

Texas Commission on Environmental Quality
Monitoring Division

Permian Basin Survey
Region 7 Midland
December 9-13, 2019

Strategic Sampling Work Group

Document Number
PB1912

Overview

The Strategic Sampling Work Group (SSWG) traveled to the Permian Basin area December 9 – 13, 2019, to conduct a survey trip for hydrogen sulfide (H₂S) and sulfur dioxide (SO₂) at selected locations within Region 7 (R7) Midland. Surveys were predominantly conducted around areas/facilities of concern identified by R7 or Emissions Event Database queries.

Project Summary

Monitoring was focused on areas where industry intersected with nearby publicly accessible areas, or where elevated concentrations of target compounds were detected. Monitoring was also conducted around areas highlighted by R7 and/or areas identified for potential continuous air monitoring sites.

Results were collected by conducting handheld instrument surveys with a Jerome J605 (Jerome) for total reduced sulfur (TRS), and by continuous monitoring of H₂S and SO₂ using a Picarro G2204 and Teledyne 101E analyzer, respectively. Mapped surveys collected data in 1-minute (min) averages, and when concentrations of target compounds were detected above 80 parts per billion by volume (ppbv) or strong odors were detected, 5- and 30-min averages were collected via stationary monitoring (Attachment A).

Global Positioning System (GPS) coordinates were collected in tandem with analytical data. Meteorological (MET) data were collected using a Climatronics All-In-One (AIO) compact weather station. Local airport weather data were used to generate wind roses that are included on the survey maps to indicate wind speed and direction during mobile monitoring.

Collected H₂S and SO₂ data were compared to the following limits:

- The SO₂ regulatory limit is 400 ppbv averaged over a 30-min period (*30 Texas Administrative Code, Part 1, Chapter 112, Subchapter A, Rule §112.3*) and 75 ppbv averaged over a 1-hour period (*Title 40 Code of Federal Regulations §50.17*).
- The H₂S regulatory limit is 80 ppbv averaged over a 30-min period (*30 Texas Administrative Code, Part 1, Chapter 112, Subchapter B, Rule §112.31*).

During this monitoring trip, a maximum instantaneous SO₂ concentration of 73 ppbv was measured east of Seminole Gas Plant on county road (CR) 205. Due to no instantaneous or averaged SO₂ concentrations exceeding regulatory limits, no SO₂ data are included in this report.

Survey maps showing H₂S concentrations higher than the H₂S regulatory limit are included as attachments. All concentrations within this report were detected downwind and are not net values.

Field Activities, Observations, and Results

Mobile monitoring within R7 occurred over a five-day period as outlined in the table below. The colors for each survey area refer to colors on the map shown in Attachment B.

Table 1: Daily Monitoring Activity and Facilities

Facilities/Areas of Interest	Survey Area	Sample Date
Neighborhoods in SW Midland SE Midland (site of 11/2019 Midland Explosion and Fire) Gardendale area	Midland (Blue)	December 9, 2019

Facilities/Areas of Interest	Survey Area	Sample Date
James Lake Gas Plant Goldsmith Gas Plant Neighborhood in Goldsmith, TX SW-7000 (Embar B-1 Battery, University Andrews 1E & 11T, 7T) Clyde Cowden Battery Gardendale Area Neighborhoods in NE and NW Odessa	Odessa and Goldsmith (Green)	December 10, 2019
Monahans North Compressor Station Neighborhoods/schools in Monahans and Kermit Wildcat Gas Plant Emmaline Tank Farm sites Cloverdale Site Tank battery west of Wildcat Gas Plant	Kermit, Wink, Pyote, and Monahans (Purple)	December 11, 2019
Waha Gas Plant Oahu Gas Plant Sand Hills Gas Plant McElroy Section 199 Emergency Flare Goldsmith, TX Goldsmith neighborhood	Crane, Coyanosa, and Sand Hill Gas Plant (Yellow) & Goldsmith (Green)	December 12, 2019
Seminole Gas Processing Plant Locations within Seminole, TX (Butane site, Disposal Site, Tank Battery near CR-105) Tank Battery NE of Seminole Gas Processing Plant	Seminole (Pink)	December 13, 2019

CR - county road
NE - northeast
NW - northwest
SE - southeast
SW - southwest

Day 1, December 9, 2019

Winds were predominantly west (W)/northwest (NW) until noon when they became light and variable. Three survey routes were mapped (Attachment C). Mapped surveys were conducted in the southwest Midland area (Attachment C, Figure 1a, Figure 1c, and Figure 1d) and in the southeast Midland area along the fence line of the tank fire site where an explosion event occurred on November 21, 2019 (Attachment C, Figure 1b and Figure 1d). No H₂S concentrations over 80 ppbv were detected, and therefore no stationary monitoring was conducted. Handheld instrument surveys were conducted in the Midland and Gardendale areas. No odors or TRS concentrations above background were detected. By noon, the rain was too heavy for further sampling.

During the afternoon, handheld instrument surveys were conducted to scout the locations for the next day's sampling. Rotten egg odors were consistently detected while scouting sites including locations seven miles east of Goldsmith on highway 158, near the Clyde Cowden Battery, near the James Lake Gas Plant, near the University Andrews, and near the Embar B-1 Battery. A maximum TRS concentration of 144 ppbv was measured seven miles east of Goldsmith on highway 158 downwind of a field of pump jacks.

Day 2, December 10, 2019

Winds were from the northeast (NE) in the morning, turned light and variable, and then changed to southerly by approximately 3:00 pm. Six survey routes were mapped (Attachment D). Surveys during

morning northeasterly winds on highway 866, west of Clyde Cowden tank batteries and James Lake Gas Plant, detected a maximum 1-min average concentration of 324 ppbv H₂S (Attachment E; Attachment D, Figure 2c and Figure 2d). Surveys were then conducted along the perimeter of Goldsmith Gas Plant (Attachment D, Figure 2a, Figure 2c, and Figure 2d), but no H₂S concentrations above 80 ppbv were detected.

Handheld instrument surveys were conducted along a small, dirt road spur off road SW-7000 near Embar B-1 Battery and University Andrews tank batteries. Staff collected TRS readings up to 1,300 ppbv; rotten egg odors were also present, consistent with the odors observed the previous day. Due to poor road conditions, the monitoring van could not access the dirt road used during handheld instrument surveys. As such, mapped surveys were conducted along highway 181 and SW-7000 (Attachment D, Figure 2b and Figure 2d); during these surveys, H₂S concentrations above 80 ppbv were not detected. Stationary monitoring along highway 181 and SW-7000 was not conducted due to no nearby residences or areas accessed by the public and the mapped surveys did not result in H₂S concentrations above 80 ppbv. As mapped surveys were conducted along highway 181 and SW-7000, handheld instrument surveys were conducted in the Gardendale area and NE and NW Odessa neighborhoods. No odors or TRS readings above background were detected.

With afternoon southerly winds, surveys were conducted along the northern fence line of the Goldsmith Gas Plant; rotten egg odors were present, consistent with the odors observed the previous day, and maximum 1-min average concentrations of 1,116 ppbv and 197 ppbv H₂S were detected (Attachment F; Attachment D, Figure 2a, Figure 2c, and Figure 2d). Handheld instrument and mapped surveys continued around the perimeter of Goldsmith Gas Plant for the remainder of the afternoon, but no H₂S concentrations above 80 ppbv were detected. Stationary monitoring was not conducted on Day 2 due to unfavorable wind conditions and shifting plumes when H₂S concentrations were above the regulatory limit.

Day 3, December 11, 2019

Winds were variable between east and southeast throughout the day. Four survey maps were created (Attachment G). A mapped survey was conducted west of the Cloverdale site and Emmaline tank farm, along highway 115 north of Pyote (Attachment G, Figure 3c and Figure 3d). Stationary monitoring was conducted on highway 115 for approximately 40 minutes due to strong odors, but no concentrations above background were detected; therefore, this stationary data was not included in this report. No further stationary monitoring was conducted at this site.

Handheld instrument surveys conducted along highway 302 north of Wildcat Gas Plant resulted in a maximum TRS concentration of 60 ppbv. A mapped survey on highway 302, along the same route, resulted in a 1-min average concentration of 138 ppbv H₂S (Attachment H; Attachment G, Figure 3a and Figure 3d). Stationary monitoring was then conducted on highway 302 NW of Wildcat Gas Plant for approximately 30 minutes; a maximum 5-min average of 150 ppbv H₂S, and a maximum 30-min average of 53 ppbv H₂S was detected (Attachment I). The stationary concentrations detected on highway 302 were monitored northwest of the tank battery west of Wildcat Gas Plant during southeasterly winds and not directly downwind of Wildcat Gas Plant (Attachment I; Attachment G, Figure 3a).

Handheld instrument surveys were conducted north of Monahans Compressor Station, along CR-404, and a maximum instantaneous concentration of 130 ppbv TRS was recorded. Mapping north of Monahans Compressor site, along CR-404, yielded no 1-min average H₂S concentration over 80 ppbv. (Attachment G, Figure 3b and Figure 3d). Due to the lack of nearby residences or areas accessed by the public, no stationary monitoring was conducted.

Handheld instrument surveys conducted within residential areas of Monahans and Kermit resulted in no odors or readings above background. Although identified as a facility of interest for this project, no handheld or mapped surveys were conducted within the vicinity of Red Bluff Gas Processing Plant due to lack of accessibility with southeasterly winds.

Day 4, December 12, 2019

Winds were predominantly W/NW for the day. Four survey maps were created (Attachment J). Handheld instrument surveys were conducted around the Waha Gas Plant, Oahu Gas Plant, Sand Hills Gas Plant, and the McElroy Section 199 Emergency Flare. No odors or TRS readings above background were detected during these handheld surveys, although, wind direction was not optimal for surveying Sand Hill or Oahu Gas Plants. By the afternoon, winds were conducive for monitoring at Goldsmith Gas Plant. Mapped surveys around Goldsmith Gas Plant and within the town of Goldsmith resulted in little to no odor detected and no H₂S concentrations monitored above background levels (Attachment J, Figure 4a, Figure 4c, and Figure 4d).

Mapped surveys were conducted along highway 866 south of Goldsmith to investigate strong odors (Attachment J, Figure 4b and Figure 4d). Stationary monitoring was conducted at this location for approximately 30 minutes and a maximum 5-min average H₂S concentration of 200 ppbv and 30-min average H₂S concentration of 49 ppbv were detected (Attachment K, Location 1). Westerly winds were expected overnight, so both vans were parked in the Goldsmith area to conduct stationary overnight monitoring. Overnight monitoring was conducted for approximately 12 hours (Attachment K, Location 2), and a maximum 5-min average H₂S concentration of 220 ppbv and 30-min average H₂S concentration of 130 ppbv were detected.

Day 5, December 13, 2019

Winds were predominantly NW/WNW for the day. Two survey maps were created (Attachment L). Handheld instrument surveys were conducted east of Seminole Gas Plant on CR-205; no TRS above background was detected. A mapped survey conducted along CR-205 for approximately 15 minutes resulted in no H₂S concentrations above background (Attachment L, Figure 5c and Figure 5d).

Strong rotten egg odors were observed NE of Seminole Gas Plant along CR-208, and TRS readings of 836 ppbv and 1,100 ppbv were detected downwind (NW) of a tank battery along CR-208. A subsequent mapped survey included a 1-min average H₂S concentration of 151 ppbv (Attachment M; Attachment L, Figure 5a, Figure 5b, and Figure 5d). Stationary monitoring at this same location was conducted for approximately 30 minutes and detected a maximum 5-min average H₂S concentration of 270 ppbv, and a 30-min average H₂S concentration of 150 ppbv (Attachment N).

Some historically odorous sites within Seminole (see Table 1) were investigated; no odors or TRS readings above background level were detected. Handheld surveys east of Seminole along CR-207 near a tank battery detected a TRS readings of 112 ppbv. Due to mechanical issues with the survey van, no surveys were possible at West Seminole San Andres Unit CO₂ Facility and Demsey Booster Station and all sampling concluded by 1:00 pm.

Quality Control (QC) Summary

QC checks were performed every 24 hours for the Picarro and Teledyne and included an equipment blank, a calibration verification, and a calibration verification duplicate to verify the calibrations. The only exception being on the last day, December 13, 2019. Due to logistics and vehicle malfunction, the last QC check was performed on Monday, December 16, 2019. This QC check passed and this nonconformance has been documented in an exception report. All QC checks met acceptance criteria.

A QC check was performed on the AIO compact weather station before and after the survey project per standard operating procedures. The QC checks met acceptance criteria for wind directions, wind speed, and temperature. The Jerome was regenerated before and after each day of sampling per standard operating procedures.

The H₂S data have been flagged with qualifiers for concentrations below the limit of detection (LOD) (J qualifier) and concentrations greater than or equal to the LOD but less than the limit of quantitation (L qualifier).

Contact Information

Peyton Pearce, Project Coordinator
Work Lead
512-239-5446
Peyton.Pearce@tceq.texas.gov

Larry Ogle
Team Lead
512-239-2312
Larry.Ogle@tceq.texas.gov

Julie Eldredge
Section Manager
512-239-1714
Julie.Eldredge@tceq.texas.gov

Hydrogen Sulfide (H₂S*) Data
PB1912 Survey Stationary Monitoring
December 11 - 13, 2019

These data were collected using a Picarro G2204 Cavity Ringdown Spectrometer H₂S Analyzer.

Date	Time	H ₂ S 5-Minute Average (ppbv)	Data Flag	H ₂ S 30-Minute Average (ppbv)	Data Flag
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Day 3, December 11, 2019

Highway 302 5.5 miles west of Highway 202

12/11/2019	11:50	150			
12/11/2019	11:55	15	L		
12/11/2019	12:00	14	L		
12/11/2019	12:05	7.5	L		
12/11/2019	12:10	77			
12/11/2019	12:15	57		53	
12/11/2019	12:20	5.3	L	29	

Day 4, December 12, 2019

Highway 866 2.8 miles south of Highway 158

12/12/2019	17:50	200			
12/12/2019	17:55	9.3	L		
12/12/2019	18:00	4.0	L		
12/12/2019	18:05	1.7	J		
12/12/2019	18:10	16	L		
12/12/2019	18:15	62		49	

Day 4-5, December 12-13, 2019

Intersection of Odessa Street and Avenue A

12/12/2019	18:40	4.8	L		
12/12/2019	18:45	3.1	L		
12/12/2019	18:50	2.6	L		
12/12/2019	18:55	2.7	L		
12/12/2019	19:00	2.2	L		
12/12/2019	19:05	3.1	L	3.1	L
12/12/2019	19:10	3.7	L	2.9	L
12/12/2019	19:15	4.7	L	3.2	L
12/12/2019	19:20	5.5	L	3.7	L
12/12/2019	19:25	3.8	L	3.8	L
12/12/2019	19:30	2.7	L	3.9	L
12/12/2019	19:35	2.1	L	3.8	L
12/12/2019	19:40	1.6	J	3.4	L
12/12/2019	19:45	1.7	J	2.9	L
12/12/2019	19:50	2.9	L	2.5	L
12/12/2019	19:55	3.2	L	2.4	L
12/12/2019	20:00	2.5	L	2.3	L
12/12/2019	20:05	2.4	L	2.4	L
12/12/2019	20:10	2.8	L	2.6	L
12/12/2019	20:15	3.3	L	2.9	L
12/12/2019	20:20	3.3	L	2.9	L
12/12/2019	20:25	3.3	L	2.9	L
12/12/2019	20:30	3.6	L	3.1	L
12/12/2019	20:35	3.3	L	3.3	L
12/12/2019	20:40	3.8	L	3.4	L

Attachment A

Date	Time	H ₂ S 5-Minute Average (ppbv)	Data Flag	H ₂ S 30-Minute Average (ppbv)	Data Flag
Day 4-5, December 12-13, 2019					
Intersection of Odessa Street and Avenue A					
12/12/2019	20:45	5.2	L	3.8	L
12/12/2019	20:50	5.8	L	4.2	L
12/12/2019	20:55	6.7	L	4.7	L
12/12/2019	21:00	6.7	L	5.3	L
12/12/2019	21:05	5.9	L	5.7	L
12/12/2019	21:10	5.8	L	6.0	L
12/12/2019	21:15	4.9	L	6.0	L
12/12/2019	21:20	6.3	L	6.1	L
12/12/2019	21:25	5.1	L	5.8	L
12/12/2019	21:30	6.1	L	5.7	L
12/12/2019	21:35	5.4	L	5.6	L
12/12/2019	21:40	3.8	L	5.3	L
12/12/2019	21:45	3.3	L	5.0	L
12/12/2019	21:50	2.9	L	4.4	L
12/12/2019	21:55	3.5	L	4.2	L
12/12/2019	22:00	3.7	L	3.8	L
12/12/2019	22:05	4.1	L	3.6	L
12/12/2019	22:10	3.6	L	3.5	L
12/12/2019	22:15	3.5	L	3.6	L
12/12/2019	22:20	3.3	L	3.6	L
12/12/2019	22:25	3.5	L	3.6	L
12/12/2019	22:30	3.7	L	3.6	L
12/12/2019	22:35	3.7	L	3.6	L
12/12/2019	22:40	3.2	L	3.5	L
12/12/2019	22:45	3.8	L	3.5	L
12/12/2019	22:50	3.9	L	3.6	L
12/12/2019	22:55	3.9	L	3.7	L
12/12/2019	23:00	3.9	L	3.7	L
12/12/2019	23:05	4.9	L	3.9	L
12/12/2019	23:10	4.9	L	4.2	L
12/12/2019	23:15	5.0	L	4.4	L
12/12/2019	23:20	5.6	L	4.7	L
12/12/2019	23:25	6.3	L	5.1	L
12/12/2019	23:30	5.3	L	5.3	L
12/12/2019	23:35	3.5	L	5.1	L
12/12/2019	23:40	3.5	L	4.9	L
12/12/2019	23:45	3.2	L	4.6	L
12/12/2019	23:50	2.6	L	4.1	L
12/12/2019	23:55	3.7	L	3.6	L
12/13/2019	0:00	2.7	L	3.2	L
12/13/2019	0:05	2.7	L	3.1	L
12/13/2019	0:10	4.2	L	3.2	L
12/13/2019	0:15	3.9	L	3.3	L
12/13/2019	0:20	3.9	L	3.5	L
12/13/2019	0:25	4.6	L	3.7	L
12/13/2019	0:30	13	L	5.4	L
12/13/2019	0:35	51		14	L
12/13/2019	0:40	57		22	
12/13/2019	0:45	15	L	24	
12/13/2019	0:50	2.3	L	24	
12/13/2019	0:55	2.9	L	24	
12/13/2019	1:00	2.4	L	22	
12/13/2019	1:05	64		24	

Attachment A

Date	Time	H ₂ S 5-Minute Average (ppbv)	Data Flag	H ₂ S 30-Minute Average (ppbv)	Data Flag
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Day 4-5, December 12-13, 2019

Intersection of Odessa Street and Avenue A

12/13/2019	1:10	97		31	
12/13/2019	1:15	63		39	
12/13/2019	1:20	65		49	
12/13/2019	1:25	5.0	L	49	
12/13/2019	1:30	2.8	L	49	
12/13/2019	1:35	2.5	L	39	
12/13/2019	1:40	2.1	L	23	
12/13/2019	1:45	14	L	15	L
12/13/2019	1:50	29		9.3	L
12/13/2019	1:55	22		12	L
12/13/2019	2:00	34		17	L
12/13/2019	2:05	80		30	
12/13/2019	2:10	120		50	
12/13/2019	2:15	210		82	
12/13/2019	2:20	22		81	
12/13/2019	2:25	5.6	L	79	
12/13/2019	2:30	21		76	
12/13/2019	2:35	47		71	
12/13/2019	2:40	210		86	
12/13/2019	2:45	220		88	
12/13/2019	2:50	164		110	
12/13/2019	2:55	91		125	
12/13/2019	3:00	46		130	
12/13/2019	3:05	58		130	
12/13/2019	3:10	56		110	
12/13/2019	3:15	16	L	72	
12/13/2019	3:20	7.1	L	46	
12/13/2019	3:25	5.2	L	31	
12/13/2019	3:30	4.7	L	24	
12/13/2019	3:35	4.7	L	16	L
12/13/2019	3:40	140		30	
12/13/2019	3:45	10.8	L	29	
12/13/2019	3:50	60		38	
12/13/2019	3:55	43		44	
12/13/2019	4:00	44		50	
12/13/2019	4:05	16	L	52	
12/13/2019	4:10	5.2	L	30	
12/13/2019	4:15	4.5	L	29	
12/13/2019	4:20	7.3	L	20	
12/13/2019	4:25	71		25	
12/13/2019	4:30	16	L	20	
12/13/2019	4:35	2.9	L	18	L
12/13/2019	4:40	2.1	L	17	L
12/13/2019	4:45	1.8	J	17	L
12/13/2019	4:50	1.9	J	16	L
12/13/2019	4:55	1.9	J	4.5	L
12/13/2019	5:00	1.7	J	2.1	L
12/13/2019	5:05	1.7	J	1.9	J
12/13/2019	5:10	2.5	L	1.9	J
12/13/2019	5:15	2.0	L	2.0	L
12/13/2019	5:20	2.3	L	2.0	L
12/13/2019	5:25	4.4	L	2.4	L
12/13/2019	5:30	6.1	L	3.2	L

Attachment A

Date	Time	H ₂ S 5-Minute Average (ppbv)	Data Flag	H ₂ S 30-Minute Average (ppbv)	Data Flag
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Day 4-5, December 12-13, 2019

Intersection of Odessa Street and Avenue A

12/13/2019	5:35	41		9.7	L
12/13/2019	5:40	95		25	
12/13/2019	5:45	54		34	
12/13/2019	5:50	35		39	
12/13/2019	5:55	6.5	L	40	
12/13/2019	6:00	2.3	L	39	
12/13/2019	6:05	1.8	J	32	
12/13/2019	6:10	38		23	
12/13/2019	6:15	82		28	
12/13/2019	6:20	20		25	
12/13/2019	6:25	2.1	L	24	
12/13/2019	6:30	2.1	L	24	
12/13/2019	6:35	1.8	J	24	
12/13/2019	6:40	1.4	J	18	L
12/13/2019	6:45	6.4	L	5.6	L
12/13/2019	6:50	59		12	L
12/13/2019	6:55	61		22	
12/13/2019	7:00	51		30	
12/13/2019	7:05	13	L	32	
12/13/2019	7:10	1.8	J	32	
12/13/2019	7:15	1.3	J	31	

Day 5, December 13, 2019

CR-208, 5000 feet east of Highway 205, Seminole, TX

12/13/2019	11:05	150			
12/13/2019	11:10	110			
12/13/2019	11:15	68			
12/13/2019	11:20	170			
12/13/2019	11:25	130			
12/13/2019	11:30	270		150	

* H₂S regulatory level is a 30-minute average of 80.0 ppbv, however data did not include upwind sampling.

All concentrations reported in parts per billion by volume (ppbv).

The H₂S limit of detection is 2.00 ppbv.

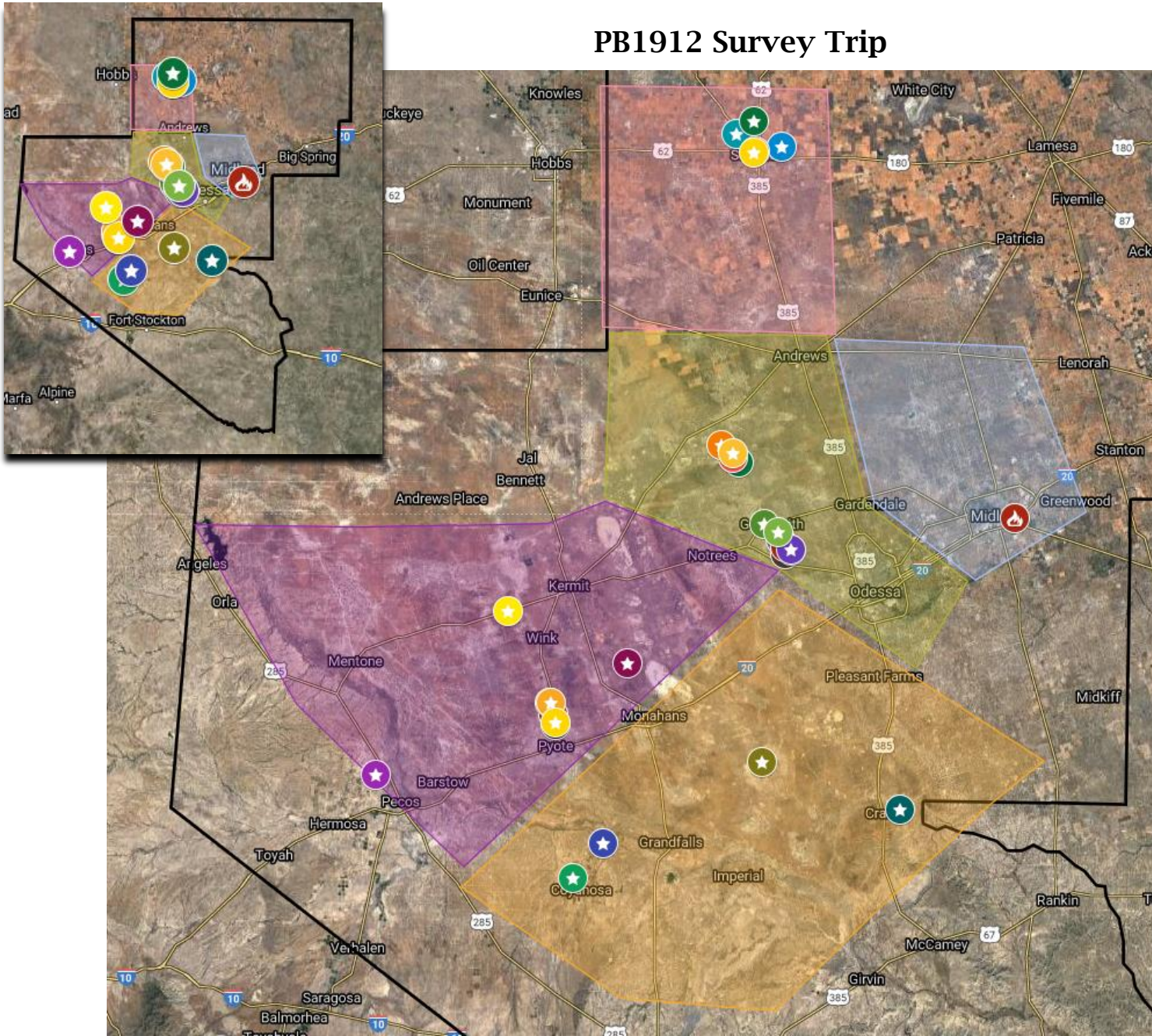
The H₂S limit of quantitation is 20.00 ppbv. Limit of quantitation is defined as the lowest point of the calibration curve.

J - reported concentration is below the limit of detection (LOD).

L- reported concentration is below the limit of quantitation (LOQ).

CR - county road

PB1912 Survey Trip



Sites and Areas Surveyed

- Midland Explosion
- Cloverdale Site
- Emmaline Tank Farm 1H (33)
- Emmaline Tank Farm 1H (34)
- Emmaline Tank Farm 2H (35)
- Emmaline Tank Farm 2H (36)
- Sand Hills Gas Plant
- Goldsmith Gas Plant
- Embar B-1 Battery
- McElroy Section 199 Emerge...
- Clyde Cowden Battery 1
- Clyde Cowden Battery 2
- Clyde Cowden Battery 7
- Clyde Cowden Battery 5
- Clyde Cowden Battery 6
- University Andrews 7T Battery
- University Andrews Battery 1...
- University Andrews 1E & 11T...
- Wildcat Gas Plant
- James Lake Gas Plant
- Waha Gas Plant
- Seminole Gas Processing Pl...
- Oahu Gas Plant
- Red Bluff Gas processing Pl...
- Monahans North Compresso...
- Tank Battery bt CR-105 & CR...
- Butane Site
- Disposal Site
- Tank Battery NE of Seminole...

Day 1 Survey Routes December 9, 2019 Midland, Texas



Figure 1a



Figure 1b

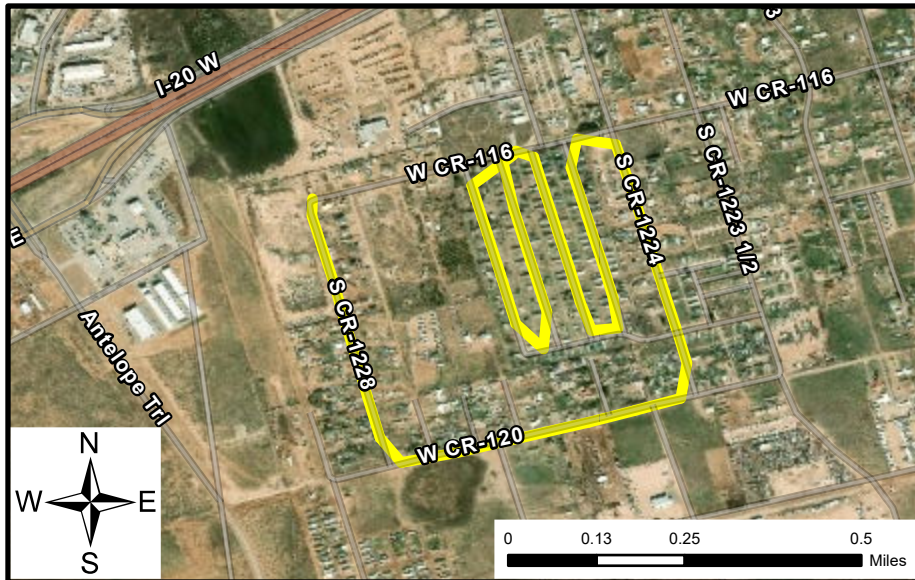


Figure 1c

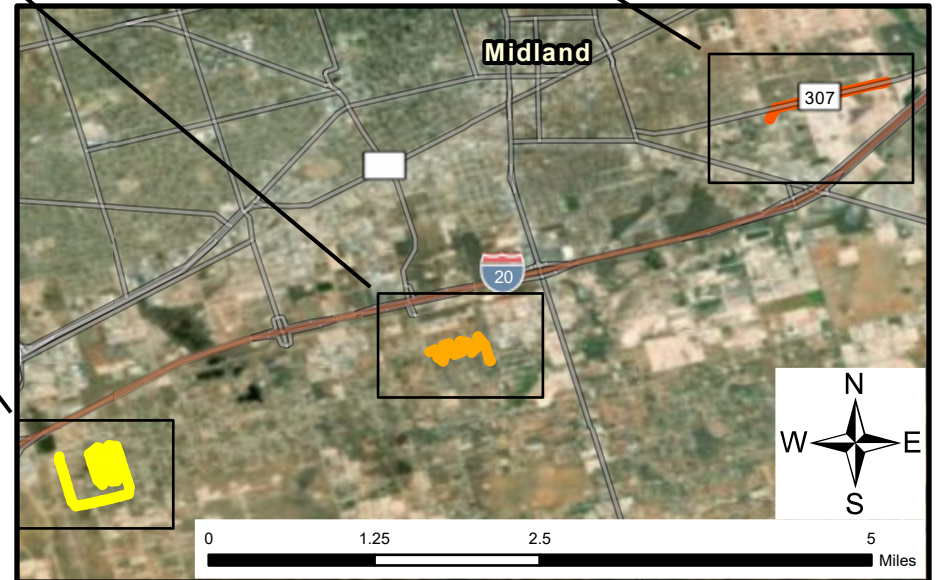


Figure 1d

Day 2 Survey Routes December 10, 2019 Goldsmith, Texas



Figure 2a

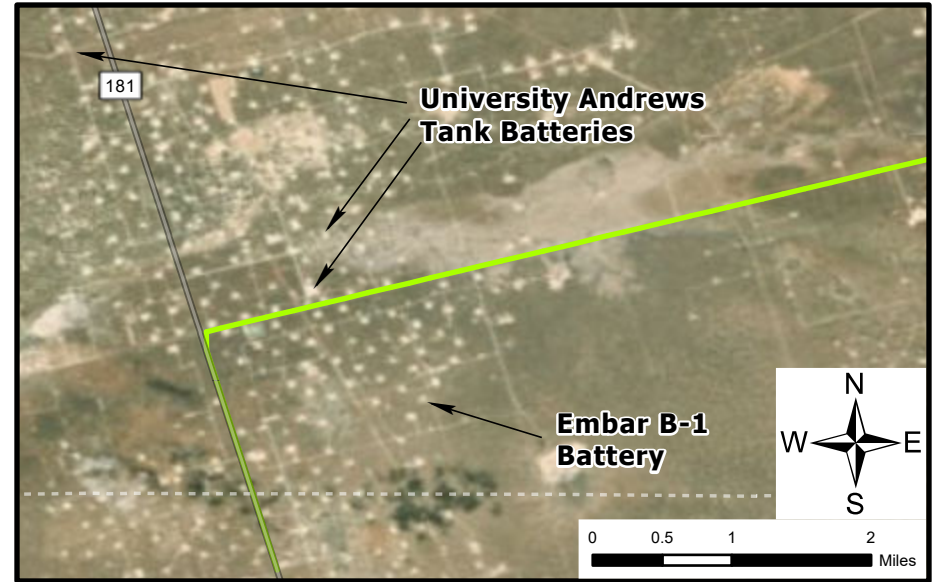


Figure 2b

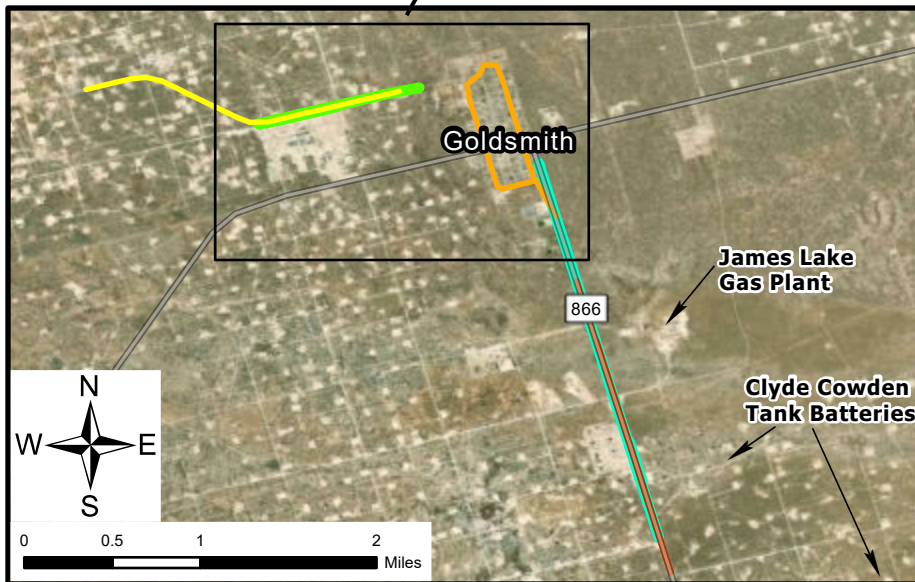


Figure 2c

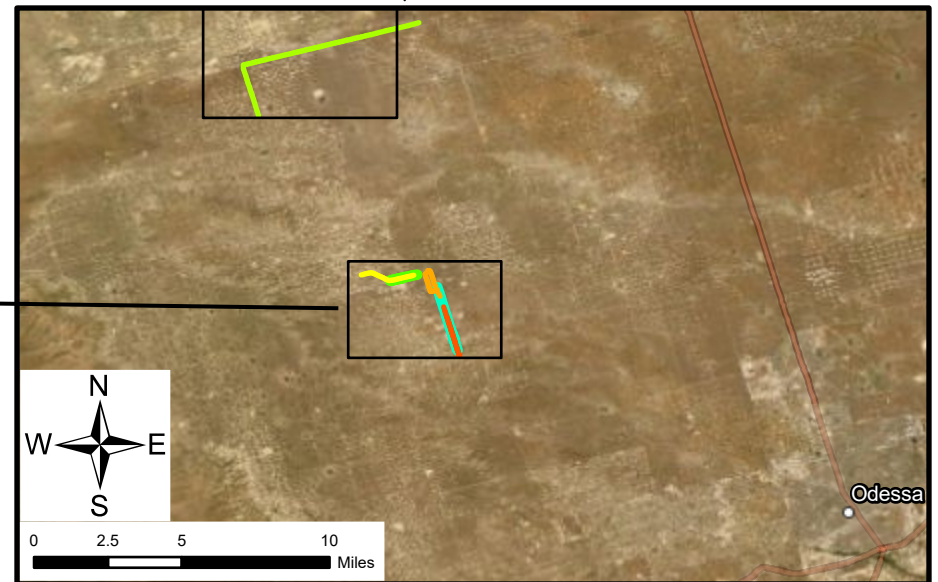
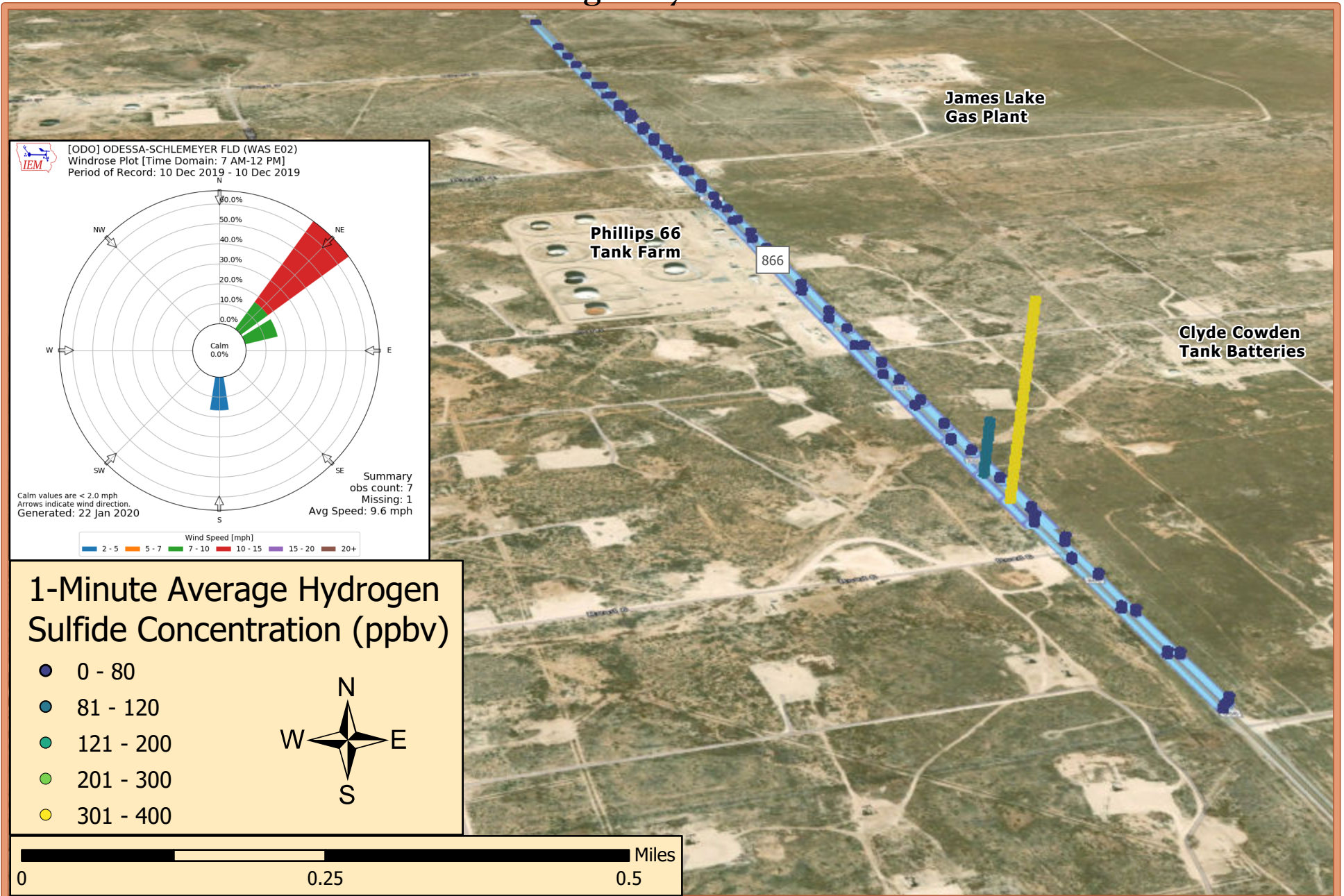


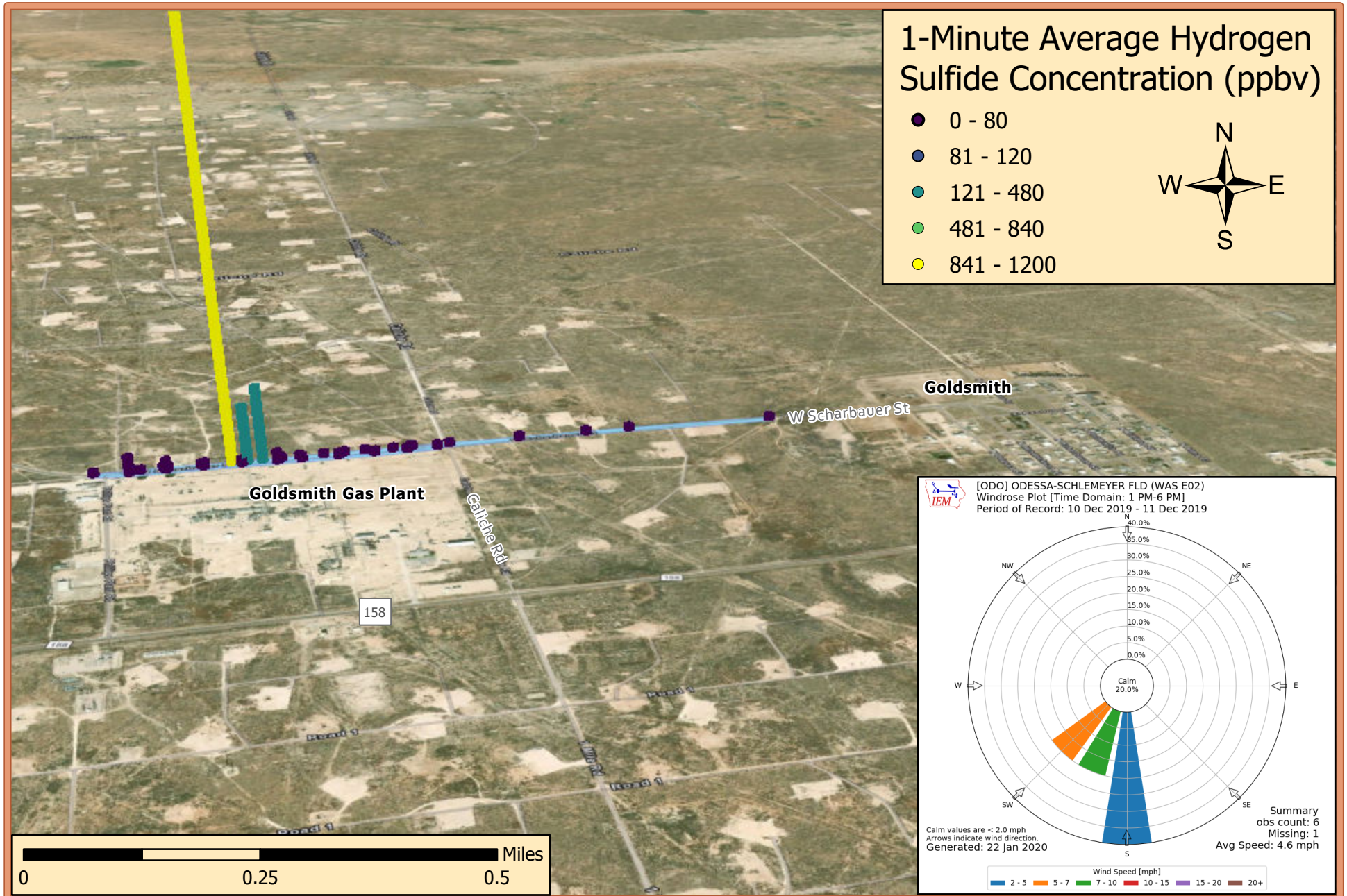
Figure 2d

Day 2, December 10, 2019 Highway 866



Wind rose generated using wind data from Odessa Schlemeyer Field Airport.

Day 2, December 10, 2019 Goldsmith Gas Plant



Wind rose generated using wind data from Odessa Schlemeyer Field Airport.

Day 3 Survey Routes December 11, 2019 Wink County, Texas

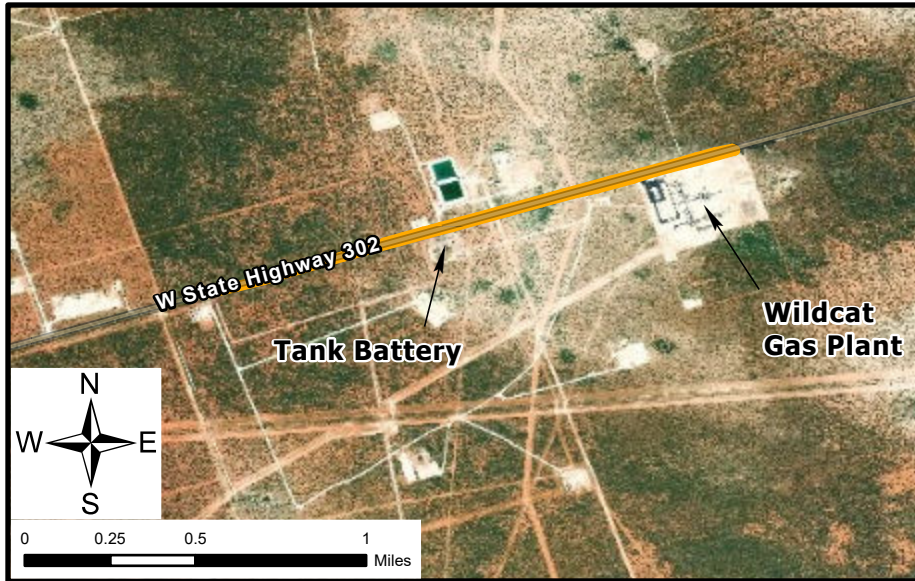


Figure 3a

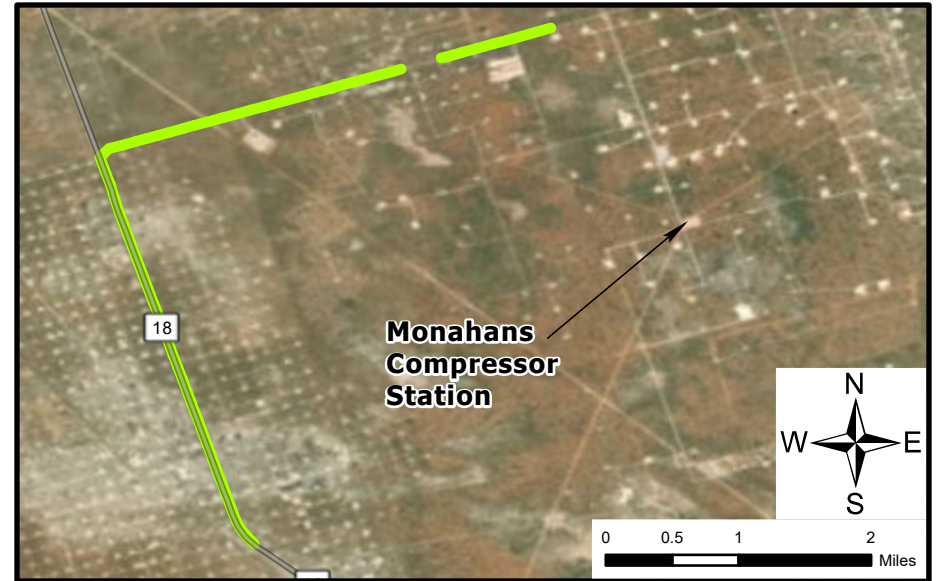


Figure 3b

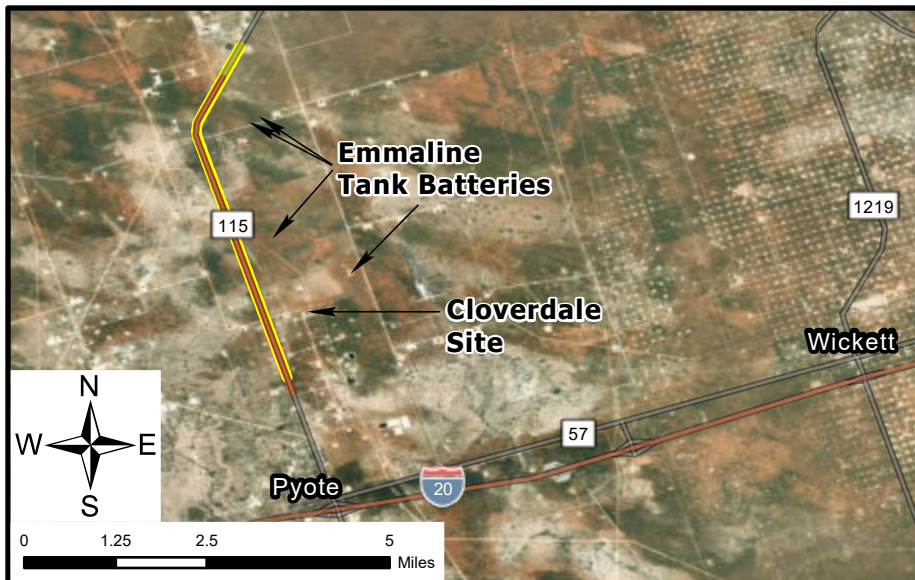


Figure 3c

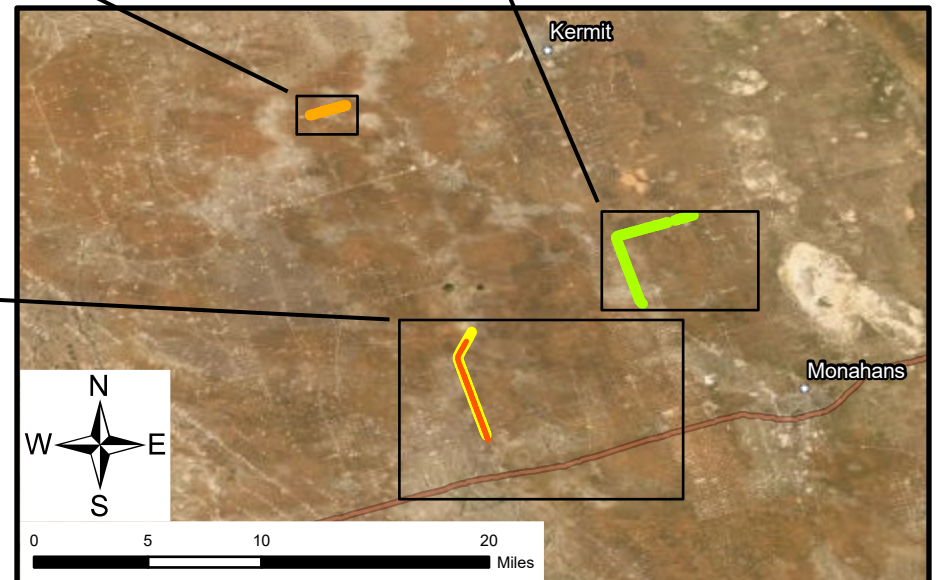
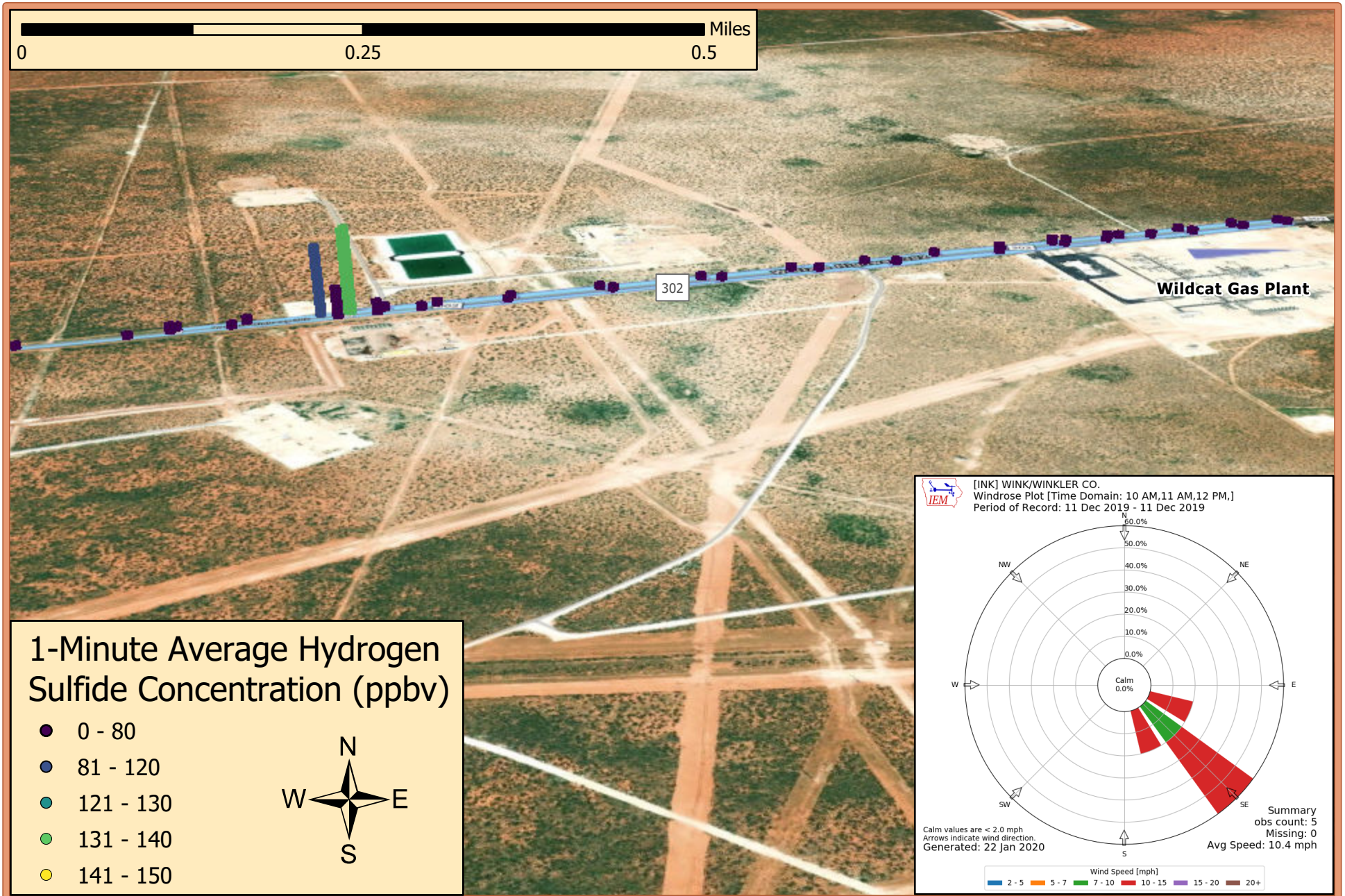


Figure 3d

Day 3, December 11, 2019 Highway 302/Wildcat Gas Plant



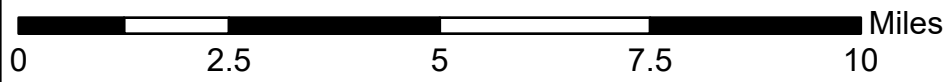
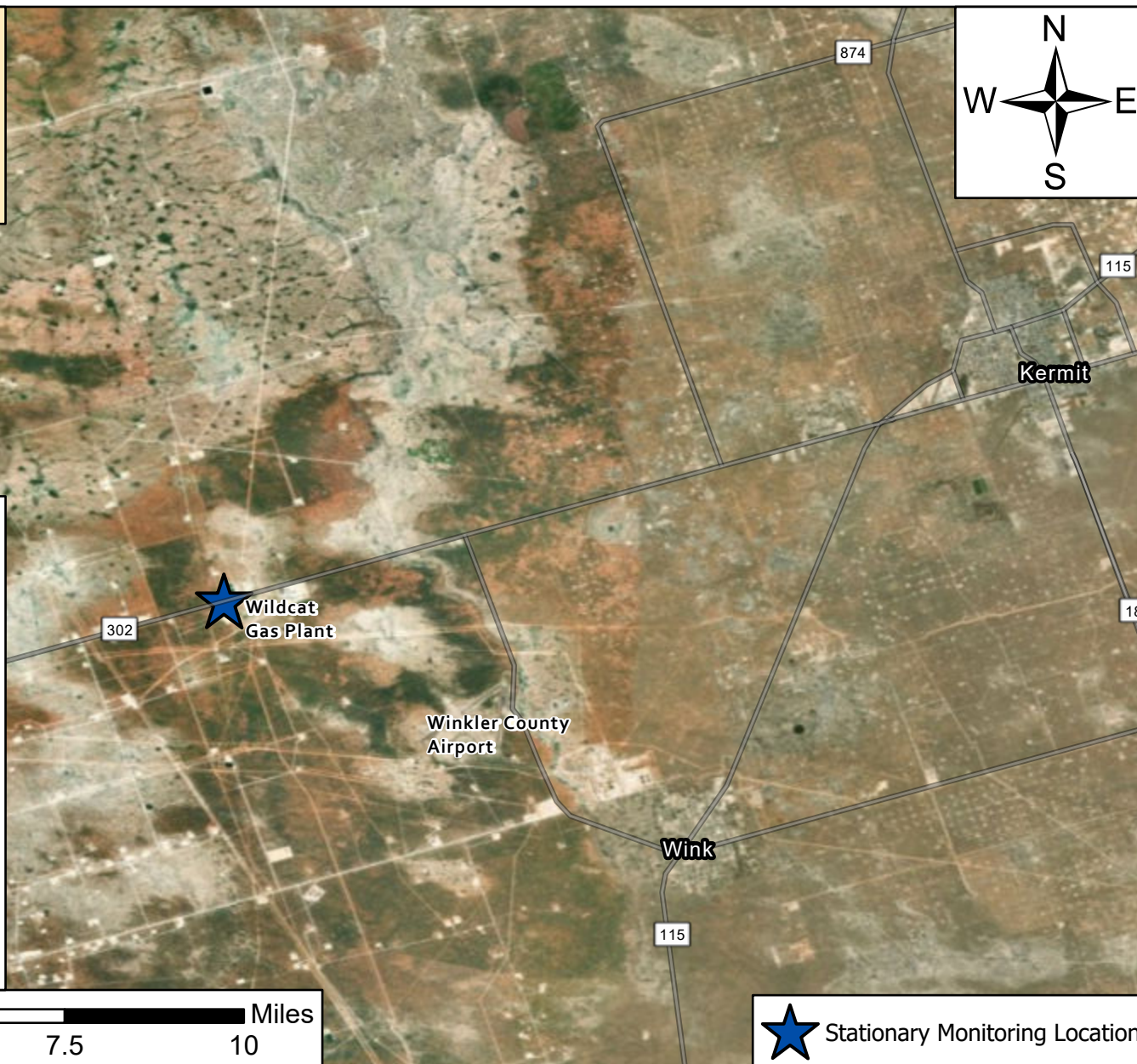
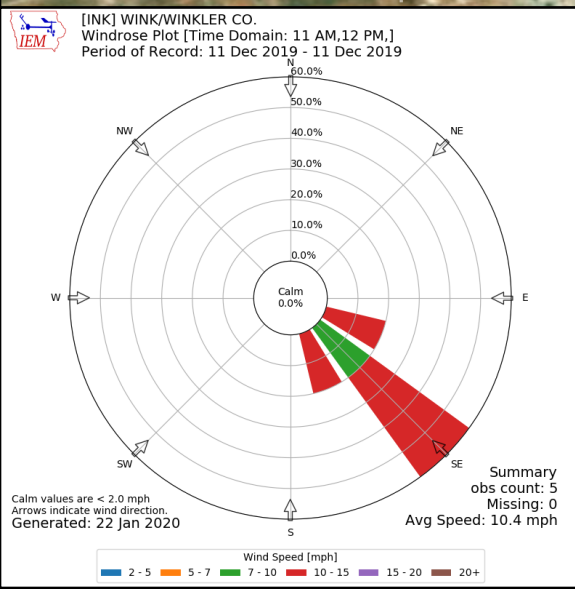
Wind rose generated using wind data from Wink FAA Airport.

Day 3, December 11, 2019 Stationary Monitoring Highway 302/Wildcat Gas Plant

Maximum H2S Concentrations

5-min average = 150 ppbv

30-min average = 53 ppbv



Stationary Monitoring Location

Wind rose generated using wind data from Winkler County Airport.

Day 4 Survey Routes December 12, 2019 Goldsmith, Texas

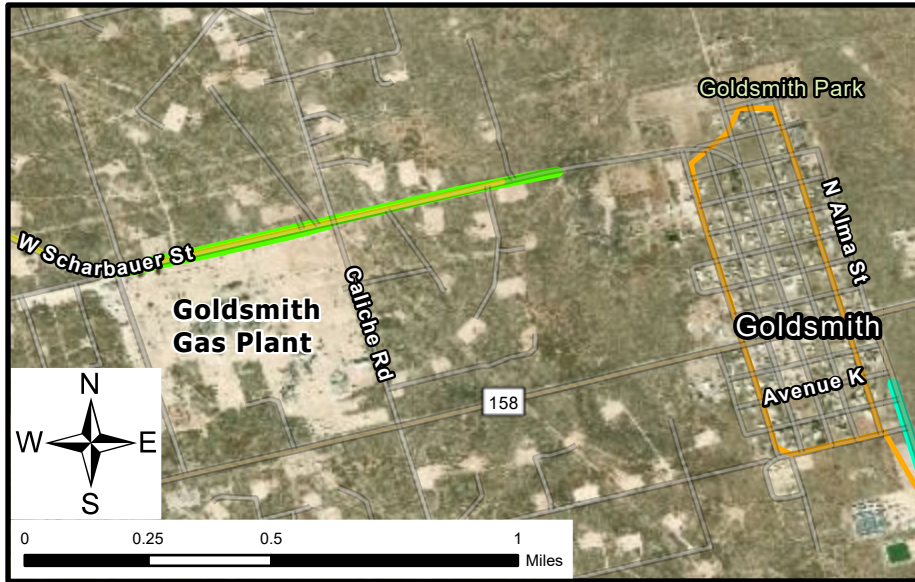


Figure 4a

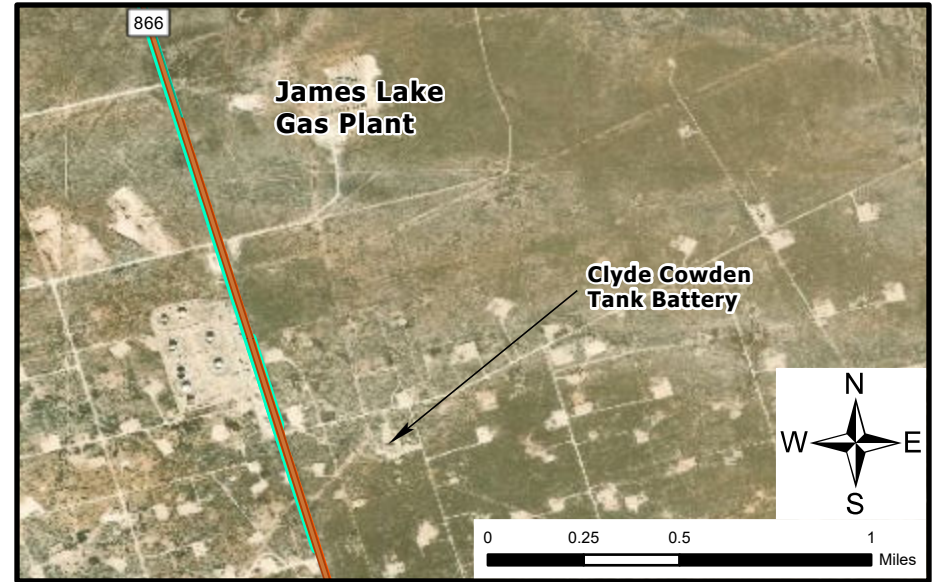


Figure 4b

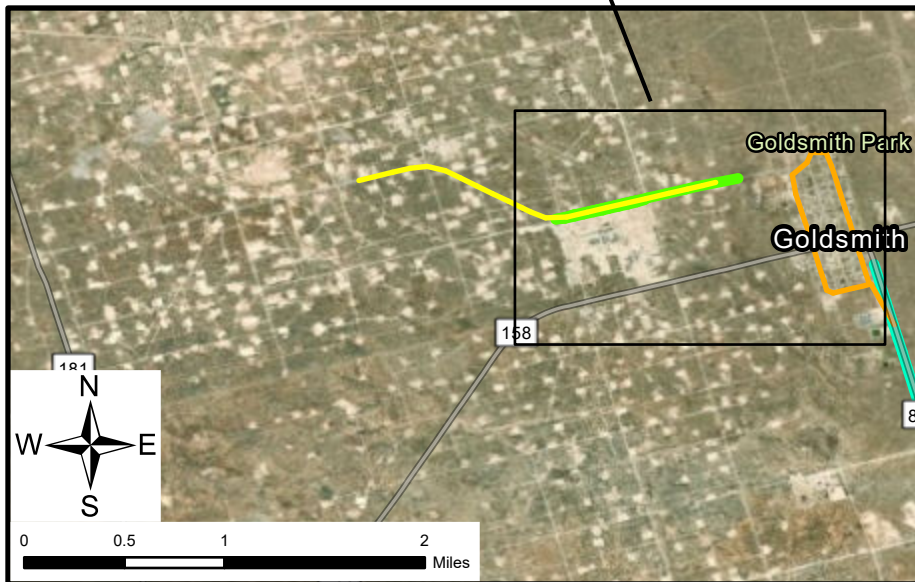


Figure 4c

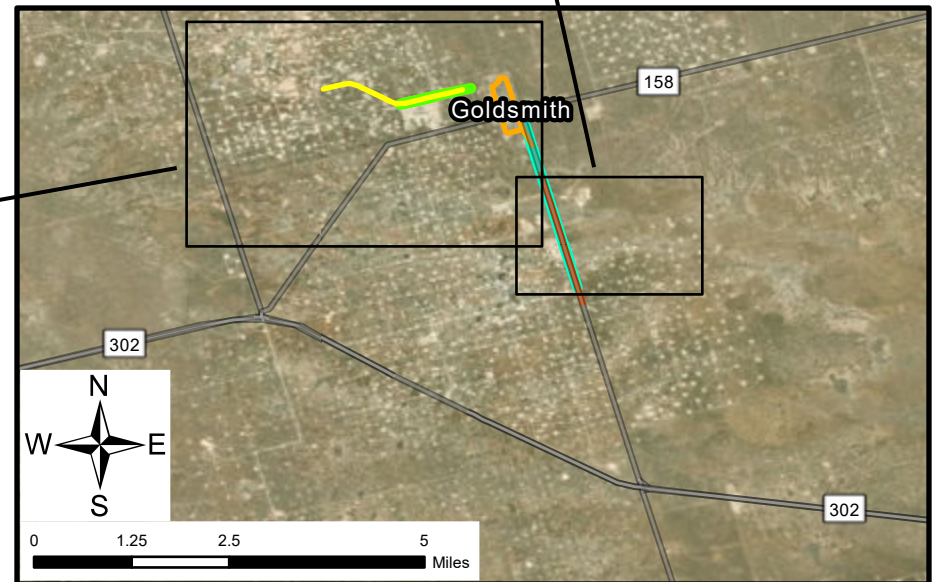


Figure 4d

Day 4, December 12, 2019 Stationary Monitoring Highway 866 and Goldsmith Overnight Sampling

Maximum H2S Concentrations

Location 1

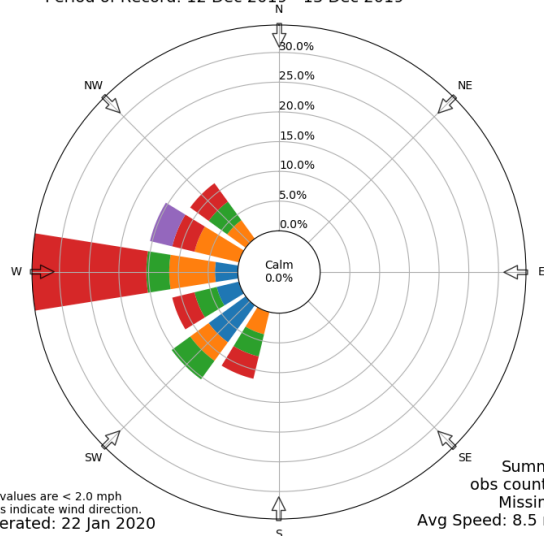
5-min average = 200 ppbv
30-min average = 49 ppbv

Location 2

5-min average = 220 ppbv
30-min average = 130 ppbv

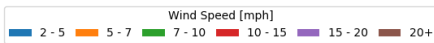


[ODO] ODESSA-SCHLEMEYER FLD (WAS E02)
Windrose Plot [All Year]
Period of Record: 12 Dec 2019 - 13 Dec 2019

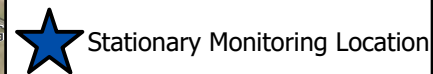


Calm values are < 2.0 mph
Arrows indicate wind direction.
Generated: 22 Jan 2020

Summary
obs count: 26
Missing: 0
Avg Speed: 8.5 mph



the GIS User Community, Sources: Esri, HERE, G



Wind rose generated using wind data from Odessa Schlemeyer Field Airport.

Day 5 Survey Routes
December 13, 2019
Seminole, Texas

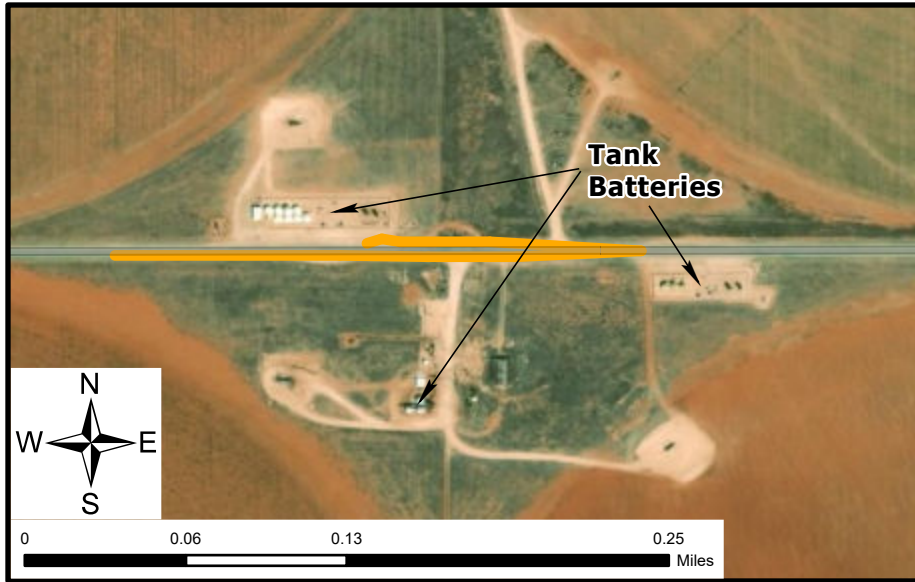


Figure 5a

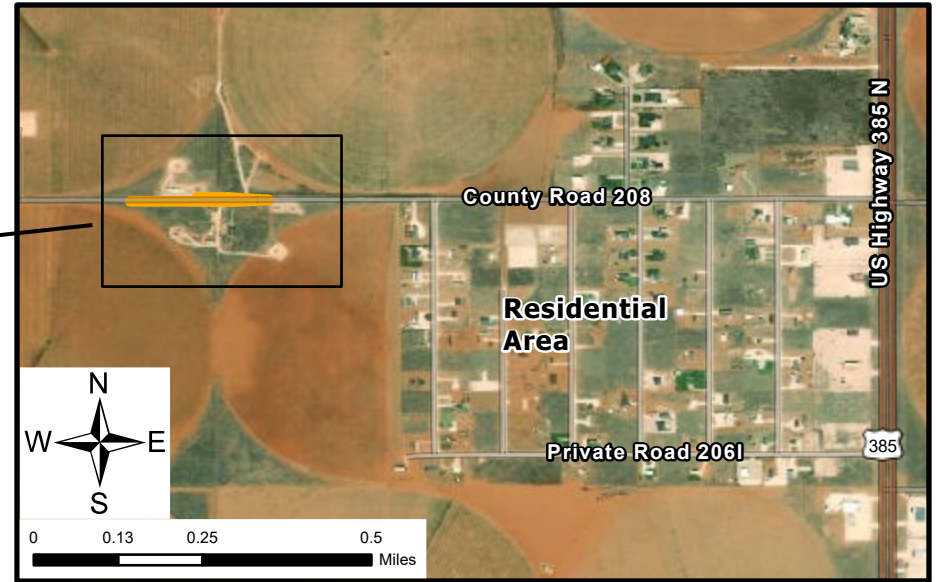


Figure 5b

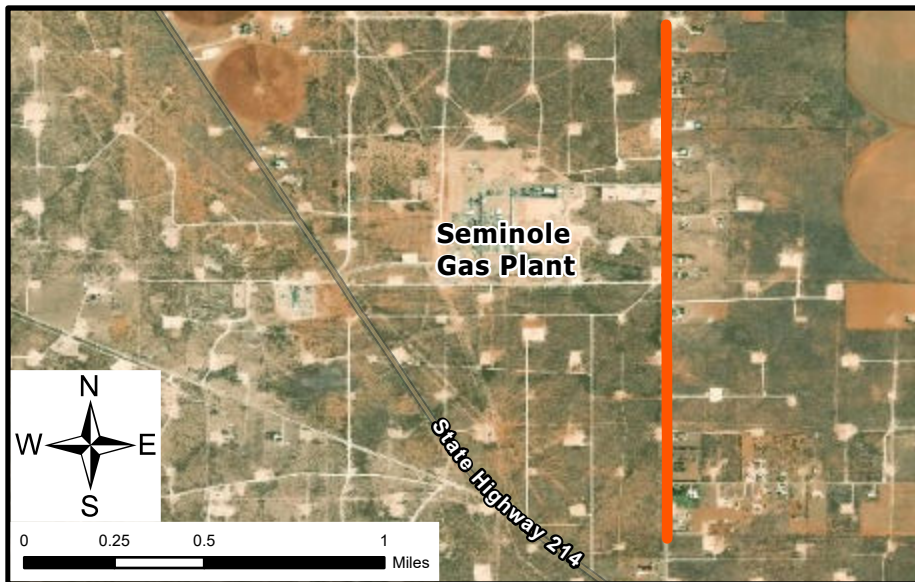


Figure 5c

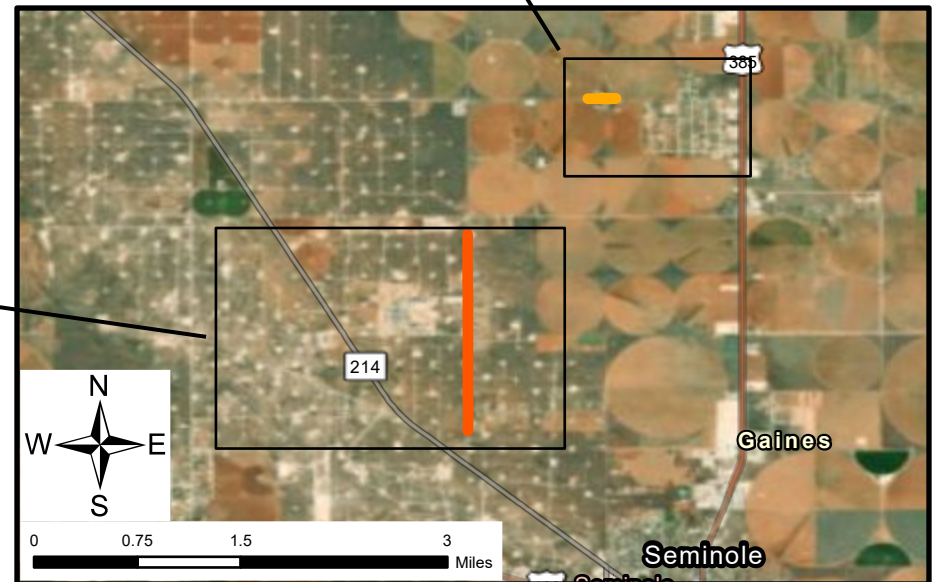
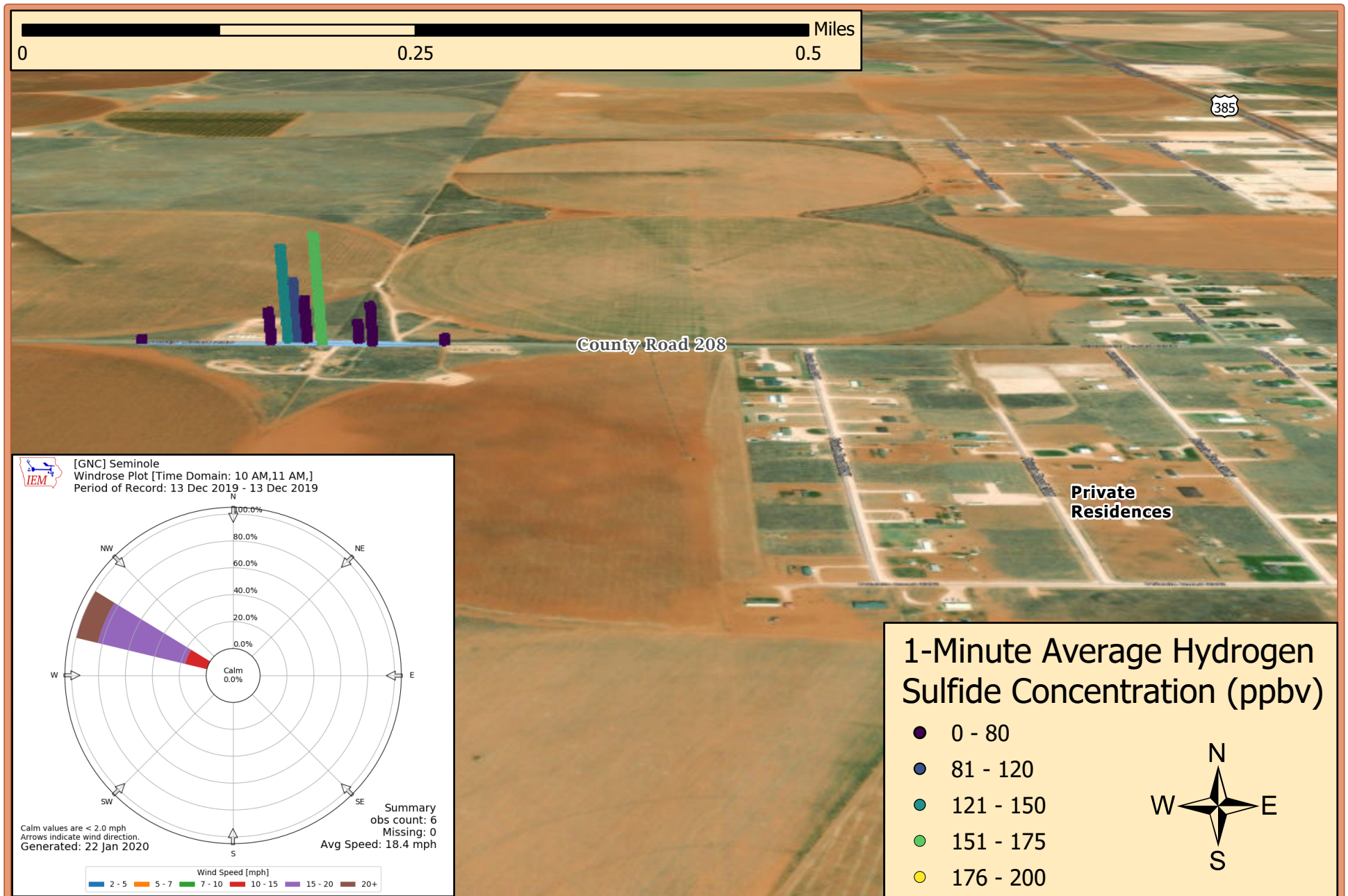


Figure 5d

Day 5, December 13, 2019 Seminole, Texas



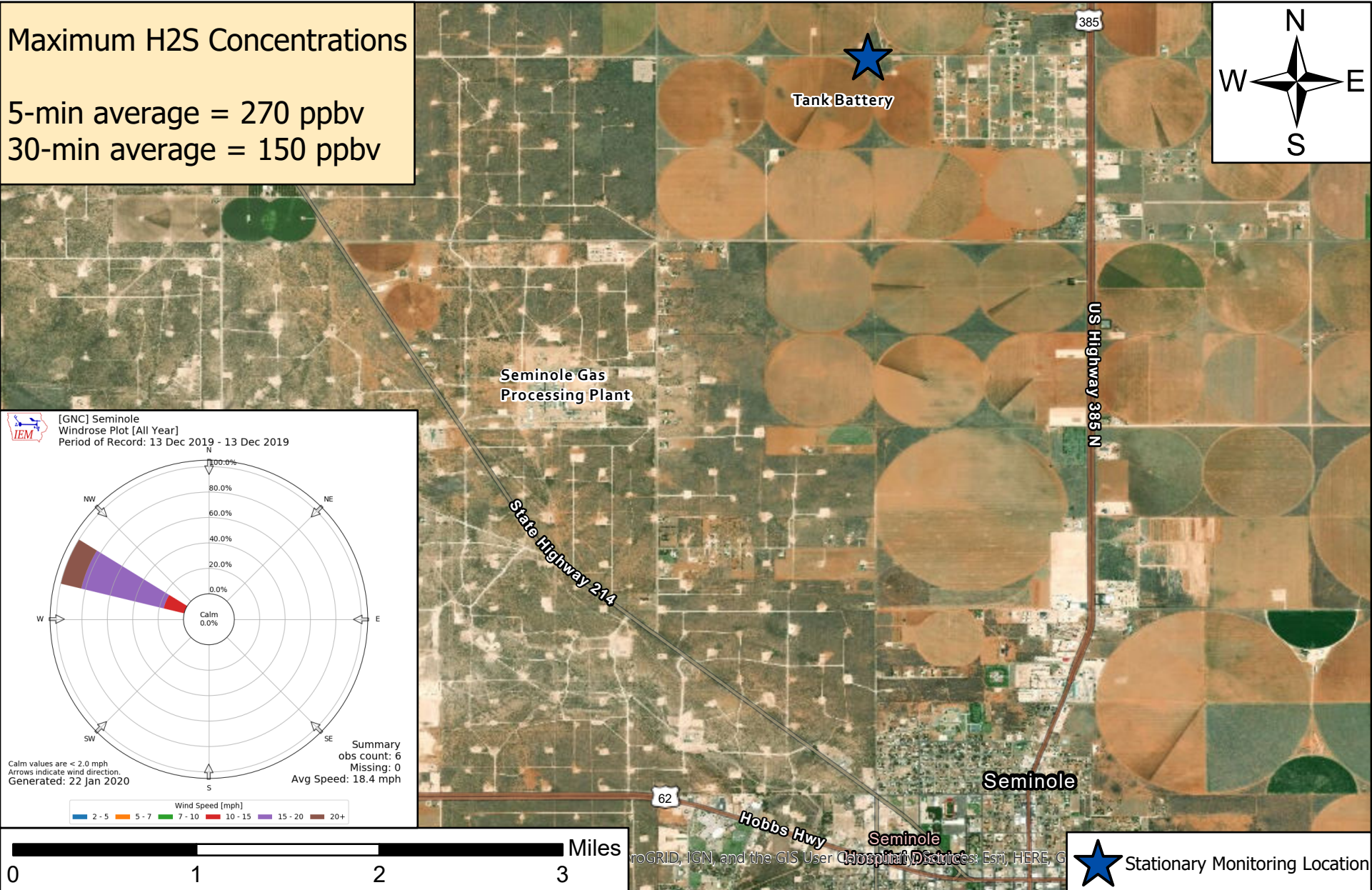
Wind rose generated using wind data from Gaines County Airport.

Day 5, December 13, 2019 Stationary Monitoring Seminole, Texas

Maximum H2S Concentrations

5-min average = 270 ppbv

30-min average = 150 ppbv



Wind rose generated using wind data from Gaines County Airport.