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September 17, 2013

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United States Environmental Protection Agency, Region II
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Re: Draft RCRA Facility Investigation (RFI) Report Volume III
Former Research and Development Property (Operable Unit 9)
RCRA Section 3008(h) Administrative Order on Consent (AOC)
Docket No. II-RCRA-90-3008(h)-209
FMC Corporation, Middleport, NY Facility
EPA I.D. No. NYD002126845

Dear Ms. Dewes and Mr. Infurna:

FMC Corporation (FMC) is submitting the draft *RCRA Facility Investigation (RFI) Report Volume III – Former Research and Development Property (Operable Unit 9)* (RFI Report Volume III) to the New York State Department of Environmental Conservation (NYSDEC) and the United States Environmental Protection Agency (USEPA) (jointly, "the Agencies") in accordance with the Administrative Order on Consent (AOC) between the parties and the Agencies'-approved RFI Work Plan for Operable Unit OU-9 (*i.e.*, Former R&D Property) of FMC's Facility in Middleport, New York.

Please contact me by telephone at (215) 299-6554 or by email at Shawn.Tollin@fmc.com with any questions.

Sincerely,

Shawn J. Tollin
Manager, Environmental Remediation

cc: M. Hinton, NYSDEC, Buffalo
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Middleport, New York

RCRA Facility Investigation (RFI) Report Volume III –

Former Research and Development Property (Operable Unit 9)

DRAFT – September 2013

RCRA Facility Investigation (RFI) Report Volume III –

Former Research and Development Property (Operable Unit 9)

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Date:
DRAFT – September 2013

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Acronyms, Abbreviations, and Units of Measure

2,4-D	2,4-dichlorophenoxyacetic acid
2,4,5-T	2,4,5-trichlorophenoxyacetic acid
2,4,5-TP	2,4,5-trichlorophenoxypropionic acid
Agencies	NYSDEC and USEPA
AOC	Administrative Order on Consent
CMS	Corrective Measures Study
CRA	Conestoga-Rovers & Associates, Inc.
DoD	Department of Defense
FMC	FMC Corporation
ID	Identification
mg/kg	milligrams per kilogram
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OU	Operable Unit
PID	photoionization detector
QA/QC	quality assurance / quality control
R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SCOs	Soil Cleanup Objectives
SSLs	Soil Screening Levels
SWMU	Solid Waste Management Unit
UCL	upper confidence level
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

1. Introduction

FMC Corporation (FMC) owns and operates an agricultural products facility located in the Village of Middleport and the Town of Royalton, New York (herein the "Facility" or "Site"; see Figure 1). FMC has been implementing a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at the Facility and off-Site areas to delineate and evaluate the presence of Site-related constituents in soil and other environmental media at the Facility and off-Site areas as a result of historical releases at or from the Facility to the environment. RFI Report Volume III addresses the area designated as Operable Unit 9 (OU-9) of FMC's Middleport, New York RCRA Facility. The New York State Department of Environmental Conservation (NYSDEC) and the United States Environmental Protection Agency (USEPA) (together the "Agencies") identify OU-9 as comprising soil at the Former Research and Development Property (Former R&D Property; Figure 1). The Former R&D Property includes three parcels zoned for industrial use and formerly owned by FMC (sold by FMC in 1985). The *RCRA Facility Investigation (RFI) Work Plan – Former Research & Development Property (Operable Unit 9)* (RFI Work Plan), submitted to the Agencies in April 2013, proposed investigation activities to supplement existing data from prior investigation programs at the Former R&D Property dating back to 1973. The RFI Work Plan was approved by the Agencies by letter dated May 1, 2013, and investigation activities were completed in the summer 2013.

The Former R&D Property RFI is one of several related investigative, monitoring and/or remedial programs being implemented by FMC to satisfy the terms and conditions of the Administrative Order on Consent (AOC) (Docket No. II RCRA-90-3008(h)-0209) entered into by FMC and the Agencies, effective July 2, 1991. The investigation summary in RFI Report Volume III has been prepared in accordance with the AOC terms and conditions and RCRA requirements.

1.1 Overview

The Facility and off-site areas are being addressed in a phased approach in which geographic areas and/or environmental media have been organized into study areas, which have been designated as Operable Units (OUs) by the Agencies. In 2005, FMC and the Agencies agreed that a multi-volume RFI Report would be prepared to present and summarize RFI sampling data and results by study area. The RFI Report is organized into the following 11 volumes:

1. Volume I — Background and Related Information
2. Volume II — Suspected Air Deposition Study Area 1 (South of the Erie Canal and West of the Niagara/Orleans County Line) and Culvert 105 Study Area South of the Erie Canal (soil; OU-2 & OU-4)
3. Volume III — Former FMC Research and Development (R&D) Property (soil; OU-9)
4. Volume IV — Culvert 105 and Flood Zone (soil; OU-5)
5. Volume V — Tributary One and Flood Plain South of Pearson/Stone Roads (soil & sediment; OU-6)
6. Volume VI — Tributary One and Flood Plain East of Stone Road to Confluence with Jeddo Creek (soil & sediment; OU-7)
7. Volume VII — Jeddo Creek, Johnson Creek, and Associated Flood Plains (soil & sediment; OU-8)

8. Volume VIII Groundwater Investigations and Remediation Results (on-site & off-site groundwater; OU-10)
9. Volume IX On-Site Soil, Surface Water, and Sediments (OU-1 & OU-11)
10. Volume X Suspected Air Deposition Study Area 2 (North of the Erie Canal and East of the Niagara/Orleans County Line) (soil; OU-3)
11. Volume ES Comprehensive Executive Summary for all volumes

To date, four of eleven RFI Report volumes are considered to be final and approved by the Agencies; RFI Report Volumes I, II and IV were issued as final in September 2009 and RFI Report Volume V was issued as final in June 2010. A detailed description of past operations and releases at the Facility, including activities related to the Former R&D Property, is provided in the Agencies'-approved RFI Report Volume I.

1.2 RFI Objectives

The RFI objectives for the Former R&D Property are to:

1. Characterize the nature and extent of FMC-related constituents that may be present in soil as a result of historical releases from solid waste management units (SWMUs), regulated units, or other potential sources;

2. Define the horizontal and vertical extent of areas proposed to be evaluated in a Corrective Measures Study (CMS), if determined to be necessary by the Agencies; and

3. Provide sufficient data to perform a CMS, if one is determined to be necessary by the Agencies, in accordance with the terms and conditions of the AOC.

To achieve these objectives, FMC is relying on data generated from 1973 through 2013. The sampling and analysis of soil at the Former R&D Property is primarily for arsenic, with additional field monitoring and laboratory testing for other constituents, as appropriate. FMC and the Agencies previously agreed that a soil arsenic "delineation" criterion of 20 milligrams per kilogram (mg/kg) is not necessarily a "remediation" criterion or standard, and that delineation of soil containing arsenic above 20 mg/kg does not mean that soil will be required to be remediated in the future.

1.3 Document Organization

The remainder of this document is organized as follows:

Section 2 – Property Description: Provides background information for the Former R&D Property, including current and former land use.

Section 3 – Soil Sampling and Analysis: Provides a summary of the soil sampling conducted at the Former R&D Property and the laboratory analysis of those samples.

Section 4 – Presentation of Data Set: Provides an assessment of the usability of the soil analytical data.

Section 5 – Soil Screening Values: Discusses the values used to screen the soil analytical data.

Section 6 – Analytical Data Evaluation: Provides an evaluation of the soil analytical data, including a comparison to soil screening values and soil arsenic background concentrations, and the horizontal and vertical distribution of arsenic in soil.

Section 7 – RFI Findings: Summarizes the findings of the investigations and data evaluations described in this RFI Report Volume III.

Tables, figures, and appendices provide supporting information and are referenced throughout the report text.

2. Property Description

2.1 Current

The Former R&D Property is a 10.5-acre area located southwest of the Facility (Figure 2) and comprises three contiguous parcels that are zoned for light industrial land uses. The western and middle parcels (Tax Parcel IDs 86.17-1-98.1 and 86.00-3-12.121) are unoccupied and collectively are improved with two inter-connected one-story buildings (constructed in 1964), two sheds, paved parking/driveway areas, and lawn areas. The eastern parcel (Tax Parcel ID 86.00-3-12.122) is occupied by a contractor and is improved with a one-story garage (constructed in 2005), a shed, driveway, and lawn areas. The Former R&D Property is abutted to the north and east by the Facility, to the west by residential properties, and to the south by Route 31, with residential and commercial properties beyond.

Soil at the Former R&D Property is silty sand and clay, with bedrock encountered approximately 4 to 8 feet below surface grade.

2.2 Historical

As indicated by aerial photographs dated 1931 and 1938, orchards occupied the Former R&D Property (Figure 3). At that time the land was owned by FMC's predecessor, Niagara Sprayer. In the 1950s, the orchard was no longer present (as indicated by an aerial photograph dated 1951; no aerial photographs are available from 1939 to 1950) and the Former R&D Property was not improved upon (i.e., no structures present).

In 1964, FMC constructed two buildings (Buildings 100 and 102), having laboratories and offices, and four attached greenhouses on the southwestern portion of [what was then] the FMC-owned property

(i.e., the area now known as the Former R&D Property) for laboratory and greenhouse testing activities.[1] A fifth greenhouse within the property was added in 1976.

In 1983, the R&D operations at the Facility were moved to FMC's R&D Center in Princeton, New Jersey. From 1983 to 1985, FMC decommissioned the laboratory and greenhouse facilities. Decommissioning activities included separation of property drainage and utilities (i.e., sanitary sewer, water, natural gas and electric) from the Facility utilities, decontamination of the greenhouses and laboratory areas, wastes disposal, and removal of the greenhouses. In 1985, FMC sold the 10.5-acre Former R&D Property.

There were two areas within the Former R&D Property used for waste handling by FMC that were subsequently designated as SWMUs by the NYSDEC in the *RCRA Facility Assessment (RFA) Preliminary Review* (1988). Specifically, waste solvents generated from research activities were containerized and stored in an outdoor drum storage area, located next to a shed, east of Building 100. This area was subsequently designated as SWMU #27. Waste pesticide-containing soil from research activities was containerized and stored in an indoor drum storage area within Building 100. This area was subsequently designated as SWMU #37. As indicated in RFI Report Volume I, SWMUs #27 and #37 were closed, decontaminated, and verified clean in 1982 in accordance with a closure plan; closure of both units was approved by the NYSDEC.

The Former R&D Property was occupied by a commercial analytical laboratory from 1986 to 1995 and since 1996 has been used for various commercial purposes.

3. Soil Sampling and Analysis

Four investigation programs have been performed at the Former R&D Property to evaluate soil for potential releases from historical FMC operations. Soil in the former waste solvent storage area (SWMU #27) has been tested for volatile organic compounds (VOCs), soil in the former locations of the greenhouses has been tested for herbicides, and soil across the entire property has been tested for the primary Site soil contaminant, arsenic.

A description of the soil sampling and analysis activities conducted at the Former R&D Property during the four investigation programs is provided in Sections 3.1 to 3.4, respectively. Sample locations are shown on Figure 4 and a summary of analyses conducted is provided in Table 1. The analytical data from these investigation programs are tabulated in Appendix A of this RFI Report Volume III.

[1] One research project conducted from1965 to 1967 was for the U.S. Department of Defense (DoD) and involved herbicide formulations, including esters of 2,4-D (dichlorophenoxyacetic acid) and 2,4,5-T (trichlorophenoxyacetic acid). Experiments were conducted, using "pipette" or "test tube" quantities, in a laboratory and a greenhouse at the Facility. For additional information, refer to FMC's *Report on Investigative Work* (2008).

3.1 1973 Facility Soil Arsenic Investigation

In 1973, 316 soil borings were advanced on an approximate 100-foot grid across the entire Facility (which included the Former R&D Property at that time), with soil samples collected from surface grade to refusal on bedrock and analyzed for arsenic (total 2,228 samples). The portion of the investigation at the Former R&D Property included 29 soil borings, with 169 soil samples analyzed for arsenic. The soil analytical data were previously provided to the Agencies in the draft *RCRA Facility Investigation Report* (Draft RFI Report) (1999).

3.2 1993-1997 Facility RFI

From 1993 to 1997, soil sampling and analysis were conducted at the Facility's SWMU locations to investigate for constituents potentially associated with the SWMU locations, and at various on-Site and off-Site locations to investigate the extent of arsenic in soil. As part of this investigation, a soil boring was advanced at the former R&D outdoor solvent storage area (SWMU #27), with analysis for VOCs. Soil samples (0- to 3-inch depth interval) were collected at two locations along the Route 31 right-of-way south of the Former R&D Property and were analyzed for arsenic. In addition, a soil sample was collected, as a split sample by FMC and the NYSDEC, at one location (D-3) previously sampled in 1973 to evaluate an anomalous result at one depth interval. The soil analytical data were provided in the 1999 Draft RFI Report.

3.3 2002 RFI Sampling Program

Supplemental RFI soil sampling and analysis were conducted at on-site and off-site locations in 2002 to evaluate the extent of arsenic in soil. As part of this investigation, soil samples (0 to 3-inch depth interval) were collected at nine locations along the western boundary of the Former R&D Property and analyzed for arsenic. The soil analytical data were provided in the *Draft 2002 Sampling Program Report* (2003).

3.4 2013 RFI Sampling Program

In July 2013, soil sampling and analysis were conducted in the former locations of the five greenhouses (one sample location within the footprint of each former greenhouse) to evaluate soil for herbicides and to extend the previously existing 100-foot soil arsenic sampling grid. Soil samples were collected at each location continuously from surface grade to refusal on bedrock. All soil samples were screened in the field for VOCs using a photoionization detector (PID), and no detectable concentrations were identified in any of the samples. All of the soil samples were analyzed for arsenic (47 samples), and all of the samples collected from the 0- to 6-inch, 6- to 12-inch, 12- to 18-inch and 18- to 24-inch depth intervals (20 samples) were analyzed for the herbicides 2,4-D, 2,4,5-T, and 2,4,5-TP (Silvex). The sampling and analysis activities, including data validation, are discussed in Appendix B of this RFI Report Volume III.

4. Presentation of Data Set

4.1 Data Usability

As discussed in Appendix B, the analytical data for field samples and associated quality assurance and quality control (QA/QC) samples collected by FMC during the 2013 sampling program were validated by ARCADIS and determined to be acceptable for use in the RFI to evaluate the extent in soil and to compare to soil screening values. Likewise, as documented in the reports identified in Section 3.2 and 3.3, respectively, samples collected by FMC during the 1993-1997 and 2002 sampling programs were validated by Conestoga-Rovers & Associates, Inc. (CRA) and determined to acceptable for use. As discussed in the 1999 Draft RFI Report, the 1973 soil arsenic data (for the Former R&D Property and the Facility) were not validated, but the results are consistent with those for other subsequent investigations. Therefore, the data are accepted for use in the RFI, with one exception. At location D-3, the result obtained for the 0- to 6-inch depth interval in 1997 is used in place of the anomalous result obtained for the 6-inch sampling depth in 1973.

Altogether the usable analytical data set includes 227 samples from 45 locations for arsenic, one sample from one location for VOCs, and 20 samples from five locations for herbicides.

4.2 Combined Results

Consistent with the approach used in all other RFI Report volumes, results for sample locations/intervals with duplicate and/or split samples (collected for QA/QC purposes) are averaged with the primary field sample result to produce a single “combined” result for that sampling location/depth interval. The approach used in the RFI Report to present the data and produce the combined result is as follows:

1. If only a single analytical result exists for a sampling location/depth interval, that value is used as the combined result.
2. If two or more analytical results (e.g., sample duplicates, splits) are available for a sampling location/depth interval, the arithmetic average of all results for that sample is used as the combined result.
3. If an analytical result is reported as not detected (ND), then a value of one-half the reported laboratory detection limit is used as the combined result.

5. Soil Screening Values

For purposes of the RFI, the soil combined results are compared to soil screening values. A description of the soil screening values applicable to the Former R&D Property is provided below.

Derivation of health risk based Soil Screening Levels (SSLs) for Site-related constituents, using standardized equations and assumptions from USEPA guidance and constituent toxicity data is documented in the 1999 Draft RFI Report. The SSLs applicable to Site-related constituents were used

in comparison to Site data to develop RFI soil sampling programs. The industrial land use SSLs (applicable to the Former R&D Property) are provided in Table 2.

In 2006, the NYSDEC promulgated regulations (6 NYCRR Subpart 375) which included constituent-specific Soil Cleanup Objectives (SCOs), with each constituent have various SCOs based on property type/usage. The SCOs were developed from ecological and human health-based criteria, and in some cases, from a state-wide background database. The SCOs applicable to industrial land use and the SCOs protective of leaching to groundwater are provided in Table 2.

Consistent with the RFI Report volumes for other study areas, the SCOs for arsenic (16 mg/kg for both categories identified above) have been replaced in Table 2 with the Middleport RFI soil arsenic delineation criterion of 20 mg/kg. Arsenic is a naturally occurring element in soil, and is also present in soil as a result of various man-made products and activities (also referred to as "anthropogenic sources"). FMC and the Agencies conducted an evaluation to estimate the amount of arsenic that may be present in Middleport soil from natural geologic conditions and non-Site-related anthropogenic sources ("2003 Gasport Background Study"). Soil samples were collected from locations of varying property types/usages in the nearby Village of Gasport, and the resulting data were used to identify a Middleport RFI soil arsenic delineation criterion. A description of this evaluation is provided in Appendix C of this RFI Report Volume III.

6. Analytical Data Evaluation

This section presents soil combined results for the Former R&D Property, a comparison to soil screening values, and a discussion of the vertical and horizontal distribution of arsenic.

6.1 Non-Arsenic Constituents Statistics and Screening

Table 2 provides a summary of the frequency of detection, maximum concentration, and comparison to soil screening values for non-arsenic constituents.

Non-arsenic constituent results for soil samples collected at the Former R&D Property are all below their respective SSL or SCO values. Herbicides were not detected in any of 20 samples, and the sample detection limits (approximately 0.05 mg/kg or less) are below the screening values. VOCs were either not detected (ten constituents) or detected at trace concentrations (three constituents) in the SWMU #27 sample, with all reported concentrations or detection limits below the screening values.

6.2 Arsenic Statistics and Screening

As indicated in Table 2, arsenic was detected in 189 of the 227 samples, with the results for 46 samples (at 26 locations) exceeding the delineation criterion of 20 mg/kg. Sample locations with a soil arsenic concentration greater than 20 mg/kg observed at any depth interval are colored pink on Figure 5 (26 locations), while locations where all soil arsenic concentrations are less than or equal to 20 mg/kg are not shaded (19 locations).

Table 3 also presents the arithmetic mean and 95% upper confidence level (UCL) on the mean for the soil arsenic data. The statistics for the soil arsenic concentrations observed at the Former R&D Property are provided below along with those for orchard land and for commercial/industrial land from the 2003 Gasport Background Study (as discussed in Appendix C).

	Arsenic Concentration Range (mg/kg)	**Arithmetic Mean (mg/kg)**	**95% UCL on the Mean (mg/kg)**
Former R&D Property	<0.5 to 71.0	11.6	16.0
Orchard Land	3.1 to 121.3	33.3	63.5
Commercial/Industrial Land	2.2 to 32.8	11.7	18.4

6.3 Horizontal and Vertical Extent of Soil Arsenic

As a basis for evaluating arsenic concentration with depth, the maximum soil arsenic concentration observed for samples within three different depth intervals (0 to 12 inches, 12 to 24 inches, and deeper than 24 inches) are color-coded (based on concentration) on Figures 6 through 8, respectively.

Table 3 provides statistics of the soil arsenic data set organized by area (each of the three parcels) and by depth (the three depth intervals identified on Figures 6 through 8). For each parcel or depth interval, the soil arsenic statistics include the number of samples analyzed, number and frequency of samples with arsenic detected, number and frequency of samples with an arsenic concentration greater than 20 mg/kg, maximum concentration, arithmetic mean, and 95% UCL of the soil arsenic data.

Based on Figures 6 through 8 and the statistics in Table 3, the soil arsenic concentrations and associated statistics are similar for each of the three parcels. While the horizontal distribution varies from sample location to sample location, overall the frequency of samples with concentrations greater than 20 mg/kg and the arithmetic mean and 95% UCL do not vary by parcel within the Former R&D Property. With respect to the vertical distribution, the frequency of samples with concentrations greater than 20 mg/kg and the arithmetic mean and 95% UCL of the soil data are lowest (among the three depth intervals identified above) for samples collected deeper than 24 inches.

7. RFI Findings

A review of the soil results from the Former R&D Property yields the following findings:

1. Site-related constituents in soil at the Former R&D Property have been adequately evaluated for constituents that may have been released as a result of historical FMC operations at the Former R&D Property or nearby at the Facility, including VOCs in the former waste solvent storage area, herbicides in the former location of the greenhouses, and arsenic throughout the property.
2. Arsenic data define the horizontal and vertical limits of potential FMC-related impacts to soil at the Former R&D Property. Non-arsenic constituent concentrations were all below applicable soil screening values.
3. Soil arsenic at the Former R&D Property has been adequately delineated relative to the Middleport RFI soil arsenic delineation criterion of 20 mg/kg and the property boundaries. The data set includes 227 soil arsenic results for samples collected from 45 locations arranged on a grid across the property, with 34 of the locations advanced to refusal on bedrock.
4. In consideration of the historical use of the Former R&D Property as an orchard and for industrial and commercial uses, soil arsenic concentrations observed at the Former R&D Property are within the range of concentrations observed for similar land usages in the 2003 Gasport Background Study.
5. Soil arsenic concentrations at the Former R&D Property above 20 mg/kg generally correspond with the former orchard location. Soil arsenic concentrations generally decrease with depth below surface grade.
6. The RFI information and analytical data are sufficient to support the performance of a CMS, if one is determined to be needed.

References

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Tables

TABLE 1
SOIL INVESTIGATION INVENTORY
FORMER R&D PROPERTY (OU-9)

RCRA FACILITY INVESTIGATION REPORT VOLUME III
FMC CORPORATION – MIDDLEPORT, NEW YORK

Report Section	Sampling Dates	Investigation Program[1]	No. of Sample Locations[2]	No. of Samples Analyzed[3]		
				Arsenic	VOCs	Herbicides
3.1	1973	Facility Soil Arsenic Investigation	29	168[4]	0	0
3.2	1993-1997	Facility RCRA Facility Investigation (RFI)	3 (+1 re-sample) [4]	3	1	0
3.3	2002	RFI Sampling Program	9	9	0	0
3.4	2013	RFI Sampling Program	5	47	0[5]	20
		Totals	46	227	1	20

Notes:

1. Table only includes sampling and analysis for portion of investigation program conducted at the Former R&D Property.
2. Sample locations are shown on Figure 3.
3. Analytical data are summarized in Appendix A.
4. One sample from the 1973 investigation was re-sampled by NYSDEC and FMC (split sample) in 1997, and the 1973 result is not included.
5. All 47 soil samples collected in 2013 were screened in the field for volatile organic compounds (VOCs) using a portable photoionization detector (PID), and no detectable concentrations of VOCs were identified.

TABLE 2
SOIL ANALYTICAL DATA SUMMARY
FORMER R&D PROPERTY (OU-9)

RCRA FACILITY INVESTIGATION REPORT VOLUME III
FMC CORPORATION - MIDDLEPORT, NEW YORK

Analyte	Frequency Detected	Maximum Concentration (mg/kg)	Samples Exceeding SCO[2] or SSL[3]	Industrial SCO (mg/kg)	Protection of Groundwater SCO (mg/kg)	Industrial SSL (mg/kg)
Metals						
Arsenic	189 / 227	71.0	46	20[4]	20[4]	38.2
Volatile Organic Compounds						
1,1,1-Trichloroethane	0 / 1	ND	0	1,000	0.68	4,550
1,1,2-Trichloroethane	0 / 1	ND	0	NV	NV	32.9
1,1-Dichloroethene	0 / 1	ND	0	1,000	0.33	2.08
1,2-Dichloroethane	0 / 1	ND	0	60	0.02	10.6
Acetone	1 / 1	0.007	0	1,000	0.05	11,700
Benzene	0 / 1	ND	0	89	0.06	26.4
Chlorobenzene	0 / 1	ND	0	1,000	1.1	393
Chloroform	0 / 1	ND	0	700	0.37	8.95
Ethylbenzene	0 / 1	ND	0	780	1.0	1,810
Methylene chloride	1 / 1	0.002	0	1,000	0.05	343
Toluene	0 / 1	ND	0	1,000	0.7	2,830
Trichloroethene	1 / 1	0.001	0	400	0.47	164
Xylenes (total)	0 / 1	ND	0	1,000	1.6	410
Herbicides						
2,4,5-T	0 / 20	ND	0	NV	NV	20,400
2,4,5-TP	0 / 20	ND	0	1,000	3.8	16,400
2,4-D	0 / 20	ND	0	NV	NV	20,400

Notes:
1. Concentrations, SCOs, and SSLs in milligrams per kilogram (mg/kg), equivalent to parts-per-million (ppm).
2. SCO = NYSDEC Remedial Program Soil Cleanup Objective listed in Table 375-6.8(b) of 6 NYCRR Subpart 375-6.
3. SSL = Soil Screening Level listed in Table 7.2 of the 1999 Draft RFI Report, dervied from USEPA Soil Screening Guidance.
4. SCO of 16 mg/kg replaced with Middleport RFI soil arsenic delineation criterion of 20 mg/kg.
5. NV = no value available.
6. ND = not detected at laboratory reporting limit; all reporting limits (Appendix A) are below the applicable soil screening values.

TABLE 3
SOIL ARSENIC STATISTICS BY AREA AND DEPTH
FORMER R&D PROPERTY (OU-9)

RCRA FACILITY INVESTIGATION REPORT VOLUME III
FMC CORPORATION - MIDDLEPORT, NEW YORK

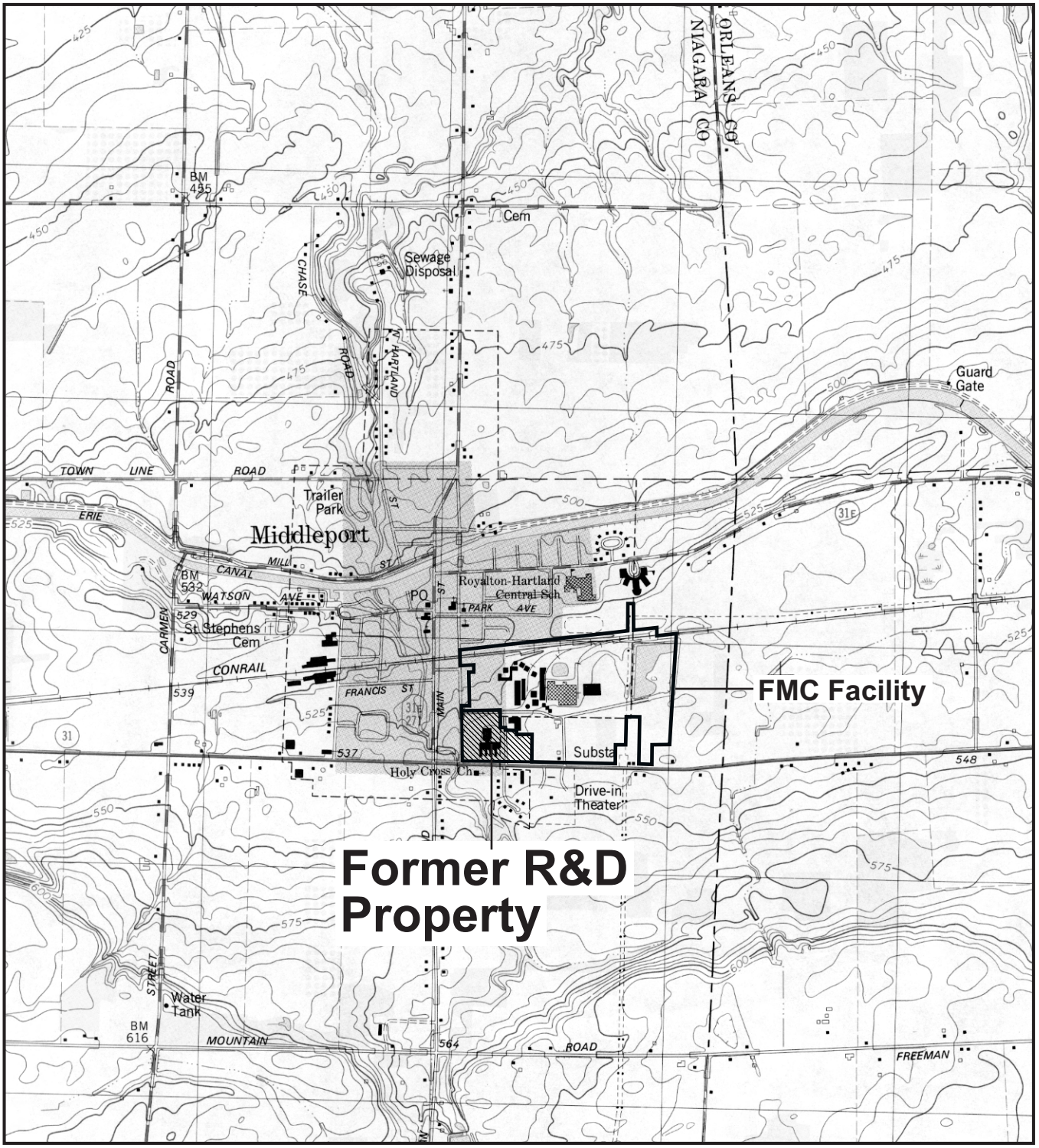
	Total Number of Samples	Detections		>20 mg/kg		Arsenic Concentration (mg/kg)			Distribution	95% UCL Method
		Samples	Frequency	Samples	Frequency	Maximum	Average	95% UCL		
Former R&D Property (all three parcels)	227	189	83%	46	20%	71.0	11.6	16.0	Nonparametric	95% KM Chebyshev
Area										
Parcel 86.17-1-98.1	123	107	87%	24	20%	71.0	10.8	16.5	Nonparametric	95% KM Chebyshev
Parcel 86.00-3-12.121	52	36	69%	9	17%	61.0	12.1	22.7	Nonparametric	95% KM Chebyshev
Parcel 86.00-3-12.122	52	46	88%	13	25%	59.0	13.0	22.0	Nonparametric	95% KM Chebyshev
Depth Interval										
0- to 12-inches	50	48	96%	23	46%	59.0	20.5	31.0	Nonparametric	95% KM Chebyshev
12- to 24-inches	38	33	87%	12	32%	71.0	17.6	31.8	Nonparametric	95% KM Chebyshev
Deeper than 24 inches	139	108	78%	11	8%	61.0	6.8	8.4	Nonparametric	95% KM Bias-corrected

Notes:

1. Distribution assessed by goodness-of-fit tests using ProUCL 4.1.00 at a 95% upper confidence level (UCL) ($\alpha = 0.05$).
   ProUCL Version 4.1.00 Technical Guide (Draft). Office of Research and Development. EPA/600/R-07/041. May 2010.
2. KM = Kaplan Meier

ARCADIS

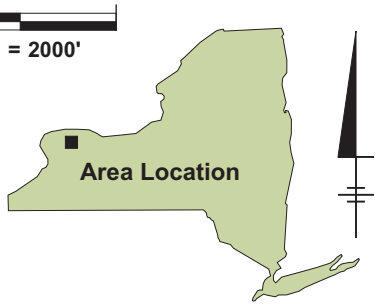
Figures



REFERENCE: BASE MAP USGS 7.5 MIN. QUAD., MEDINA, NY, 1980.

2000' 0 2000'

Approximate Scale: 1" = 2000'



FMC CORPORATION - MIDDLEPORT, NEW YORK

RCRA FACILITY INVESTIGATION REPORT VOLUME III

LOCATION MAP

ARCADIS

FIGURE 1

09/16/2013 SYRACUSE,NY-ENV/CADD-DJHOWES
B0037778/0000/00004/CDR/37778N01.CDR

SOUTH VERNON STREET

EXISTING BUILDING (FORMER BLDG 102)

TAX PARCEL ID 86.17-1-98.1

TAX PARCEL ID 86.00-3-12.121

TAX PARCEL ID 86.00-3-12.122

PAVED PARKING

EXISTING BUILDING (FORMER BLDG 100)

LOCATION OF FORMER SOIL DRUM STORAGE (SWMU #37)

FORMER SOLVENT STORAGE AREA (SWMU #27)

SHED

SHED

GARAGE

SHED

FIVE FORMER GREENHOUSES (DASHED LINES)

ROUTE 31

LEGEND:

- FORMER R&D PROPERTY
- APPROXIMATE PROPERTY LINE
- EXISTING BUILDING
- FORMER GREENHOUSE

NOTES:

1. BASEMAP OBTAINED FROM A FIGURE BY CONESTOGA-ROVERS AND ASSOCIATES ENTITLED "2003/2004 PROPOSED SAMPLING LOCATIONS" DATED OCTOBER 2003 AT A SCALE OF 1"=200'.
2. ALL LOCATIONS AND PROPERTY BOUNDARIES SHOWN ARE APPROXIMATE AND SUBJECT TO VERIFICATION.
3. BUILDINGS BEYOND FORMER R & D PROPERTY NOT SHOWN.

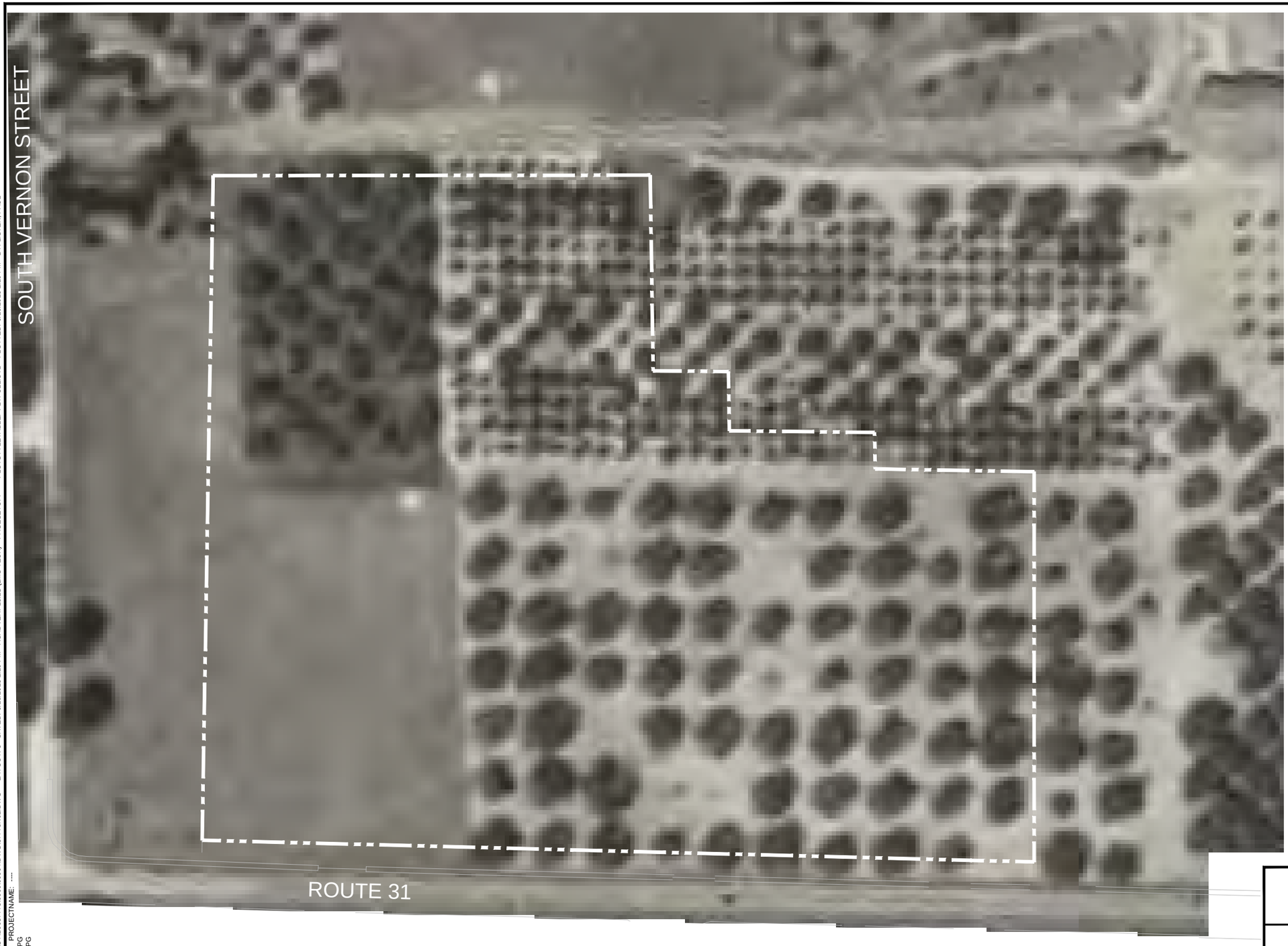
0 50' 100'
GRAPHIC SCALE

FMC CORPORATION - MIDDLEPORT, NEW YORK
RCRA FACILITY INVESTIGATION REPORT VOLUME III

SITE PLAN

ARCADIS

FIGURE **2**



LEGEND:

FORMER R&D PROPERTY

NOTES:

1. PROPERTY BOUNDARIES SHOWN ARE APPROXIMATE AND SUBJECT TO VERIFICATION.
2. 1931 AERIAL PHOTOGRAPH OBTAINED FROM NIAGARA COUNTY HIGHWAY DEPARTMENT.

FMC CORPORATION - MIDDLEPORT, NEW YORK
RCRA FACILITY INVESTIGATION REPORT VOLUME III

AERIAL PHOTOGRAPH (1931) WITH HISTORICAL ORCHARDS PRESENT

ARCADIS

FIGURE **3**

CITY: SYRACUSE, NY DIV/GROUP: ENV/REM-WIM-DV DB: P. LISTER LD: P. LISTER PM/TM/TR: D. WRIGHT LYR: ON=*;OFF=REF, (FRZ)
G:\ENV\CAD\SYRACUSE\ACTIB\03777\8000\000004\DWG\03777BN01.DWG LAYOUT: 3 SAVED: 9/16/2013 2:19 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULLCTB PLOTTED: 9/16/2013 2:19 PM BY: LISTER, PAUL
XREFS: IMAGES: PROJECTNAME: ---
37669X01.JPG
37669X02.JPG

SOUTH VERNON STREET

EXISTING BUILDING (FORMER BLDG 102)

EXISTING BUILDING (FORMER BLDG 100)

LOCATION OF FORMER SOIL DRUM STORAGE (SWMU #37)

FIVE FORMER GREENHOUSES (DASHED LINES)

PAVED PARKING

FORMER SOLVENT STORAGE AREA (SWMU #27)

SHED

SHED

GARAGE

SHED

ROUTE 31

A3+50

A6+00

A8+00

986

BHI0

BHK1

BHM1

NIAROW

WSS1

WSS2

WSS3

WSS14

WSS27

WSS28

WSS29

WSS30

BH-J1

A1I3 A1I8 A1I7 A1I4 A1J1 A1J6 A1J5 A1J2 A1J8 A1J7 A1J4 A1J3

A101 A102 A101B A103 A3H0

T1-2 T1-1 T1-4 T1-3 T2-2 T2-3 T2-1 T2-4 T3-2 T3-3 T3-4 T3-5 T3-1 T3-6 T4-3 T4-2 T4-4 T4-5 T4-1 T4-6 T6-2 T6-3 T6-4 T6-1 T7-3 T7-4 T7-8 T7-5 T7-2 T7-7 T7-6 T7-1

A3G0 A3F0 A3E0 A3D0 A3C0 A3B0 A3B1 A3A0 A3A1

G1 G2 G3 G4 G5 G8 G9

F1 F2 F3 F4 F5 F7 F8 F9 F10

E1 E3 E4 E5 E6 E7 E8 E9 E10

D1 D3 D4 D5 D6 D7 D8 D9 D10

C1 C2 C3 C4 C5 C6 C7 C8 C9 C10

B1 B2 B3 B4 B5 B6 B7 B8 B9 B10

H1 H2 H3 H4 H5 H6 H7 H8 H9 H10

I1 I2 I3 I4 I5 I6 I7 I8 I9

LEGEND:

- FORMER R&D PROPERTY
- APPROXIMATE PROPERTY LINE
- EXISTING BUILDING
- FORMER GREENHOUSE

SOIL SAMPLE LOCATIONS:

- 1973 FACILITY SOIL ARSENIC INVESTIGATION
- 1993–1997 FACILITY RFI
- 2002–2004 RFI SAMPLING PROGRAM
- 2013 RFI SAMPLING PROGRAM

NOTES:

1. BASEMAP OBTAINED FROM A FIGURE BY CONESTOGA–ROVERS AND ASSOCIATES ENTITLED "2003/2004 PROPOSED SAMPLING LOCATIONS" DATED OCTOBER 2003 AT A SCALE OF 1"=200'.
2. ALL LOCATIONS AND PROPERTY BOUNDARIES SHOWN ARE APPROXIMATE AND SUBJECT TO VERIFICATION.
3. BUILDINGS BEYOND FORMER R & D PROPERTY NOT SHOWN.
4. SOIL SAMPLE LOCATIONS BEYOND R & D PROPERTY SHOWN FOR REFERENCE ONLY.

0 50' 100'
GRAPHIC SCALE

FMC CORPORATION - MIDDLEPORT, NEW YORK
RCRA FACILITY INVESTIGATION REPORT VOLUME III

SOIL SAMPLE LOCATIONS

ARCADIS

FIGURE 4

CITY: SYRACUSE, NY GROUP: ENVCAD DB: G. STOWELL, P. LISTER LD: P. LISTER PM/TM/TR: D. WRIGHT LYR: ON=*;OFF=REF; (FRZ)
G:\ENVCAD\SYRACUSE\ACTIB\003777\8\000\000001\DWG\377788\03.DWG LAYOUT: 4 SAVED: 9/16/2013 2:20 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---
XREFS: IMAGES: PROJECTNAME: ---

SOUTH VERNON STREET

A3G0 32.4 | G1 47.0 | G2 51.0 | G3 2.0 | G4 61.0

A3F0 23.8 | F1 12.0 | F2 27.0 | F3 40.0 | F4 10.0

A3E0 22.6 | E1 37.0 | E3 10.0 | E4 20.0 | E5 59.0 | E6 23.0 | E7 52.0

A3D0 20.1 | D1 10.0 | D3 71.0 | D4 17.0 | D5 ND | D6 4.0 | D7 59.0

A3C0 17.8 | C1 6.2 | C2 19.5 | C3 65.4 | C4 12.0 | C5 ND | C6 1.0 | C7 40.0

A3B0 17.5 | A3B1 18.9 | B1 10.4 | B2 14.0 | B3 24.1 | B4 37.0 | B5 40.0 | B6 42.0 | B7 30.0

A3A0 20.5 | A3A1 22.5 | A3+50 38.3 | A6+00 21.7

EXISTING BUILDING (FORMER BLDG 102)

EXISTING BUILDING (FORMER BLDG 100)

PAVED PARKING

LOCATION OF FORMER SOIL DRUM STORAGE (SWMU #37)

FORMER SOLVENT STORAGE AREA (SWMU #27)

SHED

GARAGE

SHED

SHED

FIVE FORMER GREENHOUSES (DASHED LINES)

ROUTE 31

LEGEND:

- FORMER R&D PROPERTY
- APPROXIMATE PROPERTY LINE
- EXISTING BUILDING
- FORMER GREENHOUSE
- SOIL SAMPLE LOCATION
- 23.8 MAXIMUM SOIL ARSENIC CONCENTRATION (mg/kg):
- (NO SHADE) ≤20
- >20

NOTES:

1. BASEMAP OBTAINED FROM A FIGURE BY CONESTOGA–ROVERS AND ASSOCIATES ENTITLED "2003/2004 PROPOSED SAMPLING LOCATIONS" DATED OCTOBER 2003 AT A SCALE OF 1"=200'.
2. ALL LOCATIONS AND PROPERTY BOUNDARIES SHOWN ARE APPROXIMATE AND SUBJECT TO VERIFICATION.
3. BUILDINGS BEYOND FORMER R & D PROPERTY NOT SHOWN.
4. SAMPLE LOCATIONS WITH A MAXIMUM SOIL ARSENIC CONCENTRATION LESS THAN OR EQUAL TO 20 mg/kg IN THE SPECIFIED DEPTH INTERVAL ARE SHOWN WITHOUT SHADING.

0 50' 100'
GRAPHIC SCALE

FMC CORPORATION - MIDDLEPORT, NEW YORK
RCRA FACILITY INVESTIGATION REPORT VOLUME III

SAMPLE LOCATIONS WITH SOIL ARSENIC CONCENTRATIONS > 20 mg/kg (ANY DEPTH)

ARCADIS

FIGURE 5

SOUTH VERNON STREET

A3G0 32.4 | G1 47.0 | G2 4.0 | G3 2.0 | G4 56.0

A3F0 23.8 | F1 12.0 | F2 27.0 | F3 25.0 | F4 10.0

A3E0 22.6 | E1 34.0 | E3 7.0 | E4 20.0 | E5 59.0 | E6 23.0 | E7 52.0

A3D0 20.1 | D1 10.0 | D3 45.2 | D4 17.0 | D5 ND | D6 4.0 | D7 59.0

A3C0 17.8 | C1 6.2 | C2 3.7 | C3 6.7 | C4 12.0 | C5 ND | C6 1.0 | C7 40.0

A3B0 17.5 | A3B1 18.9 | B1 4.2 | B2 13.0 | B3 2.9 | B4 37.0 | B5 40.0 | B6 42.0 | B7 30.0

A3A0 20.5 | A3A1 22.5

38.3 A3+50

A6+00 21.7

EXISTING BUILDING (FORMER BLDG 102)

EXISTING BUILDING (FORMER BLDG 100)

PAVED PARKING

LOCATION OF FORMER SOIL DRUM STORAGE (SWMU #37)

FORMER SOLVENT STORAGE AREA (SWMU #27)

SHED

SHED

GARAGE

SHED

FIVE FORMER GREENHOUSES (DASHED LINES)

ROUTE 31

LEGEND:

- FORMER R&D PROPERTY
- APPROXIMATE PROPERTY LINE
- EXISTING BUILDING
- FORMER GREENHOUSE
- SOIL SAMPLE LOCATION
- 23.8 MAXIMUM SOIL ARSENIC CONCENTRATION (mg/kg):
- (NO SHADE) ≤20
- 20 – 25
- 25 – 30
- 30 – 50
- >50

NOTES:

1. BASEMAP OBTAINED FROM A FIGURE BY CONESTOGA–ROVERS AND ASSOCIATES ENTITLED "2003/2004 PROPOSED SAMPLING LOCATIONS" DATED OCTOBER 2003 AT A SCALE OF 1"=200'.
2. ALL LOCATIONS AND PROPERTY BOUNDARIES SHOWN ARE APPROXIMATE AND SUBJECT TO VERIFICATION.
3. BUILDINGS BEYOND FORMER R & D PROPERTY NOT SHOWN.
4. SAMPLE LOCATIONS WITH A MAXIMUM SOIL ARSENIC CONCENTRATION LESS THAN OR EQUAL TO 20 mg/kg IN THE SPECIFIED DEPTH INTERVAL ARE SHOWN WITHOUT SHADING.

0 50' 100'
GRAPHIC SCALE

FMC CORPORATION - MIDDLEPORT, NEW YORK
RCRA FACILITY INVESTIGATION REPORT VOLUME III

MAXIMUM SOIL ARSENIC CONCENTRATIONS IN 0- TO 12-INCH DEPTH INTERVAL

ARCADIS

FIGURE 6

SOUTH VERNON STREET

G1 5.0 | G2 51.0 | G3 ND | G4 54.0

F1 5.0 | F2 20.0 | F3 22.0 | F4 7.0

EXISTING BUILDING (FORMER BLDG 102)

E1 37.0 | E3 2.0 | E4 17.0 | E5 7.0 | E6 10.0 | E7 47.0

PAVED PARKING

D1 4.0 | D3 71.0 | D4 2.0 | D5 ND | D6 ND | D7 35.0

EXISTING BUILDING (FORMER BLDG 100)

LOCATION OF FORMER SOIL DRUM STORAGE (SWMU #37)

FORMER SOLVENT STORAGE AREA (SWMU #27)

C5 ND | C6 ND | C7 30.0

SHED

C1 2.4 | C2 3.4 | C3 65.4

B1 10.4 | B2 14.0 | B3 5.9 | B4 22.0 | B5 32.0 | B6 10.0 | B7 10.0

GARAGE

SHED

SHED

FIVE FORMER GREENHOUSES (DASHED LINES)

ROUTE 31

LEGEND:

- FORMER R&D PROPERTY
- APPROXIMATE PROPERTY LINE
- EXISTING BUILDING
- FORMER GREENHOUSE
- SOIL SAMPLE LOCATION
- 23.8 MAXIMUM SOIL ARSENIC CONCENTRATION (mg/kg):
- (NO SHADE) ≤20
- 20 – 25
- 25 – 30
- 30 – 50
- >50

NOTES:

1. BASEMAP OBTAINED FROM A FIGURE BY CONESTOGA–ROVERS AND ASSOCIATES ENTITLED "2003/2004 PROPOSED SAMPLING LOCATIONS" DATED OCTOBER 2003 AT A SCALE OF 1"=200'.
2. ALL LOCATIONS AND PROPERTY BOUNDARIES SHOWN ARE APPROXIMATE AND SUBJECT TO VERIFICATION.
3. BUILDINGS BEYOND FORMER R & D PROPERTY NOT SHOWN.
4. SAMPLE LOCATIONS WITH A MAXIMUM SOIL ARSENIC CONCENTRATION LESS THAN OR EQUAL TO 20 mg/kg IN THE SPECIFIED DEPTH INTERVAL ARE SHOWN WITHOUT SHADING.

0 50' 100'
GRAPHIC SCALE

FMC CORPORATION - MIDDLEPORT, NEW YORK
RCRA FACILITY INVESTIGATION REPORT VOLUME III

MAXIMUM SOIL ARSENIC CONCENTRATIONS IN 12- TO 24-INCH DEPTH INTERVAL

ARCADIS

FIGURE 7

FMC CORPORATION - MIDDLEPORT, NEW YORK
RCRA FACILITY INVESTIGATION REPORT VOLUME III

MAXIMUM SOIL ARSENIC CONCENTRATIONS DEEPER THAN 24 INCHES

ARCADIS

FIGURE 8

CITY: SYRACUSE, NY GROUP: ENVCAD DB: G. STOWELL, P. LISTER LD: P. LISTER PM/TM/TR: D. WRIGHT LYR: ON=*;OFF=REF; (FR2)
G:\ENVCAD\SYRACUSE\ACTIB\037778\000000001\DWG\377788111.DWG LAYOUT: 8 SAVED: 9/16/2013 2:25 PM ACADVER: 18.1S (LMS TECH)
XREFS: IMAGES: PROJECTNAME: ---

ARCADIS

Appendices

(appear on CD only)

A – Soil Analytical Data

B – 2013 RFI Sampling Program Summary

C – Middleport Soil Arsenic Background Concentrations

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Appendix A

Soil Analytical Data
(appears on CD only)

- A-1: Soil Analytical Results – Arsenic
- A-2: Soil Analytical Results – Volatile Organic Compounds
- A-3: Soil Analytical Results – Herbicides

TABLE A-1
SOIL ANALYTICAL RESULTS - ARSENIC
FORMER R&D PROPERTY (OU-9)

RCRA FACILITY INVESTIGATION REPORT VOLUME III
FMC CORPORATION - MIDDLEPORT, NEW YORK

Sample Location	Sample Interval (inches)	Sample Date	Soil Arsenic Concentration[1]			
			FMC Primary	FMC Duplicate	NYSDEC Split	Combined Result[2]
A3+50	0-3	11/1/1996	36.2	--	40.4	38.3
A6+00	0-3	11/1/1996	19.5	--	23.9	21.7
A3A0	0-3	10/7/2002	20.5 J	--	--	20.5
A3A1	0-3	10/7/2002	22.5 J	--	--	22.5
A3B0	0-3	10/7/2002	16.0 J	19.0 J	--	17.5
A3B1	0-3	10/7/2002	18.9 J	--	--	18.9
A3C0	0-3	10/7/2002	17.8 J	--	--	17.8
A3D0	0-3	10/7/2002	20.1 J	--	--	20.1
A3E0	0-3	10/7/2002	22.6 J	--	--	22.6
A3F0	0-3	10/7/2002	23.8 J	--	--	23.8
A3G0	0-3	10/7/2002	34.7 J	--	30.0 NE	32.4
B1	0 - 6	7/24/2013	3.15	--	--	3.15
	6 - 12	7/24/2013	4.19	--	--	4.19
	12 - 18	7/24/2013	6.09	--	--	6.09
	18 - 24	7/24/2013	10.4	--	--	10.4
	24 - 36	7/24/2013	1.36	--	--	1.36
	36 - 48	7/24/2013	1.92	--	--	1.92
	48 - 60	7/24/2013	5.22	--	--	5.22
	60 - 72	7/24/2013	2.28	--	--	2.28
	72 - 84	7/24/2013	2.46	--	--	2.46
	84 - 89	7/24/2013	3.05	--	--	3.05
B2	6-6	7/17/1973	13.0	--	--	13.0
	18-18	7/17/1973	14.0	--	--	14.0
	30-30	7/17/1973	12.0	--	--	12.0
	42-42	7/17/1973	10.0	--	--	10.0
	54-54	7/17/1973	5.0	--	--	5.0
	66-66	7/17/1973	5.0	--	--	5.0
	74.4-74.4	7/17/1973	10.0	--	--	10.0
B3	0 - 6	7/24/2013	2.90 J	--	--	2.90
	6 - 12	7/24/2013	2.24 J	--	--	2.24
	12 - 18	7/24/2013	5.94 J	--	--	5.94
	18 - 24	7/24/2013	5.17 J	--	--	5.17
	24 - 36	7/24/2013	7.75 J	--	--	7.75
	36 - 48	7/24/2013	24.1 J	--	--	24.1
	48 - 60	7/24/2013	4.42 J	4.44 J	--	4.43
	60 - 72	7/24/2013	5.87 J	--	--	5.87
	72 - 78	7/24/2013	3.90 J	--	--	3.90
B4	6-6	5/29/1973	37.0	--	--	37.0
	18-18	5/29/1973	22.0	--	--	22.0
	30-30	5/29/1973	7.0	--	--	7.0
	42-42	5/29/1973	4.0	--	--	4.0
	54-54	5/29/1973	4.0	--	--	4.0
	66-67.2	5/29/1973	4.0	--	--	4.0

TABLE A-1
SOIL ANALYTICAL RESULTS - ARSENIC
FORMER R&D PROPERTY (OU-9)

RCRA FACILITY INVESTIGATION REPORT VOLUME III
FMC CORPORATION - MIDDLEPORT, NEW YORK

Sample Location	Sample Interval (inches)	Sample Date	Soil Arsenic Concentration[1]			
			FMC Primary	FMC Duplicate	NYSDEC Split	Combined Result[2]
B5	6-6	5/18/1973	40.0	--	--	40.0
	18-18	5/18/1973	32.0	--	--	32.0
	30-30	5/18/1973	10.0	--	--	10.0
	42-42	5/18/1973	10.0	--	--	10.0
	54-54	5/18/1973	4.0	--	--	4.0
	66-66	5/18/1973	7.0	--	--	7.0
	78-81.6	5/18/1973	12.0	--	--	12.0
B6	6-6	5/18/1973	42.0	--	--	42.0
	18-18	5/18/1973	10.0	--	--	10.0
	30-30	5/18/1973	10.0	--	--	10.0
	42-42	5/18/1973	7.0	--	--	7.0
	54-54	5/18/1973	7.0	--	--	7.0
	66-66	5/18/1973	7.0	--	--	7.0
	78-78	5/18/1973	7.0	--	--	7.0
	90-92.4	5/18/1973	4.0	--	--	4.0
B7	6-6	5/18/1973	30.0	--	--	30.0
	18-18	5/18/1973	10.0	--	--	10.0
	30-30	5/18/1973	7.0	--	--	7.0
	42-42	5/18/1973	7.0	--	--	7.0
	54-54	5/18/1973	7.0	--	--	7.0
	66-66	5/18/1973	25.0	--	--	25.0
	75.6-75.6	5/18/1973	25.0	--	--	25.0
C1	0 - 6	7/24/2013	6.15	--	--	6.15
	6 - 12	7/24/2013	2.25	--	--	2.25
	12 - 18	7/24/2013	2.43	--	--	2.43
	18 - 24	7/24/2013	1.39	--	--	1.39
	24 - 36	7/24/2013	1.26	--	--	1.26
	36 - 48	7/24/2013	1.53	--	--	1.53
	48 - 60	7/24/2013	4.65	--	--	4.65
	60 - 72	7/24/2013	5.28	--	--	5.28
	72 - 84	7/24/2013	2.07	--	--	2.07
	84 - 89	7/24/2013	2.48	--	--	2.48
C2	0 - 6	7/24/2013	3.70 J	--	--	3.70
	6 - 12	7/24/2013	2.83 J	--	--	2.83
	12 - 18	7/24/2013	2.49 J	--	--	2.49
	18 - 24	7/24/2013	3.37 J	--	--	3.37
	24 - 36	7/24/2013	2.69 J	10.1 J	--	6.35
	36 - 48	7/24/2013	19.5 J	--	--	19.5
	48 - 60	7/24/2013	6.34 J	--	--	6.34
	60 - 72	7/24/2013	5.42 J	--	--	5.42
	72 - 78	7/24/2013	3.49 J	--	--	3.49

TABLE A-1
SOIL ANALYTICAL RESULTS - ARSENIC
FORMER R&D PROPERTY (OU-9)

RCRA FACILITY INVESTIGATION REPORT VOLUME III
FMC CORPORATION - MIDDLEPORT, NEW YORK

Sample Location	Sample Interval (inches)	Sample Date	Soil Arsenic Concentration[1]			
			FMC Primary	FMC Duplicate	NYSDEC Split	Combined Result[2]
C3	0 - 6	7/24/2013	6.70 J	--	--	6.70
	6 - 12	7/24/2013	6.47 J	--	--	6.47
	12 - 18	7/24/2013	65.4 J	--	--	65.4
	18 - 24	7/24/2013	49.5 J	--	--	49.5
	24 - 36	7/24/2013	34.7 J	--	--	34.7
	36 - 48	7/24/2013	18.4 J	24.4 J	--	21.4
	48 - 60	7/24/2013	18.8 J	--	--	18.8
	60 - 72	7/24/2013	2.94 J	--	--	2.94
	72 - 84	7/24/2013	3.38 J	--	--	3.38
C4	12-12	5/29/1973	12.0	--	--	12.0
	24-34.8	5/29/1973	2.0	--	--	2.0
C5	6-6	5/17/1973	1.0 U	--	--	ND
	18-18	5/17/1973	1.0 U	--	--	ND
	30-30	5/17/1973	1.0 U	--	--	ND
	42-42	5/17/1973	1.0 U	--	--	ND
	54-54	5/17/1973	1.0 U	--	--	ND
	66-66	5/17/1973	1.0 U	--	--	ND
	72-72	5/17/1973	1.0 U	--	--	ND
C6	6-6	5/17/1973	1.0	--	--	1.0
	18-18	5/17/1973	1.0 U	--	--	ND
	30-30	5/17/1973	1.0 U	--	--	ND
	42-42	5/17/1973	1.0 U	--	--	ND
	54-54	5/17/1973	1.0 U	--	--	ND
C7	6-6	5/18/1973	40.0	--	--	40.0
	18-18	5/18/1973	30.0	--	--	30.0
	30-30	5/18/1973	7.0	--	--	7.0
	42-42	5/18/1973	7.0	--	--	7.0
	54-54	5/18/1973	7.0	--	--	7.0
	66-66	5/18/1973	7.0	--	--	7.0
	75.6-75.6	5/18/1973	7.0	--	--	7.0
D1	6-6	7/17/1973	10.0	--	--	10.0
	18-18	7/17/1973	4.0	--	--	4.0
	30-30	7/17/1973	2.0	--	--	2.0
	42-42	7/17/1973	2.0	--	--	2.0
	54-54	7/17/1973	1.0 U	--	--	ND
	66-68.4	7/17/1973	1.0 U	--	--	ND
D3	0-6	4/2/1997	45.0	--	45.4	45.2
	18-18	7/16/1973	71.0	--	--	71.0
	30-30	7/16/1973	25.0	--	--	25.0
	42-42	7/16/1973	2.0	--	--	2.0
	54-54	7/16/1973	7.0	--	--	7.0
	64.8-64.8	7/16/1973	7.0	--	--	7.0

TABLE A-1
SOIL ANALYTICAL RESULTS - ARSENIC
FORMER R&D PROPERTY (OU-9)

RCRA FACILITY INVESTIGATION REPORT VOLUME III
FMC CORPORATION - MIDDLEPORT, NEW YORK

Sample Location	Sample Interval (inches)	Sample Date	Soil Arsenic Concentration[1]			
			FMC Primary	FMC Duplicate	NYSDEC Split	Combined Result[2]
D4	6-6	5/29/1973	17.0	--	--	17.0
	18-18	5/29/1973	2.0	--	--	2.0
	30-30	5/29/1973	4.0	--	--	4.0
	42-44.4	5/29/1973	2.0	--	--	2.0
D5	12-12	5/17/1973	1.0 U	--	--	ND
	24-24	5/17/1973	1.0 U	--	--	ND
	36-36	5/17/1973	1.0 U	--	--	ND
	48-48	5/17/1973	1.0 U	--	--	ND
	60-60	5/17/1973	1.0 U	--	--	ND
	72-73.2	5/17/1973	1.0 U	--	--	ND
D6	12-12	5/17/1973	4.0	--	--	4.0
	24-24	5/17/1973	1.0 U	--	--	ND
	36-36	5/17/1973	2.0	--	--	2.0
	48-48	5/17/1973	2.0	--	--	2.0
	60-62.4	5/17/1973	2.0	--	--	2.0
D7	6-6	5/17/1973	59.0	--	--	59.0
	18-18	5/17/1973	35.0	--	--	35.0
	30-30	5/17/1973	7.0	--	--	7.0
	42-42	5/17/1973	35.0	--	--	35.0
	54-54	5/17/1973	2.0	--	--	2.0
	66-66	5/17/1973	4.0	--	--	4.0
	73.2-73.2	5/17/1973	7.0	--	--	7.0
E1	6-6	7/17/1973	34.0	--	--	34.0
	18-18	7/17/1973	37.0	--	--	37.0
	30-30	7/17/1973	15.0	--	--	15.0
	42-42	7/17/1973	7.0	--	--	7.0
	49.2-49.2	7/17/1973	2.0	--	--	2.0
E3	6-6	5/29/1973	7.0	--	--	7.0
	18-18	5/29/1973	2.0	--	--	2.0
	30-30	5/29/1973	7.0	--	--	7.0
	42-42	5/29/1973	2.0	--	--	2.0
	54-54	5/29/1973	10.0	--	--	10.0
	64.8-64.8	5/29/1973	4.0	--	--	4.0
E4	6-6	5/29/1973	20.0	--	--	20.0
	18-18	5/29/1973	17.0	--	--	17.0
	30-30	5/29/1973	20.0	--	--	20.0
	42-42	5/29/1973	4.0	--	--	4.0
	54-54	5/29/1973	4.0	--	--	4.0
	66-66	5/29/1973	4.0	--	--	4.0
	73.2-73.2	5/29/1973	4.0	--	--	4.0

TABLE A-1
SOIL ANALYTICAL RESULTS - ARSENIC
FORMER R&D PROPERTY (OU-9)

RCRA FACILITY INVESTIGATION REPORT VOLUME III
FMC CORPORATION - MIDDLEPORT, NEW YORK

Sample Location	Sample Interval (inches)	Sample Date	Soil Arsenic Concentration[1]			
			FMC Primary	FMC Duplicate	NYSDEC Split	Combined Result[2]
E5	6-6	5/17/1973	59.0	--	--	59.0
	18-18	5/17/1973	7.0	--	--	7.0
	30-30	5/17/1973	1.0	--	--	1.0
	42-42	5/17/1973	1.0 U	--	--	ND
	54-54	5/17/1973	1.0 U	--	--	ND
	60-60	5/17/1973	1.0 U	--	--	ND
E6	6-6	5/17/1973	23.0	--	--	23.0
	18-18	5/17/1973	10.0	--	--	10.0
	30-30	5/17/1973	4.0	--	--	4.0
	42-42	5/17/1973	10.0	--	--	10.0
	54-54	5/17/1973	14.0	--	--	14.0
	66-67.2	5/17/1973	2.0	--	--	2.0
E7	6-6	5/17/1973	52.0	--	--	52.0
	18-18	5/17/1973	47.0	--	--	47.0
	30-30	5/17/1973	1.0	--	--	1.0
	42-42	5/17/1973	1.0 U	--	--	ND
	54-54	5/17/1973	4.0	--	--	4.0
	66-70.8	5/17/1973	14.0	--	--	14.0
F1	6-6	7/17/1973	12.0	--	--	12.0
	18-18	7/17/1973	5.0	--	--	5.0
	30-30	7/17/1973	2.0	--	--	2.0
	42-42	7/17/1973	2.0	--	--	2.0
	49.2-49.2	7/17/1973	1.0 U	--	--	ND
F2	6-6	7/17/1973	27.0	--	--	27.0
	18-18	7/17/1973	20.0	--	--	20.0
	30-30	7/17/1973	2.0	--	--	2.0
	42-42	7/17/1973	2.0	--	--	2.0
	54-56.4	7/17/1973	2.0	--	--	2.0
F3	6-6	7/16/1973	25.0	--	--	25.0
	18-18	7/16/1973	22.0	--	--	22.0
	30-30	7/16/1973	40.0	--	--	40.0
	42-42	7/16/1973	40.0	--	--	40.0
F4	6-6	5/29/1973	10.0	--	--	10.0
	18-18	5/29/1973	7.0	--	--	7.0
	30-30	5/29/1973	7.0	--	--	7.0
G1	6-6	7/17/1973	47.0	--	--	47.0
	18-18	7/17/1973	5.0	--	--	5.0
	30-30	7/17/1973	5.0	--	--	5.0
	42-42	7/17/1973	5.0	--	--	5.0
	54-54	7/17/1973	2.0	--	--	2.0
	66-66	7/17/1973	1.0 U	--	--	ND
	78-78	7/17/1973	1.0 U	--	--	ND
	87.6-87.6	7/17/1973	1.0 U	--	--	ND

TABLE A-1
SOIL ANALYTICAL RESULTS - ARSENIC
FORMER R&D PROPERTY (OU-9)

RCRA FACILITY INVESTIGATION REPORT VOLUME III
FMC CORPORATION - MIDDLEPORT, NEW YORK

Sample Location	Sample Interval (inches)	Sample Date	Soil Arsenic Concentration[1]			
			FMC Primary	FMC Duplicate	NYSDEC Split	Combined Result[2]
G2	6-6	7/16/1973	4.0	--	--	4.0
	18-18	7/16/1973	51.0	--	--	51.0
	30-30	7/16/1973	2.0	--	--	2.0
	42-42	7/16/1973	1.0 U	--	--	ND
	54-54	7/16/1973	1.0 U	--	--	ND
	66-66	7/16/1973	1.0 U	--	--	ND
	78-78	7/16/1973	1.0 U	--	--	ND
	90-91.2	7/16/1973	1.0 U	--	--	ND
G3	6-6	7/16/1973	2.0	--	--	2.0
	18-18	7/16/1973	1.0 U	--	--	ND
	30-30	7/16/1973	1.0 U	--	--	ND
	42-42	7/16/1973	1.0 U	--	--	ND
	54-54	7/16/1973	1.0 U	--	--	ND
	66-67.2	7/16/1973	1.0 U	--	--	ND
G4	6-6	5/29/1973	56.0	--	--	56.0
	18-18	5/29/1973	54.0	--	--	54.0
	30-30	5/29/1973	54.0	--	--	54.0
	42-46.8	5/29/1973	61.0	--	--	61.0

Notes:
1. Concentrations are in milligrams per kilogram (mg/kg), equivalent to parts-per-million (ppm).
2. The combined result is the arithmetic average of all primary, duplicate, and split sample results.
3. ND = not detected
4. Data Qualifiers:
   J - The analyte was positively identified; however, the associated value is an estimated concentration.
   U - The analyte was not detected; the associated value is the analyte quantitation limit.
   NE - The value is estimated due to the presence of interferences.

TABLE A-2
SOIL ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
FORMER R&D PROPERTY (OU-9)

RCRA FACILITY INVESTIGATION REPORT VOLUME III
FMC CORPORATION - MIDDLEPORT, NEW YORK

Sample Location:		BH-J1
Sample Interval (Inches):		0 - 24
Sample Date:	Units[1]	11/04/93
1,1,1-Trichloroethane	mg/kg	0.0060 U
1,1,2-Trichloroethane	mg/kg	0.0060 U
1,1-Dichloroethene	mg/kg	0.0060 U
1,2-Dichloroethane	mg/kg	0.0060 U
Acetone	mg/kg	0.0070 J
Benzene	mg/kg	0.0060 U
Chlorobenzene	mg/kg	0.0060 U
Chloroform	mg/kg	0.0060 U
Ethylbenzene	mg/kg	0.0060 U
Methylene chloride	mg/kg	0.0020 J
Toluene	mg/kg	0.0060 U
Trichloroethene	mg/kg	0.0010 J
Xylene (total)	mg/kg	0.0060 U

Notes:
1. Concentrations are in milligrams per kilogram (mg/kg), equivalent to parts-per-million (ppm).
2. Data Qualifiers:
   J - The analyte was positively identified; however, the associated value is an estimated concentration.
   U - The analyte was not detected; the associated value is the analyte quantitation limit.

TABLE A-3
SOIL ANALYTICAL RESULTS - HERBICIDES
FORMER R&D PROPERTY (OU-9)

RCRA FACILITY INVESTIGATION REPORT VOLUME III
FMC CORPORATION - MIDDLEPORT, NEW YORK

Sample Location	Sample Interval[1] (inches)	Soil Herbicides Concentration (mg/kg)[2]		
		2,4-D	2,4,5-T	2,4,5-TP (Silvex)
B-1	0 - 6	0.053 U	0.013 U	0.013 U
	6 - 12	0.056 U	0.014 U	0.014 U
	12 - 18	0.054 U	0.014 U	0.014 U
	18 - 24	0.061 U	0.015 U	0.015 U
B-3	0 - 6	0.054 U	0.013 U	0.013 U
	6 - 12	0.055 U	0.014 U	0.014 U
	12 - 18	0.056 U	0.014 U	0.014 U
	18 - 24	0.057 U	0.014 U	0.014 U
C-1	0 - 6	0.054 U	0.014 U	0.014 U
	6 - 12	0.055 U	0.014 U	0.014 U
	12 - 18	0.055 UJ	0.014 UJ	0.014 UJ
	18 - 24	0.057 UJ	0.014 UJ	0.014 UJ
C-2	0 - 6	0.053 UJ	0.013 UJ	0.013 UJ
	6 - 12	0.057 UJ	0.014 UJ	0.014 UJ
	12 - 18	0.053 U	0.013 U	0.013 U
	18 - 24	0.056 U [0.057 U]	0.014 U [0.014 U]	0.014 U [0.014 U]
C-3	0 - 6	0.056 U	0.014 U	0.014 U
	6 - 12	0.055 U	0.014 U	0.014 U
	12 - 18	0.059 U	0.015 U	0.015 U
	18 - 24	0.060 U	0.015 U	0.015 U

Notes:

1. All samples collected on 07.24.2013.
2. Concentrations are in milligrams per kilogram (mg/kg), equivalent to parts-per-million (ppm).
3. [ ] = result for duplicate sample
4. Data qualifiers:

U = constituent analyzed for but not detected; associated value is the quantitation limit
UJ = reported quantitation limit is approximate

ARCADIS

Appendix B

2013 RFI Sampling Program Summary
(appears on CD only)

ARCADIS

APPENDIX B – 2013 SOIL INVESTIGATION SUMMARY

1. Background

By letter dated February 26, 2013, the New York State Department of Environmental Conservation (NYSDEC) and the United States Environmental Protection Agency (USEPA) (together the "Agencies") requested that FMC Corporation (FMC) submit a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan for Operable Unit 9 (OU-9) of FMC's Middleport, New York RCRA Facility. The Agencies identify OU-9 as comprising soil at the Former Research and Development Property (Former R&D Property). FMC submitted the *RCRA Facility Investigation (RFI) Work Plan – Former Research and Development Property (Operable Unit 9)* (RFI Work Plan) to the Agencies on April 26, 2013, proposing investigation activities to supplement existing data from prior investigation programs.

The RFI Work Plan was approved by the Agencies by letter dated May 1, 2013, and investigation activities were conducted during the summer of 2013. In summary, the work scope included soil sampling in the former locations of five greenhouses, with field screening for volatile organic compounds (VOCs) and laboratory analysis for the potential presence of herbicides and to further evaluate the horizontal and vertical extent of arsenic. This Appendix describes the sampling and analysis activities conducted under the RFI Work Plan in 2013, as follows:

- Task 1 – Pre-Sampling Activities
- Task 2 – Sample Collection and Analysis
- Task 3 – Data Validation and Presentation

2. Task 1 – Pre-Sampling Activities

From May to July 2013, FMC coordinated with the Agencies, the Niagara County Brownfield Development Corporation, and the Village of Middleport to obtain access to the Former R&D Property. After access permission was obtained from the Village of Middleport, FMC provided the Agencies with oral and written notification of the planned schedule for sampling activities.

The five sample locations proposed in the RFI Work Plan (purple dots on Figure B-1) were surveyed, staked in the field, and recorded by a New York State licensed surveyor (McIntosh & McIntosh) using a global positioning system (GPS) surveying unit to establish the horizontal and vertical coordinates (Table B-1). Buried utilities in the vicinity of the proposed borings were identified through: 1) review of historical utility and building plans for the Former R&D Property available in FMC records; 2) notification through Dig Safely New York and the Village of Middleport; and 3) ground penetrating radar (GPR).

3. Task 2 – Sample Collection and Analysis

Soil sampling was conducted by ARCADIS on July 24, 2013, using direct-push methods (i.e., Geoprobe®) and disposal liners, following the methods and procedures referenced in the RFI Work Plan. The weather conditions were dry during sampling. A representative of the NYSDEC was present during a portion of the sampling activities.

Soil cores were collected at each location continuously from surface grade to refusal on presumed bedrock (depth varied from 6.5 to 7.0 feet below surface grade). No staining or odors indicative of impacts were associated with any of the soil samples. All soil samples were screened in the field for total VOCs using a hand-held, portable photoionization detector (PID), and no detectable concentrations of VOCs were identified in any of the samples. Therefore, consistent with the RFI Work Plan, no samples were submitted for laboratory analysis of VOCs. A physical description of the soil samples is provided in Table B-1.

Soil samples were collected from each boring at 6-inch depth intervals from surface grade to refusal for laboratory analysis (47 samples total). To evaluate the potential presence of herbicides at the former greenhouse locations, soil samples collected from surface grade to a depth of 24 inches from each boring (20 samples total) were analyzed for 2,4-D, 2,4,5-T, and 2,4,5-TP (Silvex) by EPA Method 8151. Samples collected deeper than 24 inches were held at the laboratory for potential analysis of herbicides, but were not analyzed because no detectable concentrations were identified in the first 20 samples. To further evaluate the horizontal and vertical extent of arsenic in soil at the property, all 47 samples were analyzed for arsenic by EPA Method 6010. In addition to the primary field samples, quality assurance/quality control (QA/QC) samples were submitted for laboratory analysis, including one duplicate, one matrix spike, and one matrix spike duplicate for every 20 primary field samples analyzed. A summary of the samples analyzed is provided in the table below.

Sample Depth Interval	Herbicides		Arsenic	
	Primary Samples	QA/QC Samples	Primary Samples	QA/QC Samples
0 to 6 inches	5	0	5	0
6 to 12 inches	5	0	5	0
12 to 18 inches	5	0	5	0
18 to 24 inches	5	3	5	0
24 inches to refusal (12-inch intervals)	0	0	27	9
Totals	20	3	47	9

Sample analyses were conducted by New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) certified laboratories qualified to perform the required analyses, including Pace Analytical, Inc. of Schenectady, New York (ELAP ID #11078) for arsenic and Adirondack Environmental Services, Inc. of Albany, New York (ELAP ID #10709) for herbicides. Laboratory analysis methods and procedures, including quality assurance and quality control requirements, were conducted in accordance with the RFI Work Plan.

4. Task 3 – Data Validation and Presentation

The laboratory analytical results for the primary field samples and the QA/QC samples were validated by ARCADIS as specified in the RFI Work Plan. All sample results were found to be acceptable for use. The data validation reports and the laboratory analytical data reports are provided as Attachments B-1 and B-2, respectively.

Tables comparing the soil results to screening values and figures showing the horizontal and vertical distributions of arsenic are provided in RFI Report Volume III.