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Wheeler River Project

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WHEELER RIVER PROJECT BASELINE GEOLOGY AND HYDROGEOLOGY

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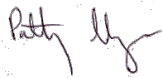
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WHEELER RIVER PROJECT BASELINE GEOLOGY AND HYDROGEOLOGY



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EXECUTIVE SUMMARY

The objective of the information presented in this report was to develop a geological and hydrogeological conceptual site model (CSM) for the Wheeler River Project. The development of the CSM has relied on an extensive data set of geological, hydrogeological, hydrochemical and geochemical information developed for the Project through drilling activities to date, and on similar information from regional studies. The following are the components of the CSM that establish the geology in the Project area and the existing (baseline) groundwater flow and quality conditions.

Geology

The Wheeler River uranium deposit is located on the eastern margin of the Athabasca Basin of northern Saskatchewan. Like other uranium deposits on the eastern portion of the Basin, the Phoenix deposit is located at the base of the sandstones and conglomerates of the Athabasca Supergroup, just above the unconformity with the underlying metasedimentary gneisses and other basement rocks of the Wollaston Supergroup.

The Phoenix ore bodies are long and narrow (approximately 25-50 m wide) and directly overlie or are near a graphitic pelite unit. The ore bodies are associated with a reverse fault, termed the WS Shear, that has a 55-degree (northeast to southwest) azimuth, and a 55-degree dip to the southeast. Faults within the basement rocks trend in a similar northeast-southwest direction as the WS Shear Zone and are well defined in the basement rocks. There are also several west-east trending cross-faults that lie roughly perpendicular to the WS Shear zone that propagate through the ore zone and basement rocks. These faults and fracture systems play an important role in groundwater flow and the evolution of geochemical signatures.

The Phoenix deposit is overlain and underlain by a natural barrier unit or halo that has limited the release or subsurface migration of uranium, and other chemical constituents associated with the mineralization in the deposit, outside of the ore body itself. This natural barrier zone has limited the migration of chemical constituents in groundwater for more than 1 billion years.

The Athabasca Supergroup sandstones are subdivided into the Manitou Falls Group that consist of coarse-to fine-grained hematite-rich conglomerates that lie along thin stratigraphic horizons and silty sandstones. The Athabasca Supergroup sandstones consist almost entirely of quartz, and any detrital feldspar that was present was altered to clay minerals, such as kaolinite and illite, during the 200-million-year long period of diagenesis that occurred in the Basin.

Some portions of the Manitou Falls Group were silicified during diagenesis whereby quartz cement sealed the sandstone's primary porosity and effectively reduced the groundwater flow through the matrix of the sandstone, and made it prone to brittle fracturing. Other areas of the Manitou Falls Group, particularly the sandstones above the WS Shear Zone and associated splays, underwent hydrothermal alteration and desilicification of the sandstone. This alteration is interpreted to increase the porosity and permeability of the sandstones in these areas. In

addition to alteration, the sandstones have also been faulted and fractured, which also affects the movement of groundwater through these units. Faults in the sandstone represent reactivated brittle basement faults along the northeast-southwest trending WS shear zone, or responses to volume adjustments in the sandstone during hydrothermal alteration and mineralization.

Hydrogeology

The primary hydrogeological units which influence groundwater flow within the Basin include:

- Upper overburden unit defining the water table and upper shallow groundwater flow system.
- Athabasca Sandstone Supergroup subdivided into 3 units including upper and lower aquifers, separated by an intervening aquitard zone.
- Basement rocks subdivided into an upper weathered (Paleoweathered) and underlying competent basement aquitard.

Two groundwater flow regimes were identified in the local basin stratigraphy. The uppermost flow system is unconfined and includes groundwater flow through the overburden and Upper Sandstone Aquifer. The lower semi-regional system is confined by the Intermediate Sandstone Aquitard, and includes flow through the Lower Sandstone Aquifer, and locally, in the Ore Zone Aquifer.

Horizontal groundwater flow in the deeper semi-regional flow system is generally directed from the west to the east and southeast, as interpreted by water level observations and groundwater chemistry. Groundwater flow within the Overburden and Upper Sandstone Aquifer is influenced by ground surface topography and surface water features. Flow in this upper groundwater flow regime is derived from recharge in the local area, whereas groundwater flow within the semi-regional groundwater flow system is derived from a combination of regional groundwater flow from upgradient sources, and vertical flow through the Intermediate Sandstone Aquitard. Vertical gradients are interpreted to be directed downward in areas west of the Phoenix deposit, and upward beneath the surrounding surface water bodies, including Whitefish and Williams Lakes.

Local to the Phoenix deposit, shallow groundwater in the overburden and the Upper Sandstone Aquifer is conceptualized to discharge into Whitefish Lake, which is located approximately 500 m east of the deposit. The water level elevations observed between the Phoenix deposit and the lake exhibit lateral gradients toward the lake and upward hydraulic gradients from the Lower Sandstone Aquifer (and Ore Zone) into Whitefish Lake through the Desilicified Zone in the Intermediate Sandstone Aquitard. It is interpreted that the elevated hydraulic conductivity value represented by the Desilicified Zone creates a preferential pathway for water to discharge into Whitefish Lake, rather than continuing to stay in the Lower Sandstone Aquifer and discharge to Russell Lake. This conclusion is also supported by streamflow measurements, that suggest that local groundwater discharge is sustaining streamflow to Whitefish Lake and other lakes in the study area, even in low precipitation periods.

Groundwater Quality

Groundwater was collected from each of the hydrostratigraphic units at the site. The groundwater is characterized by low mineralization. Concentrations of radiological and several other dissolved constituents in groundwater associated with the uranium deposit in the Phoenix study area are generally orders of magnitude lower in overlying hydrostratigraphic units and surface water than they are in the ore zone groundwater samples. This is evidence of the very low mass flux of those constituents from the Ore zone and discontinuous barrier zone aquitard that envelopes the ore zone.

The measured groundwater chemistry supports the presence of a Local Flow System, an Intermediate Sandstone Aquitard and a Lower Sandstone Aquifer in the study area. The chemistry of the groundwater in the Local Flow system is that of recharge water that is of relatively low pH, from contact with organic matter in the upper soil profile, and that has become mineralized through dissolution of quartz, feldspars, kaolinite and illite.

The chemistry of groundwater in the Intermediate Sandstone Aquitard is similar in terms of major ion composition to that of the Local Flow System, but a longer residence time in the aquitard of similar mineralogical composition to the overlying bedrock and sediments has led to more mineralization of the water, but without a change in overall hydrochemical type. Higher relative variability in the groundwater chemistry sampled from monitoring wells in the Intermediate Sandstone Aquitard may reflect the localized influence of desilicification on the flow conditions, and consequently on groundwater conditions, in a subset of these wells.

The Lower Sandstone Aquifer is characterized spatially by two types of groundwater. The first groundwater type is most similar to that observed in the Local Flow System. This is suggested to reflect hydraulically active fractures and fault systems that allow fresh recharge water to penetrate and mix with deeper waters in the Lower Aquifer. The second type of groundwater was within the zone of thermal alteration around the ore zone and has a relatively high degree of mineralization, thought to be a result of dissolution of remnant halide salts present on grain boundaries and in intragranular pores within the rock matrix at depth in the Athabasca Sandstones.

Groundwater quality results suggest that connectivity between the Upper Sandstone Aquifer and Intermediate Aquifer is limited. Again, desilicification of these Formations to the northeast of the Ore zone may affect this interaction on a localized scale. Further, although limited in number of samples available, groundwater quality in the Paleoweathered zone suggests a distinct geochemical environment in groundwater from that of the overlying Athabasca Supergroup sandstones.

Summary

The geological, hydrological, mineralogical, geochemical and hydrochemistry information collected to date for the study area provides a good baseline to understand potential changes

to the groundwater environment, during mining operations and post closure. The information has been integrated into a graphical CSM in this report.

TABLE OF CONTENTS

- 1.0 INTRODUCTION..... 1.1**
 - 1.1 Background and Study Objectives..... 1.1**
 - 1.2 Goal of the Conceptual Site Model..... 1.3**

- 2.0 PHYSICAL ENVIRONMENT 2.1**
 - 2.1 Topography 2.1**
 - 2.2 Surface Water Features 2.1**
 - 2.3 Geology/Stratigraphy..... 2.2**
 - 2.3.1 Basement Rock.....2.2
 - 2.3.2 Unconformity and Paleoweathered Basement Rocks.....2.3
 - 2.3.3 Uranium Ore Deposit (including Discontinuous Envelope of Clay and Sulphide-Cemented Rock) 2.4
 - 2.3.4 Athabasca Supergroup Sandstones and Conglomerates.....2.5
 - 2.3.5 Overburden.....2.7
 - 2.4 Structural Geology; Faulting and Fracturing 2.8**

- 3.0 HYDROGEOLOGICAL SETTING 3.1**
 - 3.1 Monitoring Activities..... 3.1**
 - 3.1.1 Surface Water Hydrology 3.1
 - 3.1.2 Groundwater Monitoring Network..... 3.1
 - 3.2 Data Sources 3.3**
 - 3.3 Hydrostratigraphic Units 3.4**
 - 3.3.1 Methodology Used to Characterize Hydrostratigraphic Units3.4
 - 3.4 Hydrostratigraphic Units and their Hydraulic Conductivity Values 3.6**
 - 3.4.1 Overburden Aquifer.....3.7
 - 3.4.2 Upper Sandstone Aquifer3.8
 - 3.4.3 Intermediate Sandstone Aquitard3.8
 - 3.4.4 Desilicified Zone.....3.8
 - 3.4.5 Lower Sandstone Aquifer.....3.9
 - 3.4.6 Upper and Lower Barrier Zone Aquitard (Clay Zones and Sulphide-Cemented Rock Zone) 3.9
 - 3.4.7 Ore Zone Aquifer 3.10
 - 3.4.8 Basement Aquitard 3.10
 - 3.5 Additional Hydraulic Properties..... 3.11**
 - 3.5.1 Anisotropy..... 3.11
 - 3.5.2 Porosity 3.11
 - 3.5.3 Storage 3.12
 - 3.6 Groundwater Flow Systems 3.12**
 - 3.6.1 Local Flow System: Overburden and Upper Sandstone Aquifers 3.13
 - 3.6.2 Semi-Regional Flow System: Lower Sandstone Aquifer..... 3.13

3.6.3 Water Level Variability 3.14

3.7 Vertical Gradients 3.14

3.7.1 Groundwater – Surface Water Interaction 3.16

3.7.2 Groundwater Recharge..... 3.17

3.8 Hydraulic Influence of Fault Zones and Drill Holes 3.18

3.8.1 Fault Zones 3.18

3.8.2 Exploration Boreholes..... 3.20

3.9 Groundwater Demand..... 3.20

4.0 GROUNDWATER CHEMISTRY 4.1

4.1 Groundwater Monitoring Network and Database..... 4.1

4.1.1 Athabasca Supergroup Sandstones 4.1

4.1.2 Ore Zone and Basement Rock Units 4.1

4.1.3 Sampling Programs 4.2

4.2 Analytical Results Overview..... 4.2

4.2.1 Constituent Groupings 4.8

4.2.2 Groundwater Ageing: Tritium Values 4.8

4.3 Interpretation of Hydrochemistry 4.11

4.3.1 Mineralogy and Solid-Phase Elemental Distribution 4.11

4.3.2 Regional Supporting Information..... 4.14

4.3.3 Hydrochemistry by Hydrostratigraphic Unit 4.14

4.4 Summary..... 4.22

5.0 CONCEPTUAL SITE MODEL SUMMARY..... 5.1

5.1 Physical Geography 5.1

5.2 Geological Setting..... 5.1

5.2.1 Overburden..... 5.2

5.2.2 Athabasca Supergroup Sandstones and Conglomerates..... 5.2

5.2.3 Basement Rock..... 5.3

5.3 Hydrogeological Framework..... 5.3

5.3.1 Groundwater Flow Systems..... 5.4

5.3.2 Aquifer Properties 5.5

5.3.3 Groundwater Recharge and Discharge..... 5.6

5.3.4 Faults, Fractures, Vertical Pathways..... 5.6

5.3.5 Baseline Groundwater Geochemistry 5.7

5.4 Links to Other Studies 5.8

6.0 STATEMENT OF LIMITATIONS 6.1

7.0 REFERENCES 7.1

APPENDIX A BOREHOLE LOGS..... A.1

APPENDIX B MONITORING WELL HYDROGRAPHS.....B.1

**APPENDIX C SUMMARY OF HYDRAULIC TESTING DATA AND CONDUCTIVITY
VALUESC.1**

**APPENDIX D 2020 HYDRAULIC TESTING ANALYSIS; WELLS GWR-033 TO GWR-037
..... D.1**

APPENDIX E CROSS-SECTIONS GENERATED IN THE PHOENIX AREA E.1

APPENDIX F GROUNDWATER SAMPLING METHODOLOGY F.1

APPENDIX G GROUNDWATER SAMPLING FIELD SHEETS G.1

APPENDIX H ANALYTICAL REPORTS AND QA/QC H.1

APPENDIX I GROUNDWATER QUALITY AND DRINKING WATER GUIDELINESI.1

APPENDIX J SUPPLEMENTAL WATER QUALITY DATA..... J.1

APPENDIX K GEOMECHANICAL REPORT (EXTERNAL REPORT; RESPEC, 2024)K.1

APPENDIX L ANALYSIS OF TRITIUM IN GROUNDWATER..... L.1

LIST OF TABLES

Table 2-1: Athabasca Supergroup Sandstone Formations and Lithofacies Descriptions.....	2.5
Table 3-1: Monitoring Well Completion Details.....	3.2
Table 3-2: Hydrostratigraphic Units beneath Phoenix.....	3.5
Table 3-3: Combinations of Lithologic and Geotechnical Parameters that Influence Hydraulic Conductivity Values in Fractured Bedrock.....	3.6
Table 3-4: Summary of Hydrostratigraphic Unit Properties	3.7
Table 3-5: Vertical Gradients in Nested Wells.....	3.15
Table 4-1: Groundwater Water Monitoring Results.....	4.4
Table 4-2: Summary Statistics, Groundwater and Surface Water Quality, Wheeler River Project	4.9
Table 4-3: Mineralogy by Unit.....	4.12
Table 4-4: Solid-Phase Elemental Concentrations.....	4.13
Table 5-1: Hydrostratigraphic Units at Phoenix.....	5.4
Table 5-2: Summary of Hydrostratigraphic Unit Properties	5.5

LIST OF FIGURES

FIGURE 1	GROUND SURFACE TOPOGRAPHY AND SURFACE WATER FEATURES
FIGURE 2	PROJECT STUDIES AND KEY REPORTS
FIGURE 3	BASEMENT LITHOLOGIES AND STRUCTURAL FEATURES
FIGURE 4	SURFICIAL GEOLOGY
FIGURE 5	INTERPRETED BEDROCK RESISTIVITY ANOMALIES (AND INTERPRETED ALTERATION ZONE)
FIGURE 6	MONITORING WELL AND BOREHOLE LOCATIONS
FIGURE 7	LOCATIONS OF CROSS-SECTIONS GENERATED AND INTERPRETED
FIGURE 8	EXAMPLE CROSS-SECTION ILLUSTRATING BOREHOLE LITHOLOGY AND INTERPRETED LITHOLOGIC SURFACES
FIGURE 9	EXAMPLE CROSS-SECTION ILLUSTRATING FRACTURE FREQUENCY
FIGURE 10	EXAMPLE CROSS-SECTION ILLUSTRATING ROCK FRIABILITY
FIGURE 11	EXAMPLE CROSS-SECTION ILLUSTRATING NORMATIVE CLAY CONTENT AND TEMPERATURE
FIGURE 12	EXAMPLE CROSS-SECTION ILLUSTRATING RQD PERCENTAGE
FIGURE 13	EXAMPLE CROSS-SECTION ILLUSTRATING PERCENTAGE CORE RECOVERY
FIGURE 14	EXAMPLE CROSS-SECTION ILLUSTRATING INTERPRETED HYDROSTRATIGRAPHIC UNITS (AQUIFERS/ AQUITARDS)
FIGURE 15	OBSERVED WATER LEVEL ELEVATIONS IN OPEN HOLES
FIGURE 16	OBSERVED WATER LEVEL ELEVATIONS IN OVERBURDEN AND UPPER SANDSTONE AQUIFER
FIGURE 17	OBSERVED WATER LEVEL ELEVATIONS IN LOWER SANDSTONE AQUIFER

FIGURE 18	WHEELER RIVER MEAN MONTHLY DISCHARGE (2011 TO 2018)
FIGURE 19	REGIONAL GROUNDWATER MONITORING WELL CLUSTERS
FIGURE 20	URANIUM AND SELECT PARAMETER CONCENTRATION IN GROUNDWATER, SPATIAL ASSESSMENT
FIGURE 21	DISTRIBUTION OF SOLID-PHASE URANIUM CONCENTRATIONS (PPM) IN THE SUBSURFACE
FIGURE 22	DISTRIBUTION OF SELECT ELEMENTAL CONCENTRATIONS (PPM) IN THE SUBSURFACE
FIGURE 23	SPECIFIC CONDUCTANCE IN GROUNDWATER WITH ELEVATION OF WELL SCREENED INTERVAL
FIGURE 24	GROUNDWATER MAJOR ION COMPOSITION (A); SELECT HYDROSTRATIGRAPHIC UNITS
FIGURE 25	GROUNDWATER MAJOR ION COMPOSITION (B); SELECT HYDROSTRATIGRAPHIC UNITS
FIGURE 26	HYDROCHEMICAL TYPE: GROUNDWATERS FOR THE WHEELER RIVER PROJECT
FIGURE 27	HYDROCHEMICAL TYPE: GROUNDWATERS FOR THE WHEELER RIVER, CIGAR LAKE AND MILLENNIUM PROJECTS
FIGURE 28	HYDROCHEMICAL TYPE: SELECT LOCAL FLOW SYSTEM SAMPLES AND SURFACE WATER SAMPLES
FIGURE 29	SUMMARY CONCEPTUAL SITE MODEL FOR THE PHOENIX AREA

1.0 INTRODUCTION

1.1 Background and Study Objectives

The Wheeler River Project proposes the development of the high-grade Phoenix uranium deposit as an in situ recovery (ISR) mining operation with on-site processing. Denison Mines Corp. (Denison) is the operator of the Wheeler River Joint Venture and holds a 90% interest (directly or through its subsidiaries). JCU (Canada) Exploration Company Ltd. owns the remaining 10% of the joint venture. The Project is located approximately 35 km north-northeast of Cameco's Key Lake Operation and 35 km southwest of Cameco's McArthur River Operation in the eastern portion of the Athabasca Basin region in northern Saskatchewan (see Figure 1).

For the project to advance, Denison must obtain federal and provincial approval of the Wheeler River Environmental Assessment (EA).

This Baseline Geology and Hydrogeology Report has been prepared as part of the Environmental Impact Statement (EIS) submission. The objective of the Geology and Hydrogeology Assessment within the Wheeler River Project EA is to identify and evaluate potential influences of mining and post-mining on the geological and hydrogeological system and nearby surface water features.

The Geology and Hydrogeology Assessment EIS scope is composed of five primary components, presented in Figure 2, and outlined as follows:

- Technical review and evaluation of available data and data inputs;
- Preparation of a Baseline Geology and Hydrogeology Report (this report) through a technical review and summary of existing geological and hydrogeological data, including the development of a hydrogeological Conceptual Site Model (CSM);
- Development of a 3-D hydrogeological model for groundwater flow modelling of baseline conditions and conditions over the life of mine, and to model chemical transport in Post-Decommissioning;
- Development of a Groundwater Monitoring Plan over the life of mine; and
- Preparation of the Geology and Groundwater section within the EIS.

The Baseline Geology and Hydrogeological Report builds on the Phoenix deposit geological model developed by Denison (Denison, 2022a), which uses geological and numeric modelling functionalities in Leapfrog Geo™ 2021.2. The model includes lithology, structure and alteration models from field data collected over more than 16 years of exploration activities.

The outcome of this report is the development of a robust CSM that will help inform the development of a numerical groundwater flow and transport model and the design of associated field programs, including the Groundwater Monitoring Plan. The Groundwater Monitoring Plan will be developed based on the outcomes and the results of the numerical

groundwater flow model. Groundwater monitoring will be designed to demonstrate compliance with regulations and predictions, and to monitor for any changes in groundwater conditions during operations relative to current baseline conditions.

This Baseline Geology and Hydrogeology Report outlines the key geological and hydrogeological feature associated with the study area. These include:

Hydrology: The study area lies within the within the southern portion of the Icelander River drainage area of the Wheeler River watershed, which is part of the Churchill River Basin. The general surface water flow direction is from the north toward the south. All surface water in the area drains toward Russell Lake, which is located about 6 km south of the Phoenix deposit.

Regional and Site Geology: Several areas of uranium mineralization amenable to in situ recovery (ISR) have been defined on the Wheeler River Property. The Phoenix deposit is the focus of this project, and it is geologically situated at or immediately above the unconformity between the Athabasca Basin sandstone and underlying older basement rocks, approximately 400 metres below surface.

Structure, Alteration and Mineralization: Regional structural trend(s), alteration and faulting were evaluated using lithologic and geotechnical data collected from vertical and oriented drill core across the Phoenix deposit area. Alterations and mineralization were examined where their presence was interpreted to alter the local groundwater flow directions, gradients, or groundwater quality.

Hydrostratigraphic Framework: Major hydrostratigraphic units were interpreted based on regional information and interpretations of hydraulic tests conducted in the study area. This included interpreted stratigraphy/lithology, structural geology, groundwater flow direction(s) including variability in flow directions, existence of preferential flow paths (both natural and manmade), estimated hydraulic conductivity values, and horizontal and vertical gradients. The major hydrostratigraphic units identified include overburden aquifer, upper Athabasca sandstone aquifer, intermediate sandstone aquitard, lower sandstone aquifer, a barrier zone aquitard overlying and underlying the ore zone, the ore zone, the paleoweathered zone of the underlying basement rock, and, lowermost, the basement aquitard. Information from field testing included pumping tests, field packer tests, resistivity geophysical surveys, as well as laboratory permeability tests were used alongside geotechnical drill hole data to understand the hydrogeological and geological stratigraphy of the study area. Further, the recharge and potential discharge areas were interpreted with emphasis on downgradient receptors and sensitive surface water bodies.

Factors Affecting Groundwater Flow Conditions: Several factors affect groundwater flow including the position of open hole drill holes, faults or fractures, recharge zones and hydraulic stresses, other non-mine related water takers, climate and precipitation, amongst others.

Baseline Groundwater Geochemical Conditions: The geochemical evaluation was used to document groundwater quality prior to mining operations. Results to date have indicated that groundwater quality is typical of that observed in other studies across the Athabasca Basin.

1.2 Goal of the Conceptual Site Model

A conceptual site model was prepared as part of this Baseline Geology and Hydrogeology Report to present the relevant geological, hydrogeological framework, surface water features and chemical distributions. Development of the conceptual model included the characterization of; a) spatial extent of key aquifers and aquitards based on the extensive geological model and data inputs; b) groundwater recharge and discharge areas; c) groundwater flow directions and gradients within and between key aquifers d) sensitive surface water receptors, and e) baseline groundwater constituent concentrations, evolution and chemical spatial distributions. The model also considers open boreholes, faults and fractures, alteration zones, hydraulic stresses, and non-mine related water takings.

A conceptual hydrogeological model is a descriptive summary, which may be accompanied by a graphical representation of the hydrogeological framework that describes the groundwater flow system(s). The conceptual model must retain sufficient complexity so that the actual components of the groundwater flow system are adequately described. Ultimately, the conceptual site model informs the development of the numerical groundwater model and groundwater monitoring plans which are used to assess the potential changes to the hydrologic systems from activities during the pre, operation and post operational mining periods. Specifically, the development of the CSM will facilitate evaluation of:

- groundwater flow in the vicinity of the planned mine;
- potential locations of groundwater wells to supply water for mining activities;
- potential groundwater pathways from the mine chamber toward potential receptors;
- field operation and site monitoring, groundwater monitoring plans;
- mine waste disposal options; and
- future risk assessment and risk management plans.

The linkages between the various studies and the final outcomes are illustrated on Figure 2.

The following sections describe the conceptual understanding of the current physical environment, and hydrogeologic setting present in the study area (Figure 2). This sets the foundation for comparison or predictions of future changes to groundwater conditions that are expected during mining and following mine closure. While the conceptual understanding may evolve as new data are collected, there is a strong scientific basis for the conceptual site model developed and presented in this report.

2.0 PHYSICAL ENVIRONMENT

The Phoenix uranium deposit lies in northern Saskatchewan in the southeastern reaches of the Athabasca Basin. The deposit is located approximately 400 m below ground surface at the unconformable contact between Athabasca Supergroup sandstones and underlying Canadian Shield basement rocks. The following sections describe the ground surface topography, surface water features and geology of the area.

2.1 Topography

Ground surface topography has been shaped by glacial and fluvial processes active in the area for tens of thousands of years. The most important topographic features in the study area are northeast to southwest trending drumlins and eskers, with lowland areas consisting of well drained glaciofluvial outwash sands and gravels, and poorly drained till plains with associated muskeg/ wetlands. Ground surface varies from a high of approximately 600 metres above sea level (m asl) on a topographic high located between the Phoenix and Gryphon deposits, to a low of 494 m asl at McGowan Lake in the southeast (Figure 1). Ground surface topography overlying the Phoenix deposit, as noted on a local digital elevation model, ranges from 520 to 550 m asl.

2.2 Surface Water Features

Surface water features such as rivers, streams, wetlands, and lakes can act as features that recharge the underlying groundwater flow system, or as a local or regional groundwater discharge features and can be important features in a hydrogeologic conceptual model.

The Phoenix deposit lies within the southern portion of the Icelander River drainage area of the Wheeler River watershed, which is part of the Churchill River Basin. The general surface water flow direction is from the north toward the south. All surface water in the area drains toward Russell Lake, which is located about 6 km south of the Phoenix deposit. Ecometrix (2020a) developed a baseline hydrology description for the area surrounding the Phoenix deposit. Over the entire monitoring program (2011 to 2018), lake and pond surface water elevations ranged from 520 m asl in the Icelander River drainage area headwater (Kratchkowsky Lake) to 488 m asl at Russell Lake.

The Russell Lake Water Survey of Canada hydrometric station (06DA005) is the only hydrometric station located within the area, and the station lies downstream of Russell Lake approximately 25 km east of the Phoenix deposit. The annual average monthly discharge from 2011 to 2018 was approximately 15 m³/s, and it drains a catchment of 3,030 square kilometres (km²; Ecometrix, 2020a).

Local to the Phoenix deposit, groundwater is conceptualized to discharge into Whitefish Lake, which is located approximately 500 m east of the deposit and has a lake level of approximately 500 m asl (Ecometrix, 2020a). Other major lakes in the area include Kratchkowsky Lake and Williams Lake, located west of the Phoenix deposit, which have lake levels of 520 and 518 m asl, respectively (Figure 1). McGowan Lake, located southeast of

Whitefish Lake and 2 km from the deposit, has a lake elevation of 494 m asl (6 m lower than Whitefish).

Discharge to streamflow as recorded in streamflow stations located along the streams and rivers located east of the Phoenix deposit were measured to be consistently increasing from above Whitefish Lake to below McGowan Lake (Ecometrix, 2020a). Similarly, discharge to streamflow as recorded in stations along the drainage west of the Phoenix deposit were also measured to increase. Low flow discharge per unit area is estimated to be approximately 125 mm/yr. This indicates that local groundwater discharge is sustaining streamflow even in low precipitation periods.

2.3 Geology/Stratigraphy

The Phoenix uranium deposit is located on the eastern margin of the Athabasca Basin of northern Saskatchewan. Like other uranium deposits on the eastern portion of the Basin, the uranium deposits are located at the unconformity between sandstones and conglomerates of the Athabasca Supergroup, and the underlying metasedimentary gneisses and other basement rocks of the Wollaston Supergroup.

Understanding the geologic history from a regional and local scale provides a foundation for the development of a conceptual hydrostratigraphic model. Through review of other uranium mines in the area, the geologic units present in Phoenix deposit closely resemble those present at Cigar Lake. Both ore deposits are present at the contact between the Canadian Shield basement rock and overlying Athabasca Supergroup sandstones. In both places, the ore deposit is overlain by a natural barrier unit or halo comprised of clays and sulphide-cemented rock that represent important hydraulic and geochemical control zones that have reduced, but not eliminated the release or subsurface migration of uranium. A general summary of the characterization of the geologic units present in the Phoenix area from basement to overburden are summarized in the following sections.

2.3.1 Basement Rock

Basement rocks beneath the Phoenix and Gryphon deposits are Paleoproterozoic-aged metasedimentary, metavolcanics and granitic gneisses and schists (Figure 3). These basement rocks are part of the Wollaston Domain of the Trans Hudson Orogen and include graphitic and non-graphitic pelitic, semipelitic gneisses, pegmatites, quartzite, calc-silicate rocks, and felsic and quartz feldspathic granitoid gneisses (Figure 3; Yeo and Delaney, 2007). Pegmatitic veins, dykes and intrusions are common in all units with garnet, cordierite, and sillimanite existing in the pelitic strata, indicating an upper amphibolite grade of metamorphism (SRK Consulting, 2018).

The basement rocks have undergone several periods of alteration following their original deposition, and these include:

- metamorphism;

- alteration post-metamorphism (less than 1800 Ma) and prior to deposition of the Athabasca Supergroup sandstones (1700 Ma; Adlahka, 2021; Toma et al., 2022);
- paleoweathering on the basement surface prior to subsidence and Basin formation; and,
- hydrothermal alteration associated with the uranium ore mineralization. The most intense areas of hydrothermal alteration occur alongside the highest-grade mineralization, and alteration decreases, and disappears, in all directions with distance away from the ore zone.

2.3.2 Unconformity and Paleoweathered Basement Rocks

A major unconformity separates the basement rock from the overlying Athabasca Supergroup sandstones. This unconformity represents the period when the basement rock was exposed and subject to weathering and erosion. A paleoweathered zone of weathered, fractured, and faulted basement rock was mapped beneath the Phoenix site below the unconformity, and it is interpreted to range in thickness from 3 to over 80 m, with the greatest thicknesses coinciding with faults, including the WS Shear zone.

The paleoweathered basement zone displays a mineralogical, and associated colour, zonation extending from the unconformity down to competent basement rock, established prior to the mineralization-associated hydrothermal alteration (Macdonald, 1980, Harvey and Bethune, 2007). The deepest zone, closest to competent rock, is the dominantly chlorite and illite "green zone". This grades into the "red zone" dominated by hematite, chlorite and illite (alteration product of kaolinite). The red zone is capped locally by a thin bleached zone at the unconformity, where the bulk of the hematite has been removed (Wilson, 1986). The sequence can also be crosscut along fractures/ overprinted by hydrothermal alteration, such as that related to ore genesis, which are characterized by yellowish to white clay-rich zones (Wilson, 1986).

The top of the unconformity or paleoweathered surface reflects the competence of the basement rocks and is the result of millions of years of tectonic stresses and erosion when the basement rocks were exposed. The elevation at the top of the unconformity within the Phoenix area ranges from a high of approximately 310 m asl along the quartzite ridge (Figure 3) approximately 2.5 km southwest of Phoenix to 120 m asl in the area 500 m northwest of Phoenix near well GWR-025.

"Quartzite ridges" are a topographic feature regionally of the sub-Athabasca unconformity surface (Li et al., 2015). They are an alteration facies resulting from pre-Athabasca group basement silicification, that cause relief at the unconformity surface of up to 200 m (Card, 2014). A quartzite ridge occurs to the west of the Phoenix deposit with a southwest-northeast trend, which parallels the Phoenix deposit. The elevation at the top of the unconformity within the Phoenix area is approximately 310 m asl along the quartzite ridge, in comparison to an elevation of approximately 150 m asl beneath the deposit (Appendix 7-A). The quartzite ridge is interpreted as a low permeability zone that acts as a

barrier to fluid flow, and played a role in controlling alteration patterns and mineralization (Card, 2014; Li et al., 2015).

2.3.3 Uranium Ore Deposit (including Discontinuous Envelope of Clay and Sulphide-Cemented Rock)

The Phoenix ore deposit lies proximal to the unconformity between the basement rocks and the overlying Athabasca sandstone. The Phoenix ore bodies are long and narrow (approximately 25-50 m wide) and directly overlie or are near a graphitic pelite unit (Figure 3). The ore bodies are associated with a reverse fault, termed the WS Shear, that has a 55-degree (northeast to southwest) azimuth, and a 55-degree dip to the southeast (Figure 3). The WS Shear zone lies at the base of the graphitic pelite and the east edge of the quartzite ridge (Figure 3; Arseneau and Revering, 2010). The quartzite ridge is interpreted to have acted as a support for thrusting and reverse faulting (Kerr, 2010; Kerr et al., 2011). Deformation within the WS Shear fault occurred primarily by fracturing, and to a lesser degree, by ductile shearing.

Several unconformity-type uranium deposits on the eastern portion of the Athabasca Basin are found along the unconformity between reducing metamorphic and igneous basement rocks, and overlying oxidized Athabasca Supergroup sandstones (Alexandre, 2020). These ore bodies are typically contained in a discontinuous envelope of clay alteration and a sulphide-cemented rock zone that extends into the overlying sandstone, and the underlying basement. At Phoenix, this black clay-rich zone is approximately 3 m thick on average and locally hydraulically isolates the ore zone from the overlying sandstones and underlying weathered basement rock.

There are uncertainties associated with the depositional models for the ore zone, but a plausible model suggests there was ductile faulting and subsequent weathering and erosion of the various basement rock lithologies. These faults were reactivated after the deposition of the Athabasca Supergroup sandstones along weak graphite-rich ductile shear zones. At the Phoenix site, this included the WS Shear zone, and the Hanging Wall Shear zone (Arseneau and Revering, 2010). Uranium (VI)-bearing oxidizing basinal fluids within the sandstone reacted with reducing fluids in the basement, and uranium (VI) was reduced to uranium (IV), and uraninite was precipitated (Alexandre, 2020). Uranium (VI) is hexavalent uranium (U^{+6}) and uranium (IV) is tetravalent uranium (U^{+4}).

Faults in the sandstone overlying the ore zone and in the underlying basement rocks trend in similar directions to the WS Shear Zone and are well defined in the basement rocks. These faults are interpreted to represent brittle reactivation and damage zone faults, and splay upwards into near vertical faults in the overlying sandstone units. There are also multiple west-east trending faults (perpendicular cross-faults) that propagate through the ore zone and basement rocks that were identified by Denison. Available lithologic and water level data is limited but suggests these faults do not extend far into the overlying sandstone.

2.3.4 Athabasca Supergroup Sandstones and Conglomerates

Overlying the basement rock are consolidated sandstones and conglomerates of the Athabasca Supergroup that were deposited 1.5 to 1.74 billion years ago (Creaser and Stasiuk, 2007). These sedimentary rocks are horizontally bedded and were deposited in an intracontinental sedimentary basin initially marked by alluvial fans, braided rivers and possibly shallow-marine or lacustrine to eolian environments (Ramaekers and Catuneanu, 2004; Ramaekers, 1990).

In the Phoenix area, the Athabasca Supergroup sandstones include the Manitou Falls Group of formations. The Group consist of coarse to fine-grained hematite-rich conglomerates that lie along thin stratigraphic horizons and silty sandstones (Ramaekers 1990), as thoroughly oxidized redbed sequences (Jefferson, 2007). Median iron oxide (Fe_2O_3) concentrations of 0.24% have been measured regionally in unmineralized Athabasca Supergroup sandstones (Alexandre, 2020).

The sandstones are differentiated by their proportions of conglomerate beds and presence of clay intraclasts as outlined in Table 2-1 (Bosman and Ramaekers, 2015; Ramaekers et al. 2007). Sandstone and conglomerate beds of the Read Formation (Table 2-1) that directly overlie the basement rocks host most of the uranium mineralization associated with the Phoenix deposit; some mineralization lies within the underlying paleoweathered basement. Table 2-1 outlines the thicknesses of the lithologic units that lie within a 2 km buffer area surrounding the Phoenix deposit. These surfaces were provided by Denison and are based on interpolation of core data drilled throughout the area.

Table 2-1: Athabasca Supergroup Sandstone Formations and Lithofacies Descriptions

Group/ Formation	Description	Thickness in Phoenix Deposit Area (m)
Manitou Falls Group MFD- Dunlop Formation	Finer-grained well sorted quartz arenite (sand size particles) with abundant (>1%) clay intraclasts (Ramaekers, 1980), and thicker beds of well sorted medium grained quartz arenite. Interpreted to be a distal portion of a large, braided stream, estuary, or braid delta (Hiatt and Kyser, 2007).	5 to 50
Manitou Falls Group - MFC- Collins Formation	Quartz arenite with rare (<1%) clay intraclasts, and conglomerate beds that are less than 2 cm thick (Ramaekers, 1980). Grain sizes of sands of the formation are coarsest at the base and finest at the top, representing decreased fluvial stream energy with time.	50 to 160
Manitou Falls Group - MFB- Bird Formation	Interbedded quartz arenite and clast supported conglomerate beds that are greater than 2 cm thick; distinguished from Read Fm and MFC by presence of >1-2% conglomerates beds (Ramaekers, 1980). Like MFC, grain sizes of sands in MFB fine upward from the base to the top of the formation, representing decreased fluvial stream energy with time.	50 to 130

Group/ Formation	Description	Thickness in Phoenix Deposit Area (m)
Manitou Falls Group - MFa - Read Formation	Poorly sorted quartz arenite, coarse quartz arenite, and pink to maroon quartz-rich pebble conglomerate, local red quartz siltstone to mudstone intraclasts and interbeds with desiccation cracks (Ramaekers, 1980). The unit has been subdivided into three informal members; 1) conglomerate to mudstone; 2) quartz arenite; and 3) quartz arenite with intraclasts (Bosman and Ramaekers, 2015). The Read Formation is abbreviated in this report as MFa, and MFr in Bosman and Ramaekers (2015).	Absent along the quartzite ridge. Reaches a maximum thickness of over 200 m.

The characteristics described in Table 2-1 are regional descriptions for the Athabasca Basin units; local-scale variations are expected due to the variability in fluvial or alluvial fan systems, including the randomness of channel erosion and amalgamation. As noted in Table 2-1, the Read Formation is absent above the quartzite ridge suggesting uplift of the basement along the thrust faults prior to or during their deposition (SRK Consulting, 2018).

Researchers have documented the nature of the lithofacies and the sequence stratigraphy of the Manitou Falls and Read Formations (Ramaekers, 1980; Hiatt and Kyser, 2007); however, diagenetic processes have greatly impacted the geotechnical and hydrogeological properties of the sandstones. The Athabasca Supergroup sandstones consist almost entirely of quartz (Ramaekers 1990), and any detrital feldspar that was present was altered to clay minerals, such as kaolinite and illite, during the 200-million-year long period of diagenesis that impacted Basin (Sibbald et al., 1976; Hoeve and Quirt, 1984). Portions of the subsurface within the Athabasca Basin have undergone extensive hydrothermal alteration including chloritization, tourmalization (dravite), hematization, illitization, dolomitization as well as silicification and desilicification. Portions of the Manitou Falls Group were silicified during diagenesis whereby quartz cement sealed the sandstone's primary porosity (Alexandre, 2020; Ng et al., 2013). The silicification process reduces the groundwater flow through the matrix of the sandstone, but also makes the sandstone prone to brittle fracturing and the introduction of secondary porosity.

Hydrothermal alteration is focused along the WS Shear Zone and associated splays and is interpreted to have propagated upwards in the sandstone hundreds of metres above the unconformity, with decreasing alteration of the sandstone moving west of the WS Shear Zone.

In addition to hydrothermal alteration, the Athabasca Supergroup sandstones have also been faulted and fractured, and these features can impact the movement of groundwater through these units. Faults in the sandstone have similar orientations to that of the WS Shear, and most of these faults represent reactivated brittle basement faults along the shear zones, or responses to volume adjustments in the sandstone during hydrothermal alteration and mineralization.

2.3.5 Overburden

Surficial geology in the area is a product of thousands of years of Quaternary-aged glacial and proglacial depositional processes. The regional geomorphology is typical of the Athabasca Plain Region and is dominated by landforms associated with continental glaciation, such as drumlins, eskers, outwash plains and till plains. Drumlins and eskers present in the Wheeler River area trend in a northeast to southwest direction and form topographic highs on the landscape. Drumlins rise over 50 m above the surrounding land surface in some areas, including the drumlin lying between the Phoenix and Gryphon deposits (Figure 1).

Based on regional-scale 1:250,000 scale mapping (Figure 4) and descriptions from borehole logs that describe surficial sediments, the surface deposits in the area consist predominantly of outwash sand and glacial till, with organic and alluvial sediments (Power, 2014; Campbell, 2007; Schreiner, 1984).

Overburden ranges in thickness from less than a few metres on low lying areas, to over 100 m in the northwestern reaches of Whitefish Lake where weathering and glacial erosion of the sandstone bedrock formed a bedrock valley or “trough”. As the trough is infilled largely by permeable glacial outwash materials, it has the potential to be a hydrogeological feature of interest in the area due to its potential influence on local groundwater flow patterns and gradients. Discussion of the feature and its hydrogeologic influence is further discussed in Section 3.3.

Outside of the bedrock trough, the overburden is interpreted to contain up to three distinct sand-rich subglacial till sheets, and three intervening stratified sand units (Campbell, 2007). As glaciers advanced from the northeast to southwest, the three tills incorporated the underlying sandstones of the Athabasca Basin and are described as sandy and bouldery to cobbly with some (approximately 10 to 20%) silt and clay. The core of the drumlins is composed of till with igneous and metamorphic clasts (pebbles) derived from distal sources; however, the upper 0.5 to 2 m of sediment that drapes over the drumlins is interpreted to be sandstone-rich till (Campbell, 2007).

Within the Phoenix area, grain size analysis was conducted on unconsolidated sands samples in monitoring wells GWR-033 and GWR-036, both located on the western side of Whitefish Lake. A grain size sample was collected in GWR-033 from approximately 9 m below ground surface, and the sample consisted of 8.8% clay-sized grains (less than 4 µm). Comparable results were seen in a sample collected approximately 13 m below surface at well GWR-036, which had 8.1% clay-sized grains (less than 4 µm). Five additional sand horizons were sampled in the overburden at GWR-036, and the clay size grain content ranged from a high of 9.2% (approximately 35 m below surface) to a low of 1.1% (approximately 36.5 m below surface).

2.4 Structural Geology; Faulting and Fracturing

Faulting and fractures of sedimentary and crystalline rocks can add complexity to hydrogeological systems such as the Athabasca Sandstone Supergroup and older basement crystalline rocks.

Figure 3 illustrates the locations of major and minor faults and illustrates their interpreted lateral off-set generated within basement rocks as interpreted by Denison staff. Of particular interest is the WS Shear zone, interpreted to be the zone along which hydrothermal fluids historically propagated upwards through the basement rocks to deposit the uranium in the existing ore zones.

In addition to the WS Shear zone, there is a zone of desilicified sandstone located northeast of the Phoenix site. In this area variations in tectonic stresses within the lower portions of the Athabasca Supergroup resulted in a region of enhanced fracturing and hydrothermal alteration (i.e., desilicification). The zone of alteration was noted to lie above and northeast of the Phoenix deposit to Whitefish Lake where cores are logged as having very low rock quality designation (RQD) values, high fracture intensity and high friability. Geophysical surveys undertaken in the area (Quantec Geoscience, 2014) identify a change in the orientation of resistivity anomalies located 350 to 400 m below surface in an area west of Whitefish Lake. Figure 5 illustrates the location of these anomalies and the areas of low resistivity, which are interpreted to be associated with the zone of desilicification, and enhanced fracturing and friability. Where fracture apertures in this zone of alteration are significantly large, and not infilled with clay particles or other minerals, the fractures could represent preferential groundwater flow paths. Clay infill of fractures has been noted within the Manitou Falls Group, Bird Formation (MFb) in borehole logs in the Phoenix deposit area and was documented in core photos taken by Denison. Additional discussion of the role of fracturing and faulting on the groundwater flow conditions are outlined in Section 3.8.

3.0 HYDROGEOLOGICAL SETTING

Precipitation, ground surface topography, water table elevation and the spatial distribution and connectivity of geologic units influence the flow of groundwater through a given area. As discussed in Section 2.3, the subsurface in the Phoenix area consists of overburden sediments, fractured sandstone and basement rock. Groundwater flow through the unconsolidated porous media is a function of the distribution of the grain sizes within the porous media that controls the hydraulic conductivity. However, groundwater flow (and contaminant transport) in fractured sandstone bedrock aquifers is more complex as the intergranular pore spaces are often discontinuous which can result in very low permeability of the rock matrix. Groundwater flow in the rock is dominated by flow through fractures in the rock (i.e., secondary porosity).

3.1 Monitoring Activities

3.1.1 Surface Water Hydrology

Denison has been monitoring groundwater and surface water stations for several years as a means of characterizing the baseline hydrogeologic and hydrologic conditions. A baseline hydrology report prepared from data collected for the project from 2011-2019, outlines the existing characterization work that was completed in the area (Ecometrix, 2020a). From 2011 to 2014 water elevation surveys were established at nine stream stations and eleven lake stations. Flow rates were measured manually, and water level data loggers were installed in the nine stream stations to measure the water elevations. Rating curves for flow rate versus water elevation were subsequently developed (Ecometrix, 2020a). Seven additional stream stations and four additional lake and pond stations were established and monitored in 2016 to 2018 to augment the 2011 to 2014 data. Water level elevations were collected in 2016 to 2018 to validate existing rating curves or to establish rating curves for new monitoring locations. Additional details on the monitoring locations and interpretations can be found in the baseline hydrology report (Ecometrix, 2020a).

3.1.2 Groundwater Monitoring Network

Groundwater wells were drilled in 2019, 2020, and 2021 across the Phoenix area to improve the understanding of groundwater flow directions, gradients and the hydrogeologic characteristics of the subsurface units. Table 3-1 outlines the well completion details for the monitoring wells within the Phoenix area and their associated water level elevations; the locations of these wells are illustrated on Figure 6. All monitoring wells are vertical except GWR-008, GWR-009 and GWR-012, which are inclined wells that dip at 80°, 65° and 78°, respectively. Borehole logs with well completion details are provided as Appendix A.

Table 3-1: Monitoring Well Completion Details

Well Name	Screened Unit (Hydrostratigraphic Unit; Table 3-2)	Screen Top	Screen Bottom	Observed Water Level	Water Level Snapshot Date
		Elevation (m asl)			
GWR-002	Overburden (Overburden Aquifer)	522.7	516.7	Dry	2019-06
GWR-003	Overburden (Overburden Aquifer)	470.8	464.8	503.69	2019-11
				504.78	2020-09
				503.71	2019-08
GWR-005	Overburden (Overburden Aquifer)	385.5	379.6	501.99	2019-11
				502.65	2020-09
GWR-006	Overburden (Overburden Aquifer)	507.7	501.8	514.33	2019-11
				515.13	2020-09
GWR-007	Overburden (Overburden Aquifer)	518.2	512.2	514.12	2019-08
GWR-008	MFa (Lower Sandstone Aquifer)	169.1	163.3	502.04	2019-11
				502.40	2020-09
				499.98	2019-08
GWR-009	MFb (Intermediate Sandstone Aquitard)	288.2	282.8	503.18	2019-11
				501.94	2020-09
				502.08	2019-08
GWR-011	MFa (Lower Sandstone Aquifer)	180.2	174.2	500.84	2019-11
				502.74	2020-09
GWR-012	MFa (Lower Sandstone Aquifer)	169.4	163.6	500.82	2019-11
				502.25	2020-09
				501.19	2019-08
GWR-013	MFb (Intermediate Sandstone Aquitard)	273.6	267.7	504.55	2020-09
GWR-014	MFc (Intermediate Sandstone Aquitard)	351.0	345.1	501.42	2019-11
				501.80	2020-09
GWR-025	MFa (Lower Sandstone Aquifer)	149.3	143.3	501.99	2019-11
				502.90	2020-09
				502.47	2019-08
GWR-027	MFb (Intermediate Sandstone Aquitard)	249.3	243.3	500.66	2019-11
				501.41	2020-09
GWR-028	MFb (Intermediate Sandstone Aquitard)	244.0	238.0	510.93	2019-11
				511.00	2020-09
GWR-029	MFa (Lower Sandstone Aquifer)	175.2	169.3	514.86	2019-11
				514.98	2020-09
				514.62	2019-08
GWR-031	Ore Zone and Barrier Zones (Ore Zone, Barrier Aquitards))	134.4	127.1	501.54	2019-11
				501.22	2020-09
GWR-032	MFa, Ore Zone, Barrier Zones, Basement Aquitard (Ore Zone and Lower Sandstone Aquifer)	139.2	127.8	501.63	2020-09

Well Name	Screened Unit (Hydrostratigraphic Unit; Table 3-2)	Screen Top	Screen Bottom	Observed Water Level	Water Level Snapshot Date
		Elevation (m asl)			
GWR-033	MFa (Lower Sandstone Aquifer)	158.4	152.4	502.63	2020-09
GWR-034	MFb (Intermediate Sandstone Aquitard)	289.0	283.0	502.17	2020-09
GWR-035	Overburden/MFd Upper Sandstone Aquifer)	494.2	491.2	501.60	2020-09
GWR-036	Overburden (Overburden Aquifer)	462.9	456.9	502.25	2020-09
GWR-037	MFd (Upper Sandstone Aquifer)	444.3	438.3	502.45	2020-09
GWR-038	MFa/ Read Formation Sandstone, Clay Barrier Zones, Ore Zone, Basement Aquitard (Lower Sandstone Aquifer, Barrier Zones, Ore Zone, Basement Aquitard)	150.7	123.5	na	
GWR-039		151.2	124.0	na	
GWR-040		152.1	124.9	na	
GWR-041		155.1	128.0	na	
GWR-042		153.2	126.0	na	
GWR-044		133.9	125.9	502.68	2021-09
GWR-046		MFc	391.4	388.5	504.07
GWR-047	MFb	261.4	258.5	503.27	2021-09
GWR-048	MFa	160.0	160.6	502.90	2021-09
na – water level elevation data not available					

Monitoring wells were also installed along the Phoenix deposit with the screened intervals often extending from the lower sandstone (MFa/ Read Formation), through the ore zone into the underlying weathered basement rock; however, static water levels and water quality samples were not recorded in these wells. These wells include GWR-001, -004, -010, -015, -016, -018, -019, -022, -023, -024, -026, -043, -044, and -045, and borehole logs for these wells are in Appendix A. Transducers were installed in these wells as well as additional wells listed in Table 3-1 as part of various studies, and hydrographs are illustrated in Appendix B. Packer and hydraulic testing were also undertaken on boreholes within the area for over 5 years, and the test details and interpreted conductivity values are listed in Appendix C and discussed in Section 3.4.

3.2 Data Sources

Denison has organized their geologic and geotechnical data with a database that was provided for use in the project. The database contains a wide range of data including major lithologies, and various geotechnical fields including estimates of rock quality designation (RQD), fracture intensity, core recovery percentages, alteration, amongst many others for most of the exploration core holes in the area.

Denison also provided tables of the percentage of clay minerals (normative clay content) calculated for the exploration boreholes and groundwater wells. Denison calculated the clay percentages for kaolinite, illite, dravite and chlorites from the bulk geochemical composition of the sandstones using an in-house set of linear equations that govern the distribution of

oxides into minerals of interest. Key oxide inputs are Al_2O_3 , Fe_2O_3 , K_2O , and MgO in percent and B in ppm.

In addition to the geotechnical data, all the available historic and recent hydraulic testing data and interpreted hydraulic conductivity values was assembled and tabulated (see Appendix D). This data was used alongside water level elevation data recorded in 22 environmental groundwater wells (green diamonds; Figure 6), and 390 water levels recorded in over 150 open hole core holes (purple squares; Figure 6).

3.3 Hydrostratigraphic Units

Hydrostratigraphic units can be derived from stratigraphic or lithologic units based on their general hydrogeologic properties. Units that can transmit reasonable volumes of water are referred to as aquifers, while units that do not readily transmit water are referred to as aquitards. As the hydraulic conductivity in fractured rock settings is generally dominated by secondary porosity features such as faults and fractures, the hydrostratigraphic units do not necessarily align with lithologic, geologic, or stratigraphic boundaries. In addition, geologic or stratigraphic units that have similar hydrogeologic properties are often grouped together to form hydrostratigraphic units.

In the fractured rock environment, coarse-grained sandstones may have lower hydraulic conductivity values than fine-grained sandstones if the rock has been altered following deposition. For example, enhanced fluid flow through relatively clay-free sandstone aquifers can cause cementation, which substantially reduces the porosity and permeability of the rock matrix, but also makes the rock brittle and subject to enhanced fracturing. If post-deposition cementation is extensive, once highly porous, and permeable sandstone units can become aquitards if unfractured (Hiatt et al., 2003). However, fracturing of the rock post-cementation can increase its ability to transmit groundwater. As such, when characterizing groundwater flow through bedrock environments the matrix porosity and the degree of interconnected fracturing together influence the hydraulic conductivity of aquifer and aquitard units.

3.3.1 Methodology Used to Characterize Hydrostratigraphic Units

Identifying the vertical and horizontal extent of aquifers and aquitards within the subsurface requires the generation and interpretation of many cross-cutting two-dimensional cross-sections. Once the two-dimensional cross-sections are interpreted, three-dimensional hydrostratigraphic layers can be created throughout the subsurface. These three-dimensional hydrostratigraphic units then form the basis for the layers within numerical groundwater flow models that can be used to simulate groundwater flow and contaminant transport and fate.

Within the Phoenix area, cross-sections were generated and used to subdivide the subsurface into nine (9) hydrostratigraphic units (Table 3-2). Figure 7 illustrates the locations of cross-sections that were generated as part of the study (see Appendix E for a complete

list of cross-sections). The interpreted hydrostratigraphic units form a stacked sequence of aquifers and aquitards.

Table 3-2: Hydrostratigraphic Units beneath Phoenix

Lithologic Unit		Hydrostratigraphic Unit (Aquifer/ Aquitard)	
Overburden		Overburden Aquifer	
Athabasca Supergroup/ Manitou Falls Group	Dunlop Formation– MFd	Upper Sandstone Aquifer	
	Collins Formation - MFc		
	Bird Formation - MFb	Intermediate Sandstone Aquitard	Desilicified Zone Aquifer
	Read Fm (MFa)	Lower Sandstone	
Upper Barrier Zone (Clay zone and sulphide-cemented rock zone)		Aquitard (overlying the ore zone)	
Ore Zone (high grade friable zone)		Ore Zone Aquifer	
Lower Barrier Zone (Clay zone and sulphide-cemented rock zone)		Aquitard (underlying the ore zone)	
Paleoweathered and Competent Basement		Basement Aquitard	

The hydrostratigraphic units presented in Table 3-2 were derived by overlaying geotechnical data on cross-section to evaluate trends in the datasets that aligned with the results of hydraulic testing completed in the Phoenix and Gryphon areas. Data visualized along the angled and vertical oriented boreholes in cross-section included the following:

- Lithology: interpreted lithologic unit (Figure 8)
- Fracture frequency: quantitative measure of fracturing per metre (Figure 9)
- Friability: qualitative measure of the friability of the rock (Figure 10)
- Normative clay content: quantitative percentage of total clays within the core (Figure 11)
- Discrete temperature measurement (Figure 11)
- RQD: quantitative measure of the competence of the rock (Figure 12)
- Core recovery: quantitative measure of the percentage of core recovered (Figure 13)
- Hydraulic conductivity estimates from hydraulic testing (Figure 13)
- Water level elevations in wells and open holes (Figures 8 to 13)

The above attributes were selected from the wealth of available data types as they were interpreted to provide the greatest hydrogeologic insight. An area illustrated on Figures 9, 10 and 12 as a “zone of alteration” was identified northeast of the Phoenix deposit. This zone of desilicification, enhanced fracture frequency and elevated friability is interpreted to be the result of the merging of two different tectonic stress fields in the area (Quantec Geoscience, 2014). In general, regions of high friability, low RQD, and low core recovery were interpreted to have resulted when hydrothermal fluid and gases were released along the shear zone and propagated along zones of weakness in the rock including fractured and

faulted bedrock. These desilicified zones are interpreted to have elevated hydraulic conductivity values compared to the unaltered bedrock, particularly where the normative clay content of the rock is low. Normative clay content is interpreted to have the ability to seal fractures in the rock where the clay content is sufficient; normative clay is observed to be elevated throughout portions of the lower portion of the Manitou Falls Group Bird Formation (MFb) and the Manitou Falls Group Collins Formation (MFC).

The combination of the fracture frequency and normative clay content features is interpreted to have the greatest influence on the observed hydraulic conductivity trends in the area surrounding the Phoenix deposit. The degree of fracturing results in the potential capability to transmit water, and thus have zones of enhanced hydraulic conductivity. This potential enhancement of hydraulic conductivity is counter-acted where sufficient clay content is present, as the clays in the rock tend to infill and seal the available fractures. The conceptual understanding of how the combinations of lithology, fracture frequency and normative clay relate to relative hydraulic conductivity values are listed in Table 3-3.

Table 3-3: Combinations of Lithologic and Geotechnical Parameters that Influence Hydraulic Conductivity Values in Fractured Bedrock

Lithology	Fracture Frequency	Normative Clay Content	Hydraulic Conductivity Value
Basement	Low	High ¹	Very Low
	High	High ¹	Moderate
Sandstone	Low	High	Low
	High	Low	Moderate to High
<i>¹Normative clay content in the basement rocks is high throughout the area</i>			

Interpreted hydraulic conductivity values from hydraulic testing conducted were used to extend the interpretations of relative hydraulic conductivity values to areas where hydraulic conductivity data was missing but estimates of fracture frequency and normative clay were available. Observed water levels which integrate hydrogeologic conditions between observation locations, were also used to support the hydrogeologic interpretations locally and extend the interpretations to areas where hydraulic conductivity data was sparse.

Cross-sections were used to illustrate the changes in geological and geotechnical data within the subsurface. Trends in the data were visualized and the combination of fracture frequency, normative clay content and lithology (i.e., overburden, sandstone, basement, etc.) were used to subdivide the subsurface into aquifer and aquitard units. Figure 14 illustrates the hydrostratigraphic units in cross-section, alongside the normative clay values, interpreted lithologic surfaces and hydraulic conductivity values interpreted from packer or pumping tests.

3.4 Hydrostratigraphic Units and their Hydraulic Conductivity Values

Hydraulic conductivity values were assembled through a review of earlier site reporting (Golder 2014; Scibek 2019; Petrotek 2020) as well as analysis of recent borehole testing by Denison and analyzed by Ecometrix. A summary of all available hydraulic conductivity

estimates is contained within Appendix C and summarized in Table 3-4. The wide range in hydraulic conductivity values cited in Table 3-4 is typical of a fractured rock environment and the variation is due to the presence of smaller-scale zones that have hydraulic conductivity values that are higher or lower than the conductivity value of the bulk rock. As such, the geomean value is considered representative of the units on a whole as the distribution of wells are considered random and not indicative of specific trends. Analysis of hydraulic testing analysis completed is contained within Appendix C.

Table 3-4: Summary of Hydrostratigraphic Unit Properties

Hydrostratigraphic Units	Field-Based Hydraulic Conductivity (m/s)		Effective Porosity (%)	Storage ²
	Range	Geomean ¹		
Overburden Aquifer/ Aquitard	3 x 10 ⁻⁶ and 2 x 10 ⁻⁴	-	25% (sand); 18% (till)	20% (Sy)
Upper Sandstone Aquifer	4 x 10 ⁻⁷ to 1 x 10 ⁻⁴	3.7 x 10 ⁻⁶	1 to 5%	1x10 ⁻⁵ (Ss)
Intermediate Bedrock Aquitard	1 x 10 ⁻¹⁰ to 3.8 x 10 ⁻⁶	8.4 x 10 ⁻⁹		
Desilicified Zone	1 x 10 ⁻⁶ to 2 x 10 ⁻⁵	4.8 x 10 ⁻⁶		
Lower Sandstone Aquifer	7.8 x 10 ⁻⁸ to 3 x 10 ⁻⁵	2.2 x 10 ⁻⁶		
Upper and Lower Barrier Zone Aquitard (clay zones and sulphide-cemented rock)	Hydraulic tests have not been completed on these units as they are relatively thin in comparison to overlying/ underlying units.			
Ore Zone Aquifer			1 to 10%	1x10 ⁻⁶ (Ss)
Basement Aquitard	1.1 x 10 ⁻¹¹ to 1.1 x 10 ⁻⁵	4.8 x 10 ⁻⁹		
¹ A geomean value was not calculated for the Overburden Aquifer/Aquitard or the Upper and Lower Barrier zone as only two measurements were available for each unit ² Sy values expressed as percent of total volume ² Ss values expressed in units of 1/m ³ Screened intervals of the wells often intercept the ore zone and upper or lower barrier zones; elevated conductivity values were interpreted to reflect the ore zone aquifer and lower values reflect the barrier zone aquitard.				

3.4.1 Overburden Aquifer

Overburden in the Phoenix area is a mixture of sand and gravel outwash, and coarse-grained sandy till with 10 - 20% silt and clay. Coarse-grained till is interpreted to lie within the centre and along the surface of the drumlins present in the area. Outwash sediments flank the sides of the drumlins and in some lowland areas. There is a range of expected hydraulic conductivity values within the overburden units reflecting the range of grain size of the overburden sediments.

Two hydraulic tests were conducted in 2020 by Denison, which were subsequently analyzed by the Ecometrix team (Appendix C), and the hydraulic conductivity values associated with the overburden aquifers were 2x10⁻⁴ and 3x10⁻⁶ m/s, respectively (Appendix C). The higher

value was interpreted to reflect the contact between the overburden and upper weathered bedrock surface, and the lower is representative of a fine sand with moderate silt content.

3.4.2 Upper Sandstone Aquifer

The Upper Sandstone Aquifer is comprised of fine to medium-grained sandstone, that has a very low (less than 3%) normative clay content. Groundwater flow within the sandstone is controlled by the fracture spacing, orientation, connectivity, and aperture thickness, as well as the permeability of the matrix, which has been influenced by diagenesis and alteration.

The hydraulic conductivity values of this unit are expected to vary depending on the cementation, alteration and fracturing of the sandstone. Five packer and pumping tests were conducted on this hydrostratigraphic unit with four of the five tests conducted on core hole WR-555 (Golder, 2014; Appendix C). Interpreted hydraulic conductivity values from the hydraulic tests ranged from 4×10^{-7} to 1×10^{-4} m/s, with a geomean of 3.7×10^{-6} m/s (Appendix C).

3.4.3 Intermediate Sandstone Aquitard

The Intermediate Sandstone Aquitard is comprised of competent fractured sandstone, that has normative clay contents that vary from 4 to 10%. Like the upper sandstone aquifer, groundwater flow within this unit is controlled by fracture spacing, orientation, connectivity, and aperture thickness; however, the normative clay content in this hydrostratigraphic unit is conceptualized to reduce or seal the fracture apertures, reduce their connectivity and in turn, reduce the hydraulic conductivity of the unit. Denison staff noted that fractures observed in core drilled that intercepts the Bird and Collin's Formations of the Manitou Falls Group (MFb and MFc) often had red hematite smearing or clay that appears to have healed once open fractures (Personal comm., Chad Sorba, January 2021).

Hydraulic conductivity values of the Intermediate Sandstone Aquitard are expected to vary within the unit depending on the cementation, alteration and fracturing of the sandstone, but in general, lower conductivity values are conceptualized. Twenty packer and pumping tests were conducted on this hydrostratigraphic unit with twelve tests being conducted on core hole WR-695 located in the Gryphon area (Golder, 2014; Appendix C). Hydraulic conductivity values ranged from 1×10^{-10} to 3.8×10^{-6} m/s (Appendix C), with a geomean of 8.4×10^{-9} m/s.

3.4.4 Desilicified Zone

There is a distinct zone in the area overlying and east of the Phoenix deposit where the Athabasca Supergroup Sandstone bedrock was subject to hydrothermal alteration resulting in desilicification of the sandstone. The Desilicified Zone is most noticeable in the Intermediate Sandstone Aquitard as the desilicified zone is characterized by poor RQD values (Figure 12), and enhanced fracture and friability (Figures 9 and 10, respectively) which are in sharp contrast to the rock qualities of the Intermediate Sandstone Aquitard. The

hydraulic properties of the Lower Sandstone Aquifer are similar to the Desilicified Zone, and portions of the Lower Sandstone Aquifer are interpreted to have been subject to hydrothermal alteration.

Matrix desilicification has effectively resulted in completely to partially unconsolidated sands, with corresponding hydraulic conductivity values measured. Figure 10 illustrates core that was drilled through the desilicified zone at well GWR-016 at an elevation of approximately 146-160 m asl, in the Lower Sandstone Aquifer, overlying the ore zone. Thermal alteration affects the matrix in the affected hydrostratigraphic units differently, with the most striking change being the increased relative rock friability in the Intermediate Sandstone Aquitard. Thermal alteration can also result in changes in the concentration and/or speciation of iron in the matrix. Bleaching – being loss of diagenetic hematite – can be prevalent, and at depth (generally within the Lower Sandstone Aquifer), pyrite replaces oxidized iron minerals.

Hydraulic conductivity values of the Desilicified Zone are expected to vary depending on the alteration and local extent of friability of the sandstone, but in general, higher hydraulic conductivity values are conceptualized. Packer and pumping tests were conducted on this hydrostratigraphic unit and interpreted hydraulic conductivity values ranged from 1×10^{-6} to 2×10^{-5} m/s (Appendix C), with a geomean of 4.8×10^{-6} m/s.

3.4.5 Lower Sandstone Aquifer

The Lower Sandstone Aquifer is comprised of fractured and faulted sandstone that overlies the basement bedrock units. This unit has a consistently low normative clay content (< 4%), and this trend of low clays is observed in core hole data across the Phoenix and Gryphon areas.

As the normative clay content in this aquifer unit is very low, the hydraulic conductivity value in this unit is generally higher than the overlying sandstone aquitard. However, exceptions exist where the fracture spacing or connectivity are low, leading to isolated lower hydraulic conductivity values. Eighteen packer and pumping tests were conducted on this hydrostratigraphic unit with six of those tests being conducted on exploration hole WR-695 located in the Gryphon area (Golder, 2014; Appendix C). Hydraulic conductivity values ranged from 7.8×10^{-8} to 3×10^{-5} m/s (Appendix C), with a geomean of 2.2×10^{-6} m/s.

3.4.6 Upper and Lower Barrier Zone Aquitard (Clay Zones and Sulphide-Cemented Rock Zone)

There is a discontinuous clay-rich matrix and sulphide-cemented rock envelope that surrounds the Phoenix uranium ore zone; this feature has played a role in the preservation of the Phoenix ore zone for millions of years. This aquitard zone is thin (generally less than 5 m above and below the ore zone) and is interpreted to have a low hydraulic conductivity value when compared to the fractured and altered sandstone of the overlying Lower Sandstone Aquifer. As such, these aquitards are interpreted to have greatly reduced the

hydraulic connection between the high-grade friable ore zone and the overlying and underlying aquifers.

Hydraulic conductivity values interpreted from hydraulic tests have not been exclusively conducted on the upper or lower barrier zone aquitards as these units are thin at the majority of the monitoring wells (i.e., less than 5 m). The hydraulic conductivity values are conceptualized to be approximately 1×10^{-9} m/s, a value that is informed by the interpreted hydraulic conductivity value from hydraulic tests conducted on the barrier zones, and ore zone aquifer (Appendix C).

3.4.7 Ore Zone Aquifer

The high-grade friable portion of the ore zone itself has varying properties along the length of the Phoenix deposit. Due to the length of the monitoring well screens and the relatively thinner width of the high-grade portion of the ore zone, there are no wells that are screened exclusively across this aquifer. However, testing is ongoing to confirm that water quality in these wells is reflective of the high-grade portion of the ore zone.

Hydraulic conductivity values interpreted from hydraulic tests have not been exclusively conducted on the ore zone, so the estimates of hydraulic conductivity values are interpreted to be approximately 1×10^{-6} to 1×10^{-7} m/s. This value is informed by Petrotek (2020) packer testing conducted at GWR-023 whereby the packers isolated the ore zone and barrier zone aquitards above and below the ore zone. Hydraulic conductivity values ranged from 1.0×10^{-7} to 5.3×10^{-7} with a geomean of 2.3×10^{-7} (Appendix C), which is interpreted to be a representative value for the ore zone aquifer.

3.4.8 Basement Aquitard

The basement aquitard is made up of the upper paleoweathered zone and the lower competent basement rock. The paleoweathered zone is characterized by geochemical zonation in iron and clay minerals and reflecting weathering and hydrothermal alteration (Section 2.3.2). The hydraulic properties within this zone will vary widely reflecting fractures and faults and clay-rich nature of the matrix. Elevated hydraulic conductivity values are expected to be limited to the primary fault zones, including the WS Shear where the rock is more fractured. Lower hydraulic conductivity values are observed in areas where the basement rocks are competent, and the fracture frequency is low. Where unfractured, the basement rocks have very low permeability and porosity values.

Packer tests in these areas have yielded hydraulic conductivity values ranging from 1.1×10^{-11} m/s to 1.1×10^{-5} m/s (Appendix C), with a geomean of 4.8×10^{-9} m/s. Hydraulic conductivities estimated from core analysis of the paleoweathered zone core produced values that ranged from 2.5×10^{-11} to 7.8×10^{-9} with a geomean of 6.2×10^{-10} m/s (Denison, 2022b). These values are lower than the hydraulic testing data but align with the hydraulic testing estimates conducted on competent basement rock.

Thirty-five packer and pumping tests have been conducted on this hydrostratigraphic unit (Appendix C). Hydraulic conductivity values ranged from 1.1×10^{-11} m/s to 1.1×10^{-5} m/s (Appendix C), with a geomean of 4.8×10^{-9} m/s.

3.5 Additional Hydraulic Properties

3.5.1 Anisotropy

Sedimentary geological units such as sandstones and overburden tills and outwash sediments typically have horizontal hydraulic conductivity values that are greater than the vertical hydraulic conductivity values due to preferential flow paths along bedding planes. Detailed information describing the vertical hydraulic conductivity in the overburden sediments, sandstone or underlying basement rock in the Phoenix area is not available; however, based on literature and professional judgement, an anisotropy ratio of 10 horizontal to 1 vertical was interpreted for the overburden and sandstone hydrostratigraphic units. An anisotropy ratio of 1:1 was interpreted for the basement aquitard hydrostratigraphic units as the orientation of fracturing within these rocks is not expected to follow bedding-planes.

3.5.2 Porosity

In the Phoenix area, the upper overburden aquifer unit is made up of unconsolidated coarse-grained sediment. Within porous media such as sand-rich till, most of the total porosity is expected to be interconnected; as such the effective porosity, total porosity and specific yield values are expected to all be similar. Effective porosity represents the fraction of the porous media that is connected and provides a path for groundwater to travel from one point to another. In the Phoenix area, the effective porosity of the overburden aquifer is expected to be approximately 25 percent on the coarse-grained sandy outwash, 18 percent where the overburden is dominated by sand-rich tills that contain 10-30% silt and clay, and 20% where the sandstone is desilicified.

In fractured bedrock aquifers, porosity consists of the space between grains (primary porosity), and fractures and dissolution features (secondary porosity). A proportion of the primary and secondary porosity features will be disconnected and will not act as pathways for groundwater flow or contaminant transport. Based on permeameter testing completed on rock core samples (Scibek, 2019), the total porosity within the sandstone units is estimated to average from 10 to 20%, whereas the fracture volume that leads to effective porosity is estimated to be much lower (i.e., 1×10^{-5}). The total porosity plays a role in the overall transport and fate of contaminants, but effective porosity values are of interest in characterizing the timing associated with the transport of constituents in groundwater.

The potential effective porosity values of the bedrock aquifers and aquitards in the study area will be a combination of the interconnected portions of primary and secondary porosity features. Effective porosity is best measured using a tracer test; in the absence of

site-specific data, effective porosity values for the bedrock units are estimated to range from 1 to 10% based on literature values (Freeze and Cherry, 1979).

3.5.3 Storage

Groundwater storage refers to the amount of water released from storage due to a unit change in pressure head. Within confined or fully saturated units, specific storage (S_s) results from water that is released due to compaction of the aquifer and expansion of water. Within unconfined aquifers, specific yield (S_y) incorporates the specific storage components as well as the drainage of pores at the water table. Within fully-saturated zones, storativity (S), also referred to as the storage coefficient, is the product of the specific storage and the saturated thickness of the tested zone.

Golder (2014) performed hydraulic testing on ten unique intervals in Well WR-555 and as part of this work they estimated storativity of the various units. Based on the interpreted hydrostratigraphic units, Golder (2014) noted the following storativity values:

- Upper Sandstone Aquifer (3 tests): range from 1.6×10^{-5} to 8.6×10^{-5}
- Intermediate Sandstone Aquitard (3 tests): 8.4×10^{-5}
- Lower Sandstone Aquifer (2 tests): 8.6×10^{-5} to 1.6×10^{-4}
- Basement (2 tests): 8.0×10^{-5} to 9.4×10^{-5}

Petrotek (2020) estimated storativity values through analysis of pumping test data conducted on the Phoenix ore zone. The storativity values in the Phoenix ore zone (i.e., Basement Aquitard) were estimated to range widely from 1.3×10^{-4} to 1×10^{-9} (Petrotek, 2020), with an overall average of 2.4×10^{-5} in Test Area 1, and 1.2×10^{-4} in Test Area 2, which are consistent with the basement storativity values estimated by Golder (2014).

3.6 Groundwater Flow Systems

Hydrogeological information was reviewed to understand the current groundwater flow directions and gradients across the study area. While there is an abundance of water level data, 390 of the 433 water level elevations were collected in open hole wells (Figure 15) that extend hundreds of metres into the subsurface. Water levels observed in these open holes represent blended water level elevations that are not representative of only one hydrostratigraphic unit. Consequently, the following sections outline the groundwater flow directions and gradients that were interpreted through review of observed water level data in regional monitoring wells that represent discretely screened intervals of the subsurface.

In general, groundwater flow in the Phoenix area is conceptualized to occur in two groundwater flow regimes; an upper flow regime that is influenced by local ground surface topography, streams and lakes, and a deeper semi-regional groundwater flow regime that is influenced by rivers and regional lake systems. In the upper or local groundwater flow regime, groundwater recharges locally and flows through the Overburden and Upper Sandstone Aquifers and discharges to nearby surface water features. In the deeper,

confined, semi-regional groundwater flow regime, groundwater is primarily sourced from the regional-flow system, west of the study area, and in part by water flowing downward through the overlying aquifers and aquitards to the Lower Sandstone Aquifer. Based on site geochemical observations, local recharge to the Lower Sandstone Aquifer may be enhanced along regional fault zones that cross-connect the shallow and deep aquifers.

3.6.1 Local Flow System: Overburden and Upper Sandstone Aquifers

Groundwater level elevations representative of the Overburden and Upper Sandstone Aquifer were limited to seven locations in the Phoenix area. While the two aquifers have different hydraulic properties, where they are hydraulically connected water levels are expected to be similar.

Figure 16 illustrates the water level elevations observed in monitoring wells screened across the Overburden (green labels) and Upper Sandstone Aquifer (orange labels). Surface water elevations in the major lakes are also illustrated on Figure 16 as pink levels alongside the ground surface topography. As illustrated on Figure 16, the water levels in this upper system are interpreted to mimic ground surface topography and flow from the upland areas as part of a local groundwater flow system and discharge into the lakes and streams, which are groundwater discharge features.

3.6.2 Semi-Regional Flow System: Lower Sandstone Aquifer

Groundwater level elevations observed in the Intermediate Sandstone Aquitard, Lower Sandstone Aquifer and Ore Zone Aquifer are illustrated on Figure 17. The hydraulic properties of the aquifer units differ, but on a broad scale, we expect similar water levels in these aquifer units.

Groundwater flow in the semi-regional groundwater flow regime is conceptualized to be dominated by flow through the Lower Sandstone Aquifer. As illustrated on Figure 17, groundwater in the Lower Sandstone Aquifer unit is interpreted to flow from the highs of approximately 515 m asl in the west, towards the groundwater elevation lows that are located near Whitefish Lake, which as a lake stage of 500 m asl (Figure 17). The lake stages for McGowan Lake (2 km east of Whitefish; Figure 17) and Russell Lake (6 km south of Phoenix deposit) are 494 and 488 m asl, respectively. While there is hydraulic potential for regional groundwater to flow toward and discharge to McGowan or Russell Lakes, the Intermediate Sandstone Aquitard is intact in the area south of the Phoenix deposit, so the Lower Sandstone Aquifer is interpreted to hydraulically separate the Semi-Regional Flow System from the overlying Upper Flow System. The presence of the Desilicified Zone forms a hydraulic connection between the Local and Semi-Regional groundwater flow system in this area, and this interpretation is supported by available water level data in monitoring wells and boreholes throughout the area.

3.6.3 Water Level Variability

Hydrographs were generated using available data recorded from transducers installed in the Phoenix area. Pressure transducers record changes in pressure within wells, and barometric pressure is also recorded in barologgers in the Phoenix area to support barometric correction of the pressure transducer data. Barometric correction is completed to remove noise due to fluctuations in barometric pressure from transient water level data. With the barometric pressure effects removed from the hydrograph, improved analysis of water level and gradient changes due to actual fluctuations in the groundwater flow system can be achieved. Most monitoring wells at Phoenix have transducers that are non-vented, so barometric correction is recommended to remove the barometric pressure signal from the water level transducer data. This is a complicated process as barometric efficiency recorded in each well is dependent on how confined the well screen is, well construction, amount of storage in the well, and the well depth, as each of these factors influences the degree of pressure delay and pressure muting between barometric pressure changes at surface and those experienced pressure change within the well itself (see Rasmussen and Crawford, 1997). As the monitoring wells are screened at various depths below surface across the Site, a rigorous barometric correction involving complex signal processing was not undertaken as part of this project. Instead, a simpler "direct subtraction of barometric pressure" approach was used acknowledging barometric efficiency-related noise is still present in some hydrographs. This was considered appropriate for this Baseline Report as the transducer data was collected and reviewed to discern long-term trends or changes in vertical gradients. A more exhaustive barometric correction was not necessary to illustrate the long-term water level variability present in the transducer data.

Appendix B illustrates the variability in water level elevations in monitoring wells across the Phoenix area on an hourly basis. Wells were grouped by their spatial location and to allow for comparison of vertical gradients for monitoring wells that lie close to one another. The hydrographs illustrate that the variations in water levels collected in 2020 and 2021 are generally less than 20 cm and similar water level variability is observed in shallow and deep monitoring wells. During the observation period, the vertical gradients within the well clustered remained constant, except for GWR-008 and GWR-009 where interpreted hydraulic testing in the ore zone reversed the gradients for a short period of time due to pumping and injection hydraulic testing. (Note: GWR-033 to GWR-035 and GWR-036 are vented transducers that do not require any corrections).

3.7 Vertical Gradients

Vertical gradients are interpreted to be generally downward at the Phoenix deposit site, transitioning to upward beneath the surrounding surface water bodies (i.e., Whitefish and Williams Lakes). Calculation of vertical gradient values is complicated by the few snapshots of water level data available, and the distance between available well "clusters" located southwest, northwest, southeast and within the Phoenix deposit (further description of the clusters is provide in Section 4.0 and Figure 19).

Recognizing this, vertical gradient calculations were conducted using water levels collected in the nested monitoring wells located southeast of Phoenix on the west side of Whitefish Lake, and two wells located east of Phoenix also on the west side of Whitefish Lake. These five wells were drilled and instrumented in 2020 to help address data gaps identified in this study.

One well nest within the Phoenix area consists of a well screened in the Lower Sandstone Aquifer (GWR-033; Read Formation), another screened in the Intermediate Sandstone Aquitard (GWR-034; MFb), and a third well screened in the Upper Sandstone Aquifer (GWR-035; MFd). A second well nest consists of a deeper well screened at the interface between the overburden and sandstone bedrock (GWR-036; MFd), and a shallower well screened in the overburden approximately 50 m below surface (GWR-037). Water levels were collected in all wells in September 2020 and vertical gradients were calculated (Table 3-5). Upward gradients (positive values in Table 3-5) were observed between each set of well pairs in the two well nests (see Figure 19 for location of well nests), which was expected as Whitefish Lake is conceptualized as a local and regional groundwater discharge location. The Whitefish Lake stage elevation is approximately 500 m asl, indicating groundwater moves vertically through the subsurface units and discharges into Whitefish Lake in the vicinity of these two well nests.

Table 3-5: Vertical Gradients in Nested Wells

Well Nest	Name	Hydrostratigraphic Unit	Screen Midpoint	Water Level Elevation	Head Difference (m)	Vertical Gradient (m/m)
			Elevation (m asl)			
WR-607 Cluster	GWR-035	Upper Sandstone Aquifer	492.70	501.60	0.57	0.002
	GWR-034	Intermediate Sandstone Aquitard	218.00	502.17		
	GWR-034	Intermediate Sandstone Aquitard	218.00	502.17	0.46	0.007
	GWR-033	Lower Sandstone Aquifer	155.40	502.63		
LA-5 Cluster	GWR-036	Overburden	459.90	502.25	0.20	0.011
	GWR-037	Upper Sandstone Aquifer	441.30	502.45		

Based on water levels in monitoring wells and core holes in the area, areas west and southwest of Phoenix are interpreted as having downward vertical gradients with an estimated magnitude of approximately 0.015 m/m. Groundwater is interpreted to flow from surface through the Intermediate Sandstone Aquitard to the Lower Sandstone Aquifer.

3.7.1 Groundwater – Surface Water Interaction

Available surface water data and reporting was reviewed to evaluate the potential interaction of groundwater and surface water in the vicinity of the Phoenix deposit. The following are some of the lines of evidence that indicate interaction between the groundwater and surface water flow systems, and these are discussed further in the underlying subsections:

- Areas of increasing surface water flow (i.e., streamflow), outside of typically high precipitation time periods. Increasing streamflow along a watercourse in dry periods can typically be attributed to groundwater discharge and is referred to as baseflow. The change in streamflow between monitoring stations can provide volumetric groundwater discharge estimates.
- Areas where the stream temperature is similar to the groundwater temperature. In summer, areas of colder surface water can be evidence of groundwater discharge, while in winter areas that resist freezing over may reflect higher local groundwater discharge rates.

Where groundwater naturally discharges to surface water, groundwater level elevations in nearby monitoring wells will on average be higher than surface water elevations.

3.7.1.1 Increased Surface Water Flow

A review of streamflow rates in the vicinity of Phoenix deposit was undertaken to evaluate areas where groundwater discharge may be preferentially occurring. Stream discharge rates observed during low flow periods were selected for the comparison as they are inferred to be more representative of conditions when groundwater discharge will be driving streamflow differences. The review focused on stream gauging stations from Whitefish Lake (SA-6 and SA-2; Figure 2-10) to downstream of McGowan Lake (SA-1) (Ecometrix, 2020a). Stream flow data suggest incremental increases during low flow periods above McGowan Lake, which indicates groundwater contribution to Whitefish Lake. Streamflow records indicate periods of incremental gains and losses within McGowan Lake meaning that these data do not conclusively indicate continuous groundwater discharge to McGowan Lake. Streamflow analysis within the Williams Lake drainage area similarly suggests modest groundwater discharge is occurring to Williams Lake and associated tributaries.

3.7.1.2 Streamflow Temperature

Groundwater discharge to streams will maintain a relatively constant temperature year-round. As such groundwater discharge zones may be evident as areas of the stream that do not ice-over completely during cold winter months, or areas that maintain cooler water conditions during summer months. From the available baseline hydrology reporting (Ecometrix, 2020a), photographs at streamflow stations SA-2 and SA-6 (upstream and downstream of Whitefish Lake) indicate areas of open water during March 2018. Such open

water conditions in March may indicate groundwater discharge that slightly warms the stream and prevents ice formation; it is noted that the mean air temperature in March is -12°C.

3.7.1.3 Hydraulic Head Data

Groundwater and surface water levels were compared to assess linkages between the two flow systems (Figures 16 and 17). As Figure 16 illustrates, the groundwater level elevations observed in monitoring wells screened in the overburden and upper Athabasca Supergroup sandstone formations east of the Phoenix deposit are higher than the lake level elevation in Whitefish Lake. Groundwater flow trends from west to east suggesting shallow groundwater flows through the overburden and Upper Sandstone Aquifer and discharges into Whitefish Lake.

Figure 17 illustrates the water level elevations for wells that are screened in the Lower Sandstone Aquifer in the semi-regional groundwater flow system. Similar to the shallow groundwater flow system, water levels in the deep groundwater flow system vary from 501 to 514 m asl and are higher than the water level elevations in Whitefish Lake (500 m asl). As such, groundwater is interpreted to move along the semi-regional flow system and discharge into Whitefish Lake via the Desilicified Zone. The lake stage elevation for Whitefish Lake is higher than the lake stage for McGowan Lake so there is potential for groundwater to remain deep and discharge into McGowan Lake; however, the water levels recorded in the monitoring wells between Phoenix and Whitefish Lake consistently show upward gradients throughout the Desilicified Zones into Whitefish Lake.

3.7.2 Groundwater Recharge

Groundwater recharge is the portion of precipitation that infiltrates to the groundwater system and is not lost to evapotranspiration, interflow, or overland flow to rivers or creeks. The percentage of precipitation that ends up as groundwater recharge is a function of the hydraulic conductivity of surficial sediments, land use, topography, and the soil moisture content.

In the Wheeler River area, groundwater recharge is the primary driver of groundwater flow. Recharge rates are conceptualized to be greatest in the areas where outwash sands are present at surface, lower where tills are present at surface, and absent where groundwater discharges to surface, such as at Whitefish Lake.

Average groundwater recharge rates can be estimated by dividing low flow values from a gauged stream by the catchment area. This approach assumes that water recharging within the catchment area discharges into the river and sustains the flow in the summer months when precipitation is low. This is a reasonable assumption if the catchment area is large and groundwater flow out the catchment is considered minimal.

A Water Survey of Canada streamflow gauge lies approximately 30 km east of the study area, on the downgradient end of Russell Lake. The average monthly streamflow from 2011

to 2018 is illustrated on Figure 18 and the average river low flow is approximately 15 m³/s (Ecometrix, 2020a). The catchment area upstream of this gauge is approximately 3,030 km² (Ecometrix, 2020a), which equates to an average groundwater recharge rate within the catchment of approximately 156 mm/year. Higher groundwater recharge values (over 200 mm/year) are expected on the outwash sands, and values lower than 125 mm/year are expected on areas where till lies at surface. These values are also supported by observed stream baseflow at site gauges SB-3 (Williams Lake drainage area) and SB-1 (Icelander River drainage area) from which local recharge rates are estimated to be between 100 to 140 mm/year (Ecometrix, 2020a).

The estimated average annual recharge rate for the Phoenix site of 156 mm/year is comparable to recharge rates estimated by Golder (2013) for the Key Lake area where recharge rates of 270 mm/year, 150, and 50 mm/year were estimated on outwash sands, drumlins and till plains, respectively.

3.8 Hydraulic Influence of Fault Zones and Drill Holes

3.8.1 Fault Zones

Broadly speaking, fault zones can act as barriers to groundwater flow or as groundwater conduits depending on the nature of the fault zone and the material within it. If the fault zone consists of finely ground rock and clay (fault gouge) or intruded material (e.g., diabase), the fault may have very low hydraulic conductivity compared with the host rock and form a barrier to flow. Such low-permeability faults may be apparent from significant differences in groundwater levels across the fault or appear as hydraulic boundaries in aquifer (pumping) tests.

Conversely, if a fault zone consists of one or more continuous open fractures, then it may act as a conduit. Under natural conditions, evidence for such conduit faults may be seen in geophysical surveys (contrasting conductivity), perturbations in groundwater levels and temperature, or the occurrence of fault related springs and discharge zones.

When the groundwater system is pumped, such as in an aquifer test or extended flow test, a conduit fault may manifest as a source of recharge, representing an apparent boundary, and/or cause anomalous drawdown in monitoring wells connected to the fault. On a regional (or basin) scale the influence of faulting on groundwater flow depends on numerous factors including the permeability of the fault(s) and their orientation with respect to the geological strata and dominant recharge and discharge zones.

The potential regional effects of faulting when faults acted as conduits could include:

- Concentration of flow within fault zones which may enhance recharge or discharge, particularly where there are inclined or low-angle conduit faults within or between those zones.

- Enhanced vertical groundwater movement through units assumed to be regional semi confining aquitards, which may be evident through geochemical signatures.
- Anisotropy. Faults or joints that have a dominant orientation can impart a preferred flow direction on intersected groundwater systems.

When faults acted as barriers, the regional effects of faulting could include:

- Limited flow within fault zones which may impede regional recharge, discharge or flow.
- Changes in anisotropy where faults that have a dominant orientation but are clogged with low permeability clays can create a barrier to preferred flow directions within dislocated groundwater systems.
- Compartmentalisation of the regional flow with differences in groundwater level and/or flow direction between fault-bounded blocks.
- Hydraulic sheltering or isolation where stagnant zones are formed.

3.8.1.1 Observations Pertinent to Faults at Phoenix

Vertical fracture or fault zones that hydraulically connect the Local (upper) and Semi-Regional (lower) groundwater flow regimes are present throughout the Athabasca Basin (Ramaekers, 1981; Kotzer and Kyser, 1990; Sibbald et al., 1990). The distribution of monitoring wells outside of the Phoenix ore zone area makes it difficult to identify these features with confidence, but these features may exist between data points.

Hydrogeologic impacts of faults can be observed in groundwater monitoring data and used to better understand fault continuity and fault infill characteristics. To characterize the presence of faults that extend through the Athabasca Sandstone Supergroup, various data sets were reviewed including water level elevations, redox characteristics, groundwater chemistry trends, and discrete temperature data.

Water level trends throughout the region surrounding the Phoenix deposit are largely consistent across the area (see Figures 15 to 17). Large scale faults that extend from ground surface through the sandstone into the top of basement rock were not evident in core; however, water levels in the deep sandstone and basement rocks in the areas west of the Phoenix ore zone (i.e., GWR-029 has a water level of 515 m asl; Figure 17) are higher than those in the ore zone (approximately 501 to 502 m asl; Figure 17). One potential interpretation is that the WS Shear zone in the area southwest of the ore zone may extend to ground surface and underlie the stream near GWR-029. The surface water level in the stream is interpreted to be 516 to 517 m asl, which is similar to the observed water level of 514 m asl in GWR-029. It is interpreted that the fault may act as a preferential pathway for water to flow quickly from surface and this stream into the Lower Aquifer thereby recharging the lower groundwater flow system in this area (Figure 29). This interpretation is supported by groundwater quality within the Lower Sandstone Aquifer at GWR-029. The groundwater quality observed in the shallow wells across the site are very similar to those observed in GWR-029 (Section 4), suggesting a connection between the two groundwater

flow systems. The similarities in water level elevations and water quality are interpreted to be due to the presence of this local fault. Discrete temperature data collected in boreholes was also reviewed and indicate a wide variability of temperatures along boreholes (Figure 11); however, the variability in temperature could not be correlated with faults.

3.8.2 Exploration Boreholes

Exploration boreholes drilled in the Phoenix area, where left partially plugged to protect surficial aquifers, have the potential to provide preferential flow paths between the overburden and Upper and Lower Sandstone Aquifers. Exploration holes were reportedly grouted approximately 10 to 20 m above and below the ore zone, resulting in open holes remaining throughout the overlying materials. These portions of the open holes may act as open conduits for groundwater flow through the 400 m of Athabasca Supergroup Sandstones. There are over 200 boreholes that lie within 100 m of the Phoenix ore zone, most of which were drilled as HQ and NQ diameter boreholes, which have diameters of 96- and 76-mm diameters, respectively.

The impact of these boreholes may be influencing the local vertical gradients observed in monitoring wells close to the Phoenix deposit, but as all observation wells local to the ore zone are screened at considerable depth (i.e., over 200 m), it is difficult to understand the potential influence of these open holes.

3.9 Groundwater Demand

The only current groundwater supply well in the Phoenix area is the camp water supply well that is located over 2 km southwest of the Phoenix deposit. The screened interval of the well and the water demands are not known but are expected to be very low given the size of the camp and the number of employees.

4.0 GROUNDWATER CHEMISTRY

The following Sections provide an overview of the analytical results for groundwater quality collected from the monitoring well network in 2019-2021. Groundwater chemistry is explored in more detail to inform the understanding of groundwater flow systems at the Site developed based on the geology and hydraulic properties of the subsurface in the previous section.

4.1 Groundwater Monitoring Network and Database

4.1.1 Athabasca Supergroup Sandstones

Groundwater monitoring at proximal upgradient locations and in the study area surrounding the Phoenix deposit occurs in the GWR-series wells. The GWR-series wells were installed in all lateral directions around the ore zone and, for the most part, were advanced in groups of three. The groups of three wells targeted each of the local and regional groundwater flow zones, including: a) the Overburden and Upper Sandstone Aquifers (overburden, MFd, and upper MFc); b) the Intermediate Sandstone Aquitard (lower MFc and upper MFb), and c) the Lower Sandstone Aquifer (Lower MFb and MFa). These groups of wells are referred to as “clusters” and they are shown in Figure 19. The Formation in which the well is screened is indicated on the figure.

In contrast to the other regional well clusters, the cluster most proximal to Whitefish Lake (“LA-5 Cluster”) is made up of two wells – a shallower well screened at the interface of the overburden and the MFd (GWR-036), and a slightly deeper well, still in the upper MFd (GWR-037). This well nest was installed to evaluate groundwater quality and vertical gradients close to groundwater discharge to Whitefish Lake, as discussed in Section 3.7.

Overlying the Phoenix deposit are five discrete interval monitoring wells that were sampled as part of the baseline program. These wells are GWR-011 (MFa) and GWR-013 (MFb), GWR-046 (MFc), GWR-047 (MFb), and GWR-048 (MFa).

A subset of the monitoring wells outlined above are installed at locations where the sandstone matrix is desilicified. Wells screened in desilicified Lower Sandstone Aquifer sediments include GWR-008, GWR-012 and GWR-011. Wells screened in desilicified Intermediate Sandstone Aquitard sediments include GWR-009, GWR-013 and GWR-047. Wells screened in desilicified Upper Sandstone Aquifer sediments include GWR-014 and GWR-037.

4.1.2 Ore Zone and Basement Rock Units

One monitoring well, GWR-031, is installed across ore zone and Paleoweathered zone. Groundwater quality from this well is considered most reflective of Paleoweathered zone hydrochemistry of the wells installed in the study area.

Monitoring wells been installed within or across the ore zone include GWR-032, GWR-038, GWR-039, GWR-040, GWR-041 and GWR-042.

Monitoring well GWR-004 was installed in the Basement Aquitard in Phase 3 of the Phoenix deposit, but due to the small drill/core size, cannot support sampling. An attempt was made to sample the basement rock as part of the Gryphon Shaft Pilot Hole Drill Support Program (SRK, 2018b). Due to low permeability and groundwater recovery, it was not possible to collect a sample from the basement rock. Water quality for these zones is available from information available from Cigar Lake (AECL, 1994) and the Millennium Project Environmental Impact Statement: Annex D, Regional Geology and Hydrogeology (Cameco, 2012).

4.1.3 Sampling Programs

Sampling of groundwater from the GWR-series wells for physical (temperature, field-measured) and chemical analyses occurred in 2019 (GWR-032 only), 2020 and 2021. All monitoring wells in the groundwater monitoring well network, listed in Table 3-1, have been sampled at least once, with the following exceptions:

- monitoring wells GWR-002 and GWR-007 are installed in overburden and were dry during sampling events in 2020 and 2021.
- monitoring wells GWR-028 and GWR-027, both installed in the MFb, are damaged and can not be sampled.

GWR-series groundwater wells sampled during one or more sampling event from 2019-2021 are indicated with green symbols in Figure 19. Field sampling methodology is provided as Appendix F.

4.2 Analytical Results Overview

The results of the groundwater quality analyses are presented by well cluster and the Phoenix ore zone area in Table 4-1. Field data sheets for the sampling events are provided as Appendix G. Analytical results and QA/QC on the samples are provided in Appendix H.

Metals and trace elements in groundwater were measured as dissolved concentrations, on field-filtered and acidified samples. The dissolved species are the most relevant form of these elements for fate and transport in the subsurface. The constituents measured in the dissolved phase are outlined in Table 4-1. For ease, a direct reference to constituents being measured in the dissolved phase is not made in the discussion that follows below – for example if the concentration or behaviour of Fe in the subsurface is discussed, it is the dissolved form of Fe in groundwater.

Groundwater quality from monitoring wells GWR-034, GWR-038 through GWR-042 is not included in the discussion here below on groundwater quality associated with the Project. These groundwaters, for reasons of well integrity (GWR-034) and inadvertent introduction

of dissolved KCl tracer into the wells (GWR-038 through GWR-042) are not considered to yield groundwater reflective of formation water.

Generally, groundwater associated with the Athabasca Sandstone Supergroup and overburden is of circumneutral pH, relatively low total dissolved solids (TDS; < 250 mg/L), and low to moderate alkalinity (10-126 mg/L). However, there are important deviations from these general groundwater qualities that are examined in more detail spatially (laterally, and by depth/hydrostratigraphic unit) in Section 4.3. Groundwater in the ore zone is circumneutral, but with higher TDS (>500 mg/L) and with, generally, higher concentrations of metals and other trace elements than measured in groundwater from Athabasca Sandstone Supergroup and overburden.

As noted above, a subset of the monitoring wells are screened in desilicified sediments of the Lower Sandstone and Upper Sandstone Aquifers and Intermediate Sandstone Aquitard. As such, groundwater quality in these wells was compared to each other (i.e., within the desilicified sediments) and to the other samples collected in their respective flow system/hydrostratigraphic unit. The objective of this comparison was to determine if a groundwater quality could be identified that was unique to the desilicified sediments (i.e., a groundwater quality unique to the Desilicified Zone). Determined through the comparison was that groundwater quality primarily reflects the flow system/hydrostratigraphic unit, meaning, for example, the water quality in GWR-009 is more comparable to the groundwater quality in samples from the Intermediate Sandstone Aquitard than to the wells in the desilicified zone, taken as a group. As such, groundwater quality was evaluated further by grouping the wells according to the hydrostratigraphic unit (or, where possible, flow system) in which the wells are installed, as outlined in Table 3-1:

- a) Local Groundwater Flow System, comprising the Overburden and Upper Sandstone Aquifers (the overburden wells with those installed in the MFd);
- b) Intermediate Bedrock Aquifer (MFc and MFb wells);
- c) Lower Sandstone Aquifer (MFa wells); and
- d) The ore zone samples.

Summary statistics (maximum, minimum and median value) are provided as Table 4-2. In addition to the groundwater results, analytical results for surface water samples collected as part of the Wheeler River Project: Baseline Aquatic Environment Study (Ecometrix, 2020b) are also included, so that the quality of groundwater versus that in surface water can be understood in the region surrounding the Phoenix deposit.

Presented in Appendix I is groundwater quality at the Site in relation to potable water guidelines. Water is not used regionally for domestic use (Appendix I), and future use, particularly of water from the deeper aquifers is not anticipated; as such, the comparison of site data to the potable water guidelines is not an evaluation of risk to humans from consumption of groundwater in the Project Area. Exceedances of health-based and aesthetic guidelines occur in all hydrostratigraphic at the Site. The frequency of exceedances is higher in the deeper hydrostratigraphic units and in the ore zone.

Table 4-1: Groundwater Water Monitoring Results

Well Cluster	Groundwater Monitoring Well	Units	Upgradient Cluster ^a				NW Cluster ^b				SE Cluster ^c				WR-607 Cluster ^d				Downgradient Cluster								
			GWR-006		GWR-029		GWR-003		GWR-025		GWR-008		GWR-009		GWR-033		GWR-034		GWR-035		GWR-005		GWR-014		GWR-012		
Lithology	Hydrostratigraphic Unit	Sampling Date	OB		Mfa		OB		Mfa		Mfa		Mfb		Mfa		Mfb		OB / MFd		OB		Mfc		Mfa		
			OB	LSA	LSA	LSA	OB	LSA	LSA/DSZ	LSA/DSZ	LSA	ISA	ISA	ISA	ISA	USA	USA	USA	USA	OB	OB	USA/DSZ	USA/DSZ	LSA/DSZ	LSA/DSZ	LSA/DSZ	LSA/DSZ
			2020-08-22	2021-04-14	2020-08-30	2021-04-12	2020-08-16	2021-04-18	2020-08-22	2021-04-17	2020-09-06	2021-04-09	2020-09-14	2021-04-10	2020-11-03	2021-05-25	2020-10-30	2021-05-24	2020-11-03	2021-05-24	2020-08-29	2021-05-22	2020-08-29	2021-05-21	2020-08-29	2021-05-23	
Field Parameters																											
Field pH		pH units	6.75	6.90	6.46	7.30	6.35	5.86	6.49	7.06	6.92	7.42	10.87	7.67	7.02	7.32	8.77	7.57	6.48	6.30	7.49	6.8	11.38*	9.77	6.94	7.17	
Field Temp.		°C	6.7	4.8	6.5	3.6	14.6	5.1	9.6	4.1	9.1	3.9	5.9	3.3	6.5	7.5	2.8	7.2	4.3	5.4	10.4	6.3	8.4	6.2	11.5	7.9	
Field Conductivity		µS/cm	53.1	92.8	56.7	108	28.2	17.2	668	1392	71.9	98.9	153	362.1	229.9	461.9	303.3	666	40.3	71	68.2	97.5	275.6	270.3	351.8	602	
ORP		mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Field SPC		µS/cm	80.4	150.9	87.6	183.1	35.3	27.8	946	2315	102	165.7	241	618	351.4	694	520	1007	66.7	113.6	93.4	150.5	397.2	421.5	470.5	896	
Field TDS		mg/L	52	98	57	119	23	18	615	1505	66	108	157	402	231	451	343	654	43	74	61	98	259	274	306	582	
Diss. O2		mg/L	3.76	4.70	2.48	12.83	9.05	3.82	3.15	12.35	7.53	12.56	3.00	12.47	3.22	6.09	9.52	5.16	3.87	8.01	2.33	11.82	1.07	12.20	1.63	11.61	
Fe2+		mg/L	1.0	1.3	2.0	-	0.0	0.0	2.0	1.0	2.5	1.5	0	1.5	2.0	1.0	0.0	0.0	0.5	0.0	2.0	1.5	0.0	0.0	2.0	1.5	
Analytical Results																											
Bicarbonate		mg/L	35	35	33	29	12	17	51	35	55	39	<1	188	43	51	166	156	22	27	34	26	115	76	112	77	
Carbonate		mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	49	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	18	<1	<1	
Chloride		mg/L	10	1.4	6.1	6.1	0.1	<0.1	233	319	3	2.7	0.3	4	57	67	<1	<1	5.8	5.7	3.3	3.3	0.4	0.4	81	86	
Hydroxide		mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
P. alkalinity		mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	46	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	15	<1	<1	
pH		pH units	7.04	7.32	7.14	7.36	6.76	6.88	6.9	6.96	7.44	7.16	10.06	7.59	7.48	7.43	8.07	7.63	7.04	6.79	6.99	6.8	7.68	9.05	7.62	7.24	
Specific conductivity		µS/cm	71	61	72	68	27	19	918	1110	86	69	215	289	331	334	481	480	54	46	70	49	190	175	452	416	
Sum of ions		mg/L	75	64	56	54	20	23	488	610	78	56	127	252	191	194	329	318	44	44	57	43	190	138	284	245	
Total alkalinity		mg/L	29	29	27	24	10	14	42	29	45	32	87	154	35	42	136	128	18	22	28	21	94	92	63		
Total hardness		mg/L	30	32	21	21	12	8	222	283	24	17	53	104	59	73	21	19	14	12	11	9	84	45	121	106	
Ammonia as nitrogen		mg/L	0.15	0.17	0.03	0.05	0.09	<0.01	0.08	0.14	0.05	0.08	0.96	0.07	0.12	0.27	0.08	0.19	<0.01	0.03	<0.01	0.01	3.4	1.9	0.35	0.33	
Nitrate (calc. from NO2+NO3-N)		mg/L	0.09	0.09	<0.04	<0.04	<0.04	0.13	<0.04	<0.04	<0.04	0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.09	<0.04	0.04	<0.04	<0.04	0.09	<0.04	<0.04	<0.04	
Nitrite		mg/L	<0.03	0.05	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.11	<0.03	<0.03	<0.03	<0.03	0.25	<0.03	<0.03	<0.03	<0.03	0.23	0.11	<0.03	<0.03	
Nitrite+Nitrate as nitrogen		mg/L	0.02	0.02	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	
Ortho-phosphate as P		mg/L	0.13	0.14	0.08	0.02	0.05	0.01	0.08	<0.01	0.12	0.16	0.04	0.2	<0.01	0.01	26	62	<0.01	0.01	0.05	0.02	<0.01	0.06	0.08	0.04	
Organic carbon, dissolved		mg/L	2.4	1.3	1.6	1.2	1.4	0.8	2.2	1.1	7	1	10	33	3.4	2	8.7	7.9	2.1	0.4	0.5	0.7	18	8.3	4.1	1.9	
Iron (II)		mg/L	-	0.04	-	0.02	-	<0.02	-	0.09	-	-	-	<0.02	-	-	-	-	-	-	-	0.07	-	<0.02	-	-	
Fluoride		mg/L	0.14	0.14	0.09	0.1	0.04	0.03	0.21	0.21	0.07	0.17	0.08	0.1	0.09	0.12	0.02	0.02	<0.01	0.02	0.09	0.11	0.08	0.18	0.01	0.24	
Total dissolved solids		mg/L	199	178	71	82	64	63	566	653	72	59	139	264	132	209	375	402	50	45	75	51	160	142	274	250	
Total suspended solids		mg/L	838	413	<1	6	133	<1	7	17	3	4	9	13	10	8	3	6	3	<1	18	20	13	24	10	26	
Calcium		mg/L	4.9	5.2	5.6	5.3	2.9	2.4	66	84	6.8	4.7	20	29	18	23	7.7	6.7	3.5	3	2.9	2.3	33	17	37	31	
Magnesium		mg/L	4.3	4.7	1.7	1.9	1.1	0.5	14	18	1.8	1.2	0.8	7.6	3.4	3.8	0.5	0.5	1.3	1	1	0.8	0.4	0.7	7	6.9	
Potassium		mg/L	1.8	1.5	1.6	1.5	1	0.3	3.5	4.1	1.7	1.5	8.6	1.2	2.1	2.1	149	148	1.1	0.7	1.1	1.2	6.3	4.4	4.4	3.7	
Sodium		mg/L	12	9	5.3	5.5	2.1	1.7	68	83	8.6	5.4	21	23	36	30	3.7	3.9	4.9	3.9	10	6.1	21	15	36	32	
Sulfate		mg/L	6.4	7	2.4	4.2	1	0.9	52	67	0.7	0.9	24	2.5	31	17	1.8	2.2	5.9	3	4.5	3	10	4.2	5.9	8.1	

Notes

a Monitoring Well GWR-028, completed in the Mfb and part of the Upgradient Cluster, could not be sampled because it is damaged

a Monitoring Well GWR-027, completed in the Mfb and part of the Upgradient Cluster, could not be sampled because it is damaged

c Monitoring Well GRW-007, completed in Overburden, and part of the SE cluster, could not be sampled because it was dry

d The water quality in GRW-034 is considered to reflect influence from drilling fluids and additives, and is not considered reliable. Analytical well for this data is not used further in this baseline report.

e Monitoring Well GRW-002, completed in Overburden, and part of the SE cluster, could not be sampled because it was dry

f Radon-222 concentration estimated based on the daughter products of Lead-214 and Bismuth-214

g Samples sent to the A.E. Lalonde AMS Laboratory, University of Ottawa for Tritium analysis are in tritium units (TU) where 1TU=0.1191Bq/L. The final results are converted to Bq/L.

h Sample was taken at the end of a 48 hour long pumping test on GWR-032. 5,680 gallons were pumped from the well during the test before sampling and no field parameters available.

i The water quality is compromised by inadvertent introduction of KCl. Groundwater quality not used in model or to calculate summary statistics.

Table 4-1: Groundwater Water Monitoring Results continued

Well Cluster	Units	LA-5 Cluster				Paloweathered Zone		Phoenix Ore Zone ^e																			
		GWR-036		GWR-037		GWR-031		GWR-011		GWR-013		GWR-032		GWR-038 ⁱ		GWR-039 ⁱ		GWR-040 ⁱ		GWR-041 ⁱ		GWR-042 ⁱ		GWR-046		GWR-047	
Groundwater Monitoring Well		OB	MfD	PWZ	MfA	MfB	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	MfC	MfB	MfA			
Lithology		OB	USA/DSZ	PWZ	LSA/DSZ	ISA/DSZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	ISA	ISA/DSZ	LSA			
Hydrostratigraphic Unit		OB	USA/DSZ	PWZ	LSA/DSZ	ISA/DSZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	ISA	ISA/DSZ	LSA			
Sampling Date		2020-11-05	2021-04-08	2020-10-24	2021-04-09	2020-08-09	2021-06-04	2020-08-08	2021-06-01	2020-08-09	2021-06-02	2019-11-14 ^b	2020-08-08	2021-06-04	2021-09-04	2021-09-05	2021-09-01	2021-09-01 DUP	2021-09-06	2021-09-07	2021-09-14	2021-09-10	2021-09-10				
Field Parameters																											
Field pH	pH units	6.45	6.62	6.13	6.02	7.03	7.21	8.70	6.82	9.68	7.35	-	6.79	6.83	7.54	6.74	6.84	6.84	6.88	6.71	6.37	6.47	6.08				
Field Temp.	°C	4.4	3.4	4.8	4.1	11.3	16.8	17.5	7.2	10.5	7.8	-	8.0	18.5	7.7	8.9	11.3	11.3	8	8.6	10.24	9.51	8.44				
Field Conductivity	µS/cm	18.3	42.8	26.4	49.1	588	1162	98.5	144.8	174.8	182.7	-	737	1486	7233	23173	11290	11290	9996	16567	136	97	111				
ORP	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	51.1	-84.5	-57.5				
Field SPC	µS/cm	30.5	73.1	43.1	81.1	789	1374	114	219.2	238.4	271.5	-	958	1683	10811	33458	15302	15302	14820	24146	192	138	163				
Field TDS	mg/L	20	48	57	53	513	893	74	142	155	176	-	623	1094	7027	21748	9947	9947	9633	15695	123	90	106				
Diss. O2	mg/L	9.80	8.36	4.01	3.00	4.62	3.65	4.64	11.91	3.60	11.83	-	1.16	2.26	5.57	4.59	2.57	2.57	6.69	6.28	12.2	3.14	1.74				
Fe2+	mg/L	0.0	0.0	0.5	1.0	0.5	0.0	0.0	1.0	0.0	1.0	-	1.5	1.5	-	-	-	-	-	-	-	-	-				
Analytical Results																											
Bicarbonate	mg/L	30	16	15	16	167	160	54	41	105	85	155	174	118	104	40	76	76	80	61	86.3	75.2	57				
Carbonate	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	24	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1				
Chloride	mg/L	0.2	<0.1	0.4	0.1	151	145	7.4	7.2	0.6	1.3	202	234	220	1600	4760	2560	2580	2270	3590	8.63	6.13	4.14				
Hydroxide	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1				
P. alkalinity	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	-	-				
pH	pH units	6.96	6.91	6.57	6.38	7.36	7.83	7.83	7.34	9.3	7.76	7.52	7.33	7.4	7.56	6.49	6.98	7.39	6.91	6.51	7.06	7.37	7.08				
Specific conductivity	µS/cm	21	35	32	39	810	686	115	99	248	141	965	1000	860	5380	16100	7530	7530	7050	11530	277	160	139				
Sum of ions	mg/L	47	28	32	29	504	439	92	71	210	126	566	598	504	3130	9220	4360	4350	4130	6760	-	-	-				
Total alkalinity	mg/L	25	13	12	13	137	131	44	34	126	70	127	143	97	85	33	62	62	66	50	70.7	61.6	46.7				
Total hardness	mg/L	16	14	8	6	190	148	38	26	57	48	267	256	182	614	2470	1830	1830	1340	1900	89.5	29.4	43.4				
Ammonia as nitrogen	mg/L	<0.01	<0.01	0.04	0.02	0.05	0.35	0.26	0.13	0.68	0.02	-	0.31	0.73	-	44	12	12	18	-	0.026	<0.005	<0.005				
Nitrate (calc. from NO2+NO3-N)	mg/L	0.49	0.49	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	0.13	<0.4	0.04	<0.04	0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02				
Nitrite	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.05	<0.03	-	<0.03	<0.03	-	<0.03	<0.03	<0.03	0.04	-	<0.01	<0.01	<0.01				
Nitrite+Nitrate as nitrogen	mg/L	0.11	0.11	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.03	-	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05				
Ortho-phosphate as P	mg/L	0.09	0.08	0.02	0.04	<0.01	0.01	0.11	0.12	0.03	0.06	-	<0.01	0.01	-	0.04	0.02	<0.01	0.02	-	-	-	-				
Organic carbon, dissolved	mg/L	1.1	0.5	3.9	2	68	6.2	3.6	1	7.9	2	-	36	5.8	-	40	19	19	21	-	34.6	8.95	15.6				
Iron (II)	mg/L	-	-	-	<0.02	-	<0.02	-	-	-	-	-	-	-	-	0.07	-	-	0.05	-	7.77	<0.02	2.3				
Fluoride	mg/L	0.01	0.06	<0.01	0.01	0.32	0.42	0.2	0.18	0.13	0.08	0.22	0.19	0.23	0.27	0.14	0.21	0.21	0.21	0.18	0.059	0.074	0.142				
Total dissolved solids	mg/L	112	66	90	55	536	393	101	66	182	177	639	628	599	3280	10400	4640	4080	4510	7830	188	132	122				
Total suspended solids	mg/L	180	71	<1	<1	5	41	171	34	28	208	-	11	17	-	68	28	26	31	-	-	-	-				
Calcium	mg/L	1.2	2.7	2	1.8	58	43	13	7.9	21	14	84	78	55	190	843	590	590	431	665	29.4	8.24	13.1				
Magnesium	mg/L	3.2	1.8	0.7	0.4	11	9.9	1.3	1.6	1.1	3.1	14	15	11	34	90	88	88	64	58	3.91	2.14	2.6				
Potassium	mg/L	5.3	2.8	1.9	1.8	5.5	5.3	2.4	2	6.7	1.8	5.6	5.4	4.6	955	3000	767	732	975	2000	6.77	4.46	1.89				
Sodium	mg/L	3.9	2.9	3.6	2.8	71	69	8.4	6.1	34	15	75	83	81	137	189	203	205	154	152	8.96	18.6	8.87				
Sulfate	mg/L	2.6	1.9	8	6.5	40	6.6	5.5	4.7	17	5.2	30	8	13	110	300	71	67	160	230	10.1	2.28	6.26				

Notes
a Monitoring Well GWR-028, completed in the MfB and part of the Upgradient Cluster, could not be sampled because it is damaged
a Monitoring Well GWR-027, completed in the MfB and part of the Upgradient Cluster, could not be sampled because it is damaged
c Monitoring Well GRW-007, completed in Overburden, and part of the SE cluster, could not be sampled because it was dry
d The water quality in GRW-034 is considered to reflect influence from drilling fluids and additives, and is not considered reliable. Analytical well for this data is not used further in this baseline report.
e Monitoring Well GRW-002, completed in Overburden, and part of the SE cluster, could not be sampled because it was dry
f Radon-222 concentration estimated based on the daughter products of Lead-214 and Bismuth-214
g Samples sent to the A.E. Lalonde AMS Laboratory, University of Ottawa for Tritium analysis are in tritium units (TU) where 1TU=0.11918Bq/L. The final results are converted to Bq/L.
h Sample was taken at the end of a 48 hour long pumping test on GWR-032. 5,680 gallons were pumped from the well during the test before sampling and no field parameters available.
i The water quality in compromised by inadvertent introduction of KCl. Groundwater quality not used in model or to calculate summary statistics.

Table 4-1: Groundwater Water Monitoring Results continued

Well Cluster	Groundwater Monitoring Well	Units	Upgradient Cluster ^a				NW Cluster ^b				SE Cluster ^c				WR-607 Cluster ^d				Downgradient Cluster							
			GWR-006		GWR-029		GWR-003		GWR-025		GWR-008		GWR-009		GWR-033		GWR-034		GWR-035		GWR-005		GWR-014		GWR-012	
			OB		Mfa		OB		Mfa		Mfa		Mfb		Mfa		Mfb		OB / Mfd		OB		Mfc		Mfa	
			Lithology	OB	OB	LSA	OB	LSA	LSA/DSZ	ISA/DSZ	LSA	ISA	USA	OB	USA/DSZ	LSA/DSZ										
Hydrostratigraphic Unit	OB	OB	LSA	OB	LSA	LSA/DSZ	ISA/DSZ	LSA	ISA	USA	OB	USA/DSZ	LSA/DSZ													
Sampling Date	2020-08-22	2021-04-14	2020-08-30	2021-04-12	2020-08-16	2021-04-18	2020-08-22	2021-04-17	2020-09-06	2021-04-09	2020-09-14	2021-04-10	2020-11-03	2021-05-25	2020-10-30	2021-05-24	2020-11-03	2021-05-24	2020-08-29	2021-05-22	2020-08-29	2021-05-21	2020-08-29	2021-05-23		
Aluminum, dissolved	mg/L	0.0096	0.016	0.014	<0.0005	0.0065	0.0055	0.0024	<0.0005	0.0081	0.0023	0.012	0.21	0.025	0.0013	0.035	0.2	0.013	0.0058	0.0022	<0.0005	0.02	0.003	0.0038	<0.0005	
Antimony, dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	0.0005	<0.0002	0.0055	<0.0002	<0.0002	<0.0002	0.0003	0.0007	<0.0002	<0.0002	<0.0002	<0.0002	0.002	<0.0002	<0.0002	<0.0002	
Arsenic, dissolved	ug/L	1.3	0.8	0.3	<0.1	0.2	0.1	<0.1	<0.1	0.1	0.1	3.3	11	2.2	1.8	0.2	0.4	0.2	0.2	1.1	1.4	0.6	0.5	0.2	<0.1	
Barium, dissolved	mg/L	0.0081	0.0095	0.0082	0.0053	0.0082	0.0056	0.12	0.11	0.1	0.042	0.059	0.22	0.059	0.059	0.011	0.018	0.015	0.016	0.024	0.015	0.15	0.11	0.25	0.15	
Beryllium, dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Bismuth, dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Boron, dissolved	mg/L	0.01	0.01	0.04	0.04	<0.01	<0.01	0.32	0.4	0.03	0.03	<0.01	<0.01	0.04	0.05	<0.01	<0.01	<0.01	<0.01	0.03	0.03	0.02	0.02	0.15	0.15	
Bromine	ug/L	22	18	85	79	<5	<5	2900	3600	40	34	<5	5	750	860	12	12	76	79	46	47	5	7	1000	1100	
Cadmium, dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001	0.0001	<0.0001	0.0003	0.0006	0.0002	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Chromium, dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0058	<0.0005	<0.0005	0.0048	0.0019	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Cobalt, dissolved	mg/L	0.0002	0.0002	<0.0001	<0.0001	0.0009	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	0.0047	0.0005	0.0005	0.0003	0.0003	0.0003	0.001	0.0012	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Copper, dissolved	mg/L	0.0008	<0.0002	<0.0002	<0.0002	0.0017	0.0007	<0.0002	<0.0002	<0.0002	0.0007	0.0008	0.0011	0.0003	<0.0002	0.016	0.025	0.0005	0.0003	<0.0002	<0.0002	0.0004	0.0009	<0.0002	<0.0002	
Iron, dissolved	mg/L	0.49	0.53	4.86	2.16	0.039	0.16	16	9.7	3.55	2.81	0.21	15.3	0.47	0.66	0.61	0.75	0.32	0.16	3.71	4.84	0.055	0.064	5.6	1.32	
Lead, dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.0002	<0.0001	0.011	0.0054	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Lithium, dissolved	ug/L	8.5	9.1	11	13	0.8	0.8	32	40	12	9.9	9	6.3	14	15	0.4	0.7	4	3.1	11	11	12	14	26	28	
Manganese, dissolved	mg/L	0.14	0.16	0.23	0.24	0.14	0.073	0.97	1.14	0.4	0.33	0.021	2.75	0.21	0.27	0.019	0.037	0.14	0.23	0.17	0.2	0.0018	0.0037	0.57	0.59	
Molybdenum, dissolved	mg/L	0.0012	0.0007	0.0001	<0.0001	0.0012	<0.0001	0.0005	0.0002	0.0003	0.0002	0.0087	0.0005	0.003	0.0026	0.0007	0.0004	0.0008	0.0009	0.0023	0.0007	0.0024	0.0034	0.0023	0.0007	
Nickel, dissolved	mg/L	0.0004	0.0004	0.0002	<0.0001	0.0021	0.0017	0.0002	<0.0001	0.0004	0.0002	0.0012	0.0053	0.0011	0.0008	0.0035	0.002	0.005	0.01	0.0003	<0.0001	0.0027	0.0015	0.0006	0.0002	
Selenium, dissolved	mg/L	<0.0001	<0.0001	0.0011	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0002	<0.0001	
Silica, soluble, dissolved	mg/L	23	24.2	17.4	17.2	16.5	17.6	17.8	16.8	25.8	23.9	19.5	30.3	10.9	12.2	5.2	6.9	20.3	19.1	19.9	20.4	15.5	16.3	24.4	21.2	
Silver, dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Strontium, dissolved	mg/L	0.034	0.029	0.12	0.12	0.02	0.02	1.88	2.19	0.12	0.1	0.24	0.21	0.3	0.36	0.021	0.022	0.033	0.031	0.057	0.059	0.26	0.15	0.61	0.59	
Sulfur	mg/L	2.1	2.3	0.8	1.4	0.33	0.3	17	22	0.23	0.3	8	0.8	10.3	5.7	0.6	0.7	1.97	1	1.5	1	3.3	1.4	2	2.7	
Thallium, dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Tin, dissolved	mg/L	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0017	0.0032	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Titanium, dissolved	mg/L	<0.0002	0.0003	<0.0002	<0.0002	0.0004	<0.0002	<0.0002	0.0004	<0.0002	<0.0002	0.0034	<0.0002	<0.0002	0.0011	0.0051	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Vanadium, dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0018	<0.0001	<0.0001	<0.0001	0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Zinc, dissolved	mg/L	0.0009	0.0041	0.001	0.0016	0.01	0.009	0.003	0.0026	0.0029	0.0016	0.0014	0.017	0.015	0.004	0.14	0.12	0.0025	0.0045	0.0064	0.0014	0.0007	0.0008	0.0007	0.002	
Phosphorus, dissolved	mg/L	0.06	0.02	0.06	<0.01	<0.01	<0.01	0.09	<0.01	0.06	0.1	0.05	0.19	<0.01	0.01	58.4	61	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.07	0.1	
Radionuclides																										
Uranium, dissolved	ug/L	1.4	0.2	0.2	0.2	0.5	<0.1	0.8	<0.1	2.4	0.7	5.3	22	3.6	0.8	136	87	0.2	<0.1	0.5	0.5	0.3	1.2	0.5	<0.1	
Uranium-234 calculated	Bq/L	0.043	0.002	0.004	0.002	0.01	0.001	0.024	0.001	0.043	0.009	0.13	0.27	0.047	0.011	2.4	1.2	0.002	0.003	0.037	0.01	0.037	0.017	0.011	0.002	
Uranium-238 calculated	Bq/L	0.043	0.002	0.004	0.002	0.01	0.001	0.024	0.001	0.043	0.009	0.13	0.27	0.047	0.011	2.4	1.2	0.002	0.003	0.037	0.01	0.037	0.017	0.011	0.002	
Lead-210	Bq/L	0.09	0.08	0.1	0.07	0.6	0.03	0.08	0.08	<0.02	0.66	0.3	1.1	0.14	0.04	22	5.7	0.03	<0.02	0.28	<0.02	0.08	0.3	0.15	0.1	
Polonium-210	Bq/L	0.13	0.22	0.02	0.34	0.2	0.05	0.02	0.18	0.05	0.67	0.07	0.73	0.02	0.16	6.3	4.4	0.06	0.03	0.11	0.02	0.03	0.52	0.03	0.26	
Radium-226	Bq/L	0.36	0.06	0.07	0.09	0.27	0.02	0.26	0.29	0.81	0.32	0.33	0.3	1.6	0.13	3.6	0.9	0.14	0.04	0.16	0.03	0.08	0.06	0.17	0.12	
Radon-222	Bq/L	32	20	35	<10	86	18	7	<4	38	<4	<3	<4	20	<3	25	8	30	20	15	<5	11	<6	23	<4	
Thorium-230	Bq/L	0.12	<0.01	<0.01	0.04	0.08	<0.01	<0.01	0.03	0.01	0.02	0.03	0.22													

Table 4-1: Groundwater Water Monitoring Results continued

Well Cluster	Groundwater Monitoring Well	Lithology	Hydrostratigraphic Unit	Units	LA-5 Cluster				Paloweahtered Zone		Phoenix Ore Zone ^a												
					GWR-036		GWR-037		GWR-031		GWR-011		GWR-013		GWR-032		GWR-038 ¹	GWR-039 ²	GWR-040 ¹		GWR-041 ¹	GWR-042 ²	GWR-046
Sampling Date	OB	MfD	USA/DSZ	PWZ	LSA/DSZ	ISA/DSZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	OZ	ISA	ISA/DSZ	LSA		
Aluminum, dissolved	mg/L	0.15	0.037	0.48	0.06	<0.005	<0.0005	0.0082	0.052	0.025	0.011	0.21	0.0057	0.0006	-	0.005	<0.005	<0.005	0.01	-	0.8	0.0065	0.001
Antimony, dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.002	0.0003	0.0014	<0.0002	0.0008	<0.0002	0.0003	<0.0002	<0.0002	-	<0.002	<0.002	<0.002	<0.002	<0.002	0.00024	<0.0001	<0.0001
Arsenic, dissolved	ug/L	0.2	0.3	0.4	1	1	1.2	4.1	1.3	3.1	0.9	3.4	0.3	0.2	-	<1	<1	<1	<1	<1	4.75	3.71	0.85
Barium, dissolved	mg/L	0.0095	0.0057	0.0073	0.0087	0.052	0.035	0.21	0.054	0.041	0.11	0.088	0.083	0.063	-	0.96	0.52	0.52	0.35	-	0.241	0.0626	0.0577
Beryllium, dissolved	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	-	<0.001	<0.001	<0.001	<0.001	-	0.000167	<0.00002	<0.00002
Bismuth, dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	-	<0.0002	<0.0002	-	<0.002	<0.002	<0.002	<0.002	-	<0.00005	<0.00005	<0.00005
Boron, dissolved	mg/L	<0.01	<0.01	<0.01	<0.01	0.5	0.55	0.04	0.04	0.02	<0.01	0.58	0.59	0.43	-	0.4	0.5	0.5	0.5	-	0.023	0.018	0.041
Bromine	ug/L	<5	<5	<5	<5	1100	1500	100	100	8	<5	-	2300	2000	-	15800	9800	9800	6800	-	11	34	57
Cadmium, dissolved	mg/L	0.00001	<0.00001	0.00002	<0.00001	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	-	<0.0001	<0.0001	<0.0001	<0.0001	-	0.0000336	<0.000005	<0.000005
Chromium, dissolved	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	0.009	0.0008	<0.0005	<0.0005	<0.0005	<0.0005	0.013	0.0011	<0.0005	-	<0.005	<0.005	<0.005	<0.005	-	0.00169	<0.0005	0.00068
Cobalt, dissolved	mg/L	0.0004	0.0002	0.0005	0.0004	0.002	0.0002	<0.0001	<0.0001	<0.0001	0.0001	0.0007	<0.0001	<0.0001	-	0.003	0.001	0.001	0.002	-	0.00584	0.00025	0.00036
Copper, dissolved	mg/L	0.002	0.0006	0.0013	0.0009	<0.002	<0.0005	0.0006	0.0018	0.0006	0.0008	<0.0002	<0.0002	<0.0002	-	<0.002	<0.002	<0.002	<0.002	-	0.00629	<0.0002	<0.0002
Iron, dissolved	mg/L	0.12	0.014	1.64	1.38	3.6	0.09	0.012	0.86	0.086	0.014	3.83	6.4	4.2	-	23	8.2	7.7	18.2	-	6.03	11.9	9.62
Lead, dissolved	mg/L	0.0001	<0.0001	0.0002	<0.0001	0.001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.0005	<0.0001	-	<0.001	<0.001	<0.001	<0.001	-	0.00157	<0.00005	<0.00005
Lithium, dissolved	ug/L	3	2.8	9.2	9	89	90	10	13	8.8	6.2	-	75	65	-	470	250	250	210	-	8.3	9.6	15.5
Manganese, dissolved	mg/L	0.048	0.039	0.12	0.16	0.22	0.13	0.085	0.36	0.026	0.22	0.2	0.24	0.22	-	1.8	0.85	0.83	0.87	-	3.91	2.14	2.6
Molybdenum, dissolved	mg/L	0.0003	0.0007	<0.0001	0.0028	0.062	0.012	0.028	0.0042	0.018	0.0054	0.078	0.0059	0.0038	-	0.008	0.011	0.011	0.045	-	0.00389	0.00374	0.00298
Nickel, dissolved	mg/L	0.0023	0.0018	0.0037	0.0023	0.04	0.0019	0.0003	0.0001	0.0024	0.0001	0.012	0.0018	0.0001	-	0.056	0.019	0.02	0.024	-	0.0487	0.00062	0.00066
Selenium, dissolved	mg/L	0.0007	0.0008	0.0001	0.0004	<0.001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001	-	0.003	0.002	0.002	0.002	-	0.000359	<0.00005	<0.00005
Silica, soluble, dissolved	mg/L	25.5	26.2	33.4	35.3	10	9.1	22.5	24.1	19.2	22.7	-	13.5	13.3	-	55.7	50.5	51.2	70.2	-	13.1	11.8	11.6
Silver, dissolved	mg/L	<0.00005	<0.00005	0.0001	0.00011	<0.0005	<0.0005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	-	<0.0005	<0.0005	<0.0005	<0.0005	-	0.000046	<0.00001	<0.00001
Strontium, dissolved	mg/L	0.012	0.012	0.014	0.012	1.4	1.17	0.13	0.12	0.16	0.08	2.37	2.51	1.66	-	23.5	16.1	16.1	11.2	-	0.115	0.0796	0.169
Sulfur	mg/L	0.87	0.6	2.7	2.1	13	2.2	1.8	1.6	5.7	1.7	-	2.7	4.3	-	100	24	22	53.3	-	8.69	1.34	3.58
Thallium, dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	-	<0.002	<0.002	<0.002	<0.002	-	<0.00001	<0.00001	<0.00001
Tin, dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.001	<0.001	<0.001	<0.001	-	0.00033	<0.0001	<0.0001
Titanium, dissolved	mg/L	0.0009	0.0004	0.0048	0.0006	<0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0002	-	<0.002	<0.002	<0.002	<0.002	-	0.00897	<0.0003	<0.0003
Vanadium, dissolved	mg/L	0.0001	0.0004	<0.0001	<0.0001	<0.001	<0.0001	0.0005	<0.0001	0.0019	<0.0001	0.0074	0.0004	<0.0001	-	<0.001	<0.001	<0.001	<0.001	-	0.0012	<0.0005	<0.0005
Zinc, dissolved	mg/L	0.0061	0.0044	0.0067	0.0041	18.4	0.69	0.0018	0.012	0.001	0.0016	2.94	5	2.62	-	0.09	0.01	0.011	0.065	-	0.0125	0.0011	0.0031
Phosphorus, dissolved	mg/L	0.04	0.04	0.01	0.03	<0.1	<0.1	0.15	0.01	0.1	0.01	-	<0.01	<0.01	-	<0.1	<0.1	<0.1	<0.1	-	<0.05	0.13	0.289
Radionuclides																							
Uranium, dissolved	ug/L	0.9	0.1	5.8	0.8	17	50	9	0.7	14	55	299	5.7	11	504	38	10	10	564	22.6	0.752	0.488	
Uranium-234 calculated	Bq/L	0.042	0.002	0.08	0.01	0.46	10.7	0.36	0.008	0.29	10.5	-	0.21	1.69	-	15.9	0.24	0.56	1	-	-	-	
Uranium-238 calculated	Bq/L	0.042	0.002	0.08	0.01	0.46	10.7	0.36	0.008	0.29	10.5	-	0.21	1.69	-	15.9	0.24	0.56	1	-	-	-	
Lead-210	Bq/L	0.14	0.07	0.08	0.05	1100	7300	0.6	0.3	0.4	8	1200	3300	2200	-	2700	5000	5000	2300	-	0.9	1.1	0.46
Polonium-210	Bq/L	0.08	0.05	0.14	0.11	460	650	0.4	0.3	0.4	13	460	260	110	-	460	700	600	420	-	0.65	0.14	1.3
Radium-226	Bq/L	0.22	0.06	0.19	0.03	120	76	1	0.5	0.5	17	300	400	180	-	6200	1500	1100	10000	-	0.93	0.24	0.75
Radon-222	Bq/L	17	20	64	57	5900	12000000	90	<8	34	41	400000 ⁰	2700000	3800000	-	6000000	6000000	6000000	4000000	-	11	1800	620
Thorium-230	Bq/L	<0.01	0.02	<0.01	<0.01	1.1	30	0.3	<0.1	0.2	4.7	14	2	7	-	21	6	10	6	-	0.2	<0.01	0.01
Tritium	Bq/L	<15	0.8	<15	0.1	<15	910	<15	0.1	<15	0.8	-	950	1800	-	RTR	<15	<15	RTR	-	<40	<40	<40

Notes
a Monitoring Well GWR-028, completed in the MfB and part of the Upgradient Cluster, could not be sampled because it is damaged
a Monitoring Well GWR-027, completed in the MfB and part of the Upgradient Cluster, could not be sampled because it is damaged
c Monitoring Well GRW-007, completed in Overburden, and part of the SE cluster, could not be sampled because it was dry
d The water quality in GRW-034 is considered to reflect influence from drilling fluids and additives, and is not considered reliable. Analytical well for this data is not used further in this baseline report.
e Monitoring Well GRW-002, completed in Overburden, and part of the SE cluster, could not be sampled because it was dry
f Radon-222 concentration estimated based on the daughter products of Lead-214 and Bismuth-214
g Samples sent to the A.E. Lalonde AMS Laboratory, University of Ottawa for Tritium analysis are in tritium units (TU) where 1TU=0.11918Bq/L. The final results are converted to Bq/L.
h Sample was taken at the end of a 48 hour long pumping test on GWR-032. 5,680 gallons were pumped from the well during the test before sampling and no field parameters available.
i The water quality in compromised by inadvertent introduction of KCl. Groundwater quality not used in model or to calculate summary statistics.

4.2.1 Constituent Groupings

Examining the median values, three constituent “groups” emerged. These groups are differentiated by colour in Table 4-2.

Group 1: This group, highlighted in pale green highlighting in Table 4-2, includes constituents for which concentrations in groundwater in all the hydrostratigraphic units and surface water did not vary significantly. This group generally included constituents present in low concentrations, often at or below analytical detection limits, and are not discussed further in the interpretation of groundwater conditions herein.

Group 2: This group, highlighted by pale yellow shading in Table 4-2 includes general groundwater quality indicators, and select trace elements. This group of constituents is evaluated further in Section 4.3.3 as they inform the conceptualization of the groundwater flow systems at the Site.

Group 3: This group, highlighted in blue in Table 4-2, primarily includes radionuclides, but also some trace elements (Cr, V, and Zn). Median concentrations/activities of Group 3 constituents in the ore zone groundwater samples are generally more than two orders of magnitude higher than those in the Athabasca Sandstone Supergroup and overburden hydrostratigraphic units. This is shown in Figure 20, where concentrations of uranium are shown for the Ore Zone Aquifer and overlying hydrostratigraphic units. Uranium concentrations in the Ore Zone Aquifer (GWR-032) have been measured at 299 µg/L and decrease by an order of magnitude or more in the overlying hydrostratigraphic unit. Baseline uranium concentrations are very low (close to or below detection limits) in Whitefish Lake. Elevated levels of these metals/trace elements constituents are, like those of uranium and other radionuclides, attributed to the mineralogy and geochemical conditions within the ore zone.

4.2.2 Groundwater Ageing: Tritium Values

The potential for analysis of tritium concentrations in groundwater to support ageing of groundwater and the development of the CSM for the Wheeler River program was evaluated using the available analytical data and information on tritium concentrations in precipitation. The analysis is presented in Appendix L. It was concluded that, beyond supporting recent groundwater recharge in the overburden and the upper sandstone aquifer – discussed further below (Section 4.3.3) - tritium concentrations in groundwater do not provide a robust means of ageing groundwater in the subsurface for the Wheeler River Project. Tritium concentrations in groundwater will continue to be measured as part of the routine groundwater sampling, to further evaluate the usefulness of this approach for refining the conceptual site model developed for the Wheeler River Project.

Table 4-2: Summary Statistics, Groundwater and Surface Water Quality, Wheeler River Project

Well Cluster	Units	Ore Zone (OZ)				Paleoweathered Zone (PWZ)				Lower Sandstone Aquifer (MFa)				Intermediate Sandstone Aquitard (MFb and MFc) ^a				Local Groundwater Flow System (OB and MFd)				Surface Water ^{b,c}				Constituent "Group"
		Number	Max	Min	Median	Number	Max	Min	Median	Number	Max	Min	Median	Number	Max	Min	Median	Number	Max	Min	Median	Number	Max	Min	Median	
Field Parameters																										
Field pH	pH units	2	6.83	6.79	6.81	2	7.21	7.03	7.12	13	8.70	6.08	7.02	5	10	6.4	7.4	12	7.5	5.9	6.5	-	-	-	-	(2) 3*
Field Temp.	°C	2	19	8.0	13	2	17	11.3	14	13	18	3.6	7.5	6	10	3.3	8.1	12	15	3.4	5.0	-	-	-	-	See note d
Field Conductivity	µS/cm	2	1486	737	1112	2	1162	588	875	13	1392.0	56.7	144.8	6	362	97	227	12	98	17	46	-	-	-	-	(2) 3*
ORP	mV	-	-	-	-	-	-	-	-	1	-57.5	-57.5	-	2	51	-85	-17	-	-	-	-	-	-	-	-	-
Field SPC	µS/cm	2	1683	958	1321	2	1374	789	1082	13	2315	87.6	219	6	618	138	334	12	151	28	77	-	-	-	-	2
Field TDS	mg/L	2	1094	623	859	2	893	513	703	13	1505	0.11	142	6	402	0	218	12	98	18	53	-	-	-	-	2
Analytical Results																										
Bicarbonate	mg/L	3	174	118	155	2	167	160	164	13	112	29	51	6	188	75.20	85.7	12	35	12	24	32	20	2.0	8.1	2
Carbonate	mg/L	3	<1	<1	-	2	<1	<1	-	13	<1	<1	-	6	18	<1	-	12	<1	<1	-	32	<1	<1	-	2
Chloride	mg/L	3	234	202	220	2	151	145	148	13	319	2.7	7.4	6	8.6	<1	0.85	12	10	<0.1	0.90	32	0.80	0.10	0.37	2
Hydroxide	mg/L	3	<1	<1	-	2	<1	<1	-	13	<1	<1	-	6	<1	<1	-	12	<1	<1	-	32	<1.1	<1	-	See note e
P. alkalinity	mg/L	3	<1	<1	-	2	<1	<1	-	12	<1	<1	-	4	15	<1	-	12	<1	<1	-	32	<1.1	<1	-	See note e
pH	pH units	3	7.52	7.33	7.40	2	7.83	7.36	7.60	13	7.83	6.90	7.34	6	9.1	7.1	7.64	12	7.32	6.38	6.90	32	7.17	6.33	6.8	See note e
Specific conductivity	µS/cm	3	1000	860	965	2	810	686	748	13	1110	68	139	6	289	141	183	12	71	19	43	32	42	12	18	See note e
Sum of ions	mg/L	3	598	504	566	2	504	439	472	12	610	54	142	4	252	126	164	12	75	20	44	32	25	6.0	13	See note e
Total alkalinity	mg/L	3	143	97	127	2	137	131	134	13	92	24	42	6	154	62	81	12	29	10	20	31	16	2.0	6.9	See note e
Total hardness	mg/L	3	267	182	256	2	190	148	169	13	283	17	43	6	104	29	66	12	32	6.0	12	31	12	4.0	5.3	See note e
Ammonia as nitrogen	mg/L	2	1	0.31	0.5	2	0	0.05	0.2	13	0.35	<0.005	0.12	6	3.4	<0.005	0.05	12	0.17	<0.01	0.02	32	1.2	<0.01	-	2
N)	mg/L	3	0.04	<0.04	-	2	<0.04	<0.04	-	13	<0.04	<0.02	-	6	0.13	<0.02	-	12	0.49	<0.04	-	32	0.25	<0.04	-	1
Nitrite	mg/L	2	<0.03	<0.03	-	2	<0.03	<0.03	-	13	<0.03	<0.01	-	6	0.23	<0.01	-	12	0.05	<0.03	-	-	-	-	-	1
Nitrite+Nitrate as nitrogen	mg/L	2	0.01	<0.01	-	2	<0.01	<0.01	-	13	<0.01	<0.01	-	6	0.05	<0.01	-	12	0.11	<0.01	-	-	-	-	-	1
Ortho-phosphate as P	mg/L	2	0.01	<0.01	-	2	0.01	<0.01	-	12	0.16	<0.01	0.08	4	0	0.005	0.06	12	0.14	0.01	0.05	-	-	-	-	1
Organic carbon, dissolved	mg/L	2	36	6	21	2	68	6	37	13	16	1.0	2.0	6	35	2.0	13.5	12	3.9	0.40	1.2	32	8.40	1.50	2.4	2
Iron (II)	mg/L	1	0.04	0.04	-	1	<0.02	<0.02	-	3	2.30	0.02	0.09	4	7.8	<0.02	-	4	0.07	<0.02	0.03	-	-	-	-	2
Fluoride	mg/L	3	0.23	0.19	0.22	2	0.42	0.32	0.37	13	0.24	0.01	0.14	6	0.2	0.06	0.08	12	0.14	0.01	0.04	32	0.06	0.01	0.02	2
Total dissolved solids	mg/L	3	639	599	628	2	536	393	465	13	653	59	122	6	264	132	169	12	199	45	65	32	35.00	11.00	23.17	See note e
Total suspended solids	mg/L	2	17	11.0	14	2	41	5.0	23	12	171	0.5	9.0	4	208	13.0	19	12	838	1.00	19	32	23.00	<1.5	-	1
Calcium	mg/L	3	84	55	78	2	58	43	51	13	84	4.7	13	6	33	8.2	23	12	5.2	1.2	2.8	32	3.50	1.00	1.39	2
Magnesium	mg/L	3	15	11.0	14	2	11	9.9	10	13	18	1.2	2.6	6	7.6	0.40	2.6	12	4.7	0.4	1.1	32	0.70	0.30	0.40	2
Potassium	mg/L	3	6	4.6	5.4	2	6	5.3	5.4	13	4.4	1.5	2.1	6	7	1.2	4	12	5.3	0.3	1.4	32	0.80	0.10	0.35	2
Sodium	mg/L	3	83	75	81	2	71	69	70	13	83	5.3	8.9	6	23	9.0	17	12	12	1.7	3.9	32	1.85	1.14	1.51	2
Sulfate	mg/L	3	30	8.0	13	2	40	6.6	23	13	67	0.70	5.9	6	10	2.3	4.7	12	8.0	0.90	3.8	32	8.30	0.30	0.68	2

Notes

- Shading is used to highlight median values
- Shading is used to indicate "Group 1" constituents - see text for details.
- Shading is used to indicate "Group 2" constituents - see text for details.
- Shading is used to indicate "Group 3" constituents - see text for details.
- Indicates where median values were not calculated. Median values were only calculated when the frequency of detection for the constituent exceeded 50% of the samples from each group. Where values were below detection, the detection limit was used to calculate median values.
- Blank Cells mean the constituent was not measured
- a Sample GWR-034 was not included in the summary statistics, as the groundwater was influenced by drilling fluids and additives and is not reflective of natural groundwater.
- b The surface water samples include all 32 lake and stream sample locations reported in Ecometrix, 2020 (Wheeler River Project: Baseline Aquatic Environment Study). Surface water quality at each location was measured on 1-6 occasions. Arithmetic mean values were reported in Ecometrix, 2020 at each location were used herein (i.e. the reported "max" value is the maximum arithmetic mean value, etc.). This was considered acceptable for the comparison only purposes within this report.
- c Metal and trace element concentrations in the surface water samples are for Total concentrations, not dissolved.
- d Temperature and Dissolved oxygen are likely to be influenced to some extent by ambient conditions, and are thus not considered further in the interpretation of groundwater conditions at the Site.
- e These constituents are considered part of Group 2 but are not discussed further in the interpretation of groundwater conditions at the site because they are correlated to or represented by other parameters being carried forward (e.g. Fe²⁺ by Dissolved Iron; laboratory-measured TDS by field-measured TDS, etc.)
- f U-234 was calculated from U-238 assuming secular equilibrium. This assumption may not hold in the groundwater flow systems. This constituent is not considered further in the interpretation of groundwater conditions at the Site.
- g Tritium concentrations were very low, with the exception of the ore zone and paleoweathered zone groundwater samples.

Table 4-2: Summary Statistics, Groundwater and Surface Water Quality, Wheeler River Project, Continued

Well Cluster	Units	Ore Zone				Paleoweathered Zone (PWZ)				Lower Sandstone Aquifer (MFa)				Intermediate Sandstone Aquitard (MFb and MFc) ^a				Local Groundwater Flow System (OB and MFD)				Surface Water ^{b,c}				Constituent "Group"	
		Number	Max	Min	Median	Number	Max	Min	Median	Number	Max	Min	Median	Number	Max	Min	Median	Number	Max	Min	Median	Number	Max	Min	Median		Number
Aluminum, dissolved	mg/L	3	0.21	0.0006	0.01	2	0.0025	0.0005	-	13	0.05	<0.0005	0.002	6	0.8	0.003	0.02	12	0.48	<0.0005	0.01	32	0.028	0.001	0.005	(1) 3*	
Antimony, dissolved	mg/L	3	0.00	<0.002	-	2	<0.002	<0.002	-	13	0.001	<0.0001	-	6	0.0007	<0.0001	-	12	<0.0002	<0.0002	-	32	0.00	<0.0002	-	1	
Arsenic, dissolved	ug/L	3	3.40	0.2	0.3	2	1.20	1.00	1.1	13	4.1	<0.1	0.20	6	11	0.50	2.3	12	1.4	0.1	0.35	32	0.0003	<0.0001	-	(1) 3*	
Barium, dissolved	mg/L	3	0.09	0.063	0.08	2	0.05	0.035	0.04	13	0.25	0.005	0.06	6	0.2	0.06	0.13	12	0.02	0.01	0.01	32	0.01	<0.00215	0.00	1	
Beryllium, dissolved	mg/L	3	0.00	<0.0001	-	2	<0.001	<0.001	-	13	<0.0001	<0.00002	-	6	0.0002	<0.00002	-	12	0.0001	<0.0001	-	32	0.00	<0.0001	-	1	
Bismuth, dissolved	mg/L	2	<0.002	<0.002	-	2	<0.002	<0.002	-	13	<0.0002	<0.00005	-	6	<0.0002	<0.00005	-	12	<0.0002	<0.0002	-	-	-	-	-	1	
Boron, dissolved	mg/L	3	0.6	0.43	0.58	2	0.6	0.50	0.53	13	0.40	0.03	0.04	6	0.02	<0.01	0.02	12	0.03	<0.01	-	32	<0.01	<0.01	-	2	
Bromine	ug/L	2	2300	2000	2150	2	1500	1100	1300	13	3600	34	100	6	34	<5	6.0	12	79	5.0	-	-	-	-	-	-	2
Cadmium, dissolved	mg/L	1	0.00001	<0.00001	-	2	<0.0001	<0.0001	-	13	<0.00001	<0.000005	-	6	0.00003	<0.000005	-	12	0.00005	<0.00001	0.00001	31	0.00	<0.00001	-	(1) 3*	
Chromium, dissolved	mg/L	3	0.013	<0.0005	0.001	2	0.009	0.001	0.005	13	0.0007	<0.0005	-	6	0.0058	<0.0005	-	12	<0.0005	<0.0005	-	32	<0.0005	<0.0005	-	3	
Cobalt, dissolved	mg/L	3	0.0007	<0.0001	0.00	2	0.0020	0.0002	0.00	13	0.0005	<0.0001	-	6	0.001	<0.0001	0.0002	12	0.001	<0.0001	0.0004	32	0.00	<0.0001	-	(1) 3*	
Copper, dissolved	mg/L	3	<0.0002	<0.0002	-	2	<0.002	<0.002	-	13	0.002	<0.0002	-	6	0.01	<0.0002	0.0009	12	0.002	<0.0002	0.001	32	0.00	<0.0002	-	(1) 3*	
Iron, dissolved	mg/L	3	6.4	3.83	4.2	2	3.6	0.09	1.8	13	16	0.01	2.8	6	15	0.01	3.05	12	4.8	0.01	0.41	32	9.50	0.01	0.10	(1) 3*	
Lead, dissolved	mg/L	3	0.0005	<0.0001	0.0003	2	0.0010	<0.0001	-	13	0.0002	<0.00005	-	6	0.00157	<0.00005	-	12	0.0002	<0.0001	-	32	<0.00012	<0.0001	-	(1) 3*	
Lithium, dissolved	ug/L	2	75	65	70	2	90	89	90	13	40	9.9	14	6	14	6.20	9.0	12	11	0.8	6.3	-	-	-	-	1	
Manganese, dissolved	mg/L	3	0.2	0.20	0.2	2	0.2	0.13	0.2	13	2.6	0.085	0.4	6	3.9	0.0018	1.18	12	0.2	0.04	0.1	32	0.34	0.003	0.013	2	
Molybdenum, dissolved	mg/L	3	0.08	0.004	0.01	2	0.06	0.01	0.04	13	0.03	<0.0001	0.001	6	0.01	0.0024	0.004	12	0.003	0.0001	0.0008	32	<0.00011	<0.0001	-	(1) 3*	
Nickel, dissolved	mg/L	3	0.01	0.00	0.00	2	0.04	0.00	0.02	13	0.001	<0.0001	0.0002	6	0.05	0.0006	0.002	12	0.010	<0.0001	0.002	32	0.0003	<0.0001	-	(1) 3*	
Selenium, dissolved	mg/L	3	0.0001	0.0001	0.0001	2	<0.001	<0.0001	-	13	0.0011	<0.00005	0.0001	6	0.0004	<0.0001	-	12	0.0008	<0.0001	-	32	<0.0001	<0.0001	-	(1) 3*	
Silica, soluble, dissolved	mg/L	2	14	13.3	13	2	10	9.1	10	13	26	11	18	6	30	11.8	16	12	35	17	22	-	-	-	-	2	
Silver, dissolved	mg/L	2	0.00005	<0.00005	-	2	<0.0005	<0.0001	-	13	<0.00005	<0.00001	-	6	0.00005	<0.00001	-	12	0.0001	<0.0001	-	32	<0.00005	<0.00005	-	1	
Strontium, dissolved	mg/L	3	3	1.7	2.4	2	1	1.2	1.3	13	2.19	0.10	0.17	6	0.26	0.08	0.13	12	0.06	0.01	0.02	32	0.02	0.01	0.01	2	
Sulfur	mg/L	2	4	2.7	4	2	13	2.2	8	13	22	0.2	2.0	6	8.7	0.80	1.6	12	2.7	0.30	1.3	-	-	-	-	See note e	
Thallium, dissolved	mg/L	3	<0.002	<0.002	-	2	<0.002	<0.002	-	13	<0.0002	<0.00001	-	6	<0.0002	<0.00001	-	12	<0.0002	<0.0002	-	32	<0.0002	<0.0002	-	1	
Tin, dissolved	mg/L	3	<0.0001	<0.0001	-	2	<0.001	<0.0001	-	13	<0.0001	<0.0001	-	6	0.0003	<0.0001	-	12	<0.0001	<0.0001	-	32	0.0007	<0.0001	-	1	
Titanium, dissolved	mg/L	3	0.0003	<0.0002	-	2	<0.002	<0.0002	-	13	0.0004	<0.0002	-	6	0.009	<0.0002	-	11	0.005	<0.0002	-	32	0.0008	<0.0002	-	1	
Vanadium, dissolved	mg/L	3	0.0074	<0.0001	0.0004	2	0.0005	<0.0001	-	13	<0.0005	<0.0001	-	6	0.002	<0.0005	-	12	0.0004	<0.0001	-	32	0.0005	<0.0001	-	3	
Zinc, dissolved	mg/L	3	5	2.62	2.9	2	18	0.69	9.5	13	0.015	0.001	0.003	6	0.0	0.0007	0.001	12	0.010	0.001	0.004	32	0.0014	<0.0005	-	3	
Phosphorus, dissolved	mg/L	2	<0.01	<0.01	-	2	<0.1	<0.01	-	13	0.29	<0.01	0.06	6	0	<0.05	0.06	12	0.06	<0.01	-	30	0.15	<0.01	-	1	
Radionuclides																											
Uranium, dissolved	ug/L	3	299	5.7	11	2	50	17.0	34	13	9.0	0.10	0.70	6	55	0.30	11.60	12	5.8	<0.1	0.5	32	<0.0001	<0.0001	-	3	
Uranium-234 calculated	Bq/L	2	2	0.21	0.95	2	11	0.46	5.58	12	0.36	0.001	0.01	4	11	0.02	0.2	12	0.1	0.001	0.0	-	-	-	-	See Note f	
Uranium-238 calculated	Bq/L	2	2	0.21	0.95	2	11	0.46	5.58	12	0.36	0.001	0.01	4	11	0.02	0.2	12	0.1	0.001	0.01	32	<0.025	<0.02	-	3	
Lead-210	Bq/L	3	3300	1200	2200	2	7300	1100	4200	13	0.66	0.01	0.1	6	8.0	0.08	1.0	12	0.60	<0.02	0.08	32	0.02	<0.005	-	3	
Polonium-210	Bq/L	3	260	110	120	2	650	460	555	13	1.3	0.02	0.2	6	13	0.03	0.6	12	0.22	0.02	0.1	32	0.01	<0.005	-	3	
Radium-226	Bq/L	3	400	180	300	2	120	76	98	13	1.6	0.07	0.3	6	17	0.06	0.3	12	0.36	0.02	0.1	-	-	-	-	3	
Radon-222	Bq/L	3	3800000	400000	2700000	2	12000000	5900	6002950	13	620	<3	10	6	1800	<4	11	12	86	<5	20	28	<0.013	<0.01	-	3	
Thorium-230	Bq/L	3	14	2.0	7.0	2	30	1.1	15.6	13	0.30	<0.01	0.01	6	4.70	<0.01	0.1	12	0.12	<0.01	-	-	-	-	-	3	
Tritium	Bq/L	2	1800	950	1375	2	910	<15	-	13	0.5	0.1	-	6	19	0.1	1.0	12	1.1	0.10	-	-	-	-	-	See Note g	

Notes

- Shading is used to highlight median values
- Shading is used to indicate "Group 1" constituents - see text for details.
- Shading is used to indicate "Group 2" constituents - see text for details.
- Shading is used to indicate "Group 3" constituents - see text for details.
- (1) 3* Indicates where a groundwater constituent was categorized as a Group 1 (or 2) constituent based on baseline groundwater quality, but was given a final categorization as a Group 3 constituent based on other information.
- Indicates where median values were not calculated. Median values were only calculated when the frequency of detection for the constituent exceeded 50% of the samples from each group. Where values were below detection, the detection limit was used to calculate median values.
- Blank Cells mean the constituent was not measured
- a Sample GWR-034 was not included in the summary statistics, as the groundwater was influenced by drilling fluids and additives and is not reflective of natural groundwater.
- b The surface water samples include all 32 lake and stream sample locations reported in Ecometrix, 2020 (Wheeler River Project: Baseline Aquatic Environment Study). Surface water quality at each location was measured on 1-6 occasions. Arithmetic mean values were reported in Ecometrix, 2020 at each location were used herein (i.e. the reported "max" value is the maximum arithmetic mean value, etc.). This was considered acceptable for the comparison only purposes within this report.
- c Metal and trace element concentrations in the surface water samples are for Total concentrations, not dissolved.
- d Temperature and Dissolved oxygen are likely to be influenced to some extent by ambient conditions, and are thus not considered further in the interpretation of groundwater conditions at the Site.
- e These constituents are considered part of Group 2 but are not discussed further in the interpretation of groundwater conditions at the site because they are correlated to or represented by other parameters being carried forward (e.g. Fe²⁺ by Dissolved Iron; laboratory-measured TDS by field-measured TDS, etc.)
- f U-234 was calculated from U-238 assuming secular equilibrium. This assumption may not hold in the groundwater flow systems. This constituent is not considered further in the interpretation of groundwater conditions at the Site.
- g Tritium concentrations were very low, with the exception of the ore zone and paleoweathered zone groundwater samples.

4.3 Interpretation of Hydrochemistry

The interpretation of baseline hydrochemistry is informed by mineralogy and solid-phase elemental concentrations and distributions for the Project area, and on relevant data from other regional assessments.

4.3.1 Mineralogy and Solid-Phase Elemental Distribution

Denison has compiled an extensive set of data on mineralogy and elemental concentrations in the bedrock matrices in the Project area. Composite samples were collected from core material every 5-20 m through the Athabasca Sandstones Supergroup and discrete samples collected every 0.5 m within and proximal to the ore zone. Several analytical methods were employed: elemental analysis following total and partial digestions of the solid matrix, infrared mineral analysis (i.e., PIMA) and petrography. Clay mineralogy was determined from the bulk geochemical composition of the samples (elemental analysis) using the normative clay calculation described in Section 3.2. Mineralogy was further evaluated in a subset of location and depth intervals by infrared mineral analysis (i.e., PIMA) and/or petrography.

The mineralogy of the ore zone and bedrock units is broken down into major – representing $\geq 2\%$ w/w components – and minor mineralogical components in Table 4-3. Minor components represent $< 2\%$ (w/w), but also classified with “minor” components are those that were identified by petrography, but where a small number of samples results in greater uncertainty about their relative proportion. The ore zone has complex mineralogy, including uraninite, (Fe, Pb, Cu, Zn) sulfides, nickel arsenides, APS minerals, oxide, carbonate, and clay minerals and quartz. The upper and lower clay units, and the paleoweathered zone are dominated by clay minerals and quartz. The Athabasca Sandstone Supergroup are dominated by quartz (greater than 90%), with relatively small proportions of iron and clay minerals. The mineralogy of the overburden has not been evaluated in detail and was not presented in Table 4-3. Grain size analysis on several overburden samples collected as part of a drilling program at the site in 2020, and described in Section 2.3.5, indicate that clay minerals make up from 1.1-9.2% by weight (based on fraction of particles $< 4 \mu\text{m}$; analytical results provided in Appendix H).

For elemental analysis, both partial and total digestions were done at the Saskatchewan Research Council (SRC). The suite of elements analyzed following digestion differed to a limited extent between the two digestion methods (e.g., major elements such as Ba, Sr were analyzed only following total digestions, whereas some trace elements such as Cd, and Se were analyzed only following partial digestion). The partial digestion consisted of a 8:1 mixture of ultra-pure and concentrated $\text{HNO}_3:\text{HCl}$ and the total digestion consisted of a mixture of ultrapure $\text{HF}:\text{HNO}_3:\text{HClO}_4$. Details of the digestion methodology are provided, for example, in Guffy, 2017. Concentrations resulting from partial digestion are thought to be more relevant to understanding metal and trace element distribution in association with hydrothermal phases (i.e., resulting from the hydrothermal alterations leading to uranium ore genesis, regionally), versus concentrations of metals and trace elements associated also with refractory heavy minerals (Jackson, 2010).

Table 4-3: Mineralogy by Unit

Unit	Mineral	Ideal Formula	Major (≥2% w/w)	Minor (< 2% w/w, or, shown to be present in Petrography or core logging)
Ore Zone	Pyrite	FeS ₂	X	
	Galena	PbS	X	
	Chalcopyrite	CuFeS ₂	X	
	Quartz	SiO ₂	X	
	Chlorite	(Fe,Mg) ₂ (Al,Fe ³⁺) ₃ Si ₃ AlO ₁₀ (OH) ₈	X	
	Muscovite/Illite	KAl ₂ (Si ₃ Al)O ₁₀ (OH;F) ₂	X	
	Kaolinite	Al ₂ Si ₂ O ₅ (OH) ₄	X	
	Fe-oxy-hydroxides	FeO(OH)·nH ₂ O	X	
	Uraninite	UO ₂	X	
	UO _{2.33}	U ₃ O ₇	X	
	UO _{2.25}	U ₄ O ₉	X	
	Schoepite	UO ₃ ·2H ₂ O	X	
	Siderite	FeCO ₃	X	
	Fluorite	CaF ₂	X	
	Gersdorffite	NiAsS		X
	Nickeline	NiAs		X
	Dravite	NaMg ₃ Al ₆ (Si ₆ O ₁₈)(BO ₃) ₃ (OH) ₃ (OH)		X
	Pyrrhotite	Fe _{1-x} S (x=0-0.17)		X
	Sphalerite	(Zn,Fe)S		X
	Feldspar	KAlSi ₃ O ₈		X
	Calcite	CaCO ₃		X
	Apatite	Ca ₅ (PO ₄) ₃ (F,Cl,OH)		X
	Corundum	Cr ₂ O ₃		X
APS Minerals	CaAl ₃ (PO ₄)(PO ₃ OH)(OH) ₆		X	
Paleoweathered Basement	Quartz	SiO ₂	X	
	Chlorite	(Fe,Mg) ₂ (Al,Fe ³⁺) ₃ Si ₃ AlO ₁₀ (OH) ₈	X	
	Illite	(K,H ₃ O)(Al,Mg,Fe) ₂ (Si,Al) ₄ O ₁₀ [(OH) ₂ ,(H ₂ O)]	X	
	Kaolinite	Al ₂ Si ₂ O ₅ (OH) ₄	X	
	Hematite	Fe ₂ O ₃	X	
	Dravite	NaMg ₃ Al ₆ (Si ₆ O ₁₈)(BO ₃) ₃ (OH) ₃ (OH)	X	
	Uraninite/Pitchblende	UO ₂		X
	Chalcopyrite	CuFeS ₂		X
	Pyrite	FeS ₂		X
	Galena	PbS		X
Upper and Lower Clay Zones	Quartz	SiO ₂	X	
	Chlorite	(Fe,Mg) ₂ (Al,Fe ³⁺) ₃ Si ₃ AlO ₁₀ (OH) ₈	X	
	Illite	(K,H ₃ O)(Al,Mg,Fe) ₂ (Si,Al) ₄ O ₁₀ [(OH) ₂ ,(H ₂ O)]	X	
	Kaolinite	Al ₂ Si ₂ O ₅ (OH) ₄	X	
	Hematite	Fe ₂ O ₃	X	
	Uraninite/Pitchblende	UO ₂	X	
	Dravite	NaMg ₃ Al ₆ (Si ₆ O ₁₈)(BO ₃) ₃ (OH) ₃ (OH)		
	Uranophane	Ca(UO ₂) ₂ (Si ₃ O ₉) ₂ ·5H ₂ O		X
	Graphite	C		X
	Carbonates	various		X
Chalcopyrite	CuFeS ₂		X	
Pyrite	FeS ₂		X	
Athabasca Sandstones	Quartz	SiO ₂	X	
	Hematite	Fe ₂ O ₃	X	
	Chlorite ^a	(Fe,Mg) ₂ (Al,Fe ³⁺) ₃ Si ₃ AlO ₁₀ (OH) ₈	X	X
	Illite ^a	(K,H ₃ O)(Al,Mg,Fe) ₂ (Si,Al) ₄ O ₁₀ [(OH) ₂ ,(H ₂ O)]	X	X
	Kaolinite ^a	Al ₂ Si ₂ O ₅ (OH) ₄	X	X
	Dravite	NaMg ₃ Al ₆ (Si ₆ O ₁₈)(BO ₃) ₃ (OH) ₃ (OH)		X
Pyrite/Sooty Pyrite	FeS ₂		X	

Notes

Uraninite

Indicates dominant minerals; can be present at values exceeding 40% w/w

Chlorite

Indicates that the clay minerals bolded, combined, represent a dominant phases (i.e. > 40% w/w)

^a In the Athabasca Sandstones, the relative dominance of the clay minerals varies by HU. The individual and combined clay mineral phases do not always represent a major mineral phase

Elemental results by both total and partial digestion have been summarized in.

Table 4-4 for uranium, thorium and select other metals or trace elements. Elements chosen are those that, based on mineralogy and regional studies (e.g. Alexandre, 2020), are expected to be elevated in the ore zone. Median concentrations have been reported for all elements (number of samples indicated as n). Concentrations of the elements following partial digestion relative to that in the total digestion varies by element and indicates that metal speciation includes more labile and refractory forms. Typically, following both digestion methods, solid-phase concentrations of U and the other elements are one or more orders of magnitude higher in the ore zone than in the overlying Athabasca Sandstone Supergroup and underlying Paleoweathered basement rock.

Within the Athabasca Sandstones Supergroup, the concentrations of most elements shown in Table 4-4 increase with depth, with maximum concentrations being observed either in the MFa or MFb.

Table 4-4: Solid-Phase Elemental Concentrations

Median Metal/Trace Element Concentrations (mg/kg)	MFd (n= 2754-3077)	MFC (n= 7116-8532)	MFb (n= 5279-6086)	Mfa (n=9415-10,436)	Ore Zone			Paleoweathered Basement (n=108)
					Black or Brown Friable High Grade U Zone (n=95)	Brown Redox U Zone (n=46)	Sulphide or Hematite Cemented U Zone (n=34)	
Total Digestion								
As	-	-	-	-	-	-	-	-
Co	0.16	0.37	0.49	0.58	105	85	91	28
Cr	8	9	13	11	119	150	180	155
Cu	1.5	1.2	1.3	3.7	2.32E+03	5.79E+03	1.11E+03	228
Mo	0.1	0.17	0.24	0.18	86	101.5	258.5	5
Ni	1.5	3.4	2.4	4.7	343.5	288.5	239	167
Pb	2.65	3.16	3.56	3.14	4055	3455	4205	83
Se	-	-	-	-	-	-	-	-
Sr	43	87	178	112	279	281	218	169
Th	3.36	11.9	23.2	11.4	73.5	131.5	96	25
U	1	1.16	1.4	2.24	4.18E+04	5.02E+04	7.58E+04	403
V	3	5.2	10.3	8.3	779	1.37E+03	713	310
Zn	2	2	2	3	333	185.5	247	31
Partial Digestion								
As	0.18	0.42	0.71	0.46	176	147	78.5	24
Co	0.06	0.12	0.16	0.22	90.5	63.5	75.5	16
Cr	-	-	-	-	-	-	-	-
Cu	0.65	0.58	0.665	2.02	2.18E+03	5.40E+03	1.05E+03	219
Mo	0.05	0.06	0.07	0.08	76	73	182	3
Ni	0.41	0.88	0.68	1.48	314	257	179	79
Pb	0.506	0.667	0.851	0.6905	3.71E+03	3.14E+03	3.72E+03	46
Se	0.1	0.1	0.1	0.1	4.5	12.5	5	1
Sr	-	-	-	-	-	-	-	-
Th	0.68	2.14	5.36	2.39	-	-	-	-
U	0.21	0.26	0.33	0.58	4.07E+04	4.88E+04	7.49E+04	335
V	0.4	0.9	1.8	1.2	561	892	507	104
Zn	0.6	0.7	0.6	0.7	262	119	77.5	14

Notes:

n= number of samples used to calculated median values; Median values calculated using value of detection limit where value <DL

"-" indicates element not analyzed following digestion by method indicated

The distribution of uranium in the solid phase is shown in Figure 21a. Shown is that uranium concentrations are elevated in the ore zone and underlying basement rock and are relatively enriched in a halo surrounding the ore zone, extending up through the MFa and into the MFb. In Figure 21b, the spatial extent of the MFa and the Desilicified Zone is superimposed over the distribution of uranium concentrations in the solid matrix. Elevated concentrations

of uranium in the MFb plot where the sediments of that Formation have undergone desilicification, suggesting uranium enrichment through the hydrothermal alteration processes. In Figure 22, elemental distributions of select other elements are shown. Copper (Figure 22a) is representative of elements that shows a distribution in solid phase concentrations like that of uranium (along with Ni and Co. Pb does not show enrichment in the halo pattern observed for uranium (Figure 22b). Thorium is understood, regionally, to be enriched in the MFb in association with accessory heavy minerals and aluminophosphate minerals formed through hydrothermal alteration (Mwenifumbo and Bernius, 2007). The median concentration of Th is highest in the MFb of the Athabasca Supergroup Formations (Table 4-4) and the spatial distribution for thorium in Figure 22c shows relative enrichment of this element in the MFb.

4.3.2 Regional Supporting Information

a) Final Report of the AECL/SKB Cigar Lake Analog Study (AECL, 1994)

Groundwater quality in association with the Cigar Lake deposit was studied extensively by AECL and partners from the 1980s through the 1990s, because they were very interested in that deposit as a natural analog for the concept of deep burial/disposal of Canada's nuclear waste. The work done at Cigar Lake has been used to inform the interpretation of groundwater evolution and redox conditions in this report. Data for select groundwater samples have been carried forward for comparison with those from the Phoenix deposit. The data, as reported by AECL (1994), is provided in Appendix J.

b) Millennium Project Environmental Impact Statement: Annex D, Regional Geology and Hydrogeology (Cameco, 2012).

The Millennium uranium deposit is basement-hosted. Work for that project included collection of groundwater chemistry in the hydrostratigraphic units of the overlying Athabasca Sandstone Supergroup and in basement rock beneath the ore zone. Data for select groundwater chemistry samples from that report have been carried into this report to support interpretation. The source data, as reported, is provided in Appendix J.

4.3.3 Hydrochemistry by Hydrostratigraphic Unit

As introduced above, interpretation of the hydrochemistry was informed by the mineralogy, solid phase elemental concentrations and the regional studies, described above. In the sections here below, general hydrochemical patterns/behaviour are first considered, and then differences in the chemistry between hydrostratigraphic units are examined.

Mineralization, Hydrochemical Type, pH and Redox

The major ion composition of groundwater, including the ions Ca^{2+} , Mg^{2+} , Na^+ , K^+ , SO_4^{2-} , Cl^- , HCO_3^- , CO_3^{2-} , and F^- , pH and redox conditions were evaluated for each of the hydrostratigraphic units. As a first step, the electrical conductivity (as field-measured Specific Conductance (SPC)) was plotted as a function of well depth in Figure 23. Specific

conductance values range from very low in the Local Groundwater Flow System ($<100 \mu\text{S}/\text{cm}$) and surface water ($<42 \mu\text{S}/\text{cm}$; not shown) to a maximum measured value of $946 \mu\text{S}/\text{cm}$, in monitoring well GWR-025 (MFa). The conductivity in this well exceeds those measured in the ore zone samples. For groundwater in the overburden, and Athabasca Sandstone Supergroup, SPC values in groundwater, in most cases, increases with depth (Figure 23), consistent with increased opportunity for water-rock interactions and associated increasing dissolution and constituent concentrations in the groundwater along the flow path from recharge at ground surface down to depth.

An important exception to the behaviour described above, is the relatively low conductivity values measured in the deeper MFa wells GWR-008, GWR-011 and GWR-029. SPC values in these wells range from $87.6 \mu\text{S}/\text{cm}$ to $114 \mu\text{S}/\text{cm}$. These SPC values are similar to those measured in the Local Groundwater Flow System and suggest very little further chemical evolution of the groundwater along the groundwater flow path to those locations with respect to recharge.

To build upon the above interpretations, the major ion compositions of groundwater in each of the hydrostratigraphic units were examined using a series of Stiff diagrams (Figures 24 and 25) and Piper plots (Figures 26, 27 and 28). Stiff diagrams are graphical representations of the concentrations (in milliequivalents/L) of major ions and the mineralization of a given sample. For example, the Stiff diagrams shown in Figure 24 for LA-5 (surface water sample in Whitefish Lake) show a distinctly different pattern/shape from that in the Intermediate Sandstone, which is in turn different than the pattern for the ore zone, shown in Figure 25. In each diagram, the cation and anion concentrations are plotted to the left and right of the central axis, respectively, and the higher the ion concentration, the further the point is plotted laterally away from the central axis. A polygonal shape is created by connecting all the ions and the filled-in/coloured area of the polygon represents the extent of mineralization (as TDS) of the samples. GWR-032 (Ore Zone) and LA-5 (SW) are "end members" of groundwater chemistry in terms of dissolved constituent concentrations (individual constituents and overall mineralization) in the study area, and this is clear by the much larger area of the (blue) polygon for GWR-032 (Figure 25). The dominant anion in the groundwater chemistry at GWR-032 is Cl^- and the dominant cations are Ca^{2+} and Na^+/K^+ . Plotted on the same scale, LA-5 has much smaller polygon (lower TDS) and no dominant cations or anions (Figure 24).

Piper plots also presents major ion composition. Each Piper plot is made up of three plots – two ternary plots that show the relative abundances of the cations, as percentages of the total concentrations (again, in milliequivalents) of cations, and anions, as percentages of the total concentration of anions, in the sample, respectively. The third plot is the central diamond, which is a matrix transformation of the two ternary plots. For example, in Figure 26, the red circle presents groundwater sampled in the ore zone (GWR-032). The ternary diagrams show that both samples contain approximately 60% Ca^{2+} and 40% Na^+ , and also approximately 60% Cl^- and 40% HCO_3^{2-} . This groundwater is of relatively mixed type - meaning no one cation or anion dominates - and as such, it plots relatively centrally in the diamond. The groundwater in the ore zone is of Ca-Na-Cl- HCO_3 type. Piper plots are

very useful because they allow you to plot many samples in the same diagram and examine the sources and processes leading to the different hydrochemical types observed.

Groundwater data from other projects (Cigar Lake and Millennium) was included with select GWR-series wells in the Piper plot shown in Figure 27, to provide wider regional context to the results from the study area. The major ion composition of shallow groundwater is compared to that in surface waters proximal to the Phoenix deposit in Figure 28.

Local Groundwater Flow System

Groundwater in the overburden has pH values that are circumneutral, but generally more acidic than those measured in the other hydrostratigraphic units or the ore zone. The minimum pH in the Shallow Flow system is 5.86 (Table 4-2). Dissolved silica (SiO_2) concentrations exceeding 33 mg/L in the groundwater evidence silicate mineral dissolution. Stiff diagrams for monitoring well GWR-006 in this groundwater flow system is shown in Figure 24. Groundwater in this flow system is characterized by low mineralization (e.g. TDS for GWR-006 is 52 mg/L; Figure 24), and none of the major cations or anions dominate the hydrochemistry of the groundwater. The groundwater types for the samples in the Local Flow System are of Ca-Na- HCO_3 or Na-Ca- HCO_3 type (Figure 26), and the samples also contain Mg, K and sulphate (Figure 26). The groundwater chemistry reflects waters in this flow system being recharge waters that become acidified through contact with the organic zone in the upper soil profile. The groundwater becomes mineralized through dissolution of the minerals that characterize these units, including (Table 4-3) quartz and clay minerals, as well as some parent material/unweathered feldspars (AECL, 1994).

The hydrochemical type of groundwaters samples from the Local Flow System are compared to those from monitoring wells installed in overburden in the area of the Gryphon deposit and from wells installed in shallow sandstone (MFd) at the Millennium deposit in Figure 28. The groundwaters are all the same mixed hydrochemical type and (not shown), mineralization. Data for the surface water samples and the Gryphon overburden groundwater samples are provided in Appendix J.

Also plotted in Figure 28 are surface water samples, taken from Whitefish lake (LA-6 and LA-5; Figure 19) and associated stream location (S2-A) and additional downstream locations including stream sample SA-2, McGowan Lake (LA-1), and Russell Lakes (LAB-1). The surface water samples, for the most part, are of the same hydrochemical type as the groundwater in the Local Groundwater Flow system, consistent with discharge of groundwater from that system to local surface water bodies. The total dissolved solids content of LA-5 (and all other lakes and stream, regionally) are lower than those in the groundwater in the Local Groundwater Flow System discharging to the lake (Table 4-2), reflecting the precipitation/surface runoff inputs into the lakes.

Recharge Conditions: Analysis of tritium values in groundwater from the Local Groundwater flow system is presented in Appendix L. Results suggest that groundwater in this flow system has been recently recharged, in the last approximately 12-25 years, but that residence times can be longer in localized areas of the flow system.

Redox Conditions: At Cigar Lake, decreasing redox potential from the overburden down to the ore zone was observed, with the overall span in redox conditions being those of environmental relevance (i.e., +250 mV to -250 mV (AECL, 1994)), with the most oxidized Eh values in samples from the overburden. In the Phoenix deposit study area, concentrations of dissolved iron vary from values close to the analytical detection limit (i.e., 0.012 mg/L at GWR-011) to several mg/L. Dissolved Fe concentrations greater than 1 mg/L suggest that ferrous ion (Fe^{2+}) is the dominant dissolved iron species and that the groundwater is anoxic. Ferrous ion (field-measured) was detected in several wells installed in the overburden and upper sandstone aquifers. Sulphate was detected in all of the overburden wells. Thus, redox conditions in the Local Flow System are considered to range from oxidized to mildly reducing.

Intermediate Sandstone Aquitard

Five wells installed in the MFd and MFc Formations were sampled as part of the 2019-2020 baseline groundwater monitoring program. These wells are located over the Phoenix deposit (GWR-046, MFc, GWR-013 and GWR-047, MFb), to the south of the Phoenix deposit (GWR-009; SE Cluster; MFb), and close to Whitefish Lake (GWR-014; MFc) (Figure 19).

The hydrochemical type of the samples in the Intermediate Sandstone Aquitard is generally the same as those in the Local Groundwater Flow System (Figure 26), but the samples are more mineralized. This can be seen in Figure 24, by comparing the Stiff diagrams for monitoring well GWR-006 (screened in Overburden) and GWR-009. Compared to groundwater in the Overburden Aquifer, water in the Intermediate Sandstone Aquitard has higher bicarbonate values. Carbonate mineral concentrations are low in all Athabasca Sandstones – they are not even minor components of the mineralogy (Table 3-3). However, the higher bicarbonate concentration, along with the more alkaline pH in this hydrostratigraphic unit, suggests higher relative carbonate mineral content associated with the higher fines in this hydrostratigraphic unit. The overall similarity in hydrochemical type reflects the overall constancy of the geochemical makeup of the Athabasca Sandstones – meaning that groundwaters react with a similar rock matrix/mineral assemblage in the Intermediate Sandstone Aquitard as in the Local Flow system.

The groundwater chemistry in wells sampled in this aquitard unit have shown relatively high variability in groundwater quality between sampling events for those sampled twice (GWR-009, GWR-013 and GWR-014). For example, field-measured pH values in GWR-009, GRW-013 and GWR-014 were more alkaline than would be expected in environmental conditions and fell to circumneutral levels in 2021. The elevated pH values measured are considered to reflect transcription error (August 2020, pH value of 11.98 at GRW-014) and potentially, influence of well construction materials on pH values. The well completion details for GWR-009 and GWR-014 (Appendix A) show a cemented zone immediately above the screened interval. The results for the five wells sampled in the Intermediate Sandstone Aquitard in 2021, as a group, support a circumneutral pH value in this aquifer.

This is also the Formation where groundwater chemistry may be most affected by desilicification of the sediments; GWR-013, GWR-014 and GWR-047 are completed in desilicified sediments of the MFb and MFc. The difference in geomean hydraulic conductivities between the Intermediation Sandstone Aquitard (8.4×10^{-9} m/s) and the Desilicified Zone (4.8×10^{-6} m/s) is approximately 3 orders of magnitude. This difference in hydraulic conductivity affects the residence time of the groundwater in the bedrock, and consequently, the groundwater quality.

Redox Conditions: Iron concentrations are variable amongst wells completed in the Intermediate Sandstone Aquitard, ranging from values <0.1 mg/L to > 1 mg/L. Field-measured ORP measurements at GWR-046 and GWR-047 (Table 4-1) are equivalent to Eh values of 251 and 116 mV, respectively. These results align with conditions of low/no oxygen and that are mildly reducing. Because of the higher variability in this unit, emphasis during the phase of mine development should be on monitoring of groundwater quality in this unit and how it is influenced by desilicification.

Lower Sandstone Aquifer

The Lower Sandstone Aquifer is characterized by two distinct hydrochemical types. The first is groundwater with low mineralization. The second groundwater type is much more highly mineralized water that has Cl^- as a dominant anion. The distinct nature of the two groundwater types is shown in Figure 25 through comparison of Stiff diagrams for GWR-029 and GWR-012. The mineralization at GWR-012 is much higher than that at GWR-029, and Cl^- , versus HCO_3^- , is the dominant anion. The mineralization and groundwater major ion composition of GWR-029 is much more similar to overburden well GWR-006 (shown in Figure 24) than to GWR-012. In the Piper plots shown in Figure 26, the distinct geochemical types are evidenced by:

- clustering of groundwater for 3 wells in the Lower Sandstone aquifer with samples from the Intermediate Sandstone Aquitard and local groundwater flow system. This hydrochemical type (dominantly in the Ca/Mg- HCO_3 quadrant of the central diamond of the Piper Plot) is shown within the purple circle; versus
- the other three wells from Lower Sandstone Aquifer, that show a higher relative dominance of Cl^- as an anion. This shifts the hydrochemical type of the groundwater to the upper portion of the central diamond in the Piper plot, as shown by the purple arrows in Figures 26. This represents the contribution of leaching of halide salts into the groundwater as it moves along the flow path.

These same two distinct hydrochemical types were also observed in the MFa at Cigar Lake.

At the Phoenix study site, the groundwaters of low mineralization were measured in three wells: GWR-029, which is in the inferred upgradient direction to the deposit, and in wells GWR-011 and GWR-009 which are proximal to the ore zone (Figure 19). At Cigar Lake, the MFa sample with low mineralization was also collected from a monitoring well installed in the inferred upgradient direction to the ore deposit. This sample is shown as "CL-LS-R" (Cigar Lake, Lower Sandstone, Recharge) in Figure 27, and as is observed in the Phoenix

study area, is most similar in groundwater type to a sample taken in the upper sandstone at Cigar Lake ("CL-US" in Figure 27). On the basis of groundwater chemistry and tritium values in that groundwater, the authors concluded that the groundwater reflected a younger water component that had penetrated to depth along hydraulically active fractures/faults. The same conclusion is made here for the Phoenix study area – meaning that fracture/fault conditions are such that some areas of the MFa are characterized by younger/recharge groundwaters.

The higher mineralization groundwater with Cl^- as the dominant anion was observed at Cigar Lake in groundwater collected from a monitoring well located within the zone of thermal alteration and in the inferred downgradient direction of the ore zone. This sample is shown in Figure 27 as "CL-LS-Out" and is of Na-Cl- HCO_3 type. The reasons for the hydrochemical type observed in that monitoring well, and specifically for the source of chloride to the water, was evaluated in some detail in the Cigar Lake studies. One possible explanation explored was that the groundwater reflected mixing of groundwater in the MFa with groundwater from the basement rock. Groundwater in the basement rock is known to be of Na-Cl type, and this is shown in Figure 27 by samples collected from monitoring wells installed in the Paleoweathered Zone at Cigar Lake ("CL-Alt-Bsmt") and the Basement at Millennium ("Millennium-Bsmt"). This sample represents one endmember hydrochemical type for the basement rock of Na-Cl type. However, the potential for the relatively elevated chloride proportion of anions in groundwater in the MFa to be a result of mixing with groundwater from the basement rocks was ruled out at Cigar Lake as groundwater flow conditions in the MFa were identified as dominantly horizontal, with a component of downward flow to the altered basement.

The source of chloride (in the MFa and the ore zone) was, rather, attributed to leaching of residual salts from the hydrothermal and/or diagenetic formation waters that are still present on grain boundaries and in intragranular pores within the rock matrix at depth. This conclusion was supported by leaching experiments conducted on core collected at the Site. The tests showed that leachable Cl was present in all rocks tested. A linear correlation between Na+K, and Cl+F+Br was found in the leachate and was also observed in groundwater. This composition suggests the residual salts are of simple halide salt composition, corresponding to those observed in primary fluid inclusions in associated hydrothermal quartz.

In the Phoenix study area, the groundwater with high mineralization was sampled from monitoring well GWR-025, located NW of the deposit, to the south of the deposit in well GWR-033, and in GWR-012, located close to LA-5. All these wells are located within, or proximal to the area of low resistivity measured in the area surrounding the Phoenix deposit (Figure 5) that has been interpreted to be associated with zones of desilicification (thermal alteration), and enhanced fracturing and friability. Thus, it is possible that the high mineralization, high salinity groundwater type observed in these wells is limited in extent to disturbed/altered conditions with the presence of remnant halides, in proximity to the ore zones at Phoenix and elsewhere regionally, such as at Cigar Lake. As noted above, the ore zone samples in the Phoenix study are of similar hydrochemical type to that observed in

GRW-033, GWR-012 and GWR-025, suggesting a similar source of elevated chloride in the ore zone.

The above discussion indicates that identifying a specific water quality for the Lower Sandstone Aquifer on a regional scale is likely not possible and will reflect hydraulically active fractures/faults that increase the influence by the recharge-type groundwater water as well as zones of thermal alteration/desilicification that increase the mineralization due dissolution of halite minerals.

When considering potential connectivity between the Lower Sandstone Aquifer and the Intermediate Sandstone Aquitard, there is a distinct lack of chloride in some groundwater sampled from some of the wells in the Intermediate Sandstone Aquitard (GWR-009, GWR-013 and GWR-014; Cl⁻ concentrations < 1 mg/L, Table 4-1) compared to wells in the Lower Sandstone Aquifer. This is demonstrated by comparing the groundwater compositions shown in the Stiff diagrams for GWR-012 (Figure 25) and GWR-009 (Figure 24). Groundwater chemistry at GWR-0 is representative of the high mineralization groundwater type in the Lower Sandstone Aquifer and shows dominance of Cl⁻ in the major anion composition. This contrasts with the lack of chloride in the hydrochemical compositions shown in the Stiff diagrams for GWR-009 – installed in the Intermediate Sandstone Aquitard. This is consistent with the general interpretation of a downward gradient between these units discussed in Section 3.6.3. However, desilicification of the sediments may change this relationship in a localized fashion.

Redox Conditions: The redox conditions in the Lower Sandstone aquifer will, likewise, vary with the groundwater type observed on a spatial scale. More oxidized conditions are expected in the localized areas of recharge from shallow groundwater. Because of the overall richness of the unaltered sandstones in iron, and the elevated dissolved iron concentrations measured in the MFa, the redox potential in the groundwater is expected to be controlled by the Fe²⁺/Fe(OH)₃ couple, as was concluded for Cigar Lake. The field-measured ORP measurement at GWR-048 (Table 4-1) is equivalent to an Eh value 142.5 mV. This is consistent with anoxic and mildly reducing conditions.

Ore Zone Aquifer

Groundwater in the ore zone is relatively highly mineralized, reflecting the low to moderate hydraulic conductivity of that hydrostratigraphic unit, longer residence times, and the (relatively) higher overall content of minerals other than quartz (Table 4-3). The groundwater hydrochemical type, as noted above, reflects the contribution of salts from hydrothermal and/or diagenetic formation waters.

Redox Conditions: Sulphate was measured in groundwater from the Phoenix ore zone. At Cigar Lake, sulphate in the ore zone samples (see "CL-OZ" in Figure 27; hydrochemical type Na-Ca-Cl-SO₄-HCO₃) was attributed to reaction of pyrite within the clay-rich portion of the barrier zone enveloping the ore zone with waters entering the ore zone from the unaltered sandstones. The sulphide content of the clay cap acts as a redox buffer that consumes oxidants such as dissolved oxygen and maintains highly reducing conditions within the ore

zone, and, in turn, the chemical stability of uranium(IV) in solid form. Measured oxidation-reduction potential in the ore zone (data collected during preparations for a tracer test, Petrotek, 2021) is approximately -265 mV. Further supporting strongly reducing conditions in the ore zone is the finding in the Cigar Lake study of methanogenic bacteria being found within the ore zone.

Paleoweathered Zone, within Basement Aquitard

Groundwater quality in monitoring well GWR-031 is considered most reflective of water quality in the paleoweathered zone. The results for this well suggest that groundwater is more highly mineralized in this zone, with higher concentrations of uranium and other metals (e.g., Ni and Zn) than are observed in the overlying Athabasca Supergroup sandstones hydrostratigraphic units. This is consistent with both a very low hydraulic conductivity (and, conversely, high residence time; Section) and high clay content (Table 4-3), and high elemental concentrations of metals and trace elements (Table 4-4).

The paleoweathered zone was sampled at Cigar Lake; analytical results are provided in Appendix J, as samples 199B and 199D. Sample 199D has been referred to in Figure 27 as "CL-Alt-Bsmt". The hydrochemical type of the Cigar Lake paleoweathered zone is Na-Cl-HCO₃ and of GWR-031 for the Phoenix deposit is a more mixed hydrochemical type (Na-Ca-Mg-Cl-HCO₃-SO₄). In the Cigar Lake study, the hydrochemistry of the sample in the paleoweathered zone was explained by recharge of the basement waters from the overlying flow regime in the Lower Athabasca Sandstones. Evolution of the groundwater chemistry in the paleoweathered zone is aligned with this flow path. The groundwater quality in the paleoweathered zone represents an intermediate along the hydrochemical evolution of groundwater from the hydrochemical type of the Athabasca Group Sandstone hydrogeological units (Ca-Na-HCO₃ to Na-Ca-HCO₃ type) to one endmember in basement rock (NaCl type). This evolution is a result of water-rock interactions within basement aquitard (including the paleoweathered zone) and is most clearly visualized in the Piper plot by shifts in relative abundance of anions, shown with gold arrows in Figure 27. The difference in hydrochemical types between groundwater from the paleoweathered zone at Cigar Lake (Na-Cl-HCO₃ type) and associated with the Phoenix deposit (Na-Ca-Mg-Cl-HCO₃-SO₄) is likely due to the screened interval of the well, which spans the ore zone, and the paleoweathered zone (Appendix A). Groundwater chemistry in GWR-031 is likely influenced by the hydrochemistry of the ore zone.

Redox Conditions Dissolved iron concentrations in monitoring well GWR-031 have varied from < 0.1 mg/L to >3 mg/L on the two sampling occasions (Table 4-1). At Cigar Lake, measured Eh values were 98-109 mV (Appendix J). Anoxic and mildly reducing conditions are expected.

Although limited in number of samples available, groundwater quality in the paleoweathered zone for both Project and Cigar Lake assessments suggest a distinct geochemical environment from that of the overlying Athabasca Supergroup sandstones hydrostratigraphic units.

4.4 Summary

Groundwater was collected from each of the hydrostratigraphic units at the site. The groundwater is characterized by low mineralization. Concentrations of radiological and several other dissolved constituents measured in groundwater associated with the uranium deposit in the Phoenix study area are generally orders of magnitude lower in overlying hydrostratigraphic units and surface water than they are in the ore zone groundwater samples, as demonstrated in Figure 20. This is evidence of the very low mass flux of those constituents from the ore zone and discontinuous barrier zone aquitard that envelopes the ore zone, over time.

The groundwater chemistry measured supports the presence of a Local Flow System, Intermediate Sandstone Aquitard and Lower Sandstone Aquifer in the study area. The chemistry of the groundwater in the Local Flow system is that of recharge water that is of relatively low pH, from contact with organic matter in the upper soil profile, and that has become mineralized through dissolution of quartz, feldspars, kaolinite and illite. The chemistry of groundwater in the Intermediate Sandstone Aquitard is similar in terms of major ion composition to that of the Local Flow System, but a longer residence time in the aquitard has led to more extensive mineral dissolution and higher mineralization, with a similar hydrochemical type. Higher relative variability in the groundwater chemistry sampled from monitoring wells in the Intermediate Sandstone Aquitard may reflect the localized influence of desilicification on the flow conditions, and consequently on groundwater conditions, in a subset of these wells. The Lower Sandstone Aquifer is characterized spatially by two types of groundwater. The first groundwater type is most similar to that observed in the Local Flow System. This is suggested to reflect hydraulically active fractures and fault systems that allow fresh recharge water to penetrate and mix with deeper waters in the Aquifer. The second type of groundwater was within the zone of thermal alteration around the ore zone and has relatively high mineralization, thought to be a result of dissolution of remnant halide salts present on grain boundaries and in intragranular pores within the rock matrix at depth in the Athabasca Sandstones.

Groundwater quality results suggest that connectivity between the Upper Sandstone Aquifer and Intermediate Aquifer is limited. Again, desilicification of these Formations to the northeast of the ore zone may affect interconnectivity of these units on a localized scale. Although limited in number of samples available, groundwater quality in the Paleoweathered zone for both Project and Cigar Lake assessments suggest a distinct geochemical environment from that of the overlying Athabasca Supergroup sandstones hydrostratigraphic units.

The regional mineralogical, elemental concentrations and groundwater data collected to date for the study area provide a good baseline to understand potential changes to the groundwater environment over the life of mine.

5.0 CONCEPTUAL SITE MODEL SUMMARY

A conceptual site model (CSM) was prepared as part of this Baseline Hydrogeological Report to present the relevant geological and hydrogeological framework, surface water features and baseline chemical distributions. The CSM is a descriptive summary and is accompanied by a graphical representation of the hydrogeological framework that describes our current understanding of components of the groundwater flow system in the Phoenix area (Figure 29).

The CSM forms the basis for the development of the numerical groundwater model and groundwater monitoring plans (Figure 2). The groundwater flow model will be used to assess changes to the hydrogeological system due to pre-, operation and post-operational mining activities and associated groundwater extraction or injection. The main features of the CSM are summarized in the following sections.

5.1 Physical Geography

Ground surface topography in the Phoenix area has been shaped by glacial and fluvial processes active for over tens of thousands of years. The most significant topographic features in the study area are the northwest to southeast trending drumlins and eskers that are separated by lowland areas of well drained glaciofluvial outwash sands and gravels, and poorly drained till plains with associated muskeg / wetlands. Ground surface varies from a high of approximately 600 metres above sea level (m asl) located between the Phoenix and Gryphon deposits, to a low of 494 m asl at McGowan Lake in the southeast (Figure 1). Ground surface topography overlying the Phoenix deposit ranges from 520 to 550 m asl (Figure 1).

5.2 Geological Setting

The Wheeler River uranium deposit is located on the eastern margin of the Athabasca Basin of northern Saskatchewan. Like other uranium deposits on the eastern portion of the Basin, the Phoenix deposit is located at the base of the sandstones and conglomerates of the Athabasca Supergroup, just above the unconformity with the underlying metasedimentary gneisses and other basement rocks of the Wollaston Supergroup.

The Phoenix deposit is overlain and underlain by a natural barrier unit or halo that has limited the release or subsurface migration of uranium, and other chemical constituents associated with the mineralization in the deposit, outside of the ore body itself. This natural barrier zone has limited the migration of chemical constituents in groundwater for more than 1 billion years. A summary of the geologic characterization present in the Phoenix area, from overburden to basement rock, are summarized in the following sections.

5.2.1 Overburden

The regional geomorphology is typical of the Athabasca Plain Region and is dominated by landforms associated with continental glaciation, such as drumlins, eskers, outwash plains and till plains (Figure 4). Drumlins and eskers present in the Wheeler River area trend in a northeast to southwest direction and form topographic highs on the landscape. Drumlins rise over 50 m above the surrounding land surface in some areas, including the drumlin lying between the Phoenix and Gryphon deposits (Figure 4).

Overburden thickness ranges from less than a few metres on low lying areas, to over 100 m in the northwestern reaches of Whitefish Lake where weathering and glacial erosion of the sandstone bedrock formed a bedrock valley or “trough”. The overburden is characterized by an abundance of sand and gravel outwash, and sand-rich glacial till that drapes the drumlins and till plains.

5.2.2 Athabasca Supergroup Sandstones and Conglomerates

Overlying the basement rock are consolidated sandstones and conglomerates of the Athabasca Supergroup that were deposited 1.5 to 1.74 billion years ago. These sedimentary rocks are horizontally bedded and were deposited in an intracontinental sedimentary basin initially marked by alluvial fans, braided rivers and possibly shallow-marine or lacustrine to eolian environments.

The Athabasca Supergroup sandstones are subdivided into the Manitou Falls Group including the Read Formation, which consist of coarse- to fine-grained hematite-rich conglomerates that lie along thin stratigraphic horizons and silty sandstones. The sandstones are differentiated by their proportions of conglomerate beds and presence of clay intraclasts.

The Athabasca Supergroup sandstones consist almost entirely of quartz, and any detrital feldspar that was present was altered to clay minerals, such as kaolinite and illite, during the 200-million-year long period of diagenesis that impacted Basin. Some portions of the Manitou Falls Group were silicified during diagenesis whereby quartz cement sealed the sandstone’s primary porosity and effectively reduced the groundwater flow through the matrix of the sandstone and made it prone to brittle fracturing. Other areas of the Manitou Falls Group, particularly along the WS Shear Zone and associated splays, underwent hydrothermal alteration and desilicification of the sandstone. This alteration is interpreted to increase the porosity and permeability of the sandstones in these areas.

In addition to alteration, the sandstones have also been faulted and fractured, which also affects the movement of groundwater through these units. Faults in the sandstone represent reactivated brittle basement faults along the northeast-southwest trending WS shear zone, or responses to volume adjustments in the sandstone during hydrothermal alteration and mineralization.

5.2.3 Basement Rock

Basement rocks beneath the Phoenix deposits are Paleoproterozoic-aged metasedimentary, metavolcanics and gneiss and schists (Figure 3). The basement rocks have undergone several periods of alteration, following their original deposition, which affect the hydrogeological setting, and these include:

- metamorphism;
- alteration post-metamorphism (<1800 Ma) and prior to deposition of the Athabasca Supergroup sandstones (1700 Ma; Adlahka, 2021; Toma et al., 2022);
- paleoweathering on the bedrock surface prior to subsidence and Basin formation; and,
- hydrothermal alteration associated with the uranium ore mineralization. The most intense areas of hydrothermal alteration occur alongside the highest-grade mineralization, and alteration decreases, and disappears, in all directions with distance away from the ore zone.

A major unconformity separates the basement rock from the overlying Athabasca Supergroup sandstones. This unconformity represents the period when the basement rock was exposed and subject to weathering and erosion.

The uranium ore deposit lies proximal to the unconformity between the basement rocks and the overlying Athabasca sandstone. The Phoenix ore bodies are long and narrow (approximately 25-50 m wide) and are located within or near a graphitic pelite unit. The uranium deposit has been isolated from the over- and underlying units by a barrier zone consisting of clays and sulphide-cemented rock, that has limited the leaching of uranium and other chemical constituents in the ore over time. This inference – regarding limiting of migration of chemical constituents away from the ore zone by the natural barrier unit – is the authors' professional opinions of the current setting, based on a thorough review and interpretation of available information.

Faults within the basement rocks trend in a similar northeast-southwest direction as the WS Shear Zone and are well defined in the basement rocks. There are also several west-east trending cross-faults that lie roughly perpendicular the WS Shear zone that propagate through the ore zone and basement rocks. These faults and fracture systems play an important role in groundwater flow and the evolution of geochemical signatures.

5.3 Hydrogeological Framework

The hydrogeological units that influence groundwater flow within the Basin presented on Figure 29 and detailed as follows:

- Upper overburden unit defining the water table and upper shallow groundwater flow system.

- Athabasca Sandstone Supergroup subdivided into 3 units including upper and lower aquifers, separated by an intervening aquitard zone.
- Basement rocks subdivided into an upper weathered (Paleoweathered) and underlying competent basement aquitard.

A summary of the geological/lithology units and the corresponding hydrogeological unit is summarized in Table 5-1 as follows:

Table 5-1: Hydrostratigraphic Units at Phoenix

Lithologic Unit		Hydrostratigraphic Unit (Aquifer/Aquitard)
Overburden		Overburden Aquifer
Athabasca Supergroup/ Manitou Falls Group	Dunlop Fm – MFd	Upper Sandstone Aquifer
	Collins Fm – MFc	
	Bird Fm – MFb	Intermediate Sandstone Aquitard (and Desilicified Zone Aquifer)
	Read Fm (MFa)	Lower Sandstone Aquifer (and Desilicified Zone Aquifer)
Upper Barrier Zone (Clay zone and sulphide-cemented rock)		Aquitard (overlying the ore zone)
Ore Zone (high grade friable zone)		Ore Zone Aquifer
Lower Barrier Zone (Clay zone and sulphide-cemented rock)		Aquitard (underlying the ore zone)
Paleoweathered and Competent Basement		Basement Aquitard

5.3.1 Groundwater Flow Systems

As presented on Figure 29, two groundwater flow regimes were identified in the local basin stratigraphy. The uppermost flow system is unconfined and includes groundwater flow through the overburden and Upper Sandstone Aquifer. The lower semi-regional system is confined by the Intermediate Sandstone Aquitard, and includes flow through the Lower Sandstone Aquifer, and locally, in the Ore Zone Aquifer.

Horizontal groundwater flow in the deeper semi-regional flow system is generally directed from the west to the east and southeast, as interpreted by water level and groundwater chemistry observations (Figure 17). Groundwater flow within the Overburden and Upper Sandstone Aquifer is influenced by ground surface topography and surface water features (Figure 16). Flow in this upper groundwater flow regime is derived from recharge in the local area, whereas groundwater flow within the semi-regional groundwater flow system is derived from a combination of regional groundwater flow from upgradient sources, and vertical flow through the Intermediate Sandstone Aquitard. Vertical gradients are

interpreted to be directed downward in areas west of the Phoenix deposit, and upward beneath the surface water bodies such as Whitefish and Williams Lakes.

5.3.2 Aquifer Properties

Hydraulic conductivity, porosity and storage values of the various units are summarized a in Table 5-2.

Table 5-2: Summary of Hydrostratigraphic Unit Properties

Hydrostratigraphic Units	Field-Based Hydraulic Conductivity (m/s)		Effective Porosity (%)	Storage ²
	Range	Geomean ¹		
Overburden Aquifer/ Aquitard	3 x 10 ⁻⁶ and 2 x 10 ⁻⁴	-	25% (sand); 18% (till)	20% (Sy)
Upper Sandstone Aquifer	4 x 10 ⁻⁷ to 1 x 10 ⁻⁴	3.7 x 10 ⁻⁶	1 to 10%	1x10 ⁻⁵ (Ss)
Intermediate Bedrock Aquitard	1 x 10 ⁻¹⁰ to 3.8 x 10 ⁻⁶	8.4 x 10 ⁻⁹		
Desilicified Zone	1 x 10 ⁻⁶ to 2 x 10 ⁻⁵	4.8 x 10 ⁻⁶		
Lower Sandstone Aquifer	7.8 x 10 ⁻⁸ to 3 x 10 ⁻⁵	2.2 x 10 ⁻⁶		
Upper and Lower Barrier Zone Aquitard (clay zones and sulphide-cemented rock)	Hydraulic tests have not been completed on these units as they are relatively thin in comparison to overlying/ underlying units.			1 to 10%
Ore Zone Aquifer				
Basement Aquitard	1.1 x 10 ⁻¹¹ to 1.1 x 10 ⁻⁵	4.8 x 10 ⁻⁹		
¹ A geomean value was not calculated for the Overburden Aquifer/Aquitard or the Upper and Lower Barrier zone as only two measurements were available for each unit ² Sy values expressed as percent of total volume ² Ss values expressed in units of 1/m ³ Screened intervals of the wells often intercept the ore zone and upper or lower barrier zones; elevated conductivity values were interpreted to reflect the ore zone aquifer and lower values reflect the barrier zone aquitard.				

Overburden is generally sand-rich with minor silt and clay content, resulting in an aquifer that ranges from high to moderate hydraulic conductivity. Thickness is highly variable, with deposits up to 60 m thick where the underlying sandstone was more intensely fractured and was thus more-easily weathered.

Aquifer zones within the sandstone result from fractured zones (presumably associated with faulting) and areas of lower clay content. Where present, the clay content is interpreted to partially infill fractures, effectively reducing hydraulic conductivity.

The hydraulic properties within the Basement Aquitard unit vary as the properties are dependent on the fracture or fault properties. The highest hydraulic conductivity values are expected along the primary fault zones, including the WS Shear where the rock is more fractured. Lower hydraulic conductivity values are observed in most portions of the

Basement Aquitards where the basement rocks are competent and fracture frequency is low.

5.3.3 Groundwater Recharge and Discharge

Groundwater recharge occurs across much of the study area, and after infiltrating to the water table, flows toward the local streams and surrounding lakes where groundwater discharges to surface. Recharge from the Local Flow System to the Lower Sandstone Aquifer is conceptualized to occur along fault zones and where downward gradients are present.

Local to the Phoenix deposit, shallow groundwater in the overburden and the Upper Sandstone Aquifer are conceptualized to discharge into Whitefish Lake, which is located approximately 500 m east of the deposit and has a lake level of approximately 500 m asl (Figure 17). Other major lakes in the area include Kratchkowsky Lake and Williams Lake, located west of the Phoenix deposit, which have lake levels of 520 and 518 m asl, respectively (Figure 17). McGowan Lake, located southeast of Whitefish Lake and 2 km from the Phoenix deposit, has a lake elevation of 494.4 m asl (6 m lower than Whitefish), while Russell Lake, located 6 km south of the deposit, has a lake elevation of 488 m asl. The water level elevations observed in water levels between the Phoenix deposit and the lake consistently exhibit an upward hydraulic gradient from the Lower Sandstone Aquifer (and ore zone) into Whitefish Lake (Figure 17) through the Desilicified Zone in the Intermediate Sandstone Aquitard. It is interpreted that the elevated hydraulic conductivity value represented by the Desilicified Zone creates a preferential pathway for water to discharge into Whitefish Lake, rather than continuing to stay in the Lower Sandstone Aquifer and discharge to Russell Lake. It is possible that some deeper regional flow, within the Upper Sandstone Aquifer, may discharge to Russell Lake south of the Phoenix site. But, despite the fact there is hydraulic potential for groundwater in the Lower Sandstone Aquifer to discharge to Russell or Mardoc Lakes, the Intermediate Sandstone Aquitard acts to hydraulically separate the Lower Sandstone Aquifer from the overlying Upper Sandstone Aquifer and the local groundwater flow regime in the Russell and Mardoc Lake areas.

Discharge to streamflow as recorded in streamflow stations located along the streams and rivers located east of the Phoenix deposit were measured to be consistently increasing from above Whitefish Lake to below McGowan Lake. Similarly, discharge to streamflow as recorded along the drainage course west of the Phoenix deposit was also measured to increase. Low flow discharge per unit area is estimated to be approximately 125 mm/yr. This indicates that local groundwater discharge is sustaining streamflow even in low precipitation periods.

5.3.4 Faults, Fractures, Vertical Pathways

Faulting of the crystalline basement and sedimentary rocks can give rise to complex hydrogeological systems. In bedrock, faults can act as complex barrier-conduit systems with

low permeability core zones and broader fracture zones that are transmissive in the plane of the fault. Vertical fracture or fault zones that hydraulically connect the local (upper) and semi-regional (lower) groundwater flow regimes are present throughout the Athabasca Basin. Information from fault investigations suggests that faults are likely represented by fracture zones with enhanced permeability and higher groundwater flow rates.

Water level trends throughout the region surrounding the Phoenix deposit are largely consistent across the area. Water levels in monitoring wells screened in the Lower Sandstone Aquifer and Basement Aquitard in areas southwest of the Phoenix deposit (see Figure 17) are higher than expected, suggesting the WS Shear zone or a related fault located southwest of the ore zone may enhance recharge to the lower groundwater flow system in this area. This interpretation is also supported by the groundwater geochemical evaluation (see Figure 17).

It is also recognized that open, unsealed exploration boreholes can create potential vertical migration pathways. These pathways will be considered during the planning and design of the groundwater monitoring plan.

5.3.5 Baseline Groundwater Geochemistry

Groundwater collected from each of the hydrostratigraphic units at the site provides a good regional understanding of baseline groundwater chemistry and has allowed examination of the differences in hydrochemistry between the hydrostratigraphic units. Overall, the groundwater sampled in the study areas is low in mineralization, and this is consistent with the understanding of groundwater in the wider region from other uranium mining projects (e.g., AECL, 1994; Cameco, 2012). From the groundwater data collected, radionuclides and some other dissolved metals/trace elements had concentrations that were higher in the ore zone (by an order of magnitude or more) in comparison to the overlying hydrostratigraphic units and surface water. This gives evidence of the very low mass flux of those constituents from the ore zone and the discontinuous barrier zone aquitard overlying and underlying the ore zone over time.

The groundwater chemistry measured supports the presence of a Local Flow System, Intermediate Sandstone Aquitard and Lower Sandstone Aquifer in the study area. The chemistry of the groundwater in the Local Flow system is that of recharge water that is of relatively low pH, from contact with organic matter in the upper soil profile, and that has become mineralized through dissolution of quartz, feldspars, kaolinite and illite. The chemistry of groundwater in the Intermediate Sandstone Aquitard is similar in terms of major ion composition to that of the Local Flow System, but a longer residence time in the aquitard has led to more extensive mineral dissolution and higher mineralization, with a similar hydrochemical type. Higher relative variability in the groundwater chemistry sampled from monitoring wells in the Intermediate Sandstone Aquitard may reflect the localized influence of desilicification on the flow conditions, and consequently on groundwater conditions, in a subset of these wells. The Lower Sandstone Aquifer is characterized spatially by two types of groundwater. The first groundwater type is most similar to that observed in

the Local Flow System. This is suggested to reflect hydraulically active fractures and fault systems that allow fresh recharge water to penetrate and mix with deeper waters in the Aquifer. The second type of groundwater was within the zone of thermal alteration around the ore zone and has relatively high mineralization, thought to be a result of dissolution of remnant halide salts present on grain boundaries and in intragranular pores within the rock matrix at depth in the Athabasca Sandstones.

Groundwater quality results suggest that connectivity between the Upper Sandstone Aquifer and Intermediate Aquifer is limited. Again, desilicification of these Formations to the northeast of the ore zone may affect interconnectivity of these units on a localized scale. Although limited in number of samples available, groundwater quality in the Paleoweathered zone for both Project and Cigar Lake assessments suggest a distinct geochemical environment from that of the overlying Athabasca Sandstone Supergroup hydrostratigraphic units.

5.4 Links to Other Studies

This conceptual site model provides the basis for building and developing a numerical model to represent groundwater flow and migration of ore zone constituents under pre-development, active mining, and post-mining conditions. The numerical model provides additional insights into the groundwater flow system and potential migration pathways throughout the planned mine activities. The numerical model has been used to evaluate potential migration pathways, assist in mine water and wastewater design, and design an effective groundwater monitoring network.

6.0 STATEMENT OF LIMITATIONS

This report has been prepared for the exclusive use of Denison Mines Corp. Factual information, interpretations and summary comments contained herein are provided for the purpose stated in the Study Objectives (Section 1.1). Under no circumstance may this information be used for purposes other than those specified unless formal authorization is provided by Ecometrix Incorporated.

This report must be read in its entirety as some sections could be falsely interpreted when taken individually or out-of-context. Further, the contents and findings of this document reference and rely on the contents of companion documents and as such the contents of this document should not be interpreted independently.

Hydrogeologic investigations are inexact sciences because groundwater systems are naturally complex, and those conditions must be interpreted between observation and measurement points. Conceptual models are simplifications of reality, and the validity and accuracy of the model depends on the amount and quality of data available for characterization relative to the degree of complexity of the setting. A wealth of data exists in the areas overlying the Phoenix deposit, which increases the confidence in the level of characterization of the groundwater flow system in this area.

Despite the level of care employed, no warranty, express or implied, is made regarding the conditions presented in this report. The insights gained through the characterization process should be used to guide decisions but there may be local level variations in groundwater characteristics in data poor areas or between monitoring stations.

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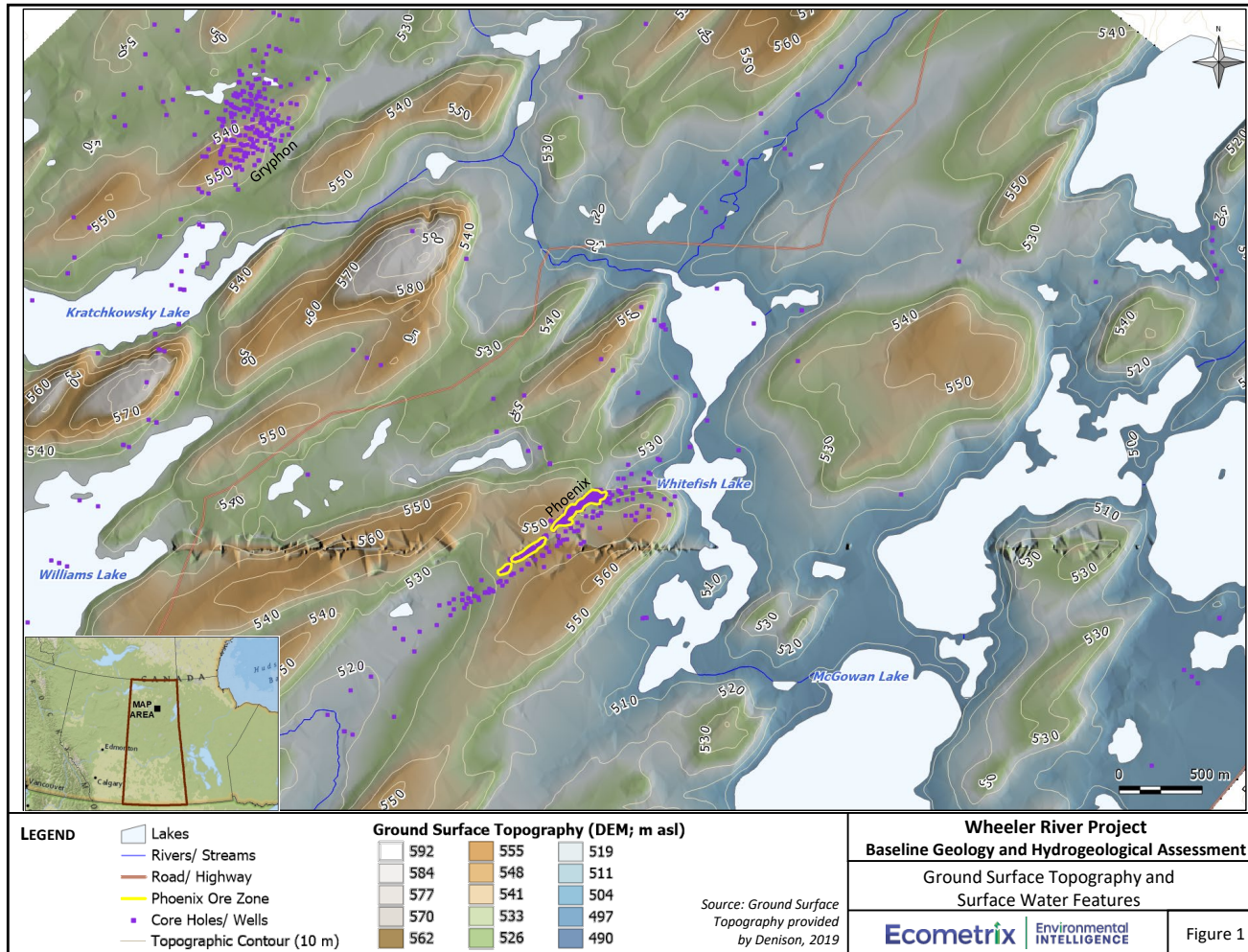
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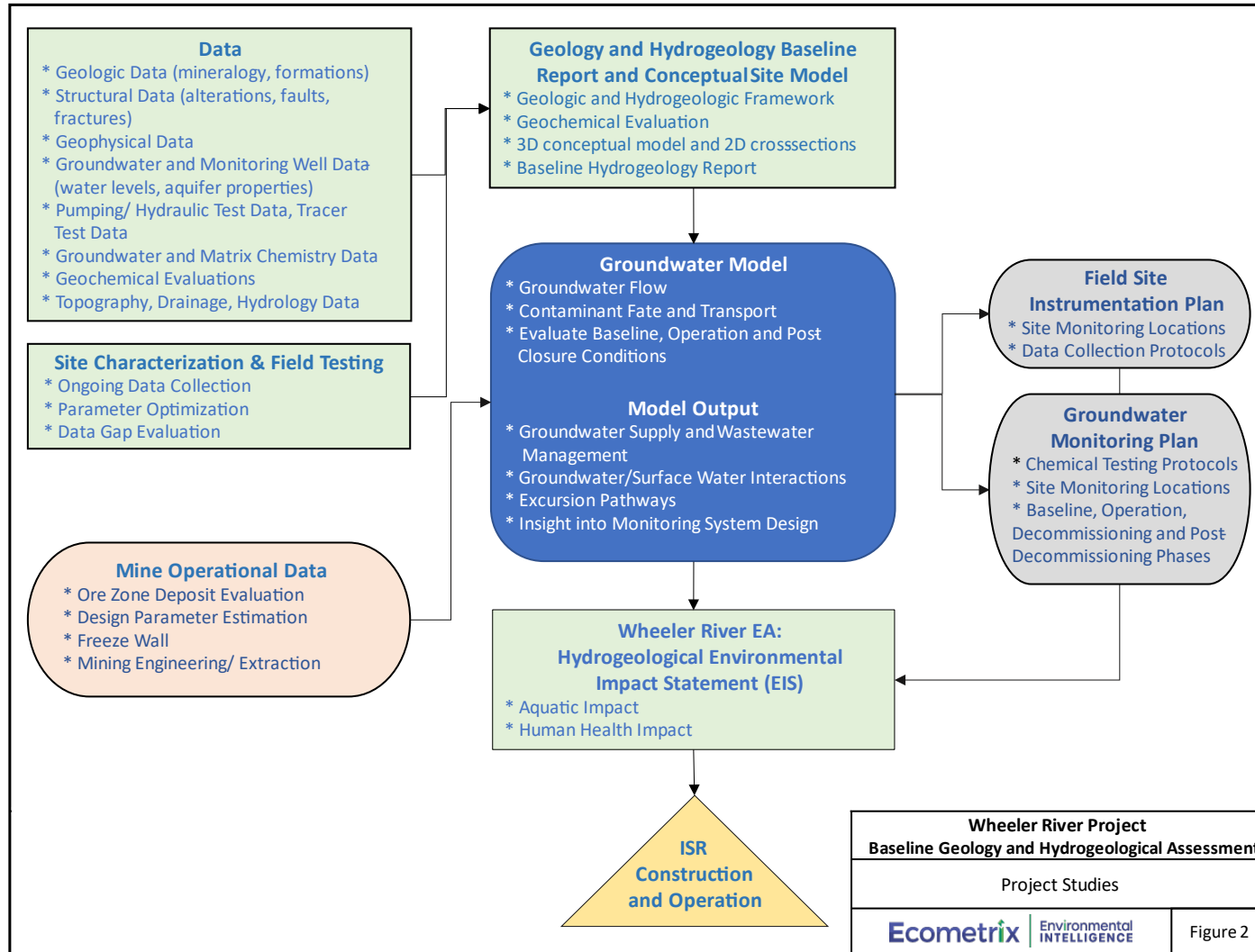
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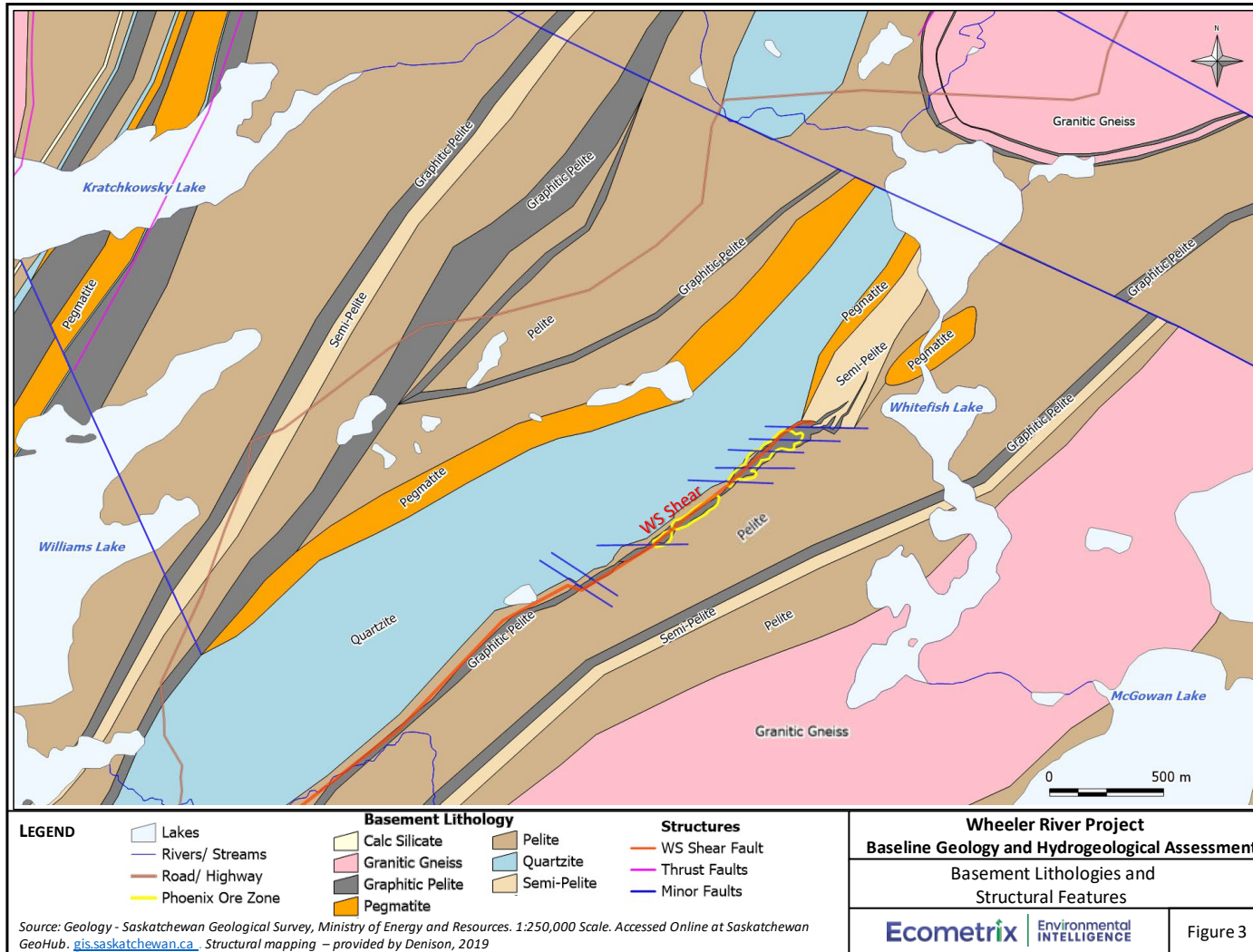
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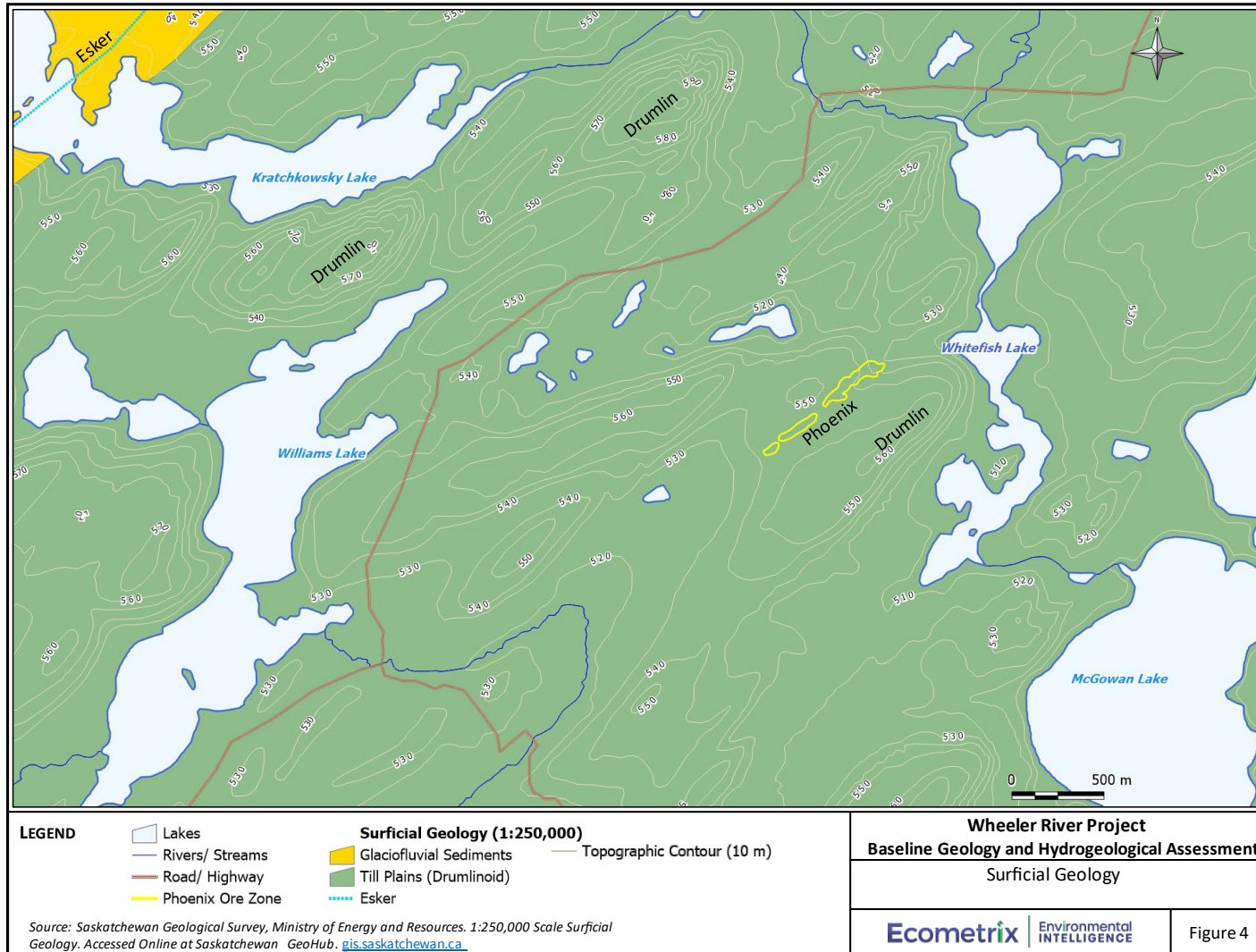
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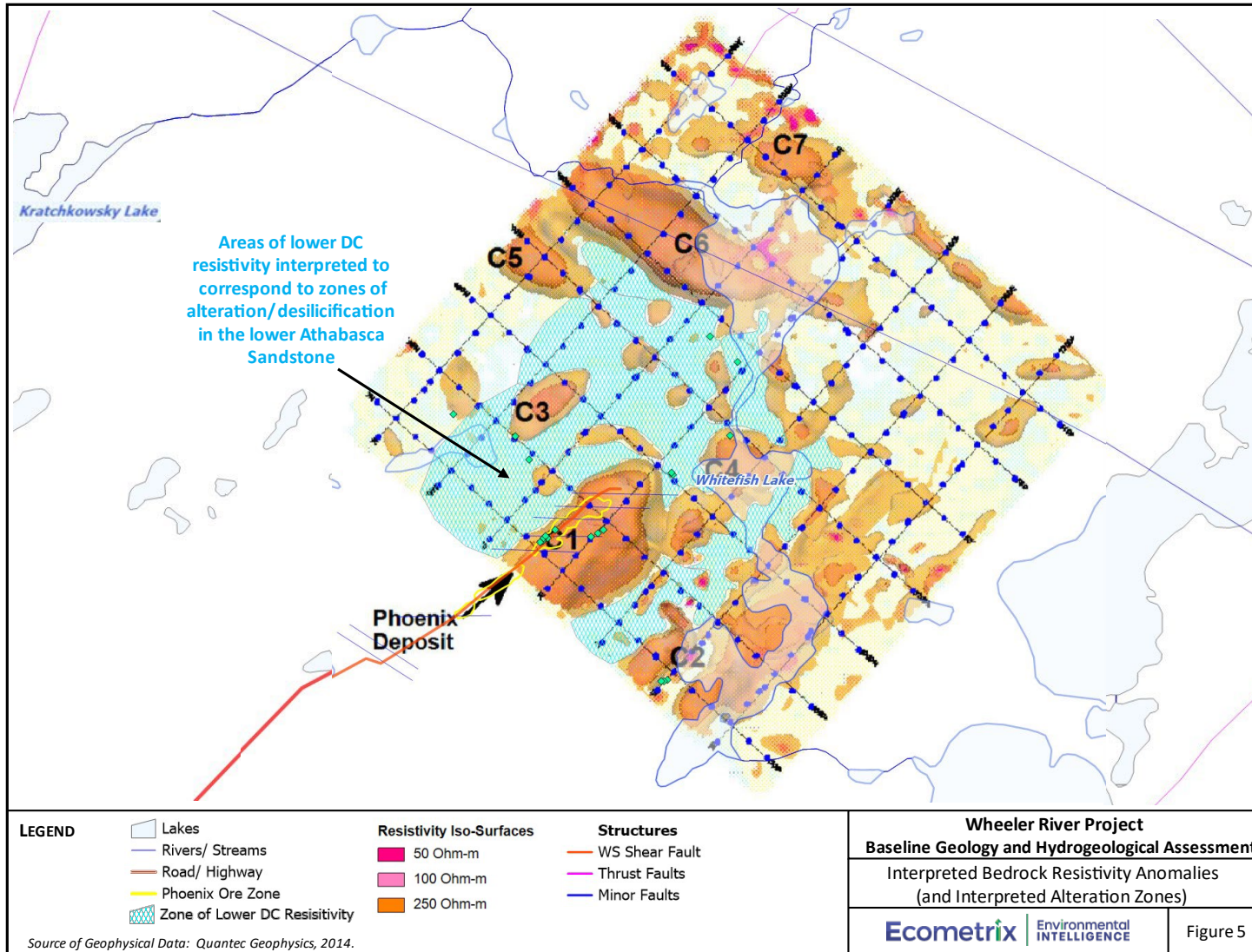
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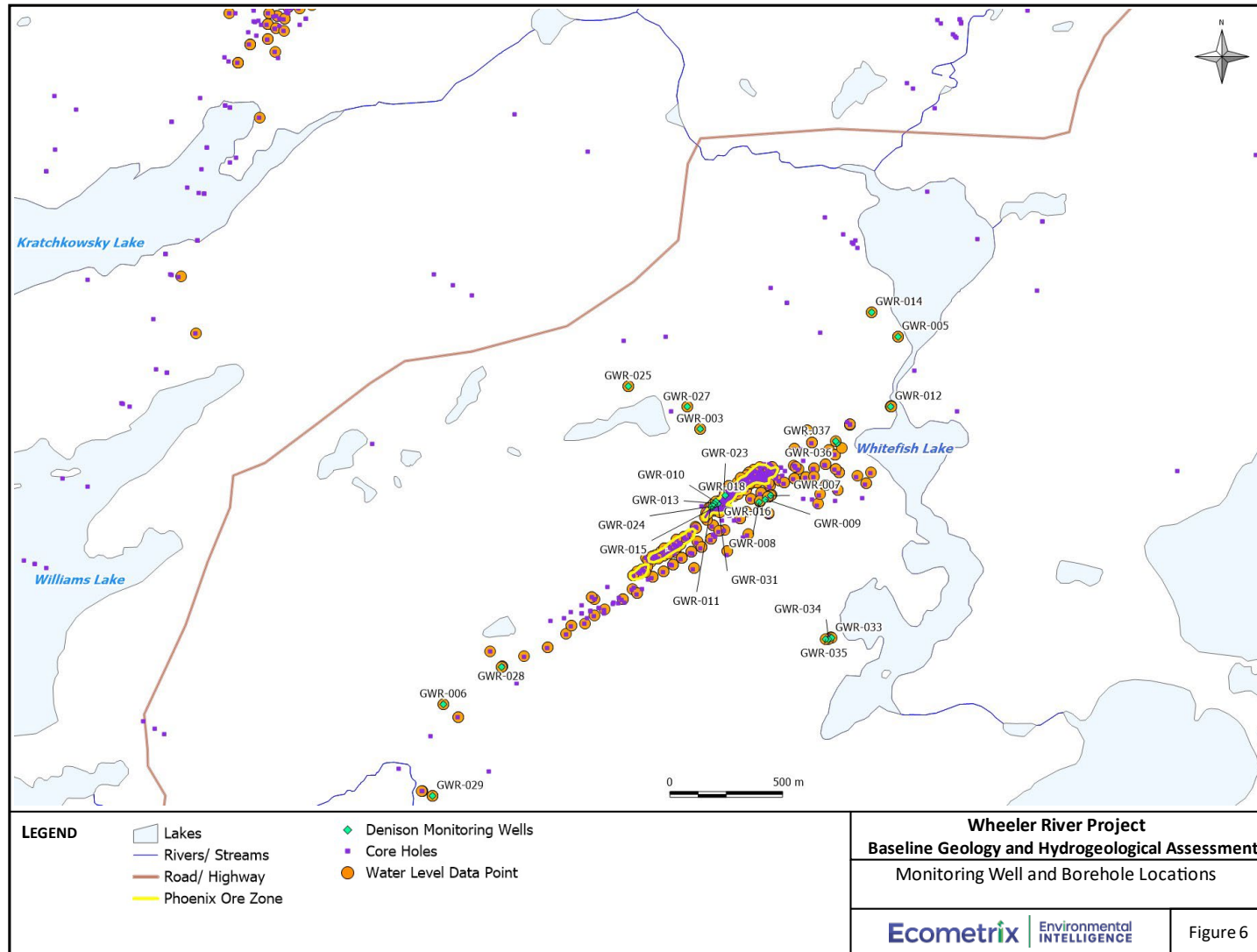


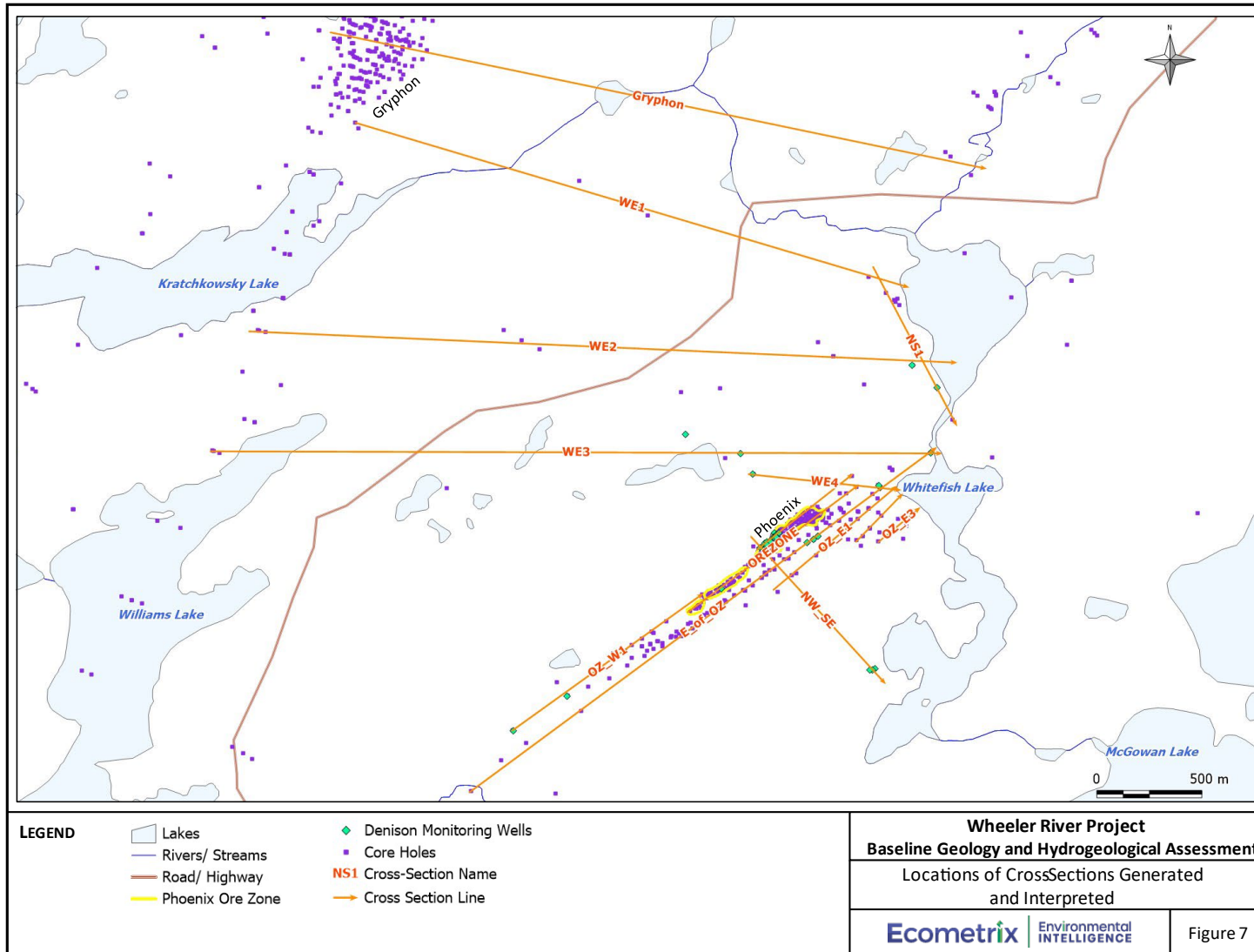


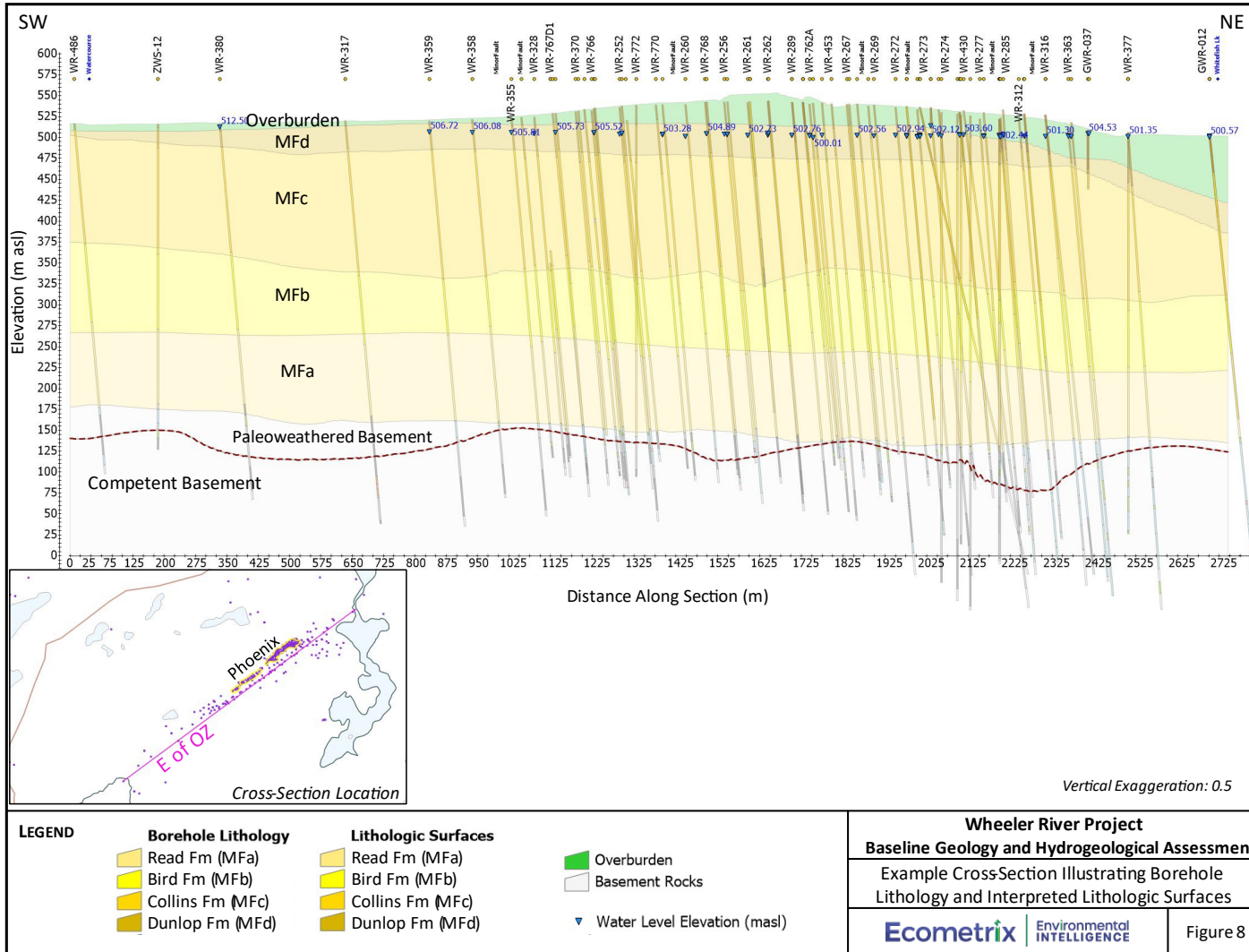


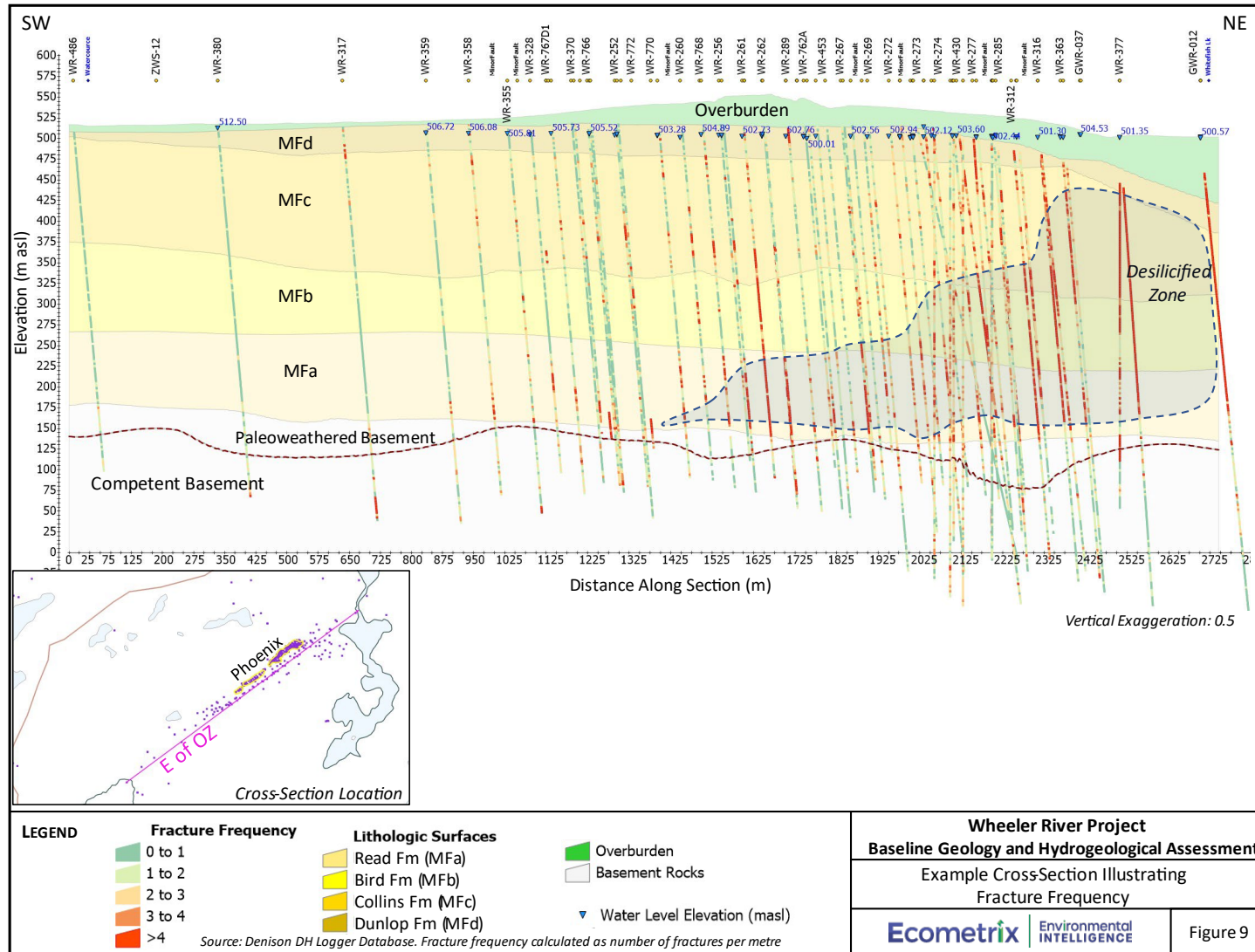


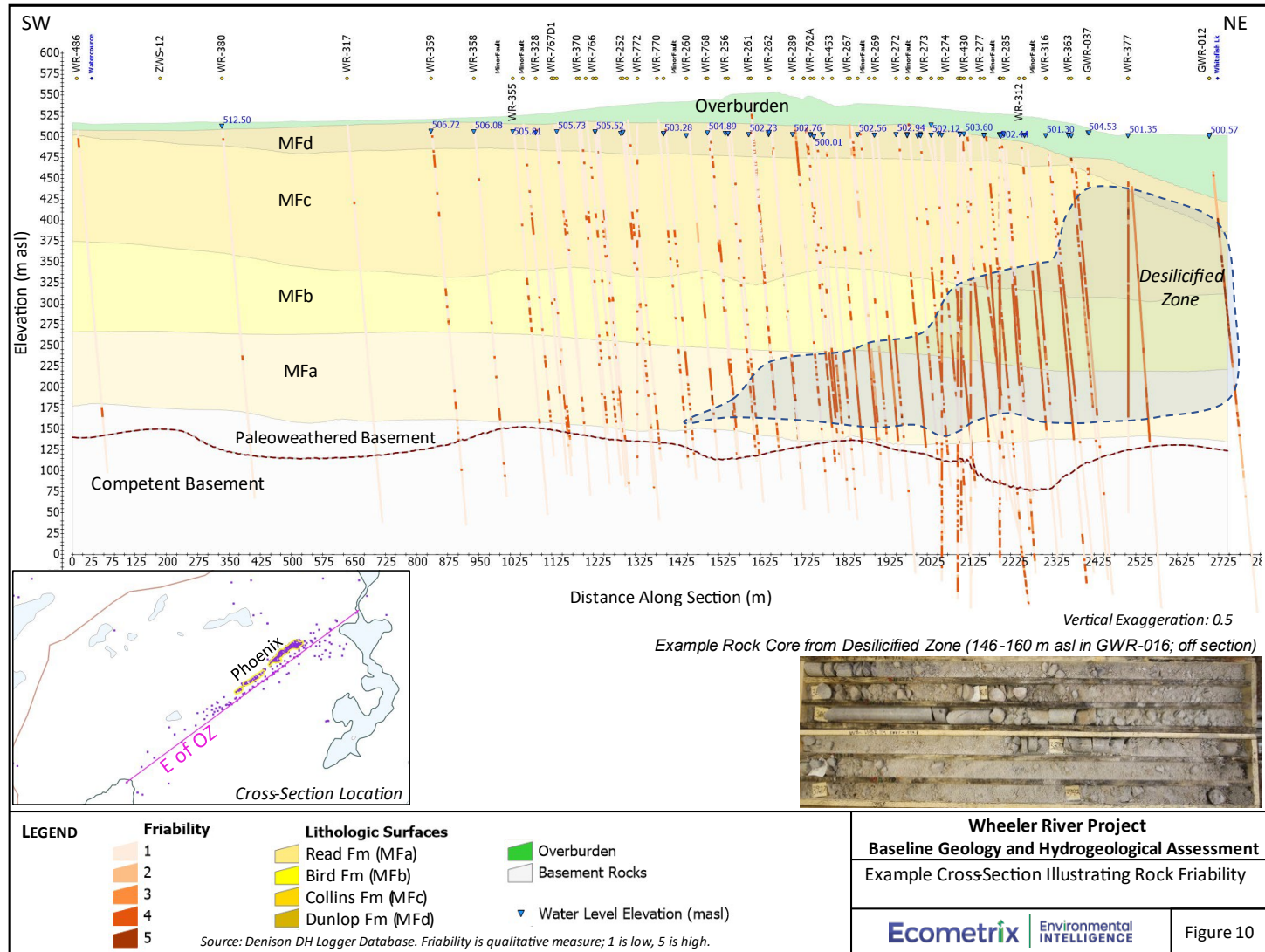


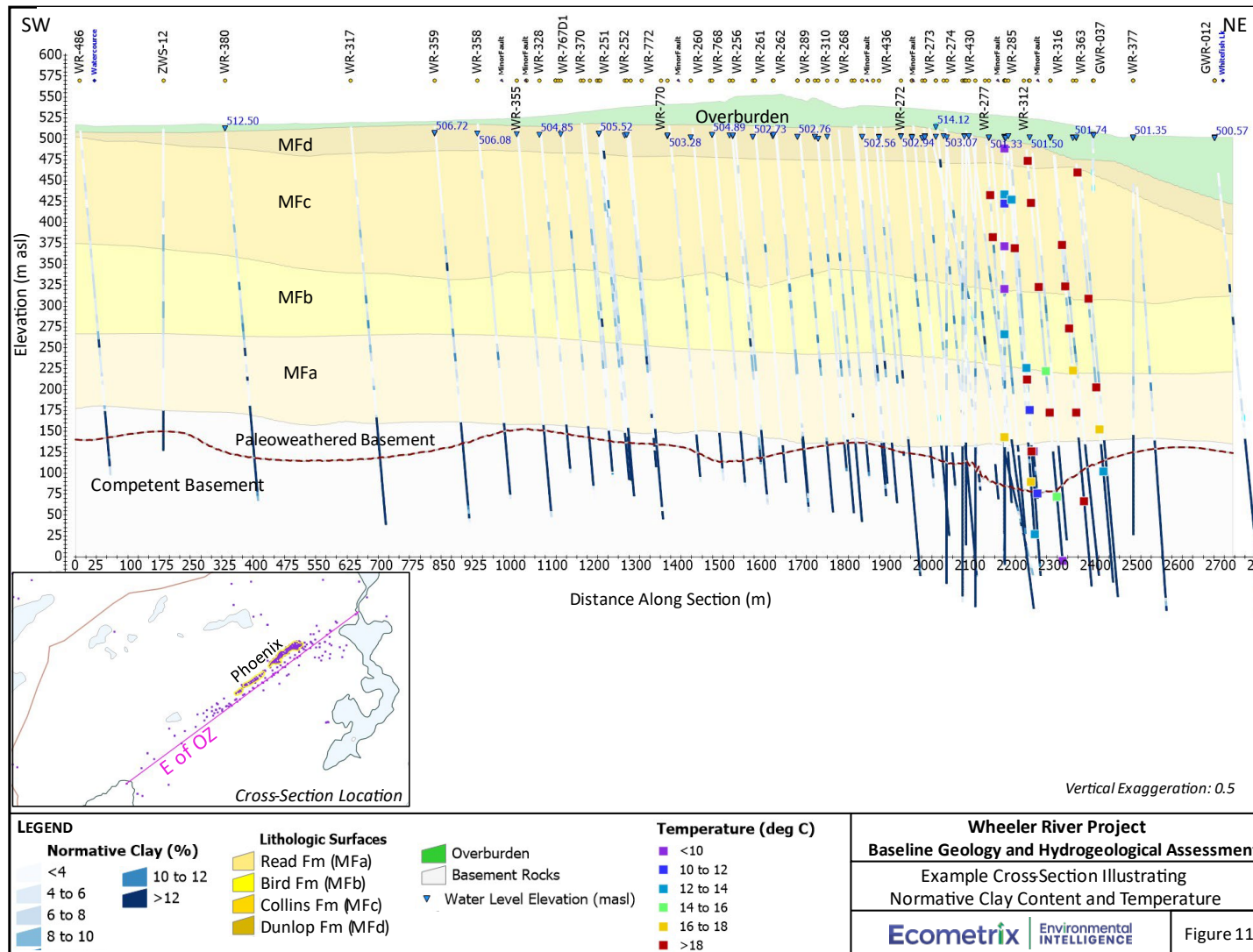


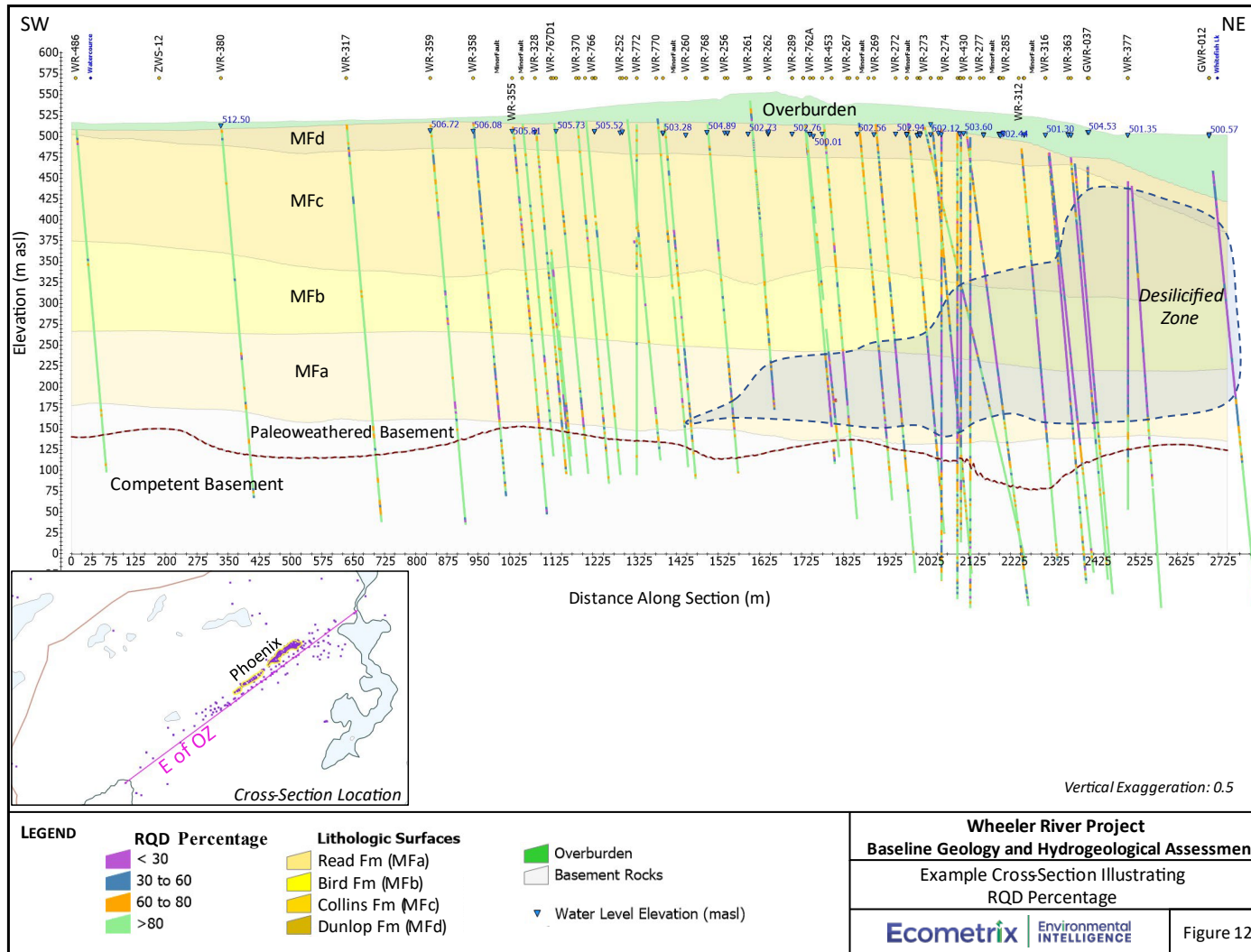


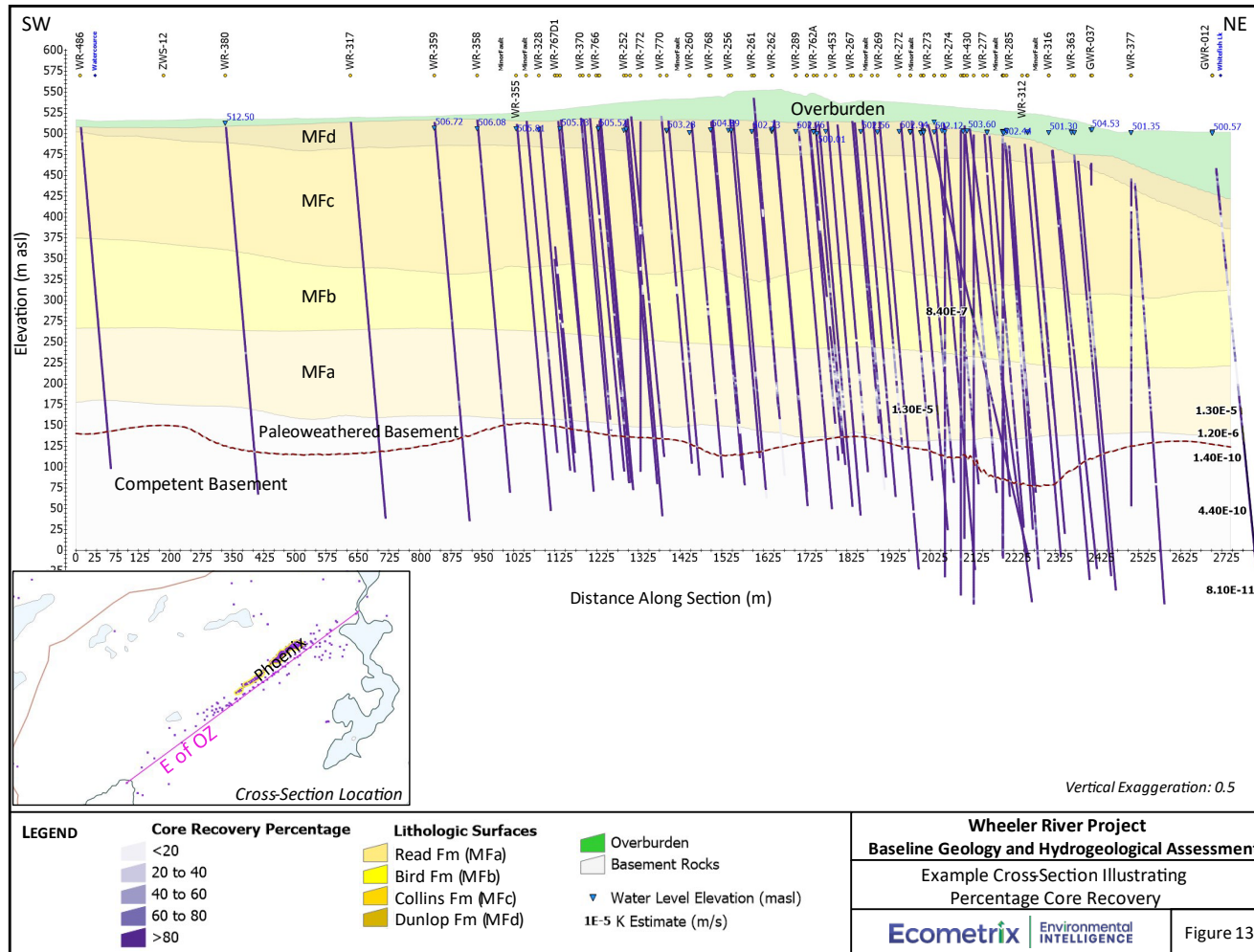


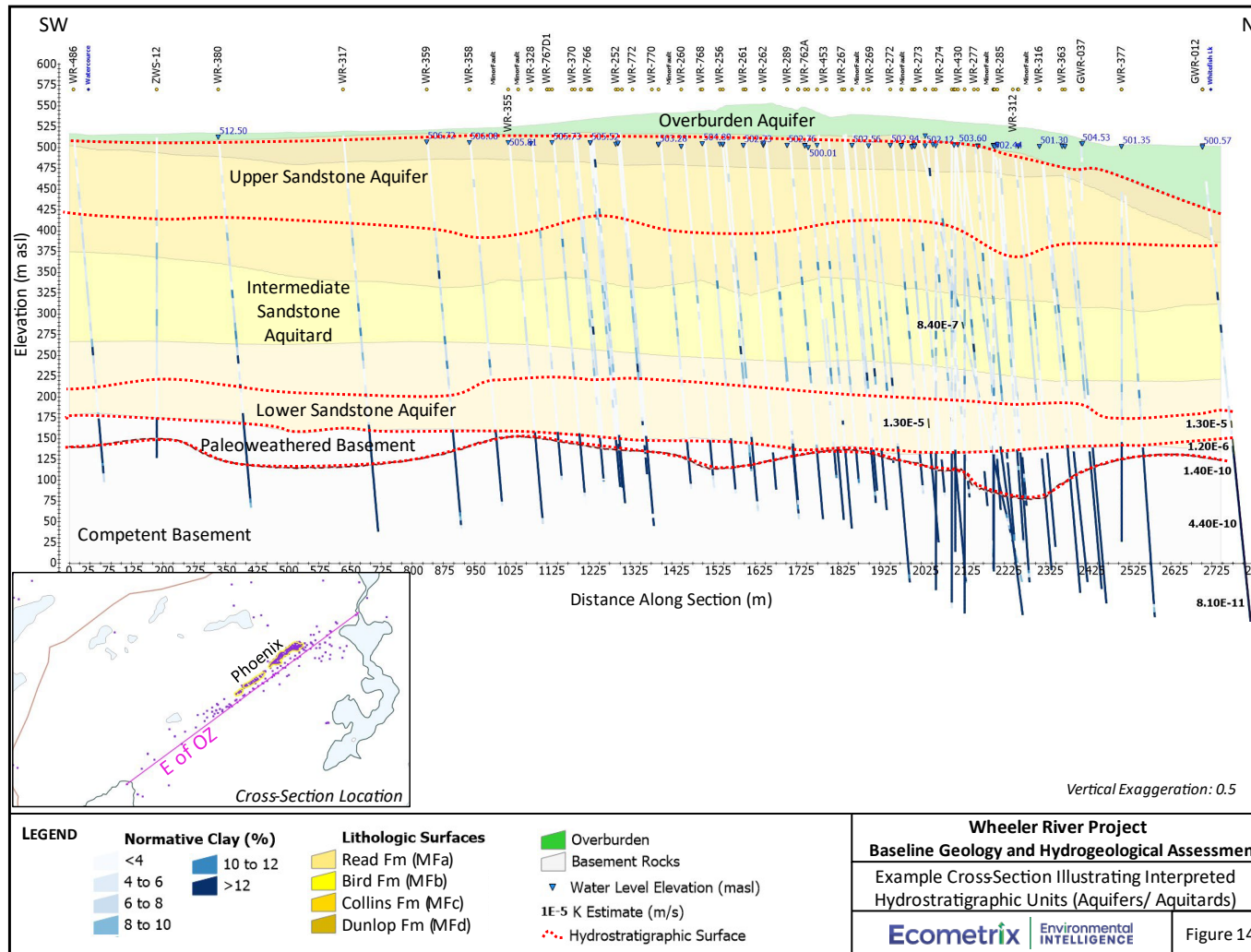


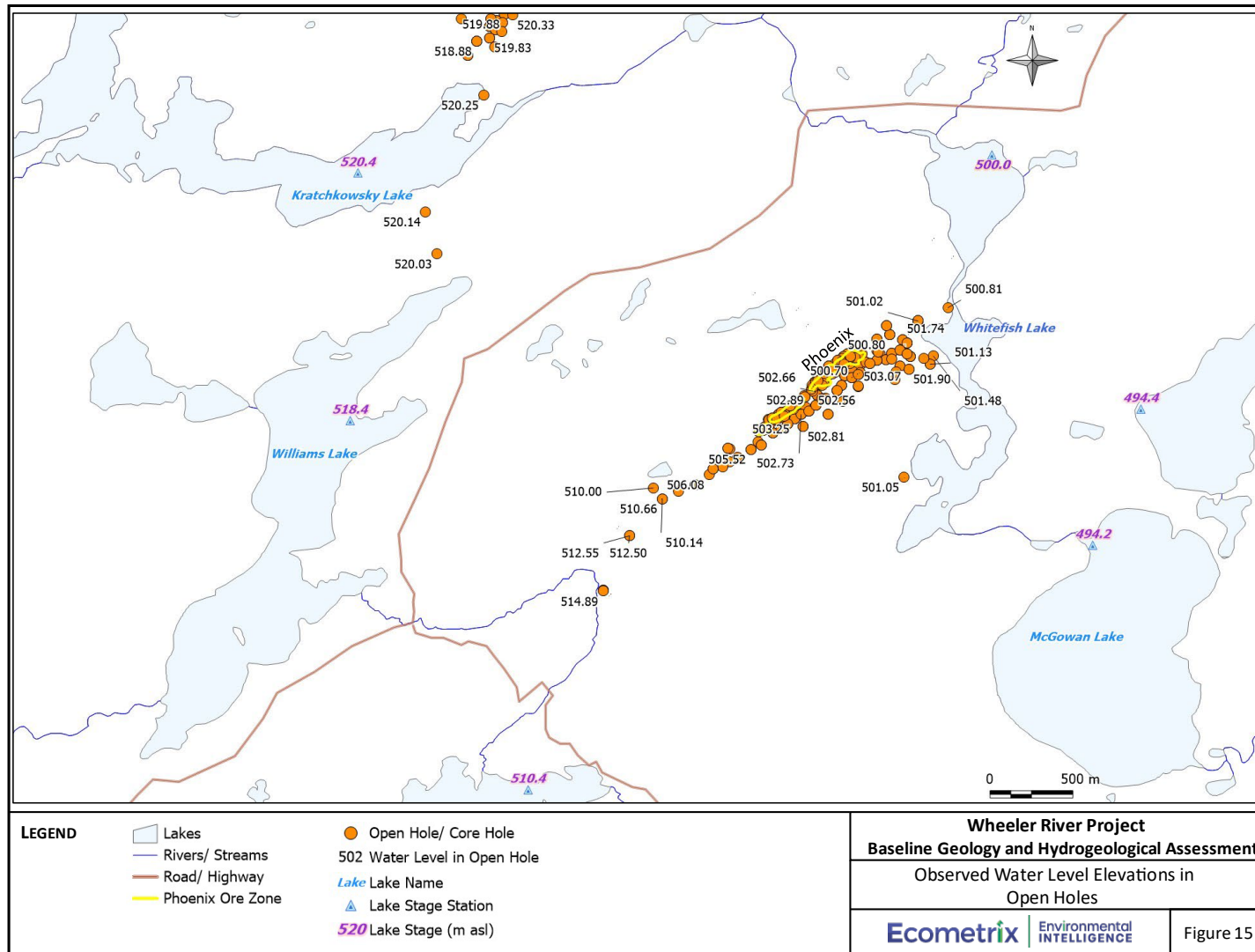


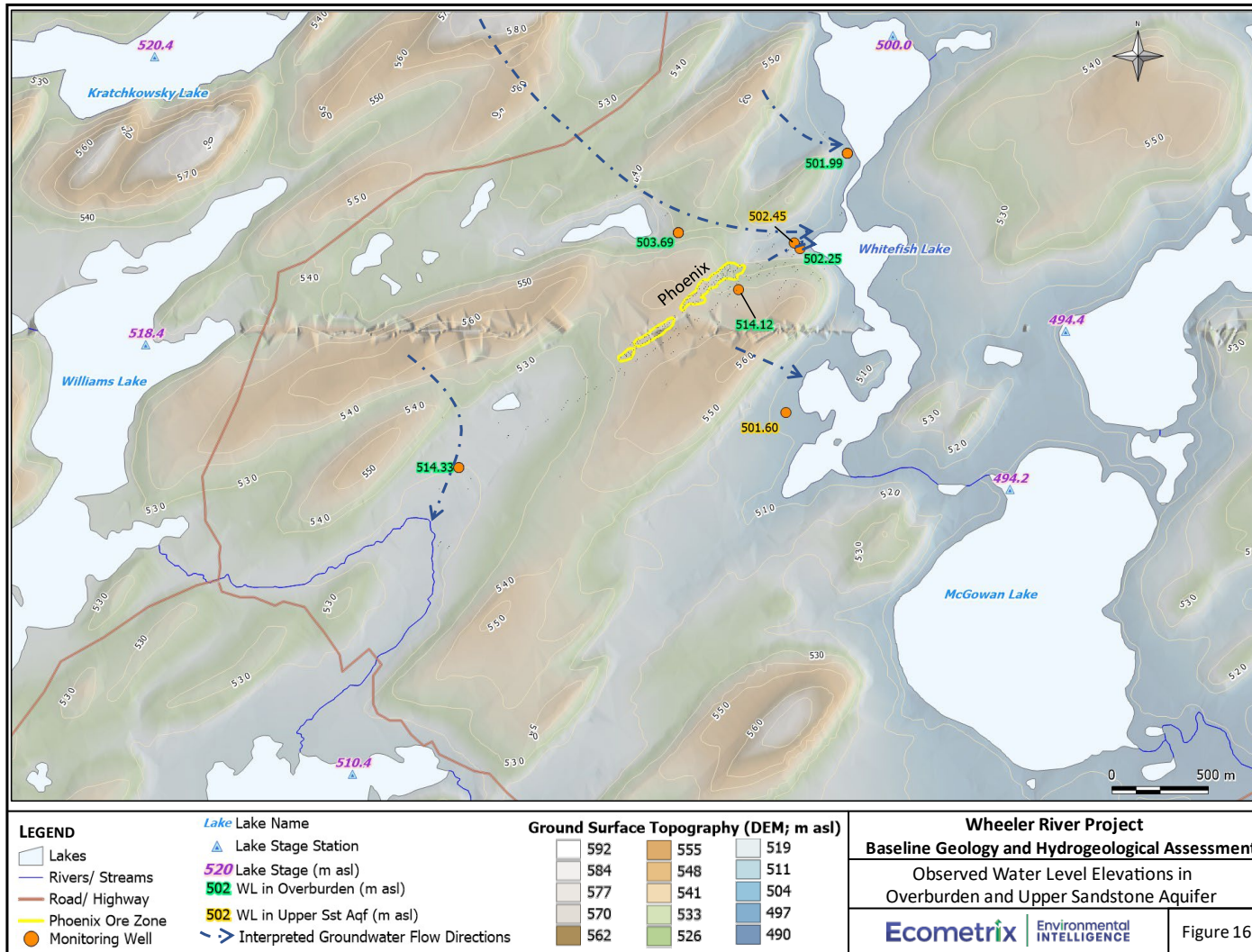


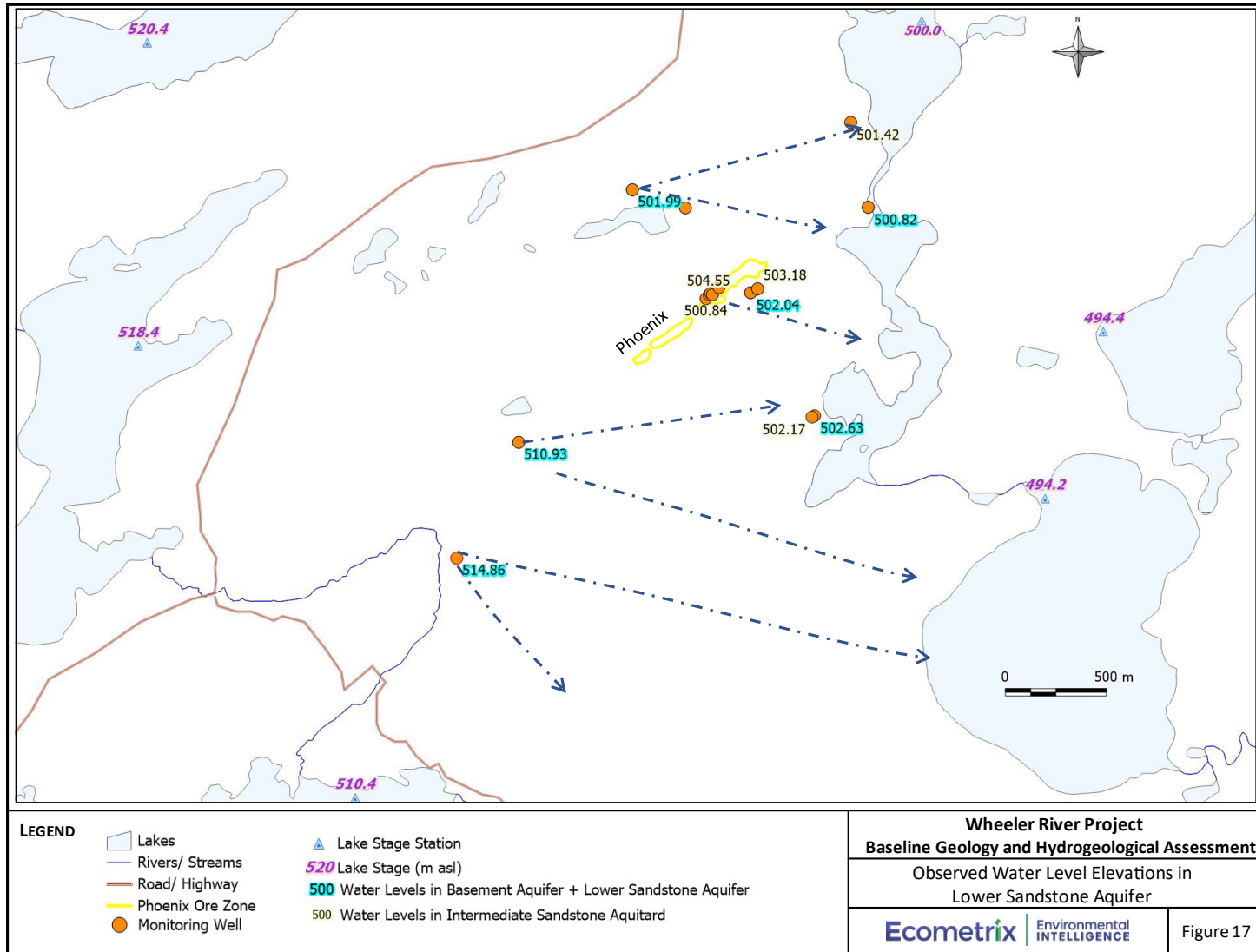


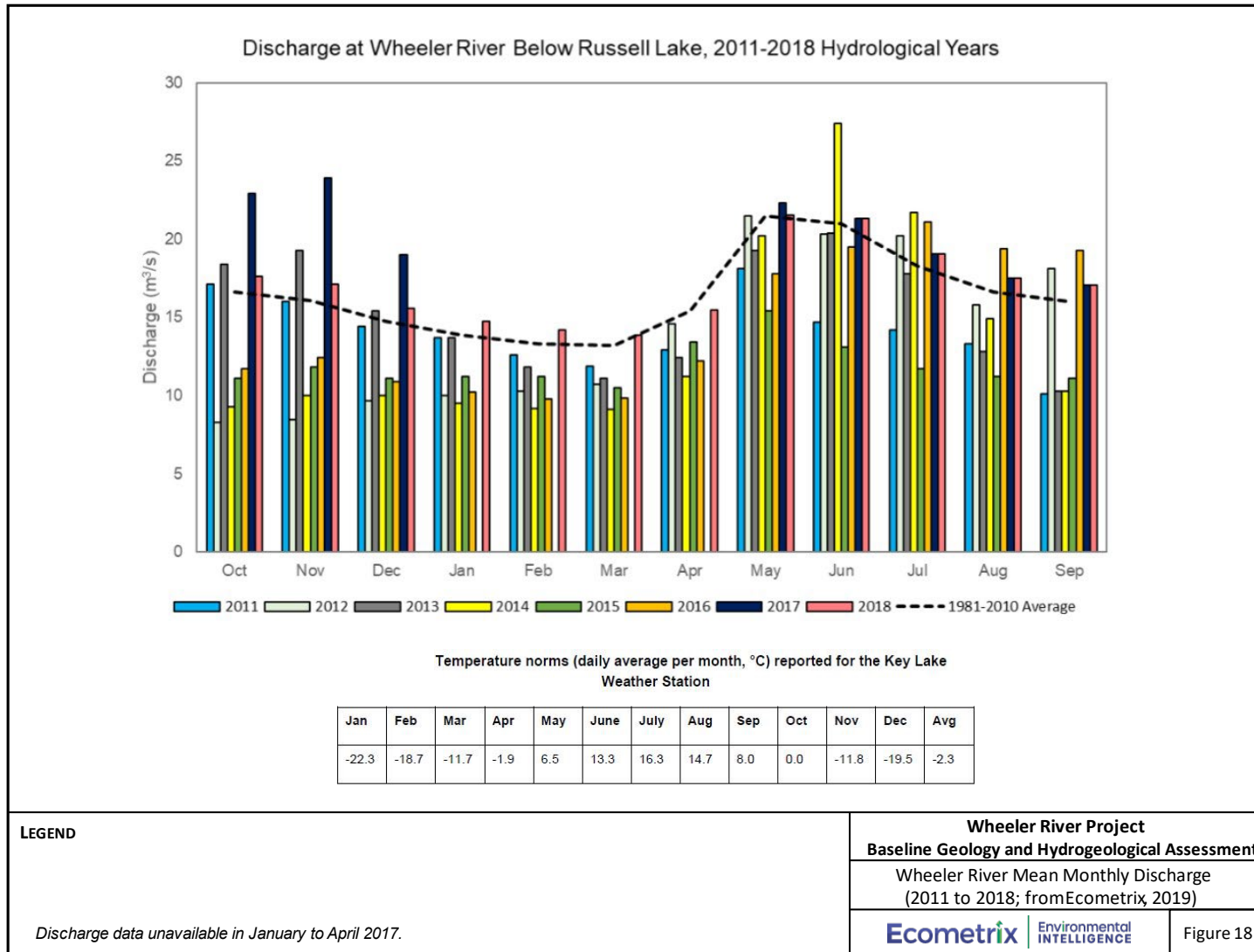


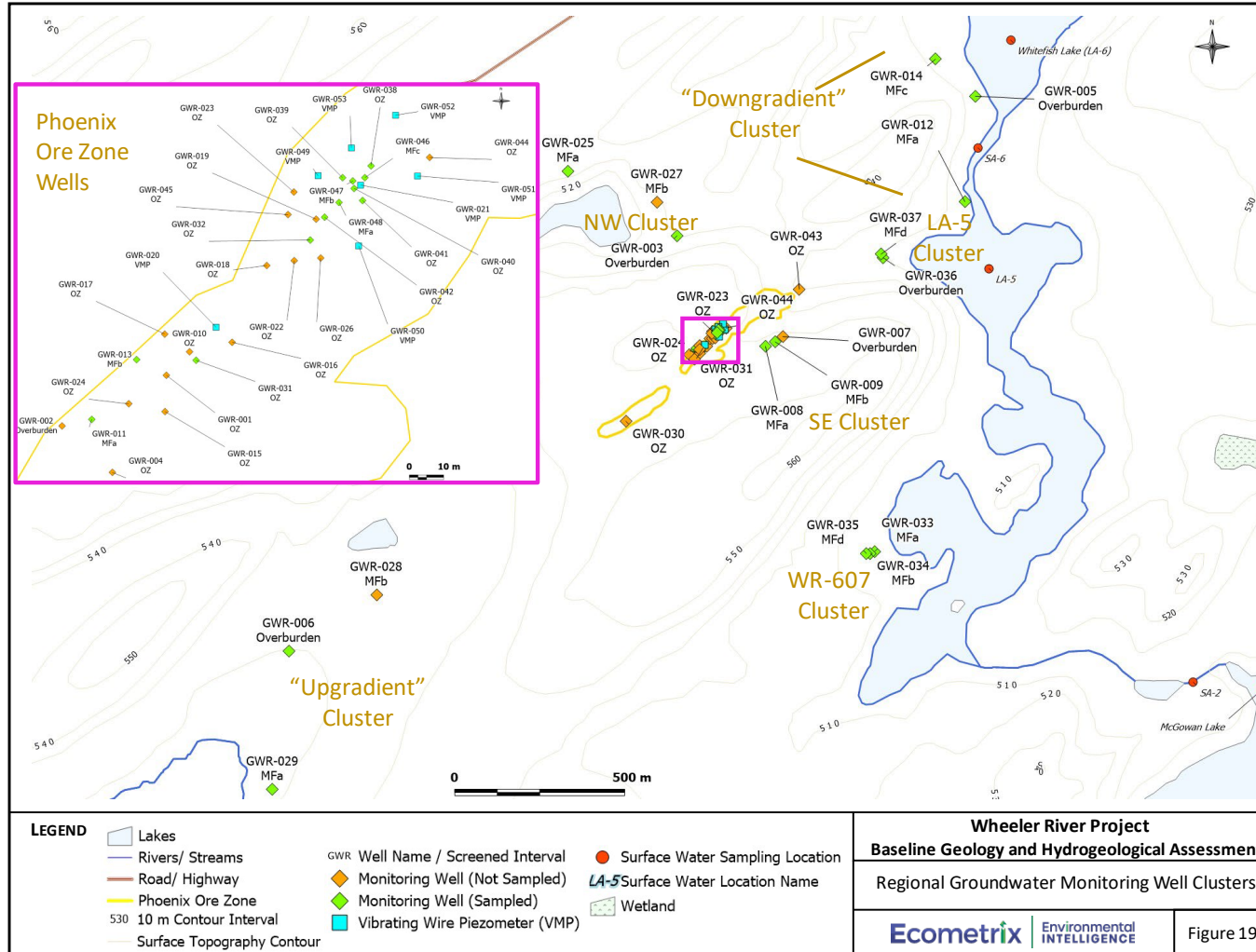


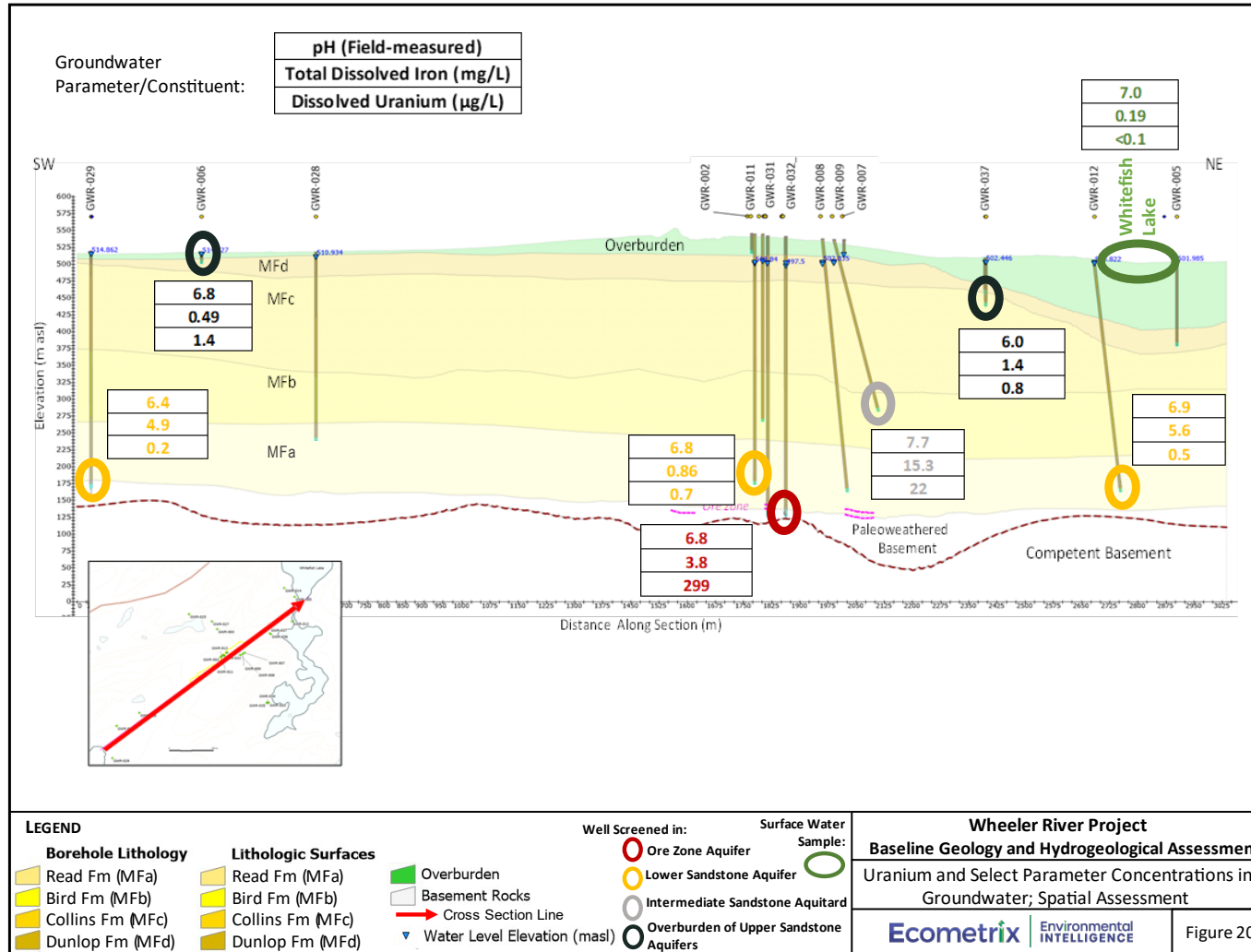


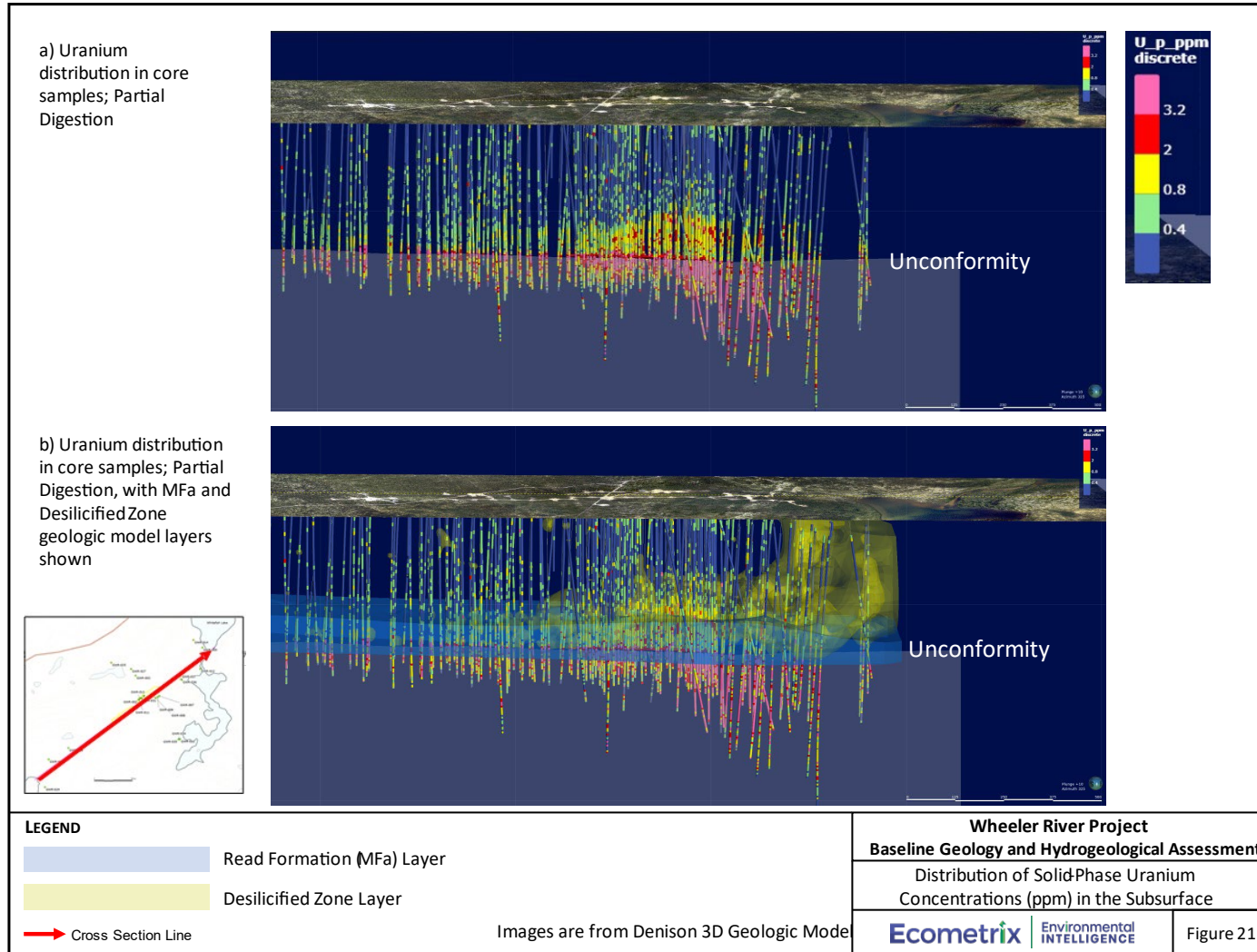


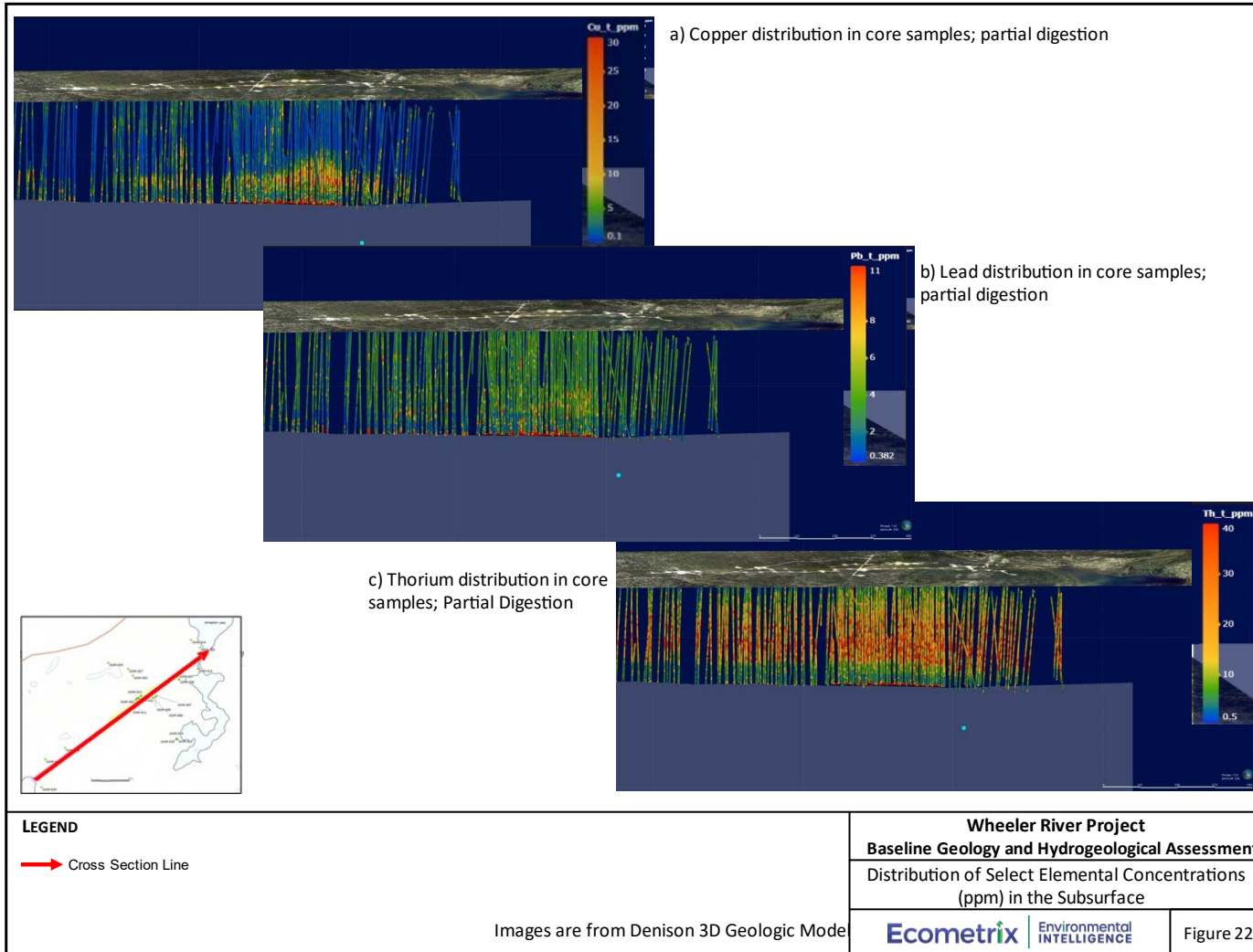


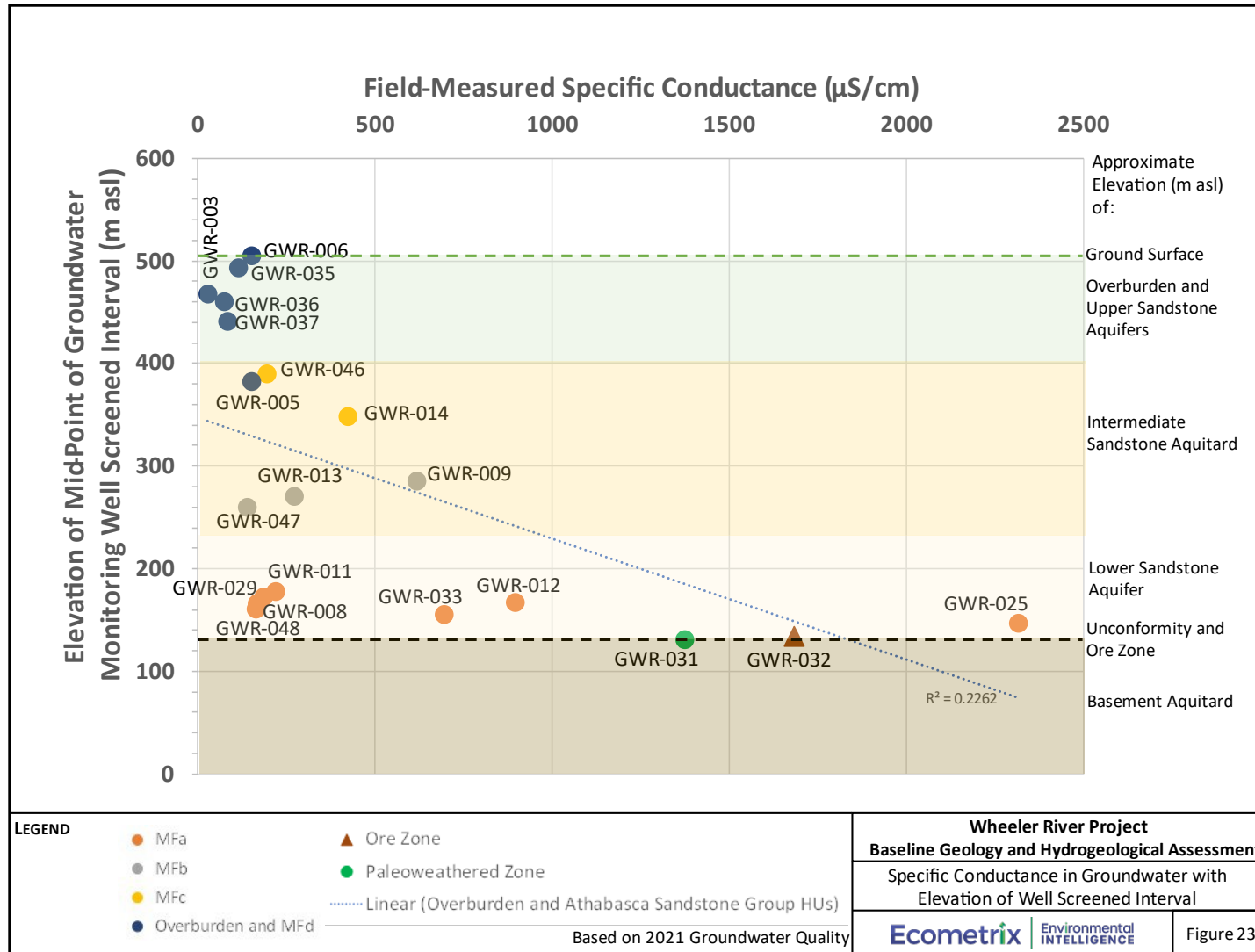


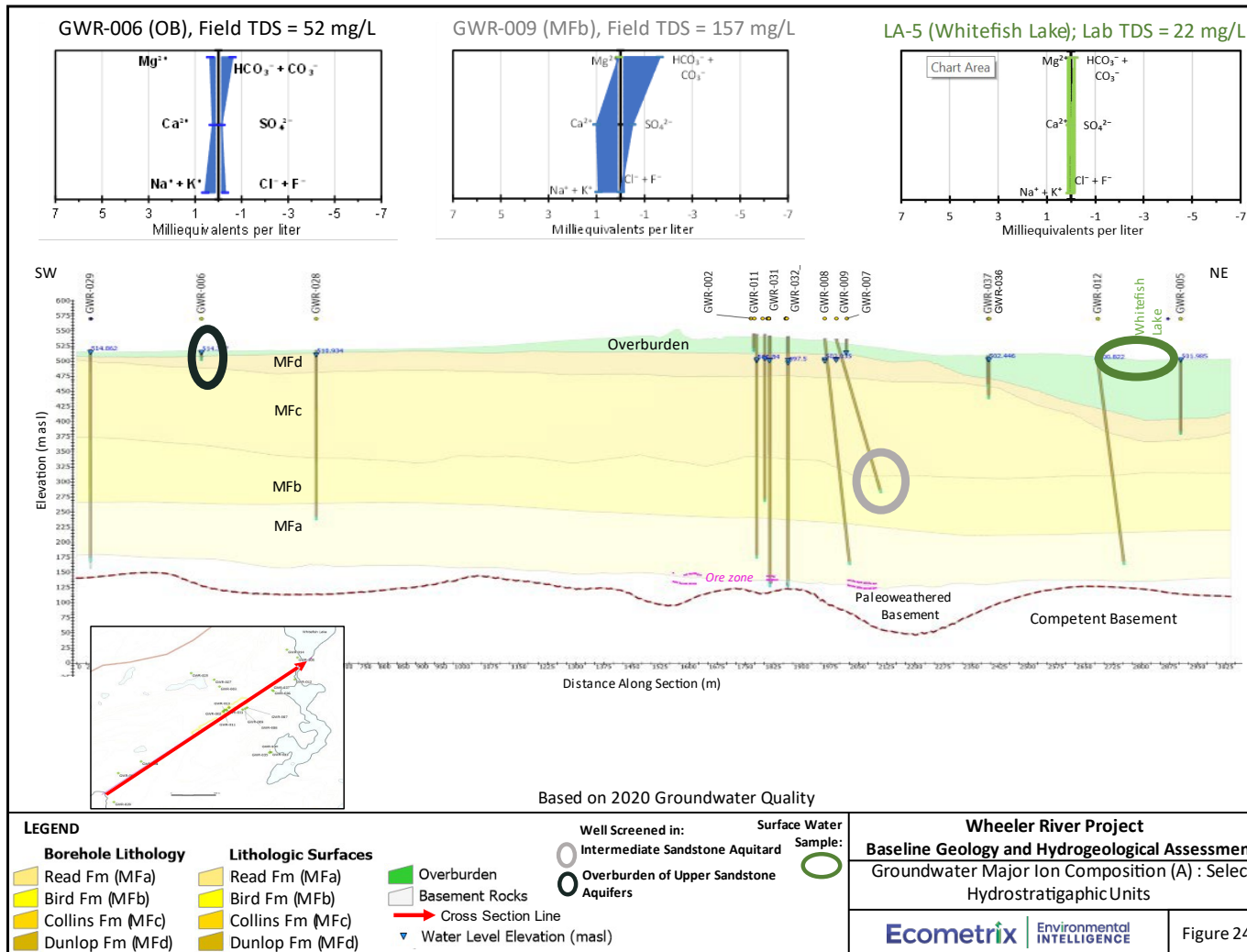


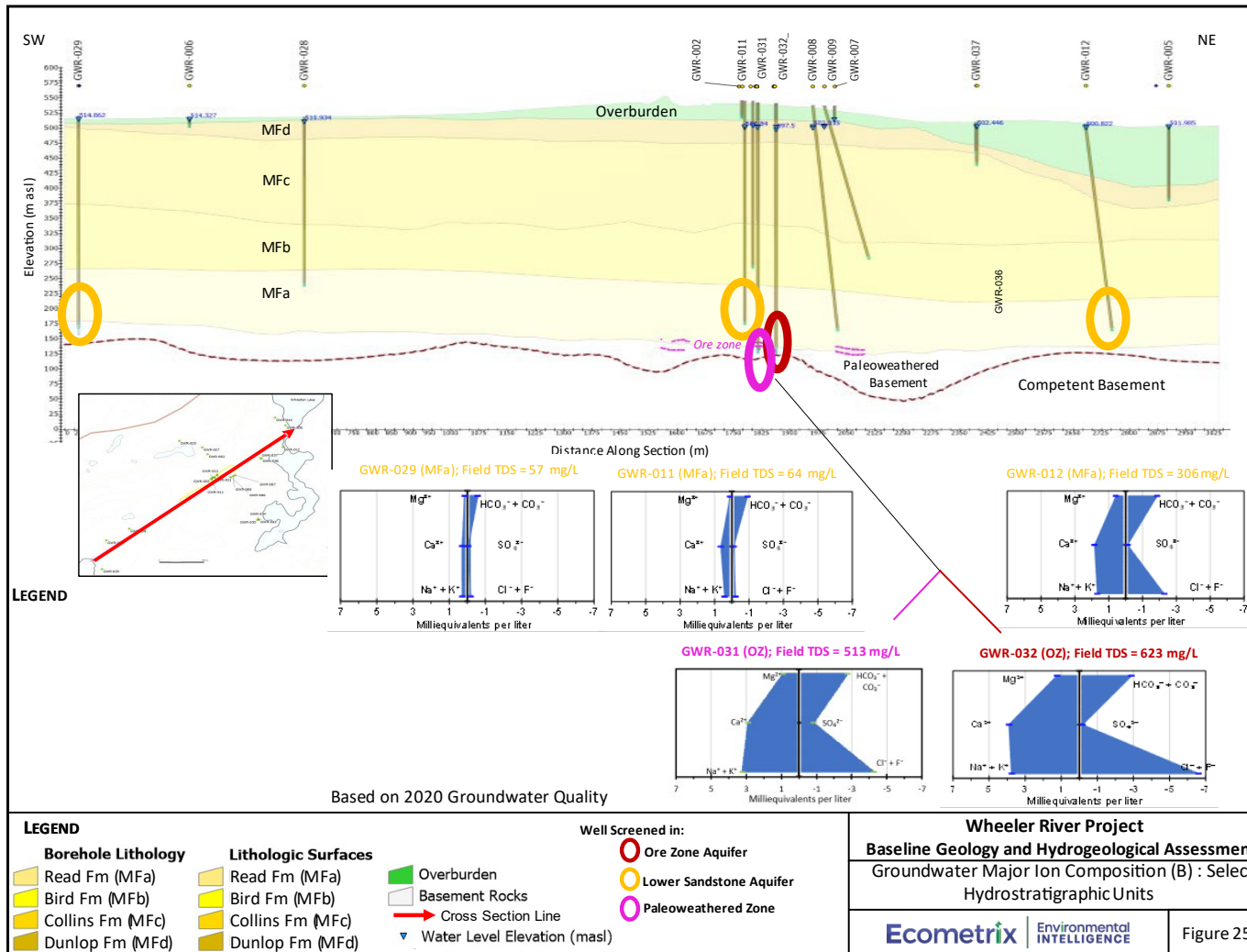


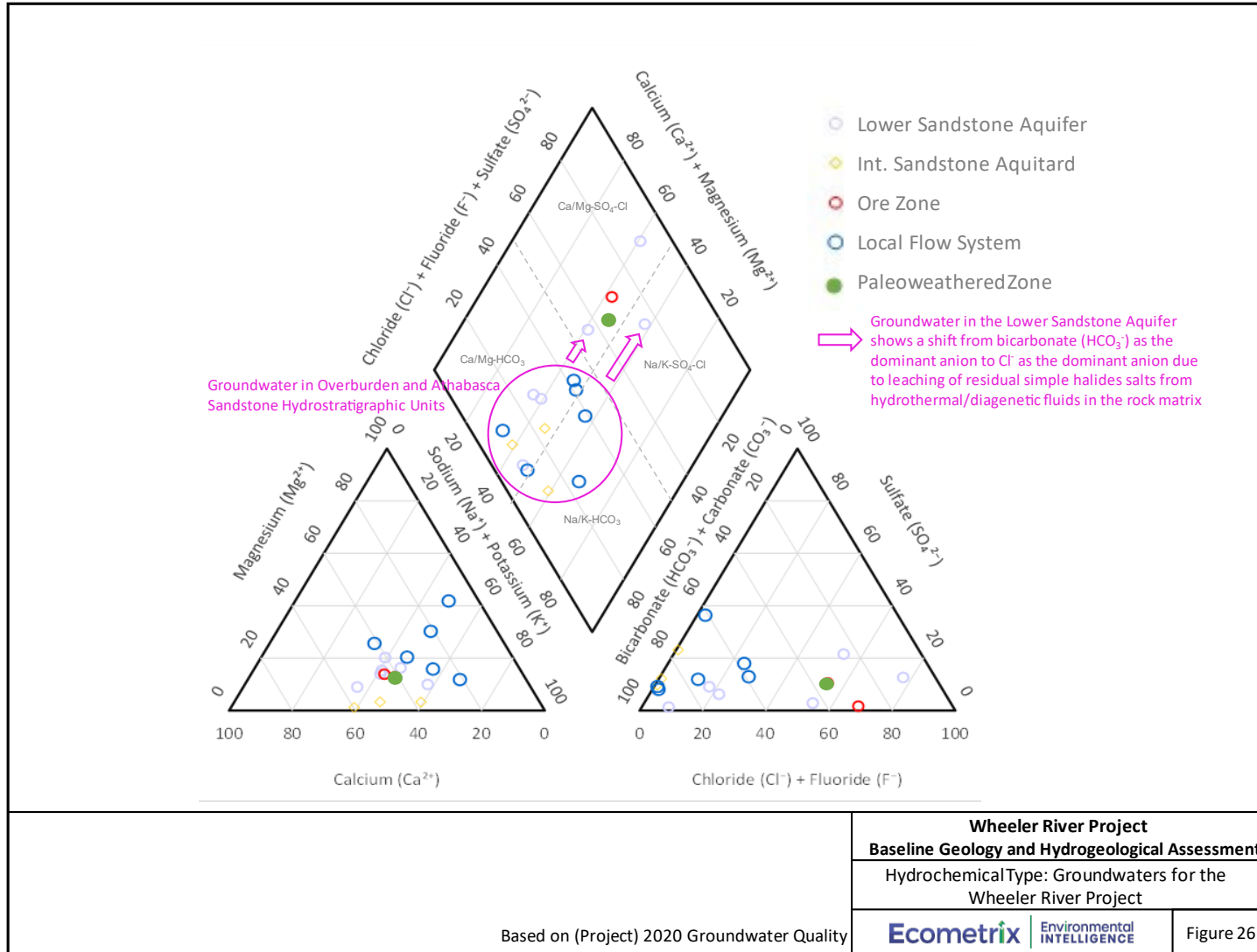


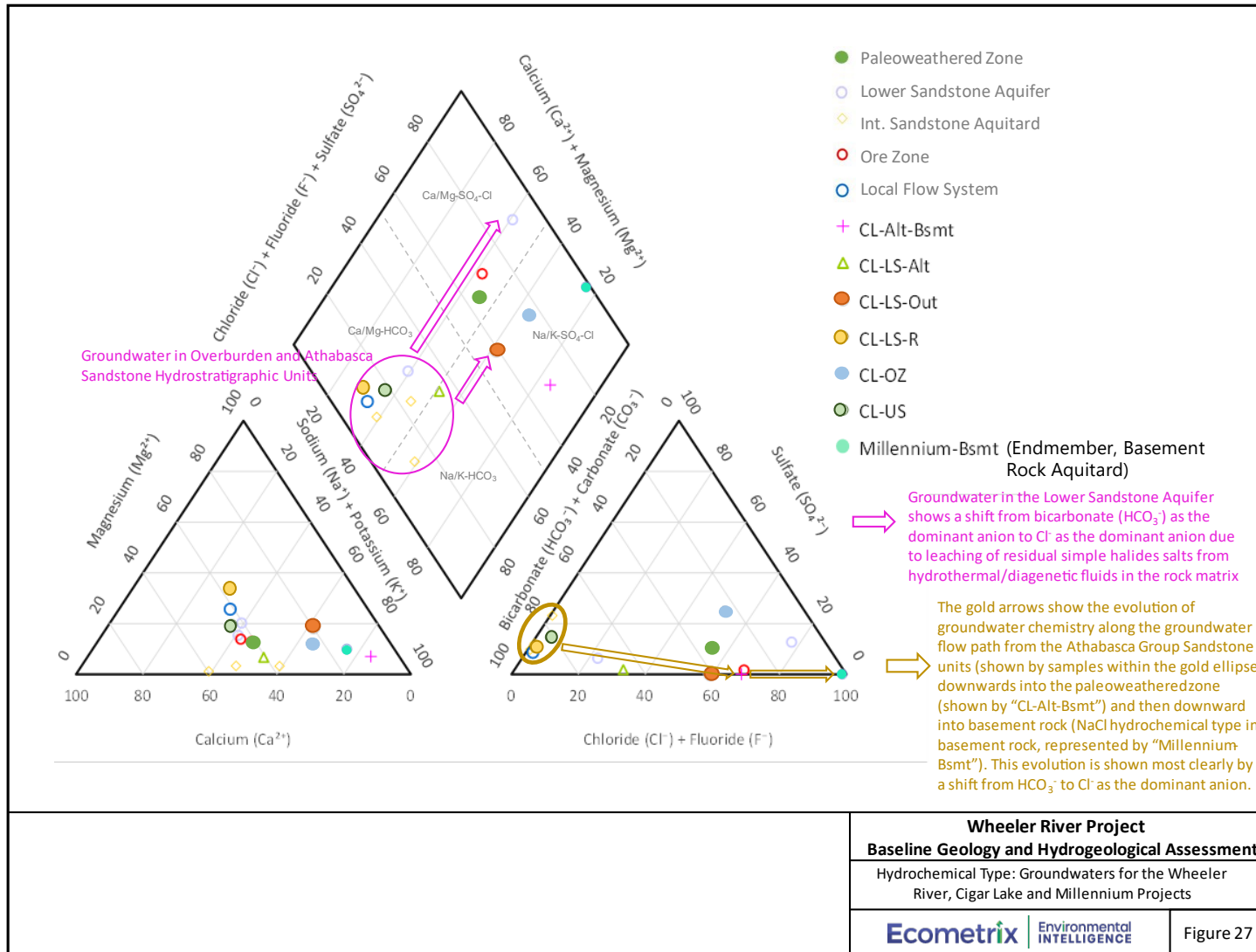


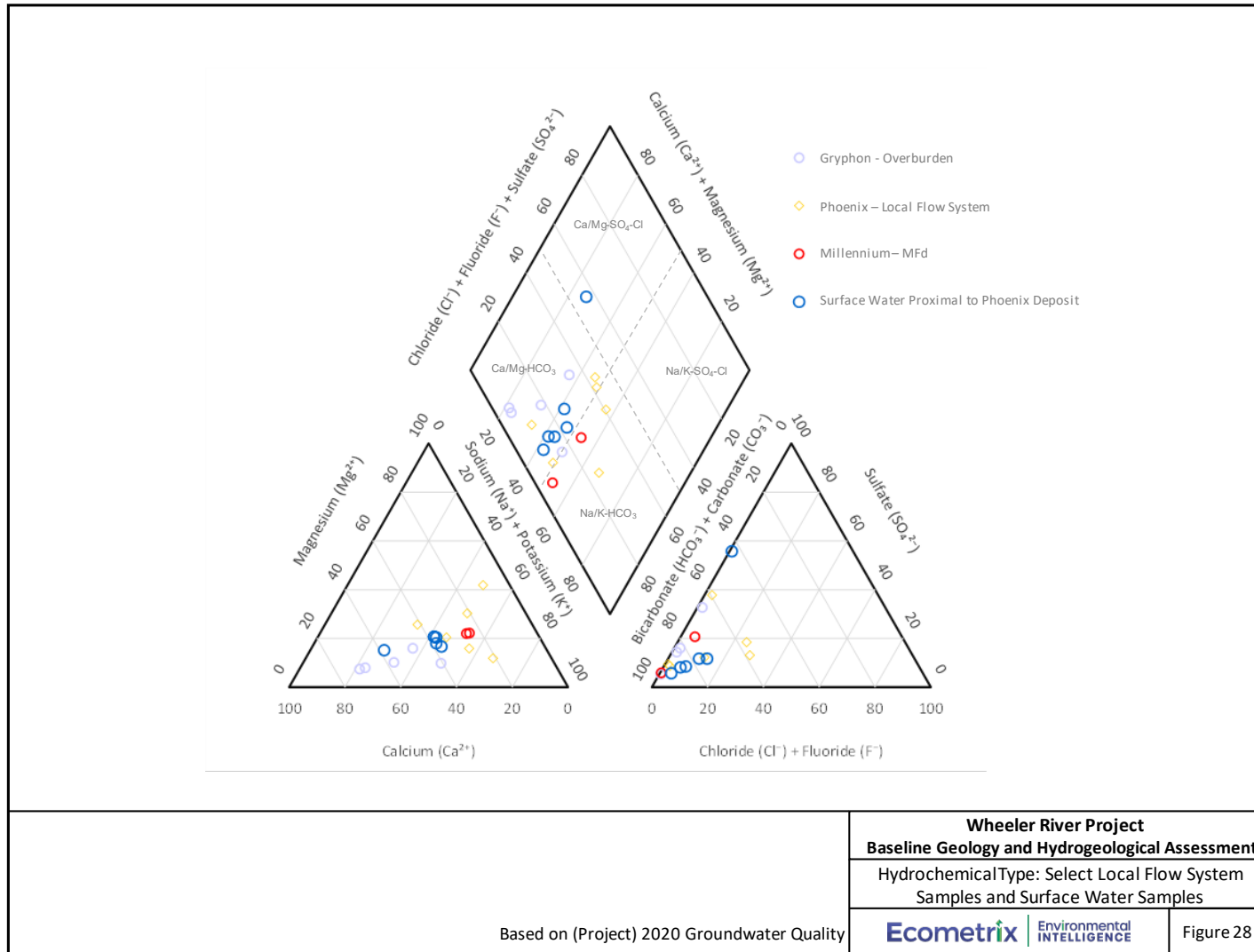


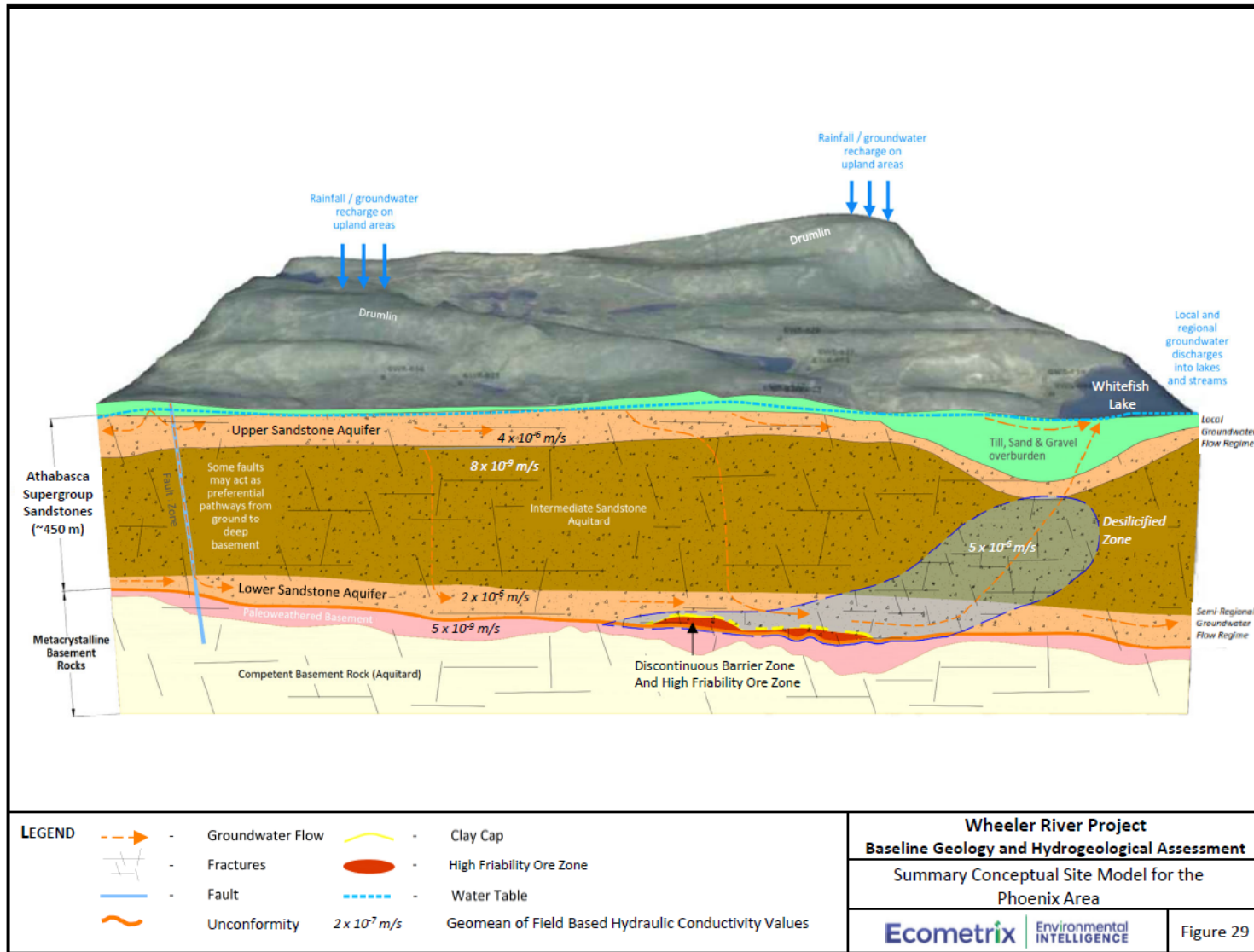












Appendix A Borehole Logs

STRIPLOGS LEGEND:

Structure Interval Codes

STRUCTURE TYPE CODE	Description	STRUCTURE TYPE CODE	Description
BC	Broken core	UC	Unconformity Contact
BED	Bedding	OF	Open fracturing
BK	Blocky core	RB	
BN	Banded	RF	Reticulate
BP	Brittle overprint	S#	Strong brittle overprint
BX	Breccia	SGG	Sandy Gouge
CABX	Cataclastic Breccia	SH	Shear
CON	Contact	SK	Slickenside
CY	Clay	SZ	Shear Zone
FA	Fold Axis	LC	Lost core
FCTZ	Fracture Zone	LN	Lineation
FLT	Fault	MY	Mylonite
FLTZ	Fault Zone	UC	Unconformity Contact
FOL	Foliation	UN	Unconsolidated
FRAC	Fracture	VN	Veining is common
FRC	Fracture	VUG	Vuggy
FRIA	Friable Zone	WX	Weak breccia
FT	Brittle fault zone	XB	Cross Bedding
FTDU	Ductile shear zone	XC	Cross Cutting Fracture
FTSBR	Semi-brittle fault zone	XH	Healed breccia
GG	Gouge	HF	Healed fracturing
GN	Gneissosity		

Lithology

ROCK TYPE CODE	Description	ROCK TYPE CODE	Description
CDPL	Cordierite pelite	MFC	Manitou falls c form
CY	Clay?	MFD	Manitou falls d form
GTCD	Garnet cord. Pelite	PEGM	Pegmatite
GTPL	Garnitiferous pelite	PELT	Pelite
FLTGG	Fault gouge	QZIT	Quartzite
FLZN	Fault zone	QZSP	Quartz semipelite
GFPL	Graphitic pelite	QZVN	Vein quartz
GTPL	Garnitiferous pelite	SDST	Sandstone
LC	Lost core	UC	Unconformity
LOST	Lost core	UX	Uranium intersection
MFA	Manitou falls a form		
MFB	Manitou falls b form		

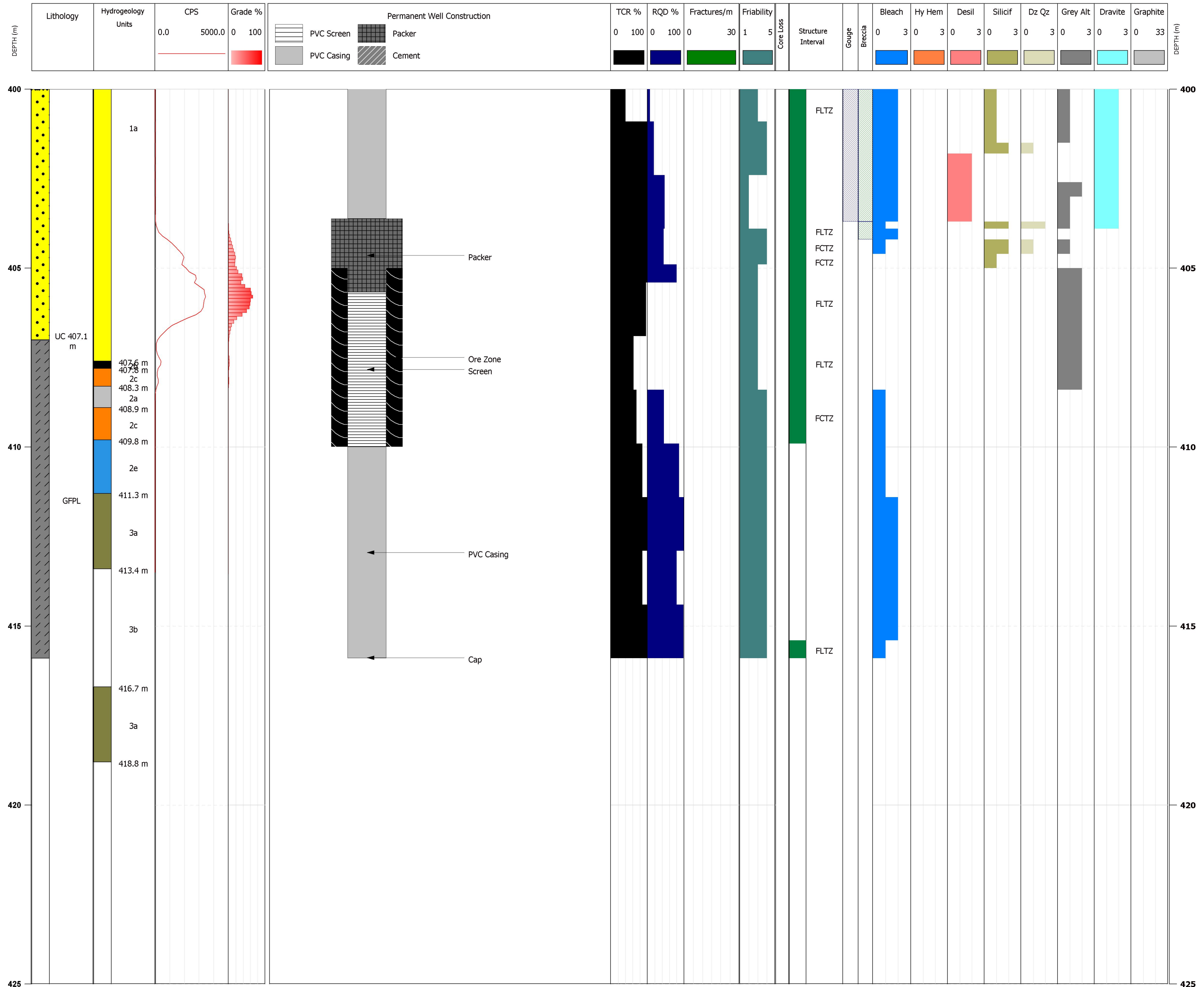
Hydrogeology Units

HYDRO UNIT	Description	HYDRO UNIT	Description
1a	Overlying Sandstone	2d	Sulphide or Hematite Cemented U Zone
1b	Sulphide Cemented Sandstone	2e	Lower Clay Zone
2a	Upper Clay Zone	3a	Paleoweathered Basement
2b	Black or Brown Friable or High- Density U	3b	Underlying Basement
2c	Mineralized Brown Redox U Zone		

Title:	Well Schematics	Drillhole #	GWR-001	Coordinates: 477,077.48 m E ; 6,374,175.3 m N Elevation: 542.03 m.
Project:	Phoenix	Drilling method:	DDH	
Drilling End Date:	2019	Total depth:	415.9 m	
		Hole Type:	PQ	

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10	OB						
20							
30							
40	MFD						
50							
60							
70							
80							
90							
100							
110							
120							
130							
140							
150	MFC						
160							
170							
180							
190							
200		PVC Casing	PVC Casing	0	403.62	403.62	2.5" SCH-80 PVC
210							
220							
230							
240							
250	MFB						
260							
270							
280							
290							
300							
310							
320							
330							
340	MFA						
350							
360							
370							
380							
390							
400		Cement	Cement	392.4	405.4	13	
405		Packer	Packer	403.62	405.67	2.05	PQ Inflatable Packer
409.99		Ore Zone	Ore Zone	405	409.99	4.01	
410	UC 407.1 m GFPL	Ore Zone	Ore Zone				
415		Screen	Screen	405.67	409.99	4.32	2.5" SCH-80 Slotted Screen
420		PVC Casing	PVC Casing	409.99	415.9	5.91	2.5" SCH-80 PVC
430							
440		Cap	Cap	415.88	415.9	0.02	
450							

Comments: Depth below surface.



Title:	Well Schematic	Drillhole #	GWR-002
Project:	Phoenix	Drilling method:	DDH
Drilling End Date:	2019	Total depth:	28.5 m
		Hole Type:	HQ

Coordinates: 477,046.95 m E ; 6,374,160.5 m N
Elevation: 545.23 m.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications	
0	OB		PVC Casing	0	22.5	22.5	2" SCH-40	
10								
20								
22.5								
		Packer	Shale Packer	22.5	22.5	0		
		Screen	PVC Screen	24.3	28.5	6	2" SCH-40	
		Cap	Cap	28.5	28.52	0.2		
30								

Comments: Depth below surface.

Title:	Well Schematic	Drillhole #	GWR-003
Project:	Phoenix	Drilling method:	
Drilling End Date:	2019	Total depth:	60 m
		Hole Type:	HQ

Coordinates: 477,009.95 m E ; 6,374,510.2 m N
Elevation: 525.58 m.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications	
0	OB		PVC Casing	0	54.06	54.6	2" SCH-40	
54.06				54.06	0			
54.06				60	5.94	2" SCH-40		
60			Cap	60	60.2	0.2		

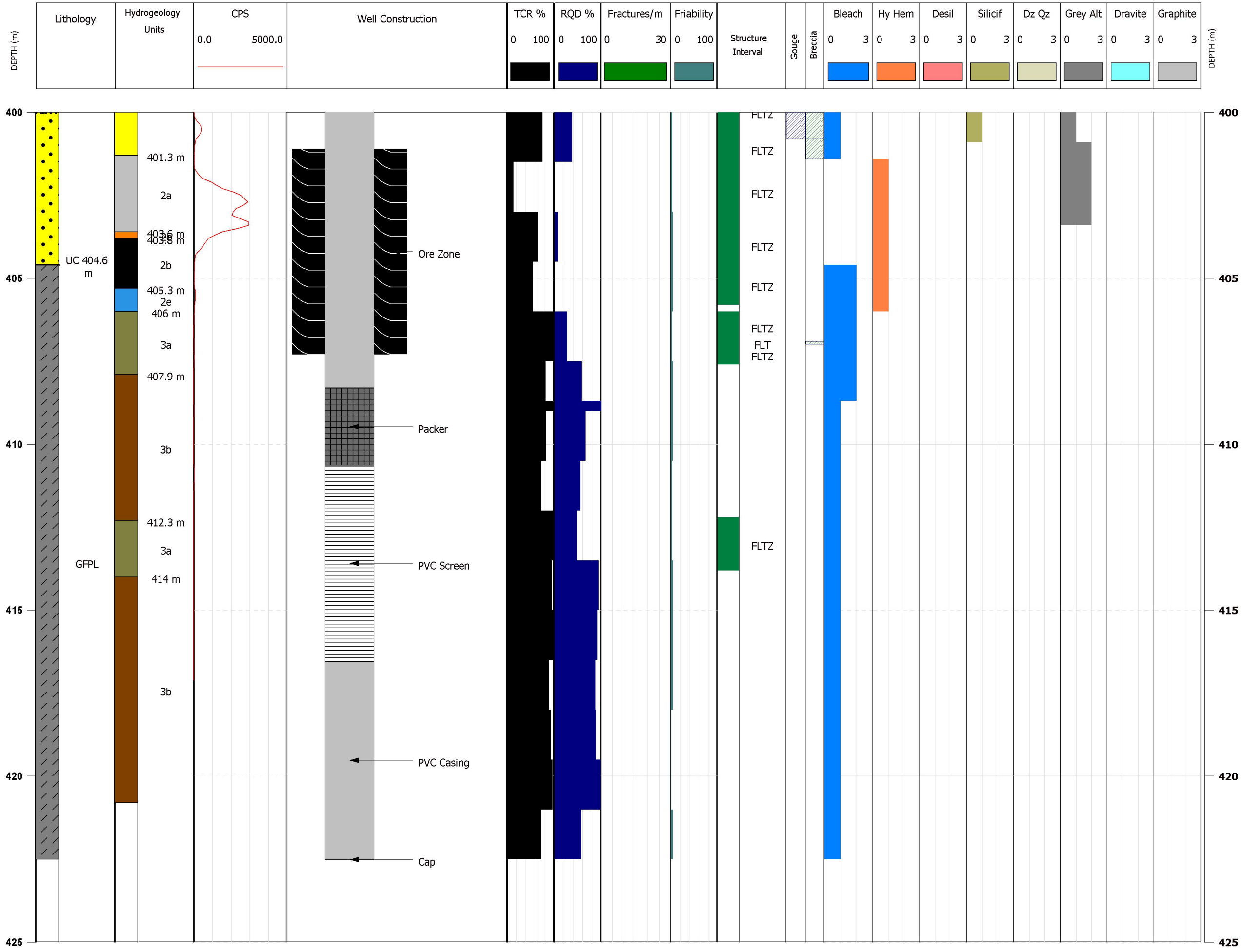
Comments: Depth below surface.

Title:	Well Schematics	Drillhole #	GWR-004
Project:	Phoenix	Drilling method:	DDH
Logged by	XX	Total depth:	422.5 m
Drilling End Date:	2019	Hole Type:	HQ

Coordinates: 477,061.65 m E ; 6,374,146.8 m N
Elevation: 541.87 m.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
	0						
10							
20							
30							
40							
50							
60							
70							
80							
90							
100							
110							
120	SDST						
130							
140							
150							
160							
170							
180							
190							
200							
210		PVC Casing	PVC Casing	0	408.3	408.3	1.5" SCH-80 PVC
220							
230							
240							
250							
260							
270	MFB						
280							
290							
300							
310							
320							
330							
340							
350	MFA						
360							
370							
380							
390							
400	UC 404.6 m		Ore Zone	401.1	407.3	6.2	
410	GFPL		Packer	408.3	410.63	2.3	HQ Inflatable Packer
420			PVC Screen	410.63	416.55	5.92	1.5" SCH-80 Slotted Screen
430			PVC Casing	416.55	422.5	5.95	1.5" SCH-80 PVC
440			Cap	422.5	422.52	0.02	

Comments: Depth below surface.



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

Title:	Well Schematic	Drillhole #	GWR-005
Project:	Phoenix	Drilling method:	
Drilling End Date:	2019	Total depth:	123 m
		Hole Type:	HQ

Coordinates: 477,887.75 m E ; 6,374,920.95 m N
Elevation: 503.39 m.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0	OB		PVC Casing	0	117.06	117.06	2" SCH-40
117.06				117.06	117.06	0	
117.06				123	5.94	2" SCH-40	
123			Cap	123	123.02	0.2	

Comments: Depth below surface.

Title:	Well Schematic	Drillhole #	GWR-006
Project:	Phoenix	Drilling method:	DDH
Logged by		Total depth:	15 m
Drilling End Date:	2019	Hole Type:	HQ

Coordinates: 475,867.96 m E ; 6,373,287.58 m N
Elevation: 517.32 m.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0	OB		PVC Casing	0	9.06	9.06	2" SCH-40
			Shale Packer	9.06	9.06	0	
			PVC Screen	9.06	15	5.94	2" SCH-40
			Cap	15	15.2	0.2	

Comments: Depth below surface.

Title:	Well Schematic	Drillhole #	GWR-007
Project:	Phoenix	Drilling method:	DDH
Logged by		Total depth:	24 m
Drilling End Date:	2019	Hole Type:	HQ

Coordinates: 477,320.96 m E ; 6,374,213.5 m N
Elevation: 536.18 m.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10			Bentonite PVC Casing	0 0	18.06 18.06	18.06 18.06	Bentonite chips 2" SCH-40
20	OB		Shale Packer PVC Screen	18.06 18.06	18.06 24	0 5.94	2" SCH-40
24 m			Cap	24	24.2	0.2	
30							

Comments: Depth below surface.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
	0						
0 - 52.4		Bentonite	Bentonite	0	52.4	52.4	Bentonite chips
0 - 372.16	SDST	PVC Casing	PVC Casing	0	372.16	372.16	1.5" SCH-80
372.16 - 374.06		HQ Inflatable Packer	HQ Inflatable Packer	372.16	374.06	1.9	
374.06 - 380		PVC Screen	PVC Screen	380	380	5.94	1.5" SCH-80
380 - 380.2		Cap	Cap	24	380.2	0.2	

Comments: Depth below surface.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
0 - 42		Bentonite	Bentonite	0	42	42	Bentonite Chips
0 - 272.16		PVC Casing	PVC Casing	0	272.16	272.16	1.5" SCH-80
190 - 280.55	SDST						
256 - 274		Cement	Cement	256	274	18	
272.16 - 274.06		HQ Inflatable Packer	HQ Inflatable Packer	272.16	274.06	1.9	
274.06 - 280.55		PVC Screen	PVC Screen	274.06	280.55	5.94	1.5" SCH-80
280.55 - 280.57		Cap	Cap	280.57	280.57	0.2	

Comments: Depth below surface.

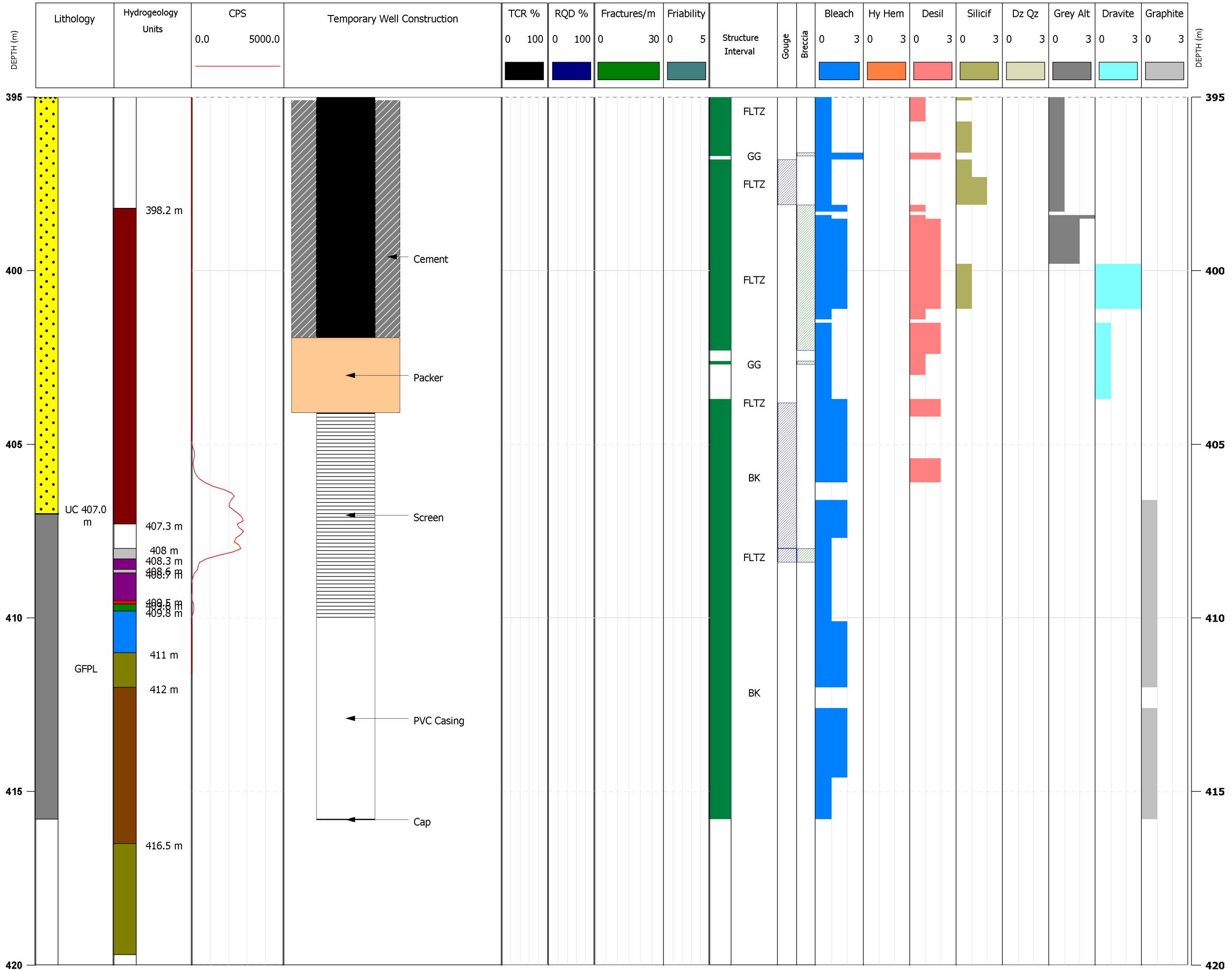
Title:	Well Schematic	Drillhole #	GWR-010
Project:	Phoenix	Drilling method:	DDH
Logged by		Total depth:	415.8 m
Drilling End Date:	2019	Hole Type:	PQ

Coordinates: 477,084.28 m E ; 6,374,182.2 m N
Elevation: 543.31 m.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10	OB						
20							
30							
40	MFD						
50							
60							
70							
80							
90							
100							
110							
120							
130							
140	MFC						
150							
160							
170							
180							
190							
200		PVC Casing	PVC Casing	0	401.93	401.93	2.5" SCH-80
210							
220							
230							
240							
250							
260	MFB						
270							
280							
290							
300							
310							
320							
330							
340							
350							
360	MFA						
370							
380							
390							
400		Cement	Cement	395.1	404.1	9	
410	UC 407.0 m GFPL	Packer	HQ Inflatable Packer	401.93	404.1	2.17	
420		Ore Zone	Ore zone	403.5	407.6	4.1	
430		Screen	PVC Screen	404.1	409.98	5.88	2.5" SCH-80
440		PVC Casing	PVC Casing	409.98	415.8	5.82	
450		Cap	Cap	415.8	415.82	0.2	

Comments: Depth below surface.

Title:	Well Schematic	Drillhole #	GWR-010	Coordinates:	477,084.28 m E ; 6,374,182.2 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	543.31 m.
Logged by:	BDB	Total depth:	415.8 m	Comments:	Edit-Text
Drilling End Date:	2019	Hole Type:	PQ		



Hydrogeology Units			
1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknwn
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
	0						
10							
20							
30							
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140							
150							
160							
170							
180		← PVC Casing	PVC Casing	0	362.1	362.1	1.5" PVC Sch 80
190	SDST						
200							
210							
220							
230							
240							
250							
260							
270							
280							
290							
300							
310							
320							
330							
340							
350							
360		← Cement Packer	Cement Packer	354	364	10	
360		← PVC Screen	PVC Screen	362.1	364	1.9	Inflatable Packer
370	370 m	← Cap	Cap	364	370	6	1.5" PVC Well Screen Sch 80
370				369.98	370	0.02	Sch 80
380							
390							

Comments: Depth below surface. No logs available.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0	SDST	PVC Casing	PVC Casing	0	339.1	339.1	1.5" PVC Sch 80
10							
20							
30							
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140							
150							
160							
170							
180							
190							
200							
210							
220							
230							
240							
250							
260							
270							
280							
290							
300							
310							
320							
330							
340		Cement Packer	Cement Packer	331	341	10	Inflatable Packer
		PVC Screen	PVC Screen	339.1	341	1.9	1.5" PVC Well Screen Sch 80
		Cap	Cap	341	347	6	
347 m				346.98	347	0.02	Sch 80
350							
360							

Comments: Depth below surface. No logs available.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0	SDST	PVC Casing	PVC Casing	0	268.7	268.7	1.5" PVC Sch 80
10							
20							
30							
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140							
150							
160							
170							
180							
190							
200							
210							
220							
230							
240							
250							
260							
262		Cement	Cement	262	272	10	
268.7		Packer	Packer	268.7	270.6	1.9	Inflatable Packer
270.6		PVC Screen	PVC Screen	270.6	276.5	5.9	1.5" PVC Well Screen Sch 80
276.48		Cap	Cap	276.48	276.5	0.02	Sch 80
276.5							
280							
290							

Comments: Depth below surface. No logs available.

Title:	Well Schematics	Drillhole #	GWR-014	Coordinates: 477,770.65 m E ; 6,375,029.8 m N Elevation: 502.9 m.
Project:	Phoenix	Drilling method:	DDH	
Logged by		Total depth:	158 m	
Drilling End Date:	2019	Hole Type:	HQ	

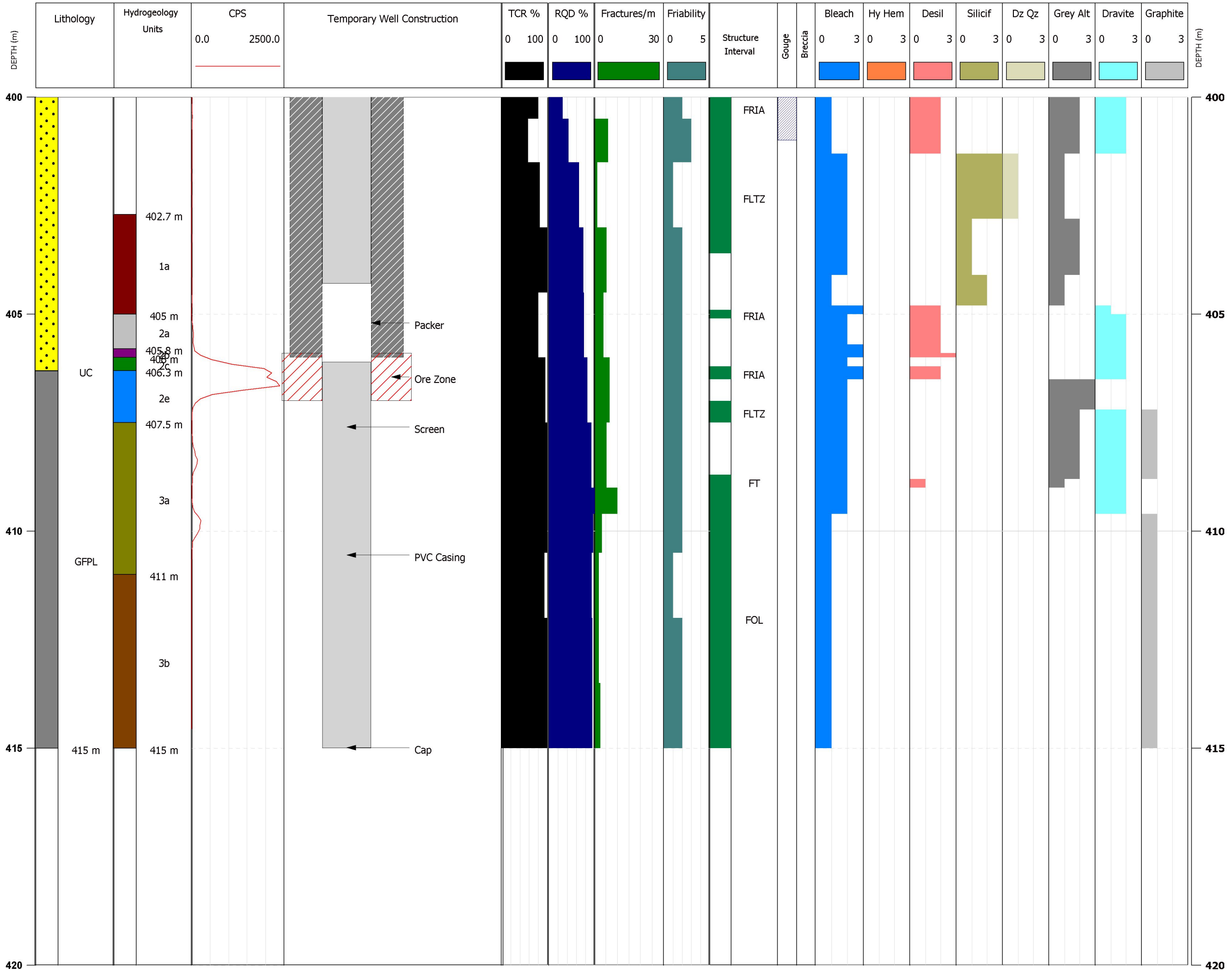
DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10							
20							
30		Bentonite	Bentonite	0	50	50	Bentonite Chips
40							
50							
60							
70		PVC Casing	PVC Casing	0	150.2	150.2	1.5" PVC Sch 80
80	SDST						
90							
100							
110							
120							
130							
140							
150		Cement	Cement	142	152	10	
		Packer	Packer	150.2	152.1	1.9	Inflatable Packer
		PVC Screen	PVC Screen	152.1	158	5.9	1.5" PVC Well Screen Sch 80
160	158 m	Cap	Cap	157.98	158	0.02	Sch 80

Comments: Depth below surface. No logs available.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10							
20							
30							
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140	SDST						
150							
160							
170							
180							
190							
200		PVC Casing	PVC Casing	0	404.3	404.3	1.5" SCH-80 PVC
210							
220							
230							
240							
250							
260							
270	269.2 m						
280							
290	MFB						
300							
310	311.5 m						
320							
330							
340							
350							
360	MFA						
370							
380							
390			Cement	386	406	20	
400			Packer	404.3	406.1	1.8	HQ Inflatable Packer
410	UC 406.3 m GFPL 415.0 m		Ore Zone	405.9	407	1.1	
420			Screen	406.1	409.1	3	1.5" SCH-80 Slotted Well screen
430			PVC Casing	406.1	415	8.9	1.5" SCH-80 PVC
440			Cap	414.98	415	0.02	
450							

Comments: Depth below surface.

Title: Well Schematics	Drillhole #: GWR-015	Coordinates: 477,077.03 m E ; 6,374,164.7 m N
Project: Phoenix	Drilling method: DDH	Elevation: 542.4 m.
Logged by:	Total depth: 415 m	Comments: Hydrogeology units logged from photos.
Drilling End Date:	Hole Type: CSW	



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

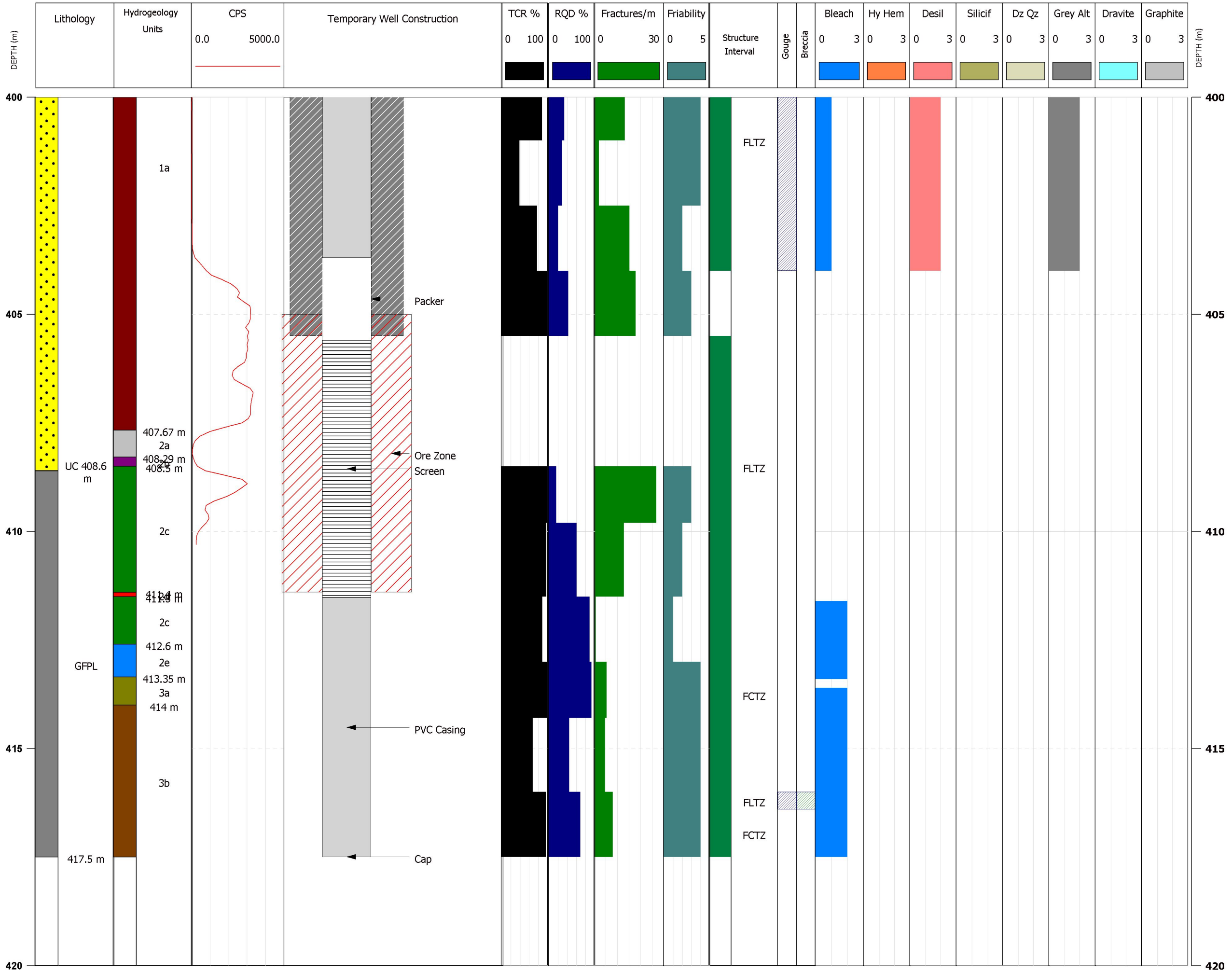
Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10							
20							
30							
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140	SDST						
150							
160							
170							
180							
190							
200		PVC Casing	PVC Casing	0	403.7	403.7	1.5" SCH-80 PVC
210							
220							
230							
240							
250							
260							
269.1	269.1 m						
270							
280							
290	MFB						
300							
308.0	308.0 m						
310							
320							
330							
340							
350							
360	MFA						
370							
380							
390							
399		Cement	Cement	388.5	405.5	17	
400							
403.7		Packer	Packer	403.7	405.6	1.9	HQ Inflatable Packer
405		Ore Zone	Ore Zone	405	411.4	6.4	
405.6		Screen	Screen	405.6	411.52	5.92	1.5" SCH-80 Slotted Well screen
411.52		PVC Casing	PVC Casing	411.52	417.5	5.98	1.5" SCH-80 PVC
417.48		Cap	Cap	417.48	417.5	0.02	
417.5	UC 408.6 m GFPL 417.5 m						
420							
430							
440							
450							

Comments: Depth below surface.

Title: Well Schematics	Drillhole #: GWR-016	Coordinates: 477,096.72 m E ; 6,374,185.0 m N
Project: Phoenix	Drilling method: DDH	Elevation: 542.73 m.
Logged by:	Total depth: 417.5 m	Comments:
Drilling End Date:	Hole Type: CSW	



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

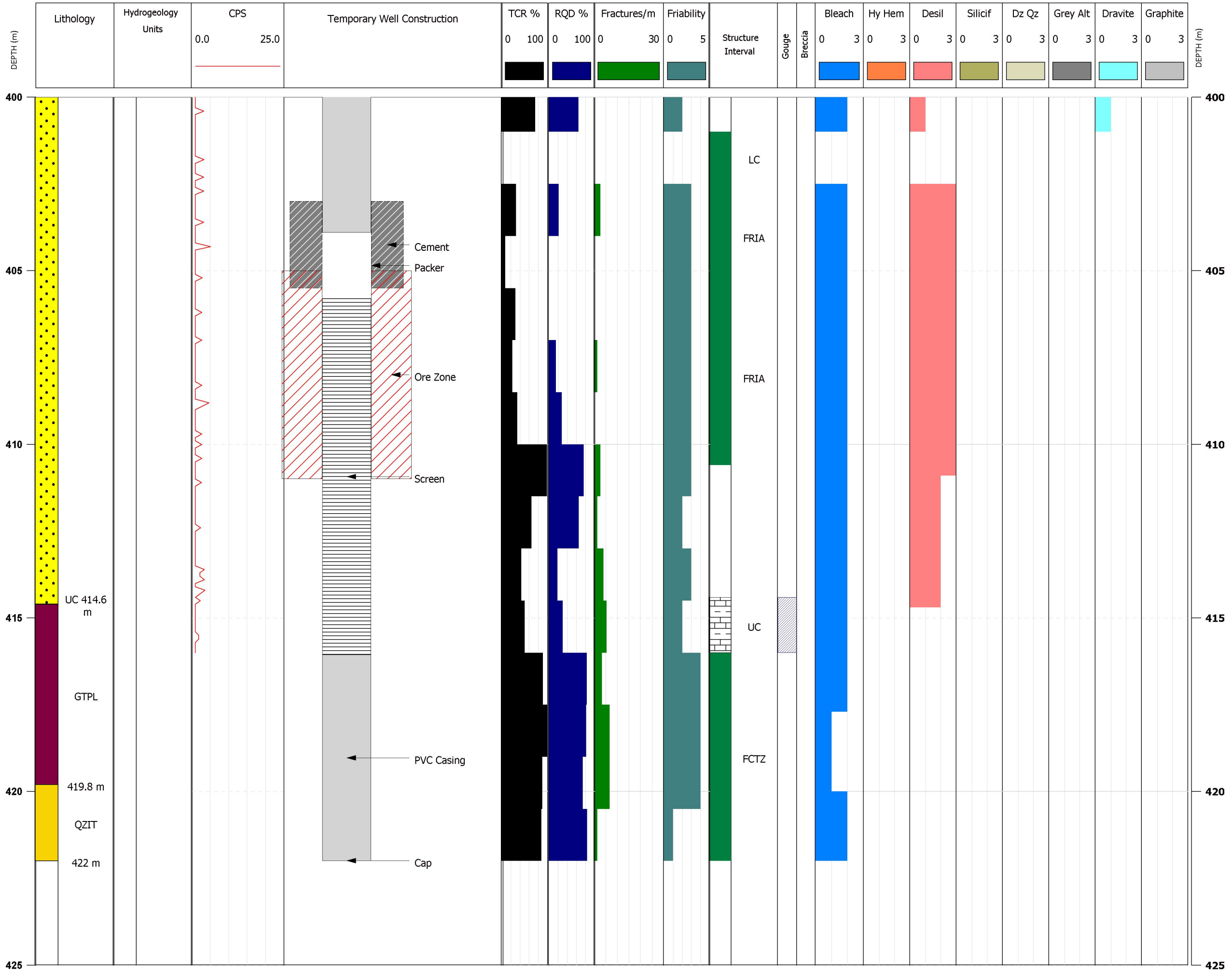
Title:	Well Schematics	Drillhole #	GWR-017
Project:	Phoenix	Drilling method:	DDH
Logged by		Total depth:	422.0 m
Drilling End Date:	2019	Hole Type:	HQ

Coordinates: 477,076.95 m E ; 6,374,187.4 m N
Elevation: 543.08 m.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
	0						
10							
20							
30							
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140	SDST						
150							
160							
170							
180							
190							
200		PVC Casing	PVC Casing	0	403.9	403.9	1.5" SCH-80 PVC
210							
220							
230							
240							
250							
260							
270	274.7 m						
280							
290							
300	MFB						
310							
320							
330	326.5 m						
340							
350							
360							
370	MFA						
380							
390							
400							
410	UC 414.6 m	Cement	Cement	403	405.5	2.5	HQ Inflatable Packer
411	GTPL 419.8 m	Packer	Packer	403.9	405.8	1.9	1.5" SCH-80 Slotted Well screen
412	QZIT 422.0 m	Ore Zone	Ore Zone	405	411	6	1.5" SCH-80 PVC
413		Screen	Screen	405.8	416.06	10.26	
414		PVC Casing	PVC Casing	416.06	422	5.94	
415		Cap	Cap	421.98	422	0.02	
420							
430							
440							
450							

Comments: Depth below surface.

Title:	Well Schematics	Drillhole #	GWR-017	Coordinates:	477,076.95 m E ; 6,374,187.4 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	543.08 m.
Logged by:		Total depth:	422 m	Comments:	
Drilling End Date:		Hole Type:	CSW		



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

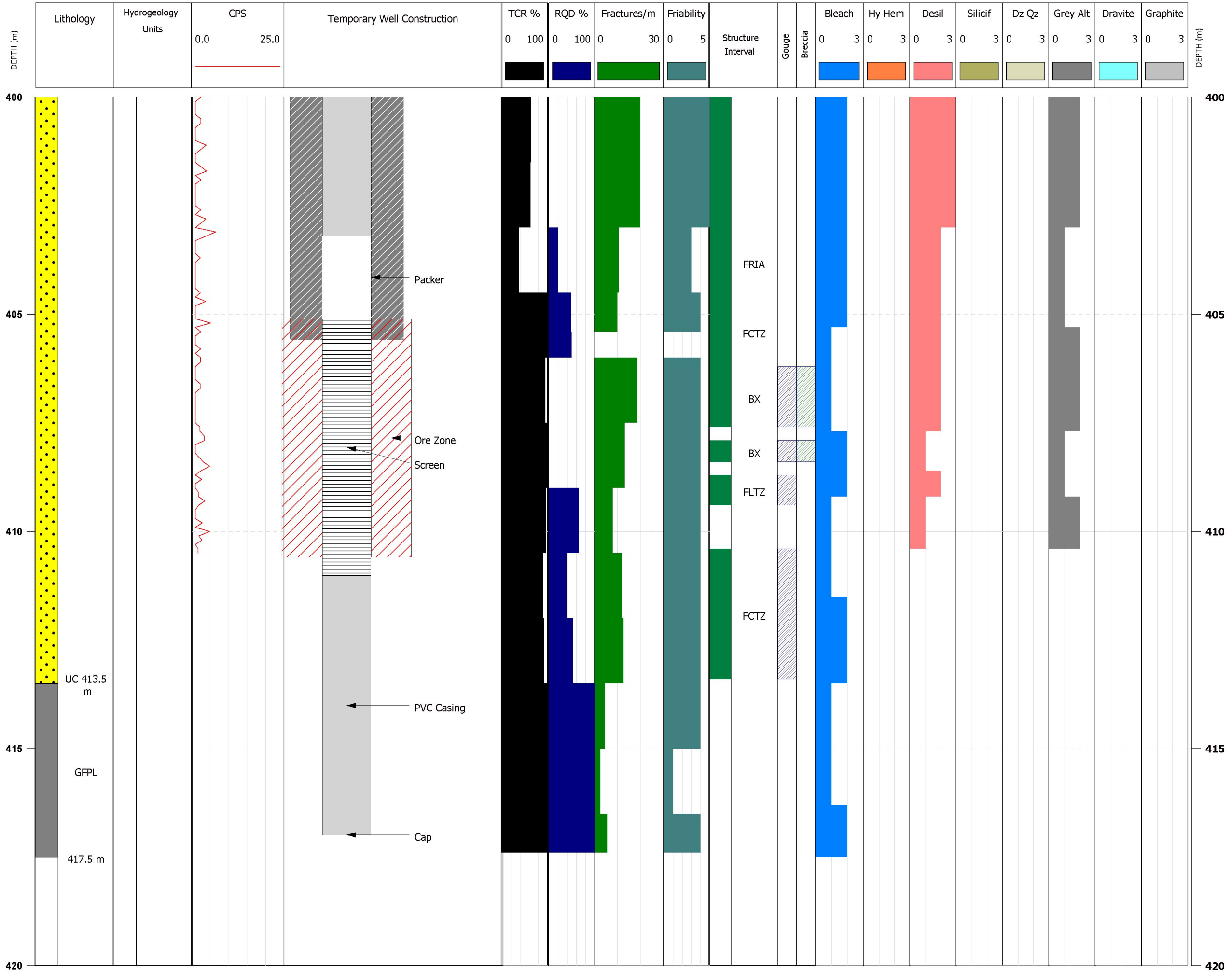
Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10							
20							
30							
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140	SDST						
150							
160							
170							
180							
190							
200		PVC Casing	PVC Casing	0	403.2	403.2	1.5" SCH-80 PVC
210							
220							
230							
240							
250							
260							
270							
274.7 m							
280	MFB						
290							
300							
310							
313.9 m							
320							
330							
340							
350							
360	MFA						
370							
380							
390		Cement	Cement	369.5	405.6	36.1	
400							
403.2		Packer	Packer	403.2	405.1	1.9	HQ Inflatable Packer
405.1		Ore Zone	Ore Zone	405.1	410.6	5.5	
410	UC 413.5 m						
411.02	GFPL 417.5 m						
411.02		Screen	Screen	405.1	411.02	5.92	1.5" SCH-80 Slotted Well screen
417		PVC Casing	PVC Casing	411.02	417	5.98	1.5" SCH-80 PVC
416.98		Cap	Cap	416.98	417	0.02	
420							
430							
440							
450							

Comments: Depth below surface.

Title: Well Schematics	Drillhole #: GWR-018	Coordinates: 477,106.84 m E ; 6,374,207.4 m N
Project: Phoenix	Drilling method: DDH	Elevation: 541.36 m.
Logged by:	Total depth: 417.5 m	Comments:
Drilling End Date:	Hole Type: CSW	



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

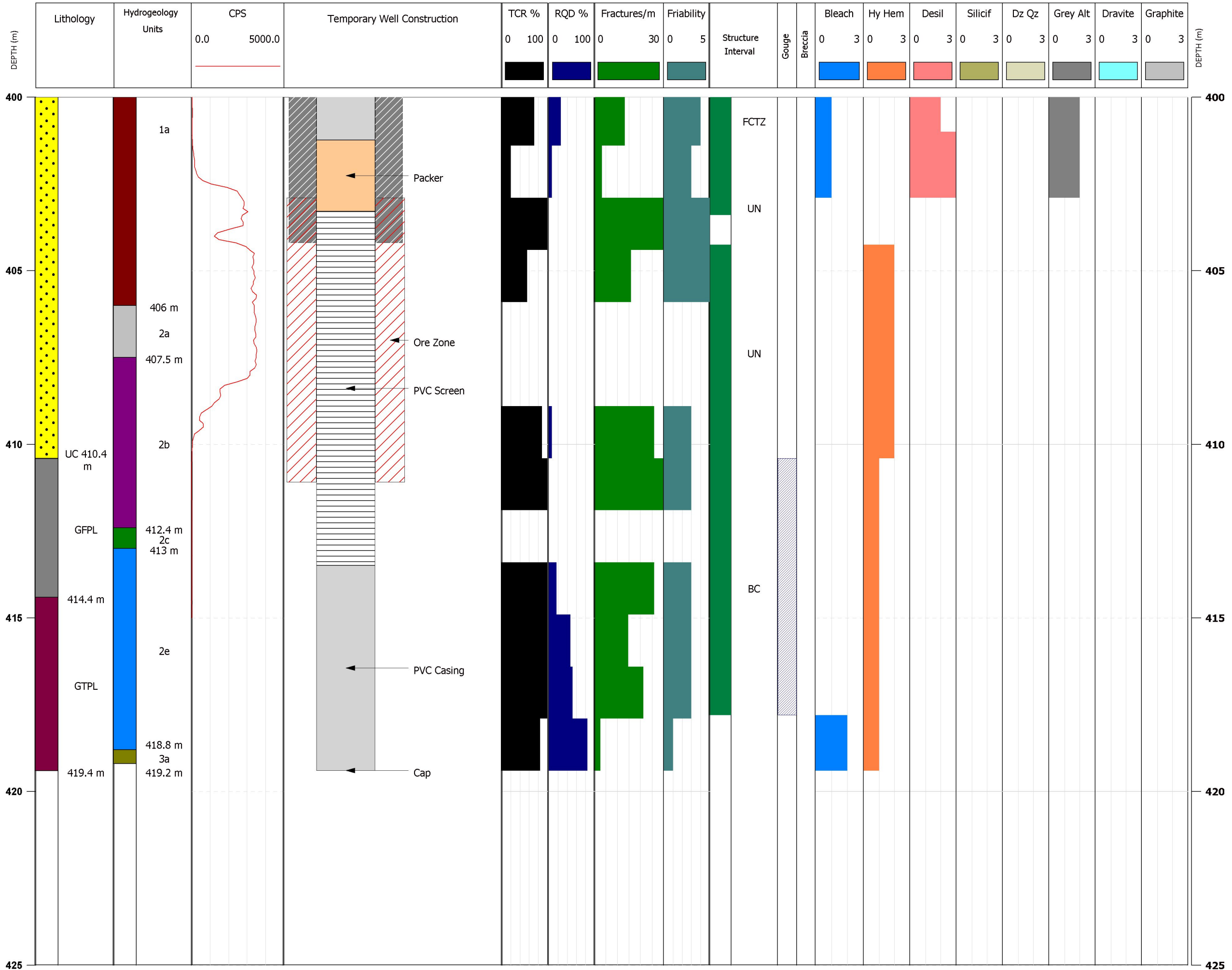
Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10	OB						
26.8							
30	MFD						
65.3							
70							
80							
90							
100							
110							
120							
130							
140	MFC						
150							
160							
170							
180							
190							
200		PVC Casing	PVC Casing	0	401.24	401.24	2.5" PVC sch 80
207.6							
220							
230							
240							
250							
260	MFB						
270							
280							
290							
300							
310							
311.4							
320							
330							
340							
350							
360	MFA						
370							
380							
390							
390		Cement	Cement	386.2	404.2	18	
400		Packer	Packer	401.24	403.29	2.05	PQ Inflatable packer
402.9		Ore Zone	Ore Zone	402.9	411.1	10.2	
410	UC 410.4 m GFP 412.4 m GTP 419.4 m	PVC Screen	PVC Screen	403.29	413.49	10.2	2.5" slotted PVC sch 80
420		PVC Casing	PVC Casing	413.49	419.4	5.91	2.5" PVC sch 80
430		Cap	Cap	419.38	419.4	0.02	
440							

Comments: Depth below surface.

Title: Well Schematics	Drillhole #: GWR-019	Coordinates: 477,121.3 m E ; 6,374,221.0 m N
Project: Phoenix	Drilling method: DDH	Elevation: 540.93 m.
Logged by:	Total depth: 419.4 m	Comments:
Drilling End Date: 2019	Hole Type: PQ	



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

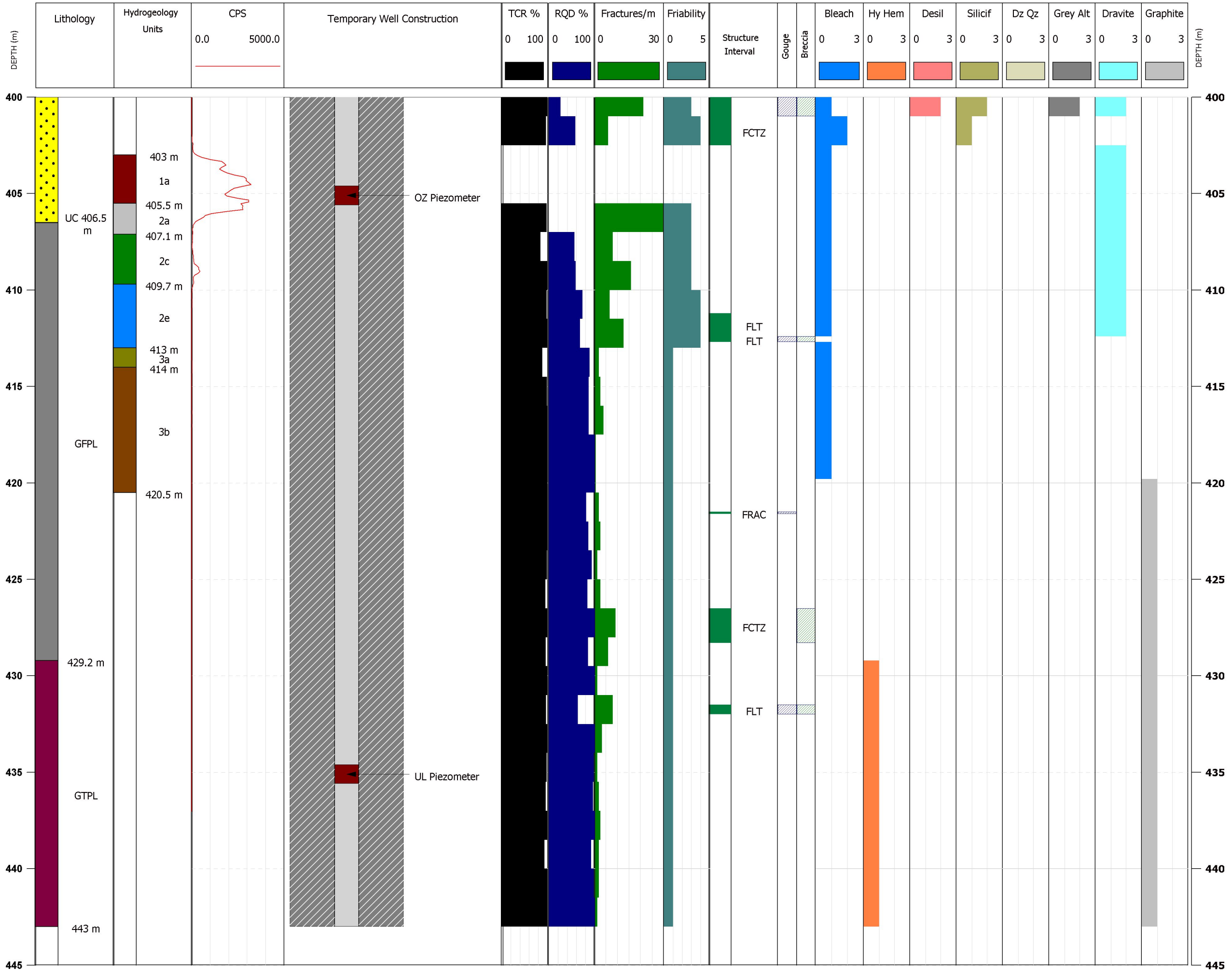
Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
25.6		OB Piezometer	VWP		25.6		Serial # VW57872
140	SDST						
220		Cement	Cement	0	436.9	443	
230		PVC Casing	PVC Casing	0	436.9	443	3/4" PVC pipe Sch 40
276.7		OL-A Piezometer	VWP		275.6		Serial # VW57873
300	MFB						
321.5							
370	MFA						
375.6		OL-B Piezometer	VWP		375.6		Serial # VW57874
406.5	UC	OZ Piezometer	VWP		405.6		Serial # VW57875
420	GFPL						
429.2							
435.6	GTPL	UL Piezometer	VWP		435.6		Serial # VW57876
443							

Comments: Depth below surface. First piezometer is 7.4 m above bottom.

Title: Well Schematics	Drillhole #: GWR-020	Coordinates: 477,092.05 m E ; 6,374,189.4 m N
Project: Phoenix	Drilling method: DDH	Elevation: 541.09 m.
Logged by:	Total depth: 443 m	Comments:
Drilling End Date: 2019	Hole Type: HQ	



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

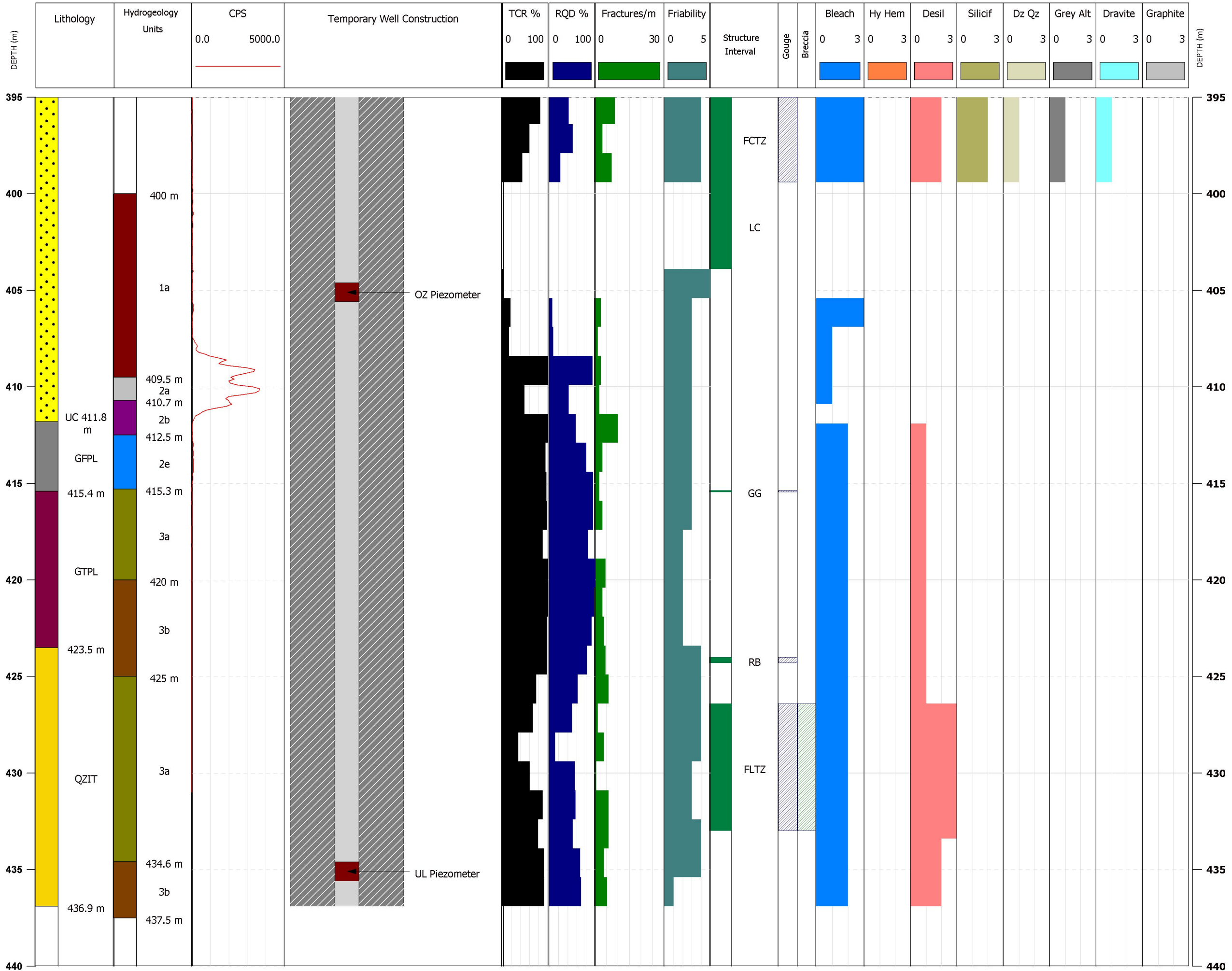
Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
25.6		OB Piezometer	VWP		25.6		Serial # VW57877
130	SDST						
220		Cement	Cement	0	436.9	436.9	
220		PVC Casing	PVC Casing	0	436.9	436.9	3/4" PVC pipe Sch 40
268.2		OL-A Piezometer	VWP		275.6		Serial # VW57878
280	MFB						
299.2							
350	MFA						
375.6		OL-B Piezometer	VWP		375.6		Serial # VW57879
405.6		OZ Piezometer	VWP		405.6		Serial # VW57880
411.8	UC						
415.4	GTPL						
423.5	QZIT						
435.6		UL Piezometer	VWP		435.6		Serial # VW578781
440							

Comments: Depth below surface. First piezometer is 1.3 m above bottom.

Title: Well Schematics	Drillhole #: GWR-021	Coordinates: 477,134.33 m E ; 6,374,231.0 m N
Project: Phoenix	Drilling method: DDH	Elevation: 540.29 m.
Logged by:	Total depth: 436.9 m	Comments:
Drilling End Date: 2019	Hole Type: HQ	



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

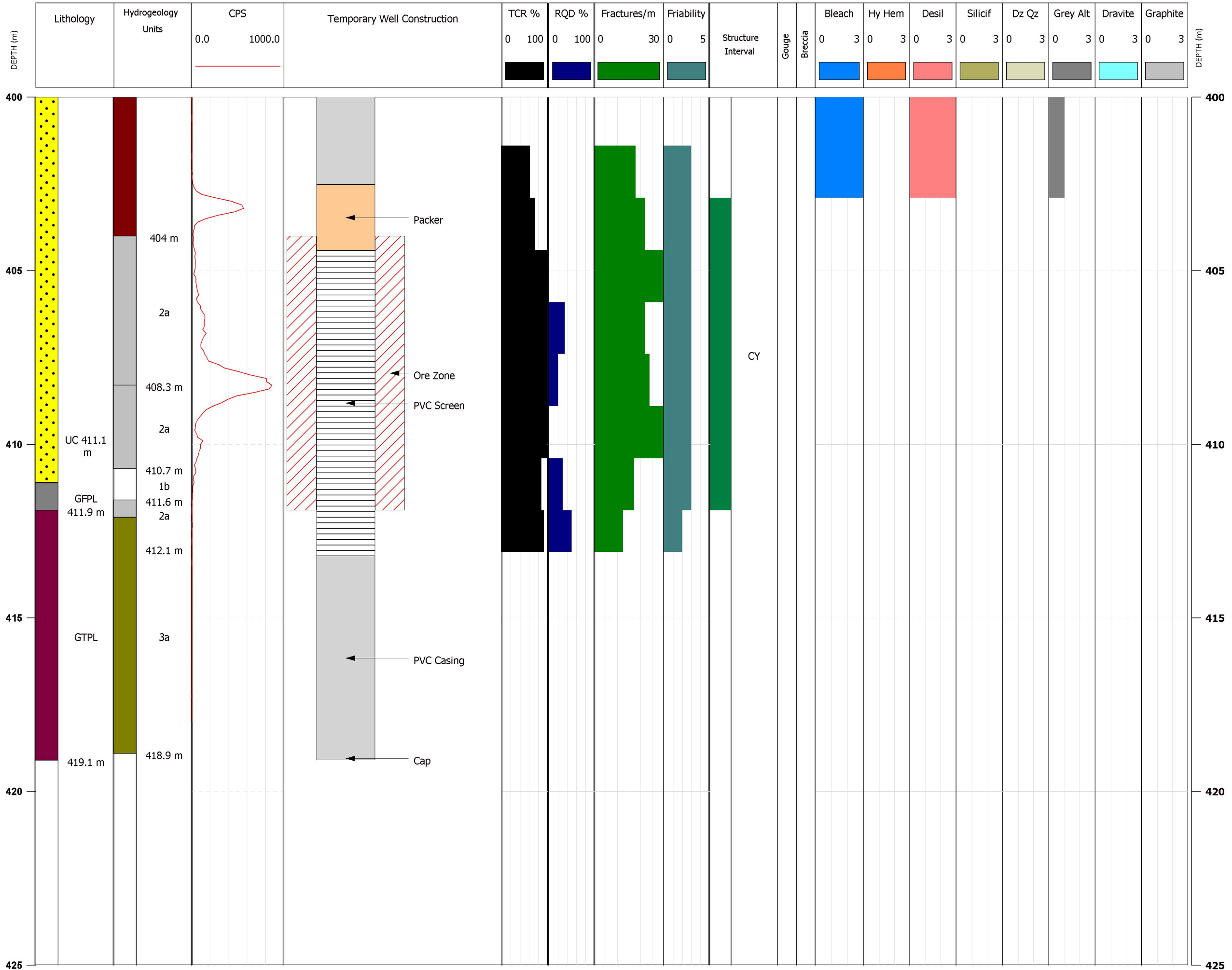
Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10	OB						
27	27 m						
30	MFD						
65	65 m						
130	MFC						
193.3		PVC Casing	PVC Casing	0	402.52	402.52	2.5" PVC sch 80
250	MFB						
305.4							
360	MFA						
385		Cement	Cement	385	398	13	
402.52		Packer	Packer	402.52	404.42	1.9	PQ Inflatable packer
404	Ore Zone	Ore Zone	Ore Zone	404	411.9	7.9	2.5" slotted PVC sch 80
404.42		PVC Screen	PVC Screen	404.42	413.21	8.79	
413.21		PVC Casing	PVC Casing	413.21	419.1	5.89	2.5" PVC sch 80
419.08		Cap	Cap	419.08	419.1	0.02	

Comments: Depth below surface.

Title: Well Schematics	Drillhole #: GWR-022	Coordinates: 477,114.87 m E ; 6,374,208.8 m N
Project: Phoenix	Drilling method: DDH	Elevation: 541.39 m.
Logged by:	Total depth: 419.1 m	Comments:
Drilling End Date: 2019	Hole Type: PQ	



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical

RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm.)

Fractures/m = Natural fractures per meter

Friability

0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

Structure Interval

BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone

*Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

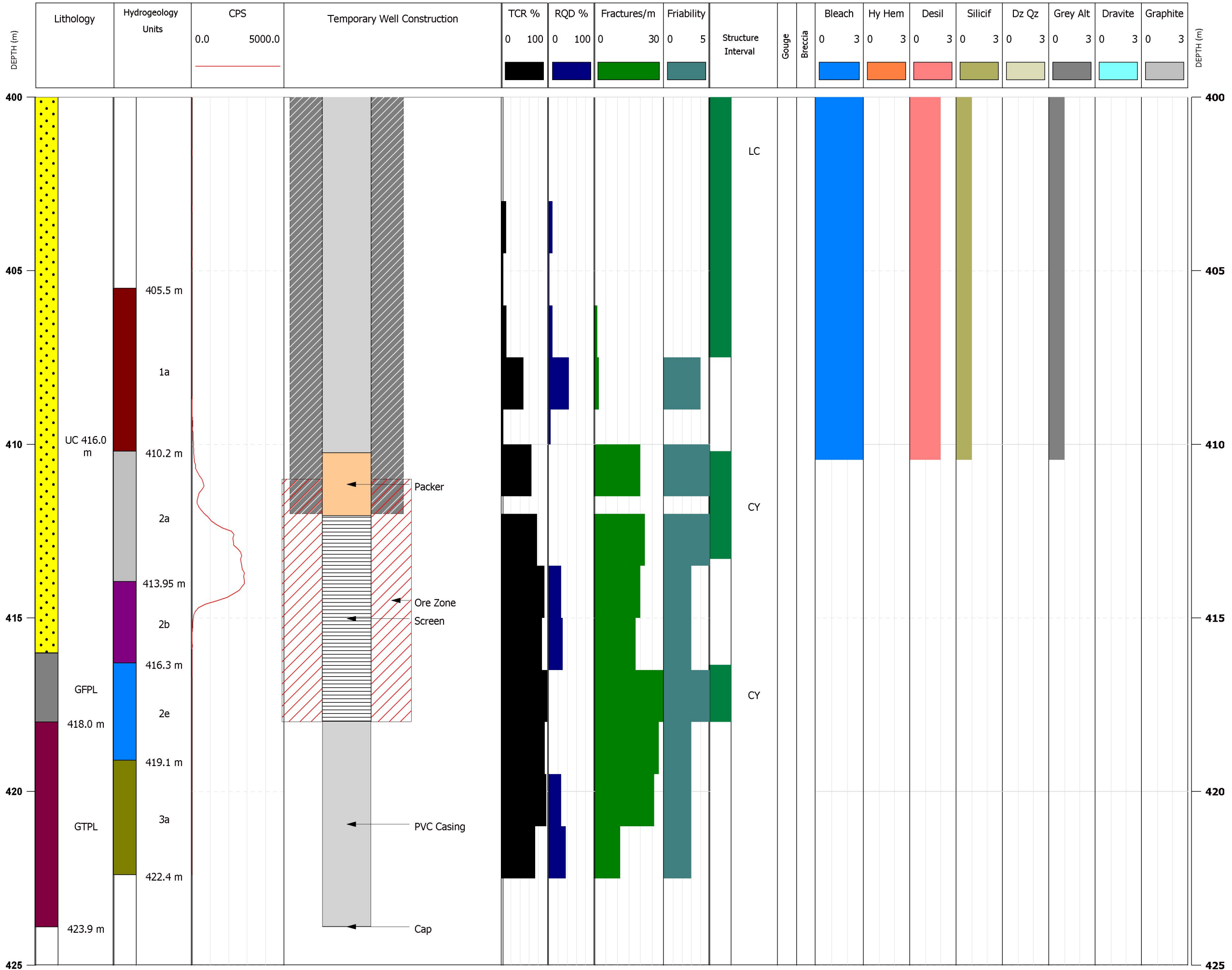
Alterations

0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10							
20							
30							
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140	SDST						
150							
160							
170							
180							
190							
200							
210		PVC Casing	PVC Casing	0	410.24	410.24	1.5" PVC
220							
230							
240							
250							
260							
270	271.6 m						
280	MFB						
290							
300	300.8 m						
310							
320							
330							
340							
350	MFA						
360							
370							
380		Cement	Cement	347	412	65	
390							
400							
410	UC 416.0 m						
410.24	GFPL 418.0 m	Packer	Packer Ore Zone	410.24	412.06	1.82	HQ Inflatable Packer
411		Ore Zone		411	418		
412.06	GTPL 423.9 m	Screen	Screen	412.06	417.98	5.92	1.5" Well screen
417.98		PVC Casing	PVC Casing Cap	417.98	423.9	5.92	1.5" PVC
423.9		Cap		423.9	423.9	0	
430							
440							
450							

Comments: Depth below surface. Had to cement twice. Cement recovered to 403 m. From 403.0 to 412 m no cement recovered however good water circulation and pressure so cement might have coated the wall of the hole.

Title:	Well Schematics	Drillhole #	GWR-023	Coordinates:	477,114.74 m E ; 6,374,229.0 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	542.59 m.
Logged by:		Total depth:	423.9 m	Comments:	
Drilling End Date:		Hole Type:	OZ/HQ		



Hydrogeology Units			
1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

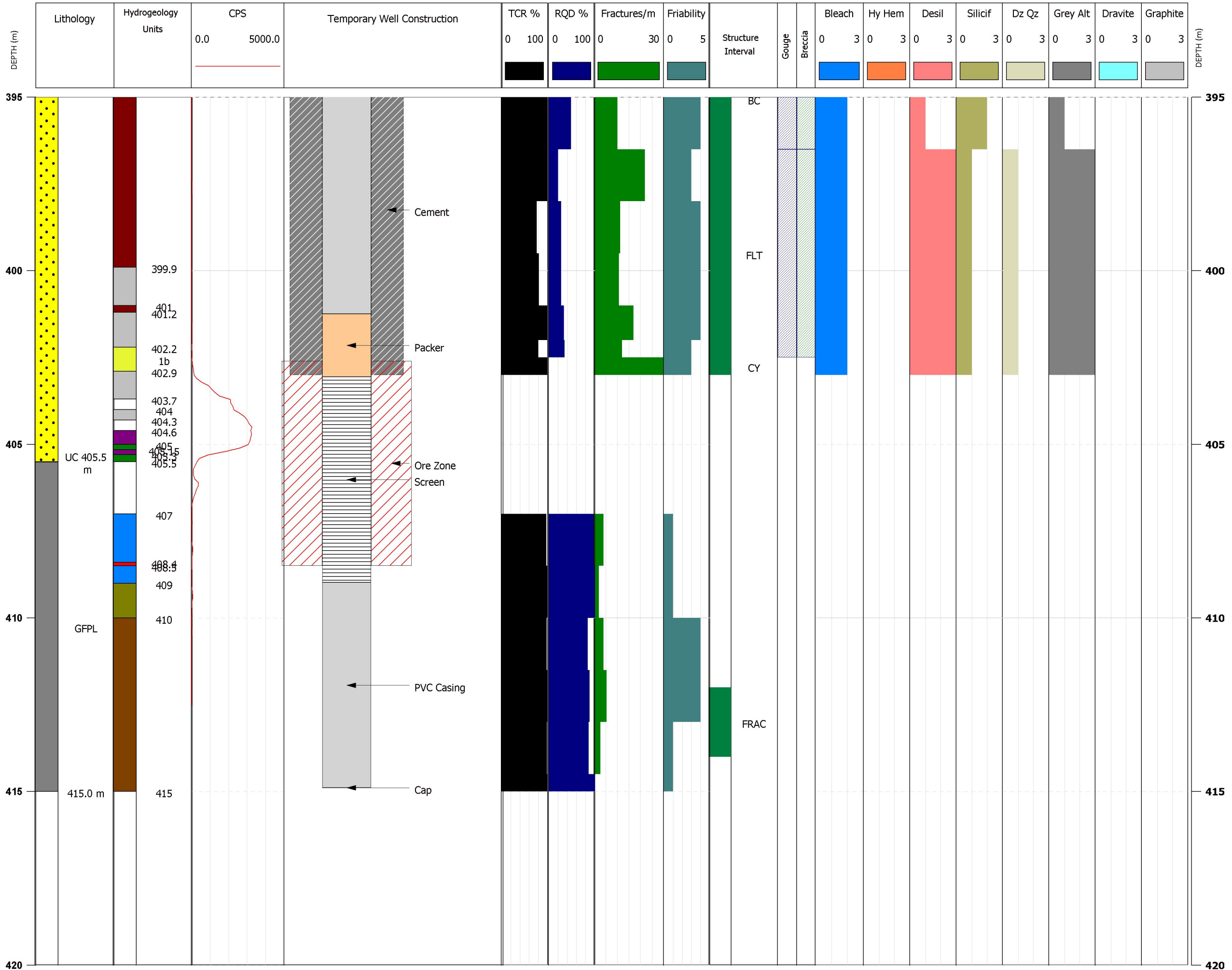
Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10							
20							
30							
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140	SDST						
150							
160							
170							
180							
190							
200		PVC Casing	PVC Casing	0	401.24	401.24	1.5" PVC
210							
220							
230							
240							
250							
260							
270							
280							
284.4 m							
290	MFB						
298.7 m							
300							
310							
320							
330							
340							
350	MFA						
360							
370							
380							
390							
393.5		Cement	Cement	393.5	403	9.5	
401.24		Packer	Packer	401.24	403.06	1.82	HQ Inflatable Packer
402.6		Ore Zone	Ore Zone	402.6	408.5	5.9	
403.06		Screen	Screen	403.06	408.98	5.92	1.5" Well screen
408.98		PVC Casing	PVC Casing	408.98	414.9	5.92	1.5" PVC
414.7		Cap	Cap	414.7	414.9	0.2	
415.0 m	UC 405.5 m GFPL 415.0 m						
420							
430							
440							
450							

Comments: Depth below surface.

Title:	Well Schematics	Drillhole #	GWR-024	Coordinates:	477,066.43 m E ; 6,374,166.9 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	542.6 m.
Logged by		Total depth:	414.9 m	Comments:	Hydro Units logged from metallurgical samples and photos.
Drilling End Date:		Hole Type:	OZ/HQ		



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

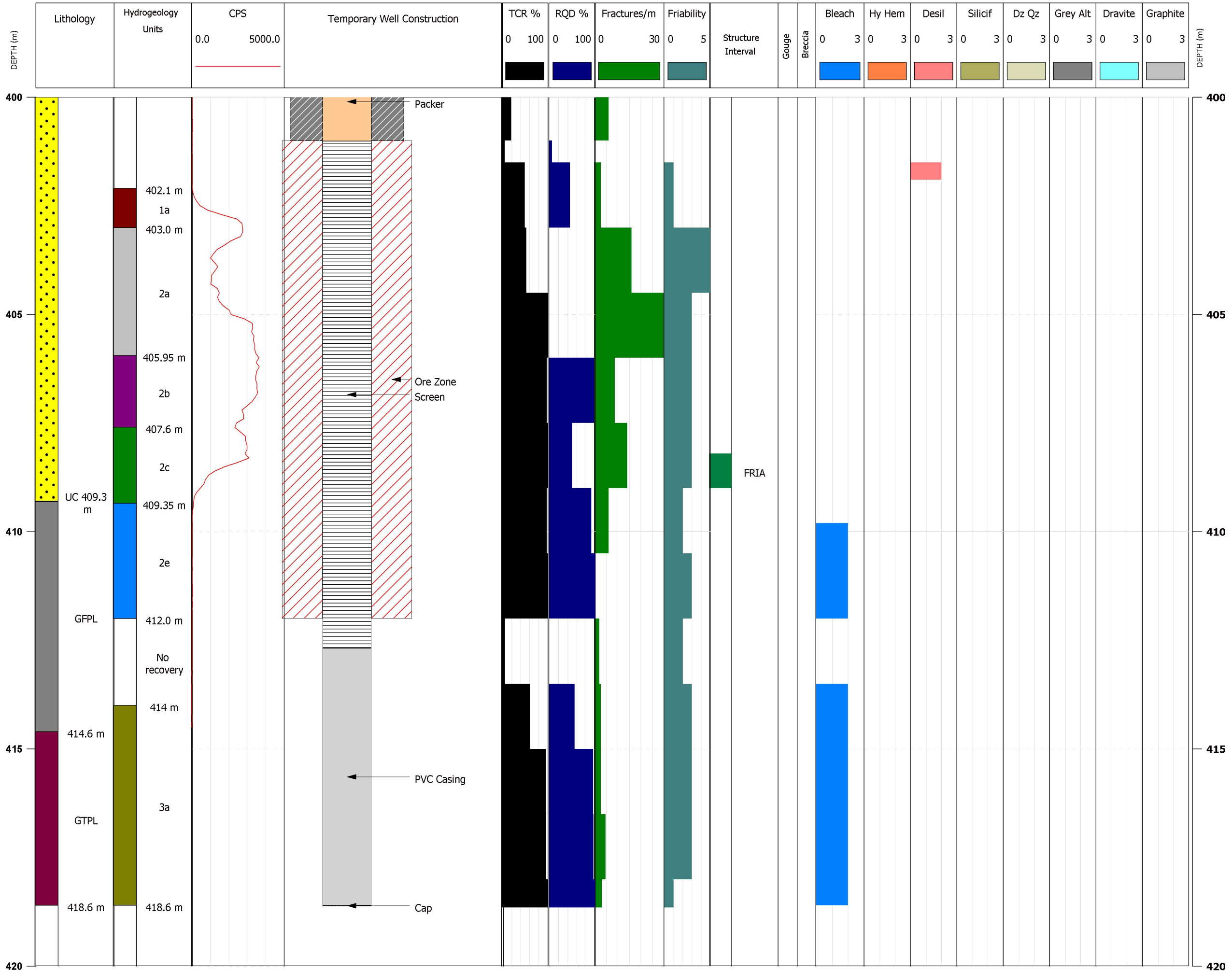
DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
0 - 55.9		Bentonite	Bentonite	0	55.9	55.9	
0 - 372.2	SDST	PVC Casing	PVC Casing	0	372.2	372.2	1.5" PVC casing Sch 80
372.2 - 374		Packer	Packer	372.2	374	1.8	HQ Inflatable Packer
374 - 380		PVC Screen	PVC Screen	374	380	6	1.5" PVC 0.04" slotted screen Sch 80
380 - 380		Cap	Cap	379.98	380	0.02	Sch 80
380	380 m						
390							
400							

Comments: Depth below surface.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10							
20							
30							
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140	SDST						
150							
160							
170							
180							
190							
200		PVC Casing	PVC Casing	0	399.19	399.19	1.5" PVC
210							
220							
230							
240							
250							
260							
270	272.6 m						
280	MFB						
290	295.0 m						
300							
310							
320							
330							
340							
350	MFA						
360							
370							
380							
390		Cement	Cement	376	401	25	
400		Packer	Packer	399.19	401.01	1.82	HQ Inflatable Packer
410	UC 409.3 m	Ore Zone	Ore Zone	401	412	11	
414.6 m	GPL	Screen	Screen	401.01	412.68	11.67	1.5" Well screen
418.6 m	GPL	PVC Casing	PVC Casing	412.68	418.6	5.92	1.5" PVC
420		Cap	Cap	418.6	418.62	0	
430							
440							
450							

Comments: Depth below surface. Lots of core loss

Title: Well Schematics	Drillhole #: GWR-026	Coordinates: 477,122.58 m E ; 6,374,209.6 m N
Project: Phoenix	Drilling method: DDH	Elevation: 540.43 m.
Logged by:	Total depth: 418.62 m	Comments: Hydrogeology Unit 3a added from photo.
Drilling End Date:	Hole Type: OZ/HQ	



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

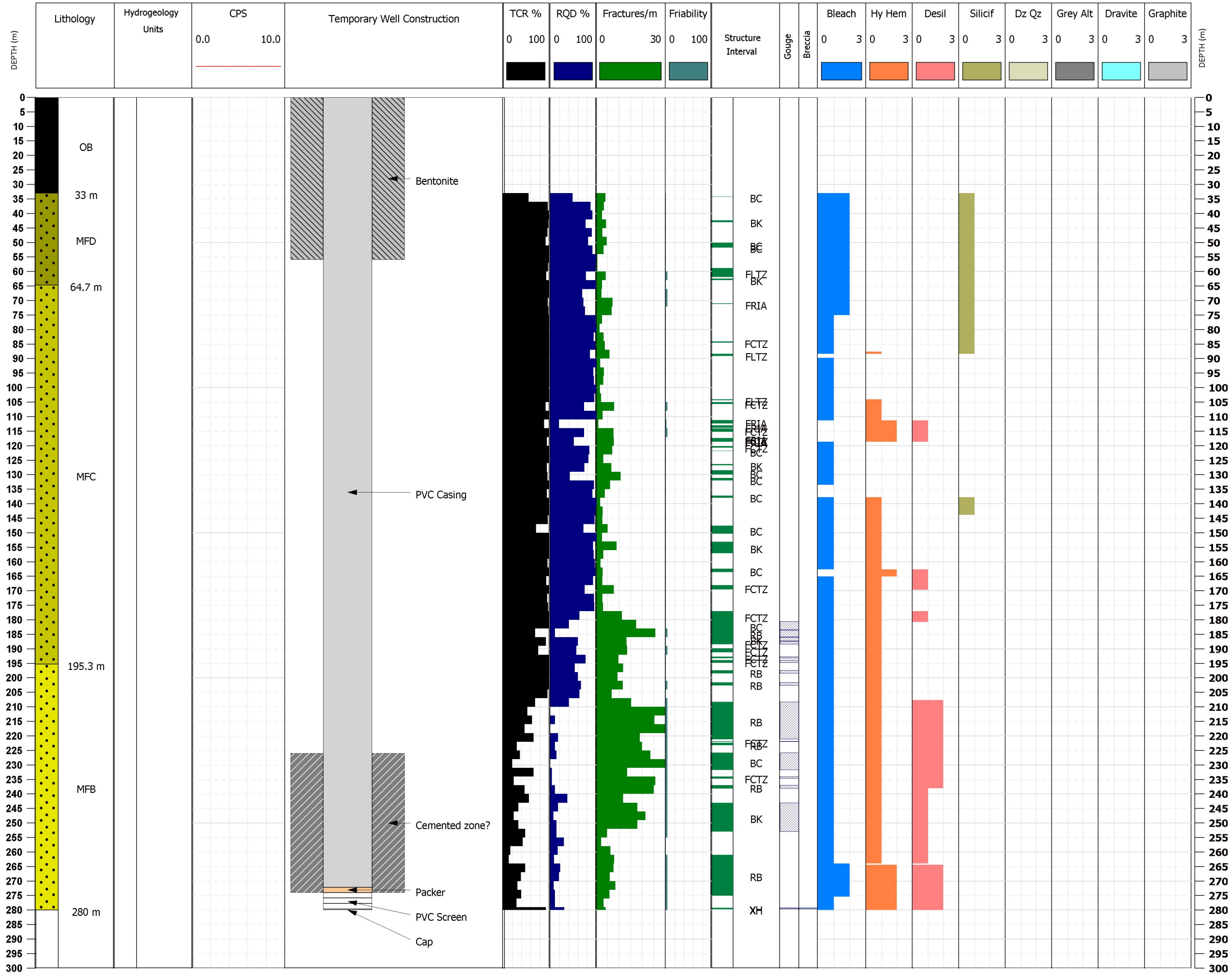
Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
0 - 33	OB						
0 - 55.9		Bentonite	Bentonite	0	55.9	55.9	
33 - 64.7	MFD						
0 - 272.2		PVC Casing	PVC Casing	0	272.2	272.2	1.5" PVC casing Sch 80
64.7 - 195.3	MFC						
226 - 274		Cemented zone?	Cemented zone?	226	274	48	
272.2 - 274		Packer	Packer	272.2	274	1.8	HQ Inflatable Packer
274 - 280		PVC Screen	PVC Screen	274	280	6	1.5" PVC 0.04" slotted screen Sch 80
279.98 - 280		Cap	Cap	279.98	280	0.02	Sch 80
280 - 280							
280 - 300							

Comments: Depth below surface.

Title:	Well Schematics	Drillhole #	GWR-027	Coordinates:	476,951.28 m E ; 6,374,608.29 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	523.5 m.
Logged by:		Total depth:	280 m	Comments:	
Drilling End Date:	2019	Hole Type:	HQ		



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
Fractures/m = Natural fractures per meter

Friability
0 = Unknown
1 = Competent (very hard)
2 = Moderately friable
3 = Friable (crumbles in hand)
4 = Locally friable over interval
5 = Unconsolidated

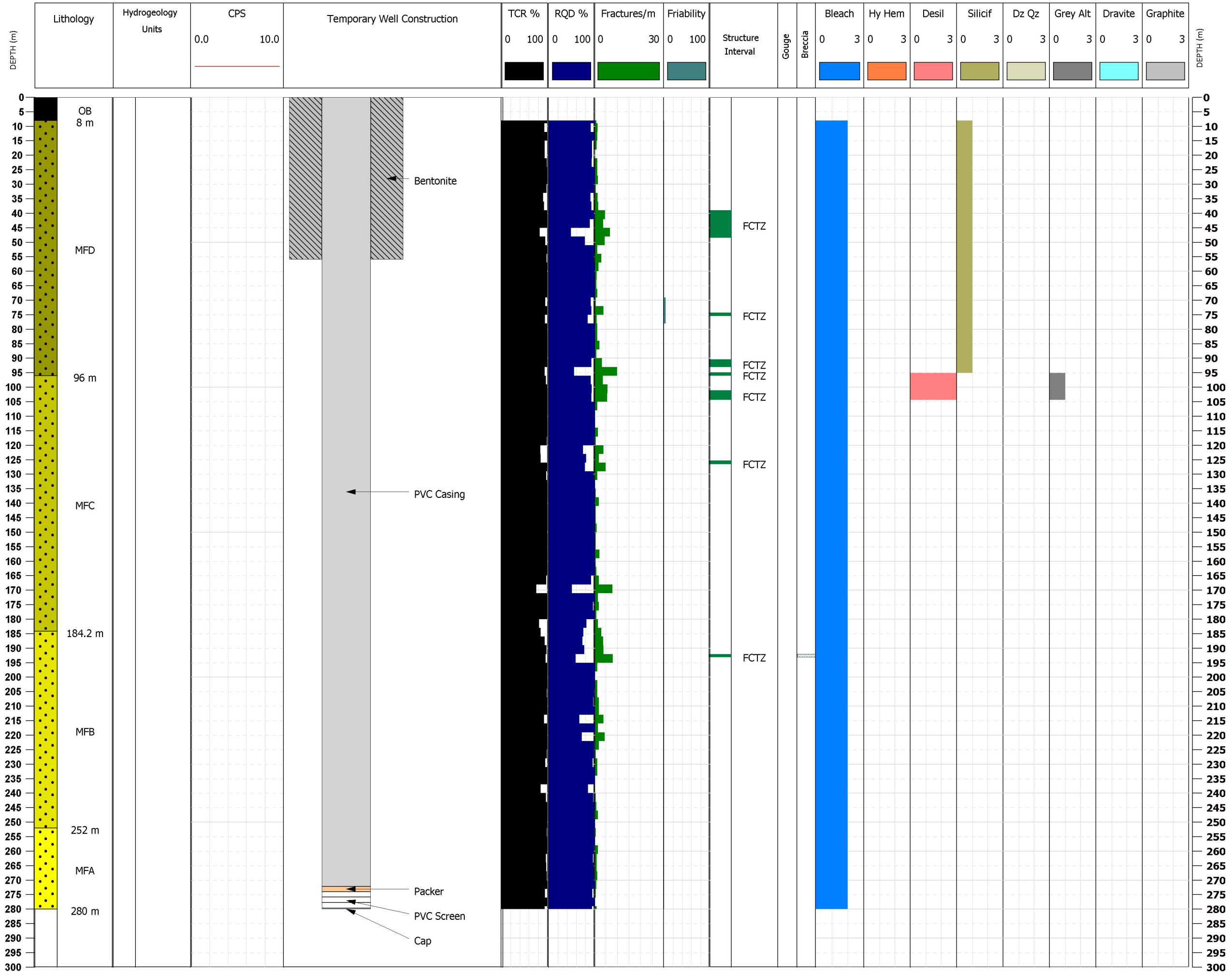
Structure Interval
BC = Breccia FLT = Fault FLTZ = Fault Zone
SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
*Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
0 = Not present
1 = Weak
2 = Moderate
3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
0 - 8	OB 8 m						
0 - 55.9		Bentonite	Bentonite	0	55.9	55.9	
55.9 - 96	MFD						
96 - 184.2	96 m						
0 - 272.2		PVC Casing	PVC Casing	0	272.2	272.2	1.5" PVC casing Sch 80
184.2 - 252	MFB						
252 - 274	MFA	Packer	Packer	272.2	274	1.8	HQ Inflatable Packer
274 - 280		PVC Screen Cap	PVC Screen Cap	274	280	6	1.5" PVC 0.04" slotted screen Sch 80
280 - 280	280 m	Cap	Cap	279.98	280	0.02	Sch 80
280 - 290							

Comments: Depth below surface.

Title:	Well Schematics	Drillhole #	GWR-028	Coordinates:	476,125.82 m E ; 6,373,453.54 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	518.52 m.
Logged by		Total depth:	280 m	Comments:	
Drilling End Date:	2019	Hole Type:	HQ		



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknwn
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

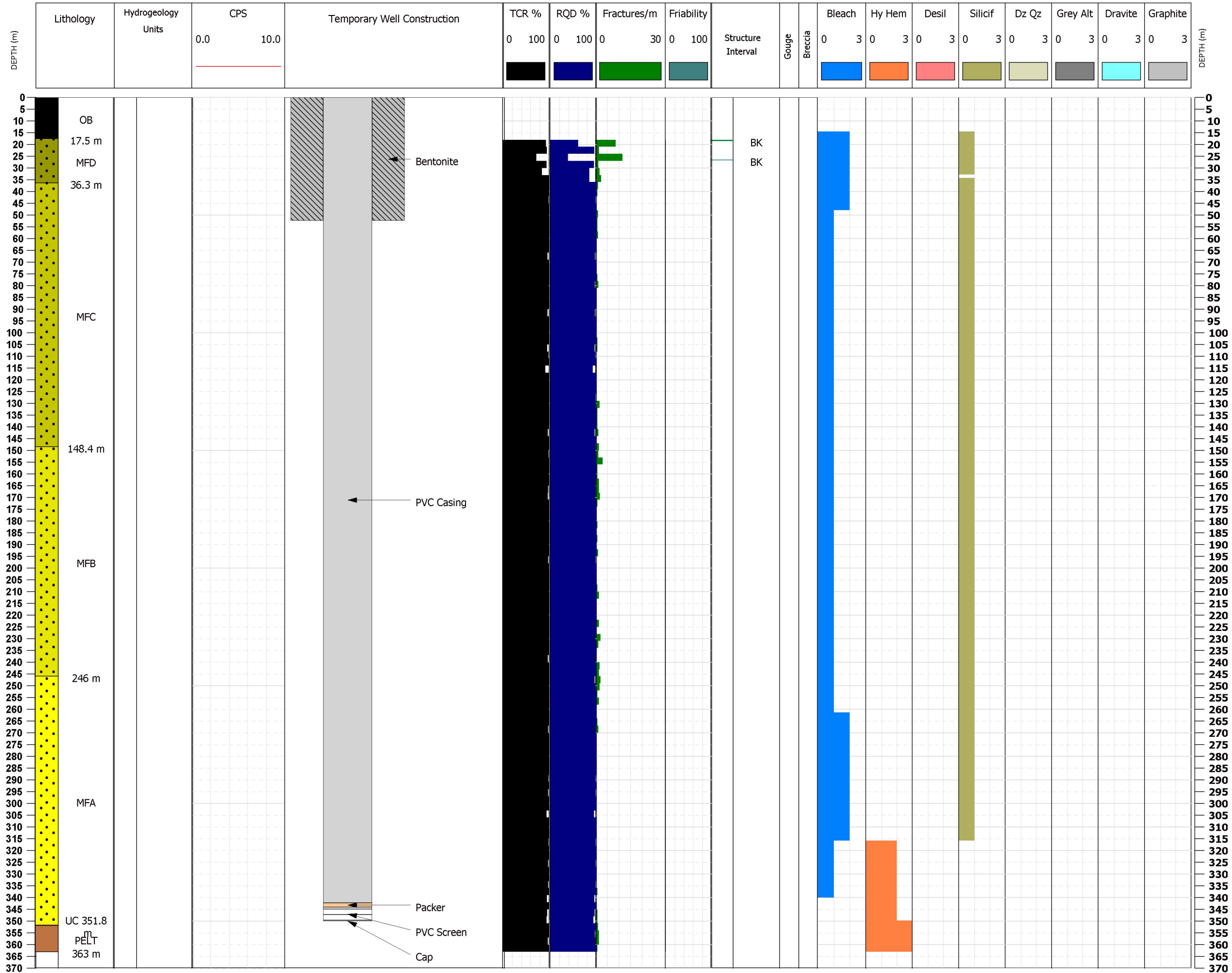
Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
0 - 17.5	OB						
17.5 - 36.3	MFD	Bentonite	Bentonite	0	52.4	52.4	
36.3 - 148.4	MFC						
148.4 - 342.26	MFB	PVC Casing	PVC Casing	0	342.26	342.26	1.5" PVC casing Sch 80
342.26 - 344.08		Packer	Packer	342.26	344.08	1.82	HQ Inflatable Packer
344.08 - 349.98		PVC Screen	PVC Screen	344.08	350	5.92	1.5" PVC 0.04" slotted screen Sch 80
349.98 - 350		Cap	Cap	349.98	350	0.02	Sch 80
350 - 363	PELT						
363 - 370	UC 351.8 m						

Comments: Depth below surface.

Title: Well Schematics	Drillhole #: GWR-029	Coordinates: 475,819.83 m E ; 6,372,881.05 m N
Project: Phoenix	Drilling method: DDH	Elevation: 519.12 m.
Logged by:	Total depth: 363 m	Comments:
Drilling End Date: 2019	Hole Type: HQ	



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknwn
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

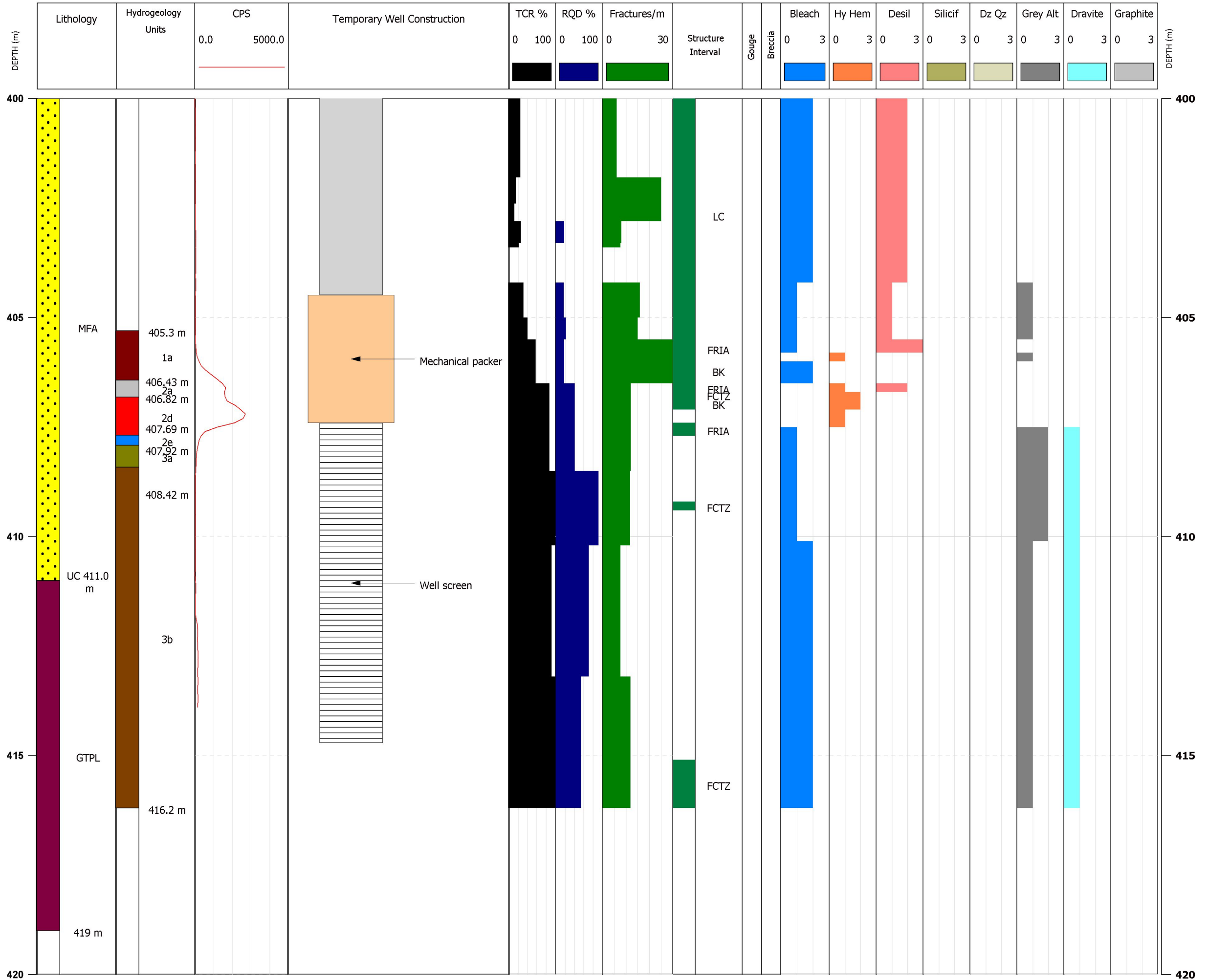
Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
	0						
10							
20							
30							
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140							
150							
160							
170							
180							
190	SDST	← PVC Casing	PVC Casing	0	363.2	363.2	1.5" PVC casing Sch 80
200							
210							
220							
230							
240							
250							
260							
270							
280							
290							
300							
310							
320							
330							
340							
350							
360							
363.2							
365		← Packer	Packer	363.2	365	1.8	HQ Inflatable Packer
371	371 m	← PVC Screen	PVC Screen	365	371	6	1.5" PVC 0.04" slotted screen Sch 80
371		← Cap	Cap	369.48	369.5	0.02	
371		← Historic Cement	Historic Cement	363.5	413.5	50	
380							
390							
400							
410							
420							

Comments: Depth below surface.

Title:	Well Schematics	Drillhole #	GWR-031	Coordinates: 477,086.15 m E ; 6,374,179.7 m N Elevation: 541.82 m. Comments:
Project:	Phoenix	Drilling method:	DDH	
Logged by		Total depth:	416.5 m	
Drilling End Date:	2019	Hole Type:	CSW	

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
0 - 27	OB	Conductor casing	Conductor casing	0	28.5	28.5	
27 - 188.55	27 m	Drop pipe	Drop pipe	0	188.55	188.55	PVC pipe Sch 40
188.55 - 189.54		Pump	Pump	188.55	189.54	0.99	
189.54 - 390.14		PVC lined steel rods	PVC lined steel rods	0	390.14	390.14	5" PVC lined steel rods
390.14 - 394.5		Intermediate casing	Intermediate casing	0	394.5	394.5	8 5/8" casing
394.5 - 399.4	SDST	Mechanical packer	Mechanical packer	390.14	391.63	1.49	
391.63 - 404.49		PVC lined steel rods	PVC lined steel rods	391.63	404.49	12.86	5" PVC lined steel rods
404.49 - 407.41		Mechanical packer	Mechanical packer	404.49	407.41	2.92	
407.41 - 414.71		Well screen	Well screen	407.41	414.71	7.3	300M InnoGuard
414.71 - 419	MFA						
419 - 420	UC 411.0 m GTPL 419 m						



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

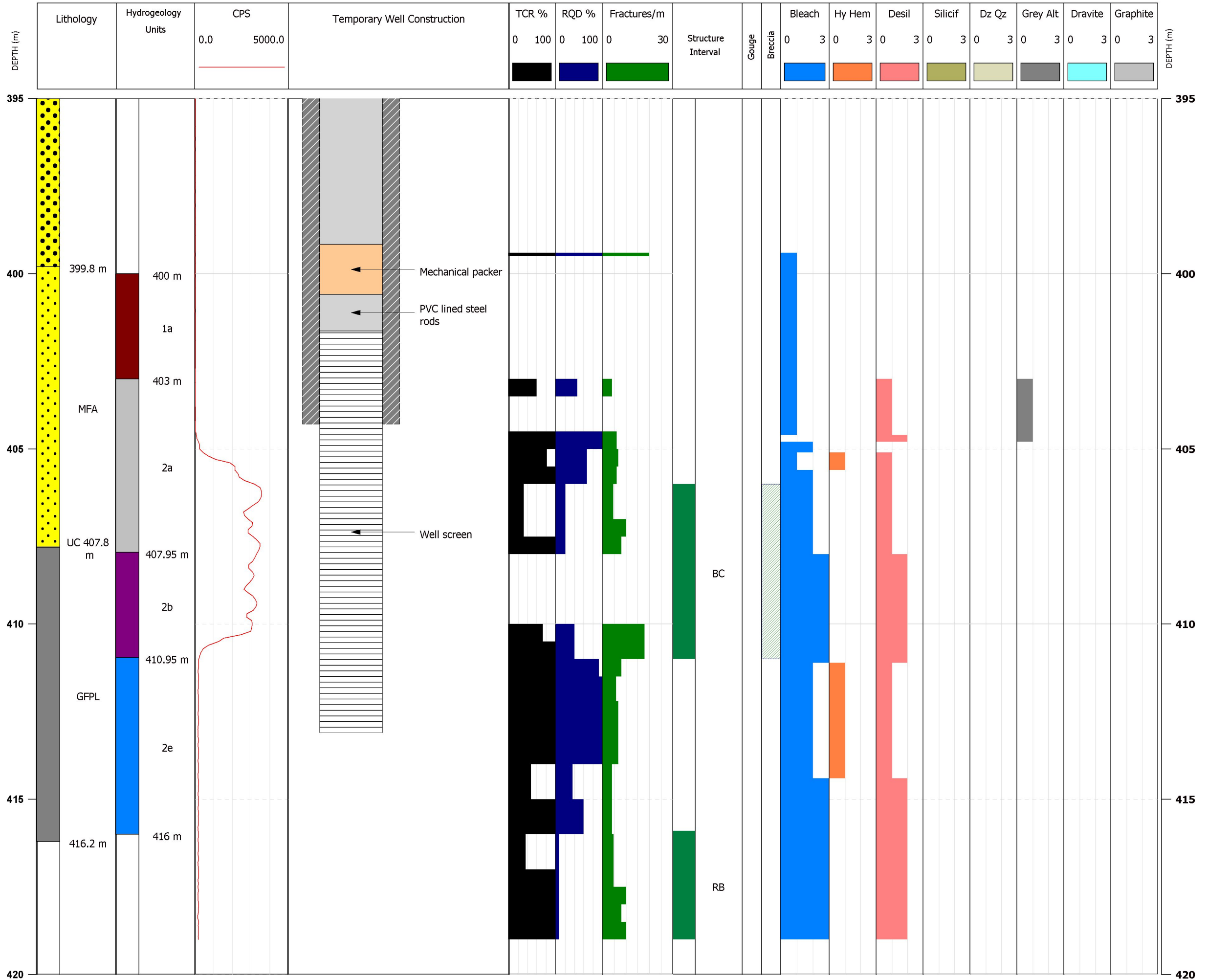
Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

Title:	Well Schematics	Drillhole #	GWR-032	Coordinates: 477,119.56 m E ; 6,374,214.92 m N Elevation: 540.86 m. Comments:
Project:	Phoenix	Drilling method:	DDH	
Logged by		Total depth:	419 m	
Drilling End Date:	2019	Hole Type:	CSW	

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
0 - 27	OB	Conductor casing	Conductor casing	0	27	27	
27 - 30	28.5 m						
0 - 224.4		Drop pipe	Drop pipe	0	224.4	224.4	PVC pipe Sch 40
0 - 399.16		PVC lined steel rods	PVC lined steel rods	0	399.16	399.16	5" PVC lined steel rods
224.4 - 225.39		Pump	Pump	224.4	225.39	0.99	
225.39 - 225.39		Cement					
399.16 - 400.59		Mechanical packer	Mechanical packer	399.16	400.59	1.43	
400.59 - 401.64		PVC lined steel rods	PVC lined steel rods	400.59	401.64	1.05	5" PVC lined steel rods
401.64 - 413.1		Well screen	Well screen	401.64	413.1	11.46	300M InnoGuard
399.8 - 416.2	SDST MFA UC 407.8 m GFPL 416.2 m						



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

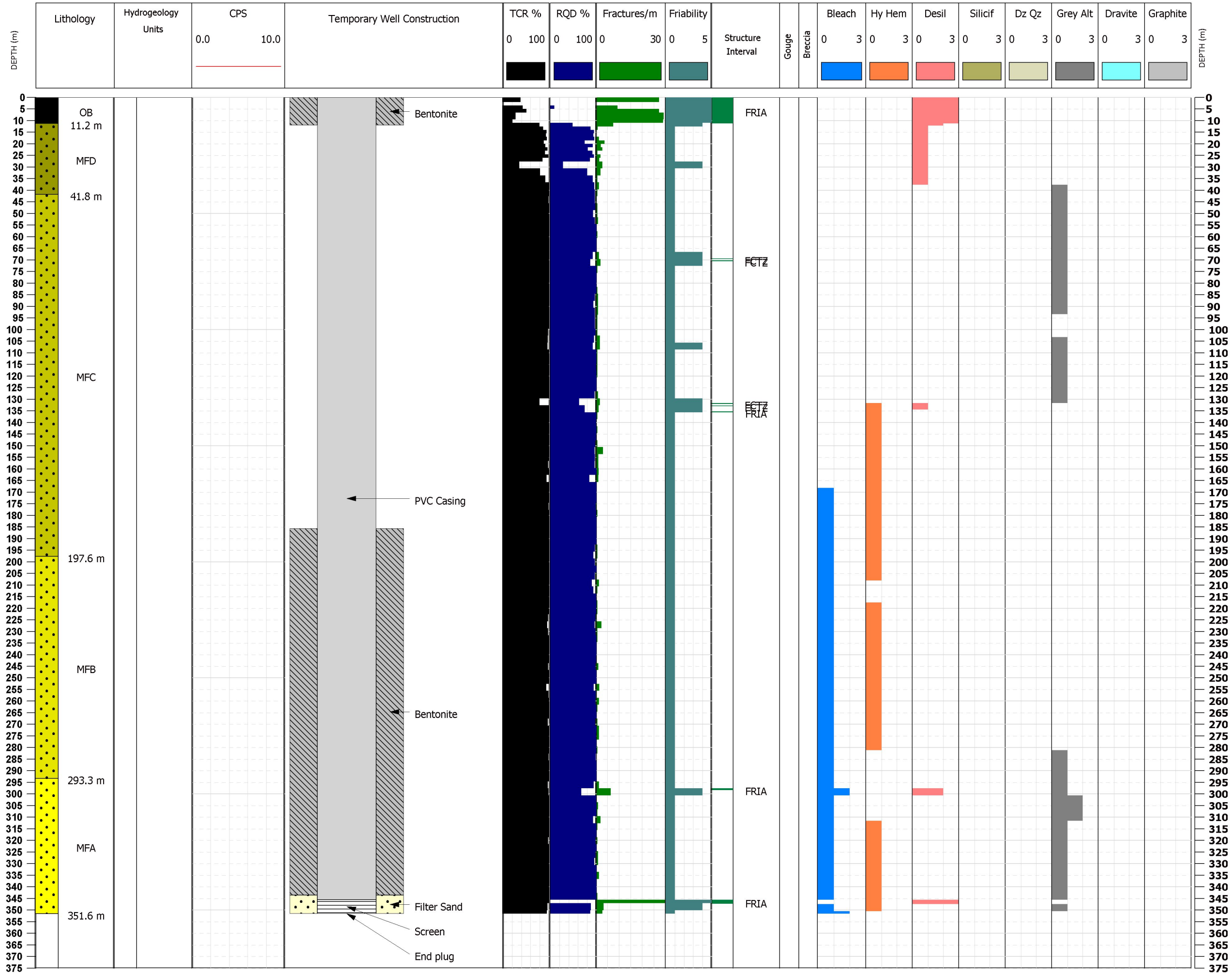
Structure Interval
 BC = Breccia
 SZ = Shear Zone
 FLT = Fault
 FCT = Fault
 FLTZ = Fault Zone
 FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
0 - 11.2	OB 11.2 m	Bentonite	Bentonite	0	12	12	3/8" coated bentonite tablets
11.2 - 41.8	MFD 41.8 m						
41.8 - 197.6	MFC 197.6 m	PVC Casing	PVC Casing	0	345.6	345.6	2.5" PVC casing sch 80
197.6 - 293.3	MFB 293.3 m	Bentonite	Bentonite	185.6	343.6	158	3/8" coated bentonite tablets
293.3 - 343.6	MFA	Filter Sand	Filter Sand	343.6	351.6	8	
343.6 - 345.6		Screen	Screen	345.6	351.6	6	2.5" PVC screen sch 80 with filter sock 3s.s. hose clamps
345.6 - 351.6		End plug	End plug	351.58	351.6	0	
351.6 - 370							

Comments: Depth below surface.

Title:	Well Schematics	Drillhole #	GWR-033	Coordinates:	477,593.45 m E ; 6,373,583.0 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	504.6 m.
Logged by:		Total depth:	351.6 m	Comments:	
Drilling End Date:	2020	Hole Type:	PQ		



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
Fractures/m = Natural fractures per meter

Friability
0 = Unknown
1 = Competent (very hard)
2 = Moderately friable
3 = Friable (crumbles in hand)
4 = Locally friable over interval
5 = Unconsolidated

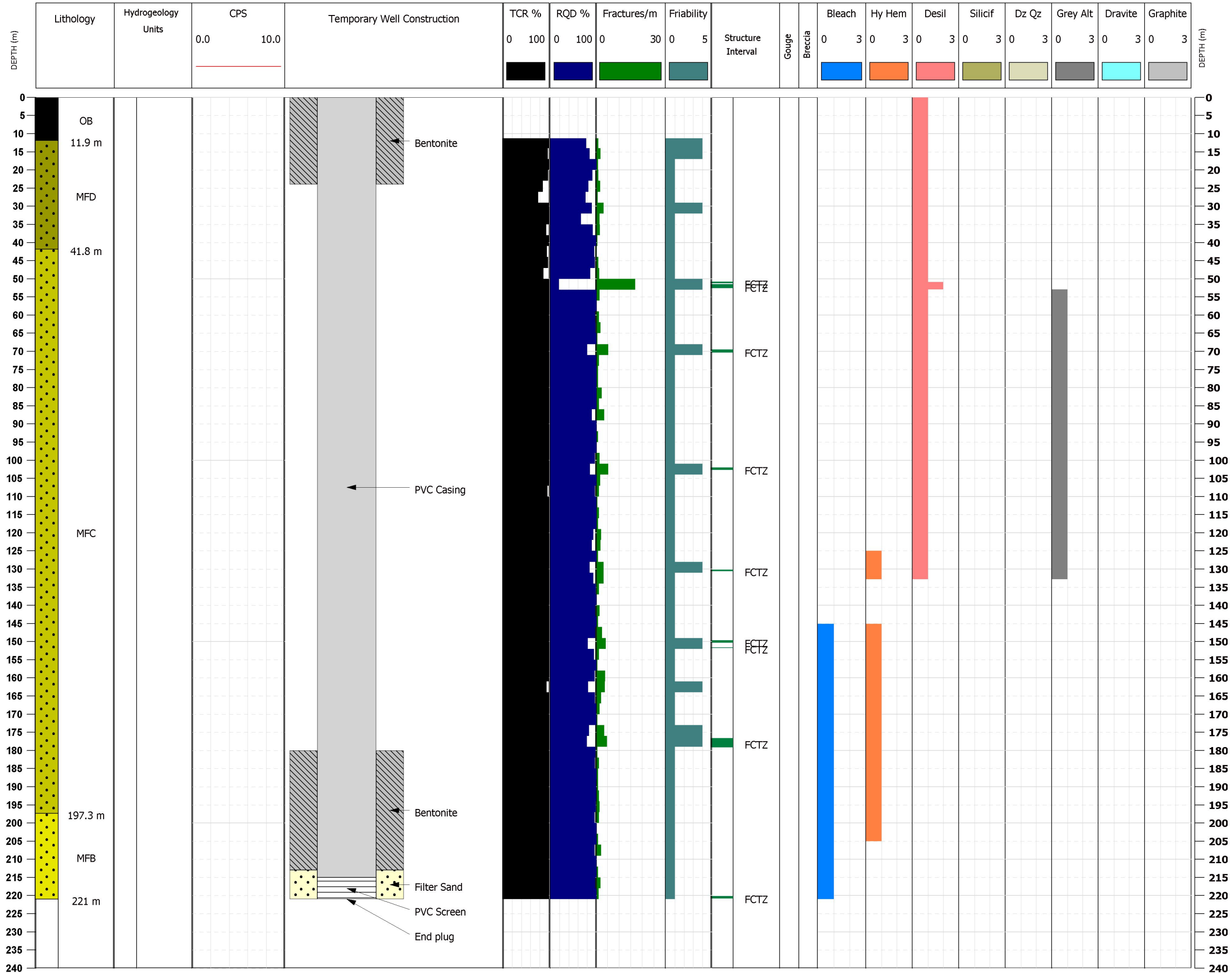
Structure Interval
BC = Breccia FLT = Fault FLTZ = Fault Zone
SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
*Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
0 = Not present
1 = Weak
2 = Moderate
3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
0 - 11.9	OB						
0 - 24	11.9 m	Bentonite	Bentonite	0	24	24	3/8" coated bentonite tablets
24 - 41.8	MFD						
41.8 - 213		PVC Casing	PVC Casing	0	215	215	2.5" PVC casing sch 80
213 - 221		Bentonite	Bentonite	180	213	33	3/8" coated bentonite tablets
221 - 221	MFB	Filter Sand	Filter Sand	213	221	8	
221 - 221	221 m	PVC Screen	PVC Screen	215	221	6	2.5" PVC screen sch 80 with filter sock 3s.s. hose clamps
221 - 221		End plug	End plug	220.98	221	0.02	
221 - 240							

Comments: Depth below surface.

Title:	Well Schematics	Drillhole #	GWR-034	Coordinates:	477,580.8 m E ; 6,373,581.3 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	504.36 m.
Logged by		Total depth:	221 m	Comments:	
Drilling End Date:	2020	Hole Type:	PQ		



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

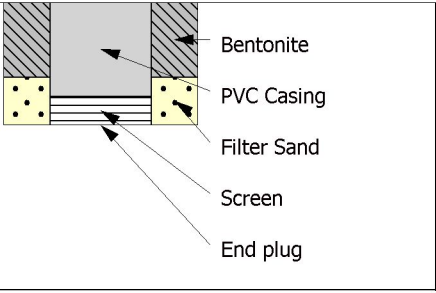
Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

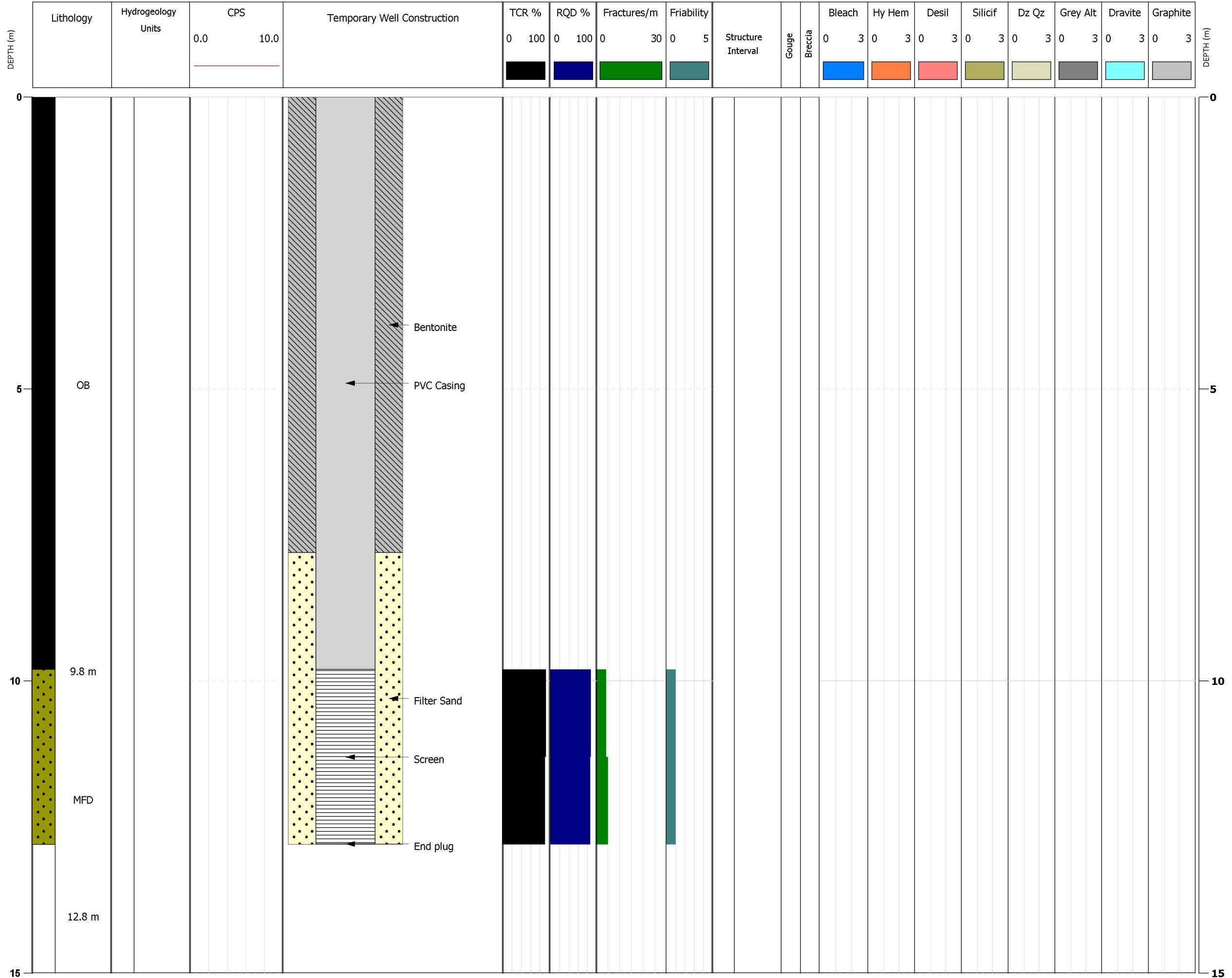
Title:	Well Schematics	Drillhole #	GWR-035
Project:	Phoenix	Drilling method:	DDH
Logged by		Total depth:	12.8 m
Drilling End Date:	2020	Hole Type:	PQ

Coordinates: 477,571.06 m E ; 6,373,579.9 m N
Elevation: 504.51 m.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
0	OB		Bentonite	0	7.8	7.8	3/8" coated bentonite tablets
9.8	9.8 m MFD		PVC Casing	0	9.8	9.8	2.5" PVC casing sch 80
12.8	12.8 m		Filter Sand	7.8	12.8	5	
			Screen	9.8	12.8	3	2.5" PVC screen sch 80 with filter sock 3s.s. hose clamps
			End plug	12.78	12.8	0.02	

Comments: Depth below surface.

Title:	Well Schematics	Drillhole #	GWR-035	Coordinates:	477,571.06 m E ; 6,373,579.9 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	504.51 m.
Logged by:		Total depth:	12.8 m	Comments:	Edit-Text
Drilling End Date:	2020	Hole Type:	PQ		



Hydrogeology Units			
1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm.)
Fractures/m = Natural fractures per meter

Friability
0 = Unknown
1 = Competent (very hard)
2 = Moderately friable
3 = Friable (crumbles in hand)
4 = Locally friable over interval
5 = Unconsolidated

Structure Interval		
BC = Breccia	FLT = Fault	FLTZ = Fault Zone
SZ = Shear Zone	FCT = Fault	FCTZ = Fracture Zone
*Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.		

Alterations
0 = Not present
1 = Weak
2 = Moderate
3 = Strong

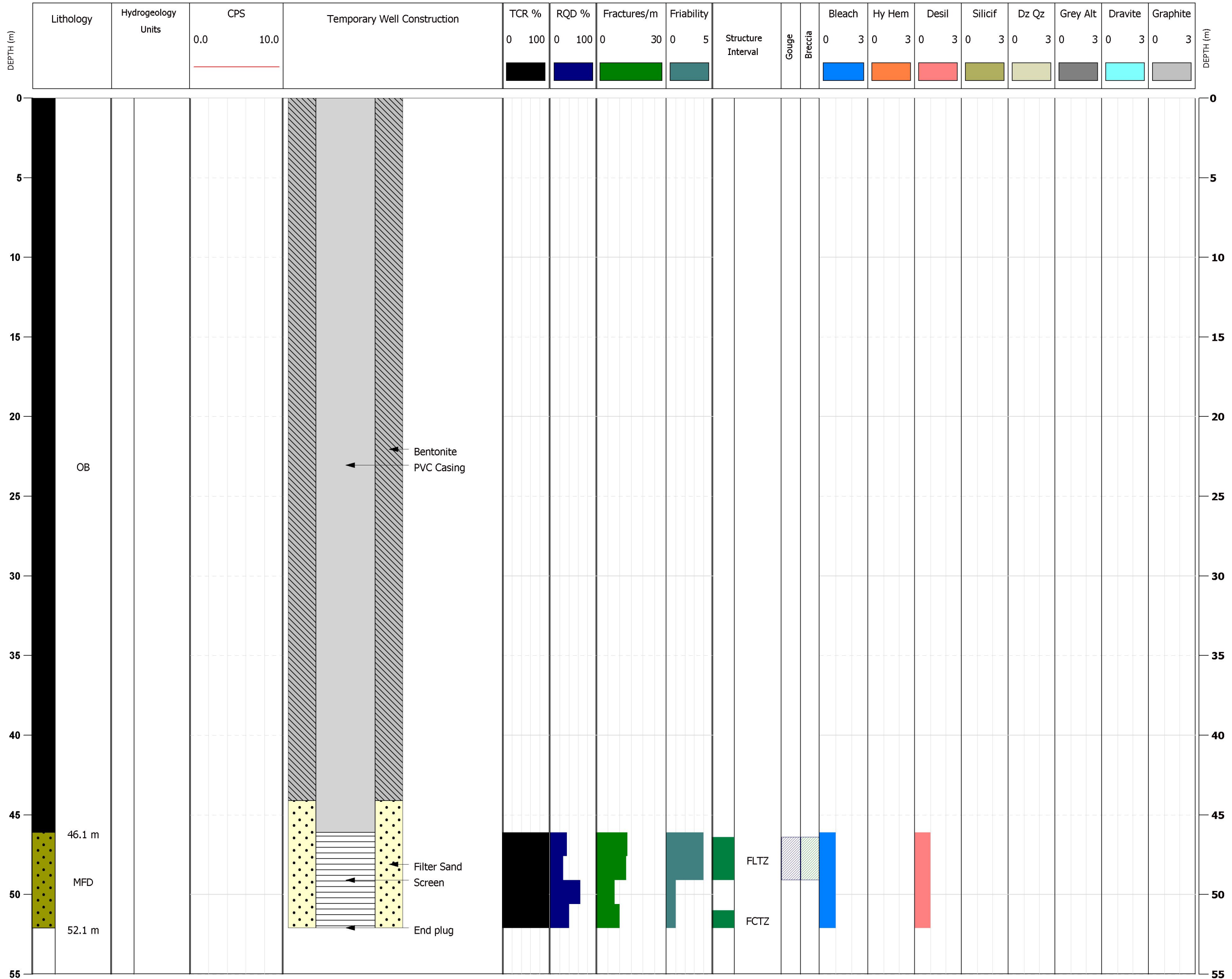
Title:	Well Schematics	Drillhole #	GWR-036
Project:	Phoenix	Drilling method:	DDH
Logged by		Total depth:	52.1 m
Drilling End Date:	2020	Hole Type:	PQ

Coordinates: 477,617.22 m E ; 6,374,449.1 m N
Elevation: 506.91 m.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10							
20	OB	Bentonite	Bentonite	0	44.1	44.1	3/8" coated bentonite tablets
30		PVC Casing	PVC Casing	0	46.1	46.1	2.5" PVC casing Sch 80
40							
50	46.1 m MFD 52.1 m	Filter Sand	Filter Sand	44.1	46.1	2	
		Screen	Screen	46.1	52.1	6	2.5" PVC screen Sch 80 with filter sock 3 s.s. hose clamps
60		End plug	End plug	52.08	52.1	0.02	

Comments: Depth below surface.

Title:	Well Schematics	Drillhole #	GWR-036	Coordinates:	477,617.22 m E ; 6,374,449.1 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	506.91 m.
Logged by:		Total depth:	52.1 m	Comments:	
Drilling End Date:	2020	Hole Type:	PQ		



Hydrogeology Units			
1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

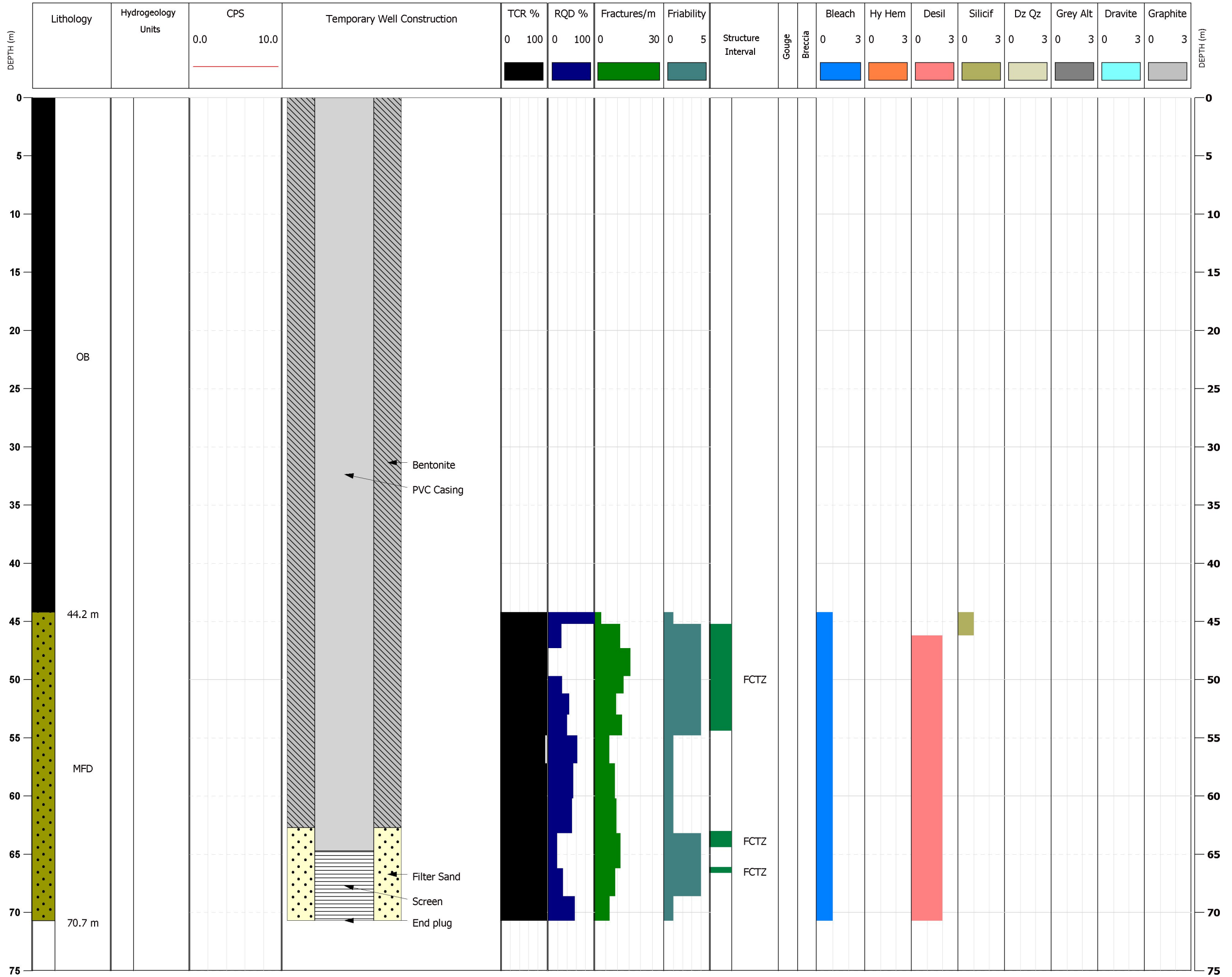
Title:	Well Schematics	Drillhole #	GWR-037
Project:	Phoenix	Drilling method:	DDH
Logged by		Total depth:	70.7m
Drilling End Date:	2020	Hole Type:	PQ

Coordinates: 477,607.69 m E ; 6,374,457.3 m N
Elevation: 506.92 m.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10							
20	OB						
30		Bentonite	Bentonite	0	62.7	62.7	3/8" coated bentonite tablets
40		PVC Casing	PVC Casing	0	64.7	64.7	2.5" PVC casing sch 80
44.2 m							
50	MFD						
60							
70	70.7 m	Filter Sand	Filter Sand	62.7	70.7	8	
		Screen	Screen	64.7	70.7	6	2.5" PVC screen sch 80 with filter sock 3s.s. hose clamps
80		End plug	End plug	70.68	70.7	0.02	

Comments: Depth below surface.

Title:	Well Schematics	Drillhole #	GWR-037	Coordinates:	477,607.69 m E ; 6,374,457.3 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	506.92 m.
Logged by:		Total depth:	70.7 m	Comments:	
Drilling End Date:	2020	Hole Type:	CSW		



Hydrogeology Units			
1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

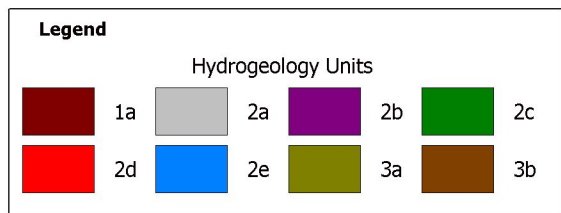
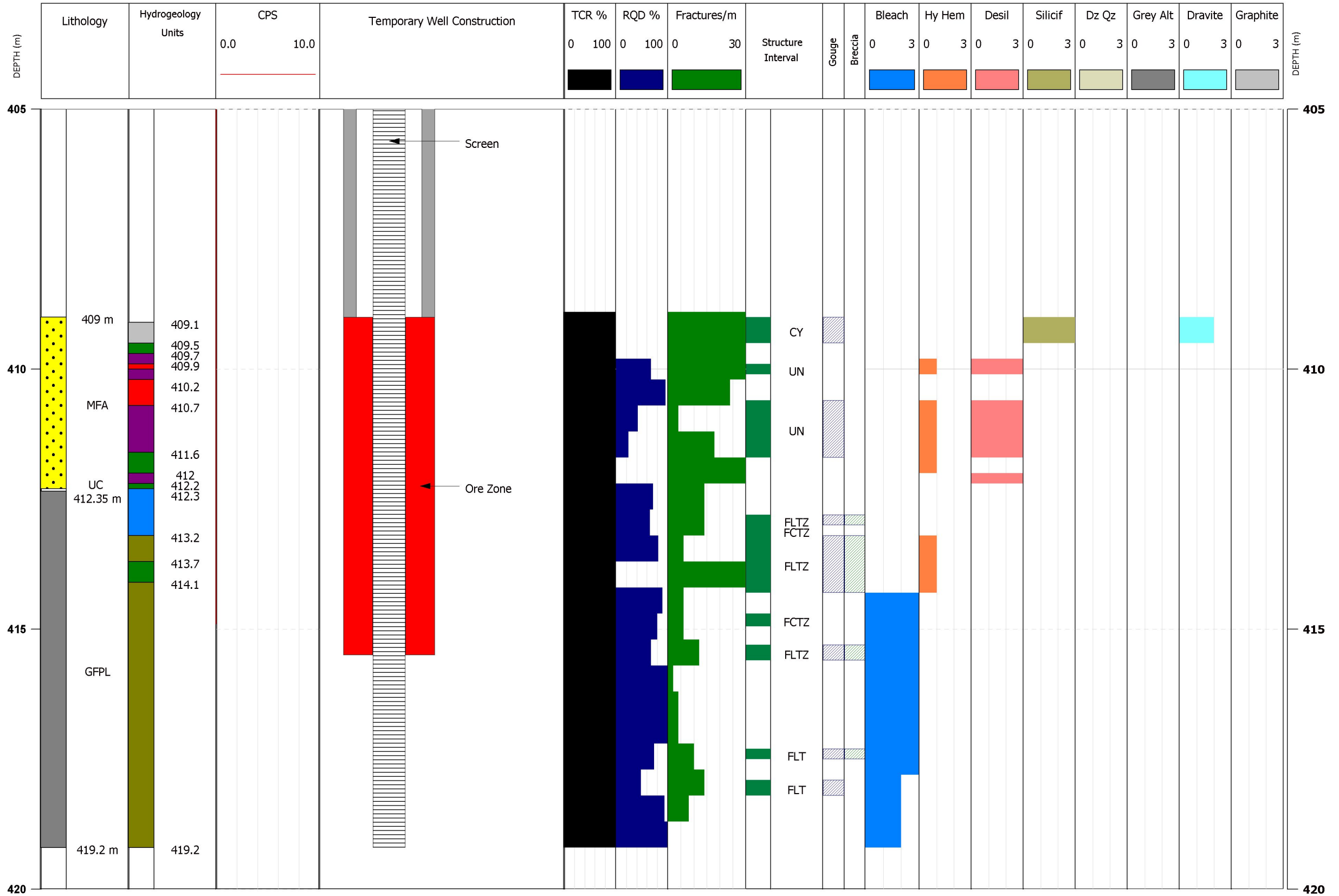
Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

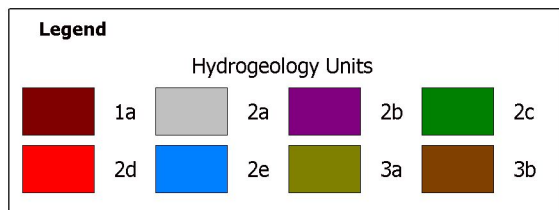
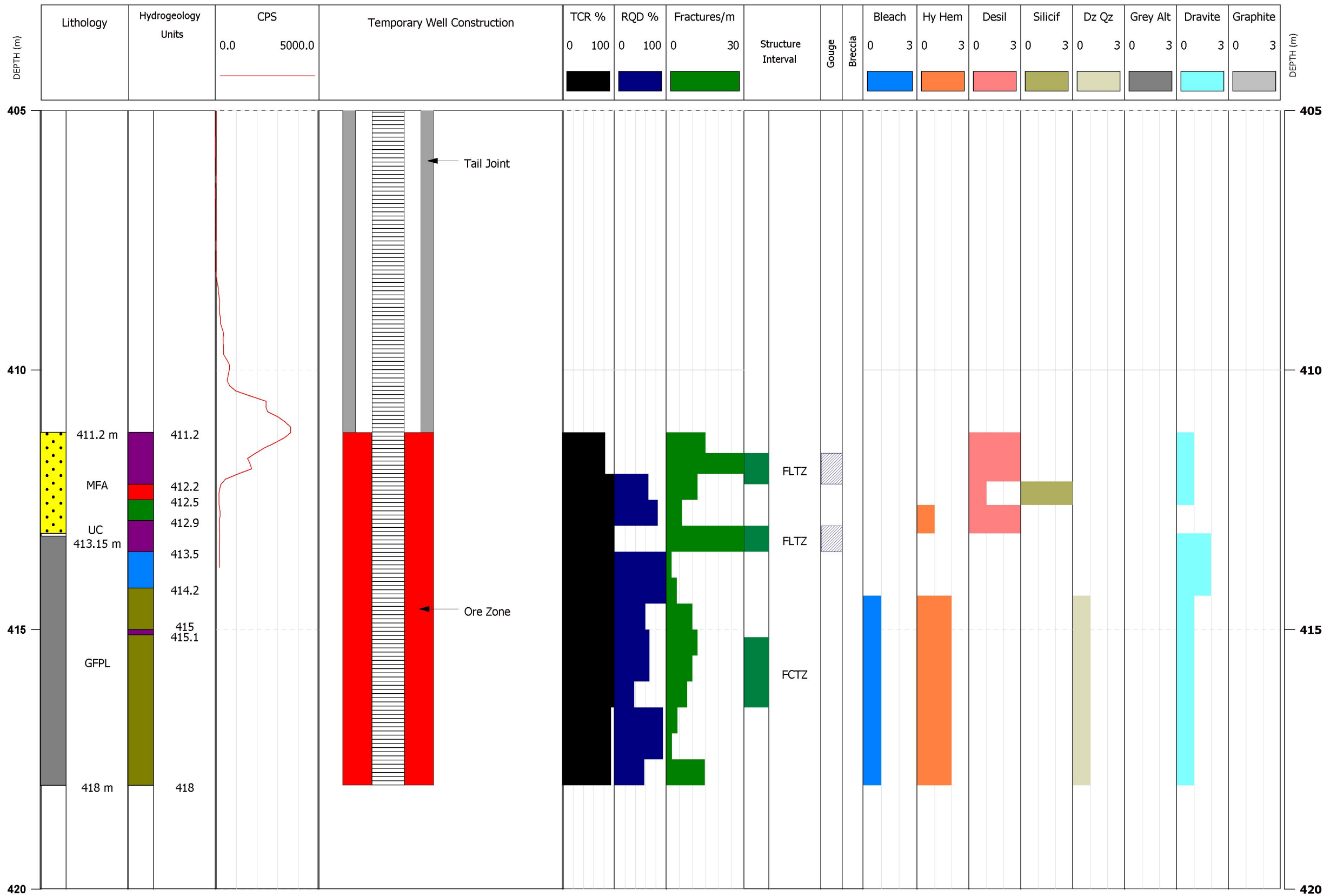
Title:	Well Schematics - Full Plot	Drillhole #	GWR-038	Coordinates: 477,138.88 m E ; 6,374,236.7 m N Elevation: 541.49 m. Comments: Depth from Tubing Hanger Flange.
Project:	Phoenix	Drilling method:	DDH	
Logged by		Total depth:	419.2 m	
Drilling End Date:		Hole Type:	CSW	

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
0 - 35.97		Cement Surface/Conductor Casing	Surface/Conductor Casing	0	35.88	35.97	13-3/8" 54.5# N80, STC set at 35.97 m, cemented to surface
0 - 298.78		Drop Pipe	Drop Pipe	0	298.78	298.78	NUE Steel
0 - 397.24		Casing Cement	Casing	0	400.9	397.24	9-5/8" 40#, J-55, STC, set at 397.24 m, cemented with G + Poz to surface.
298.78 - 300.22		Pump	Pump	298.78	300.22	1.44	4" Grundfos Submersible Pump
390.52 - 390.82		Packer	Packer	390.52	390.82	0.3	K-Packer: 5-1/2" x 4-1/2"
400.09 - 411.85		Tail Joint	Tail Joint	400.09	411.85	12.36	36', G-3
390.82 - 418		Screen	Screen	390.82	418	27.17	4-1/2" Slotted Steel Screen
411.2 - 418	409 m MFA UC 412.35 m GFPL 419.2 m	Ore Zone	Ore Zone	411.2	418	6.8	



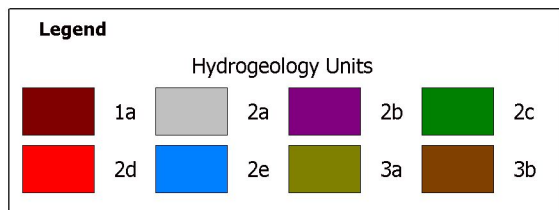
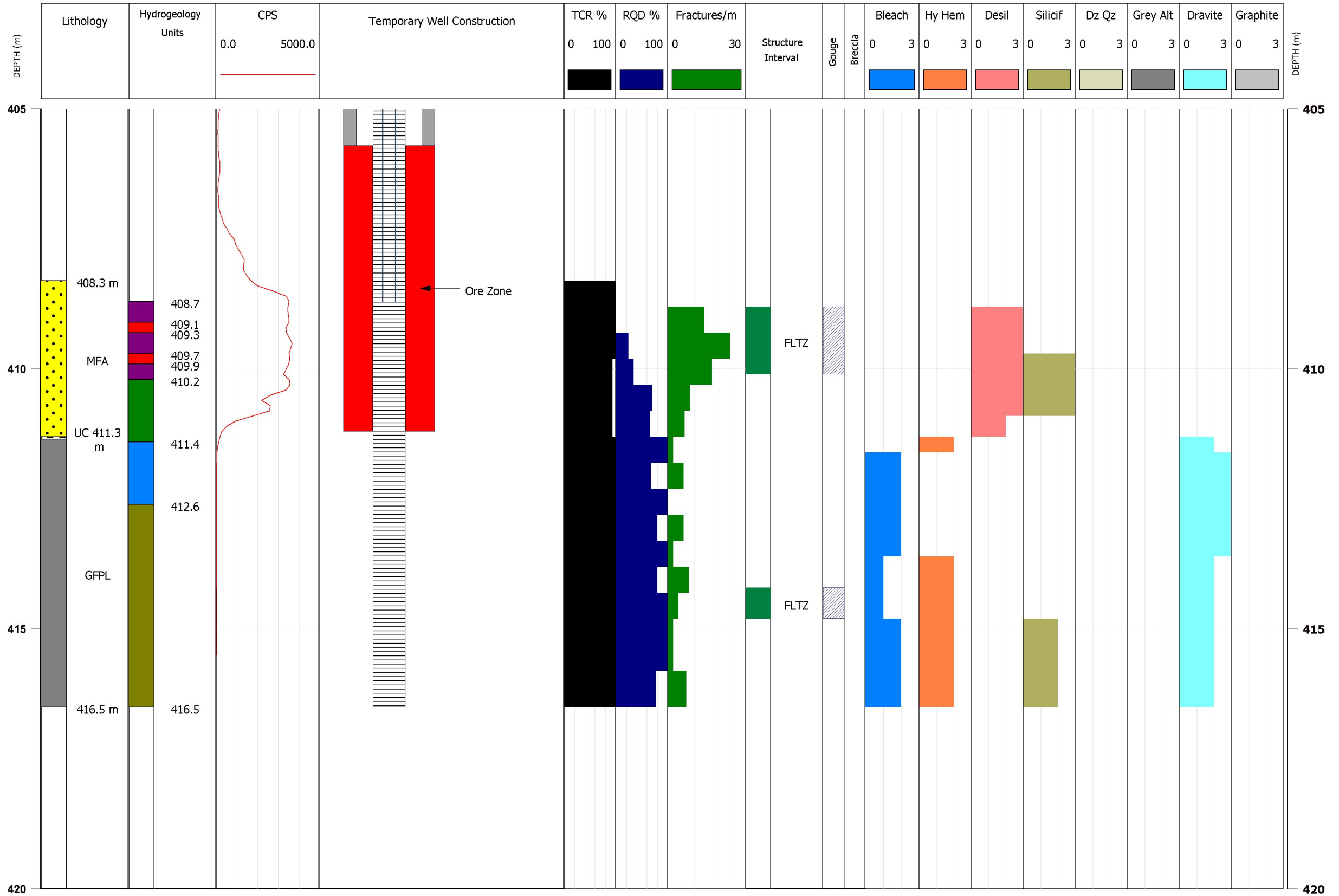
Title:	Well Schematics - Full Plot	Drillhole #	GWR-039	Coordinates: 477,128.32 m E ; 6,374,233.1 m N
Project:	Phoenix	Drilling method:	DDH	Elevation: 542.02 m.
Logged by		Total depth:	418.0 m	Comments: Depth from Tubing Hanger Flange.
Drilling End Date:		Hole Type:	CSW	

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10							
20		Cement	Surface/ Conductor Casing	0	35.88	35.88	13-3/8" 54.5# N80, STC set at 35.88 m, cemented to surface
30		Surface/ Conductor Casing					
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140							
150		Drop Pipe	Drop Pipe	0	298.78	298.78	NUE Steel
160							
170							
180							
190							
200		Casing	Casing	0	400.9	400.9	9-5/8" 40#, J-55, STC, set at 400.9 m, cemented with G + Poz to surface.
210		Cement					
220							
230							
240							
250							
260							
270							
280							
290							
300		Pump	Pump	298.78	300.22	1.44	4" Grundfos Submersible Pump
310							
320							
330							
340							
350							
360							
370							
380							
390		Packer	Packer	390.52	390.82	0.3	K-Packer: 5-1/2" x 4-1/2"
400		Screen	Screen	390.82	418	27.18	4-1/2" Slotted Steel Screen
410	411.2 m MFA UC 413.15 m GFPL 418 m	Tail Joint	Tail Joint	400.09	411.85	11.76	36', G-3
420		Ore Zone	Ore Zone	411.2	418	6.8	
430							



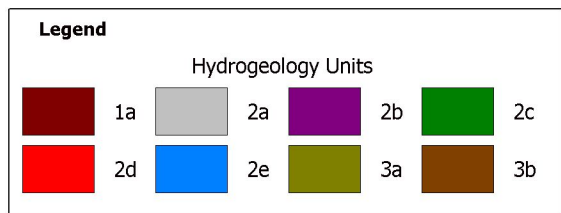
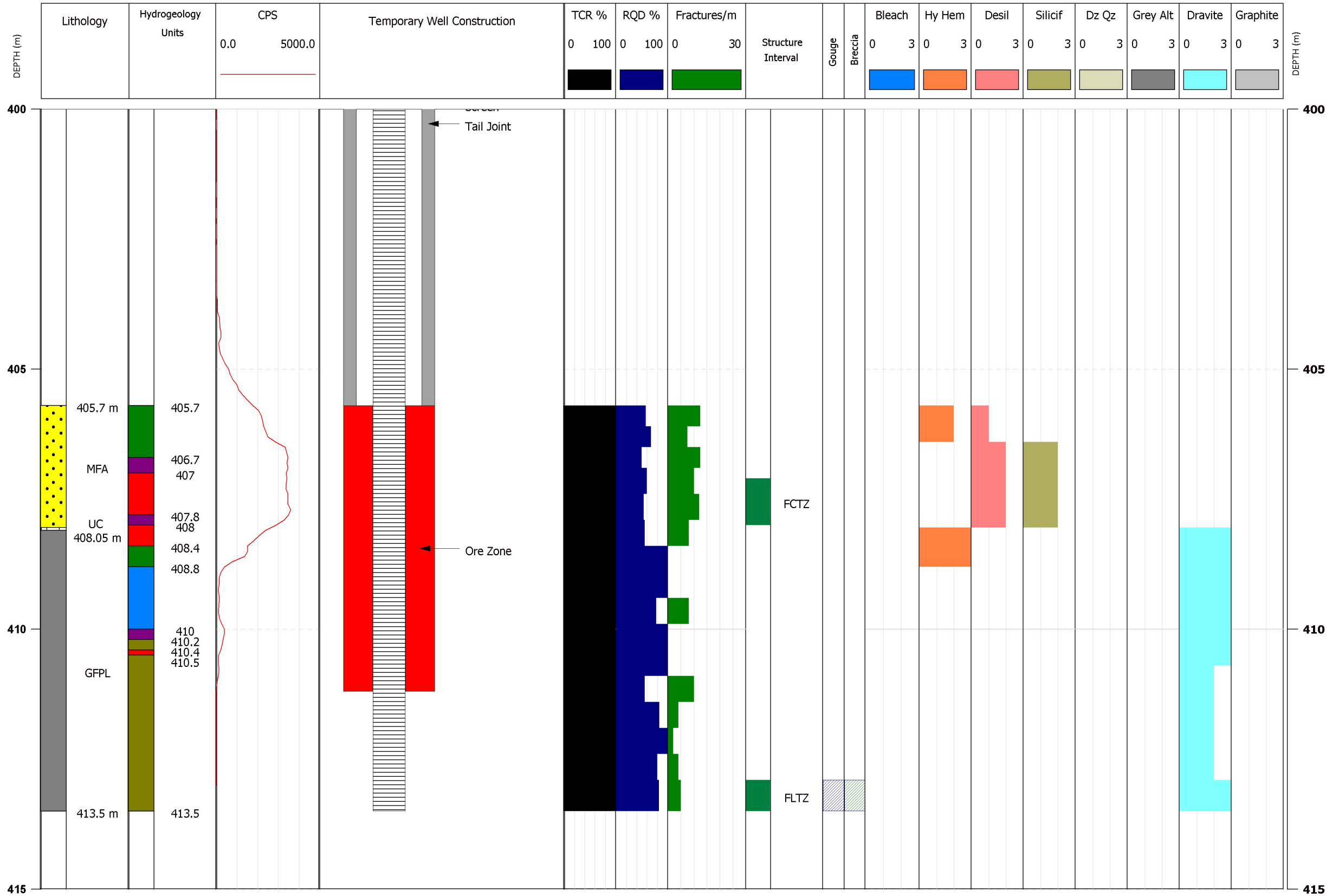
Title:	Well Schematics - Full Plot	Drillhole #	GWR-040	Coordinates: 477,131.81 m E ; 6,374,229.6 m N Elevation: 541.42 m. Comments: Depth from Tubing Hanger Flange.
Project:	Phoenix	Drilling method:	DDH	
Logged by		Total depth:	416.5 m	
Drilling End Date:		Hole Type:	CSW	

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10							
20			Surface/ Conductor Casing	0	35.95	320.4	13-3/8" 54.5# N80, STC set at 35.95 m, cemented to surface
30							
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140							
150							
160							
170							
180							
190							
200			Casing	0	396.56	226.5	9-5/8" 40#, J-55, STC, set at 396.56 m, cemented with G + Poz to surface.
210							
220			Drop Pipe	0	408.72	40.89	NUE Steel
230							
240							
250							
260							
270							
280							
290							
300							
310							
320							
330							
340							
350							
360							
370							
380							
390			Packer	389.01	389.31	114	K-Packer: 5-1/2" x 4-1/2"
400			Screen	389.31	416.5	0	4-1/2" Slotted Steel Screen
410	408.3 m MFA UC 411.3 m GFPL 416.5 m		Tail Joint	396.56	409.6	226.5	36', G-3
420			Ore Zone	405.7	411.2	5.5	
430							



Title:	Well Sematics - Full plot	Drillhole #	GWR-041	Coordinates: 477,135.39 m E ; 6,374,226.2 m N Elevation: 541.47 m. Comments: Depth from Tubing Hanger Flange.
Project:	Phoenix	Drilling method:	DDH	
Logged by		Total depth:	413.5 m	
Drilling End Date:		Hole Type:	CSW	

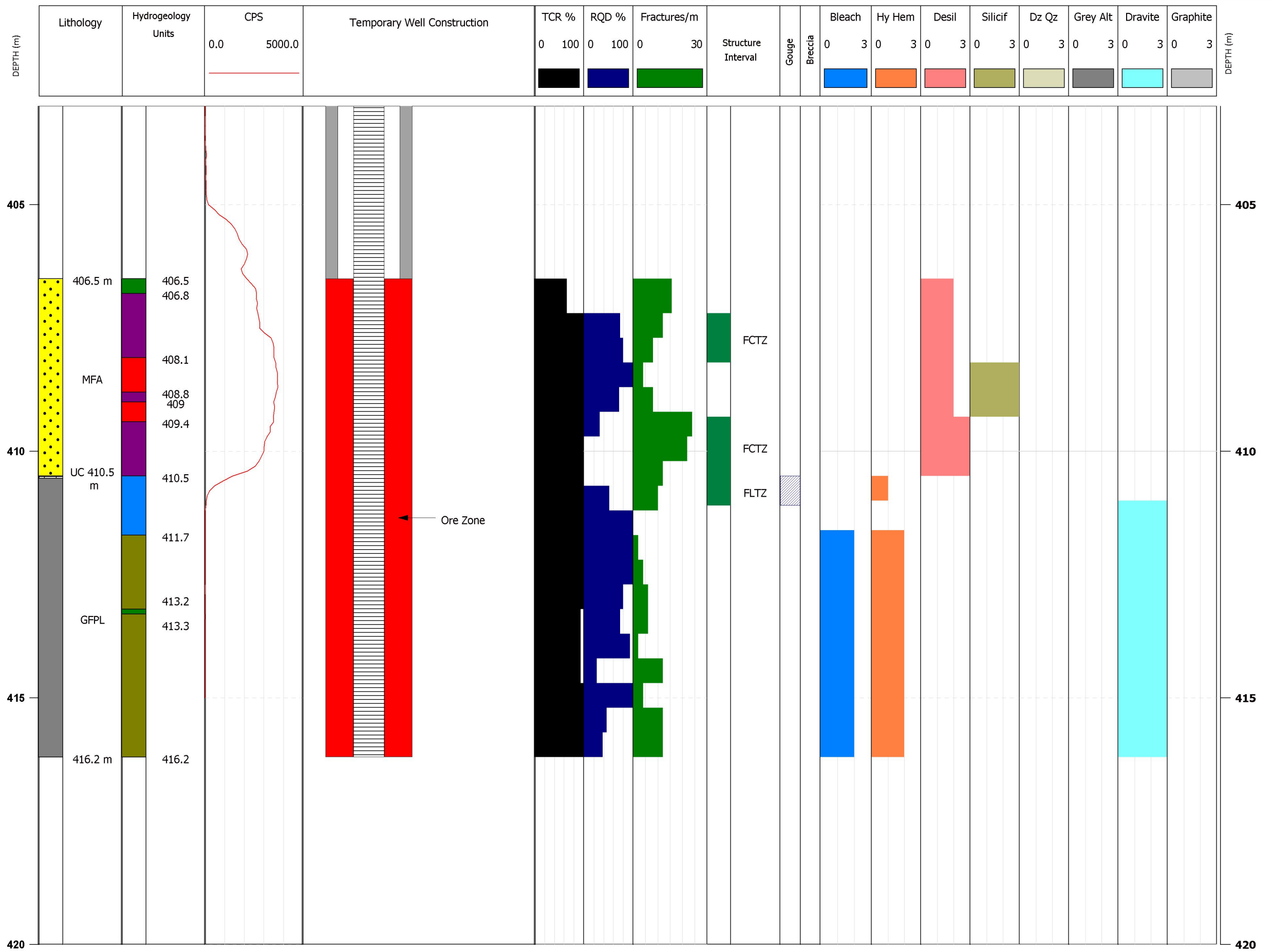
DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10							
20							
30							
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140							
150							
160							
170							
180							
190							
200							
210							
220							
230							
240							
250							
260							
270							
280							
290							
300							
310							
320							
330							
340							
350							
360							
370							
380							
390							
400							
410							
420							



Title:	Wheeler River	Drillhole #	GWR-042	Coordinates: 477,124.43 m E ; 6,374,222.6 m N
Project:	Wheeler River	Drilling method:	DDH	Elevation: 542.22 m.
Logged by		Total depth:	416.2 m	Comments: Depth from Tubing Hanger Flange
Drilling End Date:		Hole Type:	CSW	

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10							
20			Surface/ Conductor Casing	0	36.09	36.09	13-3/8" 54.5# N80, STC set at 36.09 m, cemented to surface
30							
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140							
150			Drop Pipe	0	296.7	296.7	NUE Steel
160							
170							
180							
190							
200			Casing	0	396.51	396.51	9-5/8" 40#, J-55, STC, set at 396.51 m, cemented with G + Poz to surface.
210							
220							
230							
240							
250							
260							
270							
280							
290							
300			Pump	296.7	298.14	1.44	4" Grundfos Submersible Pump
310							
320							
330							
340							
350							
360							
370							
380							
390			Packer	388.7	389	0.3	K-Packer: 5-1/2" x 4-1/2"
400	406.5 m MFA		Tail Joint	396.51	407.53	11.02	36', G-3
410	UC 410.5 m		Screen	389	416.2	27.2	4-1/2" Slotted Steel Screen
420	GFPL 416.2 m		Ore Zone	406.5	416.2	9.7	

Title:	Well Schematics	Drillhole #	GWR-042	Coordinates:	477,124.43 m E ; 6,374,222.6 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	542.22 m.
Logged by		Total depth:	416.2 m	Comments:	Depth from Tubing Hanger Flange
Drilling End Date:		Hole Type:	CSW		



Legend

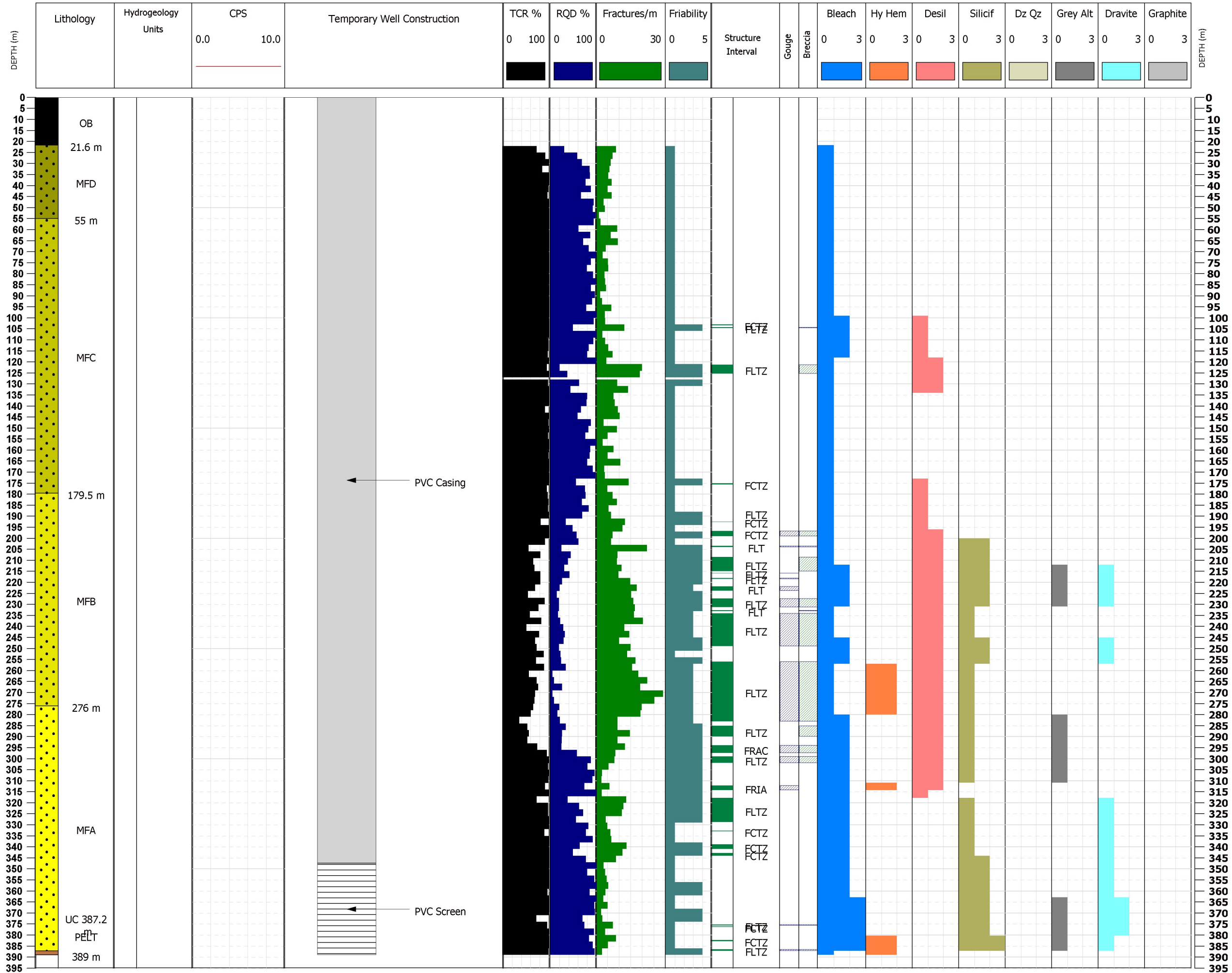
Hydrogeology Units

1a	2a	2b	2c
2d	2e	3a	3b

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10	OB						
21.6	21.6 m						
30	MFD						
55	55 m						
60							
70							
80							
90							
100							
110							
120	MFC						
130							
140							
150							
160							
170							
179.5	179.5 m	← PVC Casing	PVC Casing	0	347.4	347.4	2.5" PVC casing Sch 80
180							
190							
200							
210							
220							
230	MFB						
240							
250							
260							
270							
276	276 m						
280							
290							
300							
310							
320							
330	MFA						
340							
350							
360							
370		← PVC Screen	PVC Screen	347.4	389	41.6	2.5" slotted PVC Sch 80
380							
390	UC 2.2 m						

Comments: Depth below surface.

Title:	Well Schematics	Drillhole #	GWR-043	Coordinates:	477,369.93 m E ; 6,374,353.3 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	519.15 m.
Logged by		Total depth:	389 m	Comments:	No Hydro units logged.
Drilling End Date:	2021	Hole Type:	PQ		



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical

RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).

Fractures/m = Natural fractures per meter

Friability

0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

Structure Interval

BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone

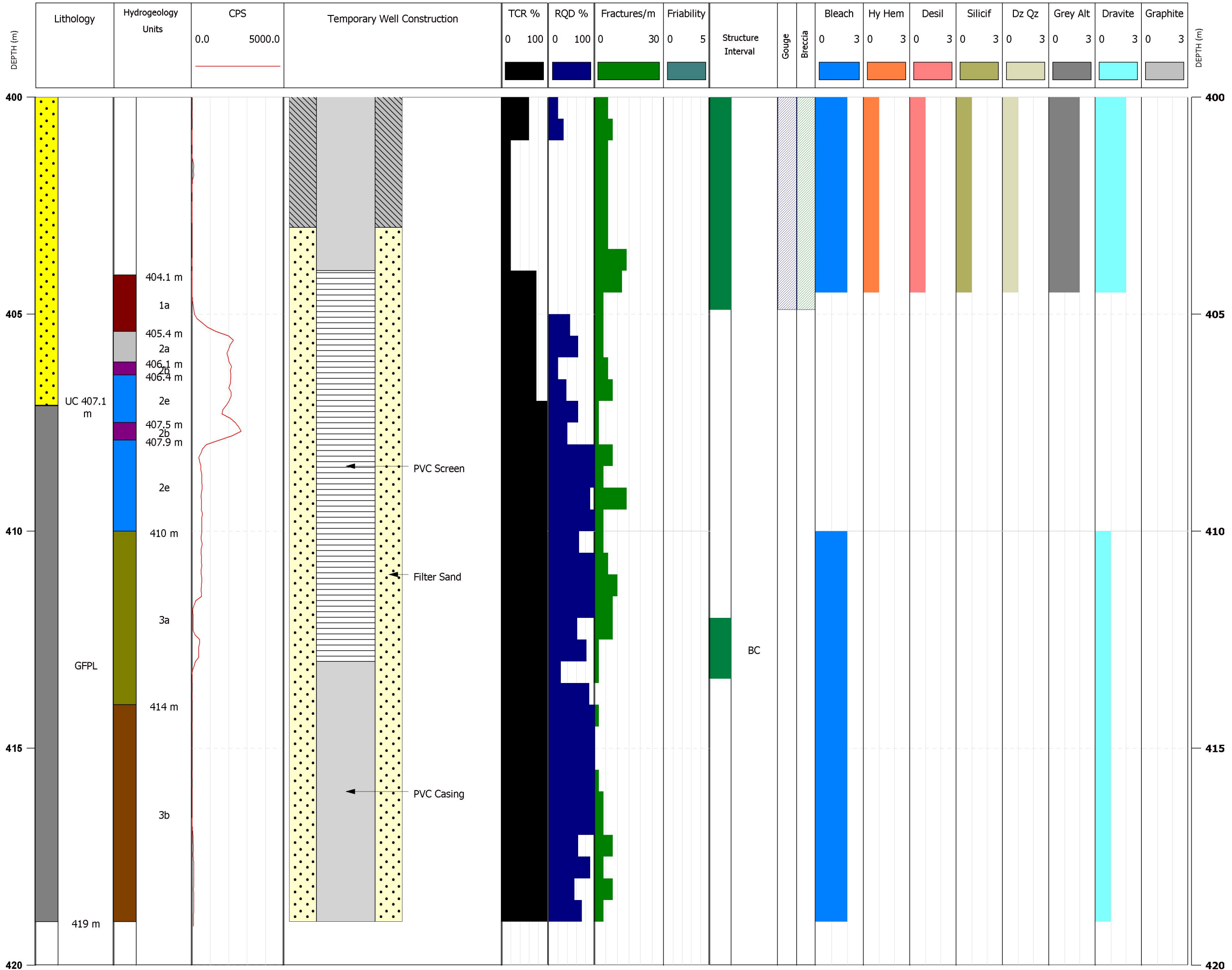
*Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations

0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
0 - 25.9	OB						
25.9 - 73.8	MFD						
73.8 - 175.6	MFC						
175.6 - 403		Bentonite	Bentonite	0	403	403	1/4" coated tablets
0 - 404		PVC Casing	PVC Casing	0	404	404	2.5" PVC casing Sch 80
403 - 413		PVC Screen	PVC Screen	404	413	9	2.5" slotted PVC Sch 80
403 - 419		Filter Sand	Filter Sand	403	419	16	
413 - 419		PVC Casing	PVC Casing	413	419	6	2.5" PVC casing Sch 80
419 - 430	UC 407.1 m GFPL 419 m						

Comments: Depth below surface.



	1a		2a		2b		2c
	2d		2e		3a		3b

Geotechnical

RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).

Fractures/m = Natural fractures per meter

Friability

0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

Structure Interval

BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone

*Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations

0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

Title:	Well Schematics	Drillhole #	GWR-046
Project:	Phoenix	Drilling method:	DDH
Logged by		Total depth:	152 m
Drilling End Date:	2021	Hole Type:	PQ

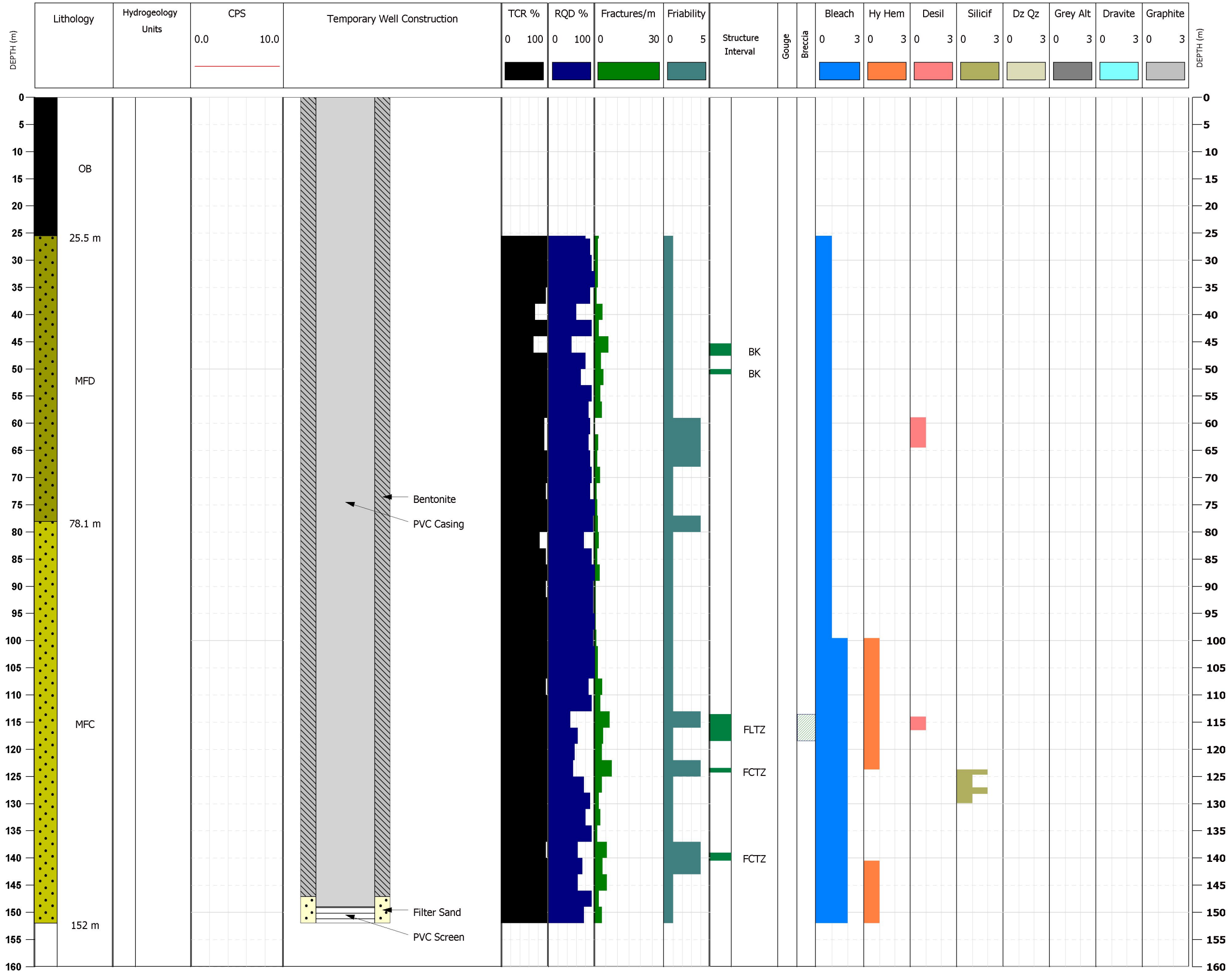
Coordinates: 477,135.58 m E ; 6,374,233.2 m N
Elevation: 540.5 m.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10	OB						
25.5	25.5 m						
30							
40							
50	MFD						
60							
70							
78.1	78.1 m						
80							
90							
100							
110	MFC						
120							
130							
140							
150	152 m						
152							
160							

Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
Bentonite	0	147.1	147.1	3/8" coaed bentonite with canola oil
PVC Casing	0	149	149	2.5" PVC casing Sch 80
Filter Sand	147.1	152	4.9	
PVC Screen	149	152	3	2.5" slotted PVC screen Sch 80

Comments: Depth below surface.

Title:	Well Schematics	Drillhole #	GWR-046	Coordinates:	477,135.58 m E ; 6,374,233.2 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	540.5 m.
Logged by:		Total depth:	152 m	Comments:	No Hydro units logged.
Drilling End Date:	2021	Hole Type:	PQ		



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

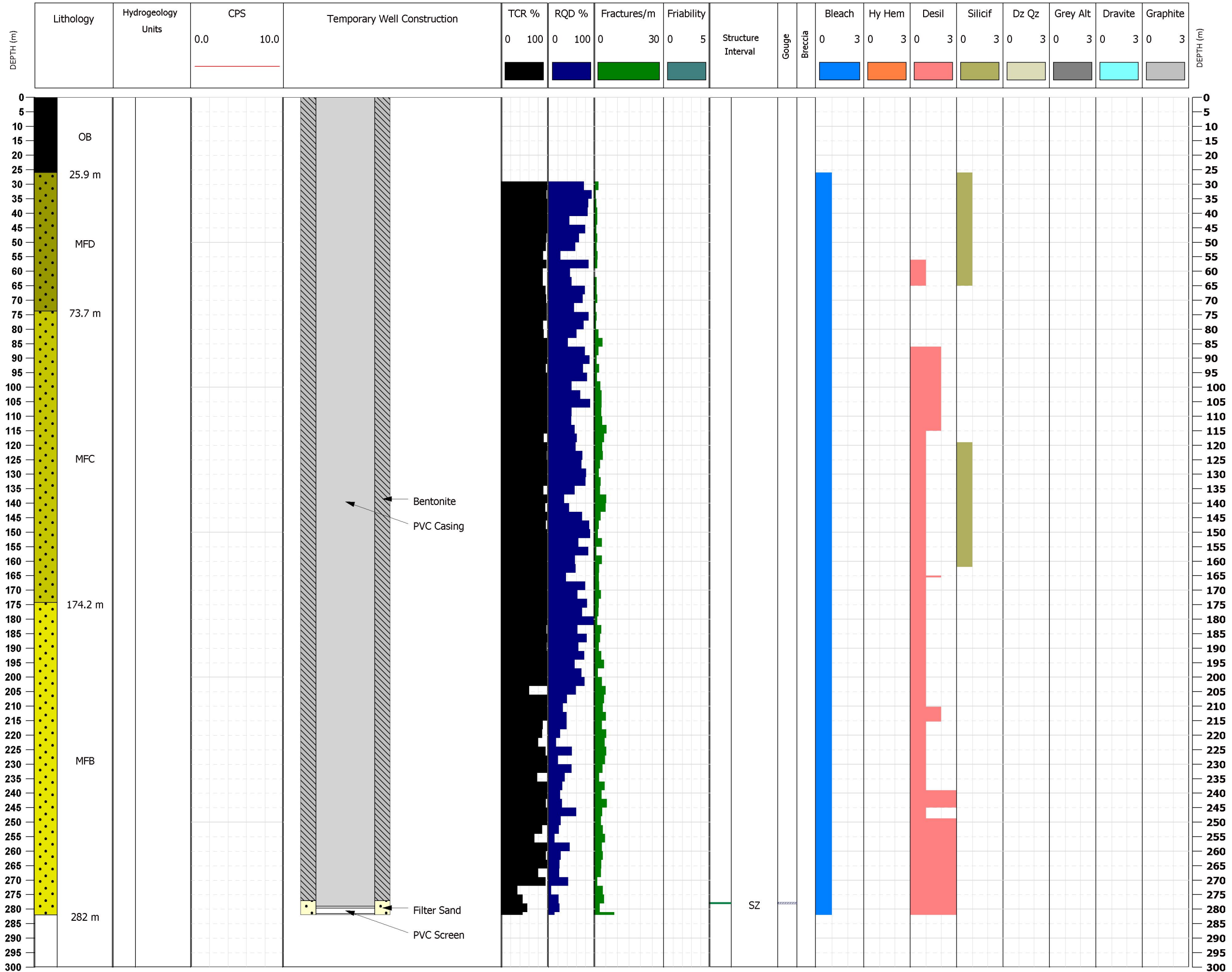
Title:	Well Schematics	Drillhole #	GWR-047
Project:	Phoenix	Drilling method:	DDH
Logged by		Total depth:	282 m
Drilling End Date:	2021	Hole Type:	PQ

Coordinates: 0.0 m E ; 0.0 m N
Elevation: 0.0 m.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10	OB						
25.9							
30	MFD						
73.7							
120	MFC						
140		Bentonite	Bentonite	0	277.1	277.1	3/8" coaed bentonite with canola oil
150		PVC Casing	PVC Casing	0	279	279	2.5" PVC casing Sch 80
174.2							
230	MFB						
277.1		Filter Sand	Filter Sand	277.1	282	4.9	
279		PVC Screen	PVC Screen	279	282	3	2.5" slotted PVC screen Sch 80
282							
290							

Comments: Depth below surface.

Title:	Well Schematics	Drillhole #	GWR-047	Coordinates:	477,132.04 m E ; 6,374,232.2 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	540.5 m.
Logged by		Total depth:	282 m	Comments:	No Hydro units or friability logged.
Drilling End Date:	2021	Hole Type:	PQ		



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknwn
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

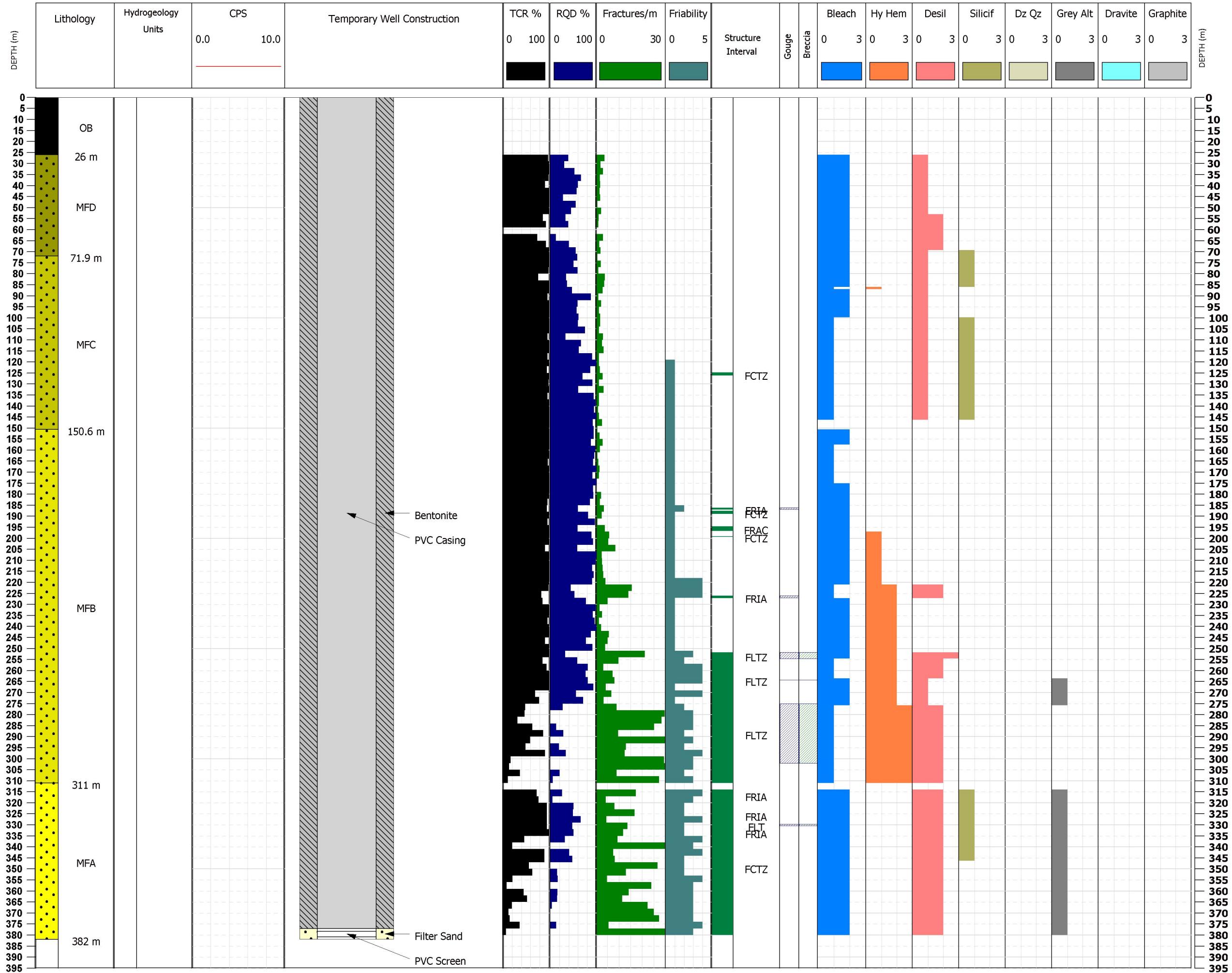
Title:	Well Schematics	Drillhole #	GWR-048
Project:	Phoenix	Drilling method:	DDH
Logged by		Total depth:	382 m
Drilling End Date:	2021	Hole Type:	

Coordinates: 477,127.99 m E ; 6,374,225.93 m N
Elevation: 540.57 m.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10	OB						
26	26 m						
30							
40							
50	MFD						
60							
70	71.9 m						
80							
90							
100							
110	MFC						
120							
130							
140							
150	150.6 m						
160							
170							
180							
190		PVC Casing	Bentonite	0	377.1	377.1	3/8" coated tablets
200		Bentonite	PVC Casing	0	377	377	2.5" PVC casing Sch 80
210							
220							
230	MFB						
240							
250							
260							
270							
280							
290							
300							
310	311 m						
320							
330							
340							
350	MFA						
360							
370							
380	382 m	PVC Screen	Filter Sand	377.1	382	4.9	
390		Filter Sand	PVC Screen	377	382	3	2.5" slotted VC screen Sch 80

Comments: Depth below surface.

Title:	Well Schematics	Drillhole #	GWR-048	Coordinates:	477,127.99 m E ; 6,374,225.93 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	540.57 m.
Logged by:		Total depth:	382 m	Comments:	
Drilling End Date:	2021	Hole Type:			



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

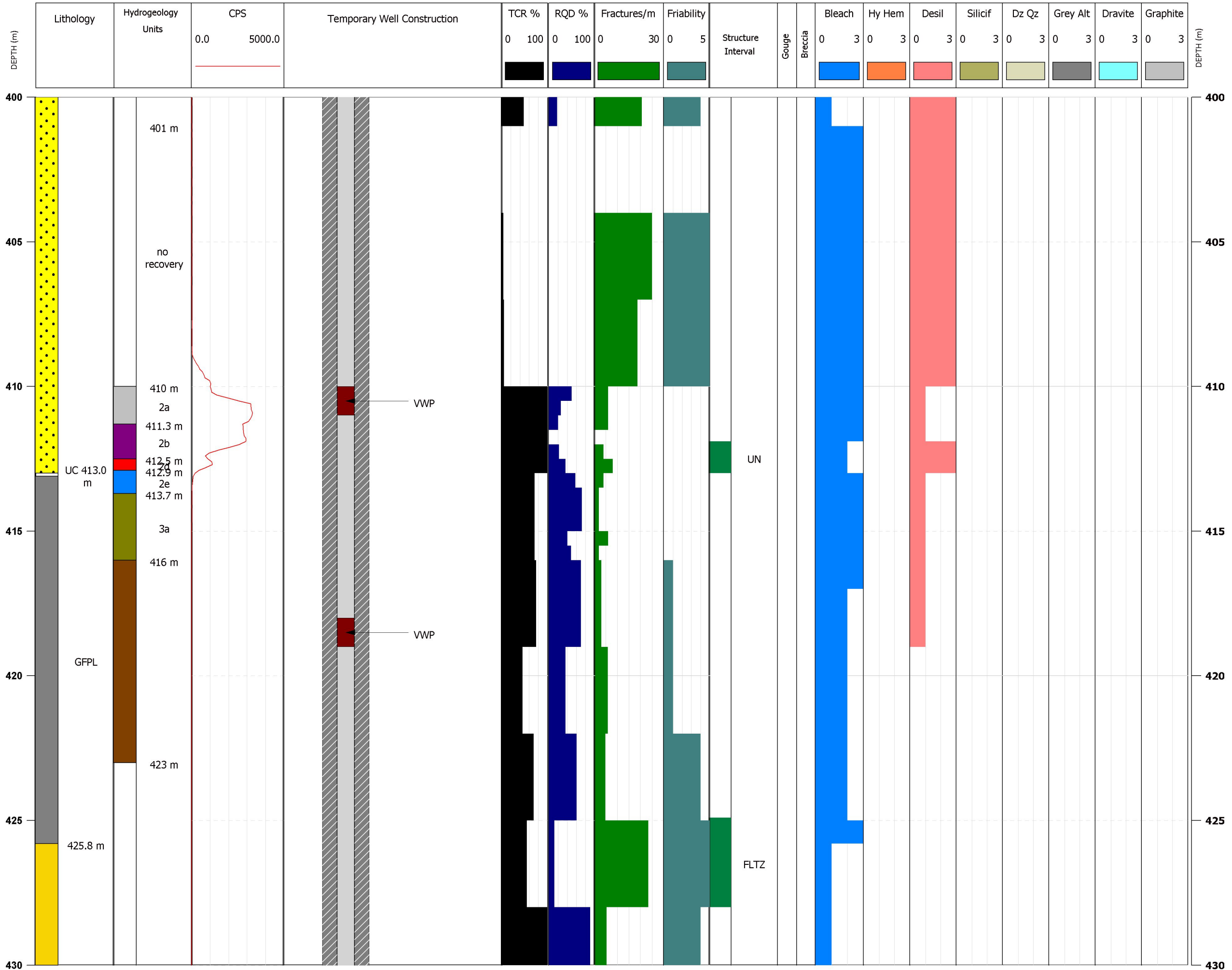
Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10	OB						
26.7	26.7 m						
30							
40	MFD						
50							
60							
70							
77.3	77.3 m						
80							
90							
100	MFC						
110							
120							
130							
140							
147		VWP	VWP		147		
150							
161	161 m						
170							
180							
190							
200							
210							
220							
227		Cement	Cement	0	452	452	
230		PVC Casing	PVC Casing	0	465	465	3/4" PVC pipe Sch 40
240							
250	MFB						
260							
270							
277		VWP	VWP		277		
280							
290							
300							
310							
320							
330							
337	337 m						
340							
350							
360							
370							
377		VWP	VWP		377		
380	MFA						
390							
400							
410	UC 413.0 m						
411		VWP	VWP		411		
419	GFPL 425.8 m						
419		VWP	VWP		419		
420							
430							
440							
450	QZIT						
452		VWP	VWP		452		
460							
465	465 m						
470							

Comments: Depth below surface.

Title:	Well Schematics	Drillhole #	GWR-049	Coordinates:	477,123.01 m E ; 6,374,234.7 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	541.26 m.
Logged by		Total depth:	465 m	Comments:	Hydrogeology units logged from photos.
Drilling End Date:	2021	Hole Type:	HQ/NQ		



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

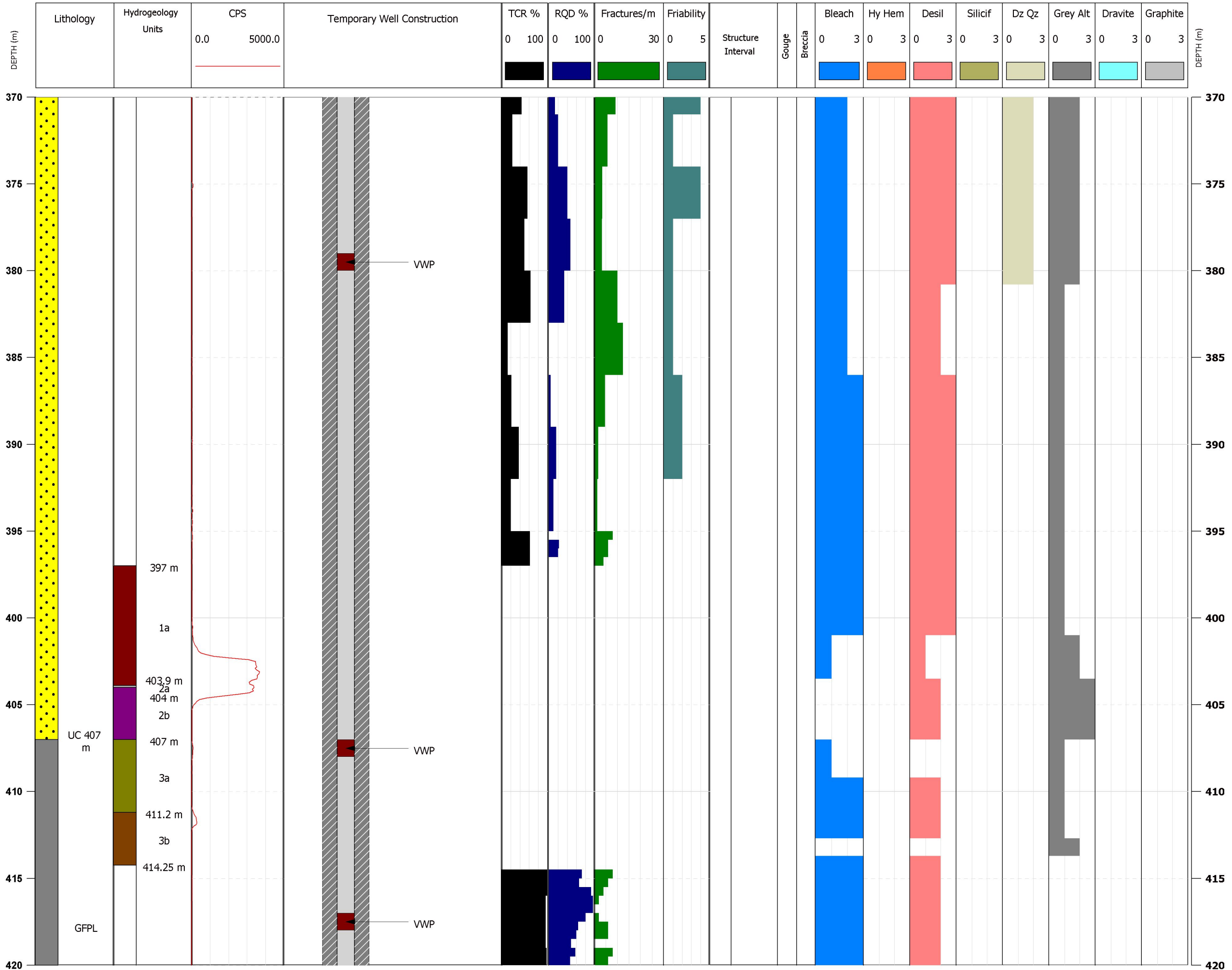
Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10	OB						
26	26 m						
30							
40	MFD						
50							
60							
70	71.8 m						
80							
90							
100	MFC						
110							
120							
130							
140							
150	151.3 m	VWP	VWP		150		
160							
170							
180							
190							
200							
210							
220							
230	MFB						
240		Cement	Cement	0	480	480	
250		PVC Casing	PVC Casing	0	482	482	3/4" PVC pipe Sch 40
260							
270							
280		VWP	VWP		280		
290							
300							
310	311 m						
320							
330							
340							
350							
360	MFA						
370							
380		VWP	VWP		380		
390							
400							
410	UC 407 m	VWP	VWP		408		
420	GFPL	VWP	VWP		418		
430	428.5 m						
440							
450	GTPL						
460							
470	464.7 m						
480	QZIT	VWP	VWP		480		

Comments: Depth below surface.



1a	2a	2b	2c
2d	2e	3a	3b

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

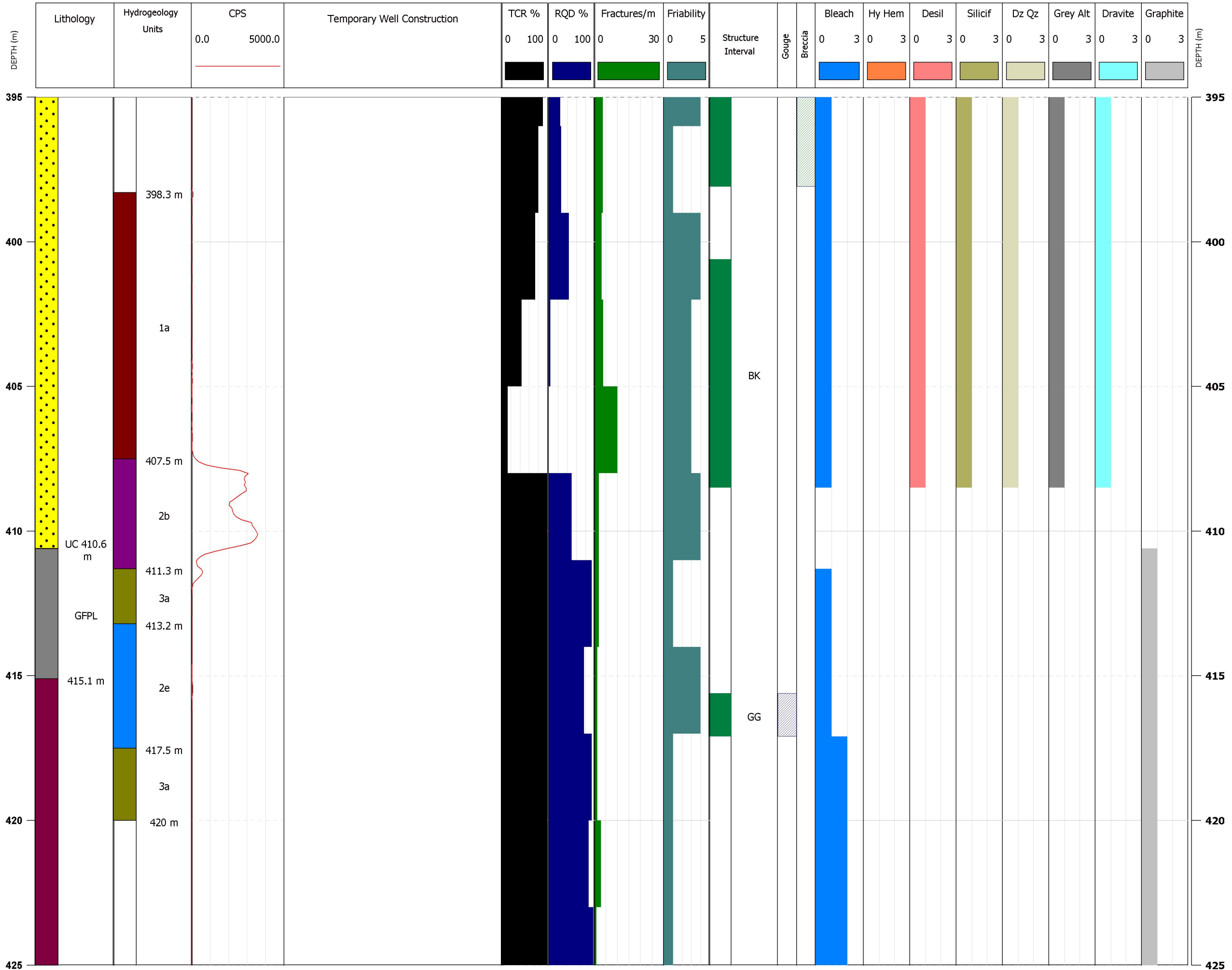
Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10	OB						
25.6							
30	MFD						
73.3							
150	MFC	VWP	VWP	150			
223		Cement	Cement	449.4	0	449.4	
223		PVC Casing	PVC Casing	451.4	0	451.4	3/4" PVC pipe Sch 40
280	MFB	VWP	VWP	280			
309							
380	MFA	VWP	VWP	380			
408		VWP	VWP	408			
415		VWP	VWP	415			
410.6	UC						
415.1	GP						
438.6	GTPL						
449.4	QZIT	VWP	VWP	449.4			
452.9							

Comments: Depth below surface. WR-342 reentry

Title:	Well Schematics	Drillhole #	GWR-051	Coordinates:	477,148.28 m E ; 6,374,228.8 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	538.98 m.
Logged by		Total depth:	450 m	Comments:	WR-342 reentry.
Drilling End Date:	2021	Hole Type:	HQ		



Hydrogeology Units			
	1a		2a
	2b		2c
	2d		2e
	3a		3b

Geotechnical

RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm.)

Fractures/m = Natural fractures per meter

Friability

0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

Structure Interval

BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone

*Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations

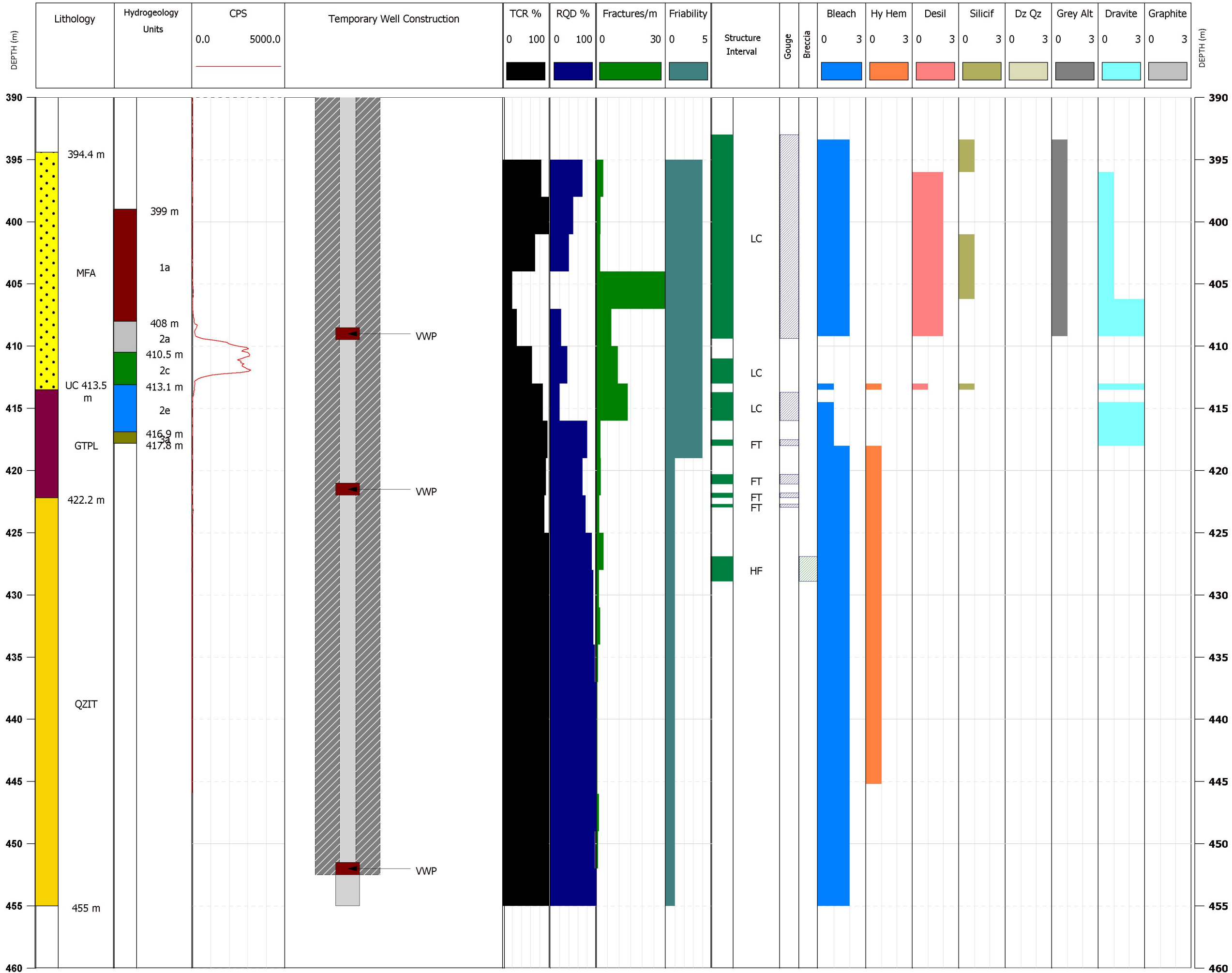
0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

Title:	Well Schematics	Drillhole #	GWR-052
Project:	Phoenix	Drilling method:	DDH
Logged by		Total depth:	455 m
Drilling End Date:	2021	Hole Type:	HQ

Coordinates: 477,143.35 m E ; 6,374,252.35 m N
Elevation: 538.4 m.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10							
20							
30							
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140							
150			VWP			150	
160							
170							
180							
190							
200							
210							
220			Cement	0	452.5	452.5	
230			PVC Casing	0	455	455	3/4" PVC pipe Sch 40
240							
250							
260							
270							
280			VWP			280	
290							
300							
310							
320							
330							
340							
350							
360							
370							
380			VWP			380	
390							
394.4	MFA						
400							
409.5	VWP					409.5	
410							
413.5	UC						
420	GTPL						
422.2	VWP					422	
430							
440	QZIT						
450							
455	VWP					452.5	
460							

Comments: Depth below surface.



Hydrogeology Units					
	1a		2a		2b
	2c		2d		2e
	3a		3b		

Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

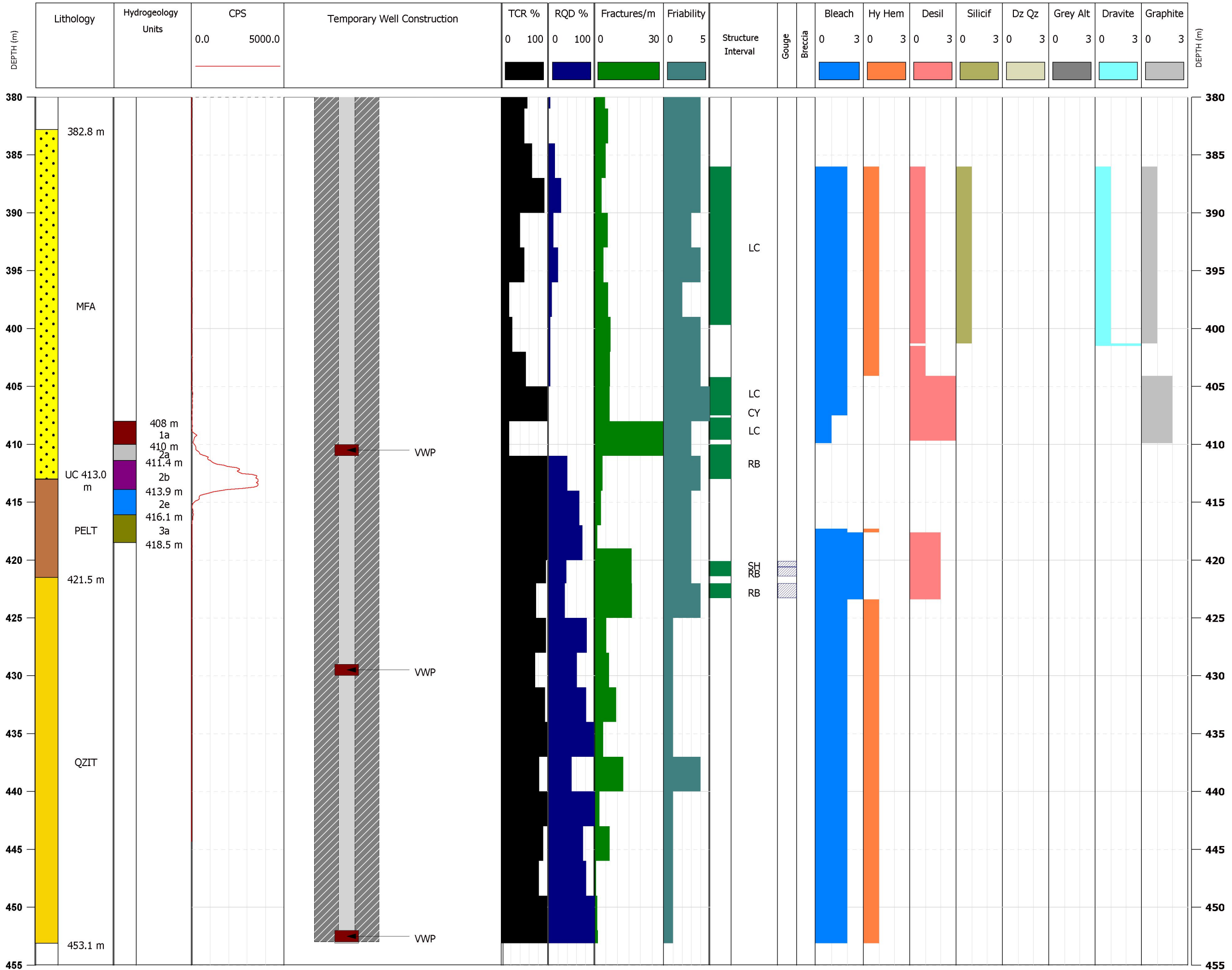
Title:	Well Schematics	Drillhole #	GWR-053
Project:	Phoenix	Drilling method:	DDH
Logged by		Total depth:	453.1 m
Drilling End Date:	2021	Hole Type:	HQ

Coordinates: 477,131.49 m E ; 6,374,242.0 m N
Elevation: 540.67 m.

DEPTH (m)	Lithology	Well Construction	Material	Depth From (m)	Depth To (m)	Length (m)	Specifications
0							
10							
20							
30							
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140							
150		VWP	VWP		150		
160							
170							
180							
190							
200							
210							
220							
230		Cement	Cement	0	453	453	
240		PVC Casing	PVC Casing	0	453.1	453.1	3/4" PVC pipe Sch 40
250							
260							
270							
280		VWP	VWP		280		
290							
300							
310							
320							
330							
340							
350							
360							
370							
380		VWP	VWP		380		
382.8	MFA						
390							
400							
410		VWP	VWP		411		
413.0	UC						
420	PELT						
421.5							
430		VWP	VWP		430		
440	QZIT						
450		VWP	VWP		453		
453.1							
460							

Comments: Depth below surface.

Title:	Well Schematics	Drillhole #	GWR-053	Coordinates:	477,131.49 m E ; 6,374,242.0 m N
Project:	Phoenix	Drilling method:	DDH	Elevation:	0.0 m.
Logged by:		Total depth:	453.1 m	Comments:	Probe data and hydrogeology units from WR-435 (reentry).
Drilling End Date:	2021	Hole Type:	HQ		



1a	2a	2b	2c
2d	2e	3a	3b

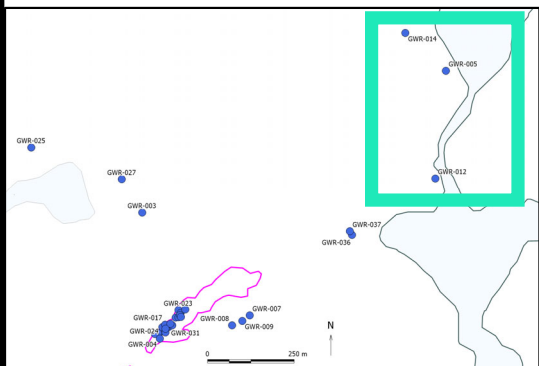
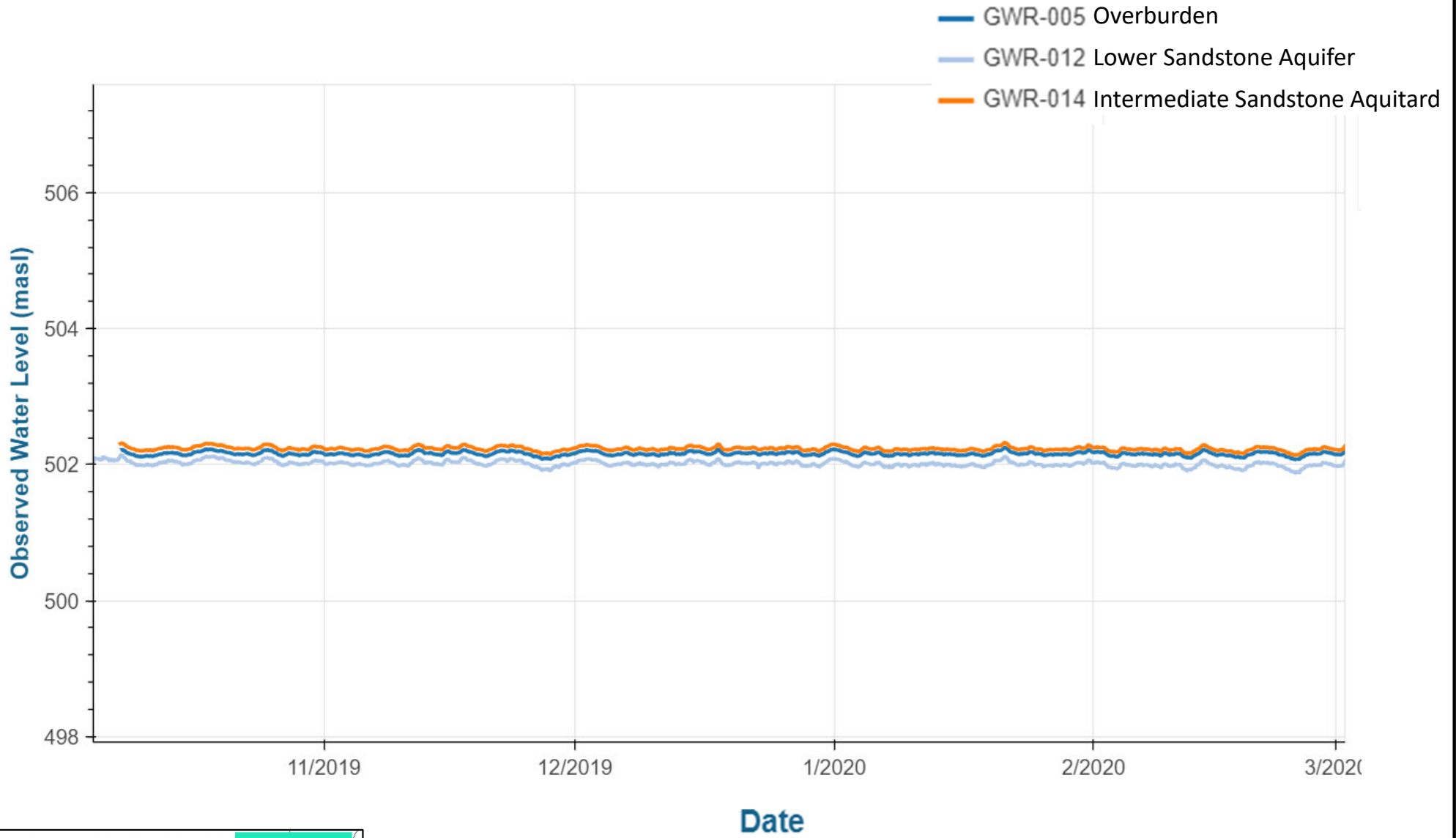
Geotechnical
 RQD % = Rock Quality Designation (sum of competent core length greater than 10 cm).
 Fractures/m = Natural fractures per meter

Friability
 0 = Unknown
 1 = Competent (very hard)
 2 = Moderately friable
 3 = Friable (crumbles in hand)
 4 = Locally friable over interval
 5 = Unconsolidated

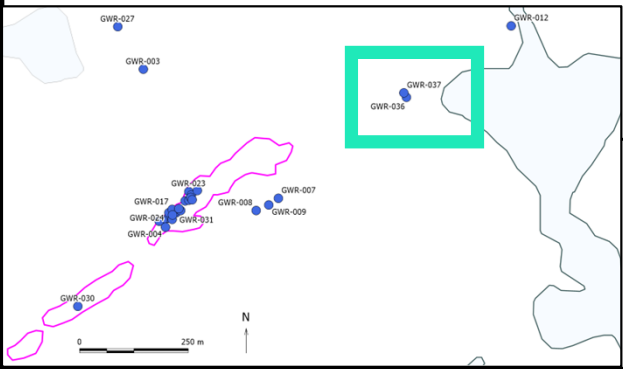
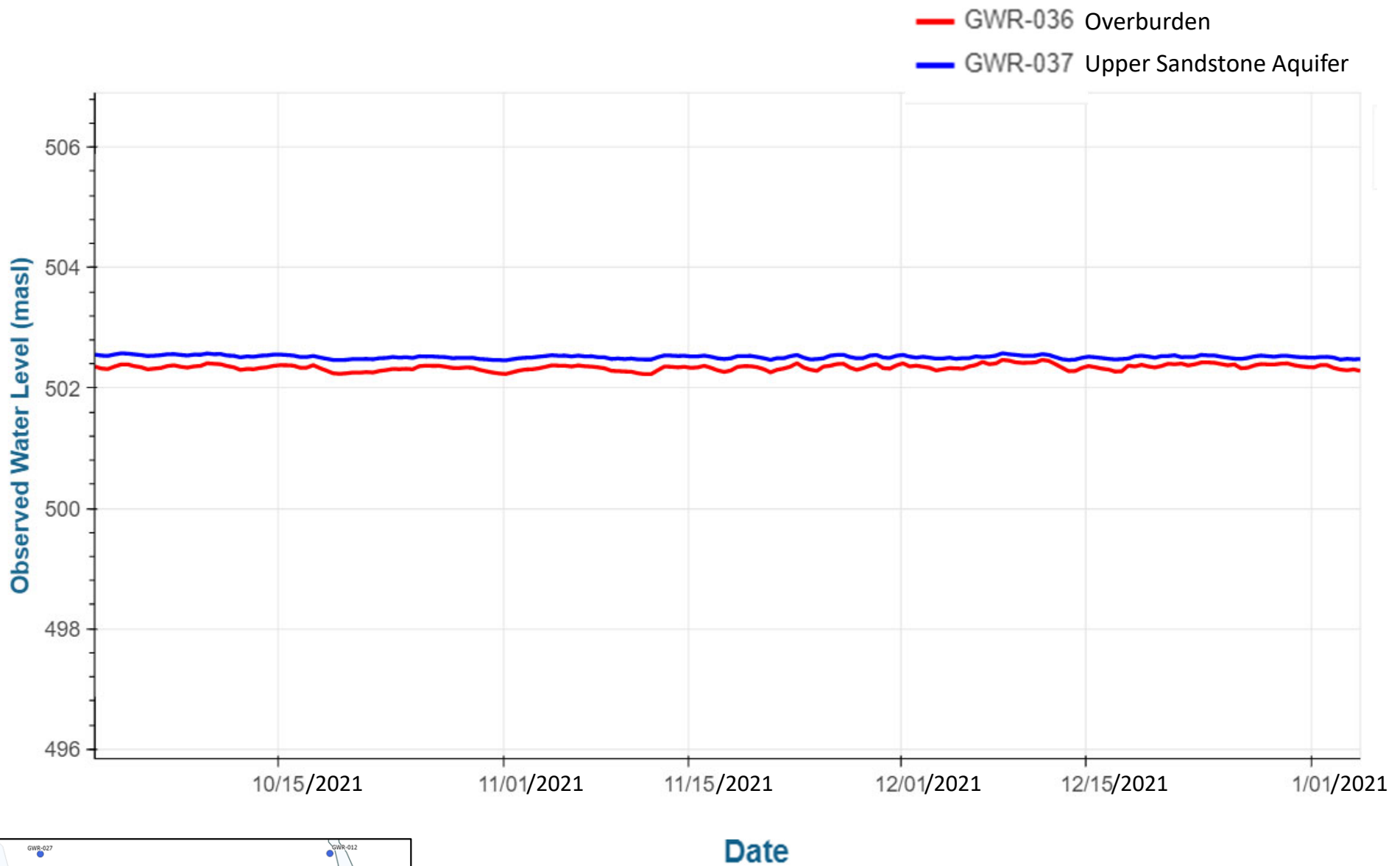
Structure Interval
 BC = Breccia FLT = Fault FLTZ = Fault Zone
 SZ = Shear Zone FCT = Fault FCTZ = Fracture Zone
 *Gouge and Breccia columns indicate the presence of these structures in the interval, not the accurate length.

Alterations
 0 = Not present
 1 = Weak
 2 = Moderate
 3 = Strong

Appendix B Monitoring Well Hydrographs

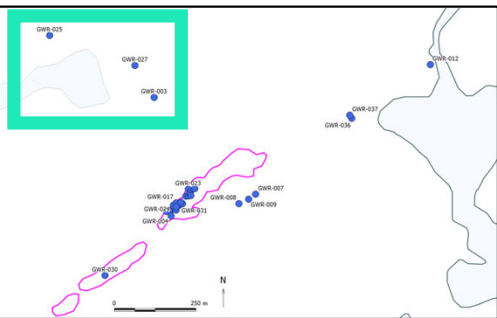
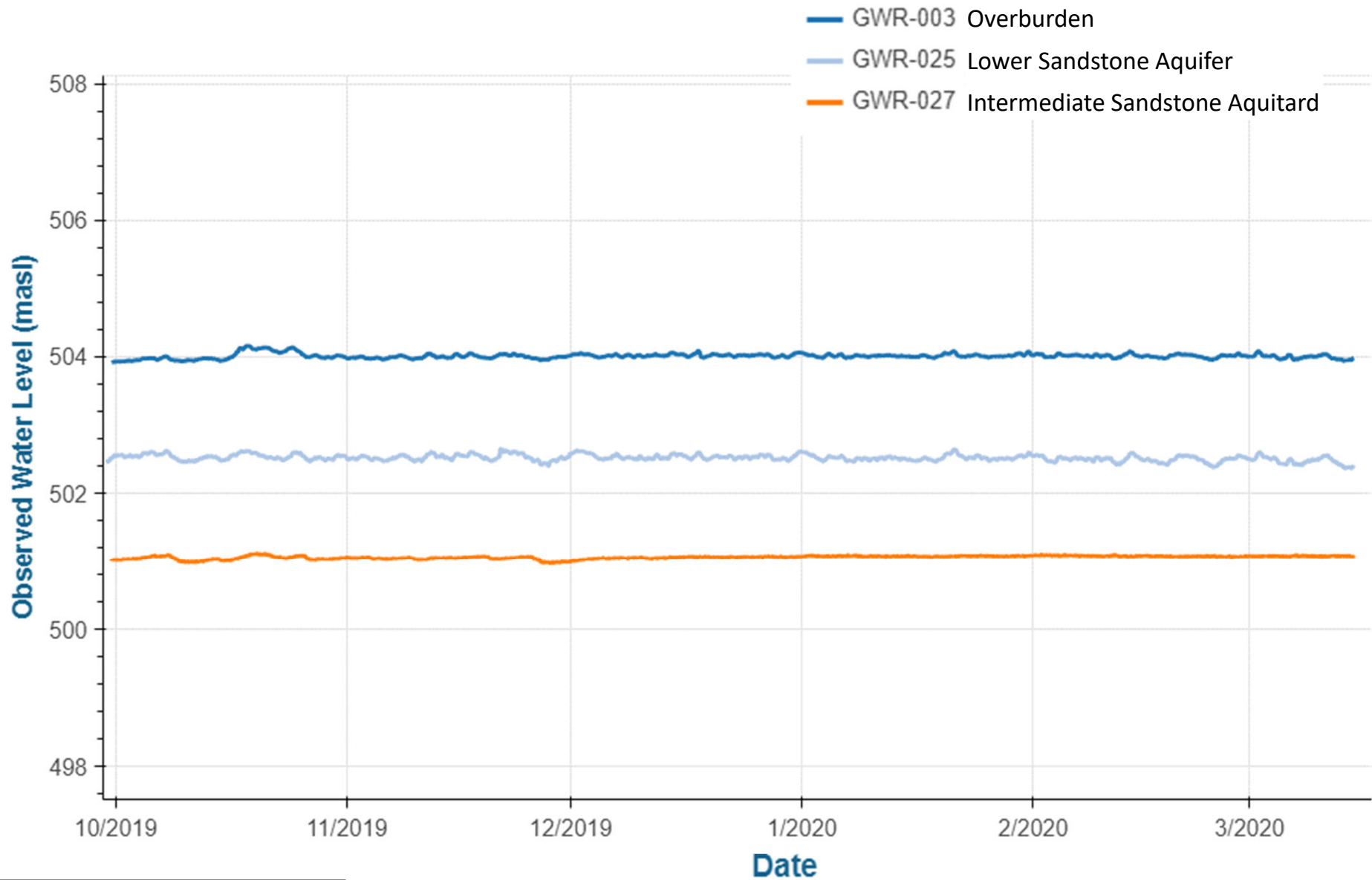


Wheeler River Project
Baseline Geology and Hydrogeological Assessment



GWR-037 contains a vented transducer that does not require barometric correction.

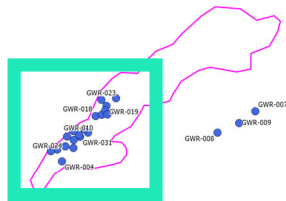
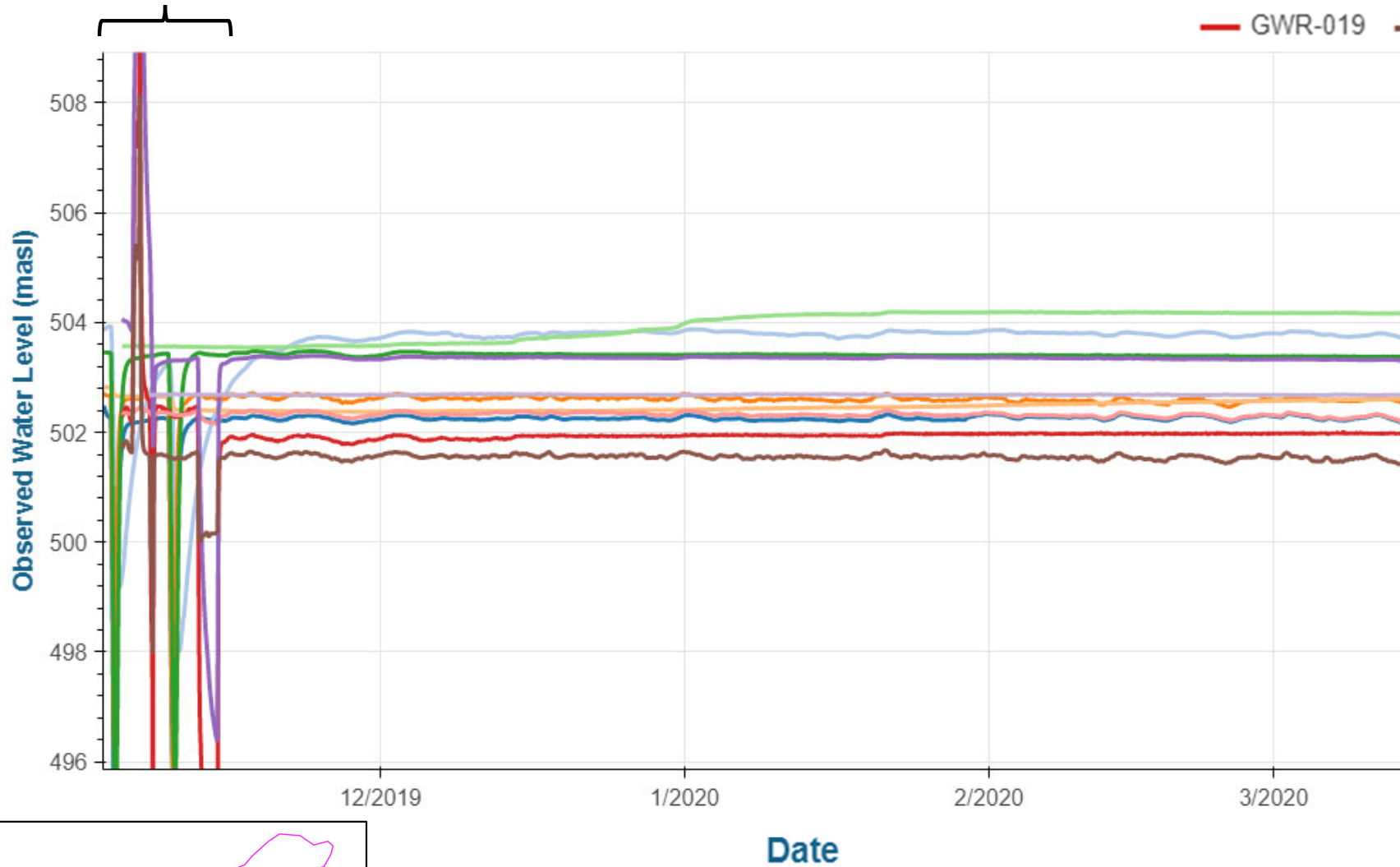
Wheeler River Project	
Baseline Geology and Hydrogeological Assessment	
B2	



Wheeler River Project
Baseline Geology and Hydrogeological Assessment

Hydraulic Testing
 (full water level extents
 not shown)

- GWR-001 GWR-015 GWR-022
- GWR-004 GWR-016 GWR-023
- GWR-010 GWR-018 GWR-024
- GWR-019 GWR-026



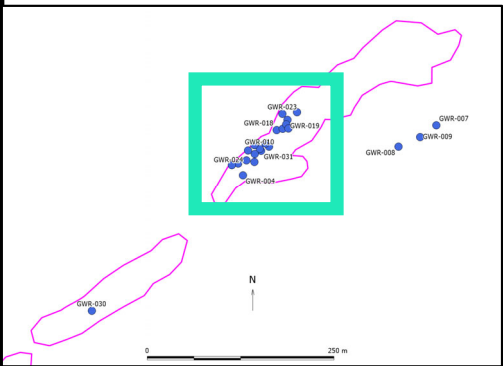
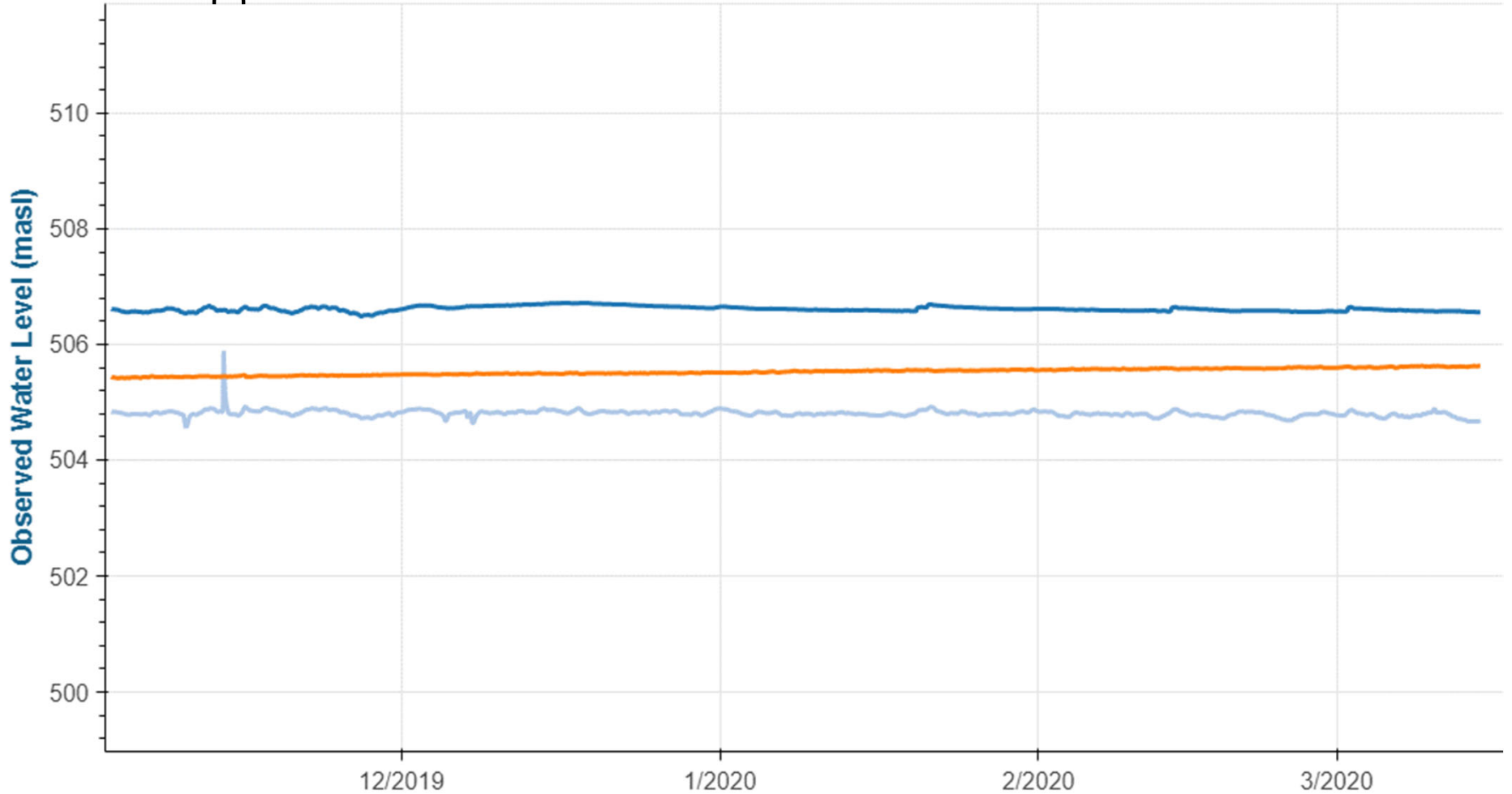
Wells screened across the Ore Zone and Barrier Zones; some wells also screened across the Lower Sandstone Aquifer and Basement Aquifers. Well screens vary from 5 to 11 m in length.

Wheeler River Project
Baseline Geology and Hydrogeological Assessment

Hydraulic Testing



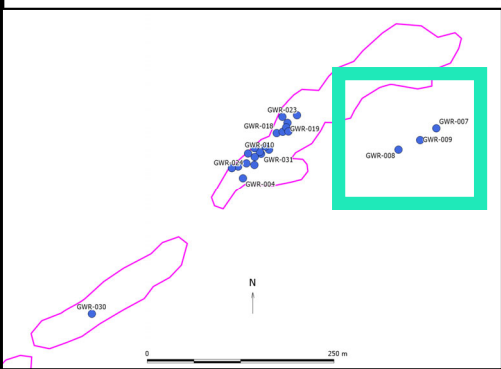
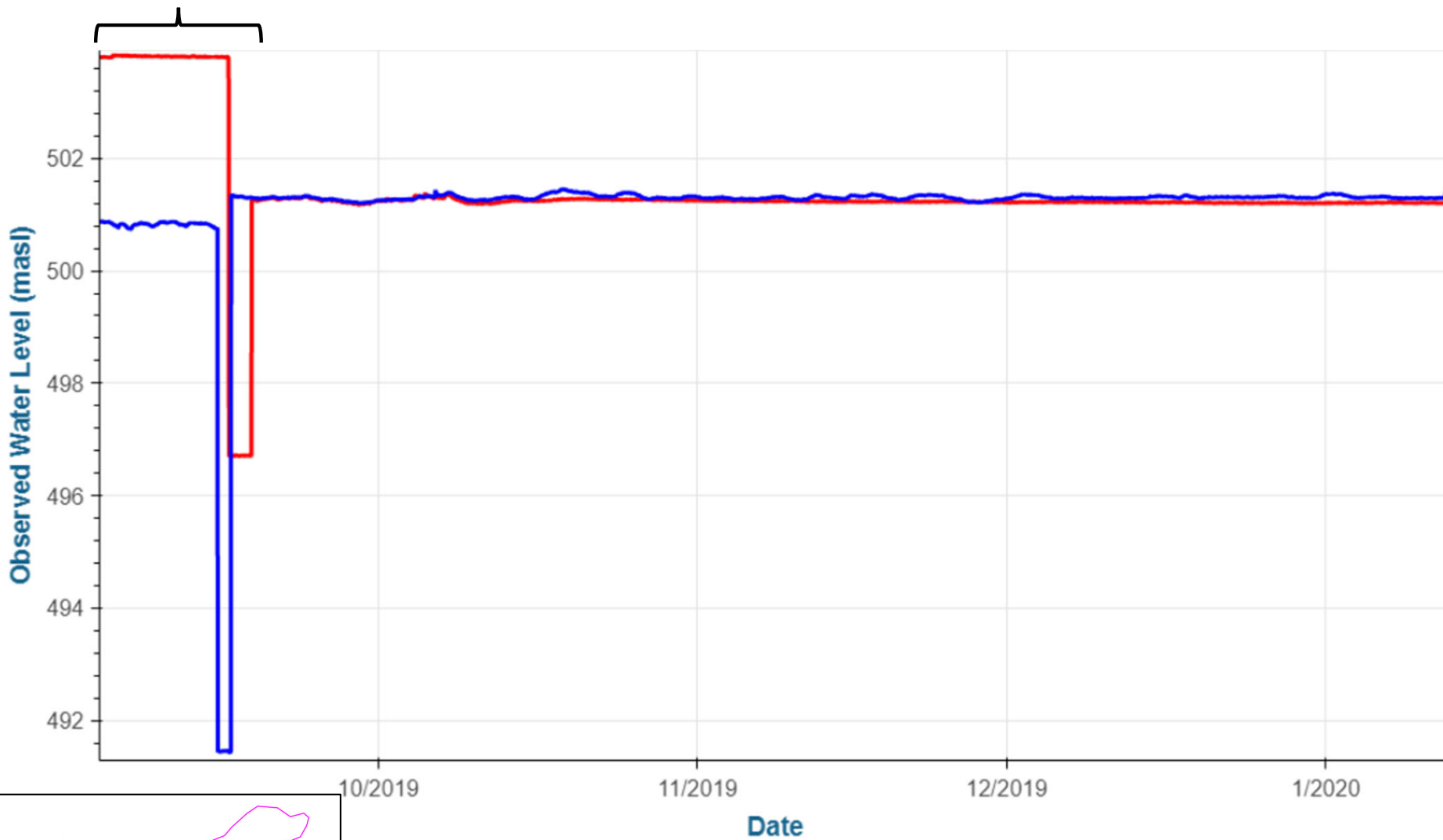
- GWR-011 Lower Sandstone Aquifer
- GWR-013 Intermediate Sandstone Aquitard
- GWR-017 Ore Zone/ Barrier Zones



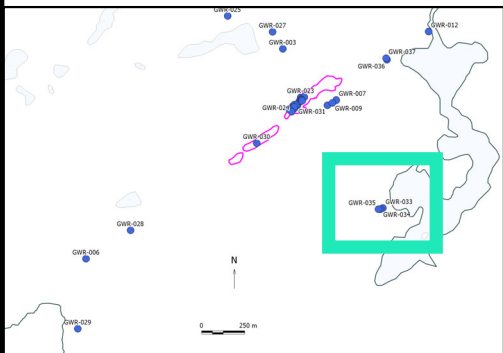
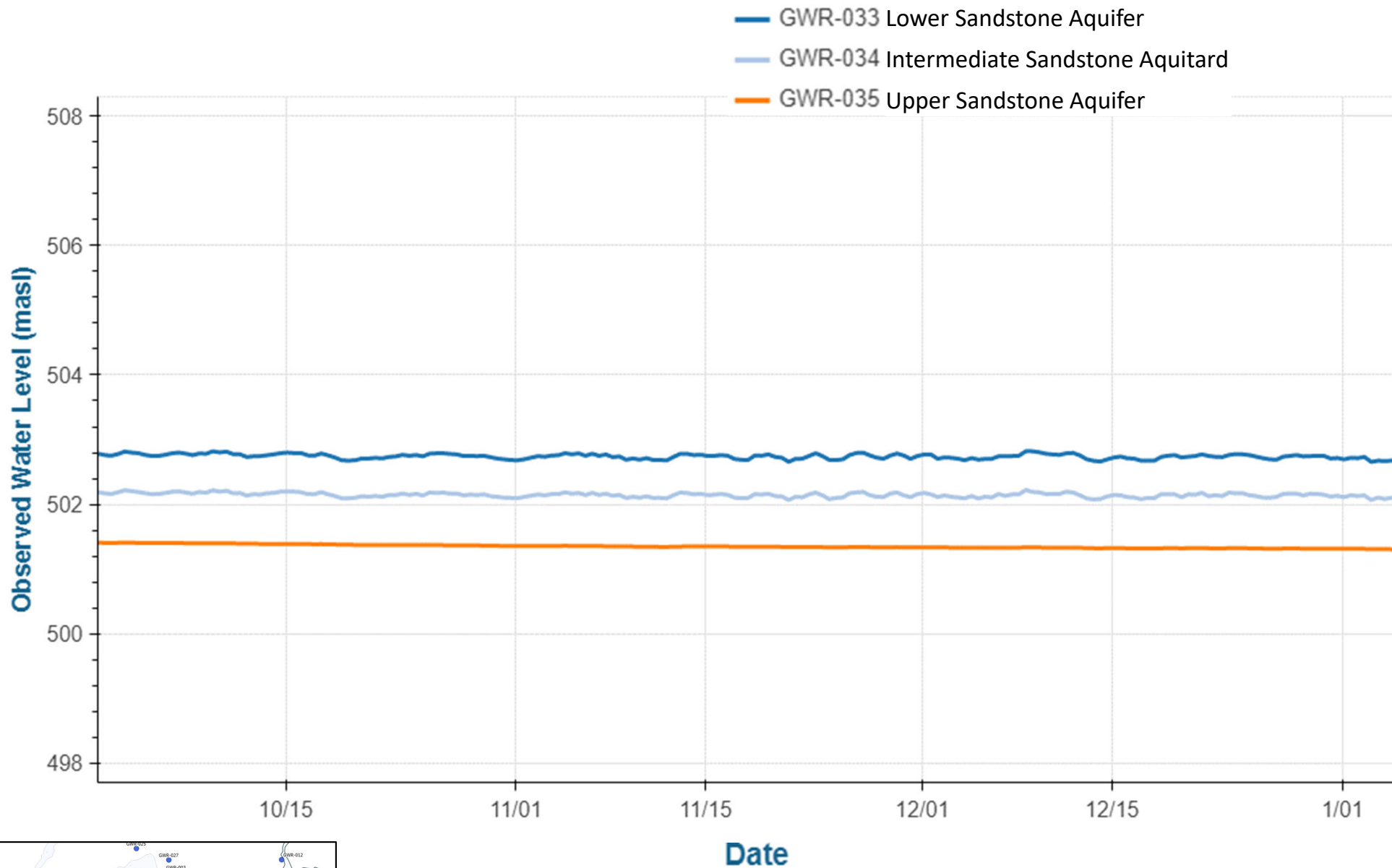
Wheeler River Project
Baseline Geology and Hydrogeological Assessment

— GWR-008 Lower Sandstone Aquifer
— GWR-009 Intermediate Sandstone Aquitard

Hydraulic Testing

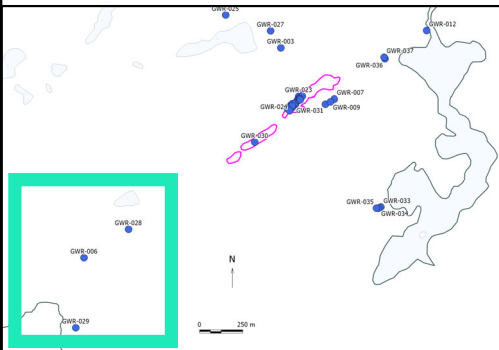
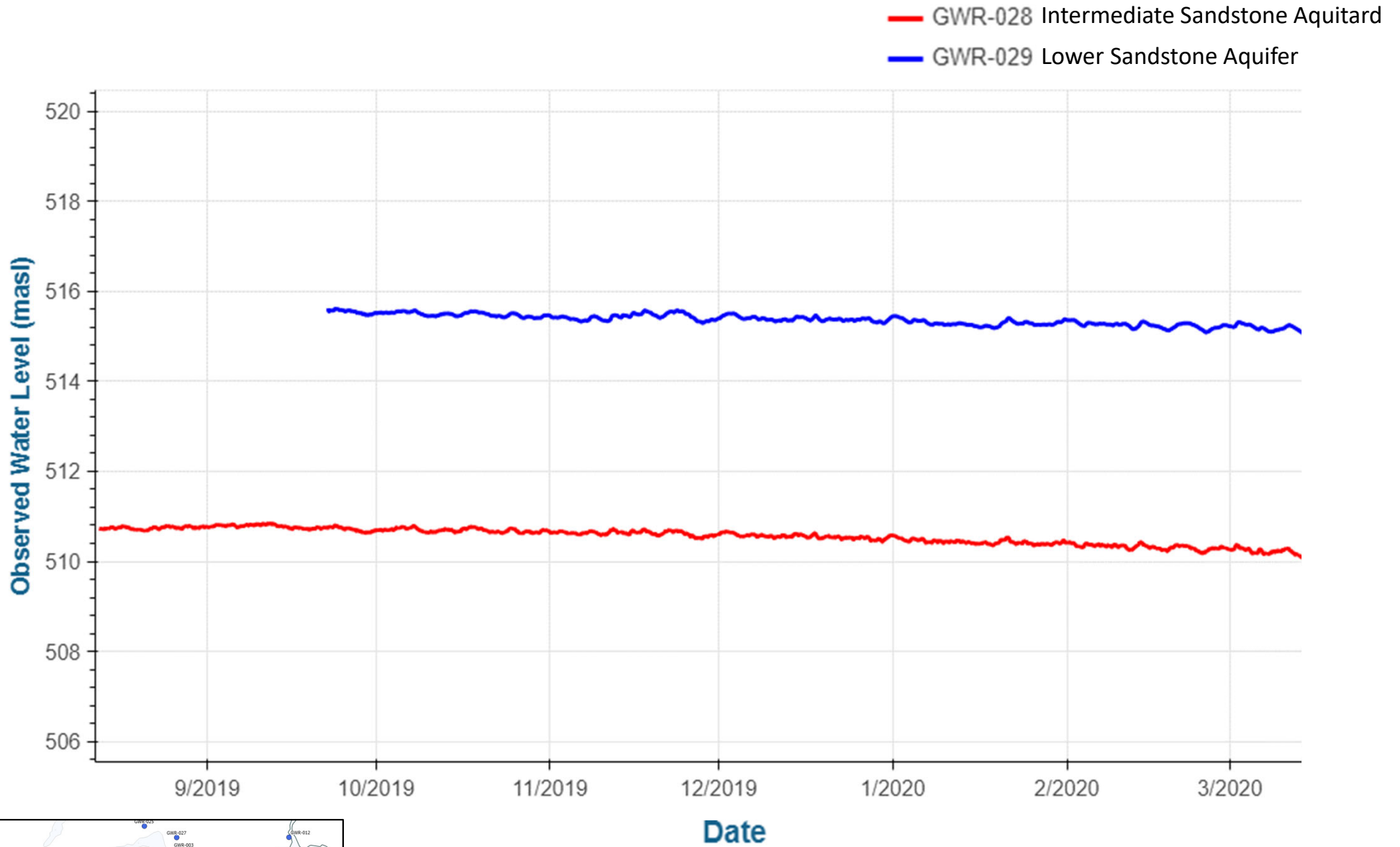


Wheeler River Project
Baseline Geology and Hydrogeological Assessment



GWR-033 to -035 contain vented transducers that do not require barometric correction.

**Wheeler River Project
Baseline Geology and Hydrogeological Assessment**



Wheeler River Project
Baseline Geology and Hydrogeological Assessment

Appendix C Summary of Hydraulic Testing Data and Conductivity Values

Table C-1 Summary of Hydraulic Testing Data and Conductivity Values

Well Name	Hydrostratigraphic Unit	Lithologic Unit	Estimated K (m/s)	Comment	Type of Hydraulic Test	Reference	Direction	Depth to Screen/ Packer (m)		
								Top	Bottom	
GWR-036	Overburden Aquifer	Overburden	3.00E-06	Pumping well	Pseudo Pump Test	Appendix D	Vertical	43.0	49.0	
GWR-035		Mfd / Overburden	2.00E-04	Pumping well	Pseudo Pump Test	Appendix D	Vertical	0.0	0.0	
GWR-037	Upper Sandstone Aquifer	MFd	1.00E-04	Pumping well	Pseudo Pump Test	Appendix D	Vertical	0.0	0.0	
WR-555		MFd	6.00E-06		Packer test	Golder, 2014	Vertical	38.4	46.5	
WR-555		MFd/ MFc contact	3.00E-06		Packer test	Golder, 2014	Vertical	44.4	88.5	
WR-555		MFc	4.00E-07		Packer test	Golder, 2014	Vertical	86.4	130.5	
WR-555		MFc	1.00E-06		Packer test	Golder, 2014	Vertical	129.4	172.5	
GWR-009		MFb	8.40E-07		Packer test	Scibek, 2019	Oriented	272.0	280.0	
GWR-027	Intermediate Sandstone Aquitard	MFb	3.80E-06	Used early-time flow rate 13 l/min	Packer test	Scibek, 2019	Vertical	274.0	280.0	
GWR-034		MFb	< 1e-7	Pumping well	Pseudo Pump Test	Appendix D	Vertical	215.0	221.0	
WR-555		MFc/ MFb contact	7.00E-07		Packer test	Golder, 2014	Vertical	171.9	214.5	
WR-606		MFa	4.30E-09		Packer test	SRK, 2015	Oriented	394.2	429.0	
WR-695		MFc	6.02E-08		Packer test	SRK, 2018b	Vertical	100.2	201.0	
WR-695		MFc	<3.0E-7	<3.0E-7	Packer test	SRK, 2018b	Vertical	202.2	210.0	
WR-695		MFc	<3.0E-7	<3.0E-7	Packer test	SRK, 2018b	Vertical	202.2	210.0	
WR-695		MFc	<2.0E-7	<2.0E-7	Packer test	SRK, 2018b	Vertical	211.2	225.0	
WR-695		MFc	1.00E-10		Packer test	SRK, 2018b	Vertical	223.2	246.0	
WR-695		MFc/ MFb	1.00E-10		Packer test	SRK, 2018b	Vertical	247.2	270.0	
WR-695		MFb	1.00E-10		Packer test	SRK, 2018b	Vertical	271.2	294.0	
WR-695		MFb	9.68E-10		Packer test	SRK, 2018b	Vertical	295.2	318.0	
WR-695		MFb	5.39E-10		Packer test	SRK, 2018b	Vertical	319.2	342.0	
WR-695		MFb/MFa	1.34E-09		Packer test	SRK, 2018b	Vertical	343.2	366.0	
WR-695		MFa	2.05E-09		Packer test	SRK, 2018b	Vertical	367.2	390.0	
WR-695		MFa	1.34E-08		Packer test	SRK, 2018b	Vertical	391.2	414.0	
GWR-046		MFc	7.60E-07		Pumping test	Petrotek, 2021	Vertical	149.0	152.0	
WR-555		Desilicified Zone	MFb	1.00E-06		Packer test	Golder, 2014	Vertical	213.7	256.5
WR-555			MFb	1.00E-05	Did packer seal?	Packer test	Golder, 2014	Vertical	255.9	298.5
GWR-014			MFc	8.70E-06		Packer test	Scibek, 2019	Vertical	149.0	158.0
WR-555	MFa		2.00E-05		Packer test	Golder, 2014	Vertical	281.7	363.3	
GWR-047	MFb		2.70E-06		Pumping test	Petrotek, 2021	Vertical	279.0	282.2	
GWR-048	MFa		2.70E-06		Pumping test	Petrotek, 2021	Vertical	379.0	382.0	
WR-405	Lower Sandstone Aquifer	MFa	3.00E-05		Packer test	SRK, 2017	Vertical	356.4	379.6	
GWR-008		MFa	1.30E-05		Packer test	Scibek, 2019	Oriented	369.0	380.0	
GWR-025		MFa	6.60E-06	Packer stayed inflated	Packer test	Scibek, 2019	Vertical	374.0	380.0	
GWR-033		MFa	4.00E-06	Pumping well	Pseudo Pump Test	Appendix D	Vertical	345.6	351.6	
GWR-048		MFa	2.70E-06		Pumping test	Petrotek, 2021	Vertical	379.0	382.0	
WR-555		MFa, Barrier Zones, Ore zone	2.00E-06		Packer test	Golder, 2014	Vertical	365.5	409.5	
WR-594		MFa	2.50E-07		Open Hole	SRK, 2015	Oriented	451.2	489.0	
WR-601		MFa and Basement	1.30E-06		Packer test	SRK, 2015	Oriented	376.2	822.0	

Well Name	Hydrostratigraphic Unit	Lithologic Unit	Estimated K (m/s)	Comment	Type of Hydraulic Test	Reference	Direction	Depth to Screen/ Packer (m)	
								Top	Bottom
WR-602		MFa and Basement	1.60E-05	fault at 463 m; open fracture at 466 m deep - drive high K	Packer test	SRK, 2015	Oriented	451.2	490.0
WR-603A		MFa	1.20E-06		Packer test	SRK, 2015	Oriented	361.2	380.0
WR-604		MFa	7.80E-08		Packer test	SRK, 2015	Oriented	418.2	450.0
WR-695		MFa	1.81E-07		Packer test	SRK, 2018b	Vertical	415.2	438.0
WR-695		MFa	8.59E-07		Packer test	SRK, 2018b	Vertical	415.2	438.0
WR-695		MFa	5.73E-07		Packer test	SRK, 2018b	Vertical	415.2	438.0
WR-695		MFa	2.92E-06		Packer test	SRK, 2018b	Vertical	439.2	462.0
WR-695		MFa	3.25E-06		Packer test	SRK, 2018b	Vertical	439.2	462.0
WR-695		MFa	5.11E-06		Packer test	SRK, 2018b	Vertical	457.2	465.0
GWR-012		MFa	1.30E-05		Packer test	Scibek, 2019	Oriented	339.0	347.0
GWR-001	Lower Sandstone Aquifer, Barrier Zones, Ore Zone, Paleoweathered Basement	MFa, Upper and Lower Barrier Aquitard, Ore Zone, Paleoweathered Basement	1.70E-08	Observation well	GWR-010 Development	Petrotek, 2020	Vertical	405.7	410.0
GWR-001			1.00E-08	Observation well	GWR-010 Development	Petrotek, 2020	Vertical	405.7	410.0
GWR-001			6.00E-08	Observation well	GWR-010 Injection Test	Petrotek, 2020	Vertical	405.7	410.0
GWR-001			6.00E-08	Observation well	GWR-031 Pump Test	Petrotek, 2020	Vertical	405.7	410.0
GWR-010			1.70E-08	Pumping well	GWR-010 Development	Petrotek, 2020	Vertical	404.2	410.0
GWR-010			2.80E-07	Observation well	GWR-001 Injection Test	Petrotek, 2020	Vertical	404.2	410.0
GWR-010			7.40E-09	Observation well	GWR-031 Pump Test	Petrotek, 2020	Vertical	404.2	410.0
GWR-015			2.20E-07	Observation well	GWR-001 Injection Test	Petrotek, 2020	Vertical	406.1	409.0
GWR-016			6.30E-07		Packer test	Scibek, 2019	Vertical	408.5	417.5
GWR-016			2.50E-09	Observation well	GWR-010 Development	Petrotek, 2020	Vertical	405.6	411.6
GWR-016			2.50E-09	Observation well	GWR-010 Development	Petrotek, 2020	Vertical	405.6	411.6
GWR-016			1.80E-09	Observation well	GWR-010 Injection Test	Petrotek, 2020	Vertical	405.6	411.6
GWR-016			1.10E-07	Observation well	GWR-001 Development	Petrotek, 2020	Vertical	405.6	411.6
GWR-016			5.40E-09	Observation well	GWR-001 Injection Test	Petrotek, 2020	Vertical	405.6	411.6
GWR-017			2.60E-06		Packer test	Scibek, 2019	Vertical	405.5	411.5
GWR-019	6.40E-09	Observation well	GWR-032 Pre-MP Injection Test	Petrotek, 2020	Vertical	403.3	413.4		
GWR-019	2.90E-07	Observation well	GWR-032 Post-MP Injection Test	Petrotek, 2020	Vertical	403.3	413.4		
WR-287	Lower Sandstone Aquifer, Barrier Zones, Ore Zone, Paleoweathered Basement	MFa, Upper and Lower Barrier Aquitard, Ore Zone, Paleoweathered Basement	1.50E-07		Packer test	SRK, 2017	Vertical	364.2	408.0
GWR-026			1.60E-06	Good test; packer inflation confirmed	Packer test	Scibek, 2019	Vertical	401.0	412.0
GWR-026			4.60E-07	Observation well	GWR-019 Injection Test	Petrotek, 2020	Vertical	401.0	412.7
GWR-026			2.50E-07	Observation well	GWR-032 Pre-MP Injection Test	Petrotek, 2020	Vertical	401.0	412.7
GWR-026			1.20E-07	Observation well	GWR-032 Post-MP Injection Test	Petrotek, 2020	Vertical	401.0	412.7
GWR-026			3.70E-07	Observation well	GWR-032 Pump Test	Petrotek, 2020	Vertical	401.0	412.7
GWR-038			3.60E-07	Pumping well	Pumping test	Petrotek, 2021	Vertical	405.0	419.2
GWR-039			5.50E-07	Pumping well	Pumping test	Petrotek, 2021	Vertical	390.8	418
GWR-040			2.70E-07	Pumping well	Pumping test	Petrotek, 2021	Vertical	389.3	416.5
GWR-041			2.30E-07	Pumping well	Pumping test	Petrotek, 2021	Vertical	386.3	413.5
GWR-042			1.70E-07	Pumping well	Pumping test	Petrotek, 2021	Vertical	389.0	416.2
GWR-004			3.00E-07		Packer test	Scibek, 2019	Vertical	401.0	409.0

Well Name	Hydrostratigraphic Unit	Lithologic Unit	Estimated K (m/s)	Comment	Type of Hydraulic Test	Reference	Direction	Depth to Screen/ Packer (m)	
								Top	Bottom
GWR-020	Barrier Zones, Ore Zone, Aquifer, Basement Aquitard	Upper and Lower Barrier Aquitard, Ore Zone, Paleoweathered Basement	5.60E-06	Not cemented above the U mineralization. Fault zone cuts this area.	Packer test	Scibek, 2019	Vertical	403.5	413.0
GWR-024			3.60E-06	Used 1st minute of flow because packer deflated	Packer test	Scibek, 2019	Vertical	403.0	410.0
GWR-024			9.10E-09	Observation well	GWR-010 Development	Petrotek, 2020	Vertical	403.0	408.9
GWR-024			9.10E-08	Observation well	GWR-001 Development	Petrotek, 2020	Vertical	403.0	408.9
GWR-032			5.60E-08	Injection	GWR-032 Pre-MP Injection Test	Petrotek, 2020	Vertical	401.6	413.1
GWR-032			5.60E-08	Injection	GWR-032 Post-MP Injection Test	Petrotek, 2020	Vertical	401.6	413.1
GWR-032			9.60E-07	Pumping well	GWR-032 Pump Test	Petrotek, 2020	Vertical	401.6	413.1
GWR-023			1.10E-07	No fractures or permeable features	Packer test	Scibek, 2019	Vertical	418.0	423.9
GWR-023	Ore Zone and Barrier Zones	Ore Zone and Barrier Zones	1.00E-07	High flow was likely storage effect into clay zone (enlarging the hole)	Packer test	Scibek, 2019	Vertical	413.0	418.0
GWR-023			5.30E-07	Observation well	GWR-019 Injection Test	Petrotek, 2020	Vertical	412.0	417.9
GWR-023			1.10E-07	Observation well	GWR-032 Post-MP Injection Test	Petrotek, 2020	Vertical	412.0	417.9
GWR-023			4.90E-07	Observation well	GWR-032 Pump Test	Petrotek, 2020	Vertical	412.0	417.9
GWR-016	Ore Zone and Barrier Zones	Upper Barrier Zone, Ore Zone	1.30E-08		Packer test	Scibek, 2019	Vertical	405.5	408.5
GWR-016	Ore Zone and Barrier Zones	Upper and Lower Barrier Zone, Ore Zone	3.60E-10	Observation well	GWR-031 Pump Test	Petrotek, 2020	Vertical	405.6	411.6
GWR-021	Lower Barrier Zone, Basement Rock	Lower Barrier Zone and Basement Aquitard	9.00E-06		Packer test	Scibek, 2019	Vertical	412.4	426.4
GWR-031	Basement Aquitard	Upper and Lower Barrier Zone, Ore Zone, Paleoweathered Basement	1.60E-09	Pumping well	GWR-031 Pump Test	Petrotek, 2020	Vertical	407.4	414.7
WR-582	Basement Aquitard	Basement	4.30E-08		Packer test	SRK, 2015	Oriented	451.2	495.0
WR-594			1.60E-07		Packer test	SRK, 2015	Oriented	490.2	517.0
WR-594			1.60E-08		Packer test	SRK, 2015	Oriented	517.2	564.0
WR-594			2.10E-07		Open Hole	SRK, 2015	Oriented	517.2	564.0
WR-605			3.40E-07		Open Hole	SRK, 2015	Oriented	451.2	510.0
GWR-018			3.50E-08		Packer test	Scibek, 2019	Vertical	405.4	412.0
GWR-021			1.10E-05		Packer test	Scibek, 2019	Vertical	427.4	443.0
GWR-024			7.30E-09	Observation well	GWR-010 Development	Petrotek, 2020	Vertical	403.0	408.9
WR-287			2.10E-08		Packer test	SRK, 2017	Vertical	409.2	465.0
WR-525			5.60E-08		Packer test	SRK, 2017	Vertical	372.2	425.7
WR-555			9.00E-09		Packer test	Golder, 2014	Vertical	433.6	481.5
WR-555			4.00E-06		Packer test	Golder, 2014	Vertical	410.8	451.5

Well Name	Hydrostratigraphic Unit	Lithologic Unit	Estimated K (m/s)	Comment	Type of Hydraulic Test	Reference	Direction	Depth to Screen/ Packer (m)	
								Top	Bottom
WR-582			1.50E-09		Packer test	SRK, 2015	Oriented	501.2	606.0
WR-582			2.60E-10		Packer test	SRK, 2015	Oriented	607.2	726.0
WR-594			8.90E-09		Packer test	SRK, 2015	Oriented	565.2	642.0
WR-594			3.70E-10		Packer test	SRK, 2015	Oriented	643.2	720.0
WR-594			1.10E-06		Open Hole	SRK, 2015	Oriented	643.2	720.0
WR-602			2.00E-09		Packer test	SRK, 2015	Oriented	491.2	569.0
WR-602			1.40E-10		Packer test	SRK, 2015	Oriented	570.2	639.0
WR-602	Basement Aquitard	Basement	1.10E-11		Packer test	SRK, 2015	Oriented	641.2	753.0
WR-603A			1.40E-10		Packer test	SRK, 2015	Oriented	381.2	420.0
WR-603A			4.40E-10		Packer test	SRK, 2015	Oriented	421.2	510.0
WR-603A			8.10E-11		Packer test	SRK, 2015	Oriented	511.2	615.0
WR-604			1.50E-06		Packer test	SRK, 2015	Oriented	451.2	480.0
WR-604			1.80E-10		Packer test	SRK, 2015	Oriented	517.2	576.0
WR-605			8.90E-11		Packer test	SRK, 2015	Oriented	511.2	615.0
WR-605			2.70E-07		Packer test	SRK, 2015	Oriented	511.2	615.0
WR-605			3.00E-09		Packer test	SRK, 2015	Oriented	616.2	699.0
WR-695			3.37E-09		Packer test	SRK, 2018b	Vertical	459.2	462.0
WR-695			1.00E-10		Packer test	SRK, 2018b	Vertical	460.2	465.0
WR-695			2.07E-09		Packer test	SRK, 2018b	Vertical	466.2	495.0
WR-695			2.26E-09		Packer test	SRK, 2018b	Vertical	496.2	525.0
WR-695			5.87E-10		Packer test	SRK, 2018b	Vertical	526.2	564.0
WR-695			1.00E-10		Packer test	SRK, 2018b	Vertical	565.2	599.5
WR-695			8.00E-10		Packer test	SRK, 2018b	Vertical	466.2	599.5
WR-695			1.00E-10		Packer test	SRK, 2018b	Vertical	466.2	599.5

Appendix D 2020 Hydraulic Testing Analysis; Wells GWR-033 to GWR-037

Aquifer Test Analyses: GWR-037 and GWR-036

Two-hour pumping tests were sequentially performed in monitoring wells GWR-036 and GWR-037 (see Figure D1 for location) in 2020 and monitoring of water levels were conducted in the adjacent well. These monitoring wells are screened in an overburden trough that the borehole logs indicate is infilled with fine- to coarse-grained sand and gravel with cobbles and boulders, and sandy till, without any evidence of a competent fine-grained aquitard unit.

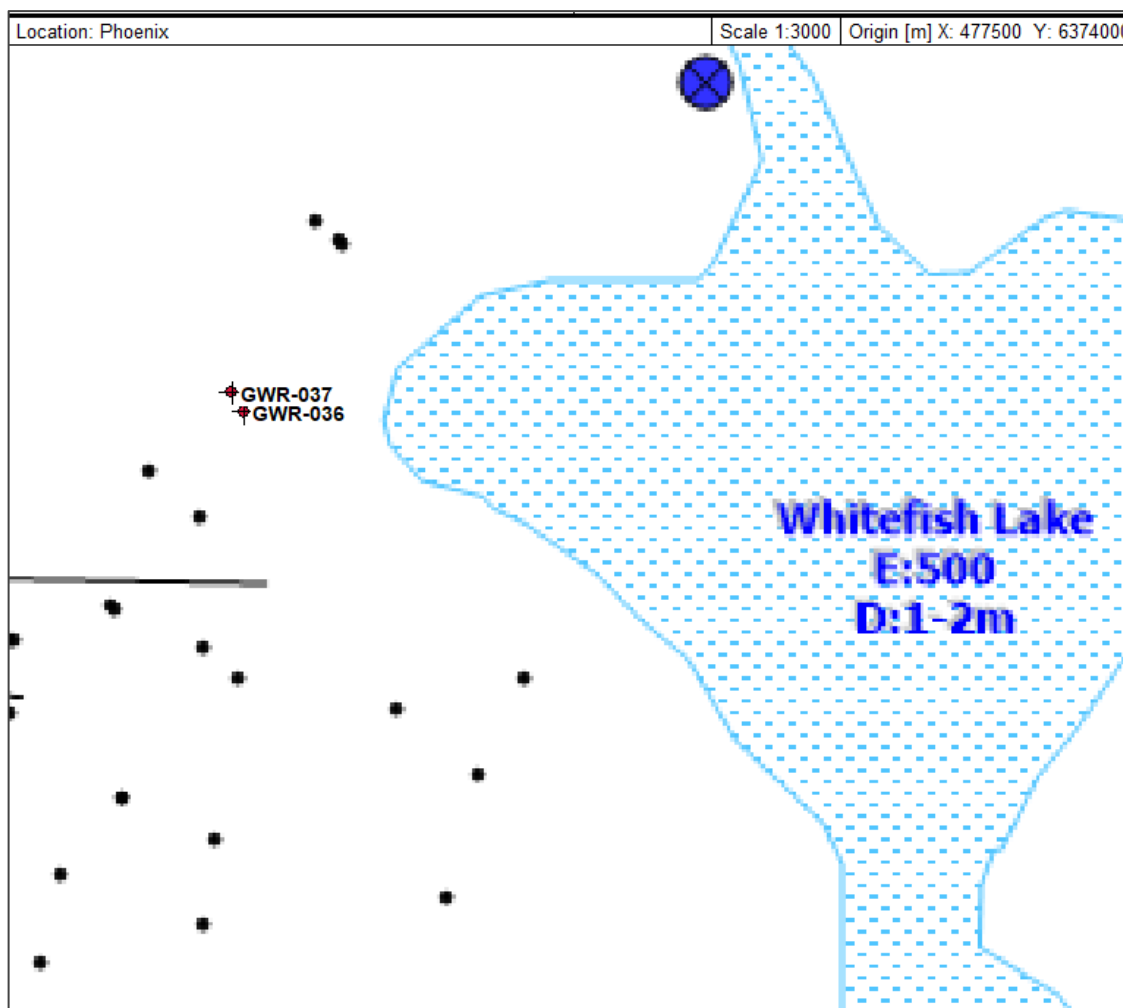


Figure D1: Well Locations

The pumped interval in both cases was 40 to 60 m below the water table, and the water level stayed more than 25 m below the water table throughout the pumping test. As the overburden consists of sandy till, sand to silty sand with cobbles and boulders, the entire saturated thickness to the drilled depth is considered to form one aquifer. The monitoring wells are considered partially penetrating as they are screened within the lower portion of the aquifer (see Table D1 for details).

Table D1: Monitoring Well Details

Feature	GWR-036	GWR-037
Ground Surface / Top of Casing (m asl)	509	509
Screened Unit	Overburden / Bedrock Interface	Upper Bedrock (MFD)
Screened Interval (depth in m btoc)	43.1-49.1 (6 m)	64.7-70.7 (6 m)
Top of Bedrock (depth in m btoc)	46.1	44.2
Coarse Gravel (depth in m btoc)	40 – 42m	41.2 – 44 m (estimate)
Overburden above Bedrock	Sand with cobbles	Sand with cobbles
Upper Bedrock	Weathered sandstone, lots of fractures	Weathered, oxidized sandstone, lots of fractures
Approximate depth (m) to water	4.82	4.77
Maximum Drawdown (m) – Pumped well	11.15	5.64
Maximum Drawdown (m) – Obs well	0.51	0.1

Considering the positioning of the wells within the setting (Table D1), as well as the limited (i.e., 2 hour) pumping test timeline, responses to pumping are expected to reflect a confined aquifer (i.e., radial flow without contribution from pore drainage), with the potential for leakage from the overlying sediments to off-set the requirement for radial flow in response to pumping.

Analysis of drawdown versus time derivatives for the pumping and observation wells suggest that the response to pumping does not purely represent that of a confined aquifer, or a leaky confined aquifer. Leakage within the overburden aquifer (GWR-036) is most evident. A review of the core photos shows a section of angular gravel at a depth of approximately 41 m below ground surface, (just above the screened interval of GWR-036), which may provide leakage within the overburden unit.

Pumping Test

The pumping of well GWR-037 was performed for 2 hours and 15 minutes (8100 s), and the rate was initially variable for the first 23 minutes. As a result, the primary analysis was focused on later-time pumping data (i.e., data after the first 25 minutes or 1500s).

The analysis is illustrated on Figure D2. The match includes analysis of both the pumping and recovery period, but the match illustrated focused on the pumping period. The analysis indicated a higher hydraulic conductivity value exists within the upper weathered bedrock than the screened portion of the lower overburden.

Leaky aquifer conditions were also evaluated (Hantush type curves) as presented on Figures D3 and D4. Similar curve matching was achieved with comparable transmissivity values.

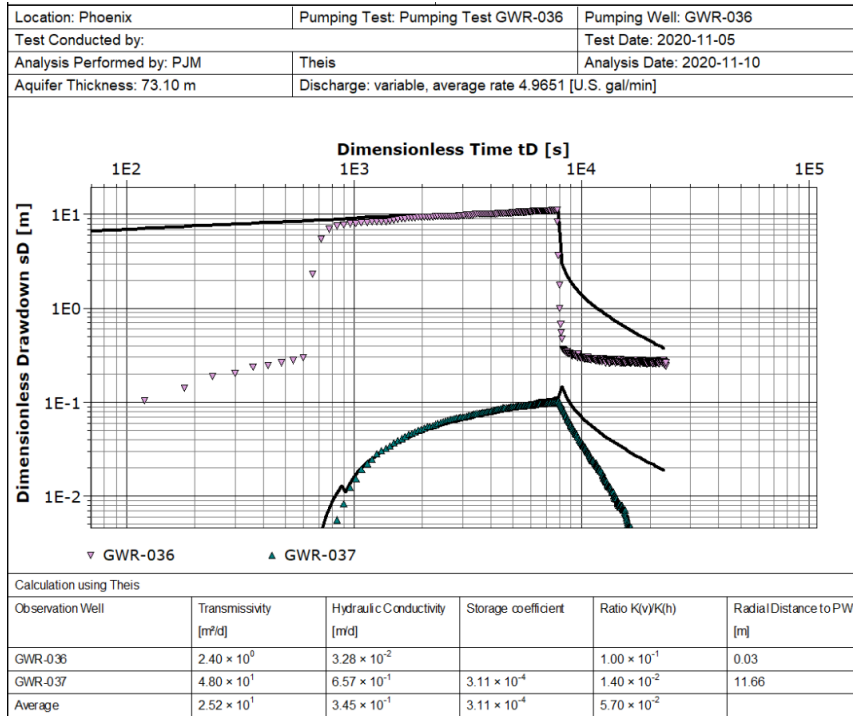


Figure D2: Theis Curve Match

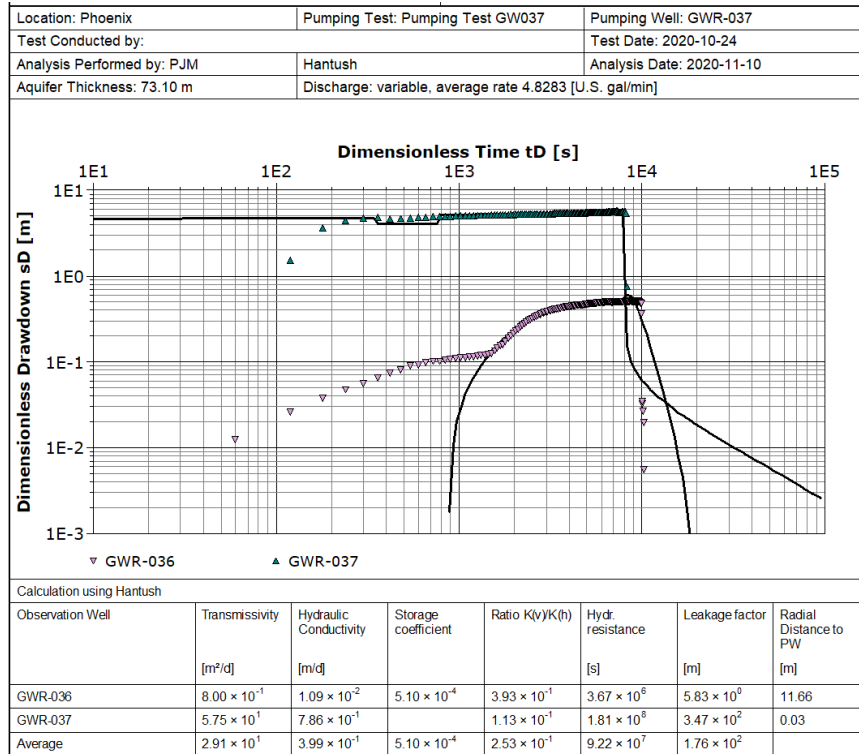


Figure D3: Hantush Leaky Aquifer Analysis - Pumping GWR-037

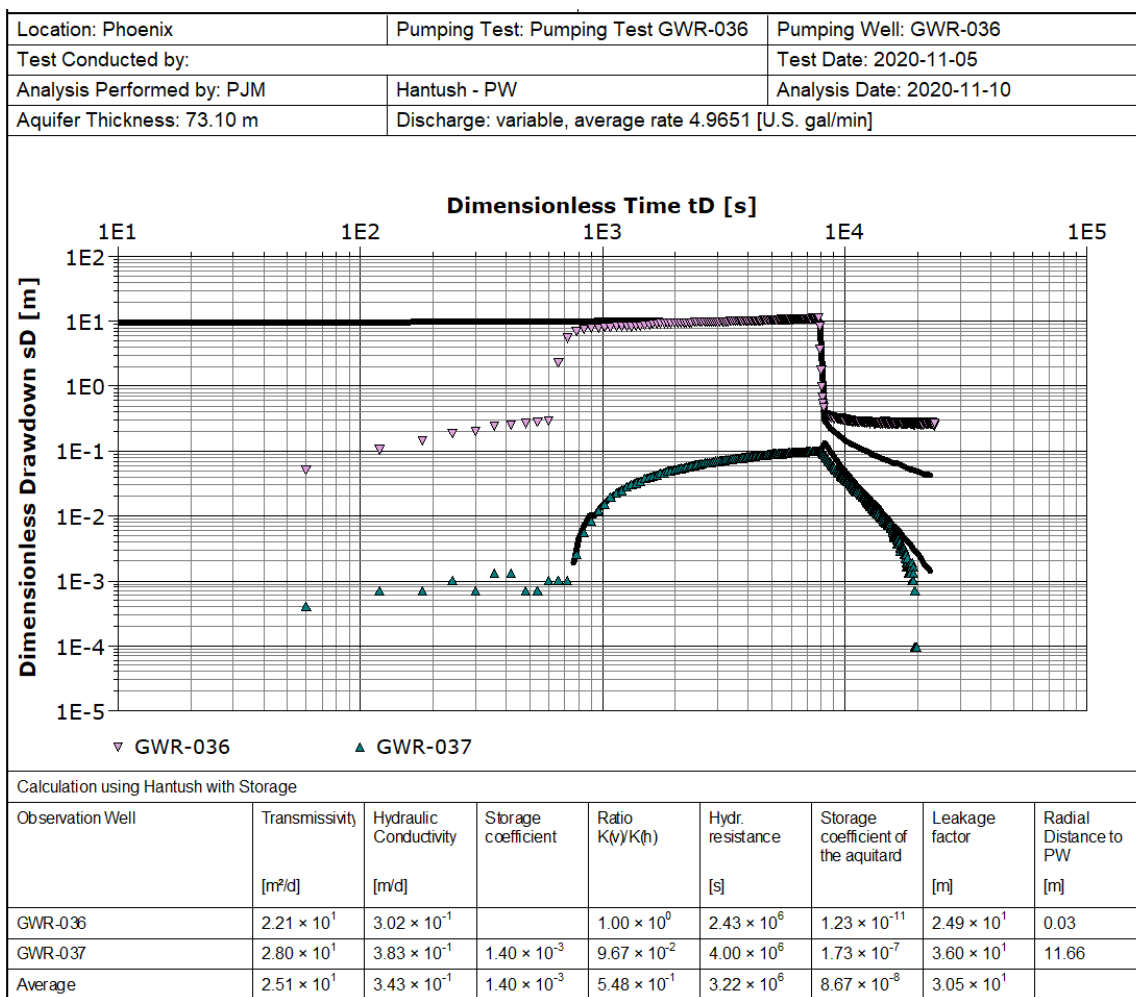


Figure D4: Hantush Leaky Aquifer Analysis - Pumping GWR-036

Analysis of recovery data alone was also performed (Figures D5 and D6).

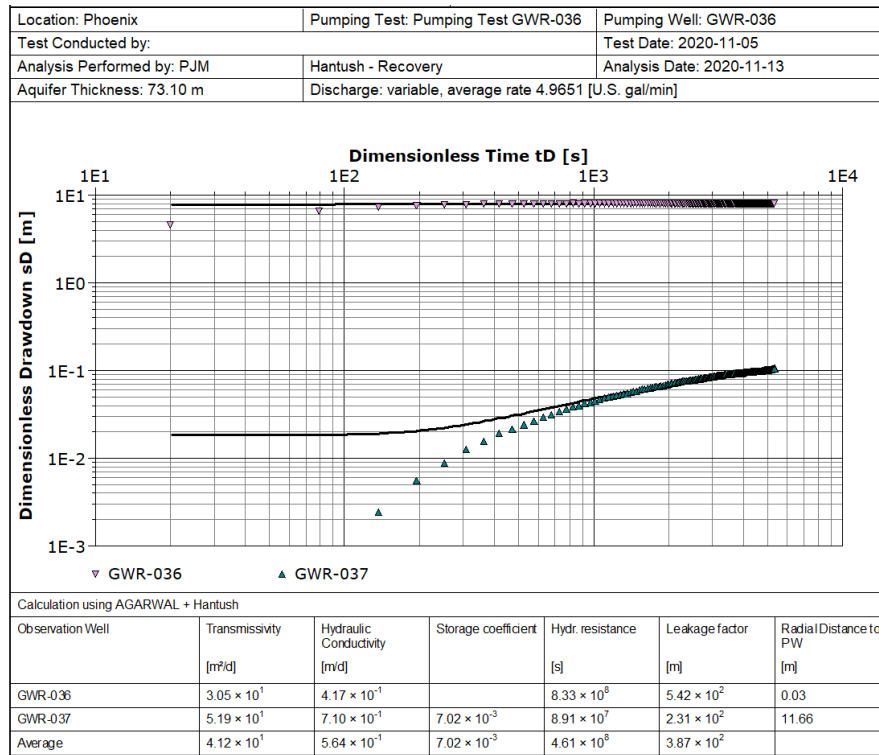


Figure D5: Recovery Analysis - Pumping GWR-036

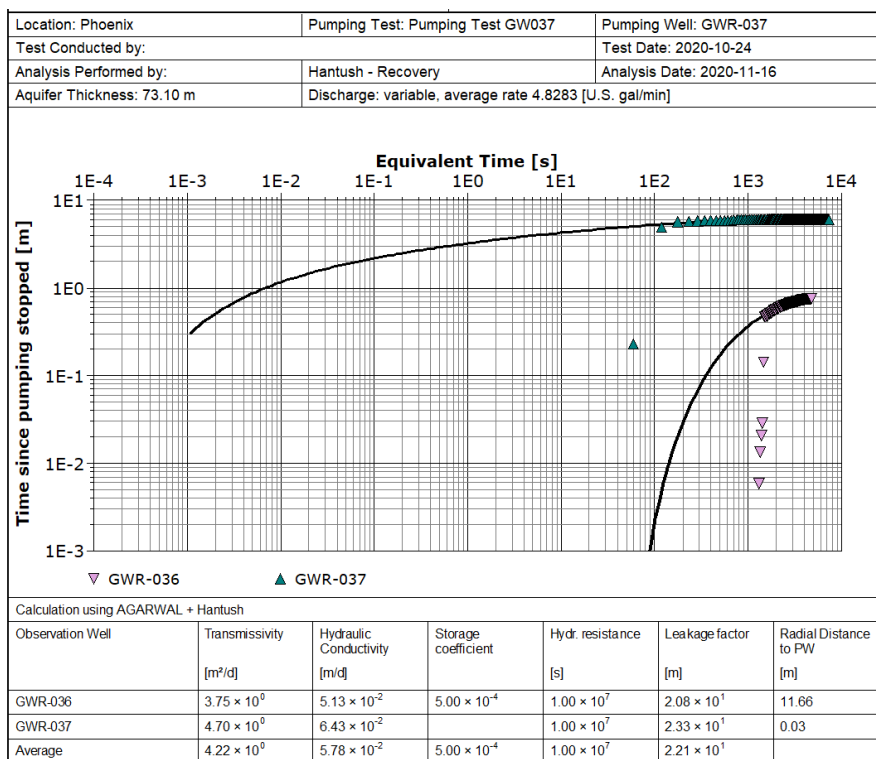


Figure D6: Recovery Analysis - Pumping GRW-037

Summary of Analysis and Values:

As noted in Table D2, the hydraulic conductivity of the upper bedrock (MFd) near Wells GRW-036 and GWR-037 is estimated to be approximately 1×10^{-4} m/s, which is considered high for a weathered sandstone. The hydraulic conductivity value for the deep overburden was estimated to be 2×10^{-6} m/s to 8×10^{-6} m/s, with higher local values interpreted in discrete beds of coarse-grained material. Specific storage values were consistently in the range of 5×10^{-5} 1/m to 5×10^{-4} 1/m. The hydraulic conductivity and storage values will be useful in constraining the hydraulic conductivity input parameters within the regional numerical groundwater model.

Table D2: Summary of Hydraulic Parameters at GWR-036 and GWR-037

Well	Method	T (m ² /d)	K (m/s)	S	Ss (1/m)	Fit Comment
GWR-037 (MFD)	Theis - Pumping	5	9.6E-06	5.00E-03	8E-04	Good
	Hantush- Pumping	57	1.1E-04	5.00E-03	8E-04	Very Good
	Hantush - Recovery	5	9.6E-06	1.00E-04	2E-05	Excellent
	Theis – Obs Well	48	9.3E-05	3.00E-04	5E-05	Very Good
	Hantush – Obs Well	28	5.4E-05	1.40E-03	2E-04	Very Good
	Hantush Recovery - Obs	50	9.6E-05	7.00E-03	1E-03	Very Good
GWR-036 (OVB)	Theis – Obs Well	7	1.4E-05	3.00E-03	5E-04	Good
	Hantush – Obs Well	1	1.9E-06	5.00E-04	8E-05	Very Good
	Hantush - Recovery	4	7.7E-06	5.00E-04	8E-05	Excellent
	Theis - Pumping	2	3.9E-06	2.00E-03	3E-04	Very Good
	Hantush- Pumping	23	4.4E-05	1.00E-04	2E-05	Good
	Hantush Recovery - Obs	30	5.8E-05	1.00E-04	2E-05	Good

Aquifer Test Analyses: GWR-033, GWR-034 and GWR-035

Pumping tests were performed in monitoring wells GWR-033 to -035 (Figure D7) with monitoring in the adjacent wells. These monitoring wells are located 600 m southeast of the Phoenix deposit and were drilled to provide insight into the regional hydrogeologic conditions at a greater distance from the ore deposit.

The three monitoring wells are located near WR-607 (known geology) and a southern embayment of Whitefish Lake. The wells were screened at different depths to create a well nest or cluster that provides insights on the changes in water level elevations from shallow bedrock (i.e., less than 10 m below surface) to the deep sandstone (i.e., 350 m below surface; Table D3).

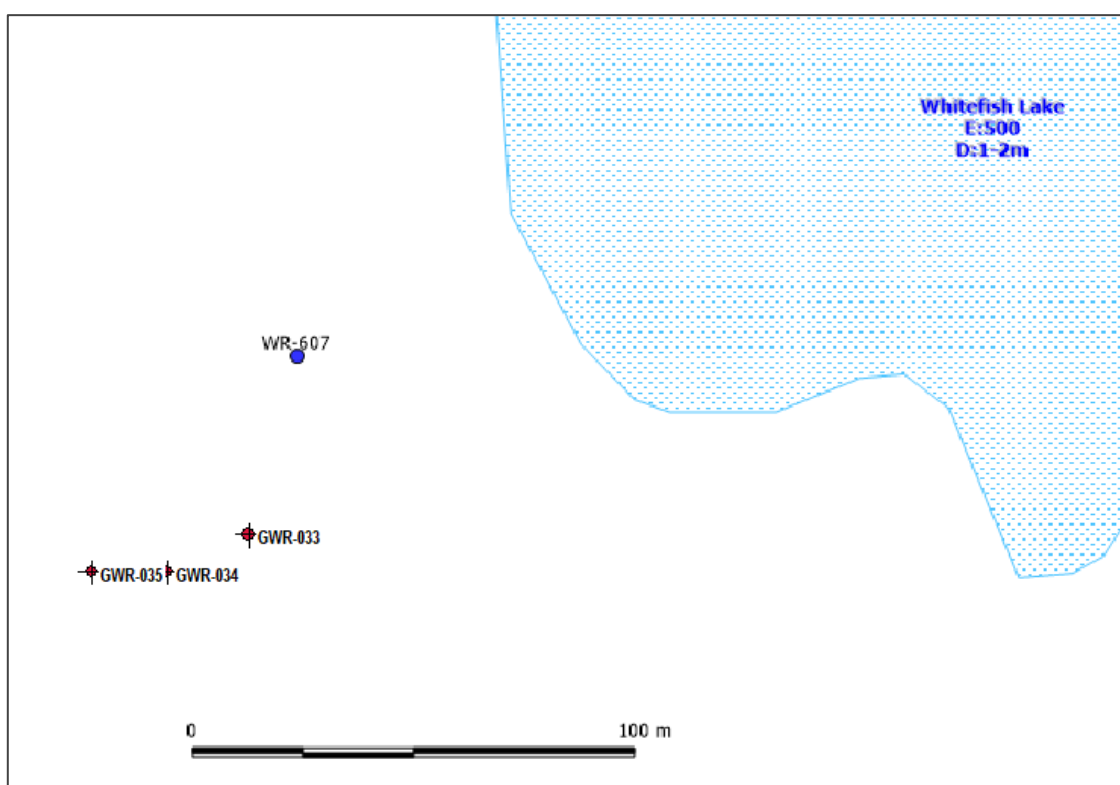


Figure D7: Well Locations

Hydrogeologic Setting

In all cases, the screened interval was well below the water table throughout the test, even though significant drawdown was experienced when pumping GWR-033 and GWR-034 (Table D3); it is noted that the depth of the submersible pump was not recorded. As such, the entire saturated thickness to the drilled depth is considered to form one multi-layered aquifer system, and the wells are partially penetrating.

Considering the positioning of the wells within the setting, as well as the limited pumping test timeline (i.e., 2 hours of pumping), responses to pumping were interpreted to reflect a confined aquifer (i.e., radial flow without contribution from pore drainage), with the potential for leakage from the overlying sediments to off-set the requirement for radial flow in response to pumping.

Table D3: Well Details at GWR-033 to GWR-035

Feature	GWR-033	GWR-034	GWR-035
Ground Surface / Top of Casing (m asl)	504	504	504
Screened Unit	MFa, above unconformity (Friable Sandstone)	MFb (fractured and friable zone)	MFd (weathered bedrock)
Screened Interval (depth in m btoc)	345.6-351.6 (6 m)	215-221 (6 m)	9.9-12.8 (3 m)
Top of Bedrock (depth in m btoc)	11.2	11.9	8
Coarse Gravel (depth in m btoc)	5 – 9 m	No core photo	4 - 8 m
Overburden above Bedrock	Sand with cobbles	No core photo	Sand with cobbles
Upper Bedrock	Weathered sandstone, friable portions	No core photo	Weathered sandstone, oxidized
Approximate depth (m) to water	2.3 m	2.6 m	3.1 m
Maximum Drawdown (m) – Pumped well	21 m	36 m	0.75 m
Maximum Drawdown (m) – Obs well	0 m	0.08 m ? (GWR-034)	< 1cm (GWR-033) ? (GWR-034)

Analysis of drawdown versus time derivatives for the pumping and observation wells suggest that the response to pumping ranges from a confined aquifer to a leaky confined aquifer (although responses were not ideal for either case). Leakage within the deep bedrock (i.e., GWR-034 and GWR-033) is most evident.

Pumping Test

The pumping of each was performed for approximately 2 hours, with a target rate of 5 USGPM. Target rates were not able to be maintained however within wells GWR-033 and GWR-034 (deep bedrock wells). As a result, variable pumping rates were calculated based on the total volume of discharge recorded throughout the test (as opposed to using instantaneous pumping rates).

In all cases, monitoring was completed within the pumped as well as the adjacent observation wells. Barometric pressure variability was available for the period from July 2020 to the end of October 2020. Late time water level fluctuations from well GRW-036 were

used to evaluate the barometric efficiency, which was found to be 0.5. Barometric corrections to drawdown were performed within the software program AquiferTest™.

Results

These analyses for wells GWR-035 and GWR-033 are illustrated on Figures D8 and D9, respectively. The match focuses on analysis of the pumping period and indicates a higher hydraulic conductivity value in the upper weathered bedrock than the deeper bedrock. Additionally, the response within GWR-033 suggests there is a higher hydraulic conductivity values in the deep sandstone unit (Read Fm; MFa) than the intermediate sandstone bedrock unit (MFb).

Leaky aquifer conditions (Hantush type curves) were also evaluated, but they were not found to provide enhanced fit to observation data at any well. Fit of recovery data was also attempted but was not well replicated with the data collected through these tests.

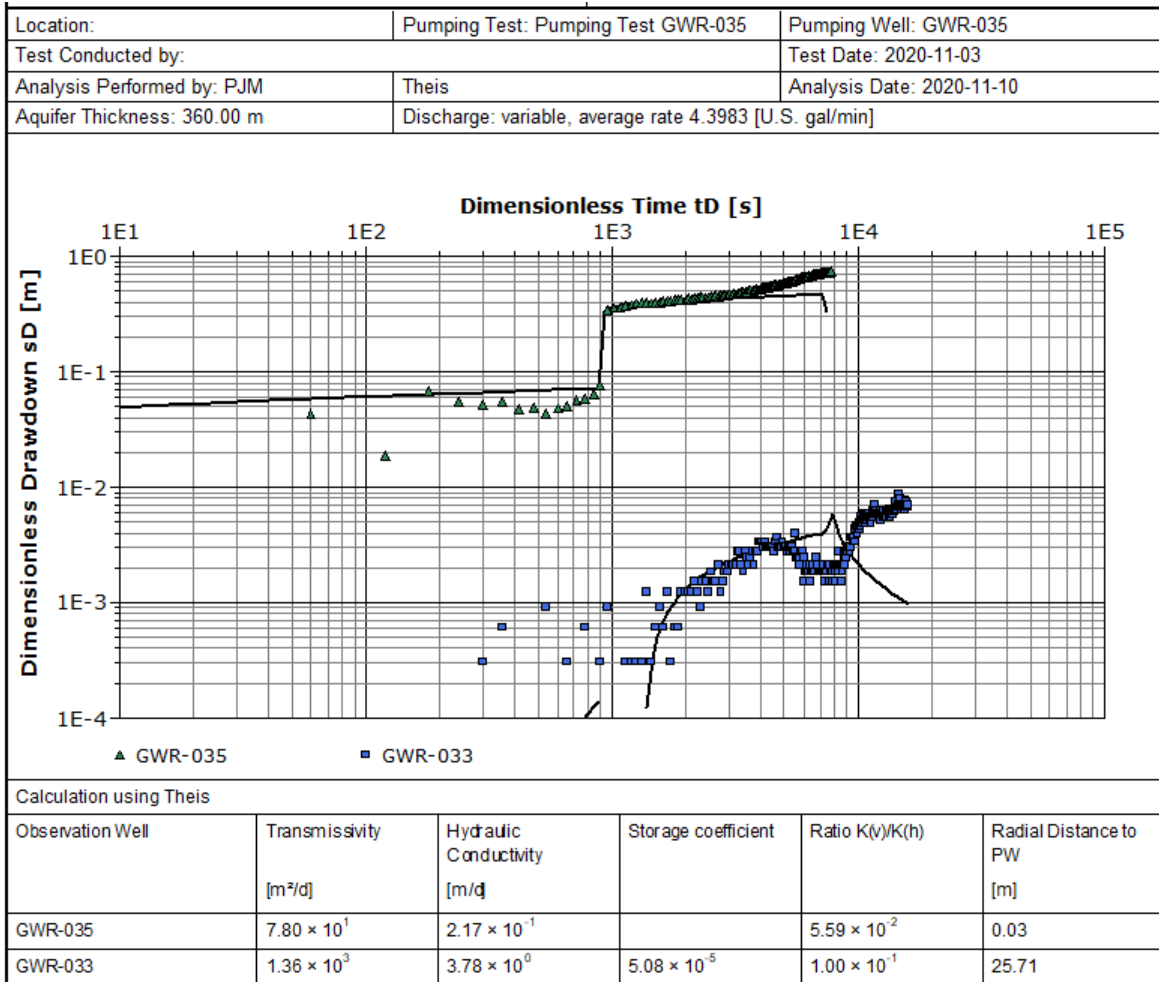


Figure D8: Theis Analysis for GWR-035

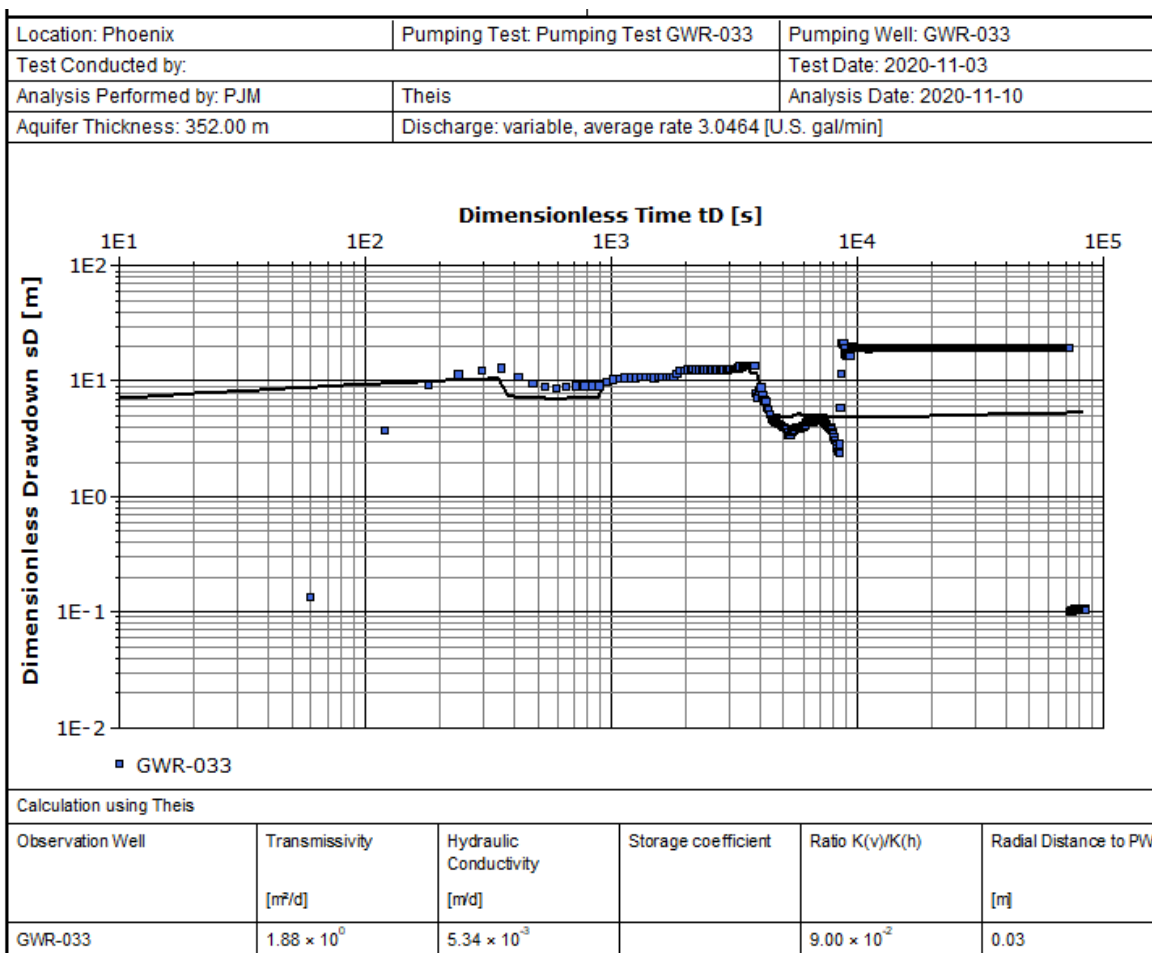


Figure D9: Theis Analysis for GWR-033

For GWR-034, the observed response to pumping of the neighbouring wells was negligible, while the well was dewatered when it was pumped. Both of those cases resulted in poor data for analysis of hydraulic conductivity. However, when the pump and associated hoses were removed (estimated as 27 L of water) from the well, the result was an inadvertent slug test. Since the transducer was still recording, the recorded water level vs. time, which resulted in a significant water level change, was used to estimate the hydraulic conductivity as a slug test analysis.

The water level recovery vs time was analyzed using three curve-fitting approaches: Hvorslev, Bouwer and Rice, and Cooper-Bredeheoft-Papadopoulos. All analyses resulted in hydraulic conductivity of 5 to 8×10^{-8} m/s; an example is presented in Figure D10.

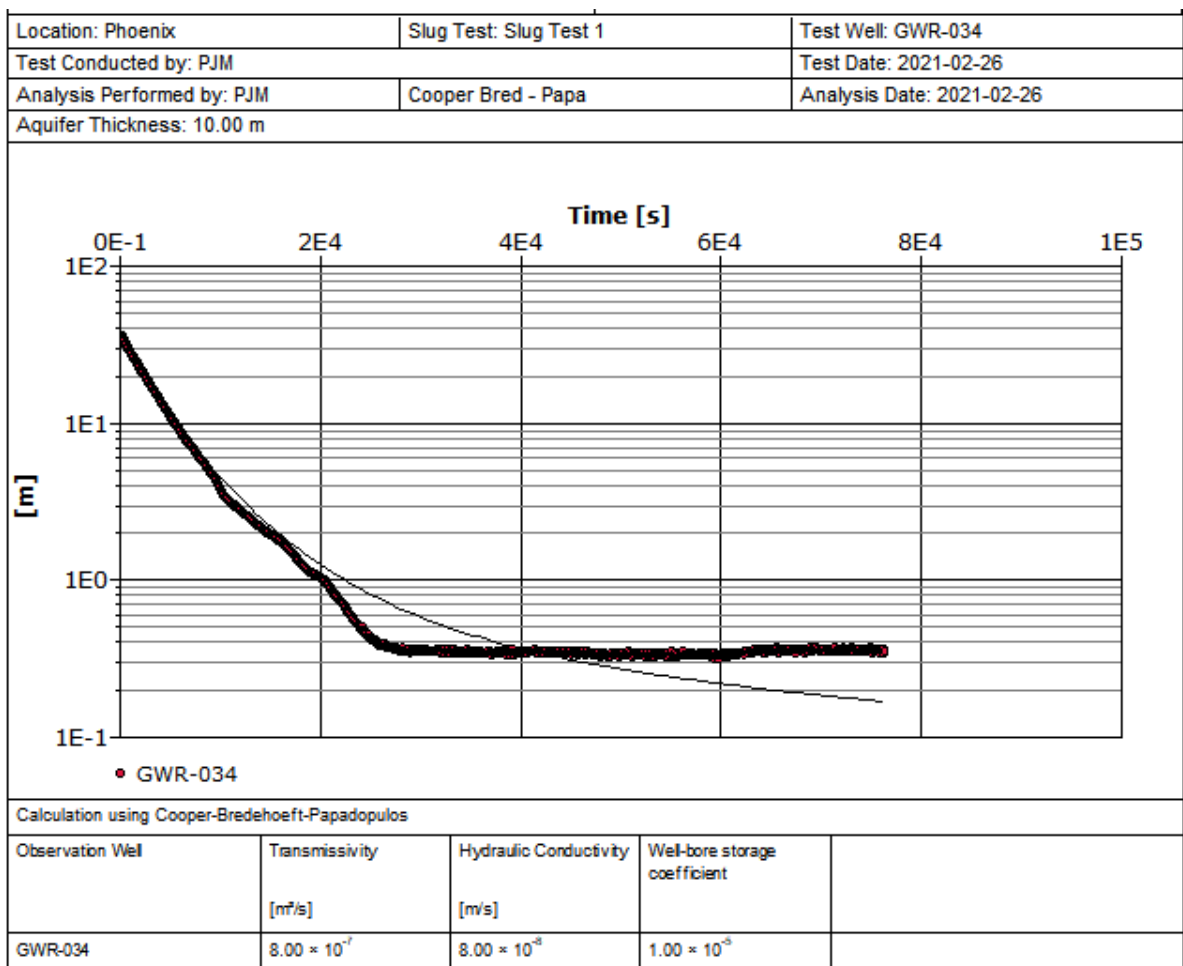


Figure D10: GWR-034 Response to Removal of Pumping Equipment

Summary of Analysis and Values:

As noted in the table below, the hydraulic conductivity of the upper bedrock (MFd) at this location is estimated to have a transmissivity on the order of 50 to 100 m²/d, and a hydraulic conductivity value of 1x10⁻⁴ m/s to 4x10⁻⁴ m/s, which is considered high for a weathered sandstone. Specific storage estimates were inconsistent, but are estimated to be approximately 10⁻⁶ 1/m.

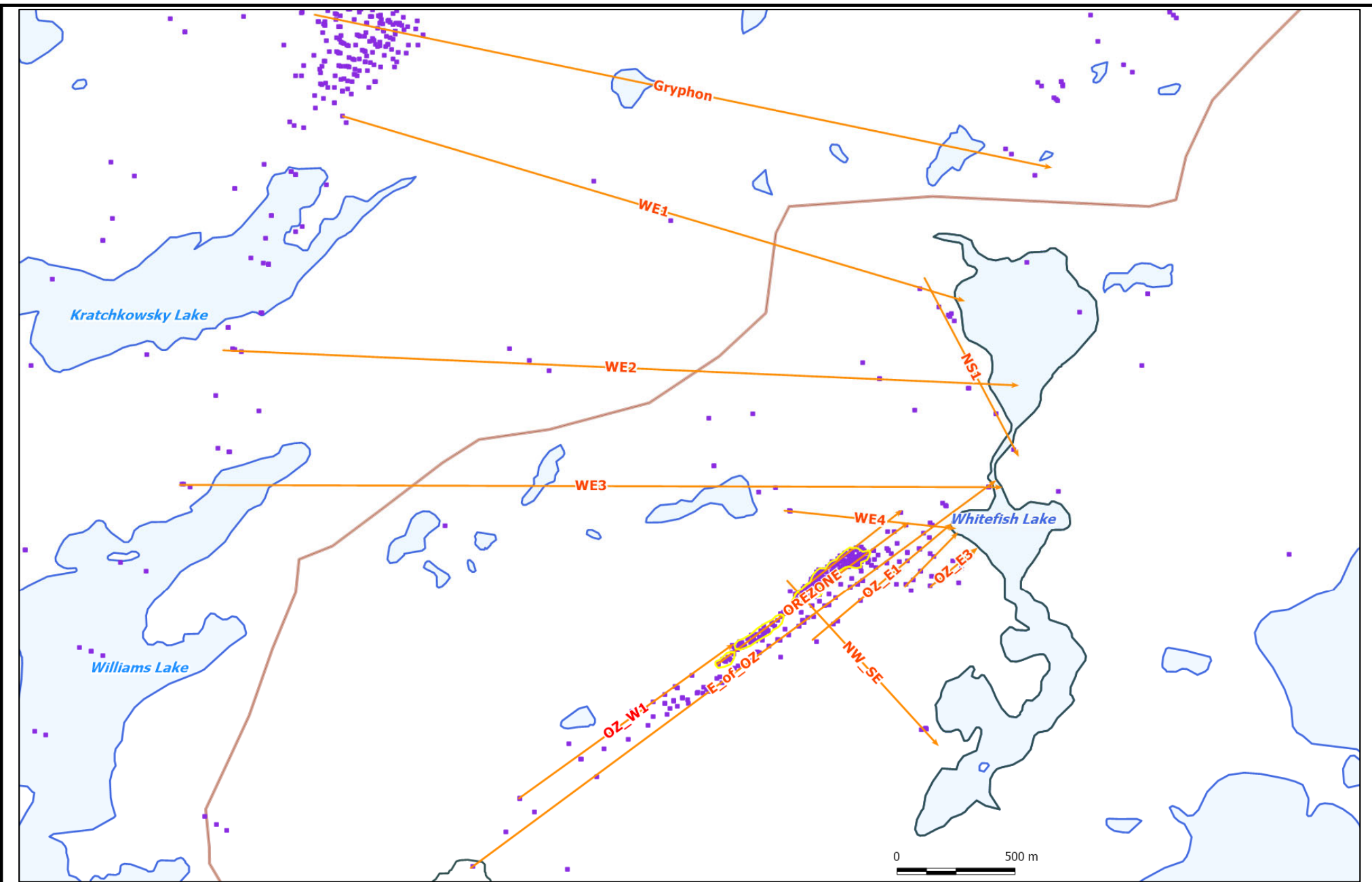
Hydraulic conductivity values for the deep bedrock (Read Fm; MFa) were estimated to range from 4x10⁻⁶ m/s to 4x10⁻⁵ m/s (Table D4). Specific storage values were consistently in the range of 10⁻⁶ 1/m to 10⁻⁵ 1/m. The overlying sandstone bedrock (MFb) was estimated to have the lowest hydraulic conductivity (less than 10⁻⁷ m/s), and a specific storage value comparable to other bedrock zones (10⁻⁵ 1/m).

Table D4: Summary of Hydraulic Parameters at GWR-033 to GWR-035








Well	Method	Pumped Well	T (m ² /d)	K (m/s)	S	Ss (1/m)
GWR-035 (Weathered MFd)	Theis – Pumping	GWR-035	50	1.9E-04	8.20E-04	3E-04
	Dougherty -Babu	GWR-035	113	4.4E-04	9.50E-02	3E-02
	Theis - Recovery	GWR-035	35	1.4E-04	2.60E-06	9E-07
	Theis - Obs Well	GWR-034	68	1.3E-04	2.00E-05	3E-06
GWR-034 (MFb)	Theis – Pumping	GWR-034	0.1	1.9E-07	1.80E-04	3E-05
	Hantush	GWR-034	2	3.9E-06	1.26E-03	2E-04
	Slug Test Analyses	GWR-034		8.0E-08	1.00E-05	1E-06
GWR-033 (Read Fm; MFa)	Theis	GWR-035	1360	4.4E-05	5.10E-05	1E-07
	Theis	GWR-034	7.3	6.0E-07	2.00E-04	1E-06
	Hantush	GWR-034	46	3.8E-06	2.00E-04	1E-06
	Theis – Pumping	GWR-033	2	3.9E-06	1.00E-04	2E-05
	Hantush-Pumping	GWR-033	70	1.4E-04	1.00E-04	2E-05
	Double Porosity – Pumping	GWR-033	2	3.9E-06	1.00E-04	2E-05

Appendix E Cross-Sections Generated in the Phoenix Area

Figure E1	Cross-Section Locations and Names
Figure E2	Gryphon Cross-Section
Figure E3	WE1 Cross-Section
Figure E4	WE2 Cross-Section
Figure E5	WE3 Cross-Section
Figure E6	WE4 Cross-Section
Figure E7	NW-SE Cross-Section
Figure E8	OZ-WE1 Cross-Section
Figure E9	Ore Zone Cross-Section
Figure E10	E of Ore Zone Cross-Section
Figure E11	OZ E1 Cross-Section
Figure E12	OZ E2 Cross-Section
Figure E13	OZ E3 Cross-Section

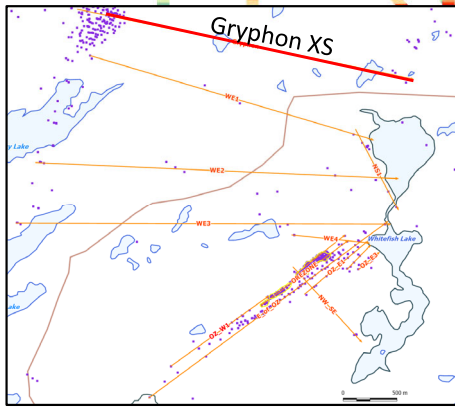
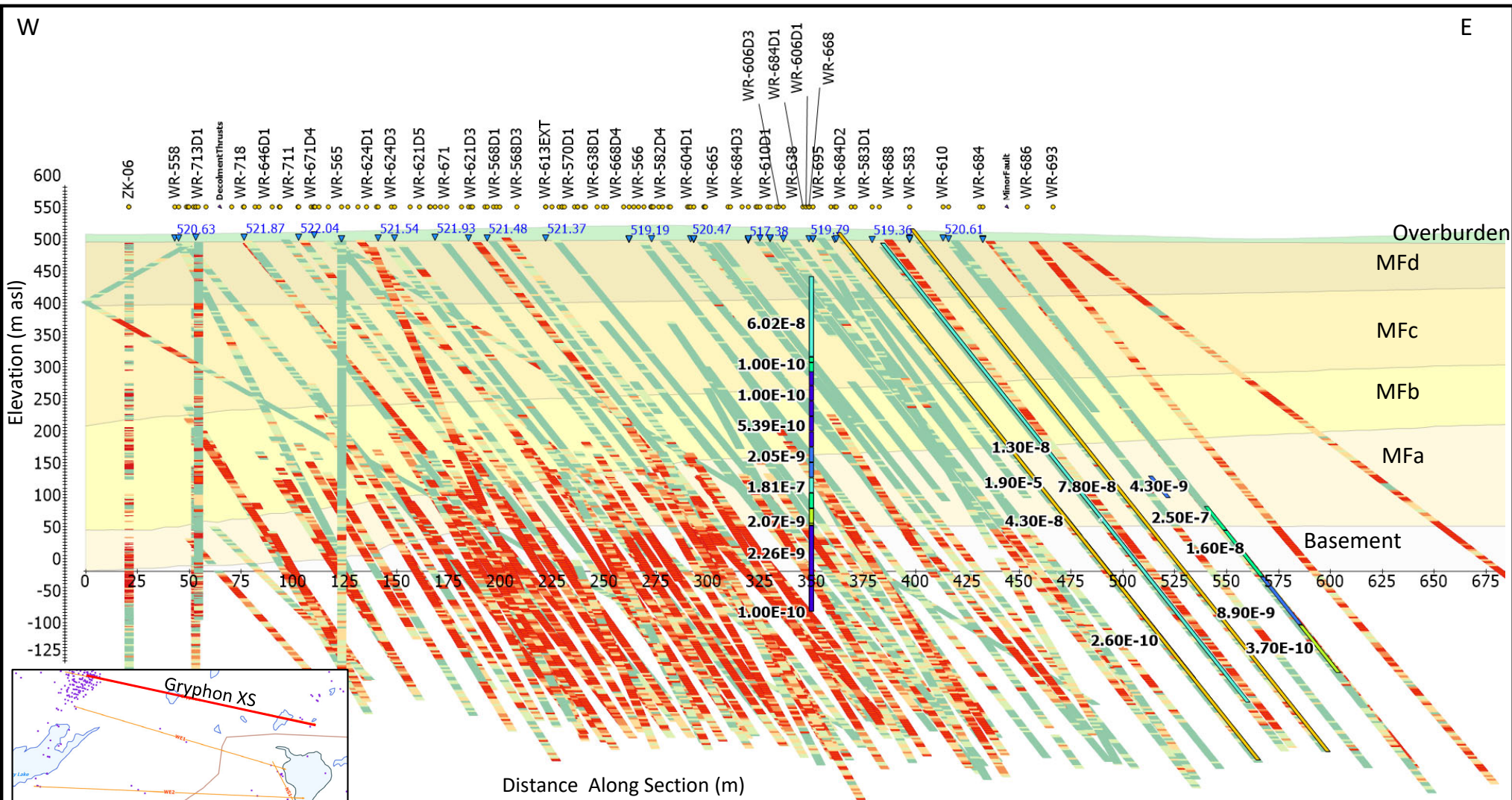


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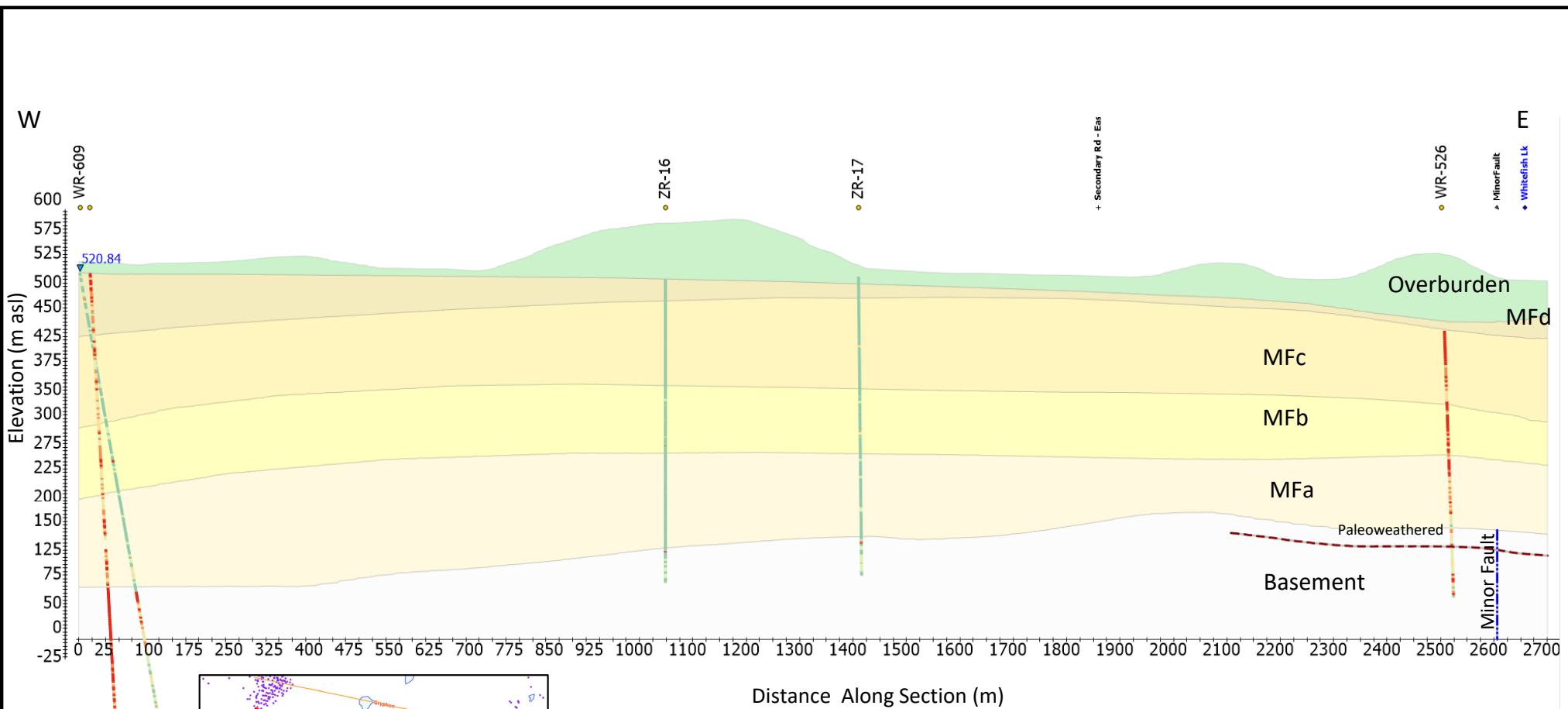
-  Lakes
-  Rivers/ Streams
-  Road/ Highway
-  Phoenix Ore Zone
-  Core Holes
-  NS1 Cross-Section Name
-  Cross Section Line

Wheeler River Project
Baseline Geology and Hydrogeological Assessment

Cross-Section Locations and Names



LEGEND Fracture Frequency 0 to 1 1 to 2 2 to 3 3 to 4 >4		Lithologic Surfaces Read Fm (MFa) Bird Fm (MFb) Collins Fm (MFC) Dunlop Fm (MFd)		Hydraulic Conductivity (m/s) <1E-10 1E-10 to 1E-9 1E-9 to 1E-8 1E-8 to 1E-7 1E-7 to 1E-6		Wheeler River Project Baseline Geology and Hydrogeological Assessment Gryphon Cross-Section	
		Overburden Basement Rocks Water Level Elevation (masl)		1E-5 K Estimate (m/s)			
<i>Source: Denison DH Logger Database</i>						E2	



LEGEND		
Fracture Frequency	Lithologic Surfaces	Lithologic Surfaces
0 to 1	Read Fm (MFa)	Overburden
1 to 2	Bird Fm (MFb)	Basement Rocks
2 to 3	Collins Fm (MFC)	Water Level Elevation (masl)
3 to 4	Dunlop Fm (MFd)	
>4		

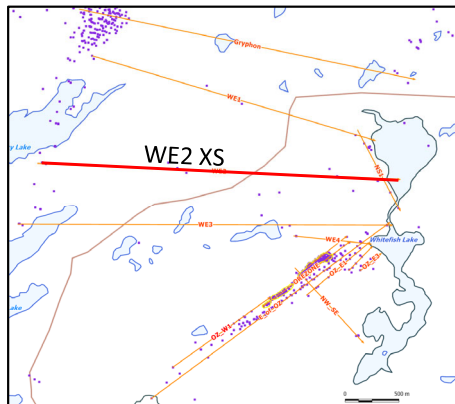
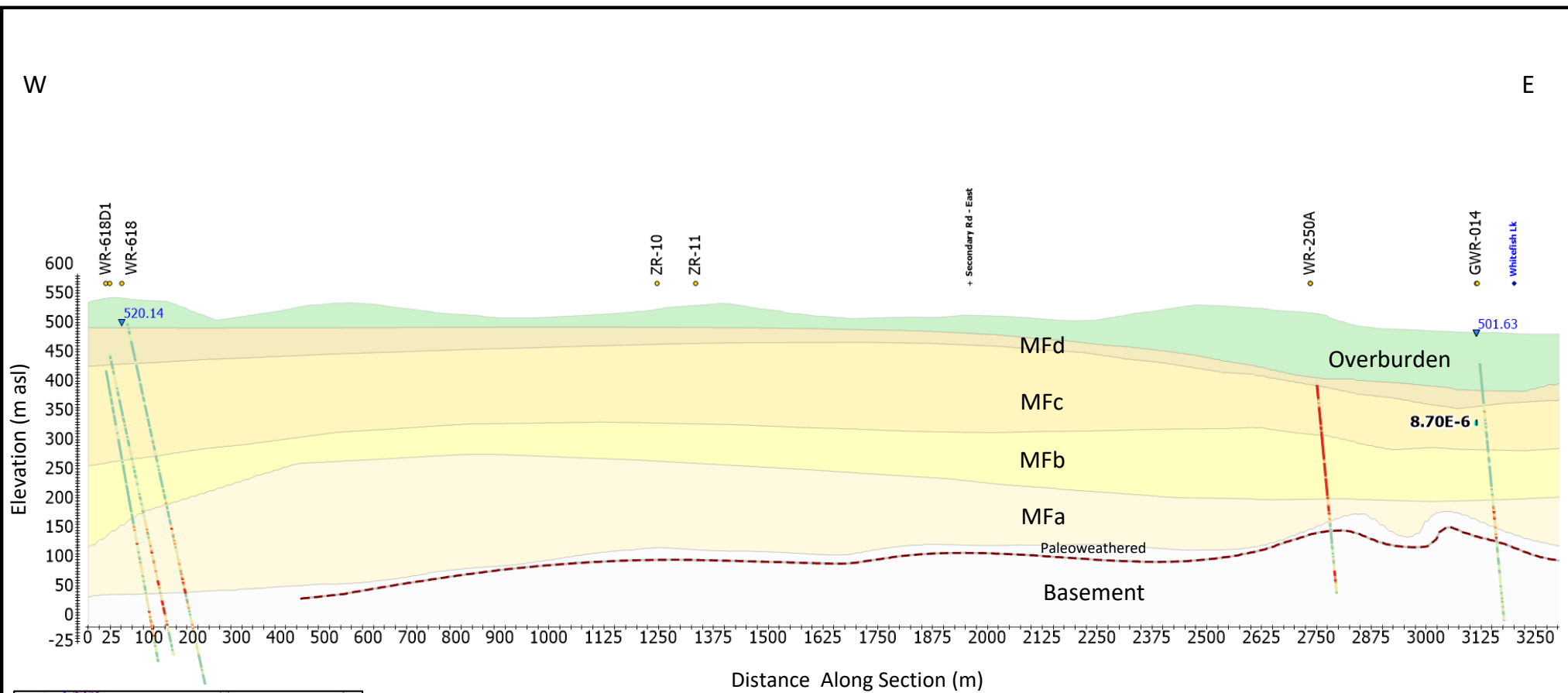
Source: Denison DH Logger Database. Fracture frequency calculated as number of fractures per metre

Wheeler River Project
Baseline Geology and Hydrogeological Assessment

WE1 Cross-Section

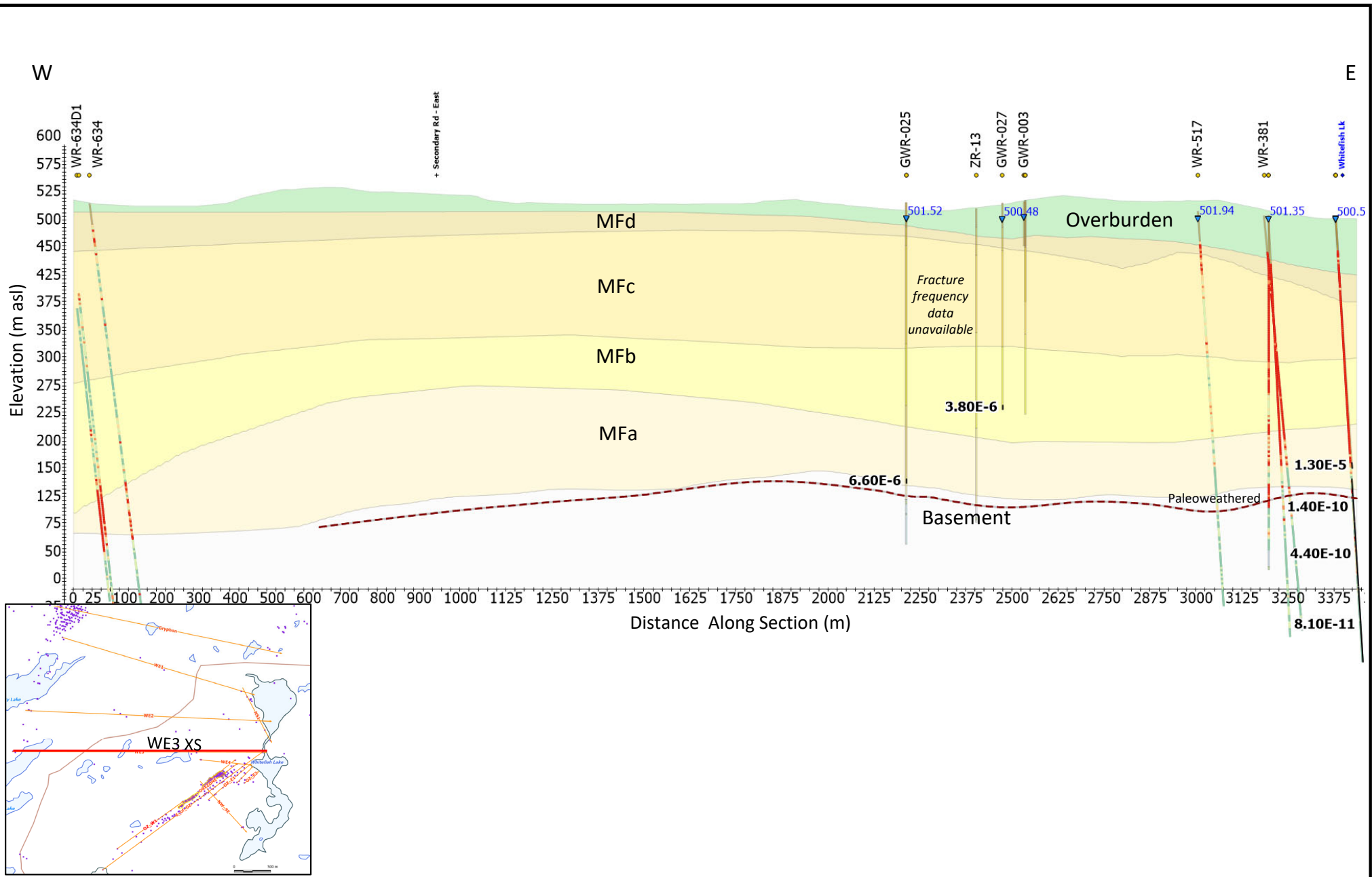
Ecometrix | Environmental INTELLIGENCE

E3



LEGEND		Hydraulic Conductivity (m/s)	
Fracture Frequency	Lithologic Surfaces	<1E-10	1E-7 to 1E-6
0 to 1	Read Fm (MFa)	1E-10 to 1E-9	1E-5 K Estimate (m/s)
1 to 2	Bird Fm (MFb)	1E-9 to 1E-8	
2 to 3	Collins Fm (MFc)	1E-8 to 1E-7	
3 to 4	Dunlop Fm (MFd)	1E-7 to 1E-6	
>4	Basement Rocks		
	Water Level Elevation (masl)		

Wheeler River Project	
Baseline Geology and Hydrogeological Assessment	
WE2 Cross-Section	
Ecometrix	Environmental INTELLIGENCE
E4	

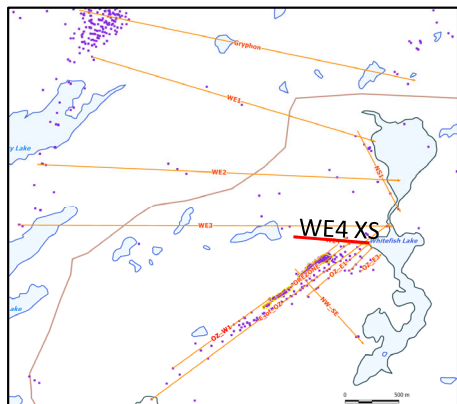
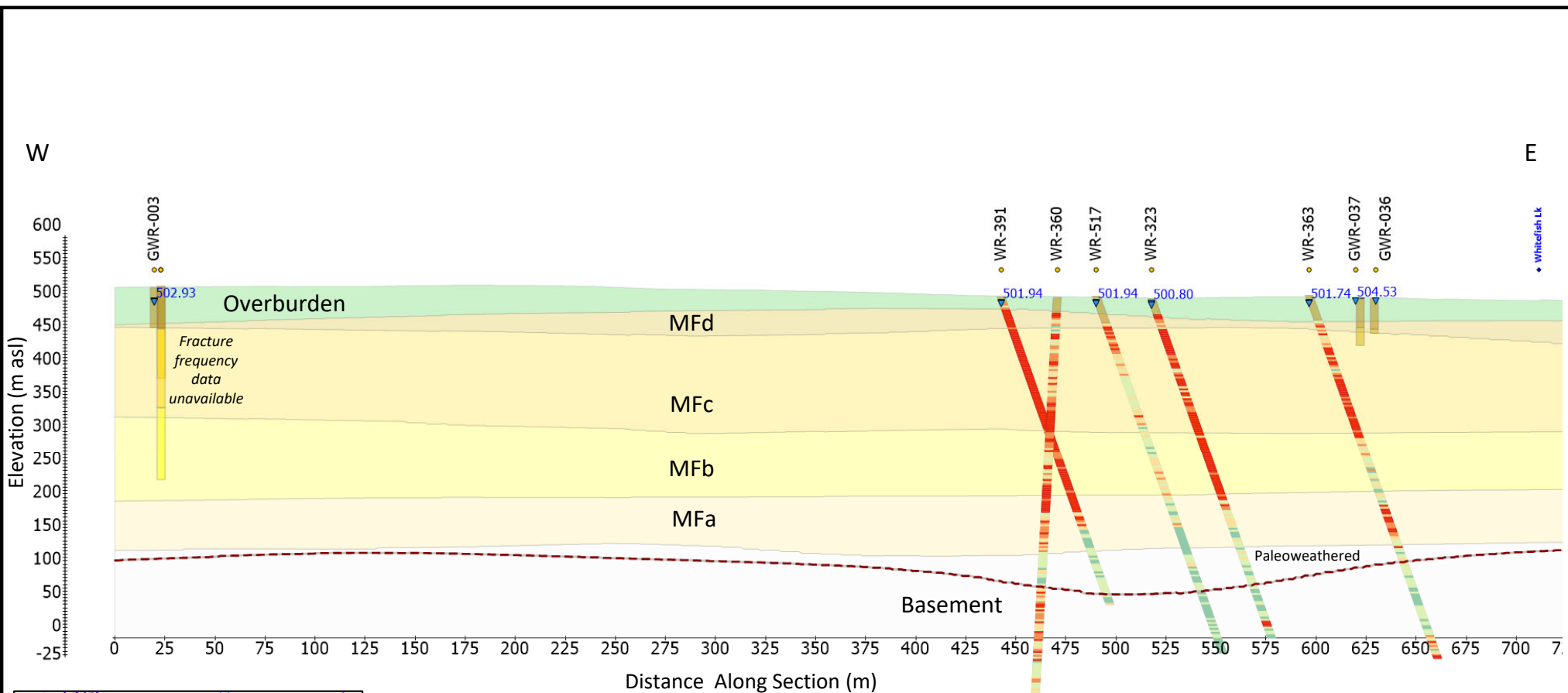


Wheeler River Project
Baseline Geology and Hydrogeological Assessment

WE3 Cross-Section

Environmental INTELLIGENCE

E5

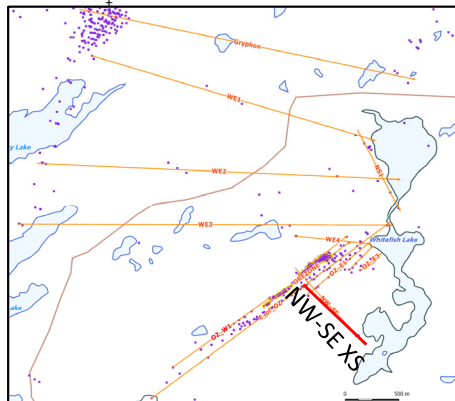
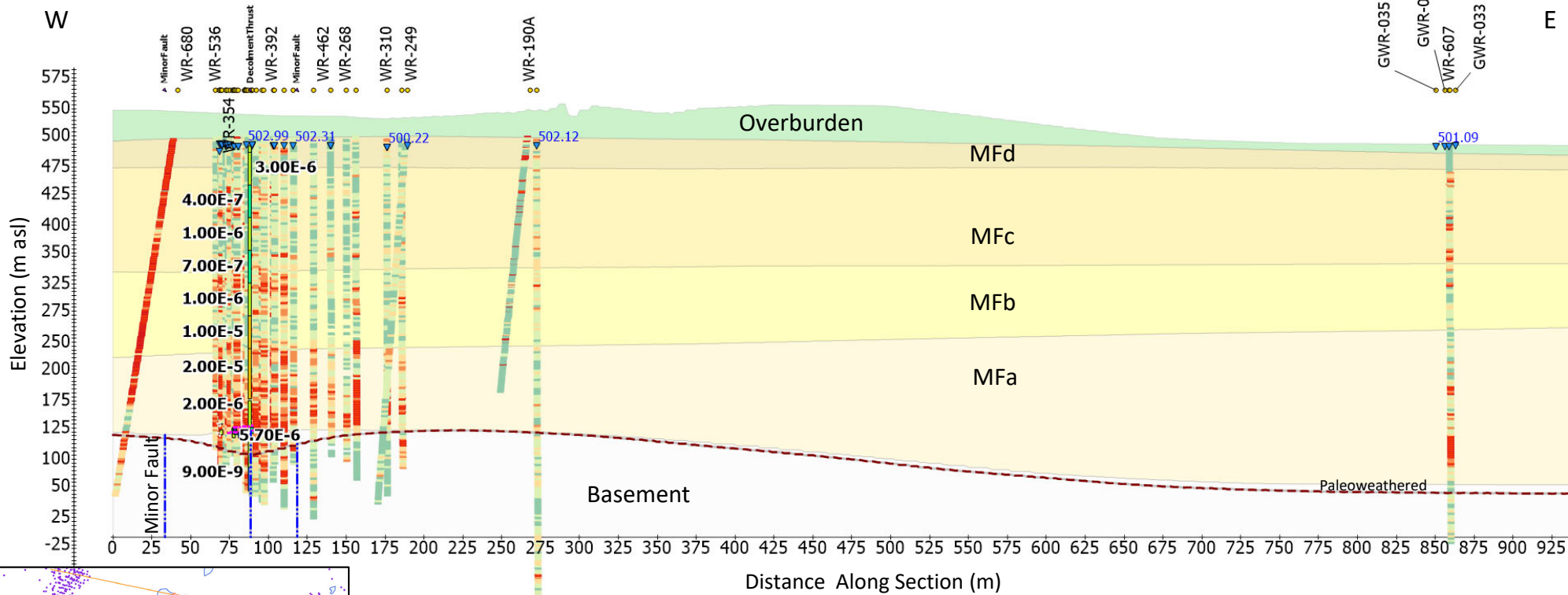


LEGEND	
Fracture Frequency	Lithologic Surfaces
0 to 1	Read Fm (MFa)
1 to 2	Bird Fm (MFb)
2 to 3	Collins Fm (MFC)
3 to 4	Dunlop Fm (MFd)
>4	

Overburden
Basement Rocks
Water Level Elevation (masl)
1E-5 K Estimate (m/s)

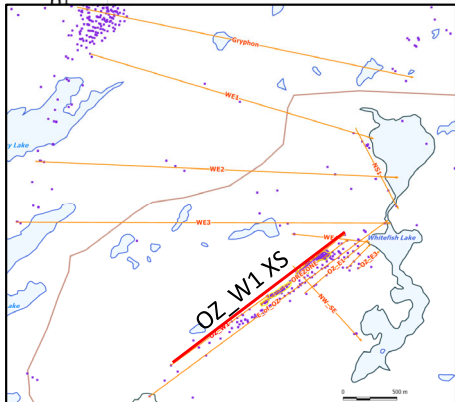
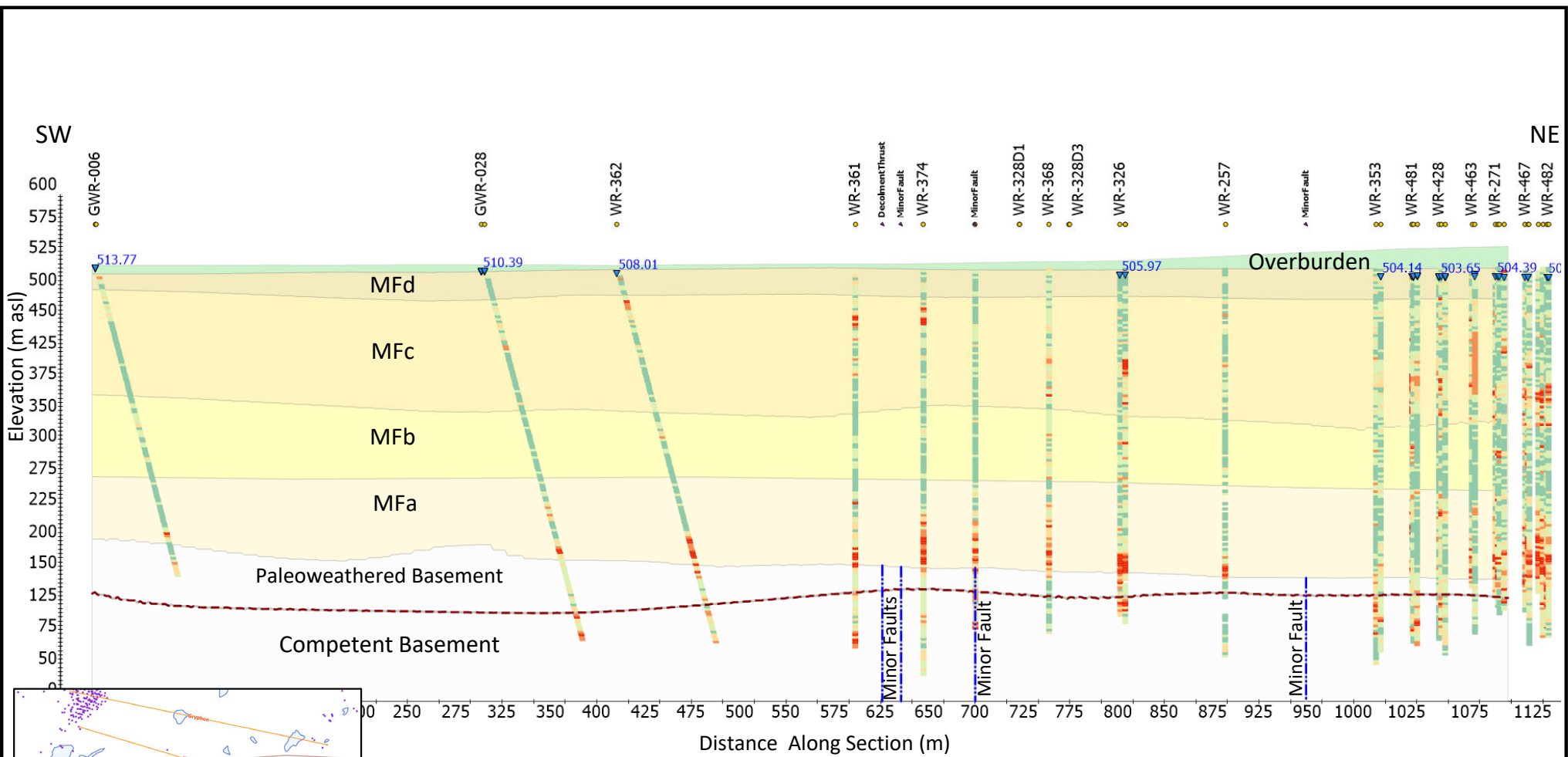
Wheeler River Project
Baseline Geology and Hydrogeological Assessment

WE4 Cross-Section



Note: Recent interpretations of the Top of Read Fm and Paleoweathered surface at wells GWR-033 to -035 are not reflected on this cross-section

LEGEND Fracture Frequency 0 to 1 1 to 2 2 to 3 3 to 4 >4		Lithologic Surfaces Read Fm (MFa) Bird Fm (MFb) Collins Fm (MFc) Dunlop Fm (MFd)		Hydraulic Conductivity (m/s) <1E-10 1E-10 to 1E-9 1E-9 to 1E-8 1E-8 to 1E-7 1E-7 to 1E-6		Wheeler River Project Baseline Geology and Hydrogeological Assessment NW-SE Cross-Section	
Overburden Basement Rocks Water Level Elevation (masl) 1E-5 K Estimate (m/s)		Overburden Basement Rocks Water Level Elevation (masl)		Ecometrix Environmental Intelligence			

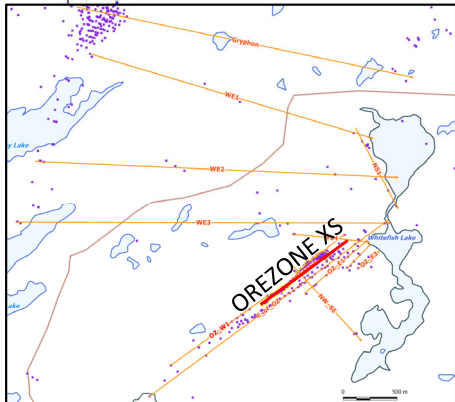
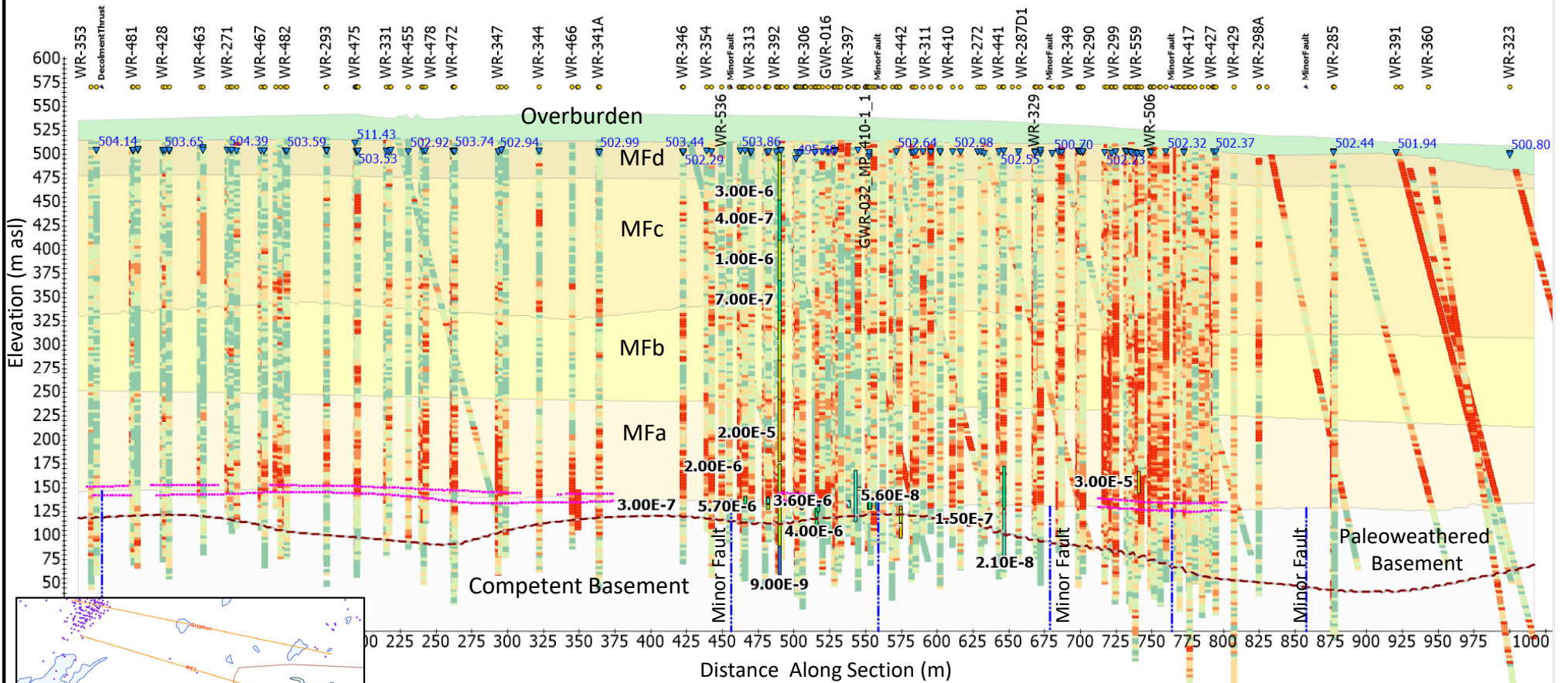


LEGEND		Hydraulic Conductivity (m/s)	
Fracture Frequency	Lithologic Surfaces	<1E-10	Overburden
0 to 1	Read Fm (MFa)	1E-10 to 1E-9	Basement Rocks
1 to 2	Bird Fm (MFb)	1E-9 to 1E-8	Water Level Elevation (masl)
2 to 3	Collins Fm (MFC)	1E-8 to 1E-7	1E-5 K Estimate (m/s)
3 to 4	Dunlop Fm (MFD)	1E-7 to 1E-6	
>4			

Wheeler River Project	
Baseline Geology and Hydrogeological Assessment	
OZ-WE1 Cross-Section	
Ecometrix	Environmental INTELLIGENCE
E8	

SW

NE



LEGEND	
Fracture Frequency	Lithologic Surfaces
0 to 1	Read Fm (MFa)
1 to 2	Bird Fm (MFb)
2 to 3	Collins Fm (MFC)
3 to 4	Dunlop Fm (MFD)
>4	

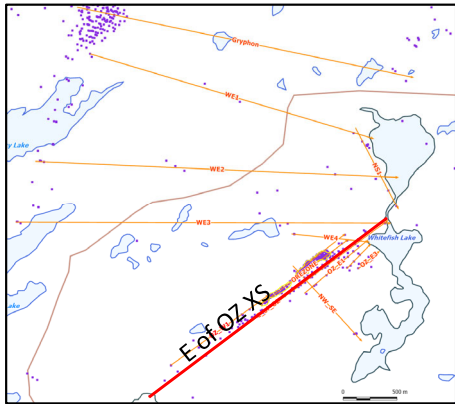
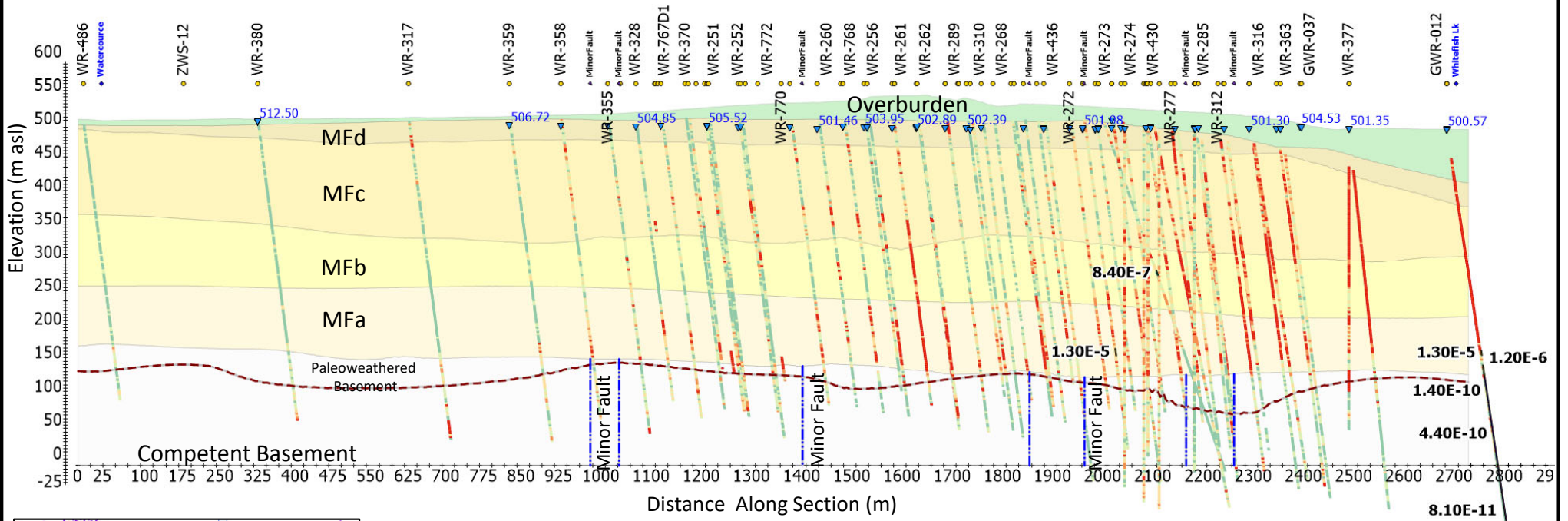
Overburden
Basement Rocks
Water Level Elevation (masl)
1E-5 K Estimate (m/s)
Ore Zone
Paleoweathered Surface

Hydraulic Conductivity (m/s)	
<1E-10	1E-10 to 1E-9
1E-9 to 1E-8	1E-8 to 1E-7
1E-7 to 1E-6	

Wheeler River Project	
Baseline Geology and Hydrogeological Assessment	
Ore Zone Cross-Section	
E9	

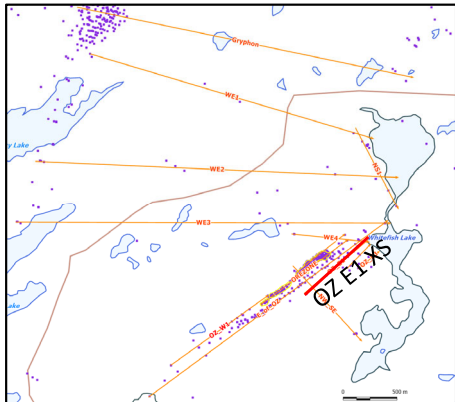
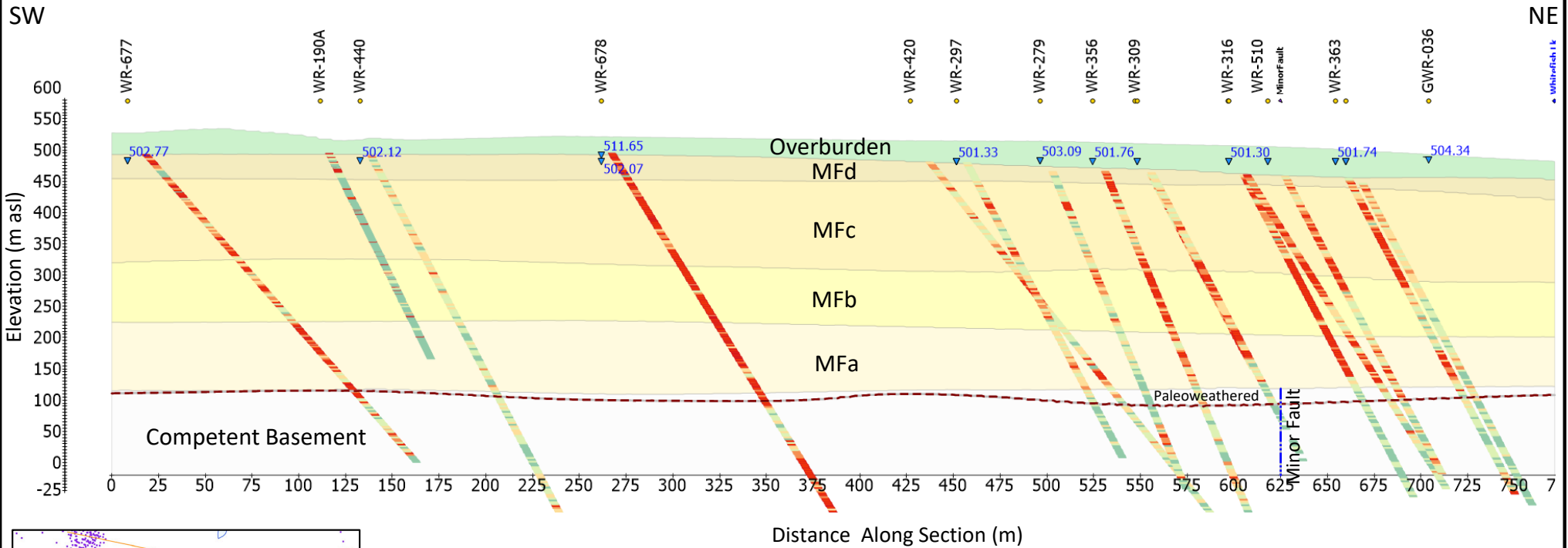
SW

NE



LEGEND		Hydraulic Conductivity (m/s)	
Fracture Frequency	Lithologic Surfaces	Overburden	<1E-10
0 to 1	Read Fm (MFa)	Basement Rocks	1E-10 to 1E-9
1 to 2	Bird Fm (MFb)	Water Level Elevation (masl)	1E-9 to 1E-8
2 to 3	Collins Fm (MFC)	1E-5 K Estimate (m/s)	1E-8 to 1E-7
3 to 4	Dunlop Fm (MFD)	Paleoweathered Surface	1E-7 to 1E-6
>4			

Wheeler River Project	
Baseline Geology and Hydrogeological Assessment	
E of Ore Zone Cross-Section	
Ecometrix	Environmental INTELLIGENCE
E10	



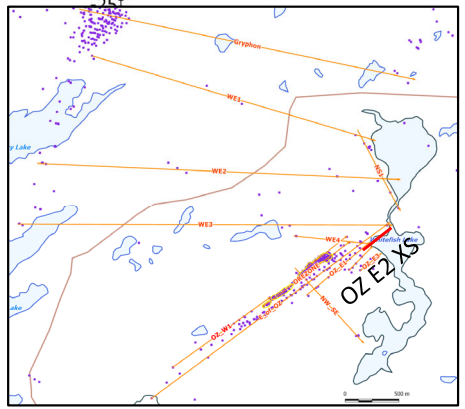
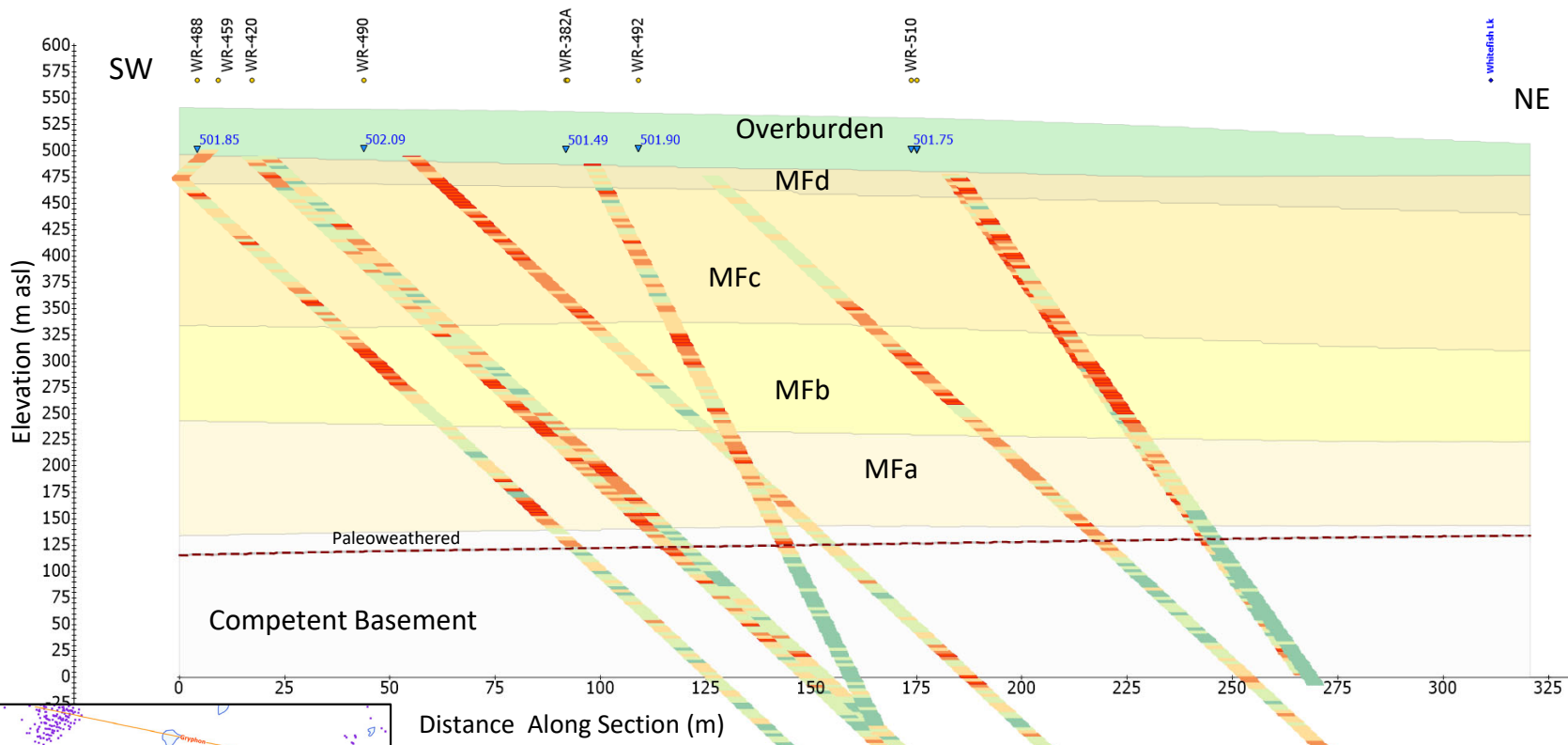
LEGEND		Hydraulic Conductivity (m/s)	
Fracture Frequency	Lithologic Surfaces	<math><1E-10</math>	$1E-10$ to $1E-9$
0 to 1	Read Fm (MFa)	$1E-9$ to $1E-8$	$1E-8$ to $1E-7$
1 to 2	Bird Fm (MFb)	$1E-7$ to $1E-6$	
2 to 3	Collins Fm (MFc)		
3 to 4	Dunlop Fm (MFd)		
>4			
Overburden	Basement Rocks		
Water Level Elevation (masl)	Paleoweathered Surface		
1E-5 K Estimate (m/s)			

Wheeler River Project
Baseline Geology and Hydrogeological Assessment

OZ E1 Cross-Section

|

E11



LEGEND		Hydraulic Conductivity (m/s)	
Fracture Frequency	Lithologic Surfaces	Overburden	<1E-10
0 to 1	Read Fm (MFa)	Basement Rocks	1E-10 to 1E-9
1 to 2	Bird Fm (MFb)	Water Level Elevation (masl)	1E-9 to 1E-8
2 to 3	Collins Fm (MFC)	1E-5 K Estimate (m/s)	1E-8 to 1E-7
3 to 4	Dunlop Fm (MFd)	Paleoweathered Surface	1E-7 to 1E-6
>4			

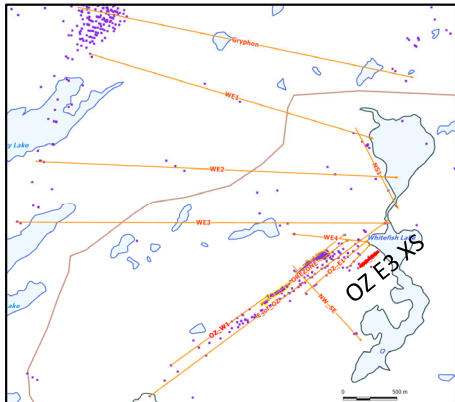
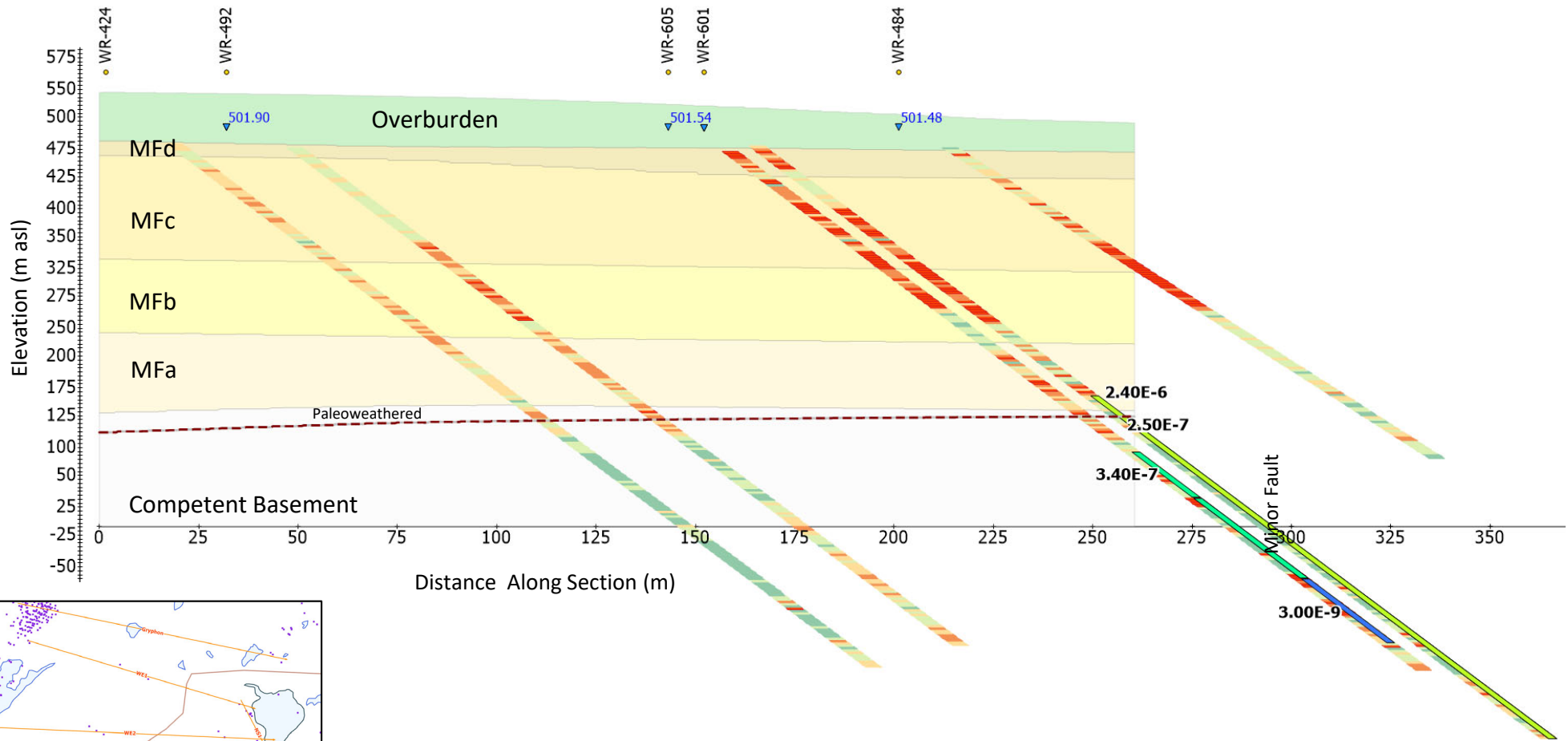
Wheeler River Project
Baseline Geology and Hydrogeological Assessment

OZ E2 Cross-Section

E12

SW

NE



LEGEND		Hydraulic Conductivity (m/s)	
Fracture Frequency	Lithologic Surfaces	<1E-10	1E-10 to 1E-9
0 to 1	Read Fm (MFa)	1E-9 to 1E-8	1E-8 to 1E-7
1 to 2	Bird Fm (MFb)	1E-7 to 1E-6	
2 to 3	Collins Fm (MFC)		
3 to 4	Dunlop Fm (MFD)		
>4	Overburden		
	Basement Rocks		
	Water Level Elevation (masl)		
	1E-5 K Estimate (m/s)		
	Paleoweathered Surface		

Wheeler River Project
Baseline Geology and Hydrogeological Assessment

OZ E3 Cross-Section

| Environmental INTELLIGENCE

E13


Appendix F Groundwater Sampling Methodology

Work Instruction

Wheeler River Evaluation Groundwater Sampling

WRE-WI-006

Revision	Date yy-mm-dd	Summary of Changes	Authorized by:
0	20-06-04	Original	David Bronkhorst, VP Operations

 Denison Mines	Wheeler River Evaluation Groundwater Sampling	
Work Instruction	WRE-WI-006	Page 2 of 12

Related Documents

Wheeler River Covid-19 Procedure Document WR-PRO-01
Radiation Protection Program
Air Lift Well Development – WRE-WI-004
WRE_FRM_AirLiftChecklist
Injection And Pump Tests – WRE-WI-005
Solinst Model 407 Bladder Pump and control unit operator’s manual

Objective and Scope	Tools and materials
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<p>The purpose of groundwater sampling is to create baseline water quality data for environmental modelling, future test work, and mining activities. Samples will also be taken from the ore zone to aid in geochemical modelling for ISR mining. The primary objective of this work instruction is to ensure the collection of the best possible representative samples from the screened interval depths</p> <p>This procedure is for groundwater sampling and does not cover purging by air lift which is covered by (Air Lift Well Development WRE HYD 01)</p> <p>To be conducted by Denison field staff</p>	<ul style="list-style-type: none"> • Truck with hitch • 20kw Generator on trailer • Nitrogen tank with regulator • Crescent wrenches • Redi-Flo pump (if applicable) • Bladder pump setup (Solinst Model 407) • Sample containers, preservatives, and filters • Coolers and ice packs • YSI water quality meter (calibrate before use) • Field notebook pencils and markers • Water level tape • Deionized water • Phosphate-free soap • Field test kits (Fe, H₂S)
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Covid-19 Mitigation Procedures	PPE Required
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<ul style="list-style-type: none"> • Practice social distancing (>2m) while undertaking work • After initial setup the work can be done alone • If social distancing is not possible for a task a cloth mask must be worn • Work involves shared contact with equipment and materials so hand sanitizer must be used before and after doing the work • Bladder pump controls must be wiped down with disinfectant wipes before and after work 	<ul style="list-style-type: none"> • Hand-held radio to check in every 2 hours when working alone • Safety glasses • Coveralls or designated work clothes (long sleeve and pants) • Rubberized work gloves • Disposable rubber gloves • TLD Badge • Polimaster Direct Reading Dosimeter
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Record(s) Required	Duration of Record(s) Storage	Responsibility for Record Mgmt.
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<ul style="list-style-type: none"> • Field Notes • WRE_FRM_GroundwaterPurgeAndSample • Chain of custody and submission forms • Shipping labels (SRC and U of O) 	Indefinitely	Technical Services Coordinator/ Environmental Services Coordinator
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	Wheeler River Evaluation Groundwater Sampling	
Work Instruction	WRE-WI-006	Page 3 of 12

Step	Instructions	Illustration of Step
<p>1. Ensure that well is developed and purged before sampling</p>	<p>Sampling will done on screened well installations that have been initially developed by air lift (confirm checklist for well; right) and have been purged by airlift or other methods for at least 1 casing volume; Record field parameters and take field tests every 1/2 casing volume during purging until parameters stabilize. 3 casing volumes maximum and record in GroundwaterPurgeAndSample form. (see Air Lift Well Development - WRE HYD 01).</p> <p>Development and purging are necessary to collect a sample that is representative of the natural formation water. Samples should be taken between 2 days and a week after well purging via air lift to allow suspended solids to settle. A bladder pump (with N₂ gas) should be used to collect the sample because it has the lowest impact on sample quality, does not cause sample aeration, and provides the most consistent sampling method. Some well installations are large enough to accommodate a Redi-Flo pump (2”), Bennet pump (2.5”), or Grundfos pump (4”) for well purging (see 20200601_WRE_WI_HYD-04-InjectionAndPumpTests) but sampling should still be done with bladder pump.</p>	<p style="text-align: center;"><u>Air Lift Checklist Form</u></p> <p>Air Lift Well Development Checklist</p> <p>Well ID: Test Supervisor: _____</p> <p>Date: start time: _____ end time: _____</p> <p>1. Airlift monitoring well development planning:</p> <ul style="list-style-type: none"> <input type="checkbox"/> estimate depth of submergenceft <input type="checkbox"/> estimate minimum air pressurepsi <p>2. Pre-air-lifting checks</p> <ul style="list-style-type: none"> <input type="checkbox"/> compressor/generator (turn on/off, check fuel) <input type="checkbox"/> airline system check (all components present): compressor valve → injection hose & connections (measure length required and mark) <input type="checkbox"/> water discharge system check: → sump pump → discharge hose & connections → discharge measuring bucket <input type="checkbox"/> measuring equipment: → water level meter → watch, tape measure, notepad, pencil <input type="checkbox"/> YSI water quality meter (calibrated before use) <p>3. Measure static water level _____ ft</p> <p>4. Install air system</p> <ul style="list-style-type: none"> <input type="checkbox"/> insert air pipe or hose down hole <input type="checkbox"/> secure hose in air inlet on well head with In Situ cap <p>5. Install water discharge system</p> <ul style="list-style-type: none"> <input type="checkbox"/> discharge hose attached to port on well head and secured with rope. Alternatively, discharge to overpack drum and use sump pump <p>6. Airlift monitoring well development</p> <ul style="list-style-type: none"> <input type="checkbox"/> start compressor and <u>open air</u> valve to begin air injection (may need to partially open valve to achieve steady-state flow; if so note how much): <p style="text-align: center;">AIR ON _____ time of day</p> <ul style="list-style-type: none"> <input type="checkbox"/> measure water discharge rate vs. time until steady state has been achieved. If steady state not possible record the length of air cycle, number of cycles, and volume purged per cycle.
<p>2. Prepare sampling materials</p>	<p>Assemble all the materials required for the sample to be taken. Refer to Appendix A for the number/size of bottles, types and amount of preservatives, field test kits, and filters required for the sample.</p>	

3. Install bladder pump in well and calculate pumping pressure

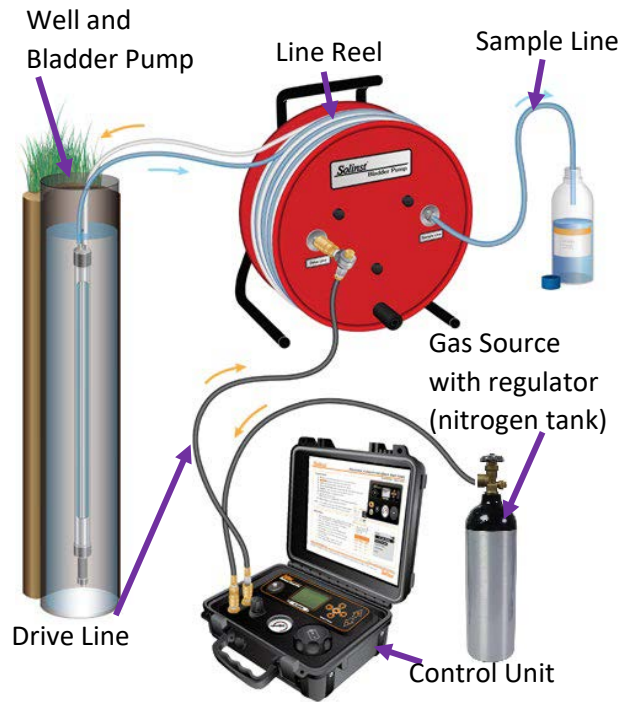
Before installing, measure the depth to water (see Injection And Pump Tests – WRE HYD 04). When installing pump, make sure that the safety line is securely attached to the bladder pump (add field picture) and set it at least 3 m below water level.

Connect the supply line from the N₂ cylinder with a regulator to the control unit. Get someone experienced with compressed gas cylinders to show you how if you are not familiar with using them. The drive line connects from the control unit to the reel (make sure it is the line with the quick exhaust fitting). Attach a 1 m length of 1/4" OD sample line to the sample connector on the reel.

Determine the pressure required to sample. 1 psi of pressure can raise a 0.7 m column of water in the line. Add 10 psi for line loss. Pressure must not exceed 250 psi. See below for formula and an example for a pump installed at 30 m below ground surface.

$$psi = \frac{Depth(m)}{0.7(psi/m)} + 10$$


$$53psi = \frac{30 m}{0.7(psi/m)} + 10$$




4. Turn on bladder pump and determine drive time

Turn the control unit regulator to the calculated pressure from Step 3. To help protect the control unit from damage due to moisture, always position it physically higher than the sample discharge and wellhead. Before use, refer to the Solinst Model 407 Bladder Pump and control unit manual for detailed instructions, troubleshooting, and operating principles.



	<p>To initially set the pump drive and vent time, submerge the sample discharge line into a clear container of water, push the manual control valve on the pump controller, and count the number of seconds until you stop seeing air bubbles in the container of water. When the air bubbles stop, the bladder is fully compressed and that is the end of the drive time. When the intake of the pump is shallower than 30 m, set the vent time to twice as long as the drive time. For example, if it took 8 seconds of drive time to compress the bladder, allow 16 seconds for the vent time to refill the bladder. When the pump intake is deeper than 30 m, the vent time will be closer to 3 to 4 times the drive time. Adjust the vent time as needed to achieve the best flow rate.</p>	
<p>5. Purge sample line and record field parameters</p>	<p>Using the pressure and drive/vent times determined in Steps 3 and 4, begin pumping. The sample line will need to be purged at least one line volume (32 mL per metre of sample line) to remove any water that was already in the line.</p> <p>Once the line is purged, begin regularly recording water quality measurements with the YSI meter (refer to the operating instructions in the meter case and ensure it has been calibrated prior to sampling). These readings should be taken in a manner that minimizes interaction between the sample and the atmosphere. Record pH, conductivity, dissolved O₂, and temperature measurements in FRM_GroundwaterPurgeAndSample.</p> <p>In addition to the purge and sample form, documentation of observations</p>	

	Wheeler River Evaluation Groundwater Sampling	
Work Instruction	WRE-WI-006	Page 6 of 12

	<p>and data acquired in the field will provide information on the acquisition of samples. Information recorded in field notes must include:</p> <ul style="list-style-type: none"> ○ Weather conditions ○ Drill hole number/ID ○ Initial water level depth ○ Volume of water purged before sampling ○ Calibration information for field instruments ○ Field parameters recorded ○ Number of water samples taken ○ Water sample identification numbers ○ Date and time of sample collection ○ Water color and odour if notable ○ Any deviations from the procedures ○ Note any possible contaminants introduced during sampling <p>Ensure that you have enough nitrogen available to complete the purging and sampling. Generally, you should allow for 10 L of nitrogen to push 1 L of water. Once the field water quality parameters have stabilized, a sample may be collected.</p>	
<p>6. Collect samples and measure using field kits</p>	<p>A total required sampling volume of approximately 6.0 L is required.</p> <p>Before opening and filling sample containers, check the sampling area for potential sources contamination. Make sure the surface area is clean and that contaminated equipment is kept clear from the sampling location. Protect the samples from airborne contaminants such as engine exhaust, wind borne dust and organic fumes (e.g. gas cans); sample upwind of these contaminants or remove them before sampling. Nitrile gloves should</p>	<p>Add Photos</p>

be worn at all times while filling sample bottles.

For samples listed in Appendix A that do not require filtering or preservation, fill sample bottle as full as possible to limit headspace. Take care not to touch the inside of the lid or sample bottle and to limit dust or other particulate entry into the bottle. Tightly seal the bottle.


For samples listed in Appendix A that require filtering and/or preservation, use a new syringe and slowly and gently force sample water through a new 0.45 µm filter into the sample bottle. When sample bottle is $\frac{3}{4}$ full, add any needed preservatives, then continue to fill the sample bottle with filtered water until no or minimal headspace remains. Take care not to touch the inside of the lid or sample bottle, and to limit dust or other particulate entry into the bottle. Tightly seal the bottle.

Quality control samples are also required and should include the collection of field duplicate, field blank, and equipment rinse blank (see Step 7).


Field Duplicate Samples: One out of every 20, or a minimum of 1 per month, groundwater sample sets should be duplicated. For these, an extra sample is collected for all parameters except tritium.

Field Blank Samples: For every 20, or a minimum of 1 per month, groundwater samples, a blank sample should be taken. The field blank will use DI water instead of sample water and will done for all parameters



	Wheeler River Evaluation Groundwater Sampling	
Work Instruction	WRE-WI-006	Page 8 of 12

	<p>except tritium, following normal procedures for each (e.g., for dissolved metals, the sample will be filtered and preserved as is done with a normal sample). The DOC field blank will be RO or de-ionized water.</p> <p>Label all sample bottles in accordance with Appendix A. Check sample bottles to ensure labels are correctly, and fully filled in with all required details. Ensure the well ID is on the label. Date and time, as well as sampler initials, are required. Time recorded should be when the sample is transferred to sample bottle(s).</p> <p>Along with the sample taken for lab analysis, field tests will be done with a HACH kit to measure ferrous iron and H₂S gas (only for ore zone samples).</p>	
<p>7. Decontaminate sample equipment</p>	<p>Between wells, sampling equipment should be thoroughly decontaminated to ensure that cross contamination does not affect results. Triple rinse field monitoring equipment using clean distilled (DI) water. The bladder pump's interior can be cleaned by disassembling (refer to manual) and washing with phosphate free soap, then rinsing with deionized water.</p> <p>One set of equipment rinse blanks should be collected from the decontaminated equipment during the season to ensure proper decontamination is taking place. Sampling procedure should match the field blank sample collection from Step 6. Equipment rinse blank should be labelled based on last well sampled.</p>	

	Wheeler River Evaluation Groundwater Sampling	
Work Instruction	WRE-WI-006	Page 9 of 12

<p>8. Ship samples</p>	<p>Shipping of samples will need to be coordinated to minimize hold time exceedances for time sensitive samples (Appendix A). Due to the remote location, it is not possible to have samples analyzed within 48 hours for nitrite (Bottle #7), so priority will be given to reduce hold time for overburden well samples which are most likely to have detectable levels. Sample sets will be shipped to SRC as soon as possible after sample collection (maximum 4 days).</p> <p>Many of the requested analytes listed (Appendix B) need to be specifically requested on the COC and/or in communications with SRC. Bismuth and lithium are not included in the standard SRC metals package and need to be specifically requested on the COC.</p>	<p>Saskatchewan Research Council 125 - 15 Innovation Boulevard Saskatoon, SK S7N 2X8 Phone: 306-933-5400</p>
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Appendix A Volumes, Preservatives and Filtering Requirements for Analytes

Bottle #	Parameter	Preferred Volume	Minimum Volume	Preserved	Filtered 0.45 um	Hold Time
1	General Chemical: Chloride, Fluoride, Specific Conductivity, Ca, Mg, Na, K, P, SO4 General Chemical Alkalinity, bicarbonate, carbonate, hydroxide, pH, TDS TSS	1.0 L plastic Fill bottle with sample. Keep cool.	250 mL	no	no	14days 4 days for pH (not critical) 7 days for TDS
2	Ammonia, Nitrate + Nitrite, N	250 ml plastic Fill bottle with sample. Keep cool.	50 mL	2 mL 20% sulfuric acid	no	28 days
3	Nitrite	100 mL plastic No preservative. No headspace. Keep cool.	5 mL	no	no	48 hours (only critical for overburden samples)
4	Dissolved Metals (including Bi and Li)	100 mL plastic Pour vial of acid into bottle and fill with sample.	10 mL	1.5 mL 17.5% HNO ₃	0.45 micron	28 days
5	Dissolved Metals (including Bi and Li)	10 mL plastic Pour vial of acid into bottle and fill with sample.	10 mL	0.2 mL 17.5% HNO ₃	0.01 micron	28 days (only on select samples; 1 per OB OL-A OL-B)
6	Bromine	100 mL plastic. Fill bottle with sample	10 mL	no	no	28 days
7	Radionuclides (including Pb-210, Po- 210, Ra-226, Th-230)	4.0 L plastic Fill bottle with sample	4.0 L	40 mL 17.5% HNO ₃	no	28 days
8	Radon-222	2 x 40 mL glass vials Date and time sampled is required.	10 mL	no	no	8 days
9	Tritium (3H)	100 mL plastic Fill bottle with sample	25 mL	no	no	28 days
10	Dissolved organic carbon	100 mL plastic. Leave unpreserved and mark bottle for lab to filter	50 mL	no	no	28 days

Appendix B Field Measurements

Parameter	Method	Comments
Temperature	YSI ProDSS Meter	Measured while purging until stable
Dissolved Oxygen	YSI ProDSS Meter	Measured while purging until stable
Conductivity	YSI ProDSS Meter	Measured while purging until stable
pH	YSI ProDSS Meter	Measured while purging until stable
Iron Speciation	HACH field kit	Measured while purging until stable
H2S	HACH field kit	Measure while purging until stable; Ore zone only

Appendix C Detailed Analyte List

Analyte	Units	Detection Limit	Method
Bicarbonate	mg/L	0.01	Alkalinity
Calcium	mg/L	0.1	ICP
Carbonate	mg/L	0.01	Alkalinity
Chloride	mg/L	0.1	Colorimetric
Fluoride	mg/L	0.01	Ion Selective Electrode
Hydroxide	mg/L	0.01	Alkalinity
Magnesium	mg/L	0.1	ICP
pH	pH Units	N/A	Ion Selective Electrode
Potassium	mg/L	0.1	ICP
Sodium	mg/L	0.1	ICP
Specific Conductivity	µS/cm	1	Conductivity cell
Sulphate	mg/L	0.2	ICP
Sums of Ions	mg/L	N/A	Calculation
Total Alkalinity	mg/L	1	Titration
Total Hardness	mg/L	1	Calculation
Total Dissolved Solids	mg/L	1	Gravimetric
Total Suspended Solids	mg/L	1	Gravimetric
Nitrate+Nitrite - N	mg/L	0.04	Colorimetric
Phosphorous	TBD	TBD	TBD
Ammonia - N	mg/L	0.01	Colorimetric
Aluminum	mg/L	0.0005	ICP-MS
Antimony	mg/L	0.0002	ICP-MS
Arsenic	mg/L	0.0001	ICP-MS
Barium	mg/L	0.0005	ICP-MS
Beryllium	mg/L	0.0001	ICP-MS
Bismuth	µg/L	0.2	ICP-MS
Boron	mg/L	0.01	ICP-MS
Cadmium	mg/L	0.00001	ICP-MS
Chromium	mg/L	0.0005	ICP-MS
Cobalt	mg/L	0.0001	ICP-MS
Copper	mg/L	0.0002	ICP-MS
Iron	mg/L	0.0005	ICP-MS
Lead	mg/L	0.0001	ICP-MS
Lithium	µg/L	0.1	ICP-MS
Manganese	mg/L	0.0005	ICP-MS

Molybdenum	mg/L	0.0001	ICP-MS
Nickel	mg/L	0.0001	ICP-MS
Selenium	mg/L	0.0001	ICP-MS
Silver	mg/L	0.00005	ICP-MS
Strontium	mg/L	0.0005	ICP-MS
Thallium	mg/L	0.0002	ICP-MS
Tin	mg/L	0.0001	ICP-MS
Titanium	mg/L	0.0002	ICP-MS
Uranium	mg/L	0.0001	ICP-MS
Vanadium	mg/L	0.0001	ICP-MS
Zinc	mg/L	0.0005	ICP-MS
Lead-210	Bq/L	Variable	Extraction/beta counting
Polonium-210	Bq/L	Variable	Alpha spectrometry
Radium-226	Bq/L	Variable	Alpha spectrometry
Thorium-230	Bq/L	Variable	Alpha spectrometry
Tritium (3H)	TU	0.7	Liquid scintillation counting
Bromine	mg/L		
Organic carbon, Dissolved	mg/L		
Radon-222	Bq/L		
Silica, soluble	Mg/L		
Sulfur	mg/L		
Uranium-234	Bq/L		
Uranium-238	Bq/L		

Appendix G Groundwater Sampling Field Sheets

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-003
 Dip: -90 Sampler: YX / JC / BB
 Project: WR-EVAL
 Date: 16-Aug-20
 Temperature/Weather: 18 *C

Depth of well (ft): 198
 Screen interval (ft):
 Depth of Static Water Level (corrected for angle)(ft): N/A

Sampling equip.: Bladder Pump

Purging equip. (circle): Redi-flow Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 198 D) Well diameter (ID) (ft): 0.16666667
 B) Depth to water level (ft): 68.24 E) Casing Volume (gal): 21.16457774
 C) Water column (A-B)(ft): 129.76 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
11:00	5.5		6.9	9.7	41.3	57.2	37	9.85	0.00	0.0	Relatively Clear
11:10	11	0.5	7.27	8.5	27	39.4	26	11.37	0.25	0.0	Muddy, Rusty brown sediment
11:20	16.5		7.34	8.6	25.5	36.9	24	11.19	0.00	0.0	Trace of Rusty brown sediment
11:30	22	1.0	7.36	7.7	22.6	33.6	22	11.43	0.00	0.0	Trace of Rusty brown sediment
11:40	27.5		7.19	7.8	21.5	32	21	11.57	0.00	0.0	Clear, Rusty brown tinge
11:50	33	1.5	7.14	7.3	20.6	31.1	20	11.87	0.00	0.0	Clear, Rusty brown tinge

Sample Collection Time: 10:00 **Ship Date:** 17-Aug-20

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	General Chemical	250	N/A	No	
2	Ammonia Nitrite	50	2 mL 20% Sulfuric Acid	No	
3	Nitrite	5	N/A	No	
4	Dissolved Metals	10	1.5 mL 17.5% HNO3	0.45 Micron	
6	Bromine	10	N/A	No	
7	Radionuclides	4000	40 mL 17.5% HN03	No	
8	Radon-222	10	N/A	No	
9	Tritium	25	N/A	No	
10	Dissolved Organic Carbon	50	N/A	No	

Final Sample Field Parameters

Ferrous Fe (mg/L) :	0.0	SPC (µS/cm) :	35.3
H ₂ S (mg/L) :	0.0	C (µS/cm) :	28.2
Diss. O ₂ (mg/L) :	9.05	pH :	6.35
TDS (mg/L) :	23	Temp. (°C) :	14.6

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-005
 Dip: -90 Sampler: ME/BB Depth of well (ft): 403.5
 Project: Wheeler Screen interval (ft): 384.0 - 403.0
 Date: 2020-08-29 Depth of Static Water Level (corrected for angle)(ft): N/A
 Temperature/Weather: Mix of sun and cloud, 10°C

Sampling equip.: Bladder Pump

Purging equip. (circle): Redi-flow Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 403.5 D) Well diameter (ID) (ft): 0.125
 B) Depth to water level (ft): 2.42 E) Casing Volume (gal): 36.8
 C) Water column (A-B)(ft): 401.08 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
2:02	5		6.82	8.6	91.4	132.9	86	10.27			Light grey, cloudy; min seds
2:14	10		7.19	7.9	81.6	121	79	11.23			Light grey, cloudy; min seds
2:30	15	0.5	7.13	8.0	74.8	110.7	72	11.42	1.50		Milky grey
2:39	20		7.03	7.7	68.7	102.5	67	11.34			Milky grey
2:53	25		6.94	8.6	67.9	98.7	64	11.18			Light grey
3:00	30	1.0	6.96	8.1	68.1	100.5	65	11.27	1.50		Light grey
3:10	35		6.94	8.2	65.2	95.8	62	11.28			Light grey, clear
3:19	40		6.89	7.9	64.0	95	62	11.38			Light grey, clear
3:27	45	1.5	6.89	7.9	63.9	94.3	61	11.36	2.00		Light grey, clear

Sample Collection Time: 2020-08-29 **Ship Date:** 2020-08-31

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-005-01	1000	No	No	
2	GWR-005-02	250	2 mL Sulfuric Acid	No	
3	GWR-005-03	100	No	No	
4	GWR-005-04	100	1.5 mL HNO ₃	0.45 micron	
6	GWR-005-06	100	No	No	
7	GWR-005-07	4000	40 mL HNO ₃	No	
8	GWR-005-08	80	No	No	
9	GWR-005-09	100	No	No	
10	GWR-005-10	100	No	No	

Final Sample Field Parameters

Ferrous Fe (mg/L) : 2.0 SPC (µS/cm) : 93.4
 H₂S (mg/L) : N/A C (µS/cm) : 68.2
 Diss. O₂ (mg/L) : 2.33 pH : 7.49
 TDS (mg/L) : 61 Temp. (°C) : 10.4

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID GWR-006

Dip: -90 Sampler JC / BB

Project: WR-EVAL

Date: 22-Aug-20

Temperature/Weather: 10 C

Depth of well (ft): 29.5

Screen interval (ft): 10.0-29.0

Depth of Static Water Level (corrected for angle)(ft): N/A

Sampling equip.: Redi-flow

Purging equip. (circle):

Redi-flow

Bailer

Air Lift

Grundfos 5SQE5-450

A) Bottom of well depth (ft): 29.5

B) Depth to water level (ft): 7.19

C) Water column (A-B)(ft): 22.31

D) Well diameter (ID) (ft): 0.16666667

E) Casing Volume (gal): 3.63888509

Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
14:30	5	1.0	6.4	7.6	108.7	162.9	106	2.62			viscous light greywater, susp
14:40	15	3.0	6.98	4.9	56.4	91.4	59	3.08	0.50		viscous light greywater, susp
14:50	25	6.0	6.65	4.9	49.6	80.5	52	4.52	1.00		light grey water, suspended s
14:55	35	8.0	6.71	4.7	49.3	80.6	52	3.13			cloudy water
15:05	45	11.0	6.73	5.2	50.2	80.6	52	3.6	1.00		cloudy water

Sample Collection Time: 15:30 **Ship Date:** 24-Aug-20

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-006-01	250	N/A	no	
2	GWR-006-02	50	2 mL 20% Sulfuric Acid	no	
3	GWR-006-03	5	N/A	no	
4	GWR-006-04	10	1.5 mL 17.5% HNO3	0.45 micron	
6	GWR-006-06	10	N/A	no	
7	GWR-006-07	4	40 mL 17.5% HN03	no	
8	GWR-006-08	10	N/A	no	
9	GWR-006-09	25	N/A	no	
10	GWR-006-010	50	N/A	no	

Final Sample Field Parameters

Ferrous Fe (mg/L) : 1.0	SPC (µS/cm) : 80.4
H ₂ S (mg/L) : 0.0	C (µS/cm) : 53.1
Diss. O ₂ (mg/L) : 3.76	pH : 6.75
TDS (mg/L) : 52	Temp. (°C) : 6.7

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-008
 Dip: -80 Sampler: ME/DG Depth of well (ft): 1246.7
 Project: Wheeler Screen interval (ft): 1227.2 - 1246.6
 Date: 2020-09-06 Depth of Static Water Level (corrected for angle)(ft): 115.12
 Temperature/Weather: Cloudy, 8°C

Sampling equip.: Bladder Pump

Purging equip. (circle): Redi-flow Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 1246.7 D) Well diameter (ID) (ft): 0.125
 B) Depth to water level (ft): 116.9 E) Casing Volume (gal): 103.7
 C) Water column (A-B)(ft): 1129.8 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
10:24	10		6.62	5.7	79.3	125.4	81	12.02			Dark grey, cloudy
10:34	20		6.72	4.8	76.8	124.9	81	12.14			Slightly lighter dark grey
10:47	40		6.74	4.7	79.0	128.9	84	12.17			Grey, cloudy
10:55	50	0.5	6.73	4.8	76.7	124.9	81	12.08	2.00		Grey, cloudy
11:00	60		6.74	4.7	76.6	124.6	81	12.16			Light grey clear
11:17	80		6.81	5.2	76.5	122.8	80	11.93			Light grey clear
11:35	100	1.0	6.84	5.3	70.7	113.3	74	12.07	2.50		Light grey clear
11:43	110		6.85	5.1	69.2	111.5	72	12.11			Light grey clear
11:52	120		6.86	4.9	66.8	108.3	70	12.17			Light grey clear

Sample Collection Time:

Ship Date:

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-008-01	1000	No	No	
2	GWR-008-02	250	2 mL Sulfuric Acid	No	
3	GWR-008-03	100	No	No	
4	GWR-008-04	100	1.5 mL HNO ₃	0.45 micron	
6	GWR-008-06	100	No	No	
7	GWR-008-07	4000	40 mL HNO ₃	No	
8	GWR-008-08	80	No	No	
9	GWR-008-09	100	No	No	
10	GWR-008-10	100	No	No	

Final Sample Field Parameters

Ferrous Fe (mg/L) : 2.5 SPC (µS/cm) : 102
 H₂S (mg/L) : N/A C (µS/cm) : 71.9
 Diss. O₂ (mg/L) : 7.53 pH : 6.92
 TDS (mg/L) : 66 Temp. (°C) : 9.1

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-009

Dip: 65 Sampler ME / BB

Project: WR-EVAL

Date: Temperature/Weathe 6C, Clo

Depth of well (ft): 918.6

Screen interval (ft): 899.1-918.5

Depth of Static Water Level (corrected for angle)(ft): 114.01

Sampling equip.: Bladder Pump

Purging equip. (circle): Redi-flow Bailor **Air Lift** Grundfos 5SQE5-450

A) Bottom of well depth (ft): 918.6

B) Depth to water level (ft): 125.8

C) Water column (A-B)(ft): 792.8

D) Well diameter (ID) (ft): 0.125

E) Casing Volume (gal): 72.77

Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
14:33	19		12.33	7.4	2641	3980	2587	11.06			Milky grey water, floating ch
15:45	20		12.2	8.2	2259	3319	2157	11.7			Milky grey water
16:05	35	0.5	12.44	5.5	2314	3687	2397	11.69	0.00		Milky grey water
16:30	50		12.33	10	2572	3602	2341	10.76			Milky grey, polymer
11:18	90		12.12	8.5	1593	2312	1501	10.88			Cloudy white water
11:42	100		12.11	7.8	1191	1772	1152	11.06			Cloudy white water
13:06	145	2.0	11.88	8.7	1003	1455	945	11.07	0.00		Cloudy white water, white flk
13:40	160		11.91	8.3	881	1293	840	11.07			Milky white water
14:06	170		11.72	8	601	890	579	11.06			Milky white water
14:20	175	2.5	11.63	7.8	547	813	529	11.11	0.00		Milky white water
14:59	190		11.43	8	464	682	443	11.07			Light grey cloudy water
15:25	200		11.16	7.8	368	548	356	11.18			Light grey cloudy water
15:53	210	3.0	10.74	7.7	310	463	301	11.13	0.00		Cloudy white water
16:20	220		10.55	7.3	292	441	287	11.34			Cloudy white water
16:34	225		10.48	7.1	284	430	279	11.4			Cloudy white water
16:48	230	3.5	10.36	6.9	276	421	274	11.4			Cloudy white water
15:05	235		11.54	9.7	625	884	574	6.51			Cloudy, foamy, viscous brow
15:40	255	4.0	11.89	7.1	748	1137	739	9.86	0.00		Cloudy, foamy, viscous brow
4:00	275		11.46	6.2	604	943	613	11.46			Cloudy, foamy, viscous brow
10:00	285	4.5	11.76	6	632	985	638	10.78	0.00		Cloudy white water, foamy
10:30	305		11.89	6.3	701	1088	708	11.58			Cloudy white water, foamy
11:00	325	5.0	12.08	6.3	919	1427	927	11.6	0.00		Cloudy white water, foamy
11:30	345		12.06	6.2	880	1373	892	11.59			Cloudy white water, foamy
12:00	365	5.5	12	6.3	848	1222	853	11.46	0.00		Cloudy white water, foamy
13:30	425	6.0	11.51	7.7	386	577	375	11.36	0.00		Cloudy white water
14:00	445		11.43	6.5	320	493	321	11.54			Cloudy white water
14:30	465	6.5	11.28	6.1	271	425	277	11.78	0.00		Cloudy white water
15:00	485		11.21	6	248	390	253	11.81			Cloudy white water
15:30	505	7.0	11.13	6.1	235	367	239	11.77	0.00		Cloudy white water
16:00	525		11.04	6.4	229	354	230	11.68			Cloudy white water
9:00	1205	16.0	9.97	4.8	139	226	147	11.97	0.00		Clear, yellow tinge
9:30	1230		9.86	4.3	139	228	149	12.01			Clear, yellow tinge

Sample Collection Time: 14/9/2020 3:30:00 PM Ship Date: 15-Sep-20

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-009-01	1000	N/A	N/A	
2	GWR-009-02	250	2 mL 20% Sulfuric Acid	N/A	
3	GWR-009-03	100	N/A	N/A	
4	GWR-009-04	100	1.5 mL 17.5% HNO3	0.45 micron	
6	GWR-009-06	100	N/A	N/A	
7	GWR-009-07	4000	40 mL 17.5% HNO3	N/A	
8	GWR-009-08	80	N/A	N/A	
9	GWR-009-09	100	N/A	N/A	
10	GWR-009-10	100	N/A	N/A	

Final Sample Field Parameters

Ferrous Fe (mg/L) :	0.0	SPC (µS/cm) :	241
H ₂ S (mg/L) :		C (µS/cm) :	153
Diss. O ₂ (mg/L) :	3.00	pH :	10.87
TDS (mg/L) :	157	Temp. (°C) :	5.9

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-011
 Dip: -90 Sampler: YX / MT / ME / JC Depth of well (ft): ~1213
 Project: Wheeler Screen interval (ft): ~1194 - 1213
 Date: 2020-08-08 Depth of Static Water Level (corrected for angle)(ft): N/A
 Temperature/Weather: Sunny, 27°C

Sampling equip.: Bladder Pump

Purging equip. (circle): Redi-flow Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): ~1213 D) Well diameter (ID) (ft): 0.125
 B) Depth to water level (ft): ~130 E) Casing Volume (gal): ~99.41
 C) Water column (A-B)(ft): ~1083 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
1:53	20		7.9	7.8	24	33.9	22	-		-	Clear, with air bubbles
2:06	35		7.54	8.2	23	32.3	22	-		-	Clear, with air bubbles
2:21	50	0.5	7.32	8.2	23	32.7	21	-	0.00	-	Clear, with air bubbles
2:40	70		7.39	8.2	23	33.1	22	-		-	Clear, with air bubbles
2:52	85		7.35	8.3	23	33.6	22	-		-	Clear, with air bubbles
3:06	100	1.0	7.48	7.8	51	76	49	-	0.00	-	Milky grey, bubbles, seds.
3:24	120		8.93	8.4	83	118.7	78	-		-	Muddy grey, lots of seds
3:36	135		8.4	7.9	84	124	81	-		-	Muddy grey, lots of seds
3:49	150	1.5	8.21	7.9	83	122.7	80	-	0.25	-	Light grey, lots of seds
4:06	170		8.2	8.6	86	125.8	82	-		-	Light grey, relatively clean
4:18	185		8.02	8	83	121.3	79	-		-	Light grey, relatively clean
4:30	200	2.0	7.97	7.8	81	120.7	78	-	0.00	-	Light grey, relatively clean

Sample Collection Time: Daytime : 2020-08-08 **Ship Date:** 2020-08-10

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-011-01	800	No	No	
2	GWR-011-02	250	2 mL Sulfuric Acid	No	
3	GWR-011-03	100	No	No	
4	GWR-011-04	100	1.5 mL HNO ₃	0.45 micron	
6	GWR-011-06	100	No	No	
7	GWR-011-07	4000	40 mL HNO ₃	No	
8	GWR-011-08	80	No	No	
9	GWR-011-09	100	No	No	
10	GWR-011-10	100	No	No	

Final Sample Field Parameters

Ferrous Fe (mg/L) : 0.0 SPC (µS/cm) : 114
 H₂S (mg/L) : N/A C (µS/cm) : 98.5
 Diss. O₂ (mg/L) : 4.64 pH : 8.70
 TDS (mg/L) : 74 Temp. (°C) : 17.5

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC IDGWR-012

Dip: -78 Sampler ME/BB

Project: WR-EVAL

Date: 29-Aug-20

Temperature/Weath Cloudy,

Depth of well (ft): 1138.5

Screen interval (ft): 1119-1138.4

Depth of Static Water Level (corrected for angle)(ft): N/A

Sampling equip.: Bladder Pump

Purging equip. (circle):

Redi-flow

Bailer

Air Lift

Grundfos 5SQE5-450

A) Bottom of well depth (ft): 1138.5

B) Depth to water level (ft): 3.31

C) Water column (A-B)(ft): 1135.19

D) Well diameter (ID) (ft): 0.125

E) Casing Volume (gal): 104.2

Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
2:25	5		8.13	11.8	343	462	300	8.76			Dark grey cloudy water, lots
2:32	20		7.69	7.4	335	482	313	11.08			Cloudy, dark grey water
2:42	40		7.49	7.9	340	484	314	10.99			Cloudy, dark grey water
2:47	50	0.5	7.42	7.6	322	479	311	11.44	1.00		Cloudy, dark grey water
2:53	60		7.39	7.9	325	481	313	11.3			Cloudy, dark grey water
3:02	80		7.44	7.9	327	479	311	11.38			Cloudy, dark grey water
3:15	100	1.0	10.85	8.4	393	573	372	10.9	0.00		Light grey, milky water
3:25	120		9.06	7.6	373	552	359	11.26			Light grey, clear water
3:35	140		7.91	7	342	512	333	11.19			Light grey, milky water
3:42	150	1.5	7.35	7	337	499	325	11.17	1.50		Light grey, clear water
3:46	160		7.22	7.4	324	489	318	11.21			Light grey, clear water
3:51	180		7.13	7	319	484	315	11.33			Light grey, clear water

Sample Collection Time: 2020-08-29

Ship Date: 2020-08-31

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-005-01	1000	N/A	N/A	
2	GWR-005-02	250	2 mL 20% Sulfuric Acid	N/A	
3	GWR-005-03	100	N/A	N/A	
4	GWR-005-04	100	1.5 mL 17.5% HNO3	0.45 micron	
6	GWR-005-06	100	N/A	N/A	
7	GWR-005-07	4000	40 mL 17.5% HN03	N/A	
8	GWR-005-08	80	N/A	N/A	
9	GWR-005-09	100	N/A	N/A	
10	GWR-005-010	100	N/A	N/A	

Final Sample Field Parameters

Ferrous Fe (mg/L) : 2.0

H₂S (mg/L) :

Diss. O₂ (mg/L) : 1.63

TDS (mg/L) : 306

SPC (µS/cm) : 470.5

C (µS/cm) : 351.8

pH : 6.94

Temp. (°C) : 11.5

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-013
 Dip: -90 Sampler: MT / YX / ME / JC Depth of well (ft): ~907
 Project: Wheeler Screen interval (ft): ~887-907
 Date: 2020-08-09 Depth of Static Water Level (corrected for angle)(ft): N/A
 Temperature/Weather: Rainy, 10°C

Sampling equip.: Bladder Pump

Purging equip. (circle): Redi-flow Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 907 D) Well diameter (ID) (ft): 0.125
 B) Depth to water level (ft): 130 E) Casing Volume (gal): ~71
 C) Water column (A-B)(ft): 777 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
9:26	27		7.65	8.9	33	47.2	30	-		-	Clear with air bubbles
9:41	35	0.5	7.58	7.7	24	35.4	23	-	0.00	-	Clear with air bubbles
9:51	45		7.52	9.5	29	41.8	27	-		-	Clear with air bubbles
10:05	60		9.19	7.8	80	119.2	78	-		-	Grey-green, susp. solids
10:13	70	1.0	9.54	7.4	132	192.8	125	-	1.75	-	Darker greyish-green
10:28	80		9.58	8.3	184	267.5	173	-		-	Darker greyish-green
10:38	90		9.53	7.9	181	266.8	173	-		-	Darker greyish-green
10:52	105	1.5	9.26	7.9	175	258.5	168	-	1.25	-	Lighter greyish-green
11:06	120		9.19	7.8	176	258.5	168	-		-	Lighter greyish-green
11:15	130		9.18	7.7	174	260	169	-		-	Lighter greyish-green
11:24	140	2.0	9.18	7.5	174	261.1	170	-	0.75	-	Lighter greyish-green

Sample Collection Time: Daytime : 2020-08-09 **Ship Date:** 2020-08-10

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-013-01	1000	No	No	
2	GWR-013-02	250	2 mL Sulfuric Acid	No	
3	GWR-013-03	100	No	No	
4	GWR-013-04	100	1.5 mL HNO ₃	0.45 micron	
6	GWR-013-06	100	No	No	
7	GWR-013-07	4000	40 mL HNO ₃	No	
8	GWR-013-08	80	No	No	
9	GWR-013-09	100	No	No	
10	GWR-013-10	100	No	No	

Final Sample Field Parameters

Ferrous Fe (mg/L) : 0.0 SPC (µS/cm) : 238.4
 H₂S (mg/L) : N/A C (µS/cm) : 174.8
 Diss. O₂ (mg/L) : 3.60 pH : 9.68
 TDS (mg/L) : 155 Temp. (°C) : 10.5

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-014
 Dip: Sampler: ME / BB Depth of well (ft): 518.4
 Project: WR-EVAL Screen interval (ft): 498.89-518.3
 Date: 29-Aug-20 Depth of Static Water Level (corrected for angle)(ft): N/A
 Temperature/Weather: Cloudy, 10C

Sampling equip.: Bladder Pump

Purging equip. (circle): Redi-flow Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 518.4 D) Well diameter (ID) (ft): 0.125
 B) Depth to water level (ft): 3.62 E) Casing Volume (gal): 47.22945631
 C) Water column (A-B)(ft): 514.78 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
4:34	5		9.73	7.7	104.8	156.5	102	10.09			Brown water, moderate sediment
4:41	10		9.98	6.2	106.3	165.4	107	11.67			Milky yellow, foamy water
4:49	15		10.03	5.9	107.8	169.3	110	11.9			Milky yellow, foamy water
4:55	20		10.03	5.7	107.7	169.8	110	11.84			Milky yellow, foamy water
5:02	25	0.5	10.15	5.8	114.8	178.8	116	11.96	0.00		Light hazy yellow water
5:11	30		11.27	5.8	321.5	506	329	12.07			Milky yellow water
8:42	35		12.01	6.6	1164	1794	1166	11.54			Light hazy yellow water
8:47	40		11.8	6.4	1064	1653	1075	11.63			Light hazy yellow water
8:52	45		11.87	6.1	1214	1894	1231	11.77			Light hazy yellow water
8:57	50	1.0	12.01	6.4	1275	1979	1286	11.74	0.50		Light hazy yellow water
9:02	55		12.08	6.2	1314	2047	1330	11.76			Light hazy yellow water
9:06	60		12.12	6.2	863	1347	876	11.75			Light hazy yellow water
9:10	65		12.12	6.3	1221	1902	1236	11.73			Light hazy yellow water
9:14	70		12.11	6.5	1124	1749	1137	11.72			Light hazy yellow water
9:19	75	1.5	12.06	6.8	961	1476	959	11.7	0.00		Light hazy yellow water
9:24	80		12.02	6.3	769	1195	777	11.73			Light hazy yellow water
9:29	85		11.93	6.6	673	1041	677	11.69			Light yellow water, clear
9:35	90		11.87	7.1	603	917	596	11.62			Light yellow water, clear
9:39	95		11.84	6.9	552	844	549	11.63			Light yellow water, clear
9:44	100	2.0	11.77	6.8	510	781	507	11.6	0.00		Light yellow water, clear
9:50	105		11.72	6.8	458	703	457	11.69			Light yellow water, clear
9:55	110		11.63	6.8	415	635	412	11.67			Light yellow water, clear
10:00	115		11.58	7	385	588	382	11.63			Light yellow water, clear
10:05	120		11.52	7.1	351	533	347	11.6			Light yellow water, clear
10:13	125	2.5	11.45	7.1	324	493	323	11.73	0.00		Light yellow water, clear

Sample Collection Time: 2020-08-29 Ship Date: 2020-08-31

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-005-01	1000	N/A	n/a	
2	GWR-005-02	250	2 mL 20% Sulfuric Acid	n/a	
3	GWR-005-03	100	N/A	n/a	
4	GWR-005-04	100	1.5 mL 17.5% HNO3	0.45 micron	
6	GWR-005-06	100	N/A	n/a	
7	GWR-005-07	4000	40 mL 17.5% HNO3	n/a	
8	GWR-005-08	80	N/A	n/a	
9	GWR-005-09	100	N/A	n/a	
10	GWR-005-010	100	N/A	n/a	

Final Sample Field Parameters

Ferrous Fe (mg/L) : 0.0 SPC (µS/cm) : 397.2
 H₂S (mg/L) : C (µS/cm) : 275.6
 Diss. O₂ (mg/L) : 1.07 pH : 11.38
 TDS (mg/L) : 259 Temp. (°C) : 8.4

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC I GWR-025

Dip: -90 Sampler: MT / JC /BB

Project: WR-EVAL

Date: 22-Aug-20

Temperature/Weather: 10 C

Depth of well (ft): 1246.7

Screen interval (ft): 1227.2-1246

Depth of Static Water Level (corrected for angle)(ft): N/A

Sampling equip.: Bladder Pump

Purging equip. (circle):

Redi-flow

Bailer

Air Lift

Grundfos 5SQE5-450

A) Bottom of well depth (ft) 1246.7

B) Depth to water level (ft) 68.59

C) Water column (A-B)(ft) 1178.11

D) Well diameter (ID) (ft): 0.125

E) Casing Volume (gal): 108.8

Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
10:40	5		6.46	8	331.5	491	319	6.97			black water
11:02	20		7.04	6.5	304.4	469.6	305	11.66			grey water
11:10	40		7.1	6.5	297.5	456	297	11.56			light grey water
11:22	60	0.5	7.02	6.7	325.6	501	326	11.52	1.50		black water
11:30	80		7.08	6.9	376.6	574	373	11.54			light grey water
11:40	100	1.0	7.08	6.6	381.3	585	381	11.33	1.50		relatively clear, brown tinge
2:30	120		6.96	8.4	695	1018	662	11.41			clear, light grey tinge
2:40	140		7.03	6.9	605	926	602	11.67			clear, clean water
2:49	160	1.5	7	7.8	601	894	581	11.43	1.50		clear, clean water
2:59	180		7	6.8	584	895	581	11.7			clear, clean water
3:09	200	2.0	7	7.7	626	930	604	11.53	2.00		clear, clean water

Sample Collection Time:

10:15

Ship Date:

24-Aug-20

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-025-01	250	N/A		
2	GWR-025-02	50	2 mL 20% Sulfuric Acid		
3	GWR-025-03	5	N/A		
4	GWR-025-04	10	1.5 mL 17.5% HNO3	0.45 micron	
6	GWR-025-06	10	N/A		
7	GWR-025-07	4000	40 mL 17.5% HNO3		
8	GWR-025-08	10	N/A		
9	GWR-025-09	25	N/A		
10	GWR-025-10	50	N/A		

Final Sample Field Parameters

Ferrous Fe (mg/L) : 2.0

H₂S (mg/L) : 0.0

Diss. O₂ (mg/L) : 3.15

TDS (mg/L) : 615

SPC (µS/cm) : 946

C (µS/cm) : 668

pH : 6.49

Temp. (°C) : 9.6

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC IDGWR-029

Dip: -90 Sampler ME / BB

Project: WR-EVAL

Date: 30-Aug-20

Temperature/Weath Mix of s

Depth of well (ft): 1148.3

Screen interval (ft): 1128.8-1148.2

Depth of Static Water Level (corrected for angle)(ft): N/A

Sampling equip.: Bladder Pump

Purging equip. (circle):

Redi-flow

Bailer

Air Lift

Grundfos 5SQE5-450

A) Bottom of well depth (ft): 1148.3

B) Depth to water level (ft): 13.59

C) Water column (A-B)(ft): 1134.71

D) Well diameter (ID) (ft): 0.125

E) Casing Volume (gal): 104.15

Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
10:11	5		6.74	9.2	75	108	70	9.26			Dark grey water, Moderate s
10:29	20		6.81	7	64	98	64	11.5			Dark grey water, Moderate s
10:47	40		6.88	8.1	65	85	62	11.39			Dark grey water, clear
10:57	50	0.5	6.86	7.9	66	97	63	11.33	2.00		Dark grey water, clear
11:12	60		6.86	8	68	96	63	10.99			Dark grey water, clear
11:30	80		6.85	8.7	60	88	58	11.32			Clear light grey water
11:49	100	1.0	6.8	7.7	61	89	58	11.41	1.50		Clear water

Sample Collection Time: 2020-08-30 9:00 **Ship Date:** 31-Aug-20

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-029-01	1000	N/A	n/a	
2	GWR-029-02	250	2 mL 20% Sulfuric Acid	n/a	
3	GWR-029-03	100	N/A	n/a	
4	GWR-029-04	100	1.5 mL 17.5% HNO3	0.45 micron	
6	GWR-029-06	100	N/A	n/a	
7	GWR-029-07	4000	40 mL 17.5% HN03	n/a	
8	GWR-029-08	80	N/A	n/a	
9	GWR-029-09	100	N/A	n/a	
10	GWR-029-010	100	N/A	n/a	

Final Sample Field Parameters

Ferrous Fe (mg/L) :	2.0	SPC (µS/cm) :	87.6
H ₂ S (mg/L) :		C (µS/cm) :	56.7
Diss. O ₂ (mg/L) :	2.48	pH :	6.46
TDS (mg/L) :	57	Temp. (°C) :	6.5

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-031
 Dip: -90 Sampler: ME / MT / JC Depth of well (ft): 1361
 Project: Wheeler Screen interval (ft): ~20
 Date: 2020-08-09 Depth of Static Water Level (corrected for angle)(ft): ~130
 Temperature/Weather: Rainy, 10°C

Sampling equip.: Grundfos 5SQE5-450

Purging equip. (circle): Redi-flow Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 1361 D) Well diameter (ID) (ft): 0.417
 B) Depth to water level (ft): ~130 E) Casing Volume (gal): ~1250
 C) Water column (A-B)(ft): ~1231 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

****Started pumping @ 8:40 am with an initial rate of 5gpm****

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
8:50	55		7.27	6.5	520	799	519	1.82			Clear, not radioactive
9:25	175		7.58	7.2	534	808	525	1.94			Clear, not radioactive
10:30	419		7.66	9.9	500	703	457	2.03			Clear, not radioactive
11:30	521		7.5	9.2	566	799	520	3.54			Clear, ~5µSv/h
1:20	647	~0.5	7.3	11.4	598	797	518	3.59	0.5	0	Clear, radioactive
2:10	700		7.1	10.8	590	794	516	3.42			Clear, radioactive
2:40	733		7.05	10.9	293	391.4	254	4.07			Clear, radioactive
3:05	760		7.04	11.6	591	788	513	4			Clear, radioactive
4:01	818		7.03	11.3	588	789	513	4.62	0.5	0	Clear, radioactive

Sample Collection Time: Daytime : 2020-08-09 **Ship Date:** 2020-08-10

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-031-01	1000	No	No	
2	GWR-031-02	250	2 mL Sulfuric Acid	No	
3	GWR-031-03	100	No	No	
4	GWR-031-04	100	1.5 mL HNO ₃	0.45 micron	
6	GWR-031-06	100	No	No	
7	GWR-031-07	4000	40 mL HNO ₃	No	
8	GWR-031-08	80	No	No	
9	GWR-031-09	100	No	No	
10	GWR-031-10	100	No	No	

Final Sample Field Parameters

Ferrous Fe (mg/L) : 0.5 SPC (µS/cm) : 789
 H₂S (mg/L) : 0.0 C (µS/cm) : 588
 Diss. O₂ (mg/L) : 4.62 pH : 7.03
 TDS (mg/L) : 513 Temp. (°C) : 11.3

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-031
 Dip: -90 Sampler: ME / MT / JC Depth of well (ft): 1361
 Project: Wheeler Screen interval (ft): ~20
 Date: 2020-08-09 Depth of Static Water Level (corrected for angle)(ft): ~130
 Temperature/Weather: Rainy, 10°C

Sampling equip.: Grundfos 5SQE5-450

Purging equip. (circle): Redi-flow Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 1361 D) Well diameter (ID) (ft): 0.417
 B) Depth to water level (ft): ~130 E) Casing Volume (gal): ~1250
 C) Water column (A-B)(ft): ~1231 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

****Started pumping @ 8:40 am with an initial rate of 5gpm****

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
8:50	55		7.27	6.5	520	799	519	1.82			Clear, not radioactive
9:25	175		7.58	7.2	534	808	525	1.94			Clear, not radioactive
10:30	419		7.66	9.9	500	703	457	2.03			Clear, not radioactive
11:30	521		7.5	9.2	566	799	520	3.54			Clear, ~5µSv/h
1:20	647	~0.5	7.3	11.4	598	797	518	3.59	0.5	0	Clear, radioactive
2:10	700		7.1	10.8	590	794	516	3.42			Clear, radioactive
2:40	733		7.05	10.9	293	391.4	254	4.07			Clear, radioactive
3:05	760		7.04	11.6	591	788	513	4			Clear, radioactive
4:01	818		7.03	11.3	588	789	513	4.62	0.5	0	Clear, radioactive

Sample Collection Time: Daytime : 2020-08-09 **Ship Date:** 2020-08-10

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-031-DUP-01	1000	No	No	
2	GWR-031-DUP-02	250	2 mL Sulfuric Acid	No	
3	GWR-031-DUP-03	100	No	No	
4	GWR-031-DUP-04	100	1.5 mL HNO ₃	0.45 micron	
6	GWR-031-DUP-06	100	No	No	
7	GWR-031-DUP-07	4000	40 mL HNO ₃	No	
8	GWR-031-DUP-08	80	No	No	
9	GWR-031-DUP-09	100	No	No	
10	GWR-031-DUP-10	100	No	No	

Final Sample Field Parameters

Ferrous Fe (mg/L) : 0.0 SPC (µS/cm) : 789
 H₂S (mg/L) : 0.0 C (µS/cm) : 613
 Diss. O₂ (mg/L) : 8.61 pH : 7.18
 TDS (mg/L) : 513 Temp. (°C) : 13.0

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-032
 Dip: -90 Sampler: MT / JC / ME Depth of well (ft): 1361.5
 Project: Wheeler Screen interval (ft): ~20
 Date: 2020-08-08 Depth of Static Water Level (corrected for angle)(ft): N/A
 Temperature/Weather: Rainy then cloudy, 16°C

Sampling equip.: Grundfos 5SQE5-450

Purging equip. (circle): Redi-flow Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 1361.5 D) Well diameter (ID) (ft): 0.417
 B) Depth to water level (ft): 422.15 E) Casing Volume (gal): 959.24
 C) Water column (A-B)(ft): 939 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

**** Samples taken at the end of 24 hr pump test. Purging field parameters unavailable****

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments

Sample Collection Time:

Ship Date:

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-032-01	1000	No	No	
2	GWR-032-02	250	2 mL Sulfuric Acid	No	
3	GWR-032-03	100	No	No	
4	GWR-032-04	100	1.5 mL HNO ₃	0.45 micron	
6	GWR-032-06	100	No	No	
7	GWR-032-07	4000	40 mL HNO ₃	No	
8	GWR-032-08	80	No	No	
9	GWR-032-09	100	No	No	
10	GWR-032-10	100	No	No	

Final Sample Field Parameters

Ferrous Fe (mg/L) : 1.5 SPC (µS/cm) : 958
 H₂S (mg/L) : 0.0 C (µS/cm) : 737
 Diss. O₂ (mg/L) : 1.16 pH : 6.79
 TDS (mg/L) : 623 Temp. (°C) : 8.0

Note: Sample taken at 9:10 am on November 14, 2019 at the end of a 48 hour long pumping test on GWR-032. 5,680 gallons were pumped from the well during the test before sampling and no field parameters available. This well was sampled again in 2020 and 2021

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-033
 Dip: -90 Sampler: ME/CS Depth of well (ft): 1153.5
 Project: Wheeler Screen interval (ft): 1133.9 - 1153.4
 Date: 2020-11-03 Depth of Static Water Level (corrected for angle)(ft): N/A
 Temperature/Weather: Overcast/cloudy, 0°C

Sampling equip.: Bladder Pump

Redi-flow

 Grundfos 5SQE5-450
Purging equip. (circle):

Redi-flow

 Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 1153.5 D) Well diameter (ID) (ft): 0.208
 B) Depth to water level (ft): 7.5 E) Casing Volume (gal): 291.27
 C) Water column (A-B)(ft): 1146 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
14:51	74		7.56	5.3	30.1	48.2	31	9.67			Clear
15:08	145	0.5	8.66	5.0	29.8	48.2	31	9.36	0.00		Clear
15:22	207		8.87	5.2	31.3	50.5	33	9.72			Clear
15:43	260		8.37	5.2	354.2	570	371	2.87			Clear, slightly cloudy
15:35	291	1.0	7.8	5.3	165.6	265.9	173	6.06	0.00		Clear, slightly cloudy
16:02	319		7.33	6.5	249.8	386.5	251	3.08			Clear, slightly cloudy
16:11	331		7.17	6.7	247.2	379.1	246	3.17			Clear, slightly cloudy
16:22	345		7.07	6.5	237.3	360.5	238	3.55			Clear
16:31	358		7.04	6.5	232.2	358.7	233	3.19			Clear

Sample Collection Time: 4:30 PM **Ship Date:** 2020-11-06

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-033-01	1000	No	No	4
2	GWR-033-02	250	2 mL Sulfuric Acid	No	4
3	GWR-033-03	100	No	No	4
4	GWR-033-04	100	1.5 mL HNO ₃	0.45 micron	4
5	GWR-033-05	10	1.5 mL HNO ₃	0.22 micron	4
6	GWR-033-06	100	No	No	4
7	GWR-033-07	4000	40 mL HNO ₃	No	4
8	GWR-033-08	80	No	No	4
9	GWR-033-09	100	No	No	4
10	GWR-033-10	100	No	No	4

Final Sample Field Parameters

Ferrous Fe (mg/L) : 2.0 SPC (µS/cm) : 351.4
 H₂S (mg/L) : N/A C (µS/cm) : 229.9
 Diss. O₂ (mg/L) : 3.22 pH : 7.02
 TDS (mg/L) : 231 Temp. (°C) : 6.5

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-035
 Dip: -90 Sampler: ME/CS Depth of well (ft): 42
 Project: Wheeler Screen interval (ft): 32.4 - 41.9
 Date: 2020-11-03 Depth of Static Water Level (corrected for angle)(ft): N/A
 Temperature/Weather: Cloudy, -1°C

Sampling equip.: Bladder Pump

Redi-flow

 Grundfos 5SQE5-450
Purging equip. (circle):

Redi-flow

 Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 42 D) Well diameter (ID) (ft): 0.208
 B) Depth to water level (ft): 10 E) Casing Volume (gal): 8.13
 C) Water column (A-B)(ft): 32 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
9:38	4	0.5	7.73	5.3	50.4	80.8	53	2.65	0.50		Clear
9:48	32	4.0	6.97	4.4	38.7	63.8	41	4.12	0.50		Clear
10:02	96	12.0	6.72	4.2	38.3	63.4	41	4.37	0.50		Clear
10:08	128	16.0	6.61	4.4	38.3	63.1	41	4.06	0.50		Clear
10:16	168	21.0	6.53	4.4	38.3	63.1	41	4.08	0.50		Clear
10:32	248	31.0	6.47	4.4	38.4	63.4	41	3.72	0.50		Clear
10:47	320	40.0	6.45	4.2	38.6	64	42	3.78	0.50		Clear
11:00	400	50.0	6.47	4.3	39.5	65.4	42	3.58	0.50		Clear
11:17	472	59.0	6.47	4.1	39.6	65.8	43	4.16	0.50		Clear

Sample Collection Time: 11:30 AM **Ship Date:** 2020-11-06

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-035-01	1000	No	No	4
2	GWR-035-02	250	2 mL Sulfuric Acid	No	4
3	GWR-035-03	100	No	No	4
4	GWR-035-04	100	1.5 mL HNO ₃	0.45 micron	4
5	GWR-035-05	10	1.5 mL HNO ₃	0.22 micron	4
6	GWR-035-06	100	No	No	4
7	GWR-035-07	4000	40 mL HNO ₃	No	4
8	GWR-035-08	80	No	No	4
9	GWR-035-09	100	No	No	4
10	GWR-035-10	100	No	No	4

Final Sample Field Parameters

Ferrous Fe (mg/L) : 0.5 SPC (µS/cm) : 66.7
 H₂S (mg/L) : N/A C (µS/cm) : 40.3
 Diss. O₂ (mg/L) : 3.87 pH : 6.48
 TDS (mg/L) : 43 Temp. (°C) : 4.3

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-036
 Dip: -90 Sampler: ME/CS Depth of well (ft): 161.1
 Project: Wheeler Screen interval (ft): 141.5 - 161.0
 Date: 2020-11-05 Depth of Static Water Level (corrected for angle)(ft): N/A
 Temperature/Weather: Cloudy, -16°C

Sampling equip.: Bladder Pump

Redi-flow

 Grundfos 5SQE5-450
Purging equip. (circle):

Redi-flow

 Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 161.1 D) Well diameter (ID) (ft): 0.208
 B) Depth to water level (ft): 15.6 E) Casing Volume (gal): 36.98
 C) Water column (A-B)(ft): 145.5 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
10:04	18.5	0.5	7.85	4.5	61.0	100.8	66	4.71	0.00		Light yellow, cloudy
10:12	55.5	1.5	7.56	2.6	26.8	46.9	30	7.88	0.00		Light brown, milky
10:23	111	3.0	7.1	3.1	23.6	40.5	26	8.92	0.00		Light brown, milky
10:31	148	4.0	6.88	3.8	22.4	37.7	24	9.05	0.00		Light brown, cloudy
10:53	259	7.0	6.71	4.9	22.4	36.4	24	9.12	0.00		Light brown, cloudy
11:08	333	9.0	6.65	5.1	10.6	17.2	11	9.09	0.00		Light brown/yellow, cloudy
11:24	407	11.0	6.55	5.0	20.5	33.2	22	9.44	0.00		Light yellow, milky
11:38	481	13.0	6.56	4.1	19.1	31.8	21	9.44	0.00		Light brown/yellow, cloudy
11:53	555	15.0	6.48	4.3	18.6	30.1	20	9.52	0.00		Light brown/yellow, cloudy

Sample Collection Time: 12:00 PM **Ship Date:** 2020-11-06

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-036-01	1000	No	No	4
2	GWR-036-02	250	2 mL Sulfuric Acid	No	4
3	GWR-036-03	100	No	No	4
4	GWR-036-04	100	1.5 mL HNO ₃	0.45 micron	4
5	GWR-036-05	10	1.5 mL HNO ₃	0.02 micron	4
6	GWR-036-06	100	No	No	4
7	GWR-036-07	4000	40 mL HNO ₃	No	4
8	GWR-036-08	80	No	No	4
9	GWR-036-09	100	No	No	4
10	GWR-036-10	100	No	No	4

Final Sample Field Parameters

Ferrous Fe (mg/L) : 0.0 SPC (µS/cm) : 30.5
 H₂S (mg/L) : N/A C (µS/cm) : 18.3
 Diss. O₂ (mg/L) : 9.80 pH : 6.45
 TDS (mg/L) : 20 Temp. (°C) : 4.4

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-037
 Dip: -90 Sampler: BB Depth of well (ft): 232.0
 Project: WR-ENV Screen interval (ft): 212.46 - 231.917
 Date: 30-Aug-20 Depth of Static Water Level (corrected for angle)(ft): N/A
 Temperature/Weather: Flurries, -13 Celsius

Sampling equip.: Bladder Pump

Purging equip. (circle): Redi-flow Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 232.0 D) Well diameter (ID) (ft): 0.208
 B) Depth to water level (ft): 16.65 E) Casing Volume (gal): 54.96
 C) Water column (A-B)(ft): 216.35 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
14:37	27	0.5	7.54	3.8	28.4	47.1	31	3.18	0.00		Cloudy water
14:44	54	1.0	7.25	3.9	52.5	87.8	57	3.85	0.50		Cloudy water, Trace of sedin
14:54	108	2.0	6.42	3.7	28.2	47.5	31	3.24	0.00		Clear water
15:05	162	3.0	6.29	4	26	43.5	28	3.50	0.50		Clear water
15:16	216	4.0	6.25	3.7	26.5	44.5	29	3.50	0.50		Clear water
15:25	270	5.0	6.18	4.3	26.3	43.5	28	3.50	0.50		Clear water
15:36	324	6.0	6.16	4.2	27.1	44.4	29	3.18	0.00		Clear water
15:46	378	7.0	6.14	4.6	27.8	45.6	30	3.43	0.50		Clear water
15:47	432	8.0	6.13	4.7	26.5	43.4	28	3.91	0.50		Clear water
16:08	486	9.0	6.13	4.6	26.4	43.2	28	3.92	0.00		Clear water
16:19	540	10.0	6.13	4.8	26.4	43.1	28	3.90	0.00		Clear water
16:31	594	11.0	6.13	4.8	26.4	43.2	28	4.00	0.50		Clear water

Sample Collection Time: 2020-10-30 16:40:00 PM **Ship Date:** 27-Oct-20

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-029-01	1000	N/A	n/a	
2	GWR-029-02	250	2 mL 20% Sulfuric Acid	n/a	
3	GWR-029-03	100	N/A	n/a	
4	GWR-029-04	100	1.5 mL 17.5% HNO3	0.45 micron	
6	GWR-029-06	100	N/A	n/a	
7	GWR-029-07	4000	40 mL 17.5% HN03	n/a	
8	GWR-029-08	80	N/A	n/a	
9	GWR-029-09	100	N/A	n/a	
10	GWR-029-010	100	N/A	n/a	

Final Sample Field Parameters

Ferrous Fe (mg/L) : 0.5 SPC (µS/cm) : 43.1
 H₂S (mg/L) : H₂S (mg/L) : 26.4
 Diss. O₂ (mg/L) : 4.01 pH : 6.13
 TDS (mg/L) : 57 Temp. (°C) : 4.8

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-003
 Dip: -90 Sampler: PB + EB Depth of well (ft): 198
 Project: Screen interval (ft): N/A
 Date: Depth of Static Water Level (corrected for angle)(ft): N/A
 Temperature/Weather: minus 12 degrees, clear sunny skies

Sampling equip.: sampled immediately after redi-flow purging

Purging equip. (circle): Redi-flow Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 198 D) Well diameter (ID) (ft): 0.1667
 B) Depth to water level (ft): 66.79 E) Casing Volume (gal): 21.41
 C) Water column (A-B)(ft): 131.21 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Started purging water @ 9:01am

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
9:26	10	0.5	5.74	3.6	35.9	60.5	39	4.84	0.00	N/A	light yellow
9:41	25	1.0	5.76	4.6	36	59	38	4.78	0.00	N/A	light yellow
10:05	45	2.0	5.84	4.7	35.4	57.8	38	4.01	0.00	N/A	clear
10:24	60	2.8	5.72	4.4	35	57.7	37	4.72	0.25	N/A	clear
10:41	75	3.5	5.8	4.9	35.1	56.8	37	4.02	0.25	N/A	clear
10:45	78.85	FINAL							0.00	N/A	clear
											Average flow rate of 0.85
											gallons per minute @
											200 Hz
											* 80 ft of hose down well
											one 50 ft blue hose at
											bottom plus 30 ft of the
											black hose on top

Sample Collection Time: 10:45am **Ship Date:**

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1					
2					
3					
4					
6					
7					
8					
9					
10					

Final Sample Field Parameters 10:45am

Ferrous Fe (mg/L) : 0.0 SPC (µS/cm) : 27.8
 H₂S (mg/L) : N/A C (µS/cm) : 17.2
 Diss. O₂ (mg/L) : 3.82 pH : 5.86
 TDS (mg/L) : 18 Temp. (°C) : 5.1

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-005
 Dip: -90 Sampler: PB + EB Depth of well (ft): 403.5
 Project: WR-EVAL Screen interval (ft): 384-403
 Date: Saturday, May 22 2021 Depth of Static Water Level (corrected for angle)(ft): n/a
 Temperature/Weather: 5, clear

Sampling equip.: sample taken immediate upon completion of purging

Purging equip. (circle): Redi-flow Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 403.5 D) Well diameter (ID) (ft): 0.125
 B) Depth to water level (ft): 2 E) Casing Volume (gal): 37 (~40gal/8 buckets)
 C) Water column (A-B)(ft): 401.5 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Start time: 7:30am

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
8:00	20	0.50	6.87	5.6	52.9	82	53	11.74	1.50	n/a	milky grey with seds
8:25	40	1.00	6.87	6	102.6	160.9	105	11.97	1.50	n/a	milky grey
8:48	60	1.50	6.86	6.4	48.7	75	49	11.79	1.75	n/a	light milky grey
9:10	80	2.00	6.85	6.8	100.6	154.7	100	11.93	1.50	n/a	light milky grey
9:32	100	2.50	6.86	6.4	99.4	152.7	99	11.77	1.75	n/a	clear
9:54	120	3.00	6.86	6.4	100.8	154.3	100	11.72	1.50	n/a	clear

Sample Collection Time: 10:03am **Ship Date:**

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-005_1	1000	no	no	stored in fridge
2	GWR-005_2	250	2ml 20% sulfuric acid	no	stored in fridge
3	GWR-005_3	100	no	no	stored in fridge
4	GWR-005_4	100	1.5ml 17.5% HNO3	yes	stored in fridge
5	GWR-005_5	250	20ml 9% HCl	no	stored in fridge
6	GWR-005_6	100	no	no	stored in fridge
7	GWR-005_7	4000	40ml 17.5% HNO3	no	stored in fridge
8	GWR-005_8	2 x 40	no	no	stored in fridge
9	GWR-005_9	500	no	no	stored in fridge
10	GWR-005_10	100	no	no	stored in fridge

Final Sample Field Parameters

Ferrous Fe (mg/L) : 1.5	SPC (µS/cm) : 150.5
H ₂ S (mg/L) : n/a	C (µS/cm) : 97.5
Diss. O ₂ (mg/L) : 11.82	pH : 6.80
TDS (mg/L) : 98	Temp. (°C) : 6.3

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-006
 Dip: -90 Sampler: PB +EB Depth of well (ft): 29.5
 Project: WR Eval Screen interval (ft): 10.0 - 29.0
 Date: April 14 2021 Depth of Static Water Level (corrected for angle)(ft): n/a
 Temperature/Weather: 2 degrees, sunny cool

Sampling equip.: Bladder Pump

Purging equip. (circle): Redi-flow Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 29.5 D) Well diameter (ID) (ft): 0.166667
 B) Depth to water level (ft): 8.33 E) Casing Volume (gal): 3.45
 C) Water column (A-B)(ft): 21.17 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
3:48pm	10.5	3	6.95	6.3	163.4	254.1	165	3.7	0.50	n/a	milky grey cloudy
3:59	14	4	6.88	5.4	121.4	194	126	2.8	1.25	n/a	milky grey cloudy
4:06	17.5	5	6.86	5.1	102.4	165.5	108	3.5	1.25	n/a	milky grey cloudy
4:12	21	6	6.87	4.9	97.8	158.6	103	3.22	1.00	n/a	milky grey cloudy
4:20	24.5	7	6.86	4.7	94.1	153.5	100	5.36	1.25	n/a	milky grey cloudy
											pumping started around
											3:19pm
											use ~ 98.6 Hz
											average pumping rate was
											0.4 to 0.5 gallons per
											minute

Sample Collection Time: 4:25pm to 4:31pm - 2 gallons **Ship Date:**

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1					
2					
3					
4					
6					
7					
8					
9					
10					

Final Sample Field Parameters collected gallons 25.5 to 27.5 from 4:25pm to 4:31pm

Ferrous Fe (mg/L) : 1.3 SPC (µS/cm) : 150.9
 H₂S (mg/L) : n/a C (µS/cm) : 92.8
 Diss. O₂ (mg/L) : 4.70 pH : 6.90
 TDS (mg/L) : 98 Temp. (°C) : 4.8

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-008
 Dip: -80 Sampler: PB/EB Depth of well (ft): 1246.7
 Project: Wheeler Screen interval (ft): 1227.2-1246.6
 Date: April 9 2021 Depth of Static Water Level (corrected for angle)(ft): 115.12
 Temperature/Weather: 2 degrees, cloudy

Sampling equip.: Bladder Pump

Purging equip. (circle): Redi-flow Bailer **Air Lift** Grundfos 5SQE5-450

A) Bottom of well depth (ft): 1246.7 D) Well diameter (ID) (ft): 0.125
 B) Depth to water level (ft): 116.9 E) Casing Volume (gal): 103.7
 C) Water column (A-B)(ft): 1129.8 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
16:42	50	0.5	7.22	4.1	106.9	177.5	115	12.44	2.50	n/a	Clear
17:00	80	-	7.38	3.9	102.0	170.2	111	12.53	-	n/a	Clear
17:17	100	1	7.42	3.9	98.0	164.5	107	12.40	2.00	n/a	Clear
17:31	120	-	7.42	4.1	98.9	165.0	107	12.50	-	n/a	Clear
17:50	150	1.5	7.40	4.0	98.2	164.6	107	12.62	1.00	n/a	Clear

Sample Collection Time: _____ **Ship Date:** _____

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1					
2					
3					
4					
6					
7					
8					
9					
10					

Final Sample Field Parameters

Ferrous Fe (mg/L) : 1.5 SPC (µS/cm) : 165.7
 H₂S (mg/L) : n/a C (µS/cm) : 98.9
 Diss. O₂ (mg/L) : 12.56 pH : 7.42
 TDS (mg/L) : 108 Temp. (°C) : 3.9

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-009
 Dip: -65 Sampler: PB/EB/JLS Depth of well (ft): 918.6
 Project: Wheeler Screen interval (ft): 899.1-918.5
 Date: April 10 2021 Depth of Static Water Level (corrected for angle)(ft): 114.01
 Temperature/Weather: sunny, snowing, -5

Sampling equip.: Bladder Pump

Purging equip. (circle): Redi-flow Bailer **Air Lift** Grundfos 5SQE5-450

A) Bottom of well depth (ft): 918.6 D) Well diameter (ID) (ft): 0.125
 B) Depth to water level (ft): 125.8 E) Casing Volume (gal): 72.77
 C) Water column (A-B)(ft): 729.8 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
9:26	55	-	2.36	4.8	21.18	3489	2267	12.21	2.00		frothy, cloudy, white
9:43	75	1.0	2.67	3.4	14.2	2400	1559	12.23	-		frothy, cloudy, white
10:18	105	1.5	3.14	4.1	15.5	2566	1665	11.85	-		cloudy, grey
10:56	150	2.0	4.36	4.1	4.7	7.8	5	12.19	0.50		cloudy, grey
11:35	190	2.5	7.20	4.4	172.1	279.3	182	11.08	-		cloudy, grey
12:06	225	3.0	7.62	4.7	386.4	612	402	11.72	1.00		cloudy, yellow
12:41	265	3.5	7.67	5.3	398.8	633	411	11.79	-		cloudy, yellow
13:18	300	4.0	7.74	5.3	427.0	677	440	11.84	1.00		cloudy, yellow
13:58	340	4.5	7.71	4.8	444.8	718	467	12.03	-		cloudy, yellow
14:33	375	5.0	7.65	4.7	232.2	347	225	11.02	2.00		cloudy, yellow
15:16	415	5.5	7.63	4.6	443.6	712	463	11.8	-		cloudy, yellow
15:50	450	6.0	7.64	4.1	419.2	692	450	12.14	1.50		cloudy, yellow
16:32	490	6.5	7.61	4.5	210.0	342	222	11.89	-		cloudy, yellow
17:15	525	7.0	7.64	3.5	384.6	644	419	12.25	1.00		cloudy, yellow
18:02	565	7.5	7.71	3.6	373.7	629	409	12.36	-		clear, yellow
18:37	600	8.0	7.67	3.3	362.1	618	402	12.47	1.50		clear, yellow

Sample Collection Time:

Ship Date:

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1					
2					
3					
4					
6					
7					
8					
9					
10					

Final Sample Field Parameters

Ferrous Fe (mg/L) : 1.5 SPC (µS/cm) : 618
 H₂S (mg/L) : C (µS/cm) : 362.1
 Diss. O₂ (mg/L) : 12.47 pH : 7.67
 TDS (mg/L) : 402 Temp. (°C) : 3.3

Approx 400 gal of mud enzymes pumped down well 24 hrs prior to purging - for this reason we took first parameters at

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-011
 Dip: -90 Sampler: PB + EB Depth of well (ft): 1213
 Project: WR-EVAL Screen interval (ft): 1194-1213
 Date: Tuesday, June 1 2021 Depth of Static Water Level (corrected for angle)(ft): n/a
 Temperature/Weather: plus 20, clear skies

Sampling equip.: sample taken immediate upon completion of purging

Purging equip. (circle): Geotech Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 1213 D) Well diameter (ID) (ft): 0.125
 B) Depth to water level (ft): 133.85 E) Casing Volume (gal): 99.5
 C) Water column (A-B)(ft): 1079.15 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Start time: 9:45am

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
10:18	25	0.25	6.96	9.2	166.8	235.5	153	11.25	N/A	N/A	slightly milky
10:53	50	0.50	7.53	9.6	174.9	241.5	157	10.99	N/A	N/A	slightly milky
11:37	75	0.75	8.18	9.4	202.7	277.1	180	11.01	N/A	N/A	milky grey
1:27	100	1.00	7.92	11.1	196.3	261.4	170	10.6	0.00	N/A	slightly milky grey
2:46	125	1.25	7.49	13.7	195.2	250.1	163	10.04	0.75	N/A	slightly milky grey
3:21	150	1.50	7.39	8.5	167.6	244.1	159	11.53	N/A	N/A	milky grey
3:42	175	1.75	7.11	8.2	165.9	245	159	11.69	N/A	N/A	milky grey
4:03	200	2.00	6.96	7.8	149.6	222.8	145	11.73	1.50	N/A	slightly milky grey
4:26	225	2.25	6.91	8.2	151.5	220.2	143	11.49	N/A	N/A	slightly milky grey
4:58	250	2.50	7.04	8.6	154.1	223.7	146	11.54	N/A	N/A	slightly cloudy
5:20	275	2.75	7.07	7.9	150.9	234.4	145	11.63	N/A	N/A	slightly cloudy
5:40	300	3.00	7.08	7.5	147.7	220.6	143	11.69	0.75	N/A	slightly cloudy

Sample Collection Time: 5:47 PM **Ship Date:** June 6 2021

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-011_1	1000	no	no	stored in fridge
2	GWR-011_2	250	2ml 20% sulfuric acid	no	stored in fridge
3	GWR-011_3	100	no	no	stored in fridge
4	GWR-011_4	100	1.5ml 17.5% HNO3	yes	stored in fridge
6	GWR-011_6	100	no	no	stored in fridge
7	GWR-011_7	4000	40ml 17.5% HNO3	no	stored in fridge
8	GWR-011_8	2 x 40	no	no	stored in fridge
9	GWR-011_9	500	no	no	stored in fridge
10	GWR-011_10	100	no	no	stored in fridge

Final Sample Field Parameters

Ferrous Fe (mg/L) : 1.0 SPC (µS/cm) : 219.2
 H₂S (mg/L) : n/a C (µS/cm) : 144.8
 Diss. O₂ (mg/L) : 11.91 pH : 6.82
 TDS (mg/L) : 142 Temp. (°C) : 7.2

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-012
 Dip: -78 Sampler: PB + EB Depth of well (ft): 1138.5
 Project: WR-EVAL Screen interval (ft): 1119-1138.5
 Date: Sunday, May 23 2021 Depth of Static Water Level (corrected for angle)(ft): n/a
 Temperature/Weather: 10, clear

Sampling equip.: sample taken immediate upon completion of purging

Purging equip. (circle): Redi-flow Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 1138.5 D) Well diameter (ID) (ft): 0.125
 B) Depth to water level (ft): 2 E) Casing Volume (gal): 104.33 (~105gal/21 buckets)
 C) Water column (A-B)(ft): 1136.5 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)
 Start time: 7:24am

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
8:11	25	0.25	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	not sampled, too murky
9:05	55	0.50	7.03	9.6	670	934	607	11.11	1.50	n/a	clear
9:47	80	0.75	9.14	9.5	701	974	633	10.92	0.25	n/a	slightly milky
10:16	105	1.00	8.6	7.8	688	1022	664	11.75	0.00	n/a	light milky grey
10:32	130	1.25	8.19	7.4	671	1004	653	11.91	0.00	n/a	slightly milky
10:48	155	1.50	7.56	7.6	651	980	637	11.69	2.00	n/a	milky
11:08	185	1.75	7.35	7.6	639	950	617	11.48	1.50	n/a	milky grey
11:25	210	2.00	7.23	7.8	337.9	502	326	11.49	1.75	n/a	slightly milky
11:42	235	2.25	7.21	7.8	630	939	611	11.59	1.75	n/a	clear
12:00	260	2.50	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	clear
12:18	285	2.75	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
12:35	315	3.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
12:52	340	3.25	7.13	8.7	618	899	619	11.42	2.00	n/a	
1:09	365	3.50	7.16	8	607	896	582	11.53	1.50	n/a	clear
1:44	375										Final sample collected

Sample Collection Time: 1:44pm

Ship Date:

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-012_1	1000	no	no	stored in fridge
2	GWR-012_2	250	2ml 20% sulfuric acid	no	stored in fridge
3	GWR-012_3	100	no	no	stored in fridge
4	GWR-012_4	100	1.5ml 17.5% HNO3	yes	stored in fridge
5	GWR-012_5	250	20ml 9% HCl	no	stored in fridge
6	GWR-012_6	100	no	no	stored in fridge
7	GWR-012_7	4000	40ml 17.5% HNO3	no	stored in fridge
8	GWR-012_8	2 x 40	no	no	stored in fridge
9	GWR-012_9	500	no	no	stored in fridge
10	GWR-012_10	100	no	no	stored in fridge

Final Sample Field Parameters

Ferrous Fe (mg/L) : 1.5	SPC (µS/cm) : 896
H ₂ S (mg/L) : n/a	C (µS/cm) : 602
Diss. O ₂ (mg/L) : 11.61	pH : 7.17
TDS (mg/L) : 582	Temp. (°C) : 7.9

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-013
 Dip: -90 Sampler: PB + EB Depth of well (ft): 907
 Project: WR-EVAL Screen interval (ft): 887-907
 Date: Wednesday, June 2 2021 Depth of Static Water Level (corrected for angle)(ft): n/a
 Temperature/Weather: plus 20, clear skies

Sampling equip.: sample taken immediate upon completion of purging

Purging equip. (circle): Geotech Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 907 D) Well diameter (ID) (ft): 0.125
 B) Depth to water level (ft): 140 E) Casing Volume (gal): ~71
 C) Water column (A-B)(ft): 767 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Start time: 7:45am

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
8:10	35	0.50	8.79	9.9	359.3	503	327	11.4	0.00	N/A	grey water
8:38	70	1.00	9.07	8.1	123.6	182.6	119	11.63	0.25	N/A	murky grey
9:04	105	1.50	8.32	8.6	209.1	304.7	198	11.65	0.50	N/A	murky grey
9:28	140	2.00	7.69	8.6	199	281.6	183	11.43	1.25	N/A	murky grey
9:54	175	2.50	7.49	7.9	184.9	276.4	180	11.77	1.25	N/A	murky grey
10:22	210	3.00	7.44	8.5	188.8	274	178	11.51	0.75	N/A	murky grey
10:45	245	2.50	7.45	8.3	93.4	136.2	89	11.66	N/A	N/A	cloudy
11:11	280	4.00	7.49	8.6	189.2	274.3	179	11.6	N/A	N/A	cloudy
11:38	315	4.50	7.46	8.3	189	275.8	179	11.74	N/A	N/A	cloudy

Sample Collection Time: 11:43 AM **Ship Date:** June 6 2021

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-013_1	1000	no	no	stored in fridge
2	GWR-013_2	250	2ml 20% sulfuric acid	no	stored in fridge
3	GWR-013_3	100	no	no	stored in fridge
4	GWR-013_4	100	1.5ml 17.5% HNO3	yes	stored in fridge
6	GWR-013_6	100	no	no	stored in fridge
7	GWR-013_7	4000	40ml 17.5% HNO3	no	stored in fridge
8	GWR-013_8	2 x 40	no	no	stored in fridge
9	GWR-013_9	500	no	no	stored in fridge
10	GWR-013_10	100	no	no	stored in fridge

Final Sample Field Parameters

Ferrous Fe (mg/L) : 1.0 SPC (µS/cm) : 271.5
 H₂S (mg/L) : n/a C (µS/cm) : 182.7
 Diss. O₂ (mg/L) : 11.83 pH : 7.35
 TDS (mg/L) : 176 Temp. (°C) : 7.8

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-014
 Dip: -90 Sampler: PB + EB Depth of well (ft): 518.4
 Project: WR-EVAL Screen interval (ft): 498.89-518.3
 Date: Friday, May 21 2021 Depth of Static Water Level (corrected for angle)(ft): n/a
 Temperature/Weather:

Sampling equip.: sample taken immediate upon completion of purging

Purging equip. (circle): Redi-flow Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 518.4 D) Well diameter (ID) (ft): 0.125
 B) Depth to water level (ft): 3.62 E) Casing Volume (gal): 47.22 (~50gal/10 buckets)
 C) Water column (A-B)(ft): 514.78 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)
 Start time: 7:34am

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
8:07	25	0.5	11.15	5.1	368.4	595	387	12.57	0.00	n/a	clear
9:01	50	1.0	10.83	4.2	328.4	542	352	12.68	0.00	n/a	lightly milky yellow
9:58	75	1.5	10.05	5.9	268.2	418.2	272	12.18	0.00	n/a	lightly milky yellow
10:30	100	2.0	9.87	6.2	172.2	264.2	169	12.38	0.00	n/a	lightly milky yellow
10:51	125	2.5	10.04	6.4	290.9	439.3	286	12.17	0.00	n/a	lightly milky yellow
11:23	150	3.0	9.79	6.9	277.9	423.4	275	12.19	0.00	n/a	lightly milky yellow

Sample Collection Time: 11:27am **Ship Date:**

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-014_1	1000	no	no	stored in fridge
2	GWR-014_2	250	2ml 20% sulfuric acid	no	stored in fridge
3	GWR-014_3	100	no	no	stored in fridge
4	GWR-014_4	100	1.5ml 17.5% HNO3	yes	stored in fridge
5	GWR-014_5	250	20ml 9% HCl	no	stored in fridge
6	GWR-014_6	100	no	no	stored in fridge
7	GWR-014_7	4000	40ml 17.5% HNO3	no	stored in fridge
8	GWR-014_8	2 x 40	no	no	stored in fridge
9	GWR-014_9	500	no	no	stored in fridge
10	GWR-014_10	100	no	no	stored in fridge

Final Sample Field Parameters

Ferrous Fe (mg/L) : 0.0	SPC (µS/cm) : 421.5
H ₂ S (mg/L) : n/a	C (µS/cm) : 270.3
Diss. O ₂ (mg/L) : 12.20	pH : 9.77
TDS (mg/L) : 274	Temp. (°C) : 6.2

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-025
 -90 Sampler: PB + EB Depth of well (ft): 1246.7
 Project: WR EVAL Screen interval (ft): 1227.2-1246
 Date: April 17 2021 Depth of Static Water Level (corrected for angle)(ft): n/a
 Temperature/Weather: minus 5, overcast

Sampling equip.: sampled directly after purging

Purging equip. (circle): Redi-flow Bailer **Air Lift** Grundfos 5SQE5-450

A) Bottom of well depth (ft): 1246.7 D) Well diameter (ID) (ft): 0.125
 B) Depth to water level (ft): 67.24 E) Casing Volume (gal): 108.26
 C) Water column (A-B)(ft): 1179.46 Casing Volume = $\pi * (D/2)^2 * C * 7.48 \text{ (ft}^3 \text{ per gal)}$
 Purging start time : 9:35am

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments	
10:27	55	0.5	6.72	3.7	1063	1792	1165	12.98	2.00	N/A	dark grey milky	
11:39	110	1.0	6.99	3.8	1347	2263	1471	12.43	1.25	N/A	dark grey milky	
12:45	165	1.5	7.03	3.9	1355	2273	1477	12.48	2.00	N/A	clear	
1:55	220	2.0	7.07	3.9	1356	2268	1474	12.38	1.00	N/A	clear	
2:58	275	2.5	7.06	4.1	662	1101	715	12.42	1.50	N/A	clear	
4:01	330	3.0	7.03	4.4	1404	2314	1504	12.25	0.75	N/A	clear	
4:18	345	3.1	SEE FINAL SAMPLE FIELD PARAMETERS									
											We had 100 ft of hose down the well, 1 blue 50ft hose and 1 black 50ft hose. We purged 69 five gallon pails worth of water between 9:35 am and 4:18pm. Average pumping rate of 1.13 gallons per minute.	

Sample Collection Time: 4:18 pm April 17 2021

Ship Date:

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1					
2					
3					
4					
6					
7					
8					
9					
10					

Final Sample Field Parameters

Ferrous Fe (mg/L) : 1.0 SPC (µS/cm) : 2315
 H₂S (mg/L) : N/A C (µS/cm) : 1392
 Diss. O₂ (mg/L) : 12.35 pH : 7.06
 TDS (mg/L) : 1505 Temp. (°C) : 4.1

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-029
 Dip: -90 Sampler: PB+EB Depth of well (ft): 1148.3
 Project: WR-Eval Screen interval (ft): 1128.8-1148.2
 Date: April 12 2021 Depth of Static Water Level (corrected for angle)(ft): N/A
 Temperature/Weather: sunny, cold

Sampling equip.: Bladder Pump

Purging equip. (circle): Redi-flow Bailer **Air Lift** Grundfos 5SQE5-450

A) Bottom of well depth (ft): 1148.3 D) Well diameter (ID) (ft): 0.125
 B) Depth to water level (ft): 14.99 E) Casing Volume (gal): 103.97
 C) Water column (A-B)(ft): 1133.51 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
9:51	50	0.5	6.86	2.6	46.4	82.6	54	13.46	N/A	N/A	clear
11:05	100	1.0	7.19	3.7	101.3	170.8	111	12.71	N/A	N/A	clear
12:15	150	1.5	7.29	4.7	108	177.8	115	12.64	N/A	N/A	clear
13:21	200	2.0	7.17	5	54.6	88.5	58	12.37	N/A	N/A	clear
14:32	250	2.5	7.33	3.8	52.5	87.6	57	12.67	N/A	N/A	clear
15:54	300	3.0	7.27	4.1	97.6	171.5	111	12.74	N/A	N/A	clear
16:08	315	FINAL									see final parameters

Sample Collection Time: **Ship Date:**

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1					
2					
3					
4					
6					
7					
8					
9					
10					

Final Sample Field Parameters sample taken from 315 gallons purged at 16:08pm, April 12 2021

Ferrous Fe (mg/L) : N/A SPC (µS/cm) : 183.1
 H₂S (mg/L) : N/A C (µS/cm) : 108
 Diss. O₂ (mg/L) : 12.83 pH : 7.30
 TDS (mg/L) : 119 Temp. (°C) : 3.6

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-031
 Dip: -90 Sampler: PB + EB Depth of well (ft): 1361
 Project: WR-EVAL Screen interval (ft): ~20
 Date: Thursday, June 3 2021 Depth of Static Water Level (corrected for angle)(ft): ~135
 Temperature/Weather: plus 20 to 35, clear skies

Sampling equip.: sample taken immediate upon completion of purging

Purging equip. (circle): Geotech Bailer Air Lift **Grundfos 5SQE5-450**

A) Bottom of well depth (ft): 1361 D) Well diameter (ID) (ft): 0.417
 B) Depth to water level (ft): ~135 E) Casing Volume (gal): ~1250
 C) Water column (A-B)(ft): 1226 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Start time: 2:04pm

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
2:20	100	N/A	8.98	26.8	1589	1505	979	1.38	N/A	N/A	clear; 6 gpm flow rate
3:00	300	N/A	7.12	30.4	1834	1655	1076	1.58	N/A	N/A	clear; 4 gpm flow rate
3:30	400	0.25	7.06	28.7	1833	1704	1107	1.31	N/A	N/A	clear; 3 gpm flow rate
4:14	500	N/A	6.99	26.6	1738	1694	1101	1.28	1.00	N/A	clear; 1 gpm flow rate
5:50	600	0.5	6.94	22.5	1596	1674	1088	2.08	1.00	N/A	clear; 1 gpm flow rate
7:45	715	N/A	7.02	15.6	1387	1690	1099	3.29	1.00	N/A	clear; 0.97 gpm flow rate

absent from 7:45pm June 3 to 7:00am June 4

7:14	1400	1.1	7.12	16.8	1421	1681	1093	3.75	0.00	N/A	clear; 0.97 gpm flow rate
8:16	1460	N/A	6.99	17.6	1286	1496	973	4	0.00	N/A	clear; 0.97 gpm flow rate
											Started purging 2:04pm June 3, ended purging at 8:23am June 4, 2021

Sample Collection Time: 8:23pm - 1467 gallons **Ship Date:** June 6 2021

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-031_1	1000	no	no	stored in fridge
2	GWR-031_2	250	2ml 20% sulfuric acid	no	stored in fridge
3	GWR-031_3	100	no	no	stored in fridge
4	GWR-031_4	100	1.5ml 17.5% HNO ₃	yes	stored in fridge
5	GWR-031_5	250	20ml 9% HCl	no	stored in fridge
6	GWR-031_6	100	no	no	stored in fridge
7	GWR-031_7	4000	40ml 17.5% HNO ₃	no	stored in fridge
8	GWR-031_8	2 x 40	no	no	stored in fridge
9	GWR-031_9	500	no	no	stored in fridge
10	GWR-031_10	100	no	no	stored in fridge

Final Sample Field Parameters

Ferrous Fe (mg/L) : 0.0	SPC (µS/cm) : 1374
H ₂ S (mg/L) : n/a	C (µS/cm) : 1162
Diss. O ₂ (mg/L) : 3.65	pH : 7.21
TDS (mg/L) : 893	Temp. (°C) : 16.8

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-032
 Dip: -90 Sampler: PB + EB Depth of well (ft): 1361.5
 Project: WR-EVAL Screen interval (ft): ~20
 Date: Friday, June 4 2021 Depth of Static Water Level (corrected for angle)(ft): ~135
 Temperature/Weather: plus 20 to 35, clear skies

Sampling equip.: sample taken immediate upon completion of purging

Purging equip. (circle): Geotech Bailer Air Lift **Grundfos 5SQE5-450**

A) Bottom of well depth (ft): 1361.5 D) Well diameter (ID) (ft): 0.417
 B) Depth to water level (ft): ~135 E) Casing Volume (gal): ~1250
 C) Water column (A-B)(ft): 1226.5 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Start time: 1:34pm with a flow rate of 6.6 gpm

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
1:55	150	0.120	7.37	33.6	1616	1385	900	3.97	0.00	N/A	clear; 6.8 gpm flow rate
2:23	340	0.272	7.08	29.4	757	697	453	4.31	N/A	N/A	clear; 6.75 gpm flow rate
3:04	610	0.488	6.97	28.7	947	884	574	2.82	0.50	N/A	clear; 6.40 gpm flow rate
4:47	1270	1.016	6.98	25.2	1943	1933	1257	2.5	0.50	N/A	clear; 6.5 gpm flow rate
7:42	2400	1.960	6.85	21.5	1641	1764	1147	2.25	0.50	N/A	clear; 6.47 gpm flow rate

Sample Collection Time: 7:53pm - 2485 gallons **Ship Date:** June 6 2021

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-032_1	1000	no	no	stored in fridge
2	GWR-032_2	250	2ml 20% sulfuric acid	no	stored in fridge
3	GWR-032_3	100	no	no	stored in fridge
4	GWR-032_4	100	1.5ml 17.5% HNO3	yes	stored in fridge
5	GWR-032_5	250	20ml 9% HCl	no	stored in fridge
6	GWR-032_6	100	no	no	stored in fridge
7	GWR-032_7	4000	40ml 17.5% HNO3	no	stored in fridge
8	GWR-032_8	2 x 40	no	no	stored in fridge
9	GWR-032_9	500	no	no	stored in fridge
10	GWR-032_10	100	no	no	stored in fridge

Final Sample Field Parameters

Ferrous Fe (mg/L) : 1.5	SPC (µS/cm) : 1683
H ₂ S (mg/L) : n/a	C (µS/cm) : 1486
Diss. O ₂ (mg/L) : 2.26	pH : 6.83
TDS (mg/L) : 1094	Temp. (°C) : 18.5

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-035
 Dip: -90 Sampler: PB + EB Depth of well (ft): 42
 Project: WR-EVAL Screen interval (ft): 32.4-41.9
 Date: Monday, May 24 2021 Depth of Static Water Level (corrected for angle)(ft): n/a
 Temperature/Weather: 10, clear

Sampling equip.: sample taken immediate upon completion of purging

Purging equip. (circle): Geotech Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 42 D) Well diameter (ID) (ft): 0.208
 B) Depth to water level (ft): 10 E) Casing Volume (gal): 8.13
 C) Water column (A-B)(ft): 32 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Start time: 10:23am

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
10:37	10	1.00	6.6	8.2	75.9	111.6	73	7.67	0.25	n/a	light grey
11:40	20	2.00	6.75	10.3	98.1	136.1	88	8.46	0.50	n/a	light grey
1:38	30	3.00	6.64	7.1	42.1	78.1	63.7	8.03	0.50	n/a	light grey
1:53	40	4.00	6.31	5.7	74.3	115.4	117.4	8.12	0.00	n/a	clear
2:03	50	5.00	6.32	5.7	72.7	114.8	75	8.07	0.00	n/a	clear
2:15	60	6.00	6.31	6	73.9	116.2	74	7.74	0.00	n/a	clear

Sample Collection Time: 1:44pm **Ship Date:**

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-035_1	1000	no	no	stored in fridge
2	GWR-035_2	250	2ml 20% sulfuric acid	no	stored in fridge
3	GWR-035_3	100	no	no	stored in fridge
4	GWR-035_4	100	1.5ml 17.5% HNO3	yes	stored in fridge
5	GWR-035_5	250	20ml 9% HCl	no	stored in fridge
6	GWR-035_6	100	no	no	stored in fridge
7	GWR-035_7	4000	40ml 17.5% HNO3	no	stored in fridge
8	GWR-035_8	2 x 40	no	no	stored in fridge
9	GWR-035_9	500	no	no	stored in fridge
10	GWR-035_10	100	no	no	stored in fridge

Final Sample Field Parameters

Ferrous Fe (mg/L) : 0.0	SPC (µS/cm) : 113.6
H ₂ S (mg/L) : n/a	C (µS/cm) : 71
Diss. O ₂ (mg/L) : 8.01	pH : 6.30
TDS (mg/L) : 74	Temp. (°C) : 5.4

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-036
 Dip: -90 Sampler: PB/JLS Depth of well (ft): 161.1
 Project: Wheeler Screen interval (ft): 141.5-161.0
 Date: 8-Apr-21 Depth of Static Water Level (corrected for angle)(ft):
 Temperature/Weather: Snowing, overcast, -2

Sampling equip.: Bladder Pump

Purging equip. (circle): Redi-flow Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 161.1 D) Well diameter (ID) (ft): 0.208
 B) Depth to water level (ft): 15.55 E) Casing Volume (gal): 36.98
 C) Water column (A-B)(ft): 145.5 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
14:50	19	0.5	7.14	3.9	139.4	232.8	157	3.28	0.00		Clear, yellow
14:54	37	1.0	7.12	3.7	114.1	192.5	125	4.22	0.00		Clear, yellow
15:02	55	1.5	6.81	3.5	62.8	106.5	69	6.79	0.00		Clear, yellow
15:11	74	2.0	6.71	3.4	52.7	90.3	59	7.46	0.00		Clear, yellow
15:18	92	1.5	6.71	3.5	51.1	87.1	57	7.77	0.00		Clear, yellow
15:27	111	3.0	6.65	3.3	45.3	77.8	51	8.35	0.00		Clear, yellow
15:34	129	3.5	6.63	3.5	44.7	76.2	50	8.35	0.00		Clear, yellow

Sample Collection Time: _____ **Ship Date:** _____

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1					
2					
3					
4					
6					
7					
8					
9					
10					

Final Sample Field Parameters

Ferrous Fe (mg/L) : 0.0 SPC (µS/cm) : 73.1
 H₂S (mg/L) : C (µS/cm) : 42.8
 Diss. O₂ (mg/L) : 8.36 pH : 6.62
 TDS (mg/L) : 48 Temp. (°C) : 3.4

*Duplicate #1 sampled

SAMPLING AND PURGING DATA SHEET

Drill Hole ID or QA/QC ID: GWR-037
 Dip: -90 Sampler: PB/JLS/EB Depth of well (ft): 232.0
 Project: Wheeler Screen interval (ft): 212.46-231.917
 Date: 9-Apr-21 Depth of Static Water Level (corrected for angle)(ft):
 Temperature/Weather: Sunny, -6

Sampling equip.: Bladder Pump

Purging equip. (circle): Redi-flow Bailer Air Lift Grundfos 5SQE5-450

A) Bottom of well depth (ft): 232.0 D) Well diameter (ID) (ft): 0.208
 B) Depth to water level (ft): 15.61 E) Casing Volume (gal): 55
 C) Water column (A-B)(ft): 216.31 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
10:10	27	0.5	7.29	4.6	216.0	352	231	2.42	0.00		Clear
10:20	55	1.0	6.37	3.9	94.0	158.5	103	2.42	1.00		Clear
10:30	82	1.5	6.13	3.7	29.3	50.1	33	2.46	1.50		Clear, sulfur smell
10:39	110	2.0	6.04	3.9	50.2	84.7	55	2.85	1.00		Clear, sulfur smell
10:49	137	1.5	6.01	4.0	48.5	81.8	53	2.83	1.50		Clear, sulfur smell
10:59	165	3.0	6.00	4.0	48.2	81.0	53	3.02	1.00		Clear, sulfur smell

Sample Collection Time: _____ **Ship Date:** _____

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1					
2					
3					
4					
6					
7					
8					
9					
10					

Final Sample Field Parameters

Ferrous Fe (mg/L) : 1.0 SPC (µS/cm) : 81.1
 H₂S (mg/L) : C (µS/cm) : 49.1
 Diss. O₂ (mg/L) : 3.00 pH : 6.02
 TDS (mg/L) : 53 Temp. (°C) : 4.1

GWR-038 SAMPLING DATA SHEET

Drill Hole ID or QA/QC ID:

Dip: -90 Sampler BB/JC Depth of well (ft):
 Project: Wheeler ENG Screen interval (ft): n/a
 Date: Sept 4/21 Depth of Static Water Level (corrected for angle)(ft): 147.6
 Temperature/Weather: Cloudy 15C

Sampling equip.: Bladder Pump

Purging equip. (circle): 1.9" Redi-flo2 Bailer Air Lift Grundfos 4" 2HP Grundfos 3" 5SQE5-450

A) Bottom of well depth (ft): 1354 D) Well diameter (ID) (ft): 0.7434
 B) Depth to water level (ft): 147.6 E) Casing Volume (gal): **3875**
 C) Water column (A-B)(ft): 1206.4 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (*ft³ per gal*)

Time	Volume (gal)	Casing Volumes	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
10:00	272.1	0.07	7.08	6.3	26100	40270	26274	4.22			Bubbly, clear water
11:00	630.88	0.16	7.07	6.9	19388	29620	19253	4.96			White water
12:00	981.89	0.25	6.79	9.5	13352	18966	12328	3.13			White water
13:00	1337.29	0.35	8.19	8.2	10288	15159	9853	4.25			White water
14:00	1690.22	0.44	8.15	9.1	7769	11155	7251	4.63			Murky grey water, trace of sediment
15:00	2052.22	0.53	7.65	7.7	8531	12755	8291	5.5			Murky grey water, trace of sediment
16:00	2407.6	0.62	7.54	7.7	7233	10811	7027	5.57			Murkky grey water, trace of sediment

Sample Collection Time: 16:00:00 PM Sept 4th, 2021 **Ship Date:** Sept 4th 2021

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-038	1000	-	-	10
2					
3					
4	GWR-038	100	1.5 mL 17.5% nitric acid	0.45 micron	10
5					
6					
7					
8					
9					
10					

Final Sample Field Parameters

Ferrous Fe (mg/L) : n/a SPC (µS/cm) : 10811
 H₂S (mg/L) : n/a C (µS/cm) : 7233
 Diss. O₂ (mg/L) : 5.57 pH : 7.54
 TDS (mg/L) : 7027 Temp. (°C) : 7.7

GWR-040 SAMPLING DATA SHEET

Drill Hole ID or QA/QC ID:

Dip: -90 Sampler: M.T. Depth of well (ft): 1364
 Project: Wheeler ENG Screen interval (ft): n/a
 Date: Sept 1/21 Depth of Static Water Level (corrected for angle)(ft): 152
 Temperature/Weather: Partly Cloudy 18C

Sampling equip.: Bladder Pump

Purging equip. (circle): 1.9" Redi-flo2 Bailer Air Lift Grundfos 4" 2HP Grundfos 3" 5SQE5-450

A) Bottom of well depth (ft): 1364 D) Well diameter (ID) (ft): 0.7434
 B) Depth to water level (ft): 152 E) Casing Volume (gal): **3935**
 C) Water column (A-B)(ft): 1212 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
Active Pumping Test. No field parameter monitoring. Sample taken at end of test prior to shutting in. Total pumping of 4,285 gallons (1.09 casing volumes) before sampling.											Refer to pump test form

Sample Collection Time: 14:00 **Ship Date:** Sept 4th 2021

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-040	1000	-	-	10
2	GWR-040	250	2 mL 20% sulfuric acid	-	10
3	GWR-040	100	-	-	10
4	GWR-040	100	1.5 mL 17.5% nitric acid	0.45 micron	10
5	Not Taken (no HCl on site)	n/a	n/a	n/a	10
6	GWR-040	100	-	-	10
7	GWR-040	4000	40 mL 17.5% nitric acid	-	10
8	GWR-040	80	-	-	10
9	GWR-040	100	-	-	10
10	GWR-040	100	-	-	10

Final Sample Field Parameters

Ferrous Fe (mg/L) : n/a SPC (µS/cm) : 15302
 H₂S (mg/L) : n/a C (µS/cm) : 11290
 Diss. O₂ (mg/L) : 2.57 pH : 6.84
 TDS (mg/L) : 9947 Temp. (°C) : 11.3

GWR-041 SAMPLING DATA SHEET

Drill Hole ID or QA/QC ID:

Dip: -90 Sampler BB/MC/JC

Project: Wheeler ENG

Date: Sept 6/21

Temperature/Weather: Cloudy 15C

Depth of well (ft):

Screen interval (ft):

Depth of Static Water Level (corrected for angle)(ft):

n/a

152

Sampling equip.: Bladder Pump

Purging equip. (circle): 1.9" Redi-flo2 Bailer Air Lift **Grundfos 4" 2HP** Grundfos 3" 5SQE5-450

A) Bottom of well depth (ft): 1364

D) Well diameter (ID) (ft): 0.7434

B) Depth to water level (ft): 152

E) Casing Volume (gal): **3935**

C) Water column (A-B)(ft): 1212

Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
08:00	178.129	0.05	7.16	6.5	33265	51400	33410	6.46			Light grey water
09:00	531.718	0.14	6.99	10.2	31360	43744	28434	6.37			Light grey water
09:30	704.845	0.18	7.05	10.9	27634	37774	24553	5.98			Light grey water
10:00	874.598	0.22	6.81	13.0	26058	33826	21987	6.07			Light grey water
10:30	1045.93	0.27	6.99	11.5	22527	30354	19730	5.97			Light grey water
11:00	1217.6	0.31	6.89	12.4	20805	27373	17792	5.36			Light grey water
11:30	1389.53	0.35	6.77	12.8	18648	24337	15819	5.79			Light grey water
12:00	1556.14	0.40	6.80	10.0	16869	23653	15374	5.99			Light grey water 180 uSv/hr
12:30	1727.67	0.44	6.85	9.5	14996	21308	13854	5.24			Light grey water radioactive
13:00	1903.07	0.48	6.88	8.5	14015	20455	13296	5.09			Light grey water 180 uSv/hr
13:30	2066.22	0.53	6.86	7.8	12926	19227	12497	6.24			Light grey water 180 uSv/hr
14:00	2232.70	0.57	6.83	8.2	12442	18333	11917	7.05			Light grey water radioactive
14:30	2405.96	0.61	6.88	8.0	11584	17143	11143	6.51			Light grey water radioactive
15:00	2576.57	0.65	6.88	8.1	11289	16664	10832	6.93			Light grey water radioactive
15:30	2727.17	0.69	6.88	8.0	9996	14820	9633	6.69			Light grey water radioactive

Sample Collection Time: 15:30:00 PM Sept 6th, 2021

Ship Date: Sept 8th 2021

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-041	1000	-	-	10
2	GWR-041	250	2 mL 20% sulfuric acid	-	10
3	GWR-041	100	-	-	10
4	GWR-041	100	1.5 mL 17.5% nitric acid	0.45 micron	10
5	GWR-041	100	None (no HCl available)	-	10
6	GWR-041	100	-	-	10
7	GWR-041	4000	40 mL 17.5% nitric acid	-	10
8	GWR-041	80	-	-	10
9	GWR-041	100	-	-	10
10	GWR-041	100	-	-	10

Final Sample Field Parameters

Ferrous Fe (mg/L) : n/a

H₂S (mg/L) : n/a

Diss. O₂ (mg/L) :

TDS (mg/L) :

SPC (µS/cm) :

C (µS/cm) :

pH :

Temp. (°C) :

GWR-042 SAMPLING DATA SHEET

Drill Hole ID or QA/QC ID:

Dip: -90 Sampler BB/MC/JC

Project: Wheeler ENG

Date: Sept 7/21

Temperature/Weather: Cloudy 15C

Depth of well (ft):

Screen interval (ft):

n/a

Depth of Static Water Level (corrected for angle)(ft):

Sampling equip.: Bladder Pump

Purging equip. (circle): 1.9" Redi-flo2 Bailer Air Lift Grundfos 4" 2HP Grundfos 3" 5SQE5-450

A) Bottom of well depth (ft):

D) Well diameter (ID) (ft):

0.7434

B) Depth to water level (ft):

164.9

E) Casing Volume (gal):

0

C) Water column (A-B)(ft):

Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volume (gal)	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	Ferrous Fe (mg/L)	H ₂ S (mg/L)	Comments
8:30	107.536		6.82	7.4	49976	74270	48926	5.15			Light grey
9:00	272.484		6.58	8.4	51174	75006	48754	5.70			Light grey
9:30	445.568		6.53	9.1	48122	69076	44899	5.84			Light grey
10:00	624		6.46	10.1	46107	64451	41893	5.9			Light yellow
10:30	806		6.44	9.7	42665	60335	39218	6.42			Light yellow
11:00	972.995		6.55	10.9	40965	56073	36447	5.81			Light yellow
11:30	1155.81		6.56	11.5	37733	50796	33017	5.47			Light yellow
12:00	1330.68		6.69	10.0	33872	47492	30870	5.97			Light yellow
12:30	1500.1		6.66	9.8	29149	40992	26376	5.0			Light yellow
13:00	1671.4		6.73	8.5	25271	36723	23890	5.0			Light yellow
13:30	1842.7		6.75	8.2	24034	35233	22860	5.4			Light yellow
14:00	2024.14		6.72	8.3	21541	31671	20586	6.00			Light yellow
14:30	2199.92		6.75	8.3	19830	29156	18951	6.71			Light yellow
15:00	2370.67		6.71	8.3	19150	28139	18290	6.77			Light yellow
15:30	2549.62		6.63	8.4	17865	26140	16991	7.23			Light yellow
16:00	2714.74		6.71	8.6	16567	24146	15695	6.28			light yellow

Sample Collection Time: 16:00:00 PM Sept 7th, 2021

Ship Date: Sept 8th 2021

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1	GWR-041	1000	-	-	10
2					
3					
4	GWR-041	100	1.5 mL 17.5% nitric acid	0.45 micron	10
5					
6					
7					
8					
9					
10					

Final Sample Field Parameters

Ferrous Fe (mg/L) : n/a

H₂S (mg/L) : n/a

Diss. O₂ (mg/L) :

TDS (mg/L) :

SPC (µS/cm) :

C (µS/cm) :

pH :

Temp. (°C) :

GWR-044 SAMPLING DATA SHEET

Drill Hole ID or QA/QC ID:

Dip: -90 Sampler: Andrew/Cameron Depth of well (ft): 1374
 Project: Wheeler ENG Screen interval (ft): 1328.4 - 1354.64
 Date: Sept 10/21 Depth of Static Water Level (corrected for angle)(ft):
 Temperature/Weather: Mix Sun and Cloud/Windy 15C

Sampling equip.: 1.9" Redi-flo2 on 3/4" Line

Purging equip. (circle): ' Redi-flo2 on 3/4" I Bailer Air Lift Grundfos 4" 2HP Grundfos 3" 5SQE5-450

A) Bottom of well depth (ft): 1374 D) Well diameter (ID) (ft): 0.2083
 B) Depth to water level (ft): 120 E) Casing Volume (gal): **316**
 C) Water column (A-B)(ft): 1254 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volumes	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	ORP	H ₂ S (mg/L)	Comments
10:15	9.91	0.03	5.45	8.94	495	712	0.465	3.57	-54.4		
10:30	19.04	0.06	5.44	8.56	357	520	0.339	1.79	-53.5		
11:00	38.55	0.12	5.45	9.54	289	411	0.267	1.8	-47.2		
11:30	57.59	0.18	5.41	9.88	466	656	0.426	1.32	-44.1		
12:00	68.07	0.22	5.37	8.98	475	684	0.445	1.18	-42		
12:30	94.44	0.30	5.45	10.11	136	191	0.124	1.26	-96.6		
13:00	125.15	0.40	5.39	10.02	487	682	0.443	1.3	-94.4		
13:30	156.75	0.50	5.29	8.59	472	686	0.448	1.89	-71.9		
14:00	188.59	0.60	5.38	9.04	534	768	0.498	1.79	-76.2		
14:30	220.23	0.70	5.49	9.82	718	1011	0.657	1.06	-76.8		
15:00	252.34	0.80	5.58	9.77	702	989	0.643	1	-75.7		
15:30	284.55	0.90	5.59	10.29	656	912	0.593	0.84	-71.7		
16:00	316.37	1.00	5.64	9.59	568	805	0.523	0.92	-70.5		
16:30	347.43	1.10	5.68	9.94	571	801	0.521	0.86	-68.4		
17:00	378.63	1.20	5.72	9.9	443	623	0.404	0.94	-69		
17:30	410.08	1.30	5.73	9.65	514	727	0.472	0.71	-90.1		
18:00	441.53	1.40	5.69	7.5	354	531	0.345	0.45	-76		sample collected here

Sample Collection Time: 16:00:00 PM Sept 11th, 2021 **Ship Date:**

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Final Sample Field Parameters

Ferrous Fe (mg/L) : n/a SPC (µS/cm) : 682
 H₂S (mg/L) : n/a C (µS/cm) : 487
 Diss. O₂ (mg/L) : 1.3 pH : 5.39
 TDS (mg/L) : 0.443 Temp. (°C) : 10.02
 ORP -76

GWR-047 SAMPLING DATA SHEET

Drill Hole ID or QA/QC ID:

Dip: -90 Sampler Andrew/Cameron Depth of well (ft): 925
 Project: Wheeler ENG Screen interval (ft): 915.16 - 925
 Date: Sept 9/21 Depth of Static Water Level (corrected for angle)(ft): 123.05
 Temperature/Weather: Cloudy 15C

Sampling equip.: 1.9" Redi-flo2 on 3/4" Line

Purging equip. (circle): ' Redi-flo2 on 3/4" l Bailer Air Lift Grundfos 4" 2HP Grundfos 3" 5SQE5-450

A) Bottom of well depth (ft): 925 D) Well diameter (ID) (ft): 0.2083
 B) Depth to water level (ft): 123.05 E) Casing Volume (gal): **202**
 C) Water column (A-B)(ft): 801.95 Casing Volume = $\pi * (D/2)^2 * C * 7.48 \text{ (ft}^3 \text{ per gal)}$

Time	Volume (gal)	Casing Volumes	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	ORP	H ₂ S (mg/L)	Comments
11:15	13		6.21	9.57	322	459	0.295	2.88	-90		
11:30	25.4		6.17	9.73	76	107	0.07	1.71	-82.3		
11:45	36.8		6.44	9.61	88	124	0.081	2.32	-89.8		
12:00	49.1		6.56	9.93	92	129	0.084	2.91	-90.3		
12:30	70.5		6.45	10.88	99	136	0.088	1.82	-86.5		
13:00	93		6.58	10.31	95	133	0.086	1.38	-86.7		
13:30	114.6		6.47	9.51	97	138	0.09	3.14	-84.5		
14:00	136.5		6.5	10.09	118	164	0.107	3.8	-81.7		
14:30	157		6.58	10.94	151	206	0.134	1.82	-86.1		
15:00	178.7		6.68	10.75	156	214	0.139	0.98	-87.4		
15:30	200.1		6.54	11.39	153	207	0.135	1.04	-82.2		
16:00	223.6		6.46	10.92	146	199	0.130	1.34	-79.5		
16:30	246.2		6.48	10.4	141	195	0.127	1.89	-82.8		
17:00	269		6.49	10.37	136	189	0.123	1.32	-79		
17:30	291		6.5	10.61	134	184	0.120	1.53	-84.7		
18:00	298.6		6.47	9.35	125	179	0.116	0.7	-75.9		
18:30	326.4		6.33	10.09	122	171	0.111	8.44	-77.6		high DO readings from conditioning bottles with sample water and then putting in bucket for YSI test
19:00	344.9		6.38	10.44	123	171	0.111	1.5	-80.9		

Sample Collection Time: 18:30:00 Sept 9th, 2021

Ship Date:

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Final Sample Field Parameters

Ferrous Fe (mg/L) : n/a SPC (µS/cm) : 138
 H₂S (mg/L) : n/a C (µS/cm) : 97
 Diss. O₂ (mg/L) : 3.14 pH : 6.47
 TDS (mg/L) : 0.09 Temp. (°C) : 9.51
 ORP -84.5

GWR-048 SAMPLING DATA SHEET

Drill Hole ID or QA/QC ID:

Dip: -90 Sampler: Andrew/Cameron Depth of well (ft): 1246.4
 Project: Wheeler ENG Screen interval (ft): 1236.56 - 1246.4
 Date: Sept 10/21 Depth of Static Water Level (corrected for angle)(ft): 124.05
 Temperature/Weather: Mix Sun and Cloud/Windy 15C

Sampling equip.: 1.9" Redi-flo2 on 3/4" Line

Purging equip. (circle): ' Redi-flo2 on 3/4" I Bailer Air Lift Grundfos 4" 2HP Grundfos 3" 5SQE5-450

A) Bottom of well depth (ft): 1246.4 D) Well diameter (ID) (ft): 0.2083
 B) Depth to water level (ft): 124.05 E) Casing Volume (gal): **283**
 C) Water column (A-B)(ft): 1122.35 Casing Volume = $\pi * (D/2)^2 * C * 7.48$ (ft³ per gal)

Time	Volume (gal)	Casing Volumes	pH	Temp. (°C)	Cond. (µS/cm)	SPC (µS/cm)	Total Dissolved Solids (TDS)	Diss. O ₂ (mg/L)	ORP	H ₂ S (mg/L)	Comments
11:30	18.61		5.77	7.19	70	106	0.069	2.16	-64.7		
12:00	61.42		5.91	8.38	73	108	0.070	1.53	-69.5		
12:30	103.65		5.77	9.18	75	107	0.070	1.15	-63.3		
13:00	149.23		5.8	8.83	74	107	0.070	1.25	-62.3		
13:30	189.57		6.13	10.42	103	143	0.093	1.45	-68.5		upped pump speed after this sample from 1.45gpm to 1.85gpm
14:00	245.38		6.12	9.69	121	171	0.111	1.42	-61.9		
14:30	303.53		6.08	8.44	111	163	0.106	1.74	-57.5		
15:00	363.60		6.32	10.55	116	160	0.104	1.39	-70.2		
15:30	419.27		6.1	9.21	108	155	0.101	0.99	-57.6		
16:00	472.43		6.07	8.19	99	145	0.095	1.71	-56.9		
16:30											
17:00											
17:30											
18:00											
18:30											
19:00											
19:30											
20:00											

Sample Collection Time: 16:00:00 PM Sept 10th, 2021 **Ship Date:**

Bottle	Sample ID	Vol. (mL)	Preservatives	Filtered?	Storage Temp. (°C)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Final Sample Field Parameters

Ferrous Fe (mg/L) : n/a SPC (µS/cm) : 163
 H₂S (mg/L) : n/a C (µS/cm) : 111
 Diss. O₂ (mg/L) : 1.74 pH : 6.08
 TDS (mg/L) : 0.106 Temp. (°C) : 8.44
 ORP -57.5

Appendix H Analytical Reports and QA/QC

2020 Data Quality Verification

Project Name: Denison Groundwater Sampling Results	Project Number: 19-2642
Report Title: N/A	Revision Number: 001
Author's Name: Neera Sundaralingam	Review Type: Analytical Data Review

Section 1: Data Verification

<p>Sample Media:</p> <input type="checkbox"/> Soil <input type="checkbox"/> Sediment <input type="checkbox"/> Rock/Core <input type="checkbox"/> Ballast <input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> Surface Water <input type="checkbox"/> Other: Click here to enter text.	<p>Number of Samples:</p> <p>202009126: 7 (incl 1 dup, 1 FB, 1 Equipment Rinse), GWR-032, GWR-031, GWR-011, GWR-013</p> <p>202009522: 1, GWR-003</p> <p>202009866: 2, GWR-025, GWR-006</p> <p>202010201: 4, GWR-014, GWR-005, GWR-012, GWR-029</p> <p>202010517: 1, GWR-008</p> <p>202010932: 1, GWR-009</p> <p>202013266: 1, GWR-037</p> <p>202013483: 1, GWR-034</p> <p>202013732: 6 (3 samples that were submitted twice, filtered and unfiltered) GWR-033, GWR-036, GWR-035 and the same samples filtered to 0.2 um. Filtered samples were only analyzed for dissolved metals</p> <p>201910289: 7 (incl 1 FB and 1 TB) DH17-3, MW17-2, DH17-5, MW17-3, DH17-6</p> <p>201810_WRE_RPT_GWResults: 7, (incl 1 TB) DH17-3, MW17-1, DH17-5, MW17-3, DH17-6, O-37</p> <p>201807466: 6, (incl 1 TB) DH17-3, MW17-1, DH17-5, MW17-3, DH17-6</p> <p>201906039: 7 (incl FB and TB) DH17-3, MW17-1, DH17-5, MW17-3, DH17-6</p>
<p>All samples are accounted for in field sheets, Chain of Custody Forms and Laboratory Certificates of Analysis?</p> <p>If not, explain. 202009126, 202009522, 202009866, 202010201, 202010517, 202010932, 202013266, 202013483, 202013732: Yes for Excel and COA, no COC provided</p>	

202010289, 2018_WRE_RPT_GWResults, 201807466, 201906039: Excel file only available	
<p>Duplicate Samples Collected/Analysed?</p> <p><input checked="" type="checkbox"/> Yes</p> <p><input type="checkbox"/> No</p> <p>If Yes:</p> <p>Duplicate Sample ID: 202009126: 8/9/2020 16:10 GWR-031 DUPLICATE</p> <p>Primary Sample ID: 202009126: 8/9/2020 16:10 GWR-031</p>	<p>Relative percent difference (RPD) for primary and duplicate sample</p> <p>All less than 30% with the exception of arsenic (66%) (1 to 2 ug/L)</p> <p>Primary and duplicate sample results satisfy the data quality criteria?</p> <p>Yes</p>
<p>Quality Control Samples Collected?</p> <p><input checked="" type="checkbox"/> Field Blank</p> <p>Sample ID: 202009126:8/9/2020 15:30 BLANK 202010289: 7/22/2019 11:15 FIELD BLANK (L-42) 201906039: 5/14/2019 12:00 BLANK (FIELD BLANK L-42)</p> <p><input checked="" type="checkbox"/> Trip Blank</p> <p>Sample ID: 201910289: 7/23/2019 TRAVEL BLANK (L-42)</p> <p>2018_WRE_RPT_GWResults: TRAVEL BLANK</p> <p>201817466: TRIP BLANK O-37</p> <p>201906039: 5/14/2019 12:00 BLANK (FIELD BLANK L-42)</p> <p><input checked="" type="checkbox"/> Equipment Rinse</p> <p>Sample ID 202009126: 8/9/2020 15:45 EQUIPMENT RINSE</p> <p><input type="checkbox"/> Other: Click here to enter text. Sample ID Click here to enter text.</p>	<p>Quality control sample results meet data quality objectives?</p> <p>Yes blanks remained below detection limits, equipment rinse remained generally below detection or within same order of magnitude of detection limit.</p> <p>Field blank from 201906039 reported a zinc concentration slightly above the detection limit (0.0018 mg/L, detection limit: 0.0005 mg/L)</p>
<p>Laboratory deviations from requested analyses?</p> <p>202009126: 8/8/2020 08:25 GWR-032: Air was bubbled through the sample before the gamma spectroscopy analysis to reduced the interferences caused by high activity of Radon. Analysis of radon exceeded the recommended 8 days as the radon had to decay to a level in our calibration range before analysis.</p> <p>202009522: 8/16/2020 15:00 GWR-003 Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved. This sample was reanalyzed</p>	

for Fluoride. Reanalysis confirms original results are within the expected measurement uncertainty.

202009866:

Holding time for Organic carbon, dissolved between sampling and receipt in lab exceeds the recommended 24 hours.

8/22/2020 10:30 GWR-025 Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

8/22/2020 15:00 GWR-006 This sample was reanalyzed for Total suspended solids. Reanalysis confirms original results are within the expected measurement uncertainty.

202010201:

8/29/2020 09:00 GWR-014 Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved. Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

8/29/2020 10:30 GWR-005 Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved. Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P. This sample was reanalyzed for Ortho-phosphate as P. Reanalysis confirms original results are within the expected measurement uncertainty.

202010517:

9/6/2020 09:00 GWR-008 This sample was reanalyzed for Ortho-phosphate as P. Reanalysis confirms original results are within the expected measurement uncertainty. Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved. Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

202010932:

9/14/2020 15:30 GWR-009 Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved. Radon result is corrected for decay to the time of sample collection.

202013266:

10/24/2020 16:40 GWR-037 An external instrument, that is outside of SRC's direct control, was used for the analysis of Radon-222. Additional quality control measures were put in place to mitigate any associated risks. This sample was reanalyzed for Total dissolved solids. Reanalysis confirms original results are within the expected measurement uncertainty. Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P. Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

202013483:

10/30/2020 17:00 GWR-034 Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved. Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P. Radon result is corrected for decay to the time of sample collection. An external instrument, that is outside of SRC's direct control, was used for the analysis of Radon-222 and Tritium. Additional quality control measures were put in place to mitigate any associated risks.

202013732:

Radon results are corrected for decay to the time of sample collection. An external instrument, that is outside of SRC's direct control, was used for the analysis of Radon-

222. Additional quality control measures were put in place to mitigate any associated risks.

11/3/2020 16:30 GWR-033 Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite. Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

11/5/2020 12:00 GWR-036 Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

11/3/2020 11:30 GWR-035 Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite. Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

201810_WRE_RPT_GWResults:

10/4/2018 09:50 O-37 The sample for radionuclides was acidified in the lab. Due to the time lapse from sampling to acidification, we can not guarantee that the results accurately reflect the concentration at the time of sampling.

Comments within Laboratory Certificates of Analysis regarding data quality 202009126, 202009522, 202009866, 202010201, 202010517, 202010932, 202013266, 202013483, 202013732 – All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Plan Chapter, for the purposes of certifying laboratory analysis. Test methods and data are validated by the laboratory's QA program

201910289, 201906039, 201807466: Excel only available, the reported results indicated no concerns with the reported results.

201810_WRE_RPT_GWResults: Cannot guarantee the results accurately reflect concentration at time of sampling for radionuclides due to time lapse from sampling to acidification for O-37


Overall, does the dataset satisfy the data quality objectives and meet the project requirements?

202009126, 202009522, 202009866, 202010201, 202010517, 202010932, 202013266, 202013483, 202013732– Yes

201910289, 201807466, 201906039– Missing Lab CoA, need to verify in order to ensure data meets requirements

Radionuclides from O-37 (201810_WRE_RPT_GWResults) may not meet requirements, also missing CoA, need to verify in order to ensure data meets requirements

Section 3: Review Completion

Reviewer's Name & Signature: Click here to enter text.	Date: Click here to enter a date	Author's Name & Signature: Neera Sundaralingam 	Date: 3 March 2021
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202009126 RPD Calculation

Group #	Unit	2020-9126	2020-9126	Percent Difference (%) ([Primary-Duplicate]/(Primary + Duplicate)) x 100
Sample #		38101	38104	
Description		8/9/2020 16:10 GWR-031	8/9/2020 16:10 GWR-031 DUPLICATE	
Sample Type		WATER	WATER	
Parameter	Unit			
Bicarbonate	mg/L	167	168	0.6
Carbonate	mg/L	<1	<1	-
Chloride	mg/L	151	150	0.7
Hydroxide	mg/L	<1	<1	-
P. alkalinity	mg/L	<1	<1	-
pH	pH units	7.36	7.34	0.3
Specific conductivity	uS/cm	810	810	0.0
Sum of ions	mg/L	504	504	0.0
Total alkalinity	mg/L	137	138	0.7
Total hardness	mg/L	190	190	0.0
Ammonia as nitrogen	mg/L	0.05	0.05	0.0
Nitrate (calc. from NO2+NO3-N)	mg/L	<0.04	<0.04	-
Nitrite	mg/L	<0.03	<0.03	-
Nitrite+Nitrate as nitrogen	mg/L	<0.01	<0.01	-
Ortho-phosphate as P	mg/L	<0.01	<0.01	-
Organic carbon, dissolved	mg/L	68	69	1.5
Fluoride	mg/L	0.32	0.33	3.1
Total dissolved solids	mg/L	536	528	1.5
Total suspended solids	mg/L	5	6	18.2
Lead-210	Bq/L	1100	1100	0.0
Polonium-210	Bq/L	460	410	11.5
Radium-226	Bq/L	120	120	0.0
Radon-222	Bq/L	5900	6400	8.1
Thorium-230	Bq/L	1.1	0.9	20.0
Tritium	Bq/L	<15	<15	-
Calcium	mg/L	58	58	0.0
Magnesium	mg/L	11	11	0.0
Potassium	mg/L	5.5	5.5	0.0

202009126 RPD Calculation

Group #		2020-9126	2020-9126	Percent Difference (%)
Sample #		38101	38104	([Primary-Duplicate]/(Primary + Duplicate)) x 100
Description		8/9/2020 16:10 GWR-031	8/9/2020 16:10 GWR-031 DUPLICATE	
Sample Type		WATER	WATER	
Parameter		Unit		
Sodium	mg/L	71	71	0.0
Sulfate	mg/L	40	40	0.0
Aluminum, dissolved	mg/L	<0.005	0.006	-
Antimony, dissolved	mg/L	<0.002	<0.002	-
Arsenic, dissolved	ug/L	1	2	66.7
Barium, dissolved	mg/L	0.052	0.052	0.0
Beryllium, dissolved	mg/L	<0.001	<0.001	-
Bismuth, dissolved	mg/L	<0.002	<0.002	-
Boron, dissolved	mg/L	0.5	0.5	0.0
Bromine	ug/L	1100	1100	0.0
Cadmium, dissolved	mg/L	<0.0001	<0.0001	-
Chromium, dissolved	mg/L	0.009	0.009	0.0
Cobalt, dissolved	mg/L	0.002	0.002	0.0
Copper, dissolved	mg/L	<0.002	<0.002	-
Iron, dissolved	mg/L	3.6	3.6	0.0
Lead, dissolved	mg/L	0.001	0.001	0.0
Lithium, dissolved	ug/L	89	88	1.1
Manganese, dissolved	mg/L	0.22	0.22	0.0
Molybdenum, dissolved	mg/L	0.062	0.062	0.0
Nickel, dissolved	mg/L	0.040	0.039	2.5
Selenium, dissolved	mg/L	<0.001	<0.001	-
Silica, soluble, dissolved	mg/L	10.0	10.0	0.0
Silver, dissolved	mg/L	<0.0005	<0.0005	-
Strontium, dissolved	mg/L	1.4	1.4	0.0
Sulfur	mg/L	13	13	0.0
Thallium, dissolved	mg/L	<0.002	<0.002	-
Tin, dissolved	mg/L	<0.001	<0.001	-
Titanium, dissolved	mg/L	<0.002	<0.002	-
Uranium, dissolved	ug/L	17	16	6.1
Vanadium, dissolved	mg/L	<0.001	<0.001	-
Zinc, dissolved	mg/L	18.4	18.4	0.0
Phosphorus, dissolved	mg/L	<0.1	<0.1	-
Uranium-234 calculated	Bq/L	0.46	0.45	2.2
Uranium-238 calculated	Bq/L	0.46	0.45	2.2

"-" RPD calculation not possible as primary and/or duplicate sample reported concentration as less than the laboratory detection limit

Environmental Analytical Laboratories
 143-111 Research Drive
 Saskatoon, SK S7N 3R2
 306-933-6932 1-800-240-8808

		2019-10289						
Group #		40996	40997	40998	40999	41000	41001	41002
Sample #		7/22/2019	7/22/2019	7/22/2019	7/22/2019	7/22/2019	7/22/2019	7/23/2019
Description		12:00	11:15	13:10	14:11 MW17-	13:10	11:15 FIELD	TRAVEL
		DH17-3	MW17-1	DH17-5	3	DH17-6	BLANK (L-42)	BLANK (L-42)
Sample Type		WATER	WATER	WATER	WATER	WATER	WATER	WATER
Analyte	Units							
Bicarbonate	mg/L	56	27	48	51	46	2	2
Carbonate	mg/L	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	0.7	0.3	0.1	0.3	0.1	<0.1	<0.1
Hydroxide	mg/L	<1	<1	<1	<1	<1	<1	<1
P. alkalinity	mg/L	<1	<1	<1	<1	<1	<1	<1
pH	pH units	7.10	6.98	7.06	7.61	7.17	5.74	5.62
Specific conductivity	uS/cm	102	62	70	90	70	<1	<1
Sum of ions	mg/L	87	51	65	80	64	2	2
Total alkalinity	mg/L	46	22	39	42	38	2	2
Total hardness	mg/L	35	20	28	25	30	<1	<1
Nitrate	mg/L	0.04	<0.04	0.21	0.30	0.22	<0.04	<0.04
Fluoride	mg/L	0.08	0.07	0.03	0.17	0.03	<0.01	<0.01
Lead-210	Bq/L						<0.02	<0.02
Lead-210, dissolved	Bq/L	<0.02	<0.02	<0.02	<0.02	<0.02		
Polonium-210	Bq/L						<0.005	<0.005
Polonium-210, dissolved	Bq/L	0.005	<0.005	<0.005	<0.005	0.009		
Radium-226	Bq/L						<0.005	<0.005
Radium-226, dissolved	Bq/L	<0.005	<0.005	<0.005	0.009	0.01		
Thorium-228	Bq/L						<0.01	<0.01
Thorium-228, dissolved	Bq/L	<0.01	<0.01	<0.01	<0.01	0.02		
Thorium-230	Bq/L						<0.01	<0.01
Thorium-230, dissolved	Bq/L	<0.01	<0.01	<0.01	<0.01	<0.01		
Thorium-232	Bq/L						<0.01	<0.01
Thorium-232, dissolved	Bq/L	<0.01	<0.01	<0.01	<0.01	<0.01		
Calcium	mg/L	12	5.9	10	8.2	11	<0.1	<0.1
Magnesium	mg/L	1.3	1.2	0.7	1.2	0.7	<0.1	<0.1
Potassium	mg/L	1.0	1.3	0.5	0.8	0.4	<0.1	<0.1
Sodium	mg/L	7.2	4.4	3.6	11	3.6	0.1	0.1
Sulfate	mg/L	8.8	11	2.2	7.0	2.2	<0.2	<0.2

Strontium	mg/L	0.035	0.027	0.029	0.052	0.033	<0.0005	<0.0005
Strontium, dissolved	mg/L	0.044	0.026	0.018	0.030	0.018		
Thallium	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thallium, dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002		
Tin	mg/L	<0.0001	<0.0001	0.0005	0.0003	0.0003	<0.0001	<0.0001
Tin, dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Titanium	mg/L	0.016	0.0059	0.085	0.030	0.13	<0.0002	<0.0002
Titanium, dissolved	mg/L	<0.0002	<0.0002	0.0002	<0.0002	0.0004		
Uranium	ug/L	0.3	0.1	0.6	1.5	0.7	<0.1	<0.1
Uranium, dissolved	ug/L	<0.1	<0.1	0.2	0.3	0.2		
Vanadium	mg/L	0.0009	0.0002	0.0056	0.0019	0.0048	<0.0001	<0.0001
Vanadium, dissolved	mg/L	<0.0001	<0.0001	0.0002	0.0002	0.0002		
Zinc	mg/L	0.013	0.0039	0.019	0.018	0.008	0.0022	<0.0005
Zinc, dissolved	mg/L	0.0035	0.0027	0.0040	0.0020	0.0028		

Note for 41001: This sample was reanalyzed for Zinc. Reanalysis confirms original results are within the expected measurement uncertainty.

SRC Group # 2020-9126

Sep 24, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Aug-10-2020

Client P.O.: E0220015

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 1, Lab Section 2 authorized by Keith Gipman, Supervisor
Results from Lab Section 4 authorized by Vicky Snook, Supervisor

-
- * Test methods and data are validated by the laboratory's Quality Assurance Program.
 - * Routine methods follow recognized procedures from sources such as
 - * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
 - * Environment Canada
 - * US EPA
 - * CANMET
 - * The results reported relate only to the test samples as provided by the client.
 - * Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.
 - * Additional information is available upon request.
 - * Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

SRC Group # 2020-9126

Sep 24, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Aug-10-2020

Client P.O.: E0220015

38100 08/08/2020 08:25 GWR-032 *WATER*
38101 08/09/2020 16:10 GWR-031 *WATER*
38102 08/08/2020 16:30 GWR-011 *WATER*

Analyte	Units	38100	38101	38102
Lab Section 1				
Bicarbonate	mg/L	174	167	54
Carbonate	mg/L	<1	<1	<1
Chloride	mg/L	234	151	Not Requested
Hydroxide	mg/L	<1	<1	<1
P. alkalinity	mg/L	<1	<1	<1
Chloride	mg/L	Not Requested	Not Requested	7.4
pH	pH units	7.33	7.36	7.83
Specific conductivity	uS/cm	1000	810	115
Sum of ions	mg/L	598	504	92
Total alkalinity	mg/L	143	137	44
Total hardness	mg/L	256	190	38
Ammonia as nitrogen	mg/L	0.31	0.05	0.26
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	0.04	<0.04	<0.04
Nitrite	mg/L	<0.03	<0.03	<0.03
Nitrite+Nitrate as nitrogen	mg/L	0.01	<0.01	<0.01
Ortho-phosphate as P	mg/L	<0.01	<0.01	0.11
Organic carbon, dissolved	mg/L	36	68	3.6
Fluoride	mg/L	0.19	0.32	0.20
Total dissolved solids	mg/L	628	536	101
Total suspended solids	mg/L	11	5	171
Lab Section 2				
Calcium	mg/L	78	58	13
Magnesium	mg/L	15	11	1.3
Potassium	mg/L	5.4	5.5	2.4
Sodium	mg/L	83	71	8.4
Sulfate	mg/L	8.0	40	5.5
Aluminum, dissolved	mg/L	0.0057	<0.005	0.0082
Antimony, dissolved	mg/L	<0.0002	<0.002	0.0014
Arsenic, dissolved	ug/L	0.3	1	4.1
Barium, dissolved	mg/L	0.083	0.052	0.21
Beryllium, dissolved	mg/L	<0.0001	<0.001	<0.0001

SRC Group # 2020-9126

Sep 24, 2020

Denison Mines Inc.

38100 08/08/2020 08:25 GWR-032 *WATER*
38101 08/09/2020 16:10 GWR-031 *WATER*
38102 08/08/2020 16:30 GWR-011 *WATER*

Analyte	Units	38100	38101	38102
Lab Section 2				
Bismuth, dissolved	mg/L	<0.0002	<0.002	<0.0002
Boron, dissolved	mg/L	0.59	0.5	0.04
Bromine	ug/L	2300	1100	100
Cadmium, dissolved	mg/L	<0.00001	<0.0001	<0.00001
Chromium, dissolved	mg/L	0.0011	0.009	<0.0005
Cobalt, dissolved	mg/L	<0.0001	0.002	<0.0001
Copper, dissolved	mg/L	<0.0002	<0.002	0.0006
Iron, dissolved	mg/L	6.4	3.6	0.012
Lead, dissolved	mg/L	0.0005	0.001	<0.0001
Lithium, dissolved	ug/L	75	89	10
Manganese, dissolved	mg/L	0.24	0.22	0.085
Molybdenum, dissolved	mg/L	0.0059	0.062	0.028
Nickel, dissolved	mg/L	0.0014	0.040	0.0003
Selenium, dissolved	mg/L	<0.0001	<0.001	0.0001
Silica, soluble, dissolved	mg/L	13.5	10.0	22.5
Silver, dissolved	mg/L	<0.00005	<0.0005	<0.00005
Strontium, dissolved	mg/L	2.51	1.4	0.13
Sulfur	mg/L	2.7	13	1.8
Thallium, dissolved	mg/L	<0.0002	<0.002	<0.0002
Tin, dissolved	mg/L	<0.0001	<0.001	<0.0001
Titanium, dissolved	mg/L	<0.0002	<0.002	<0.0002
Uranium, dissolved	ug/L	5.7	17	9.0
Vanadium, dissolved	mg/L	0.0004	<0.001	0.0005
Zinc, dissolved	mg/L	5.0	18.4	0.0018
Phosphorus, dissolved	mg/L	<0.01	<0.1	0.15
Uranium-234 calculated	Bq/L	0.21	0.46	0.36
Uranium-238 calculated	Bq/L	0.21	0.46	0.36

Lab Section 4

Polonium-210	Bq/L	260	460	0.4
Radon-222	Bq/L	2700000	5900	90
Thorium-230	Bq/L	2	1.1	0.3
Tritium	Bq/L	950	<15	<15
Radium-226	Bq/L	400	120	Not Requested
Lead-210	Bq/L	Not Requested	Not Requested	0.6
Radium-226	Bq/L	Not Requested	Not Requested	1.0
Lead-210	Bq/L	3300	1100	Not Requested

SRC Group # 2020-9126

Sep 24, 2020

Denison Mines Inc.

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 38100

Air was bubbled through the sample before the gamma spectroscopy analysis to reduced the interferences caused by high activity of Radon.

Analysis of radon exceeded the recommended 8 days as the radon had to decay to a level in our calibration range before analysis.

Radon results are corrected for decay to the time of sample collection.

SRC Group # 2020-9126

Sep 24, 2020

Denison Mines Inc.

38103 08/09/2020 10:45 GWR-013 *WATER*
38104 08/09/2020 16:10 GWR-031 DUPLICATE *WATER*

Analyte	Units	38103	38104
Lab Section 1			
Bicarbonate	mg/L	105	168
Carbonate	mg/L	24	<1
Chloride	mg/L	0.6	Not Requested
Hydroxide	mg/L	<1	<1
P. alkalinity	mg/L	20	<1
Chloride	mg/L	Not Requested	150
pH	pH units	9.30	7.34
Specific conductivity	uS/cm	248	810
Sum of ions	mg/L	210	504
Total alkalinity	mg/L	126	138
Total hardness	mg/L	57	190
Ammonia as nitrogen	mg/L	0.68	0.05
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	0.04	<0.04
Nitrite	mg/L	0.05	<0.03
Nitrite+Nitrate as nitrogen	mg/L	0.01	<0.01
Ortho-phosphate as P	mg/L	0.03	<0.01
Organic carbon, dissolved	mg/L	7.9	69
Fluoride	mg/L	0.13	0.33
Total dissolved solids	mg/L	182	528
Total suspended solids	mg/L	28	6
Lab Section 2			
Calcium	mg/L	21	58
Magnesium	mg/L	1.1	11
Potassium	mg/L	6.7	5.5
Sodium	mg/L	34	71
Sulfate	mg/L	17	40
Aluminum, dissolved	mg/L	0.025	0.006
Antimony, dissolved	mg/L	0.0008	<0.002
Arsenic, dissolved	ug/L	3.1	2
Barium, dissolved	mg/L	0.041	0.052
Beryllium, dissolved	mg/L	<0.0001	<0.001
Bismuth, dissolved	mg/L	<0.0002	<0.002
Boron, dissolved	mg/L	0.02	0.5
Bromine	ug/L	8	1100
Cadmium, dissolved	mg/L	<0.00001	<0.0001
Chromium, dissolved	mg/L	<0.0005	0.009

SRC Group # 2020-9126

Sep 24, 2020

Denison Mines Inc.

38103 08/09/2020 10:45 GWR-013 *WATER*
38104 08/09/2020 16:10 GWR-031 DUPLICATE *WATER*

Analyte	Units	38103	38104
Lab Section 2			
Cobalt, dissolved	mg/L	<0.0001	0.002
Copper, dissolved	mg/L	0.0006	<0.002
Iron, dissolved	mg/L	0.086	3.6
Lead, dissolved	mg/L	<0.0001	0.001
Lithium, dissolved	ug/L	8.8	88
Manganese, dissolved	mg/L	0.026	0.22
Molybdenum, dissolved	mg/L	0.018	0.062
Nickel, dissolved	mg/L	0.0024	0.039
Selenium, dissolved	mg/L	0.0001	<0.001
Silica, soluble, dissolved	mg/L	19.2	10.0
Silver, dissolved	mg/L	<0.00005	<0.0005
Strontium, dissolved	mg/L	0.16	1.4
Sulfur	mg/L	5.7	13
Thallium, dissolved	mg/L	<0.0002	<0.002
Tin, dissolved	mg/L	0.0001	<0.001
Titanium, dissolved	mg/L	<0.0002	<0.002
Uranium, dissolved	ug/L	14	16
Vanadium, dissolved	mg/L	0.0019	<0.001
Zinc, dissolved	mg/L	0.0010	18.4
Phosphorus, dissolved	mg/L	0.10	<0.1
Uranium-234 calculated	Bq/L	0.29	0.45
Uranium-238 calculated	Bq/L	0.29	0.45
Lab Section 4			
Lead-210	Bq/L	0.4	Not Requested
Polonium-210	Bq/L	0.4	410
Radium-226	Bq/L	0.5	Not Requested
Radon-222	Bq/L	34	6400
Thorium-230	Bq/L	0.2	0.9
Radium-226	Bq/L	Not Requested	120
Tritium	Bq/L	<15	<15
Lead-210	Bq/L	Not Requested	1100

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Radon results are corrected for decay to the time of sample collection.

SRC Group # 2020-9126

Sep 24, 2020

Denison Mines Inc.

38105 08/09/2020 15:30 BLANK *WATER*
38106 08/09/2020 15:45 EQUIPMENT RINSE *WATER*

Analyte	Units	38105	38106
Lab Section 1			
Bicarbonate	mg/L	<1	<1
Carbonate	mg/L	<1	<1
Chloride	mg/L	<0.1	<0.1
Hydroxide	mg/L	<1	<1
P. alkalinity	mg/L	<1	<1
pH	pH units	5.79	5.88
Specific conductivity	uS/cm	<1	<1
Sum of ions	mg/L	<1	<1
Total alkalinity	mg/L	<1	<1
Total hardness	mg/L	<1	<1
Ammonia as nitrogen	mg/L	0.02	0.02
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04	0.09
Nitrite	mg/L	<0.03	<0.03
Nitrite+Nitrate as nitrogen	mg/L	<0.01	0.02
Ortho-phosphate as P	mg/L	<0.01	<0.01
Organic carbon, dissolved	mg/L	<0.2	<0.2
Fluoride	mg/L	<0.01	<0.01
Total dissolved solids	mg/L	<5	6
Total suspended solids	mg/L	<1	2
Lab Section 2			
Calcium	mg/L	<0.1	<0.1
Magnesium	mg/L	<0.1	<0.1
Potassium	mg/L	<0.1	<0.1
Sodium	mg/L	<0.1	0.2
Sulfate	mg/L	<0.2	<0.2
Aluminum, dissolved	mg/L	0.0006	0.0012
Antimony, dissolved	mg/L	<0.0002	<0.0002
Arsenic, dissolved	ug/L	<0.1	<0.1
Barium, dissolved	mg/L	<0.0005	<0.0005
Beryllium, dissolved	mg/L	<0.0001	<0.0001
Bismuth, dissolved	mg/L	<0.0002	<0.0002
Boron, dissolved	mg/L	<0.01	<0.01
Bromine	ug/L	5	<5
Cadmium, dissolved	mg/L	<0.00001	<0.00001
Chromium, dissolved	mg/L	<0.0005	<0.0005
Cobalt, dissolved	mg/L	<0.0001	<0.0001

SRC Group # 2020-9126

Sep 24, 2020

Denison Mines Inc.

38105 08/09/2020 15:30 BLANK *WATER*
38106 08/09/2020 15:45 EQUIPMENT RINSE *WATER*

Analyte	Units	38105	38106
Lab Section 2			
Copper, dissolved	mg/L	<0.0002	0.0004
Iron, dissolved	mg/L	<0.0005	0.0024
Lead, dissolved	mg/L	<0.0001	<0.0001
Lithium, dissolved	ug/L	<0.1	<0.1
Manganese, dissolved	mg/L	<0.0005	<0.0005
Molybdenum, dissolved	mg/L	<0.0001	0.0002
Nickel, dissolved	mg/L	<0.0001	<0.0001
Selenium, dissolved	mg/L	<0.0001	<0.0001
Silica, soluble, dissolved	mg/L	<0.02	1.8
Silver, dissolved	mg/L	<0.00005	<0.00005
Strontium, dissolved	mg/L	<0.0005	<0.0005
Sulfur	mg/L	<0.05	<0.05
Thallium, dissolved	mg/L	<0.0002	<0.0002
Tin, dissolved	mg/L	<0.0001	<0.0001
Titanium, dissolved	mg/L	<0.0002	<0.0002
Uranium, dissolved	ug/L	<0.1	<0.1
Vanadium, dissolved	mg/L	<0.0001	<0.0001
Zinc, dissolved	mg/L	<0.0005	0.0020
Phosphorus, dissolved	mg/L	<0.01	0.01
Uranium-234 calculated	Bq/L	0.001	0.005
Uranium-238 calculated	Bq/L	0.001	0.005
Lab Section 4			
Lead-210	Bq/L	<0.02	<0.02
Polonium-210	Bq/L	<0.005	<0.005
Radium-226	Bq/L	<0.005	0.005
Radon-222	Bq/L	<3	<3
Thorium-230	Bq/L	<0.01	0.02

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Radon results are corrected for decay to the time of sample collection.

SRC Group # 2020-9126

Sep 24, 2020

Denison Mines Inc.

Analyte Methods

Name	Units	Method
P. alkalinity	mg/L	Chm-211
Organic carbon, dissolved	mg/L	Chm-399
Chloride	mg/L	Chm-115
Chloride	mg/L	Chm-133 / Chm-134
Carbonate	mg/L	Chm-211
Fluoride	mg/L	Chm-211
Bicarbonate	mg/L	Chm-211
Ammonia as nitrogen	mg/L	Chm-123
Nitrite+Nitrate as nitrogen	mg/L	Chm-124
Nitrite	mg/L	Chm-124
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	Chm-124
Hydroxide	mg/L	Chm-211
pH	pH units	Chm-211
Ortho-phosphate as P	mg/L	Chm-116
Total dissolved solids	mg/L	Chm-203
Total suspended solids	mg/L	Chm-206
Specific conductivity	uS/cm	Chm-211
Sum of ions	mg/L	Calculation
Total hardness	mg/L	Calculation
Total alkalinity	mg/L	Chm-211
Silver, dissolved	mg/L	Chm-501 / Chm-522
Aluminum, dissolved	mg/L	Chm-501 / Chm-522
Arsenic, dissolved	ug/L	Chm-501 / Chm-522
Boron, dissolved	mg/L	Chm-501 / Chm-522
Barium, dissolved	mg/L	Chm-501 / Chm-522
Beryllium, dissolved	mg/L	Chm-501 / Chm-522
Bismuth, dissolved	mg/L	Chm-501 / Chm-522
Bromine	ug/L	Chm-522
Calcium	mg/L	Chm-508
Cadmium, dissolved	mg/L	Chm-501 / Chm-522
Cobalt, dissolved	mg/L	Chm-501 / Chm-522
Chromium, dissolved	mg/L	Chm-501 / Chm-522
Copper, dissolved	mg/L	Chm-501 / Chm-522
Iron, dissolved	mg/L	Chm-501 / Chm-522
Potassium	mg/L	Chm-508
Lithium, dissolved	ug/L	Chm-501 / Chm-522
Magnesium	mg/L	Chm-508
Manganese, dissolved	mg/L	Chm-501 / Chm-522

SRC Group # 2020-9126
Sep 24, 2020

Denison Mines Inc.

Name	Units	Method
Molybdenum, dissolved	mg/L	Chm-501 / Chm-522
Sodium	mg/L	Chm-508
Nickel, dissolved	mg/L	Chm-501 / Chm-522
Phosphorus, dissolved	mg/L	Chm-501 / Chm-522
Lead, dissolved	mg/L	Chm-501 / Chm-522
Sulfur	mg/L	Chm-508
Antimony, dissolved	mg/L	Chm-501 / Chm-522
Selenium, dissolved	mg/L	Chm-501 / Chm-522
Silica, soluble, dissolved	mg/L	Chm-501 / Calculation
Tin, dissolved	mg/L	Chm-501 / Chm-522
Sulfate	mg/L	Chm-508
Strontium, dissolved	mg/L	Chm-501 / Chm-522
Titanium, dissolved	mg/L	Chm-501 / Chm-522
Thallium, dissolved	mg/L	Chm-501 / Chm-522
Uranium, dissolved	ug/L	Chm-501 / Chm-522
Uranium-234 calculated	Bq/L	Chm-522
Uranium-238 calculated	Bq/L	Chm-522
Vanadium, dissolved	mg/L	Chm-501 / Chm-522
Zinc, dissolved	mg/L	Chm-501 / Chm-522
Lead-210	Bq/L	Rad-300
Lead-210	Bq/L	Rad-101
Polonium-210	Bq/L	Rad-103
Radium-226	Bq/L	Rad-105
Radium-226	Bq/L	Rad-300
Radon-222	Bq/L	Rad-116
Thorium-230	Bq/L	Rad-106
Tritium	Bq/L	Rad-122

SRC Group # 2020-9522

Sep 10, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Aug-17-2020

Client P.O.: E0220015

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 1, Lab Section 2 authorized by Keith Gipman, Supervisor
Results from Lab Section 4 authorized by Vicky Snook, Supervisor

-
- * Test methods and data are validated by the laboratory's Quality Assurance Program.
 - * Routine methods follow recognized procedures from sources such as
 - * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
 - * Environment Canada
 - * US EPA
 - * CANMET
 - * The results reported relate only to the test samples as provided by the client.
 - * Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.
 - * Additional information is available upon request.
 - * Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

SRC Group # 2020-9522

Sep 10, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Aug-17-2020

Client P.O.: E0220015

39606 08/16/2020 15:00 GWR-003 *WATER*

Analyte	Units	39606
Lab Section 1		
Bicarbonate	mg/L	12
Carbonate	mg/L	<1
Chloride	mg/L	0.1
Hydroxide	mg/L	<1
P. alkalinity	mg/L	<1
pH	pH units	6.76
Specific conductivity	uS/cm	27
Sum of ions	mg/L	20
Total alkalinity	mg/L	10
Total hardness	mg/L	12
Ammonia as nitrogen	mg/L	0.09
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04
Nitrite	mg/L	<0.03
Nitrite+Nitrate as nitrogen	mg/L	<0.01
Ortho-phosphate as P	mg/L	0.05
Organic carbon, dissolved	mg/L	1.4
Fluoride	mg/L	0.04
Total dissolved solids	mg/L	64
Total suspended solids	mg/L	133
Lab Section 2		
Calcium	mg/L	2.9
Magnesium	mg/L	1.1
Potassium	mg/L	1.0
Sodium	mg/L	2.1
Sulfate	mg/L	1.0
Aluminum, dissolved	mg/L	0.0065
Antimony, dissolved	mg/L	<0.0002
Arsenic, dissolved	ug/L	0.2
Barium, dissolved	mg/L	0.0082
Beryllium, dissolved	mg/L	<0.0001
Bismuth, dissolved	mg/L	<0.0002

SRC Group # 2020-9522

Sep 10, 2020

Denison Mines Inc.

39606 08/16/2020 15:00 GWR-003 *WATER*

Analyte	Units	39606
Lab Section 2		
Boron, dissolved	mg/L	<0.01
Bromine	ug/L	<5
Cadmium, dissolved	mg/L	0.00001
Chromium, dissolved	mg/L	<0.0005
Cobalt, dissolved	mg/L	0.0009
Copper, dissolved	mg/L	0.0017
Iron, dissolved	mg/L	0.039
Lead, dissolved	mg/L	0.0001
Lithium, dissolved	ug/L	0.8
Manganese, dissolved	mg/L	0.14
Molybdenum, dissolved	mg/L	0.0012
Nickel, dissolved	mg/L	0.0021
Selenium, dissolved	mg/L	<0.0001
Silica, soluble, dissolved	mg/L	16.5
Silver, dissolved	mg/L	<0.00005
Strontium, dissolved	mg/L	0.020
Sulfur	mg/L	0.33
Thallium, dissolved	mg/L	<0.0002
Tin, dissolved	mg/L	<0.0001
Titanium, dissolved	mg/L	<0.0002
Uranium, dissolved	ug/L	0.5
Vanadium, dissolved	mg/L	0.0001
Zinc, dissolved	mg/L	0.010
Phosphorus, dissolved	mg/L	<0.01
Uranium-234 calculated	Bq/L	0.10
Uranium-238 calculated	Bq/L	0.10
Lab Section 4		
Lead-210	Bq/L	0.60
Polonium-210	Bq/L	0.20
Radium-226	Bq/L	0.27
Radon-222	Bq/L	86
Thorium-230	Bq/L	0.08
Tritium	Bq/L	<15

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 39606

Time between sampling and receipt in lab exceeds the recommended 24

SRC Group # 2020-9522

Sep 10, 2020

Denison Mines Inc.

hours for Organic carbon, dissolved.

This sample was reanalyzed for Fluoride. Reanalysis confirms original results are within the expected measurement uncertainty.

SRC Group # 2020-9522

Sep 10, 2020

Denison Mines Inc.

Analyte Methods

Name	Units	Method
P. alkalinity	mg/L	Chm-211
Organic carbon, dissolved	mg/L	Chm-399
Chloride	mg/L	Chm-133 / Chm-134
Carbonate	mg/L	Chm-211
Fluoride	mg/L	Chm-211
Bicarbonate	mg/L	Chm-211
Ammonia as nitrogen	mg/L	Chm-123
Nitrite+Nitrate as nitrogen	mg/L	Chm-124
Nitrite	mg/L	Chm-124
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	Chm-124
Hydroxide	mg/L	Chm-211
pH	pH units	Chm-211
Ortho-phosphate as P	mg/L	Chm-116
Total dissolved solids	mg/L	Chm-203
Total suspended solids	mg/L	Chm-206
Specific conductivity	uS/cm	Chm-211
Sum of ions	mg/L	Calculation
Total hardness	mg/L	Calculation
Total alkalinity	mg/L	Chm-211
Silver, dissolved	mg/L	Chm-501 / Chm-522
Aluminum, dissolved	mg/L	Chm-501 / Chm-522
Arsenic, dissolved	ug/L	Chm-501 / Chm-522
Boron, dissolved	mg/L	Chm-501 / Chm-522
Barium, dissolved	mg/L	Chm-501 / Chm-522
Beryllium, dissolved	mg/L	Chm-501 / Chm-522
Bismuth, dissolved	mg/L	Chm-501 / Chm-522
Bromine	ug/L	Chm-522
Calcium	mg/L	Chm-508
Cadmium, dissolved	mg/L	Chm-501 / Chm-522
Cobalt, dissolved	mg/L	Chm-501 / Chm-522
Chromium, dissolved	mg/L	Chm-501 / Chm-522
Copper, dissolved	mg/L	Chm-501 / Chm-522
Iron, dissolved	mg/L	Chm-501 / Chm-522
Potassium	mg/L	Chm-508
Lithium, dissolved	ug/L	Chm-501 / Chm-522
Magnesium	mg/L	Chm-508
Manganese, dissolved	mg/L	Chm-501 / Chm-522
Molybdenum, dissolved	mg/L	Chm-501 / Chm-522

SRC Group # 2020-9522

Sep 10, 2020

Denison Mines Inc.

Name	Units	Method
Sodium	mg/L	Chm-508
Nickel, dissolved	mg/L	Chm-501 / Chm-522
Phosphorus, dissolved	mg/L	Chm-501 / Chm-522
Lead, dissolved	mg/L	Chm-501 / Chm-522
Sulfur	mg/L	Chm-508
Antimony, dissolved	mg/L	Chm-501 / Chm-522
Selenium, dissolved	mg/L	Chm-501 / Chm-522
Silica, soluble, dissolved	mg/L	Chm-501 / Calculation
Tin, dissolved	mg/L	Chm-501 / Chm-522
Sulfate	mg/L	Chm-508
Strontium, dissolved	mg/L	Chm-501 / Chm-522
Titanium, dissolved	mg/L	Chm-501 / Chm-522
Thallium, dissolved	mg/L	Chm-501 / Chm-522
Uranium, dissolved	ug/L	Chm-501 / Chm-522
Uranium-234 calculated	Bq/L	Chm-522
Uranium-238 calculated	Bq/L	Chm-522
Vanadium, dissolved	mg/L	Chm-501 / Chm-522
Zinc, dissolved	mg/L	Chm-501 / Chm-522
Lead-210	Bq/L	Rad-101
Polonium-210	Bq/L	Rad-103
Radium-226	Bq/L	Rad-105
Radon-222	Bq/L	Rad-116
Thorium-230	Bq/L	Rad-106
Tritium	Bq/L	Rad-122

SRC Group # 2020-9866

Sep 16, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Janna Switzer

Date Samples Received: Aug-24-2020

Client P.O.: E0220015

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 1, Lab Section 2 authorized by Keith Gipman, Supervisor
Results from Lab Section 4 authorized by Vicky Snook, Supervisor

-
- * Test methods and data are validated by the laboratory's Quality Assurance Program.
 - * Routine methods follow recognized procedures from sources such as
 - * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
 - * Environment Canada
 - * US EPA
 - * CANMET
 - * The results reported relate only to the test samples as provided by the client.
 - * Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.
 - * Additional information is available upon request.
 - * Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

SRC Group # 2020-9866

Sep 16, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Janna Switzer

Date Samples Received: Aug-24-2020

Client P.O.: E0220015

40769 08/22/2020 10:30 GWR-025 *WATER*
40770 08/22/2020 15:00 GWR-006 *WATER*

Analyte	Units	40769	40770
Lab Section 1			
Bicarbonate	mg/L	51	35
Carbonate	mg/L	<1	<1
Chloride	mg/L	233	10
Hydroxide	mg/L	<1	<1
P. alkalinity	mg/L	<1	<1
pH	pH units	6.90	7.04
Specific conductivity	uS/cm	918	71
Sum of ions	mg/L	488	75
Total alkalinity	mg/L	42	29
Total hardness	mg/L	222	30
Ammonia as nitrogen	mg/L	0.08	0.15
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04	0.09
Nitrite	mg/L	<0.03	<0.03
Nitrite+Nitrate as nitrogen	mg/L	<0.01	0.02
Ortho-phosphate as P	mg/L	0.08	0.13
Organic carbon, dissolved	mg/L	2.2	2.4
Fluoride	mg/L	0.21	0.14
Total dissolved solids	mg/L	566	199
Total suspended solids	mg/L	7	838
Lab Section 2			
Calcium	mg/L	66	4.9
Magnesium	mg/L	14	4.3
Potassium	mg/L	3.5	1.8
Sodium	mg/L	68	12
Sulfate	mg/L	52	6.4
Aluminum, dissolved	mg/L	0.0024	0.0096
Antimony, dissolved	mg/L	0.0003	<0.0002
Arsenic, dissolved	ug/L	<0.1	1.3
Barium, dissolved	mg/L	0.12	0.0081
Beryllium, dissolved	mg/L	<0.0001	<0.0001
Bismuth, dissolved	mg/L	<0.0002	<0.0002

SRC Group # 2020-9866

Sep 16, 2020

Denison Mines Inc.

40769 08/22/2020 10:30 GWR-025 *WATER*
40770 08/22/2020 15:00 GWR-006 *WATER*

Analyte	Units	40769	40770
Lab Section 2			
Boron, dissolved	mg/L	0.32	0.01
Bromine	ug/L	2900	22
Cadmium, dissolved	mg/L	<0.00001	<0.00001
Chromium, dissolved	mg/L	<0.0005	<0.0005
Cobalt, dissolved	mg/L	<0.0001	0.0002
Copper, dissolved	mg/L	<0.0002	0.0008
Iron, dissolved	mg/L	16.0	0.49
Lead, dissolved	mg/L	<0.0001	<0.0001
Lithium, dissolved	ug/L	32	8.5
Manganese, dissolved	mg/L	0.97	0.14
Molybdenum, dissolved	mg/L	0.0005	0.0012
Nickel, dissolved	mg/L	0.0002	0.0004
Selenium, dissolved	mg/L	<0.0001	<0.0001
Silica, soluble, dissolved	mg/L	17.8	23
Silver, dissolved	mg/L	<0.00005	<0.00005
Strontium, dissolved	mg/L	1.88	0.034
Sulfur	mg/L	17	2.1
Thallium, dissolved	mg/L	<0.0002	<0.0002
Tin, dissolved	mg/L	<0.0001	<0.0001
Titanium, dissolved	mg/L	<0.0002	<0.0002
Uranium, dissolved	ug/L	0.8	1.4
Vanadium, dissolved	mg/L	<0.0001	<0.0001
Zinc, dissolved	mg/L	0.0030	0.0009
Phosphorus, dissolved	mg/L	0.09	0.06
Uranium-234 calculated	Bq/L	0.024	0.043
Uranium-238 calculated	Bq/L	0.024	0.043
Lab Section 4			
Lead-210	Bq/L	0.08	0.09
Polonium-210	Bq/L	0.02	0.13
Radium-226	Bq/L	0.26	0.36
Radon-222	Bq/L	7	32
Thorium-230	Bq/L	<0.01	0.12
Tritium	Bq/L	<15	<15

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 40769

Time between sampling and receipt in lab exceeds the recommended 48

SRC Group # 2020-9866

Sep 16, 2020

Denison Mines Inc.

hours for Nitrite and Ortho-phosphate as P.

Note for Sample # 40770

This sample was reanalyzed for Total suspended solids. Reanalysis confirms original results are within the expected measurement uncertainty.

The temperature of the cooler was 15.5 °C upon receipt.

Holding time for Organic carbon, dissolved between sampling and receipt in lab exceeds the recommended 24 hours.

SRC Group # 2020-9866

Sep 16, 2020

Denison Mines Inc.

Analyte Methods

Name	Units	Method
P. alkalinity	mg/L	Chm-211
Organic carbon, dissolved	mg/L	Chm-399
Chloride	mg/L	Chm-115
Carbonate	mg/L	Chm-211
Fluoride	mg/L	Chm-211
Bicarbonate	mg/L	Chm-211
Ammonia as nitrogen	mg/L	Chm-123
Nitrite+Nitrate as nitrogen	mg/L	Chm-124
Nitrite	mg/L	Chm-124
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	Chm-124
Hydroxide	mg/L	Chm-211
pH	pH units	Chm-211
Ortho-phosphate as P	mg/L	Chm-116
Total dissolved solids	mg/L	Chm-203
Total suspended solids	mg/L	Chm-206
Specific conductivity	uS/cm	Chm-211
Sum of ions	mg/L	Calculation
Total hardness	mg/L	Calculation
Total alkalinity	mg/L	Chm-211
Silver, dissolved	mg/L	Chm-501 / Chm-522
Aluminum, dissolved	mg/L	Chm-501 / Chm-522
Arsenic, dissolved	ug/L	Chm-501 / Chm-522
Boron, dissolved	mg/L	Chm-501 / Chm-522
Barium, dissolved	mg/L	Chm-501 / Chm-522
Beryllium, dissolved	mg/L	Chm-501 / Chm-522
Bismuth, dissolved	mg/L	Chm-501 / Chm-522
Bromine	ug/L	Chm-522
Calcium	mg/L	Chm-508
Cadmium, dissolved	mg/L	Chm-501 / Chm-522
Cobalt, dissolved	mg/L	Chm-501 / Chm-522
Chromium, dissolved	mg/L	Chm-501 / Chm-522
Copper, dissolved	mg/L	Chm-501 / Chm-522
Iron, dissolved	mg/L	Chm-501 / Chm-522
Potassium	mg/L	Chm-508
Lithium, dissolved	ug/L	Chm-501 / Chm-522
Magnesium	mg/L	Chm-508
Manganese, dissolved	mg/L	Chm-501 / Chm-522
Molybdenum, dissolved	mg/L	Chm-501 / Chm-522

SRC Group # 2020-9866

Sep 16, 2020

Denison Mines Inc.

Name	Units	Method
Sodium	mg/L	Chm-508
Nickel, dissolved	mg/L	Chm-501 / Chm-522
Phosphorus, dissolved	mg/L	Chm-501 / Chm-522
Lead, dissolved	mg/L	Chm-501 / Chm-522
Sulfur	mg/L	Chm-508
Antimony, dissolved	mg/L	Chm-501 / Chm-522
Selenium, dissolved	mg/L	Chm-501 / Chm-522
Silica, soluble, dissolved	mg/L	Chm-501 / Calculation
Tin, dissolved	mg/L	Chm-501 / Chm-522
Sulfate	mg/L	Chm-508
Strontium, dissolved	mg/L	Chm-501 / Chm-522
Titanium, dissolved	mg/L	Chm-501 / Chm-522
Thallium, dissolved	mg/L	Chm-501 / Chm-522
Uranium, dissolved	ug/L	Chm-501 / Chm-522
Uranium-234 calculated	Bq/L	Chm-522
Uranium-238 calculated	Bq/L	Chm-522
Vanadium, dissolved	mg/L	Chm-501 / Chm-522
Zinc, dissolved	mg/L	Chm-501 / Chm-522
Lead-210	Bq/L	Rad-101
Polonium-210	Bq/L	Rad-103
Radium-226	Bq/L	Rad-105
Radon-222	Bq/L	Rad-116
Thorium-230	Bq/L	Rad-106
Tritium	Bq/L	Rad-122

SRC Group # 2020-10201

Sep 16, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Aug-31-2020

Client P.O.: E0220015

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 1, Lab Section 2 authorized by Keith Gipman, Supervisor
Results from Lab Section 4 authorized by Vicky Snook, Supervisor

-
- * Test methods and data are validated by the laboratory's Quality Assurance Program.
 - * Routine methods follow recognized procedures from sources such as
 - * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
 - * Environment Canada
 - * US EPA
 - * CANMET
 - * The results reported relate only to the test samples as provided by the client.
 - * Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.
 - * Additional information is available upon request.
 - * Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

SRC Group # 2020-10201
Sep 16, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Aug-31-2020

Client P.O.: E0220015

41915 08/29/2020 09:00 GWR-014 *WATER*
41916 08/29/2020 10:30 GWR-005 *WATER*
41917 08/29/2020 14:40 GWR-012 *WATER*

Analyte	Units	41915	41916	41917
Lab Section 1				
Bicarbonate	mg/L	115	34	112
Carbonate	mg/L	<1	<1	<1
Chloride	mg/L	0.4	3.3	Not Requested
Hydroxide	mg/L	<1	<1	<1
P. alkalinity	mg/L	<1	<1	<1
Chloride	mg/L	Not Requested	Not Requested	81
pH	pH units	7.68	6.99	7.62
Specific conductivity	uS/cm	190	70	452
Sum of ions	mg/L	190	57	284
Total alkalinity	mg/L	94	28	92
Total hardness	mg/L	84	11	121
Ammonia as nitrogen	mg/L	3.4	<0.01	0.35
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	0.09	<0.04	<0.04
Nitrite	mg/L	0.23	<0.03	<0.03
Nitrite+Nitrate as nitrogen	mg/L	0.02	<0.01	<0.01
Ortho-phosphate as P	mg/L	<0.01	0.05	0.08
Organic carbon, dissolved	mg/L	18	0.5	4.1
Fluoride	mg/L	0.08	0.09	0.01
Total dissolved solids	mg/L	160	75	274
Total suspended solids	mg/L	13	18	10
Lab Section 2				
Calcium	mg/L	33	2.9	37
Magnesium	mg/L	0.4	1.0	7.0
Potassium	mg/L	6.3	1.1	4.4
Sodium	mg/L	21	10	36
Sulfate	mg/L	10	4.5	5.9
Aluminum, dissolved	mg/L	0.020	0.0022	0.0038
Antimony, dissolved	mg/L	0.0020	<0.0002	<0.0002
Arsenic, dissolved	ug/L	0.6	1.1	0.2
Barium, dissolved	mg/L	0.15	0.024	0.25
Beryllium, dissolved	mg/L	<0.0001	<0.0001	<0.0001

SRC Group # 2020-10201

Sep 16, 2020

Denison Mines Inc.

41915 08/29/2020 09:00 GWR-014 *WATER*
41916 08/29/2020 10:30 GWR-005 *WATER*
41917 08/29/2020 14:40 GWR-012 *WATER*

Analyte	Units	41915	41916	41917
Lab Section 2				
Bismuth, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Boron, dissolved	mg/L	0.02	0.03	0.15
Bromine	ug/L	5	46	1000
Cadmium, dissolved	mg/L	<0.00001	<0.00001	<0.00001
Chromium, dissolved	mg/L	<0.0005	<0.0005	<0.0005
Cobalt, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Copper, dissolved	mg/L	0.0004	<0.0002	<0.0002
Iron, dissolved	mg/L	0.055	3.71	5.6
Lead, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Lithium, dissolved	ug/L	12	11	26
Manganese, dissolved	mg/L	0.0018	0.17	0.57
Molybdenum, dissolved	mg/L	0.0024	0.0023	0.0023
Nickel, dissolved	mg/L	0.0027	0.0003	0.0006
Selenium, dissolved	mg/L	<0.0001	<0.0001	0.0002
Silica, soluble, dissolved	mg/L	15.5	19.9	24.4
Silver, dissolved	mg/L	<0.00005	<0.00005	<0.00005
Strontium, dissolved	mg/L	0.26	0.057	0.61
Sulfur	mg/L	3.3	1.5	2.0
Thallium, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Tin, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Titanium, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Uranium, dissolved	ug/L	0.3	0.5	0.5
Vanadium, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Zinc, dissolved	mg/L	0.0007	0.0064	0.0007
Phosphorus, dissolved	mg/L	0.03	<0.01	0.10
Uranium-234 calculated	Bq/L	0.037	0.037	0.011
Uranium-238 calculated	Bq/L	0.037	0.037	0.011
Lab Section 4				
Lead-210	Bq/L	0.08	0.28	0.15
Polonium-210	Bq/L	0.03	0.11	0.03
Radium-226	Bq/L	0.08	0.16	0.17
Radon-222	Bq/L	11	15	23
Thorium-230	Bq/L	0.01	0.04	<0.01
Tritium	Bq/L	19	<15	<15

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SRC Group # 2020-10201

Sep 16, 2020

Denison Mines Inc.

Note for Sample # 41915

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

Note for Sample # 41916

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

This sample was reanalyzed for Ortho-phosphate as P. Reanalysis confirms original results are within the expected measurement uncertainty.

The temperature of the cooler was 11.4 °C upon receipt.

SRC Group # 2020-10201
Sep 16, 2020

Denison Mines Inc.

41918 08/30/2020 09:00 GWR-029 *WATER*

Analyte	Units	41918
Lab Section 1		
Bicarbonate	mg/L	33
Carbonate	mg/L	<1
Chloride	mg/L	6.1
Hydroxide	mg/L	<1
P. alkalinity	mg/L	<1
pH	pH units	7.14
Specific conductivity	uS/cm	72
Sum of ions	mg/L	56
Total alkalinity	mg/L	27
Total hardness	mg/L	21
Ammonia as nitrogen	mg/L	0.03
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04
Nitrite	mg/L	<0.03
Nitrite+Nitrate as nitrogen	mg/L	<0.01
Ortho-phosphate as P	mg/L	0.08
Organic carbon, dissolved	mg/L	1.6
Fluoride	mg/L	0.09
Total dissolved solids	mg/L	71
Total suspended solids	mg/L	<1
Lab Section 2		
Calcium	mg/L	5.6
Magnesium	mg/L	1.7
Potassium	mg/L	1.6
Sodium	mg/L	5.3
Sulfate	mg/L	2.4
Aluminum, dissolved	mg/L	0.014
Antimony, dissolved	mg/L	<0.0002
Arsenic, dissolved	ug/L	0.3
Barium, dissolved	mg/L	0.0082
Beryllium, dissolved	mg/L	<0.0001
Bismuth, dissolved	mg/L	<0.0002
Boron, dissolved	mg/L	0.04
Bromine	ug/L	85
Cadmium, dissolved	mg/L	<0.00001
Chromium, dissolved	mg/L	<0.0005
Cobalt, dissolved	mg/L	<0.0001

SRC Group # 2020-10201
Sep 16, 2020

Denison Mines Inc.

41918 08/30/2020 09:00 GWR-029 *WATER*

Analyte	Units	41918
Lab Section 2		
Copper, dissolved	mg/L	<0.0002
Iron, dissolved	mg/L	4.86
Lead, dissolved	mg/L	<0.0001
Lithium, dissolved	ug/L	11
Manganese, dissolved	mg/L	0.23
Molybdenum, dissolved	mg/L	0.0001
Nickel, dissolved	mg/L	0.0002
Selenium, dissolved	mg/L	0.0011
Silica, soluble, dissolved	mg/L	17.4
Silver, dissolved	mg/L	<0.00005
Strontium, dissolved	mg/L	0.12
Sulfur	mg/L	0.8
Thallium, dissolved	mg/L	<0.0002
Tin, dissolved	mg/L	0.0002
Titanium, dissolved	mg/L	<0.0002
Uranium, dissolved	ug/L	0.2
Vanadium, dissolved	mg/L	<0.0001
Zinc, dissolved	mg/L	0.0010
Phosphorus, dissolved	mg/L	0.06
Uranium-234 calculated	Bq/L	0.004
Uranium-238 calculated	Bq/L	0.004
Lab Section 4		
Lead-210	Bq/L	0.10
Polonium-210	Bq/L	0.02
Radium-226	Bq/L	0.07
Radon-222	Bq/L	35
Thorium-230	Bq/L	<0.01
Tritium	Bq/L	<15

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 11.4 °C upon receipt.

SRC Group # 2020-10201

Sep 16, 2020

Denison Mines Inc.

Analyte Methods

Name	Units	Method
P. alkalinity	mg/L	Chm-211
Organic carbon, dissolved	mg/L	Chm-399
Chloride	mg/L	Chm-115
Chloride	mg/L	Chm-133 / Chm-134
Carbonate	mg/L	Chm-211
Fluoride	mg/L	Chm-211
Bicarbonate	mg/L	Chm-211
Ammonia as nitrogen	mg/L	Chm-123
Nitrite+Nitrate as nitrogen	mg/L	Chm-124
Nitrite	mg/L	Chm-124
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	Chm-124
Hydroxide	mg/L	Chm-211
pH	pH units	Chm-211
Ortho-phosphate as P	mg/L	Chm-116
Total dissolved solids	mg/L	Chm-203
Total suspended solids	mg/L	Chm-206
Specific conductivity	uS/cm	Chm-211
Sum of ions	mg/L	Calculation
Total hardness	mg/L	Calculation
Total alkalinity	mg/L	Chm-211
Silver, dissolved	mg/L	Chm-501 / Chm-522
Aluminum, dissolved	mg/L	Chm-501 / Chm-522
Arsenic, dissolved	ug/L	Chm-501 / Chm-522
Boron, dissolved	mg/L	Chm-501 / Chm-522
Barium, dissolved	mg/L	Chm-501 / Chm-522
Beryllium, dissolved	mg/L	Chm-501 / Chm-522
Bismuth, dissolved	mg/L	Chm-501 / Chm-522
Bromine	ug/L	Chm-522
Calcium	mg/L	Chm-508
Cadmium, dissolved	mg/L	Chm-501 / Chm-522
Cobalt, dissolved	mg/L	Chm-501 / Chm-522
Chromium, dissolved	mg/L	Chm-501 / Chm-522
Copper, dissolved	mg/L	Chm-501 / Chm-522
Iron, dissolved	mg/L	Chm-501 / Chm-522
Potassium	mg/L	Chm-508
Lithium, dissolved	ug/L	Chm-501 / Chm-522
Magnesium	mg/L	Chm-508
Manganese, dissolved	mg/L	Chm-501 / Chm-522

SRC Group # 2020-10201
Sep 16, 2020

Denison Mines Inc.

Name	Units	Method
Molybdenum, dissolved	mg/L	Chm-501 / Chm-522
Sodium	mg/L	Chm-508
Nickel, dissolved	mg/L	Chm-501 / Chm-522
Phosphorus, dissolved	mg/L	Chm-501 / Chm-522
Lead, dissolved	mg/L	Chm-501 / Chm-522
Sulfur	mg/L	Chm-508
Antimony, dissolved	mg/L	Chm-501 / Chm-522
Selenium, dissolved	mg/L	Chm-501 / Chm-522
Silica, soluble, dissolved	mg/L	Chm-501 / Calculation
Tin, dissolved	mg/L	Chm-501 / Chm-522
Sulfate	mg/L	Chm-508
Strontium, dissolved	mg/L	Chm-501 / Chm-522
Titanium, dissolved	mg/L	Chm-501 / Chm-522
Thallium, dissolved	mg/L	Chm-501 / Chm-522
Uranium, dissolved	ug/L	Chm-501 / Chm-522
Uranium-234 calculated	Bq/L	Chm-522
Uranium-238 calculated	Bq/L	Chm-522
Vanadium, dissolved	mg/L	Chm-501 / Chm-522
Zinc, dissolved	mg/L	Chm-501 / Chm-522
Lead-210	Bq/L	Rad-101
Polonium-210	Bq/L	Rad-103
Radium-226	Bq/L	Rad-105
Radon-222	Bq/L	Rad-116
Thorium-230	Bq/L	Rad-106
Tritium	Bq/L	Rad-122

SRC Group # 2020-10517

Sep 22, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Janna Switzer

Date Samples Received: Sep-08-2020

Client P.O.: E0220015

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 1, Lab Section 2 authorized by Keith Gipman, Supervisor
Results from Lab Section 4 authorized by Vicky Snook, Supervisor

-
- * Test methods and data are validated by the laboratory's Quality Assurance Program.
 - * Routine methods follow recognized procedures from sources such as
 - * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
 - * Environment Canada
 - * US EPA
 - * CANMET
 - * The results reported relate only to the test samples as provided by the client.
 - * Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.
 - * Additional information is available upon request.
 - * Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

SRC Group # 2020-10517

Sep 22, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Janna Switzer

Date Samples Received: Sep-08-2020

Client P.O.: E0220015

42973 09/06/2020 09:00 GWR-008 *WATER*

Analyte	Units	42973
Lab Section 1		
Bicarbonate	mg/L	55
Carbonate	mg/L	<1
Chloride	mg/L	3.0
Hydroxide	mg/L	<1
P. alkalinity	mg/L	<1
pH	pH units	7.44
Specific conductivity	uS/cm	86
Sum of ions	mg/L	78
Total alkalinity	mg/L	45
Total hardness	mg/L	24
Ammonia as nitrogen	mg/L	0.05
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04
Nitrite	mg/L	<0.03
Nitrite+Nitrate as nitrogen	mg/L	<0.01
Ortho-phosphate as P	mg/L	0.12
Organic carbon, dissolved	mg/L	7.0
Fluoride	mg/L	0.07
Total dissolved solids	mg/L	72
Total suspended solids	mg/L	3
Lab Section 2		
Calcium	mg/L	6.8
Magnesium	mg/L	1.8
Potassium	mg/L	1.7
Sodium	mg/L	8.6
Sulfate	mg/L	0.7
Aluminum, dissolved	mg/L	0.0081
Antimony, dissolved	mg/L	0.0005
Arsenic, dissolved	ug/L	0.1
Barium, dissolved	mg/L	0.10
Beryllium, dissolved	mg/L	<0.0001
Bismuth, dissolved	mg/L	<0.0002

SRC Group # 2020-10517

Sep 22, 2020

Denison Mines Inc.

42973 09/06/2020 09:00 GWR-008 *WATER*

Analyte	Units	42973
Lab Section 2		
Boron, dissolved	mg/L	0.03
Bromine	ug/L	40
Cadmium, dissolved	mg/L	<0.00001
Chromium, dissolved	mg/L	<0.0005
Cobalt, dissolved	mg/L	<0.0001
Copper, dissolved	mg/L	<0.0002
Iron, dissolved	mg/L	3.55
Lead, dissolved	mg/L	<0.0001
Lithium, dissolved	ug/L	12
Manganese, dissolved	mg/L	0.40
Molybdenum, dissolved	mg/L	0.0003
Nickel, dissolved	mg/L	0.0004
Selenium, dissolved	mg/L	<0.0001
Silica, soluble, dissolved	mg/L	25.8
Silver, dissolved	mg/L	<0.00005
Strontium, dissolved	mg/L	0.12
Sulfur	mg/L	0.23
Thallium, dissolved	mg/L	<0.0002
Tin, dissolved	mg/L	<0.0001
Titanium, dissolved	mg/L	<0.0002
Uranium, dissolved	ug/L	2.4
Vanadium, dissolved	mg/L	<0.0001
Zinc, dissolved	mg/L	0.0029
Phosphorus, dissolved	mg/L	0.06
Uranium-234 calculated	Bq/L	0.043
Uranium-238 calculated	Bq/L	0.043
Lab Section 4		
Lead-210	Bq/L	<0.02
Polonium-210	Bq/L	0.05
Radium-226	Bq/L	0.81
Radon-222	Bq/L	38
Thorium-230	Bq/L	0.01
Tritium	Bq/L	<15

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 42973

This sample was reanalyzed for Ortho-phosphate as P. Reanalysis confirms

SRC Group # 2020-10517

Sep 22, 2020

Denison Mines Inc.

original results are within the expected measurement uncertainty.

The temperature of the cooler was 17.1 °C upon receipt.

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

SRC Group # 2020-10517

Sep 22, 2020

Denison Mines Inc.

Analyte Methods

Name	Units	Method
P. alkalinity	mg/L	Chm-211
Organic carbon, dissolved	mg/L	Chm-399
Chloride	mg/L	Chm-133 / Chm-134
Carbonate	mg/L	Chm-211
Fluoride	mg/L	Chm-211
Bicarbonate	mg/L	Chm-211
Ammonia as nitrogen	mg/L	Chm-123
Nitrite+Nitrate as nitrogen	mg/L	Chm-124
Nitrite	mg/L	Chm-124
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	Chm-124
Hydroxide	mg/L	Chm-211
pH	pH units	Chm-211
Ortho-phosphate as P	mg/L	Chm-116
Total dissolved solids	mg/L	Chm-203
Total suspended solids	mg/L	Chm-206
Specific conductivity	uS/cm	Chm-211
Sum of ions	mg/L	Calculation
Total hardness	mg/L	Calculation
Total alkalinity	mg/L	Chm-211
Silver, dissolved	mg/L	Chm-501 / Chm-522
Aluminum, dissolved	mg/L	Chm-501 / Chm-522
Arsenic, dissolved	ug/L	Chm-501 / Chm-522
Boron, dissolved	mg/L	Chm-501 / Chm-522
Barium, dissolved	mg/L	Chm-501 / Chm-522
Beryllium, dissolved	mg/L	Chm-501 / Chm-522
Bismuth, dissolved	mg/L	Chm-501 / Chm-522
Bromine	ug/L	Chm-522
Calcium	mg/L	Chm-508
Cadmium, dissolved	mg/L	Chm-501 / Chm-522
Cobalt, dissolved	mg/L	Chm-501 / Chm-522
Chromium, dissolved	mg/L	Chm-501 / Chm-522
Copper, dissolved	mg/L	Chm-501 / Chm-522
Iron, dissolved	mg/L	Chm-501 / Chm-522
Potassium	mg/L	Chm-508
Lithium, dissolved	ug/L	Chm-501 / Chm-522
Magnesium	mg/L	Chm-508
Manganese, dissolved	mg/L	Chm-501 / Chm-522
Molybdenum, dissolved	mg/L	Chm-501 / Chm-522

SRC Group # 2020-10517
Sep 22, 2020

Denison Mines Inc.

Name	Units	Method
Sodium	mg/L	Chm-508
Nickel, dissolved	mg/L	Chm-501 / Chm-522
Phosphorus, dissolved	mg/L	Chm-501 / Chm-522
Lead, dissolved	mg/L	Chm-501 / Chm-522
Sulfur	mg/L	Chm-508
Antimony, dissolved	mg/L	Chm-501 / Chm-522
Selenium, dissolved	mg/L	Chm-501 / Chm-522
Silica, soluble, dissolved	mg/L	Chm-501 / Calculation
Tin, dissolved	mg/L	Chm-501 / Chm-522
Sulfate	mg/L	Chm-508
Strontium, dissolved	mg/L	Chm-501 / Chm-522
Titanium, dissolved	mg/L	Chm-501 / Chm-522
Thallium, dissolved	mg/L	Chm-501 / Chm-522
Uranium, dissolved	ug/L	Chm-501 / Chm-522
Uranium-234 calculated	Bq/L	Chm-522
Uranium-238 calculated	Bq/L	Chm-522
Vanadium, dissolved	mg/L	Chm-501 / Chm-522
Zinc, dissolved	mg/L	Chm-501 / Chm-522
Lead-210	Bq/L	Rad-101
Polonium-210	Bq/L	Rad-103
Radium-226	Bq/L	Rad-105
Radon-222	Bq/L	Rad-116
Thorium-230	Bq/L	Rad-106
Tritium	Bq/L	Rad-122

SRC Group # 2020-10932

Sep 30, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Sep-15-2020

Client P.O.: E0220015

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 1, Lab Section 2 authorized by Keith Gipman, Supervisor
Results from Lab Section 4 authorized by Vicky Snook, Supervisor

-
- * Test methods and data are validated by the laboratory's Quality Assurance Program.
 - * Routine methods follow recognized procedures from sources such as
 - * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
 - * Environment Canada
 - * US EPA
 - * CANMET
 - * The results reported relate only to the test samples as provided by the client.
 - * Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.
 - * Additional information is available upon request.
 - * Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

SRC Group # 2020-10932

Sep 30, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Sep-15-2020

Client P.O.: E0220015

44254 09/14/2020 15:30 GWR-009 *WATER*

Analyte	Units	44254
Lab Section 1		
Bicarbonate	mg/L	<1
Carbonate	mg/L	49
Chloride	mg/L	0.3
Hydroxide	mg/L	2
P. alkalinity	mg/L	46
pH	pH units	10.06
Specific conductivity	uS/cm	215
Sum of ions	mg/L	127
Total alkalinity	mg/L	87
Total hardness	mg/L	53
Ammonia as nitrogen	mg/L	0.96
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	0.04
Nitrite	mg/L	0.11
Nitrite+Nitrate as nitrogen	mg/L	0.01
Ortho-phosphate as P	mg/L	0.04
Organic carbon, dissolved	mg/L	10
Fluoride	mg/L	0.08
Total dissolved solids	mg/L	139
Total suspended solids	mg/L	9
Lab Section 2		
Calcium	mg/L	20
Magnesium	mg/L	0.8
Potassium	mg/L	8.6
Sodium	mg/L	21
Sulfate	mg/L	24
Aluminum, dissolved	mg/L	0.012
Antimony, dissolved	mg/L	0.0055
Arsenic, dissolved	ug/L	3.3
Barium, dissolved	mg/L	0.059
Beryllium, dissolved	mg/L	<0.0001
Bismuth, dissolved	mg/L	<0.0002

SRC Group # 2020-10932

Sep 30, 2020

Denison Mines Inc.

44254 09/14/2020 15:30 GWR-009 *WATER*

Analyte	Units	44254
Lab Section 2		
Boron, dissolved	mg/L	<0.01
Bromine	ug/L	<5
Cadmium, dissolved	mg/L	0.00001
Chromium, dissolved	mg/L	<0.0005
Cobalt, dissolved	mg/L	<0.0001
Copper, dissolved	mg/L	0.0008
Iron, dissolved	mg/L	0.21
Lead, dissolved	mg/L	<0.0001
Lithium, dissolved	ug/L	9.0
Manganese, dissolved	mg/L	0.021
Molybdenum, dissolved	mg/L	0.0087
Nickel, dissolved	mg/L	0.0012
Selenium, dissolved	mg/L	<0.0001
Silica, soluble, dissolved	mg/L	19.5
Silver, dissolved	mg/L	<0.00005
Strontium, dissolved	mg/L	0.24
Sulfur	mg/L	8
Thallium, dissolved	mg/L	<0.0002
Tin, dissolved	mg/L	<0.0001
Titanium, dissolved	mg/L	<0.0002
Uranium, dissolved	ug/L	5.3
Vanadium, dissolved	mg/L	<0.0001
Zinc, dissolved	mg/L	0.0014
Phosphorus, dissolved	mg/L	0.05
Uranium-234 calculated	Bq/L	0.13
Uranium-238 calculated	Bq/L	0.13
Lab Section 4		
Lead-210	Bq/L	0.30
Polonium-210	Bq/L	0.07
Radium-226	Bq/L	0.33
Radon-222	Bq/L	<3
Thorium-230	Bq/L	0.03
Tritium	Bq/L	16

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 15.7 °C upon receipt.

SRC Group # 2020-10932

Sep 30, 2020

Denison Mines Inc.

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

Radon result is corrected for decay to the time of sample collection.

SRC Group # 2020-10932

Sep 30, 2020

Denison Mines Inc.

Analyte Methods

Name	Units	Method
P. alkalinity	mg/L	Chm-211
Organic carbon, dissolved	mg/L	Chm-399
Chloride	mg/L	Chm-133 / Chm-134
Carbonate	mg/L	Chm-211
Fluoride	mg/L	Chm-211
Bicarbonate	mg/L	Chm-211
Ammonia as nitrogen	mg/L	Chm-123
Nitrite+Nitrate as nitrogen	mg/L	Chm-124
Nitrite	mg/L	Chm-124
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	Chm-124
Hydroxide	mg/L	Chm-211
pH	pH units	Chm-211
Ortho-phosphate as P	mg/L	Chm-116
Total dissolved solids	mg/L	Chm-203
Total suspended solids	mg/L	Chm-206
Specific conductivity	uS/cm	Chm-211
Sum of ions	mg/L	Calculation
Total hardness	mg/L	Calculation
Total alkalinity	mg/L	Chm-211
Silver, dissolved	mg/L	Chm-501 / Chm-522
Aluminum, dissolved	mg/L	Chm-501 / Chm-522
Arsenic, dissolved	ug/L	Chm-501 / Chm-522
Boron, dissolved	mg/L	Chm-501 / Chm-522
Barium, dissolved	mg/L	Chm-501 / Chm-522
Beryllium, dissolved	mg/L	Chm-501 / Chm-522
Bismuth, dissolved	mg/L	Chm-501 / Chm-522
Bromine	ug/L	Chm-522
Calcium	mg/L	Chm-508
Cadmium, dissolved	mg/L	Chm-501 / Chm-522
Cobalt, dissolved	mg/L	Chm-501 / Chm-522
Chromium, dissolved	mg/L	Chm-501 / Chm-522
Copper, dissolved	mg/L	Chm-501 / Chm-522
Iron, dissolved	mg/L	Chm-501 / Chm-522
Potassium	mg/L	Chm-508
Lithium, dissolved	ug/L	Chm-501 / Chm-522
Magnesium	mg/L	Chm-508
Manganese, dissolved	mg/L	Chm-501 / Chm-522
Molybdenum, dissolved	mg/L	Chm-501 / Chm-522

SRC Group # 2020-10932

Sep 30, 2020

Denison Mines Inc.

Name	Units	Method
Sodium	mg/L	Chm-508
Nickel, dissolved	mg/L	Chm-501 / Chm-522
Phosphorus, dissolved	mg/L	Chm-501 / Chm-522
Lead, dissolved	mg/L	Chm-501 / Chm-522
Sulfur	mg/L	Chm-508
Antimony, dissolved	mg/L	Chm-501 / Chm-522
Selenium, dissolved	mg/L	Chm-501 / Chm-522
Silica, soluble, dissolved	mg/L	Chm-501 / Calculation
Tin, dissolved	mg/L	Chm-501 / Chm-522
Sulfate	mg/L	Chm-508
Strontium, dissolved	mg/L	Chm-501 / Chm-522
Titanium, dissolved	mg/L	Chm-501 / Chm-522
Thallium, dissolved	mg/L	Chm-501 / Chm-522
Uranium, dissolved	ug/L	Chm-501 / Chm-522
Uranium-234 calculated	Bq/L	Chm-522
Uranium-238 calculated	Bq/L	Chm-522
Vanadium, dissolved	mg/L	Chm-501 / Chm-522
Zinc, dissolved	mg/L	Chm-501 / Chm-522
Lead-210	Bq/L	Rad-101
Polonium-210	Bq/L	Rad-103
Radium-226	Bq/L	Rad-105
Radon-222	Bq/L	Rad-116
Thorium-230	Bq/L	Rad-106
Tritium	Bq/L	Rad-122

SRC Group # 2020-13266

Nov 06, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Oct-28-2020

Client P.O.: E0220015

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 1, Lab Section 2 authorized by Keith Gipman, Supervisor
Results from Lab Section 4 authorized by Vicky Snook, Supervisor

-
- * Test methods and data are validated by the laboratory's Quality Assurance Program.
 - * Routine methods follow recognized procedures from sources such as
 - * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
 - * Environment Canada
 - * US EPA
 - * CANMET
 - * The results reported relate only to the test samples as provided by the client.
 - * Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.
 - * Additional information is available upon request.
 - * Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

SRC Group # 2020-13266

Nov 06, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Oct-28-2020

Client P.O.: E0220015

57400 10/24/2020 16:40 GWR-037 *WATER*

Analyte	Units	57400
Lab Section 1		
Bicarbonate	mg/L	15
Carbonate	mg/L	<1
Chloride	mg/L	0.4
Hydroxide	mg/L	<1
P. alkalinity	mg/L	<1
pH	pH units	6.57
Specific conductivity	uS/cm	32
Sum of ions	mg/L	32
Total alkalinity	mg/L	12
Total hardness	mg/L	8
Ammonia as nitrogen	mg/L	0.04
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04
Nitrite	mg/L	<0.03
Nitrite+Nitrate as nitrogen	mg/L	<0.01
Ortho-phosphate as P	mg/L	0.02
Organic carbon, dissolved	mg/L	3.9
Fluoride	mg/L	<0.01
Total dissolved solids	mg/L	90
Total suspended solids	mg/L	<1
Lab Section 2		
Calcium	mg/L	2.0
Magnesium	mg/L	0.7
Potassium	mg/L	1.9
Sodium	mg/L	3.6
Sulfate	mg/L	8.0
Aluminum, dissolved	mg/L	0.48
Antimony, dissolved	mg/L	<0.0002
Arsenic, dissolved	ug/L	0.4
Barium, dissolved	mg/L	0.0073
Beryllium, dissolved	mg/L	<0.0001
Bismuth, dissolved	mg/L	<0.0002

SRC Group # 2020-13266

Nov 06, 2020

Denison Mines Inc.

57400 10/24/2020 16:40 GWR-037 *WATER*

Analyte	Units	57400
Lab Section 2		
Boron, dissolved	mg/L	<0.01
Bromine	ug/L	<5
Cadmium, dissolved	mg/L	0.00002
Chromium, dissolved	mg/L	<0.0005
Cobalt, dissolved	mg/L	0.0005
Copper, dissolved	mg/L	0.0013
Iron, dissolved	mg/L	1.64
Lead, dissolved	mg/L	0.0002
Lithium, dissolved	ug/L	9.2
Manganese, dissolved	mg/L	0.12
Molybdenum, dissolved	mg/L	<0.0001
Nickel, dissolved	mg/L	0.0037
Selenium, dissolved	mg/L	0.0001
Silica, soluble, dissolved	mg/L	33.4
Silver, dissolved	mg/L	0.00010
Strontium, dissolved	mg/L	0.014
Sulfur	mg/L	2.7
Thallium, dissolved	mg/L	<0.0002
Tin, dissolved	mg/L	<0.0001
Titanium, dissolved	mg/L	0.0048
Uranium, dissolved	ug/L	5.8
Vanadium, dissolved	mg/L	<0.0001
Zinc, dissolved	mg/L	0.0067
Phosphorus, dissolved	mg/L	0.01
Uranium-234 calculated	Bq/L	0.080
Uranium-238 calculated	Bq/L	0.080
Lab Section 4		
Lead-210	Bq/L	0.08
Polonium-210	Bq/L	0.14
Radium-226	Bq/L	0.19
Radon-222	Bq/L	64
Thorium-230	Bq/L	<0.01
Tritium	Bq/L	<15

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 57400

An external instrument, that is outside of SRC's direct control, was used

SRC Group # 2020-13266

Nov 06, 2020

Denison Mines Inc.

for the analysis of Radon-222. Additional quality control measures were put in place to mitigate any associated risks.

This sample was reanalyzed for Total dissolved solids. Reanalysis confirms original results are within the expected measurement uncertainty.

The temperature of the cooler was 21.3 °C upon receipt.

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

SRC Group # 2020-13266

Nov 06, 2020

Denison Mines Inc.

Analyte Methods

Name	Units	Method
P. alkalinity	mg/L	Chm-211
Organic carbon, dissolved	mg/L	Chm-399
Chloride	mg/L	Chm-133 / Chm-134
Carbonate	mg/L	Chm-211
Fluoride	mg/L	Chm-211
Bicarbonate	mg/L	Chm-211
Ammonia as nitrogen	mg/L	Chm-123
Nitrite+Nitrate as nitrogen	mg/L	Chm-124
Nitrite	mg/L	Chm-124
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	Chm-124
Hydroxide	mg/L	Chm-211
pH	pH units	Chm-211
Ortho-phosphate as P	mg/L	Chm-116
Total dissolved solids	mg/L	Chm-203
Total suspended solids	mg/L	Chm-206
Specific conductivity	uS/cm	Chm-211
Sum of ions	mg/L	Calculation
Total hardness	mg/L	Calculation
Total alkalinity	mg/L	Chm-211
Silver, dissolved	mg/L	Chm-501 / Chm-522
Aluminum, dissolved	mg/L	Chm-501 / Chm-522
Arsenic, dissolved	ug/L	Chm-501 / Chm-522
Boron, dissolved	mg/L	Chm-501 / Chm-522
Barium, dissolved	mg/L	Chm-501 / Chm-522
Beryllium, dissolved	mg/L	Chm-501 / Chm-522
Bismuth, dissolved	mg/L	Chm-501 / Chm-522
Bromine	ug/L	Chm-522
Calcium	mg/L	Chm-508
Cadmium, dissolved	mg/L	Chm-501 / Chm-522
Cobalt, dissolved	mg/L	Chm-501 / Chm-522
Chromium, dissolved	mg/L	Chm-501 / Chm-522
Copper, dissolved	mg/L	Chm-501 / Chm-522
Iron, dissolved	mg/L	Chm-501 / Chm-522
Potassium	mg/L	Chm-508
Lithium, dissolved	ug/L	Chm-501 / Chm-522
Magnesium	mg/L	Chm-508
Manganese, dissolved	mg/L	Chm-501 / Chm-522
Molybdenum, dissolved	mg/L	Chm-501 / Chm-522

SRC Group # 2020-13266

Nov 06, 2020

Denison Mines Inc.

Name	Units	Method
Sodium	mg/L	Chm-508
Nickel, dissolved	mg/L	Chm-501 / Chm-522
Phosphorus, dissolved	mg/L	Chm-501 / Chm-522
Lead, dissolved	mg/L	Chm-501 / Chm-522
Sulfur	mg/L	Chm-508
Antimony, dissolved	mg/L	Chm-501 / Chm-522
Selenium, dissolved	mg/L	Chm-501 / Chm-522
Silica, soluble, dissolved	mg/L	Chm-501 / Calculation
Tin, dissolved	mg/L	Chm-501 / Chm-522
Sulfate	mg/L	Chm-508
Strontium, dissolved	mg/L	Chm-501 / Chm-522
Titanium, dissolved	mg/L	Chm-501 / Chm-522
Thallium, dissolved	mg/L	Chm-501 / Chm-522
Uranium, dissolved	ug/L	Chm-501 / Chm-522
Uranium-234 calculated	Bq/L	Chm-522
Uranium-238 calculated	Bq/L	Chm-522
Vanadium, dissolved	mg/L	Chm-501 / Chm-522
Zinc, dissolved	mg/L	Chm-501 / Chm-522
Lead-210	Bq/L	Rad-101
Polonium-210	Bq/L	Rad-103
Radium-226	Bq/L	Rad-105
Radon-222	Bq/L	Rad-116
Thorium-230	Bq/L	Rad-106
Tritium	Bq/L	Rad-122

SRC Group # 2020-13483

Nov 24, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Nov-03-2020

Client P.O.: E0220015

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 1, Lab Section 2 authorized by Keith Gipman, Supervisor
Results from Lab Section 4 authorized by Vicky Snook, Supervisor

-
- * Test methods and data are validated by the laboratory's Quality Assurance Program.
 - * Routine methods follow recognized procedures from sources such as
 - * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
 - * Environment Canada
 - * US EPA
 - * CANMET
 - * The results reported relate only to the test samples as provided by the client.
 - * Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.
 - * Additional information is available upon request.
 - * Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

SRC Group # 2020-13483

Nov 24, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Nov-03-2020

Client P.O.: E0220015

58245 10/30/2020 17:00 GWR-034 *WATER*

Analyte	Units	58245
Lab Section 1		
Bicarbonate	mg/L	166
Carbonate	mg/L	<1
Chloride	mg/L	<1
Hydroxide	mg/L	<1
P. alkalinity	mg/L	<1
pH	pH units	8.07
Specific conductivity	uS/cm	481
Sum of ions	mg/L	329
Total alkalinity	mg/L	136
Total hardness	mg/L	21
Ammonia as nitrogen	mg/L	0.08
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04
Nitrite	mg/L	<0.03
Nitrite+Nitrate as nitrogen	mg/L	<0.01
Ortho-phosphate as P	mg/L	26
Organic carbon, dissolved	mg/L	8.7
Fluoride	mg/L	0.02
Total dissolved solids	mg/L	375
Total suspended solids	mg/L	3
Lab Section 2		
Calcium	mg/L	7.7
Magnesium	mg/L	0.5
Potassium	mg/L	149
Sodium	mg/L	3.7
Sulfate	mg/L	1.8
Aluminum, dissolved	mg/L	0.035
Antimony, dissolved	mg/L	0.0003
Arsenic, dissolved	ug/L	0.2
Barium, dissolved	mg/L	0.011
Beryllium, dissolved	mg/L	<0.0001
Bismuth, dissolved	mg/L	<0.0002

SRC Group # 2020-13483

Nov 24, 2020

Denison Mines Inc.

58245 10/30/2020 17:00 GWR-034 *WATER*

Analyte	Units	58245
Lab Section 2		
Boron, dissolved	mg/L	<0.01
Bromine	ug/L	12
Cadmium, dissolved	mg/L	0.00003
Chromium, dissolved	mg/L	0.0048
Cobalt, dissolved	mg/L	0.0003
Copper, dissolved	mg/L	0.016
Iron, dissolved	mg/L	0.61
Lead, dissolved	mg/L	0.011
Lithium, dissolved	ug/L	0.4
Manganese, dissolved	mg/L	0.019
Molybdenum, dissolved	mg/L	0.0007
Nickel, dissolved	mg/L	0.0035
Selenium, dissolved	mg/L	0.0001
Silica, soluble, dissolved	mg/L	5.2
Silver, dissolved	mg/L	<0.00005
Strontium, dissolved	mg/L	0.021
Sulfur	mg/L	0.6
Thallium, dissolved	mg/L	<0.0002
Tin, dissolved	mg/L	0.0017
Titanium, dissolved	mg/L	0.0011
Uranium, dissolved	ug/L	136
Vanadium, dissolved	mg/L	<0.0001
Zinc, dissolved	mg/L	0.14
Phosphorus, dissolved	mg/L	58.4
Uranium-234 calculated	Bq/L	2.4
Uranium-238 calculated	Bq/L	2.4
Lab Section 4		
Lead-210	Bq/L	22
Polonium-210	Bq/L	6.3
Radium-226	Bq/L	3.6
Radon-222	Bq/L	25
Thorium-230	Bq/L	2.6
Tritium	Bq/L	<15

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 13.8 °C upon receipt.

SRC Group # 2020-13483

Nov 24, 2020

Denison Mines Inc.

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

Radon result is corrected for decay to the time of sample collection.

An external instrument, that is outside of SRC's direct control, was used for the analysis of Radon-222 and Tritium. Additional quality control measures were put in place to mitigate any associated risks.

SRC Group # 2020-13483

Nov 24, 2020

Denison Mines Inc.

Analyte Methods

Name	Units	Method
P. alkalinity	mg/L	Chm-211
Organic carbon, dissolved	mg/L	Chm-399
Chloride	mg/L	Chm-115
Carbonate	mg/L	Chm-211
Fluoride	mg/L	Chm-211
Bicarbonate	mg/L	Chm-211
Ammonia as nitrogen	mg/L	Chm-123
Nitrite+Nitrate as nitrogen	mg/L	Chm-124
Nitrite	mg/L	Chm-124
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	Chm-124
Hydroxide	mg/L	Chm-211
pH	pH units	Chm-211
Ortho-phosphate as P	mg/L	Chm-116
Total dissolved solids	mg/L	Chm-203
Total suspended solids	mg/L	Chm-206
Specific conductivity	uS/cm	Chm-211
Sum of ions	mg/L	Calculation
Total hardness	mg/L	Calculation
Total alkalinity	mg/L	Chm-211
Silver, dissolved	mg/L	Chm-501 / Chm-522
Aluminum, dissolved	mg/L	Chm-501 / Chm-522
Arsenic, dissolved	ug/L	Chm-501 / Chm-522
Boron, dissolved	mg/L	Chm-501 / Chm-522
Barium, dissolved	mg/L	Chm-501 / Chm-522
Beryllium, dissolved	mg/L	Chm-501 / Chm-522
Bismuth, dissolved	mg/L	Chm-501 / Chm-522
Bromine	ug/L	Chm-522
Calcium	mg/L	Chm-508
Cadmium, dissolved	mg/L	Chm-501 / Chm-522
Cobalt, dissolved	mg/L	Chm-501 / Chm-522
Chromium, dissolved	mg/L	Chm-501 / Chm-522
Copper, dissolved	mg/L	Chm-501 / Chm-522
Iron, dissolved	mg/L	Chm-501 / Chm-522
Potassium	mg/L	Chm-508
Lithium, dissolved	ug/L	Chm-501 / Chm-522
Magnesium	mg/L	Chm-508
Manganese, dissolved	mg/L	Chm-501 / Chm-522
Molybdenum, dissolved	mg/L	Chm-501 / Chm-522

SRC Group # 2020-13483

Nov 24, 2020

Denison Mines Inc.

Name	Units	Method
Sodium	mg/L	Chm-508
Nickel, dissolved	mg/L	Chm-501 / Chm-522
Phosphorus, dissolved	mg/L	Chm-501 / Chm-522
Lead, dissolved	mg/L	Chm-501 / Chm-522
Sulfur	mg/L	Chm-508
Antimony, dissolved	mg/L	Chm-501 / Chm-522
Selenium, dissolved	mg/L	Chm-501 / Chm-522
Silica, soluble, dissolved	mg/L	Chm-501 / Calculation
Tin, dissolved	mg/L	Chm-501 / Chm-522
Sulfate	mg/L	Chm-508
Strontium, dissolved	mg/L	Chm-501 / Chm-522
Titanium, dissolved	mg/L	Chm-501 / Chm-522
Thallium, dissolved	mg/L	Chm-501 / Chm-522
Uranium, dissolved	ug/L	Chm-501 / Chm-522
Uranium-234 calculated	Bq/L	Chm-522
Uranium-238 calculated	Bq/L	Chm-522
Vanadium, dissolved	mg/L	Chm-501 / Chm-522
Zinc, dissolved	mg/L	Chm-501 / Chm-522
Lead-210	Bq/L	Rad-101
Polonium-210	Bq/L	Rad-103
Radium-226	Bq/L	Rad-105
Radon-222	Bq/L	Rad-116
Thorium-230	Bq/L	Rad-106
Tritium	Bq/L	Rad-122

SRC Group # 2020-13732

Nov 24, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Nov-06-2020

Client P.O.: E0220015

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 1, Lab Section 2 authorized by Keith Gipman, Supervisor
Results from Lab Section 4 authorized by Vicky Snook, Supervisor

-
- * Test methods and data are validated by the laboratory's Quality Assurance Program.
 - * Routine methods follow recognized procedures from sources such as
 - * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
 - * Environment Canada
 - * US EPA
 - * CANMET
 - * The results reported relate only to the test samples as provided by the client.
 - * Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.
 - * Additional information is available upon request.
 - * Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

SRC Group # 2020-13732

Nov 24, 2020

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Nov-06-2020

Client P.O.: E0220015

59586 11/03/2020 16:30 GWR-033 *WATER*
59587 11/05/2020 12:00 GWR-036 *WATER*
59588 11/03/2020 11:30 GWR-035 *WATER*

Analyte	Units	59586	59587	59588
Lab Section 1				
Bicarbonate	mg/L	43	30	22
Carbonate	mg/L	<1	<1	<1
Chloride	mg/L	57	Not Requested	Not Requested
Hydroxide	mg/L	<1	<1	<1
P. alkalinity	mg/L	<1	<1	<1
Chloride	mg/L	Not Requested	0.2	5.8
pH	pH units	7.48	6.96	7.04
Specific conductivity	uS/cm	331	21	54
Sum of ions	mg/L	191	47	44
Total alkalinity	mg/L	35	25	18
Total hardness	mg/L	59	16	14
Ammonia as nitrogen	mg/L	0.12	<0.01	<0.01
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04	0.49	<0.04
Nitrite	mg/L	<0.03	<0.03	<0.03
Nitrite+Nitrate as nitrogen	mg/L	<0.01	0.11	<0.01
Ortho-phosphate as P	mg/L	<0.01	0.09	<0.01
Organic carbon, dissolved	mg/L	3.4	1.1	2.1
Fluoride	mg/L	0.09	0.01	<0.01
Total dissolved solids	mg/L	132	112	50
Total suspended solids	mg/L	10	180	3
Lab Section 2				
Calcium	mg/L	18	1.2	3.5
Magnesium	mg/L	3.4	3.2	1.3
Potassium	mg/L	2.1	5.3	1.1
Sodium	mg/L	36	3.9	4.9
Sulfate	mg/L	31	2.6	5.9
Aluminum, dissolved	mg/L	0.025	0.15	0.013
Antimony, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Arsenic, dissolved	ug/L	2.2	0.2	0.2
Barium, dissolved	mg/L	0.059	0.0095	0.015
Beryllium, dissolved	mg/L	<0.0001	0.0001	<0.0001

SRC Group # 2020-13732

Nov 24, 2020

Denison Mines Inc.

59586 11/03/2020 16:30 GWR-033 *WATER*
59587 11/05/2020 12:00 GWR-036 *WATER*
59588 11/03/2020 11:30 GWR-035 *WATER*

Analyte	Units	59586	59587	59588
Lab Section 2				
Bismuth, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Boron, dissolved	mg/L	0.04	<0.01	<0.01
Bromine	ug/L	750	<5	76
Cadmium, dissolved	mg/L	0.00001	0.00001	0.00002
Chromium, dissolved	mg/L	<0.0005	<0.0005	<0.0005
Cobalt, dissolved	mg/L	0.0005	0.0004	0.0010
Copper, dissolved	mg/L	0.0003	0.0020	0.0005
Iron, dissolved	mg/L	0.47	0.12	0.32
Lead, dissolved	mg/L	0.0002	0.0001	<0.0001
Lithium, dissolved	ug/L	14	3.0	4.0
Manganese, dissolved	mg/L	0.21	0.048	0.14
Molybdenum, dissolved	mg/L	0.0030	0.0003	0.0008
Nickel, dissolved	mg/L	0.0011	0.0023	0.0050
Selenium, dissolved	mg/L	0.0001	0.0007	<0.0001
Silica, soluble, dissolved	mg/L	10.9	25.5	20.3
Silver, dissolved	mg/L	<0.00005	<0.00005	<0.00005
Strontium, dissolved	mg/L	0.30	0.012	0.033
Sulfur	mg/L	10.3	0.87	1.97
Thallium, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Tin, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Titanium, dissolved	mg/L	<0.0002	0.0009	<0.0002
Uranium, dissolved	ug/L	3.6	0.9	0.2
Vanadium, dissolved	mg/L	<0.0001	0.0001	<0.0001
Zinc, dissolved	mg/L	0.015	0.0061	0.0025
Phosphorus, dissolved	mg/L	<0.01	0.04	<0.01
Uranium-234 calculated	Bq/L	0.047	0.042	0.002
Uranium-238 calculated	Bq/L	0.047	0.042	0.002
Lab Section 4				
Lead-210	Bq/L	0.14	0.14	0.03
Polonium-210	Bq/L	0.16	0.08	0.06
Radium-226	Bq/L	1.6	0.22	0.14
Radon-222	Bq/L	20	17	30
Thorium-230	Bq/L	0.03	<0.01	<0.01
Tritium	Bq/L	<15	<15	<15

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SRC Group # 2020-13732

Nov 24, 2020

Denison Mines Inc.

Note for Sample # 59586

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite.

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

Note for Sample # 59587

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

Note for Sample # 59588

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite.

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

The temperature of the cooler was 12.6 °C upon receipt.

Radon results are corrected for decay to the time of sample collection.

An external instrument, that is outside of SRC's direct control, was used for the analysis of Radon-222. Additional quality control measures were put in place to mitigate any associated risks.

SRC Group # 2020-13732

Nov 24, 2020

Denison Mines Inc.

59589 11/03/2020 16:30 GWR-033 FILTERED TO .2UM *WATER*
59590 11/05/2020 12:00 GWR-036 FILTERED TO .02UM *WATER*
59591 11/03/2020 11:30 GWR-035 FILTERED TO .2UM *WATER*

Analyte	Units	59589	59590	59591
Lab Section 2				
Aluminum, dissolved	mg/L	0.025	0.013	0.025
Antimony, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Arsenic, dissolved	ug/L	2.1	0.1	0.2
Barium, dissolved	mg/L	0.052	0.0022	0.014
Beryllium, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Bismuth, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Boron, dissolved	mg/L	0.04	<0.01	0.01
Cadmium, dissolved	mg/L	0.00002	0.00001	0.00002
Chromium, dissolved	mg/L	<0.0005	<0.0005	0.0014
Cobalt, dissolved	mg/L	0.0006	0.0003	0.0011
Copper, dissolved	mg/L	0.0028	0.0006	0.0039
Iron, dissolved	mg/L	0.25	0.0072	0.31
Lead, dissolved	mg/L	0.0002	<0.0001	0.0014
Lithium, dissolved	ug/L	13	2.7	4.1
Manganese, dissolved	mg/L	0.20	0.034	0.14
Molybdenum, dissolved	mg/L	0.0030	0.0003	0.0007
Nickel, dissolved	mg/L	0.0034	0.0017	0.0055
Selenium, dissolved	mg/L	0.0001	0.0007	<0.0001
Silver, dissolved	mg/L	<0.00005	<0.00005	<0.00005
Strontium, dissolved	mg/L	0.28	0.0074	0.036
Thallium, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Tin, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Titanium, dissolved	mg/L	0.0003	<0.0002	0.0002
Uranium, dissolved	ug/L	1.8	<0.1	0.6
Vanadium, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Zinc, dissolved	mg/L	0.019	0.0062	0.13

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 12.6 °C upon receipt.

Radon results are corrected for decay to the time of sample collection.

An external instrument, that is outside of SRC's direct control, was used for the analysis of Radon-222. Additional quality control measures were put in place to mitigate any associated risks.

SRC Group # 2020-13732

Nov 24, 2020

Denison Mines Inc.

Analyte Methods

Name	Units	Method
P. alkalinity	mg/L	Chm-211
Organic carbon, dissolved	mg/L	Chm-399
Chloride	mg/L	Chm-115
Chloride	mg/L	Chm-133 / Chm-134
Carbonate	mg/L	Chm-211
Fluoride	mg/L	Chm-211
Bicarbonate	mg/L	Chm-211
Ammonia as nitrogen	mg/L	Chm-123
Nitrite+Nitrate as nitrogen	mg/L	Chm-124
Nitrite	mg/L	Chm-124
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	Chm-124
Hydroxide	mg/L	Chm-211
pH	pH units	Chm-211
Ortho-phosphate as P	mg/L	Chm-116
Total dissolved solids	mg/L	Chm-203
Total suspended solids	mg/L	Chm-206
Specific conductivity	uS/cm	Chm-211
Sum of ions	mg/L	Calculation
Total hardness	mg/L	Calculation
Total alkalinity	mg/L	Chm-211
Silver, dissolved	mg/L	Chm-501 / Chm-522
Aluminum, dissolved	mg/L	Chm-501 / Chm-522
Arsenic, dissolved	ug/L	Chm-501 / Chm-522
Boron, dissolved	mg/L	Chm-501 / Chm-522
Barium, dissolved	mg/L	Chm-501 / Chm-522
Beryllium, dissolved	mg/L	Chm-501 / Chm-522
Bismuth, dissolved	mg/L	Chm-501 / Chm-522
Bromine	ug/L	Chm-522
Calcium	mg/L	Chm-508
Cadmium, dissolved	mg/L	Chm-501 / Chm-522
Cobalt, dissolved	mg/L	Chm-501 / Chm-522
Chromium, dissolved	mg/L	Chm-501 / Chm-522
Copper, dissolved	mg/L	Chm-501 / Chm-522
Iron, dissolved	mg/L	Chm-501 / Chm-522
Potassium	mg/L	Chm-508
Lithium, dissolved	ug/L	Chm-501 / Chm-522
Magnesium	mg/L	Chm-508
Manganese, dissolved	mg/L	Chm-501 / Chm-522

SRC Group # 2020-13732

Nov 24, 2020

Denison Mines Inc.

Name	Units	Method
Molybdenum, dissolved	mg/L	Chm-501 / Chm-522
Sodium	mg/L	Chm-508
Nickel, dissolved	mg/L	Chm-501 / Chm-522
Phosphorus, dissolved	mg/L	Chm-501 / Chm-522
Lead, dissolved	mg/L	Chm-501 / Chm-522
Sulfur	mg/L	Chm-508
Antimony, dissolved	mg/L	Chm-501 / Chm-522
Selenium, dissolved	mg/L	Chm-501 / Chm-522
Silica, soluble, dissolved	mg/L	Chm-501 / Calculation
Tin, dissolved	mg/L	Chm-501 / Chm-522
Sulfate	mg/L	Chm-508
Strontium, dissolved	mg/L	Chm-501 / Chm-522
Titanium, dissolved	mg/L	Chm-501 / Chm-522
Thallium, dissolved	mg/L	Chm-501 / Chm-522
Uranium, dissolved	ug/L	Chm-501 / Chm-522
Uranium-234 calculated	Bq/L	Chm-522
Uranium-238 calculated	Bq/L	Chm-522
Vanadium, dissolved	mg/L	Chm-501 / Chm-522
Zinc, dissolved	mg/L	Chm-501 / Chm-522
Lead-210	Bq/L	Rad-101
Polonium-210	Bq/L	Rad-103
Radium-226	Bq/L	Rad-105
Radon-222	Bq/L	Rad-116
Thorium-230	Bq/L	Rad-106
Tritium	Bq/L	Rad-122

2021 Data Quality Verification

Project Name: Hydrogeology for Wheeler River EIA	Project Number: 19-2642
Report Title: Wheeler River Project Baseline Hydrogeology	Revision Number: 1
Author's Name: Langping Wu	Review Type: Internal Draft

Section 1: Data Verification

<p>Sample Media:</p> <p><input type="checkbox"/> Soil</p> <p><input type="checkbox"/> Sediment</p> <p><input type="checkbox"/> Rock/Core</p> <p><input type="checkbox"/> Ballast</p> <p><input checked="" type="checkbox"/> Groundwater</p> <p><input type="checkbox"/> Surface Water</p> <p><input type="checkbox"/> Other:</p> <p style="padding-left: 20px;">Click here to enter text.</p>	<p>Number of Samples:</p> <p>Total of 33 samples, including</p> <ul style="list-style-type: none"> • 3 Duplicate Sample • 2 Field Blank • 2 Tracer Tank. <p>SRC Group # 2021-4265: 6 (incl 1 duplicate, 1 field blank), GWR-008, GWR-009, GWR-036, GWR-037</p> <p>SRC Group # 2021-4672: 4, GWR-003, GWR-006, GWR-025, GWR-029</p> <p>SRC Group # 2021-6345: 8 (incl 1 duplicate, 1 field blank), GWR-005, GWR-012, GWR-014, GWR-033, GWR-034, GWR-035</p> <p>SRC Group # 2021-7066: 2 (only tritium), GWR-031, GWR-032</p> <p>SRC Group # 2021-6894: 4, GWR-011, GWR-013, GWR-031, GWR-032</p> <p>SRC Group # 2021-11729: 6 (incl 1 tracer tank), GWR-038, GWR-039, GWR-040, GWR-041, GWR-042</p> <p>SRC Group # 2021-11730: 7 (incl 1 duplicate, 1 tracer tank), GWR-038 (only uranium), GWR-039, GWR-040, GWR-041, GWR-042 (only uranium)</p> <p>SRC Group # 2021-12063: 3, GWR-046, GWR-047, GWR-048</p> <p>SK2103820: 4 (incl 1 tracer tank), GWR-046, GWR-047, GWR-048</p> <p>21062021-Tritium: 8, GWR-003, GWR-006, GWR-008, GWR-009, GWR-025, GWR-029, GWR-036, GWR-037</p>
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	<p>30082021-Tritium: 6, GWR-005, GWR-012, GWR-014, GWR-033, GWR-034, GWR-035</p> <p>09092021-Tritium: 2, GWR-011, GWR-013</p>
<p>All samples are accounted for in field sheets, Chain of Custody Forms and Laboratory Certificates of Analysis?</p> <p>No</p> <p>If not, explain.</p> <p>All samples are accounted for in field sheets and Laboratory Certificates of Analysis; No Quality Control Reports provided for SRC Group # 2021-11729, # 2021-11730 and # 2021-12063; No Laboratory Certificates of Analysis for 21062021-Tritium, 30082021-Tritium and 09092021-Tritium, only excel files are available. No Chain of Custody Forms provided except for SK2103820</p>	
<p>Duplicate Samples Collected/Analysed?</p> <p><input checked="" type="checkbox"/> Yes</p> <p><input type="checkbox"/> No</p> <p>If Yes:</p> <p>Duplicate Sample ID: 04/08/2021 GRW-036 DUPLICATE #1; 05/24/2021 GRW-034 DUPLICATE #2; 09/01/2021 GWR-040 DUPLICATE</p> <p>Primary Sample ID: 04/08/2021 GWR-036; 05/24/2021 GWR-034 09/01/2021 GWR-040</p>	<p>Relative percent difference (RPD) for primary and duplicate sample:</p> <p>Less than 50% for all measured parameters, with the exception of uranium (66.7%) (0.1 to 0.2 ug/L) in GRW-036 DUPLICATE #1. Calculations of RPD are not possible for values that are below detection limit.</p> <p>Primary and duplicate sample results satisfy the data quality criteria?</p> <p>Yes</p>
<p>Quality Control Samples Collected?</p> <p><input checked="" type="checkbox"/> Field Blank</p> <p>Sample ID: SRC Group # 2021-4265: 04/08/2021 FIELD BLANK SRC Group # 2021-6345: 05/25/2021 FIELD BLANK #2</p> <p><input type="checkbox"/> Trip Blank</p> <p>Sample ID: Click here to enter text.</p> <p><input type="checkbox"/> Equipment Rinse</p> <p>Sample ID Click here to enter text.</p> <p><input type="checkbox"/> Other:Click here to enter text.</p>	<p>Quality control sample results meet data quality objectives?</p> <p>Yes</p> <p>Field blank from SRC Group # 2021-4265 reported a aluminium, copper and zinc concentrations slightly above the detection limit. Field blank from SRC Group # 2021-6345 reported an organic carbon and nitrate concentrations slightly above the detection limit. Overall, blanks remained below</p>

<p>Sample ID Click here to enter text.</p>	<p>detection or within the same order of magnitude of detection limit. There were no other indications of problems with the analysis and the results were considered.</p>
<p>Laboratory deviations from requested analyses?</p> <p>GWR-038 and GWR-042 were measured only for dissolved uranium, as they are very close to GWR-039/040/041 which have full suite analysis.</p> <p>No analytical results were provided for GWR-044.</p> <p>Comments within Laboratory Certificates of Analysis regarding data quality.</p> <p>All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis.</p> <p>SRC Group # 2021-4265: The temperature of the cooler was 9.6 °C upon receipt. Radon results are corrected for decay to the time of sample collection. GWR-008, GWR-037 and FIELD BLANK: Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P. Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.</p> <p>SRC Group # 2021-4672 The temperature of the cooler was 9.2 °C upon receipt. Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P. Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved and Iron(II).</p> <p>SRC Group # 2021-6345 The temperature of the cooler was 11.2 °C upon receipt. GWR-014: Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P. Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved and Iron(II). GWR-012 and GWR-035: Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P. GWR-034 and FIELD BLANK#2: Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.</p> <p>SRC Group # 2021-7066 SRC Group # 2021-6894</p>	

The temperature of the cooler was 9.9 °C upon receipt.

GRW-031 and GRW-032: Time between sampling and receipt in lab exceeds the recommended 24 hours for Iron (II) and Organic carbon, dissolved. Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P. Air was bubbled through the sample before the gamma spectroscopy analysis to reduce the interferences caused by high activity of Radon. Analysis of radon exceeded the recommended 8 days as the radon had to decay to a level in our calibration range before analysis.

GRW-011 and GRW-013: Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P. Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

SRC Group # 2021-11730

The temperature of the cooler was 16.3 °C upon receipt.

GRW-040 and GRW-040 Dup: Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved. Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P. Radon results are corrected for decay to the time of sample collection. Air was bubbled through the sample before the gamma spectroscopy analysis to reduce the interferences caused by high activity of Radon. Analysis of radon exceeded the recommended 8 days as the radon had to decay to a level in our calibration range before analysis.

GRW-039 and GRW-041: Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved and Iron (II). Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P. Radon results are corrected for decay to the time of sample collection. Air was bubbled through the sample before the gamma spectroscopy analysis to reduce the interferences caused by high activity of Radon. Analysis of radon exceeded the recommended 8 days as the radon had to decay to a level in our calibration range before analysis.

SRC Group # 2021-12063

The temperature of the cooler was 10.4 °C upon receipt.

Radon results are corrected for decay to the time of sample collection.

SK2103820

General Comments: The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.


Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Overall, does the dataset satisfy the data quality objectives and meet the project requirements?

Yes, except that:
No quality control reports provided for SRC Group # 2021-11729, # 2021-11730 and # 2021-12063;
No chain of custody forms provided except for SK2103820.

Section 2: Review Completion

Reviewer's Name & Signature: Click here to enter text.	Date: Click here to enter a date	Author's Name & Signature: Langping Wu 	Date: 20 May 2022
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2021-4265 RPD Calculation

SRC Group #		2021-4265	2021-4265	
Sample #		16479	16480	
Description		4/8/2021 15:45 GWR-036	4/8/2021 15:45 GWR-036 DUPLICATE #1	Relative Percentage Difference (RPD)
Sample Type		WATER	WATER	%
Parameter	Unit			
Bicarbonate	mg/L	16	16	0.0
Carbonate	mg/L	<1	<1	-
Chloride	mg/L	<0.1	0.1	-
Hydroxide	mg/L	<1	<1	-
P. alkalinity	mg/L	<1	<1	-
pH	pH units	6.91	6.9	0.1
Specific conductivity	uS/cm	35	34	2.9
Sum of ions	mg/L	28	29	-3.5
Total alkalinity	mg/L	13	13	0.0
Total hardness	mg/L	14	15	-6.9
Ammonia as nitrogen	mg/L	<0.01	0.02	-
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	0.49	0.49	0.0
Nitrite	mg/L	<0.03	<0.03	-
Nitrite+Nitrate as nitrogen	mg/L	0.11	0.11	0.0
Ortho-phosphate as P	mg/L	0.08	0.08	0.0
Organic carbon, dissolved	mg/L	0.5	0.5	0.0
Iron (II)	mg/L			-
Fluoride	mg/L	0.06	0.06	0.0
Total dissolved solids	mg/L	66	66	0.0
Total suspended solids	mg/L	71	63	11.9
Lead-210	Bq/L	0.07	0.08	-13.3
Polonium-210	Bq/L	0.05	0.06	-18.2
Radium-226	Bq/L	0.06	0.06	0.0
Radon-222	Bq/L	20	20	0.0
Thorium-230	Bq/L	0.02	0.02	0.0
Calcium	mg/L	2.7	3.1	-13.8
Magnesium	mg/L	1.8	1.7	5.7
Potassium	mg/L	2.8	2.9	-3.5
Sodium	mg/L	2.9	2.9	0.0
Sulfate	mg/L	1.9	1.9	0.0
Aluminum, dissolved	mg/L	0.037	0.053	-35.6
Antimony, dissolved	mg/L	<0.0002	<0.0002	-
Arsenic, dissolved	ug/L	0.3	0.3	0.0
Barium, dissolved	mg/L	0.0057	0.0061	-6.8

Beryllium, dissolved	mg/L	<0.0001	<0.0001	-
Bismuth, dissolved	mg/L	<0.0002	<0.0002	-
Boron, dissolved	mg/L	<0.01	<0.01	-
Bromine	ug/L	<5	<5	-
Cadmium, dissolved	mg/L	<0.00001	<0.00001	-
Chromium, dissolved	mg/L	<0.0005	<0.0005	-
Cobalt, dissolved	mg/L	0.0002	0.0002	0.0
Copper, dissolved	mg/L	0.0006	0.0008	-28.6
Iron, dissolved	mg/L	0.014	0.019	-30.3
Lead, dissolved	mg/L	<0.0001	0.0003	-
Lithium, dissolved	ug/L	2.8	2.6	7.4
Manganese, dissolved	mg/L	0.039	0.038	2.6
Molybdenum, dissolved	mg/L	0.0007	0.0007	0.0
Nickel, dissolved	mg/L	0.0018	0.0018	0.0
Selenium, dissolved	mg/L	0.0008	0.0007	13.3
Silica, soluble, dissolved	mg/L	26.2	25.7	1.9
Silver, dissolved	mg/L	<0.00005	<0.00005	-
Strontium, dissolved	mg/L	0.012	0.013	-8.0
Sulfur	mg/L	0.6	0.6	0.0
Thallium, dissolved	mg/L	<0.0002	<0.0002	-
Tin, dissolved	mg/L	<0.0001	<0.0001	-
Titanium, dissolved	mg/L	0.0004	0.0006	-40.0
Uranium, dissolved	ug/L	0.1	0.2	-66.7
Vanadium, dissolved	mg/L	0.0004	0.0003	28.6
Zinc, dissolved	mg/L	0.0044	0.0046	-4.4
Phosphorus, dissolved	mg/L	0.04	0.04	0.0

Note:

$$\text{RPD (\%)} = 100 \times (D1 - D2) / ((D1 + D2) / 2)$$

where: D1 = primary sample analysis; D2 = duplicate sample analysis.

"-" indicate RPG calculation not possible as primary and/or duplicate sample reported concentrations are less than the laboratory detection limit.

2021-6345 RPD Calculation

SRC Group #		2021-6345	2021-6345	
Sample #		23096	23097	
Descerption		5/24/2021 16:23 GWR-034	5/24/2021 16:23 GWR-034 DUPLICATE #2	Relative Percentage Difference (RPD)
Sample Type		WATER	WATER	%
Parameter	Unit			
Bicarbonate	mg/L	156	156	0.0
Carbonate	mg/L	<1	<1	-
Chloride	mg/L	<1	<1	-
Hydroxide	mg/L	<1	<1	-
P. alkalinity	mg/L	<1	<1	-
pH	pH units	7.63	7.62	0.1
Specific conductivity	uS/cm	480	481	-0.2
Sum of ions	mg/L	318	316	0.6
Total alkalinity	mg/L	128	128	0.0
Total hardness	mg/L	19	19	0.0
Ammonia as nitrogen	mg/L	0.19	0.18	5.4
Nitrate (calc. from NO2+NO3-N)	mg/L	0.09	0.09	0.0
Nitrite	mg/L	0.25	0.25	0.0
Nitrite+Nitrate as nitrogen	mg/L	0.02	0.02	0.0
Ortho-phosphate as P	mg/L	62	52	17.5
Organic carbon, dissolved	mg/L	7.9	8.2	-3.7
Iron (II)	mg/L			-
Fluoride	mg/L	0.02	0.02	0.0
Total dissolved solids	mg/L	402	452	-11.7
Total suspended solids	mg/L	6	5	18.2
Lead-210	Bq/L	5.7	6.3	-10.0
Polonium-210	Bq/L	4.4	4.6	-4.4
Radium-226	Bq/L	0.90	0.86	4.5
Radon-222	Bq/L	8	9	-11.8
Thorium-230	Bq/L	0.44	0.43	2.3
Calcium	mg/L	6.7	6.8	-1.5
Magnesium	mg/L	0.5	0.5	0.0
Potassium	mg/L	148	147	0.7
Sodium	mg/L	3.9	3.9	0.0
Sulfate	mg/L	2.2	2.0	9.5
Aluminum, dissolved	mg/L	0.20	0.21	-4.9
Antimony, dissolved	mg/L	0.0007	0.0007	0.0
Arsenic, dissolved	ug/L	0.4	0.4	0.0
Barium, dissolved	mg/L	0.018	0.018	0.0

Beryllium, dissolved	mg/L	<0.0001	<0.0001	-
Bismuth, dissolved	mg/L	<0.0002	<0.0002	-
Boron, dissolved	mg/L	<0.01	<0.01	-
Bromine	ug/L	12	14	-15.4
Cadmium, dissolved	mg/L	0.00006	0.00005	18.2
Chromium, dissolved	mg/L	0.0019	0.0019	0.0
Cobalt, dissolved	mg/L	0.0003	0.0003	0.0
Copper, dissolved	mg/L	0.025	0.025	0.0
Iron, dissolved	mg/L	0.75	0.74	1.3
Lead, dissolved	mg/L	0.0054	0.0054	0.0
Lithium, dissolved	ug/L	0.7	0.7	0.0
Manganese, dissolved	mg/L	0.037	0.038	-2.7
Molybdenum, dissolved	mg/L	0.0004	0.0003	28.6
Nickel, dissolved	mg/L	0.0020	0.0022	-9.5
Selenium, dissolved	mg/L	<0.0001	<0.0001	-
Silica, soluble, dissolved	mg/L	6.9	6.9	0.0
Silver, dissolved	mg/L	<0.00005	<0.00005	-
Strontium, dissolved	mg/L	0.022	0.022	0.0
Sulfur	mg/L	0.7	0.7	0.0
Thallium, dissolved	mg/L	<0.0002	<0.0002	-
Tin, dissolved	mg/L	0.0032	0.0033	-3.1
Titanium, dissolved	mg/L	0.0051	0.0045	12.5
Uranium, dissolved	ug/L	87	88	-1.1
Vanadium, dissolved	mg/L	0.0004	0.0004	0.0
Zinc, dissolved	mg/L	0.12	0.12	0.0
Phosphorus, dissolved	mg/L	61	60	1.7

Note:

$$\text{RPD (\%)} = 100 \times (D1 - D2) / ((D1 + D2) / 2)$$

where: D1 = primary sample analysis; D2 = duplicate sample analysis.

"-" indicate RPG calculation not possible as primary and/or duplicate sample reported concentrations are less than the laboratory detection limit.

2021-11730 RPD Calculation

SRC Group #		2021-11729 2021-11730	2021-11730	
Sample #		44627 44638	44639	
Description		9/1/2021 14:00 GWR-040	9/1/2021 14:00 GWR-040 DUPLICATE #3	Relative Percentage Difference (RPD)
Sample Type		WATER	WATER	%
Parameter	Unit			
Bicarbonate	mg/L	76	76	0.0
Carbonate	mg/L	<1	<1	-
Chloride	mg/L	2560	2580	-0.8
Hydroxide	mg/L	<1	<1	-
P. alkalinity	mg/L	<1	<1	-
pH	pH units	6.98	7.39	-5.7
Specific conductivity	uS/cm	7530	7530	0.0
Sum of ions	mg/L	4360	4350	0.2
Total alkalinity	mg/L	62	62	0.0
Total hardness	mg/L	1830	1830	0.0
Ammonia as nitrogen	mg/L	12	12	0.0
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04	<0.04	-
Nitrite	mg/L	<0.03	<0.03	-
Nitrite+Nitrate as nitrogen	mg/L	<0.01	<0.01	-
Ortho-phosphate as P	mg/L	0.02	<0.01	-
Organic carbon, dissolved	mg/L	19	19	0.0
Iron (II)	mg/L			-
Fluoride	mg/L	0.21	0.21	0.0
Total dissolved solids	mg/L	4640	4080	12.8
Total suspended solids	mg/L	28	26	7.4
Lead-210	Bq/L	5000	5000	0.0
Polonium-210	Bq/L	700	600	15.4
Radium-226	Bq/L	1500	1100	30.8
Radon-222	Bq/L	6000000	6000000	0.0
Thorium-230	Bq/L	6	10	-50.0
Calcium	mg/L	590	590	0.0
Magnesium	mg/L	88	88	0.0
Potassium	mg/L	767	732	4.7
Sodium	mg/L	203	205	-1.0
Sulfate	mg/L	71	67	5.8
Aluminum, dissolved	mg/L	<0.005	<0.005	-
Antimony, dissolved	mg/L	<0.002	<0.002	-
Arsenic, dissolved	ug/L	<1	<1	-
Barium, dissolved	mg/L	0.52	0.52	0.0

Beryllium, dissolved	mg/L	<0.001	<0.001	-
Bismuth, dissolved	mg/L	<0.002	<0.002	-
Boron, dissolved	mg/L	0.5	0.5	0.0
Bromine	ug/L	9800	9800	0.0
Cadmium, dissolved	mg/L	<0.0001	<0.0001	-
Chromium, dissolved	mg/L	<0.005	<0.005	-
Cobalt, dissolved	mg/L	0.001	0.001	0.0
Copper, dissolved	mg/L	<0.002	<0.002	-
Iron, dissolved	mg/L	8.2	7.7	6.3
Lead, dissolved	mg/L	<0.001	<0.001	-
Lithium, dissolved	ug/L	250	250	0.0
Manganese, dissolved	mg/L	0.85	0.83	2.4
Molybdenum, dissolved	mg/L	0.011	0.011	0.0
Nickel, dissolved	mg/L	0.019	0.020	-5.1
Selenium, dissolved	mg/L	0.002	0.002	0.0
Silica, soluble, dissolved	mg/L	50.5	51.2	-1.4
Silver, dissolved	mg/L	<0.0005	<0.0005	-
Strontium, dissolved	mg/L	16.1	16.1	0.0
Sulfur	mg/L	24	22	8.7
Thallium, dissolved	mg/L	<0.002	<0.002	-
Tin, dissolved	mg/L	<0.001	<0.001	-
Titanium, dissolved	mg/L	<0.002	<0.002	-
Uranium, dissolved	ug/L	10	10	0.0
Vanadium, dissolved	mg/L	<0.001	<0.001	-
Zinc, dissolved	mg/L	0.010	0.011	-9.5
Phosphorus, dissolved	mg/L	<0.1	<0.1	-

Note:

$$\text{RPD (\%)} = 100 \times (D1 - D2) / ((D1 + D2) / 2)$$

where: D1 = primary sample analysis; D2 = duplicate sample analysis.

"-" indicate RPG calculation not possible as primary and/or duplicate sample reported concentrations are less than the laboratory detection limit.

SRC Group # 2021-4265

Apr 29, 2021

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Jennifer Skilnick

Date Samples Received: Apr-12-2021

Client P.O.: WRE_E0220083

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 1 approved by Hamilton, Ashley
Results from Lab Section 4 approved by Smith-Windsor, Jenna
Results from Lab Section 2 approved by Britton, Stephanie

-
- * Test methods and data are validated by the laboratory's Quality Assurance Program.
 - * Routine methods follow recognized procedures from sources such as
 - * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
 - * Environment Canada
 - * US EPA
 - * CANMET
 - * The results reported relate only to the test samples as provided by the client.
 - * Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.
 - * Additional information is available upon request.
 - * Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

SRC Group # 2021-4265

Apr 29, 2021

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Jennifer Skilnick

Date Samples Received: Apr-12-2021

Client P.O.: WRE_E0220083

16479 04/08/2021 15:45 GWR-036 *WATER*
16480 04/08/2021 15:45 DUPLICATE #1 *WATER*
16481 04/08/2021 17:30 FIELD BLANK *WATER*

Analyte	Units	16479	16480	16481
Lab Section 1				
Bicarbonate	mg/L	16	16	2
Carbonate	mg/L	<1	<1	<1
Chloride	mg/L	<0.1	0.1	<0.1
Hydroxide	mg/L	<1	<1	<1
P. alkalinity	mg/L	<1	<1	<1
pH	pH units	6.91	6.90	5.70
Specific conductivity	uS/cm	35	34	<1
Sum of ions	mg/L	28	29	2
Total alkalinity	mg/L	13	13	2
Total hardness	mg/L	14	15	<1
Ammonia as nitrogen	mg/L	<0.01	0.02	<0.01
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	0.49	0.49	<0.04
Nitrite	mg/L	<0.03	<0.03	<0.03
Nitrite+Nitrate as nitrogen	mg/L	0.11	0.11	<0.01
Ortho-phosphate as P	mg/L	0.08	0.08	<0.01
Organic carbon, dissolved	mg/L	0.5	0.5	<0.2
Fluoride	mg/L	0.06	0.06	<0.01
Total dissolved solids	mg/L	66	66	<5
Total suspended solids	mg/L	71	63	<1
Lab Section 2				
Calcium	mg/L	2.7	3.1	<0.1
Magnesium	mg/L	1.8	1.7	<0.1
Potassium	mg/L	2.8	2.9	<0.1
Sodium	mg/L	2.9	2.9	<0.1
Sulfate	mg/L	1.9	1.9	<0.2
Aluminum, dissolved	mg/L	0.037	0.053	0.0006
Antimony, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Arsenic, dissolved	ug/L	0.3	0.3	<0.1
Barium, dissolved	mg/L	0.0057	0.0061	<0.0005
Beryllium, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Bismuth, dissolved	mg/L	<0.0002	<0.0002	<0.0002

SRC Group # 2021-4265

Apr 29, 2021

Denison Mines Inc.

16479 04/08/2021 15:45 GWR-036 *WATER*
16480 04/08/2021 15:45 DUPLICATE #1 *WATER*
16481 04/08/2021 17:30 FIELD BLANK *WATER*

Analyte	Units	16479	16480	16481
Lab Section 2				
Boron, dissolved	mg/L	<0.01	<0.01	<0.01
Bromine	ug/L	<5	<5	<5
Cadmium, dissolved	mg/L	<0.00001	<0.00001	<0.00001
Chromium, dissolved	mg/L	<0.0005	<0.0005	<0.0005
Cobalt, dissolved	mg/L	0.0002	0.0002	<0.0001
Copper, dissolved	mg/L	0.0006	0.0008	0.0003
Iron, dissolved	mg/L	0.014	0.019	<0.0005
Lead, dissolved	mg/L	<0.0001	0.0003	<0.0001
Lithium, dissolved	ug/L	2.8	2.6	<0.1
Manganese, dissolved	mg/L	0.039	0.038	<0.0005
Molybdenum, dissolved	mg/L	0.0007	0.0007	<0.0001
Nickel, dissolved	mg/L	0.0018	0.0018	<0.0001
Selenium, dissolved	mg/L	0.0008	0.0007	<0.0001
Silica, soluble, dissolved	mg/L	26.2	25.7	<0.02
Silver, dissolved	mg/L	<0.00005	<0.00005	<0.00005
Strontium, dissolved	mg/L	0.012	0.013	<0.0005
Sulfur	mg/L	0.6	0.6	<0.05
Thallium, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Tin, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Titanium, dissolved	mg/L	0.0004	0.0006	<0.0002
Uranium, dissolved	ug/L	0.1	0.2	<0.1
Vanadium, dissolved	mg/L	0.0004	0.0003	<0.0001
Zinc, dissolved	mg/L	0.0044	0.0046	0.0021
Phosphorus, dissolved	mg/L	0.04	0.04	<0.01
Uranium-234 calculated	Bq/L	0.002	0.003	<0.001
Uranium-238 calculated	Bq/L	0.002	0.003	<0.001
Lab Section 4				
Lead-210	Bq/L	0.07	0.08	<0.02
Polonium-210	Bq/L	0.05	0.06	<0.005
Radium-226	Bq/L	0.06	0.06	<0.005
Radon-222	Bq/L	20	20	<5
Thorium-230	Bq/L	0.02	0.02	<0.01

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

Time between sampling and receipt in lab exceeds the recommended 24

SRC Group # 2021-4265

Apr 29, 2021

Denison Mines Inc.

hours for Organic carbon, dissolved.

The temperature of the cooler was 9.6 °C upon receipt.

Radon results are corrected for decay to the time of sample collection.
Time between sampling and receipt in lab exceeds the recommended 24
hours for Organic carbon, dissolved.

SRC Group # 2021-4265

Apr 29, 2021

Denison Mines Inc.

16482 04/09/2021 18:30 GWR-008 *WATER*

Analyte	Units	16482
Lab Section 1		
Bicarbonate	mg/L	39
Carbonate	mg/L	<1
Chloride	mg/L	2.7
Hydroxide	mg/L	<1
P. alkalinity	mg/L	<1
pH	pH units	7.16
Specific conductivity	uS/cm	69
Sum of ions	mg/L	56
Total alkalinity	mg/L	32
Total hardness	mg/L	17
Ammonia as nitrogen	mg/L	0.08
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04
Nitrite	mg/L	<0.03
Nitrite+Nitrate as nitrogen	mg/L	<0.01
Ortho-phosphate as P	mg/L	0.16
Organic carbon, dissolved	mg/L	1.0
Fluoride	mg/L	0.17
Total dissolved solids	mg/L	59
Total suspended solids	mg/L	4
Lab Section 2		
Calcium	mg/L	4.7
Magnesium	mg/L	1.2
Potassium	mg/L	1.5
Sodium	mg/L	5.4
Sulfate	mg/L	0.9
Aluminum, dissolved	mg/L	0.0023
Antimony, dissolved	mg/L	<0.0002
Arsenic, dissolved	ug/L	0.1
Barium, dissolved	mg/L	0.042
Beryllium, dissolved	mg/L	<0.0001
Bismuth, dissolved	mg/L	<0.0002
Boron, dissolved	mg/L	0.03
Bromine	ug/L	34
Cadmium, dissolved	mg/L	<0.00001
Chromium, dissolved	mg/L	<0.0005
Cobalt, dissolved	mg/L	<0.0001

Denison Mines Inc.

16482 04/09/2021 18:30 GWR-008 *WATER*

Analyte	Units	16482
Lab Section 2		
Copper, dissolved	mg/L	0.0007
Iron, dissolved	mg/L	2.81
Lead, dissolved	mg/L	<0.0001
Lithium, dissolved	ug/L	9.9
Manganese, dissolved	mg/L	0.33
Molybdenum, dissolved	mg/L	0.0002
Nickel, dissolved	mg/L	0.0002
Selenium, dissolved	mg/L	<0.0001
Silica, soluble, dissolved	mg/L	23.9
Silver, dissolved	mg/L	<0.00005
Strontium, dissolved	mg/L	0.10
Sulfur	mg/L	0.3
Thallium, dissolved	mg/L	<0.0002
Tin, dissolved	mg/L	<0.0001
Titanium, dissolved	mg/L	<0.0002
Uranium, dissolved	ug/L	0.7
Vanadium, dissolved	mg/L	<0.0001
Zinc, dissolved	mg/L	0.0016
Phosphorus, dissolved	mg/L	0.10
Uranium-234 calculated	Bq/L	0.009
Uranium-238 calculated	Bq/L	0.009
Lab Section 4		
Lead-210	Bq/L	0.66
Polonium-210	Bq/L	0.67
Radium-226	Bq/L	0.32
Radon-222	Bq/L	<4
Thorium-230	Bq/L	0.02

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

The temperature of the cooler was 9.6 °C upon receipt.

Radon results are corrected for decay to the time of sample collection.
Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

SRC Group # 2021-4265

Apr 29, 2021

Denison Mines Inc.

SRC Group # 2021-4265

Apr 29, 2021

Denison Mines Inc.

16483 04/10/2021 18:45 GWR-009 *WATER*
16484 04/09/2021 11:30 GWR-037 *WATER*

Analyte	Units	16483	16484
Lab Section 1			
Bicarbonate	mg/L	188	16
Carbonate	mg/L	<1	<1
Chloride	mg/L	0.4	0.1
Hydroxide	mg/L	<1	<1
P. alkalinity	mg/L	<1	<1
pH	pH units	7.59	6.38
Specific conductivity	uS/cm	289	39
Sum of ions	mg/L	252	29
Total alkalinity	mg/L	154	13
Total hardness	mg/L	104	6
Ammonia as nitrogen	mg/L	0.07	0.02
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04	<0.04
Nitrite	mg/L	<0.03	<0.03
Nitrite+Nitrate as nitrogen	mg/L	<0.01	<0.01
Ortho-phosphate as P	mg/L	0.20	0.04
Organic carbon, dissolved	mg/L	33	2.0
Iron (II)	mg/L	<0.02	<0.02
Fluoride	mg/L	0.10	0.01
Total dissolved solids	mg/L	264	55
Total suspended solids	mg/L	13	<1
Lab Section 2			
Calcium	mg/L	29	1.8
Magnesium	mg/L	7.6	0.4
Potassium	mg/L	1.2	1.8
Sodium	mg/L	23	2.8
Sulfate	mg/L	2.5	6.5
Aluminum, dissolved	mg/L	0.21	0.060
Antimony, dissolved	mg/L	<0.0002	<0.0002
Arsenic, dissolved	ug/L	11	1.0
Barium, dissolved	mg/L	0.22	0.0087
Beryllium, dissolved	mg/L	<0.0001	<0.0001
Bismuth, dissolved	mg/L	<0.0002	<0.0002
Boron, dissolved	mg/L	<0.01	<0.01
Bromine	ug/L	5	<5
Cadmium, dissolved	mg/L	0.00001	<0.00001
Chromium, dissolved	mg/L	0.0058	<0.0005

SRC Group # 2021-4265

Apr 29, 2021

Denison Mines Inc.

16483 04/10/2021 18:45 GWR-009 *WATER*
16484 04/09/2021 11:30 GWR-037 *WATER*

Analyte	Units	16483	16484
Lab Section 2			
Cobalt, dissolved	mg/L	0.0047	0.0004
Copper, dissolved	mg/L	0.0011	0.0009
Iron, dissolved	mg/L	15.3	1.38
Lead, dissolved	mg/L	0.0003	<0.0001
Lithium, dissolved	ug/L	6.3	9.0
Manganese, dissolved	mg/L	2.75	0.16
Molybdenum, dissolved	mg/L	0.0038	0.0028
Nickel, dissolved	mg/L	0.0053	0.0023
Selenium, dissolved	mg/L	<0.0001	0.0004
Silica, soluble, dissolved	mg/L	30.3	35.3
Silver, dissolved	mg/L	<0.00005	0.00011
Strontium, dissolved	mg/L	0.21	0.012
Sulfur	mg/L	0.8	2.1
Thallium, dissolved	mg/L	<0.0002	<0.0002
Tin, dissolved	mg/L	<0.0001	<0.0001
Titanium, dissolved	mg/L	0.0034	0.0006
Uranium, dissolved	ug/L	22	0.8
Vanadium, dissolved	mg/L	0.0018	<0.0001
Zinc, dissolved	mg/L	0.017	0.0041
Phosphorus, dissolved	mg/L	0.19	0.03
Uranium-234 calculated	Bq/L	0.27	0.010
Uranium-238 calculated	Bq/L	0.27	0.010
Lab Section 4			
Lead-210	Bq/L	1.1	0.05
Polonium-210	Bq/L	0.73	0.11
Radium-226	Bq/L	0.30	0.03
Radon-222	Bq/L	<4	57
Thorium-230	Bq/L	0.22	<0.01

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 16484

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

The temperature of the cooler was 9.6 °C upon receipt.

SRC Group # 2021-4265

Apr 29, 2021

Denison Mines Inc.

Radon results are corrected for decay to the time of sample collection.
Time between sampling and receipt in lab exceeds the recommended 24
hours for Organic carbon, dissolved.

SRC Group # 2021-4265

Apr 29, 2021

Denison Mines Inc.

Analyte Methods

Name	Units	Method
P. alkalinity	mg/L	Chm-211
Organic carbon, dissolved	mg/L	Chm-399
Chloride	mg/L	Chm-133 / Chm-134
Carbonate	mg/L	Chm-211
Fluoride	mg/L	Chm-211
Iron (II)	mg/L	Chm-225
Bicarbonate	mg/L	Chm-211
Ammonia as nitrogen	mg/L	Chm-123
Nitrite+Nitrate as nitrogen	mg/L	Chm-124
Nitrite	mg/L	Chm-124
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	Chm-124
Hydroxide	mg/L	Chm-211
pH	pH units	Chm-211
Ortho-phosphate as P	mg/L	Chm-116
Total dissolved solids	mg/L	Chm-203
Total suspended solids	mg/L	Chm-206
Specific conductivity	uS/cm	Chm-211
Sum of ions	mg/L	Calculation
Total hardness	mg/L	Calculation
Total alkalinity	mg/L	Chm-211
Silver, dissolved	mg/L	Chm-501 / Chm-522
Aluminum, dissolved	mg/L	Chm-501 / Chm-522
Arsenic, dissolved	ug/L	Chm-501 / Chm-522
Boron, dissolved	mg/L	Chm-501 / Chm-522
Barium, dissolved	mg/L	Chm-501 / Chm-522
Beryllium, dissolved	mg/L	Chm-501 / Chm-522
Bismuth, dissolved	mg/L	Chm-501 / Chm-522
Bromine	ug/L	Chm-522
Calcium	mg/L	Chm-508
Cadmium, dissolved	mg/L	Chm-501 / Chm-522
Cobalt, dissolved	mg/L	Chm-501 / Chm-522
Chromium, dissolved	mg/L	Chm-501 / Chm-522
Copper, dissolved	mg/L	Chm-501 / Chm-522
Iron, dissolved	mg/L	Chm-501 / Chm-522
Potassium	mg/L	Chm-508
Lithium, dissolved	ug/L	Chm-501 / Chm-522
Magnesium	mg/L	Chm-508
Manganese, dissolved	mg/L	Chm-501 / Chm-522

SRC Group # 2021-4265

Apr 29, 2021

Denison Mines Inc.

Name	Units	Method
Molybdenum, dissolved	mg/L	Chm-501 / Chm-522
Sodium	mg/L	Chm-508
Nickel, dissolved	mg/L	Chm-501 / Chm-522
Phosphorus, dissolved	mg/L	Chm-501 / Chm-522
Lead, dissolved	mg/L	Chm-501 / Chm-522
Sulfur	mg/L	Chm-508
Antimony, dissolved	mg/L	Chm-501 / Chm-522
Selenium, dissolved	mg/L	Chm-501 / Chm-522
Silica, soluble, dissolved	mg/L	Chm-501 / Calculation
Tin, dissolved	mg/L	Chm-501 / Chm-522
Sulfate	mg/L	Chm-508
Strontium, dissolved	mg/L	Chm-501 / Chm-522
Titanium, dissolved	mg/L	Chm-501 / Chm-522
Thallium, dissolved	mg/L	Chm-501 / Chm-522
Uranium, dissolved	ug/L	Chm-501 / Chm-522
Uranium-234 calculated	Bq/L	Chm-522
Uranium-238 calculated	Bq/L	Chm-522
Vanadium, dissolved	mg/L	Chm-501 / Chm-522
Zinc, dissolved	mg/L	Chm-501 / Chm-522
Lead-210	Bq/L	Rad-101
Polonium-210	Bq/L	Rad-103
Radium-226	Bq/L	Rad-105
Radon-222	Bq/L	Rad-116
Thorium-230	Bq/L	Rad-106

SRC Group # 2021-4672

May 05, 2021

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Jennifer Skilnick

Date Samples Received: Apr-20-2021

Client P.O.: WRE_E0221082

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 1 approved by Hamilton, Ashley
Results from Lab Section 4 approved by Smith-Windsor, Jenna
Results from Lab Section 2 approved by Britton, Stephanie

-
- * Test methods and data are validated by the laboratory's Quality Assurance Program.
 - * Routine methods follow recognized procedures from sources such as
 - * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
 - * Environment Canada
 - * US EPA
 - * CANMET
 - * The results reported relate only to the test samples as provided by the client.
 - * Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.
 - * Additional information is available upon request.
 - * Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

SRC Group # 2021-4672

May 05, 2021

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Jennifer Skilnick

Date Samples Received: Apr-20-2021

Client P.O.: WRE_E0221082

17599 04/12/2021 16:08 GWR-029 *WATER*
17600 04/14/2021 16:31 GWR-006 *WATER*
17601 04/17/2021 16:18 GWR-025 *WATER*

Analyte	Units	17599	17600	17601
Lab Section 1				
Bicarbonate	mg/L	29	35	35
Carbonate	mg/L	<1	<1	<1
Chloride	mg/L	6.1	1.4	Not Requested
Hydroxide	mg/L	<1	<1	<1
P. alkalinity	mg/L	<1	<1	<1
Chloride	mg/L	Not Requested	Not Requested	319
pH	pH units	7.36	7.32	6.96
Specific conductivity	uS/cm	68	61	1110
Sum of ions	mg/L	54	64	610
Total alkalinity	mg/L	24	29	29
Total hardness	mg/L	21	32	283
Ammonia as nitrogen	mg/L	0.05	0.17	0.14
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04	0.09	<0.04
Nitrite	mg/L	<0.03	0.05	<0.03
Nitrite+Nitrate as nitrogen	mg/L	<0.01	0.02	<0.01
Ortho-phosphate as P	mg/L	0.02	0.14	<0.01
Organic carbon, dissolved	mg/L	1.2	1.3	1.1
Iron (II)	mg/L	0.02	0.04	0.09
Fluoride	mg/L	0.10	0.14	0.21
Total dissolved solids	mg/L	82	178	653
Total suspended solids	mg/L	6	413	17
Lab Section 2				
Calcium	mg/L	5.3	5.2	84
Magnesium	mg/L	1.9	4.7	18
Potassium	mg/L	1.5	1.5	4.1
Sodium	mg/L	5.5	9.0	83
Sulfate	mg/L	4.2	7.0	67
Aluminum, dissolved	mg/L	<0.0005	0.016	<0.0005
Antimony, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Arsenic, dissolved	ug/L	<0.1	0.8	<0.1
Barium, dissolved	mg/L	0.0053	0.0095	0.11
Beryllium, dissolved	mg/L	<0.0001	<0.0001	<0.0001

SRC Group # 2021-4672

May 05, 2021

Denison Mines Inc.

17599 04/12/2021 16:08 GWR-029 *WATER*
17600 04/14/2021 16:31 GWR-006 *WATER*
17601 04/17/2021 16:18 GWR-025 *WATER*

Analyte	Units	17599	17600	17601
Lab Section 2				
Bismuth, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Boron, dissolved	mg/L	0.04	0.01	0.40
Bromine	ug/L	79	18	3600
Cadmium, dissolved	mg/L	<0.00001	<0.00001	<0.00001
Chromium, dissolved	mg/L	<0.0005	<0.0005	<0.0005
Cobalt, dissolved	mg/L	<0.0001	0.0002	<0.0001
Copper, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Iron, dissolved	mg/L	2.16	0.53	9.7
Lead, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Lithium, dissolved	ug/L	13	9.1	40
Manganese, dissolved	mg/L	0.24	0.16	1.14
Molybdenum, dissolved	mg/L	<0.0001	0.0007	0.0002
Nickel, dissolved	mg/L	<0.0001	0.0004	<0.0001
Selenium, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Silica, soluble, dissolved	mg/L	17.2	24.2	16.8
Silver, dissolved	mg/L	<0.00005	<0.00005	<0.00005
Strontium, dissolved	mg/L	0.12	0.029	2.19
Sulfur	mg/L	1.4	2.3	22
Thallium, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Tin, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Titanium, dissolved	mg/L	<0.0002	0.0003	0.0004
Uranium, dissolved	ug/L	0.2	0.2	<0.1
Vanadium, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Zinc, dissolved	mg/L	0.0016	0.0041	0.0026
Phosphorus, dissolved	mg/L	<0.01	0.02	<0.01
Uranium-234 calculated	Bq/L	0.002	0.002	0.001
Uranium-238 calculated	Bq/L	0.002	0.002	0.001

Lab Section 4

Lead-210	Bq/L	0.07	0.08	0.08
Polonium-210	Bq/L	0.34	0.22	0.18
Radium-226	Bq/L	0.09	0.06	0.29
Radon-222	Bq/L	<10	20	<4
Thorium-230	Bq/L	0.04	<0.02	0.03

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 9.2 °C upon receipt.

SRC Group # 2021-4672

May 05, 2021

Denison Mines Inc.

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved and Iron (II).

SRC Group # 2021-4672

May 05, 2021

Denison Mines Inc.

17602 04/18/2021 10:45 GWR-003 *WATER*

Analyte	Units	17602
Lab Section 1		
Bicarbonate	mg/L	17
Carbonate	mg/L	<1
Chloride	mg/L	<0.1
Hydroxide	mg/L	<1
P. alkalinity	mg/L	<1
pH	pH units	6.88
Specific conductivity	uS/cm	19
Sum of ions	mg/L	23
Total alkalinity	mg/L	14
Total hardness	mg/L	8
Ammonia as nitrogen	mg/L	<0.01
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	0.13
Nitrite	mg/L	<0.03
Nitrite+Nitrate as nitrogen	mg/L	0.03
Ortho-phosphate as P	mg/L	0.01
Organic carbon, dissolved	mg/L	0.8
Iron (II)	mg/L	<0.02
Fluoride	mg/L	0.03
Total dissolved solids	mg/L	63
Total suspended solids	mg/L	<1
Lab Section 2		
Calcium	mg/L	2.4
Magnesium	mg/L	0.5
Potassium	mg/L	0.3
Sodium	mg/L	1.7
Sulfate	mg/L	0.9
Aluminum, dissolved	mg/L	0.0055
Antimony, dissolved	mg/L	<0.0002
Arsenic, dissolved	ug/L	0.1
Barium, dissolved	mg/L	0.0056
Beryllium, dissolved	mg/L	<0.0001
Bismuth, dissolved	mg/L	<0.0002
Boron, dissolved	mg/L	<0.01
Bromine	ug/L	<5
Cadmium, dissolved	mg/L	0.00001
Chromium, dissolved	mg/L	<0.0005

SRC Group # 2021-4672

May 05, 2021

Denison Mines Inc.

17602 04/18/2021 10:45 GWR-003 *WATER*

Analyte	Units	17602
Lab Section 2		
Cobalt, dissolved	mg/L	0.0003
Copper, dissolved	mg/L	0.0007
Iron, dissolved	mg/L	0.16
Lead, dissolved	mg/L	<0.0001
Lithium, dissolved	ug/L	0.8
Manganese, dissolved	mg/L	0.073
Molybdenum, dissolved	mg/L	<0.0001
Nickel, dissolved	mg/L	0.0017
Selenium, dissolved	mg/L	<0.0001
Silica, soluble, dissolved	mg/L	17.6
Silver, dissolved	mg/L	<0.00005
Strontium, dissolved	mg/L	0.020
Sulfur	mg/L	0.3
Thallium, dissolved	mg/L	<0.0002
Tin, dissolved	mg/L	<0.0001
Titanium, dissolved	mg/L	<0.0002
Uranium, dissolved	ug/L	<0.1
Vanadium, dissolved	mg/L	<0.0001
Zinc, dissolved	mg/L	0.0090
Phosphorus, dissolved	mg/L	<0.01
Uranium-234 calculated	Bq/L	0.001
Uranium-238 calculated	Bq/L	0.001
Lab Section 4		
Lead-210	Bq/L	0.03
Polonium-210	Bq/L	0.05
Radium-226	Bq/L	0.02
Radon-222	Bq/L	18
Thorium-230	Bq/L	<0.01

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 9.2 °C upon receipt.

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved and Iron (II).

SRC Group # 2021-4672

May 05, 2021

Denison Mines Inc.

Analyte Methods

Name	Units	Method
P. alkalinity	mg/L	Chm-211
Organic carbon, dissolved	mg/L	Chm-399
Chloride	mg/L	Chm-115
Chloride	mg/L	Chm-133 / Chm-134
Carbonate	mg/L	Chm-211
Fluoride	mg/L	Chm-211
Iron (II)	mg/L	Chm-225
Bicarbonate	mg/L	Chm-211
Ammonia as nitrogen	mg/L	Chm-123
Nitrite+Nitrate as nitrogen	mg/L	Chm-124
Nitrite	mg/L	Chm-124
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	Chm-124
Hydroxide	mg/L	Chm-211
pH	pH units	Chm-211
Ortho-phosphate as P	mg/L	Chm-116
Total dissolved solids	mg/L	Chm-203
Total suspended solids	mg/L	Chm-206
Specific conductivity	uS/cm	Chm-211
Sum of ions	mg/L	Calculation
Total hardness	mg/L	Calculation
Total alkalinity	mg/L	Chm-211
Silver, dissolved	mg/L	Chm-501 / Chm-522
Aluminum, dissolved	mg/L	Chm-501 / Chm-522
Arsenic, dissolved	ug/L	Chm-501 / Chm-522
Boron, dissolved	mg/L	Chm-501 / Chm-522
Barium, dissolved	mg/L	Chm-501 / Chm-522
Beryllium, dissolved	mg/L	Chm-501 / Chm-522
Bismuth, dissolved	mg/L	Chm-501 / Chm-522
Bromine	ug/L	Chm-522
Calcium	mg/L	Chm-508
Cadmium, dissolved	mg/L	Chm-501 / Chm-522
Cobalt, dissolved	mg/L	Chm-501 / Chm-522
Chromium, dissolved	mg/L	Chm-501 / Chm-522
Copper, dissolved	mg/L	Chm-501 / Chm-522
Iron, dissolved	mg/L	Chm-501 / Chm-522
Potassium	mg/L	Chm-508
Lithium, dissolved	ug/L	Chm-501 / Chm-522
Magnesium	mg/L	Chm-508

SRC Group # 2021-4672

May 05, 2021

Denison Mines Inc.

Name	Units	Method
Manganese, dissolved	mg/L	Chm-501 / Chm-522
Molybdenum, dissolved	mg/L	Chm-501 / Chm-522
Sodium	mg/L	Chm-508
Nickel, dissolved	mg/L	Chm-501 / Chm-522
Phosphorus, dissolved	mg/L	Chm-501 / Chm-522
Lead, dissolved	mg/L	Chm-501 / Chm-522
Sulfur	mg/L	Chm-508
Antimony, dissolved	mg/L	Chm-501 / Chm-522
Selenium, dissolved	mg/L	Chm-501 / Chm-522
Silica, soluble, dissolved	mg/L	Chm-501 / Calculation
Tin, dissolved	mg/L	Chm-501 / Chm-522
Sulfate	mg/L	Chm-508
Strontium, dissolved	mg/L	Chm-501 / Chm-522
Titanium, dissolved	mg/L	Chm-501 / Chm-522
Thallium, dissolved	mg/L	Chm-501 / Chm-522
Uranium, dissolved	ug/L	Chm-501 / Chm-522
Uranium-234 calculated	Bq/L	Chm-522
Uranium-238 calculated	Bq/L	Chm-522
Vanadium, dissolved	mg/L	Chm-501 / Chm-522
Zinc, dissolved	mg/L	Chm-501 / Chm-522
Lead-210	Bq/L	Rad-101
Polonium-210	Bq/L	Rad-103
Radium-226	Bq/L	Rad-105
Radon-222	Bq/L	Rad-116
Thorium-230	Bq/L	Rad-106

SRC Group # 2021-6345

Jun 08, 2021

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Jennifer Skilnick

Date Samples Received: May-26-2021

Client P.O.: WRE_E0221082

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 1 approved by Hamilton, Ashley
Results from Lab Section 4 approved by Smith-Windsor, Jenna
Results from Lab Section 2 approved by Britton, Stephanie

-
- * Test methods and data are validated by the laboratory's Quality Assurance Program.
 - * Routine methods follow recognized procedures from sources such as
 - * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
 - * Environment Canada
 - * US EPA
 - * CANMET
 - * The results reported relate only to the test samples as provided by the client.
 - * Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.
 - * Additional information is available upon request.
 - * Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

SRC Group # 2021-6345

Jun 08, 2021

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Jennifer Skilnick

Date Samples Received: May-26-2021

Client P.O.: WRE_E0221082

23092 05/21/2021 11:27 GWR-014 *WATER*
23093 05/22/2021 10:03 GWR-005 *WATER*

Analyte	Units	23092	23093
Lab Section 1			
Bicarbonate	mg/L	76	26
Carbonate	mg/L	18	<1
Chloride	mg/L	0.4	3.3
Hydroxide	mg/L	<1	<1
P. alkalinity	mg/L	15	<1
pH	pH units	9.05	6.80
Specific conductivity	uS/cm	175	49
Sum of ions	mg/L	138	43
Total alkalinity	mg/L	92	21
Total hardness	mg/L	45	9
Ammonia as nitrogen	mg/L	1.9	0.01
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04	<0.04
Nitrite	mg/L	0.11	<0.03
Nitrite+Nitrate as nitrogen	mg/L	<0.01	<0.01
Ortho-phosphate as P	mg/L	0.06	0.02
Organic carbon, dissolved	mg/L	8.3	0.7
Iron (II)	mg/L	<0.02	0.07
Fluoride	mg/L	0.18	0.11
Total dissolved solids	mg/L	142	51
Total suspended solids	mg/L	24	20
Lab Section 2			
Calcium	mg/L	17	2.3
Magnesium	mg/L	0.7	0.8
Potassium	mg/L	4.4	1.2
Sodium	mg/L	15	6.1
Sulfate	mg/L	4.2	3.0
Aluminum, dissolved	mg/L	0.0030	<0.0005
Antimony, dissolved	mg/L	<0.0002	<0.0002
Arsenic, dissolved	ug/L	0.5	1.4
Barium, dissolved	mg/L	0.11	0.015
Beryllium, dissolved	mg/L	<0.0001	<0.0001

SRC Group # 2021-6345

Jun 08, 2021

Denison Mines Inc.

23092 05/21/2021 11:27 GWR-014 *WATER*
23093 05/22/2021 10:03 GWR-005 *WATER*

Analyte	Units	23092	23093
Lab Section 2			
Bismuth, dissolved	mg/L	<0.0002	<0.0002
Boron, dissolved	mg/L	0.02	0.03
Bromine	ug/L	7	47
Cadmium, dissolved	mg/L	<0.00001	<0.00001
Chromium, dissolved	mg/L	<0.0005	<0.0005
Cobalt, dissolved	mg/L	<0.0001	<0.0001
Copper, dissolved	mg/L	0.0009	<0.0002
Iron, dissolved	mg/L	0.064	4.84
Lead, dissolved	mg/L	<0.0001	<0.0001
Lithium, dissolved	ug/L	14	11
Manganese, dissolved	mg/L	0.0037	0.20
Molybdenum, dissolved	mg/L	0.0034	0.0007
Nickel, dissolved	mg/L	0.0015	<0.0001
Selenium, dissolved	mg/L	0.0001	<0.0001
Silica, soluble, dissolved	mg/L	16.3	20.4
Silver, dissolved	mg/L	<0.00005	<0.00005
Strontium, dissolved	mg/L	0.15	0.059
Sulfur	mg/L	1.4	1.0
Thallium, dissolved	mg/L	<0.0002	<0.0002
Tin, dissolved	mg/L	<0.0001	<0.0001
Titanium, dissolved	mg/L	<0.0002	<0.0002
Uranium, dissolved	ug/L	1.2	0.5
Vanadium, dissolved	mg/L	<0.0001	<0.0001
Zinc, dissolved	mg/L	0.0008	0.0014
Phosphorus, dissolved	mg/L	0.07	<0.01
Uranium-234 calculated	Bq/L	0.017	0.010
Uranium-238 calculated	Bq/L	0.017	0.010
Lab Section 4			
Lead-210	Bq/L	0.30	<0.02
Polonium-210	Bq/L	0.52	0.02
Radium-226	Bq/L	0.06	0.03
Radon-222	Bq/L	<6	<5
Thorium-230	Bq/L	<0.01	<0.01

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Time between sampling and receipt in lab exceeds the recommended 24 hours for Iron (II) and Organic carbon, dissolved.

SRC Group # 2021-6345

Jun 08, 2021

Denison Mines Inc.

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

The temperature of the cooler was 11.2 °C upon receipt.

SRC Group # 2021-6345

Jun 08, 2021

Denison Mines Inc.

23094 05/23/2021 13:14 GWR-012 *WATER*
23095 05/24/2021 14:23 GWR-035 *WATER*
23096 05/24/2021 16:23 GWR-034 *WATER*

Analyte	Units	23094	23095	23096
Lab Section 1				
Bicarbonate	mg/L	77	27	156
Carbonate	mg/L	<1	<1	<1
Chloride	mg/L	86	Not Requested	<1
Hydroxide	mg/L	<1	<1	<1
P. alkalinity	mg/L	<1	<1	<1
Chloride	mg/L	Not Requested	5.7	Not Requested
pH	pH units	7.24	6.79	7.63
Specific conductivity	uS/cm	416	46	480
Sum of ions	mg/L	245	44	318
Total alkalinity	mg/L	63	22	128
Total hardness	mg/L	106	12	19
Ammonia as nitrogen	mg/L	0.33	0.03	0.19
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04	0.04	0.09
Nitrite	mg/L	<0.03	<0.03	0.25
Nitrite+Nitrate as nitrogen	mg/L	<0.01	0.01	0.02
Ortho-phosphate as P	mg/L	0.04	0.01	62
Organic carbon, dissolved	mg/L	1.9	0.4	7.9
Fluoride	mg/L	0.24	0.02	0.02
Total dissolved solids	mg/L	250	45	402
Total suspended solids	mg/L	26	<1	6
Lab Section 2				
Calcium	mg/L	31	3.0	6.7
Magnesium	mg/L	6.9	1.0	0.5
Potassium	mg/L	3.7	0.7	148
Sodium	mg/L	32	3.9	3.9
Sulfate	mg/L	8.1	3.0	2.2
Aluminum, dissolved	mg/L	<0.0005	0.0058	0.20
Antimony, dissolved	mg/L	<0.0002	<0.0002	0.0007
Arsenic, dissolved	ug/L	<0.1	0.2	0.4
Barium, dissolved	mg/L	0.15	0.016	0.018
Beryllium, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Bismuth, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Boron, dissolved	mg/L	0.15	<0.01	<0.01
Bromine	ug/L	1100	79	12
Cadmium, dissolved	mg/L	<0.00001	0.00001	0.00006
Chromium, dissolved	mg/L	<0.0005	<0.0005	0.0019

SRC Group # 2021-6345

Jun 08, 2021

Denison Mines Inc.

23094 05/23/2021 13:14 GWR-012 *WATER*
23095 05/24/2021 14:23 GWR-035 *WATER*
23096 05/24/2021 16:23 GWR-034 *WATER*

Analyte	Units	23094	23095	23096
Lab Section 2				
Cobalt, dissolved	mg/L	<0.0001	0.0012	0.0003
Copper, dissolved	mg/L	<0.0002	0.0003	0.025
Iron, dissolved	mg/L	1.32	0.16	0.75
Lead, dissolved	mg/L	<0.0001	<0.0001	0.0054
Lithium, dissolved	ug/L	28	3.1	0.7
Manganese, dissolved	mg/L	0.59	0.23	0.037
Molybdenum, dissolved	mg/L	0.0007	0.0009	0.0004
Nickel, dissolved	mg/L	0.0002	0.010	0.0020
Selenium, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Silica, soluble, dissolved	mg/L	21.2	19.1	6.9
Silver, dissolved	mg/L	<0.00005	<0.00005	<0.00005
Strontium, dissolved	mg/L	0.59	0.031	0.022
Sulfur	mg/L	2.7	1.0	0.7
Thallium, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Tin, dissolved	mg/L	<0.0001	<0.0001	0.0032
Titanium, dissolved	mg/L	<0.0002	<0.0002	0.0051
Uranium, dissolved	ug/L	<0.1	<0.1	87
Vanadium, dissolved	mg/L	<0.0001	<0.0001	0.0004
Zinc, dissolved	mg/L	0.0020	0.0045	0.12
Phosphorus, dissolved	mg/L	<0.01	<0.01	61
Uranium-234 calculated	Bq/L	0.002	0.003	1.2
Uranium-238 calculated	Bq/L	0.002	0.003	1.2

Lab Section 4

Lead-210	Bq/L	0.10	<0.02	5.7
Polonium-210	Bq/L	0.26	0.03	4.4
Radium-226	Bq/L	0.12	0.04	0.90
Radon-222	Bq/L	<4	20	8
Thorium-230	Bq/L	<0.01	<0.01	0.44

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 23094

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

Note for Sample # 23095

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

SRC Group # 2021-6345

Jun 08, 2021

Denison Mines Inc.

Time between sampling and receipt in lab exceeds the recommended 24
for Organic carbon, dissolved

The temperature of the cooler was 11.2 °C upon receipt.

SRC Group # 2021-6345

Jun 08, 2021

Denison Mines Inc.

23097 05/24/2021 16:23 DUPLICATE #2 *WATER*
23098 05/25/2021 11:22 GWR-033 *WATER*
23099 05/25/2021 14:00 FIELD BLANK #2 *WATER*

Analyte	Units	23097	23098	23099
Lab Section 1				
Bicarbonate	mg/L	156	51	1
Carbonate	mg/L	<1	<1	<1
Chloride	mg/L	<1	67	Not Requested
Hydroxide	mg/L	<1	<1	<1
P. alkalinity	mg/L	<1	<1	<1
Chloride	mg/L	Not Requested	Not Requested	<0.1
pH	pH units	7.62	7.43	5.85
Specific conductivity	uS/cm	481	334	<1
Sum of ions	mg/L	316	194	1
Total alkalinity	mg/L	128	42	1
Total hardness	mg/L	19	73	<1
Ammonia as nitrogen	mg/L	0.18	0.27	<0.01
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	0.09	<0.04	0.09
Nitrite	mg/L	0.25	<0.03	<0.03
Nitrite+Nitrate as nitrogen	mg/L	0.02	<0.01	0.02
Ortho-phosphate as P	mg/L	52	0.01	0.01
Organic carbon, dissolved	mg/L	8.2	2.0	0.3
Fluoride	mg/L	0.02	0.12	<0.01
Total dissolved solids	mg/L	452	209	<5
Total suspended solids	mg/L	5	8	<1
Lab Section 2				
Calcium	mg/L	6.8	23	<0.1
Magnesium	mg/L	0.5	3.8	<0.1
Potassium	mg/L	147	2.1	<0.1
Sodium	mg/L	3.9	30	<0.1
Sulfate	mg/L	2.0	17	<0.2
Aluminum, dissolved	mg/L	0.21	0.0013	<0.0005
Antimony, dissolved	mg/L	0.0007	<0.0002	<0.0002
Arsenic, dissolved	ug/L	0.4	1.8	<0.1
Barium, dissolved	mg/L	0.018	0.059	<0.0005
Beryllium, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Bismuth, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Boron, dissolved	mg/L	<0.01	0.05	<0.01
Bromine	ug/L	14	860	<5
Cadmium, dissolved	mg/L	0.00005	<0.00001	<0.00001
Chromium, dissolved	mg/L	0.0019	<0.0005	<0.0005

SRC Group # 2021-6345

Jun 08, 2021

Denison Mines Inc.

23097 05/24/2021 16:23 DUPLICATE #2 *WATER*
23098 05/25/2021 11:22 GWR-033 *WATER*
23099 05/25/2021 14:00 FIELD BLANK #2 *WATER*

Analyte	Units	23097	23098	23099
Lab Section 2				
Cobalt, dissolved	mg/L	0.0003	0.0005	<0.0001
Copper, dissolved	mg/L	0.025	<0.0002	<0.0002
Iron, dissolved	mg/L	0.74	0.66	<0.0005
Lead, dissolved	mg/L	0.0054	<0.0001	<0.0001
Lithium, dissolved	ug/L	0.7	15	<0.1
Manganese, dissolved	mg/L	0.038	0.27	<0.0005
Molybdenum, dissolved	mg/L	0.0003	0.0026	<0.0001
Nickel, dissolved	mg/L	0.0022	0.0008	<0.0001
Selenium, dissolved	mg/L	<0.0001	<0.0001	<0.0001
Silica, soluble, dissolved	mg/L	6.9	12.2	<0.02
Silver, dissolved	mg/L	<0.00005	<0.00005	<0.00005
Strontium, dissolved	mg/L	0.022	0.36	<0.0005
Sulfur	mg/L	0.7	5.7	<0.05
Thallium, dissolved	mg/L	<0.0002	<0.0002	<0.0002
Tin, dissolved	mg/L	0.0033	<0.0001	<0.0001
Titanium, dissolved	mg/L	0.0045	<0.0002	<0.0002
Uranium, dissolved	ug/L	88	0.8	<0.1
Vanadium, dissolved	mg/L	0.0004	<0.0001	<0.0001
Zinc, dissolved	mg/L	0.12	0.0040	<0.0005
Phosphorus, dissolved	mg/L	60	0.01	<0.01
Uranium-234 calculated	Bq/L	1.2	0.011	<0.001
Uranium-238 calculated	Bq/L	1.2	0.011	<0.001

Lab Section 4

Lead-210	Bq/L	6.3	0.04	<0.02
Polonium-210	Bq/L	4.6	0.12	<0.005
Radium-226	Bq/L	0.86	0.13	<0.005
Radon-222	Bq/L	9	<3	<3
Thorium-230	Bq/L	0.43	<0.01	<0.01

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Time between sampling and receipt in lab exceeds the recommended 24 for Organic carbon, dissolved

The temperature of the cooler was 11.2 °C upon receipt.

SRC Group # 2021-6345

Jun 08, 2021

Denison Mines Inc.

Analyte Methods

Name	Units	Method
P. alkalinity	mg/L	Chm-211
Organic carbon, dissolved	mg/L	Chm-399
Chloride	mg/L	Chm-115
Chloride	mg/L	Chm-133 / Chm-134
Carbonate	mg/L	Chm-211
Fluoride	mg/L	Chm-211
Iron (II)	mg/L	Chm-225
Bicarbonate	mg/L	Chm-211
Ammonia as nitrogen	mg/L	Chm-123
Nitrite+Nitrate as nitrogen	mg/L	Chm-124
Nitrite	mg/L	Chm-124
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	Chm-124
Hydroxide	mg/L	Chm-211
pH	pH units	Chm-211
Ortho-phosphate as P	mg/L	Chm-116
Total dissolved solids	mg/L	Chm-203
Total suspended solids	mg/L	Chm-206
Specific conductivity	uS/cm	Chm-211
Sum of ions	mg/L	Calculation
Total hardness	mg/L	Calculation
Total alkalinity	mg/L	Chm-211
Silver, dissolved	mg/L	Chm-501 / Chm-522
Aluminum, dissolved	mg/L	Chm-501 / Chm-522
Arsenic, dissolved	ug/L	Chm-501 / Chm-522
Boron, dissolved	mg/L	Chm-501 / Chm-522
Barium, dissolved	mg/L	Chm-501 / Chm-522
Beryllium, dissolved	mg/L	Chm-501 / Chm-522
Bismuth, dissolved	mg/L	Chm-501 / Chm-522
Bromine	ug/L	Chm-522
Calcium	mg/L	Chm-508
Cadmium, dissolved	mg/L	Chm-501 / Chm-522
Cobalt, dissolved	mg/L	Chm-501 / Chm-522
Chromium, dissolved	mg/L	Chm-501 / Chm-522
Copper, dissolved	mg/L	Chm-501 / Chm-522
Iron, dissolved	mg/L	Chm-501 / Chm-522
Potassium	mg/L	Chm-508
Lithium, dissolved	ug/L	Chm-501 / Chm-522
Magnesium	mg/L	Chm-508

SRC Group # 2021-6345

Jun 08, 2021

Denison Mines Inc.

Name	Units	Method
Manganese, dissolved	mg/L	Chm-501 / Chm-522
Molybdenum, dissolved	mg/L	Chm-501 / Chm-522
Sodium	mg/L	Chm-508
Nickel, dissolved	mg/L	Chm-501 / Chm-522
Phosphorus, dissolved	mg/L	Chm-501 / Chm-522
Lead, dissolved	mg/L	Chm-501 / Chm-522
Sulfur	mg/L	Chm-508
Antimony, dissolved	mg/L	Chm-501 / Chm-522
Selenium, dissolved	mg/L	Chm-501 / Chm-522
Silica, soluble, dissolved	mg/L	Chm-501 / Calculation
Tin, dissolved	mg/L	Chm-501 / Chm-522
Sulfate	mg/L	Chm-508
Strontium, dissolved	mg/L	Chm-501 / Chm-522
Titanium, dissolved	mg/L	Chm-501 / Chm-522
Thallium, dissolved	mg/L	Chm-501 / Chm-522
Uranium, dissolved	ug/L	Chm-501 / Chm-522
Uranium-234 calculated	Bq/L	Chm-522
Uranium-238 calculated	Bq/L	Chm-522
Vanadium, dissolved	mg/L	Chm-501 / Chm-522
Zinc, dissolved	mg/L	Chm-501 / Chm-522
Lead-210	Bq/L	Rad-101
Polonium-210	Bq/L	Rad-103
Radium-226	Bq/L	Rad-105
Radon-222	Bq/L	Rad-116
Thorium-230	Bq/L	Rad-106

SRC Group # 2021-6894

Jul 23, 2021

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Jennifer Skilnick

Date Samples Received: Jun-07-2021

Client P.O.: WRE_E0221082

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 1 approved by Hamilton, Ashley
Results from Lab Section 4 approved by Smith-Windsor, Jenna
Results from Lab Section 2 approved by Britton, Stephanie

-
- * Test methods and data are validated by the laboratory's Quality Assurance Program.
 - * Routine methods follow recognized procedures from sources such as
 - * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
 - * Environment Canada
 - * US EPA
 - * CANMET
 - * The results reported relate only to the test samples as provided by the client.
 - * Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.
 - * Additional information is available upon request.
 - * Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

SRC Group # 2021-6894

Jul 23, 2021

Denison Mines Inc.

200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Jennifer Skilnick

Date Samples Received: Jun-07-2021

Client P.O.: WRE_E0221082

25066 06/01/2021 17:47 GWR-011 *WATER*
25067 06/02/2021 11:43 GWR-013 *WATER*

Analyte	Units	25066	25067
Lab Section 1			
Bicarbonate	mg/L	41	85
Carbonate	mg/L	<1	<1
Chloride	mg/L	7.2	1.3
Hydroxide	mg/L	<1	<1
P. alkalinity	mg/L	<1	<1
pH	pH units	7.34	7.76
Specific conductivity	uS/cm	99	141
Sum of ions	mg/L	71	126
Total alkalinity	mg/L	34	70
Total hardness	mg/L	26	48
Ammonia as nitrogen	mg/L	0.13	0.02
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04	0.13
Nitrite	mg/L	<0.03	<0.03
Nitrite+Nitrate as nitrogen	mg/L	<0.01	0.03
Ortho-phosphate as P	mg/L	0.12	0.06
Organic carbon, dissolved	mg/L	1.0	2.0
Fluoride	mg/L	0.18	0.08
Total dissolved solids	mg/L	98	177
Total suspended solids	mg/L	34	208
Lab Section 2			
Calcium	mg/L	7.9	14
Magnesium	mg/L	1.6	3.1
Potassium	mg/L	2.0	1.8
Sodium	mg/L	6.1	15
Sulfate	mg/L	4.7	5.2
Aluminum, dissolved	mg/L	0.052	0.011
Antimony, dissolved	mg/L	<0.0002	<0.0002
Arsenic, dissolved	ug/L	1.3	0.9
Barium, dissolved	mg/L	0.054	0.11
Beryllium, dissolved	mg/L	<0.0001	<0.0001
Bismuth, dissolved	mg/L	<0.0002	<0.0002

SRC Group # 2021-6894

Jul 23, 2021

Denison Mines Inc.

25066 06/01/2021 17:47 GWR-011 *WATER*
25067 06/02/2021 11:43 GWR-013 *WATER*

Analyte	Units	25066	25067
Lab Section 2			
Boron, dissolved	mg/L	0.04	<0.01
Bromine	ug/L	100	<5
Cadmium, dissolved	mg/L	<0.00001	<0.00001
Chromium, dissolved	mg/L	<0.0005	<0.0005
Cobalt, dissolved	mg/L	<0.0001	0.0001
Copper, dissolved	mg/L	0.0018	0.0008
Iron, dissolved	mg/L	0.86	0.014
Lead, dissolved	mg/L	0.0001	<0.0001
Lithium, dissolved	ug/L	13	6.2
Manganese, dissolved	mg/L	0.36	0.22
Molybdenum, dissolved	mg/L	0.0042	0.0054
Nickel, dissolved	mg/L	0.0001	0.0018
Selenium, dissolved	mg/L	<0.0001	<0.0001
Silica, soluble, dissolved	mg/L	24.1	22.7
Silver, dissolved	mg/L	<0.00005	<0.00005
Strontium, dissolved	mg/L	0.12	0.080
Sulfur	mg/L	1.6	1.7
Thallium, dissolved	mg/L	<0.0002	<0.0002
Tin, dissolved	mg/L	<0.0001	<0.0001
Titanium, dissolved	mg/L	<0.0002	<0.0002
Uranium, dissolved	ug/L	0.7	55
Vanadium, dissolved	mg/L	<0.0001	<0.0001
Zinc, dissolved	mg/L	0.012	0.0016
Phosphorus, dissolved	mg/L	0.01	0.01
Uranium-234 calculated	Bq/L	0.008	10.5
Uranium-238 calculated	Bq/L	0.008	10.5
Lab Section 4			
Lead-210	Bq/L	0.3	8
Polonium-210	Bq/L	0.3	13
Radium-226	Bq/L	0.5	17
Radon-222	Bq/L	<8	41
Thorium-230	Bq/L	<0.1	4.7

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 9.9 °C upon receipt.

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

SRC Group # 2021-6894

Jul 23, 2021

Denison Mines Inc.

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

SRC Group # 2021-6894

Jul 23, 2021

Denison Mines Inc.

25068 06/03/2021 08:23 GWR-031 *WATER*
25069 06/04/2021 19:53 GWR-032 *WATER*

Analyte	Units	25068	25069
Lab Section 1			
Bicarbonate	mg/L	160	118
Carbonate	mg/L	<1	<1
Chloride	mg/L	145	220
Hydroxide	mg/L	<1	<1
P. alkalinity	mg/L	<1	<1
pH	pH units	7.83	7.40
Specific conductivity	uS/cm	686	860
Sum of ions	mg/L	439	504
Total alkalinity	mg/L	131	97
Total hardness	mg/L	148	182
Ammonia as nitrogen	mg/L	0.35	0.73
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04	<0.04
Nitrite	mg/L	<0.03	<0.03
Nitrite+Nitrate as nitrogen	mg/L	<0.01	<0.01
Ortho-phosphate as P	mg/L	0.01	0.01
Organic carbon, dissolved	mg/L	6.2	5.8
Iron (II)	mg/L	<0.02	0.04
Fluoride	mg/L	0.42	0.23
Total dissolved solids	mg/L	393	599
Total suspended solids	mg/L	41	17
Lab Section 2			
Calcium	mg/L	43	55
Magnesium	mg/L	9.9	11
Potassium	mg/L	5.3	4.6
Sodium	mg/L	69	81
Sulfate	mg/L	6.6	13
Aluminum, dissolved	mg/L	<0.0005	0.0006
Antimony, dissolved	mg/L	0.0003	<0.0002
Arsenic, dissolved	ug/L	1.2	0.2
Barium, dissolved	mg/L	0.035	0.063
Beryllium, dissolved	mg/L	<0.0001	<0.0001
Bismuth, dissolved	mg/L	<0.0002	<0.0002
Boron, dissolved	mg/L	0.55	0.43
Bromine	ug/L	1500	2000
Cadmium, dissolved	mg/L	<0.00001	<0.00001
Chromium, dissolved	mg/L	0.0008	<0.0005

Denison Mines Inc.

25068 06/03/2021 08:23 GWR-031 *WATER*
25069 06/04/2021 19:53 GWR-032 *WATER*

Analyte	Units	25068	25069
Lab Section 2			
Cobalt, dissolved	mg/L	0.0002	<0.0001
Copper, dissolved	mg/L	<0.0002	<0.0002
Iron, dissolved	mg/L	0.090	4.20
Lead, dissolved	mg/L	<0.0001	<0.0001
Lithium, dissolved	ug/L	90	65
Manganese, dissolved	mg/L	0.13	0.22
Molybdenum, dissolved	mg/L	0.012	0.0038
Nickel, dissolved	mg/L	0.0019	0.0010
Selenium, dissolved	mg/L	<0.0001	<0.0001
Silica, soluble, dissolved	mg/L	9.1	13.3
Silver, dissolved	mg/L	<0.00005	<0.00005
Strontium, dissolved	mg/L	1.17	1.66
Sulfur	mg/L	2.2	4.3
Thallium, dissolved	mg/L	<0.0002	<0.0002
Tin, dissolved	mg/L	<0.0001	<0.0001
Titanium, dissolved	mg/L	<0.0002	<0.0002
Uranium, dissolved	ug/L	50	11
Vanadium, dissolved	mg/L	<0.0001	<0.0001
Zinc, dissolved	mg/L	0.69	2.62
Phosphorus, dissolved	mg/L	<0.01	<0.01
Uranium-234 calculated	Bq/L	10.7	1.69
Uranium-238 calculated	Bq/L	10.7	1.69

Lab Section 4

Polonium-210	Bq/L	650	110
Radium-226	Bq/L	76	180
Radon-222	Bq/L	12000000	3800000
Thorium-230	Bq/L	30	7
Lead-210	Bq/L	7300	2200

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 25068

Time between sampling and receipt in lab exceeds the recommended 24 hours for Iron (II).

Air was bubbled through the sample before the gamma spectroscopy analysis to reduce the interferences caused by high activity of Radon.

Analysis of radon exceeded the recommended 8 days as the radon had to decay to a level in our calibration range before analysis.

SRC Group # 2021-6894

Jul 23, 2021

Denison Mines Inc.

Note for Sample # 25069

Time between sampling and receipt in lab exceeds the recommended 24 hours for Iron (II).

Air was bubbled through the sample before the gamma spectroscopy analysis to reduce the interferences caused by high activity of Radon.

Analysis of radon exceeded the recommended 8 days as the radon had to decay to a level in our calibration range before analysis.

The temperature of the cooler was 9.9 °C upon receipt.

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

SRC Group # 2021-6894

Jul 23, 2021

Denison Mines Inc.

Analyte Methods

Name	Units	Method
P. alkalinity	mg/L	Chm-211
Organic carbon, dissolved	mg/L	Chm-399
Chloride	mg/L	Chm-115
Chloride	mg/L	Chm-133 / Chm-134
Carbonate	mg/L	Chm-211
Fluoride	mg/L	Chm-211
Iron (II)	mg/L	Chm-225
Bicarbonate	mg/L	Chm-211
Ammonia as nitrogen	mg/L	Chm-123
Nitrite+Nitrate as nitrogen	mg/L	Chm-124
Nitrite	mg/L	Chm-124
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	Chm-124
Hydroxide	mg/L	Chm-211
pH	pH units	Chm-211
Ortho-phosphate as P	mg/L	Chm-116
Total dissolved solids	mg/L	Chm-203
Total suspended solids	mg/L	Chm-206
Specific conductivity	uS/cm	Chm-211
Sum of ions	mg/L	Calculation
Total hardness	mg/L	Calculation
Total alkalinity	mg/L	Chm-211
Silver, dissolved	mg/L	Chm-501 / Chm-522
Aluminum, dissolved	mg/L	Chm-501 / Chm-522
Arsenic, dissolved	ug/L	Chm-501 / Chm-522
Boron, dissolved	mg/L	Chm-501 / Chm-522
Barium, dissolved	mg/L	Chm-501 / Chm-522
Beryllium, dissolved	mg/L	Chm-501 / Chm-522
Bismuth, dissolved	mg/L	Chm-501 / Chm-522
Bromine	ug/L	Chm-522
Calcium	mg/L	Chm-508
Cadmium, dissolved	mg/L	Chm-501 / Chm-522
Cobalt, dissolved	mg/L	Chm-501 / Chm-522
Chromium, dissolved	mg/L	Chm-501 / Chm-522
Copper, dissolved	mg/L	Chm-501 / Chm-522
Iron, dissolved	mg/L	Chm-501 / Chm-522
Potassium	mg/L	Chm-508
Lithium, dissolved	ug/L	Chm-501 / Chm-522
Magnesium	mg/L	Chm-508

SRC Group # 2021-6894

Jul 23, 2021

Denison Mines Inc.

Name	Units	Method
Manganese, dissolved	mg/L	Chm-501 / Chm-522
Molybdenum, dissolved	mg/L	Chm-501 / Chm-522
Sodium	mg/L	Chm-508
Nickel, dissolved	mg/L	Chm-501 / Chm-522
Phosphorus, dissolved	mg/L	Chm-501 / Chm-522
Lead, dissolved	mg/L	Chm-501 / Chm-522
Sulfur	mg/L	Chm-508
Antimony, dissolved	mg/L	Chm-501 / Chm-522
Selenium, dissolved	mg/L	Chm-501 / Chm-522
Silica, soluble, dissolved	mg/L	Chm-501 / Calculation
Tin, dissolved	mg/L	Chm-501 / Chm-522
Sulfate	mg/L	Chm-508
Strontium, dissolved	mg/L	Chm-501 / Chm-522
Titanium, dissolved	mg/L	Chm-501 / Chm-522
Thallium, dissolved	mg/L	Chm-501 / Chm-522
Uranium, dissolved	ug/L	Chm-501 / Chm-522
Uranium-234 calculated	Bq/L	Chm-522
Uranium-238 calculated	Bq/L	Chm-522
Vanadium, dissolved	mg/L	Chm-501 / Chm-522
Zinc, dissolved	mg/L	Chm-501 / Chm-522
Lead-210	Bq/L	Rad-300
Lead-210	Bq/L	Rad-101
Polonium-210	Bq/L	Rad-103
Radium-226	Bq/L	Rad-105
Radon-222	Bq/L	Rad-116
Thorium-230	Bq/L	Rad-106

SRC Group # 2021-7066

Jun 18, 2021

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Jennifer Skilnick

Date Samples Received: Jun-09-2021

Client P.O.: WRE_E0221082

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 4 approved by Smith-Windsor, Jenna

- * Test methods and data are validated by the laboratory's Quality Assurance Program.
- * Routine methods follow recognized procedures from sources such as
 - * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
 - * Environment Canada
 - * US EPA
 - * CANMET
- * The results reported relate only to the test samples as provided by the client.
- * Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.
- * Additional information is available upon request.
- * Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

SRC Group # 2021-7066

Jun 18, 2021

Denison Mines Inc.
 200-230 22nd Street East
 Saskatoon, SK S7K 0E9
 Attn: Jennifer Skilnick

Date Samples Received: Jun-09-2021

Client P.O.: WRE_E0221082

25735 06/04/2021 08:30 GWR-031 *WATER*
 25736 06/04/2021 19:30 GWR-032 *WATER*

Analyte	Units	25735	25736
Lab Section 4			
Tritium	Bq/L	910	1800

SRC Group # 2021-7066

Jun 18, 2021

Denison Mines Inc.

Analyte Methods

Name	Units	Method
Tritium	Bq/L	Rad-122

RUSH

SRC Group # 2021-11729

Sep 10, 2021

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Sep-08-2021

Client P.O.: WRE_T0421210

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 1 approved by Gipman, Keith
Results from Lab Section 2 approved by Britton, Stephanie

-
- * Test methods and data are validated by the laboratory's Quality Assurance Program.
 - * Routine methods follow recognized procedures from sources such as
 - * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
 - * Environment Canada
 - * US EPA
 - * CANMET
 - * The results reported relate only to the test samples as provided by the client.
 - * Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.
 - * Additional information is available upon request.
 - * Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

RUSH

SRC Group # 2021-11729

Sep 10, 2021

Denison Mines Inc.

200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

IR-205: The 'Tracer Tank' label refers to the predetermined KCl tracer concentration of 15% (75,000 to 85,000 ppm Cl and K) utilized for injection as part of the 2021 Tracer Test. This sample is not discussed further in the Wheeler River Project Baseline Geology and Hydrogeology report.

Date Samples Received: Sep-08-2021

Client P.O.: WRE_T0421210

44624 09/02/2021 14:00 TRACER TANK *WATER*
44625 09/04/2021 14:00 GWR-038 *WATER*
44626 09/05/2021 14:00 GWR-039 *WATER*

Analyte	Units	44624	44625	44626
Lab Section 1				
Bicarbonate	mg/L	12	104	40
Carbonate	mg/L	<1	<1	<1
Chloride	mg/L	3180	1600	4760
Hydroxide	mg/L	<1	<1	<1
P. alkalinity	mg/L	<1	<1	<1
pH	pH units	6.94	7.56	6.49
Specific conductivity	uS/cm	11120	5380	16100
Sum of ions	mg/L	6370	3130	9220
Total alkalinity	mg/L	10	85	33
Total hardness	mg/L	46	614	2470
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	0.04	0.04	<0.04
Nitrite+Nitrate as nitrogen	mg/L	0.01	0.01	<0.01
Fluoride	mg/L	0.02	0.27	0.14
Total dissolved solids	mg/L	6220	3280	10400
Lab Section 2				
Calcium	mg/L	17	190	843
Magnesium	mg/L	1.0	34	90
Potassium	mg/L	3120	955	3000
Sodium	mg/L	31	137	189
Sulfate	mg/L	11	110	300

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.3 °C upon receipt.

RUSH

SRC Group # 2021-11729

Sep 10, 2021

Denison Mines Inc.

44627 09/01/2021 14:00 GWR-040 *WATER*
44628 09/06/2021 14:00 GWR-041 *WATER*
44629 09/07/2021 14:00 GWR-042 *WATER*

Analyte	Units	44627	44628	44629
Lab Section 1				
Bicarbonate	mg/L	76	80	61
Carbonate	mg/L	<1	<1	<1
Chloride	mg/L	2560	2270	3590
Hydroxide	mg/L	<1	<1	<1
P. alkalinity	mg/L	<1	<1	<1
pH	pH units	6.98	6.91	6.51
Specific conductivity	uS/cm	7530	7050	11530
Sum of ions	mg/L	4360	4130	6760
Total alkalinity	mg/L	62	66	50
Total hardness	mg/L	1830	1340	1900
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04	<0.04	<0.04
Nitrite+Nitrate as nitrogen	mg/L	<0.01	<0.01	<0.01
Fluoride	mg/L	0.21	0.21	0.18
Total dissolved solids	mg/L	4640	4510	7830
Lab Section 2				
Calcium	mg/L	590	431	665
Magnesium	mg/L	88	64	58
Potassium	mg/L	767	975	2000
Sodium	mg/L	203	154	152
Sulfate	mg/L	71	160	230

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.3 °C upon receipt.

RUSH

SRC Group # 2021-11729

Sep 10, 2021

Denison Mines Inc.

Analyte Methods

Name	Units	Method
P. alkalinity	mg/L	Chm-211
Chloride	mg/L	Chm-115
Carbonate	mg/L	Chm-211
Fluoride	mg/L	Chm-211
Bicarbonate	mg/L	Chm-211
Nitrite+Nitrate as nitrogen	mg/L	Chm-124
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	Chm-124
Hydroxide	mg/L	Chm-211
pH	pH units	Chm-211
Total dissolved solids	mg/L	Chm-203
Specific conductivity	uS/cm	Chm-211
Sum of ions	mg/L	Calculation
Total hardness	mg/L	Calculation
Total alkalinity	mg/L	Chm-211
Calcium	mg/L	Chm-508
Potassium	mg/L	Chm-508
Magnesium	mg/L	Chm-508
Sodium	mg/L	Chm-508
Sulfate	mg/L	Chm-508

SRC Group # 2021-11730

Nov 02, 2021

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Sep-08-2021

Client P.O.: WRE_T0421210

These results are preliminary and are subject to revision.

The final authorized report will be provided when all tests have been completed.

Preliminary

SRC Group # 2021-11730

Nov 02, 2021

Denison Mines Inc.
 200-230 22nd Street East
 Saskatoon, SK S7K 0E9
 Attn: Mikkel Tetland

Date Samples Received: Sep-08-2021

Client P.O.: WRE_T0421210

44633 09/02/2021 14:00 TRACER TANK *WATER*
 44634 09/04/2021 14:00 GWR-038 *WATER*
 44635 09/07/2021 14:00 GWR-042 *WATER*

Analyte	Units	44633	44634	44635
Lab Section 2				
Uranium, dissolved	ug/L	26	504	564

The temperature of the cooler was 16.3 °C upon receipt.

This is a preliminary report. Results are subject to revision. The final authorized report will be provided when all tests have been completed.

Preliminary

SRC Group # 2021-11730

Nov 02, 2021

Denison Mines Inc.

44636 09/05/2021 14:00 GWR-039 *WATER*
44637 09/06/2021 14:00 GWR-041 *WATER*

Analyte	Units	44636	44637
Lab Section 1			
Ammonia as nitrogen	mg/L	44	18
Nitrite	mg/L	<0.03	0.04
Ortho-phosphate as P	mg/L	0.04	0.02
Organic carbon, dissolved	mg/L	40	21
Iron (II)	mg/L	0.07	0.05
Total suspended solids	mg/L	68	31
Lab Section 2			
Aluminum, dissolved	mg/L	0.005	0.010
Antimony, dissolved	mg/L	<0.002	<0.002
Arsenic, dissolved	ug/L	<1	<1
Barium, dissolved	mg/L	0.96	0.35
Beryllium, dissolved	mg/L	<0.001	<0.001
Bismuth, dissolved	mg/L	<0.002	<0.002
Boron, dissolved	mg/L	0.4	0.5
Bromine	ug/L	15800	6800
Cadmium, dissolved	mg/L	<0.0001	<0.0001
Chromium, dissolved	mg/L	<0.005	<0.005
Cobalt, dissolved	mg/L	0.003	0.002
Copper, dissolved	mg/L	<0.002	<0.002
Iron, dissolved	mg/L	23.0	18.2
Lead, dissolved	mg/L	<0.001	<0.001
Lithium, dissolved	ug/L	470	210
Manganese, dissolved	mg/L	1.8	0.87
Molybdenum, dissolved	mg/L	0.008	0.045
Nickel, dissolved	mg/L	0.056	0.024
Selenium, dissolved	mg/L	0.003	0.002
Silica, soluble, dissolved	mg/L	55.7	70.2
Silver, dissolved	mg/L	<0.0005	<0.0005
Strontium, dissolved	mg/L	23.5	11.2
Sulfur	mg/L	100	53.3
Thallium, dissolved	mg/L	<0.002	<0.002
Tin, dissolved	mg/L	<0.001	<0.001
Titanium, dissolved	mg/L	<0.002	<0.002
Uranium, dissolved	ug/L	38	10
Vanadium, dissolved	mg/L	<0.001	<0.001
Zinc, dissolved	mg/L	0.090	0.065

Preliminary

SRC Group # 2021-11730

Nov 02, 2021

Denison Mines Inc.

44636 09/05/2021 14:00 GWR-039 *WATER*
44637 09/06/2021 14:00 GWR-041 *WATER*

Analyte	Units	44636	44637
Lab Section 2			
Phosphorus, dissolved	mg/L	<0.1	<0.1
Uranium-234 calculated	Bq/L	15.9	1.0
Uranium-238 calculated	Bq/L	15.9	1.0
Lab Section 4			
Polonium-210	Bq/L	460	420
Radon-222	Bq/L	6000000	4000000
Thorium-230	Bq/L	21	6
Tritium	Bq/L	RTR	RTR
Radium-226	Bq/L	6200	10000
Lead-210	Bq/L	2700	2300

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 44636

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved and Iron (II).

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

Radon results are corrected for decay to the time of sample collection.

Air was bubbled through the sample before the gamma spectroscopy analysis to reduce the interferences caused by high activity of Radon.

Analysis of radon exceeded the recommended 8 days as the radon had to decay to a level in our calibration range before analysis.

Note for Sample # 44637

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved and Iron (II).

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

Radon results are corrected for decay to the time of sample collection.

Air was bubbled through the sample before the gamma spectroscopy analysis to reduce the interferences caused by high activity of Radon.

Analysis of radon exceeded the recommended 8 days as the radon had to decay to a level in our calibration range before analysis.

The temperature of the cooler was 16.3 °C upon receipt.

This is a preliminary report. Results are subject to revision. The final authorized report will be provided when all tests have been completed.

Preliminary

SRC Group # 2021-11730

Nov 02, 2021

Denison Mines Inc.

44638 09/01/2021 14:00 GWR-040 *WATER*

Analyte	Units	44638
Lab Section 1		
Ammonia as nitrogen	mg/L	12
Nitrite	mg/L	<0.03
Ortho-phosphate as P	mg/L	0.02
Organic carbon, dissolved	mg/L	19
Total suspended solids	mg/L	28
Lab Section 2		
Aluminum, dissolved	mg/L	<0.005
Antimony, dissolved	mg/L	<0.002
Arsenic, dissolved	ug/L	<1
Barium, dissolved	mg/L	0.52
Beryllium, dissolved	mg/L	<0.001
Bismuth, dissolved	mg/L	<0.002
Boron, dissolved	mg/L	0.5
Bromine	ug/L	9800
Cadmium, dissolved	mg/L	<0.0001
Chromium, dissolved	mg/L	<0.005
Cobalt, dissolved	mg/L	0.001
Copper, dissolved	mg/L	<0.002
Iron, dissolved	mg/L	8.2
Lead, dissolved	mg/L	<0.001
Lithium, dissolved	ug/L	250
Manganese, dissolved	mg/L	0.85
Molybdenum, dissolved	mg/L	0.011
Nickel, dissolved	mg/L	0.019
Selenium, dissolved	mg/L	0.002
Silica, soluble, dissolved	mg/L	50.5
Silver, dissolved	mg/L	<0.0005
Strontium, dissolved	mg/L	16.1
Sulfur	mg/L	24
Thallium, dissolved	mg/L	<0.002
Tin, dissolved	mg/L	<0.001
Titanium, dissolved	mg/L	<0.002
Uranium, dissolved	ug/L	10
Vanadium, dissolved	mg/L	<0.001
Zinc, dissolved	mg/L	0.010
Phosphorus, dissolved	mg/L	<0.1

Preliminary

SRC Group # 2021-11730

Nov 02, 2021

Denison Mines Inc.

44638 09/01/2021 14:00 GWR-040 *WATER*

Analyte	Units	44638
Lab Section 2		
Uranium-234 calculated	Bq/L	0.24
Uranium-238 calculated	Bq/L	0.24
Lab Section 4		
Polonium-210	Bq/L	700
Radon-222	Bq/L	6000000
Thorium-230	Bq/L	6
Tritium	Bq/L	<15
Radium-226	Bq/L	1500
Lead-210	Bq/L	5000

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 44638

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

Radon results are corrected for decay to the time of sample collection.

Air was bubbled through the sample before the gamma spectroscopy analysis to reduce the interferences caused by high activity of Radon.

Analysis of radon exceeded the recommended 8 days as the radon had to decay to a level in our calibration range before analysis.

The temperature of the cooler was 16.3 °C upon receipt.

This is a preliminary report. Results are subject to revision. The final authorized report will be provided when all tests have been completed.

Preliminary

SRC Group # 2021-11730

Nov 02, 2021

Denison Mines Inc.

44639 09/01/2021 14:00 GWR-040 DUPLICATE *WATER*

Analyte	Units	44639
Lab Section 1		
Bicarbonate	mg/L	76
Carbonate	mg/L	<1
Chloride	mg/L	2580
Hydroxide	mg/L	<1
P. alkalinity	mg/L	<1
pH	pH units	7.39
Specific conductivity	uS/cm	7530
Sum of ions	mg/L	4350
Total alkalinity	mg/L	62
Total hardness	mg/L	1830
Ammonia as nitrogen	mg/L	12
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	<0.04
Nitrite	mg/L	<0.03
Nitrite+Nitrate as nitrogen	mg/L	<0.01
Ortho-phosphate as P	mg/L	<0.01
Organic carbon, dissolved	mg/L	19
Fluoride	mg/L	0.21
Total dissolved solids	mg/L	4080
Total suspended solids	mg/L	26
Lab Section 2		
Calcium	mg/L	590
Magnesium	mg/L	88
Potassium	mg/L	732
Sodium	mg/L	205
Sulfate	mg/L	67
Aluminum, dissolved	mg/L	<0.005
Antimony, dissolved	mg/L	<0.002
Arsenic, dissolved	ug/L	<1
Barium, dissolved	mg/L	0.52
Beryllium, dissolved	mg/L	<0.001
Bismuth, dissolved	mg/L	<0.002
Boron, dissolved	mg/L	0.5
Bromine	ug/L	9800
Cadmium, dissolved	mg/L	<0.0001
Chromium, dissolved	mg/L	<0.005
Cobalt, dissolved	mg/L	0.001

Preliminary

SRC Group # 2021-11730

Nov 02, 2021

Denison Mines Inc.

44639 09/01/2021 14:00 GWR-040 DUPLICATE *WATER*

Analyte	Units	44639
Lab Section 2		
Copper, dissolved	mg/L	<0.002
Iron, dissolved	mg/L	7.7
Lead, dissolved	mg/L	<0.001
Lithium, dissolved	ug/L	250
Manganese, dissolved	mg/L	0.83
Molybdenum, dissolved	mg/L	0.011
Nickel, dissolved	mg/L	0.020
Selenium, dissolved	mg/L	0.002
Silica, soluble, dissolved	mg/L	51.2
Silver, dissolved	mg/L	<0.0005
Strontium, dissolved	mg/L	16.1
Sulfur	mg/L	22
Thallium, dissolved	mg/L	<0.002
Tin, dissolved	mg/L	<0.001
Titanium, dissolved	mg/L	<0.002
Uranium, dissolved	ug/L	10
Vanadium, dissolved	mg/L	<0.001
Zinc, dissolved	mg/L	0.011
Phosphorus, dissolved	mg/L	<0.1
Uranium-234 calculated	Bq/L	0.56
Uranium-238 calculated	Bq/L	0.56
Lab Section 4		
Polonium-210	Bq/L	600
Radon-222	Bq/L	6000000
Thorium-230	Bq/L	10
Tritium	Bq/L	<15
Radium-226	Bq/L	1100
Lead-210	Bq/L	5000

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 44639

Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

Time between sampling and receipt in lab exceeds the recommended 48 hours for Nitrite and Ortho-phosphate as P.

Radon results are corrected for decay to the time of sample collection.

Air was bubbled through the sample before the gamma spectroscopy analysis to reduce the interferences caused by high activity of Radon.

Preliminary

SRC Group # 2021-11730

Nov 02, 2021

Denison Mines Inc.

Analysis of radon exceeded the recommended 8 days as the radon had to decay to a level in our calibration range before analysis.

The temperature of the cooler was 16.3 °C upon receipt.

This is a preliminary report. Results are subject to revision. The final authorized report will be provided when all tests have been completed.

Preliminary

SRC Group # 2021-11730

Nov 02, 2021

Denison Mines Inc.

Analyte Methods

Name	Units	Method
P. alkalinity	mg/L	Chm-211
Organic carbon, dissolved	mg/L	Chm-399
Chloride	mg/L	Chm-115
Carbonate	mg/L	Chm-211
Fluoride	mg/L	Chm-211
Iron (II)	mg/L	Chm-225
Bicarbonate	mg/L	Chm-211
Ammonia as nitrogen	mg/L	Chm-123
Nitrite+Nitrate as nitrogen	mg/L	Chm-124
Nitrite	mg/L	Chm-124
Nitrate (calc. from NO ₂ +NO ₃ -N)	mg/L	Chm-124
Hydroxide	mg/L	Chm-211
pH	pH units	Chm-211
Ortho-phosphate as P	mg/L	Chm-116
Total dissolved solids	mg/L	Chm-203
Total suspended solids	mg/L	Chm-206
Specific conductivity	uS/cm	Chm-211
Sum of ions	mg/L	Calculation
Total hardness	mg/L	Calculation
Total alkalinity	mg/L	Chm-211
Silver, dissolved	mg/L	Chm-501 / Chm-522
Aluminum, dissolved	mg/L	Chm-501 / Chm-522
Arsenic, dissolved	ug/L	Chm-501 / Chm-522
Boron, dissolved	mg/L	Chm-501 / Chm-522
Barium, dissolved	mg/L	Chm-501 / Chm-522
Beryllium, dissolved	mg/L	Chm-501 / Chm-522
Bismuth, dissolved	mg/L	Chm-501 / Chm-522
Bromine	ug/L	Chm-522
Calcium	mg/L	Chm-508
Cadmium, dissolved	mg/L	Chm-501 / Chm-522
Cobalt, dissolved	mg/L	Chm-501 / Chm-522
Chromium, dissolved	mg/L	Chm-501 / Chm-522
Copper, dissolved	mg/L	Chm-501 / Chm-522
Iron, dissolved	mg/L	Chm-501 / Chm-522
Potassium	mg/L	Chm-508
Lithium, dissolved	ug/L	Chm-501 / Chm-522
Magnesium	mg/L	Chm-508
Manganese, dissolved	mg/L	Chm-501 / Chm-522

Preliminary

SRC Group # 2021-11730

Nov 02, 2021

Denison Mines Inc.

Name	Units	Method
Molybdenum, dissolved	mg/L	Chm-501 / Chm-522
Sodium	mg/L	Chm-508
Nickel, dissolved	mg/L	Chm-501 / Chm-522
Phosphorus, dissolved	mg/L	Chm-501 / Chm-522
Lead, dissolved	mg/L	Chm-501 / Chm-522
Sulfur	mg/L	Chm-508
Antimony, dissolved	mg/L	Chm-501 / Chm-522
Selenium, dissolved	mg/L	Chm-501 / Chm-522
Silica, soluble, dissolved	mg/L	Chm-501 / Calculation
Tin, dissolved	mg/L	Chm-501 / Chm-522
Sulfate	mg/L	Chm-508
Strontium, dissolved	mg/L	Chm-501 / Chm-522
Titanium, dissolved	mg/L	Chm-501 / Chm-522
Thallium, dissolved	mg/L	Chm-501 / Chm-522
Uranium, dissolved	ug/L	Chm-501 / Chm-522
Uranium-234 calculated	Bq/L	Chm-522
Uranium-238 calculated	Bq/L	Chm-522
Vanadium, dissolved	mg/L	Chm-501 / Chm-522
Zinc, dissolved	mg/L	Chm-501 / Chm-522
Lead-210	Bq/L	Rad-300
Polonium-210	Bq/L	Rad-103
Radium-226	Bq/L	Rad-300
Radon-222	Bq/L	Rad-116
Thorium-230	Bq/L	Rad-106
Tritium	Bq/L	Rad-122

SRC Group # 2021-12063

Nov 16, 2021

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Sep-16-2021

Client P.O.: WRE-T0421210

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 4 approved by Snook, Vicky
Results from Lab Section 1 approved by Hamilton, Ashley
Results from Lab Section 2 approved by Britton, Stephanie

-
- * Test methods and data are validated by the laboratory's Quality Assurance Program.
 - * Routine methods follow recognized procedures from sources such as
 - * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
 - * Environment Canada
 - * US EPA
 - * CANMET
 - * The results reported relate only to the test samples as provided by the client.
 - * Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.
 - * Additional information is available upon request.
 - * Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

SRC Group # 2021-12063

Nov 16, 2021

Denison Mines Inc.
200-230 22nd Street East
Saskatoon, SK S7K 0E9
Attn: Mikkel Tetland

Date Samples Received: Sep-16-2021

Client P.O.: WRE-T0421210

45769 09/14/2021 GWR-046 *WATER*
45770 09/10/2021 GWR-047 *WATER*
45771 09/11/2021 GWR-048 *WATER*

Analyte	Units	45769	45770	45771
Lab Section 1				
Bicarbonate	mg/L	See attached	See attached	See attached
Carbonate	mg/L	See attached	See attached	See attached
Chloride	mg/L	See attached	See attached	See attached
Hydroxide	mg/L	See attached	See attached	See attached
P. alkalinity	mg/L	See attached	See attached	See attached
pH	pH units	See attached	See attached	See attached
Specific conductivity	uS/cm	See attached	See attached	See attached
Sum of ions	mg/L	See attached	See attached	See attached
Total alkalinity	mg/L	See attached	See attached	See attached
Total hardness	mg/L	See attached	See attached	See attached
Ammonia as nitrogen	mg/L	See attached	See attached	See attached
Nitrate	mg/L	See attached	See attached	See attached
Nitrite	mg/L	See attached	See attached	See attached
Nitrite+Nitrate as nitrogen	mg/L	See attached	See attached	See attached
Organic carbon, dissolved	mg/L	See attached	See attached	See attached
Iron (II)	mg/L	See attached	See attached	See attached
Iron (III), calculated	mg/L	See attached	See attached	See attached
Fluoride	mg/L	See attached	See attached	See attached
Total dissolved solids	mg/L	See attached	See attached	See attached
Lab Section 2				
Calcium	mg/L	See attached	See attached	See attached
Magnesium	mg/L	See attached	See attached	See attached
Potassium	mg/L	See attached	See attached	See attached
Sodium	mg/L	See attached	See attached	See attached
Sulfate	mg/L	See attached	See attached	See attached
Aluminum, dissolved	mg/L	See attached	See attached	See attached
Antimony, dissolved	mg/L	See attached	See attached	See attached
Arsenic, dissolved	ug/L	See attached	See attached	See attached
Barium, dissolved	mg/L	See attached	See attached	See attached
Beryllium, dissolved	mg/L	See attached	See attached	See attached
Bismuth, dissolved	mg/L	See attached	See attached	See attached

SRC Group # 2021-12063

Nov 16, 2021

Denison Mines Inc.

45769 09/14/2021 GWR-046 *WATER*
45770 09/10/2021 GWR-047 *WATER*
45771 09/11/2021 GWR-048 *WATER*

Analyte	Units	45769	45770	45771
Lab Section 2				
Boron, dissolved	mg/L	See attached	See attached	See attached
Bromine	ug/L	11	34	57
Cadmium, dissolved	mg/L	See attached	See attached	See attached
Chromium, dissolved	mg/L	See attached	See attached	See attached
Cobalt, dissolved	mg/L	See attached	See attached	See attached
Copper, dissolved	mg/L	See attached	See attached	See attached
Iron	mg/L	See attached	See attached	See attached
Iron, dissolved	mg/L	See attached	See attached	See attached
Lead, dissolved	mg/L	See attached	See attached	See attached
Lithium, dissolved	ug/L	See attached	See attached	See attached
Manganese, dissolved	mg/L	See attached	See attached	See attached
Molybdenum, dissolved	mg/L	See attached	See attached	See attached
Nickel, dissolved	mg/L	See attached	See attached	See attached
Selenium, dissolved	mg/L	See attached	See attached	See attached
Silver, dissolved	mg/L	See attached	See attached	See attached
Strontium, dissolved	mg/L	See attached	See attached	See attached
Thallium, dissolved	mg/L	See attached	See attached	See attached
Tin, dissolved	mg/L	See attached	See attached	See attached
Titanium, dissolved	mg/L	See attached	See attached	See attached
Uranium, dissolved	ug/L	See attached	See attached	See attached
Vanadium, dissolved	mg/L	See attached	See attached	See attached
Zinc, dissolved	mg/L	See attached	See attached	See attached
Lab Section 4				
Lead-210	Bq/L	0.9	1.1	0.46
Polonium-210	Bq/L	0.65	0.14	1.3
Radium-226	Bq/L	0.93	0.24	0.75
Radon-222	Bq/L	11	1800	620
Thorium-230	Bq/L	0.20	<0.01	0.01
Tritium	Bq/L	<40	<40	<40

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 10.4 °C upon receipt.

Radon results are corrected for decay to the time of sample collection.

SRC Group # 2021-12063

Nov 16, 2021

Denison Mines Inc.

Analyte Methods

Name	Units	Method
P. alkalinity	mg/L	Chm-211
Organic carbon, dissolved	mg/L	Chm-399
Chloride	mg/L	Chm-115
Carbonate	mg/L	Chm-211
Fluoride	mg/L	Chm-211
Iron (III), calculated	mg/L	Calculation
Iron (II)	mg/L	Chm-225
Bicarbonate	mg/L	Chm-211
Ammonia as nitrogen	mg/L	Chm-123
Nitrite+Nitrate as nitrogen	mg/L	Chm-124
Nitrite	mg/L	Chm-124
Nitrate	mg/L	Chm-124
Hydroxide	mg/L	Chm-211
pH	pH units	Chm-211
Total dissolved solids	mg/L	Chm-203
Specific conductivity	uS/cm	Chm-211
Sum of ions	mg/L	Calculation
Total hardness	mg/L	Calculation
Total alkalinity	mg/L	Chm-211
Silver, dissolved	mg/L	Chm-501 / Chm-522
Aluminum, dissolved	mg/L	Chm-501 / Chm-522
Arsenic, dissolved	ug/L	Chm-501 / Chm-522
Boron, dissolved	mg/L	Chm-501 / Chm-522
Barium, dissolved	mg/L	Chm-501 / Chm-522
Beryllium, dissolved	mg/L	Chm-501 / Chm-522
Bismuth, dissolved	mg/L	Chm-501 / Chm-522
Bromine	ug/L	Chm-522
Calcium	mg/L	Chm-508
Cadmium, dissolved	mg/L	Chm-501 / Chm-522
Cobalt, dissolved	mg/L	Chm-501 / Chm-522
Chromium, dissolved	mg/L	Chm-501 / Chm-522
Copper, dissolved	mg/L	Chm-501 / Chm-522
Iron	mg/L	Chm-522
Iron, dissolved	mg/L	Chm-501 / Chm-522
Potassium	mg/L	Chm-508
Lithium, dissolved	ug/L	Chm-501 / Chm-522
Magnesium	mg/L	Chm-508
Manganese, dissolved	mg/L	Chm-501 / Chm-522

SRC Group # 2021-12063

Nov 16, 2021

Denison Mines Inc.

Name	Units	Method
Molybdenum, dissolved	mg/L	Chm-501 / Chm-522
Sodium	mg/L	Chm-508
Nickel, dissolved	mg/L	Chm-501 / Chm-522
Lead, dissolved	mg/L	Chm-501 / Chm-522
Antimony, dissolved	mg/L	Chm-501 / Chm-522
Selenium, dissolved	mg/L	Chm-501 / Chm-522
Tin, dissolved	mg/L	Chm-501 / Chm-522
Sulfate	mg/L	Chm-508
Strontium, dissolved	mg/L	Chm-501 / Chm-522
Titanium, dissolved	mg/L	Chm-501 / Chm-522
Thallium, dissolved	mg/L	Chm-501 / Chm-522
Uranium, dissolved	ug/L	Chm-501 / Chm-522
Vanadium, dissolved	mg/L	Chm-501 / Chm-522
Zinc, dissolved	mg/L	Chm-501 / Chm-522
Lead-210	Bq/L	Rad-101
Polonium-210	Bq/L	Rad-103
Radium-226	Bq/L	Rad-105
Radon-222	Bq/L	Rad-116
Thorium-230	Bq/L	Rad-106
Tritium	Bq/L	Rad-122



Environmental

CERTIFICATE OF ANALYSIS

Work Order : **SK2103820**
Client : **Saskatchewan Research Council**
Contact : Mikkell Tetland
Address : 143- 111 RESEARCH DRIVE
Saskatoon SK Canada S7N 3R2
Telephone : ----
Project : ----
PO : ----
C-O-C number : ----
Sampler : ----
Site : denison Mines
Quote number : standard rates
No. of samples received : 4
No. of samples analysed : 4

Page : 1 of 5
Laboratory : Saskatoon - Environmental
Account Manager : Brian Morgan
Address : 819 58 Street East
Saskatoon SK Canada S7K 6X5
Telephone : 1 306 221 7147
Date Samples Received : 21-Sep-2021 16:00
Date Analysis Commenced : 22-Sep-2021
Issue Date : 05-Oct-2021 10:17

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Colby Bingham	Quality Systems Coordinator	Inorganics, Saskatoon, Saskatchewan
Colby Bingham	Quality Systems Coordinator	Metals, Saskatoon, Saskatchewan
Elke Tabora		Inorganics, Calgary, Alberta
Hedy Lai	Team Leader - Inorganics	Inorganics, Saskatoon, Saskatchewan
Lian Nesbitt	Laboratory Analyst	Metals, Saskatoon, Saskatchewan
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Melissa Houseman	Team Leader - Inorganics	Inorganics, Saskatoon, Saskatchewan
Melissa Houseman	Team Leader - Inorganics	Metals, Saskatoon, Saskatchewan
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta



General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

<i>Unit</i>	<i>Description</i>
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Qualifiers

<i>Qualifier</i>	<i>Description</i>
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
IB:INT	Ion Balance Reviewed: Imbalance is due to interference or non-measured component.
SFP	Sample was filtered and preserved at the laboratory.



Analytical Results

Sub-Matrix: Water					Client sample ID	Tracer Tank	GWR-046	GWR-047	GWR-048	----
(Matrix: Water)					Client sampling date / time	14-Sep-2021 12:00	14-Sep-2021 12:00	10-Sep-2021 12:00	10-Sep-2021 12:00	----
Analyte	CAS Number	Method	LOR	Unit	SK2103820-001	SK2103820-002	SK2103820-003	SK2103820-004	-----	
					Result	Result	Result	Result	----	
Sample Preparation										
dissolved Fe2 filtration location	----	EP541	-	-	----	Field	Field	Field	Field	----
Physical Tests										
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	112	89.5	29.4	43.4	----	
conductivity	----	E100	2.0	µS/cm	230000	277	160	139	----	
pH	----	E108	0.10	pH units	3.15	7.06	7.37	7.08	----	
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	<1.0	86.3	75.2	57.0	----	
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	----	
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	----	
alkalinity, total (as CaCO3)	----	E290	2.0	mg/L	<2.0	70.7	61.6	46.7	----	
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L	170000	188	132	122	----	
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	----	0.0260	<0.0050	<0.0050	----	
bromide	24959-67-9	E235.Br	0.10	mg/L	----	<0.10	<0.10	<0.10	----	
nitrogen, total	7727-37-9	EC368	0.050	mg/L	----	2.65	0.287	0.669	----	
Kjeldahl nitrogen, total [TKN]	----	E318	0.200	mg/L	----	2.65	0.287	0.669	----	
chloride	16887-00-6	E235.Cl	0.50	mg/L	84800	8.63	6.13	4.14	----	
fluoride	16984-48-8	E235.F	0.020	mg/L	<20.0 ^{DLDS}	0.059	0.074	0.142	----	
nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	<20.0 ^{DLDS}	<0.020	<0.020	<0.020	----	
nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	<10.0 ^{DLDS}	<0.010	<0.010	<0.010	----	
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	421	10.1	2.28	6.26	----	
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L	<22.4	<0.0500	<0.0500	<0.0500	----	
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	----	34.6	8.95	15.6	----	
Ion Balance										
anion sum	----	EC101	0.10	meq/L	2400	1.87	1.46	1.19	----	
cation sum	----	EC101	0.10	meq/L	2190	2.70	1.97	1.67	----	
ion balance (cation-anion difference)	----	EC101	0.010	%	4.58	18.2 ^{IB.INT}	14.9 ^{IB.INT}	16.8 ^{IB.INT}	----	
ion balance (cations/anions ratio)	----	EC101	0.010	%	91.2	144 ^{IB.INT}	135 ^{IB.INT}	140 ^{IB.INT}	----	
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	----	0.800	0.0065	0.0010	----	



Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	Tracer Tank	GWR-046	GWR-047	GWR-048	----
Client sampling date / time					14-Sep-2021 12:00	14-Sep-2021 12:00	10-Sep-2021 12:00	10-Sep-2021 12:00	----	
Analyte	CAS Number	Method	LOR	Unit	SK2103820-001	SK2103820-002	SK2103820-003	SK2103820-004	-----	
					Result	Result	Result	Result	---	
Dissolved Metals										
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	----	0.00024	<0.00010	<0.00010	----	
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	----	0.00475	0.00371	0.00085	----	
barium, dissolved	7440-39-3	E421	0.00010	mg/L	----	0.241	0.0626	0.0577	----	
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	----	0.000167	<0.000020	<0.000020	----	
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	----	<0.000050	<0.000050	<0.000050	----	
boron, dissolved	7440-42-8	E421	0.010	mg/L	----	0.023	0.018	0.041	----	
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	----	0.0000336	<0.0000050	<0.0000050	----	
calcium, dissolved	7440-70-2	E421	0.050	mg/L	37.2	29.4	8.24	13.1	----	
cesium, dissolved	7440-46-2	E421	0.000010	mg/L	----	0.000042	<0.000010	0.000019	----	
chromium, dissolved	7440-47-3	E421	0.00050	mg/L	----	0.00169	<0.00050	0.00068	----	
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	----	0.00584	0.00025	0.00036	----	
copper, dissolved	7440-50-8	E421	0.00020	mg/L	----	0.00629	<0.00020	<0.00020	----	
iron, dissolved	7439-89-6	E421	0.030	mg/L	10.7	6.03	11.9	9.62	----	
lead, dissolved	7439-92-1	E421	0.000050	mg/L	----	0.00157	<0.000050	<0.000050	----	
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	----	0.0083	0.0096	0.0155	----	
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	4.58	3.91	2.14	2.60	----	
manganese, dissolved	7439-96-5	E421	0.00500	mg/L	<1.00 ^{DLDS}	1.08	0.844	0.715	----	
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	----	0.00389	0.00374	0.00298	----	
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	----	0.0487	0.00062	0.00066	----	
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	----	<0.050	0.130	0.289	----	
potassium, dissolved	7440-09-7	E421	0.050	mg/L	84200	6.77	4.46	1.89	----	
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	----	0.00159	0.00212	0.00125	----	
selenium, dissolved	7782-49-2	E421	0.000050	mg/L	----	0.000359	<0.000050	<0.000050	----	
silicon, dissolved	7440-21-3	E421	0.050	mg/L	----	13.1	11.8	11.6	----	
silver, dissolved	7440-22-4	E421	0.000010	mg/L	----	0.000046	<0.000010	<0.000010	----	
sodium, dissolved	17341-25-2	E421	0.050	mg/L	707	8.96	18.6	8.87	----	
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	----	0.115	0.0796	0.169	----	
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	----	8.69	1.34	3.58	----	
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	----	<0.00020	<0.00020	<0.00020	----	
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	----	<0.000010	<0.000010	<0.000010	----	
thorium, dissolved	7440-29-1	E421	0.00010	mg/L	----	0.00201	<0.00010	<0.00010	----	



Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	Tracer Tank	GWR-046	GWR-047	GWR-048	----
Client sampling date / time					14-Sep-2021 12:00	14-Sep-2021 12:00	10-Sep-2021 12:00	10-Sep-2021 12:00	----	
Analyte	CAS Number	Method	LOR	Unit	SK2103820-001	SK2103820-002	SK2103820-003	SK2103820-004	-----	
					Result	Result	Result	Result	---	
Dissolved Metals										
tin, dissolved	7440-31-5	E421	0.00010	mg/L	----	0.00033	<0.00010	<0.00010	----	
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	----	0.00897	<0.00030	<0.00030	----	
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	----	0.00138	0.00507	0.00330	----	
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	----	0.0226	0.000752	0.000488	----	
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.100 ^{DLDS}	0.00120	<0.00050	<0.00050	----	
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	----	0.0125	0.0011	0.0031	----	
zirconium, dissolved	7440-67-7	E421	0.00030	mg/L	----	0.0137	0.00032	<0.00030	----	
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	----	
Speciated Metals										
iron, ferrous [Fe II], dissolved	15438-31-0	E541	0.020	mg/L	----	7.77 ^{SFP}	<0.020 ^{SFP}	2.30 ^{SFP}	----	

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: SK2103820	Page	: 1 of 13
Client	: Saskatchewan Research Council	Laboratory	: Saskatoon - Environmental
Contact	: Mikkel Tetland	Account Manager	: Brian Morgan
Address	: 143- 111 RESEARCH DRIVE Saskatoon SK Canada S7N 3R2	Address	: 819 58 Street East Saskatoon, Saskatchewan Canada S7K 6X5
Telephone	: ----	Telephone	: 1 306 221 7147
Project	: ----	Date Samples Received	: 21-Sep-2021 16:00
PO	: ----	Issue Date	: 05-Oct-2021 10:17
C-O-C number	: ----		
Sampler	: ----		
Site	: denison Mines		
Quote number	: standard rates		
No. of samples received	: 4		
No. of samples analysed	: 4		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Duplicate outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Duplicate (DUP) RPDs								
Physical Tests	Anonymous	Anonymous	conductivity	----	E100	4.5 % ^{DUP-H}	Diff <2x LOR	Low Level DUP DQO exceeded (difference > 2 LOR).

Result Qualifiers

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.



Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water** Evaluation: * = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Anions and Nutrients : Ammonia by Fluorescence											
Amber glass total (sulfuric acid) GWR-046	E298	14-Sep-2021	02-Oct-2021	----	----		02-Oct-2021	28 days	18 days	✓	
Anions and Nutrients : Ammonia by Fluorescence											
Amber glass total (sulfuric acid) GWR-047	E298	10-Sep-2021	02-Oct-2021	----	----		02-Oct-2021	28 days	22 days	✓	
Anions and Nutrients : Ammonia by Fluorescence											
Amber glass total (sulfuric acid) GWR-048	E298	10-Sep-2021	02-Oct-2021	----	----		02-Oct-2021	28 days	22 days	✓	
Anions and Nutrients : Bromide in Water by IC											
HDPE GWR-046	E235.Br	14-Sep-2021	----	----	----		24-Sep-2021	28 days	10 days	✓	
Anions and Nutrients : Bromide in Water by IC											
HDPE GWR-047	E235.Br	10-Sep-2021	----	----	----		22-Sep-2021	28 days	12 days	✓	
Anions and Nutrients : Bromide in Water by IC											
HDPE GWR-048	E235.Br	10-Sep-2021	----	----	----		22-Sep-2021	28 days	12 days	✓	
Anions and Nutrients : Chloride in Water by IC											
HDPE GWR-046	E235.Cl	14-Sep-2021	----	----	----		24-Sep-2021	28 days	10 days	✓	



Matrix: **Water** Evaluation: * = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Anions and Nutrients : Chloride in Water by IC											
HDPE Tracer Tank	E235.Cl	14-Sep-2021	----	----	----		24-Sep-2021	28 days	10 days	✓	
Anions and Nutrients : Chloride in Water by IC											
HDPE GWR-047	E235.Cl	10-Sep-2021	----	----	----		22-Sep-2021	28 days	12 days	✓	
Anions and Nutrients : Chloride in Water by IC											
HDPE GWR-048	E235.Cl	10-Sep-2021	----	----	----		22-Sep-2021	28 days	12 days	✓	
Anions and Nutrients : Fluoride in Water by IC											
HDPE GWR-046	E235.F	14-Sep-2021	----	----	----		24-Sep-2021	28 days	10 days	✓	
Anions and Nutrients : Fluoride in Water by IC											
HDPE Tracer Tank	E235.F	14-Sep-2021	----	----	----		24-Sep-2021	28 days	10 days	✓	
Anions and Nutrients : Fluoride in Water by IC											
HDPE GWR-047	E235.F	10-Sep-2021	----	----	----		22-Sep-2021	28 days	12 days	✓	
Anions and Nutrients : Fluoride in Water by IC											
HDPE GWR-048	E235.F	10-Sep-2021	----	----	----		22-Sep-2021	28 days	12 days	✓	
Anions and Nutrients : Nitrate in Water by IC											
HDPE GWR-046	E235.NO3	14-Sep-2021	----	----	----		24-Sep-2021	3 days	10 days	* EHTR	
Anions and Nutrients : Nitrate in Water by IC											
HDPE Tracer Tank	E235.NO3	14-Sep-2021	----	----	----		24-Sep-2021	3 days	10 days	* EHTR	



Matrix: **Water** Evaluation: * = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec Actual		Eval	Analysis Date	Holding Times Rec Actual		Eval
Anions and Nutrients : Nitrate in Water by IC										
HDPE GWR-047	E235.NO3	10-Sep-2021	----	----	----		22-Sep-2021	3 days	12 days	* EHTR
Anions and Nutrients : Nitrate in Water by IC										
HDPE GWR-048	E235.NO3	10-Sep-2021	----	----	----		22-Sep-2021	3 days	12 days	* EHTR
Anions and Nutrients : Nitrite in Water by IC										
HDPE GWR-046	E235.NO2	14-Sep-2021	----	----	----		24-Sep-2021	3 days	10 days	* EHTR
Anions and Nutrients : Nitrite in Water by IC										
HDPE Tracer Tank	E235.NO2	14-Sep-2021	----	----	----		24-Sep-2021	3 days	10 days	* EHTR
Anions and Nutrients : Nitrite in Water by IC										
HDPE GWR-047	E235.NO2	10-Sep-2021	----	----	----		22-Sep-2021	3 days	12 days	* EHTR
Anions and Nutrients : Nitrite in Water by IC										
HDPE GWR-048	E235.NO2	10-Sep-2021	----	----	----		22-Sep-2021	3 days	12 days	* EHTR
Anions and Nutrients : Sulfate in Water by IC										
HDPE GWR-046	E235.SO4	14-Sep-2021	----	----	----		24-Sep-2021	28 days	10 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE Tracer Tank	E235.SO4	14-Sep-2021	----	----	----		24-Sep-2021	28 days	10 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE GWR-047	E235.SO4	10-Sep-2021	----	----	----		22-Sep-2021	28 days	12 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Anions and Nutrients : Sulfate in Water by IC											
HDPE GWR-048	E235.S04	10-Sep-2021	----	----	----		22-Sep-2021	28 days	12 days	✔	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)											
Amber glass total (sulfuric acid) GWR-046	E318	14-Sep-2021	28-Sep-2021	----	----		28-Sep-2021	28 days	14 days	✔	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)											
Amber glass total (sulfuric acid) GWR-047	E318	10-Sep-2021	28-Sep-2021	----	----		28-Sep-2021	28 days	18 days	✔	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)											
Amber glass total (sulfuric acid) GWR-048	E318	10-Sep-2021	28-Sep-2021	----	----		28-Sep-2021	28 days	18 days	✔	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE dissolved (nitric acid) GWR-047	E421	10-Sep-2021	22-Sep-2021	----	----		23-Sep-2021	180 days	13 days	✔	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE dissolved (nitric acid) GWR-048	E421	10-Sep-2021	22-Sep-2021	----	----		23-Sep-2021	180 days	13 days	✔	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE dissolved (nitric acid) GWR-046	E421	14-Sep-2021	22-Sep-2021	----	----		23-Sep-2021	180 days	9 days	✔	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE dissolved (nitric acid) Tracer Tank	E421	14-Sep-2021	22-Sep-2021	----	----		23-Sep-2021	180 days	9 days	✔	
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)											
Amber glass dissolved (sulfuric acid) GWR-046	E358-L	14-Sep-2021	29-Sep-2021	----	----		02-Oct-2021	28 days	18 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)											
Amber glass dissolved (sulfuric acid) GWR-047	E358-L	10-Sep-2021	29-Sep-2021	----	----		02-Oct-2021	28 days	22 days	✔	
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)											
Amber glass dissolved (sulfuric acid) GWR-048	E358-L	10-Sep-2021	29-Sep-2021	----	----		02-Oct-2021	28 days	22 days	✔	
Physical Tests : Alkalinity Species by Titration											
HDPE GWR-047	E290	10-Sep-2021	----	----	----		23-Sep-2021	14 days	13 days	✔	
Physical Tests : Alkalinity Species by Titration											
HDPE GWR-048	E290	10-Sep-2021	----	----	----		23-Sep-2021	14 days	13 days	✔	
Physical Tests : Alkalinity Species by Titration											
HDPE GWR-046	E290	14-Sep-2021	----	----	----		23-Sep-2021	14 days	9 days	✔	
Physical Tests : Alkalinity Species by Titration											
HDPE Tracer Tank	E290	14-Sep-2021	----	----	----		23-Sep-2021	14 days	9 days	✔	
Physical Tests : Conductivity in Water											
HDPE GWR-047	E100	10-Sep-2021	----	----	----		23-Sep-2021	28 days	13 days	✔	
Physical Tests : Conductivity in Water											
HDPE GWR-048	E100	10-Sep-2021	----	----	----		23-Sep-2021	28 days	13 days	✔	
Physical Tests : Conductivity in Water											
HDPE GWR-046	E100	14-Sep-2021	----	----	----		23-Sep-2021	28 days	9 days	✔	



Matrix: **Water** Evaluation: * = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
Rec	Actual	Rec		Actual							
Physical Tests : Conductivity in Water											
HDPE Tracer Tank	E100	14-Sep-2021	----	----	----		23-Sep-2021	28 days	9 days	✓	
Physical Tests : pH by Meter											
HDPE GWR-046	E108	14-Sep-2021	----	----	----		23-Sep-2021	0.25 hrs	216 hrs	* EHTR-FM	
Physical Tests : pH by Meter											
HDPE Tracer Tank	E108	14-Sep-2021	----	----	----		23-Sep-2021	0.25 hrs	216 hrs	* EHTR-FM	
Physical Tests : pH by Meter											
HDPE GWR-047	E108	10-Sep-2021	----	----	----		23-Sep-2021	0.25 hrs	312 hrs	* EHTR-FM	
Physical Tests : pH by Meter											
HDPE GWR-048	E108	10-Sep-2021	----	----	----		23-Sep-2021	0.25 hrs	312 hrs	* EHTR-FM	
Speciated Metals : Dissolved Ferrous Iron in Water by Colour											
HDPE dissolved (hydrochloric acid) GWR-047	E541	10-Sep-2021	23-Sep-2021	----	----		23-Sep-2021	----	13 days	EHTR-FM	
Speciated Metals : Dissolved Ferrous Iron in Water by Colour											
HDPE dissolved (hydrochloric acid) GWR-048	E541	10-Sep-2021	23-Sep-2021	----	----		23-Sep-2021	----	13 days	EHTR-FM	
Speciated Metals : Dissolved Ferrous Iron in Water by Colour											
HDPE dissolved (hydrochloric acid) GWR-046	E541	14-Sep-2021	23-Sep-2021	----	----		23-Sep-2021	----	9 days	EHTL	

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended
 EHTR: Exceeded ALS recommended hold time prior to sample receipt.
 EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
 Rec. HT: ALS recommended hold time (see units).



Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: * = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
Analytical Methods							
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	299780	1	19	5.2	5.0	✓
Ammonia by Fluorescence	E298	309096	1	20	5.0	5.0	✓
Bromide in Water by IC	E235.Br	299527	2	3	66.6	5.0	✓
Chloride in Water by IC	E235.Cl	299532	2	40	5.0	5.0	✓
Conductivity in Water	E100	299779	1	19	5.2	5.0	✓
Dissolved Ferrous Iron in Water by Colour	E541	300953	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	299697	1	8	12.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	306497	2	25	8.0	5.0	✓
Fluoride in Water by IC	E235.F	299531	2	40	5.0	5.0	✓
Nitrate in Water by IC	E235.NO3	299528	2	40	5.0	5.0	✓
Nitrite in Water by IC	E235.NO2	299529	2	40	5.0	5.0	✓
pH by Meter	E108	299778	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	299530	2	40	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	303490	1	4	25.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	299780	1	19	5.2	5.0	✓
Ammonia by Fluorescence	E298	309096	1	20	5.0	5.0	✓
Bromide in Water by IC	E235.Br	299527	2	3	66.6	5.0	✓
Chloride in Water by IC	E235.Cl	299532	2	40	5.0	5.0	✓
Conductivity in Water	E100	299779	1	19	5.2	5.0	✓
Dissolved Ferrous Iron in Water by Colour	E541	300953	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	299697	1	8	12.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	306497	2	25	8.0	5.0	✓
Fluoride in Water by IC	E235.F	299531	2	40	5.0	5.0	✓
Nitrate in Water by IC	E235.NO3	299528	2	40	5.0	5.0	✓
Nitrite in Water by IC	E235.NO2	299529	2	40	5.0	5.0	✓
pH by Meter	E108	299778	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	299530	2	40	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	303490	1	4	25.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	299780	1	19	5.2	5.0	✓
Ammonia by Fluorescence	E298	309096	1	20	5.0	5.0	✓
Bromide in Water by IC	E235.Br	299527	2	3	66.6	5.0	✓
Chloride in Water by IC	E235.Cl	299532	2	40	5.0	5.0	✓
Conductivity in Water	E100	299779	1	19	5.2	5.0	✓
Dissolved Ferrous Iron in Water by Colour	E541	300953	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	299697	1	8	12.5	5.0	✓



Matrix: **Water** Evaluation: * = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
<i>Analytical Methods</i>							
Method Blanks (MB) - Continued							
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	306497	2	25	8.0	5.0	✓
Fluoride in Water by IC	E235.F	299531	2	40	5.0	5.0	✓
Nitrate in Water by IC	E235.NO3	299528	2	40	5.0	5.0	✓
Nitrite in Water by IC	E235.NO2	299529	2	40	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	299530	2	40	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	303490	1	4	25.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	309096	1	20	5.0	5.0	✓
Bromide in Water by IC	E235.Br	299527	2	3	66.6	5.0	✓
Chloride in Water by IC	E235.Cl	299532	2	40	5.0	5.0	✓
Dissolved Ferrous Iron in Water by Colour	E541	300953	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	299697	1	8	12.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	306497	2	25	8.0	5.0	✓
Fluoride in Water by IC	E235.F	299531	2	40	5.0	5.0	✓
Nitrate in Water by IC	E235.NO3	299528	2	40	5.0	5.0	✓
Nitrite in Water by IC	E235.NO2	299529	2	40	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	299530	2	40	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	303490	1	4	25.0	5.0	✓



Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Saskatoon - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Saskatoon - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Bromide in Water by IC	E235.Br Saskatoon - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC	E235.Cl Saskatoon - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Saskatoon - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC	E235.NO2 Saskatoon - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC	E235.NO3 Saskatoon - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Saskatoon - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Saskatoon - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Calgary - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO ₂ . NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Dissolved Metals in Water by CRC ICPMS	E421 Saskatoon - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Ferrous Iron in Water by Colour	E541 Vancouver - Environmental	Water	APHA 3500-Fe B/James Ball et al (1999)	This analysis is carried out using procedures adapted from APHA 3500-Fe B and Environ. Sci. Technol. 1999, 33, 5, 807–813. The procedure involves preliminary sample filtration, and ferrous iron is determined using the "FerroZine" colourimetric method. Holding time is 7 days for 0.45um filtration or 6 months if samples have been filtered using 0.1um filters.
Dissolved Hardness (Calculated)	EC100 Saskatoon - Environmental	Water	APHA 2340B	"Hardness (as CaCO ₃), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO ₃ equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Saskatoon - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Saskatoon - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Saskatoon - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).
Total Nitrogen (calculation)	EC368 Saskatoon - Environmental	Water	BC MOE LABORATORY MANUAL (2005)	Total Nitrogen is a calculated parameter. Total Nitrogen = Total Kjeldahl Nitrogen + [Nitrate and Nitrite (as N)].
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions



<i>Preparation Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Preparation for Ammonia	EP298 Calgary - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Calgary - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent.
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Dissolved Metals Water Filtration	EP421 Saskatoon - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO ₃ .
Dissolved Ferrous Iron in Water by Colour	EP541 Vancouver - Environmental	Water	APHA 3500-Fe B/James Ball et al (1999)	This analysis is carried out using procedures adapted from APHA 3500-Fe B and "A New Method for the Direct Determination of Dissolved Iron Concentration in Acid Mine Waters" published by James W. Ball et al (1999). The procedure involves preliminary sample filtration, and ferrous iron is determined using the "FerroZine" colourimetric method.

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Work Order Reference
SK2103820



Telephone: +1 306 869 8370

Turnaround Time: Regular Rush (100% surcharge)
 Rush (100% surcharge) + overtime charges authorized*
* Contact lab in advance to authorize

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Radon: background 100% 2m/4m 100% 4m

WSA Flag:

Routes: [Grid]

Preservatives: [Grid]

Site: [Grid]

In Sample: [Grid]

Received by: [Grid]

SRC Group: _____
Client Code: _____
Date Time received: _____
Storage: _____

Invoice to:
Company Name: Deason, Alex
Contact Name: Mike
Address: 306-1032 Street
City/Prov: askatoon SK
Postal Code: S7N 1K2
Email: alex@deason.com
Phone: 306-243-1000
PO#: 091-70421210 Quoi #: 1500 343/1000-711

Report Format: PDF Excel
Report Results to: Water Security Agency WaterTrax Database

Report to: Same as Invoice to?

Company Name: _____
Contact Name: _____
Address: _____
City/Prov: _____
Postal Code: _____
Phone: _____
Email: _____

Handwritten notes:
#4, 10, 11
Archie confirmed
Deason contact

Tests Required

Sample No.	Sample Type (water, soil, etc.)	Date Sampled	As per	As per	As per	As per	As per	As per	As per
2	Water	Sept 14	X	X	X	X	X	X	X
11	Water	Sept 14	X	X	X	X	X	X	X
11	Water	Sept 10	X	X	X	X	X	X	X
11	Water	Sept 1	X	X	X	X	X	X	X

Sample Site Description:

Tracer Tank
GW R-046
GW R-047
GW R-048

I hereby relinquish the above listed samples to SRC Analytical and authorize the above listed analysis as per the Standard

Relinquished by Signature: *[Signature]*

(Printed Name) _____ on the _____ day of _____ (Month) _____ (Year)



SUBMITTER SUMMARY			
Submitter Name:	Jennifer Skilnick	Affiliation:	Denison Mines Corp.
Submitter Email:	jskilnick@denisonmines.com	Street Address:	200 - 230 22nd Street East
Submitter Phone:	(306) 281-8305	City, Province:	Saskatoon, SK
Principal Investigator Name:	Elizabeth Haack	Postal Code:	S7K 0E9
Principal Investigator Email:	ehaack@ecometrix.ca	Country:	Canada
Principal Investigator Phone:		Date Submitted:	2021-04-19 and 2021-04-21

PROJECT INFORMATION	
Project Title:	Wheeler River Project
Country:	Canada
Site Name:	Phoenix
Collection Date:	April 8 2021 to April 10, 2021 and April 12, 2021 to April 18, 2021

SUBMISSION TIMELINE	
Date samples received (YYYY/MM/DD)	Report date (YYYY/MM/DD)
(2021/04/20) and (2021/04/22)	(2021/06/21)

ANALYTICAL NOTES

Please note: Unless otherwise specified in the submission form, any remaining sample material will be held for a period of six (6) months, after which time it will be discarded.

CONTACT INFORMATION	
Should you have any questions regarding your data or sample preparation please contact:	
Name:	Monika Wilk
Email:	mwilk@uottawa.ca
Phone:	613-562-5800 ext.6183

Researchers are asked to report any publications that include data generated at the AEL AMS facility. Publication notifications should be sent to ael-ams@uottawa.ca. Published data should include the unique UO identifier number provided in this analytical report.



Table 1. Tritium results for enriched water samples

UofO Number	Sample ID	³ H (TU)	± 1σ (TU)	³ H (Bq/L)
UOT-2638	GWR-008	4.2	0.8	0.5
UOT-2639	GWR-009	10.0	0.9	1.2
UOT-2640	GWR-036	6.4	0.8	0.8
UOT-2641	GWR-037	1.2	0.4	0.1
UOT-2642	GWR-029	0.8	0.6	0.1
UOT-2643	GWR-006	1.1	0.6	0.1
UOT-2644	GWR-025	3.5	0.7	0.4
UOT-2645	GWR-003	9.3	0.9	1.1

Remarks: TU is Tritium Units where 1TU=0.1191Bq/L



SUBMITTER SUMMARY			
Submitter Name:	Jennifer Skilnick	Affiliation:	Denison Mines Corp.
Submitter Email:	jskilnick@denisonmines.com	Street Address:	200 - 230 22nd Street East
Submitter Phone:	(306) 281-8305	City, Province:	Saskatoon, SK
Principal Investigator Name:	Elizabeth Haack	Postal Code:	S7K 0E9
Principal Investigator Email:	ehaack@ecometrix.ca	Country:	Canada
Principal Investigator Phone:		Date Submitted:	26-May-21

PROJECT INFORMATION	
Project Title:	Wheeler River Project
Country:	Canada
Site Name:	Phoenix
Collection Date:	May 21, 2021 to May 25, 2021

SUBMISSION TIMELINE	
Date samples received (YYYY/MM/DD)	Report date (YYYY/MM/DD)
(2021/05/28)	(2021/08/30)

ANALYTICAL NOTES

Please note: Unless otherwise specified in the submission form, any remaining sample material will be held for a period of six (6) months, after which time it will be discarded.

CONTACT INFORMATION	
Should you have any questions regarding your data or sample preparation please contact:	
Name:	Monika Wilk
Email:	mwilk@uottawa.ca
Phone:	613-562-5800 ext.6183

Researchers are asked to report any publications that include data generated at the AEL AMS facility. Publication notifications should be sent to ael-ams@uottawa.ca. Published data should include the unique UO identifier number provided in this analytical report.



Table 1. Tritium results for enriched water samples

UofO Number	Sample ID	³ H (TU)	± 1σ (TU)	³ H (Bq/L)
UOT-2718	GWR-005	<0.8		0.10
UOT-2719	GWR-012	<0.8		0.10
UOT-2720	GWR-014	1.1	0.6	0.13
UOT-2721	GWR-033	4.3	0.7	0.51
UOT-2722	GWR-034	10.0	0.9	1.19
UOT-2723	GWR-035	6.7	0.8	0.80

Remarks: TU is Tritium Units where 1TU=0.1191Bq/L



SUBMITTER SUMMARY			
Submitter Name:	Jennifer Skilnick	Affiliation:	Denison Mines Corp.
Submitter Email:	jskilnick@denisonmines.com	Street Address:	200 - 230 22nd Street East
Submitter Phone:	(306) 281-8305	City, Province:	Saskatoon, SK
Principal Investigator Name:	Elizabeth Haack	Postal Code:	S7K 0E9
Principal Investigator Email:	ehaack@ecometrix.ca	Country:	Canada
Principal Investigator Phone:		Date Submitted:	7-Jun-21

PROJECT INFORMATION	
Project Title:	Wheeler River Project
Country:	Canada
Site Name:	Phoenix
Collection Date:	June 1 and June 2

SUBMISSION TIMELINE	
Date samples received (YYYY/MM/DD)	Report date (YYYY/MM/DD)
(2021/06/15)	(2021/09/09)

ANALYTICAL NOTES

Please note: Unless otherwise specified in the submission form, any remaining sample material will be held for a period of six (6) months, after which time it will be discarded.

CONTACT INFORMATION	
Should you have any questions regarding your data or sample preparation please contact:	
Name:	Monika Wilk
Email:	mwilk@uottawa.ca
Phone:	613-562-5800 ext.6183

Researchers are asked to report any publications that include data generated at the AEL AMS facility. Publication notifications should be sent to ael-ams@uottawa.ca. Published data should include the unique UO identifier number provided in this analytical report.



Table 1. Tritium results for enriched water samples

UofO Number	Sample ID	³ H (TU)	± 1σ (TU)	³ H (Bq/L)
UOT-2759	GWR-011	1.1	0.7	0.13
UOT-2760	GWR-013	6.5	0.9	0.78

Remarks: TU is Tritium Units where 1TU=0.1191Bq/L

Appendix I Groundwater Quality and Drinking Water Guidelines

Regionally, groundwater is not relied upon for drinking water. This is understood from a search of water wells within a 100 km radius of the Project Area, provided below. A single domestic use well is listed in the Government of Saskatchewan, Water Security Agency, Water Well Information Database (WSA, 2022) within the search area. The one listed domestic well is a (shallow) well drilled by Cameco Corporation in 1969 to a depth of approximately 72 m bgs, installed in sand. There is also a shallow drinking water well at the existing Wheeler River Project camp, located over two kilometres southwest of the Phoenix deposit. There are no records in the database of groundwater wells for non-industrial use, meaning, there is no records of groundwater wells being used by residents in the area as a potable water source.

Groundwater quality collected as part of this baseline report is considered herein in the context of drinking water guidelines. The objective is to identify where exceedances of drinking water guidelines occur to understand the general suitability of raw groundwater in the study area as a potable water source. This is not an assessment of risk to human health from ingestion of groundwater as a potable water source.

Available drinking water guidelines for the groundwater constituents for the Project were compiled. Where guidelines for groundwater constituents were not available from Health Canada (2020), available guidelines from other sources were used. Shown in Table I1 is groundwater quality in GWR-series wells for groundwater constituents for which drinking water guidelines were available, and the source of the drinking water guidelines. Groundwater monitoring wells where uncertainty with well integrity (e.g., GWR-034) or water quality (e.g., ore zone wells with water quality affected by the KCl tracer) were not included in Table I1.

Exceedances of drinking water guidelines are shown in Table I2. Exceedances of health-based and aesthetic guidelines occur in all hydrostratigraphic at the Site. The frequency of exceedances is higher in the deeper hydrostratigraphic units and in the ore zone.

Table I1: Baseline Water Quality and Drinking Water Guidelines

Well Cluster	Groundwater Monitoring Well	Lithology	Hydrostratigraphic Unit	Sampling Date	Sampling Time	Units	Drinking Water Guideline		Upgradient Cluster ^a				NW Cluster ^b				SE Cluster ^c				WR-607 Cluster ^d				Downgradient Cluster				
							Value	Source	GWR-006		GWR-029		GWR-003		GWR-025		GWR-008		GWR-009		GWR-033		GWR-035		GWR-005		GWR-014		GWR-012
								OB	Mfa	OB	Mfa	OB	Mfa	OB	Mfa	OB	Mfa	OB / MfD	USA	OB	MfC	OB	MfA	OB	MfA				
								OB	LSA	OB	LSA	LSA/DSZ	ISA/DSZ	LSA	USA	OB	USA/DSZ	OB	USA/DSZ	OB	USA/DSZ	OB	USA/DSZ	OB	USA/DSZ				
								2020-08-22	2021-04-14	2020-08-30	2021-04-12	2020-08-16	2021-04-18	2020-08-22	2021-04-17	2020-09-06	2021-04-09	2020-09-14	2021-04-10	2020-11-03	2021-05-25	2020-11-03	2021-05-24	2020-08-29	2021-05-22	2020-08-29	2021-05-21	2020-08-29	2021-05-23
								15:00	16:31	9:00	16:08	15:00	10:45	10:30	16:18	9:00	18:30	15:30	18:45	16:30	11:22	11:30	14:23	10:30	10:03	9:00	11:27	14:40	13:14
Field Parameters																													
Field pH		pH units		7-10.5	1	6.75	6.90	6.46	7.30	6.35	5.86	6.49	7.06	6.92	7.42	10.87	7.67	7.02	7.32	6.48	6.30	7.49	6.8	11.38*	9.77	6.94	7.17		
Field TDS		mg/L		500	1	52	98	57	119	23	18	615	1505	66	108	157	402	231	451	43	74	61	98	259	274	306	582		
Analytical Results																													
Nitrate (calc. from NO2+NO3-N)		mg/L		45	1	0.09	0.09	<0.04	<0.04	<0.04	0.13	<0.04	<0.04	<0.04	<0.04	0.04	<0.04	<0.04	<0.04	<0.04	0.04	<0.04	<0.04	0.09	<0.04	<0.04	<0.04	<0.04	<0.04
Nitrite		mg/L		3	1	<0.03	0.05	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.11	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.23	0.11	<0.03	<0.03	<0.03	
Sulfate		mg/L		500	1	6.4	7	2.4	4.2	1	0.9	52	67	0.7	0.9	24	2.5	31	17	5.9	3	4.5	3	10	4.2	5.9	8.1		
Aluminum, dissolved		mg/L		0.1	1	0.0096	0.016	0.014	<0.0005	0.0065	0.0055	0.0024	<0.0005	0.0081	0.0023	0.012	0.21	0.025	0.0013	0.013	0.0058	0.0022	<0.0005	0.02	0.003	0.0038	<0.0005	<0.0005	
Arsenic, dissolved		ug/L		10	1	1.3	0.8	0.3	<0.1	0.2	0.1	<0.1	<0.1	0.1	0.1	3.3	11	2.2	1.8	0.2	0.2	1.1	1.4	0.6	0.5	0.2	<0.1	<0.1	
Barium, dissolved		mg/L		2	1	0.0081	0.0095	0.0082	0.0053	0.0082	0.0056	0.12	0.11	0.1	0.042	0.059	0.22	0.059	0.059	0.015	0.016	0.024	0.015	0.15	0.11	0.25	0.15		
Boron, dissolved		mg/L		5	1	0.01	0.01	0.04	0.04	<0.01	<0.01	0.32	0.4	0.03	0.03	<0.01	<0.01	0.04	0.05	<0.01	<0.01	0.03	0.03	0.02	0.02	0.15	0.15		
Cadmium, dissolved		mg/L		0.007	1	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	0.00001	0.00001	<0.00001	0.00002	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Chromium, dissolved		mg/L		0.05	1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt, dissolved		mg/L		0.001	2	0.0002	0.0002	<0.0001	<0.0001	0.0009	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0047	0.0005	0.0005	0.001	0.0012	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Copper, dissolved		mg/L		2	1	0.0008	<0.0002	<0.0002	<0.0002	0.0017	0.0007	<0.0002	<0.0002	<0.0002	<0.0002	0.0007	0.0008	0.0011	0.0003	<0.0002	0.0005	0.0003	<0.0002	<0.0002	0.0004	0.0009	<0.0002	<0.0002	
Iron, dissolved		mg/L		0.3	1	0.49	0.53	4.86	2.16	0.039	0.16	16	9.7	3.55	2.81	0.21	15.3	0.47	0.66	0.32	0.16	3.71	4.84	0.055	0.064	5.6	1.32		
Lead, dissolved		mg/L		0.005	1	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Manganese, dissolved		mg/L		0.12	1	0.14	0.16	0.23	0.24	0.14	0.073	0.97	1.14	0.4	0.33	0.021	2.75	0.21	0.27	0.14	0.23	0.17	0.2	0.0018	0.0037	0.57	0.59		
Molybdenum, dissolved		mg/L		0.07	3	0.0012	0.0007	0.0001	<0.0001	0.0012	<0.0001	0.0005	0.0002	0.0003	0.0002	0.0087	0.0038	0.003	0.0026	0.0008	0.0009	0.0023	0.0007	0.0024	0.0034	0.0023	0.0007		
Nickel, dissolved		mg/L		0.07	3	0.0004	0.0004	0.0002	<0.0001	0.0021	0.0017	0.0002	<0.0001	0.0004	0.0002	0.0012	0.0053	0.0011	0.0008	0.005	0.01	0.0003	<0.0001	0.0027	0.0015	0.0006	0.0002		
Selenium, dissolved		mg/L		0.05	1	<0.0001	<0.0001	0.0011	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0002	<0.0001	<0.0001	
Strontium, dissolved		mg/L		7	1	0.034	0.029	0.12	0.12	0.02	0.02	1.88	2.19	0.12	0.1	0.24	0.21	0.3	0.36	0.033	0.031	0.057	0.059	0.26	0.15	0.61	0.59		
Zinc, dissolved		mg/L		5	1	0.0009	0.0041	0.001	0.0016	0.01	0.009	0.003	0.0026	0.0029	0.0016	0.0014	0.017	0.015	0.004	0.0025	0.0045	0.0064	0.0014	0.0007	0.0008	0.0007	0.0007	0.002	
Radionuclides																													
Uranium, dissolved		ug/L		20	1	1.4	0.2	0.2	0.2	0.5	<0.1	0.8	<0.1	2.4	0.7	5.3	22	3.6	0.8	0.2	<0.1	0.5	0.3	1.2	0.5	0.5	<0.1	<0.1	
Lead-210		Bq/L		0.5	1	0.09	0.08	0.1	0.07	0.6	0.03	0.08	0.08	<0.02	0.66	0.3	1.1	0.14	0.04	0.03	<0.02	0.28	<0.02	0.08	0.3	0.15	0.1		
Radium-226		Bq/L		0.2	1	0.36	0.06	0.07	0.09	0.27	0.02	0.26	0.29	0.81	0.32	0.33	0.3	1.6	0.13	0.14	0.04	0.16	0.03	0.08	0.06	0.17	0.12		
Tritium		Bq/L		7000	1	<15	0.1	<15	0.1	<15	1.1	<15	0.4	<15	0.5	16	1.2	<15	0.5	<15	0.8	<15	<0.1	19	0.1	<15	<0.1		

Notes
 a 6.75 Bolded and Highlighted values exceed Drinking Water Guidelines
 Sample was taken at the end of a 48 hour long pumping test on GWR-032. 5,680 gallons were pumped from the well during the test before sampling and no field parameters available.
 b Sampling time reflects that recorded on Certificate of Analysis

Guideline Sources
 1 Health Canada 2020. Guidelines for Canadian Drinking Water Quality Summary Table. September. https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-table-EN-2020-02-11.pdf
 2 BC MECCS 2020. Source Drinking Water Quality Guidelines, Guideline Summary Ministry of Environment & Climate Change Strategy Water Protection & Sustainability Branch.
 3 WHO 2017. Guidelines for Drinking Water Quality. Fourth Edition Incorporating The First Addendum.

Table I1: Baseline Water Quality and Drinking Water Guidelines, continued

Well Cluster Groundwater Monitoring Well Lithology Hydrostratigraphic Unit Sampling Date Sampling Time	Units	Drinking Water Guideline		LA-5 Cluster				Paloweathered Zone		Phoenix Ore Zone ^a									
				GWR-036		GWR-037		GWR-031		GWR-011	GWR-013	GWR-032			GWR-046 ^b	GWR-047 ^b	GWR-048 ^b		
		Value	Source	OB	Mfd	PWZ	MFa	Mfb	OZ			Mfc	Mfb	Mfa					
				USA/DSZ		PWZ		LSA/DSZ		ISA/DSZ		OZ			ISA	ISA/DSZ	LSA		
				2020-11-05	2021-04-08	2020-10-24	2021-04-09	2020-08-09	2021-06-04	2020-08-08	2021-06-01	2020-08-09	2021-06-02	2019-11-14 ^a	2020-08-08	2021-06-04	2021-09-14	2021-09-10	2021-09-10
		12:00	15:45	16:40	11:30	16:10	8:30	16:30	17:47	10:45	11:43	9:10	8:25	19:30	12:00	12:00	12:00		
Field Parameters																			
Field pH	pH units	7-10.5	1	6.45	6.62	6.13	6.02	7.03	7.21	8.70	6.82	9.68	7.35	-	6.79	6.83	6.37	6.47	6.08
Field TDS	mg/L	500	1	20	48	57	53	513	893	74	142	155	176	-	623	1094	123	90	106
Analytical Results																			
Nitrate (calc. from NO2+NO3-N)	mg/L	45	1	0.49	0.49	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	0.13	<0.4	0.04	<0.04	<0.02	<0.02	<0.02
Nitrite	mg/L	3	1	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.05	<0.03	-	<0.03	<0.03	<0.01	<0.01	<0.01
Sulfate	mg/L	500	1	2.6	1.9	8	6.5	40	6.6	5.5	4.7	17	5.2	30	8	13	10.1	2.28	6.26
Aluminum, dissolved	mg/L	0.1	1	0.15	0.037	0.48	0.06	<0.005	<0.0005	0.0082	0.052	0.025	0.011	0.21	0.0057	0.0006	0.8	0.0065	0.001
Arsenic, dissolved	ug/L	10	1	0.2	0.3	0.4	1	1	1.2	4.1	1.3	3.1	0.9	3.4	0.3	0.2	4.75	3.71	0.85
Barium, dissolved	mg/L	2	1	0.0095	0.0057	0.0073	0.0087	0.052	0.035	0.21	0.054	0.041	0.11	0.088	0.083	0.063	0.241	0.0626	0.0577
Boron, dissolved	mg/L	5	1	<0.01	<0.01	<0.01	<0.01	0.5	0.55	0.04	0.04	0.02	<0.01	0.58	0.59	0.43	0.023	0.018	0.041
Cadmium, dissolved	mg/L	0.007	1	0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0.000336	<0.00005	<0.00005
Chromium, dissolved	mg/L	0.05	1	<0.0005	<0.0005	<0.0005	<0.0005	0.009	0.0008	<0.0005	<0.0005	<0.0005	<0.0005	0.013	0.0011	<0.0005	0.00169	<0.0005	0.00068
Cobalt, dissolved	mg/L	0.001	2	0.0004	0.0002	0.0005	0.0004	0.002	0.0002	<0.0001	<0.0001	<0.0001	0.0001	0.0007	<0.0001	<0.0001	0.00584	0.00025	0.00036
Copper, dissolved	mg/L	2	1	0.002	0.0006	0.0013	0.0009	<0.002	<0.0002	0.0006	0.0018	0.0006	0.0008	<0.0002	<0.0002	<0.0002	0.00629	<0.0002	<0.0002
Iron, dissolved	mg/L	0.3	1	0.12	0.014	1.64	1.38	3.6	0.09	0.012	0.86	0.086	0.014	3.83	6.4	4.2	6.03	11.9	9.62
Lead, dissolved	mg/L	0.005	1	0.0001	<0.0001	0.0002	<0.0001	0.001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0.0003	0.0005	<0.0001	0.00157	<0.00005	<0.00005
Manganese, dissolved	mg/L	0.12	1	0.048	0.039	0.12	0.16	0.22	0.13	0.085	0.36	0.026	0.22	0.2	0.24	0.22	3.91	2.14	2.6
Molybdenum, dissolved	mg/L	0.07	3	0.0003	0.0007	<0.0001	0.0028	0.062	0.012	0.028	0.0042	0.018	0.0054	0.078	0.0059	0.0038	0.00389	0.00374	0.00298
Nickel, dissolved	mg/L	0.07	3	0.0023	0.0018	0.0037	0.0023	0.04	0.0019	0.0003	0.0001	0.0024	0.0018	0.012	0.0014	0.001	0.0487	0.00062	0.00066
Selenium, dissolved	mg/L	0.05	1	0.0007	0.0008	0.0001	0.0004	<0.001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001	0.000359	<0.00005	<0.00005
Strontium, dissolved	mg/L	7	1	0.012	0.012	0.014	0.012	1.4	1.17	0.13	0.12	0.16	0.08	2.37	2.51	1.66	0.115	0.0796	0.169
Zinc, dissolved	mg/L	5	1	0.0061	0.0044	0.0067	0.0041	18.4	0.69	0.0018	0.012	0.001	0.0016	2.94	5	2.62	0.0125	0.0011	0.0031
Radionuclides																			
Uranium, dissolved	ug/L	20	1	0.9	0.1	5.8	0.8	17	50	9	0.7	14	55	299	5.7	11	22.6	0.752	0.488
Lead-210	Bq/L	0.5	1	0.14	0.07	0.08	0.05	1100	7300	0.6	0.3	0.4	8	1200	3300	2200	0.9	1.1	0.46
Radium-226	Bq/L	0.2	1	0.22	0.06	0.19	0.03	120	76	1	0.5	0.5	17	300	400	180	0.93	0.24	0.75
Tritium	Bq/L	7000	1	<15	0.8	<15	0.1	<15	910	<15	0.1	<15	0.8	-	950	1800	<40	<40	<40

Notes

6.75 Bolded and Highlighted values exceed Drinking Water Guidelines

a Sample was taken at the end of a 48 hour long pumping test on GWR-032. 5,680 gallons were pumped from the well during the test before sampling and no field parameters available.

b Sampling time reflects that recorded on Certificate of Analysis

Guideline Sources

- Health Canada 2020. Guidelines for Canadian Drinking Water Quality Summary Table. September. https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-table-EN-2020-02-11.pdf
- BC MECCS 2020. Source Drinking Water Quality Guidelines, Guideline Summary Ministry of Environment & Climate Change Strategy Water Protection & Sustainability Branch .
- WHO 2017. Guidelines for Drinking Water Quality. Fourth Edition Incorporating The First Addendum.

Table I2: Exceedances of Drinking Water Guidelines in Baseline Water Quality

Constituent Exceeding Guideline	Hydrostratigraphic Unit (HU) in which the exceedances of potable water quality guidelines occur ^a	Notes
pH < 7 ^b	All HUs (most wells)	Aesthetic Objective, primarily to minimize corrosion and reduce leaching from distribution systems.
TDS ^b	LSA (GWR-012, GWR-025), PW (GWR-031) and OZ (GWR-032)	Aesthetic Objective; based on taste
Aluminum, dissolved ^c	OB and USA (GWR-036; GWR-037), ISA (GWR-046; GWR-009) and OZ (GWR-032)	All values are below the Maximum Acceptable Concentrations of 2.9 mg/L (Health Canada, 2020), which is to be applied as an annual running average. Concentrations exceeded the 0.1 mg/L operational guidance value (OG), only on the first sampling of the well. The OG value was set to minimize potential for metal accumulation and release in distribution systems.
Arsenic, dissolved	ISA (GWR-009)	ALARA value; recognized that that elevated values associated with some groundwaters (HC, 2020)
Cobalt, dissolved	OB/MFd (GWR-035), ISA (GWR-046; GWR-009) and GWR-031 (PW)	Health-based value
Iron, dissolved	All HUs (most wells)	Aesthetic Objective; based on taste and staining of laundry and plumbing fixtures
Manganese, dissolved	All HUs (most wells)	Maximum Acceptable Concentration
Molybdenum, dissolved	OZ (GWR-032)	Health-based value
Uranium, dissolved	ISA (GWR-009; GWR-046), PW (GWR-031) and OZ (GWR-032)	Maximum Acceptable Concentration
Lead-210	OB/USA (GWR-003, GWR-005, GWR-014), ISA (GWR-009, GWR-013, GWR-046, GWR-047), LSA (GWR-008, GWR-011, GWR-048), PW (GWR-031) and OZ (GWR-032)	Maximum Acceptable Concentration.
Radium-226	ISA (GWR-013, GWR-046), LSA (GWR-008, GWR-011, GWR-033, GWR-048), PW (GWR-031) and OZ (GWR-032)	Maximum Acceptable Concentration

Notes

^a OB/USA = Overburden Aquifer and Upper Sandstone Aquifer; ISA = Intermediate Sandstone Aquitard; LSA = Lower Sandstone Aquifer, PW = Paleoweathered Zone; OZ = Ore Zone

^b Field-measured values used for pH and TDS

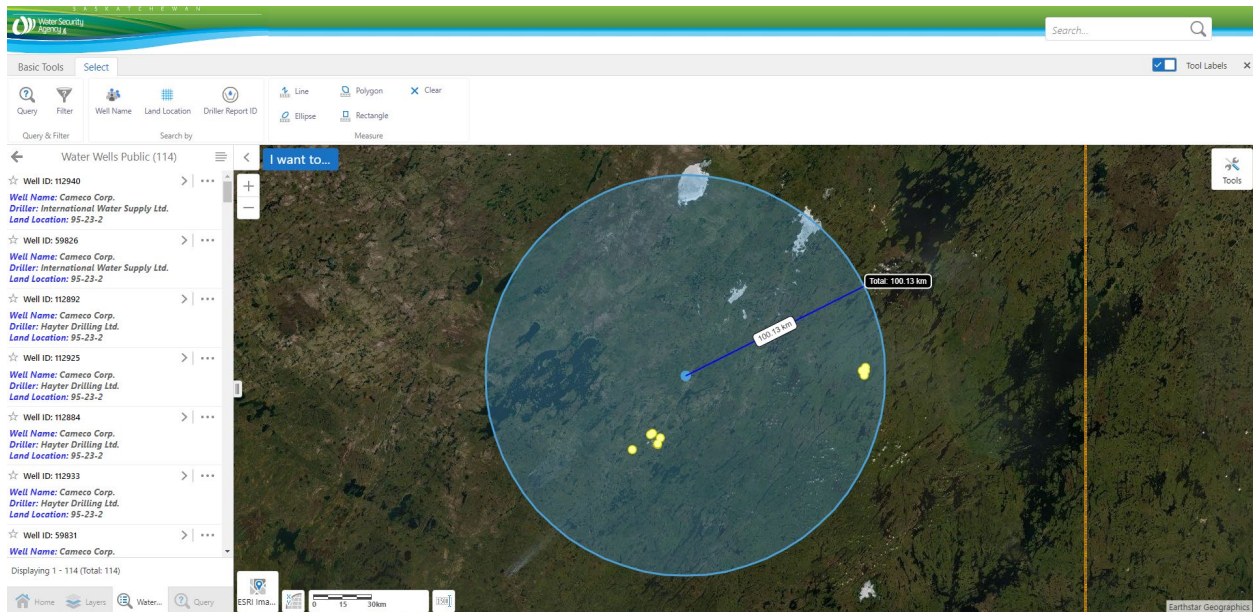
^c Exceedances generally during first sampling event only; suggesting exceedances related to well conditions and not Formation water

Water well Search

The WSA (Water Security Agency), Water Well Information Database. Government of Saskatchewan was last accessed on September 20, 2022. <https://www.wsask.ca/water-info/ground-water/online-driller-reports/>.

Search Details:

- A well radius search was conducted in areas within 100 km of the site (i.e. Denison Phoenix Deposit) using a center point as follows:
 - o Easting 477119.560
 - o Northing 6374214.920
 - o Zone 13V
- There are 141 public well water records within a 100 km radius of the site. Below is a screenshot of the well locations:



Tables I3 and I4 provide well record details.

Table I3: Water Well Records Report within 100 km radius of the Project Area

geometry	GCK_OID	WUID	LID	Well Name	Driller	NTS Maps	Major Basin	Sub Basin	Elevation (ft)	RM	Hole Number	Completion Date	Instal Method
K-11762483.7631309.Y.7811188.04883753.Z.NaH	0112940	95-23-2	Camero Corp.	International Water Supply Ltd.				64	1800	921	W28	1985.05.19	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	1	59848	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	W28	1979.06.09	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	2	112892	95-23-2	Camero Corp.	Hayter Drilling Ltd.			64	1800	921	009	1986.02.08	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	3	112925	95-23-2	Camero Corp.	Hayter Drilling Ltd.			64	1800	921	006	1985.05.27	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	4	112884	95-23-2	Camero Corp.	Hayter Drilling Ltd.			64	1800	921	22A	1986.04.29	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	5	114933	95-23-2	Camero Corp.	Hayter Drilling Ltd.			64	1800	921	W21	1985.06.29	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	6	108811	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800			1979.07.01	Drilled
K-11564976.2681523.Y.7809770.7003821.Z.NaH	7	93672	28-98-12-2	Midwest Joint Venture	Mccell Drilling			35	1580			1988.01.26	Bored
K-11763991.0655179.Y.7809705.5961178.Z.NaH	8	213500	16-95-23-2	Camero Corp.	Elk Point Drilling Corp.	74H03		34	1673	921	GMOTRW-5	2006.05.19	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	9	112928	95-23-2	Camero Corp.	Hayter Drilling Ltd.			64	1800	921	007	1979.06.12	Drilled
K-11763991.0655179.Y.7809705.5961178.Z.NaH	10	103481	12-95-23-2	Camero Corp.	International Water Supply Ltd.			64	1710	921	004	1986.04.18	Drilled
K-11564976.3345077.Y.7872785.7498438.Z.NaH	11	93678	34-98-12-2	Midwest Joint Venture	Mccell Drilling			35	1571			1988.01.28	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	12	112904	95-23-2	Camero Corp.	Hayter Drilling Ltd.			64	1800	921	006	1985.06.10	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	13	112908	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800			1979.06.12	Drilled
K-11763991.0655179.Y.7809705.5961178.Z.NaH	14	121463	16-95-23-2	Camero Corp.	Elk Point Drilling Corp.	74H03		34	1673	921	GMOTRW-8	2006.05.16	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	15	112901	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	003	1985.07.22	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	16	112922	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	003	1985.05.22	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	17	108823	95-23-2	Camero Corp.	International Water Supply Ltd.	74H04		64	1800	921	0000000	1979.06.12	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	18	108844	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800			1979.07.29	Bored
K-11762483.7631309.Y.7811188.04883753.Z.NaH	19	112895	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	D18	1984.12.06	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	20	112887	95-23-2	Camero Corp.	Hayter Drilling Ltd.			64	1800	921	D45	1986.05.02	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	21	112930	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	W17	1985.06.20	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	22	112907	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	009	1985.06.17	Drilled
K-11763991.0655179.Y.7809705.5961178.Z.NaH	23	112907	12-95-23-2	Camero Corp.	International Water Supply Ltd.			64	1710	921	002	1986.05.14	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	24	121912	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	G15	1984.11.01	Drilled
K-11564976.3345077.Y.7872785.7498438.Z.NaH	25	93675	34-98-12-2	Midwest Joint Venture	Mccell Drilling			35	1571			1988.02.01	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	26	112908	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	022	1984.10.23	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	27	112918	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	021	1984.10.04	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	28	112939	95-23-2	Camero Corp.	Hayter Drilling Ltd.			64	1800	921	W27	1985.07.05	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	29	112923	95-23-2	Camero Corp.	Hayter Drilling Ltd.			64	1800	921	004	1985.07.11	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	30	108844	95-23-2	Camero Corp.	International Water Supply Ltd.	74H03		64	1800	921	0000000	1985.06.12	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	31	112890	95-23-2	Camero Corp.	Hayter Drilling Ltd.			64	1800	921	G15	1985.04.22	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	32	112888	95-23-2	Camero Corp.	Hayter Drilling Ltd.			64	1800	921	G11	1986.04.16	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	33	112938	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	010	1985.07.05	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	34	108817	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800			1979.06.12	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	35	105050	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800		C46	1979.04.20	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	36	112902	95-23-2	Camero Corp.	Hayter Drilling Ltd.			64	1800	921	004	1985.07.11	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	37	112915	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	018	1984.09.26	Drilled
K-11564976.2681523.Y.7809770.7003821.Z.NaH	38	93670	28-98-12-2	Midwest Joint Venture	Mccell Drilling			35	1580			1988.01.27	Drilled
K-11564976.3345077.Y.7872785.7498438.Z.NaH	39	93676	34-98-12-2	Midwest Joint Venture	Mccell Drilling			35	1571			1988.01.27	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	40	112907	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800		C39	1979.06.16	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	41	121127	95-23-2	Camero Corp.	International Water Supply Ltd.	74H04		64	1706	921	000000A	1992.02.01	Drilled
K-11564976.2681523.Y.7809770.7003821.Z.NaH	42	93665	27-98-12-2	Midwest Joint Venture	Bennett/Burnford			35	1571			1988.01.23	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	43	112920	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	001	1985.06.13	Drilled
K-11763991.0655179.Y.7809705.5961178.Z.NaH	44	213461	16-95-23-2	Camero Corp.	Elk Point Drilling Corp.	74H03		34	1673	921	GMOTRW-6	2006.05.18	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	45	112936	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	W24	1985.07.08	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	46	112935	95-23-2	Camero Corp.	Hayter Drilling Ltd.			64	1800	921	007	1985.06.12	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	47	112885	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	014	1986.04.27	Drilled
K-11763991.0655179.Y.7809705.5961178.Z.NaH	48	213497	16-95-23-2	Camero Corp.	Elk Point Drilling Corp.	74H03		34	1673	921	GMOTRW-2	2006.05.15	Drilled
K-11564976.3345077.Y.7872785.7498438.Z.NaH	49	93673	34-98-12-2	Midwest Joint Venture	Mccell Drilling			35	1571			1988.02.01	Drilled
K-11763991.0655179.Y.7809705.5961178.Z.NaH	50	108844	12-95-23-2	Camero Corp.	International Water Supply Ltd.			64	1710	921	002	1986.05.10	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	51	112929	95-23-2	Camero Corp.	Hayter Drilling Ltd.			64	1800	921	010	1985.05.15	Drilled
K-11781300.867924.Y.7795417.61173398.Z.NaH	52	234362	NE-20-94-24-2	Valard Construction LP	J R Valard Construction LP	74H04		64	1866	999	GTW13-02	2013.10.13	Drilled
K-11564976.3345077.Y.7872785.7498438.Z.NaH	53	93668	27-98-12-2	Midwest Joint Venture	Mccell Drilling			35	1579	999	0000013	1988.02.01	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	54	112905	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	007	1985.06.17	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	55	112896	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	D20	1984.10.06	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	56	112900	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	020	1985.07.23	Drilled
K-11564976.3345077.Y.7872785.7498438.Z.NaH	57	93666	27-98-12-2	Midwest Joint Venture	Mccell Drilling			35	1579	999	0000011	1988.01.20	Drilled
K-11763991.0655179.Y.7809705.5961178.Z.NaH	58	213462	16-95-23-2	Camero Corp.	Elk Point Drilling Corp.	74H03		34	1673	921	GMOTRW-7	2006.05.18	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	59	112921	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	002	1985.05.20	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	60	108822	95-23-2	Camero Corp.	International Water Supply Ltd.	74H04		64	1800	921	000000C	1979.06.26	Bored
K-11762483.7631309.Y.7811188.04883753.Z.NaH	61	112937	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	W25	1985.07.20	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	62	108825	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800			1985.06.13	Bored
K-11763991.0655179.Y.7809705.5961178.Z.NaH	63	213488	16-95-23-2	Camero Corp.	Elk Point Drilling Corp.	74H03		34	1673	921	GMOTRW-3	2006.05.21	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	64	112886	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	G18	1986.05.10	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	65	112931	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	W18	1985.06.20	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	66	108845	12-95-23-2	Camero Corp.	International Water Supply Ltd.			64	1710	921	G	1985.07.09	Drilled
K-11762483.7631309.Y.7811188.04883753.Z.NaH	67	108840	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800		C75	1979.08.19	Bored
K-11762483.7631309.Y.7811188.04883753.Z.NaH	68	112913	95-23-2	Camero Corp.	International Water Supply Ltd.			64	1800	921	G16	1984.10.11	Drilled
K-11564976.2681523.Y.7													

Table I4: Domestic water well lithology

GCX_OID	cWWDRIId	cdescrip	ccolour	cmaterial	ndepth
1	59826	Fine-medium	Brown	Sand	223
1	59826	Unknown	Unknown	Boulders	237

w

Appendix J Supplemental Water Quality Data

Table J1: Supplemental Groundwater and Surface Water Quality

Well Cluster	Units	Overburden Wells - Gryphon Area					Surface Water Samples; Phoenix Project Area and Downstream							
		DH17-3	DH17-5	MW17-1	MW17-3	DH17-6	LA-5	LA-6	LA-1	LA-1-Bottom	LAB-1	SA-2	SA-6	
Groundwater Monitoring Well		OB	OB	OB	OB	OB	SW	SW	SW	SW	SW	SW	SW	
Lithology		OB	OB	OB	OB	OB	SW	SW	SW	SW	SW	SW	SW	
Sampling Date		7/22/2019	7/22/2019	7/22/2019	7/22/2019	7/22/2019	10-Sep-2016	12-Sep-2016	16-Mar-2018	16-Mar-2018	15-Sep-2016	05-Jul-2019	29-Aug-2019	
Field Parameters														
Field pH	pH units	-	-	-	-	-	9	6.85	7.22	6.51	7.02	6.98	6.86	
Field Temp.	°C	-	-	-	-	-	12	8.61	18.62	11.7	12.6	14	13.8	
Field Conductivity	µS/cm	-	-	-	-	-	13	12	15	16	30	13.7	13.7	
Field SPC	µS/cm	-	-	-	-	-	18	17	17	20	39	17.4	17.5	
Field TDS	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	
Diss. O2	mg/L	-	-	-	-	-	9	10.78	9.22	2.91	9.67	9.11	7.33	
Fe2+	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	
Analytical Results														
Bicarbonate	mg/L	56	48	27	51	46	8	4	10	6	8	5	12	
Carbonate	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Chloride	mg/L	0.7	0.1	0.3	0.3	0.1	0.3	0.4	0.5	0.5	<0.1	0.4	0.3	
Hydroxide	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
P. alkalinity	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
pH	pH units	7.1	7.06	6.98	7.61	7.17	6.95	6.71	6.82	6.8	6.96	7.04	6.93	
Specific conductivity	µS/cm	102	70	62	90	70	19	18	15	14	47	9	11	
Sum of ions	mg/L	87	65	51	80	64	12	8.0	15	12	23	9	16	
Total alkalinity	mg/L	46	39	22	42	38	7.0	3.0	8	5	7.0	4	10	
Total hardness	mg/L	35	28	20	25	30	5.0	5.0	5	5	12	4.0	5.0	
Ammonia as nitrogen	mg/L			<0.04			0.07	0.04	0.03	0.02	<0.01	0.01	0.02	
Nitrate (calc. from NO2+NO3-N)	mg/L	0.04	0.21		0.3	0.22	<0.04	<0.04	0.29	0.6	0.05	0.04	0.04	
Nitrite	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	
Nitrite+Nitrate as nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	
Ortho-phosphate as P	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	
Organic carbon, dissolved	mg/L	-	-	-	-	-	2.1	2.2	2.2	2.2	2.4	2.7	2.6	
Fluoride	mg/L	0.08	0.03	0.07	0.17	0.03	0.02	0.02	0.03	0.02	0.02	0.02	0.01	
Total dissolved solids	mg/L	-	-	-	-	-	22	14	22	22	30	12	18	
Total suspended solids	mg/L	-	-	-	-	-	4	4	<1	<1	1	<1	<5	
Calcium	mg/L	12	10	5.9	8.2	11	1.2	1.2	1.4	1.4	3.8	1.1	1.2	
Magnesium	mg/L	1.3	0.7	1.2	1.2	0.7	0.4	0.4	0.4	0.4	0.6	0.3	0.4	
Potassium	mg/L	1	0.5	1.3	0.8	0.4	0.2	0.2	0.4	0.4	0.3	0.3	0.3	
Sodium	mg/L	7.2	3.6	4.4	11	3.6	1.4	1.4	1.6	1.6	1.8	1.4	1.4	
Sulfate	mg/L	8.8	2.2	11	7	2.2	0.6	0.5	0.8	0.8	8.1	0.6	0.6	

Table J1: Supplemental Groundwater and Surface Water Quality, Continued

Well Cluster	Units	Overburden Wells - Gryphon Area					Surface Water Samples; Phoenix Project Area and Downstream						
		DH17-3	DH17-5	MW17-1	MW17-3	DH17-6	LA-5	LA-6	LA-1	LA-1-Bottom	LAB-1	SA-2	SA-6
Aluminum, dissolved	mg/L	0.0031	0.023	0.008	0.005	0.023	0.0078	0.0093	0.0046	0.0034	0.0025	0.0071	0.0072
Antimony, dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic, dissolved	µg/L	0.9	0.3	0.3	0.8	0.3	0.1	< 0.1	0.1	< 0.1	< 0.1	0.0001	0.1
Barium, dissolved	mg/L	0.029	0.017	0.0061	0.01	0.017	0.0027	0.0027	0.0032	0.0031	0.0035	0.002	0.0022
Beryllium, dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth, dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Boron, dissolved	mg/L	<0.01	<0.01	<0.01	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bromine	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium, dissolved	mg/L	<0.00001	0.00001	<0.00001	<0.00001	0.00002	0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	0.00001
Chromium, dissolved	mg/L	<0.0005	0.0006	<0.0005	0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt, dissolved	mg/L	0.0082	0.0003	0.0002	0.0001	0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper, dissolved	mg/L	0.0025	0.0015	0.0006	0.0003	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Iron, dissolved	mg/L	1.57	0.33	0.14	0.019	0.32	0.19	0.21	0.037	0.036	0.076	0.066	0.1
Lead, dissolved	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lithium, dissolved	µg/L	-	-	-	-	-	-	-	-	-	-	-	-
Manganese, dissolved	mg/L	0.44	0.11	0.2	0.036	0.12	0.020	0.017	0.0039	0.0053	0.041	0.0098	0.013
Molybdenum, dissolved	mg/L	0.0055	0.0025	0.0028	0.026	0.0027	<0.0001	<0.0001	<0.0001	<0.0001	0.0013	<0.0001	<0.0001
Nickel, dissolved	mg/L	0.0007	0.001	0.0005	0.0009	0.001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Selenium, dissolved	mg/L	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silica, soluble, dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Silver, dissolved	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Strontium, dissolved	mg/L	0.044	0.018	0.026	0.03	0.018	0.012	0.012	0.014	0.014	0.017	0.01	0.011
Sulfur	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Thallium, dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Tin, dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium, dissolved	mg/L	<0.0002	0.0002	<0.0002	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Vanadium, dissolved	mg/L	<0.0001	0.0002	<0.0001	0.0002	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc, dissolved	mg/L	0.0035	0.004	0.0027	0.002	0.0028	<0.0005	<0.0005	0.001	0.0016	<0.0005	<0.002	<0.0005
Phosphorus, dissolved	mg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Radionuclides													
Uranium, dissolved	µg/L	<0.1	0.2	<0.1	0.3	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	<0.0001	< 0.1
Uranium-234 calculated	Bq/L	-	-	-	-	-	-	-	-	-	-	-	-
Uranium-238 calculated	Bq/L	-	-	-	-	-	-	-	-	-	-	-	-
Lead-210	Bq/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02
Polonium-210	Bq/L	0.005	<0.005	<0.005	<0.005	0.009	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Radium-226	Bq/L	<0.005	<0.005	<0.005	0.009	0.01	0.008	<0.005	<0.005	<0.005	0.006	<0.005	<0.005
Radon-222	Bq/L	-	-	-	-	-	-	-	-	-	-	-	<0.01
Thorium-230	Bq/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Tritium	Bq/L	-	-	-	-	-	-	-	-	-	-	-	-

Appendix K Geomechanical Report (External Report; RESPEC, 2024)

The information presented in Appendix K was based on the same geologic information as was used herein to develop the regional hydrogeology CSM for the Project. A clarification is provided, however, on differences in terminology for the desilicified zone used between the two reports.

Herein, the desilicified zone was delineated using rock core RQD, friability and fracture frequency (Section 3.4.4). Specifically, to delineate the desilicified zone in the hydrogeology CSM, core with a friability of 3 or greater was interpreted to be hydrothermally altered sandstone of high relative porosity and permeability in comparison to the unaltered Athabasca Supergroup sandstones, through substantive loss of matrix silica content (10% or more; Sorba and Tetland, Personal Communication).

In the RESPEC (2024) report, differentiation was made with respect to the level of desilicification of the altered sandstones using the terms “Altered Sandstone” and “Desilicified Sandstone”. The “Altered Sandstone” was delineated using the same friability criteria as was used in the hydrogeology CSM to define the desilicified zone (i.e., a friability of 3 or more). The “Desilicified Sandstone” was delineated in RESPEC (2024) using a friability of 4 or greater, which represents extreme desilicification of the rock matrix (loss of matrix silica of up to 30% or more; Sorba and Tetland, Personal Communication). The zones of extreme desilicification were differentiated from the rest of the Altered Sandstone and ascribed very conservative average material properties presented in Table 1 of Appendix K. These average material properties included zero cohesion. As the objective of the geomechanical study was to evaluate the potential for bedrock collapse within the freeze wall above the ore zone, it was important to differentiate these zones of no cohesion for a worst-case scenario assessment.

Thus, the linkage between the two studies is as follows: the combined Altered Sandstone and Desilicified Sandstone shown in Figure 2a and 2b of Appendix K correspond to the “Desilicified Zone” shown in this report as Figures 9, 10, 12, and 29.

References

Sorba, C. and Tetland, M. Discussion of Project geology and minerals in once open fractures. Oral communication, Chad Sorba and Mikkel Tetland, Denison Mines to the Ecometrix team.



EXTERNAL MEMORANDUM

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Dana Harris
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cc: Project Central File 02924

From: Neel Gupta
Cody Vining
Brett Dueck
RESPEC
3824 Jet Drive
Rapid City, SD 57703

Date: January 25, 2024

Subject: Results of a Geomechanical Study Investigating the Stability of the Rock Mass in Response to In Situ Recovery of Uranium-Enriched Rock for the Wheeler River Uranium Project (Revision 1)

Denison Mines Corporation (Denison), a uranium exploration and development company, has a flagship Wheeler River Uranium project. This project is the largest undeveloped in situ recovery (ISR) uranium project in Northern Saskatchewan's eastern Athabasca Basin. The project site is located approximately 35 kilometers (km) north-northeast of the Cameco Corporation (Cameco) Key Lake operation and 35 km southwest of the Cameco McArthur River operation in the eastern Athabasca Basin. Denison proposes developing the Phoenix deposit in this region.

At the Phoenix deposit, Denison plans to drill the set of injection/recovery wells for ISR of uranium-enriched rock through leaching with a freeze wall isolating the operations from the surrounding rock mass. In response to the leaching process, the remnant ore zone may displace or fail and may no longer be able to support the overburden load while causing instability in the surrounding rock mass because of the stress redistribution. Denison, therefore, has requested a geomechanical study to analyze the geomechanical stability of the rock mass around the excavation and freeze wall from the leaching process. This memorandum documents the geomechanical study and briefly discusses the study objectives and approach, significant results, and conclusions.

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STUDY OBJECTIVES AND APPROACH

In a recent geomechanical study [Vining et al., 2023], RESPEC Company, LLC (RESPEC) developed a three-dimensional (3D) strip model of a specific geological section where maximum ore extraction is planned to investigate the stability of the mined cavity and estimate the surface disturbance. The boundary conditions of the strip numerical model assumed an infinite array of the modeled cross-section, where ore extraction is maximum, along the length of the Phoenix deposit. Considering the boundary conditions of the strip model and presuming the average material properties of key stratigraphic layers, the numerical model predicted surface displacement of approximately 7.5 centimeters (cm) and marginal stability of the rock mass limited to the extent of 16 meters (m) from the top extent of mined excavation.

The primary objectives of the current study are evaluating the geomechanical stability of the rock mass around the excavation and proposed freeze wall in response to the in situ leaching operations in Zone A of the Phoenix deposit. To achieve the desired objectives, RESPEC modified the previously developed 3D strip model [Vining et al., 2023] to create a full-scale 3D model using the structural finite difference program *FLAC3D* [Itasca Consulting Group, Inc., 2021] while presuming the similar, average material properties of key stratigraphic layers. Considering the computational time and analysis effort, creating a numerical model that extends across the entire extent of Zone A is impractical. Because the *FLAC3D* program imposes a plane of symmetry along its boundaries, RESPEC, in consultation with Denison, simulated the half-length of Zone A, and the modeling domain encompasses the Phoenix deposit's northeast extent, as shown in Figure 1. The vertical extent of the 3D model is assumed to be 1,000 m below ground surface (bgs), and the lateral boundary is approximately 135 m away from the extent of the low-grade ore zone. The model boundaries located far away from the excavation boundaries isolated the influence of model boundaries on the excavation response. The kinematic boundary conditions of the numerical model prevent normal (horizontal) displacements along the four vertical boundaries of the model and vertical displacements of the bottom boundary. These constraints allow the interior portion of the model to move freely. In situ stress data were not available for the Phoenix deposit. The vertical stress was assumed to be lithostatic (i.e., equal to the weight of the overburden) and determined as a function of depth from the weight of the overburden. In rock mass, the horizontal stress is considered isotropic (i.e., maximum and minimum horizontal stress equal to the vertical stress). For instance, at the depth of 400 m bgs, the average in situ vertical stress is approximately 10 megapascals (MPa).

Denison provided the AutoCAD drawings of key stratigraphic layers in the Phoenix deposit, which were used to develop the 3D structural model. Table 1 summarizes these stratigraphic layers. Figure 2(a) presents the elevation view of the 3D model, which illustrates the continually changing elevations and thicknesses of the rock layers, for example, upper and lower clay, sandstone with sulfide, and altered basement. Figure 2(b) illustrates the 3D extent of desilicified sandstone within altered sandstone. Based on the geological model of the Phoenix deposit developed by Denison, the total volume of the desilicified sandstone is approximately 4 percent of the total volume of altered sandstone. Except for the desilicified sandstone and sandstone with sulfide, the modeled stratigraphic units and their material properties are consistent with the 3D strip model in the previous geomechanical study [Vining et al., 2023]. In consultation with Denison, RESPEC assumed the Mohr-Coulomb property of sandstone with sulfide was similar to altered sandstone and the desilicified sandstone was similar to sand [Terzaghi and Peck, 1967].

Random rock removal was adopted to represent the in situ leaching process in the numerical model. Rock removal included the instantaneous excavation of 30 percent of rock by volume from the high-grade ore zone and 3 percent from the low-grade ore zone. According to Denison, high- and low-

grade ore zones are based on the uranium grade and encompass different stratigraphic layers (e.g., upper clay, lower clay, ore zone) within the Phoenix deposit. Denison plans to adopt the freeze wall design for ISR of uranium-enriched rock; therefore, RESPEC explicitly modeled the freeze wall, which was 20 m thick and located at a distance of 15 m from the extent of the low-grade ore zone. Figure 3 presents the vertical extent of the high- and low-grade ore zones on the vertical plane and surrounding freeze wall.

In the numerical simulation, the pressure at the excavation surface was maintained at a pressure equivalent to a wellhead pressure of 0 MPa with a freshwater gradient of 0.01 MPa/m. Considering that the overlying sandstone is fractured and permeable, and the elevation of the potentiometric surface is near the ground level, RESPEC also simulated the influence of porewater pressure on the predicted stresses and displacement, which is consistent with the previous study [Vining et al., 2023].

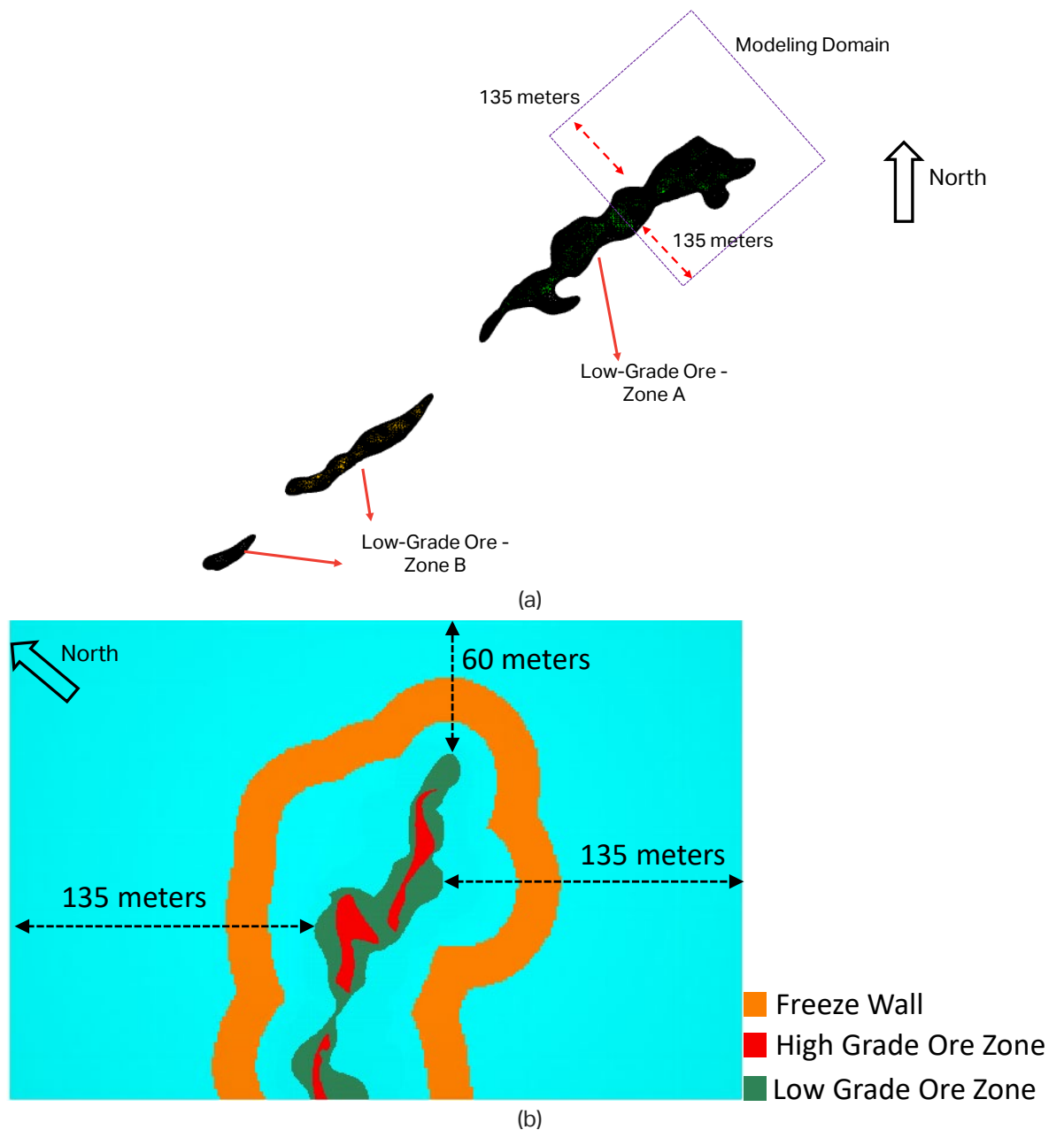


Figure 1. Plan View of the (a) Low-Grade Ore in Zone A and Zone B of the Phoenix Deposit and (b) Extent of Modeling Domain.

Table 1. Average Material Properties

Stratigraphy	Cohesion (MPa)	Friction Angle (degree)	Rock-Mass Compressive Strength (MPa)	Tensile Strength (MPa)	Rock-Mass Modulus (MPa)	Poisson's Ratio (—)	Density (g/cc)
Overburden	1.44	26.93	4.84	4.7	2,241.65	0.20	2.6
Stiff Sandstone	1.44	26.93	4.84	4.7	2,241.65	0.20	2.6
Altered Sandstone	1.07	22.54	3.39	1.0	1,363.76	0.25	2.1
Sandstone with Sulfide	1.07	22.54	3.39	1.0	1,363.76	0.25	2.1
Desilicified Sandstone	0.0	30.0	0.0	0.0	1,363.76	0.25	2.1
Upper Clay	0.03	16.6	0.12	0.20	55.17	0.28	1.7
Ore Zone	0.22	20.11	0.54	0.51	188.75	0.28	4.2
Lower Clay	0.15	18	0.48	0.20	206.43	0.28	1.7
Altered Basement	2.72	25.88	9.17	1.2	4,254.55	0.15	2.1
Stiff Basement	5.57	31.46	20.34	10.7	11,564.83	0.11	2.7

g/cc = grams per cubic centimeter

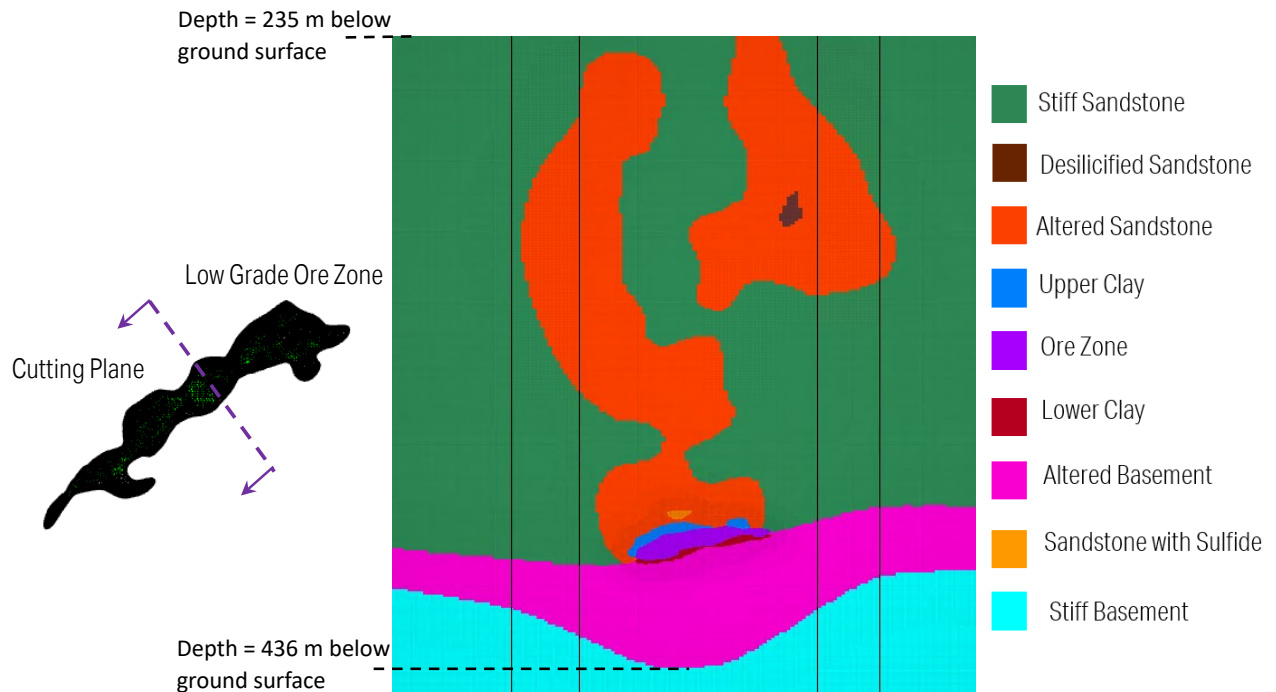


Figure 2(a). Elevation View of the Numerical Model Illustrating Changing Elevation of Different Stratigraphic Units Represented in the Structural Model.

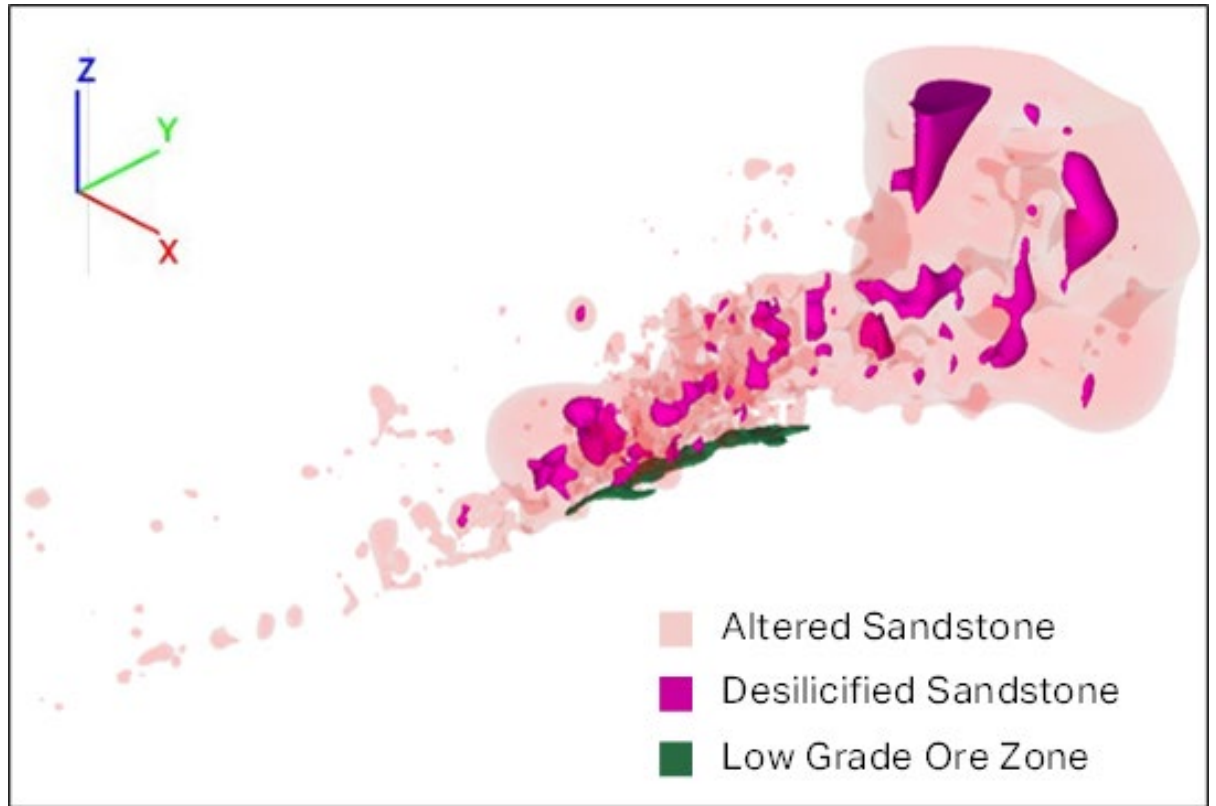


Figure 2(b). 3D Extent of Desilicified Sandstone Within Altered Sandstone at Phoenix Deposit.

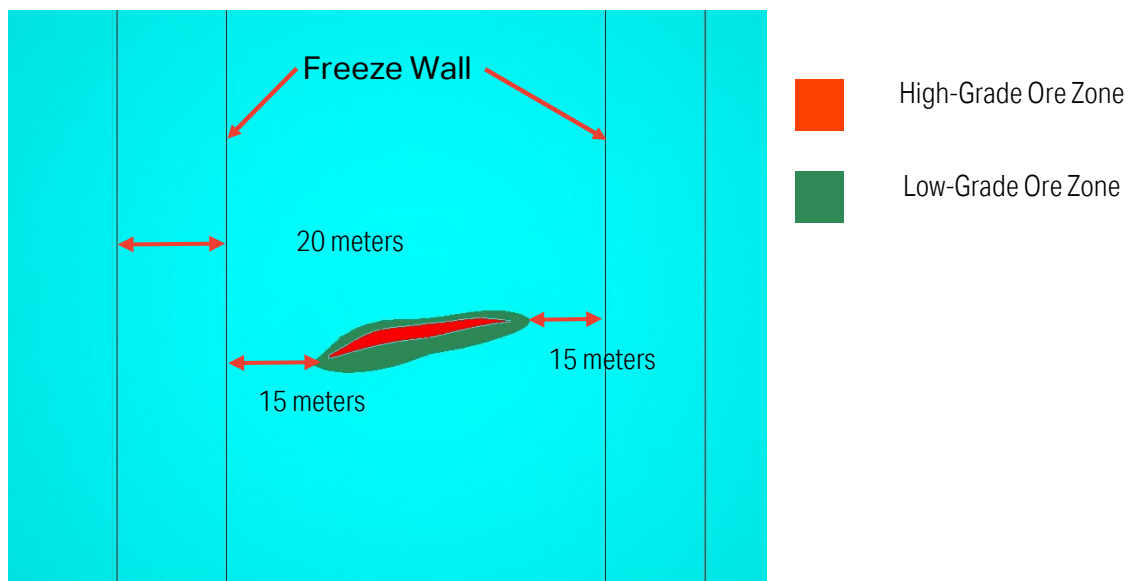


Figure 3. Elevation View of the Numerical Model Illustrating the Relative Location of the Freeze Wall to the High- and Low-Grade Ore Zones in Zone A of the Phoenix Deposit.



RESULTS

The numerical model-predicted stresses and displacements were scrutinized to assess the surface subsidence and the stability of the remaining ore zone, surrounding rock mass, and freeze wall. The outcomes of the numerical simulation are discussed in the following subsections.

ROCK STABILITY

RESPEC simulated the rheological behavior of rock presuming the Mohr-Coulomb constitutive model for each stratigraphic unit to analyze the stress redistribution in case of failure of the remnant rock around the excavation. In the post-simulation analysis, the Mohr-Coulomb Factor of Safety (MCFS) was determined to quantify the competency of the rock mass based on the predicted stress fields. The MCFS value greater than, equal to, or less than 1.0 quantifies the material as not failing, at failure, or failed, respectively. The potential for tensile fracturing in the rock mass was also analyzed using the least compressive principal stress (LCPS). The magnitude of LCPS will be positive at locations where a tensile stress component exists in any direction. Site-specific strength properties of the rock after freezing were unavailable at the time of the study; therefore, RESPEC took a conservative approach and assumed that the properties of the freeze wall were similar to the host rock.

Figures 4 and 5 present the MCFS contour and LCPS contour, respectively, on a horizontal plane passing through the depth of 390, 399, 406, and 413 m bgs. Figures 6 and 7 present the MCFS and LCPS contour on multiple vertical planes. MCFS contour (Figures 4 and 6) presents that the failure conditions (i.e., red contour) are limited within the close proximity (i.e., 5 to 8 m) of the low-grade ore zone, and its lateral extent varies with the depth of the ore zone below the ground surface. However, the MCFS is always greater than 2.50 within the modeled extent of the freeze wall. LCPS contour (Figures 5 and 7) presents that the marginally compressive stress conditions (i.e., yellow and red contours) are predicted within the extent of the low-grade ore zone, and compressive stresses greater than 5 MPa are predicted within the proposed extent of the freeze wall. Figure 8 quantifies the failure volume predicted within the different stratigraphic units. Within the modeled domain of Zone A, the predicted failure volume was approximately 8, 22, 41, and 26 percent of the modeled volume of sandstone with sulfide, upper clay, ore zone, and lower clay, respectively. However, the failure volume is less than 0.02 percent of the modeled volume of stiff or altered sandstone, desilicified sandstone, and altered and stiff basement rock. Additionally, 0 percent failure volume is predicted within the freeze wall.

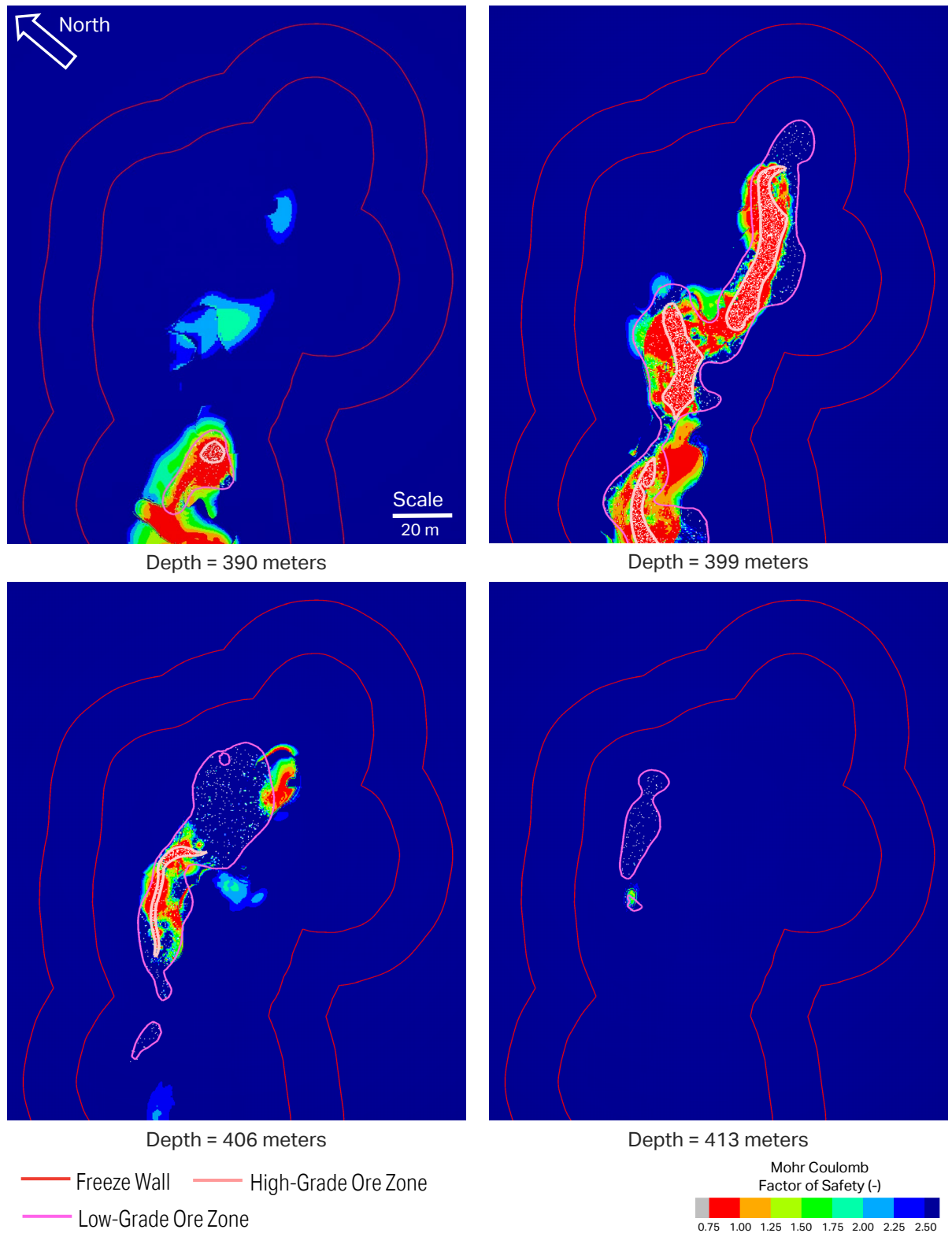


Figure 4. Plot of Mohr-Coulomb Factor of Safety Values on a Horizontal Plane Passing at a depth of 390, 399, 406, and 413 Meters Below Ground Surface.

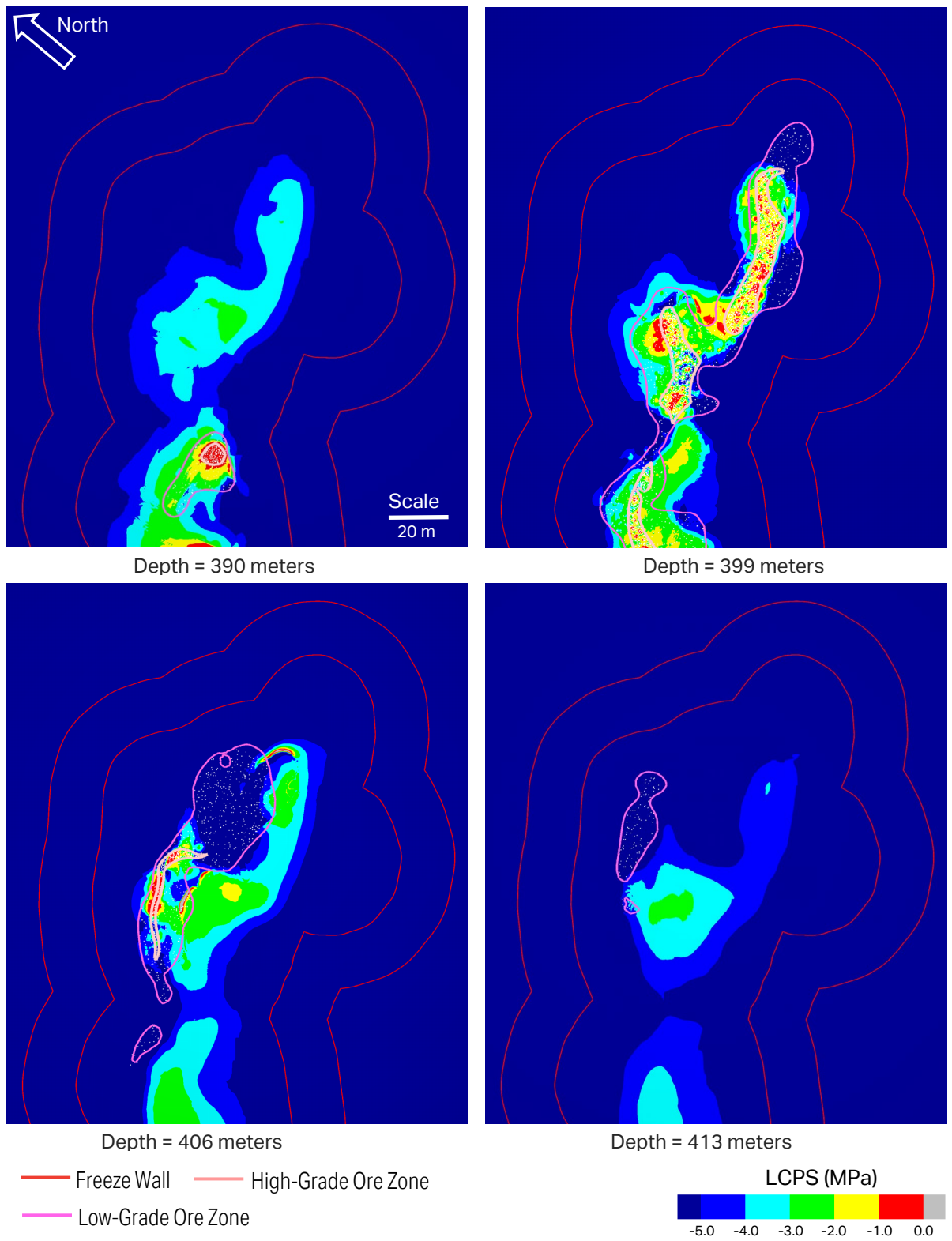
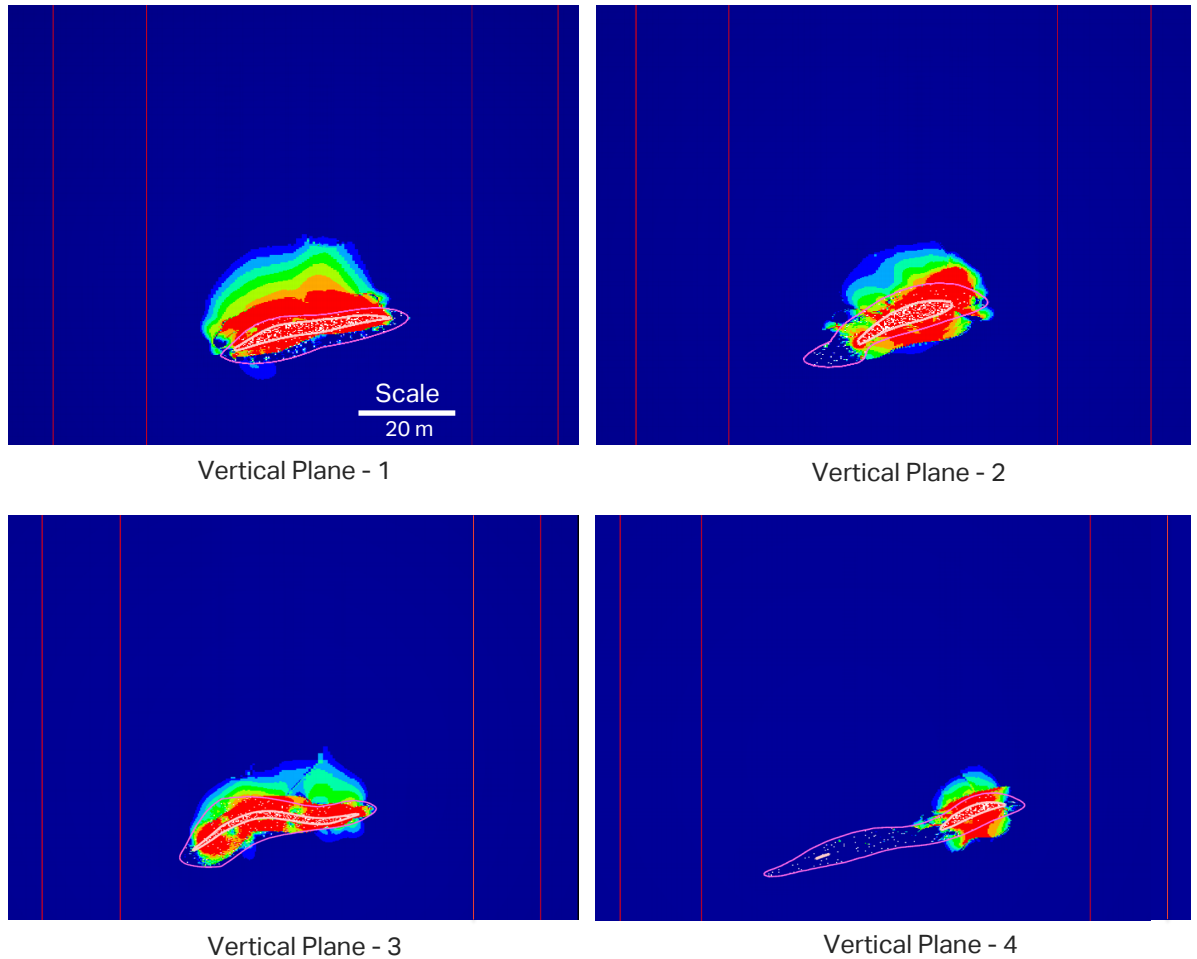


Figure 5. Plot of Least Compressive Principal Stress Values on a Horizontal Plane Passing at a Depth of 390, 399, 406, and 413 Meters Below Ground Surface.



— Freeze Wall — High-Grade Ore Zone
— Low-Grade Ore Zone

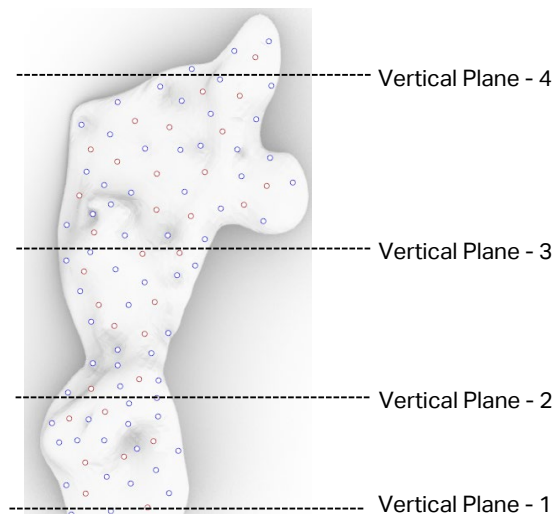
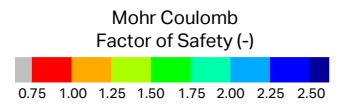
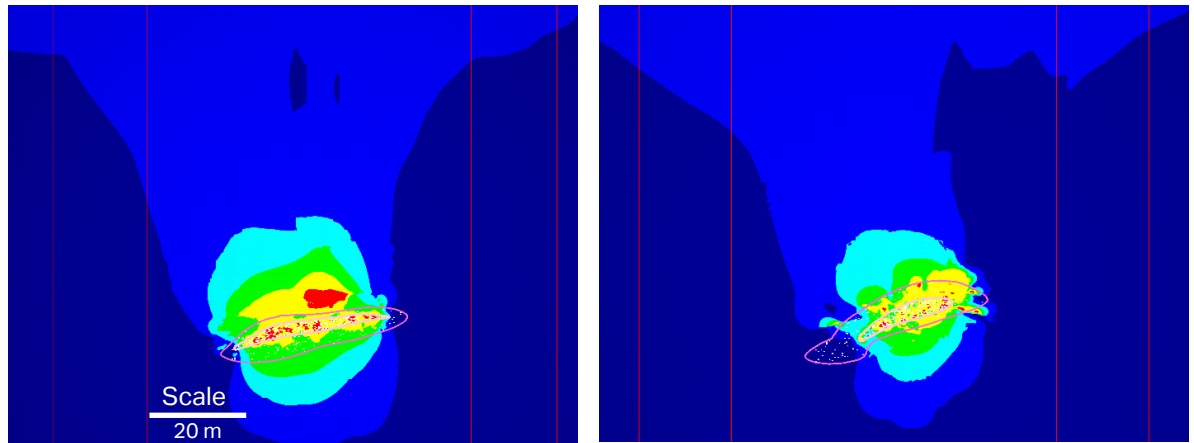
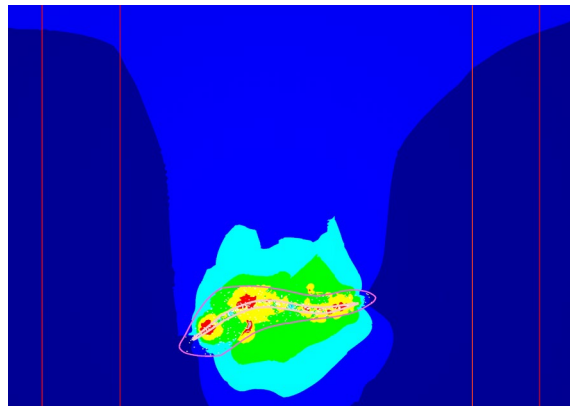


Figure 6. Plot of Mohr-Coulomb Factor of Safety Values on Multiple Vertical Planes.

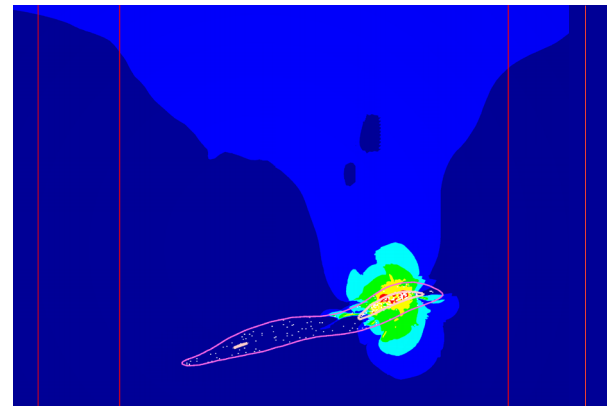


Vertical Plane - 1

Vertical Plane - 2



Vertical Plane - 3



Vertical Plane - 4

— Freeze Wall — High-Grade Ore Zone
 — Low-Grade Ore Zone

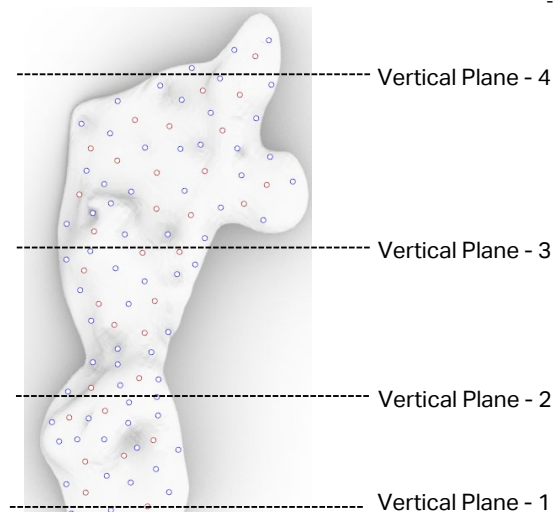
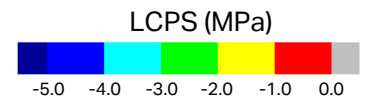


Figure 7. Plot of Least Compressive Principal Stress Values on Multiple Vertical Planes.

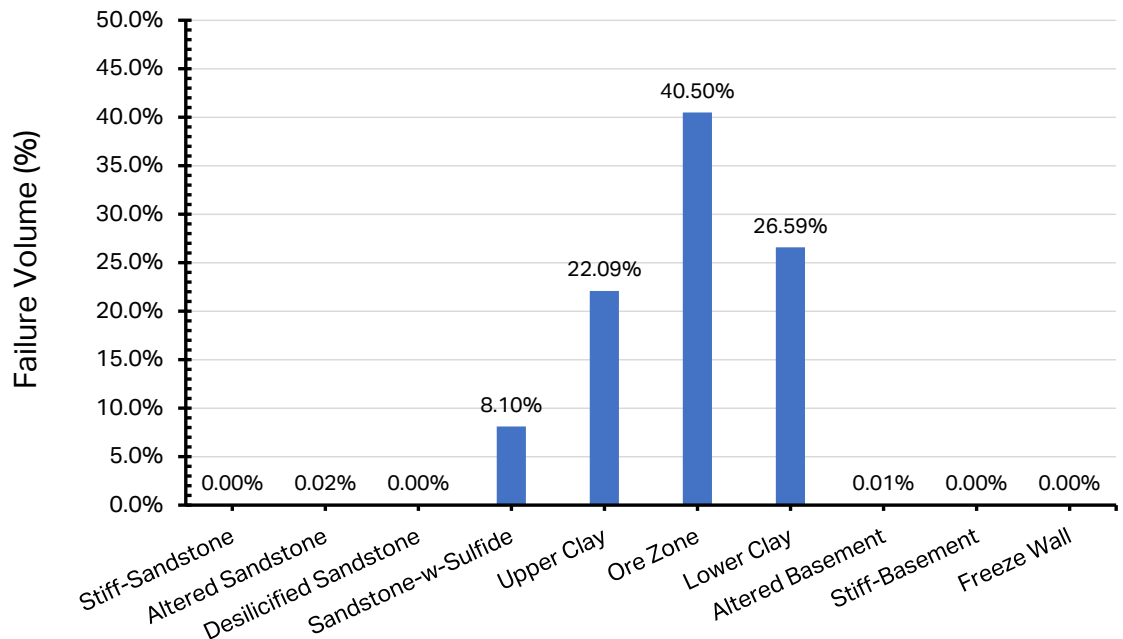


Figure 8. Failure Volume in Different Stratigraphic Units.

SURFACE SUBSIDENCE

In response to the proposed leaching process, the surrounding host rock will displace into the mined cavity, which manifests as subsidence at the ground surface. The numerical model predicted the negligible vertical displacement of approximately 2.5 millimeters (mm) on the ground surface. Figure 9 presents the contours of vertical displacement predicted on a vertical plane passing through the modeling domain's southern boundary. The contour on the vertical plane presents that the vertical displacement of the rock mass immediately above the low-grade ore zone ranges between 42 and 49 cm and quickly reduces to the range between 0 and 7 cm at a distance of 4 to 5 m from the low-grade ore zone. The current study's numerical model-predicted surface subsidence is significantly smaller than the surface subsidence of 7.5 cm predicted in the previous geomechanical study [Vining et al., 2023], which is likely attributed to the difference in the modeling domain and boundary conditions between the two models. In the previous study, the 3D strip model presumed an infinite array of modeled cross sections and corresponding excavation of uranium-enriched rock; in the current study, the full-scale model included the representative extent of Zone A at the Phoenix deposit.

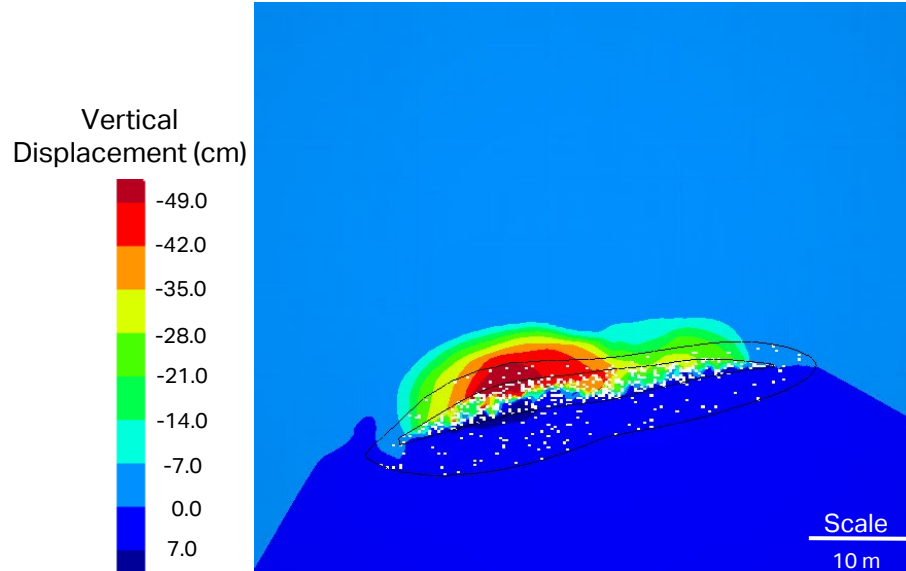


Figure 9. Contour of Vertical Displacement After the Proposed Volumetric Extraction on a Vertical Plane Passing Through the Modeling Domain's Southern Boundary.

CONCLUSIONS

The study objective was to better understand the anticipated response of the surrounding rock mass, particularly the freeze wall, after proposed volumetric rock extraction from the high- and low-grade ore zone. The significant outcomes from this study are as follows:

- / **The geomechanical numerical model predicted stability against shear or tensile failure within the proposed extent of the freeze wall.** Considering the average estimate of the material properties of modeled stratigraphic layers, the predicted failure conditions in the rock mass are limited to 5 to 8 m of the extent of the low-grade ore zone. Within the proposed extent of the freeze wall, the MCFS values are greater than 2.50, and the magnitude of LCPS is greater than 5 MPa in compression, indicating the limited potential of instability in the freeze wall.
- / **The numerical model predicted vertical displacement at the surface in response to the proposed volumetric extraction is negligible.** The vertical displacement of the rock mass near the modeling domain's southern extent is at a maximum immediately above the low-grade ore zone, ranging between 42 and 49 cm, which reduces to the range between 0 and 7 cm at a distance of 4 to 5 m from the low-grade ore zone. At the ground surface, the average vertical displacement is approximately 2.5 mm.

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Appendix L Analysis of Tritium in Groundwater

The potential for tritium concentrations in groundwater to support ageing of groundwater and the development of the CSM for the Wheeler River program was evaluated using the available analytical data and information on tritium concentrations in precipitation.

Analysis

Information considered in the assessment is presented in the following text and associated tables: Table L1 and L2.

- a) Table L1: Provides tritium concentrations in precipitation over time since the 1950s. The source of the tritium data for Canadian locations, including Churchill, Fort Smith and Ottawa, was from the International Atomic Energy Agency Global Network of Isotopes in Precipitation database (GNIP; <https://nucleus.iaea.org/wiser>). Tritium concentrations over time due to radioactive decay were calculated for examination against tritium concentrations in groundwater concentrations for the Wheeler River Project.
- b) Table L2: Provides tritium concentrations measured in groundwater under baseline conditions for the Wheeler River Project. The tritium concentrations highlighted in yellow/orange were analyzed at the André E. Lalonde AMS Laboratory, University of Ottawa. The detection limit of < 15 Bq/L at the Saskatchewan Research council does not support interpretation of tritium concentrations with respect to groundwater flow conditions, considering the discussion below. The detection limit at the University of Ottawa is 0.8 TU (0.095 Bq/L). Tritium values measured in groundwater samples in 2021 at the University of Ottawa were examined further in the context of ageing groundwater for the Project.

Tritium concentrations in groundwater measured for the Wheeler River Project must consider several factors. These include:

- a) Tritium concentrations in groundwater can be used to identify recharge to mostly granular aquifers in the last approximately 68-70 years, since the early 1950s (Cherry et al., 2004); water recharged prior to that time will have tritium values below analytical detection limits. This is shown in Table L1, where groundwater recharged prior to 1952, extrapolated out more than 60 years, has tritium values that are below the analytical detection limit of 0.1 Bq/L.
- b) Maximum tritium concentrations in the precipitation, associated with “bomb tritium” were observed in the early 1960s. At the present time, tritium concentrations in groundwater recharged at that time would be in the range of 14 Bq/L to 53 Bq/L. Values

this high were not observed in groundwater at the Wheeler River Project in 2021, and only in one instance in 2020, which is discussed further below.

- c) Tritium concentrations in precipitation have stabilized from historically high “bomb tritium” values to values of approximately 9-25 Tritium Units (TU), equivalent to 1.1 – 3.0 Bq/L, in the last approximately 20 years.
- d) Tritium concentrations may reflect the influence of drilling fluids, which is generally other groundwater from the site.
- e) Tritium is produced within the uranium ore deposits of the Athabasca region; this is evidenced by tritium concentrations at GWR-032 (Table L2) that were measured to be 950 Bq/L (2020) and 1800 Bq/L (2021) and are higher than can be explained by “bomb tritium”. Tritium production in the ore zone is primarily by neutron capture by ${}^6\text{Li}$ (AECL, 1994). The groundwater sample from the paleoweathered zone (GWR-031; 910 Bq/L) are also considered to be reflecting tritium generation associated with the deposit.

It is Ecometrix’s opinion, based on the above considerations and the discussion that follows, that measurement and analysis of tritium data at the Wheeler River Project is limited in value to conceptual model development, and the current data suggests it raises more questions than can be answered. Tritium concentrations in groundwater will continue to be measured as part of the routine groundwater sampling, to further evaluate the usefulness of this approach for refining the conceptual site model developed for the Wheeler River Project.

Table L1: Calculated Tritium Concentrations in Groundwater based on time period of recharge

Time Periods of Interest for recharge	Tritium concentrations in precipitation		Half-Lives of Tritium				
			1	2	3	4	5
			Years Elapsed				
			12.3	24.6	36.9	49.2	61.5
TU	Bq/L ^a	Tritium concentration measured in Groundwater (Bq/L) ^{b,c}					
Recharged Prior to 1952 (Clark and Fritz, 1997)	8.2E+00	9.8E-01	4.9E-01	2.4E-01	1.2E-01	6.1E-02	3.1E-02
1953, annual average, Ottawa	2.7E+01	3.3E+00	1.6E+00	8.1E-01	4.1E-01	2.0E-01	1.0E-01
1956, annual average, Ottawa	1.5E+02	1.7E+01	8.7E+00	4.3E+00	2.2E+00	1.1E+00	5.4E-01
1959, annual average, Ottawa	5.4E+02	6.4E+01	3.2E+01	1.6E+01	8.0E+00	4.0E+00	2.0E+00
1963, monthly maximum, Fort Smith (NWT)	7.1E+03	8.5E+02	4.3E+02	2.1E+02	1.1E+02	5.3E+01	2.7E+01
1963, annual average, Fort Smith (NWT)	3.8E+03	4.6E+02	2.3E+02	1.1E+02	5.7E+01	2.9E+01	1.4E+01
1969, annual average, Fort Smith (NWT)	4.0E+02	4.8E+01	2.4E+01	1.2E+01	6.0E+00	3.0E+00	1.5E+00
1979, annual average, Ottawa	4.8E+01	5.8E+00	2.9E+00	1.4E+00	7.2E-01	3.6E-01	1.8E-01
1992 Average (Churchill, MB)	1.8E+01	2.1E+00	1.1E+00	5.3E-01	2.6E-01	1.3E-01	6.6E-02
2000-2019, Maximum annual average, Ottawa	2.3E+01	2.7E+00	1.3E+00	6.7E-01	3.4E-01	1.7E-01	8.4E-02
2000-2019, Minimum annual average, Ottawa	9.7E+00	1.2E+00	5.8E-01	2.9E-01	1.4E-01	7.2E-02	3.6E-02
Snow (AECL, 1994) (6 TU)	6.0E+00	7.1E-01	3.6E-01	1.8E-01	8.9E-02	4.5E-02	2.2E-02

Notes

- a Tritium concentrations in TU were converted to Bq/L using the conversion factor of 0.1191 used by the André E. Lalonde AMS Laboratory at the University of Ottawa
- b Yellow Highlighting indicates calculated concentration at approximate present-day (2019-2021)
- c The detection limit for tritium at the André E. Lalonde AMS Laboratory, University of Ottawa in the water samples is 0.8 TU (0.095 Bq/L); Values shown in italics are below the detection limit

Table L2: Summary of Tritium Concentrations Measured in Groundwater for the Wheeler River EIS

Groundwater Well	Hydrostratigraphic Unit	Sampling Date	Tritium Concentration (Bq/L)
GWR-006	OB	2020-08-22	<15
GWR-006		2021-04-14	0.1
GWR-029	LSA	2020-08-30	<15
GWR-029		2021-04-12	0.1
GWR-003	OB	2020-08-16	<15
GWR-003		2021-04-18	1.1
GWR-025	LSA	2020-08-22	<15
GWR-025		2021-04-17	0.4
GWR-008	LSA/DSZ	2020-09-06	<15
GWR-008		2021-04-09	0.5
GWR-009	ISA/DSZ	2020-09-14	16
GWR-009		2021-04-10	1.2
GWR-033	LSA	2020-11-03	<15
GWR-033		2021-05-25	0.5
GWR-034	ISA	2020-10-30	<15
GWR-034		2021-05-24	1.2
GWR-035	USA	2020-11-03	<15
GWR-035		2021-05-24	0.80
GWR-005	OB	2020-08-29	<15
GWR-005		2021-05-22	<0.1
GWR-014	ISA/DSZ	2020-08-29	19
GWR-014		2021-05-21	0.13
GWR-012	LSA/DSZ	2020-08-29	<15
GWR-012		2021-05-23	<0.1
GWR-036	OB	2020-11-05	<15
GWR-036		2021-04-08	0.8
GWR-037	USA/DSZ	2020-10-24	<15
GWR-037		2021-04-09	0.1
GWR-031	PWZ	2020-08-09	<15
GWR-031		2021-06-04	910
GWR-011	LSA/DSZ	2020-08-08	<15
GWR-011		2021-06-01	0.13
GWR-013	ISA/DSZ	2020-08-09	<15
GWR-013		2021-06-02	0.78
GWR-032	OZ	2020-11-01	-
GWR-032		2020-08-08	950
GWR-032		2021-06-04	1800
GWR-046	ISA	9/14/2021	<40
GWR-047	ISA/DSZ	9/10/2021	<40
GWR-048	LSA	9/10/2021	<40

Overburden and Groundwater Wells in the uppermost Upper Sandstone Aquifer

There are three wells monitored as part of the baseline program that are installed in overburden materials: GWR-006, GWR-003 and GWR-005. Two other wells are installed in the uppermost Athabasca Sandstone Group unit (MFd) immediately beneath the overburden. These wells are GWR-036, GWR-035. Tritium values in groundwater wells installed in the overburden and upper sandstone ranged from <0.1 Bq/L to 1.1 Bq/L. Tritium concentrations were 1.1 Bq/L in GWR-003, 0.8 Bq/L in GWR-036 and 0.8 Bq/L in GWR-035. These tritium concentrations in groundwater sampled in these wells is considered to have been recharged in the last 12-25 years. To check alignment between these results and the 3D hydrogeological model, particle tracking was done to estimate minimum groundwater residence times (in years) at each well cluster location. For the overburden unit, the particle tracking results indicated minimum residence times of between 0.5 and 20 years.

Tritium concentrations were at or below the detection limit of 0.1 Bq/L at GWR-006 and GWR-005. Monitoring well GWR-006 is very shallow (screened from 9-15 mbgs), whereas GWR-005 is the deepest of the overburden wells, with a screened interval from 117-123 mbgs. It is considered plausible that the low tritium values reflects the potential for longer residence groundwater times due to heterogeneity in hydraulic conductivities of till material in the overburden. However, tritium concentrations in snow are also lower than in precipitation (AECL, 1994). Thus, it is possible that in the localized areas to those groundwater monitoring wells, materials are lower hydraulic conductivity, and the tritium concentrations are relatively more influenced by snowmelt. Longer residence times in the overburden materials in wells GWR-006 and GWR-005 is supported by higher specific conductance in those wells GWR-003 and GWR-036. Field-measured specific conductance values in GWR-006 and GWR-005 were approximately 150 $\mu\text{S}/\text{cm}$ in 2021, whereas values at GWR-003 and GWR-036 were < 75 $\mu\text{S}/\text{cm}$ in 2021 (Table 3-2 of Appendix 7-A to the EIS).

Deeper Groundwater

Interpretation of tritium values for "ageing" of groundwater was considered inappropriate beyond the shallowest units at the Site. This is because of the relatively low values of tritium in the groundwater in all but the ore zone, and the numerous confounding factors/complexities. Several tritium concentrations are within 1-3 times the analytical detection limits and are thus considered at the limits of interpretability.

One possible confounding factor at low tritium concentrations is contamination of the sample with drilling fluids. Influence of drilling fluids is possibly a factor in the tritium concentrations observed in groundwater well GWR-014. In that well, tritium values in 2020 were measured as 16 Bq/L at SRC. This is the highest value of tritium detected in groundwater in the Athabasca Sandstone hydrogeologic units and was not reproduced when the well was sampled in 2021; the tritium concentration fell significantly to 0.13 Bq/L. The higher relative concentration of tritium in that well is not considered to reflect "bomb tritium" because of the significant change upon resampling, and it is considered possible that the groundwater quality in that well was

influenced by drilling fluids/well construction materials, which was also noted for this well in terms of groundwater quality in the Baseline Report (Appendix 7-A of the EIS). Influence of drilling fluids is also considered the likely explanation for the tritium concentration of 1.2 Bq/L in monitoring well GWR-034. As was noted in the Baseline Report, the water quality in GRW-034 is considered to reflect influence from drilling fluids and additives and is not considered reliable. Tritium concentrations in groundwater will continue to be measured as part of the routine groundwater sampling, to further evaluate the usefulness of this approach for refining the conceptual site model developed for the Wheeler River Project.

Conclusion

The conclusion is that, beyond alignment between some samples in the overburden and the upper sandstone aquifer, tritium concentrations in groundwater do not provide a robust means of ageing groundwater in the subsurface within the LSA.

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