Integrated
Environmental
Solutions

1143 Highland Drive
Suite B
Ann Arbor, MI 48108-2237
Telephone: 734-971-7080
Fax: 734-971-9022

FOCUSED FIELD INVESTIGATION REPORT

IBM B906/PAGE INDUSTRIAL PARK SITE
NYSDEC SITE CODE 3-14-077
TOWN OF POUGHKEEPSIE
DUTCHESS COUNTY, NEW YORK

PREPARED FOR

SCHLUMBERGER RESOURCE MANAGEMENT SERVICES, INC.

(SCHLUMBERGER INDUSTRIES, INC.)

October 2001

Andrew F. Diefendorf
Senior Consulting Hydrogeologist

Daniel E. Oman, P.E.
Project Manager

Draft

RMT®
Integrated Environmental Solutions

1143 Highland Drive
Suite B
Ann Arbor, MI 48108-2237
Telephone: 734-971-7080
Fax: 734-971-9022

FOCUSED FIELD INVESTIGATION REPORT

IBM B906/PAGE INDUSTRIAL PARK SITE
NYSDEC SITE CODE 3-14-077
TOWN OF POUGHKEEPSIE
DUTCHESS COUNTY, NEW YORK

PREPARED FOR

SCHLUMBERGER RESOURCE MANAGEMENT SERVICES, INC.

(SCHLUMBERGER INDUSTRIES, INC.)

October 2001

Andrew F. Diefendorf
Senior Consulting Hydrogeologist

Daniel E. Oman, P.E.
Project Manager

Draft

Table of Contents

List of Tables

List of Figures

List of Appendices

Acronyms and Abbreviations

CERCLA	--	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CO	--	Consent Order
DCE	--	Dichloroethene
DER	--	Division of Environmental Remediation, formerly the Division of Hazardous Waste Remediation
DHWR	--	Division of Hazardous Waste Remediation, now the Division of Environmental Remediation
EPA	--	Environmental Protection Agency
FFI	--	Focused Field Investigation
FS	--	Feasibility Study
GPM	--	Gallons Per Minute
IBM	--	International Business Machines
IRM	--	Interim Remedial Measure
mg/kg	--	milligrams per kilogram
LMS	--	Lawler, Matusky and Skelly Engineers
NAPL	--	Non-Aqueous Phase Liquid
NYSDEC	--	New York State Department of Environmental Conservation
NYSDOH	--	New York State Department of Health
OB&G	--	O'Brien and Gere Engineers
PAH	--	Poly-Aromatic Hydrocarbon
PCB	--	Poly-Chlorinated Biphenyl
PCE	--	Tetrachloroethene
PID	--	Photo Ionization Detector
PM	--	Project Manager
ppm/ppb/ppt	--	parts per million/parts per billion/parts per trillion
PRAP	--	Proposed Remedial Action Plan
PRP	--	Potentially Responsible Party
PSA	--	Preliminary Site Assessment
PVC	--	Polyvinyl Chloride
QA/QC	--	Quality Assurance/Quality Control
RA	--	Remedial Action
RCRA	--	Resource Conservation and Recovery Act
RI	--	Remedial Investigation
RI/FS	--	Remedial Investigation/Feasibility Study
RMT	--	Residuals Management Technology of New York
ROD	--	Record of Decision
RP	--	Responsible Party

STL	--	Severn Trent Laboratories
TAGM	--	Technical and Administrative Guidance Memorandum
TCE	--	Trichloroethene
TCA	--	Trichloroethane
TCLP	--	Toxicity Characteristic Leaching Procedure
µg/l or µg/L	--	micrograms per liter
USGS	--	United States Geological Survey
UST	--	Underground Storage Tank
VOC	--	Volatile Organic Compound

Section 1 Introduction

1.1 Project Initiation

This Focused Field Investigation (FFI) was conducted by RMT, New York (RMT) on behalf of Schlumberger Resources Management Services, Inc. (Schlumberger) to satisfy the requirements of a Consent Order entered into by the New York State Department of Environmental Conservation (NYSDEC) and Schlumberger Industries, Inc. on August 16, 1995.

1.2 Site History

The following discussion of the site history was compiled from several sources, including the O'Brien & Gere *IBM B906/Page Industrial Complex Site Work Plan* (OB&G, 1996) and the Lawler, Matusky and Skelly Engineers *Final Groundwater Monitoring Report* to NYSDEC (LMS, 1988).

The IBM B906/Page Industrial Park Site is northeast of Poughkeepsie, New York at 360 Manchester Road (Route 55) as seen in Figure 1. B906 consists of a currently vacant industrial building in the Page Industrial Park. The building area is approximately 94,000 square feet and was reportedly constructed in 1953 by H. G. Page. The building is served by public water and an on-site septic system. H.G.P. Realty, Inc. has retained ownership of B906 since 1955. B906 is bordered by Route 55 to the south, an unused railroad right-of-way and Industrial Park facilities to the north, Industrial Park facilities on the eastern boundary, and vacant land to the west (Figure 2).

B906 was occupied by the Daystrom Company who manufactured cables and timers for U.S. Navy artillery shells from 1953-1969. In the 1960's, the Weston Company took over B906 and continued using the building for the same purposes. The company was a vendor for IBM who took over the site in 1969. Processes during this time included plating, heat-treating, degreasing and spray painting.

IBM-East Fishkill occupied the building from 1962 to 1974. From 1962 to 1969 IBM was a co-tenant with the Daystrom Company and its successor. IBM was the only occupant from 1969 to 1974. From 1962 to 1967 IBM used B906 for office use only.

From 1967 to 1971, IBM-East Fishkill operated a pilot plating line and laboratories in the building. In 1971, IBM-East Fishkill eliminated the pilot plating line and installed more offices. The laboratory operations continued with the on-site sanitary disposal systems continuing to be used for rinse-water disposal.

IBM-East Fishkill moved out of B906 and IBM-Poughkeepsie took over operations in 1974. IBM-Poughkeepsie continued to use the building for offices and established other operations including vapor degreasing, steam cleaning, paint spraying, and laboratory operations. IBM installed an underground storage tank (UST) sometime after 1974 on the northwest side of the building that collected wastewater for off-site disposal. In 1976, IBM-Poughkeepsie added an instrument laboratory to B906.

In 1977, IBM removed all wet processes, except for the laboratories, from B906. All laboratory wastes continued to be collected in the UST. The laboratories were removed in 1981 and the UST was also reportedly removed. IBM continued to use the building for office space.

1.3 Summary of Previous Investigations and Actions

IBM began a Groundwater Protection Program in an area downgradient of the B906 site in 1981 that concluded that there was a source of contamination near the northwest corner of B906 contributing TCE and PCE to the groundwater. In 1983, IBM conducted a remedial action at B906, which involved the excavation, removal, and disposal of contaminated soil from the northwest corner of B906, as shown on Figure 3. Approximately 2575 cubic yards of soil was excavated and disposed of at SCA's Model City Landfill which is a New York state permitted facility. The site was placed on the New York State Registry of Inactive Hazardous Waste Disposal Site as a Class 2 site (site # 3-14-077) in 1984. A Class 2 site represents a significant threat to human health and the environment, and action is required. IBM-Poughkeepsie vacated B906 in 1988. Groundwater monitoring by IBM through 1988 concluded that contaminants had not decreased since the time of the site remediation.

In July 1990, IBM performed a closure operation of the monitoring wells involved in the B906 monitoring effort. The majority of these wells were permanently abandoned by filling with bentonite slurry and capped with concrete. Seven of the wells were abandoned by welding the well covers in place. Of these seven wells, three were destroyed during the widening of Route 55.

Schlumberger, as a successor to Daystrom, was approached by NYSDEC in 1994 to undertake further investigation into contamination of the property. Schlumberger entered into a Consent Order with NYSDEC in the fall of 1995. Four groundwater monitoring wells were re-developed and a fifth well installed. A report was submitted in 1998 with results of sampling of these wells over a one-year period and recommendations for further action. Figure 3 shows the locations of previous remediation efforts in the study area.

1.4 Purpose and Objectives

The purpose of this FFI was to meet the requirements of the Consent Order and later recommendations agreed upon between Schlumberger and NYSDEC by achieving the following objectives:

1. Define the nature and extent of groundwater contamination at the B906 site and the actual and potential pathways for contamination migration at the site, particularly to define the eastern and western limits of groundwater contamination at B906, by installing and sampling additional groundwater monitoring wells.
2. Identify, if possible, sources of contamination at B906 by evaluating all available site data.
3. Identify any additional information necessary to characterize the B906 site.

Section 2
Summary of Fieldwork

2.1 Monitoring Well Installation

FFI fieldwork for the B906 area commenced April 2001. RMT personnel installed a total of four monitoring wells (two shallow, two deep) around the perimeter of B906. Two of the monitoring wells, MW-RMT-2S and MW-RMT-2D, were located in the vicinity of the northeast corner of B906. MW-RMT-1S and MW-RMT-1D were placed along the western side of B906. With consultation with NYSDEC these two wells were moved from their original proposed locations due to accessibility problems. Monitoring well locations are shown in Figure 4. Logs of test borings and well completion diagrams are in Appendices A and B, respectively. A summary of the individual wells is as follows.

- MW-RMT-2S was drilled to a total depth of 55 feet below ground surface (bgs). Bedrock was encountered at 32 feet bgs and a 6-inch diameter steel casing was grouted 2 feet into the bedrock. The well was left as an open-hole monitoring well and developed to low turbidity.
- MW-RMT-2D was drilled to a total depth 145 feet bgs. Bedrock was encountered at 42 feet bgs and a 6-inch diameter steel casing was grouted 3 feet into the bedrock. A 2-inch diameter PVC well with a 10-foot screen was installed. The well was completed with a sand pack to two feet above the screened interval, a two-foot bentonite pellet layer above the sand pack, and the remaining annular space above the bentonite seal with a low pH cement-bentonite grout seal. All packs and seals were installed by tremie methods. The monitoring well was developed to low turbidity.
- MW-RMT-1S was drilled to a total depth of 41 feet bgs. Bedrock was encountered at 17.5 feet bgs and a 6-inch diameter steel casing was grouted 5 feet into the bedrock. The well was left as an open-hole monitoring well and developed to moderate turbidity.
- MW-RMT-1D was drilled to a total depth 113.5 feet bgs. Bedrock was encountered at 20 feet bgs and a 6-inch diameter steel casing was grouted 2 feet into the bedrock. A 2-inch diameter PVC well with a 10-foot screen was installed. The well was completed with a sand pack to two feet above the screened interval, a two-foot bentonite pellet layer above the sand pack, and the remaining annular space above the bentonite seal with a low pH cement-bentonite grout seal. All packs and seals were installed by tremie methods. The monitoring well was developed to low turbidity.

The overburden soils at each well were sampled every five feet using a split-spoon sampler. Each five-foot sample was screened with a Photo Ionization Detector (PID) and one representative sample was submitted to the laboratory for volatile organic compound (VOC) analysis for each well. The soil sample analytical results are in Appendix C. The wells were completed through the bedrock using a 6-inch air-rotary rig. Drill cuttings, plastic sheeting, and expendables used during monitoring well installation were contained in drums for disposal at an off-site facility. Water generated during drilling and monitoring well development was transported to the U.S. Filter Wastewater Treatment Plant for disposal. The new monitoring well locations and elevations were surveyed by RMT and tied to the existing elevation and location data.

2.2 Monitoring Well Purging

Monitoring well sampling began on July 23, 2001 and was completed on July 25, 2001. Before sampling, all monitoring wells were purged until field parameters stabilized over three consecutive well volumes. Field parameters consisted of pH, conductivity, and temperature. Turbidity was also measured to assure sampling groundwater with turbidity less than 50 NTU. Monitoring wells 906-24R, OBG-01, MW-RMT-1D, and MW-RMT-2D were sampled after they were purged dry and allowed to recover enough to sample.

Due to the variety of monitoring well construction, four types of pumps and bailers were used to purge the monitoring wells at B906. Monitoring wells 906-27R, 906-24R, MW-RMT-1S, and MW-RMT-2S were purged and sampled with a Grundfus pump. Monitoring wells MW-RMT-1D and OBG-1 were purged and sampled with disposable bailers. Monitoring wells 906-31S and 906-7R were purged and sampled using a peristaltic pump. MW-RMT-2D was purged and sampled with a Keck pump.

Purge waters were contained in an onsite 1,000-gallon polytank and a rented 14,000-gallon Baker tank. Approximately 1600 gallons of water was generated during the course of sampling. This water was transported to the U.S. Filter Waste Water Treatment Plant for disposal.

2.3 Monitoring Well Sampling

Nine monitoring wells were sampled in July 2001: MW-RMT-1D, MW-RMT-1S, MW-RMT-2D, MW-RMT-2S, OBG-1, 906-27R, 906-24R, 906-7R, and 906-31S (see Figure 3).

Samples were collected following the methods stated in the OB&G IBM B906/Page Industrial Complex Site Work Plan. All samples were collected in 40 mL glass vials with Teflon-lined caps and HCl preservative. The samples were maintained at a temperature of 4° C. As outlined in the work plan, one duplicate sample and one trip blank were also analyzed. In addition, a field blank of water used for decontamination was also collected and analyzed. The analytical methodology was updated from NYSDEC Method 91-1 to the more recent NYSDEC Method 95-5. Samples were analyzed for VOCs by Severn Trent Laboratory (STL) in Newburgh, New York. To assure proper data quality, STL utilized full QC protocols that are outlined in Appendix D.

Section 3
Findings

3.1 Geologic Setting

The site is underlain by shale bedrock of the Normanskill Formation of Middle Ordovician Age and dolostone of the Wappinger Formation of Ordovician Age (see Figure 5). The Normanskill Formation shale underlies most of the site although it does not outcrop anywhere in the site. The dolostone forms a prominent ridge immediately to the west of the site. Inspection of the outcrops indicates steeply dipping bedding of the dolostone. According to LMS reports (1983) the bedrock strikes approximately North 25° East and dips approximately 45° East. The dolostone appears to be fault-contacted off site to the west with another outcrop of the Normanskill Formation shale.

The on-site shale-dolostone contact has been located with outcrop mapping and borehole data. The contact begins north of B906 at Wappinger Creek and trends south-southwest just off the corner of B931 and from there to the northwest corner of B906. From there, it trends further south and crosses Route 55.

Figure 6 shows a bedrock elevation contour map constructed from previous boring logs as well as data from the most recent monitoring well installation. The bedrock contours show a rolling topography underneath B906, including a bedrock valley along the western side of B906. This bedrock valley is coincident with the buried shale-dolostone contact and probably reflects erosion of the weaker shale unit. The bedrock elevation map also indicates another bedrock valley along the eastern side of B906. These buried bedrock valleys are also illustrated in cross-section in Figure 7, which runs along the northern boundary of B906. To the north these valleys merge into a single channel identified in previous reports.

Overlying the shale and dolostone bedrock are Pleistocene glacio-fluvial and Recent alluvial sediments associated with the Wappinger Creek. These unconsolidated sediments include a discontinuous glacial till, channel gravel deposits associated with post-glacial stream deposition, and fine-grained deposits associated with overbank deposition, abandoned channel fill, and colluvium. These sediments vary in thickness across the site from as little as a few feet to over fifty feet.

3.2 Hydrologic Setting

The regional hydrogeologic setting of the B906 site is within the postglacial floodplain of Wappinger Creek, which borders the site to the north, east, and southeast (see Figure 1). Regional recharge is from the west and flowing to Wappinger Creek. The dolostone ridge to the west of B906 marks a probable groundwater flow divide which acts to isolate the Industrial Park site from groundwater flow to the west. There are two groundwater aquifers present in the B906 site; a deep bedrock aquifer, and a shallow unconsolidated aquifer.

The number and location of active and available monitoring wells in the Industrial Park has changed over time. There are currently only nine monitoring wells remaining on site; all clustered in the immediate vicinity of B906. This distribution of monitors alone is insufficient to produce an accurate representation of the hydrology of the study area. Also, because there are other apparent groundwater contaminant sources in the Industrial Park, it was important to evaluate B906 in relation to the entire Industrial Park as well as Wappinger Creek. Therefore, previously reported data from other investigations within the Industrial Park were used to augment the current data in an attempt to evaluate hydrologic conditions park-wide. Interpretations of groundwater piezometric levels and apparent groundwater flow directions represented in this report are a general interpretation of those conditions, rather than a specific snapshot of the aquifer at any given time. Piezometric groundwater levels were developed using data from a range of times, rather than from one specific date. Although groundwater elevations fluctuate naturally over time in response to natural variations in precipitation and evaporation, RMT's approach provides a plausible and usable description of groundwater conditions in the B906 and Industrial Park areas.

A summary of the water-level measurements from July 2001 is presented in Table 1. Using the approach outlined above, piezometric contour maps for the two aquifers were developed for the deep and shallow aquifers as shown in Figures 8 and 9, respectively.

3.2.1 Deep Bedrock Aquifer Conditions

As illustrated in Figure 8, the localized deep groundwater flow is controlled by two groundwater divides at or near B906. In addition to the inferred groundwater divide along the bedrock ridge to the west, there is a secondary groundwater divide in the bedrock directly under B906. Groundwater flow appears to be converging from the east and west and then moves either north or south of B906.

3.2.2 Shallow Overburden Aquifer Conditions

Figure 9 illustrates the piezometric contours for monitoring wells installed in the shallow unconsolidated sediment aquifer that overlies the bedrock. Contours of piezometric levels in the shallow aquifer roughly mirror the bedrock contours. In contrast to the bedrock aquifer, however, the secondary groundwater divide is north of B906 with apparent groundwater flow moving either northeast toward Wappinger

Creek, or south toward B906. The flow to the northeast appears to follow a buried channel mentioned in previous reports that would provide a contaminant migration pathway to Wappinger Creek.

3.2.3 Hydraulic Conductivities

Results of previously reported hydraulic conductivity tests for both aquifers vary by three to four orders of magnitude for the deep bedrock aquifer (3.91E-03 to 2.60E-05 cm/sec) and the shallow unconsolidated sediments aquifer (3.30E-04 to 2.93E-01 cm/sec). These tests indicate two very heterogeneous aquifers that cannot be adequately quantified by slug testing of monitoring wells. OB&G found slug testing of wells to be highly inaccurate. Further slug testing was deemed unlikely to contribute to any further use in characterization of the aquifers. More meaningful determinations would require full-scale test pumping.

3.3 Groundwater Quality Evaluations

3.3.1 July 2001 B906 Conditions

Groundwater samples were collected in July 2001 from the nine monitoring wells around B906 at the locations shown in Figure 4. Laboratory analysis of the samples confirmed the presence of TCE, PCE, and other chlorinated VOCs in the groundwater at B906. A summary of the analytical results is presented in Table 2. Full analytical results are listed in Appendix D. The highest concentrations of TCE and PCE were found in the proximity of the northwest corner of B906 in monitoring wells 906-7R, 906-24R, 906-24R, MW-RMT-1S, and MW-RMT-1D. The highest concentrations of PCE were found in the immediate vicinity of the northwest corner of B906 while the highest concentrations of TCE were found further to the north of B906, centered around monitoring well 906-27R. Monitoring well 906-31S, located on the east side of B906 also showed elevated levels of TCE and PCE. These results are highlighted in Figure 10 and 11, respectively, which show the locations and extent of the contamination plumes at B906.

Figures 10 and 11 show two distinct plumes. One plume is to the northwest of B906, and is characterized by chemical constituents found in 1983 at monitoring wells 906-7, 906-24, and 906-27. The other plume is east of B906, and is characterized by chemical constituents found in 1983 at monitoring wells 906-18S, 906-19, 906-28, 906-31, 906-32 and 906-33. Chemical fingerprinting of the two plumes, as graphically presented in Figure 12, supports this interpretation. The plume to the northwest of B906 is characterized by the presence of 1,1,1- trichloroethane (TCA) and 1,1-dichloroethane (DCA). This plume has very low or non-detectable concentrations of chloroform. On the other hand, the plume east of B906 shows no detectable DCA and a trace of TCA. The east plume has consistent detections of chloroform. Also the northwest plume shows high level's of PCE, TCE, trans-1,2,-dichloroethene (DCE) and vinyl chloride. These are low or non-detectable in the east plume.

3.3.2 Historical Industrial Park Conditions

To evaluate changes in the nature and extent of groundwater contamination over time, and to aid in determining the source(s) of that contamination, the results of the recent sampling event were compared to past sampling events. Tables 2, 3, 4, 5, and 6 provide summaries of analytical data from 1983, 1987, 1988, and 1997 sampling events, respectively. Only the highest detection values obtained during multiple-event sampling in any one year were used in these tables. Representations of the TCE and PCE plumes in 1997 are shown in Figures 13 and 14, respectively. Representations of the TCE and PCE plumes in 1983 are shown in Figures 15 and 16, respectively.

Figures 13 and 14 show two plume areas for TCE and PCE similar to results from 2001. A close comparison between the 1997 and 2001 results, however, indicates a noticeable decrease in the plume concentration over the four-year period. Since analytical data are unavailable for the B931 and B932 areas in 2001 and 1997, it is not possible to comment on the nature or extent of contaminant concentrations in other areas of the Industrial Park at those times.

Sampling data from 1983 allow for an analysis of contaminant concentrations over a broader portion of the Industrial Park. Figures 15 and 16 show four distinct TCE/PCE plumes in the Park; (1) at the northwest corner of B906 (B906 NW), (2) along the eastern side of B906 (B906 E), (3) in the vicinity of B931, and (4) in the vicinity of B932. The greatest concentrations of TCE are centered on monitoring wells 906-27 and 931-11. The greatest PCE concentrations are centered on monitoring well 906-24.

The shape and distribution of the contaminant plumes correlate well with the general groundwater flow directions indicated by Figures 7 and 8. In general, it appears that most of the plumes are migrating through the shallow, unconsolidated channel-fill deposits. The B931 contaminant plume appears to have followed the path of the buried channel mentioned in previous reports and confirmed by RMT. This buried channel system may also have controlled the geometry of the B906 northwest and east plumes.

Due to the distribution pattern and general well construction of monitoring wells, it is difficult to evaluate the vertical distribution contamination. The monitoring wells used to delineate the extent of the B931, B932, and B906-east plumes are primarily shallow wells in the unconsolidated sediment aquifer, and the monitoring wells used to delineate the B906 northwest plume are primarily deep, bedrock wells. In addition, the majority of the previously installed bedrock monitoring wells were either screened near the bedrock-sediment contact or left as open hole wells. Therefore, it should not be assumed that groundwater from any one of these wells is representative of a specific aquifer.

3.3.3 Contaminant Concentration Trends at B906

A comparison of historical data shows fluctuations in TCE and PCE through time at monitoring wells at B906. As shown in Figure 17, TCE concentrations, after an initial rise, have steadily decreased through time at all sampling locations. The same trend is seen in PCE concentrations (see Figure 18). While there is an initial rise in contaminant concentrations between 1983 and 1987, the overall downward trend for TCE and PCE in the group of monitoring wells is obvious. This trend indicates that VOC concentrations are diminishing through natural attenuation processes.

3.4 Potential Contaminant Sources

File records indicate numerous environmental investigations have been conducted on and near the Industrial Park. These include the Tau Laboratories and Building B931 sites in the Industrial Park, and the Harris Corporation site 3000 feet to the west of B906. In addition to B906, each of these other sites has been suspect as a potential contaminant source area for the plume(s) on the site and leachate seeps along Wappinger Creek.

3.4.1 Harris Corporation

Listed as NYSDEC Site No. 314061, the Harris Corporation Site to the west of B906 was documented to have used TCE; cis-1,2-DCE; 1,2-dichlorobenzene; 1,1-dichlorobenzene, and TCA. PCE, TCE and DCE have been found in the groundwater at that site. The groundwater divide on the dolostone ridge between the Harris Corporation site and B906 makes flow of contaminants between the two sites unlikely.

3.4.2 IBM B931 Building

The B931 Building operated by IBM is documented to have had a septic system and underground liquid waste storage at locations shown on Figure 19. Shallow soils at B931 were found to be contaminated with PCE and TCE.

3.4.3 Tau Laboratories Building

The Tau Laboratories facilities are listed as NYSDEC Site No. 314038. Tau used Freon 113 in large quantities. Freon was found in the subsurface during Dvirka and Bartilucci's

(1993) site assessment. Tau also had a septic tank (see Figure 19). The site assessment found that TCE levels in the vicinity of the septic were higher than in upgradient wells at B931, and that TCA and DCA were highest downgradient of the Tau septic system and at seeps along Wappinger Creek. Freon was also detected in the seeps.

3.5 Source Fingerprinting

To further identify potential contaminant source areas within the Industrial Park, an evaluation of the groundwater monitoring data from wells located within plumes as shown on the 1983 TCE and PCE plume maps was made. Each of these plumes appears to be independent of the other. Additional graphical fingerprinting was performed as shown in Figure 20. A comparison between Figures 12 and 20 shows that these plumes have unique constituents that differentiate them from each other.

The B931/Tau plume appears to have two different sources, depending on the location of monitoring wells in the plume, and whether the wells are downgradient or close to the B931 IBM leachfield, or the Tau Laboratories. Those wells in the plume component nearest B931 (931-5, 931-6, 931-8, 931-B, 931-D, and 931-E) are predominantly composed of PCE and TCE with little or no detection of other VOCs. This agrees well with the soil contamination found in the vicinity of B931. Those wells associated with the Tau Laboratories component of the plume (931-1, 931-2, and 931-F) further downgradient show TCA, DCA, and chloroethane as major constituents not found in the B931 component of the plume. The presence of TCA and DCA agrees with the data found in the 1993 site assessment of Tau. Chloroform is not found in the B931/Tau plume. These results all suggest that this plume probably has two comingled sources independent of B906. Additionally, the B931/Tau plume has been characterized in previous reports by high levels of Freon-113. Freon-113 was detected during the Preliminary Site Assessment (PSA) performed by Dvirka & Bartilucci in 1993 at a concentration of 500 μg/L in the bedrock monitoring well located directly downgradient of the former UST on the Tau Industries site. NYSDEC has previously documented that Tau Laboratories utilized large amounts of Freon-113 in the manufacturing of microchips. Freon-113 was detected once at a much lower concentration of 4.5 μg/L in one groundwater sample collected at the B906 site and historical documents reviewed did not indicate that Freons were ever utilized at the IBM B906 site.

The B932 plume has high concentrations of TCE and much higher concentrations of trans-1,2-DCE, TCA and DCA than is seen in the other plumes within the Industrial Park. Given an apparent bedrock high and a flow divide between B906 and B932, and the difference in contaminant makeup and concentration, it is unlikely that B906 is a source for contamination at B932 or the seeps in that area.

These unique chemical fingerprints indicate that all four plumes probably had different source areas.

3.6 B906 Source(s)

A comparison of Figures 10 and 11 shows that TCE appears to be concentrated around monitoring well 906-27R, while PCE concentrations are centered on 906-24R at B906. This suggests that there may have been more than one VOC source area from the plume; one at the corner of B906, and one to the north of the rail line. A low-level residual source of VOCs appears to remain somewhere in the vicinity of the northwest corner of the B906. In 1985 IBM undertook a major effort to remove contaminated soil from that area, reportedly removing nearly 90 percent of the apparent source. Soil sampling conducted by RMT in 2001 found only 30 µg/Kg of PCE in one soil sample above the water table. That shallow sample taken at MW-RMT-1S was immediately adjacent to the west side of B906. The VOC source north of the rail line may be related to residual soil contamination from past spillage. Results of analysis of soils samples are presented in Appendix C. The diminished concentration of VOCs in the groundwater with time indicates that this source is attenuating naturally.

Coupled with the limited extent of the plume, the generally low concentrations and diminishing contaminant concentrations suggest that any contaminant source in the area of the B906 is not contributing to off-site groundwater or surface-water contamination. In addition, all potential off-site groundwater receptors have been supplied with public water connections.

Section 4
Conclusions

Based on our review of previous work performed at the Page Industrial Park and the most current round of sampling at B906 we summarize our conclusions as follows:

1. Moderately low levels of VOCs, consisting primarily of PCE and TCE, can be found in the groundwater in the immediate vicinity of B906.
2. Movement of groundwater appears to be divided into northerly and southerly components with discharge of groundwater ultimately at Wappinger Creek.
3. The extent of groundwater contamination attributable to B906 operations appears to be limited to the area of B906 and within the Industrial Park site.
4. Groundwater contamination in the vicinity of B906 appears to be diminishing with time due to natural attenuation.
5. There appears to be no connection between groundwater contamination found at B906 and the Harris Corporation site.
6. The current source of groundwater contamination at B906 may be from residual soil contamination near the NW corner of B906 or the adjacent area of the abandoned rail line.
7. Other on-site contaminant plumes detected in the past, as well as leachate seeps at Wappinger Creek, appear to be related to activities at the B931, B932 and Tau Buildings, and not B906.
8. Sufficient groundwater monitoring has been performed to characterize the limits of groundwater contamination at B906.
9. The risk to groundwater receptors from the residual contamination found at B906 appears minimal.

Section 5
Site References

Chazen Environmental Services, Inc. 1990. *Page Industrial Complex Groundwater Monitoring Well Closure for International Business Machines*, August 1990.

Chernin & Gold. 1989. Letter to Robert Marino, New York State Department of Environmental Conservation, re: *IBM B906/931, Site No. 314077, Dutchess County, Region 3*, September 19, 1989.

Chernin & Gold. 1992. Letter Regarding *Preliminary Site Assessments at Inactive Hazardous Waste Disposal Sites* – New York State Superfund Chapter 857, Laws of 1982 Site Name: Page Industrial Park, Site ID No: 314038, Site Address: Route 55, Poughkeepsie, Dutchess County, February 24, 1992.

Conestoga-Rovers & Associates Limited. 1984. *Remedial Action Project Building 906*, Final Report, March 1984.

Dvirca and Bartilucci Consulting Engineers. 1993. *Preliminary Site Assessment*, Page Industrial Park, Town of Poughkeepsie, Dutchess County, NY.

Ebasco Services, Inc. 1995. Letter to Henry Page, HG Page & Sons, Inc., re: *IBM B906/931 Site, Site Access Request*, April 28, 1995.

Groundwater Sciences Corporation; Milton Chazen Associates; Lawler, Matusky & Skelly Engineers. 1988. *Building 906 Final Groundwater Monitoring Report to NYSDEC*, May 1988.

Groundwater Sciences Corporation; Milton Chazen Associates; Lawler, Matusky & Skelly Engineers. 1988. *Building 906, Final Groundwater Monitoring Report to NYSDEC, IBM Corporation*, Poughkeepsie, New York, May 1988.

IBM Corporation. 1984. Presentation to New York State and Dutchess County. *Final Investigative Report: Ground Water Program*, February 21, 1984.

IBM Corporation. 1989. Letter to Thomas Jorling, New York State Department of Environmental Conservation, re: *Inactive Hazardous Waste Site 314077 Region 3*, April 6, 1989.

IBM Corporation. 1989. Letter to Mr. Al Klauss, New York State Department of Environmental Conservation, Region III, re: *Building 906 Final Report*, May 25, 1989.

IBM Corporation. 1989. Letter to Mr. Thomas C. Jorling, New York State Department of Environmental Conservation, re: *Inactive Hazardous Waste Site Registry IBM Poughkeepsie, Dutchess County Registry No. 314001,* June 21, 1989.

IBM Corporation. 1989. Letter to Mr. Al Klauss, New York State Department of Environmental Conservation, re: *May 25, 1989 letter to A. Klauss from J.J. Everhart, Building 906 Monitoring Well Closure,* July 17, 1989.

IBM Corporation. 1989. Letter to Franc Grabar, New York State Department of Environmental Conservation, August 14, 1989.

IBM Corporation. 1989. Letter to Mr. Al Klauss, New York State Department of Environmental Conservation, re: *May 25, 1989 and July 17, 1989 letters to A. Klauss from J. J. Everhart,* August 18, 1989.

IBM Corporation. 1990. *Building 906 Monitoring Well Closure Agreement/Page Industrial Complex,* June 1990.

Lawler, Matusky & Skelly Engineers. 1982. *Interim Report on Building 931,* August 1982.

Lawler, Matusky & Skelly Engineers. 1983. *Hydrogeology and Chemistry of the Harris Corporation Plant Site,* Poughkeepsie, NY, March 1983.

Lawler, Matusky & Skelly Engineers. 1983. *IBM – Poughkeepsie, Hydrogeology and Chemistry of Building 906 Area,* Final Report, March 1983.

Lawler, Matusky & Skelly Engineers. 1983. *Proposed Remedial Action Plan, Harris Corporation Plant Site,* Poughkeepsie, NY, March 1983.

Lawler, Matusky & Skelly Engineers. 1983. *Groundwater Remediation: Test Results and Proposed Final System at The Harris Corporation Plant Site,* Poughkeepsie, New York, August 1983.

Lawler, Matusky & Skelly Engineers. 1984. *IBM – Poughkeepsie, Hydrogeology and Chemistry of Building 906 Area,* Data Report, February 1984.

New York State Department of Environmental Conservation. 1986. *Site Investigation Report,* Tau Industries, Page Industrial Park, Poughkeepsie, New York, June 28, 1986.

New York State Department of Environmental Conservation. 1987. Letter Regarding a Phase II Investigation, February 17, 1987.

New York State Department of Environmental Conservation. 1987. Letter Regarding Page Industrial Park, July 20, 1987.

New York State Department of Environmental Conservation. 1989. Letter to Mr. Rittinger, re: *May 5, 1989 letter requesting a change in site description and reclassification for IBM B906/931 Site No. 314077,* June 8, 1989.

New York State Department of Environmental Conservation. 1989. Letter to IBM Corporation, re: *Reclassification Request for the Building 906 site,* July 21, 1989.

New York State Department of Environmental Conservation. 1989. Letter to James J. Everhart, IBM Corporation, re: *IBM B906/931, Site ID #314077, Dutchess County, Region* 3, July 25, 1989.

New York State Department of Environmental Conservation. 1989. Memorandum to Linda Beagle, re: *November 1, 1989 IBM Meeting,* November 21, 1989.

New York State Department of Environmental Conservation. 1992. Letter Regarding *Preliminary Site Assessments at Inactive Hazardous Waste Disposal Sites* – New York State Superfund Chapter 857, Laws of 1982, February 19, 1992.

New York State Department of Environmental Conservation. 1993. Letter to John Ritter, Chernin & Gold, re: *Registry of Inactive Hazardous Waste Disposal,* May 19, 1993.

New York State Department of Environmental Conservation. 1993. Memorandum to Jeffrey Lacy, Division of Environmental Enforcement, re: *Class 2 Referral – IBM B906, Site No. 314077,* June 4, 1993.

New York State Department of Environmental Conservation. 1994. John Ritter, Chernin & Gold, re: *IBM B906 Site #314077,* April 7, 1994.

New York State Department of Environmental Conservation. 1994. *Analytical Report,* Page Industrial Park – Tau Labs, June 17, 1994.

New York State Department of Environmental Conservation. 1995. Letter to Joseph Page, re: *B906 Site #3-14-007,* August 10, 1995.

New York State Department of Environmental Conservation. 1996. Memorandum Regarding *Page Industrial Park – HR Score, Site ID #314038,* March 27, 1996.

New York State Department of Environmental Conservation. 1996. Letter Regarding *Page Industrial Park FOIL Request No. 96-654,* December 3, 1996.

New York State Department of Environmental Conservation. *Letter to Mr. John Rittinger, Chernin & Gold, IBM B906/931, Site No. 314077, Dutchess County, Region 3.*

New York State Department of Health. 1992. Letter Regarding *Change to Registry Page Industrial Park (IBM/Tau) ID #314038 (T),* Poughkeepsie, Dutchess County, July 15, 1992.

New York State Department of Health. 1993. Letter to Earl Barcomb, New York State Department of Environmental Conservation, re: *Classification Package (reclass) IBM B906, Site I.D. #314077, Poughkeepsie, Dutchess County,* February 26, 1993.

New York State Department of Health. 1995. Letter to Keith Brown, New York State Department of Environmental Conservation, re: *Proposed Work Plan IBM B906 Site #314077, Poughkeepsie, Dutchess County,* October 31, 1995.

NUS Corporation-Superfund Division. 1988. *Preliminary Assessment Report, IBM B906/931 Site,* Final Draft, Poughkeepsie, New York, December 1988.

O'Brien & Gere Engineers, Inc. 1996. *IBM B906/Page Industrial Complex Site Work Plan,* February 1996.

Tables

Table 1
B906
Groundwater Elevations July 2001

WELL LOCATION	DATE	TIME	REFERENCE ELEVATION (MSL)	DEPTH TO WATER (FEET) T/PVC	WATER ELEVATION (MSL)
906-31S	07/23/2001	12:20	177.50	17.10	160.40
MW-RMT-2D	07/23/2001	12:30	177.18	9.80	167.38
MW-RMT-2S	07/23/2001	12:33	177.32	15.80	161.52
906-27R	07/23/2001	12:44	175.30	14.65	160.65
906-7R	07/23/2001	12:49	175.66	14.12	161.54
906-24R	07/23/2001	12:51	175.80	15.03	160.77
MW-RMT-1S	07/23/2001	13:01	177.75	16.16	161.59
MW-RMT-1D	07/23/2001	13:03	177.57	79.13	98.44
OBG-01	07/23/2001	13:06	177.60	17.20	160.40

Table 2
B906
Analytical Results Summary July 2001
Summary of Chlorinated VOCs

COMPOUND	MW-RMT-1D	MW-RMT-1S	MW-RMT-2D	MW-RMT-2S	OBG-01	906-31S	906-7R	906-24R	906-27R
Trichlorothene	1.3	6.4	< 10	< 10	< 10	29	6.7	190	290
Trichlorethane	1.4	2.8	< 10	< 10	< 10	< 10	< 10	6	1.8
Tetrachloroethene	30	40	< 10	2	2.8	28	12	370	130
1,2-Dichloroethene	< 10	1.3	< 10	< 10	< 10	< 10	25	49	17
1,1-Dichloroethane	3.5	5.6	< 10	< 10	< 10	< 10	84	52	< 10
Chloroform	< 10	< 10	< 10	< 10	< 10	17	< 10	< 10	< 10
Vinyl Chloride	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Carbon Tetrachloride	< 10	< 10	< 10	< 10	< 10	< 10	4	< 10	< 10
Chloroethane	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10

Note: All concentrations in ug/L (ppb)

COMPOUND	906-7 [illegible]	906-15	906-[illegible]
Trichloroethene	52.0	BDL	BDL
Trichloroethane	4.0	BDL	BDL
Tetrachlorethane	68.0	BDL	BDL
1,1-Dichloroethane	126.0	BDL	BDL
Chloroform	2.0	BDL	BDL
trans-1,2-Dichloroethene	108.0	BDL	BDL
Vinyl Chloride	25.0	BDL	BDL
Chloroethane	BDL	BDL	BDL
Carbon Tetrachloride	BDL	BDL	BDL

COMPOUND	906-16S	906-28	906-24
Trichloroethene	3.0	BDL	84.0
Trichloroethane	BDL	BDL	61.0
Tetrachlorethane	2.0	BDL	283.0
1,1-Dichloroethane	BDL	BDL	135.0
Chloroform	BDL	BDL	BDL
trans-1,2-Dichloroethene	0.5	BDL	28.0
Vinyl Chloride	BDL	BDL	BDL
Chloroethane	BDL	BDL	BDL
Carbon Tetrachloride	BDL	BDL	BDL

COMPOUND	906-26-S	931-1	931-2
Trichloroethene	BDL	28.0	BDL
Trichloroethane	BDL	BDL	60.0
Tetrachlorethane	BDL	24.0	BDL
1,1-Dichloroethane	BDL	BDL	100.0
Chloroform	BDL	BDL	BDL
trans-1,2-Dichloroethene	BDL	BDL	BDL
Vinyl Chloride	BDL	BDL	BDL
Chloroethane	BDL	BDL	180.0
Carbon Tetrachloride	BDL	BDL	BDL

COMPOUND	931-3	[illegible] E	[illegible] F
Trichloroethene	BDL	77.0	42.0
Trichloroethane	BDL	BDL	3.0
Tetrachlorethane	BDL	65.0	31.0
1,1-Dichloroethane	BDL	BDL	BDL
Chloroform	BDL	BDL	BDL
trans-1,2-Dichloroethene	BDL	BDL	6.0
Vinyl Chloride	BDL	BDL	BDL
Chloroethane	BDL	BDL	BDL
Carbon Tetrachloride	BDL	BDL	BDL

BDL = Below Dectection Limit

Table 4
B906
1987 Groundwater Monitoring Results
Summary of Chlorinated VOCs

COMPOUND	906-27R	906-27R	906-9S	906-9S	906-14R	906-14R	906-19S	906-19S
Trichloroethene	1300.0	1100.0	4.3	5.9	6.0	1.0	73.0	41.0
Trichloroethane	5.4	5.6	5.3	9.2	BDL	BDL	8.9	2.5
Tetrachloroethene	420.0	370.0	28.0	21.0	BDL	BDL	41.0	29.0
trans-1,2-Dichloroethene	49.0	53.0	4.6	8.7	BDL	BDL	2.1	3.1
1,1-Dichloroethane	2.5	1.5	1.2	2.3	BDL	BDL	2.6	1.0
Chloroform	BDL	BDL	BDL	BDL	BDL	BDL	3.6	3.3
Vinyl Chloride	1.8	2.6	BDL	BDL	BDL	BDL	BDL	BDL
Carbon Tetrachloride	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

COMPOUND	906-24R	906-24R	906-7R	906-7R	906-28S	906-28S	906-31S	906-31S
Trichloroethene	150.0	290.0	44.0	62.0	BDL	BDL	71.0	82.0
Trichloroethane	110.0	180.0	3.4	16.0	BDL	BDL	5.1	2.4
Tetrachloroethene	802.0	880.0	35.0	40.0	5.0	8.0	56.0	80.0
trans-1,2-Dichloroethene	39.0	56.0	86.0	100.0	BDL	BDL	2.9	1.9
1,1-Dichloroethane	143.0	130.0	127.0	20.0	BDL	BDL	BDL	BDL
Chloroform	BDL	BDL	BDL	BDL	1.0	3.4	6.9	8.4
Vinyl Chloride	BDL	BDL	33.0	12.0	BDL	BDL	BDL	BDL
Carbon Tetrachloride	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL = Below Dectection Limit

Table 5
B906
1988 Groundwater Monitoring Results
Summary of Chlorinated VOCs

COMPOUND	906-27R	906-9S	906-14R	906-19S	906-24R	906-7R	906-28S	906-31S
Trichloroethene	1100.0	5.9	1.0	41.0	290.0	62.0	BDL	82.0
Trichloroethane	5.6	9.2	BDL	2.5	180.0	16.0	BDL	2.4
Tetrachlorethene	370.0	21.0	BDL	29.0	880.0	40.0	8.0	80.0
trans-1,2-Dichlorethene	53.0	8.7	BDL	3.1	56.0	100.0	BDL	1.9
1,1-Dichloroethane	1.5	2.3	BDL	1.0	130.0	20.0	BDL	BDL
Chloroform	BDL	BDL	BDL	3.3	BDL	BDL	3.4	8.4
Vinyl Chloride	2.6	BDL	BDL	BDL	BDL	12.0	BDL	BDL

BDL = Below Dectection Limit

Table 6
B906
1997 Groundwater Monitoring Results
Summary of Chlorinated VOCs

COMPOUND	OBG-1	906-7R	906-24R	906-27R	906-31S
Trichloroethene	10.0	13.0	280.0	550.0	35.0
Trichloroethane	BDL	10.0	130.0	16.0	3.0
Tetrachloroethane	3.0	15.0	1300.0	320.0	46.0
cis-1,2-Dichloroethene	BDL	47.0	13.0	35.0	2.0
Chloroform	10.0	BDL	BDL	BDL	25.0
Vinyl Chloride	BDL	8.0	BDL	BDL	BDL

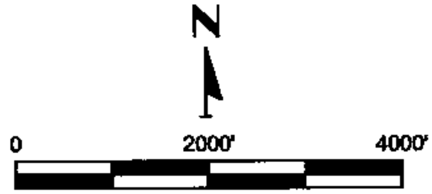
BDL = Below Dectection Limit

Figures

RMT COMPUTER AIDED DESIGN AND DRAFTING

SOURCE

1. BASE MAP DEVELOPED FROM THE POUGHKEEPSIE AND PLEASANT VALLEY, NEW YORK 7.5 MINUTE U.S.G.S. TOPOGRAPHIC QUADRANGLE MAPS, DATED 1995 AND 1989 RESPECTIVELY.



RMT INC.

B906 SITE
PAGE INDUSTRIAL PARK
POUGHKEEPSIE, NEW YORK

SITE LOCATION MAP

DRAWN BY:	SJL
APPROVED BY:	DK
PROJECT NUMBER:	70925.01
FILE NUMBER:	709250111.DWG
DATE:	OCTOBER 2001

FIGURE 1

PLOT DATA
Drawing Name: J:\70925\01\709250111.dwg
Operator Name: Scale: lucidos 1"=2000'
Dwg Size: Plot Date: 99060 Bytes Thursday, October 11, 2001
Plot Time: Attached Xrefs: 11:39:1295 AM No xref's Attached.