

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

LUST Case File #: 4396.01-.02
Facility ID # 0-003594
Coconino County

All American Fuel
57 S. Lake Powell Blvd.
Page, Arizona 86040

Background:

All American Fuel formerly known as Page Chevron (1980-2016) and originally as Page Texaco, is an active fuel facility. The UST owner/operator is C.E. Hepworth, Inc. According to ADEQ records, the first UST was installed in 1978 and contained diesel fuel. Three gasoline USTs were installed in 1982 and were permanently removed in March 1996. Leaking UST (LUST) number 4396.01 was assigned in March 1996 to a gasoline UST, and LUST number 4396.02 was assigned in March 1996 to gasoline product piping. A 500-gallon waste oil UST was installed in August 1989, and was removed in December 1994. Three gasoline USTs were installed in December 1996. No site investigations occurred until 2008 under the UST State Assurance Fund. ADEQ approved the *Site Characterization Report* in 2009. The depth to groundwater at the Site was approximately 4 to 7 feet below ground surface (bgs). The groundwater contamination from this site migrated west/southwest beneath the former Page Mobil site and comingled with their plume. The former Page Mobil LUST release #5550.01 was closed in accordance with ADEQ's requirements in December 2020. The *Corrective Action Plan (CAP)* for the former Page Texaco site was approved in August 2010. A soil vapor extraction (SVE) 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 at both sites.

Removal or control of the source of contamination:

In March 1996, the original three gasoline USTs were removed from the former Page Texaco site. The UST Closure Report identified the presence of volatile organic compounds (VOCs) in the soil. On April 9, 2010, Blaes Environmental Management (BEM) conducted a short SVE remedial feasibility test at the site. During the period ranging from April 2010 through June 2010, BEM undertook the preliminary work to initiate a SVE and groundwater air sparging remediation program at the site.

An all-electric 250 cubic feet per minute catalytic oxidizer (Mako #MIM198) began operation at the former Page Texaco site on June 15, 2010 utilizing wells CV-1 through CV-10. On July 8, 2010, the same catalytic oxidizer also began extracting vapors from the adjacent former Page Mobil site utilizing wells MV-1 through MV-11. Due to low vapor concentrations observed throughout the remedial period, all former Page Texaco SVE wells (CV-1 - CV-10) were closed on October 27, 2010. The former Page Texaco SVE wells were closed in order to increase vacuum and flow (and therefore mass removal) from the former Page Mobil site. In addition to

the Rietschle DLR-100 air sparge system, a Husky VT631503AJ Compressor (6.5 standard cubic feet per minute [scfm] @ 40 psi, 5.5 scfm @ 90 psi, 135-psi max) also began operation at the Page Texaco site on September 15, 2011 utilizing sparge wells CA-1 through CA-4. On June 6, 2011, BEM attempted to install an additional three temporary air sparge wells located near groundwater monitoring well PC-2 on June 6, 2011. The attempt using a hand auger proved unsuccessful due to refusal of the tool at approximately seven feet below ground surface (bgs).

Due to low vapor concentrations observed throughout the remedial program, all former Page Texaco vapor extraction wells (CVI - CV10) were closed on October 27, 2010. The former Page Texaco SVE wells were closed in order to increase vacuum and flow (and therefore mass removal) from the former Page Mobil site. The SVE system ran for a total of 2,905.2 hours from June 15, 2010 to October 27, 2010, achieving a cumulative up-time of approximately 90.3%. During the remedial program, the SVE system maintained an average vacuum of 33 inches of water column and an average flow rate of 178 cfm. It should be noted that on July 8, 2010, SVE wells associated with the neighboring former Mobil facility (ADEQ LUST #5510.01) were opened to the SVE system, which was shared between the two sites.

Since the initiation of the vapor extraction system (VES) activities at the Page Texaco site on July 8, 2010 through May 31, 2011, an estimated 7,857 pounds of petroleum hydrocarbons (an estimated 88.5 pounds lbs of benzene) was removed from the vadose soils from both the former Page Mobil and Page Texaco sites.

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 bgs. 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 because some of the monitor wells were completed within bedrock, the depth to groundwater at the site can vary by several feet. Recharge of this shallow 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. Groundwater flow rates are suspected to be highly variable at the site based upon the heterogeneity within the unconfined aquifer that was characterized during monitor well installation. The water elevation data collected at the site indicates that the groundwater gradient is relatively steep at approximately

0.05 ft. /ft.; the 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, domestic and/or municipal wells are not considered potential receptors.

Groundwater sampling began at the site in April 2009, and continued until November 2019. Historic VOC concentrations in monitoring well PC-2 exceeded applicable AWQS or Tier 1 Corrective Action Guidance Levels. The highest benzene concentration was 13,200 micrograms per liter ($\mu\text{g/L}$) in PC-2 in April 2009. After active remediation, the benzene concentration decreased to approximately 1,400 $\mu\text{g/L}$ in PC-2. Benzene concentrations continued to decrease via natural attenuation. During the November 2019 groundwater sampling event, the benzene concentration in monitoring well PC-2 was 50.7 $\mu\text{g/L}$, which exceeds the AWQS of 5 $\mu\text{g/L}$. Benzene concentrations were less than laboratory reporting limits in the other on-site monitoring well PC-2.

The off-site (down-gradient) monitoring wells (PC-5 and PC-7) were sampled in February and October 2018 and November 2019 to account for possible seasonal variations. These down-gradient wells have not been impacted by the benzene plume based on sampling results that show no benzene detections above laboratory reporting limits.

Groundwater plume stability:

Concentration trend analysis was performed using the GIS Mann-Kendall (MK) Tool Kit for constituent analysis. Because the former Page Mobil and Page Texaco are adjacent sites, the analysis used well data selected from both locations as of November 2019.

MK analyses were done on samples from the Former Page Mobil wells PM-1, PM-2, PM-3, PM-4, and PM-6, as well as the Page Texaco wells PC-1, PC-2, and PC-3 to examine trends in contaminant concentrations.

The trend analysis results for the Page Texaco sample data for PC-1 and PC-3 showed that benzene, toluene, ethylbenzene, total xylenes, 1,2 DCA, 1,2,4 TMB and 1,3,5 TMB were either decreasing, stable or there was no trend to the data. The results for PC-2 showed that naphthalene was probably decreasing while the results for the other contaminants in PC-2 show either stable or decreasing trends in the data. The trend for benzene is generally decreasing.

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 concentrations. Samples from the down gradient wells PC-5, and PC-7 did not show detectable contamination in the November 21, 2019 sampling event. 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 may be 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. The results indicate there are 137 registered wells 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 of the City water 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:

In 2010, for the adjacent LUST site (former Page Mobil), a soil gas survey was conducted within the backfill materials above both the sewer and water utility lines that run down the northern boundary of Lake Powell Boulevard from Elm Street to Navajo Drive. Since the former Page Texaco site lies at the corner of Elm Street and Lake Powell Boulevard, several of the soil gas survey points potentially intercepted the lateral edge of the Page Texaco groundwater contaminant plume. Each vapor sample was field screened for percent of the lower explosive limit (LEL), oxygen concentration (%), carbon monoxide concentration (%), and hydrogen

sulfide concentration (%) utilizing a combustible gas indicator (CGI) meter; as well as for relative volatile organic compound (VOC) concentrations utilizing a photo-ionization detector (PID). The data collected during the soil gas survey indicated that combustible hydrocarbon vapors existed in a very narrow section of the backfill materials above the sewer line trench near the boundary between the former Page Mobil property and the former Taco Bell property. This vapor did not appear to be related to the former Page Texaco hydrocarbon plume, rather it appeared to be associated with the Page Mobil LUST site.

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 (cross-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 and concentrations of contaminants are declining; therefore, it is believed that there is no 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 data tables:

PC-1 (up-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	Depth to Water (feet)
April 2009	7.65	<1.0	8.36
December 2009	<1.0	<1.0	7.37
March 2010	<1.0	<1.0	6.34
December 2010	<1.0	<1.0	6.89
March 2011	<1.0	<1.0	6.98
July 2010-May 2011 SVE/AS			
June 2011	2.78	<1.0	6.72
September 2011	81.3	<1.0	6.83

December 2011	<1.0	<1.0	6.95
March 2012	<1.0	<1.0	6.90
September 2012	14.0	<1.0	7.04
June 2013	2.1	<1.0	6.69
December 2013	3.3	<1.0	6.37
April 2014	<2.0	<1.0	6.56
October 2014	3.08	<1.0	6.72
October 2015	<0.50	<1.0	6.15
October 2016	<1.0	<1.0	6.58
October 2017	<1.0	<1.0	6.66
October 2018	<1.0	<1.0	6.29
November 2019	<1.0	<1.0	6.81

PC-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	Depth to Water (feet)
April 2009	13,200	2,470	7.04
December 2009	2,490	1,170	7.80
March 2010	7,830	1,560	6.34
December 2010	2,720	743	7.10
March 2011	2,420	570	7.17
July 2010-May 2011 SVE/AS			
June 2011	2,530	284	6.85
September 2011	416	450	7.09
December 2011	1,410	267	7.02
March 2012	1,090	207	6.91
September 2012	791	116	7.28
June 2013	380	99	6.88
December 2013	120	46	6.73
April 2014	80	36	6.85
October 2014	147	58.6	7.15
October 2015	47.2	<40	6.67
October 2016	68.2	15.1	7.06
October 2017	7.06	6.38	7.08
October 2018	27.2	15.3	6.87
November 2019	50.7	12.2	7.31

PC-3 (cross gradient off-site)
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)
April 2009	7.49	<1.0	4.97
December 2009	<1.0	<1.0	5.0
March 2010	<1.0	<1.0	4.55
December 2010	<1.0	<1.0	4.71
March 2011	<1.0	<1.0	4.91
July 2010-May 2011 SVE/AS			
June 2011	<1.0	<1.0	4.77
December 2011	<1.0	<1.0	5.02
September 2012	<1.0	<1.0	5.00
June 2013	<1.0	<1.0	4.64
October 2013	<2.0	<2.0	4.54
December 2013	<2.0	<2.0	4.51
October 2014	<0.50	<5	4.75
October 2015	<0.5	<2.0	4.47
October 2016	<1.0	<1.0	4.37
October 2017	<1.0	<1.0	4.81
October 2018	<1.0	<1.0	4.02
November 2019	<1.0	<1.0	4.68

PM-4 (down-gradient off site at Page Mobil)
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

PC-7 (down gradient off-site)
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)
December 2011	<1.00	<1.00	10.17
September 2012	<1.00	<1.00	9.71
December 2013	<1.00	<1.00	9.96
November 2019	<1.00	<1.0	Not reported*

*No reports found with depth to water measurements for this well

PC-8 (down gradient off-site)
Total Depth: 15 feet bgs Screened Interval: 5 – 15 feet bgs

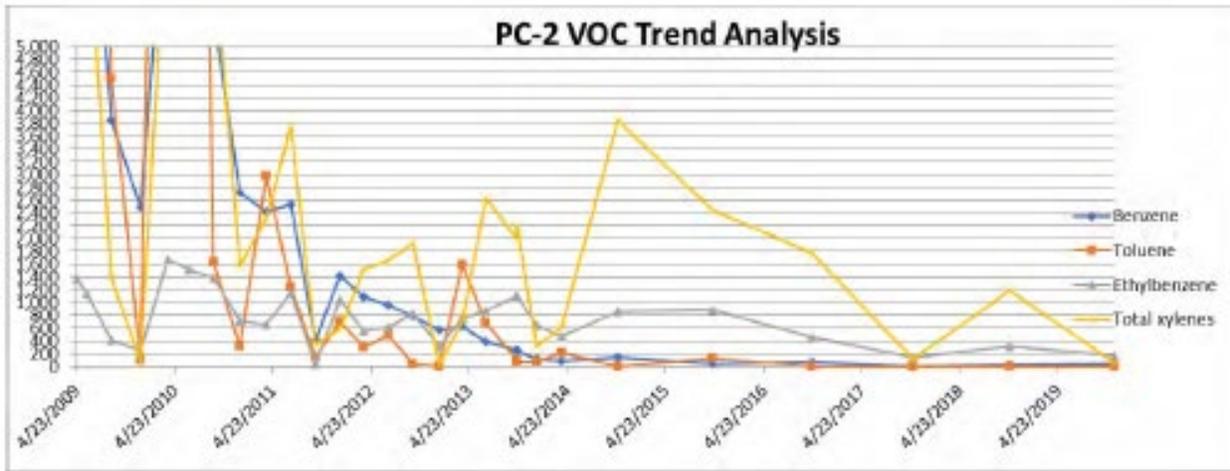
Date	Benzene AWQS is 5.0 µg/L	MTBE Tier 1 Corrective Action Standard is 94 µg/L	Depth to Water (feet)
December 2011	<1.00	<1.00	10.39
September 2012	<1.00	<1.00	9.60
December 2013	<1.00	<1.00	9.98
February 2018	<0.500	<2.0	9.94
October 2018	<1.0	<1.0	Not reported*
November 2019	<1.0	<1.0	Not reported*

*With the exception of February 2018, no reports found with depth to water measurements for this well

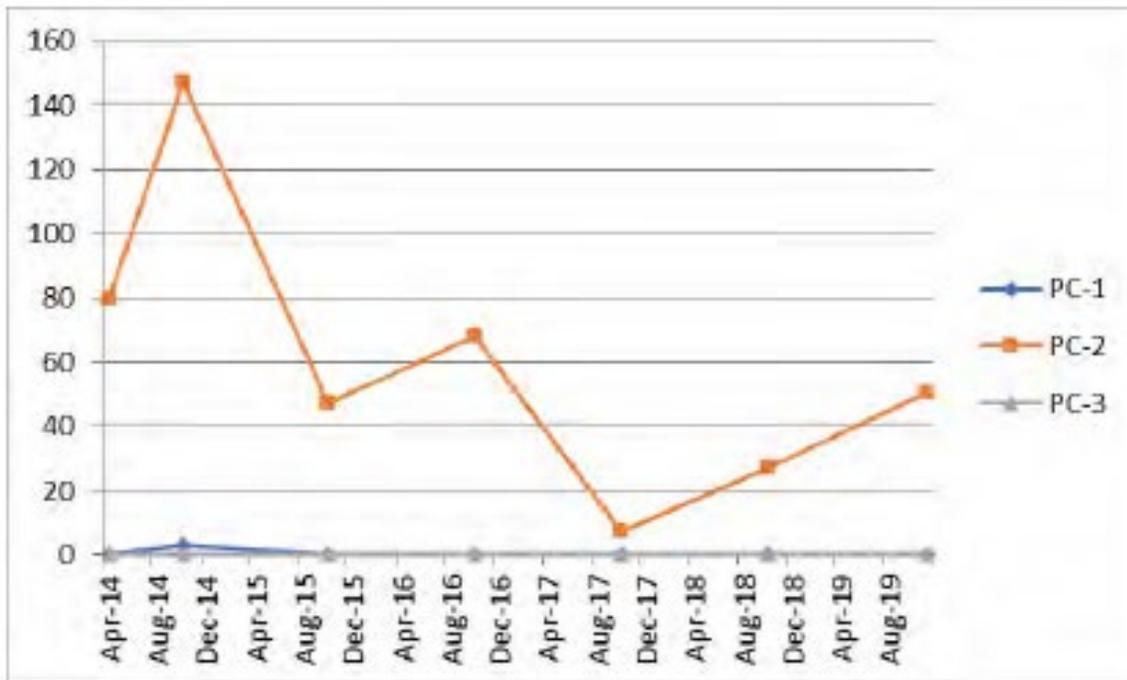
PC-5 (down gradient off-site)
Total Depth: 15 feet bgs Screened Interval: 3 – 15 feet bgs

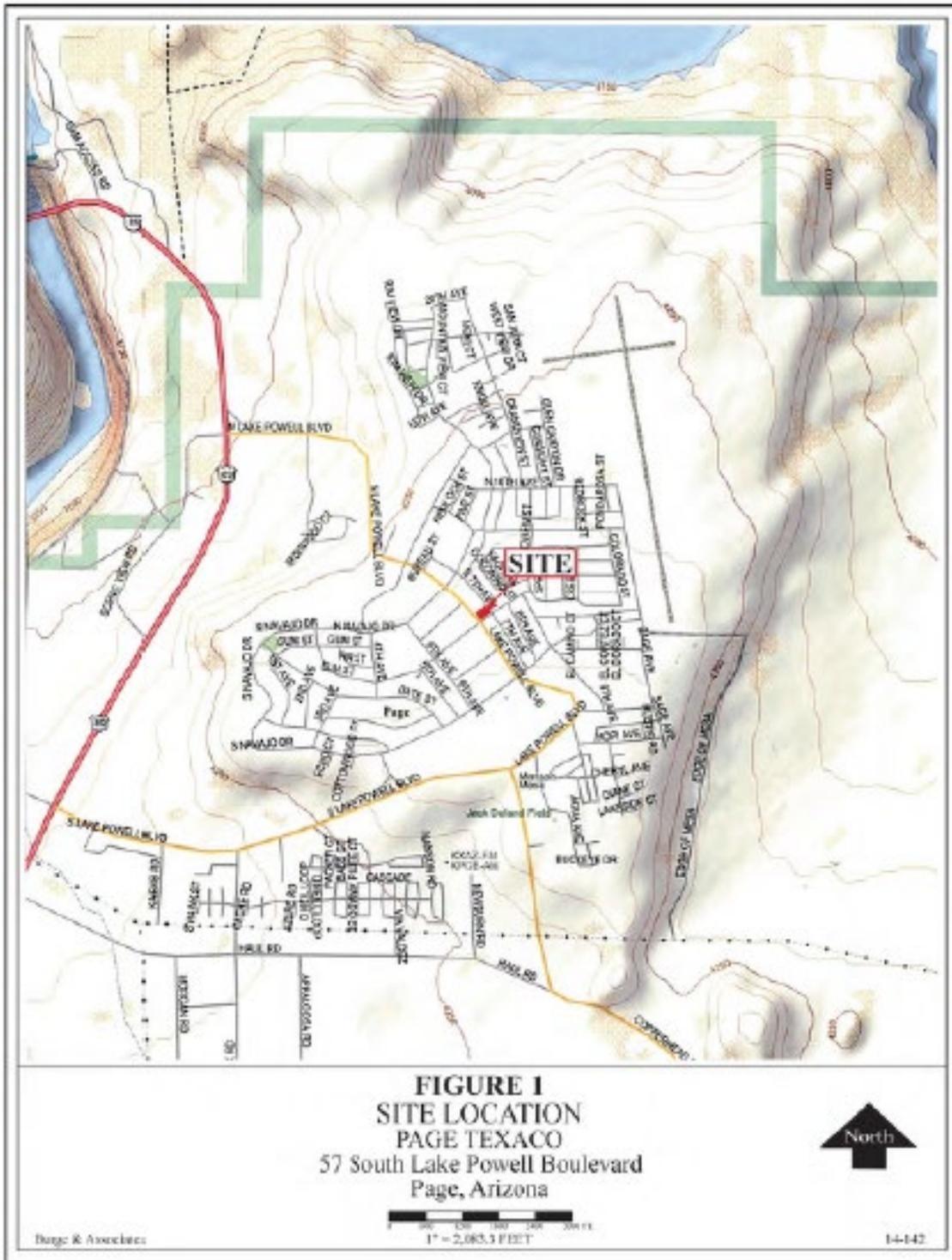
Date	Benzene AWQS is 5.0 µg/L	MTBE Tier 1 Corrective Action Standard is 94 µg/L	Depth to Water (feet)
December 2011	<1.0	14.8	6.12
September 2012	<1.0	11.2	6.81
December 2013	<2.0	<1.0	5.84
February 2018	<0.500	35.5	8.56
October 2018	<1.0	<1.0	Not reported*

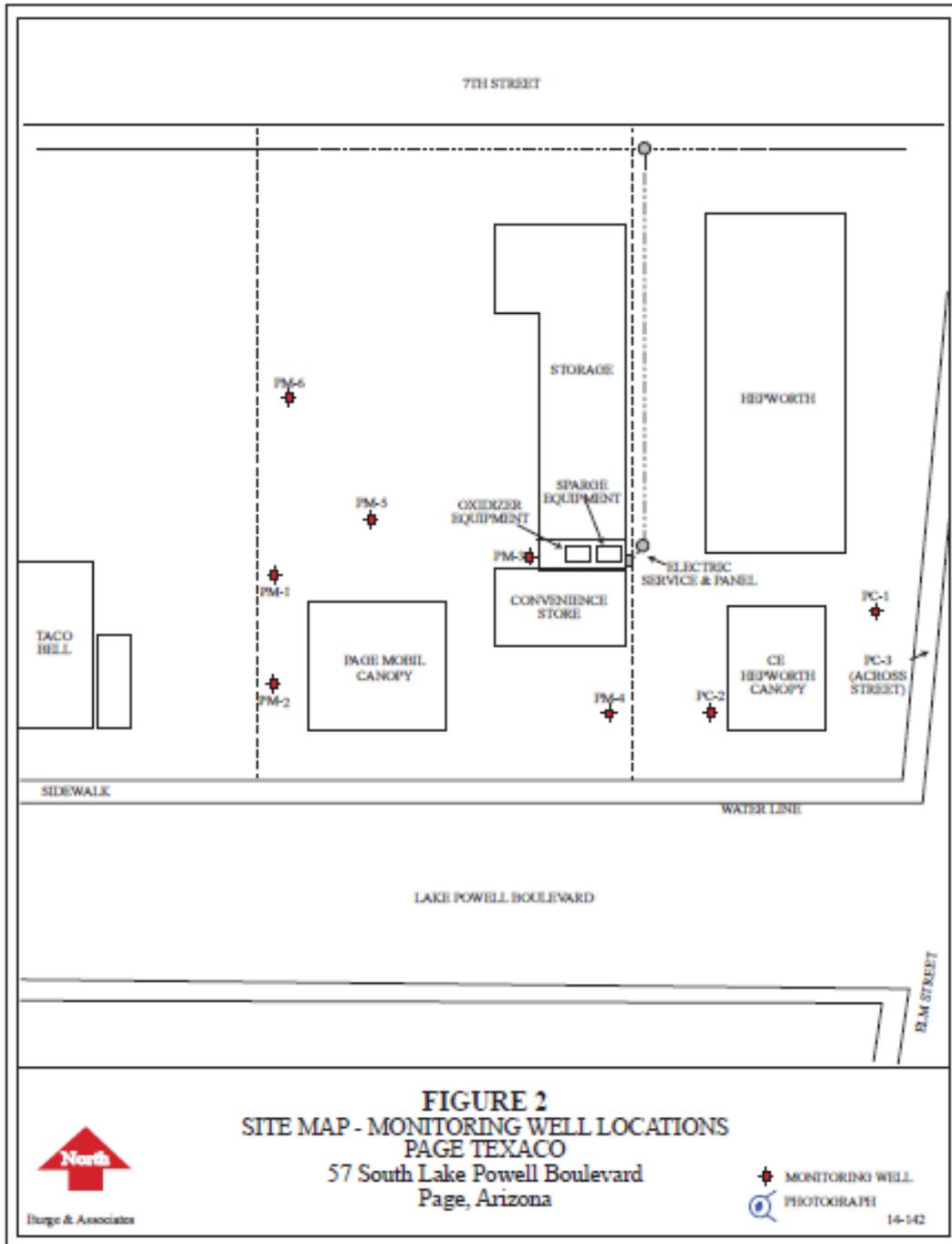
*With the exception of February 2018, no reports found with depth to water measurements for this well

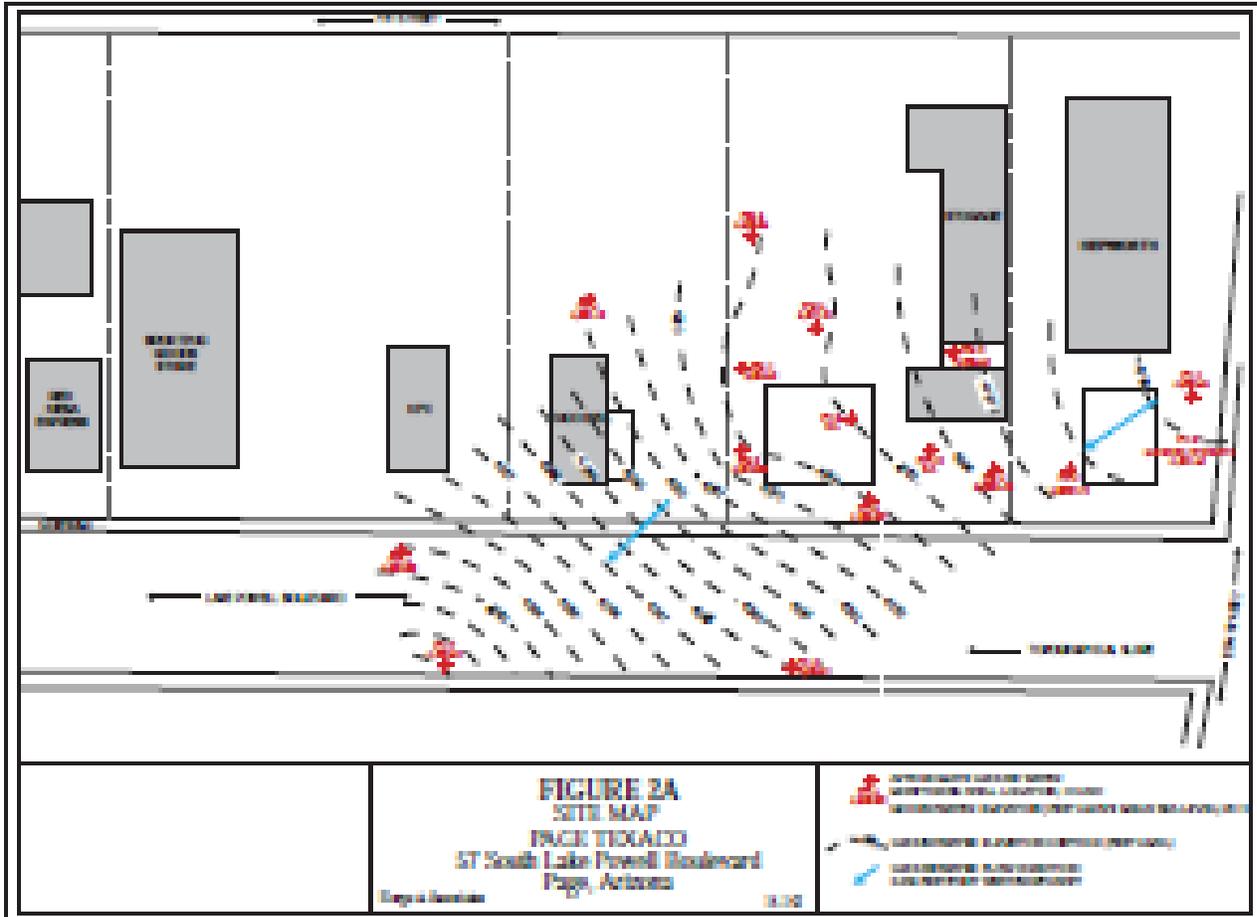


Benzene











Bunge & Associates

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

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