Remedial Action Work Plan

Shay Oil Chevron
280 E. Main Street
Quartzsite, AZ 85346

Apex Project No.: SHA04.001
Account Number B2068245
VRP Site Code 150004-02

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Prepared for:
Shay Oil Co., Inc.
51 E. 10th St
Yuma, AZ 85364

Prepared by:

APEX ENVIROTECH, INC.

Apex Envirotech, Inc.

1221 W. 103rd St. #270

Kansas City, MO 64114

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EXECUTIVE SUMMARY

During the weeks of March 28th, 2022, and August 1st, 2022, Apex completed three interim site characterization goals as noted below.

- Characterization of the source area vertically for groundwater.
- Characterization of the source area vertically for soil.
- Characterization of the southeastern lateral extent of the groundwater plume.

In a letter dated June 8, 2023, The Arizona Department of Environmental Quality-Voluntary Remediation Program (ADEQ-VRP) concluded the vertical and lateral extent of soil and groundwater at the (Shay Oil Chevron) Site is currently characterized. The letter further requests the following:

"*Shay Oil Company shall develop a remedial action work plan (RAWP) that meets the requirements of Arizona Revised Statutes (A.R.S.) § 49-175 by September 8, 2023. In addition to the requirements of A.R.S. § 49-175, the VRP requests the following is included in the remedial action work plan:*

- *A feasibility study approach to remedy selection.*
- *Address risk and contingencies for potential future groundwater use.*
- *Remedy contingencies if groundwater conditions (e.g. significant changes in groundwater elevation or plume expansion) change over time, especially as it relates to contaminant transport in groundwater.*
- *Cross-section figures depicting groundwater monitoring wells, hydrogeology, and contaminant distribution.*
- *A monitoring program and metrics for measuring progress of the selected remedy.*
- *Appropriate community involvement approach for current landowners where current data indicate contamination exists below ground surface."*

After LNAPL removal in 2005, Soil Vapor Extraction/Air Sparge and In-Situ Bioremediation polishing have been used to the limits of their practical efficiency. The tight clay and extremely low transmissivity of the impacted aquifer have been a major hindrance to past remedial methodologies. MtBE and benzene are the two residual petroleum components remaining in groundwater at the Site exceeding Arizona Water Quality Standards (AWQSs).

The groundwater plume is delineated to the AWQS by QS-10 to the north, QS-20 to the northeast, QS-19 to the east, QD-2 to the south, to the west by QS- 1, and by QS-11 to the northwest.

This RAWP is an evaluation of applicable remedial alternatives and recommends monitored natural attenuation (MNA) of MtBE and benzene in groundwater as the remedial process best suited to the site-specific conditions at Shay Oil Chevron. The Site is under the regulatory oversight of the Arizona

Department of Environmental Quality (ADEQ) Voluntary Remediation Program (VRP) under VRP Site Code 150004-02.

1.0 INTRODUCTION

Groundwater sampling, site characterization, and remediation activities have been conducted at the Site since 1992. The purpose of this report is to provide data collected during previous sampling, remediation, and site characterization activities to select appropriate remedial methods and define remediation goals. Inclusion in the VRP is the result of a 1992 release from a former above ground storage tank (AST) and not associated with the past or current underground storage tank (UST) operations.

2.0 MODIFIED CONCEPTUAL SITE MODEL (CSM)

Beginning in 1992, an estimated 8,500-12,000 gallons of unleaded regular gasoline released in the source area impacted groundwater as light non-aqueous phase liquid (LNAPL) and soluble components in the monitoring wells. No LNAPL has reappeared since 2005. However, dissolved benzene and MtBE concentrations continue to be detected in groundwater above AWQS standards. After multiple remedial events, the distal extent of the groundwater plume is limited to the east adjoining property, the subject property, and the extreme southeast and southwest corners of the adjoining north properties. After completion of the two monitoring wells QS-19 and QS-20 and subsequent groundwater sampling event, the following conditions were observed:

- MTBE and benzene are the two Contaminants of Concern (COCs) present in groundwater at the Site exceeding AWQSs. MtBE in groundwater is delineated to the AWQS by QS-10 to the north, QS-20 to the northeast, QS-19 to the east, QD-2 to the south, to the west by QS-1, and by QS-11 to the northwest. Benzene in groundwater is delineated to the AWQS by QS-10 to the north, QS-20 to the northeast, QS-19 to the east, QD-2 to the south, QS-1 and QS-3 to the west, and QS-11 to the northwest. See Figures 4 and 5.
- The Site is characterized by tight clay lithologies, and an aquifer (impacted by the Shay Oil release) encountered at approximately 60’ below ground surface (bgs). The transmissivity of the aquifer is extremely low (≤ 1gpm) and reported to be contaminated with septic tank effluent and high total dissolved solids. The subsurface is not saturated below 70’ bgs where a Site-wide aquitard is present.
- Two source areas should be considered during remediation selection; first, a mostly vertical soil source area beneath the release point, and second, a more horizontal source area represented by the smear zones that formed by fluctuating water levels when LNAPL was present at the site between 1992 and 2005 and thereafter, by soluble petroleum components in groundwater adsorbing onto the clay lithologies present in and above the aquifer.

3.0 SITE CHARACTERISTICS

3.1 Physical Location

The Site has been a retail motor fuels station since the early 1990s. Shay Oil discovered the release in April 1992, based on station inventory reconciliation from November 1991 to April 1992. The loss of product was identified, and the station suspended operations until repairs were completed later in September 1992. Original estimates were that between 8,500 and 12,500 gallons of regular unleaded gasoline was released. Repairs included the excavation and replacement of product lines from the regular unleaded 10,000-gallon AST. The Site occupies approximately 0.7 acres in a mixed commercial and residential area. The land to the west is a beauty shop and to the east of the site a residential property that currently is occupied seasonally. The Lutheran Church of Quartzsite occupies the land north of the site across Cowell Avenue. Approximately 300 feet to the south across Business I-10/Main Street is RV parking.

3.2 Land and Water Use Survey

Please refer to the Land and Water Use Survey dated April 21, 2023, attached as Appendix A.

3.3 Facility Structures

At the time of the release, the station consisted of a single canopy and dispenser island, a small store/office building, and one underground and two aboveground fuel storage tanks. See Figure 7. These tanks included:

- One 5,000-gallon, single-walled fiberglass underground storage tank (UST), containing super-unleaded gasoline.
- One 10,000-gallon, vertical, single-walled steel aboveground tank (AST), containing plus-unleaded gasoline; and,
- One, horizontal AST, single-walled steel tank, divided into 8,277-gallon and 5,677-gallon sections, both containing regular unleaded gasoline.

In 2003, the Site was leveled, all original ASTs and USTs were removed, and a complete re-build was initiated, including underground storage tank (UST) installation and construction of a new convenience store. The Shay Oil Quartzite facility currently includes two 10,000-gallon double walled fiberglass USTs containing diesel and premium gasoline and two 12,000-gallon USTs containing regular gasoline. Six dispensers occupy the area beneath a single canopy placed diagonally on the site. The convenience store occupies the northwest corner of the property. See Figure 2.

3.4 Historical Land Use

The Site has been a retail motor fuels station since the early 1990s.

3.5 Current Land Use

The Shay Oil Quartzite facility currently includes two 10,000-gallon double walled fiberglass USTs containing diesel and premium gasoline, and two 12,000-gallon USTs containing regular gasoline. Six dispensers occupy the area beneath a single canopy placed diagonally on the site. The convenience store occupies the northwest corner of the property.

3.6 Active Management Area/Water Provider

Starting in the year 1994, the Town began to supply water from well 55-550647, located approximately 1.25 miles to the west-northwest of the Site. In the year 2004 a second public well (55-204271), located approximately 1 mile to the north-northeast of the site, was added. The wells are 1,280 & 1,260 feet in depth, respectively.

The Town municipal wells have the capacity to serve the needs of the current population and the needs for future potential growth of the Town based on the population growth projection. From the year 2000 to 2010, the population of Quartzsite increased by 9% and is expected to increase by approximately 30% from the year 2015 to 2030, according to the General Plan.

3.7 Topography

The site is located near the center of the La Posa Plain in southwestern Arizona. The La Posa Plain is an elongated alluvial valley typical of the Basin and Range Province. The Plain is bounded by the Dome Rock Mountains on the west and the Polmosa Mountains on the east. The Plain is traversed by the north flowing Tyson Wash, a small to moderate size ephemeral wash located approximately 1/2 mile west of the site (Ross et al., 1991).

3.8 Stratigraphy and Hydrology

The subsurface in the study area consists of an upper unit of alluvium overlying the Neocene Bouse Formation that, in turn, overlies fanglomerate and bedrock (Metzger, et al., 1973). In the area of the Site, the subsurface is clay or silty clay. The details of the origins of the Bouse Formation are widely debated. The clay and other siliciclastic units found at the Site are either shallow-marine, lacustrine or fluvial, or likely a combination of some or all the above. The subsurface is composed of 10-15' of alluvium overlaying a series of inorganic clays and minor silty clays. The water bearing zone contains more coarse-grained material allowing for the infiltration of groundwater, and in the past, installation of wells used for domestic purposes prior to the completion of the municipal water and sewer system. A highly plastic fat clay is found at approximately 70' bgs forming a site-wide aquitard.

An upper aquifer (impacted by the Shay Oil release) in the vicinity of the Site is encountered at approximately 60 feet bgs and is not saturated below approximately an aquitard found at 70 below ground surface (bgs). A deeper aquifer is found throughout the Quartzsite study area separated from the upper aquifer by a thick sequence of clays and limestones and is typically found at approximately 400 feet bgs. The upper aquifer, impacted at the site, is characterized (Ross et al., 1991) as follows:

"The upper perched aquifer is found from 30 to 100 feet bgs. The saturated thickness is generally less than 30 feet. According to Metzger, et al (1973), the extent of this aquifer is limited to an area around Quartzsite and north approximately 5 miles and is restricted to the vicinity of Tyson Wash. Flow direction for the upper aquifer is estimated to be northward along the wash based on limited water level data reviewed by the ADEQ. Although no quantitative information is available for the transmissivity of the upper aquifer; it is apparently exceptionally low. Most shallow wells in the study area produce less than 1 gallon per minute and generally can pump only 5-10 minutes before specially installed automatic pump switches turn off the pumps due to dropping water levels in the wells. The shallow aquifer in the vicinity of Quartzsite is documented to have been impacted by private septic systems. The lower aquifer has not been affected to such an extent as the upper aquifer."

4.0 SURROUNDING LAND USE AND POPULATIONS

The surrounding area is retail, residential and light industrial. A full-time population exists year-round but dramatically increases in the winter months. Figure 6 demonstrates the uses of the surrounding properties, which include residences to the northeast and east, an RV park and vacant lot across the highway to the south, a beauty salon to the west, an active church to the north and empty lots to the northeast.

5.0 CONTAMINANTS OF CONCERN

The COCs are those typically associated with a gasoline release: benzene, toluene, ethylbenzene, total xylenes (BTEX), methyl tert-butyl ether (MTBE), naphthalene and total petroleum hydrocarbons-gasoline range (TPH-GRO). LNAPL was removed from the site by 2005, leaving soluble components in the groundwater and entrained in clay lithologies. The soluble components benzene and MtBE remaining in groundwater from the AST release in 1992 are the sole subject of this cleanup effort.

6.0 IMPACTED MEDIA

Groundwater and soil constitute the affected media at the site.

7.0 APPLICABLE STATE REGULATORY LEVELS

Regulatory Level	Regulatory Citation
Groundwater Protection Levels (GPLs)	A.A.C. R18-7-203(B)(1); ADEQ GPL Guidance: http://www.azdeq.gov/environ/waste/sps/
Arizona Water Quality Standards (AWQSs)	A.R.S. §49-225.D

8.0 EXPOSURE/RECEPTOR ASSESSMENT

8.1 Exposure Pathways

Circa 1992, regular unleaded gasoline product was released to the environment from leaking AST underground product lines located just west of the former store, east of the former UST, and north of the canopy and dispenser island. See Figure 7 for the Historic Site Layout.

A source area soil study requested by the VRP in 2000 was completed by Apex that included three soil borings (PL-1, PL-2, and PL-3) in and around the source of the release near QS-6. Results infer the release traveled vertically in the soil beneath the leaking product lines until reaching the aquifer then being carried downgradient to the northeast, east and southeast. Analytical results showed residual petroleum below the non-residential screening levels in all soil samples collected in the source area soil. A second source area soil study was requested by the VRP and completed during site characterization in 2022. The soil vapor sampling methodology used generated sampling data has adequately defined the source area soil. QB-1 and QB-2 were completed in the former source area and converted to monitoring wells QS-17 and QS-18. Four of the nine downhole vapor samples, collected in summa canisters, contained enough volume to be analyzed. The three-phase partitioning calculations on the soil vapor samples collected show the soil is adequately characterized and below residential soil remedial levels (R-SRLs) and groundwater protection levels (GPLs).

Site characterization activities indicate that the groundwater plume delineated to drinking water standards extends less than ¼ mile from the site boundaries to the north, northeast, east, and southeast.

8.2 Plume Stability Evaluation

Apex completed a plume stability evaluation utilizing the Ricker methodology. The Ricker report, dated December 14, 2023, is attached as Appendix B. Please note that this evaluation does not take into account the most recent wells (QS-17 through QS-20), which delineated the farthest extent of the benzene and MtBE plumes on the east and northeastern properties but with only one monitoring event to-date do not represent or provide usable data for the Ricker evaluation. Therefore, the Ricker plume stability evaluation evaluates the center or source area of the plume. In Summary, the results of the Ricker Plume Stability Evaluation indicate that:

- The center of mass (COM) for the benzene and MtBE plumes remain centered south of QS-4 in the southeastern portion of the Site. The COM distance vs time shows a decrease for benzene and increase for MtBE. Although the center of mass trend line for MtBE is shown as increasing, the COM plots are all located nearly on top of each other, suggesting de minimus movement over the five (5) year period evaluated.
- Plume volume vs time, plume area vs time and average concentration vs time are decreasing for benzene and neither decreasing nor increasing for MtBE.
- Average plume mass vs time is decreasing for benzene and neither decreasing nor increasing for MtBE.

- Based on the results of the Ricker Plume Stability Evaluation, the source area of the plume is stable on site.
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8.3 Exposure Points & Route

The following table demonstrates the potential exposure points and routes for the impacted media:

Media Type	Potential Exposure Points & Route
Groundwater	• Onsite Private well. • East, north, northeast private wells

8.4 Receptor Population & Complete Pathways

A review of land and natural resources was performed as part of the Land and Water Use Survey (LWUS) dated April 21, 2023, Appendix A. As part of the LWUS, Apex contacted north, northeast, and east adjacent property owners to determine if any private wells were present on the properties. There are no private wells remaining on these adjacent properties. In addition, there is no longer a private well on the Site. Based on this, the drinking water pathway *is not complete.* Based on the above, no exposure points and routes have an impacted or potentially impacted receptor (incomplete pathway).

9.0 PREVIOUS INVESTIGATIONS

Groundwater monitoring and remediation activities resulting from the AST product line release described above date back to 1992. Table 3 includes a summary of groundwater analytical data collected to date. Currently, there are two analytes that exceed remediation levels: benzene and MtBE.

The source of the release was traced to leaking AST underground product lines which were located just west of the former store near the UST and north of the canopy and dispenser island. The historic site layout is shown on Figure 7. A source area soil study requested by the VRP in 2000 was completed by Apex that included three soil borings (PL-1, PL-2, and PL-3) in and around the source of the release near QS-6. Results infer the release traveled vertically in the soil beneath the leaking product lines until reaching the perched aquifer then being carried downgradient to the northeast, east and southeast. Analytical results showed residual petroleum below the non-residential screening levels in all soil samples collected in the source area soil.

Apex completed an additional source area soil investigation requested by the VRP in March 2021 which included drilling two soil borings (QB-1 and QB-2), collection of soil vapor samples from the soil borings (converted to soil data via 3-phase portioning) and converting the two soil borings into monitoring wells (QS-18 and QS-17, respectively). The data observed in the field documented an aquitard is present site-wide starting around 75’ bgs. Based on the soil vapor sample results, the source area soil has been defined laterally and vertically.

During two drilling events, which occurred on March 28 through 31, 2022 and August 1 through 4, 2022, Apex conducted the advancement of seven (7) soil borings (QD-1 through QD-7) for the

collection of grab water samples. Soil boring locations (QD-3 and QD-7) were selected for monitoring well installation (QS-19 and QS-20, respectively).
MTBE and benzene in groundwater were delineated to the AWQS by QS-10 to the north, QS-20 to the northeast, QS-19 to the east, QD-2 to the south, to the west by QS-1, and by QS-11 to the northwest.

The results of the work performed resulted in modifications to the previous CSM, specifically, the presence of two source area soils: First, a vertical soil source area beneath the release point, from surface to the aquifer and second, a more horizontal source area represented by the smear zones that formed by fluctuating water levels when LNAPL was present on the groundwater between 1992 and 2005 and thereafter, soluble petroleum components in groundwater adsorbing onto the clay lithologies present in and above the aquifer.

Please refer to the Site Characterization Results Report (the SCR), dated April 24, 2023 (See Appendix C) by Apex Envirotech, Inc. for details of this site characterization activity and the most recent groundwater sampling data from November 2022.

10.0 PREVIOUS REMEDIATION

10.1 Hand Bailing

In 1992, Delta Environmental Consultants completed hand bailing of monitoring wells that contained floating liquid hydrocarbons on a daily basis. This activity was performed on QS-6, QS-7 and QS-9 on a daily basis and on other wells with elevated levels of floating liquid hydrocarbons.

10.2 Free Product Skimming

In 1992, Delta Environmental Consultants installed a Flexible Axial Peristaltic pump system (FAP) to skim floating liquid hydrocarbons from monitoring wells. The floating liquid hydrocarbons and water recovered from the wells were being retained in 55-gallon drums prior to being picked up for proper disposal. Data regarding gallons recovered by Delta are not available.

10.3 Soil Vapor Extraction System (SVE)

In March 1993, Aegis Environmental performed a vapor extraction pilot to test to gather data to be used to engineer the proper system parameters. In 1994, a soil vapor extraction system was then installed by Apex Envirotech, Inc. with the following attributes:

System Basics:

- Eight vapor extraction wells and one domestic were connected to a thermal oxidizer
- 250 cfm thermal oxidizer and controls
- Manifolds from the wells were installed below grade and stubbed-out inside fence.
- From the blower, above ground piping fed well vapors to the oxidizer.
- Propane was used as supplementary fuel for oxidizer.

The soil vapor extraction system was operational for approximately 14 months from January 1994 through February 1995. Based on effluent concentrations and cubic feet of soil vapor treated, Apex estimates 5000 gallons of gasoline were removed and treated by the SVE during operation.

From May 2004 until Feb 2017, a 100 cfm SVE (w/activated carbon treatment) was operated

removing soil vapor from monitoring wells near the point of release, mainly QS-7, QS-14 and QS-6. Six other monitoring wells were also plumbed into the SVE system, QS-1, QS-4, QS-5, QS-7, QS-8, and QS-9. These six wells being located peripheral to the source area did not produce significant returns of volatile components and were not accessed routinely. A passive aerator was installed in monitoring well QS-7. This aerator consisted of tubing run from the surface at the well head down to the bottom of the well. As vapors are extracted, air is pulled in through the tube and through the groundwater, causing the water to bubble and displace volatile compounds.

Field data from the second SVE system shows the actual recovery of gallons equivalent was very low. From 2004 through 2008 recovered gasoline from vapor averaged 0.005 gallons per day, totaling less than 3.0 equivalent gallons per year.

Possible additional benefits from running the system included circulating air in the subsurface and well sparging in QS-7.

10.4 In-situ Bioremediation Process

In March of 1995, Apex completed the application of 200,000 gallons of water containing petroleum degrading microorganisms and nutrients, introduced through wells into the soil and groundwater at the site. The application had the effect of lowering on-site concentrations of dissolved phase hydrocarbons in some wells but had the adverse effect of mobilizing trapped pockets of LNAPL in other wells. The overall results were positive as shown in the reduction of benzene and MtBE in most wells since application.

10.5 Current Sampling and Monitoring Activities

Annual groundwater monitoring activities are currently being performed at the subject site, the last event being in November 2022. This activity includes water level measurements in the on-site and off-site monitoring wells and collection of water samples for analysis of benzene, toluene, ethylbenzene and xylene (BTEX) and MTBE in nine wells. Results reports of the analytical tests are included in annual monitoring reports. The most recent groundwater monitoring results is included in this report in the Site Characterization report included as Appendix C.

11.0 Site Characterization Results

11.1 Current Groundwater Conditions

On March 28 through 31, 2022 and August 1 through 4, 2022, Apex conducted the advancement of seven (7) soil borings (QD-1 through QD-7) for the collection of grab water samples. Two of the soil boring locations (QD-3 and QD-7) were selected for monitoring well installation (QS-19 and QS-20, respectively). A well survey was performed at the Site and the elevations of QS-19 and QS-20 were measured. Groundwater elevations were plotted for the November 2022 sampling event which indicated a northeasterly groundwater flow direction. Groundwater elevations are provided on Figure 3, Potentiometric Map.

Based on laboratory analytical data, benzene concentrations exceed the AWQS of 5 ppb at wells QS-6, QS-9, and QS-18 and MtBE concentrations exceed the AWQS of 20/94 ppb at wells QS-1, QS-4 through QS-9, QS-17, and QS-18.

Compared with the May 2021 groundwater sampling event, benzene concentrations increased in wells QS-1, QS-3, and QS-6. Benzene concentrations decreased in wells QS-9 and QS-18. All other wells were below detection limits for benzene.

Compared with the May 2021 groundwater sampling event, MTBE concentrations increased in wells QS-1, QS-6, and QS-8, and remained the same in QS-9. MBTE concentrations decreased in QS-4, QS-5, QS-17, and QS-18. The results were below detection limits in QS-10, QS-11, QS-16, QS-19, and QS-20. Refer to Figures 4 and 5 for plume locations.

In a letter dated June 8,2023 the VRP stated the following: The "VRP concurs that the vertical and lateral extent of soil and groundwater at the Site is currently characterized".

11.2 Conceptual Contaminant Distribution

As previously described, the distribution of soluble gasoline components are found in two locations first, a mostly vertical soil source area beneath the release point, and second, a more horizontal source area represented by the smear zones that formed by fluctuating water levels when LNAPL was present at the site between 1992 and 2005 and thereafter, soluble petroleum components in groundwater adsorbing onto the clay lithologies present in and above the aquifer. Cross-sections A-A' and B-B' (Figure 14 and 15) show this smear zone and its relationship to the groundwater plumes.

11.3 Benzene

Figure 3 shows the current horizontal extent of the benzene plume at the site. The condition of the plume being assumed as stable and attenuating. Figures 9 and 10 show the downward concentrations trends in most of the wells supporting the inference that naturally occurring processes, primarily adsorption, dispersion, and chemical and biological degradation are reducing the mass over time and mitigating the risk of downgradient migration.

11.5 MtBE

Figure 4 shows the current horizontal extent of the MtBE plume at the site. The condition of the plume being assumed as stable and attenuating. Figures 11 and 12 show the downward concentrations trends in most of the wells supporting the inference that naturally occurring processes, primarily adsorption, dispersion, and chemical and biological degradation are reducing the mass over time and mitigating downgradient migration.

12.0 REMEDIATION METHOD SELECTION

12.1 Remediation Rational and Assumptions

Previous remediation efforts on the site have included LNAPL recovery via FAP pumping, soil vapor and air sparge, and In-situ bioremediation polishing completed on the source area and areas affected by LNAPL. Each method has been used to the extent of practical effectiveness. The tight clay present at the Site, and the extremely low transmissivity in the aquifer limited the effectiveness of these remedial methods (except for LNAPL collection from the monitoring wells). Fortunately, the clay and extremely low transmissivity of the aquifer has the benefit of retarding migration off-site and promoted adsorption and plume stability after remediation efforts removed LNAPL and most of the residual gasoline entrained in source area soil.

The previous remediation methods used have been successful in removing all LNAPL occurrences at the site and a significant percentage of the residual gasoline found in the source area soil. However, residual petroleum components adsorbed onto the clay bleed off slowly into the groundwater causing benzene and MtBE concentrations in source area wells and some peripheral wells to remain above the AWQS Standards.

The following assumptions used in the selection process were derived from previous sampling data, groundwater monitoring reports, remediation activities and site investigations.

- All LNAPL has been removed from the Site.
- The remaining source areas include a vertical area in clay beneath the release point and a horizontal smear zone above and including the impacted aquifer.
- The residual components of the release (benzene and MtBE) in the clay will bleed off slowly over time into groundwater.
- Onsite contaminant plumes have been stable for the 5 previous years and will remain stable.
- Groundwater elevations have remained stable for the last 5 years and will remain stable.
- Transmissivity rates of the aquifer are extremely low.
- Attenuation and dispersion are lowering concentrations of both COCs over time, benzene at a greater rate than MtBE.
- An aquitard is present at approximately 70’ bgs throughout the area of investigation including off-site areas.

Based upon based on past remedial experience, and the behavior and of benzene and MtBE over time in the Site-specific conditions, Apex has reviewed five remediation alternatives for this Site, specifically:

1. No Action
2. Soil Vapor Extraction/Air Sparging
3. In Situ Bioremediation
4. Source Area Excavation
5. Monitored Natural Attenuation (recommended)

This section provides:

- General description of each remediation technology.
- Advantages and disadvantages of each.
- Evaluation and effectiveness based on site specific conditions.
- Final selection of the preferred alternative.

12.2 No Action

The use of a "No Action" approach to remediation involves no physical work or reporting. Because of this, it is the most cost effective but produces no progress toward creating a solution to the issues at the Site.

Summary of Adaptability of Method to Site

Because of the obvious drawbacks to this remediation approach, and the inability to bring the Site in regulatory compliance using it, it is poorly adapted for use at this site and will not be given further consideration.

12.3 Soil Vapor Extraction/Air Sparging

A phased approach to remediation by using Soil Vapor Extraction (SVE) combined with Air Sparging (AS) as a polishing step, has been used successfully at the Site in two different iterations. Immediately after LNAPL recovery ceased in 1993, a 250 CFM thermal oxidizer was installed at the source area and SVE is an in-situ remediation technology that recovers volatile contaminants from subsurface soil through application of a vacuum to extraction wells appropriately spaced and screened across the contaminated zone. The extracted vapor was treated at the surface using a thermal oxidizer then a catalytic oxidizer before discharged to the atmosphere. A second low-flow SVE system using carbon capture was installed and operated between 2005 and 2017. Very small amounts of gasoline as vapor were recovered during the second time period.

Advantages

- SVE can reduce high levels of volatile contaminants that are adsorbed to soil or trapped within soil pore space with minimal disturbance to site operations.
- SVE is a cost-effective approach for soil and groundwater that is too extensive or inaccessible to allow excavation (i.e. under building);
- SVE wells (angle wells, if needed) can be placed beneath the building to address the core of the source area.
- Process is well documented and can have relatively predictable results based on track record.

Disadvantages

- Effectiveness can be negatively affected by tight clay soil present at site.
- Some excavation is needed to install underground infrastructure which is disruptive to ongoing retail sales of petroleum products.

Summary of Adaptability of Method to Site

Previous SVE/AS systems used have significantly reduced the mass of volatile components available to this method. What can be expected if implemented again would be a short period of significant measurable recovery followed by very low asymptotic levels of recovery over a long duration where the costs to install and operate do not justify the benefits and is not recommended at this time.

12.4 In Situ Bioremediation (ISB)

In March 1995, 200,000 gallons of water containing petroleum degrading microorganisms and nutrients were introduced through wells into the soil and groundwater. Four additional inoculation wells were drilled to 60 feet around the point of the release. In Situ Bioremediation (ISB) involves injection of a commercially available biological product with nutrients that increases the biodegradation of the petroleum hydrocarbons in the subsurface near monitoring wells that have the effect of lowering petroleum concentrations over time.

Advantages

- ISB can reduce high levels of volatile contaminants that are adsorbed to soil or trapped within soil pore space with minimal disturbance to site operations.
- ISB is effective reducing contaminants in groundwater after the other methods have removed LNAPL and reduced initial concentrations in the source area(s);
- ISB is a cost-effective approach for soil and groundwater that is too extensive or inaccessible to allow excavation (i.e. under building or depth to aquifer)
- Injection wells (angle wells) can be placed beneath the building to address the core of the source area.

Disadvantages

- Multiple applications may be necessary.
- Track record that shows many different site-specific conditions can affect bioremediation and preclude biological activity from taking place, making predictability difficult.
- MtBE biodegradation can produce by-products, TBA for example, that can be problematic.
- Can remobilize contaminates and move the plume downgradient.
- Effectiveness is reduced by tight clay soil present at site and extremely low transmissivity of the aquifer.

Summary of Adaptability of Method to Site

The previous bioremediation application in 2005 was able to reduce concentrations of BTEX and MtBE in the groundwater plume. Three site specific conditions limited the effectiveness of the process:

1. Much of the Site and offsite to the north was impacted by up to a 3-foot thickness of LNAPL in monitoring wells before recovery efforts were completed, leaving a smear zone between 45’ bgs and the aquifer base at 70’ bgs in the wells present at the time.
2. The MtBE and benzene in the gasoline adsorbed onto the clay lithologies in many cases are not accessible to the bioremediation solutions due to lack of pore space and the homogeneity of the clay lithologies.
3. In the aquifer present, most shallow wells in the study area produce less than 1 gallon per minute due to extremely low transmissivity, hindering the transport and circulation of bioremediation solutions throughout the project area.

Used successfully at the Site in past cleanup efforts, data indicate the method has been used to the extent of its limitations considering site conditions and is not recommended for reapplication.

12.5 Source Area Excavation

Excavation is a remedial approach that involves the physical removal of contaminated soil from a source area. The excavated soil may be transported off-site to a regulated treatment and disposal facility or remediated to acceptable levels using ex-situ treatment methods.

Advantages

- Immediate removal of contaminated soil that may leach into underlying groundwater or volatilize into the atmosphere through exposed ground surfaces.
- Cost effective if addressing small volumes of shallow soil.

Disadvantages

- Disruption to on-site operations
- Volatilization of contaminants during removal, management of soil stockpiles
- Off-site transportation and disposal costs.

Summary of Adaptability of Method to Site

The Site is an active gasoline retail station and excavation to the depths needed to access the impacted soils (approx. 50 bgs) would engulf the entire footprint of the station. The method is not practical or recommended for this site.

12.6 Monitored Natural Attenuation (MNA)

According to the EPA:
“*… monitored natural attenuation (MNA) is a remediation technology that uses natural processes to clean up sites. MNA is a common approach for cleaning up groundwater contaminated with petroleum hydrocarbons (PHCs) and certain fuel additives (MtBE). MNA is a process that uses natural processes in soil and groundwater to reduce the concentration or mass of contaminants. These processes include adsorption, precipitation, dispersion, natural chemical degradation, and microbiological destruction. MNA can take several years to decades to clean up a site, depending on several factors, such as the concentration of contaminants…*”

Advantages

- Generates less waste than most other methods.
- Keeps contaminates in place avoiding transfer to other media.
- Reduced risk of human exposure to contaminants of concern.
- Minimal disruption of site structures and infrastructures.
- Can be used as a polishing step after other remedial alternatives.
- Lower remediation costs than some active remediation methods.
- Been approved for use at over 100 Superfund sites.

Disadvantages

- MNA may take several years to decades to clean up a site.
- Longer time frames may be required to achieve remediation objectives compared to active remediation measures due to site-specific conditions.
- Toxicity and/or mobility of degradation by-products may be problematic.
- Long-term monitoring may be more extensive and for a longer duration.
- Possible continued contamination migration, and/or cross-media transfer of contaminants.

Summary of Adaptability of Method to Site

Based on site specific conditions, previous remediation efforts and the decreasing trends of concentrations of MtBE and benzene over time, MNA is recommended as the proper method to reach the Regulatory Objectives (ROs).

12.7 Recommended Remedial Method

The Plume Stability Report discussed in section 2.6.2 provides evidence that the center of the plume is not currently mobile and has not moved significantly over the past 5 years. Therefore, a long duration MNA program is very appropriate and would not pose a risk to down gradient or cross gradient receptors.

12.8 Remedial Objectives (ROs)

- Provide assurance that plume remains stable and changes in groundwater gradient or elevation does not create off site plume migration.
- Alert surrounding property owners that the groundwater under their property is not potable and should not be used for any purpose.
- Monitor the concentrations of benzene and MtBE in groundwater over time.
- Monitor MNA performance indicators to track attenuation progress.

- Request “NFA” or equivalent from ADEQ-VRP when groundwater concentrations reach 5.0 ug/l for benzene and 94 ug/l for MtBE or as otherwise negotiated.

13.0 MNA INPLEMENTION PLAN

MNA will be conducted to remediate remaining COCs concentrations in groundwater, exceeding the AWQS Corrective Action Standards. Groundwater conditions across the site will be monitored to confirm that contaminants are being naturally attenuated and the natural attenuation mechanisms are proceeding as expected. The following sections discuss the implementation of MNA.

13.1 MNA Groundwater Sampling Plan and MNA Tracking

QS-19, QS-20 and QS-10 are designated as sentinel wells to track the farthest peripheral downgradient extent of the plumes. Along with QS-17 and QS-18 (both data deficient), these wells will be sampled for BTEX, and petroleum components using EPA Method 8260B on a quarterly basis for three years. Results will be used in preparing the ongoing plume stability reports and check for downgradient plume creep. Should exceedances be detected in the sentinel wells, the ADEQ-VRP will be notified, and appropriate actions will be discussed, designed and implemented.

Annual sampling and analysis of groundwater from all monitoring wells by EPA Method 8260B will be conducted. Please refer to Table 1, attached, for wells and frequency of sampling and gauging.

During the annual sampling events, four (4) monitoring wells, specifically QS-3, QS-18, and QS-9 and QS-10, (Figure 10) will be sampled for natural attenuation parameters. QS-18 is at the point of the release and has the largest MtBE and benzene concentrations. QS-9 is medial to the point of release. QS-3 is upgradient of the plume and QS-10 is downgradient of the plume and is also a sentinel well. Together these wells provide a holistic view of the plume. Contaminant concentrations are expected to be highest at QS-18 and QS-9 and natural attenuation processes are likely to be observed here. The following MNA parameters will be analyzed by a fixed-base laboratory or in the field. They will be used as indicators of the progress of natural attenuation:

- Nitrate (laboratory analysis, EPA 353.2 or SW 9056)
- Sulfate (laboratory analysis, EPA 375.4 or SW 9056)
- Alkalinity (laboratory analysis, SM 2320B)
- Conductivity (field analysis).
- Oxidation reduction potential (field analysis).
- pH (field analysis),
- Temperature (field analysis).
- Dissolved oxygen (field analysis).
- Ferrous iron (field analysis).

Data collected will be analyzed to identify patterns and trends that indicate the presence or absence of natural attenuation. The primary indicators being the concentrations of MtBE and benzene over time. Other metrics to be tracked will be oxidation-reduction potential and electron receptor-donor indicators. Trends of all above mentioned metrics will be analyzed and used to adjust the well selection and frequency to maximize relevant data or decrease sampling of wells if indicated by the data. Data will be compiled and presented in annual reporting and summarized in triennial reports.

At some point in the future, more esoteric tests can be used to assess if natural attenuation is taking place and confirm that changes in MNA metrics are not due to other, non-MNA causes. Methods can include stable isotope analysis or compound-specific isotope analysis

Groundwater sampling procedures will follow the Apex SOP contained in Appendix D. However, purge water will be disposed of as investigation derived waste in accordance with all applicable regulations. No permits are required for the MNA implementation.

Predicting the time needed to achieve remedial goals is difficult but it is not unreasonable to expect that an extended duration will be needed. A minimum of three years of MNA is proposed as a first phase to mitigate the on-site dissolved COCs concentrations in groundwater to less than the AWQS Corrective Action Standards.

13.2 Annual Site Status Reports

Annual Site Status Reports will be submitted to VRP during MNA. This report will contain, but not limited to, the following information:

- Description of activities completed in the reporting period and results of the activities.
- Discussion of the results, evaluation of metrics, any contingency actions taken or required.
- Conclusions and recommendations.
- Laboratory analytical reports.
- Site maps, groundwater gradient map, site map with concentration results.
- Table of results, table of historic results, and the charts/tables requested in Comments 10 and 11 as noted in ADEQ-VRP response letter.
- Update Plume Stability data.
- Contaminant mass will be calculated when enough data is present and tracked over time.
- A Mann-Kendall analysis will be completed to identify specific well trends. Apex will utilize the Monitoring and Remediation Optimization System (MAROS) software for the Mann-Kendal analysis. The analysis will include both the entire data set and a rolling data window (e.g. 2-3 years) to determine if declining trends are present and if they are changing over time. After each round the rolling trends should be updated to reduce the effect of earlier data on the current trend. All associated worksheets and/or toolkit printouts will be included as an appendix to the report. The Mann-Kendall will be used to evaluate the trends to confirm the remediation is proceeding as expected, or if regions of the plume have "stalled." Trends will be used to support modifying (optimizing) the monitoring program by reducing monitoring at low priority or stable wells or increasing monitoring at key wells where trends are changing.

Concentrations of COCs and MNA parameters will be charted and evaluated on an annual basis and recommendations will be included in the report for any changes in procedures or current assumptions regarding plume location and stability. Groundwater levels, and concentrations of MtBE and benzene and all process metrics will be tabled and graphed as indicators of attenuation progress.

13.3 Plume Stability Evaluation Reports

The VRP requests a revised PS Report (Ricker) every three years as an accompaniment to a triennial remedy evaluation (TRE) report. As part of the site status reporting, modification of the Plume Stability Evaluation will be performed to incorporate new sampling data (see 13.1). No changes have been made to the plume stability report in the current iteration of this document. The following comments will be incorporated into future Ricker Plume Stability Reports:

- Surfer boundaries will include data from the sentinel wells QS-17 through QS-20 to smooth the plume edges so as not to skew the plume volume.
- All groundwater analytical data before 2019 will be omitted from the tables and graphs.
- Additional contours for benzene between the 5 and 1000 parts per million (ppm) (e.g. 10 ppm) to be added.
- Additional contours for MtBE between the 20 and 500 ppm and one greater than the 500 ppm to be added.

13.4 Triannual Remediation Remedy Evaluation

The VRP requests a remedy evaluation every three years in lieu of an annual report for the third year. The TRE will contain all properties of an annual report as described above, including data tables, maps with the following additions:

- Compare current data to clean up goals. Data should include concentrations of CoCs, and current down gradient extent of the plume.
- Analyze and discuss the results obtained from the remediation activities. Determine whether the remediation is proceeding in respect to cleanup goals. Discuss possible issues complicating the MNA methodology.
- Summarize data collected that are being used to determine if MNA is progressing. (See 13.1 above) These data will include estimated contaminant mass removal rates.
- An overall summary will be provided that will present opinions on the results of the three-year study period, leading to conclusions and recommendations, including:
    - Is there identifiable progress using MNA on this site.
    - Is the monitoring program adequate or are changes needed to secure proper data sets.
    - Is the need for an alternative remedial method inferred by the data

A meeting with the ADEQ VRP is proposed three years after implementation of the MNA to discuss progress and effectiveness of the method and discuss the results of the triannual remedial report.

13.5 Proposed Implementation Schedule

Apex plans to implement the MNA program in 3-year phases upon written approval from the VRP. Below is a proposed first phase schedule of tasks and estimated time to completion:

PHASE ONE TASK	TASK DESCRIPTIONS Three Year Period August 2024 – September 2027	COMPLIANCE SCHEDULE (Calendar Days)	
		TASK	**CUMULATIVE**
1	Conduct Quarterly/Annual CoC and MNA Monitoring Sept 2024-2027	5 days per event 4 events per year over 3 years	60 days
2	Submit two (2) Annual Site Status Reports Sept 2025-2026	4 days per report 2 reports	14 Days
3	Triannual Remediation Remedy Evaluation Report And Plume Stability Report Sept 2027	6 days per report	6 days
4	Meeting with the ADEQ -VRP MNA Progress Nov 2027	2 days for meeting and prep	2 days

13.6 Analytical Lab

Apex plans to use Orange Coast Analytical, Inc. for groundwater testing services. ADHS certificate and credential are attached in Appendix D.

13.7 Community Involvement

A public participation program in accordance with ADEQ guidelines will be developed for the proposed actions in this RAWP. Proposed public participation activities will include a public notice to be published on the ADEQ website and in the local paper. Text of the notification is found in Appendix D. Individual contact will be made with each of the following affected property owners and representatives:

1. Ms. Donna Hanks – Adjacent and contiguous property to the east of the Site
2. Pastor Kevin J. Meyer of Covenant Lutheran Church – Adjacent and contiguous to the north.
3. George and Edith Paul – Adjacent and contiguous property to the NE of the site.

Apex will provide a written description of the release, remediation activities previously performed and the status of the plume. The proposed MNA process will be explained in an interview with each of the property owners. Apex and ADEQ VRP contact information will be distributed that can be used if questions arise. No other landowners (Shay Oil notwithstanding) are located immediately downgradient or over the aerial extent of the plume.

14.0 Contingencies

- Groundwater Use:

  Based on the presence of readily available municipal water and the poor nature and quality of the aquifer, there is low probability that residents or businesses will access the groundwater near the plume for domestic or commercial use.

- Increase in Concentrations of COCs:

  If significant reversal of downward trends in benzene or MtBE occur, more active remediation methods could be used in affected areas. These include SVE and AS, In-Situ Chemical Oxidation, and pumping and treatment of impacted groundwater.

- Change in Groundwater Elevation:

  A static groundwater level will likely continue, inferred by the consistent elevations measured over the past 10 years and lack of septic tank usage after the municipal sewer system installation in the area. Annual measurements of groundwater elevation will be tracked, and anomalous measurements will be investigated in respect to protection of the surrounding community. If plume creep occurs, appropriate action will be taken after consulting with the ADEQ-VRP.

- Nearby Receptors

  The depth to groundwater on-site and off-site is approximately 60’ bgs. Contact with groundwater by residents, construction workers or others is not anticipated. No domestic wells or other potential receptors were identified in the recent LWUS survey completed by Apex and included herein in Appendix A.

- Future Development

  The Site is bounded on the north by an established church and east by residence that is occupied seasonally. Neither site can be expected to be developed soon. To the northeast are several lots currently undeveloped and unoccupied, which could be used for new construction. Current downgradient extent of the plume appears to stop just short of these lots. As previously mentioned, depth to groundwater would preclude exposure to workers or residents if development occurred.

15.0 Proposed Phase One Schedule of Tasks:

RAWP Submittal	June 2024
ADEQ Review of RAWP	July 2024
Quarterly Groundwater Sampling Events	Sept 2024-2027
Submittal of Annual Site Status Reports	Sept 2025-2026
Submittal of Triannual Remediation Remedy Evaluation Report	Sept 2027
Meet with ADEQ for MNA Evaluation	Nov 2027

SIGNATURES

This report is based on available information and was prepared in accordance with currently accepted geologic, hydrogeologic and engineering practice. No other warranty is implied or intended. This report has been prepared for the sole use of Shay Oil Company, Inc. and the Arizona Department of Environmental Quality (ADEQ), Voluntary Remediation Program (VRP) and applies to the subject site only. Use of this report by third parties shall be at such parties' sole risk.

Sincerely,

APEX ENVIROTECH, INC.

Patty Small

63299
PATTY
SMALL
6/20/2024

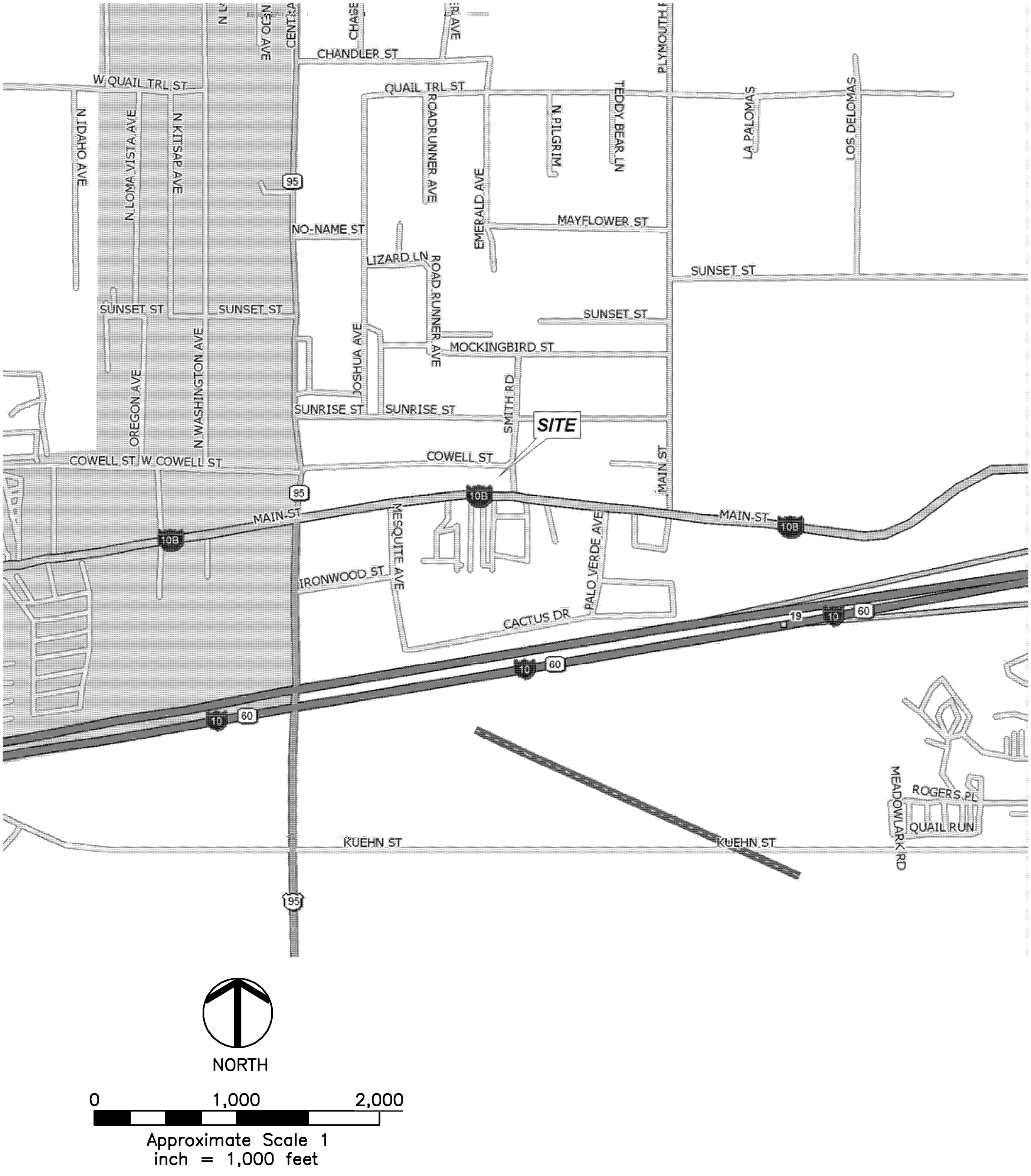
Patty Small
AZ RG #63299
Project Geologist

Thomas E. Paul
Sr.V.P., Principal
Apex QA Manager

Figures 1-15

Table 1: Groundwater Monitoring Schedule

Table 2: Well Construction Summary



APEX
ENVIROTECH, INC.

DRAWN BY: N. Rouillard
DATE: 8/3/22
REVISIONS

SITE VICINITY MAP

Shay Oil Company, Inc.
Business Loop I-10
Quartzsite, Arizona

FIGURE
1

PROJECT NUMBER:
SHA04.001

LEGEND

- 🔴 Soil Boring/Grab Water Sample Locations
- ⊕ Current Monitoring Well Locations

FIGURE 2

PROJECT NUMBER: SHA04.001

SITE MAP

Shay Oil Company, Inc.
Business Loop I-10
Quartzsite, Arizona

DRAWN BY: N. Rouillard
DATE: 11/22/22

REVISIONS

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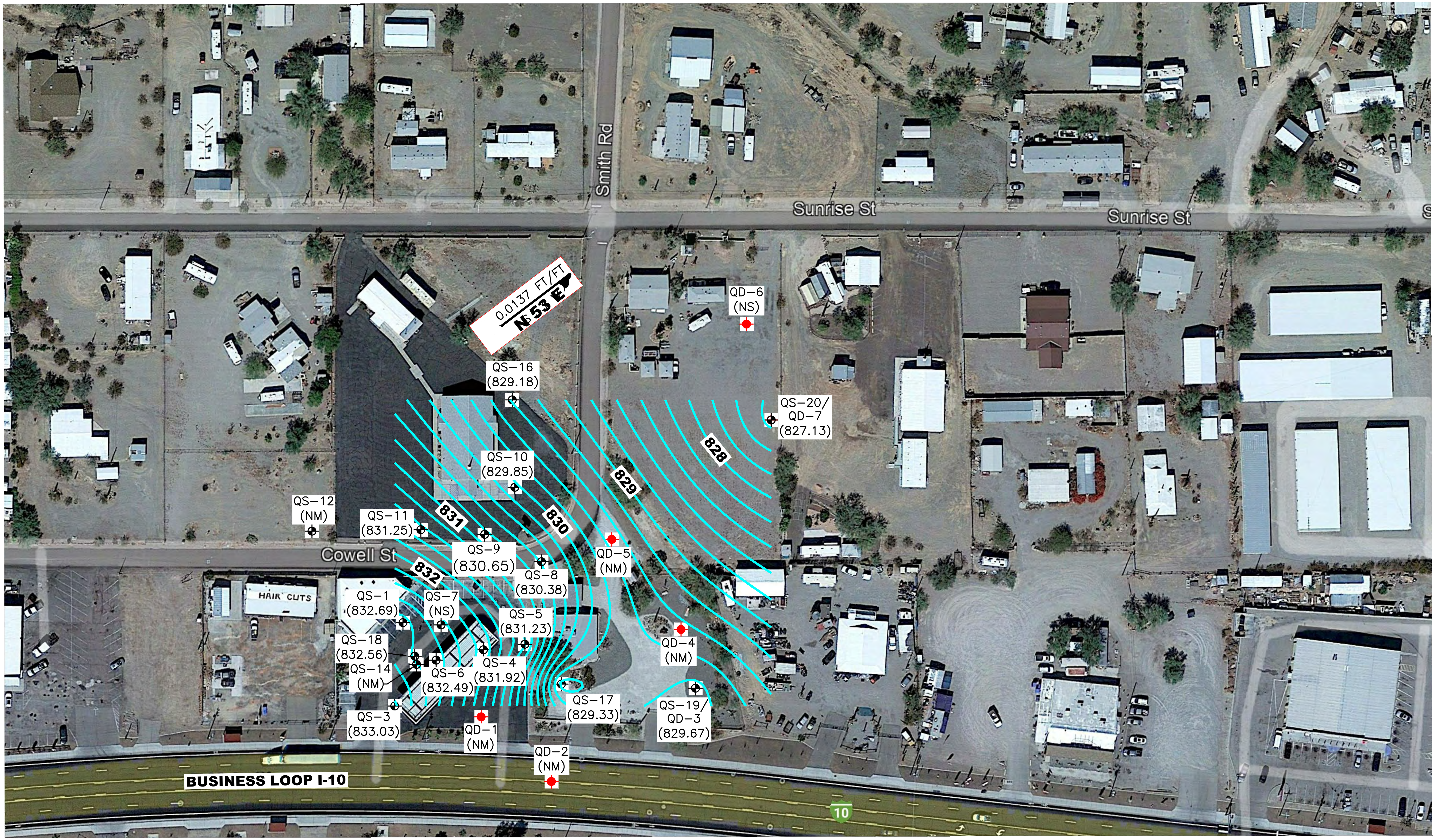

NORTH

0 100 200

Approximate Scale
1 inch = 100 feet

LEGEND

● Soil Boring/Grab Water Sample Locations

⊕ Current Monitoring Well Locations

Groundwater Contour Line
(Contour Interval = 2 ft.)

0.0137 FT/FT Approximate Groundwater Gradient And Flow Direction

(NM) Not Measured

FIGURE
3

PROJECT NUMBER:
SHA04.001

POTENTIOMETRIC MAP

Shay Oil Company, Inc.
Business Loop I-10
Quartzsite, Arizona

DRAWN BY: N. Rouillard
DATE: 3/24/23

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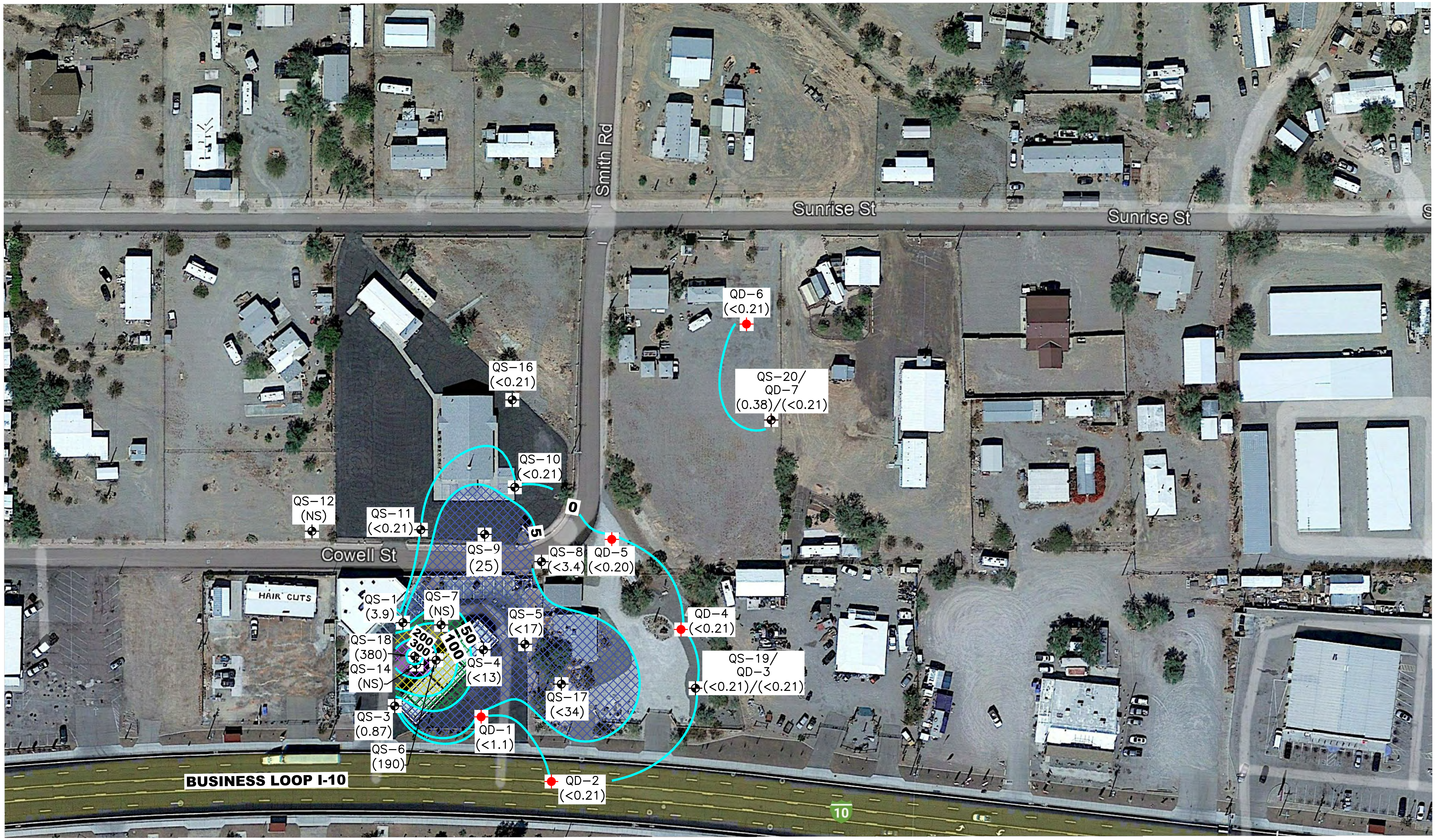
APEX
ENVIROTECH, INC.



NORTH

0 100 200
Approximate Scale
1 inch = 100 feet

LEGEND

● Soil Boring/Grab Water Sample Locations

⌖ Current Monitoring Well Locations

(380) Concentration Of Benzene In Groundwater Measured In µg/L

— Line Of Equal Concentration Of Benzene In Groundwater Measured In µg/L

(NS) Not Sampled

FIGURE **4**

PROJECT NUMBER: SHA04.001

MAP OF BENZENE IN GROUNDWATER

Shay Oil Company, Inc.
Business Loop I-10
Quartzsite, Arizona

DRAWN BY: N. Rouillard
DATE: 3/24/23

REVISIONS

APEX ENVIROTECH, INC.

FIGURE 5

PROJECT NUMBER: SHA04.001

MAP OF MTBE IN GROUNDWATER

Shay Oil Company, Inc.
Business Loop I-10
Quartzsite, Arizona

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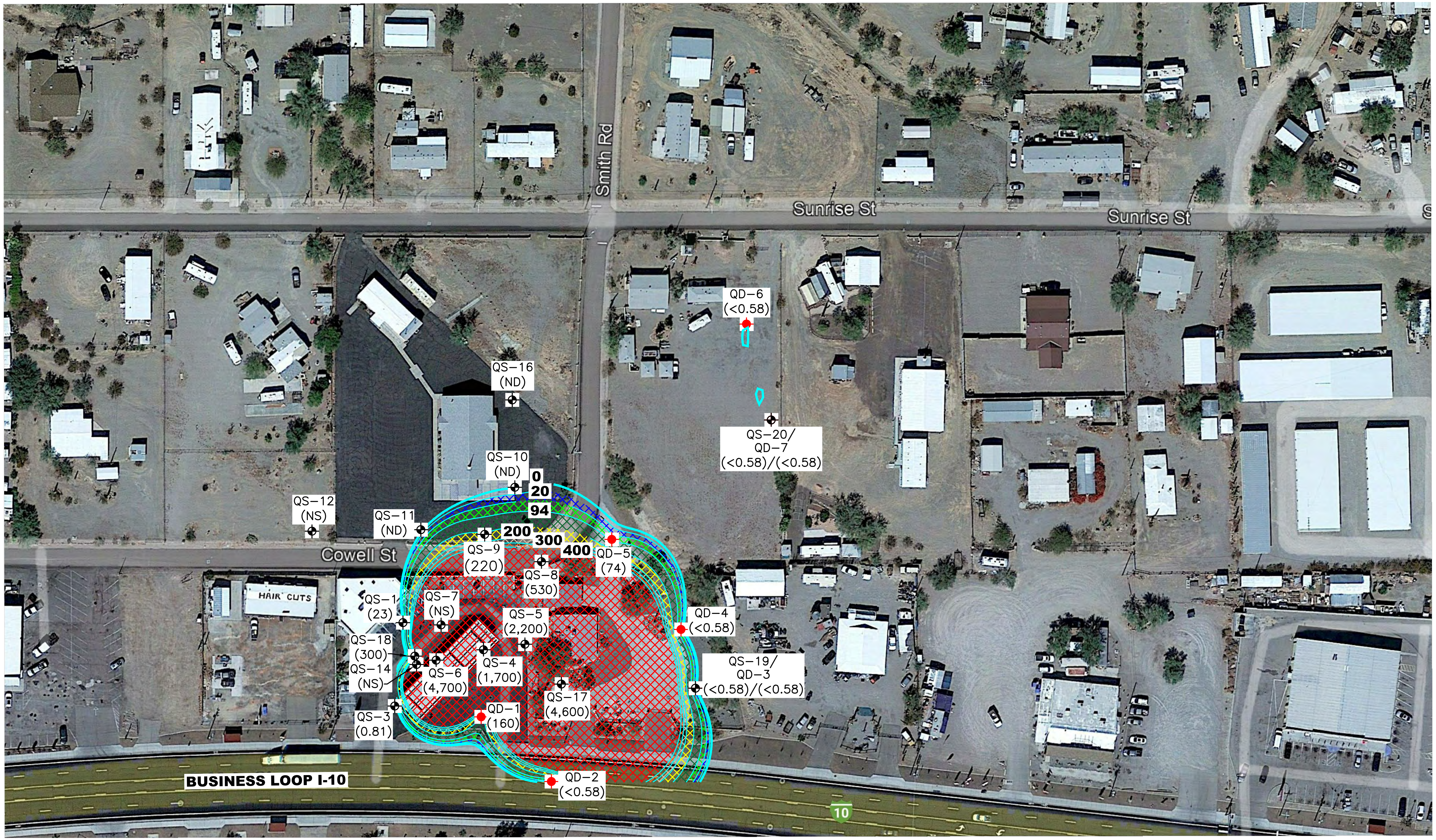
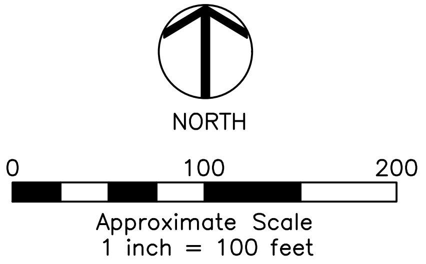
DATE: 3/24/23
REVISIONS

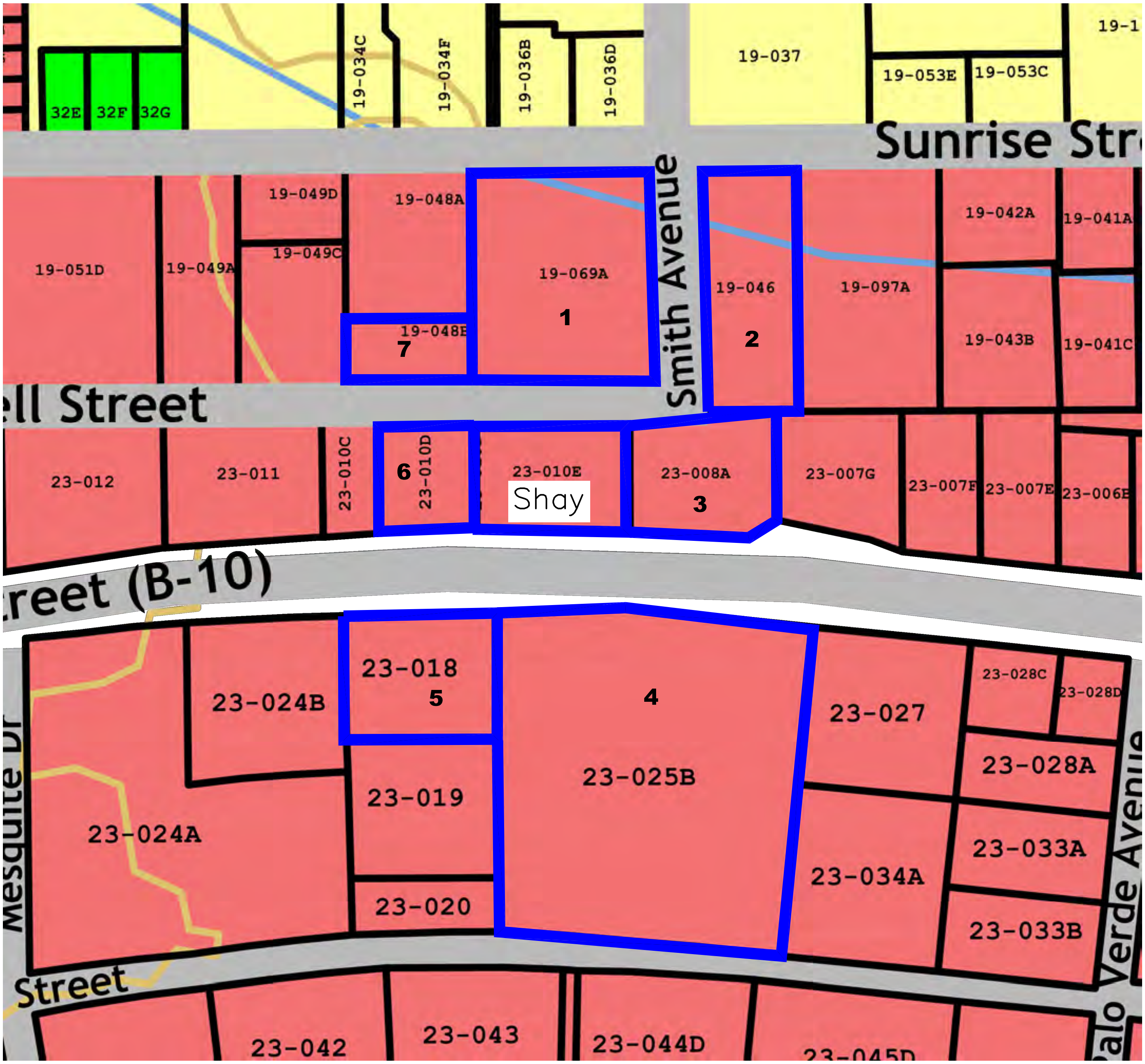
APEX ENVIROTECH, INC.





LEGEND

🟥	Soil Boring/Grab Water Sample Locations
⌖	Current Monitoring Well Locations
(4,700)	Concentration Of MTBE In Groundwater Measured In µg/L
━	Line Of Equal Concentration Of MTBE In Groundwater Measured In µg/L
(ND)	Not Detected
(NS)	Not Sampled



LEGEND

1. Covenant Lutheran Church - 270 E Cowell St
2. Residence - 55 N Smith Ave
3. Residence - 310 E Main St
4. Crawford's RV Park - 315 E Main St
5. Vacant Lot - 235 E Main St
6. Quartzsite Beauty Salon - 250 E Main St
7. Vacant - 250 E Cowell St

APEX
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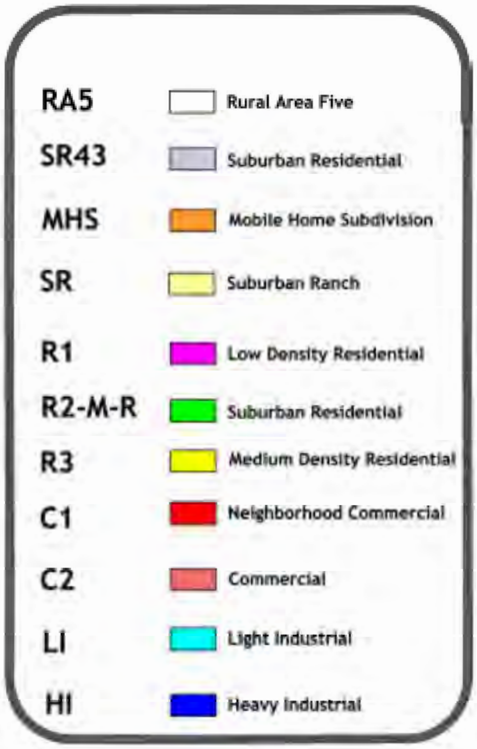
DATE: 3/24/23
REVISIONS

CURRENT SITE SPECIFIC LAND USE

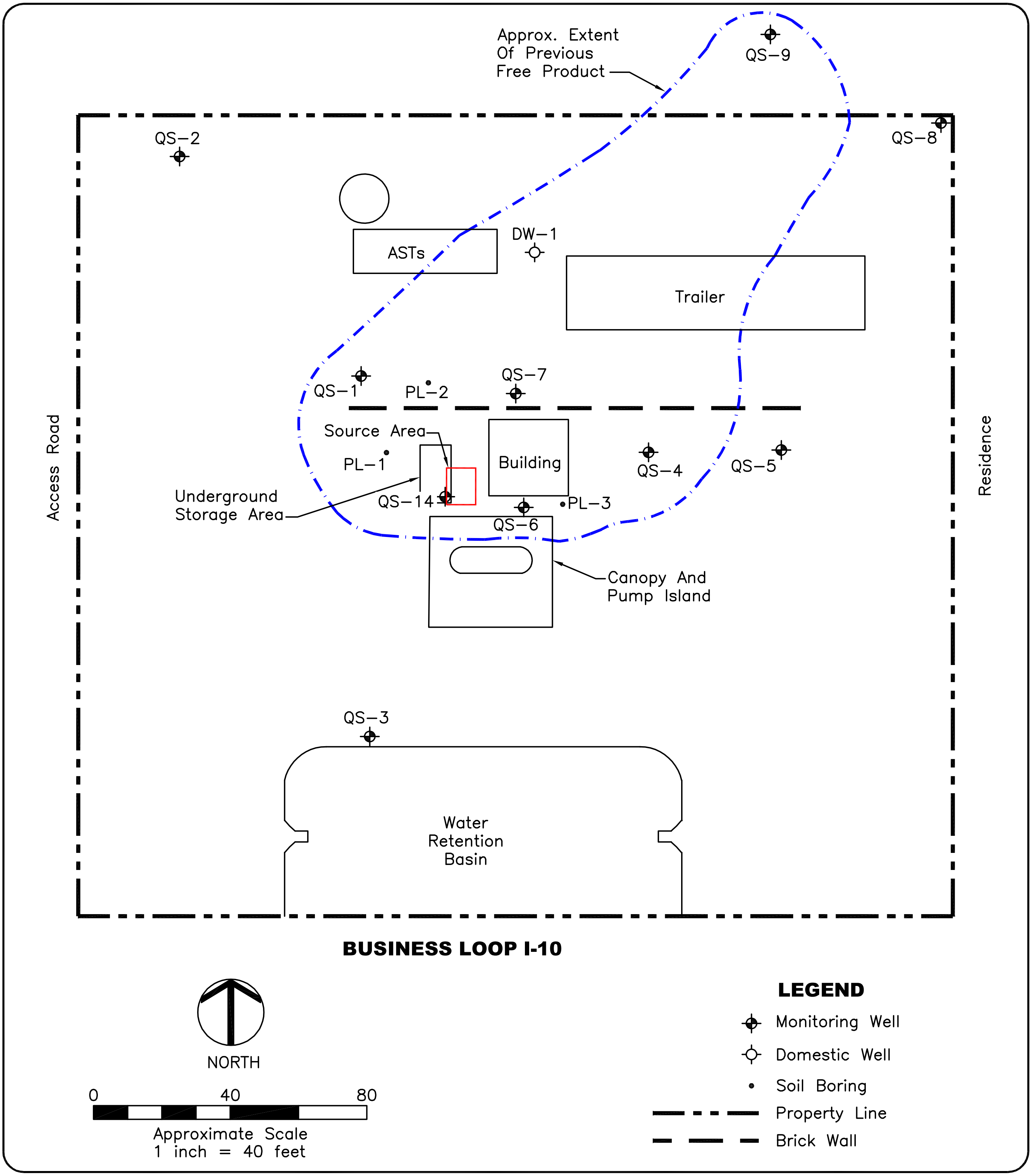
Shay Oil Company, Inc.
Business Loop I-10
Quartzsite, Arizona

FIGURE
6

PROJECT NUMBER:
SHA04.001



RA5	⬜	Rural Area Five
SR43	▨	Suburban Residential
MHS	🟧	Mobile Home Subdivision
SR	🟨	Suburban Ranch
R1	🟪	Low Density Residential
R2-M-R	🟩	Suburban Residential
R3	🟨	Medium Density Residential
C1	🟥	Neighborhood Commercial
C2	🟥	Commercial
LI	🟦	Light Industrial
HI	🟦	Heavy Industrial



APEX
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DATE: 3/24/23
REVISIONS

HISTORIC SITE LAYOUT WITH LNAPL PLUME

Shay Oil Company, Inc.
Business Loop I–10
Quartzsite, Arizona

FIGURE
7

PROJECT NUMBER:
SHA04.001

FIGURE 8

Monitoring Well Hydrographs
Business Loop I-10, Quartzite, Arizona

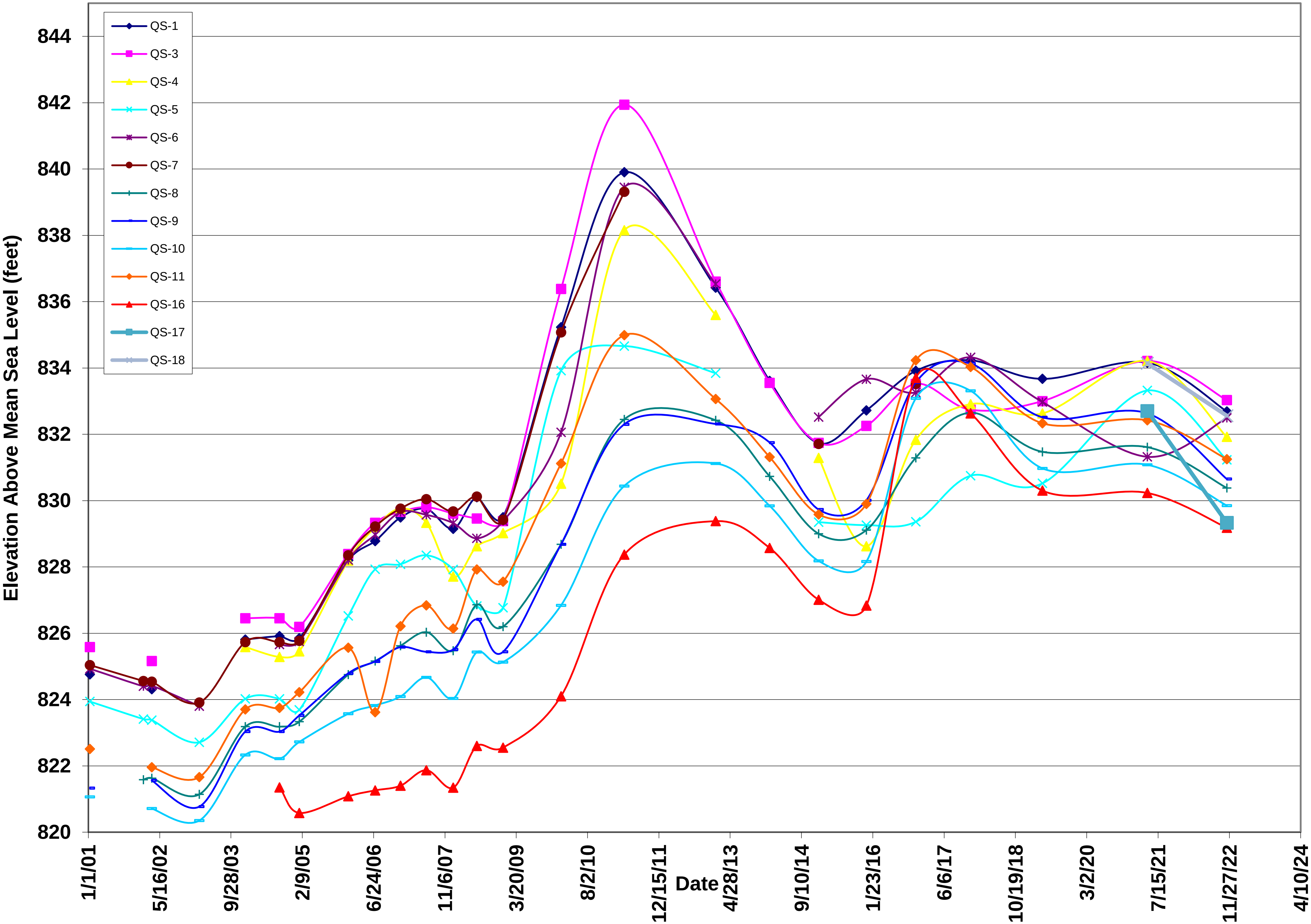


Figure 9

Benzene Concentrations in Select Monitoring Wells
Shay Oil Co., I - 10 Business Loop, Quartzsite, AZ

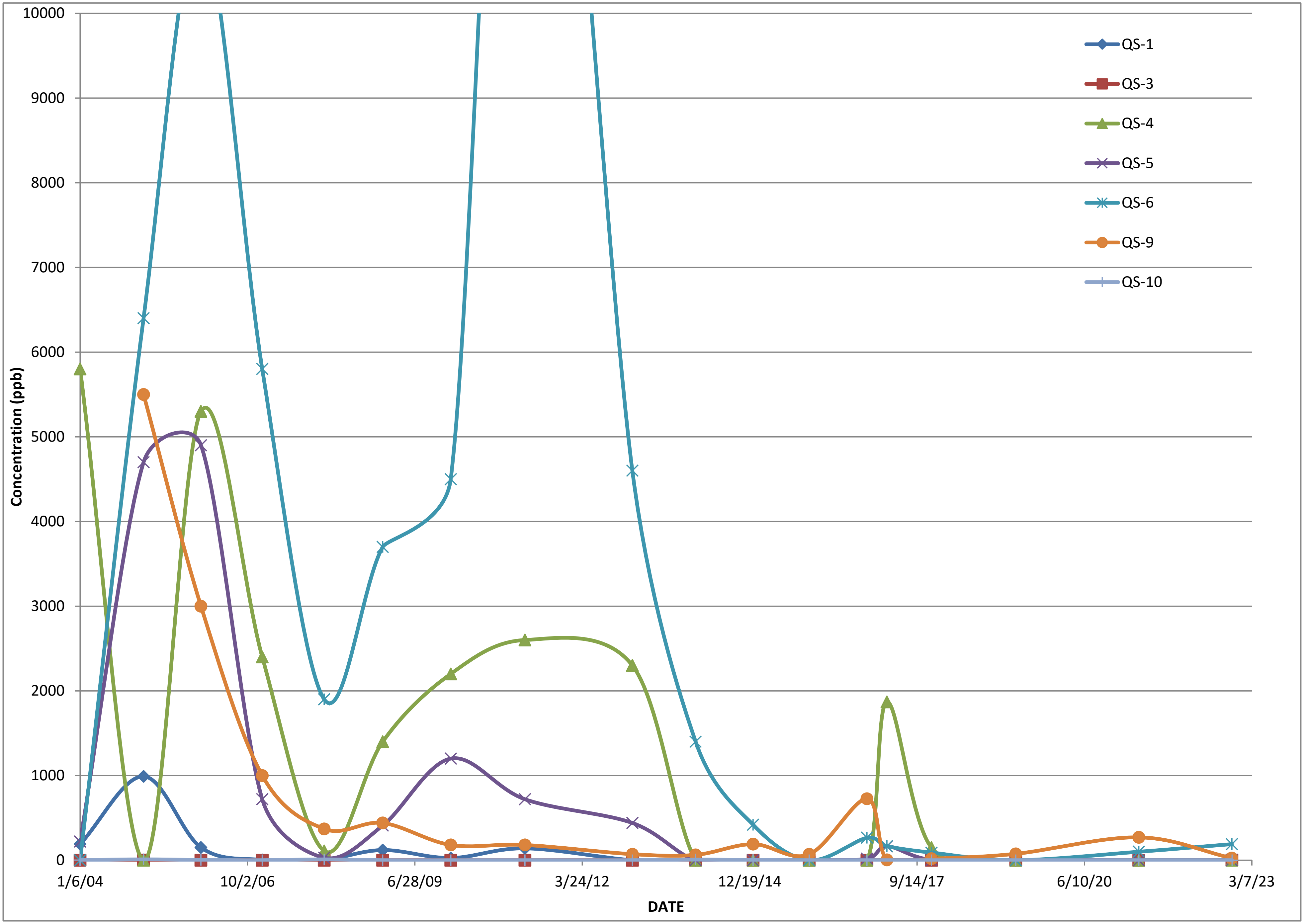


Figure 10

Benzene Concentrations in Select Monitoring Wells
Shay Oil Co., I - 10 Business Loop, Quartzsite, AZ

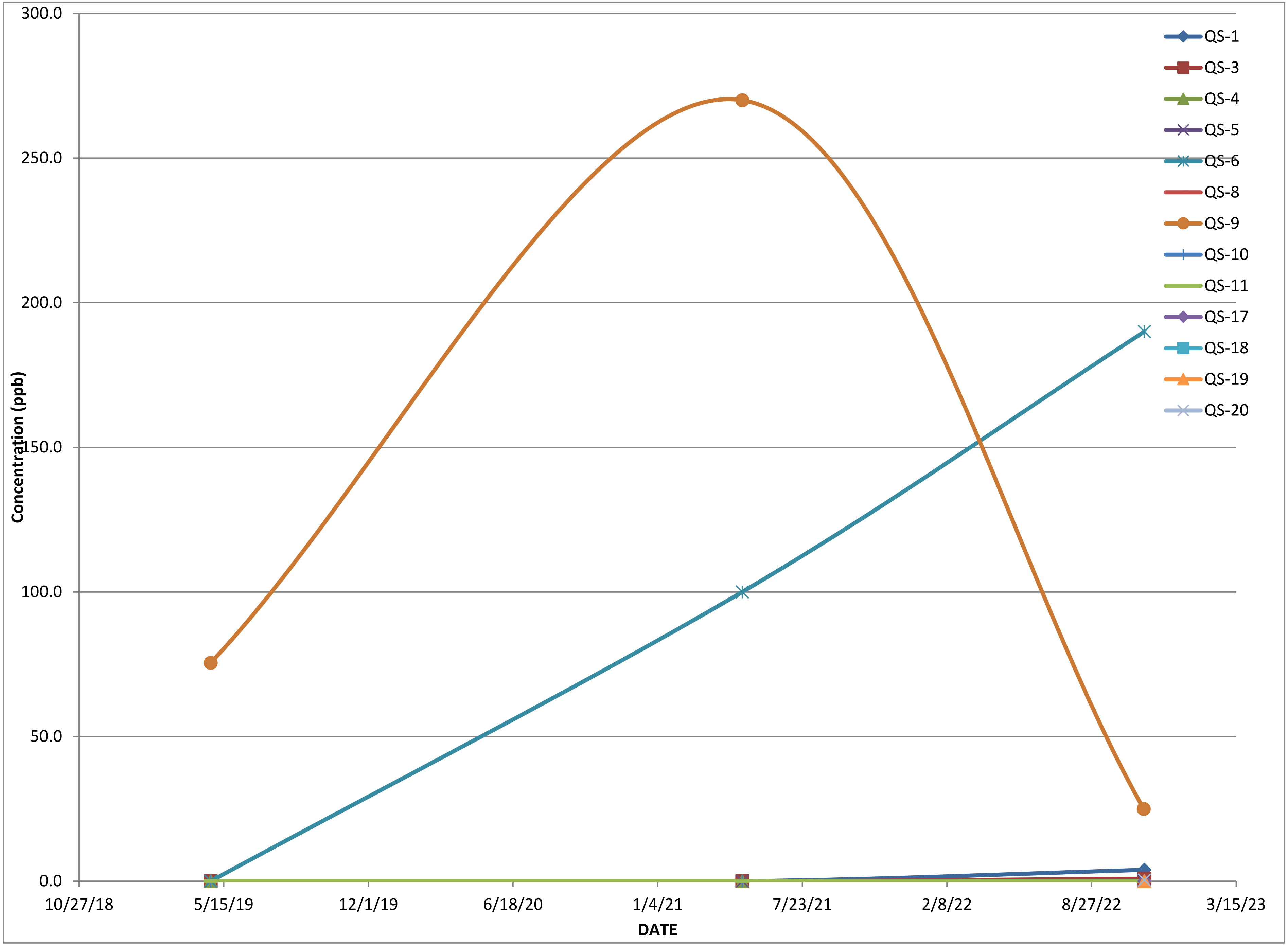


FIGURE 11
MtBE Concentrations in Select Monitoring Wells
Shay Oil Co., I - 10 Business Loop, Quartzsite, AZ

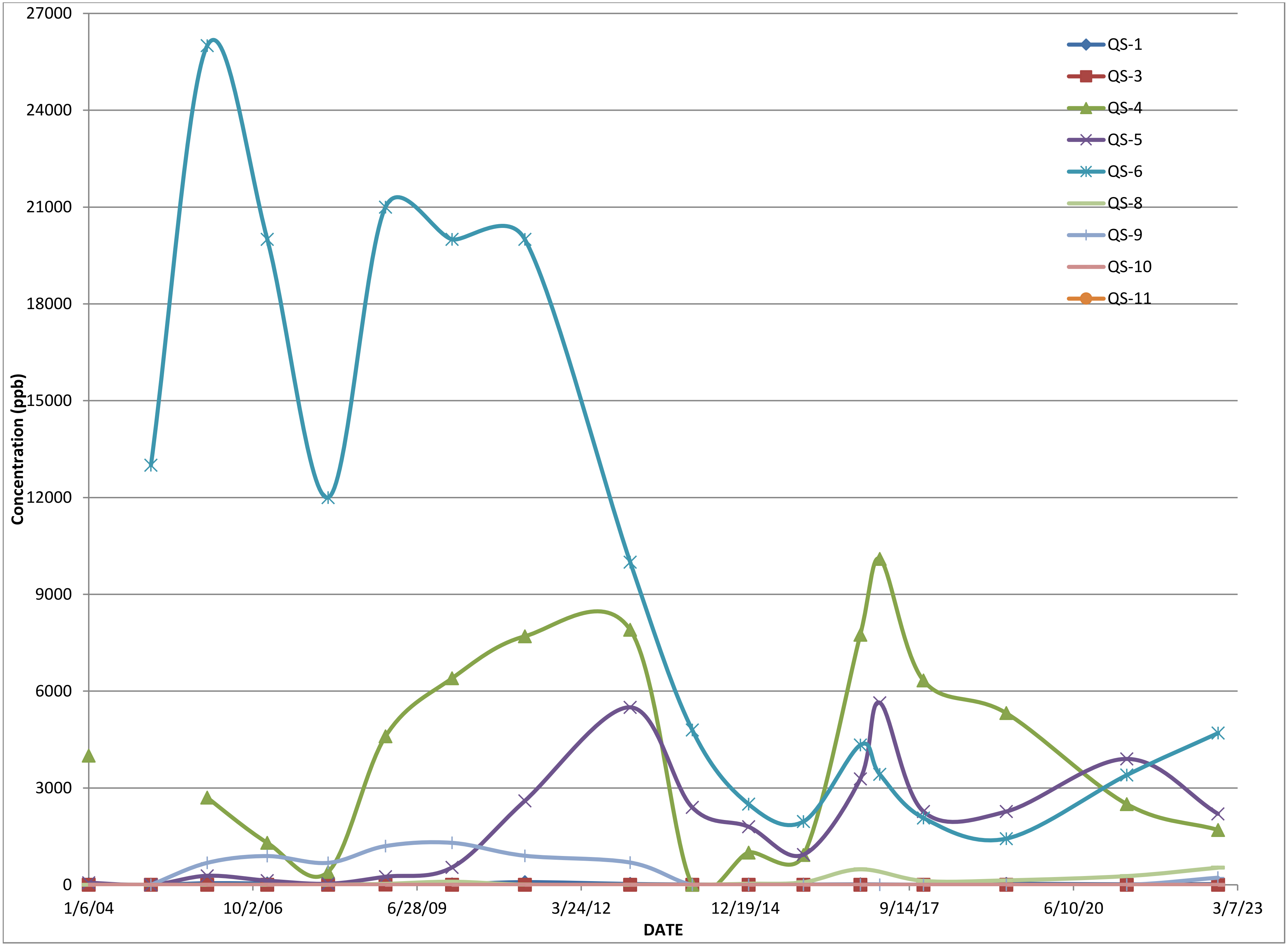
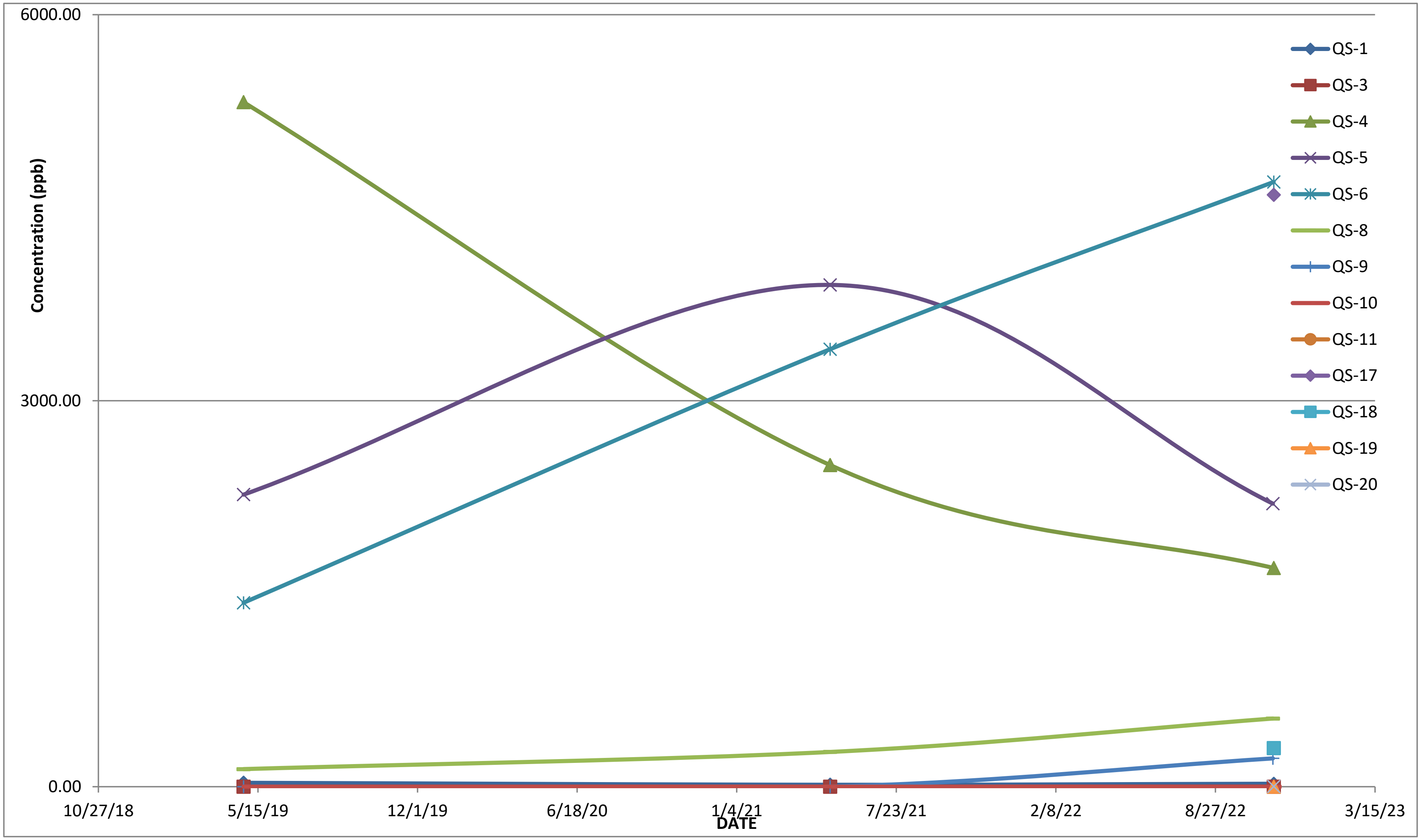
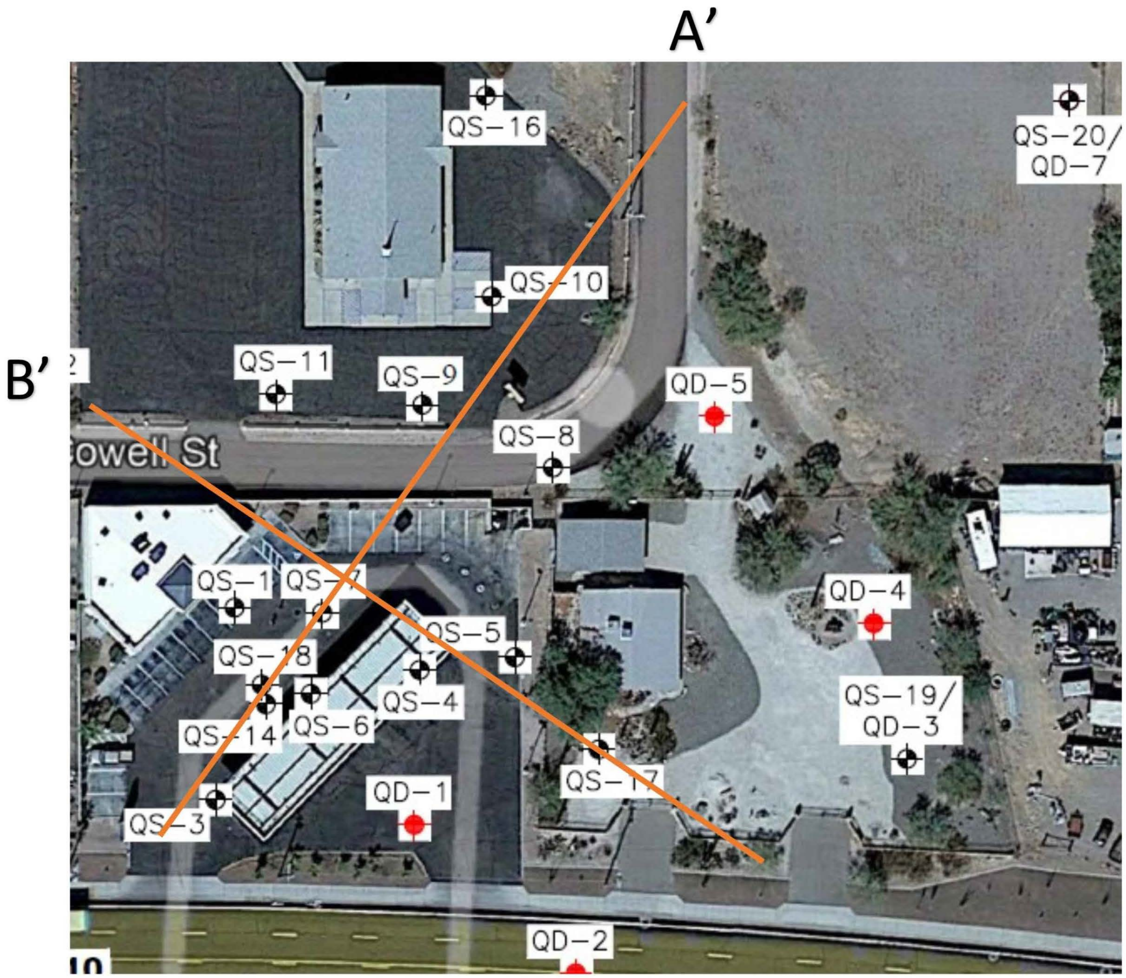
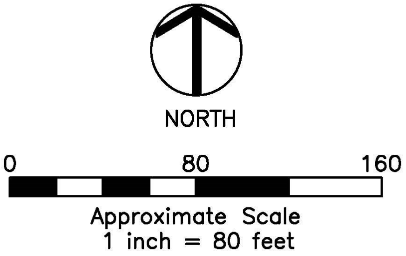


FIGURE 12

MtBE Concentrations in Select Monitoring Wells
Shay Oil Co., I - 10 Business Loop, Quartzsite, AZ







APEX
ENVIROTECH, INC.

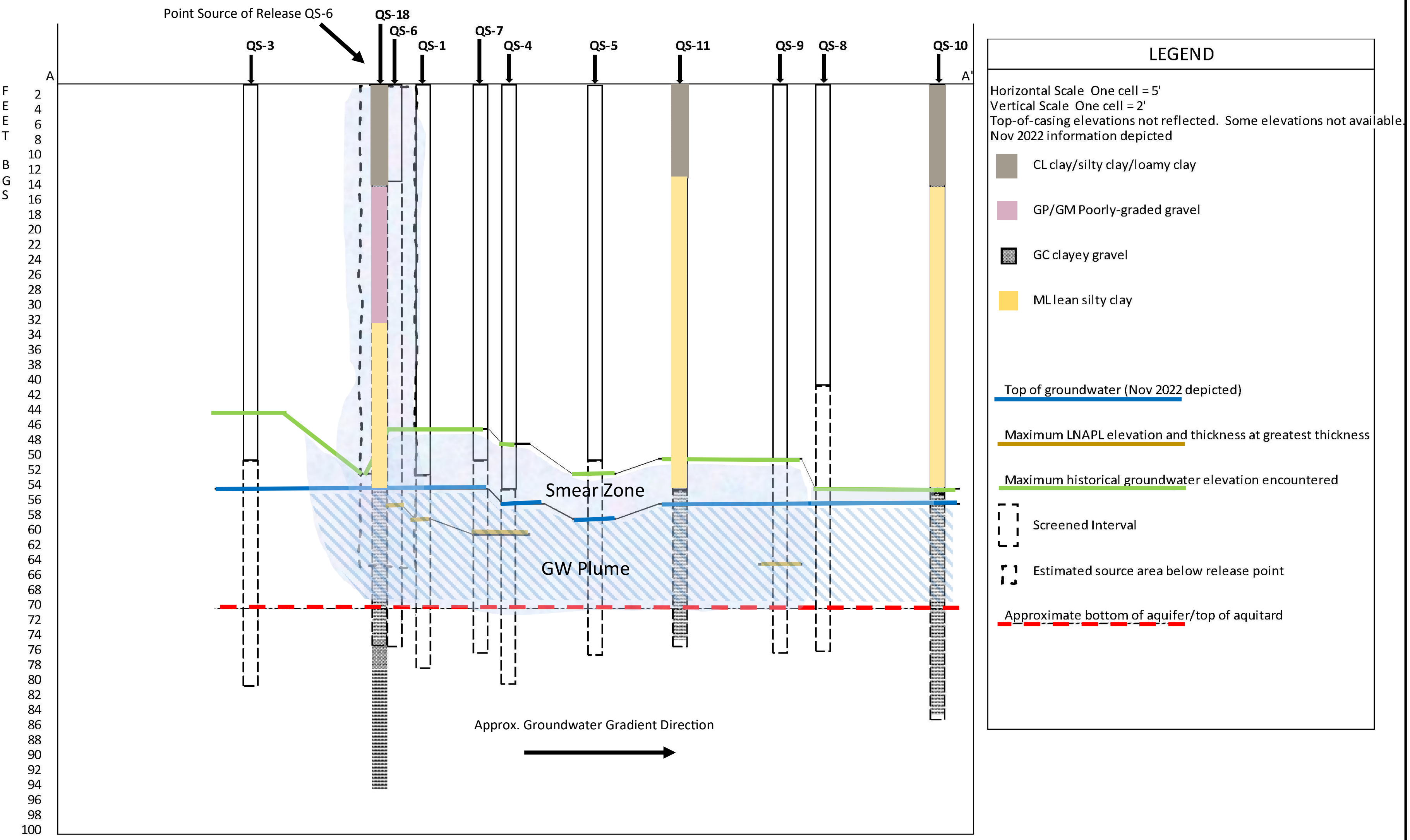
DRAWN BY: R. Ochoa
DATE: 02/23/24
REVISIONS

CROSS SECTION AERIAL SITE MAP

Shay Oil Company, Inc.
280 East Main Street
Quartzsite, AZ. 85346

FIGURE
13

PROJECT NUMBER:
SHA04.001



Scale: H = 1 inch = 50 feet
V = 1inch = 20 feet

APEX
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DRAWN BY:	R. Ochoa
DATE:	2/7/24

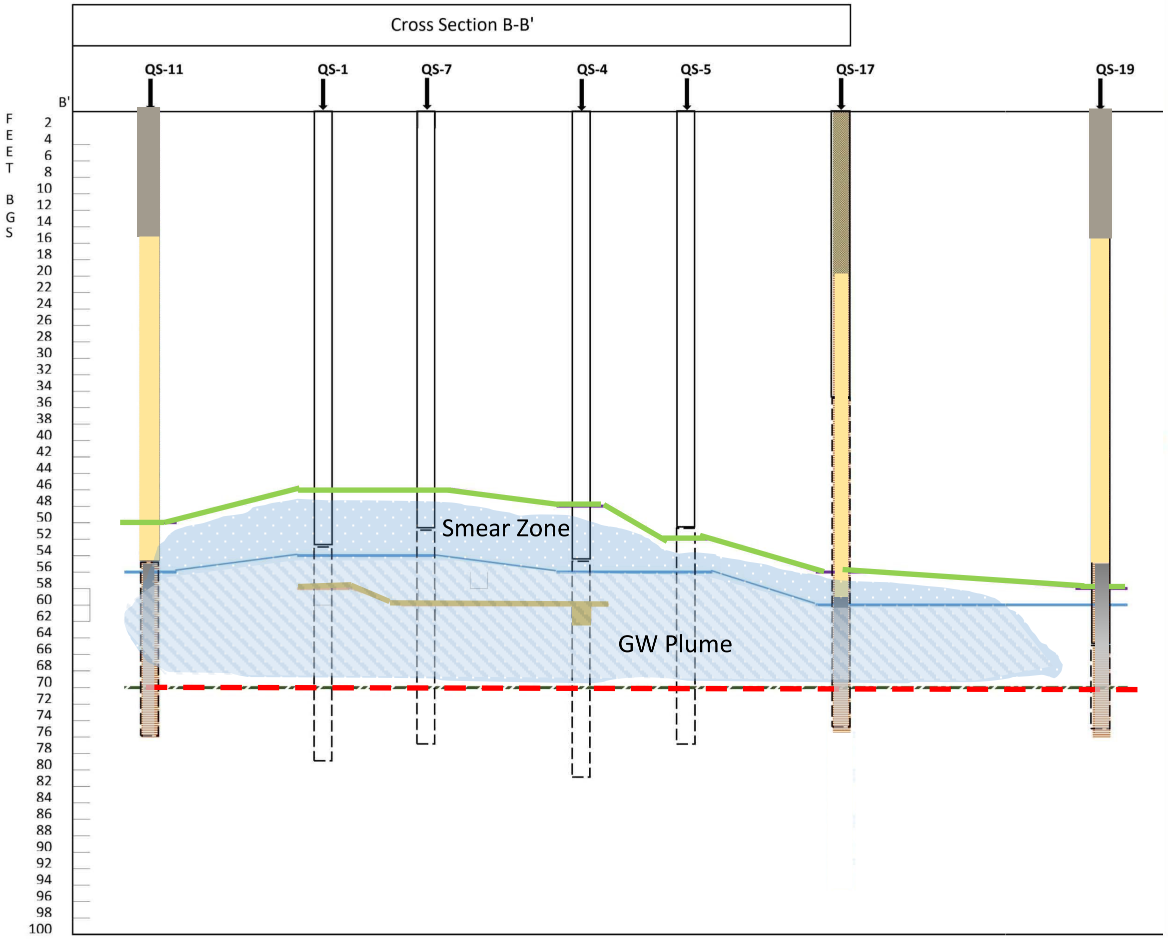
REVISIONS

CROSS SECTION MAP A-A'

Shay Oil Company, Inc.
280 East Main St.
Quartzsite, AZ 85346

FIGURE
14

PROJECT NUMBER:
SHA04.001



See attached legend.

LEGEND

Top-of-casing elevations not reflected. Some elevations not avail
Nov 2022 information depicted

- ■ CL clay/silty clay/loamy clay
- ■ GP/GM Poorly-graded gravel
- ▦ GC clayey gravel
- ■ ML lean silty clay
- Top of groundwater (Nov 2022 depicted)
- Maximum LNAPL elevation and thickness at greatest thickness
- Maximum historical groundwater elevation encountered
- ⬚ Screened Interval
- Approximate bottom of aquifer/top of aquitard

SCALE: H = 1" = 40'
V = 1" = 23'

APEX
ENVIROTECH, INC.

DRAWN BY: R. Ochoa
DATE: 02/23/24

REVISIONS

CROSS SECTION B-B'

Shay Oil Company, Inc.
280 East Main Street
Quartzsite, AZ. 85346

FIGURE
15

PROJECT NUMBER:
SHA04.001

Table 1: Groundwater Monitoring Schedule

Well Name	ADWR Registration Number	Screen Interval (feet bgs)	Sample Collection Method and Depth	Geologic Unit	Well Use	Groundwater Monitoring Plan (Sampling and Monitoring Schedule)				
						Water Quality Sampling and Analysis			Water Level Measurement	
						Quarterly	Annual		Quarterly	Annual
						VOCs	VOCs	MNA		
QS-1	55-535871	52-78	Low Flow (water table)	Unconsolidated	Monitor	---	X	---	X	X
QS-2	55-535872	54-80	NS (abandoned)	Unconsolidated	NA	---	---	---	---	---
QS-3	55-535873	53-80	Low Flow (water table)	Unconsolidated	MNA/Monitor	---	X	X	X	X
QS-4	55-535874	54-80	Low Flow (water table)	Unconsolidated	Monitor	---	X	---	X	X
QS-5	55-535875	50-76	Low Flow (water table)	Unconsolidated	Monitor	---	X	---	X	X
QS-6	55-535876	14-75	Low Flow (water table)	Unconsolidated	Monitor	---	X	---	X	X
QS-7	55-535877	50-76	NS (well obstructed)	Unconsolidated	NA	---	---	---	---	---
QS-8	55-537914	40-76	Low Flow (water table)	Unconsolidated	Monitor	---	X	---	X	X
QS-9	55-537910	50-76	Low Flow (water table)	Unconsolidated	MNA/Monitor	---	X	X	X	X
QS-10	55-537909	55-85	Low Flow (water table)	Unconsolidated	MNA/Sentinel	X	X	X	X	X
QS-11	55-537911	54-75	Low Flow (water table)	Unconsolidated	Monitor	---	X	---	X	X
QS-12	55-537912	54-75	NS (not located)	Unconsolidated	NA	---	---	---	---	---
QS-13	55-535870	55-80	NS (abandoned)	Unconsolidated	NA	---	---	---	---	---
QS-14	55-536731	55-75	NS (abandoned)	Unconsolidated	NA	---	---	---	---	---
QS-15	55-547894	55-75	NS (destroyed)	Unconsolidated	NA	---	---	---	---	---
QS-16	55-547895	55-75	Low Flow (water table)	Unconsolidated	Monitor	---	X	---	X	X
QS-17	55-925918	35-75	Low Flow (water table)	Unconsolidated	Monitor	X	X	---	X	X
QS-18	55-925919	35-75	Low Flow (water table)	Unconsolidated	MNA/Monitor	X	X	X	X	X
QS-19	55-928508	65-75	Low Flow (water table)	Unconsolidated	Sentinel	X	X	---	X	X
QS-20	55-928510	65-75	Low Flow (water table)	Unconsolidated	Sentinel	X	X	---	X	X

NS = Not Sampled

Note: Most all of the online well records do not indicate the assigned Well Number (or refer to an incorrect well #) and/or were installed before Apex become the consultant, so the ADWR Registration Numbers for wells QS-1 through QS-16 represent Apex's best assumption based on date of installation, depth, and screened intervals.

Table 2

Well Construction Summary

Well Number	ADWR Registration Number	Measurement Point Elevation (feet amsl)	Well Casing Diameter (inches)	Top of Screen (feet bgs)	Bottom of Screen (feet bgs)
QS-1	55-535871	886.59	4	52	78
QS-2	55-535872	Abandoned 3/20/03	4	54	80
QS-3	55-535873	886.72	4	53	80
QS-4	55-535874	886.52	4	54	80
QS-5	55-535875	887.63	4	50	76
QS-6	55-535876	886.77	4	14	75
QS-7	55-535877	886.42	4	50	76
QS-8	55-537914	886.94	4	40	76
QS-9	55-537910	886.31	4	50	76
QS-10	55-537909	886.48	4	55	85
QS-11	55-537911	886.01	4	54	75
QS-12	55-537912	884.75	4	54	75
QS-13	55-535870	Abandoned 3/20/03	4	55	80
QS-14	55-536731	Abandoned 3/20/03	4	55	75
QS-15	55-547894	Well destroyed 1998	2	55	75
QS-16	55-547895	885.78	2	55	75
QS-17	55-925918	888.2	2	35	75
QS-18	55-925919	886.34	2	35	75
QS-19	55-928508	888.54	2	65	75
QS-20	55-928510	887.86	2	65	75

Note: Most all of the online well records indicate the assigned Well Number (or refer to a well ID that does not exist), so the ADWR Registration Numbers in the table represent Apex's best assumption based on date of installation, depth, and screened intervals.

Appendix A:

Land and Water Use Survey (LWUS)

Appendix B:

Ricker Plume Stability Evaluation

Appendix C:

Site Characterization Results Report

April 24, 2023 – Apex Envirotech, Inc.

Appendix D:

Apex Envirotech, Inc. Standard Operating Procedures

Orange Coast Labs ADHS Certifications

RAWP Notification Text

APEX ENVIROTECH, INC.

STANDARD OPERATING PROCEDURES

SOP-1
HOLLOW STEM AUGER SOIL BORING SAMPLING

During drilling, soil samples for chemical analysis are collected in thin-walled brass tubes, of varying diameters and lengths (e.g., four or six inches long by two inches outside diameter). Three or four of the selected tubes, plus a spacer tube, are set in an 18-inch long split-barrel sampler of the appropriate inside-diameter.

Where possible, the split-barrel sampler is driven its entire length either hydraulically or using a 140-pound drop hammer. The sampler is extracted from the borehole and the brass tubes, containing the soil samples, are removed. Upon removal from the sampler, the selected brass tubes are either immediately trimmed and capped with aluminum foil or "Teflon" sheets and plastic caps or the samples are extruded from the tubes and sealed within other appropriate, cleaned sample containers. The samples are then hermetically sealed, labeled, and refrigerated for delivery, under strict chain-of-custody, to the analytical laboratory. These procedures minimize the potential for cross-contamination and volatilization of volatile organic compounds (VOC) prior to chemical analysis.

One soil sample collected at each sampling interval is analyzed in the field using either a portable photo ionization detector (PID), flame ionization detector (FID), organic vapor analyzer, catalytic gas detector, or an explosimeter. The purpose of this field analysis is to qualitatively determine the presence or absence of hydrocarbons, and the samples to be analyzed at the laboratory. The soil sample is sealed in either a brass tube, glass jar, or plastic bag to allow for some volatilization of VOC. The PID is then used to measure the concentrations of hydrocarbons within the container’s headspace. The data is recorded on both field notes and the boring logs at the depth corresponding to the sampling point.

Other soil samples are collected to document the soil and/or stratigraphic profile beneath the project site, and estimate the relative permeability of the subsurface materials. All drilling and sampling equipment are either steam cleaned or washed in solution and doubly rinsed in deionized water prior to use at each site and between boreholes to minimize the potential for cross-contamination.

In the event the soil samples cannot be submitted to the analytical laboratory on the same day they are collected (e.g., due to weekends or holidays), the samples are temporarily stored until the first opportunity for submittal either on ice in a cooler, such as when in the field, or in a refrigerator at Apex's office.

SOP-2
DIRECT PUSH SOIL BORING SAMPLING

During drilling, soil samples for chemical analysis are collected in thin-walled plastic tubes, of varying diameters and lengths (e.g., two inches outer diameter by four feet long). The plastic sampling tube is placed inside a steel rod and driven into the subsurface to the desired depth using a direct push drill rig. The steel rod is then removed from the subsurface and the plastic tube containing the soil sample are removed from the steel rod. The process is repeated until the desired depth of the boring is reached.

Upon removal from the steel rods, approximately the bottom six inches of each tube is cut off and capped to be potentially submitted for analysis. The tubes capped with aluminum foil or "Teflon" sheets and plastic caps or the samples are extruded from the tubes and sealed within other appropriate, cleaned sample containers. The samples are then hermetically sealed, labeled, and refrigerated for delivery, under strict chain-of-custody, to the analytical laboratory. These procedures minimize the potential for cross-contamination and volatilization of volatile organic compounds (VOC) prior to chemical analysis.

The remaining portion of the plastic tube is cut open and a portion of the soil sample collected at each sampling interval is analyzed in the field using either a portable PID, FID, organic vapor analyzer, catalytic gas detector, or an explosimeter. The purpose of this field analysis is to qualitatively determine the presence or absence of hydrocarbons, and the samples to be analyzed at the laboratory. The soil sample is sealed in either a glass jar or plastic bag to allow for some volatilization of VOC. The PID is then used to measure the concentrations of hydrocarbons within the container’s headspace. The data is recorded on both field notes and the boring logs at the depth corresponding to the sampling point.

Other soil samples are collected to document the soil and/or stratigraphic profile beneath the project site, and estimate the relative permeability of the subsurface materials. All drilling and sampling equipment are either steam cleaned or washed in solution and doubly rinsed in deionized water prior to use at each site and between boreholes to minimize the potential for cross-contamination.

In the event the soil samples cannot be submitted to the analytical laboratory on the same day they are collected (e.g., due to weekends or holidays), the samples are temporarily stored until the first opportunity for submittal either on ice in a cooler, such as when in the field, or in a refrigerator at Apex's office.

SOP-3
SOIL EXCAVATION AND SAMPLING

Excavation and subsequent soil sampling is performed under the direction of a registered geologist or civil engineer. To reduce the potential for cross-contamination, all excavation equipment is either steam cleaned or washed prior to use and between excavations. Soil samples for chemical analysis are collected in cleaned, thin-walled brass tubes of varying diameters and lengths (e.g., six inches long by two inches outside diameter) or other appropriate cleaned sample container. If used, one tube may be set in a two inch inside diameter, hand-driven sampler. To reduce the potential for cross-contamination between samples, the sampler is washed in a solution and doubly rinsed between each sampling event.

Upon recovery, a portion of the soil sample is sealed for later screening with either a portable PID, FID, or an explosimeter. Another portion of the sample is used for description of the excavated materials. A third portion of the sample is hermetically sealed, labeled and refrigerated for delivery, under strict chain-of-custody, to the analytical laboratory. These procedures minimize the potential for cross-contamination and volatilization of volatile organic compounds prior to chemical analysis.

In the event the soil samples cannot be submitted to the analytical laboratory on the same day they are collected (e.g., due to weekends or holidays), the samples are temporarily stored until the first opportunity for submittal either on ice in a cooler, such as when in the field, or in a refrigerator at Apex's office.

SOP-4
SOIL CLASSIFICATION

Soil samples are classified according to the Unified Soil Classification System. Representative portions of the samples may be submitted, under strict chain-of-custody, to an analytical laboratory for further examination and verification of the in-field classification and analysis of soil mechanical and/or petrophysical properties. The soil types are indicated on logs of either excavations or borings together with depths corresponding to the sampling points and other pertinent information.

SOP-5
SAMPLE IDENTIFICATION AND CHAIN-OF-CUSTODY PROCEDURES

Sample identification and chain-of-custody procedures ensure sample integrity as well as document sample possession from the time of collection to ultimate disposal. Each sample container submitted for analysis is labeled to identify the job number, date, time of sample collection, a sample number unique to the sample, any in-field measurements made, sampling methodology, name(s) of on-site personnel, and any other pertinent field observations also recorded on the field excavation or boring log.

Chain-of-custody forms are used to record possession of the sample from time of collection to arrival at the laboratory. During shipment, the person with custody of the samples will relinquish them to the next person by signing the chain-of-custody form(s) and noting the date and time. The sample-control officer at the laboratory will verify sample integrity, correct preservation, confirm collection in the proper container(s), and ensure adequate volume for analysis.

If these conditions are met, the samples will be assigned unique laboratory log numbers for identification throughout analysis and reporting. The log numbers will be recorded on the chain-of-custody forms and in the legally-required log book maintained in the laboratory. The sample description, date received, client's name, and any other relevant information will also be recorded.

SOP-6
LABORATORY ANALYTICAL QUALITY ASSURANCE AND CONTROL

In addition to routine instrument calibration, replicates, spikes, blanks, spiked blanks, and certified reference materials are routinely analyzed at method-specific frequencies to monitor precision and bias. Additional components of the laboratory Quality Assurance/Quality Control program include:

1. Participation in state and federal laboratory accreditation/certification programs;

2. Participation in both U.S. EPA Performance Evaluation studies (WS and WP studies) and inter-laboratory performance evaluation programs;

3. Standard operating procedures describing routine and periodic instrument maintenance;

4. "Out-of-Control"/Corrective Action documentation procedures; and,

5. Multi-level review of raw data and client reports.

SOP-7
HOLLOW-STEM AUGER MONITORING WELL INSTALLATION AND DEVELOPMENT

Boreholes for monitoring wells are drilled using a truck-mounted, hollow-stem auger drill rig. The borehole diameter will be a minimum of four inches larger than the outside diameter of the casing when installing well screen. The hollow-stem auger provides minimal interruption of drilling while permitting soil sampling at desired intervals. Soil samples are collected by either hammering (with a 140-pound drop hammer) or hydraulically pushing a conventional split-barrel sampler containing pre-cleaned two inch-diameter brass tubes. A geologist or engineer from Apex Envirotech, Inc., continuously logs each borehole during drilling and constantly checks drill cuttings for indications of both the first recognizable occurrence of groundwater and volatile hydrocarbons using either a PID, FID, or an explosimeter. The sampler is rinsed between samples and either steam cleaned or washed with all other drilling equipment between borings to minimize the potential for cross-contamination.

Monitoring wells are cased with threaded, factory-perforated and blank Schedule 40 PVC. The perforated interval consists of slotted casing, generally with 0.020-inch wide by 1.5 inch long slots, with 42 slots per foot. A PVC cap may be secured to the bottom of the casing with stainless steel screws; no solvents or cements are used. Centering devices may be fastened to the casing to ensure even distribution of filter material and grout within the borehole annulus. The well casing is thoroughly washed and/or steam cleaned, or may be purchased as pre-cleaned, prior to installation.

After setting the casing inside the hollow-stem auger, sand or gravel filter material is poured into the annular space to fill from boring bottom to generally one foot above the perforated interval. A one to two foot thick bentonite plug is set above this filter material to prevent grout from infiltrating the filter pack. Either neat cement, containing about five percent bentonite or sand-cement grout is then tremmied into the annular space from the top of the bentonite plug to near surface. A traffic-rated vault is installed around each wellhead for wells located in parking lots or driveways, while steel "stovepipes" are usually set over wellheads in landscaped areas.

After installation, the wells are thoroughly developed to remove residual drilling materials from the wellbore, and to improve well performance by removing fine material from the filter pack that may pass into the well. Well development techniques used may include pumping, surging, bailing, swabbing, jetting, flushing, and air-lifting. All development water is collected either in drums or tanks for temporary storage, and properly disposed of depending on laboratory analytical results. To minimize the potential for cross-contamination between wells, all development equipment is either steam cleaned or properly washed prior to use. Following development, the well is allowed to stand undisturbed for a minimum of 24 hours before its first sampling.

SOP-8
ROTARY DRILLING MONITORING WELL INSTALLATION AND DEVELOPMENT

Boreholes for monitoring wells may be drilled using truck-mounted drill rigs capable of air- and mud-rotary drilling, and continuous coring and/or drilling with tri-cone roller or fixed-blade drag bits. Generally, rotary drilling is used when more conventional hollow-stem auger drilling either is or becomes infeasible. Various drilling fluids (mud or air), used to keep the borehole from caving and to remove drill cuttings, are chosen according to the nature of the soils and/or geologic formations expected to be encountered as well as the monitoring program. Samples may be collected directly from cores. A geologist or engineer from Apex Envirotech, Inc., continuously logs each boring during drilling and checks returned drill cuttings for indications of both the first recognizable occurrence of groundwater and volatile hydrocarbons, using either a portable PID, FID, or explosimeter. All drilling equipment is either steam cleaned or washed between borings to minimize the potential for cross-contamination.

Frequently, hollow-stem augers are used to drill and sample to either a minimum depth or auger refusal. In such cases, the augers may be left in place as temporary surface casing, with the center plug removed and drilling/coring carried out through the augers. Alternatively, a shallow conductor casing, or surface casing, may be set by drilling to a desired depth with a large-diameter bit, then setting the casing and proceeding with the drilling/coring. After total drill depth (TD) is reached, the borehole may be logged by geophysical means or hydraulically tested. If casing is not set to the bottom of the borehole, the lower portion of the hole may be grouted or backfilled accordingly. The borehole may be drilled out (reamed) as necessary with a large-diameter bit.

Upon reaching TD, drilling fluid is circulated to remove cuttings. Selected casing is then run into the borehole and set to the desired depth. Monitoring wells are cased with clean, threaded, factory-perforated and blank casing. The perforated interval consists of slotted casing, generally with 0.020-inch-wide by 1.5 inch-long slots, with 42 slots per foot. Centering devices may be fastened to the casing the ensure even distribution of filter material and grout within the borehole annulus. The well casing is thoroughly washed and/or steam cleaned, or may be purchased as pre-cleaned, prior to installation. All recoverable drilling fluid and/or cuttings are collected for temporary storage and disposed of properly pending analytical results.

After setting the casing, sand or gravel filter material is poured into the annular space to fill from boring bottom to generally 1 foot above the perforated interval. A one to two foot-thick bentonite plug is set above this filter material to prevent grout from infiltrating the filter pack. Either neat cement, containing about five percent bentonite, or sand-cement grout is then tremmied into the annular space from the top of the bentonite plug to near surface. A traffic-rated vault is installed around each wellhead for wells located in parking lots or driveways, while steel "stovepipes" are usually set over wellheads in landscaped areas.

After installation, the wells are thoroughly developed to remove residual drilling materials from the wellbore, and to improve well performance by removing fine material from the filter pack that may pass into the well. Well development techniques used may include pumping, surging, bailing, swabbing, jetting, flushing, and air-lifting. All development water is collected either in drums or tanks for temporary storage, and properly disposed of pending laboratory analytical results. To minimize the potential for cross-contamination between wells, all development equipment is either steam cleaned or properly washed prior to use. Following development, the well is allowed to stand undisturbed for a minimum of 24 hours before its first sampling.

SOP-9
GROUNDWATER PURGING AND SAMPLING

Prior to water sampling, each well is purged by evacuating a minimum of three wetted well-casing volumes of groundwater. When required, purging will continue until either the discharge water temperature, conductivity, or pH stabilize, a maximum of ten wetted-casing volumes of groundwater have been recovered, or the well is bailed dry. When practical, the groundwater sample should be collected when the water level in the well recovers to at least 80 percent of its static level.

The sampling equipment consists of either a "Teflon" bailer, PVC bailer, or stainless steel bladder pump with a "Teflon" bladder. If the sampling system is dedicated to the well, then the bailer is usually "Teflon," but the bladder pump is PVC with a polypropylene bladder. In general and depending on the intended laboratory analysis, 40-milliliter glass, volatile organic analysis (VOA) vials, with "Teflon" septa, are used as sample containers.

The groundwater sample is decanted into each VOA vial in such a manner that there is no meniscus at the top of the vial. A cap is quickly secured to the top of the vial. The vial is then inverted and gently tapped to see if air bubbles are present. If none are present, the vial is labeled and refrigerated for delivery, under strict chain-of-custody, to the analytical laboratory. Label information should include a unique sample identification number, job identification number, date, time, type of analysis requested, and the sampler's name.

For quality control purposes, a duplicate water sample is collected from each well. This sample may also be analyzed or put on hold at the laboratory. When required, a trip blank, prepared at the laboratory, is placed in the transport cooler. It is labeled similar to the well samples, remains in the cooler during transport, and is analyzed by the laboratory along with the groundwater samples. In addition, a field blank may be prepared in the field when sampling equipment is not dedicated. The field blank is prepared after a pump or bailer has been either steam cleaned or properly washed, prior to use in the next well, and is analyzed along with the other samples. The field blank analysis demonstrates the effectiveness of the in-field cleaning procedures to prevent cross-contamination.

To minimize the potential for cross-contamination between wells, all well development and water sampling equipment not dedicated to a well is either steam cleaned or properly washed between uses. As a secondary precautionary measure, wells are sampled in order of least to highest concentrations as established by available previous analytical data.

In the event the water samples cannot be submitted to the analytical laboratory on the same day they are collected (e.g., due to weekends or holidays), the samples are temporarily stored until the first opportunity for submittal either on water ice in a cooler, such as when in the field, or in refrigerator at Apex's office.

SOP-10
MEASURING LIQUID LEVELS USING WATER LEVEL METER OR INTERFACE PROBE

Field equipment used for liquid-level gauging typically includes the measuring instrument (water-level meter or interface probe) and product bailer(s). The field kit also includes cleaning supplies (buckets, solution, spray bottles, and deionized water) to be used in cleaning the equipment between wells.

Prior to measurement, the instrument tip is lowered into the well until it touches bottom. Using the previously established top-of-casing or top-of-box (i.e., wellhead vault) point, the probe cord (or halyard) is marked and a measuring tape (graduated in hundredths of a foot) is used to determine the distance between the probe end and the marking on the cord. This measurement is then recorded on the liquid-level data sheet as the "Measured Total Depth" of the well.

When necessary in using the interface probe to measure liquid levels, the probe is first electrically grounded to either the metal stove pipe or another metal object nearby. When no ground is available, reproducible measurements can be obtained by clipping the ground lead to the handle of the interface probe case.

The probe tip is then lowered into the well and submerged in the groundwater. An oscillating (beeping) tone indicates the probe is in water. The probe is slowly raised until either the oscillating tone ceases or becomes a steady tone. In either case, this is the depth-to-water (DTW) indication and the DTW measurement is made accordingly. The steady tone indicates floating liquid hydrocarbons (FLH). In this case, the probe is slowly raised until the steady tone ceases. This is the depth-to-product (DTP) indication and the DTP measurement is made accordingly.

The process of lowering and raising the probe must be repeated several times to ensure accurate measurements. The DTW and DTP measurements are recorded on the liquid-level data sheet. When FLH are indicated by the probe's response, a product bailer is lowered partially through the FLH-water interface to confirm the FLH on the water surface and as further indication of the FLH thickness, particularly in cases where the FLH layer is quite thin. This measurement is recorded on the data sheet as "FLH thickness."

In order to avoid cross-contamination of wells during the liquid-level measurement process, wells are measured in the order of "clean" to "dirty" (where such information is available). In addition, all measurement equipment is cleaned with solution and thoroughly rinsed with deionized water before use, between measurements in respective wells, and at the completion of the day's use.

SOP-11

SOIL VAPOR SAMPLING: "TEDLAR" BAG SAMPLING TECHNIQUE / REMEDIATION SYSTEM SAMPLING

Prior to vapor sampling, the vacuum system must reach a stabilized air flow (cubic feet per minute) for approximately 15 minutes. Prior to the actual collection of the vapor sample, the following data is recorded: air flow, temperature, and pressure at collection ports and gauges.

The sampling equipment consists of a Tedlar™ bag (available in 1, 3, 5, and 10 liter sizes), a diaphragm pump, and 3/16-inch-diameter polyethylene tubing (approximately 1 foot long). The Tedlar™ bag should be fitted with an integral valve for filling and sealing the bag after sampling. The diaphragm pump inlet and outlet are fitted with 3/16-inch hose barbs for attaching the sample tubing. Prior to vapor sampling, the soil vapor source (vapor screen, vapor extraction well or manifold, etc.) must be isolated for sampling. A sample label with the sample number and date and time of sample collection is prepared and placed on the Tedlar™ bag.

If the sample is being collected from an operating vapor extraction system, the target vapor manifolds must be set up with sample ports that can be isolated without interrupting system operation. Prior to the actual collection of the vapor sample, source data is recorded: air flow, temperature, and pressure; or, well identification number and depth interval of screen.

Typical sampling ports consist of a 1/4 –inch ball valve fitted with a 3/16-inch hose barb to form a slip stream from the sample source.

The sampling procedure requires one end of the tubing be slipped over the sample port hose barb and the other end over the diaphragm pump inlet hose barb to form an air-tight connection. The sampling pump is then started and the pump is purged for one minute with the vapor to be sampled.

Following purging, the discharge of the pump is then connected to the "Tedlar" bag using a section of 3/16-inch tubing. The pump is restarted and the bag is opened and allowed to fill to approximately 3/4 of its capacity. Caution should be taken not to overfill the sampling bag. The sample is placed in a non-refrigerated dry cooler with sufficient packing to prevent damage during transport. Cooling samples will cause condensation of moisture within the sample, thereby distorting the laboratory analysis.

For quality control purposes, a duplicate vapor sample should be collected from each sampling port. This sample is then put on hold at the laboratory pending initial analysis. To ensure quality control and minimize the potential for cross-contamination prior to and during sampling, the diaphragm pump is thoroughly purged for approximately five minutes with nitrogen or clean air (i.e., compressed clean air). A "blank" sample of the discharged air is captured in a "Tedlar" bag at the end of the purging procedure and may be analyzed to ensure the purging was effective.

To minimize the potential for cross-contamination between air samples, the polyethylene tubing, if not sample dedicated, is thoroughly cleaned and rinsed.

Vapor samples are subject to very limited holding times, typically 48 hours. Thus, care must taken to avoid delays in submittal of vapor samples to the laboratory. In the event the vapor samples cannot be submitted to the analytical laboratory on the same day they are collected, they are to be temporarily stored in the dry, non-refrigerated, packed cooler until the very first opportunity for submittal well within the required holding time, taking into account the time needed for shipment to and receipt by the laboratory.

SOP-12

VAPOR SAMPLING: SUMMA CANISTER SAMPLING TECHNIQUE

Prior to vapor sampling, the vacuum system must reach a stabilized air flow (cubic feet per minute) for approximately 15 minutes. Prior to the actual collection of the vapor sample, the following data is recorded: air flow, temperature, and pressure at collection ports and gauges.

The sampling equipment consists of a sterilized, gas-tight, "Summa" stainless steel canister (available in one and six liter volumes), flow meter (if required, obtained and calibrated by the laboratory) and 1/4-inch-diameter polyethylene tubing approximately 2 feet in length.

The sampling ports are brass connections fitted with silicone septa and threaded into a tapped hole in the system piping.

The sampling procedure requires one end of the tubing to be slipped over the sampling port and the other end over the canister nozzle or flow meter (if required) to acquire an air-tight connection. The valve should be opened at this time and the initial pressure should then be recorded to verify that the Summa canister is under vacuum. The Summa canister is allowed to collect the soil vapor sample at a predetermined duration. After the sample has been collected record the final vacuum reading (approximately five pounds per square inch (psig)) to ensure that the flow meter was working properly, if applicable. Immediately following the sample collection, complete sampling information is recorded on the label on the air sampling canister (e.g., sample ID, date, time, location, and temperature). The sample is placed in a non-refrigerated, dry cooler with sufficient packing to ensure against damage during transport. Cooling samples will cause condensation of any moisture within the air sample, thereby distorting laboratory analysis.

Summa canister samples are subject to hold times of typically 30 days and with some compounds a more rigid hold time of 14 days is required.

SOP-13
SOIL VAPOR SAMPLING: SYRINGE SAMPLING TECHNIQUE

Prior to vapor sampling, the vacuum system must reach a stabilized air flow (cubic feet per minute) for approximately 15 minutes. Prior to the actual collection of the vapor sample, the following data is recorded: air flow, temperature, and pressure at collection ports and gauges.

The sampling equipment consists of a clean, 100cc, gas-tight syringe and silicone septa.

The sampling ports are brass connections, fitted with silicone septa, and threaded into a tapped hole in the system piping. Samples are collected by inserting a clean syringe into the septum and the plunger actuated several times. Each syringe should be purged of three syringe volumes before collecting the sample. On the fourth purge, the plunger is extracted slowly until the syringe is filled with a gas sample, then the syringe is withdrawn and the needle immediately plugged with a silicone stopper. The sample should be placed in a non-refrigerated, dry cooler with sufficient packing to eliminate breakage during transport. Cooling samples will cause condensation of moisture, thereby distorting laboratory analysis.

Duplicate air samples should be collected as in SOP-10. Vapor samples are also subject to the same hold times and must be stored as stated in SOP-10.

SOP-14
SOIL VAPOR SURVEY SAMPLING: "TEDLAR" BAG SAMPLING TECHNIQUE

The sampling equipment consists of a "Tedlar" bag (available in 1, 3, 5, and 10 liter sizes), an SKC universal sample pump, soil vapor probe, and 1/4-inch-diameter polyethylene tubing (approximately three feet long).

A Roto-hammer or slam bar is used to obtain a three foot hole into the ground area, where the soil vapor sample will be collected. Once the hole has been formed the soil vapor probe will be inserted into the hole and advanced the remaining two feet, five feet total below ground surface (bgs), with the use of either a slide hammer, using a tee adapter and using physical force. Once the vapor probe has been inserted into the ground a bentonite seal must be formed between ambient air and the sample air. The bentonite must be hydrated and create an air tight seal around the probe. If required IPA can be placed on the joints of the vapor probe and analyzed for in the sample to ensure that ambient air is not diluting the soil vapor survey samples.

Once the sample apparatus has been set up new tubing will be connected to the inlet of the SKC sample pump. The pump operates at a low flow purge rate of 200 milliliters per minute to prevent air stripping of contaminants from the soil. Once three volumes have been evacuated (minimum 4.2 minutes of sample time) a sample can be collected. Verification with a PID will determine when the maximum concentration is obtained and a sample should be collected. If measurable concentrations are not obtained with the PID after 7 purge volumes (10 minutes) a sample should be collected. Once a sample has been determined to be collected new tubing will be placed on the effluent of the sample pump running to the Tedlar bag, which should be filled to 3/4 of volume capacity. Caution should be taken not to overfill the sampling bag. The sample is placed in a non-refrigerated dry cooler with sufficient packing to eliminate damage during transport. Cooling samples will cause condensation of moisture within the sample, thereby distorting laboratory analysis.

To minimize the potential for cross-contamination between air samples new polyethylene tubing will be used for every sample.

Vapor samples are also subject to the same hold times and must be stored as stated in SOP-10.

SOP-15
SOIL GAS SAMPLING FROM DIRECT PUSH SOIL BORING: "TEDLAR" BAG SAMPLING TECHNIQUE

To obtain soil gas samples from a direct push drill rig, advance a discreet sampling rod with a 6-inch retractable vapor screen to the desired sample depth. Release the sample screen cover from the screen and retract the rod 6-inches. Place a dry bentonite powder layer in the annulus to seal the borehole from surface air interference. Tamp the bentonite powder, place a hydrated bentonite layer in the annulus, and follow with a second dry bentonite layer. Attach the soil gas sampling diaphragm pump to the rod casing using polyethylene tubing.

The sampling equipment consists of a Tedlar™ bag (available in 1, 3, 5, and 10 liter sizes), a diaphragm pump, and 3/16-inch-diameter polyethylene tubing (approximately 1 foot long). The Tedlar™ bag should be fitted with an integral valve for filling and sealing the bag after sampling. The diaphragm pump inlet and outlet are fitted with 3/16-inch hose barbs for attaching the sample tubing. A sample label with the sample number and date and time of sample collection is prepared and placed on the Tedlar™ bag.

The sampling procedure requires one end of the tubing be slipped over the direct push drill rod sample port hose barb and the other end over the diaphragm pump inlet hose barb to form an air-tight connection. The sampling pump is then started and the pump is purged for 1 minute with the vapor to be sampled. Following purging, the discharge of the pump is then connected to the Tedlar™ bag using a section of 3/16-inch tubing. The pump is restarted and the bag is opened and allowed to fill to approximately 3/4 of its capacity. Caution should be taken not to overfill the sampling bag. The sample is placed in a non-refrigerated dry cooler with sufficient packing to prevent damage during transport. Cooling samples will cause condensation of moisture within the sample, thereby distorting the laboratory analysis.

To minimize the potential for cross-contamination between air samples, the polyethylene tubing is replaced with new tubing.

Vapor samples are also subject to the same hold times and must be stored as stated in SOP-10.

SOP-16
SOIL GAS SAMPLING FROM SOIL VAPOR POINT

Installation of a soil vapor point may be performed with a hand auger or truck mounted auger drilling rig. Once the boring has achieved the desired depth, a 6-inch long slotted probe, capped on both ends with one end fitted with a Swagelok fitting attached to 3/16-inch diameter Nylon tubing of desired length is placed in the boring and 12inches of filter pack placed in the annulus. A layer of dry bentonite powder or chips, followed by a layer of hydrated bentonite, and a final layer of dry bentonite powder or chips will be placed in the annulus above the filter pack. Excess tubing at the top is coiled and placed in a flush finished well box.

Soil vapor samples will be collected no sooner than one week after probe installation to permit soil vapors to accumulate within the probe. Soil vapor sampling will occur after a minimum of five consecutive precipitation-free days and after any on site irrigation has ceased.

The sampling equipment consists of a Tedlar™ bag (available in 1, 3, 5, and 10 liter sizes), a diaphragm pump, and 3/16-inch-diameter polyethylene tubing (approximately 1 foot long). The Tedlar™ bag should be fitted with an integral valve for filling and sealing the bag after sampling. The diaphragm pump inlet and outlet are fitted with 3/16-inch hose barbs for attaching the sample tubing. A sample label with the sample number and date and time of sample collection is prepared and placed on the Tedlar™ bag.

The sampling procedure requires the end of the tubing from the probe be connected to the diaphragm pump inlet hose barb to form an air-tight connection. The sampling pump is then started and the pump is purged for 1 minute with the vapor to be sampled. Following purging, the discharge of the pump is then connected to the Tedlar™ bag using a section of 3/16-inch tubing. The pump is restarted and the bag is opened and allowed to fill to approximately 3/4 of its capacity. Caution should be taken not to overfill the sampling bag. The sample is placed in a non-refrigerated dry cooler with sufficient packing to prevent damage during transport. Cooling samples will cause condensation of moisture within the sample, thereby distorting the laboratory analysis.

To minimize the potential for cross-contamination between air samples, the polyethylene tubing on the discharge side of the pump is replaced with new tubing.

Vapor samples are also subject to the same hold times and must be stored as stated in SOP-10.

SOP-17
WASTEWATER COMPLIANCE SAMPLE COLLECTION

Grab samples

Grab samples provide information about pollutant concentrations only at the moment they are collected; and they should be representative of the wastewater conditions at the time of sample collection. Grab samples are usually taken manually, but can be collected using an automatic sampler.

Grab samples for oil and grease or volatile organics should be collected manually, not by an automatic sampler. Oil and grease may adhere to automatic sampler tubing while volatile organics in an automatic sampler will volatilize. Grab samples are collected by filling the sample containers by holding them just beneath the surface of the waste stream, or under the flow at an outfall pipe. The mouth of the container should be faced into the current while keeping the hands, sampler and any other equipment downstream to minimize the chance of contamination.

Where it is impractical or unsafe to sample by hand, a sampling rod or bucket and rope can be used. Sampling rods are polycarbonate or stainless-steel poles with a large clamp or cage on one end designed to securely hold various sizes of sample container. Containers are placed in the cage while sampling to provide extra reach or to prevent the hands from contaminating the sample or contacting wastes.

Composite Sample Collection

The sample is usually transported from the sample intake to the collection bottle by a plastic tube called the “sample transport subsystem.” Make sure the composite sampler is placed well above the sample stream to ensure the tubing runs in a taut, straight line to prevent pooling of liquid. Take care to avoid sharp bends and twists in the transport line. The sample storage subsystem can accommodate either a single large collection bottle or a number of smaller collection bottles. Samplers with individual bottles for discrete collection are usually equipped with a cassette that rotates to fill the bottle during sampling. The total sample volume storage capability should be at least 2 gallons (7.6 liters). Some samplers have a capacity of up to 5 gallons.

For a composite sample collected with an automated sampler, filter the sample within 15 minutes after completion of collection and before adding preservatives. If it is known or suspected that dissolved sample integrity will be compromised during collection of a composite sample collected automatically over time (e.g., by interchange of a metal between dissolved and suspended forms), collect and filter grab samples to be composited in place of a composite sample collected automatically. Sample collection vessels, either large composite or discrete sample containers, must be constructed of materials appropriate for the tests to be performed. If samples for extractable organics are to be collected, *all* parts of the sampler that come in contact with the wastewater stream must be constructed of materials appropriate for extractable organics collection and analysis.

Handling, Packaging, and Transporting Samples

After collection, preserve each sample within 15 minutes of collection if necessary. Place samples with temperature storage requirements in coolers. Ensure that all samples required to be kept cool are surrounded and in contact with enough ice to cool to 6°C or less. It is important that containers are in an ice bath; i.e. in contact with water that is in contact with ice, especially in warm weather, to ensure adequate cooling. Make sure that all glass sampling containers are placed in bubble-wrap sleeves to protect from breaking. Bubble-wrap may insulate samples from cooling and it may be necessary to place additional ice in coolers.

Check to see that samples are adequately labeled and that container lids are secure.

Documentation

Compliance/Inspection documents include field notebooks, calibration records, instantaneous probe data, validation and verification records, sample collection data, records of analytical data in hard copy or in electronic form and QC records. Documents will be maintained in accordance with the requirements of the appropriate Quality Assurance Project Plan (QAPP).

ARIZONA DEPARTMENT
OF HEALTH SERVICES

ENVIRONMENTAL LABORATORY LICENSE

Issued to:

Laboratory Director: **Mark Noorani**
Owner/Representative: **Mr. Mark Noorani**

Orange Coast Analytical, Inc.
AZ0646

is in compliance with Environmental Laboratory's applicable standards for the State of Arizona and maintains on file a List of Parameters for which the laboratory is certified to perform analysis.

PERIOD OF LICENSURE FROM: 06/23/2023 TO: 06/23/2024

1912

Steven D. Baker, Chief
Office of Laboratory Licensure & Certification
Bureau of State Laboratory Services

Arizona Department Of Health Services

Office of Laboratory Licensure and Certification

250 N.17th Avenue, Phoenix, Arizona 85007-3246

AIR

Parameter	EPA Method	Certified On
VOCS IN VAPOR	8260B AZ (VAPOR) (0.0)	4/25/2011 12:00:00 AM

Total Count: 1

SDW

Parameter	EPA Method	Certified On
EDB/DBCP	EPA 504.1 (1.1)	3/22/2005 12:00:00 AM

Total Count: 1

SW

Parameter	EPA Method	Certified On
ALUMINIUM	6010D	9/14/2017 2:08:10 PM
ANTIMONY	6010D	9/14/2017 2:08:11 PM
ARSENIC	6010D	9/14/2017 2:08:12 PM
BARIUM	6010D	9/14/2017 2:08:13 PM
BERYLLIUM	6010D	9/14/2017 2:11:28 PM
CADMIUM	6010D	9/14/2017 2:11:29 PM
CALCIUM	6010D	9/14/2017 2:11:30 PM
CHLORIN. HERBS BY GC METHYLATION	EPA 8151A	5/29/2007 12:00:00 AM
CHROMIUM, HEXAVALENT	EPA 7196A	11/13/2019 11:12:44 AM
CHROMIUM, TOTAL	6010D	9/14/2017 2:11:31 PM
CLOSED SYSTEM PURGE AND TRAP EXTRACT. VOCS	EPA 5035A	5/29/2007 12:00:00 AM
COBALT	6010D	9/14/2017 2:14:45 PM
COPPER	6010D	9/14/2017 2:14:46 PM
CYANIDE	EPA 9010C	12/5/2006 12:00:00 AM
CYANIDE	EPA 9014	5/8/2008 12:00:00 AM
FLASH POINT BY PENSKY MARTEMS CUP	EPA 1010A	6/23/2003 12:00:00 AM
FLORISIL CLEANUP	EPA 3620C	6/23/2003 12:00:00 AM
IRON	6010D	9/14/2017 2:14:47 PM
LEAD	6010D	9/14/2017 2:14:47 PM
MAGNESIUM	6010D	9/14/2017 2:21:29 PM
MANGANESE	6010D	9/14/2017 2:21:30 PM

SW

Parameter	EPA Method	Certified On
MERCURY	EPA 7470A	6/23/2003 12:00:00 AM
MERCURY	EPA 7471B	6/23/2003 12:00:00 AM
MOLYBDENUM	6010D	9/14/2017 2:25:26 PM
NICKEL	6010D	9/14/2017 2:25:27 PM
ORGANOCHLORINE PESTICIDES BY GC	EPA 8081B	6/23/2003 12:00:00 AM
PAHS	EPA 8310	6/23/2003 12:00:00 AM
PCBS BY GC	EPA 8082A	6/23/2003 12:00:00 AM
POTASSIUM	6010D	9/14/2017 2:25:28 PM
PURGE AND TRAP FOR AQUEOUS SAMPLES	EPA 5030C	5/29/2007 12:00:00 AM
SEDIMENTS, SLUDGES AND SOILS	EPA 3050B	6/23/2003 12:00:00 AM
SELENIUM	6010D	9/14/2017 2:25:29 PM
SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS	EPA 8270C	6/23/2003 12:00:00 AM
SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION	EPA 3510C	6/23/2003 12:00:00 AM
SILVER	6010D	9/14/2017 2:25:30 PM
SODIUM	6010D	9/14/2017 2:25:30 PM
SPLP	EPA 1312	10/27/2009 12:00:00 AM
TCLP	EPA 1311	6/23/2003 12:00:00 AM
THALLIUM	6010D	9/14/2017 2:25:31 PM
TOTAL METALS	EPA 3010A	6/23/2003 12:00:00 AM
ULTRASONIC EXTRACTION	EPA 3550C	6/23/2003 12:00:00 AM
VANADIUM	6010D	9/14/2017 2:25:32 PM
VOCs by GC/MS, INCLUDING N-HEXANE	EPA 8260B	6/23/2003 12:00:00 AM
ZINC	6010D	9/14/2017 2:25:33 PM

Total Count: 44

WW

Parameter	EPA Method	Certified On
ALKALINITY, TOTAL	SM 2320B (2011)	5/9/2007 12:00:00 AM
ALUMINUM	EPA 200.8 (5.4)	7/17/2009 12:00:00 AM
AMMONIA	EPA 350.1 (2.0)	4/11/2018 10:59:31 AM
ANTIMONY	EPA 200.8 (5.4)	5/29/2007 12:00:00 AM

WW

Parameter	EPA Method	Certified On
ARSENIC	EPA 200.8 (5.4)	6/6/2008 12:00:00 AM
BARIUM	EPA 200.8 (5.4)	7/17/2009 12:00:00 AM
BERYLLIUM	EPA 200.8 (5.4)	6/6/2008 12:00:00 AM
BIOCHEMICAL OXYGEN DEMAND/CARBONACEOUS BIOCHEMICAL OXYGEN DEMAND	SM 5210B (2011)	10/27/2009 12:00:00 AM
BORON	EPA 200.8 (5.4)	7/17/2009 12:00:00 AM
BROMIDE	EPA 300.0 (2.1)	6/23/2003 12:00:00 AM
CADMIUM	EPA 200.8 (5.4)	6/6/2008 12:00:00 AM
CALCIUM	EPA 200.8 (5.4)	7/17/2009 12:00:00 AM
CHEMICAL OXYGEN DEMAND	EPA 410.4 (2.0)	6/23/2003 12:00:00 AM
CHLORIDE	EPA 300.0 (2.1)	6/23/2003 12:00:00 AM
CHROMIUM TOTAL	EPA 200.8 (5.4)	6/23/2003 12:00:00 AM
COBALT	EPA 200.8 (5.4)	7/17/2009 12:00:00 AM
COPPER	EPA 200.8 (5.4)	6/6/2008 12:00:00 AM
CYANIDE AMENABLE TO CHLORINATION	SM 4500-CN G	5/1/2008 12:00:00 AM
CYANIDE, TOTAL	SM 4500-CN BCE (2011)	6/23/2003 12:00:00 AM
FLUORIDE	EPA 300.0 (2.1)	6/23/2003 12:00:00 AM
HARDNESS (SUM CA & MG)	EPA 200.8	7/17/2009 12:00:00 AM
IRON	EPA 200.8 (5.4)	7/17/2009 12:00:00 AM
KJELDAHL, TOTAL NITROGEN	EPA 351.2 (2.0)	4/11/2018 10:59:31 AM
LEAD	EPA 200.8 (5.4)	6/6/2008 12:00:00 AM
MAGNESIUM	EPA 200.8 (5.4)	7/17/2009 12:00:00 AM
MANGANESE	EPA 200.8 (5.4)	7/17/2009 12:00:00 AM
MERCURY	EPA 245.1 (3.0)	6/23/2003 12:00:00 AM
MOLYBDENUM	EPA 200.8 (5.4)	7/17/2009 12:00:00 AM
NICKEL	EPA 200.8 (5.4)	6/6/2008 12:00:00 AM
NITRATE	EPA 300.0 (2.1)	6/23/2003 12:00:00 AM
NITRATE-NITRITE (AS N)	EPA 353.2 (2.0)	10/21/2019 2:42:32 PM
NITRITE (AS N)	EPA 300.0 (2.1)	6/23/2003 12:00:00 AM
OIL AND GREASE AND PETROLEUM HYDROCARBONS	EPA 1664 REV B	7/29/2013 12:00:00 AM
ORTHOPHOSPHATE	EPA 300.0 (2.1)	6/23/2003 12:00:00 AM

WW

Parameter	EPA Method	Certified On
PHOSPHORUS, TOTAL	SM 4500-P H (2011)	4/17/2020 9:41:30 AM
PHOSPHORUS, TOTAL	EPA 200.7 (4.4)	5/1/2008 12:00:00 AM
POTASSIUM	EPA 200.8 (5.4)	7/17/2009 12:00:00 AM
RESIDUE NONFILTERABLE (TSS)	SM 2540D (2011)	6/23/2003 12:00:00 AM
RESIDUE, FILTERABLE	SM 2540C (2011)	6/23/2003 12:00:00 AM
SELENIUM	EPA 200.8 (5.4)	6/23/2003 12:00:00 AM
SILVER	EPA 200.8 (5.4)	6/6/2008 12:00:00 AM
SODIUM	EPA 200.8 (5.4)	7/17/2009 12:00:00 AM
SULFATE	EPA 300.0 (2.1)	6/23/2003 12:00:00 AM
SULFIDE	SM 4500-S2- D (2011)	6/23/2003 12:00:00 AM
THALLIUM	EPA 200.8 (5.4)	5/29/2007 12:00:00 AM
TITANIUM	EPA 200.8 (5.4)	7/17/2009 12:00:00 AM
TURBIDITY, NTU	EPA 180.1 (2.0)	6/23/2003 12:00:00 AM
VANADIUM	EPA 200.8 (5.4)	7/17/2009 12:00:00 AM
ZINC	EPA 200.8 (5.4)	6/6/2008 12:00:00 AM

Total Count: 49

Instrument

Instrument	Instrument Code	Quantity	Certified On
MERCURY ANALYZER	MA	1	6/23/2003 12:00:00 AM
INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETER	ICP/MS	1	10/27/2009 12:00:00 AM
HIGH PERFORMANCE LIQUID CHROMATOGRAPH	HPLC	1	6/23/2003 12:00:00 AM
ION CHROMATOGRAPH	IC	1	4/30/2014 12:00:00 AM
INDUCTIVELY COUPLED PLASMA SPECTROMETER	ICP	1	6/23/2003 12:00:00 AM
GAS CHROMATOGRAPH/MASS SPECTROMETER	GC/MS	2	6/23/2003 12:00:00 AM
GAS CHROMATOGRAPH	GC	1	5/5/2017 9:50:03 AM
AUTOMATED AUTOANALYZER	AUTOANALYZER	1	3/29/2018 11:31:13 AM

Total Count: 8

Software

Software Code	Certified On
ENVIROQUANT - GCMS	6/23/2003 12:00:00 AM

Software

Software Code	Certified On
ENVIROQUANT - GC	6/23/2003 12:00:00 AM
PERKIN ELMER - ICP/MS	10/27/2009 12:00:00 AM
PEAKNET (DIONEX) - IC	10/27/2009 12:00:00 AM
HP CHEMSTATION-HPLC	3/22/2010 12:00:00 AM
OMNION (LACHAT) - AUTO ANALYZER	4/11/2018 10:59:31 AM
ENVIROQUANT/CHEMSTATION - GC	5/5/2017 12:25:00 PM

Total Count: 7

ARIZONA DEPARTMENT
OF HEALTH SERVICES

Arizona
Department of
Health Services

ENVIRONMENTAL LABORATORY LICENSE

Issued to:

Laboratory Director: **Mark Noorani**
Owner/Representative: **Mr. Mark Noorani**

Orange Coast Analytical, Inc.
AZ0558

is in compliance with Environmental Laboratory's applicable standards for the State of Arizona and maintains on file a List of Parameters for which the laboratory is certified to perform analysis.

PERIOD OF LICENSURE FROM: 01/09/2023 TO: 01/09/2024

Steven D. Baker, Chief
Office of Laboratory Licensure & Certification
Bureau of State Laboratory Services

Arizona Department Of Health Services

Office of Laboratory Licensure and Certification

250 N.17th Avenue, Phoenix, Arizona 85007-3246

AIR

Parameter	EPA Method	Certified On
VOCS IN VAPOR	8260B AZ (VAPOR) (0.0)	1/11/2022 4:40:21 PM

Total Count: 1

SW

Parameter	EPA Method	Certified On
AROMATIC & HALOGENATED VOCS BY GC	EPA 8021B	8/25/2016 4:57:32 PM
C10-C32 HYDROCARBONS	8015AZ1	1/10/2017 2:38:56 PM
CLOSED SYSTEM PURGE AND TRAP EXTRACT. VOCS	EPA 5035A	8/25/2016 4:57:32 PM
CORROSIVITY PH DETERMINATION	EPA 9040C	8/25/2016 4:57:32 PM
NONHALOGENATED ORGANICS USING GC/FID	EPA 8015D	8/25/2016 4:57:32 PM
PAINT FILTER LIQUIDS TEST	EPA 9095B	8/25/2016 4:57:32 PM
PH (HYDROGEN ION)	EPA 9041A	8/25/2016 4:57:32 PM
PH (HYDROGEN ION)	EPA 9045D	8/25/2016 4:57:32 PM
PURGE AND TRAP FOR AQUEOUS SAMPLES	EPA 5030C	8/25/2016 4:57:32 PM
VOCs by GC/MS, INCLUDING N-HEXANE	EPA 8260B	8/25/2016 4:57:32 PM

Total Count: 10

WW

Parameter	EPA Method	Certified On
HYDROGEN ION (pH)	SM 4500-H B (2011)	8/25/2016 4:57:32 PM

Total Count: 1

Instrument

Instrument	Instrument Code	Quantity	Certified On
GAS CHROMATOGRAPH/MASS SPECTROMETER	GC/MS	1	10/8/1996 12:00:00 AM
GAS CHROMATOGRAPH	GC	1	12/1/2016 12:40:12 PM
GAS CHROMATOGRAPH	GC	1	11/30/2018 10:11:35 AM

Total Count: 3

Software

Software Code	Certified On
TURBOCHROM - GC	1/8/2010 12:00:00 AM

Software

Software Code	Certified On
ENVIROQUANT-GC/MS	1/8/2010 12:00:00 AM

Total Count: 2

Notice of Submission of Remediation Plan

Date of Notice : TBD

Notice is hereby given by Shay Oil Company, Inc. of the submission of a Remedial Action Work Plan (RAWP) to the Arizona Department of Environmental Quality (ADEQ) Voluntary Remediation Program (VRP) as follows:

1. The RAWP proposes actions to remediate a release of unleaded gasoline into the environment.
2. The release occurred at Shay Oil Chevron 280 E. Main Street Quartzsite, AZ 85346
3. The RAWP proposes the use of Monitored Natural Attenuation (MNA) as the proposed remedial method to achieve remedial objectives and regulatory compliance.
4. A copy of the approved RAWP is available on the ADEQ-VRP website at

https://www.azdeq.gov/vrp/shay-oil-chevron or by contacting the ADEQ-VRP Project Manager at 602-771-4847.

5. Comments or questions on the RAWP may be sent to the ADEQ-VRP Project Manager at osuch.nichole@azdeq.gov or mail to:

   ADEQ-VRP
   ADEQ Main Office
   1110 W. Washington St.
   Phoenix, AZ 85007

6. Comments must be received within 21 days of the date of this notice.

Appendix A:

Land and Water Use Survey (LWUS)

(Attached to Separate Email)

Appendix B:

Ricker Plume Stability Evaluation

(Attached to Separate Email)

Appendix C:

Site Characterization Results Report

April 24, 2023 – Apex Envirotech, Inc.

(Attached to Separate Email)