page of the log book will be used for extemporaneous reporting, such as sketches, tables, providing details or comments on events reported sequentially, or interpretations, and notes identifying use of any other field documentation such as COCs and Standard Forms.

Standard Forms have been adopted in this FSP to facilitate the collection of consistent data (See Appendix A). This will preclude detailed documentation of, for example, lithologic descriptions in the Field Log Book. A reference, however, to use of each specific form must be made in the log book.

The date will be placed at the top of every page in the left-hand corner of the right page. The time of entry recordings will be in columnar form down the left-hand side of the right page. If an entry is made in a non-dedicated log book, then the date, project name, and project number will be entered left to right, respectively, along the top of the right page. Entries should be dated, and time of entry recorded. At the beginning of each day, the first two entries will be "Personnel/Contractors On Site" and "Weather." At the end of each day's entry or particular event, if appropriate, the person entering the field notes should draw a diagonal line originating from the bottom left corner of the page to the conclusion of the entry and sign along the line indicating the conclusion of the entry or the day's activity.

Entries in field log books will be legible (printing is preferable) and will contain accurate and inclusive documentation of project activities (investigation, monitoring remediation, closure, maintenance, etc.). Information pertaining to health and safety aspects, personnel on site, visitor's names, association, and time of arrival/departure, etc., should also be recorded. Language should be objective, factual, and free of personal feelings or other terminology that might prove inappropriate, since field records are the basis for later written reports. Once completed, these field log books become accountable documents and must be maintained as part of the project files.

Sample collection and handling activities, as well as visual observations, will be documented in the field log books. The sample collection equipment (where appropriate), field analytical equipment, and equipment used to make physical measurements will be identified in the field log books. Calculations, results, and calibration data for field sampling, field analytical, and field physical measurement equipment will also be recorded in the field log books, except where these are referenced as being recorded on approved field forms. Field analyses and measurements must be traceable to the specific piece of field equipment utilized and to the field investigator collecting the sample, making the measurement, or conducting analyses. Log books will be updated as field work progresses.

When an individual log book is full, the log book will be submitted to the AECOM project manager for final cataloging and filing. The log books will be stored in the Project File. Copies of specific sections will be made available to personnel upon request.

7.2 STANDARD FORMS

All non-bound field records (e.g., drilling logs, well construction forms, sampling records, COCs, aquifer testing forms) will be completed the day the associated activity occurs. Field data collected using electronic data loggers or computer entry forms, will be downloaded as soon as practical onto CDs or uploaded to office servers. If possible, the person collecting the data will download electronic data on a daily basis. This person will be responsible for verifying that the data collected are adequately represented in electronic media and in the file. A hard copy of the data, and any graphical representation produced by logging software, will also be printed out and duplicated. Examples of forms typically used are provided in Attachment A of this FSP.

7.3 SAMPLE IDENTIFICATION

During this project, a unique sample identifier will designate each sample collected. The following system may be used to assign unique sample identification numbers; however, modifications should be made as needed to clearly and appropriate identify samples for each site or project. Each sample will be identified by an alphanumeric character identifier, as described below.

The following codes will be used for identifying other sample types:

CODE	Sample Type
FB	Field (Rinsate) Blank
N + 50	Field Duplicate (e.g., field duplicate of MW-3S will be MW-53S)
TB	Trip Blank
MS/MSD	Matrix Spike/ Matrix Spike Duplicate

Field blanks and trip blanks will be labeled for the day of collection. For MS/MSD samples, the MS/MSD will be added to the sample ID and included on the COC as a note.

An example of the sample numbering system is provided below.

Sample Identifier	Description
MW-1S	Existing well MW-1S
MW-101D	New deep monitoring well
SB-02-0406	Soil sample from 4 to 6 ft interval from boring SB-02.

FBW070203	Field blank associated with water samples collected on February 3, 2007
TB070203	Trip blank associated with samples shipped 2/3/07.

7.4 SAMPLE LABELING

A non-removable label will be affixed to each sample container. Labels will be marked with permanent marker pens. The following information will be contained on each label:

Project name;

Sample identifier;

Company (AECOM);

Sample date and time;

Sampler's initials;

Sample preservation; and

Analysis required.

7.5 SAMPLE CHAIN OF CUSTODY

At the time of the sampling, a field team member will record the sample information in the field log book, well sampling form or drilling log, and on a COC form. The sample information recorded in the log books will be at least as detailed as that recorded on labels, and should indicate the type of sample (e.g., groundwater, soil), sample preservation, and sampling location, in sufficient detail as to allow re-sampling at the same location. Errors on forms or logbook entries will be stricken with a single line and corrected, with the date and initials of the person making the correction.

After samples are collected, the field team member will immediately place the filled containers in coolers and iced to 4^{o} C. Samples will be preserved as required and specified in the QAPP (Table 2). The field team will maintain custody of the samples until they are shipped to the laboratory. The entries on the COC form will correspond to the field log book, standard forms, and sample labels.

Original white copies of COCs will be forwarded to the laboratory. Yellow copies and associated shipping air bills will be maintained by the Field Supervisor with all other documentation until provided to the Project Manager. COCs will be copied to the field file weekly. Yellow copies will be filed by the Project Manager or designated representative on a weekly basis (at a minimum) in the Project File for permanent storage.

7.6 SAMPLE PACKAGING AND SHIPPING

Samples collected for laboratory analysis will be shipped by a commercial overnight delivery service to the laboratory on the day of collection (if possible; otherwise samples will be shipped on the day after collection), following proper identification, chain-of-custody, preservation, and packaging procedures. Samples which require maintenance at 4º C (essentially all aqueous and non-aqueous samples submitted for chemical analysis) which are collected and shipped on a Friday must be delivered to, and accepted by, the laboratory on Saturday; note that it may be necessary to arrange this in advance.

Sample packaging and shipping procedures are summarized as follows:

A properly completed chain-of-custody form will accompany each sample shipment. The sample identifiers will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to the laboratory, or to/from a secure storage area.

Samples will be properly packaged to avoid breakage, stored on ice at 4° C for shipment and dispatched to the appropriate laboratory for analysis. (In the event that samples must be held overnight prior to shipment, the temperature of the cooler and presence of sufficient ice will be checked and new ice added prior to shipment.) A signed COC form will be enclosed and secured to the inside top of each sample box or cooler. The COC (white copy), a cooler receipt form (if applicable), and any additional documentation will be placed in a plastic bag to prevent them from getting wet, and one copy will be retained by the field team leader.

Shipping containers will be secured with strapping tape and custody seals for shipment to the laboratory. Signed custody seals will be covered with clear plastic tape. The cooler will be taped shut with strapping tape in at least two locations.

Samples will be transported to the laboratory by a commercial overnight carrier (e.g., UPS or FedEx) unless other arrangements are made on a project-specific basis (e.g., laboratory courier sample pickup; or hand delivery of samples to the laboratory by AECOM personnel).

8.0 REFERENCES

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APPENDIX B

Quality Assurance Project Plan

Table of Contents

1.0 QUALITY ASSURANCE PROJECT PLAN - INTRODUCTION

1.1 PURPOSE AND OBJECTIVE

The purpose of this Quality Assurance Project Plan (QAPP) is to document planned investigative activities and establish the criteria for performing these activities at a predetermined quality.

1.1.1 PROJECT MANAGEMENT AND ORGANIZATION

The general responsibilities of key project personnel are listed below.

Project Manager – The Project Manger will have responsibility for overall project management and coordination of the initiation and implementation of the activities.
QA Officer – A Quality Assurance Officer (QAO) will be identified for each work assignment. The QAO will be responsible for oversight of the data validation and laboratory subcontractors, as well as data usability reports.

H & S Officer –will be responsible for oversight of the preparation of the project health and safety plan, approving it, and tracking of its implementation.

2.0 SITE INVESTIGATION

2.1 FIELD SAMPLING PROCEDURES

Field activities are detailed in the Work Plan and FSP and are not repeated in the QAPP.

3.0 SAMPLE HANDLING

3.1 SAMPLE IDENTIFICATION AND LABELING

Samples will be assigned a unique identification using the sample location or other sample-specific identifier. Sample identification may be limited to a specific number of alphanumeric characters to be consistent with the limitations of the laboratory tracking/reporting software. The general sample identification format follows (other designations may be used to accommodate the requirements of specific projects).

DP = Dual Phase Well;

SVE = Soil Vapor Extraction point;

SVI = Soil Vapor Intrusion point;

PZ = Piezometer;

FB = Field (Equipment Rinsate) Blank; and

TB = Trip Blank

XX = Numerical sample identifier (up to five characters). This will ordinarily be the number of the monitoring well or soil boring location from which the sample was obtained (e.g., DP-01 would be a water sample from dual-phase well 01).

YY = Soil sampling depth (up to four characters). This will identify the interval the soil sample is collected from (e.g., SVE-03-1214 would be a soil sample collected at Soil Vapor Extraction Point 03 from the 12 to 14 foot interval).

QC field duplicate samples will be submitted blind to the laboratory; a fictitious sample ID will be created using the same system as the original by adding 50 to the original well ID (e.g., DP-51 would be a field duplicate of DP-01). The sample identifications (of the original sample and its field duplicate) will be marked in the field book and on the copy of the chain-of-custody kept by the sampler and copied to the project manager. Affixed to each sampling container will be a non-removable label on which the following information will be recorded with permanent water-proof ink:

- Site name, location, and job number;
- Sample identification code;
- Date and time;
- Sampler's name;
- Preservative;
- Type of sample (e.g., water, soil, sludge, sediment); and,
- Requested analyses.

3.1.1 SAMPLE. BOTTLES, PRESERVATION, AND HOLDING TIME

Table 1 identifies the sample matrix, analytical parameters, containers, preservatives, analytical method, and sample holding time, for the analyses to be performed. Sample bottle requirements, preservation, and holding times are discussed further below.

TABLE 1

Matrix	Analyte	Container	Preservative	Method	Holding Time
Groundwater	VOCs	40 ml VOA	HCl	601/602	48 hr
Soil	VOCs	4 oz jar	none	601/602	48 hr
Soil Gas	VOCs	Tedlar bag	none	TO-15	48 hr
Soil Vapor	VOCs	Summa Cannister	none	TO-15	48 hr

3.1.2 Sample Bottles

The selection of sample containers used to collect samples is based on the criteria of sample matrix, analytical method, potential contaminants of concern, reactivity of container material with the sample, QA/QC requirements and any regulatory protocol requirements.

Sample bottles will be provided by the analytical laboratory and will conform to the requirements of the USEPA Specifications and Guidance for Contaminant-Free Sample Containers. Aqueous samples for volatile organic compound (VOC) analysis will be collected in 40-mL vials with teflon septa.

3.1.3 Sample Preservation

Samples will be preserved as indicated below and summarized on Table 1.

<u>Aqueous Samples</u>:

Volatile organics - cooled to 4º C; HCl added to pH ≤ 2.

Chemical preservatives will be added to the sample bottles (prior to sample collection) by the analytical laboratory. The pH of samples will be spot-checked in the field and additional preservative will be added as needed..

Non-Aqueous (e.g., soil and sediment) Samples:

No chemical preservatives are added to non-aqueous samples

Air Samples (Summa Canisters):

No chemical preservatives are used for air samples.

3.1.4 Holding Times

Contractual holding times (see Table 1) are calculated from the validated time of sample receipt (VTSR) by the laboratory; samples will be shipped from the field to arrive at the lab no later than 48 hours from the time of sample collection. Holding time requirements will be those specified in the NYSDEC ASP 2005; it should be noted that for volatile organics analyses, these holding times are more stringent than the holding time NYSDEC 2004 ASP Laboratory Certification Manual.

Although trip blanks are prepared in the analytical laboratory and shipped to the site prior to the collection of environmental samples, for the purposes of determining holding time conformance, trip blanks will be considered to have been generated on the same day as the environmental samples with which they are shipped and delivered. Procurement of bottles and blanks will be scheduled to prevent trip blanks from being stored for excessive periods prior to their return to the laboratory; the goal is that trip blanks should be held for no longer than one week prior to use.

3.2 CHAIN OF CUSTODY AND SHIPPING

A chain-of-custody form will trace the path of sample containers from the project site to the laboratory. Chain-of-custody forms are typically provided by the analytical laboratory.

Sample bottle tracking sheets or the chain-of-custody will be used to track the containers from the laboratory to the containers' destination. The project manager will notify the laboratory of upcoming field sampling events and the subsequent transfer of samples. This notification will include information concerning the number and type of samples, and the anticipated date of arrival. Insulated sample shipping containers (typically coolers) will be provided by the laboratory for shipping samples. Sample bottles within each shipping container will be individually labeled with an adhesive identification label provided by the laboratory. Project personnel receiving the sample containers from the laboratory will check each cooler for the condition and integrity of the bottles prior to field work.

Once the sample containers are filled, they will be immediately placed in the cooler with ice (in Ziploc plastic bags to prevent leaking) or synthetic ice packs to maintain the samples at 4º C. The field sampler will indicate the sample designation/location number in the space provided on the chain-of-custody form for each sample. The chain of custody forms will be signed and placed in a sealed plastic Ziploc bag in the cooler. The completed shipping container will be closed for transport with nylon strapping, or a similar shipping tape, and two paper seals will be affixed to the lid. The seals must be broken to open the cooler and will indicate tampering if the seals are broken before receipt at the laboratory. A label may be affixed identifying the cooler as containing "Environmental Samples" and the cooler will be shipped by an overnight delivery service to a NYSDEC approved laboratory.

4.0 DATA QUALITY REQUIREMENTS

4.1 ANALYTICAL METHODS

Analytical and extraction/sample preparation methods to be use are summarized below.

Volatile Organics - SW-846 Method 601/602

Air samples (SVE vapor, process rain influent and effluent vapor) will be collected in Tedlar and analyzed by USEPA method TO-15.

All samples will be sent to an analytical laboratory which will be certified by the NYSDOH Environmental Laboratory Approved Program .The laboratory will be confirmed to be in good standing for the applicable ASP/CLP parameter groups.

4.1.1 Accuracy

The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical method on similar samples. Percent method recovery criteria and those determined from laboratory performance data, are used to evaluate accuracy in matrix (sample) spike and blank spike quality control samples. A matrix spike and blank spike or laboratory control will be performed once for every analytical batch or as specified in the method or ASP. Other method-specific laboratory QC samples (such as continuing calibration standards) may also be used in the assessment of analytical accuracy. Sample (matrix) spike recovery is calculated as:

$$\% \text{ Recovery} = 100 \times (SSR-SR)/SA$$

Where:

SSR = Spiked sample Result

SR = Sample Result, and

SA = Spike Added

Accuracy measures the bias in a measurement system. It is difficult to measure accuracy for the entire data collection activity. Accuracy will be assessed through use of known QC samples. Accuracy values can be presented in a variety of ways. Accuracy will be normally presented as percent recovery.

Routine organic analytical protocol requires a surrogate spike in each sample. Surrogate recovery will be defined as:

$$\% \text{ Recovery} = (R/S) \times 100$$

Where:

S = surrogate spike concentration

R = reported surrogate compound concentration

Recovery criteria for laboratory spikes and other laboratory QC samples through which accuracy may be evaluated are established in the applicable analytical method.

4.1.2 Representativeness

The representativeness of data is only as good as the representativeness of the samples collected. Sampling and handling procedures, and laboratory practices are designed to provide a standard set of performance-driven criteria to provide data of the same quality as other analyses of similar matrices using the same methods under similar conditions. Representativeness will be determined by a comparison of the quality controls for these samples against data from similar samples analyzed at the same time.

4.1.3 Comparability

Comparability of analytical data among laboratories becomes more accurate and reliable when all labs follow the same procedure and share information for program enhancement. Some of these procedures include:

- Instrument standards traceable to National Institute of Standards and Technology (NIST), the US Environmental Protection Agency (USEPA), or the New York State Departments of Health or Environmental Conservation;
- Using standard methodologies;
- Reporting results for similar matrices in consistent units;
- Applying appropriate levels of quality control within the context of the laboratory quality assurance program; and,
- Participation in inter-laboratory studies to document laboratory performance.

By using traceable standards and standard methods, the analytical results can be compared to other labs operating similarly. The QA Program documents internal performance. Periodic laboratory proficiency studies are instituted as a means of monitoring intra-laboratory performance.

Comparability is also assessed by comparison of the project data to data generated previously; and, if available, comparison of the data for multiple sampling events conducted for the project. Comparability (consistency) of sampling techniques is also assessed, to some extent, by analysis of field duplicates; although it should be noted that large differences between field duplicates may result from a wide variety of causes, not just inconsistent sampling.

4.1.4 Completeness

The goal of completeness is to generate the maximum amount possible of valid data for all planned samples. Completeness of 100 percent indicates that all planned samples were collected; and the resultant data were fully valid and acceptable. As completeness is a function of both field activities and laboratory activities, separate completeness goals are established for each.

The default goal for sampling completeness is 95 percent, as is calculated as

$$\text{Sampling Completeness (\%)} = (Sc/Sp) \times 100$$

Where:

Sc = Samples collected (submitted) for analysis (documented from field records or COC)

Sp = Samples planned (as documented in the FSP or QAPP)

The default goal for analytical completeness is also set at 95 percent. Analytical completeness may be less than 100 percent either due to systemic failures that result in the rejection or loss of data for an entire sample; or compound-specific rejection (e.g., 2-hexanone) within an otherwise valid analysis.

Typically, the default overall completeness goal is 90 percent useable data. The impact of rejected or unusable data will be made on a case-by-case basis. If the goals can be achieved without the missing datum or data, or if data from a different sampling event can be used to fill the data gap, no further action would be necessary. However, loss of critical data may require resampling or reanalysis.

4.2 FIELD QUALITY ASSURANCE

Blank water generated for use during this project must be “demonstrated analyte-free.” The criteria for analyte-free water is based on the USEPA-assigned values for the Contract Required Quantitation Limits (CRQLs) for CLP analyses, or the RL for SW-846 or other methods.

However, specifically for the common laboratory contaminants (acetone and 2-butanone), the allowable limits are five times the CRQL (or RL). For methylene chloride, the limit is 2.5 times the CRQL.

The analytical testing required for the water to be demonstrated as analyte-free must be performed prior to the start of sample collection; thus, blank water will be supplied by the laboratory.

4.2.1 Field Equipment (Rinsate) Blanks

Equipment blanks consist of demonstrated, analyte-free water that show if sampling equipment has the potential for contaminant carryover to give a false impression of contamination in an environmental sample. When blank water is used to rinse a piece of sampling equipment (before it is used to sample), the rinsate is collected and analyzed to see if sampling could be biased by contamination from the equipment.

Rinsate blanks are not required when samples are collected directly into laboratory-provided containers.

Field Equipment (Rinsate) blanks for split spoon samplers: One rinsate blank will be collected for every 20 soil samples collected or one per week, whichever is more frequent. The rinsate blanks will be collected from the split spoon sampling equipment.

Equipment blanks are not collected or submitted in association with air samples.

4.2.2 Field Duplicate Samples

Field duplicate samples are used to assess the variability of a matrix at a specific sampling point and to assess the reproducibility of the sampling method.

Aqueous field duplicate samples are second samples collected from the same location, at the same time, in the same manner as the first, and placed into a separate container (technically, these are co-located samples). Each duplicate sample will be analyzed for the same parameters as the original sample collected that day.

Soil duplicate samples are collected from a single location and device (e.g., split spoon sampler). Soil duplicates for VOC analysis are collected without homogenization.

The default field duplicate precision (RPD) objective is ≤50% percent RPD for all matrices where the sample concentration is at least two times the reporting limit. The RPD is not calculable when the analyte is not detected in one or both analyses. A more detailed discussion of the calculation is provided in Section 4.2.2 (Precision), above. Field duplicates will be collected at a frequency of one per 20 environmental samples for aqueous and non-aqueous sample for TCL/TAL analyses.

4.2.3 Trip Blanks

The purpose of a VOC trip blank (using demonstrated analyte-free water) is to place a mechanism of control on sample bottle preparation and blank water quality, and sample handling. The trip blank travels from the lab to the site with the empty sample bottles and back from the site with the collected samples. There will be a minimum of one trip blank per shipment containing aqueous samples for VOC analysis.

Trip blanks will be collected only when aqueous volatile organics are being sampled and shipped; except that a trip blank is not required when the only aqueous samples in a shipment are QC samples (rinsate blanks).

4.2.4 Temperature Blanks

The laboratory will use either an infrared instrument to measure the temperature of liquid samples, or a temperature blank will be used to measure the temperature of liquid samples. If used, temperature blanks will be supplied by the analytical laboratory. If multiple coolers are necessary to store and transport aqueous samples, then each cooler will contain an individual temperature blank (if used).

4.3 FIELD TESTING QC

Field testing of groundwater will be performed during purging of wells prior to sampling for laboratory samples. Field QC checks of control limits for pH, specific conductance (conductivity) and turbidity are detailed below. The calibration frequencies discussed below are the minimum. Field personnel can and should check calibration more frequently in adverse conditions, if anomalous readings are obtained, or subjective observations of instrument performance suggest the possibility of erroneous readings. Calibration logs for the instruments discussed below are attached to this document.

4.3.1 pH Meter

The pH meter is calibrated daily, using two standards bracketing the range of interest (generally 4.0 and 7.0). If the pH QC control sample (a pH buffer, which may be the same or different than those used to initially calibrate the instrument) exceeds 0.1 pH units from the true value, the source of the error will be determined and the instrument recalibrated. If a continuing calibration check with pH 7.0 buffer is off by more than 0.1 pH units, the instrument will be recalibrated. Expired buffer solutions will not be used.

Note that gel-type probes take longer to equilibrate (up to 15 minutes at near-freezing temperatures); this must be taken into account in calibrating the instrument and reading samples and standards.

4.3.2 Specific Conductivity

A vendor-provided conductivity standard will be used to check the calibration of the conductivity meter daily. Specific conductance QC samples will be on the order of 0.01 or 0.1 molar potassium chloride (KCl) solutions in accordance with manufacturer's recommendations.

4.3.3 Turbidity

The turbidity meter should be calibrated using a standard as close as possible to 50 NTU (the critical value for determining effectiveness of well development and evacuation). The turbidimeter will be checked daily. The turbidity QC sample will be a commercially prepared polymer standard (Advanced Polymer System, Inc., or similar).

4.3.4 Temperature

Temperature probes associated with instruments (such as the YSI SCT-33 conductivity and temperature meter) are not subject to field calibration, but the calibration should be checked to monitor instrument performance. It is recommended that the instrument temperature reading be checked against a NIST-traceable thermometer concurrently with checking the conductivity calibration. The instrument manual will be referenced for corrective actions if accurate readings cannot be obtained.

4.4 LABORATORY QUALITY ASSURANCE

4.4.1 Method Blanks

A method blank is laboratory water on which every step of the method is performed and analyzed along with the samples. They are used to assess the background variability of the method and to assess the introduction of contamination to the samples by the method, technique, or instruments as the sample is prepared and analyzed in the laboratory. Method blanks will be analyzed at a frequency of one for every twenty samples analyzed or as otherwise specified in the analytical protocol.

4.4.2 Laboratory Duplicates

Laboratory duplicates are sub-samples taken from a single aliquot of sample after the sample has been thoroughly mixed or homogenized (with the exception of volatile organics), to assess the precision or reproducibility of the analytical method on a sample of a particular matrix. Laboratory duplicates will be performed on spiked samples as a matrix spike and a matrix spike duplicate (MS/MSD) for volatile organics.

4.4.3 Spiked Samples

Two types of spiked samples will be prepared and analyzed as quality controls: matrix spikes and matrix spike duplicates (MS/MSD). The MS/MSDs are analyzed to evaluate instrument and method performance and performance on samples of similar matrix. They will be analyzed at a frequency of one (pair) for every 20 samples. In addition, matrix spike blanks (MSBs) will also be prepared and analyzed by the laboratory as required by NYSDEC ASP.

4.4.4 Laboratory Control Sample

A fortified clean matrix (laboratory control sample, or LCS) is analyzed with each analysis. These samples generally consist of a standard aqueous or solid matrix fortified with the analytes of interest for single-analyte methods and selected analytes for multi-analyte methods according to the appropriate analytical method. The LCS may be analyzed in duplicate for some methods (LCSD). The analyte recovery from each analysis (LCS and LCSD) is used to monitor analytical accuracy; analytical precision can be assessed from evaluation of the LCS/LCSD in the same manner as the MS/MSD.

5.0 FIELD DATA DOCUMENTATION

Field reporting documentation, including field logbooks and field data reporting forms, is discussed in FSP Section 8, especially sections 8.1 and 8.2, and not repeated here.

6.0 EQUIPMENT CALIBRATION AND MAINTENANCE

Quality assurance for instrumentation and equipment used for a project is controlled by a formal calibration program, which verifies that equipment is of the proper type, range, accuracy, and precision to provide data compatible with specified requirements. Instruments and equipment that measure a quantity, or whose performance is expected at a stated level, are subject to calibration. Calibration is performed using reference standards or externally by calibration agencies or equipment manufacturers.

6.1 STANDARD WATER AND AIR QUALITY FIELD EQUIPMENT

Field equipment used during the collection of environmental samples typically includes a turbidimeter (turbidity per EPA Method 180.1), pH meter (pH per EPA Method 150.1), conductivity meter (specific conductance per EPA Method 120.1), thermometer, and photoionization detector. See also Section 4.4 of this QAPP for additional discussion.

The organic vapor analyzer (MultiRAE, HNu-PI 101, or equivalent organic vapor analyzer) used for soil screening and health and safety air monitoring will be calibrated following the manufacturer's instructions, at the beginning of the day, whenever the instrument is shut off for more than two hours, and at the field technician's discretion.

7.0 DATA REPORTING

All sampling data collected and Calibration records will be retained and submitted to the NYSDEC during the annual report. The project QA officer will review the report prior to submittal.

7.1 FIELD DATA VERIFICATION

Field personnel will record all field data in bound field logbooks and on standard forms. After checking the validity of the data in the field notes, the Project Manager or his/her designee will reduce the data to tabular form, when possible, by entering the data into data files. Where appropriate, the data files will be set up for direct input into the project database. Subjective data will be filed as hard copies for later review by the Project Manager and incorporation into technical reports, as appropriate.

Verification of field data will be performed at two different levels. The first level of data verification will be performed at the time of collection by following standard procedures and QC checks. The second level of review consists of the Project Manager and QA manager reviewing the data to confirm that the correct codes and units have been included. After data reduction into tables and arrays is complete, the Site Manager will review data sets for anomalous values. The Project Manager, who will review field reports for reasonableness and completeness, will validate subjective field and technical data.

8.0 CORRECTIVE ACTIONS

If instrument performance or data fall outside acceptable limits, then corrective actions will be taken. These actions may include recalibration or standardization of instruments, acquiring new standards, replacing equipment, repairing equipment, and reanalyzing samples or redoing sections of work.

Situations related to this project requiring corrective action will be documented and made part of the project file. For each measurement system identified requiring corrective action, the responsible individual for initiating the corrective action and also the individual responsible for approving the corrective action, if necessary, will be identified.

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