West Well / Parking Area Site NYSDEC Site #413010 and Boiler Room Site NYSDEC Site #413013

Remediation Review and Enhancement Work Plan March 2016

Amphenol Corporation Sidney, New York



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Introduction

Amphenol Corporation previously manufactured a variety of electrical connectors at its facility located at 40 - 60 Delaware Avenue in Sidney, New York. The parcel occupies approximately 45 acres. Several different business entities have used this site for industrial manufacturing since the late 1800's. In 2014, all manufacturing operations were re-located to a new facility within the Village of Sidney. The plating operations at the plant, which are housed in a separate building on the west end of the site, however, were not moved and continue at the 40 - 60 Delaware Avenue site.

Two separate and distinct environmental remediation areas are defined on the property. These sites are referred to as the West Well / Parking Area site (#413010) and the Boiler Room area (#413013) on the New York State Department of Environmental Conservation (NYSDEC) registry of Inactive Hazardous Waste Sites. Figure 1 depicts the 40 – 60 Delaware Avenue plant site and the location of the West Well and Boiler Room remediation areas. Each site has an independent Administrative Order on Consent (AOC) that has been executed between Amphenol and the NYSDEC. Groundwater extraction and treatment, initiated as interim remedial measures (IRMs) have been ongoing at each respective site for approximately 20 years as part of Amphenol's compliance with the AOCs.

This document presents a proposed work plan for environmental groundwater investigations to supplement previously completed studies regarding the environmental conditions of the site. Furthermore, in addition to defining current groundwater environmental conditions at the site, data from these supplemental investigations will be used to support a future assessment of feasible operational modifications or enhancements to the ongoing groundwater remedial actions. Additionally, the results from these efforts will facilitate the preparation of a site-wide Statement of Basis (SoB) for the 40 - 60 Delaware Avenue property.

General Site Background

West Well / Parking Area (#413010)

The West Well (Figure 1) has historically been used as an industrial supply well for the facility's process water demands. Concentrations of chlorinated volatile organic compounds (CVOCs) exceeding the New York State Class GA standards, primarily trichloroethylene and its degradation species, were discovered in the West Well discharge in 1984. Several environmental studies were completed following this discovery which concluded that the primary source of CVOCs was the former solvent storage area with a secondary minor source area beneath the West Parking lot (ERM; April 1986). A plan to remediate the contaminants in the groundwater by continuing to pump the West Well and treating the discharge with air stripping technology was approved by the Department and implemented in March 1988.

In late 1988, during routine maintenance activities, a loss of plating process wastewater was discovered from the wastewater conveyance trenches in the floor of the plating building. A subsequent study concluded that concentrations of cadmium, chromium, zinc and cyanide in the shallow groundwater zone exceed NYS Class GA standards.

Amphenol and the NYSDEC executed an AOC for the West Well / Parking Lot site in November 1989. The AOC calls for Amphenol to address "on-site and off-site contamination" using means that are "technology and economically feasible and will most effectively identify and mitigate to the extent practicable any present or potential future threat to the environment posed by the past disposal of hazardous and industrial wastes" at the site. For the purposes of addressing the COVCs in the West Well, Amphenol proposed and NYSDEC agreed that this AOC goal was best met by continuing to operate and treat the West Well discharge.

Additionally, the AOC provides for the submittal of a Supplemental Remedial Program if other environmental impacts are discovered that require addressing. This being the case for the identification of the select heavy metals in the shallow groundwater beneath the plating building, Amphenol submitted in September 1991, and the Department approved, a SRP calling for the extraction and treatment of groundwater from two monitoring wells that contained the highest concentration of metals. This action initiated near the end of 1999 and continued until July 2014.

As noted earlier, the West Well discharge, following air stripping treatment to remove CVOCs, is used for process water demands at the facility. Any flow that is not consumed for process needs is allowed to by-pass (overflow) the process distribution system and is then discharged to outfall #002 which is permitted under the New York State Pollution Discharge Elimination System (SPDES Permit # 0003824). Outfall #002 also receives storm water flows and the effluent from the Boiler Room site groundwater collection and treatment system.

In March 2015, Amphenol was advised by NYSDEC that routine monitoring data indicated that the discharge at outfall #002 exceeded the chronic Whole Effluent Toxicity (WET) limits prescribed in the facility's permit. The Department concluded that the chronic WET exceedance was likely caused by naturally occurring inorganic compounds in the groundwater that are discharged via the West Well overflow and/or the Boiler Room remediation system effluent. The Department further directed Amphenol to undertake a Toxicity Reduction Evaluation (TRE) to identify solutions to bring the outfall #002 discharge into compliance.

A work plan for the TRE was subsequently submitted and approved by NYSDEC. The report submitted upon completion of the work plan tasks conclude that the preferred approach to eliminating the chronic WET exceedances was to discontinue overflowing

the unconsumed portion of West Well pumping to outfall #002. Additionally, the Boiler Room remedial system effluent would be redirected to SPDES outfall #001 which has been determined to have sufficient hydraulic capacity and diluent to address the Department's WET concerns.

Boiler Room Area (#413013)

In November 1984, an underground storage tank located adjacent to the boiler room at the east end of the facility (Figure 1) was removed. This tank had been used to contain waste oil from various manufacturing operations. During the tank removal, soils surrounding the tank were found to be contaminated. This prompted additional subsurface soil and groundwater investigations in this area of the plant.

Between January 1985 and February 1995 several phases of remedial investigations were completed. The purpose of these studies was to evaluate the extent of groundwater impacts along the northwest side of the property and hydraulically down-gradient between the plant and the Village of Sidney supply well and identify appropriate remedial measures to mitigate further off site transport of contaminated groundwater. These objectives were defined in an Administrative Order on Consent (AOC file #R-4-0539-88-02) executed between the NYSDEC and Amphenol in November 1989.

In April 1996, as part of a pre-design study associated with a proposed interim remedial measure (IRM) for the Boiler Room site designed to capture shallow groundwater where the highest concentrations of contaminants were detected, a test groundwater recovery well and treatment system was constructed. This approach proved successful and subsequently, two additional recovery wells were installed to improve the contaminant capture capability of the IRM system. These wells became operational in mid-February 1999. Also in February 1999, NYSDEC issued a Record of Decision (ROD) calling for the continued operation of the IRM groundwater collection and treatment system as the remedy for the Boiler Room site. Amphenol continues to operate this remedial system.

In 2004, at the request of NYSDEC and the New York State Department of Health (NYSDOH), Amphenol initiated a program to assess the potential for soil vapor intrusion (SVI) from off-site concentrations of TCE in the shallow groundwater to affect indoor air chemistry in residential and commercial buildings north of the facility. In response to soil vapor and indoor air monitoring data, 15 residential sub-slab depressurization (vapor mitigation) systems were installed in the neighborhood north of the site.

In addition to soil vapor and indoor air monitoring and the operation of vapor mitigation systems, it was suggested by the NYSDOH that enhancement of the ongoing groundwater remediation on the Boiler Room site would be helpful to reduce the risk of

soil vapor intrusion in the down-gradient neighborhoods. In response to this suggestion, Amphenol undertook a series of activities in the spring of 2011 designed to better understand the contaminant distribution along the down-gradient (north side) of the plant and possibly define feasible approaches to improve the on-going groundwater remediation. The investigation efforts included:

- Completion nineteen (19) membrane interface probes to screen for volatile organic compounds (VOCs)
- Installation of eight (8) additional groundwater monitoring wells
- Groundwater sampling and analyses

Based on the results of the supplemental investigations, it was apparent that:

- concentrations of TCE above 1,000 ppb extend vertically to depths of approximately 80 feet below ground level
- a source of TCE likely exists beneath the manufacturing facility

In responses to these discoveries, Amphenol initiated pilot testing of two Advanced Remediation Technologies (ART TM) wells. Pilot testing on these wells is continuing.

As mentioned previously, Amphenol has relocated its manufacturing their operations to a newly constructed manufacturing facility in the Village of Sidney. As a result, the former, main plant building became sufficiently accessible to allow investigation of the subsurface beneath the old plant through the floor. A work plan for additional MIP surveying beneath the plant floor was submitted to and approved by NYSDEC in May 2015. The results of this effort were provided in a letter report to NYSDEC in December 2015.

Supplemental Investigations Purpose and Scopes

West Well / Parking Area (#413010)

The purpose of the supplemental groundwater investigations at the West Well site are to:

- assess the current distribution of COVCs and the metals of concern
- evaluate if pumping the West Well at a volume that meets the minimum process flow demand would still sufficiently control groundwater contaminant migration to meet the intent of the AOC
- develop a conceptual design for an on-demand process water delivery system that would eliminate the overflow of excess discharge to outfall #002.

The specifics associated with each task are described below.

Present Contaminant Distribution Assessment

Figure 2 illustrates the West Well remediation area. The West Well site has been undergoing groundwater remediation using a pump and treat approach for nearly 30 years. As a result of this effort, concentrations of CVOCs have been substantially reduced. In fact at some locations, where the initial historic investigations revealed concentrations of TCE at several orders of magnitude greater than the maximum contaminant level (MCL) of 5 parts per billion (ppb), recent monitoring reported levels of < 1ppb. The metals of concern have fluctuated within a historically defined range with no discernable pattern.

Routine groundwater quality monitoring is completed using select monitoring wells at the West Well site on a quarterly schedule. These data have been provided to NYSDEC in quarterly monitoring reports since the groundwater remediation IRM was implemented.

To provide for a more complete assessment of the present distribution of COVCs and the metals of interest (cadmium, chromium, nickel and zinc) and cyanide, all existing groundwater monitoring wells in the West Well remediation area will be sampled. Table 1 summarizes the specific wells to be sampled. This complete set of samples will be collected on two occasions coincidental with the routine quarterly groundwater monitoring events scheduled for March and June 2016. All samples will be analyzed for CVOCs using EPA method 8260. The metals will be analyzed by EPA 200.7. Total cyanide will be quantified using EPA 335.4.

Evaluation of West Well Area of Influence at Reduced Pumping Rates

The West Well was reportedly pumped at a rate of 438 gallons per minute (GPM) during the aquifer performance test completed for the 1986 hydrogeologic investigation report (ERM; April 1986) that lead to the design of the IRM to manage the COVCs discovered in the shallow and deep overburden units that underlie the site. This test revealed substantial drawdown and relatively rapid response in the deep overburden to pumping of the West Well.

The West Well is currently equipped with a direct drive, line-shaft turbine pump. Pump operating speed and therefore discharge volume is not presently controlled relative to pumping level, discharge line pressure or discharge volume.

More recent available flow monitoring data indicates that the average daily flow for the previous 3 years has been approximately 400,000 gallons per day (GPD) or 278 GPM. Presently, the minimum process demand is approximately 100 GPM or approximately 180 GPM less than the West Well is delivering. As noted earlier, the unused portion of the well's yield is directed to outfall #002.

To assess the West Well's ability to control the present distribution of groundwater contaminants at lower discharge rates such that the provisions of the AOC are complied with, additional aquifer performance tests will be completed. Prior to completing these tests, however, modifications must be made to the existing pump's power configuration and flow metering. More specifically, the following will be completed prior to performing the lower yield aquifer performance tests:

- Installation of a variable frequency drive (VFD) on the pump motor electrical feed line such that pump speed can be controlled
- Installation of a new flow meter on the line from the well pump discharge to the air stripper influent to improve lower rate measuring accuracy

After configuring the West Well to deliver controlled lower yields, an aquifer performance test will be completed at a yield of 100 GPM to assess the area of hydraulic influence created by this level of withdrawal. In addition to monitoring the drawdown in the West Well during the test, groundwater elevations will also be monitored in the three deep overburden monitoring wells that have historically been used to demonstrate the West Wells area of influence (WP-4, WW-5 and WW-6). Although, as in past aquifer performance tests, equilibrium conditions are expected to be observed after 24 hours of pumping, the test will continue for up to 72 so best assure that hydraulically equilibrium had been established.

Groundwater elevations at select shallow groundwater monitoring wells near the West Well will also be recorded throughout the test. Although previous tests did not observe responses in the shallow water table that were attributed directly to West Well pumping, these data are useful to assess the variability in vertical hydraulic gradients between the shallow and deep overburden units.

The groundwater elevation gathered will be interpreted using traditional non-equilibrium (Theis) and equilibrium flow (Theim) mathematical

solutions. These analyses, together cone of influence mapping using the empirical data, will be used to estimate the capture area of the West Well at the 100 GPM yield.

Interpretation of the test data will be initiated in the field during the performance of the test. This will afford the opportunity to increase (or decrease) the West Well discharge rate and directly observe hydraulic influences at variable pumping rates. We propose to perform the aquifer performance test during the plating operations annual maintenance shutdown in July 2016. Upon completion of the lower yield aquifer performance test, the West Well yield will be increased back to the pretest discharge rate.

Conceptual Design for an On-Demand Process Water Delivery System

Assuming it can be demonstrated that the contaminants of concern in the West Well remediation area can be managed consistent with the goals defined in the AOC at a lower discharge rate from the supply well, Amphenol will proceed with the conceptual design of an on-demand process water delivery system. The elements of a conceptual design that eliminates the current unused portion of the supply well discharge to outfall 002 may vary greatly depending on the results of the aquifer performance test. Possible alternatives might have to consider the following possible West Well pumping scenarios:

- Pumping rate equal to the minimum process demands of 100 GPM with any overflow during the weekend and maintenance shut-downs being directed to the plating wastewater treatment plant final effluent tank for discharge to SPDES outfall 001
- Pumping rate greater than the minimum process demands of 100 GPM and greater than what excess could be accommodated by the plating wastewater treatment plant final effluent tank for discharge to SPDES outfall 001

Reporting

Following the completion of the data collection and interpretation for the tasks described above, a technical memorandum will be prepared and submitted to NYSDEC. The document will include a summary of the work efforts undertaken and data collected. Interpretations of the distribution of the CVOCs and metals will be provided together with an estimate of the West Well capture area at a reduced yield. A proposed

approach to eliminating the overflow to outfall 002 will be presented together with a conceptual design for the infrastructure modifications necessary to implement the solution.

Boiler Room Area (# 413013)

The purpose of the supplemental groundwater investigations at the Boiler Room site are to:

- chemically characterize the contaminant source area beneath the former manufacturing building floor revealed by the 2015 MIP survey
- preliminary evaluate if in-situ biological degradation or in-situ chemical oxidation technology may be feasible as treatment options for the source material beneath the plant floor
- develop baseline fate and transport simulation modeling of the CVOCs in the groundwater at the Boiler Room remediation area

Source area characterization

The MIP survey and down-gradient groundwater chemistry data indicate that a source CVOCs occurs beneath the floor of the now inactive manufacturing facility. Chemical characterization of the material beneath the floor is necessary to understand the potential long term environmental associated risk associated with this area. This will be accomplished by collecting soil and groundwater samples from the source area.

A total of four (4) soil borings will be completed at the locations depicted on Figure 3. Split-spoon soil samples will be collected continuously from where native materials are encountered (about 5 feet below the floor) to a depth of 100 feet below the plant floor level. Soil samples will be inspected and logged for their geologic characteristics. One composite sample of every 3 feet will be screened for VOCs using a PID. Soil samples will be retained for chemical characterization to access the viability of in-situ bio-degradation and chemical oxidation remediation methods.

Groundwater samples will be collected during the completion of a given soil boring at 10 foot intervals beginning at 20 feet below the floor level using Geoprobe ™, SP-16 groundwater sampling device. Groundwater samples will be analyzed for VOCs, chloride, nitrate, sulfate, phosphate and Total Organic Carbon (TOC). Additionally, in-field analysis of -pH, DO, ORP and EC will be completed. A composite sample of the groundwater throughout the depth of the soil boing will also be collected for use in the in-site treatability evaluations.

In-situ Treatability Evaluations

JTM and Amphenol intend to engage SiREM Labs of Guelph, Ontario, Canada to complete bench scale bio-degradation and chemical oxidation treatability evaluations of the CVOC source material beneath the plant. The study will consist of the following sub-tasks:

- Characterization of the baseline groundwater
- Microcosm construction
- Microcosm incubation, sampling and analysis
- Natural oxidant demand testing
- Permanganate CVOC treatability testing

The composite groundwater samples collected during the soil boring efforts will be analyzed for Dehalococcoides (Dhc) and vinyl chloride reductase (vcrA) quantification (Gene-Trac® Dhc and Gene-Trac® VC). Groundwater will also be analyzed for VOCs, anions, pH and ORP to compare with the field sample data.

Bio-degradation evaluation

Anaerobic microcosms will be constructed using site groundwater and geologic materials. The treatment microcosms will be amended with the target contaminants to reach desired target concentrations.

Anaerobic intrinsic control microcosms will be used to measure intrinsic biodegradation activity. An emulsified vegetable oil (EVO) product will be evaluated as the electron donor. One replicate of each anaerobic control and treatment will be amended with resazurin to monitor redox conditions.

After reducing conditions are achieved (typically 2 to 4 weeks after electron donor addition), one set of the electron donor treatment microcosms will be amended with a dehalorespiring microbial consortium (KB-1[®]) to assess the ability of this culture to promote or accelerate complete reductive dechlorination. KB-1[®] is a natural microbial consortium containing *Dehalococcoides* (*Dhc*) bacteria capable of complete dechlorination of chlorinated ethenes to ethene.

Controls and treatments will be constructed in triplicate. Microcosms will be sealed to allow repetitive sampling of each microcosm, and to allow addition of amendments to sustain metabolic/biodegradation activities.

Bio-treatability microcosms will be incubated for a period of three to six months. Aqueous samples will be collected from the control and treatment microcosms every two to three weeks for analysis of CVOCs and dissolved hydrocarbon gases (DHGs, e.g., ethene, ethane or methane).

In addition, at four selected time points, the electron donor amended microcosms will be sampled for analysis of volatile fatty acids (VFAs, e.g., lactate, acetate and propionate) to permit evaluation of electron donor fermentation and longevity. Anions (i.e., sulfate, nitrate, chloride and phosphate) will be evaluated at four selected time points and pH will be measured as required. Gene-Trac[®] *Dhc* and Gene-Trac[®] VC quantification will be performed on the treatment microcosms at the middle and end of the study and from the active controls at the end point of the study only. The table below provides a summary of the sampling parameters and frequency.

Sampling intervals for individual treatments may be modified (either shorter or longer intervals) during the study based on observed microbial activity, cVOC degradation rates, and depletion of electron donors/acceptors.

Anticipated Microcosm Sampling and Analyses

Analyte	Applicable Microcosms	Sample Events	Total Analyses		
cVOCs and DHGs	12	7 + 3 baseline	87		
VFAs	6	3	18		
Anions	12	4 + 3 baseline	51		
pH	12	As required	To be determined		
Dhc and vcrA	9	2	5*		

^{*}samples from triplicates combined to provide one sample per set of microcosms for analysis

> Chemical oxidation evaluation

The natural chemical oxidant demand of the site geologic materials will be estimated using permanganate. Treatment reactors will be constructed in glass containers using site geologic materials and groundwater in 1:1 ratios by weight. The reactors will be amended with a permanganate solution. Reactors will be incubated for 7 days at room temperature. Aqueous samples will be collected and analyzed for permanganate on days 0, 3 and 7. Permanganate oxidant demand will be calculated per kilogram of soil.

Following estimation of the natural oxidant demand, the dose of permanganate required to degrade the CVOCs at the site will be assessed. Control and treatment reactors will be prepared using site geologic materials and groundwater in a slurry form with an approximate ration of 1:2 by weight. The reactors will be spiked with TCE if necessary to achieve a concentration representative of the site. The treatment reactors will be amended with low, medium and high dosages of permanganate, the concentrations of which will be determined based on the natural oxidant demand estimate. Reactors will be incubated at room temperature for 7 days.

Samples will be collected on days 0, 3 and 7 and analyzed for CVOCs and permanganate.

Baseline Fate and Transport Modeling

Coincidental with the MIP surveying in 2015, a comprehensive groundwater sampling event was completed concurrent with the routine, annual monitoring event for the Boiler Room site. This included all those wells associated with the Boiler Room site located along the north side on the plant including the following (refer to Figure 1 for their location):

BR-4, BR-11, BR-12, BR-13, BR-14, BR-15, BR-17, BR-18, BR-19S, BR-19I, BR-19D, BR-20, BR-21I, BR-21 D, BR-22 S, BR-22 I, BR-23, BR-24, BR-25, BR-26S, BR-26I, BR-27S, BR-27I, BR-28I, BR-29I, BR-30I, MW-4 * wells in italics are included in the routine Boiler Room annual monitoring event

This sampling event will be repeated in June 2016.

Historical, routine groundwater monitoring data submitted to NYSDEC as part of Amphenol's compliance with the Boiler Room VOC indicate that the total VOC concentration at off-site groundwater monitoring wells is trending lower. Using the data gather from the source characterization efforts together with the broader groundwater sampling event and available historic hydrogeologic and groundwater quality data, baseline groundwater fate and transport modeling will be completed. This effort will employ the BIOCHLOR, Natural Attenuation Decision Support System, Version 2.2. This analytical solution is a reasonable first step to assessing the potential future concentrations of CVOCs in the groundwater at the Boiler Room site.

Reporting to NYSDEC

Following completion source area characterization tasks, a technical memorandum will be submitted to NYSDEC. This document will provide a summary of findings and a compilation of data including soil boring logs and laboratory analytical results. We expect this data submittal to be available approximately 90 days after completion of the soil borings.

Subsequent to the in-situ treatability evaluation, a separate letter report will submitted presenting the results of the study. Assuming all the prepared microcosms require 6 months of incubation, we expect this report to be submitted approximately 8 months after the soil borings are completed.

Proposed Program Schedule and Progress Reporting to NYSDEC

The proposed program schedule is provided as Figure 4.

In addition to the technical memorandum submitted to present the results of the technical evaluations, we propose to provide once monthly progress reports to the NYSDEC remedial program manager throughout completion of the proposed supplementary investigations. These updates will provide an opportunity to advise and consult with the NYSDEC representative as the program progresses.

Table 1

Amphenol Corporation West Well and Plating Building Area Groundwater Monitoring Well Summary

Well ID

West Well Monitoring Wells

- WW-2
- WW-3
- WW-4
- WP-1

Plating Building Wells

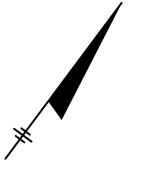
- MW-1
- MW-2
- MW-3
- MW-4
- **MW-5**
- MW-6
- **MW-7**
- MW-8
- 10100-0
- MW-9 MW-11
- MW-12
- MW-13
- MW-14

Deep Overburden Wells

- WW-1
- WW-5
- WW-6
- WP-4

GROUNDWATER REMEDIATION ENHANCEMENT PROGRAM AMPHENOL CORPORATION SIDNEY, NEW YORK

GROUNDWATER MONITORING WELL AND MEMBRANE INTERFACE PROBE LOCATION MAP



<u>LEGEND</u>

WEST WELL HOUSE MONITOR WELL BOILER ROOM MONITOR WELL

RECOVERY WELL

MIP LOCATION





FEBRUARY 29, 2016 FILE NO. XXX.XX.030



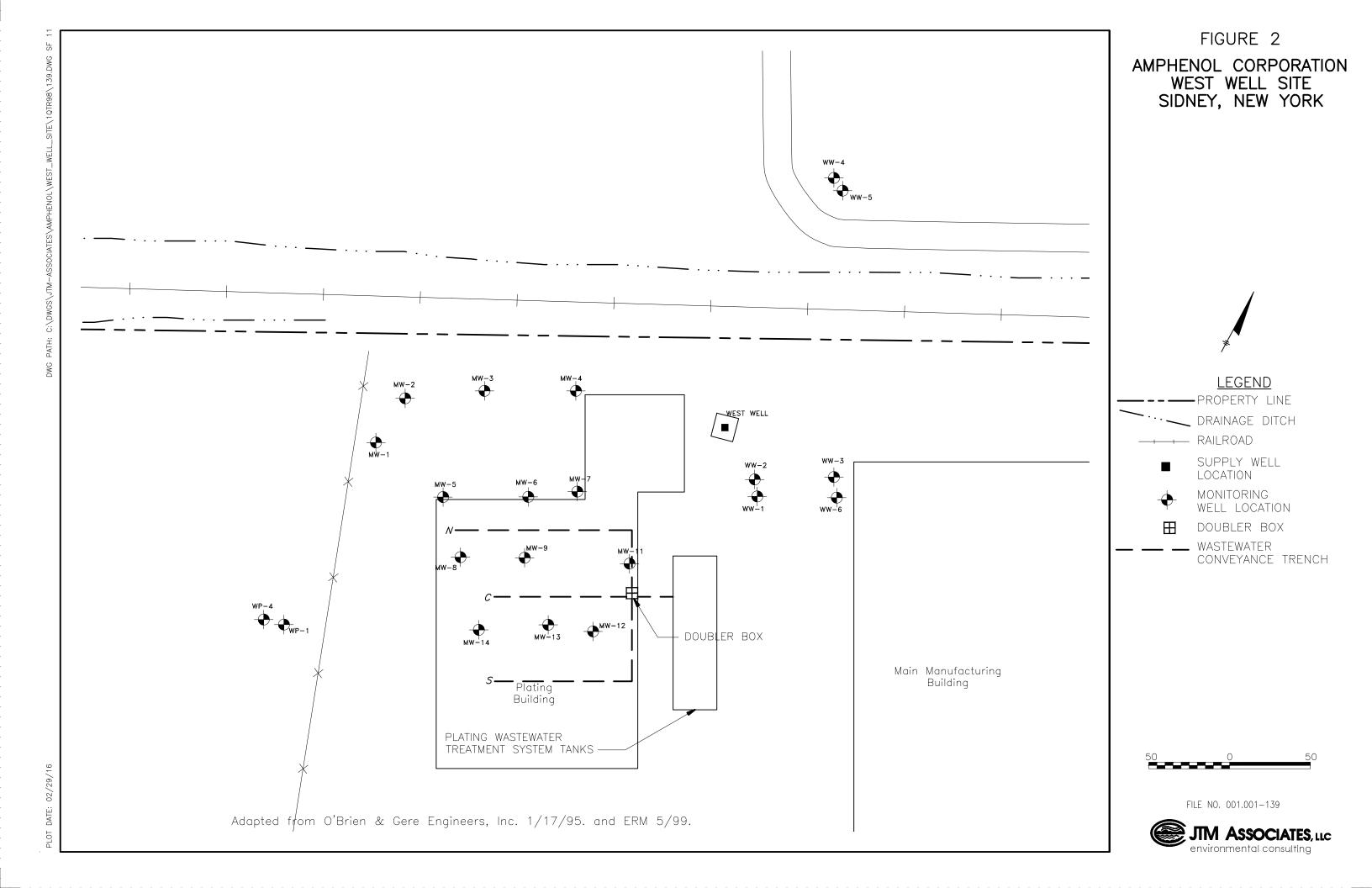


FIGURE 3

GROUNDWATER REMEDIATION ENHANCEMENT PROGRAM AMPHENOL CORPORATION SIDNEY, NEW YORK

PROPOSED SOIL BORING LOCATION MAP



LEGEND

MIP LOCATION

△ PROPOSED SOIL BORING LOCATION



Figure 4 Amphenol Corporation Sidney, New York Supplemental Site Investigations West Well / Plating Building and Boiler Room Sites

2016 Program Schedule

Task	February	March	April	May	June	July	August	September	October	November	December
Work Plan Preparation											
West Well Site											
Sampling of Existing Monitoring Wells											
Review of 1986 Pump Test and Reconfigure West Well for Lower Yield Testing											
Consider Installation of Additional Piezometers / Monitoring Wells											
Lower Yield Aquifer Performance Tests											
Data Interpretation											
Process Water System Conceptual Design											
Prepare West Well Technical Memorandum											
Boiler Room Site											
Source Area Characterization											
In-site Bio-deg and Chem-OX Evaluations											
Expanded Sampling Event											
Fate and Transport Modeling											
Boiler Room Site Technical Memorandum											