



GROUNDWATER AVAILABILITY STUDY BLUEBONNET PROPERTY HENDERSON COUNTY, TX

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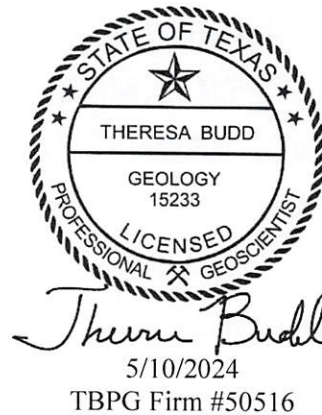
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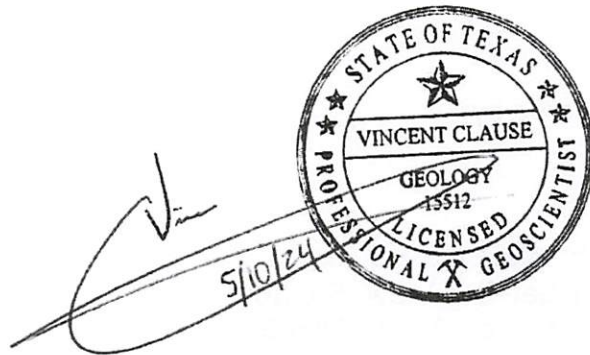
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EXECUTIVE SUMMARY

LRE Water, LLC (“LRE”), on behalf of Pure Bliss, LLC, has prepared a groundwater availability study for an approximately 4,120-acre property in Henderson County, Texas. The property is herein referred to as the “Bluebonnet Property.” The primary objective of this study was to evaluate the availability and feasibility of developing up to 17,000 acre-feet per year (ac-ft/yr) of groundwater from the aquifers that underlie the property. The principal groundwater resources in Henderson County include the Queen City Sand and Carrizo-Wilcox aquifers. The target aquifers beneath the Bluebonnet Property are the Queen City Sand, the Reklaw/Carrizo Sand, and the Middle Wilcox aquifer.

Based on this evaluation, the project’s water demands of up to 17,000 ac-ft/yr could possibly be met with the installation of 27 production wells on the Bluebonnet Property. This wellfield configuration comprises 11 wells in the Queen City Sand (at depths of 320 to 490 feet below land surface [ft bls]), six wells in the Reklaw/Carrizo Sand (at depths of 470 to 510 ft bls) and 10 wells in the Middle Wilcox (at depths of 1,195 to 1,300 ft bls). Long-term pumping rates range from 150 to 800 gallons per minute (gpm) from the Queen City Sand, 50 to 125 gpm from the Reklaw/Carrizo Sand, and 200 to 900 gpm from the Middle Wilcox. Water quality assessments for the target aquifers indicate that groundwater supplies beneath the Bluebonnet Property are fresh and suitable for public supply.

The Bluebonnet Property is located within the jurisdiction of the Neches and Trinity Valley Groundwater Conservation District (“NTVGCD”) and Groundwater Management Area No. 11 (GMA-11). The NTVGCD regulates groundwater production in Henderson County, while GMA-11 establishes desired future conditions (DFCs) for the aquifers within the management area. The currently adopted DFCs are 33 feet of drawdown in the Queen City Sand Aquifer and 106 feet of drawdown in the Carrizo-Wilcox Aquifer, expressed in terms of average drawdown in Henderson County. These DFCs were established based on known and anticipated pumping during the last round of joint planning in 2021. Simulated numerical modeling conducted for the Northern Portion of the Carrizo-Wilcox Aquifer Groundwater Availability Model (“North QCSCW GAM”) indicates that the proposed production of 17,000 ac-ft/yr may not be feasible under the current model assumptions and constraints. Currently, this volume of groundwater exceeds the modeled available groundwater (MAG) established by the Texas Water Development Board (TWDB). Obtaining production permits from the NTVGCD would be essential for this project to be considered in the current round of GMA-11 joint planning, therefore increasing the available MAG issued by the TWDB.

While this evaluation indicates that groundwater resources in the Queen City Sand and Carrizo-Wilcox aquifers are available to meet the project demands, a cautious and conservative approach is recommended due to data limitations and current model assumptions regarding the aquifer properties beneath the Bluebonnet Property. Initiating preliminary discussions with the local groundwater regulatory authorities will be crucial for navigating the permitting and joint planning process, which will ensure sustainable resource utilization and the project's long-term viability.

SECTION 1: INTRODUCTION

1.1 BACKGROUND

For this work, LRE compiled and reviewed publicly available information pertaining to the geologic structure, lithology, hydraulic properties, and water quality of the target aquifers beneath the Bluebonnet Property in Henderson County, TX. This included a review of geologic and hydrogeologic data from published groundwater studies, geologic maps, state well reports, well drilling reports, water quality analyses, and other applicable information from published literature. Data sources included the Texas Commission on Environmental Quality (TCEQ), the Texas Water Development Board (TWDB), the Submitted Drillers Report (SDR) Database, and LRE files. LRE's literature review included the TWDB Report No. 150 ("R-150") "Ground-Water Conditions in Anderson, Cherokee, Freestone, and Henderson Counties, Texas by Guyton & Associates (1972) and TWDB Report No. 327 ("R-327") "Evaluation of Ground Water Resources in the Vicinity of the Cities of Henderson, Jacksonville, Kilgore, Lufkin, Nacogdoches, Rusk, and Tyler in East Texas" by Preston and Moore (1991). Hydraulic properties for the target aquifers were extracted from the Northern Portion of the Queen City, Sparta, and Carrizo-Wilcox Aquifer Groundwater Availability Model ("North QCSCW GAM") by Schorr and others (2020).

1.2 STUDY AREA

The Bluebonnet Property encompasses approximately 4,120 acres of primarily undeveloped land in the southeast portion of Henderson County, Texas. The Bluebonnet Property is transected by FM-315 S and borders FM-3506 to the north-northeast and CR-4235 to the southwest. It is also located approximately two miles south of Moore Station, Texas and borders the city limits of Coffee City, Texas. Lake Palestine is located approximately 1.25-miles to the east. A site location map of the Bluebonnet Property is provided in Figure 1.

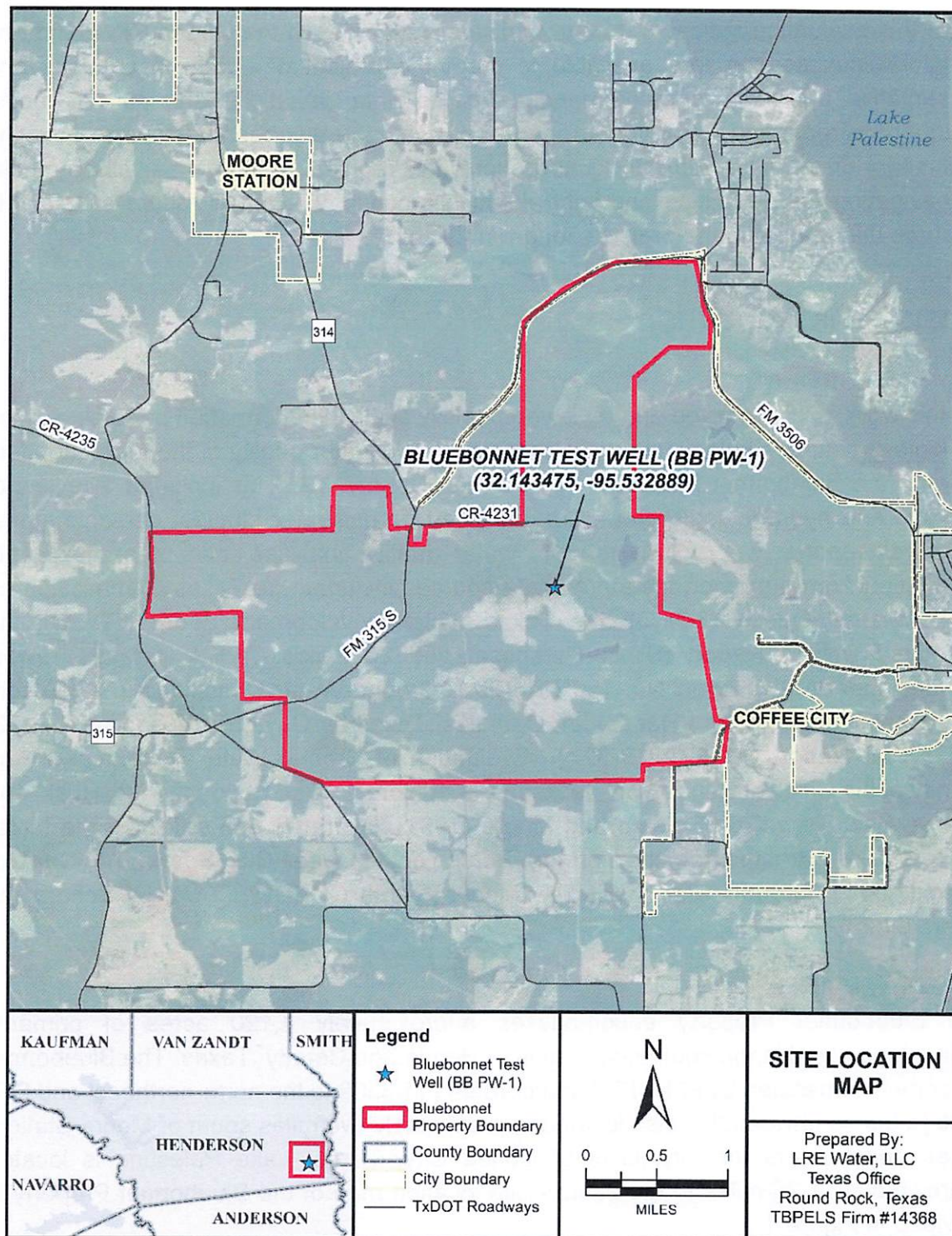


Figure 1. Site Location Map

SECTION 2: GEOLOGIC SETTING

The geology beneath the Bluebonnet Property is comprised of a northeast to southwest trending sequence of Eocene-age sand, silt, and clays. Figure 2 illustrates the Geologic Atlas of Texas (GAT) surface geology and the aquifer outcrop extents in southern Henderson County at and around the Bluebonnet Property. In the higher elevation areas of the Bluebonnet Property (primarily in the western portion of the property), the Sparta Sand and Weches Formation are present at surface (Figure 2). The Sparta Sand is a fine- to medium-grained sand with some interbeds of sandy clays, and the Weches Formation is primarily composed of interbedded sands, silts, and clays (Guyton & Associates, 1972). Elsewhere, the Queen City Sand outcrops (i.e., is exposed at the surface) across the Bluebonnet Property and is comprised of fine-grained sands with interbeds of shale and sandy shale (Figure 2).

The Queen City Sand overlies the Reklaw Formation, which is primarily comprised of interbedded sand and clay (Guyton & Associates, 1972). The Carrizo Sand underlies the Reklaw Formation and is characterized as a massive sand unit consisting of a very fine-grained upper section and a fine- to medium-grained lower section (Pieper and others, 1965). The Wilcox Group underlies the Carrizo Sand and is generally subdivided into three units, namely the “Upper Wilcox,” the “Middle Wilcox,” and the “Lower Wilcox.” In Henderson County, the units of the Wilcox Group are generally indistinguishable or “undivided” and are comprised primarily of interbedded sand, silt, and clay with minor amounts of lignite (Guyton & Associates, 1972). Locally, sands in the “Middle Wilcox” and “Lower Wilcox” are fine- to coarse-grained and thick-bedded (Guyton & Associates, 1972). The Midway Group underlies the Wilcox Group and consists almost entirely of impermeable clays. Table 1 summarizes general stratigraphic units present beneath the Bluebonnet Property.

Table 1. Summary of Generalized Stratigraphic Units Beneath the Bluebonnet Property

Series	Group	Stratigraphic Unit	Principal Composition
Eocene	Claiborne	Sparta Sand	Interbedded sand and clay
		Weches Formation	Clay
		Queen City Sand	Interbedded sand and clay
		Reklaw Formation	Clay, silt, and sand
		Carrizo Sand	Massive sand
	Wilcox	Wilcox Group	Interbedded sand, silt, and clay
	Midway	Midway Group	Clay

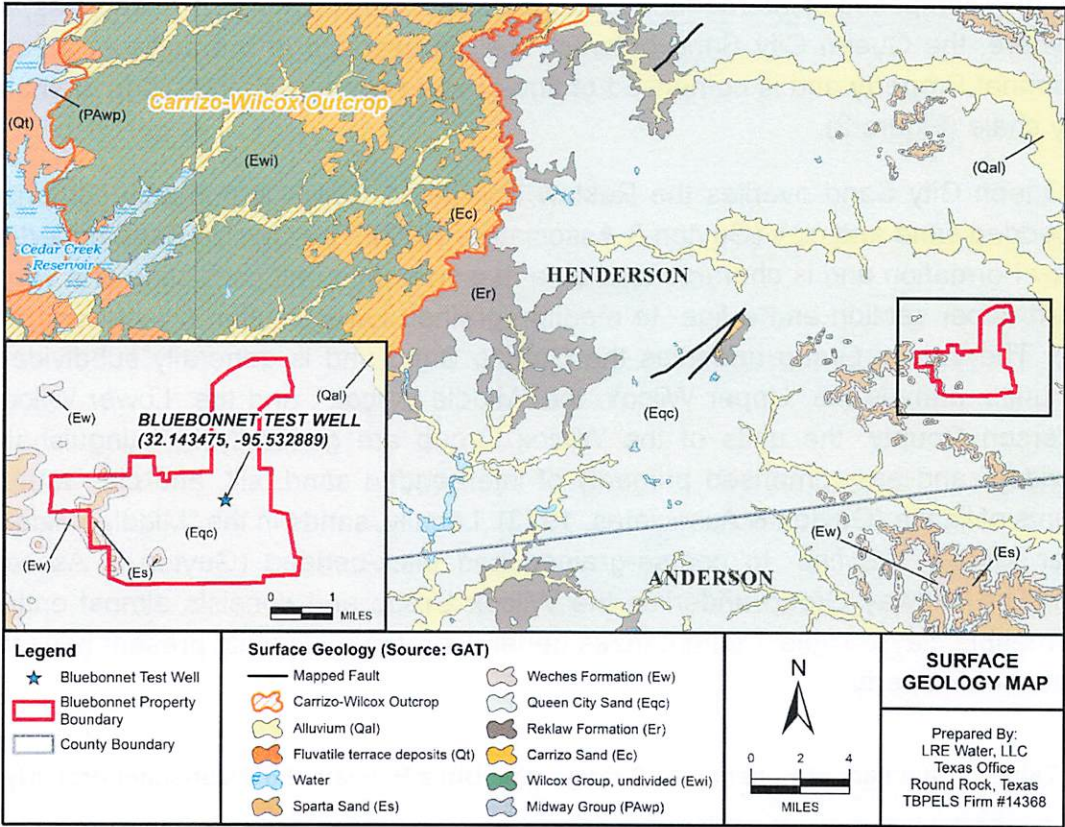


Figure 2. Surface Geology Map

2.1 TARGET AQUIFERS

The Queen City Sand and Sparta Sand are classified as minor aquifers by the TWDB and provide water primarily for domestic and livestock purposes in Henderson County. The Carrizo-Wilcox Aquifer is classified as a major aquifer system by the TWDB and is comprised of thick, laterally extensive and permeable fluvio-deltaic sands separated by clayey, silty, discontinuous sand mixtures. The Carrizo-Wilcox Aquifer outcrops approximately 15 miles west of the Bluebonnet Property in the western part of Henderson County along a broad northeast-southwest trending belt and locally dips to the southeast beneath the Bluebonnet Property (Figure 2).

The Sparta Sand, Queen City Sand, Carrizo Sand, and Wilcox Group aquifers are the principal water-bearing formations in Henderson County (Guyton & Associates, 1972). Due to its limited occurrence, the Sparta Sand does not likely contain significant quantities of groundwater beneath the Bluebonnet Property. Therefore, the target aquifers beneath the Bluebonnet Property are the Queen City Sand and Carrizo-Wilcox aquifers.

2.2 GEOLOGIC MAPPING

LRE prepared geologic subsurface structure maps, net sand thickness (ispoach) maps, and geologic cross sections using ArcMap and IHS Petra® Geologic Mapping Software to visualize the geologic structure and saturated sands beneath the Bluebonnet Property. LRE obtained geophysical logs from the Brackish Resources Aquifer Characterization System (BRACS) Database and interpreted formation depths and sand thicknesses of the Queen City Sand, Reklaw Formation, Carrizo Sand, and Wilcox Group beneath the Bluebonnet Property. LRE used “type” logs and characteristic electric log signatures in TWDB R-150 (Guyton & Associates, 1972) to correlate formations beneath the Bluebonnet Property.

Andrews & Foster Drilling Company (A&F) drilled an 8.75-inch pilot hole (“BB PW-1”) at Latitude 32.143475, Longitude -95.532889 to approximately 1,198 feet below land surface (ft bls) to determine formation depths and productivity of aquifers beneath the Bluebonnet Property. GeoCAM conducted geophysical logging of the pilot borehole on February 17, 2024, which included gamma ray, resistivity, and spontaneous potential logs. The geophysical log for the BB PW-1 test well is provided in Appendix A. LRE used the geophysical logs from the BRACS Database and the BB PW-1 pilot hole to prepare the geologic maps for the Bluebonnet Property.

2.2.1 Formation Depths

LRE prepared structure maps for the base of the Queen City Sand, Reklaw Formation, Carrizo Sand, and Wilcox Group beneath the Bluebonnet Property, as provided in Appendix B. LRE employed the U.S. Geological Survey National Elevation Dataset (NED) 30-Meter Resolution Digital Elevation Model (2004) to establish a land surface elevation in feet above mean sea level (ft msl) across the Bluebonnet Property to standardize formation depths into units of feet below land surface (ft bls) (Appendix B).

The Wilcox Group is primarily undifferentiated in Henderson County and therefore individual sand units were not distinguished from well-to-well. However, surfaces were created for the “Upper Wilcox”, “Middle Wilcox”, and the lowermost sand interval of the “Lower Wilcox” based on significant changes in lithology (Appendix B). Table 2 summarizes the formation depths beneath the Bluebonnet Property in units of feet above mean sea level (ft msl) and feet below land surface (ft bls) based on LRE’s interpretation and correlation of surrounding geophysical logs.

Table 2. Formation Depths Beneath the Bluebonnet Property

Formation	Top Elevation (ft msl)	Base Elevation (ft msl)	Depth to Top (ft bls)	Depth to Base (ft bls)	Aquifer Thickness (ft)	Net Sand Thickness (ft)
Queen City	GL	12 – 34	GL	270 – 560	270 – 560	212 – 275
Reklaw	12 – 34	65 – (-10)	270 – 560	325 – 610	40 – 70	100 – 125
Carrizo	65 – (-10)	(-12) – (-105)	325 – 610	420 – 700	75 – 105	
Upper Wilcox	(-12) – (-105)	(-315) – (-460)	420 – 700	735 – 1,005	250 – 390	70 – 85
Middle Wilcox	(-315) – (-460)	(-710) – (-850)	735 – 1,005	1,150 – 1,405	325 – 435	155 – 200
Lower Wilcox	(-710) – (-850)	(-1,085) – (-1,215)	1,150 – 1,405	1,530 – 1,790	350 – 430	25 – 90

“ft” indicates feet, “ft msl” indicates feet above mean sea level, “ft bls” indicates feet below land surface, “GL” indicates Ground Level, measured from the NED (USGS, 2004).

Beneath the Bluebonnet Property, elevations to the base of the formations range from approximately 12 to 34 ft msl for the Queen City Sand, 65 to -10 ft msl for the Reklaw Formation, -12 to -105 ft msl for the Carrizo Sand, -315 to -460 ft msl for the Upper Wilcox, -710 to -850 ft msl for the Middle Wilcox, and -1,085 to -1,215 ft msl for the Lower Wilcox (Table 2)(Appendix B). These elevations correspond to depths of 270 to 560 ft bls to the base of the Queen City Sand, approximately 325 to 610 ft bls to the base of the Reklaw Formation, approximately 420 to 700 ft bls to the base of the Carrizo Sand, approximately 735 to 1,005 ft bls to the base of the Upper Wilcox, approximately 1,150 to 1,405 ft bls to

the base of the Middle Wilcox, and approximately 1,530 to 1,790 ft bls to the base of the Wilcox (Table 2).

Based on LRE's analysis of the BB PW-1 log, the Queen City Sand is present from land surface to approximately 364 ft bls, the Reklaw Formation is present from approximately 364 ft bls to 420 ft bls, the Carrizo Sand is present from approximately 420 ft bls to 510 ft bls, and the Wilcox Group is present from approximately 510 ft bls to the total depth (TD) of 1,198 ft bls. Based on the depths to the base of the Wilcox Group beneath the Bluebonnet Property, the BB PW-1 pilot hole did not penetrate the entire thickness of the Wilcox Group.

2.2.2 Formation Thickness

Formation thicknesses were calculated as the difference between each formation top and base (Appendix B). Formation thickness of the Queen City Sand is measured from the base of the formation to land surface. Beneath the Bluebonnet Property, formation thickness ranges from approximately 270 to 560 feet for the Queen City Sand, approximately 40 to 70 feet for the Reklaw Formation, approximately 75 to 105 feet for the Carrizo Sand, approximately 250 to 390 feet for the Upper Wilcox, approximately 325 to 435 feet for the Middle Wilcox, and approximately 350 to 430 feet for the Lower Wilcox (Table 2).

2.2.3 Net Sand Thickness

LRE prepared net sand thickness (isopach) maps for the Queen City Sand, Carrizo Sand, and Wilcox Group beneath the Bluebonnet Property, as provided in Appendix C. Saturated net sand thickness for the Queen City Sand was calculated for the sands located 100 feet below the water table. This subset of saturated sands represents the likely production sand interval(s) for a well completed in the Queen City Sand on the Bluebonnet Property. More specifically, this production interval limits the potential for shallow groundwater contamination and minimizes well-to-well interference with nearby shallow domestic or livestock wells.

In this area of Henderson County, the contact between the lower part of the Reklaw Formation is sand dominated and does not appear hydraulically distinct from the underlying Carrizo Sand. Therefore, net sand calculations for the Carrizo Sand also include sands found within the base of the Reklaw Formation (Appendix C). Provided herein, the Carrizo Sand will be referred to as the "Reklaw/Carrizo Sand," which describes the production zone in the lower part of the Reklaw Formation containing fine-grained, quartz sand and the massive, fine- to medium-grained quartz sand interval of the Carrizo Sand. LRE's net sand analysis of the Reklaw/Carrizo Sand and Wilcox Group only

evaluated the likely screened sands (intervals greater than 10 feet) and therefore provides a conservative estimate for the total sands within each of these formations (Appendix C). Net sands within the Upper, Middle, and Lower Wilcox were also aggregated for each interval.

Based on LRE's analysis of net sands beneath the Bluebonnet Property, saturated net sands range from approximately 212 to 275 feet for the Queen City Sand, and net sand thickness ranges from 100 to 125 feet for the Reklaw/Carrizo Sand, 70 to 85 feet for the Upper Wilcox, 155 to 200 feet for the Middle Wilcox and 25 to 90 feet for the Lower Wilcox (Table 2)(Appendix C).

Based on the geophysical log for BB PW-1, the saturated net sand thickness of the Queen City Sand is approximately 245 feet, while the net sand thickness of the Reklaw/Carrizo Sand is approximately 120 feet (Appendix A). The Upper and Middle Wilcox Group present net sand thicknesses of approximately 80 feet and 169 feet, respectively (Appendix A). Considering the depths of the Wilcox Group from surrounding geophysical logs, the BB PW-1 pilot hole did not fully penetrate the entire thickness of the Middle Wilcox. Consequently, the net sands provided herein underestimate the actual net sand thickness of the Middle Wilcox Group at the BB PW-1 test well location.

2.2.4 Structural Features

LRE prepared geologic cross sections using IHS Petra® Geologic Mapping Software to show the general depth, thickness, and dip of the formations beneath the Bluebonnet Property (Appendix D). Cross Sections A-A' and C-C' represent the dip of the formations to the southeast and Cross Section B-B' represents strike of the formations trending northeast-southwest (Appendix D). The closest mapped fault to the Bluebonnet Property is approximately six miles to the west, as shown in Figure 2. No faults were identified in the immediate vicinity of the Bluebonnet Property based on the prepared structure maps and cross sections; however, it is possible that smaller localized faults are present beneath the Bluebonnet Property where no data is available and structure depths were interpolated.

SECTION 3: AQUIFER PROPERTIES

In general, the productivity of a well is influenced by its hydraulic properties, which include a well's specific capacity and aquifer properties such as hydraulic conductivity, transmissivity, specific yield and specific storage. Specific capacity is primarily a function of the well's performance, which relates to well efficiency and construction. Specific capacity can be derived by dividing a well's pumping rate (in gallons per minute [gpm]) by drawdown (in feet). Hydraulic conductivity is a measure of the aquifer's ability to transmit water and can be expressed in units of gallons per day per square foot (gpd/ft²). Transmissivity, a function of hydraulic conductivity and the aquifer's saturated thickness, is a measure of the aquifer's ability to transmit groundwater and can be expressed in units of gallons per day per foot (gpd/ft). Specific yield is defined as the volume of water released from storage by an unconfined aquifer per unit surface area of aquifer per unit decline in the water table. Storativity, also known as the storage coefficient, is defined as the volume of water released from storage per unit surface area per unit change in hydraulic head for confined aquifers. Both specific yield and storativity are dimensionless. These hydraulic properties can be calculated from a constant rate pumping test, where the pumping rate is held constant and drawdown in the well (i.e., water level decline from the static, pre-pumping water level, in feet) is measured over a specified timeframe.

3.1 SITE-SPECIFIC AQUIFER PROPERTIES FROM TEST WELL

A&F constructed a test well ("BB PW-1") to determine the site-specific hydraulic properties of the aquifer(s) beneath the Bluebonnet Property. A&F prepared a well diagram for the BB PW-1 test well, which is provided in Appendix E. The BB PW-1 test well was completed with an 8.625-inch outer-diameter surface casing to approximately 855 feet bls and a 3-inch galvanized steel liner from approximately 780 feet bls to 1,198 feet bls. The 3-inch diameter liner consisted of pipe-based screen from approximately 881-923 ft bls, 1,008-1,071 ft bls, and 1,134-1,198 ft bls for a total of 169 feet of screen.

A&F conducted a 25-hour constant rate pumping test at the BB PW-1 test well on April 1-2, 2024, at an average pumping rate of 270 gpm. The static water level was at approximately 297 feet bls prior to starting the test. After pumping the well for 25 hours at 270 gpm, there was approximately 92 feet of drawdown in the wellbore, which equates to a specific capacity of 2.93 gpm/ft. LRE analyzed the pumping test data for the pumping portion of the test using the Cooper-Jacob (1946) solution and the non-pumping (recovery) portion of the test using the Theis (1935) residual drawdown solution. Based on the pumping test results and recovery data, transmissivity was calculated to be approximately 17,820 gallons per day per foot (gpd/ft) from the pumping portion of the test and 8,910 gpd/ft for the recovery portion of the test. The time-drawdown graphs used

to plot the pumping test data and calculate transmissivity are presented in Figure 3 for the pumping portion of the test and Figure 4 for the recovery portion of the test.

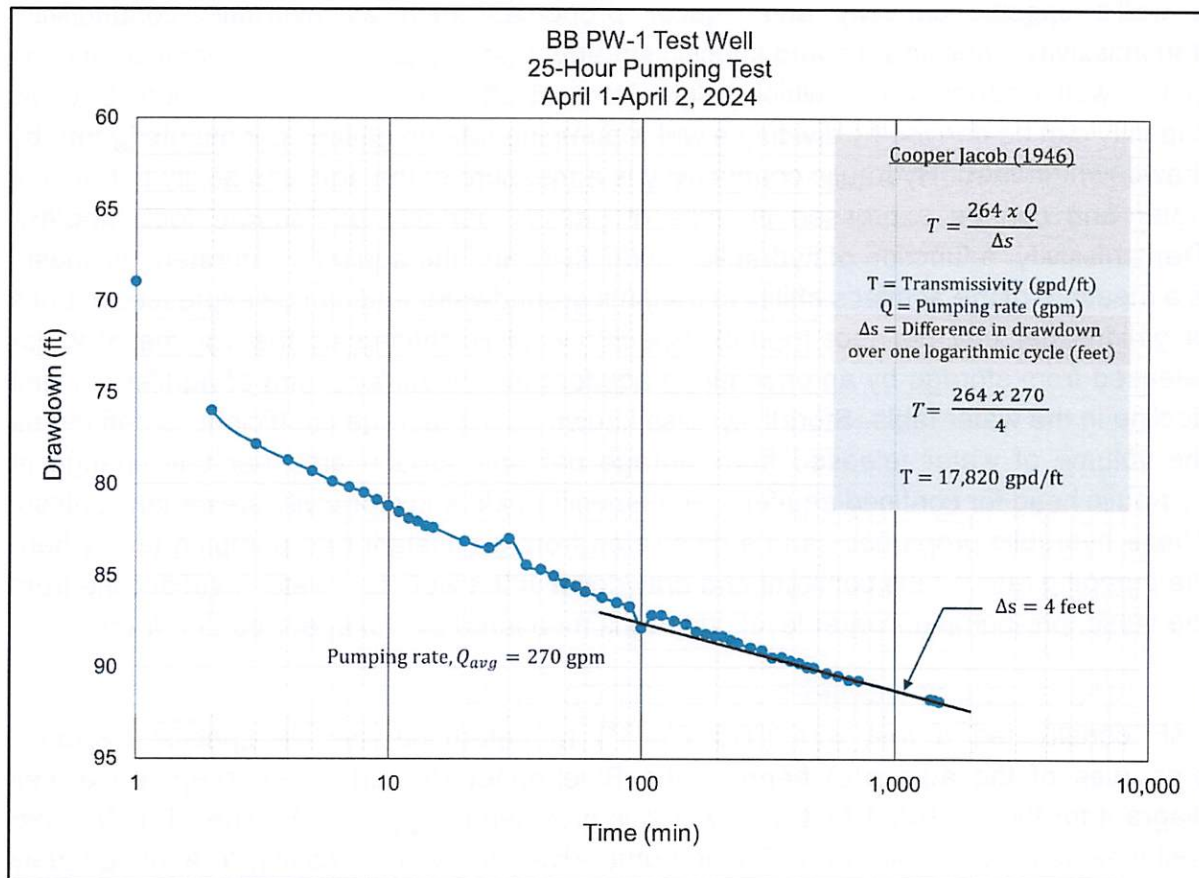


Figure 3. Time-Drawdown Graph for BB PW-1 Test Well

Hydraulic conductivity can be calculated by dividing transmissivity (in gpd/ft) by the net sand thickness (ft). Hydraulic conductivity was calculated to be 52.72 gpd/ft² to 105.44 gpd/ft² for the Middle Wilcox beneath the BB PW-1 test well based on the calculated transmissivity of 8,910 gpd/ft and 17,820 gpd/ft and net sand thickness (screen length) of 169 feet. No observation wells were used during the 25-hour pumping test and therefore storativity was not calculated for the Middle Wilcox at the BB PW-1 test well location.

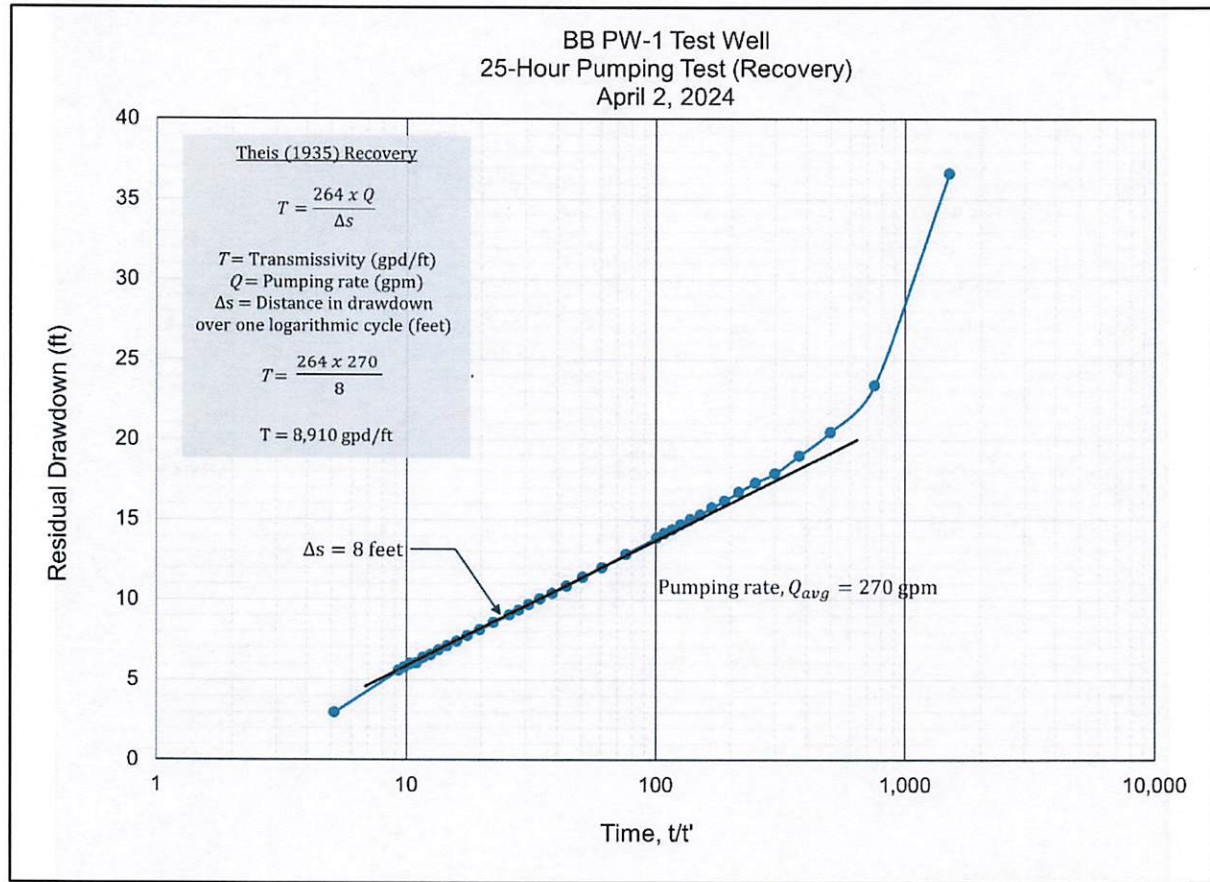


Figure 4. Time-Drawdown Recovery Graph for BB PW-1 Test Well

3.2 ESTIMATED AQUIFER PROPERTIES FROM SURROUNDING WELLS

Where site-specific hydraulic properties are not available from pumping tests, they can be estimated from surrounding wells with reported pumping test data. LRE reviewed TWDB R-150 to assess the reported hydraulic properties for the target aquifers in Henderson County. In addition, LRE obtained reported pumping test data from surrounding wells in the Submitted Driller's Report (SDR) Database and the TWDB Groundwater Database to estimate hydraulic properties of the target aquifers beneath the Bluebonnet Property. Surrounding well data from the SDR and TWDB Database are presented in Figure 5, 6, and 7 for the Queen City Sand, Reklaw/Carrizo Sand, and the Wilcox Group aquifers, respectively. Due to the range in well depths and transmissivity estimates for the Wilcox Group, the wells were distinguished as either "Upper, Middle, or Lower Wilcox" based on the well completion depths and structure maps (Appendix B).

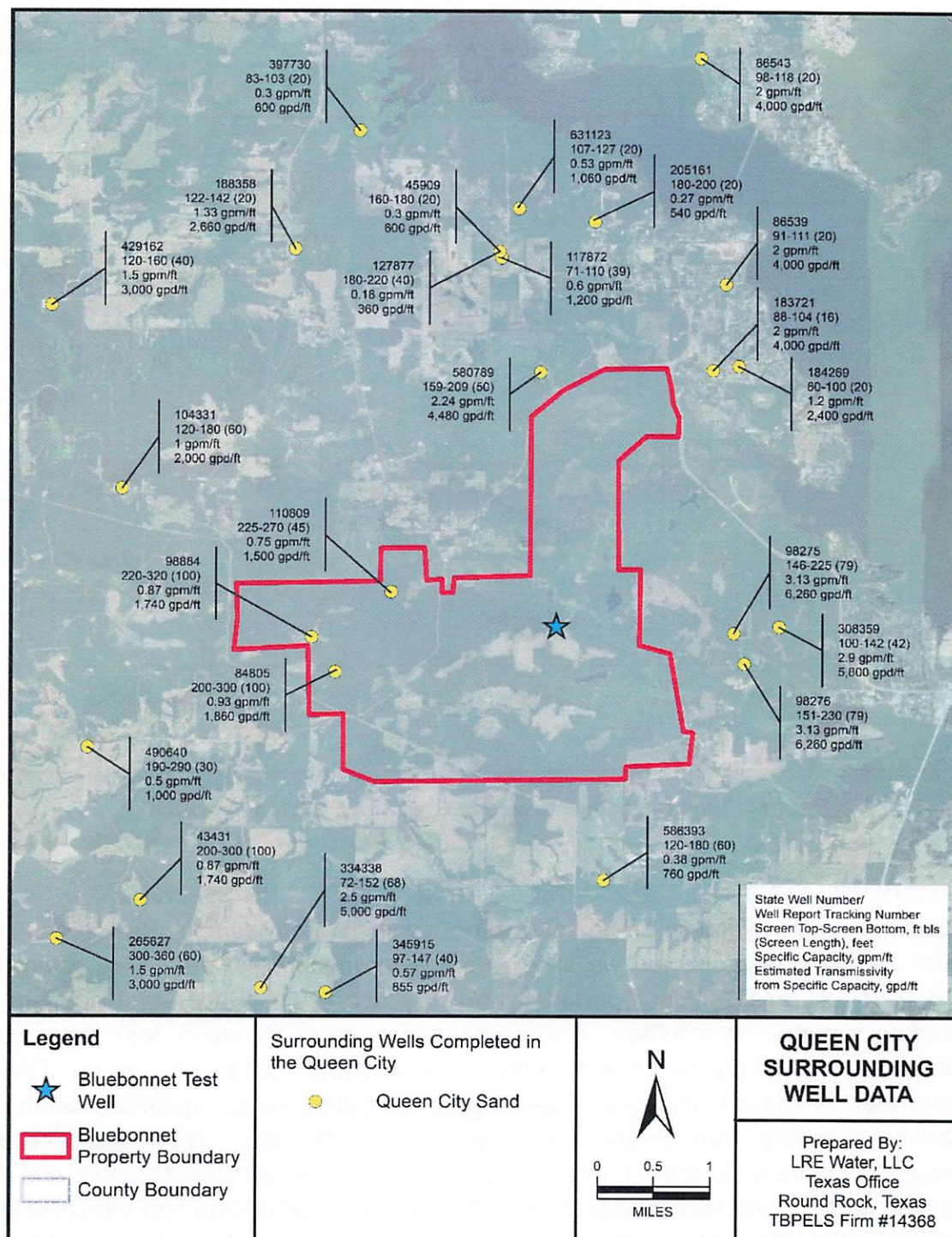


Figure 5. Surrounding Well Data for the Queen City Sand

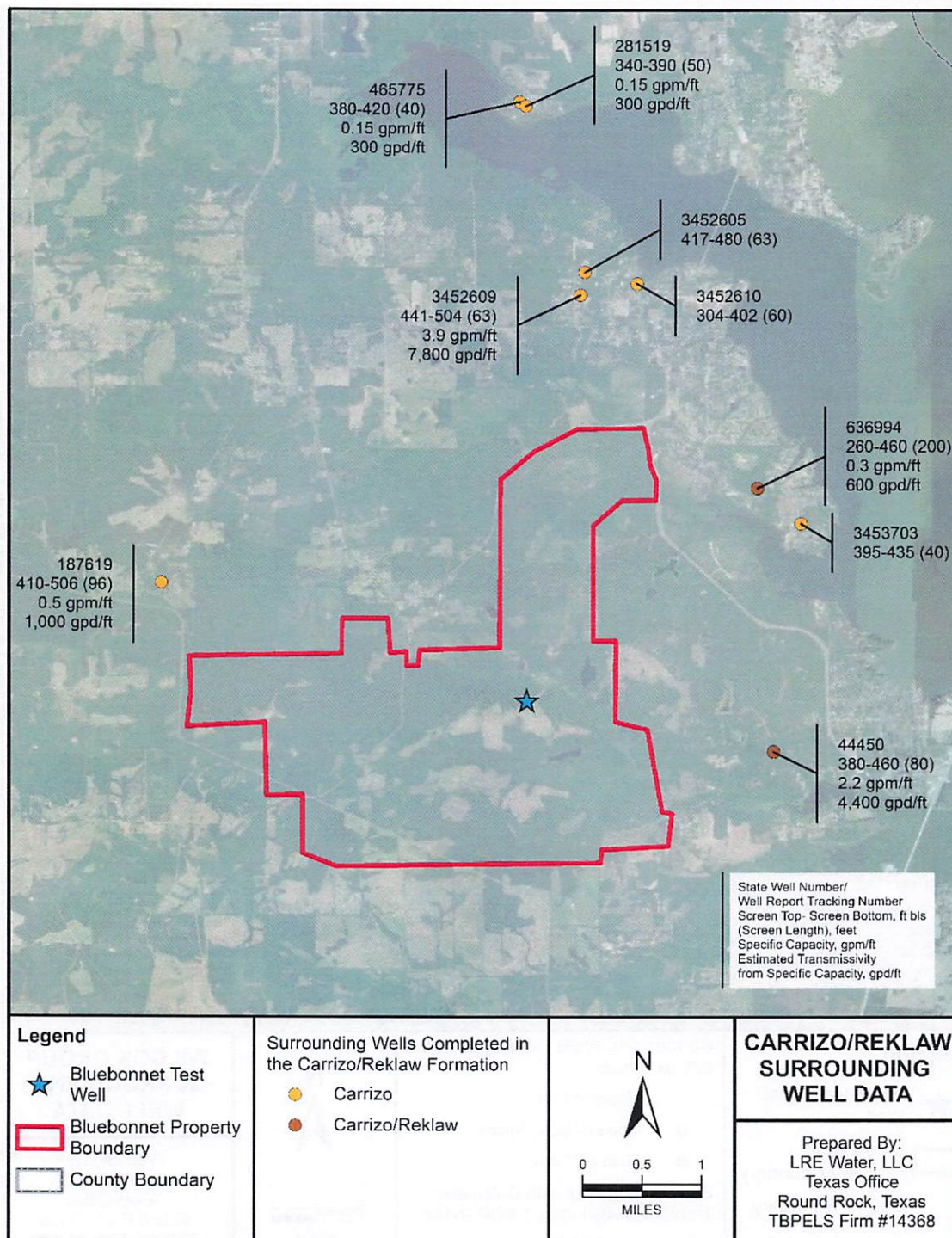


Figure 6. Surrounding Well Data for the Reklaw/Carrizo Sand

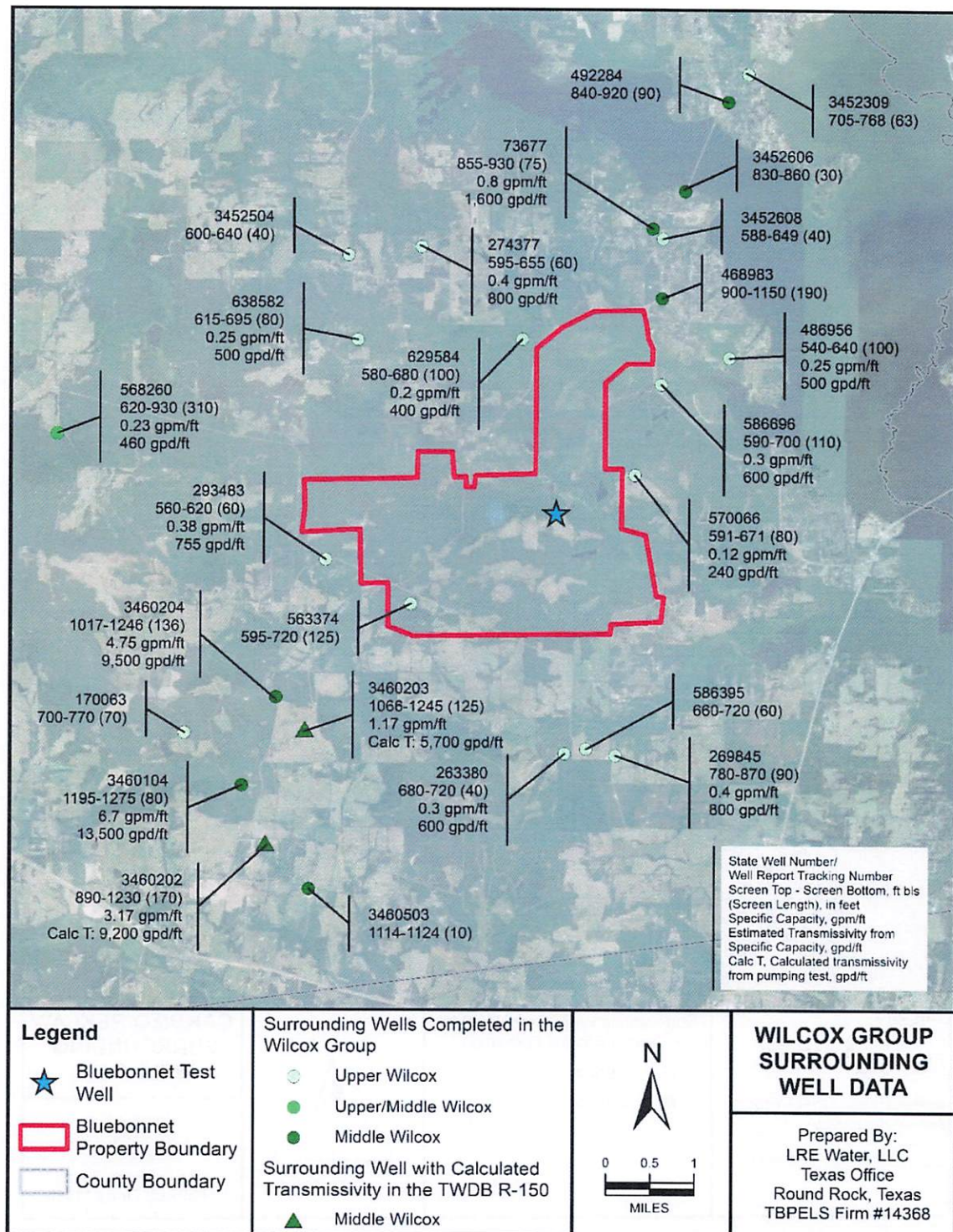


Figure 7. Surrounding Well Data for the Wilcox Group

LRE used site-specific and surrounding well data to estimate hydraulic properties of the target aquifers beneath the Bluebonnet Property. Table 3 summarizes the hydraulic properties of the target aquifers beneath the Bluebonnet Property based on surrounding well data, reported pumping test results, and geophysical logs.

Table 3. Estimated Hydraulic Properties Beneath the Bluebonnet Property

Formation	Depth to Base (ft bls)	Aquifer Thickness (ft)	Net Sand Thickness (ft)	Static Water Level (ft bls)	K (gpd/ft ²)	T (gpd/ft)
Queen City Sand	270 – 560	270 – 560	212 – 275	0 – 210	2.4 – 185	550 – 37,200
Reklaw/Carrizo Sand	420 – 700	125 – 155	100 – 125	175 – 245	8 – 96	800 – 11,500
Upper Wilcox	735 – 1,005	250 – 390	70 – 85	150 – 235	1.3 – 5.8	110 – 440
Middle Wilcox	1,150 – 1,405	325 – 435	155 – 200	185 – 490	52.7 – 105.4	8,320 – 21,125
Lower Wilcox	1,530 – 1,790	350 – 430	25 – 90	--	--	--

"ft" indicates feet, "ft bls" indicates feet below land surface, land surface measured from the NED (USGS, 2004), "gpd/ft²" indicates gallons per day per foot squared, "gpd/ft" indicates gallons per day per foot, K = hydraulic conductivity, T = Transmissivity, "--" indicates value not available/calculated.

3.2.1 Specific Capacity

Surrounding wells in the SDR and TWDB Database within a three-mile radius of the Bluebonnet Property had reported specific capacity values ranging from 0.18 to 3.13 gpm/ft for the Queen City Sand (Figure 5), 0.18 to 3.9 gpm/ft for the Reklaw/Carrizo Sand (Figure 6), 0.12 to 0.4 gpm/ft for the Upper Wilcox, 0.8 to 6.7 gpm/ft for the Middle Wilcox Group, and 0.23 gpm/ft for a well completed in the Upper and Middle Wilcox Group (Figure 7). There were no surrounding wells completed in the Lower Wilcox with reported specific capacity values (Figure 7). In the TWDB R-150, two wells (State Well Number 3460203 and 3460202) within a three-mile radius of the Bluebonnet Property contained reported specific capacities (Guyton & Associates, 1972). These wells are completed in the Middle Wilcox and their specific capacity values range from 1.17 to 3.17 gpm/ft (Guyton & Associates, 1972), as shown in Figure 7. Pumping rates from surrounding wells range from 10 gpm to 150 gpm for the Queen City Sand, 12 gpm to 135 gpm for the Reklaw/Carrizo Sand, 15 gpm to 50 gpm for the Upper Wilcox and 150 gpm to 500 gpm for the Middle Wilcox. In general, wells located closer to Lake Palestine showed higher specific capacity values in the Queen City Sand, which could be a result of recharge or influence from Lake Palestine or Caney/Highsaw Creek (Figure 5). Surrounding wells completed in the Middle Wilcox generally contained higher reported specific capacity values than wells completed in the other target aquifers (Figure 7).

It is important to note that specific capacity does not account for important variables such as well efficiency, well size, or partial penetration of the well into the aquifer. Therefore, specific capacity should only be used as a general indicator of aquifer productivity.

3.2.2 Transmissivity and Hydraulic Conductivity

LRE reviewed TWDB R-150 to assess transmissivity values calculated from constant-rate pumping tests for the target aquifers in Henderson County. Within a three-mile radius of the Bluebonnet Property, two wells (State Well Numbers 3460202 and 3460203) had calculated transmissivity values of 9,200 and 5,700 gpd/ft for the Wilcox Group, respectively, as shown in Figure 7 (Guyton & Associates, 1972). However, it is noted in Guyton & Associates (1972) that several wells with reported pumping test data in the TWDB R-150 may not fully penetrate the entire aquifer thickness, which results in lower estimates of transmissivity. Therefore, these values likely underestimate the actual transmissivity for wells completed in the Wilcox Group that fully penetrate the entire aquifer thickness. No transmissivity values were reported in the TWDB R-150 for wells completed in the Queen City Sand, Reklaw/Carrizo Sand, or Upper/Lower Wilcox Group surrounding the Bluebonnet Property.

Where time-drawdown measurements are not available to calculate transmissivity from a constant-rate pumping test using the Theis (1935) or Cooper Jacob (1946) equation, it can be estimated from specific capacity where reported yield (in gpm) and drawdown (in feet) are available. Transmissivity can be estimated using an empirical equation developed by Driscoll (1986), where a well's specific capacity (in gpm/ft) is multiplied by 1,500 for unconfined aquifers and 2,000 for confined aquifers. Beneath the Bluebonnet Property, the Carrizo-Wilcox Group aquifers are confined, and the Queen City aquifer is considered unconfined to semi-confined. When calculating transmissivity from specific capacity, wells where the pumping water levels fell below the top of the screen were calculated using a multiplier of 1,500, and those where the pumping water level remained above the top of the screen were calculated using a multiplier of 2,000 (Driscoll, 1986).

Estimates of transmissivity were calculated from reported specific capacity values for surrounding wells in the TWDB and SDR Database using the Driscoll (1986) estimation method. Within a three-mile radius of the Bluebonnet Property, estimates of transmissivity were computed for 26 wells completed in the Queen City Sand (Figure 5), six wells completed in the Reklaw/Carrizo Sand (Figure 6), nine wells completed in the Upper Wilcox and five wells completed in the Middle Wilcox (Figure 7). These estimates ranged from approximately 360 to 6,260 gpd/ft for the Queen City Sand (Figure 5), 300 to 7,800 gpd/ft for the Reklaw/Carrizo Sand (Figure 6), 240 to 800 gpd/ft for the Upper Wilcox, and 1,600 to 13,500 gpd/ft for the Middle Wilcox from wells surrounding the Bluebonnet

Property (Figure 7). No estimates of transmissivity were available from surrounding wells completed in the Lower Wilcox.

Most wells completed in the shallower portion of the Queen City Sand are “partially penetrating” and were constructed as low-yield wells for domestic, irrigation or livestock use. In addition, several wells completed in the Wilcox Group do not penetrate the entire aquifer thickness, which can underestimate the actual aquifer transmissivity. In general, wells with higher transmissivity estimates are larger-diameter wells that penetrate the entire aquifer thickness and are used for irrigation, industrial, or public supply. Therefore, higher transmissivity values and well yields could likely be obtained from larger-diameter and properly constructed wells that penetrate the entire aquifer thickness.

Hydraulic conductivity is an estimate of aquifer productivity that is independent of aquifer thickness. To account for variations in transmissivity from partially penetrating wells, hydraulic conductivity values were calculated for surrounding wells by dividing the estimated transmissivity from the Driscoll (1986) estimation method (in gpd/ft) by the screen length (in feet). Hydraulic conductivity values from surrounding wells ranged from approximately 1.25 to 250 gpd/ft² for the Queen City Sand, approximately 3.1 to 122.4 gpd/ft² for the Reklaw/Carrizo Sand, approximately 1.3 to 8.9 gpd/ft² for the Upper Wilcox, and 20 to 168 gpd/ft² for the Middle Wilcox. These values are consistent with the hydraulic conductivity values calculated for the Middle Wilcox at the BB PW-1 test well location, which range from 52.72 to 105.44 gpd/ft².

LRE estimated hydraulic conductivity values for the target aquifers beneath the Bluebonnet Property from surrounding hydraulic conductivity values using spatial analyst tools in ArcMap. These estimates range from approximately 2.4 to 185 gpd/ft² for the Queen City Sand, 8 to 96 gpd/ft² for the Reklaw/Carrizo Sand, and 1.3 to 5.8 gpd/ft² for the Upper Wilcox beneath the Bluebonnet Property (Table 3). Since site-specific data is available for the Middle Wilcox, the Middle Wilcox is assumed to have a hydraulic conductivity of 52.72 to 105.44 gpd/ft² beneath the Bluebonnet Property (Table 3). No estimates of hydraulic conductivity were available for surrounding wells completed in the Lower Wilcox.

Surrounding estimates of hydraulic conductivity were used to calculate transmissivity for the target aquifers beneath the Bluebonnet Property, assuming all the proposed wells will penetrate the entire aquifer thickness (net sand thickness) of the target aquifers. This was calculated by multiplying hydraulic conductivity (in gpd/ft²) from surrounding well data by net sand thickness (ft) for each target aquifer. This resulted in transmissivity estimates of approximately 550 to 37,200 gpd/ft for the Queen City Sand, 800 to 11,500 gpd/ft for the

Reklaw/Carrizo Sand, and 110 to 440 gpd/ft for the Upper Wilcox beneath the Bluebonnet Property (Table 3). Based on the hydraulic conductivity values of 52.72 to 105.44 gpd/ft² and the net sand thickness of the Middle Wilcox beneath the Bluebonnet Property, transmissivity values for the Middle Wilcox range from 8,320 to 21,125 gpd/ft for the Middle Wilcox beneath the Bluebonnet Property (Table 3). These transmissivity values for the Middle Wilcox are consistent with transmissivity values calculated from surrounding well data, as shown in Figure 7. No estimates of transmissivity were calculated for the Lower Wilcox beneath the Bluebonnet Property.

The range in transmissivity values across all formations can likely be attributed to variations in the permeability, net sand thickness and aquifer thickness, proximity to aquifer boundary conditions (such as faults or recharge zones), partially penetrating wells (i.e., wells that do not fully penetrate the entire aquifer thickness or screen all the water-bearing sands), improperly conducted pumping tests or measurements during drawdown tests, and variations in estimating transmissivity from the Driscoll method (1986). Therefore, the hydraulic properties of the target aquifers beneath the Bluebonnet Property can only be confirmed after test well drilling.

3.2.3 Storativity

No estimates of storativity were available for the target aquifers from pumping test data for surrounding wells in the TWDB and SDR Database. In addition, no estimates of storativity were reported for the target aquifers in TWDB R-150 in Henderson County.

3.2.4 Water Levels

Recent water level data for the target aquifers were obtained from surrounding wells in the TWDB and SDR Database. Water level elevation surfaces were mapped for the Queen City Sand, Reklaw/Carrizo Sand, Upper Wilcox, and Middle Wilcox beneath the Bluebonnet Property and are presented in Appendix F. In general, groundwater flows to the east-southeast beneath the Bluebonnet Property (Appendix F). Water level elevations in the Queen City Sand beneath the Bluebonnet Property range from approximately land surface to 210 ft bls (365 to 485 ft msl) (Table 3) (Appendix F). Water levels in the eastern part of the Bluebonnet Property are at or near land surface, which is possibly due to surface water interactions between Lake Palestine, Caney Creek, and Highsaw Creek and the shallow groundwater system (Appendix F). Water levels in the Reklaw/Carrizo Sand are anticipated to be approximately 190 to 375 ft bls (175 to 245 ft msl) beneath the Bluebonnet Property (Table 3) (Appendix F). Water levels in the Upper Wilcox range from approximately 230 to 396 ft bls (150 to 235 ft msl) beneath the Bluebonnet Property (Table 3) (Appendix F). Water levels in the Middle Wilcox range from approximately 185 to 490 ft bls (140 to 215 ft msl) beneath the Bluebonnet Property (Table 3) (Appendix F), which

are consistent with static water levels in the BB PW-1 test well of 297 ft bls (142 ft msl). No surrounding wells were completed in the Lower Wilcox, and therefore reported water levels were not available for the Lower Wilcox beneath the Bluebonnet Property.

3.3 EXTRACTED PROPERTIES FROM GROUNDWATER AVAILABILITY MODEL

The Texas Water Development Board has developed Groundwater Availability Models (GAMs) to simulate the impacts of groundwater pumping on aquifers and to provide estimates of groundwater availability for groundwater resource management and water planning purposes. In general, GAMs are not intended to be used for obtaining site-specific aquifer parameters but can be used to provide general estimates of hydraulic properties where site-specific and surrounding well data are limited. The Bluebonnet Property lies within the extent of the Northern Portion of the Queen City, Sparta, and Carrizo-Wilcox Aquifers GAM ("North QCSCW GAM") (Schorr and others, 2020). For modeling purposes, the North QCSCW GAM comprises the following aquifer units, from youngest to oldest, based on significant differences in geologic properties: Quaternary alluvium and younger units (Layer 1), Sparta Sand (Layer 2), Weches Formation (Layer 3), Queen City Sand (Layer 4), Reklaw Formation (Layer 5), Carrizo Sand (Layer 6), and the Wilcox Group, which is sub-divided into the Upper Wilcox (Layer 7), Middle Wilcox (Layer 8), and Lower Wilcox (Layer 9) (Schorr and others, 2020). Hydraulic properties from the North QCSCW GAM were extracted from the water-bearing units/layers from the cells beneath the Bluebonnet Property and are summarized in Table 4 for the Queen City, Reklaw/Carrizo Sand, and Wilcox Group aquifers.

Table 4. Hydraulic Properties Beneath the Bluebonnet Property from the North QCSCW GAM

Model Layer	Base Elevation (ft msl)	Model Layer Thickness (ft)	Water Level Elevation (ft msl)	S or Sy	K (gpd/ft ²)
4	65 – 105	300 – 445	440 – 420	0.15	19.1 – 28.2
5	25 – (-70)	80 – 140	--	0.10	0.19
6	(-15) – (-85)	35 – 45	190 – 125	0.0004 – 0.0005	52.7
7	(-395) – (-480)	345 – 385	100 – 60	0.0003 – 0.0004	29.5 – 29.6
8	(-670) – (-820)	255 – 380	180 – 150	0.0007 – 0.0009	7.9 – 10.2
9	(-1,085) – (-1,210)	375 – 415	205 – 200	0.0001 – 0.0004	2.1 – 2.7

"North QCSCW GAM" indicates the Northern Portion of the Queen City, Sparta, and Carrizo-Wilcox Aquifers Groundwater Availability Model (Schorr and others, 2020), "ft" indicates feet, "ft msl" indicates feet above mean sea level, "gpd/ft²" indicates gallons per day per foot squared, K = hydraulic conductivity, S = Storativity (confined aquifer), Sy = Specific Yield (unconfined aquifer), "--" indicates value not available/calculated.

3.3.1 Formation Depths

Structure data from the North QCSCW GAM indicate that the elevation for the base of the Queen City Sand (Layer 4) is approximately 65 to 105 ft msl, 25 to -70 ft msl for the Reklaw Formation (Layer 5), -15 to -85 ft msl for the Carrizo Sand (Layer 6), -395 to -480 ft msl for the Upper Wilcox (Layer 7), -670 to -820 ft msl for the Middle Wilcox (Layer 8), and -1,085 to -1,210 ft msl for the Lower Wilcox (Layer 9) beneath the Bluebonnet Property (Table 4).

3.3.2 Aquifer Thickness

Aquifer thicknesses for the model layers beneath the Bluebonnet Property are approximately 300 to 445 feet for the Queen City Sand (Layer 4), approximately 80 to 140 feet thick for the Reklaw Formation (Layer 5), approximately 35 to 45 feet thick for the Carrizo Sand (Layer 6), approximately 345 to 385 feet thick for the Upper Wilcox (Layer 7), approximately 255 to 380 feet for the Middle Wilcox (Layer 8), and approximately 375 to 415 feet thick for the Lower Wilcox (Layer 9) beneath the Bluebonnet Property (Table 4).

3.3.3 Hydraulic Conductivity

Beneath the Bluebonnet Property, hydraulic conductivity values from the North QCSCW GAM range from 19.1 to 28.2 gpd/ft² for the Queen City Sand (Layer 4), 0.19 gpd/ft² for the Reklaw Formation (Layer 5), 52.7 gpd/ft² for the Carrizo Sand (Layer 6), 29.5 to 29.6 gpd/ft² for the Upper Wilcox (Layer 7), 7.9 to 10.2 gpd/ft² for the Middle Wilcox (Layer 8), and 2.1 to 2.7 gpd/ft² for the Lower Wilcox (Layer 9)(Table 4).

In general, hydraulic conductivity values from the North QCSCW GAM for the cells beneath the Bluebonnet Property tend to underestimate the hydraulic conductivity values calculated from site-specific pumping tests and surrounding well data. This is primarily due to the lack of available data used in these model layers in the area of the Bluebonnet Property. It should be noted that the vast majority of hydraulic conductivity values from the North QCSCW GAM are reported from wells located at or near the outcrop areas. Therefore, the spatial distribution of hydraulic conductivity data in the deeper, downdip (confined) portions of the Carrizo-Wilcox aquifer is limited and does not likely represent aquifer conditions beneath the Bluebonnet Property.

3.3.4 Storativity

Specific storage, expressed in per foot (ft⁻¹) units, were extracted from the North QCSCW GAM for cells beneath the BB PW-1 test well location. Storativity, a dimensionless property, was computed for each confined model layer by multiplying the aquifer net sand thickness (in feet) by the specific storage coefficient (ft⁻¹) from the North QCSPCW GAM

(Table 4). For unconfined aquifers, storativity is referred to as the specific yield and is defined as the volume of water that a unit of saturated permeable rock releases from storage per unit surface area of aquifer per unit decline in water table (Freeze and Cherry, 1979). Storage properties were specified in the North QCSCW GAM from Fryar and others (2003) and Kelley and others (2004) for the northern portions of the Queen City Sand and Carrizo-Wilcox aquifer system. A specific yield value of 0.15 was specified for the Queen City Sand and 0.10 for the Reklaw Formation in Schorr and others (2020), as provided in Table 4. Specific storage values from the North QCSCW GAM were assumed to be $4 \times 10^{-6} \text{ ft}^{-1}$ for the Carrizo and $4.5 \times 10^{-6} \text{ ft}^{-1}$ for all Wilcox model layers (Schorr and others, 2020). Storativity values for the Carrizo-Wilcox layers beneath the Bluebonnet Property were derived by multiplying the specific storage values from the North QCSCW GAM by the aquifer net sand thickness (Appendix C). This resulted in storativity values of approximately 0.0004 to 0.0005 for the Carrizo, 0.0003 to 0.0004 for the Upper Wilcox, 0.0007 to 0.0009 for the Middle Wilcox, and 0.0001 to 0.0004 for the Lower Wilcox beneath the Bluebonnet Property (Table 4).

3.3.5 Water Levels

LRE extracted the 2015 water elevation contours from the North QCSCW GAM for the target aquifers (Schorr and others, 2020). These water levels range from 440 to 420 feet msl for the Queen City Sand (Layer 4), approximately 190 to 125 ft msl for the Carrizo (Layer 6), 100 to 60 ft msl for the Upper Wilcox (Layer 7), approximately 180 to 150 ft msl for the Middle Wilcox (Layer 8) and approximately 205 to 200 ft msl for the Lower Wilcox (Layer 9) beneath the Bluebonnet Property (Table 4). In general, these water level elevations from the North QCSCW GAM are higher than the recent water level measurements from surrounding wells.

SECTION 4: WATER QUALITY

The TCEQ regulates the quality of public water supplies using a defined set of primary and secondary drinking water standards for specific water quality constituents in accordance with 30 TAC §290.104 and §290.105. The TCEQ has established Maximum Contaminant Levels (MCLs) and Secondary Constituent Levels (SCLs) for several constituents of concern for organic, inorganic, microbial, and radionuclide contaminants. Water with constituent concentrations exceeding the MCLs pose a public health risk and must be treated and/or blended to bring the constituent levels below the MCL prior to distribution. Constituent concentrations exceeding the SCL are not considered a health risk but can cause aesthetic issues such as taste, color, or odor. Written approval from the TCEQ executive director is needed before water with constituent concentrations above the SCLs may be used for public supply. Water treatment or blending may also be required to lower the constituent concentrations below the SCLs. Per the TCEQ requirements, Henderson County is not considered a “high-risk” county for radionuclides, and therefore water quality analyses for radionuclides will not be required.

4.1.1 Site-Specific Water Quality Data

A water sample was collected from the BB PW-1 test well to assess the water quality beneath the Bluebonnet Property. A&F collected a water sample on April 2, 2024 and submitted the sample to SPL laboratory for analysis of drinking water constituents. The water quality laboratory report for the BB PW-1 test well is provided in Appendix G. The laboratory analysis results were compared to the TCEQ standards for drinking water and are summarized in Table 5. The laboratory results indicate that no constituents exceeded the TCEQ MCLs or SCLs for drinking water (Table 5). Therefore, water quality in the Middle Wilcox from the BB PW-1 test well meets all TCEQ standards for drinking water supplies.

Total Dissolved Solids (TDS), expressed in milligrams per liter (mg/L), is a measure of all dissolved constituents in water and is commonly used as an indicator of water quality. The TWDB classifies groundwater quality into four broad categories; fresh (less than 1,000 mg/L), slightly-saline (1,000-3,000 mg/L), moderately-saline (3,000-10,000 mg/L), and very-saline (10,000-35,000 mg/L)(LBG-Guyton Associates, 2003). The TCEQ SCL for TDS is 1,000 mg/L. Water quality results from the BB PW-1 test well indicate that water in the Middle Wilcox Group is fresh beneath the Bluebonnet Property, with a TDS concentration of 320 mg/L (Table 5).

Table 5. Reported Water Quality Results from the BB PW-1 Test Well

Water Quality Parameter	TCEQ Standard	BB PW-1 (Sampled 04/08/24)
Alkalinity, Total (mg/L as CaCO ₃)	NS	257
Aluminum, Total (mg/L as Al)	0.05 to 0.20**	0.04
Antimony, Total (mg/L as Sb)	0.006*	0.001
Arsenic, Total (mg/L as As)	0.010*	0.0006
Barium, Total (mg/L as Ba)	2.00*	0.02
Beryllium, Total (mg/L as Be)	0.004*	0.0005
Bicarbonate, Calc (mg/L as HCO ₃)	NS	248
Bromide (mg/L as Br)	NS	<0.100
Cadmium, Total (mg/L as Cd)	0.005*	<0.0001
Calcium (mg/L)	NS	1.61
Chloride (mg/L as Cl)	300**	28.7
Chromium, Total (mg/L as Cr)	0.100*	0.001
Copper, Total (mg/L as Cu)	1.000**	<0.0003
Fluoride (mg/L as F)	2.0** or 4.0*	0.13
Total Hardness, Calc (mg/L as CaCO ₃)	NS	4.65
Iron, Total (mg/L as Fe)	0.30**	<0.04
Lead, Total (mg/L as Pb)	0.015***	<0.0005
Manganese, Total (mg/L as Mn)	NS	0.013
Magnesium, Total (mg/L)	NS	0.152
Mercury, Total (mg/L as Hg)	0.002*	0.0001
Nickel, Total (mg/L as Ni)	NS	0.0007
Nitrate-Nitrite Nitrogen (mg/L as N)	10.00*	<0.05
Nitrate Nitrogen, Total (mg/L as N)	1.00*	<0.02
Nitrite Nitrogen, Total (mg/L as N)	1.00*	<0.03
pH, Lab (std units)	>7.0*	8.5
Selenium, Total (mg/L as Se)	0.050*	0.001
Silver, Total (mg/L as Ag)	0.100**	0.0002
Sodium (mg/L as Na)	NS	120
Sulfate (mg/L as SO ₄)	300**	48.1
Thallium, Total (mg/L as Tl)	0.002*	0.001
TDS, Sum of Constituents (mg/L)	1,000**	320
Zinc, Total (mg/L as Zn)	5.00**	0.001

"NS" indicates no TCEQ Standard, "<" indicates concentration is below the laboratory detection limit,

"mg/L" indicates milligram per liter.

*TCEQ MCL for Primary Drinking Water Standards

**TCEQ Secondary Constituent Level for Secondary Drinking Water Standards

***TCEQ Lead Action Level

4.1.2 Surrounding Water Quality Data

LRE obtained reported water quality data from the TWDB Database from surrounding wells within approximately five miles of the Bluebonnet Property. This included data from 30 wells completed in the Queen City Sand, eight wells completed in the Carrizo Sand, and 15 wells completed in the Wilcox Group aquifer. Figure 8 and 9 show the locations of surrounding wells with reported water quality data for the Queen City Sand and the Carrizo-Wilcox aquifer, respectively. Wells that were “dual completed” (i.e., screened in two aquifers) were not included in the dataset. Tables 6, 7, and 8 summarize the minimum, maximum, and median concentrations of constituents detected in surrounding wells and the number of wells with reported measurements for each water quality parameter for the Queen City Sand, Carrizo Sand, and Wilcox Group aquifers, respectively. These water quality data were compared to the TCEQ MCLs and SCLs for public drinking water supplies. Only the most recent reported water quality data for each constituent in each well were analyzed.

Groundwater from the target aquifers within five miles of the Bluebonnet Property is generally fresh, with a median TDS concentration of 115 mg/L for the Queen City Sand (Table 6), 171 mg/L for the Carrizo Sand (Table 7), and 327 mg/L for the Wilcox Group aquifer (Table 8), as shown in Figure 8 and 9. These results are consistent with water quality results from the BB PW-1 test well that was completed in the Wilcox Group, which had a TDS concentration of 320 mg/L (Table 5). The TCEQ SCL for TDS was exceeded in two wells (State Well Numbers 3452307 and 3452306) completed in the Queen City Sand at slightly to moderately saline concentrations of 2,601 mg/L and 8,206 mg/L, respectively (Table 6). These wells are located approximately four to five miles north of the Bluebonnet Property within the Queen City Sand outcrop and were drilled to relatively shallow depths of 32 feet and 10 feet, respectively (Figure 8). According to the TWDB R-150, some shallow wells in the outcrop of the Queen City Sand contain highly mineralized water (Guyton & Associates, 1972). Therefore, these exceedances were likely local occurrences of highly mineralized water in shallow wells. Based on the median concentrations of TDS from surrounding wells, it is anticipated that water in the target aquifers beneath the Bluebonnet Property is fresh.

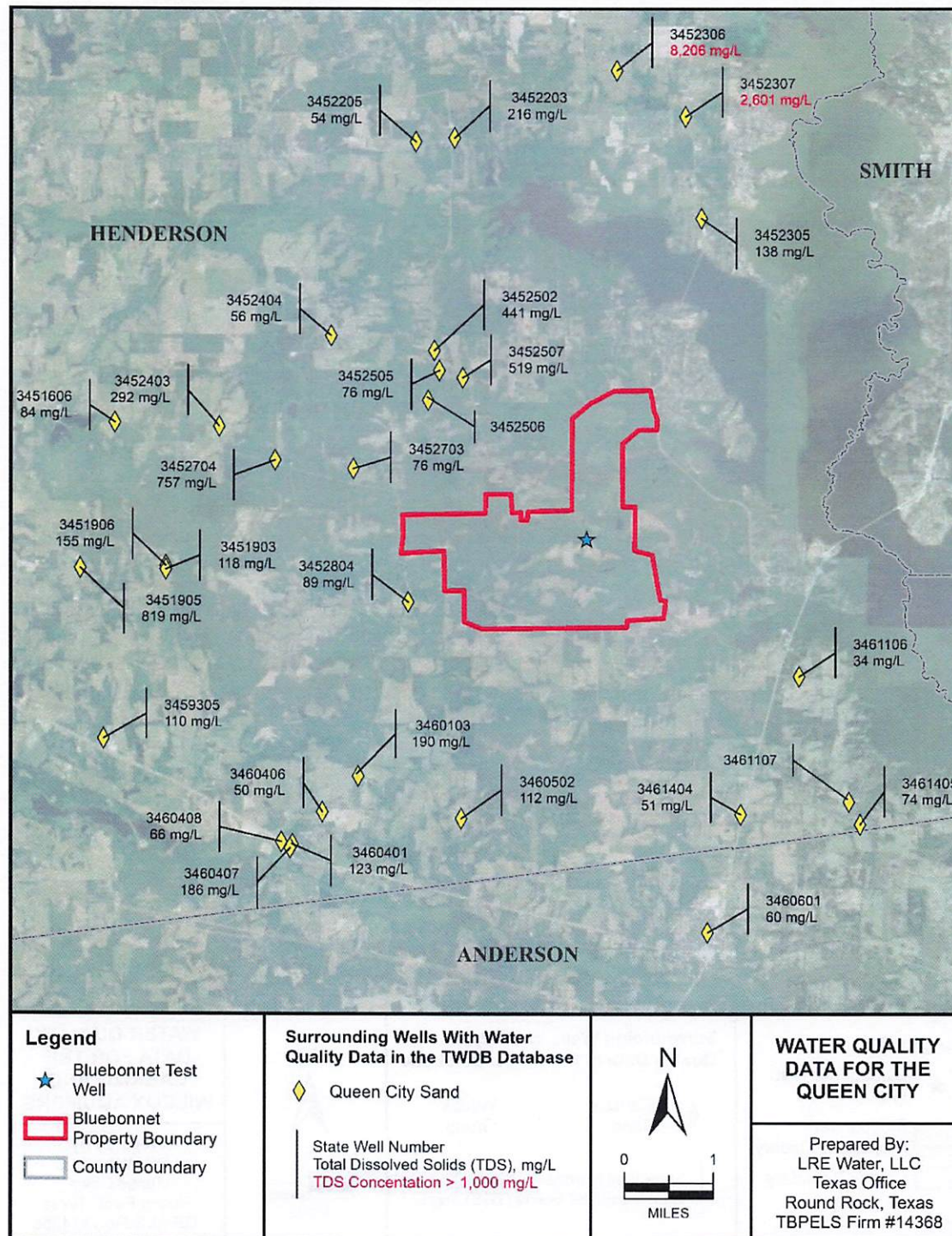


Figure 8. Surrounding Wells with Water Quality Data for the Queen City Sand

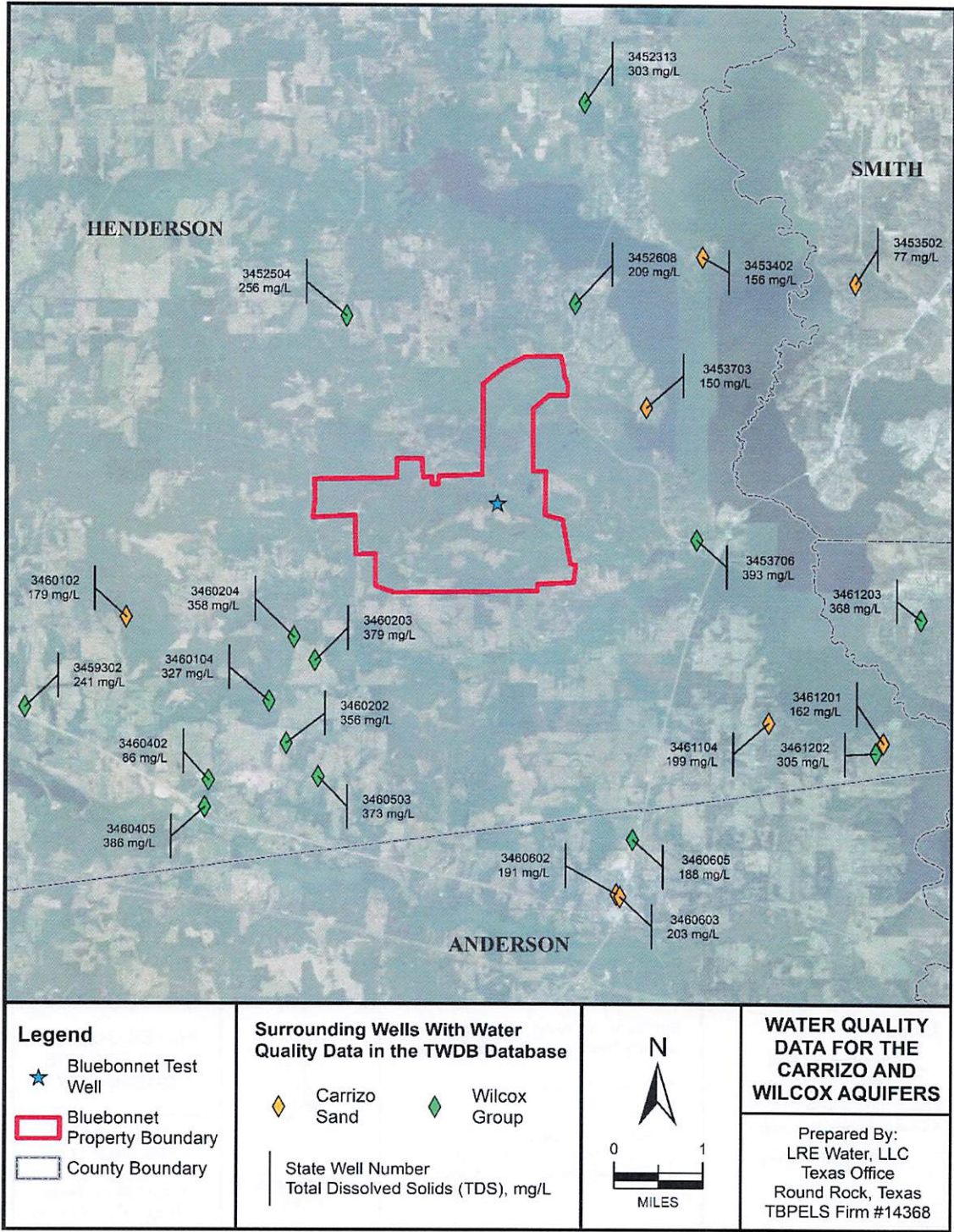


Figure 9. Surrounding Wells with Water Quality Data for the Carrizo-Wilcox Aquifer

Table 6. Reported Water Quality Results from the TWDB Database for the Queen City Sand

Water Quality Parameter	TCEQ Standard	Queen City Sand (30 Wells)			
		Min	Max	Median	Count
Alkalinity, Total (mg/L as CaCO ₃)	NS	10	157	30	29
Aluminum, Dissolved (mg/L as Al)	0.05 to 0.20**	<0.004	<0.005	<0.005	2
Antimony, Dissolved (mg/L as Sb)	0.006*	<0.001	<0.001	<0.001	2
Arsenic, Dissolved (mg/L as As)	0.010*	<0.001	<0.002	<0.002	2
Barium, Dissolved (mg/L as Ba)	2.00*	0.03	0.01	0.07	2
Beryllium, Dissolved (mg/L as Be)	0.004*	<0.001	<0.001	<0.001	2
Bicarbonate, Calc (mg/L as HCO ₃)	NS	12	192	37	29
Bromide, Dissolved (mg/L as Br)	NS	0.04	0.07	0.06	2
Cadmium, Dissolved (mg/L as Cd)	0.005*	<0.001	<0.001	<0.001	2
Calcium (mg/L)	NS	2.4	466	24	17
Chloride, Total (mg/L as Cl)	300**	3	1,910 [†]	27	28
Chromium, Dissolved (mg/L as Cr)	0.100*	<0.001	0.002	<0.001	2
Copper, Dissolved (mg/L as Cu)	1.000**	0.006	0.011	0.008	2
Fluoride, Dissolved (mg/L as F)	2.0** or 4.0*	0	0.40	<0.10	11
Total Hardness, Calc (mg/L as CaCO ₃)	NS	10	3,322	97	19
Iron, Total (mg/L as Fe)	0.30**	0.01	0.58	<0.10	8
Lead, Dissolved (mg/L as Pb)	0.015***	<0.001	<0.001	<0.001	2
Magnesium (mg/L)	NS	1	525	4.5	18
Mercury, Dissolved (mg/L as Hg)	0.002*	<0.0002	<0.0002	<0.0002	1
Nitrate Nitrogen Dissolved Calc (mg/L as N)	10.00*	<0.40	35.97	<13.00	11
Nitrite Nitrogen, Dissolved (mg/L as N)	1.00*	<0.01	<0.01	<0.01	2
pH, Field (std units)	>7.0*	5.4	7.6	6.0	11
Potassium, Total (mg/L as K)	NS	1.0	12.0	4.4	6
Selenium, Dissolved (mg/L as Se)	0.050*	<0.004	<0.005	<0.005	2
Silica, Dissolved (mg/L as SiO ₂)	NS	17.0	60.0	24.5	10
Silver, Dissolved (mg/L as Ag)	0.100**	<0.001	<0.001	<0.001	1
Sodium, Total (mg/L as Na)	NS	3	1,535	44	18
Sulfate, Total (mg/L as SO ₄)	300**	<4	3,710 [†]	<10	29
Temperature (Celsius)	NS	19.0	24.2	21.5	6
Thallium, Dissolved (mg/L as Tl)	0.002*	<0.001	<0.001	<0.001	2
TDS, Sum of Constituents (mg/L)	1,000**	34	8,206 [†]	115	28
Zinc, Dissolved (mg/L as Zn)	5.00**	0.01	0.13	0.07	2

Cells highlighted in Red indicate TCEQ MCL exceedance, cells highlighted in Yellow indicate TCEQ Secondary Standard exceedance, "NS" indicates no TCEQ Standard, "<" indicates concentration is below the laboratory detection limit or was flagged as a conversion error in TWDB Database, "mg/L" indicates milligram per liter, "Calc" indicates constituent was calculated.

*TCEQ MCL for Primary Drinking Water Standards,

**TCEQ Secondary Constituent Level for Secondary Drinking Water Standards

*** TCEQ Lead Action Level

[†] Concentrations associated with shallow well located in the Queen City outcrop (State Well Numbers 3452306 and 3452307)

Table 7. Reported Water Quality Results from the TWDB Database for the Carrizo Sand

Water Quality Parameter	TCEQ Standard	Carrizo Sand (8 Wells)			
		Min	Max	Median	Count
Alkalinity, Total (mg/L as CaCO ₃)	NS	39	161	123	8
Aluminum, Dissolved (mg/L as Al)	0.05 to 0.20**	<0.004	<0.020	<0.005	4
Antimony, Dissolved (mg/L as Sb)	0.006*	<0.001	<0.001	<0.001	3
Arsenic, Dissolved (mg/L as As)	0.010*	<0.001	<0.010	<0.002	5
Barium, Dissolved (mg/L as Ba)	2.00*	0.04	0.09	0.07	4
Beryllium, Dissolved (mg/L as Be)	0.004*	<0.001	<0.001	<0.001	3
Bicarbonate, Calc (mg/L as HCO ₃)	NS	48	188	146	8
Bromide, Dissolved (mg/L as Br)	NS	<0.02	<0.02	<0.02	3
Cadmium, Dissolved (mg/L as Cd)	0.005*	<0.001	<0.002	<0.001	4
Calcium (mg/L)	NS	2.0	28.0	5.8	7
Chloride, Total (mg/L as Cl)	300**	4	58	6	7
Chromium, Dissolved (mg/L as Cr)	0.100*	<0.001	<0.020	<0.003	5
Copper, Dissolved (mg/L as Cu)	1.000**	<0.001	0.002	<0.002	4
Fluoride, Dissolved (mg/L as F)	2.0** or 4.0*	0.07	0.20	<0.12	8
Total Hardness, Calc (mg/L as CaCO ₃)	NS	13	92	22	8
Iron, Total (mg/L as Fe)	0.30**	<0.10	1.40	<0.16	7
Lead, Dissolved (mg/L as Pb)	0.015***	<0.001	<0.005	<0.001	4
Magnesium (mg/L)	NS	0.7	5.6	1.7	7
Mercury, Dissolved (mg/L as Hg)	0.002*	<0.0001	<0.0002	<0.0002	4
Nitrate Nitrogen Dissolved Calc (mg/L as N)	10.00*	<0.02	0.50	<0.14	8
Nitrite Nitrogen, Dissolved (mg/L as N)	1.00*	<0.01	<0.01	<0.01	2
pH, Field (std units)	>7.0*	6.2	8.3	7.9	8
Potassium, Total (mg/L as K)	NS	<2.0	<5.0	<3.5	2
Selenium, Dissolved (mg/L as Se)	0.050*	<0.002	<0.005	<0.004	4
Silica, Dissolved (mg/L as SiO ₂)	NS	10.0	14.0	11.4	7
Silver, Dissolved (mg/L as Ag)	0.100**	<0.001	0.005	<0.002	4
Sodium, Total (mg/L as Na)	NS	15	76	59	7
Sulfate, Total (mg/L as SO ₄)	300**	9	26	11	7
Temperature (Celsius)	NS	18.2	23.0	23.0	5
Thallium, Dissolved (mg/L as Tl)	0.002*	<0.001	<0.001	<0.001	3
TDS, Sum of Constituents (mg/L)	1,000**	77	203	171	8
Zinc, Dissolved (mg/L as Zn)	5.00**	<0.004	<0.005	<0.005	4

Cells highlighted in Red indicate TCEQ MCL exceedance, cells highlighted in Yellow indicate TCEQ Secondary Standard exceedance, "NS" indicates no TCEQ Standard, "<" indicates concentration is below the laboratory detection limit or was flagged as a conversion error in TWDB Database, "mg/L" indicates milligram per liter, "Calc" indicates constituent was calculated.

*TCEQ MCL for Primary Drinking Water Standards

**TCEQ Secondary Constituent Level for Secondary Drinking Water Standards

*** TCEQ Lead Action Level

Table 8. Reported Water Quality Results from the TWDB Database for the Wilcox Group

Water Quality Parameter	TCEQ Standard	Wilcox Group (15 Wells)			
		Min	Max	Median	Count
Alkalinity, Total (mg/L as CaCO ₃)	NS	16	261	200	15
Aluminum, Dissolved (mg/L as Al)	0.05 to 0.20**	<0.005	<0.005	<0.005	1
Antimony, Dissolved (mg/L as Sb)	0.006*	<0.001	<0.001	<0.001	1
Arsenic, Dissolved (mg/L as As)	0.010*	<0.001	<0.001	<0.001	3
Barium, Dissolved (mg/L as Ba)	2.00*	0.02	0.13	0.07	3
Beryllium, Dissolved (mg/L as Be)	0.004*	<0.001	<0.001	<0.001	1
Bicarbonate, Calc (mg/L as HCO ₃)	NS	20	294	237	15
Bromide, Dissolved (mg/L as Br)	NS	0.02	0.02	0.02	1
Cadmium, Dissolved (mg/L as Cd)	0.005*	<0.001	<0.002	<0.002	3
Calcium (mg/L)	NS	2.0	8.8	3.2	13
Chloride, Total (mg/L as Cl)	300**	7	34	15	13
Chromium, Dissolved (mg/L as Cr)	0.100*	<0.001	<0.004	<0.004	3
Copper, Dissolved (mg/L as Cu)	1.000**	<0.001	0.004	<0.004	3
Fluoride, Dissolved (mg/L as F)	2.0** or 4.0*	0.1	0.4	0.2	15
Total Hardness, Calc (mg/L as CaCO ₃)	NS	6	43	14	15
Iron, Total (mg/L as Fe)	0.30**	0.04	5.20	0.17	10
Lead, Dissolved (mg/L as Pb)	0.015***	<0.001	<0.005	<0.005	3
Magnesium (mg/L)	NS	0.1	4.1	1.0	13
Mercury, Dissolved (mg/L as Hg)	0.002*	<0.0001	<0.0002	<0.0001	3
Nitrate Nitrogen Dissolved Calc (mg/L as N)	10.00*	0	2.50	<0.04	15
Nitrite Nitrogen, Dissolved (mg/L as N)	1.00*	<0.01	<0.01	<0.01	2
pH, Field (std units)	>7.0*	5.8	8.7	8.3	15
Potassium, Total (mg/L as K)	NS	1.0	5.6	2.7	4
Selenium, Dissolved (mg/L as Se)	0.050*	<0.002	<0.005	<0.002	3
Silica, Dissolved (mg/L as SiO ₂)	NS	7.4	18.0	13.5	12
Silver, Dissolved (mg/L as Ag)	0.100**	<0.001	<0.003	<0.003	3
Sodium, Total (mg/L as Na)	NS	6	146	130	13
Sulfate, Total (mg/L as SO ₄)	300**	12	154	42	13
Temperature (Celsius)	NS	21.0	28.0	23.7	8
Thallium, Dissolved (mg/L as Tl)	0.002*	<0.001	<0.001	<0.001	1
TDS, Sum of Constituents (mg/L)	1,000**	86	393	327	15
Zinc, Dissolved (mg/L as Zn)	5.00**	<0.005	0.016	<0.005	3

Cells highlighted in Red indicate TCEQ MCL exceedance, cells highlighted in Yellow indicate TCEQ Secondary Standard exceedance, "NS" indicates no TCEQ Standard, "<" indicates concentration is below the laboratory detection limit or was flagged as a conversion error in TWDB Database, "mg/L" indicates milligram per liter, "Calc" indicates constituent was calculated.

*TCEQ MCL for Primary Drinking Water Standards

**TCEQ Secondary Constituent Level for Secondary Drinking Water Standards

*** TCEQ Lead Action Level

The TCEQ MCL for pH (>7.0 standard units) was not met in one well completed in the Carrizo Sand (State Well Number 3453502)(Table 7), and one well completed in the Wilcox Group (State Well Number 3460402)(Table 8). Eight wells with water quality data for the Queen City Sand contained water with pH concentrations below 7.0 standard units (Table 6). Concentrations of pH are determined in the field at the time of sample collection and therefore may be influenced by improper sampling procedures or equipment calibration errors. However, several surrounding wells completed in the Queen City Sand contained water with lower pH values, and therefore the water in the Queen City Sand may be slightly acidic (<7 standard units) beneath the Bluebonnet Property. The pH of water produced from the BB PW-1 test well was 8.5 standard units (Table 5). Therefore, the concentration of pH in the Wilcox Group is anticipated to be above 7.0 standard units beneath the Bluebonnet Property.

The TCEQ MCL for arsenic is 0.01 mg/L. The concentration of arsenic in one well completed in the Carrizo Sand (State Well Number 3453502) was below the laboratory detection limit of 0.01 mg/L (Table 7). Therefore, water in the Carrizo Sand is not expected to exceed the TCEQ MCL of 0.01 mg/L for arsenic beneath the Bluebonnet Property.

Several surrounding wells completed in the Queen City Sand contained elevated levels of nitrate-nitrogen that exceeded the TCEQ MCL of 10 mg/L (Table 6). These elevated concentrations of nitrate-nitrogen are present in shallow wells at depths less than 75 feet. Therefore, these elevated levels may likely be attributed to shallow groundwater contamination from the surface and not naturally occurring in the formation at greater depths in the Queen City Sand.

The TCEQ SCL for iron (0.3 mg/L) was exceeded in one well completed in the Queen City Sand (State Well Number 3461404)(Table 6), two wells completed in the Carrizo Sand (State Well Number 3460603 and 3453502)(Table 7), and several wells completed in the Wilcox Group (Table 8). Guyton & Associates (1972) indicates that the Wilcox Group contains high iron content in Henderson County, but the occurrence of iron is generally not well understood and may be attributed to other factors, such as corrosion or false readings from particularly turbid water. The concentration of iron in the Middle Wilcox from the BB PW-1 test well was less than 0.04 mg/L (Table 5), and the median concentration of iron in all aquifers were below the TCEQ SCL of 0.3 mg/L. Therefore, elevated levels of iron in surrounding wells producing from the Wilcox Group are likely attributed to corrosion or erroneous readings caused by highly turbid water, and water in the Wilcox Group beneath the Bluebonnet Property is not anticipated to contain concentrations of iron above the TCEQ SCL.

Several wells completed in the Queen City Sand contained elevated concentrations of sulfate and chloride that exceeded the TCEQ SCLs (Table 6). The two wells completed in the Queen City Sand (State Well Numbers 3452307 and 3452306) with the TDS concentrations above the TCEQ SCL of 1,000 mg/L were also found to contain elevated levels of chloride at concentrations of 810 m/L and 1,910 mg/L, respectively, and elevated levels of sulfate at concentrations of 914 mg/L and 3,710 mg/L, respectively (Table 6). These were likely local occurrences of high chloride and sulfate in the Queen City Sand and are not likely to occur beneath the Bluebonnet Property.

SECTION 5: WELL SPACING REQUIREMENTS

According to 16 TAC §76.100, public supply wells shall be located a minimum horizontal distance of 150-feet from any concentrated sources of potential contamination. LRE reviewed publicly available databases to identify potential sources of contamination (PSOCs) within and surrounding the Bluebonnet Property. Data sources included the TCEQ Source Water Assessment and Protection Viewer, the TWDB and SDR Database, the RRC Public Data Viewer, and the FEMA National Flood Hazard Layer (NFHL) Viewer.

5.1 TCEQ WELL SETBACK DISTANCE REQUIREMENTS

According to 30 TAC §290.41(c)(A)-(E), public groundwater sources shall be located at distances from potential hazards so that there will be no danger of pollution from flooding or unsanitary surroundings, such as privies, sewage, sewage treatment plants, livestock, solid waste disposal sites, or underground petroleum and chemical storage tanks and liquid transmission pipelines or abandoned or improperly sealed wells. Specifically, no well site shall be located within 50 feet of a sanitary sewer, septic tank, storm sewer, livestock pasture, or cemetery; within 150 feet of a septic tank perforated drain field, areas irrigated by low dosage, low angle spray on-site sewage facilities, absorption beds, improperly constructed water wells, or underground petroleum and chemical storage tanks or liquid transmission pipelines; within 300 feet of a sewage wet well, sewage pumping station or a drainage ditch which contains industrial waste discharge; within 500 feet of a sewage treatment plants, animal feed lots, solid disposal sites, or lands on which sewage plant or septic tank sludge is applied. In addition, all known abandoned or inoperative wells within a ¼-mile of the proposed well site shall be reported to the TCEQ, which include landfill and dump sites, animal feedlots, military or industrial facilities, wood-treatment facilities, and/or liquid petroleum storage and transmission facilities.

Figure 10 presents the potential sources of contamination within and surrounding the Bluebonnet Property identified in the publicly available databases.

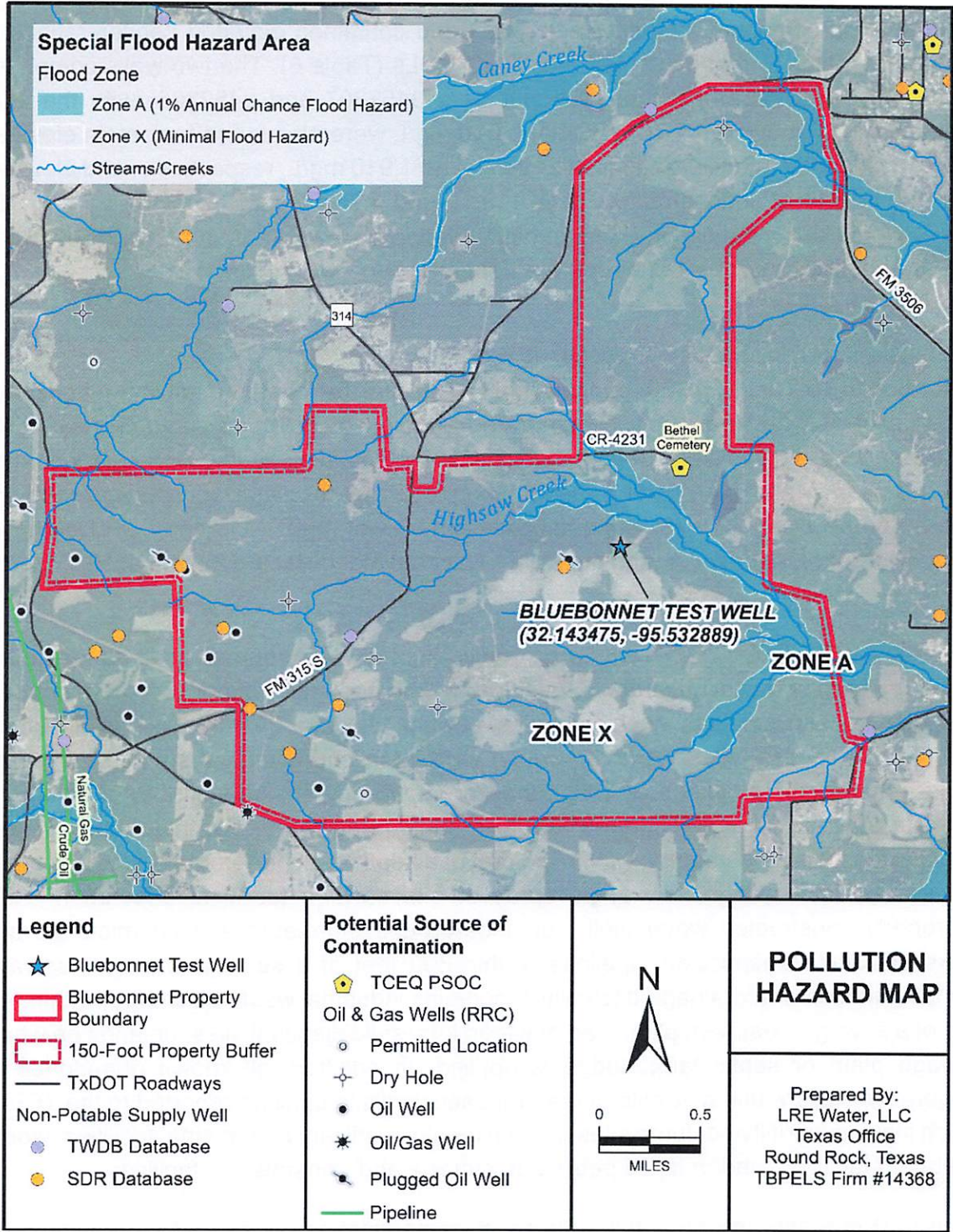


Figure 10. Pollution Hazard Map

Based on the mapped PSOCs in Figure 10, there is a cemetery (“Bethel Cemetery”) located within the Bluebonnet Property off CR-4231 and several oil wells, plugged oil wells, and oil/gas wells located on the western part of the Bluebonnet Property. In addition, there are several domestic and rig supply wells from the SDR and TWDB Database located throughout the Bluebonnet Property that are considered to be “improperly constructed” water wells (Figure 10). New public supply wells shall be located at distances from the PSOCs identified in Figure 10 in accordance with 30 TAC §290.41(A)-(E) to satisfy the TCEQ well setback distance requirements. Prior to well construction and permitting with the TCEQ, a well pollution hazard survey will be conducted to verify that no other potential sources of contamination exist within the well setback distances.

5.1.1 FLOOD ZONES

In general, a public supply well shall be located at a site not generally subject to flooding per the 16 TAC §76.100(a)(3). However, if a public supply well is to be placed in a flood-prone area, it shall be completed with a watertight sanitary well seal with a steel sleeve extending a minimum of 36 inches above ground level and 24 inches below the ground surface. Caney Creek runs through the northeast part of the Bluebonnet Property and Highsaw Creek runs through the eastern part of the Bluebonnet Property (Figure 10). These areas are identified as Special Flood Hazard Areas (SFHAs) with having a 1-percent annual chance of flooding (“Zone A”). Conceptual well locations shall be located in areas not identified as a SFHA (“Zone X”) within the Bluebonnet Property.

5.2 NTVGCD WELL SPACING REQUIREMENTS

The Bluebonnet Property lies within the jurisdiction of the Neches and Trinity Valley Groundwater Conservation District (“NTVGCD” or “District”), which regulates the use of groundwater in Henderson County. The NTVGCD has adopted Rules (Effective June 11, 2003, Amended as of September 17, 2020) to regulate groundwater withdrawals by means of well spacing in order to minimize drawdown of the water table or the reduction of artesian pressure, prevent interference between wells, prevent degradation of water quality, prevent waste, and to facilitate DFC achievement. LRE reviewed the District’s Rules to identify requirements pertaining to well spacing for non-exempt wells within the District boundaries.

New wells must comply with the following minimum well spacing requirements:

1. Well(s) shall be located a minimum of 50 feet from any adjacent property line; and
2. Well(s) shall be located a minimum horizontal distance to prevent overlapping cones of depression resulting from production rates.

SECTION 6: ANALYTICAL GROUNDWATER MODELING

LRE conducted analytical groundwater modeling to estimate well yields and well-to-well interference between the proposed wells on the Bluebonnet Property. LRE used proprietary software that utilizes the Cooper-Jacob (1946) equation to simulate the proposed production and estimate well yields for wells completed in the Carrizo-Wilcox aquifer (i.e., confined aquifers). For wells completed in the Queen City Sand (i.e., unconfined aquifer), LRE used the Cooper-Jacob (1946) equation and the Jacob (1944) modification to account for the reduction in saturated thickness when dewatering an unconfined aquifer due to pumping.

6.1 MODEL ASSUMPTIONS

When estimating well yields, LRE limits pumping water levels in the wellbore to ensure that at least 30-50% of the saturated thickness (unconfined) or artesian pressure (confined) of the aquifer is remaining after a specified period. This provides a “safety factor” with respect to unforeseen interference effects from future groundwater users and unknown aquifer or operational conditions, such as areas of low transmissivity or lower well efficiency. Several factors can influence well yield, including aquifer hydraulic properties, aquifer boundary conditions, thickness of the water-bearing material, well efficiency, well spacing (with respect to nearby pumping wells screened in the same aquifer), and pump characteristics. The modeling assumes that the proposed wells are 12-inch diameter wells operating at 70% efficiency. For public supply wells, LRE modeled the average continuous rates that can be sustained from the aquifer for over 50 years. Model scenarios assume that the proposed wells are pumping 24/7/365 to simulate the “maximum” drawdown impacts for each pumping scenario. If the proposed wells will not be pumping 24/7/365, then the impacts will be less than those presented herein. For confined aquifers, available drawdown is measured from static water level to the top of the aquifer or screen. For unconfined aquifers, the available drawdown (or saturated thickness), is measured from static water level to the bottom of the aquifer. LRE modeled the well yields so that 30-50% of the aquifer’s saturated thickness (unconfined aquifer) or artesian pressure (confined aquifers) remain in the aquifer after pumping the proposed well(s) for 50 years. LRE used “50% remaining available drawdown” as a more “conservative” approach and “30% remaining available drawdown” as a more “aggressive” approach when estimating well yields. Therefore, this assumes that with 50% remaining available drawdown, the amount of water in the aquifer will be reduced by half after 50 years of continuous pumping. Alternatively, the more aggressive approach results in higher well yields that will leave 30% of the available drawdown remaining in the aquifer after 50 years of continuous pumping.

6.2 PROPOSED WELL LOCATIONS

LRE developed conceptual wellfields for the target aquifers beneath the Bluebonnet Property, as presented in Figure 11. Proposed wells were located in areas of favorable hydraulic properties (i.e., higher transmissivity, hydraulic conductivity, and net sands) to maximize individual well yields and were spaced throughout the Bluebonnet Property to minimize well interference between wells completed in the same aquifer. In addition, proposed wells were located in accordance with the TCEQ well setback distance requirements and the NTVGCD well spacing requirements.

For the purpose of this study, each wellsite was issued a numerical number (with numbers “1” through “13”) and each proposed well was identified with the wellsite number and designated aquifer that the proposed well will produce from (“QC” = Queen City Sand, “CZ” = Reklaw/Carrizo Sand, and “WLX” = Wilcox Group). Multiple wells may be located at the same wellsite where hydraulic properties were favorable for several target aquifers (Figure 11). This configuration assumes that multiple wells at the same wellsite are producing from different target aquifers and the aquifers are not hydraulically connected. In some cases, there may only be one well at a wellsite if the hydraulic properties in the other target aquifers were not favorable.

6.3 MODEL INPUT PARAMETERS

Input parameters for the proposed wells used in the analytical groundwater modeling are provided in Table 9 for the Queen City Sand and Reklaw/Carrizo Sand aquifers and Table 10 for the Middle Wilcox Aquifer. The model input parameters used to estimate well yields include the top of the screen (ft bls), bottom of the screen (ft bls), aquifer thickness (ft), net sand thickness (ft), pump setting depth (ft bls), static water level (ft bls), storativity for confined aquifers or specific yield for unconfined aquifers (dimensionless), hydraulic conductivity (gpd/ft²), and transmissivity (gpd/ft). These parameters are based on the site-specific and estimated hydraulic properties from surrounding wells, including data obtained from the pumping test conducted at the BB PW-1 test well, surrounding well data from the TWDB and SDR Database, geologic structure/net sand thickness maps and data extracted from the North QCSCW GAM. Pump setting depths for the proposed wells assume that pumping water levels in the wellbore will be at least 30 feet above the pump setting depth.

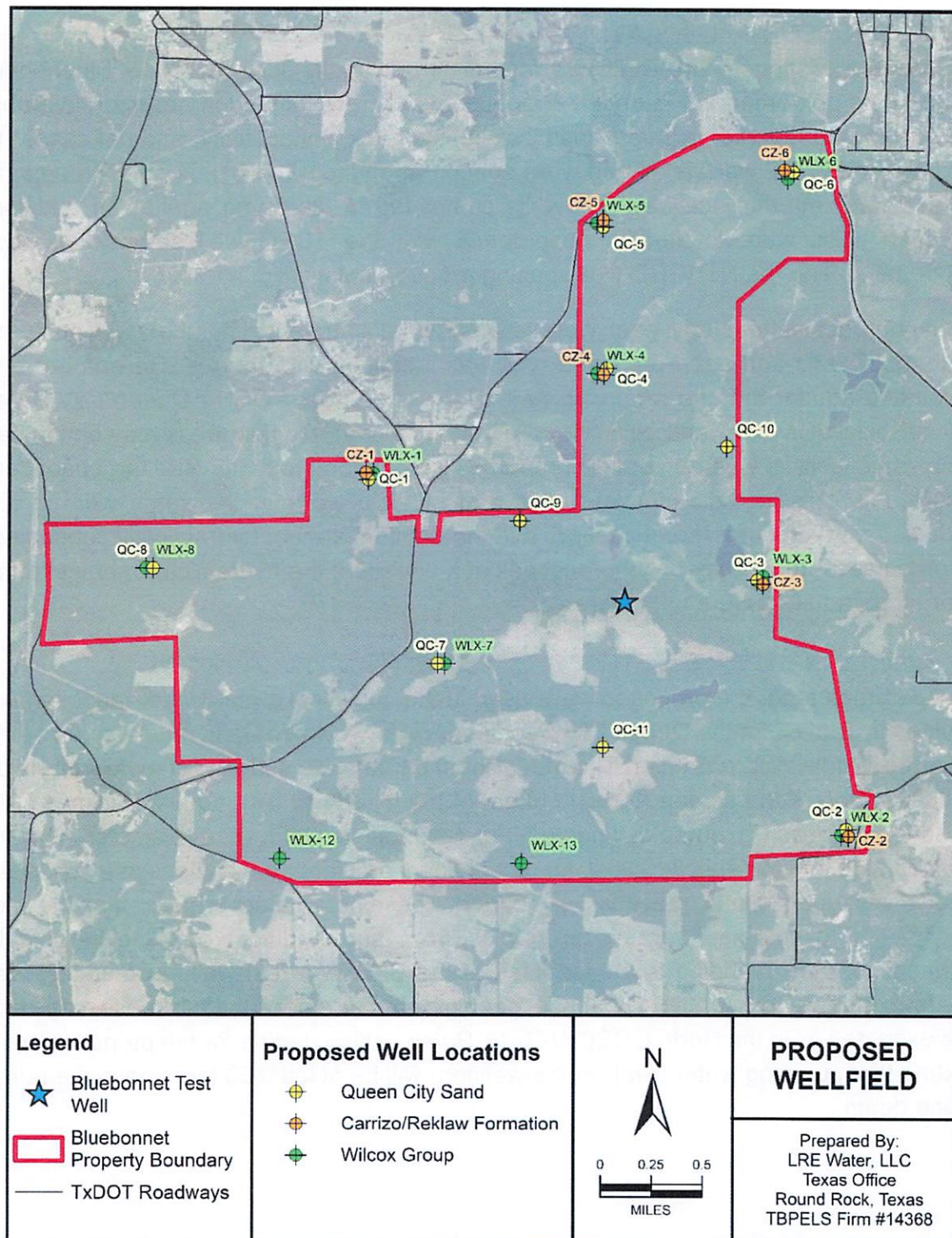


Figure 11. Proposed Well Locations

Table 9. Model Input Parameters for Proposed Wells Completed in the Queen City Sand and Reklaw/Carrizo Sand on the Bluebonnet Property

Proposed Well	Aquifer	Top of Screen (ft bls)	Bottom of Screen (ft bls)	Aquifer Thickness (ft)	Net Sand Thickness (ft)	Pump Setting (ft bls)	Static Water Level (ft bls)	S or Sy*	K (gpd/ft ²)	T (gpd/ft)
QC-1	Queen City	115	370	360	255	300	10	0.15	44.08	11,240
QC-2	Queen City	140	375	335	235	300	40	0.15	32.66	7,675
QC-3	Queen City	105	345	340	240	270	5	0.15	49.17	11,800
QC-4	Queen City	100	345	345	245	270	0	0.15	66.94	16,400
QC-5	Queen City	100	340	340	240	270	0	0.15	85.29	20,470
QC-6	Queen City	110	320	310	210	260	10	0.15	134.14	28,170
QC-7	Queen City	125	365	340	240	295	25	0.15	32.19	7,725
QC-8	Queen City	230	490	365	260	420	125	0.15	20.19	5,250
QC-9	Queen City	100	345	345	245	270	0	0.15	50.39	12,345
QC-10	Queen City	125	370	350	245	290	20	0.15	57.51	14,090
QC-11	Queen City	110	350	345	240	275	5	0.15	32.92	7,900
CZ-1	Reklaw/Carrizo	370	505	135	115	365	235	0.0005	68.78	7,910
CZ-2	Reklaw/Carrizo	370	510	140	105	365	235	0.0004	82.76	8,690
CZ-3	Reklaw/Carrizo	345	490	145	120	340	215	0.0005	71.75	8,610
CZ-4	Reklaw/Carrizo	345	490	145	120	340	210	0.0005	83.46	10,015
CZ-5	Reklaw/Carrizo	340	480	140	120	335	200	0.0005	92.33	11,080
CZ-6	Reklaw/Carrizo	315	470	155	125	310	190	0.0005	76.16	9,520

"ft bls" indicates feet below land surface, land surface from NED (USGS, 2004), "ft" indicates feet, "gpd/ft²" indicates gallons per day per foot squared, "gpd/ft" indicates gallons per day per foot, *indicates value is obtained from the North QCSCW GAM (Schorr and others, 2020), S = Storativity (confined aquifers), Sy = Specific Yield (unconfined aquifer), K = hydraulic conductivity, T = Transmissivity.

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Table 10. Model Input Parameters for Proposed Wells Completed in the Middle Wilcox Aquifer on the Bluebonnet Property

Proposed Well	Top of Screen (ft bls)	Bottom of Screen (ft bls)	Aquifer Thickness (ft)	Net Sand Thickness (ft)	Pump Setting (ft bls)	Static Water Level (ft bls)	S*	"Low" K (gpd/ft ²)	"High" K (gpd/ft ²)	"Low" T (gpd/ft)	"High" T (gpd/ft)
WLX-1	840	1,225	385	190	720	290	0.0009	52.72	105.44	10,020	20,035
WLX-2	765	1,195	430	170	645	265	0.0008	52.72	105.44	8,965	17,925
WLX-3	840	1,210	370	180	700	265	0.0008	52.72	105.44	9,490	18,980
WLX-4	845	1,220	375	190	715	265	0.0008	52.72	105.44	10,020	20,035
WLX-5	830	1,215	385	195	700	245	0.0009	52.72	105.44	10,280	20,560
WLX-6	855	1,250	395	195	725	265	0.0009	52.72	105.44	10,280	20,560
WLX-7	832	1,225	393	180	712	305	0.0008	52.72	105.44	9,490	18,980
WLX-8	900	1,300	400	195	790	370	0.0009	52.72	105.44	10,280	20,560
WLX-12	880	1,290	410	185	760	370	0.0008	52.72	105.44	9,750	19,505
WLX-13	800	1,205	405	170	680	285	0.0008	52.72	105.44	8,960	17,925

"ft bls" indicates feet below land surface, land surface from NED (USGS, 2004), "ft" indicates feet, "gpd/ft²" indicates gallons per day per foot squared, "gpd/ft" indicates gallons per day per foot, *indicates value is obtained from the North QCSCW GAM (Schorr and others, 2020), S = Storativity, K = hydraulic conductivity, T = Transmissivity.

Transmissivity values for the Upper Wilcox beneath the Bluebonnet Property was relatively low (110 to 440 gpd/ft)(Table 3). For the Lower Wilcox, local transmissivity data was not available, and the hydraulic conductivity values for the Lower Wilcox from the North QCSCW GAM are relatively low for this formation (Table 4). Due to the lower hydraulic conductivity and transmissivity values of the Upper and Lower Wilcox, these aquifers are unlikely to sustain pumping rates greater than 50 gpm over a 50-year pumping period. Therefore, only proposed wells completed in the Queen City Sand, Reklaw/Carrizo Sand, and Middle Wilcox were included in the modeling.

LRE determined the target production zones for each proposed well location using the structure maps and net sand thickness maps provided in Appendix B and Appendix C, respectively. The target production zones (i.e., the “top of the screen” and the “bottom of the screen”) for wells completed in the confined (Carrizo-Wilcox) aquifers is equivalent to be the “top” and “bottom” of the aquifer. For the confined (Carrizo-Wilcox) aquifers, aquifer thickness was calculated from the bottom of the aquifer to the top of the aquifer (in feet). For the unconfined (Queen City Sand) aquifer, aquifer thickness was calculated from the base of the aquifer to static water level (in feet). Net sand thickness was extracted from the net sand maps at each proposed well location (Appendix C) and is equal to the anticipated screen length (in feet).

Static water levels were obtained from surrounding wells in the SDR and TWDB Database with recent water level measurements. At some of the proposed well locations, static water level in the Queen City Sand is anticipated to be at land surface (0 ft bls)(Appendix F).

Specific yield was obtained from the North QCSCW GAM (Schorr and others, 2020) and was assumed to be 0.15 for all proposed wells completed in the Queen City Sand (Table 9). Storativity values for the proposed Reklaw/Carrizo Sand wells were calculated by multiplying net sand thickness of the Reklaw/Carrizo Sand at the proposed well location (in feet) by a specific storage value of $4 \times 10^{-6} \text{ ft}^{-1}$ from the North QCSCW GAM (Schorr and others, 2020), which range from 0.0004 to 0.0005 for the proposed wells (Table 9). Storativity values for the proposed Middle Wilcox wells were calculated by multiplying net sand thickness of the Middle Wilcox at the proposed well location (in feet) by a specific storage value of $4.5 \times 10^{-6} \text{ ft}^{-1}$ from the North QCSCW GAM (Schorr and others, 2020), which range from 0.0008 to 0.0009 (Table 10).

Transmissivity values for the proposed wells were calculated by multiplying the estimated hydraulic conductivity by net sand thickness. For proposed wells producing from the Queen City Sand, hydraulic conductivity calculated from surrounding hydraulic

conductivity values was multiplied by the saturated net sand thickness of the Queen City Sand at the proposed well location. For the Reklaw/Carrizo Sand, hydraulic conductivity values from surrounding wells were calculated by net sand thickness of the Reklaw/Carrizo Sand at the proposed well location. For the Middle Wilcox, a “low” and “high” transmissivity estimate were used to model well yields based on the range in values calculated from the pumping test at BB PW-1 (Table 10). Transmissivity values for the Middle Wilcox were derived by multiplying the estimated hydraulic conductivity of 52.72 gpd/ft² and 105.44 gpd/ft² by the net sand thickness of the Middle Wilcox at the proposed well location. This provides a range of well yields based on a “low” transmissivity from a hydraulic conductivity of 52.72 gpd/ft² and a “high” transmissivity estimate from a hydraulic conductivity of 105.44 gpd/ft² for the Middle Wilcox beneath the Bluebonnet Property (Table 10).

6.4 ESTIMATED WELL YIELDS

For this work, LRE modeled groundwater production at the proposed well locations using the model input parameters in Tables 9 and 10. LRE modeled well yields for the target aquifers over 50 years and presented the results in Table 11 for wells completed in the Queen City Sand and Reklaw/Carrizo Sand aquifers and Table 12 for wells completed in the Middle Wilcox aquifer. Well yields are the pumping rates that the aquifer/well can sustain for long-term use (50 years). Cumulative drawdown (in feet) was calculated for each proposed well based on the well yield and pumping scenario (Table 11 and 12). Cumulative drawdown values include drawdown imposed from the pumping well and any well interference from nearby pumping wells completed in the same aquifer. The provided well yields assume that all proposed wells are pumping simultaneously. Cumulative drawdown values do not include drawdown resulting from surrounding wells completed in the same aquifer that are located outside of the Bluebonnet Property.

Wells yield in for the Queen City Sand range from 150 to 650 gpm for a total of 3,250 gpm (5,256 ac-ft/yr) with 50% of the saturated thickness remaining, and 200 to 800 gpm for a total of 3,925 gpm (6,348 ac-ft/yr) with 30% of the saturated thickness remaining after 50 years (Table 11). This range in yields for the Queen City Sand can be primarily attributed to the range in estimates of transmissivity beneath the Bluebonnet Property. Additionally, the variation in water levels within the Queen City Sand are likely influenced by shallow groundwater interactions with Lake Palestine, Caney Creek, and Highsaw Creek across the Bluebonnet Property (Appendix F).

A specific yield of 0.15 was assumed for the Queen City Sand in the modeling based on the specific yield values from the North QCSCW GAM (Schorr and others, 2020). If test well drilling and testing indicates a higher storativity or specific yield value than 0.15 for

the Queen City Sand, then well yields may be higher for the Queen City Sand. Alternatively, if the storativity or specific yield for the Queen City Sand is lower than 0.15, then the provided well yields may not be attainable.

Well yields for the Reklaw/Carrizo Sand range from 50 to 100 gpm for a total of 450 gpm (728 ac-ft/yr) with 50% artesian pressure remaining in the aquifer after 50 years, and 75 to 125 gpm for a total of 600 gpm (970 ac-ft/yr) with 30% artesian pressure remaining in the aquifer after 50 years (Table 11). These lower well yields can be primarily attributed to lower net sands and less available drawdown in the aquifer.

Table 11. Estimated Well Yields and Drawdown for the Proposed Wells in the Queen City Sand and Reklaw/Carrizo Sand on the Bluebonnet Property

Proposed Well	Aquifer	50% Remaining Available Drawdown		30% Remaining Available Drawdown	
		Well Yields (gpm)	Cumulative Drawdown (ft)	Well Yields (gpm)	Cumulative Drawdown (ft)
QC-1	Queen City	275	185	325	253
QC-2	Queen City	200	158	250	225
QC-3	Queen City	250	169	300	231
QC-4	Queen City	350	180	400	236
QC-5	Queen City	500	174	600	239
QC-6	Queen City	650	154	800	217
QC-7	Queen City	175	176	200	234
QC-8	Queen City	150	170	200	264
QC-9	Queen City	225	168	275	231
QC-10	Queen City	300	175	350	231
QC-11	Queen City	175	163	225	237
Total	Queen City Sand	3,250	gpm	3,925	gpm
		5,256	ac-ft/yr	6,348	ac-ft/yr
CZ-1	Reklaw/Carrizo	75	73	100	98
CZ-2	Reklaw/Carrizo	75	67	100	90
CZ-3	Reklaw/Carrizo	50	61	75	85
CZ-4	Reklaw/Carrizo	75	70	100	93
CZ-5	Reklaw/Carrizo	100	74	125	96
CZ-6	Reklaw/Carrizo	75	68	100	91
Total	Reklaw/Carrizo Sand	450	gpm	600	gpm
		728	ac-ft/yr	970	ac-ft/yr

"gpm" indicates gallons per minute, "ft" indicates feet, "ac-ft/yr" indicates acre-feet per year.

Well yields for wells completed in the Middle Wilcox with lower estimates of transmissivity range from 200 to 250 gpm for a total of 2,400 gpm (3,882 ac-ft/yr) with 50% artesian pressure remaining in the aquifer after 50 years, and 300 to 450 gpm for a total of 3,350 gpm (5,404 ac-ft/yr) with 30% artesian pressure remaining in the aquifer after 50 years

(Table 12). Well yields for wells completed in the Middle Wilcox with higher estimates of transmissivity range from 300 to 600 gpm for a total of 4,300 gpm (6,954 ac-ft/yr) with 50% artesian pressure remaining in the aquifer after 50 years, and 500 to 900 gpm for a total of 5,900 gpm (9,542 ac-ft/yr) with 30% artesian pressure remaining in the aquifer after 50 years (Table 12). Higher well yields in the Middle Wilcox can be primarily attributed to higher estimates of transmissivity and greater available drawdown in the aquifer.

Table 12. Estimated Well Yields and Drawdown for the Proposed Wells in the Middle Wilcox

Proposed Well	Aquifer	50% Remaining Available Drawdown		30% Remaining Available Drawdown	
		Well Yields (gpm)	Cumulative Drawdown (ft)	Well Yields (gpm)	Cumulative Drawdown (ft)
"High" Transmissivity Based on Hydraulic Conductivity of 105.44 gpd/ft ²					
WLX-1	Middle Wilcox	400	259	500	354
WLX-2	Middle Wilcox	400	253	500	346
WLX-3	Middle Wilcox	500	280	700	397
WLX-4	Middle Wilcox	500	280	600	381
WLX-5	Middle Wilcox	500	271	700	386
WLX-6	Middle Wilcox	600	279	900	409
WLX-7	Middle Wilcox	300	247	500	364
WLX-8	Middle Wilcox	300	227	500	335
WLX-12	Middle Wilcox	400	247	500	339
WLX-13	Middle Wilcox	400	268	500	357
Total	Middle Wilcox	4,300	gpm	5,900	gpm
		6,954	ac-ft/yr	9,542	ac-ft/yr
"Low" Transmissivity Based on Hydraulic Conductivity of 52.72 gpd/ft ²					
WLX-1	Middle Wilcox	200	261	300	371
WLX-2	Middle Wilcox	200	252	300	360
WLX-3	Middle Wilcox	300	299	400	410
WLX-4	Middle Wilcox	250	282	350	393
WLX-5	Middle Wilcox	300	287	400	395
WLX-6	Middle Wilcox	350	296	450	399
WLX-7	Middle Wilcox	200	266	250	362
WLX-8	Middle Wilcox	200	244	300	349
WLX-12	Middle Wilcox	200	247	300	353
WLX-13	Middle Wilcox	200	259	300	371
Total	Middle Wilcox	2,400	gpm	3,350	gpm
		3,882	ac-ft/yr	5,404	ac-ft/yr

"gpm" indicates gallons per minute, "ft" indicates feet, "ac-ft/yr" indicates acre-feet per year.

As previously mentioned, analytical groundwater modeling was performed for proposed wells completed in the Upper and Lower Wilcox aquifers, which indicated that wells completed in these aquifers could not sustain pumping rates greater than 50 gpm for 50 years. Based on the net sand maps (Appendix C), there is anticipated to be approximately 70 to 85 feet of fresh water-bearing sands in the Upper Wilcox and approximately 25 to 90 feet of fresh water-bearing sands in the Lower Wilcox beneath the Bluebonnet Property. Although the Upper and Lower Wilcox were not modeled as viable long-term options, production from these formations may be feasible if exploratory drilling can confirm higher transmissivity values. If exploratory test holes indicate higher transmissivity values for the Upper and Lower Wilcox than the local well data or the GAM suggests, then LRE would recommend screening additional sands in the Upper Wilcox with wells completed in the Reklaw/Carrizo Sand, and screening additional sands in the Lower Wilcox with wells completed in the Middle Wilcox to increase overall productivity. However, it should be noted that poorer water quality with higher TDS content is expected in the deeper portions of the Wilcox Group and therefore only fresh water-bearing sands of the Lower Wilcox should be developed. This can only be confirmed after test hole drilling and testing.

It is important to note that the provided well yields are based on the assumptions and hydraulic properties for the target aquifers beneath the proposed wellsites, as provided in Table 9 and Table 10. Site-specific hydraulic properties and actual well yields can only be determined after the drilling and testing. This modeling also does not take into account additional water supply from recharge, which results from the infiltration of water from precipitation in the aquifer outcrop, seepage from lakes or other bodies of surface water, or by vertical and lateral movement of water between formations. The proposed wells are located within the outcrop of the Queen City Sand and in close proximity to Lake Palestine and Caney/Highsaw Creeks, which may provide recharge to the Queen City Sand. It is possible that higher well yields could be sustained from wells completed in the Queen City than those presented in Table 11 due to recharge. However, wells completed in the Queen City Sand may also be more susceptible to changes in water levels and impacts from drought conditions. The installation of 11 wells completed in the Queen City Sand, six wells completed in the Reklaw/Carrizo Sand, and 10 wells completed in the Middle Wilcox could likely produce approximately 12,938 ac-ft/yr of groundwater supply and up to approximately 16,860 ac-ft/yr for 50 years (Table 11 and 12).

SECTION 7: GROUNDWATER REGULATORY ENTITIES

The Bluebonnet Property is located within the jurisdiction of the Neches & Trinity Valley GCD and Groundwater Management Area 11 (GMA-11), which are entities that manage the groundwater resources in Henderson County. Figure 12 shows the boundaries of the entities that manage the groundwater resources in Henderson County.

7.1 NECHES & TRINITY VALLEY GCD

LRE reviewed the NTVGCD's Rules to identify requirements pertaining to permitting and production limits for non-exempt wells within the District boundaries.

7.1.1 *Well Permitting Requirements*

Per the District Rule 5.4, all applications for a water well drilling permit, operating permit, transfer permit, or permit amendment shall include the following information: general well owner information, documents establishing the applicable authority to construct and/or operate a well for the proposed use, statement of the nature and purpose of the water and intended amount of water for use, declaration of compliance with District Rules and Management Plan, well location, and estimated production rate. A hydrogeological report addressing the area of influence, drawdown, recovery time, and other pertinent information required by the District shall also be included with permit applications for: 1) requests to drill a well with a maximum capacity of more than 2 million gallons a day (mgd), or 2) requests to modify to increase production or production capacity of a Public Water Supply, Municipal, Commercial, Industrial, Agricultural, or Irrigation well with an outside casing diameter greater than 10 inches. LRE anticipates that the proposed wells on the Bluebonnet Property will require production permits with hydrogeological reports.

7.1.2 *Management Plan*

The NTVGCD Management Plan (Amended August 15, 2019) was developed in accordance with Chapter 36 of the Texas Water Code and provisions of TAC Title 31, Groundwater Management Plan Certification. The primary purpose of the Management Plan is to identify the management goals of the District, estimate the availability of groundwater in the District, project water demands, and outline how the District will manage and conserve their groundwater resources. The District will implement the provisions of the management plan as a guide for District actions, operations, and decision-making. Such measures include regularly assessing the water supply of groundwater storage conditions, establishing an observation well network to monitor aquifer water levels, and conducting investigations of the available groundwater resources.

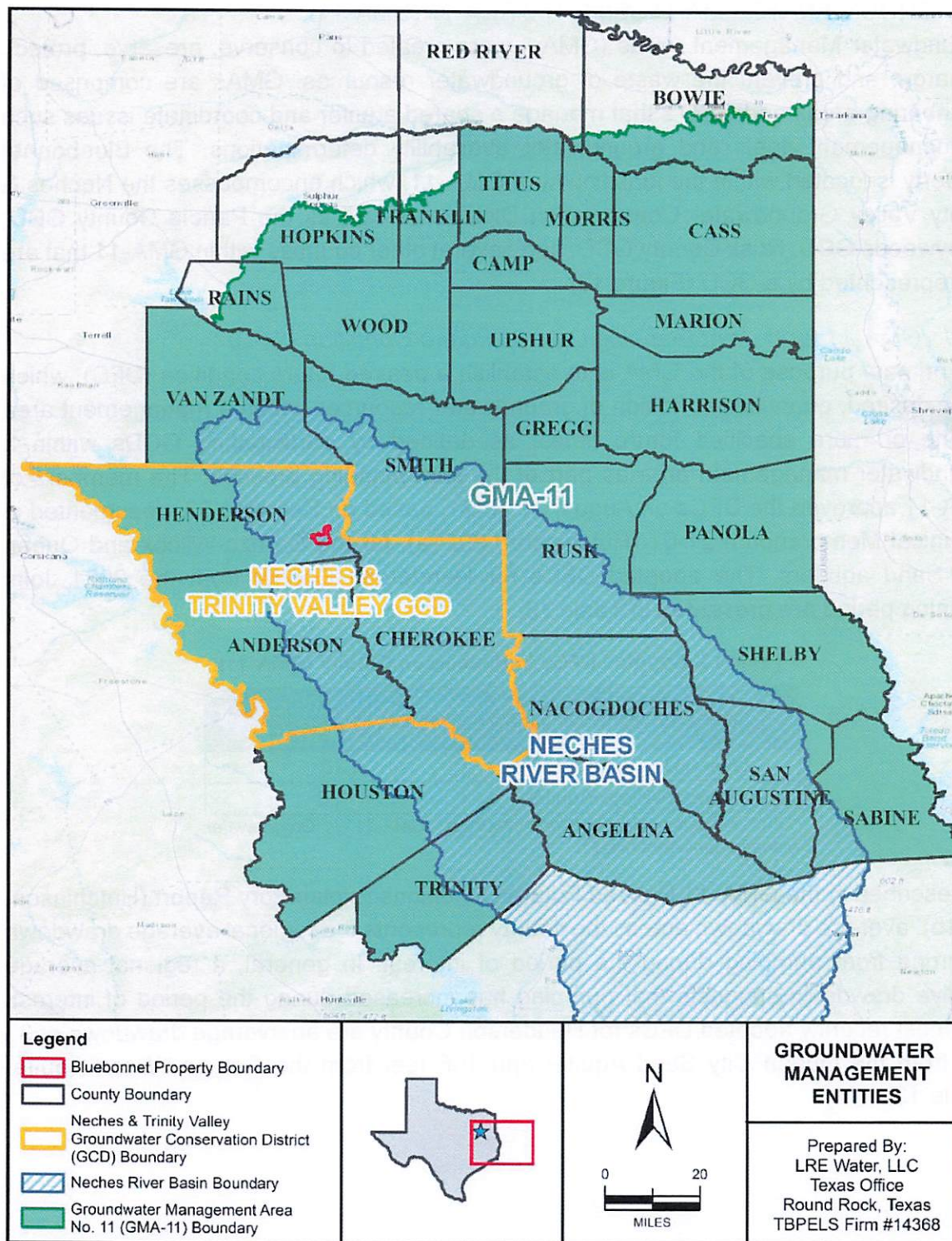


Figure 12. Groundwater Management Entities for Henderson County

7.2 GROUNDWATER MANAGEMENT AREA 11 (GMA-11)

Groundwater Management Areas (GMAs) were created to conserve, preserve, protect, recharge, and prevent the waste of groundwater resources. GMAs are comprised of neighboring areas and GCD's that manage a shared aquifer and coordinate issues such as management goals and groundwater availability determinations. The Bluebonnet Property is located within the jurisdiction of GMA-11, which encompasses the Neches & Trinity Valley Groundwater Conservation District, as well as the Panola County GCD, Pineywoods GCD, Rusk County GCD, and several other counties within GMA-11 that are not represented by a GCD (Figure 12).

7.2.1 GMA-11 2021 Joint Planning Desired Future Condition (DFC)

The primary purpose of the GMA is to establish a desired future condition (DFC), which is the desired, quantified condition of groundwater resources within a management area at one or more specified future times, as defined by participating GCDs within a groundwater management area as part of the joint planning process. The members of GMA-11 approved the DFCs on August 11, 2021, based on Scenario 33, documented in Technical Memorandum 21-01 (Hutchinson, 2021a), for the Carrizo-Wilcox and Queen City Sand aquifers. The adopted DFCs for Henderson County from the 2021 Joint Planning period are presented in Table 13.

Table 13. Adopted DFCs in Henderson County (GMA-11)

Average Drawdown in Henderson County, in feet	
Aquifer	2021(2013-2080)
Queen City Sand Aquifer	33
Carrizo-Wilcox Aquifer	106

"DFC" indicates desired future condition, "GMA-11" is Groundwater Management Area No. 11

As described in the GMA-11 Desired Future Conditions Explanatory Report (Hutchinson, 2021b), average drawdown across the county represents the regional average drawdown occurring from pumping during the period of interest. In general, a regional average positive drawdown suggests that pumping has increased during the period of interest. The most recently adopted DFCs for Henderson County are an average drawdown of 33 feet from the Queen City Sand Aquifer and 106 feet from the Carrizo-Wilcox Aquifer (Table 13).

7.2.2 Modeled Available Groundwater (MAG) 2021 Joint Planning

Modeled available groundwater (MAG), as defined in Chapter 36 of the Texas Water Code (2011), is the estimated average amount of water that may be produced annually to achieve a desired future condition. The TWDB issued the GAM Run-21-016 MAG Report for the Carrizo-Wilcox, Queen City, and Sparta Aquifers in GMA-11 on February 17, 2022 (Wade, 2022), which used the North QCSCW GAM (Schorr and others, 2022) and documented development of the estimated modeled available groundwater associated with the DFCs adopted by GMA-11 on August 11, 2021.

The Bluebonnet Property is located within the Neches River Basin, as shown in Figure 12. Table 14 summarizes the MAG from the 2021 Joint Planning Cycle GAM Run 21-016 (Wade, 2022) from 2020 to 2080 by aquifer for the Neches River Basin in Henderson County. The MAG from 2020 to 2080 is 10,516 acre-feet per year (ac-ft/yr) for the Queen City Sand Aquifer and 3,996 ac-ft/yr for the Carrizo-Wilcox Aquifer, which equates to a total MAG of 14,512 ac-ft/yr or approximately 12.96 mgd (Table 14).

Table 14. MAG for Henderson County – Neches River Basin (2021 Joint Planning)

Aquifer	Modeled Available Groundwater (ac-ft/yr)						
	2020	2030	2040	2050	2060	2070	2080
Queen City Sand Aquifer	10,516	10,516	10,516	10,516	10,516	10,516	10,516
Carrizo-Wilcox Aquifer	3,996	3,996	3,996	3,996	3,996	3,996	3,996
Total MAG (ac-ft/yr)	14,512	14,512	14,512	14,512	14,512	14,512	14,512

"MAG" indicates Modeled Available Groundwater, "ac-ft/yr" indicates acre-feet per year

Table 15 summarizes the MAG from the 2021 Joint Planning Cycle GAM Run 21-016 (Wade, 2022) from 2020 to 2080 by aquifer for the Neches & Trinity Valley GCD in Henderson County. The MAG from 2020 to 2080 ranges from 10,671 to 10,670 ac-ft/yr for the Queen City Sand Aquifer and 7,222 ac-ft/yr for the Carrizo-Wilcox Aquifer, which equates to a total MAG ranging from 17,893 to 17,892 ac-ft/yr or approximately 15.97 mgd (Table 15).

Table 15. MAG for Henderson County – Neches & Trinity Valley GCD (2021 Joint Planning)

Aquifer	Modeled Available Groundwater (ac-ft/yr)						
	2020	2030	2040	2050	2060	2070	2080
Queen City Aquifer	10,671	10,671	10,671	10,670	10,670	10,670	10,670
Carrizo-Wilcox Aquifer	7,222	7,222	7,222	7,222	7,222	7,222	7,222
Total MAG	17,893	17,893	17,893	17,892	17,892	17,892	17,892

"MAG" indicates Modeled Available Groundwater, "ac-ft/yr" indicates acre-feet per year

SECTION 8: NUMERICAL GROUNDWATER MODELING

Groundwater Availability Models (GAMs) are regional-scale numerical models developed to simulate the impacts of groundwater pumping on aquifers and to provide estimates of groundwater availability for groundwater resource management and water planning purposes. The North QCSCW GAM is the currently adopted GAM for the Northern Portion of the Carrizo-Wilcox Aquifer System (Schorr and others, 2020). Due to the size of GAMs and complexity of the aquifer systems, GAMs are not exact representations of local hydrogeologic conditions and often lack detailed localized data such as pumping tests, current water level measurements and aquifer depths. GAMs are however useful tools in predicting regional water level trends and impacts from hydrologic stresses such as groundwater pumping. The North QCSCW GAM was recently updated in 2020 by Schorr and others (2020) was used to create the DFCs for GMA-11 in 2021. During this process, some of the model files were altered to simulate future conditions, as outlined in technical memorandums from Hutchinson (2020, 2021a, 2021c, 2021d, 2021e, 2021f). The model files used to create the DFCs were also used in LRE's analysis.

To evaluate the impacts of the proposed production on the recently adopted DFCs, LRE added the proposed well locations in the associated North QCSCW GAM model cells in MODFLOW and simulated the proposed production outlined in Table 16. "Pumping Scenario #1" is the lower pumping scenario that includes 5,256 ac-ft/yr from the Queen City Sand (Layer 4), 728 ac-ft/yr from the Carrizo Sand (Layer 6), and 6,954 ac-ft/yr from the Middle Wilcox (Layer 8), which correspond to the production rates from the "50% remaining artesian pressure" analytical modeling scenario (Table 11 and 12). "Pumping Scenario #2" is the higher pumping scenario that includes 6,348 ac-ft/yr from the Queen City Sand (Layer 4), 970 ac-ft/yr from the Carrizo Sand (Layer 6), and 9,542 ac-ft/yr from the Middle Wilcox (Layer 8), which correspond to the production rates from the "30% remaining artesian pressure" analytical modeling scenario (Table 11 and 12). Both pumping scenarios utilize the higher Middle Wilcox hydraulic conductivity estimate to simulate a higher maximum sustained groundwater withdrawal rate.

Table 16. Proposed Production from Bluebonnet Property for the Numerical Modeling

Aquifer	Modeled Production, in ac-ft/yr	
	Pumping Scenario #1 ("50% Remaining Artesian Pressure")	Pumping Scenario #2 ("30% Remaining Artesian Pressure")
Queen City Sand	5,256	6,348
Carrizo Sand	728	970
Middle Wilcox	6,954	9,542
Total	12,938	16,860

"ac-ft/yr" indicates acre-feet per year.

Modeled drawdown from the proposed production for the Queen City Sand and Carrizo-Wilcox aquifers were computed and compared to the drawdown from the “Base Case” model run (Hutchison, W.R., 2021d) used to calculate the 2021 DFC’s (which did not include the proposed wellfield). The amount of additional drawdown in Henderson County was calculated as a result of the proposed production at the Bluebonnet Property. This aims to simulate the potential impacts in relation to the most recent DFC, which will allow 33 feet of drawdown in the Queen City Sand and 106 feet of drawdown in the Carrizo-Wilcox aquifer across Henderson County (Table 13).

Table 17 presents the additional drawdown caused only by the proposed production from the Bluebonnet Property after 50 years of pumping. The model results from Pumping Scenario #1 indicate that approximately 20 feet of additional drawdown will occur in the Queen City Sand and 34 feet of additional drawdown will occur in the Carrizo-Wilcox in Henderson County after 50 years as a result of the proposed production from the Bluebonnet Property (Table 17). The model results from Pumping Scenario #2 indicate that approximately 20 feet of additional drawdown will occur in the Queen City Sand and 36 feet of additional drawdown will occur in the Carrizo-Wilcox in Henderson County after 50 years as a result of the proposed production at the Bluebonnet Property (Table 17).

Table 17. Additional Drawdown in Henderson County After 50 Years

Aquifer	Modeled Drawdown in Henderson County, in feet	
	Pumping Scenario #1 (“50% Remaining Artesian Pressure”)	Pumping Scenario #2 (“30% Remaining Artesian Pressure”)
Queen City Sand	20	20
Carrizo-Wilcox	34	36

It should be noted that the numerical modeling results underestimate the total impacts to the DFC, as the proposed pumping rates provided in Table 16 could not be sustained in the GAM model run. Based on our evaluation, the site-specific local hydrogeologic characteristics are more favorable than the hydraulic properties for each model layer in the North QCSCW GAM, and thus the well yields modeled from the analytical modeling scenarios are not attainable in the numerical modeling scenarios. Therefore, pumping rates were automatically reduced in MODFLOW to prevent the modeled cells from being depleted. This process in MODFLOW is called “auto-flow” reduction. The pumping rates were automatically reduced in MODFLOW and eventually stabilized at approximately 8,500 ac-ft/yr (total) in Pumping Scenario #1 (lower pumping rates) and 9,137 ac-ft/yr (total) in Pumping Scenario #2 (higher pumping rates), respectively. It is important to note that the impacts presented in Table 17 correspond to the MODFLOW-adjusted pumping

rates and do not reflect drawdown from the total proposed production of 12,938 ac-ft/yr (Pumping Scenario #1) or 16,860 ac-ft/yr (Pumping Scenario #2) from the Queen City Sand and Carrizo-Wilcox aquifers. Since this is an automated process in MODFLOW, the rates could not be adjusted to reflect the total proposed production amounts, and therefore the total impacts from the proposed production could not be determined.

Some limitations of this analysis are as follows:

1. The DFC modeling uses hydraulic properties from the North QCSCW GAM, which are not an accurate representation of hydraulic properties for the target aquifers beneath the Bluebonnet Property.
2. The MODFLOW modeling will simulate pumping until the cell (aquifer) is nearly depleted, which is not realistic when considering operational limitations, such as screen intervals and pump depths.
3. The proposed production of 12,938 ac-ft/yr from Pumping Scenario #1 and 16,860 ac-ft/yr from Pumping Scenario #2 exceeded the allowable production for the model cells in MODFLOW, which caused auto flow reduction. Therefore, the total impacts from the proposed production could not be determined.

To accurately model the total impacts from the proposed production, the hydraulic properties for the target aquifers in the North QCSCW GAM should be updated with the site-specific hydraulic properties to reflect actual aquifer conditions and enhance the accuracy of the model and simulate impacts to the target aquifers.

SECTION 9: CONCLUSIONS

The principal groundwater resources in Henderson County include the Queen City Sand and Carrizo-Wilcox aquifers. Based on this evaluation, the target production zones beneath the Bluebonnet Property capable of producing significant volumes of water to support a large-scale wellfield infrastructure project include the Queen City Sand, the Reklaw/Carrizo Sand and the Middle Wilcox aquifers.

A test well ("BB PW-1") was constructed on the Bluebonnet property to determine the site-specific hydraulic properties of the aquifer(s) beneath the Bluebonnet Property. The BB PW-1 test well was drilled to a depth of 1,198 ft bls and was completed in the Middle Wilcox aquifer with 169 feet of screen. A 25-hour pumping test was conducted at the BB PW-1 test well on April 1, 2024 to determine the site-specific hydraulic properties of the Middle Wilcox aquifer beneath the Bluebonnet Property. LRE analyzed the pumping test

data from the BB PW-1 test well and calculated a transmissivity of 17,820 gpd/ft from the pumping portion of the test using the Cooper-Jacob (1946) solution and a transmissivity of 8,910 gpd/ft from the non-pumping (recovery) portion of the test using the Theis (1935) residual drawdown solution. Based on 169 feet of screen in the BB PW-1 test well, the hydraulic conductivity of the Middle Wilcox aquifer beneath the Bluebonnet Property was calculated to be 52.72 gpd/ft² to 105.44 gpd/ft².

A water quality sample was collected from the BB PW-1 test well and analyzed for common drinking water constituents. The water quality laboratory results from the BB PW-1 test well were compared to the TCEQ standards for drinking water supplies, which indicated that no constituents exceeded the TCEQ MCLs or SCLs for drinking water. Therefore, water quality in the Middle Wilcox aquifer beneath the Bluebonnet Property is anticipated to meet the TCEQ standards for drinking water supplies. Surrounding water chemistry data for the Queen City Sand and Carrizo-Wilcox aquifers were obtained from the TCWD Database and indicate that water in the target aquifers is generally fresh, with total dissolved solids concentrations of less than 1,000 mg/L. Moreover, water quality analyses from wells completed in the target aquifers surrounding the Bluebonnet Property generally conform to the TCEQ MCLs and SCLs for drinking water supply. Therefore, water quality in the target aquifers beneath the Bluebonnet Property is anticipated to meet the TCEQ standards for drinking water supplies.

Where hydraulic properties could not be determined from site-specific data, properties were estimated from surrounding wells, including data obtained from the TWDB and SDR Database, geologic structure and net sand thickness maps, and data extracted from the North QCSCW GAM. LRE conducted analytical groundwater modeling using the estimated hydraulic properties to determine well yields that the target aquifers could sustain for 50 years. LRE modeled well yields so that 30-50% of the aquifer's saturated thickness (Queen City Sand) or artesian pressure (Carrizo-Wilcox Aquifer) remain in the aquifer after pumping the proposed wells for 50 years. More specifically, LRE modeled "50% remaining available drawdown" as a more "conservative" approach, and the "30% remaining available drawdown" as a more "aggressive" approach.

The analytical results indicate that proposed wells on the Bluebonnet Property could produce yields ranging from 150 to 650 gpm (3,250 gpm or 5,256 ac-ft/yr) with 50% of the saturated thickness remaining, and 200 to 800 gpm (3,925 gpm or 6,348 ac-ft/yr) with 30% of the saturated thickness remaining in the Queen City Sand after 50 years. Wells yields for the Queen City Sand is primarily influenced by the range in estimates of transmissivity beneath the Bluebonnet Property and variation in water levels, which is primarily influenced by shallow groundwater interactions with Lake Palestine, Caney

Creek, and Highsaw Creek. For proposed wells completed in the Reklaw/Carrizo Sand, yields range from 50 to 100 gpm (450 gpm or 728 ac-ft/yr) with 50% artesian pressure remaining, and 75 to 125 gpm (600 gpm or 970 ac-ft/yr) with 30% artesian pressure remaining after 50 years.

For the Middle Wilcox, well yields were modeled using a “low” transmissivity estimate based on a hydraulic conductivity value of 52.72 gpd/ft² and a “high” transmissivity estimate based on a hydraulic conductivity value of 105.44 gpd/ft². Well yields for the Middle Wilcox with lower estimates of transmissivity range from 200 to 250 gpm (2,400 gpm or 3,882 ac-ft/yr) with 50% artesian pressure remaining, and 300 to 450 gpm (3,350 gpm or 5,404 ac-ft/yr) with 30% artesian pressure remaining after 50 years. Well yields for the Middle Wilcox with higher estimates of transmissivity range from 300 to 600 gpm (4,300 gpm or 6,954 ac-ft/yr) with 50% artesian pressure remaining, and 500 to 900 gpm (5,900 gpm or 9,542 ac-ft/yr) with 30% artesian pressure remaining after 50 years. The recommended wellfield includes the installation of 11 wells completed in the Queen City Sand to depths of approximately 320 to 490 feet, six wells completed in the Reklaw/Carrizo Sand to depths of approximately 470 to 510 feet, and 10 wells completed in the Middle Wilcox to depths of approximately 1,195 to 1,300 feet. This wellfield configuration meets regulatory spacing requirements and minimizes drawdown interference between wells completed in the same aquifer. At full wellfield build out, LRE estimates that approximately 12,958 to 16,860 ac-ft of groundwater is available annually from the Queen City Sand and Carrizo-Wilcox aquifers beneath the Bluebonnet Property.

The Bluebonnet Property is located within the jurisdiction of GMA-11, which manages groundwater resources in Henderson County. GMA-11 adopted desired future conditions (DFCs) for the Queen City Sand and Carrizo-Wilcox aquifers, which include 33 feet of drawdown in the Queen City Sand, and 106 feet of drawdown in the Carrizo-Wilcox aquifer in Henderson County. LRE conducted numerical modeling in MODFLOW to determine the impacts of the proposed production on the currently adopted DFCs. Due to the current model assumptions and limitations, impacts from the proposed production could not be accurately depicted. Updated hydraulic properties in the North QCSCW GAM would accurately reflect aquifer current conditions and impacts to the target aquifers.

SECTION 10: CONCLUSIONS

Based on this evaluation, LRE recommends drilling and constructing test wells in the target aquifers to further confirm the quality and quantity of groundwater supplies beneath the Bluebonnet Property. Understanding the “site-specific” hydraulic properties of the target aquifers is crucial for refining estimates of water quality and well yields, which can substantially influence the number of wells necessary to meet project demands, thereby providing a more accurate determination of feasibility projections for the entire project.

The test well(s) shall be drilled to ensure that all the target production zones have been fully penetrated to maximize overall well yields. Borehole geophysical logging would provide estimates of net sand thickness and formation depths, and advanced geophysical logging could provide estimates of hydraulic properties, including hydraulic conductivity, transmissivity, resistivity, temperature, formation permeability, porosity, and estimated TDS. Zonal testing during drilling can provide water quality data and measurements of hydraulic conductivity for specific target production zones, which would be particularly useful for the Wilcox Group aquifer. Based on the results of zonal testing and selection of the target production zone(s), the borehole could be completed as either a temporary or permanent production well.

Until additional site-specific data and hydraulic properties can be confirmed, LRE suggests using the conservative production estimates and wellfield development approach presented within this report. These estimates should not be viewed as maximum production limits, but instead serve as a reference and initial framework for future conversations and project development. As additional data is obtained from test well drilling and aquifer testing, LRE recommends updating the model with site-specific hydraulic properties and adjusting or confirming well yields.

Lastly, LRE recommends that Pure Bliss, LLC initiate preliminary discussions with NTVGCD and GMA-11 regarding any planned groundwater production within the ongoing round of Joint Planning, to be completed in 2026. This proactive engagement will facilitate alignment with regulatory requirements and enhance the project’s long-term viability. Implementing these recommendations will not only provide crucial data to support informed decision-making, but may also promote collaboration with regulatory entities, which will ensure a sustainable and successful groundwater supply project.

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Groundwater Availability Study
Bluebonnet Property
Henderson County, TX
May 10, 2024

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Appendix A – Test Well “BB PW-1” Geophysical Log



Borehole: BLUEBONNET WELL

Logs: GAMMA,SP,RESISTIVITY

Water Well Logging & Video Recording Services

Geo Cam, Inc. 17118 Classen rd. San Antonio, TX 78247 877-495-9121

Project: BLUEBONNET WELL

Date: 02/17/2024

Client: ANDREWS & FOSTER

County: HENDERSON

Location: N 32° 08' 36.5" W 95° 31' 58.4"

State: TX

BOREHOLE DATA

Drilling Contractor: ANDREWS & FOSTER

Driller T.D. (ft) : 1200'

Elevation: 436' GPS

Logger T.D. (ft) : 1203'

Depth Ref: TABLE

Date Drilled: 02/17/2024

BIT RECORD

CASING RECORD

RUN	BIT SIZE (in)	FROM (ft)	TO (ft)	SIZE/WGT/THK	FROM (ft)	TO (ft)
1	8.75"	40'	TD	16" PVC	1' AGL	40'
2						
3						

Drill Method: MUD ROTARY Weight:

Fluid Level (ft) : FULL

Hole Medium:

Mud Type:

Time Since Circ:

Viscosity:

Rm:

at:

Deg F

GENERAL DATA

Logged by: VICTOR S

Unit/Truck: 15

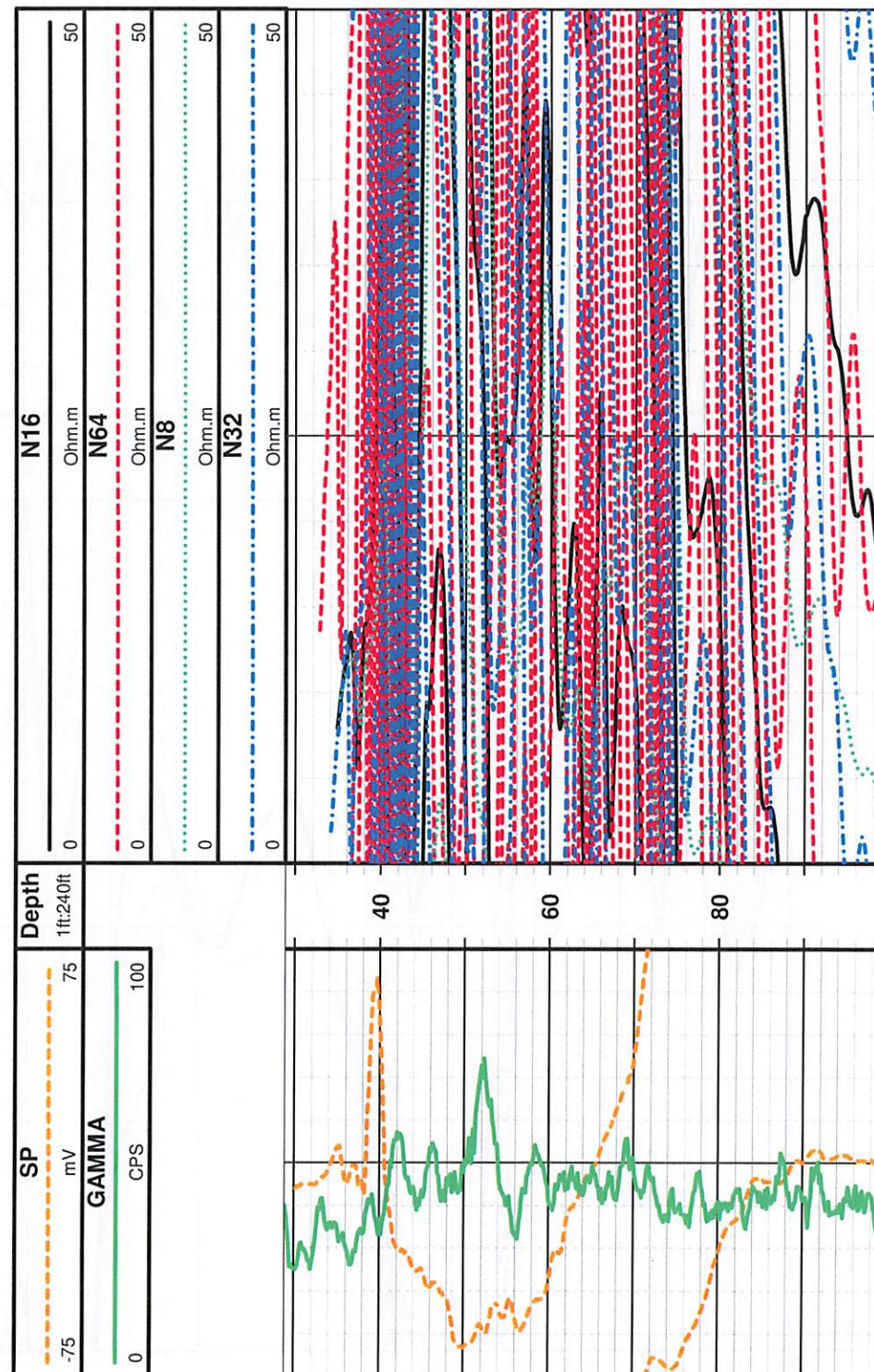
Witness: JOHN

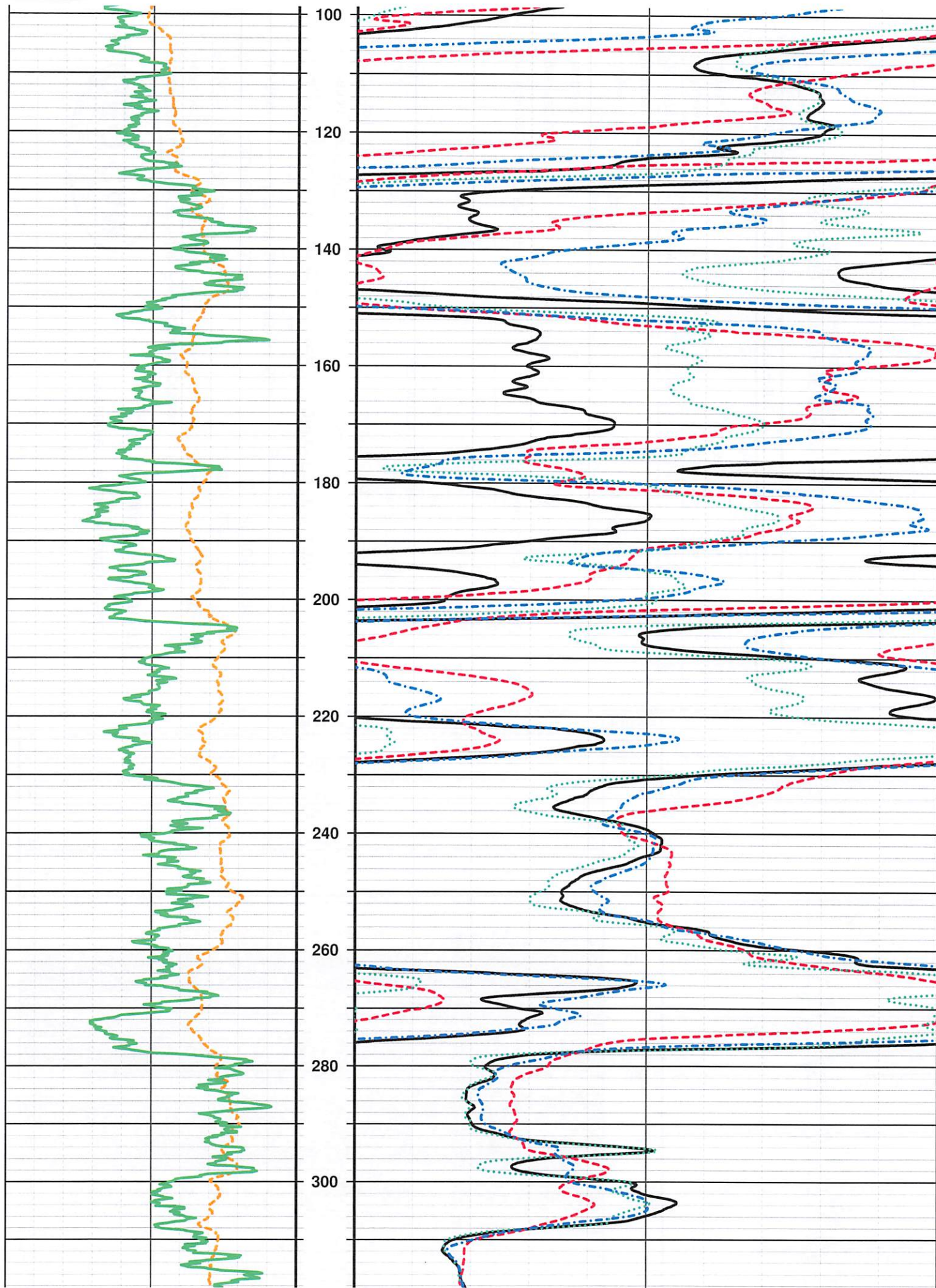
LOG TYPE	RUN NO	SPEED (ft/min)	FROM (ft)	TO (ft)	FT./ IN.
GAMMA	2	35'	1193.1'	28.9'	
RESISTIVITY	2	35'	1199.6'	35.2'	
SP	2	35'	1194.6'	30.2'	

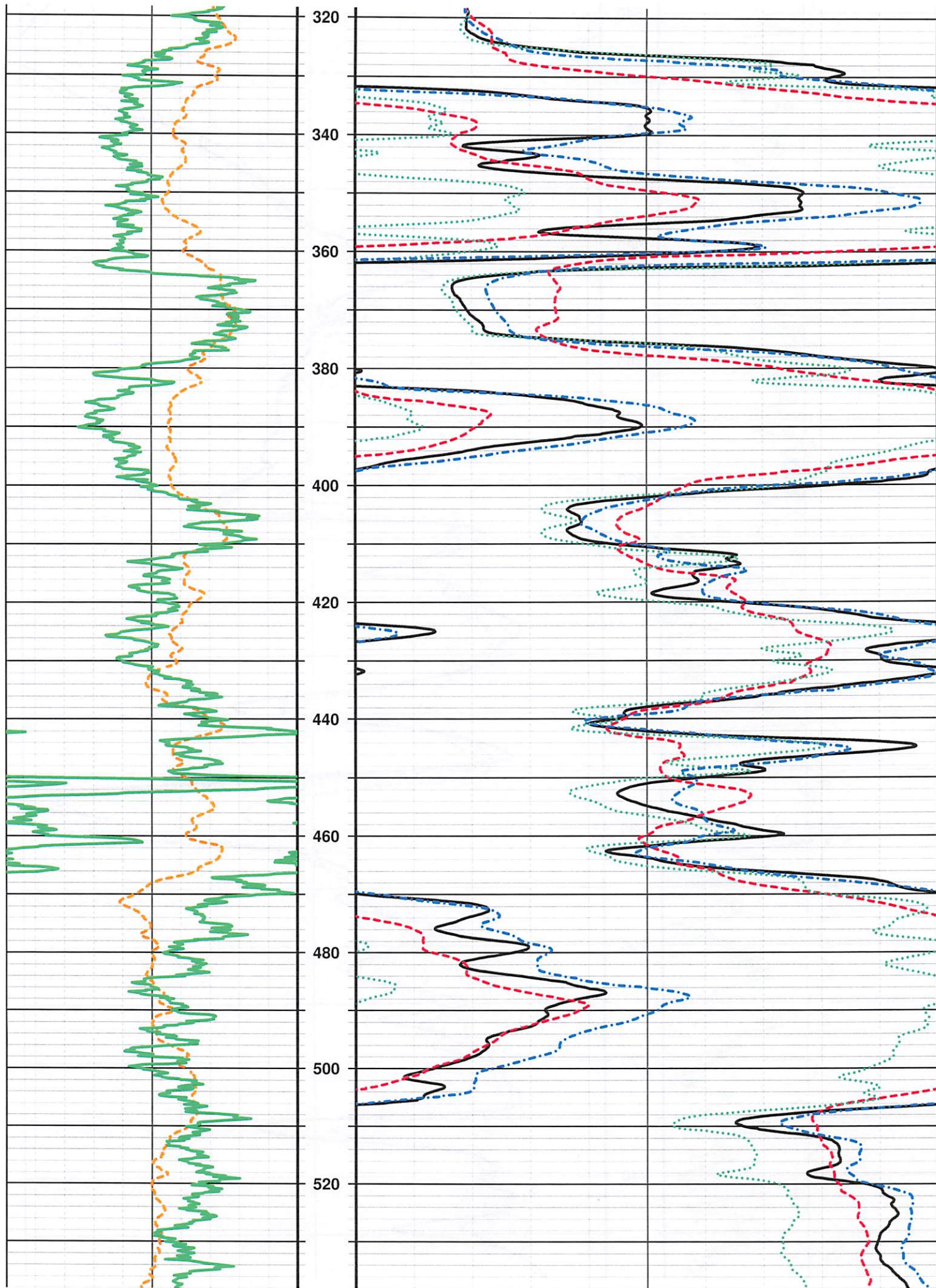
Tool Serial No. GAMMA-4831 RES-4804

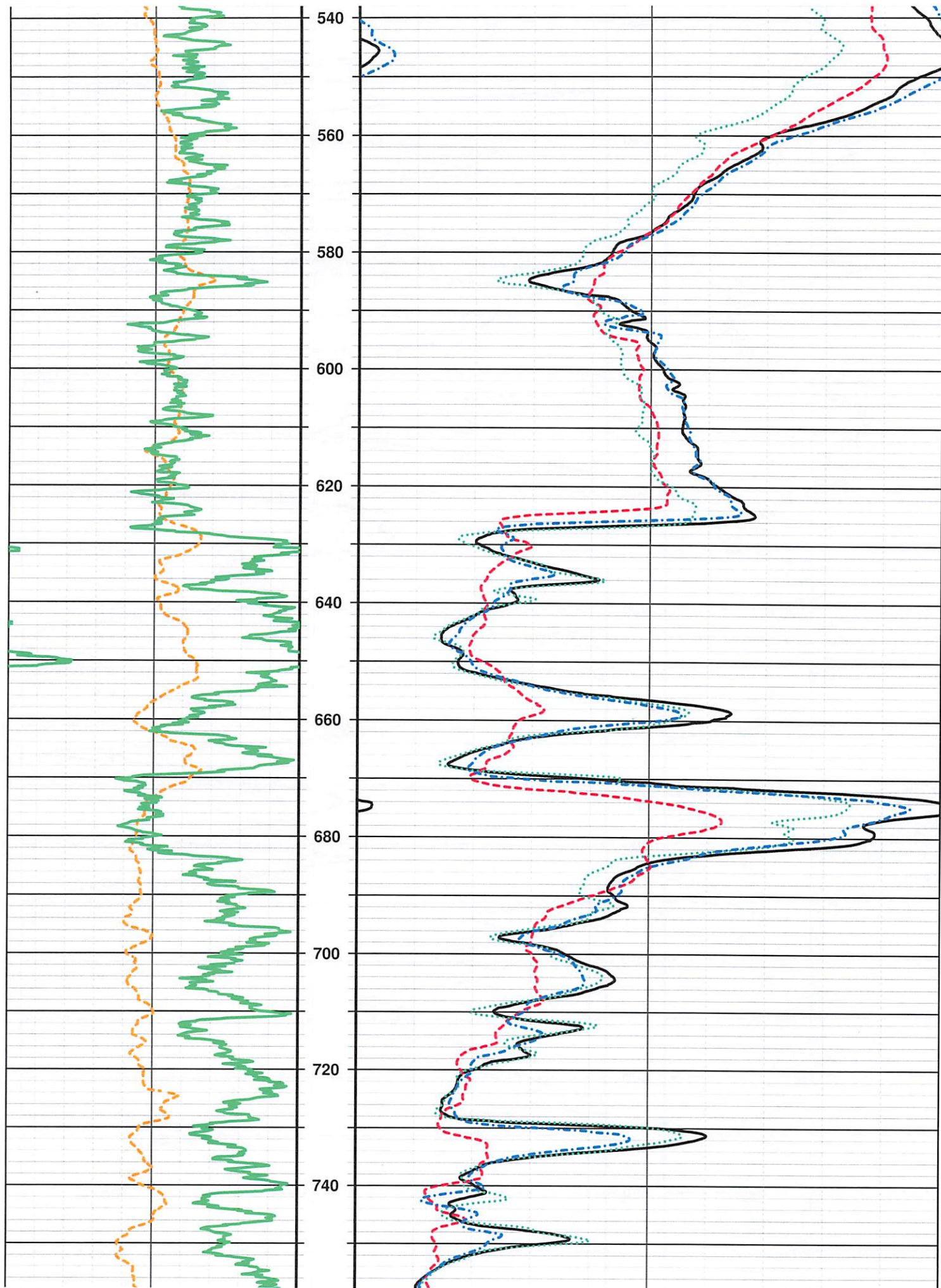
Comments:

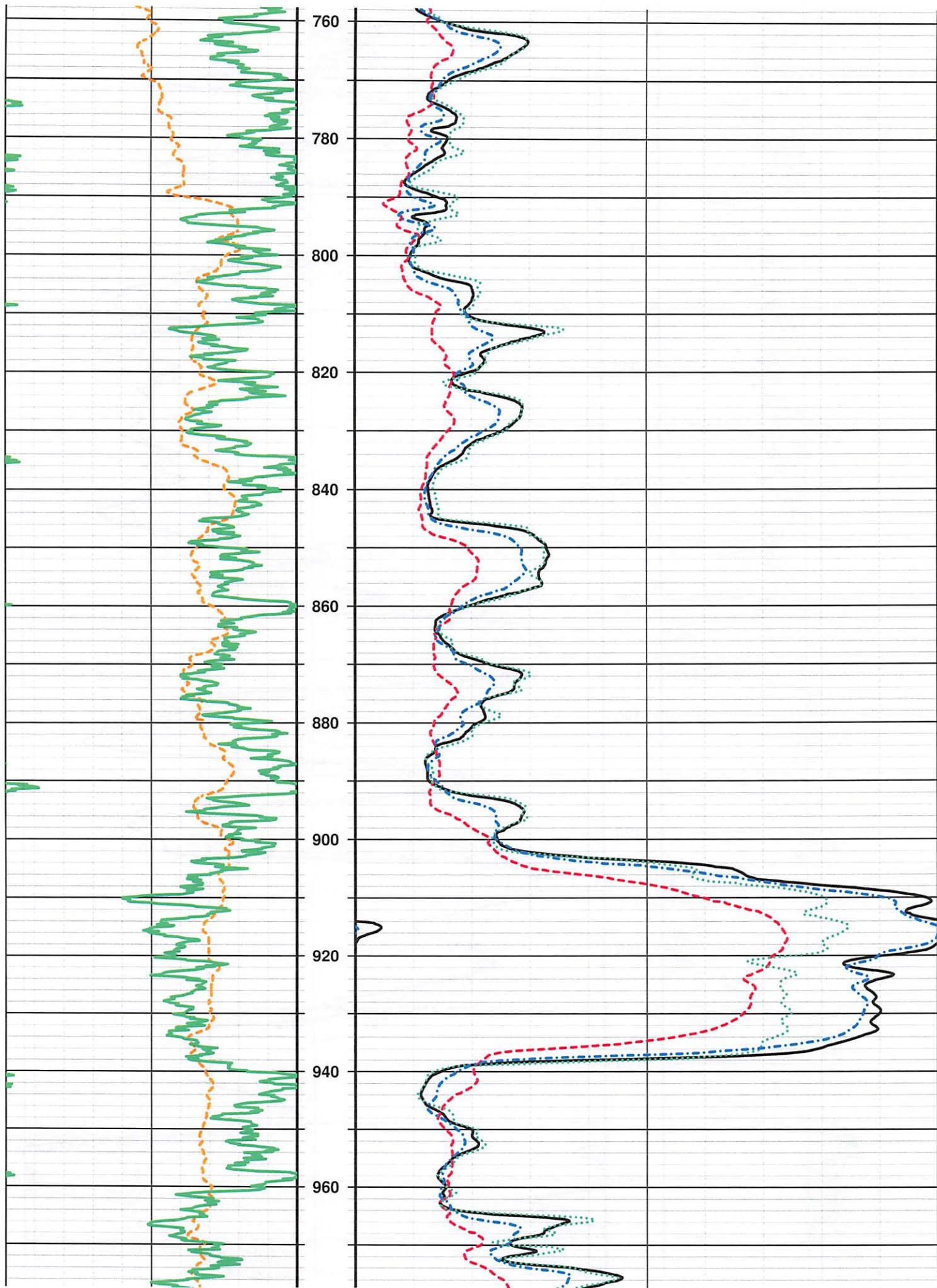
ALL MEASUREMENTS WERE TAKEN FROM TABLE.
TABLE =5' ABOVE GROUND LEVEL

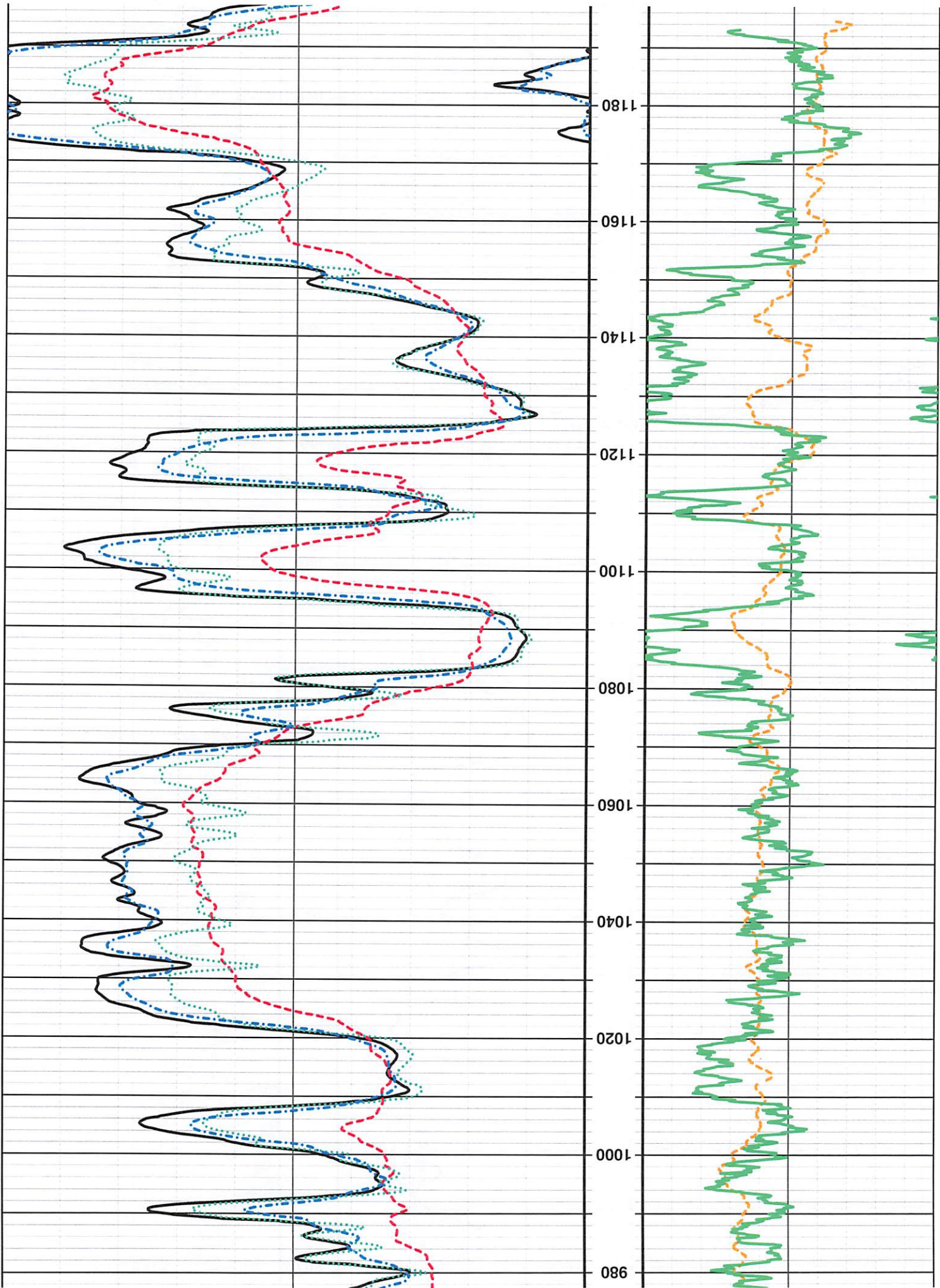


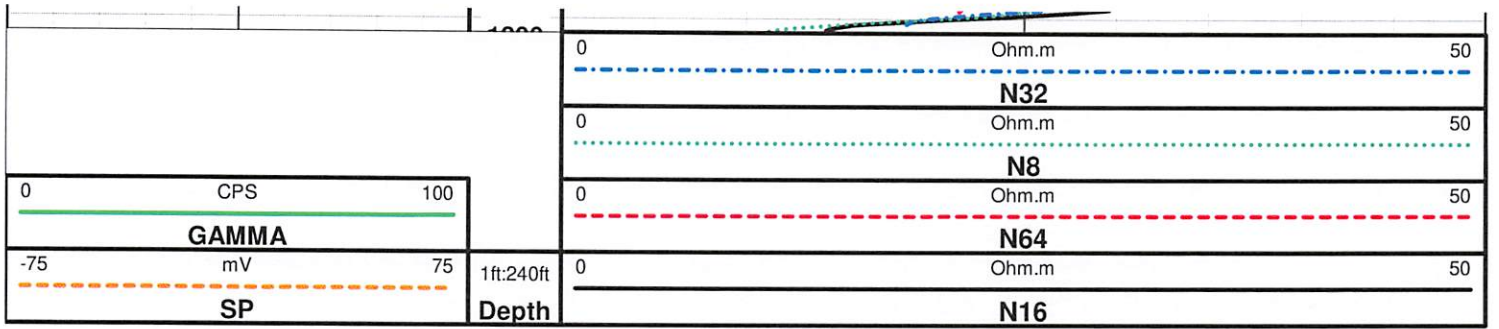








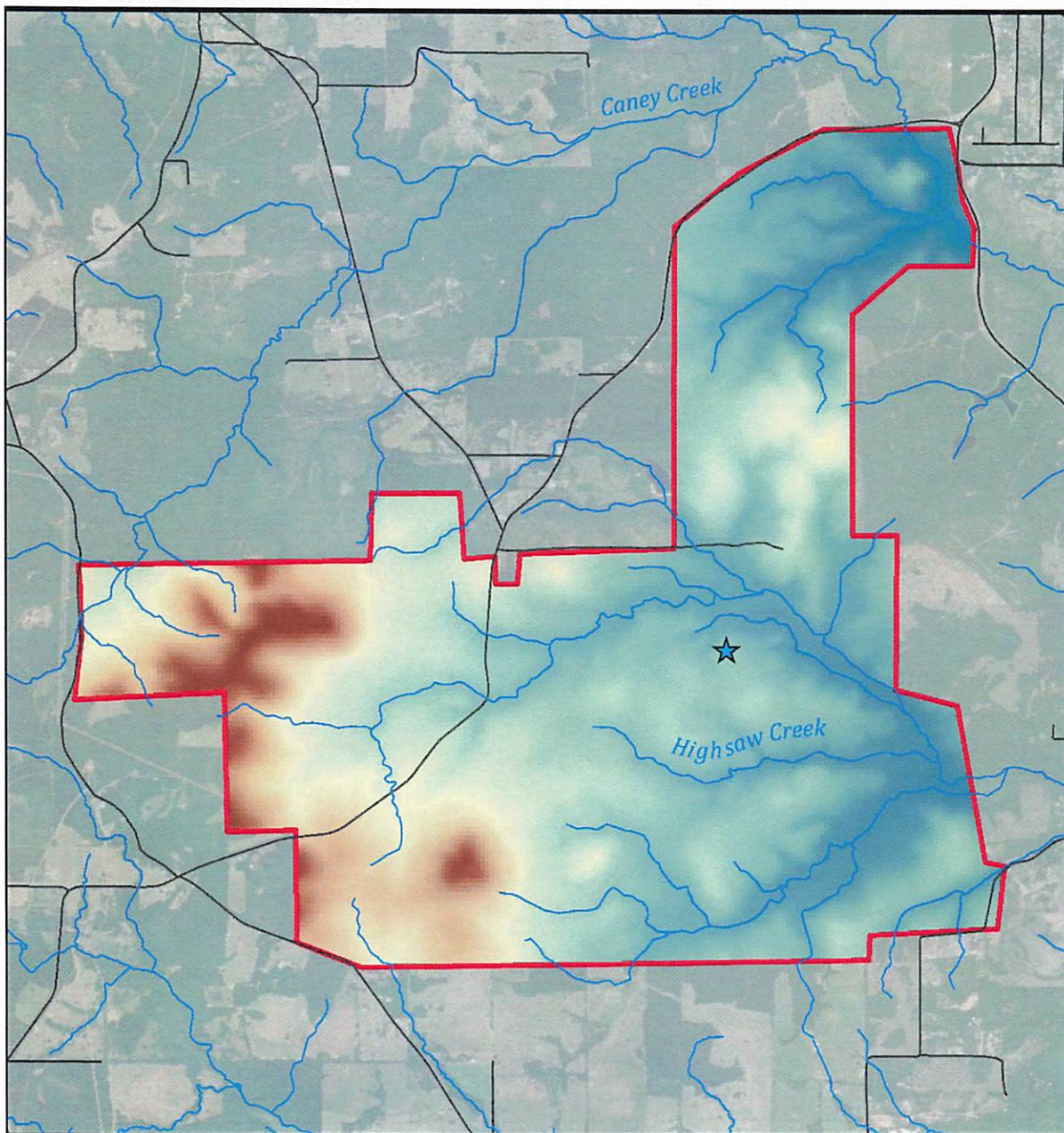




2720' 20.24733 - 5 10m 0.000 4



Appendix B – Structure Maps



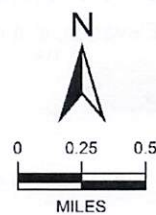
Legend

-  Bluebonnet Test Well
-  Bluebonnet Property Boundary
-  TxDOT Roadways
-  Streams/Creeks

National Elevation Dataset Digital Elevation Model (USGS, 2004)

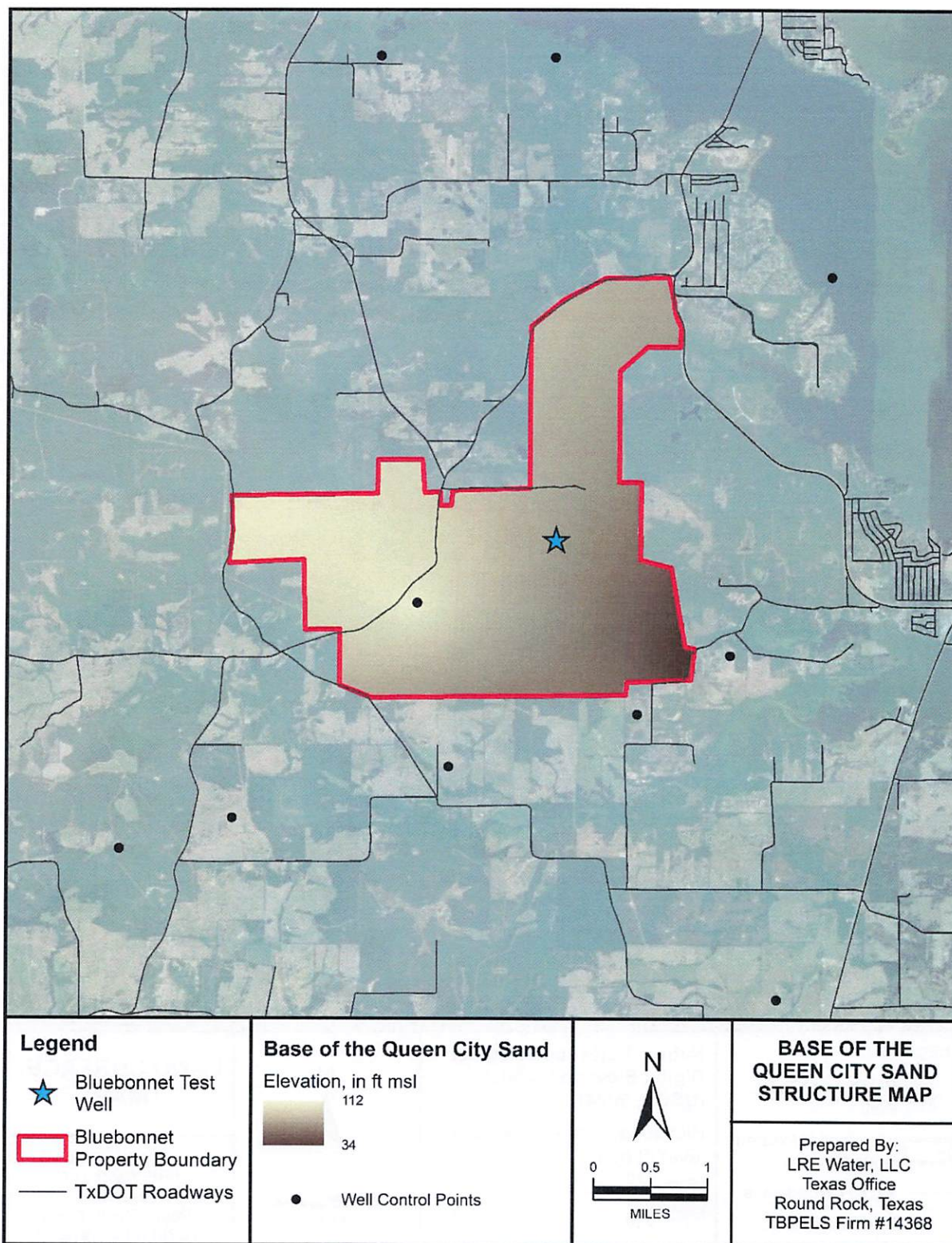
Elevation, in feet mean sea level (ft msl)

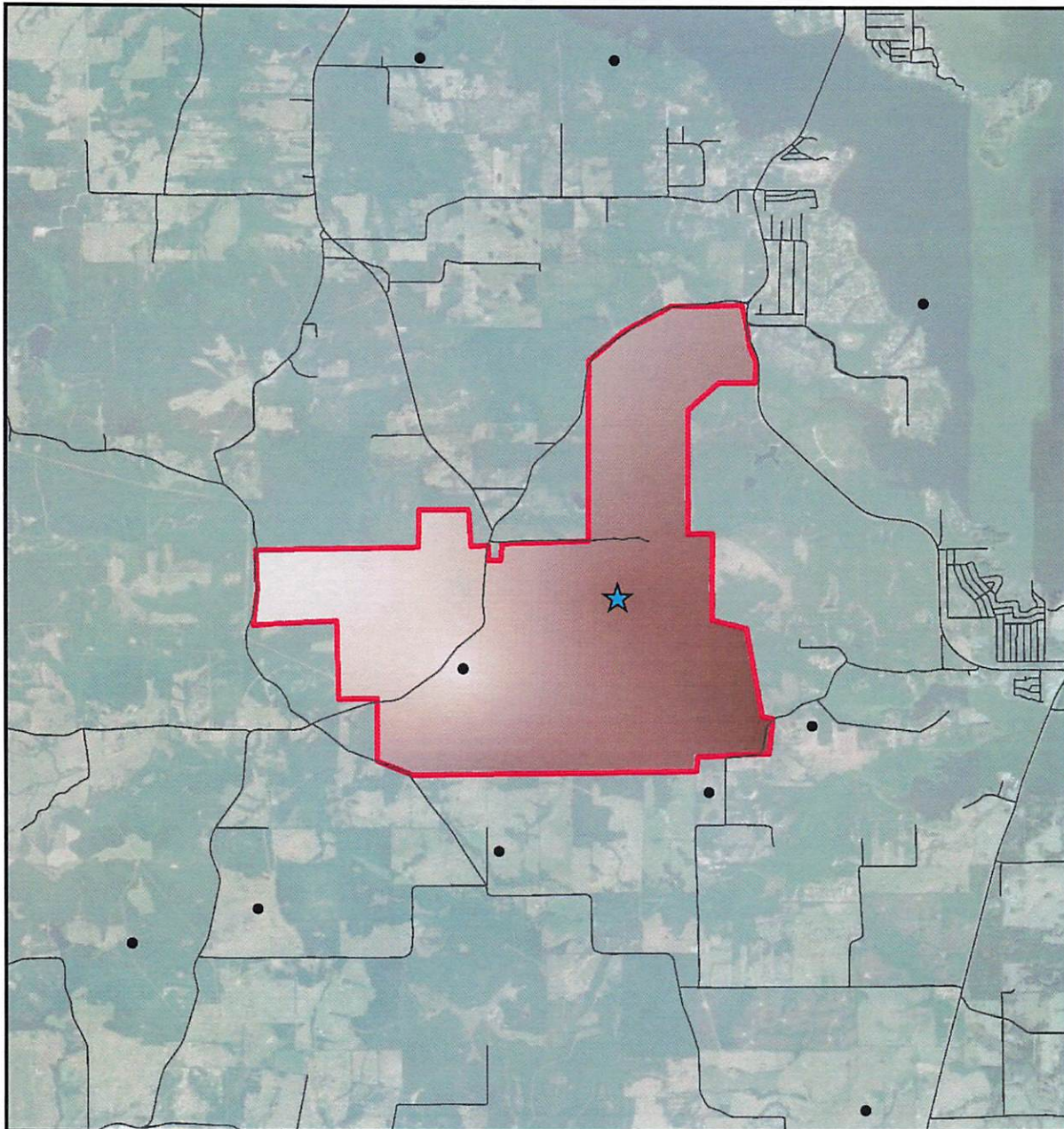
670
350



LAND SURFACE MAP

Prepared By:
LRE Water, LLC
Texas Office
Round Rock, Texas
TBPELS Firm #14368





Legend

-  Bluebonnet Test Well
-  Bluebonnet Property Boundary
-  TxDOT Roadways

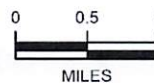
Base of the Reklaw Formation

Elevation, in ft msl



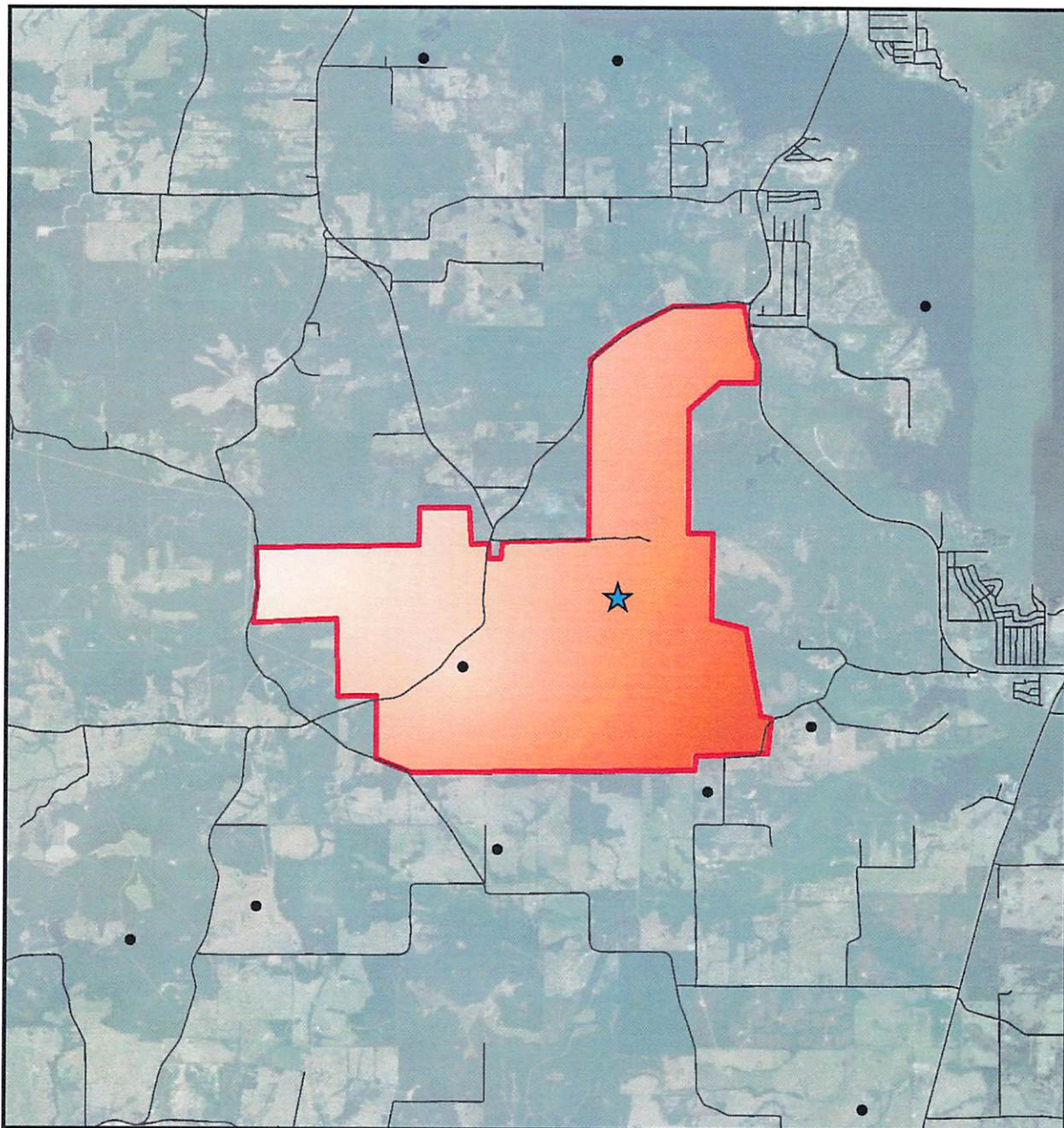
-  Well Control Points

N



BASE OF THE REKLAW FORMATION STRUCTURE MAP

Prepared By:
LRE Water, LLC
Texas Office
Round Rock, Texas
TBPELS Firm #14368



Legend



Bluebonnet Test Well



Bluebonnet Property Boundary



TxDOT Roadways

Base of the Carrizo Sand

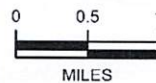
Elevation, in ft msl



-105

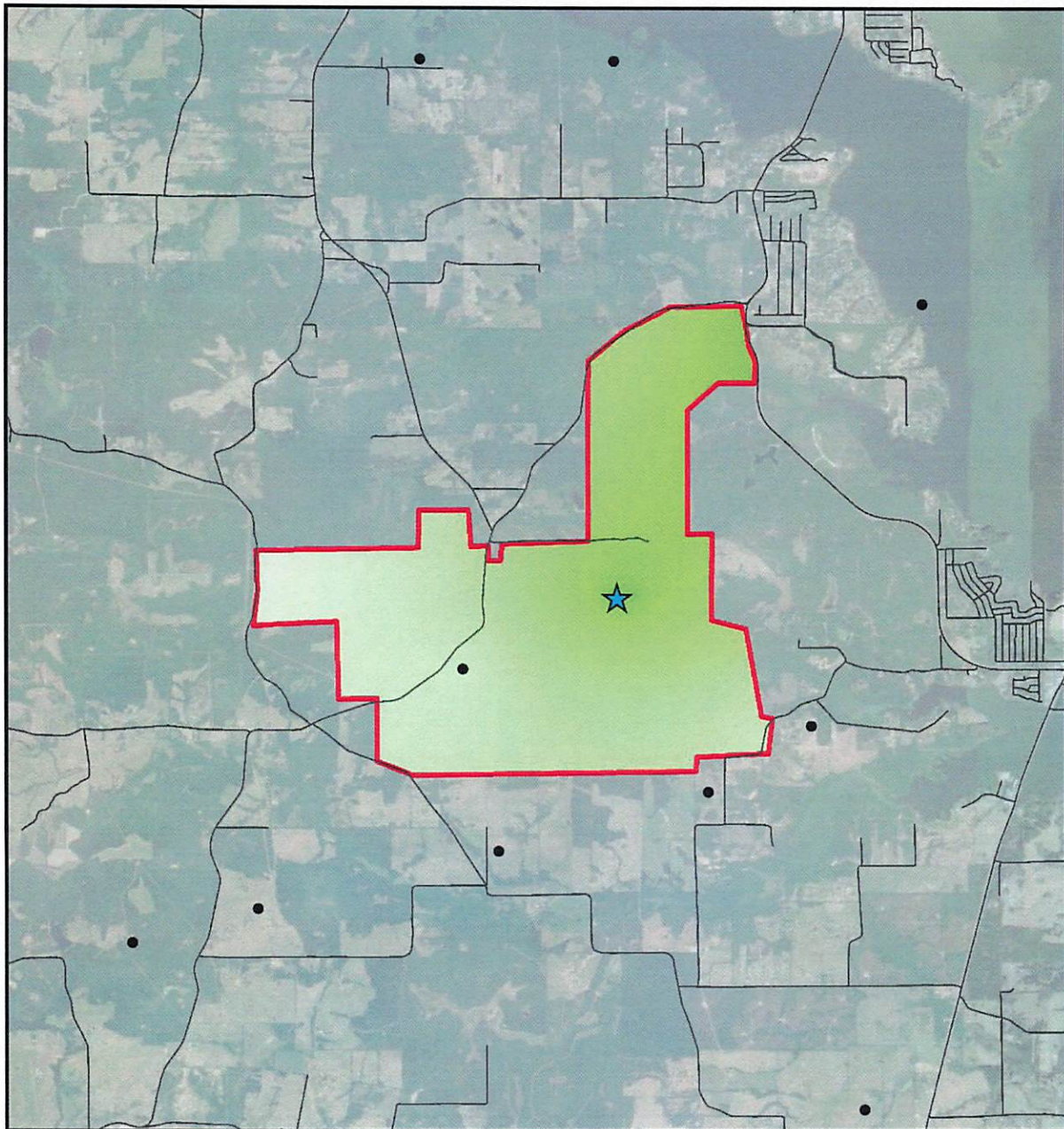


Well Control Points



BASE OF THE CARRIZO SAND STRUCTURE MAP

Prepared By:
LRE Water, LLC
Texas Office
Round Rock, Texas
TBPELS Firm #14368



Legend

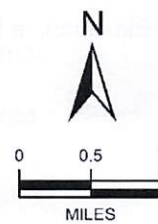
-  Bluebonnet Test Well
-  Bluebonnet Property Boundary
-  TxDOT Roadways

Base of the Upper Wilcox

Elevation, in ft msl

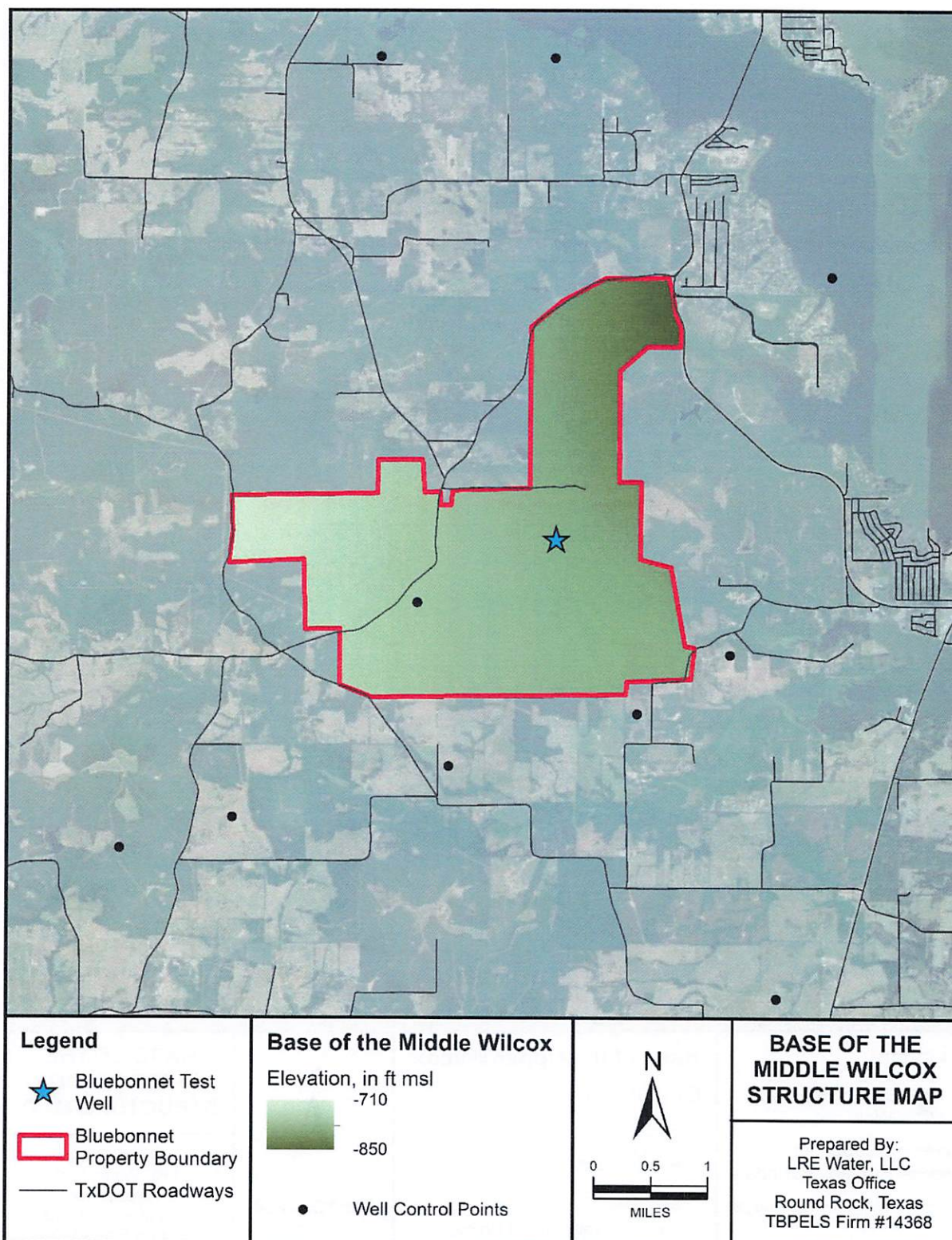


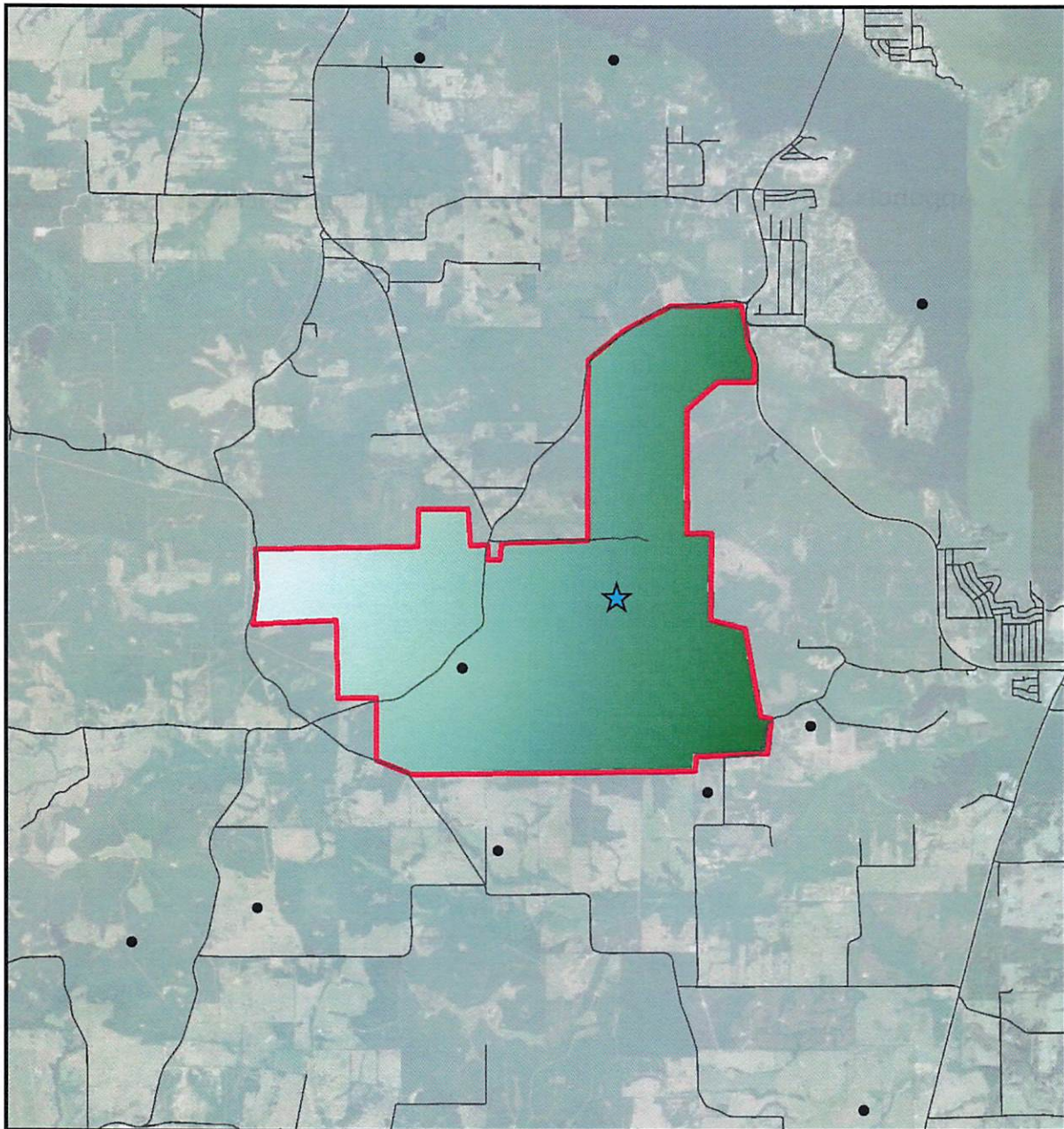
-  Well Control Points



**BASE OF THE
UPPER WILCOX
STRUCTURE MAP**

Prepared By:
LRE Water, LLC
Texas Office
Round Rock, Texas
TBPCLS Firm #14368





Legend

-  Bluebonnet Test Well
-  Bluebonnet Property Boundary
-  TxDOT Roadways

Base of the Lower Wilcox

Elevation, in ft msl



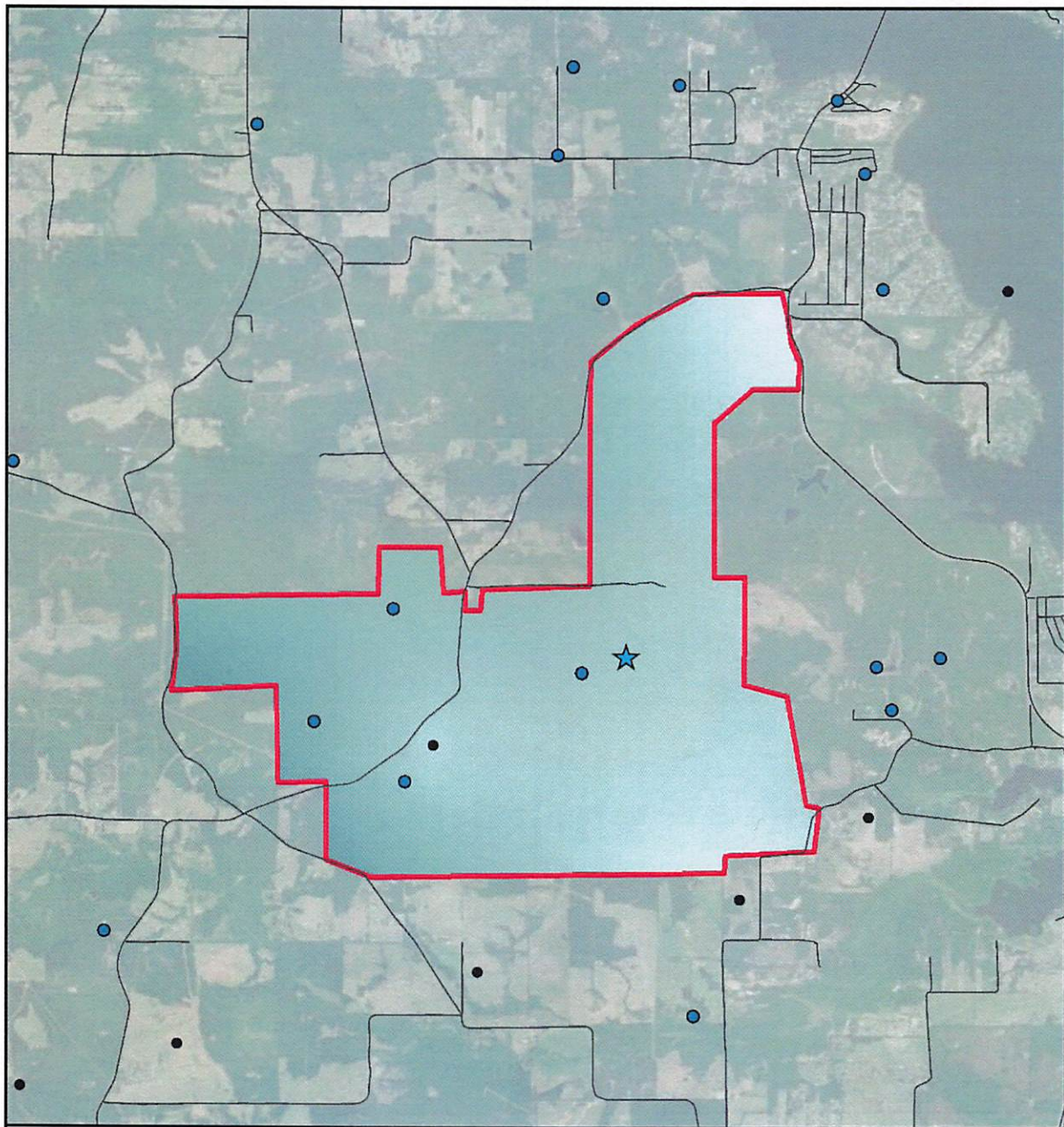
-  Well Control Points



BASE OF THE LOWER WILCOX STRUCTURE MAP

Prepared By:
LRE Water, LLC
Texas Office
Round Rock, Texas
TBPELS Firm #14368

Appendix C – Net Sand Thickness and Saturated Sand Thickness Maps



Legend

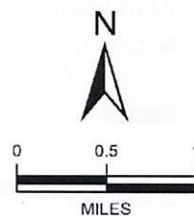
- ★ Bluebonnet Test Well
- Bluebonnet Property Boundary
- TxDOT Roadways
- Water Level Measurements
- Well Control Points

Saturated Sands in the Queen City Sand 100 Feet Below the Water Table

Saturated Sand Thickness, in feet

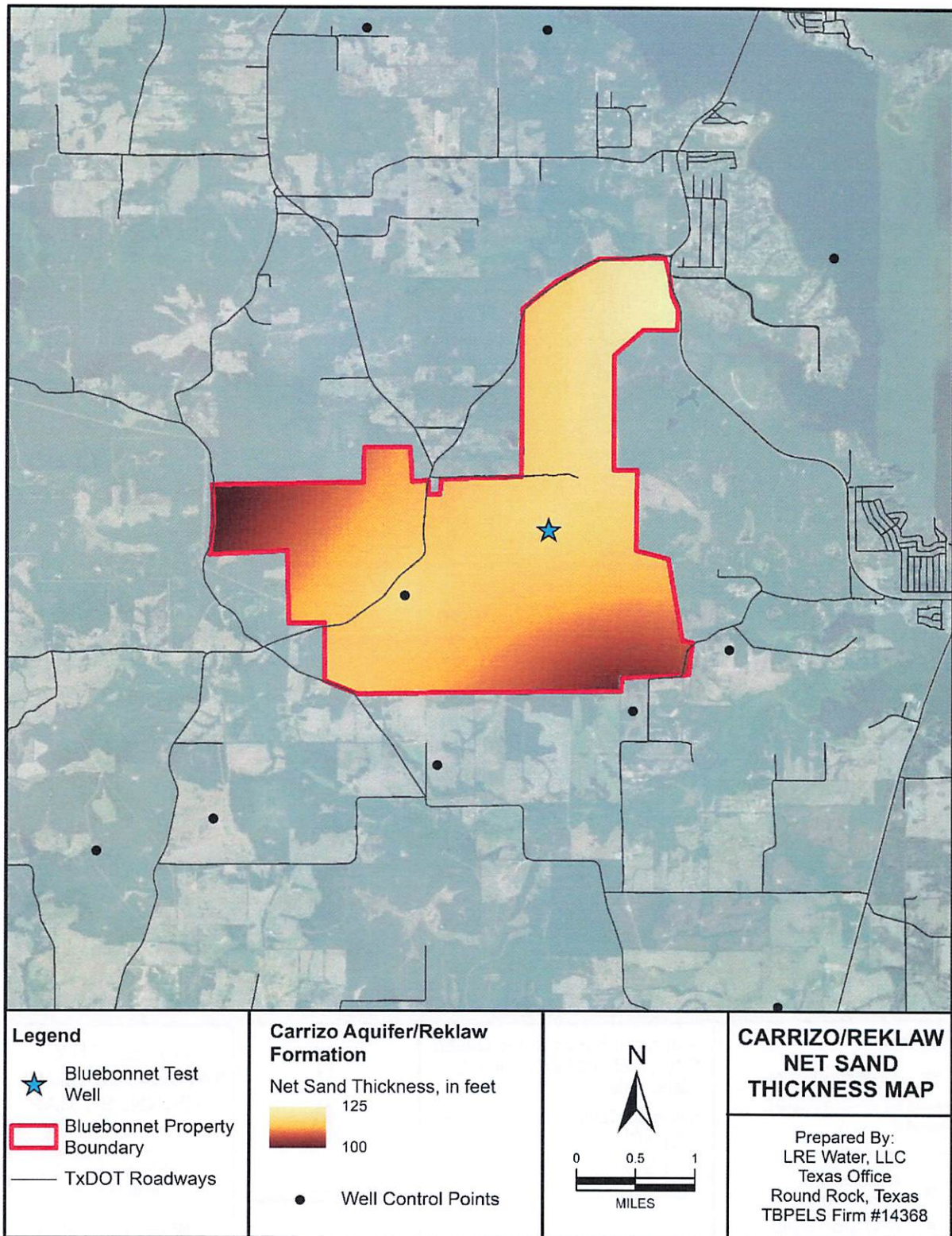
275

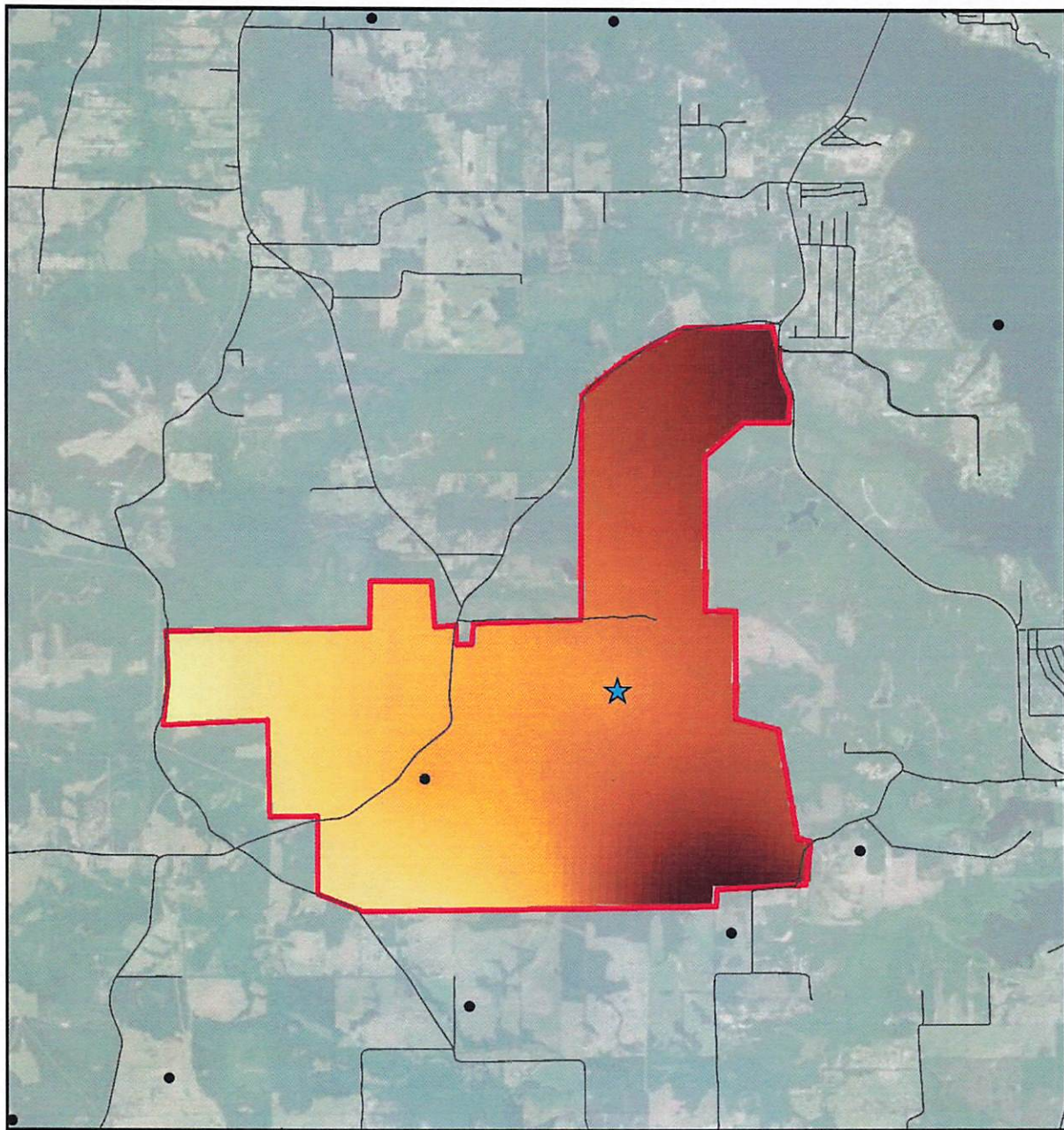
212



QUEEN CITY SATURATED SAND THICKNESS MAP

Prepared By:
LRE Water, LLC
Texas Office
Round Rock, Texas
TBPELS Firm #14368





Legend

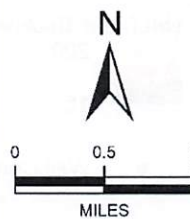
-  Bluebonnet Test Well
-  Bluebonnet Property Boundary
-  TxDOT Roadways

Upper Wilcox Aquifer

Net Sand Thickness, in feet

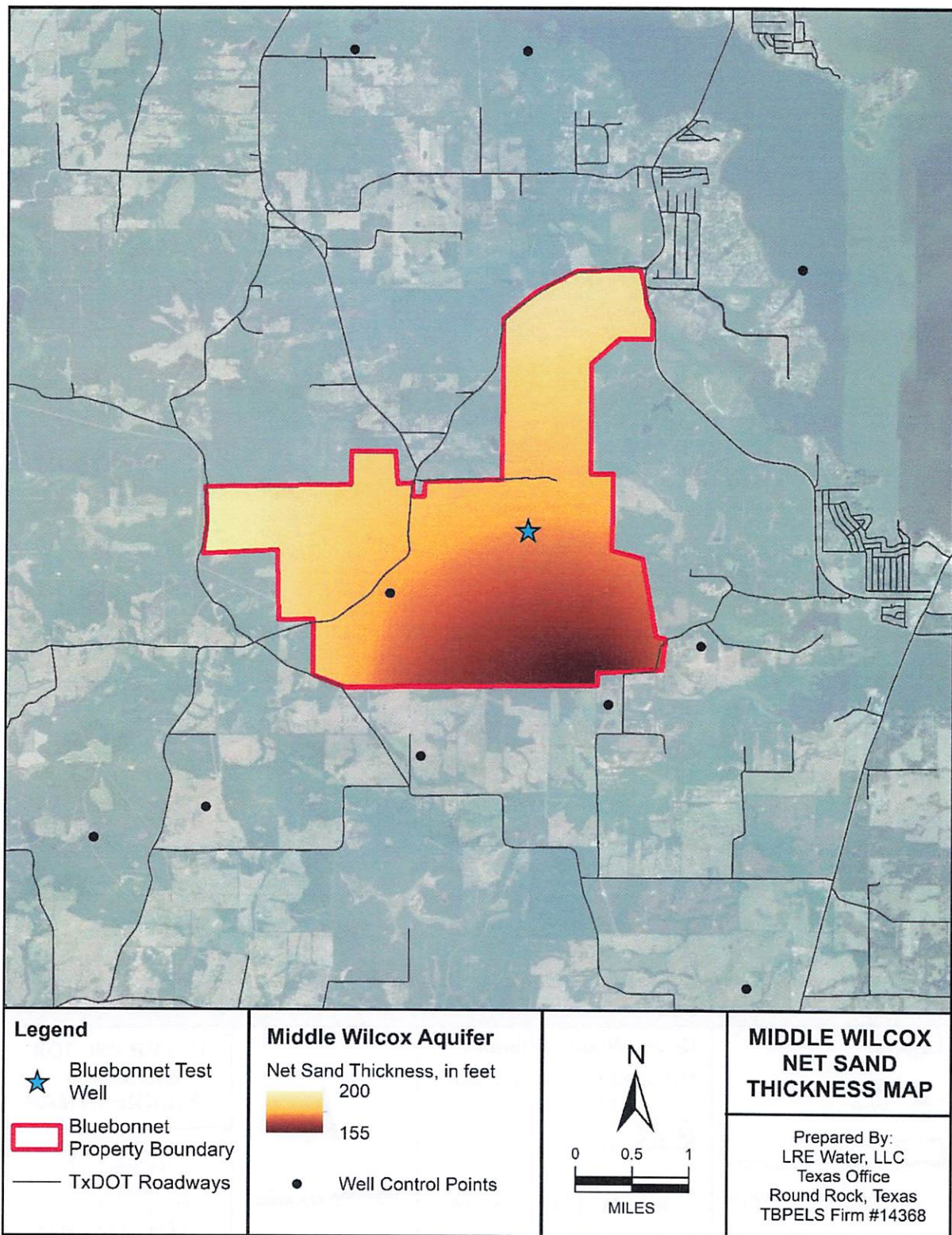


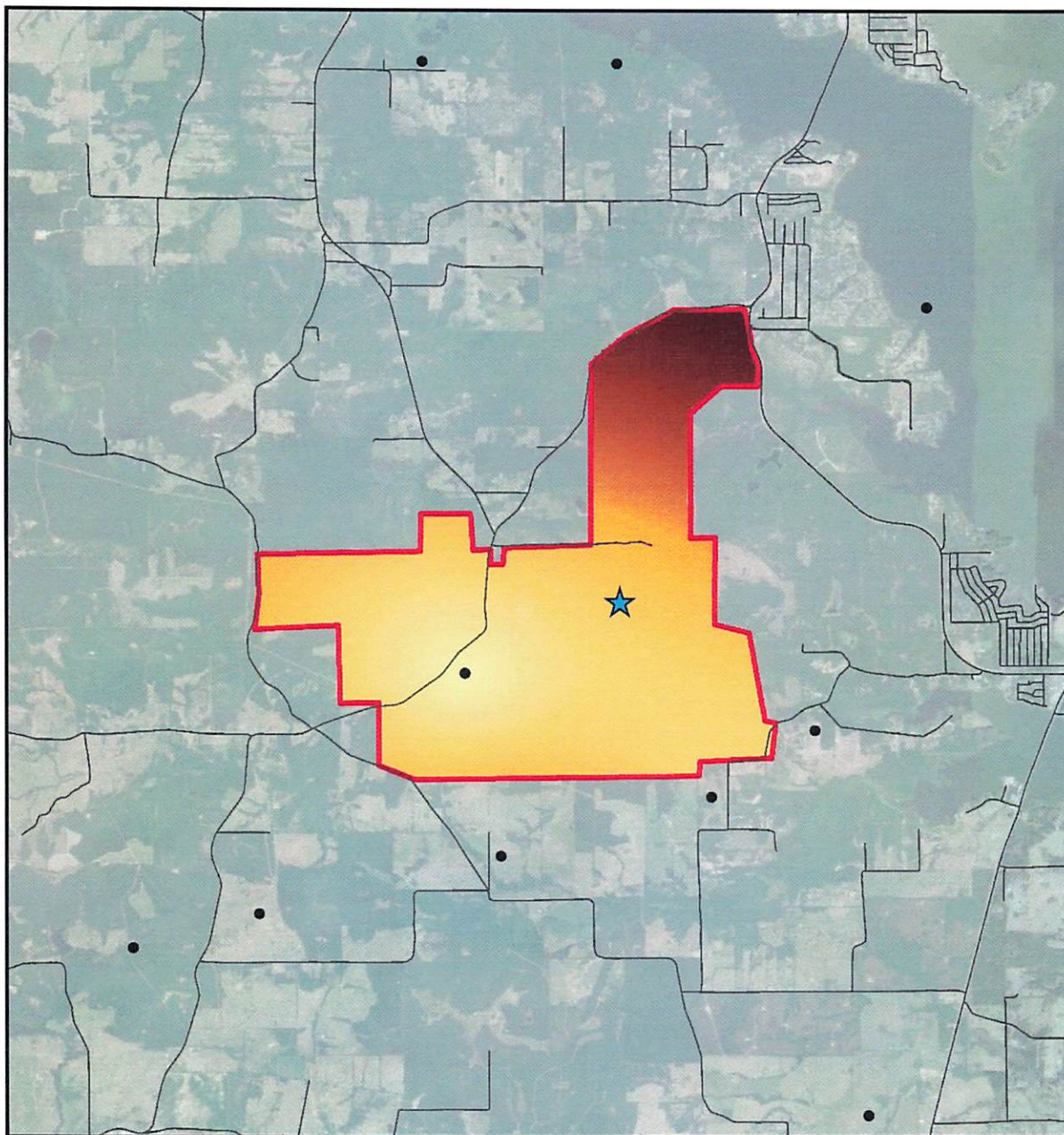
-  Well Control Points



UPPER WILCOX NET SAND THICKNESS MAP

Prepared By:
LRE Water, LLC
Texas Office
Round Rock, Texas
TBPELS Firm #14368





Legend

-  Bluebonnet Test Well
-  Bluebonnet Property Boundary
-  TxDOT Roadways

Lower Wilcox Aquifer

Net Sand Thickness, in feet



-  Well Control Points

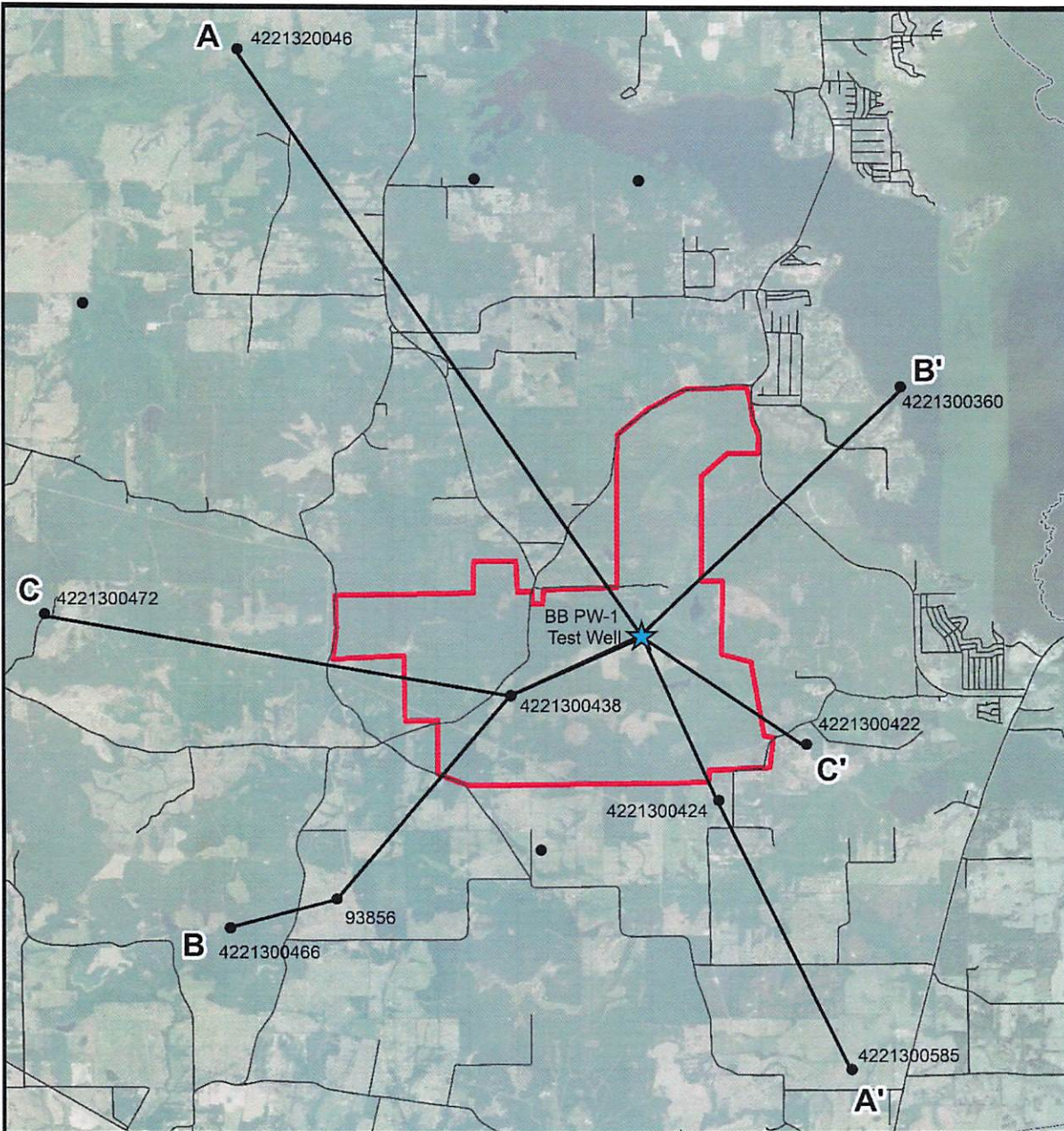
N



LOWER WILCOX NET SAND THICKNESS MAP

Prepared By:
LRE Water, LLC
Texas Office
Round Rock, Texas
TBPELS Firm #14368

Appendix D – Geologic Cross Sections



Legend

- Bluebonnet Test Well
- Bluebonnet Property Boundary
- TxDOT Roadways
- County Boundary

— Cross Section Lines

• Well Control Points

• API Number/BRACS ID



LOCATION OF GEOLOGIC CROSS SECTIONS

Prepared By:
LRE Water, LLC
Texas Office
Round Rock, Texas
TBPELS Firm #14368

A

ANDERSON COUNTY LAND CATTLE CO 1 Bluebonnet Test Well
4221320046 BB-PW-1

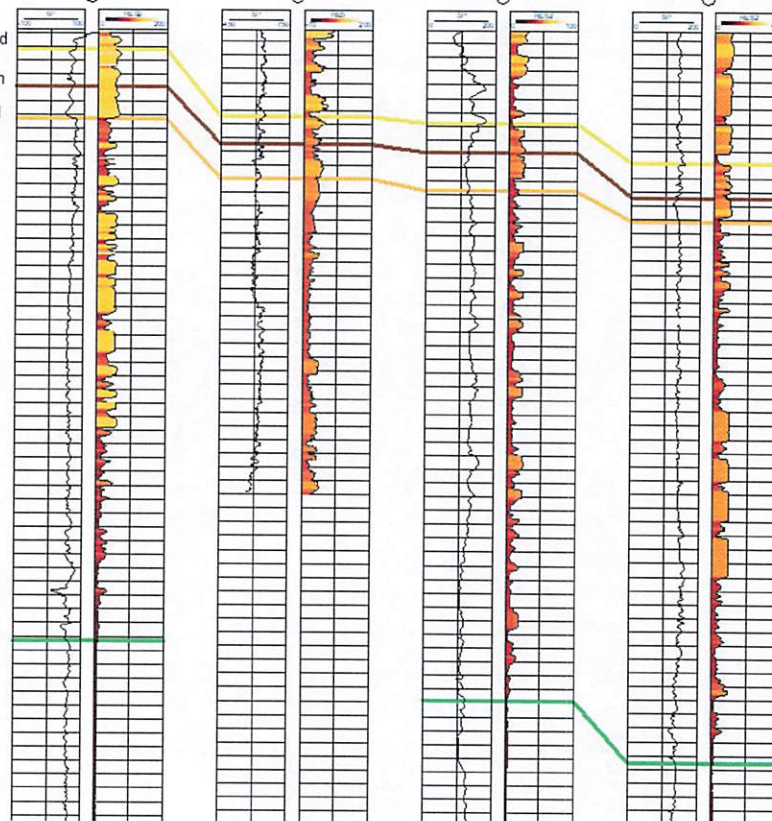
HENRY PAGE 1
4221300424

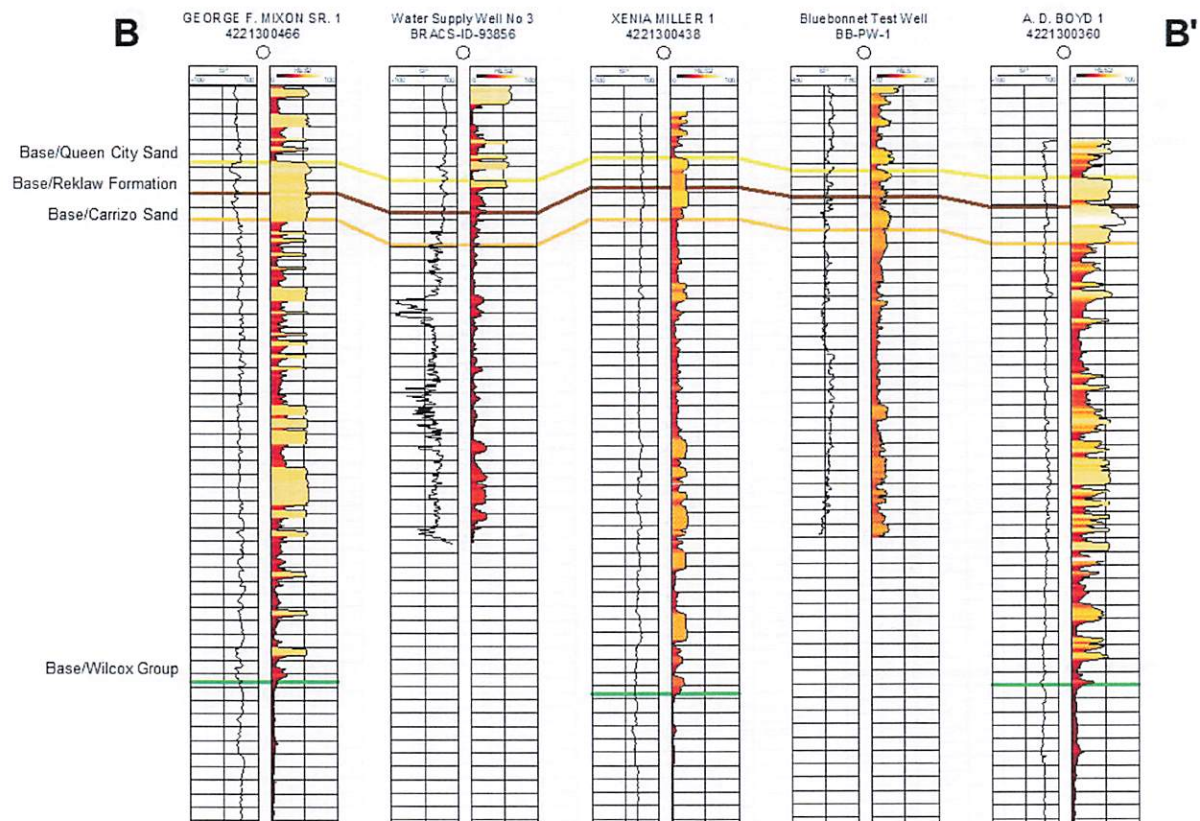
E.C. GARNER 1
4221300585

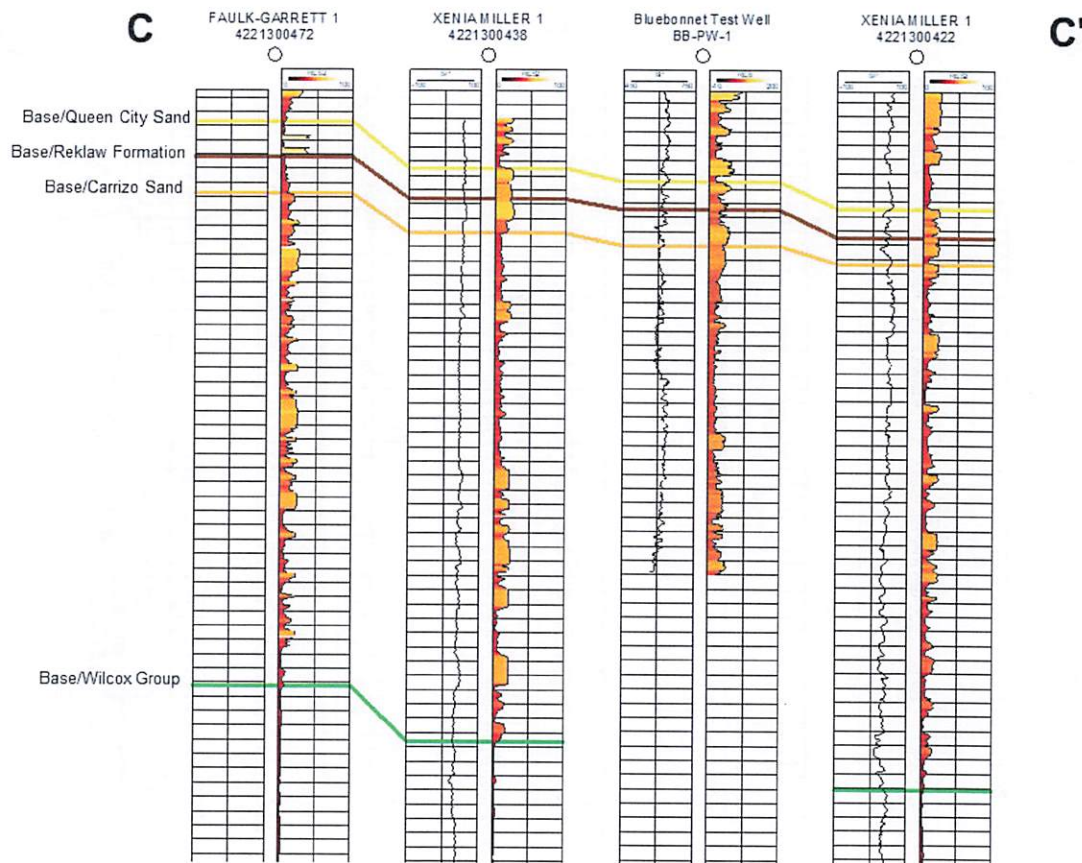
A'

Base/Queen City Sand
Base/Reklaw Formation
Base/Carrizo Sand

Base/Wilcox Group







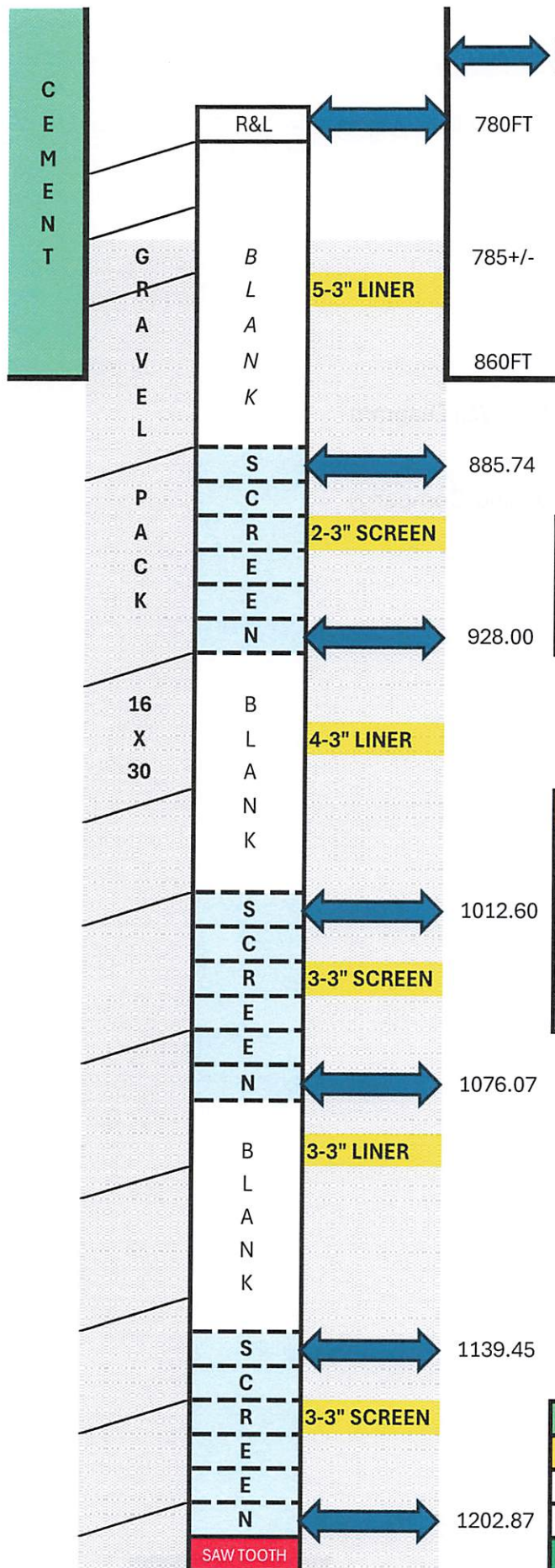
Appendix E – Test Well “BB PW-1” Well Diagram

(Prepared by Andrews & Foster Drilling Company)

DATE	TIME	DEPTH	TEMP	WELL
10/10	10:00	100	70	BB PW-1
10/10	10:05	150	75	BB PW-1
10/10	10:10	200	80	BB PW-1
10/10	10:15	250	85	BB PW-1
10/10	10:20	300	90	BB PW-1
10/10	10:25	350	95	BB PW-1
10/10	10:30	400	100	BB PW-1

DATE	TIME	DEPTH	TEMP	WELL
10/10	10:35	450	105	BB PW-1
10/10	10:40	500	110	BB PW-1
10/10	10:45	550	115	BB PW-1
10/10	10:50	600	120	BB PW-1
10/10	10:55	650	125	BB PW-1
10/10	11:00	700	130	BB PW-1
10/10	11:05	750	135	BB PW-1

DATE	TIME	DEPTH	TEMP	WELL
10/10	11:10	800	140	BB PW-1
10/10	11:15	850	145	BB PW-1
10/10	11:20	900	150	BB PW-1
10/10	11:25	950	155	BB PW-1
10/10	11:30	1000	160	BB PW-1
10/10	11:35	1050	165	BB PW-1
10/10	11:40	1100	170	BB PW-1
10/10	11:45	1150	175	BB PW-1
10/10	11:50	1200	180	BB PW-1
10/10	11:55	1250	185	BB PW-1
10/10	12:00	1300	190	BB PW-1
10/10	12:05	1350	195	BB PW-1
10/10	12:10	1400	200	BB PW-1
10/10	12:15	1450	205	BB PW-1
10/10	12:20	1500	210	BB PW-1
10/10	12:25	1550	215	BB PW-1
10/10	12:30	1600	220	BB PW-1
10/10	12:35	1650	225	BB PW-1
10/10	12:40	1700	230	BB PW-1
10/10	12:45	1750	235	BB PW-1
10/10	12:50	1800	240	BB PW-1
10/10	12:55	1850	245	BB PW-1
10/10	1:00	1900	250	BB PW-1
10/10	1:05	1950	255	BB PW-1
10/10	1:10	2000	260	BB PW-1
10/10	1:15	2050	265	BB PW-1
10/10	1:20	2100	270	BB PW-1
10/10	1:25	2150	275	BB PW-1
10/10	1:30	2200	280	BB PW-1
10/10	1:35	2250	285	BB PW-1
10/10	1:40	2300	290	BB PW-1
10/10	1:45	2350	295	BB PW-1
10/10	1:50	2400	300	BB PW-1
10/10	1:55	2450	305	BB PW-1
10/10	2:00	2500	310	BB PW-1
10/10	2:05	2550	315	BB PW-1
10/10	2:10	2600	320	BB PW-1
10/10	2:15	2650	325	BB PW-1
10/10	2:20	2700	330	BB PW-1
10/10	2:25	2750	335	BB PW-1
10/10	2:30	2800	340	BB PW-1
10/10	2:35	2850	345	BB PW-1
10/10	2:40	2900	350	BB PW-1
10/10	2:45	2950	355	BB PW-1
10/10	2:50	3000	360	BB PW-1
10/10	2:55	3050	365	BB PW-1
10/10	3:00	3100	370	BB PW-1
10/10	3:05	3150	375	BB PW-1
10/10	3:10	3200	380	BB PW-1
10/10	3:15	3250	385	BB PW-1
10/10	3:20	3300	390	BB PW-1
10/10	3:25	3350	395	BB PW-1
10/10	3:30	3400	400	BB PW-1
10/10	3:35	3450	405	BB PW-1
10/10	3:40	3500	410	BB PW-1
10/10	3:45	3550	415	BB PW-1
10/10	3:50	3600	420	BB PW-1
10/10	3:55	3650	425	BB PW-1
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10/10	4:25	3950	455	BB PW-1
10/10	4:30	4000	460	BB PW-1
10/10	4:35	4050	465	BB PW-1
10/10	4:40	4100	470	BB PW-1
10/10	4:45	4150	475	BB PW-1
10/10	4:50	4200	480	BB PW-1
10/10	4:55	4250	485	BB PW-1
10/10	5:00	4300	490	BB PW-1
10/10	5:05	4350	495	BB PW-1
10/10	5:10	4400	500	BB PW-1
10/10	5:15	4450	505	BB PW-1
10/10	5:20	4500	510	BB PW-1
10/10	5:25	4550	515	BB PW-1
10/10	5:30	4600	520	BB PW-1
10/10	5:35	4650	525	BB PW-1
10/10	5:40	4700	530	BB PW-1
10/10	5:45	4750	535	BB PW-1
10/10	5:50	4800	540	BB PW-1
10/10	5:55	4850	545	BB PW-1
10/10	6:00	4900	550	BB PW-1
10/10	6:05	4950	555	BB PW-1
10/10	6:10	5000	560	BB PW-1
10/10	6:15	5050	565	BB PW-1
10/10	6:20	5100	570	BB PW-1
10/10	6:25	5150	575	BB PW-1
10/10	6:30	5200	580	BB PW-1
10/10	6:35	5250	585	BB PW-1
10/10	6:40	5300	590	BB PW-1
10/10	6:45	5350	595	BB PW-1
10/10	6:50	5400	600	BB PW-1
10/10	6:55	5450	605	BB PW-1
10/10	7:00	5500	610	BB PW-1
10/10	7:05	5550	615	BB PW-1
10/10	7:10	5600	620	BB PW-1
10/10	7:15	5650	625	BB PW-1
10/10	7:20	5700	630	BB PW-1
10/10	7:25	5750	635	BB PW-1
10/10	7:30	5800	640	BB PW-1
10/10	7:35	5850	645	BB PW-1
10/10	7:40	5900	650	BB PW-1
10/10	7:45	5950	655	BB PW-1
10/10	7:50	6000	660	BB PW-1
10/10	7:55	6050	665	BB PW-1
10/10	8:00	6100	670	BB PW-1
10/10	8:05	6150	675	BB PW-1
10/10	8:10	6200	680	BB PW-1
10/10	8:15	6250	685	BB PW-1
10/10	8:20	6300	690	BB PW-1
10/10	8:25	6350	695	BB PW-1
10/10	8:30	6400	700	BB PW-1
10/10	8:35	6450	705	BB PW-1
10/10	8:40	6500	710	BB PW-1
10/10	8:45	6550	715	BB PW-1
10/10	8:50	6600	720	BB PW-1
10/10	8:55	6650	725	BB PW-1
10/10	9:00	6700	730	BB PW-1
10/10	9:05	6750	735	BB PW-1
10/10	9:10	6800	740	BB PW-1
10/10	9:15	6850	745	BB PW-1
10/10	9:20	6900	750	BB PW-1
10/10	9:25	6950	755	BB PW-1
10/10	9:30	7000	760	BB PW-1
10/10	9:35	7050	765	BB PW-1
10/10	9:40	7100	770	BB PW-1
10/10	9:45	7150	775	BB PW-1
10/10	9:50	7200	780	BB PW-1
10/10	9:55	7250	785	BB PW-1
10/10	10:00	7300	790	BB PW-1
10/10	10:05	7350	795	BB PW-1
10/10	10:10	7400	800	BB PW-1
10/10	10:15	7450	805	BB PW-1
10/10	10:20	7500	810	BB PW-1
10/10	10:25	7550	815	BB PW-1
10/10	10:30	7600	820	BB PW-1
10/10	10:35	7650	825	BB PW-1
10/10	10:40	7700	830	BB PW-1
10/10	10:45	7750	835	BB PW-1
10/10	10:50	7800	840	BB PW-1
10/10	10:55	7850	845	BB PW-1
10/10	11:00	7900	850	BB PW-1
10/10	11:05	7950	855	BB PW-1
10/10	11:10	8000	860	BB PW-1
10/10	11:15	8050	865	BB PW-1
10/10	11:20	8100	870	BB PW-1
10/10	11:25	8150	875	BB PW-1
10/10	11:30	8200	880	BB PW-1
10/10	11:35	8250	885	BB PW-1
10/10	11:40	8300	890	BB PW-1
10/10	11:45	8350	895	BB PW-1
10/10	11:50	8400	900	BB PW-1
10/10	11:55	8450	905	BB PW-1
10/10	12:00	8500	910	BB PW-1
10/10	12:05	8550	915	BB PW-1
10/10	12:10	8600	920	BB PW-1
10/10	12:15	8650	925	BB PW-1
10/10	12:20	8700	930	BB PW-1
10/10	12:25	8750	935	BB PW-1
10/10	12:30	8800	940	BB PW-1
10/10	12:35	8850	945	BB PW-1
10/10	12:40	8900	950	BB PW-1
10/10	12:45	8950	955	BB PW-1
10/10	12:50	9000	960	BB PW-1
10/10	12:55	9050	965	BB PW-1
10/10	1:00	9100	970	BB PW-1
10/10	1:05	9150	975	BB PW-1
10/10	1:10	9200	980	BB PW-1
10/10	1:15	9250	985	BB PW-1
10/10	1:20	9300	990	BB PW-1
10/10	1:25	9350	995	BB PW-1
10/10	1:30	9400	1000	BB PW-1
10/10	1:35	9450	1005	BB PW-1
10/10	1:40	9500	1010	BB PW-1
10/10	1:45	9550	1015	BB PW-1
10/10	1:50	9600	1020	BB PW-1
10/10	1:55	9650	1025	BB PW-1
10/10	2:00	9700	1030	BB PW-1
10/10	2:05	9750	1035	BB PW-1
10/10	2:10	9800	1040	BB PW-1
10/10	2:15	9850	1045	BB PW-1
10/10	2:20	9900	1050	BB PW-1
10/10	2:25	9950	1055	BB PW-1
10/10	2:30	10000	1060	BB PW-1
10/10	2:35	10050	1065	BB PW-1
10/10	2:40	10100	1070	BB PW-1
10/10	2:45	10150	1075	BB PW-1
10/10	2:50	10200	1080	BB PW-1
10/10	2:55	10250	1085	BB PW-1
10/10	3:00	10300	1090	BB PW-1
10/10	3:05	10350	1095	BB PW-1
10/10	3:10	10400	1100	BB PW-1
10/10	3:15	10450	1105	BB PW-1
10/10	3:20	10500	1110	BB PW-1
10/10	3:25	10550	1115	BB PW-1
10/10	3:30	10600	1120	BB PW-1
10/10	3:35	10650	1125	BB PW-1
10/10	3:40	10700	1130	BB PW-1
10/10	3:45	10750	1135	BB PW-1
10/10	3:50	10800	1140	BB PW-1
10/10	3:55	10850	1145	BB PW-1
10/10	4:00	10900	1150	BB PW-1
10/10	4:05	10950	1155	BB PW-1
10/10	4:10	11000	1160	BB PW-1
10/10	4:15	11050	1165	BB PW-1
10/10	4:20	11100	1170	BB PW-1
10/10	4:25	11150	1175	BB PW-1
10/10	4:30	11200	1180	BB PW-1
10/10	4:35	11250	1185	BB PW-1
10/10	4:40	11300	1190	BB PW-1
10/10	4:45	11350	1195	BB PW-1
10/10	4:50	11400	1200	BB PW-1
10/10	4:55	11450	1205	BB PW-1
10/10	5:00	11500	1210	BB PW-1
10/10	5:05	11550	1215	BB PW-1
10/10	5:10	11600	1220	BB PW-1
10/10	5:15	11650	1225	BB PW-1
10/10	5:20	11700	1230	BB PW-1
10/10	5:25	11750	1235	BB PW-1



ANDREWS & FOSTER

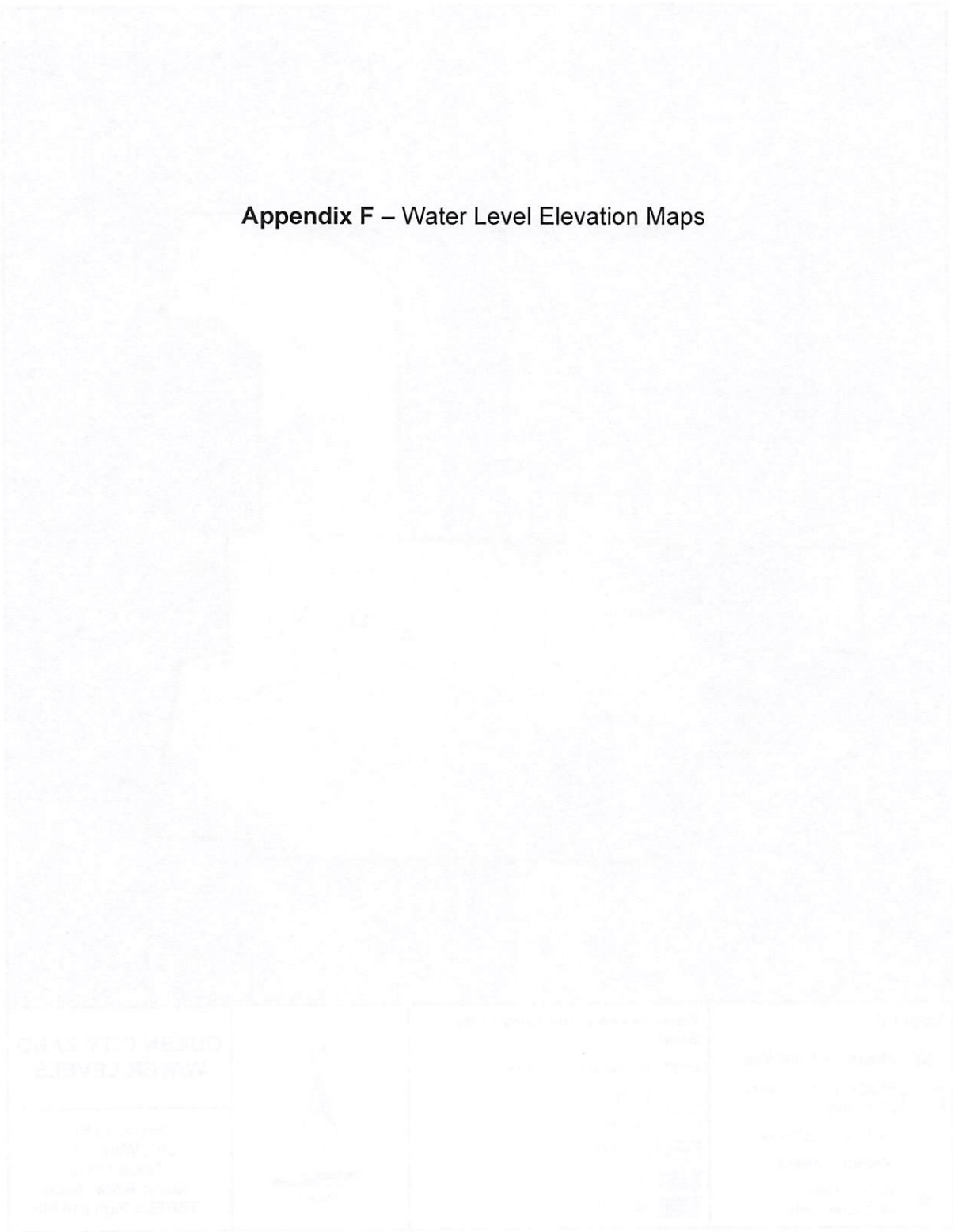
BLUEBONNET RANCH PW-1

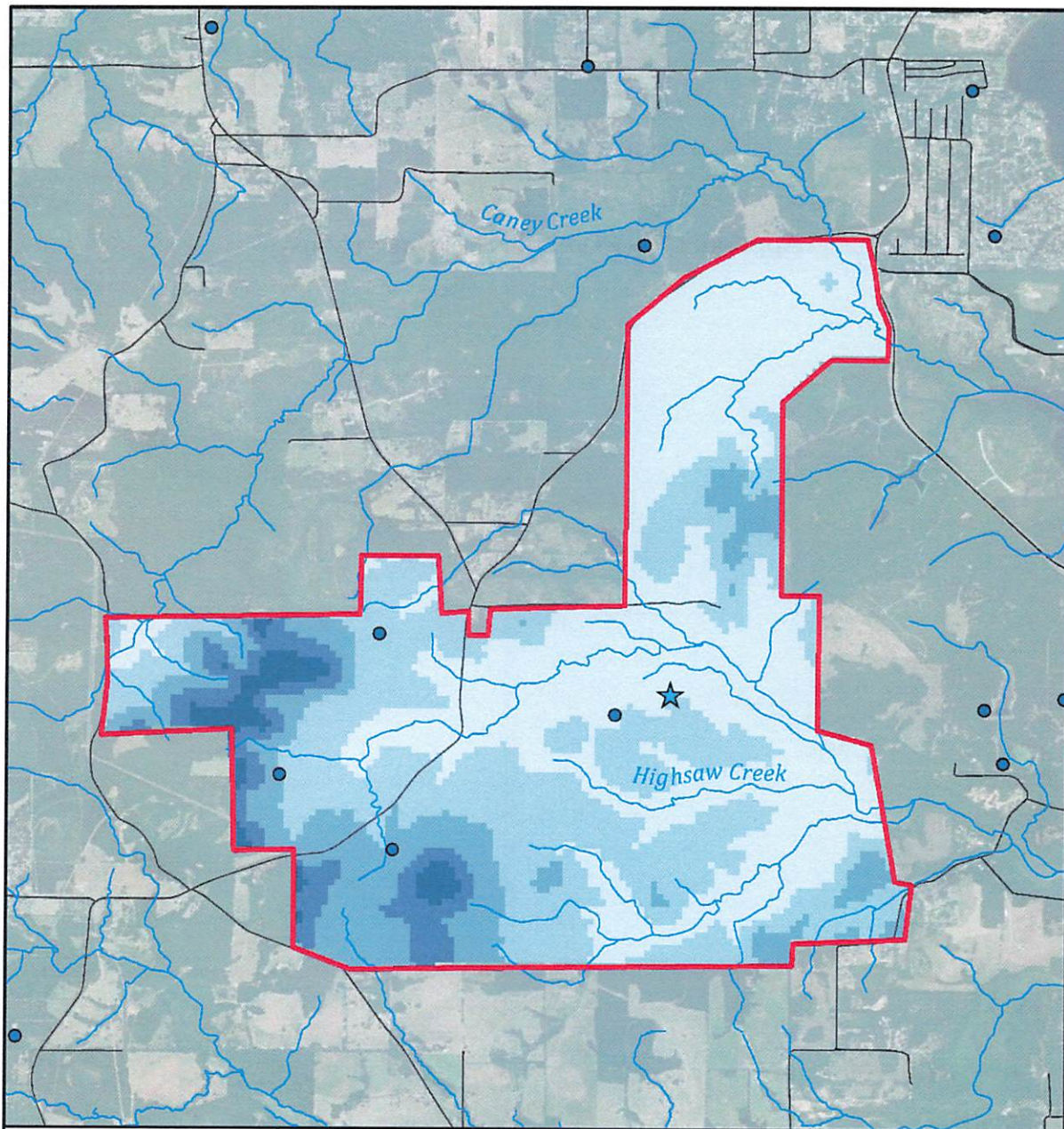
	FROM	TO	FOOTAGE	BAGS
GRAVEL	1220	1200	20	15
GRAVEL	1200	890	310	170
GRAVEL	890	860	30	20
GRAVEL	860	800	60	30
			BAGS	235
			POUNDS	11,750.00

QTY	Description
8	3"-PIPE BASE SS 025 SCREEN (169.15FT)
1	SAW TOOTH NIPPLE
1	R&L COUPLING AND NIPPLE
12	3" -GALV STEEL LINER (253.72FT)
12	3" BOW TYPE CENTRALIZERS
15000	LBS OF 16X30 GRAVEL PACK (20% EXCESS)

SCREEN-LINER TALLY					
	SCREEN		LINER		
JT 1	21.13	42.26	21.16	JT 1	
JT 2	21.13		21.13	JT 2	
JT 3	21.15		21.15	JT 3	
JT 4	21.17		21.16	JT 4	
JT 5	21.15	63.47	21.14	JT 5	105.74
JT 6	21.15		21.15	JT 6	
JT 7	21.13		21.14	JT 7	
JT 8	21.14		21.16	JT 8	
JT 9		63.42	21.15	JT 9	84.60
JT 10			21.14	JT 10	
JT 11			21.09	JT 11	
JT 12			21.15	JT 12	63.38
SCREEN	169.15				
LINER	253.72				
TOTAL	422.87				
TOP LINER	780.00				
TD	1202.87	169.15	253.72		253.72

Appendix F – Water Level Elevation Maps





Legend

- ★ Bluebonnet Test Well
- Bluebonnet Property Boundary
- TxDOT Roadways
- ~ Streams/Creeks
- Water Level Measurements

Water Levels in the Queen City Sand

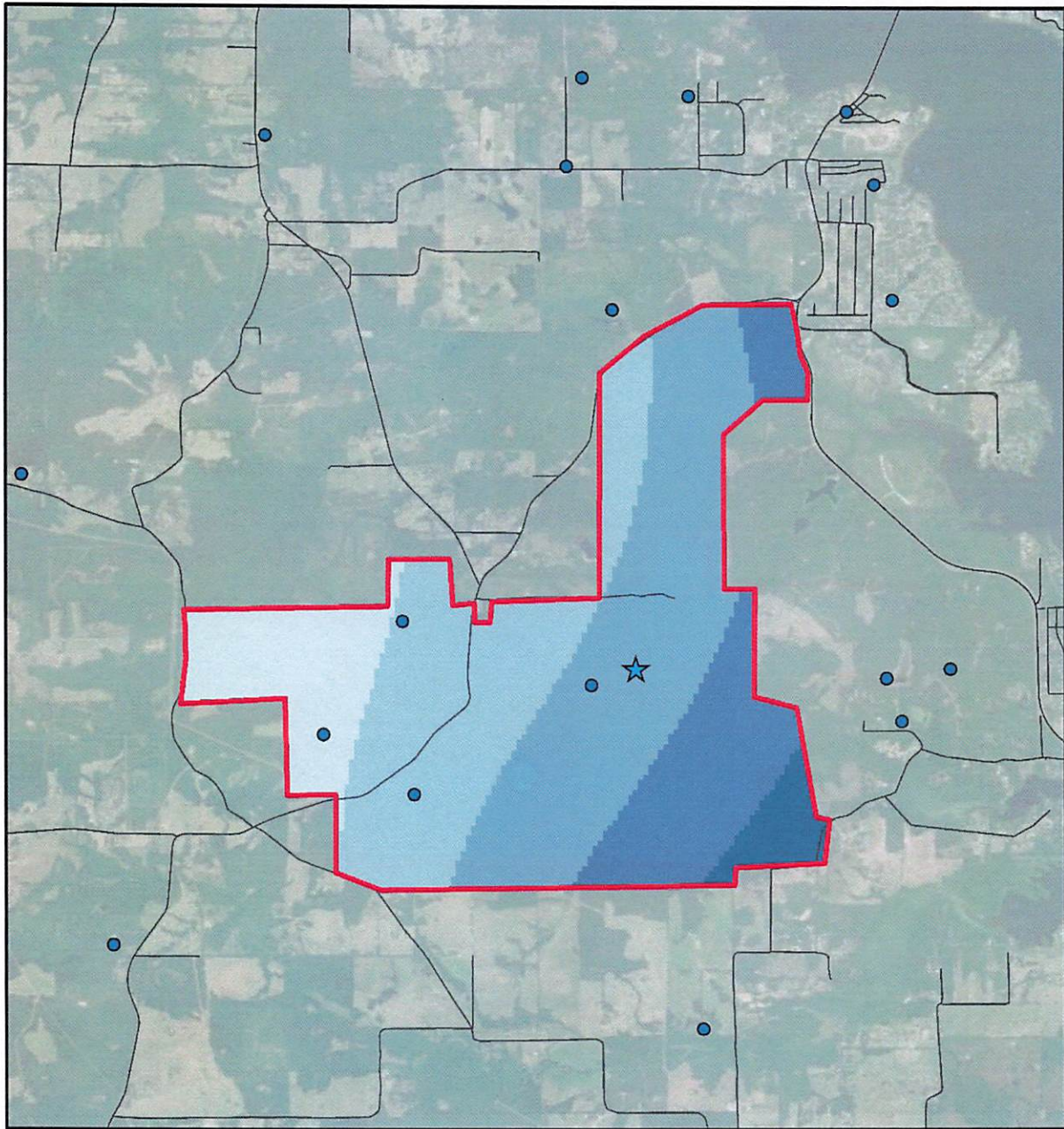
Depth to Water Level, ft bls

- 0 - 10
- 10 - 50
- 50 - 100
- 100 - 150
- 150 - 210



QUEEN CITY SAND WATER LEVELS

Prepared By:
LRE Water, LLC
Texas Office
Round Rock, Texas
TBPELS Firm #14368



Legend

-  Bluebonnet Test Well
-  Bluebonnet Property Boundary
-  TxDOT Roadways
-  Water Level Measurements

Water Level Elevation in the Queen City Sand

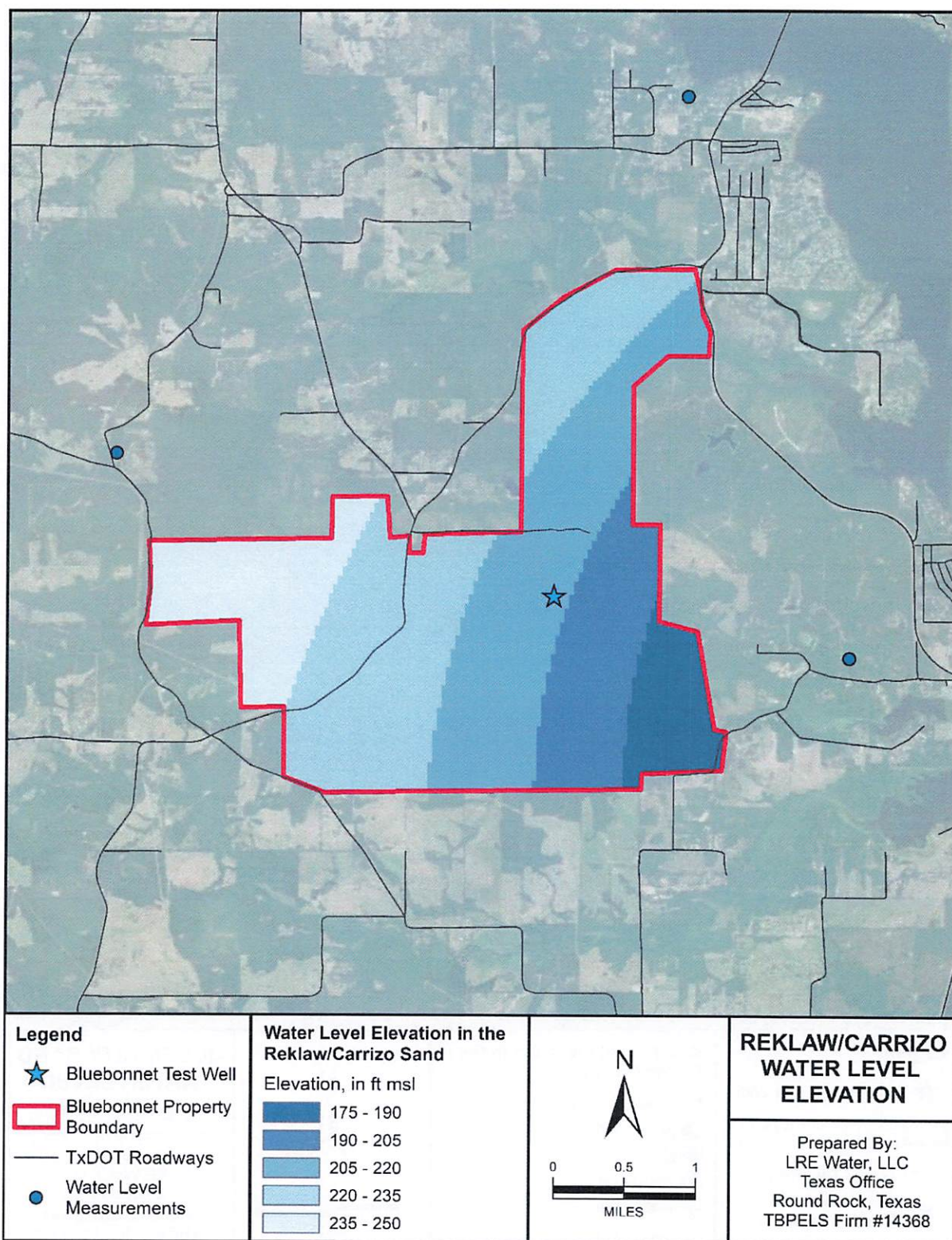
Elevation, in ft msl

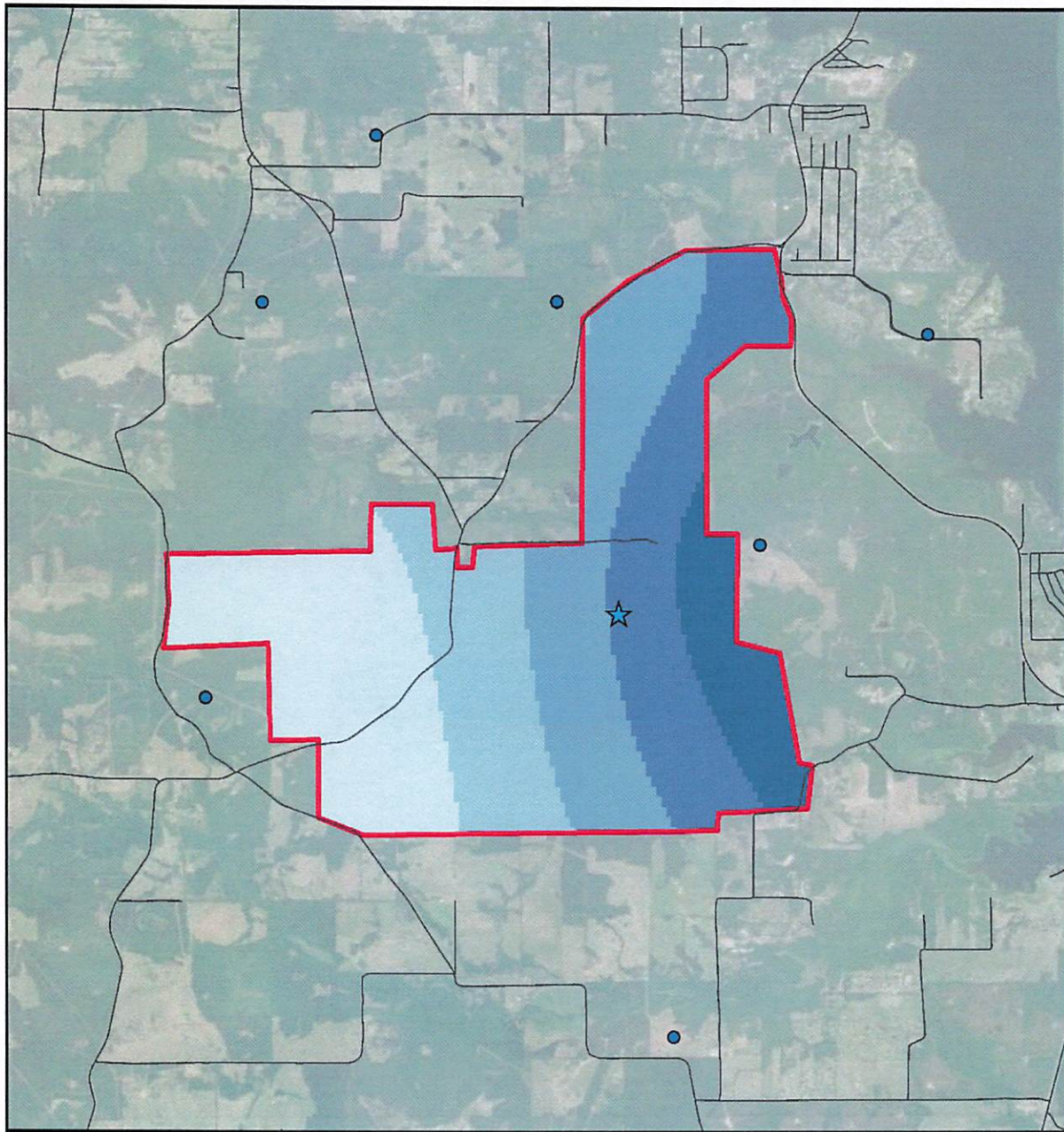
-  365 - 385
-  385 - 410
-  410 - 435
-  435 - 460
-  460 - 485



QUEEN CITY SAND WATER LEVEL ELEVATION

Prepared By:
LRE Water, LLC
Texas Office
Round Rock, Texas
TBPELS Firm #14368





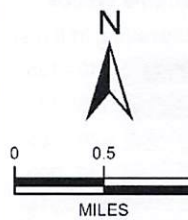
Legend

-  Bluebonnet Test Well
-  Bluebonnet Property Boundary
-  TxDOT Roadways
-  Water Level Measurement

Water Level Elevation in the Upper Wilcox

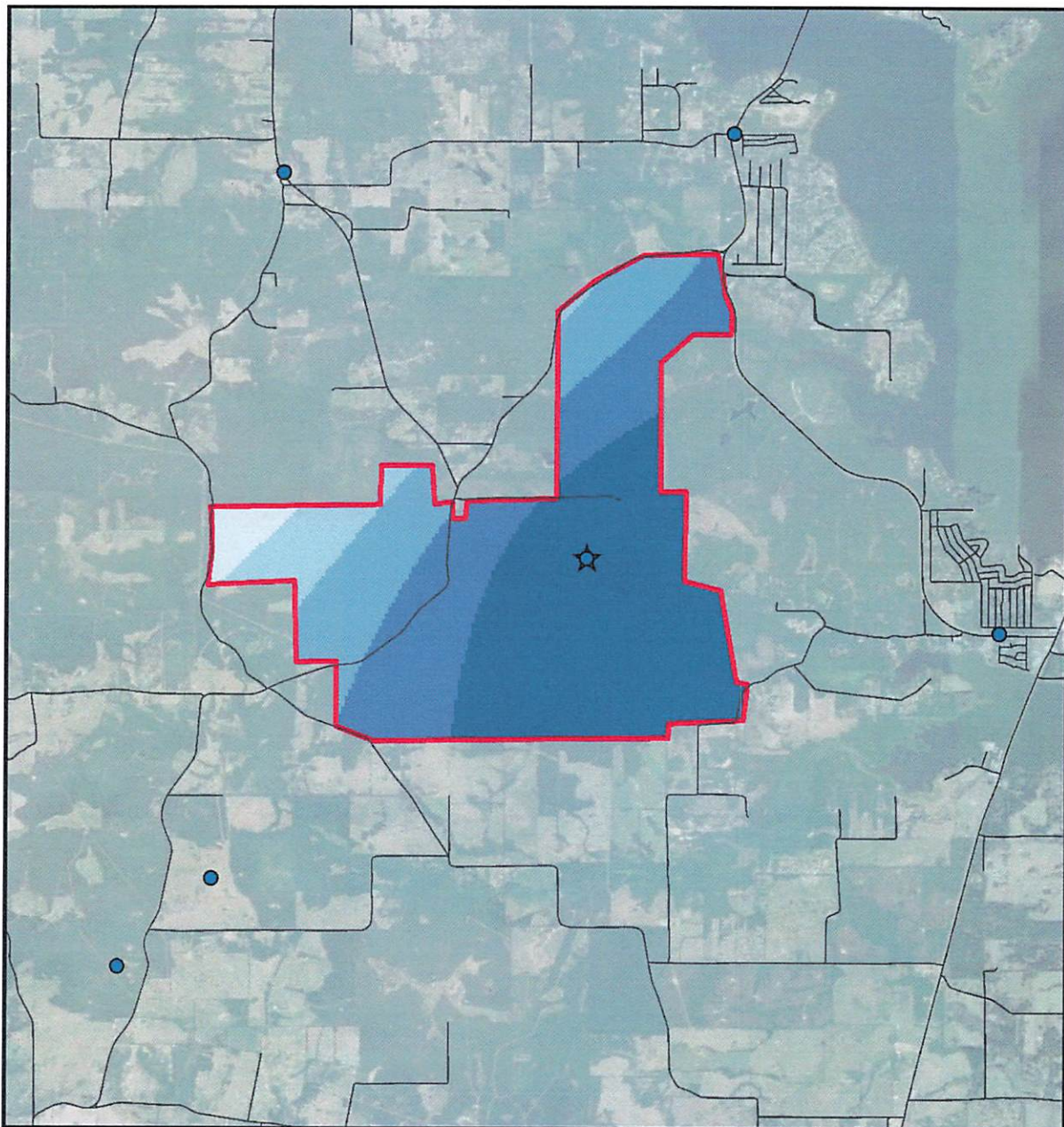
Elevation, in ft msl

-  150 - 165
-  165 - 180
-  180 - 195
-  195 - 210
-  210 - 235



UPPER WILCOX WATER LEVEL ELEVATION

Prepared By:
LRE Water, LLC
Texas Office
Round Rock, Texas
TBPELS Firm #14368



Legend

- ★ Bluebonnet Test Well
- Bluebonnet Property Boundary
- TxDOT Roadways
- Water Level Measurements

Water Level Elevation in the Middle Wilcox

Elevation, in ft msl

- 140 - 155
- 155 - 170
- 170 - 185
- 185 - 200
- 200 - 215



MIDDLE WILCOX WATER LEVEL ELEVATION

Prepared By:
LRE Water, LLC
Texas Office
Round Rock, Texas
TBPELS Firm #14368

SAMPLE CROSS REFERENCE

Project

1097565

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 Don Foster
 PO Box 348
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Printed 4/19/2024 Page 1 of 1
 PINE BLISS RANCH WELL # 2

Sample	Sample ID	Taken	Time	Received
2285970	PINE BLISS RANCH WELL # 2	04/02/2024	08:45:00	04/02/2024

Bottle 01 Client supplied plastic
 Bottle 02 Client supplied plastic
 Bottle 03 Client supplied plastic
 Bottle 04 Amber 32 Oz
 Bottle 05 16 oz HNO3 Metals Plastic
 Bottle 06 H2SO4 to pH <2 Amber Glass 250 mL w/Teflon lined lid(4)
 Bottle 07 NaOH to pH >12 Polyethylene 250 mL/amber
 Bottle 08 Prepared Bottle: CN TRAACS Autosampler Vial (Batch 1112255) Volume: 10.00000 mL <== Derived from 07 (5 ml)
 Bottle 09 Prepared Bottle: Mercury Preparation for Metals (Batch 1112473) Volume: 50.00000 mL <== Derived from 05 (25 ml)
 Bottle 10 Prepared Bottle: ICP Preparation for Metals (Batch 1112480) Volume: 50.00000 mL <== Derived from 05 (50 ml)
 Bottle 11 Prepared Bottle: 2 mL Glass vial (Batch 1113139) Volume: 3.00000 mL <== Derived from 04 (123 ml)
 Bottle 12 Prepared Bottle: ICP Preparation for Metals (Batch 1114044) Volume: 50.00000 mL <== Derived from 05 (50 ml)

Method	Bottle	PrepSet	Preparation	QcGroup	Analytical
EPA 300.0 2.1	01	1112467	04/02/2024	1112467	04/02/2024
EPA 300.0 2.1	01	1113154	04/05/2024	1113154	04/05/2024
TX Method 1005	11	1113139	04/08/2024	1114080	04/10/2024
EPA 300.0 2.1	01	1112468	04/02/2024	1112468	04/02/2024
EPA 200.8 5.4	10	1112480	04/03/2024	1113266	04/08/2024
EPA 200.8 5.4	10	1112480	04/03/2024	1112638	04/03/2024
EPA 200.8 5.4	10	1112480	04/03/2024	1112870	04/04/2024
EPA 200.7 4.4	10	1112480	04/03/2024	1112703	04/04/2024
EPA 245.1 3	09	1112473	04/03/2024	1112532	04/03/2024
EPA 200.8 5.4	12	1114044	04/12/2024	1115138	04/18/2024
SM 2320 B-2011	04	1113045	04/05/2024	1113045	04/05/2024
SM 4500-CN ⁻ E-2016	08	1112255	04/02/2024	1112517	04/03/2024
SM 4500-CO2 D-1997			04/08/2024		04/08/2024
SM 2510 B-2011	04	1112417	04/03/2024	1112417	04/03/2024
SM 2330 B-1993			04/08/2024		04/08/2024
SM 2120 B-2011	06	1112630	04/03/2024	1112630	04/03/2024
SM 2540 C-2015	04	1112956	04/04/2024	1112956	04/04/2024
SM 2340 B-2011			04/04/2024		04/04/2024
SM 5310 C-2014	06	1112926	04/04/2024	1112926	04/04/2024
SM 4500-H+ B-2011	04	1112430	04/03/2024	1112430	04/03/2024

Email: Kilgore.ProjectManagement@spllabs.com

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Andrews & Foster
Don Foster
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Project
1097565

Printed: 04/19/2024

RESULTS

Sample Results

2285970 PINE BLISS RANCH WELL #2

Received: 04/02/2024

Drinking Water

Collected by: Client
Taken: 04/02/2024

Andrews & Foster
08:45:00

PO:

EPA 200.7 4.4 Prepared: 1112480 04/03/2024 09:00:00 Analyzed 1112703 04/04/2024 09:32:00 KBI

Parameter	Results	Units	RL	Flags	CAS	Bottle
Calcium	1.61	mg/L	5.00	J	7440-70-2	10
Iron, Total	<0.0379	mg/L	0.0379		7439-89-6	10
Magnesium, Total	0.152	mg/L	5.00	J	7439-95-4	10
Sodium	120	mg/L	5.00		7440-23-5	10

EPA 200.8 5.4 Prepared: 1112480 04/03/2024 09:00:00 Analyzed 1112638 04/03/2024 20:35:00 JC2

Parameter	Results	Units	RL	Flags	CAS	Bottle
Aluminum, Total	0.0387	mg/L	0.005		7429-90-5	10
Barium, Total	0.0222	mg/L	0.005		7440-39-3	10
Cadmium, Total	<0.00012	mg/L	0.00012		7440-43-9	10
Chromium, Total	0.0012	mg/L	0.001		7440-47-3	10
Copper, Total	<0.000325	mg/L	0.000325		7440-50-8	10
Lead, Total	<0.000549	mg/L	0.000549		7439-92-1	10
Manganese, Total	0.0129	mg/L	0.001		7439-96-5	10
Nickel, Total	0.000671	mg/L	0.001	J	7440-02-0	10
Thallium, Total	0.0012	mg/L	0.001		7440-28-0	10
Zinc, Total	0.00103	mg/L	0.001	B	7440-66-6	10

EPA 200.8 5.4 Prepared: 1112480 04/03/2024 09:00:00 Analyzed 1112870 04/04/2024 16:58:00 JC2

Parameter	Results	Units	RL	Flags	CAS	Bottle
Arsenic, Total	0.000574	mg/L	0.0005		7440-38-2	10
Beryllium, Total	0.000516	mg/L	0.0005		7440-41-7	10
Selenium, Total	0.00134	mg/L	0.002	J	7782-49-2	10

EPA 200.8 5.4 Prepared: 1112480 04/03/2024 09:00:00 Analyzed 1113266 04/08/2024 14:36:00 JC2

Parameter	Results	Units	RL	Flags	CAS	Bottle
Silver, Total	0.000222	mg/L	0.0002		7440-22-4	10



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2285970 PINE BLISS RANCH WELL # 2

Received: 04/02/2024

Drinking Water

Collected by: Client
 Taken: 04/02/2024

Andrews & Foster
 08:45:00

PCO:

EPA 200.8 5.4		Prepared:	1114044	04/12/2024	09:00:00	Analyzed	1115138	04/18/2024	16:39:00	JC2
Parameter	Results	Units	RL	Flags	CAS	Bottle				
NELAC Antimony, Total	0.00127	mg/L	0.001		7440-36-0	12				
EPA 245.1 3		Prepared:	1112473	04/03/2024	09:30:00	Analyzed	1112532	04/03/2024	13:59:00	KB1
Parameter	Results	Units	RL	Flags	CAS	Bottle				
NELAC Mercury, Total	0.000123	mg/L	0.0002	J	7439-97-6	09				
EPA 300.0 2.1		Prepared:	1112467	04/02/2024	14:41:00	Analyzed	1112467	04/02/2024	14:41:00	NAZ
Parameter	Results	Units	RL	Flags	CAS	Bottle				
NELAC Bromide	<0.100	mg/L	0.100			01				
NELAC Fluoride	0.127	mg/L	0.100			01				
NELAC Nitrate-Nitrite Nitrogen	<0.053	mg/L	0.053			01				
EPA 300.0 2.1		Prepared:	1112468	04/02/2024	14:41:00	Analyzed	1112468	04/02/2024	14:41:00	NAZ
Parameter	Results	Units	RL	Flags	CAS	Bottle				
NELAC DW Nitrate-Nitrogen Total	<0.0226	mg/L	0.0226		14797-55-8	01				
NELAC DW Nitrite-Nitrogen, Total	<0.0304	mg/L	0.0304			01				
EPA 300.0 2.1		Prepared:	1113154	04/05/2024	15:15:00	Analyzed	1113154	04/05/2024	15:15:00	NAZ
Parameter	Results	Units	RL	Flags	CAS	Bottle				
NELAC Chloride	28.7	mg/L	3.00			01				
NELAC Sulfate	48.1	mg/L	3.00			01				
SM 2120 B-2011		Prepared:	1112630	04/03/2024	13:31:00	Analyzed	1112630	04/03/2024	13:31:00	TRC
Parameter	Results	Units	RL	Flags	CAS	Bottle				
z Color, True	<5	PtCo Units	5.0			06				
SM 2320 B-2011		Prepared:	1113045	04/05/2024	08:40:00	Analyzed	1113045	04/05/2024	08:40:00	KN1
Parameter	Results	Units	RL	Flags	CAS	Bottle				
z Total Alkalinity (as CaCO3)	257	mg/L	1.00			04				



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Andrews & Foster
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Athens, TX 75751

Project
1097565

Printed: 04/19/2024

2285970 PINE BLISS RANCH WELL # 2

Received: 04/02/2024

Drinking Water

Collected by: Client
Taken: 04/02/2024

Andrews & Foster
08:45:00

PO:

SM 2330 B-1993 Prepared: 04/08/2024 08:07:45 Calculated 04/08/2024 08:07:45 CAL

Parameter	Results	Units	RL	Flags	CAS	Bottle
Langelier Saturation Index @22C	-0.4823					

SM 2340 B-2011 Prepared: 04/04/2024 14:08:03 Calculated 04/04/2024 14:08:03 CAL

Parameter	Results	Units	RL	Flags	CAS	Bottle
Total Hardness as CaCO ₃ -Ca/MgEq	4.65	mg/L	5.00			

SM 2510 B-2011 Prepared: 1112417 04/03/2024 10:30:00 Analyzed 1112417 04/03/2024 10:30:00 JK1

Parameter	Results	Units	RL	Flags	CAS	Bottle
Lab Spec. Conductance at 25 C	621	umhos/cm				04

SM 2540 C-2015 Prepared: 1112956 04/04/2024 08:00:00 Analyzed 1112956 04/04/2024 08:00:00 JK1

Parameter	Results	Units	RL	Flags	CAS	Bottle
Total Dissolved Solids	320	mg/L	20.0			04

SM 4500-CN⁻E-2016 Prepared: 1112255 04/02/2024 14:15:17 Analyzed 1112517 04/03/2024 09:51:00 AMB

Parameter	Results	Units	RL	Flags	CAS	Bottle
Cyanide, total	<0.00238	mg/L	0.00238			08

SM 4500-CO₂ D-1997 Prepared: 04/03/2024 13:38:36 Calculated 04/03/2024 13:38:36 CAL

Parameter	Results	Units	RL	Flags	CAS	Bottle
Hydroxide / Calc	<0.5	mg/L	0.5			

SM 4500-CO₂ D-1997 Prepared: 04/08/2024 08:07:45 Calculated 04/08/2024 08:07:45 CAL

Parameter	Results	Units	RL	Flags	CAS	Bottle
Bicarbonate (as CaCO ₃) / Calc	248	mg/L	0.5			

SM 4500-CO₂ D-1997 Prepared: 04/08/2024 08:38:40 Calculated 04/08/2024 08:38:40 CAL

Parameter	Results	Units	RL	Flags	CAS	Bottle
Carbonate (as CaCO ₃) / Calc	4.62	mg/L	0.5			



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Andrews & Foster
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Athens, TX 75751-

Project
1097565

Printed: 04/19/2024

2285970 PINE BLISS RANCH WELL # 2

Received: 04/02/2024

Drinking Water Collected by: Client Andrews & Foster
Taken: 04/02/2024 08:45:00

PO:

SM 4500-CO2 D-1997 Prepared: 04/08/2024 08:38:40 Calculated 04/08/2024 08:38:40 CAL

Parameter	Results	Units	RL	Flags	CAS	Bottle
Free Carbon Dioxide / Calc	1.44	mg/L	0.5			

SM 4500-CO2 D-1997 Prepared: 04/08/2024 08:38:44 Calculated 04/08/2024 08:38:44 CAL

Parameter	Results	Units	RL	Flags	CAS	Bottle
Carbon Dioxide / Calc	222	mg/L	0.5			

SM 4500-H+ B-2011 Prepared: 1112430 04/03/2024 11:00:00 Analyzed 1112430 04/03/2024 11:00:00 JK1

Parameter	Results	Units	RL	Flags	CAS	Bottle
Laboratory pH	8.5 @ 17 C	SU	2.00			04

SM 5310 C-2014 Prepared: 1112926 04/04/2024 16:53:00 Analyzed 1112926 04/04/2024 16:53:00 MP1

Parameter	Results	Units	RL	Flags	CAS	Bottle
Total Organic Carbon	0.712	mg/L	0.500			06

TX Method 1005 Prepared: 1113139 04/08/2024 10:09:04 Analyzed 1114080 04/10/2024 21:28:00 BRU

Parameter	Results	Units	RL	Flags	CAS	Bottle
C12 to C28 TPH (DRO)	<0.976	mg/L	0.976			11
C28 to C36 TPH (ORO)	<0.976	mg/L	0.976			11
C6 to C12 TPH (GRO)	<0.976	mg/L	0.976			11

TX Method 1005 Prepared: 1113139 04/08/2024 10:09:04 Calculated 1114080 04/12/2024 12:38:53 CAL

Parameter	Results	Units	RL	Flags	CAS	Bottle
C06 to C36 TPH	<0.976	mg/L	0.976			11

Sample Preparation

2285970 PINE BLISS RANCH WELL # 2

Received: 04/02/2024

04/02/2024



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Andrews & Foster
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 Athens, TX 75751

Project
1097565

Printed: 04/19/2024

2285970 PINE BLISS RANCH WELL # 2

Received: 04/02/2024

04/02/2024

		Prepared:	04/02/2024	13:38:36	Calculated	04/02/2024	13:38:36	CAL		
z	Environmental Fee (per Project)	Verified								
		Prepared:	04/19/2024	14:35:00	Analyzed	04/19/2024	14:35:00	WJP		
z	Level IV Data Review	Completed								
	EPA 200.2 2.8	Prepared:	1112480	04/03/2024	09:00:00	Analyzed	1112480	04/03/2024	09:00:00	HLT
z	Liquid Metals Digestion	50/50	ml						05	
	EPA 200.2 2.8	Prepared:	1114044	04/12/2024	09:00:00	Analyzed	1114044	04/12/2024	09:00:00	HLT
z	Liquid Metals Digestion	50/50	ml						05	
	EPA 245.1 3	Prepared:	1112473	04/03/2024	09:30:00	Analyzed	1112473	04/03/2024	09:30:00	ALB
NELAC	Mercury Liquid Metals Digestion	50/25	ml						05	
	SM 2540 C-2015	Prepared:	1112604	04/04/2024	08:00:00	Analyzed	1112604	04/04/2024	08:00:00	JKI
NELAC	Total Dissolved Solids Started	Started								
	SM 4500-CN ⁻ C-2016	Prepared:	1112255	04/02/2024	14:15:17	Analyzed	1112255	04/02/2024	14:15:17	MEG
NELAC	Cyanide Distillation	10/5	ml						07	
	TX 1005	Prepared:	1113139	04/08/2024	10:09:04	Analyzed	1113139	04/08/2024	10:09:04	PEV
z	TexasTX 1005 TPH Extraction	3/123	ml						04	



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1097565

Printed: 04/19/2024

2285970 PINE BLISS RANCH WELL # 2

Received: 04/02/2024

04/02/2024

TX Method 1005

Prepared: 1113139 04/08/2024 10:09:04 Analyzed 1114080 04/10/2024 21:28:00 BRU

Texas1005 TPH Expansion - C36

Entered

11

Qualifiers:

J - Analyte detected below quantitation limit

B - Analyte detected in the associated method blank

We report results on an As Received (or Wet) basis unless marked Dry Weight.

Unless otherwise noted, testing was performed at SPL, Inc. - Kilgore laboratory which holds International, Federal, and state accreditations. Please see our Websites for details.

(N)ELAC - Covered in our NELAC scope of accreditation

z -- Not covered by our NELAC scope of accreditation

These analytical results relate to the sample tested. This report may NOT be reproduced EXCEPT in FULL without written approval of SPL Kilgore. Unless otherwise specified, these test results meet the requirements of NELAC.

RL is the Reporting Limit (sample specific quantitation limit) and is at or above the Method Detection Limit (MDL). CAS is Chemical Abstract Service number. RL is our Reporting Limit, or Minimum Quantitation Level. The RL takes into account the Instrument Detection Limit (IDL), Method Detection Limit (MDL), and Practical Quantitation Limit (PQL), and any dilutions and/or concentrations performed during sample preparation (EQL). Our analytical result must be above this RL before we report a value in the 'Results' column of our report (without a 'J' flag). Otherwise, we report ND (Not Detected above RL), because the result is "<" (less than) the number in the RL column. MAL is Minimum Analytical Level and is typically from regulatory agencies. Unless we report a result in the result column, or interferences prevent it, we work to have our RL at or below the MAL.



Bill Peery, MS, VP Technical Services



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Analytical Set 1112517

SM 4500-CN⁻ E-2016

Blank

Parameter	PrepSet	Reading	MDL	MQL	Units	File
Cyanide, total	1112255	ND	0.00238	0.005	mg/L	126175802

CCV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Cyanide, total	0.508	0.500	mg/L	102	90.0 - 110	126175801
Cyanide, total	0.502	0.500	mg/L	100	90.0 - 110	126175811
Cyanide, total	0.503	0.500	mg/L	101	90.0 - 110	126175822
Cyanide, total	0.501	0.500	mg/L	100	90.0 - 110	126175833
Cyanide, total	0.500	0.500	mg/L	100	90.0 - 110	126175835
Cyanide, total	0.502	0.500	mg/L	100	90.0 - 110	126175836
Cyanide, total	0.501	0.500	mg/L	100	90.0 - 110	126175837
Cyanide, total	0.494	0.500	mg/L	98.8	90.0 - 110	126175838
Cyanide, total	0.492	0.500	mg/L	98.4	90.0 - 110	126175839

Duplicate

Parameter	Sample	Result	Unknown	Unit	RPD	Limit%
Cyanide, total	2285917	ND	0.0038	mg/L	200 *	20.0

ICV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Cyanide, total	0.201	0.200	mg/L	100	90.0 - 110	126175800

LCS Dup

Parameter	PrepSet	LCS	LCSD	Known	Limits%	LCS%	LCSD%	Units	RPD	Limit%
Cyanide, total	1112255	0.397	0.391	0.400	90.0 - 110	99.2	97.8	mg/L	1.52	20.0

Mat. Spike

Parameter	Sample	Spike	Unknown	Known	Units	Recovery %	Limits %	File
Cyanide, total	2285917	0.398	0.0038	0.400	mg/L	99.5	90.0 - 110	126175807

Analytical Set 1112956

SM 2540 C-2015

Blank

Parameter	PrepSet	Reading	MDL	MQL	Units	File
Total Dissolved Solids	1112956	ND	5.00	5.00	mg/L	126186346

ControlBlk

Parameter	PrepSet	Reading	MDL	MQL	Units	File
Total Dissolved Solids	1112956	-0.0002			grams	126186333

Duplicate

Parameter	Sample	Result	Unknown	Unit	RPD	Limit%
Total Dissolved Solids	2285956	1860	1990	mg/L	6.75	20.0

LCS

Parameter	PrepSet	Reading	Known	Units	Recover%	Limits	File
Total Dissolved Solids	1112956	192	200	mg/L	96.0	85.0 - 115	126186347

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Standard

Parameter	Sample	Reading	Known	Units	Recover%	Limits%	File
Total Dissolved Solids		96.0	100	mg/L	96.0	90.0 - 110	126186334

Analytical Set

1112467

EPA 300.0 2.1

AWRL/LOQ C

Parameter	Reading	Known	Units	Recover%	Limits%	File
Bromide	0.120	0.100	mg/L	120	70.0 - 130	126174710
Fluoride	0.094	0.100	mg/L	94.0	70.0 - 130	126174710
Nitrate-Nitrite Nitrogen	0.0612	0.053	mg/L	115	70.0 - 130	126174710

Blank

Parameter	PrepSet	Reading	MDL	MQL	Units	File
Bromide	1112467	ND	0.0383	0.100	mg/L	126174711
Fluoride	1112467	ND	0.010	0.100	mg/L	126174711
Nitrate-Nitrite Nitrogen	1112467	ND	0.00841	0.053	mg/L	126174711

CCB

Parameter	PrepSet	Reading	MDL	MQL	Units	File
Bromide	1112467	0.046	0.0383	0.100	mg/L	126174707
Bromide	1112467	0.074	0.0383	0.100	mg/L	126174727
Bromide	1112467	0.069	0.0383	0.100	mg/L	126174739
Fluoride	1112467	0	0.010	0.100	mg/L	126174707
Fluoride	1112467	0	0.010	0.100	mg/L	126174727
Fluoride	1112467	0	0.010	0.100	mg/L	126174739

CCV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Bromide	9.85	10.0	mg/L	98.5	90.0 - 110	126174706
Bromide	9.91	10.0	mg/L	99.1	90.0 - 110	126174726
Bromide	9.96	10.0	mg/L	99.6	90.0 - 110	126174738
Fluoride	9.80	10.0	mg/L	98.0	90.0 - 110	126174706
Fluoride	10.4	10.0	mg/L	104	90.0 - 110	126174726
Fluoride	10.4	10.0	mg/L	104	90.0 - 110	126174738
Nitrate-Nitrite Nitrogen	4.97	5.30	mg/L	93.8	90.0 - 110	126174706
Nitrate-Nitrite Nitrogen	5.53	5.30	mg/L	104	90.0 - 110	126174726
Nitrate-Nitrite Nitrogen	5.52	5.30	mg/L	104	90.0 - 110	126174738

LCS Dup

Parameter	PrepSet	LCS	LCSD	Known	Limits%	LCS%	LCSD%	Units	RPD	Limit%
Bromide	1112467	5.26	5.32	5.00	90.0 - 120	105	106	mg/L	1.13	20.0
Fluoride	1112467	5.73	5.65	5.00	88.0 - 115	115	113	mg/L	1.41	20.0
Nitrate-Nitrite Nitrogen	1112467	2.91	2.90	2.65	88.0 - 115	110	109	mg/L	0.344	20.0

MSD

Parameter	Sample	MS	MSD	UNK	Known	Limits	MS%	MSD%	Units	RPD	Limit%
Bromide	2285785	209	226	11.0	200	80.0 - 120	99.0	108	mg/L	8.23	20.0
Fluoride	2285785	245	245	ND	200	80.0 - 120	122 *	122 *	mg/L	0	20.0

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MSD

Parameter	Sample	MS	MSD	UNK	Known	Limits	MS%	MSD%	Units	RPD	Limit%
Nitrate-Nitrite Nitrogen	2285785	124	125	1.13	106	80.0 - 120	116	117	mg/L	0.811	20.0
Bromide	2285996	91.5	102	2.90	100	80.0 - 120	88.6	99.1	mg/L	11.2	20.0
Fluoride	2285996	123	125	ND	100	80.0 - 120	123 *	125 *	mg/L	1.61	20.0
Nitrate-Nitrite Nitrogen	2285996	64.0	64.4	1.22	53.0	80.0 - 120	118	119	mg/L	0.635	20.0

Analytical Set

1112468

EPA 300.0 2.1

AWRL/LOQ C

Parameter	Reading	Known	Units	Recover%	Limits%	File
DW Nitrate-Nitrogen Total	0.0228	0.0226	mg/L	101	70.0 - 130	126174744
DW Nitrite-Nitrogen, Total	0.0384	0.0304	mg/L	126	70.0 - 130	126174744

Blank

Parameter	PrepSet	Reading	MDL	MQL	Units	File
DW Nitrate-Nitrogen Total	1112468	ND	0.00745	0.0226	mg/L	126174745
DW Nitrite-Nitrogen, Total	1112468	ND	0.0036	0.0304	mg/L	126174745

CCB

Parameter	PrepSet	Reading	MDL	MQL	Units	File
DW Nitrate-Nitrogen Total	1112468	0	0.00745	0.0226	mg/L	126174741
DW Nitrate-Nitrogen Total	1112468	0	0.00745	0.0226	mg/L	126174754
DW Nitrate-Nitrogen Total	1112468	0	0.00745	0.0226	mg/L	126174756
DW Nitrite-Nitrogen, Total	1112468	0.0061	0.0036	0.0304	mg/L	126174741
DW Nitrite-Nitrogen, Total	1112468	0	0.0036	0.0304	mg/L	126174754
DW Nitrite-Nitrogen, Total	1112468	0	0.0036	0.0304	mg/L	126174756

CCV

Parameter	Reading	Known	Units	Recover%	Limits%	File
DW Nitrate-Nitrogen Total	2.21	2.26	mg/L	97.8	90.0 - 110	126174740
DW Nitrate-Nitrogen Total	2.21	2.26	mg/L	97.8	90.0 - 110	126174753
DW Nitrate-Nitrogen Total	2.21	2.26	mg/L	97.8	90.0 - 110	126174755
DW Nitrite-Nitrogen, Total	2.76	3.04	mg/L	90.8	90.0 - 110	126174740
DW Nitrite-Nitrogen, Total	3.32	3.04	mg/L	109	90.0 - 110	126174753
DW Nitrite-Nitrogen, Total	3.31	3.04	mg/L	109	90.0 - 110	126174755

LCS Dup

Parameter	PrepSet	LCS	LCSD	Known	Limits%	LCS%	LCSD%	Units	RPD	Limit%
DW Nitrate-Nitrogen Total	1112468	1.19	1.19	1.13	70.0 - 116	105	105	mg/L	0	30.0
DW Nitrite-Nitrogen, Total	1112468	1.72	1.71	1.52	70.0 - 116	113	112	mg/L	0.583	30.0

MSD

Parameter	Sample	MS	MSD	UNK	Known	Limits	MS%	MSD%	Units	RPD	Limit%
DW Nitrate-Nitrogen Total	2285785	50.9	50.7	1.13	45.2	70.0 - 130	110	110	mg/L	0.403	30.0
DW Nitrite-Nitrogen, Total	2285785	73.5	74.6	ND	60.8	70.0 - 130	121	123	mg/L	1.49	30.0
DW Nitrate-Nitrogen Total	2285996	26.8	26.8	1.22	22.6	70.0 - 130	113	113	mg/L	0	30.0
DW Nitrite-Nitrogen, Total	2285996	37.2	37.6	ND	30.4	70.0 - 130	122	124	mg/L	1.07	30.0

Analytical Set

1113154

EPA 300.0 2.1

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CCB

Parameter	PrepSet	Reading	MDL	MQL	Units	File
Chloride	1113154	0	0.0298	0.300	mg/L	126190868
Chloride	1113154	0	0.0298	0.300	mg/L	126190887
Chloride	1113154	0	0.0298	0.300	mg/L	126190899
Sulfate	1113154	0	0.160	0.300	mg/L	126190868
Sulfate	1113154	0.0027	0.160	0.300	mg/L	126190887
Sulfate	1113154	0.0057	0.160	0.300	mg/L	126190899

CCV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Chloride	10.0	10.0	mg/L	100	90.0 - 110	126190867
Chloride	10.0	10.0	mg/L	100	90.0 - 110	126190886
Chloride	9.95	10.0	mg/L	99.5	90.0 - 110	126190898
Sulfate	10.2	10.0	mg/L	102	90.0 - 110	126190867
Sulfate	10.0	10.0	mg/L	100	90.0 - 110	126190886
Sulfate	10.4	10.0	mg/L	104	90.0 - 110	126190898

LCS Dup

Parameter	PrepSet	LCS	LCSD	Known	Limits%	LCS%	LCSD%	Units	RPD	Limit%
Chloride	1113154	5.37	5.29	5.00	85.0 - 115	107	106	mg/L	1.50	20.0
Sulfate	1113154	5.23	5.17	5.00	85.0 - 115	105	103	mg/L	1.15	20.0

MSD

Parameter	Sample	MS	MSD	UNK	Known	Limits	MS%	MSD%	Units	RPD	Limit%
Chloride	2285314	450	451	358	100	80.0 - 120	92.0	93.0	mg/L	1.08	20.0
Sulfate	2285314	256	257	153	100	80.0 - 120	103	104	mg/L	0.966	20.0
Chloride	2285970	38.8	38.8	28.7	10.0	80.0 - 120	101	101	mg/L	0	20.0
Sulfate	2285970	57.2	57.0	48.1	10.0	80.0 - 120	91.0	89.0	mg/L	2.22	20.0

Analytical Set

1112532

EPA 245.1 3

Blank

Parameter	PrepSet	Reading	MDL	MQL	Units	File
Mercury, Total	1112473	ND	0.113	0.200	ug/L	126176346

CCV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Mercury, Total	4.93	5.000	ug/L	98.6	90.0 - 110	126176319
Mercury, Total	4.97	5.000	ug/L	99.4	90.0 - 110	126176320
Mercury, Total	4.83	5.000	ug/L	96.6	90.0 - 110	126176345
Mercury, Total	4.95	5.000	ug/L	99.0	90.0 - 110	126176354
Mercury, Total	4.81	5.000	ug/L	96.2	90.0 - 110	126176364
Mercury, Total	4.77	5.000	ug/L	95.4	90.0 - 110	126176369

ICL

Parameter	Reading	Known	Units	Recover%	Limits%	File
Mercury, Total	20.0	20.00	ug/L	100	90.0 - 110	126176318

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ICV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Mercury, Total	4.96	5.000	ug/L	99.2	90.0 - 110	126176317

LCS Dup

Parameter	PrepSet	LCS	LCSD	Known	Limits%	LCS%	LCSD%	Units	RPD	Limit%
Mercury, Total	1112473	8.87	9.14	10.0	85.0 - 115	88.7	91.4	ug/L	3.00	20.0

MSD

Parameter	Sample	MS	MSD	UNK	Known	Limits	MS%	MSD%	Units	RPD	Limit%
Mercury, Total	2284780	8.63	8.36	ND	10.0	70.0 - 130	86.3	83.6	ug/L	3.18	20.0
Mercury, Total	2285921	8.61	9.09	ND	10.0	70.0 - 130	86.1	90.9	ug/L	5.42	20.0

Analytical Set

1112638

EPA 200.8 5.4

Blank

Parameter	PrepSet	Reading	MDL	MQL	Units	File
Aluminum, Total	1112480	ND	0.0039	0.005	mg/L	126179321
Arsenic, Total	1112480	0.00235	0.000902	0.001	mg/L	126179321
Barium, Total	1112480	ND	0.00207	0.005	mg/L	126179321
Cadmium, Total	1112480	ND	0.00012	0.001	mg/L	126179321
Chromium, Total	1112480	0.00042	0.000392	0.001	mg/L	126179321
Copper, Total	1112480	ND	0.000325	0.001	mg/L	126179321
Lead, Total	1112480	ND	0.000549	0.001	mg/L	126179321
Nickel, Total	1112480	ND	0.000154	0.001	mg/L	126179321
Thallium, Total	1112480	ND	0.000966	0.001	mg/L	126179321
Zinc, Total	1112480	ND	0.000844	0.001	mg/L	126179321

CCV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Aluminum, Total	0.0511	0.05	mg/L	102	90.0 - 110	126179247
Aluminum, Total	0.0519	0.05	mg/L	104	90.0 - 110	126179271
Aluminum, Total	0.0514	0.05	mg/L	103	90.0 - 110	126179280
Aluminum, Total	0.0523	0.05	mg/L	105	90.0 - 110	126179315
Aluminum, Total	0.0529	0.05	mg/L	106	90.0 - 110	126179325
Aluminum, Total	0.0538	0.05	mg/L	108	90.0 - 110	126179337
Aluminum, Total	0.0539	0.05	mg/L	108	90.0 - 110	126179348
Aluminum, Total	0.0528	0.05	mg/L	106	90.0 - 110	126179351
Barium, Total	0.050	0.05	mg/L	100	90.0 - 110	126179247
Barium, Total	0.0488	0.05	mg/L	97.6	90.0 - 110	126179259
Barium, Total	0.0496	0.05	mg/L	99.2	90.0 - 110	126179271
Barium, Total	0.0488	0.05	mg/L	97.6	90.0 - 110	126179280
Barium, Total	0.0499	0.05	mg/L	99.8	90.0 - 110	126179292
Barium, Total	0.0491	0.05	mg/L	98.2	90.0 - 110	126179303
Barium, Total	0.050	0.05	mg/L	100	90.0 - 110	126179325
Barium, Total	0.0493	0.05	mg/L	98.6	90.0 - 110	126179337
Barium, Total	0.0499	0.05	mg/L	99.8	90.0 - 110	126179348
Barium, Total	0.0493	0.05	mg/L	98.6	90.0 - 110	126179351
Barium, Total	0.0506	0.05	mg/L	101	90.0 - 110	126179375

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Parameter	Reading	Known	Units	Recover%	Limits%	File
Barium, Total	0.0498	0.05	mg/L	99.6	90.0 - 110	126179388
Cadmium, Total	0.0487	0.05	mg/L	97.4	90.0 - 110	126179247
Cadmium, Total	0.0483	0.05	mg/L	96.6	90.0 - 110	126179259
Cadmium, Total	0.0488	0.05	mg/L	97.6	90.0 - 110	126179271
Cadmium, Total	0.049	0.05	mg/L	98.0	90.0 - 110	126179280
Cadmium, Total	0.0481	0.05	mg/L	96.2	90.0 - 110	126179315
Cadmium, Total	0.0483	0.05	mg/L	96.6	90.0 - 110	126179325
Cadmium, Total	0.0477	0.05	mg/L	95.4	90.0 - 110	126179337
Cadmium, Total	0.0482	0.05	mg/L	96.4	90.0 - 110	126179348
Cadmium, Total	0.0475	0.05	mg/L	95.0	90.0 - 110	126179351
Chromium, Total	0.0509	0.05	mg/L	102	90.0 - 110	126179247
Chromium, Total	0.0505	0.05	mg/L	101	90.0 - 110	126179259
Chromium, Total	0.051	0.05	mg/L	102	90.0 - 110	126179271
Chromium, Total	0.0508	0.05	mg/L	102	90.0 - 110	126179315
Chromium, Total	0.0512	0.05	mg/L	102	90.0 - 110	126179325
Chromium, Total	0.0507	0.05	mg/L	101	90.0 - 110	126179337
Chromium, Total	0.0515	0.05	mg/L	103	90.0 - 110	126179348
Chromium, Total	0.0504	0.05	mg/L	101	90.0 - 110	126179351
Copper, Total	0.0514	0.05	mg/L	103	90.0 - 110	126179247
Copper, Total	0.0496	0.05	mg/L	99.2	90.0 - 110	126179259
Copper, Total	0.0508	0.05	mg/L	102	90.0 - 110	126179271
Copper, Total	0.0492	0.05	mg/L	98.4	90.0 - 110	126179280
Copper, Total	0.0498	0.05	mg/L	99.6	90.0 - 110	126179292
Copper, Total	0.0529	0.05	mg/L	106	90.0 - 110	126179303
Copper, Total	0.0516	0.05	mg/L	103	90.0 - 110	126179315
Copper, Total	0.0507	0.05	mg/L	101	90.0 - 110	126179325
Copper, Total	0.0503	0.05	mg/L	101	90.0 - 110	126179337
Copper, Total	0.0516	0.05	mg/L	103	90.0 - 110	126179348
Lead, Total	0.0491	0.05	mg/L	98.2	90.0 - 110	126179259
Lead, Total	0.0498	0.05	mg/L	99.6	90.0 - 110	126179271
Lead, Total	0.0496	0.05	mg/L	99.2	90.0 - 110	126179280
Lead, Total	0.0491	0.05	mg/L	98.2	90.0 - 110	126179315
Lead, Total	0.0496	0.05	mg/L	99.2	90.0 - 110	126179325
Lead, Total	0.0497	0.05	mg/L	99.4	90.0 - 110	126179337
Lead, Total	0.0499	0.05	mg/L	99.8	90.0 - 110	126179348
Manganese, Total	0.051	0.05	mg/L	102	90.0 - 110	126179247
Manganese, Total	0.0496	0.05	mg/L	99.2	90.0 - 110	126179259
Manganese, Total	0.0501	0.05	mg/L	100	90.0 - 110	126179271
Manganese, Total	0.0503	0.05	mg/L	101	90.0 - 110	126179280
Manganese, Total	0.050	0.05	mg/L	100	90.0 - 110	126179315
Manganese, Total	0.0506	0.05	mg/L	101	90.0 - 110	126179325
Manganese, Total	0.0505	0.05	mg/L	101	90.0 - 110	126179337
Nickel, Total	0.0501	0.05	mg/L	100	90.0 - 110	126179259
Nickel, Total	0.0518	0.05	mg/L	104	90.0 - 110	126179271
Nickel, Total	0.0496	0.05	mg/L	99.2	90.0 - 110	126179280

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CCV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Nickel, Total	0.051	0.05	mg/L	102	90.0 - 110	126179315
Nickel, Total	0.0497	0.05	mg/L	99.4	90.0 - 110	126179325
Nickel, Total	0.0501	0.05	mg/L	100	90.0 - 110	126179337
Nickel, Total	0.0517	0.05	mg/L	103	90.0 - 110	126179348
Thallium, Total	0.049	0.05	mg/L	98.0	90.0 - 110	126179259
Thallium, Total	0.0493	0.05	mg/L	98.6	90.0 - 110	126179271
Thallium, Total	0.0478	0.05	mg/L	95.6	90.0 - 110	126179315
Thallium, Total	0.0489	0.05	mg/L	97.8	90.0 - 110	126179325
Thallium, Total	0.0482	0.05	mg/L	96.4	90.0 - 110	126179337
Zinc, Total	0.0533	0.05	mg/L	107	90.0 - 110	126179247
Zinc, Total	0.0487	0.05	mg/L	97.4	90.0 - 110	126179259
Zinc, Total	0.050	0.05	mg/L	100	90.0 - 110	126179271
Zinc, Total	0.0506	0.05	mg/L	101	90.0 - 110	126179315
Zinc, Total	0.0494	0.05	mg/L	98.8	90.0 - 110	126179325
Zinc, Total	0.0492	0.05	mg/L	98.4	90.0 - 110	126179337
Zinc, Total	0.0498	0.05	mg/L	99.6	90.0 - 110	126179348

ICV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Aluminum, Total	0.0507	0.05	mg/L	101	90.0 - 110	126179232
Barium, Total	0.0485	0.05	mg/L	97.0	90.0 - 110	126179232
Cadmium, Total	0.0492	0.05	mg/L	98.4	90.0 - 110	126179232
Chromium, Total	0.0497	0.05	mg/L	99.4	90.0 - 110	126179232
Copper, Total	0.049	0.05	mg/L	98.0	90.0 - 110	126179232
Lead, Total	0.0493	0.05	mg/L	98.6	90.0 - 110	126179232
Manganese, Total	0.0495	0.05	mg/L	99.0	90.0 - 110	126179232
Nickel, Total	0.050	0.05	mg/L	100	90.0 - 110	126179232
Thallium, Total	0.0488	0.05	mg/L	97.6	90.0 - 110	126179232
Zinc, Total	0.0491	0.05	mg/L	98.2	90.0 - 110	126179232

LCS Dup

Parameter	PrepSet	LCS	LCSD	Known	Limits%	LCS%	LCSD%	Units	RPD	Limit%
Aluminum, Total	1112480	0.510	0.514	0.500	85.0 - 115	102	103	mg/L	0.781	20.0
Arsenic, Total	1112480	0.497	0.491	0.500	85.0 - 115	99.4	98.2	mg/L	1.21	20.0
Barium, Total	1112480	0.499	0.502	0.500	85.0 - 115	99.8	100	mg/L	0.599	20.0
Cadmium, Total	1112480	0.242	0.242	0.250	85.0 - 115	96.8	96.8	mg/L	0	20.0
Chromium, Total	1112480	0.501	0.498	0.500	85.0 - 115	100	99.6	mg/L	0.601	20.0
Copper, Total	1112480	0.505	0.506	0.500	85.0 - 115	101	101	mg/L	0.198	20.0
Lead, Total	1112480	0.507	0.513	0.500	85.0 - 115	101	103	mg/L	1.18	20.0
Manganese, Total	1112480	0.498	0.495	0.500	85.0 - 115	99.6	99.0	mg/L	0.604	20.0
Nickel, Total	1112480	0.506	0.504	0.500	85.0 - 115	101	101	mg/L	0.396	20.0
Thallium, Total	1112480	0.501	0.510	0.500	85.0 - 115	100	102	mg/L	1.78	20.0
Zinc, Total	1112480	0.499	0.495	0.500	85.0 - 115	99.8	99.0	mg/L	0.805	20.0

MRL Check

Parameter	Reading	Known	Units	Recover%	Limits%	File
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MRL Check

Parameter	Reading	Known	Units	Recover%	Limits%	File
Lead, Total	0.000902	0.001	mg/L	90.2	25.0 - 175	126179234
Manganese, Total	0.000858	0.001	mg/L	85.8	25.0 - 175	126179234

MS

Parameter	Sample	MS	MSD	UNK	Known	Limits	MS%	MSD%	Units	RPD	Limit%
Barium, Total	2285896	0.513	0	0.286	0.500	70.0 - 130	45.4 *		mg/L		20.0

MSD

Parameter	Sample	MS	MSD	UNK	Known	Limits	MS%	MSD%	Units	RPD	Limit%
Aluminum, Total	2286469	1.40	1.47	0.907	0.500	70.0 - 130	98.6	113	mg/L	13.3	20.0
Arsenic, Total	2286469	0.508	0.518	0.0091	0.500	70.0 - 130	99.8	102	mg/L	1.98	20.0
Barium, Total	2286469	0.577	0.589	0.0799	0.500	70.0 - 130	99.4	102	mg/L	2.39	20.0
Cadmium, Total	2286469	0.242	0.247	ND	0.250	70.0 - 130	96.8	98.8	mg/L	2.04	20.0
Chromium, Total	2286469	0.500	0.511	0.00216	0.500	70.0 - 130	99.6	102	mg/L	2.19	20.0
Copper, Total	2286469	0.494	0.514	0.00234	0.500	70.0 - 130	98.3	102	mg/L	3.99	20.0
Lead, Total	2286469	0.498	0.513	0.000868	0.500	70.0 - 130	99.4	102	mg/L	2.97	20.0
Manganese, Total	2286469	0.506	0.530	0.0262	0.500	70.0 - 130	96.0	101	mg/L	4.88	20.0
Nickel, Total	2286469	0.499	0.513	0.007	0.500	70.0 - 130	98.4	101	mg/L	2.81	20.0
Thallium, Total	2286469	0.501	0.509	ND	0.500	70.0 - 130	100	102	mg/L	1.58	20.0
Zinc, Total	2286469	0.488	0.505	0.0321	0.500	70.0 - 130	91.2	94.6	mg/L	3.66	20.0
Zinc, Total	2286512	0.479	0.493	0.0012	0.500	70.0 - 130	95.6	98.4	mg/L	2.89	20.0

Analytical Set

1112703

EPA 200.7 4.4

Blank

Parameter	PrepSet	Reading	MDL	MDL	Units	File
Calcium	1112480	ND	0.0156	0.500	mg/L	126181134
Iron, Total	1112480	ND	0.00379	0.025	mg/L	126181134
Magnesium, Total	1112480	ND	0.00367	0.500	mg/L	126181134
Sodium	1112480	ND	0.0139	0.500	mg/L	126181134

CCV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Calcium	25.2	25.0	mg/L	101	90.0 - 110	126181123
Calcium	25.3	25.0	mg/L	101	90.0 - 110	126181133
Calcium	25.1	25.0	mg/L	100	90.0 - 110	126181143
Iron, Total	2.51	2.50	mg/L	100	90.0 - 110	126181123
Iron, Total	2.51	2.50	mg/L	100	90.0 - 110	126181133
Iron, Total	2.49	2.50	mg/L	99.6	90.0 - 110	126181143
Magnesium, Total	25.2	25.0	mg/L	101	90.0 - 110	126181123
Magnesium, Total	25.3	25.0	mg/L	101	90.0 - 110	126181133
Magnesium, Total	25.1	25.0	mg/L	100	90.0 - 110	126181143
Sodium	24.6	25.0	mg/L	98.4	90.0 - 110	126181123
Sodium	24.8	25.0	mg/L	99.2	90.0 - 110	126181133
Sodium	24.5	25.0	mg/L	98.0	90.0 - 110	126181143

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ICL

Parameter	Reading	Known	Units	Recover%	Limits%	File
Calcium	49.7	50.0	mg/L	99.4	95.0 - 105	126181117
Iron, Total	4.92	5.00	mg/L	98.4	95.0 - 105	126181117
Magnesium, Total	49.7	50.0	mg/L	99.4	95.0 - 105	126181117
Sodium	50.2	50.0	mg/L	100	95.0 - 105	126181117

ICV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Calcium	25.1	25.0	mg/L	100	90.0 - 110	126181121
Iron, Total	2.54	2.50	mg/L	102	90.0 - 110	126181121
Magnesium, Total	25.1	25.0	mg/L	100	90.0 - 110	126181121
Sodium	24.1	25.0	mg/L	96.4	90.0 - 110	126181121

LCS Dup

Parameter	PrepSet	LCS	LCSD	Known	Limits%	LCS%	LCSD%	Units	RPD	Limit%
Calcium	1112480	4.94	4.90	5.00	85.0 - 115	98.8	98.0	mg/L	0.813	25.0
Iron, Total	1112480	0.490	0.491	0.500	85.0 - 115	98.0	98.2	mg/L	0.204	25.0
Magnesium, Total	1112480	4.98	4.95	5.00	85.0 - 115	99.6	99.0	mg/L	0.604	25.0
Sodium	1112480	4.66	4.63	5.00	85.0 - 115	93.2	92.6	mg/L	0.646	25.0

LDR

Parameter	Reading	Known	Units	Recover%	Limits%	File
Calcium	97.2	100	mg/L	97.2	90.0 - 110	126181118
Iron, Total	9.72	10.0	mg/L	97.2	90.0 - 110	126181118
Magnesium, Total	100	100	mg/L	100	90.0 - 110	126181118
Sodium	107	100	mg/L	107	90.0 - 110	126181118

MRL Check

Parameter	Reading	Known	Units	Recover%	Limits%	File
Calcium	0.527	0.500	mg/L	105	25.0 - 175	126181122
Iron, Total	0.0336	0.050	mg/L	67.2	25.0 - 175	126181122
Magnesium, Total	0.531	0.500	mg/L	106	25.0 - 175	126181122
Sodium	0.513	0.500	mg/L	103	25.0 - 175	126181122

MSD

Parameter	Sample	MS	MSD	UNK	Known	Limits	MS%	MSD%	Units	RPD	Limit%
Calcium	2286469	35.2	35.4	30.8	5.00	75.0 - 125	88.0	92.0	mg/L	4.44	25.0
Iron, Total	2286469	3.77	3.84	3.34	0.500	75.0 - 125	86.0	100	mg/L	15.1	25.0
Magnesium, Total	2286469	8.83	8.93	4.30	5.00	75.0 - 125	90.6	92.6	mg/L	2.18	25.0
Sodium	2286469	120	121	116	5.00	75.0 - 125	80.0	100	mg/L	22.2	25.0

Analytical Set

1112870

EPA 200.8 5.4

Blank

Parameter	PrepSet	Reading	MDL	MQL	Units	File
Arsenic, Total	1112480	ND	0.00025	0.0005	mg/L	126184135
Beryllium, Total	1112480	ND	0.000605	0.0005	mg/L	126184135
Selenium, Total	1112480	ND	0.000728	0.002	mg/L	126184135

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CCV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Arsenic, Total	0.0501	0.05	mg/L	100	90.0 - 110	126184133
Arsenic, Total	0.0511	0.05	mg/L	102	90.0 - 110	126184143
Arsenic, Total	0.0498	0.05	mg/L	99.6	90.0 - 110	126184153
Arsenic, Total	0.0492	0.05	mg/L	98.4	90.0 - 110	126184164
Arsenic, Total	0.0475	0.05	mg/L	95.0	90.0 - 110	126184174
Arsenic, Total	0.0477	0.05	mg/L	95.4	90.0 - 110	126184184
Arsenic, Total	0.049	0.05	mg/L	98.0	90.0 - 110	126184195
Beryllium, Total	0.0476	0.05	mg/L	95.2	90.0 - 110	126184133
Beryllium, Total	0.0481	0.05	mg/L	96.2	90.0 - 110	126184143
Beryllium, Total	0.0514	0.05	mg/L	103	90.0 - 110	126184174
Beryllium, Total	0.0476	0.05	mg/L	95.2	90.0 - 110	126184184
Beryllium, Total	0.0513	0.05	mg/L	103	90.0 - 110	126184195
Selenium, Total	0.0523	0.05	mg/L	105	90.0 - 110	126184116
Selenium, Total	0.0506	0.05	mg/L	101	90.0 - 110	126184123
Selenium, Total	0.051	0.05	mg/L	102	90.0 - 110	126184133
Selenium, Total	0.0496	0.05	mg/L	99.2	90.0 - 110	126184143
Selenium, Total	0.0505	0.05	mg/L	101	90.0 - 110	126184153
Selenium, Total	0.052	0.05	mg/L	104	90.0 - 110	126184164
Selenium, Total	0.0492	0.05	mg/L	98.4	90.0 - 110	126184174
Selenium, Total	0.0475	0.05	mg/L	95.0	90.0 - 110	126184184
Selenium, Total	0.0492	0.05	mg/L	98.4	90.0 - 110	126184195

ICV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Arsenic, Total	0.0478	0.05	mg/L	95.6	90.0 - 110	126184111
Beryllium, Total	0.047	0.05	mg/L	94.0	90.0 - 110	126184111
Selenium, Total	0.0495	0.05	mg/L	99.0	90.0 - 110	126184111

LCS Dup

Parameter	PrepSet	LCS	LCSD	Known	Limits%	LCS%	LCSD%	Units	RPD	Limit%
Arsenic, Total	1112480	0.516	0.514	0.500	85.0 - 115	103	103	mg/L	0.388	20.0
Beryllium, Total	1112480	0.184	0.184	0.200	85.0 - 115	92.0	92.0	mg/L	0	20.0
Selenium, Total	1112480	0.521	0.520	0.500	85.0 - 115	104	104	mg/L	0.192	20.0

MSD

Parameter	Sample	MS	MSD	UNK	Known	Limits	MS%	MSD%	Units	RPD	Limit%
Arsenic, Total	2286469	0.510	0.518	0.00571	0.500	70.0 - 130	101	102	mg/L	1.57	20.0
Beryllium, Total	2286469	0.203	0.205	ND	0.200	70.0 - 130	102	102	mg/L	0.980	20.0
Selenium, Total	2286469	0.477	0.497	ND	0.500	70.0 - 130	95.4	99.4	mg/L	4.11	20.0

Analytical Set 1112926

SM 5310 C-2014

AWRL/LOQ C

Parameter	Reading	Known	Units	Recover%	Limits%	File
Total Organic Carbon	2.00	2.00	mg/L	100	50.0 - 150	126185814

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Parameter	PrepSet	Reading	MDL	MQL	Units	File
Total Organic Carbon	1112926	0.100	0.0168	0.500	mg/L	126185813
Total Organic Carbon	1112926	0.124	0.0168	0.500	mg/L	126185819
Total Organic Carbon	1112926	0.0913	0.0168	0.500	mg/L	126185843
Total Organic Carbon	1112926	0.0783	0.0168	0.500	mg/L	126185867

CCV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Total Organic Carbon	10.5	10.0	mg/L	105	90.0 - 110	126185810
Total Organic Carbon	9.73	10.0	mg/L	97.3	90.0 - 110	126185817
Total Organic Carbon	9.77	10.0	mg/L	97.7	90.0 - 110	126185831
Total Organic Carbon	9.78	10.0	mg/L	97.8	90.0 - 110	126185842
Total Organic Carbon	10.4	10.0	mg/L	104	90.0 - 110	126185855
Total Organic Carbon	10.5	10.0	mg/L	105	90.0 - 110	126185866

ICL

Parameter	Reading	Known	Units	Recover%	Limits%	File
Total Organic Carbon	20.3	20.0	mg/L	102	90.0 - 110	126185809
Total Organic Carbon	19.6	20.0	mg/L	98.0	90.0 - 110	126185816

ICV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Total Organic Carbon	10.6	10.0	mg/L	106	90.0 - 110	126185811
Total Organic Carbon	10.5	10.0	mg/L	105	90.0 - 110	126185818

LCS

Parameter	PrepSet	Reading	Known	Units	Recover%	Limits	File
Total Organic Carbon	1112926	5.36	5.00	mg/L	107	85.0 - 115	126185812
Total Organic Carbon	1112926	5.18	5.00	mg/L	104	85.0 - 115	126185815
Total Organic Carbon	1112926	5.24	5.00	mg/L	105	85.0 - 115	126185820
Total Organic Carbon	1112926	5.08	5.00	mg/L	102	85.0 - 115	126185844
Total Organic Carbon	1112926	5.14	5.00	mg/L	103	85.0 - 115	126185868

MSD

Parameter	Sample	MS	MSD	UNK	Known	Limits	MS%	MSD%	Units	RPD	Limit%
Total Organic Carbon	2286522	10.8	10.8	0.274	10.0	85.0 - 115	105	105	mg/L	0	20.0
Total Organic Carbon	2286523	10.8	10.7	0.204	10.0	85.0 - 115	106	105	mg/L	0.948	20.0
Total Organic Carbon	2286524	10.8	10.6	0.209	10.0	85.0 - 115	106	104	mg/L	1.91	20.0
Total Organic Carbon	2286525	11.5	11.2	0.438	10.0	85.0 - 115	111	108	mg/L	2.75	20.0

Standard

<i>Parameter</i>	<i>Sample</i>	<i>Reading</i>	<i>Known</i>	<i>Units</i>	<i>Recover%</i>	<i>Limits%</i>	<i>File</i>
Total Organic Carbon		51.8	50.0	mg/L	104	90.0 - 110	126185808

Analytical Set

1113266

EPA 200.8 5.4

Blank

Parameter	PrepSet	Reading	MDL	MQL	Units	File
Selenium, Total	1112480	0.00166	0.000728	0.002	mg/L	126193411

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Parameter	PrepSet	Reading	MDL	MQL	Units	File
Silver, Total	1112480	0.0000754	0.0000625	0.0002	mg/L	126193411

CCV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Silver, Total	0.049	0.05	mg/L	98.0	90.0 - 110	126193407
Silver, Total	0.0491	0.05	mg/L	98.2	90.0 - 110	126193416
Silver, Total	0.0492	0.05	mg/L	98.4	90.0 - 110	126193424
Silver, Total	0.0487	0.05	mg/L	97.4	90.0 - 110	126193432
Silver, Total	0.0504	0.05	mg/L	101	90.0 - 110	126193438
Silver, Total	0.0492	0.05	mg/L	98.4	90.0 - 110	126193447
Silver, Total	0.0501	0.05	mg/L	100	90.0 - 110	126193457
Silver, Total	0.0499	0.05	mg/L	99.8	90.0 - 110	126193464

ICV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Silver, Total	0.0498	0.05	mg/L	99.6	90.0 - 110	126193381

LCS Dup

Parameter	PrepSet	LCS	LCSD	Known	Limits%	LCS%	LCSD%	Units	RPD	Limit%
Selenium, Total	1112480	0.512	0.517	0.500	85.0 - 115	102	103	mg/L	0.972	20.0
Silver, Total	1112480	0.103	0.0997	0.100	85.0 - 115	103	99.7	mg/L	3.26	20.0

MSD

Parameter	Sample	MS	MSD	UNK	Known	Limits	MS%	MSD%	Units	RPD	Limit%
Selenium, Total	2286469	0.502	0.504	0.00199	0.500	70.0 - 130	100	100	mg/L	0.399	20.0
Silver, Total	2286469	0.0977	0.0984	0.000096	0.100	70.0 - 130	97.6	98.3	mg/L	0.715	20.0

Analytical Set

1115138

EPA 200.8 5.4

Blank

Parameter	PrepSet	Reading	MDL	MQL	Units	File
Antimony, Total	1114044	0.00091	0.000399	0.001	mg/L	126235172

CCV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Antimony, Total	0.0541	0.05	mg/L	108	90.0 - 110	126235171
Antimony, Total	0.0525	0.05	mg/L	105	90.0 - 110	126235180

ICV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Antimony, Total	0.0496	0.05	mg/L	99.2	90.0 - 110	126235157

LCS Dup

Parameter	PrepSet	LCS	LCSD	Known	Limits%	LCS%	LCSD%	Units	RPD	Limit%
Antimony, Total	1114044	0.561	0.573	0.500	85.0 - 115	112	115	mg/L	2.12	20.0

MSD

Parameter	Sample	MS	MSD	UNK	Known	Limits	MS%	MSD%	Units	RPD	Limit%
Antimony, Total	2289356	0.573	0.574	0.000656	0.500	70.0 - 130	114	115	mg/L	0.175	20.0

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Analytical Set

1114080

TX Method 1005

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Parameter	PrepSet	Reading	MDL	MQL	Units	File
C12 to C28 TPH (DRO)	1113139	6.78	0.193	1.00	mg/L	126210899
C28 to C36 TPH (ORO)	1113139	1.48	0.400	4.00	mg/L	126210899
C6 to C12 TPH (GRO)	1113139	ND	0.228	1.00	mg/L	126210899

CCV

Parameter	Reading	Known	Units	Recover%	Limits%	File
C12 to C28 TPH (DRO)	579	500	mg/L	116	70.0 - 130	126210898
C12 to C28 TPH (DRO)	620	500	mg/L	124	70.0 - 130	126210908
C12 to C28 TPH (DRO)	523	500	mg/L	105	70.0 - 130	126210909
C12 to C28 TPH (DRO)	533	500	mg/L	107	70.0 - 130	126210912
C6 to C12 TPH (GRO)	436	500	mg/L	87.2	70.0 - 130	126210898
C6 to C12 TPH (GRO)	442	500	mg/L	88.4	70.0 - 130	126210908
C6 to C12 TPH (GRO)	459	500	mg/L	91.8	70.0 - 130	126210909
C6 to C12 TPH (GRO)	396	500	mg/L	79.2	70.0 - 130	126210912

LCS Dup

Parameter	PrepSet	LCS	LCSD	Known	Limits%	LCS%	LCSD%	Units	RPD	Limit%
C12 to C28 TPH (DRO)	1113139	469	499	500	75.0 - 125	93.8	99.8	mg/L	6.20	20.0
C6 to C12 TPH (GRO)	1113139	380	375	500	75.0 - 125	76.0	75.0	mg/L	1.32	20.0

MSD

Parameter	Sample	MS	MSD	UNK	Known	Limits	MS%	MSD%	Units	RPD	Limit%
C12 to C28 TPH (DRO)	2286650	15.4	8.85	4.44	12.3	75.0 - 125	89.1	35.9 *	mg/L	85.2 *	20.0
C6 to C12 TPH (GRO)	2286650	8.12	7.69	1.47	12.3	75.0 - 125	54.1 *	50.6 *	mg/L	6.68	20.0

Surrogate

Parameter	Sample	Type	Reading	Known	Units	Recover%	Limits%	File
1-Chlorooctane (Surrogate)		CCV	198	250	mg/L	79.2	50.0 - 150	126210898
1-Chlorooctane (Surrogate)		CCV	221	250	mg/L	88.4	50.0 - 150	126210908
1-Chlorooctane (Surrogate)		CCV	259	250	mg/L	104	50.0 - 150	126210909
1-Chlorooctane (Surrogate)		CCV	261	250	mg/L	104	50.0 - 150	126210912
oTerphenyl (Surrogate)		CCV	205	250	mg/L	82.0	50.0 - 150	126210898
oTerphenyl (Surrogate)		CCV	232	250	mg/L	92.8	50.0 - 150	126210908
oTerphenyl (Surrogate)		CCV	250	250	mg/L	100	50.0 - 150	126210909
oTerphenyl (Surrogate)		CCV	260	250	mg/L	104	50.0 - 150	126210912
1-Chlorooctane (Surrogate)	1113139	Blank	23.8	25.0	mg/L	95.2	50.0 - 150	126210899
1-Chlorooctane (Surrogate)	1113139	LCS	25.4	25.0	mg/L	102	50.0 - 150	126210910
1-Chlorooctane (Surrogate)	1113139	LCS Dup	27.0	25.0	mg/L	108	50.0 - 150	126210911
oTerphenyl (Surrogate)	1113139	Blank	26.8	25.0	mg/L	107	50.0 - 150	126210899
oTerphenyl (Surrogate)	1113139	LCS	25.9	25.0	mg/L	104	50.0 - 150	126210910
oTerphenyl (Surrogate)	1113139	LCS Dup	27.7	25.0	mg/L	111	50.0 - 150	126210911
1-Chlorooctane (Surrogate)	2285970	Unknown	5.39	6.10	mg/L	88.4	50.0 - 150	126210905
oTerphenyl (Surrogate)	2285970	Unknown	6.56	6.10	mg/L	108	50.0 - 150	126210905
1-Chlorooctane (Surrogate)	2286650	MS	6.60	6.15	mg/L	107	50.0 - 150	126210903
1-Chlorooctane (Surrogate)	2286650	MSD	5.28	6.15	mg/L	85.9	50.0 - 150	126210904

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Surrogate

Parameter	Sample	Type	Reading	Known	Units	Recover%	Limits%	File
oTerphenyl (Surrogate)	2286650	MS	7.23	6.15	mg/L	118	50.0 - 150	126210903
oTerphenyl (Surrogate)	2286650	MSD	6.07	6.15	mg/L	98.7	50.0 - 150	126210904

Analytical Set

1112417

SM 2510 B-2011

Blank

Parameter	PrepSet	Reading	MDL	MQL	Units	File
Lab Spec. Conductance at 25 C	1112417	0.984			umhos/cm	126173731

Duplicate

Parameter	Sample	Result	Unknown	Unit	RPD	Limit%
Lab Spec. Conductance at 25 C	2285970	624	621	umhos/cm	0.482	20.0

ICV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Lab Spec. Conductance at 25 C	13300	12900	umhos/cm	103	90.0 - 110	126173734

Standard

Parameter	Sample	Reading	Known	Units	Recover%	Limits%	File
Lab Spec. Conductance at 25 C	1112417	1430	1410	umhos/cm	101	90.0 - 110	126173732
Lab Spec. Conductance at 25 C	1112417	101	100	umhos/cm	101	90.0 - 110	126173733
Lab Spec. Conductance at 25 C	1112417	1430	1410	umhos/cm	101	90.0 - 110	126173745

Analytical Set

1112430

SM 4500-H+ B-2011

Duplicate

Parameter	Sample	Result	Unknown	Unit	RPD	Limit%
Laboratory pH	2285970	8.50	8.50	SU	0	20.0
Laboratory pH	2286016	8.30	8.20	SU	1.21	20.0

Standard

Parameter	Sample	Reading	Known	Units	Recover%	Limits%	File
Laboratory pH	1112430	5.99	6.00	SU	99.8	90.0 - 110	126174082
Laboratory pH	1112430	7.93	8.00	SU	99.1	90.0 - 110	126174083
Laboratory pH	1112430	5.99	6.00	SU	99.8	90.0 - 110	126174095
Laboratory pH	1112430	7.92	8.00	SU	99.0	90.0 - 110	126174096
Laboratory pH	1112430	5.96	6.00	SU	99.3	90.0 - 110	126174108
Laboratory pH	1112430	7.91	8.00	SU	98.9	90.0 - 110	126174109

Analytical Set

1112630

SM 2120 B-2011

Blank

Parameter	PrepSet	Reading	MDL	MQL	Units	File
Color, True	1112630	ND	5.0	5.0	PtCo Units	126178968

Duplicate

Parameter	Sample	Result	Unknown	Unit	RPD	Limit%
Color, True	2285970	ND	ND	PtCo Units		20

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Analytical Set **1113045**

SM 2320 B-2011

Blank

Parameter	PrepSet	Reading	MDL	MQL	Units	File
Total Alkalinity (as CaCO ₃)	1113045	ND	1.00	1.00	mg/L	126187795

CCV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Total Alkalinity (as CaCO ₃)	25.5	25.0	mg/L	102	90.0 - 110	126187794
Total Alkalinity (as CaCO ₃)	25.0	25.0	mg/L	100	90.0 - 110	126187808
Total Alkalinity (as CaCO ₃)	27.0	25.0	mg/L	108	90.0 - 110	126187821

Duplicate

Parameter	Sample	Result	Unknown	Unit	RPD	Limit%
Total Alkalinity (as CaCO ₃)	2285944	416	414	mg/L	0.482	20.0
Total Alkalinity (as CaCO ₃)	2286157	1150	1150	mg/L	0	20.0

ICV

Parameter	Reading	Known	Units	Recover%	Limits%	File
Total Alkalinity (as CaCO ₃)	26.0	25.0	mg/L	104	90.0 - 110	126187793

Mat. Spike

Parameter	Sample	Spike	Unknown	Known	Units	Recovery %	Limits %	File
Total Alkalinity (as CaCO ₃)	2285944	440	414	25.0	mg/L	104	70.0 - 130	126187811
Total Alkalinity (as CaCO ₃)	2286157	1160	1150	25.0	mg/L	40.0	70.0 - 130	126187798

* Out RPD is Relative Percent Difference: $\frac{\text{abs}(r_1 - r_2)}{\text{mean}(r_1, r_2)} * 100\%$

Recovery% is Recovery Percent: $\frac{\text{result}}{\text{known}} * 100\%$

Blank - Method Blank (reagent water or other blank matrices that contains all reagents except standard(s) and is processed simultaneously with and under the same conditions as samples; carried through preparation and analytical procedures exactly like a sample; monitors); ICV - Initial Calibration Verification; CCB - Continuing Calibration Blank; CCV - Continuing Calibration Verification (same standard used to prepare the curve; typically a mid-range concentration; verifies the continued validity of the calibration curve); MSD - Matrix Spike Duplicate (replicate of the matrix spike; same solution and amount of target analyte added to the MS is added to a third aliquot of sample; quantifies matrix bias and precision.); LCS Dup - Laboratory Control Sample Duplicate (replicate LCS; analyzed when there is insufficient sample for duplicate or MSD; quantifies accuracy and precision.); AWRL/LOQ C - Ambient Water Reporting Limit/LOQ Check Std; MS - Matrix Spike (same solution and amount of target analyte added to the LCS is added to a second aliquot of sample; quantifies matrix bias.); MRL Check - Minimum Reporting Limit Check Std; LDR - Linear Dynamic Range Standard; LCS - Laboratory Control Sample (reagent water or other blank matrices that is spiked with a known quantity of target analyte(s) and carried through preparation and analytical procedures exactly like a sample; typically a mid-range concentration; verifies that bias and precision of the analytical process are within control limits; determines usability of the data.); Surrogate - Surrogate (mimics the analyte of interest but is unlikely to be found in environmental samples; added to analytical samples for QC purposes. **ANSI/ASQC E4 1994 Ref #4 TRADE QA Resources Guide.)

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PO Number 24-061 Pine Bliss/Blue Bonnet**Well 2***Hand Delivered by Client to Region or LAB***Matrix: Drinking Water**

Sampler Printed Name David Cantrell
Sampler Affiliation Lead Service Tech
Sampler Signature [Signature]
☐ Samples Radioactive? ☐ Samples Contain Dioxin? ☐ Samples Biological Hazard?

SPL Kilgore # (Lab Only)	Sample ID	Bottles	Date	Time	Notes
	<u>Pine Bliss Ranch Well #2</u>		<u>4/2/24</u>	<u>8:45</u>	

1 H₂SO₄ to pH <2 Amber Glass 250 mL w/Teflon lined lid
NELAC TOCL Total Organic Carbon SM 5310 C-2014 (28.0 days)

1 HNO₃ to pH <2 Polyethylene 500 mL for Metals
301L Liquid Metals Digestion EPA 200.2 2.8 (180 days)
NELAC *FeI Iron, Total EPA 200.7 4.4 CAS:7439-89-6 (180 days)
NELAC *MgI Magnesium, Total EPA 200.7 4.4 CAS:7439-95-4 (180 days)
NELAC *NaI Sodium EPA 200.7 4.4 CAS:7440-23-5 (180 days)
? *CaI Calcium EPA 200.7 4.4 CAS:7440-70-2 (180 days)
NELAC *AlM Aluminum, Total EPA 200.8 5.4 CAS:7429-90-5 (180 days)
NELAC *PbM Lead, Total EPA 200.8 5.4 CAS:7439-92-1 (180 days)
NELAC *MnM Manganese, Total EPA 200.8 5.4 CAS:7439-96-5 (180 days)

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Well 2

NELAC	*NiM	Nickel, Total	EPA 200.8 5.4 CAS:7440-02-0 (180 days)
NELAC	*AgM	Silver, Total	EPA 200.8 5.4 CAS:7440-22-4 (180 days)
NELAC	*TlM	Thallium, Total	EPA 200.8 5.4 CAS:7440-28-0 (180 days)
NELAC	*SbM	Antimony, Total	EPA 200.8 5.4 CAS:7440-36-0 (180 days)
NELAC	*AsM	Arsenic, Total	EPA 200.8 5.4 CAS:7440-38-2 (180 days)
NELAC	*BaM	Barium, Total	EPA 200.8 5.4 CAS:7440-39-3 (180 days)
NELAC	*BeM	Beryllium, Total	EPA 200.8 5.4 CAS:7440-41-7 (180 days)
NELAC	*CdM	Cadmium, Total	EPA 200.8 5.4 CAS:7440-43-9 (180 days)
NELAC	*CrM	Chromium, Total	EPA 200.8 5.4 CAS:7440-47-3 (180 days)
NELAC	*CuM	Copper, Total	EPA 200.8 5.4 CAS:7440-50-8 (180 days)
NELAC	*ZnM	Zinc, Total	EPA 200.8 5.4 CAS:7440-66-6 (180 days)
NELAC	*SeM	Selenium, Total	EPA 200.8 5.4 CAS:7782-49-2 (180 days)
NELAC	747L	Mercury Liquid Metals Digestion	EPA 245.1 3 (28.0 days)
NELAC	*Hg	Mercury, Total	EPA 245.1 3 CAS:7439-97-6 (28.0 days)
NELAC	THC	Total Hardness as CaCO ₃ -Ca/MgEq	SM 2340 B-2011

1	H2SO4 to pH <2 250 ml Polyethylene	
NELAC	INNL	Nitrate-Nitrite Nitrogen
		EPA 300.0 2.1 (28.0 days)

3	Amber Glass Liter w/Teflon lined lid	
Short Hold	TCol	Color, True
		SM 2120 B-2011 (2.00 days)

1	Polyethylene 1/2 gal (White)	
NELAC	Short Hold	INZW
		DW Nitrite-Nitrogen, Total
		EPA 300.0 2.1 (2.00 days)
NELAC		IBL
		Bromide
		EPA 300.0 2.1 (28.0 days)
NELAC		ICL
		Chloride
		EPA 300.0 2.1 (28.0 days)



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Well 2

NELAC	IFIL	Fluoride	EPA 300.0 2.1 (28.0 days)
NELAC	ISAL	Sulfate	EPA 300.0 2.1 (28.0 days)
NELAC	IN3W	DW Nitrate-Nitrogen Total	EPA 300.0 2.1 CAS:14797-55-8 (2.00 days)
2	AIKT	Total Alkalinity (as CaCO3)	SM 2320 B-2011 (14.0 days)
	LSI	Langelier Saturation Index @22C	SM 2330 B-1993 (14.0 days)
NELAC	CONL	Lab Spec. Conductance at 25 C	SM 2510 B-2011 (28.0 days)
NELAC	TDS	Total Dissolved Solids	SM 2540 C-2015 (7.00 days)
	HCO3	Bicarbonate (as CaCO3) / Calc	SM 4500-CO2 D-1997 (14.0 days)
	CO2	Carbon Dioxide / Calc	SM 4500-CO2 D-1997 (14.0 days)
	CO3	Carbonate (as CaCO3) / Calc	SM 4500-CO2 D-1997 (14.0 days)
	CO2F	Free Carbon Dioxide / Calc	SM 4500-CO2 D-1997 (14.0 days)
	OH	Hydroxide / Calc	SM 4500-CO2 D-1997 (30.0 days)
2	pHLL	Laboratory pH	SM 4500-H+ B-2011
	3	HCl to pH < 125 glass (ZHE)	
2	ITPE	Texas1005 TPH Expansion - C36	TX Method 1005 (7.00 days)
	1	NaOH to pH > 12 Polyethylene 250 mL/amber	
NELAC	CN	Cyanide, total	SM 4500-CN E-2016 (14.0 days)



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Well 2

Date	Time	Requisitioned	Date	Time	Received
4/2/24	1035	Printed Name <u>David Caldwell</u> Affiliation			Printed Name <u>Rayshawn Thompson SPL Lab</u> Affiliation
		Signature			Signature <u>[Signature]</u>
		Printed Name Affiliation			Printed Name Affiliation
		Signature			Signature
		Printed Name Affiliation			Printed Name Affiliation
		Signature			Signature
		Printed Name Affiliation			Printed Name Affiliation
		Signature			Signature

Sample Received on Ice?

☒ Yes

☐ No

Cooler/Sample Secure?

☒ Yes

☐ No

If Shipped: Tracking Number & Temp - See Attached

The accredited column designates accreditation by A - A2LA, N - NELAP, or Z - not listed under scope of accreditation. Unless otherwise specified, SPL Kilgore shall provide these ordered services pursuant to our Standard Terms & Conditions Agreement (available for download from the welcome page at <<http://www.ana-lab.com>>). Ana-Lab personnel collect samples as specified by SPL Kilgore SOP #000323.

Comments

4/2 1035 RT
Date Time Tech
Temp: 5.0 / 5.2 C
Therm#: 6444 Corr Fact: 0.2 C

1. SAMPLES MUST BE STORED AT THE FOLLOWING TEMPERATURES: -20°C TO -80°C