SWMU 11 - Crude Phosphorus Burial Area

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5.5.11 SWMU 11 – Crude Phosphorus Burial Area

The location of Solid Waste Management Unit (SWMU) 11 is shown on Figure 5.5.11-1a and SWMU 1 monitoring stations and sample locations are provided on Figure 5.5.11-1b. The Crude Phosphorus Burial Area, SWMU 11, contains excess crude phosphorus. In the early history of the plant (pre-1980), excess crude phosphorus was occasionally excavated from the Clarifier (SWMU 2), located north of SWMU 11, and immediately placed in trenches and covered with soil or slag. According to plant records, the burial area (identified as Disposal Site No. 1 on the Engineering Drawings in Appendix 5.5.11-A) is approximately 140 feet by 160 feet. This burial area was closed in the late 1970s and was capped with a multi-layer system illustrated in cross-section in Appendix 5.5.11-A as "No. 1 Waste Burial Site", and consisting of the following layers (from bottom to top):

1) 2 feet of graded and rolled clay fill
2) Graded granular slag layer
3) Synthetic membrane (BURKE #3200, 20 mil-EPO (Polyolefin))
4) 2 feet granulated slag
5) 2 feet clay fill – contoured for drainage

SWMU 11 contains the same material as the Clarifier (SWMU 2). Therefore, analytical data representative of crude phosphorus in the Clarifier is also applicable to the SWMU 11 (*see* Section 5.5.2 for the discussion of crude phosphorus).

Rhodia installed a continuous phosphine monitoring system around the clarifier as required by the RCRA § 7003 Order and submits annual phosphine monitoring reports[1] to EPA. The time-weighted average values reported from the continuous monitoring for phosphine have been 0.0 parts per million by volume (ppm_v), which is well below the EPA-approved action levels of 0.3 ppm_v (8-hour time-weighted average) or 1.0 ppm_v (15-minute short-term exposure limit). The detection limit is around 0.03 ppm_v. This monitoring system is positioned north of SWMU 11.

Monitoring well MW-01-2 is located between SWMU 11 and the Clarifier (*see* Figure 5.5.11-1b). The groundwater quality in the area of SWMU 11 likely has been impacted by a release of process water from the tailing basin and/or clarifier. For instance, arsenic and sulfate concentrations in samples from MW-97-7, sidegradient of SWMU 11 but likely subject to tailing basin influence (*see* Section 5.3), are higher than the concentrations in groundwater samples from MW-01-2 on the downgradient side of SWMU 11. The concentrations of arsenic and sulfate in groundwater samples

[1] Monthly reports were submitted to U.S. EPA until the submittal schedule was changed to annual reporting as provided in the U.S. EPA's March 14, 2009 letter to Rhodia.

from other wells further upgradient of SWMU 11 (i.e., MW-97-6, MW-01-4, and MW-01-5, *see* Figure 5.5.11-2) are lower than at either MW-97-7 or MW-01-2.

Elemental phosphorus was not detected in the groundwater samples from MW-01-2, suggesting that SWMU 11 is not a source of elemental phosphorus to the groundwater.

5.5.11.1 SWMU 11 Phosphine Gas Investigation and Results

A soil gas phosphine (i.e., PH3) investigation was conducted at SWMU11 between October 20 and 22, 2009 in accordance with the Crude Phosphorus Burial Area – Phosphine Monitoring Plan (Appendix N of the final RCRA Facility Investigation Work Plan, Barr 2009). The phosphine monitoring program consisted of ambient air screening and grid-based screening.

5.5.11.1.1 Breathing Zone and Ground Surface

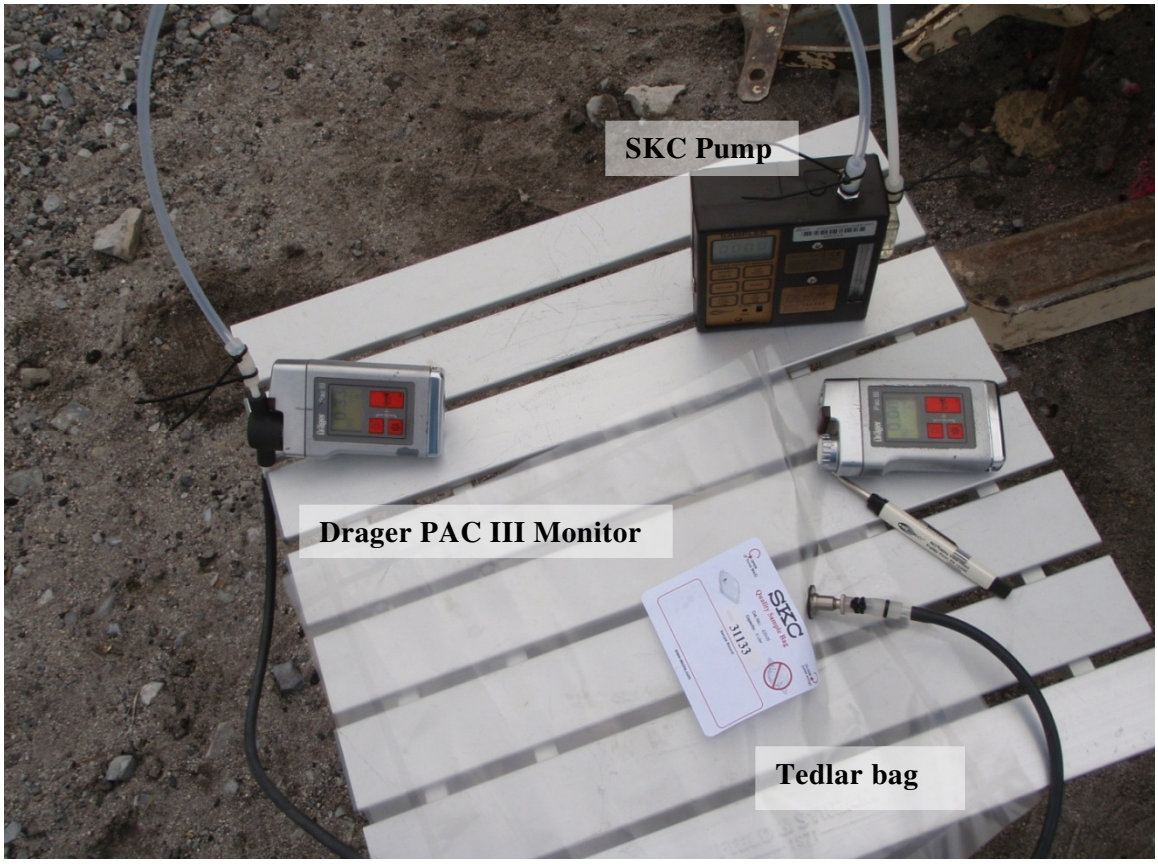
Thirty stations were established in the SWMU 11 area on a grid spacing of approximately 60 feet as shown on Figure 5.5.11-1b. Six reference stations outside of the SWMU 11 area were also included in the investigation (Figure 5.5.11-2). At each station, the breathing zone (5-feet above ground surface) and ground surface (1/2- to 1-inch above ground) were monitored for phosphine. The results of the breathing zone and ground surface phosphine monitoring are summarized in Table 5.5.11-1. Phosphine was not detected in the breathing zone or at the ground surface at any of the 30 grid-based stations, or at any of the 6 reference stations.

5.5.11.1.2 Soil Gas

A soil gas probe was installed at each location that was not located on the capped burial area so as not to penetrate the synthetic liner. The soil gas probe was driven to depth [(either 1.5 or 6 feet below ground surface (bgs)] by Geoprobe equipment. The depth alternated between 1.5 ft and 6 feet for subsequent probe locations[2]. The expendable steel point was disengaged from the post-run tubing (PRT) expendable point holder attached to the bottom of the drive rods by inserting center rods fitted with a post-run "point popper" tool to hold the expendable point in place while pulling up on the drive rod. At each monitoring station, new Teflon tubing was attached to the PRT adaptor's barbed end and secured with a short length of electrical tape to prevent the PRT adaptor from spinning in the Teflon tubing as it was threaded into the PRT expendable point holder. The short length of electrical tape was applied to the outside of the Teflon tubing and PRT adaptor and did not come into contact

[2] EPA comments on the phosphine monitoring work plan prior to conducting the field work required the evaluation of phosphine at the depth of the buried crude phosphorus (i.e., about 6-feet bgs). Rhodia responded to the comment and modified the plan to monitor for phosphine at the 6-foot depth interval at every other probe location. EPA approved this modification in an email dated October 15, 2009.

with the soil gas sample. Prior to extracting the soil gas sample for field screening, a thick bentonite slurry was placed around the drive rods as a surface seal. The soil gas was extracted from the ground at a rate of approximately 0.75 liters per minute by a pump (manufactured by SKC, Inc.) and conveyed to the phosphine monitor (Drager PAC III Monitor). The soil gas was contained in a tedlar bag after passing over the phosphine monitor. The gas monitoring system is shown below:



The pump was not able to extract soil gas at several locations due to the characteristics of the silty clay soils. At these locations, the probe was pulled up a few inches and another attempt was made to extract soil gas. The depth of each point was recorded in the log book and included on the data summary table. Upon completion of soil gas field screening, the drive rods were removed and the resulting borehole was sealed with bentonite.

Phosphine concentrations for each soil gas probe are summarized in Table 5.5.11-1, and are depicted on Figure 5.5.11-3. The soil gas concentrations fell into one of three categories:

- Not detected[3] (i.e., < 0.02 ppmv) – 10 of 27 stations
- Trace concentration (i.e., ≥ 0.02 ppmv and ≤ 0.05 ppmv) – 12 of 27 stations
- Above reference area concentration (> 0.05 ppmv) – 5 of 27 stations.

Phosphine was reported at two of six reference area samples at concentrations 0.02 ppm_v and 0.05 ppm_v, as shown on Table 5.5.11-1 and Figure 5.5.11-4.

The reproducibility of the higher phosphine concentrations was evaluated. A second soil gas probe was installed approximately 3 feet from the initial probe at each of the 4 stations that reported initial phosphine concentrations greater than 0.06 ppmv and one station with very low initial phosphine concentrations. The resulting data are summarized below:

Station ID	Depth	PH3 concentration [ppmv]	
		Initial	Replicate
CPBA-7	1.5 ft	0.31	0.08
CPBA-17	1.5 ft	0.31	0.44
CPBA-19	1.5 ft	0.25	0.11
CPBA-25	1.5 ft	0.36	0.07
CPBA-8	1.5 ft	0.02	0.02

Relatively consistent phosphine concentrations were recorded at only one station (CPBA-17 (1.5 ft)). All other stations with initial phosphine concentrations greater than 0.06 ppmv reported lower phosphine concentrations in the second soil gas probe. These readings are also shown on Table 5.5.11-1 and Figure 5.5.11-3.

Rhodia prepared the Technical Memorandum for the Crude Phosphorus Burial Area – Phosphine Monitoring Report (Appendix 5.5.11-B), which was submitted to EPA on June 22, 2010. The Technical Memorandum proposed additional monitoring at the crude phosphorus burial area. Five stations in the crude phosphorus burial area, which were initially monitored in October 2009, were repeated during the July 13, 2010 monitoring program. Soil gas probes were reinstalled at the same location as the 2009 monitoring stations (within approximately 1.5 to 2 feet). The phosphine monitoring results are summarized below and on Table 5.5.11-1:

[3] Detection limit based on instrument literature.

Station ID	Breathing Zone	Ground Surface	Soil Gas	
	PH3 [ppmv]	PH3 [ppmv]	Depth	PH3 [ppmv]
CPBA-7	ND	ND	1.5 ft	0.12
CPBA-9	ND	ND	1.5 ft	ND
CPBA-17	ND	ND	1.5 ft	0.17
CPBA-19	ND	ND	1.5 ft	0.08
CPBA-25	ND	ND	1.5 ft	0.13

Note:
ND - not detected at detection limit of 0.02 ppmv (based on sensor literature).
Reference area concentration = 0.05 ppmv (maximum)

As with the initial investigation, phosphine was not detected during the initial walk across SWMU 11and phosphine was not detected in the breathing zone or at the ground surface at any of the 5 grid-based stations.

For comparison purposes, the soil gas concentrations from 2009 and 2010 monitoring events are summarized below and on Figure 5.5.11-3:

Station ID	Depth	PH3 concentration [ppmv]		
		2009		2010
		Initial	Replicate	
CPBA-7	1.5 ft	0.31	0.08	0.12
CPBA-9	1.5 ft	0.06	---	ND
CPBA-17	1.5 ft	0.31	0.44	0.17
CPBA-19	1.5 ft	0.25	0.11	0.08
CPBA-25	1.5 ft	0.36	0.07	0.13

Relatively consistent phosphine concentrations were observed between the 2009 replicate and 2010 monitoring results with the exception of CPBA-17, where a lower phosphine concentration was measured during the 2010 event.

5.5.11.2 Conclusions

The results of the phosphine monitoring program indicate that phosphine gas is not being released to the atmosphere, as discussed below:

- Phosphine is not detected in the air at a height of approximately 5 feet (typical breathing zone height).

- Phosphine is not detected in the air at the ground surface (1/2-inch to 1-inch above ground surface).

- Phosphine was not detected (or detected at or below reference area concentrations) in 22 of 27 stations.

- Phosphine concentrations in the soil gas at SWMU 11are very low and do not result in detectable concentrations above the ground surface. The phosphine concentrations detected in the soil gas are at least two orders of magnitude below the Immediately Dangerous to Life or Health (IDLH) level of 50 ppmv.

- The maximum phosphine concentration detected in the soil gas is below the occupational short-term exposure level (STEL) of 1.0 ppmv.

The results from the screening level phosphine monitoring program demonstrate that phosphine is not being released to the atmosphere at detectable concentrations. Low concentrations of phosphine are present in the soil gas in the immediate area below ground, with no detected concentrations above ground. Phosphine gas concentrations in soil are orders of magnitude below IDLH conditions, and they are below the occupational short-term exposure levels.

This SWMU contains buried elemental phosphorus. A health and safety plan is required during any intrusive activities in this SWMU, and includes phosphine monitoring and appropriate safeguards for worker protection.

There is sufficient information to conduct the risk assessment for this SWMU. The risk assessment will identify which parameters, if any, are present at concentrations that warrant corrective measures. The dataset would be reviewed at that time and additional sampling may be necessary to inform the corrective measures study or later during the corrective measures design phase.

5.5.11.3 References

Barr Engineering Co. 2009. Final Phase I RCRA Facility Investigation Work Plan Corrective Action Order on Consent, Docket No. RCRA-08-2004-0001., Rhodia Silver Bow Plant, Butte, Montana, March 2009.

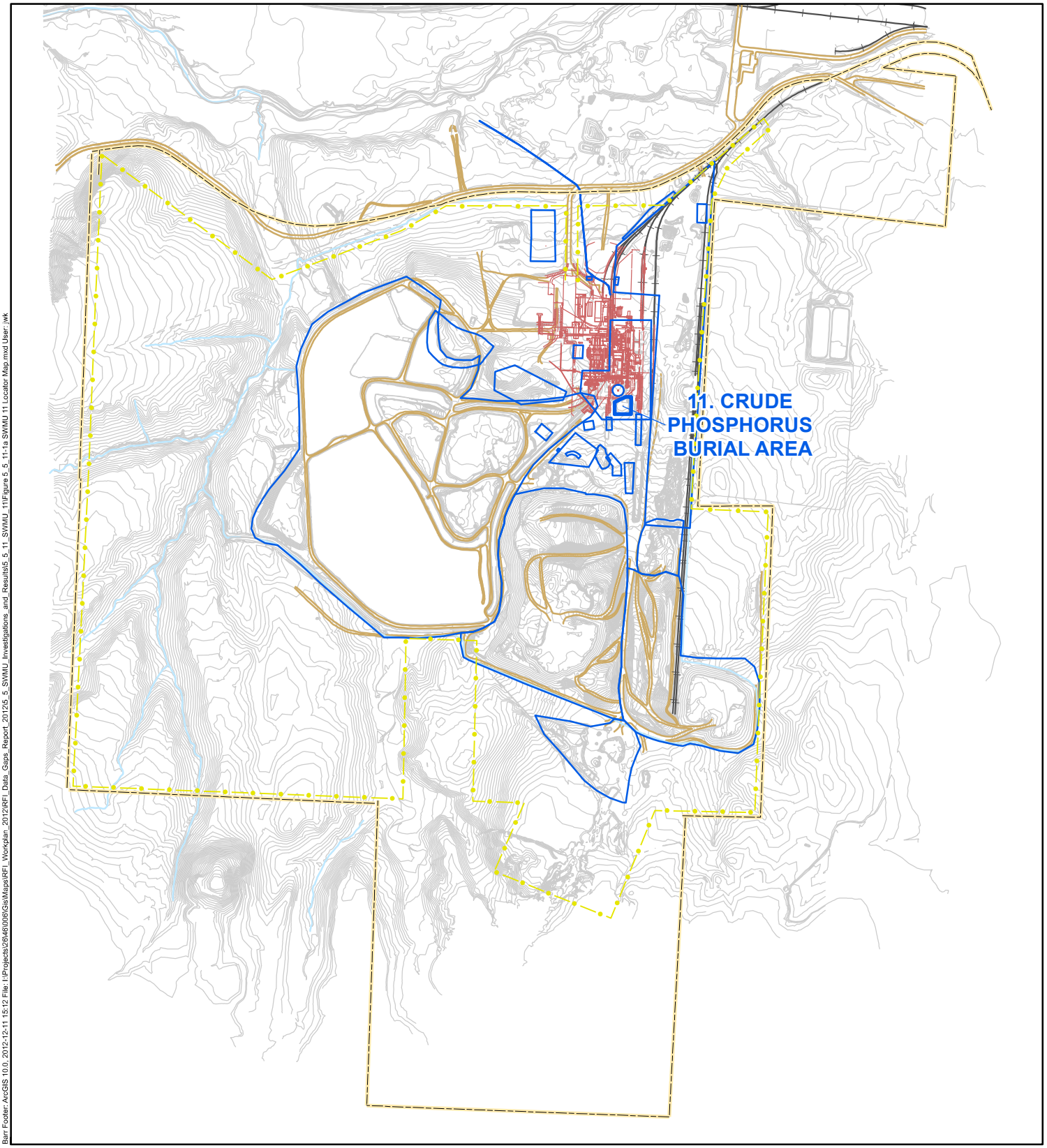
Tables

Table 5.5.11-1
SWMU 11 - Phosphine Gas Monitoring
Rhodia Silver Bow Plant

	Breathing Zone	Ground Surface	Soil Gas		
Station ID	PH3 [ppmv]	PH3 [ppmv]	Depth	PH3 [ppmv] August 2009	PH3 [ppmv] July 2010
SWMU 11 (See Figure 5.5.11-3)					
CPBA-1	ND	ND	1.5 ft	ND	
CPBA-2	ND	ND	6 ft	ND	
CPBA-3	ND	ND	1.5 ft	ND	
CPBA-4	ND	ND	4.3 ft	ND	
CPBA-5	ND	ND	1.5 ft	0.02	
CPBA-6	ND	ND	6 ft	ND	
CPBA-7	ND	ND	1.5 ft	0.31	0.12
			1.5 ft	0.08	
CPBA-8	ND	ND	5.3 ft	0.02	
			5.3 ft	0.02	
CPBA-9	ND	ND	1.5 ft	0.06	ND
CPBA-10	ND	ND	6 ft	ND	
CPBA-11	ND	ND	1.1 ft	0.05	
CPBA-12	ND	ND	5 ft	0.04	
CPBA-13	ND	ND	1.5 ft	0.03	
CPBA-14	ND	ND	6 ft	ND	
CPBA-15	ND	ND	Liner		
CPBA-16	ND	ND	Liner		
CPBA-17	ND	ND	1.5 ft	0.31	0.17
			1.5 ft	0.44	
CPBA-18	ND	ND	6 ft	0.05	
CPBA-19	ND	ND	1.5 ft	0.25	0.08
			1.5 ft	0.11	
			6 ft	0.05	
CPBA-20	ND	ND	6 ft	ND	
CPBA-21	ND	ND	Liner		
CPBA-22	ND	ND	Liner		
CPBA-23	ND	ND	1.5 ft	0.03	
CPBA-24	ND	ND	4 ft	0.02	
CPBA-25	ND	ND	1.5 ft	0.36	0.13
			1.5 ft	0.07	
CPBA-26	ND	ND	5 ft	0.05	
CPBA-27	ND	ND	1.5 ft	0.03	
CPBA-28	ND	ND	6 ft	ND	
CPBA-29	ND	ND	1.5 ft	0.04	
CPBA-30	ND	ND	6 ft	ND	
Reference Area - (See Figure 5.5.11-4)					
REF-1	ND	ND	1.5 ft	0.05	
REF-2	ND	ND	1.5 ft	ND	
REF-3	ND	ND	1.5 ft	0.02	
REF-4	ND	ND	1.5 ft	ND	
REF-5	ND	ND	4 ft	ND	
REF-6	ND	ND	1.5 ft	ND	

Note:
ND - not detected at detection limit of 0.02 ppmv (based on sensor literature).
Reference area concentration = 0.05 ppmv (maximum)

Figures



SWMU 11
Other SWMUs
Former Plant Structures
Elevation Contour
Drainage
Railroad
Road
Property Boundary
Fence Line

N

Feet
1,000 0 1,000

Figure 5.5.11-1a

SWMU 11 LOCATION
Rhodia Silver Bow Plant
Montana

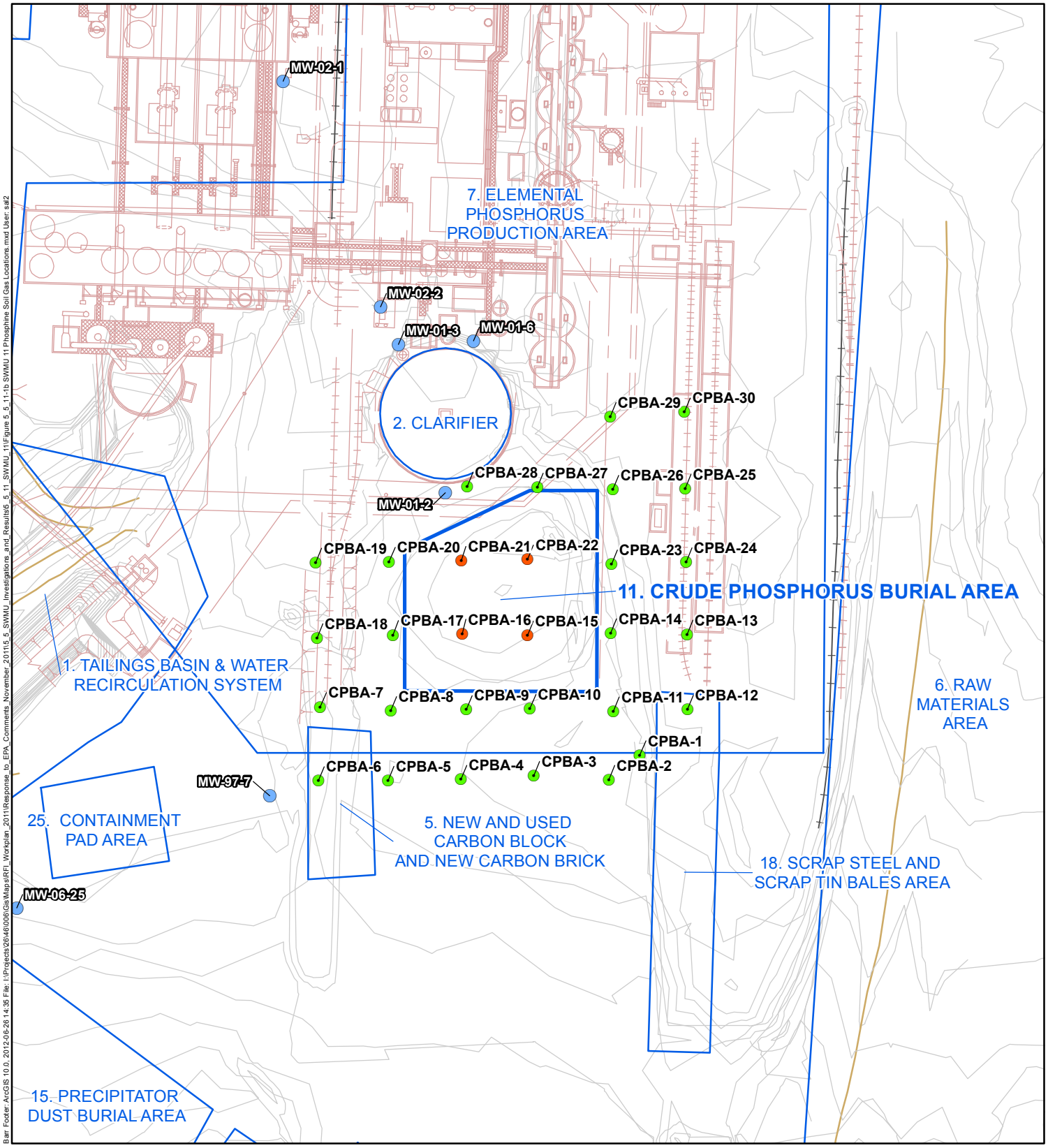
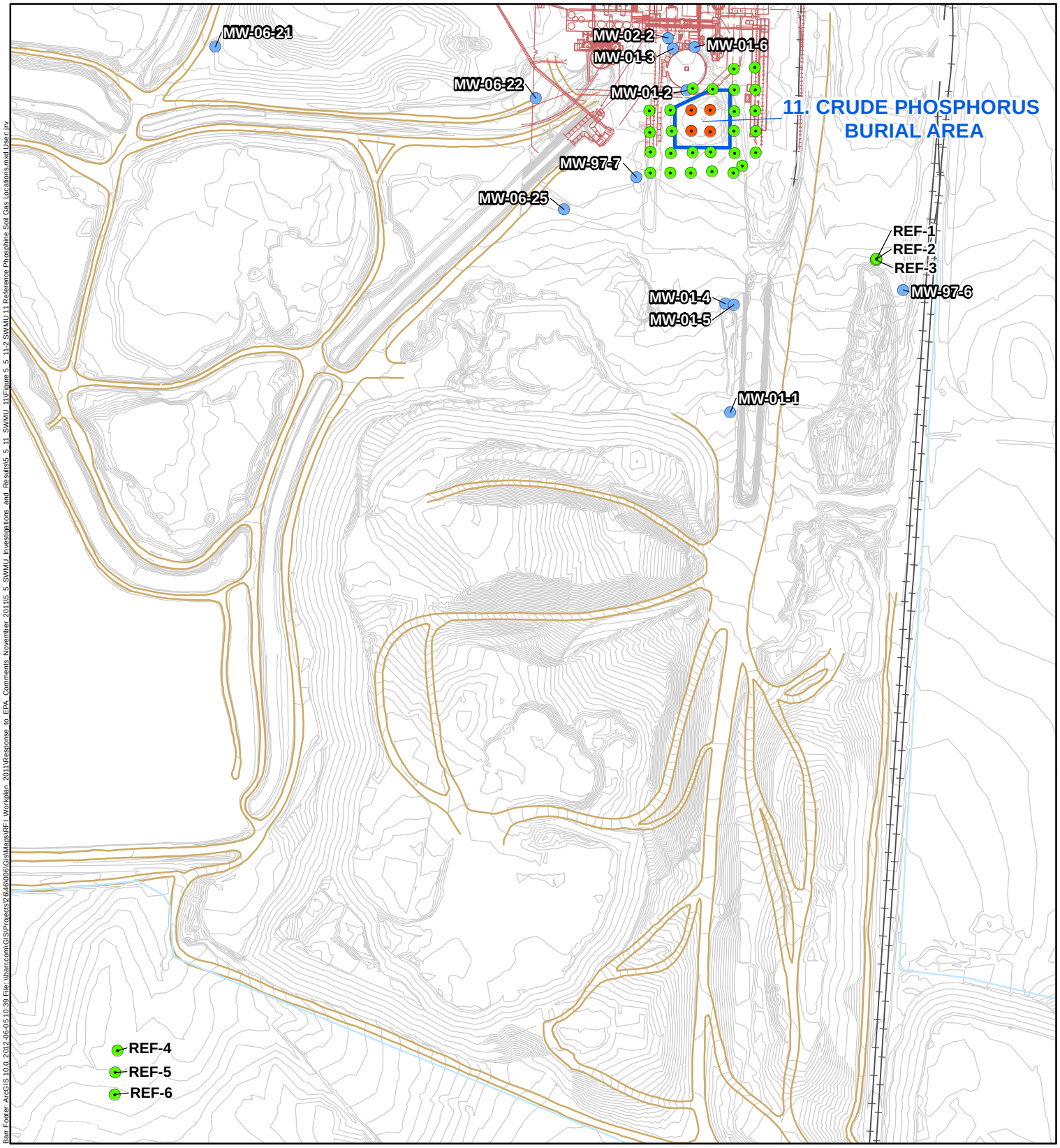


Figure 5.5.11-1b

SWMU 11
MONITORING STATIONS AND SAMPLE PROBE LOCATIONS
Rhodia Silver Bow Plant
Montana



Breathing Zone and Ground Surface Monitoring Location (Liner Present)

Breathing Zone, Ground Surface, and Soil Gas Location

Monitoring Well

Solid Waste Management Unit

Former Plant Structures

Elevation Contour

Drainage

Railroad

Road

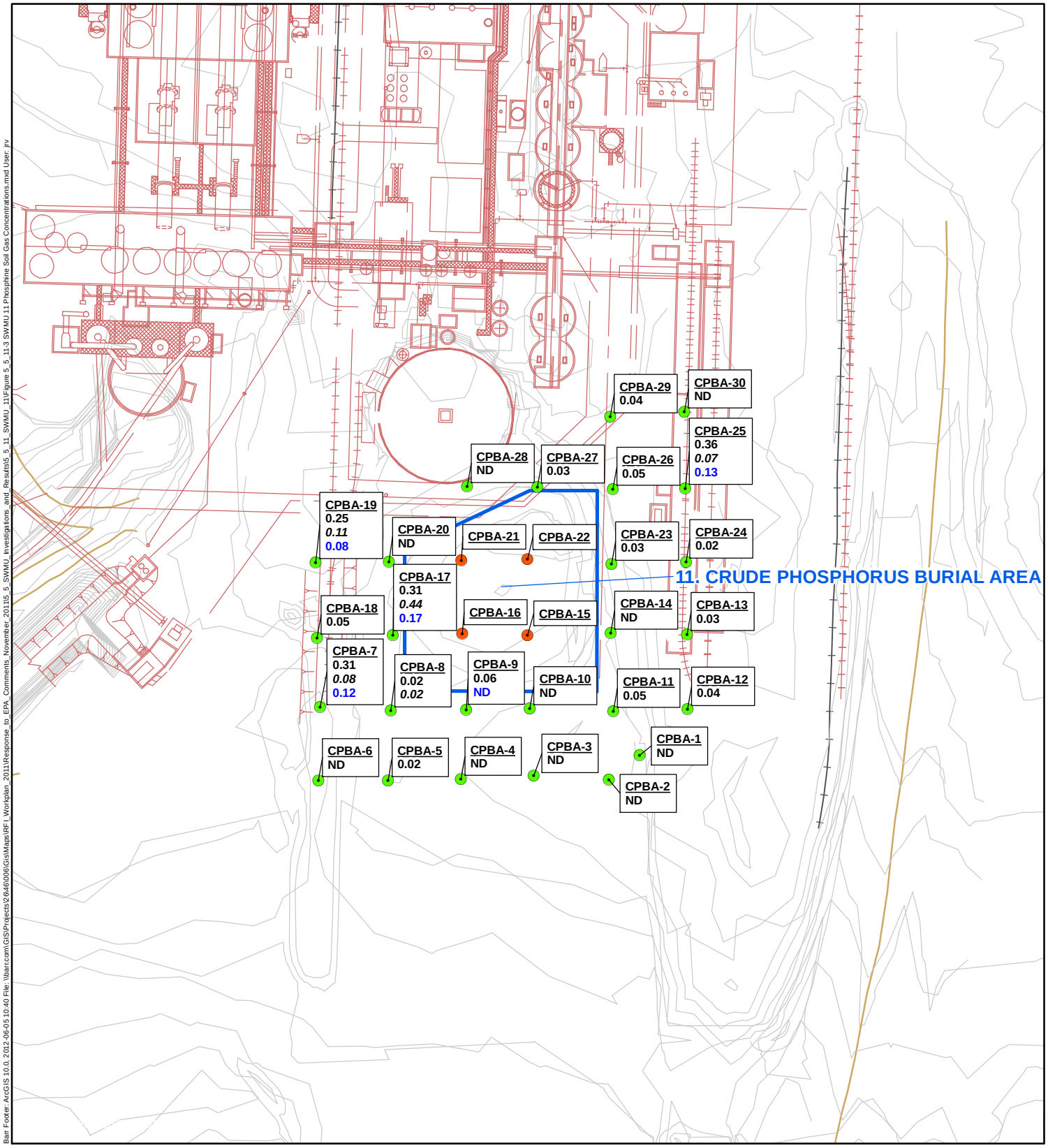
N

Feet

350 0 350

Figure 5.5.11-2

REFERENCE PHOSPHINE SOIL GAS LOCATIONS
Rhodia Silver Bow Plant
Montana



Barr Foster ArcGIS 10.0, 2012-06-05 10:40 File: \\barr.com\GIS\Projects\26460006\GisMaps\RFI_Workplan_2011\Response_to_EPA_Comments_November_201115_5_SWMU_Investigations_and_Results\5_5_11_SWMU_11\Figure 5_5_11-3 SWMU 11 Phosphine Soil Gas Concentrations.mxd User: jrv

Breathing Zone and Ground Surface Monitoring Location (Liner Present)

Breathing Zone, Ground Surface, and Soil Gas Location

0.31 2009 Measured Phosphine Soil Gas Concentration (ppmv)

0.08 2009 Measured Phosphine Soil Gas Concentration Replicate (ppmv)

0.08 2010 Measured Phosphine Soil Gas Concentration (ppmv)

ND Not Detected at the Instrument Detection Limit

Solid Waste Management Unit

Elevation Contour

Drainage

Railroad

Road

Former Plant Structures

N

Feet

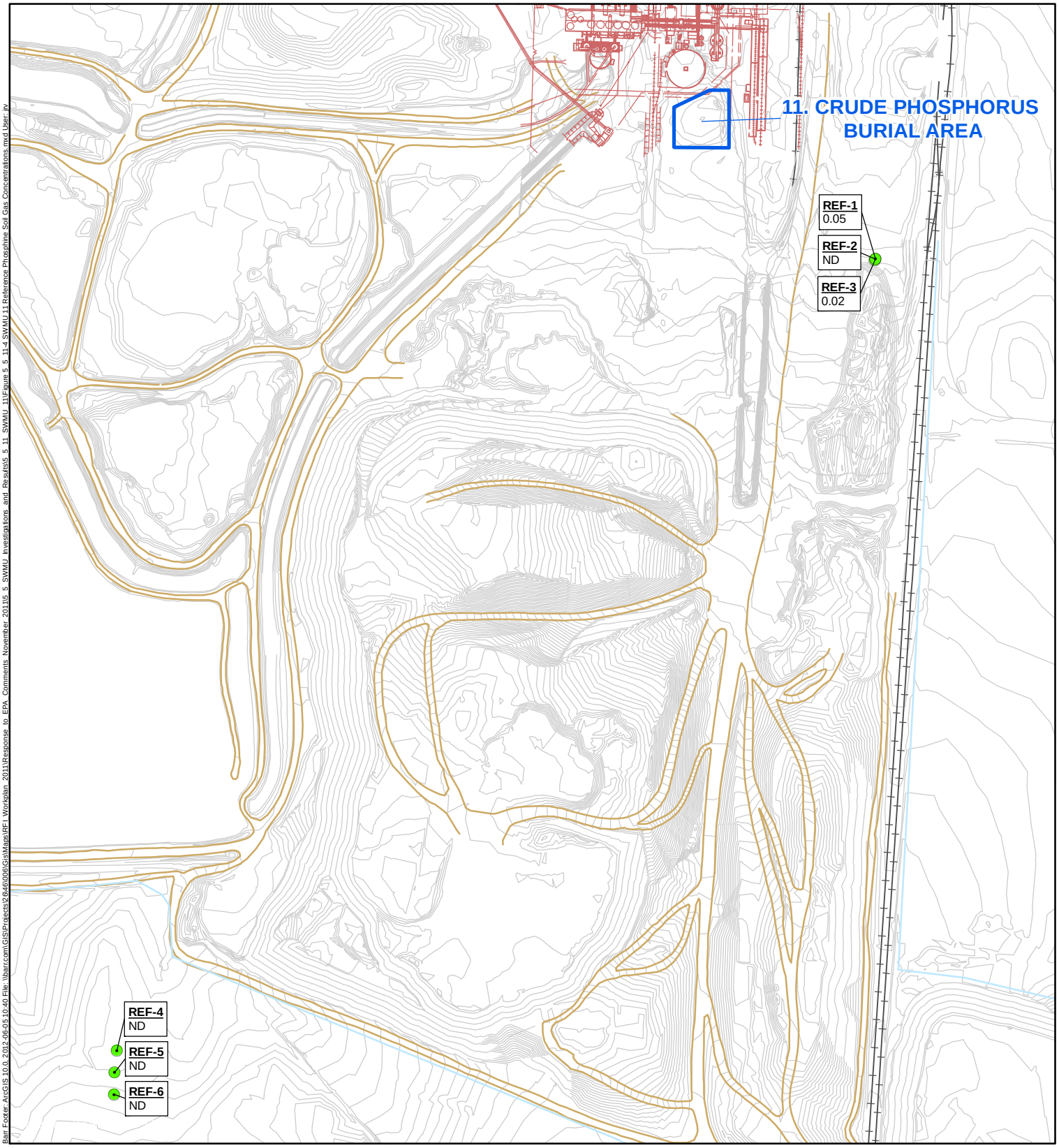
100 0 100

Figure 5.5.11-3

SWMU 11 PHOSPHINE SOIL GAS CONCENTRATIONS
Rhodia Silver Bow Plant
Montana

Where data was collected from sampled location at multiple depths, only shallow data is provided on figure.

Breathing zone and ground surface soil monitoring was non-detect at all monitored locations.



Breathing Zone and Ground Surface Monitoring Location (Liner Present)

Breathing Zone, Ground Surface, and Soil Gas Location

0.02 2009 Measured Phosphine Soil Gas Concentration (ppmv)

ND Not Detected at the Instrument Detection Limit

Solid Waste Management Unit

Former Plant Structures

Elevation Contour

Drainage

Railroad

Road

N

Feet

350 0 350

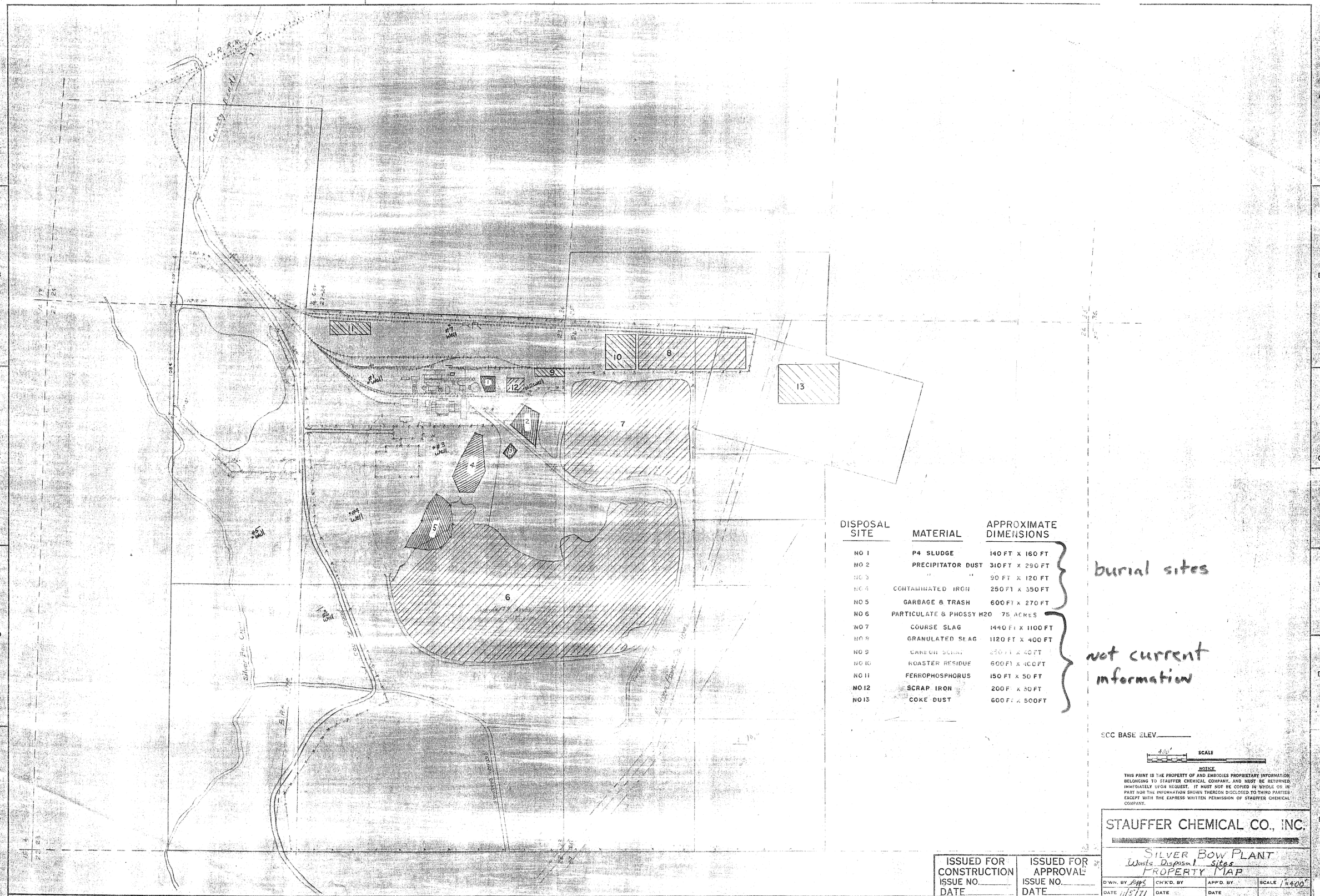
Figure 5.5.11-4

REFERENCE PHOSPHINE SOIL GAS CONCENTRATIONS
Rhodia Silver Bow Plant
Montana

Appendices

Appendix 5.5.11-A

Engineering Details - Burial Areas



DISPOSAL SITE	MATERIAL	APPROXIMATE DIMENSIONS
NO 1	P4 SLUDGE	140 FT X 160 FT
NO 2	PRECIPITATOR DUST	310 FT X 290 FT
NO 3	" "	90 FT X 120 FT
NO 4	CONTAMINATED IRON	250 FT X 350 FT
NO 5	GARBAGE & TRASH	600 FT X 270 FT
NO 6	PARTICULATE & PHOSSY H20	75 ACRES
NO 7	COURSE SLAG	1440 FT X 1100 FT
NO 8	GRANULATED SLAG	1120 FT X 400 FT
NO 9	CARBON SCRAP	250 FT X 40 FT
NO 10	ROASTER RESIDUE	600 FT X 400 FT
NO 11	FERROPHOSPHORUS	150 FT X 50 FT
NO 12	SCRAP IRON	200 FT X 80 FT
NO 13	COKE DUST	600 FT X 500 FT

burial sites

not current information

SCC BASE ELEV._____

400' SCALE

STAUFFER CHEMICAL CO., INC.

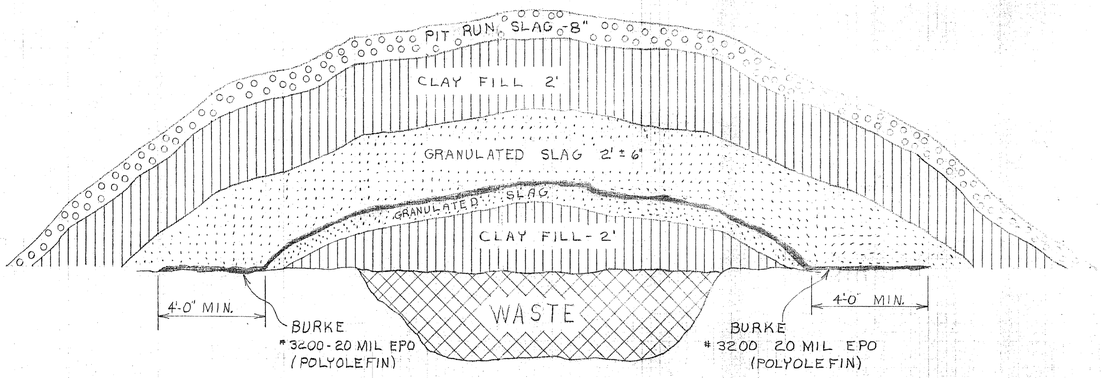
SILVER BOW PLANT
Waste Disposal sites
PROPERTY MAP

ISSUED FOR CONSTRUCTION	ISSUED FOR APPROVAL
ISSUE NO.____	ISSUE NO.____
DATE	DATE

DWN. BY PJPS	CH'K'D. BY	APP'D. BY	SCALE 1"=400'
DATE 11/5/71	DATE	DATE	
D'WG. NO. SB-TA-100 JA-2	WORK ORDER	ISSUE	FILE NO.

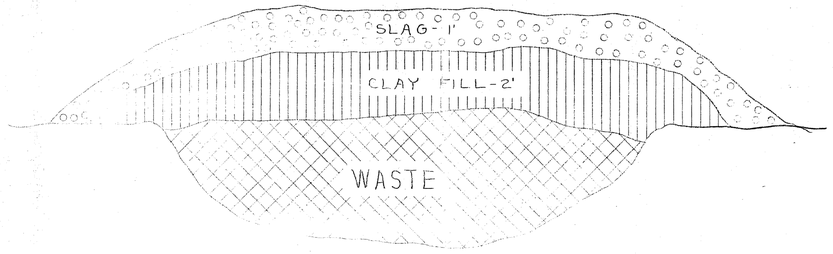
Save

BA 05104



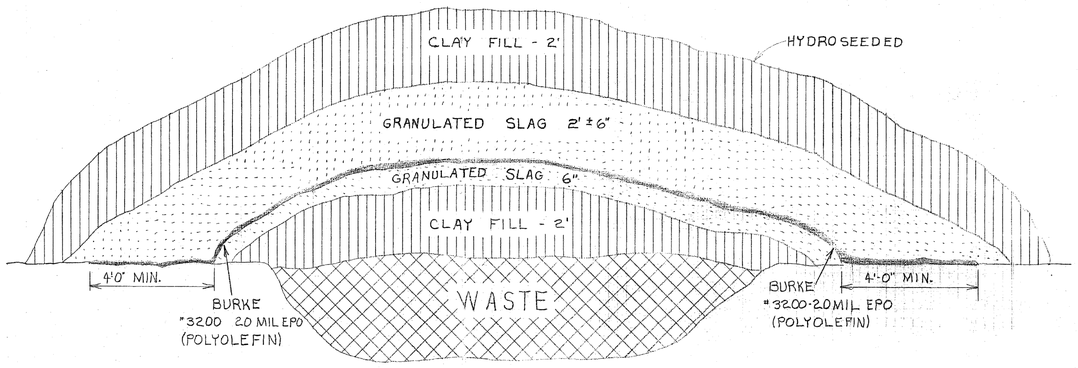
FIRST LAYER CLAY FILL GRADED AND ROLLED
FIRST LAYER GRAN. SLAG GRADED 6"
SECOND LAYER GRAN. SLAG GRADED
SECOND LAYER CLAY FILL CONTOURED FOR DRAINAGE

Nº 1 WASTE BURIAL SITE



CLAY FILL - GRADED
SLAG - GRADED

Nºs 5 WASTE BURIAL SITE



FIRST LAYER CLAY FILL GRADED AND ROLLED
FIRST LAYER GRAN. SLAG GRADED
SECOND LAYER GRAN. SLAG GRADED
SECOND LAYER CLAY FILL CONTOURED FOR DRAINAGE

Nºs 2, 3, 4 WASTE BURIAL SITES

SCC BASE ELEV._____

SCALE

ISSUED FOR CONSTRUCTION	ISSUED FOR APPROVAL
ISSUE NO._____	ISSUE NO._____
DATE_____	DATE_____

BA 05103

STAUFFER CHEMICAL CO., INC.

ENGINEERING DEPARTMENT SILVER BOW, MONTANA

WASTE BURIAL SITES
CROSS-SECTIONS TYPICAL

D'WN. BY	CH'K'D. BY	APP'D. BY	SCALE
J.R.P.			NONE
DATE 9-29-81	DATE	DATE	
D'WG. NO.	WORK ORDER	ISSUE	FILE NO.
SB-1-A-100 4B		A	

MONSEN ENG. 800 7-78 M/G 02119

Appendix 5.5.11-B

Technical Memorandum
Crude Phosphorus Burial Area – Phosphine Monitoring Report

Barr Engineering Company
4700 West 77th Street • Minneapolis, MN 55435-4803
Phone: 952-832-2600 • Fax: 952-832-2601 • www.barr.com *An EEO Employer*

Minneapolis, MN • Hibbing, MN • Duluth, MN • Ann Arbor, MI • Jefferson City, MO • Bismarck, ND

Technical Memorandum

To: Sara Sparks (U.S. EPA) & Rebecca Holmes (Mt DEQ)
From: Kevin McGilp/Tom Mattison
Subject: Crude Phosphorus Burial Area - Phosphine Monitoring Report
Date: June 22, 2010
Project: 26/46-0006 SQ09 200
c: Dan Bersanti, Cam Balentine, Ken Kastner, Cathy Laughner

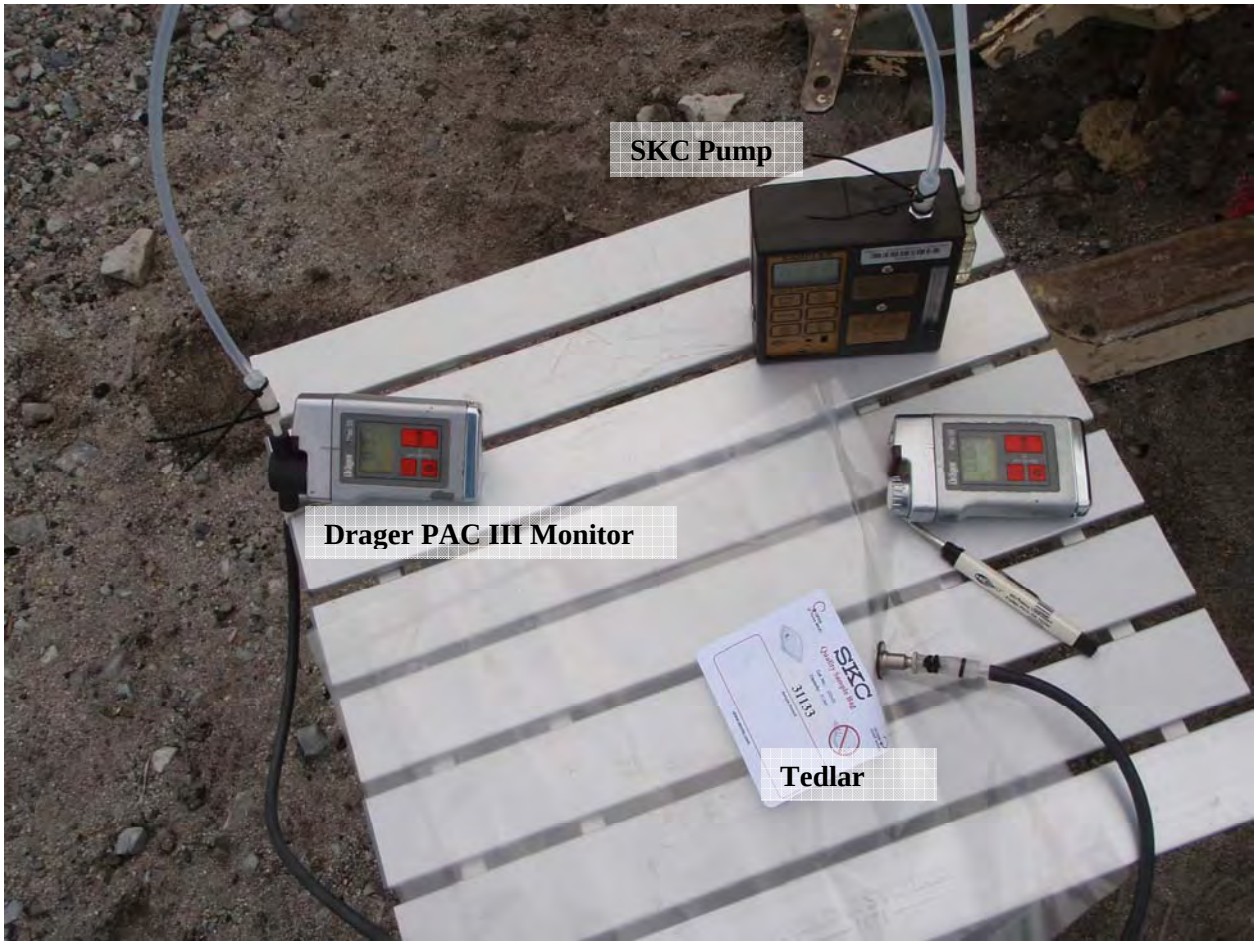
This technical memorandum summarizes the results of the Crude Phosphorus Burial Area – Phosphine Monitoring Work Plan that was implemented between October 20 and 22, 2009. The crude phosphorus burial area is located south and southeast of the clarifier as shown on Figure 1. According to Plant records, the burial area is approximately 140 feet by 160 feet, and located as shown on Figure 2. In the early history of the plant, occasionally excess crude phosphorus was excavated from the clarifier and immediately placed in adjacent trenches and covered with soil or slag. This burial area was closed in the late 1970s and was capped with a multi-layer system consisting of the following layers (from bottom to top):

1) 2 feet of graded and rolled clay fill
2) Graded granular slag layer
3) Synthetic membrane (BURKE #3200, 20 mil-EPO (Polyolefin))
4) 2 feet granulated slag
5) 2 feet clay fill – contoured for drainage
6) Coarse slag

The phosphine monitoring program consisted of ambient air screening, and grid-based screening. First, the phosphine concentration in the breathing zone was monitored while walking across the capped crude phosphorus burial area. Thirty stations were established on a grid spacing of approximately 60 feet as shown on Figure 2. Six reference stations were also included in the investigation (Figure 3). At each station, the breathing zone (5-feet above ground surface) and ground surface (1/2- to 1-inch above ground) were monitored for phosphine.

A soil gas probe was installed at each location that was not located on the capped burial area so as not to penetrate the synthetic liner. The soil gas probe was driven to depth (either 1.5 or 6 feet) by Geoprobe equipment. The expendable steel point was disengaged from the post-run tubing (PRT) expendable point

holder attached to the bottom of the drive rods by inserting center rods fitted with a post-run "point popper" tool to hold the expendable point in place while pulling up on the drive rod. At each monitoring station, new Teflon tubing was attached to the PRT adaptor's barbed end and secured with a short length of electrical tape to prevent the PRT adaptor from spinning in the Teflon tubing as it was threaded into the PRT expendable point holder. The short length of electrical tape was applied to the outside of the Teflon tubing and PRT adaptor and did not come into contact with the soil gas sample. Prior to extracting the soil gas sample for field screening, a thick bentonite slurry was placed around the drive rods as a surface seal. The soil gas was extracted from the ground at a rate of approximately 0.75 liters per minute by a SKC pump and conveyed to the phosphine monitor (PAC III). The soil gas was contained in a tedlar bag after passing over the phosphine monitor.



The pump was not able to extract soil gas at several locations due to the characteristics of the silty clay soils. At these locations, the probe was pulled up a few inches and another attempt was made to extract

soil gas. The depth of each point is identified in the station identifier. Upon completion of soil gas field screening, the drive rods were removed and the resulting borehole was permanently sealed with bentonite.

Weather Conditions

Weather conditions were obtained from the weather underground website (www.wunderground.com) for the Butte airport. The hourly observations are provided in Attachment A, and the daily conditions are summarized below:

Condition	10/20/2009	10/21/2009	10/22/2009
Mean Temperature	39 °F	41 °F	40 °F
Average Humidity	81 %	73 %	62 %
Precipitation	0.08 in	Trace	0.01 in
Barometric Pressure	30.03 in Hg	30.17 in Hg	30.09 in Hg
Wind Speed	2 mph (NNW)	2 mph (S)	5 mph (WNW)

Phosphine Monitoring Results

The results of the phosphine monitoring program are summarized in Table 1. Phosphine was not detected during the initial walk across the crude phosphorus burial area. In addition, phosphine was not detected in the breathing zone or at the ground surface at any of the 30 grid-based stations or at any of the 6 reference stations. The detection limit is 0.02 ppmv based on the sensor literature.

The results of the soil gas monitoring program are summarized in Table 1, and are depicted on Figure 2. None of the phosphine concentrations exceeded the measuring range of the monitoring system. Therefore, soil gas monitoring using an instrument with a higher measuring range is not required.

The soil gas concentrations fell into one of three categories:

- Not detected[1] (i.e., ≤ 0.02 ppmv) – 10 of 27 stations
- Trace concentration (i.e., ≤ 0.05 ppmv) – 12 of 27 stations
- Above reference area concentration (> 0.05 ppmv) – 5 of 27 stations.

[1] Detection limit based on instrument literature.

Six soil gas probes were installed in areas where elemental phosphorus was not managed to evaluate the sensitivity of the monitoring equipment. Three soil gas probes were installed in the raw materials area (near station RM-2-7) and three soil probes were installed in the natural area located south of the coarse slag pile. These reference stations are depicted on Figure 3. Stable phosphine concentrations were reported in 2 of the 6 reference stations at a concentration as high as 0.05 ppmv.

The reproducibility of the higher phosphine concentrations was also evaluated. A second soil gas probe was installed approximately 3 feet from the initial probe at each of the 4 stations that reported initial phosphine concentrations greater than 0.06 ppmv and one station with very low initial phosphine concentrations. The resulting data are summarized below:

Station ID	PH3 concentration [ppmv]	
	Initial	Replicate
CPBA-7 (1.5 ft)	0.31	0.08
CPBA-17 (1.5 ft)	0.31	0.44
CPBA-19 (1.5 ft)	0.25	0.11
CPBA-25 (1.5 ft)	0.36	0.07
CPBA-8 (1.5 ft)	0.02	0.02

Relatively consistent phosphine concentrations were recorded at one station (CPBA-17 (1.5 ft)). All other stations with initial phosphine concentrations greater than 0.06 ppmv reported lower phosphine concentrations in the second soil gas probe.

Conclusions

The following conclusions were developed based on the results of the Crude Phosphorus Burial Area – Phosphine Monitoring Work Plan:

- Phosphine is not detected in the air at a height of approximately 5 feet (typical breathing zone height).
- Phosphine is not detected in the air at the ground surface (1/2-inch to 1-inch above ground surface).
- Phosphine was not detected (or detected at reference area concentrations) in 22 of 27 stations.

- Phosphine may be present in the soil gas at the crude phosphorus burial area, but the concentrations are very low, and do not result in detectable concentrations above the ground surface. The phosphine concentrations detected in the soil gas are at least two orders of magnitude below the concentration considered immediately dangerous to life or health (IDLH) at 50 ppmv.

- The maximum phosphine concentration detected in the soil gas was below the occupational short-term exposure level (STEL) of 1.0 ppmv (STEL).

- The stations with the higher phosphine concentrations were at a depth of 1.5 feet below ground surface.

- Higher levels of phosphine were not found at three of the four stations with the higher levels of phosphine when replicate soil gas monitoring was conducted.

The screening level phosphine monitoring program demonstrates that phosphine is not being released to the atmosphere at detectable concentrations. Low concentrations of phosphine may be present in the soil gas in the immediate area, but the concentrations are not consequential (i.e., orders of magnitude below IDLH conditions and below the occupational short-term exposure levels).

Proposed Additional Investigation

As requested by EPA/MtDEQ, Rhodia will conduct a similar phosphine screening investigation at the precipitator dust burial area (SWMU 15 and 16). Since the precipitator dust burial areas were covered with essentially the same design, the monitoring procedures will be as detailed in the Crude Phosphorus Burial Area – Phosphine Monitoring Work Plan (Appendix N of the Phase 1 RFI Work Plan dated March 25, 2009). The soil gas at the precipitator dust burial areas will be monitored at a depth of 1.5 feet since the higher phosphine concentrations were detected at a depth of 1.5 feet at the crude phosphorus burial area. The grid spacing will be as shown on Figure 4. Locations that fall within the coarse slag pile will not be installed

In addition, as requested by EPA/tDEQ, Rhodia will install soil gas probes at the locations where phosphine was detected at concentrations above the maximum reference area concentration during the fall 2009 field investigation:

- CPBA-7 (1.5 ft)
- CPBA-9 (1.5 ft)
- CPBA-17 (1.5 ft)
- CPBA-19 (1.5 ft)
- CPBA-25 (1.5 ft)

This will provide additional data to confirm the inconsequential phosphine concentrations in the soil gas at the crude phosphorus burial area.

Tables

Table 1

Air and Soil Gas Quality Data - Phosphine
SWMU 11 - Crude Phosphorus Burial Area
Rhodia Silver Bow Plant

	Breathing Zone	Ground Surface	Soil Gas	
StationID	PH3 [ppmv]	PH3 [ppmv]	SampleID	PH3 [ppmv]
CPBA-1	ND	ND	CPBA-1 (1.5 ft)	ND
CPBA-2	ND	ND	CPBA-2 (6 ft)	ND
CPBA-3	ND	ND	CPBA-3 (1.5 ft)	ND
CPBA-4	ND	ND	CPBA-4 (4.3 ft)	ND
CPBA-5	ND	ND	CPBA-5 (1.5 ft)	0.02
CPBA-6	ND	ND	CPBA-6 (6 ft)	ND
CPBA-7	ND	ND	CPBA-7 (1.5 ft)	0.31
			CPBA-7 (1.5 ft)	0.08
CPBA-8	ND	ND	CPBA-8 (5.3 ft)	0.02
			CPBA-8 (5.3 ft)	0.02
CPBA-9	ND	ND	CPBA-9 (1.5 ft)	0.06
CPBA-10	ND	ND	CPBA-10 (6 ft)	ND
CPBA-11	ND	ND	CPBA-11(1.1 ft)	0.05
CPBA-12	ND	ND	CPBA-12 (5 ft)	0.04
CPBA-13	ND	ND	CPBA-13(1.5 ft)	0.03
CPBA-14	ND	ND	CPBA-14 (6 ft)	ND
CPBA-15	ND	ND	Liner	
CPBA-16	ND	ND	Liner	
CPBA-17	ND	ND	CPBA-17(1.5 ft)	0.31
			CPBA-17(1.5 ft)	0.44
CPBA-18	ND	ND	CPBA-18 (6 ft)	0.05
CPBA-19	ND	ND	CPBA-19(1.5 ft)	0.25
			CPBA-19(1.5 ft)	0.11
			CPBA-19 (6 ft)	0.05
CPBA-20	ND	ND	CPBA-20 (6 ft)	ND
CPBA-21	ND	ND	Liner	
CPBA-22	ND	ND	Liner	
CPBA-23	ND	ND	CPBA-23(1.5 ft)	0.03
CPBA-24	ND	ND	CPBA-24 (4 ft)	0.02
CPBA-25	ND	ND	CPBA-25(1.5 ft)	0.36
			CPBA-25(1.5 ft)	0.07
CPBA-26	ND	ND	CPBA-26 (5 ft)	0.05
CPBA-27	ND	ND	CPBA-27(1.5 ft)	0.03
CPBA-28	ND	ND	CPBA-28 (6 ft)	ND
CPBA-29	ND	ND	CPBA-29(1.5 ft)	0.04
CPBA-30	ND	ND	CPBA-30 (6 ft)	ND
Reference Area - (See Figure 3)				
REF-1	ND	ND	REF-1 (1.5 ft)	0.05
REF-2	ND	ND	REF-2 (1.5 ft)	ND
REF-3	ND	ND	REF-3 (1.5 ft)	0.02
REF-4	ND	ND	REF-4 (1.5 ft)	ND
REF-5	ND	ND	REF-5 (4 ft)	ND
REF-6	ND	ND	REF-6 (1.5 ft)	ND

Note:

ND - not detected at detection limit of 0.02 ppmv (based on sensor literature).

Reference area concentration = 0.05 ppmv (maximum)

Figures

Barr Footer: Date: 12/4/2009 10:20:16 AM File: I:\Projects\26\4600\6\GisMaps\RFI Workplan 2009\Soil Gas Survey\Figure 1Grid Over Buried Area SWMU 7 - Close Up.mxd User: cls

Imagery: FSA 2005

- Monitoring Well
- Production Well
- Breathing Zone and Ground Surface Location
- Breathing Zone, Ground Surface, and Soil Gas Location

N

Feet

150 0 150

Figure 1

GRID OVER BURIAL AREA
Rhodia Silver Bow Plant
Montana

Barr Footer: Date: 12/4/2009 10:20:48 AM File: I:\Projects\26\4600\6\GisMaps\RFI Workplan 2009\Soil Gas Survey\Figure 2 - Crude Phosphorous Monitoring Stations.mxd User: dls

Imagery: FSA 2005

- Breathing Zone and Ground Surface Monitoring Station
- Breathing Zone, Ground Surface and Soil Gas Monitoring Station
- 0.31 Measured Phosphine Soil Gas Concentration (ppmv)
- 0.08 Measured Phosphine Soil Gas Concentration Replicate (ppmv)
- ND Not Detected at the Instrument Detection Limit
- Monitoring Well
- Production Well
- Capped Area

N

Feet

100 0 100

Figure 2

CRUDE PHOSPHORUS BURIAL AREA MONITORING STATIONS
Rhodia Silver Bow Plant
Montana

Barr Footer: Date: 12/4/2009 10:21:03 AM File: I:\Projects\26\46006\Gis\Maps\RFI Workplan 2009\Soil Gas Survey\Figure 3 - Crude Phosphorous Burial Area Ref Stations.mxd User: cls

Imagery: FSA 2005

- Breathing Zone and Ground Surface Monitoring Station
- Breathing Zone, Ground Surface and Soil Gas Monitoring Station
- 0.31 Measured Phosphine Soil Gas Concentration (ppmv)
- 0.08 Measured Phosphine Soil Gas Concentration Replicate (ppmv)
- ND Not Detected at the Instrument Detection Limit
- Monitoring Well
- Production Well
- Capped Area

N

Feet

350 0 350

Figure 3

CRUDE PHOSPHORUS BURIAL
REFERENCE STATIONS
Rhodia Silver Bow Plant
Montana

Barr Footer: Date: 2/15/2010 12:25:40 PM File: I:\Projects\26\646\006\Gis\Maps\RFI_Workplan_2009\Grid_Over_Precipitator_Dust_Burial_Areas.mxd User: bal

Imagery: FSA 2005

- Breathing Zone and Ground Surface Location
- Breathing Zone, Ground Surface, and Soil Gas Location
- Existing Wells
- Solid Waste Management Units and Areas of Concern
- Proposed Electromagnetic Survey Area

N

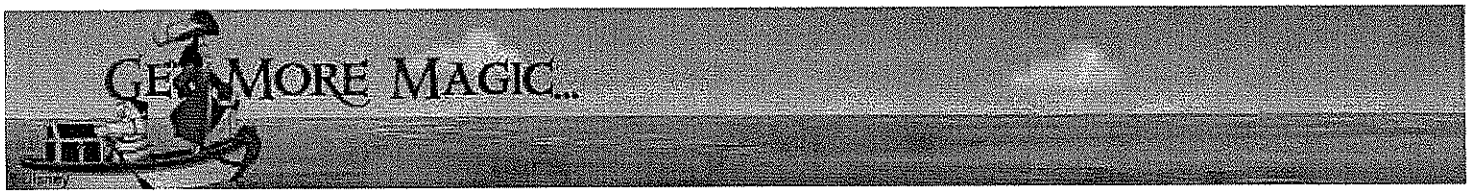
Feet
100 0 100 200 300 400

Meters
25 0 25 50 75 100 125

Figure 4

GRID OVER PRECIPITATOR
DUST BURIAL AREAS
Rhodia Silver Bow Plant
Montana

Attachment A



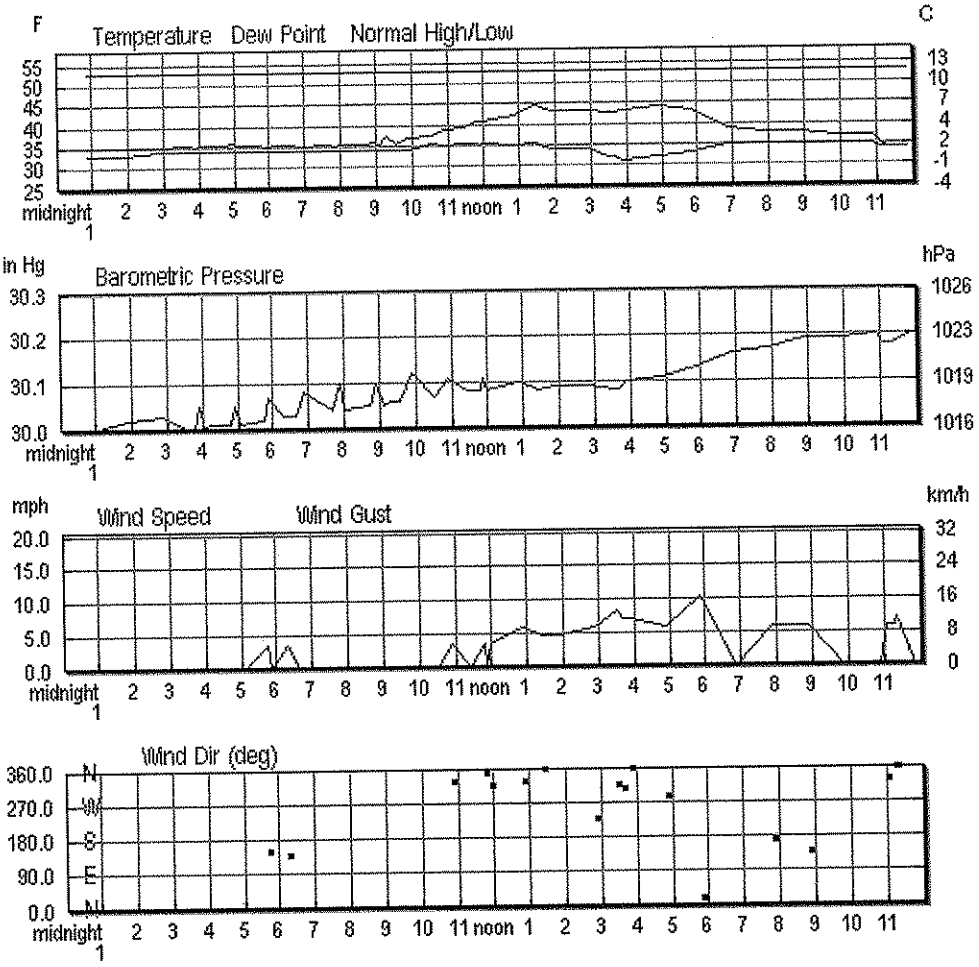
History for Butte, MT

Tuesday, October 20, 2009

Daily Summary

	Actual:	Average :	Record :
Temperature:			
Mean Temperature	**39** °F	**39** °F	
Max Temperature	**45** °F	**53** °F	**77** °F (1927)
Min Temperature	**33** °F	**25** °F	**10** °F (1943)
Degree Days:			
Heating Degree Days	26	26	
Month to date heating degree days	605	443	
Since 1 July heating degree days	1084	1147	
Cooling Degree Days	0	0	
Month to date cooling degree days	0	0	
Year to date cooling degree days	34	127	
Moisture:			
Dew Point	**33** °F		
Average Humidity	81		
Maximum Humidity	100		
Minimum Humidity	62		
Precipitation:			
Precipitation	**0.08** in	**0.02** in	**0.40** in (1899)
Month to date precipitation	0.96	0.56	
Year to date precipitation	12.03	11.42	
Sea Level Pressure:			
Sea Level Pressure	**30.03** in		
Wind:			
Wind Speed	**2** mph (NNW)		
Max Wind Speed	**12** mph		
Max Gust Speed	**15** mph		
Visibility	**8** miles		
Events	Rain		

T = Trace of Precipitation, **MM** = Missing Value **Source:** NWS Daily Summary



Hourly Observations

Time (MDT):	Temp.:	Dew Point:	Humidity:	Sea Level Pressure:	Visibility:	Wind Dir:	Wind Speed:	Gust Speed:	Precip:	Events:	Conditions:
12:53 AM	**35.1** °F	**33.1** °F	92%	**30.00** in	**10.0** miles	Calm	Calm	-	**0.02** in		Overcast
1:53 AM	**35.1** °F	**33.1** °F	92%	**30.02** in	**10.0** miles	Calm	Calm	-	**0.02** in	Rain	Light Rain
2:53 AM	**35.1** °F	**34.0** °F	96%	**30.03** in	**10.0** miles	Calm	Calm	-	**0.01** in	Rain	Light Rain
3:39 AM	**35.6** °F	**33.8** °F	93%	**30.00** in	**8.0** miles	Calm	Calm	-	**0.01** in	Rain	Light Rain
3:48 AM	**35.6** °F	**33.8** °F	93%	**30.00** in	**8.0** miles	Calm	Calm	-	**0.01** in	Rain	Light Rain
3:53 AM	**35.1** °F	**34.0** °F	96%	**30.05** in	**8.0** miles	Calm	Calm	-	**0.01** in	Rain	Light Rain
4:03 AM	**35.6** °F	**33.8** °F	93%	**30.00** in	**7.0** miles*	Calm	Calm	-	**0.00** in	Rain	Light Rain *
4:10 AM	**35.6** °F	**33.8** °F	93%	**30.01** in	**7.0** miles	Calm	Calm	-	**0.01** in	Rain	Light Rain
4:29 AM	**35.6** °F	**33.8** °F	93%	**30.01** in	**7.0** miles	Calm	Calm	-	**0.01** in	Rain	Light Rain
4:35 AM	**35.6** °F	**33.8** °F	93%	**30.01** in	**8.0** miles	Calm	Calm	-	**0.01** in	Rain	Light Rain
4:46 AM	**35.6** °F	**33.8** °F	93%	**30.01** in	**8.0** miles	Calm	Calm	-	**0.01** in	Rain	Light Rain
4:53 AM	**36.0** °F	**34.0** °F	93%	**30.05** in	**8.0** miles	Calm	Calm	-	**0.01** in	Rain	Light Rain
5:03 AM	**35.6** °F	**33.8** °F	93%	**30.01** in	**8.0** miles	Calm	Calm	-	**0.00** in	Rain	Light Rain
5:44 AM	**35.6** °F	**33.8** °F	93%	**30.02** in	**10.0** miles	SSE	**3.5** mph	-	**0.01** in		Overcast
5:53 AM	**35.1** °F	**34.0** °F	96%	**30.07** in	**10.0** miles	Calm	Calm	-	**0.01** in		Overcast
6:17 AM	**35.6** °F	**33.8** °F	93%	**30.03** in	**10.0** miles	SE	**3.5** mph	-	N/A		Overcast
6:39 AM	**35.6** °F	**33.8** °F	93%	**30.03** in	**10.0** miles	Calm	Calm	-	N/A		Overcast
6:53 AM	**35.1** °F	**34.0** °F	96%	**30.08** in	**10.0** miles	Calm	Calm	-	N/A		Overcast

7:39 AM	35.6 °F	33.8 °F	93%	30.04 in	10.0 miles	Calm	Calm	-	N/A	Overcast
7:53 AM	35.1 °F	34.0 °F	96%	30.10 in	10.0 miles	Calm	Calm	-	N/A	Overcast
8:01 AM	35.6 °F	33.8 °F	93%	30.04 in	10.0 miles	Calm	Calm	-	N/A	Overcast
8:44 AM	35.6 °F	33.8 °F	93%	30.05 in	10.0 miles	Calm	Calm	-	N/A	Overcast
8:53 AM	36.0 °F	34.0 °F	93%	30.10 in	10.0 miles	Calm	Calm	-	N/A	Overcast
9:07 AM	35.6 °F	33.8 °F	93%	30.05 in	10.0 miles	Calm	Calm	-	N/A	Overcast
9:17 AM	37.4 °F	33.8 °F	87%	30.06 in	10.0 miles	Calm	Calm	-	N/A	Overcast
9:35 AM	35.6 °F	33.8 °F	93%	30.06 in	10.0 miles	Calm	Calm	-	N/A	Overcast
9:53 AM	37.0 °F	34.0 °F	89%	30.12 in	10.0 miles	Calm	Calm	-	N/A	Overcast
10:30 AM	37.4 °F	35.6 °F	93%	30.07 in	10.0 miles	Calm	Calm	-	N/A	Overcast
10:53 AM	39.0 °F	35.1 °F	86%	30.11 in	10.0 miles	NNW	3.5 mph	-	N/A	Overcast
11:25 AM	39.2 °F	35.6 °F	87%	30.08 in	10.0 miles	Calm	Calm	-	N/A	Overcast
11:49 AM	41.0 °F	35.6 °F	81%	30.08 in	10.0 miles	North	3.5 mph	-	N/A	Overcast
11:53 AM	41.0 °F	35.1 °F	79%	30.11 in	10.0 miles	Calm	Calm	-	N/A	Overcast
12:00 PM	41.0 °F	35.6 °F	81%	30.08 in	10.0 miles	NW	3.5 mph	-	N/A	Overcast
12:53 PM	42.1 °F	35.1 °F	76%	30.10 in	10.0 miles	NNW	5.8 mph	-	N/A	Overcast
1:25 PM	44.6 °F	35.6 °F	71%	30.08 in	10.0 miles	North	4.6 mph	-	N/A	Overcast
1:53 PM	43.0 °F	34.0 °F	71%	30.09 in	10.0 miles	Variable	4.6 mph	-	N/A	Overcast
2:53 PM	43.0 °F	34.0 °F	71%	30.09 in	10.0 miles	SW	5.8 mph	-	N/A	Overcast
3:30 PM	42.8 °F	32.0 °F	66%	30.08 in	10.0 miles	NW	8.1 mph	-	N/A	Overcast
3:39 PM	42.8 °F	32.0 °F	66%	30.08 in	10.0 miles	NW	6.9 mph	-	N/A	Overcast
3:53 PM	43.0 °F	30.9 °F	62%	30.10 in	10.0 miles	North	6.9 mph	-	N/A	Overcast
4:53 PM	44.1 °F	32.0 °F	63%	30.11 in	10.0 miles	WNW	5.8 mph	-	N/A	Overcast
5:53 PM	43.0 °F	33.1 °F	68%	30.13 in	10.0 miles	NNE	10.4 mph	-	0.00 in Rain	Light Rain
6:53 PM	39.0 °F	35.1 °F	86%	30.16 in	10.0 miles	Calm	Calm	-	0.02 in Rain	Light Rain
7:53 PM	37.9 °F	35.1 °F	89%	30.17 in	10.0 miles	South	5.8 mph	-	N/A	Overcast
8:53 PM	37.9 °F	35.1 °F	89%	30.19 in	10.0 miles	SE	5.8 mph	-	N/A	Overcast
9:53 PM	37.0 °F	35.1 °F	93%	30.19 in	10.0 miles	Calm	Calm	-	N/A	Overcast
10:53 PM	37.0 °F	35.1 °F	93%	30.20 in	10.0 miles	Calm	Calm	-	N/A	Scattered Clouds
11:03 PM	35.6 °F	33.8 °F	93%	30.18 in	10.0 miles	NNW	5.8 mph	-	N/A	Scattered Clouds
11:18 PM	33.8 °F	33.8 °F	100%	30.18 in	1.5 miles	North	5.8 mph	-	N/A	Scattered Clouds
11:20 PM	33.8 °F	33.8 °F	100%	30.18 in	0.8 miles	North	6.9 mph	-	N/A	Mostly Cloudy
11:53 PM	34.0 °F	34.0 °F	100%	30.20 in	1.0 miles	Calm	Calm	-	N/A	Overcast

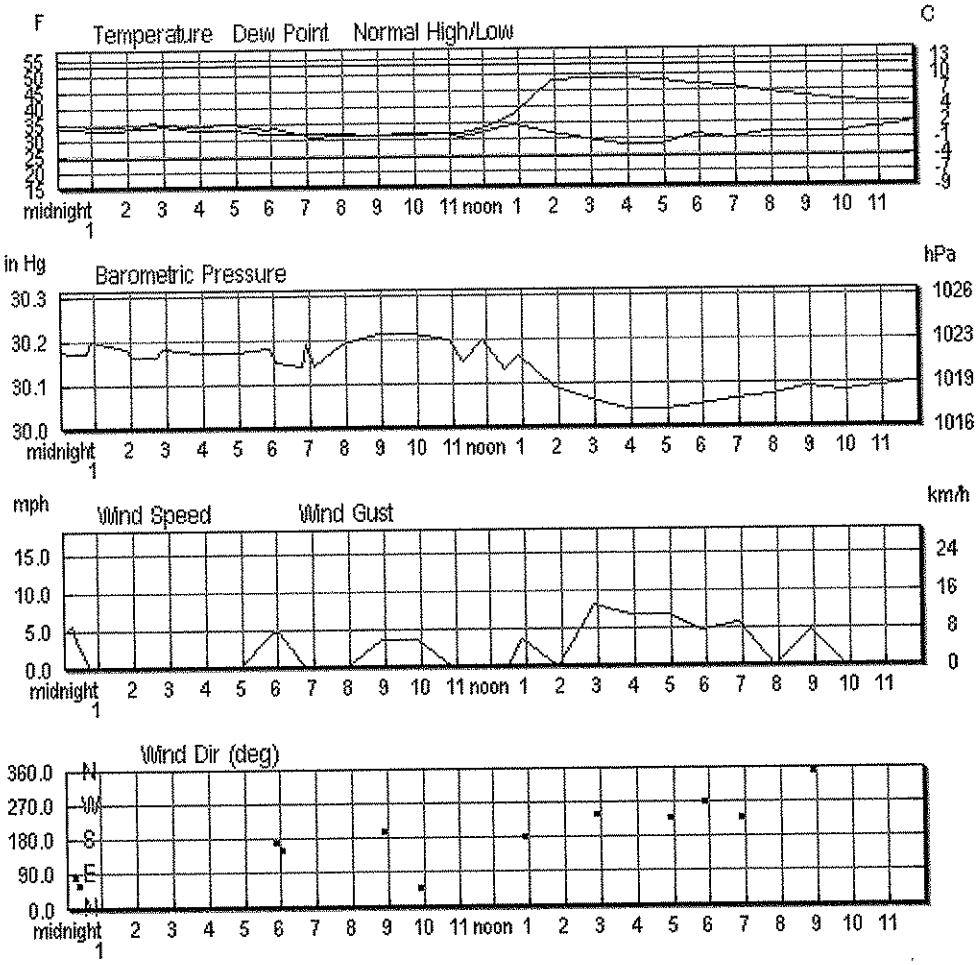
History for Butte, MT

Wednesday, October 21, 2009

Daily Summary

	Actual:	Average :	Record :
Temperature:			
Mean Temperature	**41** °F	**39** °F	
Max Temperature	**50** °F	**53** °F	**75** °F (2003)
Min Temperature	**31** °F	**24** °F	**9** °F (1996)
Degree Days:			
Heating Degree Days	24	26	
Month to date heating degree days	629	469	
Since 1 July heating degree days	1108	1173	
Cooling Degree Days	0	0	
Month to date cooling degree days	0	0	
Year to date cooling degree days	34	127	
Moisture:			
Dew Point	**34** °F		
Average Humidity	73		
Maximum Humidity	100		
Minimum Humidity	46		
Precipitation:			
Precipitation	**T** in	**0.02** in	**0.73** in (1974)
Month to date precipitation	0.96	0.58	
Year to date precipitation	12.03	11.44	
Sea Level Pressure:			
Sea Level Pressure	**30.17** in		
Wind:			
Wind Speed	**2** mph (South)		
Max Wind Speed	**10** mph		
Max Gust Speed	**13** mph		
Visibility	**6** miles		
Events	Fog , Rain		

T = Trace of Precipitation, **MM** = Missing Value **Source:** NWS Daily Summary



Hourly Observations

Time (MDT):	Temp.:	Dew Point:	Humidity:	Sea Level Pressure:	Visibility:	Wind Dir:	Wind Speed:	Gust Speed:	Precip:	Events:	Conditions:
12:02 AM	33.8 °F	33.8 °F	100%	30.18 in	0.8 miles	East	4.6 mph	-	N/A		Overcast
12:14 AM	33.8 °F	33.8 °F	100%	30.17 in	0.5 miles	East	5.8 mph	-	N/A	Fog	Fog
12:21 AM	33.8 °F	33.8 °F	100%	30.17 in	0.5 miles	ENE	3.5 mph	-	N/A	Fog	Fog
12:44 AM	33.8 °F	33.8 °F	100%	30.17 in	2.0 miles	Calm	Calm	-	N/A		Overcast
12:53 AM	34.0 °F	33.1 °F	96%	30.20 in	0.8 miles	Calm	Calm	-	N/A		Overcast
1:53 AM	34.0 °F	33.1 °F	96%	30.18 in	1.5 miles	Calm	Calm	-	N/A		Overcast
1:58 AM	33.8 °F	33.8 °F	100%	30.16 in	3.0 miles	Calm	Calm	-	N/A		Overcast
2:43 AM	35.6 °F	33.8 °F	93%	30.16 in	9.0 miles	Calm	Calm	-	N/A		Overcast
2:53 AM	35.1 °F	34.0 °F	96%	30.18 in	10.0 miles	Calm	Calm	-	N/A		Overcast
3:53 AM	34.0 °F	33.1 °F	96%	30.17 in	10.0 miles	Calm	Calm	-	N/A		Overcast
4:53 AM	35.1 °F	33.1 °F	92%	30.17 in	10.0 miles	Calm	Calm	-	N/A		Overcast
5:53 AM	33.1 °F	32.0 °F	96%	30.18 in	7.0 miles	South	4.6 mph	-	N/A		Overcast
6:03 AM	33.8 °F	32.0 °F	93%	30.15 in	8.0 miles	SSE	4.6 mph	-	N/A		Overcast
6:47 AM	32.0 °F	32.0 °F	100%	30.14 in	1.8 miles	Calm	Calm	-	N/A		Overcast
6:53 AM	32.0 °F	32.0 °F	100%	30.19 in	1.2 miles	Calm	Calm	-	N/A		Overcast
7:06 AM	32.0 °F	30.2 °F	93%	30.14 in	0.5 miles	Calm	Calm	-	N/A	Fog	Fog
7:53 AM	32.0 °F	30.9 °F	96%	30.19 in	0.2 miles	Calm	Calm	-	N/A	Fog	Fog
8:53 AM	30.9 °F	30.9 °F	100%	30.21 in	0.2 miles	SSW	3.5 mph	-	N/A	Fog	Light Freezing Fog

9:53 AM	**32.0** °F	**30.9** °F	96%	**30.21** in	**0.2** miles	NE	**3.5** mph	-	N/A	Fog	Fog
10:53 AM	**32.0** °F	**32.0** °F	100%	**30.20** in	**1.0** miles	Calm	Calm	-	N/A		Overcast
11:19 AM	**32.0** °F	**30.2** °F	93%	**30.15** in	**3.0** miles	Calm	Calm	-	N/A		Overcast
11:53 AM	**33.1** °F	**32.0** °F	96%	**30.20** in	**10.0** miles	Calm	Calm	-	N/A		Overcast
12:28 PM	**35.6** °F	**33.8** °F	93%	**30.13** in	**10.0** miles	Calm	Calm	-	N/A		Scattered Clouds
12:53 PM	**37.9** °F	**34.0** °F	86%	**30.16** in	**10.0** miles	South	**3.5** mph	-	N/A		Clear
1:53 PM	**48.0** °F	**32.0** °F	54%	**30.09** in	**10.0** miles	Calm	Calm	-	N/A		Scattered Clouds
2:53 PM	**48.9** °F	**30.0** °F	48%	**30.06** in	**10.0** miles	WSW	**8.1** mph	-	N/A		Overcast
3:53 PM	**48.9** °F	**28.0** °F	44%	**30.04** in	**10.0** miles	Variable	**6.9** mph	-	N/A		Overcast
4:53 PM	**48.0** °F	**28.0** °F	46%	**30.04** in	**10.0** miles	SW	**6.9** mph	-	N/A		Overcast
5:53 PM	**46.9** °F	**30.9** °F	54%	**30.05** in	**10.0** miles	West	**4.6** mph	-	N/A		Overcast
6:53 PM	**46.0** °F	**30.0** °F	54%	**30.06** in	**10.0** miles	SW	**5.8** mph	-	N/A		Overcast
7:53 PM	**44.1** °F	**32.0** °F	63%	**30.07** in	**10.0** miles	Calm	Calm	-	N/A		Overcast
8:53 PM	**43.0** °F	**32.0** °F	65%	**30.09** in	**10.0** miles	North	**4.6** mph	-	N/A		Overcast
9:53 PM	**42.1** °F	**32.0** °F	67%	**30.08** in	**10.0** miles	Calm	Calm	-	N/A		Overcast
10:53 PM	**41.0** °F	**33.1** °F	73%	**30.09** in	**10.0** miles	Calm	Calm	-	N/A		Overcast
11:53 PM	**41.0** °F	**34.0** °F	76%	**30.10** in	**10.0** miles	Calm	Calm	-	**0.00** in	Rain	Light Rain

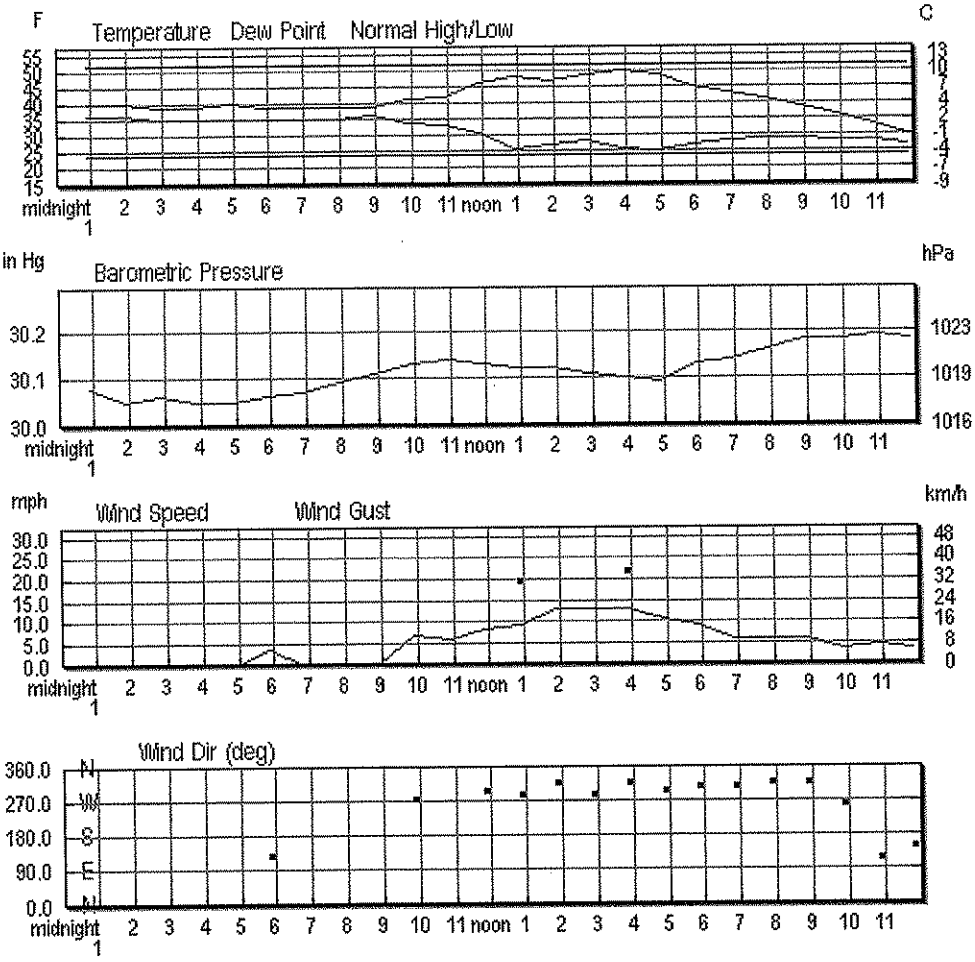
History for Butte, MT

Thursday, October 22, 2009

Daily Summary

	Actual:	Average :	Record :
Temperature:			
Mean Temperature	**40** °F	**38** °F	
Max Temperature	**50** °F	**52** °F	**79** °F (2003)
Min Temperature	**29** °F	**24** °F	**13** °F (1957)
Degree Days:			
Heating Degree Days	25	27	
Month to date heating degree days	654	496	
Since 1 July heating degree days	1133	1200	
Cooling Degree Days	0	0	
Month to date cooling degree days	0	0	
Year to date cooling degree days	34	127	
Moisture:			
Dew Point	**33** °F		
Average Humidity	62		
Maximum Humidity	85		
Minimum Humidity	39		
Precipitation:			
Precipitation	**0.01** in	**0.02** in	**0.37** in (1967)
Month to date precipitation	0.97	0.60	
Year to date precipitation	12.04	11.46	
Sea Level Pressure:			
Sea Level Pressure	**30.09** in		
Wind:			
Wind Speed	**5** mph (WNW)		
Max Wind Speed	**18** mph		
Max Gust Speed	**23** mph		
Visibility	**10** miles		
Events			

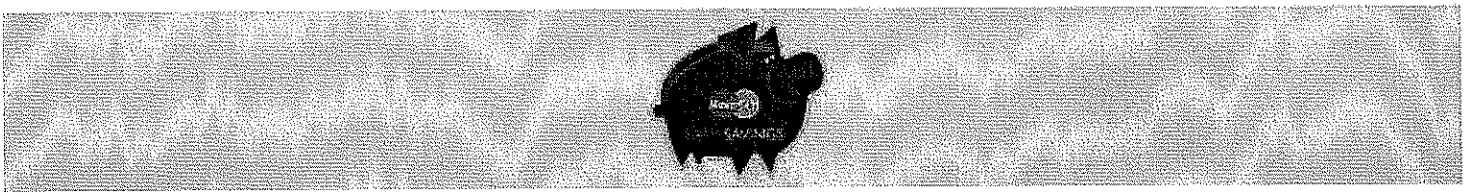
T = Trace of Precipitation, **MM** = Missing Value **Source:** NWS Daily Summary



Hourly Observations

Time (MDT):	Temp.:	Dew Point:	Humidity:	Sea Level Pressure:	Visibility:	Wind Dir:	Wind Speed:	Gust Speed:	Precip:	Events:	Conditions:
12:53 AM	39.9 °F	36.0 °F	86%	30.08 in	10.0 miles	Calm	Calm	-	0.00 in		Overcast
1:53 AM	39.9 °F	36.0 °F	86%	30.05 in	10.0 miles	Calm	Calm	-	N/A		Overcast
2:53 AM	39.0 °F	35.1 °F	86%	30.06 in	10.0 miles	Calm	Calm	-	N/A		Overcast
3:53 AM	39.0 °F	35.1 °F	86%	30.05 in	10.0 miles	Calm	Calm	-	0.00 in		Overcast
4:53 AM	39.9 °F	35.1 °F	83%	30.05 in	10.0 miles	Calm	Calm	-	N/A		Overcast
5:53 AM	39.0 °F	35.1 °F	86%	30.06 in	10.0 miles	SE	3.5 mph	-	N/A		Overcast
6:53 AM	39.0 °F	35.1 °F	86%	30.07 in	10.0 miles	Calm	Calm	-	N/A		Overcast
7:53 AM	39.0 °F	35.1 °F	86%	30.09 in	10.0 miles	Calm	Calm	-	N/A		Overcast
8:53 AM	39.0 °F	36.0 °F	89%	30.11 in	10.0 miles	Calm	Calm	-	0.00 in		Overcast
9:53 AM	41.0 °F	34.0 °F	76%	30.13 in	10.0 miles	West	6.9 mph	-	N/A		Overcast
10:53 AM	42.1 °F	33.1 °F	70%	30.14 in	10.0 miles	Variable	5.8 mph	-	0.00 in		Partly Cloudy
11:53 AM	46.0 °F	30.9 °F	56%	30.13 in	10.0 miles	WNW	8.1 mph	16.1 mph	N/A		Clear
12:53 PM	48.0 °F	26.1 °F	42%	30.12 in	10.0 miles	WNW	9.2 mph	19.6 mph	N/A		Partly Cloudy
1:53 PM	46.9 °F	27.0 °F	46%	30.12 in	10.0 miles	NW	12.7 mph	-	N/A		Scattered Clouds
2:53 PM	48.9 °F	28.0 °F	44%	30.11 in	10.0 miles	WNW	12.7 mph	18.4 mph	N/A		Clear
3:53 PM	50.0 °F	26.1 °F	39%	30.10 in	10.0 miles	NW	12.7 mph	21.9 mph	N/A		Overcast
4:53 PM	48.9 °F	25.0 °F	39%	30.09 in	10.0 miles	WNW	10.4 mph	-	0.01 in		Mostly Cloudy
											Scattered

5:53 PM	**45.0** °F	**27.0** °F	49%	**30.13** in	**10.0** miles	NW	**9.2** mph	-	N/A	Clouds
6:53 PM	**43.0** °F	**28.0** °F	56%	**30.14** in	**10.0** miles	NW	**5.8** mph	-	N/A	Mostly Cloudy
7:53 PM	**41.0** °F	**28.9** °F	62%	**30.16** in	**10.0** miles	NW	**5.8** mph	-	N/A	Mostly Cloudy
8:53 PM	**39.0** °F	**28.9** °F	67%	**30.18** in	**10.0** miles	NW	**5.8** mph	-	N/A	Clear
9:53 PM	**36.0** °F	**28.0** °F	73%	**30.18** in	**10.0** miles	West	**3.5** mph	-	N/A	Clear
10:53 PM	**33.1** °F	**28.0** °F	82%	**30.19** in	**10.0** miles	ESE	**4.6** mph	-	N/A	Clear
11:53 PM	**30.0** °F	**27.0** °F	88%	**30.18** in	**10.0** miles	SSE	**3.5** mph	-	N/A	Clear



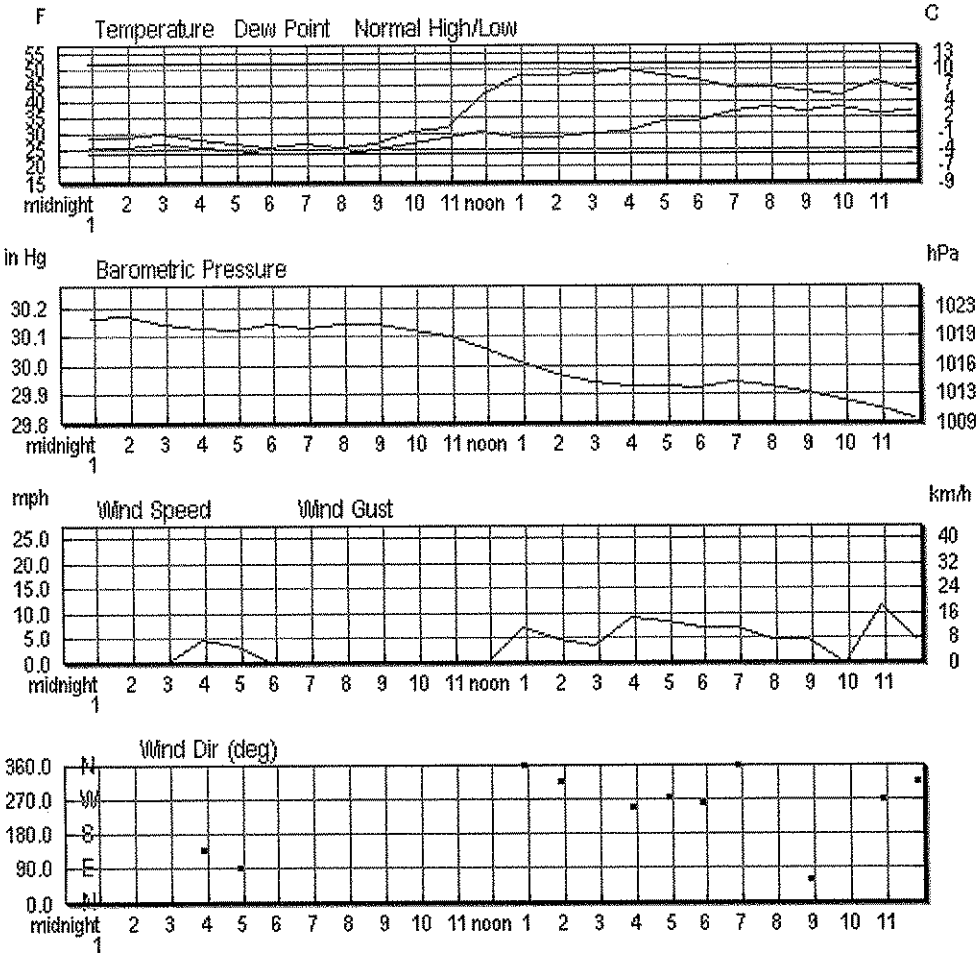
History for Butte, MT

Friday, October 23, 2009

Daily Summary

	Actual:	Average :	Record :
Temperature:			
Mean Temperature	**38** °F	**38** °F	
Max Temperature	**50** °F	**52** °F	**71** °F (1937)
Min Temperature	**25** °F	**24** °F	**8** °F (1935)
Degree Days:			
Heating Degree Days	27	27	
Month to date heating degree days	681	523	
Since 1 July heating degree days	1160	1227	
Cooling Degree Days	0	0	
Month to date cooling degree days	0	0	
Year to date cooling degree days	34	127	
Moisture:			
Dew Point	**28** °F		
Average Humidity	69		
Maximum Humidity	92		
Minimum Humidity	46		
Precipitation:			
Precipitation	**0.06** in	**0.02** in	**0.21** in (2001)
Month to date precipitation	1.03	0.62	
Year to date precipitation	12.10	11.48	
Sea Level Pressure:			
Sea Level Pressure	**30.01** in		
Wind:			
Wind Speed	**3** mph (NW)		
Max Wind Speed	**15** mph		
Max Gust Speed	**20** mph		
Visibility	**10** miles		
Events	Rain		

T = Trace of Precipitation, **MM** = Missing Value **Source:** NWS Daily Summary



Hourly Observations

Time (MDT):	Temp.:	Dew Point:	Humidity:	Sea Level Pressure:	Visibility:	Wind Dir:	Wind Speed:	Gust Speed:	Precip:	Events:	Conditions:
12:53 AM	**28.9** °F	**26.1** °F	89%	**30.16** in	**10.0** miles	Calm	Calm	-	N/A		Clear
1:53 AM	**28.9** °F	**26.1** °F	89%	**30.17** in	**10.0** miles	Calm	Calm	-	N/A		Clear
2:53 AM	**30.0** °F	**27.0** °F	88%	**30.14** in	**10.0** miles	Calm	Calm	-	N/A		Clear
3:53 AM	**28.0** °F	**26.1** °F	92%	**30.13** in	**10.0** miles	SE	**4.6** mph	-	N/A		Clear
4:53 AM	**27.0** °F	**25.0** °F	92%	**30.12** in	**10.0** miles	East	**3.5** mph	-	N/A		Clear
5:53 AM	**26.1** °F	**24.1** °F	92%	**30.14** in	**10.0** miles	Calm	Calm	-	N/A		Clear
6:53 AM	**27.0** °F	**24.1** °F	89%	**30.13** in	**10.0** miles	Calm	Calm	-	N/A		Clear
7:53 AM	**26.1** °F	**24.1** °F	92%	**30.14** in	**10.0** miles	Calm	Calm	-	N/A		Clear
8:53 AM	**27.0** °F	**25.0** °F	92%	**30.14** in	**10.0** miles	Calm	Calm	-	N/A		Clear
9:53 AM	**30.9** °F	**27.0** °F	85%	**30.12** in	**10.0** miles	Calm	Calm	-	N/A		Clear
10:53 AM	**32.0** °F	**28.9** °F	88%	**30.10** in	**10.0** miles	Calm	Calm	-	N/A		Clear
11:53 AM	**42.1** °F	**30.9** °F	65%	**30.06** in	**10.0** miles	Calm	Calm	-	N/A		Partly Cloudy
12:53 PM	**48.0** °F	**28.9** °F	48%	**30.01** in	**10.0** miles	North	**6.9** mph	-	N/A		Overcast
1:53 PM	**48.0** °F	**28.9** °F	48%	**29.97** in	**10.0** miles	NW	**4.6** mph	-	N/A		Overcast
2:53 PM	**48.9** °F	**30.0** °F	48%	**29.94** in	**10.0** miles	Variable	**3.5** mph	-	N/A		Overcast
3:53 PM	**50.0** °F	**30.9** °F	48%	**29.93** in	**10.0** miles	WSW	**9.2** mph	-	N/A		Overcast
4:53 PM	**48.0** °F	**34.0** °F	58%	**29.93** in	**10.0** miles	West	**8.1** mph	-	**0.00** in		Overcast
5:53 PM	**46.9** °F	**34.0** °F	61%	**29.92** in	**10.0** miles	West	**6.9** mph	**17.3** mph	**0.00** in	Rain	Light Rain

6:53 PM	**44.1** °F	**37.0** °F	76%	**29.94** in	**9.0** miles	North	**6.9** mph	-	**0.04** in	Rain	Light Rain
7:53 PM	**44.1** °F	**37.9** °F	79%	**29.93** in	**10.0** miles	Variable	**4.6** mph	-	**0.01** in		Overcast
8:53 PM	**43.0** °F	**37.0** °F	80%	**29.91** in	**10.0** miles	ENE	**4.6** mph	-	**0.00** in		Overcast
9:53 PM	**42.1** °F	**37.9** °F	85%	**29.88** in	**10.0** miles	Calm	Calm	-	**0.01** in		Overcast
10:53 PM	**46.0** °F	**36.0** °F	68%	**29.85** in	**10.0** miles	West	**11.5** mph	-	N/A		Overcast
11:53 PM	**43.0** °F	**37.0** °F	80%	**29.82** in	**10.0** miles	NW	**4.6** mph	-	**0.00** in	Rain	Light Rain

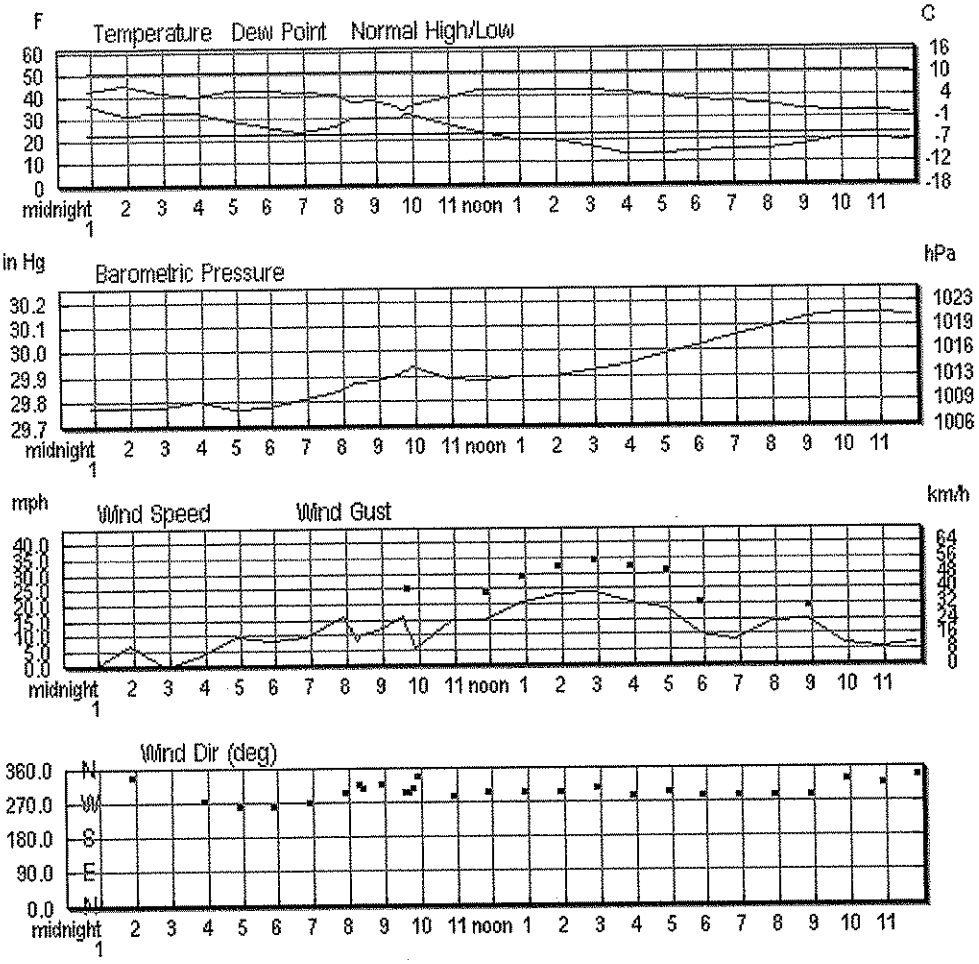
History for Butte, MT

Saturday, October 24, 2009

Daily Summary

	Actual:	Average :	Record :
Temperature:			
Mean Temperature	**39** °F	**37** °F	
Max Temperature	**46** °F	**51** °F	**72** °F (2007)
Min Temperature	**31** °F	**23** °F	**0** °F (1919)
Degree Days:			
Heating Degree Days	26	28	
Month to date heating degree days	707	551	
Since 1 July heating degree days	1186	1255	
Cooling Degree Days	0	0	
Month to date cooling degree days	0	0	
Year to date cooling degree days	34	127	
Moisture:			
Dew Point	**26** °F		
Average Humidity	60		
Maximum Humidity	89		
Minimum Humidity	30		
Precipitation:			
Precipitation	**0.02** in	**0.02** in	**0.40** in (1897)
Month to date precipitation	1.05	0.64	
Year to date precipitation	12.12	11.50	
Sea Level Pressure:			
Sea Level Pressure	**29.95** in		
Wind:			
Wind Speed	**12** mph (WNW)		
Max Wind Speed	**25** mph		
Max Gust Speed	**36** mph		
Visibility	**9** miles		
Events	Rain , Snow		

T = Trace of Precipitation, **MM** = Missing Value **Source:** NWS Daily Summary



Hourly Observations

Time (MDT):	Temp.:	Dew Point:	Humidity:	Sea Level Pressure:	Visibility:	Wind Dir:	Wind Speed:	Gust Speed:	Precip:	Events:	Conditions:
12:53 AM	**43.0** °F	**36.0** °F	76%	**29.78** in	**10.0** miles	Calm	Calm	-	**0.00** in		Overcast
1:53 AM	**45.0** °F	**32.0** °F	60%	**29.78** in	**10.0** miles	NNW	**6.9** mph	**19.6** mph	N/A		Overcast
2:53 AM	**42.1** °F	**33.1** °F	70%	**29.78** in	**10.0** miles	Calm	Calm	-	N/A		Mostly Cloudy
3:53 AM	**39.9** °F	**33.1** °F	77%	**29.80** in	**10.0** miles	West	**3.5** mph	-	N/A		Overcast
4:53 AM	**43.0** °F	**28.9** °F	58%	**29.77** in	**10.0** miles	West	**9.2** mph	**16.1** mph	N/A		Overcast
5:53 AM	**43.0** °F	**26.1** °F	51%	**29.78** in	**10.0** miles	West	**8.1** mph	-	N/A		Overcast
6:53 AM	**42.1** °F	**24.1** °F	49%	**29.81** in	**10.0** miles	West	**9.2** mph	-	N/A		Scattered Clouds
7:53 AM	**41.0** °F	**26.1** °F	55%	**29.84** in	**10.0** miles	WNW	**16.1** mph	**26.5** mph	**0.00** in	Rain	Light Rain
8:16 AM	**37.4** °F	**30.2** °F	75%	**29.87** in	**10.0** miles	NW	**8.1** mph	-	**0.00** in	Rain	Light Rain
8:23 AM	**37.4** °F	**30.2** °F	75%	**29.87** in	**10.0** miles	NW	**10.4** mph	-	**0.00** in	Rain	Light Rain
8:53 AM	**37.9** °F	**30.0** °F	73%	**29.88** in	**10.0** miles	NW	**11.5** mph	-	**0.00** in		Mostly Cloudy
9:33 AM	**35.6** °F	**30.2** °F	81%	**29.91** in	**1.8** miles	WNW	**16.1** mph	**31.1** mph	**0.01** in	Snow	Light Snow
9:41 AM	**33.8** °F	**30.2** °F	87%	**29.92** in	**1.2** miles	WNW	**11.5** mph	**25.3** mph	**0.01** in	Snow	Light Snow
9:47 AM	**33.8** °F	**32.0** °F	93%	**29.92** in	**3.0** miles	NW	**9.2** mph	-	**0.01** in	Snow	Light Snow
9:53 AM	**35.1** °F	**32.0** °F	89%	**29.94** in	**9.0** miles	NNW	**5.8** mph	-	**0.01** in		Overcast
10:53 AM	**39.0** °F	**27.0** °F	62%	**29.89** in	**10.0** miles	WNW	**15.0** mph	**21.9** mph	**0.01** in	Rain	Light Rain
11:53 AM	**43.0** °F	**24.1** °F	47%	**29.88** in	**10.0** miles	WNW	**15.0** mph	**24.2** mph	**0.00** in		Partly Cloudy
											Scattered

12:53 PM	**43.0** °F	**19.9** °F	40%	**29.90** in	**10.0** miles	WNW	**20.7** mph	**28.8** mph	N/A	Clouds
1:53 PM	**43.0** °F	**19.9** °F	40%	**29.90** in	**10.0** miles	WNW	**23.0** mph	**32.2** mph	N/A	Mostly Cloudy
2:53 PM	**43.0** °F	**17.1** °F	35%	**29.92** in	**10.0** miles	NW	**24.2** mph	**34.5** mph	N/A	Mostly Cloudy
3:53 PM	**42.1** °F	**14.0** °F	32%	**29.95** in	**10.0** miles	WNW	**20.7** mph	**32.2** mph	N/A	Partly Cloudy
4:53 PM	**39.9** °F	**14.0** °F	35%	**29.99** in	**10.0** miles	WNW	**18.4** mph	**31.1** mph	N/A	Clear
5:53 PM	**37.9** °F	**15.1** °F	39%	**30.02** in	**10.0** miles	WNW	**10.4** mph	**20.7** mph	N/A	Clear
6:53 PM	**37.0** °F	**16.0** °F	42%	**30.06** in	**10.0** miles	WNW	**8.1** mph	-	N/A	Overcast
7:53 PM	**36.0** °F	**16.0** °F	44%	**30.09** in	**10.0** miles	WNW	**13.8** mph	**21.9** mph	N/A	Overcast
8:53 PM	**34.0** °F	**17.1** °F	50%	**30.13** in	**10.0** miles	WNW	**15.0** mph	**19.6** mph	N/A	Mostly Cloudy
9:53 PM	**33.1** °F	**19.9** °F	59%	**30.15** in	**10.0** miles	NNW	**6.9** mph	-	N/A	Mostly Cloudy
10:53 PM	**33.1** °F	**19.9** °F	59%	**30.15** in	**10.0** miles	NW	**5.8** mph	-	N/A	Mostly Cloudy
11:53 PM	**32.0** °F	**19.0** °F	59%	**30.14** in	**10.0** miles	NNW	**6.9** mph	-	N/A	Mostly Cloudy