PRELIMINARY SITE ASSESSMENT
FMC CORPORATION
PEROXYGEN CHEMICALS DIVISION
TONAWANDA, NEW YORK SITE
SITE NO. 915025

Prepared for:
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Peroxygen Chemicals Division
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1.0 INTRODUCTION

FMC Corporation (FMC) has entered into an Order on Consent (Index #B9-0431-93-06), effective November 22, 1993, with the New York State Department of Environmental Conservation (NYSDEC) to perform a Preliminary Site Assessment (PSA) at FMC's Peroxygen Chemicals Division manufacturing facility located at 37 Sawyer Avenue in Tonawanda, New York (NYSDEC Site No. 915025). Approximately 100 tons of plant waste materials were reportedly disposed of over a twelve year period (from 1964 to 1976) in two to four pits located along the southwestern portion of the plant property. Woodward-Clyde Consultants (WCC) has been retained to assist FMC in performance of the PSA.

In accordance with the terms and provisions of the Order, FMC submitted a Work Plan for conducting a PSA Investigation to the NYSDEC on January 21, 1994. A revised work plan reflecting NYSDEC comments was submitted on May 11, 1994. An addendum to this Work Plan was submitted July 14, 1994, responding to the final NYSDEC comment letter of June 28, 1994. The Work Plan, with the Addendum, was approved by NYSDEC in a letter dated August 12, 1994. In accordance with the schedule in the approved Work Plan, the PSA report is due within 60 days of receipt of laboratory data. Laboratory data was received by WCC on November 21, 1994.

This report describes the Preliminary Site Assessment (PSA) performed at the Tonawanda Plant site in accordance with the approved Work Plan. Work was completed in accordance with the schedule presented in the Work Plan. Completion of the PSA report was delayed slightly from the preliminary schedule due to delays in receipt of laboratory deliverables, which were received approximately 8 weeks after sample collection, versus the anticipated 4 to 6 weeks. No other delays were encountered.

The subsequent sections of this report present:

- The objectives of the PSA Investigation (Section 2)
- Site background information (Section 3)

- A summary of methods used, including sample locations, sampling methods, and analytical procedures (Section 4)
- Results of the field investigation (Section 5)
- Conclusions based on the findings (Section 6)
- Recommendations for additional work (Section 7)
- A certification that work was completed in accordance with the Work Plan (Section 8)

2.0
OBJECTIVES

As set forth in the Order, the objectives of this investigation are to gather data to enable the Department to (1) determine whether hazardous waste is present at the Site; and (2) if hazardous wastes are present, characterize the nature of such wastes and determine whether they constitute a significant threat to public health or the environment.

3.0 BACKGROUND

The FMC Facility is located at the corner of Sawyer Avenue and River Road in the Town of Tonawanda, Erie County, New York. A location map is provided as Figure 3-1. The plant was built by Buffalo Electro-Chemical Company (BECCO) in 1925. In 1952, BECCO was acquired by the Food Machinery and Chemical Corporation; in 1961, the company name was shortened to FMC Corporation. According to FMC personnel, chemicals produced at the facility have not changed substantially over the entire history of the facility, going back to 1925.

On January 6, 1994, FMC submitted to NYSDEC a report of a "Records Search" concerning the history of potential hazardous waste disposal at the facility. Information collected during this "Records Search" suggests that some waste disposal may also have occurred along the western boundary of the parking lot. In this PSA report, the area south of the parking lot is designated Site-1, while the area to the west is designated Site-2. A site map is provided as Figure 3-2.

Based on the available information, waste disposal activities at both Site-1 and Site-2 ceased in approximately 1976. Disposal areas were reportedly covered with clay. The 1-acre parcel of land (Site-1) has since been graded with gravel while Site-2 has been graded and grassed. According to the NYSDEC Report entitled "Inactive Hazardous Waste Disposal Sites in New York State" (NYSDEC, 1986), the pits on Site-1 were properly closed.

In 1988, Site-1 was listed by NYSDEC as an inactive hazardous waste disposal site and further classified by NYSDEC as a Class 2a site. This classification indicates that investigation is required to determine whether hazardous wastes were disposed of on-site, and, if so, whether conditions resulting from such disposal constitute a significant threat to human health or the environment.

Investigations conducted by the USGS in 1982 and 1983 (Senior, 1983), at Site-1 indicated that a tight clay layer was encountered at shallow depths (0.5 to 3.5 feet below

grade), and that no groundwater was encountered in borings drilled up to 11.5 feet in depth. Thus, there is no evidence of a continuous shallow groundwater zone which could potentially result in horizontal contamination transport.

In 1989, Ecology and Environment (E&E), under contract to the NYSDEC, performed a Phase I investigation of the FMC Site. The investigation consisted of a records review, interviews and physical inspection of Site-1. The purposes of the investigation were to provide a preliminary evaluation of the potential hazardous waste present at the time, to estimate the potential pollutant migration pathways leading off site, and to determine the natural resources or extent of the human population that might be affected by the pollutants. This information was reviewed by WCC prior to development of the PSA Work Plan.

The site is listed in the Registry of Inactive Hazardous Waste Disposal Sites in New York State as Site No. 915025. According to the current Registry Listing, NYSDEC believes that FMC used two and possibly four pits, located in an undeveloped area south of a plant parking lot, for the disposal of an estimated 100 tons of peroxygen chemicals between the years 1964 through 1976. FMC entered into an Order on Consent, effective November 22, 1993, to perform a Preliminary Site Assessment (PSA) at FMC's Tonawanda facility.

3.1 SITE DESCRIPTION

The FMC Tonawanda Plant is located in an industrial area of Tonawanda, New York between Interstate 190 and the Niagara River. The river is located approximately 1,800 feet west of the FMC Plant.

Site-1 is an approximately one acre parcel owned by FMC, located south of the current paved plant parking lot. The area is currently covered with gravel placed over thin plastic sheeting used for weed control. Site-1 is bounded by the FMC plant to the east, the plant parking lot to the north, a vacant parcel owned by FMC to the west (Site-2), and a Niagara Mohawk rail spur and coal unloading area to the south (see Figure 3-2).

The surface topography of Site-1 slopes gently to the south and west. The land surface along the western fence line of Site-1 is approximately 1 to 2 feet higher than the adjacent portion of Site-2. Based on the site topography, surface water runoff likely flows toward Site-2. A sewer line crosses Site-1. The approximate location of the sewer line is shown on Figure 3-2. There are no surface water bodies on Site-1.

Site-2 is an approximately three acre parcel, owned by FMC, located west of the plant parking lot. Site-2 is currently level and grassed. Site-2 is bordered by Site-1 and the plant parking lot to the east, Sawyer Avenue to the north, River Road (and Niagara Mohawk's Huntley Station) to the west, and the Niagara Mohawk rail spur to the south.

Site-2 is relatively flat. Intermittent surface drainage ditches are present along the northern boundary of the parcel, adjacent to Sawyer Avenue, and the western boundary, adjacent to River Road. These ditches would receive surface water runoff from Site-2. Some surface water drainage may also occur at the southern boundary of Site-1 and Site-2, along the Niagara Mohawk rail spur. Sewer lines and raw water supply lines run under Site-2, as shown on Figure 3-2. There are no surface water bodies on Site-2.

3.2 SITE HISTORY

Woodward-Clyde completed a review of the history of disposal of wastes which may be hazardous at the FMC facility, presented in the report to NYSDEC titled "Preliminary Site Assessment, Report of Records Search" dated January 6, 1994. This review included a review of documents in FMC and NYSDEC files, review of historical aerial photographs, and interviews with current and former FMC employees. The conclusions of the records search are as follows:

1. The FMC Tonawanda Plant was constructed by BECCO in 1925. Chemicals produced at the facility have changed little over time. Major products included persulfate and peroxide salts. Other chemicals produced included perborates, hydrogen peroxide, peracetic acid, and dipicolinic acid.

2. A review of records, employee interviews and a review of aerial photographs indicates that on-site disposal of potentially hazardous wastes occurred between

approximately 1952 and 1976. Disposal occurred in two areas referred to as Site-1, south of the parking lot, and Site-2, west of the parking lot (see Figure 3-2). Employees reported disposal in approximately four pits on Site-1, approximately 12 to 15 feet in diameter and 6 feet in depth. Wastes disposed in these pits reportedly included floor sweepings and product residues. One employee recalled disposal of small quantities of paint and paint solvent in Site-1. The pits were reportedly covered with clay. NYSDEC (NYSDEC, 1986) has acknowledged that Site-1 pits were properly closed.

3. Eighteen geotechnical soil borings were advanced on the western portion of the plant property between 1967 and 1969. Plant waste was reported in two of the eighteen borings, and evidence of fill (e.g., wood fragments) was reported in one boring. The remaining borings reported native soils.

4. In general, the potentially hazardous wastes reportedly disposed of on-site were primarily composed of plant products which do not include hazardous wastes listed in present RCRA or NYSDEC hazardous waste regulations. Under present regulatory provisions, some waste materials may have exhibited the characteristic of ignitability at the time of disposal. However, due to the rapid degradation rates of these chemicals, which are strong oxidizers, products disposed of on-site have almost certainly degraded into salts over time, and would therefore no longer exhibit the characteristic of ignitability. One employee recalled that paint wastes and solvents, likely representing low volume wastes, were also disposed of in the pits on Site-1. These wastes represent potentially hazardous wastes. Paint wastes reportedly contained 1,1,1-trichloroethane. Paint wastes also potentially contain flammable solvents and heavy metal pigments, and could exhibit other hazardous waste characteristics. Oily rags from the powerhouse, possibly containing residues of 1,1,1-trichloroethane used to clean equipment, were also reportedly placed in the pits on Site-1. A small quantity of unknown product from another FMC plant and warehoused at the FMC Tonawanda facility may have been disposed of in one of the pits on Site-1.

5. The review of aerial photographs indicated disturbed areas or excavations generally correlating with information obtained during employee interviews. In

Site-1, three areas of disturbance or excavation were noted in the 1966 and 1969 aerial photographs (see Figure 3-2). One or more additional pits in the southwest corner of Site-1, reported to have existed in the 1950's to 1968 by Mr. Clarence Dick, may not be evident in the aerial photographs.

Aerial photographs indicate disturbance or excavations in Site-2 just west of the parking lot fence, consistent with locations of a disposal area reported by two employees. Small piles of material in the central portion of Site-2 in the 1969 aerial photograph and an unvegetated area on the western portion of Site-2 are consistent with reports of use of coal ash to fill this area.

6. The native clays underlying the entire site, including any disposal pits, represent a barrier to contaminant migration.

Additional supporting documentation is provided in the "Records Search" Report.

3.3 SITE GEOLOGY/HYDROLOGY

The Site is located within the Erie-Ontario Lowlands Physiographic Province of New York, which is characterized by a thick, gently dipping (southward at a rate of 20 to 50 feet per mile) sequence of rock formations, ranging from sandstones and shales to dolomites and limestones from the Silurian and Devonian Periods. The site is underlain by the Late Silurian Camillus Formation, a member of the Salina Group. The Camillus Formation lithology consists of gray to light gray shale, siltstone and dolostone with occasional to abundant lenses, veins, and beds of anhydrite, halite, and gypsum. Gypsum is the most predominant evaporite mineral present. Groundwater flow is primarily through secondary features of fractures and solution cavities. The Camillus contains significant groundwater reserves in secondary cavities formed by dissolution of the evaporite deposits, but this water is generally of poor quality and unacceptable for use as a municipal or private water supply due to the high concentrations of dissolved ionic species. Some industrial supply wells have been completed in the Camillus Formation. Groundwater flow in the bedrock across the site is probably toward the Niagara River.

The surficial geology of Western New York has been largely controlled by the effects of Pleistocene glaciation. Glacial deposits in the Erie-Ontario basin of Western New York were formed almost entirely during Late Wisconsinan time by an expansion of the Laurentide Ice Sheet. This period of glaciation began approximately 30,000 years before present and lasted until approximately 12,000 years before present. The resultant deposits in the area include glacial moraine, till, drift, and lacustrine deposits. Lacustrine deposits were the result of embayments and water level fluctuations caused by the influx of glacial meltwater trapped in the Erie Basin by retreating ice and glacial moraines. This resulted in several episodes of water level fluctuations in the Erie basin at significantly higher elevations than the current Lake Erie level. These lacustrine deposits frequently overlie previous glacial deposits.

The lacustrine deposits are medium to fine sand, silt, and clay, which are thin to massively bedded. These deposits typically exhibit very low vertical permeabilities. The silt and clay deposits are frequently varved and there is some moderate permeability along the bedding planes in some locations.

The site stratigraphy, as indicated by the geotechnical investigation conducted by Pittsburgh Testing Laboratories, shows varying thin layers of fill consisting of crushed stone, slag, cinders, sand, silt and clay to a maximum depth of 5.1 feet, then brown to red-brown silty clay with traces of gravel to a depth of 25 feet. Two geotechnical borings were continued to bedrock. The locations of these borings were in Site-1 and the central portion of the parking lot. The log of the boring from Site-1 indicates that the silty clay lacustrine deposits continued to a depth of approximately 58 feet where weathered bedrock was encountered. The log of the boring from the central portion of the parking lot indicates that the silty clay lacustrine deposits continue to a depth of approximately 49.5 feet, where very dense silty fine sand with gravel was encountered, which is most likely till. The till was approximately 6 feet in thickness below which weathered bedrock was encountered at a depth of approximately 55 feet.

The hydrology of the unconsolidated deposits varies. The predominant lithology on the site, the lacustrine silty clay, is of very low permeability. Samples of this material collected from locations approximately 1/2 mile south of the FMC facility show permeability of undisturbed samples in the range of 10^{-8} cm/second. The hydraulic

conductivity of the fill and till are not known. The nature and thickness of the fill varies widely and the permeability of the material may be expected to correspond accordingly. The typical thickness of the fill in the geotechnical investigation was about 2 feet. Water was reported in only one geotechnical boring at completion, and was likely associated with the crushed stone fill below asphalt pavement. The sewer line which transects the central portion of Site-2 and the parking lot may include coarse granular fill and pipe bedding which would have higher permeabilities than the natural formations. Shallow groundwater on the site most likely occurs as discontinuous perched water above the natural deposits. Perched water was observed in the fill/waste layers overlying the clay in some test pits excavated during this investigation.

The very low permeability of the natural deposits likely precludes hydraulic connection between the isolated areas of granular fill. The thickness of the lacustrine deposits above the bedrock also prevents vertical flow of the perched water downward.

4.0
METHODS

The Work Plan presented a detailed Sampling and Analysis Plan, Quality Assurance Plan, and Health and Safety Plan. The field investigation methods were consistent with those specified in the Work Plan except as noted below. This section presents a summary of sample locations and sampling and analytical methods used in the investigation.

4.1 SAMPLING PROCEDURES

4.1.1 Waste Samples

In accordance with the Work Plan, test pits were excavated around four suspected waste disposal locations on Site-1 (designated A through D), and four suspected waste disposal locations of Site-2 (designated E through H). In addition, at the request of NYSDEC, test pits were excavated in the western portion of Site-2 (location I), where coal ash and cinders may have been placed as fill. Figure 4-1 illustrates the location of the test pits. All test pit excavations were inspected by a WCC geologist, and observations were recorded in logs (see Appendix A).

The Work Plan required excavation of up to eight test pits around each suspected waste disposal pit location. At some locations, fewer than eight test pits were excavated or test pits were relocated due to:

- the small area encompassed by some locations, and overlap with an adjacent location,
- the presence of underground utilities which precluded safe excavation in the northern portion of Location G,
- the property boundary, which represented the southern limit of investigation at Locations A and D.

Based upon these field conditions, fewer than eight test pits were excavated at location B on Site-1 (7 test pits) and Location G on Site-2 (4 test pits). Additional test pits were excavated at locations A, C, and D on Site-1 (9, 10, and 9 test pits, respectively), and locations F, H and I on Site-2 (9 test pits each). A total of 75 test pits, versus 72 planned, were excavated. Modifications in the excavation program were reviewed in the field with NYSDEC's on-site representative, Mr. J. Hyden, and were approved. As shown in Figure 4-1, the test pit excavations provided broad coverage of the potential areas of concern.

The Work Plan required collection of waste samples for analysis at each location where evidence of disposal of apparent waste materials was observed, based upon visual observations or field testing. At each test pit location where potential plant wastes were encountered, representative samples were tested in the field for presence of oxidizers. No positive results for oxidizers were recorded. At locations where plant wastes were encountered, organic vapor analyses using field instrumentation (Century OVA or HNu meter) were used to screen samples for potential volatile organics. At test pits in Location A where apparent waste materials were encountered (test pits A-1 through A-6), organic vapor readings of waste sample jar headspace were recorded, in accordance with the Work Plan. At Location D, waste sample jar headspace readings were not accomplished due to a malfunction of the OVA. However, direct readings of organic vapors over uncontained apparent waste materials were obtained prior to the OVA malfunction. Elevated organic vapor readings were observed in some test pits in Locations A and D. These results were considered in selecting samples for laboratory analyses.

Based upon the field test results, and visual observations of material encountered in the test pits, it was determined that residual plant waste was encountered at only two waste pit locations (Areas A and D on Site-1). Samples of waste for laboratory analysis were collected from these locations, in accordance with the Work Plan. Composite samples were prepared from materials showing the greatest potential for contamination based upon field observations. At Location A, a sample was collected based upon the organic odor observed, primarily related to a green clayey material observed at this location. Some metallic sandy material was also observed at Location A. At Location D, a sample was collected based on observations of white, hard salt-like materials, oily/tarry

material, and a grease-like material, in conjunction with reworked silty clay. In general, samples were collected from the backhoe bucket. At Location A, a sample of the odorous clayey material was collected directly from the pit sidewall, because this material was not effectively captured by the backhoe bucket.

Selection of waste sample locations was reviewed and approved in the field by NYSDEC's representative, J. Hyden.

4.1.2 Soil Samples

The Work Plan required collection of soil samples from the natural clay unit underlying each location where apparent waste materials were encountered. In accordance with the Work Plan, grab soil samples for chemical analysis were collected at locations A and D. Undisturbed Shelby tube samples for geophysical analysis (grain size and permeability) were collected from Location C on Site-1 and Location F on Site-2.

4.1.3 Decontamination Procedures

All non-dedicated equipment used during waste and soil sampling activities was thoroughly decontaminated prior to each use according to the following procedures:

1. Brush all foreign material off of equipment
2. Rinse with de-ionized water rinse.
3. Wash with non-phosphate detergent/potable water solution.
4. Rinse with de-ionized water rinse.
5. Air dry.

The backhoe was decontaminated between sample locations by means of a high-pressure steam or spray wash and prior to being mobilized on the site.

All fluids generated during decontamination were containerized for proper disposal by FMC.

4.2 ANALYTICAL PROCEDURES

A summary of analyses performed and analytical methodologies is provided in Tables 4-1 and 4-2.

4.2.1 Waste Samples

The following waste classification tests were performed on waste samples:

- Ignitability (oxidizers)
- Toxicity Characteristic Leaching Procedure (TCLP)
  - -- Metals
  - -- Volatile organics
- PCBs

Volatile organic analysis was performed on a grab sample from test pit A-5. Test pit A-5 had the highest headspace OVA readings, and organic odors were observed at this location. Volatile organic analysis was performed on a composite sample from Location D-4. Location D-4 was selected for analysis because it contained the greatest quantity of apparent waste materials of any pit in Location D based upon visual observations. The remaining analyses were performed on samples composited across the depth of apparent waste materials observed in the test pits at Locations A-5 and D-4.

At the request of NYSDEC, TCL-semi-volatile organic analysis was performed at one location (Location D-4) on Site-1, selected based upon visual evidence of potential organic contamination.

4.2.2 Soil Samples

Soil samples were collected from the upper unit of natural soil or clay underlying Locations A and D. These samples were analyzed for Target Compound List (TCL) volatile organic compounds and RCRA metals, to evaluate potential migration of waste constituents into soil underlying the pits. Volatile organic analyses were performed on a grab sample representing the top of the natural clay/soil stratum. The remaining

analyses were performed on a composite of the upper two feet of the natural soil/clay layer. At the request of NYSDEC, TCL semi-volatile organic analysis was performed at Location D-4 on Site-1, selected on the basis of visual evidence of potential organic contamination in overlying waste materials. One sample of the natural clay soils from each of Site-1 and Site-2 was collected and analyzed for grain-size distribution and permeability.

4.2.3 Analytical Procedures

A summary of sample analyses performed is presented on Table 4-1. Analytical protocols that were used for this investigation are summarized on Table 4-2. Analytical parameters are summarized on Table 4-3. Analyses were performed by Nytest Environmental, Inc., (NYS Lab ID No. 10195) with the exception of the analyses of oxidizers and permeability, and grain size analyses. Potential presence of oxidizers was screened using ASTM Method D-4981-89 (Standard Test Method for Screening of Oxidizers in Wastes). If presence of oxidizers was indicated in a waste sample by the screening, the sample was to be analyzed for the hazardous waste characteristic of ignitability (for solid oxidizers) in accordance with 49 CFR 173, Appendix F. All results of screening tests for oxidizers were negative, thus no further analysis for oxidizers was required. Analyses for permeability and grain size were performed by WCC using ASTM methods D5084-90 for permeability and D-422 for grain size. There are no NYSDOH protocols for these analyses.

4.3 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

QA/QC procedures were followed in accordance with Appendix A of the Work Plan. QA/QC samples were collected in the field at the required frequency, including field replicate and equipment blank samples.

Analytical results provided by the laboratory were reviewed and validated by WCC using the following documents as guidance:

1. CLP Organics Data Review and Preliminary Review. SOP No. HW-6, Revision 8. USEPA Region II. January 1992.

2. Evaluation of Metals Data for the Contract Laboratory Program (CLP) based on SOW 3/90, Revision XI. USEPA Region II. January 1992.

5.0 RESULTS

5.1 FIELD OBSERVATIONS

Test pit logs, summarizing field observations, are presented in Appendix A. Significant field observations are summarized on Table 5-1 and are discussed below.

Visual evidence of waste disposal was encountered at two locations on Site-1, locations A and D, both located near the southern property boundary. No substantial evidence of waste disposal was encountered at locations B and C on Site-1, or at locations E through I on Site 2.

Location A. Evidence of waste disposal was observed in the eastern portion of Area A, primarily in test pits A-5, A-6, and A-9, where copper colored sand-like material, wood, wire, ceramic material, metal, and drum ring remnants were observed, in addition to fill materials (e.g., flyash and slag) found in other portions of the site. Odorous clayey material with slightly elevated organic vapor readings was also observed in test pits A-5 and A-8. Apparent waste materials were encountered to depths approximately 5 feet below ground surface (bgs) where the native clay was observed. The remaining test pits in Area A encountered typical fill material (primarily flyash and slag) found in other portions of the plant site. Three waste samples (from pits A-5, A-6, and A-9) were tested for presence of oxidizers. All results were negative.

Location B. No evidence of plant waste materials was encountered in Area B. Fill materials consisting primarily of flyash, with some brick, wood, metal and ceramic material were encountered in this area, to depths of approximately 5 feet.

Location C. No substantial evidence of plant waste was encountered in Area C. One isolated small clump (approximately 2″ x 3″ x 4″) of a salt-like material was encountered. This material was tested for presence of oxidizers, with negative results. This test pit, and the other test pits in Area C encountered flyash used as fill material.

Location D. Evidence of plant waste was encountered in several test pits in Location D (test pits D-2, D-3, D-4, D-5, D-8, D-9, and D-10). Apparent waste materials encountered included salts, drum ring remnants, oil/tar, grease and copper colored sand-like material. Waste materials were encountered at depths up to 7 feet bgs, where the native clays were encountered. Five waste samples were tested for presence of oxidizers (test pits D-2, D-3, D-4, D-5, and D-8); all results were negative. Fill material in this area included flyash and rubble (bricks and wood). Elevated organic vapor readings were encountered in several test pits in Location D.

Location E. No evidence of plant waste disposal was encountered in Location E. Fill material encountered in this area included flyash and rubble (brick, metal, cement, wire, clay, tile and asphalt). Fill was encountered to depths up to 7.5 feet bgs.

Location F. No evidence of plant waste or disposal was encountered in Location F. Fill material was limited in this location, with some rubble (concrete, brick, ceramic, shotrock) observed near the surface. The native clay layer was encountered at depths ranging from 1.0 to 3.5 feet bgs.

Location G. No evidence of plant waste disposal was encountered at Location G. Some fill material was observed near the surface, with slag, flyash, and rubble (brick and ceramic material) encountered at depths ranging from 1.5 to 3.0 feet.

Location H. No evidence of plant waste disposal was encountered at Location H. Fill materials, including slag, flyash and rubble (wood, metal, ceramic, brick) were encountered at depths up to 5.0 feet bgs.

Location I. No evidence of plant waste disposal was encountered at Location I. Miscellaneous fill materials, primarily rubble (brick, concrete, metal, asphalt, wood) and some coal and slag, were encountered at depths up to 4.0 feet bgs. A sandy material was encountered in test pit I-7. This material was tested for presence of oxidizers; results were negative.

The approximate extent of plant waste disposal identified during this investigation is shown on Figure 4-1. The approximate northern and western limits of apparent waste

materials in Locations A and D were determined based on field observations. The southern and eastern limits were not defined. Fill materials (flyash, broken ceramic, brick and wood) were encountered in the test pits located immediately south of the sewer line (e.g., test pits B-2, B-4, B-6, B-7, D-1, D-6, H-2, H-3, H-5, and H-6). However, no evidence of plant waste materials was observed in these test pits.

5.2 ANALYTICAL RESULTS

5.2.1 Waste Samples

Waste samples were collected from Locations A and D on Site-1, the only locations where evidence of disposal of plant waste was encountered (e.g., observation of apparent waste material, staining and elevated OVA readings). Based on field observations, samples for analysis were collected from test pits A-5 and D-4. Results of analyses of these samples are presented on Tables 5-2 through 5-4.

5.2.1.1 TCLP Results

TCLP results for the waste samples are presented on Table 5-2. All TCLP-volatile organics and 1,1,1-trichloroethane, which is not on the TCLP parameter list but was analyzed at the request of NYSDEC, were below detection limits. All TCLP metals were below the applicable regulatory limit for the toxicity characteristic.

5.2.1.2 PCB Results

PCBs were detected in both waste samples. Aroclors-1254 and 1260 were reported in replicate samples from test pit D-4, at concentrations ranging from 6.8 to 14 mg/kg (ppm) (see Table 5-3). Aroclor-1260 was reported in the sample from test pit A-5, at a concentration of 16,000 mg/kg (ppm).

5.2.1.3 Semi-Volatile Organics

Table 5-4 presents a summary of semi-volatile organic results for the waste sample from test pit D-4, selected based on field observations as the sample location with the highest

potential for contamination by organic compounds. Semi-volatile organics in this sample were generally low or non-detected. As expected, the primary semi-volatile organics detected were polyaromatic hydrocarbons (PAHs). PAHs detected included:

Compound	Concentration (mg/kg) (ppm)
naphthalene	1.2
2-methylnaphthalene	1.8
acenaphthene	0.44
dibenzofuran	0.38
fluorene	0.54
phenanthrene	4.7
fluoranthene	1.7
pyrene	1.9
benzo(a)anthracene	1.1
chrysene	1.3
benzo(b)fluoranthene	0.7
benzo(k)fluoranthene	0.68
benzo(a)pyrene	0.31
indeno(1,2,3-c,d)pyrene	0.22
dibenzo(a,h)anthracene	0.14
benzo(g,h,i)perylene	0.15

As noted in Section 5.1.1 of the Work Plan, it was anticipated that low concentrations of PAH would be detected due to the extensive use of coal at the adjacent Niagara Mohawk facility, and use of asphalt paving materials at the FMC site. Thus, these compounds are not considered indicative of plant waste materials.

The only other semi-volatile organic compounds detected were:

Compound	Concentration (mg/kg)
4-methylphenol	0.89
1,2,4-trichlorobenzene	1.0
butylbenzylphthalate	0.66
bis(2-ethylhexyl)phthalate	3.8

The presence of 1,2,4-trichlorobenzene may be related to the presence of PCBs at this location. Trichlorobenzenes have also been used as pesticides. The phthalate esters are common plasticizers, and are common laboratory artifacts. 4-methylphenol (o-cresol)

has been used as a disinfectant. None of these compounds is a known or suspected hazardous constituent of plant wastes from the FMC Tonawanda Plant.

5.2.1.4 Summary

All TCLP test results on samples of apparent waste materials from Locations A and D were below regulatory criteria for hazardous wastes. PCBs were detected in waste samples from Locations A and D. Analysis of a selected sample for semi-volatile organic compounds did not detect any compounds considered known or suspected hazardous constituents of plant wastes generated at the FMC Tonawanda Plant.

5.2.2 Soil Samples

Soil samples were collected from the native clays underlying waste disposal pits in Locations A and D. In accordance with the Work Plan, samples for volatile organic compounds were grab samples from the upper 6 inches of the native clay underlying the pits. Remaining parameters were analyzed on composite samples of the upper two feet of the native clay. Results of analyses for these samples are presented in Tables 5-5 through 5-7, and are discussed below.

5.2.2.1 Volatile Organics

Volatile organic compounds were generally low or not detected in soil samples from Locations A-5 and D-4 (see Table 5-5). The following volatile organic compounds were detected in soil samples:

	Concentration (mg/kg)		
Compound	D-4	D-4 Dup.	A-5
methylene chloride	0.013		
acetone	0.16	0.15	
benzene			0.001
tetrachloroethene			0.063
toluene	0.002	0.002	
chlorobenzene			0.002
ethyl benzene	0.002	0.002	0.003
xylenes (total)	0.002	0.003	0.096

Acetone and methylene chloride were detected in laboratory method blanks, and may be laboratory artifacts.

As shown above, all volatile organic compounds were below 0.2 mg/kg (ppm) in the upper 6 inches of native soils under the waste disposal pits, and most detected compounds were below 0.01 mg/kg.

5.2.2.2 Semi-Volatile Organics

As shown in Table 4-6, no semi-volatile organic compounds were detected in native soils underlying the waste disposal pits.

5.2.2.3 Metals

Metal concentrations in native clays underlying waste disposal pits are summarized on Table 5-7. Metal concentrations were generally low or not detected, and appear to be typical of natural background metal concentrations.

5.2.2.4 Summary

Low concentrations (less than 0.2 mg/kg) of volatile organic compounds were detected in the native clays underlying waste disposal pits in Locations A and D. No semi-volatile organic compounds were detected, and reported metal concentrations were low, and apparently typical of natural background.

5.3 GEOPHYSICAL TESTING

Geophysical property testing was performed on samples of the native clay layer underlying Site-1 and Site-2. Samples from test pit C-7 on Site-1 and F-8 on Site-2 were tested for grain-size distribution and permeability, to evaluate the effectiveness of the clay layer as a barrier to contaminant migration. Geophysical test results are included in Appendix B. Results are discussed below.

Based on grain-size distribution, both samples were classified as clay. The Site-1 sample was classified as a brown slightly plastic clay with traces of fine gravel and fine sand, and 87.4% passing a 200 mesh sieve. The permeability of this sample was 3.3×10^{-7} cm/sec.

The Site-2 sample was classified as a red-brown medium plastic silty clay, with traces of coarse-fine sand. Permeabilities for replicate samples from Site-2 were 1.1×10^{-6} and 2.0×10^{-7} cm/sec. Reported clay densities were in the range of 130.3 to 134.5 pounds/cubic foot, or about 1.8 tons/cubic yard.

5.4 QUALITY ASSURANCE/QUALITY CONTROL

Field replicate samples and equipment (field) blanks were collected in accordance with the Work Plan requirements. Analytical data were reviewed and validated by WCC. The results of the data validation are discussed in Appendix C, and appropriate data qualifiers have been incorporated into the data summary tables in this report. The overall conclusion of the data validation was that the data reported were acceptable for their intended use, with minor qualification. No substantial contamination was detected in equipment blanks. Acceptable precision was achieved in analyses of field replicate samples. Additional details concerning the data validation can be found in Appendix C. Copies of laboratory data summary forms (Form-1s) are included in Appendix D.

6.0 CONCLUSIONS

The following conclusions are based on the results of the PSA field investigation.

1) Evidence of disposal of plant manufacturing waste was encountered at only two of nine suspected disposal pit locations. These two locations (Locations A and D on Site-1) are both located along the southern property boundary. The approximate extent of waste to the west and north of these disposal pits was determined by observations during test pit excavations. The eastern and southern extent of waste disposal was not determined. Depth of waste disposal ranged to approximately 7 feet bgs.

2) A native clay layer was encountered at all test pit locations, at depths ranging from 2 to 7 feet bgs. Previous geotechnical investigations at the site indicate that the thickness of the clay layer is on the order of 50 feet and underlies the entire site. The clay layer has low permeability in the range of 2×10^{-7} to 1×10^{-6} cm/sec.

3) Miscellaneous fill materials (primarily flyash, slag and rubble) were encountered at most test pit locations.

4) None of the samples collected for analysis exhibited a hazardous waste characteristic. All tests for presence of oxidizers, the primary plant waste, were negative, confirming that any oxidizing materials disposed of at the site have decomposed to innocuous salts. All TCLP results were below regulatory criteria for hazardous waste. No semi-volatile organics representative of plant wastes were reported in apparent waste materials.

5) The PCB concentration in the sample from Location A on Site-1 was well above the NYS hazardous waste criterion. The source of PCBs at this location is unknown. The extent of PCB contamination was not determined in this investigation. Due to the low mobility of PCBs, the low permeability

of the native clay underlying the site, and the clay cover placed over the disposal pits, no substantial migration of PCBs from the original disposal location is anticipated.

Thus, the risk to human health or the environment is minimal.

6) Analysis of native clay samples underlying waste disposal pits did not indicate any significant migration of contaminants from the waste. Only traces (less than 0.2 mg/kg) of volatile organic compounds were detected. No semi-volatile organics were detected. Reported metal concentrations were typical of background.

7) The locations of waste disposal pits identified during this investigation were not in the vicinity of the sewer lines crossing Site-1 and Site-2. The location of wastes, in conjunction with the low permeability of the native clays into which wastes were placed, indicated no substantial potential for waste related contaminants to be transported in the sewer lines or bedding materials.

8) Based upon the low permeability of the native clay underlying the site, the low concentration of constituents found in soil directly underlying the waste disposal pits, and the low mobility of PCBs, there is no evidence suggesting potential for groundwater contamination due to past waste disposal practices at the site.

7.0
RECOMMENDATIONS

7.1 GENERAL RECOMMENDATIONS

Additional investigation is proposed to determine the extent of PCB contamination in apparent waste materials, and potentially in underlying soils at the site. Due to the low mobility of PCBs, the low permeability of the native clay underlying the site and the clay cover placed over the disposal pits, PCB contamination is probably localized, primarily at Location A-5. However, detection of PCBs at Location D-4, indicates the possibility that PCBs may be present throughout the waste disposal locations A and D. The PSA investigation did not include testing for PCBs in soils underlying the waste disposal pits, and test trench excavations did not delineate the extent of apparent waste present to the south and east of Locations A and D. Therefore, additional investigation is proposed to characterize the vertical and horizontal extent of PCB contamination at these locations. It is recommended that reclassification of the site be deferred pending completion of the additional investigation.

No other additional work is recommended. The results of the PSA investigation confirmed that:

- Plant wastes (oxidizers) disposed in the pits, and potentially exhibiting the hazardous waste characteristic of ignitability, have decomposed, as expected, and are no longer hazardous. No evidence of materials exhibiting hazardous waste characteristics was identified during the PSA.

- The low permeability natural clay layer underlying the site represents an effective barrier to contaminant transport. Thus, potential for groundwater contamination related to waste disposal is not a concern, and groundwater monitoring is not warranted.

- There is no evidence that hazardous wastes were disposed of in proximity to the sewer lines crossing the site. Thus, no additional testing of the sewer lines or backfill materials is warranted.

7.2 ADDITIONAL INVESTIGATION

The following work is recommended to characterize the vertical and horizontal extent of PCBs at Locations A and D on Site-1 at the FMC Tonawanda Plant.

7.2.1 Vertical Extent

Four soil borings are proposed for vertical delineation, two each in Locations A and D. The purpose of these borings is to determine whether PCB contamination has penetrated the native clay underlying the pits. These borings will penetrate the native clay underlying the disposal pits to a depth of approximately 2 feet. Using a split spoon sampler, soil samples will be collected from 0" to 6", 6" to 12", and 18" to 24" from the top of the clay layer. The samples will be analyzed sequentially in order of increasing depth. For example, if the 0" to 6" sample from a given boring does not contain PCBs (< 1 ppm), no analysis of deeper samples at that location will be performed. In this manner, the depth of penetration of PCBs into the clay layer, if any, will be determined. If visual observations in the field suggest contamination more than two feet into the clay layer (e.g., oily staining), the boring will be extended, and additional samples will be collected at one foot intervals, until visual evidence of contamination is absent, samples collected will be analyzed sequentially with depth as described above.

One boring in each of Location A and D will be advanced at the approximate locations of samples containing PCBs encountered during the PSA. A second boring will be advanced near the center of the disposal area based on data collected to date. The approximate location of these borings is shown on Figure 7-1.

7.2.2 Horizontal Delineation

A series of additional shallow borings will be advanced in a grid pattern covering the area surrounding waste disposal Locations A and D. The purpose of this grid is to

establish the horizontal extent of PCBs in apparent waste materials above the clay layer. The grid will be established on approximately 25-foot centers starting at locations of waste disposal identified during the PSA, and will proceed outward until evidence of plant waste is no longer encountered in the borings. Assuming access is granted, the grid will be extended to the south, onto the Niagara Mohawk property adjacent to FMC. It is anticipated that the initial off-site borings will be located near the property line (within approximately 5 feet). Due to the presence of railroad tracks, a berm, and a ditch on the Niagara Mohawk property, boring locations in this area will likely be modified in the field based on accessibility. The approximate locations of the proposed boring grid is shown on Figure 7-1.

Four additional borings will be advanced in the immediate vicinity of test pit location A-5, to better delineate the horizontal extent of PCB contamination in this area. These borings will be placed approximately 12 feet away from the original sample location (see Figure 7-1).

The shallow borings will be advanced through waste/fill to the top of the clay layer. Waste/fill samples above the clay layer will be collected from split spoon samplers. Samples for analysis will be selected in the field based on visual evidence of contamination (e.g., oily stains) if any. If no evidence of contamination is observed, samples for analysis will be collected from the split spoon immediately above the native clay layer.

7.2.3 Sampling and Analysis

With the exception of the use of borings rather than test pits to collect samples, the sampling and decontamination procedures presented in the approved Work Plan will be followed.

Samples will be analyzed for PCBs, using EPA Method 8080.

7.2.4 QA/QC

Applicable provisions of the QA Plan presented in Appendix A of the approved PSA Work Plan will apply to the additional investigation. Field replicate samples will be collected on the basis of one replicate per 20 field samples. Due to the limited potential for cross-contamination of samples by PCBs, only two equipment blanks will be collected during the field program.

7.2.5 Health and Safety

The Health and Safety Plan presented as Appendix B to the approved Work Plan will apply to the additional investigation. An addendum to the Health and Safety Plan will be developed to specifically address the hazards associated with PCBs prior to conducting the proposed field work.

8.0 CERTIFICATION

Woodward-Clyde Consultants provided full-time inspection of field work, and completed this PSA report in accordance with the provisions of the Work Plan. Location and number of test pits installed during the investigations were subject to minor modifications, based upon field conditions, as documented in this report and as approved by NYSDEC's field representative. Due to equipment malfunction, organic vapor headspace readings were not obtained for waste samples from Location D. However, organic vapor screening of waste samples in this area was completed prior to the malfunction, and these data were considered in selection of samples for laboratory analyses. No other significant deviations from the Work Plan occurred.

Tables

TABLE 4-1

SUMMARY OF SAMPLING AND ANALYSIS
PRELIMINARY SITE ASSESSMENT
FMC, TONAWANDA, NEW YORK SITE

Sample Matrix	Laboratory Parameters	Investigative Samples	QA Samples: Equipment Blanks	QA Samples: Field Replicates	QA Samples: MS/MD[1] Samples	Matrix Total
Waste	Oxidizer Screening[2]	10	--	--	--	10
	TCLP - VOCs	2	--	1	1/1	5
	TCLP - Metals	2	--	1	1/1	5
	TCL - Semi-Volatiles	1	--	--	--	1
	PCBs	2	1	1	1/1	6
Soil	TCL - VOCs	2	1	1	1/1	6
	RCRA - Metals	2	1	1	1/1	6
	TCL - Semi-Volatiles	1	--	--	--	1
	Permeability	2	--	--	--	2
	Grain Size	2	--	--	--	2

Notes:

(1) Matrix spike/matrix spike duplicate samples. Oxidizer screening will consist of a laboratory duplicate sample analysis. A matrix spike/laboratory duplicate analysis will be performed for metals.

(2) The DOT oxidizer test (49 CFR 173 Appendix F) will be applied to any wastes identified as potential oxidizers based on the oxidizer screening test.

TCLP Toxicity characteristics leaching procedure.

TCL Target compound list

VOCs Volatile organic compounds

TABLE 4-2

ANALYTICAL METHODS
PRELIMINARY SITE ASSESSMENT
FMC, TONAWANDA, NEW YORK SITE

Matrix	Parameters	Method	Method Reference
Waste	Oxidizer Screening	D-4981-89	1
	DOT Oxidizer Test	---	2
	TCLP Extraction	---	3
	TCLP - VOCs	91-1	3
	TCLP - Metals	CLP-M	3
	TCL - Semi-Volatiles	91-2	3
	PCBs	91-3 Modified(1)	3
Soil	TCL VOCs	91-1	3
	RCRA - Metals	CLP-M	3
	TCL - Semi-Volatiles	91-2	3
	Permeability	D5084-90	1
	Grain Size Analysis	D422	1

Notes

TCLP Toxicity characteristic leaching procedures

TCL Target compound list

(1) Modified for the analysis of PCBs only

NB Data packages for method reference 3 will be consistent with ASP Category B type deliverables.

Method References

(1) American Society for Testing and Materials (ASTM), 1990.
(2) 49 CFR 173 Appendix F.
(3) NYSDEC Analytical Services Protocol (ASP), 1991.

TABLE 4-3
ANALYTICAL PARAMETERS
PRELIMINARY SITE ASSESSMENT
FMC, TONAWANDA, NEW YORK SITE

TCLP - Volatile Organic Compounds (Waste)

- benzene
- carbon tetrachloride
- chlorobenzene
- chloroform
- 1,2-dichloroethane
- 1,1,1-trichloroethane
- tetrachloroethylene
- trichloroethylene
- 1,1-dichloroethylene
- vinyl chloride
- methyl ethyl ketone

TCL - Volatile Organic Compounds (Soil)

- chloromethane
- bromomethane
- vinyl chloride
- chloroethane
- methylene chloride
- acetone
- carbon disulfide
- 1,1-dichloroethene
- 1,1-dichloroethane
- 1,2-dichloroethene (total)
- chloroform
- 1,2-dichloroethane
- 2-butanone
- 1,1,1-trichloroethane
- 1,1,2,2-tetrachloroethane
- chlorobenzene
- xylenes (total)
- carbon tetrachloride
- bromodichloromethane
- 1,2-dichloropropane
- cis-1,3-dichloropropene
- trichloroethene
- dibromochloromethane
- 1,1,2-trichloroethane
- benzene
- trans-1,3-dichloropropene
- bromoform
- 4-methyl-2-pentanone
- 2-hexanone
- tetrachloroethene
- toluene
- ethyl benzene
- styrene

TCL - Semi-Volatile Organic Compounds (Waste and Soil)

- phenol
- bis(2-chloroethyl)ether
- 2-chlorophenol
- 1,3-dichlorobenzene
- 1,4-dichlorobenzene
- 1,2-dichlorobenzene
- 2-methylphenol
- 2,2-oxybis (1-chloropropane)
- 4-methylphenol
- n-nitroso-di-n-propylamine
- hexachloroethane
- nitrobenzene
- isophorone
- 2-nitrophenol
- 2,4-dimethylphenol
- bis(2-chloroethoxy)methane
- 2,4-dichlorophenol
- 1,2,4-trichlorobenzene
- naphthalene
- 4-chloroaniline
- hexachlorobutadiene
- 4-chloro-3-methylphenol
- 2-methylnaphthalene
- hexachlorocyclopentadiene

TABLE 4-3
ANALYTICAL PARAMETERS
PRELIMINARY SITE ASSESSMENT
FMC, TONAWANDA, NEW YORK SITE

(Continued)

TCL - Semi-Volatile Organic Compounds (Waste and Soil) (continued)

- 2,4,6-trichlorophenol
- 2,4,5-trichlorophenol
- 2-chloronaphthalene
- 2-nitroaniline
- dimethylphthalate
- acenaphthylene
- 2,6-dinitrotoluene
- 3-nitroaniline
- acenaphthene
- 2,4-dinitrophenol
- 4-nitrophenol
- dibenzofuran
- 2,4-dinitrotoluene
- diethylphthalate
- 4-chlorophenyl-phenyl-ether
- fluorene
- 4-nitroaniline
- 4,6-dinitro-2-methylphenol
- n-nitrosodiphenylamine
- 4-bromophenyl-phenylether
- hexachlorobenzene
- pentachlorophenol
- phenanthrene
- anthracene
- carbazole
- di-n-butylphthalate
- fluoranthene
- pyrene
- butylbenzylphthalate
- 3,3'-dichlorobenzidine
- benzo(a)anthracene
- chrysene
- bis(2-ethylhexyl)phthalate
- di-n-octylphthalate
- benzo(b)fluoranthene
- benzo(k)fluoranthene
- benzo(a)pyrene
- indeno(1,2,3-cd)pyrene
- dibenz(a,h)anthracene
- benzo(g,h,i)perylene

TCLP/RCRA Metals (Waste and Soil)

- arsenic
- barium
- cadmium
- chromium
- lead
- mercury
- selenium
- silver

PCBs (Waste)

- Aroclor-1016
- Aroclor-1221
- Aroclor-1232
- Aroclor-1242
- Aroclor-1248
- Aroclor-1254
- Aroclor-1260

TABLE 5-1
SUMMARY OF OBSERVATIONS IN TEST PITS
FMC - TONAWANDA, NEW YORK PSA

Area-Pit #	Waste Found	Oxidizer Test Result	Fill Found/Type	Depth to Native Clay (ft)	Comments
A-1	No		Slag	-4.0	
A-2	No		Slag	-4.0	
A-3	No		Slag	-3.7 to -4.5	
A-4	No		Slag	-3.5	
A-5	Copper colored sand like material	Negative	Wood, Wire, Ceramic	-5.0	Green mottled clay, odorous, 1-4 ppm OVA
A-6	Copper colored sand like material	Negative	Brick, Cement, Metal	-5.0	
A-7	No		Slag	-4.75	
A-8	No		Flyash	-4.5	Odor from mottled clay, 3-5 ppm OVA
A-9	Fill from drum ring	Negative	Cardboard, Metal, Flyash, Cement, Slag	-5.0	
A-10	No		Flyash	-5.0	
B-1	No		Brick, Wood, Flyash	-4.5	
B-2	No		Flyash	-5.0	
B-3	No		Slag, Flyash	-4.5	
B-4	No		Metal, Ceramic	-3.5	
B-5	No		Flyash, Slag	-4.0	
B-6	No		No	-3.0	
B-7	No		Flyash, Slag	-3.5	
C-1	No		Flyash	-2.5	
C-2	No		Flyash	-2.0	
C-3	No		Flyash	-3.5	
C-4	Salt-like substance	Negative	Flyash	-3.5	
C-5	No		Flyash	-3.0 to -4.0	
C-6	No		Flyash	-4.0 to -4.5	

TABLE 5-1
SUMMARY OF OBSERVATIONS IN TEST PITS
FMC - TONAWANDA, NEW YORK PSA

Area-Pit #	Waste Found	Oxidizer Test Result	Fill Found/Type	Depth to Native Clay (ft)	Comments
C-7	No		Flyash	-4.0 to -4.5	Shelby tube sample - Site-1
C-8	No		Flyash	-3.0 to -3.5	
C-9	No		Flyash	-2.0	
D-1	No		Brick, Wood, Flyash	-4.5	Green black clay gave 20-250 ppm (OVA) on fresh surface
D-2	Material from drum ring	Negative	Wood, Brick, Metal, Cardboard, Drum Ring, Flyash	-5.5	
D-3	Flyash and brick	Negative	Wood, Brick, Metal, Flyash	-6.0	
D-4	Oil\tar, grease(?), salt-like substance	Negative	Brick, Wood, Metal, Rubbish, Etc.	-7.0	Wet, sampled waste and soil
D-5	Salt-like substance	Negative	Brick, Wood, Plastic	-6.0	
D-6	No		Brick, Flyash	-4.5	200-400 ppm (OVA) off flyash
D-7	No		Flyash	-5.0	1-8 ppm (OVA) flyash
D-8	Salt-like substance	Negative	Flyash	-5.0	100-300 ppm (OVA) off flyash
D-9	Very little salt-like substance		Flyash, Brick	-4.5	
D-10	Very little metallic "sand"		Flyash, Brick	-4.5	
E-1	No		Cement, Wire	-4.0	
E-2	No		Brick, Cement	-4.0	
E-3	No		No	-5.5	
E-4	No		No	-2.5	
E-5	No		Clay Tile, Asphalt, Brick, Cement	-7.5	Sewer-like odor (wet)
E-6	No		Brick, Cement	-7.0	

TABLE 5-1
SUMMARY OF OBSERVATIONS IN TEST PITS
FMC - TONAWANDA, NEW YORK PSA

Area-Pit #	Waste Found	Oxidizer Test Result	Fill Found/Type	Depth to Native Clay (ft)	Comments
E-7	No		Cement	-2.0	
E-8	No		Clay Tile, Brick, Metal, Cement, Flyash	-6.0	
F-1	No		No	-1.5 to -2.0	
F-2	No		No	-1.5	
F-3	No		Brick at Surface	-1.5	
F-4	No		Concrete at Surface	-1.0	Old sewer pipe intersect
F-5	No		Concrete at Surface	-1.5	
F-6	No		No	-1.0	
F-7	No		Ceramic, Brick at Surface	-1.0	
F-8	No		Ceramic, Shotrock at Surface	-1.0	Site-2 Shelby Tube Sample
F-9	No		Shotrock	-3.5	
G-1	No		Slag	-3.0	
G-2	No		No	-2.0	
G-3	No		Flyash, Brick, Ceramic at Surface	-1.5	
G-4	No		Slag	-3.0	
H-1	No		Slag, Flyash	-3.0	Wet
H-2	No		Slag, Flyash	-3.0 to -3.5	
H-3	No		Wood, Metal, Slag	-3.5	
H-4	No		Flyash	-3.5 to -4.0	
H-5	No		No	-4.5	
H-6	No		Ceramic at Surface	-5.0	
H-7	No		Ceramic at Surface, Slag	-2.5	

TABLE 5-1
SUMMARY OF OBSERVATIONS IN TEST PITS
FMC - TONAWANDA, NEW YORK PSA

Area-Pit #	Waste Found	Oxidizer Test Result	Fill Found/Type	Depth to Native Clay (ft)	Comments
H-8	No		Flyash	-2.5	
H-9	No		Brick	-2.5	
I-1	No		Brick at Surface	-2.5	
I-2	No		No	-2.5	
I-3	No		Brick, Concrete at Surface	-2.0	
I-4	No		Metal, Brick, Asphalt at Surface	-4.0	
I-5	No		No	-3.5	
I-6	No		Metal, Wood, Coal, Concrete, Slag near Surface	-4.0	
I-7	Sand like material	Negative	Cement with Sand- like Material	-3.0	
I-8	No		Cement, Metal	-3.0	
I-9	No		No	-2.0	

TABLE 5-2
SUMMARY OF ANALYTICAL RESULTS
WASTE SAMPLES - TCLP
FMC - TONAWANDA, NY PSA
SEPTEMBER 1994

Location:	D-4W		Dup. D-4W		A-5W		
Sample Date:	9/20/94		9/20/94		9/2094		
Units:	mg/l		mg/l		mg/l		
Compound TCLP-VOCs	**Lab Result**	**WCC Qualifier**	**Lab Result**	**WCC Qualifier**	**Lab Result**	**WCC Qualifier**	**Regulatory Limit mg/l**
benzene	ND 0.05		ND 0.05		ND 0.05		0.5
carbon tetrachloride	ND 0.05		ND 0.05		ND 0.05		0.5
chlorobenzene	ND 10		ND 10		ND 10		100
chloroform	ND 0.6		ND 0.6		ND 0.6		6.0
1,2-dichloroethane	ND 0.05		ND 0.05		ND 0.05		0.5
1,1-dichloroethene	ND 0.07		ND 0.07		ND 0.07		0.7
methyl ethyl ketone	ND 20		ND 20		ND 20		200
tetrachloroethene	ND 0.07		ND 0.07		ND 0.07		0.7
trichloroethene	ND 0.05		ND 0.05		ND 0.05		0.5
vinyl chloride	ND 0.02		ND 0.02		ND 0.02		0.2
1,1,1-trichloroethane	ND[1] –		ND[1] –		ND[1] –		–
Compound TCLP-Metals							
arsenic	92.5		155		52.0U		5,000
barium	26,900		16,800		989		100,000
cadmium	2.0U		2.0U		12.5	J	1,000
chromium	19.6		20.8		5.0U		5,000
lead	26.0U		26.0U		3,180		5,000
mercury	0.20U		0.20U		0.20U		200
selenium	90.0U		90.0U		90.0U		1,000
silver	5.0U		5.0U		5.0U		5,000

Notes:

Lab Results

U The compound was analyzed for, but was not detected above the level of the associated value.
ND[1] Compound was searched for but was not detected. A quantitation limit was not calculated since 1,1,1-trichloroethane does not have a TCLP regulatory limit.

WCC Qualifiers

J Indicates an estimated concentration due to outlying QC data.

By: KJS Chk: AJM
December 22, 1994

TABLE 5-3
SUMMARY OF ANALYTICAL RESULTS
WASTE SAMPLES - PCBs
FMC - TONAWANDA, NY PSA
SEPTEMBER 1994

Location:	D-4W		Dup. D-4W		A-5W		EB-1	
Sample Date:	9/20/94		9/20/94		9/2094		9/20/94	
Units:	mg/kg		mg/kg		mg/kg		µg/l	
Compounds PCBs	Lab Result	WCC Qualifier	Lab Result	WCC Qualifier	Lab Result	WCC Qualifier	Lab Result	WCC Qualifier
Aroclor-1016	0.12U		0.110U		22U		1.0U	
Aroclor-1221	0.240U		0.230U		45U		2.0U	
Aroclor-1232	0.120U		0.110U		22U		1.0U	
Aroclor-1242	0.120U		0.110U		22U		1.0U	
Aroclor-1248	0.120U		0.110U		22U		1.0U	
Aroclor-1254	13DP	J	7.3DP	J	22U		1.0U	
Aroclor-1260	14D		6.8D		16,000		1.0U	

Notes:

Lab Results:

D Result reported from secondary dilution analysis.
P Percent difference (%D) between duel column GC results exceeds 25 percent.
U The compound was analyzed for, but was not detected above the level of the associated value.

WCC Qualifiers:

J Indicates an estimated concentration due to outlying QC data.

By: KJS Chk: AJM
December 22, 1994

TABLE 5-4
SUMMARY OF ANALYTICAL RESULTS
WASTE SAMPLES - SEMI-VOLATILE ORGANICS
FMC - TONAWANDA, NY PSA
SEPTEMBER 1994

Location:	D-4W	
Sample Date:	9/20/94	
Units:	µg/kg	
Compounds TCL-BNAs	Lab Result	WCC Qualifier
phenol	1,200U	R
bis(2-chloroethyl)ether	1,200U	
2-chlorophenol	1,200U	R
1,3-dichlorobenzene	1,200U	
1,4-dichlorobenzene	1,200U	
1,2-dichlorobenzene	1,200U	
2-methylphenol	1,200U	R
2,2'-oxybis(1-chloropropane)	1,200U	
4-methylphenol	890J	J
n-nitroso-di-n-propylamine	1,200U	
hexachloroethane	1,200U	
nitrobenzene	1,200U	
isophorone	1,200U	
2-nitrophenol	1,200U	
2,4-dimethylphenol	1,200U	R
2,4-dichlorophenol	1,200U	R
1,2,4-trichlorobenzene	1,000J	J
naphthalene	1,200	
4-chloroaniline	1,200U	
hexachlorobutadiene	1,200U	UJ
bis(2-chloroethoxy)methane	1,200U	
4-chloro-3-methylphenol	1,200U	R
2-methylnaphthalene	1,800	
hexachlorocyclopentadiene	1,200U	
2,4,6-trichlorophenol	1,200U	R
2,4,5-trichlorophenol	2,800U	R
2-chloronaphthalene	1,200U	
2-nitroaniline	2,800U	
dimethylphthalate	1,200U	

TABLE 5-4 (Cont.)
SUMMARY OF ANALYTICAL RESULTS
WASTE SAMPLES - SEMI-VOLATILE ORGANICS
FMC - TONAWANDA, NY PSA
SEPTEMBER 1994

Location:		D-4W	
Sample Date:		9/20/94	
Units:		µg/kg	
Compounds TCL-BNAs	Lab Result		WCC Qualifier
acenaphthylene	1,200U		
2,6-dinitrotoluene	1,200U		
3-nitroaniline	2,800U		
acenaphthene	440J		
2,4-dinitrophenol	2,800U		R
4-nitrophenol	2,800U		R
dibenzofuran	380J		
2,4-dinitrotoluene	1,200U		
diethylphthalate	1,200U		
4-chlorophenyl-phenylether	1,200U		
fluorene	540J		
4-nitroaniline	2,800U		
4,6-dinitro-2-methylphenol	2,800U		R
n-nitrosodiphenylamine	1,200U		
4-bromophenyl-phenylether	1,200U		
hexachlorobenzene	1,200U		
pentachlorophenol	2,800U		R
phenanthrene	4,700		
anthracene	1,200U		
carbazole	1,200U		
di-n-butylphthalate	1,200U		
fluoranthene	1,700		J
pyrene	1,900		
butylbenzyphthalate	660J		
3,3'-dichlorobenzidine	1,200U		UJ
benzo(a)anthracene	1,100J		
chrysene	1,300		
bis(2-ethylhexyl)phthalate	3,800B		
di-n-octylphthalate	1,200U		UJ

TABLE 5-4 (Cont.)
SUMMARY OF ANALYTICAL RESULTS
WASTE SAMPLES - SEMI-VOLATILE ORGANICS
FMC - TONAWANDA, NY PSA
SEPTEMBER 1994

Location:	D-4W	
Sample Date:	9/20/94	
Units:	µg/kg	
Compounds	**Lab**	**WCC**
TCL-BNAs	**Result**	**Qualifier**
benzo(b)fluoranthene	700J	J
benzo(k)fluoranthene	680J	
benzo(a)pyrene	310J	J
indeno(1,2,3-cd)pyrene	220J	J
dibenz(a,h)anthracene	140J	
benzo(g,h,i)perylene	150J	
Tentatively Identified Compounds (TICS)		
unknown	9,700JAB	R
unknown	448,200J	
unknown hydrocarbons	15,100J	
unknown aromatics	4,700J	

Notes:

Lab Results

A Compound is a suspected aldol condensation product that most likely was contributed from laboratory contamination.
B Compound was found in associated laboratory method blank sample.
J For target compounds, indicates a result below the contract required quantitation limit (CRQL), but greater than zero; value is considered an estimate. For TICs, indicates an estimated concentration since result was not quantitated using an authentic standard.
U The compound was analyzed for, but was not detected above the level of the associated value.

WCC Qualifiers

J Indicates an estimated concentration due to outlying QC data.
R Indicates an unusable result due to outlying QC data or due to suspected laboratory contamination (TICs only).
U Indicates the result is qualified as non-detected at the value detected in the sample (when value is greater than CRQL) or, at the numerical value preceding the "U" qualifier (when value is less than CRQL).
UJ Indicates a result that has been qualified as non-detected (see "U" above) and the quantitation limit estimated due to outlying QC data, or indicates an estimated quantitation limit for non-detects due to outlying QC data.

TABLE 5-5
SUMMARY OF ANALYTICAL RESULTS
SOIL SAMPLES - VOLATILE ORGANICS
FMC - TONAWANDA, NY PSA
SEPTEMBER 1994

Location:	D-4S		Dup. D-4S		A-5S		EB-1	
Sample Date:	9/20/94		9/20/94		9/2094		9/20/94	
Units:	µg/kg		µg/kg		µg/kg		µg/l	
Compounds TCL-VOCs	Lab Result	WCC Qualifier	Lab Result	WCC Qualifier	Lab Result	WCC Qualifier	Lab Result	WCC Qualifier
chloromethane	12U		12U		12U		10U	
bromomethane	12U		12U		12U		10U	
vinyl chloride	12U		12U		12U		10U	
chloroethane	12U		12U		12U		10U	
methylene chloride	13B		6JB	12U	6JB	12U	9JB	10U
acetone	160B	J	150B	J	60B	UJ	10U	UJ
carbon disulfide	12U		2J		12U		10U	
1,1-dichloroethene	12U		12U		12U		10U	
1,1-dichloroethane	12U		6J		2J		10U	
1,2-dichloroethene (total)	12U		12U		12U		10U	
chloroform	12U		12U		12U		10U	
1,2-dichloroethane	12U		12U		14		10U	
2-butanone	30B	UJ	32B	UJ	10JB	12UJ	10U	
1,1,1-trichloroethane	12U		12U		12U		10U	
carbon tetrachloride	12U		12U		12U		10U	
bromodichloromethane	12U		12U		12U		10U	
1,2-dichloropropane	12U		12U		12U		10U	
cis-1,3-dichloropropene	12U		12U		12U		10U	
trichloroethene	12U		12U		2J	12UJ	12	
dibromochloromethane	12U		12U		12U		10U	
1,1,2-trichloroethane	12U		12U		12U		10U	
benzene	12U		12U		1J	J	10U	
trans-1,3-dichloropropene	12U		12U		12U		10U	
bromoform	12U		12U		12U		10U	
4-methyl-2-pentanone	12U		12U		12U		10U	
2-hexanone	12U		12U		12U		10U	
tetrachloroethene	12U		12U		63		10U	

by: KJS Chk by: AJM
January 18, 1995

TABLE 5-5 (Cont.)
SUMMARY OF ANALYTICAL RESULTS
SOIL SAMPLES - VOLATILE ORGANICS
FMC - TONAWANDA, NY PSA
SEPTEMBER 1994

Location:	D-4S		Dup. D-4S		A-5S		EB-1	
Sample Date:	9/20/94		9/20/94		9/2094		9/20/94	
Units:	µg/kg		µg/kg		µg/kg		µg/l	
Compounds TCL-VOCs	**Lab Result**	**WCC Qualifier**	**Lab Result**	**WCC Qualifier**	**Lab Result**	**WCC Qualifier**	**Lab Result**	**WCC Qualifier**
1,1,2,2-tetrachloroethane	12U		12U		12U		10U	
toluene	2J	J	2J	J	12U		10U	
chlorobenzene	12U		12U		2J	J	10U	
ethylbenzene	2J		2J		3J		10U	
styrene	12U		12J		12U		10U	
xylene (total)	2J		3J		96		10U	
Tentatively Identified Compounds (TICS)								
unknown siloxane	24J	R	9J	R	--		--	
unknowns					33J		--	
unknown hydrocarbons					752J		--	

Notes:

Lab Results

B Compound was found in associated laboratory method blank sample.
J For target compounds, indicates a result below the contract required quantitation limit (CRQL), but greater than zero; value is considered an estimate. For TICs, indicates an estimated concentration since result was not quantitated using an authentic standard.
U The compound was analyzed for, but was not detected above the level of the associated value.

WCC Qualifiers

J Indicates an estimated concentration due to outlying QC data.
R Indicates an unusable result due to outlying QC data or due to suspected laboratory contamination (TICs) only.
U Indicates the result is qualified as non-detected at the value detected in the sample (when value is greater than CRQL) or, at the numerical value preceding the "U" qualifier (when value is less than CRQL).
UJ Indicates a result that has been qualified as non-detected (see "U" above) and the quantitation limit estimated due to outlying QC data, or indicates an estimated quantitation limit for non-detects due to outlying QC data.

TABLE 5-6
SUMMARY OF ANALYTICAL RESULTS
SOIL SAMPLES - SEMI-VOLATILE ORGANICS
FMC - TONAWANDA, NY PSA
SEPTEMBER 1994

Location:		D-4S
Sample Date:		9/20/94
Units:		µg/kg
Compounds TCL-BNAs	Lab Result	WCC Qualifier
phenol	780U	
bis(2-chloroethyl)ether	780U	
2-chlorophenol	780U	
1,3-dichlorobenzene	780U	
1,4-dichlorobenzene	780U	
1,2-dichlorobenzene	780U	
2-methylphenol	780U	
2,2'-oxybis(1-chloropropane)	780U	
4-methylphenol	780U	
n-nitroso-di-n-propylamine	780U	
hexachloroethane	780U	
nitrobenzene	780U	
isophorone	780U	
2-nitrophenol	780U	
2,4-dimethylphenol	780U	
2,4-dichlorophenol	780U	
1,2,4-trichlorobenzene	780U	
naphthalene	780U	
4-chloroaniline	780U	
hexachlorobutadiene	780U	
bis(2-chloroethoxy)methane	780U	
4-chloro-3-methylphenol	780U	
2-methylnaphthalene	780U	
hexachlorocyclopentadiene	780U	UJ
2,4,6-trichlorophenol	780U	
2,4,5-trichlorophenol	1900U	
2-chloronaphthalene	780U	
2-nitroaniline	1900U	

TABLE 5-6 (Cont.)
SUMMARY OF ANALYTICAL RESULTS
SOIL SAMPLES - SEMI-VOLATILE ORGANICS
FMC - TONAWANDA, NY PSA
SEPTEMBER 1994

Location:		D-4S
Sample Date:		9/20/94
Units:		µg/kg
Compounds TCL-BNAs	Lab Result	WCC Qualifier
dimethylphthalate	780U	
acenaphthylene	780U	
2,6-dinitrotoluene	780U	
3-nitroaniline	1900U	
acenaphthene	780U	
2,4-dinitrophenol	1900U	
4-nitrophenol	1900U	
dibenzofuran	780U	
2,4-dinitrotoluene	780U	
diethylphthalate	780U	
4-chlorophenyl-phenylether	780U	
fluorene	780U	
4-nitroaniline	1900U	
4,6-dinitro-2-methylphenol	1900U	
n-nitrosodiphenylamine	780U	
4-bromophenyl-phenylether	780U	
hexachlorobenzene	780U	
pentachlorophenol	1900U	
phenanthrene	780U	
anthracene	780U	
carbazole	780U	
di-n-butylphthalate	780U	
fluoranthene	780U	UJ
pyrene	780U	
butylbenzyphthalate	780U	
3,3'-dichlorobezidine	780U	UJ
benzo(a)anthracene	780U	
chrysene	780U	

TABLE 5-6 (Cont.)
SUMMARY OF ANALYTICAL RESULTS
SOIL SAMPLES - SEMI-VOLATILE ORGANICS
FMC - TONAWANDA, NY PSA
SEPTEMBER 1994

Location:	D-4S	
Sample Date:	9/20/94	
Units:	µg/kg	
Compounds TCL-BNAs	Lab Result	WCC Qualifier
bis(2-ethylhexyl)phthalate	780U	
di-n-octylphthalate	780U	UJ
benzo(b)fluoranthene	780U	UJ
benzo(k)fluoranthene	780U	
benzo(a)pyrene	780U	UJ
indeno(1,2,3-cd)pyrene	780U	UJ
dibenz(a,h)anthracene	780U	
benzo(g,h,i)perylene	780U	
Tentatively Identified Compounds (TICS)		
unknown	11,000JAB	R
unknowns	9,900J	
unknown aromatic	220J	

Notes:

Lab Results

A Compound is a suspected aldol condensation product that most likely was contributed from laboratory contamination.

B Compound was found in associated laboratory method blank sample.

J For target compounds, indicates a result below the contract required quantitation limit (CRQL), but greater than zero; value is considered an estimate. For TICs, indicates an estimated concentration since result was not quantitated using an authentic standard.

U The compound was analyzed for, but was not detected above the level of the associated value.

WCC Qualifiers

R Indicates an unusable result due to outlying QC data or due to suspected laboratory contamination (for TICs only).

UJ Indicates a result that has been qualified as non-detected (see "U" above) and the quantitation limit estimated due to outlying QC data, or indicates an estimated quantitation limit for non-detects due to outlying QC data.

TABLE 5-7
SUMMARY OF ANALYTICAL RESULTS
SOIL SAMPLES - METALS
FMC - TONAWANDA, NY PSA
SEPTEMBER 1994

Location:	D-4S		Dup. D-4S		A-5S		EB-1	
Sample Date:	9/20/94		9/20/94		9/2094		9/20/94	
Units:	mg/kg		mg/kg		mg/kg		µg/l	
RCRA Metals	Lab Result	WCC Qualifier	Lab Result	WCC Qualifier	Lab Result	WCC Qualifier	Lab Result	WCC Qualifier
arsenic	3.4B	J	2.9B		3.6B		5.0U	
barium	469	J	190	J	116		11.0U	
cadmium	0.47U		0.47U		0.58B	J	2.0U	
chromium	20.7		20.0		22.1		5.0U	
lead	9.7	J	11.0	J	13.0	J	3.0U	
mercury	0.12U	UJ	0.12U	UJ	0.12U	UJ	0.20U	UJ
selenium	1.1U	UJ	1.0U	UJ	1.1U	UJ	5.0U	
silver	1.2U	UJ	1.2U	UJ	1.2U	UJ	6.5B	

Notes:

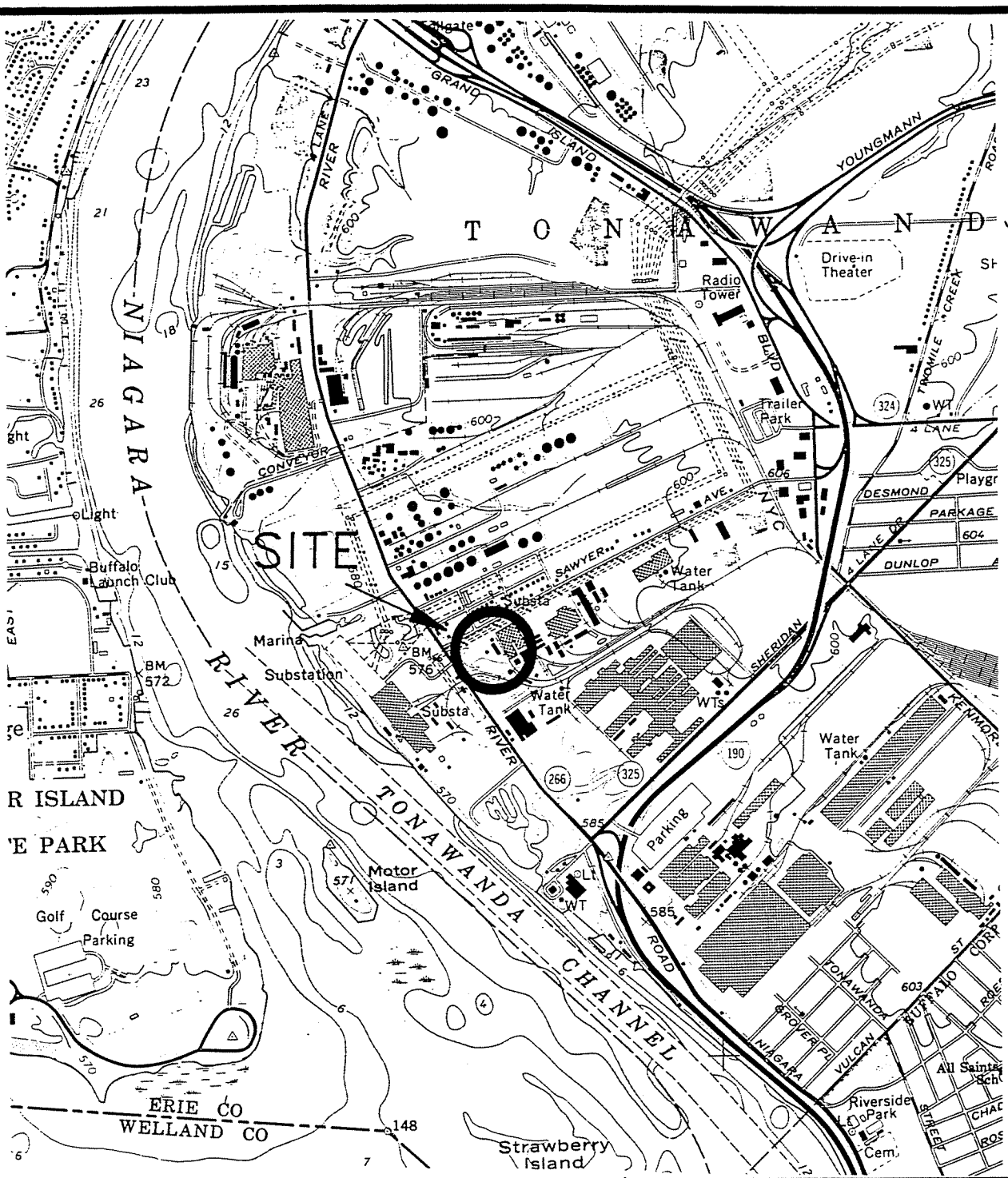
Lab Results

B Indicates a detection below the contract required detection limit (CRQL) but greater than zero.
U The compound was analyzed for, but was not detected above the level of the associated value.

WCC Qualifiers

U Indicates the result is qualified as non-detected at the value detected in the sample (when value is greater than CRQL) or, at the numerical value preceding the "U" qualifier (when value is less than CRQL).
J Indicates an estimated concentration due to outlying QC data.
UJ Indicates a result that has been qualified as non-detected (see "U" above) and the quantitation limit estimated due to outlying QC data, or indicates an estimated quantitation limit for non-detects due to outlying QC data.

Figures



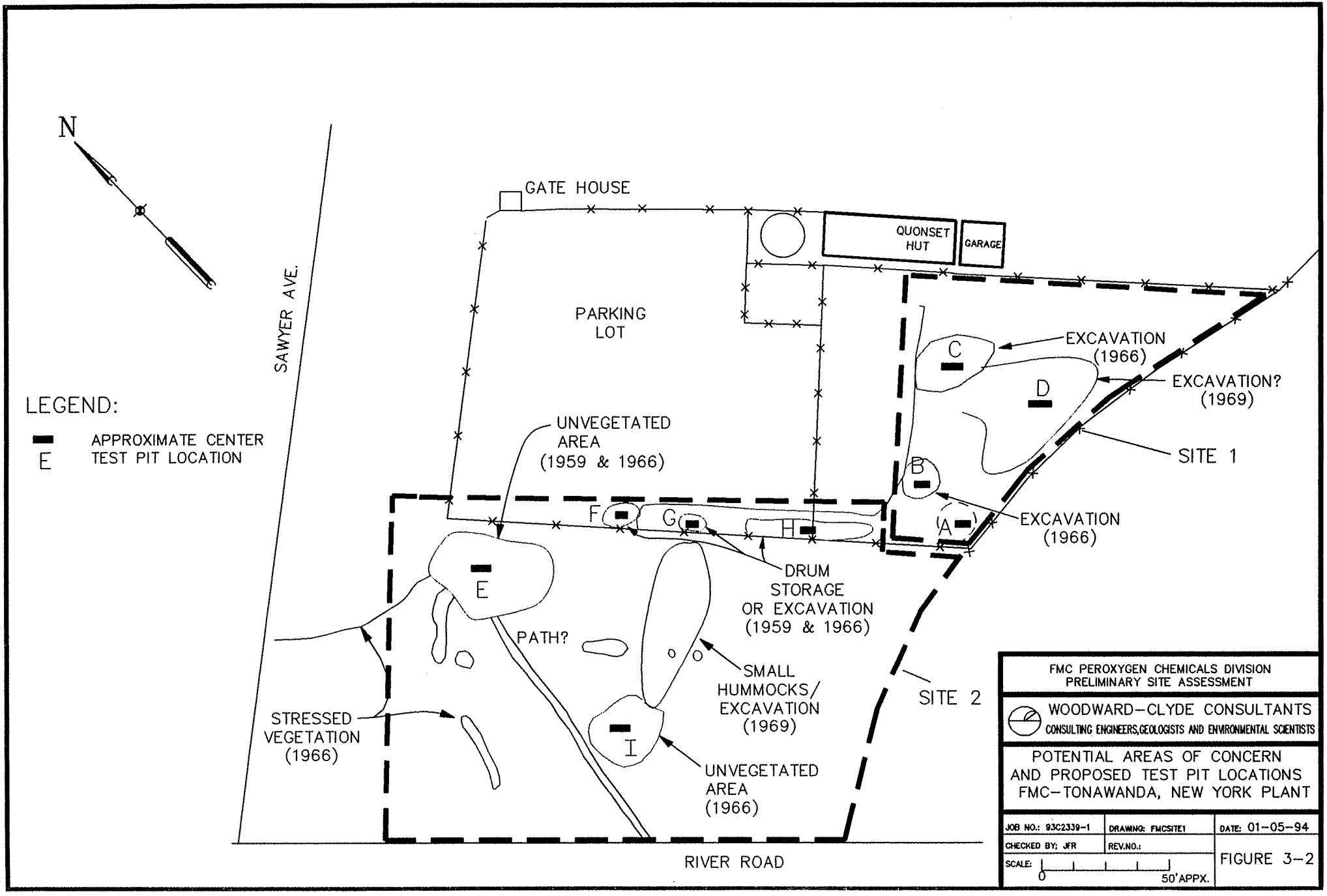
From U.S.G.S. Buffalo NW, N.Y.–Ont. Quadrangle
NW/4 Buffalo 15'
N4252.5–W7852.5/7.5

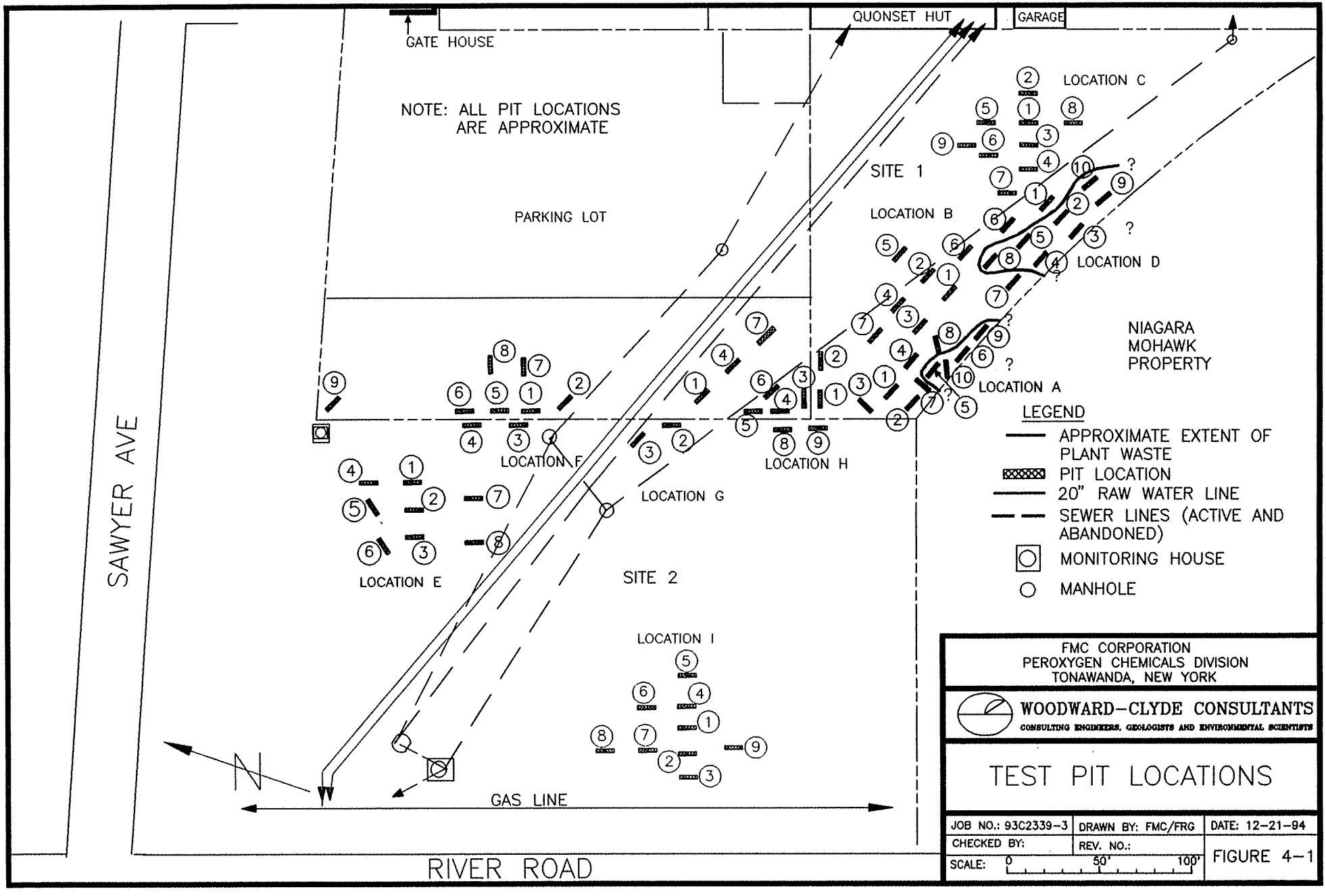
FMC Peroxygen Chemicals Division
Preliminary Site Assessment

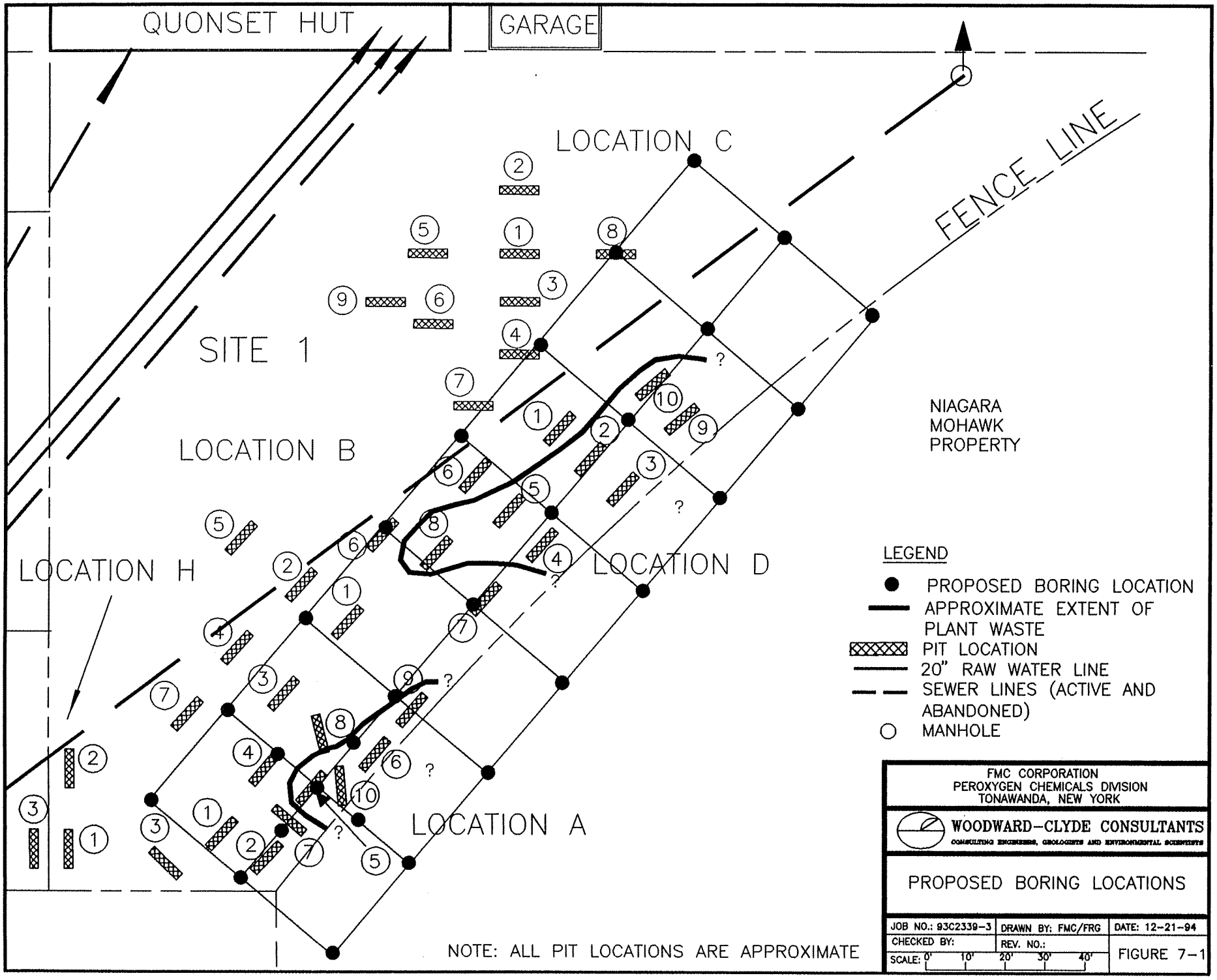
WOODWARD–CLYDE CONSULTANTS
Consulting Engineers, Geologists and Environmental Scientists

SITE LOCATION MAP

Job No.:93C2339–1	Drawing No.	Date:
Checked by: JFR	Rev. No.:	
Scale: 1"=2000'		Figure 3–1


N
LEGEND:
APPROXIMATE CENTER
TEST PIT LOCATION
E
SAWYER AVE.
GATE HOUSE
QUONSET HUT
GARAGE
PARKING LOT
EXCAVATION (1966)
EXCAVATION? (1969)
SITE 1
UNVEGETATED AREA (1959 & 1966)
EXCAVATION (1966)
DRUM STORAGE OR EXCAVATION (1959 & 1966)
PATH?
SMALL HUMMOCKS/ EXCAVATION (1969)
SITE 2
STRESSED VEGETATION (1966)
UNVEGETATED AREA (1966)
RIVER ROAD
A
B
C
D
E
F
G
H
I
FMC PEROXYGEN CHEMICALS DIVISION
PRELIMINARY SITE ASSESSMENT
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
POTENTIAL AREAS OF CONCERN AND PROPOSED TEST PIT LOCATIONS
FMC-TONAWANDA, NEW YORK PLANT
JOB NO.: 93C2339-1
DRAWING: FMCSITE1
DATE: 01-05-94
CHECKED BY: JFR
REV.NO.:
SCALE:
0
50' APPX.
FIGURE 3-2


GATE HOUSE
QUONSET HUT
GARAGE
NOTE: ALL PIT LOCATIONS ARE APPROXIMATE
SITE 1
PARKING LOT
LOCATION B
LOCATION C
LOCATION D
LOCATION A
NIAGARA MOHAWK PROPERTY
LOCATION E
LOCATION F
LOCATION G
LOCATION H
LOCATION I
SITE 2
SAWYER AVE
GAS LINE
RIVER ROAD
N
LEGEND
APPROXIMATE EXTENT OF PLANT WASTE
PIT LOCATION
20" RAW WATER LINE
SEWER LINES (ACTIVE AND ABANDONED)
MONITORING HOUSE
MANHOLE
FMC CORPORATION
PEROXYGEN CHEMICALS DIVISION
TONAWANDA, NEW YORK
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
TEST PIT LOCATIONS
JOB NO.: 93C2339-3
DRAWN BY: FMC/FRG
DATE: 12-21-94
CHECKED BY:
REV. NO.:
SCALE: 0 50' 100'
FIGURE 4-1


QUONSET HUT
GARAGE
LOCATION C
FENCE LINE
SITE 1
LOCATION B
NIAGARA
MOHAWK
PROPERTY
LOCATION H
LOCATION D
LOCATION A
LEGEND
PROPOSED BORING LOCATION
APPROXIMATE EXTENT OF PLANT WASTE
PIT LOCATION
20" RAW WATER LINE
SEWER LINES (ACTIVE AND ABANDONED)
MANHOLE
NOTE: ALL PIT LOCATIONS ARE APPROXIMATE
FMC CORPORATION
PEROXYGEN CHEMICALS DIVISION
TONAWANDA, NEW YORK
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
PROPOSED BORING LOCATIONS
JOB NO.: 93C2339-3
DRAWN BY: FMC/FRG
DATE: 12-21-94
CHECKED BY:
REV. NO.:
SCALE: 0' 10' 20' 30' 40'
FIGURE 7-1

Woodward-Clyde Consultants, Inc.
Engineering & sciences applied to the earth & its environment

September 22, 1995
93C2339-6

Mr. John Hyden
Environmental Engineer II
NYSDEC
270 Michigan Avenue
Buffalo, New York 14203-2999

Subject: Interim Remedial Measures - Project Operations Plan
Preliminary Site Assessment (PSA)
FMC Corporation, Tonawanda, New York
DEC Site 915025

Dear Mr. Hyden:

On Thursday, August 24, 1995, representatives of FMC (Richard Wise, Patricia Nevrincean) and Woodward-Clyde Consultants (Anthony Misercola, Frank Garbe) met with you at FMC's Tonawanda facility. At this meeting, we discussed and agreed to interim remedial measures to be conducted at locations A and D on Site-1 at the FMC Tonawanda Plant. Site-1 and locations A and D were previously identified in WCC's PSA report dated January 1995. The remedial measures agreed upon include excavation of surface and subsurface soils at locations A and D having PCB concentrations above 1 ppm and 10 ppm in surface and subsurface soils, respectively.

Based upon further discussions and your letter dated August 28, we understand that NYSDEC has requested that a brief Project Operations Plan be submitted to document the remedial measures to be implemented for PCB contaminated soil at locations A and D on Site-1 at the FMC Tonawanda Plant. This letter will therefore serve as the Project Operations Plan for the interim remedial measures to be conducted by FMC. This plan addresses:

- areas to be excavated
- post-excavation confirmatory testing
- staging and disposal of excavated soil
- backfill material

Previous Data Acquisition

As part of the PSA investigation conducted in September 1994, test pits were excavated at suspected waste disposal areas. Waste samples were collected from locations A and D on Site-1, the only locations where evidence of disposal of plant waste was encountered. PCBs

Amherst Office
15 Hazelwood Drive, Suite 110 • Amherst, New York 14228-2229
716-691-1777 • Fax 716-691-4560

were detected in both waste samples. Aroclors-1254 and 1260 were reported in replicate samples from test pit D-4, at total PCB concentrations of 27 and 14 ppm. Aroclor-1260 was reported in the waste sample from test pit A-5 at a concentrations of 16,000 ppm.

In July, 1995, following approval from NYSDEC, an additional investigation was performed to characterize the vertical and horizontal extent of PCBs at locations A and D on Site-1. During this investigation, borings were advanced in a grid pattern covering the area surrounding waste disposal locations A and D. At each subsurface location where PCB concentrations exceeded 10 ppm, a corresponding surficial soil sample was analyzed to identify the extent of surficial soil PCB concentrations above 1 ppm.

Figure 1 presents subsurface PCB concentrations for the grid established around waste disposal locations A and D during the additional investigation. Figure 2 presents the subsurface and surface soil PCB concentrations on the grid at location A and the expected area of excavation at location A based on a 10 ppm subsurface and 1 ppm surface soil cleanup criteria ("action levels"). Surface soil samples were not analyzed in the vicinity of location D since subsurface samples from the additional investigation did not yield PCB concentrations at or above the 10 ppm "action level". The area of expected excavation at location D, based on PCB concentrations in excess of 10 ppm from replicate waste samples at test pit D-4 (during the initial 1994 investigation), is not shown on Figure 2. Figures 1 and 2 were provided to you at the August 24th meeting.

Remedial Measures

- Areas To Be Remediated

  Based upon analytical results obtained from the initial PSA Investigation and Additional Investigation, it appears that two small areas on Site-1 in the vicinity of test pits A-5 and D-4 contain PCB concentrations above NYSDEC's subsurface action level of 10 ppm. No significant surficial contamination is present in surficial materials beyond the area of subsurface contamination near test pit A-5. Surficial soils adjacent to test pit D-4 were not investigated in accordance with the approved Additional Investigation since subsurface grid samples in the vicinity of this area were non-detected for PCBs or yielded PCB concentrations below 10 ppm.

  Analytical results from the investigations have also shown that PCBs have not penetrated significantly into the underlying clay layer. As such, in areas where subsurface PCB concentrations or surface soil PCB concentrations exceeded action levels, soils will be excavated to the top of the native clay, which varies along Site-1 from 2 to 8 feet below

ground surface. Excavations in test pit A-5 area will be initially limited to the immediate vicinity of samples exceeding the 10 -ppm criterion (Y6, A5SE, A5E, test pit A-5 and A5S). The initial excavation in the D-4 area will comprise the D-4 test pit.

- Post Excavation Testing

  In each of areas A and D, soils will be excavated until the margins of the excavation meet the applicable action level, based upon post-excavation sampling, or samples from previous boring locations. Approximate limits of excavation will be determined in the field based upon the results of field tests for PCBs using the immunoassay method. Excavation will proceed outward in approximate 5 foot increments from locations exceeding the action levels until the field test indicate that action levels have been met, or until the excavation reaches a location known to meet the action level based upon previous testing (see Figures 1 and 2). Confirmatory samples from the final excavations will be submitted for PCB analyses to an off-site commercial laboratory. Confirmatory composite samples will be collected from each of the four sidewalls of the excavation (surface and subsurface soils) and from the base of each excavation. Three subsamples will be included in each composite sample. These samples will be analyzed for PCBs in accordance with SW-846 Test Method 8080. Pending receipt of confirmatory analyses and backfilling, the excavations will be provided with a temporary cover consisting of polyethylene sheeting. Barrier tape will be placed around the excavations until backfill is completed.

- Staging and Disposal of Excavated Materials

  Excavated soils will be placed into 20 cubic yard rolloffs, covered with plastic tarps, and staged on-site pending off-site disposal. Waste profiles have been prepared by FMC, and this soil has been accepted for disposal at Chemical Waste Management's Model City, New York facility. Manifest records will be maintained for all material removed for off-site disposal.

- Backfill

  Following receipt of the confirmatory sample results and assuming that PCB results are less than NYSDEC action levels (10 ppm subsurface, 1 ppm surface), the excavations will be backfilled with soil excavated by FMC from the vicinity of ditches surrounding the Tonawanda Plant. This soil was excavated because low pH runoff from the plant warehouse fire on August 18, 1995 entered these ditches. Low pH surface soil from this excavation was containerized for off-site disposal. Excavated soil with pH ranging from

7.93 to 9.7 was retained on-site for use in backfilling the excavations at locations A and D. In a September 1, 1995 letter from R. Wise of FMC to M. Hans of NYSDEC, FMC provided additional information concerning this soil, and requested permission to use it as backfill in the on-site excavations. The acceptability of this soil as backfill was confirmed in a letter from M. Hans to R. Wise dated September 15, 1995.

NYSDEC will be informed of the schedule of activities and will be given the opportunity to inspect excavations and field testing. The current schedule of activities calls for field work to be conducted during the weeks of September 25 or October 2, assuming your prompt approval of this work plan. We will inform you verbally of the final work schedule after receiving your approval and scheduling work with subcontractors.

Closure Rpt. or Final Engr. Rpt. on PCB soil removal project

FMC recognizes that final approval of the remediation is contingent upon NYSDEC's receipt of a report fully documenting activities performed, and validated results of confirmatory post-excavation sampling.

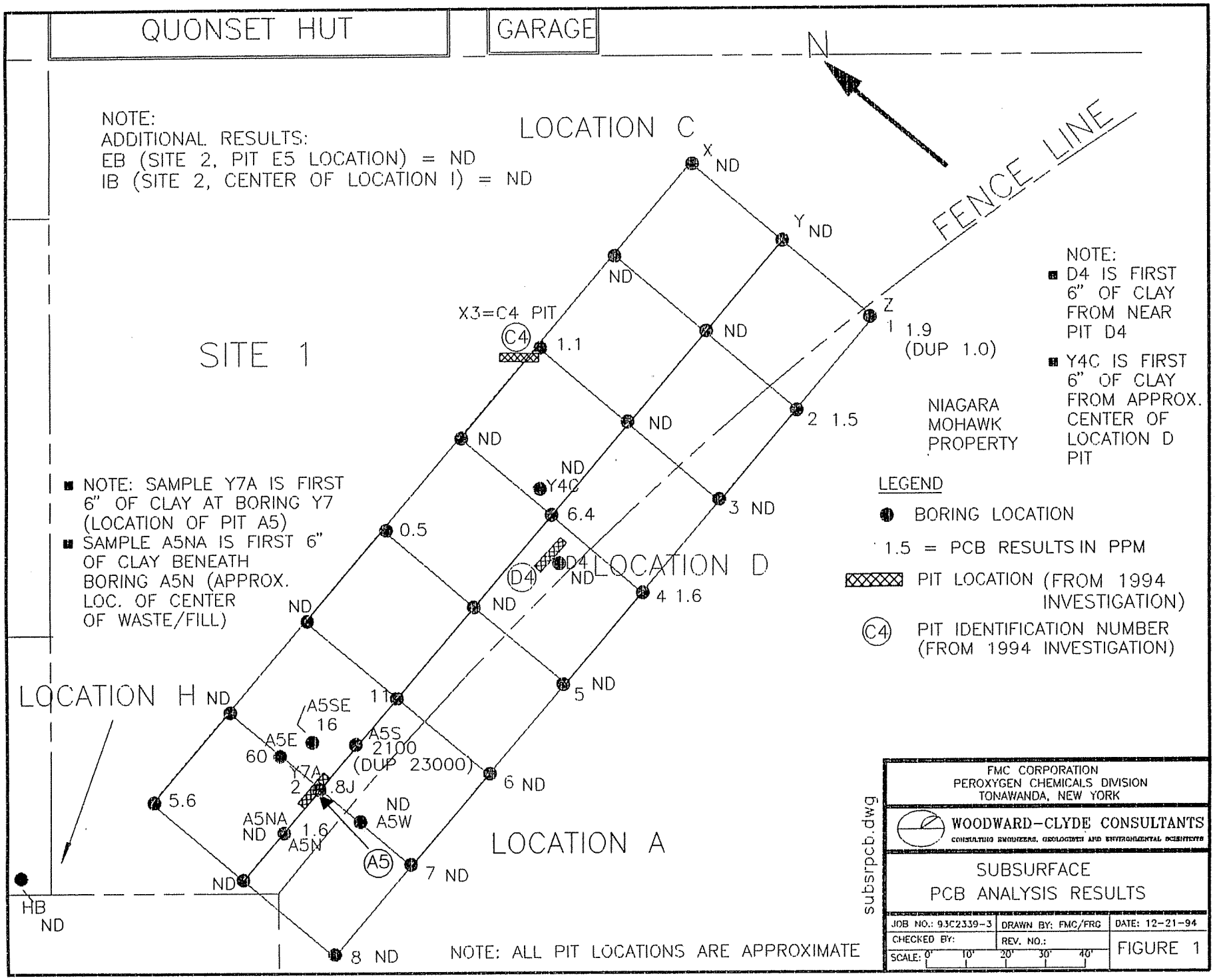
We appreciate your rapid response and look forward to your expeditious approval of this plan for interim remediation.

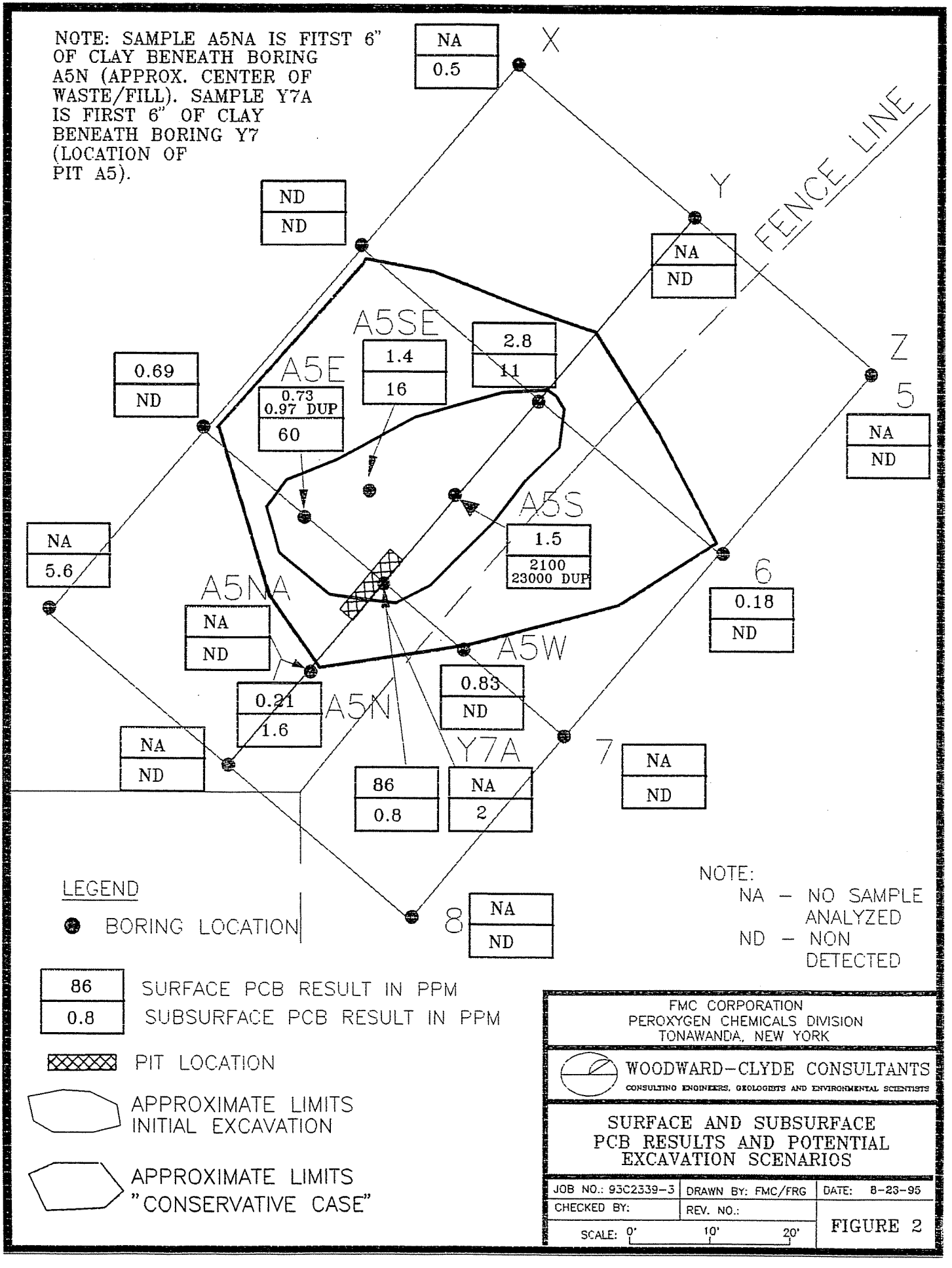
Sincerely,

Anthony J. Misercola
Assistant Project Scientist

James F. Roetzer

James F. Roetzer, Ph.D.
Vice President


QUONSET HUT
GARAGE
N
FENCE LINE
NOTE:
ADDITIONAL RESULTS:
EB (SITE 2, PIT E5 LOCATION) = ND
IB (SITE 2, CENTER OF LOCATION I) = ND
LOCATION C
X ND
Y ND
Z 1 1.9 (DUP 1.0)
2 1.5
3 ND
4 1.6
5 ND
6 ND
7 ND
8 ND
X3=C4 PIT
C4 1.1
SITE 1
ND
ND
ND
ND
ND
Y4C
6.4
0.5
D4
ND
LOCATION D
ND
ND
11
LOCATION H ND
A5SE 16
A5E 60
A5S 2100 (DUP 23000)
Y7A 2
.8J
5.6
A5NA ND
1.6 A5N
ND A5W
A5
HB ND
LOCATION A
NOTE:
D4 IS FIRST 6" OF CLAY FROM NEAR PIT D4
Y4C IS FIRST 6" OF CLAY FROM APPROX. CENTER OF LOCATION D PIT
NIAGARA MOHAWK PROPERTY
NOTE: SAMPLE Y7A IS FIRST 6" OF CLAY AT BORING Y7 (LOCATION OF PIT A5)
SAMPLE A5NA IS FIRST 6" OF CLAY BENEATH BORING A5N (APPROX. LOC. OF CENTER OF WASTE/FILL)
LEGEND
BORING LOCATION
1.5 = PCB RESULTS IN PPM
PIT LOCATION (FROM 1994 INVESTIGATION)
C4 PIT IDENTIFICATION NUMBER (FROM 1994 INVESTIGATION)
NOTE: ALL PIT LOCATIONS ARE APPROXIMATE
subsrpcb.dwg
FMC CORPORATION
PEROXYGEN CHEMICALS DIVISION
TONAWANDA, NEW YORK
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
SUBSURFACE
PCB ANALYSIS RESULTS
JOB NO.: 93C2339-3
DRAWN BY: FMC/FRG
DATE: 12-21-94
CHECKED BY:
REV. NO.:
SCALE: 0' 10' 20' 30' 40'
FIGURE 1


NOTE: SAMPLE A5NA IS FITST 6" OF CLAY BENEATH BORING A5N (APPROX. CENTER OF WASTE/FILL). SAMPLE Y7A IS FIRST 6" OF CLAY BENEATH BORING Y7 (LOCATION OF PIT A5).
X
Y
Z
5
6
7
8
FENCE LINE
A5SE
A5E
A5S
A5NA
A5W
A5N
Y7A
NA / 0.5
ND / ND
NA / ND
0.69 / ND
1.4 / 16
2.8 / 11
0.73 / 0.97 DUP / 60
NA / ND
NA / 5.6
1.5 / 2100 / 23000 DUP
0.18 / ND
NA / ND
0.21 / 1.6
0.83 / ND
NA / ND
86 / 0.8
NA / 2
NA / ND
NA / ND
LEGEND
BORING LOCATION
NOTE:
NA – NO SAMPLE ANALYZED
ND – NON DETECTED
86 / 0.8
SURFACE PCB RESULT IN PPM
SUBSURFACE PCB RESULT IN PPM
PIT LOCATION
APPROXIMATE LIMITS INITIAL EXCAVATION
APPROXIMATE LIMITS "CONSERVATIVE CASE"
FMC CORPORATION
PEROXYGEN CHEMICALS DIVISION
TONAWANDA, NEW YORK
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
SURFACE AND SUBSURFACE PCB RESULTS AND POTENTIAL EXCAVATION SCENARIOS
JOB NO.: 93C2339-3
DRAWN BY: FMC/FRG
DATE: 8-23-95
CHECKED BY:
REV. NO.:
SCALE: 0' 10' 20'
FIGURE 2

New York State Department of Environmental Conservation
270 Michigan Avenue, Buffalo, New York 14203-2999
(716) 851-7220

June 9, 1995

Mr. Richard K. Wise, Environmental Manager
FMC Corporation
Peroxygen Chemicals Division
P.O. Box 845
Buffalo, NY 14240

DEC 24

Dear Mr. Wise:

Preliminary Site Assessment
FMC Corporation
DEC Site No. 915025

The response to our February 28, 1995 comments to the above referenced Preliminary Site Assessment (PSA) Report, as given in your April 13 letter, are acceptable to us except for the response to Comment # 2, on the definition of surface water pathways. In addition to the verbiage describing the surface water run-off paths, we request that a plot of these routes be provided. This plot plan should include all drainage ditches and swales, in order to completely show all drainage routes from all areas. We prefer that the plot plan and applicable discussion be submitted to us either prior to, or along with the Data Analysis mentioned on Page 4 of your letter. Thank you for your attention to this request. If you have questions on this correspondence, please contact us.

Sincerely yours,

John W. Hyden, PhD, P.E.
Environmental Engineer II

cc: Ms. Jane Thapa

FMC Corporation

Peroxygen Chemicals Division
Box 845
Buffalo New York 14240
716 876 8300

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

FMC

April 13, 1995

Mr. John Hyden
Environmental Engineer II
New York State Department of
Environmental Conservation
270 Michigan Avenue
Buffalo, NY 14203-2999

Subject: Response to NYSDEC Comments -
Work Plan Addendum
Preliminary Site Assessment (PSA)
FMC Corporation, Tonawanda, New York
DEC Site 915025

Dear Mr. Hyden:

On Tuesday, March 21, 1995, representatives of FMC Corporation (Richard Wise, Patricia Nevrincean) and Woodward-Clyde Consultants (James Roetzer, Anthony Misercola) met with you at FMC's Tonawanda facility. At this meeting, we discussed the February 28, 1995 letter from the New York State Department of Environmental Conservation (NYSDEC), over your signature, providing comments relative to the PSA Report dated January 19, 1995 for the above-captioned program.

We understand, based on the comment letter and our meeting, that NYSDEC found the PSA Report to be satisfactory. Some additional information and testing was requested by NYSDEC to be performed as part of the investigation proposed by FMC at Section 7 in the PSA Report. The following summarizes our discussions and understanding of agreements at the March 21, 1995 meeting. Additionally, a schedule of activities to be performed for the supplemental PSA work is presented herein. Actual dates for the field activities will be provided to NYSDEC following selection of subcontractors (laboratory, drilling) and negotiation of an access agreement with Niagara Mohawk for off-site work.

For ease of review, the comments and our discussions/agreements have been restated and addressed separately. We understand that the agreements reached at the meeting are subject to your written confirmation after NYSDEC's review is completed.

NYSDEC COMMENT #1

To confirm that no PCBs have migrated from Disposal Areas A and D, we recommend that immunoassay tests for Aroclor 1254 and 1260 be performed in Areas C-4, E-5, H and I (see PSA Figure 4-1 and Table 5-1).

RESPONSE TO COMMENT #1

FMC agreed that subsurface (approximately 6 feet deep) samples from the four NYSDEC requested locations would be analyzed for PCBs. As discussed at the meeting, location C-4 was already included for additional investigation in the proposed work plan presented in the PSA report (see PSA Report Figure 7-1). Thus, three additional samples will be collected (from Areas E-5, H and I). We understand that immunoassay test kits for PCB analyses were suggested by NYSDEC based on potential cost savings. However, it was agreed at the meeting that all subsurface samples requiring analysis including the additionally requested NYSDEC locations, would be analyzed for PCBs by an off-site certified laboratory using EPA Method 8080 (medium level) which provides detection limits in the range of 1-2 ppm. This detection limit is well below NYSDEC's guidance value of 10 ppm PCBs for subsurface soils.

NYSDEC COMMENT #2

... surface water pathways from these areas should be defined.

RESPONSE TO COMMENT #2

A discussion of surface water pathways for Site-1 and Site-2 is presented in Section 3.1 of the PSA Report. In general, surface water run-off from Site-1 flows toward Site-2. Intermittent drainage ditches are present along the northern boundary of Site-2, adjacent to Sawyer Avenue, and the western boundary, adjacent to River Road. These ditches may receive surface water run-off from Site-2. Some surface water drainage may also occur at the southern boundary of Site-1, along the Niagara Mohawk rail spur. There are no surface water bodies on either Site-1 or Site-2.

As discussed at the meeting, subsequent to use for waste disposal in approximately 1976, the disposal areas were covered with clay. As such, it was agreed at the meeting, that based on the presence of a clay cap, migration of PCBs via surface water run-off is not an issue. (During excavation of test pits to conduct the PSA, portions of the clay cap were disturbed; to the extent practical, the excavated clay was replaced on top of the test pit excavation). At the meeting, you requested that selected samples of the clay cap (overlying areas of PCB contamination) be analyzed for PCBs at detection limits below 1 ppm, to confirm the absence of surficial contamination. FMC agreed to collect and analyze surface soil samples in areas containing elevated PCBs in the subsurface.

Surface soil samples, (0 to 1 foot below grade) representing undisturbed samples of the clay cap, will be obtained at or adjacent to each boring location. These samples will be retained for laboratory analyses, following completion of the subsurface analyses. Two surface soil samples will be analyzed from each area (e.g., Area A or D) where PCBs greater than 10 ppm are detected in the subsurface. These surface soil samples will be biased toward the highest detected PCB concentrations in the subsurface boring samples, i.e., surface soil samples will be analyzed at the locations of the two highest subsurface PCB concentrations. No surface soil samples will be analyzed in Areas where PCBs are not detected in subsurface samples, or where PCB subsurface concentrations are below 10 ppm. The surface soil samples will be analyzed using Method 8080, low-level, which is capable of achieving detection limits on the order of 0.1 to 0.2 ppm. Because surface samples for analysis will be selected after completion of subsurface samples, the prescribed method holding time will be exceeded; however, considering the stability of PCBs, results of analyses will be considered valid despite the holding time exceedance.

NYSDEC COMMENT #3

Provisions should be made for DEC and other government agency representatives to be given the opportunity to observe the field investigation activities described in PSA Report Sections 7.2.1 and 7.2.2. Also, these representatives should be given the opportunity to take split samples for analyses.

RESPONSE TO COMMENT #3

FMC will notify NYSDEC approximately two weeks in advance of expected sampling dates. NYSDEC representatives will be allowed to collect split samples, if desired and requested.

A schedule of activities to be performed for the supplemental PSA work is as follows:

ACTIVITY	SCHEDULE
Mobilization/Preparation Subcontracting	To be completed within 30 days of obtaining access from Niagara Mohawk for off-site work, and obtaining NYSDEC approval of this addendum letter.
Field Work * Soil Borings * Sample Collection	Expected to be completed within one week of mobilization, weather permitting.

ACTIVITY	SCHEDULE
Laboratory Analysis * Soils Samples	Expected to be completed within 8 weeks, to allow for two rounds of analysis, if necessary
Data Analysis/Report Preparation	Report of findings (per Paragraph III.D of the order on consent) to be submitted to NYSDEC as a supplement to the PSA Report within 60 days of receipt of the final laboratory results

As previously noted, actual dates for the activities above will be provided to NYSDEC subsequent to contractor selection and completion of arrangements for access to Niagara Mohawk property.

Based on the results of this further investigation, FMC will evaluate remedial options and provide a recommendation to the NYSDEC with the supplemental PSA report.

Please advise us at your earliest convenience if this letter is acceptable to NYSDEC. If so, this letter can serve as an addendum to the recommendations for additional investigation in the January 19, 1995 PSA Report. We look forward to hearing from you.

Very truly yours,

Richard K. Wise
Environmental Manager