

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

**LUST Case File #: 1223.01
Facility ID # 0-006320
Navajo County**

**Crabtree Auto Center
615 Navajo Boulevard
Holbrook, Arizona 86025**

Background:

In 1988, Merrill Lee Young inherited the Crabtree Auto Center (CAC) property. From January 1988 to May 1993, Earl Craig operated Earl's Texaco. From August through December 1993, Tom Crabtree operated a retail gasoline station, and then operated an auto repair facility (Crabtree Auto Center) until November 1999. Southwest Transmission was also a tenant after November 1999, with an unknown end date. The current occupant is a pawn-shop which has been there since 2008 when the current property owner purchased it.

According to ADEQ files three underground storage tanks (USTs) were installed in 1979, and removed in September 1995. In April 1990, ADEQ opened leaking underground storage tank (LUST) release #1223.01 at the dispenser lines at the dispenser island, when two dispenser lines were replaced.

The LUST files indicate that Merrill Lee Young was the UST owner for the .01 LUST release, and Earl V. Craig was the UST operator. According to the LUST files, regular (leaded) and unleaded gasoline were stored in the USTs.

ADEQ opened LUST release #1223.02 in October 1995 when the waste oil tank was removed, and the LUST release was closed in April 2010.

According to the LUST files, the .01 release was assigned to an unleaded gasoline dispenser line and the LUST case was closed in June 1990. LUST release .01 was re-opened in August 2000 based on soil and groundwater data collected under the dispenser piping area during site characterization. Both soil and groundwater contaminant concentrations exceeded applicable regulatory standards for benzene. ADEQ requested a *Corrective Action Plan* from the UST owner and approved it in 2005.

Active remediation was conducted between 2009 and 2010. All corrective actions by the UST owner and their consultant, Tierra Dynamic Inc. (TDI) ended at the Site when the State Assurance Fund ended in June 2010. Groundwater analytical results from 2010 indicated that free product existed in several monitoring wells.

ADEQ sent a compliance status letter to the UST owner in 2013. According to the LUST file, Mr. Young's son responded that TDI had removed all of the remediation equipment from the Site in 2010 and that the Site was closed-out and the property had been sold in 2008.

Between 2014 and 2018, ADEQ contacted the current property owner regarding the State Lead program conducting corrective actions to complete LUST case closure. However, the property owner did not grant access to perform corrective actions. In 2019, ADEQ's State Lead program contracted with Groundwater & Environmental Services, Inc. (GES) to conduct groundwater sampling at the Site to evaluate site conditions. ADEQ attempted to contact Mr. Craig regarding conducting corrective actions through the Pre Approval Program, with no response.

Removal or control of the source of contamination:

The UST system, along with the waste oil tank, was removed from the Site in September 1995. In 2006, 3,802 cubic yards of soil was excavated and disposed of at the Painted Desert Landfill in Joseph City, Arizona. The depth of soil excavation was to groundwater at the clay/sand interface.

TDI installed a horizontal air sparge/soil vapor extraction (AS/SVE) system between 2006 and February 2009. The AS/SVE system operated between February 2009 and June 2010.

On September 4, 2019, GES and Resilient Drilling mobilized to abandon offsite monitoring well TDI-17 to remove it as a potential conduit for vertical cross-contamination to the subsurface as directed by ADEQ. Well TDI-17 was located in W. Erie Street about 50 feet north of the CAC property and within about 15 feet south of the Southwest Transmission property. Free product, believed based on prior lab analysis to be weathered and biodegraded Stoddard solvent, was removed from the well prior to abandonment activities. Then the surface was completed to match the surrounding road/asphalt.

TDI-17 was the most impacted monitoring well, containing multiple COCs above AWQS and containing up to two (2) feet of free product. TDI-17 was the only well that exhibited concentrations of ethylbenzene, total xylenes, and 1,2-DBA above AWQS. In addition, TDI-17 was the only well with detections of benzo[a]pyrene and TEL as well as significant concentrations of 1,2,4-trimethylbenzene (TMB), and 1,3,5-TMB. Based on the lab analysis of the free product, current and historical groundwater gradient, and location of the original UST infrastructure, the source of impacts detected in TDI-17 are not believed to have originated from CAC. It should be noted that based on ADEQ's records, the shallow groundwater in the area around the CAC property is contaminated by multiple LUST sites. Two of the LUST sites are located within 250 feet north, generally up gradient of the CAC site.

Characterization of the groundwater plume:

Groundwater impacts appear to be delineated through installation and monitoring of wells TDI-18, TDI-19, TDI-21, TDI-22, and W4529-7. The stability of plume contaminant concentrations in other site monitoring wells is described below. The source area well, TDI-1, is located in the former UST basin; it has not contained any COCs above AWQS based on the latest two groundwater monitoring events (June and September 2019). The majority of groundwater impacts above AWQS at CAC are limited to MTBE and 1,2-DCA and appear to be localized in the TDI-2 and TDI-20 area, both of which are adjacent to the reported source area.

Groundwater monitoring was conducted at the site on May 21-22, 2019. During the groundwater monitoring event, an oil-water interface probe/meter was used to measure depth to water (DTW) levels and thickness of potential free product in site monitoring wells. Free product was detected solely in former well TDI-17 at a thickness of 2.34 feet. Based on groundwater elevations calculated for May 21-22, 2019 used to construct groundwater contours, groundwater flow was to the southwest with a gradient of approximately 0.003 feet/foot.

Following collection of the set of DTW measurements on May 21, 2019, compliance (purge) groundwater samples were collected from site monitoring wells TDI-17, TDI-18, TDI-19, TDI-21, W4529-6, and W4529-7.

Analytical results from the May 21-22, 2019 groundwater monitoring event are summarized in tables below for COCs detected in samples collected from monitoring wells at concentrations greater than their respective AWQS. These COCs included ethylbenzene in TDI-17 (1,080 micrograms per liter [$\mu\text{g/L}$]), which exceeded the AWQS of 700 $\mu\text{g/L}$; 1,2-DBA in TDI-17 (0.0566 $\mu\text{g/L}$) AWQS of 0.05 $\mu\text{g/L}$; 1,2-DCA in TDI-19 (14.1 $\mu\text{g/L}$) and in W4529-6 (9.91 $\mu\text{g/L}$) exceeded the AWQS of 5.0 $\mu\text{g/L}$. It should be noted that TEL was also detected in TDI-17 at a concentration of 1.4 $\mu\text{g/L}$.

Groundwater monitoring was conducted at the site on September 4-5, 2019. DTW measurements were collected on September 4, 2019 from groundwater monitoring wells TDI-1, TDI-2, TDI-3, TDI-4, TDI-17, TDI-18, TDI-19, TDI-20, TDI-21, TDI-23, W4529-6, and W4529-7. Well TDI-23 construction records indicate that the total depth of the well is 19.75 feet below ground surface (bgs). However, during the September 4-5, 2019 monitoring event, it appeared to have a blockage in the casing at approximately 12.19 feet bgs; therefore, the well could not be gauged or sampled. Groundwater elevations ranged from 5,061.38 feet above mean sea level (amsl) in TDI-17 to 5,063.67 feet amsl in TDI-2. Based on the calculated groundwater elevations used to prepare potentiometric surface contours, groundwater flow was determined to be south/southwest with a gradient of approximately 0.015 feet/foot. On September 4-5, 2019, after DTW measurements were measured from the set of site monitoring wells, compliance (purge) groundwater samples were collected from wells TDI-1, TDI-2, TDI-3, TDI-4, TDI-17, TDI-18, TDI-19, TDI-20, TDI-21, W4529-6, and W4529-7.

Analytical results from the September 4-5, 2019 groundwater monitoring event are summarized below for chemicals of concern (COCs) detected in groundwater samples at concentrations greater than their respective AWQS: MTBE concentrations in TDI-2 (1,590 $\mu\text{g/L}$) and TDI-21 (616 $\mu\text{g/L}$) exceeded the AWQS of 94 $\mu\text{g/L}$; and 1,2-DCA concentrations in TDI-2 (10.9 $\mu\text{g/L}$), TDI-3 (7.48 $\mu\text{g/L}$), TDI-4 (6.07 $\mu\text{g/L}$), TDI-19 (12.9 $\mu\text{g/L}$), TDI-20 (34.9 $\mu\text{g/L}$), TDI-21 (14.8 $\mu\text{g/L}$), and W4529-6 (10.1 $\mu\text{g/L}$) exceeded the AWQS of 5.0 $\mu\text{g/L}$.

Also during the September 4-5, 2019 groundwater monitoring event, free product was detected with the oil-water interface indicator in TDI-17 at a thickness of 2.35 feet. Free product was removed from the well and then properly abandoned by ADEQ's Contractor in mid-September 2019, as discussed previously in this document.

Groundwater plume stability:

From 1999 to present, the depth to groundwater beneath the site has ranged from approximately 10 to 15 feet bgs. Some concentration variability has been observed between sampling events, but a long-term decreasing trend of COC concentrations has remained. The groundwater gradient has generally been to the south/southwest since 1999. Overall, COC concentrations have been declining in monitoring wells since 1999. GES conducted a trend analysis of benzene, MTBE, and 1,2-DCA concentrations in wells TDI-1, TD-2, TDI-3, TDI-4, TDI-18, TDI-19, TDI-20, TDI-21, TDI-22, TDI-23, and W4529-6 using the GSI Mann-Kendall Toolkit for Constituent Trend Analysis. The following summary indicates benzene is decreasing around the source area in TDI-1, TDI-2, and TDI-20, and W4529-6. Benzene is increasing in TDI-18 and TDI-21 due to multiple non-detect groundwater results skewing the overall trend. Benzene is stable or displaying no trend in the remaining wells; MTBE is decreasing around the source area in TDI-1, TDI-2, TDI-3, TDI-4, and TDI-18. MTBE is increasing in TDI-20. MTBE is stable or displaying no trend in the remaining wells. 1,2-DCA is decreasing in the source area in TDI-1, TDI-2, TDI-3, TDI-4, and W4529-6. 1,2-DCA is increasing in TDI-19. 1,2-DCA is stable or displaying no trend in the remaining wells. The output concentration trends suggest long-term stability of the groundwater plume.

MTBE contamination is localized in the proximity of TDI-1, TDI-2, TDI-3 from 1999 to 2001. In 2004, MTBE begins to appear in TDI-20 and continues to persist in 2019. MTBE was also detected in 2006 east of the source area when TDI-23 was installed. MBTE continued to gradually decrease in TDI-23 until 2010 when it was last sampled. In the 2019 groundwater monitoring event, TDI-23 was unable to be sampled due to the lack of groundwater in the well casing. 1,2-DCA contamination has been localized around source wells TDI-1 and TDI-2 since 1999; it has significantly decreased over time with concentrations now slightly over the AWQS across the well network. The 1,2-DCA contamination in off-site well TDI-21 may be from another LUST site.

GES utilized the Groundwater Spatiotemporal Data Analysis Tool (GWSDAT) to visualize the dissolved and free product impacts at the site as a function of time. GWSDAT's input consists of physical monitoring locations, groundwater elevations, free product thicknesses, and contaminant concentrations collected from specific monitoring well locations over time. The GWSDAT output is a series of maps showing concentration contours identified by a range of colors for specific dates and analytes. Each map represents a single monitoring event. When sequenced together the maps can adequately depict the contaminant plume movement within the monitoring well network. The data used for this study included all monitoring wells installed throughout the Site.

Based on the GWSDAT output, it appears that the bulk of the benzene contaminant mass was located around TDI-1, TDI-2, TDI-3, and TDI-20 source area starting in 1998. From 1998 to 2019, the benzene plume shrinks to below AWQS across the Site.

Natural Attenuation:

Natural attenuation processes include diffusion, dispersion, sorption, volatilization, and biodegradation. A decreasing trend in VOC concentrations in groundwater has been established,

which supports that natural attenuation is occurring. Hydrologic and geochemical data can be used to indirectly demonstrate the type(s) of natural attenuation processes.

The primary line of evidence for natural attenuation is decreasing contaminant concentration trends. Based on a review of groundwater analytical data and results of the Mann-Kendall Toolkit, a decreasing trend of COC concentrations in groundwater is well documented in all wells. This data analysis, in conjunction with the BIOSCREEN evaluation (see description below) supports the primary line of evidence for occurrence of natural attenuation.

The secondary line of evidence is hydrogeologic and geochemical data that can be used to demonstrate indirectly the type(s) of natural attenuation processes active at the Site. GES collected samples for monitored natural attenuation (MNA) analysis during the September 4-5, 2019 groundwater monitoring event from one up gradient well (TDI-2), the source area well (TDI-1), and one down gradient well (TDI-21).

Byproducts of microbial metabolism include ferrous iron and manganese. While ferrous iron is not detected in any of the samples, manganese is substantially higher in the source area when compared to the up and down gradient wells. Further indications of biodegradation are the depletion of oxygen, nitrate, and sulfate within the source plume. Concentrations of these three parameters are low in the source area when compared to both the up and down gradient wells, with a significant increase in the down gradient well, further supporting the secondary line of evidence for natural attenuation.

GES used the Air Force Center of Environmental Excellence BIOSCREEN model to simulate remediation through natural attenuation of dissolved petroleum hydrocarbons, specifically MTBE. The model was run using TDI-2, TDI-1, and TD-20 as the source for MTBE. Multiple assessments were conducted due to the nature of MTBE degradation in groundwater. MTBE readily dissolves in groundwater and its rate of biodegradation varies greatly. Based on values referenced by the EPA, iterations using 2.0 years for the half-life of MTBE was assessed over 10 and 50 years. Results of these assessments indicate that the contamination plume is stable and shrinking even under conservative assumptions.

Threatened or impacted drinking water wells:

GES conducted a receptor survey on October 14, 2019 using reviewed information available on the Arizona Department of Water Resources (ADWR) website for water wells within a ½-mile radius of the Site. The database identified four hundred and ten (410) wells within the search radius. Of these wells, two hundred and fifty one (251) are listed as “Monitoring,” one hundred and thirteen (113) as “Other,” forty-one (41) as “Non-Exempt,” and five (5) as “Exempt.” All of the wells are registered and used for monitoring or geotechnical purposes except for “Exempt” well #55-610758. The well was installed to 200 feet bgs in 1978 for domestic use and is located approximately 1,200 feet northwest (up-gradient/cross-gradient) of the CAC site. No pumping data or well construction details are available in the ADWR records. Based on the location of the well and historical groundwater gradients, the well is not a potential receptor of contamination stemming from the CAC site.

The City of Holbrook operates a regulated public water system (AZ04-0915) which pumps groundwater from three wells located on McLaws Road. This well field is located approximately 7 miles to the southwest of the LUST site. According to the most recently posted Consumer Confidence Report (2018) on the City's webpage, in 2016 there were no detections of VOCs in samples collected from the wells.

According to ADWR rules, 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:

Subsurface soils generally consist of layers of silt and clay from ground surface to a depth of approximately 25 feet bgs. Groundwater is encountered between 13 to 15 feet bgs.

Based on groundwater analytical results of source well TDI-1, it appears the majority of contamination has been removed minus residual MTBE concentrations. However, adjacent source wells TDI-2 and TDI-20 contain groundwater concentrations of MTBE and 1,2-DCA above AWQS. Based on soil boring sampling analytical data from September 1998, it appears that the extent of soil contamination was adequately delineated around the source area.

The area surrounding the CAC site includes commercial, industrial, and residential properties. No soil contamination is present off-site. The property adjacent to the site to the west is shown on GES' maps as a residence (113 W. Erie Street). Upon review of the Navajo County Assessor's webpage, that property is actually a retail store. The next property to the west was reportedly a child care center (115 W. Erie Street). The parcel is listed on the Assessor's parcel map as a residence, and the address is 115 W. Delaware Street (the entrance to the home is located here, on the street to the south of Erie Street). Aerial photos from May 2008, do show a child care business on the Erie Street side of the parcel. A phone directory check does list a child care center at 115 W. Erie Street.

Based on historical groundwater gradients and residential properties located to the west along Erie Street, groundwater at the site was evaluated for potential vapor intrusion risk to these off-site properties. Well W4529-7 is located in Erie Street to the west of the site, and the well did not show any VOC contamination present over laboratory reporting limits when sampled in May and September 2019. Prior to obtaining site access in September 2019, ADEQ evaluated MTBE contamination in groundwater for potential vapor intrusion risk at the site, by modeling the VOC data collected from the western most well located at the site (TDI-20). The Johnson & Ettinger model (screening level version) was used to calculate a cancer and non-cancer risk level. Historic MTBE concentrations were used as a worse-case scenario, and the model indicated that the remaining groundwater contamination did not pose a cancer or non-cancer risk to potential on-site or off-site receptors. In September 2019, TDI-20 showed MTBE at a concentration of 616 ug/L. This concentration is lower than historic concentrations, so this concentration do not pose an inhalation risk.

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 competed at the

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 representing source area and down gradient conditions:

TDI-1 (UST basin)
Total Depth: 25 feet. Screened 5-25 feet.

Date	Benzene AWQS is 5.0 ug/L	MTBE Tier 1 Corrective Action Standard 94 ug/L	1,2-DCA AWQS is 5.0 ug/L	Depth to Water (feet)
November 1998	690	540	650	11.68
May 1999	7200	1800	1400	11.22
May 2000	5000	1400	650	10.49
May 2001	1300	3500	980	10.61
November 2001- February 2004	Not sampled	Not sampled	Not sampled	Not measured
June 2004	9.6	3200	490	11.88
July 2005	91	590	100	11.62
January-February 2006 Soil Excavation				
August 2006	<0.50	150	11	12.46
December 2007	1.4	1900	260	12.00
July 2008	9.9	400	70	11.71
October 2008	<5.0	780	160	12.00
February 2009 AS/SVE start				
November 2009	<1.0	2050	27.8	11.67
December 2009 AS/SVE end				
April 2010	<1.0	42.9	<1.0	13.10
May 2010-May 2018	Not sampled	Not sampled	Not sampled	Not measured
June 2019	<1.0	32.6	<1.00	14.12
September 2019	<5.0	74.3	<5.00	14.72

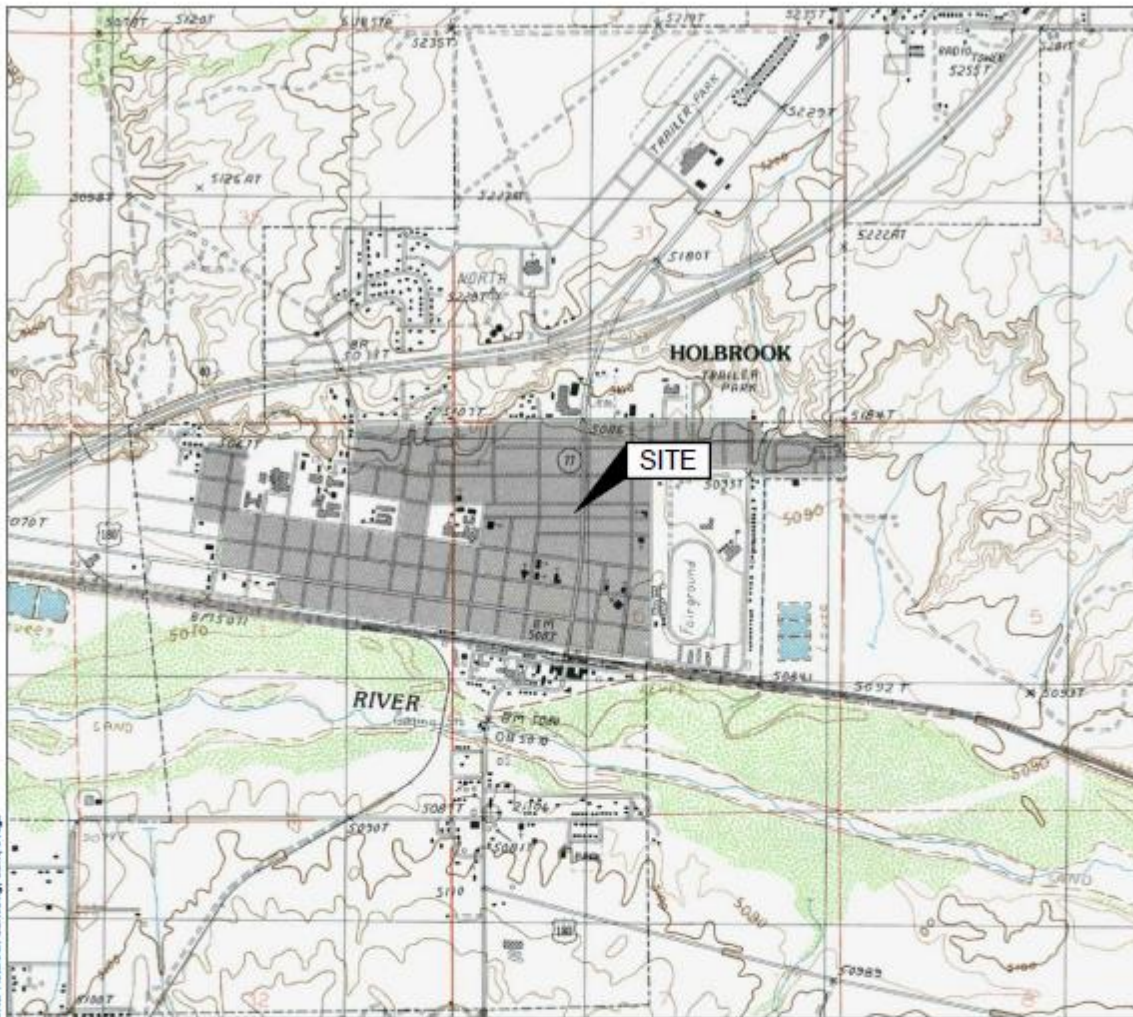
TDI-3 (on-site; down gradient of UST basin)
Total Depth: 25 feet. Screened 5-25 feet.

Date	Benzene AWQS is 5.0 ug/L	MTBE Tier 1 Corrective Action Standard 94 ug/L	1,2-DCA AWQS is 5.0 ug/L	Depth to Water (feet)
November 1998	560	<200	58	11.21
May 1999	1900	660	140	11.01
May 2000	1600	400	84	10.49
May 2001	5509	260	77	10.36
November 2001- February 2004	Not sampled	Not sampled	Not sampled	Not measured
June 2004	<0.50	85	38	11.65
July 2005	<0.50	68	35	11.43
January-February 2006 Soil Excavation				
August 2006	<0.50	42	43	12.24
December 2007	Not sampled	Not sampled	Not sampled	Not measured
July 2008	<1.0	90	64	11.52
October 2008	<1.0	98	85	11.80
February 2009 AS/SVE start				
November 2009	<1.0	99.0	63.4	12.57
December 2009 AS/SVE end				
April 2010	226	160	47.9	12.77
May 2010-May 2018	Not sampled	Not sampled	Not sampled	Not measured
June 2019	<1.00	15.5	1.58	13.77
September 2019	<1.00	59.1	7.48	14.42

TDI-21 (off site cross gradient)*multiple LUST sites in area
Total Depth: 32 feet. Screened 7-27 feet.

Date	Benzene AWQS is 5.0 ug/L	MTBE Tier 1 Corrective Action Standard 94 ug/L	1,2-DCA AWQS is 5.0 ug/L	Depth to Water (feet)
December 1999	<0.50	<1.0	3.0	10.68
May 2000	<0.50	<1.0	5.9	10.47
May 2001	<0.50	<1.0	5.8	10.39
August 2001	<0.50	<1.0	6.7	11.09
November 2001- February 2004	Not sampled	Not sampled	Not sampled	Not measured

June 2004	<0.50	3.0	12	11.65
July 2005	<0.50	<1.0	5.6	11.41
August 2006	<0.50	17	14	12.24
December 2007	Not sampled	Not sampled	Not sampled	Not measured
July 2008	<1.0	<1.0	<1.0	11.52
October 2008	<1.0	<1.0	<1.0	11.82
November 2009	<1.0	<1.0	1.26	12.50
April 2010	<1.0	<1.0	<1.0	12.38
May 2010-May 2018	Not sampled	Not sampled	Not sampled	Not measured
May 2019	<1.00	0.654	<1.00	14.19
September 2019	<1.00	42.5	14.8	13.53



Mt. Emmons ...200-Phoenix ADEQ-Crabtree Auto Service Center Holbrook SL Map, SL M ewg

Source:
 U.S.G.S 1:5 Minute Series
 Topographic Quadrangle, 19L8
 Holbrook, Arizona
 Contour Interval 1:20
 Supplemental Contour Interval 1:10
 Township - 1:1N
 Range - 21E
 Section - 6



Quadrangle Location

Site Location Map	
Arizona Department of Environmental Quality Crabtree Auto Service Center 615 Navajo Boulevard Holbrook, Arizona	
Drawn E.L.	Date 05/22/19
Designed	Figure
Approved	
 Scale In Feet 	





