

**PROPOSED UNDERGROUND STORAGE TANK (UST)
RELEASE CASE CLOSURE EVALUATION SUMMARY**

LUST Case File #: 5510.01
Facility ID # 0-005252
Coconino County

Page Mobil
55 S. Lake Powell Blvd.
Page, Arizona 86040

Background:

The former Page Mobil remains inactive as a fuel facility. The first underground storage tank (UST) system (USTs #1-5) was installed in 1975, and was permanently removed in 1986. The second UST system of UST #6-11 were installed in 1986. Soil samples were collected in 2002 due to odors at a business (Taco Bell) located approximately 90 feet west of the Page Mobil canopy. In 2007, monitor wells were installed, and petroleum contamination was confirmed. LUST number 5510.01 was assigned in May 2007 to the gasoline dispenser island. The UST system was closed (by removal) in December 2009. The 2009 *Site Characterization Report* fully described the regional geology and hydrogeology. The depth to groundwater at the Site was approximately 4 to 7 feet below ground surface. The adjacent property to the east is the Page Texaco facility with a reported release (LUST #4396.01-.02) that has impacted groundwater that has migrated onto the former Page Mobil property and comingled with the subject plume. The *Corrective Action Plan* (CAP) was approved in August 2010. A vapor extraction remedial system operated between July 2010 and May 2011 at the site. In August 2014, ADEQ approved the CAP modification to change the remedial method to monitored natural attenuation (MNA), with annual groundwater monitoring.

Removal or control of the source of contamination:

In December 2009, all six (6) USTs were removed from the Site. Eleven (11) soil samples were collected from the sidewalls of the excavations, four (4) samples were collected below the dispenser islands, and two (2) samples were collected as composite samples from the stockpiled soil that was removed from the excavation. The UST Closure Report identified the presence of stained soil in the tank excavation sidewalls and the presence of a sheen or free product on the water within the excavation. Blaes Environmental Management Inc. (BEM) conducted active remediation. A vapor extraction system (VES) operated from July 2010 to May 2011. An air sparge (AS) system also operated from 2010 to 2014. During the last remedial operational period of January 1, 2014 to April 1, 2014 BEM conducted two operational and maintenance visits to the site. During each visit, the system performance was monitored by observing system parameters such as temperature, pressure, flow rate, total run-time and system alarms. Each item was recorded and any necessary adjustments were made to assure optimal operation. Typical maintenance includes removing water condensate and solids from their respective filters, lubricating and/or oiling the blowers (compressors) and (if necessary) tightening the blower belts for proper operation. During the remedial period, the Rietschle DLR-100 AS system operated for a total of approximately 180.3 hours. The timer on the Rietschle AS system was programmed

for 3-hours of air injection for every 24-hour period (15-minutes of operation per two-hour period) from January 1, 2014 to April 1, 2014. Air was injected into a rotation of eight (8) of the eleven (11) AS wells associated with the former Mobil facility. During the remedial period, the average flow rate was approximately 5.3 cfm per AS well. The average total pressure for the AS system was approximately 26.5 psi. The groundwater air-sparging program produced diminished or asymptotic results compared to the beginning of the remediation program, so it was discontinued in 2014.

Since the initiation of the VES activities at the former Page Mobil site on July 8, 2010 through May 31, 2011, an estimated 7,857 pounds of petroleum hydrocarbons (88.5 lbs. of benzene) have been removed from the vadose soils from both the former Page Mobil and Page Texaco sites. BEM recommended a revised CAP implementing MNA be submitted for review by ADEQ.

Characterization of the groundwater plume:

The Site is located in a topographically high area as compared to the rest of the city. The unconfined aquifer at the Site is located in unconsolidated sands of variable thickness ranging from 5 to about 20 feet. Depth to bedrock varies from 8 feet to greater than 15 feet. The aquifer is within recent eolian deposits consisting of fine and very fine sand and weathered bedrock that overlies and was derived from the Jurassic Navajo Sandstone. Because of the heterogeneity of the aquifer and some of the monitor wells were completed within bedrock, the depth to groundwater can vary by several feet. Recharge of this aquifer is likely due to landscape irrigation (especially in the housing development about 500 feet northeast/up-gradient from the Site) and some leakage of water lines, septic and sewer systems, based on odors and apparent biological activity observed during well sampling. The unpaved areas of the housing development are another probable area of surface recharge of the aquifer. The existence of this aquifer is dependent on the low permeability of the Navajo Sandstone as compared to the unconsolidated fine sand and silts of the overlying eolian deposits. The potential of groundwater infiltrating the Navajo Sandstone is highly dependent on the degree of cementation and the presence of fractures.

The depth to the water table varies through the year and appears to respond to expected spring and summer precipitation. Expected hydrologic characteristics of this type aquifer are predominantly good porosity and moderate to high permeability. Because the exact nature of the subsurface topography of the Navajo Sandstone is not known and the heterogeneity within the unconfined aquifer discovered during monitor well installation the groundwater flow rates are likely highly variable. The groundwater gradient is relatively steep at ~0.05 ft. /ft. and flow direction is approximately to the southwest. Because of the low potential for the eolian sediments to be a productive aquifer, and potential contamination from surface runoff and irrigation, no potable water is produced from this unconfined aquifer. Therefore, wells are not considered potential receptors.

Groundwater plume stability:

Trend analysis was performed using the GIS Mann-Kendall Tool Kit for constituent analysis. The trend analysis results for the Former Page Mobil sample data for PM-1, PM-3, PM-4, and

PM-6 showed that the concentration trends were either decreasing or stable. The results for PM-2 showed that 1, 2 DCA was probably increasing while the results for the other contaminants in PM-2 show either stable or decreasing trends in the data. The 1, 2-DCA concentrations in PM-2 have been below the AWQS since at least 2014. PM-2 is the closest well to the Former Page Mobil release point (the gasoline dispenser island).

The remediation efforts by BEM described in their June 20, 2014 report, along with natural attenuation, appears to have contributed to the predominantly downward trend in contaminant levels. Samples from the down gradient wells PC-5, and PC-7 did not show detectable contamination in the November 21, 2019 sampling. These wells are located off-site at Lake Powell Boulevard.

Natural Attenuation:

There may be several factors that control the reduction of contaminant concentration levels seen in the monitor wells. Biological attenuation is probably occurring to some extent because of nutrients available from the leaking sewer systems. What is also likely is that the groundwater flow through the aquifer beneath the Site is roughly balanced by infiltration into the shallow aquifer. Contaminant reduction would be primarily due to dilution and dispersion. Significant reductions would occur during high flow events that would result from infiltration after a sustained summer storm.

Degradation of petroleum hydrocarbons in groundwater can proceed via aerobic or anaerobic microbial processes. Bacteria present in soil and groundwater obtain energy for cell production and maintenance by facilitating thermodynamically advantageous oxidation-reduction reactions involving the transfer of electrons from electron donors to available electron acceptors. When sufficient dissolved oxygen (DO) is present in groundwater, biodegradation of hydrocarbons proceeds aerobically (with oxygen as the electron acceptor). As oxygen becomes less available, anaerobic microorganisms consume electron acceptors in the following order of preference: nitrate, manganese (IV), iron (III), sulfate, and carbon dioxide. Anaerobic biodegradation processes are thus associated with decreased concentrations of nitrate and sulfate, increased concentrations of dissolved manganese and ferrous iron, and production of methane within the plume (i.e., elevated when compared to background).

The following geochemical indicator parameters were collected as part of routine MNA evaluations from 2014 to 2019: manganese, methane, sulfate, total nitrate, and total nitrite. In addition, DO, oxidation-reduction potential (ORP), and ferrous iron field measurements were collected.

Threatened or impacted drinking water wells:

ADEQ conducted a review of registered wells in the Arizona Department of Water Resources (ADWR) well database. 137 registered wells are located within 0.5 mile of the Site. All of the wells are monitoring, observation or remedial wells. Ten of the wells registered as exempt wells, are observation/monitoring wells.

The Page Utility Enterprises provides potable water to the City. The City operates a regulated public water system (AZ04-003017). The City obtains water from Lake Powell and the Colorado

River. According to the 2019 ADEQ Consumer Confidence Report, no VOCs were detected in samples collected during the February 2019 sampling event.

According to ADWR, any new or replacement well located at or near the LUST site would need to meet the criteria of A.A.C. R12-15-1302 (B) (3).

Other exposure pathways:

Other nearby properties included retail and commercial facilities, lodging, restaurants, a bank, and industrial buildings. There are no sensitive receptors in the area of the release or in the down-gradient direction within ¼ mile. The Coconino County Health Service building is about ¼ mile to the northwest (up-gradient), the Veterans Administration Clinic is about 550 feet to the northwest, and single family housing that may have elderly occupants are within ¼ mile to the northeast, east, and southeast of the Site. The groundwater contamination is limited to on-site, so it does not pose a threat to any off-site receptors.

Requirements of A.R.S. §49-1005(D) and (E):

The results of the corrective action completed at the site assure protection of public health, welfare and the environment, to the extent practicable, the clean-up activities completed at this site allow for the maximum beneficial use of the site, while being reasonable, necessary and cost effective.

Other information that is pertinent to the LUST case closure approval:

The facility and LUST files were reviewed for information regarding prior cleanup activities, prior site uses and operational history of the UST system prior to removal.

Groundwater tables:

PM-1 (cross gradient of source well)
Total Depth: 15 feet bgs Screened Interval: 5 – 15 feet bgs

Date	Benzene AWQS is 5.0 µg/L	MTBE Tier 1 Corrective Action Standard is 94 µg/L	Free Product Thickness (feet)	Depth to Water (feet)
May 2007	130	350	0.00	6.42
2009-2010			0.76-0.43	7.66-7.40
July 2010-May 2011 SVE/AS				
September 2011	1,040	102	0.00	7.55
December 2011	1,180	72.1	0.00	7.50
March 2012	1,040	111	0.00	7.35
September 2012	1,540	64	0.00	7.72
June 2013	417	83	0.00	7.43

December 2013	970	44	0.00	7.16
April 2014	940	59	0.00	6.98
October 2014	689	45.6	0.00	7.48
October 2015	457	39.1	0.00	7.25
October 2016	42.4	19.3	0.00	7.46
October 2017	<1.0	11.7	0.00	7.76
October 2018	<1.0	18.9	0.00	8.58
November 2019	<1.0	13.4	0.00	8.20

PM-2 (source area)

Total Depth: 15 feet bgs Screened Interval: 5 – 15 feet bgs

Date	Benzene AWQS is 5.0 µg/L	MTBE Tier 1 Corrective Action Standard is 94 µg/L	Free Product Thickness (feet)	Depth to Water (feet)
May 2007	14,000	1,100	0.00	6.06
2009-2010	---	---	0.54-0.16	7.15-6.67
July 2010-May 2011 SVE/AS				
September 2011	9,960	174	0.00	7.44
December 2011	16,400	492	0.00	6.85
March 2012	3,700	115	0.00	6.67
September 2012	16,400	492	0.00	7.33
June 2013	2,890	61	0.00	7.4
December 2013	4,000	120	0.00	6.54
April 2014	270	20	0.00	6.72
October 2014	11	570	0.00	7.25
October 2015	2,160	370	0.00	6.86
October 2016	2,790	75.3	0.00	7.58
October 2017	<1.0	283	0.00	8.56
October 2018	<1.0	298	0.00	10.80
November 2019	<1.0	179	0.00	9.93

PM-3 (cross gradient)

Total Depth: 15 feet bgs Screened Interval: 4 – 14 feet bgs

Date	Benzene AWQS is 5.0 µg/L	MTBE Tier 1 Corrective Action Standard is 94 µg/L	Depth to Water (feet)
May 2007	<0.50	37	5.04
December 2009	<1.0	7.57	6.30
July 2010-May 2011 SVE/AS			
December 2011	<1.0	2.8	5.45

September 2012	<1.0	<1.0	5.14
June 2013	<1.0	<1.0	5.05
October 2013	<1.0	51.00	4.79
December 2013	<1.0	1.2	4.93
October 2014	<0.5	<5	5.07
October 2015	<0.5	<2.0	4.77
October 2016	<1.0	<1.0	5.04
October 2017	<1.0	<1.0	4.94
October 2018	<1.0	<1.0	4.92
November 2019	<1.0	<1.0	5.33

PM-4 (cross gradient)
Total Depth: 15 feet bgs Screened Interval: 4 – 14 feet bgs

Date	Benzene AWQS is 5.0 µg/L	MTBE Tier 1 Corrective Action Standard is 94 µg/L	Depth to Water (feet)
May 2007	11,000	800	5.49
December 2009	514	482	7.26
July 2010-May 2011 SVE/AS			
December 2011	7.8	538	5.79
September 2012	<1.0	<1.0	6.61
June 2013	4.5	85.4	5.55
October 2013	<2.0	64	5.87
December 2013	<2.0	<1.0	5.90
October 2014	<0.50	<5	6.25
October 2015	<0.5	53.8	5.75
October 2016	<1.0	<1.0	6.42
October 2017	<1.0	<1.0	6.02
October 2018	<1.0	23.8	6.25
November 2019	<1.0	24.9	6.37

PM-6 (up gradient)
Total Depth: 15 feet bgs Screened Interval: 5 – 15 feet bgs

Date	Benzene AWQS is 5.0 µg/L	MTBE Tier 1 Corrective Action Standard is 94 µg/L	Depth to Water (feet)
April 2009	1.07	19.4	6.31
June 2009	41.4	17.8	6.50
December 2009	17.5	10.0	6.85
July 2010-May 2011 SVE/AS			
December 2011	3.2	2.9	6.51

September 2012	<1.0	4.0	7.08
March 2013	4.5	1.6	6.37
June 2013	<1.0	2.7	6.91
October 2013	<2.0	2.4	6.59
December 2013	<2.0	<1.0	6.03
October 2014	<0.50	<5.0	6.55
October 2015	<0.5	<2.0	6.47
October 2016	<1.0	<1.0	7.29
October 2017	<1.0	<1.0	7.47
October 2018	<1.0	<1.0	7.14
November 2019	<1.0	<1.0	6.68

PM-5 (cross gradient towards L4396)
Total Depth: 15 feet bgs Screened Interval: 5 – 15 feet bgs

Date	Benzene AWQS is 5.0 µg/L	MTBE Tier 1 Corrective Action Standard is 94 µg/L	Depth to Water (feet)
April 2009	1,900	<100	6.71
June 2009	5,590	224	6.48
December 2009	Not analyzed	Not analyzed	Not measured
July 2010-May 2011 SVE/AS			
December 2011	1,210	<10	6.60
September 2012	1,250	<10	9.74
March 2013	678	<10	6.58
June 2013	1,030	<10	6.46
October 2013	890	<10	6.36
December 2013	180	<10	6.20
October 2014	780	<50.0	6.82
October 2015- November 2019	Not analyzed- well damaged	Not analyzed- well damaged	Not measured – well damaged

PC-7 (down gradient off-site- installed for L4396)
Total Depth: 15 feet bgs Screened Interval: 5 – 15 feet bgs

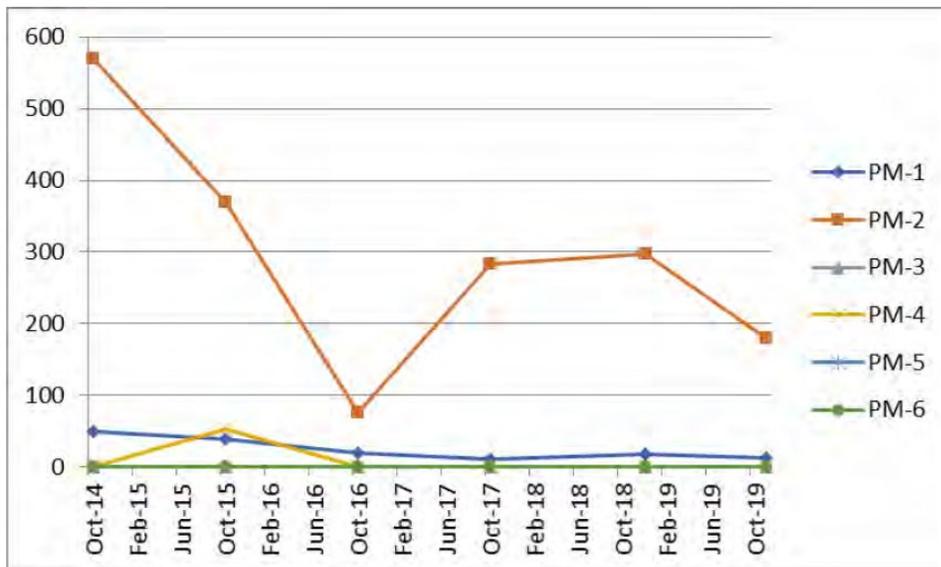
Date	Benzene AWQS is 5.0 µg/L	MTBE Tier 1 Corrective Action Standard is 94 µg/L	Depth to Water (feet)
February 2018	<0.500	<2.0	9.94
October 2018	<1.0	<1.0	Not reported*
November 2019	<1.0	<1.0	Not reported*

*With the exception of February 2018, no reports found with depth to water measurements for the two off-site wells

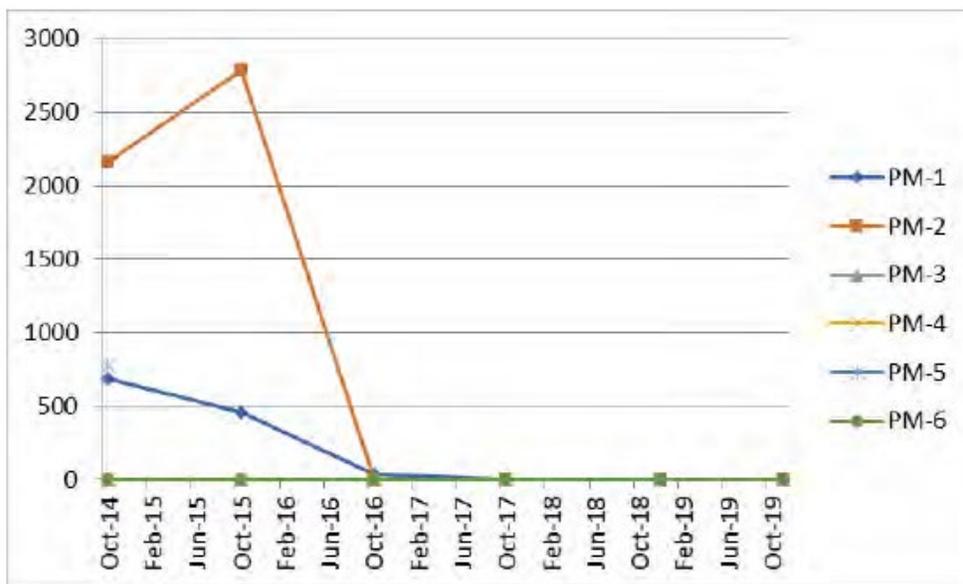
PC-5 (down gradient off-site- installed for L4396)
Total Depth: 15 feet bgs Screened Interval: 3 – 15 feet bgs

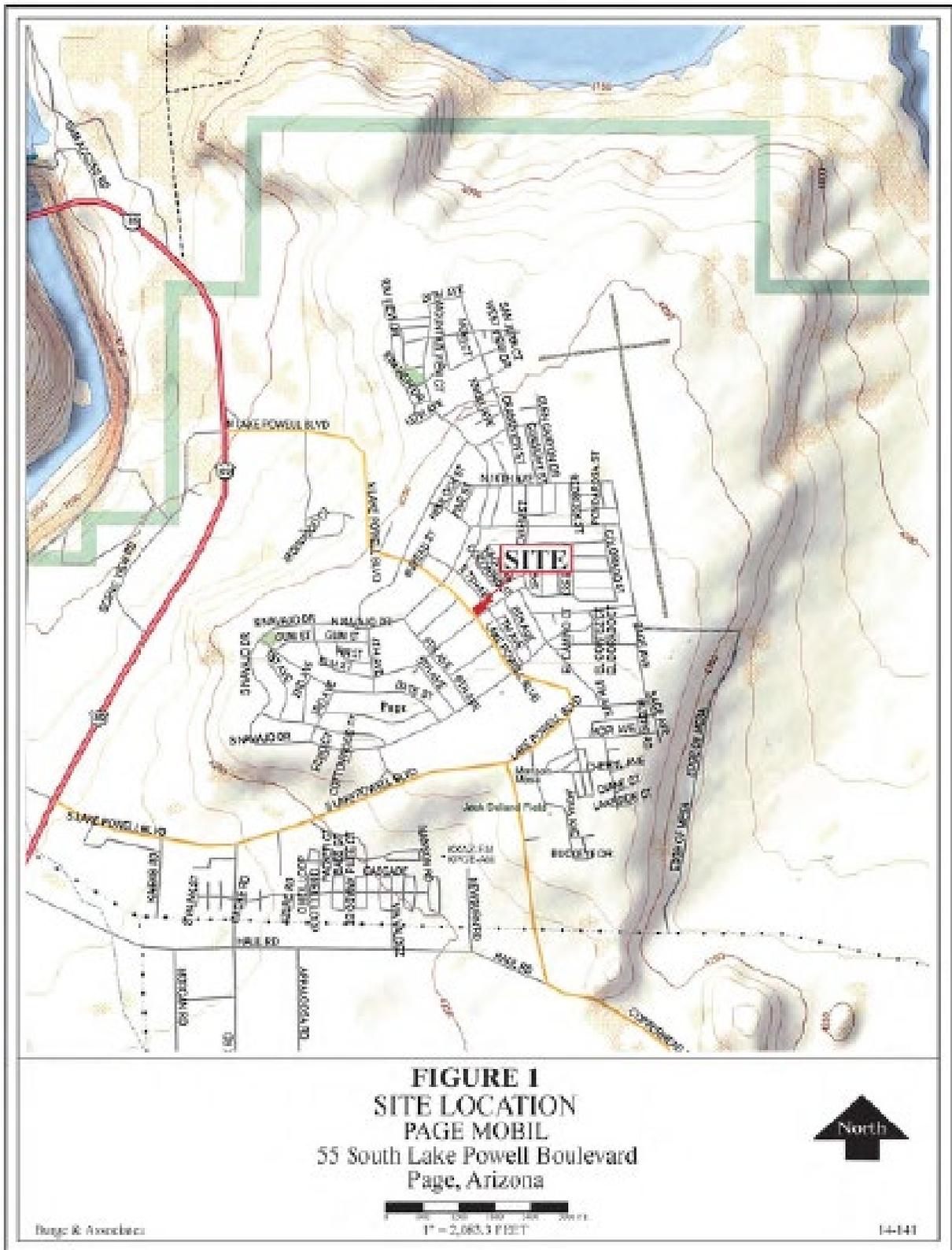
Date	Benzene AWQS is 5.0 µg/L	MTBE Tier 1 Corrective Action Standard is 94 µg/L	Depth to Water (feet)
February 2018	<0.500	35.5	8.56
October 2018	<1.0	<1.0	Not reported*

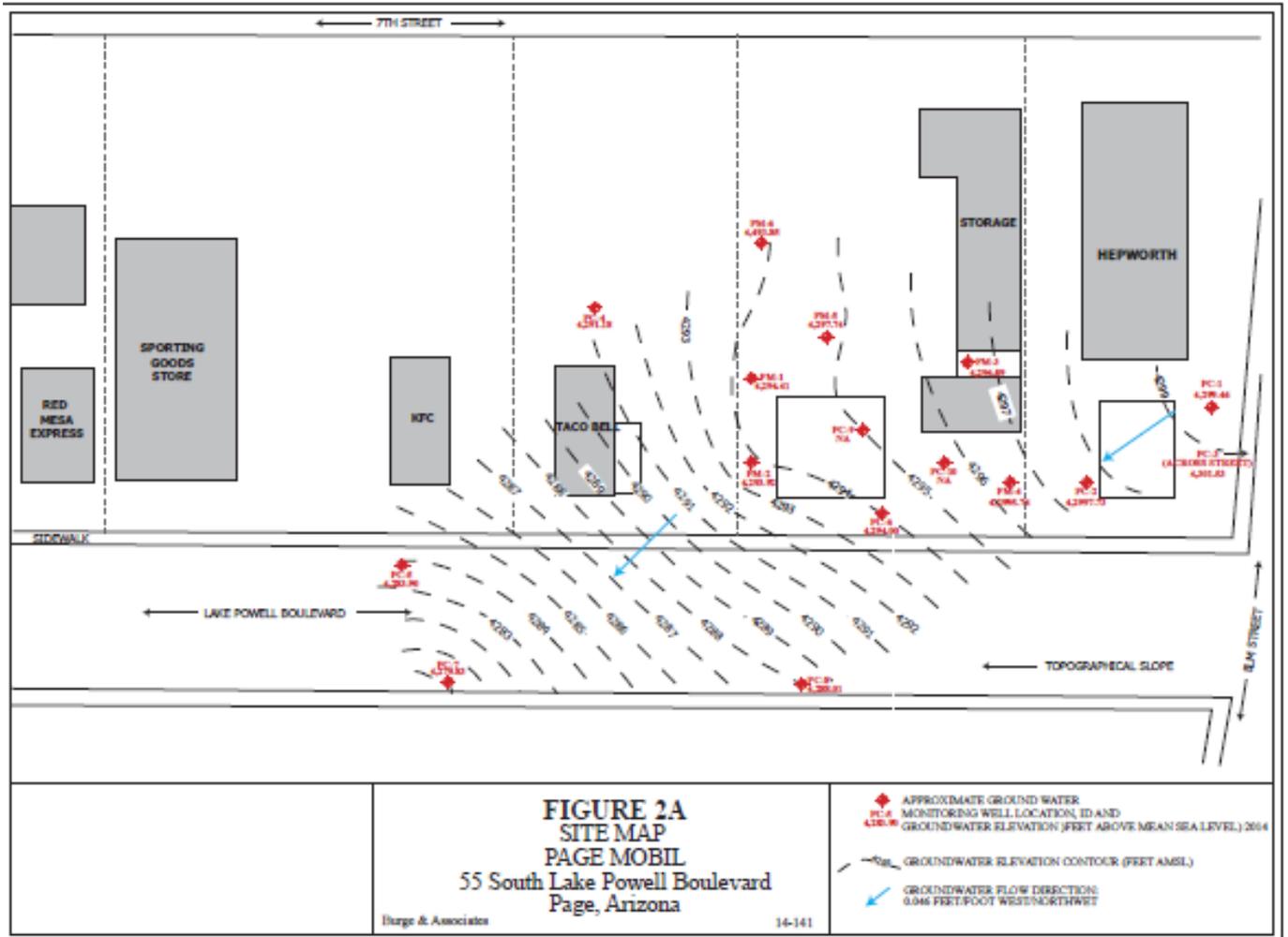
Methyl-tert-butyl Ether (MTBE)



Benzene









Burge & Associates

FIGURE 1A
0.5-MILE RADIUS MONITORING WELL LOCATIONS
PAGE MOBIL
55 South Lake Powell Boulevard
Page, Arizona

14-141