

*Protecting Our Water Environment*



*Metropolitan Water Reclamation District of Greater Chicago*

***MONITORING AND RESEARCH  
DEPARTMENT***

*REPORT NO. 18-10*

*ODOR MONITORING PROGRAM AT THE METROPOLITAN WATER  
RECLAMATION DISTRICT OF GREATER CHICAGO'S SOLIDS DRYING  
AND SOLIDS PROCESSING FACILITIES DURING 2017*

*June 2018*

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ODOR MONITORING PROGRAM AT THE METROPOLITAN WATER RECLAMATION  
DISTRICT OF GREATER CHICAGO'S SOLIDS DRYING AND SOLIDS PROCESSING  
FACILITIES DURING 2017

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## LIST OF ACRONYMS

CS	construction site
District	Metropolitan Water Reclamation District of Greater Chicago
H <sub>2</sub> S	hydrogen sulfide
HASMA	Harlem Avenue Solids Management Area
LASMA	Lawndale Avenue Solids Management Area
M&O	Maintenance and Operations
M&R	Monitoring and Research
ppbv	parts per billion by volume
RASMA	Ridgeland Avenue Solids Management Area
SDA	solids drying area
SDS	solids drying site
SPS	solids processing site
WRP	water reclamation plant

## **ACKNOWLEDGMENTS**

The authors wish to acknowledge the assistance of the Maintenance and Operations Department personnel in carrying out odor monitoring activities at various facilities.

The efforts of the Monitoring and Research Department laboratory technicians, Messrs. Robert Bodnar, Marc Byrnes, Harold Robinson, Edgar Rojas Herbas, Thota Reddy, and Ms. Rachel Ryan in the Wastewater Treatment Process Research Section, who carried out the odor monitoring surveys and maintained the database are greatly appreciated.

Thanks are also due to Ms. Laura Franklin, Administrative Specialist, for her diligence in proofreading and formatting this report.

## **DISCLAIMER**

Mention of proprietary equipment 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) has maintained a program of monitoring odors at one solids drying site (SDS), one solids processing site (SPS), and five solids drying areas (SDAs) since 1990. The Ridgeland Avenue Solids Management Area (RASMA) and Stony Island SDA were removed from the odor monitoring program as they no longer are used by the District and the land is now leased by others. Both Monitoring and Research (M&R) Department and Maintenance and Operations (M&O) Department personnel made subjective observations regarding the type and intensity of any odor perceived during odor monitoring. The M&R Department staff recorded instantaneous hydrogen sulfide (H<sub>2</sub>S) measurements using a handheld monitor at each monitoring site. The number of locations at each facility varied from 9 to 17. The frequency of monitoring varied from one to two days per week at the SDS, SDAs, and SPS. Each odor observation was characterized as very strong, strong, easily noticeable, faint, very faint, or no odor.

During 2017, no very strong odors were observed; one strong odor was observed at the Calumet Water Reclamation Plant (WRP) SDS; twelve strong odors were observed at the Harlem Avenue Solids Management Area (HASMA), Marathon, and Vulcan SDAs, and the Lawndale Avenue Solids Management Area (LASMA) SPS. At all the sites that were monitored, the observations were characterized as faint to no odor from 88 to 99 percent of the time.

At each of the SDS, SDAs, and SPS, there are specific locations which had noticeable odors. A summary of locations which had occasional strong or very strong odors is presented in Table 1.

The H<sub>2</sub>S levels generally followed a pattern similar to the odor observations, with occasional high values. The average level of H<sub>2</sub>S ranged from <3.0 to 10.6 parts per billion by volume (ppbv) at the SDS, SDAs, and SPS.



TABLE 1: STRONG AND VERY STRONG ODOR OBSERVATIONS – 2017

Facility (Station Number)	Number of Strong Odor Observations	Number of Very Strong Odor Observations	Total Number of Observations
<b>Calumet WRP SDS</b>			
Drying Cell 1 SW (14)	<u>1</u>	<u>0</u>	808
	Total 1	0	
<b>HASMA, Marathon, and Vulcan SDAs, and LASMA SPS</b>			
LASMA Lagoon 24 (8)	2		928
LASMA Lagoon 30 (9)	1		
Cell 2E – 2W (11)	1		
Cell 3E – 3W (12)	2		
Cell 4E – 4W (13)	1		
Cell 5E – 5W (14)	1		
Marathon West (16)	<u>4</u>	<u>0</u>	
	Total 12	0	

Note: HASMA = Harlem Avenue Solids Management Area.  
 LASMA = Lawndale Avenue Solids Management Area.  
 SDA = Solids Drying Area.  
 SDS = Solids Drying Site.  
 SPS = Solids Processing Site.

## INTRODUCTION

The M&R Department, in conjunction with the M&O Department, has been conducting an odor monitoring program at various District solids drying and processing facilities for the past 27 years. The program was initiated by the M&R Department to monitor the solids processing and drying sites at LASMA, HASMA, Marathon, and Vulcan Construction Site (CS) in 1990, and was expanded to the Calumet WRP SDS in 1992, and to RASMA and Stony Island SDA in 2001 as part of the District's SDA operating permits. Odor monitoring for RASMA and Stony Island SDA was terminated as they are no longer used as biosolids drying sites and the land is leased by others.

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 locations 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 to 5, corresponding to no odor, very faint, faint, easily noticeable, strong, and very strong. In addition to the subjective evaluation of odors in terms of intensity and character, the ambient air is sampled and analyzed for H<sub>2</sub>S concentration using the Jerome Model 631-X and Model J605 H<sub>2</sub>S analyzers. The monitoring range of Model 631-X is 3 ppbv to 50 ppmv. The monitoring range of Model J605 is 3 ppbv to 10 ppmv.

The objective of this program is to collect and maintain a database of odor levels within and around each solids drying and processing facility as part of a mandate by the Illinois Environmental Protection Agency for odor management at the District's drying facilities. This data can also be used to study the trends in odor levels associated with solids drying and processing operations and to correlate odor levels with conditions related to solids drying and processing operations or changing conditions within the facility that in turn can be used for applying deodorizing agents or designing facilities for composting of biosolids.

A summary of the odor monitoring program for the solids drying and processing facilities 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, who conducts the monitoring, if H<sub>2</sub>S is measured by District personnel, and the number of odor complaints.

Maps showing the odor monitoring locations are presented in [Appendix AI](#).

The number of monitoring locations at each facility varies (9 to 17) depending upon the size of the facility and the history of odor episodes at those facilities. The solids drying and processing facilities are monitored one or two days per week.

In 2017, one odor complaint was received at the Calumet WRP SDS; two odor complaints were received at the HASMA, Marathon, and Vulcan SDAs, and LASMA SPS.

This report presents the odor monitoring data for the year 2017. The odor monitoring data has been reviewed and summarized in terms of frequency of occurrence, locations of possible odor sources, and H<sub>2</sub>S levels.

TABLE 2: ODOR MONITORING PROGRAM FOR 2017

Facility	Number of Locations Monitored	Year Began	Months of Year	Days per Week	Departments Participating	H <sub>2</sub> S Measured	Number of Odor Complaints	Number of Complaints Verified
Calumet WRP SDS	9	1992	12	1 2	M&R M&O	Yes No	2	2
HASMA, Marathon, Vulcan SDAs, and LASMA SPS	17	1990	12	1 to 2	M&R	Yes	1	1

Note: HASMA = Harlem Avenue Solids Management Area.  
 LASMA = Lawndale Avenue Solids Management Area.  
 SDA = Solids Drying Area.  
 SDS = Solids Drying Site.  
 SPS = Solids Processing Site.  
 M&R = Monitoring and Research Department.  
 M&O = Maintenance and Operations Department.

## **RESULTS OF ODOR MONITORING AT THE METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO'S SOLIDS DRYING AND SOLIDS PROCESSING FACILITIES IN 2017**

The results of the various odor monitoring programs at each of the monitored sites for 2017 are summarized in Table 3. The results have been divided into two major groups: significant odors, which include the very strong, strong, and easily noticeable odors, and insignificant odors, which are either no odors, very faint, or faint.

A general observation drawn from the table is that at the Calumet WRP SDS, where both M&R and M&O Department personnel conducted odor monitoring, M&O Department personnel observed a lower percentage of odors detected. This may be due to the fact that M&O Department personnel are exposed to the specific areas on a daily basis, which can result in olfactory desensitization, as compared to the M&R Department personnel, who visit the sites occasionally. Thus, M&O Department personnel may not differentiate especially well between significant and insignificant odors.

### **Calumet Water Reclamation Plant Solids Drying Site**

The Calumet WRP SDS consists of the East SDA, located east of the Calumet WRP, and the West SDA, located west of the Calumet WRP. The occurrence of strong odors at the drying areas, which also includes the non-operational centrifuge building located at the East SDA, was infrequent. The majority of the observations were described as faint to no odor. No very strong odors were detected in 2017. One strong odor was observed at the SDS in April. Strong odors were observed under one percent of the time on a monthly basis. Easily noticeable odors occurred between 0 and 12 percent of the time on a monthly basis throughout the various locations. Figure 1 presents the monthly frequency of occurrence of the easily noticeable, strong, and very strong odor observations. The easily noticeable odors were highest during September 2017.

The average H<sub>2</sub>S levels were between <3.0 and 7.4 ppbv, as shown in Table 4. The highest value observed (270 ppbv) was at the East Drying Cell 1 SW on August 25, 2017.

One odor complaint was received and verified with regard to the Calumet WRP SDS during 2017.

TABLE 3: ODOR MONITORING RESULTS FOR 2017

Facility	Departments Participating	Total Number of Observations	Number of Observations Significant Odors Detected			Number Insignificant Odors <sup>1</sup>	Percent Insignificant Odors
			Very Strong	Strong	Easily Noticeable		
Calumet WRP SDS	M&R	511	0	1	39	471	92%
	M&O	297	0	0	3	294	99%
HASMA, Marathon, Vulcan SDAs, and LASMA SPS	M&R	928	0	12	98	818	88%

Note: HASMA = Harlem Avenue Solids Management Area.

LASMA = Lawndale Avenue Solids Management Area.

SDA = Solids Drying Area.

SDS = Solids Drying Site.

SPS = Solids Processing Site.

M&R = Monitoring and Research Department.

M&O = Maintenance and Operations Department.

<sup>1</sup>Insignificant odors are all observations of faint, very faint, or no odor.

FIGURE 1: PERCENT MONTHLY ODOR OBSERVANCES AT THE CALUMET WATER RECLAMATION PLANT SOLIDS DRYING SITE – 2017

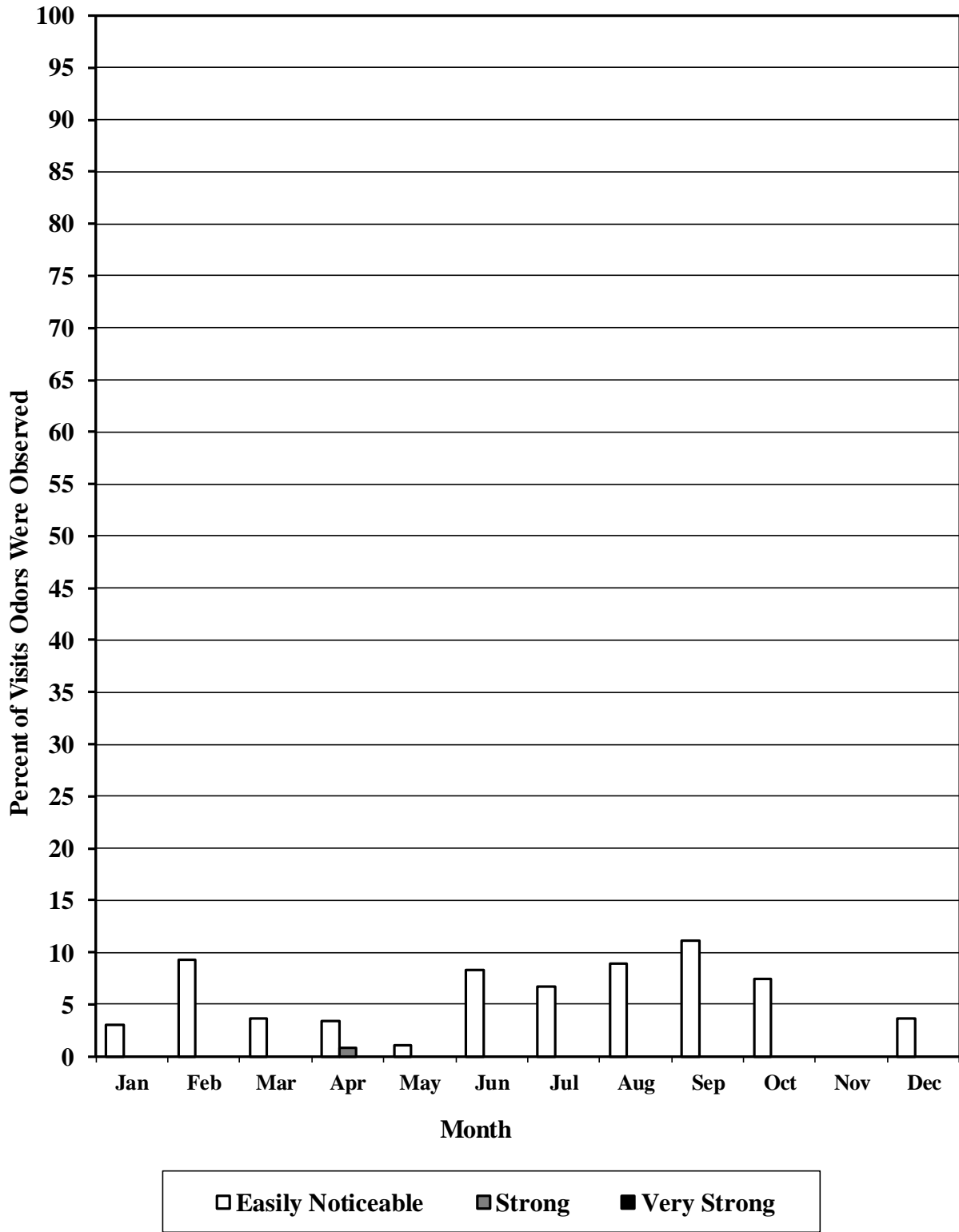


TABLE 4: HYDROGEN SULFIDE READINGS AT THE CALUMET WATER RECLAMATION PLANT SOLIDS DRYING SITE – 2017

Location <sup>2</sup>	Hydrogen Sulfide, ppbv <sup>1</sup>		
	Mean <sup>3</sup>	Percent of Readings Below the Detection Limit	Maximum
East Drying Cell #1 SW (14)	7.4	47%	270
Hopper Building (15)	<3.0	61%	20
East Drying Cell #8 NW (16)	<3.0	61%	14
East Drying Cell #8 NE (17)	<3.0	59%	13
Truck Scale/Centrifuge (18)	4.5	45%	154
East Drying Cell #1 SE (19)	4.3	56%	148
West Drying Cell #1 @ Gate (20)	5.7	52%	161
West Drying Cell #4 (21)	3.5	54%	29
Bituminous Road @ Gate (22)	<3.0	57%	10

<sup>1</sup>ppbv = Parts per billion by volume.

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

<sup>3</sup>Mean values are calculated using the average of all recordings by the Jerome hydrogen sulfide analyzer. The detection limit for the Jeromes is 3 ppbv, but could display 0~3 ppbv on the meter. If the measurement was below the detection limit, the value displayed was used to calculate the mean whether it was 0 or some other number in between 0 and 3.

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

The HASMA facility consists of HASMA, LASMA, the Vulcan SDA, and Marathon, located near the intersection of South Harlem Avenue and the Chicago Sanitary and Ship Canal, on the north bank of the Canal. The HASMA, Vulcan SDA, and Marathon SDAs and the LASMA SPS had 88 percent of the total observations characterized as faint to no odor. There was no very strong odor observation. There were 12 strong odor observations out of 928 total observations. The strong odor observations were spread among the various locations (LASMA Lagoon 24, LASMA Lagoon 30, Cell 2E – 2W, Cell 3E – 3W, Cell 4E – 4W, Cell 5E – 5W, and Marathon West) depending upon the activity at the time. Two extremely high measurements were removed from the data calculations because the readings could not be verified as there were no odor complaints in the vicinity, the technician did not observe a strong hydrogen sulfide smell when performing the analysis, nor did any operations personnel notice anything out of the ordinary. The high reading may have been due to a malfunction of the instrument used.

The percentage of observations at which easily noticeable, strong, and very strong odors were observed was plotted by month, and is presented in [Figure 2](#). The frequency of observed odors is generally highest during the spring through the summer months (February through July) when solids processing and drying are being carried out. The easily noticeable odor observations ranged from 0 to 19.1 percent during this time period.

The average H<sub>2</sub>S levels at the various locations around these SDAs and SPS ranged from <3.0 to 10.6 ppbv, as shown in [Table 5](#). The highest value observed (160 ppbv) was at Marathon on May 24, 2017.

One odor complaint was received and verified in 2017 with regard to these solids drying and processing facilities.



FIGURE 2: PERCENT MONTHLY ODOR OBSERVANCES AT THE HARLEM AVENUE SOLIDS MANAGEMENT AREA, VULCAN SOLIDS DRYING AREAS, MARATHON SOLIDS DRYING AREAS, AND LAWNSDALE AVENUE SOLIDS MANAGEMENT AREA SOLIDS PROCESSING SITE – 2017

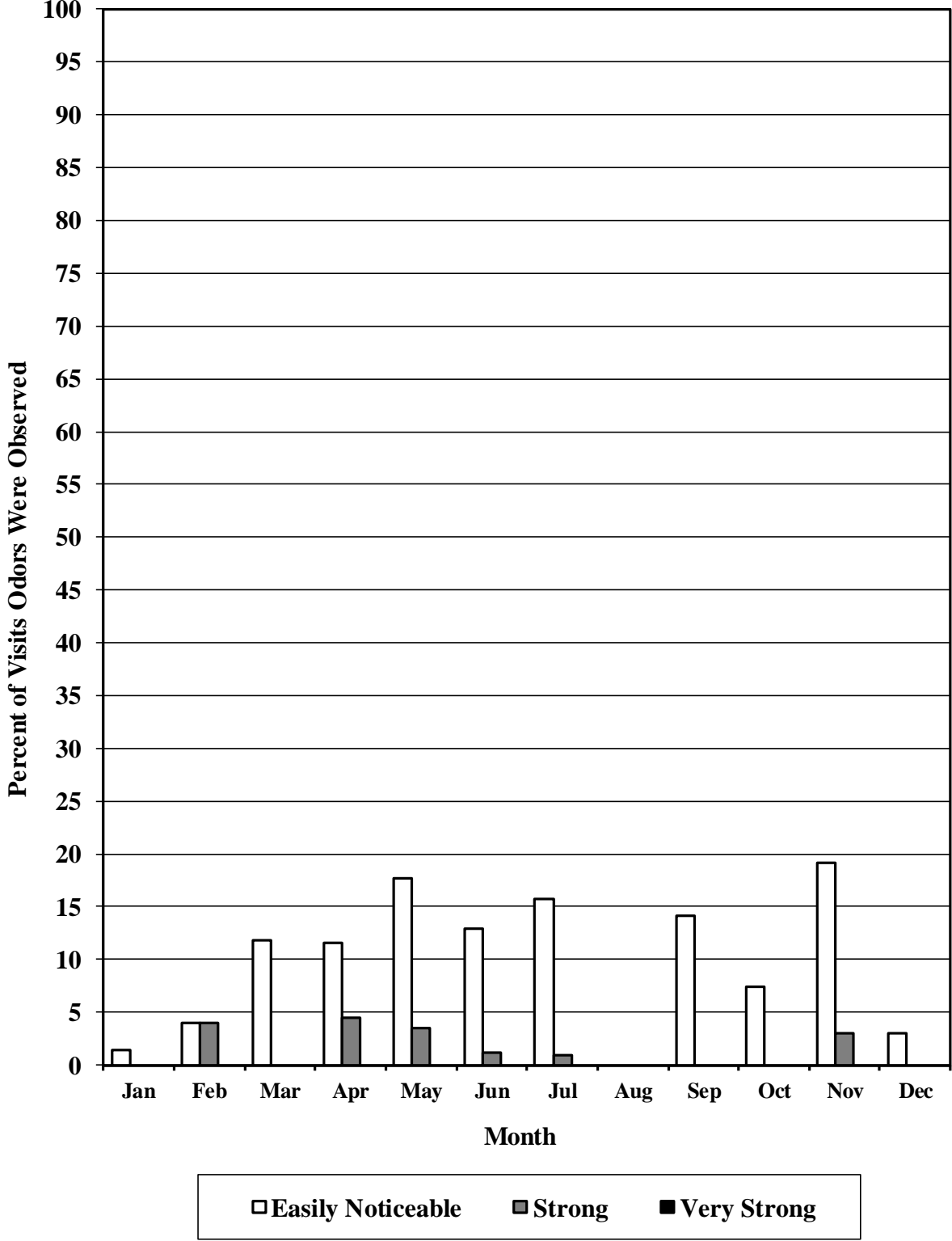


TABLE 5: HYDROGEN SULFIDE READINGS AT THE HARLEM AVENUE SOLIDS MANAGEMENT AREA, VULCAN SOLIDS DRYING AREAS, MARATHON SOLIDS DRYING AREAS, AND LAWNSDALE AVENUE SOLIDS MANAGEMENT AREA SOLIDS PROCESSING SITE – 2017

Location	Hydrogen Sulfide, ppbv <sup>1</sup>		
	Mean <sup>2</sup>	Percent of Readings Below the Detection Limit	Maximum
HASMA (1) <sup>3</sup>	<3.0	73%	020
HASMA Center (1.5) <sup>4</sup>	<3.0	67%	17
Vulcan CS South (2)	<3.0	60%	8
Vulcan CS North (3)	<3.0	53%	11
Vulcan CS TARP Drop Shaft (4)	<3.0	49%	13
Vulcan CS TARP Well (5)	<3.0	58%	7
LASMA Lagoon 1 (6)	3.0	60%	34
LASMA Lagoon 16 (7)	<3.0	55%	12
LASMA Lagoon 24 (8) <sup>4</sup>	8.1	42%	60
LASMA Lagoon 30 (9)	4.4	55%	46
LASMA Cell 1E-1W (10)	4.6	54%	65
LASMA Cell 2E-2W (11)	4.0	60%	51
LASMA Cell 3E-3W (12)	3.9	58%	33
LASMA Cell 4E-4W (13)	7.7	62%	120
LASMA Cell 5E-5W (14)	3.3	52%	18

TABLE 5 (Continued): HYDROGEN SULFIDE READINGS AT THE HARLEM AVENUE SOLIDS MANAGEMENT AREA, VULCAN CONSTRUCTION SITE, MARATHON SOLIDS DRYING AREAS, AND LAWNSDALE AVENUE SOLIDS MANAGEMENT AREA SOLIDS PROCESSING SITE – 2017

Location	Hydrogen Sulfide, ppbv <sup>1</sup>		
	Mean <sup>2</sup>	Percent of Readings Below the Detection Limit	Maximum
Marathon (15)	<10.6	56%	160
Marathon West (16)	9.8	58%	150

Note: HASMA = Harlem Avenue Solids Management Area.  
 LASMA = Lawndale Avenue Solids Management Area.  
 CS = Construction Site.  
 TARP = Tunnel and Reservoir Plan.

<sup>1</sup>ppbv = Parts per billion by volume.

<sup>2</sup>Mean values are calculated using the average of all recordings by the Jerome hydrogen sulfide analyzer. The detection limit for the Jeromes is 3 ppbv, but could be displayed as 0 ppbv on the meter. If the measurement was below the detection limit, the value displayed was used to calculate the mean whether it was 0 or some other number in between 0 and 3.

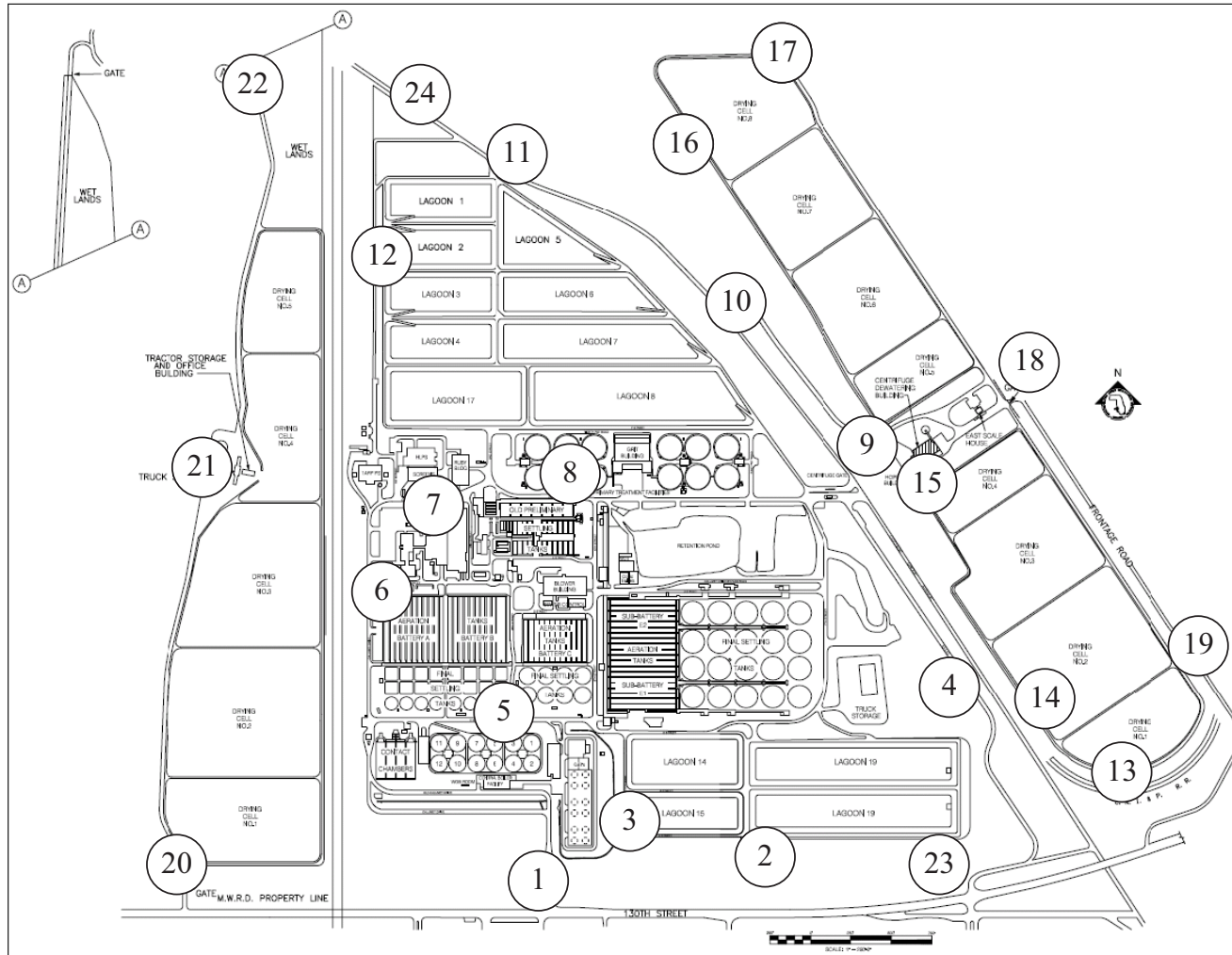
<sup>3</sup>Numbers in parentheses correspond to Station numbers in [Figure AI-2](#).

<sup>4</sup>The handwritten odor sheet showed the H<sub>2</sub>S level was 7,100 ppbv at HASMA Center (1.5) and 7,200 ppbv at LASMA Lagoon 24 (8). However, the odor strength at these locations had an odor intensity of “Easily Noticeable” with an odor type of sludge. An investigation was conducted, and it was found that there were no reported odor complaints in the vicinity of those readings. A hydrogen sulfide reading that extreme would have a much higher odor intensity. These readings may be caused by a malfunction of the meter and hence excluded from the calculations.

APPENDIX AI

LOCATION OF ODOR MONITORING STATIONS AT THE METROPOLITAN WATER  
RECLAMATION DISTRICT OF GREATER CHICAGO SOLIDS DRYING AREAS AND  
SOLIDS PROCESSING SITES

FIGURE AI-1: CALUMET WATER RECLAMATION PLANT AND CALUMET WATER RECLAMATION PLANT SOLIDS DRYING AREAS\*

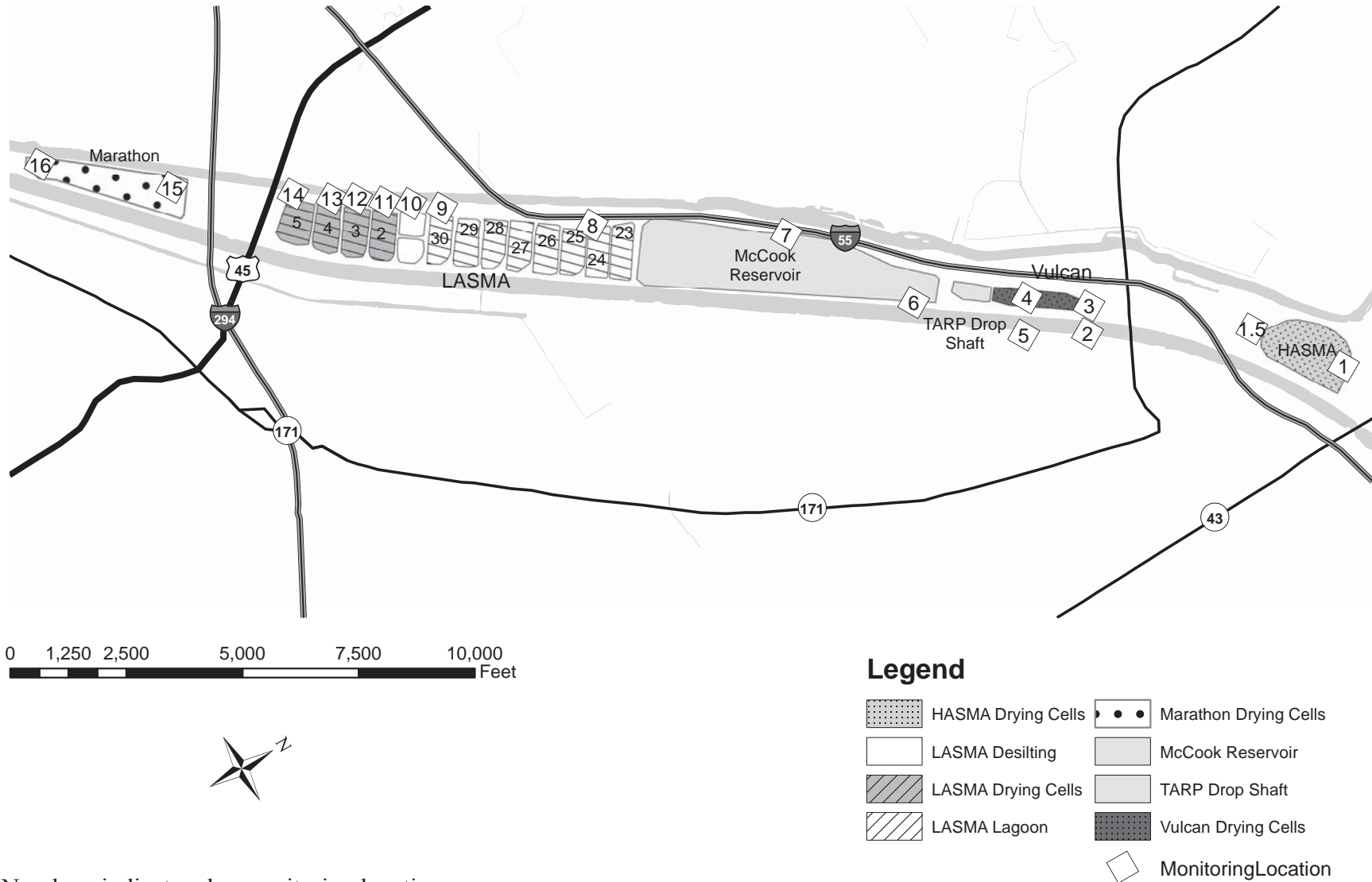


I-IV

\*Numbered circles (14–22) indicate odor monitoring locations for Solids Drying Areas.

FIGURE AI-2: HARLEM AVENUE SOLIDS MANAGEMENT AREA, VULCAN SOLIDS DRYING AREAS, AND MARATHON SOLIDS DRYING SITES AND LAWNSDALE AVENUE SOLIDS MANAGEMENT AREA SOLIDS PROCESSING SITE\*

AI-2



\*Numbers indicate odor monitoring locations.