FMC Idaho LLC, Pocatello, Idaho

Site-Wide Gas Assessment Report for the FMC Plant Operable Unit

FINAL

December 2010

EXECUTIVE SUMMARY

ES.1 INTRODUCTION

This Executive Summary briefly describes the background and objectives for the site-wide gas assessment field work performed by FMC Corporation at the FMC Plant Operable Unit (OU), a part of the Eastern Michaud Flats (EMF) Superfund Site, and summarize the results and conclusions of this report. This Site-Wide Gas Assessment Report for the FMC Plant OU (*Site-Wide Gas Assessment*) is being submitted to fulfill the requirements of the Supplemental Remedial Investigation (SRI) Field Modification #15 Work Plan (MWH, 2010a; *Field Modification #15 Work Plan*) as approved by EPA on July 7, 2010. Site-wide gas assessment samples were collected within areas of the FMC Plant OU that have the potential to generate phosphine gas (PH3), a result of historical elemental phosphorus (P4) processing. The sampling encompassed both the areas that have been subject to CERCLA investigation and remedial action evaluation and areas where closed RCRA-regulated waste management units are located.

ES.2 SITE-WIDE GAS ASSESSMENT BACKGROUND AND OBJECTIVES

Background. The FMC Idaho LLC facility (Site) is located in southeastern Idaho, approximately 2.5 miles northwest of Pocatello, Idaho (see Figure 1-1) and is part of the Eastern Michaud Flats (EMF) Superfund Site. The FMC Site is on privately-owned fee land which, except for its eastern-most portion, is within the exterior boundaries of the Fort Hall Indian Reservation. Historically, the Site was an elemental phosphorus manufacturing plant owned and operated by FMC Corporation (FMC). The operations primarily used phosphate ore, coke, and silica as raw materials for the manufacture of elemental phosphorus (P4). Phosphate ore processing at the Site ceased in December 2001.

Process water (known as phossy water) during operations was used to isolate P4 from contact with air and to slurry precipitator dust (a furnace by-product). Phossy water and precipitator slurry were typically managed separately in a series of surface impoundments located to the west of the P4 furnaces. A number of these surface impoundments (Ponds 8S, 11S, 12S, 13S, 14S, 15S, 16S, 17S, 18A, 8E, and 9E) were closed and capped under EPA-approved RCRA closure plans.

Numerous other surface impoundments were historically dewatered and/or covered. These ponds, which had ceased receiving wastes prior to the narrowing of the Bevill exemption and thus were not subject to RCRA requirements, are located within Remedial Areas RA-C and RA-D. These historical impoundment areas, as well as other areas of the FMC Plant OU, including the furnace building, phos dock and secondary condenser area (RA-B), the calciner area (RA-E), the railcars buried in the slag pile (RA-F1), and the railroad swale (RA-K), were the subject of soil and groundwater investigations in the CERCLA Supplemental Remedial Investigation/Supplemental Feasibility Study

(SRI/SFS) that FMC conducted under the *2003 Administrative Order on Consent* (2003 AOC).

RCRA-regulated and historical CERCLA ponds may contain a combination of P4, precipitator slurry, and phossy water from operations. Mixing of these waste streams can create conditions favorable for the generation of phosphine gas. The release of these gases from these areas has been assessed several times since 1997 and there have been several studies characterizing these releases.

As the RCRA-regulated ponds and CERCLA areas identified above are known to contain or have the potential to contain P4 and thus may generate PH3 and other gases of potential concern (GOPCs), additional assessment is being requested by EPA. This proposed site-wide phosphine investigation responds to that request. A more complete history of both the CERCLA investigation areas and the closure and post-closure actions at the RCRA-regulated ponds is provided in the final *EMF RI Report* (BEI, 1996), the *RCRA Ponds Post- Closure Plans for the FMC Plant OU*, the various Pond 16S work plans and reports, the final *SRI Report for the FMC Plant OU* (MWH, 2009b), and final *SFS Report for the FMC Plant OU* (MWH, 2010b).

Site-Wide Gas Assessment Objectives. EPA directed FMC to develop a site-wide phosphine measurement plan pursuant to the "other work" provisions of the *2003 AOC*. EPA defined the objective of this site-wide phosphine investigation as follows:

> *The objective of this investigation is to get a site-wide snapshot understanding of phosphine gas generation associated with RCRA ponds and CERCLA remediation areas (RAs) that are known or suspected to contain elemental phosphorus waste. The characterization effort is focused on phosphine gas because phosphine is the primary gas of concern that can be used to evaluate the extent of potential gas generation. This event is not intended to replace the long term gas monitoring that will be required under both the RCRA and CERCLA monitoring plans. In addition, this effort is not intended to replace the need for full characterization of the nature and extent of the phosphine gas generation in the CERCLA RAs if it is determined that the current conceptual site model (CSM) presented in the supplemental remedial investigation (SRI) and the supplemental feasibility study (SFS) is incorrect and significant quantities of phosphine gas are found being generated within the soil column.*

Sample Design. As the RCRA-regulated ponds and a few CERCLA areas are known to contain or have the potential to contain P4 and thus may generate PH3 and other GOPCs, a gas assessment study was performed in these areas. The sampling design and rationale for both the CERCLA RAs and RCRA ponds are also discussed in the EPA-approved Field Modification #15 Work Plan and FSP and are summarized below.

1. CERCLA RA data collection:
    - Industrial Hygiene Monitoring
    - Ambient Air Monitoring
    - Soil gas PH3 Sampling
    - Soil gas GOPC Sampling
    - Soil flux PH3 Sampling
    - Surface scans PH3

2. RCRA Pond data collection:
    - Industrial Hygiene Monitoring
    - Ambient Air Monitoring
    - Soil gas PH3 Sampling
    - Perimeter Scan PH3 Monitoring
    - Cap Scan PH3 Monitoring
    - TMP Enclosure PH# Monitoring
    - Sump PH3 Monitoring
    - TMP PH3 Sampling
    - TMP GOPC Sampling
    - Perimeter Piping PH3 Sampling

ES.3 SUMMARY OF THE SITE-WIDE GAS ASSESSMENT RESULTS

The results of the site-wide gas assessment are summarized below for the (1) Industrial hygiene and ambient air monitoring, (2) CERCLA remedial areas, and (3) closed RCRA ponds area. The site-wide gas assessment results are described in detail in Sections 3.0 and 4.0 of this report and summarized on Tables ES-1 (CERCLA Remedial Areas) and ES-2 (RCRA Ponds).

<u>Site-Wide Industrial Hygiene and Ambient Air PH3 Monitoring</u>

- No industrial hygiene monitoring alarms occurred during the site-wide assessment field work which represented over 1,500 man-hours and about 950 hours of personnel monitoring for phosphine during the sampling in the RCRA pond area, on tasks immediately adjacent to potential sources of PH3, and at the identified CERCLA remedial areas.
- All of the 153 results of the breathing zone sampling at the CERCLA areas were 0.00 ppm PH3

- All of the 126 results of the breathing zone sampling at the RCRA ponds were 0.00 ppm PH3.

CERCLA Remedial Area Assessment

- All of the 107 results from the surface scans at RA-D, underground piping at RA-C, the traverse along the slag pile at RA-F1, and the bottom of the slag pit at RA-B were 0.00 ppm PH3.
    - The majority of the soil gas sampling results, 383 of 420 total recorded readings (over 90%), were 0.00 ppm PH3 and none of the readings were above the OSHA 8-hour TWA PEL of 0.30 ppm PH3. 37 of the 420 total recorded soil gas readings (9%) were non-zero (>0.00 ppm) and individual readings ranged from 0.02 to 0.15 ppm PH3. The average (mean) PH 3 soil gas results for RA-B and RA-K was 0.00 ppm and RA-C and RA-F1 was 0.01 ppm.
- Soil gas GOPC results:
    - Hydrogen sulfide results ranged from 0.144 to 1.054 ppm and were all well below the OSHA PEL for general industry of 20 ppm (ceiling). The majority of the results were in the range of the reported "false" positive results for field blank samples of 0.26 and 0.20 ppm H2S.
    - All hydrogen cyanide results were non-detect (<0.058 ppm HCN).
    - Only one (RAKSG101 on 7/22/10) of 25 samples, including duplicates, was reported as detected above the hydrofluoric acid detection limit of 0.20 ppm HF. The sample at RAKSG101 on the next day (7/23/10) was one of the 24 non-detect (<0.2 ppm HF) results.
- Flux chamber results:
    - The highest average PH3 concentration within the flux chambers was 0.447 ppm PH3 at RA-B soil gas location #3 and the collocated flux chamber that was measured using OSHA method 1003 (both sampled on 8/3/2010) was 0.258 ppm PH3. These concentrations are for the 10 liters within the flux chamber and the 24 hour incubation period. On an 8 hour basis, the average PH 3 concentrations would be below the OSHA 8-hour TWA PEL of 0.30 ppm PH3 and, as described above, the breathing zone sampling at this flux chamber location was 0.00 ppm PH3 indicating that the PH3 flux rate at RA-B soil gas location #3 is too low to be detectable in ambient air.
    - The average PH3 concentrations within the flux chamber at RA-C 6S soil gas location #3 measured on 7/30 and 8/3/2010 were 0.022 and 0.028 ppm PH3 which are an order of magnitude lower than the OSHA 8-hour TWA PEL of 0.30 ppm PH3. As described above, the breathing zone sampling at this flux chamber location was 0.00 ppm PH3 indicating that the PH3 flux rate at RA-C soil gas location #3 is too low to be detectable in ambient air. The other RA-C flux chamber locations averaged 0.00 ppm PH3.

- The maximum average PH3 concentration within the RA-F1 flux chambers was 0.004 ppm which is below the real-time detection capability of field monitors (e.g., Draeger Pac III).
- The average PH3 concentrations within the flux chambers at RA-K soil gas location #3 and step-out location 3E measured on 8/3 and 8/11/2010 were 0.030 and 0.023 ppm PH3 which are an order of magnitude lower than the OSHA 8-hour TWA PEL of 0.30 ppm PH3. As described above, the breathing zone sampling at these flux chamber locations was 0.00 ppm PH3 indicating that the PH3 flux rate at RA-K soil gas locations #3 and step-out location 3E is too low to be detectable in ambient air. The other RA-K and step-out locations flux chamber locations averaged 0.00 ppm PH3.

RCRA Ponds Assessment

- All of the 146 phosphine monitoring results in ambient air outside appurtenances were 0.00 ppm PH3, and other than at a limited area within the perimeter surface scan at Pond 15S adjacent to soil gas location 15S-12, the balance of the 320 results for the other RCRA ponds were 0.00 ppm PH3. Phosphine was not detected above 0.00 ppm PH3 during the follow-up cap surface scan performed at Pond 15S.
- As expected based on the conceptual model, the highest phosphine concentrations were recorded in samples of gas from TMPs (e.g., immediately above the pond waste zone). As shown on Table ES-2, mean TMP concentrations were highest at Pond 15S (107,811 ppm PH3), Pond 18 Cell A (21,088 ppm PH3), and Pond 17 (9,477 ppm PH3). Phosphine results from the other RCRA pond TMPs were lower, ranging from 6 ppm PH3 (Pond 9E) to 4,313 ppm PH3 (Phase IV ponds).
- As expected based on the conceptual model, the next highest phosphine concentrations were recorded in samples from perimeter gas collection piping (e.g., piping under the pond cap). As shown on Table ES-2, mean perimeter piping concentrations were highest at Pond 17 (18,007 ppm PH3), Pond 18 Cell A (7,123 ppm PH3), and Pond 15S (4,391 ppm PH3). Phosphine results from the other RCRA pond perimeter piping were lower, ranging from 0 ppm PH3 (Pond 9E) to 1,800 ppm PH3 (Pond 8E).
- Phosphine was detected in a limited number of perimeter soil gas locations (approximately 18 to 24 inches below ground surface, five feet outside the anchor trench and within the limit of final cover of the closed pond)
  - at Pond 17 (10 of 11 locations were >0.00 ppm and ranged from 0.06 to 171 ppm PH3),
  - at Pond 15S (7 of 15 locations were >0.00 ppm and ranged from 0.02 to 127 ppm PH3), and
  - at Pond 18 Cell A (7 of 10 locations were >0.00 ppm and ranged from 0.01 to 58 ppm PH3).
  - Note that these detections are not in ambient air and employee personnel IH monitors did not alarm during the scans.

- The perimeter soil gas PH3 results for Pond 8S, Pond 9E, and the Phase IV ponds were all 0.00 ppm PH3.

- Phosphine was not detected outside of any TMP well enclosure. Phosphine was detected above the OSHA 8-hour TWA PEL of 0.30 ppm within only one enclosure at Pond 8E (2.64 ppm PH3). This detection was traced back to a remnant of the construction of the concrete pad upon which the TMP enclosure sits, and the superfluous PVC conduit has since been sealed with grout.
- Phosphine was not detected outside of any RCRA Pond sump (cap drainage and LCDRS manholes). Phosphine was detected above the OSHA 8-hour TWA PEL of 0.30 ppm inside the two ET cap drainage lift stations at Pond 15S (0.34 and 2.62 ppm PH3) and at one of the two ET cap drainage lift stations at Pond 18 Cell A (1.00 ppm PH3).
- GOPC results from TMPs (immediately above the waste zone):
  - Hydrogen sulfide results were greater than the OSHA PEL for general industry of 20 ppm (ceiling) for H_2S in TMPs at Pond 17 (684 ppm H2S in primary sample and 561 ppm H2S in duplicate sample). Due to sample dilution, the H_2S results from the Pond 15S TMPs were non-detect at a detection limit higher than the H_2S 8-hour TWA PEL. The results from the TMPs at the Phase IV ponds, Pond 8E and Pond 18 Cell A were below the OSHA PEL for H_2S and ranged from 0.204 ppm H2S (Phase IV ponds TMP7) to 19.8 ppm H2S (Pond 8E TMP4 duplicate, Pond 8E TMP4 primary sample result was 4.7 ppm H2S).
  - All hydrogen cyanide results were non-detect at a detection limit below the OSHA 8-hour TWA PEL of 10 ppm for HCN, except the results from Pond 15S TMP #1 that was non-detect at a detection limit higher than the 8-hour TWA PEL for HCN due to sample dilution.
  - Other than the result from the Phase IV ponds TMP (1.61 ppm HF), the hydrogen fluoride (measured as hydrofluoric acid) results (or detection limit for non-detect results) were above the OSHA PEL of 3 ppm for HF and ranged from 6.4 ppm HF (Pond 18 Cell A TMP3, undiluted sample) to 816 ppm HF (Pond 17 TMP2 duplicate, Pond 17 TMP2 primary sample result was 738 ppm HF, diluted sample).

ES.4 SITE-WIDE GAS ASSESSMENT CONCLUSIONS

The site-wide gas assessment results summarized above and detailed in Sections 3.0 and 4.0 of this report corroborate two primary conclusions. The first is that the site-wide gas assessment findings for the CERCLA RAs support the current CSM and no change to the CSM for CERCLA areas is warranted.

The second conclusion is that the gas assessment findings also show that while PH3 is present at significant concentrations beneath and within some of the RCRA Pond cap systems, it is not found in ambient air. Further, although phosphine is the primary gas of

concern at the RCRA Ponds, other gases of concern, such as hydrogen sulfide and hydrogen fluoride, were measured at concentrations above regulatory values (OSHA PELS). Phosphine and other gases detected in specific appurtenances, gas collection piping beneath the final caps and the temperature monitoring points (TMPs) at the RCRA ponds will be addressed pursuant to the EPA Unilateral Administrative Order for Removal Action, CERCLA Docket No. CERCLA 10-2010-0170 (the RCRA Ponds UAO).

In addition, the field sampling methodologies used during the site-wide assessment were appropriate to monitor for potential phosphine at the CERCLA remedial areas and RCRA Ponds area. These methods should also be considered for the long-term phosphine monitoring that is identified as a component of the soil remedial alternatives detailed in the SFS and for phosphine monitoring under the RCRA Ponds UAO, as appropriate.

TABLE ES-1
CERCLA AREAS
SUMMARY OF RESULTS OF PHOSPHINE (PH3) SAMPLING
SITE-WIDE GAS ASSESSMENT
(Page 1 of 1)

		Breathing zone measurements				Appurtenances (3 storm drain manholes)				Soil Gas				Surface Scan				Soil Flux			
CERCLA AREAS		No. readings	Min	Mean	Max	No. readings	Min	Mean	Max	No. readings	Min	Mean	Max	No. readings	Min	Mean	Max	No. readings	Min	Mean	Max
RA-B	Furnace bldg area	50	0.00	0.00	0.00	9	0.00	0.00	0.03	150	0.00	0.00	0.00	-	-	-	-	140	0.00	0.10	0.61
RA-C	Old Ponds - Pond 6S, 7S,10S	50	0.00	0.00	0.00	-	-	-	-	150	0.00	0.01	0.10	-	-	-	-	80	0.00	0.01	0.05
RA-D	Old Pond 9S, 1E	3	0.00	0.00	0.00	-	-	-	-	-	-	-	-	67	0.00	0.00	0.00	-	-	-	-
RA-F1	Slag pile - rail car areas	26	0.00	0.00	0.00	-	-	-	-	75	0.00	0.01	0.15	17	0.00	0.00	0.00	60	0.00	0.00	0.03
RA-K	Railroad swale	15	0.00	0.00	0.00	-	-	-	-	45	0.00	0.00	0.04	-	-	-	-	120	0.00	0.01	0.09
RA-C	Underground piping	1	0.00	0.00	0.00	-	-	-	-	-	-	-	-	15	0.00	0.00	0.00	-	-	-	-
RA-B	Slag pit	8	0.00	0.00	0.00	-	-	-	-	-	-	-	-	8	0.00	0.00	0.00	-	-	-	-

NOTE: The soil flux summary represents only the Draeger field monitor results for PH3, the PH3 results from the OSHA method 1003 sorbent tubes is not included.

TABLE ES-2
RCRA PONDS
SUMMARY OF RESULTS OF PHOSPHINE (PH3) SAMPLING
SITE-WIDE GAS ASSESSMENT
(Page 1 of 2)

RCRA PONDS	OUTSIDE / ABOVE RCRA CAP															
	Breathing zone measurements				Outside Appertenances				Inside Appertenances				Surface Scan			
	No. samples	min	mean	max	No. samples	min	mean	max	No. samples	min	mean	max	No. samples	min	mean	max
8S	12	0.00	0.00	0.00	12	0.00	0.00	0.00	6	0.00	0.00	0.00	39	0.00	0.00	0.00
8E	15	0.00	0.00	0.00	10	0.00	0.00	0.00	5	0.00	0.53	2.64	40	0.00	0.00	0.00
9E	20	0.00	0.00	0.00	32	0.00	0.00	0.00	16	0.00	0.00	0.00	72	0.00	0.00	0.00
Phase IV	22	0.00	0.00	0.00	34	0.00	0.00	0.00	17	0.00	0.00	0.00	99	0.00	0.00	0.00
15S	25	0.00	0.00	0.00	32	0.00	0.00	0.00	16	0.00	0.19	2.62	138	0.00	0.00	0.51
17	18	0.00	0.00	0.00	14	0.00	0.00	0.00	7	0.00	0.00	0.00	50	0.00	0.00	0.00
18A	14	0.00	0.00	0.00	12	0.00	0.00	0.00	6	0.00	0.17	1.00	20	0.00	0.00	0.00

TABLE ES-2
RCRA PONDS
SUMMARY OF RESULTS OF PHOSPHINE (PH3) SAMPLING
SITE-WIDE GAS ASSESSMENT
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RCRA PONDS	RCRA CAP PERIMETER				BELOW THE CAP							
	Soil Gas				Perimeter Piping				Temperature Monitoring Points (TMPs)			
	No. samples	min	mean	max	No. samples	min	mean	max	No. samples	min	mean	max
8S	27	0.00	0.00	0.00	3	837	978	1,125	3	2,461	2,755	3,059
8E	27	0.00	0.01	0.06	3	1,707	1,800	1,847	12	200	1,644	3,293
9E	51	0.00	0.00	0.00	3	0	0	0	3	6	6	7
Phase IV	45	0.00	0.00	0.00	12	0	187	775	12	85	4,313	14,924
15S	45	0.00	10.87	132	3	4,249	4,391	4,599	15	64,485	107,811	177,750
17	33	0.00	16.51	206	3	17,847	18,007	18,130	15	1,646	9,477	19,063
18A	30	0.00	6.21	65	3	6,779	7,123	7,568	6	11,873	21,088	30,792

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ACRONYMS AND ABBREVIATIONS

AOC	Administrative Order on Consent
ags	above ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSM	Conceptual Site Model
DQO	data quality objective
EMF	Eastern Michaud Flats
EPA	U.S. Environmental Protection Agency
ET	evapo-transpiration
FMC	FMC Corporation
FMDL	field method detection limit
FSP	field sampling plan
GES	gas extraction system
GETS	gas extraction and treatment system
GOC	gases of concern
GOPC	gases of potential concern
HCN	hydrogen cyanide
HF	hydrogen fluoride
H2S	hydrogen sulfide
HASP	Health and Safety Plan
IDLH	immediately dangerous as life and health
IH	industrial hygiene
LCDRS	leachate collection, detection and removal system
LDR	land disposal restriction
MWH	MWH Americas, Inc.
OU	operable unit
P4	elemental phosphorus
PEL	permissible exposure limit
PH3	phosphine
ppm	parts per million
QAPP	quality assurance project plan
RA	remediation area
RCRA	Resource Conservation and Recovery Act
Site	FMC LLC Idaho facility
SFS	Supplemental Feasibility Study
SRI	Supplemental Remedial Investigation
SOW	Statement of Work
TMP	temperature monitoring point
UAO	Unilateral Administrative Order

1.0 INTRODUCTION

This Site-Wide Gas Assessment Report for the FMC Plant OU (*Site-Wide Gas Assessment*) is being submitted to fulfill the requirements of the Supplemental Remedial Investigation (SRI) Field Modification #15 Work Plan (MWH, 2010a; *Field Modification #15 Work Plan*) as approved by EPA on July 7, 2010. Site-wide gas assessment samples were collected within areas of the FMC Plant OU that have the potential to generate PH3 gas a result of historical elemental phosphorus (P4) processing. The sampling encompassed both the areas that have been subject to CERCLA investigation and remedial action evaluation and areas where closed RCRA-regulated waste management units are located.

1.1 PROJECT BACKGROUND

The FMC Idaho LLC facility (Site) is located in southeastern Idaho, approximately 2.5 miles northwest of Pocatello, Idaho (see Figure 1-1) and is part of the Eastern Michaud Flats (EMF) Superfund Site. The FMC Site is on privately-owned fee land which, except for its eastern-most portion, is within the exterior boundaries of the Fort Hall Indian Reservation. Historically, the Site was an elemental phosphorus manufacturing plant owned and operated by FMC Corporation (FMC). The operations primarily used phosphate ore, coke, and silica as raw materials for the manufacture of elemental phosphorus (P4). Phosphate ore processing at the Site ceased in December 2001.

Process water (known as phossy water) during operations was used to isolate P4 from contact with air and to slurry precipitator dust (a furnace by-product). Phossy water and precipitator slurry were typically managed separately in a series of surface impoundments located to the west of the P4 furnaces. A number of these surface impoundments (Ponds 8S, 11S, 12S, 13S, 14S, 15S, 16S, 17S, 18A, 8E, and 9E) were closed and capped under EPA-approved RCRA closure plans. A RCRA Consent Decree entered on July 13, 1999, required FMC, among other things, to close and cap pond waste in accordance with all applicable RCRA requirements and EPA-approved closure plans and schedules as specified in the decree. The RCRA pond closures were completed in 2005.

Numerous other surface impoundments were historically dewatered and/or covered. These ponds, which had ceased receiving wastes prior to the narrowing of the Bevill exemption and thus were not subject to RCRA requirements, are located within Remedial Areas RA-C (historical Ponds 00S, 0S, 1S, 2S, 3S, 4S, 5S, 6S, 7S, and 10S) and RA-D (historical ponds 9S, 1E, 2E, 3E, 4E, 5E, 6E, and 7E). These historical impoundment areas, as well as other areas of the FMC Plant OU, including the furnace building, phos dock and secondary condenser area (RA-B), the calciner area (RA-E), the railcars buried in the slag pile (RA-F1), and the railroad swale (RA-K), were the subject of soil and groundwater investigations in the CERCLA Supplemental Remedial Investigation/Supplemental Feasibility Study (SRI/SFS) that FMC conducted under the *2003 Administrative Order on Consent* (2003 AOC).

RCRA-regulated and historical CERCLA ponds may contain a combination of P4, precipitator slurry, and phossy water from operations. As described in the final *SFS Report for the FMC Plant OU* (MWH, 2010b), P4 bearing waste streams result in the generation of phosphine gas under various conditions. The release of these gases from these areas has been assessed several times since 1997 and there have been several studies characterizing these releases. Additional details on these studies are included in the *Pond 16S Gas Characterization and Ambient Air Monitoring Work Plan* (*Pond 16S GCWP*; MWH, 2007a), completed as Task 1 of the Statement of Work (SOW) under the Pond 16S *Unilateral Administrative Order for Removal Action* (*Pond 16S UAO*, EPA, 2006). Under the Pond 16S UAO, a gas extraction system has been operating at Pond 16S since November 2007as detailed in the *Pond 16S Remedial Action Work* Plan (MWH, 2008b) and the *Pond 16S Monitoring and Reporting Plan* (*Pond 16S MRP*, MWH, 2009a). Gas extraction was initiated on Pond 15S in April 2010 (prior to the site-wide gas assessment) and gas extraction was initiated on Pond 17 in October 2010 (after the site-wide gas assessment was conducted).

As the RCRA-regulated ponds and CERCLA areas identified above are known to contain or have the potential to contain P4 and thus may generate PH3 and other GOPCs, additional assessment is being requested by EPA. This proposed site-wide phosphine investigation responds to that request. The areas proposed for investigation are shown on Figure 1-2. A more complete history of both the CERCLA investigation areas and the closure and post-closure actions at the RCRA-regulated ponds is provided in the final *EMF RI Report* (BEI, 1996), the *RCRA Ponds Post- Closure Plans for the FMC Plant OU*, the various Pond 16S work plans and reports, the final *SRI Report for the FMC Plant OU* (MWH, 2009b), and draft *SFS Report for the FMC Plant OU* (MWH, 2010b).

1.2 PROJECT OBJECTIVES

EPA directed FMC to develop a site-wide phosphine measurement plan pursuant to the "other work" provisions of the *2003 AOC*. EPA defined the objective of this site-wide phosphine investigation as follows:

> *The objective of this investigation is to get a site-wide snapshot understanding of phosphine gas generation associated with RCRA ponds and CERCLA remediation areas (RAs) that are known or suspected to contain elemental phosphorus waste. The characterization effort is focused on phosphine gas because phosphine is the primary gas of concern that can be used to evaluate the extent of potential gas generation. This event is not intended to replace the long term gas monitoring that will be required under both the RCRA and CERCLA monitoring plans. In addition, this effort is not intended to replace the need for full characterization of the nature and extent of the phosphine gas generation in the CERCLA RAs if it is determined that the current conceptual site model (CSM) presented in the supplemental remedial investigation (SRI) and the supplemental feasibility study (SFS) is incorrect and significant quantities of phosphine gas are found being generated within the soil column.*

As a result, this investigation was conducted at locations determined to have phosphine generation potential based on the presence of P4 in soils, fill or piping, regardless of whether those locations are in the CERCLA remediation areas or within the perimeter of the RCRA-regulated waste management units.

1.3 DOCUMENT ORGANIZATION

This document is a component of the investigation at the FMC Plant OU. Additional details on the FMC facility operations, previous environmental investigations with potential relevance to the FMC Plant OU, and physical characteristics of the FMC Plant OU and surrounding area based on the results of the EMF RI investigations are not repeated here. This information can be found by referring to the EMF *RI Report* and the *SRI Report for the FMC Plant OU*.

The *Site-Wide Gas Assessment Report* is organized as follows:

Section 1 describes a brief summary of site-wide gas assessment project background and objectives.

Section 2 describes the field programs that were conducted during the site-wide gas assessment, including data collection equipment and procedures and sample analytical methods.

Section 3 describes, on a CERCLA RA basis, the nature and extent of PH3 and other GOPCs that appear to be associated with the FMC Plant OU activities. Concentrations of detected constituents in subsurface and ambient air gas samples are compared to the method detection limits and other standards. The findings are further evaluated in the contamination assessment.

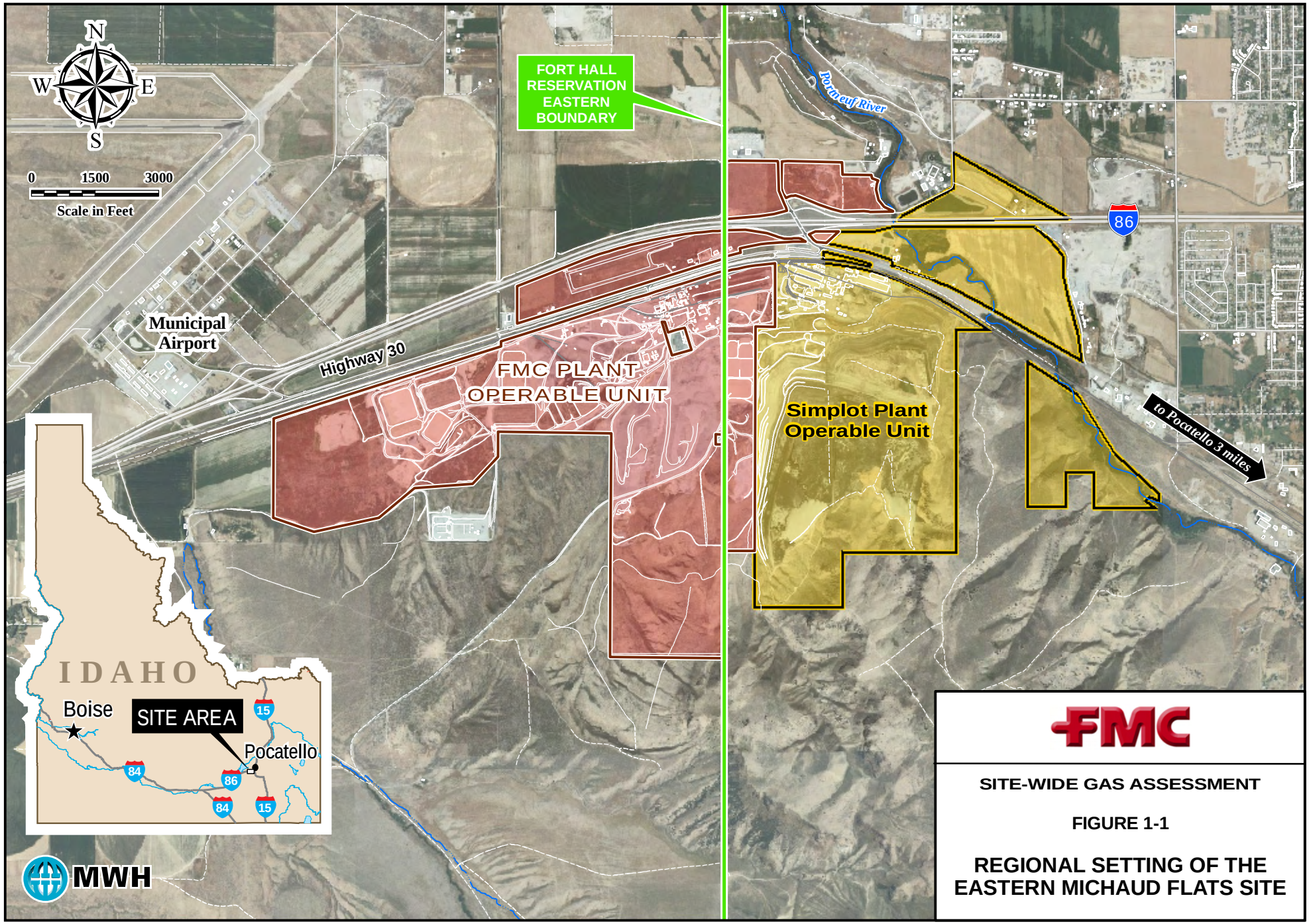
Section 4 describes, on a RCRA pond basis, the nature and extent of PH3 and other GOPCs that appear to be associated with the FMC Plant OU activities. Concentrations of detected constituents in subsurface and ambient air gas samples are compared to the method detection limits and other standards. The findings are further evaluated in the contamination assessment.

Section 5 summarizes the findings of each field program and presents the key conclusions for the program as a whole and, where appropriate, for individual areas.

Section 6 includes the references cited in this *Site-Wide Gas Assessment Report*.

As required by the *Field Modification #15 Work Plan*, this Report includes tabulated results and sample location figures, and includes as appendices the validated analytical results, field data, field observations, and field logs.

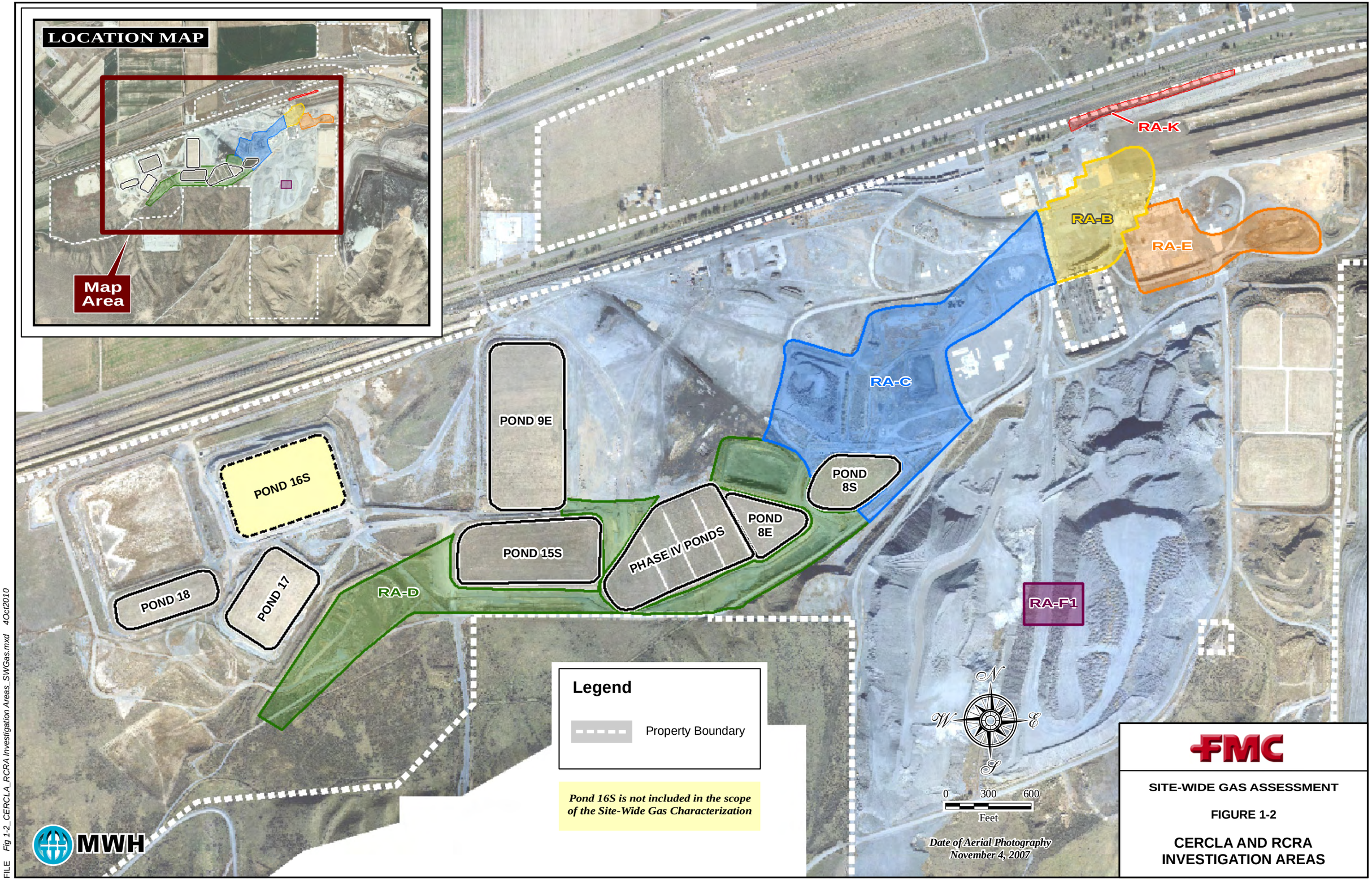
FILE *Fig 1-1_Regional Setting_waerial_SWGas.mxd* *4Oct2010*



SITE-WIDE GAS ASSESSMENT

FIGURE 1-1

REGIONAL SETTING OF THE EASTERN MICHAUD FLATS SITE



SITE-WIDE GAS ASSESSMENT

FIGURE 1-2

CERCLA AND RCRA INVESTIGATION AREAS

FILE Fig 1-2_CERCLA_RCRA Investigation Areas_SWGas.mxd 4Oct2010

2.0 FIELD INVESTIGATION PROGRAMS AND TECHNIQUES

This section summarizes the field activities conducted at the FMC Plant Site during summer 2010 as part of the site-wide gas assessment program. Included in this section are the objectives and rationale for each field activity, discussions of the field programs conducted at individual CERCLA RAs and RCRA ponds, and the equipment/procedures that were used to complete each field program.

2.1 FIELD INVESTIGATION PROGRAMS AND RATIONALE

As the RCRA-regulated ponds and a few CERCLA areas are known to contain or have the potential to contain P4 and thus may generate PH3 and other GOPCs, a gas assessment study was performed in these areas. The areas proposed for investigation are shown on Figure 1-2. The sampling design and rationale for both the CERCLA RAs and RCRA ponds are also discussed in the EPA-approved *Field Modification #15 Work Plan* and *FSP* and are summarized below.

2.1.1 CERCLA Areas

The CERCLA areas that were included in this site-wide gas assessment were RA-B, RA-C, RA-D, RA-F1, RA K, and underground piping in RAs C and E. These areas were identified in the SFS Report as areas containing or potentially containing P4. These areas were also identified as having the potential for the generation of PH3 as noted in the *Comparison of Conventional and Alternative Capping Systems for Use at the FMC Plant OU* (MWH, 2009c). Site specific details of each RA are presented in the *Field Modification #15 Work Plan* and *FSP*. The specific field sampling approach for each of the CERCLA areas is discussed below and summarized in Table 2-1.

The general approach to measurement of PH3 in the CERCLA areas was to use shallow (~18-24 inches below ground surface [bgs]) soil gas probes as an initial screening in an identified expected worst-case (e.g., greatest mass of P4) sub-area of each RA. The depth interval of 18 to 24 inches bgs was selected for consistency with the EPA-approved Pond 16S UAO perimeter soil gas monitoring and as an appropriate depth to assess for the presence of PH3 in the pore space in shallow soils that may also flux into ambient air. The soil gas sampling triggered follow-up surface passive flux chamber measurements where shallow soil gas measurements were detected at a level above the field instrument field method detection limit (FMDL), as described in Section 2.2.2.2, below. This would allow for a worst-case RA PH3 flux calculation. A subset of soil gas sampling locations, selected based upon the locations with the highest PH3 soil gas measurements, were also sampled for other GOPCs as summarized on Table 2-2, specifically, hydrogen cyanide (HCN), hydrogen sulfide (H2S), and hydrogen fluoride (HF). However, several RAs warranted a different approach. The specific approach to PH3 measurements for each of the CERCLA areas is discussed below.

In addition, a measurement of PH3 in the breathing level (four to five feet above the ground surface) for IH purposes was recorded at the time of each gas measurement and the field teams recorded the location (by GPS) and concentrations should a personnel monitor alarm be sounded. An investigation would be performed and documented to determine, if possible, the source of the PH3 causing the alarm. In addition to surveying the location of any alarms, the locations of all samples were surveyed using GPS and the coordinates was recorded in the project documentation. Appendix A, Field Forms, includes the sample coordinates.

RA-B Sampling. The sampling focused on the soil around the furnace building foundation in areas most likely to contain PH3 and GOPC accumulation. Ten soil gas probe locations were placed in areas that likely would be the worst-case sub-area for PH3/GOPC flux to ambient air. Ten (10) locations were selected based upon having two sample locations per furnace and associated P4 sump (there were four furnaces within the furnace building) plus a sample location at each end of the foundation (i.e., four sample locations on the north side, four on the south side and 1 each on the east and west "ends" of the furnace building foundation). Based on agency comments, several proposed locations were adjusted to move them to locations proximal to preliminary (March 2009) soil gas sampling points. The sampling locations are presented with results in Section 3.0.

If any of the shallow subsurface measurements of PH3 around the furnace building foundation perimeter exceeded the determined soil gas field method detection limit ($FMDL_{sg}$) (as described in Section 2.2.2.1), then surface flux sampling was performed at that location to determine PH3 flux into the ambient air. Based on the results of the PH3 samples, the need for step-out sampling around RA-B was also evaluated.

After the first three rounds of PH3 measurements (of the total five sampling rounds), any soil gas sampling locations above the $FMDL_{sg}$ were also identified for GOPC analysis. During the final two rounds of PH3 soil gas measurements, GOPC sampling was performed at those selected locations. A minimum of three soil gas locations were sampled for GOPCs.

At the former slag pit within RA-B, eight soil gas sampling locations were sampled for PH3 in the ambient air. At each location an ambient air sample was collected at ground level (one to two inches above ground surface [ags]) and one ambient air sample was collected in the breathing zone (four to five ft ags) for PH3.

RA-C Sampling. RA-C consists of Ponds 6S, 7S and 10S. Ponds 6S and 7S were the largest historic CERCLA ponds and contained the largest volume of P4. Distribution of the soil gas probes included three at Pond 6S, four at Pond 7S and three at Pond 10S. The sampling locations are presented with results in Section 3.0.

If any of the shallow subsurface measurements of PH3 within the ponds exceeded the $FMDL_{sg}$ (as described in Section 2.2.2.1), then surface flux sampling was performed at that location to determine PH3 flux into the ambient air.

After the first three rounds of PH3 measurements (of the total five sampling rounds), any soil gas sampling locations above the $FMDL_{sg}$ were also identified for GOPC analysis. During the final two rounds of PH3 soil gas measurements, GOPC sampling was performed at those selected locations. A minimum of three soil gas locations were sampled for GOPCs.

RA-D Sampling. RA-D consists of Ponds 1E, 4E and 9S. There is no evidence of P4 in Ponds 1E, 4E and 9S and the remaining fill material in these ponds is very shallow (less than 2 inches over most of the former pond surface). Soil probes were not appropriate in these areas as they would extend beneath the pond fill material into the underlying native soils. Therefore, a screening for PH3 at the surface of the historic CERCLA ponds that are still exposed was deemed appropriate (i.e., those pond areas not covered by a RCRA pond). Since only a veneer of process material remains within the RA-D subareas, the sampling approach at RA-D involved performing a surface scan for PH3 at ponds 9S, 1E, and 4E.

RA-F1 Sampling. RA-F1 consists of the slag pile and the buried railcars. Three shallow subsurface gas sampling probes (F1-1 through F1-3) were placed at the slag pile over the area which encompasses the area where the railcars are buried. One of the subsurface gas sampling probe locations in the buried railcar area was located at the lowest topographic point in the area. Due to the depth of the railcars in the slag pile and the extremely rough surface and size of the slag pile, it was impossible to predict the pathway of PH3 generated from the railcars to the surface of the slag pile. The slag in the area of the railcars is relatively uniform across the area and it was determined that shallow subsurface soil gas sampling on the slag pile surface nearest the railcars was appropriate. A fourth and fifth soil gas sampling probes were installed on the north and east sides of the slag pile. The sampling locations are presented with results in Section 3.0.

If any of the shallow subsurface measurements of PH3 within the slag pile exceeded the $FMDL_{sg}$ (as described in Section 2.2.2.1), then surface flux sampling was performed at that location to determine PH3 flux into the ambient air.

After the first three rounds of PH3 measurements (of the total five sampling rounds), any soil gas sampling locations above the $FMDL_{sg}$ were also identified for GOPC analysis. During the final two rounds of PH3 soil gas measurements, GOPC sampling was performed at those selected locations. A minimum of three soil gas locations were sampled for GOPCs.

RA-K Sampling. RA-K is a narrow strip (an area of about 2.4 acres) along the northeastern property boundary that was used as a stormwater retention pond (the "railroad swale"). P4 has been detected in subsurface soil gas sampling along the length of RA-K. The sampling approach at RA-K involved placing three (3) shallow subsurface sampling probes spaced evenly along the east-west center axis. These probe locations were selected to provide spatial coverage along the length of the RA-K as well as based

on existing preliminary (March 2009) soil gas probe results. The sampling locations are presented with results in Section 3.0.

If any of the shallow subsurface measurements of PH3 within the railroad swale exceeded the FMDLsg (as described in Section 2.2.2.1), then surface flux sampling was performed at that location to determine PH3 flux into the ambient air.

After the first three rounds of PH3 measurements (of the total five sampling rounds), any soil gas sampling locations above the $FMDL_{sg}$ were also identified for GOPC analysis. During the final two rounds of PH3 soil gas measurements, GOPC sampling was performed at those selected locations. A minimum of three soil gas locations were sampled for GOPCs.

Underground Piping in RA-C and RA-E Sampling Rationale. The highest density of underground piping on the FMC Plant Site with potential conditions that could result in PH3 generation was in the piping corridor at the northeastern portion of RA-C and surface screening for PH3 was performed in this area. RA-E includes the area southeast of RA-B and encompasses the calciner area, the historic kiln scrubber ponds and associated underground piping. The calciner process was "upstream" of the furnace building and P4 was not handled in this area and was not present in the historic kiln scrubber ponds. The calciners were fired with CO gas from the furnace building and a section of underground CO pipeline remains within RA-E and may contain some P4. The P4 contained in this underground piping would be relatively pure P4 and contain no precipitator slurry or phossy solids. The exact location and depth of piping is approximate in several of the piping corridors so surface scanning was the selected as the sampling approach rather than soil gas probes.

If PH3 was detected during the surface scan in the piping corridor in RA-C at concentrations greater than the surface scan field method detection limit ($FMDL_{ss}$) (as described in Section 2.2.2.2), similar sampling would be performed over a one-half acre sampling cell located over the underground CO line in RA-E.

2.1.2 RCRA Ponds

The RCRA Pond areas included in this site-wide gas assessment include RCRA Ponds 8E, 9E, 8S, 15S, 17, 18 Cell A and Phase IV Ponds which include 14S, 13S, 12S, and 11S. Based upon conceptual models for the RCRA ponds, the most direct pathway for PH3 gas to release is from a temperature monitoring point (TMP) that is improperly sealed or through the soil pore-space between the cap liner anchor trench and the pond liner anchor trench. The second release pathway may result in releases through other paths of least resistance, i.e., the evapo-transpiration (ET) cap drainage collection system as has been observed at Pond 15S.

The approach to performing PH3 measurements was the same for all of these RCRA Ponds and is therefore described only once in the discussion below.

Sampling Rationale. Given the identified potential release pathways as described above, sampling for PH3 was conducted for:

- the air around each of the 50 TMP enclosures
- air within each of the 50 TMP enclosures
- the air near the surface around the perimeter of each RCRA cap (and the surface of any RCRA cap if the cap perimeter surface identified PH3 concentrations ≥ 0.2 ppm)
- soil gas at a depth of 18 to 24 inches five (5) feet outside the cap anchor trench and within the limits of final cover (see Table 2-3)
- sumps associated with the RCRA pond, i.e., ET cap drainage sumps and leachate collection, detection and removal system (LCDRS) collection sumps
- selected TMPs
- perimeter gas extraction piping at each RCRA Pond

Sample locations for each of the RCRA ponds are presented with results in Section 4.0. Measurements of PH3 in the breathing level (four to five feet above the ground surface) for IH purposes were also recorded at the time of the RCRA pond investigations and the field teams recorded the location (by GPS) and concentrations should a personnel monitor alarm be sounded. An investigation would be performed and documented to determine, if possible, the source of the PH3 causing the alarm. In addition to surveying the location of any alarms, the locations of all samples were surveyed using GPS and the coordinates was recorded in the project documentation.

In addition to the sampling programs listed above, to determine an approximate concentration of other GOPCs at the waste layer within the pond, sampling of select TMPs for GOPCs was also be performed. However, as was demonstrated during the gas characterization at Pond 16S, direct sampling and analysis of PH3 and other GOPC from TMPs is problematic.

As can be seen on Table 2-4, there are a total of 50 TMPs on the RCRA ponds (excluding Pond 16S). Given the time, effort and health and safety issues involved with sampling TMPs using methods that have been developed for Pond 16S, a judgmental sampling approach was used. This TMP sampling approach targeted a subset of the TMPs that have been identified as representing the "worst case" PH3 concentrations (i.e., selection of TMPs on ponds where PH3 is most likely to be present based upon the quantity of P4-containing wastes disposed and industrial hygiene TMP screening results). At least one TMP was sampled for PH3 at each RCRA Pond. In addition, judgmental sampling was used to select a number of TMPs that will also be analyzed for other GOPCs, i.e., HCN, H2S, and HF. Based upon an analysis of historical industrial hygiene PH3 monitoring at the RCRA Pond TMPs, TMPs were judgmentally selected for sampling as presented in Table 2-5.

RCRA Pond 8E Sampling. Pond 8E is located between the Phase IV ponds and Pond 8S. Nine soil gas probes were installed around the perimeter of the pond and sampled one time. A perimeter field scan was completed around the pond. Four TMPs are located on the pond. Three of the TMPs were sampled for PH3 and one TMP was sampled for PH3 and GOPC. All sumps associated with Pond 8E and the perimeter piping were sampled for PH3.

RCRA Pond 9E Sampling. Pond 9E is located in the northern part of the RCRA pond area. Seventeen soil gas probes were installed around the perimeter of the pond and sampled one time. A perimeter field scan was completed around the pond. Ten TMPs are located on the pond. One of the TMPs was sampled for PH3. All sumps associated with Pond 9E and the perimeter piping were sampled for PH3.

RCRA Pond 8S Sampling. Pond 8S is the easternmost RCRA pond in the area. Nine soil gas probes were installed around the perimeter of the pond and sampled one time. A perimeter field scan was completed around the pond. Four TMPs are located on the pond. One of the TMPs was sampled for PH3. All sumps associated with Pond 8S and the perimeter piping were sampled for PH3.

RCRA Phase IV Pond Sampling. The Phase IV Ponds are located in the eastern part of the RCRA Pond area between Pond 15S and Pond 8E. The Phase IV Ponds include Pond 11S, 12S, 13S, and 14S. Fifteen soil gas probes were installed around the perimeter of the pond and sample one time. A perimeter field scan was completed around the ponds. Thirteen TMPs are located on the ponds. Four of the TMPs were sampled for PH3 and one TMP was sampled for PH3 and GOPC. All sumps associated with Phase IV Ponds and the perimeter piping were sampled for PH3.

RCRA Pond 15S Sampling. Pond 15S is located in the south central part of the RCRA Pond area. Fifteen soil gas probes were installed around the perimeter of the pond and sampled one time. A perimeter field scan was completed around the pond as well as scan of the pond. Ten TMPs are located on the pond. Four of the TMPs were sampled for PH3 and four TMPs were sampled for PH3 and GOPC. All sumps associated with Pond 15S and the perimeter piping was sampled for PH3.

RCRA Pond 17 Sampling. Pond 17 is located in the western part of the RCRA Pond area. Eleven soil gas probes were installed around the perimeter of the pond and sampled one time. A perimeter field scan was completed around the pond. Six TMPs are located on the pond. Three of the TMPs were sampled for PH3 and one TMP was sampled for PH3 and GOPC. All sumps associated with Pond 17 and the perimeter piping were sampled for PH3.

RCRA Pond 18A Sampling. Pond 18A is the westernmost pond in the RCRA Pond area. Ten soil gas probes were installed around the perimeter of the pond and sampled one time. A perimeter field scan was completed around the pond. Three TMPs are located on the pond. One of the TMPs was sampled for PH3 and one TMP was sampled

for PH3 and GOPC. All sumps associated with Pond 18A and the perimeter piping were sampled for PH3.

2.2 FIELD EQUIPMENT AND PROCEDURES

Field procedures followed during this site-wide are described in the *FSP,* and summarized below. Any deviations from the original scope of work are further described as part of field modifications in Section 2.2.14. The procedures used for evaluation of the analytical data are discussed in Section 2.2.15.

2.2.1 Ambient Air/Industrial Hygiene Sampling

A measurement of PH3 in the breathing level (four to five feet above the ground surface) for IH purposes was recorded prior to all soil gas, soil flux, surface scans, pond TMP, pond sumps, and pond piping measurements. Note that two different field monitors were used. The Draeger Pac III monitor was used for all field measurements and had the alarm set at 0.2 ppm. The ToxiPro monitor was used primarily for industrial hygiene personnel monitoring and had the alarm set at 0.3 ppm (factory set). The field teams were instructed to record the location (by GPS) and concentrations should a personnel monitor alarm be sounded. An investigation would be performed and documented to determine, if possible, the source of the PH3 causing the alarm; however, as discussed in Section 3.0, this did not occur.

In RA-B, a one-time ambient air sampling event was performed in the bottom of the slag pit. The objective of this sampling was to evaluate if PH3 in the air around RA-B had migrated into the low lying area of the slag pit to the south the furnace building. Eight random locations were selected in the bottom of the slag pit including at one location near the slag pit sump. A one-event ambient air sampling program was performed during morning hours (7:00 am to 9:00 am). Ambient air readings were recorded at one to two inches ags and in the breathing zone (four to five feet ags). Measurements were collected using a Draeger Pac III field instrument (0-20 ppm range).

2.2.2 Field Method Detection Limit Sampling and Blank Sampling

The Draeger Pac III (0 to 20 ppm range) has a read-out that measures to two decimal places, i.e., 0.00 ppm. The instrument manufacturer states that the Draeger Pac III has an accuracy of ± 5% of the measured value or less. However, FMC has experienced that false positive readings may be experienced as a result of rapid changes in moisture, proximity to automobile exhaust, etc. As decisions were made based on the detection of PH3 (e.g., decisions to perform flux chamber measurements based upon detection of PH3 in the soil gas or decision to perform additional surface scans), it was important to establish a $FMDL_{sg}$, a soil flux field method detection limit ($FMDL_{sf}$), and a $FMDL_{ss}$ for the Draeger Pac III field instrument. The methods and procedures for determining these limits are described below.

2.2.2.1 Soil Gas Field Method Detection Limit

In order to determine the field instrument $FMDL_{sg}$ to be used during this monitoring effort, FMC established two soil gas probe locations at a location where soil gas PH3 could not be encountered, e.g., on the Northern Properties adjacent to the FMC office trailers. These two "background" soil gas locations were measured using the Draeger Pac III field instrument during the 5-day soil gas sampling event following the same procedures as the site soil gas probes discussed in Section 2.2.3, below. These "background" soil gas results were used to develop the determined $FMDL_{sg}$ upon which decisions would be made. FMC expected this $FMDL_{sg}$ to be 0.05 ppm or lower. The daily individual PH3 measurements for both "background" soil gas probes were 0.00 ppm PH3 during the five-day soil gas sampling activities, thus setting the $FMDL_{sg}$ to be 0.00 ppm. The one of the soil gas FMDL locations were also sampled for the GOPCs. There were detections of H2S both times the FMDL location was sampled as reported in Appendix B and further discussed in Appendix C. There were no detections of HCN or HF in the background location.

2.2.2.2 Soil Flux Field Method Detection Limit

Similar to the $FMDL_{sg}$, an $FMDL_{sf}$ was placed at background location next to the soil gas probes. The "background" soil flux chamber was sampled the same as the site soil flux chambers described in Section 2.2.4, below. The background soil flux probe was sampled during both the primary and step-out soil flux sampling events. During both background events, all individual one-minute readings were 0.00 ppm PH3; therefore the $FMDL_{sf}$ was 0.00 ppm.

2.2.2.3 Surface Scan Field Method Detection Limit

Prior to beginning the surface scan, an $FMDL_{ss}$ was determined for the sampling method. The $FMDL_{ss}$ was deemed necessary as any surface scan result above the $FMDL_{ss}$ would trigger additional investigation of the potential source area. The background area for the surface scan was on the Northern Properties southeast of the FMC office trailers. The background scan was conducted using the same methods and procedures as described for the CERCLA and RCRA areas in Section 2.2.5. All eight measurements, collected once per minute in the background area, were 0.00 ppm PH3; therefore, the $FMDL_{ss}$ was 0.00 ppm.

2.2.2.4 Ambient Field Blank Sampling

Ambient field blanks were collected for both the soil gas and soil flux sampling efforts and the field data are provided in Appendix A. Ambient field blanks were collected at a rate of ten percent of the total number of samples for each analysis, or one each day samples are collected (whichever was greater).

With the exception of one of the six field blanks for PH3 (blanks collected at RA-C 10S #3), all of the field blanks were 0.00 ppm PH3. At RA-C 10S #3, the three individual readings were 0.08 ppm PH3. In addition, three field blanks were collected for laboratory analysis of GOPCs.

The results of the ambient field blank collected in the field and sent to the laboratory for GOPC analysis are presented in Table C-5 of the Data Verification and Validation report (Appendix C) of this report. The affect of the field blank on the sample data are listed in Section C2.2.3.2 of Appendix C.

2.2.3 Soil Gas Sampling

Soil gas probes were used to measure PH3 in both the CERCLA and RCRA areas. All PH3 measurements were collected using a Draeger Pac III field instrument. Below are descriptions of equipment used and procedures for soil gas sampling.

2.2.3.1 CERCLA Areas

Soil gas probes were constructed of a 3 foot by ¼ inch stainless steel rod, a ¼ brass ball valve affixed to the top of the rod and a 5 inch by 5 inch stainless steel plate welded onto the stainless steel rod. The soil gas probe was sealed between the plate and the ground surface using bentonite. To install the soil gas probes in the ground, a ½ inch pilot hole was drilled to about 30 inches deep or refusal. The soil gas probes were installed to about 18-24 inches bgs and the locations of all soil gas probe locations were surveyed using GPS.

One (1) field sampling result, consisting of an average of three (3) individual readings per sampling event, was taken from each sample point for five consecutive days in order to cover a range of barometric pressure conditions. In addition, the five soil gas measurements at each location were staggered to provide measurements that were representative over a 24-hour day (e.g., day one sampling of all probes will begin at approximately 2:00 am, day two sampling of all probes will begin at approximately 7:00 am, day three sampling of all probes will begin at approximately 12 noon, day four sampling of all probes will begin at approximately 5:00 pm, and day five sampling will begin at approximately 10:00 pm). The sample train included an air sampling pump and a Draeger Pac III field instrument (0 to 20 ppm range).

Based on field sampling results, a subset of soil gas sampling locations in each CERLCA RA were selected based on the locations with the highest PH3 soil gas measurements. If no PH3 detections were recorded, locations were selected in consultation with EPA. These locations were sampled for other GOPCs, specifically, HCN, H2S, and HF. The sample collection was performed using sorbent tubes per the following methods:

- HCN by NIOSH Method 6010
- H2S by OSHA Method 1008
- HF by NIOSH Method 7903

As the GOPC soil gas sampling followed the PH3 soil gas sampling, the soil gas sampling probe was already be purged. The GOPC sampling train was hooked to the soil gas sampling probe valve. The GOPC sampling train consisted of the sampling tubing, the gas sampling pump, and the designated sorbent tube (HCN, HF, or H2S). The gas

sampling pump was set to the following flow rates and sample times depending on the sorbent tube being used:

- HCN: 200ml/min for 15 min for a total of 3 L
- H2S: 1,000 ml/min for 10 min for a total of 10 L
- HF: 300 ml/min for 10 min for a total of 3 L

2.2.3.2 RCRA Ponds

RCRA pond perimeter soil gas sampling was performed at each RCRA pond similar to the CERLA RA areas. The sample probes were installed to a depth of 18 to 24 inches, at 200-foot spacing around the perimeter of the pond, and at a location approximately 5 feet outside the cap anchor trench, within the limit of final cover. The soil gas probes were constructed, installed, and sampled following the same methods and procedures as the CERCLA areas. One field measurement was taken from each sample point during one event and all soil gas measurements were made using the Draeger Pac III field instrument with a 0 to 20 ppm measurement range. GOPC measurements were not collected from the RCRA pond soil gas probes.

2.2.4 Soil Flux Sampling

Surface passive flux chambers were installed in CERCLA RA areas typically in locations that had detectable concentrations of PH3. The flux chambers were constructed of ridged clear plastic with a volume of approximately 10 liters. A plastic valve with tubing extended from the flux chamber to a plastic ball valve for soil gas sampling. The flux chamber was sealed and secured to the ground surface using bentonite molded to fit tightly around the flux chamber rim and the ground surface. The flux chamber incubation time was a minimum of 24 hours prior to sampling. Soil gas from inside the flux chamber was sampled at a flow rate of 500 ml/minute. The sampling was conducted over 20 minutes to completely evacuate one volume of the flux chamber. Readings were recorded from the Draeger Pac III (0-20 ppm) field instrument after the initial one minute and were continued each minute throughout the 20 minute sampling period.

The mean of the 20 recorded results for each of the flux chambers deployed at the designated RAs ("primary flux chambers") was then calculated and compared to the $FMDL_{sf}$. If the mean of the primary results was less than or equal to the detection limit, the results for that primary flux measurement were considered indistinguishable from background and no further data evaluation was performed.

If the mean of the primary results were greater than the $FMDL_{sf}$, the results for that primary flux measurement were utilized to calculate a soil to air PH3 flux rate as follows:

Flux chamber surface area (A) = 641.3 cm^2 [diameter = 28.575 cm]
Flux chamber volume (V) = 9.937 x 10-3 m^3 [volume = 9.937 liters]
Incubation period (I) = 24 hours

PH3 molar volume at 25° C = 24.46 liters/mol
PH3 molecular weight = 34 grams/mol
Conversion Factor from PH3 ppm to PH3 mg/m^3 at standard pressure and temperature (CF) =1.39

C_{fc} = Mean PH3 concentration primary flux chamber in ppm
Mass Flux (mg) = C_{fc} x CF x V
Flux Rate (mg/cm^2/hour) = Mass Flux / A / I

During the soil flux sampling on July 30, 2010, it was noted that some of the flux chambers that were deployed on July 29, 2010 were set following a significant rain event, and while the soil appeared to have dried out when the flux chambers were deployed, significant visible condensation was observed inside of these chambers, which may or may not have affected the PH3 meter when the flux chamber measurements were made. Based on possible affects of condensation, the soil flux chamber at several locations was re-deployed and re-sampled following the *Field Modification #15 Work Plan*, except that co-located flux chambers were used to collect data using the Draeger Pac III field instrument, as well as collecting a sample on OSHA Method 1003 sampling cassettes. These results are further discussed in Section 3.0.

2.2.5 Surface Scans

Surface scans were used to measure near-surface PH3 at both CERCLA and RCRA areas. All surface scan PH3 measurements were collected using a Draeger Pac III field instrument. Below are descriptions of equipment used and procedures for the surface scans.

2.2.5.1 CERCLA Areas

Surface scans for PH3 as completed in CERCLA RA areas included Pond 1E, Pond 4E and Pond 9S in RA-D and underground piping in RA-C. The sampling approach at the piping corridor in RA-C and the ponds in RA-D involved performing a surface scan for PH3 similar to the cap surface monitoring used for Pond 16S characterization and monitoring and as described in the *FSP*.

Each pond area in RA-D was treated as one sampling cell with only the floor (bottom) of the pond being scanned. For those areas with inaccessible or steep terrain, e.g., side slopes of Pond 9S, only the level surface of the area was sampled. A one-acre area of the piping corridor in RA-C was designated as the sampling cell. This one-acre sampling cell was selected over the area with the highest density of underground piping. The approximate areas for scanning were as follows:

- Pond 1E = 1.1 acres
- Pond 4E = 1.5 acres
- Pond 9S = 1.0 acre
- Piping corridor in RA-C = 1.0 acre

- Piping area in RA-E = 0.5 acre

One (1) sampling event was performed at each pond area in RA-D and sampling cell in RA-C following specified meteorological conditions. The sample train involved the system as specified in the *Pond 16S MRP* including a sampling wand, an air sampling pump, and a Draeger Pac III field instrument.

All surface scans were only performed during certain meteorological conditions. The surface scans were not performed if any of the following meteorological conditions were encountered:

- Rain, snow or other precipitation
- Average wind speeds greater than 10 miles per hour
- Instantaneous wind speed greater than 15 miles per hour
- Snow cover or surface water accumulation (ponding)

The surface scan at RA-D and RA-C involved scanning the surface at an elevation of approximately one to two inches above ground surface, following a pre-determined sampling path. The surface scanning was conducted with an integrated sampler, which was a portable self-contained unit constructed of a stainless steel sampling probe, rotometer, battery-powered sampling pump, and a calibrated Draeger Pac III single field instrument (0 to 20 ppm range). While walking each transect at a normal walking pace (two to three miles per hour), the collection probe inlet was steadily moved in a horizontal sweeping motion, from side-to-side to extend the width of the collection path to approximately three feet. The sampler flow rate was set at approximately 300 ml/minute. Data was recorded every one minute during the surface scan. As well as recording the concentration data, barometric pressure and other weather observations were recorded. The Draeger Pac III field instrument was set to alarm at 0.01 ppm above the $FMDL_{ss}$ (e.g., if the $FMDL_{ss}$ is determined to be 0.00 ppm, then the alarm will be set at 0.01 ppm). At any point during the surface scan, if the Draeger Pac III alarm went off, a flag was placed at that point and the surface scan continued. Once the surface scan was completed on that area, each flagged point, if any, was investigated in an attempt to determine the source of the PH3. All logged data and any subsequent investigations were recorded and reported.

If PH3 was detected during the surface scan in the piping corridor in RA-C at concentrations greater than the $FMDL_{ss}$, similar sampling would be performed over a one-half acre sampling cell located over the underground CO line in RA-E. As discussed in Section 3.7, no scans were required in RA-E.

2.2.5.2 RCRA Ponds

Pond perimeter surface scan sampling was performed at RCRA Ponds 8E, 9E, 8S, Phase IV Ponds, 15S, 17 and 18 Cell A. The sampling approach for the perimeters scans was the same as the CERCLA scan procedures discussed above. Each of the pond perimeter surface scanning areas was sampled only once and as a single sampling “cell”. The approximate lineal distance for scanning at each pond was as follows:

- Pond 8E = 1,725 feet
- Pond 9E = 3,520 feet
- Pond 8S = 1,550 feet
- Phase IV Ponds = 2,970 feet
- Pond 15S = 3,080 feet
- Pond 17 = 2,300 feet
- Pond 18 Cell A = 2,250 feet

The walking path for the pond cap perimeter surface scan was completed in two passes. The first pass was approximately five feet outside the cap anchor trench. The second pass was approximately 15 feet outside the cap anchor trench. As well as recording the concentration data, barometric pressure and other weather observations were recorded. Field sampling notes are provided in the field forms in Appendix A.

When the pond perimeter surface scanning detected PH3 at a level above the $FMDL_{SS}$, then measurement of PH3 over the entire RCRA Pond cap surface was performed to determine any release of PH3 through the cap surface. This sampling was performed per the procedure in Section 2.5 of the *FSP*, which was consistent with Section 3.3 of the *Pond 16S MRP* and the *Pond 16S QAPP*. This sampling was performed on each RCRA cap under the same meteorological parameters that are prescribed for the perimeter pond scans (i.e., no precipitation, no snow accumulation, and average wind speeds less than 10 mph) and using the same sampling procedures and sampling train.

2.2.6 RCRA Pond TMP Enclosure Sampling

Sampling the TMP enclosure was performed at RCRA Ponds 8E, 9E, 8S, Phase IV Ponds, 15S, 17 and 18 Cell A. TMP enclosures are constructed of painted steel and are approximately 2.5 feet wide, 2.5 feet deep, and 3 feet tall with the top consisting of a hinged lid allowing access to the TMP. All TMP enclosures were sampled at the RCRA ponds for PH3 during one sampling event at each pond. The number of TMPs at each RCRA pond is:

- Pond 8E has 4 TMPs
- Pond 9E has 10 TMPs
- Pond 8S has 4 TMPs
- Phase IV Ponds have 13 TMPs
- Pond 15S has 10 TMPs
- Pond 17 has 6 TMPs
- Pond 18 Cell A has 3 TMPs

Measurements of PH3 in the air around and within each TMP were performed to monitor for potential releases of PH3 from the TMP. The RCRA pond TMP enclosure sampling procedure was similar for all RCRA ponds. In general, the measurement involved making a sweep of air around the TMP enclosure using the Draeger Pac III field instrument (0-20 ppm range) at a distance of one-foot outside the enclosure, at elevations of six inches above the cap surface, and within the enclosure at approximately 1.5 feet from the top of the TMP enclosure. This sampling was performed once at each RCRA pond TMP. The barometric pressure and other weather observations such as wind direction and temperature were recorded. Field sampling notes are provided in the field forms in Appendix A.

2.2.7 RCRA Pond Sump Sampling

Sampling the RCRA pond sumps was performed at RCRA Ponds 8E, 9E, 8S, Phase IV Ponds, 15S, 17 and 18 Cell A. RCRA Ponds 8S, Phase IV Ponds, 15S, and 18 Cell A have the "double RCRA cap" design, and therefore have ET caps. These ET caps are equipped with ET cap drainage systems to collect precipitation that infiltrate through the ET cap. RCRA Ponds 8E, 9E, 15S, 17, and 18 Cell A have pond liner leachate collection, detection and removal systems (LCDRS). Both the ET cap drainage systems and the LCDRS have collection sumps. All of these RCRA pond sumps were sampled for PH3 only during one sampling event at each pond. For all RCRA pond sump sampling, the PH3 measurement was made using the Draeger Pac III field instrument (0 to 20 ppm measurement range). Measurements were made on the outside and inside of the RCRA pond sumps.

The number of sumps at each RCRA pond is:

- Pond 8E has no ET cap drainage sumps and 1 LCDRS sump
- Pond 9E has no ET cap drainage sumps and 6 LCDRS sump
- Pond 8S has 2 ET cap drainage sumps and no LCDRS sumps
- Phase IV Ponds have 4 ET cap drainage sumps and no LCDRS sumps
- Pond 15S has 2 ET cap drainage sumps and 4 LCDRS sumps
- Pond 17 has no ET cap drainage sumps and 1 LCDRS sump
- Pond 18 Cell A has 2 ET cap drainage sumps and 1 LCDRS observation pipe (with dedicated pump and wiring located within the observation pipe).

The measurements outside of the sumps were collected first. The inside of the sumps were sampled only if the outside measurements did not exceed 1 ppm. With any ambient air measurement of 1.0 ppm, site workers moved upwind to get out of the area of PH3, and then followed the procedures as outlined in the *RCRA Pond Area Work Rules*. During the sump sampling, the sump lid was opened and the Draeger Pac III field instrument was lowered into the sump enclosure to a depth of about 1 foot above the sump bottom (or water level if water is present). The PH3 reading was allowed to stabilize and the measurement recorded.

2.2.8 RCRA Pond TMP Sampling

Sampling the TMPs was performed at RCRA Ponds 8E, 9E, 8S, Phase IV Ponds, 15S, 17 and 18 Cell A. Select TMPs were sampled at these RCRA ponds for PH3 with a smaller subset of these TMPs being sampled for GOPCs in addition to PH3 using the procedures in Section 2.8 of the *FSP*. Table 2-5 summarizes the TMP sampling.

The RCRA Pond TMP sampling relied on methods developed and used at Pond 16S TMP gas characterization and subsequent TMP demonstration sampling. A Gas Extraction System (GES) unit was used to extract and treat gas at each TMP prior to and during TMP sampling. The GES was used to purge the TMP, perform an initial PH3 concentration screening, and provide the extraction and treatment of purge gas. In general, the TMP sampling involved using an initial screening concentration determination using the dilution capabilities of the GES unit and calculating the TMP gas PH3 concentration. If the screening calculated TMP gas concentration was less than 10,000 ppm PH3, a direct sample of the TMP gas was made and diluted using a calibrated dilution manifold. PH3 concentrations were measured using the Draeger Pac III field instrument (0-1,000 ppm range). If the concentration from the initial screening was greater than 10,000 ppm using the GES system, then the measurement was recorded and an estimated concentration calculated based upon the operational data of the GES. As well as recording the concentration data, barometric pressure and other weather observations were recorded during TMP sampling. Once the PH3 measurements were made, a direct sample of the TMP gas to measure GOPCs at designated TMPs was collected.

As discussed above, the TMP gas sampling was performed in several steps. The first step was a screening level sampling to establish the screening level PH3 concentration and was based upon a calculation using operating parameters from the GES. The second level was to perform a more accurate PH3 concentration measurement using a direct gas sampling method, if the screening level was less than 10,000 ppm PH3. The third step was to collect GOPC samples, as necessary. These procedures are discussed in more detail below.

Screening-Level TMP Gas PH3 Sampling Procedure. As this procedure was used when TMP gas PH3 concentration were unknown, it was assumed that the PH3 levels were high, i.e., the concentration was above the concentration that is immediately dangerous to life or health (IDLH = 50 ppm) and above the lower explosive limit (LEL = 20,000 ppm). A mobile GES unit was connected to the TMP and purged for at least three TMP volumes of gas. The time necessary to purge varied based upon the TMP concentrations, but was approximately 10 minutes per standard GES operating procedures. After purging, the following operating parameters were recorded from the operating GES:

- Gas flowrate from the TMP
- GES inlet flowrate

- GES inlet PH3 concentration using the Draeger Pac III field instrument (0 to 1,000 ppm range)

Based on these recorded GES operating parameters, the TMP gas PH3 concentration was calculated as follows:

Screening level TMP gas PH3 conc. = (GES inlet PH3 concentration x total GES inlet flow)/TMP flow

These steps were repeated to collect two additional screening-level TMP gas PH3 concentrations. These measurements were collected at least 10 minutes apart. Once the three screening level TMP gas PH3 concentrations were calculated and recorded, the average concentration was recorded. If the average screening level TMP gas PH3 concentration was greater than or equal to 10,000 ppm, it was considered unsafe to attempt a direct sampling of TMP gas (second-level sampling). The average screening level was recorded as the TMP PH3 gas concentration and collection of GOPC concentrations was completed, as necessary. If the average screening level TMP gas PH3 concentration was less 10,000 ppm, the second-level PH3 sampling procedure was performed as further described below.

Second-Level TMP Gas PH3 Sampling Procedure. This procedure was intended for use in measuring PH3 in pond TMP gas that is known to be less than 10,000 ppm as result of the screening-level TMP gas sampling. To avoid release of PH3 to the environment, the pond gas sampled during this procedure was discharged directly to the Mobile Gas Extraction (GES) unit to avoid discharge of untreated pond gas to the atmosphere. As the Mobile GES unit was already connected and the TMP purged during the screening level testing, the TMP gas sampling train was connected to the unit. The sampling train consisted of a peristaltic sampling pump, gas dilution manifold, and a Draeger PAC III PH3 (0 to 1,000 ppm) equipped with a Draeger calibration cap, and nitrogen gas cylinder for sample dilution Mass flow meters in the dilution/mixing manifold indicated the flow rate of pond gas and dilution gas (nitrogen). The combined total flow extracted from the TMP piping plus any dilution gas was approximately 500 ml/min. When the PH3 readings had stabilized, Draeger monitor PH3 readings were recorded in addition to the dilution/mixing manifold gas flow rates, the calculated dilution rate, and the calculated PH3 concentration corrected for any dilution. Three consecutive data sets were recorded, at least 10 minutes apart. The average screening level was recorded as the TMP PH3 gas concentration and collection of GOPC concentrations was completed, as necessary.

TMP Gas GOPC Sampling Procedure. This procedure was used in measuring GOPCs in pond TMP gas. The GOPC sample collection was performed using sorbent tubes per the same methods used for GOPC sampling from CERCLA soil gas probes.

See Table 2-6 for a summary of the analytical methods for TMP sampling. The sampling was perfumed immediately following the PH3 sampling and sampling train was similar except that sorbent tubes for each analyte were connected instead of the Draeger field instrument. The flow rates of pond gas through the GOPC sampling train using the

sampling pump were adjusted and. The flowrate and collection time for each GOPC analyte was as follows:

- HCN: 200ml/min for 20 min for a total of 4 L
- H2S: 500 ml/min for 10 min for a total of 5 L
- HF: 300 ml/min for 10 min for a total of 3 L

Note that the sampling for each sorbent tube was performed separately. The sorbent tubes were not sampled in series. After the sampling was completed from the TMP, fresh air was allowed to run through the sampling train until the train has been purged.

2.2.9 RCRA Pond Perimeter Piping

Sampling PH3 in the RCRA Pond cap perimeter piping was performed at RCRA Ponds 8E, 9E, 8S, Phase IV Ponds, 15S, 17 and 18 Cell A. Perimeter piping was installed beneath each RCRA pond cap as a means to extract pond gases should pressure thresholds defined in the post-closure plans be exceeded. The perimeter piping sampling was performed upon completion of the TMP sampling at each of the RCRA ponds. RCRA pond perimeter piping PH3 measurements were collected at each RCRA pond using the same methods as described above for TMP sampling, except that the GES unit was connected to one of the perimeter piping standpipes instead of the TMP. In summary, a GES unit was installed to purge the perimeter piping of at least one total piping volume. The inlet gas to the GES unit was diluted with ambient air to less than 500 ppm (a limit on the treatment capability of the carbon). Dilution gas flowrate was measured along with inlet gas flowrate. PH3 concentration was measured at the inlet to the GES using the Draeger Pac III field instrument (0-1,000 ppm range) which allowed for calculating the PH3 concentration in the perimeter piping. If this calculated perimeter piping gas concentration was less than 10,000 ppm PH3, a direct sample of the perimeter gas was made and diluted using the calibrated dilution manifold. If the concentration was greater than 10,000 ppm using the GES system, then the measurement was recorded and an estimated concentration calculated based upon the operational data of the GES. As well as recording the concentration data, barometric pressure and other weather observations pertaining to direction of gas flow at the pond perimeter were recorded during perimeter piping sampling. Field sampling notes are provided in the field forms in Appendix A.

2.2.10 Field and Laboratory Method Testing

The primary field instrument for measuring PH3 is the Draeger Pac III gas monitor outfitted with the PH3 detector with a range of 0 to 20 ppm. Notable exceptions included the TMPs and perimeter piping that utilized detectors with 0 to 1,000 ppm range. All Draeger Pac III gas monitors used for this project were calibrated no less than every 14 days. In addition to the calibration every 14 days, a comparison of the Draeger Pac III gas monitor (0-20 ppm range) and OSHA Method 1003 measurements was performed. Following standard calibration of the Draeger Pac III gas monitor using the 0 ppm and

0.5 ppm PH3 standard calibration gases, the Draeger Pac III and OSHA Method 1003 were used to sample a 5 ppm PH3 standard calibration gas under controlled (indoor) conditions.

Two tests of the calibration gas were performed. During the first test 23.61 liters of the calibration gas was pump through the sampling cassette at 1.57 liters per min (L/min) for 15 minutes. The recovery was approximately 2.0 percent. It was determined that this was more gas than the sampling cassette was able to absorb. The test was performed again using 2.5 liters of the calibration gas pumped through the cassette at a rate of 0.5 L/min. The recovery was approximately 20 percent. The results of the test are included in Table 2-7. As shown in the table, the cassette results were much lower than the 5 ppm PH3 standard calibration gas and the Drager Pac III results were within 5 percent of the standard calibration gas.

The PH_3 analytical results for the OSHA Method 1003 sampling cassette for the second round of testing were again anomalously low, despite sampling at the reduced flow rate. It should be noted that OSHA Method 1003 for PH3 is an industrial hygiene method designed for sampling ambient air at very low ppm levels over an extended period of time. There has been no testing on the cassettes to determine the recoveries when the cassettes are exposed to high ppm concentration over a short period of time. After consulting with the manufacture (SKC) of the sampling cassettes, it has been determined that the cassettes were not designed to be used in the way the calibration gas was sampled.

Also, based upon these comparison test results, it would appear that the OSHA Method 1003 cassette results are biased low at the PH3 calibration gas concentration of 5.0 ppm. The low bias from the OSHA Method 1003 results on the 5.0 ppm PH3 calibration gas does not affect the overall site-wide gas assessment results as the EPA-approved SRI Field Modification #15 Work Plan specified using the Draeger Pac III field instrument for PH3 measurements in the field. However, it should be noted that measurements using the OSHA Method 1003 cassettes were used to support Draeger Pac III field measurements during re-sampling of several soil flux measurement locations. These soil flux PH3 concentrations were much lower (0.00 to 0.09 ppm) than the calibration gas (5.0 ppm) and a low bias was not observed in the OSHA Method 1003 cassette results as compared to the Draeger Pac III field measurement.

2.2.11 Sample Labeling, Handling, Shipment and Analysis

A label was placed on each sample container submitted for analysis (PH3 and GOPC cassettes and tubes from soil gas, soil flux, and TMP sampling) and included information as required in the *FSP*. After these samples were collected, they were stored in a locked office at the FMC Training Center. Soil gas samples were hand delivered under chain-of-custody to ALS Laboratories in Salt Lake City, Utah. PH3 was analyzed using Occupational safety and Health Administration (OSHA) Method 1003. GOPC soil gas samples were analyzed for H2S using OSHA 1008, HCN by National Institute for Occupational Safety and Health (NIOSH) Method 6010 and HF by NIOSH Method 7903.

2.2.12 Sample Identification

Each sample was uniquely labeled. Samples were named according to area location designation and sample type designation. For example, a sample collected from TMP#2 on Pond 15S on August 1, 2010 at 11:23 would be designated Pond15STMP2 and the date and time were recorded on the label. Time was recorded in military or 24-hour format. Dates were listed by month, day and year. Blind duplicate samples were numbered sequentially using SM for site-wide monitoring and with a number sequence starting at 1001 (e.g., SM-1001, SM-1002, SM-1003, etc.). Field blanks were numbered sequentially using SM for site-wide monitoring and with a number sequence starting at 2002 (e.g., SM-2001, SM-2002, SM-2003, etc.). Sample type abbreviations are as follows:

- Temperature monitoring probe – TMP
- Soil gas probe – SG
- Soil flux chamber – SF
- Ambient Air - AA
- Pond perimeter piping – PP
- Pond sump – LCS for LCDRS sumps and CDS for ET cap drainage sumps

2.2.13 Investigation Derived Waste

The Investigation Derived Waste (IDW) was characterized and handled according to the methods and procedures identified in the *FSP*. No hazardous waste was generated during the site-wide gas assessment activities. The generation of IDW was limited to used disposable gloves and used tubing. These items were disposed in trash receptacles at the site and were ultimately disposed of at the FMC Plant Site landfill (RU 18).

2.2.14 Deviations from the Work Plan

Field modifications or deviations were changes that were identified by the field personnel and required a change to the scope of work, approved methodologies, and routine procedures in order to perform and/or improve data collection. None of the deviations significantly changed or compromised any of the site-wide gas assessment objectives or conclusions. Field modifications were developed, proposed or implemented due to one or more of the following reasons:

- Unforeseen field conditions
- Health and safety of field personnel
- Efficiency of sample collection and analysis
- Equipment, methods or procedures that proved to be inappropriate, inadequate, or

unworkable in the field

The minor field modifications were communicated in the conference calls held with EPA and other agencies and in the weekly reports. The minor field modifications are summarized below and are also discussed in Sections 3.0 and 4.0 as they pertain to the sampling results.

- **GOPC Sampling from TMPs.** During GOPC sampling at Pond 18A TMP #3, autoignition of pond gas (which was > 20,000 ppm PH3) occurred in the ¼-inch Tygon tubing connected to the sample tube. This melted the Tygon tubing. While no one was injured or exposed to PH3 (there was no escape of pond gas to the atmosphere), the GOPC sampling procedure was modified when sampling TMPs or perimeter piping. If the screening level PH3 measurement is greater than 10,000 ppm, the GOPC sample was collected at the inlet to the Mobile GES treatment unit at which point the pond gas was diluted to below the LEL of PH3. The GOPC concentration will be calculated and reported based upon laboratory results and the dilution rate of the pond gas.
- **Soil Flux Sampling in CERCLA Areas.** Soil flux data collected at three sampling points (RA-B furnace building location #3, RA-C Pond 6S location #3, and RA-K railroad swale location #3) had measurements of PH3. The flux chambers were deployed on a day following a significant rain event, and while the soil appeared to have dried out when the flux chambers were deployed, significant visible condensation was observed inside of these chambers, which may or may not be affecting the PH3 meter when the flux chamber measurements were made. Based on this, field staff re-deployed flux chambers at these locations (after removing the bentonite from previous flux chamber sampling) and resampled as per sampling plan, except that co-located flux chambers were used to collect data using the Draeger Pac III field instrument, as well as collecting a sample on OSHA Method 1003 sampling cassettes.
- **TMP Sampling on Pond 15S and Phase IV Ponds.** The TMP gas at TMP #1 on the Phase IV Ponds (Pond 14S) and TMPs #8, #9, and #10 on Pond 15S was unable to be sampled as no gas could be extracted from these TMPs. Extraction of gas from these TMPs had not been attempted in the past. It should be noted that these TMPs (as with all TMPs) was not designed for gas extraction, but for containment of a temperature sensor for monitoring temperature within the pond cover system, as required in the *Phase IV Pond and Pond 15S Post-Closure Plans*. The temperature sensor does not appear to be affected. TMP gas data was not collected from these TMPs.
- **Locations of samples at RA-K.** In RA-K (railroad swale), the location of soil gas probe #1 was determined to be overlying the liner which had been installed in the west end of the railroad swale back in 1990. To better characterize the area, soil gas sampling location #1 was relocated to a point approximately half-way between soil gas sampling location #2 and #3. The *Field Modification #15 Work Plan* provided for field relocation as necessary to accommodate access.

2.2.15 Evaluation of Analytical Data

2.2.15.1 Quality Assurance Program

Prior to starting the site-gas assessment field activities, a QA program was developed. The purpose of this program was to define the policy, organization, functional activities, and QA/QC protocols that would be used to meet the DQOs of the site-wide gas assessment program. Descriptions of the DQOs and procedures associated with the field program, including sampling collection, sample custody, laboratory analysis, and QC and QA for the site-wide gas assessment were presented in the *Field Modification #15 Work Plan* as well as the *Pond 16S Quality Assurance Project Plan* (*QAPP*) included as Appendix B to the *Field Modification #15 Work Plan*.

2.2.15.2 Selection of Analytical Methods

Laboratory analytical methods used during the site-wide gas assessment are summarized in Tables 2-2 and 2-7. All analytical methods were performed in accordance with the *Field Modification #15 Work Plan* and *FSP*. ALS of Salt Lake City, Utah performed PH3 and GOPC analyses during the project.

2.2.15.3 Review of Analytical Data

The laboratory provided the analytical results as an electronic data deliverable (EDD) and in a hard-copy version to the validation company LDC. Upon receipt, all data were reviewed by a qualified chemist from LDC to determine if they were valid. During the data validation review, the chemist looked at each analyte that was detected to evaluate whether its presence in the sample was attributable to environmental conditions, or if it was an artifact from field or laboratory procedures. The review of site-wide gas assessment data from contract laboratories was at Level III and approximately 10 percent of the data generated were validated at Level IV.

The laboratory data reports and LDC's validation reports are provided in Appendix B. All data qualifiers, as well as the reason for using the qualifier, are discussed in the Data Validation Report (Appendix C). Once the data were reviewed, validated, and qualified, they were downloaded by a computerized database into summary tables. The results of the data validation are summarized in the Data Validation Report provided in Appendix C.

TABLE 2-1
CERCLA AREA
SOIL GAS SAMPLING SUMMARY
SITE-WIDE GAS ASSESSMENT
(Page 1 of 1)

CERCLA Sampling Area	PH3 Sampling [1]		GOPC Sampling [2]		Soil Flux Sampling	
	# of Sample Locations	# of Sampling Events [3]	Min. # of Sample Locations [4]	# of Sampling Events [5]	Min. # of Sample Locations [4]	# of Sampling Events
RA-B						
Furnace Building Foundation Perimeter	10	5	3	2	3	1
RA-C						
Pond 6S	3	5	1	2	1	1
Pond 7S	4	5	1	2	1	1
Pond 10S	3	5	1	2	1	1
RA-F1						
Buried Railcars	5	5	3	1	3	1
RA-K						
Railroad Swale	3	5	3	1	3	3
	# of Sample Locations	**# of Sampling Events**				
RA-B						
Slag Pit and Sump Areas	8	1	NA	NA	NA	NA
RA-D						
Former CERCLA Ponds	Surface Scan	1	NA	NA	NA	NA
Underground Piping						
RA-C Corridor	Surface Scan	1	NA	NA	NA	NA
RA-E	Surface Scan based on RA-C results	1 based on RA-C results	NA	NA	NA	NA

[1] PH3 sampling was performed using the Draeger Pac III field instrument.
[2] GOPC sampling methods are: HCN using NIOSH Method 6010
HF using NIOSH Method 7903
H2S using OSHA Method 1008
[3] Collected over a 5-day period.
[4] Number of sample locations for GOPC and soil flux sampling was dependent on outcome of first three PH3 sampling events.
[5] Performed along with final two PH3 sampling events.

TABLE 2-2
ANALYTICAL METHOD SUMMARY FOR
SOIL GAS AND SOIL FLUX SAMPLING IN CERCLA AREAS
SITE-WIDE GAS ASSESSMENT
(Page 1 of 1)

Constituent	Method[(a)]	Sampling Media	Holding Time	Sampling Procedure	Analytical Procedure
Phosphine	Draeger Pac III Field Instrument	Draeger Sensor XS Hydride	NA	Soil gas: Use Draeger with 0-20 ppm range. If reading is > 20 ppm, use Draeger with 0-1,000 ppm range.	NA. Field measurement.
Phosphine	OSHA 1003	Glass filter, polyester filter treated with mercuric chloride, preloaded in a cassette. *SKC Part No. 225-9018*	Not Established	Soil flux: Collect 1 cassette at two (2) l/min for 5 minutes	Treated filters are digested with sulfuric acid and analyzed by inductive coupled plasma-atomic emission spectroscopy (ICP-AES).
Hydrogen cyanide	NIOSH 6010	Sorbent tube, soda lime. *SKC Part No. 226-28*	7 Days	Soil Gas: Collect 1 sorbent tube at 200 ml/min for 15 minutes	Sorbent is extracted with distilled water and analyzed using visible absorption spectrophotometry.
Hydrogen sulfide	OSHA 1008	Sorbent tube, silica gel coated with silver nitrate and a glass fiber filter treated with sodium carbonate/glycerol. *SKC Part No. 226-177*	30 Days	Soil Gas: Collect 1 sorbent tube at 1,000 ml/min for 10 minutes	Sorbent is extracted with sodium cyanide/sodium hydroxide, coverted to sulfate using hygrogen peroxide and the extract is analyzed using ion chromatography.
Hydrogen fluoride	NIOSH 7903	Sorbent tube, silica gel (specially cleaned). *SKC Part No.226-10-03*	21 Days	Soil Gas: Collect 1 sorbent tube at 300 ml/min for 10 minutes	Sorbent is extracted with eluent, and the eluent is analyzed using ion chromatography.

[a] Analytical Method References:
Sampling and Analytical Methods (U.S. Department of Labor, Occupational Safety & Health Administration [OSHA]).
Manual of Analytical Methods (National Institute for Occupational Safety and Health [NIOSH]),

TABLE 2-3
RCRA PONDS
PERIMETER SOIL GAS SAMPLING SUMMARY
SITE-WIDE GAS ASSESSMENT
(Page 1 of 1)

RCRA Pond	Reference Figure	PH3 Sampling [1]	
		# of Sample Locations	# of Sampling Events
Pond 8E	See Figure 4-1 of Report for sample locations	9	1
Pond 9E	See Figure 4-2 of Report for sample locations	17	1
Pond 8S	See Figure 4-3 of Report for sample locations	9	1
Phase IV Ponds	See Figure 4-4 of Report for sample locations	15	1
Pond 15S	See Figure 4-5 of Report for sample locations	15	1
Pond 17	See Figure 4-6 of Report for sample locations	11	1
Pond 18 Cell A	See Figure 4-7 of Report for sample locations	10	1

[1] PH3 sampling was performed using the Draeger Pac III field instrument.

TABLE 2-4
DESCRIPTION OF RCRA PONDS (Excluding Pond 16S)
SITE-WIDE GAS ASSESSMENT
(Page 1 of 1)

Pond Number	Description of Wastes Received	Year In Service	Pond Size (acres)	Estimated Total Fill at Closure (acre-feet)	Closure Certification	Cap Design Type # of TMPs # of ET Cap Drainage Sumps #of LCDRS Collection Sumps
8E	Primarily NOSAP (lime-treated) precipitator slurry and residual non-lime treated precipitator slurry/phossy solids	1984 – 1997	4.1	27	January 2005	RCRA engineered cap[1] TMPs = 4 ET Cap Drainage Sumps = 0 LCDRS Sumps = 1
9E	Precipitator slurry	1986 – 1994	12.9	17	January 2001	RCRA engineered cap[1] TMPs = 10 ET Cap Drainage Sumps = 0 LCDRS Sumps = 6
8S	Phossy water and phossy solids	1970 - 1981	3.2	44	December 1999	RCRA double cap[2] TMPs = 4 ET Cap Drainage Sumps = 2 LCDRS Sumps = 0
Phase IV	Phossy water and phossy solids	1980 – 1998	8.9	Pond 11S = 19 Pond 12S = 19 Pond 13S = 3.8 Pond 14S = 1.5	January 2005	RCRA double cap[2] TMPs = 13 ET Cap Drainage Sumps = 4 LCDRS Sumps = 0
15S	Phossy water and phossy solids	1982 – 1993	9.4	140	January 2005	RCRA double cap[2] TMPs = 10 ET Cap Drainage Sumps = 2 LCDRS Sumps = 4
17	RCRA Consent Decree on-specification NOSAP slurry only	1998 – 2001	9.0	59	December 2005	RCRA engineered cap[1] TMPs = 6 ET Cap Drainage Sumps = 0 LCDRS Sumps = 1
18 Cell A	Phossy water and phossy solids, minor RCRA Consent Decree off-specification NOSAP slurry	1998 - 2001	3.8	25	December 2005	RCRA double cap[2] TMPs = 3 ET Cap Drainage Sumps = 2 LCDRS Sumps = 1

[1].RCRA engineered cap does not have an ET cap.
[2] RCRA double cap does have an ET cap.

TABLE 2-5
RCRA PONDS
TMP SAMPLE SUMMARY
SITE-WIDE GAS ASSESSMENT
(Page 1 of 1)

TMPs	PH3	GOPC
Pond 8E		
TMP 1	X	
TMP 2	X	
TMP 3	X	
TMP 4	X	X
Pond 9E		
TMP 7	X	
Pond 8S		
TMP 1	X	
Pond 11S		
TMP 11	X	
Pond 12S		
TMP 7	X	X
TMP 8	X	
Pond 13S		
TMP 4	X	
Pond 14S		
TMP 1	X	
Pond 15S		
TMP 1	X	X
TMP 2	X	X
TMP 5	X	X
TMP 6	X	X
TMP 7	X	
TMP 8	X	
TMP 9	X	
TMP 10	X	
Pond 17		
TMP 1	X	
TMP 2	X	X
TMP 4	X	
TMP 5	X	
TMP 6	X	
Pond 18 Cell A		
TMP 2	X	
TMP 3	X	X

TABLE 2-6
ANALYTICAL METHOD SUMMARY FOR
RCRA POND TMP SAMPLING
SITE-WIDE GAS ASSESSMENT
(Page 1 of 1)

Constituent	Method[a]	Sampling Media	Holding Time	Sampling Procedure	Analytical Procedure
Phosphine	Draeger Pac III Field Instrument	Draeger Sensor XS Hydride	NA	TMP: Use Draeger with 0-1,000 ppm range	NA. Field measurement.
Hydrogen cyanide	NIOSH 6010	Sorbent tube, soda lime. *SKC Part No. 226-28*	7 Days	TMP: Collect one (1) sorbent tube at 200 ml/min for 20 minutes	Sorbent is extracted with distilled water and analyzed using visible absorption spectrophotometry.
Hydrogen sulfide	OSHA 1008	Sorbent tube, silica gel coated with silver nitrate and a glass fiber filter treated with sodium carbonate/glycerol. *SKC Part No. 226-177*	30 Days	TMP: Collect one (1) sorbent tube at 500 ml/min for 10 minutes	Sorbent is extracted with sodium cyanide/sodium hydroxide, coverted to sulfate using hygrogen peroxide and the extract is analyzed using ion chromatography.
Hydrogen fluoride	NIOSH 7903	Sorbent tube, silica gel (specially cleaned). *SKC Part No.226-10-03*	21 Days	TMP: Collect one (1) sorbent tube at 300 ml/min for 10 minutes	Sorbent is extracted with eluent and the eluent is analyzed using ion chromatography.

[a] Analytical Method References:
Sampling and Analytical Methods (U.S. Department of Labor, Occupational Safety & Health Administration [OSHA]).
Manual of Analytical Methods (National Institute for Occupational Safety and Health [NIOSH]),
Methods Proposed or Promulgated in the Federal Register (U.S. EPA Emission Measurement Center.)
Annual Book of Standards (American Society for Testing and Materials Methods [ASTM], 1998)

TABLE 2-7
COMPARISON OF DRAEGER PAC III AND PH3 CASSETTE DATA
SITE-WIDE GAS ASSESSMENT
(Page 1 of 1)

		Analyte	Phosphine			
		Analytical Method	OSHA1003			Draeger Pac III
		Molecular Weight	33.998			
Sample Identification	**Sample Date**	**Volume (L)**	**µg/Sample**	**µg/l**	**ppm**	**ppm**
07/30/10PH31	7/30/2010	23.61	**4.1**	**0.174**	**0.115**	**5.05**
07/30/10PH32	7/30/2010	23.61	**4**	**0.169**	**0.112**	**5.20**
07/30/10PH32 Dup	7/30/2010	23.61	**4.7**	**0.199**	**0.132**	**5.00**
OSHA1003COMP1	9/3/2010	2.5	**3.8**	**1.520**	**1.004**	**5.10**
OSHA1003COMP2	9/3/2010	2.5	**3.7**	**1.480**	**0.978**	**5.05**
OSHA1003COMP2 Dup	9/3/2010	2.5	**3.2**	**1.280**	**0.846**	**5.05**

3.0 EVALUATION OF CERCLA AREA SPECIFIC FINDINGS

3.1 INTRODUCTION

The CERCLA areas included in the site-wide gas assessment study included Remediation Areas (RAs) B, C, D, F1, K and Underground Piping in RAs C and E that are identified in the SFS Report as containing or potentially containing P4 (see Table 3-4 in the draft *SFS Report*). As such, these areas were also identified as having the potential for phosphine gas generation in *Comparison of Conventional and Alternative Capping Systems for Use at the FMC Plant OU* (see Section 3.4.3). The general approach to measurement of PH3 in the CERCLA areas was to use shallow soil gas sampling as an initial screening in sub-areas of RAs that have been identified as containing P4 in the subsurface. The shallow soil gas sampling results were used to identify locations for surface passive flux chamber measurements, primarily at locations where shallow soil gas measurements were detected at a level above the field instrument field method detection limit (FMDL), although a minimum number of three flux chamber sampling locations at each RA was established by EPA. This sampling is discussed further below. A subset of soil gas sampling locations, selected based upon the locations with the highest PH3 soil gas measurements, were also sampled for other GOPCs.

However, several RAs warranted a different approach. For example, near-surface gas sampling was performed at historic pond locations in RA-D and at areas in RA-C where numerous underground pipes are closely spaced in a relatively small area. . The specific approach and results for scoped and follow-on investigations are presented and discussed below as they apply to each RA. The field method detection limit sampling effort is assessed first, because the results of the field method detection limit investigations are initially used for screening the results from each RA. Following the discussion of field method detection limit, conditions within each RA are evaluated in the following subsections:

1. Site Description – discusses the potential for the presence of PH3 based on the RA's historic activities.

2. Problem Statements – includes objectives and rationale for the field programs conducted within the area from the EPA-approved *Field Modification #15 Work Plan.*

3. Investigation Results – presents summary data tables from the site-wide gas sampling activities. These results from each of the programs are discussed for each of the sampling programs conducted at each area.

4. Contamination Assessment – presents evaluations and implications of the results in each of the investigation areas.

3.2 RA-B

3.2.1 Description

RA-B includes the furnace building, slag pit, phos dock, secondary condenser, and an area downgradient of the furnace building where P4 was detected in the groundwater capillary fringe during the SRI. RA-B has an estimated 580 to 5,470 tons of P4, as reported in Section 4.2.4 of the *SRI Report* (MWH, 2009b). While several subareas of RA-B could contain P4 in the subsurface, by far the majority of this estimated P4 in subsurface soils would be beneath the furnace building, P4 product sumps, and within the area where soil temperatures were elevated above the melting point of P4 as a result of historic slag handling operations.

3.2.2 Problem Statement

Given that the majority of subsurface P4 is expected to be under the furnace building and the furnace building steel reinforced concrete foundation remains in place, any PH3 generated in this area could accumulate under the relatively impermeable foundation. PH3 or GOPCs, if present, would likely move to the edge of the foundation, similar to what has been observed at the RCRA Pond cap perimeters (i.e., RCRA Ponds 15 and 16). Therefore, the subsurface soils around the furnace building foundation would present the most likely potential areas of PH3/GOPC accumulation and, therefore, the worst-case sub-area for PH3/GOPC flux to ambient air, if present. As a result of the potential for PH3/GOPC accumulation, the following field programs were performed RA-B.

- Industrial Hygiene (Ambient Air) Monitoring
- Soil Gas Monitoring
- Soil Flux Monitoring
- Slag Pit Ambient Air Monitoring
- Manhole Monitoring

3.2.3 Investigation Results

3.2.3.1 Industrial Hygiene (Ambient Air) Monitoring

A measurement of PH3 in the breathing level (four to five feet above the ground surface) for IH purposes was recorded at the time of each soil gas measurement and soil flux measurement. The field teams were also required to report the location and concentration should a personnel monitor alarm be sounded. Of the 50 breathing zone measurements around the furnace building and 8 breathing zone measurements in the slag pit, all of the field measurements were 0.00 ppm PH3 as shown on Tables 3-1, 3-3, 3-6, and 3-7 and no personnel alarms sounded during the investigations.

3.2.3.2 Soil Gas Monitoring

The initial sampling approach at RA-B involved the placement of ten shallow (approximately 18 inches bgs) subsurface gas sampling probes around the furnace building foundation as shown on Figure 3-1. During each of the five daily measurements, three PH3 readings using a Draeger Pac III field instrument (0-20 ppm range) were recorded per location, and the average reading was calculated. As reported on Table 3-1, all of the individual measurements (150 total measurements) were reported to be 0.00 ppm PH3.

As required by the *Field Modification #15 Work Plan*, a subset of the ten soil gas sampling locations around the furnace building foundation was selected for measurement of GOPCs. As all ten probes reported 0.00 ppm PH3 during the first three sampling rounds, three probes were selected for GOPC sampling based on historical data. Soil gas probes FB-2, FB-3, and FB-4 were selected for GOPC sampling. Samples for laboratory analysis of HCN, HF, and H2S were submitted to the laboratory during the final two sampling events (day 4 and day 5). These results are provided on Table 3-2. None of the soil gas probes had detectable concentrations of HCN or HF during either of the two days of sampling. All of the probes reported concentrations of H2S. However, these concentrations were similar to the results reported for background $FMDL_{sg}$ soil gas. The RA-B soil probe location H2S concentrations ranged from 0.144 ppm to 0.355 ppm whereas the FMDL (background) results were 0.144 and 0.23 ppm. These results are well below the OSHA Permissible Exposure Limit (PEL) of 20 ppm.

3.2.3.3 Soil Flux Monitoring

Surface flux measurements involved placement of passive surface flux chambers at soil gas sampling locations around the furnace building perimeter where measurements of PH3 exceeded the $FMDL_{sg}$. As none of the soil gas probe locations in RA-B reported a detection of PH3, FMC consulted with EPA and agreed on three soil gas probe locations for the flux chamber measurements. Flux chambers were deployed and measured at FB-3, FB-4 and FB-9 as indicated on Figure 3-1. Soil flux location, FB-3, was the only location that had detectable measurements of PH3 as reported on Table 3-3. The 20-minute average flux PH3 concentration at FB-3 was 0.23 ppm and individual measurements ranged from 0.20 to 0.27 ppm PH3.

This soil flux location had measurements of PH3, which were not anticipated given that PH3 was not detected in the underlying soil gas sampled the prior week. The field notes for this sampling also noted that the flux chambers were deployed on a day following a significant rain event, and while the soil appeared to have dried out when the flux chambers were deployed, significant visible condensation was observed inside of these chambers, which may or may not have affected the PH3 meter when the flux chamber measurements were made. Based on possible affects of condensation, the soil flux chamber at FB-3 was re-deployed and re-sampled as per *Field Modification #15 Work Plan*, except that co-located flux chambers were used to collect data using the Draeger Pac III field instrument, as well as collecting a sample using a OSHA Method 1003 sampling cassettes. The 20-minute average flux PH3 concentration at the co-located FB-

3 was 0.45 ppm and individual measurements ranged from 0.36 to 0.61 ppm PH3 (Table 3-3). The PH3 laboratory cassette result was 0.26 ppm PH3 as shown on Table 3-4. In addition to the soil flux measurements, a soil gas measurement collected from FB-3 coinciding with the flux measurements still reported an average reading of 0.00 ppm PH3.

Based on the field measurements of 0.23 and 0.45 ppm PH3, three step-out soil flux chambers were deployed to the north, east, and west of FB-3 as shown on Figure 3-1 and listed on Table 3-3. These locations were selected in consultation with the Shoshone-Bannock Tribes and IDEQ during field visits. The soil flux measurements at the step-out locations also included the collection of data using the Draeger Pac III field instrument, as well as collecting a sample on OSHA Method 1003 sampling cassettes. The field measurements were low to non-detect with FB-3 West and FB-3 East averaging 0.00 ppm PH3 and FB-3 North averaging 0.02 ppm PH3. The laboratory cassette results from FB-3 West and BF-3 East were both below the reporting limit (<0.07 ppm) as shown on Table 3-4. A co-located flux chamber for sampling using OSHA Method 1003 sampling cassettes was not deployed at location FB-3 North; however, the average Draeger Pac III measurement of 0.02 ppm PH3 is also below the 0.07 ppm PH3 reporting limit for the OSHA Method 1003 sampling cassettes used to sample FB-3 West and FB-3 East.

As detailed in the *Field Modification #15 Work Plan*, the twenty (20) PH3 measurements from each flux chamber were averaged and the average concentration was used to calculate a PH3 flux rate in milligrams PH3 per square centimeter per hour. The average PH3 concentration and calculated flux rate for the RA-B flux chamber samples are provided below and detailed in Table 3-5:

RA-B Flux Sample Location	Sample Date	Average PH3 (ppm)	Flux Rate (mg/cm2/hr)
3	7/30/2010	0.226	2.03E-07
3	8/3/2010	0.447	4.01E-07
3 (OSHA 1003)	8/3/2010	0.258	2.32E-07
3E	8/11/2010	0.001	8.97E-10
3E (OSHA 1003)	8/11/2010	<0.07	NC
3W	8/11/2010	0.002	1.79E-09
3W (OSHA 1003)	8/11/2010	<0.07	NC
3N	8/11/2010	0.016	1.44E-08
4	7/30/2010	0.000	0.00E+00
9	7/30/2010	0.000	0.00E+00

The results of the collocated flux chamber results using the OSHA Method 1003 are included for completeness and a flux rate was calculated using the result for the OSHA Method 1003 sample at flux chamber location FB-3 collected on August 3, 2010; however, a flux rate was not calculated (NC) for the two non-detected OSHA Method 1003 results at locations FB-3 East and FB-3 West collected on August 11, 2010.

3.2.3.3 Slag Pit Ambient Air Monitoring

A one-event ambient air sampling program was performed within the slag pit area of RA-B. Eight random locations were selected in the bottom of the slag pit, including near the slag pit sump (see Figure 3-2). Ambient air readings were taken near the ground surface (one to two inches above the ground surface) and at the breathing zone (four to five feet above the ground surface) using a Draeger Pac III field instrument. Both ambient air sampling heights at all eight sampling locations reported measurements of 0.00 ppm PH3 (see Table 3-6).

3.2.3.4 Manhole Monitoring

Per the direction of Kira Lynch in email dated August 5, 2010, a stormwater drainage manhole identified by the Shoshone-Bannock Tribes during a site visit in the area of RA-B as well as two additional stormwater manholes identified by FMC were added to the scope of work. Sampling of the storm sewer drainage manhole (MH-1) east of furnace building soil gas sampling location, FB-5, and storm sewer manholes MH-2 and MH-3 (see Figure 3-1) was performed pursuant to the procedures for sampling RCRA pond sumps (e.g., measure the PH3 concentration outside the lid and the PH3 concentration at the bottom of the manhole with a Draeger Pac III field instrument). MH-1 and MH-2 reported non-detectable concentrations of PH-3 (0.00 ppm PH3). MH-3 reported a measurement of 0.03 ppm PH3 inside of the manhole but 0.00 ppm PH3 outside of the lid and downgradient in the breathing space as shown on Table 3-7.

3.2.4 Contamination Assessment

The majority of the PH3 results for RA-B were non-detectable concentrations (0.00 ppm PH3). The limited number of PH3 detections from soil gas and soil flux locations around FB-3 were low concentrations and not entirely unexpected based on the historical knowledge that P4 exists in the subsurface beneath RA-B. The site-wide gas assessment findings for this RA support the current CSM and no change to the CSM for RA-B is warranted. As a result, the remedial alternatives evaluated in the SFS for this RA are appropriate and no change to the SFS is warranted.

3.3 RA-C

3.3.1 Description

RA-C includes the area to the west, southwest of RA-B and includes nine unlined process ponds (Ponds 00S, 0S, 1S, 2S, 3S, 4S, 5S, 6S, and 7S) and one single-lined pond (Pond 10S), all of which were taken out of service prior to RCRA regulation of the wastes they received. RA-C has a total estimated quantity of P4 of 4,440 to 10,800 tons (as estimated

at the time the ponds were taken out of service). As described in the Field Modification # 15 Work Plan, Ponds 6S and 7S are the largest of the historic CERCLA ponds within RA-C and contained the most P4, precipitator slurry, and phossy solids at the time they were taken out of service. Therefore, these two ponds represent the most likely worst-case sub-areas for PH3 generation and accumulation. In addition, Pond 10S is unique among the historic CERCLA ponds in that it has a single liner, was the last of the RA-C ponds to be taken out of service, and was not covered with fill materials when taken out of service.

3.3.2 Problem Statement

Given that Ponds 6S and 7S were the largest historic CERCLA ponds and contained the largest volume of P4, sampling of these two ponds for PH3 represented the worst-case for PH3/GOPC generation and/or accumulation. Due to its uniqueness, Pond 10S also warranted PH3/GOPC sampling. Therefore, the subsurface soils within these sub-areas would present the most likely potential areas of PH3/GOPC accumulation and, therefore, the worst-case sub-area for PH3/GOPC flux to ambient air, if present. As a result of the potential for PH3/GOPC accumulation, the following field programs were performed RA-C.

- Industrial Hygiene (Ambient Air) Monitoring
- Soil Gas Monitoring
- Soil Flux Monitoring

3.3.3 Investigation Results

3.3.3.1 Industrial Hygiene (Ambient Air) Monitoring

A measurement of PH3 in the breathing level for IH purposes was recorded at the time of each soil gas measurement and soil flux measurement. The field teams were also required to report the location and concentration should a personnel monitor alarm be sounded. No personal alarms were sounded during any investigations at RA-C. Of the 50 breathing zone measurements, all of the field measurements were 0.00 ppm PH3 as shown on Tables 3-1 and 3-3.

3.3.3.2 Soil Gas Monitoring

The initial sampling approach at RA-C involved placing ten shallow (approximately 18 inches bgs) subsurface gas sampling probes between the three ponds (four at Pond 7S, three at Pond 6S, and three at Pond 10S) as shown on Figure 3-3. During each of the five daily measurements, three PH3 readings using a Draeger Pac III field instrument (0-20 ppm range) were recorded per location, and the average reading was calculated. A total of 150 soil gas measurements were collected between the three ponds. As shown on Table 3-1, all of the individual measurements at Pond 7S were reported to be 0.00 ppm PH3. One soil gas location in Pond 6S, Pond 6S-3, reported an average measurement of 0.02 ppm PH3 on the first day of sampling; however, the concentrations measured in this

probe from the following four days were 0.00 ppm PH3. The other two probes in Pond 6S, Pond 6S-1 and Pond 6S-2, both reported measurements of 0.00 ppm PH3. The most detected measurements were recorded from Pond 10S. The average daily measurement from soil gas probe, Pond 10S-1, ranged from 0.00 to 0.07 ppm PH3, while the average measurement from Pond 10S-3, ranged from 0.00 to 0.09 ppm PH3. There were no detected measurements from soil gas probe, Pond 10S-2.

As required by the *Field Modification #15 Work Plan*, a subset of the ten soil gas sampling locations at the Ponds were selected for measurement of GOPCs (one at each pond). After the first three rounds of PH3 measurements (of five sampling rounds), soil gas sampling locations above the $FMDL_{sg}$ were identified. Since the soil gas probes at Pond 7S were all non-detect, location Pond 7S-3 was selected as it was closest to the center of the pond. Based on the detected measurements, soil gas probe locations, Pond 6S-3 and Pond 10S-3 were selected for GOPC sampling. Samples for laboratory analysis of HCN, HF, and H2S were submitted to the laboratory during the final two sampling events (day 4 and day 5). These results are provided on Table 3-2. None of the soil gas probes had detectable concentrations of HCN or HF during either of the two days of sampling. All of the probes reported low concentrations of H2S. The RA-C soil probe location H2S concentrations ranged from 0.177 ppm to 1.054 ppm. The highest concentrations were reported from Pond 10S-3. The first round of GOPC sampling at this location had H2S concentrations of 0.658 ppm in the primary sample and 1.054 ppm in the duplicate sample. The second day of GOPC sampling from this location had an H2S concentration of 0.25 ppm. The H2S concentrations in Pond 7S from day 4 and day 5 sampling were 0.988 and 0.177, respectively. Concentrations reported from Pond 6S were 0.612 ppm and 0.21/0.224 ppm (primary/duplicate), respectively._The FMDL background location results for H2S were 0.144 and 0.23 ppm. These results are well below the OSHA PEL of 20 ppm.

3.3.3.3 Soil Flux Monitoring

Surface flux measurements involved placement of passive surface flux chambers at soil gas sampling locations in the three Ponds where measurements of PH3 exceeded the $FMDL_{sg}$. Similar to the rationale for GOPC sampling discussed above, probe locations Pond 6S-3, Pond7S-3, and Pond 10S-3 were selected for flux chamber measurements as shown on Figure 3-3. A total of 80 soil flux measurements were recorded during the sampling of the three locations as shown on Table 3-3 (one location was sampled twice). Soil flux location, Pond 6S-3, was the only location that had detectable measurements of PH3. The 20-minute average flux PH3 concentration at Pond 6S-3 was 0.02 ppm and individual measurements ranged from 0.00 to 0.04 ppm PH3.

The field notes for this sampling also noted that the flux chambers were deployed on a day following a significant rain event, and while the soil appeared to have dried out when the flux chambers were deployed, significant visible condensation was observed inside of Pond 6S-3 chamber, which may or may not have affected the PH3 meter when the flux chamber measurements were made. Based on possible affects of condensation, the soil flux chamber at this location was re-deployed and re-sampled as per *Field Modification #15 Work Plan*, except that co-located flux chambers were used to collect data using the

Draeger Pac III field instrument, as well as collecting a sample on OSHA Method 1003 sampling cassettes. The 20-minute average flux PH3 concentration at the co-located Pond 6S-3 was 0.03 ppm and individual measurements ranged from 0.00 to 0.05 ppm PH3 (Table 3-3). The PH3 laboratory cassette result was less than the reporting limit of 0.064 ppm PH3 as reported on Table 3-4. In addition to the soil flux measurements, a soil gas measurement collected from Pond 6S-3 coinciding with the flux measurements reported an average reading of 0.00 ppm PH3.

As detailed in the *Field Modification #15 Work Plan*, the twenty (20) PH3 measurements from each flux chamber were averaged and the average concentration was used to calculate a PH3 flux rate in milligrams PH3 per square centimeter per hour. The average PH3 concentration and calculated flux rate for the RA-C flux chamber samples are provided below and detailed on Table 3-5:

RA-C Flux Sample Location	Sample Date	Average PH3 (ppm)	Flux Rate (mg/cm2/hr)
6S-3	7/30/2010	0.022	1.97E-08
6S-3	8/3/2010	0.028	2.47E-08
6S-3 (OSHA 1003)	8/3/2010	<0.064	NC
7S-3	7/30/2010	0.000	0.00E+00
10S-3	7/30/2010	0.000	0.00E+00

The result of the collocated flux chamber result for the OSHA Method 1003 sample at flux chamber location 6S-3 collected on August 3, 2010 is included for completeness, but a flux rate was not calculated (NC) for the this non-detected OSHA Method 1003 result.

3.3.4 Contamination Assessment

The majority of the PH3 results for RA-C were non-detectable concentrations (0.00 ppm PH3). The limited number of PH3 detections from soil gas and soil flux locations from the three ponds were low concentrations and not entirely unexpected based on the historical knowledge that the potential for P4 exists in these ponds. The site-wide gas assessment findings for this RA support the current CSM and no change to the CSM for RA-C is warranted. As a result, the remedial alternatives evaluated in the SFS for this RA are appropriate and no change to the SFS is warranted.

3.4 RA-D

3.4.1 Description

RA-D includes the area to the west and southwest of RA-C and includes eight unlined process ponds taken out of service prior to RCRA regulations. This area is shown on

Figure 3-4. Unlike RA-C, RA-D is believed to have no significant amount of remaining P4, for the following reasons:

- Ponds 9S, 1E, and 4E were air-dried to allow for reclamation of dried precipitator slurry. The precipitator slurry was excavated and hauled off-site for sale. While a thin veneer of dried precipitator slurry may remain on the surface, no evidence of P4 exists.
- Ponds 2E, 3E, 5E, and 6E were air-dried and then excavated to allow for construction of RCRA ponds 8E, 11S, 12S, 13S, 14S, and 15S. During RCRA pond construction, materials were removed to below original grade, thus no P4-containing materials remained.
- Pond 7E was a decant pond, i.e., it received only clarified decant water from other ponds. Therefore, no P4 was or is currently present.

Therefore, the potential for PH3 generation or accumulation within RA-D is considered to be very low.

3.4.2 Problem Statement

Given that RA-D has no evidence of P4 and remaining fill materials are very shallow (less than two inches over most of the former pond surface), soil probes were not appropriate as they would extend into the underlying native soils. Therefore, a screening for PH3 at the surface of the historic CERCLA ponds that are still exposed was deemed appropriate (i.e., those pond areas not covered by a closed RCRA pond). Since only a veneer of process material remains within the RA-D subareas, sampling for other GOPCs is not warranted. As a result of the potential for PH3 accumulation, the following field programs were performed RA-D.

- Industrial Hygiene (Ambient Air) Monitoring
- Surface scan

3.4.3 Investigation Results

3.4.3.1 Industrial Hygiene (Ambient Air) Monitoring

A measurement of PH3 in the breathing level for IH purposes were recorded prior to the surface scans at Ponds 9S, 1E, and 4E. The field teams were also required to report the location and concentration should a personnel monitor alarm be sounded. No personal alarms were sounded during any investigations at RA-D. The three breathing zone measurements (one at each pond), were 0.00 ppm PH3 as shown on Table 3-8.

3.4.3.2 Surface Scan

The sampling approach at RA-D involved performing a surface scan for PH3 at ponds 9S, 1E, and 4E. The sampling methodology (as described in Section 2.2.5) was similar to the cap surface monitoring used at the RCRA ponds. Each RA-D pond area was treated as one sampling cell with only the floor (bottom) of the pond being scanned, i.e., the side

slopes of the pond area were not sampled due to poor accessibility. A total of 67 of measurements were logged between the three ponds (31 at Pond 1E, 18 and Pond 4E, and 18 at Pond 9S) and all PH3 measurements were 0.00 ppm.

3.4.4 Contamination Assessment

All of the PH3 surface scan results for RA-D were non-detectable concentrations (0.00 ppm PH3). This confirms the CSM that there is a thin veneer of pond sediments in parts of RA-D with little to no potential for P4 to exist in the subsurface. The site-wide gas assessment findings for this RA support the current CSM and no change to the CSM for RA-D is warranted. As a result, the remedial alternatives evaluated in the SFS for this RA are appropriate and no change to the SFS is warranted.

3.5 RA-F1

3.5.1 Description

RA-F1 (an area of about 2.7 acres) includes the area near the center of the slag pile (RA-F) where 21 railcars containing heels of P4 sludge are known to be buried as shown on Figure 3-5. These railcars have an estimated 200 to 2,000 tons of P4, but the railcars would not contain pond sediments. In addition, the railcars are buried at a significant depth (80 to 100 feet) in the slag pile. Therefore, the potential for phosphine generation/accumulation is expected to be very low.

3.5.2 Problem Statement

Given the depth of the railcars in the slag pile and the extremely rough surface and size of the slag pile, it is impossible to predict the pathway of PH3 from the railcars to the surface of the slag pile, if PH3 is being generated. However, given that the slag in the area of the railcars should be relatively uniform across the area, i.e., pit run slag, there is likely not a preferential pathway nor an expected accumulation area. Therefore, shallow subsurface soil gas sampling at the point on the slag pile surface nearest the railcars was appropriate. As the railcars are buried at a significant depth, and the process wastes within the railcars would not be expected to generate GOPCs, monitoring for GOPCs in RA-F1 was not included in the EPA-approved *Field Modification #15 Work Plan*. However, pursuant to discussion during the July 28, 2010 weekly status call and as agreed by EPA, a subset of three soil gas probes, were identified for GOPC sampling. As a result of the potential for PH3/GOPC accumulation, the following field programs were performed RA-F1.

- Industrial Hygiene (Ambient Air) Monitoring
- Soil Gas Monitoring
- Soil Flux Monitoring
- Surface Scan

- Coke Test

3.5.3 Investigation Results

3.5.3.1 Industrial Hygiene (Ambient Air) Monitoring

A measurement of PH3 in the breathing level for IH purposes were recorded prior to the soil gas, soil flux, and surface scans at RA-F1. The field teams were also required to report the location and concentration should a personnel monitor alarm be sounded. No personal alarms were sounded during any investigations at RA-F1. Of the 26 breathing zone measurements, all were 0.00 ppm PH3 as shown on Tables 3-1, 3-3, and 3-8.

3.5.3.2 Soil Gas Monitoring

The initial sampling approach at RA-F1 involved placing five shallow (approximately 18 inches bgs) subsurface gas sampling probes across the slag pile (three in the buried railcar area and two at the toe of the pile as shown on Figure 3-5). During each of the five daily measurements, three PH3 readings using a Draeger Pac III field instrument (0-20 ppm range) were recorded per location, and the average reading was calculated.

A total of 75 soil gas measurements were collected over the five day period. On sampling day one, three probes, F1-1, F1-3 and F1-4 reported PH3 concentrations averaging 0.03, 0.14, and 0.01 ppm PH3, respectively. With the exception of F1-1, both F1-3, and F1-4 did not have detectable concentrations (all measurements were 0.00 ppm PH3) on subsequent days (day's two thru five). Detectable concentrations of PH3 from F1-1 were noted during four of the five soil gas sampling events with concentrations ranging between 0.00 and 0.09 ppm PH3 and a five-day average concentration of 0.03 ppm PH3 as reported on Table 3-1.

Pursuant to discussion during the July 28, 2010 weekly status call and as agreed by EPA, a subset of the three soil gas sampling locations at the slag pile were selected for measurement of GOPCs. Based on the detected measurements during the first three rounds of PH3 measurements, soil gas probe, F1-1, F1-3, and F1-4 were selected for GOPC sampling based on historical data. Samples for laboratory analysis of HCN, HF, and H2S were submitted to the laboratory during the final two sampling events (day 4 and day 5). These results are provided on Table 3-2. None of the probes had concentrations of HCN or HF above the reporting limit. All of the probes reported low concentrations of H2S. However, these concentrations were similar to the background $FMDL_{sg}$ soil gas results. The RA-F1 soil probe location H2S concentrations ranged from 0.171 ppm to 0.329 ppm whereas the FMDL results were 0.144 and 0.23 ppm. These results are well below the OSHA PEL of 20 ppm.

3.5.3.3 Soil Flux Monitoring

Surface flux measurements involved placement of passive surface flux chambers at soil gas sampling locations at the slag pile where measurements of PH3 exceeded the $FMDL_{sg}$. Similar to the rationale for GOPC sampling discussed above, probe locations F1-1, F1-3, and F1-4 were selected for flux chamber measurements as shown on Figure

3-5. Of the 60 soil flux measurements collected, soil flux location, F1-3, was the only location that had detectable measurements of PH3 as shown on Table 3-3. At this location, three of the individual one-minute readings were recorded as 0.02 or 0.03 ppm PH3. However, the 20-minute average flux PH3 concentration at F1-3 was 0.00 ppm PH3.

As detailed in the *Field Modification #15 Work Plan*, the twenty (20) PH3 measurements from each flux chamber were averaged and the average concentration was used to calculate a PH3 flux rate in milligrams PH3 per square centimeter per hour. The average PH3 concentration and calculated flux rate for the RA-F1 flux chamber samples are provided below and detailed in Table 3-5:

RA-F1 Flux Sample Location	Sample Date	Average PH3 (ppm)	Flux Rate (mg/cm2/hr)
1	7/30/2010	0.000	0.00E+00
3	7/30/2010	0.004	3.14E-09
4	7/30/2010	0.000	0.00E+00

3.5.3.3 Surface Scan

Based on recommendation by Brian English of IDEQ during a field visit, a surface scan was added to the original scope and performed in the buried railcar area, specifically near soil gas and soil flux location, F1-3. The sampling methodology (as described in Section 2.2.5) was similar to the cap surface monitoring used at the RCRA ponds. A total of 17 of measurements were logged in the scan area and all PH3 readings were 0.00 ppm as reported on Table 3-8.

3.5.3.4 Coke Test

Based on recommendation by Brian English of IDEQ during a field visit, a test of coke nodules found in the vicinity of sample location F1-3 was added to the original scope. Nodules were gathered from the ground surface in the slag ladling area just west and north of sample location F1-3. The nodules were placed in a tedlar bag and crushed with a hammer. The crushed sample was approximately 40 ml and contained approximately 50% fines and 50% 1-2-inch minus material. The sample was placed in a 100 ml jar with a ¼-inch sample connection in the lid. The head space in the sample jar was tested for PH3 using a sample pump and Draeger Pac III field instrument (0 to 20 ppm range). A total of three PH3 readings were taken from this sample and all readings were 0.00 ppm as reported in Table 3-9.

3.5.4 Contamination Assessment

The majority of the PH3 results for RA-F were non-detectable concentrations (0.00 ppm PH3). The site-wide gas assessment findings for this RA support the current CSM and no

change to the CSM for RA-F1 is warranted. As a result, the remedial alternatives evaluated in the SFS for this RA are appropriate and no change to the SFS is warranted.

3.6 RA-K

3.6.1 Description

RA-K (an area of about 2.4 acres) includes a narrow strip of area along the northeastern property boundary that was used as a stormwater retention pond (the "railroad swale") as shown on Figure 3-6. RA-K has been investigated during the SRI and is estimated to contain relatively low volumes of P4 (4 to 10 tons) at low concentrations. Therefore, RA-K is presumed to have a very low potential for phosphine generation.

3.6.2 Problem Statement

Given that low concentrations of P4 have been detected at RA-K, subsurface soil gas sampling along the length of RA-K was warranted. Since only a small amount of process materials would be expected to present in RA-K, as demonstrated during the SRI sampling for other GOPCs was not included in the EPA-approved *Field Modification #15 Work Plan*. However, pursuant to discussion during the July 28, 2010 weekly status call and as agreed by EPA, three soil gas probes were identified for GOPC sampling. As a result of the potential for PH3/GOPC accumulation, the following field programs were performed RA-K.

- Industrial Hygiene (Ambient Air) Monitoring
- Soil Gas Monitoring
- Soil Flux Monitoring

3.6.3 Investigation Results

3.6.3.1 Industrial Hygiene (Ambient Air) Monitoring

A measurement of PH3 in the breathing level for IH purposes were recorded prior to the soil gas and soil flux measurements at RA-K. The field teams were also required to report the location and concentration should a personnel monitor alarm be sounded. No personal alarms were sounded during any investigations at RA-K. Of the 15 breathing zone measurements, all were 0.00 ppm PH3 as shown on Tables 3-1 and 3-3.

3.6.3.2 Soil Gas Monitoring

The initial sampling approach at RA-K involved placing three shallow (approximately 18 inches bgs) subsurface gas sampling probes spaced along the east-west center axis as shown on Figure 3-6. During each of the five daily measurements, three PH3 readings using a Draeger Pac III field instrument (0-20 ppm range) were recorded per location, and the average reading was calculated.

A total of 45 soil gas measurements were collected over the five day period as shown on Table 3-1. No detectable measurements (all 0.00 ppm PH3) were recorded in both RAK-2 and RAK-3 during each of the five sampling events/days. Detectable concentrations of PH3 were measured in RAK-1 on day four of sampling. Concentrations during from this sampling event ranged from 0.03 to 0.05 ppm PH3 and averaged 0.04 ppm PH3. However, the measurements from previous days and the following day (days one thru three and day five) were all 0.00 ppm PH3. The five-day average at RAK-1 was 0.01 ppm PH3.

Pursuant to discussion during the July 28, 2010 weekly status call and as agreed by EPA, the three soil gas sampling locations were selected for measurement of GOPCs. As there were only three soil gas probe locations in RA-K, all three probes were selected for GOPC sampling. Samples for laboratory analysis of HCN, HF, and H2S were submitted to the laboratory during the final two sampling events (day 4 and day 5). These results are provided on Table 3-2. None of the probes had concentrations of HCN. One probe, RAK-1 had a concentration of HF of 4.49 ppm on the first day of sampling. However, this location reported a concentration less than the detection limit (<0.198 ppm) on the second day of sampling. As sample RAK-1 on 7/22/10 was the only detection out of a total of 25 CERCLA area HF samples, the detection is suspect. Validation of the results did not reveal a reason for the reported HF result for the first day sample and the non-detect result for the second day sample at RAK-1.

All of the probes reported concentrations of H2S. However, these concentrations were similar to slightly greater than the background $FMDL_{sg}$ soil gas results. The RA-K soil probe location H2S concentrations ranged from 0.24 ppm to 0.593 ppm whereas the FMDL results were 0.144 and 0.23 ppm. These results are well below the OSHA PEL of 20 ppm.

3.6.3.3 Soil Flux Monitoring

Surface flux measurements involved placement of passive surface flux chambers at soil gas sampling locations within the railroad swale where measurements of PH3 exceeded the $FMDL_{sg}$. In order to have a minimum of three locations, all three probes were monitored even though two of the three soil gas probes were non-detect for PH3 as shown on Figure 3-6. Soil flux location, RAK-3, was the only location that had detectable measurements of PH3 as reported on Table 3-3. The 20-minute average flux PH3 concentration at FB-3 was 0.02 ppm and individual measurements ranged from 0.00 to 0.06 ppm PH3.

This soil flux location had measurements of PH3 which were not anticipated given that PH3 was not detected in the underlying soil gas sampled the prior week. The field notes for this sampling also noted that the flux chambers were deployed on a day following a significant rain event, and while the soil appeared to have dried out when the flux chambers were deployed, significant visible condensation was observed inside of these chambers, which may or may not have affected the PH3 meter when the flux chamber measurements were made. Based on possible affects of condensation, the soil flux

chamber at RAK-3 was re-deployed and re-sampled as per *Field Modification #15 Work Plan*, except that co-located flux chambers were used to collect data using the Draeger Pac III field instrument, as well as collecting a sample on OSHA Method 1003 sampling cassettes. The 20-minute average flux PH3 concentration at the co-located RAK-3 was 0.03 ppm and individual measurements ranged from 0.00 to 0.09 ppm PH3. The PH3 laboratory cassette result was less than the reporting limit (<0.064 ppm) as reported on Table 3-4. In addition to the soil flux measurements, a soil gas measurement collected from FB-3 coinciding with the flux measurements reported an average reading of 0.01 ppm PH3.

Based on the average field measurements of 0.02 and 0.03 ppm PH3, two step-out soil flux chambers were deployed to the east and west of RAK-3 as shown on Figure 3-6 and listed on Table 3-3. The soil flux measurements at the step-out locations also included the collection of data using the Draeger Pac III field instrument. The field measurements in RAK-3 west were non-detect (all measurements 0.00 ppm PH3). The field measurements in RAK-east ranged from 0.00 to 0.04 ppm PH3 over the 20 one-minute readings and the 20-minute average reading was 0.02 ppm PH3. No step-outs were performed further to the east as RAK-east was located on the eastern edge of the railroad swale.

As detailed in the *Field Modification #15 Work Plan*, the twenty (20) PH3 measurements from each flux chamber were averaged and the average concentration was used to calculate a PH3 flux rate in milligrams PH3 per square centimeter per hour. The average PH3 concentration and calculated flux rate for the RA-K flux chamber samples are provided below and detailed on Table 3-5:

RA-K Flux Sample Location	Sample Date	Average PH3 (ppm)	Flux Rate (mg/cm2/hr)
3	7/30/2010	0.023	2.06E-08
3	8/3/2010	0.030	2.69E-08
3 (OSHA 1003)	8/3/2010	<0.064	NC
3E	8/11/2010	0.023	2.06E-08
3W	8/11/2010	0.000	0.00E+00
1	7/30/2010	0.003	2.24E-09
2	7/30/2010	0.000	0.00E+00

The result of the collocated flux chamber result for the OSHA Method 1003 sample at flux chamber location RAK-3 collected on August 3, 2010 is included for completeness, but a flux rate was not calculated (NC) for the this non-detected OSHA Method 1003 result.

3.6.4 Contamination Assessment

The majority of the PH3 results for RA-K were non-detectable concentrations (0.00 ppm PH3). The limited number of PH3 detections from soil gas and soil flux locations from the railroad swale were low concentrations and not entirely unexpected based on the historical knowledge that the potential for P4 exists in these ponds. The site-wide gas assessment findings for this RA support the current CSM and no change to the CSM for RA-K is warranted. As a result, the remedial alternatives evaluated in the SFS for this RA are appropriate and no change to the SFS is warranted.

3.7 UNDERGROUND PIPING IN RA-C AND RA-E

3.7.1 Description

Underground piping remains in RA-A, RA-B, RA-C, and RA-D. The highest density of this underground piping exists within the northeastern-most portion of RA-C, the piping corridor that linked the operations within RA-B to the ponds at RA-C and RA-D.

RA-E includes the area southeast of RA-B and encompasses the calciner area, including the historic kiln scrubber ponds. As the calciner process was “upstream” of the furnace building, P4 was not handled in this area (except as noted below) and was not present in the historic kiln scrubber ponds. However, the calciners were fired with CO gas from the furnace building. A section of underground CO line remains within RA-E and is presumed to contain some P4. The P4 contained in this underground piping, if present, would be relatively pure P4 and contain no precipitator slurry or phossy solids.

While PH3 generation/accumulation may be possible from materials remaining in the underground piping, the volumes of this material and the areal extent of the piping does not suggest appreciable amounts of PH3 generation/accumulation.

3.7.2 Problem Statement

Given that underground piping is not an area source and the exact location or depth of piping is unknown, a different sampling approach was warranted. The highest density of underground piping with potential conditions that could result in PH3 generation is in the piping corridor at the northeastern portion of RA-C. Therefore, surface screening for PH3 was performed in this area. Since only small amounts of process materials would be expected to remain within the underground piping, sampling for other GOPCs is not warranted. As a result of the potential for PH3/GOPC accumulation, the following field programs were performed for underground piping.

- Industrial Hygiene (Ambient Air) Monitoring
- Surface Scan

3.7.3 Investigation Results

3.7.3.1 Industrial Hygiene (Ambient Air) Monitoring

A measurement of PH3 in the breathing level for IH purposes was recorded prior to the surface scan within the underground piping area of RA-C. The field teams were also required to report the location and concentration should a personnel monitor alarm be sounded. No personal alarms were sounded during the surface scan in RA-C. One breathing zone measurement was collected prior to the surface scan and was 0.00 ppm PH3 as shown on Table 3-8.

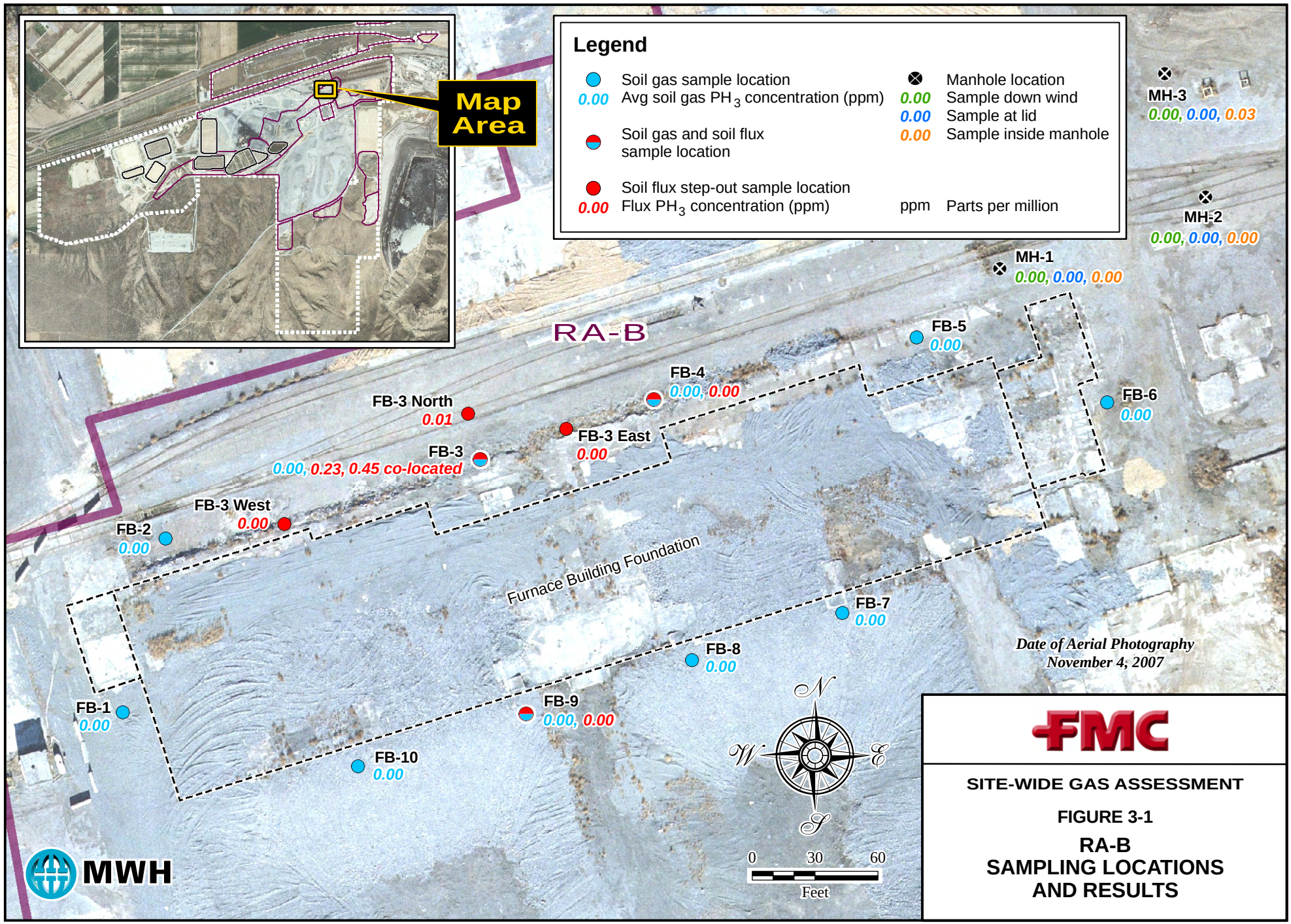
3.7.3.2 Surface Scan

The sampling approach at the piping corridor in RA-C involved performing a surface scan for PH3 similar to that proposed for RA-D. The sampling methodology (as described in Section 2.2.5) was similar to the cap surface monitoring used at the RCRA ponds. A one-acre area of the piping corridor in RA-C was designated as the sampling cell as shown on Figure 3-7. This one-acre sampling cell was selected over the area with the highest density of underground piping. One (1) sampling event was performed in the piping corridor sampling cell. Data was logged once every minute during the perimeter surface scan. If PH3 was detected during the surface scan in the piping corridor in RA-C at concentrations greater than the $FMDL_{ss}$, similar scanning would have been performed over a one-half acre sampling cell located over the underground CO line in RA-E included on Figure 3-7. A total of 15 measurements were logged in the one-acre RA-C cell and all PH3 readings were 0.00 ppm as listed in Table 3-8. As a result, no surface scan investigation was warranted in RA-E underground piping area.

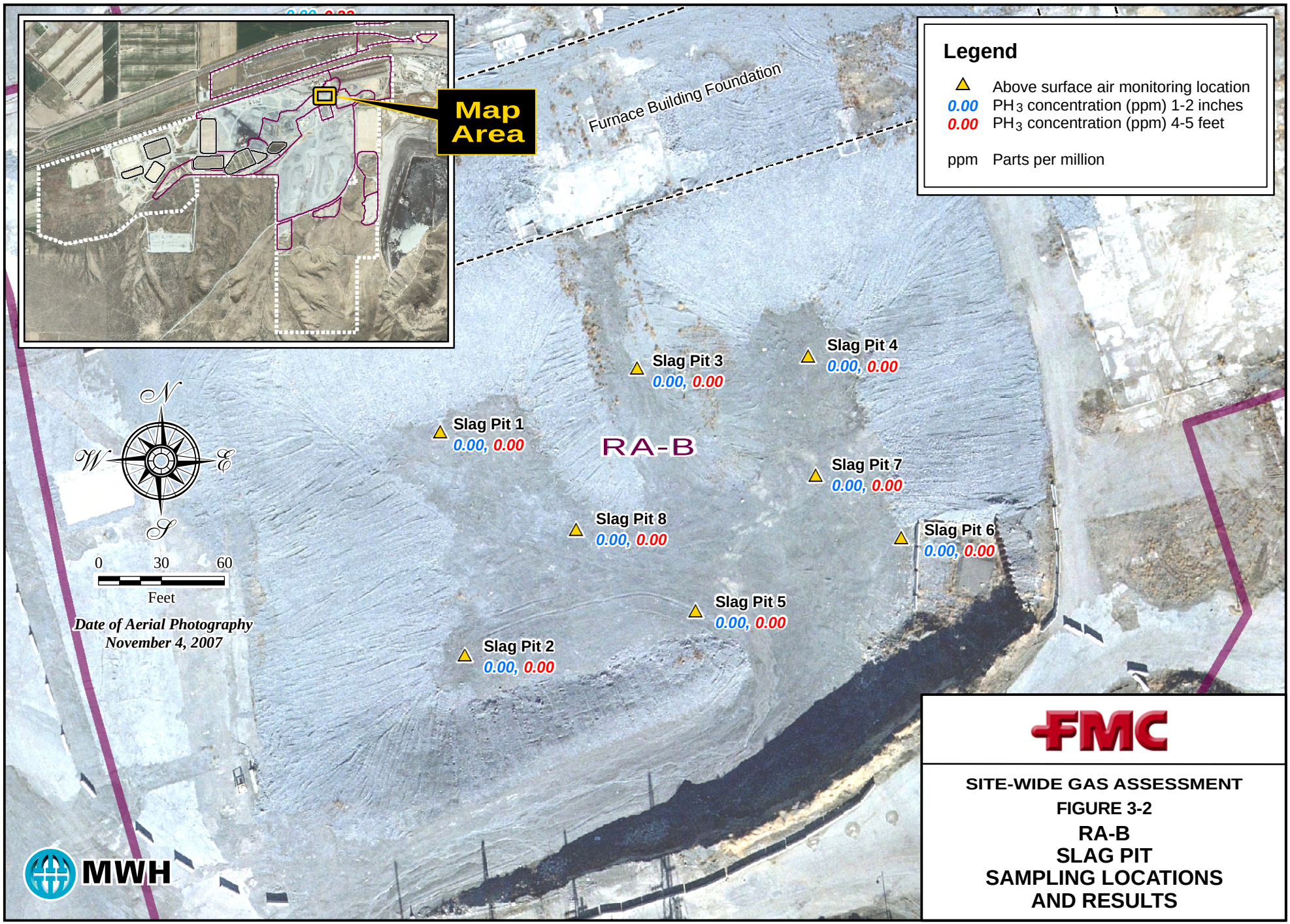
3.7.4 Contamination Assessment

All of the PH3 surface scan results in the underground piping area in RA-C were non-detectable concentrations (0.00 ppm PH3). This confirms the CSM with little to no potential for PH3 generation in the subsurface to flux to the environment. The site-wide gas assessment findings for this RA support the current CSM and no change to the CSM for underground piping throughout the FMC Plant is warranted. As a result, the remedial alternatives evaluated in the SFS for this RA are appropriate and no change to the SFS is warranted.

FILE *Fig 3-1_FMC_RA-B_SoilGas_Flux.mxd 4Oct2010*



FILE *Fig 3-2_FMC_RA-B_Slag Pit.mxd 21Sep2010*

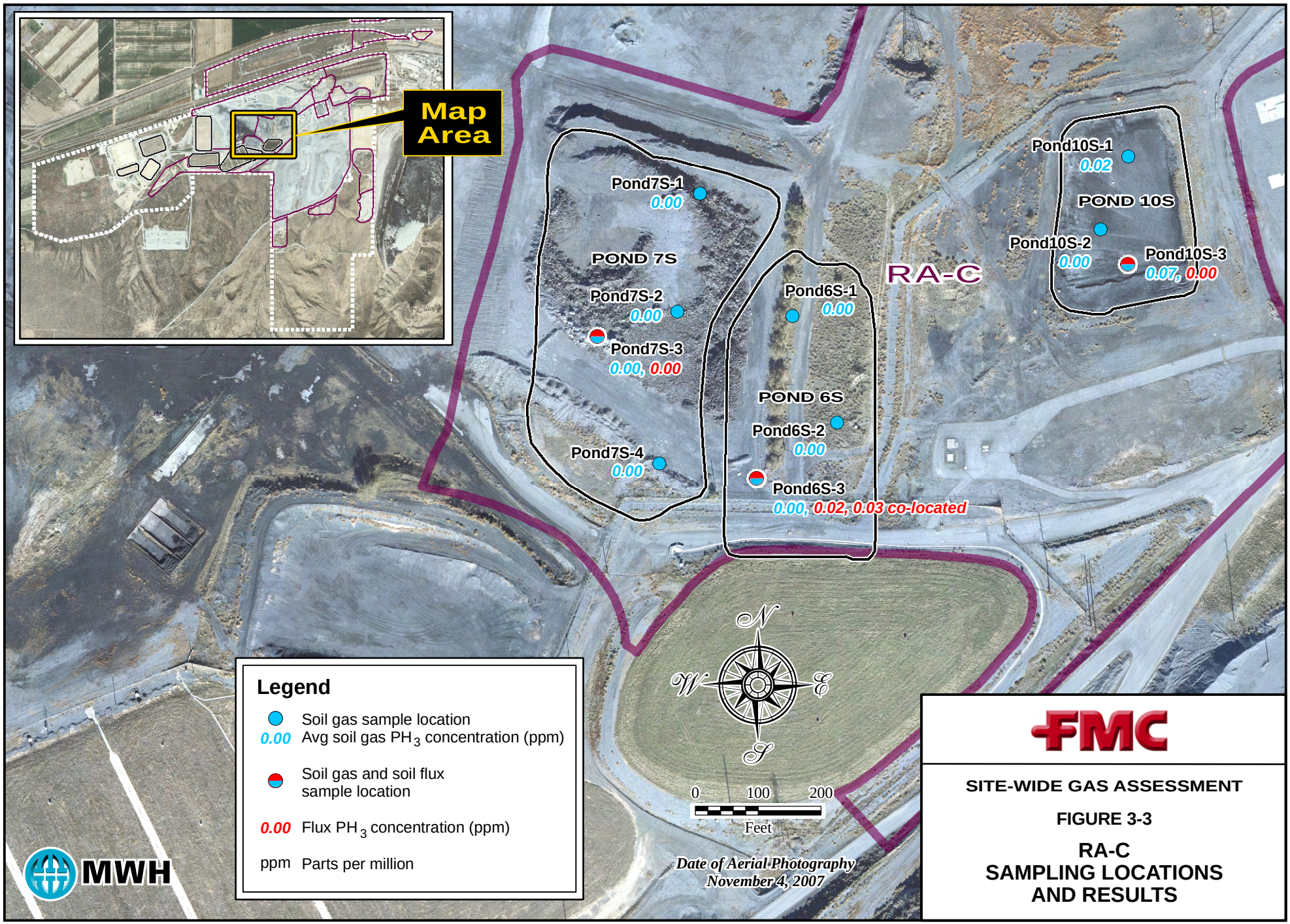


SITE-WIDE GAS ASSESSMENT

FIGURE 3-2

RA-B
SLAG PIT
SAMPLING LOCATIONS
AND RESULTS

FILE *Fig 3-3_FMC_RA-C_SoilGas_Flux.mxd 4Oct2010*

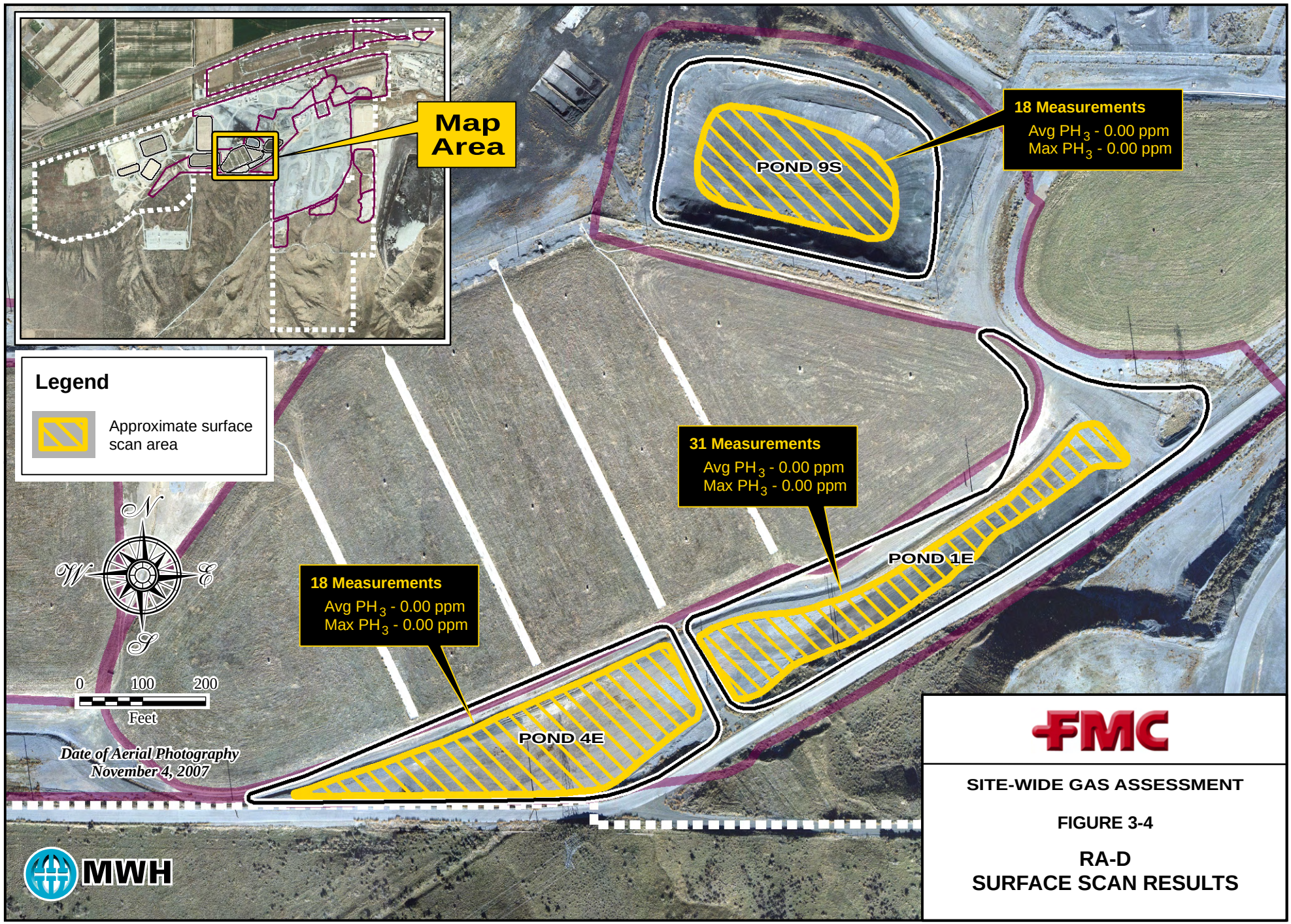


SITE-WIDE GAS ASSESSMENT

FIGURE 3-3

RA-C SAMPLING LOCATIONS AND RESULTS

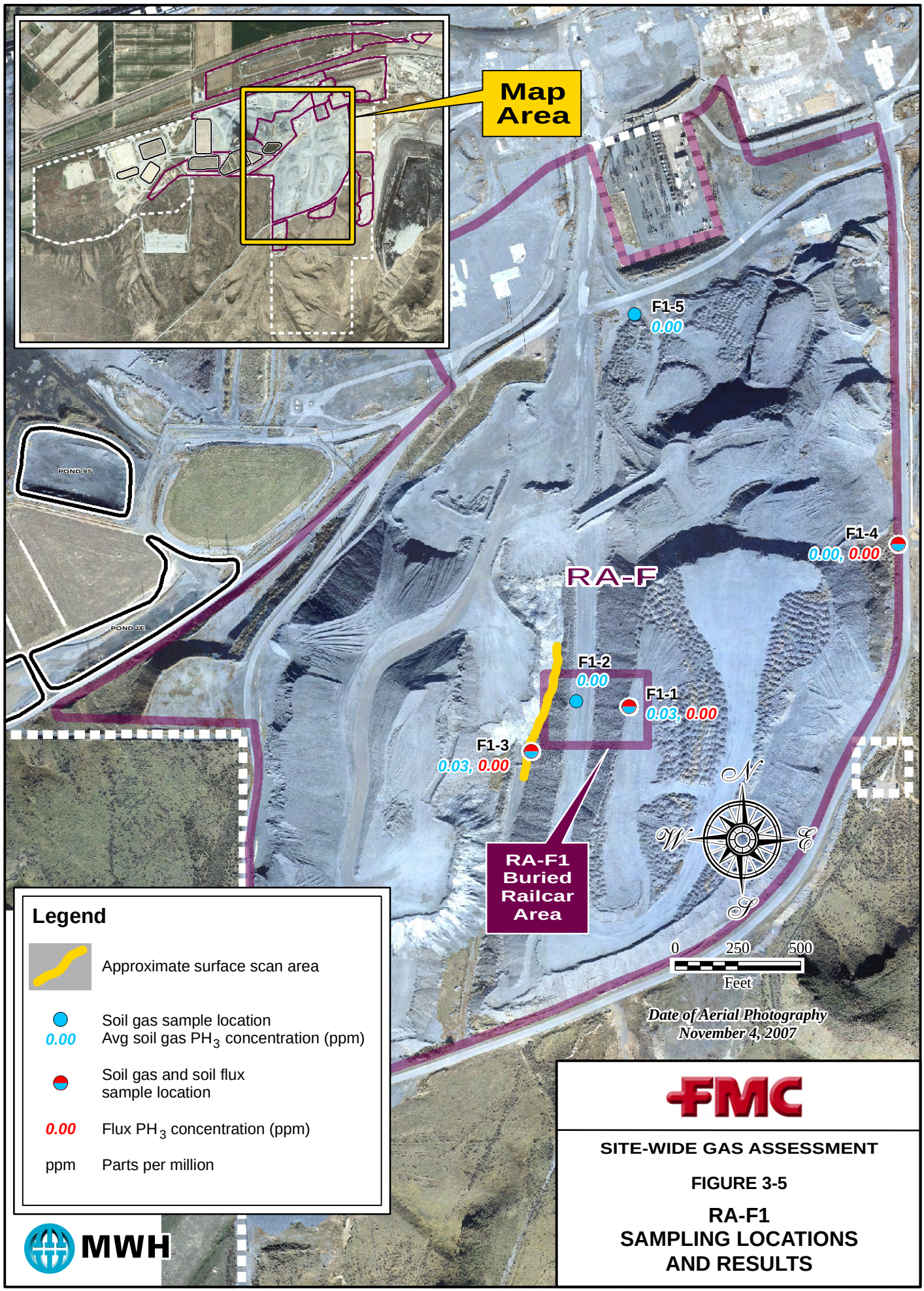
FILE *Fig 3-4_FMC_RA-D_SurfScanResults.mxd 20Sep2010*



SITE-WIDE GAS ASSESSMENT

FIGURE 3-4

RA-D
SURFACE SCAN RESULTS



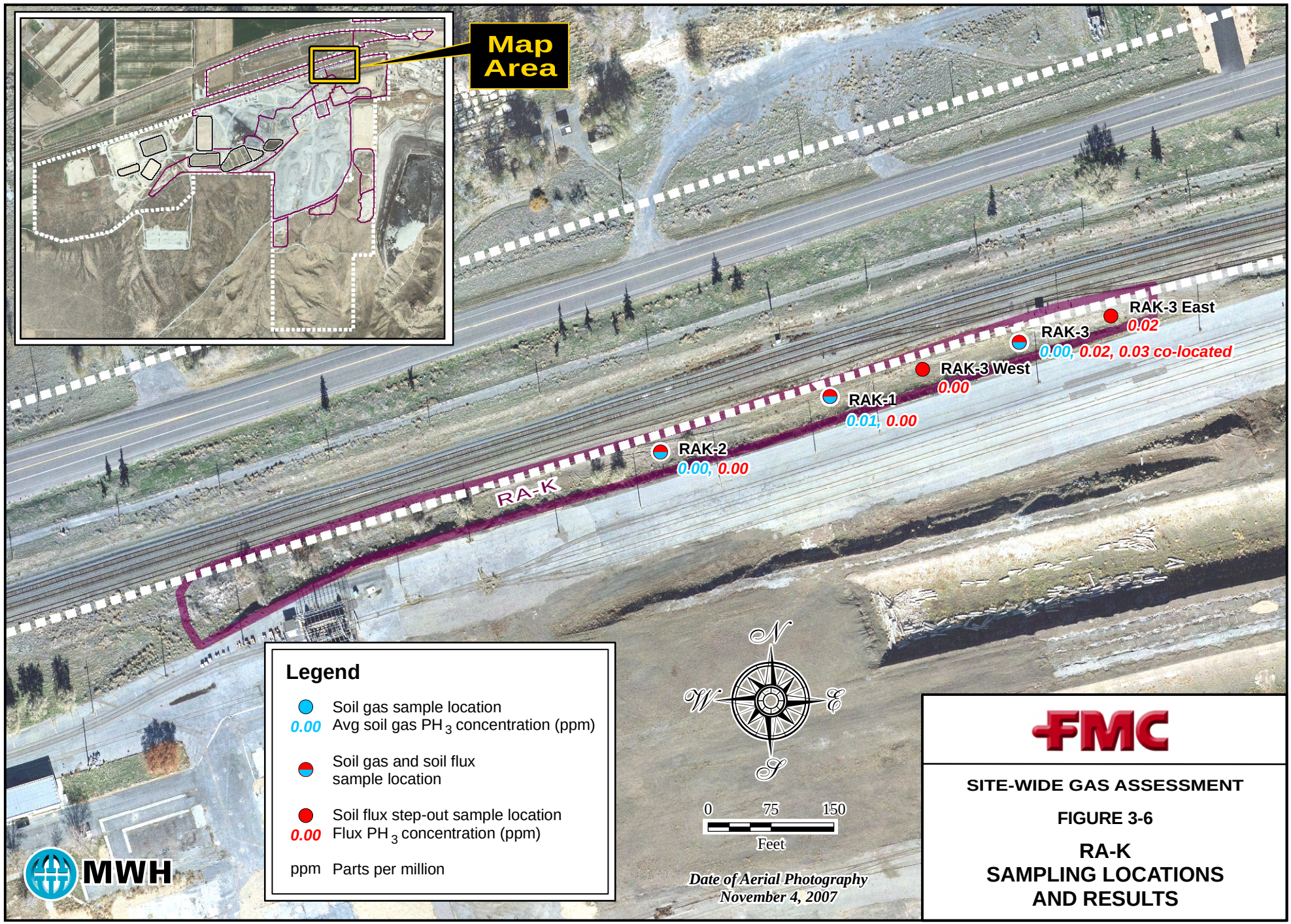
SITE-WIDE GAS ASSESSMENT

FIGURE 3-5

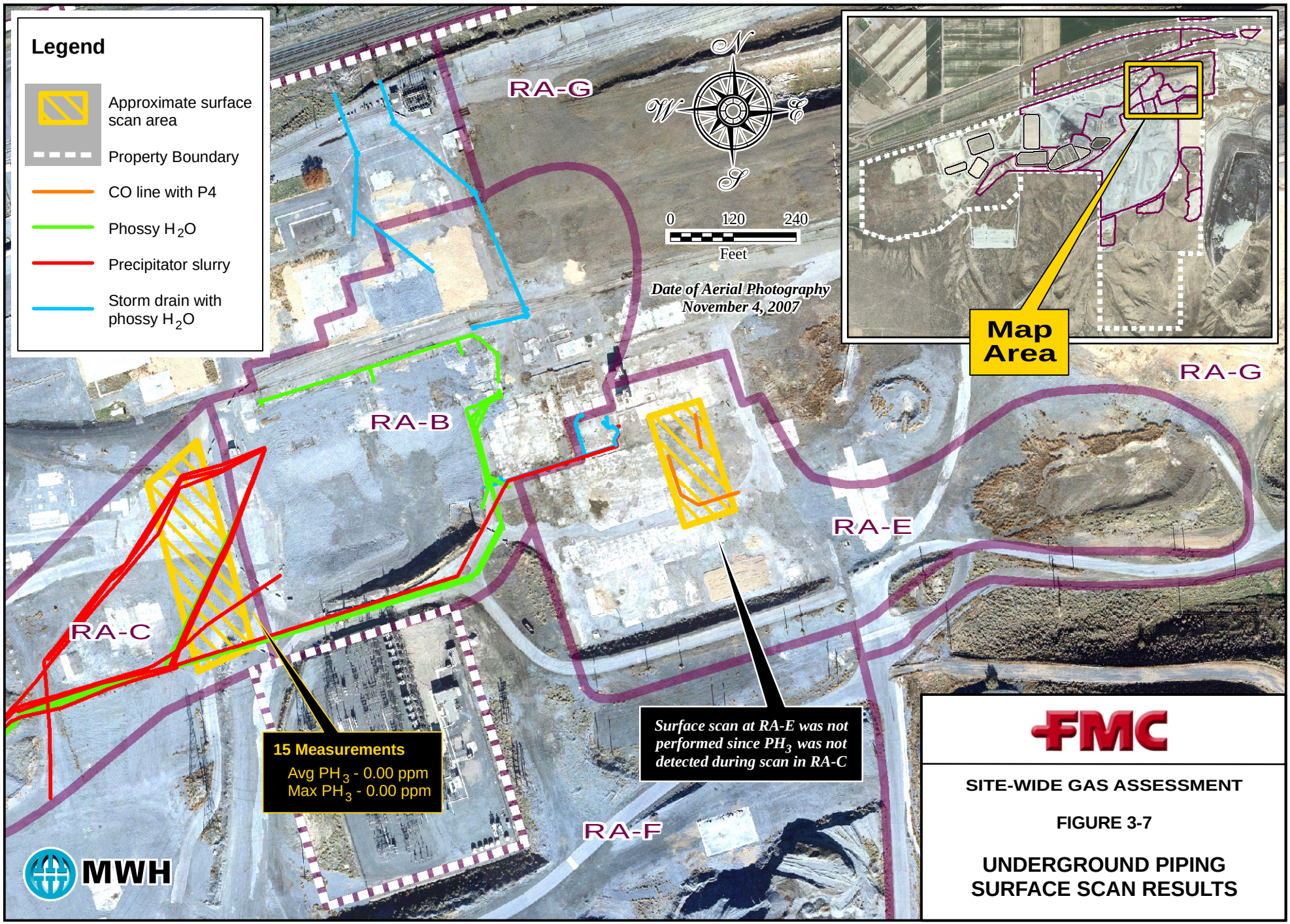
RA-F1
SAMPLING LOCATIONS
AND RESULTS

FILE Fig 3-5_FMC_RA-F1_SoilGasResults.mxd 4Oct2010

FILE *Fig 3-6_FMC_RA-K_SoilGas_Flux Results.mxd 4Oct2010*



FILE *Fig 3-7_FMC_UndergroundPipingSurfScan Results.mxd* *21Sep2010*



FMC

SITE-WIDE GAS ASSESSMENT

FIGURE 3-7

UNDERGROUND PIPING SURFACE SCAN RESULTS

TABLE 3-1
CERCLA AREAS
SOIL GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 1 of 5)

	Location	Soil Gas Probe #	Date	Time	PH3 Measurement (ppm)				
					Breathing Level Air	Soil Gas			
						First	Second	Third	Day 1 Average
Day 1	**$FMDL_{SG}$**	FMDL-SG-A	7/19/2010	0916	0.00	0.00	0.00	0.00	0.00
		FMDL-SG-B	7/19/2010	0937	0.00	0.00	0.00	0.00	0.00
	RAB	FB-1	7/19/2010	0856	0.00	0.00	0.00	0.00	0.00
		FB-2	7/19/2010	1000	0.00	0.00	0.00	0.00	0.00
		FB-3	7/19/2010	1026	0.00	0.00	0.00	0.00	0.00
		FB-4	7/19/2010	1038	0.00	0.00	0.00	0.00	0.00
		FB-5	7/19/2010	1055	0.00	0.00	0.00	0.00	0.00
		FB-6	7/19/2010	1110	0.00	0.00	0.00	0.00	0.00
		FB-7	7/19/2010	1122	0.00	0.00	0.00	0.00	0.00
		FB-8	7/19/2010	1139	0.00	0.00	0.00	0.00	0.00
		FB-9	7/19/2010	1243	0.00	0.00	0.00	0.00	0.00
		FB-10	7/19/2010	1252	0.00	0.00	0.00	0.00	0.00
	RAC	Pond 7S-1	7/19/2010	1700	0.00	0.00	0.00	0.00	0.00
		Pond 7S-2	7/19/2010	1752	0.00	0.00	0.00	0.00	0.00
		Pond 7S-3	7/19/2010	1805	0.00	0.00	0.00	0.00	0.00
		Pond 7S-4	7/19/2010	1821	0.00	0.00	0.00	0.00	0.00
		Pond 6S-1	7/19/2010	1540	0.00	0.00	0.00	0.00	0.00
		Pond 6S-2	7/19/2010	1550	0.00	0.00	0.00	0.00	0.00
		Pond 6S-3	7/19/2010	1636	0.00	**0.02**	**0.02**	**0.02**	**0.02**
		Pond 10S-1	7/19/2010	1428	0.00	**0.05**	**0.05**	**0.06**	**0.05**
		Pond 10S-2	7/19/2010	1440	0.00	0.00	0.02	0.00	0.01
		Pond 10S-3	7/19/2010	1448	0.00	**0.09**	**0.08**	**0.08**	**0.08**
	RAF1	F1-1	7/19/2010	1314	0.00	**0.03**	**0.03**	**0.03**	**0.03**
		F1-2	7/19/2010	1333	0.00	0.00	0.00	0.00	0.00
		F1-3	7/19/2010	1547	0.00	**0.12**	**0.14**	**0.15**	**0.14**
		F1-4	7/19/2010	1505	0.00	0.00	0.00	**0.02**	**0.01**
		F1-5	7/19/2010	1522	0.00	0.00	0.00	0.00	0.00
	RAK	RAK-1	7/19/2010	1850	0.00	0.00	0.00	0.00	0.00
		RAK-2	7/19/2010	1915	0.00	0.00	0.00	0.00	0.00
		RAK-3	7/19/2010	1932	0.00	0.00	0.00	0.00	0.00

Note that shaded locations indicate where GOPCs were sampled.

TABLE 3-1
CERCLA AREAS
SOIL GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 2 of 5)

	Location	Soil Gas Probe #	Date	Time	PH3 Measurement (ppm)				
					Breathing Level Air	Soil Gas			
						First	Second	Third	Day 2 Average
Day 2	**$FMDL_{SG}$**	FMDL-SG-A	7/20/2010	1317	0.00	0.00	0.00	0.00	0.00
		FMDL-SG-B	7/20/2010	1325	0.00	0.00	0.00	0.00	0.00
	RAB	FB-1	7/20/2010	1327	0.00	0.00	0.00	0.00	0.00
		FB-2	7/20/2010	1350	0.00	0.00	0.00	0.00	0.00
		FB-3	7/20/2010	1427	0.00	0.00	0.00	0.00	0.00
		FB-4	7/20/2010	1442	0.00	0.00	0.00	0.00	0.00
		FB-5	7/20/2010	1448	0.00	0.00	0.00	0.00	0.00
		FB-6	7/20/2010	1503	0.00	0.00	0.00	0.00	0.00
		FB-7	7/20/2010	1516	0.00	0.00	0.00	0.00	0.00
		FB-8	7/20/2010	1528	0.00	0.00	0.00	0.00	0.00
		FB-9	7/20/2010	1537	0.00	0.00	0.00	0.00	0.00
		FB-10	7/20/2010	1600	0.00	0.00	0.00	0.00	0.00
	RAC	Pond 7S-1	7/20/2010	2115	0.00	0.00	0.00	0.00	0.00
		Pond 7S-2	7/20/2010	2127	0.00	0.00	0.00	0.00	0.00
		Pond 7S-3	7/20/2010	2152	0.00	0.00	0.00	0.00	0.00
		Pond 7S-4	7/20/2010	2204	0.00	0.00	0.00	0.00	0.00
		Pond 6S-1	7/20/2010	1956	0.00	0.00	0.00	0.00	0.00
		Pond 6S-2	7/20/2010	2012	0.00	0.00	0.00	0.00	0.00
		Pond 6S-3	7/20/2010	2058	0.00	0.00	0.00	0.00	0.00
		Pond 10S-1	7/20/2010	1530	0.00	**0.07**	**0.07**	**0.07**	**0.07**
		Pond 10S-2	7/20/2010	1846	0.00	0.00	0.00	0.00	0.00
		Pond 10S-3	7/20/2010	1857	0.00	**0.07**	**0.08**	**0.08**	**0.08**
	RAF	F1-1	7/20/2010	1738	0.00	0.00	**0.02**	**0.02**	**0.01**
		F1-2	7/20/2010	1756	0.00	0.00	0.00	0.00	0.00
		F1-3	7/20/2010	1810	0.00	0.00	0.00	0.00	0.00
		F1-4	7/20/2010	1923	0.00	0.00	0.00	0.00	0.00
		F1-5	7/20/2010	1934	0.00	0.00	0.00	0.00	0.00
	RAK	RAK-1	7/20/2010	2315	0.00	0.00	0.00	0.00	0.00
		RAK-2	7/20/2010	2322	0.00	0.00	0.00	0.00	0.00
		RAK-3	7/20/2010	2333	0.00	0.00	0.00	0.00	0.00

Note that shaded locations indicate where GOPCs were sampled.

TABLE 3-1
CERCLA AREAS
SOIL GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 3 of 5)

	Location	Soil Gas Probe #	Date	Time	PH3 Measurement (ppm)				
					Breathing Level Air	Soil Gas			
						First	Second	Third	Day 3 Average
Day 3	**$FMDL_{SG}$**	FMDL-SG-A	7/21/2010	2003	0.00	0.00	0.00	0.00	0.00
		FMDL-SG-B	7/21/2010	2011	0.00	0.00	0.00	0.00	0.00
	RAB	FB-P1	7/21/2010	1740	0.00	0.00	0.00	0.00	0.00
		FB-P2	7/21/2010	1750	0.00	0.00	0.00	0.00	0.00
		FB-P3	7/21/2010	1801	0.00	0.00	0.00	0.00	0.00
		FB-P4	7/21/2010	1822	0.00	0.00	0.00	0.00	0.00
		FB-P5	7/21/2010	1835	0.00	0.00	0.00	0.00	0.00
		FB-P6	7/21/2010	1847	0.00	0.00	0.00	0.00	0.00
		FB-P7	7/21/2010	1858	0.00	0.00	0.00	0.00	0.00
		FB-P8	7/21/2010	1907	0.00	0.00	0.00	0.00	0.00
		FB-P9	7/21/2010	1929	0.00	0.00	0.00	0.00	0.00
		FB-P10	7/21/2010	1947	0.00	0.00	0.00	0.00	0.00
	RAC	Pond 7S-1	7/21/2010	1040	0.00	0.00	0.00	0.00	0.00
		Pond 7S-2	7/21/2010	1052	0.00	0.00	0.00	0.00	0.00
		Pond 7S-3	7/21/2010	1104	0.00	0.00	0.00	0.00	0.00
		Pond 7S-4	7/21/2010	1118	0.00	0.00	0.00	0.00	0.00
		Pond 6S-1	7/21/2010	1007	0.00	0.00	0.00	0.00	0.00
		Pond 6S-2	7/21/2010	1017	0.00	0.00	0.00	0.00	0.00
		Pond 6S-3	7/21/2010	1029	0.00	0.00	0.00	0.00	0.00
		Pond 10S-1	7/21/2010	0915	0.00	**0.03**	**0.02**	**0.03**	**0.03**
		Pond 10S-2	7/21/2010	0926	0.00	0.00	0.00	0.00	0.00
		Pond 10S-3	7/21/2010	0935	0.00	**0.07**	**0.08**	**0.08**	**0.08**
	RAF	F1-1	7/21/2010	0800	0.00	**0.05**	**0.05**	**0.06**	**0.05**
		F1-2	7/21/2010	0815	0.00	0.00	0.00	0.00	0.00
		F1-3	7/21/2010	0826	0.00	0.00	0.00	0.00	0.00
		F1-4	7/21/2010	0839	0.00	0.00	0.00	0.00	0.00
		F1-5	7/21/2010	0855	0.00	0.00	0.00	0.00	0.00
	RAK	RAK-1	7/21/2010	1139	0.00	0.00	0.00	0.00	0.00
		RAK-2	7/21/2010	1155	0.00	0.00	0.00	0.00	0.00
		RAK-3	7/21/2010	1207	0.00	0.00	0.00	0.00	0.00

Note that shaded locations indicate where GOPCs were sampled.

TABLE 3-1
CERCLA AREAS
SOIL GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 4 of 5)

	Location	Soil Gas Probe #	Date	Time	PH3 Measurement (ppm)				
					Breathing Level Air	Soil Gas			
						First	Second	Third	Day 4 Average
Day 4	**$FMDL_{SG}$**	FMDL-SG-A	7/23/2010	210	0.00	0.00	0.00	0.00	0.00
		FMDL-SG-B	7/22/2010	No Data	0.00	No Data	No Data	No Data	No Data
	RAB	FB-P1	7/22/2010	2110	0.00	0.00	0.00	0.00	0.00
		FB-P2	7/22/2010	2133	0.00	0.00	0.00	0.00	0.00
		FB-P3	7/22/2010	2237	0.00	0.00	0.00	0.00	0.00
		FB-P4	7/22/2010	2302	0.00	0.00	0.00	0.00	0.00
		FB-P5	7/22/2010	2312	0.00	0.00	0.00	0.00	0.00
		FB-P6	7/22/2010	2328	0.00	0.00	0.00	0.00	0.00
		FB-P7	7/22/2010	2340	0.00	0.00	0.00	0.00	0.00
		FB-P8	7/22/2010	2353	0.00	0.00	0.00	0.00	0.00
		FB-P9	7/23/2010	0003	0.00	0.00	0.00	0.00	0.00
		FB-P10	7/23/2010	0013	0.00	0.00	0.00	0.00	0.00
	RAC	Pond 7S-1	7/22/2010	0950	0.00	0.00	0.00	0.00	0.00
		Pond 7S-2	7/22/2010	1000	0.00	0.00	0.00	0.00	0.00
		Pond 7S-3	7/22/2010	0938	0.00	0.00	0.00	0.00	0.00
		Pond 7S-4	7/22/2010	1016	0.00	0.00	0.00	0.00	0.00
		Pond 6S-1	7/22/2010	0845	0.00	0.00	0.00	0.00	0.00
		Pond 6S-2	7/22/2010	0858	0.00	0.00	0.00	0.00	0.00
		Pond 6S-3	7/22/2010	0830	0.00	0.00	0.00	0.00	0.00
		Pond 10S-1	7/22/2010	0540	0.00	**0.02**	**0.03**	**0.03**	**0.03**
		Pond 10S-2	7/22/2010	0551	0.00	0.00	0.00	0.00	0.00
		Pond 10S-3	7/22/2010	0601	0.00	0.00	0.00	0.00	0.00
	RAF	F1-1	7/23/2010	0045	0.00	**0.03**	**0.04**	**0.04**	**0.04**
		F1-2	7/23/2010	0104	0.00	0.00	0.00	0.00	0.00
		F1-3	7/23/2010	0116	0.00	0.00	0.00	0.00	0.00
		F1-4	7/23/2010	0130	0.00	0.00	0.00	0.00	0.00
		F1-5	7/23/2010	0141	0.00	0.00	0.00	0.00	0.00
	RAK	RAK-1	7/22/2010	1238	0.00	0.05	0.03	0.04	**0.04**
		RAK-2	7/22/2010	1312	0.00	0.00	0.00	0.00	0.00
		RAK-3	7/22/2010	1355	0.00	0.00	0.00	0.00	0.00

Note that shaded locations indicate where GOPCs were sampled.

TABLE 3-1
CERCLA AREAS
SOIL GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 5 of 5)

	Location	Soil Gas Probe #	Date	Time	PH3 Measurement (ppm)				
					Breathing Level Air	Soil Gas			
						First	Second	Third	Day 5 Average
Day 5	**$FMDL_{SG}$**	FMDL-SG-A	7/23/2010	0730	0.00	0.00	0.00	0.00	0.00
		FMDL-SG-B	7/23/2010	0742	0.00	0.00	0.00	0.00	0.00
	RAB	FB-P1	7/23/2010	0755	0.00	0.00	0.00	0.00	0.00
		FB-P2	7/23/2010	0807	0.00	0.00	0.00	0.00	0.00
		FB-P3	7/23/2010	0817	0.00	0.00	0.00	0.00	0.00
		FB-P4	7/23/2010	0900	0.00	0.00	0.00	0.00	0.00
		FB-P5	7/23/2010	0910	0.00	0.00	0.00	0.00	0.00
		FB-P6	7/23/2010	0958	0.00	0.00	0.00	0.00	0.00
		FB-P7	7/23/2010	1010	0.00	0.00	0.00	0.00	0.00
		FB-P8	7/23/2010	1024	0.00	0.00	0.00	0.00	0.00
		FB-P9	7/23/2010	1033	0.00	0.00	0.00	0.00	0.00
		FB-P10	7/23/2010	1043	0.00	0.00	0.00	0.00	0.00
	RAC	Pond 7S-1	7/23/2010	0337	0.00	0.00	0.00	0.00	0.00
		Pond 7S-2	7/23/2010	0346	0.00	0.00	0.00	0.00	0.00
		Pond 7S-3	7/23/2010	0357	0.00	0.00	0.00	0.00	0.00
		Pond 7S-4	7/23/2010	0415	0.00	0.00	0.00	0.00	0.00
		Pond 6S-1	7/23/2010	0307	0.00	0.00	0.00	0.00	0.00
		Pond 6S-2	7/23/2010	0318	0.00	0.00	0.00	0.00	0.00
		Pond 6S-3	7/23/2010	0420	0.00	0.00	0.00	0.00	0.00
		Pond 10S-1	7/23/2010	0235	0.00	0.00	0.00	0.00	0.00
		Pond 10S-2	7/23/2010	0244	0.00	0.00	0.00	0.00	0.00
		Pond 10S-3	7/23/2010	0250	0.00	**0.09**	**0.09**	**0.10**	**0.09**
	RAF	F1-1	7/23/2010	0445	0.00	0.00	0.00	0.00	0.00
		F1-2	7/23/2010	0450	0.00	0.00	0.00	0.00	0.00
		F1-3	7/23/2010	0603	0.00	0.00	0.00	0.00	0.00
		F1-4	7/23/2010	0706	0.00	0.00	0.00	0.00	0.00
		F1-5	7/23/2010	0733	0.00	0.00	0.00	0.00	0.00
	RAK	RAK-1	7/23/2010	0509	0.00	0.00	0.00	0.00	0.00
		RAK-2	7/23/2010	0517	0.00	0.00	0.00	0.00	0.00
		RAK-3	7/23/2010	0527	0.00	0.00	0.00	0.00	0.00

Note that shaded locations indicate where GOPCs were sampled.

TABLE 3-2
CERCLA AREAS
SOIL GAS LABORATORY GOPC SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 1 of 2)

	Analyte	**Hydrogen sulfide**			**Hydrogen Cyanide**			**Hydrofluoric acid**		
	Analytical Method	**OSHA1008**			**NIOSH6010**			**NIOSH7903**		
	Volume (L)	**10**			**3**			**3**		
	Molecular Weight	**34.082**			**27.0253**			**20.00634**		
	PEL (ppm)	**20/50**			**10**			**3**		
	IDLH (ppm)	**100**			**50**			**30**		
	LEL (ppm)	**40,000**			**56,000**			**N/A**		
Sample Identification	**Sample Date**	**µg/Sample**	**µg/l**	**ppm**	**µg/Sample**	**µg/l**	**ppm**	**µg/Sample**	**µg/l**	**ppm**
FMDLSGA01	7/23/2010	**3.5**	**0.349**	**0.23**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
FMDLSGA02	7/23/2010	**2.2 B**	**0.22 B**	**0.144 B**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RABSGFB201	7/22/2010	**4.4**	**0.44**	**0.289**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RABSGFB202	7/23/2010	**2.2**	**0.22**	**0.144**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RABSGFB301	7/22/2010	**2.5**	**0.25**	**0.164**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RABSGFB302	7/23/2010	**3.9**	**0.39**	**0.257**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RABSGFB401	7/22/2010	**N/A**	**N/A**	**N/A**	<0.21	<0.069	<0.058	N/A	N/A	N/A
RABSGFB401	7/23/2010	**5.4**	**0.54**	**0.355**	N/A	N/A	N/A	<0.53	<0.176	<0.198
RABSGFB402	7/23/2010	**4.7**	**0.47**	**0.309**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RACPond10SSG301	7/22/2010	**10**	**1**	**0.658**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RACPond10SSG301 Dup	7/22/2010	**16**	**1.6**	**1.054**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RACPond10SSG302	7/23/2010	**3.8**	**0.38**	**0.25**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RACPond6SSG301	7/22/2010	**15**	**1.5**	**0.988**	<0.21	<0.069	<0.058	N/A	N/A	N/A
RACPond6SSG301	8/3/2010	**N/A**	**N/A**	**N/A**	N/A	N/A	N/A	<0.53	<0.176	<0.198
RACPond6SSG302	7/23/2010	**2.7**	**0.27**	**0.177**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RACPond7SSG301	7/22/2010	**9.3**	**0.93**	**0.612**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RACPond7SSG302	7/23/2010	**3.2 B**	**0.32 B**	**0.21 B**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RACPond7SSG302 Dup	7/23/2010	**3.4 B**	**0.339 B**	**0.224 B**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RAFSGF1101	7/23/2010	**2.6**	**0.26**	**0.171**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RAFSGF1102	7/23/2010	**2.9**	**0.289**	**0.191**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RAFSGF1301	7/23/2010	**5**	**0.5**	**0.329**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RAFSGF1302	7/23/2010	**4.2**	**0.42**	**0.276**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RAFSGF1401	7/23/2010	**4.2**	**0.42**	**0.276**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RAFSGF1402	7/23/2010	**4.9**	**0.49**	**0.322**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RAKSG101	7/22/2010	**9**	**0.9**	**0.593**	<0.21	<0.069	<0.058	**12**	**4**	**4.49**
RAKSG102	7/23/2010	**3.8**	**0.38**	**0.25**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RAKSG201	7/22/2010	**7**	**0.699**	**0.461**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198

TABLE 3-2
CERCLA AREAS
SOIL GAS LABORATORY GOPC SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 2 of 2)

	Analyte	**Hydrogen sulfide**			**Hydrogen Cyanide**			**Hydrofluoric acid**		
	Analytical Method	**OSHA1008**			**NIOSH6010**			**NIOSH7903**		
	Volume (L)	**10**			**3**			**3**		
	Molecular Weight	**34.082**			**27.0253**			**20.00634**		
	PEL (ppm)	**20/50**			**10**			**3**		
	IDLH (ppm)	**100**			**50**			**30**		
	LEL (ppm)	**40,000**			**56,000**			**N/A**		
Sample Identification	**Sample Date**	**µg/Sample**	**µg/l**	**ppm**	**µg/Sample**	**µg/l**	**ppm**	**µg/Sample**	**µg/l**	**ppm**
RAKSG202	7/23/2010	**3.7**	**0.369**	**0.243**	<0.21	<0.069	<0.058	<0.53	<0.176	<0.198
RAKSG301	7/22/2010	**6.1**	**0.609**	**0.401**	<0.21	<0.069	<0.058	N/A	N/A	N/A
RAKSG301	8/3/2010	N/A	N/A	N/A	N/A	N/A	N/A	<0.53	<0.176	<0.198

Bold Bolded result indicates positively identified compound.
µg micrograms
µg/l micrograms per liter
ppm parts per million
N/A Not applicable
B Analyte detected in an associated blank.
PEL Permissible exposure limit, per U. S. Occupational Safety & Health Administration
IDLH Immediately Dangerous to Life or Health
LEL Lower Explosive Limit
Conversion from µg/l to ppm = concentration in µg/l X (22.46 / molecular weight of compound)

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
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Field Method Detection Limit		Sampling week of:	July 26, 2010
Date Installed:	7/29/2010	Date Sampled:	7/30/2010
Time Intalled:	1446	Time Sampled:	1446
Location Description:	$FMDL_{SF}$	Sample Location:	FMC Trailers
Breathing Level PH3 (ppm):		0.00	

Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.00	11 minutes	0.00
2 minutes	0.00	12 minutes	0.00
3 minutes	0.00	13 minutes	0.00
4 minutes	0.00	14 minutes	0.00
5 minutes	0.00	15 minutes	0.00
6 minutes	0.00	16 minutes	0.00
7 minutes	0.00	17 minutes	0.00
8 minutes	0.00	18 minutes	0.00
9 minutes	0.00	19 minutes	0.00
10 minutes	0.00	20 minutes	0.00
		20-minute avg:	**0.00**

RA-B Furnace Building Foundation #3		Sampling week of:	July 26, 2010
Date Installed:	7/29/2010	Date Sampled:	7/30/2010
Time Intalled:	1000	Time Sampled:	1000
Location Description:	RA-B	Sample Location:	#3
Breathing Level PH3 (ppm):		0.00	

Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	**0.27**	11 minutes	**0.21**
2 minutes	**0.26**	12 minutes	**0.22**
3 minutes	**0.25**	13 minutes	**0.21**
4 minutes	**0.25**	14 minutes	**0.21**
5 minutes	**0.24**	15 minutes	**0.21**
6 minutes	**0.24**	16 minutes	**0.21**
7 minutes	**0.24**	17 minutes	**0.20**
8 minutes	**0.24**	18 minutes	**0.20**
9 minutes	**0.23**	19 minutes	**0.21**
10 minutes	**0.22**	20 minutes	**0.20**
		20-minute avg:	**0.23**

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

RA-B Furnace Building Foundation #4		Sampling week of:	July 26, 2010
Date Installed:	7/29/2010	Date Sampled:	7/30/2010
Time Intalled:	1021	Time Sampled:	1021
Location Description:	RA-B	Sample Location:	#4
Breathing Level PH3 (ppm):		0.00	
Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.00	11 minutes	0.00
2 minutes	0.00	12 minutes	0.00
3 minutes	0.00	13 minutes	0.00
4 minutes	0.00	14 minutes	0.00
5 minutes	0.00	15 minutes	0.00
6 minutes	0.00	16 minutes	0.00
7 minutes	0.00	17 minutes	0.00
8 minutes	0.00	18 minutes	0.00
9 minutes	0.00	19 minutes	0.00
10 minutes	0.00	20 minutes	0.00
		20-minute avg:	**0.00**

RA-B Furnace Building Foundation #9		Sampling week of:	July 26, 2010
Date Installed:	7/29/2010	Date Sampled:	7/30/2010
Time Intalled:	1042	Time Sampled:	1042
Location Description:	RA-B	Sample Location:	#9
Breathing Level PH3 (ppm):		0.00	
Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.00	11 minutes	0.00
2 minutes	0.00	12 minutes	0.00
3 minutes	0.00	13 minutes	0.00
4 minutes	0.00	14 minutes	0.00
5 minutes	0.00	15 minutes	0.00
6 minutes	0.00	16 minutes	0.00
7 minutes	0.00	17 minutes	0.00
8 minutes	0.00	18 minutes	0.00
9 minutes	0.00	19 minutes	0.00
10 minutes	0.00	20 minutes	0.00
		20-minute avg:	**0.00**

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
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RA-C Pond 7S #3		Sampling week of:	July 26, 2010
Date Installed:	7/29/2010	Date Sampled:	7/30/2010
Time Intalled:	1339	Time Sampled:	1339
Location Description:	RA-C Pond 7S	Sample Location:	#3
Breathing Level PH3 (ppm):		0.00	
Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.00	11 minutes	0.00
2 minutes	0.00	12 minutes	0.00
3 minutes	0.00	13 minutes	0.00
4 minutes	0.00	14 minutes	0.00
5 minutes	0.00	15 minutes	0.00
6 minutes	0.00	16 minutes	0.00
7 minutes	0.00	17 minutes	0.00
8 minutes	0.00	18 minutes	0.00
9 minutes	0.00	19 minutes	0.00
10 minutes	0.00	20 minutes	0.00
		20-minute avg:	**0.00**

RA-C Pond 6S #3		Sampling week of:	July 26, 2010
Date Installed:	7/29/2010	Date Sampled:	7/30/2010
Time Intalled:	1356	Time Sampled:	1356
Location Description:	RA-C Pond 6S	Sample Location:	#3
Breathing Level PH3 (ppm):		0.00	
Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.02	11 minutes	0.02
2 minutes	0.02	12 minutes	0.04
3 minutes	0.03	13 minutes	0.04
4 minutes	0.03	14 minutes	0.03
5 minutes	0.00	15 minutes	0.03
6 minutes	0.02	16 minutes	0.00
7 minutes	0.03	17 minutes	0.00
8 minutes	0.03	18 minutes	0.03
9 minutes	0.02	19 minutes	0.00
10 minutes	0.03	20 minutes	0.02
		20-minute avg:	**0.02**

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 4 of 18)

RA-C Pond 10S #3		Sampling week of:	July 26, 2010
Date Installed:	7/29/2010	Date Sampled:	7/30/2010
Time Intalled:	1417	Time Sampled:	1417
Location Description:	RA-C Pond 10S	Sample Location:	#3
Breathing Level PH3 (ppm):		0.00	
Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.00	11 minutes	0.00
2 minutes	0.00	12 minutes	0.00
3 minutes	0.00	13 minutes	0.00
4 minutes	0.00	14 minutes	0.00
5 minutes	0.00	15 minutes	0.00
6 minutes	0.00	16 minutes	0.00
7 minutes	0.00	17 minutes	0.00
8 minutes	0.00	18 minutes	0.00
9 minutes	0.00	19 minutes	0.00
10 minutes	0.00	20 minutes	0.00
		20-minute avg:	**0.00**

RA-F1 Slag Pile #1		Sampling week of:	July 26, 2010
Date Installed:	7/29/2010	Date Sampled:	7/30/2010
Time Intalled:	1105	Time Sampled:	1105
Location Description:	RA-F1 Slag Pile	Sample Location:	#1
Breathing Level PH3 (ppm):		0.00	
Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.00	11 minutes	0.00
2 minutes	0.00	12 minutes	0.00
3 minutes	0.00	13 minutes	0.00
4 minutes	0.00	14 minutes	0.00
5 minutes	0.00	15 minutes	0.00
6 minutes	0.00	16 minutes	0.00
7 minutes	0.00	17 minutes	0.00
8 minutes	0.00	18 minutes	0.00
9 minutes	0.00	19 minutes	0.00
10 minutes	0.00	20 minutes	0.00
		20-minute avg:	**0.00**

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 5 of 18)

RA-F1 Slag Pile #3		Sampling week of:	July 26, 2010
Date Installed:	7/29/2010	Date Sampled:	7/30/2010
Time Intalled:	1120	Time Sampled:	1120
Location Description:	RA-F1 Slag Pile	Sample Location:	#3
Breathing Level PH3 (ppm):		0.00	
Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.02	11 minutes	0.00
2 minutes	0.00	12 minutes	0.00
3 minutes	0.00	13 minutes	0.00
4 minutes	0.00	14 minutes	0.00
5 minutes	0.02	15 minutes	0.00
6 minutes	0.00	16 minutes	0.00
7 minutes	0.00	17 minutes	0.00
8 minutes	0.03	18 minutes	0.00
9 minutes	0.00	19 minutes	0.00
10 minutes	0.00	20 minutes	0.00
		20-minute avg:	**0.00**

RA-F1 Slag Pile #4		Sampling week of:	July 26, 2010
Date Installed:	7/29/2010	Date Sampled:	7/30/2010
Time Intalled:	1142	Time Sampled:	1142
Location Description:	RA-F1 Slag Pile	Sample Location:	#4
Breathing Level PH3 (ppm):		0.00	
Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.00	11 minutes	0.00
2 minutes	0.00	12 minutes	0.00
3 minutes	0.00	13 minutes	0.00
4 minutes	0.00	14 minutes	0.00
5 minutes	0.00	15 minutes	0.00
6 minutes	0.00	16 minutes	0.00
7 minutes	0.00	17 minutes	0.00
8 minutes	0.00	18 minutes	0.00
9 minutes	0.00	19 minutes	0.00
10 minutes	0.00	20 minutes	0.00
		20-minute avg:	**0.00**

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 6 of 18)

RA-K Railroad Swale #1		Sampling week of:	July 26, 2010
Date Installed:	7/29/2010	Date Sampled:	7/30/2010
Time Intalled:	1155	Time Sampled:	1155
Location Description:	RA-K R. Swale	Sample Location:	#1
Breathing Level PH3 (ppm):		0.00	
Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.00	11 minutes	0.00
2 minutes	0.00	12 minutes	0.00
3 minutes	0.00	13 minutes	0.02
4 minutes	0.00	14 minutes	0.00
5 minutes	0.00	15 minutes	0.00
6 minutes	0.00	16 minutes	0.00
7 minutes	0.00	17 minutes	0.00
8 minutes	0.00	18 minutes	0.00
9 minutes	0.03	19 minutes	0.00
10 minutes	0.00	20 minutes	0.00
		20-minute avg:	**0.00**

RA-K Railroad Swale #2		Sampling week of:	July 26, 2010
Date Installed:	7/29/2010	Date Sampled:	7/30/2010
Time Intalled:	1258	Time Sampled:	1258
Location Description:	RA-K R. Swale	Sample Location:	#2
Breathing Level PH3 (ppm):		0.00	
Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.00	11 minutes	0.00
2 minutes	0.00	12 minutes	0.00
3 minutes	0.00	13 minutes	0.00
4 minutes	0.00	14 minutes	0.00
5 minutes	0.00	15 minutes	0.00
6 minutes	0.00	16 minutes	0.00
7 minutes	0.00	17 minutes	0.00
8 minutes	0.00	18 minutes	0.00
9 minutes	0.00	19 minutes	0.00
10 minutes	0.00	20 minutes	0.00
		20-minute avg:	**0.00**

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 7 of 18)

RA-K Railroad Swale #3		Sampling week of:	July 26, 2010
Date Installed:	7/29/2010	Date Sampled:	7/30/2010
Time Intalled:	1318	Time Sampled:	1318
Location Description:	RA-K R. Swale	Sample Location:	#3
Breathing Level PH3 (ppm):		0.00	

Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.06	11 minutes	0.00
2 minutes	0.06	12 minutes	0.02
3 minutes	0.05	13 minutes	0.00
4 minutes	0.05	14 minutes	0.02
5 minutes	0.04	15 minutes	0.00
6 minutes	0.05	16 minutes	0.00
7 minutes	0.04	17 minutes	0.00
8 minutes	0.03	18 minutes	0.00
9 minutes	0.02	19 minutes	0.00
10 minutes	0.00	20 minutes	0.02
		20-minute avg:	**0.02**

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 8 of 18)

Soil gas PH3 measurement collected in conjunction with soil flux sampling.					PH3 Measurement (ppm)			
Field Method Detection Limit - SG - A						Soil Gas		
Location	Soil Gas Probe #	Date	Time	Breathing Level Air	First	Second	Third	Average
$FMDL_{SG}$	FMDL-SG-A	8/3/2010	1032	0.00	0.00	0.00	0.00	0.00

Field Method Detection Limit - SF - A		Sampling week of:	August 2, 2010
Date Installed:	8/2/2010	Date Sampled:	8/3/2010
Time Intalled:	1005	Time Sampled:	1009
Location Description:	$FMDL_{SF}$	Sample Location:	FMC Trailers
Breathing Level PH3 (ppm):		0.00	
Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.00	11 minutes	0.00
2 minutes	0.00	12 minutes	0.00
3 minutes	0.00	13 minutes	0.00
4 minutes	0.00	14 minutes	0.00
5 minutes	0.00	15 minutes	0.00
6 minutes	0.00	16 minutes	0.00
7 minutes	0.00	17 minutes	0.00
8 minutes	0.00	18 minutes	0.00
9 minutes	0.00	19 minutes	0.00
10 minutes	0.00	20 minutes	0.00
		20-minute avg:	**0.00**

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

Soil gas PH3 measurement collected in conjunction with soil flux sampling.					PH3 Measurement (ppm)			
RA-B Furnace Building Foundation #3						Soil Gas		
Location	Soil Gas Probe #	Date	Time	Breathing Level Air	First	Second	Third	Average
RA-B Furnace Building	RAB FB SF#3	8/3/2010	1056	0.00	0.00	0.00	0.00	0.00

RA-B Furnace Building Foundation #3		Sampling week of:	August 2, 2010
Date Installed:	8/2/2010	Date Sampled:	8/3/2010
Time Intalled:	1030	Time Sampled:	1030
Location Description:	RA-B	Sample Location:	#3
Breathing Level PH3 (ppm):		0.00	
Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	**0.61**	11 minutes	**0.42**
2 minutes	**0.58**	12 minutes	**0.42**
3 minutes	**0.55**	13 minutes	**0.41**
4 minutes	**0.52**	14 minutes	**0.40**
5 minutes	**0.51**	15 minutes	**0.39**
6 minutes	**0.48**	16 minutes	**0.37**
7 minutes	**0.47**	17 minutes	**0.38**
8 minutes	**0.46**	18 minutes	**0.36**
9 minutes	**0.45**	19 minutes	**0.36**
10 minutes	**0.44**	20 minutes	**0.36**
		20-minute avg:	**0.45**
Note: A co-located soil flux chamber was placed at 1030 on 8/2/2010 and sampled at 1040			

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

Soil gas PH3 measurement collected in conjunction with soil flux sampling.					PH3 Measurement (ppm)			
RA-C Pond 6S #3						Soil Gas		
Location	Soil Gas Probe #	Date	Time	Breathing Level Air	First	Second	Third	Average
RA-C Pond 6S	RAC Pond 6S SG#3	8/3/2010	1146	0.00	0.00	0.00	0.00	0.00

RA-C Pond 6S #3		Sampling week of:	August 2, 2010
Date Installed:	8/2/2010	Date Sampled:	8/3/2010
Time Intalled:	1100	Time Sampled:	1130
Location Description:	RA-C Pond 6S	Sample Location:	#3
Breathing Level PH3 (ppm):		0.00	

Start Time:	PH3 Reading (ppm)	Continued:	PH3 Reading (ppm)
1 minute	0.05	11 minutes	0.03
2 minutes	0.03	12 minutes	0.00
3 minutes	0.03	13 minutes	0.03
4 minutes	0.03	14 minutes	0.03
5 minutes	0.03	15 minutes	0.03
6 minutes	0.03	16 minutes	0.00
7 minutes	0.04	17 minutes	0.03
8 minutes	0.03	18 minutes	0.02
9 minutes	0.03	19 minutes	0.03
10 minutes	0.03	20 minutes	0.02
		20-minute avg:	**0.03**

Note: A co-located soil flux chamber was placed at 1100 on 8/2/2010 and sampled at 1130

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

Soil gas PH3 measurement collected in conjunction with soil flux sampling.					PH3 Measurement (ppm)			
RA-K Railroad Swale #3						Soil Gas		
Location	Soil Gas Probe #	Date	Time	Breathing Level Air	First	Second	Third	Average
RA-K Railroad Swale	RAK SG#3	8/3/2010	1303	0.00	0.02	0.02	0.00	0.01

RA-K Railroad Swale #3		Sampling week of:	August 2, 2010
Date Installed:	8/2/2010	Date Sampled:	8/3/2010
Time Intalled:	1200	Time Sampled:	1200
Location Description:	RA-K R. Swale	Sample Location:	#3
Breathing Level PH3 (ppm):		0.00	

Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.09	11 minutes	0.03
2 minutes	0.04	12 minutes	0.03
3 minutes	0.04	13 minutes	0.03
4 minutes	0.03	14 minutes	0.02
5 minutes	0.04	15 minutes	0.03
6 minutes	0.04	16 minutes	0.03
7 minutes	0.03	17 minutes	0.03
8 minutes	0.04	18 minutes	0.00
9 minutes	0.02	19 minutes	0.00
10 minutes	0.03	20 minutes	0.00
		20-minute avg:	**0.03**

Note: A co-located soil flux chamber was placed at 1200 on 8/2/2010 and sampled at 1210

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

Field Method Detection Limit A		Sampling week of:	August 9, 2010
Date Installed:	8/10/2010	Date Sampled:	8/11/2010
Time Intalled:	1530	Time Sampled:	1640
Location Description:	FMDLA	Sample Location:	FMDLA
Breathing Level PH3 (ppm):		0.00	

Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.00	11 minutes	0.00
2 minutes	0.00	12 minutes	0.00
3 minutes	0.00	13 minutes	0.00
4 minutes	0.00	14 minutes	0.00
5 minutes	0.00	15 minutes	0.00
6 minutes	0.00	16 minutes	0.00
7 minutes	0.00	17 minutes	0.00
8 minutes	0.00	18 minutes	0.00
9 minutes	0.00	19 minutes	0.00
10 minutes	0.00	20 minutes	0.00
		20-minute avg:	**0.00**

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

RA-B Furnace Building Foundation #3 West		Sampling week of:	August 9, 2010
Date Installed:	8/10/2010	Date Sampled:	8/11/2010
Time Intalled:	1400	Time Sampled:	1400
Location Description:	RA-B West of #3	Sample Location:	#3 West
Breathing Level PH3 (ppm):		0.00	
Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	**0.02**	11 minutes	0.00
2 minutes	**0.02**	12 minutes	0.00
3 minutes	0.00	13 minutes	0.00
4 minutes	0.00	14 minutes	0.00
5 minutes	0.00	15 minutes	0.00
6 minutes	0.00	16 minutes	0.00
7 minutes	0.00	17 minutes	0.00
8 minutes	0.00	18 minutes	0.00
9 minutes	0.00	19 minutes	0.00
10 minutes	0.00	20 minutes	0.00
		20-minute avg:	**0.00**
Note: A co-located soil flux chamber was placed at 1400 on 8/10/2010 and sampled at 1400			

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

RA-B Furnace Building Foundation #3 East		Sampling week of:	August 9, 2010
Date Installed:	8/10/2010	Date Sampled:	8/11/2010
Time Intalled:	1420	Time Sampled:	1427
Location Description:	RA-B East of #3	Sample Location:	#3 East
Breathing Level PH3 (ppm):		0.00	
Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.00	11 minutes	0.00
2 minutes	0.00	12 minutes	0.00
3 minutes	**0.02**	13 minutes	0.00
4 minutes	0.00	14 minutes	0.00
5 minutes	0.00	15 minutes	0.00
6 minutes	0.00	16 minutes	0.00
7 minutes	0.00	17 minutes	0.00
8 minutes	0.00	18 minutes	0.00
9 minutes	0.00	19 minutes	0.00
10 minutes	0.00	20 minutes	0.00
		20-minute avg:	**0.00**
Note: A co-located soil flux chamber was placed at 1420 on 8/10/2010 and sampled at 1427			

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 15 of 18)

RA-B Furnace Building Foundation #3 North		Sampling week of:	August 9, 2010
Date Installed:	8/10/2010	Date Sampled:	8/11/2010
Time Intalled:	1430	Time Sampled:	1455
Location Description:	RA-B Railroad Tracks	Sample Location:	#3 North
Breathing Level PH3 (ppm):		0.00	
Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	**0.03**	11 minutes	**0.02**
2 minutes	**0.02**	12 minutes	0.00
3 minutes	0.00	13 minutes	0.00
4 minutes	**0.03**	14 minutes	0.00
5 minutes	**0.02**	15 minutes	0.00
6 minutes	**0.02**	16 minutes	0.00
7 minutes	**0.02**	17 minutes	0.00
8 minutes	0.00	18 minutes	0.00
9 minutes	0.00	19 minutes	0.00
10 minutes	**0.02**	20 minutes	0.00
		20-minute avg:	**0.01**

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

RA-K Railroad Swale #3 West		Sampling week of:	August 9, 2010
Date Installed:	8/10/2010	Date Sampled:	8/11/2010
Time Intalled:	1510	Time Sampled:	1557
Location Description:	RA-K R. Swale	Sample Location:	#3 West
Breathing Level PH3 (ppm):		0.00	

Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.00	11 minutes	0.00
2 minutes	0.00	12 minutes	0.00
3 minutes	0.00	13 minutes	0.00
4 minutes	0.00	14 minutes	0.00
5 minutes	0.00	15 minutes	0.00
6 minutes	0.00	16 minutes	0.00
7 minutes	0.00	17 minutes	0.00
8 minutes	0.00	18 minutes	0.00
9 minutes	0.00	19 minutes	0.00
10 minutes	0.00	20 minutes	0.00
		20-minute avg:	**0.00**

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

RA-K Railroad Swale #3 East		Sampling week of:	August 9, 2010
Date Installed:	8/10/2010	Date Sampled:	8/11/2010
Time Intalled:	1510	Time Sampled:	1557
Location Description:	RA-K R. Swale	Sample Location:	#3 East
Breathing Level PH3 (ppm):		0.00	

Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	**0.02**	11 minutes	**0.02**
2 minutes	0.00	12 minutes	**0.03**
3 minutes	**0.03**	13 minutes	**0.02**
4 minutes	**0.03**	14 minutes	**0.03**
5 minutes	**0.03**	15 minutes	**0.02**
6 minutes	**0.03**	16 minutes	**0.02**
7 minutes	**0.04**	17 minutes	0.00
8 minutes	**0.04**	18 minutes	**0.03**
9 minutes	**0.03**	19 minutes	**0.02**
10 minutes	**0.02**	20 minutes	0.00
		20-minute avg:	**0.02**

TABLE 3-3
CERCLA AREAS
SOIL FLUX PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

RA-K Railroad Swale Field Blank		Sampling week of:	August 9, 2010
Date Installed:	8/10/2010	Date Sampled:	8/11/2010
Time Intalled:	1510	Time Sampled:	1557
Location Description:	RA-K R. Swale	Sample Location:	Field Blank
Breathing Level PH3 (ppm):		0.00	

Start Time:	**PH3 Reading (ppm)**	**Continued:**	**PH3 Reading (ppm)**
1 minute	0.00	11 minutes	0.00
2 minutes	0.00	12 minutes	0.00
3 minutes	0.00	13 minutes	0.00
4 minutes	0.00	14 minutes	0.00
5 minutes	0.00	15 minutes	0.00
6 minutes	0.00	16 minutes	0.00
7 minutes	0.00	17 minutes	0.00
8 minutes	0.00	18 minutes	0.00
9 minutes	0.00	19 minutes	0.00
10 minutes	0.00	20 minutes	0.00
		20-minute avg:	**0.00**

TABLE 3-4
CERCLA AREAS
SOIL FLUX LABORATORY PH3 SAMPLING RESULTS
SITE-WDIE GAS ASSESSMENT
(Page 1 of 1)

	Analyte	**Phosphine**		
	Analytical Method	**OSHA1003**		
	Volume (L)	**10**		
	Molecular Weight	**33.997**		
	PEL (ppm)	**0.3**		
	IDLH (ppm)	**50**		
	LEL (ppm)	**17,900**		
Sample Identification	**Sample Date**	**µg/Sample**	**µg/l**	**ppm**
RABFBSF3PH3	8/3/2010	**3.9**	**0.39**	**0.258**
RABSF3EPH3	8/11/2010	<3.2	<0.11	<0.07
RABSF3WPH3	8/11/2010	<3.2	<0.11	<0.07
RAC6SSF3PH3	8/3/2010	<2.9	<0.097	<0.064
RAKSF3PH3	8/3/2010	<2.9	<0.097	<0.064

Bold Bolded result indicates positively identified compound.
µg micrograms
µg/l micrograms per liter
ppm parts per million
L liter
PEL Permissible exposure limit, per U. S. Occupational Safety & Health Administration
IDLH Immediately Dangerous to Life or Health
LEL Lower Explosive Limit
Conversion from µg/l to ppm = concentration in µg/l X (22.46 / molecular weight of compound)

TABLE 3-5
CERCLA AREAS
SOIL MASS FLUX SUMMARY
SITE-WIDE GAS ASSESSMENT
(Page 1 of 2)

Remediation Area	**RA-B**	**RA-B**	**RA-B**	**RA-B**	**RA-B**	**RA-B**	**RA-B**	**RA-B**	**RA-K**	**RA-K**	**RA-K**	**RA-K**
SG/Flux Chamber Location	**3**	**3**	**3**	**3E**	**3W**	**3N**	**4**	**9**	**3**	**3**	**3E**	**3W**
Date Measured	7/30/2010	8/3/2010	8/3/2010	8/11/2010	8/11/2010	8/11/2010	7/30/2010	7/30/2010	7/30/2010	8/3/2010	8/11/2010	8/11/2010
OSHA 1003 result (ppm)	NA	NA	**0.258**	**<0.07**	**<0.07**	NA	NA	NA	NA	**<0.064**	NA	NA
Draeger III Readings (ppm)												
Minute 1	**0.27**	**0.61**		0.00	**0.02**	**0.03**	0.00	0.00	**0.06**	**0.09**	**0.02**	0.00
2	**0.26**	**0.58**		0.00	**0.02**	**0.02**	0.00	0.00	**0.06**	**0.04**	0.00	0.00
3	**0.25**	**0.55**		**0.02**	0.00	0.00	0.00	0.00	**0.05**	**0.04**	**0.03**	0.00
4	**0.25**	**0.52**		0.00	0.00	**0.03**	0.00	0.00	**0.05**	**0.03**	**0.03**	0.00
5	**0.24**	**0.51**		0.00	0.00	**0.02**	0.00	0.00	**0.04**	**0.04**	**0.03**	0.00
6	**0.24**	**0.48**		0.00	0.00	**0.02**	0.00	0.00	**0.05**	**0.04**	**0.03**	0.00
7	**0.24**	**0.47**		0.00	0.00	**0.02**	0.00	0.00	**0.04**	**0.03**	**0.04**	0.00
8	**0.24**	**0.46**		0.00	0.00	0.00	0.00	0.00	**0.03**	**0.04**	**0.04**	0.00
9	**0.23**	**0.45**		0.00	0.00	0.00	0.00	0.00	**0.02**	**0.02**	**0.03**	0.00
10	**0.22**	**0.44**		0.00	0.00	**0.02**	0.00	0.00	0.00	**0.03**	**0.02**	0.00
11	**0.21**	**0.42**		0.00	0.00	**0.03**	0.00	0.00	0.00	**0.03**	**0.02**	0.00
12	**0.22**	**0.42**		0.00	0.00	**0.02**	0.00	0.00	**0.02**	**0.03**	**0.03**	0.00
13	**0.21**	**0.41**		0.00	0.00	0.00	0.00	0.00	0.00	**0.03**	**0.02**	0.00
14	**0.21**	**0.40**		0.00	0.00	**0.03**	0.00	0.00	**0.02**	**0.02**	**0.03**	0.00
15	**0.21**	**0.39**		0.00	0.00	**0.02**	0.00	0.00	0.00	**0.03**	**0.02**	0.00
16	**0.21**	**0.37**		0.00	0.00	**0.02**	0.00	0.00	0.00	**0.03**	**0.02**	0.00
17	**0.20**	**0.38**		0.00	0.00	**0.02**	0.00	0.00	0.00	**0.03**	0.00	0.00
18	**0.20**	**0.36**		0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.03**	0.00
19	**0.21**	**0.36**		0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.02**	0.00
20	**0.20**	**0.36**		0.00	0.00	**0.02**	0.00	0.00	**0.02**	0.00	0.00	0.00
Count (n)	20	20	1	20	20	20	20	20	20	20	20	20
Average (mean) flux chamber concentration (ppm)	**0.226**	**0.447**		**0.001**	**0.002**	**0.016**	**0.000**	**0.000**	**0.023**	**0.030**	**0.023**	**0.000**
Flux chamber surface area (A) = 641.3 cm2 Flux chamber volume (V) = 9.937 x 10-3 m3 Incubation period (I) = 24 hours Conversion Factor from PH3 ppm to PH3 mg/m3 (@STP) = 1.39												
Mass Flux (mg) = Cfc (ppm) x CF x V	**3.12E-03**	**6.17E-03**	**3.56E-03**	**1.38E-05**	**2.76E-05**	**2.21E-04**	**0.00E+00**	**0.00E+00**	**3.18E-04**	**4.14E-04**	**3.18E-04**	**0.00E+00**
Flux Rate (mg/cm2/hour) = Mass Flux / A / I	**2.03E-07**	**4.01E-07**	**2.32E-07**	**8.97E-10**	**1.79E-09**	**1.44E-08**	**0.00E+00**	**0.00E+00**	**2.06E-08**	**2.69E-08**	**2.06E-08**	**0.00E+00**

TABLE 3-5
CERCLA AREAS
SOIL MASS FLUX SUMMARY
SITE-WIDE GAS ASSESSMENT
(Page 2 of 2)

Remediation Area	**RA-K**	**RA-K**	**RA-C**	**RA-C**	**RA-C**	**RA-C**	**RA-F1**	**RA-F1**	**RA-F1**
SG/Flux Chamber Location	**1**	**2**	**6S-3**	**6S-3**	**7S-3**	**10S-3**	**1**	**3**	**4**
Date Measured	7/30/2010	7/30/2010	7/30/2010	8/3/2010	7/30/2010	7/30/2010	7/30/2010	7/30/2010	7/30/2010
OSHA 1003 result (ppm)	NA	NA	NA	**<0.064**	NA	NA	NA	NA	NA
Draeger III Readings (ppm)									
Minute 1	0.00	0.00	**0.02**	**0.05**	0.00	0.00	0.00	**0.02**	0.00
2	0.00	0.00	**0.02**	**0.03**	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	**0.03**	**0.03**	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	**0.03**	**0.03**	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	**0.03**	0.00	0.00	0.00	**0.02**	0.00
6	0.00	0.00	**0.02**	**0.03**	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	**0.03**	**0.04**	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	**0.03**	**0.03**	0.00	0.00	0.00	**0.03**	0.00
9	**0.03**	0.00	**0.02**	**0.03**	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	**0.03**	**0.03**	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	**0.02**	**0.03**	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	**0.04**	0.00	0.00	0.00	0.00	0.00	0.00
13	**0.02**	0.00	**0.04**	**0.03**	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	**0.03**	**0.03**	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	**0.03**	**0.03**	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	**0.03**	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	**0.03**	**0.02**	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	**0.03**	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	**0.02**	**0.02**	0.00	0.00	0.00	0.00	0.00
Count (n)	20	20	20	20	20	20	20	20	20
Average (mean) flux chamber concentration (ppm)	**0.003**	**0.000**	**0.022**	**0.028**	**0.000**	**0.000**	**0.000**	**0.004**	**0.000**
Flux chamber surface area (A) = 641.3 cm2 Flux chamber volume (V) = 9.937 x 10-3 m3 Incubation period (I) = 24 hours Conversion Factor from PH3 ppm to PH3 mg/m3 (@STP) = 1.39									
Mass Flux (mg) = Cfc (ppm) x CF x V	**3.45E-05**	**0.00E+00**	**3.04E-04**	**3.80E-04**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**4.83E-05**	**0.00E+00**
Flux Rate (mg/cm2/hour) = Mass Flux / A / I	**2.24E-09**	**0.00E+00**	**1.97E-08**	**2.47E-08**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**3.14E-09**	**0.00E+00**

TABLE 3-6
CERCLA AREAS
SLAG PIT AMBIENT AIR PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 1 of 1)

Location	Date	Time	PH3 Measurement (ppm) Sample Height AGS 1-2 inches	4-5 feet
Sample Location #1	7/20/2010	700	0.00	0.00
Sample Location #2	7/20/2010	700	0.00	0.00
Sample Location #3	7/20/2010	700	0.00	0.00
Sample Location #4	7/20/2010	700	0.00	0.00
Sample Location #5	7/20/2010	700	0.00	0.00
Sample Location #6	7/20/2010	700	0.00	0.00
Sample Location #7	7/20/2010	700	0.00	0.00
Sample Location #8	7/20/2010	700	0.00	0.00

TABLE 3-7
CERCLA AREAS
MANHOLE SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 1 of 1)

RA-B Storm Sewer Manhole Sampling			Sampling week of: August 9, 2010				
			PH3 (ppm)				
Manhole #	**Date**	**Time**	**Breathing Level Air**		**At Manhole Lid**		**Inside Manhole**
			Downwind	**Location**	**(max)**	**Location**	
1 *	8/10/2010	1430	0.00	NA	0.00	NA	0.00
2	8/10/2010	1435	0.00	NA	0.00	NA	0.00
3	8/10/2010	1440	0.00	NA	0.00	NA	**0.03**

* Manhole #1 was identified by SBT during site visit of 8/5/2010.

TABLE 3-8
CERCLA AREAS
SURFACE SCAN PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 1 of 3)

Field Method Detection Limit						Sampling week of:	July 26, 2010	
Date:	7/26/2010	Start Time:	1302			Wind Speed:	2.3 - 8 mph	
Weather Observations:					Partly cloudy.			
Location of Surface Scan:		Southeast of FMC Trailers						
Breathing Level PH3 (ppm):		0.00						
Minute:	**PH3 (ppm)**	**Area Flagged?[1]**	**Minute:**	**PH3 (ppm)**	**Area Flagged?[1]**	**Minute:**	**PH3 (ppm)**	**Area Flagged?[1]**
1	0.00							
2	0.00							
3	0.00							
4	0.00							
5	0.00							
6	0.00							
7	0.00							
8	0.00							

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

RA-C Underground Piping						Sampling week of:	July 26, 2010	
Date:	7/28/2010	Start Time:	1036			Wind Speed:	8 mph	
Weather Observations:					Partly cloudy.			
Location of Surface Scan:		RA-C west of furnace building.						
Breathing Level PH3 (ppm):		0.00						
Minute:	**PH3 (ppm)**	**Area Flagged?[1]**	**Minute:**	**PH3 (ppm)**	**Area Flagged?[1]**	**Minute:**	**PH3 (ppm)**	**Area Flagged?[1]**
1	0.00	No	11	0.00	No			
2	0.00	No	12	0.00	No			
3	0.00	No	13	0.00	No			
4	0.00	No	14	0.00	No			
5	0.00	No	15	0.00	No			
6	0.00	No						
7	0.00	No						
8	0.00	No						
9	0.00	No						
10	0.00	No						

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

TABLE 3-8
CERCLA AREAS
SURFACE SCAN PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 2 of 3)

RA-D Pond 1E					Sampling week of:	July 26, 2010		
Date:	7/28/2010	Start Time:	1300		Wind Speed:	5.6 mph		
Weather Observations:					Partly cloudy.			
Location of Surface Scan:			RA-D Pond 1E					
Breathing Level PH3 (ppm):			0.00					
Minute:	**PH3 (ppm)**	**Area Flagged?[1]**	**Minute:**	**PH3 (ppm)**	**Area Flagged?[1]**	**Minute:**	**PH3 (ppm)**	**Area Flagged?[1]**
1	0.00	No	12	0.00	No	23	0.00	No
2	0.00	No	13	0.00	No	24	0.00	No
3	0.00	No	14	0.00	No	25	0.00	No
4	0.00	No	15	0.00	No	26	0.00	No
5	0.00	No	16	0.00	No	27	0.00	No
6	0.00	No	17	0.00	No	28	0.00	No
7	0.00	No	18	0.00	No	29	0.00	No
8	0.00	No	19	0.00	No	30	0.00	No
9	0.00	No	20	0.00	No	31	0.00	No
10	0.00	No	21	0.00	No			
11	0.00	No	22	0.00	No			

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

RA-D Pond 4E					Sampling week of:	July 26, 2010		
Date:	7/28/2010	Start Time:	1430		Wind Speed:	5.8 mph		
Weather Observations:					Partly cloudy.			
Location of Surface Scan:			RA-D Pond 4E					
Breathing Level PH3 (ppm):			0.00					
Minute:	**PH3 (ppm)**	**Area Flagged?[1]**	**Minute:**	**PH3 (ppm)**	**Area Flagged?[1]**	**Minute:**	**PH3 (ppm)**	**Area Flagged?[1]**
1	0.00	No	12	0.00	No			
2	0.00	No	13	0.00	No			
3	0.00	No	14	0.00	No			
4	0.00	No	15	0.00	No			
5	0.00	No	16	0.00	No			
6	0.00	No	17	0.00	No			
7	0.00	No	18	0.00	No			
8	0.00	No						
9	0.00	No						
10	0.00	No						
11	0.00	No						

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

TABLE 3-8
CERCLA AREAS
SURFACE SCAN PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 3 of 3)

RA-D Pond 9S			Sampling week of:	July 26, 2010
Date:	7/28/2010	Start Time: 1100	Wind Speed:	2 mph
Weather Observations:		Partly cloudy.		
Location of Surface Scan:		RA-D Pond 9S		
Breathing Level PH3 (ppm):		0.00		

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	12	0.00	No			
2	0.00	No	13	0.00	No			
3	0.00	No	14	0.00	No			
4	0.00	No	15	0.00	No			
5	0.00	No	16	0.00	No			
6	0.00	No	17	0.00	No			
7	0.00	No	18	0.00	No			
8	0.00	No						
9	0.00	No						
10	0.00	No						
11	0.00	No						

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

RA-F1 Railcar Area			Sampling week of:	August 2, 2010
Date:	8/3/2010	Start Time: 1355	Wind Speed:	4 mph
Weather Observations:		Clear		
Location of Surface Scan:		RA-F1 near SG probe 1-3		
Breathing Level PH3 (ppm):		0.00		

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	11	0.00	No			
2	0.00	No	12	0.00	No			
3	0.00	No	13	0.00	No			
4	0.00	No	14	0.00	No			
5	0.00	No	15	0.00	No			
6	0.00	No	16	0.00	No			
7	0.00	No	17	0.00	No			
8	0.00	No						
9	0.00	No						
10	0.00	No						

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

TABLE 3-9
CERCLA AREAS
CRUSHED COKE TEST PH3 MEASUREMENT RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 1 of 1)

Crushed Coke PH3 Test						
		PH3 Measurement (ppm)				
			Crushed Coke Sample			
Date	Time	Breathing Level Air	First	Second	Third	Average
8/9/2010	1336	0.00	0.00	0.00	0.00	0.00
Approximately 40 ml of coke nodules (taken from the slag ladling area in the slag pile) was crushed to 50% fines and 50% < 1/2-inch within a bag. Head space was measured using a Draeger Pac III meter (0-20 ppm range).						

4.0 RCRA Pond Areas

4.1 INTRODUCTION

The RCRA Pond areas included in the site-wide gas assessment scope of work included all of the RCRA Ponds (8E, 9E, 8S, Phase IV, 15S, 17, 18 Cell A) with the exception of Pond 16S which is being monitored under the Pond 16S UAO. A summary of the RCRA Ponds are presented in Table 2-4. Based upon the current conceptual model for the RCRA ponds, the most direct pathway for PH3 gas to release from the RCRA ponds is 1) from a temperature monitoring point (TMP) if improperly sealed, and/or 2) through the soil pore-space between the cap liner anchor trench and the pond liner anchor trench. The second release pathway may result in releases through other paths of least resistance, i.e., the evapo-transpiration (ET) cap drainage collection system as has been observed at Pond 15S. The approach to performing PH3 measurements was the same for all of these RCRA Ponds and included perimeter soil gas sampling, perimeter surface scans, TMP sampling, perimeter piping sampling, and sump sampling. Conditions within each RCRA pond are evaluated in the following subsections:

1. Site Description – discusses the potential for the presence of PH3 based on the Pond's historic activities.

2. Problem Statements – includes objectives and rationale for the field programs conducted within the pond area from the EPA-approved *Field Modification #15 Work Plan*.

3. Investigation Results – presents summary data tables from the site-wide gas sampling activities. These results from each of the programs are discussed for each of the sampling programs conducted at each pond.

4. Contamination Assessment – presents evaluations and implications of the results in each of the ponds.

4.2 POND 8E SAMPLING RESULTS AND EVALUATION

4.2.1 Pond 8E Site Description

Pond 8E, Waste Management Unit (WMU) #11, is a triangular-shaped pond of 4.1 acres and original capacity of 27 acre-feet. This pond was constructed with a 30-mil PVC double-liner system equipped with a leachate collection, detection and removal system (LCDRS) between the two liners. Pond 8E was put into operation in 1984, primarily to store and consolidate precipitator slurry prior to transfer to Pond 9E (WMU #9). The pond was eventually filled with lime-treated (NOSAP) precipitator slurry, although some residual non-lime-treated precipitator slurry and phossy solids also remained. Pond 8E last received waste in 1997 with a final waste inventory estimated to be 27 acre-feet at closure.

Pond 8E was closed using a "RCRA engineered cap" (as described above), consistent with the *Pond 8E Closure Plan* as approved by EPA in January 2003. The cover construction was completed in November 2004, and FMC certified closure completion in January 2005.

4.2.2 Pond 8E Problem Statement

PH3 may be accumulating beneath the Pond 8E final cap and within cap features (e.g., sumps and piping) and possibly fluxing to the atmosphere. As a result of the potential for PH3/GOPC accumulation, the following field programs were performed at Pond 8E.

- Industrial Hygiene (Ambient Air) Monitoring
- Soil Gas Monitoring
- Perimeter Scans
- TMP Enclosure Monitoring
- Sump Monitoring
- TMP Sampling
- Perimeter Piping Monitoring

4.2.3 Pond 8E Investigation Results

4.2.3.1 Industrial Hygiene (Ambient Air) Monitoring

Measurements of PH3 in the breathing level for IH purposes were recorded prior to the investigations at Pond 8E. The field teams were also required to report the location and concentration should a personnel monitor alarm be sounded. No personal alarms were sounded during sampling at Pond 8E. Fifteen (15) breathing zone measurement were collected prior to the various investigations and all measurements were 0.00 ppm PH3 as shown on Tables 4-1 to 4-7.

4.2.3.2 Soil Gas Monitoring

Soil gas monitoring around the perimeter of Pond 8E included sampling of nine soil gas probe locations as shown on Figure 4-1. Three PH3 readings using a Draeger Pac III field instrument (0-20 ppm range) were recorded per location, and the average reading was calculated. Samples were collected once from each location. A total of 27 individual soil gas measurements were collected from the nine probes as reported on Table 4-1. No detectable measurements (0.00 ppm PH3) were recorded in any of the nine soil gas probes.

4.2.3.3 Perimeter Scans

The perimeter scan methodology (as described in Section 2.2.5) was similar to the scans used at the CERCLA areas. A total of 40 measurements were logged in the Pond 8E cap

perimeter area and all PH3 readings were 0.00 ppm as reported on Table 4-2. As a result, no surface scan of the 8E cap surface was required.

4.2.3.4 TMP Enclosure Monitoring

Measurements of PH3 in the air around and within each of the four TMPs were performed to monitor for potential releases of PH3 from the TMP. Measurements were collected from outside the enclosure at the top of the TMP, outside of the enclosure above the cap surface, and within the enclosure. The measurements collected outside of the TMPs were all 0.00 ppm PH3. Measurements from inside the enclosure were non-detect (0.00 ppm PH3) at TMPs 8E-2 and 8E-4. A detection of 0.03 ppm PH3 and 2.64 ppm PH3 was recorded within TMPs 8E-1 and 8E-3, respectively as listed on Table 4-3. Both of these detections were traced back to a remnant of the construction of the concrete pad upon which the TMP enclosures sit, and the superfluous PVC conduits have since been sealed with grout, as discussed during the conference call with EPA to review the weekly report on August 4, 2010.

4.2.3.5 Sump Monitoring

Pond 8E has one LCDRS sump that was monitored. Similar to the TMP enclosure sampling, readings were collected at the breathing zone level, right above the sump lid, and within the sump enclosure. Measurements of PH3 at all three locations were 0.00 ppm PH3 for 8E LCDRS-1 as shown on Table 4-4.

4.2.3.6 TMP Sampling

All four TMPs at Pond 8E were sampled for PH3 and one of the TMPs, TMP 8E-4, was sampled for both PH3 and GOPCs. As all the TMP PH3 screening level results were below 10,000 ppm PH3, direct measurements were collected from each TMP as presented on Table 4-5. The lowest PH3 concentration was detected from TMP 8E-1 with an average concentration of 211 ppm PH3. The other three locations had considerably higher average concentrations, which ranged from 1,481 ppm PH3 in TMP 8E-3 to 4,548 ppm PH3 in TMP 8E-2.

In addition, to PH3 measurements, samples for GOPCs were collected from TMP 8E-4. Both H2S and HF were detected in TMP 8E-4 in both the primary and duplicate samples (see Table 4-6). The concentration of H2S was 4.74 ppm and 19.8 ppm in the primary and duplicate sample, respectively, which are below the PEL of 20 ppm and the 10-minute maximum exposure of 50 ppm. The concentration of HF was 7.86 and 9.36 ppm, respectively. The HF values are greater than the PEL of 3 ppm but well below the IDLH of 30 ppm. It is important to note that HCN was not detected in TMP 8E-4.

4.2.3.7 Perimeter Piping Sampling

Three individual measurements of the pond perimeter piping were collected and the average calculated at Pond 8E. As the screening level measurement was below 10,000 ppm (1,300 ppm PH3), a direct measurement was collected and was 1,800 ppm PH3 as listed in Table 4-7.

4.2.4 Pond 8E Contamination Assessment

The site-wide gas assessment findings support that PH3 is accumulating underneath the final cap as evidenced by the TMP and perimeter piping PH3 concentrations; however, PH3 does not appear to be fluxing to the environment at levels that could potentially be harmful to site workers or the environment. The conclusion is based on the soil gas readings and perimeter scans (all 0.00 ppm PH3 measurements). However, Pond 8E is subject to the 2010 UAO and will be addressed under this UAO.

4.3 POND 9E SAMPLING RESULTS AND EVALUATION

4.3.1 Pond 9E Site Description

Pond 9E is a rectangular-shaped pond of 12.9 acres and original capacity of 70 acre-feet. This pond was constructed with a 30-mil PVC double-liner system equipped with a LCDRS between the two liners. Pond 9E was put into operation in 1986, primarily to store and consolidate precipitator slurry for solar drying. Pond 9E last received RCRA hazardous wastes in January 1994. The pond was eventually dredged of solids (to the extent practicable) and those were placed into Pond 16S (WMU #10). The residual solids (determined to be non-hazardous) were allowed to dry with a final waste inventory estimated to be 17 acre-feet at closure. In 1996, FMC began preparations to place Pond 9E into non-hazardous waste service by placing a layer of bentonite clay, a layer of geotextile fabric, and a protective layer of slag over the dried residual solids. In October 1996, EPA requested that FMC discontinue the preparation of Pond 9E for transition to non-hazardous service.

Pond 9E was closed using a “RCRA engineered cap” (as described above), consistent with the *Pond 9E Closure Plan* as approved by EPA in March 2000. The cover construction was completed in December 2000, and FMC certified closure completion in January 2001

4.3.2 Pond 9E Problem Statement

PH3 may be accumulating beneath the Pond 9E final cap and within cap features (e.g., sumps and piping) and possibly fluxing to the atmosphere. As a result of the potential for PH3/GOPC accumulation, the following field programs were performed at Pond 9E.

- Industrial Hygiene (Ambient Air) Monitoring
- Soil Gas Monitoring
- Perimeter Scans
- TMP Enclosure Monitoring
- Sump Monitoring
- TMP Sampling

- Perimeter Piping Monitoring

4.3.3 Pond 9E Investigation Results

4.3.3.1 Industrial Hygiene (Ambient Air) Monitoring

Measurements of PH3 in the breathing level for IH purposes were recorded prior to the investigations at Pond 9E. The field teams were also required to report the location and concentration should a personnel monitor alarm be sounded. No personal alarms were sounded during sampling at Pond 9E. Twenty (20) breathing zone measurements were collected prior to the various investigations and all measurements were 0.00 ppm PH3 as shown on Tables 4-1 to 4-7.

4.3.3.2 Soil Gas Monitoring

Soil gas monitoring around the perimeter of Pond 9E included sampling of 17 soil gas probe locations as shown on Figure 4-2. Three PH3 readings using a Draeger Pac III field instrument (0-20 ppm range) were recorded per location, and the average reading was calculated. A total of 51 individual soil gas measurements were collected from the 17 probes as reported on Table 4-1. No detectable measurements (0.00 ppm PH3) were recorded in any of the 17 soil gas probes.

4.3.3.3 Perimeter Scans

The perimeter scan methodology (as described in Section 2.2.5) was similar to the scans used at the CERCLA areas. A total of 40 measurements were logged in the Pond 9E cap perimeter area and all PH3 readings were 0.00 ppm as reported on Table 4-2. As a result, no surface scan of the 9E cap surface was required.

4.3.3.4 TMP Enclosure Monitoring

Measurements of PH3 in the air around and within each of the 10 TMPs were performed to monitor for potential releases of PH3 from the TMP. Measurements were collected from outside the enclosure at the top of the TMP, outside of the enclosure above the cap surface, and within the enclosure. All measurements collected outside and within each of the 10 TMPs were 0.00 ppm PH3 as shown on Table 4-3.

4.3.3.5 Sump Monitoring

Six LCDRS sumps were monitored at Pond 9E. Similar to the TMP enclosure sampling, readings were collected at the breathing zone level, right above the sump lid, and within the sump enclosure. Measurements of PH3 were 0.00 ppm PH3 from outside and within the six sumps as shown on Table 4-4.

4.3.3.6 TMP Sampling

One of the 10 TMPs at Pond 9E (TMP 9E-7) was sampled for PH3. As the TMP PH3 screening level results were below 10,000 ppm PH3 (average screening result of 5.33 ppm PH3), direct measurements were collected from the TMP as presented on Table 4-5. The average PH3 concentration was 6.20 ppm.

4.3.3.7 Perimeter Piping Sampling

Three individual measurements of the pond perimeter piping were collected and the average calculated at Pond 9E. Both the screening level measurement and the direct measurement were 0.00 ppm PH3 for all individual readings as listed in Table 4-7.

4.3.4 Pond 9E Contamination Assessment

The site-wide gas assessment findings support that PH3 is not appreciably accumulating underneath the final cap as supported by the TMP PH3 concentration of 6.2 ppm PH3 and the perimeter piping concentration of 0.00 ppm PH3. The pond also does not appear to be fluxing PH3 to the environment at levels that could potentially be harmful to site workers or the environment as the soil gas and perimeter scans measurements were all 0.00 ppm PH3.

4.4 POND 8S SAMPLING RESULTS AND EVALUATION

4.4.1 Pond 8S Site Description

Pond 8S is tear-drop-shaped pond of 3.2 acres and original capacity of 70 acre-feet. This pond was constructed without any liner or leachate collection systems. Pond 8S was put into operation in 1970, primarily for the management of phossy water, although some precipitator slurry was also placed in the pond during the first year of operation. Pond 8S received wastes until 1993.

The final waste inventory was estimated to be 44 acre-feet at closure. Pond 8S was closed using a “RCRA double cap” (including an ET cap as described above), consistent with the *Pond 8S Closure Plan* as approved by EPA in August 1998. The cover construction was completed in October 1999, and FMC certified closure completion in December 1999.

4.4.2 Pond 8S Problem Statement

PH3 may be accumulating beneath the Pond 8S final cap and within cap features (e.g., sumps and piping) and possibly fluxing to the atmosphere. As a result of the potential for PH3/GOPC accumulation, the following field programs were performed at Pond 8S.

- Industrial Hygiene (Ambient Air) Monitoring
- Soil Gas Monitoring
- Perimeter Scans
- TMP Enclosure Monitoring
- Sump Monitoring
- TMP Sampling
- Perimeter Piping Monitoring

4.4.3 Pond 8S Investigation Results

4.4.3.1 Industrial Hygiene (Ambient Air) Monitoring

Measurements of PH3 in the breathing level for IH purposes were recorded prior to the investigations at Pond 8S. The field teams were also required to report the location and concentration should a personnel monitor alarm be sounded. No personal alarms were sounded during sampling at Pond 8S. Twelve (12) breathing zone measurements were collected prior to the various investigations and all measurements were 0.00 ppm PH3 as shown on Tables 4-1 to 4-7.

4.4.3.2 Soil Gas Monitoring

Soil gas monitoring around the perimeter of Pond 8S included sampling of nine soil gas probe locations as shown on Figure 4-3. Three PH3 readings using a Draeger Pac III field instrument (0-20 ppm range) were recorded per location, and the average reading was calculated. A total of 27 individual soil gas measurements were collected from the nine probes as reported on Table 4-1. No detectable measurements (0.00 ppm PH3) were recorded in any of the nine soil gas probes.

4.4.3.3 Perimeter Scans

The perimeter scan (as described in Section 2.2.5) was similar to the scans used at the CERCLA areas. A total of 39 measurements were logged in the Pond 8S cap perimeter area and all PH3 readings were 0.00 ppm as reported on Table 4-2. As a result, no surface scan of the 8S cap surface was required.

4.4.3.4 TMP Enclosure Monitoring

Measurements of PH3 in the air around and within each of the four TMPs were performed to monitor for potential releases of PH3 from the TMP. Measurements were collected from outside the enclosure at the top of the TMP, outside of the enclosure above the cap surface, and within the enclosure. All measurements collected outside and within each of the four TMPs were 0.00 ppm PH3 as listed in Table 4-3.

4.4.3.5 Sump Monitoring

Two ET cap drainage sumps were monitored at Pond 8S. Similar to the TMP enclosure sampling, readings were collected at the breathing zone level, right above the sump lid, and within the sump enclosure. Measurements of PH3 were 0.00 ppm PH3 from outside and within the two sumps as reported in Table 4-4.

4.4.3.6 TMP Sampling

One of the four TMPs (TMP 8S-1) at Pond 8S was sampled for PH3. As the TMP PH3 screening level result was below 10,000 ppm PH3 (average screening result of 2,116 ppm PH3), a direct measurements was collected from the TMP as presented on Table 4-5. The average PH3 concentration was 2,755 ppm PH3.

4.4.3.7 Perimeter Piping Sampling

Three individual measurements of the pond perimeter piping were collected and the average calculated at Pond 8S. As the screening level measurement was below 10,000

ppm (637 ppm PH3), a direct measurement was collected and the average concentration was 978 ppm PH3.

4.4.4 Pond 8S Contamination Assessment

The site-wide gas assessment findings support that PH3 is accumulating underneath the final cap as evidenced by the TMP and perimeter piping PH3 concentrations; however, PH3 does not appear to be fluxing to the environment at levels that could potentially be harmful to site workers or the environment. The conclusion is based on the soil gas readings and perimeter scans (all 0.00 ppm PH3 measurements).

4.5 PHASE IV PONDS SAMPLING RESULTS AND EVALUATION

4.5.1 Phase IV Ponds Site Description

The Phase IV Ponds consist of a series of four separate ponds (Ponds 11S, 12S, 13S, and 14S) of 8.9 total acres and a combined original capacity of 94 acre-feet. These ponds were constructed with a single 30-mil PVC liner and a leachate detection system that consisted of lysimeters (although this detection system is considered to be non-functional, likely due to crushed lysimeters). The Phase IV Ponds were put into operation in 1980 to receive, clarify, and recycle phossy water. Ponds 11S, 12S, and 13S were used to settle out solids from the wastewater by gravity separation. Pond 14S was primarily a surge pond for clarified water prior to recycle back to the manufacturing process. Although Ponds 11S, 12S, and 13S were periodically dredged to Pond 15S (and later Pond 16S), phossy solids containing P4 remained in these ponds at the time of closure. The Phase IV ponds last received process wastes 1998 with a final waste inventory estimated to be 43 acre-feet at closure.

The Phase IV ponds were closed using a “RCRA double cap” (including an ET cap as described above), consistent with the *Phase IV Pond Closure Plan* as approved by EPA in March 2003. The cover construction was completed in November 2004, and FMC certified closure completion in January 2005.

4.5.2 Phase IV Ponds Problem Statement

PH3 may be accumulating beneath the Phase IV Ponds final cap and within cap features (e.g., sumps and piping) and possibly fluxing to the atmosphere. As a result of the potential for PH3/GOPC accumulation, the following field programs were performed at the Phase IV Ponds.

- Industrial Hygiene (Ambient Air) Monitoring
- Soil Gas Monitoring
- Perimeter Scans
- TMP Enclosure Monitoring

- Sump Monitoring
- TMP Sampling
- Perimeter Piping Monitoring

4.5.3 Phase IV Ponds Investigation Results

4.5.3.1 Industrial Hygiene (Ambient Air) Monitoring

Measurements of PH3 in the breathing level for IH purposes were recorded prior to the investigations at the Phase IV Pond. The field teams were also required to report the location and concentration should a personnel monitor alarm be sounded. No personal alarms were sounded during sampling at the Phase IV Ponds. Twenty-two (22) breathing zone measurements were collected prior to the various investigations and all measurements were 0.00 ppm PH3 as shown on Tables 4-1 to 4-7.

4.5.3.2 Soil Gas Monitoring

Soil gas monitoring around the perimeter of the Phase IV Ponds included sampling of 15 soil gas probe locations as shown on Figure 4-4. Three PH3 readings using a Draeger Pac III field instrument (0-20 ppm range) were recorded per location, and the average reading was calculated. Of the 45 individual soil gas measurements collected, all measurements were 0.00 ppm PH3 as presented in Table 4-1.

4.5.3.3 Perimeter Scans

The surface scan methodology (as described in Section 2.2.5) was similar to the scans used at the CERCLA areas. A total of 99 measurements were logged around the Phase IV Ponds cap perimeter area and all PH3 readings were 0.00 ppm as reported on Table 4-2. As a result, no surface scan of the Phase IV Ponds cap surface was required.

4.5.3.4 TMP Enclosure Monitoring

Measurements of PH3 in the air around and within each of the 13 TMPs were performed to monitor for potential releases of PH3 from the TMP. Measurements were collected from outside the enclosure at the top of the TMP, outside of the enclosure above the cap surface, and within the enclosure. All measurements collected outside and within each of the 13 TMPs were 0.00 ppm PH3 as listed in Table 4-3.

4.5.3.5 Sump Monitoring

Four ET cap drainage sumps were monitored at the Phase IV Ponds. Similar to the TMP enclosure sampling, readings were collected at the breathing zone level, right above the sump lid, and within the sump enclosure. Measurements of PH3 were 0.00 ppm PH3 from outside and within the four sumps as reported in Table 4-4.

4.5.3.6 TMP Sampling

Five of the 13 TMPs at the Phase IV Ponds were sampled for PH3 (TMPs Phase IV-1, -4, -7, -8, -11) and one of the TMPs, TMP Phase IV-7, was sampled for both PH3 and GOPCs. As noted in Section 2.2.14, gas was unable to be extracted from TMP Phase IV-

1 on Pond 14S. Extraction of gas from this TMP had not been attempted in the past. It should be noted that this TMP (as with all TMPs) was not designed for gas extraction, but for containment of a temperature sensor for monitoring temperature within the pond cover system, as required in the *Phase IV Pond and Pond 15S Post-Closure Plan*. The temperature sensor did not appear to be affected.

As the TMP PH3 screening level results were below 10,000 ppm PH3 in TMP-4, TMP-7 and TMP-11, direct measurements were collected from each TMP as presented on Table 4-5. The lowest PH3 concentration was detected from TMP-4 (Pond 13S) with an average concentration of 87 ppm PH3. TMP-11 (Pond 11S) had an average concentration of 485 ppm PH3, while TMP-7 (Pond 12S) had a considerably higher average concentration of 2,150 ppm PH3. One of the TMPs had a screening level result greater than 10,000 ppm PH3 so no direct reading was attempted. The average screening level measurement from TMP-8 (Pond 12S) was 14,528 ppm PH3.

In addition, to PH3 measurements, samples for GOPCs were collected from TMP Phase IV-7. Both H2S and HF were detected in TMP Phase IV-7 with a H2S concentration of 0.204 ppm and a HF concentration 1.609 ppm as reported on Table 4-6. This H2S concentration is below the PEL 20 ppm and the IDLH of 50 ppm. The concentration of HF was below the PEL of 3 ppm and below the IDLH of 30 ppm. It is important to note that HCN was not detected in TMP Phase IV-7.

4.5.3.7 Perimeter Piping Sampling

Measurements of the pond perimeter piping were collected from each of Phase IV ponds (11S, 12S, 13S, and 14S). As the screening level measurements were below 10,000 ppm, from the perimeter piping at all four ponds direct measurements were collected. Ponds 11S, 13S, and 14S all reported low concentrations ranging from 0.00 ppm PH3 at Pond 14S to 15.67 ppm PH3 at Pond11S (see Table 4-7). The PH3 concentration from the perimeter piping around Pond 12S was higher than the other ponds with an average concentration of 732 ppm PH3.

4.5.4 Phase IV Ponds Contamination Assessment

The site-wide gas assessment findings support that PH3 is accumulating underneath the final cap as evidenced by the TMP and perimeter piping PH3 concentrations; however, PH3 does not appear to be fluxing to the environment at levels that could potentially be harmful to site workers or the environment. The conclusion is based on the soil gas readings and perimeter scans (all 0.00 ppm PH3 measurements). Furthermore, the H2S and HF in the Phase IV pond gases are 1) below regulatory limits, 2) below 10% of the LEL, and 3) do not pose a threat to human health or the environment. It is proposed that that these GOPCs be eliminated from future consideration as a GOC at the Phase IV Ponds.

4.6 POND 15S SAMPLING RESULTS AND EVALUATION

4.6.1 Pond 15S Site Description

Pond 15S is a rectangular-shaped pond of 9.4 acres and original capacity of 140 acre-feet. This pond was constructed with a 30-mil PVC double-liner system equipped with a LCDRS between the two liners. Pond 15S was put into operation in 1982, primarily to receive wastewater from the Pond 8S P4 recovery process, phossy wastes from dredging of the Phase IV ponds, and decant water from Pond 9E. Pond 15S last received process wastes in September 1993 with a final waste inventory estimated to be 140 acre-feet at closure.

Pond 15S was closed using a "RCRA double cap" (including an ET cap as described above) consistent with the *Pond 15S Closure Plan* as approved by EPA in January 2003. The cover construction was completed in November 2004, and FMC certified closure completion in January 2005.

FMC voluntarily began gas extraction on Pond 15S in April 2010. Gas extraction has continued on the perimeter piping of Pond 15S since that time.

4.6.2 Pond 15S Problem Statement

PH3 may be accumulating beneath the Pond 15S final cap and within cap features (e.g., sumps and piping) and possibly fluxing to the atmosphere. As a result of the potential for PH3/GOPC accumulation, the following field programs were performed at Pond 15S.

- Industrial Hygiene (Ambient Air) Monitoring
- Soil Gas Monitoring
- Perimeter Scans
- TMP Enclosure Monitoring
- Sump Monitoring
- TMP Sampling
- Perimeter Piping Monitoring

4.6.3 Pond 15S Investigation Results

4.6.3.1 Industrial Hygiene (Ambient Air) Monitoring

Measurements of PH3 in the breathing level for IH purposes were recorded prior to the investigations at Pond 15S. The field teams were also required to report the location and concentration should a personnel monitor alarm be sounded. No personal alarms were sounded during sampling at Pond 15S. Twenty five (25) breathing zone measurements were collected prior to the various investigations and all measurements were 0.00 ppm

PH3 as shown on Tables 4-1 to 4-7.

4.6.3.2 Soil Gas Monitoring

Soil gas monitoring around the perimeter of Pond 15S included sampling of 15 soil gas probe locations as shown on Figure 4-5. Three PH3 readings using a Draeger Pac III field instrument (0-20 ppm range) were recorded per location, and the average reading was calculated.

Approximately half of the soil gas probes (eight of 17) had concentrations of 0.00 ppm PH3 as listed on Table 4-1. The average concentrations from the other seven probes ranged from 0.02 to 128 ppm PH3. The highest concentration was reported at 15S-12, located at the south central/southwest portion of the pond. The two probes to the east of this location, 15S-13 and 15S-14, had elevated PH3 concentrations of 34 and 1.08 ppm PH3, respectively. However, the probe to the west, 15S-11, had a measurement of 0.05 ppm PH3. The detections in two soil gas probes on the north side of Pond 15S (15S-2 and 15S-3) were less than on the south side and were 0.02 and 0.14 ppm PH3.

4.6.3.3 Perimeter Scans

The perimeter scan methodology (as described in Section 2.2.5) was similar to the scans used at the CERCLA areas. A total of 88 measurements were logged around Pond 15S cap perimeter area and all but three of the PH3 readings were 0.00 ppm as reported on Table 4-2. Three measurement locations were flagged during the perimeter scans. The measurements were 0.03, 0.07 and 0.51 ppm PH3. These locations are shown on Figure 4-5. As a result, a surface scan of the Pond 15S cap surface was required and is discussed below.

4.6.3.4 Cap Scans

Based on three flagged areas during the perimeter surface scan, the entire cap surface of Pond 15S was scanned. The cap surface was divided into nine sampling grid cells and several measurements were collected in each sampling grids according to the methods and procedures described in Section 2.2.5. There were no detections of PH3 (0.00 ppm PH3) from any of the sampling cells on the Pond 15S cap surface as reported on Table 4-8.

4.6.3.5 TMP Enclosure Monitoring

Measurements of PH3 in the air around and within each of the 10 TMPs on Pond 15S were performed to monitor for potential releases of PH3 from the TMP. Measurements were collected from outside the enclosure at the top of the TMP, outside of the enclosure above the cap surface, and within the enclosure. All measurements collected outside and within each of the 10 TMPs were 0.00 ppm PH3 as shown on Table 4-3.

4.6.3.6 Sump Monitoring

Four LCDRS sumps and two ET cap drainage sumps were monitored at the Pond 15S. Similar to the TMP enclosure sampling, readings were collected at the breathing zone level, right above the sump lid, and within the sump enclosure. Measurements of PH3

from the four LCDR sumps were 0.00 ppm PH3 from outside and within the sumps as shown on Table 4-4. At the two ET cap drainage sumps, no PH3 was detected outside of

the sumps; however, measurements of 0.34 and 2.64 ppm PH3 were reported in sumps LS-01, and LS-02, respectively.

4.6.3.7 TMP Sampling

Eight of the 10 TMPs on Pond 15S were to be sampled for PH3 (TMPs 15S-1, 15S-2, 15S-5,15S -6, 15S-7, 15S-8, 15S-9, 15S-10) and four of the TMPs, TMP 15S-1, 15S-2, 15-5, and 15S-6, were to be sampled for both PH3 and GOPCs. As noted in Section 2.2.14, gas was unable to be extracted from TMPs 15S-8, 15S-9, and 15S-10. Extraction of gas from these TMPs had not been attempted in the past. It should be noted that these TMPs (as with all TMPs) were not designed for gas extraction, but for containment of a temperature sensor for monitoring temperature within the pond cover system, as required in the *Phase IV Pond and Pond 15S Post-Closure Plan*. The temperature sensors did not appear to be affected.

The TMP PH3 screening level results in the five TMPs that were sampled were all greater than 10,000 ppm PH3; therefore, no direct measurements were attempted as shown on Table 4-5. The screening level measurements ranged from 68,282 ppm PH3 in 15S-5 to 169,701 ppm PH3 is 15S-7. The second highest screening level measurement was reported in TMP 15S-1 and was 141,092 ppm PH3.

Both H2S and HCN were below the reporting limits at the four TMPs (15S-1, 15S-2, 15S-5, and 15S-6) sampled on Pond 15S as shown on Table 4-6. However, accounting for dilution during the GOPC sampling, the reporting limits were greater than the H2S PEL 20 ppm and IDLH of 100 ppm for most of the samples. Two of four TMPs had concentrations of HF greater than the reporting limit. The HF concentrations in the primary and duplicate sample from TMP 15S-2 were 68 and 125 ppm, respectively. These concentrations are higher than the HF PEL of 3 ppm and the IDLH value of 30 ppm. The highest HF concentration was found in TMP 15S-5 and was 173 ppm.

4.6.3.8 Perimeter Piping Sampling

Three individual measurements of the pond perimeter piping were collected and the average calculated at Pond 15S. As the screening level measurement was less than 10,000 ppm (5,422 ppm PH3), a direct measurement was collected. The average direct measurement was 4,391 ppm PH3 as reported on Table 4-7.

4.6.4 Pond 15S Contamination Assessment

The site-wide gas assessment findings show that PH3 is present at high concentrations beneath the Pond 15S RCRA pond cap, and is clearly the primary gas of concern. This pond is subject to the 2010 UAO and will be addressed under this UAO.

4.7 POND 17 SAMPLING RESULTS AND EVALUATION

4.7.1 Pond 17 Site Description

Pond 17 is a rectangular-shaped pond of 9 acres and original capacity of 85 acre-feet. This pond was constructed with a 30-mil PVC double-liner system equipped with a leachate collection, detection and removal system (LCDRS) between the two liners. Pond 17 was put into operation in 1998 and, as prescribed by the July 1999 RCRA Consent Decree, received only on specification NOSAP lime-treated precipitator slurry. Pond 17 last received waste in 2001 with a final waste inventory estimated to be 59 acre-feet at closure.

Pond 17 was closed using a "RCRA engineered cap" (as described above), consistent with the *Pond 17 Closure Plan* that EPA approved in February 2005. The cover construction was completed in November 2005, and FMC certified closure completion in December 2005.

4.7.2 Pond 17 Problem Statement

PH3 may be accumulating beneath the Pond 17 final cap and within cap features (e.g., sumps and piping) and possibly fluxing to the atmosphere. As a result of the potential for PH3/GOPC accumulation, the following field programs were performed at Pond 17.

- Industrial Hygiene (Ambient Air) Monitoring
- Soil Gas Monitoring
- Perimeter Scans
- TMP Enclosure Monitoring
- Sump Monitoring
- TMP Sampling
- Perimeter Piping Monitoring

4.7.3 Pond 17 Investigation Results

4.7.3.1 Industrial Hygiene (Ambient Air) Monitoring

Measurements of PH3 in the breathing level for IH purposes were recorded prior to the investigations at Pond 17. The field teams were also required to report the location and concentration should a personnel monitor alarm be sounded. No personal alarms were sounded during sampling at Pond 17. Eighteen (18) breathing zone measurements were collected prior to the various investigations and all measurements were 0.00 ppm PH3 as shown on Tables 4-1 to 4-7.

4.7.3.2 Soil Gas Monitoring

Soil gas monitoring around the perimeter of Pond 17 included sampling of 11 soil gas probe locations as shown on Figure 4-6. Three PH3 readings using a Draeger Pac III field instrument (0-20 ppm range) were recorded per location, and the average reading was calculated. Samples were collected once from each location.

All but one of the soil gas probes reported concentration of PH3 as reported on Table 4-1. All three individual measurements from soil gas probe 17-6 were 0.00 ppm PH3. The average concentrations from the other 10 probes ranged from 0.06 to 171 ppm PH3. The highest concentration was reported at 17-7 on the eastern side of the pond. However, the probes on either side of this probe, 17-6 and 17-8 had concentrations of 0.00 and 0.06 ppm PH3, respectively. The second highest concentration was from probe 17-11 and was 7.90 ppm PH3. This probe is located in the southeast corner of the pond.

4.7.3.3 Perimeter Scans

The perimeter scan methodology (as described in Section 2.2.5) was similar to the scans used at the CERCLA areas. A total of 50 measurements were logged around Pond 17 cap perimeter area and all PH3 readings were 0.00 ppm as presented in Table 4-2. As a result, no surface scan of the Pond 17 cap surface was required.

4.7.3.4 TMP Enclosure Monitoring

Measurements of PH3 in the air around and within each of the six TMPs on Pond 17 were performed to monitor for potential releases of PH3 from the TMP. Measurements were collected from outside the enclosure at the top of the TMP, outside of the enclosure above the cap surface, and within the enclosure. All measurements collected outside and within each of the six TMPs were 0.00 ppm PH3 as shown on Table 4-3.

4.7.3.5 Sump Monitoring

One LCDRS sump was monitored at the Pond 17. Similar to the TMP enclosure sampling, readings were collected at the breathing zone level, right above the sump lid, and within the sump enclosure. Measurements of PH3 were 0.00 ppm PH3 from outside and within the sump shown on Table 4-4.

4.7.3.6 TMP Sampling

Five of the six TMPs on Pond 17 were sampled for PH3 (TMPs 17-1, -2, -4, -5, -6) and one of the TMPs, TMP 17-2, was sampled for both PH3 and GOPCs. The TMP PH3 screening level results were below 10,000 ppm PH3 in TMP 17-4 and TMP 17-6; therefore, direct measurements were collected from these two TMPs as presented on Table 4-5. The lowest PH3 concentration was detected from TMP 17-6 with an average concentration of 1,661 ppm PH3. TMP 17-4 had an average concentration of 4,800 ppm PH3. The other three TMPs had screening level results greater than 10,000 ppm PH3, and as a result, no direct readings were attempted. The highest concentration was reported in TMP 17-1 (18,001 ppm PH3), followed by concentrations of 12,129 and 10,352 ppm PH3 in TMP 17-5 and TMP 17-2, respectively. Both TMP 17-4 and TMP 17-5 are located nearest soil gas probe 17-2, which was the soil gas probe with the highest PH3 concentration.

Both H2S and HF were detected in TMP 17-2 in both the primary and duplicate samples. The concentration of H2S was 684 ppm and 561 ppm in the primary and duplicate sample, respectively (see Table 4-6). These concentrations exceed the H2S PEL of 20 ppm and the IDLH of 100 ppm but are below 10% of the LEL. The concentrations of HF were 738 and 816 ppm in the primary and duplicate samples, respectively. Both the HF PEL of 3 ppm and the IDLH of 30 ppm were exceeded in TMP 17-2. Note that HCN was not detected in TMP 17-2.

4.7.3.7 Perimeter Piping Sampling

Three individual measurements of the pond perimeter piping were collected and the average calculated at Pond 17. As the screening level measurement was above 10,000 ppm, no direct measurement was attempted. The average screening level concentration was 18,007 ppm as reported on Table 4-7.

4.7.4 Pond 17 Contamination Assessment

The site-wide gas assessment findings show that PH3 is present at high concentrations beneath the Pond 18A RCRA pond cap, and is clearly the primary gas of concern. This pond is subject to the 2010 UAO and will be addressed under this UAO.

4.8 POND 18A SAMPLING RESULTS AND EVALUATION

4.8.1 Pond 18A Site Description

Pond 18 Cell A is a rectangular-shaped pond of 3.8 acres and original capacity of 40 acre-feet. This pond was constructed with a 30-mil PVC double-liner system equipped with a LCDRS between the two liners. Note that Pond 18 Cell B was closed by removal of all waste materials. Pond 18 Cell A was put into operation in 1998 to receive phossy water and minor amounts of off-specification lime-treated precipitator slurry. Pond 18 Cell A last received process wastes in 2001 with a final waste inventory estimated to be 25 acre-feet at closure.

Pond 18 Cell A was closed using a “RCRA double cap” (including an ET cap as described above) consistent with the *Pond 18 Cell A Closure Plan* that EPA approved in February 2005. The cover construction was completed in November 2005, and FMC certified closure completion in December 2005.

4.8.2 Pond 18A Problem Statement

PH3 may be accumulating beneath the Pond 17 final cap and within cap features (e.g., sumps and piping) and possibly fluxing to the atmosphere. As a result of the potential for PH3/GOPC accumulation, the following field programs were performed at Pond 18A.

- Industrial Hygiene (Ambient Air) Monitoring
- Soil Gas Monitoring

- Perimeter Scans
- TMP Enclosure Monitoring
- Sump Monitoring
- TMP Sampling
- Perimeter Piping Monitoring

4.8.3 Pond 18A Investigation Results

4.8.3.1 Industrial Hygiene (Ambient Air) Monitoring

Measurements of PH3 in the breathing level for IH purposes were recorded prior to the investigations at Pond 18A. The field teams were also required to report the location and concentration should a personnel monitor alarm be sounded. No personal alarms were sounded during sampling at Pond 18A. Fourteen (14) breathing zone measurements were collected prior to the various investigations and all measurements were 0.00 ppm PH3 as shown on Tables 4-1 to 4-7.

4.8.3.2 Soil Gas Monitoring

Soil gas monitoring around the perimeter of Pond 18A included sampling of 10 soil gas probe locations as shown on Figure 4-7. Three PH3 readings using a Draeger Pac III field instrument (0-20 ppm range) were recorded per location, and the average reading was calculated.

All but three of the soil gas probes reported concentration of PH3 as shown on Table 4-1. All individual measurements from soil gas probes 18A-1, 18A-7, and 18A-10 were 0.00 ppm PH3. The average concentrations from the other seven probes ranged from 0.01 to 58 ppm PH3. The highest concentration was reported at 18A-4 on the northeast side of the pond. However, the probes on either side of this probe, 18A-3 and 18A-5 had concentrations of 0.63 and 0.01 ppm PH3, respectively. The second highest concentration was from probe 18A-2 and was 2.81 ppm PH3. This probe is located near the northwest corner of the pond.

4.8.3.3 Perimeter Scans

The perimeter scan methodology (as described in Section 2.2.5) was similar to the scans used at the CERCLA areas. A total of 20 measurements were logged around Pond 18A cap perimeter area and all PH3 readings were 0.00 ppm as reported on Table 4-2. As a result, no surface scan of the Pond 18A cap surface was required.

4.8.3.4 TMP Enclosure Monitoring

Measurements of PH3 in the air around and within each of the three TMPs on Pond 18A were performed to monitor for potential releases of PH3 from the TMP. Measurements were collected from outside the enclosure at the top of the TMP, outside of the enclosure above the cap surface, and within the enclosure. All measurements collected outside and within each of the three TMPs were 0.00 ppm PH3 as shown on Table 4-3.

4.8.3.5 Sump Monitoring

One LCDRS sump and two ET cap drainage sumps were monitored at the Pond 18A. Similar to the TMP enclosure sampling, readings were collected at the breathing zone level, right above the sump lid, and within the sump enclosure. Measurements of PH3 were 0.00 ppm PH3 from outside of all sumps. Inside of one sump associated with the cap drainage system, PH3 was measured at 1.0 ppm and at 0.00 ppm inside the other sumps as listed in Table 4-4.

4.8.3.6 TMP Sampling

One of the three TMPs on Pond 18A was sampled for PH3 (TMPs 18A-2) and one of the TMPs, TMP 18A-3, was sampled for both PH3 and GOPCs. The TMP PH3 screening level results were greater 10,000 ppm PH3 in both TMPs; therefore, direct measurements were not attempted. The highest screening level concentration was report in TMP 18A-3 at 29,889 ppm PH3, while TMP 18A-2 reported a screening level concentration of 12,286 ppm PH3 as shown on Table 4-5. Both TMP 18A-2 and TMP 18A-3 are located near soil gas probe 18A-4, which had the highest soil gas probe PH3 concentration.

In addition, to PH3 measurements, samples for GOPCs were collected from TMP 18A-3. Both H2S and HF were detected in TMP 18-3. The concentration of H2S was 3.10 ppm, (see Table 4-6) and the concentration of HF was 6.36 ppm. The concentration of H2S was well below the PEL and IDLH values of 20 and 100 ppm, respectively. The HF concentration in TMP 18-3 exceeds the PEL of 3 ppm but is well below the IDLH value of 30 ppm. It is important to note that HCN was not detected in TMP 18-3.

4.8.3.7 Perimeter Piping Sampling

Three individual measurements of the pond perimeter piping were collected and the average calculated at Pond 18A. As the screening level measurement was less than 10,000 ppm (5,859 ppm PH3), a direct measurement was collected. The average direct measurement was 7,123 ppm PH3 as reported in Table 4-7.

4.8.4 Pond 18A Contamination Assessment

The site-wide gas assessment findings support that PH3 is accumulating underneath the final cap and shallow subsurface soil as evidenced by the soil gas, TMP and perimeter piping PH3 concentrations; however, PH3 does not appear to be fluxing to the environment at levels that could potentially be harmful to site workers or the environment. The conclusion is based on perimeter scans (several 0.00 ppm PH3 measurements).

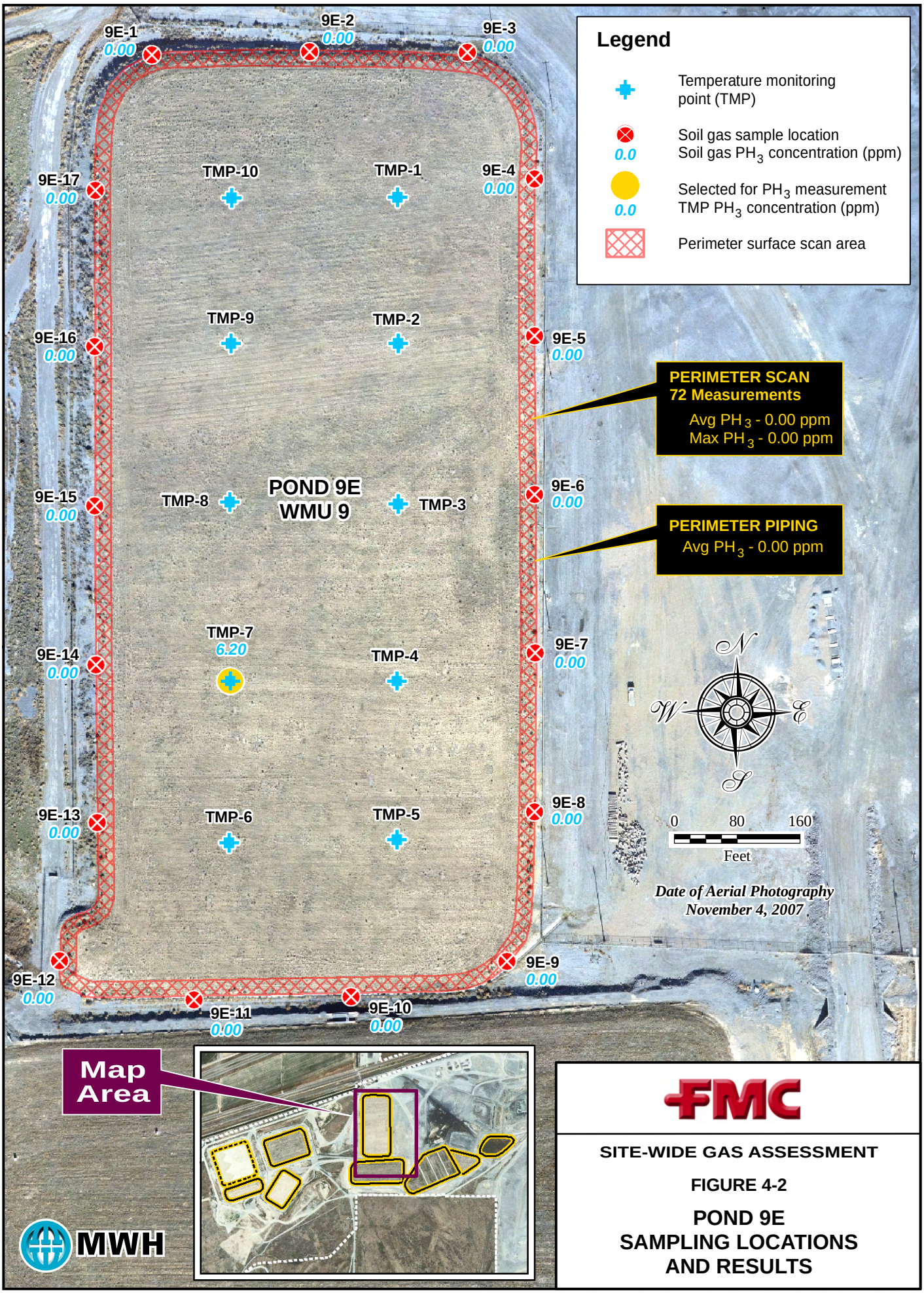
FMC

SITE-WIDE GAS ASSESSMENT

FIGURE 4-1

POND 8E
SAMPLING LOCATIONS
AND RESULTS

FILE Fig 4-1_FMC_RCRA Pond 8E_GasSampling Results.mxd 22Sep2010



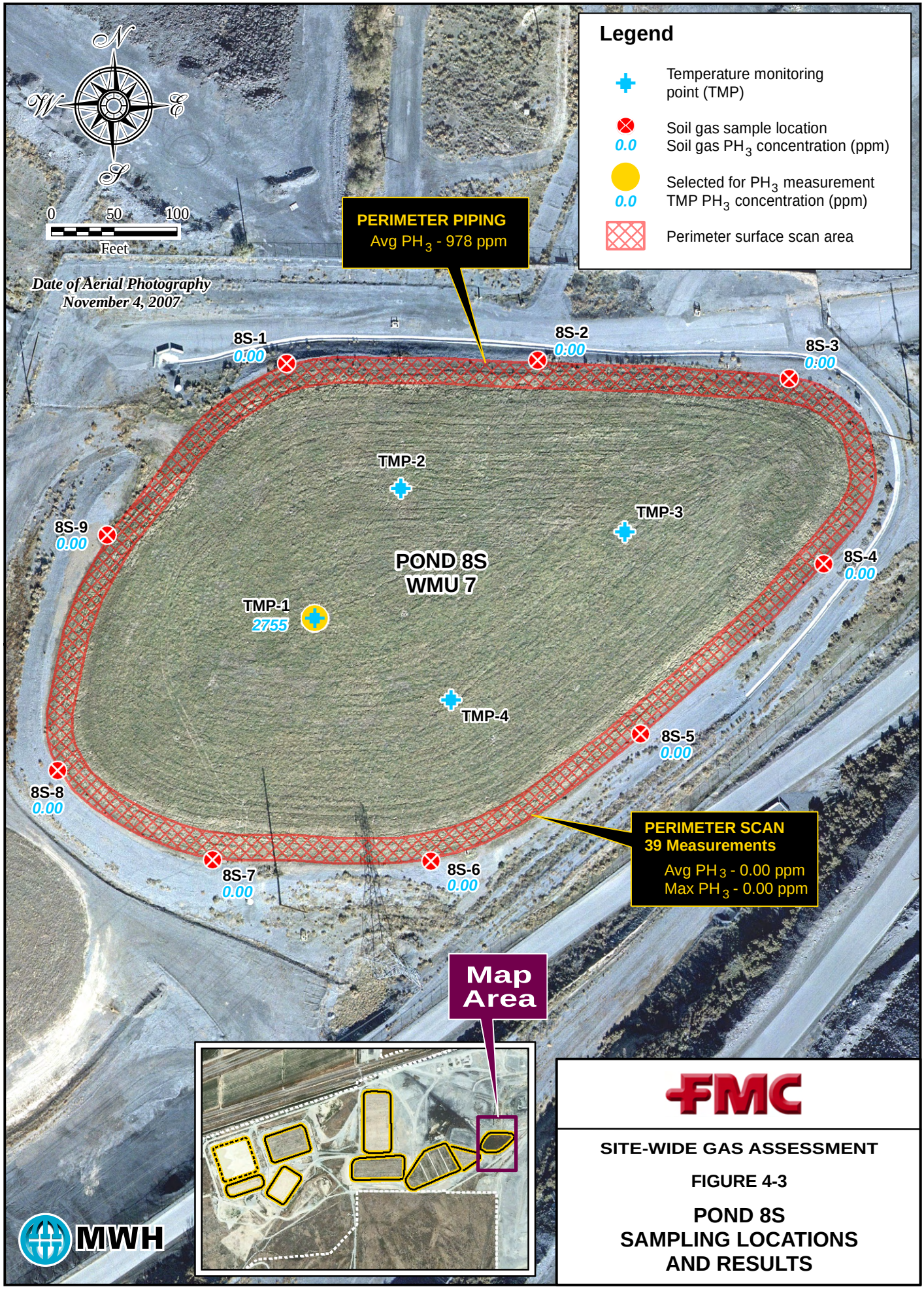
FMC

SITE-WIDE GAS ASSESSMENT

FIGURE 4-2

POND 9E
SAMPLING LOCATIONS
AND RESULTS

FILE Fig 4-2_FMC_RCRA Pond 9E_GasSampling_Results.mxd 4Oct2010



FMC

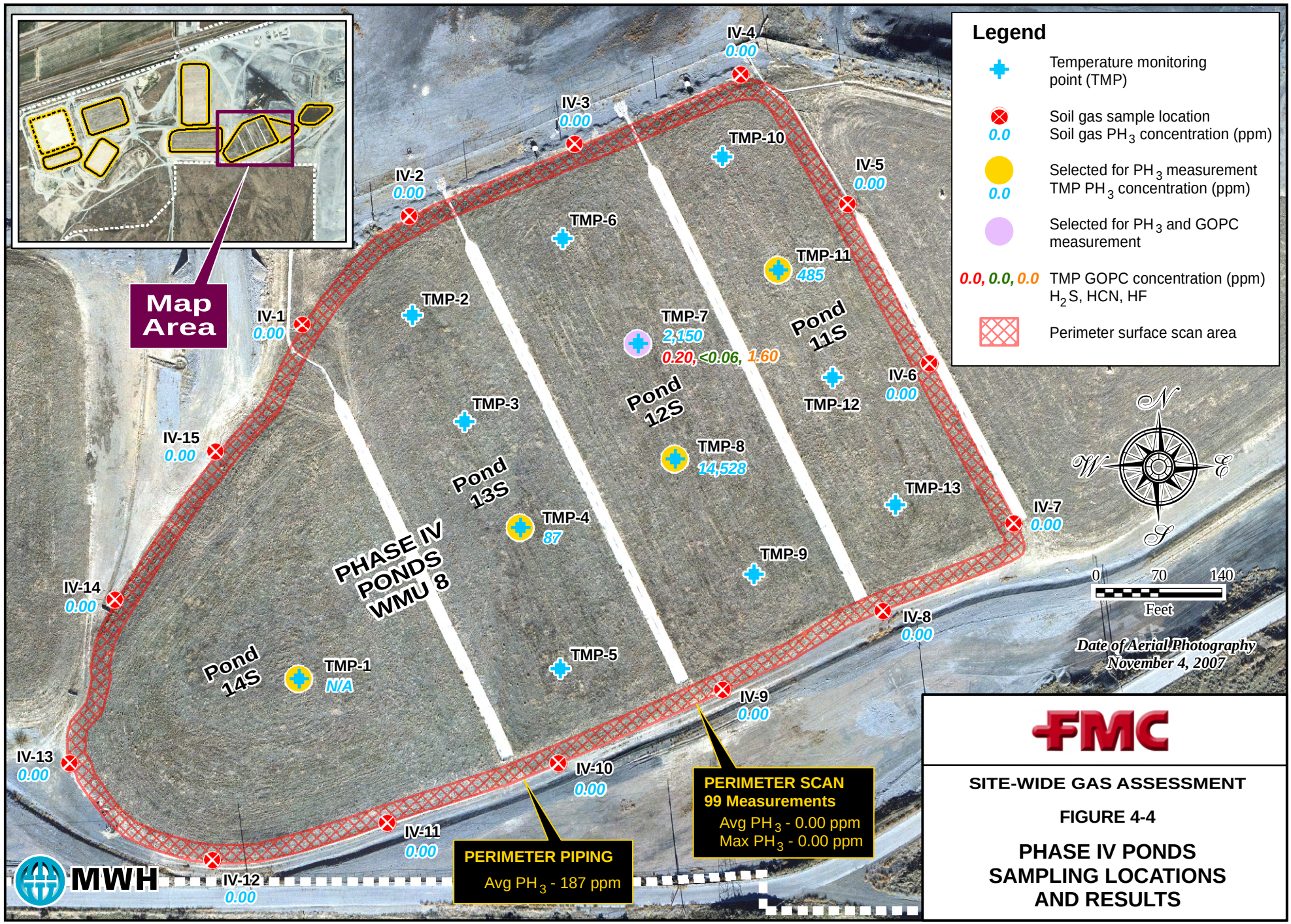
SITE-WIDE GAS ASSESSMENT

FIGURE 4-3

POND 8S
SAMPLING LOCATIONS
AND RESULTS

FILE Fig 4-3_FMC_RCRA Pond 8S_GasSampling_Results.mxd 4Oct2010

FILE *Fig 4-4_FMC_RCRA Phase IV Ponds_GasSampling_Results.mxd 22Sep2010*



SITE-WIDE GAS ASSESSMENT

FIGURE 4-4

PHASE IV PONDS SAMPLING LOCATIONS AND RESULTS

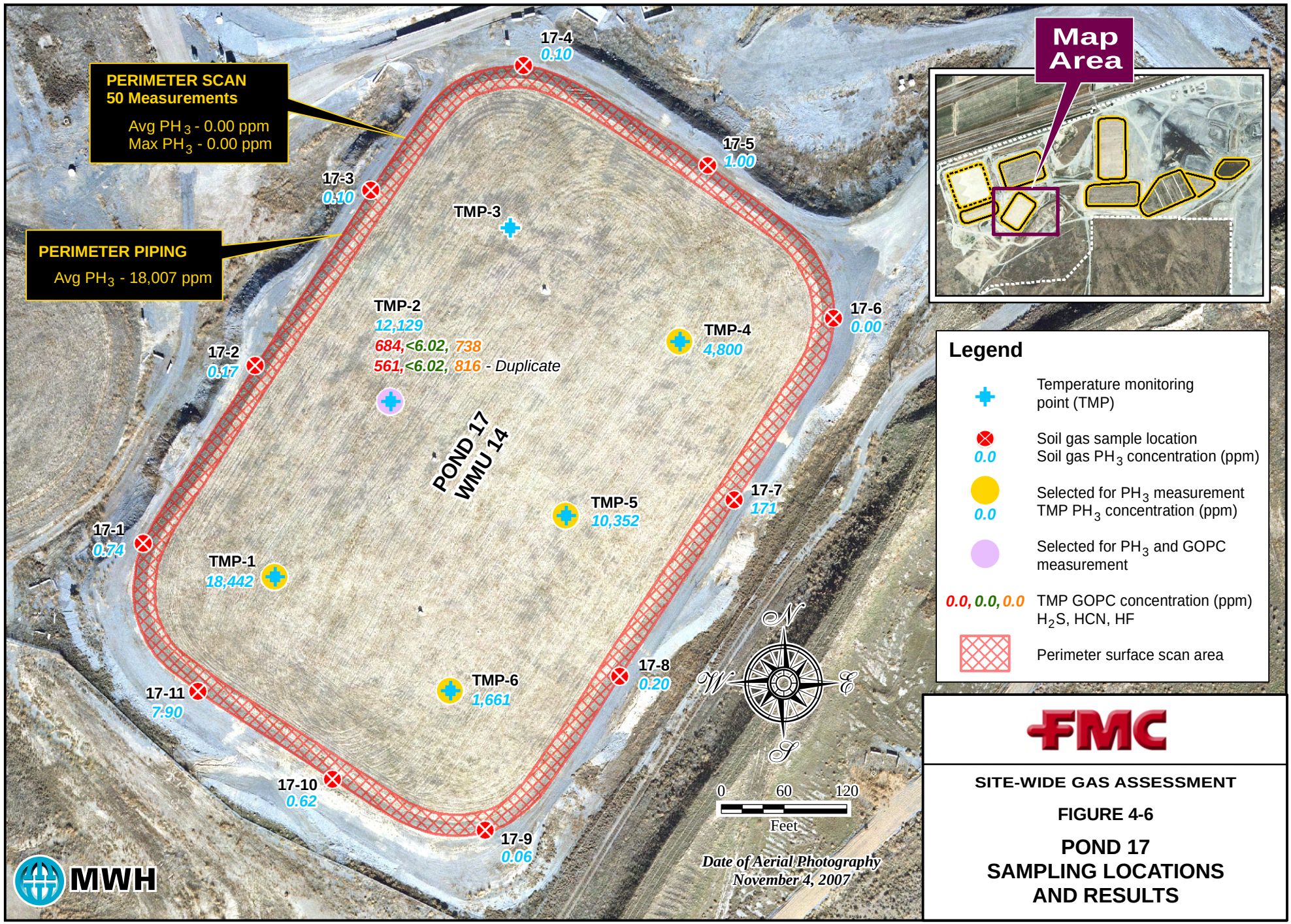
FILE *Fig 4-5_FMC_RCRA Pond 15S_GasSampling_Results.mxd* *29Sep2010*

SITE-WIDE GAS ASSESSMENT

FIGURE 4-5

POND 15S SAMPLING LOCATIONS AND RESULTS

FILE *Fig 4-6_FMC_RCRA Pond 17_GasSampling_Results_landscape.mxd 29Sep2010*



FILE *Fig 4-7_FMC_RCRA Pond 18_GasSampling_Results.mxd* *22Sep2010*

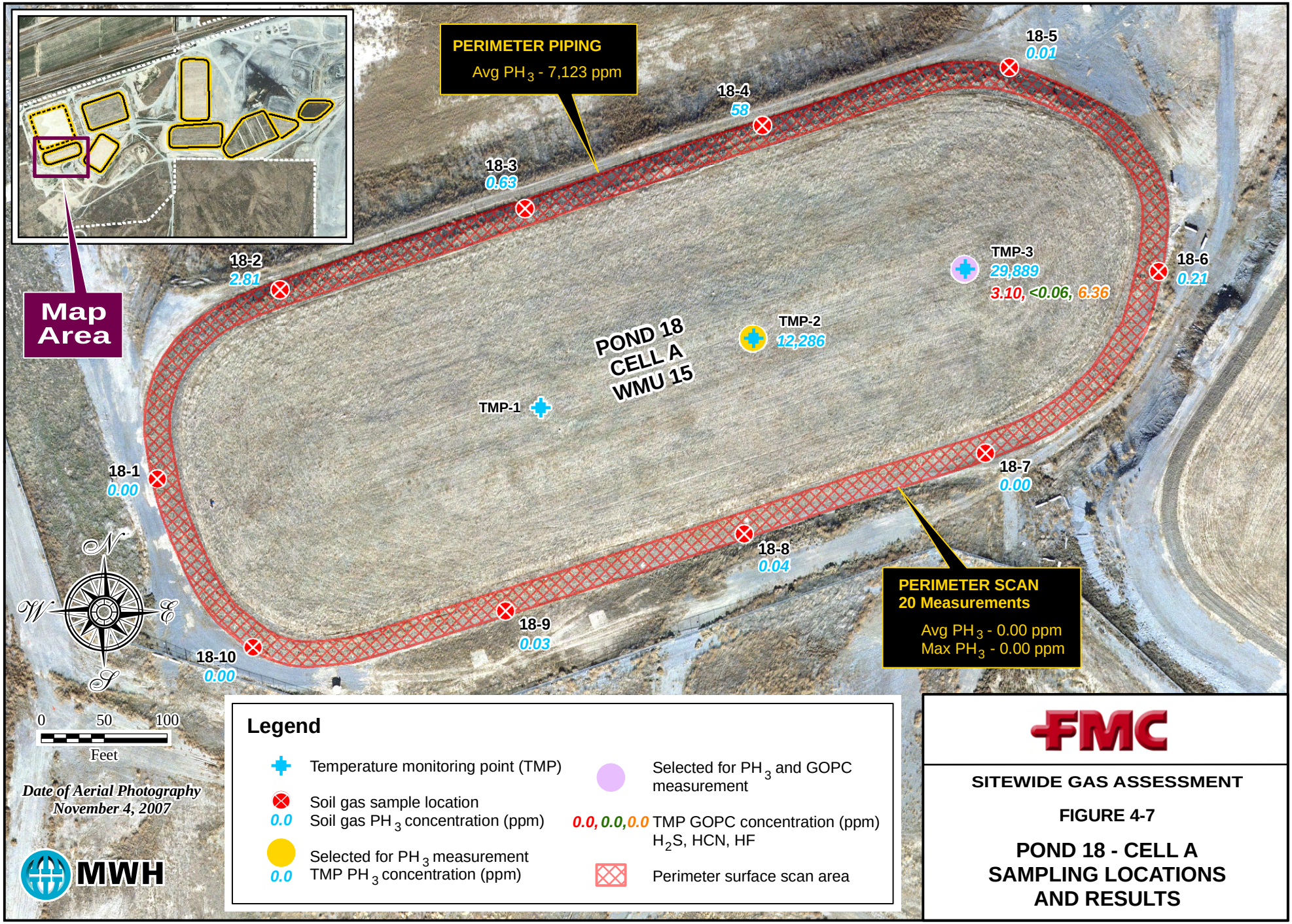


TABLE 4-1
RCRA PONDS
SOIL GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 1 of 4)

Pond 8E						Sampling week of:	July 19, 2010
			PH3 Measurement (ppm)				
				Soil Gas			
Soil Gas Probe #	Date	Time	Breathing Level Air	First	Second	Third	Average
1	7/20/2010	941	0.00	**0.02**	**0.06**	**0.06**	**0.05**
2	7/20/2010	1054	0.00	0.00	0.00	0.00	0.00
3	7/20/2010	1104	0.00	0.00	0.00	0.00	0.00
4	7/20/2010	1114	0.00	0.00	0.00	0.00	0.00
5	7/20/2010	1124	0.00	0.00	0.00	0.00	0.00
6	7/20/2010	1135	0.00	0.00	0.00	**0.02**	**0.01**
7	7/21/2010	634	0.00	0.00	0.00	0.00	0.00
8	7/21/2010	646	0.00	0.00	0.00	0.00	0.00
9	7/21/2010	657	0.00	0.00	0.00	0.00	0.00

Pond 9E						Sampling week of:	July 26, 2010
			PH3 Measurement (ppm)				
				Soil Gas			
Soil Gas Probe #	Date	Time	Breathing Level Air	First	Second	Third	Average
1	7/27/2010	1130	0.00	0.00	0.00	0.00	0.00
2	7/27/2010	1235	0.00	0.00	0.00	0.00	0.00
3	7/27/2010	1245	0.00	0.00	0.00	0.00	0.00
4	7/27/2010	1255	0.00	0.00	0.00	0.00	0.00
5	7/27/2010	1305	0.00	0.00	0.00	0.00	0.00
6	7/27/2010	1315	0.00	0.00	0.00	0.00	0.00
7	7/27/2010	1325	0.00	0.00	0.00	0.00	0.00
8	7/27/2010	1335	0.00	0.00	0.00	0.00	0.00
9	7/27/2010	1440	0.00	0.00	0.00	0.00	0.00
10	7/27/2010	1451	0.00	0.00	0.00	0.00	0.00
11	7/27/2010	1503	0.00	0.00	0.00	0.00	0.00
12	7/27/2010	1525	0.00	0.00	0.00	0.00	0.00
13	7/27/2010	1535	0.00	0.00	0.00	0.00	0.00
14	7/27/2010	1544	0.00	0.00	0.00	0.00	0.00
15	7/27/2010	1558	0.00	0.00	0.00	0.00	0.00
16	7/27/2010	1609	0.00	0.00	0.00	0.00	0.00
17	7/27/2010	1621	0.00	0.00	0.00	0.00	0.00

TABLE 4-1
RCRA PONDS
SOIL GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 2 of 4)

Pond 8S							Sampling week of: July 19, 2010
			PH3 Measurement (ppm)				
				Soil Gas			
Soil Gas Probe #	Date	Time	Breathing Level Air	First	Second	Third	Average
1	7/20/2010	0803	0.00	0.00	0.00	0.00	0.00
2	7/20/2010	0814	0.00	0.00	0.00	0.00	0.00
3	7/20/2010	0828	0.00	0.00	0.00	0.00	0.00
4	7/20/2010	0839	0.00	0.00	0.00	0.00	0.00
5	7/20/2010	0849	0.00	0.00	0.00	0.00	0.00
6	7/20/2010	0900	0.00	0.00	0.00	0.00	0.00
7	7/21/2010	0910	0.00	0.00	0.00	0.00	0.00
8	7/21/2010	0922	0.00	0.00	0.00	0.00	0.00
9	7/21/2010	0951	0.00	0.00	0.00	0.00	0.00

Phase IV Ponds							Sampling week of: July 19, 2010
			PH3 Measurement (ppm)				
				Soil Gas			
Soil Gas Probe #	Date	Time	Breathing Level Air	First	Second	Third	Average
1	7/21/2010	1435	0.00	0.00	0.00	0.00	0.00
2	7/21/2010	1450	0.00	0.00	0.00	0.00	0.00
3	7/21/2010	1505	0.00	0.00	0.00	0.00	0.00
4	7/21/2010	1520	0.00	0.00	0.00	0.00	0.00
5	7/21/2010	1535	0.00	0.00	0.00	0.00	0.00
6	7/21/2010	2115	0.00	0.00	0.00	0.00	0.00
7	7/21/2010	2125	0.00	0.00	0.00	0.00	0.00
8	7/21/2010	2135	0.00	0.00	0.00	0.00	0.00
9	7/21/2010	2145	0.00	0.00	0.00	0.00	0.00
10	7/21/2010	2155	0.00	0.00	0.00	0.00	0.00
11	7/21/2010	2308	0.00	0.00	0.00	0.00	0.00
12	7/21/2010	2316	0.00	0.00	0.00	0.00	0.00
13	7/21/2010	2328	0.00	0.00	0.00	0.00	0.00
14	7/21/2010	2340	0.00	0.00	0.00	0.00	0.00
15	7/21/2010	2348	0.00	0.00	0.00	0.00	0.00

TABLE 4-1
RCRA PONDS
SOIL GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 3 of 4)

Pond 15S						Sampling week of:	July 26, 2010
			PH3 Measurement (ppm)				
				Soil Gas			
Soil Gas Probe #	**Date**	**Time**	**Breathing Level Air**	**First**	**Second**	**Third**	**Average**
1	7/27/2010	1113	0.00	0.00	0.00	0.00	0.00
2	7/27/2010	1126	0.00	**0.03**	0.00	**0.03**	**0.02**
3	7/27/2010	1138	0.00	**0.14**	**0.14**	**0.13**	**0.14**
4	7/27/2010	1250	0.00	0.00	0.00	0.00	0.00
5	7/27/2010	1303	0.00	0.00	0.00	0.00	0.00
6	7/27/2010	1318	0.00	0.00	0.00	0.00	0.00
7	7/27/2010	1333	0.00	0.00	0.00	0.00	0.00
8	7/27/2010	1348	0.00	0.00	0.00	0.00	0.00
9	7/27/2010	1358	0.00	0.00	0.00	0.00	0.00
10	7/27/2010	1409	0.00	**0.07**	**0.03**	**0.02**	**0.04**
11	7/27/2010	1451	0.00	**0.06**	**0.05**	**0.05**	**0.05**
12	7/27/2010	1503	0.00	**132**	**128**	**122**	**127**
13	7/27/2010	1543	0.00	**30**	**38**	**35**	**34**
14	7/27/2010	1554	0.00	**1.21**	**1.03**	**0.99**	**1.08**
15	7/27/2010	2348	0.00	0.00	0.00	0.00	0.00

Pond 17						Sampling week of:	July 26, 2010
			PH3 Measurement (ppm)				
				Soil Gas			
Soil Gas Probe #	**Date**	**Time**	**Breathing Level Air**	**First**	**Second**	**Third**	**Average**
1	7/26/2010	1401	0.00	**0.77**	**0.73**	**0.71**	**0.74**
2	7/22/2010	1417	0.00	**0.15**	**0.16**	**0.19**	**0.17**
3	7/22/2010	1428	0.00	**0.12**	**0.08**	**0.10**	**0.10**
4	7/22/2010	1440	0.00	**0.11**	**0.10**	**0.10**	**0.10**
5	7/22/2010	1530	0.00	**1.28**	**0.85**	**0.88**	**1.00**
6	7/26/2010	1545	0.00	0.00	0.00	0.00	0.00
7	7/26/2010	1554	0.00	**206**	**175**	**131**	**171**
8	7/26/2010	1615	0.00	**0.30**	**0.18**	**0.11**	**0.20**
9	7/26/2010	1630	0.00	**0.06**	**0.06**	**0.06**	**0.06**
10	7/26/2010	1641	0.00	**0.81**	**0.56**	**0.50**	**0.62**
11	7/26/2010	1655	0.00	**7.15**	**8.45**	**8.10**	**7.90**

TABLE 4-1
RCRA PONDS
SOIL GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 4 of 4)

Pond 18A	Sampling week of: July 19 and 26, 2010						
			PH3 Measurement (ppm)				
				Soil Gas			
Soil Gas Probe #	**Date**	**Time**	**Breathing Level Air**	**First**	**Second**	**Third**	**Average**
1	7/22/2010	0029	0.00	0.00	0.00	0.00	0.00
2	7/22/2010	0036	0.00	**2.38**	**2.66**	**3.40**	**2.81**
3	7/22/2010	0051	0.00	**0.61**	**0.64**	**0.63**	**0.63**
4	7/22/2010	0110	0.00	**65**	**55**	**55**	**58**
5	7/22/2010	0233	0.00	0.00	**0.02**	0.00	**0.01**
6	7/26/2010	1433	0.00	**0.10**	**0.25**	**0.27**	**0.21**
7	7/26/2010	1450	0.00	0.00	0.00	0.00	0.00
8	7/26/2010	1550	0.00	**0.04**	**0.04**	**0.04**	**0.04**
9	7/26/2010	1520	0.00	**0.03**	**0.04**	**0.02**	**0.03**
10	7/26/2010	1535	0.00	0.00	0.00	0.00	0.00

TABLE 4-2
RCRA PONDS
POND PERIMETER PH3 SURFACE SCANS
SITE-WIDE GAS ASSESSMENT
(Page 1 of 7)

RCRA Pond 8E Perimeter				Sampling week of:	August 9, 2010
Date:	8/9/2010	Start Time:	0937	Wind Speed:	3.7 mph
Weather Observations:			Mostly cloudy		
Location of Surface Scan:		Pond 8E Perimeter			
Breathing Level PH3 (ppm):		0.00			

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	16	0.00	No	31	0.00	No
2	0.00	No	17	0.00	No	32	0.00	No
3	0.00	No	18	0.00	No	33	0.00	No
4	0.00	No	19	0.00	No	34	0.00	No
5	0.00	No	20	0.00	No	35	0.00	No
6	0.00	No	21	0.00	No	36	0.00	No
7	0.00	No	22	0.00	No	37	0.00	No
8	0.00	No	23	0.00	No	38	0.00	No
9	0.00	No	24	0.00	No	39	0.00	No
10	0.00	No	25	0.00	No	40	0.00	No
11	0.00	No	26	0.00	No			
12	0.00	No	27	0.00	No			
13	0.00	No	28	0.00	No			
14	0.00	No	29	0.00	No			
15	0.00	No	30	0.00	No			

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

TABLE 4-2
RCRA PONDS
POND PERIMETER PH3 SURFACE SCANS
SITE-WIDE GAS ASSESSMENT
(Page 2 of 7)

RCRA Pond 9E Perimeter				Sampling week of:	August 2, 2010
Date:	8/2/2010	Start Time:	1315	Wind Speed:	7.5 mph
Weather Observations:			Sunny w/ slight breeze.		
Location of Surface Scan:		RCRA Pond 9E Perimeter			
Breathing Level PH3 (ppm):		0.00			

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	26	0.00	No	51	0.00	No
2	0.00	No	27	0.00	No	52	0.00	No
3	0.00	No	28	0.00	No	53	0.00	No
4	0.00	No	29	0.00	No	54	0.00	No
5	0.00	No	30	0.00	No	55	0.00	No
6	0.00	No	31	0.00	No	56	0.00	No
7	0.00	No	32	0.00	No	57	0.00	No
8	0.00	No	33	0.00	No	58	0.00	No
9	0.00	No	34	0.00	No	59	0.00	No
10	0.00	No	35	0.00	No	60	0.00	No
11	0.00	No	36	0.00	No	61	0.00	No
12	0.00	No	37	0.00	No	62	0.00	No
13	0.00	No	38	0.00	No	63	0.00	No
14	0.00	No	39	0.00	No	64	0.00	No
15	0.00	No	40	0.00	No	65	0.00	No
16	0.00	No	41	0.00	No	66	0.00	No
17	0.00	No	42	0.00	No	67	0.00	No
18	0.00	No	43	0.00	No	68	0.00	No
19	0.00	No	44	0.00	No	69	0.00	No
20	0.00	No	45	0.00	No	70	0.00	No
21	0.00	No	46	0.00	No	71	0.00	No
22	0.00	No	47	0.00	No	72	0.00	No
23	0.00	No	48	0.00	No			
24	0.00	No	49	0.00	No			
25	0.00	No	50	0.00	No			

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

TABLE 4-2
RCRA PONDS
POND PERIMETER PH3 SURFACE SCANS
SITE-WIDE GAS ASSESSMENT
(Page 3 of 7)

RCRA Pond 8S Perimeter				Sampling week of:	July 26, 2010
Date:	7/27/2010	Start Time:	0751	Wind Speed:	Calm
Weather Observations:			Clear		
Location of Surface Scan:		RCRA Pond 8S			
Breathing Level PH3 (ppm):		0.00			

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	16	0.00	No	31	0.00	No
2	0.00	No	17	0.00	No	32	0.00	No
3	0.00	No	18	0.00	No	33	0.00	No
4	0.00	No	19	0.00	No	34	0.00	No
5	0.00	No	20	0.00	No	35	0.00	No
6	0.00	No	21	0.00	No	36	0.00	No
7	0.00	No	22	0.00	No	37	0.00	No
8	0.00	No	23	0.00	No	38	0.00	No
9	0.00	No	24	0.00	No	39	0.00	No
10	0.00	No	25	0.00	No			
11	0.00	No	26	0.00	No			
12	0.00	No	27	0.00	No			
13	0.00	No	28	0.00	No			
14	0.00	No	29	0.00	No			
15	0.00	No	30	0.00	No			

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

TABLE 4-2
RCRA PONDS
POND PERIMETER PH3 SURFACE SCANS
SITE-WIDE GAS ASSESSMENT
(Page 4 of 7)

RCRA Phase IV Pond Perimeter			Sampling week of:	July 26, 2010
Date:	7/27/2010	Start Time: 0910	Wind Speed:	3 to 6 mph
Weather Observations:		Clear		
Location of Surface Scan:		RCRA Phase IV Ponds		
Breathing Level PH3 (ppm):		0.00		

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	34	0.00	No	67	0.00	No
2	0.00	No	35	0.00	No	68	0.00	No
3	0.00	No	36	0.00	No	69	0.00	No
4	0.00	No	37	0.00	No	70	0.00	No
5	0.00	No	38	0.00	No	71	0.00	No
6	0.00	No	39	0.00	No	72	0.00	No
7	0.00	No	40	0.00	No	73	0.00	No
8	0.00	No	41	0.00	No	74	0.00	No
9	0.00	No	42	0.00	No	75	0.00	No
10	0.00	No	43	0.00	No	76	0.00	No
11	0.00	No	44	0.00	No	77	0.00	No
12	0.00	No	45	0.00	No	78	0.00	No
13	0.00	No	46	0.00	No	79	0.00	No
14	0.00	No	47	0.00	No	80	0.00	No
15	0.00	No	48	0.00	No	81	0.00	No
16	0.00	No	49	0.00	No	82	0.00	No
17	0.00	No	50	0.00	No	83	0.00	No
18	0.00	No	51	0.00	No	84	0.00	No
19	0.00	No	52	0.00	No	85	0.00	No
20	0.00	No	53	0.00	No	86	0.00	No
21	0.00	No	54	0.00	No	87	0.00	No
22	0.00	No	55	0.00	No	88	0.00	No
23	0.00	No	56	0.00	No	89	0.00	No
24	0.00	No	57	0.00	No	90	0.00	No
25	0.00	No	58	0.00	No	91	0.00	No
26	0.00	No	59	0.00	No	92	0.00	No
27	0.00	No	60	0.00	No	93	0.00	No
28	0.00	No	61	0.00	No	94	0.00	No
29	0.00	No	62	0.00	No	95	0.00	No
30	0.00	No	63	0.00	No	96	0.00	No
31	0.00	No	64	0.00	No	97	0.00	No
32	0.00	No	65	0.00	No	98	0.00	No
33	0.00	No	66	0.00	No	99	0.00	No

[1] Any PH3 reading > the $FMDL_{SS}$ was flagged and later investigated.

TABLE 4-2
RCRA PONDS
POND PERIMETER PH3 SURFACE SCANS
SITE-WIDE GAS ASSESSMENT
(Page 5 of 7)

RCRA Pond 15S Perimeter			Sampling week of:	August 2, 2010
Date:	8/2/2010	Start Time: 1045	Wind Speed:	7.2 MPH
Weather Observations:		Clear		
Location of Surface Scan:		Pond 15S Perimeter		
Breathing Level PH3 (ppm):		0.00		

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	34	0.00	No	67	0.00	No
2	0.00	No	35	0.00	No	68	0.00	No
3	0.00	No	36	0.00	No	69	0.00	No
4	0.00	No	37	0.00	No	70	0.00	No
5	0.00	No	38	0.00	No	71	0.00	No
6	0.00	No	39	0.00	No	72	0.00	No
7	0.00	No	40	0.00	No	73	0.00	No
8	0.00	No	41	0.00	No	74	0.00	No
9	0.00	No	42	0.00	No	75	0.00	No
10	0.00	No	43	0.00	No	76	0.07	Yes
11	0.00	No	44	0.00	No	77	0.00	No
12	0.00	No	45	0.00	No	78	0.00	No
13	0.00	No	46	0.00	No	79	0.51	Yes
14	0.00	No	47	0.00	No	80	0.00	No
15	0.00	No	48	0.00	No	81	0.00	No
16	0.00	No	49	0.00	No	82	0.00	No
17	0.00	No	50	0.00	No	83	0.00	No
18	0.00	No	51	0.00	No	84	0.00	No
19	0.00	No	52	0.00	No	85	0.00	No
20	0.00	No	53	0.03	Yes	86	0.00	No
21	0.00	No	54	0.00	No	87	0.00	No
22	0.00	No	55	0.00	No	88	0.00	No
23	0.00	No	56	0.00	No			
24	0.00	No	57	0.00	No			
25	0.00	No	58	0.00	No			
26	0.00	No	59	0.00	No			
27	0.00	No	60	0.00	No			
28	0.00	No	61	0.00	No			
29	0.00	No	62	0.00	No			
30	0.00	No	63	0.00	No			
31	0.00	No	64	0.00	No			
32	0.00	No	65	0.00	No			
33	0.00	No	66	0.00	No			

[1] Any PH3 reading > the $FMDL_{SS}$ was flagged and later investigated.

TABLE 4-2
RCRA PONDS
POND PERIMETER PH3 SURFACE SCANS
SITE-WIDE GAS ASSESSMENT
(Page 6 of 7)

RCRA Pond 17 Perimeter				Sampling week of:	August 2, 2010
Date:	8/2/2010	Start Time:	0910	Wind Speed:	3.2 mph
Weather Observations:			Sunny with slight breeze		
Location of Surface Scan:		RCRA Pond 17			
Breathing Level PH3 (ppm):		0.00			

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	21	0.00	No	41	0.00	No
2	0.00	No	22	0.00	No	42	0.00	No
3	0.00	No	23	0.00	No	43	0.00	No
4	0.00	No	24	0.00	No	44	0.00	No
5	0.00	No	25	0.00	No	45	0.00	No
6	0.00	No	26	0.00	No	46	0.00	No
7	0.00	No	27	0.00	No	47	0.00	No
8	0.00	No	28	0.00	No	48	0.00	No
9	0.00	No	29	0.00	No	49	0.00	No
10	0.00	No	30	0.00	No	50	0.00	No
11	0.00	No	31	0.00	No			
12	0.00	No	32	0.00	No			
13	0.00	No	33	0.00	No			
14	0.00	No	34	0.00	No			
15	0.00	No	35	0.00	No			
16	0.00	No	36	0.00	No			
17	0.00	No	37	0.00	No			
18	0.00	No	38	0.00	No			
19	0.00	No	39	0.00	No			
20	0.00	No	40	0.00	No			

[1] Any PH3 reading > the $FMDL_{SS}$ was flagged and later investigated.

TABLE 4-2
RCRA PONDS
POND PERIMETER PH3 SURFACE SCANS
SITE-WIDE GAS ASSESSMENT
(Page 7 of 7)

RCRA Pond 18A Perimeter				Sampling week of:	August 2, 2010
Date:	8/2/2010	Start Time:	0753	Wind Speed:	Calm
Weather Observations:			Sunny		
Location of Surface Scan:		Pond 18A Perimeter			
Breathing Level PH3 (ppm):		0.00			

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	21	0.00	No	41	0.00	No
2	0.00	No	22	0.00	No	42	0.00	No
3	0.00	No	23	0.00	No	43	0.00	No
4	0.00	No	24	0.00	No	44	0.00	No
5	0.00	No	25	0.00	No	45	0.00	No
6	0.00	No	26	0.00	No	46	0.00	No
7	0.00	No	27	0.00	No	47	0.00	No
8	0.00	No	28	0.00	No	48	0.00	No
9	0.00	No	29	0.00	No	49	0.00	No
10	0.00	No	30	0.00	No	50	0.00	No
11	0.00	No	31	0.00	No	51	0.00	No
12	0.00	No	32	0.00	No	52	0.00	No
13	0.00	No	33	0.00	No	53	0.00	No
14	0.00	No	34	0.00	No	54	0.00	No
15	0.00	No	35	0.00	No	55	0.00	No
16	0.00	No	36	0.00	No	56	0.00	No
17	0.00	No	37	0.00	No	57	0.00	No
18	0.00	No	38	0.00	No	58	0.00	No
19	0.00	No	39	0.00	No	59	0.00	No
20	0.00	No	40	0.00	No			

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

TABLE 4-3
RCRA PONDS
TMP ENCLOSURE PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 1 of 3)

Pond 8E						Sampling week of:	July 26, 2010
TMP #	**Date**	**Time**	**PH3 (ppm) Ground Level Perimeter (max)**	**Location**	**PH3 (ppm) Top Level Perimeter (max)**	**Location**	**PH3 (ppm) Inside Enclosure**
1	7/28/2010	1131	0.00	NA	0.00	NA	0.03
2	7/28/2010	1131	0.00	NA	0.00	NA	0.00
3	7/28/2010	1131	0.00	NA	0.00	NA	**2.64**
4	7/28/2010	1131	0.00	NA	0.00	NA	0.00

Pond 9E						Sampling week of:	July 26, 2010
TMP #	**Date**	**Time**	**PH3 (ppm) Ground Level Perimeter (max)**	**Location**	**PH3 (ppm) Top Level Perimeter (max)**	**Location**	**PH3 (ppm) Inside Enclosure**
1	7/27/2010	840	0.00	NA	0.00	NA	0.00
2	7/27/2010	840	0.00	NA	0.00	NA	0.00
3	7/27/2010	840	0.00	NA	0.00	NA	0.00
4	7/27/2010	840	0.00	NA	0.00	NA	0.00
5	7/27/2010	840	0.00	NA	0.00	NA	0.00
6	7/27/2010	840	0.00	NA	0.00	NA	0.00
7	7/27/2010	840	0.00	NA	0.00	NA	0.00
8	7/27/2010	840	0.00	NA	0.00	NA	0.00
9	7/27/2010	840	0.00	NA	0.00	NA	0.00
10	7/27/2010	840	0.00	NA	0.00	NA	0.00

Pond 8S						Sampling week of:	July 26, 2010
TMP #	**Date**	**Time**	**PH3 (ppm) Ground Level Perimeter (max)**	**Location**	**PH3 (ppm) Top Level Perimeter (max)**	**Location**	**PH3 (ppm) Inside Enclosure**
1	7/26/2010	834	0.00	NA	0.00	NA	0.00
2	7/26/2010	834	0.00	NA	0.00	NA	0.00
3	7/26/2010	834	0.00	NA	0.00	NA	0.00
4	7/26/2010	834	0.00	NA	0.00	NA	0.00

TABLE 4-3
RCRA PONDS
TMP ENCLOSURE PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 2 of 3)

Phase IV Ponds				Sampling week of:			July 26, 2010
TMP #	Date	Time	PH3 (ppm) Ground Level Perimeter (max)	Location	PH3 (ppm) Top Level Perimeter (max)	Location	PH3 (ppm) Inside Enclosure
1	7/28/2010	0750	0.00	NA	0.00	NA	0.00
2	7/28/2010	0750	0.00	NA	0.00	NA	0.00
3	7/28/2010	0750	0.00	NA	0.00	NA	0.00
4	7/28/2010	0750	0.00	NA	0.00	NA	0.00
5	7/28/2010	0750	0.00	NA	0.00	NA	0.00
6	7/28/2010	0750	0.00	NA	0.00	NA	0.00
7	7/28/2010	0750	0.00	NA	0.00	NA	0.00
8	7/28/2010	0750	0.00	NA	0.00	NA	0.00
9	7/28/2010	0750	0.00	NA	0.00	NA	0.00
10	7/28/2010	0750	0.00	NA	0.00	NA	0.00
11	7/28/2010	0750	0.00	NA	0.00	NA	0.00
12	7/28/2010	0750	0.00	NA	0.00	NA	0.00
13	7/28/2010	0750	0.00	NA	0.00	NA	0.00

Pond 15S				Sampling week of:			July 26, 2010
TMP #	Date	Time	PH3 (ppm) Ground Level Perimeter (max)	Location	PH3 (ppm) Top Level Perimeter (max)	Location	PH3 (ppm) Inside Enclosure
1	7/28/2010	0935	0.00	NA	0.00	NA	0.00
2	7/28/2010	0935	0.00	NA	0.00	NA	0.00
3	7/28/2010	0935	0.00	NA	0.00	NA	0.00
4	7/28/2010	0935	0.00	NA	0.00	NA	0.00
5	7/28/2010	0935	0.00	NA	0.00	NA	0.00
6	7/28/2010	0935	0.00	NA	0.00	NA	0.00
7	7/28/2010	0935	0.00	NA	0.00	NA	0.00
8	7/28/2010	0935	0.00	NA	0.00	NA	0.00
9	7/28/2010	0935	0.00	NA	0.00	NA	0.00
10	7/28/2010	0935	0.00	NA	0.00	NA	0.00

TABLE 4-3
RCRA PONDS
TMP ENCLOSURE PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 3 of 3)

Pond 17				Sampling week of:			July 26, 2010
TMP #	**Date**	**Time**	**PH3 (ppm) Ground Level Perimeter (max)**	**Location**	**PH3 (ppm) Top Level Perimeter (max)**	**Location**	**PH3 (ppm) Inside Enclosure**
1	7/28/2010	1302	0.00	NA	0.00	NA	0.00
2	7/28/2010	1302	0.00	NA	0.00	NA	0.00
3	7/28/2010	1302	0.00	NA	0.00	NA	0.00
4	7/28/2010	1302	0.00	NA	0.00	NA	0.00
5	7/28/2010	1302	0.00	NA	0.00	NA	0.00
6	7/28/2010	1302	0.00	NA	0.00	NA	0.00

Pond 18A				Sampling week of:			July 19, 2010
TMP #	**Date**	**Time**	**PH3 (ppm) Ground Level Perimeter (max)**	**Location**	**PH3 (ppm) Top Level Perimeter (max)**	**Location**	**PH3 (ppm) Inside Enclosure**
1	7/20/2010	1002	0.00	NA	0.00	NA	0.00
2	7/20/2010	1011	0.00	NA	0.00	NA	0.00
3	7/20/2010	1018	0.00	NA	0.00	NA	0.00

TABLE 4-4
RCRA PONDS
POND SUMP PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 1 of 2)

Pond 8E					Sampling week of:	July 26, 2010	
Sump #[1]	Date	Time	PH3 (ppm) Breathing Level Air		PH3 (ppm) At Sump Lid		PH3 (ppm) Inside Sump
			Downwind	Location	(max)	Location	
LCDRS-1	7/28/2010	0935	0.00	NA	0.00	NA	0.00

[1] "LCDRS-#" denotes a pond liner leachate collection sump. "LS-#" denotes an ET cap drainage sump.

Pond 9E					Sampling week of:	July 26, 2010	
Sump #[1]	Date	Time	PH3 (ppm) Breathing Level Air		PH3 (ppm) At Sump Lid		PH3 (ppm) Inside Sump
			Downwind	Location	(max)	Location	
LCDRS-1	7/28/2010	1545	0.00	NA	0.00	NA	0.00
LCDRS-2	7/28/2010	1545	0.00	NA	0.00	NA	0.00
LCDRS-3	7/28/2010	1545	0.00	NA	0.00	NA	0.00
LCDRS-4	7/28/2010	1545	0.00	NA	0.00	NA	0.00
LCDRS-5	7/28/2010	1545	0.00	NA	0.00	NA	0.00
LCDRS-6	7/28/2010	1545	0.00	NA	0.00	NA	0.00

[1] "LCDRS-#" denotes a pond liner leachate collection sump. "LS-#" denotes an ET cap drainage sump.

Pond 8S					Sampling week of:	July 26, 2010	
Sump #[1]	Date	Time	PH3 (ppm) Breathing Level Air		PH3 (ppm) At Sump Lid		PH3 (ppm) Inside Sump
			Downwind	Location	(max)	Location	
LS-01	7/28/2010	0840	0.00	NA	0.00	NA	0.00
LS-02	7/28/2010	0840	0.00	NA	0.00	NA	0.00

[1] "LCDRS-#" denotes a pond liner leachate collection sump. "LS-#" denotes an ET cap drainage sump.

Phase IV Ponds					Sampling week of:	July 26, 2010	
Sump #[1]	Date	Time	PH3 (ppm) Breathing Level Air		PH3 (ppm) At Sump Lid		PH3 (ppm) Inside Sump
			Downwind	Location	(max)	Location	
LS-01	7/28/2010	0920	0.00	NA	0.00	NA	0.00
LS-02	7/28/2010	0920	0.00	NA	0.00	NA	0.00
LS-03	7/28/2010	0920	0.00	NA	0.00	NA	0.00
LS-04	7/28/2010	0920	0.00	NA	0.00	NA	0.00

[1] "LCDRS-#" denotes a pond liner leachate collection sump. "LS-#" denotes an ET cap drainage sump.

TABLE 4-4
RCRA PONDS
POND SUMP PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 2 of 2)

Pond 15S					Sampling week of:	July 26, 2010	
Sump #[1]	**Date**	**Time**	**PH3 (ppm) Breathing Level Air**		**PH3 (ppm) At Sump Lid**		**PH3 (ppm) Inside Sump**
			Downwind	**Location**	**(max)**	**Location**	
LS-01	7/28/2010	1402	0.00	NA	0.00	NA	**0.34**
LS-02	7/28/2010	1402	0.00	NA	0.00	NA	**2.62**
LCDRS-1	7/28/2010	1402	0.00	NA	0.00	NA	0.00
LCDRS-2	7/28/2010	1402	0.00	NA	0.00	NA	0.00
LCDRS-3	7/28/2010	1402	0.00	NA	0.00	NA	0.00
LCDRS-4	7/28/2010	1402	0.00	NA	0.00	NA	0.00

[1] "LCDRS-#" denotes a pond liner leachate collection sump. "LS-#" denotes an ET cap drainage sump.

Pond 17					Sampling week of:	July 26, 2010	
Sump #[1]	**Date**	**Time**	**PH3 (ppm) Breathing Level Air**		**PH3 (ppm) At Sump Lid**		**PH3 (ppm) Inside Sump**
			Downwind	**Location**	**(max)**	**Location**	
LCDRS-1	7/28/2010	1534	0.00	NA	0.00	NA	0.00

[1] "LCDRS-#" denotes a pond liner leachate collection sump. "LS-#" denotes an ET cap drainage sump.

Pond 18A					Sampling week of:	July 26, 2010	
Sump #[1]	**Date**	**Time**	**PH3 (ppm) Breathing Level Air**		**PH3 (ppm) At Sump Lid**		**PH3 (ppm) Inside Sump**
			Downwind	**Location**	**(max)**	**Location**	
LCDRS-1	7/28/2010	1504	0.00	NA	0.00	NA	0.00
LS-01	7/28/2010	1504	0.00	NA	0.00	NA	**1.00**
LS-02	7/28/2010	1504	0.00	NA	0.00	NA	0.00

[1] "LCDRS-#" denotes a pond liner leachate collection sump. "LS-#" denotes an ET cap drainage sump.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 1 of 27)

Pond 8E TMP #1				Sampled week of:	August 2, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/3/2010	2	65.33	**3.02**	**99**
Run #2	8/3/2010	2	65.16	**3.44**	**112**
Run #3	8/3/2010	1.99	65.16	**3.88**	**127**
Breathing Level Air PH3:		0.00		**Average:**	**113**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/3/2010	466	NA	**NA**	**200**
Run #2	8/3/2010	489	NA	**NA**	**220**
Run #3	8/3/2010	483	NA	**NA**	**212**
				Average:	**211**
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

Pond 8E TMP #2				Sampled week of:	August 2, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/3/2010	1.77	63.33	**92**	**3289**
Run #2	8/3/2010	1,77	63.66	**94**	**3386**
Run #3	8/3/2010	1.77	63.24	**96**	**3436**
Breathing Level Air PH3:		0.00		**Average:**	**3370**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/3/2010	104	393	**980**	**4683**
Run #2	8/3/2010	61	423	**555**	**4404**
Run #3	8/3/2010	78	419	**715**	**4556**
				Average:	**4548**
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 3 of 27)

Pond 8E TMP #3				Sampled week of:	August 2, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/2/2010	1.86	63.82	**30**	**1027**
Run #2	8/2/2010	1.83	62.95	**31**	**1067**
Run #3	8/2/2010	1.82	62.96	**31**	**1070**
Breathing Level Air PH3:		0.00		**Average:**	**1055**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/2/2010	223	285	**665**	**1515**
Run #2	8/2/2010	195	308	**565**	**1457**
Run #3	8/2/2010	198	309	**575**	**1472**
				Average:	**1481**
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 4 of 27)

Pond 8E TMP #4				Sampled week of:	August 2, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/2/2010	1.88	65.66	**58**	**2026**
Run #2	8/2/2010	1.88	65.93	**59**	**2068**
Run #3	8/2/2010	1.88	65.28	**58**	**2019**
Breathing Level Air PH3:		0.00		**Average:**	**2038**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/2/2010	142	372	**910**	**3293**
Run #2	8/2/2010	107	405	**655**	**3134**
Run #3	8/2/2010	64	352	**434**	**2821**
				Average:	**3083**
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	Yes	8/2/2010	200 ml/min for 15 min.	POND8ETMP04-HCN	1023
H2S	Yes	8/2/2010	1,000 ml/min for 10 min.	POND8ETMP04-H2S	0957
HF	Yes	8/2/2010	300 ml/min for 10 min.	POND8ETMPO4-HF	1058

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 5 of 27)

Pond 9E TMP #7				Sampled week of:	July 26, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/27/2010	1.98	64.95	**0.14**	**4.60**
Run #2	7/27/2010	1.98	64.74	**0.17**	**5.50**
Run #3	7/27/2010	1.98	64.96	**0.18**	**5.90**
Breathing Level Air PH3:		0.00		**Average:**	**5.33**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/27/2010	497	NA	NA	**6.05**
Run #2	7/27/2010	500	NA	NA	**6.75**
Run #3	7/27/2010	500	NA	NA	**5.80**
				Average:	**6.20**
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 6 of 27)

Pond 8S TMP #1				Sampled week of:	July 26, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/26/2010	1.35	61.72	**45**	**2055**
Run #2	7/26/2010	1.34	62.19	**46**	**2135**
Run #3	7/26/2010	1.34	61.57	**47**	**2158**
Breathing Level Air PH3:		0.00		**Average:**	**2116**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/26/2010	173	510.00	775	**3059**
Run #2	7/26/2010	185	409.00	855	**2745**
Run #3	7/26/2010	188	350.00	860	**2461**
				Average:	**2755**
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

Phase IV Ponds TMP #1				Sampled week of:	July 26, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	No data collected. TMP plugged such that no flow could be established.				
Run #2					
Run #3					
Breathing Level Air PH3:				**Average:**	
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	No data collected. TMP plugged such that no flow could be established.				
Run #2					
Run #3					
				Average:	
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 8 of 27)

Phase IV Ponds TMP #4				Sampled week of:	July 26, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/27/2010	2.00	65.49	**1.66**	**54**
Run #2	7/27/2010	2.00	65.66	**1.76**	**58**
Run #3	7/27/2010	1.99	65.28	**1.80**	**59**
Breathing Level Air PH3:		0.00		**Average:**	**57**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/27/2010	211	NA	NA	**85**
Run #2	7/27/2010	233	NA	NA	**88**
Run #3	7/27/2010	241	NA	NA	**88**
				Average:	**87**
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 9 of 27)

Phase IV Ponds TMP #7				Sampled week of:	July 26, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/28/2010	1.79	64.29	**56**	**2011**
Run #2	7/28/2010	1.83	64.68	**58**	**2047**
Run #3	7/28/2010	1.83	64.20	**60**	**2108**
Breathing Level Air PH3:		0.00		**Average:**	**2055**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/28/2010	92	399.00	402	**2145**
Run #2	7/28/2010	107	423.00	426	**2110**
Run #3	7/28/2010	100	420.00	422	**2194**
				Average:	**2150**
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	Yes	7/28/2010	200 ml/min for 15 min.	POND12-TMP7-HCN	1117
H2S	Yes	7/28/2010	1,000 ml/min for 10 min.	POND12-TMP7-H2S	1103
HF	Yes	7/28/2010	300 ml/min for 10 min.	POND12-TMP7-HF	1139

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 10 of 27)

Phase IV Ponds TMP #8				Sampled week of:	July 26, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/28/2010	0.89	62.91	**199**	**14028**
Run #2	7/28/2010	0.87	62.76	**204**	**14633**
Run #3	7/28/2010	0.87	64.20	**208**	**14924**
Breathing Level Air PH3:		0.00		**Average:**	**14528**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	Not sampled as Screening Level was > 10,000 ppm.				
Run #2					
Run #3					
				Average:	
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

Phase IV Ponds TMP #11				Sampled week of:	July 26, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/28/2010	1.84	65.38	**7.50**	**267**
Run #2	7/28/2010	1.84	65.16	**7.55**	**268**
Run #3	7/28/2010	1.83	64.95	**8.05**	**285**
Breathing Level Air PH3:		0.00		**Average:**	**273**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/28/2010	480	NA	NA	**486**
Run #2	7/28/2010	489	NA	NA	**482**
Run #3	7/28/2010	493	NA	NA	**486**
				Average:	**485**
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

Pond 15S TMP #1				Sampled week of:	August 9, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/9/2010	0.19	64.03	**400**	**139371**
Run #2	8/9/2010	0.16	63.05	**374**	**144852**
Run #3	8/9/2010	0.16	62.65	**360**	**139054**
Breathing Level Air PH3:		0.00		**Average:**	**141092**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	Not sampled as Screening Level was > 10,000 ppm.				
Run #2					
Run #3					
				Average:	Not Sampled
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	Yes	8/9/2010	200 ml/min for 15 min.	OND15S-TMP1-HC	0831
H2S	Yes	8/9/2010	1,000 ml/min for 10 min.	OND15S-TMP1-H2	0910
HF	Yes	8/9/2010	300 ml/min for 10 min.	POND15S-TMP1-HI	1131

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

Pond 15S TMP #2				Sampled week of:	August 9, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/9/2010	0.25	57.61	**362**	**81346**
Run #2	8/9/2010	0.24	57.10	**362**	**85420**
Run #3	8/9/2010	0.24	57.14	**364**	**86093**
Breathing Level Air PH3:		0.00		**Average:**	**84286**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	Not sampled as Screening Level was > 10,000 ppm.				
Run #2					
Run #3					
				Average:	
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	Yes	8/9/2010	200 ml/min for 15 min.	OND15S-TMP2-HC	1125
H2S	Yes	8/9/2010	1,000 ml/min for 10 min.	OND15S-TMP2-H2	1110
HF	Yes	8/9/2010	300 ml/min for 10 min.	POND15S-TMP2-HI	1259

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 14 of 27)

Pond 15S TMP #5				Sampled week of:	August 9, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/9/2010	0.2	59.62	**238**	**73833**
Run #2	8/9/2010	0.2	59.37	**222**	**66527**
Run #3	8/9/2010	0.2	57.86	**220**	**64485**
Breathing Level Air PH3:		0.00		**Average:**	**68282**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	Not sampled as Screening Level was > 10,000 ppm.				
Run #2					
Run #3					
				Average:	
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	Yes	8/9/2010	200 ml/min for 15 min.	OND15S-TMP5-HC	1441
H2S	Yes	8/9/2010	1,000 ml/min for 10 min.	OND15S-TMP5-H2	1429
HF	Yes	8/9/2010	300 ml/min for 10 min.	POND15S-TMP5-HI	1500

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 15 of 27)

Pond 15S TMP #6				Sampled week of:	August 2, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/5/2010	0.31	62.73	**380**	**76082**
Run #2	8/5/2010	0.31	62.48	**380**	**75952**
Run #3	8/5/2010	0.31	62.30	**376**	**75049**
Breathing Level Air PH3:		0.00		**Average:**	**75694**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	Not sampled as Screening Level was > 10,000 ppm.				
Run #2					
Run #3					
				Average:	
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	Yes	8/10/2010	200 ml/min for 15 min.	OND15S-TMP6-HC	1349
H2S	Yes	8/10/2010	1,000 ml/min for 10 min.	OND15S-TMP6-H2	1521
HF	Yes	8/10/2010	300 ml/min for 10 min.	POND15S-TMP6-HI	1415

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

Pond 15S TMP #7				Sampled week of:	August 9, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/11/2010	0.2	65.16	**490**	**161223**
Run #2	8/11/2010	0.18	65.33	**470**	**170130**
Run #3	8/11/2010	0.16	65.05	**440**	**177750**
Breathing Level Air PH3:		0.00		**Average:**	**169701**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	Not sampled as Screening Level was > 10,000 ppm.				
Run #2					
Run #3					
				Average:	
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

Pond 15S TMP #8				Sampled week of:	8/9/2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	No sample as flow from TMP could not be established.				
Run #2					
Run #3					
Breathing Level Air PH3:		0.00		**Average:**	
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1					
Run #2					
Run #3					
				Average:	
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

Pond 15S TMP #9				Sampled week of:	8/9/2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	No sample as flow from TMP could not be established.				
Run #2					
Run #3					
Breathing Level Air PH3:		0.00		**Average:**	
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1					
Run #2					
Run #3					
				Average:	
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

Pond 15S TMP #10				Sampled week of:	8/9/2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	No sample as flow from TMP could not be established.				
Run #2					
Run #3					
Breathing Level Air PH3:		0.00		**Average:**	
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1					
Run #2					
Run #3					
				Average:	
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

Pond 17 TMP #1				Sampled week of:	August 2, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/4/2010	0.62	62.84	**177**	**17925**
Run #2	8/4/2010	0.62	62.84	**181**	**18339**
Run #3	8/4/2010	0.62	62.84	**178**	**19063**
Breathing Level Air PH3:		0.00		**Average:**	**18442**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	Not sampled as Screening Level was > 10,000 ppm.				
Run #2					
Run #3					
				Average:	
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 21 of 27)

Pond 17 TMP #2				Sampled week of:	August 2, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/4/2010	0.64	65.99	**114**	**11841**
Run #2	8/4/2010	0.63	65.55	**118**	**12230**
Run #3	8/4/2010	0.63	65.39	**119**	**12317**
Breathing Level Air PH3:		0.00		**Average:**	**12129**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	Not sampled as Screening Level was > 10,000 ppm.				
Run #2					
Run #3					
				Average:	
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	Yes	8/4/2010	200 ml/min for 15 min.	POND17TMP2-HCN	1254
H2S	Yes	8/4/2010	1,000 ml/min for 10 min.	POND17TMP2-H2S	1042
HF	Yes	8/4/2010	300 ml/min for 10 min.	POND17TMP2-HF	1121

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

Pond 17 TMP #4				Sampled week of:	August 2, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/3/2010	0.7	61.50	**34**	**2977**
Run #2	8/3/2010	0.7	61.28	**36**	**3133**
Run #3	8/3/2010	0.7	61.09	**37**	**3218**
Breathing Level Air PH3:		0.00		**Average:**	**3109**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/3/2010	67	426	**600**	**4414**
Run #2	8/3/2010	74	425	**750**	**4996**
Run #3	8/3/2010	77	422	**770**	**4990**
				Average:	**4800**
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

Pond 17 TMP #5				Sampled week of:	August 2, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/3/2010	0.62	63.33	**98**	**9979**
Run #2	8/3/2010	0.62	63.31	**101**	**10408**
Run #3	8/3/2010	0.62	63.30	**104**	**10668**
Breathing Level Air PH3:		0.00		**Average:**	**10352**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	Not sampled as Screening Level was > 10,000 ppm.				
Run #2					
Run #3					
				Average:	
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 24 of 27)

Pond 17 TMP #6				Sampled week of:	August 2, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/3/2010	0.56	62.72	**12.00**	**1334**
Run #2	8/3/2010	0.56	62.67	**12.00**	**1337**
Run #3	8/3/2010	0.56	62.68	**12.00**	**1339**
Breathing Level Air PH3:		0.00		**Average:**	**1337**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/3/2010	204	290	**680**	**1646**
Run #2	8/3/2010	204	288	**700**	**1688**
Run #3	8/3/2010	197	288	**670**	**1649**
				Average:	**1661**
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 25 of 27)

Pond 18A TMP #2				Sampled week of:	July 19, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/21/2010	1.18	68.57	**204**	**11873**
Run #2	7/21/2010	1.16	69.13	**206**	**12297**
Run #3	7/21/2010	1.15	69.07	**212**	**12688**
Breathing Level Air PH3:		0.00		**Average:**	**12286**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	Not sampled as Screening Level was > 10,000 ppm.				
Run #2					
Run #3					
				Average:	Not Sampled
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	No		200 ml/min for 15 min.		
H2S	No		1,000 ml/min for 10 min.		
HF	No		300 ml/min for 10 min.		

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

TABLE 4-5
RCRA PONDS
TMP GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

Pond 18A TMP #3				Sampled week of:	July 19, 2010
Screening Level TMP Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/22/2010	0.72	69.46	**308**	**28620**
Run #2	7/22/2010	0.75	69.63	**324**	**30256**
Run #3	7/22/2010	0.74	69.51	**330**	**30792**
Breathing Level Air PH3:		0.00		**Average:**	**29889**
Second-Level TMP Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	Not sampled as Screening Level was > 10,000 ppm.				
Run #2					
Run #3					
				Average:	Not Sampled
GOPC TMP Gas Sampling [1]					
	Sampled?	**Date**	**Sample Rate**	**Sample #**	**Time of Sample**
HCN	Yes	7/22/2010	200 ml/min for 15 min.	POND18ATMP3-H	1125
H2S	Yes	7/22/2010	1,000 ml/min for 10 min.	POND18ATMP3-H	1102
HF	Yes	7/22/2010	300 ml/min for 10 min.	POND18ATMP3-H	1147

[1] Results of GOPC sampling (if performed) are pending laboratory analysis and data validation.

TABLE 4-6
RCRA PONDS
TMP LABORATORY GOPC SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT

			Analyte	**Hydrogen sulfide**				**Hydrogen Cyanide**				**Hydrofluoric acid**			
			Analytical Method	**OSHA1008**				**NIOSH6010**				**NIOSH7903**			
			Volume (L)	**10**				**3**				**3**			
			Molecular Weight	**34.082**				**27.0253**				**20.00634**			
			PEL (ppm)	**20/50**				**10**				**3**			
			IDLH (ppm)	**100**				**50**				**30**			
			LEL (ppm)	**40,000**				**56,000**				**N/A**			
Sample Identification	**Sample Date**	**Phosphine Concentration (ppm)[1]**	**Dilution Factor[2]**	**µg/Sample**	**µg/l**	**Reported ppm[3]**	**Actual ppm[4]**	**µg/Sample**	**µg/l**	**Reported ppm[3]**	**Actual ppm[4]**	**µg/Sample**	**µg/l**	**Reported ppm[3]**	**Actual ppm[4]**
PhaseIVPondsTMP7	7/28/2010	273.33	1	**3.1**	**0.309**	**0.204**	**0.204**	<0.21	<0.069	<0.058	<0.058	**4.3**	**1.433**	**1.609**	**1.609**
Pond15STMP1	8/10/2010	141092.3	391.56	<7.1 UJ	<0.709 UJ	<0.467 UJ	<182 UJ	<0.21	<0.069	<0.058	<22.7	<0.53	<0.176	<0.198	<77.5
Pond15STMP1 Dup	8/10/2010	141092.3	391.56	<7.1 UJ	<0.709 UJ	<0.467 UJ	<182 UJ	<0.21	<0.069	<0.058	<22.7	<0.53	<0.176	<0.198	<77.5
Pond15STMP2	8/9/2010	84286	238.08	<7.1 UJ	<0.709 UJ	<0.467 UJ	<111 UJ	<0.21	<0.069	<0.058	<13.8	**0.76**	**0.253**	**0.284**	**68**
Pond15STMP2 Dup	8/11/2010	84286	238.08	<7.1 UJ	<0.709 UJ	<0.467 UJ	<111 UJ	<0.21	<0.069	<0.058	<13.8	**1.4**	**0.466**	**0.523**	**125**
Pond15STMP5	8/9/2010	68281	289.35	<7.1 UJ	<0.709 UJ	<0.467 UJ	<135 UJ	<0.21	<0.069	<0.058	<16.8	**1.6**	**0.533**	**0.598**	**173**
Pond15STMP6	8/10/2010	75694	200.97	<7.1 UJ	<0.709 UJ	<0.467 UJ	<93.9	<0.21	<0.069	<0.058	<11.7	<0.53	<0.176	<0.198	<39.8
Pond17TMP2	8/4/2010	12129.33	103.81	**100 J-,B**	**10 J-,B**	**6.589 J-,B**	**684**	<0.21	<0.069	<0.058	<6.02	**19**	**6.333**	**7.11**	**738**
Pond17TMP2 Dup	8/4/2010	12129.33	103.81	**82 J-,B**	**8.199 J-,B**	**5.403 J-,B**	**561**	<0.21	<0.069	<0.058	<6.02	**21**	**7**	**7.858**	**816**
Pond18ATMP3	7/22/2010	29889	1	**47**	**4.7**	**3.097**	**3.097**	<0.21	<0.069	<0.058	<5.45	**17**	**5.666**	**6.361**	**6.361**
Pond8ETMP4	8/2/2010	2038	1	**72**	**7.2**	**4.744**	**4.744**	<0.21	<0.069	<0.058	<0.058	**21**	**7**	**7.858**	**7.858**
Pond8ETMP4 Dup	8/2/2010	2038	1	**300**	**30**	**19.769**	**19.769**	<0.21	<0.069	<0.058	<0.058	**25**	**8.333**	**9.355**	**9.355**

Reporting limit or concentration greater than established PEL
Reporting limit or concentration greater than established PEL and IDLH
Bold Bolded result indicates positively identified compound.
µg micrograms
µg/l micrograms per liter
L liter
ppm parts per million
B Analyte detected in an associated blank.
J- Data are estimated, potentially biased low due to associated quality control data.
UJ Potential low bias, possible false negative.
N/A Not applicable
PEL Permissible exposure limit, per U. S. Occupational Safety & Health Administration
IDLH Immediately Dangerous to Life or Health
LEL Lower Explosive Limit
Conversion from µg/l to ppm = concentration in µg/l X (22.46 / molecular weight of compound)

[1] Measured from the TMP using an Draeger Pac III meter
[2] If phosphine concentration was greater than 10,000 ppm, GOPC samples were collected using a dilution box
[3] Concentration reported by laboratory
[4] Laboratory concentration multiplied by dilution factor.

TABLE 4-7
RCRA PONDS
PERIMETER PIPPING GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 1 of 5)

Pond 8E Perimeter Piping				Sampling week of:	July 26, 2010
Screening Level Perimeter Piping Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/29/2010	1.63	63.13	**36**	**1397**
Run #2	7/29/2010	1.64	62.96	**29**	**1114**
Run #3	7/29/2010	1.64	63.41	**36**	**1393**
Breathing Level Air PH3:		0.00		**Average:**	**1301**
Second-Level Perimeter Piping Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/29/2010	224	280.00	**820**	**1845**
Run #2	7/29/2010	196	300.00	**730**	**1847**
Run #3	7/29/2010	178	316.00	**615**	**1707**
				Average:	**1800**

Pond 9E Perimeter Piping				Sampling week of:	July 26, 2010
Screening Level Perimeter Piping Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/27/2010	2.00	63.82	**0.00**	**0.00**
Run #2	7/27/2010	2.00	63.05	**0.00**	**0.00**
Run #3	7/27/2010	2.00	63.01	**0.00**	**0.00**
Breathing Level Air PH3:		0.00		**Average:**	**0.00**
Second-Level Perimeter Piping Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/27/2010	502	NA	NA	**0.00**
Run #2	7/27/2010	499	NA	NA	**0.00**
Run #3	7/27/2010	498	NA	NA	**0.00**
				Average:	**0.00**

TABLE 4-7
RCRA PONDS
PERIMETER PIPPING GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 2 of 5)

Pond 8S Perimeter Piping				Sampling week of:	July 26, 2010
Screening Level Perimeter Piping Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/26/2010	1.83	63.22	**21.00**	**726**
Run #2	7/26/2010	1.82	63.69	**18.00**	**629**
Run #3	7/26/2010	1.82	63.54	**16.00**	**557**
Breathing Level Air PH3:		0.00		**Average:**	**637**
Second-Level Perimeter Piping Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/26/2010	485	263.00	**730**	**1125**
Run #2	7/26/2010	492	279.00	**620**	**971**
Run #3	7/26/2010	489	262.00	**545**	**837**
				Average:	**978**

Phase IV Pond 11S Perimeter Piping				Sampling week of:	July 26, 2010
Screening Level Perimeter Piping Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/29/2010	1.98	63.14	**0.00**	**0.00**
Run #2	7/29/2010	1.98	63.14	**0.00**	**0.00**
Run #3	7/29/2010	1.98	62.92	**0.23**	**7.00**
Breathing Level Air PH3:		0.00		**Average:**	**2.33**
Second-Level Perimeter Piping Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/29/2010	464	NA	NA	**17.00**
Run #2	7/29/2010	461	NA	NA	**17.00**
Run #3	7/29/2010	464	NA	NA	**13.00**
				Average:	**15.67**

TABLE 4-7
RCRA PONDS
PERIMETER PIPPING GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 3 of 5)

Phase IV Pond 12S Perimeter Piping				Sampling week of:	July 26, 2010
Screening Level Perimeter Piping Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/29/2010	1.24	62.45	**5.55**	**279**
Run #2	7/29/2010	1.23	62.23	**9.55**	**484**
Run #3	7/29/2010	1.23	62.41	**7.20**	**366**
Breathing Level Air PH3:		0.00		**Average:**	**376**
Second-Level Perimeter Piping Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/29/2010	467	NA	NA	**630**
Run #2	7/29/2010	454	NA	NA	**775**
Run #3	7/29/2010	412	NA	NA	**790**
				Average:	**732**

Phase IV Pond 13S Perimeter Piping				Sampling week of:	July 26, 2010
Screening Level Perimeter Piping Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/27/2010	1.82	61.69	**0.00**	**0.00**
Run #2	7/27/2010	1.85	61.69	**0.00**	**0.00**
Run #3	7/27/2010	1.82	61.74	**0.00**	**0.00**
Breathing Level Air PH3:		0.00		**Average:**	**0.00**
Second-Level Perimeter Piping Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/27/2010	467	NA	NA	**0.06**
Run #2	7/27/2010	465	NA	NA	**0.06**
Run #3	7/27/2010	459	NA	NA	**0.05**
				Average:	**0.06**

TABLE 4-7
RCRA PONDS
PERIMETER PIPPING GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 4 of 5)

Phase IV Pond 14S Perimeter Piping				Sampling week of:	July 26, 2010
Screening Level Perimeter Piping Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/27/2010	1.86	62.23	0.00	0.00
Run #2	7/27/2010	1.86	62.40	0.00	0.00
Run #3	7/27/2010	1.85	62.56	0.00	0.00
Breathing Level Air PH3:		0.00		**Average:**	**0.00**
Second-Level Perimeter Piping Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/27/2010	498	NA	NA	**0.00**
Run #2	7/27/2010	500	NA	NA	**0.00**
Run #3	7/27/2010	492	NA	NA	**0.00**
				Average:	**0.00**

Pond 15S Perimeter Piping				Sampling week of:	August 9, 2010
Screening Level Perimeter Piping Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/11/2010	4.22	87.80	**292**	**6074**
Run #2	8/11/2010	4.45	87.80	**256**	**5048**
Run #3	8/11/2010	4.23	87.07	**250**	**5143**
Breathing Level Air PH3:		0.00		**Average:**	**5422**
Second-Level Perimeter Piping Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/11/2010	67	437	**575**	**4325**
Run #2	8/11/2010	58	436	**540**	**4599**
Run #3	8/11/2010	64	435	**545**	**4249**
				Average:	**4391**

TABLE 4-7
RCRA PONDS
PERIMETER PIPPING GAS PH3 SAMPLING RESULTS
SITE-WIDE GAS ASSESSMENT
(Page 5 of 5)

Pond 17 Perimeter Piping				Sampling week of:	August 2, 2010
Screening Level Perimeter Piping Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	8/5/2010	0.83	64.95	**232**	**18130**
Run #2	8/5/2010	0.84	64.47	**234**	**18044**
Run #3	8/5/2010	0.83	64.21	**232**	**17847**
Breathing Level Air PH3:		0.00		**Average:**	**18007**
Second-Level Perimeter Piping Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	Not sampled as Screening Level was > 10,000 ppm.				
Run #2					
Run #3					
				Average:	

Pond 18A Perimeter Piping				Sampling week of:	July 19, 2010
Screening Level Perimeter Piping Gas PH3 Sampling - Based Upon GES Operational Data					
GES Data	**Date**	**Gas Flow from TMP (scfm)**	**GES Inlet Flow (scfm)**	**Measured GES inlet PH3 (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/22/2010	1.98	63.96	**165**	**5326**
Run #2	7/22/2010	1.97	63.96	**189**	**6128**
Run #3	7/22/2010	1.97	63.96	**189**	**6123**
Breathing Level Air PH3:		0.00		**Average:**	**5859**
Second-Level Perimeter Piping Gas PH3 Sampling - Direct Measurement					
Measurement	**Date**	**Pond Gas Flow (ml/min)**	**N2 Flow (ml/min)**	**Diluted Gas PH3 Conc. (ppm)**	**Calculated TMP PH3 Conc. (ppm)**
Run #1	7/22/2010	44	425	**710**	**7568**
Run #2	7/22/2010	46	429	**680**	**7021**
Run #3	7/22/2010	55	423	**780**	**6779**
				Average:	**7123**

TABLE 4-8
RCRA PONDS
POND CAP PH3 SURFACE SCANS
SITE-WIDE GAS ASSESSMENT
(Page 1 of 9)

RCRA Pond 15S Cap Surface		Cell #:	1	Sampling week of:	August 2, 2010
Date:	8/4/2010	Start Time:	0816	Wind Speed:	4.7 mph
Weather Observations:			Mostly sunny		
Location of Surface Scan:		RCRA Pond 15S Cap Cell #1			
Breathing Level PH3 (ppm):		0.00			

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	21	0.00	No	41	0.00	No
2	0.00	No	22	0.00	No	42	0.00	No
3	0.00	No	23	0.00	No	43	0.00	No
4	0.00	No	24	0.00	No	44	0.00	No
5	0.00	No	25	0.00	No	45	0.00	No
6	0.00	No	26	0.00	No	46	0.00	No
7	0.00	No	27	0.00	No	47	0.00	No
8	0.00	No	28	0.00	No	48	0.00	No
9	0.00	No	29	0.00	No	49	0.00	No
10	0.00	No	30	0.00	No	50	0.00	No
11	0.00	No	31	0.00	No			
12	0.00	No	32	0.00	No			
13	0.00	No	33	0.00	No			
14	0.00	No	34	0.00	No			
15	0.00	No	35	0.00	No			
16	0.00	No	36	0.00	No			
17	0.00	No	37	0.00	No			
18	0.00	No	38	0.00	No			
19	0.00	No	39	0.00	No			
20	0.00	No	40	0.00	No			

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

TABLE 4-8
RCRA PONDS
POND CAP PH3 SURFACE SCANS
SITE-WIDE GAS ASSESSMENT
(Page 2 of 9)

RCRA Pond 15S Cap Surface		Cell #:	2	Sampling week of:	August 2, 2010
Date:	8/4/2010	Start Time:	0926	Wind Speed:	5.9 mph
Weather Observations:			Mostly sunny		
Location of Surface Scan:		RCRA Pond 15S Cap Cell #2			
Breathing Level PH3 (ppm):		0.00			

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	21	0.00	No	41	0.00	No
2	0.00	No	22	0.00	No	42	0.00	No
3	0.00	No	23	0.00	No	43	0.00	No
4	0.00	No	24	0.00	No	44	0.00	No
5	0.00	No	25	0.00	No	45	0.00	No
6	0.00	No	26	0.00	No	46	0.00	No
7	0.00	No	27	0.00	No	47	0.00	No
8	0.00	No	28	0.00	No	48	0.00	No
9	0.00	No	29	0.00	No			
10	0.00	No	30	0.00	No			
11	0.00	No	31	0.00	No			
12	0.00	No	32	0.00	No			
13	0.00	No	33	0.00	No			
14	0.00	No	34	0.00	No			
15	0.00	No	35	0.00	No			
16	0.00	No	36	0.00	No			
17	0.00	No	37	0.00	No			
18	0.00	No	38	0.00	No			
19	0.00	No	39	0.00	No			
20	0.00	No	40	0.00	No			

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

TABLE 4-8
RCRA PONDS
POND CAP PH3 SURFACE SCANS
SITE-WIDE GAS ASSESSMENT
(Page 3 of 9)

RCRA Pond 15S Cap Surface		Cell #:	3	Sampling week of:	August 2, 2010
Date:	8/4/2010	Start Time:	1047	Wind Speed:	4.4
Weather Observations:			Mostly sunny		
Location of Surface Scan:		RCRA Pond 15S Cap Cell #3			
Breathing Level PH3 (ppm):		0.00			

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	21	0.00	No	41	0.00	No
2	0.00	No	22	0.00	No	42	0.00	No
3	0.00	No	23	0.00	No	43	0.00	No
4	0.00	No	24	0.00	No	44	0.00	No
5	0.00	No	25	0.00	No	45	0.00	No
6	0.00	No	26	0.00	No	46	0.00	No
7	0.00	No	27	0.00	No	47	0.00	No
8	0.00	No	28	0.00	No	48	0.00	No
9	0.00	No	29	0.00	No			
10	0.00	No	30	0.00	No			
11	0.00	No	31	0.00	No			
12	0.00	No	32	0.00	No			
13	0.00	No	33	0.00	No			
14	0.00	No	34	0.00	No			
15	0.00	No	35	0.00	No			
16	0.00	No	36	0.00	No			
17	0.00	No	37	0.00	No			
18	0.00	No	38	0.00	No			
19	0.00	No	39	0.00	No			
20	0.00	No	40	0.00	No			

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

TABLE 4-8
RCRA PONDS
POND CAP PH3 SURFACE SCANS
SITE-WIDE GAS ASSESSMENT
(Page 4 of 9)

RCRA Pond 15S Cap Surface		Cell #:	4	Sampling week of:	August 2, 2010
Date:	8/4/2010	Start Time:	1250	Wind Speed:	7.2 mph
Weather Observations:			Mostly sunny		
Location of Surface Scan:		RCRA Pond 15S Cap Cell #4			
Breathing Level PH3 (ppm):		0.00			

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	21	0.00	No	41	0.00	No
2	0.00	No	22	0.00	No	42	0.00	No
3	0.00	No	23	0.00	No	43	0.00	No
4	0.00	No	24	0.00	No	44	0.00	No
5	0.00	No	25	0.00	No	45	0.00	No
6	0.00	No	26	0.00	No	46	0.00	No
7	0.00	No	27	0.00	No	47	0.00	No
8	0.00	No	28	0.00	No	48	0.00	No
9	0.00	No	29	0.00	No	49	0.00	No
10	0.00	No	30	0.00	No	50	0.00	No
11	0.00	No	31	0.00	No	51	0.00	No
12	0.00	No	32	0.00	No	52	0.00	No
13	0.00	No	33	0.00	No			
14	0.00	No	34	0.00	No			
15	0.00	No	35	0.00	No			
16	0.00	No	36	0.00	No			
17	0.00	No	37	0.00	No			
18	0.00	No	38	0.00	No			
19	0.00	No	39	0.00	No			
20	0.00	No	40	0.00	No			

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

TABLE 4-8
RCRA PONDS
POND CAP PH3 SURFACE SCANS
SITE-WIDE GAS ASSESSMENT
(Page 5 of 9)

RCRA Pond 15S Cap Surface		Cell #:	5	Sampling week of:	August 2, 2010
Date:	8/4/2010	Start Time:	1409	Wind Speed:	8.6 mph
Weather Observations:			Mostly sunny		
Location of Surface Scan:		RCRA Pond 15S Cap Cell #5			
Breathing Level PH3 (ppm):		0.00			

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	21	0.00	No	41	0.00	No
2	0.00	No	22	0.00	No	42	0.00	No
3	0.00	No	23	0.00	No	43	0.00	No
4	0.00	No	24	0.00	No	44	0.00	No
5	0.00	No	25	0.00	No	45	0.00	No
6	0.00	No	26	0.00	No	46	0.00	No
7	0.00	No	27	0.00	No	47	0.00	No
8	0.00	No	28	0.00	No	48	0.00	No
9	0.00	No	29	0.00	No			
10	0.00	No	30	0.00	No			
11	0.00	No	31	0.00	No			
12	0.00	No	32	0.00	No			
13	0.00	No	33	0.00	No			
14	0.00	No	34	0.00	No			
15	0.00	No	35	0.00	No			
16	0.00	No	36	0.00	No			
17	0.00	No	37	0.00	No			
18	0.00	No	38	0.00	No			
19	0.00	No	39	0.00	No			
20	0.00	No	40	0.00	No			

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

TABLE 4-8
RCRA PONDS
POND CAP PH3 SURFACE SCANS
SITE-WIDE GAS ASSESSMENT
(Page 6 of 9)

RCRA Pond 15S Cap Surface		Cell #:	6	Sampling week of:	August 2, 2010
Date:	8/5/2010	Start Time:	0744	Wind Speed:	calm
Weather Observations:			Mostly sunny		
Location of Surface Scan:		RCRA Pond 15S Cap Cell #6			
Breathing Level PH3 (ppm):		0.00			

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	21	0.00	No	41	0.00	No
2	0.00	No	22	0.00	No	42	0.00	No
3	0.00	No	23	0.00	No	43	0.00	No
4	0.00	No	24	0.00	No	44	0.00	No
5	0.00	No	25	0.00	No	45	0.00	No
6	0.00	No	26	0.00	No	46	0.00	No
7	0.00	No	27	0.00	No	47	0.00	No
8	0.00	No	28	0.00	No	48	0.00	No
9	0.00	No	29	0.00	No	49	0.00	No
10	0.00	No	30	0.00	No	50	0.00	No
11	0.00	No	31	0.00	No	51	0.00	No
12	0.00	No	32	0.00	No	52	0.00	No
13	0.00	No	33	0.00	No			
14	0.00	No	34	0.00	No			
15	0.00	No	35	0.00	No			
16	0.00	No	36	0.00	No			
17	0.00	No	37	0.00	No			
18	0.00	No	38	0.00	No			
19	0.00	No	39	0.00	No			
20	0.00	No	40	0.00	No			

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

TABLE 4-8
RCRA PONDS
POND CAP PH3 SURFACE SCANS
SITE-WIDE GAS ASSESSMENT
(Page 7 of 9)

RCRA Pond 15S Cap Surface		Cell #:	7	Sampling week of:	August 2, 2010
Date:	8/5/2010	Start Time:	0758	Wind Speed:	1 mph
Weather Observations:			Clear		
Location of Surface Scan:		RCRA Pond 15S Cap Cell #7			
Breathing Level PH3 (ppm):		0.00			

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	21	0.00	No	41	0.00	No
2	0.00	No	22	0.00	No	42	0.00	No
3	0.00	No	23	0.00	No	43	0.00	No
4	0.00	No	24	0.00	No	44	0.00	No
5	0.00	No	25	0.00	No	45	0.00	No
6	0.00	No	26	0.00	No	46	0.00	No
7	0.00	No	27	0.00	No	47	0.00	No
8	0.00	No	28	0.00	No	48	0.00	No
9	0.00	No	29	0.00	No	49	0.00	No
10	0.00	No	30	0.00	No	50	0.00	No
11	0.00	No	31	0.00	No	51	0.00	No
12	0.00	No	32	0.00	No	52	0.00	No
13	0.00	No	33	0.00	No	53	0.00	No
14	0.00	No	34	0.00	No	54	0.00	No
15	0.00	No	35	0.00	No			
16	0.00	No	36	0.00	No			
17	0.00	No	37	0.00	No			
18	0.00	No	38	0.00	No			
19	0.00	No	39	0.00	No			
20	0.00	No	40	0.00	No			

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

TABLE 4-8
RCRA PONDS
POND CAP PH3 SURFACE SCANS
SITE-WIDE GAS ASSESSMENT
(Page 8 of 9)

RCRA Pond 15S Cap Surface		Cell #:	8	Sampling week of:	August 2, 2010
Date:	8/5/2010	Start Time:	0859	Wind Speed:	1.9 mph
Weather Observations:			Clear		
Location of Surface Scan:		RCRA Pond 15S Cap Cell #8			
Breathing Level PH3 (ppm):		0.00			

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	21	0.00	No	41	0.00	No
2	0.00	No	22	0.00	No	42	0.00	No
3	0.00	No	23	0.00	No	43	0.00	No
4	0.00	No	24	0.00	No	44	0.00	No
5	0.00	No	25	0.00	No	45	0.00	No
6	0.00	No	26	0.00	No	46	0.00	No
7	0.00	No	27	0.00	No	47	0.00	No
8	0.00	No	28	0.00	No	48	0.00	No
9	0.00	No	29	0.00	No	49	0.00	No
10	0.00	No	30	0.00	No	50	0.00	No
11	0.00	No	31	0.00	No	51	0.00	No
12	0.00	No	32	0.00	No	52	0.00	No
13	0.00	No	33	0.00	No	53	0.00	No
14	0.00	No	34	0.00	No	54	0.00	No
15	0.00	No	35	0.00	No			
16	0.00	No	36	0.00	No			
17	0.00	No	37	0.00	No			
18	0.00	No	38	0.00	No			
19	0.00	No	39	0.00	No			
20	0.00	No	40	0.00	No			

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

TABLE 4-8
RCRA PONDS
POND CAP PH3 SURFACE SCANS
SITE-WIDE GAS ASSESSMENT
(Page 9 of 9)

RCRA Pond 15S Cap Surface		Cell #:	9	Sampling week of:	August 2, 2010
Date:	8/5/2010	Start Time:	0914	Wind Speed:	2 mph
Weather Observations:			Clear		
Location of Surface Scan:		RCRA Pond 15S Cap Cell #9			
Breathing Level PH3 (ppm):		0.00			

Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]	Minute:	PH3 (ppm)	Area Flagged?[1]
1	0.00	No	21	0.00	No	41	0.00	No
2	0.00	No	22	0.00	No	42	0.00	No
3	0.00	No	23	0.00	No	43	0.00	No
4	0.00	No	24	0.00	No	44	0.00	No
5	0.00	No	25	0.00	No	45	0.00	No
6	0.00	No	26	0.00	No	46	0.00	No
7	0.00	No	27	0.00	No	47	0.00	No
8	0.00	No	28	0.00	No	48	0.00	No
9	0.00	No	29	0.00	No	49	0.00	No
10	0.00	No	30	0.00	No	50	0.00	No
11	0.00	No	31	0.00	No	51	0.00	No
12	0.00	No	32	0.00	No			
13	0.00	No	33	0.00	No			
14	0.00	No	34	0.00	No			
15	0.00	No	35	0.00	No			
16	0.00	No	36	0.00	No			
17	0.00	No	37	0.00	No			
18	0.00	No	38	0.00	No			
19	0.00	No	39	0.00	No			
20	0.00	No	40	0.00	No			

[1] Any PH3 reading > the $FMDL_{ss}$ was flagged and later investigated.

5.0 CONCLUSION AND RECOMMENDATIONS

Submittal of this Site-Wide Gas Assessment Report is intended to satisfy the requirements of the *Field Modification #15 Work Plan*. Site-wide gas samples were collected and analyzed in accordance with specifications contained in the approved *Field Modification #15 Work Plan* with field changes as noted in this document.

5.1 SUMMARY OF RESULTS

The results of the site-wide gas assessment are summarized below for the (1) industrial hygiene and ambient air monitoring, (2) CERCLA remedial areas, and (3) closed RCRA ponds area. The site-wide gas assessment results are described in detail in Sections 3.0 and 4.0 of this report and summarized on Tables ES-1 (CERCLA Remedial Areas) and ES-2 (RCRA Ponds).

Site-Wide Industrial Hygiene and Ambient Air PH3 Monitoring

- No industrial hygiene monitoring alarms occurred during the site-wide assessment field work which represented over 1,500 man-hours and about 950 hours of personnel monitoring for phosphine during of sampling in the RCRA pond area, on tasks immediately adjacent to potential sources of PH3, and at the identified CERCLA remedial areas.
- All of the 153 results of the breathing zone sampling at the CERCLA areas were 0.00 ppm PH3
- All of the 126 results of the breathing zone sampling at the RCRA ponds were 0.00 ppm PH3.

CERCLA Remedial Area Assessment

- All of the 107 results from the surface scans at RA-D, underground piping at RA-C, the traverse along the slag pile at RA-F1, and the bottom of the slag pit at RA-B were 0.00 ppm PH3.
- The majority of the soil gas sampling results, 383 of 420 total recorded readings (over 90%), were 0.00 ppm PH3 and none of the readings were above the OSHA 8-hour TWA PEL of 0.30 ppm PH3. 37 of the 420 total recorded soil gas readings (9%) were non-zero (>0.00 ppm) and individual readings ranged from 0.02 to 0.15 ppm PH3. The average (mean) PH 3 soil gas results for RA-B and RA-K was 0.00 ppm and RA-C and RA-F1 was 0.01 ppm.
- Soil gas GOPC results:
  - Hydrogen sulfide results ranged from 0.144 to 1.054 ppm and were all well below the OSHA PEL for general industry of 20 ppm (ceiling). The majority of the results were in the range of the reported “false” positive results for field blank samples of 0.26 and 0.20 ppm H_2S.
  - All hydrogen cyanide results were non-detect (<0.058 ppm HCN).

- Only one (RAKSG101 on 7/22/10) of 25 samples, including duplicates, was reported as detected above the hydrofluoric acid detection limit of 0.20 ppm HF. The sample at RAKSG101 on the next day (7/23/10) was one of the 24 non-detect (<0.2 ppm HF) results.

- Flux chamber results:
  - The highest average PH3 concentration within the flux chambers was 0.447 ppm PH3 at RA-B soil gas location #3 and the collocated flux chamber that was measured using OSHA method 1003 (both sampled on 8/3/2010) was 0.258 ppm PH3. These concentrations are for the 10 liters within the flux chamber and the 24 hour incubation period. On an 8 hour basis, the average PH 3 concentrations would be below the OSHA 8-hour TWA PEL of 0.30 ppm PH3 and, as described above, the breathing zone sampling at this flux chamber location was 0.00 ppm PH3 indicating that the PH3 flux rate at RA-B soil gas location #3 is too low to be detectable in ambient air.
  - The average PH3 concentrations within the flux chamber at RA-C 6S soil gas location #3 measured on 7/30 and 8/3/2010 were 0.022 and 0.028 ppm PH3 which are an order of magnitude lower than the OSHA 8-hour TWA PEL of 0.30 ppm PH3. As described above, the breathing zone sampling at this flux chamber location was 0.00 ppm PH3 indicating that the PH3 flux rate at RA-C soil gas location #3 is too low to be detectable in ambient air. The other RA-C flux chamber locations averaged 0.00 ppm PH3.
  - The maximum average PH3 concentration within the RA-F1 flux chambers was 0.004 ppm which is below the real-time detection capability of field monitors (e.g., Draeger Pac III).
  - The average PH3 concentrations within the flux chambers at RA-K soil gas location #3 and step-out location 3E measured on 8/3 and 8/11/2010 were 0.030 and 0.023 ppm PH3 which are an order of magnitude lower than the OSHA 8-hour TWA PEL of 0.30 ppm PH3. As described above, the breathing zone sampling at these flux chamber locations was 0.00 ppm PH3 indicating that the PH3 flux rate at RA-K soil gas locations #3 and step-out location 3E is too low to be detectable in ambient air. The other RA-K and step-out locations flux chamber locations averaged 0.00 ppm PH3.

<u>RCRA Ponds Assessment</u>

- All of the 146 phosphine monitoring results in ambient air outside appurtenances were 0.00 ppm PH3, and other than at a limited area within the perimeter surface scan at Pond 15S adjacent to soil gas location 15S-12, the balance of the 320 results for the other RCRA ponds were 0.00 ppm PH3. Phosphine was not detected above 0.00 ppm PH3 during the follow-up cap surface scan performed at Pond 15S.
- As expected based on the conceptual model, the highest phosphine concentrations were recorded in samples of gas from TMPs (e.g., immediately above the pond waste zone). As shown on Table ES-2, mean TMP concentrations were highest at Pond 15S

(107,811 ppm PH3), Pond 18 Cell A (21,088 ppm PH3), and Pond 17 (9,477 ppm PH3). Phosphine results from the other RCRA pond TMPs were lower, ranging from 6 ppm PH3 (Pond 9E) to 4,313 ppm PH3 (Phase IV ponds).

- As expected based on the conceptual model, the next highest phosphine concentrations were recorded in samples from perimeter gas collection piping (e.g., piping under the pond cap). As shown on Table ES-2, mean perimeter piping concentrations were highest at Pond 17 (18,007 ppm PH3), Pond 18 Cell A (7,123 ppm PH3), and Pond 15S (4,391 ppm PH3). Phosphine results from the other RCRA pond perimeter piping were lower, ranging from 0 ppm PH3 (Pond 9E) to 1,800 ppm PH3 (Pond 8E).
- Phosphine was detected in a limited number of perimeter soil gas (approximately 18 to 24 inches below ground surface, five feet outside the anchor trench and within the limit of final cover of the closed pond)
  - at Pond 17 (10 of 11 locations were >0.00 ppm and ranged from 0.06 to 171 ppm PH3),
  - at Pond 15S (7 of 15 locations were >0.00 ppm and ranged from 0.02 to 127 ppm PH3), and
  - at Pond 18 Cell A (7 of 10 locations were >0.00 ppm and ranged from 0.01 to 58 ppm PH3).
  - Note that these detections are not in ambient air and employee personnel IH monitors did not alarm during the scans.
  - The perimeter soil gas PH3 results for Pond 8S, Pond 9E, and the Phase IV ponds were all 0.00 ppm PH3.
- Phosphine was not detected outside of any TMP well enclosure. Phosphine was detected above the OSHA 8-hour TWA PEL of 0.30 ppm within only one enclosure at Pond 8E 2.64 ppm PH3). This detection was traced back to a remnant of the construction of the concrete pad upon which the TMP enclosure sits, and the superfluous PVC conduit has since been sealed with grout.
- Phosphine was not detected outside of any RCRA Pond sump (cap drainage and LCDRS manholes). Phosphine was detected above the OSHA 8-hour TWA PEL of 0.30 ppm inside the two ET cap drainage lift stations at Pond 15S (0.34 and 2.62 ppm PH3) and at one of the two ET cap drainage lift stations at Pond 18 Cell A (1.00 ppm PH3).
- GOPC results from TMPs (immediately above the waste zone):
  - Hydrogen sulfide results were greater than the OSHA PEL for general industry of 20 ppm (ceiling) for H_2S in TMPs at Pond 17(684 ppm H2S in primary sample and 561 ppm H2S in duplicate sample). Due to sample dilution, the H_2S results from the Pond 15S TMPs were non-detect at a detection limit higher than the H_2S 8-hour TWA PEL. The results from the TMPs at the Phase IV ponds, Pond 8E and Pond 18 Cell A were below the OSHA PEL for H_2S and ranged from 0.204 ppm H2S (Phase IV ponds TMP7) to 19.8 ppm

H2S (Pond 8E TMP4 duplicate, Pond 8E TMP4 primary sample result was 4.7 ppm H2S).

- All hydrogen cyanide results were non-detect at a detection limit below the OSHA 8-hour TWA PEL of 10 ppm for HCN, except the results from Pond 15S TMP #1 that was non-detect at a detection limit higher than the 8-hour TWA PEL for HCN due to sample dilution.
- Other than the result from the Phase IV ponds TMP (1.61 ppm HF), the hydrogen fluoride (measured as hydrofluoric acid) results (or detection limit for non-detect results) were above the OSHA PEL of 3 ppm for HF and ranged from 6.4 ppm HF (Pond 18 Cell A TMP3, undiluted sample) to 816 ppm HF (Pond 17 TMP2 duplicate, Pond 17 TMP2 primary sample result was 738 ppm HF, diluted sample). .

5.2 CONCLUSIONS

The site-wide gas assessment results summarized above and detailed in Sections 3.0 and 4.0 of this report corroborate two primary conclusions. The first is that the site-wide gas assessment findings for the CERCLA RAs support the current CSM and no change to the CSM for CERCLA areas is warranted.

The second conclusion is that the gas assessment findings also show that while PH3 is present at significant concentrations beneath and within some of the RCRA Pond cap systems, it was not found in ambient air during the one month of field work on the site conducting the site-wide gas assessment. Further, although phosphine is the primary gas of concern at the RCRA Ponds, other gases of concern, such as hydrogen sulfide and hydrogen fluoride, were measured at concentrations above regulatory values (OSHA PELs). Phosphine and other gases detected in specific appurtenances, gas collection piping beneath the final caps and the temperature monitoring points (TMPs) at the RCRA ponds will be addressed pursuant to the EPA Unilateral Administrative Order for Removal Action, CERCLA Docket No. CERCLA 10-2010-0170 (“the RCRA Ponds UAO”).

In addition, the field sampling methodologies used during the site-wide assessment were appropriate to monitor for potential phosphine at the CERCLA remedial areas and RCRA Ponds area. These methods would also be appropriate for the long-term phosphine monitoring that is identified as a component of the soil remedial alternatives detailed in the SFS and for phosphine monitoring under the RCRA Ponds UAO, as appropriate.

6.0 REFERENCES

Bechtel Environmental, Inc. 1996. Remedial Investigation for the Eastern Michaud Flats Site. Bechtel Environmental, Inc. Draft issued September 1995 and revised August 1996.

BEI. *See* Bechtel Environmental, Inc.

EPA. *See* United States Environmental Protection Agency.

MWH, 2007a. Pond 16S Gas Characterization and Ambient Air Monitoring Work Plans. May 2007.

MWH, 2007b. Pond 16S Gas Characterization Report. July 2007.

MWH, 2008a. Pond 16S Quality Assurance Project Plan. February 2008.

MWH, 2008b. Pond 16S Pond 16S Removal Action Work Plan. February 2008.

MWH, 2009a. Pond 16S Monitoring and Reporting Plan. October 2009.

MWH, 2009b. Supplemental Remedial Investigation Report for the FMC Plant Operable Unit - Final. May 2009.

MWH, 2009c. Comparison of Conventional and Alternative Capping Systems for Use at the FMC Plant OU. June 2009.

MWH, 2010a. SRI Work Plan for the FMC Plant Operable Unit Field Modification #15 Site-Wide Gas Assessment. July 2010.

MWH, 2010b. Supplemental Feasibility Study Report for the FMC Plant Operable Unit - Final. July 2010.

United States Environmental Protection Agency. 2003. Statement of Work (SOW). http://yosemite.epa.gov/R10/CLEANUP.NSF/88b0452f26c113d88825685f006ab43f/41199131114ae8ec88256517006c051c!OpenDocument

United States Environmental Protection Agency. 2006. Guidance for the Data Quality Objectives Process, EPA QA/G-4, EPA/240/B-06/001.