

Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

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DEPARTMENT*

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*ODOR MONITORING PROGRAM AT METROPOLITAN WATER
RECLAMATION DISTRICT FACILITIES DURING 2008*

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Metropolitan Water Reclamation District of Greater Chicago

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ODOR MONITORING PROGRAM AT METROPOLITAN WATER
RECLAMATION DISTRICT FACILITIES DURING 2008

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DISCLAIMER

Mention of proprietary equipment and chemicals in this report does not constitute endorsement by the Metropolitan Water Reclamation District of Greater Chicago.

SUMMARY

The Metropolitan Water Reclamation District of Greater Chicago (District) maintains a program of monitoring odors at five water reclamation plants (WRPs), one solids drying site, one solids processing site (SPS), and four solids drying areas (SDAs). This program started in 1990. Both Monitoring and Research (M&R) Department and Maintenance and Operations (M&O) Department personnel make subjective observations regarding the type and intensity of any odor perceived. The M&R Department staff records instantaneous hydrogen sulfide (H₂S) measurements using a handheld monitor at each monitoring site. The number of locations at each facility varies from 4 to 19. The frequency of monitoring varies from one day per week at the Ridgeland SDA to seven days per week during the summer months at the Kirie WRP. Each odor observation is characterized as very strong, strong, easily noticeable, faint, very faint, or no odor.

During 2008 eight very strong odors, out of 4,583 observations, were observed at the Stickney WRP, 13 very strong odors out of 2,509 were observed at the Calumet WRP, two very strong odors were observed at the Harlem Avenue Solids Management Area (HASMA), Marathon, and Vulcan SDA and the Lawndale Avenue Solids Management Area (LASMA). There were no very strong odors observed at the North Side or Egan WRPs or the other SDAs and SPSs. The majority of the observations at the five WRPs were characterized as faint to no odor from 67 to 99 percent of the time. At the six SDAs and sites, observations were characterized as faint to no odor from 69 to 97 percent of the time.

At each of the WRPs there are specific locations which have noticeable odors. A summary of the locations which had occasional strong odors is presented in [Table 1](#). For example, at the Calumet WRP the area where most strong odors were observed is in the vicinity of the preliminary tanks and the Sludge Concentration Building. At the Stickney WRP the areas where most strong odors were observed are the preliminary tanks, Imhoff tanks, and sludge concentration tanks. While strong odors are generally infrequent, it shows there is the potential for odors from these areas. Strong odors occurring along Laramie Avenue were identified as typical odors coming from the Koppers Industries, Inc., plant, which is just east of the Stickney WRP.

The H₂S levels generally followed a pattern similar to the odor observations with occasional high values. The average level of H₂S ranges from 0.5 to 95.3 ppbv (parts per billion by volume) at the WRPs. At the Stickney WRP the average H₂S levels along the periphery of the plant were 6 to 9 ppbv and 8 to 47 ppbv at the majority of locations within the WRP.

TABLE 1: STRONG ODOR OBSERVATIONS—2008

Facility	Number of Strong Odor Observations	Total Number of Observations
Calumet WRP		
Plant Entrance	1	
Lagoon #19 SW Corner	4	
Sludge Concentration Building	23	
Lagoon #19 NE Corner	11	
Sludge Digester Tanks	6	
TARP Pump Station	1	
Preliminary Tanks	23	
Lagoons #1 and #2	7	
Ellis Ave. & 130th St.	<u>1</u>	
	Total 77	2,509
Calumet SDS		
Drying Cell #1 SW	6	
Hopper Building	2	
Drying Cell #8 NW	2	
Drying Cell #8 NE	1	
Truck Scale/Centrifuge	3	
Drying Cell #SE	4	
Drying Cell #1 at Gate	1	
West Drying Cell #4	<u>2</u>	
	Total 21	1,796
Egan WRP		
Waste Gas Burner	<u>1</u>	
	Total 1	314
Kirie WRP		
Return Channel	1	
Airlift A1	1	
Airlift A2	<u>3</u>	
	Total 5	9,786

TABLE 1 (Continued): STRONG ODOR OBSERVATIONS—2008

Facility	Number of Strong Odor Observations	Total Number of Observations
North Side WRP		
McCormick Road	1	
Final Tank Battery D3	2	
Gallery Bldg. Battery D Mix Channel	2	
Weir Preliminary Tank #10	1	
Weir Rect. Preliminary Tanks	2	
Main St. Sludge Conc. Tanks	<u>1</u>	
	Total 9	611
Stickney WRP		
Imhoff Tanks*	30	
Digesters 6th Ave. & B St.	3	
Centrifuges (Pre)	7	
Centrifuges (Post)	7	
Sludge Concentration Tanks	17	
Preliminary Tanks**	37	
Lombard Ave. @ Gate/39th St.	1	
Laramie Ave. & 40th St.*	11	
Laramie Ave. & 39th St.	<u>10</u>	
	Total 123	4,583
HASMA, Marathon, Vulcan SDAs, and LASMA SPS		
HASMA	6	
HASMA center***	10	
Vulcan South	1	
Vulcan North	3	
Vulcan CS	5	
Vulcan TARP Well	1	
Lagoon #1	1	
Lagoon #24***	2	
Lagoon #30	2	
LASMA Drying Cells	21	
Marathon	2	
Marathon West	<u>3</u>	
	Total 57	1,789

TABLE 1 (Continued): STRONG ODOR OBSERVATIONS—2008

Facility	Number of Strong Odor Observations	Total Number of Observations
RASMA SDA	<u>0</u> Total 0	131
Stony Island SDA NE Corner Cell #5	<u>1</u> Total 1	233

*There were four observations of a very strong odor at these locations at the Stickney WRP.

**There were four observations of very strong odors at the Preliminary Tanks at the Stickney WRP.

***There were two observations of a very strong odor at HASMA center and Lagoon #24.

SDS = Solids Drying Site.

SDA = Solids Drying Area.

SPS = Solids Processing Site.

WRP = Water Reclamation Plant.

INTRODUCTION

The M&R Department in conjunction with the M&O Department has been conducting an odor monitoring program at various District facilities for the past 18 years. The initial program started with the solids processing and drying sites at LASMA, HASMA, Marathon, and Vulcan in 1990, and was expanded to the WRPs and other drying sites. The latest additions were the Ridgeland and Stony Island solids drying sites in 2001.

At each location a similar procedure is followed to monitor odors. M&R Department personnel, and at some facilities M&O Department personnel, visit various stations at each facility on a regular basis. The odor monitoring personnel make subjective observations regarding the character and intensity of odors at each of the stations. The odor intensities are ranked on a scale of 0, no odor, 1, very faint, 2, faint, 3, easily noticeable, 4, strong, and 5, very strong odor. In addition to the subjective odor measurements, the ambient air is sampled and analyzed for H₂S using a Jerome Model 631-X H₂S meter.

The objective of this program is to collect and maintain a database of odor levels within and around each WRP, and associated solids processing areas. The data are used to study the trends in odor levels associated with WRP operations, and to correlate odor levels to conditions related to WRP operations or changing conditions within the WRP, such as installation of odor control equipment, or sometimes to conditions unrelated to the WRP. Since several residential areas surround the WRPs in the program, the odor monitoring activities are also designed to provide early warning of odorous conditions that develop within the WRPs, and to allow control of them before they come to the notice of the residents. If a very strong odor is observed, the incident is reported at the time of observation to the respective plant operations personnel.

This report presents the odor monitoring data for the year 2008. The odor monitoring data in terms of frequency of occurrence, locations of possible odor sources, and H₂S levels has been reviewed and summarized.

A summary of the odor monitoring program is presented in Table 2. This table includes a brief description of the program with regard to when the monitoring commenced at each facility, the number of monitoring locations, the frequency of the monitoring, and who conducts the monitoring.

Maps showing the odor monitoring sites at each WRP and SDA are presented in Appendix AI.

The number of monitoring locations at each facility varies from 4 to 19, depending upon the size of the facility and the history of odor episodes in those facilities. The Calumet and Stickney WRPs and SDAs are monitored from three to five days per week. At the Kirie WRP, the M&O Department monitors the facility every day, once per shift, from the spring through fall months.

TABLE 2: ODOR MONITORING PROGRAM FOR 2008

Facility	Number of Locations Monitored	Year Began	Months of Year	Days Per Week	Departments Participating	H ₂ S Measured	Number of Odor Complaints	Number of Complaints Verified
Calumet WRP	15	1992	12	3 2	M&R M&O	Yes	0	0
Calumet SDS	9	1992	12	3 2	M&R M&O	Yes	0	0
Egan WRP	7	1993	12	1 **	M&R M&O**	Yes	7	7
Kirie WRP	17	1996	12	1 7*	M&R M&O	Yes	3	2
North Side WRP	13	1992	12	1 **	M&R M&O**	Yes	1	0
Stickney WRP	19	1991	12	3 2	M&R M&O	Yes	0	0
HASMA, Vulcan, Marathon SDA, and LASMA SPS	17	1990	12	3	M&R	Yes	2	1

TABLE 2 (Continued): ODOR MONITORING PROGRAM FOR 2008

Facility	Number of Locations Monitored	Year Began	Months of Year	Days Per Week	Departments Participating	H ₂ S Measured	Number of Odor Complaints	Number of Complaints Verified
RASMA SDA	4	2001	12	1 to 2	M&R	Yes	0	0
Stony Island SDA	4	2001	12	1	M&R	Yes	0	0

Note: SDA = Solids Drying Area
 SDS = Solids Drying Site
 SPS = Solids Processing Site
 WRP = Water Reclamation Plant

- ω *At Kirie, M&O Department personnel conduct odor monitoring surveys 7 days a week 3 times a day from May through November.
- **The M&O Department conducts periodic odor monitoring surveys at these facilities depending upon conditions, but the data are not included in this report.

Odor complaints in 2008 at the various facilities were very infrequent, ranging from none at the Calumet WRP, Calumet SDS, Stickney WRP, Ridgeland Avenue Solids Management Area (RASMA) SDA, and Stony Island SDA, to seven at the John E. Egan WRP.

RESULTS OF ODOR MONITORING AT METROPOLITAN WATER RECLAMATION DISTRICT OF CHICAGO FACILITIES IN 2008

The results of the various odor monitoring programs at each of the District facilities for 2008 are summarized in Table 3. The results have been divided into two major groups: detected odors, which includes the very strong, strong, and easily noticeable odor categories, and non-detected odors, which are either faint, very faint, or no odor.

A general observation drawn from the table is that at those facilities where both M&R Department and M&O Department personnel conducted odor monitoring, the M&O Department personnel show a lower frequency in odors detected. This may be due to the fact that the M&O Department personnel are exposed to the specific area on a daily basis as compared to the M&R Department personnel which can result in olfactory desensitization. Thus, they may not differentiate especially well between faint and easily noticeable odors.

Calumet Water Reclamation Plant

In general, the majority of the odor monitoring observations ranged from faint to no odor; 72 percent of the time by M&R Department personnel and 92 percent of the time by M&O Department personnel, respectively. The strong odors mainly occurred around the sludge concentration building and preliminary tanks, with 10 percent and 11 percent of the observations at these locations, respectively. Areas which had easily noticeable odors were in the vicinity of the preliminary tanks, sludge concentration tanks and northeast corner of Lagoon #16, sludge digester tanks, southwest corner of Lagoon #16, and Aeration Battery A.

The H₂S measurements made at the time of the odor monitoring by the M&R Department personnel are summarized in Table 4. The highest instantaneous readings were at the sludge concentration building and the preliminary tanks.

Figure 1 summarizes the monthly observations of easily noticeable, strong, and very strong odors made during 2008 in terms of frequency of occurrence. The frequency of easily noticeable observations ranged between 7 and 22.6 percent each month with the highest percentage occurring in May. Very strong odors were observed less than one percent of the time on average during 2008.

No odor calls pertaining to the Calumet WRP were received in 2008.

Calumet Solids Drying Site

The Calumet Solids Drying Site consists of the East SDA, located east of the Calumet WRP, and the West SDA, located west of the Calumet WRP. As with the Calumet WRP, the occurrence of strong odors at the drying areas, which also includes the centrifuge building located at the East SDA, was infrequent. The majority of the observations were described as faint to no odor. A few strong odors were observed at the drying areas during March, April, May, July,

TABLE 3: ODOR MONITORING RESULTS FOR 2008

Facility	Departments Participating	Total Number of Observations	Number of Observations Odors Were Detected			Number Non-Detects*	Percent Non-Detects
			Very Strong	Strong	Easily Noticeable		
Calumet WRP	M&R	1,300	9	56	294	941	72
	M&O	1,209	4	21	76	1,108	92
Calumet SDS	M&R	979	0	8	141	830	85
	M&O	817	0	10	31	776	95
Egan WRP	M&R M&O**	314	0	1	34	279	89
Kirie WRP	M&R	808	0	4	134	670	83
	M&O	8,978	0	1	95	8,882	99
North Side WRP	M&R M&O**	611	0	9	147	455	74
Stickney WRP	M&R	2,385	8	105	678	1,594	67
	M&O	2,198	0	18	114	2,066	94
HASMA Vulcan and Marathon SDA and LASMA SPS	M&R	1,789	2	57	499	1,231	69

TABLE 3 (Continued): ODOR MONITORING RESULTS FOR 2008

Facility	Departments Participating	Total Number of Observations	Number of Observations Odors Were Detected			Number Non-Detects*	Percent Non-Detects
			Very Strong	Strong	Easily Noticeable		
RASMA SDA	M&R	131	0	0	4	127	97
Stony Island SDA	M&R	233	0	1	16	206	88

Note: SDS = Solids Drying Site
 SDA = Solids Drying Area
 SPS = Solids Processing Site
 WRP = Water Reclamation Plant

*Non-detects are all observations of faint, very faint, or no odor.

**The M&O Department conducts periodic odor monitoring surveys at these facilities but the data are not included in this Table.

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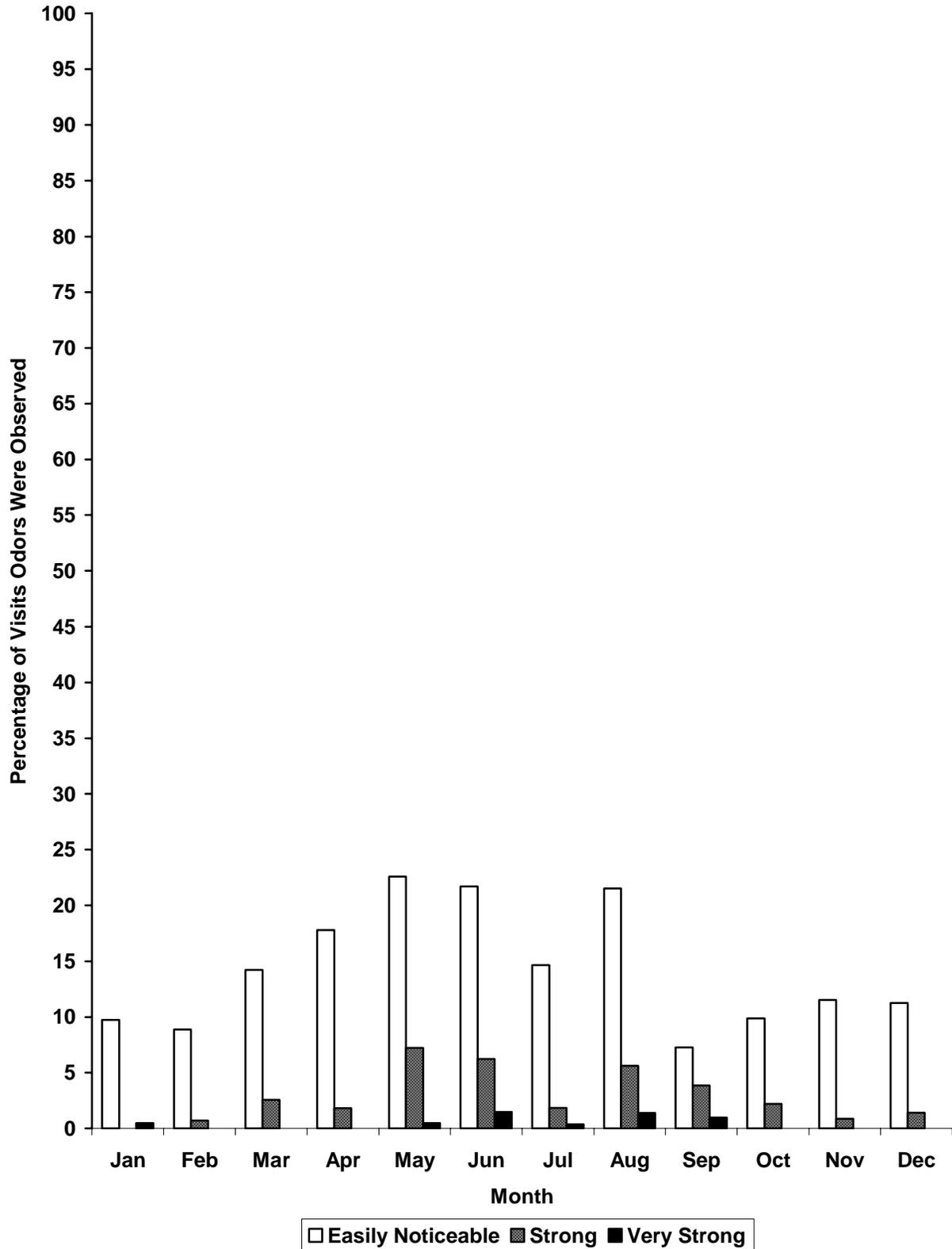
TABLE 4: HYDROGEN SULFIDE READINGS AT
CALUMET WATER RECLAMATION PLANT—2008

Location	Hydrogen Sulfide, ppbv ¹		
	Mean	Minimum	Maximum
Plant Entrance (1) ²	4.7	0	110
Lagoon #16 SW Corner (2)	12.2	0	510
Sludge Conc. Bldg. (3)	95.3	0	5,400
Lagoon #16 NE Corner (4)	5.3	0	26
Sludge Digester Tanks (5)	6.6	0	200
Aeration Battery A—West (6)	5.7	0	110
TARP Pump Station (7)	0.5	0	6
Preliminary Tanks (8)	38.4	0	2,000
Gate Near Lagoon #9 (9)	5.1	0	57
Between Lagoon #7 & #8 (10)	4.6	0	19
Lagoon #1 & #2 (11)	5.4	0	36
Lagoon #3 & #4 (12)	4.9	0	18
Ellis Ave. & 130th St. (13)	5.0	0	16
H ₂ S Monitor—130th St. (23)	4.3	0	15
North H ₂ S Monitor (24)	7.4	0	230

¹ ppbv = Parts per billion by volume.

² Numbers in parentheses correspond to Station numbers in [Figure AI-1](#).

FIGURE 1: ODOR OBSERVANCES AT
CALUMET WATER RECLAMATION PLANT—2008



August, and September 2008. Strong odors occurred about two percent of the time at the SDAs. Easily noticeable odors occurred between 3 and 16 percent of the time throughout the various drying area locations. [Figure 2](#) presents the monthly frequency of occurrence of the easily noticeable, strong, and very strong odor observations. The easily noticeable odors peaked during August 2008.

The average H₂S levels were between 4.6 and 6.5 ppbv, as shown in [Table 5](#). The highest value observed (130 ppbv) was at the Truck Scale/Centrifuge Building.

No odor calls were received with regard to the Calumet Solids Drying Site.

John E. Egan Water Reclamation Plant

There was one strong odor observation at the John E. Egan WRP in 2008. Faint or no odors were reported 89 percent of the time. The easily noticeable odor observations occurred 11 percent of the time, and occurred most frequently in the vicinity of the primary tanks and near the waste gas burner.

The percentage of observations at which easily noticeable, strong, and very strong odors were observed during 2008 are plotted by month in [Figure 3](#).

The average H₂S measurements ranged from 5.2 to 8.1 ppbv, as shown in [Table 6](#). The highest average level and highest instantaneous level was observed near the waste gas burner.

Seven odor calls pertaining to the John E. Egan WRP were received in 2008, all of which were verified as being associated with odors originating in the WRP.

James C. Kirie Water Reclamation Plant

There were five strong odor observations at the James C. Kirie WRP during 2008. Faint or no odors were reported 83 percent (M&R Department) and 99 percent (M&O Department) of the time. The easily noticeable odors which occurred were generally in the vicinity of air lift station A1 (9 percent), the return aeration channel (7 percent), and air lift station A2 (7 percent).

[Figure 4](#) summarizes the observations of easily noticeable or stronger odors by odor monitoring personnel during 2008. There were five strong odor episodes which were observed during January and April 2008.

The measured H₂S levels are summarized in [Table 7](#). The highest maximum and average levels of H₂S, 160 ppbv and 8.8 ppbv, respectively, were measured in the vicinity of Ridge Lane—Point #1. All the other locations had averages ranging from 4.6 to 6.4 ppbv.

Three odor calls were received regarding the Kirie WRP, of which two were verified as resulting from Kirie WRP operations.

FIGURE 2: ODOR OBSERVANCES AT CALUMET WATER RECLAMATION PLANT SOLIDS DRYING SITES—2008

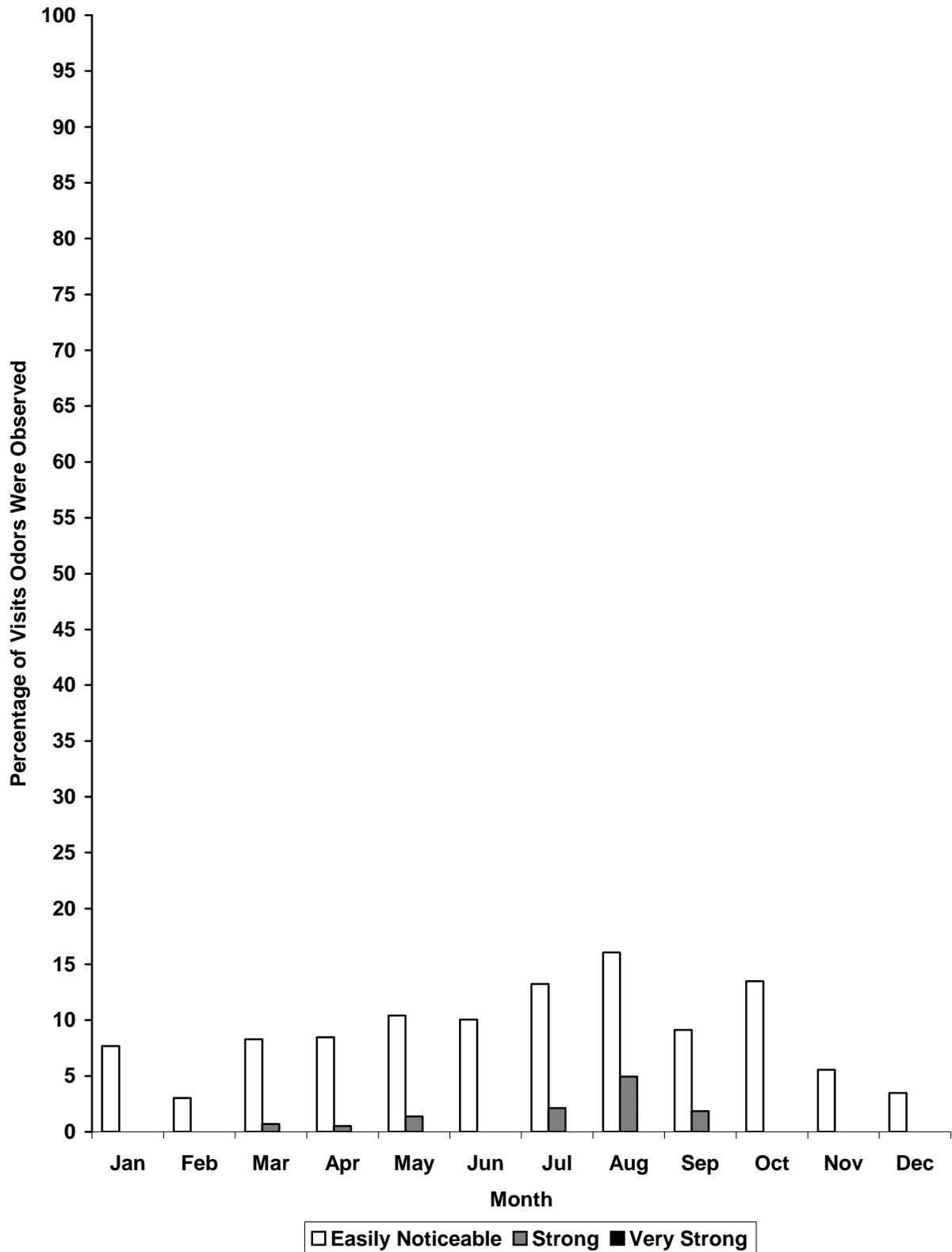


TABLE 5: HYDROGEN SULFIDE READINGS AT CALUMET
SOLIDS DRYING SITES—2008

Location	Hydrogen Sulfide, ppbv ¹		
	Mean	Minimum	Maximum
East Drying Cell #1 SW (14) ²	5.1	0	16
Hopper Building (15)	5.3	0	22
East Drying Cell #8 NW (16)	5.0	0	11
East Drying Cell #8 NE (17)	5.0	0	10
Truck Scale/Centrifuge (18)	6.5	0	130
East Drying Cell #1 SE (19)	5.0	0	17
West Drying Cell #1 @ Gate (20)	5.0	0	21
West Drying Cell #4 (21)	5.0	0	15
Bituminous Road @ Gate (22)	4.6	0	11

¹ ppbv = Parts per billion by volume.

² Numbers in parentheses correspond to Station numbers in [Figure AI-1](#).

FIGURE 3: ODOR OBSERVANCES AT
JOHN E. EGAN WATER RECLAMATION PLANT—2008

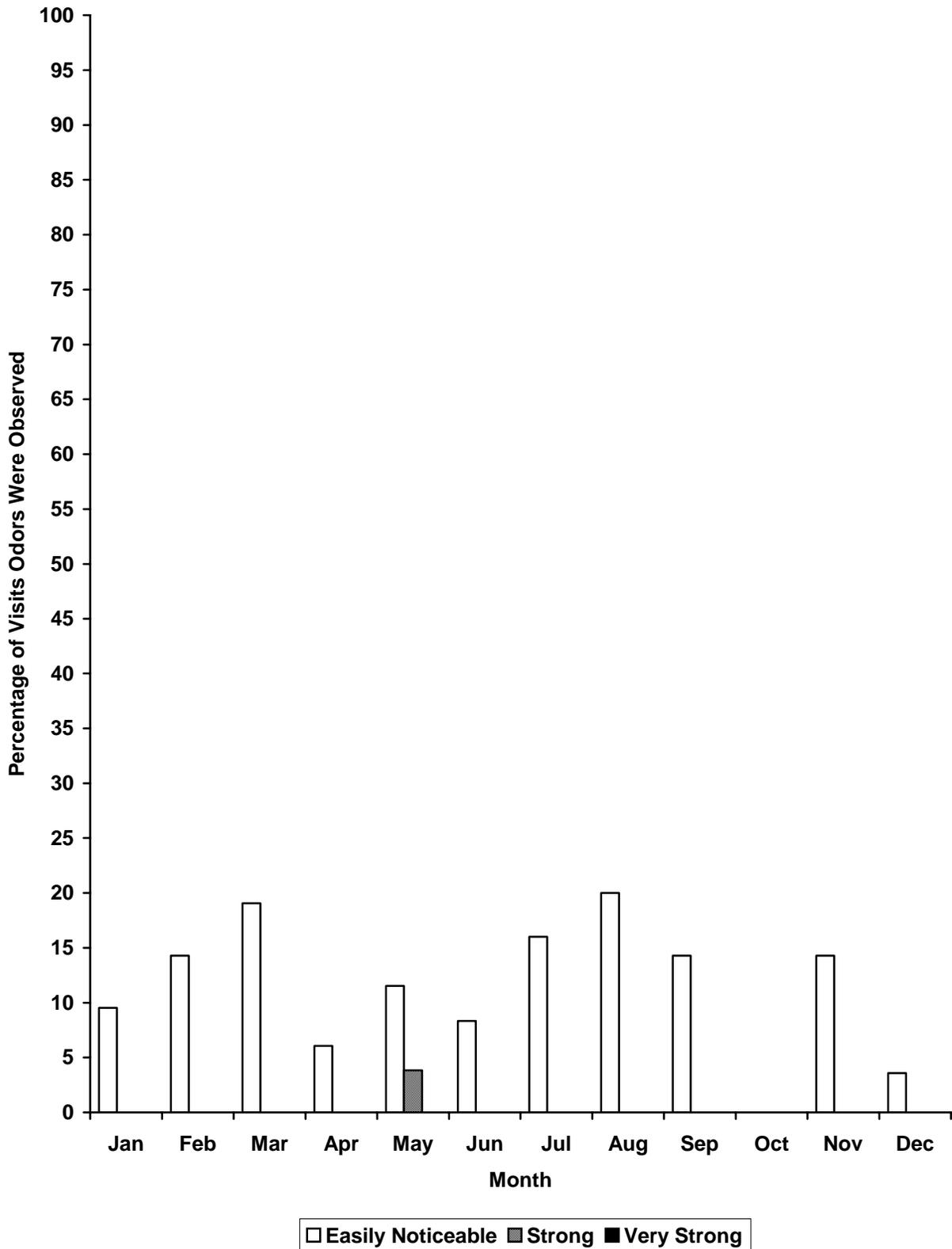


TABLE 6: HYDROGEN SULFIDE READINGS AT JOHN E. EGAN WATER RECLAMATION PLANT—2008

Location	Hydrogen Sulfide, ppbv ¹		
	Mean	Minimum	Maximum
West Entrance Gate (1) ²	6.1	0	19
Near Waste Gas Burner (2)	8.1	1	88
Primary Tanks (3)	5.7	2	10
South End “A” Drive (4)	5.4	2	10
Final Tanks (5)	5.2	1	10
East Entrance Gates (6)	5.4	2	10
West of Storage Building (7)	5.9	2	11

¹ppbv = Parts per billion by volume.

²Numbers in parentheses correspond to Station numbers in [Figure AI-2](#).

FIGURE 4: ODOR OBSERVANCES AT
JAMES C. KIRIE WATER RECLAMATION PLANT—2008

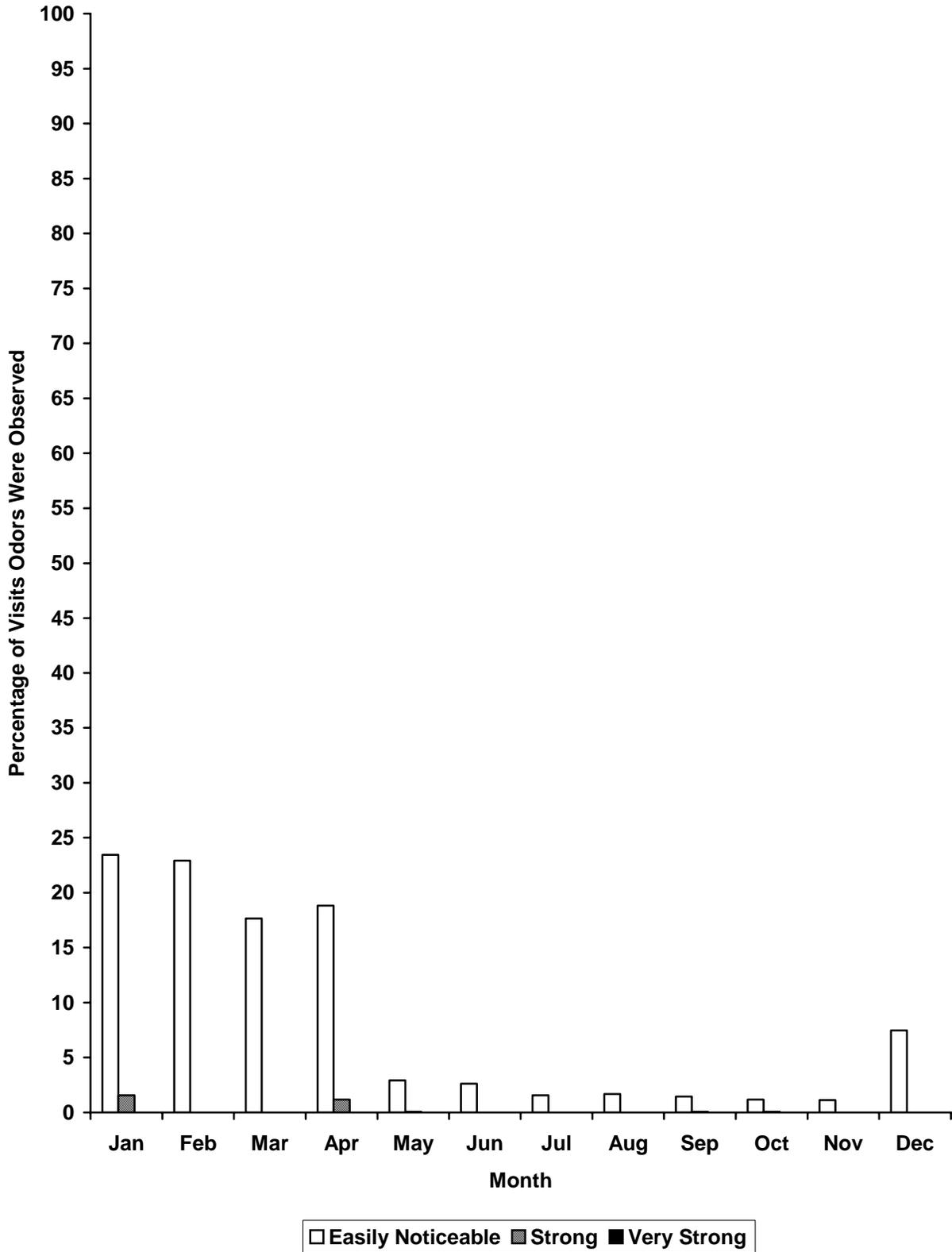


TABLE 7: HYDROGEN SULFIDE READINGS AT JAMES C. KIRIE WATER RECLAMATION PLANT—2008

Location	Hydrogen Sulfide, ppbv ¹		
	Mean	Minimum	Maximum
Plant Entrance (1) ²	5.1	0	16
Pump Station (2)	5.8	0	21
Air Lift B1 (3)	5.2	0	28
Road C-1 (4)	5.0	0	9
Return Channel (5)	6.4	0	48
East Gallery—North (6)	4.6	0	8
Road C-2 (7)	5.2	0	9
Road C-3 (8)	4.8	0	10
Road C-4 (9)	4.8	0	10
Air Lift A-1 (10)	5.1	0	12
Air Lift A-2 (11)	5.0	0	8
Road C-5 (12)	4.8	0	10
Road C-6 (13)	5.0	0	10
Road C-7 (14)	4.7	0	9
Air Lift B2 (15)	4.9	0	10
Ridge Lane—Point #1 (16)	8.8	0	160
Marshall and Pleasant (17) Lane—Point #2	5.3	0	15

¹ppbv = Parts per billion by volume.

²Numbers in parentheses correspond to Station numbers in [Figure AI-3](#).

North Side Water Reclamation Plant

The majority of the observations at the North Side WRP were faint to no odor. There were no very strong odor observations and 9 strong odor observations at this WRP during 2008. The easily noticeable odors accounted for 24 percent of the total observations, with the greatest frequency around Preliminary Tank 3.

The monthly percentage of observations at which easily noticeable, strong, and very strong odors were observed are shown in [Figure 5](#). In general, the frequency of occurrence of easily noticeable odors was lower from July to December than earlier in the year.

The measured H₂S levels are summarized in [Table 8](#). The highest mean and maximum readings were at the McCormick Road location.

One odor call regarding the North Side WRP was received in 2008, but the call was not verified as being associated with odors originating in the WRP.

Stickney Water Reclamation Plant

At the Stickney WRP, the majority of the observations in 2008 were faint to no odor, with 67 percent of M&R Department and 94 percent of M&O Department observations meeting this classification, respectively. Overall, there were eight very strong odor observations and 123 strong odor observations, which accounts for 3 percent of the total number of observations. Most of these strong odors occurred in the vicinity of the preliminary tanks and Imhoff tanks. The strong odors observed at Laramie and 39th Street along with some of the strong odors in the vicinity of the Imhoff tanks were identified as a tar-like odor which was attributed to the adjacent chemical plant operated by Koppers Industries, Inc.

[Figure 6](#) is a plot of the percentage of easily noticeable, strong, and very strong odors observed each month at the Stickney WRP. The frequency of occurrence of easily noticeable odors ranged from 0 percent to 25 percent of the time. The highest frequencies were observed at the preliminary tanks, predigestion and postdigestion centrifuges, concentration tanks, and Imhoff tanks. The strong odor occurrences were also spread out over the year except for the month of May, in which no strong odor was observed.

The highest average H₂S level was adjacent to the preliminary tanks at Twelfth Avenue, with a concentration of 46.9 ppbv ([Table 9](#)). Two extreme concentrations of H₂S, 3,000 and 1,200 ppbv, were measured at the preliminary tanks at Twelfth Avenue and the West Digester Concentration Building, respectively. Plant management was notified of these extreme H₂S readings as required by the standard operating procedure.

No odor calls were received regarding the Stickney WRP.

FIGURE 5: ODOR OBSERVANCES AT
NORTH SIDE WATER RECLAMATION PLANT—2008

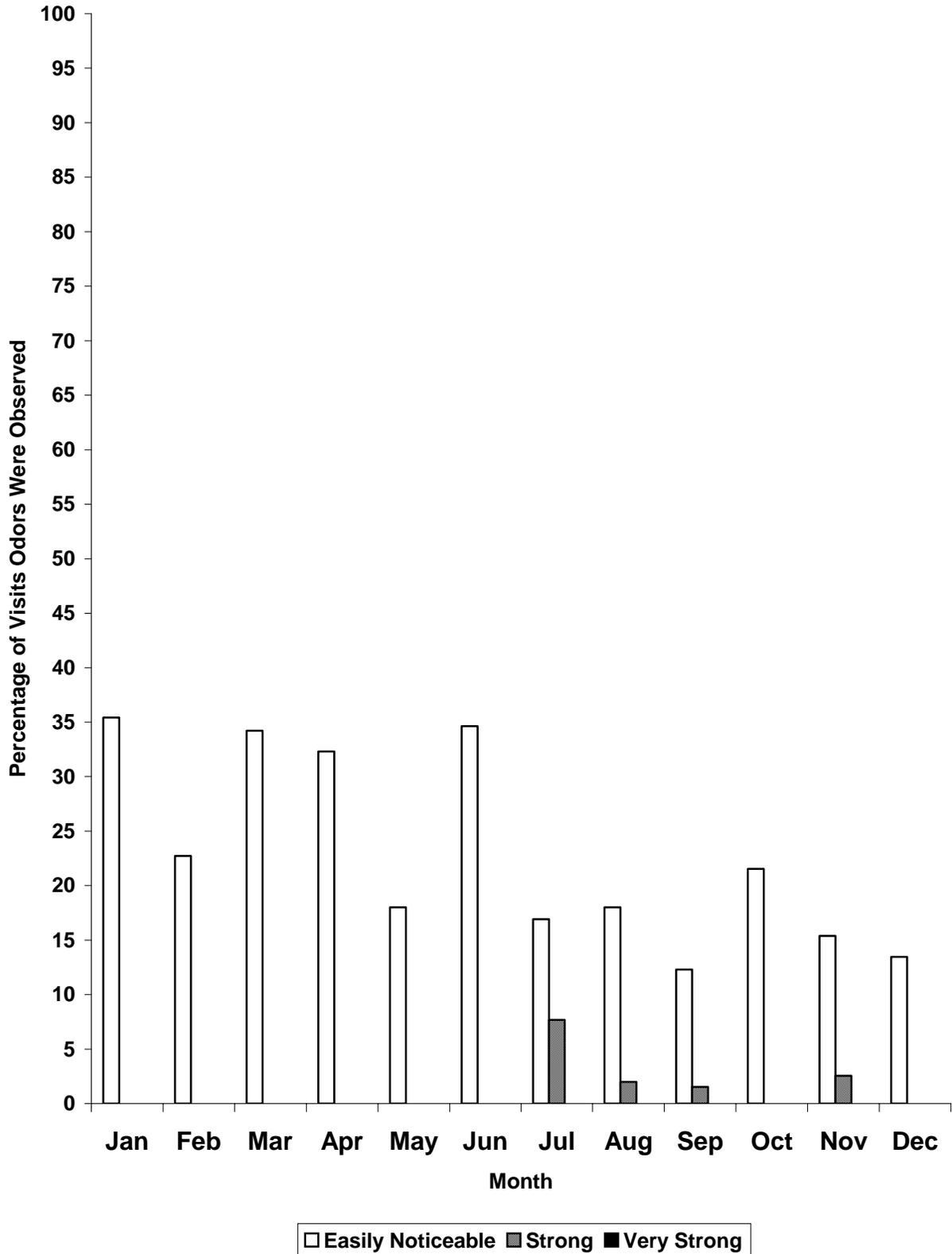


TABLE 8: HYDROGEN SULFIDE READINGS AT NORTH SIDE WATER RECLAMATION PLANT—2008

Location	Hydrogen Sulfide, ppbv ¹		
	Mean	Minimum	Maximum
Howard Street West End (1) ²	5.9	0	10
Howard Street East (2) of McCormick Road	10.5	0	290
McCormick Road (3)	34.8	0	1,200
P&B Building (4)	5.6	0	21
North Ave. Rect. Tank A6 (5)	12.2	0	350
North Ave. Rect. Tank B6 (6)	7.1	0	110
North Ave. Rect. Tank C6 (7)	4.6	0	10
Final Tank Batt. D3 (8)	4.8	0	11
Gallery Bldg. of Batt. D (9) Mix Channel	4.8	0	9
Main Street and Avenue E (10)	4.7	0	14
Covered Weir Prel. Tank 10 (11)	5.3	0	10
Weir Rect. Prel. Tank 3 (12)	5.8	0	23
Main St. Covered Sludge (13) Conc. Tanks	5.8	0	18

¹ppbv = Parts per billion by volume.

²Numbers in parentheses correspond to Station numbers in [Figure AI-4](#).

FIGURE 6: ODOR OBSERVANCES AT
STICKNEY WATER RECLAMATION PLANT—2008

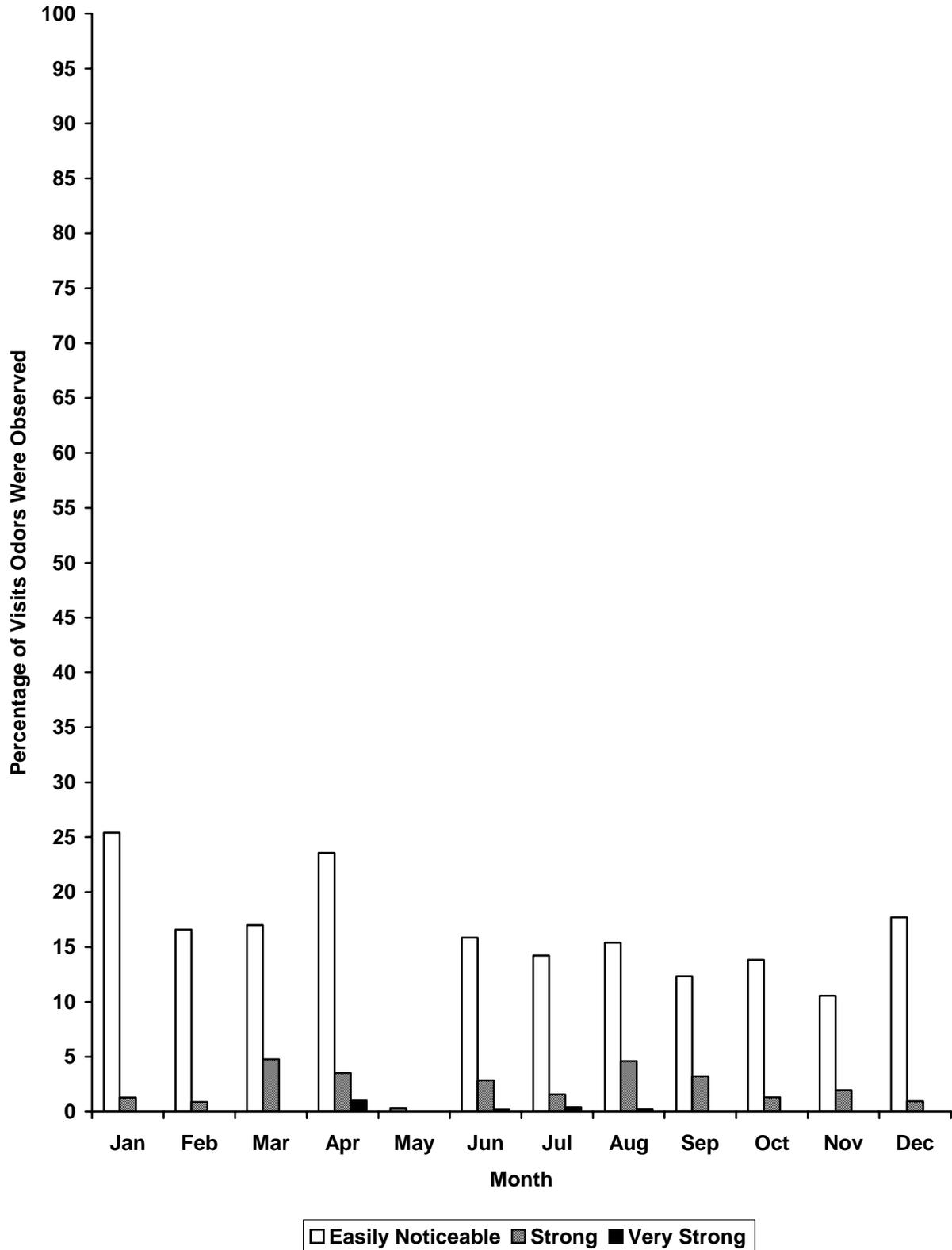


TABLE 9: HYDROGEN SULFIDE READINGS AT
STICKNEY WATER RECLAMATION PLANT—2008

Location	Hydrogen Sulfide, ppbv ¹		
	Mean	Minimum	Maximum
Imhoff B St./3rd Ave. (1) ²	12.6	0	663
Imhoff B St./4th Ave. (2)	17.1	0	220
Imhoff B St./5th Ave. (3)	11.3	0	103
Digester 6th Ave. @ B St. (4)	8.0	0	26
West Digester Cont. Bldg. (5)	19.4	0	1,200
Centrifuges 6th Ave. @ Pre. (6)	21.3	0	500
Centrifuges 6th Ave. @ Post (7)	8.6	0	41
Concentration G St. North (8)	19.0	0	290
Concentration D St. South (9)	15.9	0	160
Preliminary 12th Ave. (10)	46.9	0	3,000
Preliminary 10th Ave. (11)	35.1	0	430
39th St./Central Ave. (12)	7.5	0	33
39th St./Morton College Ent. (13)	7.4	0	18
39th St./Dig. @ 57th Ave. (14)	7.0	0	17
39th St./Between Austin and Lombard (15)	7.4	0	140
Battery D, B St/13th Ave. (16)	7.0	0	43
Lombard Ave. @ Gate/39th St. (18)	6.2	0	34
Laramie and 40th St. (19)	9.4	0	28
Laramie and 39th St. (20)	8.9	0	39

¹ppbv = Parts per billion by volume.

²Numbers in parentheses correspond to Station numbers in [Figure AI-5](#).

Harlem Avenue Solids Management Area, Vulcan, and Marathon Solids Drying Areas, and Lawndale Avenue Solids Management Area Solids Processing Site

The HASMA, Vulcan, Marathon, and LASMA sites had 69 percent of the observations characterized as faint to no odor. There were two very strong odors and 57 strong odor observations out of 1,789 total observations. The strong odor observations were divided among the various areas (HASMA, HASMA Center, Vulcan, LASMA Cells Lagoons 24 and 30, and Marathon) depending upon the activity at the time.

The percentage of observations at which easily noticeable, strong, and very strong odors were observed was plotted by month and are presented in [Figure 7](#). The frequency of observed odors is generally highest during the late spring through the fall months when solids processing and drying is being carried out.

The average H₂S levels at the various locations around these SDAs and SPS ranged from 5.7 and 18.3 ppbv as shown in [Table 10](#).

Two odor calls were received in 2008 with regard to the HASMA, Vulcan, and Marathon SDAs and the LASMA SPS, one of which was verified as originating at the site mentioned in the call.

Ridgeland Avenue Solids Management Area and Stony Island Solids Drying Areas

The RASMA SDA had 97 percent of the observations characterized as faint to no odor. The easily noticeable odors were three percent of the total observations; these observations occurred in February and November 2008 ([Figure 8](#)) expressed as percent frequency of occurrence. There was no strong odor observation during 2008. The average H₂S levels at the various locations around the RASMA SDA ranged from 4.3 to 5.2 ppbv, as shown in [Table 11](#).

The RASMA SDA was not used as a biosolids drying site during 2008.

The Stony Island SDA had 88 percent of the observations characterized as faint to no odor, with one strong odor observation in 2008. The easily noticeable odors accounted for approximately 7 percent of the total observations.

A monthly summary of the observations at the Stony Island SDA of easily noticeable, strong, and very strong odors during 2008 is presented in [Figure 9](#) expressed as frequency of occurrence. The only strong odors occurred during the month of August.

The average H₂S levels around the Stony Island SDA, as shown in [Table 11](#), varied from 1.6 to 2.9 ppbv.

No odor calls were received in 2008 with regard to the RASMA and Stony Island SDAs.

FIGURE 7: ODOR OBSERVANCES AT HARLEM AVENUE SOLIDS MANAGEMENT AREA, VULCAN, MARATHON SOLIDS DRYING AREAS AND LAWNSDALE AVENUE SOLIDS MANAGEMENT AREA SOLIDS PROCESSING SITE—2008

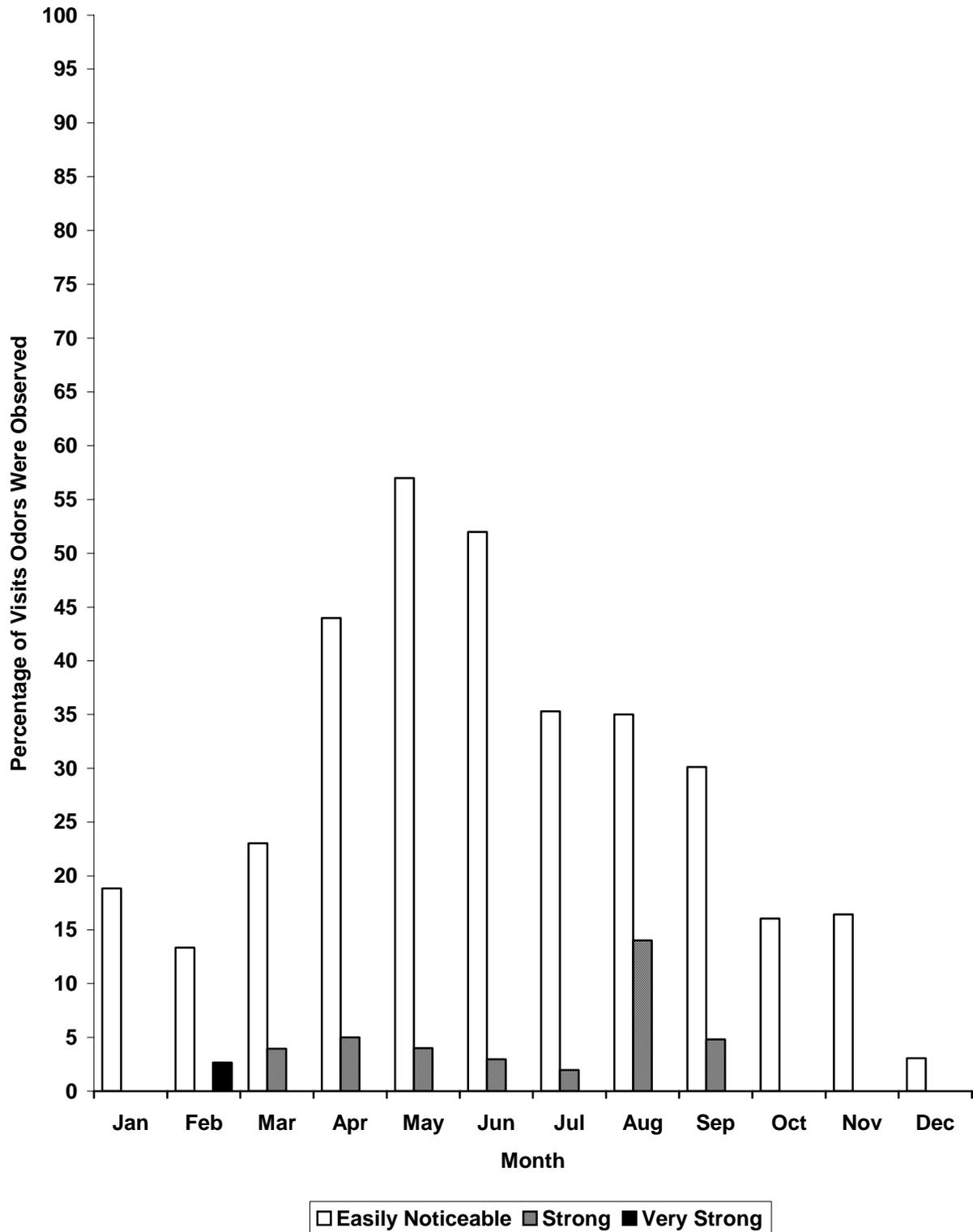


TABLE 10: HYDROGEN SULFIDE READINGS AT HARLEM AVENUE SOLIDS MANAGEMENT AREA, VULCAN, MARATHON SOLIDS DRYING AREAS AND LAWNSDALE AVENUE SOLIDS MANAGEMENT AREA SOLIDS PROCESSING SITE—2008

Location	Hydrogen Sulfide, ppbv ¹		
	Mean	Minimum	Maximum
HASMA (1) ²	6.0	0	26
HASMA Center (1.5)	6.7	0	51
Vulcan South (2)	17.2	0	740
Vulcan North (3)	7.2	0	150
Vulcan TARP Drop Shaft (4)	6.4	0	38
Vulcan TARP Well (5)	6.5	0	45
LASMA Lagoon 1 (6)	6.2	0	30
LASMA Lagoon 16 (7)	6.3	0	36
LASMA Lagoon 24 (8)	7.3	0	43
LASMA Lagoon 30 (9)	18.3	0	1,600
LASMA Cell 1E-1W (10)	6.9	0	57
LASMA Cell 2E-2W (11)	7.9	0	240
LASMA Cell 3E-3W (12)	5.8	0	19
LASMA Cell 4E-4W (13)	6.4	0	38
LASMA Cell 5E-5W (14)	7.2	0	140
Marathon (15)	6.0	0	57
Marathon West (16)	5.7	0	29

¹ppbv = Parts per billion by volume.

²Numbers in parentheses correspond to Station numbers in [Figure AI-6](#).

FIGURE 8: ODOR OBSERVANCES AT RIDGELAND AVENUE SOLIDS MANAGEMENT AREA SOLIDS DRYING AREA—2008

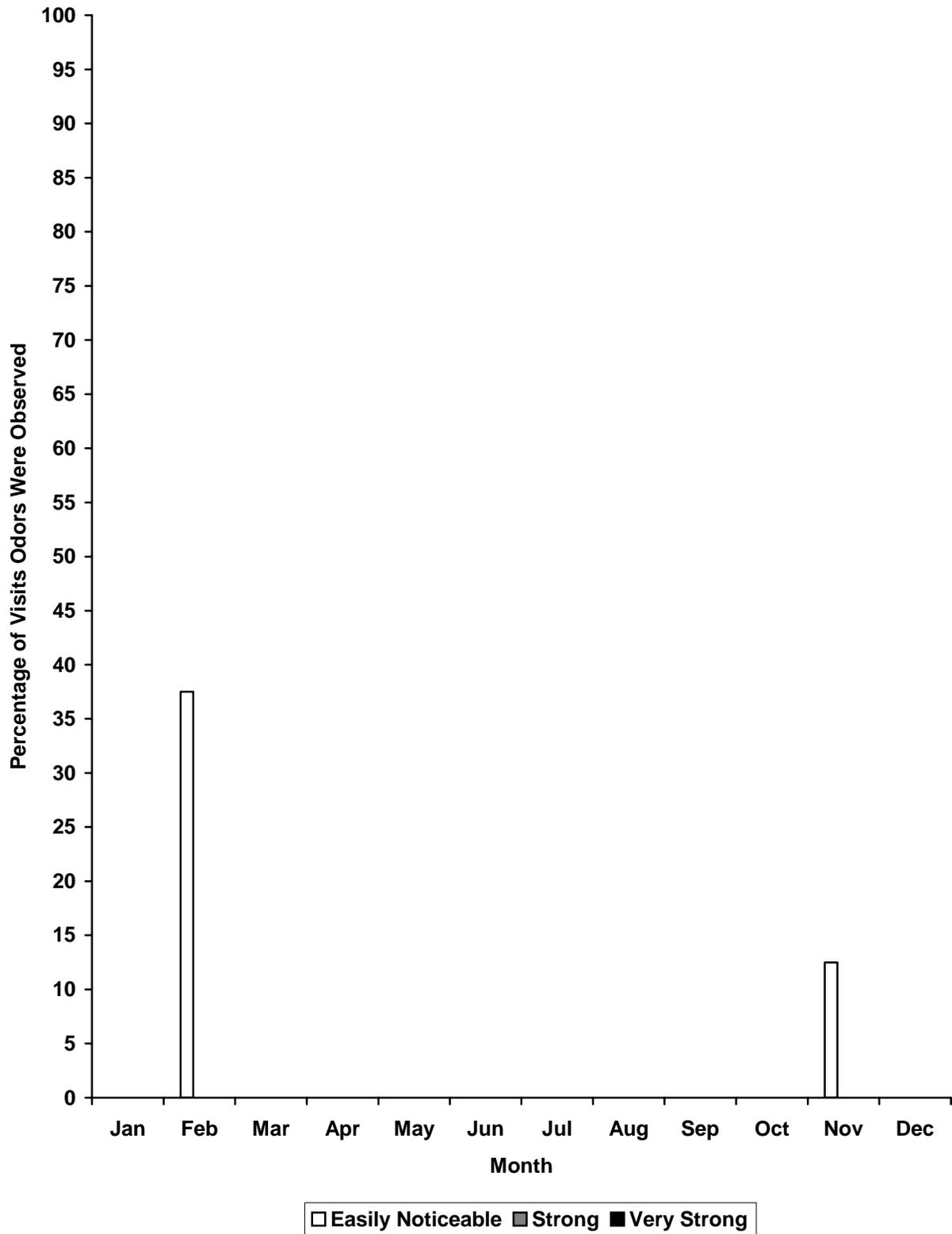


TABLE 11: HYDROGEN SULFIDE READINGS AT RIDGELAND AVENUE SOLIDS MANAGEMENT AREA AND STONY ISLAND SOLIDS DRYING AREAS—2008

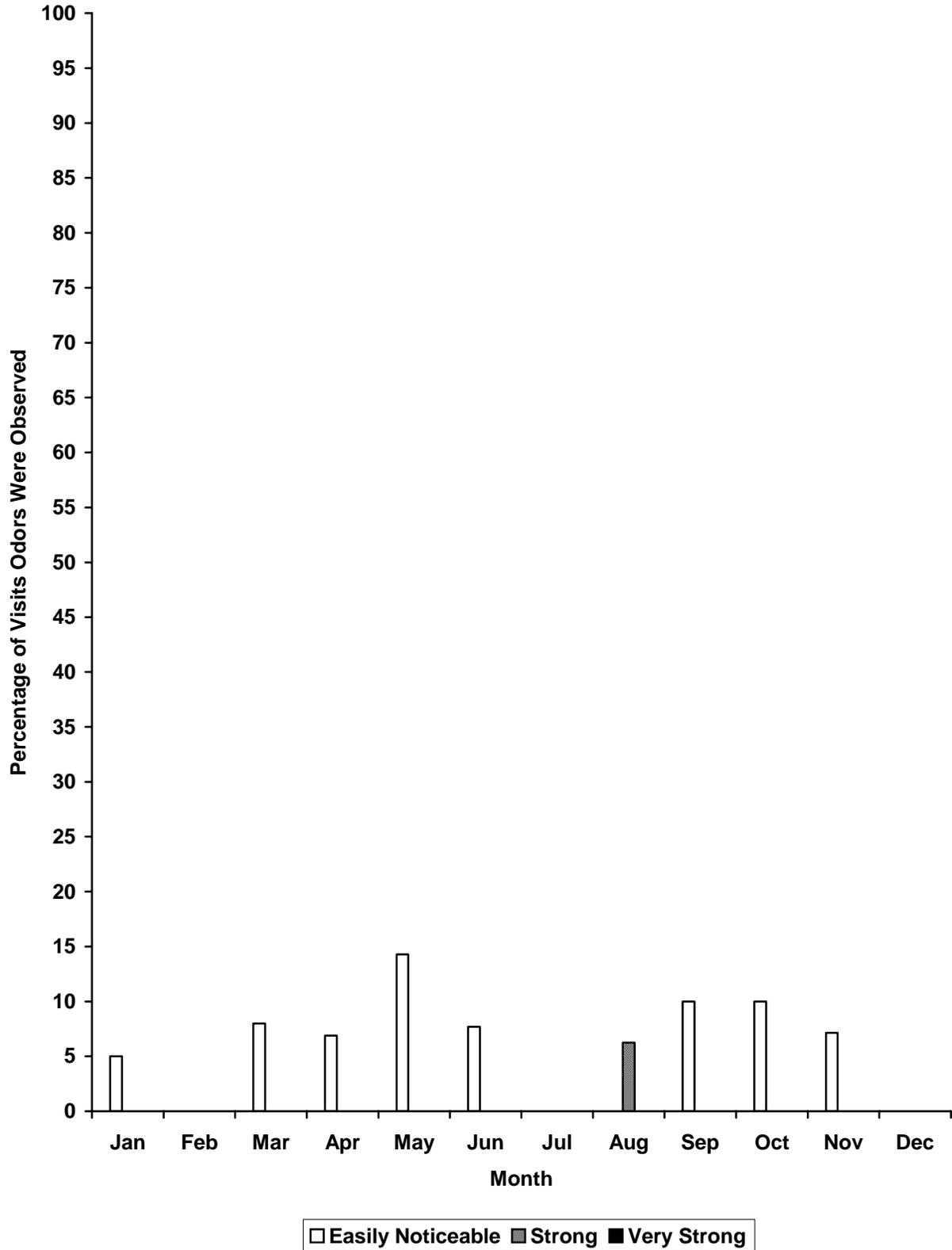
Location	Hydrogen Sulfide, ppbv ¹		
	Mean	Minimum	Maximum
-----RASMA-----			
SW Parking Area (1) ²	5.2	0	11
North of Cell 2W (2)	4.3	0	9
NE Corner Cell 5E (3)	4.3	0	11
South of Cell 5 (4)	4.4	0	16
-----Stony Island-----			
Entrance 122nd St (1) ³	2.9	0	39
NE Corner Cell 5 (2)	2.6	0	10
South End Cells 4 & 7 (3)	2.7	0	9
West Side of Cell 3 (4)	1.6	0	9

¹ppbv = Parts per billion by volume.

²Numbers in parentheses correspond to Station numbers in [Figure AI-7](#).

³Numbers in parentheses correspond to Station numbers in [Figure AI-8](#).

FIGURE 9: ODOR OBSERVANCES AT STONY ISLAND SOLIDS DRYING AREA—2008



CALUMET CONTINUOUS AMBIENT HYDROGEN SULFIDE MONITORS

Two H₂S monitoring stations were set up in October 2002 for the continuous monitoring and recording of ambient air H₂S concentration. One station (North Monitor) is located at the northern boundary of the Calumet WRP, and the second station (South Monitor) is located outside of the plant fence line near 130th Street. Each station consists of a H₂S analyzer in a temperature-controlled shelter. The monitors are Single Point Monitors made by Honeywell Analytics. Lead acetate impregnated tape is used for the measurement of H₂S with a concentration range of 0 to 90 parts per billion. Measurements are recorded every eight minutes.

A summary of the monthly H₂S concentrations measured during 2008 is presented in [Table 12](#). The monitors were in operation all year except for December, when both stationary monitors were out of service. All minimum values were zero. The majority of the concentration values were less than 10 ppbv.

[Table 13](#) shows the percent observations greater than 10 ppbv for the months of June through August. The South and North Monitor percentage of values greater than 10 ppbv varied from 0.2–5 percent and 0.1–2.0 percent. The monthly maximum H₂S concentrations ranged from 0 ppbv to 100.2 ppbv for the North Monitor and from 0 ppbv to 18.2 ppbv for the South Monitor ([Table 12](#)). Both monitors recorded higher H₂S concentrations during the warmer months.

The highest H₂S concentration of 100.2 ppbv was recorded on August 28, 2008, and September 1, 2008, with the North Monitor as shown in [Table 14](#). The first event began at 4:00 AM and peaked at 4:16 AM at 100.2 ppbv. Subsequently, the H₂S concentration gradually decreased to 2.7 ppbv at about 5:20 AM. The second event began on September 1, 2008, at 1:04 AM and peaked at 1:52 AM at 100.2 ppbv. Subsequently, the H₂S concentration decreased to 4.7 ppbv at 3:04 AM. It was typical to see H₂S concentration peaks late at night or in the early morning hours. The odor patrol has not been able to verify the higher readings recorded by the continuous monitors because the high readings of the continuous monitors occurred in the early morning hours.

The H₂S recordings adjacent to unit processes during the strong and very strong odor observances could not be clearly correlated to the elevated H₂S readings by the stationary monitors for most occasions. [Table 15](#) presents the nine very strong odor episodes that were observed adjacent to unit processes at the Calumet WRP by M&R and M&O odor patrols using the hand-held monitors, and the corresponding stationary monitor readings at the north and south boundaries of the plant. Based on the information on the measured H₂S values, a clear trend between the patrol observance and the stationary monitoring readings could not be established. However, a more intensive odor patrol will be deployed in 2009 during extreme weather conditions to better correlate the odor patrol H₂S readings with the stationary monitor recordings.

TABLE 12: CALUMET WATER RECLAMATION PLANT HYDROGEN SULFIDE
CONTINUOUS AMBIENT MONITORING—2008*

Month	<u>H₂S at North Monitor, ppbv</u>		<u>H₂S at South Monitor, ppbv</u>	
	Mean	Maximum	Mean	Maximum
January	0.1	2.0	0.2	11.0
February	0.0	0.0	0.0	0.0
March	0.2	3.0	0.1	1.0
April	0.0	6.0	0.2	4.0
May	1.0	19.2	0.4	8.0
June	0.2	15.2	0.1	8.6
July	3.5	34.6	0.4	14.0
August	1.9	100.2	2.1	18.2
September	1.1	100.2	0.2	14.0
October	0.4	16.1	0.0	0.0
November	0.3	21.6	0.0	0.0
December	NR	NR	NR	NR

*Summary of hydrogen sulfide readings taken every 8 minutes. Minimum values are all zero.
ppbv = Parts per billion by volume.
NR = No readings.

TABLE 13: PERCENT OF HYDROGEN SULFIDE CONCENTRATIONS ABOVE STATED VALUES AT THE CALUMET WATER RECLAMATION PLANT CONTINUOUS MONITORING STATION—2008

Month	Total Number of Observations	Percent Observations		
		> 0 ppbv ¹	> 3 ppbv	> 10 ppbv
.....South Monitor.....				
June	22,348	3.0	1.0	0.2
July	21,943	4.0	1.0	0.1
August	22,368	10.0	5.0	0.2
.....North Monitor.....				
June	16,402	22.0	1.0	0.1
July	12,323	15.0	8.0	2.0
August	11,543	38.0	12.0	2.0

¹ppbv = Parts per billion by volume.

TABLE 14: HYDROGEN SULFIDE SPIKE AT THE CALUMET WATER RECLAMATION PLANT NORTH MONITOR, AUGUST 28, 2008, AND SEPTEMBER 1, 2008

Date	Time	Elapsed Minutes	Hydrogen Sulfide, ppbv ¹
8/28/2008	4:00–4:08	8	5.1
	4:16–4:32	16	100.2
	4:40–4:48	8	66.8
	4:56–5:04	8	6.3
	5:12–5:20	8	2.7
9/1/2008	1:04–1:12	8	9.8
	1:20–1:28	8	37.7
	1:36–1:44	8	75.5
	1:52–2:08	16	100.2
	2:16–2:24	8	68.4
	2:32–2:40	8	54.7
	2:48–2:56	8	17.3
	3:04–3:12	8	4.7

¹ppbv = Parts per billion by volume.

TABLE 15: VERY STRONG ODOR OBSERVANCES AT CALUMET WATER RECLAMATION PLANT AND CORRESPONDING STATIONARY MONITORS' HYDROGEN SULFIDE READING—2008

Location	Date		Wind Direction	Handheld Monitor Reading Adjacent to Unit Process (ppbv)	Stationary Monitor H ₂ S Reading (ppbv) ¹	
	M&R	M&O			North	South
Sludge Concentration Building	5/29	—	SW	34	16	9
	6/5	—	SW	5,400	7	2
	6/9	—	SW	3,500	6	6
	6/10	—	SW	3,250	6	8
	6/16	—	SW	110	5	6
	8/5		SW	150	6	6
	8/18		SW	190	6	7
Sludge Digester Tanks	6/11	—	SSE	200	0	6
	—	9/7	WSW	NM	NR	NR
Preliminary Tanks	7/25	—	Calm	220	5	8
	8/19	—	NE	2,000	4	0
Lagoon 19 NE Corner	—	8/24	N	NM	NR	NR
TARP Pump Station	—	9/7	WSW	NM	NR	NR

NR = No reading (negative reading—error).

NM = Not monitored.

¹ppbv = Parts per billion by volume.

APPENDIX AI

LOCATION OF ODOR MONITORING STATIONS AT DISTRICT WATER RECLAMATION
PLANTS, SOLIDS DRYING AREAS, AND SOLIDS PROCESSING SITES

FIGURE AI-2: JOHN E. EGAN WATER RECLAMATION PLANT AND SOLIDS DRYING AREA
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)

AI-2

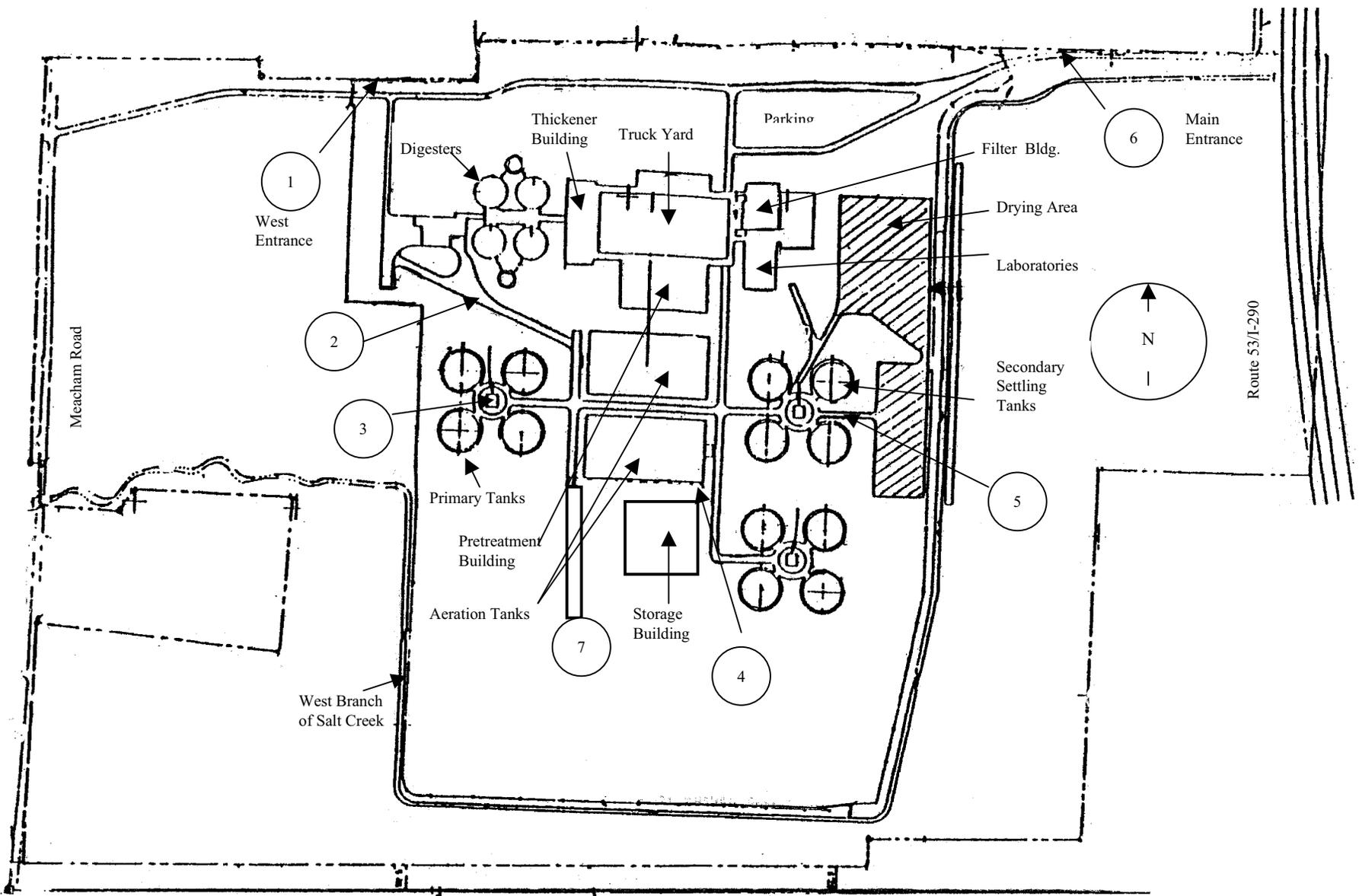
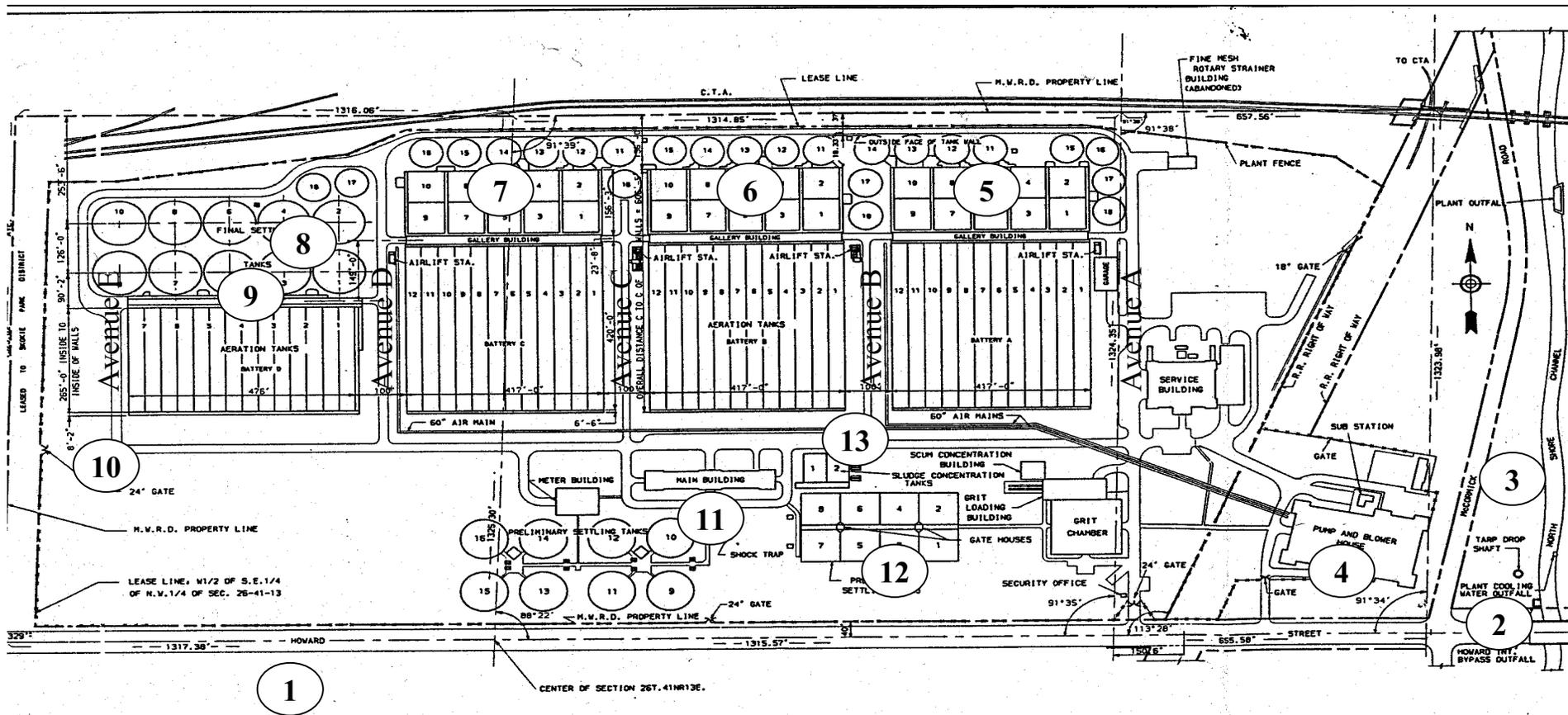


FIGURE AI-4: NORTH SIDE WATER RECLAMATION PLANT
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)



METROPOLITAN WATER RECLAMATION DISTRICT
OF GREATER CHICAGO
LOCATION PLAN
NORTH SIDE WRP



FIGURE AI-6: HARLEM AVENUE SOLIDS MANAGEMENT AREA, VULCAN, AND MARATHON SOLIDS DRYING SITES AND LAWDALE SOLIDS MANAGEMENT AREA SOLIDS PROCESSING SITE (NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)

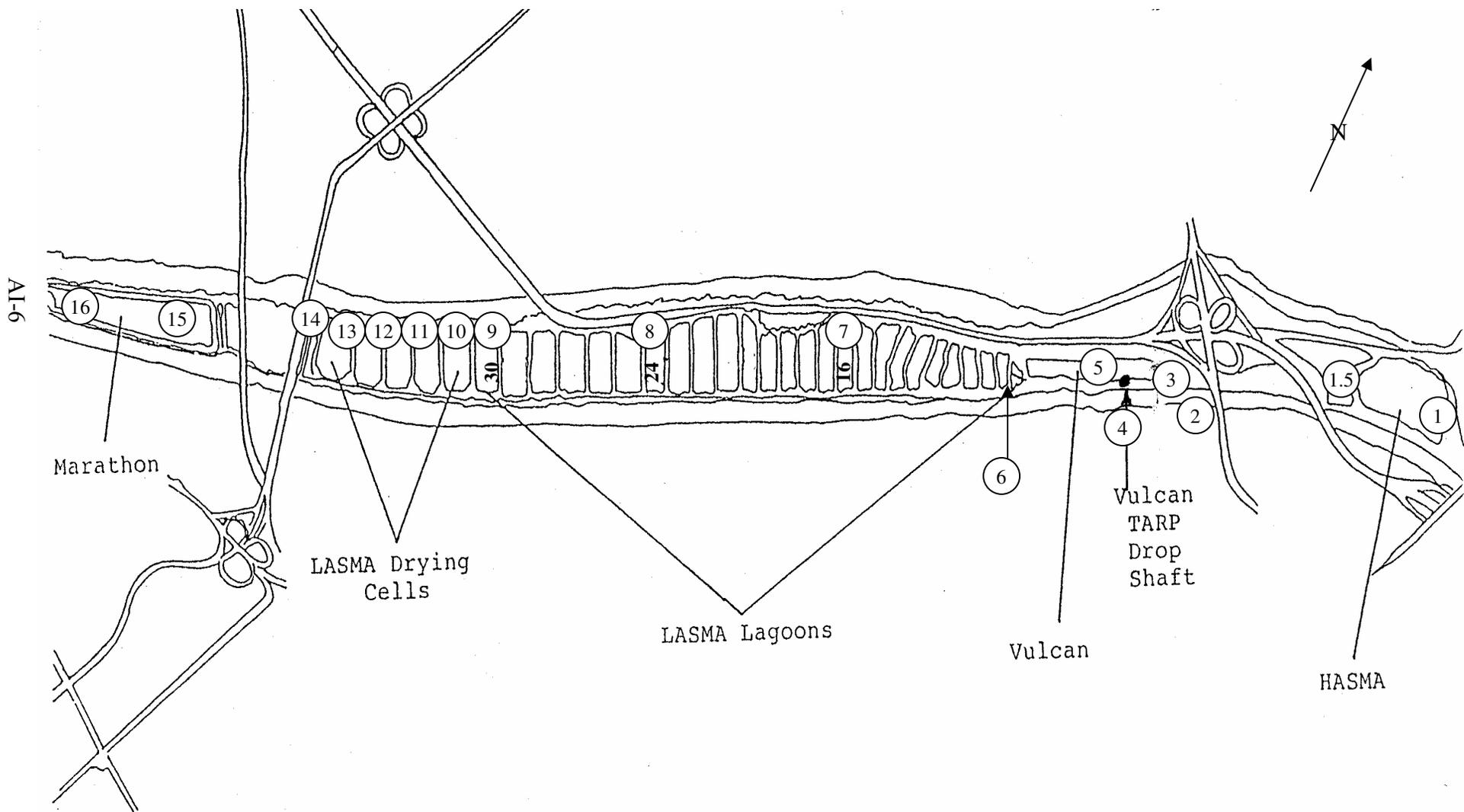


FIGURE AI-7: RIDGELAND AVENUE SOLIDS MANAGEMENT AREA SOLIDS DRYING AREA
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)

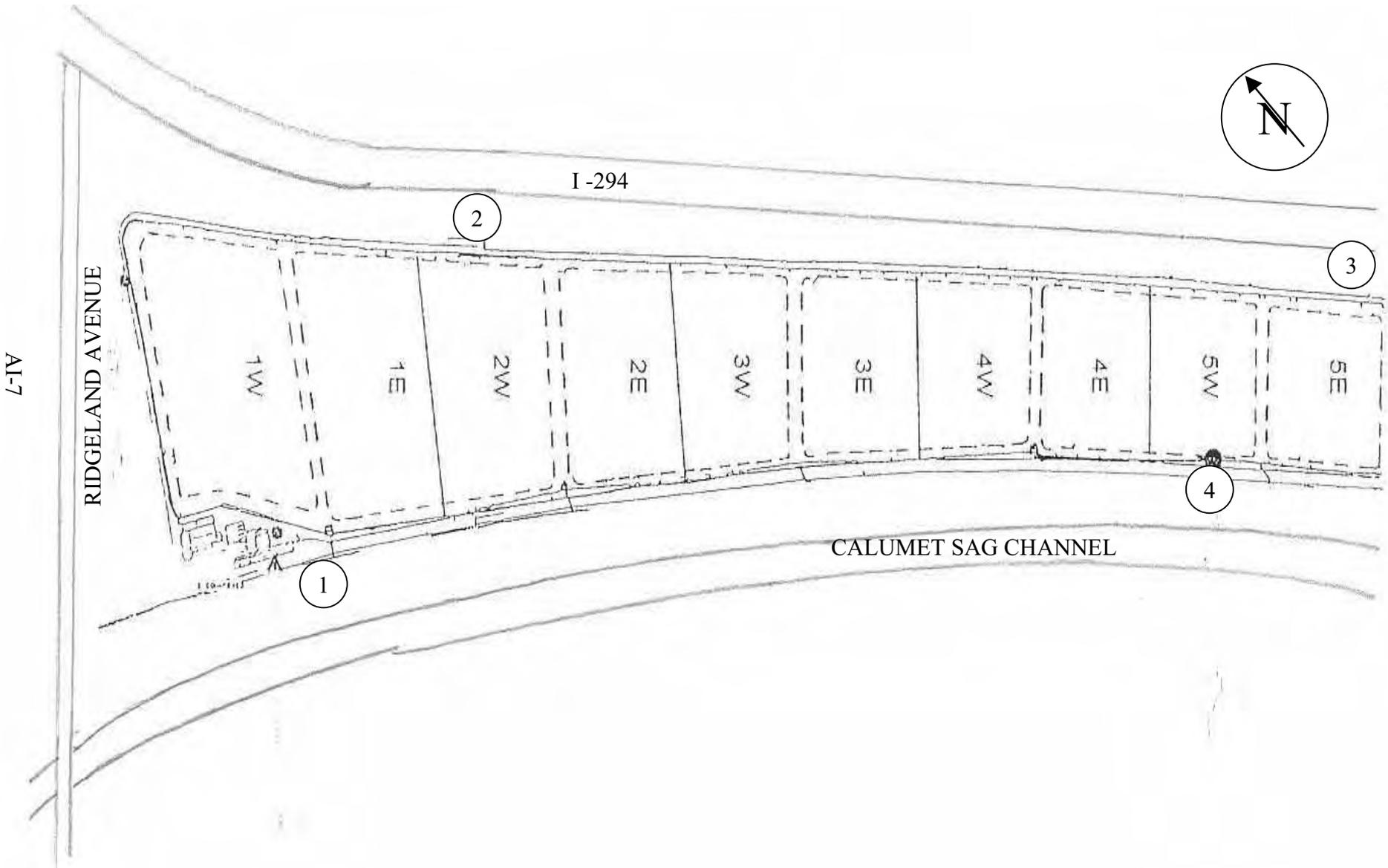


FIGURE AI-8: STONY ISLAND SOLIDS DRYING AREA
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)

