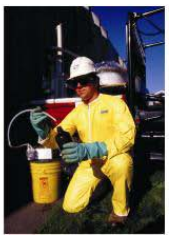
SCS FIELD SERVICES







City of Albuquerque

Nazareth Landfill Gas Probe Investigation Report

Presented To:

City of Albuquerque

City of Albuquerque
Environmental Health Department
1 Civic Plaza, NW
Albuquerque, NM 87103
(505) 768-2633

Presented By:

SCS FIELD SERVICES
3351 Candelaria Rd, NE
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June 28, 2013 (Revised)
File No. 07209112.05

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1 INTRODUCTION

This report summarizes a field investigation at the former City of Albuquerque Nazareth Landfill (Landfill) to determine landfill gas (LFG) concentrations and to recommend remedial design, if needed near and around the recreational vehicle (RV) utility service connections at the Landfill.

2 BACKGROUND

The former Nazareth Landfill operated from 1971 to 1972. The Landfill was City of Albuquerque owned and operated. The Landfill was a municipal solid waste facility and may have also taken construction debris. The estimated depth of the solid waste is approximately 30 feet below ground surface. The former Landfill was approximately eight (8) acres in size (see Figure 1- Site Plan).

The former Landfill is currently used as a parking lot during the Albuquerque International Balloon Fiesta. It currently contains connection services for electric and water for RV parking. Most of the year the area is vacant, except for a security trailer located on the west side of the Landfill. The Landfill is elevated above the main Balloon Fiesta field by approximately 50 feet. The surface of the RV parking area is covered with asphalt millings. No subgrade beneath the millings exists.

The former Landfill also contains ten (10) LFG probes that were placed on the north, east, and south perimeters of the Landfill boundary. These probes have been monitored on a quarterly basis since 2004. None of the LFG probes have registered any significant methane and/or hydrogen sulfide concentrations since 2004 (see Figure 2- Gas Probe Locations).

Because of the public use associated with this Landfill, the City's Environmental Health Department (EHD) commissioned SCS to explore the extent and concentrations of landfill/methane gas within the RV utility connection service area and the areas adjacent to it. During the last Balloon Fiesta, an area adjacent to the RV utility connections contained a crack in the millings. EHD scanned the crack for LFG using a flame ionization detector (surface emissions monitoring device) calibrated to 500 ppm methane. The area registered gas in excess of 500 ppm. Based on the results of this preliminary investigation, EHD requested SCS to perform the field investigation described in this report to assess several subsurface landfill gas-related concentrations.

3 SUBSURFACE INVESTIGATION

On April 25 and April 26, 2013, SCS-FS and Enviro-drill installed twenty-three (23) gas probes in the landfill at locations within designated RV parking areas. The probes were installed using a Geoprobe Hurricane 1000, which hammered the geoprobe into the ground.

Prior to any field work being performed, SCS prepared a site-specific health and safety plan (SSHASP) for the geoprobe installation. The SSHASP was prepared based on the existing gas probe monitoring SSHASP for the site. Also prior to the performance of the subsurface investigation, SCS contacted One Call (811) and the Balloon Fiesta staff to assist with locating

any underground utilities. Utilities which were located consisted of water and electric lines as shown on Figure 2 – Gas Probe Locations.

During the installation of the gas probes, wellbore landfill gas concentrations were monitored using a GEM 2000 and a four gas meter (M-40), which analyzed the wellbore for carbon monoxide, oxygen, hydrogen sulfide and the lower explosive limit of methane. All instruments were calibrated, as required by the manufacturer, prior to obtaining these readings. All readings and borehole information was recorded in a field notebook. The data collected included, landfill gas readings, depth of boring, boring location, backfill information and surface completion details.

The gas probes were installed in approximate 50-foot spacing (spacing was chosen based on surface/special features and/or any existing utility lines). Once the geoprobe reached its final depth, plastic tubing (1/4-inch diameter) was placed in the borehole to within a few inches of the bottom of the boring, or to a depth that allowed for the tubing to be placed in waste materials. Once the tubing was installed, the tubing was left in the borehole and the borehole was backfilled with 10/20 silica sand to within a foot of ground surface. The remainder of the borehole was filled with bentonite pellets (3/8 inch chips). The bentonite was then hydrated. The gas probes were installed from a depth of five (5) feet to a maximum depth of twenty-four (24) feet.

Once the backfilling of the probe was complete, the field personnel collected methane, oxygen, carbon dioxide, and balance gas concentrations using a GEM 2000. Hydrogen sulfide will also be recorded using the M-40 four gas meter. Once the readings stabilized, the readings were recorded and saved in the GEM 2000 and written in a field log (see Table 1 for Gas Probe Results).

The plastic tubing was left in the boring for future use by EHD/SCS. A handheld GPS (Topcon GMS-2 Pro) was used to get coordinates of each geoprobe and other surface features that were pertinent to the project (utilities). This information is shown on the Site Plan (see Figure 1).

4 RESULTS

Table 1 shows the installation details of each of the gas probe. During the installation, LFG, including hydrogen sulfide, was encountered in a number of gas probes as the boring was being drilled. LFG concentrations exceeded the lower explosive limit (LEL) and hydrogen sulfide concentrations reached a high concentration of 65 ppm. The hydrogen sulfide concentration was high enough that drilling had to be temporarily stopped in order to allow the boring to vent and to obtain an industrial fan so as to vent the vapors away from the field crew.

A number of gas probes could not be installed below 8 feet due to drill refusal. Native soil and/or cover material varied in depth from 5 to 24 feet below ground surface.

Table 2 depicts the LFG probe readings obtained on April 26, 2013. Hydrogen sulfide reached a maximum concentration of 42 ppm. On May 13, 2013, the gas probes were read again and methane concentrations ranged from 0.0 to 48 percent (see Table 3). Figures 3 and 4 depict methane concentration contours for methane concentrations collected on April 26, 2013 and June 10, 2013.

5 RECOMMENDATIONS

Based on the field investigation and the two gas probe reading events performed on April 26 and May 13, 2013, SCS recommends that three (3) passive vent trenches be installed at the site. One (1) trench should be installed in each north-south roadway that separates each RV parking area (see Figure 3 and 4). The trench should be placed parallel to the roadway. The length of the trench should be approximately 400 feet long and have a depth of 10 to 15 feet below ground surface. The trench should be filled with coarse grained material (gravel). Venting of the trenches should be accomplished by using an active collection system that would operate during the weeks of Balloon Fiesta. This time period should include when volunteers and Balloon Fiesta staff are preparing the field for visitors as well as the actual Balloon Fiesta event week.

An alternative to the above proposed remediation system would be to install vent trenches in the three rows where the current RV utilities are located. If this alternative is chosen, then passive venting using turbines should be installed at the end of each trench.

TABLES

TABLE 1 - GAS PROBE INSTALLATION DETAILS

DATE: 5/17/2013

PROBE ID	LOCATION	DEPTH OF BORE (ft)	DEPTH OF TUBING (ft)	METHANE (% vol)	H2S (% vol)	COMMENTS
1	Road South of pad 16	11.5	10	ND	ND	Native soil approximately 10.5 to 11.5.
2	Pad 15 East	21	15	100% LEL	ND	Native soil approximately 15 feet
3	Pad #12 East	11.5	11.5	100% LEL	65 ppm	Refusal at 11.5 feet
4	Pad #10 east	8	8	ND	ND	
5	Pad #8 East	8	8	100% LEL	9 - +10 ppm	Abandon one geoprobe and moved to pad # 7 East Tubing came out of boring when pulling up on drill rods. Re-installed tubing to 8 feet below ground surface.
6	Pad #5 East	10.5	10.5	100%LEL	43 ppm	Difficult drilling at 10 feet
7	Pad #2 East	14	14	NR	30 ppm	First two feet difficult drilling. Temporarily stopped work because vent fan was not working.
8	Near fence west of pad 6	10	10	ND	ND	Refusal at approximately 10 feet
9	Fence east of pad 14	10	9.75	ND	ND	Encountered H2S while pushing probe
10	Road south of pad 48	10	8.5	ND	ND	Difficult drilling from 9 to 10 ft. Native soil 9 feet
11	Pad # 46 west	9	8	ND	ND	Difficult drilling from 6 to 9ft
12	Pad # 43 west	8.5	7.5	ND	ND	Difficult drilling from 9 to 10 ft. Native soil 9 feet
13	Pad #40 west	5	5	ND	ND	Encountered hard material at 5 ft, could not get pass
14	Pad #38 west	14	12.5	ND	ND	Difficult drilling from 9 to 14 ft
15	Pad # 35 west	13	12	ND	ND	Difficult drilling from 12 to 13 ft. Native soil 12 feet
16	Pad #33 west	23	20.5	ND	ND	Encountered native soil at approx. 22.5 ft Installed tubing in landfill materials at 20.5 ft
17	Pad # 52 west	11.5	10.5	ND	ND	Difficult drilling from 10 to 11.5 ft. Approx. native soils at 10.5
18	House West	7	5	ND	ND	Difficult drilling from 1 to 7 ft. Approximate native soil at 5 feet
19	North of Janie's trailer	24	23	ND	ND	Native soils at approximately 24 feet
20	South of Janie's trailer	6.5	5	ND	ND	Native soils at approximately 5 feet
21	Northwest of pad 17	11	10	ND	ND	Native soil approximately 10 to 11 feet.
22	West of pad 57	8.5	8	ND	ND	Refusal at approximately 8.5 feet
23	Roadway south of pad 64	8	7	ND	ND	Refusal at approximately 8 feet

ND - did not detect landfill gas in the boring.

NR - not recorded

TABLE 2 - GAS PROBE READINGS APRIL 26, 2013

DATE: 4/26/2013

WEATHER: Clear
INSTRUMENT USED: GEM 2000
CALIBRATION GAS: 50% METHANE; 35% CARBON DIOXIDE

Probe #	Location	Methane	Carbon Dioxide	Oxygen	Balance Gas	H2S
		(%in vol)	(%in vol)	(%in vol)	(%in vol)	(ppm)
1	Road South 15	16.9	25.9	0.0	57.2	0.0
2	Pad 15 East	24.2	27.3	0.0	48.5	0.0
3	Pad 12 East	41.1	34.3	0.0	24.6	42.0
4	Pad 10 East	42.4	30.3	0.0	27.3	0.0
5	Pad 7 East	31.2	25.1	0.0	43.7	0.0
6	Pad 5 East	37.9	23.9	0.0	33.2	0.0
7	Pad 2 East	17.7	23.8	0.3	58.5	8.0
8	West of 6	46.5	34.4	0.0	19.1	0.0
9	Fence East of 14	36.1	32.2	0.0	31.7	12.0
10	Road South of 48	17.6	26.9	0.0	55.5	0.0
11	Pad 46 West	24.9	28.6	0.0	41.5	0.0
12	Pad 43 West	24.6	28.2	0.0	47.2	0.0
13	Pad 40 West	38.1	33.5	0.0	28.4	0.0
14	Pad 38 West	27.2	22.4	1.4	49.0	0.0
15	Pad 35 West	27.6	28.6	0.1	43.7	0.0
16	Pad 33 West	27.6	31.0	0.4	41.0	0.0
17	Pad 52 West	17.8	19.8	4.6	57.8	0.0
18	House West	17.7	20.8	3.0	58.5	0.0
19	North of House	0.0	6.5	13.1	80.4	0.0
20	South of House	1.2	7.8	12.0	79.0	0.0
21	NW of 17	0.0	10.9	8.7	80.4	0.0
22	West of 57	15.8	25.5	0.2	58.5	0.0
23	SW of 64	17.4	28.0	0.0	54.6	2.0

TABLE 3 - GAS PROBE READINGS MAY 13, 2013

DATE: 5/13/2013

INSTRUMENT USED: Envision
CALIBRATION GAS: 50%/35%/20.8% Methane/Carbon Oxide/Oxygen

Probe #	Location	Methane	Carbon Dioxide	Oxygen	Balance Gas	H2S
		(%in vol)	(%in vol)	(%in vol)	(%in vol)	(ppm)
1	Road South 15	16.8	28.8	0.0	54.4	0.0
2	Pad 15 East	27.1	31.4	0.0	41.5	0.0
3	Pad 12 East	42.0	35.9	0.0	22.1	0.0
4	Pad 10 East	48.0	37.5	0.0	14.5	0.0
5	Pad 7 East	43.5	38.2	0.0	18.3	0.0
6	Pad 5 East	43.8	37.7	0.0	18.5	0.0
7	Pad 2 East	39.4	35.8	0.0	24.8	0.0
8	West of 6	47.3	38.6	0.0	14.1	0.0
9	Fence East of 14	38.0	34.8	0.0	27.2	0.0
10	Road South of 48	18.1	31.5	0.0	50.4	0.0
11	Pad 46 West	26.2	34.6	0.0	39.2	H2S High alarm
12	Pad 43 West	28.1	35.3	0.0	36.6	H2S High Alarm
13	Pad 40 West	26.0	34.9	0.4	38.7	H2S present
14	Pad 38 West	30.0	36.2	0.0	33.8	0.0
15	Pad 35 West	30.3	36.7	0.0	33.0	0.0
16	Pad 33 West	20.4	31.1	0.0	48.5	0.0
17	Pad 52 West	4.9	26.8	0.0	68.3	0.0
18	House West	5.9	26.7	0.0	67.4	0.0
19	North of House	0.0	7.2	14.7	78.1	0.0
20	South of House	5.1	26.3	0.0	68.6	0.0
21	NW of 17	0.0	10.9	11.5	77.6	0.0
22	West of 57	NR	NR	NR	NR	NR
23	SW of 64	NR	NR	NR	NR	NR

NR- probe not read
Intera collected data

TABLE 1 - NAZARETH GAS PROBE READINGS

DATE: 6/10/2013

WEATHER: Partly Cloudy, slightly breezy **INSTRUMENT USED:** GEM 2000

CALIBRATION GAS: 50% METHANE; 35% CARBON DIOXIDE

Probe #	Location	Time	Methane	Carbon Dioxide	Oxygen	Balance Gas	H2S
		(24-hr clock)	(%in vol)	(%in vol)	(%in vol)	(%in vol)	(ppm)
1	Road South 15	1620	25.3	29.0	0.2	45.9	0.0
2	Pad 15 East	1623	38.4	31.5	0.0	30.7	**2.0**
3	Pad 12 East	1626	26.9	32.5	0.0	39.5	3.0
4	Pad 10 East	1630	24.0	35.0	0.0	39.0	3.0
5	Pad 7 East	1634	46.0	16.0	0.0	36.0	2.0
6	Pad 5 East	1638	55.0	13.0	0.0	31.0	0.0
7	Pad 2 East	1642	59	13	0.0	27.0	2.0
8	West of 6	1644	NR	NR	NR	NR	NR
9	Fence East of 14	1640	46.0	26.0	0.0	27.0	2.0
10	Road South of 48	1650	62.0	38.0	0.0	0.0	2.0
11	Pad 46 West	1652	60.0	38.0	0.0	2.0	2.0
12	Pad 43 West	1654	25.0	56.0	0.0	18.0	2.0
13	Pad 40 West	1656	18.0	45.0	0.0	33.0	0.0
14	Pad 38 West	1658	35.0	55.0	0.0	9.0	0.0
15	Pad 35 West	1700	36.0	44.0	0.0	18.0	0.0
16	Pad 33 West	1703	1.1	0.1	17.3	81.6	0.0
17	Pad 52 West	1707	5.5	26.0	0.0	29.1	0.0
18	House West	1722	6.8	27.0	0.2	65.6	0.0
19	North of House	1712	0.2	6.6	12.4	80.6	0.0
20	South of House	1714	5.7	26.0	0.1	68.0	0.0
21	NW of 17	1705	0.8	10.7	8.1	80.1	0.0
22	West of 57	1710	16.9	30.8	0.0	52.6	0.0
23	SW of 64	1725	12.0	28.0	0.1	59.0	0.7

NR - Not recorded

FIGURES

Maps of Landfill Gas Monitoring Locations

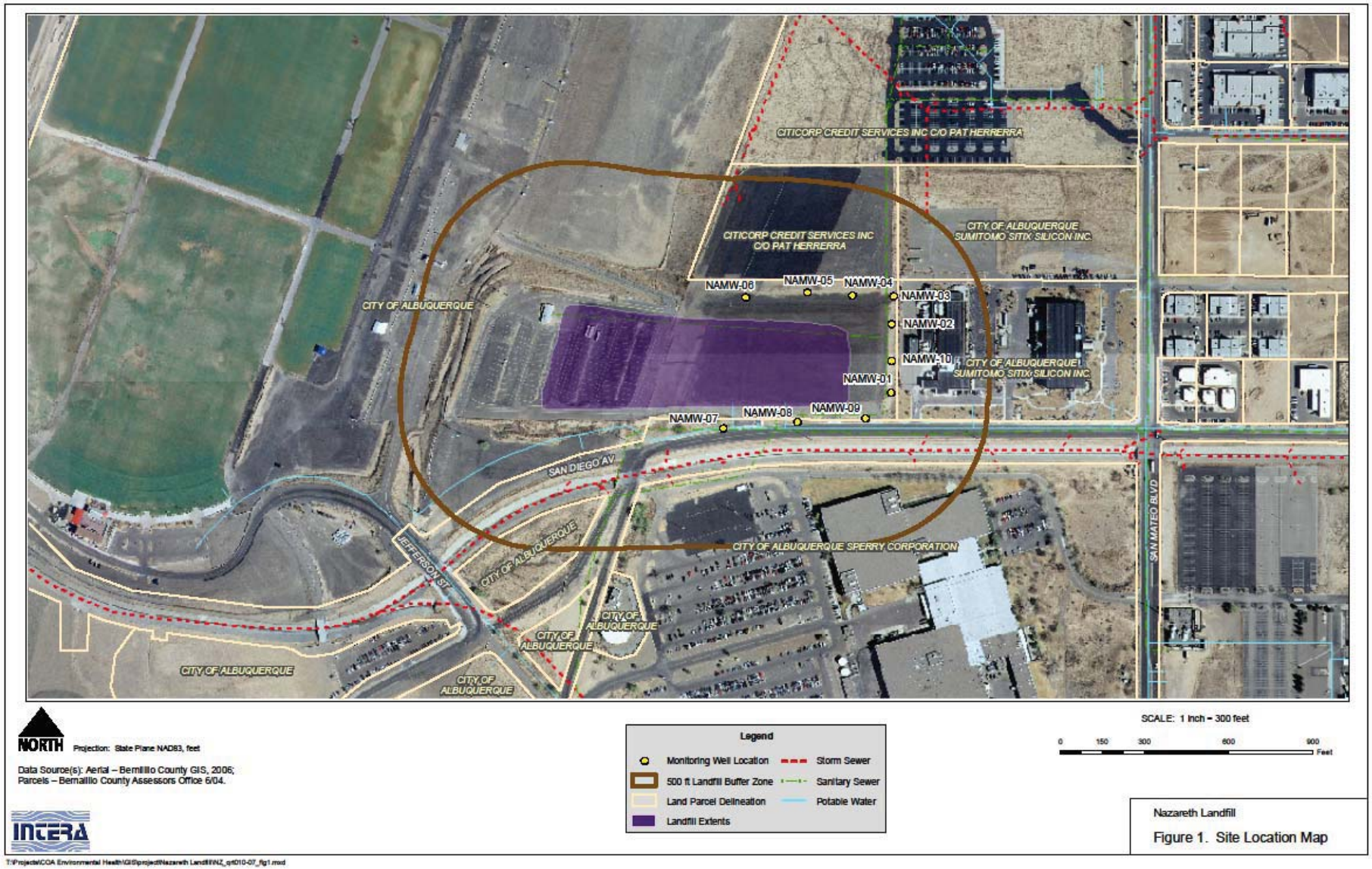

Figure 1 - Site Plan

Figure 2 - Gas Probe Locations

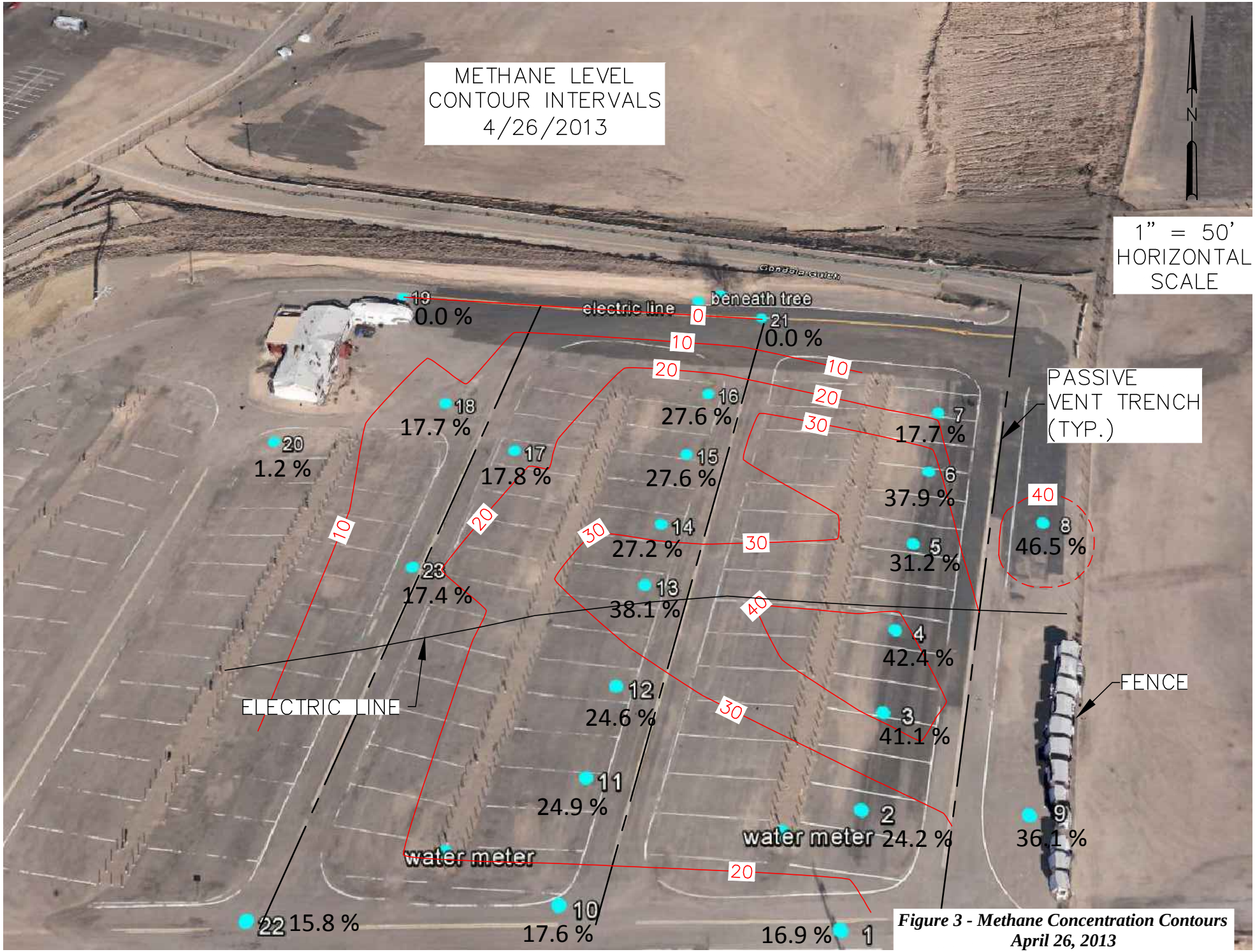

Figure 3 - Methane Concentration Contours
April 26, 2013

Figure 4 - Methane Concentration Contours
June 10, 2013