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RCRA Facility Investigation (RFI) Report

Volume X –

Suspected Air Deposition Study Area 2 (North of the Erie Canal and East of the Niagara/Orleans County Line)

FINAL October 2012

RCRA Facility Investigation (RFI) Report Volume X – Suspected Air Deposition Study Area 2 (North of the Erie Canal and East of the Niagara/Orleans County Line)

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Acronyms, Abbreviations, and Units of Measure

Agencies	NYSDEC and USEPA
AOC	Administrative Order on Consent
CMS	Corrective Measures Study
CRA	Conestoga-Rovers & Associates
FMC	FMC Corporation
mg/kg	milligrams per kilogram
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
UCL	Upper Confidence Level
USEPA	United States Environmental Protection Agency

1. Introduction

1.1 Overview

FMC Corporation (FMC) owns and operates a pesticide formulating facility located in the Village of Middleport and the Town of Royalton, New York (herein the "Facility, "Plant" or "Site"), which has been used for the manufacturing and/or formulation of pesticide products since the 1920s. The location of the Facility is indicated on Figure 1.1.

FMC has been implementing a comprehensive Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) to delineate and evaluate the presence of Site-related constituents in soil, surface water, sediment, soil gas, indoor air and/or groundwater at the Facility and off-site areas as a result of past releases of hazardous wastes and hazardous constituents from the Facility into the environment. In addition, the RFI has been performed to gather necessary data to support RCRA Corrective Measures Studies (CMS) on an area-specific-basis, as needed, to identify, evaluate and recommend appropriate corrective measures. The RFI is one of several related investigative, monitoring, and/or remedial programs being implemented to satisfy the terms and conditions of an Administrative Order on Consent (AOC) [Docket No. II RCRA-90-3008(h)-0209] entered into by FMC, the New York State Department of Environmental Conservation (NYSDEC), and the United States Environmental Protection Agency (USEPA), effective July 2, 1991 (USEPA, NYSDEC, and FMC 1991). The NYSDEC and USEPA are referred to herein jointly as "the Agencies."

Comprehensive RFI field investigation activities have been performed in numerous phases from 1993 to 2009 under the direction of the Agencies, in consultation with the New York State Department of Health (NYSDOH). In late 2005, FMC and the Agencies agreed that a multi-volume RFI Report would be prepared to present and summarize RFI sampling data and other investigation results on an area by area basis (referenced as "Study Areas"). Altogether, the multi-volume RFI Report is comprised of the following 11 volumes:

- Volume I Background and Related Information
- 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
- Volume III Former FMC Research and Development (R&D) Property
- Volume IV Culvert 105 and Flood Zone
- Volume V Tributary One and Flood Plain South of Pearson/Stone Roads
- Volume VI Tributary One and Flood Plain East of Stone Road to Confluence with Jeddo Creek
- Volume VII Jeddo Creek, Johnson Creek, and Associated Flood Plains
- Volume VIII Groundwater Investigations and Remediation Results
- Volume IX On-Site Soil, Surface Water, and Sediments

- Volume X Suspected Air Deposition Study Area 2 (North of the Erie Canal and East of the Niagara/Orleans County Line)
- Volume ES Comprehensive Executive Summary for all Volumes

To date four of eleven RFI Report volumes have been issued; 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. Descriptions of the off-site RFI Study Areas, current and historical operations at the Facility, current and historical land use, previous and ongoing environmental investigations and monitoring programs, previous and ongoing remedial activities, regional setting, and the results of Middleport area soil background studies conducted are provided in RFI Report Volume I. Draft RFI Report Volume X is the fifth RFI Report volume prepared and submitted by FMC.

1.2 RFI Report Volume X Objectives

RFI Report Volume X presents the RFI soil investigation results for soil in the off-site area potentially affected by historical air deposition north of the Erie Canal and east of the Niagara/Orleans county line (referred to herein as "Air Deposition Study Area 2"). The Study Area is proximate to, but does not include, the off-site area potentially affected by historical air deposition south of the Erie Canal and west of the Niagara/Orleans county line (referred to herein as "Air Deposition Study Area 1") described in RFI Report Volume II. The location of Air Deposition Study Area 2 is shown in yellow on Figure 1.2. For reference, also shown on Figure 1.2 are Air Deposition Study Area 1 (in gray) and the Facility (in cross-hatch). As discussed further in Section 3 of this document, with concurrence from the Agencies, sampling and analysis of soil in Air Deposition Study Area 2 was performed for arsenic. By letter to FMC dated January 27, 2010, the Agencies determined that the available data were sufficient to estimate the horizontal and vertical extent of Site-related arsenic in soil in Air Deposition Study Area 2, and directed that FMC propose a schedule for submittal of draft RFI Report Volume X for Air Deposition Study Area 2. FMC submitted a proposed schedule by letter dated February 24, 2010, followed by submittal by letter dated April 16, 2010 of a preliminary delineation. The Agencies approved that delineation, subject to conditions, by letter dated February 14, 2011, thereby triggering the submittal of a draft RFI Report in accordance with the schedule submitted on February 24, 2010.

The objectives of the RFI Report Volume X are to:

- Delineate the extent of potential Site-related arsenic that may be present in soil within Air Deposition Study Area 2 based on a comparison of soil arsenic data to a delineation criterion of 20 mg/kg, with consideration given to other factors (e.g., historical land use, data variability, wind patterns, ground features).

- Define the horizontal and vertical extent of areas proposed to be evaluated in a CMS.

- 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.

1.3 Document Organization

The remainder of this document is organized as follows:

Section 2 – Description of RFI Report Volume X Study Area: Provides background information for Air Deposition Study Area 2, including the identification of properties within the Study Area and current and former land use.

Section 3 – Soil Sampling and Analysis: Provides a summary of the soil sampling conducted in Air Deposition Study Area 2 and the laboratory analysis of those samples, including an evaluation of data usability per NYSDEC requirements.

Section 4 – Discussion of Potential Sources of Arsenic: Discusses studies conducted to estimate the background concentration of arsenic in Middleport soil, and information pertaining to potential non-FMC related anthropogenic sources of arsenic in Air Deposition Study Area 2.

Section 5 – Distribution of Arsenic in Soil in Air Deposition Study Area 2: Provides a summary of the horizontal and vertical distribution of arsenic in soil in Air Deposition Study Area 2, and an evaluation of potential sources of specific soil arsenic results above background.

Section 6 – Findings and Proposed CMS Study Area: Summarizes the findings of the investigations and data evaluations described in this RFI Report Volume X for Air Deposition Study Area 2, and provides the rationale for the proposed extent of the corresponding proposed CMS Study Area.

2. Description of RFI Report Volume X Study Area

This section presents a review of background information for Air Deposition Study Area 2, including the identification of properties and current and former land use.

2.1 Description of Air Deposition Study Area 2

By letters dated September 24, 2007 and March 10, 2008, the Agencies communicated their determinations that additional soil sampling and arsenic analysis was needed beyond the limits of Air Deposition Study Area 1 in the following two areas:

- Along and north of the Erie Canal property between the end of William Street and Sampling Location SS33 (within Air Deposition Area 1); and
- East of the Niagara / Orleans County Line between Sampling Locations WW36 and D36 (within Air Deposition Area 1).

Figure 1.2 includes labels indicating the location of William Street and the three above-referenced sampling locations. Air Deposition Study Area 2 (shown in yellow on Figure 1.2) includes all or portions of the following six properties: Properties R2a, R2b and R2c north of the Erie Canal and Properties R2d, R2e and R2f east of the county line.

2.2 Current and Historical Land Uses

Air Deposition Study Area 2 includes the Erie Canal Towpath north of the canal, wooded land and agricultural fields. Historical uses of the properties are indicated on Figure 2.1 and are summarized below, based on information obtained from aerial photographs provided in Appendix 2E of RFI Report Volume I and interviews of the property owners.

Property ID	Current Use	Historical Use
R2a	Towpath & Wooded land	Towpath & Wooded land
R2b	Agricultural field	Agricultural field (orchard in 1930s)
R2c	Agricultural field	Agricultural field
R2d	Agricultural field	Agricultural field
R2e	Wooded land	Wooded land
R2f	Wooded land	Agricultural field

3. Soil Sampling and Analysis

By letter dated November 10, 2008, FMC submitted to the Agencies Addendum No. 2 to the 2004 Soil Sampling Work Plan (referred to herein as "Addendum No. 2") with respect to the collection of soil samples at areas north of the Erie Canal and east of the county line and analysis of the samples for arsenic. By letter dated December 9, 2008, the Agencies, in consultation with the NYSDOH, approved Addendum No. 2.

3.1 Sample Collection

FMC began implementation of Addendum No. 2 in early 2009 and obtained written access permission for sampling at the six properties by early April 2009. The 54 sampling locations proposed in Addendum No. 2 were located and marked by a New York State licensed surveyor (McIntosh & McIntosh). Figure 3.1 shows the sampling locations and Table A-1 in Appendix A provides the surveyed coordinates and elevations of the sampling locations. As proposed in Addendum No. 2, the sampling locations were oriented on an approximate 200-foot grid, with two rows of 13 sampling locations (26 total) north of the Erie Canal and two columns of 14 sampling locations (28 total) east of the county line.

During the week of April 20, 2009, soil samples were collected from the 0- to 3-inch, 3- to 6-inch, 6- to 9-inch and 9- to 12-inch depth intervals at each of the 54 sampling locations. Primary and quality assurance/quality control (QA/QC) duplicates were collected by FMC and some split samples were collected by the Agencies. Altogether, FMC collected and analyzed 216 primary samples. Duplicate samples were collected for QA/QC purposes by FMC at a frequency of 1 per 20 primary samples (resulting in 11 duplicate samples), consistent with the approved Addendum No. 2. A representative of the NYSDEC was present during sampling, and collected split samples at a frequency of 1 per 10 primary samples (resulting in 21 primary split samples plus 1 duplicate split sample). Table 3.1 summarizes the number of sampling locations and number of each type of sample collected at each property. A physical description of the soil samples is provided in Appendix A (Table A-1).

3.2 Sample Analysis and Validation

All FMC samples were submitted to TestAmerica Laboratories, Inc. of Pittsburgh, Pennsylvania (NYSDOH Environmental Laboratory Accreditation Program [ELAP]-approved laboratory #11182) for analysis of total arsenic in accordance with Section 3 of Addendum No. 2. The laboratory analytical results for the FMC samples were validated by ARCADIS and found to be acceptable for use. Both the validation reports and the laboratory analytical data reports were submitted to the Agencies by FMC letter dated July 31, 2009. The Agencies' split samples were analyzed by Columbia Analytical Services, Inc., and those results were reviewed by the NYSDEC and provided to FMC by the Agencies.

By letter to FMC dated August 24, 2009, the Agencies concluded that the analytical results from both FMC's primary and duplicate samples and the Agencies' split samples exhibited acceptable precision and accuracy to be used as presented, and that there was good correlation between the FMC and Agencies' split sample results. The validated and accepted soil arsenic concentration results for both FMC's and the Agencies'

primary and QA/QC samples are provided in Appendix A for sampling locations north of the Erie Canal and east of the county line (Tables A-2 and A-3, respectively).

3.3 Combined Data Set

Consistent with the approach to be used in all RFI Report volumes, results for sample locations/intervals with duplicate and/or split samples are presented in this document. The results were also combined for a given unique sampling location and depth interval 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 results is as follows:

- If only a single analytical result existed for a sampling location/depth interval, that value was used as the combined result.
- If two or more analytical results (e.g., splits, duplicates) were reported for a sampling location/depth interval, the arithmetic average of all results for that sample was used as the combined result.
- If an analytical result was reported as not detected (ND), then a value of one-half the reported laboratory detection limit was used as the combined result (all samples in RFI Report Volume X have detectable concentrations).

The combined soil arsenic concentrations for the 216 soil sample locations/intervals (54 locations with four depths intervals each) collected from Air Deposition Study Area 2 are provided on Figure 3.1, organized by property.

4. Discussion of Potential Sources of Arsenic in Soil

Arsenic is a naturally occurring element in soil, and is also present in soil as a result of the use of a variety of man-made products and activities (also referred to as "anthropogenic sources"). The amount of arsenic in each soil sample collected in Air Deposition Study Area 2 consists or could consist of a combination of several sources, as follows:

- Natural geologic conditions
- Potential non-Site-related anthropogenic sources
- Potential historical air deposition from past operations at the FMC Facility

An evaluation of the extent of arsenic in soil in Air Deposition Study Area 2 that is potentially derived from historical releases from operations at the FMC Facility requires identification of the amount of arsenic present in soil due to natural geologic conditions and potential non-Site-related anthropogenic sources. This evaluation is complicated by the use of many products containing arsenic for agricultural and commercial purposes and in everyday life beginning in the late 1800s. To assist in this evaluation, FMC and the Agencies attempted to estimate the background levels of arsenic (from both natural conditions and non-FMC related anthropogenic sources) in soil representative of the Middleport area.

4.1 Potential Non-Site-Related Anthropogenic Sources

Potential anthropogenic sources of arsenic within Air Deposition Study Area 2 not related to past Facility operations include:

- Applying arsenic-containing pesticides at historical orchards (refer to green hatch areas shown on Figure 2.1) and in the treatment of trees
- Applying arsenic-containing pesticides, fertilizers, and lawn care and horticultural products (e.g., lime, potting soil, chicken manure) at agricultural fields, along railroad tracks, electrical power line corridors and the canal towpath, and in landscaping activities
- Using arsenic-containing wood treatment products and/or pressure-treated lumber in the construction of fences and other structures
- Burning and storing coal and depositing coal ash (it is reported that many homes in Middleport were formerly heated by coal and train engines formerly burned coal)
- Placement of arsenic-containing fill materials

References for these sources include http://pubs.usgs.gov/fs/2005/3152/, http://www.atsdr.cdc.gov/toxprofiles/index.asp, and http://www.dnrec.delaware.gov/whs/awm/SIRB/Pages/Arsenic.aspx. One or more of these sources may have been associated with some of the properties within Air Deposition Study Area 2. Historical land uses at properties in Air Deposition Study Area 2, including the former locations of orchards and agricultural land were discussed in Section 2.2 and are shown on Figure 2.1.

Arsenical pesticides were commonly used in Western New York in fruit orchards and for other agricultural purposes (reference Merwin et al 1994, Bishop et al 1961, Peryea 2004, Dragun et al 1991, Woolson 1975, Gianessi et al 1994, Woolson et al 1971). FMC and its predecessor companies (e.g., Niagara Sprayer) manufactured and managed common arsenical pesticides (e.g., calcium arsenate and lead arsenate) at the FMC Facility from approximately 1928 to 1974. Some of the arsenical pesticide products produced at the Facility could well have been used by others in the Middleport area for agricultural purposes (e.g., orchards, crop land) and other non-agricultural purposes (e.g., treatment of trees, weed control along railroad and power lines, other historical uses by local industries/businesses). While the presence of an historical orchard does not necessarily indicate that arsenic-based pesticides were used, or, if used at an orchard or other area, the extent of impact on soil arsenic concentrations, in the context of common practices at the time, such use can be reasonably inferred. The levels present now would depend on a number of factors including amounts applied, methods of application, concentrations of arsenic within the pesticide product, and the number of applications.

The varied and generally undocumented possible use of these materials does not provide a basis to determine the specific contribution to the arsenic in the Air Deposition Study Area 2 soils. The potential non-FMC related anthropogenic sources of arsenic discussed in this section are not unique to the Middleport area. The 2003 Gasport Background Study discussed in the following section was designed to investigate non-FMC related anthropogenic sources of arsenic in a soil environment similar to Middleport, and the resultant background data set is expected to generally account for typical arsenic concentrations associated with non-FMC related anthropogenic sources.

4.2 Background Levels of Arsenic in Middleport Soil

From 1985 to 2003, several sampling and analysis studies were conducted by FMC and/or the Agencies to characterize background arsenic concentrations in Middleport soil (refer to Section 6 of RFI Report Volume I for a detailed review of these studies). The most comprehensive study was the 2001-2003 Gasport background study, proposed by the Agencies in the Background Study Work Plan (Agencies 2001). This program was designed to provide a database of local area soil arsenic concentrations to support the calculation of background levels of arsenic in Middleport soil, weighted by the proportionate areas of different types of historical land uses.

To implement this program, FMC collected surface soil samples from orchards, agricultural fields, undeveloped wooded properties, public properties, and residential properties in the nearby Village of Gasport, which was selected based on its similar soil geology and similar pattern of historical land uses to those found in Middleport, and the fact that properties in Gasport would not have been potentially impacted by releases from the FMC Plant in Middleport. The results of the 2001-2003 Gasport background study were presented in the report titled Development of Arsenic Background in Middleport Soils (CRA 2003), which was approved by the Agencies in June 2003 and is provided in Appendix 6A of RFI Report Volume I. The data collected in the 2001-2003 Gasport background study are provided in Table B-1 in Appendix B, and are summarized by property type/usage (e.g., orchard, residential) in Table B-2.

The 2001-2003 Gasport data were then used in conjunction with the proportionate total area of historical land use types within a specific area in the Village of Middleport (called the "Middleport Study Area"), the bounds of which were defined in the Background Study Work Plan, to calculate an overall background level of arsenic in soil weighted by property type/usage (refer to Table B-3 in Appendix B).

In 2004, additional historical aerial photographs of the Middleport Study Area were identified. In 2007, FMC used these additional aerial photographs to revise the land use weighting factors (primarily those attributable to orchard land), and proposed re-calculated arsenic background levels based on the revised weighting factors and other changes in methodology. The Agencies reviewed the FMC proposal along with the additional aerial photographs, and determined that there was not a significant change in the amount of historical orchard land when considering the entire 1931-1978 time period, and as a result advised that the arsenic background levels calculated from the 2003 Background Study Report remain appropriate for use as arsenic comparison criteria. FMC agreed in a March 28, 2008 letter to the use of this criterion for delineation purposes in off-Site study areas, but reserved the right to present discussions in a CMS based on FMC's analysis of background data/conditions and other factors bearing on whether arsenic found in soil in a particular study area or portions of an area is attributable to releases from the FMC Facility.

4.3 Arsenic Soil Screening Level

In letters dated March 10, 2008 and September 24, 2007, the Agencies advised that the appropriate criterion for delineation of FMC-related arsenic in the Middleport area soil should be 20 mg/kg[1] (based on the weighted 95th percentile calculated in the 2001-2003 Gasport background study), but that other factors (e.g., historical land use, data variability, flood zone topography, wind patterns, ground features) may be considered. In its March 28, 2008 letter agreeing to use of the 20 mg/kg value for purposes of delineation of potential FMC-related arsenic in soils in off-Site study areas, FMC advised that it would also include in appropriate RFI and CMS Report volumes discussions of the information concerning the aerial photos that were found after completion of the 2001-2003 Soil Background Study and the revised historic land use percentages/weighting factors, and associated statistical values (including the weighted 95th and 98th percentiles) that FMC submitted to the Agencies in 2007 (transmitted by letter dated June 26, 2007) titled *Revised Evaluation of Background Arsenic Soil Concentrations in Middleport, New York*. FMC further advised that the revised land use weighting factors and associated statistical values would be estimated using both FMC's method based on the 2007 Report and the method that the Agencies suggested in their March 10, 2008 using a time-weight for each photo date. This information and estimations appear in Appendix B to this Volume X of the RFI Report.

[1] Milligrams per kilogram (mg/kg); equivalent to parts-per-million (ppm)

5. Distribution of Arsenic in Soil in Air Deposition Study Area 2

This section presents the statistics of the soil arsenic data set for Air Deposition Study Area 2 by property and location, the vertical and horizontal distribution of the data set, and a weight-of-evidence evaluation of the potential source of arsenic observed above background at specific locations.

5.1 Statistics of the Soil Arsenic Data by Property and Location

The statistics of the soil arsenic data set (collected at all depths) are provided in Table 5.1, organized both by property and by location (i.e., whether north of the Erie Canal or east of the county line). The statistics include the number of samples and the minimum, maximum, arithmetic mean of surface soil (i.e., 0- to 3-inch depth interval), arithmetic mean of all soil depth intervals, and 95% upper confidence level (UCL) of the soil arsenic data.

5.2 Horizontal Extent of Soil Arsenic

The maximum soil arsenic concentration observed (at any depth interval) at each sampling location is shown on Figure 5.1. Sampling locations with a maximum concentration above 20 mg/kg are color-coded (24 locations), while locations with a maximum concentration less than 20 mg/kg are not shaded (30 locations). The spatial distribution of soil arsenic concentrations above 20 mg/kg in each depth interval (0- to 3-inch, 3- to 6-inch, 6- to 9-inch and 9- to 12-inch) is shown (by color coding of sampling locations) on Figures 5.2 through 5.5, respectively. Figures 5.2 through 5.4 were generated using Mining Visualization System (MVS), a two-dimensional model that interpolates between data points, independently for each depth interval (0- to 3-inch, 3- to 6-inch and 6- to 9-inch, respectively). In Figure 5.5 (9- to 12-inch depth interval), only the sample location is color-coded (i.e., no interpolation between data points).

Soil arsenic concentrations in the 13 sampling locations farthest north of the Erie Canal and the 14 sampling locations farthest east of the county line are below or slightly above 20 mg/kg (with allowance for normal sample variability), except for two samples (Sample R2c-NN23, 9-12” north of the Erie Canal and Sample R2e-T40, 0-3” east of the county line). A discussion of the potential sources of soil arsenic at these two sampling locations is provided in Section 5.4 below.

5.3 Vertical Extent of Soil Arsenic

A frequency plot of the percentage of samples below a particular soil arsenic concentration is provided in Figure 5.6 for all data collected from each of the 0- to 3-inch, 3- to 6-inch, 6- to 9-inch and 9- to 12-inch depth intervals. The frequency distributions for the 0- to 3-inch and 3- to 6-inch depth intervals are very similar, while the distributions for the two deeper intervals contain substantially more data points with lower concentrations. Approximately 96% (52 of 54) of all samples collected in the 9- to 12-inch depth interval have soil arsenic concentrations below 20 mg/kg. As shown on Figure 5.5, the soil samples collected in the 9- to 12-inch depth interval with arsenic concentration results above 20 mg/kg are at locations R2a-PP19 (26.1 mg/kg) and R2c-NN23 (30.0 mg/kg).

5.4 Potential Non-FMC Soil Arsenic Concentrations

Soil affected by air deposition of arsenic from the FMC Facility would be expected to exhibit the following characteristics (in the absence of other factors discussed below):

- Concentrations that decrease with increasing distance from the Facility, with the areal extent predominantly to the north and northeast based on historical wind patterns
- Concentrations that do not vary significantly over short distances in the cross-wind direction (i.e., concentrations at locations the same distance and in the same direction from the Facility should be similar)
- Concentrations that are higher at the surface and decrease with increasing depth below grade

In Air Deposition Study Area 1 (see RFI Report Volume II), it was found that soil arsenic concentrations do not always exhibit the above-referenced characteristics, with deviations more pronounced at the outer limits of the study area. In some locations it was necessary to distinguish those soil arsenic conditions that are potentially the result of air deposition from the Facility from those soil arsenic conditions that may be the result of other sources due to a number of uncertainties, including:

- Other anthropogenic sources of arsenic may be present
- Activities may have occurred to move the soil after air deposition occurred (such as excavation, tilling or re-grading)
- The modeling of potential air deposition that was conducted in 1996 was subject to a number of uncertainties, including simulation of air movement and the limited data available on historical air emissions from the Facility
- Variable weather conditions (wind direction, wash-out by flooding)

Therefore, based on a "weight-of-evidence" approach, FMC concludes that soil arsenic concentrations above background at sampling location R2c-NN23 north of the Erie Canal and at Property R2e (locations R2e-T38 and R2e-T40) east of the county line are not likely to be associated with historical air deposition from the Facility. The bases for this conclusion are the lower soil arsenic concentrations at sampling locations the same distance from the FMC Facility on either side of these sampling locations (cross-wind, inasmuch as the prevailing wind direction is from the southwest to the northeast), and the characteristics of the immediate areas around the sampling locations.

Sampling location R2c-NN23 is situated along a surface water drainage ditch (Culvert 104) that receives surface water runoff from surrounding farm land and properties south of the Erie Canal (see Appendix C for the Agencies' findings regarding historical drainage to Culvert 104). Soil arsenic concentrations detected at this location (21.9 to 30.0 mg/kg) are within the range of concentrations observed at wooded/overgrown/ agricultural properties (3.1 to 56.7 mg/kg, including outliers) in the Gasport Soil Background Study (see Table B-2 of Appendix B). In addition, soil arsenic concentrations at this location increase with depth, which is not consistent with air deposition.

Sampling locations R2e-T38 and R2e-T40 are situated on a small triangular overgrown parcel (Property R2e) between mainline railroad tracks and an electrical power line corridor, with a historical trolley line formerly passing through the property. Given the historical use of the property and its proximity to the mainline railroad tracks and an electrical power line corridor, it is possible that arsenical pesticides have been used on the property. Railroad ties, old posts and debris are evident on the property. Soil arsenic concentrations detected at this location (7.2 to 34.6 mg/kg) are within the range of concentrations observed at wooded/overgrown/agricultural properties (3.1 to 56.7 mg/kg, including outliers) in the Gasport Soil Background Study (see Table B-2 of Appendix B). In addition, soil arsenic concentrations at sampling locations immediately to the north and south of these locations are lower (at or near 20 mg/kg), supporting the existence of an arsenic source or sources other than air deposition from the Facility.

6. RFI Findings and Proposed CMS Area

A review of the information and analytical data collected for Air Deposition Study Area 2 during the RFI yielded the following findings:

1. Soil arsenic in Air Deposition Study Area 2 has been adequately characterized and delineated. This data set includes arsenic results of soil samples collected from 54 locations and four depth intervals (i.e., the 0- to 3-inch, 3- to 6-inch, 6- to 9-inch and 9- to 12-inch depth intervals).
2. With consideration given to other factors (e.g., data variability, wind patterns, ground features, historical land use), the horizontal and vertical extent of arsenic has been delineated relative to 20 mg/kg in soil in Air Deposition Study Area 2.
3. A weight-of-evidence approach was used to identify sample locations where soil arsenic concentrations above background are not likely attributable to historical air deposition from the Facility. However, these locations have been conservatively included in the proposed area to be evaluated in a CMS for Air Deposition Study Area 2.
4. The information and data are sufficient to support the performance of a CMS, if one is determined to be needed.

Properties and areas proposed for inclusion in a CMS are highlighted green on Figure 6.1. Where the extent of arsenic is not bound by analytical results below 20 mg/kg, the proposed CMS area was estimated to extend approximately 200 feet beyond the farthest sampling locations from the Facility, or to the boundary of the subject property, whichever occurs first. Inclusion in a CMS does not necessarily rule out the possibility that other non-FMC related sources may be contributing to the soil concentration of arsenic at some locations. If a CMS is performed, it will evaluate the need for and the nature and scope of any final corrective measures consistent with the existing Corrective Action Objectives established by the Agencies for soil in off-Site study areas.

References

Agencies. 2001. Program to Determine Extent of FMC-Related Arsenic Contamination in Middleport Soil - Part A - Work Plan for Development of Arsenic Background in Middleport Soil (April, revised November).

Agencies. 2007. Letter to Mr. Brian McGinnis, FMC Corporation, from Mr. Matt Mortefolio, NYSDEC and Mr. Michael Infurna, USEPA. Agencies' directives on outstanding issues regarding RFI and CMS. September 24, 2007.

Agencies. 2008a. Letter to Mr. Brian McGinnis, FMC Corporation, from Mr. Matt Mortefolio, NYSDEC and Mr. Michael Infurna, USEPA. Agencies' confirmation of agreements and resolution of outstanding issues regarding RFI and CMS. March 10, 2008.

Agencies. 2008b. Letter to Mr. Brian McGinnis, FMC Corporation, from Mr. Matt Mortefolio, NYSDEC and Mr. Michael Infurna, USEPA. Agencies' approval of FMC's Addendum No. 2 to the July 2004 Soil Sampling Work Plan for Areas Potentially Affected by Historic Air Deposition. December 9, 2008.

Agencies. 2009. Letter to Mr. Brian McGinnis, FMC Corporation, from Mr. Matt Mortefolio, NYSDEC and Mr. Michael Infurna, USEPA. Agencies' determination that the analytical results from both FMC's primary and duplicate samples and the Agencies' split samples from the April 2009 sampling event exhibited acceptable precision and accuracy to be used as presented. August 24, 2009.

Agencies. 2010. Letter to Mr. Brian McGinnis, FMC Corporation, from Mr. Matt Mortefolio, NYSDEC and Mr. Michael Infurna, USEPA. Agencies' determination of sufficient data in Air Deposition Study Area 2 to complete RFI characterization and delineation. January 27, 2010.

Agencies. 2011. Letter to Mr. Brian McGinnis, FMC Corporation, from Mr. Matt Mortefolio, NYSDEC and Mr. Michael Infurna, USEPA. Agencies' determination of sufficient data in Air Deposition Study Area 2 to estimate horizontal and vertical extent of arsenic, and request for submission of a figure(s) showing estimated horizontal extent of FMC-related soil arsenic. February 14, 2011.

ARCADIS. 2009. RCRA Facility Investigation Report – 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 (September).

ARCADIS and AMEC Geomatrix. 2009. RCRA Facility Investigation Report – Volume I – Background and Related Information (September).

Bishop, R.F. and D. Chisholm. 1961. "Arsenic Accumulation in Annapolis Valley Orchard Soils," Canadian Journal of Soil Science, Vol. 42, pp. 77-80. 1961.

BBL. 2004. Soil Sampling Work Plan for Areas Potentially Affected by Historic Air Deposition (July).

CRA. 2003. Development of Arsenic Background in Middleport Soils (February).

Dragun, J. and A. Chiasson. 1991. Elements in North American Soils. Hazardous Materials Control Resources Institute. 1991.

FMC. 2008a. Letter to Mr. Matt Mortefolio, NYSDEC and Mr. Michael Infurna, USEPA, from Mr. Brian McGinnis, FMC Corporation. FMC Corporation's response to Agencies' letter dated March 10, 2008. March 28, 2008.

FMC. 2008b. Addendum No. 2 to the July 2004 Soil Sampling Plan – Areas Potentially Affected by Historical Air Deposition, FMC Corporation, Middleport, New York (November 10, 2008).

FMC. 2009. Letter to Mr. Matt Mortefolio, NYSDEC and Mr. Michael Infurna, USEPA, from Mr. Brian McGinnis, FMC Corporation. FMC's submittal of validated soil analytical results from the April 2009 sampling event. July 31, 2009.

FMC. 2010a. Letter to Mr. Matt Mortefolio, NYSDEC and Mr. Michael Infurna, USEPA, from Mr. Brian McGinnis, FMC Corporation. FMC's submittal of proposed schedule for submittal of preliminary delineation and draft RFI Report Volume X. February 24, 2010.

FMC. 2010b. Letter to Mr. Matt Mortefolio, NYSDEC and Mr. Michael Infurna, USEPA, from Mr. Brian McGinnis, FMC Corporation. FMC's submittal of preliminary delineation of soil arsenic in Air Deposition Study Area 2. April 16, 2010.

Gianessi, L.P. and M. Phillips. 1994. "Pesticide Use in U.S. Apple Orchards: A Short History," National Center for Food and Agriculture Policy Discussion Paper PS-94-2 October. Washington DC. (October).

Merwin, I., P. Pruyne et al. 1994. "Persistence, Phytotoxicity and Management of Arsenic, Lead and Mercury Residues in Old Orchard Soils in New York," Chemosphere, Vol. 29, No. 6, pp. 1361-1367. 1994.

Peryea, F.J. 2004. "Historical Use of Lead Arsenate Insecticides, Resulting Soil Contamination and Implications for Soil Remediation," Tree Fruit Research & Extension Center, Washington State University, updated as of July 2004.

USEPA, NYSDEC and FMC Corporation. 1991. Administrative Order on Consent [Docket No. II RCRA-90-3008(h)-0209] entered into by FMC, NYSDEC and USEPA, effective July 2, 1991.

Woolson, E.A. et al. 1971. "The Chemistry and Phytotoxicity of Arsenic in Soils: I. Contaminated Field Soils," Soil Sci. Soc. Amer. Proc., Vol. 35, 1971.

Woolson, E.A., ed. 1975. "Arsenical Pesticides – A Symposium Sponsored by the Division of Pesticide Chemistry at the 168th Meeting of the American Chemical Society, Atlantic City, NJ, Sept. 9, 1974," American Chemical Society, 1975.

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Tables

TABLE 3.1
SAMPLE INVENTORY OF SOIL ANALYTICAL DATA SET

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

Property	Number of Sampling Locations	Number of FMC Samples		Number of Agencies' Split Samples	
		Primary	Duplicate	Primary	Duplicate
R2a	13	52	2	6	0
R2b	7	28	1	3	1
R2c	6	24	2	2	0
R2d	10	40	2	4	0
R2e	2	8	1	1	0
R2f	16	64	3	5	0
Total	**54**	**216**	**11**	**21**	**1**

Notes:

1. FMC primary samples represent the results of the initial sample collected at that specific location and depth interval.
2. FMC duplicate samples were collected at the same time as the primary sample to verify that the sample collection and analysis methods produced consistent results. The duplicate samples were collected at a rate of approximately 5% (i.e., 1 for every 20 FMC primary samples collected). This rate is averaged over the entire sampling event.
3. NYSDEC split samples were collected to verify that sample collection and analysis procedures were not biased over the course of the sampling event. NYSDEC split samples were collected at a rate of approximately 10%.

TABLE 5.1
STATISTICAL SUMMARY OF SOIL ARSENIC DATA BY PROPERTY AND LOCATION

RCRA FACILITY INVESTIGATION
FMC CORPORATION - MIDDLEPORT, NEW YORK

	Number of Samples	Arsenic Concentration (mg/kg)					Distribution	95% UCL Method
		Minimum	Maximum	Average Surface (0-3")	Average All Depths	95% UCL		
Property								
R2a	52	2.7	49.3	22.8	18.5	20.9	Normal	95% Student's-t UCL
R2b	28	2.5	24.7	17.4	14.2	16.1	Normal	95% Student's-t UCL
R2c	24	2.1	30.0	15.9	14.6	17.1	Normal	95% Student's-t UCL
R2d	40	3.3	20.3	15.3	12.8	16.3	Nonparametric	95% Chebyshev (Mean, Sd) UCL
R2e	8	7.2	34.6	32.7	20.8	28.2	Normal	95% Student's-t UCL
R2f	64	2.7	36.1	18.3	14.4	15.7	Normal	95% Student's-t UCL
Location								
North of Canal	104	2.1	49.3	19.8	16.4	18.0	Gamma	95% Approximate Gamma UCL
East of County Line	112	2.7	36.1	18.3	14.3	15.3	Normal	95% Student's-t UCL

Notes:

1. Distribution assessed by goodness-of-fit tests using ProUCL 4.1.00 at a 95% upper confidence level (UCL) ($\alpha = 0.05$).

Distributions:

Normal (N): data set follows a normal distribution, according to the Shapiro-Wilk test.

Gamma (G): data set follows a gamma distribution, according to the Kolmogorov-Smirnov test.

Lognormal (Ln): data set follows a lognormal distribution, according to the Shapiro-Wilk test.

Nonparametric (NP): data set does not follow any of the three distributions noted above.

References:

USEPA. 2010. ProUCL Version 4.1.00 Technical Guide (Draft). Office of Research and Development. EPA/600/R-07/041. May.

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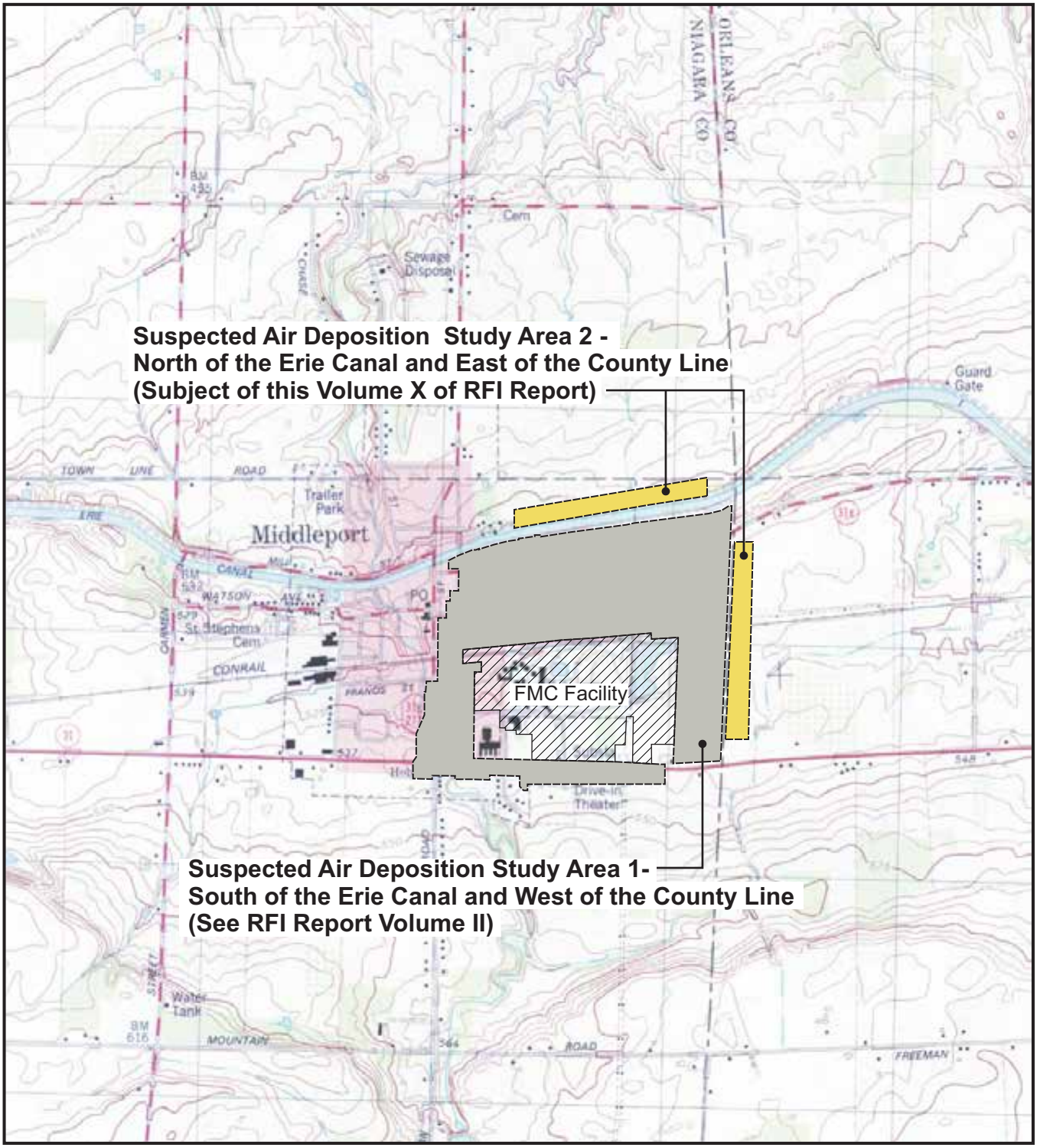
Figures



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 - VOLUME X

LOCATION MAP

ARCADIS

FIGURE **1.1**

05/05/2011 SYRACUSE,NY-ENV/CAD-KLS, DJHOWES
B0037735/0000/00007/CDR/37735N01.CDR

TOWN OF HARTLAND
VILLAGE OF MIDDLEPORT
TOWN OF ROYALTON
TOWN OF RIDGEWAY
TOWN OF SHELBY

R2b
R2c
R2a

CULVERT 104
(APPROXIMATE LOCATION)

NEW YORK STATE BARGE CANAL

SAMPLE LOCATION SS33

SAMPLE
LOCATION
WW36

WILLIAM STREET

R2d

NIAGARA/ORLEANS COUNTY LINE

R2e

R2f

FMC FACILITY

VILLAGE OF MIDDLEPORT
VILLAGE OF ROYALTON

NIAGARA STREET

TOWN OF ROYALTON
TOWN OF SHELBY

SAMPLE LOCATION D36

AIR DEPOSITION STUDY AREA 2 (YELLOW)

LEGEND:

- APPROXIMATE PROPERTY BOUNDARY
- CULVERT (BURIED SECTION)
- OPEN DITCH/EDGE OF WATER
- R2d — PROPERTY IDENTIFICATION
- AIR DEPOSITION STUDY AREA 1 (GRAY)
- AIR DEPOSITION STUDY AREA 2 (YELLOW)

NOTES:

1. BASEMAP OBTAINED FROM A FIGURE BY CONESTOGA–ROVERS AND ASSOCIATES TITLED "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. PROPERTY IDENTIFICATION NUMBERS SHOWN ARE NOT RELATED TO STREET ADDRESSES OR TAX PARCEL IDS.

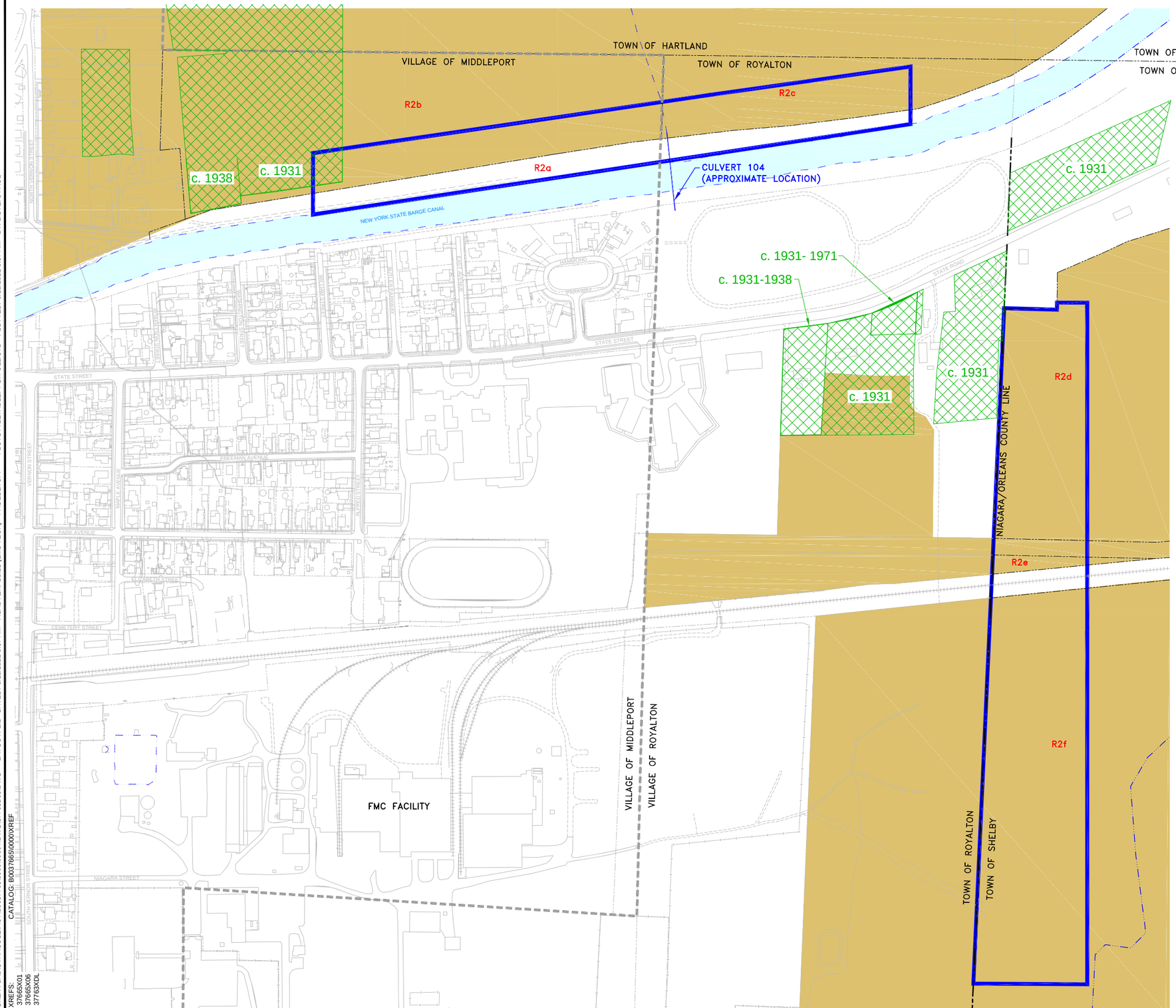
0 200' 400'
APPROXIMATE GRAPHIC SCALE

FMC CORPORATION - MIDDLEPORT, NEW YORK
RCRA FACILITY INVESTIGATION - VOLUME X

IDENTIFICATION OF STUDY AREA

ARCADIS

FIGURE
1.2



LEGEND:

- APPROXIMATE PROPERTY BOUNDARY
- CULVERT (BURIED SECTION)
- OPEN DITCH/EDGE OF WATER
- R2d — PROPERTY IDENTIFICATION
- AIR DEPOSITION STUDY AREA 2
- HISTORICAL ORCHARDS
- HISTORICAL FARM FIELDS

NOTES:

1. BASEMAP OBTAINED FROM A FIGURE BY CONESTOGA–ROVERS AND ASSOCIATES TITLED "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. PROPERTY IDENTIFICATION NUMBERS SHOWN ARE NOT RELATED TO STREET ADDRESSES OR TAX PARCEL IDS.
4. HISTORICAL ORCHARD AND FARM FIELD LOCATIONS WERE IDENTIFIED BASED ON REVIEW OF AERIAL PHOTOGRAPHS DATED 1931, 1938, 1951, 1958, 1966, 1968, 1971, 1973, 1977, 1978, 1995, 2002, AND 2010.
5. DATES ON HISTORICAL ORCHARDS INDICATE MINIMUM TIME PERIOD AS SHOWN ON THE HISTORICAL RESOURCES. THE DEPICTED LIMITS OF HISTORICAL ORCHARDS ARE SUBJECT TO INTERPRETATION OF AVAILABLE AERIAL PHOTOGRAPHS AND PROFESSIONAL JUDGEMENT. THE AGENCIES DO NOT NECESSARILY AGREE IN EVERY CASE WITH THE INTERPRETATION OF THE DEPICTED LIMITS OF THE HISTORICAL ORCHARD AREAS ON THIS FIGURE.

0 200' 400'
APPROXIMATE GRAPHIC SCALE

FMC CORPORATION - MIDDLEPORT, NEW YORK
RCRA FACILITY INVESTIGATION - VOLUME X

HISTORICAL LAND USES AT PROPERTIES WITHIN AND ADJOINING AIR DEPOSITION STUDY AREA 2

ARCADIS

FIGURE
2.1

SOIL ARSENIC CONCENTRATIONS NORTH OF THE ERIE CANAL (MG/KG)

Sample Location	Sample Depth Interval (inches) 0 - 3	3 - 6	6 - 9	9 - 12
Property R2a				
R2a-PP9	11.1	13.2	12.9	9.0
R2a-PP11	22.1	28.6	17.7	13.6
R2a-PP13	16.3	24.9	11.0	8.7
R2a-PP15	21.6	23.1	16.3	8.4
R2a-PP17	19.8	14.2	5.1	2.7
R2a-PP19	38.6	37.3	49.3	24.1
R2a-PP21	38.9	33.7	23.9	7.1
R2a-PP23	23.2	27.9	19.3	6.8
R2a-PP25	27.2	30.7	14.1	4.4
R2a-PP27	28.8	25.4	20.6	13.4
R2a-PP29	24.8	28.2	15.2	6.8
R2a-PP31	22.1	22.8	14.7	5.3
R2a-PP33	8.9	7.7	12.4	11.8
Property R2b				
R2b-NN9	22.8	33.8	21.9	13.4
R2b-NN11	12.4	10.8	7.8	5.4
R2b-NN13	12.4	12.1	16.4	8.7
R2b-NN15	19.4	13.2	14.0	6.3
R2b-NN17	18.7	17.6	18.9	10.1
R2b-NN19	23.2	21.8	24.7	8.3
R2b-NN21	19.0	15.4	11.2	2.8
Property R2c				
R2c-NN23	21.8	24.8	28.1	30.8
R2c-NN25	18.5	19.7	22.8	4.4
R2c-NN27	13.8	15.6	12.6	6.3
R2c-NN29	15.8	13.7	6.8	2.1
R2c-NN31	13.4	17.1	9.9	3.7
R2c-NN33	14.3	12.6	13.9	11.9

SOIL ARSENIC CONCENTRATIONS EAST OF THE COUNTY LINE (MG/KG)

Sample Location	Sample Depth Interval (inches) 0 - 3	3 - 6	6 - 9	9 - 12
Property R2d				
R2d-V38	17.1	18.1	15.3	6.2
R2d-V40	15.9	20.0	15.3	3.8
R2d-W38	14.4	15.3	15.6	19.7
R2d-W40	16.2	14.8	13.2	6.7
R2d-X38	19.4	30.1	13.8	4.9
R2d-X40	15.8	14.1	11.3	4.9
R2d-YY38	16.2	19.0	11.9	6.7
R2d-YY40	16.3	13.8	16.7	6.7
R2d-Z38	15.8	15.1	12.5	4.1
R2d-Z40	19.8	14.0	8.2	3.3
Property R2e				
R2e-T38	30.8	30.8	12.8	6.1
R2e-T40	34.8	28.8	16.9	7.2
Property R2f				
R2f-D38	19.1	6.1	4.1	3.8
R2f-D40	23.8	15.6	10.7	4.1
R2f-F38	12.8	17.3	11.0	13.3
R2f-F40	13.6	14.7	16.9	13.5
R2f-H38	16.2	16.6	16.9	6.8
R2f-H40	11.1	14.3	13.8	7.8
R2f-J38	30.1	19.6	17.0	14.8
R2f-J40	16.8	17.3	12.9	8.9
R2f-L38	30.8	31.3	9.5	5.2
R2f-L40	16.8	18.6	17.8	16.4
R2f-N38	22.4	19.6	9.2	14.8
R2f-N40	17.8	17.4	13.1	6.9
R2f-P38	19.1	30.2	20.1	5.5
R2f-P40	17.8	20.1	8.9	4.4
R2f-R38	20.9	22.4	20.1	6.8
R2f-R40	19.0	18.5	11.0	3.7

LEGEND:

- APPROXIMATE PROPERTY BOUNDARY
- CULVERT (BURIED SECTION)
- OPEN DITCH/EDGE OF WATER
- R2d — PROPERTY IDENTIFICATION
- ● — APRIL 2009 SOIL SAMPLE LOCATION IN AIR DEPOSITION STUDY AREA 2 (PURPLE)

ARSENIC CONCENTRATIONS ARE:

1. PRESENTED IN MILLIGRAMS PER KILOGRAM (MG/KG); EQUIVALENT TO PARTS PER MILLION (PPM).
2. THE ARITHMETIC AVERAGE OF ALL PRIMARY, DUPLICATE AND SPLIT SAMPLE RESULTS FOR EACH SAMPLE.
3. SHADED PINK IF GREATER THAN 20.0 MG/KG.

NOTES:

1. BASEMAP OBTAINED FROM A FIGURE BY CONESTOGA–ROVERS AND ASSOCIATES TITLED "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. PROPERTY IDENTIFICATION NUMBERS SHOWN ARE NOT RELATED TO STREET ADDRESSES OR TAX PARCEL IDS.

0 200' 400'
APPROXIMATE GRAPHIC SCALE

FMC CORPORATION - MIDDLEPORT, NEW YORK
RCRA FACILITY INVESTIGATION - VOLUME X

SOIL SAMPLING LOCATIONS AND ARSENIC CONCENTRATIONS

ARCADIS

FIGURE **3.1**

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DV DB: P. LISTER LD: P. LISTER PM/TM: T. YOUNG TR: D. WRIGHT LYR:ON=*;OFF=REF, (FRZ)
G:\ENVCAD\SYRACUSE\ACTIB\03776300\000004\DWG\37763B100.DWG LAYOUT: 3.1 SAVED: 9/18/2012 10:16 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 9/18/2012 10:16 AM BY: LISTER, PAUL
CATALOG B00376650000XREF
XREFS:
37665X01
37665X06
37763XDL

TOWN OF HARTLAND
VILLAGE OF MIDDLEPORT
TOWN OF ROYALTON
TOWN OF RIDGEWAY
TOWN OF SHELBY
ERIE CANAL
CULVERT 104
(APPROXIMATE LOCATION)
R2a
R2b
R2c
R2d
R2e
R2f
NIAGARA/ORLEANS COUNTY LINE
TOWN OF ROYALTON
TOWN OF SHELBY
FMC FACILITY
STATE STREET
NIAGARA STREET
PARK AVENUE
CEMETERY STREET
FREEMAN AVENUE
HAMMOND PARKWAY
VERNON STREET
MAPLE AVENUE
ASHER STREET
SOUTH VERNON STREET

NN9 22.8
NN11
NN13
NN15
NN17
NN19 24.7
NN21
NN23 30.0
NN25 22.0
NN27
NN29
NN31
NN33

PP9
PP11 22.1
PP13 20.9
PP15 23.8
PP17
PP19 49.3
PP21 39.7
PP23 27.9
PP25 30.7
PP27 26.4
PP29 26.2
PP31 22.5
PP33

WW38 WW40
YY38 YY40
Z38 Z40
X38 20.3 X40
V38 V40
T38 30.8 T40 34.6
R38 22.4 R40
P38 23.1 P40 22.3
N38 22.4 N40
L38 21.2 L40
J38 36.1 J40
H38 H40
F38 F40
D38 D40 23.8

LEGEND:
- APPROXIMATE PROPERTY BOUNDARY
- COUNTY LINE
- CULVERT (BURIED PIPE)
- OPEN DITCH/EDGE OF WATER
- R2d — PROPERTY IDENTIFICATION
- SOIL SAMPLING LOCATION
- WW40 — SAMPLING LOCATION ID
- 23.8 — MAXIMUM SOIL ARSENIC CONCENTRATION (mg/kg):
  - <20 (NO SHADE)
  - 20 – 25
  - 25 – 30
  - 30 – 40
  - 40 – 50

NOTES:

1. BASEMAP OBTAINED FROM A FIGURE BY CONESTOGA–ROVERS AND ASSOCIATES TITLED "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. PROPERTY IDENTIFICATION NUMBERS SHOWN ARE NOT RELATED TO STREET ADDRESSES OR TAX PARCEL IDS.
4. SAMPLING LOCATIONS WITH A MAXIMUM CONCENTRATION LESS THAN 20 mg/kg ARE SHOWN WITHOUT SHADING.

0 200' 400'
APPROXIMATE GRAPHIC SCALE

FMC CORPORATION - MIDDLEPORT, NEW YORK
RCRA FACILITY INVESTIGATION - VOLUME X

SOIL SAMPLING LOCATIONS WITH MAXIMUM ARSENIC CONCENTRATION ABOVE 20 mg/kg

ARCADIS

FIGURE
5.1

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DV DB: P. LISTER LD: P. LISTER PM/TM: T. YOUNG TR: D. WRIGHT LYR:ON=*;OFF=REF, (FRZ)
G:\ENV\CAD\SYRACUSE\ACTIVE\B003776300000000041DWG\3776381O.DWG LAYOUT: 5.1 SAVED: 9/18/2012 2:14 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 9/18/2012 2:15 PM BY: LISTER, PAUL
CATALOG: B0037665000000XREF
XREFS:
377631XDL
376652X06

TOWN OF HARTLAND

VILLAGE OF MIDDLEPORT

TOWN OF ROYALTON

TOWN OF RIDGEWAY

TOWN OF SHELBY

R2b

R2a

R2c

R2d

R2e

R2f

NN9 NN11 NN13 NN15 NN17 NN19 NN21 NN23 NN25 NN27 NN29 NN31 NN33

PP9 PP11 PP13 PP15 PP17 PP19 PP21 PP23 PP25 PP27 PP29 PP31 PP33

WW38 WW40

YY38 YY40

Z38 Z40

X38 X40

V38 V40

T38 T40

R38 R40

P38 P40

N38 N40

L38 L40

J38 J40

H38 H40

F38 F40

D38 D40

ERIE CANAL

CULVERT 104
(APPROXIMATE LOCATION)

NIAGARA/ORLEANS COUNTY LINE

FMC FACILITY

STATE STREET

SOUTH STREET

NIAGARA STREET

PARK AVENUE

CEMETERY STREET

FREEMAN AVENUE

ELIZABETH STREET

HAMMOND PARKWAY

MAIN STREET

NORTH VERNON STREET

SOUTH VERNON STREET

MAPLE AVENUE

ALFRED STREET

LEGEND:

- APPROXIMATE PROPERTY BOUNDARY
- COUNTY LINE
- CULVERT (BURIED PIPE)
- OPEN DITCH/EDGE OF WATER
- R2d — PROPERTY IDENTIFICATION
- • — SOIL SAMPLING LOCATION
- WW40 — SAMPLING LOCATION ID

SOIL ARSENIC CONCENTRATION (ppm):

- <20 (NO SHADE)
- 20 – 25
- 25 – 30
- 30 – 40
- 40 – 50

NOTES:

1. BASEMAP OBTAINED FROM A FIGURE BY CONESTOGA–ROVERS AND ASSOCIATES TITLED "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. PROPERTY IDENTIFICATION NUMBERS SHOWN ARE NOT RELATED TO STREET ADDRESSES OR TAX PARCEL IDS.
4. SAMPLING LOCATIONS WITH AN ARSENIC CONCENTRATION LESS THAN 20 mg/kg ARE SHOWN WITHOUT SHADING.
5. MODEL INPUT DATA WERE SOIL (0– TO 3–INCH DEPTH RANGE) ARSENIC CONCENTRATIONS FROM LOCATIONS SHOWN ON THIS FIGURE AND IN SUSPECTED AIR DEPOSITION STUDY AREA #1. THE DATA WERE ENTERED INTO MINING VISUALIZATION SYSTEM (VERSION 7.3), WHICH INTERPOLATED ARSENIC CONCENTRATIONS BETWEEN SAMPLED LOCATIONS TO PRODUCE THE COLOR–CODED ESTIMATED DISTRIBUTION OF SOIL ARSENIC CONCENTRATIONS.

0 200' 400'
APPROXIMATE GRAPHIC SCALE

FMC CORPORATION - MIDDLEPORT, NEW YORK
**RCRA FACILITY INVESTIGATION -
VOLUME X**

VISUALIZATION MODEL SOIL ARSENIC CONCENTRATIONS IN 0- TO 3-INCH DEPTH INTERVAL

ARCADIS

FIGURE
5.2

CITY: SYRACUSE,NY DIV/GROUP: ENV/IM-DV DB: P. LISTER LD: P. LISTER PM/TM: T. YOUNG TR: D. WRIGHT LYR:ON=*OFF=REF (FR2)
G:\ENVCAD\SYRACUSE\ACTIB\03776\300\0100\04\DWG\377763C11.DWG LAYOUT: 5.2 SAVED: 9/18/2012 2:34 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 9/18/2012 2:34 PM BY: LISTER, PAUL
XREFS: IMAGES: CATALOG: B00376650000XREF
37763XDL 0to3inch_5-28-09.tif
37665X06

TOWN OF HARTLAND

VILLAGE OF MIDDLEPORT

TOWN OF ROYALTON

TOWN OF RIDGEWAY

TOWN OF SHELBY

R2b

R2c

R2a

R2d

R2e

R2f

NN9 NN11 NN13 NN15 NN17 NN19 NN21 NN23 NN25 NN27 NN29 NN31 NN33

PP9 PP11 PP13 PP15 PP17 PP19 PP21 PP23 PP25 PP27 PP29 PP31 PP33

ERIE CANAL

CULVERT 104
(APPROXIMATE LOCATION)

NIAGARA/ORLEANS COUNTY LINE

WW38 WW40

YY38 YY40

Z38 Z40

X38 X40

V38 V40

T38 T40

R38 R40

P38 P40

N38 N40

L38 L40

J38 J40

H38 H40

F38 F40

D38 D40

FMC FACILITY

STATE STREET

NIAGARA STREET

SOUTH STREET

FREEMAN AVENUE

PARK AVENUE

CEMETERY STREET

HAMMOND PARKWAY

NORTH MAIN STREET

SOUTH MAIN STREET

VERNON STREET

MAPLE AVENUE

ALFRED STREET

LEGEND:

- APPROXIMATE PROPERTY BOUNDARY
- COUNTY LINE
- CULVERT (BURIED PIPE)
- OPEN DITCH/EDGE OF WATER
- R2d — PROPERTY IDENTIFICATION
- • — SOIL SAMPLING LOCATION
- WW40 — SAMPLING LOCATION ID

SOIL ARSENIC CONCENTRATION (ppm):

- <20 (NO SHADE)
- 20 – 25
- 25 – 30
- 30 – 40
- 40 – 50

NOTES:

1. BASEMAP OBTAINED FROM A FIGURE BY CONESTOGA–ROVERS AND ASSOCIATES TITLED "2003/2004 PROPOSED SAMPLING LOCATIONS" DATED OCTOBER 2003 AT A SCALE OF 1"=200'.
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3. PROPERTY IDENTIFICATION NUMBERS SHOWN ARE NOT RELATED TO STREET ADDRESSES OR TAX PARCEL IDS.
4. SAMPLING LOCATIONS WITH AN ARSENIC CONCENTRATION LESS THAN 20 mg/kg ARE SHOWN WITHOUT SHADING.
5. MODEL INPUT DATA WERE SOIL (3– TO 6–INCH DEPTH RANGE) ARSENIC CONCENTRATIONS FROM LOCATIONS SHOWN ON THIS FIGURE AND SUSPECTED AIR DEPOSITION STUDY AREA #1. THE DATA WERE ENTERED INTO MINING VISUALIZATION SYSTEM (VERSION 7.3), WHICH INTERPOLATED ARSENIC CONCENTRATIONS BETWEEN SAMPLED LOCATIONS TO PRODUCE THE COLOR–CODED ESTIMATED DISTRIBUTION OF SOIL ARSENIC CONCENTRATIONS.

0 200' 400'
APPROXIMATE GRAPHIC SCALE

FMC CORPORATION - MIDDLEPORT, NEW YORK
RCRA FACILITY INVESTIGATION - VOLUME X

VISUALIZATION MODEL SOIL ARSENIC CONCENTRATIONS IN 3- TO 6-INCH DEPTH INTERVAL

ARCADIS

FIGURE
5.3

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DV DB: P. LISTER LD: P. LISTER PM/TM: T. YOUNG TR: D. WRIGHT LYR:ON=*;OFF=REF, (FRZ)
G:\ENV\CAD\SYRACUSE\ACT\B003776300000000004\DWG\377663C12.DWG LAYOUT: 5.3 SAVED: 9/18/2012 2:40 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 9/18/2012 2:40 PM BY: LISTER, PAUL
XREFS: 377633XDL 376665X06
IMAGES: 3to6inch_5-28-09.tif
CATALOG: B003766500000XREF

TOWN OF HARTLAND
VILLAGE OF MIDDLEPORT
TOWN OF ROYALTON
TOWN OF RIDGEWAY
TOWN OF SHELBY
TOWN OF ROYALTON
TOWN OF SHELBY
NIAGARA/ORLEANS COUNTY LINE
ERIE CANAL
CULVERT 104
(APPROXIMATE LOCATION)
FMC FACILITY
R2a
R2b
R2c
R2d
R2e
R2f
NN9
NN11
NN13
NN15
NN17
NN19
NN21
NN23
NN25
NN27
NN29
NN31
NN33
PP9
PP11
PP13
PP15
PP17
PP19
PP21
PP23
PP25
PP27
PP29
PP31
PP33
WW38
WW40
YY38
YY40
Z38
Z40
X38
X40
V38
V40
T38
T40
R38
R40
P38
P40
N38
N40
L38
L40
J38
J40
H38
H40
F38
F40
D38
D40
MAIN STREET
NORTH VERNON STREET
PARK AVENUE
CEMETERY STREET
SOUTH STREET
STATE STREET
FREEMAN AVENUE
MAPLE AVENUE
ALFRED STREET
HAMMOND PARKWAY
NIAGARA STREET
SOUTH VERNON STREET
JOHN ST STREET

LEGEND:
- APPROXIMATE PROPERTY BOUNDARY
- COUNTY LINE
- CULVERT (BURIED PIPE)
- OPEN DITCH/EDGE OF WATER
- R2d — PROPERTY IDENTIFICATION
- • — SOIL SAMPLING LOCATION
- WW40 — SAMPLING LOCATION ID

SOIL ARSENIC CONCENTRATION (ppm):
- <20 (NO SHADE)
- 20 – 25
- 25 – 30
- 30 – 40
- 40 – 50

NOTES:

1. BASEMAP OBTAINED FROM A FIGURE BY CONESTOGA–ROVERS AND ASSOCIATES TITLED "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. PROPERTY IDENTIFICATION NUMBERS SHOWN ARE NOT RELATED TO STREET ADDRESSES OR TAX PARCEL IDS.
4. SAMPLING LOCATIONS WITH AN ARSENIC CONCENTRATION LESS THAN 20 mg/kg ARE SHOWN WITHOUT SHADING.
5. MODEL INPUT DATA WERE SOIL (6– TO 9–INCH DEPTH RANGE) ARSENIC CONCENTRATIONS FROM LOCATIONS SHOWN ON THIS FIGURE AND SUSPECTED AIR DEPOSITION STUDY AREA #1. THE DATA WERE ENTERED INTO MINING VISUALIZATION SYSTEM (VERSION 7.3), WHICH INTERPOLATED ARSENIC CONCENTRATIONS BETWEEN SAMPLED LOCATIONS TO PRODUCE THE COLOR–CODED ESTIMATED DISTRIBUTION OF SOIL ARSENIC CONCENTRATIONS.

0 200' 400'
APPROXIMATE GRAPHIC SCALE

FMC CORPORATION - MIDDLEPORT, NEW YORK
RCRA FACILITY INVESTIGATION - VOLUME X

VISUALIZATION MODEL SOIL ARSENIC CONCENTRATIONS IN 6- TO 9-INCH DEPTH INTERVAL

ARCADIS

FIGURE
5.4

CITY: SYRACUSE, NY DIV/GROUP: ENV/CADD DB: P. LISTER LD: P. LISTER PM: E. RANKIN TM/TR: D. WRIGHT LYR:ON=*;OFF=REF* (FRZ)
G:\ENV\CAD\SYRACUSE\ACT\B0037763\000\0004\DWG\37763C13.DWG LAYOUT: 5.4 SAVED: 9/18/2012 2:42 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 9/18/2012 2:42 PM BY: LISTER, PAUL
XREFS: IMAGES: CATALOG: B0037665\0000\XREF
37763XDL 6to9inch 5-28-09.tif
37665X06

TOWN OF HARTLAND
VILLAGE OF MIDDLEPORT
TOWN OF ROYALTON
TOWN OF RIDGEWAY
TOWN OF SHELBY

R2b
R2c
R2a
R2d
R2e
R2f

NN9 NN11 NN13 NN15 NN17 NN19 NN21 NN23 NN25 NN27 NN29 NN31 NN33
PP9 PP11 PP13 PP15 PP17 PP19 PP21 PP23 PP25 PP27 PP29 PP31 PP33

ERIE CANAL

CULVERT 104
(APPROXIMATE LOCATION)

FMC FACILITY

NIAGARA/ORLEANS COUNTY LINE

WW38 WW40
YY38 YY40
Z38 Z40
X38 X40
V38 V40
T38 T40
R38 R40
P38 P40
N38 N40
L38 L40
J38 J40
H38 H40
F38 F40
D38 D40

MAIN STREET
NORTH VERNON STREET
PARK AVENUE
CEMETERY STREET
ELIZABETH STREET
FREEMAN AVENUE
MAPLE AVENUE
ALBERT STREET
HAMMOND PARKWAY
STATE ROAD
STATE STREET
SOUTH STREET
SOUTH VERNON STREET
NIAGARA STREET
JOHN ST STREET

LEGEND:
- APPROXIMATE PROPERTY BOUNDARY
- COUNTY LINE
- CULVERT (BURIED PIPE)
- OPEN DITCH/EDGE OF WATER
- R2d — PROPERTY IDENTIFICATION
- • — SOIL SAMPLING LOCATION
- WW40 — SAMPLING LOCATION ID
- SOIL ARSENIC CONCENTRATION (ppm):
- <20 (NO SHADE)
- 20 – 25
- 25 – 30
- 30 – 40
- 40 – 50

NOTES:

1. BASEMAP OBTAINED FROM A FIGURE BY CONESTOGA–ROVERS AND ASSOCIATES TITLED "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. PROPERTY IDENTIFICATION NUMBERS SHOWN ARE NOT RELATED TO STREET ADDRESSES OR TAX PARCEL IDS.
4. SAMPLING LOCATIONS WITH AN ARSENIC CONCENTRATION LESS THAN 20 mg/kg ARE SHOWN WITHOUT SHADING.

0 200' 400'
APPROXIMATE GRAPHIC SCALE

FMC CORPORATION - MIDDLEPORT, NEW YORK
RCRA FACILITY INVESTIGATION - VOLUME X

SOIL ARSENIC CONCENTRATIONS IN 9- TO 12-INCH DEPTH INTERVAL

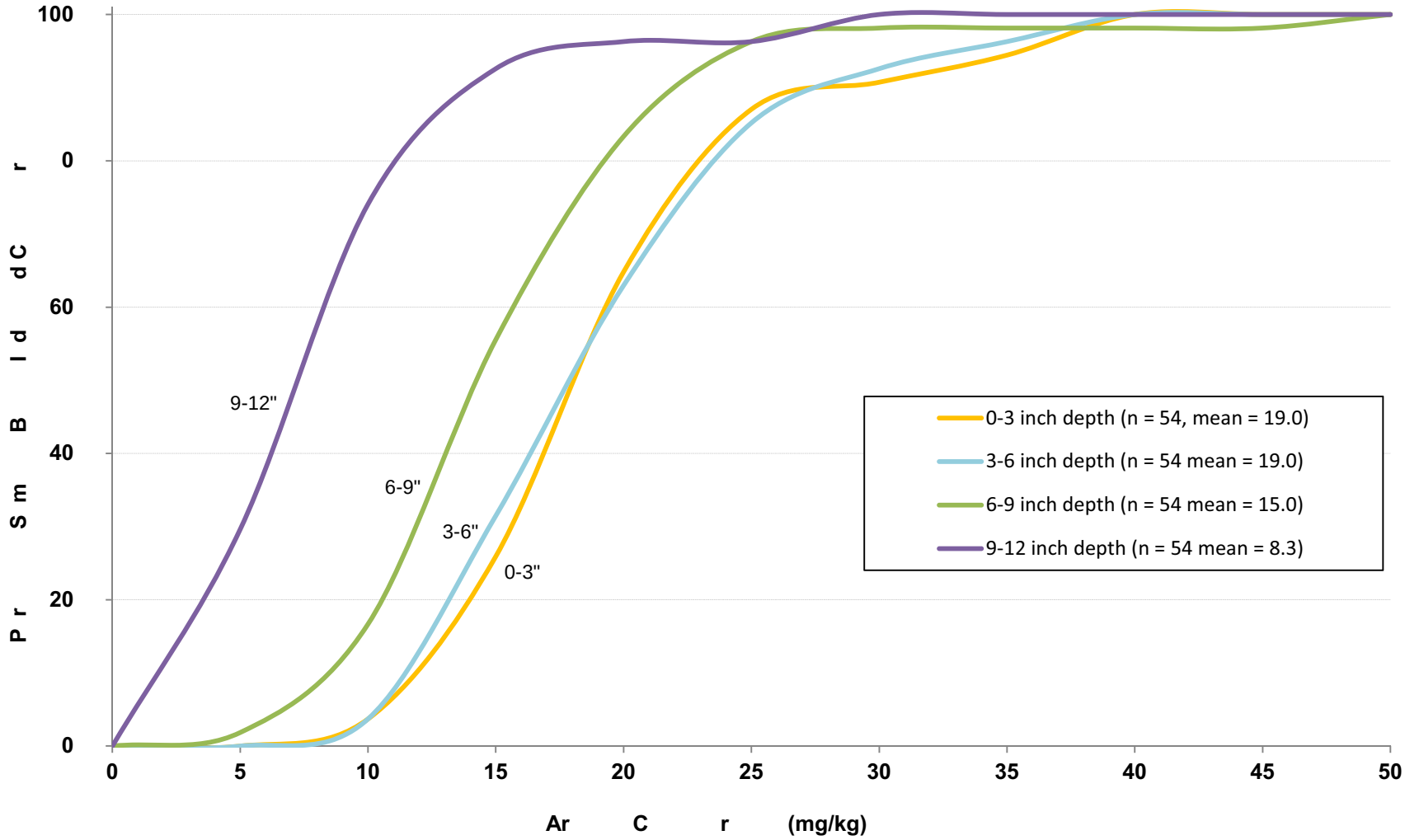
ARCADIS

FIGURE
5.5

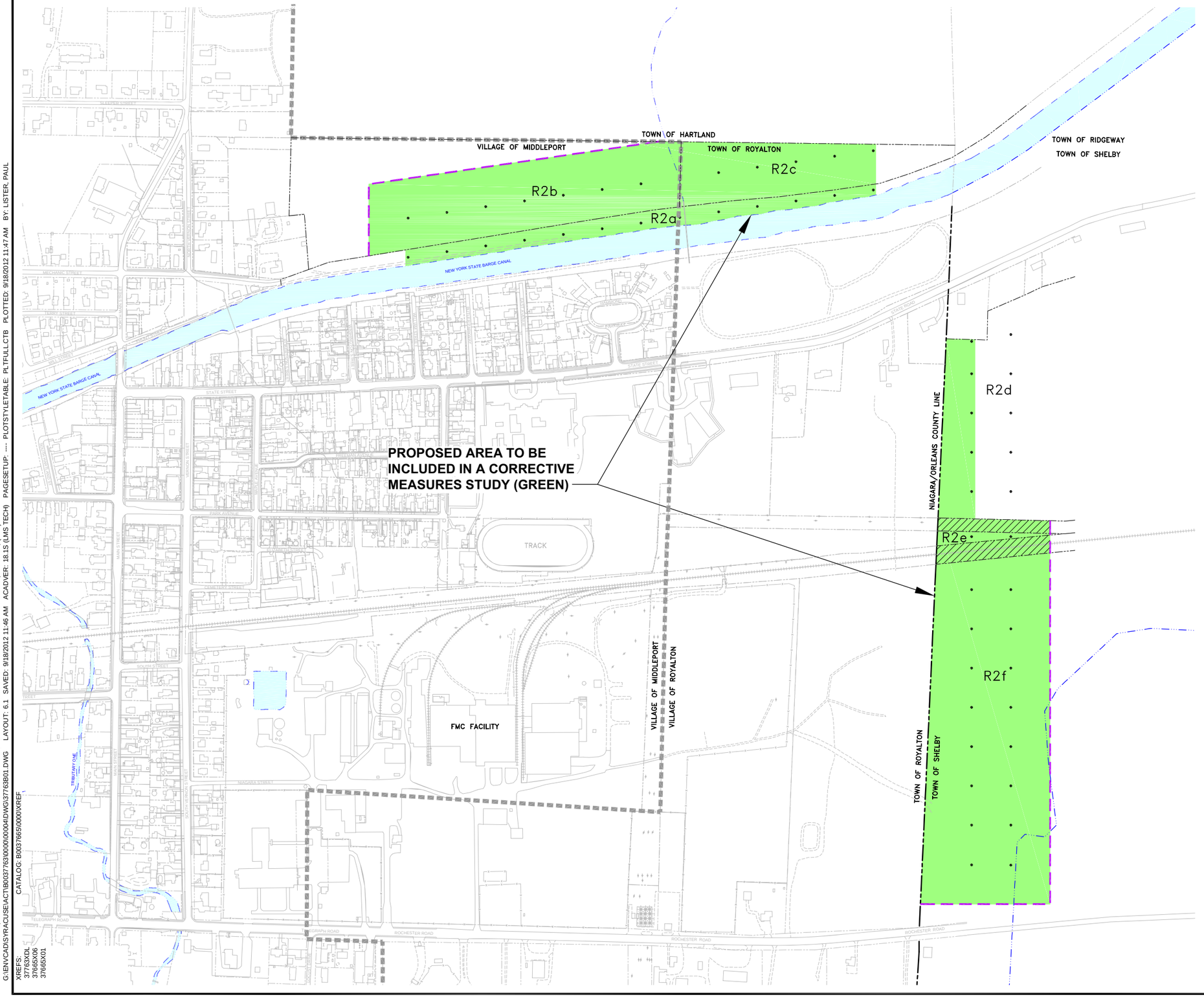
CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DV DB: P. LISTER LD: P. LISTER PM/TM: T. YOUNG TR: D. WRIGHT LYR:ON=*;OFF=REF; (FR2)
G:\ENVCAD\SYRACUSE\ACT\B0037763\000000041DWG\37763C14.DWG LAYOUT: 5.5 SAVED: 9/18/2012 2:43 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 9/18/2012 2:44 PM BY: LISTER, PAUL
XREFS: IMAGES: CATALOG: B0037665\0000\XREF
37763XDL
37665X06

FIGURE 5.6
DISTRIBUTION OF SOIL ARSENIC CONCENTRATION BY DEPTH INTERVAL

RCRA FACILITY INVESTIGATION - VOLUME X
FMC CORPORATION - MIDDLEPORT NEW YOR



Note:
1. Includes all data for samples collected in Study Area.



LEGEND:

- APPROXIMATE PROPERTY BOUNDARY
- COUNTY LINE
- R2d PROPERTY IDENTIFICATION
- SOIL SAMPLING LOCATION (2009)
- PROPOSED AREA TO BE INCLUDED IN CMS
- PROPERTIES RFI SAMPLING WAS NOT PERFORMED
- EXTENT OF CMS AREA IS APPROXIMATE

NOTES:

1. BASEMAP OBTAINED FROM A FIGURE BY CONESTOGA–ROVERS AND ASSOCIATES TITLED "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. PROPERTY IDENTIFICATION NUMBERS SHOWN ARE NOT RELATED TO STREET ADDRESSES OR TAX PARCEL IDS.

0 250' 500'
GRAPHIC SCALE

FMC CORPORATION - MIDDLEPORT, NEW YORK
RCRA FACILITY INVESTIGATION - VOLUME X

PROPOSED AREA TO BE INCLUDED IN A CORRECTIVE MEASURES STUDY

ARCADIS

FIGURE **6.1**

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DV DB: P. LISTER LD: P. LISTER PM/TM: T. YOUNG TR: D. WRIGHT LYR:ON=*;OFF=REF, (FR2)
G:\ENVCAD\SYRACUSE\ACTIB\03776300\000004\DWG\37763B01.DWG LAYOUT: 6.1 SAVED: 9/18/2012 11:46 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 9/18/2012 11:47 AM BY: LISTER, PAUL
XREFS:
37763XDL
37665X06
37665X01
CATALOG B0037665\0000\XREF

ARCADIS

Appendix A

Soil Sample Description and Analytical Results

Contents:

TABLE A-1
SOIL SAMPLING LOCATIONS STRATIGRAPHY

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

Boring ID	Survey Coordinates			Date	Depth of Boring (feet)	Sample Description	
	Northing	Easting	Elevation				
R2a-PP9	1171223.13	1178256.01	516.52	4/21/2009	1.0'	0.0' - 0.9'	Brown to red/brown silt, little fine sand, trace medium to coarse sand, trace organics, trace fine gravel
R2a-PP11	1171252.23	1178453.88	512.44	4/21/2009	1.0'	0.0' - 1.0'	Brown silt, some fine sand, trace medium to coarse sand, trace to little fine gravel, trace organics
R2a-PP13	1171281.34	1178651.75	514.66	4/21/2009	1.0'	0.0' - 0.8'	Brown silt, some fine sand, trace medium to coarse sand, trace fine gravel, trace organics
R2a-PP-15	1171310.44	1178849.62	515.20	4/21/2009	1.0'	0.0' - 0.6'	Dark brown silt, little fine sand, trace medium to coarse sand, trace organics
						0.6' - 1.0'	Brown silt and fine sand, trace medium to coarse sand, trace fine gravel
R2a-PP17	1171339.54	1179047.49	514.20	4/21/2009	1.0'	0.0' - 0.3'	Dark brown silt, little fine sand, trace medium to coarse sand, trace organics
						0.3' - 1.0'	Brown silt and fine sand, trace medium to coarse sand, trace fine gravel, damp
R2a-PP19	1171368.65	1179245.36	510.47	4/21/2009	1.0'	0.0' - 1.0'	Brown silt, little fine to medium sand, trace coarse sand, trace fine gravel, trace organics
R2a-PP21	1171397.75	1179443.23	508.91	4/21/2009	1.0'	0.0' - 0.6'	Brown silt, little fine sand, trace medium to coarse sand, trace organics
						0.6' - 1.0'	Brown silt, some fine sand, trace medium to coarse sand, trace fine gravel, damp
R2a-PP23	1171426.85	1179641.10	508.58	4/21/2009	1.0'	0.0' - 0.7'	Dark brown silt, little fine to medium sand, trace organics
						0.7' - 1.0'	Brown silt, some fine to medium sand, trace coarse sand
R2a-PP25	1171454.82	1179839.14	512.15	4/21/2009	1.0'	0.0' - 0.7'	Dark brown silt, little fine to coarse sand, trace organics
						0.7' - 1.0'	Brown silt, some fine sand, trace medium to coarse sand, trace fine gravel
R2a-PP27	1171482.66	1180036.22	512.66	4/21/2009	1.0'	0.0' - 0.7'	Dark brown silt, little fine to coarse sand, trace fine gravel, trace organics
						0.7' - 1.0'	Brown silt, some fine sand, trace medium to coarse sand, damp
R2a-PP29	1171510.50	1180233.29	510.78	4/21/2009	1.0'	0.0' - 0.6'	Dark brown silt , little fine to coarse sand, trace organics
						0.6' - 1.0'	Brown silt, some fine sand, little medium to coarse sand, damp
R2a-PP31	1171538.33	1180430.37	512.34	4/21/2009	1.0'	0.0' - 0.6'	Dark brown silt, little fine to medium sand, trace organics
						0.6' - 1.0'	Brown silt, some fine sand, trace medium to coarse sand, damp
R2a-PP33	1171566.17	1180627.45	516.74	4/21/2009	1.0'	0.0' - 0.3'	Dark brown silt & fine sand, little medium to coarse sand, trace organics
						0.3' - 1.0'	Brown silt, little fine to medium sand, trace coarse sand, trace fine gravel

TABLE A-1
SOIL SAMPLING LOCATIONS STRATIGRAPHY

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

Boring ID	Survey Coordinates			Date	Depth of Boring (feet)	Sample Description	
	Northing	Easting	Elevation				
R2b-NN9	1171423.13	1178255.90	503.54	4/21/2009	1.0'	0.0' - 0.9'	Dark brown, silt, little fine sand, trace medium to coarse sand, trace organics, damp
						0.9' - 1.0'	Brown silt and fine sand, trace fine gravel, damp
R2b-NN11	1171452.23	1178453.77	504.31	4/21/2009	1.0'	0.0' - 0.6'	Brown silt, some fine sand, trace medium sand, trace organics, damp
R2b-NN13	1171481.34	1178651.64	504.78	4/21/2009	1.0'	0.0' - 1.0'	Brown silt, some fine sand, trace medium to coarse sand, trace fine gravel, damp
R2b-NN15	1171510.44	1178849.52	503.32	4/21/2009	1.0'	0.0' - 1.0'	Brown silt, some fine sand, trace medium to coarse sand, trace fine gravel, trace organics
R2b-NN17	1171539.54	1179047.39	498.35	4/21/2009	1.0'	0.0' - 1.0'	Brown silt, some fine sand, trace medium to coarse sand, trace fine gravel, trace organics, wet to damp
R2b-NN19	1171568.65	1179245.26	497.60	4/21/2009	1.0'	0.0' - 0.4'	Brown silt, little fine sand, trace clay, trace organics, damp
						0.4' - 1.0'	Brown silt, some fine sand, trace medium to coarse sand, trace organics, damp
R2b-NN21	1171597.75	1179443.13	499.03	4/21/2009	1.0'	0.0' - 0.9'	Brown silt, some trace to little fine sand, trace medium to coarse sand, trace organics, damp
						0.9' - 1.0'	Tan fine sand, dry
R2c-NN23	1171626.85	1179641.00	498.84	4/21/2009	1.0'	0.0' - 1.0'	Brown silt, little fine sand, trace medium sand, trace organics, damp
R2c-NN25	1171654.82	1179839.03	500.75	4/21/2009	1.0'	0.0' - 0.8'	Dark brown silt, little fine sand, trace medium to coarse sand, trace organics, damp
						0.8' - 1.0'	Red/brown silty clay, trace fine sand, damp
R2c-NN27	1171682.66	1180036.11	501.01	4/21/2009	1.0'	0.0' - 1.0'	Brown silt, little fine sand, trace clay, trace medium to coarse sand, trace organics, damp
R2c-NN29	1171710.50	1180233.19	501.24	4/21/2009	1.0'	0.0' - 1.0'	Brown silt, some fine sand, little clay, trace medium to coarse sand, trace fine gravel, trace organics
R2c-NN31	1171738.33	1180430.27	500.23	4/21/2009	1.0'	0.0' - 0.6'	Brown silt, some to little fine sand, trace medium to coarse sand, trace organics, trace clay
						0.6' - 1.0'	Brown silt and fine sand, trace medium sand
R2c-NN33	1171766.17	1180627.34	502.22	4/21/2009	1.0'	0.0' - 1.0'	Brown silt, little to some fine sand, trace organics, trace fine gravel, damp
R2d - V38	1170029.58	1181128.56	531.80	4/21/2009	1.0'	0.0' - 1.0'	Brown silt, little fine sand, little clay, trace medium to coarse sand, trace organics
R2d-V40	1170029.58	1181328.56	530.92	4/21/2009	1.0'	0.0' - 0.8'	Brown silt, little fine sand, little clay, trace medium to coarse sand, trace organics
						0.8' - 1.0'	Brown - red/brown silty clay, trace fine sand
R2d-WW38	1170794.58	1181128.56	533.03	4/21/2009	1.0'	0.0' - 1.0'	Brown silt, little clay, trace fine to coarse sand, trace organics

TABLE A-1
SOIL SAMPLING LOCATIONS STRATIGRAPHY

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

Boring ID	Survey Coordinates			Date	Depth of Boring (feet)	Sample Description	
	Northing	Easting	Elevation				
R2d-WW40	1170829.58	1181328.56	534.03	4/21/2009	1.0'	0.0' - 0.8'	Brown silt, some clay, trace fine to coarse sand, trace fine gravel, trace organics
						0.8' - 1.0'	Red/brown silty clay
R2d-X38	1170229.58	1181128.56	531.05	4/21/2009	1.0'	0.0' - 0.7'	Dark brown silt, little clay, little fine sand, trace medium to coarse sand, trace organics
						0.7' - 1.0'	Brown - red/brown silty clay
R2d-X40	1170229.58	1181328.56	531.41	4/21/2009	1.0'	0.0' - 1.0'	Brown silty clay, trace fine to medium sand, trace organics
R2d-YY38	1170629.58	1181128.56	532.21	4/21/2009	1.0'	0.0' - 1.0'	Brown silt, little to some clay, trace fine sand, trace organics, damp
R2d-YY40	1170629.58	1181328.56	532.04	4/21/2009	1.0'	0.0' - 0.8'	Brown silt, little fine sand, little clay, trace medium to coarse sand, trace organics
						0.8' - 1.0'	Red/brown silty clay
R2d-Z38	1170429.58	1181128.56	530.99	4/21/2009	1.0'	0.0' - 0.8'	Brown silty clay, trace fine sand, trace organics
						0.8' - 1.0'	Red/brown silty clay
R2d-Z40	1170429.58	1181328.56	531.18	4/21/2009	1.0'	0.0' - 0.8'	Brown silty clay, trace fine sand, trace organics, damp
						0.8' - 1.0'	Red/brown silty clay
R2e-T38	1169799.58	1181128.56	533.84	4/21/2009	1.0'	0.0' - 0.9'	Brown silt, some fine sand, trace medium-coarse sand and fine gravel, damp
R2e-T40	1169799.58	1181328.56	531.38	4/21/2009	1.0'	0.0' - 0.8'	Dark brown silt, some fine sand, trace medium-coarse sand and fine gravel, wet
						0.8' - 1.0'	Brown silty clay, damp
R2f-D38	1168126.80	1181128.56	535.47	4/23/2009	1.0'	0.0' - 0.7'	Red/brown silty clay, trace fine sand, trace organics, damp
						0.7' - 1.0'	Red/brown silt, some fine sand, little clay, trace organics, damp
R2f-D40	1168125.66	1181328.56	534.61	4/23/2009	1.0'	0.0' - 0.8'	Dark brown silt and fine sand, trace clay, trace medium to coarse sand, trace organics, damp
						0.8' - 1.0'	Brown, fine sand, some silt, trace medium to coarse sand, damp
R2f-F38	1168329.58	1181128.56	538.93	4/23/2009	1.0'	0.0' - 1.0'	Brown silt, some fine sand, trace medium to coarse sand, little clay, trace organics, damp
R2f-F40	1168329.58	1181328.56	535.20	4/23/2009	1.0'	0.0' - 1.0'	Brown silt, little clay, little fine sand, trace medium to coarse sand, trace organics
R2f-H38	1168529.58	1181128.56	536.78	4/23/2009	1.0'	0.0' - 0.75'	Dark brown silt, little fine sand, trace clay, trace medium to coarse sand, trace organics, damp
						0.75' - 1.0'	Red/brown silty clay, trace fine sand
R2f-H40	1168529.58	1181328.56	535.64	4/23/2009	1.0'	0.0' - 1.0'	Dark brown silt, little fine sand, trace clay, trace medium to coarse sand, trace fine gravel, trace organics, damp
R2f-J38	1168729.58	1181128.56	540.96	4/23/2009	1.0'	0.0' - 1.0'	Brown silt, little fine sand, trace medium to coarse sand, trace organics

TABLE A-1
SOIL SAMPLING LOCATIONS STRATIGRAPHY

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

Boring ID	Survey Coordinates			Date	Depth of Boring (feet)	Sample Description	
	Northing	Easting	Elevation				
R2f-J40	1168729.58	1181328.56	534.98	4/23/2009	1.0'	0.0' - 0.9'	Dark brown silt, little to some fine sand, trace medium to coarse sand, trace organics, wet
R2f-L38	1168929.58	1181128.56	536.58	4/23/2009	1.0'	0.0' - 0.6'	Dark brown silt, little fine sand, trace medium to coarse sand, trace organics, damp
						0.6' - 1.0'	Red/brown silty clay, trace fine to coarse sand
R2f-L40	1168929.58	1181328.56	531.87	4/23/2009	1.0'	0.0' - 1.0'	Brown silt, little fine sand, trace medium to coarse sand, trace fine gravel, trace organics, damp
R2f-N38	1169129.58	1181128.56	538.31	4/23/2009	1.0'	0.0' - 0.85'	Brown silt, little fine sand, trace medium to coarse sand, trace organics
						0.85' - 1.0'	Brown fine to medium gravel
R2f-N40	1169129.58	1181328.56	531.10	4/23/2009	1.0'	0.0' - 0.8'	Brown silt, little fine sand, trace medium to coarse sand, trace organics, damp
						0.8' - 1.0'	Brown silt, little fine sand, trace medium to coarse sand, trace organics, little clay, damp
R2f-P38	1169329.58	1181128.56	534.21	4/23/2009	1.0'	0.0' - 0.7'	Dark brown silt, little fine sand, trace medium to coarse sand, trace organics, damp
						0.7' - 1.0'	Brown silt and fine sand, trace medium to coarse sand, trace fine gravel
R2f-P40	1169329.58	1181328.56	531.30	4/23/2009	1.0'	0.0' - 0.7'	Brown silt, little fine sand, trace medium to coarse sand, trace organics, damp
						0.7' - 1.0'	Red/brown silt, some fine sand, trace medium to coarse sand, damp
R2f-R38	1169529.58	1181128.56	533.41	4/23/2009	1.0'	0.0' - 1.0'	Brown silt, little fine sand, trace medium to coarse sand, trace fine gravel, trace organics, damp
R2f-R40	1169529.58	1181328.56	530.89	4/23/2009	1.0'	0.0' - 0.8'	Brown silt, little fine sand, trace medium to coarse sand, trace organics, damp
						0.8' - 1.0'	Red/brown silty clay, trace fine to coarse sand, damp

Note:
1. Survey data are New York State Planar, North American Datum 1983 coordinates (NAD83); elevations to National Geodetic Vertical Datum 1929 (NGVD29).

TABLE A-2
SOIL ARSENIC CONCENTRATIONS NORTH OF THE ERIE CANAL

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

Sample ID	Sample Depth (inches)	Sample Date	Arsenic Results				
			FMC Samples		NYSDEC Split Samples		Combined Concentration (mg/kg)
			Primary (mg/kg)	Duplicate (mg/kg)	Primary (mg/kg)	Duplicate (mg/kg)	
Property R2a							
R2a-PP9	0 - 3	4/21/2009	11.1	--	--	--	11.1
	3 - 6	4/21/2009	13.5	--	12.8	--	13.2
	6 - 9	4/21/2009	12.9	--	--	--	12.9
	9 - 12	4/21/2009	9.0	--	--	--	9.0
R2a-PP11	0 - 3	4/21/2009	22.1	--	--	--	22.1
	3 - 6	4/21/2009	20.5	--	--	--	20.5
	6 - 9	4/21/2009	17.7	--	--	--	17.7
	9 - 12	4/21/2009	13.8	--	--	--	13.8
R2a-PP13	0 - 3	4/21/2009	19.1	--	17.5	--	18.3
	3 - 6	4/21/2009	20.9	--	--	--	20.9
	6 - 9	4/21/2009	11.0	--	--	--	11.0
	9 - 12	4/21/2009	5.7	--	--	--	5.7
R2a-PP15	0 - 3	4/21/2009	23.8	--	--	--	23.8
	3 - 6	4/21/2009	23.1	--	--	--	23.1
	6 - 9	4/21/2009	18.3	--	--	--	18.3
	9 - 12	4/21/2009	6.4	--	--	--	6.4
R2a-PP17	0 - 3	4/21/2009	19.9	--	--	--	19.9
	3 - 6	4/21/2009	16.2	12.2	--	--	14.2
	6 - 9	4/21/2009	5.1	--	--	--	5.1
	9 - 12	4/21/2009	2.7	--	--	--	2.7
R2a-PP19	0 - 3	4/21/2009	36.0	--	--	--	36.0
	3 - 6	4/21/2009	37.2	--	--	--	37.2
	6 - 9	4/21/2009	49.3	--	--	--	49.3
	9 - 12	4/21/2009	26.1	--	--	--	26.1
R2a-PP21	0 - 3	4/21/2009	36.9	--	--	--	36.9
	3 - 6	4/21/2009	39.7	--	--	--	39.7
	6 - 9	4/21/2009	24.0	--	23.8	--	23.9
	9 - 12	4/21/2009	7.1	--	--	--	7.1
R2a-PP23	0 - 3	4/21/2009	23.2	--	--	--	23.2
	3 - 6	4/21/2009	27.9	--	--	--	27.9
	6 - 9	4/21/2009	19.2	--	--	--	19.2
	9 - 12	4/21/2009	5.8	--	--	--	5.8
R2a-PP25	0 - 3	4/21/2009	29.4	27.5	24.7	--	27.2
	3 - 6	4/21/2009	30.7	--	--	--	30.7
	6 - 9	4/21/2009	14.1	--	--	--	14.1
	9 - 12	4/21/2009	4.4	--	--	--	4.4
R2a-PP27	0 - 3	4/21/2009	26.0	--	--	--	26.0
	3 - 6	4/21/2009	26.4	--	--	--	26.4
	6 - 9	4/21/2009	20.6	--	--	--	20.6
	9 - 12	4/21/2009	13.4	--	--	--	13.4

TABLE A-2
SOIL ARSENIC CONCENTRATIONS NORTH OF THE ERIE CANAL

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

Sample ID	Sample Depth (inches)	Sample Date	Arsenic Results				
			FMC Samples		NYSDEC Split Samples		Combined Concentration (mg/kg)
			Primary (mg/kg)	Duplicate (mg/kg)	Primary (mg/kg)	Duplicate (mg/kg)	
R2a-PP29	0 - 3	4/21/2009	26.5	--	23.1	--	24.8
	3 - 6	4/21/2009	26.2	--	--	--	26.2
	6 - 9	4/21/2009	15.2	--	--	--	15.2
	9 - 12	4/21/2009	6.8	--	--	--	6.8
R2a-PP31	0 - 3	4/21/2009	22.1	--	--	--	22.1
	3 - 6	4/21/2009	22.5	--	--	--	22.5
	6 - 9	4/21/2009	14.7	--	--	--	14.7
	9 - 12	4/21/2009	5.3	--	--	--	5.3
R2a-PP33	0 - 3	4/21/2009	5.3	--	--	--	5.3
	3 - 6	4/21/2009	8.6	--	6.7	--	7.7
	6 - 9	4/21/2009	12.5	--	--	--	12.5
	9 - 12	4/21/2009	11.8	--	--	--	11.8
Property R2b							
R2b-NN9	0 - 3	4/21/2009	22.5	--	--	--	22.5
	3 - 6	4/21/2009	22.8	--	--	--	22.8
	6 - 9	4/21/2009	21.6	--	--	--	21.6
	9 - 12	4/21/2009	12.4	--	--	--	12.4
R2b-NN11	0 - 3	4/21/2009	12.4	--	--	--	12.4
	3 - 6	4/21/2009	10.5	--	--	--	10.5
	6 - 9	4/21/2009	7.8	--	--	--	7.8
	9 - 12	4/21/2009	3.8	--	3.6	2.7	3.4
R2b-NN13	0 - 3	4/21/2009	12.4	--	--	--	12.4
	3 - 6	4/21/2009	12.1	--	--	--	12.1
	6 - 9	4/21/2009	15.4	--	--	--	15.4
	9 - 12	4/21/2009	9.7	--	--	--	9.7
R2b-NN15	0 - 3	4/21/2009	18.4	--	--	--	18.4
	3 - 6	4/21/2009	13.2	--	--	--	13.2
	6 - 9	4/21/2009	15.5	--	12.5	--	14.0
	9 - 12	4/21/2009	6.3	--	--	--	6.3
R2b-NN17	0 - 3	4/21/2009	16.7	--	--	--	16.7
	3 - 6	4/21/2009	17.6	--	--	--	17.6
	6 - 9	4/21/2009	16.9	--	--	--	16.9
	9 - 12	4/21/2009	10.1	--	--	--	10.1
R2b-NN19	0 - 3	4/21/2009	24.5	21.9	--	--	23.2
	3 - 6	4/21/2009	24.0	--	19.5	--	21.8
	6 - 9	4/21/2009	24.7	--	--	--	24.7
	9 - 12	4/21/2009	6.3	--	--	--	6.3
R2b-NN21	0 - 3	4/21/2009	16.0	--	--	--	16.0
	3 - 6	4/21/2009	15.4	--	--	--	15.4
	6 - 9	4/21/2009	11.2	--	--	--	11.2
	9 - 12	4/21/2009	2.5	--	--	--	2.5

TABLE A-2
SOIL ARSENIC CONCENTRATIONS NORTH OF THE ERIE CANAL

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

Sample ID	Sample Depth (inches)	Sample Date	Arsenic Results				
			FMC Samples		NYSDEC Split Samples		Combined Concentration (mg/kg)
			Primary (mg/kg)	Duplicate (mg/kg)	Primary (mg/kg)	Duplicate (mg/kg)	
Property R2c							
R2c-NN23	0 - 3	4/21/2009	23.3	--	20.5	--	21.9
	3 - 6	4/21/2009	24.9	--	--	--	24.9
	6 - 9	4/21/2009	26.1	--	--	--	26.1
	9 - 12	4/21/2009	30.0	--	--	--	30.0
R2c-NN25	0 - 3	4/21/2009	16.5	--	--	--	16.5
	3 - 6	4/21/2009	19.7	--	--	--	19.7
	6 - 9	4/21/2009	22.0	--	--	--	22.0
	9 - 12	4/21/2009	4.4	--	--	--	4.4
R2c-NN27	0 - 3	4/21/2009	13.9	--	--	--	13.9
	3 - 6	4/21/2009	15.0	--	--	--	15.0
	6 - 9	4/21/2009	14.0	11.1	--	--	12.6
	9 - 12	4/21/2009	10.8	--	5.8	--	8.3
R2c-NN29	0 - 3	4/21/2009	15.5	--	--	--	15.5
	3 - 6	4/21/2009	13.7	--	--	--	13.7
	6 - 9	4/21/2009	6.8	--	--	--	6.8
	9 - 12	4/21/2009	2.1	--	--	--	2.1
R2c-NN31	0 - 3	4/21/2009	15.3	11.5	--	--	13.4
	3 - 6	4/21/2009	17.1	--	--	--	17.1
	6 - 9	4/21/2009	9.9	--	--	--	9.9
	9 - 12	4/21/2009	3.7	--	--	--	3.7
R2c-NN33	0 - 3	4/21/2009	14.3 J	--	--	--	14.3
	3 - 6	4/21/2009	12.6 J	--	--	--	12.6
	6 - 9	4/21/2009	13.9 J	--	--	--	13.9
	9 - 12	4/21/2009	11.9 J	--	--	--	11.9

Notes:

1. Arsenic results are presented in milligrams per kilogram (mg/kg); equivalent to parts per million (ppm).
2. FMC primary samples represent the results of the initial sample collected at that specific location and depth interval.
3. FMC duplicate samples were collected at the same time as the primary sample to verify that the sample collection and analysis methods produced consistent results. The duplicate samples were collected at a rate of approximately 5% (i.e., 1 for every 20 FMC primary samples collected). This rate is averaged over the entire event.
4. NYSDEC split samples were collected to verify that sample collection and analysis procedures were not biased over the course of the sampling event. NYSDEC split samples were collected at a rate of approximately 10%.
5. Data Qualifier: J = Positively identified, but concentration is estimated.
6. Combined concentration is the arithmetic average of all primary, duplicate and split sample results.
7. Combined concentrations greater than 20.0 mg/kg are shaded pink.

TABLE A-3
SOIL ARSENIC CONCENTRATIONS EAST OF THE COUNTY LINE

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

Sample ID	Sample Depth (inches)	Sample Date	Arsenic Results				
			FMC Samples		NYSDEC Split Samples		Combined Concentration (mg/kg)
			Primary (mg/kg)	Duplicate (mg/kg)	Primary (mg/kg)	Duplicate (mg/kg)	
Property R2d							
R2d-V38	0 - 3	4/21/2009	17.1 J	--	--	--	17.1
	3 - 6	4/21/2009	18.1 J	--	--	--	18.1
	6 - 9	4/21/2009	15.3 J	--	--	--	15.3
	9 - 12	4/21/2009	5.2 J	--	--	--	5.2
R2d-V40	0 - 3	4/21/2009	16.4 J	--	17.4	--	16.9
	3 - 6	4/21/2009	20.0 J	--	--	--	20.0
	6 - 9	4/21/2009	16.3 J	--	--	--	16.3
	9 - 12	4/21/2009	3.6 J	--	--	--	3.6
R2d-WW38	0 - 3	4/21/2009	14.4	--	--	--	14.4
	3 - 6	4/21/2009	16.3	--	--	--	16.3
	6 - 9	4/21/2009	15.6	--	--	--	15.6
	9 - 12	4/21/2009	19.7	--	--	--	19.7
R2d-WW40	0 - 3	4/21/2009	15.2	--	--	--	15.2
	3 - 6	4/21/2009	14.8	--	--	--	14.8
	6 - 9	4/21/2009	13.2	--	--	--	13.2
	9 - 12	4/21/2009	5.7	--	--	--	5.7
R2d-X38	0 - 3	4/21/2009	13.7 J	13.1	--	--	13.4
	3 - 6	4/21/2009	20.3 J	--	--	--	20.3
	6 - 9	4/21/2009	13.4 J	--	14.2	--	13.8
	9 - 12	4/21/2009	4.5 J	--	--	--	4.5
R2d-X40	0 - 3	4/21/2009	18.8 J	--	--	--	18.8
	3 - 6	4/21/2009	14.1 J	--	--	--	14.1
	6 - 9	4/21/2009	11.3 J	--	--	--	11.3
	9 - 12	4/21/2009	4.9 J	--	--	--	4.9
R2d-YY38	0 - 3	4/21/2009	16.5 J	--	13.9	--	15.2
	3 - 6	4/21/2009	18.2 J	17.7	--	--	18.0
	6 - 9	4/21/2009	11.0 J	--	--	--	11.0
	9 - 12	4/21/2009	6.7 J	--	--	--	6.7
R2d-YY40	0 - 3	4/21/2009	16.3	--	--	--	16.3
	3 - 6	4/21/2009	13.5	--	--	--	13.5
	6 - 9	4/21/2009	16.7	--	--	--	16.7
	9 - 12	4/21/2009	5.7	--	--	--	5.7
R2d-Z38	0 - 3	4/21/2009	15.8 J	--	--	--	15.8
	3 - 6	4/21/2009	15.1 J	--	--	--	15.1
	6 - 9	4/21/2009	12.5 J	--	--	--	12.5
	9 - 12	4/21/2009	4.1 J	--	--	--	4.1
R2d-Z40	0 - 3	4/21/2009	10.0 J	--	--	--	10.0
	3 - 6	4/21/2009	14.0 J	--	--	--	14.0
	6 - 9	4/21/2009	6.8 J	--	5.5	--	6.2
	9 - 12	4/21/2009	3.3 J	--	--	--	3.3

TABLE A-3
SOIL ARSENIC CONCENTRATIONS EAST OF THE COUNTY LINE

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

Sample ID	Sample Depth (inches)	Sample Date	Arsenic Results				
			FMC Samples		NYSDEC Split Samples		Combined Concentration (mg/kg)
			Primary (mg/kg)	Duplicate (mg/kg)	Primary (mg/kg)	Duplicate (mg/kg)	
Property R2e							
R2e-T38	0 - 3	4/21/2009	33.6 J	27.9	--	--	30.8
	3 - 6	4/21/2009	34.5 J	--	26.5	--	30.5
	6 - 9	4/21/2009	12.5 J	--	--	--	12.5
	9 - 12	4/21/2009	8.1 J	--	--	--	8.1
R2e-T40	0 - 3	4/21/2009	34.6 J	--	--	--	34.6
	3 - 6	4/21/2009	26.8 J	--	--	--	26.8
	6 - 9	4/21/2009	15.9 J	--	--	--	15.9
	9 - 12	4/21/2009	7.2 J	--	--	--	7.2
Property R2f							
R2f-D38	0 - 3	4/23/2009	10.1	--	--	--	10.1
	3 - 6	4/23/2009	6.7	--	--	--	6.7
	6 - 9	4/23/2009	4.1	--	--	--	4.1
	9 - 12	4/23/2009	3.5	--	--	--	3.5
R2f-D40	0 - 3	4/23/2009	23.8	--	--	--	23.8
	3 - 6	4/23/2009	10.6	--	--	--	10.6
	6 - 9	4/23/2009	10.7	--	--	--	10.7
	9 - 12	4/23/2009	4.1	--	--	--	4.1
R2f-F38	0 - 3	4/23/2009	12.6	--	--	--	12.6
	3 - 6	4/23/2009	17.2	--	--	--	17.2
	6 - 9	4/23/2009	11.0	--	--	--	11.0
	9 - 12	4/23/2009	13.3	--	--	--	13.3
R2f-F40	0 - 3	4/23/2009	13.6	--	--	--	13.6
	3 - 6	4/23/2009	14.7	14.7	--	--	14.7
	6 - 9	4/23/2009	15.6	--	--	--	15.6
	9 - 12	4/23/2009	13.5	--	--	--	13.5
R2f-H38	0 - 3	4/23/2009	15.2	--	--	--	15.2
	3 - 6	4/23/2009	16.9	--	--	--	16.9
	6 - 9	4/23/2009	16.8	--	--	--	16.8
	9 - 12	4/23/2009	6.6	--	--	--	6.6
R2f-H40	0 - 3	4/23/2009	11.1	--	--	--	11.1
	3 - 6	4/23/2009	12.5	--	16.0	--	14.3
	6 - 9	4/23/2009	13.6	--	--	--	13.6
	9 - 12	4/23/2009	7.5	--	--	--	7.5
R2f-J38	0 - 3	4/23/2009	36.1	--	--	--	36.1
	3 - 6	4/23/2009	19.6	--	--	--	19.6
	6 - 9	4/23/2009	17.0	--	--	--	17.0
	9 - 12	4/23/2009	14.8	--	--	--	14.8
R2f-J40	0 - 3	4/23/2009	15.9	--	--	--	15.9
	3 - 6	4/23/2009	17.3	--	--	--	17.3
	6 - 9	4/23/2009	12.0	--	--	--	12.0
	9 - 12	4/23/2009	8.9	--	--	--	8.9

TABLE A-3
SOIL ARSENIC CONCENTRATIONS EAST OF THE COUNTY LINE

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

Sample ID	Sample Depth (inches)	Sample Date	Arsenic Results				
			FMC Samples		NYSDEC Split Samples		Combined Concentration (mg/kg)
			Primary (mg/kg)	Duplicate (mg/kg)	Primary (mg/kg)	Duplicate (mg/kg)	
R2f-L38	0 - 3	4/23/2009	19.0	22.5	--	--	20.8
	3 - 6	4/23/2009	22.4	--	19.9	--	21.2
	6 - 9	4/23/2009	9.5	--	--	--	9.5
	9 - 12	4/23/2009	5.2	--	--	--	5.2
R2f-L40	0 - 3	4/23/2009	16.8	--	--	--	16.8
	3 - 6	4/23/2009	18.6	--	--	--	18.6
	6 - 9	4/23/2009	17.6	--	--	--	17.6
	9 - 12	4/23/2009	19.4	--	--	--	19.4
R2f-N38	0 - 3	4/23/2009	22.4	--	--	--	22.4
	3 - 6	4/23/2009	19.5	--	--	--	19.5
	6 - 9	4/23/2009	9.2	--	--	--	9.2
	9 - 12	4/23/2009	14.5	--	--	--	14.5
R2f-N40	0 - 3	4/23/2009	17.6	--	--	--	17.6
	3 - 6	4/23/2009	17.4	--	--	--	17.4
	6 - 9	4/23/2009	14.1	--	12.1	--	13.1
	9 - 12	4/23/2009	6.0	--	--	--	6.0
R2f-P38	0 - 3	4/23/2009	19.8	--	18.4	--	19.1
	3 - 6	4/23/2009	20.2	--	--	--	20.2
	6 - 9	4/23/2009	23.1	--	--	--	23.1
	9 - 12	4/23/2009	5.9	--	--	--	5.9
R2f-P40	0 - 3	4/23/2009	17.6	--	--	--	17.6
	3 - 6	4/23/2009	22.3	--	--	--	22.3
	6 - 9	4/23/2009	9.0	--	--	--	9.0
	9 - 12	4/23/2009	4.4	--	--	--	4.4
R2f-R38	0 - 3	4/23/2009	20.9	--	--	--	20.9
	3 - 6	4/23/2009	22.4	--	--	--	22.4
	6 - 9	4/23/2009	20.1	--	--	--	20.1
	9 - 12	4/23/2009	8.0	--	--	--	8.0
R2f-R40	0 - 3	4/23/2009	19.0	--	--	--	19.0
	3 - 6	4/23/2009	17.4	19.1	--	--	18.3
	6 - 9	4/23/2009	11.0	--	--	--	11.0
	9 - 12	4/23/2009	3.2	--	2.1	--	2.7

Notes:

1. Arsenic results are presented in milligrams per kilogram (mg/kg); equivalent to parts per million (ppm).
2. FMC primary samples represent the results of the initial sample collected at that specific location and depth interval.
3. FMC duplicate samples were collected at the same time as the primary sample to verify that the sample collection and analysis methods produced consistent results. The duplicate samples were collected at a rate of approximately 5% (i.e., 1 for every 20 FMC primary samples collected). This rate is averaged over the entire event.
4. NYSDEC split samples were collected to verify that sample collection and analysis procedures were not biased over the course of the sampling event. NYSDEC split samples were collected at a rate of approximately 10%.
5. Data Qualifier: J = Positively identified, but concentration is estimated.
6. Combined concentration is the arithmetic average of all primary, duplicate and split sample results.
7. Combined concentrations greater than 20.0 mg/kg are shaded pink.

ARCADIS

Appendix B

Background Levels of Arsenic in Middleport Soil

Contents:

TABLE B-1
SOIL ARSENIC DATA FROM 2001-2003 GASPORT BACKGROUND STUDY

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

Property Group	Land Use Type	Property ID	Sample Location	Depth (inches)	Arsenic Concentration (mg/kg)				
					Primary	Duplicate	Agency Split	Other	Combined
Wooded-Agricultural	Crop Field	Ca	CA-1A	0-3	56.7				56.7
Wooded-Agricultural	Crop Field	Ca	CA-1B	0-3	4.9				4.9
Wooded-Agricultural	Crop Field	Ca	CA-2A	0-3	5.2				5.2
Wooded-Agricultural	Crop Field	Ca	CA-2B	0-3	4.1				4.1
Wooded-Agricultural	Crop Field	Ca	CA-3A	0-3	5	4.6			4.8
Wooded-Agricultural	Crop Field	Ca	CA-3B	0-3	3.5				3.5
Wooded-Agricultural	Crop Field	Ca	CA-4A	0-3	33.5		31.1		32.3
Wooded-Agricultural	Crop Field	Ca	CA-4B	0-3	7.1				7.1
Wooded-Agricultural	Crop Field	Cc	CC-1A	0-3	3.2				3.2
Wooded-Agricultural	Crop Field	Cc	CC-1B	0-3	3 J				3
Wooded-Agricultural	Crop Field	Cc	CC-2A	0-3	3.3		3.1		3.2
Wooded-Agricultural	Crop Field	Cc	CC-2B	0-3	2.9 J				2.9
Wooded-Agricultural	Crop Field	Cc	CC-3A	0-3	3.2				3.2
Wooded-Agricultural	Crop Field	Cc	CC-3B	0-3	2.3 J				2.3
Wooded-Agricultural	Crop Field	Cc	CC-4A	0-3	3.2				3.2
Wooded-Agricultural	Crop Field	Cc	CC-4B	0-3	4.4 J				4.4
Wooded-Agricultural	Crop Field	Cd	CD-1A	0-3	4.1		3.5		3.8
Wooded-Agricultural	Crop Field	Cd	CD-1B	0-3	5.1 J				5.1
Wooded-Agricultural	Crop Field	Cd	CD-2A	0-3	9.8				9.8
Wooded-Agricultural	Crop Field	Cd	CD-2B	0-3	11.9 J				11.9
Wooded-Agricultural	Crop Field	Cd	CD-3A	0-3	3.7				3.7
Wooded-Agricultural	Crop Field	Cd	CD-3B	0-3	4.4 J				4.4
Wooded-Agricultural	Crop Field	Cd	CD-4A	0-3	9.4				9.4
Wooded-Agricultural	Crop Field	Cd	CD-4B	0-3	8.4 J				8.4
Wooded-Agricultural	Crop Field	Ce	CE-1A	0-3	3.4				3.4
Wooded-Agricultural	Crop Field	Ce	CE-1B	0-3	4.7 J				4.7
Wooded-Agricultural	Crop Field	Ce	CE-2A	0-3	4.6				4.6
Wooded-Agricultural	Crop Field	Ce	CE-2B	0-3	3.4 J				3.4
Wooded-Agricultural	Crop Field	Ce	CE-3A	0-3	4.2				4.2
Wooded-Agricultural	Crop Field	Ce	CE-3B	0-3	4.1 J				4.1
Wooded-Agricultural	Crop Field	Ce	CE-4A	0-3	3.7		2.8		3.3
Wooded-Agricultural	Crop Field	Ce	CE-4B	0-3	4 J				4
Wooded-Agricultural	Crop Field	Ch	CH-1A	0-3	3.3				3.3
Wooded-Agricultural	Crop Field	Ch	CH-1B	0-3	5.3 J				5.3
Wooded-Agricultural	Crop Field	Ch	CH-2A	0-3	5.5				5.5
Wooded-Agricultural	Crop Field	Ch	CH-2B	0-3	36.9 J				36.9
Wooded-Agricultural	Crop Field	Ch	CH-3A	0-3	54.4		52.6		53.5
Wooded-Agricultural	Crop Field	Ch	CH-3B	0-3	5.3 J				5.3
Wooded-Agricultural	Crop Field	Ch	CH-4A	0-3	7.7				7.7
Wooded-Agricultural	Crop Field	Ch	CH-4B	0-3	3.3 J				3.3
Wooded-Agricultural	Wooded	Wd	WD-1A	0-3	6.9	6.9			6.9
Wooded-Agricultural	Wooded	Wd	WD-1B	0-3	3.3 J				3.3
Wooded-Agricultural	Wooded	Wd	WD-2A	0-3	7.9		7.3		7.6
Wooded-Agricultural	Wooded	Wd	WD-2B	0-3	6.7 J				6.7
Wooded-Agricultural	Wooded	Wd	WD-3A	0-3	8.8				8.8
Wooded-Agricultural	Wooded	Wd	WD-3B	0-3	8.1 J				8.1
Wooded-Agricultural	Wooded	Wd	WD-4A	0-3	5.1				5.1
Wooded-Agricultural	Wooded	Wd	WD-4B	0-3	7.2 J				7.2
Wooded-Agricultural	Wooded	We	WE-1A	0-3	4.2				4.2
Wooded-Agricultural	Wooded	We	WE-1B	0-3	4.7				4.7
Wooded-Agricultural	Wooded	We	WE-2A	0-3	5.2				5.2
Wooded-Agricultural	Wooded	We	WE-2B	0-3	3.2				3.2
Wooded-Agricultural	Wooded	We	WE-3A	0-3	4.7		3.8		4.3
Wooded-Agricultural	Wooded	We	WE-3B	0-3	4				4
Wooded-Agricultural	Wooded	We	WE-4A	0-3	3.7				3.7
Wooded-Agricultural	Wooded	We	WE-4B	0-3	3.4				3.4
Commercial-Indsutrial	Commercial	Bb	BB-1A	0-3	2.4 J	6.1 J	2.3	2.2	3.3
Commercial-Indsutrial	Commercial	Bb	BB-2A	0-3	4.6				4.6
Commercial-Indsutrial	Commercial	Bb	BB-3A	0-3	5.2				5.2
Commercial-Indsutrial	Commercial	Bf	BF-1A	0-3	7.5				7.5

TABLE B-1
SOIL ARSENIC DATA FROM 2001-2003 GASPORT BACKGROUND STUDY

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

Property Group	Land Use Type	Property ID	Sample Location	Depth (inches)	Arsenic Concentration (mg/kg)				
					Primary	Duplicate	Agency Split	Other	Combined
Commercial-Indsutrial	Commercial	Bf	BF-2A	0-3	9.9		2.9		6.4
Commercial-Indsutrial	Commercial	Bf	BF-3A	0-3	13.2				13.2
Commercial-Indsutrial	Industrial	Ia	IA-1A	0-3	33.5	32.1			32.8
Commercial-Indsutrial	Industrial	Ia	IA-2A	0-3	26.1				26.1
Commercial-Indsutrial	Industrial	Ia	IA-3A	0-3	3.5		3.1		3.3
Commercial-Indsutrial	Industrial	Ib	IB-1A	0-3	12.5				12.5
Commercial-Indsutrial	Industrial	Ib	IB-2A	0-3	20.4		20.8		20.6
Commercial-Indsutrial	Industrial	Ib	IB-3A	0-3	4.9				4.9
Residential-Public	Residential	Ra	RA-1A	0-3	6.3				6.3
Residential-Public	Residential	Ra	RA-2A	0-3	17.4		12.5		15
Residential-Public	Residential	Ra	RA-3A	0-3	4.5				4.5
Residential-Public	Residential	Rb	RB-1A	0-3	16.7		3.5		10.1
Residential-Public	Residential	Rb	RB-2A	0-3	11.6				11.6
Residential-Public	Residential	Rb	RB-3A	0-3	12.8				12.8
Residential-Public	Residential	Rc	RC-1A	0-3	8.7		7.2		8
Residential-Public	Residential	Rc	RC-2A	0-3	9.5				9.5
Residential-Public	Residential	Rc	RC-3A	0-3	9.9				9.9
Residential-Public	Residential	Re	RE-1A	0-3	5.7				5.7
Residential-Public	Residential	Re	RE-2A	0-3	7.7				7.7
Residential-Public	Residential	Re	RE-3A	0-3	18.6		20.3		19.5
Residential-Public	Residential	Rf	RF-1A	0-3	14.7		14.3		14.5
Residential-Public	Residential	Rf	RF-2A	0-3	21.2				21.2
Residential-Public	Residential	Rf	RF-3A	0-3	14.5				14.5
Residential-Public	Residential	Rg	RG-1A	0-3	7.3				7.3
Residential-Public	Residential	Rg	RG-2A	0-3	5.6				5.6
Residential-Public	Residential	Rg	RG-3A	0-3	8		7.3		7.7
Residential-Public	Residential	Rh	RH-1A	0-3	4.6	3.9	4.2		4.2
Residential-Public	Residential	Rh	RH-2A	0-3	20.3 J				20.3
Residential-Public	Residential	Rh	RH-3A	0-3	9.1				9.1
Residential-Public	School	Sa	SA-1A	0-3	4.2	4.3	3.3	3.5	3.8
Residential-Public	School	Sa	SA-2A	0-3	3.3				3.3
Orchard	Orchard	Oa	OA-1A	0-3	14.7				14.7
Orchard	Orchard	Oa	OA-2A	0-3	8.8		8		8.4
Orchard	Orchard	Oa	OA-3A	0-3	27.8				27.8
Orchard	Orchard	Oa	OA-4A	0-3	10.4				10.4
Orchard	Orchard	Ob	OB-1A	0-3	3.8	3.7			3.8
Orchard	Orchard	Ob	OB-2A	0-3	40.4		45.9		43.2
Orchard	Orchard	Ob	OB-3A	0-3	4.6				4.6
Orchard	Orchard	Ob	OB-4A	0-3	3.1				3.1
Orchard	Orchard	Od	OD-1A	0-3	130	129	105		121
Orchard	Orchard	Od	OD-2A	0-3	81.9				81.9
Orchard	Orchard	Od	OD-3A	0-3	24.5				24.5
Orchard	Orchard	Od	OD-4A	0-3	56.3				56.3

Notes:
1. All samples collected in May 2002 during the Gasport Background Study.
2. Approximate locations of properties sampled shown on Figure B-1 of this Volume X of the RFI Report.
3. Results reported in *Development of Arsenic Background in Middleport Soil* (CRA 2003).
4. The combined result is the arithmetic average of all values reported for any primary field sample, field duplicate sample, Agency split sample, and additional other samples collected.
5. J = Associated value is estimated.

TABLE B-2
SUMMARY OF SOIL ARSENIC CONCENTRATIONS BY PROPERTY TYPE/USAGE FROM 2001-2003 GASPORT BACKGROUND STUDY

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

Major Property Type/Usage	Number of Samples	Arsenic Concentrations (mg/kg)				
		Range	Mean	95% UCL	95th Percentile	98th Percentile
Orchard Land (3 Orchards)	12	3.1 to 121.3	33.3	63.5	99.6	112.6
Wooded or Overgrown Land and Agricultural Crop Field Land (2 Wooded, 5 Crop Fields)						
Including 4 potential statistical outliers	56	3.1 to 56.7	7.9	14.2	33.5	51.8
Excluding 4 potential statistical outliers	52	3.1 to 11.9	5.0	5.5	9.1	9.8
Commercial and Industrial Land (2 Business and 2 Industrial Properties)	12	2.2 to 32.8	11.7	18.4	29.1	31.3
Residential and Public Land (7 Residential Properties, 1 School)	23	3.3 to 21.1	10.1	12.0	20.2	20.7

Note: 95% UCL = 95% Upper Confidence Limit on the Mean

The 2001-2003 Gasport Background Study generated total arsenic data for 103 surface soil samples (0 - 3-inch depth interval) collected from four major property types/usage groups. An analysis for potential statistical outliers identified four points in the wooded/overgrown/agricultural crop field land group.

TABLE B-3
SUMMARY OF ESTIMATED MIDDLEPORT SOIL ARSENIC BACKGROUND CONCENTRATIONS

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

Property Type/Usage Weighting Factor Calculation Method[1]	Weighted Mean		95% UCL on Weighted Mean		95th Percentile		98th Percentile	
	Excluding Potential Outliers[2] N=99 (mg/kg)	Including Potential Outliers[3] N=103 (mg/kg)	Excluding Potential Outliers[2] N=99 (mg/kg)	Including Potential Outliers[3] N=103 (mg/kg)	Excluding Potential Outliers[2] N=99 (mg/kg)	Including Potential Outliers[3] N=103 (mg/kg)	Excluding Potential Outliers[2] N=99 (mg/kg)	Including Potential Outliers[3] N=103 (mg/kg)
2001 Gasport Work Plan[4, 5]	**8.1**	**9.7**	**8.7**	**12**	**19**	**22**	**28**	**30**
Updated 2001 Gasport Work Plan[6, 8]	13	14	19	19	39	40	76	75
Time-Weighted Alternative[7, 8]	9.3	11	13	14	23	25	40	41

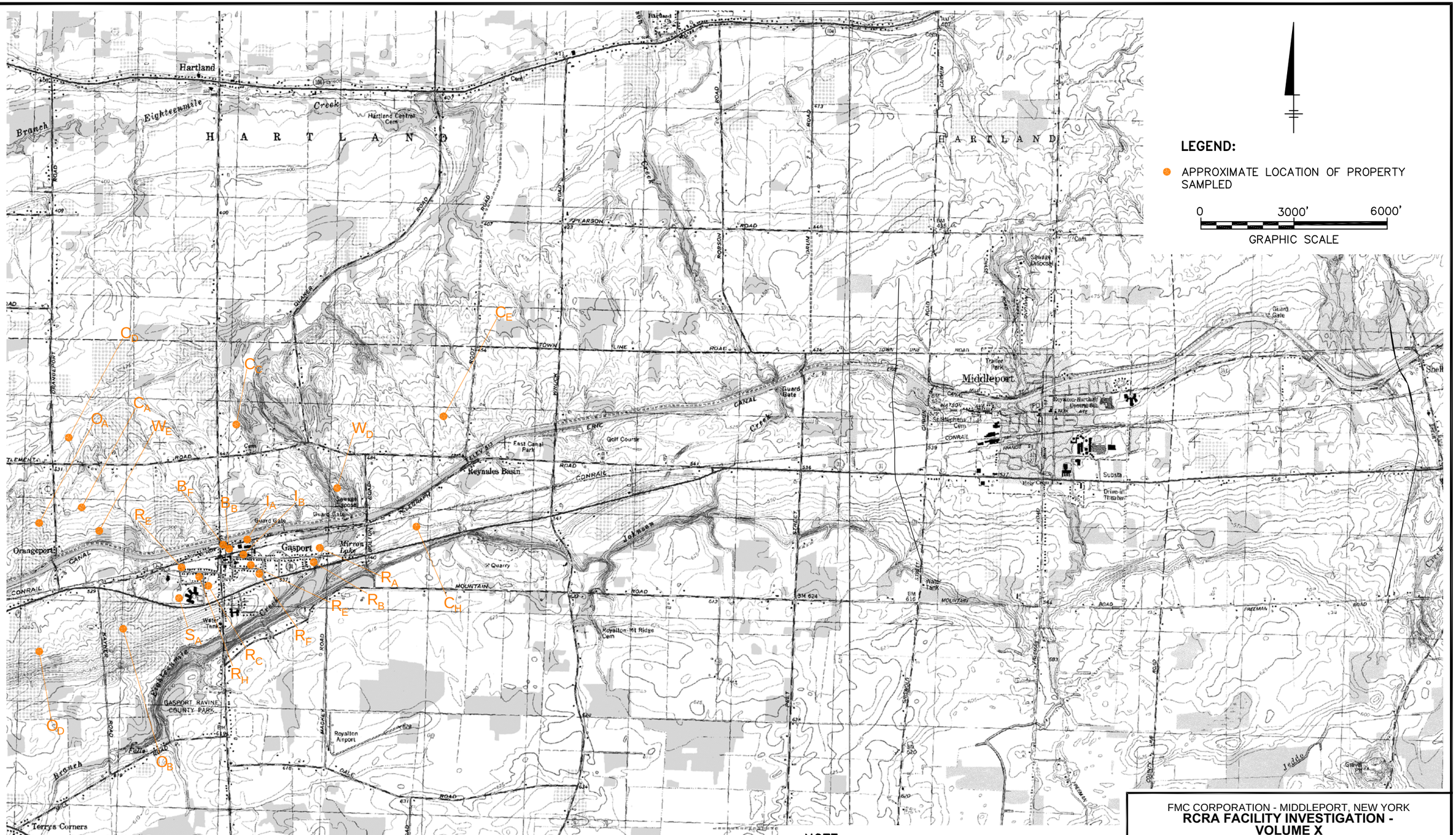
See Notes on Page 2.

TABLE B-3
SUMMARY OF ESTIMATED MIDDLEPORT SOIL ARSENIC BACKGROUND CONCENTRATIONS

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

Notes:

1. The Middleport background soil arsenic concentrations presented in this table are statistical values that were calculated using property type/usage group weighting factors (i.e., percentages) derived for the Middleport study area. The property type/usage groups are defined in the NYSDEC document entitled "Program to Determine Extent of FMC-Related Arsenic Contamination in Middleport - Part A - Work Plan for Development of Arsenic Background in Middleport Soil" (Agencies, September 2001) [2001 Gasport Work Plan]. The statistical values are calculated based on the soil arsenic data for different property types/usages presented in the report entitled "Development of Arsenic Background in Middleport Soil" [2003 Gasport Background Study Report]; the data are also provided in Appendix B (Table B-1) of this Volume X of the RFI Report.
2. Calculated concentrations in this column are based on the 2003 Gasport Background Study data, excluding 4 potential outliers (total sample size = 99).
3. Calculated concentrations in this column are based on the 2003 Gasport Background Study data, including 4 potential outliers (total sample size = 103).
4. The 2001 Gasport Work Plan arsenic values were calculated using property type/usage group weighting factors specified in the 2001 Gasport Work Plan that are time-weighted, with cumulative orchard areas within two time periods (1931-1958 and 1968-1978), based on aerial photos provided in the Draft RCRA Facility Investigation (RFI) Report (CRA, January 1999) [1999 Draft RFI Report]. The calculated arsenic values are presented in the 2003 Gasport Background Study Report, with the exception of the 98th percentile values, which were subsequently added in early 2011 in response to the Agencies' comments on the Draft CMS Report for the Suspected Air Deposition and Culvert 105 Study Areas.
5. The Agencies selected 20 mg/kg arsenic (based on the weighted 95th percentile of the 2003 Gasport Background Study soil data, using the 2001 Gasport Work Plan calculation method) as the delineation criterion for FMC-related arsenic in Middleport soils for the purposes of the RFI, with consideration given to other factors that could influence potential historical air deposition and stormwater flow.
6. The Updated 2001 Gasport Work Plan arsenic values were calculated using revised property type/usage group weighting factors. The revised property type/usage group weighting factors were calculated as specified in the 2001 Gasport Work Plan and are time-weighted, with cumulative orchard areas within two time periods (1931-1958 and 1968-1978), based on aerial photos provided in the 1999 Draft RFI Report and eight additional aerial photos. The revised property type/usage group weighting factors and the calculated arsenic values are presented in Appendix 6B of RFI Report Volume I – Background and Related Information [RFI Report Volume I].
7. The Time Weighted Alternative arsenic values were calculated using revised property type/usage group weighting factors. The revised property type/usage group weighting factors are time-weighted based on the individual dates of each aerial photo used. The aerial photos used include those provided in the 1999 Draft RFI Report and eight additional photos. The revised property type/usage group weighting factors and the calculated arsenic values are presented in Appendix 6B of RFI Report Volume I.
8. The Agencies have not accepted the statistical values from the Updated 2001 Work Plan or the Time-Weighted Alternative presented in the second and third rows, for reasons explained in their March 10, 2008 letter.



LEGEND:

- APPROXIMATE LOCATION OF PROPERTY SAMPLED

0 3000' 6000'

GRAPHIC SCALE

NOTE:

THIS FIGURE WAS PREPARED FROM A DRAWING BY CRA, ENTITLED "SURFACE SOIL BACKGROUND SAMPLE LOCATIONS", FIGURE 7.1, DRAWING NO. 2788 (55) AUG 05/97(NF) REV.0 @ A SCALE OF 1" = 3,000'.

FMC CORPORATION - MIDDLEPORT, NEW YORK
RCRA FACILITY INVESTIGATION - VOLUME X

2002-2003 GASPORT BACKGROUND SOIL SAMPLING LOCATIONS

ARCADIS

FIGURE **B-1**

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DV DB: P. LISTER LD: P. LISTER PM/TM: T. YOUNG TR: D. WRIGHT LYR:ON=*:OFF=REF; (FRZ)
G:\ENVCAD\SYRACUSE\ACT\B0037763\000000004\DWG\37763B65.DWG LAYOUT: B-1 SAVED: 9/18/2012 9:48 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 9/18/2012 9:48 AM BY: LISTER, PAUL
XREFS: IMAGES: CATALOG: B0037665\0000\XREF
37763XBL 37669X23.TIF

Appendix C

Agencies' Findings Regarding Historical Drainage to Culvert 104

Contents:

New York State Department of Environmental Conservation

Division of Solid and Hazardous Materials

Bureau of Hazardous Waste and Radiation Management, 9th Floor
625 Broadway, Albany, New York 12233-7258

Phone: (518) 402-8594 · **FAX:** (518) 402-9024

Website: www.dec state.ny.us

January 25, 2006

Mr. Paul Bona, Jr.
Superintendent of Schools
Royalton-Hartland School District
54 State Street
Middleport, NY 14105

Dear Mr. Bona:

Re: FMC-Middleport Facility Environmental Matters
Royalton-Hartland Middle and High Schools
Followup To Our August & September 2005 Letters &
Response To Your December 2005 Letters

This letter is written on behalf of the New York Department of Environmental Conservation (DEC), the New York Department of Health (DOH) and the United States Environmental Protection Agency (EPA), hereafter collectively referred to as the Agencies. It is intended both as a followup letter to our letters dated August 31, 2005 [Infurna/Mortefolio/Bethoney to Bona] and September 22, 2005 [Hammond/Carlson/Mugdan to Seeger], and as a response to your letters dated December 5, 2005 and December 20, 2005.

Before delving into the topics of these letters, the Agencies would like to make clear that, based on all available information and environmental data, we see nothing that raises an immediate health concern. However, as discussed in this letter, certain matters deserve further environmental investigation, including the potential for vapor intrusion associated with contaminated groundwater migrating from FMC's facility, as well as the management of various chemicals and cleaning materials used and stored in the school.

Also, the Agencies have reviewed the report titled "Dr. Rosalie Bertell and the International Institute of Concern for Public Health" provided to us in your December 20, 2005 letter. A number of factual errors and mis-interpretations of analytical data have been identified in this report, and for the

most part, the Agencies do **not** agree with the opinions or conclusions presented by Dr. Bertell. We have provided you (in this letter) with what the Agencies consider to be the correct information/data and the Agencies' interpretation of this information/data. We hope this will clarify matters, and provide some assistance to you and the School Board.

This letter, and its enclosures, focus on four (4) topics which are derived from the letters mentioned in the opening paragraph. They all have to do with FMC historic environmental contamination and concerns about its potential effects on the Royalton-Hartland (R-H) School property and students. They are as follows:

1. FMC Off-site Groundwater Contaminant Migration and Vapor Intrusion Potential
   (Followup to Agencies' August 31 & September 22, 2005 letters, and in response to School's December 20, 2005 letter)

2. FMC Building Demolitions and Reported Migration of Potentially Contaminated Dust
   (In response to School's December 5 & December 20, 2005 letters)

3. Alleged FMC Agent Orange Research and Possible Other Previously Un-disclosed Chemicals
   (Followup to Agencies' September 22, 2005 letter, and in response to School's December 20, 2005 letter)

4. Alleged FMC Migration Pathway Under School Property Through Culvert 104
   (Followup to Agencies' August 31, 2005 letter)

The Agencies have provided a comprehensive evaluation and a status report on each of the above topics in Enclosure Nos. 1 - 4 of this letter. With regard to Topic #1 above, be advised that the Agencies have recently requested FMC to perform further investigative activities and FMC has verbally agreed. These activities will involve the school grounds and buildings. These investigative activities and the reasons the Agencies consider them necessary are described in detail in Enclosure No. 1. Be advised that the Agencies consider the School District's cooperation in the performance of these investigative activities as essential to obtain the information and data necessary to adequately evaluate environmental conditions on school property.

We will continue to work with members of the Middleport community and the School District to address any health-related or environmental questions or concerns regarding environmental conditions at the FMC site and surrounding areas. We also suggest that, in the future, you contact the Project Managers of the respective Agencies if you have any concerns regarding issues related to, or potentially related to the FMC site. These individuals are the ones who are most closely involved with FMC environmental activities and who therefore are the most likely to be able to address your concerns. Please feel free to contact any of the following Agency Project Managers: Matthew Mortefolio of NYSDEC at (518) 402-8594, Charlotte Bethoney of NYSDOH at (518) 402-7860, or Michael Infurna of USEPA at (212) 637-4177.

Sincerely,

Stephen Hammond	G. Anders Carlson, Ph.D.	Walter Mugdan
Div. Of Solid &	Div. of Environmental Health	Div. Of Environmental
Hazardous Material	Investigation	Planning Protection
NYSDEC	NYSDOH	USEPA

cc: w/encl. - R. Reigle, Royalton - Hartland School Board Member
M. Hall, Royalton - Hartland School Board Member
S. Hughes, Royalton - Hartland School Board Member
D. Bragg, Royalton - Hartland School Board Member
R. Laubacker, Royalton - Hartland School Board Member
W. Howell, Royalton - Hartland School Board Member
J. Conley, Royalton - Hartland School Board Member
C. Szurbula, NYS Education Department
B. McGinnis, FMC, Philadelphia
D. Watts, New Jersey Institute
D. Seaman, Seaman, Jones, Hogan & Brooks
J. Maedl, Mayor, Village of Middleport
M. Infurna, USEPA
M. Mortefolio, NYSDEC Albany
D. Radtke, NYSDEC Albany
M. Hinton, NYSDEC Region 9 Buffalo
C. Bethoney, NYSDOH

cc: w/o encl: Hon. S. L. Wirth, NYS Assembly, Dist. 142
Hon. F. Delmonte, NYS Assembly, Dist. 138
Hon. G. Maziarz, NYS Senate
Hon. T. Reynolds, Member, US House of Representatives
Hon. H. Clinton, US Senate
Hon. C. Schumer, US Senate
J. Reidy, USEPA
E. Dassatti, NYSDEC Albany
G. Sutton, NYSDEC Region 9 Buffalo
D. David, NYSDEC Region 9 Buffalo
G. Litwin, NYSDOH
S. Page, NYSDOH, Buffalo
R. VanHouten, NYSDOH, Rochester

ENCLOSURE NO. 4

Alleged FMC Migration Pathway
Under School Property Through Culvert 104

Topic #4 - Alleged FMC Migration Pathway Under School Property Through Culvert 104:

As stated in our August 31, 2005 letter, the Agencies completed a document review and found no evidence of a preferential migration pathway for FMC contaminants running north under the eastern portion of the School property to Culvert 104 which runs under the Barge Canal. However, the Agencies indicated in this letter that we would perform sampling near the inlet and outlet of Culvert 104 to see if any FMC contaminants might be present and potentially migrating through this pathway.

On October 24, 2005, DEC staff collected 3 soil samples from 2 locations. The samples were collected from about the top 3 inches of soil in ditches. Two (2) samples were collected at a location a few feet from the culvert inlet south of the Barge Canal and one (1) at a location a few feet from the culvert outlet north of the canal. FMC personnel were not involved nor were they present at the time of this sampling. The samples were sent to a NYSDEC contract laboratory for chemical analysis.

The Agencies had each of the soil samples analyzed for a total of 38 chemical contaminants from the FMC Site Specific Parameter List (SSPL) which has been developed from the 1988 FMC Master Compound List. These include arsenic; lead; 2,4-D & 2,4,5-T (ingredients used in Agent Orange); a total of 19 chlorinated pesticides including DDT; and other pesticides & herbicides, some of which like carbofuran are uniquely FMC produced chemicals. The results from these analyses are presented at the end of this enclosure and are summarized below:

- Out of the 19 chlorinated pesticides only DDD, DDE, DDT & Dieldrin were detected in one or more of the 3 samples, with **all** at concentrations **below** NYSDEC Soil Cleanup Objectives (SCOs). The highest concentration was DDE at an estimated 0.096 mg/kg, **far below** NYSDEC's SCO of 2.1 mg/kg.
- The highest concentration of lead detected was at a concentration of 104.0 mg/kg, **below** NYSDEC's SCO of 400.0 mg/kg for lead.
- The highest concentration of arsenic detected was at a concentration of 12.1 mg/kg, which is **within** the 3.1 to 21.1 mg/kg range of local residential background.
- None of the remaining 32 chemical contaminants were detected in any of the 3 samples.

Therefore, based on the results of this sampling and the prior records review, the Agencies see no evidence of a conduit or structure under the eastern portion of the School property or on the property between State Street and the Barge Canal, nor any evidence to support that Culvert 104 was/is a migration pathway for FMC-related contaminants. Unless new information is brought forth that might significantly alter this conclusion, the Agencies see no reason to further investigate this particular matter.

New York State Department of Environmental Conservation
Division of Solid and Hazardous Materials
Bureau of Radiation & Hazardous Site Management, 9th Floor
625 Broadway, Albany, New York 12233-7258
Phone: (518) 402-8594 • **FAX:** (518) 402-9024
Website: www.dec.state.ny.us

Denise M.Sheehan
Acting Commissioner

August 31, 2005

Mr. Paul Bona, Jr.
Superintendent of Schools
Royalton-Hartland School District
54 State Street
Middleport, NY 14105

Dear Mr. Bona:

Re: FMC-Middleport Facility Environmental Matters
Royalton-Hartland Elementary and High School
Response To Your June 2005 Letters

The United States Environmental Protection Agency (USEPA), the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH) have received and reviewed your letters dated June 13, 2005. As a result, the USEPA, NYSDEC & NYSDOH are responding jointly to your June 2005 letters, and are hereafter referred to collectively as the "Agencies".

Your two (2) June 2005 letters present four (4) separate and distinct topics which collectively have to do with FMC historic environmental contamination and concerns about its potential effects on the Royalton-Hartland (R-H) School property and students. These are as follows:

1. Scheduling of 2005 FMC remediation activities on their North Railroad property, south of the School property;
2. Potential FMC contaminant migration pathway under school property leading to a "suggested" underground structure north of State Street and subsequently to a culvert under the Barge Canal;
3. FMC groundwater contaminant migration as it relates to the School property; and
4. FMC related soil contaminants on School property and the potential re-contamination of previously remediated areas of the School property.

It should be noted that three of the topics were originally presented in your February 3, 2005 and February 28, 2005 letters, which the Agencies responded to with our letter dated March 29, 2005. These topics also appear in your April 18, 2005 letter and were discussed with you and Royalton-Hartland School Board members during our May 18, 2005 meeting. Copies of past correspondence on these topics, including and subsequent to your February 2005 letters, are provided in this letter's Enclosure No.1. this letter is therefore a followup to the Agencies' March 29 letter and the May 18 meeting discussions, with regard to these topics.

Below the Agencies have provided a comprehensive evaluation of the above mentioned topics in response to the questions/comments in your June 13 letters.

1. Scheduling and Status of FMC North Railroad Property Remediation Activities:

It is the Agencies' understanding that FMC provided the School with a letter and schedule of the FMC North Railroad Property Interim Corrective Measure (ICM) activities by hand delivery on June 2, 2005 (copy of FMC letter presented in this letter's Enclosure No.2). This schedule is included in FMC's June 2005 Phase 1 ICM Work Plan for the North Railroad Property which was approved by the Agencies' letter dated June 27, 2005 (copy of the Agencies' letter presented in this letter's Enclosure No.2).

As of the date of this letter, FMC reports that their remediation contractor is on or ahead of schedule with regard to all tasks in the FMC ICM Work Plan. Specifically, all excavation of contaminated soil has been completed, and all cover construction and most of the restoration activities north of the railroad track, including the area adjacent to the School property, have been completed. Cover construction and restoration activities south of the railroad track are anticipated to be completed on or before the scheduled dates.

2. Potential FMC Contaminant Migration Pathway Under and Beyond School Property:

In your February 3, 2005 letter, you indicated that a culvert under the NYS Barge Canal had been identified on the north side of State Street, and that this culvert feeds a tributary which flows northward into Jeddo Creek. You also indicated that satellite images suggest the presence of underground structures which lead into the culvert from State Street, directly north of Royalton-Hartland Elementary School property. You raised a concern that this culvert and suspected underground structure might be acting as a migration pathway for FMC-related groundwater contaminants and that this underground pathway may pass through School property. In our March 29, 2005 response letter, the Agencies indicated that we would perform a records review and conduct a site visit of the area to investigate the culvert and suspected underground structure, and any associated underground contaminant migration pathway from FMC through School property. In your April 18, 2005 letter, you re-iterated concerns about the culvert, suspected structure and the potential contaminant migration pathway, and it was a topic of discussion at our May 18, 2005 meeting.

The first topic of your June 13, 2005 letter further discusses the suspected underground contaminant pathway and your concern that it may cross School property. Your letter requests the results of the Agencies' investigation of this matter.

As per the commitment made in our March 29, 2005 letter, the Agencies have now completed our records search and review, and performed a site visit regarding the above matter. The Agencies have reviewed historic documents (e.g., maps, plans, aerial photos, etc.) from the Royalton-Hartland School District, the NYS Department of Transportation (NYSDOT), the NYS Thruway Authority (maintains Barge Canal), as well as NYSDEC files, and conducted a site visit of the culvert area south of the Barge Canal. Agencies' staff also discussed this matter with Village maintenance personnel. Copies of some pertinent historic

documents reviewed by Agencies' staff and copies of digital photographs taken during the site visit, are presented in this letter's Enclosure No.3. Below is a summary of the Agencies' review and site visit:

- Records do not indicate the presence of any man-made conduit or other underground structure running from the FMC Plant to State Street, through the School property.
- Records do not indicate the presence of any historic man-made conduit or other underground structure on the property east of the Hammond Parkway development between State Street and the Barge Canal. However, in 1995, the NYS Department of Transportation installed a storm sewer pipe from State Street to the inlet of Culvert 104. Records do not indicate that any underground structure on the property between State Street and the Barge Canal was encountered during this installation.
- Existing groundwater data do not suggest the presence of a preferential groundwater migration pathway running through the eastern portion of the School property towards State Street.
- The presence of a 36-inch diameter cast iron culvert under the Barge Canal just east of the Hammond Parkway development has been confirmed. Records indicate that this is Culvert 104.
- Culvert 104 discharges on the north side of the canal to a tributary which flows north into Tributary One, which in turn flows into Jeddo Creek.
- Culvert 104 collects surface water from the property immediately south of its inlet and from ditches which run east and west on the south side of the canal. These ditches drain a portion of the Hammond Parkway development and the area east of the culvert's inlet.
- A concrete standpipe approximately 24 inches in diameter with a depth of about 6 feet was identified just south of the Culvert 104 inlet. Water was observed flowing from the west through the base of this standpipe into a pipe that discharges to the inlet of Culvert 104. Records indicate that this standpipe is connected to the Village's sanitary sewer system.

Based on the above, the Agencies see little, if any, evidence to suggest that there is a preferential contaminant migration pathway from the FMC site, running under the School property and discharging into Culvert 104. However, the Agencies realize that historic records are not always complete and surface observations cannot be used to attest to sub-surface conditions. Therefore, the Agencies are planning on sampling the sediment and/or surface water near the outlet and/or inlet of Culvert 104, and analyzing the samples for FMC-related contaminants, including, but not limited to arsenic. This sampling should be performed this Fall. Beyond this sampling, the Agencies do not plan any further investigations of this culvert pathway, unless the analytical results or other new information should indicate that such investigations are warranted.

3. FMC Groundwater Contaminant Migration related to School Property:

The second topic of your June 13, 2005 letter requests information on FMC groundwater contaminant migration as it relates to groundwater quality in the geologic zones under the School property. Past correspondence between the School and the Agencies presented in this letter's Enclosure No.1 (School's February 28, 2005 letter; Agencies' March 29, 2005 letter and; School's April 18, 2005 letter) dealt with the potential for Volatile Organic Compounds

(VOCs) in groundwater causing vapor intrusion into structures. On August 2, 2005, FMC and the Agencies conducted an Availability Sessions for school officials and interested members of the public to provide information and respond to questions regarding groundwater quality related to the school property. These sessions included a presentation by FMC consultants on groundwater and the planned groundwater VOC investigations on school property.

Below the Agencies have presented information separately on groundwater quality related to the school property and investigations into the potential presence of VOCs in soil vapor.

School Groundwater Quality -

In the area of the FMC Plant site and school property, natural groundwater flows generally in a north to northwest direction in three (3) distinct geological zones. From the ground surface downward, the first of these zones is referred to as the "Overburden" zone that is made up of a soil layer which ranges in thickness from about 8 to 18 feet on school property. The natural horizontal groundwater flow rate in the Overburden zone is estimated to be about 8 feet per year, which is relatively slow due to the high clay content of the overburden soils. The other two zones are the "Shallow Bedrock" zone whose top surface lies about 8 to 18 feet below the ground surface on school property, and the "Deep Bedrock" zone whose top surface lies about 26 to 43 feet below the ground surface on school property. These two bedrock zones are mainly made up of fractured sandstone and shale. The natural horizontal groundwater flow rate in these zones is highly variable depending on fractures in the bedrock.

Monitoring wells on the FMC Plant site indicate very significant levels of groundwater contamination made up of a variety of chemical compounds associated with past manufacturing and operational practices at the Plant. Contaminants most prevalent in the groundwater beneath Plant site include arsenic, methylene chloride, ethylene thiourea and ammonia.

Along the boundary between the FMC-owned railroad property and the school property there are 4 monitoring well "clusters" (a "cluster" is a group of monitoring wells installed at a single location to monitor groundwater at different depths) that are located on school property along the south property boundary. These monitoring wells along the school's southern property line show significant levels of FMC related contaminants in groundwater, but at much lower concentrations than those located on the FMC Plant site.

Another monitoring well cluster is located approximately 600 feet to the north of the school's southern property line near the southeast corner of the High School building. With the exception of sporadic detections of a few constituents at low levels, the groundwater in the overburden and shallow bedrock at this well cluster meets groundwater standards. The monitoring well in this cluster for the deep bedrock zone generally has levels of ammonia in groundwater that exceed the groundwater standard. Additional constituents are also detected in this deep well on sporadic occasions. It is important to note that this deep bedrock well monitors groundwater at depths greater than 50 feet below the ground surface.

FMC has performed numerous Interim Corrective Measures (ICMs) on their Plant site to control the migration of groundwater contamination, including ongoing activities being

implemented during the 2005 summer construction season. FMC has installed and continues to upgrade a groundwater recovery system along its entire northern property boundary and other on-site locations. This includes blasting bedrock trenches and the installation of extraction wells to continuously remove contaminated groundwater. The systems along FMC's northern property line are designed to hydraulically control the northward migration of groundwater contamination and are expected to have a positive impact on groundwater quality on the school property.

It should also be noted that the Agencies participated in a walkthrough of the school buildings on August 3, 2005. Part of the purpose of this walk through was to observe each of the areas where school employees had indicated that flooding had occurred within occupied portions of the buildings. For each of the areas observed, it appeared that the flooding had been caused by storm water run-off (not groundwater) entering the buildings. Therefore, there is no reason to believe the flood waters were contaminated.

GroundwaterVOC Soil Vapor Potential -

As you are probably already aware, the Agencies requested that FMC submit Work Plans to investigate the potential for groundwater VOCs in soil vapor on the School property and Plant site by letter dated June 14, 2005, as part of a State-wide initiative (a copy of the June 14 letter is presented in Enclosure No.4). The Agencies' requested the Work Plan for the School property primarily as a result of VOC's above groundwater standards identified in one monitoring well cluster along the School's southern property boundary. However, it is important to note that groundwater VOCs are **not** present in the monitoring wells closest to school buildings.

FMC submitted the requested Work Plan for the School property by letter dated July 25, 2005, and the Agencies approved this plan by letter dated August 5, 2005 (a copy of the August 5 letter is presented in Enclosure No.4). The Work Plan includes collecting soil gas samples just above the groundwater table for VOC analysis at 15 locations running in an east/west line across the School property between the school buildings and the athletic fields. The Work Plan also includes the installation of an additional groundwater monitoring well cluster on School property.

FMC contractors, with oversight by NYSDEC staff, collected the 15 soil vapor samples during the week of August 8, and submitted them to a NYSDOH certified laboratory for VOC analysis. FMC has provided preliminary (unvalidated) results from this sampling to the Agencies. The preliminary results indicate generally low levels of petroleum and non-petroleum VOCs in all soil vapor samples collected. The sources of these contaminants are unknown at this time, but could be related to historic spills or activities at the FMC plant site and/or on the school property (unrelated to FMC). No "hot spot" locations were identified as the levels of detected compounds were relatively consistent across the 1500 foot transect of sampled school property.

Additional VOC groundwater data are needed to complete the evaluation of the soil vapor results and to help determine the source(s) of the contamination. This groundwater monitoring is scheduled for October, 2005. Upon receipt of the new groundwater data, the

Agencies will evaluate new and existing data, in conjunction with information obtained during the Agencies' August 3 school building walkthrough, to determine if a vapor intrusion investigation is warranted at the school buildings.

4. FMC Related Contamination and Potential Re-Contamination of Soil on School Property:

The third topic of your June 13, 2005 letter requests that the Agencies provide an appraisal of the soil contamination in the un-remediated areas of the School property and on the possibility that soils in the remediated area of the School property may have been re-contaminated, including but not limited to arsenic. Below, the Agencies have presented separately the requested appraisals of the un-remediated areas and potential re-contamination of the remediated area, regarding the soils on School property.

Soil Contamination on Un-remediated Areas of School Property:

In addition to your June 13, 2005 letter, 2005 correspondence between the School and the Agencies presented in this letter's Enclosure No.1 (School's February 28, 2005 letter; Agencies' March 29, 2005 letter and; School's April 18, 2005 letter) have dealt with the topic of soil contamination on School property. These past correspondence have dealt with specific questions/comments related to arsenic and other constituents. Below the Agencies have presented a more comprehensive appraisal of the soil conditions on the un-remediated areas of School property, first with respect to arsenic and subsequently with respect to other potential chemical constituents related to past FMC Plant operations.

Arsenic -

Before proceeding into the Agencies' appraisal of arsenic contamination on un-remediated areas of School property, the Agencies would like to clarify matters with regard to the arsenic data base for the soils on School property which has been a topic in previous correspondence. In your February 3, 2005 letter, you alleged that the Agencies were being misleading by only disclosing and using the lower arsenic value where split samples were taken instead of the higher and average values. You also provided a single example for arsenic where you believed that this was the case. In our March 29, 2005 response letter, the Agencies indicated that the 1999 Draft RCRA Facility Investigation (RFI) Report (which is in FMC's document repository at the Village of Middleport Library) contains the high, low and average results for all split and duplicate samples. The Agencies also requested that you provide us with any document where you considered that the school's arsenic data had not been presented properly, and we would look into the matter. In your April 18, 2005 letter you provided a copy of a figure that presents the school property arsenic data which was attached to an August 1998 Fact Sheet put out by the Agencies, and alleged that the data on the figure was misleading. After reviewing the figure from the 1998 Fact Sheet against the arsenic data in the 1999 Draft RFI Report and the 1999 ICM Work Plan, it appears that the figure contains some errors for data points where splits or duplicates are involved. In some cases where splits or duplicates are involved it appears the lower or higher result was indicated on the figure, instead of the average value, as per established convention. While we apologize for the errors, the Agencies would like to assure you that these were inadvertent

transcription errors, and not part of any deliberate attempt to mislead the School or the public. We would also like to assure you that these errors do not significantly alter the overall arsenic data base for the school property. To clarify the record, the Agencies have presented a table containing the original and corrected arsenic surface soil data and a table with the original and corrected arsenic data averages, in Enclosure No.5 of this letter. Note that the data in these table which appears with a line through it, indicates that the soil from which this sample was taken was removed during the 1999 ICM project. A map showing the locations of the samples obtained from the un-remediated areas of the school yard is also provided in this letter's Enclosure No.5.

In your June 13, 2005 letter you inquired about the mechanisms suspected of causing contamination of School property soils. The Agencies believe that current information indicates that two (2) mechanisms were involved in the suspected migration of arsenic onto the school property from past operations at the FMC Plant. The first mechanism of arsenic migration is through surface water flow. It is suspected that historic surface water run-off from waste disposal and other contaminated areas of the FMC Plant migrated into the ditches along the railroad tracks and in turn onto the southern portion of the school property as a result of past flooding. The Agencies have no information which would suggest that historic flooding from these ditches extended beyond the remediated areas of the School property. Therefore, we do not consider historic surface water flooding to be a mechanism through which the un-remediated areas were contaminated with arsenic. The second mechanism of arsenic migration from historic operations at the FMC Plant site is through air deposition. It is suspected that historic air emission sources on the FMC Plant site caused particulates to be released into the air which contained arsenic. These in turn migrated via wind patterns and eventually settled on the surrounding area. Wind patterns and FMC's air deposition model indicate that the school property is one of the likely arsenic deposition areas. Therefore, the Agencies do consider air deposition from past FMC Plant operations to be the likely mechanism through which areas of the School property were contaminated with arsenic.

Based on review of the arsenic data for the un-remediated areas of the school yard (see Enclosure No.5), the Agencies have identified arsenic concentrations at a number of specific locations and in terms of area averages, which are somewhat elevated above local background. Specifically, these arsenic concentrations are above the local background arsenic concentration range for soil on residential/public property of 3.3 to 21.1 ppm. As a result, the Agencies do consider some soils in the un-remediated areas of the school property to be contaminated with arsenic.

In 1998, we provided you with a copy of the USEPA Baseline Human Health Risk Assessment of the arsenic concentrations in school yard surface soils (Pre-ICM). This assessment estimated potential health risks to students (both athletes and non-athletes) from exposure to the arsenic concentrations in soil on all areas of the school yard. After completion of the 1999 ICM in the are of the football and soccer fields, the Agencies re-calculated these risks using the same methodologies, exposure scenarios and other assumptions as were used in the 1998 USEPA Baseline Human Health Risk Assessment, except using only the arsenic data from the un-remediated areas of the school yard (Post-ICM). The results of this Post-ICM re-assessment indicate that for student athletes and non-athletes, the estimated cancer risk is within EPA's acceptable risk range, and their

estimated toxic risk is below EPA's threshold criteria, with regard to exposure to the arsenic levels in surface soils on the un-remediated areas of the school yard. The results of the pre & post-ICM risk assessments are presented on tables in Enclosure No.5 of this letter.

In conclusion, with regard to arsenic in un-remediated school yard soil, the Agencies' position as expressed in our May 26, 2000 letter remains unchanged. As the Agencies stated in that letter "the entire school yard is suitable for both athletic and non-athletic uses by all school children, in terms of their exposure to known school yard soil arsenic levels". However, as the Agencies also stated in that letter, "No final remedial decisions can be made with regard to the school yard until this process [the Corrective Measures Study (CMS) process] is completed". A copy of the May 26, 2000 letter is included at the end of this letter's Enclosure No.5.

Other Constituents -

The Agencies have reviewed the existing data on the un-remediated areas of School property with regard to chemical constituents potentially in the soil, other than arsenic. The results of that review are presented below:

- First with regard to lead, a total of 66 samples have been analyzed for lead at 64 locations across the un-remediated area of the School property, which include 64 samples of surface soils. Only one (1) of the 66 sample results for lead exceed the criteria for lead in EPA's Soil Screening Guidance for residential surface soil of 400 ppm. It is important to note however that the EPA criteria is for surface soil and the single result of 562 ppm is at a depth range of 1.5 to 2.0 feet below the ground surface. None of the 64 surface soil lead results exceed the above criteria.

- With regard to chemical constituents other than arsenic and lead, a total of 9 samples have been analyzed at 7 locations across the un-remediated area of the School property, which include 7 samples of surface soils. These other constituents include the following groups of chemical constituents:

    - Volatile Organic Compounds (23 individual constituents);
    - Priority Pollutants - Acids, Base/Neutrals (57 individual constituents);
    - Purgeable Haloginated Organic Compounds (26 individual constituents);
    - Metals (14 individual constituents, not including arsenic & lead);
    - Methyl Carbamates (5 individual constituents);
    - Phenolic Compounds (2 individual constituents);
    - Chlorinated Pesticides (23 individual constituents);
    - Total Phenols;
    - Total Chlorinated Hydrocarbons; and
    - Total Organic Carbon

  Only one (1) of the results from the analysis of the above groups marginally exceeded the criteria in EPA's Soil Screening Guidance for residential surface soil and NYSDEC's Soil Cleanup Objectives Guidance for one (1) out of over 150 individual constituents. That constituent was 4,4-DDE at 3.0 ppm, which is above

the 1.88 ppm criteria. It is also important to note that constituents other than arsenic and lead, are only suspected to be associated with past surface water releases from FMC and flooding events, and that the un-remediated areas of the school property are not suspected of being impacted by past FMC related surface water releases and flooding.

Based on the above and our review of other soil data south of the un-remediated areas of the School property, the Agencies do not consider these other constituents to be of concern with regard to exposure of students and others to the surface soils in these un-remediated areas.

Possible Re-Contamination of Soils in the Previously Remediated Area:

In your February 3, 2005 letter, you expressed concern that flooding onto the remediated area of the School property could have caused contaminants to migrate from the FMC-owned North Railroad property, re-contaminating soils in the remediated area. In our March 29, 2005 response letter, the Agencies' acknowledged this possibility and indicated that we would perform soil sampling along the school's southern boundary to investigate if the remediated soil may have become re-contaminated. By letter dated May 5, 2005, the Agencies provided you with a Sampling Work Plan for this soil sampling and analysis. On May 18, 2005, NYSDEC staff collected 13 surface soil samples from 12 locations in the remediated area along the school's southern fence line which is subject to flooding from railroad property surface water run-off. The samples were submitted to a NYSDOH approved laboratory under contract with the NYSDEC. All samples were analyzed for arsenic and lead, and 7 were also analyzed for chlorinated pesticides.

Analytical results indicate that arsenic concentrations in the soil samples ranged from 2.5 to 12.0 ppm, which is within the range of the local background data for public/residential soils (3.3 to 21.1 ppm) and similar to the arsenic concentrations of the clean soil used to backfill the remediated area. Lead concentrations in the soil samples ranged from 7.4 to 15.2 ppm, which is well below the USEPA guidance criteria of 400 ppm for residential surface soil. Some chlorinated pesticides were detected at trace levels, all well below USEPA and NYSDEC guidance criteria. The Agencies have included the complete NYSDEC Report on this sampling, including the individual sample results, laboratory report and data quality review, in Enclosure No.6 of this letter.

Based on these sampling results, the Agencies have concluded that no measurable re-contamination of the remediated area of the School property has occurred. It is also important to note that the ICM currently being completed on the FMC-owned North Railroad property should prevent any future re-contamination of the remediated area from surface water run-off.

The Agencies are open to discussing with you and other School Board members, the topics of this letter and any other appropriate topics regarding the school which are related to FMC environmental investigations. If you or the School Board feel that further discussions are needed to address any remaining questions or concerns, please feel free to contact either Michael Infurna (USEPA) at (212) 637-4177, or Matt Mortefolio (NYSDEC) at (518) 402-8594, or Charlotte Bethoney (NYSDOH) at 1-(800) 548-1158, ext. 2-7860.

Sincerely,

for

Michael Infurna
EPA Project Manager
RCRA Programs Branch
Div. of Environmental
Planning Protection
USEPA

Matt Mortefolio, P.E.
DEC Project Manager
Div. of Solid &
Hazardous Materials
NYSDEC

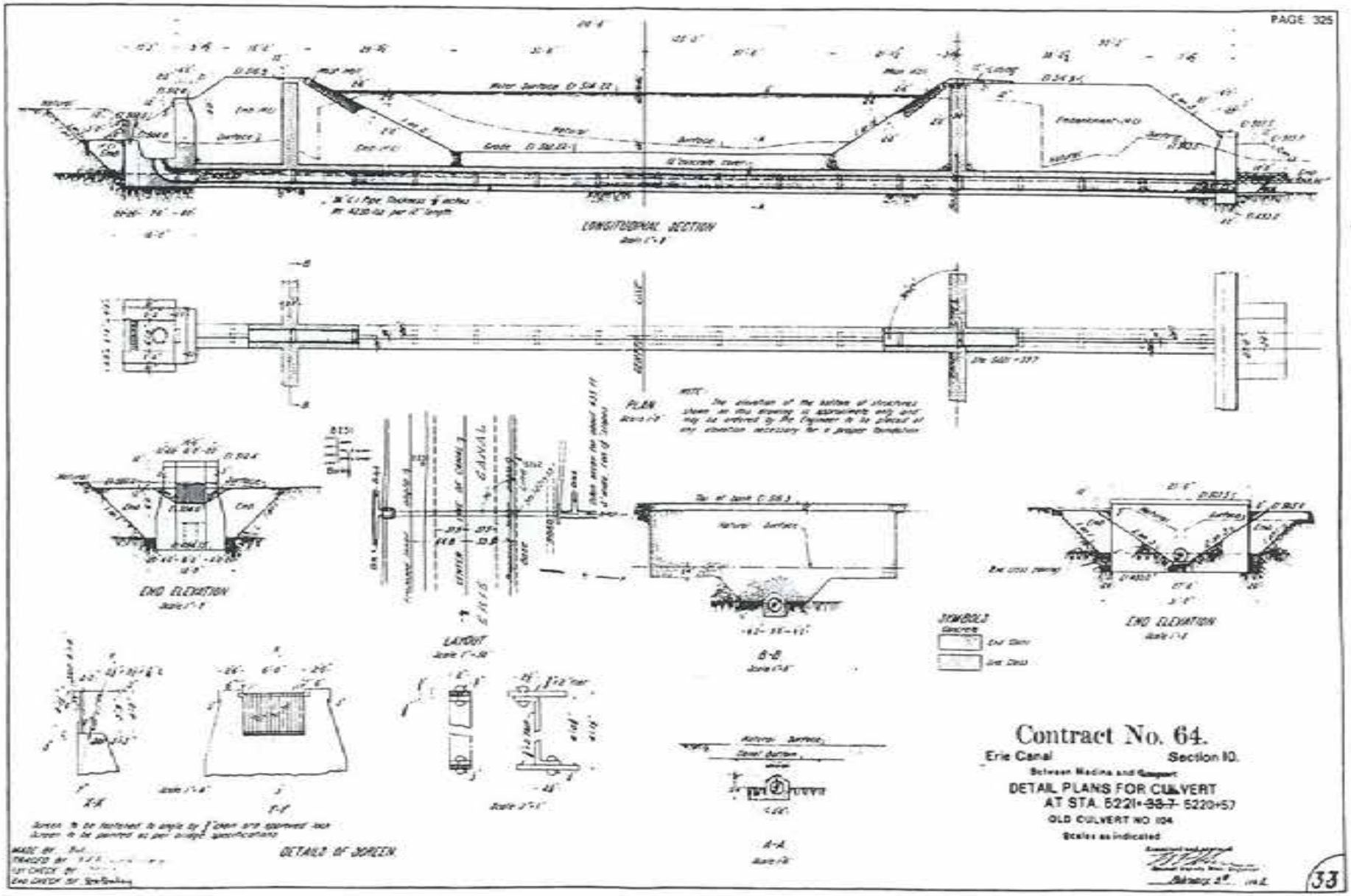
for

Charlotte Bethoney
DOH Project Manager
Bur. of Environmental
Exposure Investigation
NYSDOH

cc: wo/encs. - P. Riegle, Royalton - Hartland School Board Member
S. Hughes, Royalton - Hartland School Board Member
D. Bragg, Royalton - Hartland School Board Member
R. Laubacker, Royalton - Hartland School Board Member
M. Hall, Royalton - Hartland School Board Member
W. Howell, Royalton - Hartland School Board Member
J. Conley, Royalton - Hartland School Board Member
B. McGinnis, FMC, Philadelphia
D. Watts, New Jersey Institute
D. Seaman, Seaman, Jones, Hogan & Brooks
J. Macdl, Mayor, Village of Middleport

ENCLOSURE NO. 3

Historic Documents and Digital Photos from Investigation of Suspected Underground Migration Pathway



Contract No. 64.

Erie Canal Section 10.

Between Medina and Gaspport

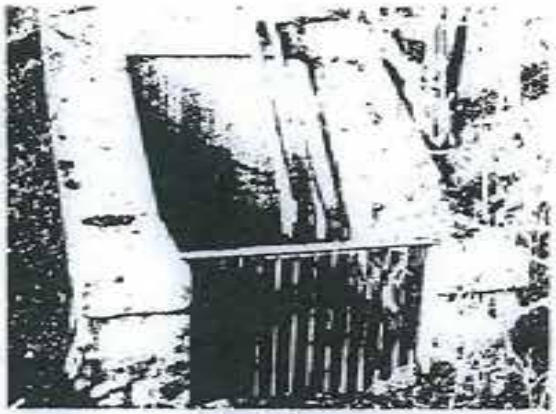
DETAIL PLANS FOR CULVERT

AT STA. 5221+~~38.7~~ 5220+57

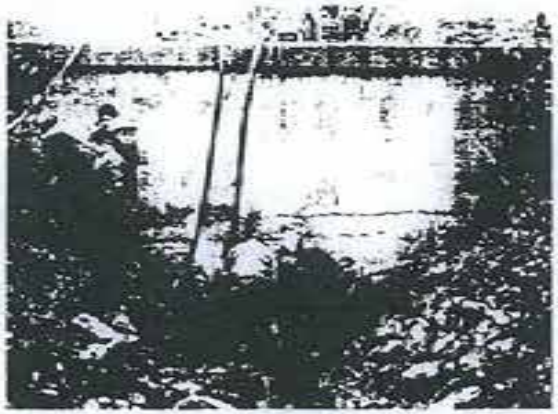
OLD CULVERT NO 104

Scales as indicated

Culvert #104 214' of 36" Cast Iron Pipe



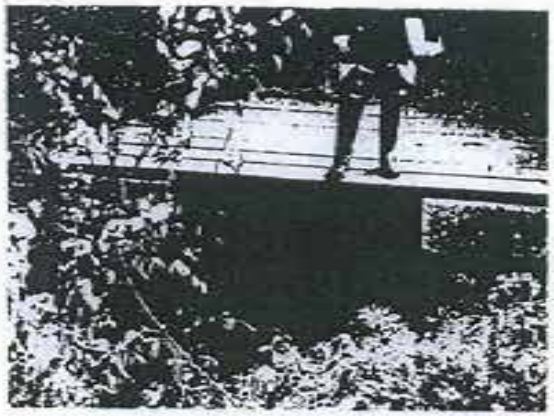
Entrance
Headwall and wingwalls in good condition. A few efflorescent covered cracks on right wingwall.



Exit
Headwall in fair to good condition with a few cracks and scaled areas around culvert barrel.

Cast iron pipe culvert in good condition. ½" thick steel plate patch near center ready to fall off, but probably another one exists on the outside and the pipe is encased in 1' of concrete. 8" flowing pipe from sewage treatment plant runs into entrance. Pipe 1/3 filled with mud. No leaks.

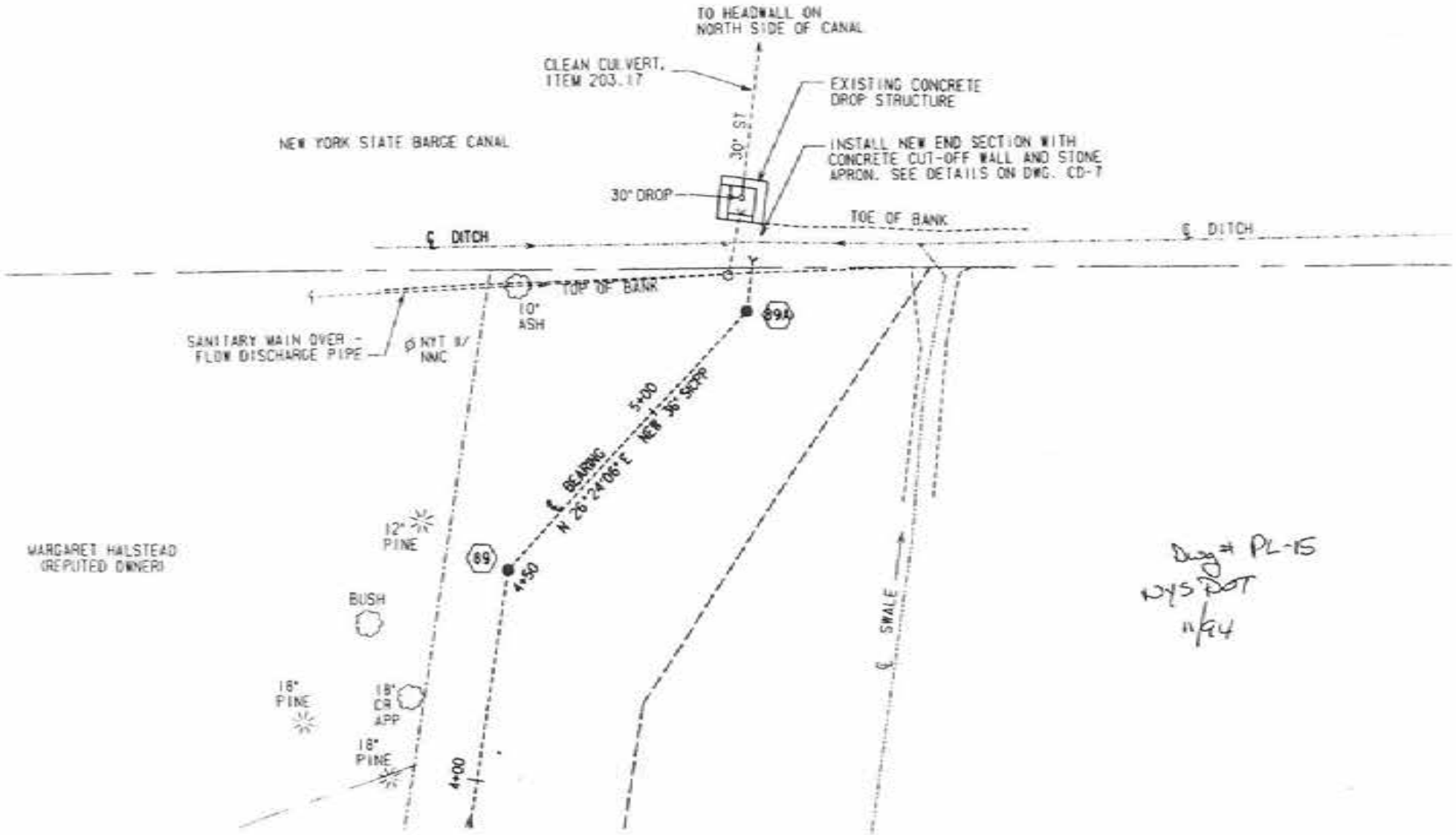
Culvert #105 (Dive) 180' of 30" Cast Iron Pipe
Not Inspected



Exit
Headwall and wingwalls in good condition. Note culvert well covered with planks.

Historic Culvert 104
Inspection Photos

Diagram of: Culvert 104 Inlet; Old Standpipe & Sewer Main; and New DOT Storm Sewer.



Dwg # PL-15
NYSDOT
11/64

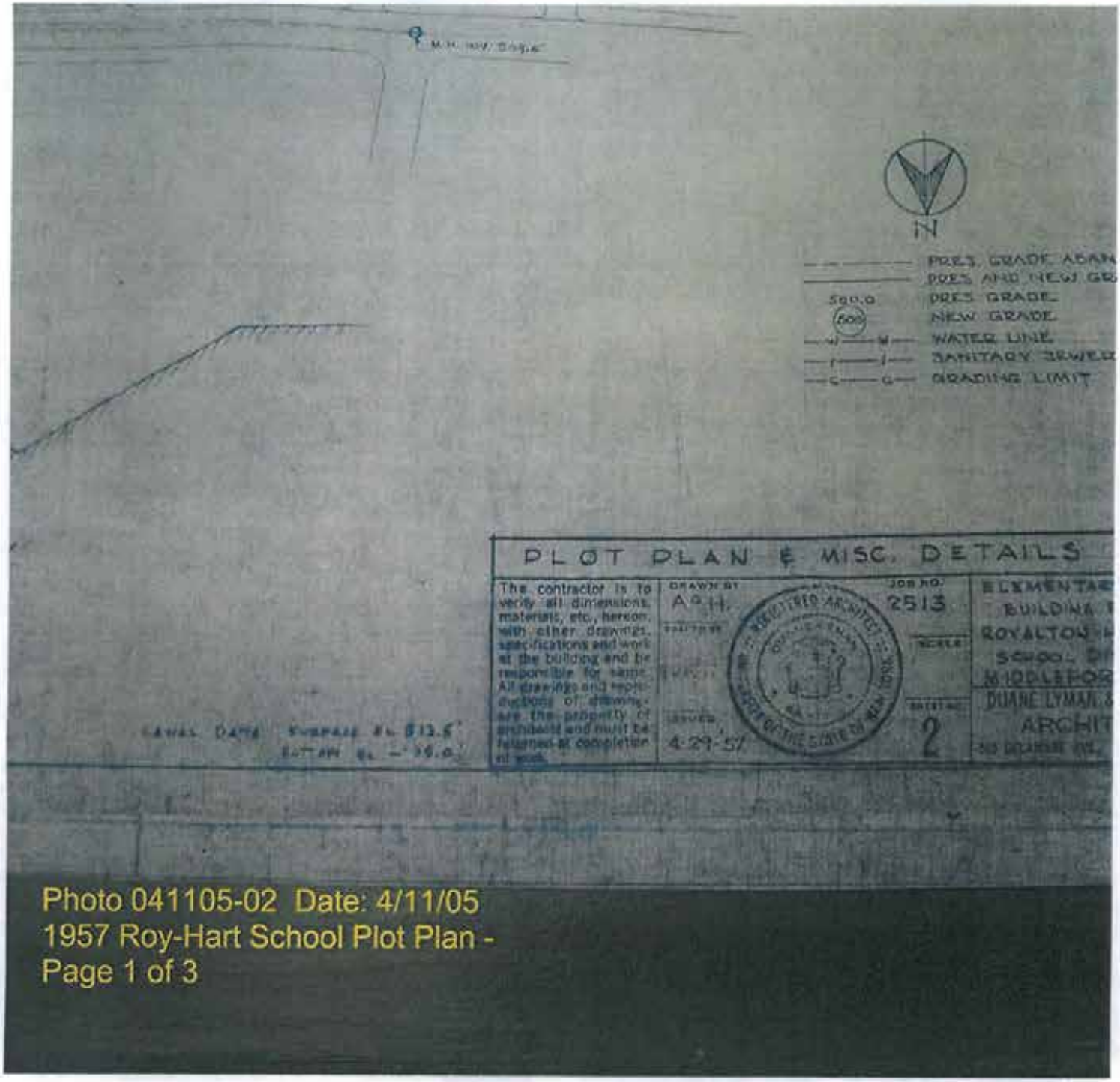
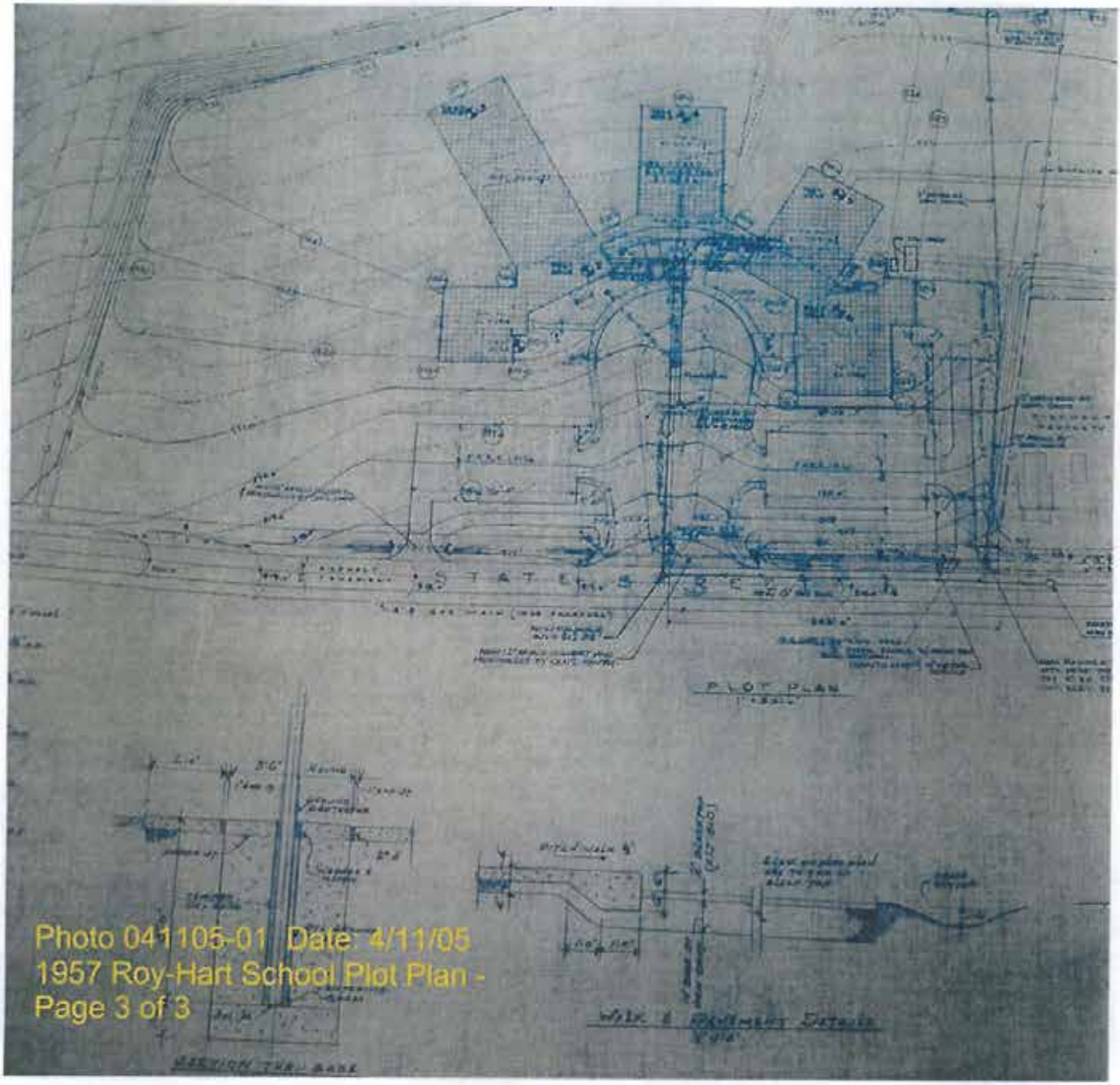


Photo 041105-02 Date: 4/11/05
1957 Roy-Hart School Plot Plan -
Page 1 of 3



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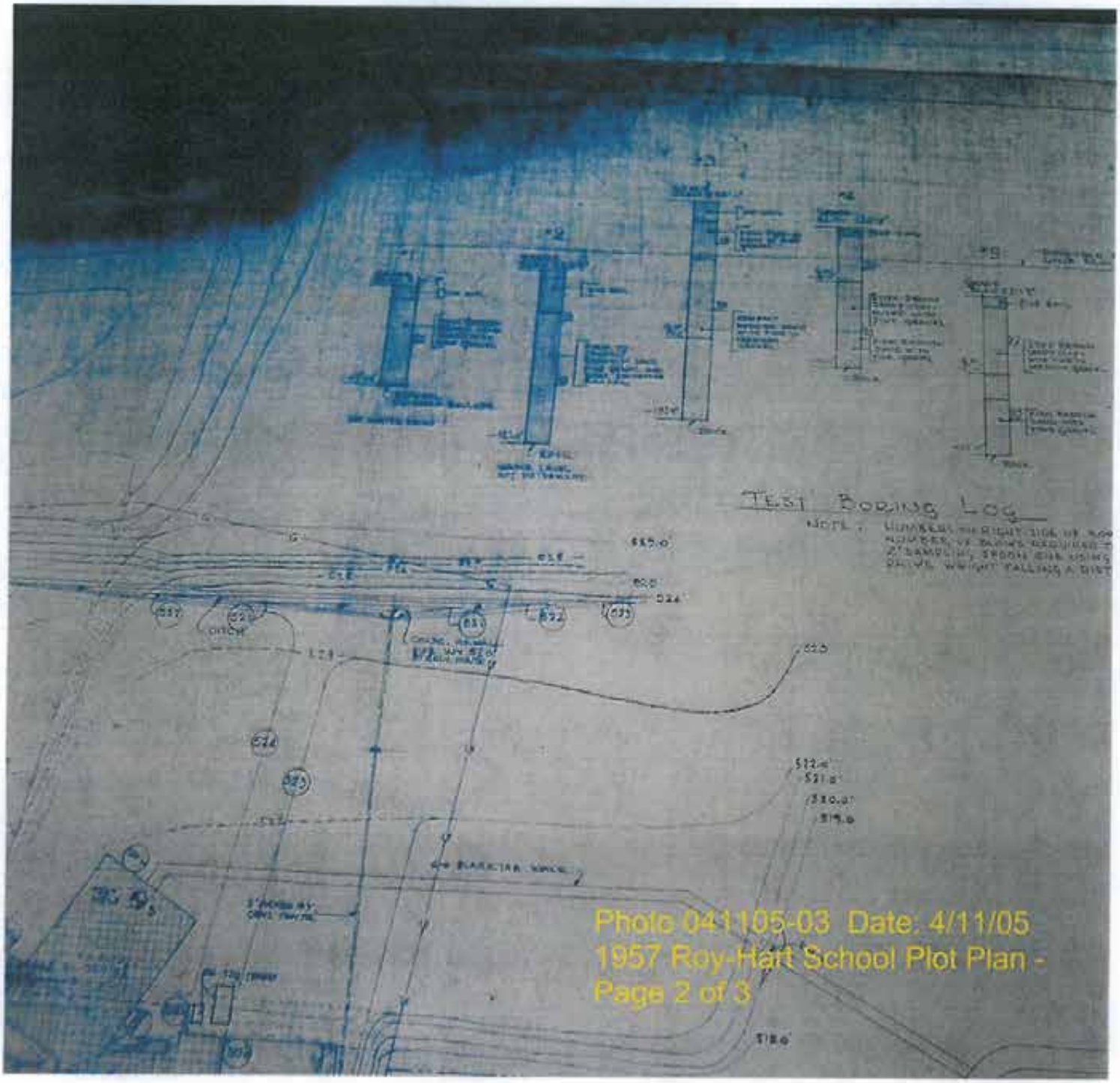
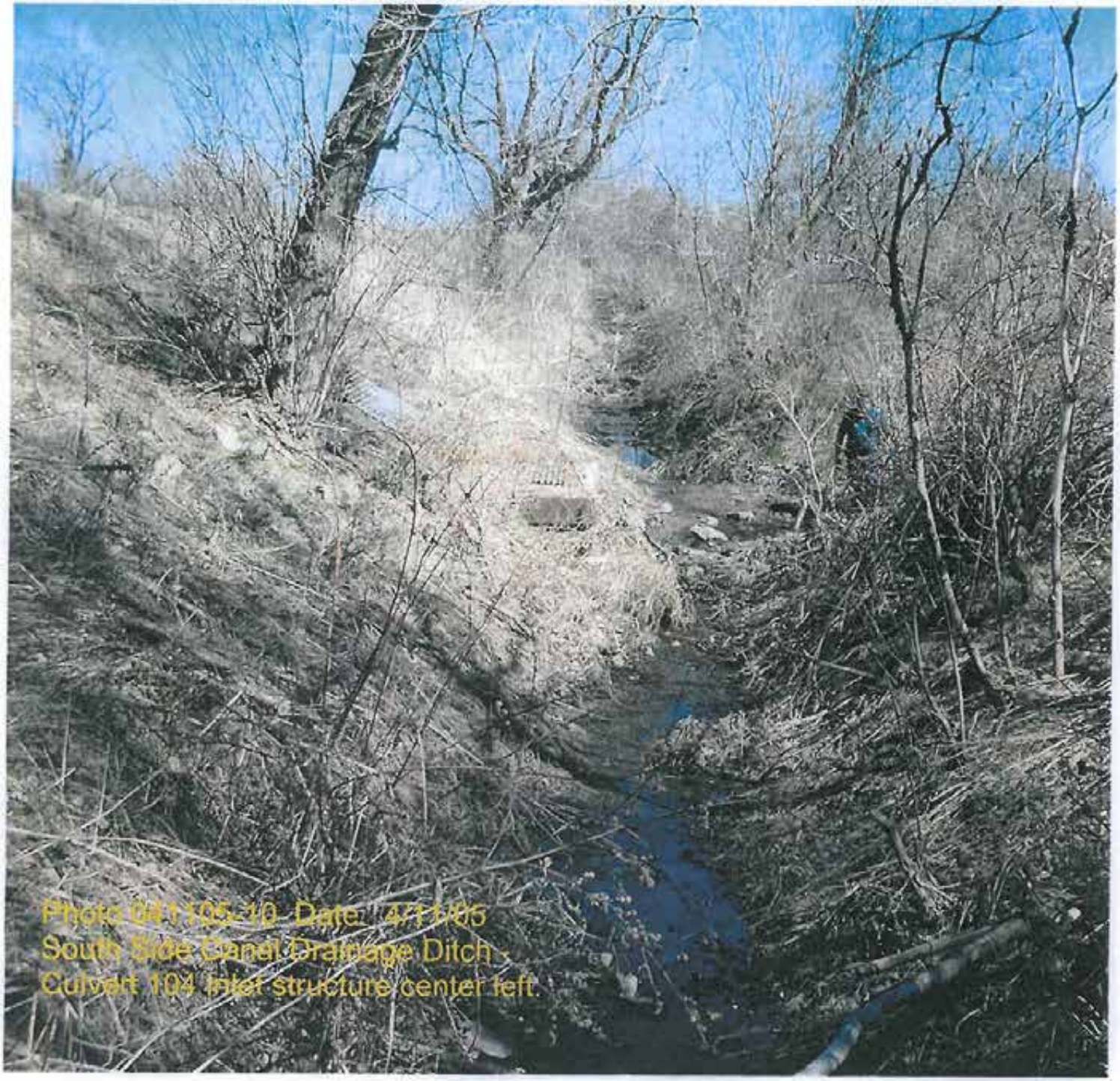
1957 Roy-Hart School Plot Plan -
Page 3 of 3


TEST BORING LOG
Photo 041105-03 Date: 4/11/05
1957 Roy-Hart School Plot Plan -
Page 2 of 3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South Side Canal Drainage Ditch -
Culvert 104 inlet structure center left.

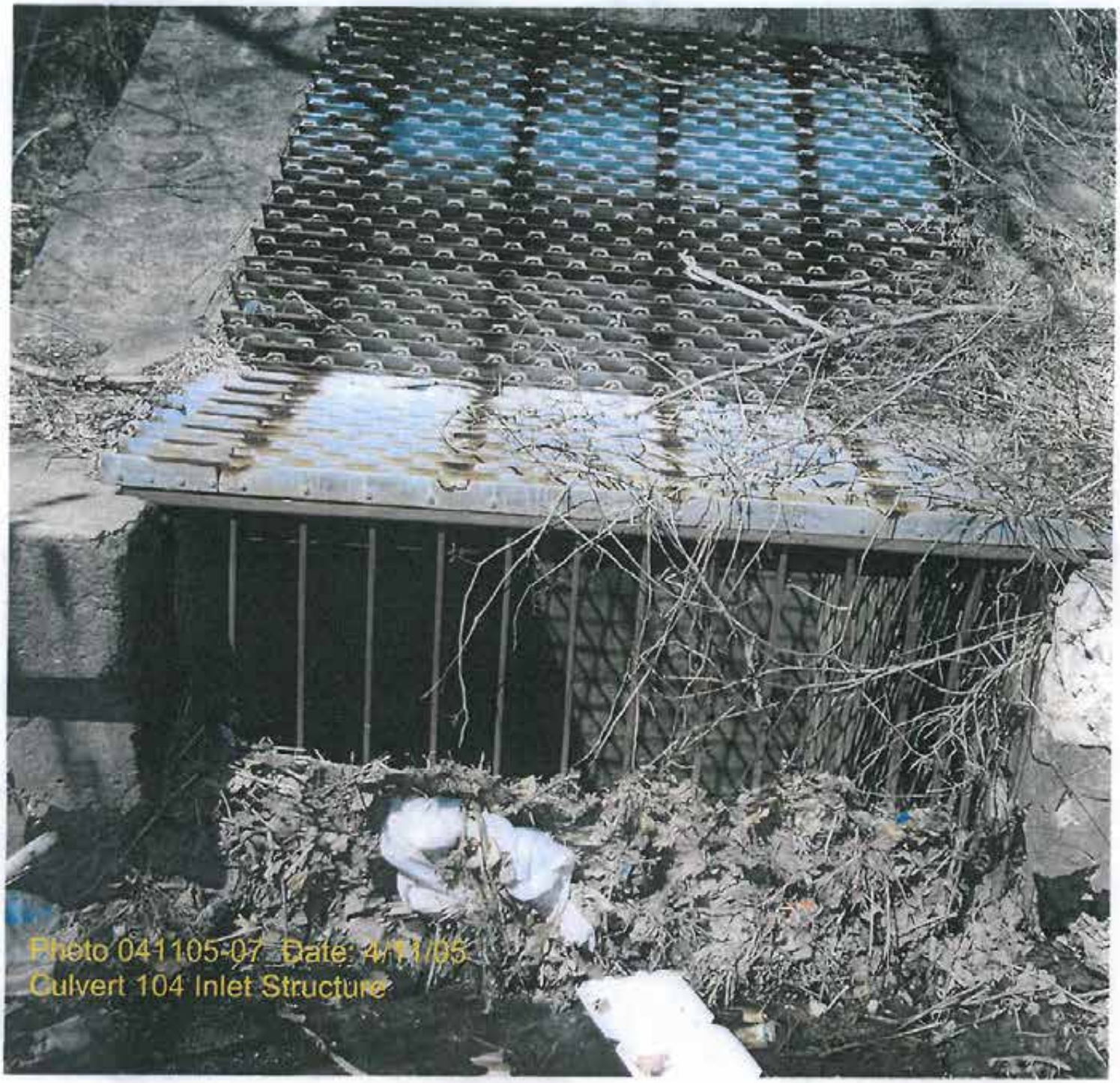


Photo 041105-07 Date: 4/11/05
Culvert 104 Inlet Structure


Photo 041105-06 Date: 4/11/05
South Side Canal Drainage Ditch -
West of Culvert 104 inlet (inlet on bottom right)

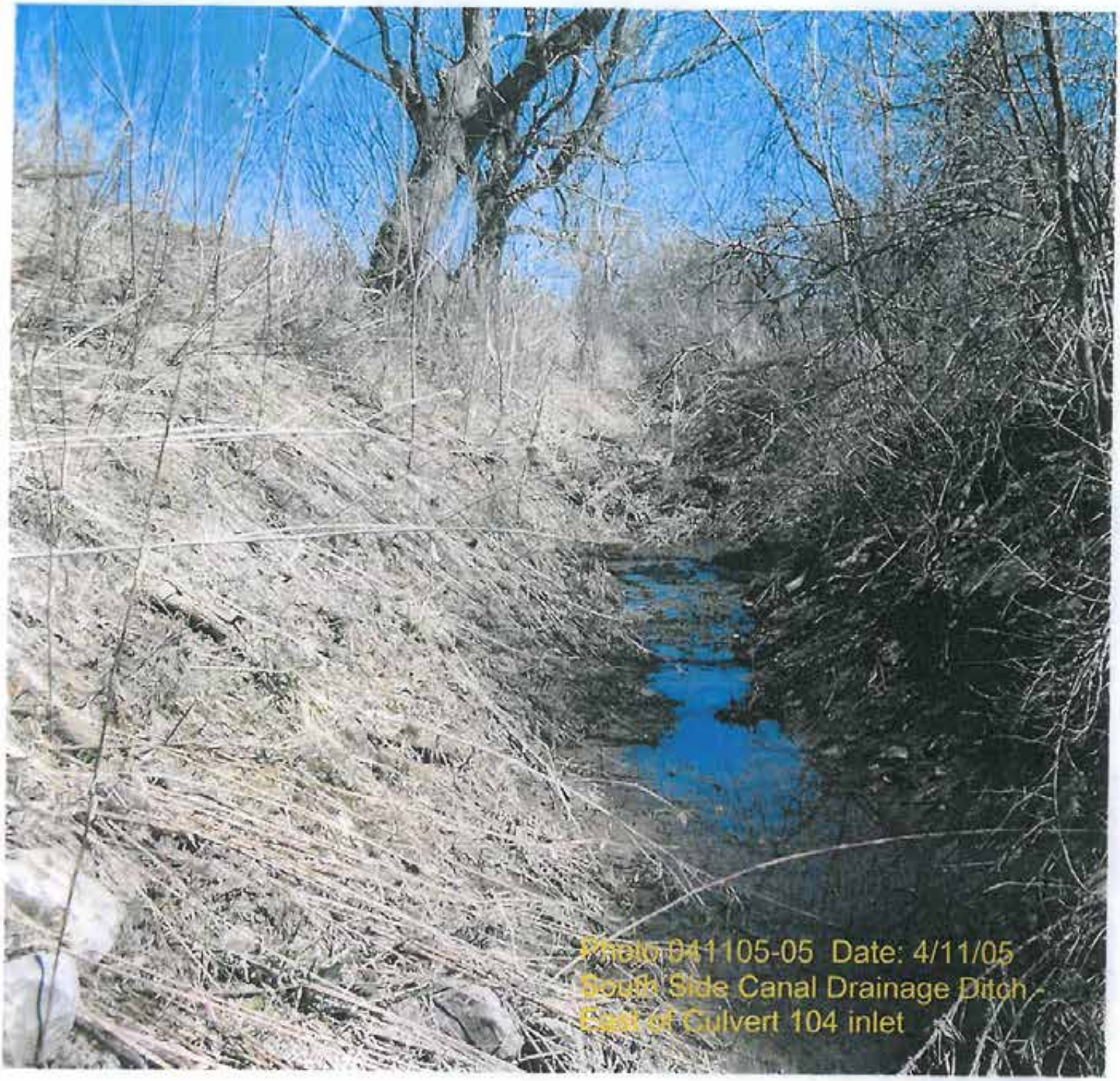
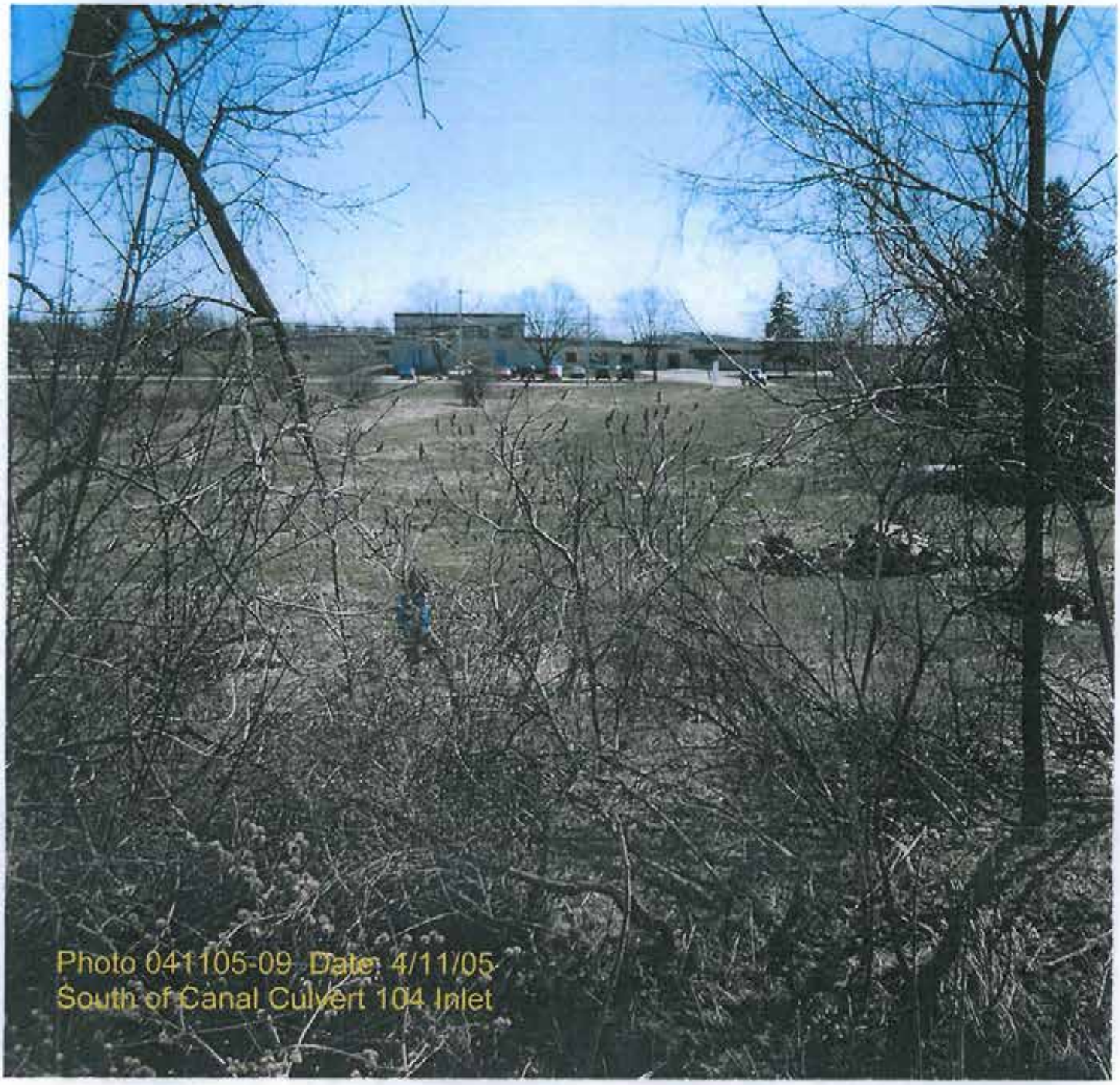


Photo 041105-05 Date: 4/11/05
South Side Canal Drainage Ditch -
East of Culvert 104 inlet


Photo 041105-08 Date: 4/11/05
South of Canal Culvert 104 Inlet -
Old Standpipe (bottom right)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South of Canal Culvert 104 Inlet