Site Investigation Report
San Juan Mine
Remediation and Restoration Study

Prepared for

New Mexico Energy, Minerals and
Natural Resources Department
Mining and Minerals Division

Prepared by

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Executive Summary

The San Juan Generating Station Facility and Mine Remediation and Restoration Study Act (Section 74-4H-1 to 74-4H-4, NMSA 1978) (the Act) was created to require the New Mexico Energy, Minerals and Natural Resources Department (EMNRD) and the New Mexico Environment Department (NMED) to investigate the San Juan Mine and San Juan Generating Station for potential environmental impacts and to enforce remediation and restoration if necessary. EMNRD is responsible for investigation of the mine, while NMED is responsible for investigation of the generating station. The purpose of this report is to fulfill the first requirement of Section 74-4H-3 of the Act on behalf of EMNRD, which is to thoroughly investigate the San Juan Mine to evaluate if any environmental impacts have affected lands and waters on the mine site or adjacent to the mine site. Daniel B. Stephens & Associates, Inc. (DBS&A) used the data evaluated in our quality assurance/quality control (QA/QC) documentation report to characterize the San Juan Mine and surrounding areas for the San Juan Mine remediation and restoration study. The results of this report will be presented to the state legislature as required by Section 74-4H-3 of the Act.

The San Juan Mine is in San Juan County, New Mexico north/northeast of the town of Kirtland and the unincorporated communities of Fruitland and Waterflow. South of the mine is the closest major waterway, the San Juan River, which flows west, is fed upstream of the mine by the Animas and La Plata Rivers, and is fed downstream of the mine by the Chaco River. The surface topography of the mine generally slopes south/southwest toward the San Juan River. Regional climate for the mine site area is classified as arid to semiarid and vegetation cover is primarily Great Basin Desert Scrub, with areas of urban and farmland cover south of the mine near the river. Mining activity began as surface mining in the early 1970s and continued until 2002, when operations shifted to underground mining. Underground mining continued until cessation of mining in 2022. Coal from the San Juan Mine was supplied to the adjacent San Juan Generating Station and coal combustion by-products (CCBs) produced at the station, consisting of fly ash, bottom ash, and flue gas desulfurization material, have been buried in the former surface pits on the mine site.

Four ephemeral drainages cross the mine property and drain into the San Juan River: Hutch Canyon, Shumway, Stevens, and Westwater Arroyos. Westwater and Hutch Canyon Arroyos feed into the Shumway, which flows toward the southwest into the San Juan River. Stevens Arroyo flows directly into the San Juan River. Diversions have been constructed for Hutch Canyon, Shumway, and Westwater Arroyos to allow stormwater flows to circumvent pits and stockpiles at the mine site. An abandoned branch of Shumway Arroyo created by these diversions, known as the Shumway Arroyo Backwater Reach, feeds into Shumway Arroyo south of the generating station and west of the Juniper Pit. Stormwater impoundments have been constructed throughout the mine site to prevent the flow of stormwater from disturbed areas from entering the arroyos.

Groundwater is found in three distinct hydrologic units at the San Juan Mine. The uppermost unit is groundwater in alluvial sediments found in Shumway and Westwater Arroyos. Beneath the alluvial groundwater is the Fruitland Formation. Most groundwater in the Fruitland Formation is found within the No. 8 Coal Seam near the contact with the underlying Pictured Cliffs Sandstone; however, some groundwater is found above the coal seam near the contact with the overlying alluvium. Groundwater is also present in the Pictured Cliffs Sandstone throughout the mine site. Beneath the Pictured Cliffs Sandstone is the Lewis Shale, an aquitard. There is potential for water from each of these three units to enter the backfilled pits. The pits are currently mostly unsaturated due to the low permeability of fill material. More than 30 wells are completed in the fill, alluvium, Fruitland Formation, and Pictured Cliffs Sandstone across the mine site. Hydraulic conductivity and groundwater yields are low and water quality is poor for all three water-bearing hydrologic units. Two groundwater recovery systems have been constructed on site to capture impacted alluvial groundwater. The San Juan Generating Station operates these systems. One system, the Shumway Recovery Trench, is located just downgradient of the confluence between Westwater Arroyo and the Shumway Arroyo Backwater Reach. The second system, the Memorial Trench Recovery System, is located upgradient of the first system between it and the San Juan Generating Station.

Environmental data used for the San Juan Mine remediation and restoration study were obtained from EMNRD’s Mining and Minerals Division (MMD) via e-mail or downloaded from MMD’s website. These data originated from various sources, including the U.S. Geological Survey (USGS), MMD, and Westmoreland Coal Company, the current owner/ operator of the San Juan Mine. The data acquired include climate data, borehole and well logs, survey data for monitoring locations, depth to groundwater measurements at site monitor wells, groundwater quality data, surface water quality data, mine facility data, regraded spoil data, CCB analytical results, pumping and slug test data, location data for nearby wells, and stormwater flow event data. Numerical data, such as depth to groundwater and water quality data, were compiled into an MS Access database in order to use the data to create hydrographs and time-series plots of water quality data and to perform statistical analyses. Spatial datasets, such as monitor point survey data, were compiled into a geographic information system (GIS) to produce maps of the mine in relation to surrounding areas. DBS&A has documented the quality and usefulness of the existing data in the QA/QC documentation report.

Data reviewed by DBS&A demonstrate that groundwater of the San Juan Mine is of poor quality and limited quantity. Impacts to groundwater in water-bearing bedrock (i.e., the Fruitland Formation and Pictured Cliffs Sandstone) through mining activity, if any, cannot be meaningfully distinguished from the regionally poor quality of groundwater in these units. These units have very low yields in addition to their poor quality; there is virtually no beneficial use potential from these units in the vicinity of the mine. Alluvial groundwater in the vicinity of Westwater and Shumway Arroyos appears to also be of naturally poor quality; however, the lack of conclusive background data limits this conclusion. The most upgradient alluvial monitor well (QNT), which has elevated constituent concentrations, is located near anthropogenic disturbance (i.e., area of form ponds and former Piñon Pit). NMED is planning to have a new monitor well installed further upgradient of QNT to better establish background water quality. Some of the poor quality appears to be attributable to the generating station; releases from the generating station to Westwater Arroyo are documented. The San Juan Generating Station operates recovery systems (i.e., Memorial Trench Recovery System and Shumway Recovery Trench) to intercept the poor-quality alluvial groundwater.

Surface water quality is better than that of groundwater. The impoundments and best management practices (BMPs) used by the mine to contain the flow of stormwater from mine-disturbed areas have been effective. Stormwater discharges from impoundments to the local arroyos are rare, as evidenced by monitoring at National Pollutant Discharge Elimination System (NPDES) outfalls. The stormwater impoundments are sufficiently sized; therefore, the NPDES outfalls are almost always dry. Releases from the generating station to Westwater Arroyo are documented. Surface water monitoring sites located along Westwater Arroyo downgradient of the generating station and mine (i.e., SWM #4 and SWM #6) exhibit elevated boron, sulfate, and TDS concentrations.

San Juan Mine groundwater has two primary potential receptors: downgradient off-site water supply wells completed in the San Juan River alluvium and the river itself. DBS&A addressed possible adverse effects to human health and the community by considering the flow of poor-quality groundwater from the mine to these receptors. The two potential seepage pathways from the mine to these receptors are (1) the Shumway Arroyo alluvial system and (2) transport through the water-bearing bedrock. Neither pathway is likely to convey impacted groundwater from the mine in the near future due to the generating station's operation of the two alluvial groundwater recovery systems (i.e., Memorial Trench Recovery System and Shumway Recovery Trench) and low hydraulic conductivities of the bedrock hydrologic units (Fruitland Formation and Pictured Cliffs Sandstone). The estimated time for site water to reach the river through the water-bearing bedrock is in excess of 2,000 years. Also, oil and gas pumping has altered the groundwater gradient of the bedrock units away from the natural gradient toward the San Juan River, further restricting the bedrock pathway.

DBS&A identified two areas of primary concern: (1) alluvial groundwater beneath Westwater Arroyo and the Shumway Arroyo Backwater Reach (SABR) and (2) sediment of Westwater Arroyo that appears to be impacting surface water quality. Although the existing data are sufficient to characterize most conditions, some additional data are needed. They include (1) an additional monitor well placed further upgradient from existing well QNT to better establish background alluvial water quality, (2) completing (possibly nesting) two additional wells near the same location as the new background alluvial well and screening them separately in either Fruitland Formation or Picture Cliffs Sandstone, and (3) sediment sampling and leach testing of the samples to determine whether sediments are impacted and constituents are being remobilized during storm events. Recommendations are also offered in the report to assist with data acquisition and interpretation.

1. Introduction

Daniel B. Stephens & Associates, Inc. (DBS&A) prepared this site investigation report for the San Juan Mine remediation and restoration study on behalf of the New Mexico Energy, Minerals and Natural Resources Department (EMNRD). The San Juan Mine is in San Juan County, approximately 10 miles west of Farmington, New Mexico (Figure 1). It consists of a former underground mine area, former pits (e.g., Piñon and Sage Pits), and the existing Juniper Pit, which is currently being backfilled (Figure 2). For approximately 50 years (1973 through 2022), the mine supplied coal to the adjacent San Juan Generating Station, which is now closed and is being demolished. This report describes groundwater and surface water conditions at the mine based on existing data collected at the site, previous studies, and other publicly available information. It is a desktop investigation. Its purpose is to support future decisions regarding permitting and remediation and restoration at the site.

The San Juan Generating Station Facility and Mine Remediation and Restoration Study Act (Section 74-4H-1 to 74-4H-4, NMSA 1978) (the Act) became effective on July 1, 2023, and tasks EMNRD with characterizing environmental conditions at the San Juan Mine. The New Mexico Environment Department (NMED) is responsible for investigation of the San Juan Generating Station. Section 74-4H-3 of the Act authorizes EMNRD to contract with environmental consultants to conduct the study of the San Juan Mine. This includes investigation to determine the extent of any environmental contamination and development of a restoration and remediation planning document if necessary. Addressing possible adverse effects to human health and community resilience, particularly resulting from groundwater contamination, is also required by Section 74-4H-3. EMNRD contracted with DBS&A to perform these tasks.

Several groundwater monitor wells and surface water sampling sites exist at the San Juan Mine and have been monitored for decades, providing a long history of water quality data for the mine. DBS&A used these existing data, along with other publicly available information, to characterize environmental conditions at the mine. The characterization includes assessment of potential mine impacts to groundwater and surface water and identification of data gaps. The desktop investigation presented herein will be used to determine whether a separate remediation and restoration planning document is necessary and if so, to support its development.

2. Background

The following subsections describe the requirements of the San Juan Generating Station Facility and Mine Remediation and Restoration Study Act and summarize the mine's history and general site characteristics.

2.1 Sections 74-4H-1 to 74-4H-4, NMSA 1978

New Mexico House Bill 142 was passed by the 56th New Mexico State Legislature on April 5, 2023. Its passage created the San Juan Generating Station Facility and Mine Remediation and Restoration Study Act (Sections 74-4H-1 to 74-4H-4, NMSA 1978) (the Act). The Act requires NMED and EMNRD to investigate, plan, oversee, monitor, and enforce remediation and restoration at the San Juan Mine Generating Station Facility and San Juan Mine, respectively. EMNRD is responsible for activities at the San Juan Mine, while NMED is responsible for activities at the San Juan Generating Station.

Requirements of the Act include (1) conduct a comprehensive study of the generating facility and mine to determine if there have been any environmental impacts to lands and waters on or adjacent to the generating facility and mine and (2) develop reclamation and restoration plans that provide environmental protection and prevent the migration of contaminants and off-site pollution. The purpose of these requirements is to make the generating facility and mine acceptable for post-mining purposes that protect natural resources and the aesthetic value of adjoining areas. Proposed post-mine land uses are grazing and wildlife habitat (Westmoreland, 2019).

The Act requires that EMNRD and NMED provide and present their remediation and restoration studies to the state legislature. The presentations will be given to the legislative interim committee that deals with water and natural resources.

2.2 Site History

Mining began at the San Juan Mine in the early 1970s after over a decade of prospecting and exploration. The U.S. Office of Surface Mining Reclamation and Enforcement (OSMRE) approved an environmental impact assessment (EIA) for the site in 1973. At the start of mining, the mine was owned by the Western Coal Company (formerly the New Mexico Public Service Coal Company) and was operated by Utah International, Inc. (UII). Coal was mined from a surface strip mine, which was expanded in 1976 after OSMRE approved another EIA. UII became the owner of the mine in 1980. Mining operations were continuous from the 1970s—through a shift to underground mining in October 2002—until operations were halted in September 2011 due to an underground fire. The mine began operations again in June 2012. UII was acquired by BHP Billiton in the early 1980s. BHP Billiton owned the mine and the San Juan Coal Company (New Mexico Coal) operated the mine through the early 2010s, until Westmoreland Coal Company (Westmoreland) became the owner and operator in February 2016 (Nickelson, 1988; Stewart, 2018; OSMRE, 2019).

Coal combustion byproducts (CCBs) produced at the San Juan Generating Station have been buried in the former surface-mine pits at the San Juan Mine since operations began in the early 1970s (Stewart, 2018). CCBs are composed of fly ash, bottom ash, and flue gas desulfurization material. Characteristics and potential mobility of contaminants from these materials have been previously investigated, as described in Section 6.

3. Location and Setting

The San Juan Mine is in northern San Juan County, New Mexico (Figure 1), within several sections of Township 30 North, Range 15 West. Kirtland, Fruitland, and Waterflow are the nearest town and unincorporated communities to the mine. They are all located south or southwest of the mine. The cities of Farmington, Aztec, and Bloomfield are also close to the mine and are located to the east. South of the mine, the San Juan River flows to the west and is fed by the Animas and La Plata Rivers upstream of the mine, as well as the Chaco River downstream. Appendix A is a map created using the New Mexico Oil Conservation Division (OCD) Oil and Gas Map Application that shows water bodies near the San Juan Mine. This application is accessible through the OCD website (http://www.emnrd.state.nm.us/OCD/ocdgis.html).

3.1 Geography and Climate

Figure 3 shows a U.S. Geological Survey (USGS) topography map of the mine and surrounding area. Elevations within the mine permit boundary range from about 5,160 feet above mean sea level (feet msl) to about 5,720 feet msl. The topography generally slopes toward the southwest, with a few areas sloping directly toward the south.

The climate for the region is characterized as arid to semiarid with potential evaporation exceeding precipitation. A National Weather Service (NWS) reporting station located in

Fruitland, New Mexico (5,220 feet msl) about 3 miles from the mine reports an average annual precipitation of 8.26 inches. On-site weather stations report an average annual precipitation of 9.67 inches. In Farmington, New Mexico, average annual net evaporation is estimated to be 49 inches (Westmoreland, 2022). A USGS study on the San Juan Mine area reports an average annual precipitation rate of 9.66 inches, an estimated potential evapotranspiration range of 24 to 35 inches, and an annual average pan evaporation rate of 66.81 inches (Stewart, 2018).

The majority of the mine area vegetation is considered to be Great Basin Desert Scrub while the southernmost part of the mine property extends into urban or farmland cover (Thomson et al., 2012).

3.2 Soils

Figure 4 shows the soil coverage over the mine area. Most of the mine area (from northwest to the central area) is covered by the gently sloping Blancot-Notal association and extremely steep Badland outcrops. In the southwest part of the mine, the primary soils are the very steep Haplargids-Blackston-Torriorthents complex and the less steep Avalon sandy loam. The eastern part of the mine has more extremely steep badlands as well as the moderately steep Farb-Persayo-Rock outcrop complex.

3.3 Geology

Figure 5 shows a general geology map of the mine and nearby areas. Quaternary-age alluviums (Qcf and alluvium of the Quaternary Naha and Tsegi Formations [Qnt]), eolian sand (Qes), and terrace gravels (Q) sit atop much of the exposed geology on mine property, which is Cretaceous-age Kirtland Shale (Kk) and Fruitland Formation (Kf). The oldest outcropping unit on site, Pictured Cliffs Sandstone (Kpc), is also present. Alluvium is present along drainages channels and may be incised into underlying geologic units (e.g., Qnt). The Kirtland Shale is composed of three different members, all of which are present on site. The youngest and oldest members (the Upper Shale Member [Kku] and Lower Shale Member [Kkl], respectively) are green-gray shales with black carbonaceous beds and minor amounts of sandstone. The Farmington Sandstone Member (Kkm) is positioned between the two shale members, and consists primarily of tan-colored sandstone. Below the Kirtland Shale is the Fruitland Formation, which consists of gray to black shale, light brown sandstone, and coal. The oldest unit exposed on site is the Pictured Cliffs Sandstone, which is a tan, marine sandstone. Several older units that underlie the units exposed on-site outcrop in a monocline hogback to the west of the mine (known only as “the Hogback”). These Cretaceous-age units include the Lewis Shale (Kl), Cliff

House Sandstone (Kch), and Menefee Formation (Kmf); the Cliff House Sandstone and the Menefee Formation belong to the Mesaverde Group (Ward, 1990).

The alluvium of Shumway and Westwater Arroyos is derived mainly from reworked Qnt, with larger clasts derived from nearby outcrops of the Cretaceous rocks (Strobell et al., 1980; Metric, 1982). Both Qnt and Qnt-derived alluvium may be remobilized, remixed, and redeposited during ephemeral flow events.

3.4 Surface Water and Groundwater Resources

Appendix A is a map created using the OCD Oil and Gas Map Application that shows water bodies near the San Juan Mine. This application is accessible through the OCD website (http://www.emnrd.state.nm.us/OCD/ocdgis.html). It is a comprehensive reference for identifying and mapping surface water features and local water systems in New Mexico.

South of the mine, the San Juan River flows to the west and is fed by the Animas and La Plata Rivers upstream of the mine, as well as the Chaco River downstream. Several agricultural fields are located along the San Juan River and New Mexico Highway 64 (NM 64), which parallels the river (Appendix A). Water from the river is used to irrigate the fields. Irrigation water is conveyed through canals and ditches. Farther south are more agricultural fields that appear to be watered using center-pivot irrigation, as the shapes of most fields are circles. The San Juan River and La Plata River and their associated alluvial groundwater systems are important sources of drinking and irrigation water in the vicinity of the mine (Stewart, 2018). The New Mexico Office of the State Engineer (OSE) lists 246 active water supply wells, or points of diversion (PODs), in the vicinity of the mine, as shown in Figure 6. This information was obtained from the OSE PODs geographic information system (GIS) layer that includes POD locations extracted from the OSE Water Administration Technical Engineering Resource System (W.A.T.E.R.S.) database as of May 1, 2025 (NMOSE, 2025). The PODs include 211 domestic wells, 13 irrigation wells, 8 livestock wells, 3 municipal supply wells, and 11 industrial or commercial wells. Most of these wells have a total depth less than 100 feet and are located near the San Juan and La Plata Rivers, although a small number of wells are completed to depths of several hundred feet. The shallower wells are likely completed in alluvial sediments along the rivers.

4. Site Reconnaissance

DBS&A conducted a site reconnaissance on May 9, 2024 with representatives from MMD and Westmoreland. The purpose of the site reconnaissance was to familiarize DBS&A with site conditions, operations, and existing features of the mine's environmental monitoring program (e.g., stormwater samplers and wells). Photographs of site conditions during the site reconnaissance are provided in Appendix B. They include pictures of the stormwater retention ponds, NPDES outfalls, monitor wells, Juniper Pit, and reclamation activities.

5. Public Notice and Outreach

Input taken from the public was also considered for the San Juan Mine Remediation and Restoration Study. DBS&A set up a website for the public to comment on the study (sanjuanmine.com). The website included a form to submit comments, as well as a link to the EMNRD government site, where information on the San Juan Mine is posted. This comment website was live from August 5 through September 19, 2024, and was intended to collect comments to be answered at a public meeting. The public notice also included information on this public meeting, which was held at the San Juan College campus in Farmington, New Mexico on September 26, 2024. Public notices containing this information were distributed through a local newspaper and two local public radio stations, as well as eight official mailings to municipalities and tribes in the area surrounding the San Juan Mine.

The newspaper advertisement was presented in the *Tri-City Record*, a Farmington area newspaper, once a week on Fridays for five weeks, from August 23 to September 20, 2024. This advertisement was published in the paper's legal section in both English and Spanish, directed the public to comment on the San Juan Mine study, and called attention to the public meeting. A shorter version of the newspaper advertisement (to fit within the 30 seconds allowed by the radio stations) was aired on a couple of local radio stations in the Four Corners area: KSUT Public Radio and KTNN 660 AM/101.5 FM (the Voice of the Navajo Nation). Public notice was aired on each station three times per day for a period of 45 days from August 5 to September 19, 2024. The radio public notice also directed the public to comment and advertised the public meeting. Official mailings of the public notice were sent to eight entities located around the San Juan Mine: the San Juan County seat, two municipalities (the City of Farmington and the Town of Kirtland), and five tribal entities (the Ute Mountain Ute Tribe, three Navajo Nation Chapters [San

Juan, Upper Fruitland, and Nenahnezad], and the Navajo Nation Environmental Protection Agency [NNEPA]).

Only one comment was posted to the site before the public meeting (Table 1). Due to the low volume of comments, the meeting mainly consisted of an overview presentation of the San Juan Mine. Only one person attended the public meeting. Therefore, a second opportunity for public comment was open from October 4 through 30, 2024 and was advertised in the *Tri-City Record*. During this second period, an additional comment was made (Table 1).

6. Overview of Existing Studies and Data

6.1 Previous Studies

Several published studies on the San Juan Mine and its potential impact on environmental resources are available and were reviewed for this site investigation report. These studies discuss conditions and resources in the vicinity of the mine and evaluate operations (e.g., mine dewatering and pit backfilling with CCBs) that may affect water resources (e.g., groundwater levels and quality). Findings and conclusions of each report are summarized in the following subsections.

6.1.1 Stewart (2018)

USGS published a modeling study of the San Juan Mine in 2018 (Stewart, 2018). It presents findings from an analysis into the site-specific post-mining hydrologic characteristics of the San Juan Mine. The analysis was conducted using numerical groundwater flow modeling (i.e., MODFLOW-NWT and MODPATH). USGS developed a MODFLOW-NWT model of the site to estimate the time it will take for groundwater to recover to pre-mining steady-state conditions and to determine potential groundwater flow paths from CCB storage areas toward other hydrologic features in the area around the mine. The underground mine was dewatered during operations, and groundwater levels are expected to rise (recover) post-mining.

Inputs for the model include data on general and hydrologic characteristics of the study area. The study area used in the report is a 234-square mile area bounded by the Hogback (to the west), the San Juan River alluvial groundwater system (to the south), and a groundwater divide east of the La Plata River. This study area fully encompasses the San Juan Mine permit area. General descriptions of the study area in the report include physiography, regional climate, local climate (temperature, precipitation, and evaporation), land use, geologic history, and geologic structure. Hydrologic characteristics include the area's surface water system, which includes rivers, arroyos (or ephemeral drainage channels), natural ponds, lakes, seeps, springs, industrial process ponds, and irrigation, as well as the area's hydrostratigraphic framework, which includes specific characteristics of geologic and hydrologic units.

The report cites Stone et al. (1983), which recognizes Quaternary alluvium and Cliff House Sandstone as the most important water-bearing units in the region. Alluvium is present along the site's ephemeral wash, where it does contain groundwater of poor quality. Cliff House Sandstone depth is greater than 600 feet in the region (including the mine), except possibly at the Hogback. This depth limits its use as a water supply according to the report.

The report concludes that groundwater at the CCB storage areas, which are located at various places along the west side of the mine site (Figure 2), will recover to the pre-mining steady state or to a new steady state between 6,600 and 10,600 years after dewatering ends. The time range varies because it is dependent on distance from the residual cone-of-groundwater depression at the underground mine. The report also concludes that the majority of potential groundwater flow paths originating from the CCB storage areas are toward the west, south, and southeast. A few flow paths originating from the southeastern corner of the CCB storage areas and traveling in a southern direction reach the San Juan River around 2,400 years after mining operations end. Most other pathways will likely enter the alluvium of Shumway Arroyo or Westwater Arroyo at around 1,320 years and travel through arroyo alluvium until reaching the San Juan River alluvium around 1,520 years post-mining.

6.1.2 Stewart and Thomas (2015)

USGS published a data evaluation study of the San Juan Mine in 2015 (Stewart and Thomas, 2015). The purpose of the study was to compile and present the data ultimately used for Stewart (2018). The data include information for wells on and around the mine (i.e., location and completion information), and depths to water and water quality for the wells. The data are organized into one figure and three tables. Figure 1 of Stewart and Thomas (2015) shows an outline of the study and mine permit areas in addition to the wells used in the study. Each well symbol also indicates the water-bearing unit of completion. Table 1 of Stewart and Thomas (2015) contains information on each of the 71 wells used in the assessment, including designation, water-bearing unit, coordinates, land surface elevation, well stick-up and elevation, type of data used, and period of record of data used. Table 2 of Stewart and Thomas (2015) includes depth to water data for the period of record indicated in Table 1, the source of each data point, and data quality notes. Table 3 of Stewart and Thomas (2015) contains water quality data, source notes, and data quality notes for the 71 wells over the period of record. The table includes concentrations for 7 constituents: arsenic, calcium, chloride, sodium, sulfate, sulfide, and total dissolved solids (TDS). The report also includes a discussion on the quality of the well survey data collected for the assessment. As the purpose of the report is to simply present the compiled data, no conclusions are drawn. However, conclusions on the data are provided in Stewart (2018).

6.1.3 Thomson et al. (2012)

The purpose of Thomson et al. (2012) was to determine if CCBs could potentially contaminate groundwater located beneath the disposal areas. To assess this possibility, the physical, hydraulic, chemical, mineralogical, and leaching attributes of new (recently placed) and old (buried) CCBs were quantified. Then, a numerical flow model was developed using these attributes to simulate water movement through the unsaturated CCBs and any overlying cover materials. The report concludes that the potential for groundwater contamination from the buried CCBs is low because numerical modeling predicts little downward water flow and leachate testing shows low contaminant concentrations. It should be noted that the study focused on the downward movement of infiltrating meteoric water. There is potential for groundwater to interact with buried CCBs as regional groundwater levels recover. The report did not consider this scenario; however, Stewart (2018) does.

The physical characteristics used to develop the model started with a general description of the mine site, local geology, and site hydrology. The characteristics also included the geotechnical attributes of CCBs and cover materials used at the mine. The geotechnical properties included compressibility, saturated hydraulic conductivity, and unsaturated hydraulic properties of CCBs. The geochemical properties of the CCBs were determined using material directly produced by the generating station (fly ash, bottom ash, and flue gas desulfurization sludge) and core samples from already buried CCBs at the mine.

The report concludes with a discussion of the properties of San Juan Mine CCBs and modeling results. For physical properties, fly and bottom ashes have similar density and compressibility values. Saturated hydraulic conductivity decreases as dry density increases and is much higher for fly and bottom ashes than for the cover material used for reclaiming pits. For geochemical properties, the main elemental components of fly and bottom ashes are aluminum, boron, barium, calcium, iron, potassium, sodium, and silicon. The mineralogy of these materials is dominated by amorphous glass along with mullite, quartz, calcite, and clay minerals. The main elemental component of flue gas desulfurization sludge is gypsum (i.e., hydrated calcium sulfate). Later-placed (shallower) CCBs have lower concentrations of boron and barium than earlier-placed (deeper) CCBs. Total concentrations of metals regulated under Section 3103 of 20.6.2 NMAC (Section 3103 standards) were low.

When ash and spoil materials were leached with deionized water and No. 8 Coal Seam water, leachate concentrations of most elements (boron, potassium, chromium, magnesium, copper, molybdenum, sodium, and nickel) decreased over time; however, the concentrations of aluminum, barium, calcium, lithium, silicon, and strontium initially increased before decreasing over time. Arsenic concentration remained low during leaching. Concentrations of aluminum, boron, barium, calcium, selenium, silicon, and vanadium were noted to be higher in CCB leachate than in native groundwater, but most element concentrations were comparable.

The physical characteristics of CCBs and spoil (cover) materials and site-specific climate data were used to develop a numerical unsaturated flow model, using HYDRUS-1D, to determine the overall water flux through the cover/buried CCB system. Results of the modeling showed that the cover material is suitable for preventing water from infiltrating from the land surface to the buried CCBs and that the downward flow of water through cover/buried CCB system is low.

6.1.4 Metric Corporation Studies

The purpose of the Metric Corporation (Metric) (1982) study was to characterize groundwater flow and quality along Westwater Arroyo and lower Shumway Arroyo and then evaluate surface water/ groundwater interaction along three reaches. At the time of the study, the San Juan Generating Station was discharging wastewater from settling ponds to Westwater Arroyo. The study included the installation of 68 piezometers and 22 surface water sites, along the two arroyos, from June 21 to August 13, 1982.

Of the 68 piezometers, 60 were used to determine groundwater level elevations. Depth to water measurements were recorded at the new piezometers, 3 existing piezometers, and 1 existing well and then combined with surface water elevation measurements to map the water table within the alluvium. Data were collected on July 12, 1982 (partial preliminary assessment) and on August 15 and 16, 1982 (complete assessment). The constructed potentiometric maps showed groundwater generally flowing parallel to the courses of the arroyos or their diversions from the generating station (north) to the San Juan River (south). The extents of saturation are limited to the vicinity of the arroyos and diversions and were also shown in the potentiometric maps.

To characterize water quality of the alluvial groundwater, 8 new piezometers were installed along the two arroyos. Water quality samples were collected from these piezometers as well as 4 piezometers installed for the groundwater level elevation measurements and 13 existing piezometers. The parameters analyzed for were field pH and temperature, TDS, calcium, magnesium, potassium, sodium, bicarbonate, chloride, fluoride, sulfate, boron, and nitrate. Water quality results showed a wide range of salinity values along the arroyos. Salinity values beneath upper Westwater Arroyo ranged from 4,500 milligrams per liter (mg/L) (near where the arroyo is recharged) to 10,000 mg/L (just north of the Generating Station). The study attributed the increase to natural salts and evaporation. Continuing south, the salinity increased to a maximum of approximately 50,000 mg/L near the confluence of the two arroyos. South of the confluence, salinity decreased, as lower TDS irrigation water from nearby farmland recharged the Shumway Arroyo. TDS concentrations in this area ranged from about 1,000 to 2,000 mg/L.

Metric has also authored other reports, which are referenced in Stewart (2018). The references made to Metric Corporation (1982) focus only on characterizing the alluvium. Quaternary alluvium is present along the arroyos on site alongside Quaternary Naha and Tsegi deposits, even when mapped as only Naha and Tsegi. This alluvium is composed mainly of these two units, as well as clasts of underlying units, such as Kirtland Shale, Fruitland Formation, Pictured Cliffs Sandstone, Lewis Shale, and Cliff House Sandstone. The thickness of the alluvium is typically anywhere from 20 to 30 feet, with localized areas up to 40 feet thick. References to the 1990 and 2003 reports focus on hydraulic properties used in the Stewart (2018) groundwater model. The porosity of mine spoil is 40 percent. Resaturation of the surface pits from the water-bearing Fruitland Formation will take an estimated 300 years, and the horizontal hydraulic conductivity used is about 14.5 feet per day (ft/d). Based on the referenced information included in Stewart (2018), Metric (2006) seems to be a report on a study of San Juan Generating Station impacts to groundwater in Westwater Arroyo. The main sources of impact are from the North Evaporation Pond (NEP) and the raw water pond near the generating station. Groundwater impacts were observed at wells MW4, KPC1, QNT, and GD.

Metric (2007) builds on and compiles previous reports by including characterization of the alluvium, hydraulic properties of the alluvium, and potential sources of groundwater impacts from the generating station. The 2007 report adds to the description of the geology by noting that recharge to the alluvium likely occurs during runoff events, as well as from the underlying bedrock, and describing the regional dip of the bedrock. The report also mentions several wells (QAL1 through QAL4) installed in the alluvium along Westwater Arroyo to monitor impacts from the San Juan Generating Station. The remainder of the references mention operations at the generating station involving raw water taken from the San Juan River and potential leaks from the NEP. Most of the raw water is used for cooling processes at the generating station; however, some water is diverted to the mine during the delivery of CCBs. After being used at the generating station, the processed water becomes a brine that cannot be reused. This brine is transferred to the evaporation ponds (including the NEP), where the water is disposed of through evaporation. Leaks from the NEP are the likely cause of alluvial groundwater impacts in Westwater Arroyo. Most of the historical leaks and repairs to the NEP are not recorded; however, it is known that the NEP leaked in the late 1980s and was repaired in the 1990s. Metric hypothesized that if the repaired liner breaches in the NEP were successful, wells installed to monitor impacts (i.e., NEP3 and NEP4) from the pond would show decreasing water levels. However, during the study, the water levels increased and indicated that the pond was leaking again. In response to the findings of the 2006 and 2007 reports, the generating station installed a groundwater recovery trench with several recovery trench wells downgradient of the facility. This trench is called the Memorial Trench Recovery System and is shown in Figure 2.

6.2 San Juan Generating Station Discharge Permits

NMED regulates discharges at the San Juan Generating Station under three discharge permits (DPs): DP-306, DP-1327, and DP-1843. DP-306 pertains to the generating station’s management of residual solid wastes that are (or were) placed into a solid waste disposal cell. Operational wastewater discharges are (or were) covered under DP-1327 and include process waters, stormwater collected in coal pile runoff basins, recovery trench return water, process upset-related surface water flows, and treated domestic effluent. DP-1843 applies to operation of the Shumway Recovery Trench that is located approximately 3,000 feet south (downgradient) of the Memorial Recovery Trench System (Figure 2).

DBS&A reviewed DP-1843 to obtain information regarding the Shumway Recovery Trench. This recovery system may be of importance to the San Juan Mine, as it might capture high-TDS groundwater originating from the mine. The latest version of the permit is dated March 14, 2018 (NMED, 2018). The generating station’s renewal application for this permit is currently under NMED review.

The recovery system was constructed in 2018 to remove impacted alluvial groundwater from beneath the lower Shumway Arroyo under a Consent Decree (Case No. 10-cv-003320-MCA-LAM, filed in U.S. District Court for the District of New Mexico on April 12, 2012) between Public Service Company of New Mexico (PNM), BHP Billiton, Ltd, and Sierra Club. The Consent Decree resulted from a lawsuit filed by Sierra Club alleging that releases of water from the San Juan

Generating Station caused constituent levels in groundwater and surface water to exceed state and federal water quality standards. The system consists of an interceptor trench (i.e., slurry wall) and extraction well, constructed across Shumway Arroyo, immediately south (downgradient) of the historical confluence of Shumway and Westwater Arroyos (Figure 2). Up to 200,000 gallons per day (gpd) of groundwater is pumped from the recovery system to the generating station, and is ultimately disposed of in evaporation ponds operated under DP-1327. A network of 6 wells, installed on opposite sides of the interceptor trench, is used to monitor conditions at the recovery system. Because the recovery system is located immediately downgradient of the historical confluence, it likely captures any high-TDS water flowing through the alluvial sediments of the Shumway Arroyo Backwater Reach (SABR) (Figure 2). This reach originates at the San Juan Mine.

Renewal of DP-1843 is expected to include installation of new shallow and deep monitor wells near the interceptor trench and incorporate some existing wells into the recovery system's monitoring network (NMED, 2025).

6.3 Existing Site Data

DBS&A compiled existing site data into a GIS and an Access database to support the site investigation presented in this report. The quality and completion of the data were also evaluated (DBS&A, 2025). The following types of data are available for the San Juan Mine:

- *Climate data*. There are two meteorological stations listed in the current permit (Westmoreland, 2019): Met IB and Met IIB. Both stations are 10-meter-tall towers with wind speed, wind direction, and temperature sensors. Met IB also has relative humidity and precipitation sensors. Each station has a datalogger to record values (Westmoreland, 2019). The data made available to DBS&A for the mine include monthly precipitation values from 1974 to 1996 and monthly temperature values (mean, maximum, and minimum) from 1992 to 1996 (Westmoreland, 2019).
- *Borehole and well logs*. There are few lithologic logs and completion diagrams available for the on-site wells. Logs and diagrams are available for four deep wells (17CC, 26AA, 32CD, and 35DD) and a few older wells drilled into the No. 8 Coal Seam in the Fruitland Formation, such as G3 and G20 (Westmoreland, 2019). Appendix 804.B in the current permit document also contains completion diagrams for piezometers from an early 1980s study on the arroyos in and around the San Juan Mine, completed by Metric Corporation (Westmoreland, 2019). The locations given for these piezometers are vague and the included location map is

unreadable. Because most borehole logs were unavailable, DBS&A relied on completion information summarized in report tables (e.g., Table 1 of Stewart, 2018) and well designations when developing geologic cross sections and developing maps specific to water-bearing geologic units. Some well designations are indicative of completion; for instance, KF-1 is completed in Fruitland (F) Formation, and KPC-3 is completed in Pictured Cliffs (PC) Sandstone.

- *Survey data for monitoring locations*. Survey data (i.e., coordinates and top of casing elevations) are available for a total of 48 wells, including all of the wells on the current monitoring schedule (Westmoreland, Undated-a). Table 804.A-1 in the current permit document supplements this information with additional completion information on several bedrock monitor wells (Westmoreland, 2019).
- *Depth to groundwater measurements at site monitor wells*. A total of 10 years (2014 to 2024) of depth to groundwater measurements are available for the current schedule of groundwater monitor wells (Westmoreland, Undated-b). Measurements ranging in date from the 1980s to the late 1990s are also available for GA, GB, GD, GE, GL, G3, G10, and G20 (Westmoreland, 2019). Multiple measurements from 1997 are available for G25 and G26, as well as 1998 for the deep wells (Westmoreland, 2019).
- *Groundwater quality data*. Groundwater is currently monitored at 32 wells at the San Juan Mine (Westmoreland, 2024). Data exist for other wells and piezometers that were either mined out or installed for a specific study that has since ended; these locations are not currently monitored. The groundwater quality data span 50 years, from 1973 through the end of 2024. The parameters sampled include general chemistry (alkalinity, bromide, chloride, fluoride, hydroxide, nitrate, nitrite, pH, phosphate, phosphorus, specific conductance, sulfate, sulfide, sulfur, TDS, and total organic carbon [TOC]), dissolved and total metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, cyanide, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, radium-226/-228, selenium, silica, silicon, silver, sodium, strontium, thallium, uranium, vanadium, and zinc), and multiple organics. The organic parameters have only been sampled since 2022, with the exception of phenols.
- *Surface water quality data*. Surface water is currently monitored from 13 automated samplers located in drainages on the San Juan Mine property. The sample dates for these data range from the late 1970s to 2024. Limited data are available from the National Pollutant Discharge Elimination System (NPDES) outfalls because they rarely discharge. Data from the early 2010s are available for two of the NPDES outfalls. Surface water quality

parameters include a list similar to the groundwater quality parameters, plus organics and a few total parameters in addition to the dissolved ones. Only data provided since 2010 include analytical methods and laboratory information (Westmoreland, Undated-c and Undated-d).

- *Mine facilities*. Water quality data from 2004 through 2011 are available for eight on-site ponds. Other samples (pre-2015) from mine facilities are available; however, specific locations for these samples are not known (Westmoreland, Undated-c).
- *Other data types*. The following types of data are also available:
  - Regraded spoil data (Westmoreland, 2024)
  - Annual CCB analytical results 2006-2024 (Westmoreland, 2022)
  - Pumping and/or slug test data for nine on-site wells (Westmoreland, 2019).
  - Locations for nearby permitted and unpermitted wells in the vicinity of the San Juan Mine (Westmoreland, 2019 and Undated-e).
  - Stormwater flow event data for stations on Shumway and Westwater Arroyos on September 14, 1979 (Westmoreland, 2019).
- *Online data*. A variety of site-specific and regional data are available from online resources, such as well information from OSE and soils data from SSURGO. These sources are referenced in this report where the data are used and/or discussed.

7. Environmental Conditions at San Juan Mine

This section describes existing physical conditions at the San Juan Mine (Section 7.1) and environmental impacts (Section 7.2).

7.1 Physical Characteristics

The following subsections describe the physical attributes of the mine in terms of its features, ephemeral drainages (i.e., arroyos), and hydrogeology.

7.1.1 Existing Mine Features

As shown in Figure 2, most of the existing mine features are located in the western half of the San Juan Mine lease and permit boundary. The San Juan Generating Station is located just west of the mine. Directly southeast of the Generating Station is the Coal Stockpile Area. The Juniper Pit is located southeast of the Coal Stockpiles and is currently being backfilled. Two former open pits are found on the property: the Piñon and Sage Pits. The Piñon Pit is located north of the Coal Stockpiles and the Sage Pit is located south of the Juniper Pit. These pits have been filled in with CCBs and mine spoils, covered with topsoil, and reseeded. The Underground Mine area is east of the Juniper Pit.

CCBs produced at the San Juan Generating Station have been buried at the San Juan Mine since mining began in the early 1970s (Stewart, 2018). CCBs are composed of fly ash, bottom ash, and flue gas desulfurization material. Areas where CCBs have been buried are shown in Figure 2. CCBs are interbedded with mine spoils (i.e., poorly graded, pulverized overburden). When full, backfilled pits are covered with top soil and revegetated in accordance with an approved reclamation plan. Potential impact of buried CCBs on groundwater was a topic of investigation in both Stewart (2018) and Thomson et al (2012), as described in Section 6.

7.1.2 Ephemeral Drainages

The San Juan Mine is located within the watersheds of Westwater and Shumway Arroyos (Figure 1). Westwater Arroyo is a tributary to Shumway Arroyo. The two arroyos were diverted from their natural courses to two constructed diversion channels in the early 1980s (Stewart, 2018). As expected, the diversion channels are called the Westwater Diversion and the Shumway Diversion (Figure 2). They route stormwater flows through portions of the San Juan Mine and San Juan Generating Station. The Westwater Diversion joins the Shumway Diversion near the boundary between the mine and generating station. The Shumway Diversion continues to the south and then joins the natural Westwater Arroyo, approximately 1.25 miles north of the former natural confluence of the two arroyos.

Hutch Canyon Arroyo is a tributary to Shumway Arroyo. Stevens Arroyo is located in the southeast portion of the San Juan Mine and flows directly to the San Juan River (Figure 2). The four arroyos within the mine permit boundary (i.e., Hutch Canyon, Shumway, Stevens, and Westwater Arroyos) (Figure 2) are ephemeral and tend to carry stormwater only during periods of heavy and/or consistent precipitation. Construction of the Shumway Diversion allowed portions of the natural Hutch Canyon and Shumway Arroyo drainages to be altered during mining.

The flow of stormwater on the San Juan Mine is contained and, to the extent practical, stormwater is not allowed to flow off-site. The mine uses constructed impoundments and other best management practices (BMPs) for stormwater retention. The impoundments are located primarily along the current drainage paths of Shumway and Westwater Arroyos (Figure 2). The purpose of the BMPs is to prevent stormwater from flowing off-site, limiting potential transport of mine impacted sediments and water. The efficacy of each BMP is monitored at a NPDES outfall that is sampled in the event of a discharge event (e.g., when an impoundment overflows). For instance, NPDES #11 is positioned near the impoundment used to keep stormwater out of the SABR. The BMPs have been effective at preventing stormwater from flowing off-site, as there have been few discharges; consequently, limited outfall water quality data are available (Section 7.2).

The Memorial Trench Recovery System is located near Westwater Arroyo, south (downgradient) of the generating station (Figure 2). The purpose of this system is to capture and remove seepage originating from the San Juan Generating Station. The seepage is extracted from alluvial sediment and pumped to the San Juan Generating Station for disposal in evaporation ponds. The system was installed in response to the discovery that generating station processes were contributing seepage to Westwater Arroyo alluvial groundwater (Metric, 2007). The Shumway Arroyo groundwater collection trench is located further downgradient, immediately below the confluence of Westwater Arroyo and the SABR. The San Juan Generating Station operates this second alluvial groundwater extraction system in accordance with DP-1843, as discussed in Section 6.2.

7.1.3 Hydrogeology

Groundwater is found in alluvial sediments beneath Shumway and Westwater Arroyos, the No. 8 Coal Seam of the Fruitland Formation, and Pictured Cliffs Sandstone, within the San Juan Mine lease and permit boundary. The water-bearing units have generally been described as low-yielding, with water of poor quality (Stewart, 2018; Section 804 of Westmoreland, 2019). Monitor wells have been completed in the three hydrologic units at the mine. The uppermost unit is an alluvial groundwater system that is limited in extent to the alluvium at the site's arroyos. The arroyos on the site are incised into Qnt. Beneath the alluvial groundwater system is the Fruitland Formation, which mainly hosts water in the No. 8 Coal Seam near the contact with the underlying Pictured Cliffs Sandstone; however, water is also present above the No. 8 Coal Seam near the contact with alluvium in some places. Pictured Cliffs Sandstone is also a water-bearing unit and is present throughout the site. Pictured Cliffs Sandstone is underlain by the Lewis Shale, which is considered an aquitard. Potentiometric surfaces for the three hydrologic units can be present in the backfilled pits, which contain mine spoil and CCBs. Some water may also be perched on the contact between backfill and an underlying unit.

Pumping and slug tests have been conducted at site monitor wells to determine hydraulic properties (i.e., hydraulic conductivity and storage values) for the different water-bearing units. Tests have also been performed on backfill materials to determine their hydraulic properties. Various investigators have performed these tests. Stewart (2018) and existing mine permit documents (Westmoreland, 2019) provide hydraulic property estimates based on review of findings presented in existing reports, as summarized below:

- *Backfill materials:* Hydraulic conductivity of mine spoil is 0.024 ft/d. Hydraulic conductivity values for CCBs vary depending on ash type. Hydraulic conductivity values for fly ash, bottom ash, and undifferentiated ash are 0.283 ft/d, 14.2 ft/d, and 6.52×10^{-4} ft/d, respectively. Storage values for these types of materials are typically not determined. Porosities range from 0.40 to 0.45.
- *Quaternary sediments:* Hydraulic conductivity of alluvium within the arroyos ranges from less than 10 ft/d to 25 ft/d. Hydraulic conductivity of Qnt present in the arroyos is 14.5 ft/d. A storage value is not provided, but a porosity value of 0.35 is provided.
- *Fruitland Formation:* Hydraulic conductivity of the Fruitland Formation about the No. 8 Coal Seam ranges from 1.0×10^{-4} to 1.0×10^{-3} ft/d (vertical) and from 0.001 to 0.0015 ft/d (horizontal). Specific yield and storativity values for this portion of the Fruitland Formation are 0.05 and 2.5×10^{-5}, respectively. For the No. 8 Coal Seam, hydraulic conductivity ranges from 4.0×10^{-4} to 0.01 ft/d (vertical) and from 0.0001 to 4.33 ft/d (horizontal); storativity and specific yield values range from 2.5×10^{-5} to 4.2×10^{-4} and from 0.01 to 0.05, respectively. The existing mine permit (Westmoreland, 2019) provides geometric mean transmissivity and hydraulic conductivity values for the No. 8 Coal Seam of 0.242 square feet per day (ft^2/d) and 0.17 ft/d, respectively.
- *Pictured Cliffs Sandstone:* Hydraulic conductivity ranges from 7.0×10^{-5} to 1.5×10^{-3} ft/d (vertical) and from 7.0×10^{-3} to 0.015 ft/d (horizontal). Vertical and horizontal conductivity values may be as high as 33 and 328 ft/d, respectively, in heavily fractured Pictured Cliffs Sandstone. Only a specific yield is provided for Pictured Cliffs Sandstone: 0.05.
- *Lewis Shale (aquitard):* Vertical and horizontal hydraulic conductivities range from 5.8×10^{-11} to 2.84×10^{-5} ft/d and from 2.73×10^{-11} to 2.84×10^{-4} ft/d, respectively.

Hydraulic conductivity values for the backfill materials and water-bearing units are generally small. Consequently, groundwater yields are low (as evidenced by the mine's difficulties in purging and sampling monitor wells), and transport times for dissolved constituents are expected to be long. Alluvium and bottom ash exhibit the highest hydraulic conductivity, with values between 10 and 25 ft/d.

Three hydrogeologic cross sections of the surface pit area of the mine were drawn to show the relationship between geology and hydrology. Figure 7 is a plan view map with all three lines and the wells used to develop each section shown. Figures 8 through 10 show the hydrogeologic cross sections and include potentiometric surfaces for the water-bearing units.

Figure 8 is a cross section along the A-A′ line (Figure 7). It runs north to south along the Westwater Arroyo area. The surface geology consists of spoil backfill (fill) at the former Piñon Pit and Juniper Pit, Qnt, and Fruitland Formation. The surface geology is successively underlain by Fruitland Formation (where present), Pictured Cliffs Sandstone, and Lewis Shale. Groundwater is present in the Qnt alluvium and spoil backfill. Several monitor wells have been completed in these materials. This groundwater appears to be perched on the underlain Cretaceous rocks. A few wells (i.e., KPC-2 and KPC-5) are completed in upper Pictured Cliffs Sandstone in the vicinity of the SABR. Groundwater levels at these wells are comparable to those at the nearby alluvial wells; however, groundwater yields are typically insufficient for purging and water quality sampling.

Figure 9 is a section along B-B′, which also runs north to south, across Shumway Arroyo, Juniper Pit, and the SABR. The surface geology consists of fill, Qnt, and Fruitland Formation. This geology is underlain by Fruitland Formation near the south end of the line and Pictured Cliffs Sandstone. The alluvium is shallow and unsaturated along this line; therefore, there is no alluvial potentiometric surface. There are two different Fruitland Formation potentiometric surfaces in this section. One surface is present in the No. 8 Coal Seam and backfill of the Juniper Pit. The other surface is shown in three wells screened in the weathered upper Fruitland Formation toward the middle of the section. The Pictured Cliffs Sandstone potentiometric surface is present near the top of the Pictured Cliffs Sandstone at the southern end of the section. Pictured Cliffs Sandstone groundwater yields are typically insufficient for well purging and water quality sampling along this section line.

Figure 10 is a section along the C-C′ line, which runs west to east through the confluence of Westwater Arroyo and the SABR in the west, and along the rest of the SABR to the east. The alluvial potentiometric surface is present along the bottom of the arroyo in the western half of the section. The Fruitland Formation potentiometric surface begins at the eastern edge of SABR and runs east into the Juniper Pit backfill. Fruitland Formation has been mined out through much of the Juniper Pit. The Pictured Cliffs Sandstone potentiometric surface is near the upper contact with Fruitland Formation and in the lower part of the Juniper Pit backfill in the eastern part of the section. This potentiometric surface flattens out in the alluvium to the west, where Pictured Cliffs Sandstone groundwater elevations are similar to those found in the alluvium. Pictured Cliffs Sandstone groundwater yields are often insufficient to sample for water quality.

7.2 Surface Water, Groundwater, and Environmental Impacts

The subsections below outline the mine's network of surface water monitoring sites and monitor wells. This includes a discussion on the flow behavior and chemical impacts in the three hydrologic units.

7.2.1 Surface Water and Groundwater Monitoring Network

In total, the mine actively monitors 32 groundwater wells and 13 surface water monitoring sites. Figure 11 shows the distribution of groundwater monitor wells and surface water monitoring sites across the mine property. Each of the monitor wells is screened in one of four lithologic units (i.e., spoil/backfill, alluvium, Fruitland Formation, or Pictured Cliffs Sandstone). The mine monitors each well quarterly for the parameters specified in Table 907.B(4)-2 of the mine permit (Westmoreland, 2019). These parameters include field parameters (i.e., pH, temperature, and specific conductance), alkalinity, major anions and cations, bromide, fluoride, nitrate and nitrate, phenols, phosphorus, several metals (both total and dissolved concentrations), TOC, TDS, and hardness.

Each of the surface water sites are located along one of the arroyos (SWM #3, #4, #5, #6, #7, #17, Lower Hutch Canyon, Upper and Lower Stevens Arroyo) or in areas to measure runoff from areas reclaimed or in the process of reclamation (SWM #11 through #14). The sites are monitored monthly and promptly after each precipitation event to measure flow and collect samples for laboratory analysis. The exception to this is SWM #17, which is only measured for flow rate. The collected samples are analyzed for the parameters shown in Table 907.B(4)-4 of the mine permit (Westmoreland, 2019), which include field parameters, chloride, fluoride, sulfate, several metals (total concentrations), TDS, total suspended solids (TSS), and hardness.

7.2.2 Groundwater Levels and Flow Directions

Figures 12 through 14 are potentiometric surface maps for the three hydrologic units for the second quarter 2024. The alluvial groundwater potentiometric surface generally follows the course of Westwater Arroyo, with groundwater flowing from north to south (Figure 12). Water level data for wells completed in weathered Cretaceous rocks at the generating station indicate that groundwater in this zone flows east and discharges into the alluvium (PNM, 2024). These wells are shown in Figure 12 and are included in the contouring of the potentiometric surface. Water level elevations in the alluvium range from 5,139.16 feet above mean sea level (feet msl) at well GE, located near the confluence of Westwater and Shumway Arroyos, to 5,224.63 feet msl at well QNT, located west of the former Piñon Pit. Wells along Shumway Arroyo (SA-4 and SM-8) and STA-1 (not pictured in Figure 12) along Stevens Arroyo were dry in the second quarter of 2024. The risk of downgradient fluid migration in the alluvium is mitigated by the generating station's two groundwater recovery well systems (i.e., the Memorial Trench Recovery System and Shumway Recovery Trench) (Figure 2). These systems intercept poor-quality alluvial groundwater. The water captured by the systems is currently disposed of at the generating station, in accordance with DP-1327 and DP-1843.

Saturated alluvium appears to be juxtaposed against fill materials both horizontally and vertically, as seen at wells SM-6 and SM-16. However, dry conditions at most fill wells suggest that inflow from the alluvium to backfill materials of the Juniper pit may be limited (Figure 12). Water is present at SM-1, but other fill wells (SM-10 and SM-11) are dry. This may be because the two wells are screened too high to definitively assess whether saturation is present in the fill (Figure 12). Well QNT is the most upgradient alluvial monitor well in the vicinity of both the mine and the generating station. It has historically been treated as a background well; however, it is located near the area of former ponds at the San Juan Generating Station and downgradient of the former Piñon Pit. Metric documents suggest that QNT may have been impacted by the NEP and a raw water pond (Section 6.1.4). NMED is expected to install (or have the generating station install) a monitor well further upgradient of well QNT (NMED, 2025). The proposed monitor well will be located upgradient of anthropogenic disturbances, and is therefore expected to provide a better determination of natural alluvial water quality.

The Fruitland Formation No. 8 Coal Seam potentiometric surface shows groundwater flowing generally from west to east (Figure 13), consistent with the regional dip of the Fruitland Formation (Stewart, 2018). Localized flow directions and gradients may vary due to mine dewatering. Groundwater flows south with a gradient of 0.010 foot per foot (ft/ft) in the northern portion of the permit area, but otherwise flows to the east/northeast with gradients of

0.012 and 0.013 ft/ft. Water level elevation range from 5,076.02 feet msl at well SM-5, located east of the former Coal Stockpile Area, to 5,171.61 feet msl at well G3, located at the northern end of the mine to the east of the former Piñon Pit. The three wells screened in the upper part of the Fruitland Formation (KF-2, SA-1, and SA-3) (not in the No. 8 Coal Seam) were not used to contour. Water levels at the three wells range from 5,179.69 feet msl at SA-1 to 5,188.48 feet msl at SA-3.

The Pictured Cliffs Sandstone potentiometric surface appears to flow from the northwest to the southeast with gradients of 0.018 to 0.024 ft/ft (Figure 14). There are no Pictured Cliffs Sandstone wells in the central part of the mine site, which presents some uncertainty in this interpretation. In the second quarter of 2024, Pictured Cliffs Sandstone water level elevation ranged from 5,074.28 feet msl at well KPC-3, located to the west of the Juniper Pit, to 5,256.08 feet msl at well MW-4, located south of the San Juan Generating Station. Well MW-4 is outside of the mine permit boundary and monitored by the generating station under DP-1327 (PNM, 2024). There were no dry Pictured Cliffs Sandstone wells during this monitoring event.

Hydrographs for all wells shown on these figures are included as Appendix C. Groundwater levels are expected to recover (i.e., rise) due to the cessation of dewatering activities (Stewart, 2018) at both the mine (surface and underground) and oil and gas wells. The hydrograph of KF-1 shows an approximately 35-foot increase in water level since 2023; otherwise, water levels at most monitor wells have been steady or show only slight decreasing or increasing trends.

7.2.3 Water Quality

The following sections discuss water quality at the San Juan Mine monitoring sites. Time-series plots of boron, sulfate, TDS, and pH are provided in Appendix D. They show temporal changes in water quality. The spatial distributions of boron, sulfate, and TDS in the second quarter 2024 are presented in Figures 15 through 18. Sulfate and TDS concentrations are elevated in most of the groundwater monitor wells, and boron concentration is notably elevated at monitor wells completed in fill (i.e., SM-series wells); therefore, these parameters were selected to describe water quality at the mine.

Box and whisker plots of boron, sulfate, and TDS concentrations and pH values for each water type (e.g., surface water, alluvial groundwater, etc.) are provided in Figures 19a through 19d. They were developed from the mine's historical monitoring data. Each water type includes all sample locations associated with that water type. Each box encompasses 50 percent of the data values; larger boxes are indicative of greater variability. The highest sulfate and TDS concentrations are observed at alluvial wells. Boron concentration is highest at the fill wells. Values of pH are near natural to slightly alkaline. Quality of surface water is better than that of groundwater (i.e., lower constituent concentrations). Appendix E provides box and whisker plots for analytes that have more than 10 observations.

DBS&A also prepared tabulated comparisons of the historical monitoring data to water quality standards (Tables 2 through 6). Surface water quality data are compared to criteria numerated in 20.6.4 NMAC, and groundwater data are compared to criteria numerated in 20.6.2.3103 NMAC (Section 3103 standards). The arroyos at the mine are ephemeral, so criteria for livestock watering, wildlife habitat, and limited aquatic life were used along with irrigation for the surface water quality comparison (Table 2).

7.2.3.1 Surface Water

As discussed in Section 7.1.2, several ephemeral drainages (arroyos) pass through the site, principally Shumway Arroyo and its tributaries (Figure 2). The total drainage area of Shumway Arroyo's watershed is 90,660 acres (USGS, Undated). Flow occurs in the arroyos when the precipitation rate exceeds the infiltration rate. Surface water quality is primarily influenced by interactions with surficial soil and sediment, which vary spatially throughout the watershed. The watershed includes exposures of the Cretaceous Lewis Shale, Cliff House Sandstone, Menefee Formation, Point Lookout Sandstone (Kpl) in the upland areas in and above the Hogback, and exposures of the Cretaceous Kirkland Shale (including the Upper Shale, Farmington Sandstone, and Lower Shale Members), Fruitland Formation, and Pictured Cliffs Formation below the Hogback. The alluvium throughout the watershed is composed of eroded sediments from these rock units. Given the flashy nature of ephemeral flow events, stormwaters tend to accumulate high sediment loads, allowing for a variety of water-sediment reactions. These reactions may vary depending on where precipitation occurs in the watershed, which influences sediment composition, and therefore surface water quality.

Surface water quality at the mine site is monitored using a network of surface water samplers that capture water during flow events (Section 7.2.1). Surface water samples are gathered after flow events, which are irregular and infrequent. Surface water quality has been measured since the 1980s at some locations. The surface water monitoring network was expanded in 2011, after which as many as nine sites were monitored in a given year. Time-series plots for selected surface water parameters (i.e., boron, TDS, sulfate, and pH) are provided in Appendix D. Figure 15 shows the most recent laboratory results for boron, TDS, and sulfate at each of the mine's 13 surface water samplers. Several of the monitoring sites have not been sampled in several years because the samplers have remained dry (e.g., stormwater was last observed at SWM #4 in September 2009).

Surface water quality varies significantly, with TDS concentrations ranging from 30 to 12,200 mg/L (SWM #4), with a median concentration of 392 mg/L (Figure 19a). This range does not include results of samples collected from the NPDES outfalls, which have TDS concentrations below 1,000 mg/L. Typically, surface water is of better quality than groundwater, exhibiting lower constituent concentrations.

New Mexico surface water quality standards are provided in 20.6.4 NMAC. The standards include different numerical criteria depending on the location and/or characteristics of the surface water (e.g., perennial versus ephemeral). The drainages at the mine are ephemeral, so criteria for livestock watering, wildlife habitat, and acute aquatic life were used to compare stormwater sample results to surface water quality standards (per 20.6.4.97 NMAC). DBS&A also included irrigation standards in the comparison (Table 2). Some acute aquatic life metal standards are based on water hardness. DBS&A calculated the hardness of each sample to determine acute aquatic life standards (per 20.6.4.900 NMAC).

Exceedances of surface water quality standards are observed in the surface water quality data (Table 2). Notable exceedances include dissolved aluminum and boron concentrations above irrigation standards, gross alpha activity above the livestock watering standard, mercury and selenium concentrations above the wildlife habitat standards, and total aluminum concentrations above acute aquatic life criteria. Exceedances of other standards are less frequent. In the context of stormwater samples collected from arroyos, some of these exceedances are expected because the element is ubiquitous in nature (e.g., dissolved and total aluminum). Other exceedances may be due at least in part to generating station and/or mining activities. For instance, most of the boron exceedances are from sampling at SWM #6, located in Westwater Arroyo downgradient of the generating station and mine. Other notable sites with several boron exceedances are SWM #4 and SWM #7. Most of the gross alpha exceedances are also from sampling at SWM #6; however, this parameter does not appear to be analyzed for at many of the other surface water monitoring locations. Samples collected from SWM #3, SWM #5, and SWM #6 have exceeded standards for total mercury and selenium. While selenium exceedances are frequent, mercury concentrations are more variable, and the constituent is often not detected.

DBS&A compared the surface water quality data to the surface water quality standards to help support data review; however, some standards may not be relevant. For instance, stormwater flows are not expected to source irrigation water or provide aquatic habitat. However, livestock watering standards may be applicable due to the proposed post-mining land use of grazing, and if stormwater is impounded for this use.

Interactions between impacted sediment (i.e., exposed and weathered coal and disturbed areas) and surface water can lead to surface water quality impairment, such as elevated concentrations of TDS, sulfate, and metals. SWM #4 (near the former coal stockpile area) and SWM #6 (Westwater Arroyo downgradient of the generating station and mine) exhibit poorer water quality (Figure 15), although SWM #4 has been dry for several years. It was last sampled in September 2009. Sediment of Westwater Arroyo appears to be impacted and influencing surface water quality.

Westmoreland manages and monitors stormwater in accordance with a NPDES permit (No. NM0028746). The mine has constructed impoundments and maintains BMPs to prevent stormwater from mine areas from discharging to the arroyos. The BMPs have been effective at preventing stormwater in mine areas from flowing off-site (and ultimately to the San Juan River), as there are few outfall water quality data; samples can only be collected during discharge events. NPDES data provided to DBS&A from Westmoreland show that historically only 6 samples have been collected at the NPDES outfalls. The outfalls are shown in Figure 2. These samples include two from NPDES #1 (on August 23 and 24, 2012) and four from NPDES #10 (on July 9, and September 2, 14, and 19, 2011). Stormwater, particularly captured surface water, evaporates or infiltrates into alluvium. Infiltration from surface water bodies is the primary mode of recharge to the alluvial groundwater system (focused recharge). Recharge from mine impounded surface water—particularly if it has been evapoconcentrated—is currently the most significant water quality issue posed by surface water; however, water quality in the alluvial groundwater system is generally much poorer than the water quality observed in surface water. As discussed in subsequent sections, alluvial groundwater is captured in the former pits or at one of two collection systems: (1) the Memorial Trench Recovery System and (2) the Shumway Recovery Trench.

7.2.3.2 Groundwater

Groundwater quality throughout the San Juan Mine site is poor. With the exception of some samples from two historical alluvial monitoring locations (GF and WT-15), TDS concentrations have exceeded the Section 3103 standard of 1,000 mg/L in all groundwater wells throughout their monitoring histories (Figure 19a). Typical TDS values range from above 2,000 mg/L to over 20,000 mg/L, indicating brackish to saline waters. Groundwater is generally a sodium-bicarbonate or sodium-sulfate water type. In addition to TDS, concentrations of most inorganic constituents (e.g., common anions and metals) exceed Section 3103 standards at some or most locations throughout the site. Tables 3 through 6 summarize Section 3103 exceedances by analyte for each of the subsurface water types (i.e., water-bearing fill, alluvium, Fruitland Formation, and Pictured Cliffs Sandstone). The tables were constructed from the mine's historical monitoring data, and only include those analytes with a Section 3103 exceedance for a given water type. With the exception of phenols, which occur naturally in coal and other organic-rich deposits, concentrations of organic constituents (i.e., benzene, trichloroethene [TCE], etc.) have not been found to exceed Section 3103 standards. The constituents with results that generally exceed Section 3103 standards are arsenic, boron, chloride, fluoride, iron, manganese, nitrate, phenols, sulfate, TDS, and uranium. Results for each of these constituents frequently exceed the Section 3103 standard at two or more monitor wells in each hydrologic unit (considering monitor wells with greater than 10 measurements).

Available chemistry data range from 1973 to present. The number of groundwater monitor wells and samples collected has increased over time, beginning with 5 monitoring locations in 1973, and increasing to 15 monitoring locations in 1985, 20 locations in 2011, and now more than 30 monitor wells. Time-series plots of boron, sulfate, TDS, and pH are provided in Appendix D. The distributions of boron, sulfate, and TDS in the three hydrologic units (alluvium and fill, Fruitland Formation, and Pictured Cliffs Sandstone) are shown in Figures 16 through 18.

Groundwater quality in fill material has been measured since 2011 in the SM-series wells, JP-2, M3.1, M3.2, and M3.3. Although designed as SM wells, SM-6 and SM-16 are screened in alluvium that underlies fill. Some of these wells no longer exist (JP-2) or are currently only monitored by the San Juan Generating Station (the M3-series wells). Available data show TDS concentrations ranging from 15,700 to 27,100 mg/L (median of 21,600 mg/L) (Figure 19a). Both the minimum and maximum TDS concentrations are observed at SM-5 (Table 3). Time-series plots for SM-5 and SM-7 are provided in Appendix D. TDS concentration is stable at SM-7 and is gradually increasing at SM-5. Boron concentrations are notably elevated in fill compared to other hydrologic units (Figure 19c), ranging from 0.8 mg/L (JP-2) to 39.6 mg/L (SM-7) (median of 1.7 mg/L), above the Section 3103 standard of 0.75 mg/L (Table 3). Second quarter 2024 water quality results at the SM-series wells are shown in Figures 16 through 18. Most SM-series wells are mapped with the alluvial groundwater wells based on their locations, completion depths, and water level elevations; however, SM-3 and SM-5 are mapped with Fruitland Formation wells and SM-4 and SM-7 are mapped with Pictured Cliffs Sandstone wells due to their completion depths.

Alluvial groundwater is of variable quality throughout the site, demonstrating the greatest range of TDS concentrations—from 634 mg/L (well GF) to greater than 60,000 mg/L (well GL) (median of 17,200 mg/L) (Figure 19a). Well GF was located near Shumway Arroyo where it crossed County Road 6800, and well GL is located in the backwater reach of the Shumway Arroyo (i.e., SABR) northeast of the Shumway Recovery Trench. TDS trends in alluvial groundwater are stable, with concentrations within historical ranges or decreasing, except at WWA-1 and WWA-2 (located in the former coal stockpile area), where TDS concentrations are increasing (Appendix D). Wells GL and GE exhibit the most temporal variability, with results spanning tens of thousands of mg/L in TDS concentrations. Alluvial groundwater quality is poorest in the SABR (Figure 16). Monitor well GL is located in a groundwater divide (Figure 12), where alluvial groundwater may either flow to the southwest toward the Shumway Recovery Trench or to the southeast toward the backfilled Juniper Pit. Given this location, groundwater is believed to be fairly stagnant and concentrations may be elevated due to evapoconcentration and/or long residence time. Geochemical modeling performed by Westmoreland supports evaporation as the primary cause of elevated constituent concentrations at well GL (Westmoreland, 2019). Mixing with groundwater from Pictured Cliffs Sandstone, historical discharges from the generating station, and flushing of salt by seepage from nearby raw water reservoir may also be contributing factors (Westmoreland, 2019). Uranium and phenols frequently exceed the Section 3103 standards at GL, in addition to other typically elevated constituents (e.g., sulfate and boron). Concentrations of nitrate and several metals (e.g., arsenic, barium, cadmium, cobalt, chromium, copper, lead, selenium, and thallium) also sometimes exceed the Section 3103 standards at GL, as well as other alluvial groundwater monitoring locations (Table 4).

Monitor well QNT is the most upgradient alluvial monitor well in the vicinity of site. For this reason, background alluvial groundwater quality has historically been referenced to this well. It is located north of both the generating station and most of the mine near Westwater Arroyo (Figure 2). TDS concentrations at QNT range from 1,400 to 31,700 mg/L (average of 20,259 mg/L). In addition to TDS, concentrations of boron, chloride, fluoride, nitrate, sulfate, and uranium have typically exceeded Section 3103 standards. Although this well has historically been considered upgradient of the generating station and most of the mine, it is downgradient of the former Piñon Pit to the east and appears to be downgradient of the area of the former locations of ponds operated by the generating station (Figure 12) and other historical disturbances, presenting uncertainty as to the degree to which it is truly representative of background water quality. The presence of significantly elevated nitrate concentrations (120 to 290 mg/L) further draws this into question. Elevated nitrate at QNT is likely due to generating station operations, mining, or possibly gravel pit blasting. QNT appears to be located in the footprint of a historical gravel pit operated by PNM (Westmoreland, 2024). DBS&A recognizes background alluvial groundwater quality as a data gap. That said, background alluvial groundwater quality is still expected to be poor based on baseline water quality sampling conducted in 1973 at alluvial wells GC, GD, and GE (Westmoreland, 2019). TDS concentrations at these wells in 1973 ranged from 6,700 mg/L (GC) to 20,256 mg/L (GD).

TDS concentrations in groundwater of the Fruitland Formation range from 2,320 mg/L (G3) to 36,100 mg/L (KF-2) (median of 6,300 mg/L) (Figure 19a), and are generally stable (Appendix D). Monitor well completions in the Fruitland Formation appear to be either within a weathered upper portion or in the No. 8 Coal Seam, where most groundwater saturation and flow within the Fruitland Formation tends to occur (Stewart, 2018). Water quality data from some Fruitland Formation wells (e.g., G3) are generally indicative of native coal seam water. Coal mining activity may impact water quality predominantly by changing redox conditions, which can mobilize metals and other constituents. While not common, Section 3103 exceedances of silver, aluminum, barium, cadmium, chromium, lead, selenium, silver, thallium, and zinc variably occur in many Fruitland Formation monitor wells (Table 5). Most or all wells show Section 3103 exceedances for boron, chloride, fluoride, iron, phenols, sulfate, TDS, and uranium. Also, pH values are often high in Fruitland Formation wells, ranging from 7.20 to 10.39. Several monitor wells have historically shown results exceeding the Section 3103 upper limit for pH of 9, but currently meet the standard (Appendix D). Many Fruitland Formation wells are not sampled (Figure 17), presumably due to insufficient well yields for conventional volume purge techniques. Use of a no-purge technique (e.g., HydraSleeve samplers) may help to overcome this issue, as water appears to be present at many of the Fruitland Formation wells (Section 9). Higher-yielding Fruitland Formation wells exhibit better water quality (Westmoreland, 2019), potentially biasing interpretation of Fruitland Formation water quality. As in most hydrologic units at the site, groundwater of the Fruitland Formation is typically a sodium-sulfate type. However, some Fruitland Formation locations, including G3 and G26, are a sodium-bicarbonate type. This is characteristic of Fruitland Formation water in coal bed methane producing regions of the San Juan Basin, where sulfate reduction has converted sulfate to bicarbonate and sulfide gas (NRC, 2010).

Groundwater quality in the Pictured Cliffs Sandstone is like that of the Fruitland Formation, although higher constituent concentrations are encountered in some Pictured Cliffs Sandstone monitoring locations. TDS concentrations range from 2,420 mg/L (GA) to 39,500 mg/L (KPC-4) (median of 9,700 mg/L) (Figure 19a). TDS concentration trends are stable except for at KPC-4, which shows an increasing TDS trend (Appendix D). Results at monitor well GB notably exceed the Section 3103 standards for a variety of constituents, including barium, cadmium, chromium, nitrate, lead, phenols, and uranium (Table 6). Results at well GA also exceed the standards for these constituents, as well as aluminum, cyanide, pH (historically), and selenium. Other Pictured Cliffs Sandstone wells do not exhibit standard exceedances for these trace constituents. The occurrence of these constituents at GA and GB is likely due to localized redox conditions. Well GA is a sodium-bicarbonate water type and has high concentrations of hydrogen sulfide gas, implying localized sulfate reduction. As in the Fruitland Formation, groundwater yields of the Pictured Cliffs Sandstone are low, precluding the collection of groundwater samples using conventional volume purge methods (Figure 18). Only two Pictured Cliffs Sandstone groundwater samples were recovered in the second quarter of 2024, both with TDS concentrations below 10,000 mg/L (GA and KPC-3). The poor quality of Pictured Cliffs Sandstone groundwater at the site is consistent with regional groundwater quality of Pictured Cliffs Sandstone in the San Juan Basin (Westmoreland, 2019).

With one potential exception (i.e., alluvial groundwater beneath the SABR), significant impacts to water quality from mine activities are not apparent. The water quality observed in the Fruitland Formation throughout the mine area is consistent with its regional range in TDS concentrations (NRC, 2010). While mining activities may locally impact redox conditions and constituent speciation, substantive changes from mining to the beneficial use potential of Fruitland Formation water are not apparent. Similarly, the regionally brackish nature of Pictured Cliffs Sandstone water (Stewart, 2018) is consistent with that of Pictured Cliffs Sandstone groundwater observed at the mine.

8. Potential Seepage Pathways

DBS&A addressed possible adverse effects to human health and the community by considering the flow of poor-quality groundwater from the mine site to potential downgradient receptors. The receptors include the San Juan River and downgradient off-site water supply wells along the river (Figure 6). Groundwater can reach these receptors by two potential routes (seepage pathways): (1) the Shumway Arroyo alluvial groundwater system and (2) travel through water-bearing bedrock (e.g., Fruitland Formation and Pictured Cliffs Sandstone). Both potential seepage pathways present minimal risk to downgradient receptors in the near term due to the presence of groundwater collection facilities (e.g., the Shumway Recovery Trench) and the low-permeability nature of the water-bearing bedrock.

The Westwater and Shumway Arroyo alluvial system drains groundwater throughout the site toward the San Juan River. Alluvial groundwater is of poor quality, potentially due in part to mine-related impacts and discharges from the San Juan Generating Station. Alluvial groundwater may also drain groundwater from water-bearing bedrock, which can outcrop or subcrop along the alluvium, as shown in Figure 8. Backfill areas hydrologically connected to the alluvium may also discharge into or mix with the alluvial system; however, many backfill areas are currently unsaturated and behave as temporary groundwater sinks, such as the backfill areas east of the SABR (Figure 12). The Shumway Arroyo alluvial system becomes constricted in the vicinity of the Shumway Arroyo Groundwater Recovery System, which is a cutoff trench that spans the approximate width of the alluvium. It is expected that functionally all alluvial groundwater is intercepted by this recovery system, preventing it from reaching downgradient receptors, such as the San Juan River. NMED is expected to install (or have the generating station install) additional monitor wells downgradient of recovery system (NMED, 2025). Data collected at these wells, along with existing wells, can be used to assess recovery system effectiveness.

The natural flow of groundwater from the Fruitland Formation and the Pictured Cliffs Sandstone is toward the San Juan River. However, mine dewatering and potentially oil and gas pumping has altered the groundwater gradient in the Fruitland Formation and possibly the Pictured Cliffs Sandstone away from the river, as seen in Figures 13 and 14. Following mine closure, the groundwater gradient is expected to reequilibrate toward the river. These water-bearing rocks have low permeability, and the estimated time for site water to reach the river is in excess of 2,000 years (Stewart, 2018). The cross-sectional width of mining activities in the No. 8 Coal Seam is approximately 30,000 feet perpendicular to the natural groundwater flow direction. As shown in Appendix F, using the geometric mean transmissivity 0.242 ft^2/d for the No. 8 Coal Seam (Westmoreland, 2019) and a hydraulic gradient of 0.015, approximately 109 cubic feet per day (cfd) (815 gpd) of water may discharge from the No. 8 Coal Seam to the alluvium of the San Juan River, where the coal seam outcrops and subcrops (Stewart, 2018). The San Juan River near Fruitland, New Mexico (USGS gage 09367540) has a mean annual discharge of 2,542 cubic feet per second (cfs), or approximately 220 million cfd (1.64 billion gpd) (Stewart, 2018). Assuming similar discharge values for the San Juan River in the future, the relative proportion of No. 8 Coal Seam groundwater discharging into the river will be negligible. Discharge from the No. 8 Coal Seam is expected to locally impact alluvial groundwater more than surface water; however, the proportion of potential recharge to the alluvial system from the coal seam compared to the river itself is minimal. The transmissivity of the Pictured Cliffs Sandstone is 1.16 ft^2/d (well GA). Assuming the same cross-sectional area and gradient as the Fruitland Formation, approximately

522 cfd (3,905 gpd) may potentially discharge to the San Juan River alluvium. This negates areas where the Pictured Cliffs Sandstone underlies the alluvial system entirely; in these areas, there is no potential for discharge.

9. Data Gaps and Recommendations

The San Juan Mine currently monitors more than 30 wells and 13 surface water sites as part of their quarterly monitoring program, with data provided to EMNRD. Many of these locations have been monitored for decades, providing a long history of water quality data for the mine. DBS&A used these data to characterize environmental conditions at the mine and to identify areas of concern that include (1) alluvial groundwater beneath Westwater Arroyo and the SABR and (2) sediment of Westwater Arroyo that appears to be impacting surface water quality. The San Juan Generating Station operates recovery trenches to address these impacts.

Although the existing data are sufficient to characterize most conditions, some additional data are needed. DBS&A identified the following data gaps as part of our study:

- The most upgradient alluvial monitor well is QNT. It is located north of the generating station and most of the mine, but near other disturbances (e.g., area of former evaporation ponds and the former Piñon Pit). It has historically been treated as a background well; however, the well's proximity to disturbances and water quality (Section 6.1.4) suggest that it may exhibit some impairment. A further upgradient alluvial monitor well is needed to better establish background water quality. NMED is planning to have such a well installed (NMED, 2025). Appendix G provides a map showing the proposed location for the well, which is approximately 600 feet northwest of QNT. The map also shows the locations of five proposed nested monitor wells along Westwater Arroyo (presumably to be completed in alluvium and Cretaceous Rocks). Data collected from these wells will help to further characterize groundwater conditions beneath Westwater Arroyo.
- Background Fruitland Formation and Picture Cliffs Sandstone wells are needed. These background wells could be placed near the same location as the new background alluvial well (or possibly nested with it).
- Elevated constituent concentrations have been observed at surface water monitor sites (i.e., SWM #4 and SWM #6) located in Westwater Arroyo downgradient from the former coal stockpile area. DBS&A recommends sediment sampling and leach testing of the samples to determine whether sediments are impacted and constituents are being remobilized during

storm events. Possible testing includes the synthetic precipitation leaching procedure (SPLP) or meteoric water mobility procedure. Sediment samples could be collected during the advancement of boreholes for NMED's proposed additional monitor wells (Appendix G).

DBS&A also offers the following recommendations:

- Due to low yields, many bedrock wells are not sampled (Figures 17 and 18). Use of a no-purge technique (e.g., HydraSleeve samplers) may help to overcome this issue, as water appears to be present at many of the wells. DBS&A's understanding is that the mine is not collecting water quality samples because they are unable to purge the wells and have them sufficiently recover.
- Surface water quality data have not been collected during several storm events at various monitoring sites due to either (1) flow events not reaching the minimum stage necessary for a sample to be collected or (2) the intensity of the flow event destroying sampling equipment. Exploring alternative sampler designs may help to resolve this issue so that more samples can be collected.
- There are no Pictured Cliffs Sandstone wells in the central portion of the mine area. This presents some uncertainty regarding groundwater flow direction and water quality. Although there are enough Pictured Cliffs Sandstone wells around the mine area to make reasonable inferences, an additional monitor well in the center of the site would assist with data interpretation.

10. Conclusions

The purpose of this site investigation report was to satisfy the Act (Section 74-4H-1 to 74-4H-4, NMSA 1978), which requires EMNRD to perform a study of the San Juan Mine to identify any mining-related environmental impacts in support of site remediation and restoration. DBS&A reviewed San Juan Mine environmental data and concludes that groundwater beneath the site is of poor quality. Two areas of primary concern were identified: (1) alluvial groundwater beneath Westwater Arroyo and the SABR and (2) sediment of Westwater Arroyo that appears to be impacting surface water quality.

Alluvial groundwater is present beneath the four arroyos on the mine property and likely has naturally poor water quality, but conclusive background water quality data are lacking. As part of their study, NMED is planning to install a new monitor well upgradient of well QNT to better establish background water quality. Mining activity and the San Juan Generation Station may be causes of some of the poorer water quality, such as that of the alluvial groundwater in the vicinity of the SABR and upgradient of the Shumway Recovery Trench; however, given that alluvial groundwater likely exhibits naturally elevated constituent concentrations (e.g., high TDS), it is difficult to distinguish anthropogenic impacts from the naturally elevated constituent concentrations. The generating station operates two alluvial groundwater recovery systems along Westwater and Shumway Arroyos to capture the poor-quality alluvial groundwater and pump it to evaporation ponds at the generating station, preventing the water from potentially reaching the San Juan River.

Groundwater is also present in the Fruitland Formation and Pictured Cliffs Sandstone, which is also of naturally poor quality. Groundwater wells completed in these two rock units have very low yields. Groundwater in the three hydrologic units at the mine (the alluvium, Fruitland Formation, and Pictured Cliffs Sandstone) would generally not be considered for fresh water supply due to their low well yields and potential for naturally elevated constituent concentrations.

Potential off-site receptors include the San Juan River and water supply wells along the river. Groundwater can potentially reach these receptors by two routes: (1) the Shumway Arroyo alluvial groundwater system and (2) travel through water-bearing bedrock. Both of these potential seepage pathways present minimal risk to the receptors due to the presence of alluvial groundwater recovery systems and low-permeability of the water-bearing bedrock.

Surface water quality is better than groundwater quality but does appear to show some impairment in Westwater Arroyo downgradient of the former coal stockpile area and generating station (at SWM #4 and SWM #6). Releases from the generating station to Westwater Arroyo are documented. In accordance with its NPDES permit, the mine contains stormwater from disturbed areas, preventing it from flowing into the local arroyos. NPDES monitoring at outfalls has shown very few discharge events, as the outfalls typically remain dry because the mine’s impoundments are sufficiently large to hold most stormwater.

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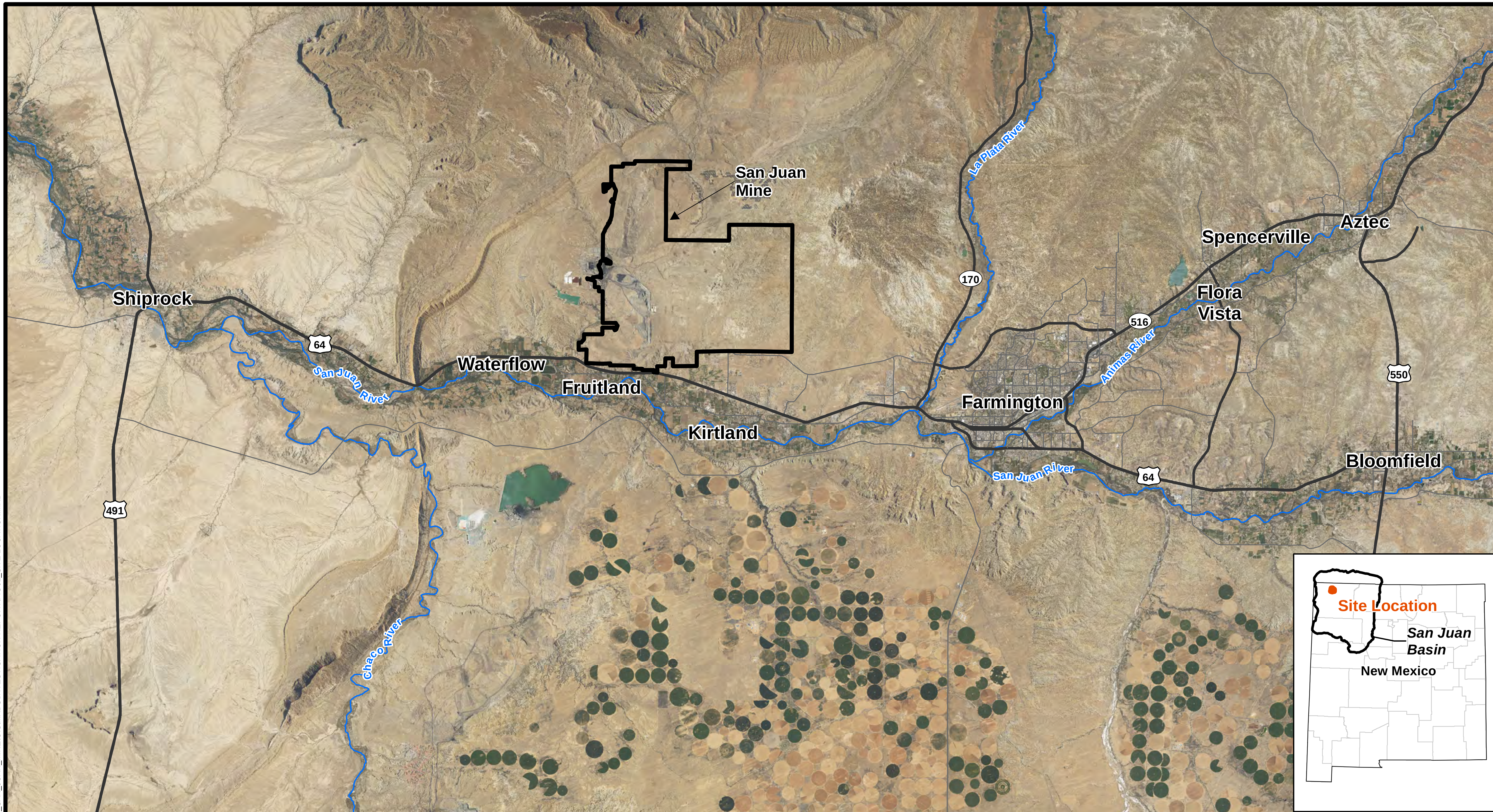
Figures



Source: Aerial imagery (NAIP, 2024).

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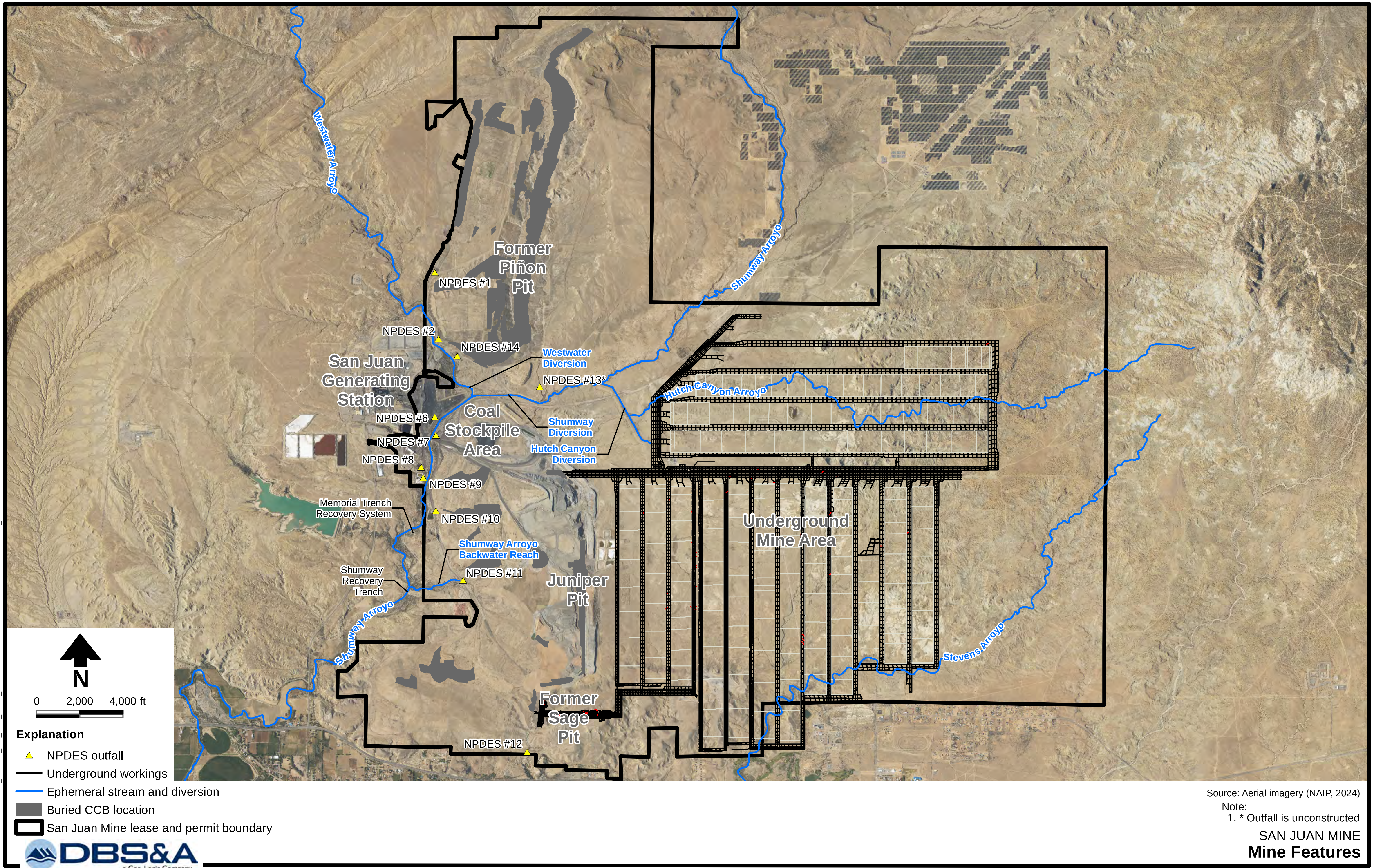
SAN JUAN MINE
Site Location

Figure 1



S:\PROJECTS\DB24.1140_EMNRD_NM_SAN_JUAN_MINE\GIS\MXDS\INVESTIGATION REPORT\FIG02_MINE FEATURES.MXD

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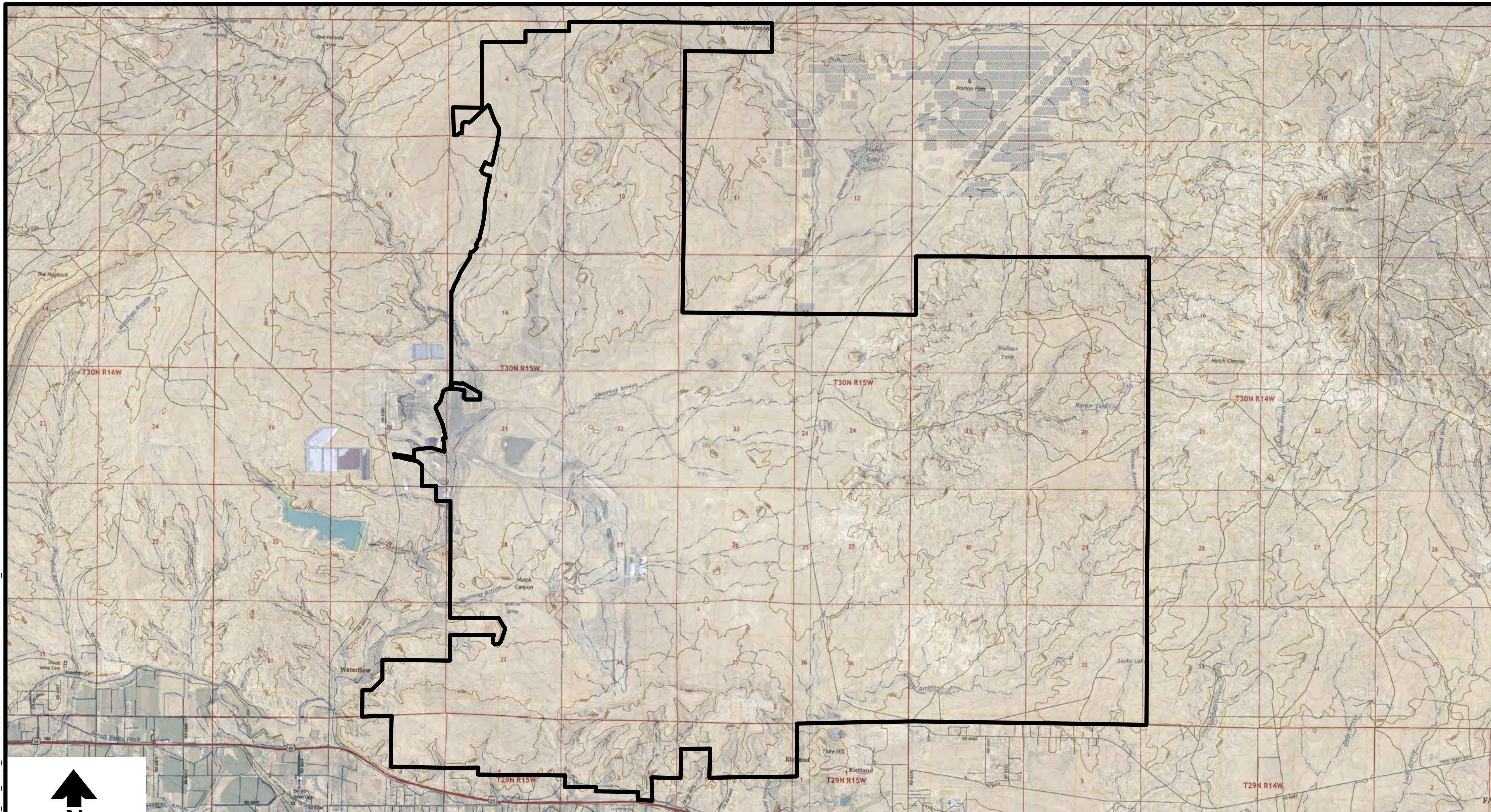
6/26/2025 DB24.1140

Source: Aerial imagery (NAIP, 2024)

Note:
1. * Outfall is unconstructed

SAN JUAN MINE
Mine Features

Figure 2



N

0 2,150 4,300 ft

Explanation

San Juan Mine lease and permit boundary

Source:
1. Surface topography (USGS, 2023).
   a. Chimney Rock Quadrangle
   b. Fruitland Quadrangle
   c. Waterflow Quadrangle
   d. Youngs Lake Quadrangle
2. Aerial imagery (NAIP, 2024).

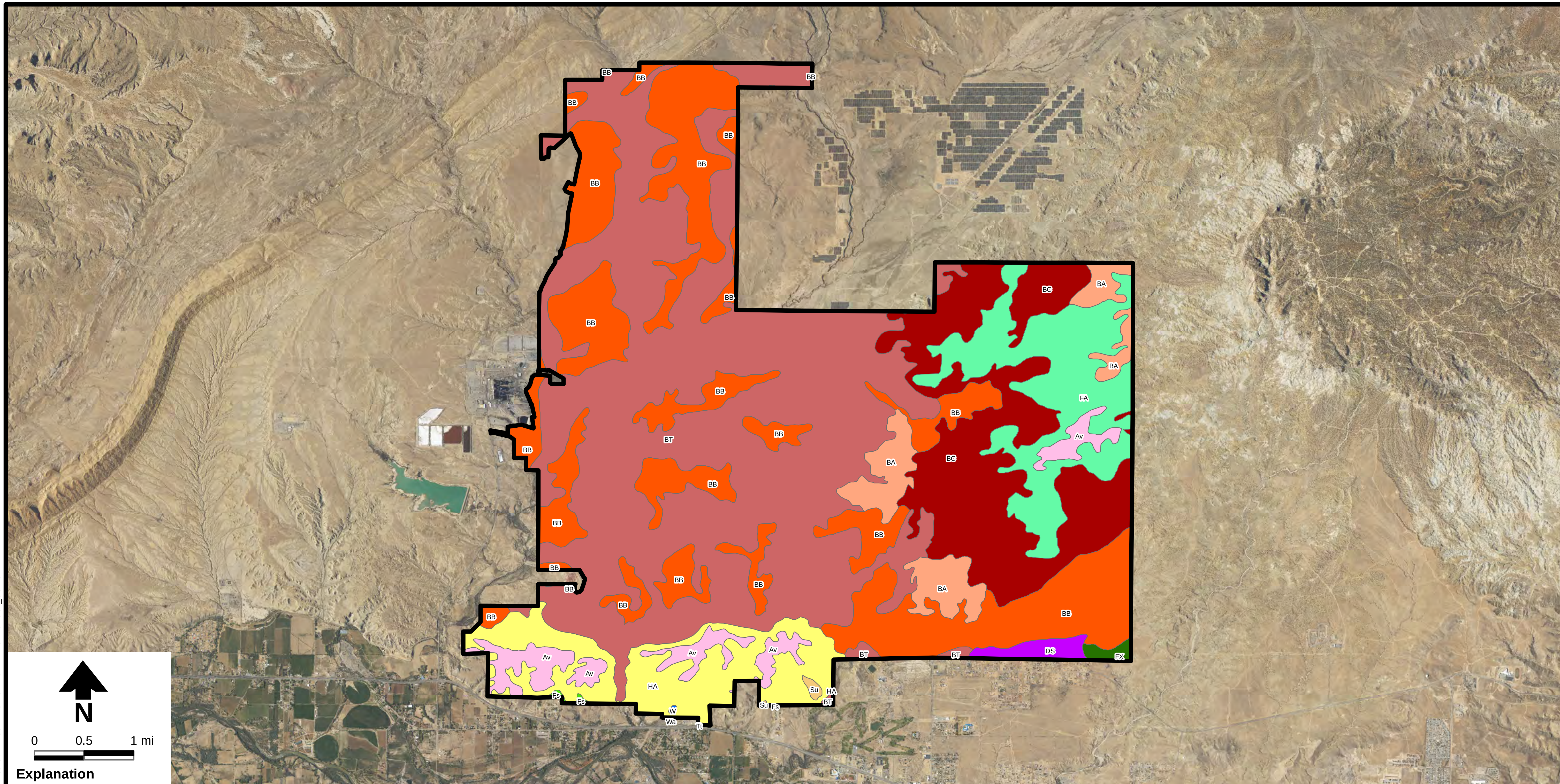
SAN JUAN MINE
Surface Topography

DBS&A a Geo-Logic Company

5/22/2025 DB24.1140

Figure 3

S:\PROJECTS\DB24.1140_EMNRD_NM_SAN_JUAN_MINE\GIS\MXDS\INVESTIGATION REPORT\FIG03_TOPO.MXD



Explanation

San Juan Mine lease and permit boundary

Soil type

- Av — Avalon sandy loam, 2-5% slopes
- BA — Badland
- BB — Badland-Monierco-Rock outcrop complex, extremely steep
- BC — Badland-Rock outcrop Persayo complex, extremely steep
- BT — Blancot-Notal association, gently sloping
- DS — Doak-Sheppard-Shiprock association, rolling
- FA — Farb-Persayo-Rock outcrop compex, moderately steep
- Fs — Fruitland sandy loam, wet, 2-5% slopes
- FX — Fruitland-Persayo-Sheppard complex, hilly
- HA — Haplargids-Blackston-Torriorthents complex, very steep
- Su — Stumble loamy sand, 3-8% slopes
- Tt — Turley clay loam, wet, 0-2% slopes
- W — Lakes, rivers, reservoirs
- Wa — Walrees loam

Source:
1. Aerial imagery (NAIP, 2024).
2. Soils (SSURGO, 2023).

SAN JUAN MINE
Soil Map

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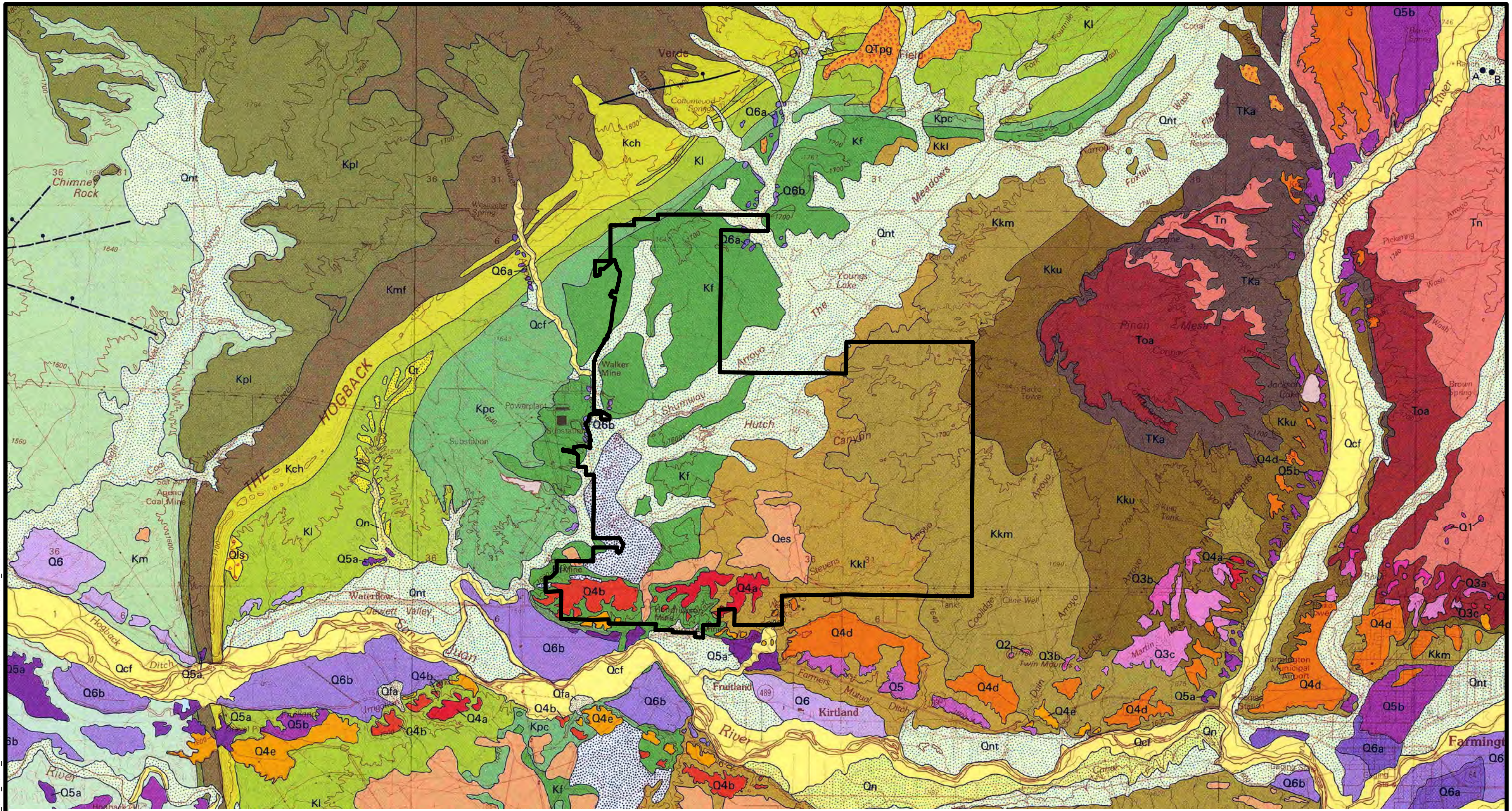
5/22/2025 DB24.1140

Figure 4

S:\PROJECTS\DB24.1140_EMNRD_NM_SAN_JUAN_MINE\GIS\MXDS\INVESTIGATION REPORT\FIG04_SOILS.MXD



N

0 0.75 1.5 mi

Explanation

San Juan Mine lease and permit boundary

Source: Surface geology (Ward, 1990).

SAN JUAN MINE
Generalized Surface Geology

Figure 5

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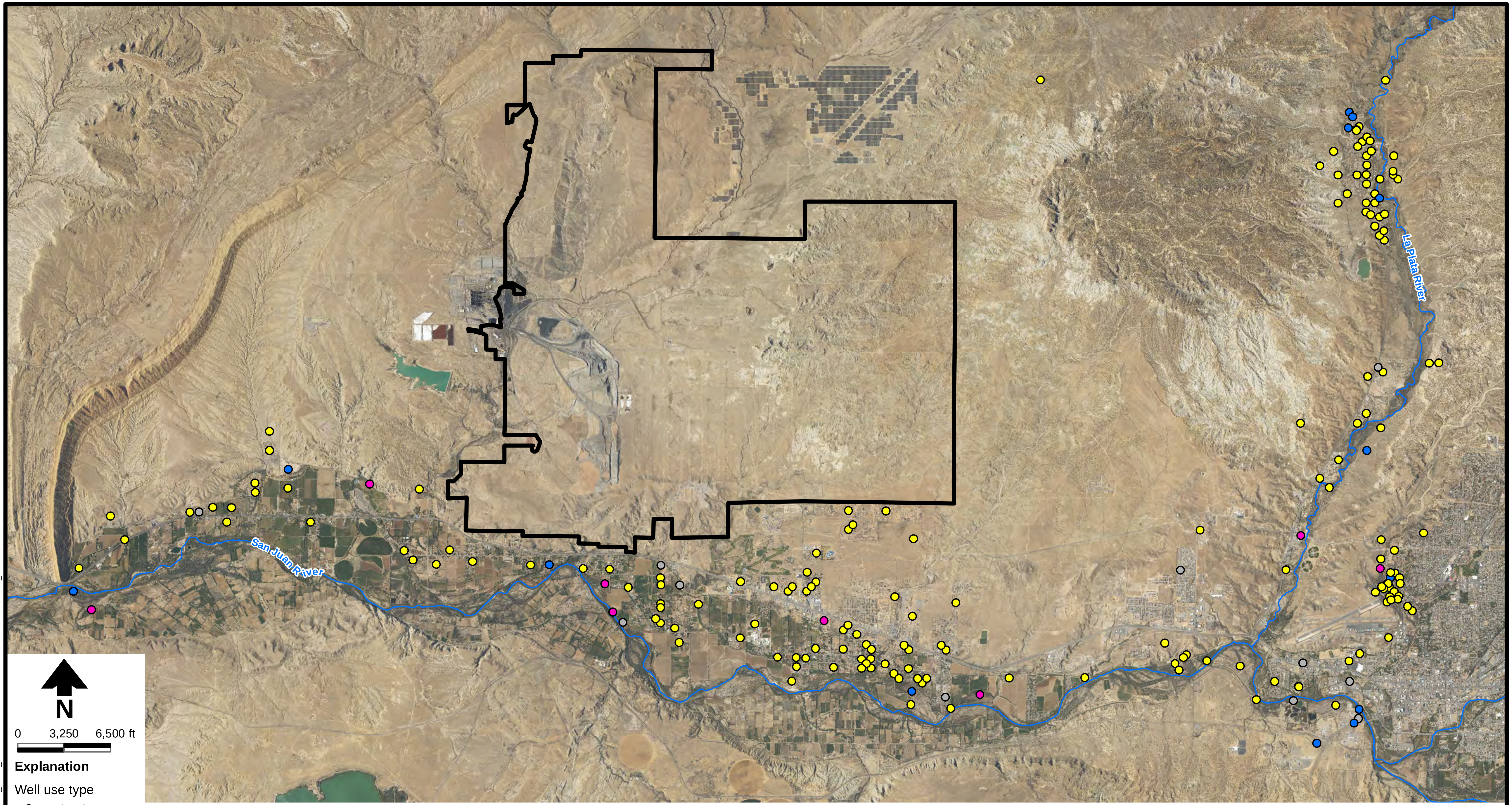
6/10/2025 DB24.1140

S:\PROJECTS\DB24.1140_EMNRD_NM_SAN_JUAN_MINE\GIS\MXDS\INVESTIGATION REPORT\FIG05_GEOLOGY.MXD



Source: Aerial imagery (NAIP, 2024).

Explanation

Well use type

- Irrigation
- Livestock
- Domestic/municipal
- Industrial/commercial
- River
- San Juan Mine lease and permit boundary

Note: Point of Diversion (POD) locations obtained from the New Mexico Office of the State Engineer (NM OSE) POD GIS layer, which includes POD locations extracted from the OSE W.A.T.E.R.S. (Water Administration Technical Engineering Resource System) database as of May 1, 2025.

S:\PROJECTS\DB24.1140_EMNRD_NM_SAN_JUAN_MINE\GIS\MXDS\INVESTIGATION REPORT\FIG06_OSE POD.MXD

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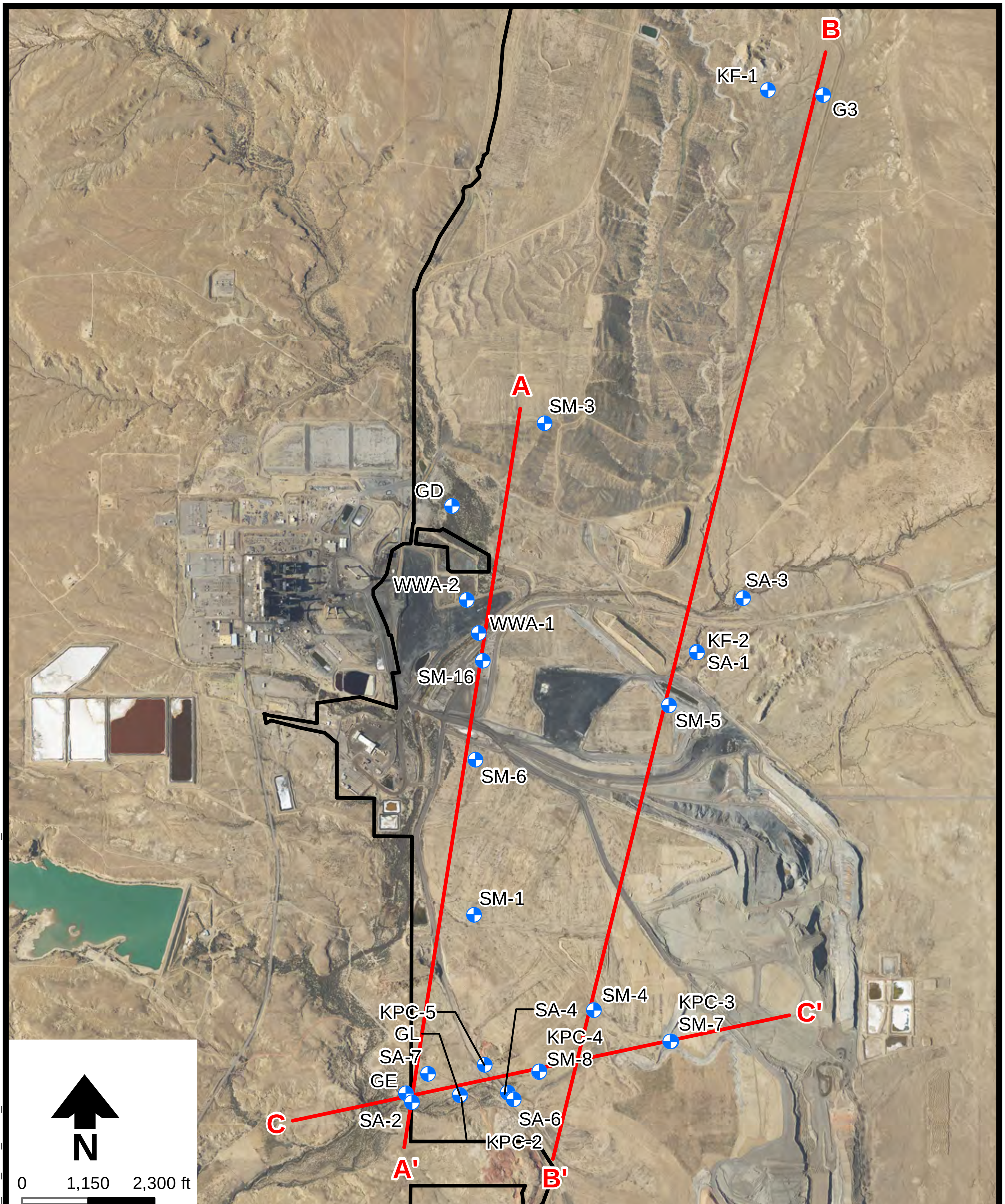
5/22/2025 DB24.1140

SAN JUAN MINE
New Mexico Office of the State Engineer
Active Points of Diversion

Figure 6



Source: Aerial imagery (NAIP, 2024)

Explanation

- Monitor well
- Cross section line
- San Juan Mine lease and permit boundary

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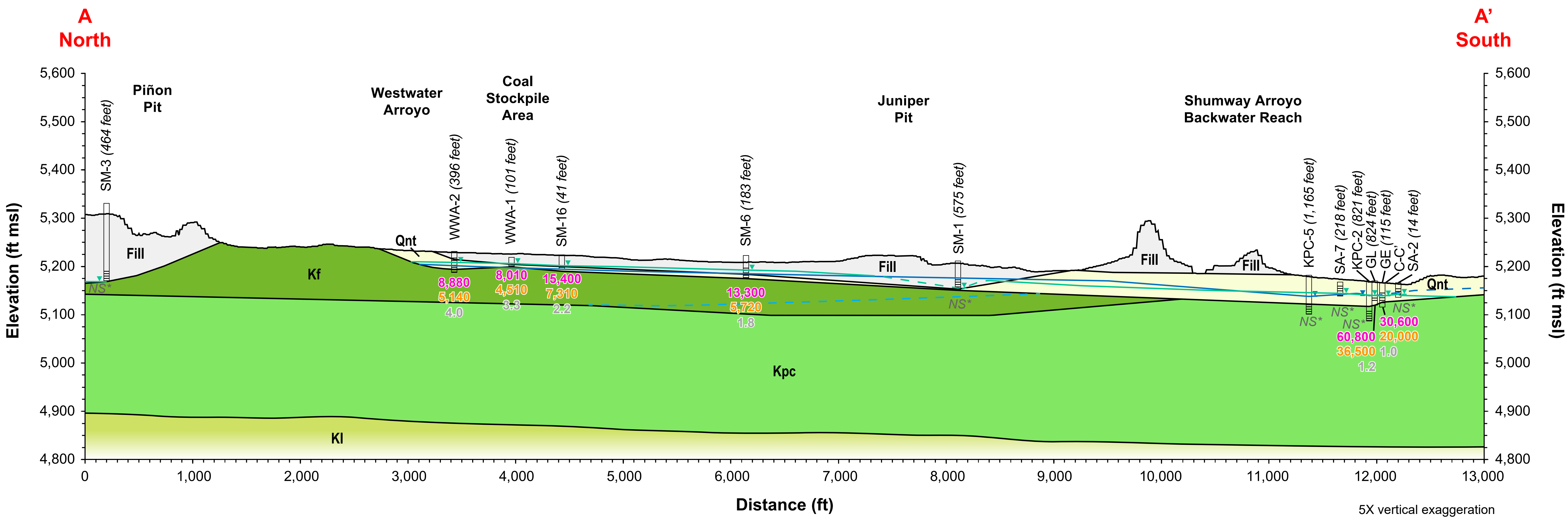
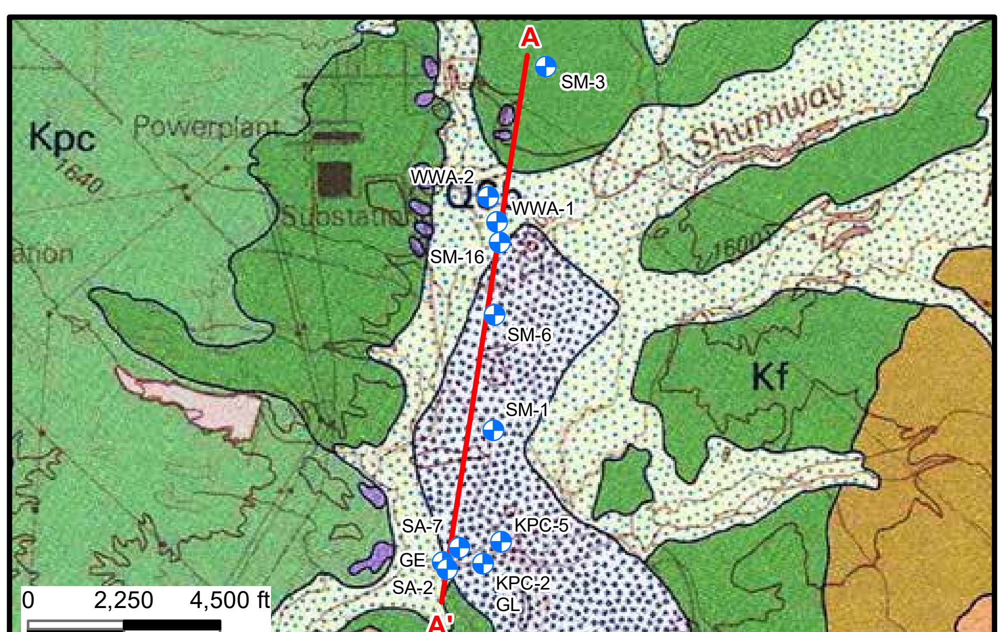
6/23/2025 DB24.1140

SAN JUAN MINE

Hydrogeologic Cross Section Lines

Figure 7





Explanation

Monitor well with screened interval

19,200 Total dissolved solids concentration (mg/L)

8,490 Sulfate concentration (mg/L)

1.5 Boron (mg/L)

Ground surface elevation

Perched potentiometric surface, dashed where inferred

Fruitland Formation potentiometric surface, dashed where inferred

Pictured Cliffs Sandstone potentiometric surface, dashed where inferred

Lithology

Fill Spoil backfill

Qnt Quaternary Naha and Tsegi Alluviums

Kf Cretaceous Fruitland Formation

Kpc Cretaceous Pictured Cliffs Sandstone

Kl Cretaceous Lewis Shale

Notes:
1. Water levels and chemistry values are from April 30 to June 26, 2024.
2. **Bold** indicates that chemistry value exceeds the Section 3103 standard.
3. Surface elevation data from July 2022.
4. * Insufficient water to sample.

S:\PROJECTS\DB24.1140_EMNRD_NM_SAN_JUAN_MINE\VR_DRAWINGS\A-A'A-A'.AI

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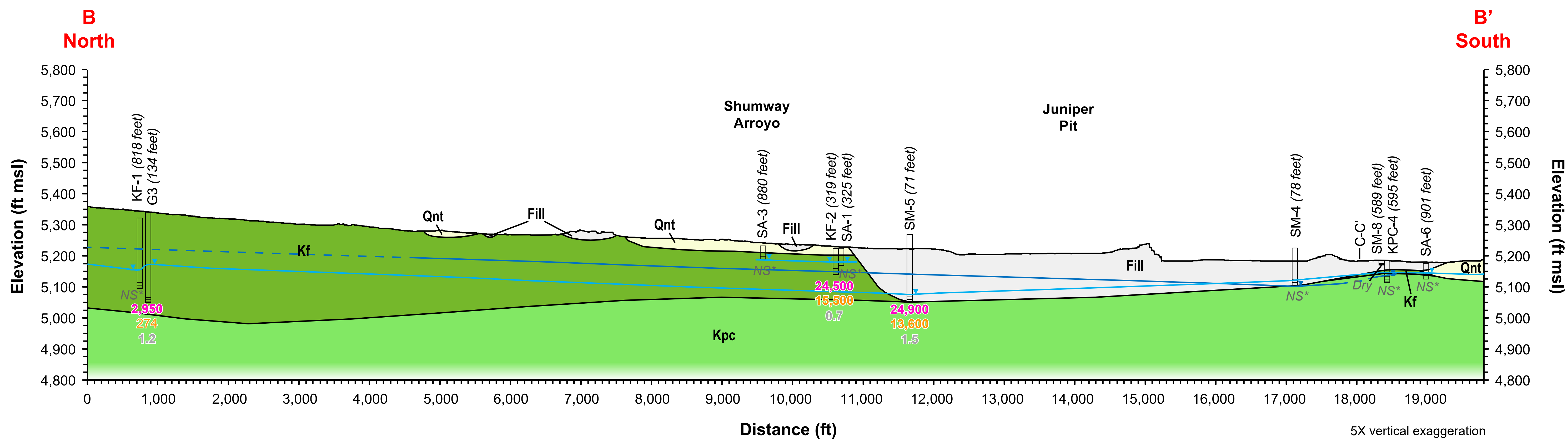
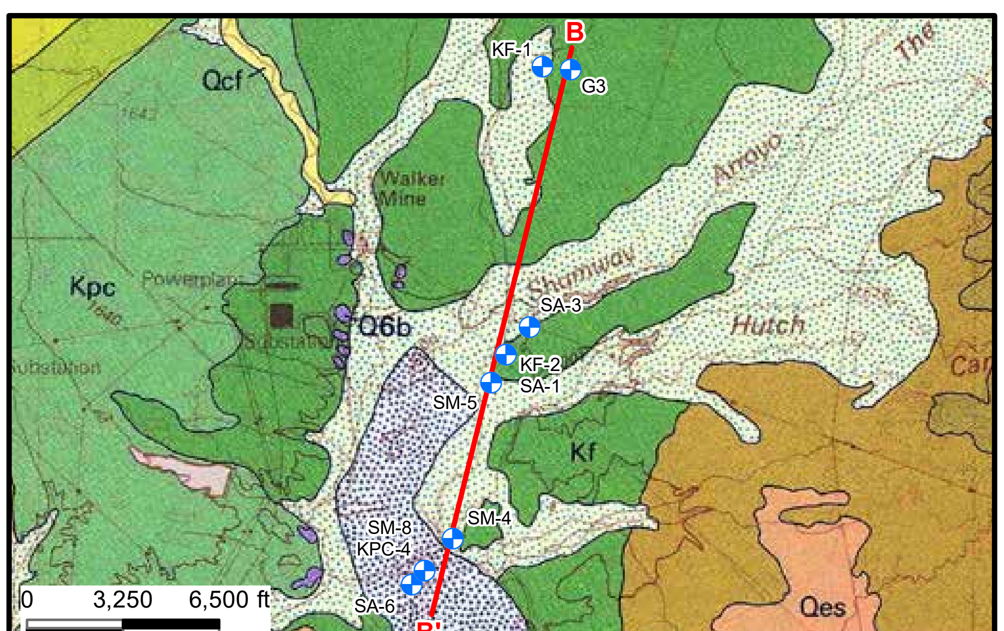
6/23/2025 DB24.1140

SAN JUAN MINE

Generalized Hydrogeologic Cross Section A-A'

Figure 8





Explanation

Monitor well with screened interval

2,950 Total dissolved solids concentration (mg/L)

274 Sulfate concentration (mg/L)

1.2 Boron (mg/L)

Ground surface elevation

Fruitland Formation potentiometric surface

Pictured Cliffs Sandstone potentiometric surface, dashed where inferred

Lithology

Fill Spoil backfill

Qnt Quaternary Naha and Tsegi Alluviums

Kf Cretaceous Fruitland Formation

Kpc Cretaceous Pictured Cliffs Sandstone

Notes:
1. Water levels and chemistry values are from April 30 to June 25, 2024.
2. **Bold** indicates that chemistry value exceeds the Section 3103 standard.
3. Surface elevation data from July 2022.
4. * Insufficient water to sample.

S:\PROJECTS\DB24.1140_EMNRD_NM_SAN_JUAN_MINE\VR_DRAWINGS\B-B'B-B'.AI

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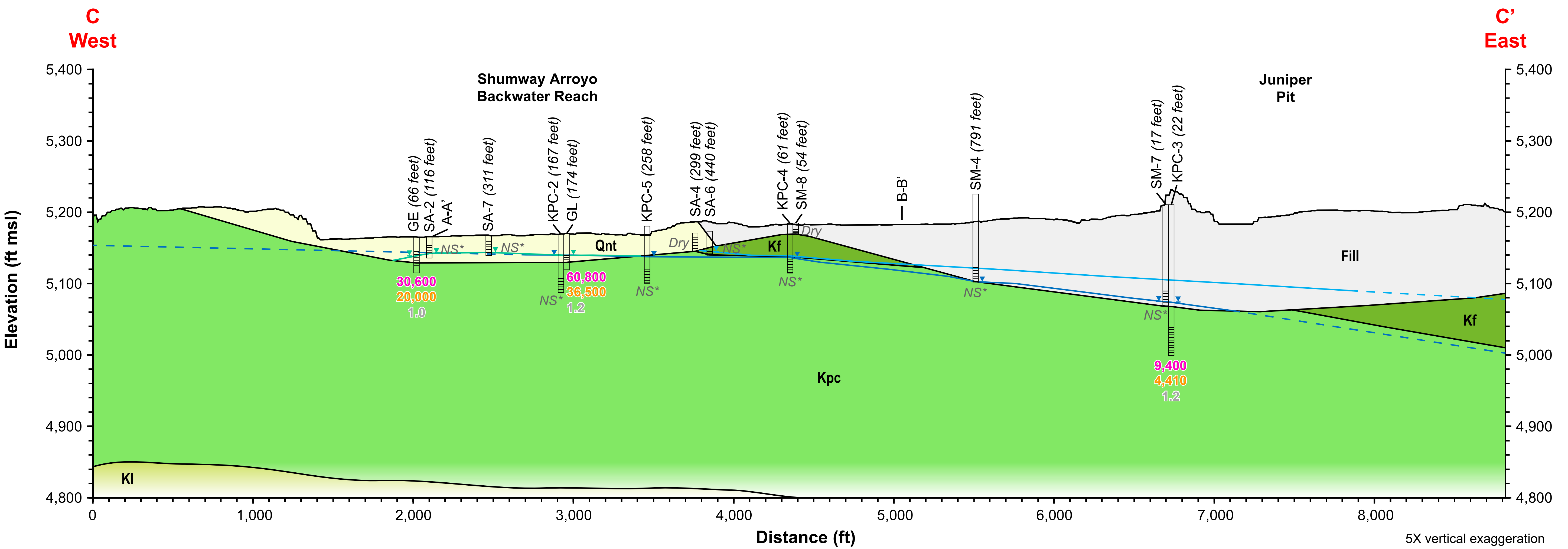
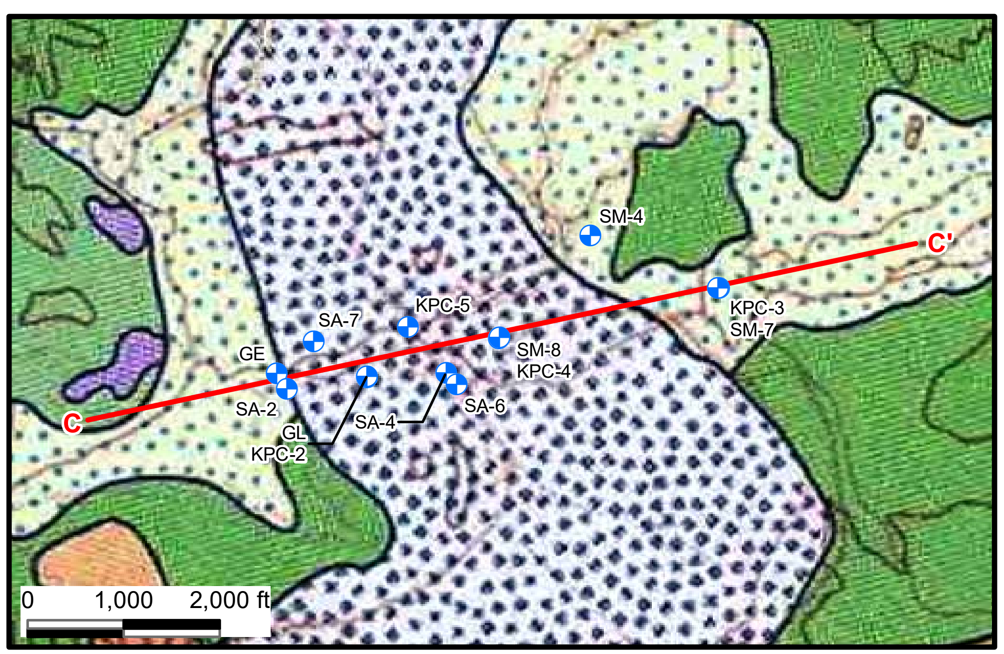
6/17/2025 DB24.1140

SAN JUAN MINE
Generalized Hydrogeologic Cross Section B-B'

Figure 9





Explanation

Monitor well with screened interval

9,400 Total dissolved solids concentration (mg/L)

4,410 Sulfate concentration (mg/L)

1.2 Boron (mg/L)

Ground surface elevation

Alluvium potentiometric surface

Fruitland Formation potentiometric surface

Pictured Cliffs Sandstone potentiometric surface, dashed where inferred

Lithology

Fill	Spoil backfill
Qnt	Quaternary Naha and Tsegi Alluviums
Kf	Cretaceous Fruitland Formation
Kpc	Cretaceous Pictured Cliffs Sandstone
Kl	Cretaceous Lewis Shale

Notes:
1. Water levels and chemistry values are from April 30 to June 26, 2024.
2. **Bold** indicates that chemistry value exceeds the Section 3103 standard.
3. Surface elevation data from July 2022.
4. * Insufficient water to sample.

S:\PROJECTS\DB24.1140_EMNRD_NM_SAN_JUAN_MINE\VR_DRAWINGS\C-C'\C-C'.AI

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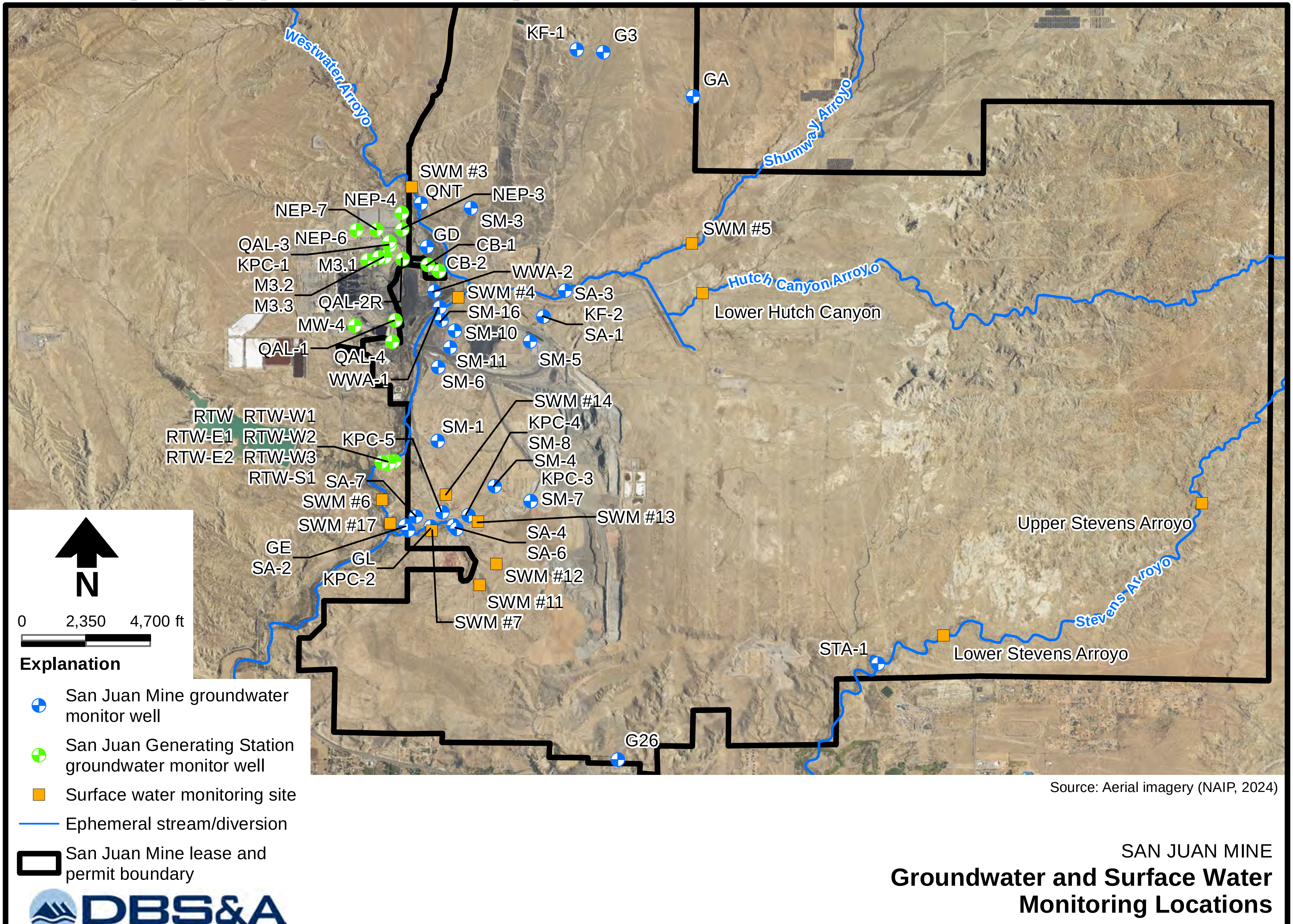
6/17/2025 DB24.1140

SAN JUAN MINE
Generalized Hydrogeologic Cross Section C-C'

Figure 10

S:\PROJECTS\DB24.1140_EMNRD_NM_SAN_JUAN_MINE\GIS\MXDS\INVESTIGATION REPORT\FIG11_MONITORING SITES.MXD



Source: Aerial imagery (NAIP, 2024)

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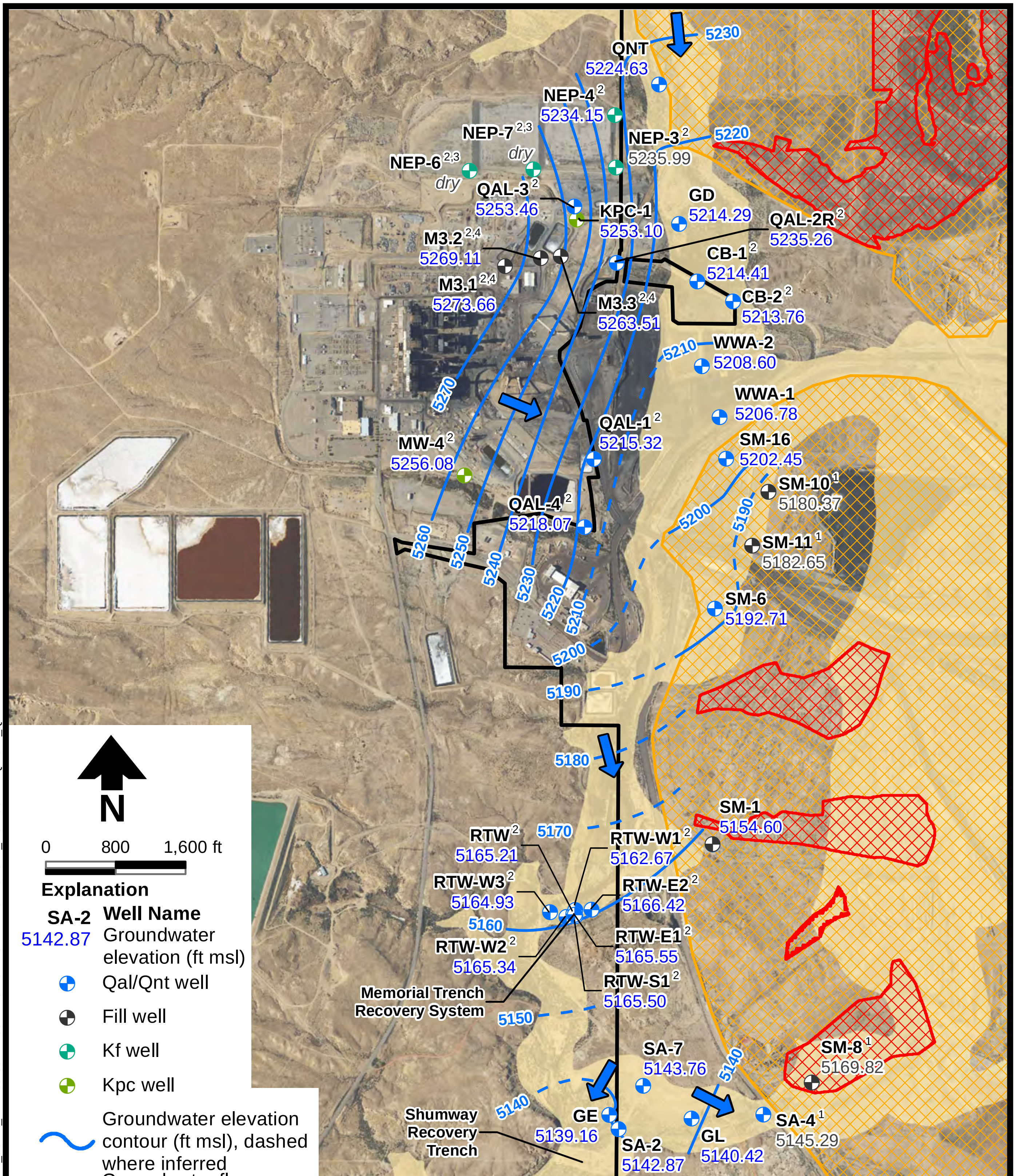
6/23/2025
DB24.1140

SAN JUAN MINE
Groundwater and Surface Water Monitoring Locations

Figure 11



Explanation

SA-2 5142.87	Well Name Groundwater elevation (ft msl)
	Qal/Qnt well
	Fill well
	Kf well
	Kpc well
	Groundwater elevation contour (ft msl), dashed where inferred
	Groundwater flow direction
	CCB backfill area
	Approximate pit boundary
	San Juan Mine lease and permit boundary
	Historical alluvium extent

Notes:
1. Dry with estimated bottom of well elevation posted.
2. Water level data from DP-1327 Second Quarter 2024 Quarterly Monitoring Report.
3. NEP-1 and NEP-2 referred to as NEP-6 and NEP-7 in the DP-1327 Monitoring report, respectively.
4. M3.# series wells referred to as MP 3.# in the DP-1327 Monitoring Report.

Source:
1. Aerial imagery (NAIP, 2024)
2. Alluvial geology (Strobell et al. 1980)

SAN JUAN MINE

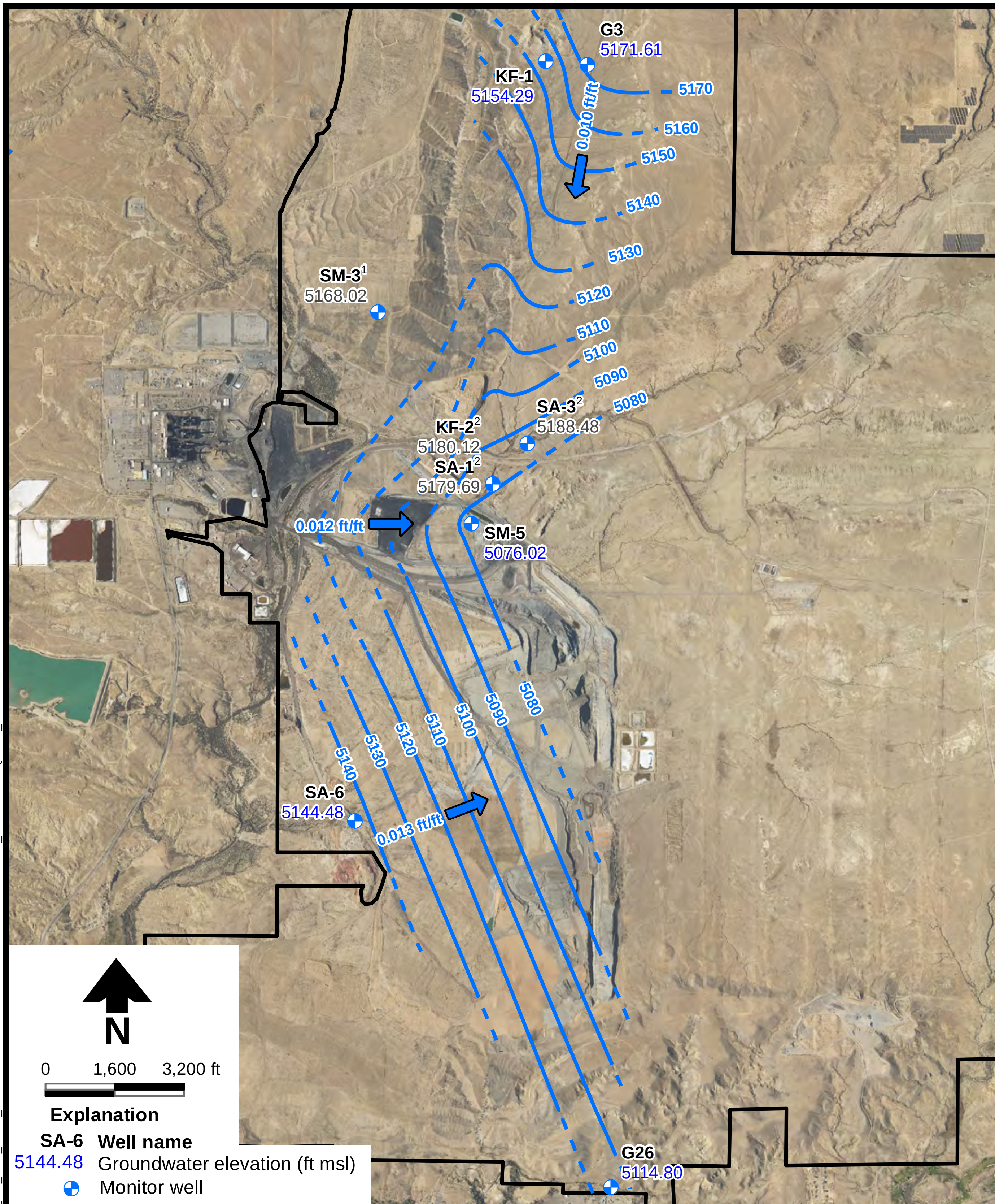
Potentiometric Surface Elevations Alluvium/Backfill, Second Quarter 2024

DBS&A a Geo-Logic Company

6/25/2025 DB24.1140

Figure 12

S:\PROJECTS\DB24.1140_EMNRD_NM_SAN_JUAN_MINE\GIS\MXDS\INVESTIGATION REPORT\FIG12_POT SURF 2Q 2024_QAL.MXD



Explanation

SA-6 **Well name**
5144.48 Groundwater elevation (ft msl)
Monitor well
Groundwater elevation contour (ft msl), dashed where inferred
San Juan Mine lease and permit boundary
Groundwater flow direction

Source: Aerial imagery (NAIP, 2024)

Notes:
1. SM-3 water level may be perched. Not used for contouring.
2. Screened in Fruitland Formation above the No. 8 Coal Seam. Not used for contouring.

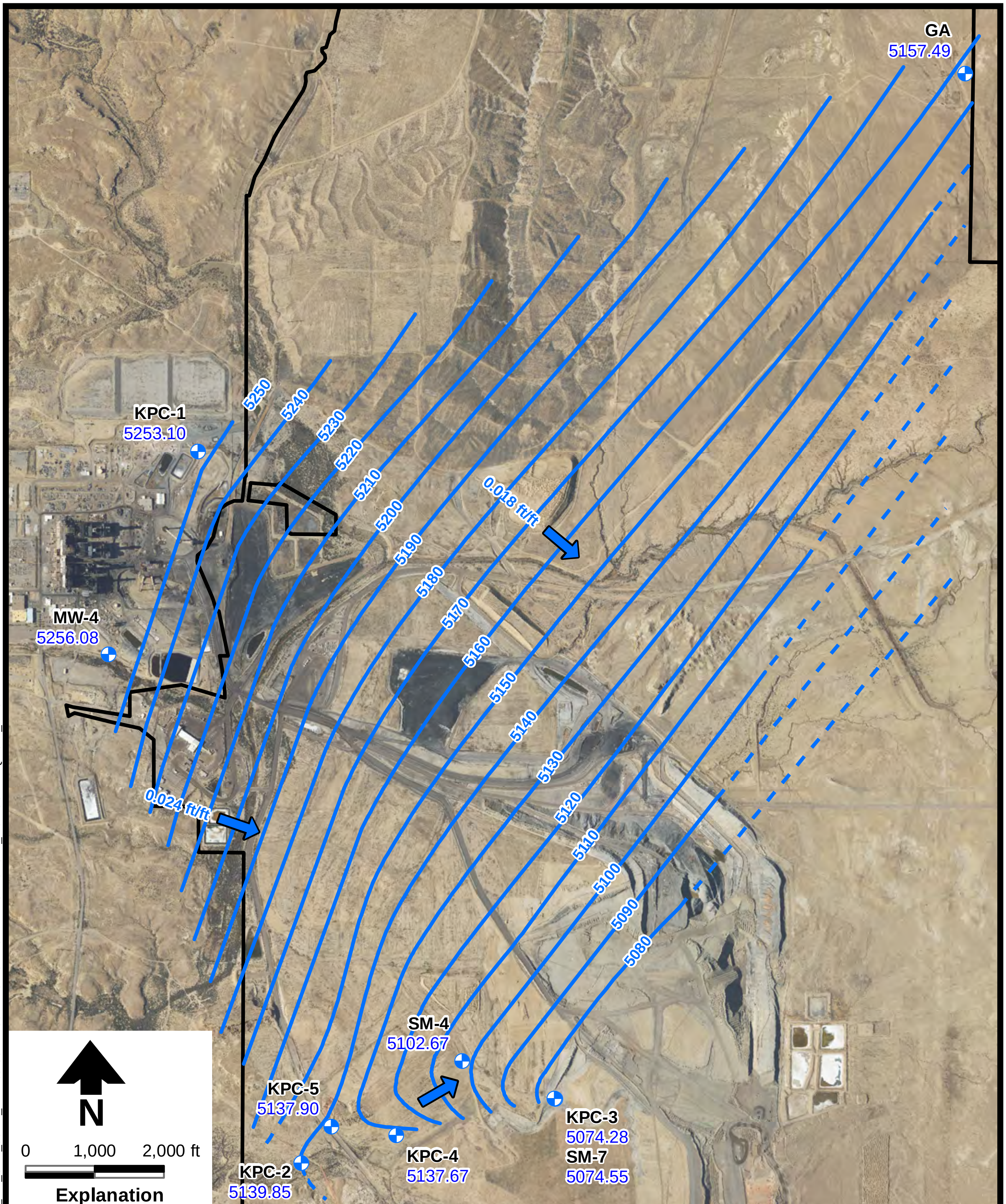
SAN JUAN MINE
Potentiometric Surface Elevations
Fruitland Formation, Second Quarter 2024

DBS&A
a Geo-Logic Company

6/23/2025 DB24.1140

Figure 13

S:\PROJECTS\DB24.1140_EMNRD_NM_SAN_JUAN_MINE\GIS\MXDS\INVESTIGATION REPORT\FIG13_POT SURF 2Q 2024_KF.MXD



Explanation

SM-4 Well name

5102.67 Groundwater elevation (ft msl)

Monitor well

Groundwater elevation contour (ft msl), dashed where inferred

Groundwater flow direction

San Juan Mine lease and permit boundary

Source: Aerial imagery (NAIP, 2024)

Note: MW-4 is monitored by the San Juan Generating Station.

SAN JUAN MINE

Potentiometric Surface Elevations
Pictured Cliffs Sandstone, Second Quarter 2024

S:\PROJECTS\DB24.1140_EMNRD_NM_SAN_JUAN_MINE\GIS\MXDS\INVESTIGATION REPORT\FIG14_POT SURF 2Q 2024_KPC.MXD

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6/16/2025 DB24.1140

S:\PROJECTS\DB24.1140_EMNRD_NM_SAN_JUAN_MINE\GIS\MXDS\INVESTIGATION REPORT\FIG15_SURFACE WATER CHEMISTRY.MXD

Source: Aerial imagery (NAIP, 2024)

Explanation

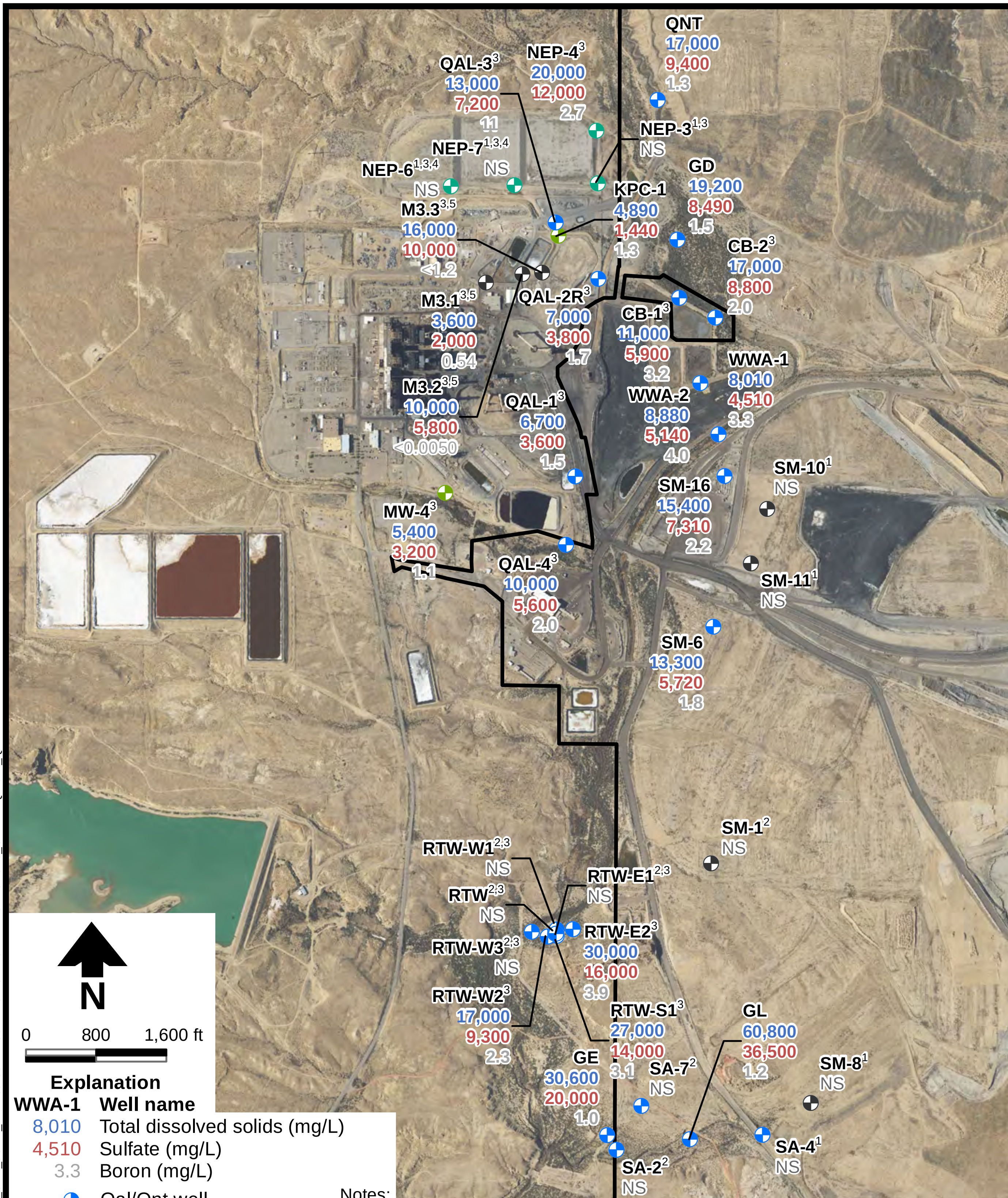
SWM #6 (03/23) **Well name** (Date of measurement)
2,640 TDS (mg/L)
1,540 Sulfate (mg/L)
0.5 Boron (mg/L)
Surface water monitoring site
Ephemeral stream/diversion
San Juan Mine lease and permit boundary

Notes:
1. **Bold** indicates that boron concentration exceeds the Section 900 irrigation standard.
2. *Italics* indicate that boron concentration exceeds the Section 900 livestock standard.
3. There are no Section 900 surface water standards for TDS or sulfate.

SAN JUAN MINE
Surface Water Sampling Sites
Most Recent Water Quality Results

DBS&A a Geo-Logic Company
6/23/2025 DB24.1140

Figure 15



Explanation

WWA-1	**Well name**
8,010	Total dissolved solids (mg/L)
4,510	Sulfate (mg/L)
3.3	Boron (mg/L)
	Qal/Qnt well
	Fill well
	Kf well
	Kpc well
	San Juan Mine lease and permit boundary

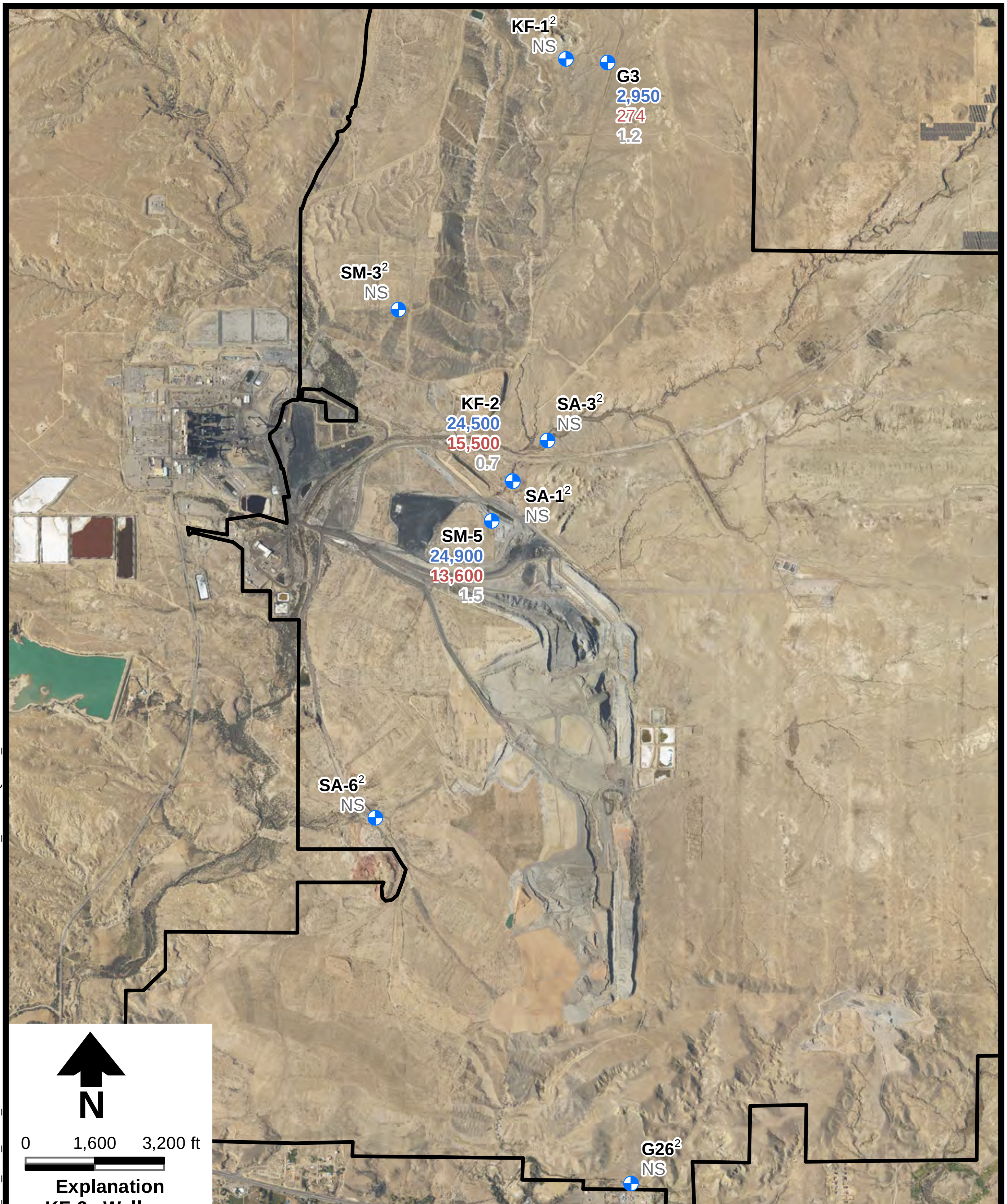
Notes:
1. No sample: dry
2. No sample: not enough water to sample
3. Water quality data from DP-1327 Second Quarter 2024 Quarterly Monitoring Report.
4. NEP-1 and NEP-2 referred to as NEP-6 and NEP-7 in the DP-1327 Monitoring Report, respectively.
5. M3.# series wells referred to as MP 3.# in the DP-1327 Monitoring Report.
6. **Bold** indicates that value exceeds the Section 3103 standard.

SAN JUAN MINE
Water Quality
Alluvium/Backfill, Second Quarter 2024

DBS&A a Geo-Logic Company

6/19/2025 DB24.1140

S:\PROJECTS\DB24.1140_EMNRD_NM_SAN_JUAN_MINE\GIS\MXDS\INVESTIGATION REPORT\FIG16_CHEM 2Q 2024_QAL.MXD



Explanation

KF-2 Well name
24,500 Total dissolved solids (mg/L)
15,500 Sulfate (mg/L)
0.7 Boron (mg/L)
Monitor well
San Juan Mine lease and permit boundary

Notes:
1. No sample: dry
2. No sample: not enough water to sample
3. **Bold** indicates that value exceeds the Section 3103 standard.

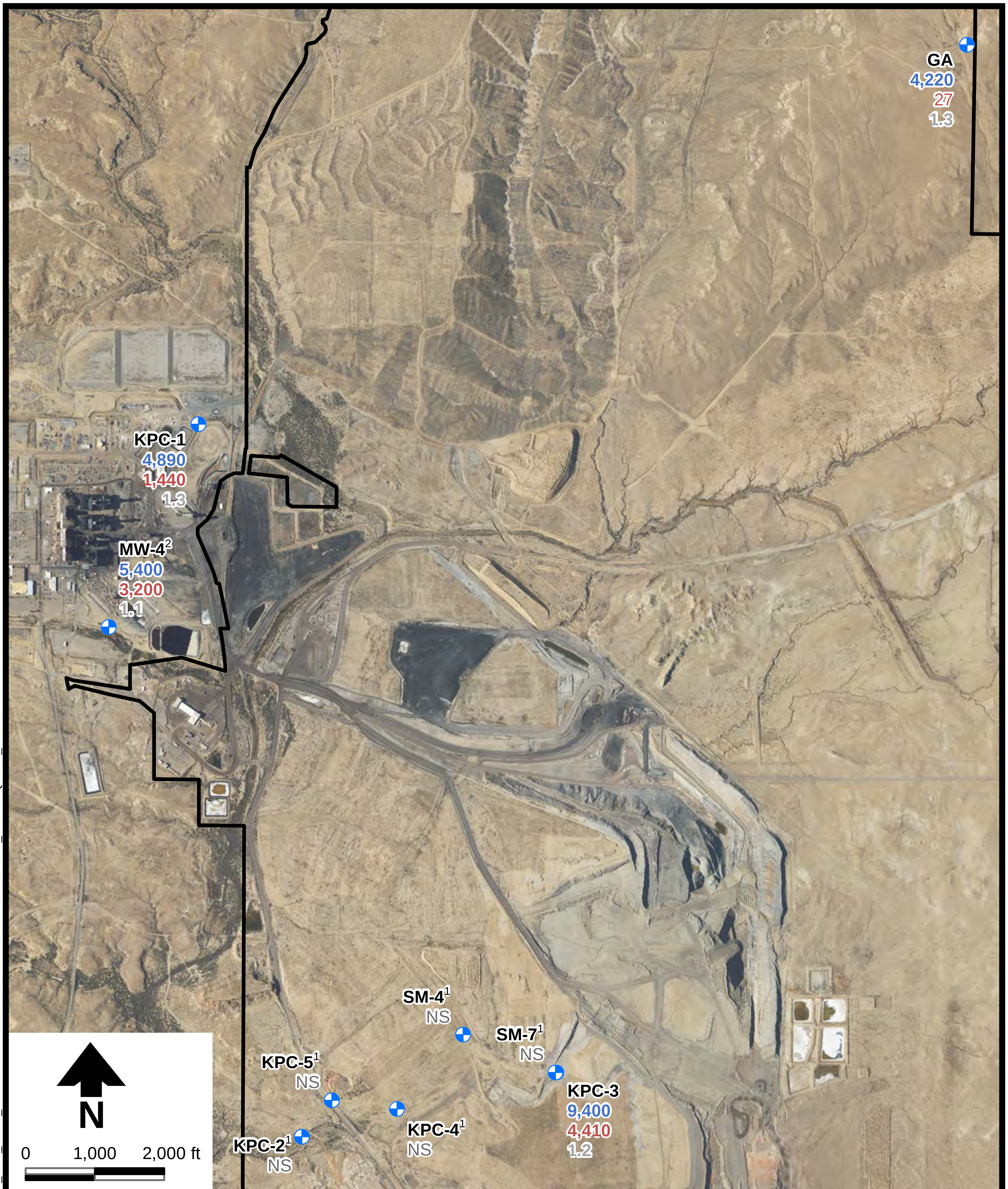
Source: Aerial imagery (NAIP, 2024)

SAN JUAN MINE
Water Quality
Fruitland Formation, Second Quarter 2024

DBS&A a Geo-Logic Company
6/10/2025 DB24.1140

Figure 17

S:\PROJECTS\DB24.1140_EMNRD_NM_SAN_JUAN_MINE\GIS\MXDS\INVESTIGATION REPORT\FIG17_CHEM 2Q 2024_KF.MXD



Explanation

KPC-3 **Well name**
9,400 Total dissolved solids (mg/L)
4,410 Sulfate (mg/L)
1.2 Boron (mg/L)
Monitor well
San Juan Mine lease and permit boundary

Notes:
1. No sample: not enough water to sample.
2. Water quality data from DP-1327 Second Quarter 2024 Quarterly Monitoring Report.
3. **Bold** indicates that value exceeds the Section 3103 standard.

Source: Aerial imagery (NAIP, 2024)

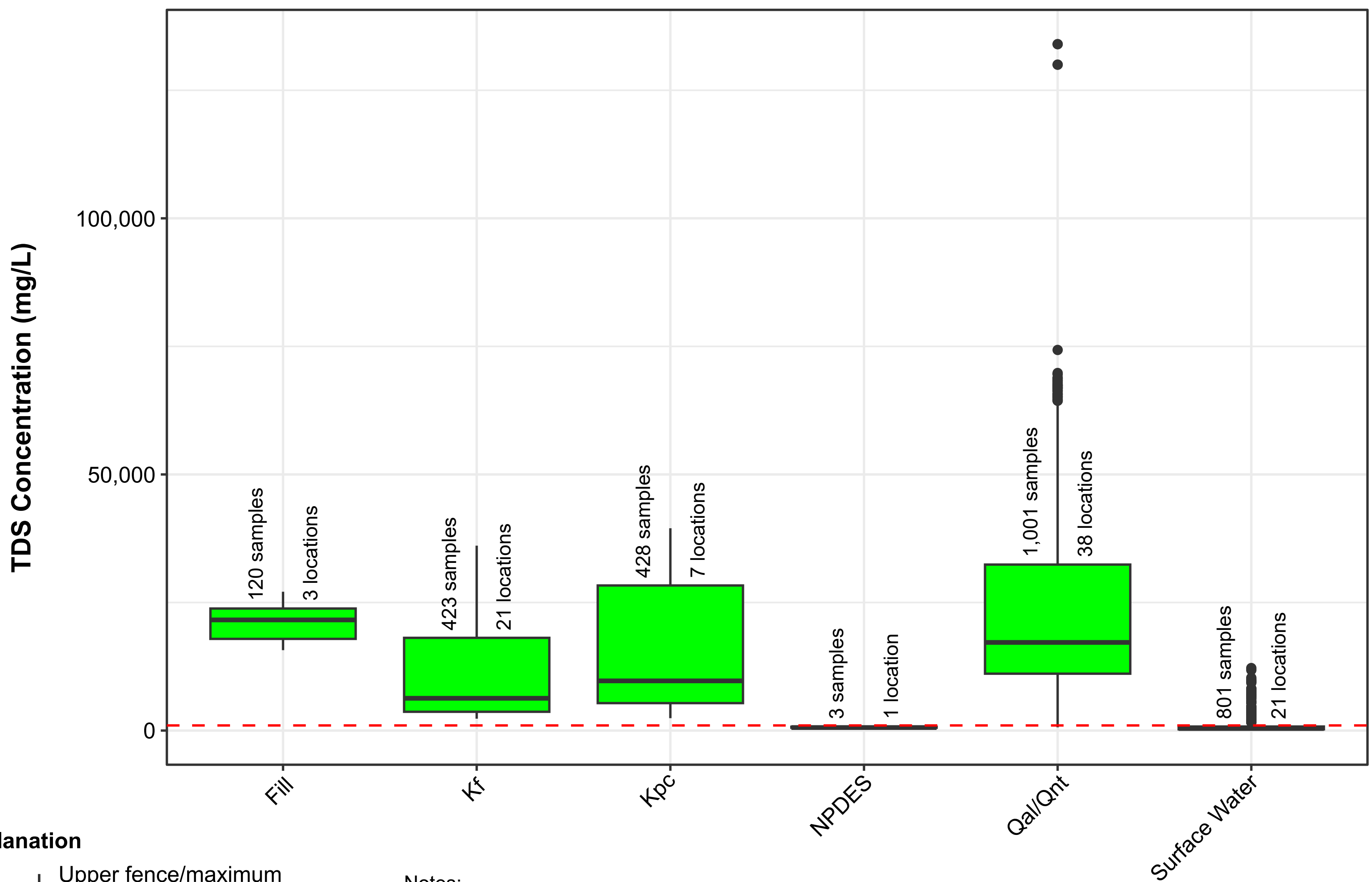
SAN JUAN MINE
Water Quality
Pictured Cliffs Sandstone, Second Quarter 2024

DBS&A a Geo-Logic Company

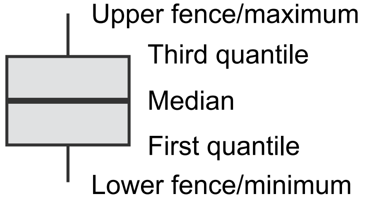
6/19/2025 DB24.1140

Figure 18

S:\PROJECTS\DB24.1140_EMNRD_NM_SAN_JUAN_MINE\GIS\MXDS\INVESTIGATION REPORT\FIG18_CHEM 2Q 2024_KPC.MXD



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples and locations in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Total Dissolved Solids

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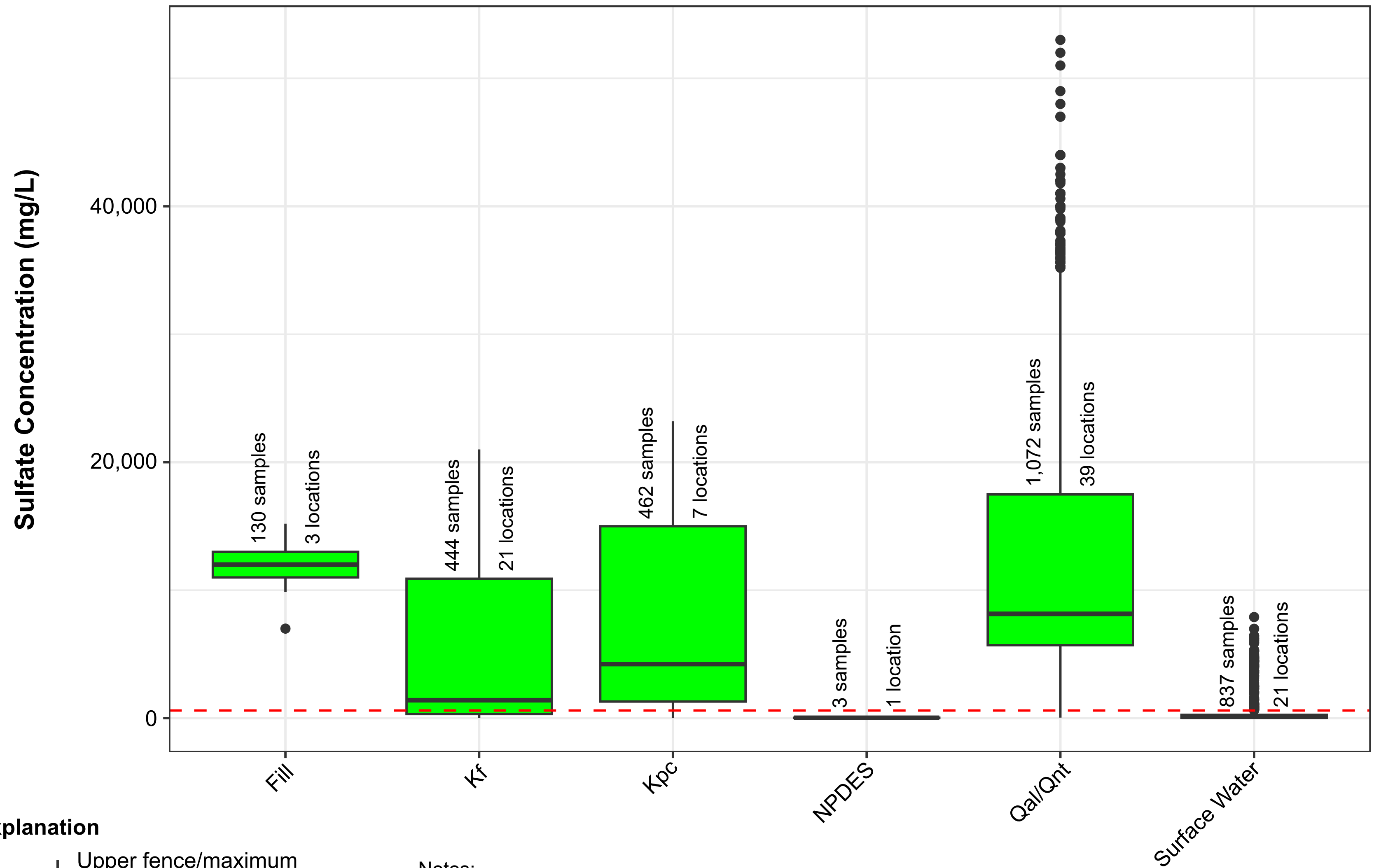
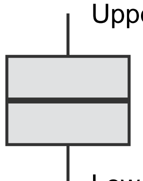
6/20/2025 DB24.1140

Figure 19a



Explanation

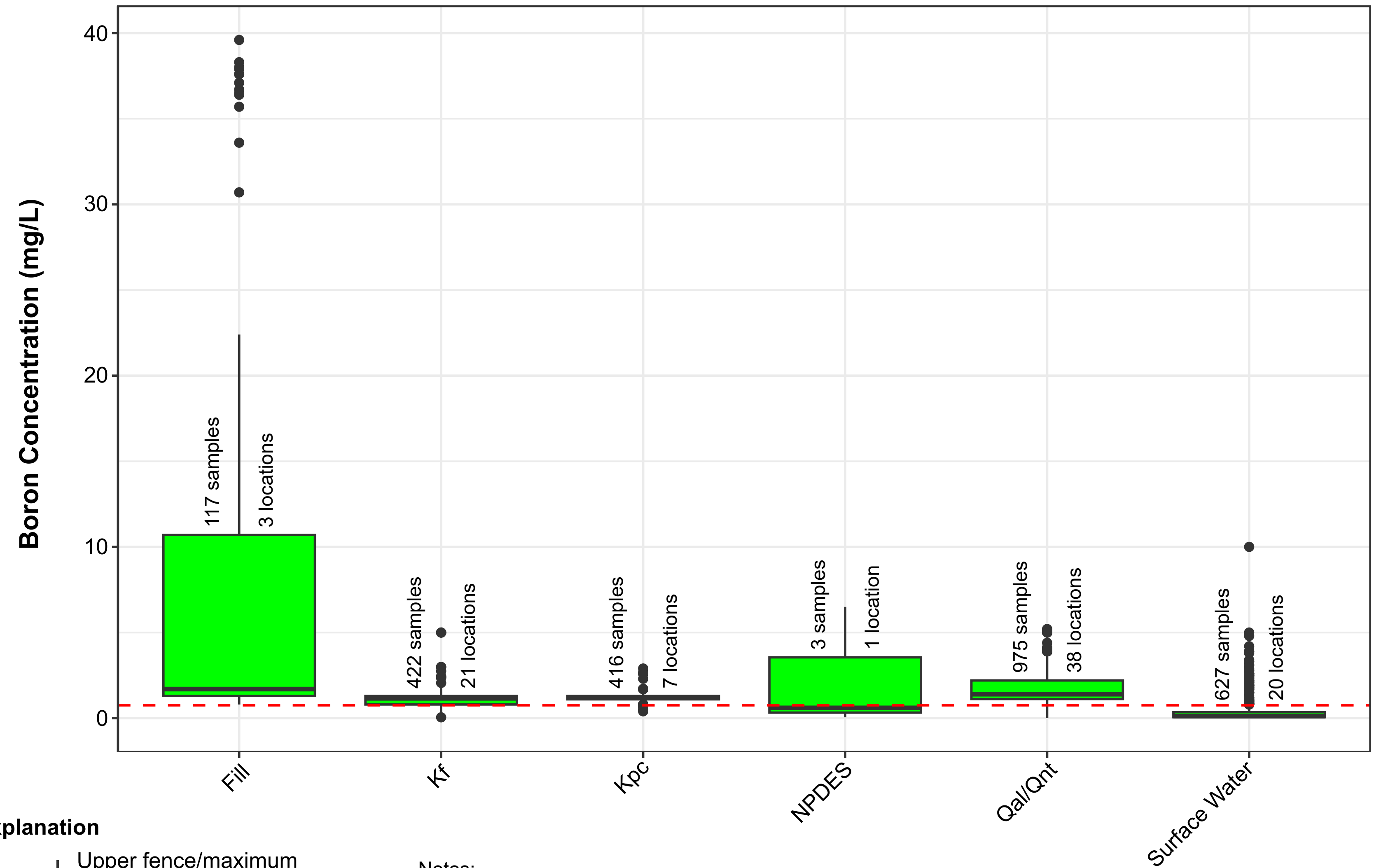


Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples and locations in each group are given next to each plot.
4. Outlier values shown as points.

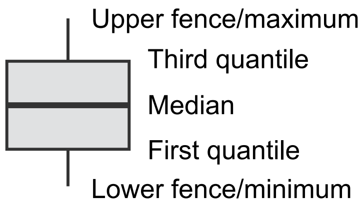
SAN JUAN MINE
Box and Whisker Comparison Plot
Sulfate

Figure 19b

a Geo-Logic Company
6/20/2025
DB24.1140



Explanation



Notes:

1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples and locations in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE

Box and Whisker Comparison Plot

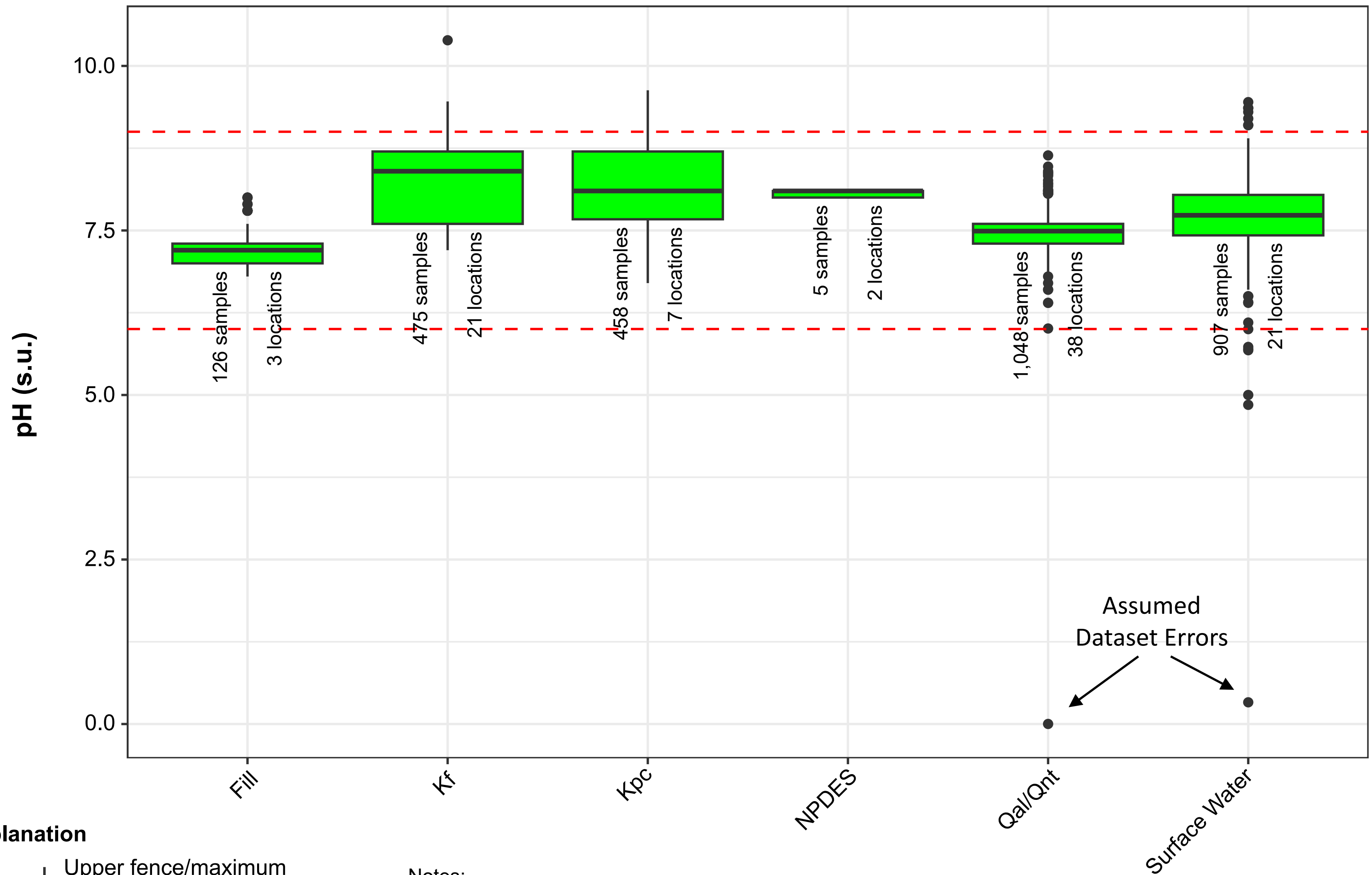
Boron

Figure 19c

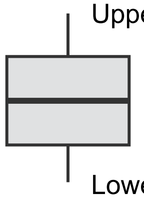
DBS&A a Geo-Logic Company

6/20/2025 DB24.1140

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm



Explanation



Notes:

1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples and locations in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE

Box and Whisker Comparison Plot

pH

Figure 19d

DBS&A a Geo-Logic Company

6/20/2025 DB24.1140

Tables

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Table 1. Comments Posted During Public Comments Periods
Page 1 of 5

Poster	Affiliation	Date	Comment
Mike Eisenfeld [a]	San Juan Citizens Alliance, Tó Nizhóní Ání, Diné Citizens Against Ruining our Environment (Diné C.A.R.E.), and Western Environmental Law Center	9/19/2024	September 19, 2024 San Juan Citizens Alliance, Tó Nizhóní Ání, Diné Citizens Against Ruining our Environment (Diné C.A.R.E.), and Western Environmental Law Center Comments in Response to New Mexico Energy, Minerals, and Natural Resources Department Mining and Minerals Division Request for Public Comment Regarding a Remediation and Restoration Study at the San Juan Mine The closure of San Juan Mine and San Juan Generating Station in 2022 has resulted in the need for a comprehensive restoration, reclamation and remediation plan (Plan) commensurate with the environmental consequences of the 52 years of facility operation. The local Four Corners communities have been challenged with the complexity of jurisdictional oversight of San Juan Generating Station and San Juan Mine. The 2019 Final Environmental Impact Statement (EIS) prepared by the U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement (OSMRE) with Cooperating Agencies U.S. Environmental Protection Agency (EPA), Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (USFWS) and New Mexico Mining (MMD) and Minerals Division on the San Juan Mine Deep Lease Extension Mining Plan Modification did not carry through the Just Transition Alternative that should have been analyzed in detail (to identify reclamation requirements). Abandonment proceedings for San Juan Generating Station initiated in 2019 before the New Mexico Public Regulation Commission per the Energy Transition Act of 2019 resulted in replacement energy opportunities with shutdown of the SJGS/San Juan Mine complex. The closure of SJGS and San Juan Mine in 2022 were indicative of economic challenges facing the coal industry, the recognition that the facilities were no longer viable, and the urgent need to transition to clean energy in New Mexico. The August 24, 2024 demolishing of the stacks at San Juan Generating Station provides finality for the coal plant and the permanent closure of San Juan Mine, which requires immediate reclamation with no known alternative use. If there is any proposed change to the alternate use of the SJGS/San Juan Mine site, beyond reclamation and remediation, Community groups request an independent or supplemental NEPA analysis, and request that study convenors identify any other planned alternate uses of the SJGS/San Juan Mine site to assist federal agencies in identifying NEPA opportunities. According to the 2019 Final EIS on the San Juan Mine Deep Lease Extension Mining Plan Modification: "If the alternate use after 2022 falls outside the bounds of the analysis in this EIS (less emission control, new form of transit, new use), then the OSMRE or another federal agency with an action associated with the new use (such as approval of a new rail line or spur) would conduct an independent or supplemental NEPA analysis to analyze new impacts or impacts outside the bounds of those analyzed in this EIS." (EIS at page 33). Community groups also request a full analysis of current reclamation bonds and their ability to achieve full reclamation and remediation of San Juan Mine, and an updated analysis of the cleanup needs associated with coal combustion residuals, toxic release inventory disposal impacts, and meaningful hydrologic reclamation. The 2019 Final EIS for the San Juan Mine Deep Lease Extension Mining Plan Modification disclosed that coal combustion residuals ("CCR") from SJGS were disposed in the mining pits at San Juan Mine. (EIS at pages 22-23). This connects impacts from SJGS and San Juan Mine that must be considered as cumulative impacts and connected actions. CCR are the remnants of the burned coal, and the dumping of CCR in the underground San Juan Mine pits potentially exposes water resources to toxic releases (including releases of arsenic, barium, lead, mercury, and other metals). OSMRE included information from the Toxic Release Inventory ("TRI"), noting that TRI constituents include arsenic, barium, beryllium, chromium, lead, mercury, selenium, thallium, and vanadium. OSMRE concludes, however, that the TRI disposal impacts at San Juan Mine are "trace" even though the TRI dumping at San Juan Mine has entailed over 28 million pounds from 2008-2016, averaging 3.18 million pounds per year (EIS at pages 22-23). However, these TRI totals do not include other pollution from SJGS or the cumulative impacts of the Four Corners Power Plant/Navajo Mine, which is on the other side of the San Juan River. It was unconscionable in 2019 that OSMRE would neglect the toxic legacy of the San Juan Mine and SJGS complex and thus ignore significant public health implications of OSMRE's decision to approve further mining and additional disposal of CCR in unlined mining pits. The reclamation performance bond submitted by San Juan Mine owner Westmoreland in connection with the 2019 mine permit application was substantially and materially deficient. Most significantly, Westmoreland's bond does not cover the costs of full remediation of CCR pits at the mine, as the Surface Mining Control and Reclamation Act SMCRA requires. 30 U.S.C. § 1259(a); 30 C.F.R. § 800.14(b) (SMCRA and the regulations further require that the reclamation bond be "sufficient to assure the completion of the reclamation plan if the work had to be performed by the regulatory authority.") Additionally, Westmoreland's bond is not supported by a meaningful hydrologic reclamation plan to ensure cleanup of toxins. OSMRE and MMD/New Mexico Environment Department (NMED) must ensure that as the San Juan Mine and SJGS shut down, reclamation occurs expeditiously, completely, and effectively. The 2019 Final EIS for the San Juan Mine Deep Lease Extension Mining Plan Modification disclosed that the San Juan Mine historically emitted significant quantities of methane. These emissions were discovered by a team of scientists from NASA, NOAA, and several universities. The scientists conducted an airborne campaign to identify the sources of a 2,500-square mile methane "hot spot" that was discovered in 2014 over the Four Corners Region through analysis of satellite data. A subsequent study identified the San Juan Mine as the third largest source of methane emissions in the basin. These findings are confirmed by the EPA Greenhouse Gas Reporting Program, which reports that the San Juan Mine emitted 809,000 mt CO_2e from the venting of mine waste methane in 2016, roughly 13% of methane emissions detected in the basin.

Table 1. Comments Posted During Public Comments Periods
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Poster	Affiliation	Date	Comment
Mike Eisenfeld [a] (cont.)	San Juan Citizens Alliance, Tó Nizhóní Ání, Diné Citizens Against Ruining our Environment (Diné C.A.R.E.), and Western Environmental Law Center	9/19/2024	In 2023, the New Mexico State Legislature passed the San Juan Generating Station Facility and Mine Remediation and Restoration Study Act, NMSA 1978, § 74-4H-3 (2023), authorizing the Mining and Minerals Division of the New Mexico Energy, Minerals, and Natural Resources Department (EMNRD) to contract with third-party professionals to develop an independent reclamation and restoration planning document. EMNRD has initiated this process and is now seeking public comments on what impacted communities consider specific, measurable steps for potential cleanup of the generating facility and mine while prioritizing employment of workers that were previously employed at the facility and mine. New Mexico Mining and Minerals Division (MMD) has contracted Daniel B. Stephens and Associates to complete a study of the San Juan Mine per requirements of HB 142. As part of the study, EMNRD seeks to engage stakeholders in the early stages of our project with the goal of incorporating feedback and thus improve the robustne ss of the final report. Our comments address the early stages of the reclamation and restoration planning document and also point to the responsible regulatory oversight for a project of this magnitude. Please ensure that our organizations, San Juan Citizens Alliance, Tó Nizhóní Ání, Diné Citizens Against Ruining our Environment (Diné C.A.R.E.), and Western Environmental Law Center are included in any and all opportunities in participation as stakeholders for the San Juan Generating Station Facility and Mine Remediation and Restoration Study. We also request that EMNRD and New Mexico Environment Department notify us of any distinct components of the study pertaining to the San Juan Mine and San Juan Generating Station. We note that these comments are due September 19, 2024 before the meeting held for public input on the San Juan Mine Remediation and Restoration Study on September 26, 2024 in Farmington. In general, Community Groups offer the following recommendations: Cleanup, reclamation and restoration should be to the highest closure/decommissioning of SJGS and San Juan Mine, and the study should identify reclamation economic opportunities and employment opportunities for the local community. The San Juan Generating Station Facility and Mine Remediation and Restoration Study should track jobs created and investment in the reclamation/restoration economy created to clean up the coal complex legacy. The San Juan Generating Station Facility and Mine Remediation and Restoration Study should clarify, and if needed, make recommendations to rectify any loopholes in the reclamation oversight and reclamation regulatory responsibilities of Federal and State agencies. The Study should include a review and inventory of all regulatory requirements and applications, particularly associated with toxic and/or contamination liabilities at the site including, but not limited to the Solid Waste Disposal Act/ Resource Conservation and Recovery Act (42 USC 6901 et seq.; Asbestos Hazard Emergency Response Act (15 USC 52); Clean Air Act (42 USC 7401 et seq.): Toxic Substances Control Act (15 USC 2601-2692); Emergency Planning and Community Right-to-Know Act (42 USC 11001); New Mexico Hazardous Waste Act (NMSA § 74-4-1); Comprehensive Environmental Response, Compensation, and Liability Act (Superfund) 42 U.S.C. §9601 et seq. (1980): New Mexico Solid Waste Act (20.9.1-20.9.25 NMAC); New Mexico Surface Mining Act (NMSA § 69-25A-20); New Mexico Water Quality Act (NMSA § 74-6-1); New Mexico Ground Water Protection Act (NMSA § 74-6B-1). The study should strictly adhere to mine closure requirements of the New Mexico Surface Mining Act. The conductors should convene meetings with responsible agencies for stakeholder participation for postmining options at the coal complex site beyond defined traditional uses, or should make recommendations accordingly. Mine Waste Methane at San Juan Mine should be captured and used. A plan for capturing methane should be part of the San Juan Generating Station Facility and Mine Remediation and Restoration Study. It is unacceptable to allow any future venting of methane from the abandoned San Juan Mine. The San Juan Generating Station Facility and Mine Remediation and Restoration Study should focus on the legacy and history of Toxic Release Inventory (TRI) at SJGS/San Juan Mine and extraordinarily high levels of barium, arsenic and other heavy metal contamination. The San Juan Generating Station Facility and Mine Remediation and Restoration Study should include a site-specific Human Health Risk Assessment given the known TRI Inventory data and the air emissions from the collective SJGS and mine. The San Juan Generating Station Facility and Mine Remediation and Restoration Study should incorporate latest guidance on Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities: Legacy CCR Surface Impoundments (40 CFR Parts 9 and 257 [EPA-HQ-OLEM-2020-0107; FRL-7814-04-OLEM] RIN 2050-AH14) and consider the long term contamination issues associated with the dumping of coal ash and Coal Combustion Wastes in the aboveground and underground San Juan Mine. The Study should consider removal of all CCR from San Juan Mine. The San Juan Generating Station Facility and Mine Remediation and Restoration Study should quantify all costs associated with remediation/restoration of SJGS/San Juan Mine and determine if bonds are sufficient. Groups also request that study convenors analyze the required SMCRA compliance associated with bond sufficiency.

Table 1. Comments Posted During Public Comments Periods
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Poster	Affiliation	Date	Comment
Mike Eisenfeld [a] (cont.)	San Juan Citizens Alliance, Tó Nizhóní Ání, Diné Citizens Against Ruining our Environment (Diné C.A.R.E.), and Western Environmental Law Center	9/19/2024	To the extent possible, the re-use of SJGS/San Juan Mine sites should be brownfield reclamation, including renewables. The San Juan Generating Station Facility and Mine Remediation and Restoration Study should thoroughly review and incorporate Cumulative Hydrologic Impact Assessments for San Juan Mine, and also review the USDOI, U.S. Geological Survey Hydrologic Assessment and Numerical Simulation of Groundwater Flow, San Juan Mine, San Juan County, New Mexico, 2010–13, Scientific Investigations Report 2017-5155 for sources of heavy metal migration (including barium and arsenic). Potential impacts to San Juan River are critical elements of the San Juan Generating Station Facility and Mine Remediation and Restoration Study, and st udy convenors should include potential impacts to the San Juan River. The San Juan Generating Station Facility and Mine Remediation and Restoration Study must incorporate Environmental Justice principles allowing for full community participation that recognizes the diversity of the Four Corners population and provides opportunities for consultation/language translation and input (including Free, Prior and Informed Consent, as included in the United Nations Declaration of the Rights of Indigenous Peoples). The Study must meet current state of New Mexico requirements on Diversity, Equity and Inclusion. We note that certain segments of Four Corners community members have often been left out of the dialogue on energy export projects. We advocate for renewable energy projects to utilize existing transmission and substation infrastructure at the SJGS/San Juan Mine site. All contaminants at effluent ponds, evaporation ponds, containment ponds, reservoirs and solid waste pits at SJGS should be permanently removed from the site. Please provide information on where current wastes from effluent ponds, evaporation ponds, containment ponds, reservoirs and solid waste pits are being transported to. We recommend that study convenors analyze potential reuses for the site unrelated to fossil fuel use or development, including brownfield redevelopment for solar projects. We also recommend that study convenors analyze potential community benefits of brownfield redevelopment, including the opportunities for local employment, community impact payments and investments to nearby communities impacted by the toxic legacy of San Juan Mine, and potential local or benefits of solar energy created by brownfield redevelopment. Please include all documents referenced and/or incorporated by reference in this comment letter into the Administrative Record for the project. Community groups offer specific comments and questions on the following: San Juan Generating Station Facility and Mine Remediation and Restoration Study Act, House Bill 142, 2023 Section 2 (F): The Study should fully evaluate “toxic metal contaminants” at SJGS and San Juan Mine as defined as EPA’s twenty-one identified constituents of concern in coal ash leachate. Some of the toxic metal contaminants, such as methyl mercury, resulted from emissions from coal burning at SJGS leading to deposition in area waterways. Other high level of toxic metal contamination known from SJGS/San Juan Mine coal complex include barium and arsenic. Section 3 (A) (2): The study must be an independent reclamation and restoration plan that results in a course of action to prevent contamination from toxic metal contaminants at the San Juan Mine/SJGS site and to the San Juan River. Section 3 (C): With the deadline of July 1, 2025 for the remediation and restoration study, EMNRD and NMED should ensure that there is interface between public stakeholders and owners of the SJGS/Westmoreland (owner of San Juan Mine) to ensure that financial commitments to address contamination are met. Daniel B. Stephens and Associates shouldn’t be tasked with conducting this outreach – it should be state agencies with regulatory responsibilities. MMD and OSMRE should hold off on bond release on San Juan Mine until this remediation and restoration study is completed in 2025. In addition, no new permitting of the SJGS/San Juan Mine historic site should occur until reclamation/restoration is complete and all contamination removed, including all forms of coal ash. State of New Mexico, Energy, Minerals and Natural Resources Department and Daniel B. Stephens and Associates SHARE No. 24-521-0600-0215 Task 4: The plan should include potential impacts to the San Juan River and also to the Shumway Arroyo, a perennial waterway that was created at San Juan Mine and SJGS over many years of water discharge.

Table 1. Comments Posted During Public Comments Periods
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Poster	Affiliation	Date	Comment
Mike Eisenfeld [a] (cont.)	San Juan Citizens Alliance, Tó Nizhóní Ání, Diné Citizens Against Ruining our Environment (Diné C.A.R.E.), and Western Environmental Law Center	9/19/2024	Task 4(C): Although providing various scenarios regarding remediation could be useful, the historic impacts of potential contamination and the extensive Toxic Release Inventory associated with the facilities warrant extensive remediation. A study published in May 2014 in Proceedings of the National Academy for Sciences by Los Alamos National Laboratory and Department of Energy, "Multiscale observations of CO2, CO and pollutants at Four Corners for emission verification and attribution," refers to the San Juan Generating Station (as well as the Four Corners Power Plant) as the largest point source of pollution in the United States (Lindenmaier, R. , et al., Proceedings of the National Academy of Sciences, 2014; DOI: 10.1073/pnas.1321883111 "Multiscale observations of CO2, CO and pollutants at Four Corners for emission verification and attribution," Earth and Environmental Sciences and Space and Remote Sensing, Los Alamos National Laboratory, NM). Impacts from historic coal mining operations at San Juan Mine and from SJGS coal combustion are significant. Task 8: Preparation and presentation of the plan should incorporate projected costs of complete remediation of contamination at the SJGS/San Juan Mine coal complex. San Juan Decommissioning and Trust Funds Agreement among Public Service Company Of New Mexico; Tucson Electric Power Company; The City Of Farmington, New Mexico; M-S-R Public Power Agency; The Incorporated County Of Los Alamos, New Mexico; Southern California Public Power Authority; City Of Anaheim; Utah Associated Municipal Power Systems; Tri-State Generation And Transmission Association, Inc.; PNMR Development And Management Corporation, July 31, 2015 This agreement defines the responsibilities of past owners at SJGS on the Decommissioning Agreement which becomes effective on the Exit Date. This agreement also sets forth cost shares in decommissioning of SJGS. The agreement also requires establishment of a Decommissioning Committee, with a representative from each party on the agreement and a Decommissioning Agent. The agreement stipulates that a Decommissioning Study (Plan) is to begin within thirty (30) days after the decision is made to retire the last unit at SJGS. This could be construed to have occurred at the latest in 2022. Commentors request information regarding the specific date considered as initiating the Plan. Decommissioning is defined in the Agreement in Section 2.2.11 as, Decommissioning means, subject to the provisions set forth in Section 4.3, removal of the San Juan Project facilities from service in conjunction with retirement of facilities or closure of the Project in accordance with either the requirements of applicable Law, if any, or Prudent Cost Avoidance. (emphasis added). Possible Decommissioning activities include the dismantlement, demolition, removal, retirement in place, salvage, remediation and/or reclamation of the San Juan Project or a portion thereof (but not of the San Juan Mine), including any planning and administrative activities incident there to and related reporting and monitoring requirements. In Section 5.1.1 of the agreement, The Decommissioning Study will: (i) determine the current federal and state requirements under Law, if any, for Decommissioning a coal-fired electric generation plant in the state of New Mexico; (ii) estimate the cost of Decommissioning Work to the level required by Law, which may include ongoing monitoring of the SJGS Plant Site ("Required Plan"); and (iii) estimate the cost of other approaches proposed by either the Decommissioning Committee or the Decommissioning Agent. Additionally, the following applies in Section 5.1.2, 5.1.2 All Decommissioning Plans included in the Decommissioning Study will: (i) include provisions to dispose of any remaining fly ash; (ii) subject to the provisions of Section 19 of the Restructuring Agreement, provide for the identification and remediation of any environmental concerns existing at the time Decommissioning begins; (iii) include provisions addressing security, risk management and insurance; and (iv) describe the Decommissioning Work proposed to be performed. We recommend that EMNRD and NMED keep track of the San Juan Decommissioning and Trust Funds Agreement progress and work plan and require full and complete decommissioning/remediation. We respectfully request written, periodic reporting from EMNRD and NMED concerning SJGS and San Juan Minecommunications and compliance concerning the Decommissioning Plans as they pertain to the San Juan Generating Station Facility and Mine Remediation and Restoration Study. San Juan Generating Station Retirement Scope and Cost Estimate, Public Service Company of New Mexico, PNM SJGS Decommissioning Study Project No. 112523, Revision 1, Prepared by Burns and McDonnell Engineering Company, Inc., 2019 This study looked at a Retirement in Place scenario or Full Demolition of SJGS. As of August 2024, full demolition of SJGS is occurring and Full Decommissioning should be required/pursued. This study estimated the Upper Bound of Full Demolition at $127 million in 2019 costs. The Study mention in Section 6.8 the intent to backfill effluent ponds with the disclaimer that should solids in these ponds be deemed hazardous, additional financial cost would be incurred for off-site removal. Effluent ponds, evaporation ponds, containment ponds, reservoirs and solid waste pits at SJGS should be focal points for contamination analysis, monitoring and removal. Section 7 of the Burns and McDonnell Study on SJGS Retirement is for Full Demolition Scope and should be incorporated by reference into the San Juan Generating Station Facility and Mine Remediation and Restoration Study. This section mentions PCBs which could be a major contamination problem at the facility.

**Table 1. Comments Posted During Public Comments Periods
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Poster	Affiliation	Date	Comment
Mike Eisenfeld [a] (cont.)	San Juan Citizens Alliance, Tó Nizhóní Ání, Diné Citizens Against Ruining our Environment (Diné C.A.R.E.), and Western Environmental Law Center	9/19/2024	New Mexico Environment Department, San Juan Generating Station Cleanup – HB 142 (2023): Update to Radioactive and Hazardous Materials Committee, Justin Ball Bureau Chief, Ground Water Quality Bureau, August 14, 2024 According to this presentation, Phase 1 and Phase 2 Environmental Sites Assessments (ESA) need to occur to determine environmental contamination at the SJGS site. In addition, the presentation cited that PNM is moving final on-site fly ash and coal combustion residuals to the San Juan Mine Mine. It is unclear to commenters if Daniel B. Stephens and Associates SHARE No. 24-521-0600-0215 Scope of Work includes preparation of Phase 1 and Phase ESA documents and compliance. Commentors request clarification regarding preparation of ESA and NEPA documents and compliance for the project. Thank you for this opportunity to submit public comments. Community Groups look forward to engaging further regarding SJGS/San Juan Mine cleanup and reserve the right to amend these comments after participation in public me etings for the project. Please reach out with any questions or further information. Respectfully submitted, Mike Eisenfeld San Juan Citizens Alliance mike@sanjuancitizens.org (505) 360-8994 Robyn Jackson (she/her/asdza´a´) Diné C.A.R.E. robyn.jackson@dine-care.org (928) 228-5805 Nicole Horseherder Tó Nizhóní Ání nicole@tonizhoniani.org (928) 240-0762 Rose Rushing Western Environmental Law Center rushing@westernlaw.org (505) 278-9577
Thomas Singer	Western Environmental Law Center	10/28/2024	I am writing in regards to the REQUEST FOR PROPOSALS FOR CONDUCTING A COMPREHENSIVE STUDY AND DEVELOPING A RESTORATION AND REMEDIATION PLAN FOR THE SAN JUAN MINE. In Task 4 of the Scope of Work, I strongly encourage MMD to ensure that for the comprehensive restoration, reclamation, and remediation Plan, the contractor fully explore a wide range of potential future uses of the site in conjunction with Task 5 (Conduct outreach within impacted communities to inform the Study). The Study should not limit future uses considered to grazing per my understanding of the existing permit. In particular we would like to see solar, battery storage, and transmission development considered as future potential site uses. Task 4.c is to "Provide various scenarios regarding remediation including a no action, intermediate and extensive if so warranted", and we believe that there are potential uses beyond grazing that would warrant different levels of restoration, reclamation, and remediation and that should be considered. In Task 8, in addition to "incorporat[ing] and address[ing] written comments from MMD on the draft Study and potential Plan", we also recommend providing an opportunity for public review of and comment on the contractor's draft Study and potential Plan and provide adequate time for such review and comment. Thank you for your consideration of these comments.

Table 2. Surface Water Quality Exceedances by Analyte
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Analyte	Section 20.6.4 Surface Water Standard (mg/L [a])				No. of Non-Detect Results	No. of Detections	No. of Samples Exceeding Standard				Result (mg/L [a])				Location(s) of Minimum	Location(s) of Maximum
	Irrigation	Livestock Watering	Wildlife Habitat	Acute Aquatic Life			Irrigation	Livestock Watering	Wildlife Habitat	Acute Aquatic Life	Min	Median	Average	Max		
Gross alpha (pCi/L)	—	15	—	—	1	47	—	33	—	—	2.2	28.3	35.5	127	SWM #6	SWM #3
Aluminum	5	—	—	0.75 [b]	60	119	40	—	—	2	0.003	0.4	99.6	2,330	SWM #6	SWM #5
Aluminum, total	—	—	—	Varies [c]	0	87	—	—	—	30	0.03	121	179.9	1460	SWM #12	SWM #3
Arsenic	0.1	0.2	—	0.34	175	342	1	0	—	0	0.0005	0.0021	0.005	0.16	SWM #6	SWM #7
Boron	0.75	5	—	—	131	424	91	1	—	—	0.01	0.2	0.57	10	McCabe Dam, SWM #1, and SWM #2	SWM #6
Cadmium	0.01	0.05	—	Varies [c]	386	128	2	1	—	23	0.00005	0.001	0.002	0.07	SWM #3, SWM #5, and SWM #6	SWM #1
Chromium	0.1	1	—	0.0016 [d]	380	137	3	0	—	31 [d]	0.001	0.01	0.02	0.5	SWM #3, SWM #5, SWM #6, SWM #7, SWM #12, SWM #14, Lower Hutch Canyon, and Lower Stevens Arroyo	SWM #7
Cobalt	0.05	1	—	—	3	5	2	0	—	—	0.02	0.03	0.04	0.07	SWM #4 and SWM #5	SWM #4 and SWM #5
Copper	0.2	0.5	—	Varies [c]	6	98	0	0	—	16	0.0007	0.0033	0.009	0.1	SWM #6 and SWM #12	SWM #5
Lead	5	0.1	—	Varies [c]	261	237	1	19	—	18	0.0001	0.002	0.22	38	SWM #6, SWM #7, Lower Stevens Arroyo, and Upper Stevens Arroyo	SWM #7
Manganese	—	—	—	Varies [c]	62	291	—	—	—	9	0.005	0.11	0.54	12.4	SWM #3, SWM #6, and SWM #7	Upper Stevens Arroyo
Mercury	—	—	—	0.0014	33	27	—	—	—	4	0.00001	0.0002	0.0031	0.06	SWM #6	SWM #13
Mercury, total	—	0.01	0.00077	Varies [c]	25	23	—	0	13	—	0.00002	0.0009	0.0009	0.0021	SWM #6	SWM #7, Lower Stevens Arroyo, and Upper Stevens Arroyo
Molybdenum	1	—	—	—	5	10	0	0	—	—	0.005	0.01	0.03	0.07	SWM #4	SWM #4
Radium-226 + -228 (pCi/L)	—	30	—	—	0	6	—	4	—	—	15.65	38.31	56.1	170.88	SWM #5	SWM #7
Selenium	Varies [e]	0.05	—	—	295	267	4	6	—	—	0.001	0.004	0.12	15.4	SWM #3, SWM #5, SWM #6, SWM #7, SWM #9, SWM #16, Lower Hutch Canyon, and Lower Stevens Arroyo	SWM #5
Selenium, total	—	—	0.005	0.02	4	26	—	—	13	—	0.001	0.0055	0.007	0.02	SWM #6	SWM #6

Notes are provided at the end of the table.

Table 2. Surface Water Quality Exceedances by Analyte
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Analyte	Section 20.6.4 Surface Water Standard (mg/L [a])				No. of Non-Detect Results	No. of Detections	No. of Samples Exceeding Standard				Result (mg/L [a])				Location(s) of Minimum	Location(s) of Maximum
	Irrigation	Livestock Watering	Wildlife Habitat	Acute Aquatic Life			Irrigation	Livestock Watering	Wildlife Habitat	Acute Aquatic Life	Min	Median	Average	Max		
Silver	—	—	—	Varies [c]	402	42	—	—	—	6	0.00005	0.000165	0.003	0.02	SWM #3, SWM #5, SWM #6, and Lower Stevens Arroyo	SWM #5
Sulfate	No standard, provided for reference				71	669	No standard, provided for reference				1.53	127	638.1	7,900	SWM #8	SWM #6
TDS					1	708					30	400	973	12,200	SWM #13 and SWM #14	SWM #4
Zinc	2	25	—	Varies [c]	204	319	4	0	—	32	0.001	0.02	0.11	3.63	SWM #5, SWM #6, and SWM #7	SWM #5

[a] Unless otherwise noted.
[b] The acute standard only applies for samples with pH below 6.5 or above 9.0.
[c] Acute standard calculated as a function of hardness, as provided in 20.6.4 NMAC.
[d] Acute standard for chromium (VI); number of exceedances calculated assuming that all chromium is chromium (VI).
[e] Standard is 0.25 mg/L if sulfate concentration is 500 mg/L or greater; otherwise, standard is 0.13 mg/L.
mg/L = Milligrams per liter
pCi/L = Picocuries per liter
TDS = Total dissolved solids

Table 3. Backfill Water Quality Exceedances by Analyte

Analyte	Section 3103 Standard (mg/L)	Date Range	Total Monitored Locations	No. of Locations with Exceedances	Total No. of Samples	No. of Non-Detect Results	No. of Results Exceeding Standard	Result [a] (mg/L)				Location of Minimum	Location of Maximum
								Min	Median	Average	Max		
Arsenic	0.01	2011-2023	3	1	118	96	5	0.0005	0.0025	0.0044	0.03	SM-5	SM-7
Boron	0.75	2011-2023	3	3	117	0	117	0.8	1.7	8.557	39.6	JP-2	SM-7
Chloride	250	2011-2024	3	3	130	0	130	510	1,850	1,530	3,800	SM-7	JP-2
Iron	1	2011-2023	3	3	116	10	52	0.015	0.9	1.234	7.19	SM-5	SM-5
Manganese	0.2	2011-2023	3	3	116	0	116	0.65	1.28	1.449	2.66	SM-5	SM-7
Phenols	0.005	2011-2014	3	1	28	26	2	0.005	0.005	0.0075	0.05	JP-2	SM-7
Sulfate	600	2011-2024	3	3	130	0	130	7,000	12,000	12,078	15,200	JP-2	SM-5
TDS	1,000	2011-2023	3	3	120	0	120	15,700	21,600	21,003	27,100	SM-5	SM-5
Thallium	0.002	2011-2024	3	1	216	208	3	0.0001	0.0025	0.0019	0.007	SM-5	SM-5

[a] Non-detects approximated as one-half the reporting limit.
mg/L = Milligrams per liter
TDS = Total dissolved solids

Table 4. Alluvial Groundwater Quality Exceedances by Analyte
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Analyte	Section 3103 Standard (mg/L [a])	Date Range	Total Monitored Locations	No. of Locations with Exceedances	Total No. of Samples	No. of Non-Detect Results	No. of Results Exceeding Standard	Result [b] (mg/L [a])				Location of Minimum	Location of Maximum
								Min	Median	Average	Max		
Aluminum	5	1974-2023	17	1	831	708	2	0.0005	0.05	0.214	6.93	GF	GD
Arsenic	0.01	1973-2023	17	7	877	780	18	0.00025	0.0025	0.0061	0.83	GD	SA-7
Boron	0.75	1973-2023	38	26	975	36	873	0.01	1.4	1.708	5.2	GC	WWA-2
Barium	2	1974-2023	17	3	846	729	3	0.0025	0.05	0.1401	4	GE	GE
Cadmium	0.005	1973-2023	17	6	873	788	26	0.000025	0.0005	0.0056	0.25	GD	GD
Chloride	250	1973-2024	39	33	1,072	4	979	0.005	2,140	2,582.44	9500	GC	GL
Cobalt	0.05	1974-2022	12	4	562	503	4	0.0025	0.005	0.0073	0.3	GC	GE
Chromium, total	0.05	1973-2023	17	5	871	693	23	0.0005	0.002	0.0146	0.88	GC	GL
Copper	1	1973-2022	13	2	741	566	2	0.0005	0.005	0.0375	2.5	GC	GL
Fluoride	1.6	1973-2024	36	17	1,050	13	398	0.005	1.5	1.9968	37.1	GD	GD
Iron	1	1973-2023	15	9	1,020	518	149	0.0005	0.05	0.8186	34.7	GD	GL
Manganese	0.2	1973-2023	15	13	864	88	274	0.0005	0.1	0.2416	29.7	GF	SM-6
Nickel	0.2	1973-2009	5	1	63	20	1	0.0005	0.02	0.0365	0.24	GC	GD
Nitrate	10	1973-2014	35	8	376	93	129	0.01	5	25.394	358	GE	GE
pH (s.u.) [c]	6–9	1973-2024	38	1	1,048	0	1	0.001	7.49	7.4638	8.64	WWA-3	GC
Lead	0.015	1973-2023	15	6	875	568	55	0.00005	0.0005	0.0109	0.6	GD	GL
Phenols	0.005	1974-2014	14	7	363	213	146	0.0005	0.008	0.1076	7.56	GC	GL
Radium-226 + -228 (pCi/L)	5	2011-2024	11	3	425	29	3	0.007	0.9	1.2251	9.9	SM-16	WWA-2
Selenium	0.05	1973-2024	15	7	1,650	713	146	0	0.0025	0.0166	0.68	GL	SM-6
Sulfate	600	1973-2024	39	39	1,072	2	1,056	43	8,150	12,902.1	53,000	GL	GL

Notes are provided at the end of the table.

Table 4. Alluvial Groundwater Quality Exceedances by Analyte
Page 2 of 2

Analyte	Section 3103 Standard (mg/L [a])	Date Range	Total Monitored Locations	No. of Locations with Exceedances	Total No. of Samples	No. of Non-Detect Results	No. of Results Exceeding Standard	Result [b] (mg/L [a])				Location of Minimum	Location of Maximum
								Min	Median	Average	Max		
TDS	1,000	1973-2023	38	38	1,001	0	990	634	17,200	23,672	134,000	GF	GL
Thallium	0.002	2009-2024	12	2	980	903	8	0.00003	0.0025	0.002	0.2	QNT	GL
Uranium	0.03	1979-2022	13	12	759	63	533	0.001	0.06	1.9373	150	GC	GL

[a] Unless otherwise noted.
[b] Non-detects approximated as one-half the reporting limit.
[c] Minimum value of 0.001 recorded at WWA-3 is believed to be an error.
mg/L = Milligrams per liter
s.u. = Standard units
pCi/L = Picocuries per liter
TDS = Total dissolved solids

Table 5. Fruitland Formation Groundwater Quality Exceedances by Analyte
Page 1 of 2

Analyte	Section 3103 Standard (mg/L [a])	Date Range	Total Monitored Locations	No. of Locations with Exceedances	Total No. of Samples	No. of Non-Detect Results	No. of Results Exceeding Standard	Result [b] (mg/L [a])				Location of Minimum	Location of Maximum
								Min	Median	Average	Max		
Silver	0.05	1983-2002	9	1	29	17	1	0.00125	0.0025	0.0259	0.5	G10	G26
Aluminum	5	1983-2022	20	4	408	291	7	0.01	0.05	0.41	26.9	G3	G-5
Arsenic	0.01	1983-2022	20	4	418	336	5	0.00025	0.0025	0.0035	0.06	G26	G14
Boron	0.75	1982-2022	21	21	422	4	318	0.05	1.16	1.105	5	G3	G26
Barium	2	1983-2022	20	8	413	272	34	0.005	0.05	0.864	51.6	G20	17CC
Cadmium	0.005	1983-2022	20	1	416	374	2	0.000025	0.0005	0.0024	0.25	G26	G26
Chloride	250	1982-2024	21	20	445	0	364	58	755	1,250.9	16700	G26	32CD
Chromium, Total	0.05	1983-2022	20	5	416	295	12	0.0005	0.003	0.0094	0.28	G26	G3
Fluoride	1.6	1982-2024	19	15	434	4	261	0.005	2	2.0236	25	G3	G-5
Iron	1	1983-2022	19	12	466	175	75	0.005	0.08	4.6561	778.8	G26	G-5
Manganese	0.2	1983-2022	19	9	405	142	121	0.0025	0.02	0.2482	8	G20	G-5
Nitrate	10	1982-2014	11	3	109	61	13	0.005	0.175	4.4033	43.2	G3	G26
pH (s.u.)	6-9	1982-2024	21	8	475	0	34	7.2	8.4	8.21	10.39	SA-1	G10
Lead	0.015	1983-2022	19	9	415	217	21	0.00005	0.0019	0.0073	0.56	G26	G-5
Phenols	0.005	1983-2014	18	16	199	83	113	0.0025	0.025	0.1157	1.97	G26	32CD
Radium-226 + -228 (pCi/L)	5	2010-2024	5	1	184	14	1	0.001	1.1	1.3823	10.4	G3	SA-1
Selenium	0.05	1983-2024	18	2	762	482	18	0	0.0025	0.0096	0.5	G3	G26
Sulfate	600	1982-2024	21	14	444	4	287	5	1,403.5	4,430.78	21,000	17CC	KF-2
TDS	1,000	1982-2022	21	21	423	0	423	2,320	6,300	9,657	36,100	G3	KF-2
Thallium	0.002	2010-2024	5	1	420	401	2	0.00004	0.0025	0.0017	0.006	G3	G3

Notes are provided at the end of the table.

Table 5. Fruitland Formation Groundwater Quality Exceedances by Analyte Page 2 of 2

Analyte	Section 3103 Standard (mg/L [a])	Date Range	Total Monitored Locations	No. of Locations with Exceedances	Total No. of Samples	No. of Non-Detect Results	No. of Results Exceeding Standard	Result [b] (mg/L [a])				Location of Minimum	Location of Maximum
								Min	Median	Average	Max		
Uranium	0.03	1986-2022	19	14	355	195	90	0.000005	0.001	0.0553	1	G26	G-5
Zinc	10	1983-2022	18	2	415	187	3	0.0025	0.02	1.62	305	G20	G14

[a] Unless otherwise noted.
[b] Non-detects approximated as one-half the reporting limit.
mg/L = Milligrams per liter
s.u. = Standard units
pCi/L = Picocuries per liter
TDS = Total dissolved solids

Table 6. Pictured Cliffs Sandstone Groundwater Quality Exceedances by Analyte

Analyte	Section 3103 Standard (mg/L [a])	Date Range	Total Monitored Locations	No. of Locations with Exceedances	Total No. of Samples	No. of Non-Detect Results	No. of Results Exceeding Standard	Result [b] (mg/L [a]) Min	Median	Average	Max	Location of Minimum	Location of Maximum
Aluminum	5	1974-2022	7	1	396	369	1	0.005	0.05	0.0969	7.88	GA	GA
Arsenic	0.01	1973-2022	7	3	409	379	5	0.00025	0.0025	0.0045	0.34	GA	KPC-5
Boron	0.75	1973-2022	7	7	416	1	401	0.4	1.2	1.184	2.9	GB	GA
Barium	2	1974-2022	7	2	400	301	3	0.005	0.05	0.1902	11	GA	GB
Cadmium	0.005	1973-2022	7	2	407	387	5	0.000025	0.0005	0.0015	0.14	GA	GB
Chloride	250	1973-2024	7	7	462	1	459	0.5	1,725	2,329.81	7,000	KPC-4	GB
Cyanide	0.2	1974-1984	2	1	11	5	4	0.005	0.07	0.8741	4.3	GA	GA
Cobalt	0.05	1979-2022	7	1	326	322	1	0.0025	0.005	0.0053	0.09	GA	GB
Chromium, total	0.05	1973-2022	7	2	407	307	6	0.0005	0.0005	0.0054	0.28	GA	GA
Fluoride	1.6	1973-2024	7	5	458	11	292	0.005	2	1.9393	6.9	GA	GB
Iron	1	1973-2022	7	5	467	219	23	0.005	0.05	0.2211	6.42	GA	KPC-3
Manganese	0.2	1973-2022	7	4	404	109	83	0.00025	0.07	0.5504	154	GA	KPC-2
Nitrate	10	1973-2014	7	2	147	129	4	0.005	0.5	3.3433	194	GA	GB
pH (s.u.)	6-9	1973-2024	7	1	458	0	15	6.7	8.1	8.13	9.63	GB	GA
Lead	0.015	1973-2022	7	2	408	236	14	0.00005	0.0002	0.0039	0.24	GA	GA
Phenols	0.005	1979-2014	7	3	136	91	44	0.0025	0.005	0.0655	0.88	GA	GB
Radium-226 + -228 (pCi/L)	5	2010-2024	6	5	246	9	87	0.001	4.2	4.2929	15.2	GA	KPC-4
Selenium	0.05	1973-2024	7	1	866	738	12	0.00006	0.002	0.0054	0.4	KPC-1	GA
Sulfate	600	1973-2024	7	7	462	5	372	2.5	4,230	7,226.35	23,200	KPC-4	KPC-2
TDS	1000	1973-2023	7	7	428	0	428	2,420	9,700	15,247	39,500	GA	KPC-4

Notes are provided at the end of the table.

Table 6. Pictured Cliffs Sandstone Groundwater Quality Exceedances by Analyte
Page 2 of 2

Analyte	Section 3103 Standard (mg/L [a])	Date Range	Total Monitored Locations	No. of Locations with Exceedances	Total No. of Samples	No. of Non-Detect Results	No. of Results Exceeding Standard	Result [b] (mg/L [a])				Location of Minimum	Location of Maximum
								Min	Median	Average	Max		
Thallium	0.002	2011-2024	6	2	572	557	3	0.00002	0.0025	0.0018	0.02	KPC-1	KPC-5
Uranium	0.03	1979-2022	7	2	380	274	9	0.00005	0.0005	0.0229	1.5	GA	GB

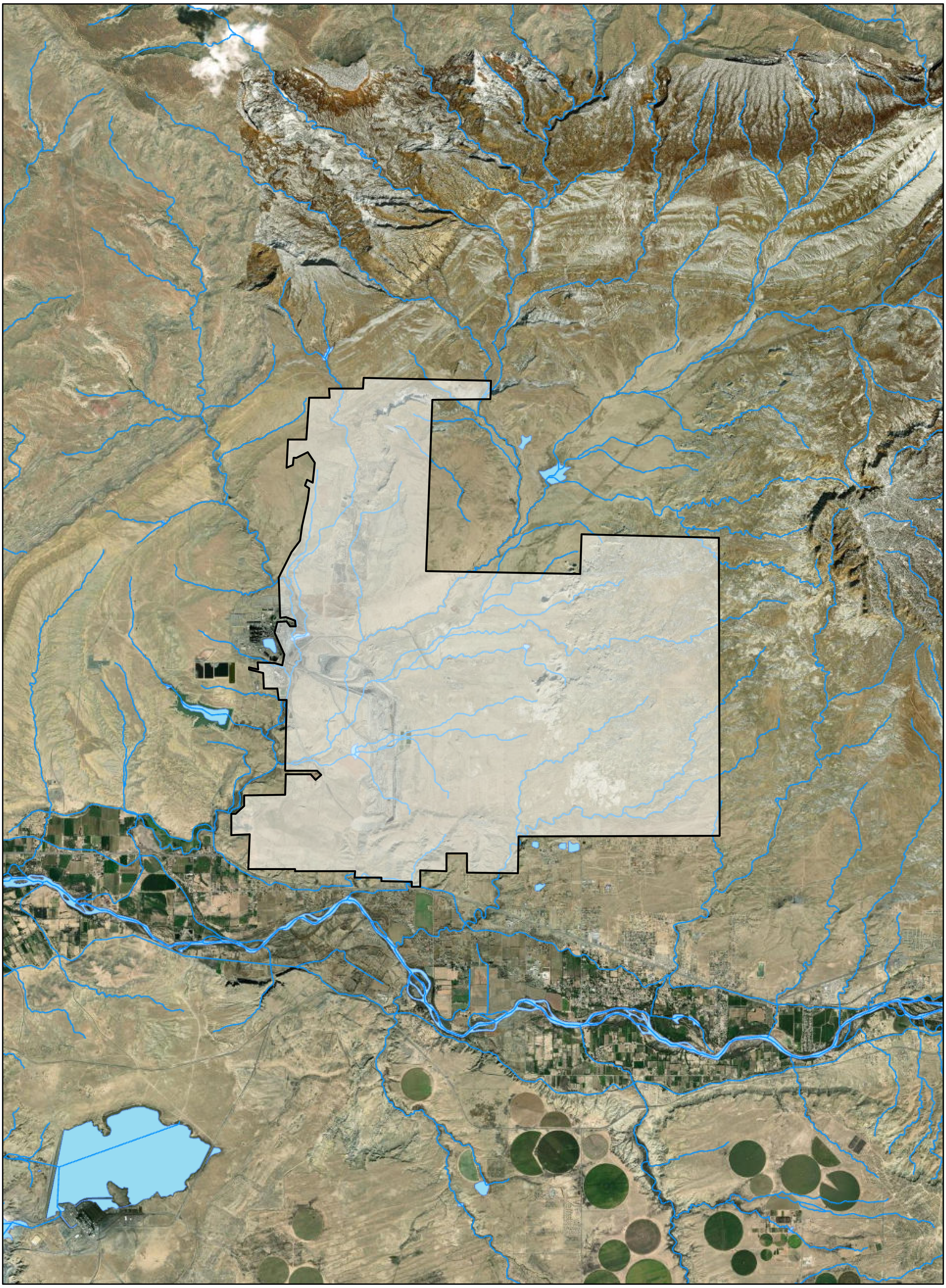
[a] Unless otherwise noted.
[b] Non-detects approximated as one-half the reporting limit.
mg/L = Milligrams per liter
s.u. = Standard units
pCi/L = Picocuries per liter
TDS = Total dissolved solids

Appendix A

Water Features near the San Juan Mine OCD Oil and Gas Map Application

a Geo-Logic Company

Water Features near the San Juan Mine



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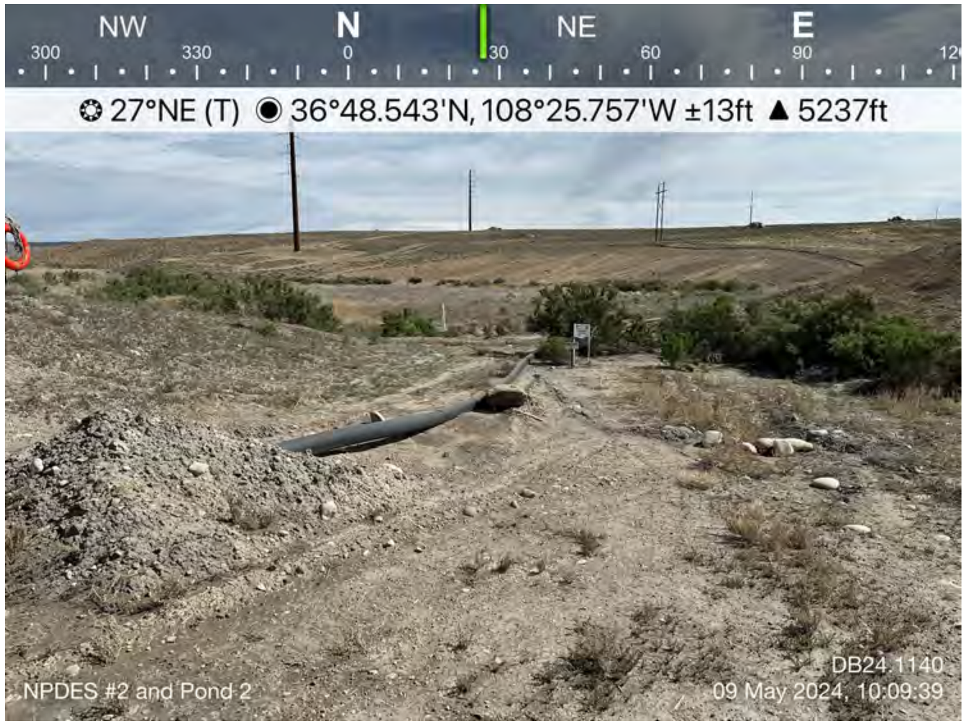
New Mexico Oil Conservation Division

Appendix B

Site Reconnaissance Photographs
May 9, 2024

DBS&A
a Geo-Logic Company


NW
N
NE
E
300
330
0
30
60
90
27°NE (T) 36°48.543'N, 108°25.757'W ±13ft 5237ft
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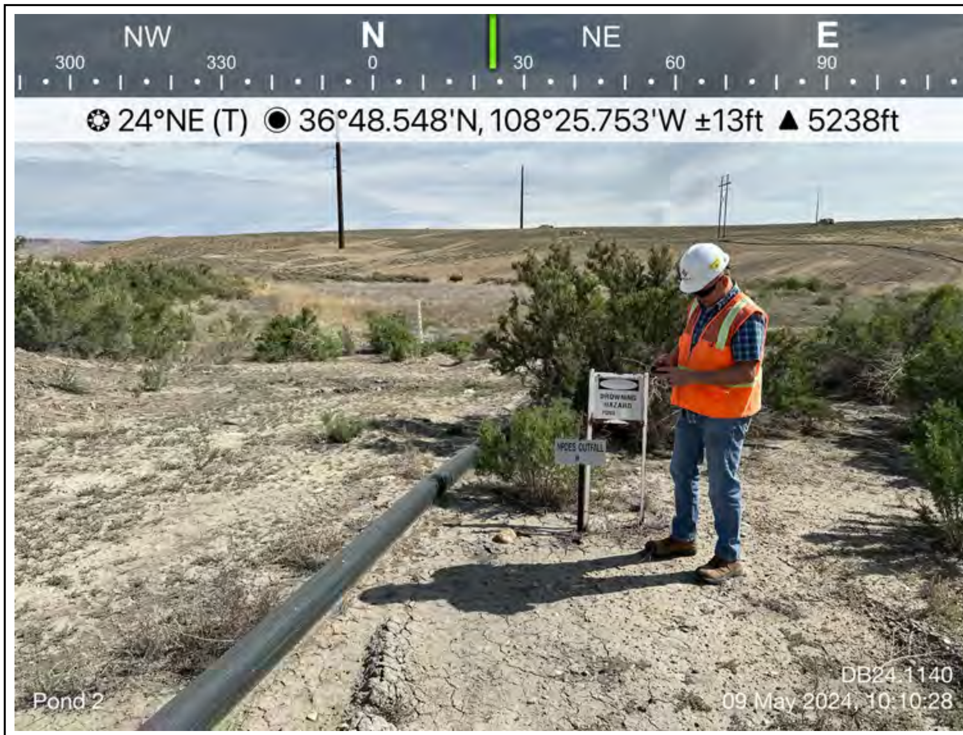
NW
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NE
E
300
330
0
30
60
90
24°NE (T) 36°48.548'N, 108°25.753'W ±13ft 5238ft
Pond 2
DB24.1140
09 May 2024, 10:10:28


NW
N
NE
E
300
330
0
30
60
90
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Pond 2
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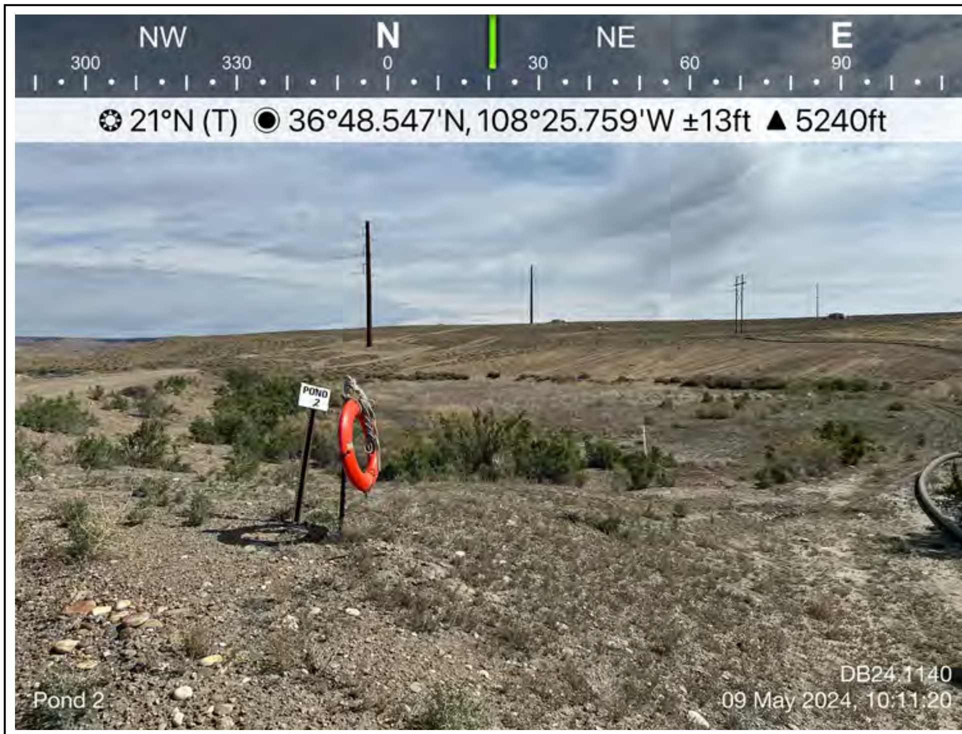
NW
N
NE
E
300
330
0
30
60
90
21°N (T) 36°48.547'N, 108°25.759'W ±13ft ▲ 5240ft
POND 2
Pond 2
DB24.1140
09 May 2024, 10:11:20

P:_DB24-1140\Site Investigation Rpt.6-25\Appx B_Photos\pg03.doc

DBS&A a Geo-Logic Company

6/27/2025 DB24.1140

SAN JUAN MINE
Photographs


NW
N
NE
E
300
330
0
60
90
120
30°NE (T) 36°48.743'N, 108°25.865'W ±13ft ▲ 5251ft
SWM #3
DB24.1140
09 May 2024, 10:23:12


W
NW
N
NE
240
270
300
0
30
60
330°NW (T) 36°49.055'N, 108°25.778'W ±13ft ▲ 5279ft
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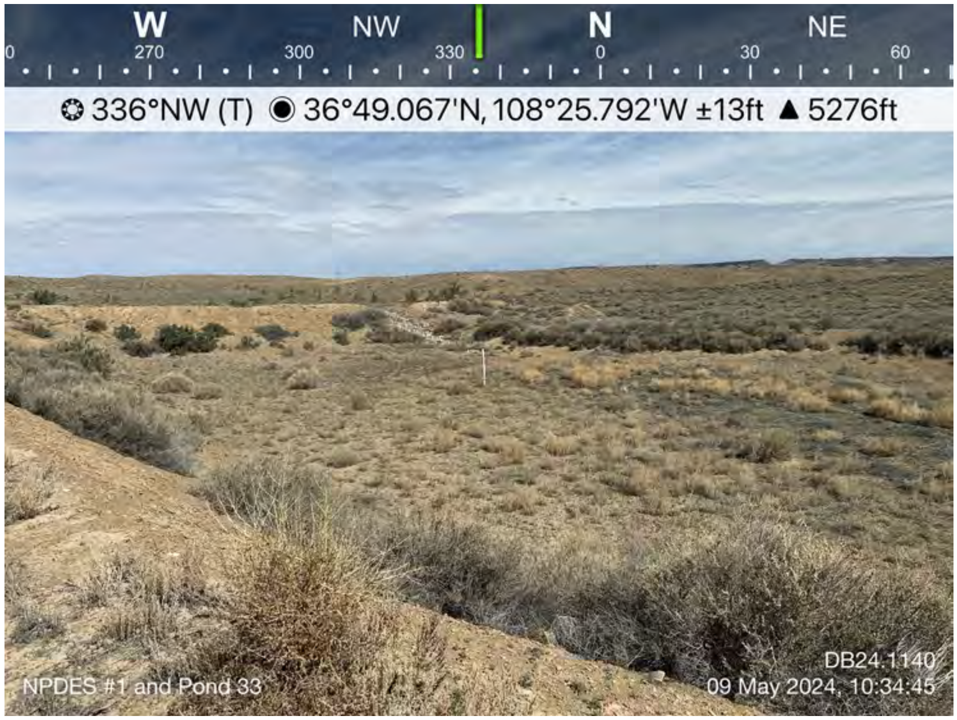
W
NW
N
NE
270
300
330
0
30
60
336°NW (T) 36°49.067'N, 108°25.792'W ±13ft 5276ft
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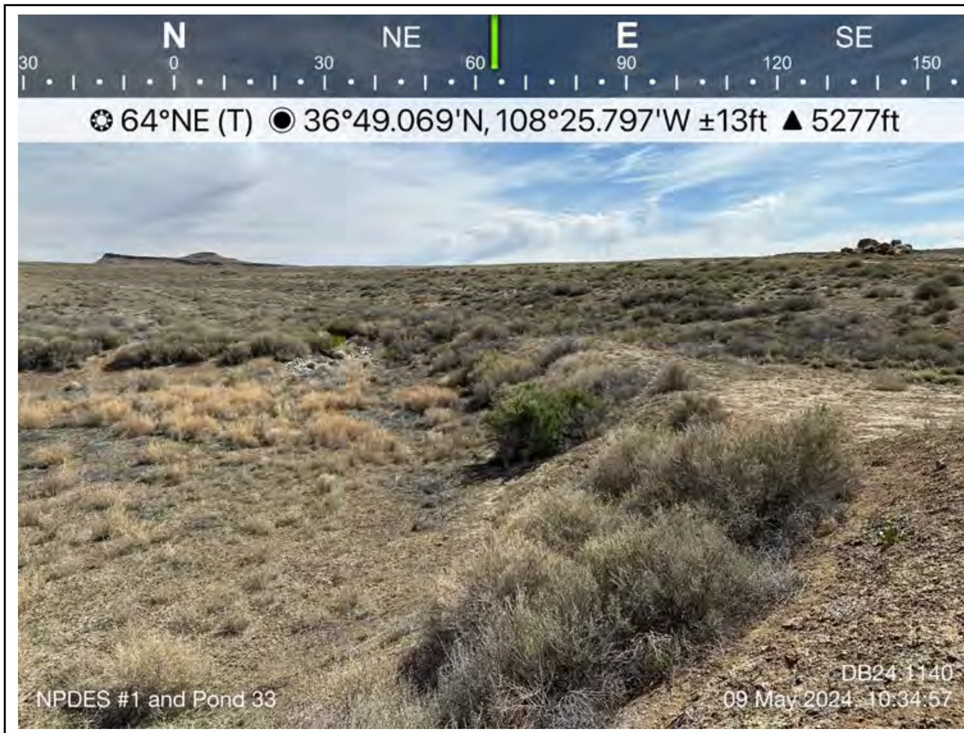
N
NE
E
SE
30
0
30
60
90
120
150
64°NE (T) 36°49.069'N, 108°25.797'W ±13ft 5277ft
NPDES #1 and Pond 33
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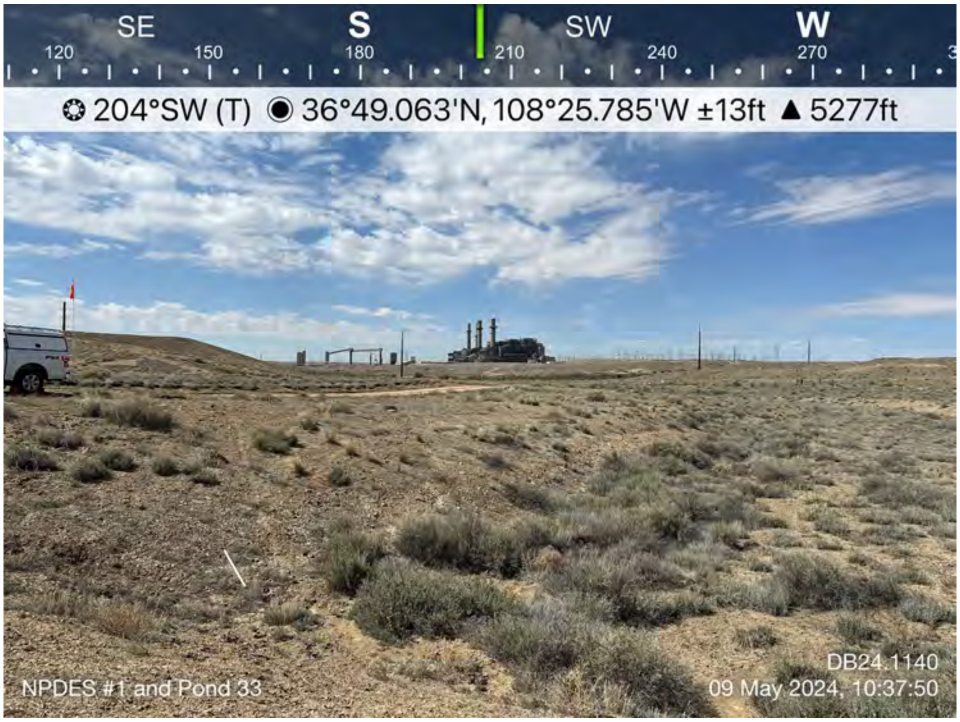
SE
S
SW
W
120
150
180
210
240
270
204°SW (T) 36°49.063'N, 108°25.785'W ±13ft 5277ft
NPDES #1 and Pond 33
DB24.1140
09 May 2024, 10:37:50


S
SW
W
NW
150
180
210
270
300
330
240°SW (T) 36°48.415'N, 108°23.779'W ±13ft 5260ft
Monitor Well GC
DB24.1140
09 May 2024, 11:05:45

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a Geo-Logic Company

6/27/2025 DB24.1140

SAN JUAN MINE
Photographs


E
SE
S
SW
60
90
120
150
180
210
144°SE (T) 36°46.927'N, 108°24.633'W ±13ft 5223ft
Juniper Pit
DB24.1140
09 May 2024, 11:37:16


E
SE
S
SW
60
90
120
150
180
210
141°SE (T) 36°46.927'N, 108°24.633'W ±13ft 5219ft
Juniper Pit
DB24.1140
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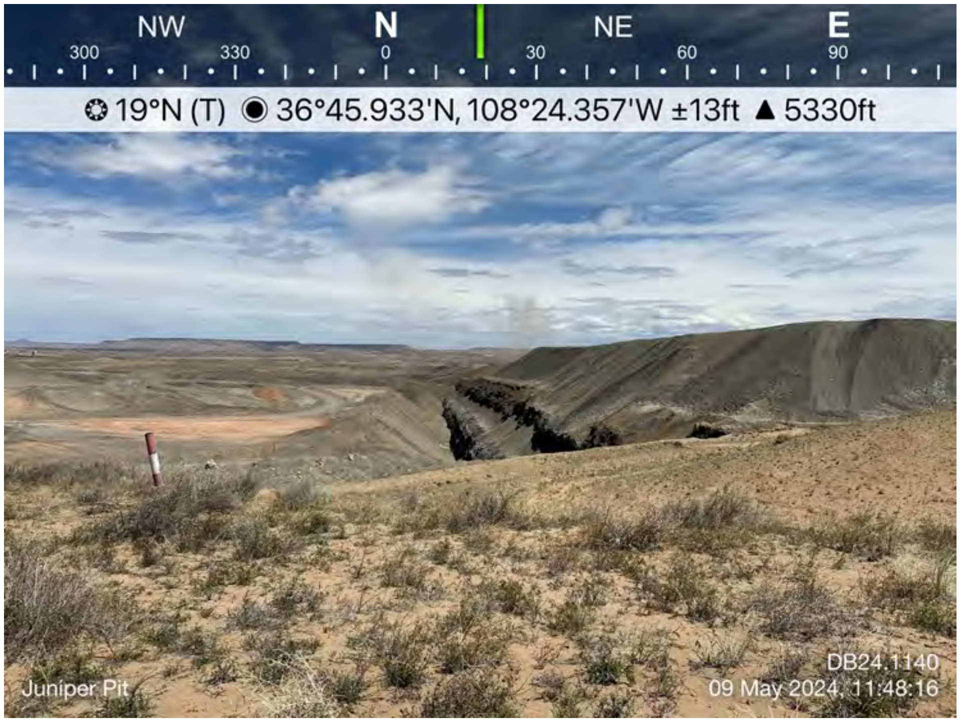
DBS&A a Geo-Logic Company

6/27/2025 DB24.1140

SAN JUAN MINE
Photographs


NW
N
NE
E
300
330
0
30
60
90
19°N (T) 36°45.933'N, 108°24.357'W ±13ft 5330ft
Juniper Pit
DB24.1140
09 May 2024, 11:48:16


W
NW
N
NE
270
300
330
0
30
60
350°N (T) 36°45.880'N, 108°24.333'W ±13ft 5424ft
Juniper Pit
DB24.1140
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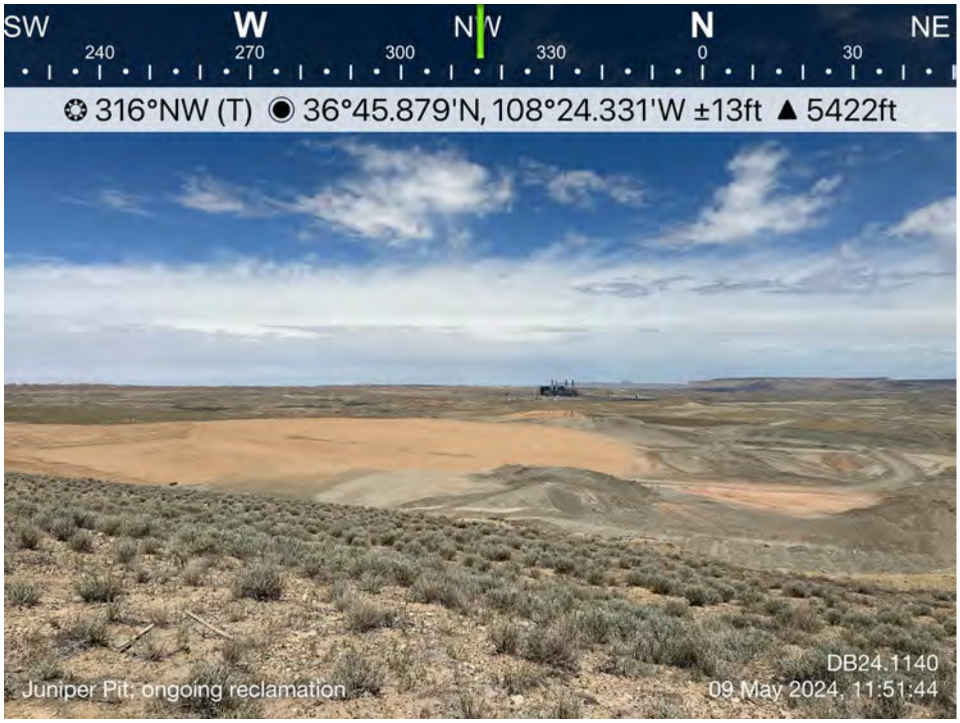
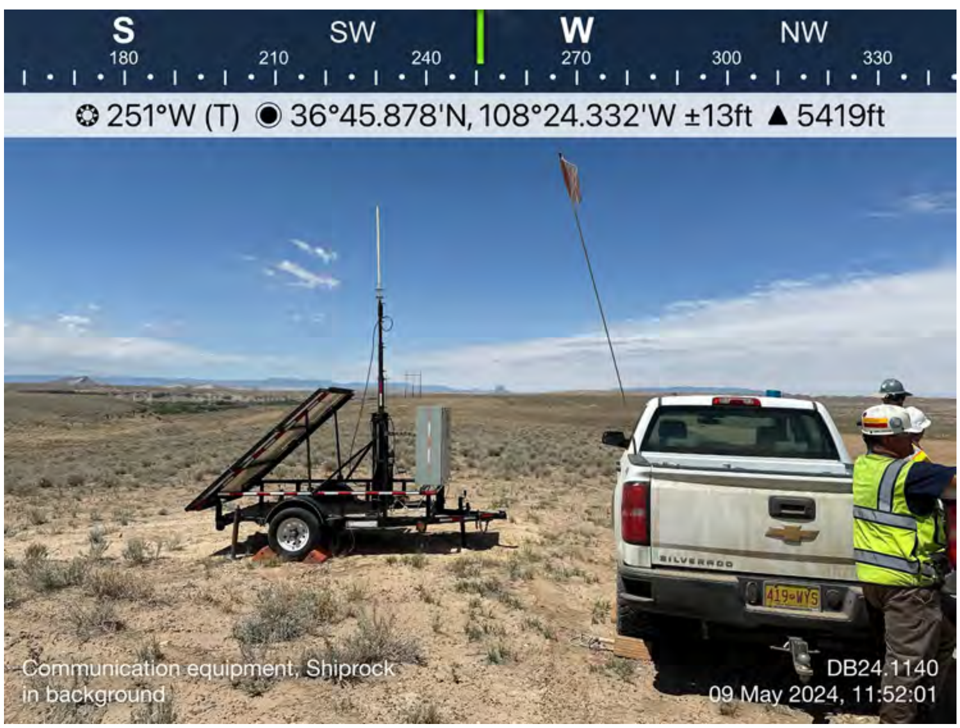
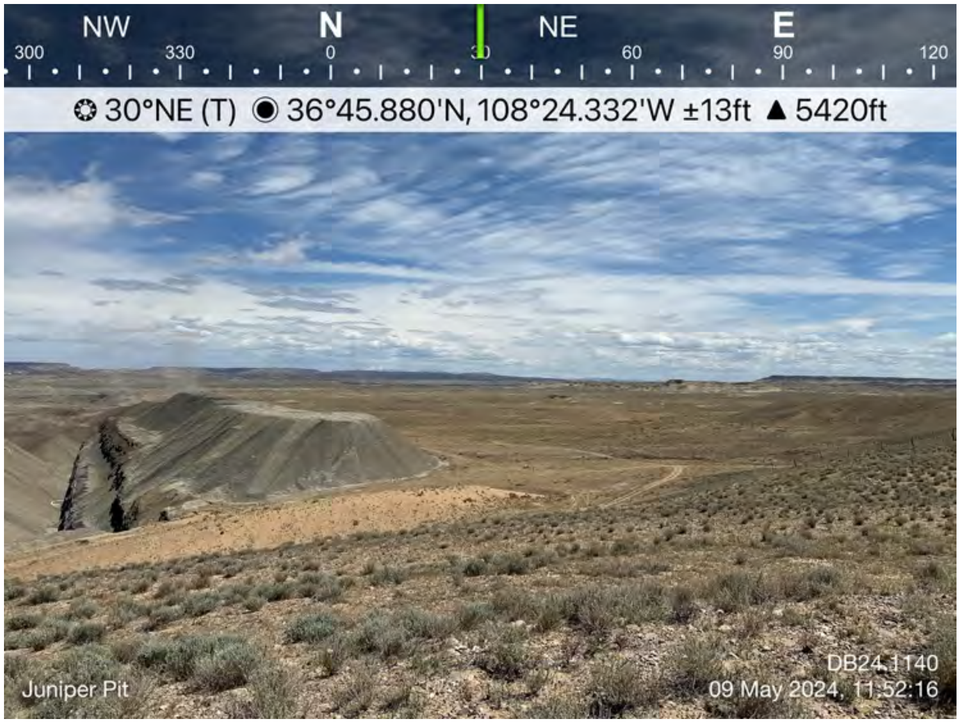
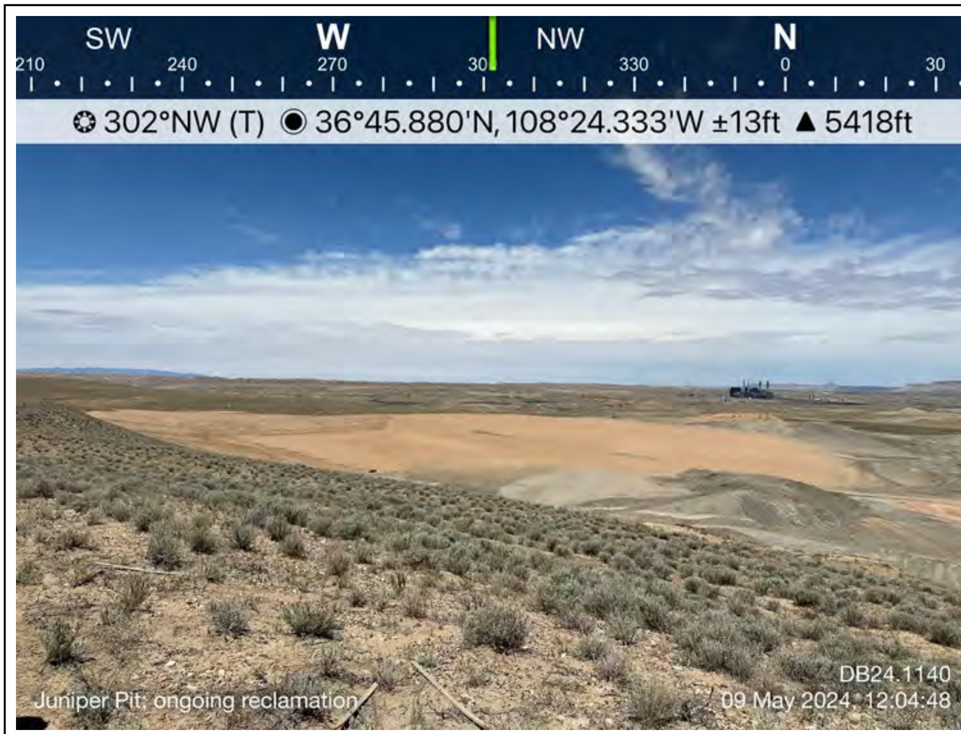
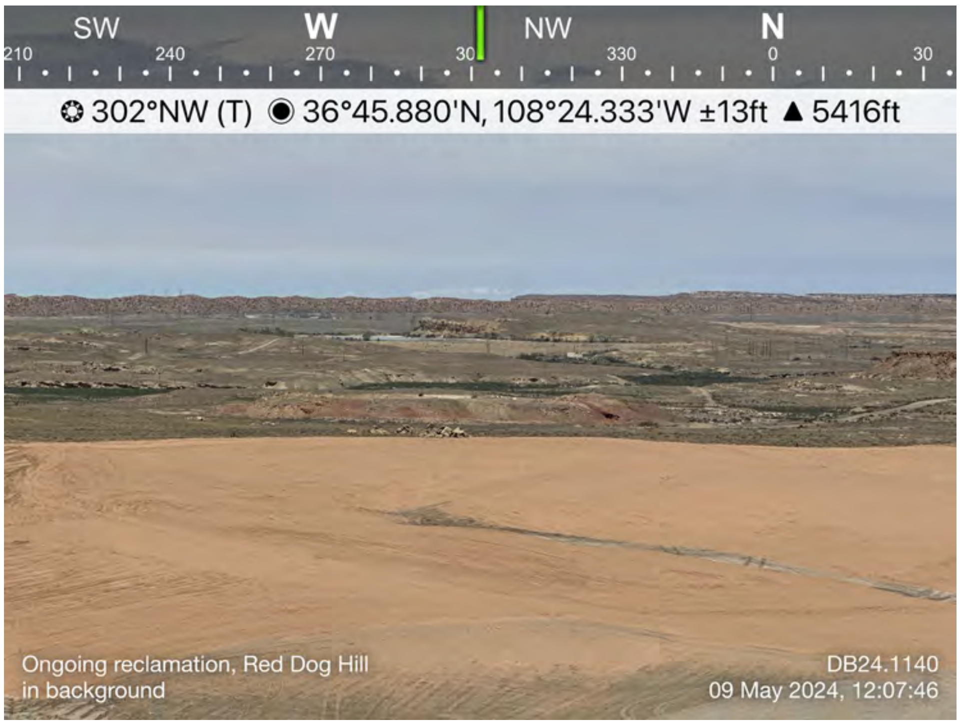




SAN JUAN MINE
Photographs


NW
N
NE
E
300
330
0
30
60
90
120
30°NE (T) 36°45.880'N, 108°24.332'W ±13ft 5420ft
Juniper Pit
DB24.1140
09 May 2024, 11:52:16


SW
W
NW
N
210
240
270
300
330
0
30
302°NW (T) 36°45.880'N, 108°24.333'W ±13ft 5418ft
Juniper Pit; ongoing reclamation
DB24.1140
09 May 2024, 12:04:48



Ongoing reclamation, Red Dog Hill in background

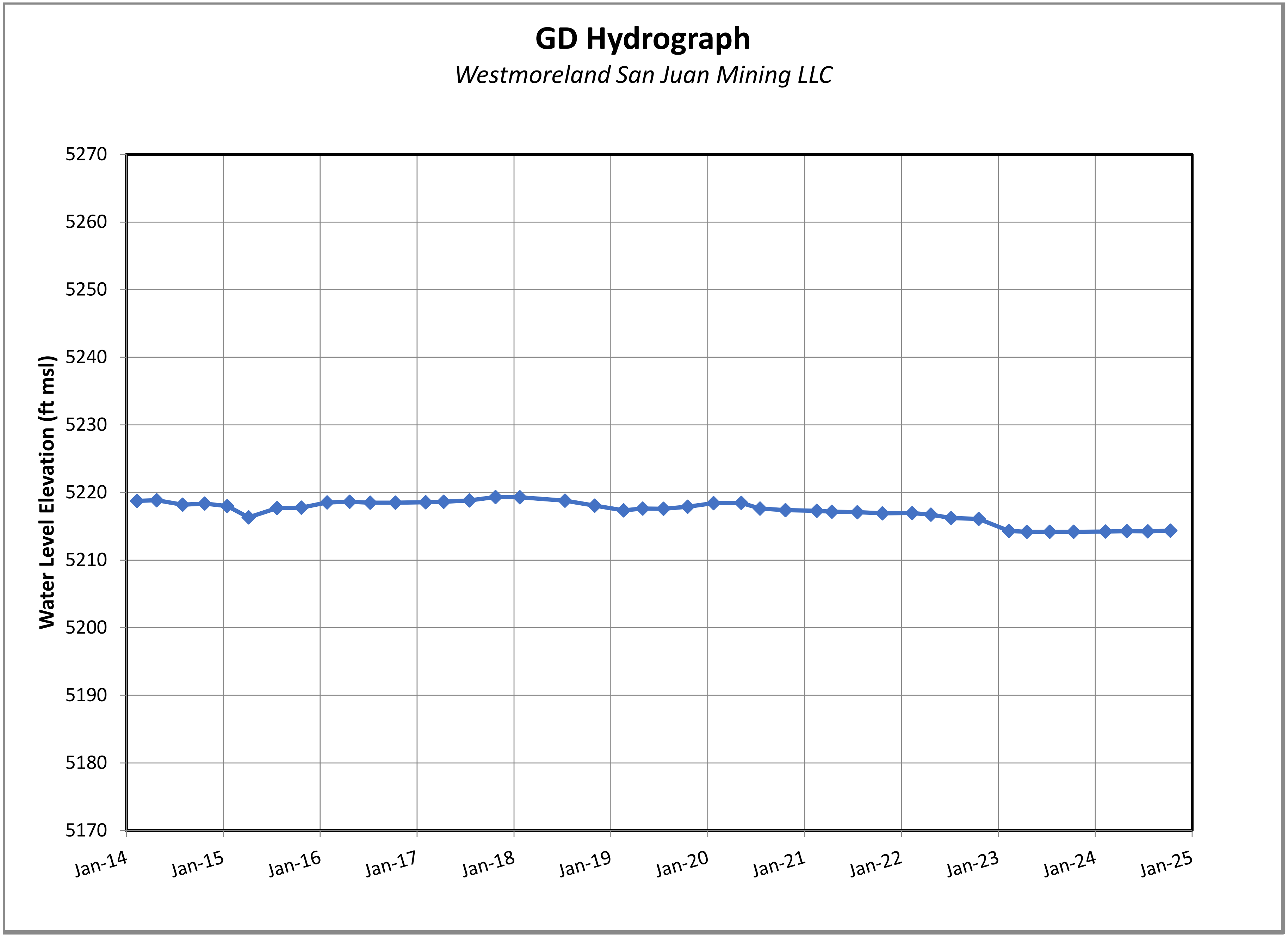
Appendix C

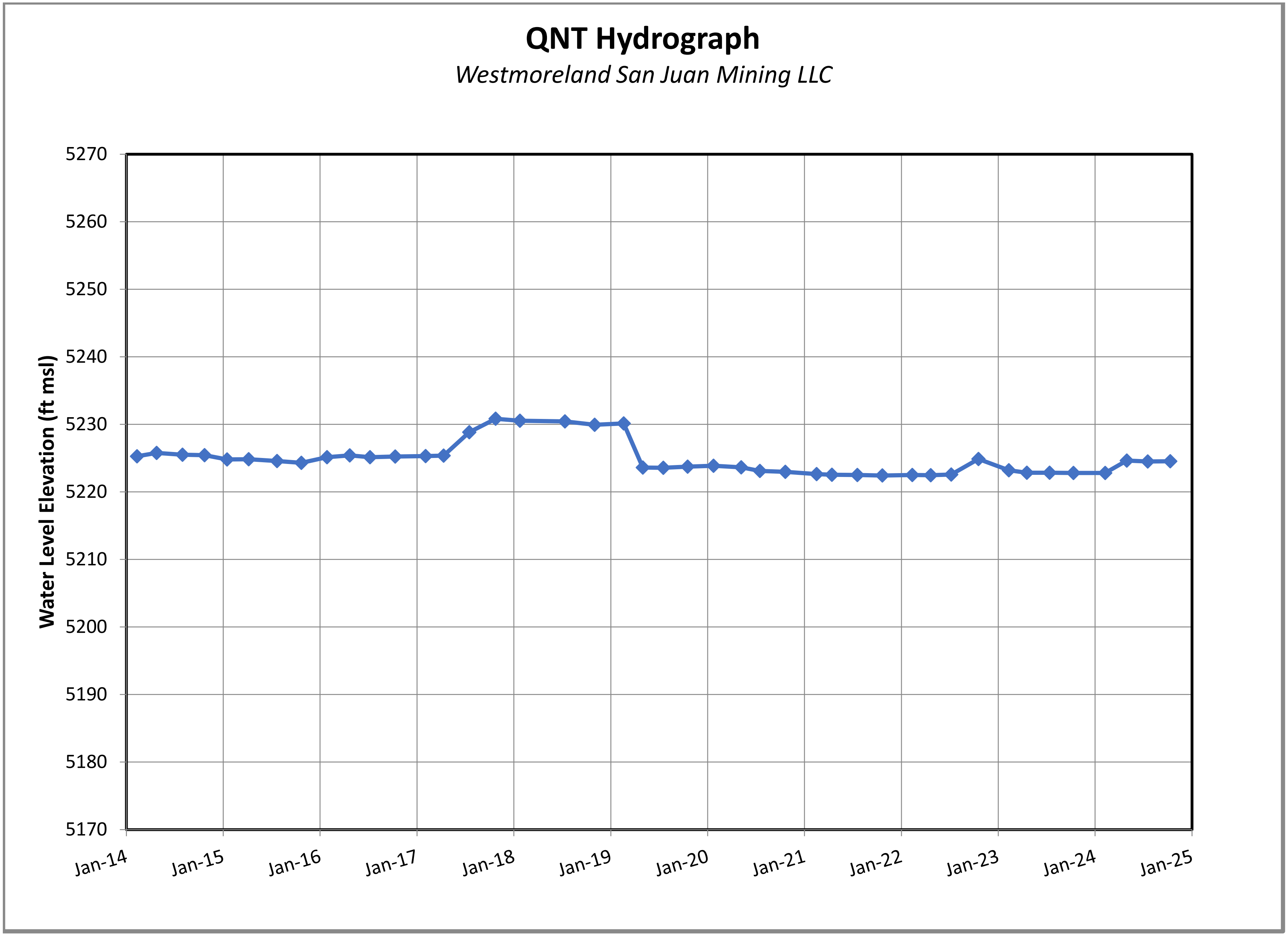
Monitor Well Hydrographs

DBS&A
a Geo-Logic Company

Alluvial Groundwater

DBS&A
a Geo-Logic Company


GD Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5270
5260
5250
5240
5230
5220
5210
5200
5190
5180
5170
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25



QNT Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5270
5260
5250
5240
5230
5220
5210
5200
5190
5180
5170
Jan-14
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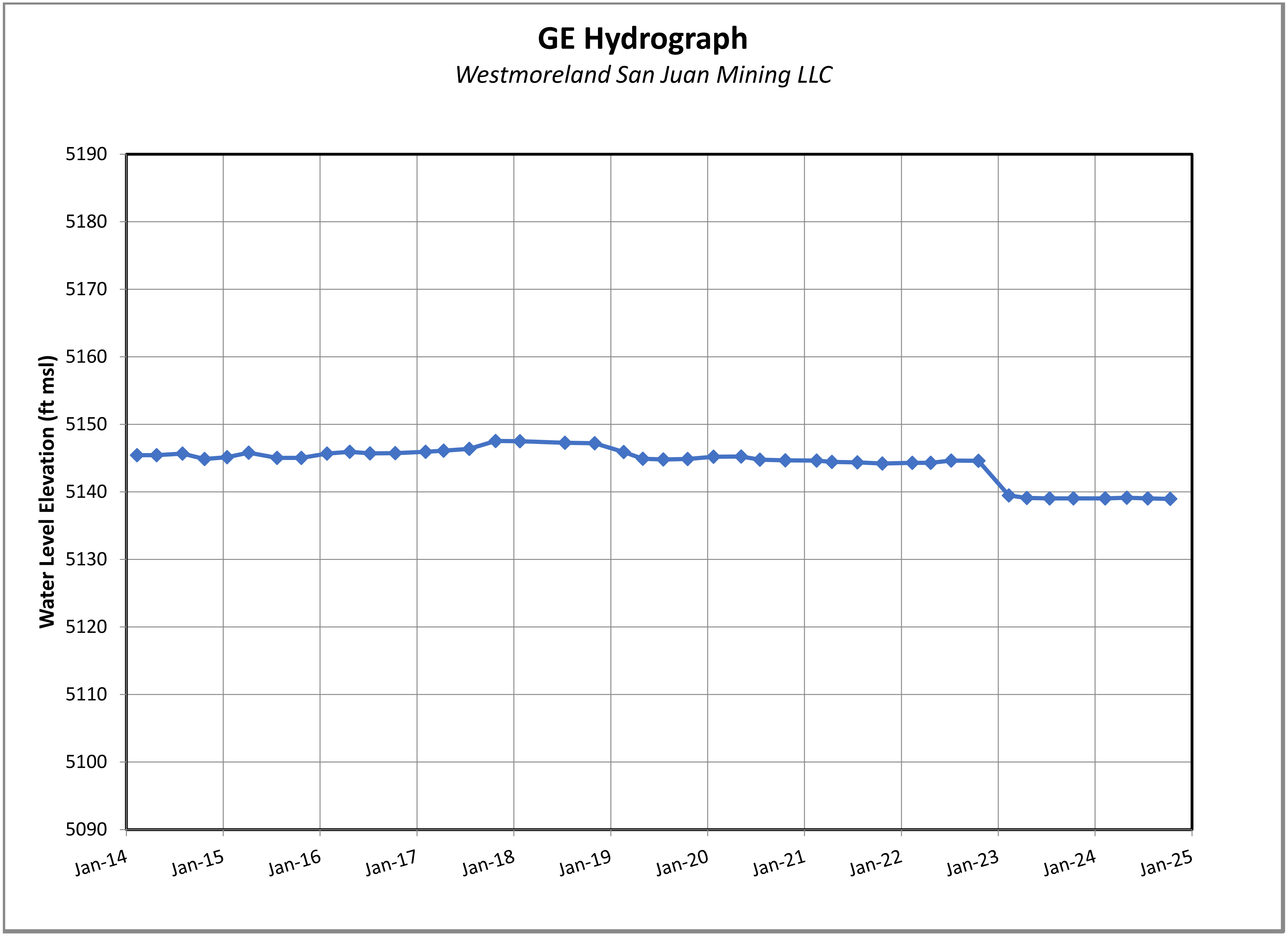
Jan-23
Jan-24
Jan-25


GE Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5190
5180
5170
5160
5150
5140
5130
5120
5110
5100
5090
Jan-14
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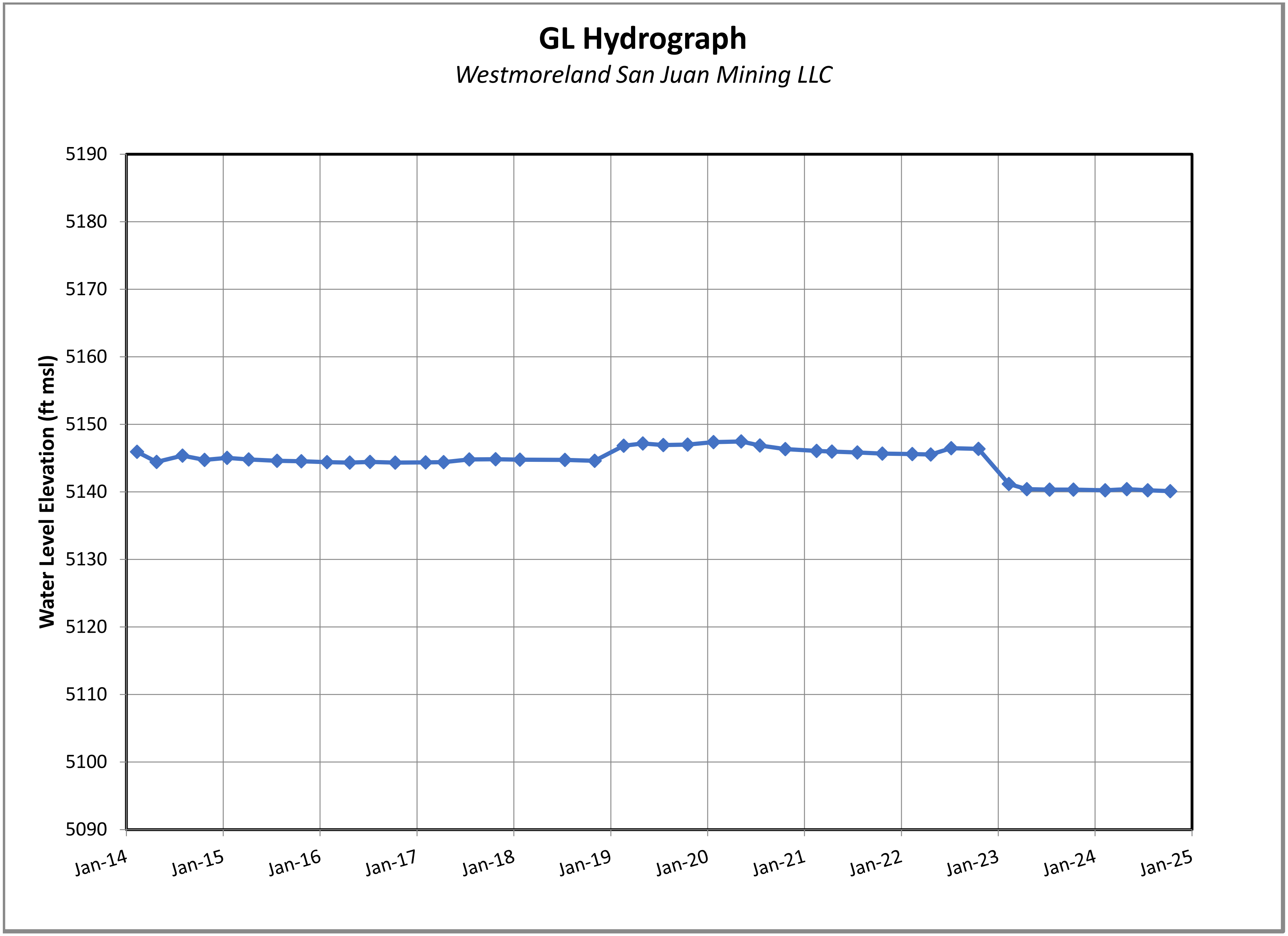
Jan-23
Jan-24
Jan-25



GL Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5190
5180
5170
5160
5150
5140
5130
5120
5110
5100
5090
Jan-14
Jan-15
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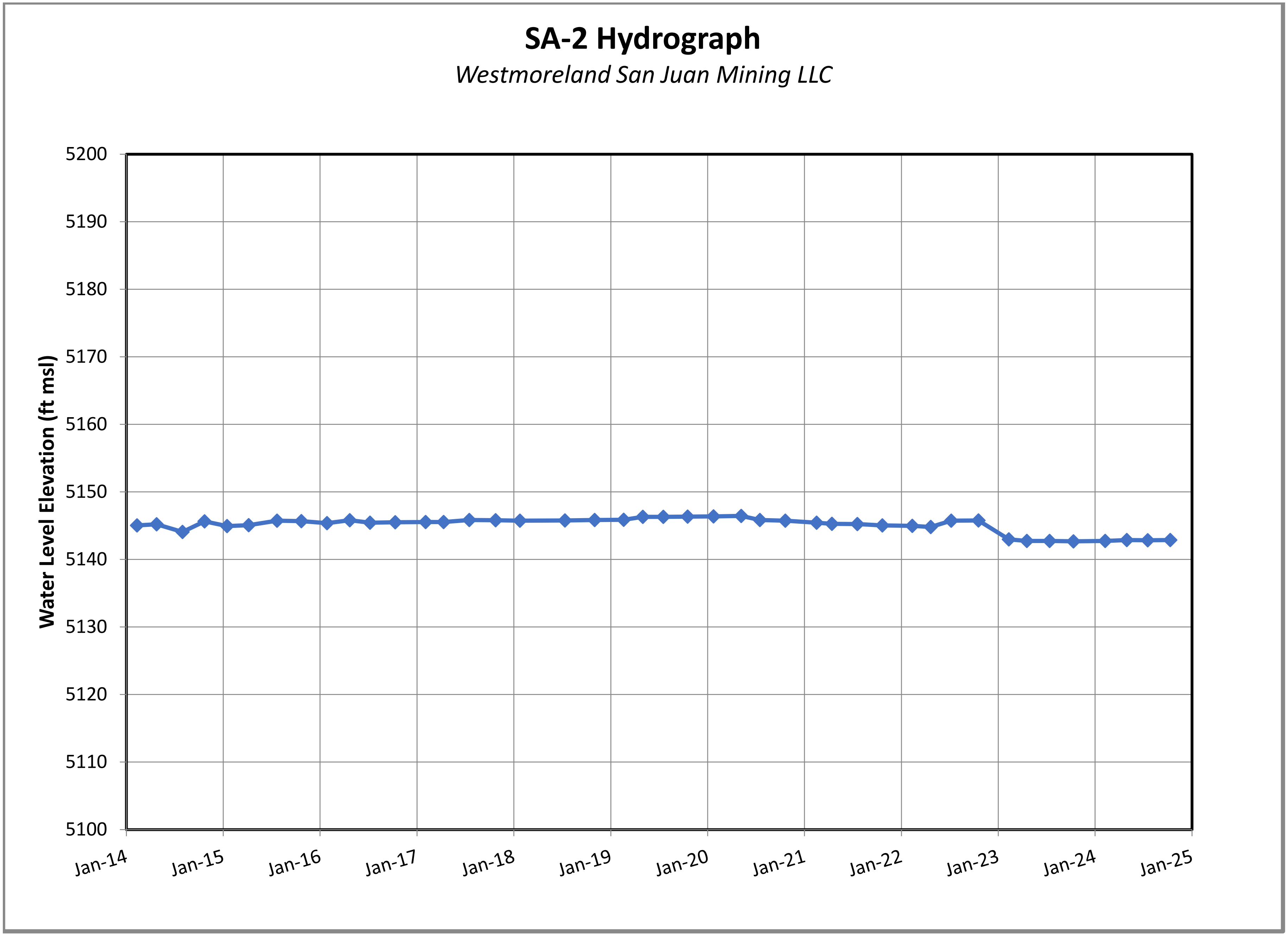
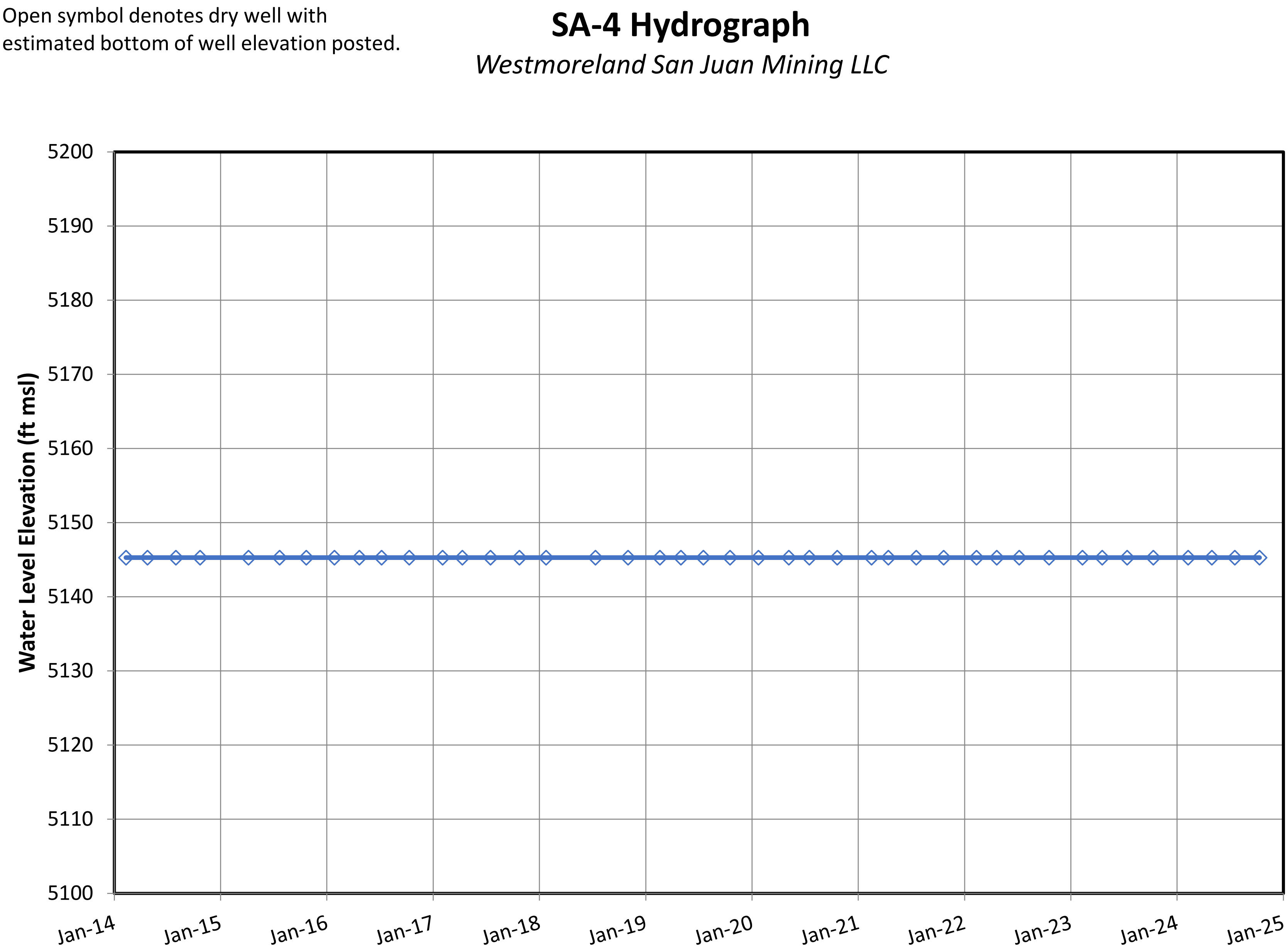
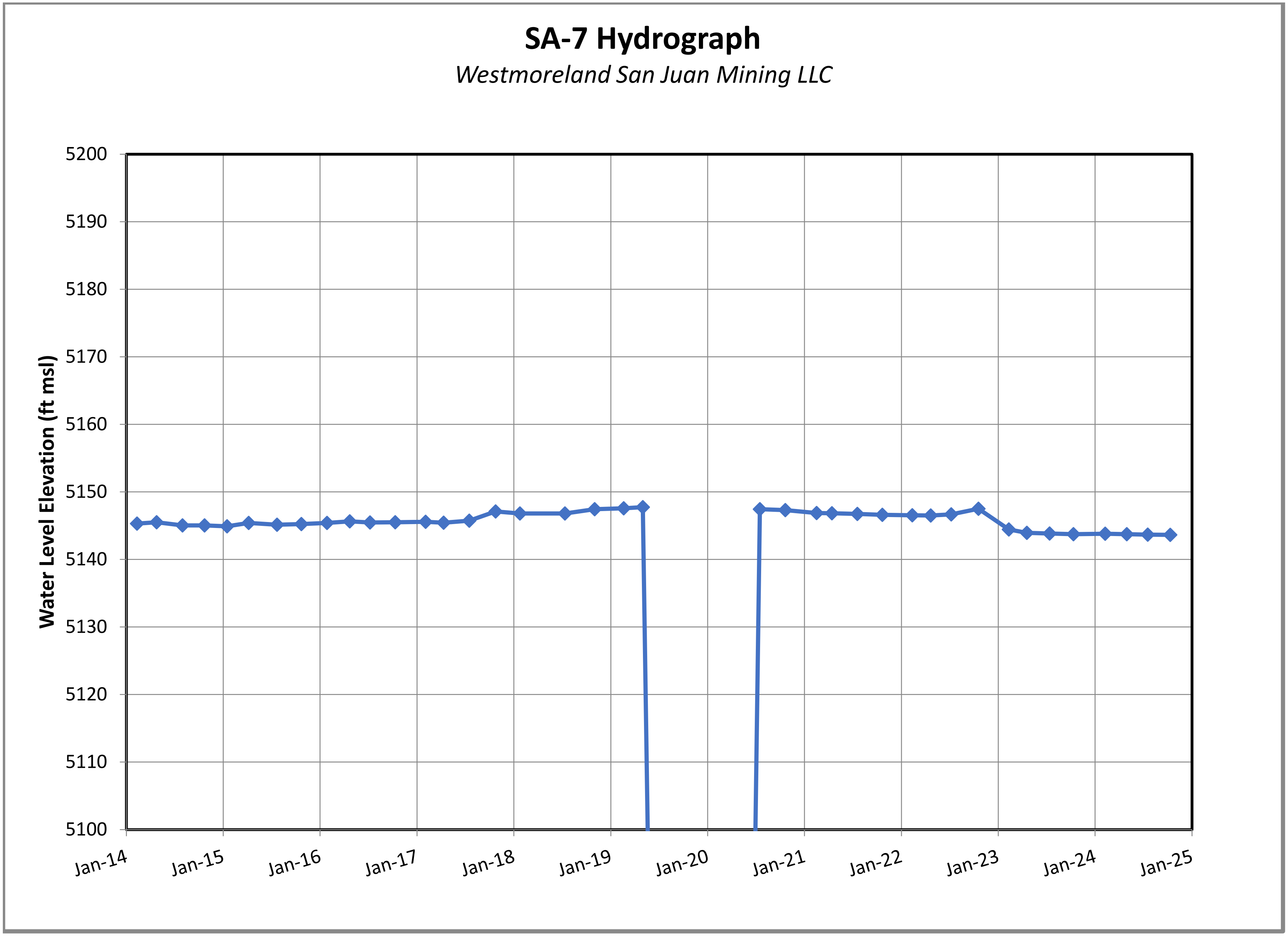
Jan-23
Jan-24
Jan-25

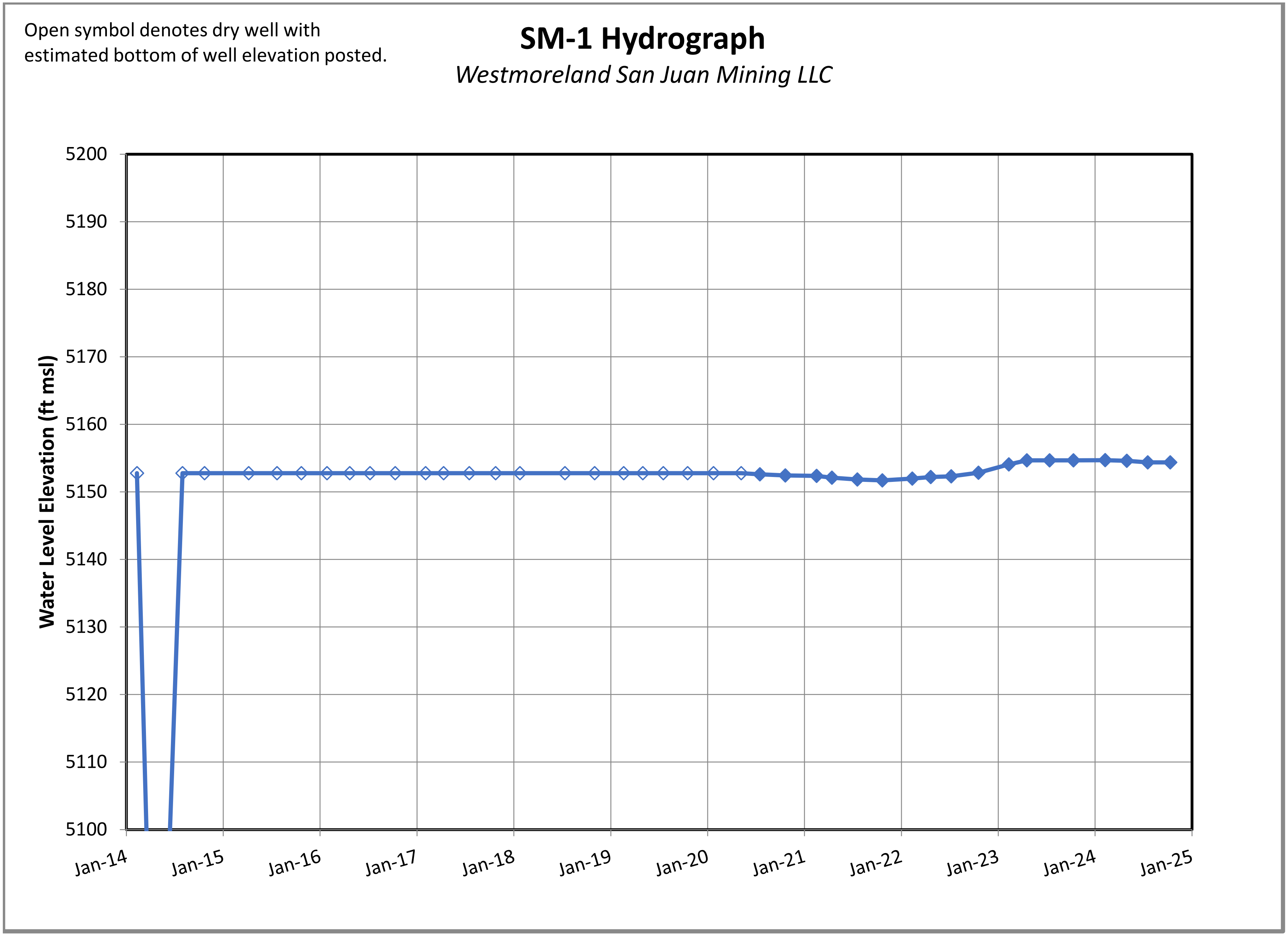


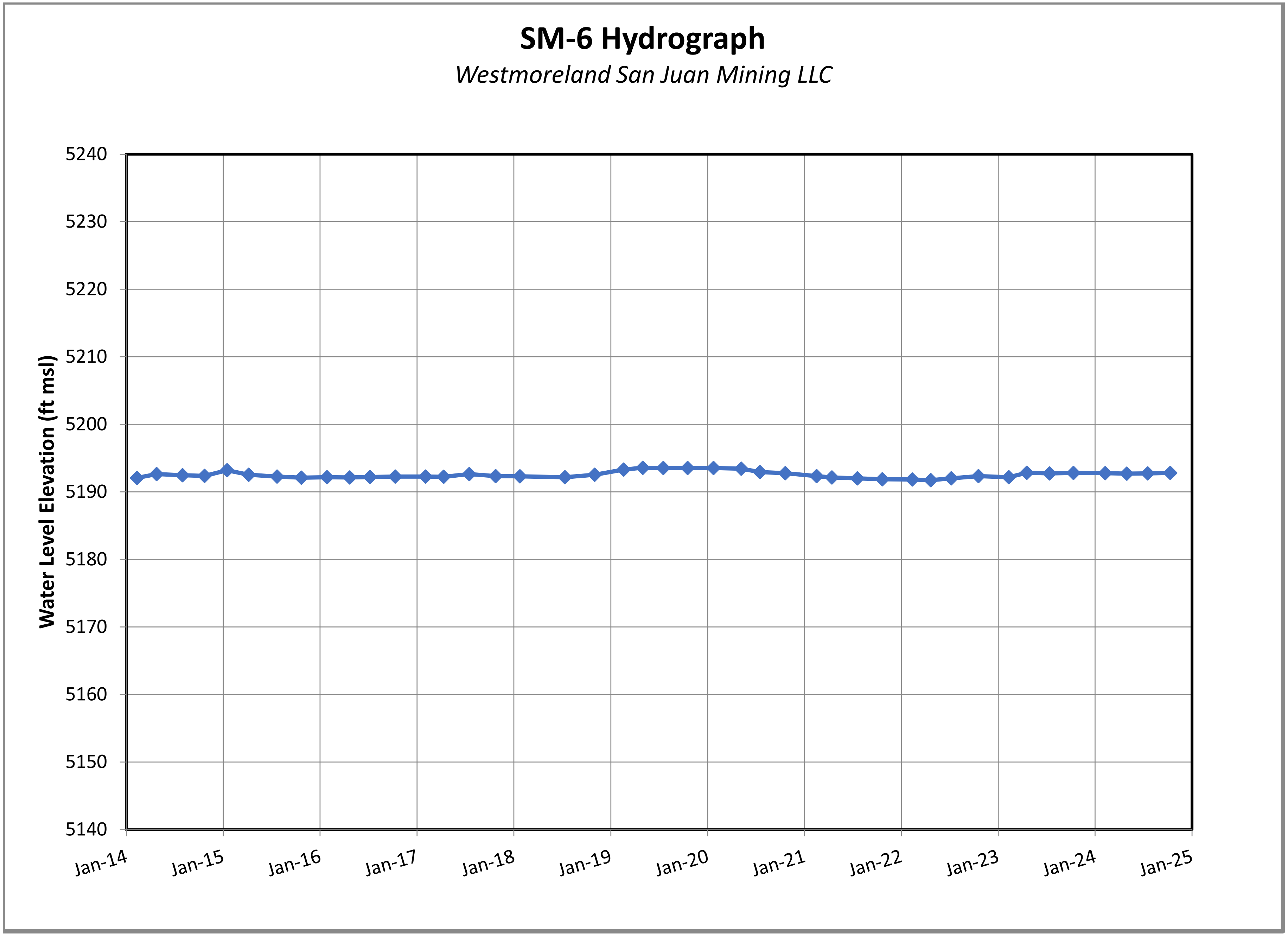
SA-2 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5200
5190
5180
5170
5160
5150
5140
5130
5120
5110
5100
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25

Open symbol denotes dry well with
estimated bottom of well elevation posted.




SA-7 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5200
5190
5180
5170
5160
5150
5140
5130
5120
5110
5100
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25

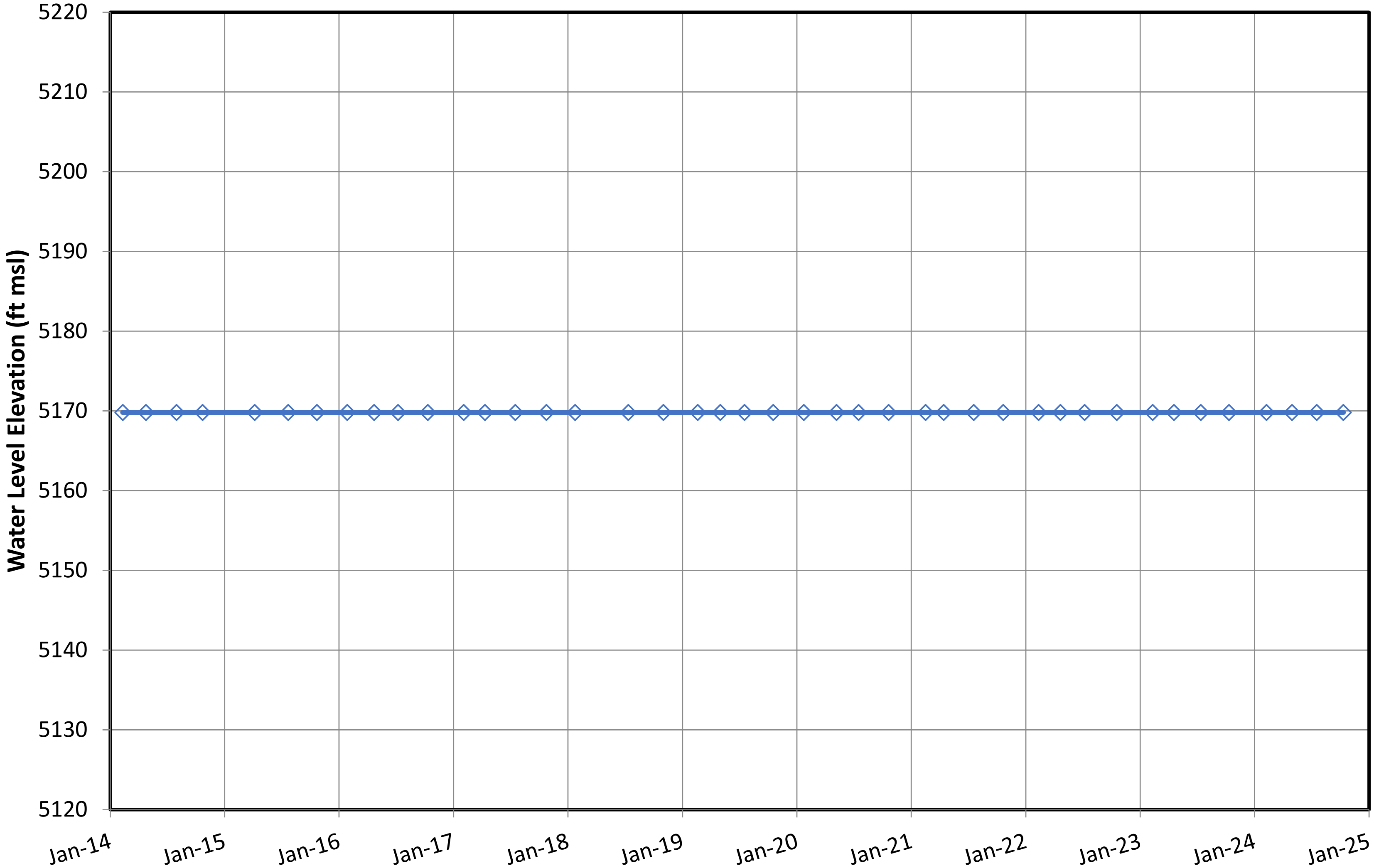

Open symbol denotes dry well with
estimated bottom of well elevation posted.
SM-1 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5200
5190
5180
5170
5160
5150
5140
5130
5120
5110
5100
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25


SM-6 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5240
5230
5220
5210
5200
5190
5180
5170
5160
5150
5140
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25

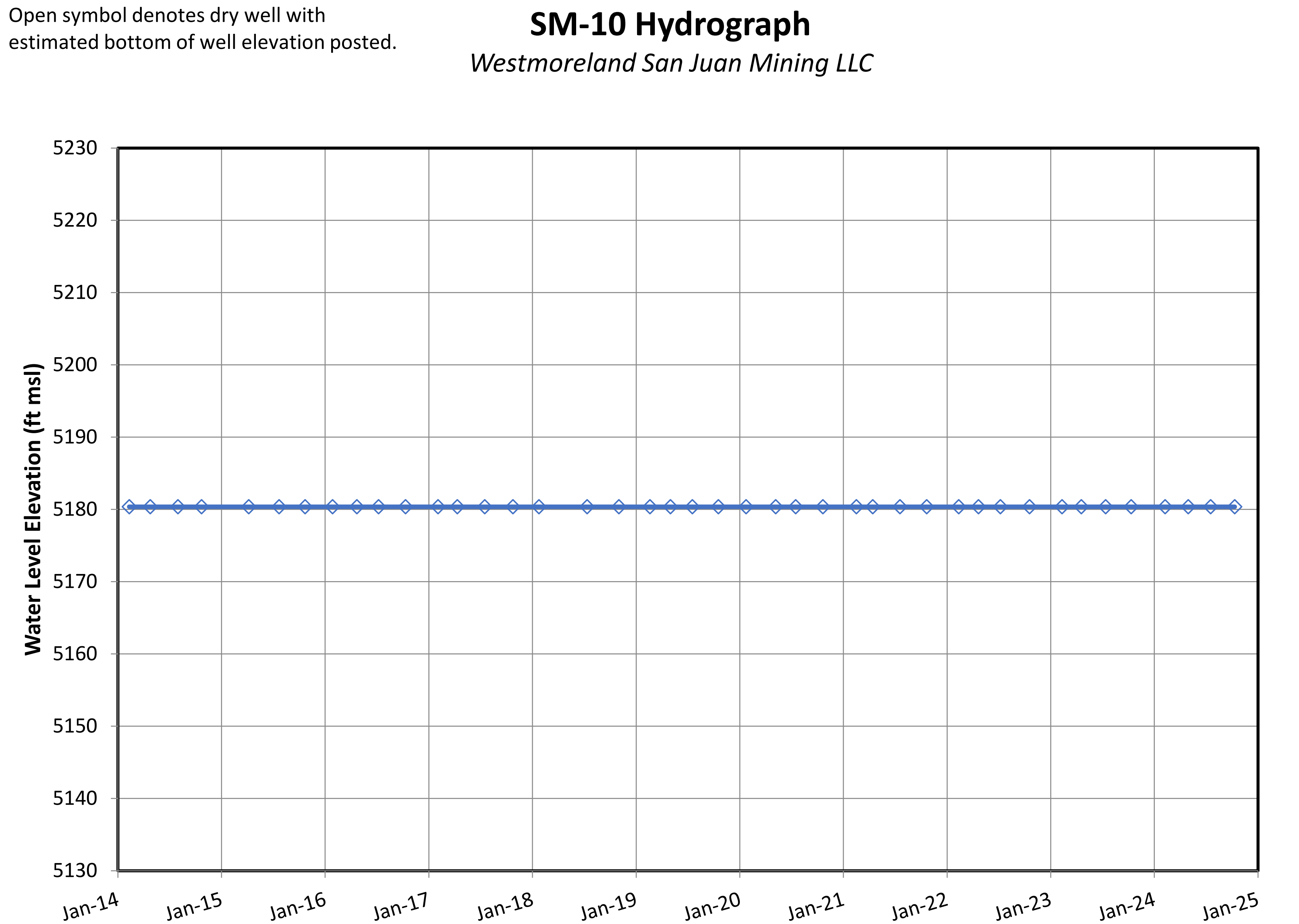
Open symbol denotes dry well with
estimated bottom of well elevation posted.

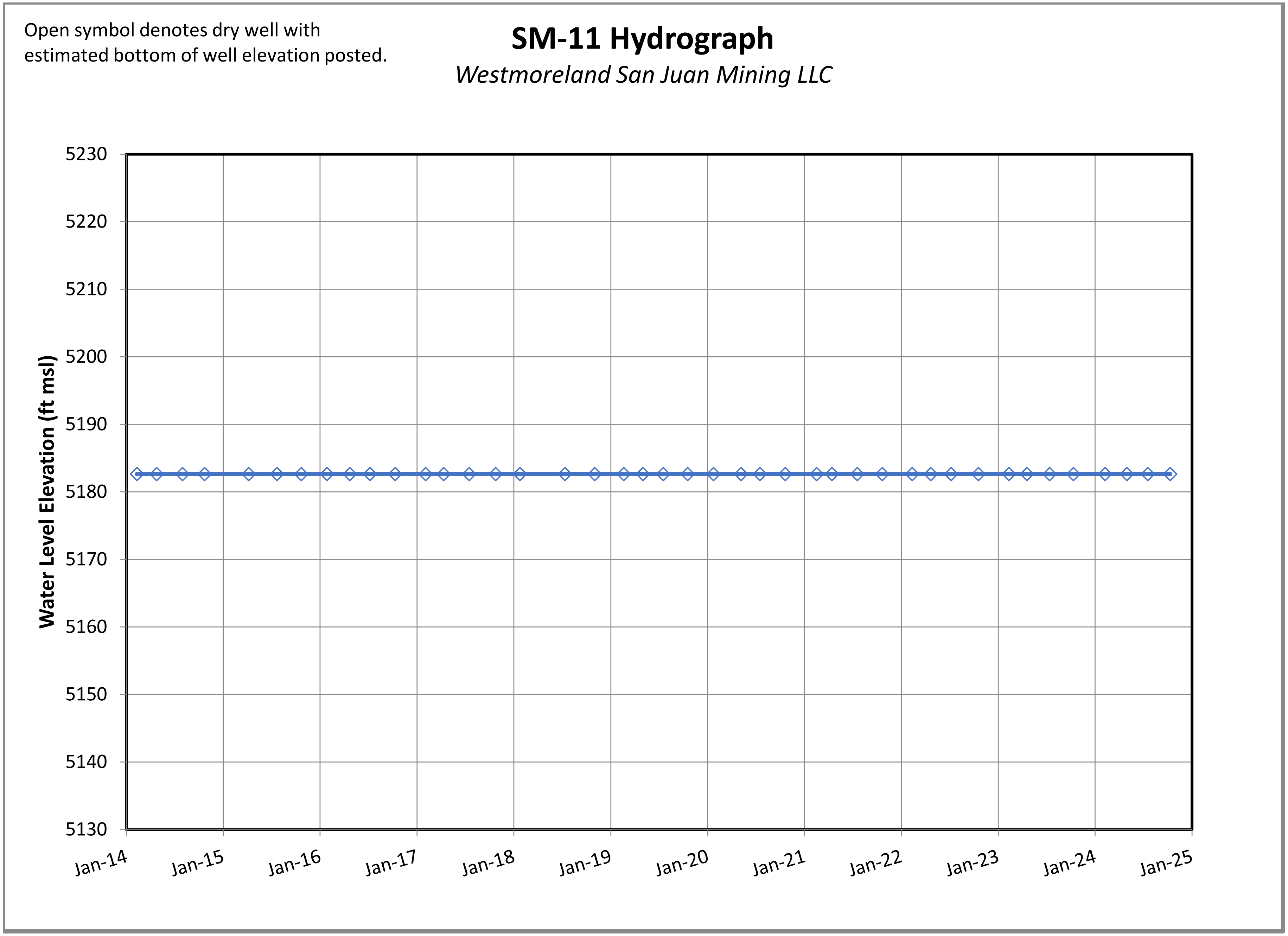
SM-8 Hydrograph

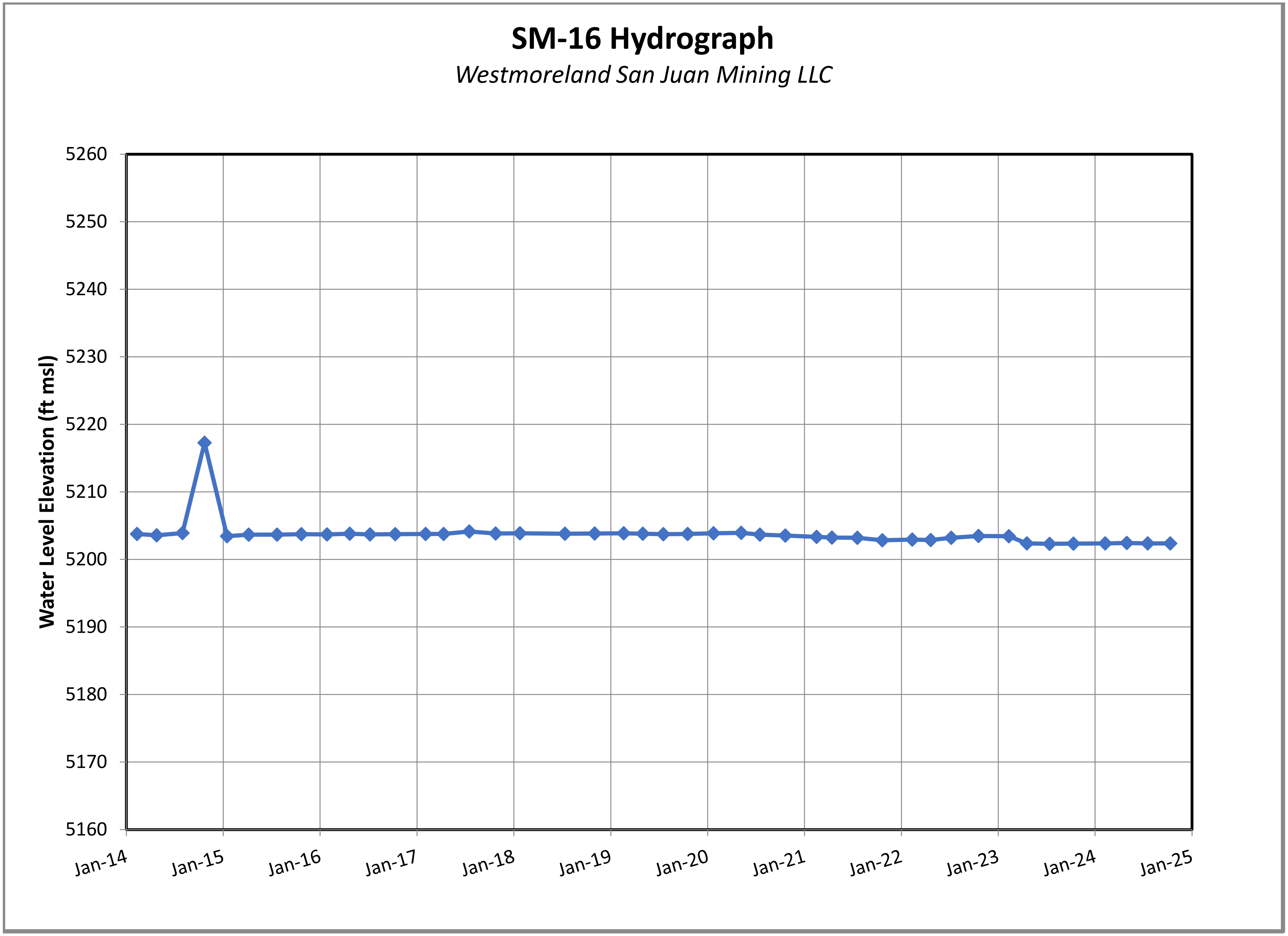
Westmoreland San Juan Mining LLC

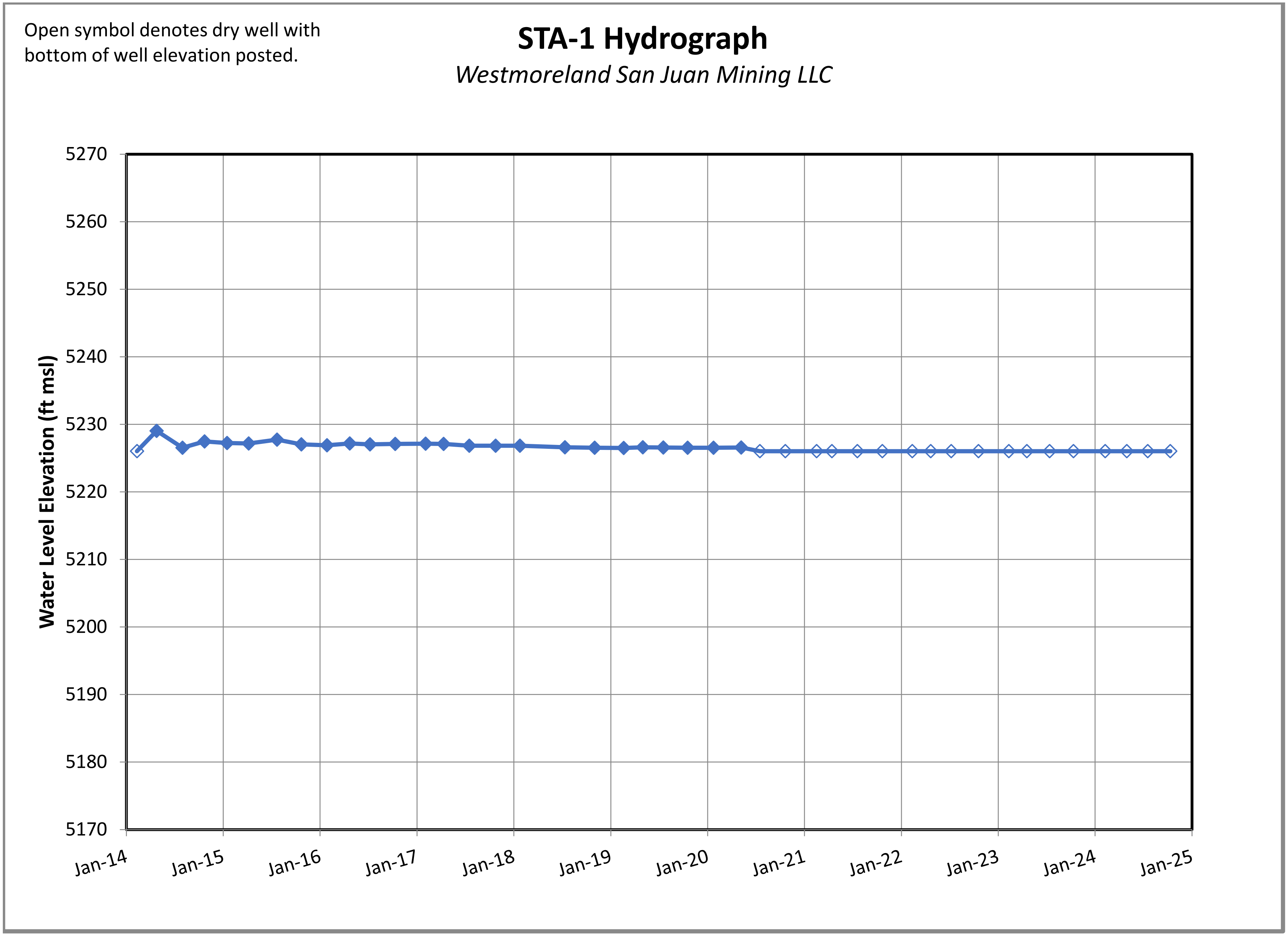


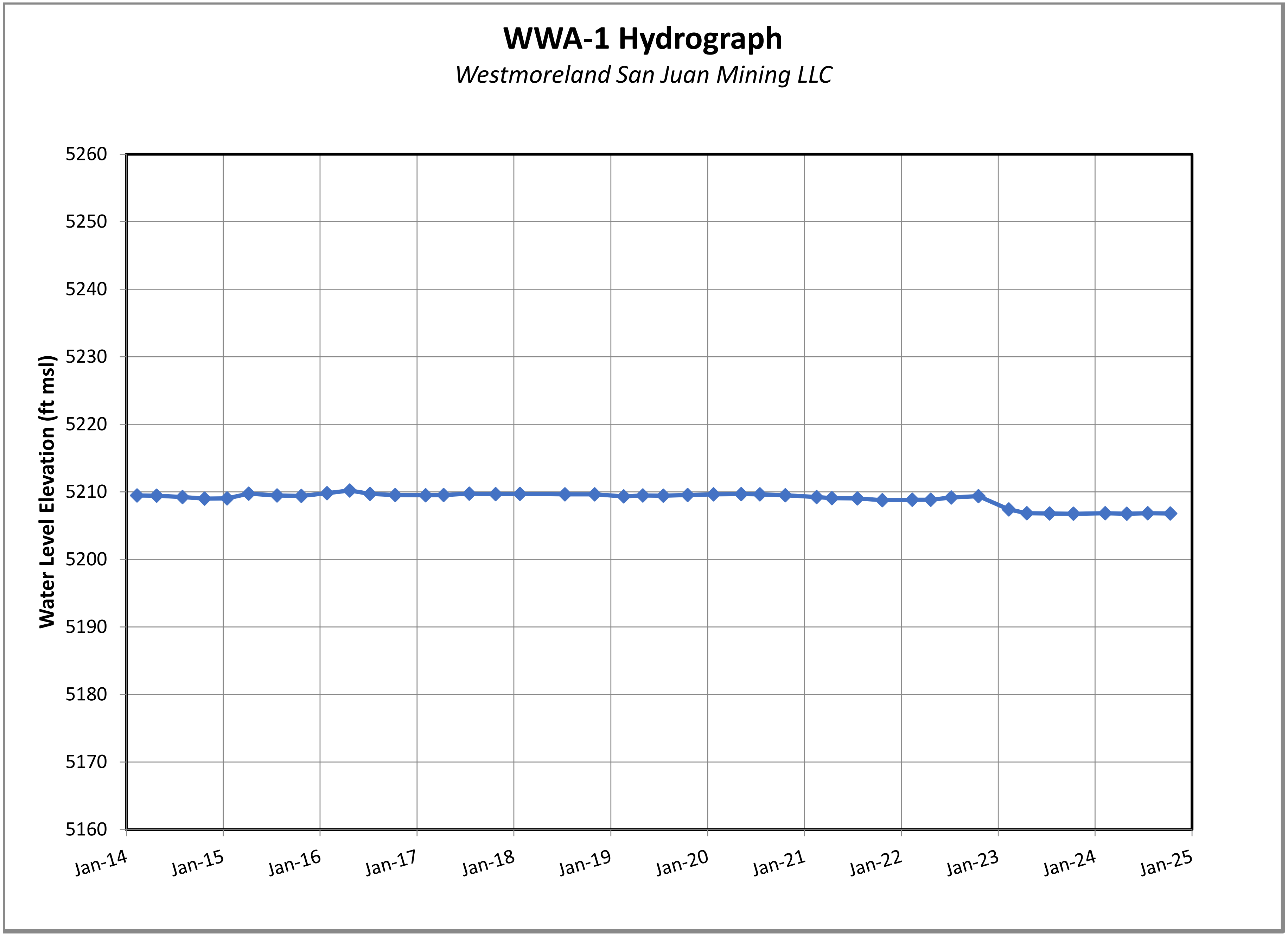
Open symbol denotes dry well with estimated bottom of well elevation posted.



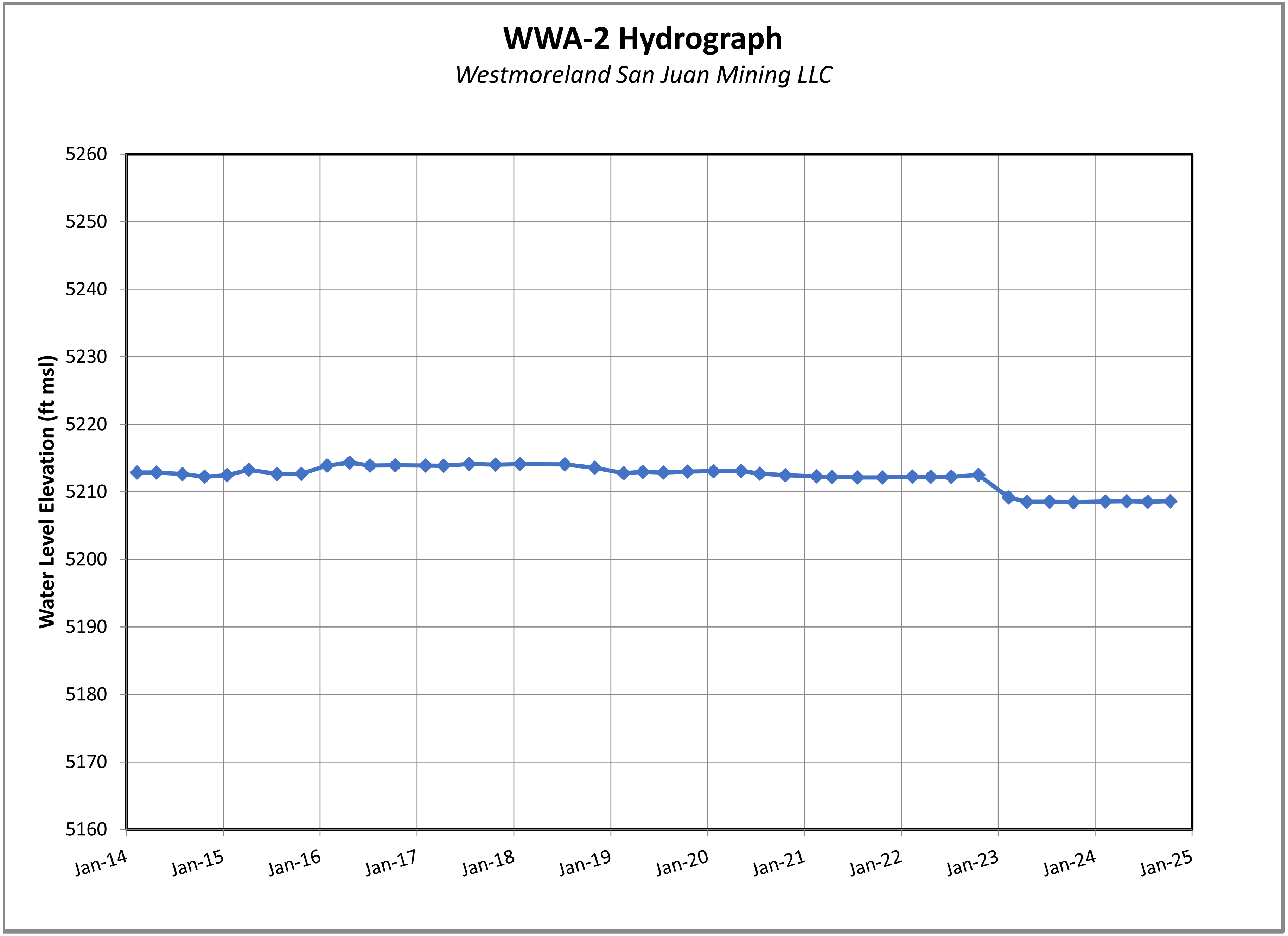

Open symbol denotes dry well with
estimated bottom of well elevation posted.
SM-11 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5230
5220
5210
5200
5190
5180
5170
5160
5150
5140
5130
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25


SM-16 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5260
5250
5240
5230
5220
5210
5200
5190
5180
5170
5160
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25


Open symbol denotes dry well with bottom of well elevation posted.
STA-1 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5270
5260
5250
5240
5230
5220
5210
5200
5190
5180
5170
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25

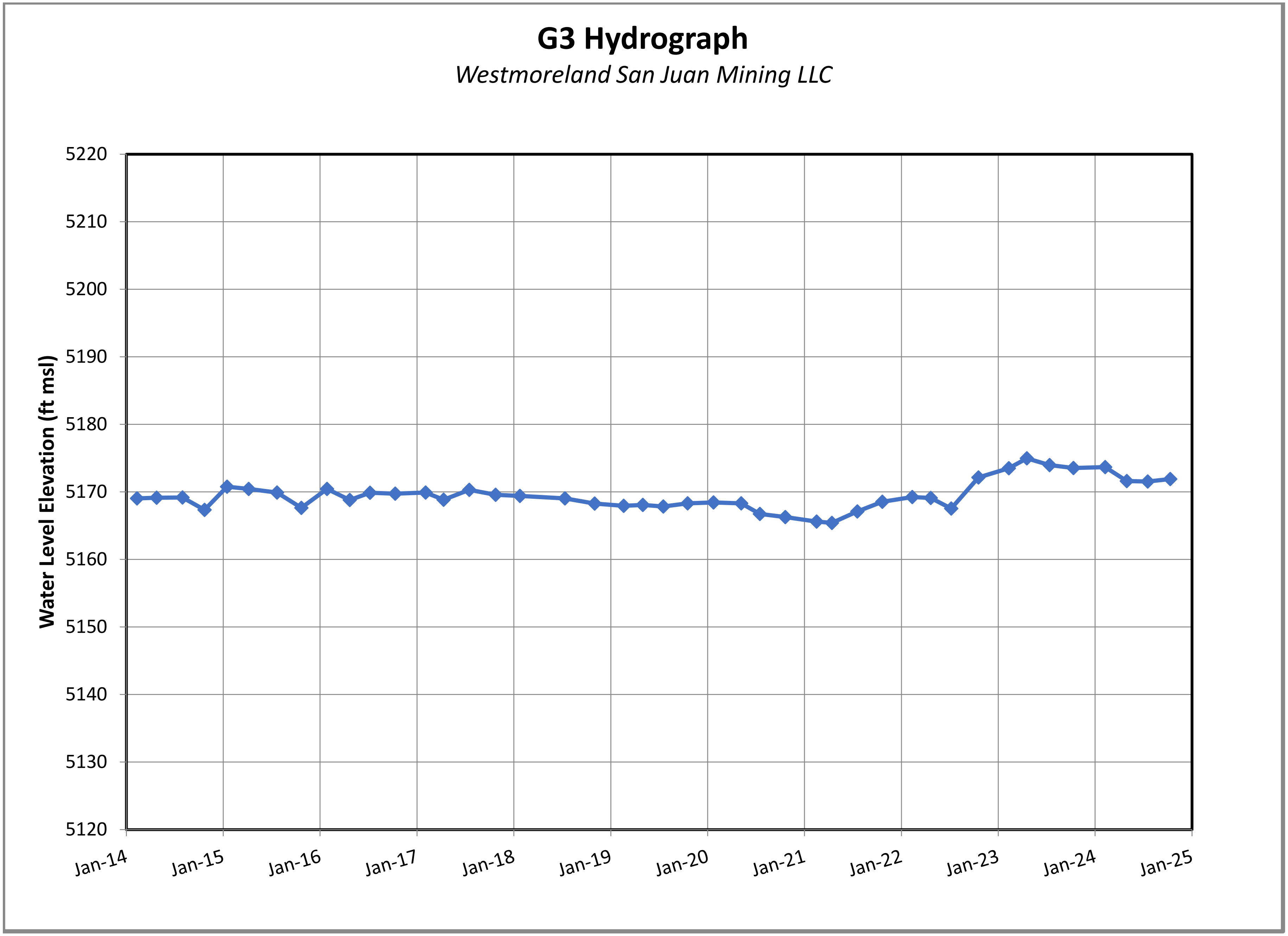


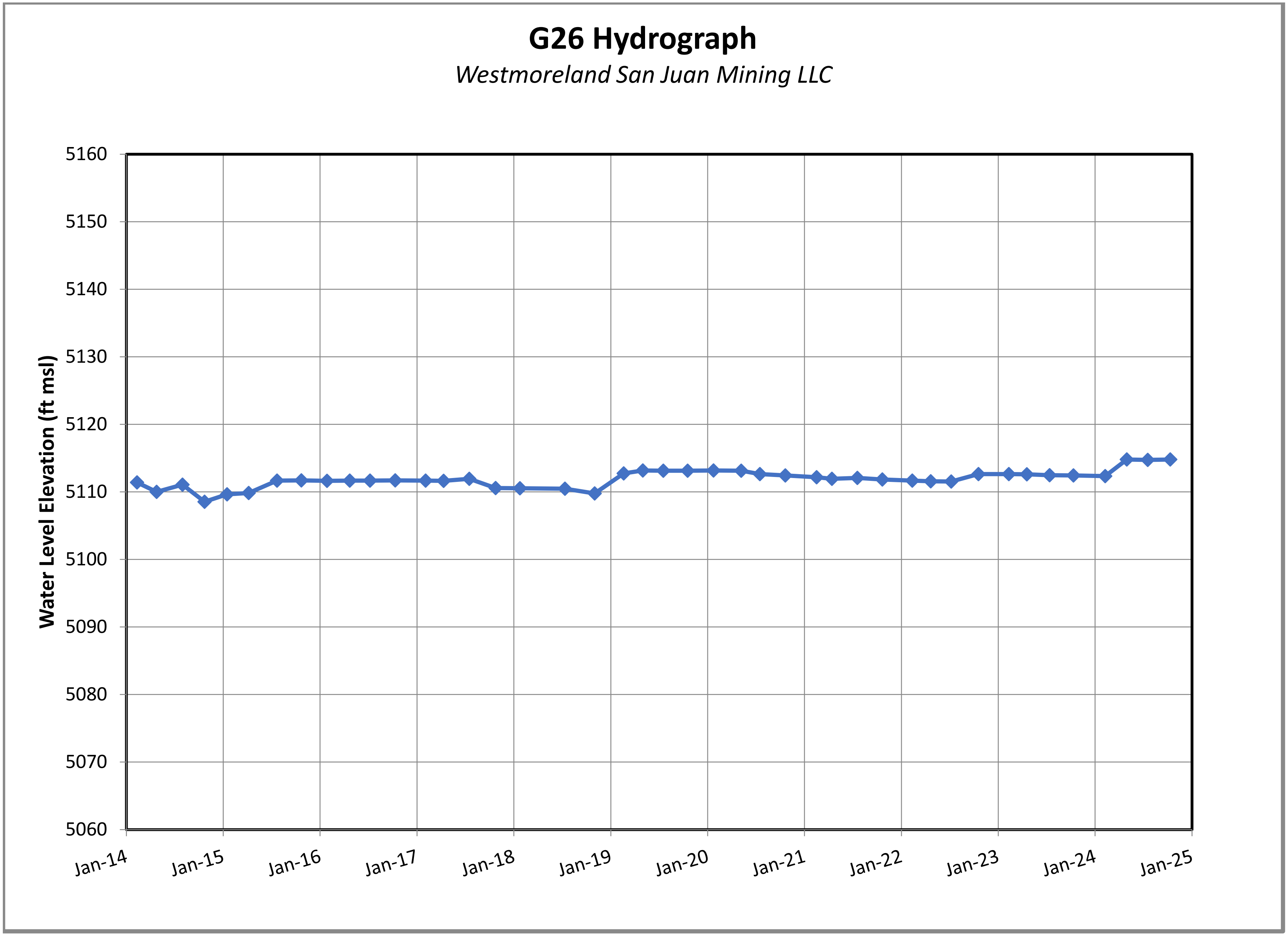
WWA-1 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5260
5250
5240
5230
5220
5210
5200
5190
5180
5170
5160
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25



WWA-2 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5260
5250
5240
5230
5220
5210
5200
5190
5180
5170
5160
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25

Fruitland Formation


G3 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5220
5210
5200
5190
5180
5170
5160
5150
5140
5130
5120
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25


G26 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5160
5150
5140
5130
5120
5110
5100
5090
5080
5070
5060
Jan-14
Jan-15
Jan-16
Jan-17
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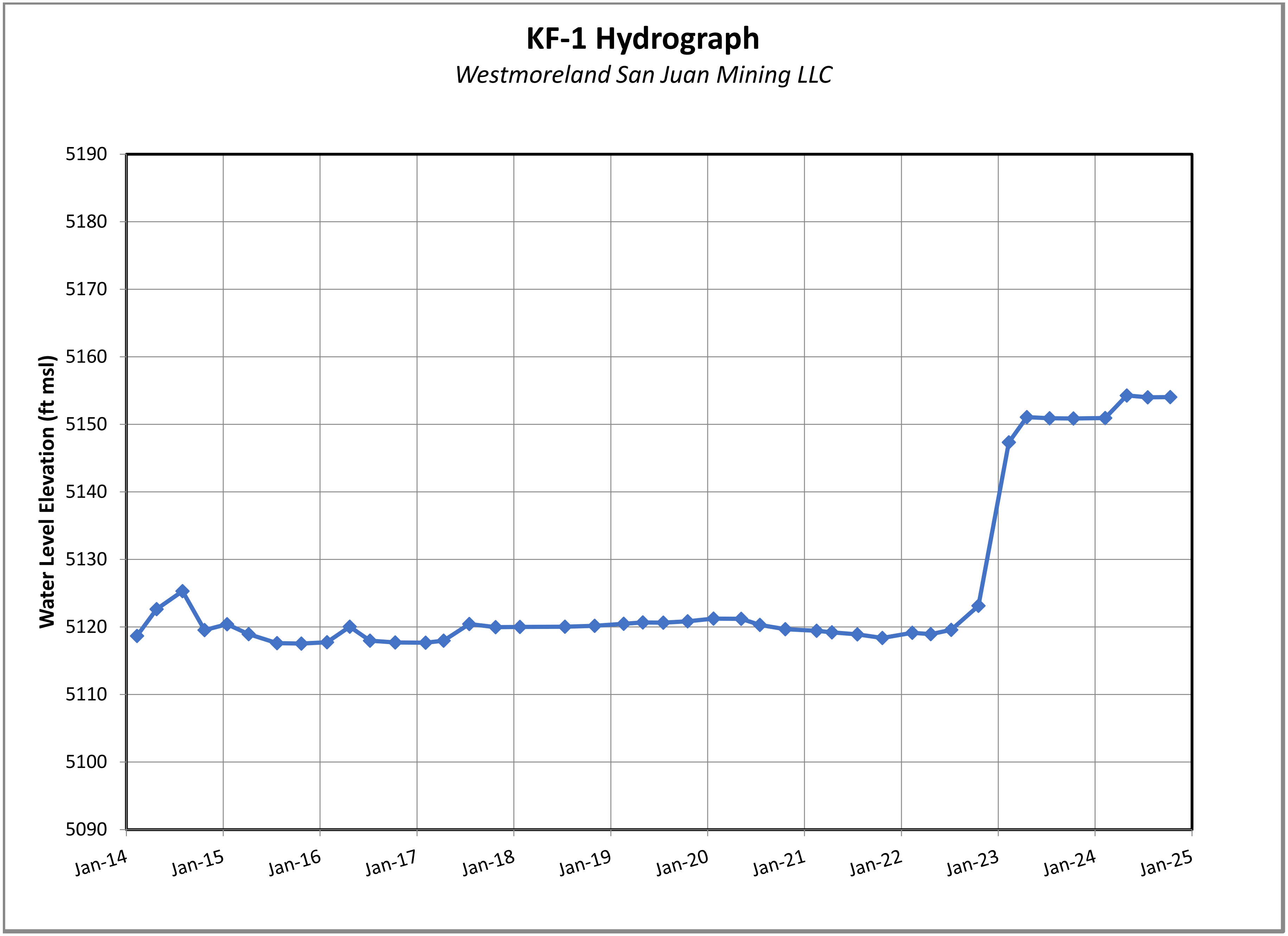
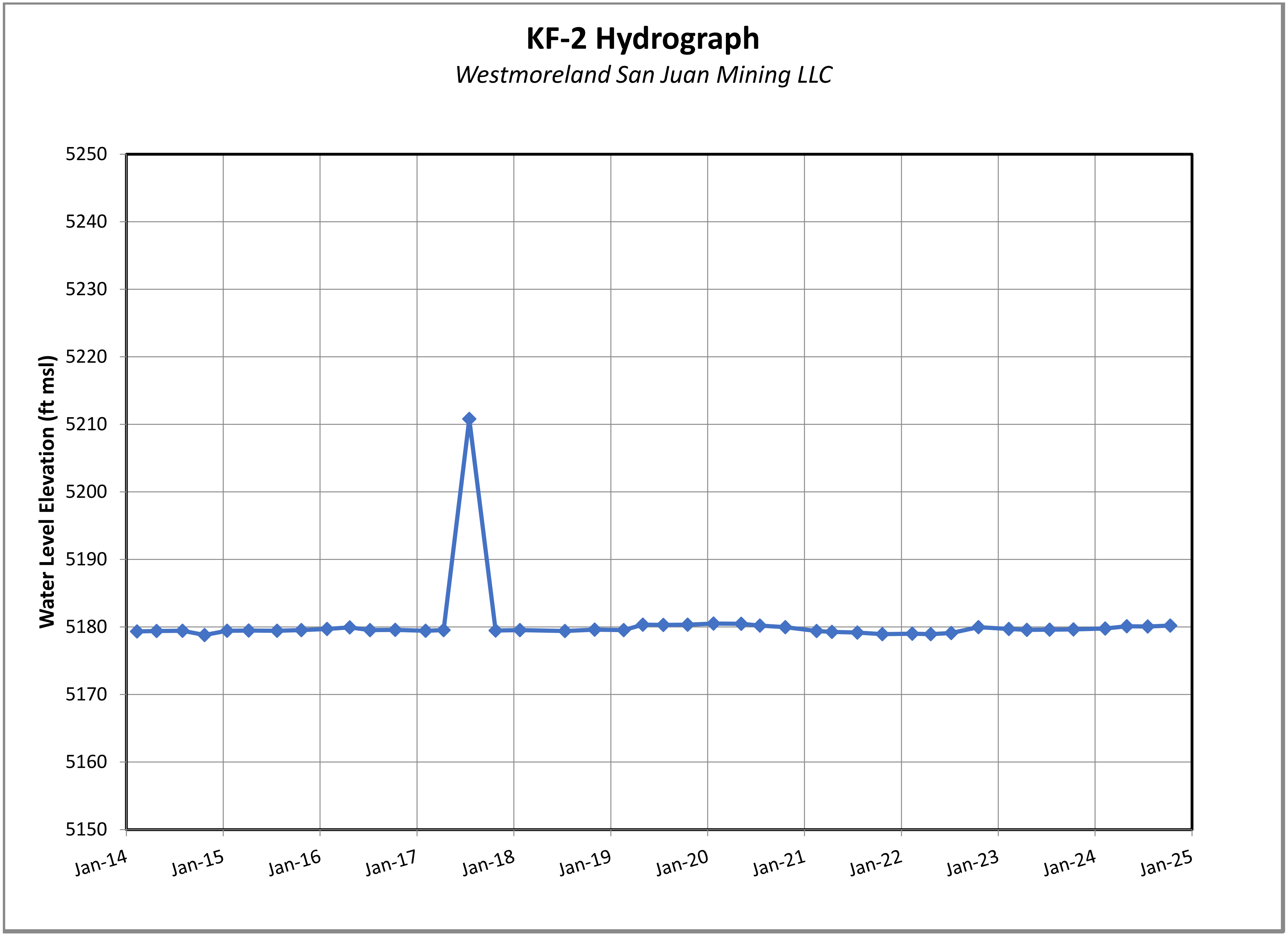
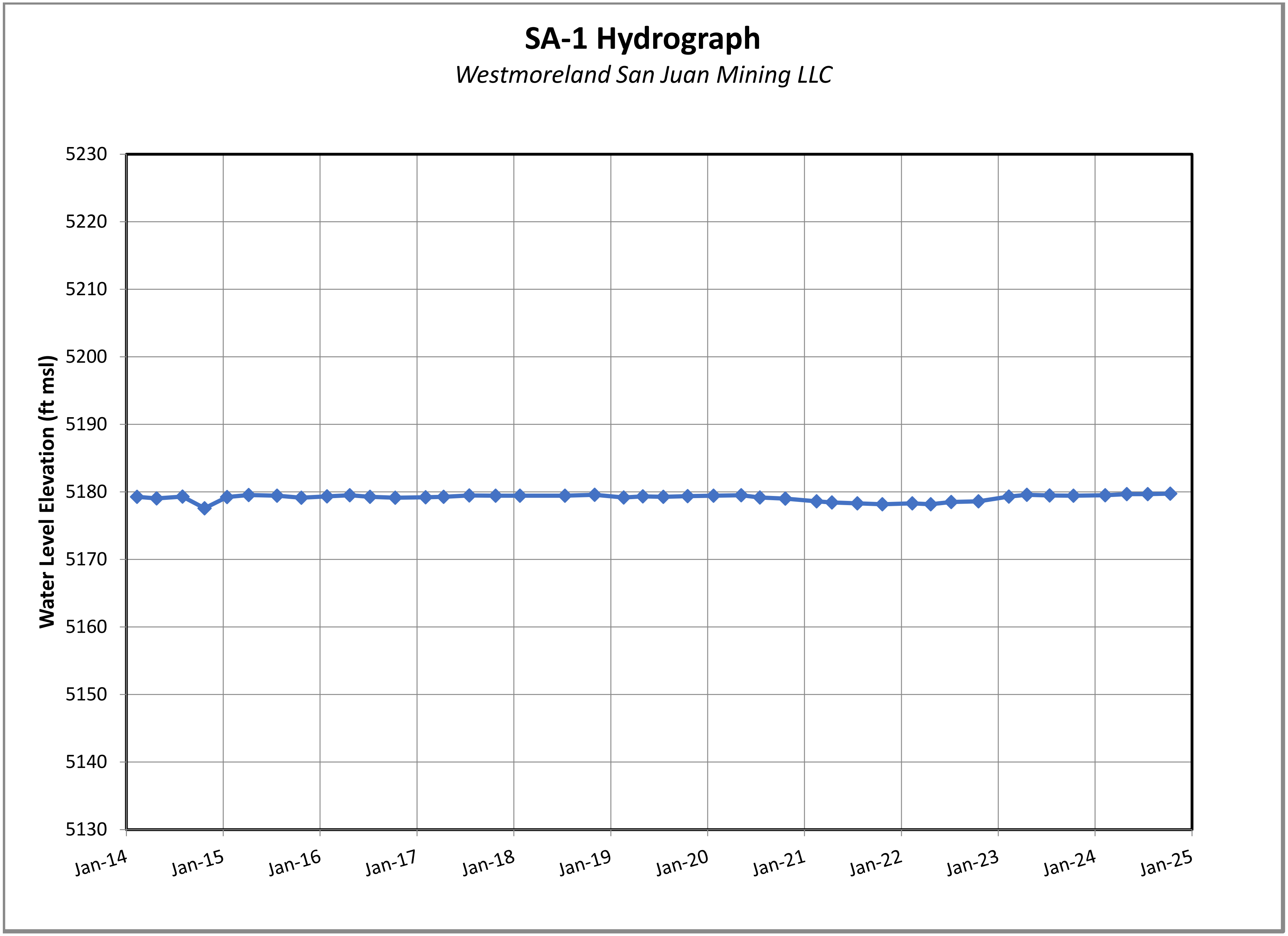
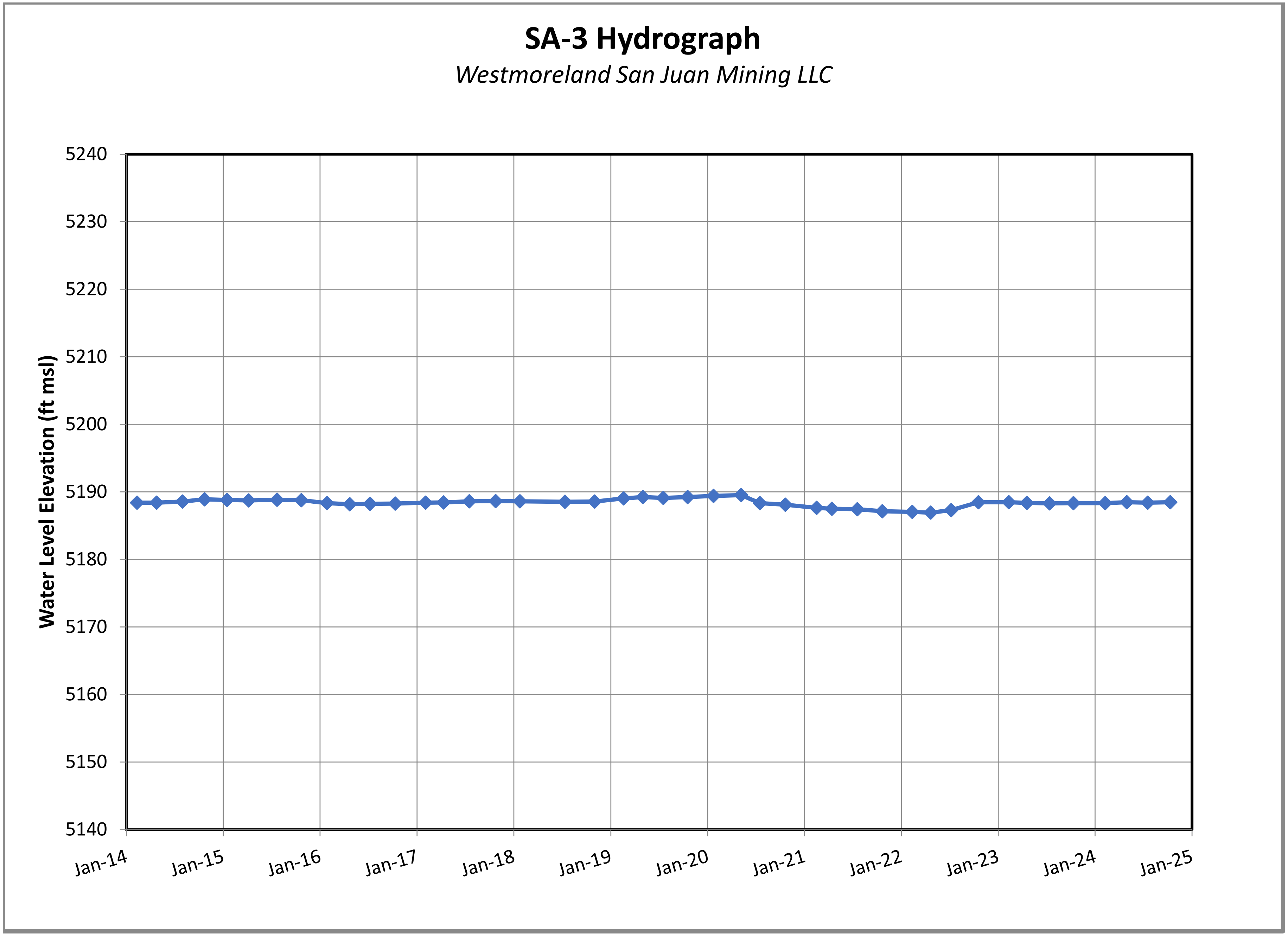
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25



KF-1 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5190
5180
5170
5160
5150
5140
5130
5120
5110
5100
5090
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25


KF-2 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5250
5240
5230
5220
5210
5200
5190
5180
5170
5160
5150
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25


SA-1 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5230
5220
5210
5200
5190
5180
5170
5160
5150
5140
5130
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25


SA-3 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5240
5230
5220
5210
5200
5190
5180
5170
5160
5150
5140
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
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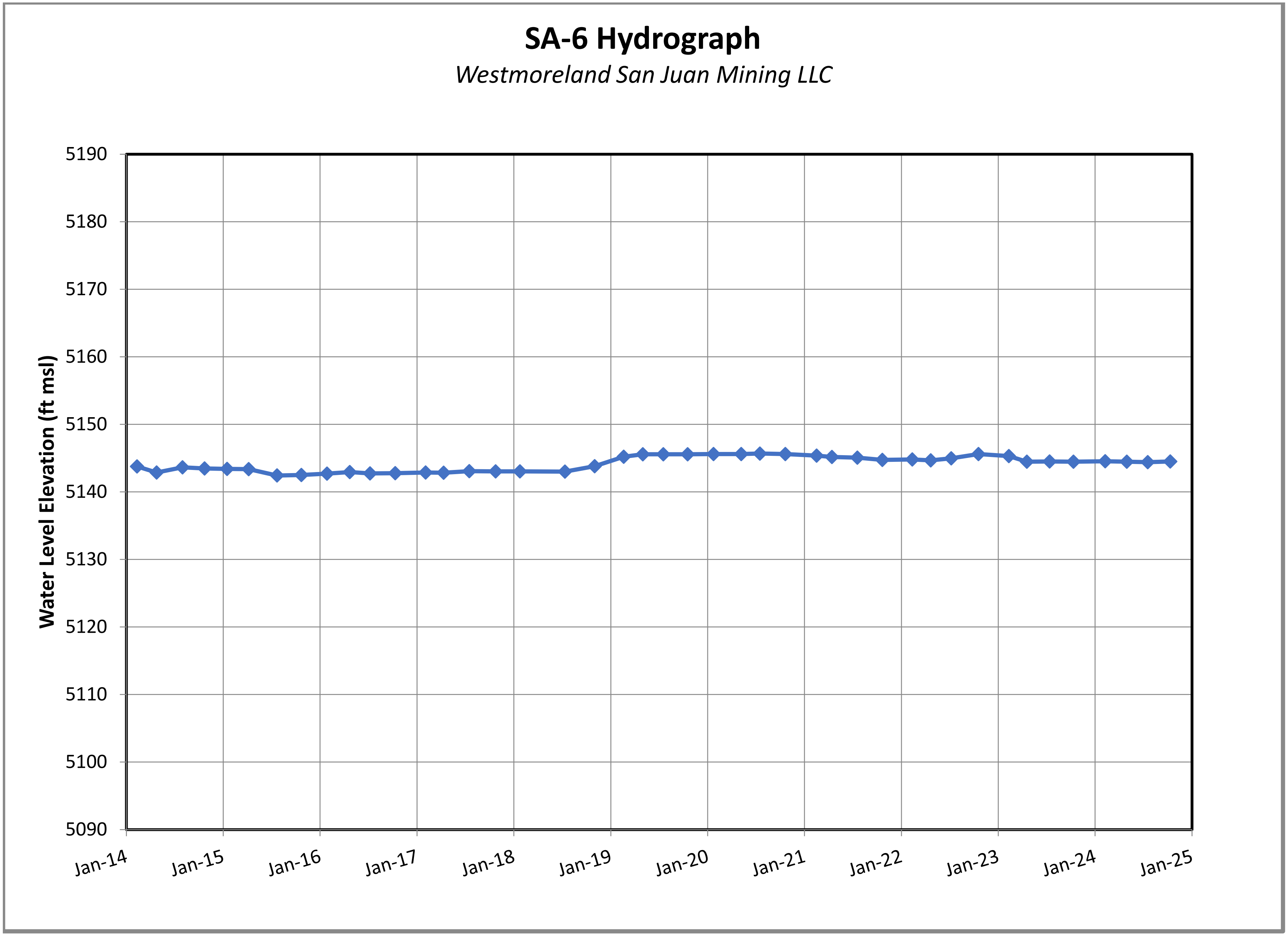
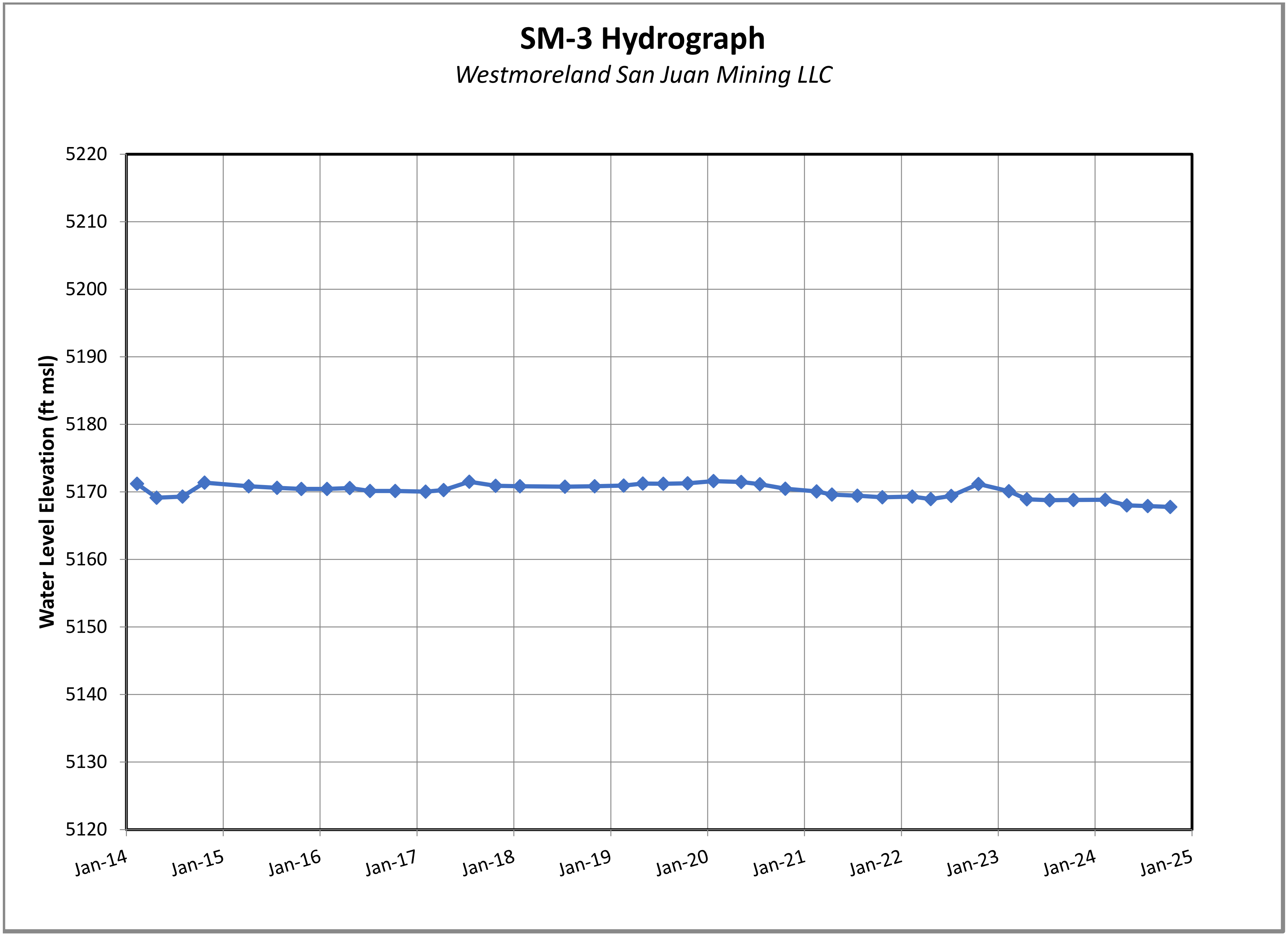
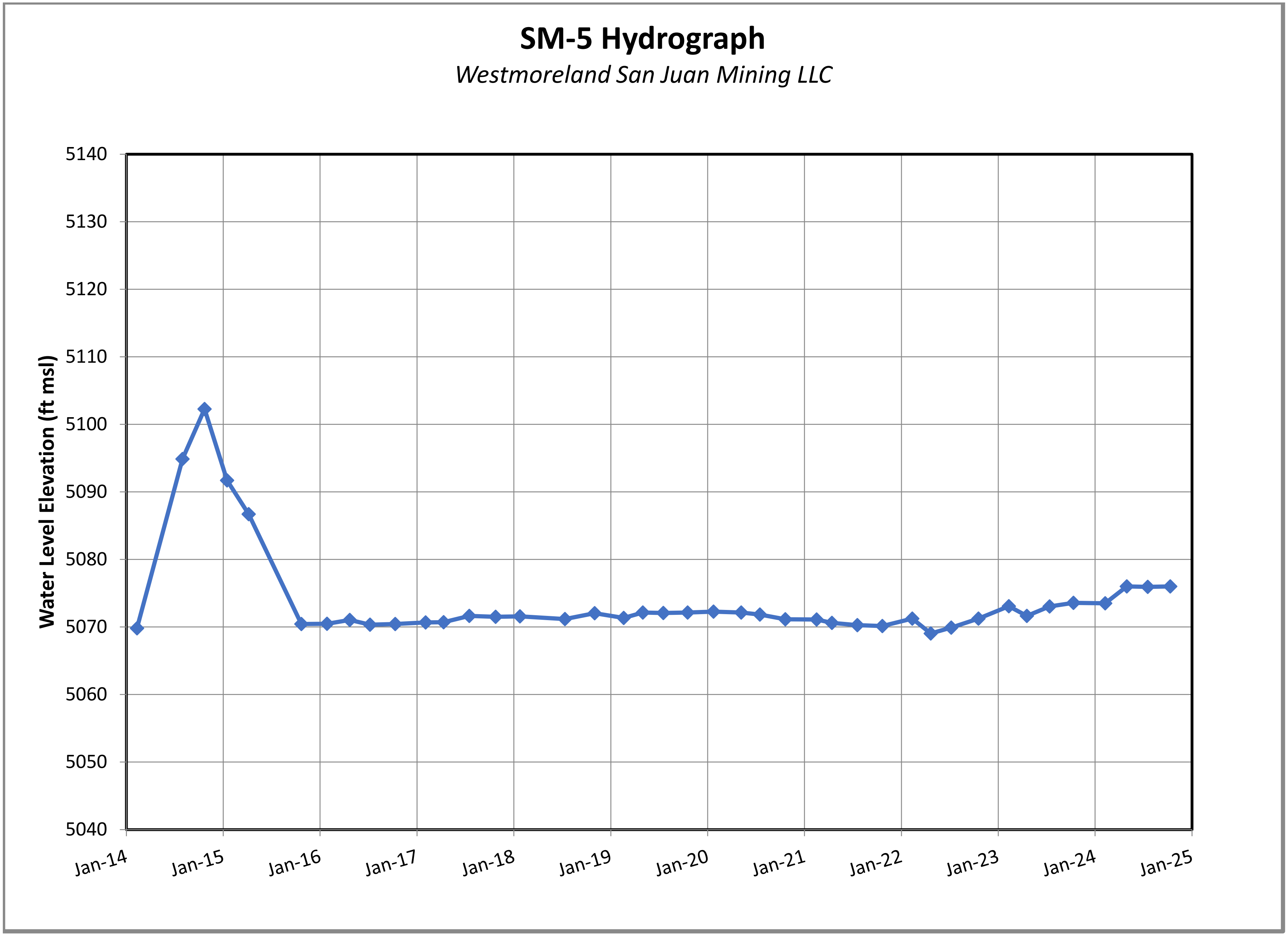
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25



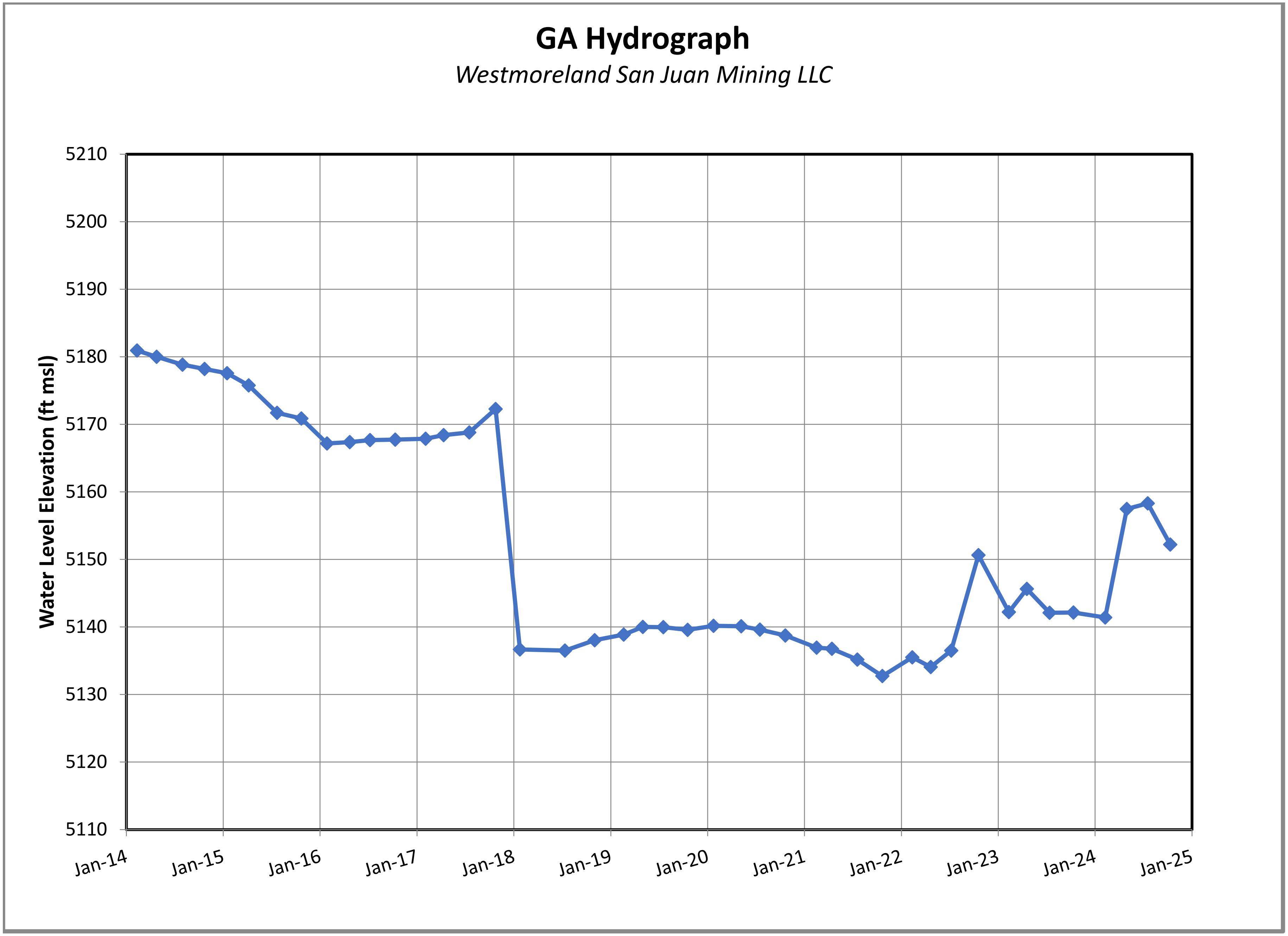
SA-6 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5190
5180
5170
5160
5150
5140
5130
5120
5110
5100
5090
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25

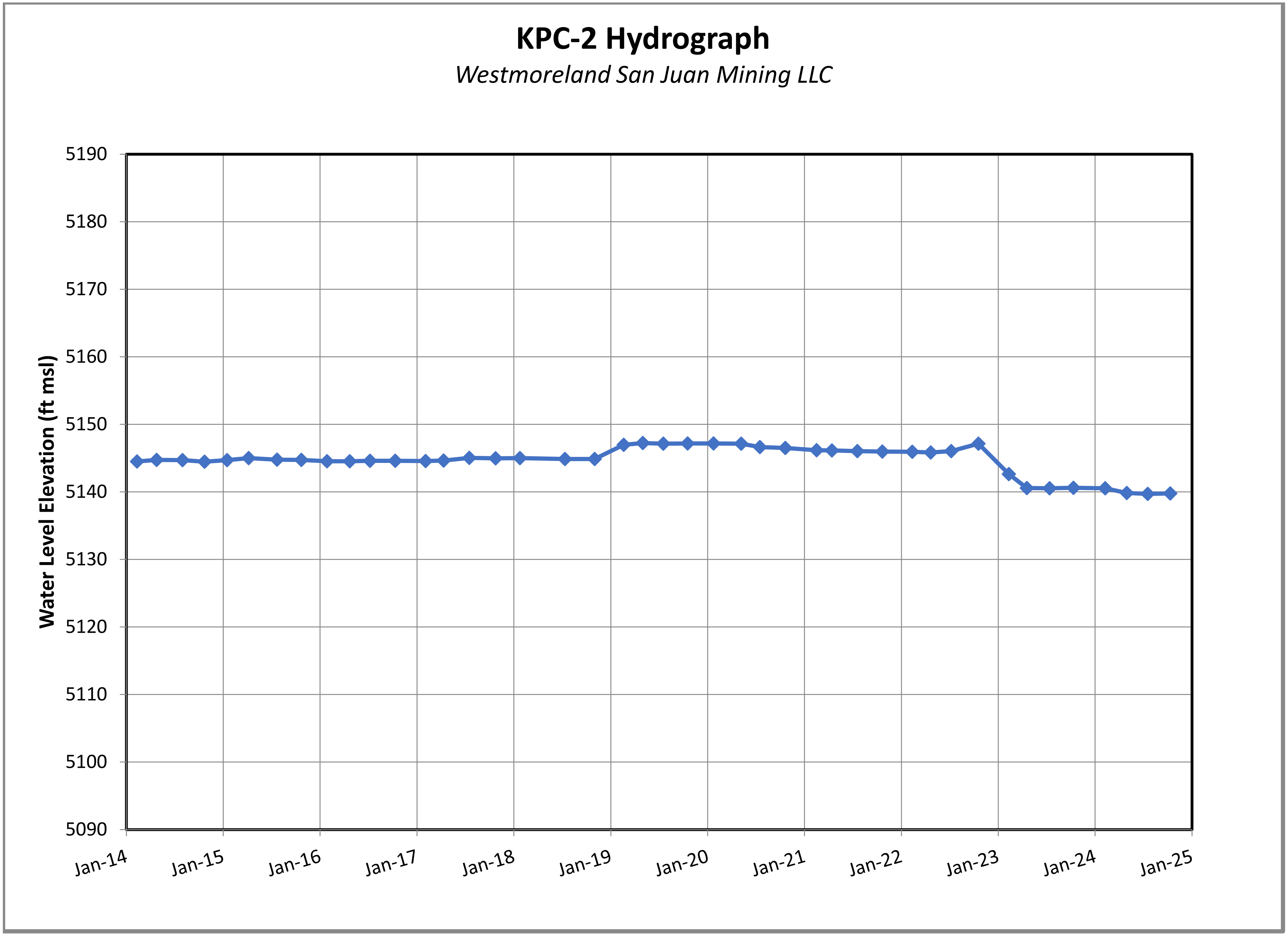

SM-3 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5220
5210
5200
5190
5180
5170
5160
5150
5140
5130
5120
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25


SM-5 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5140
5130
5120
5110
5100
5090
5080
5070
5060
5050
5040
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25

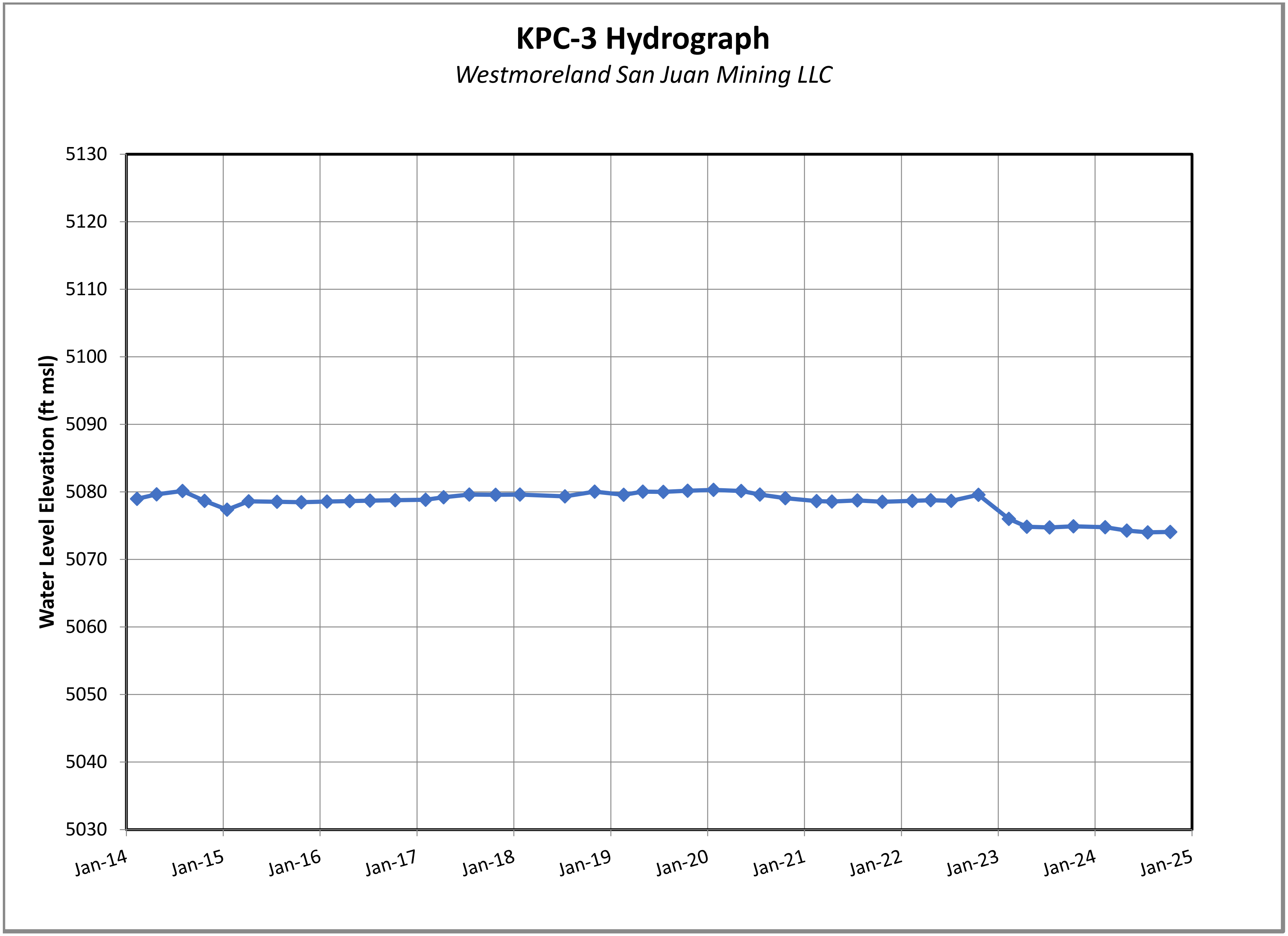
Pictured Cliffs Sandstone

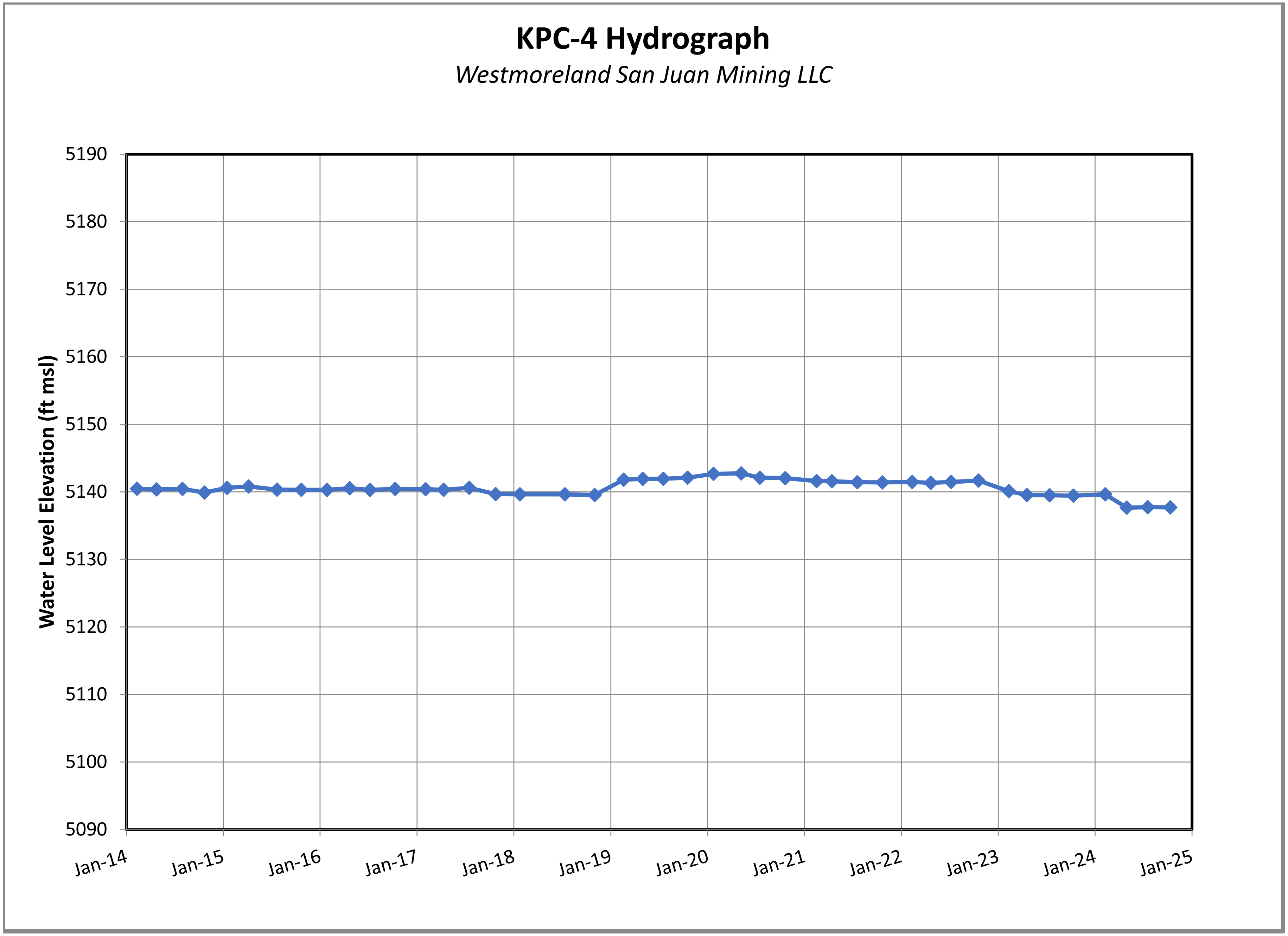
DBS&A
a Geo-Logic Company


GA Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5210
5200
5190
5180
5170
5160
5150
5140
5130
5120
5110
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25

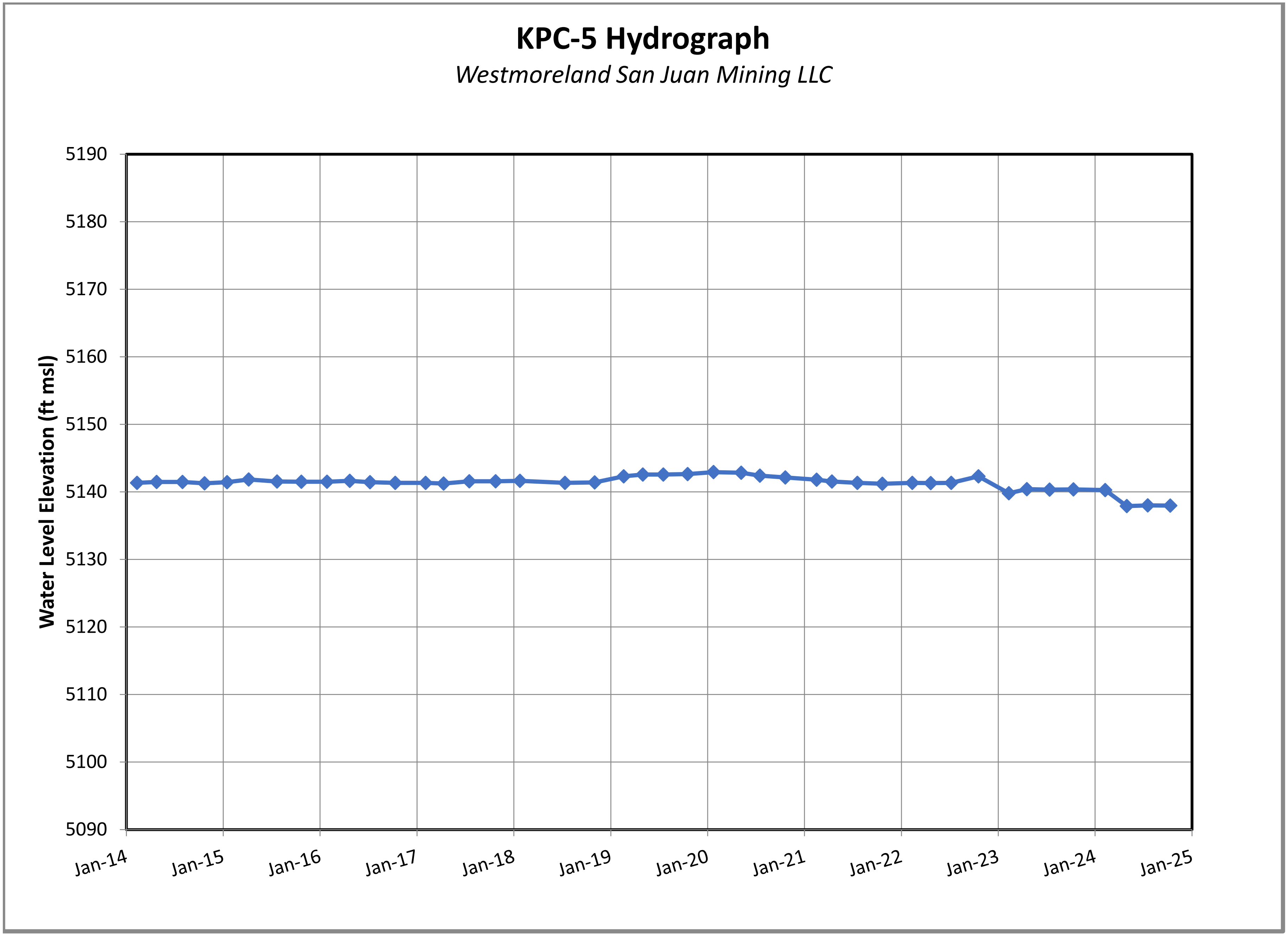


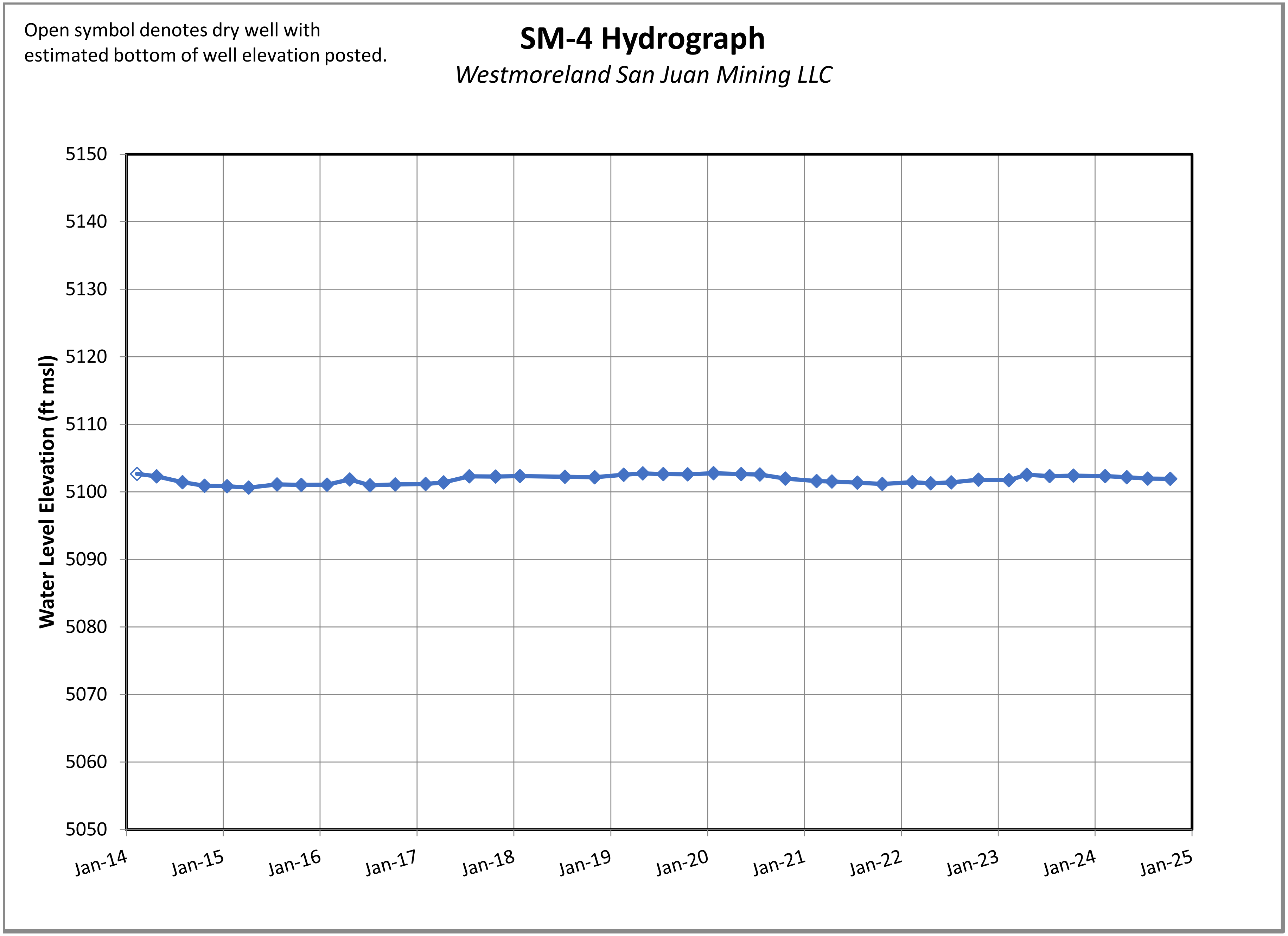
KPC-2 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5190
5180
5170
5160
5150
5140
5130
5120
5110
5100
5090
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25


KPC-3 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5130
5120
5110
5100
5090
5080
5070
5060
5050
5040
5030
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25

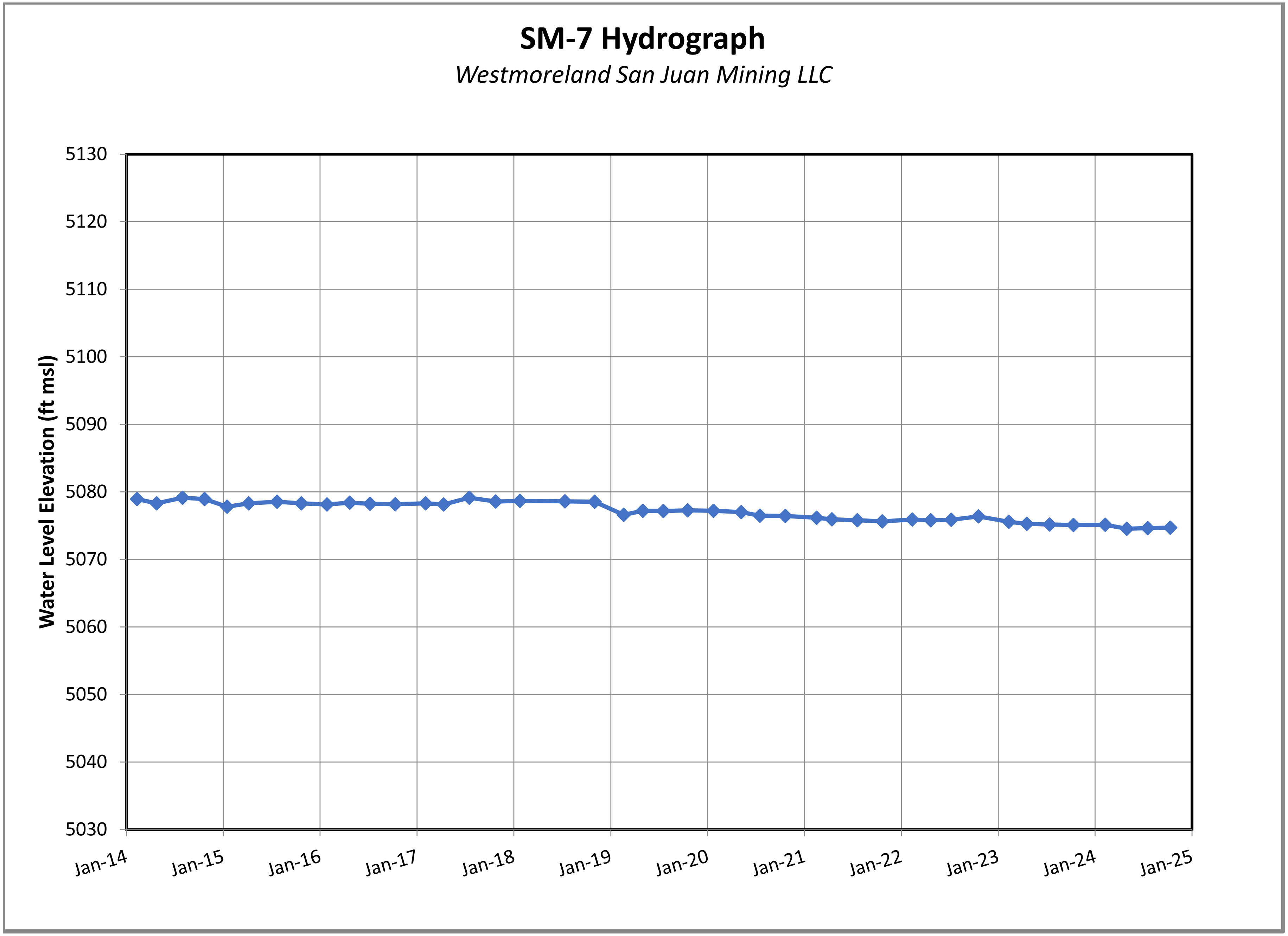


KPC-4 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5190
5180
5170
5160
5150
5140
5130
5120
5110
5100
5090
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25


KPC-5 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5190
5180
5170
5160
5150
5140
5130
5120
5110
5100
5090
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25



Open symbol denotes dry well with
estimated bottom of well elevation posted.
SM-4 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5150
5140
5130
5120
5110
5100
5090
5080
5070
5060
5050
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25


SM-7 Hydrograph
Westmoreland San Juan Mining LLC
Water Level Elevation (ft msl)
5130
5120
5110
5100
5090
5080
5070
5060
5050
5040
5030
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25

Appendix D

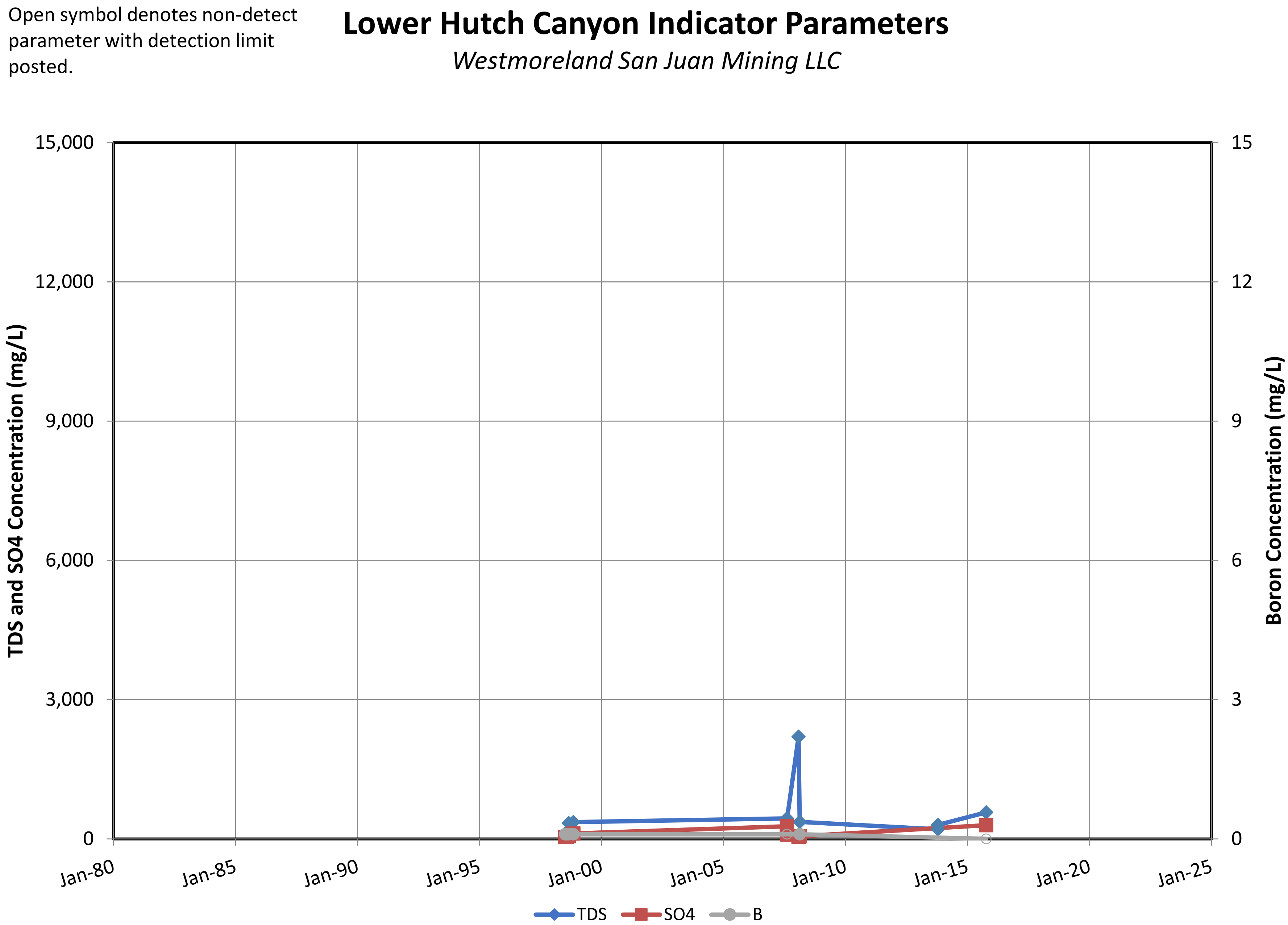
Time-Series Plots of Water Quality Parameters

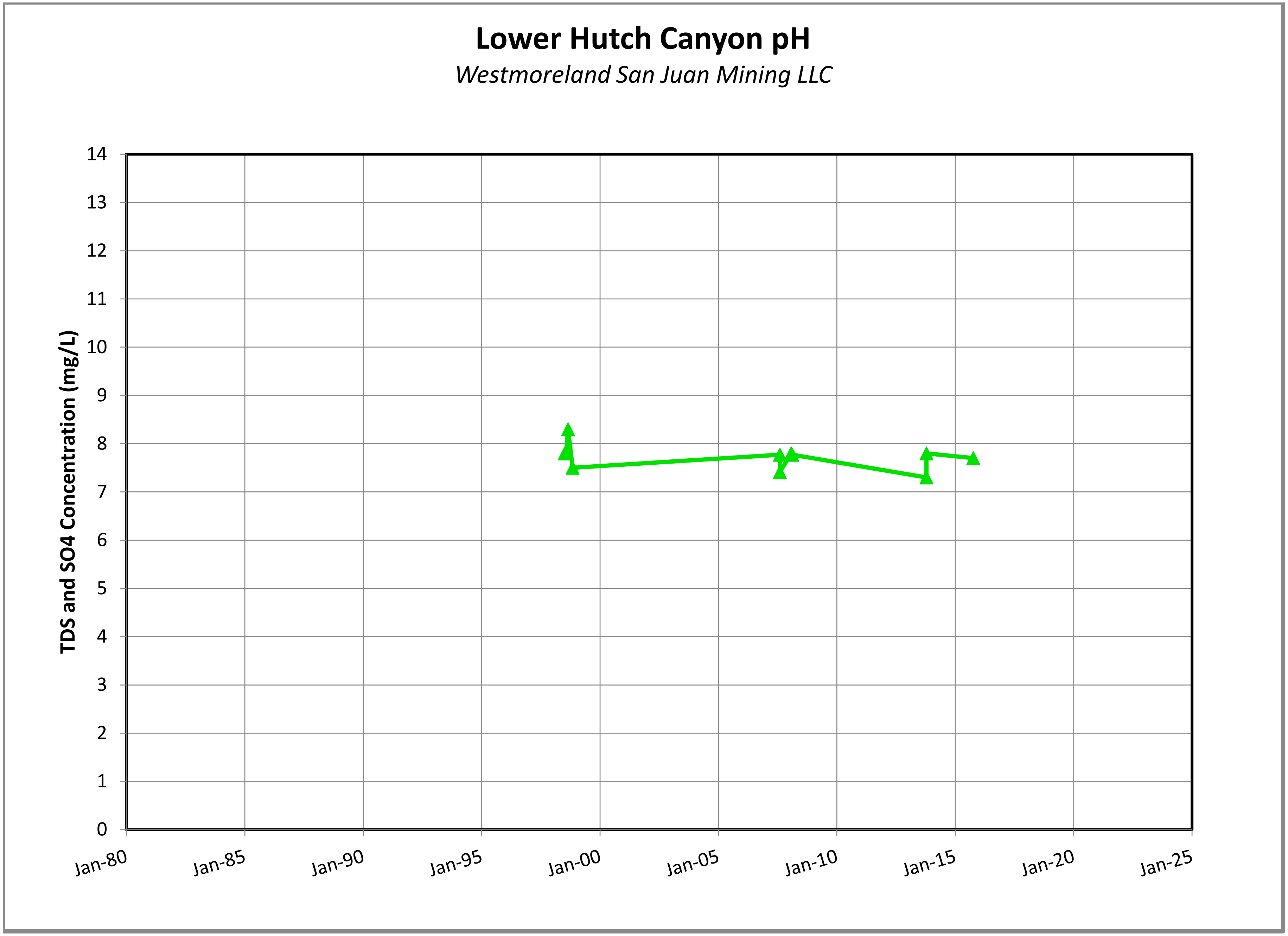
DBS&A
a Geo-Logic Company

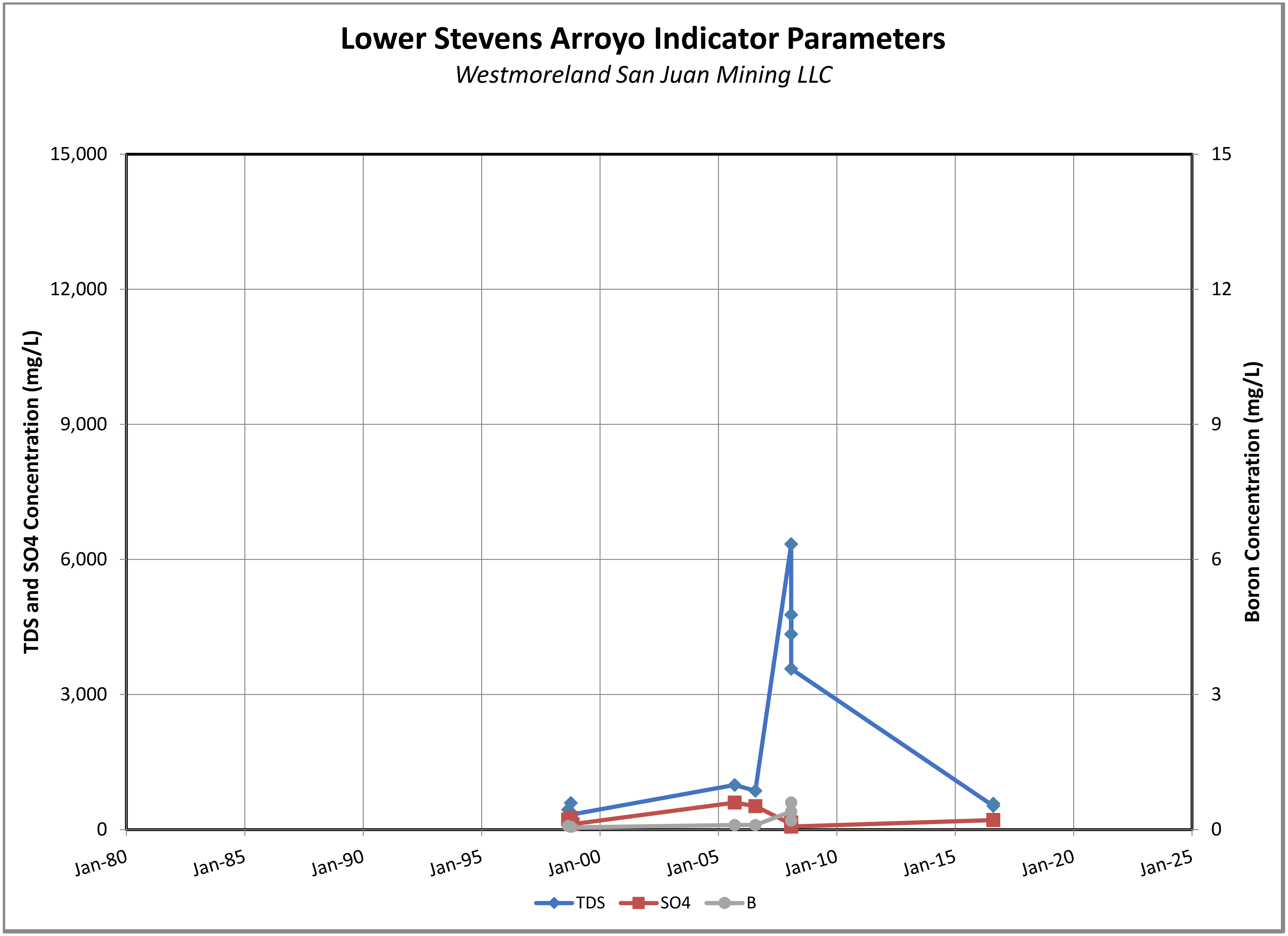
Surface Water

a Geo-Logic Company

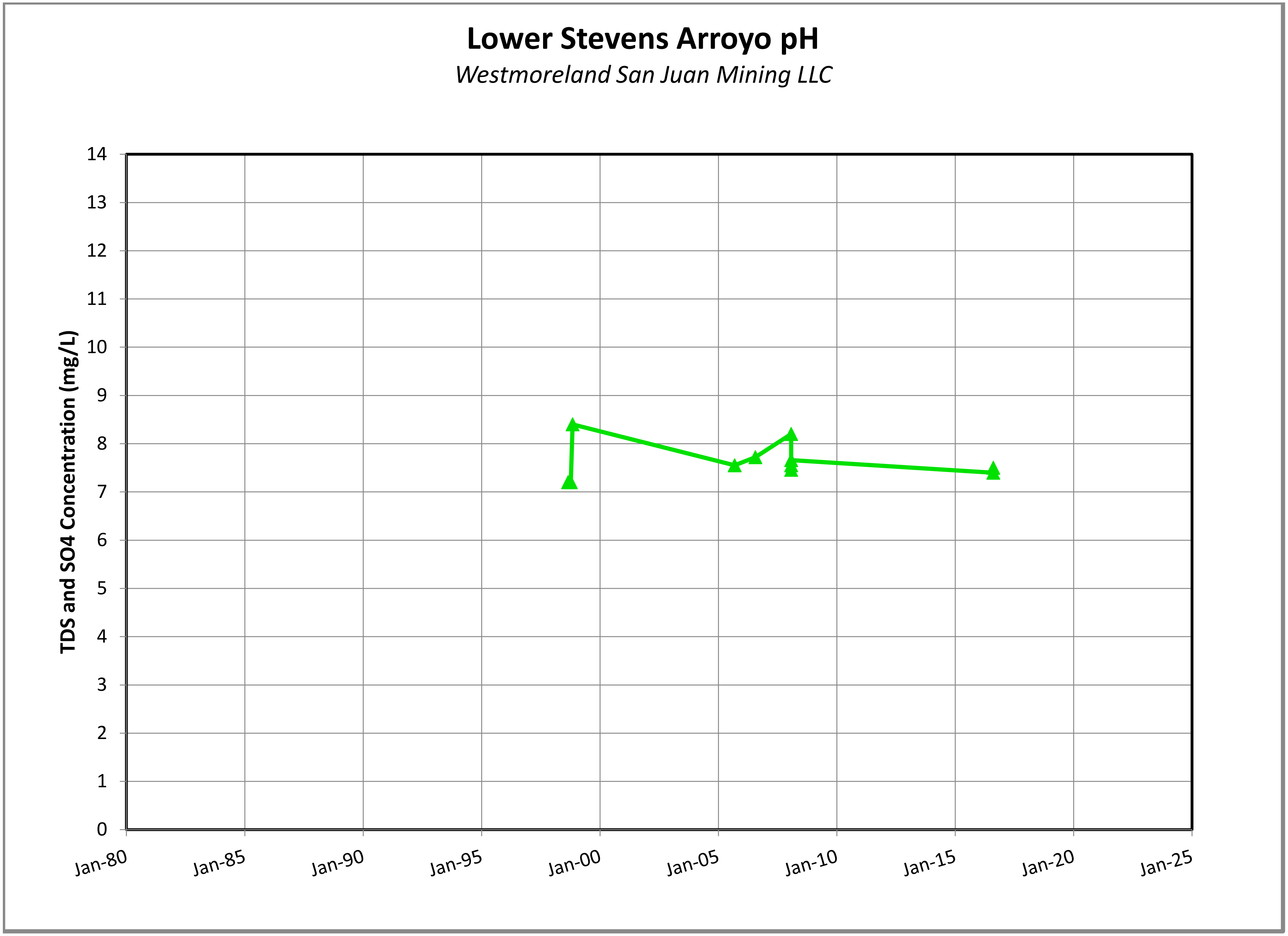
Open symbol denotes non-detect parameter with detection limit posted.



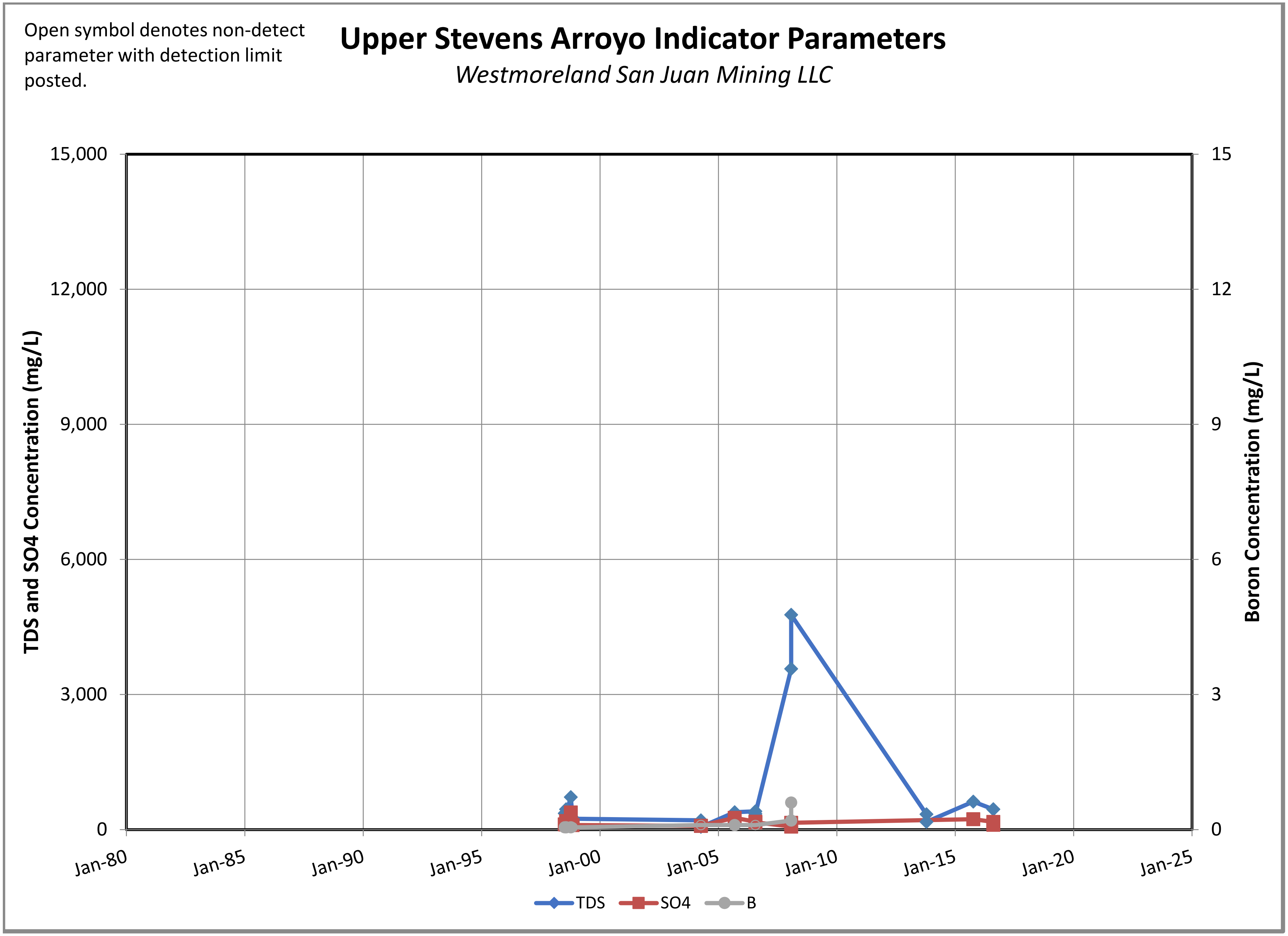

Lower Hutch Canyon pH
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25

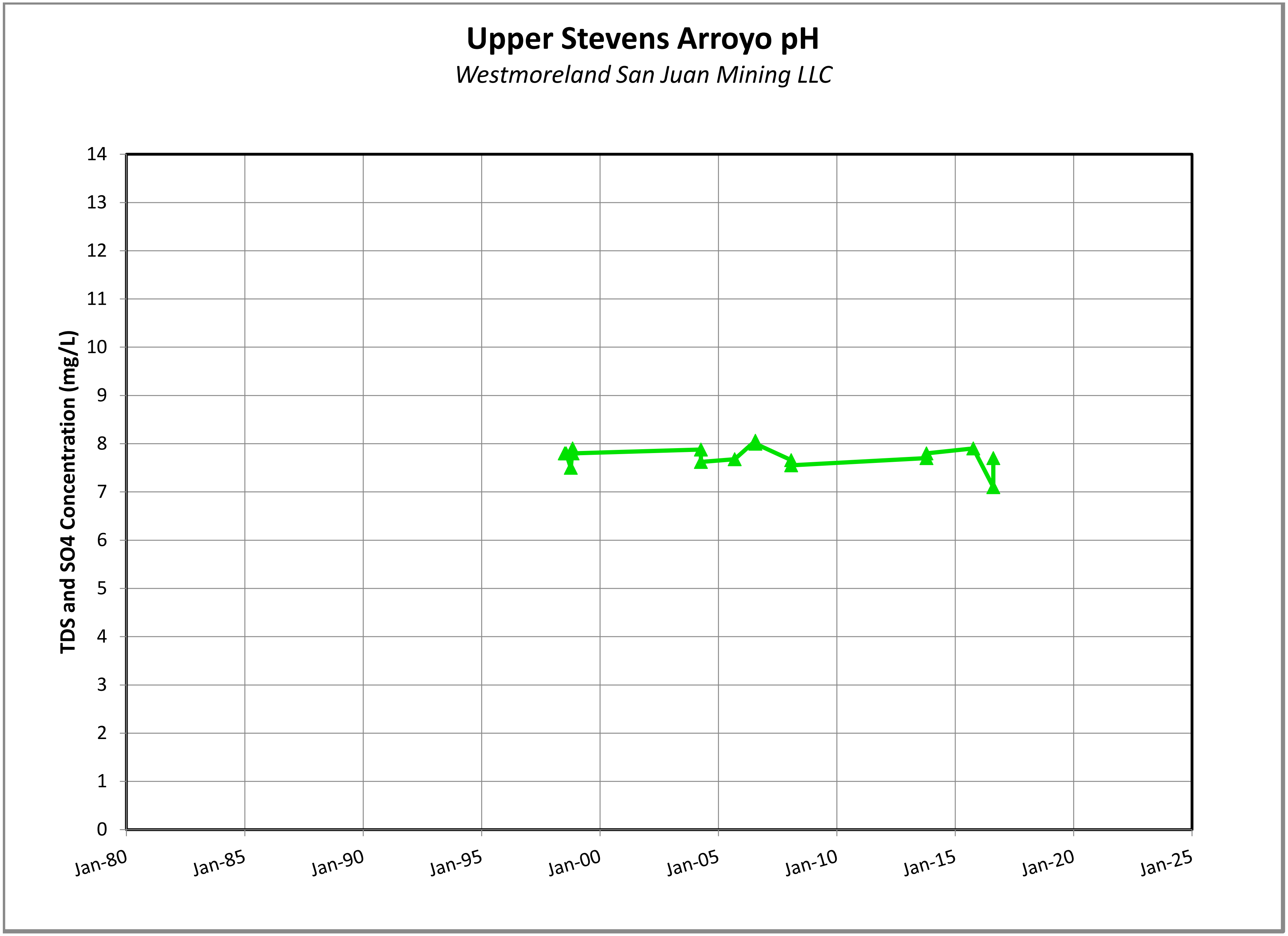


Lower Stevens Arroyo Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
15,000
12,000
9,000
6,000
3,000
0
15
12
9
6
3
0
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25
TDS
SO4
B

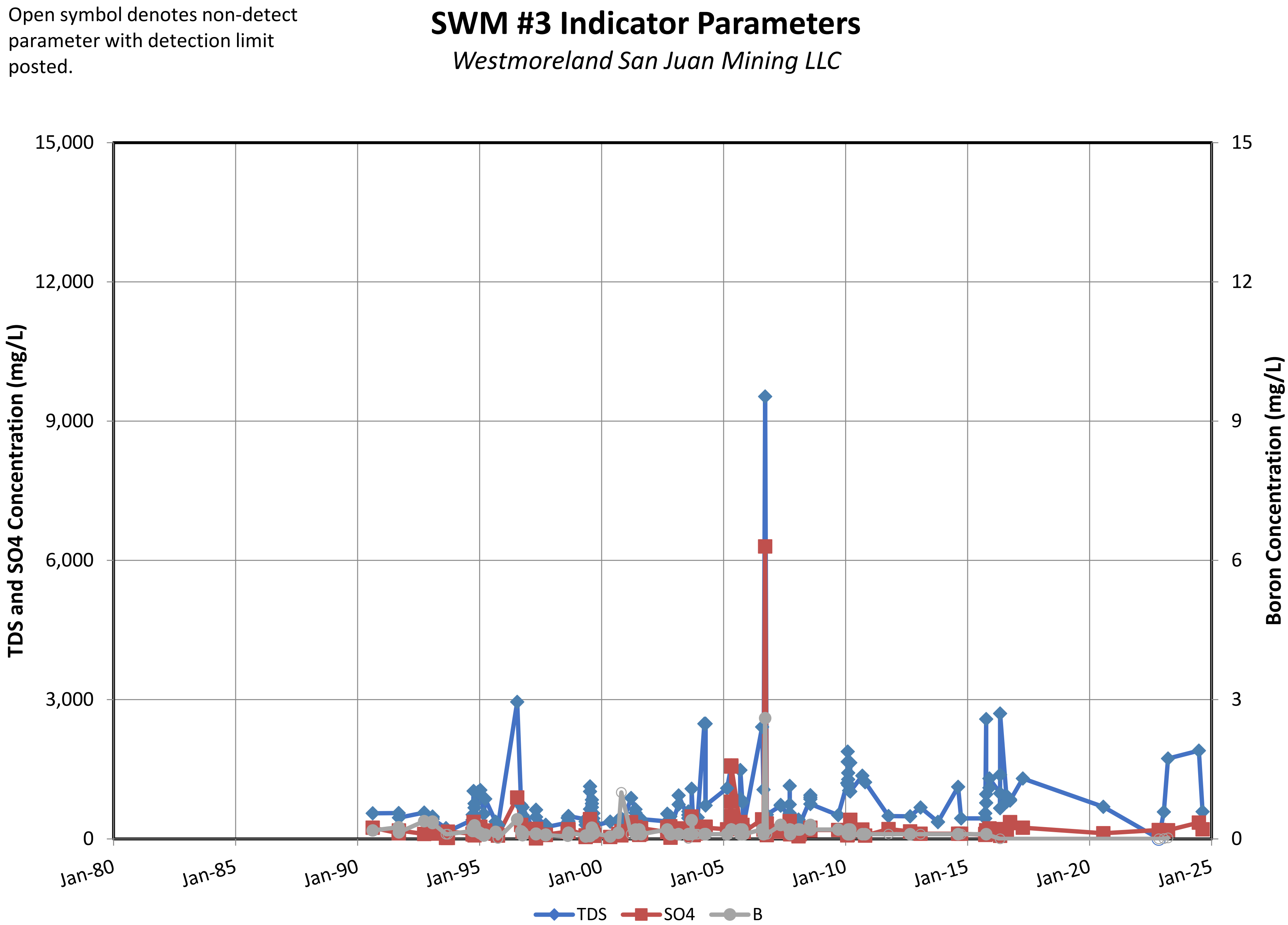


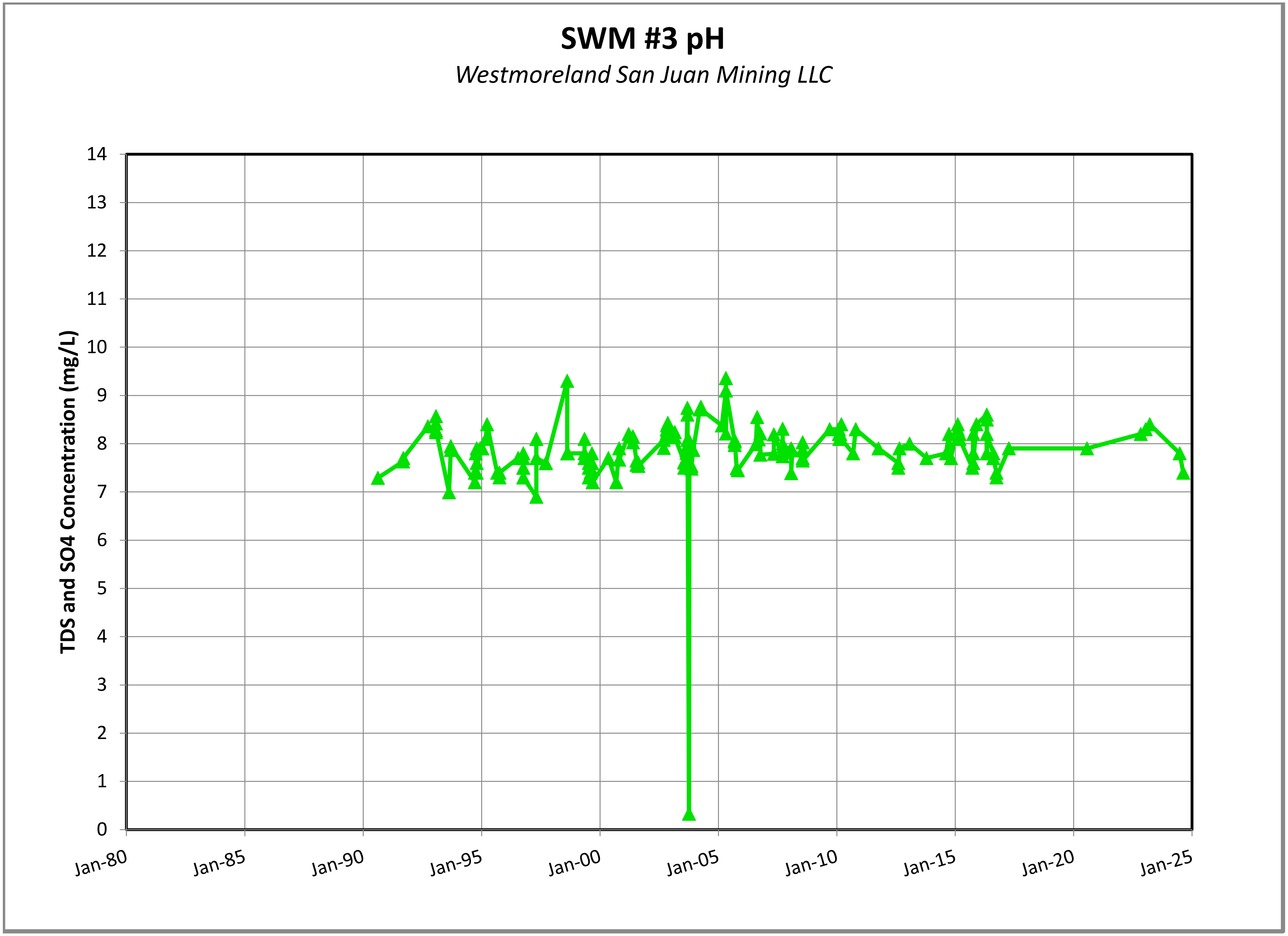
Lower Stevens Arroyo pH
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25

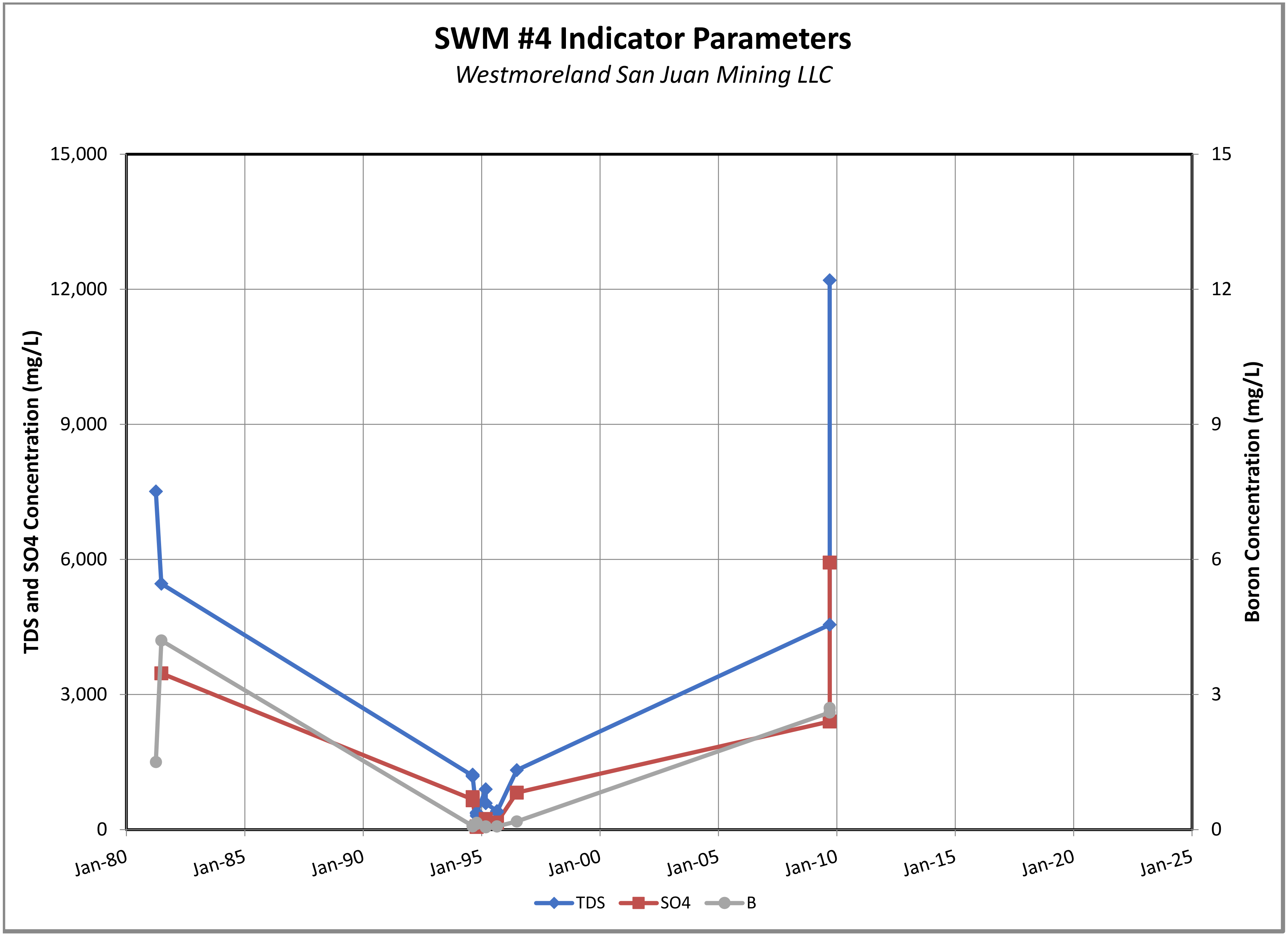

Open symbol denotes non-detect parameter with detection limit posted.
Upper Stevens Arroyo Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
15,000
12,000
9,000
6,000
3,000
0
15
12
9
6
3
0
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25
TDS
SO4
B

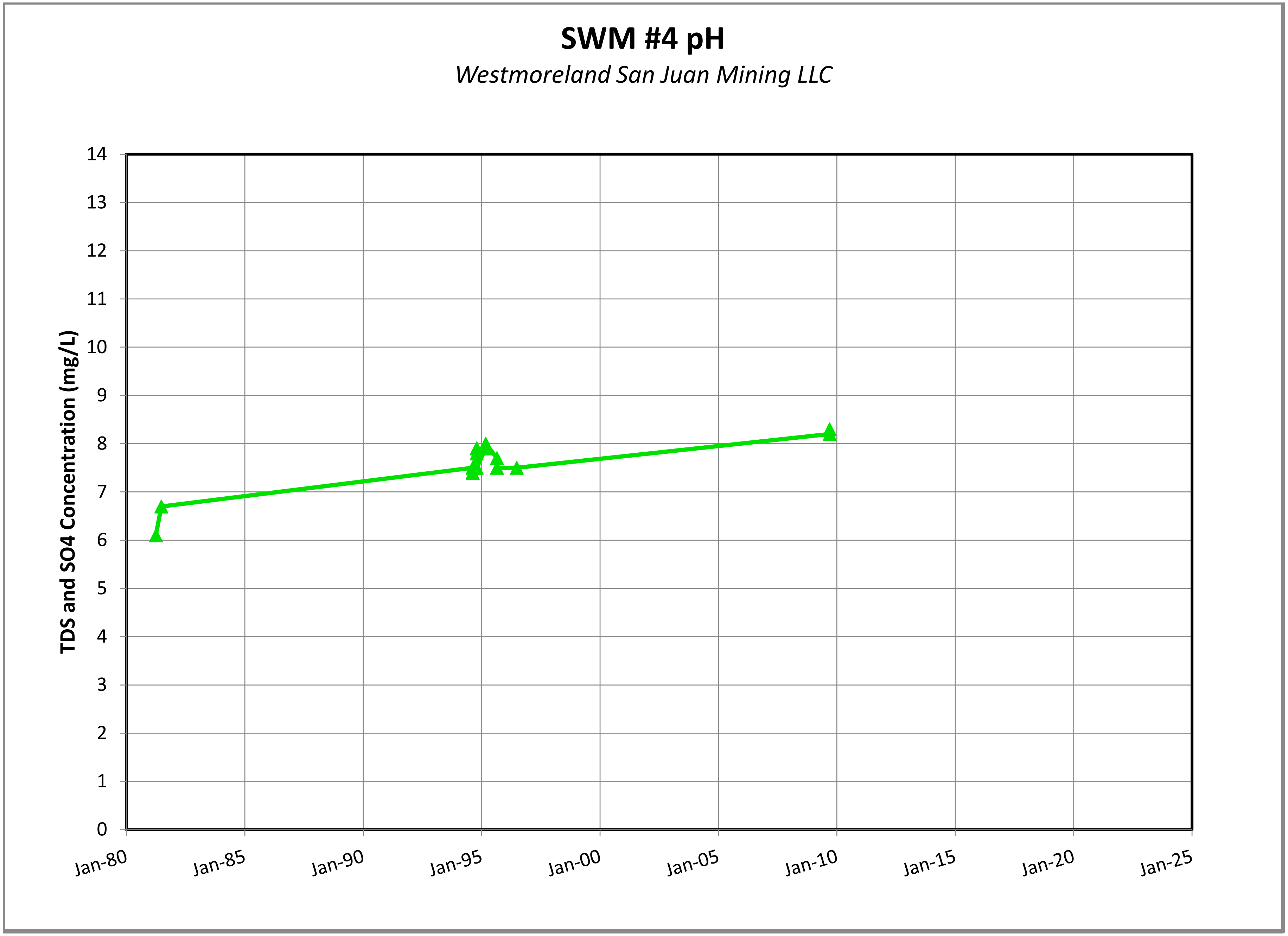

Upper Stevens Arroyo pH
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25

Open symbol denotes non-detect parameter with detection limit posted.



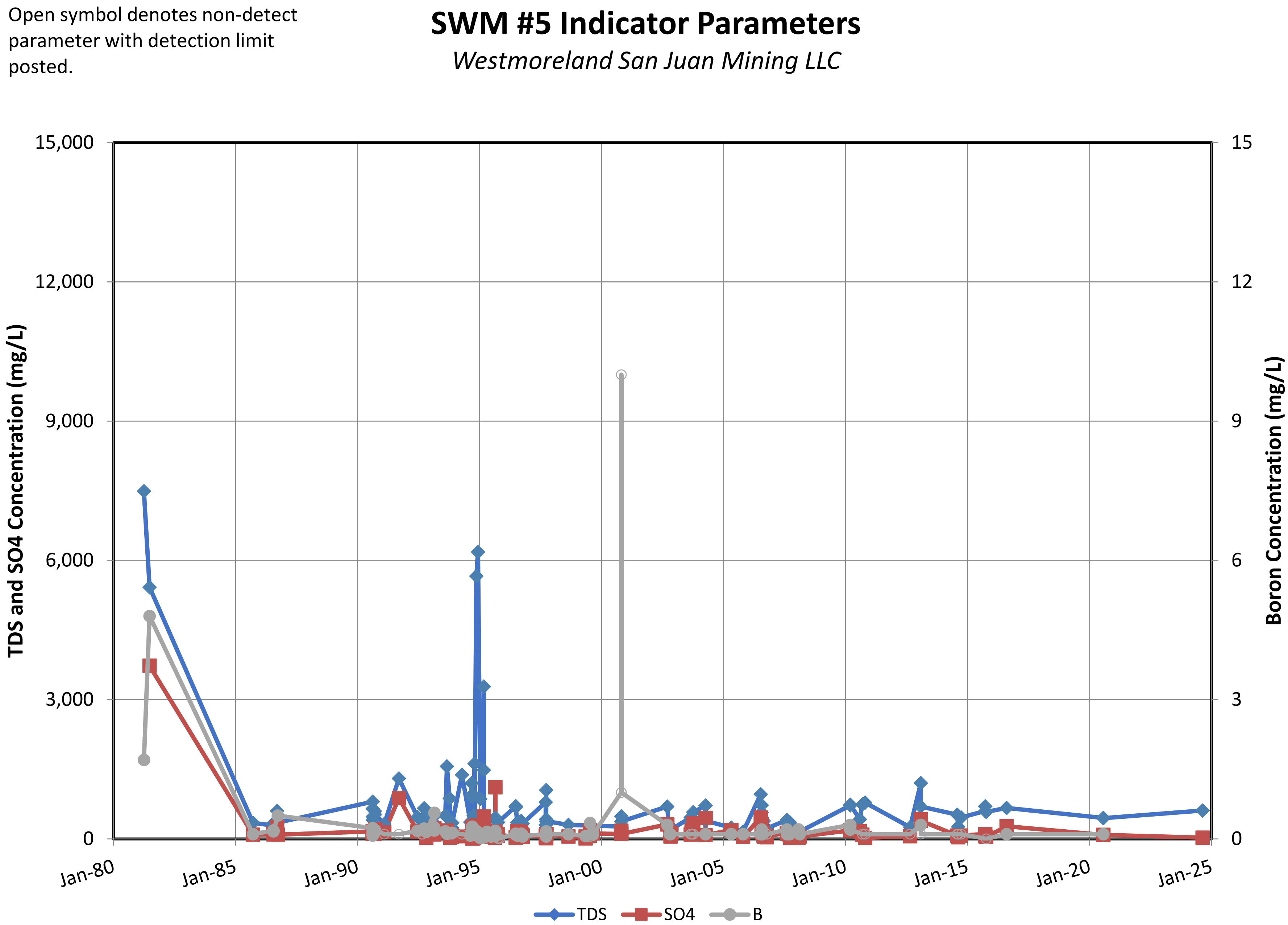

SWM #3 pH
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25

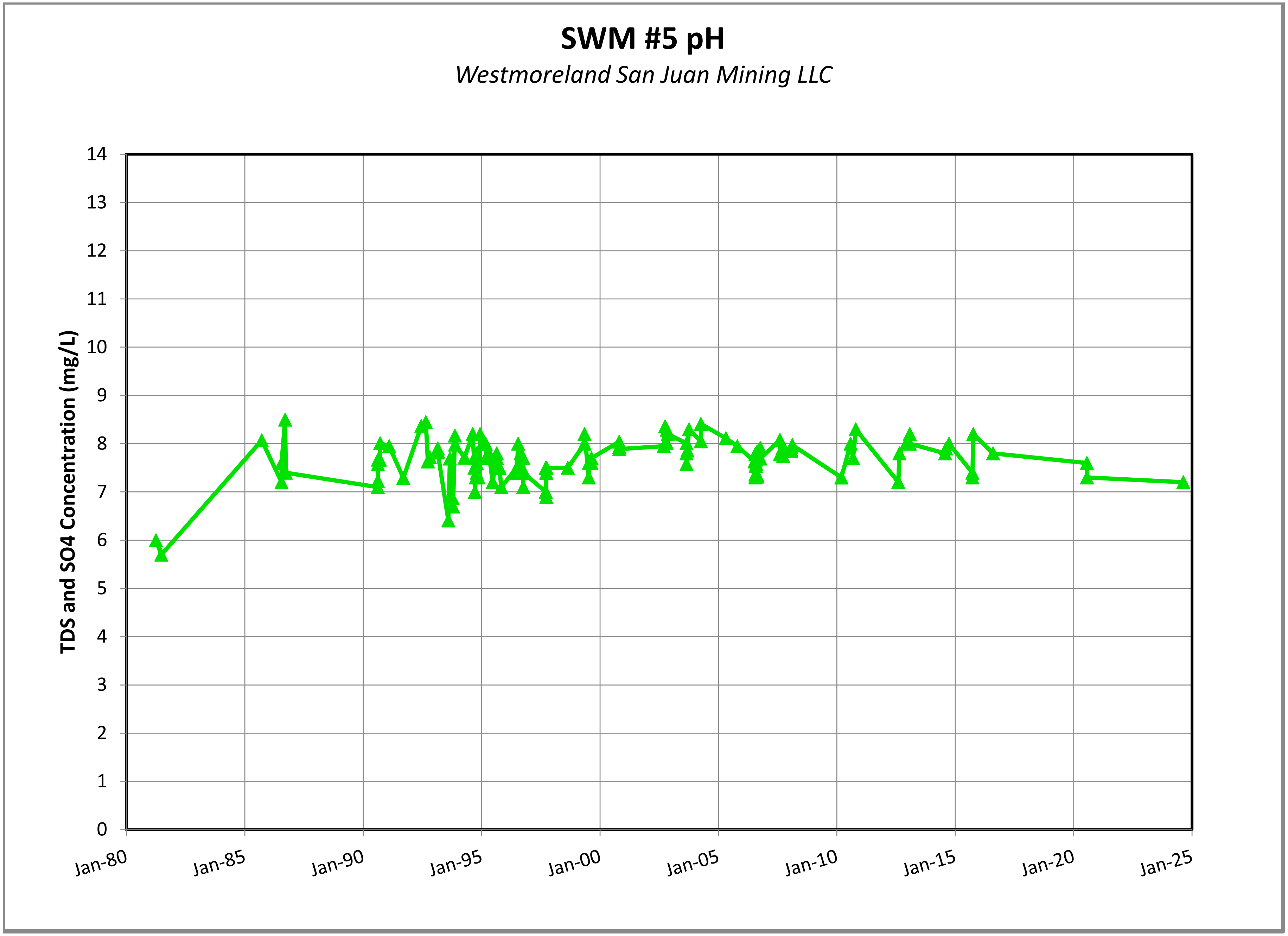

SWM #4 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
15,000
12,000
9,000
6,000
3,000
0
15
12
9
6
3
0
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25
TDS
SO4
B



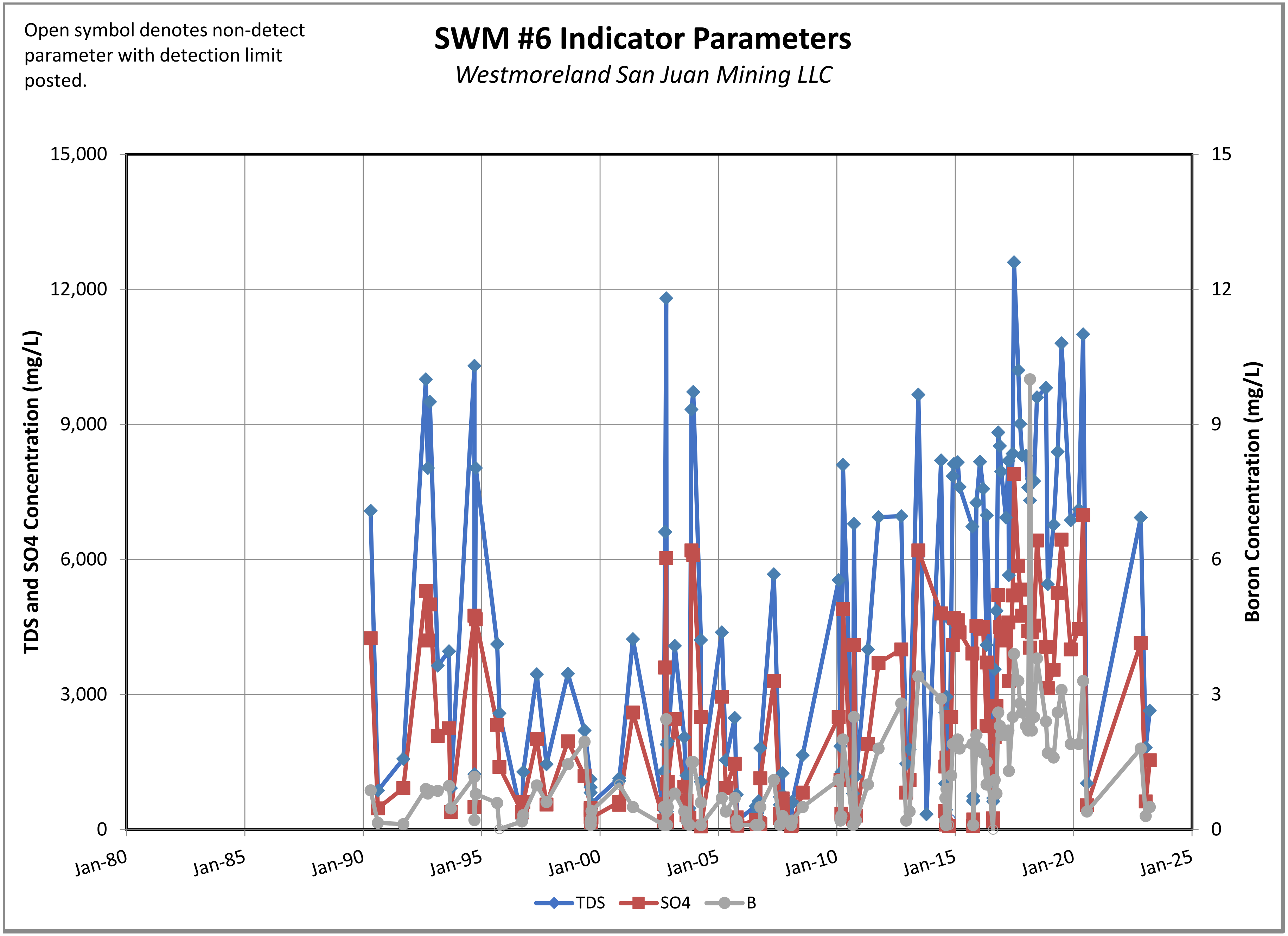
SWM #4 pH
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25

Open symbol denotes non-detect parameter with detection limit posted.

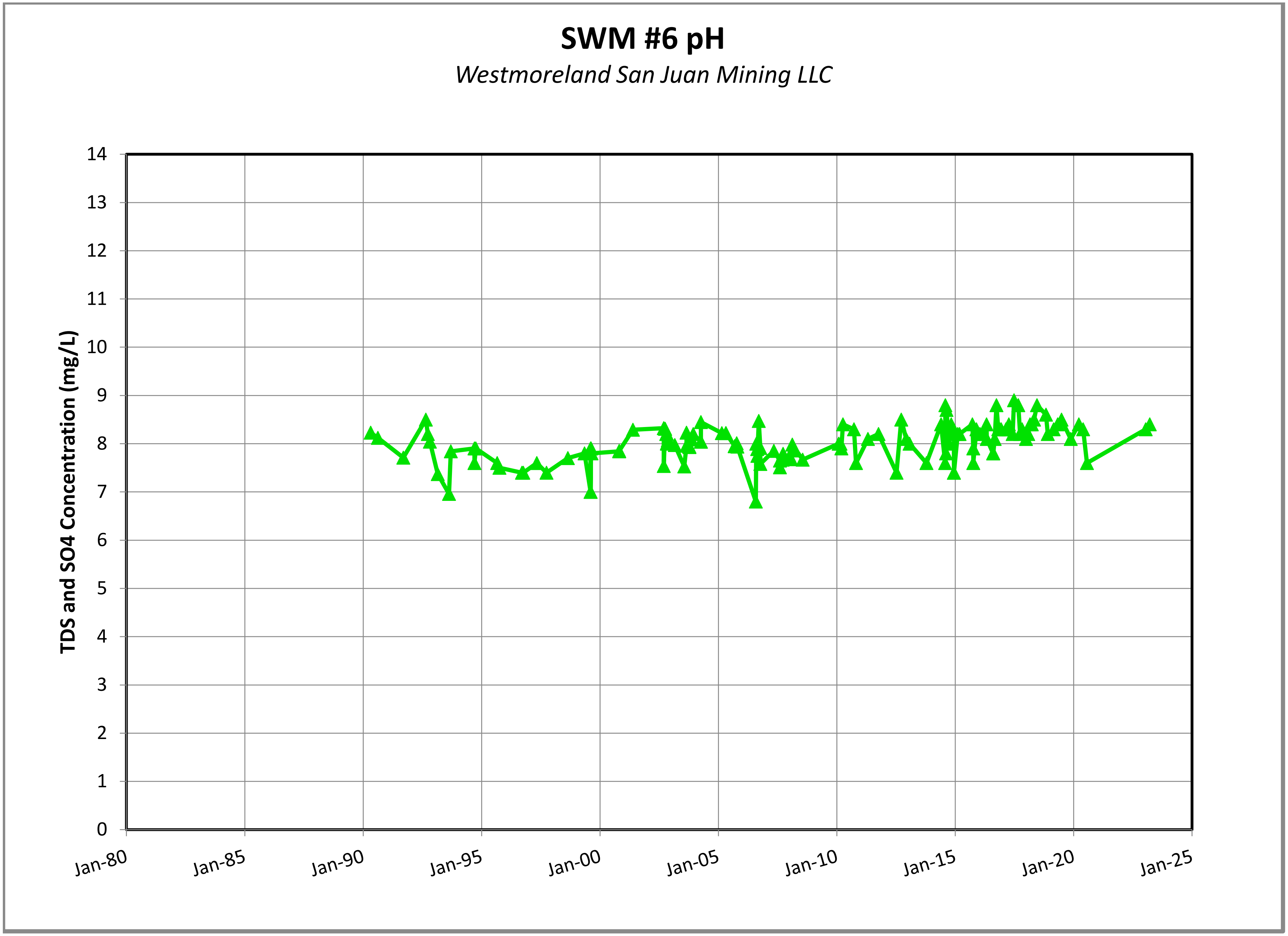


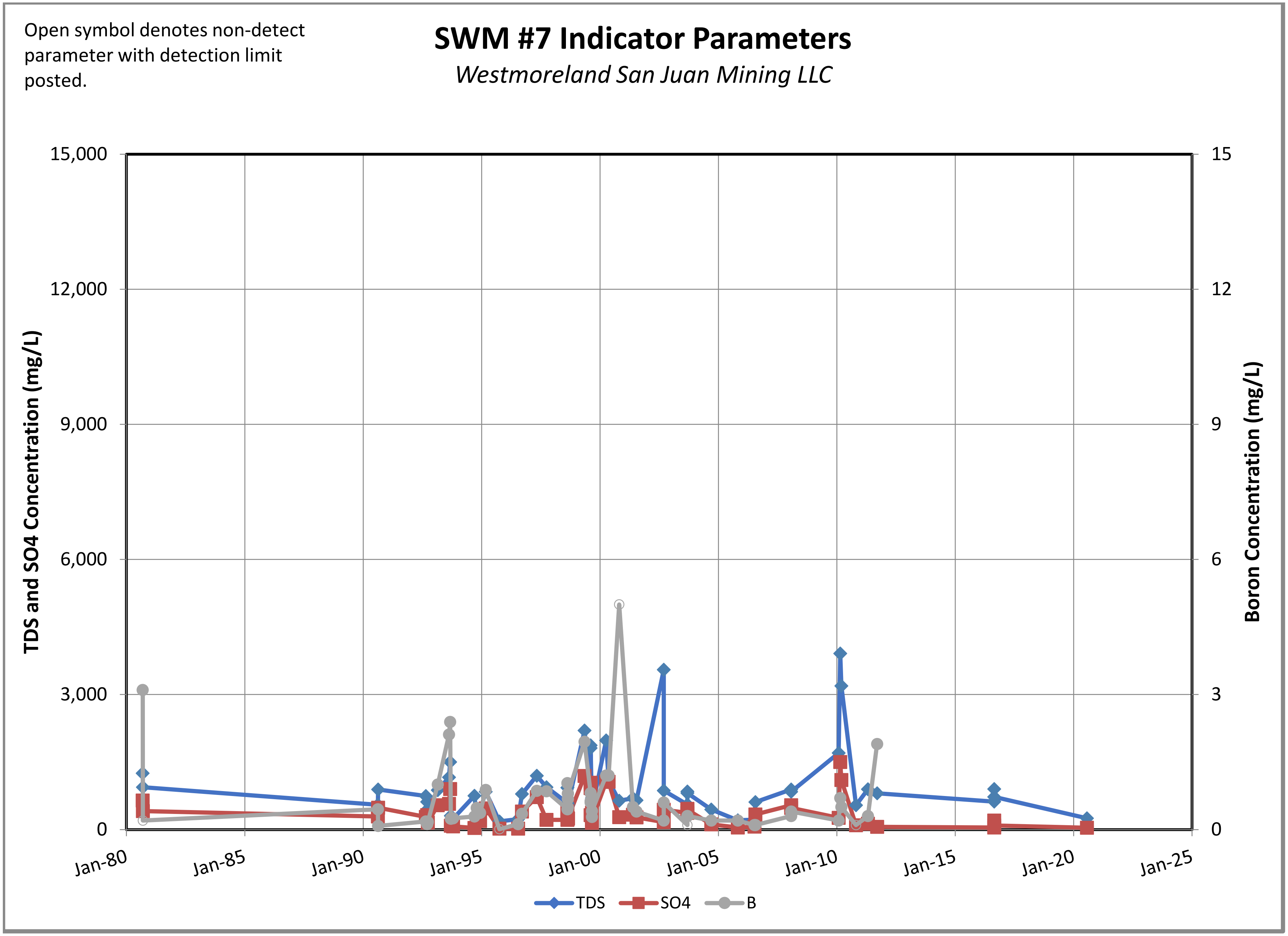


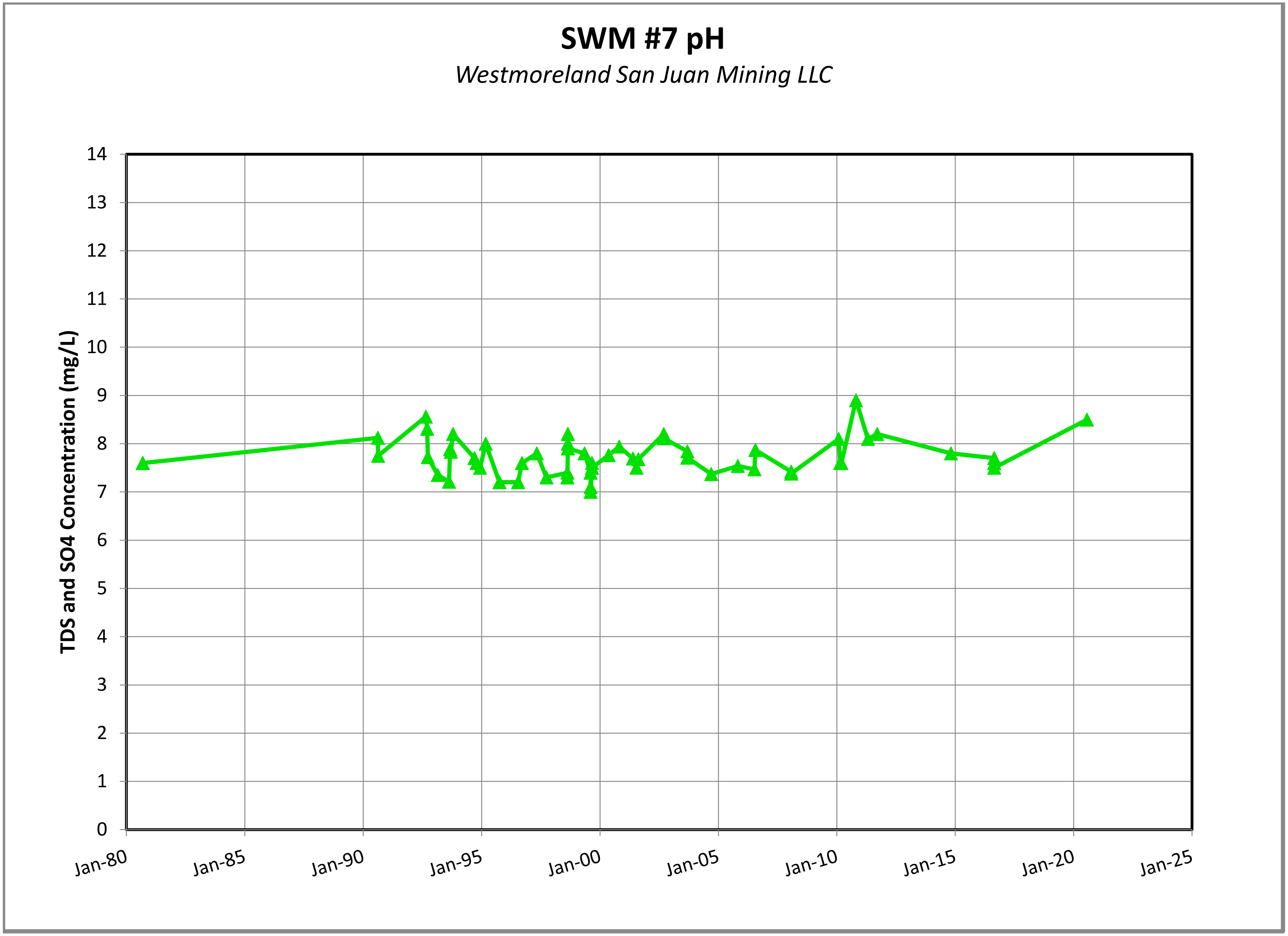
SWM #5 pH
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25



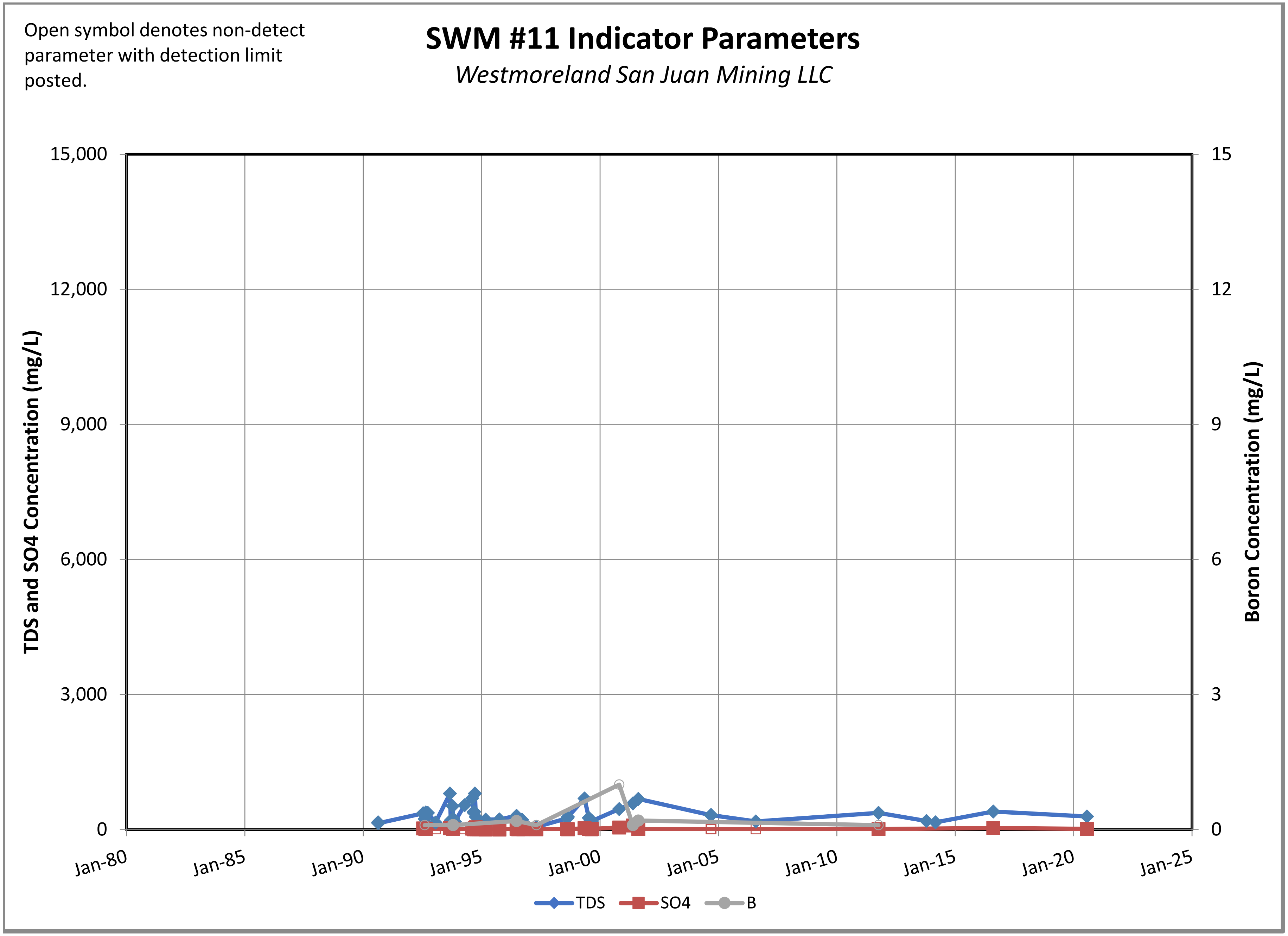
Open symbol denotes non-detect parameter with detection limit posted.
SWM #6 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
15,000
12,000
9,000
6,000
3,000
0
15
12
9
6
3
0
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25
TDS
SO4
B


SWM #6 pH
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25

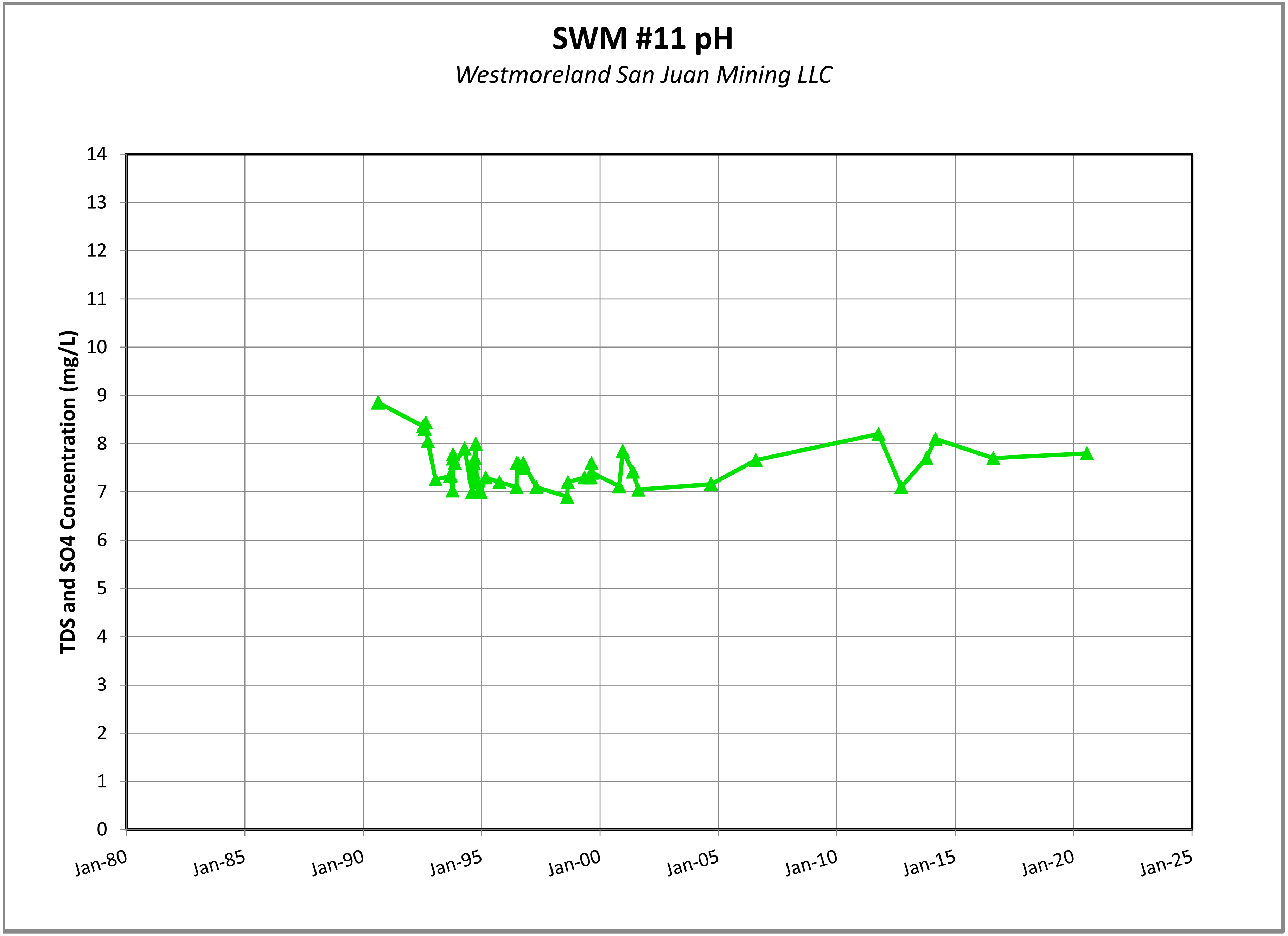

Open symbol denotes non-detect parameter with detection limit posted.
SWM #7 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
15,000
12,000
9,000
6,000
3,000
0
15
12
9
6
3
0
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25
TDS
SO4
B



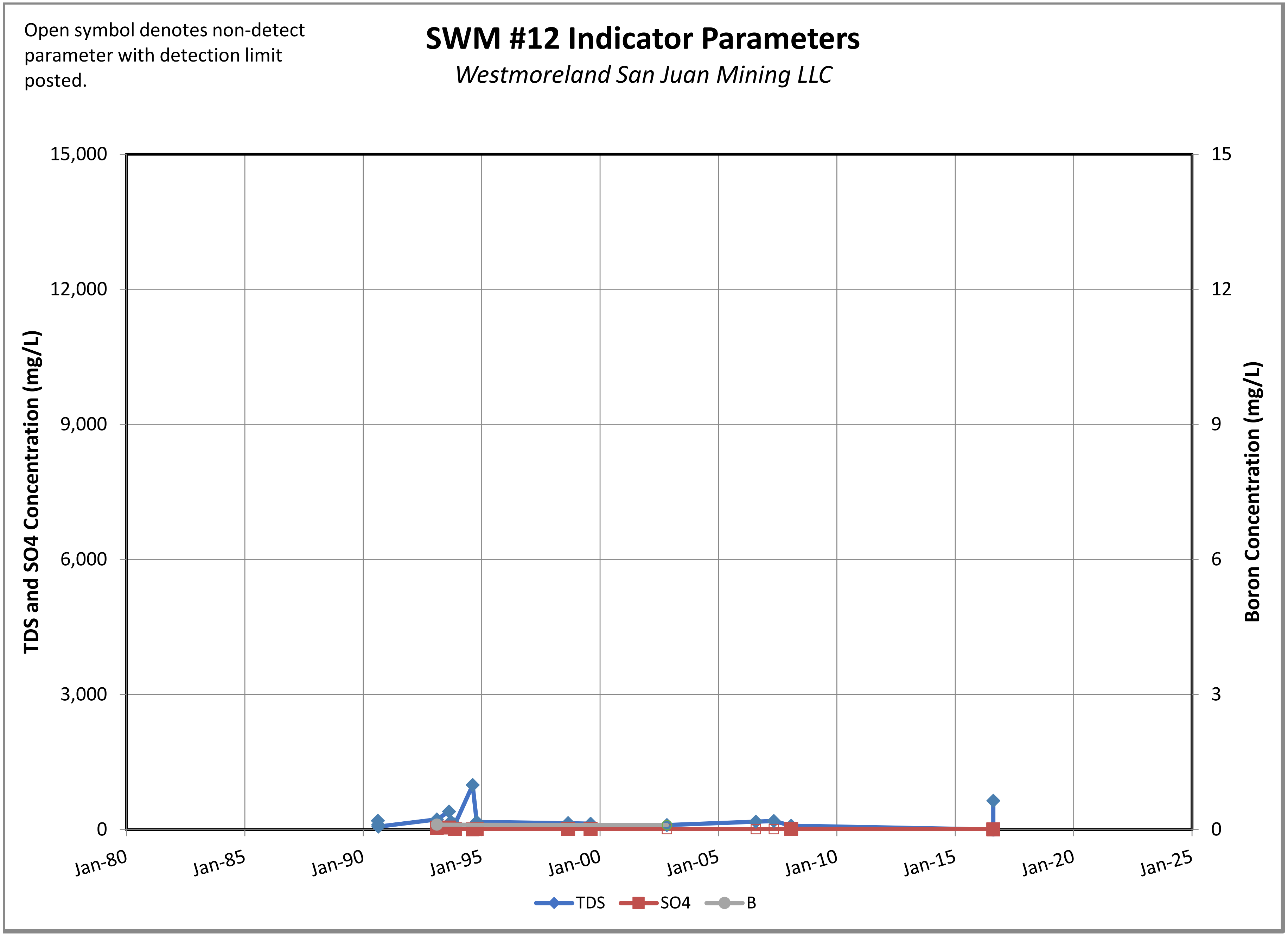
SWM #7 pH
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25

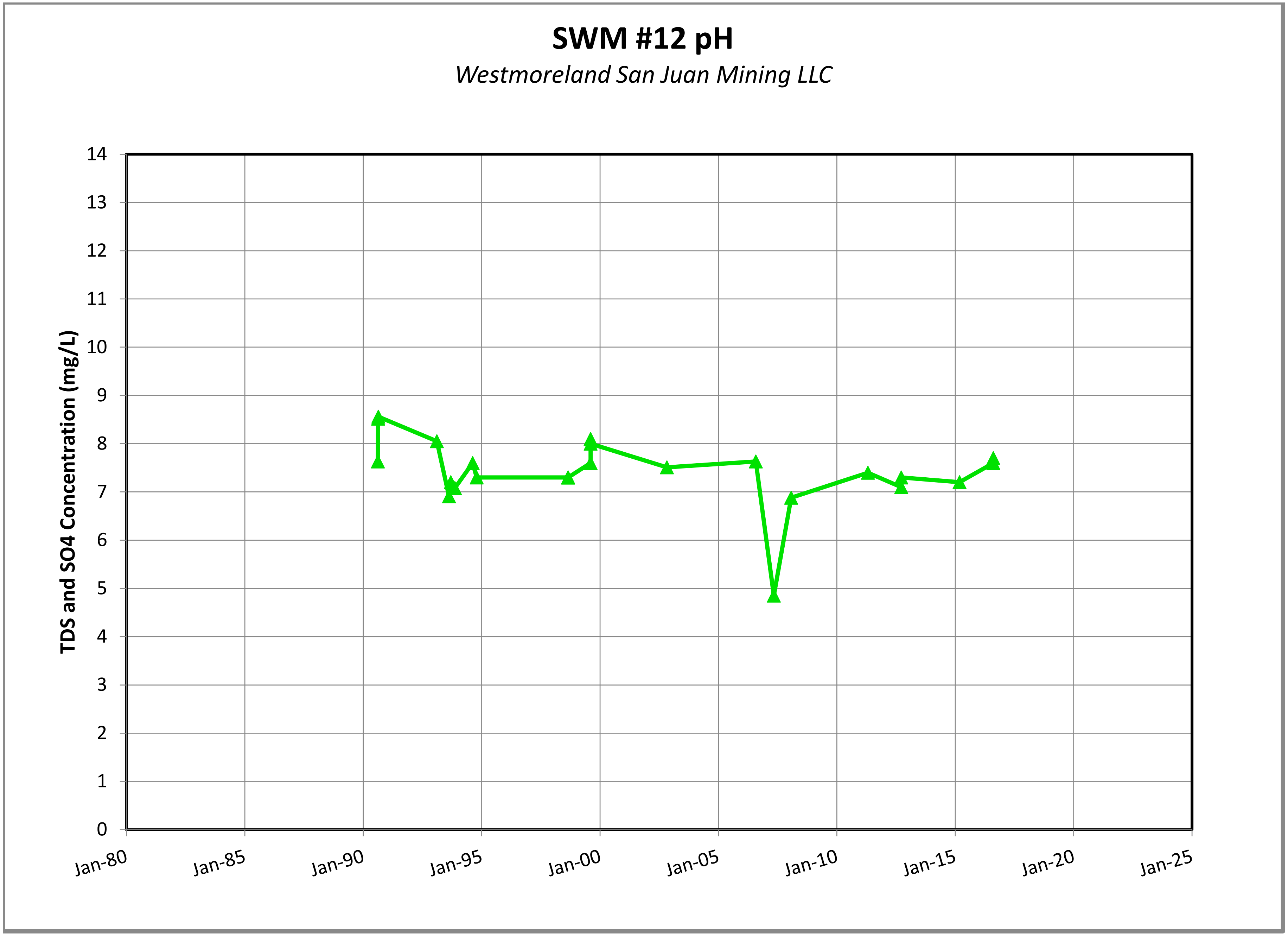


Open symbol denotes non-detect parameter with detection limit posted.
SWM #11 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
15,000
12,000
9,000
6,000
3,000
0
15
12
9
6
3
0
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25
TDS
SO4
B

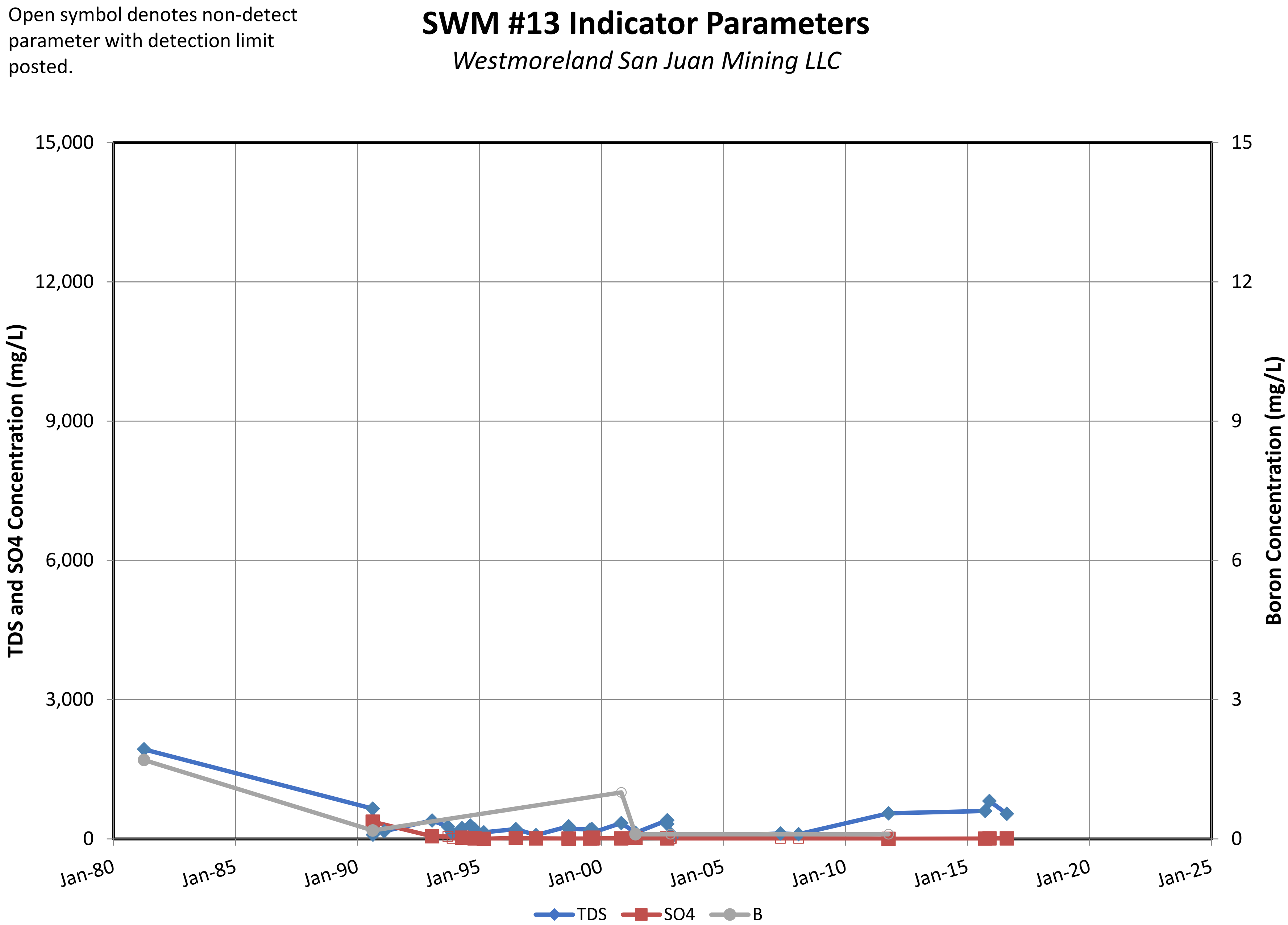


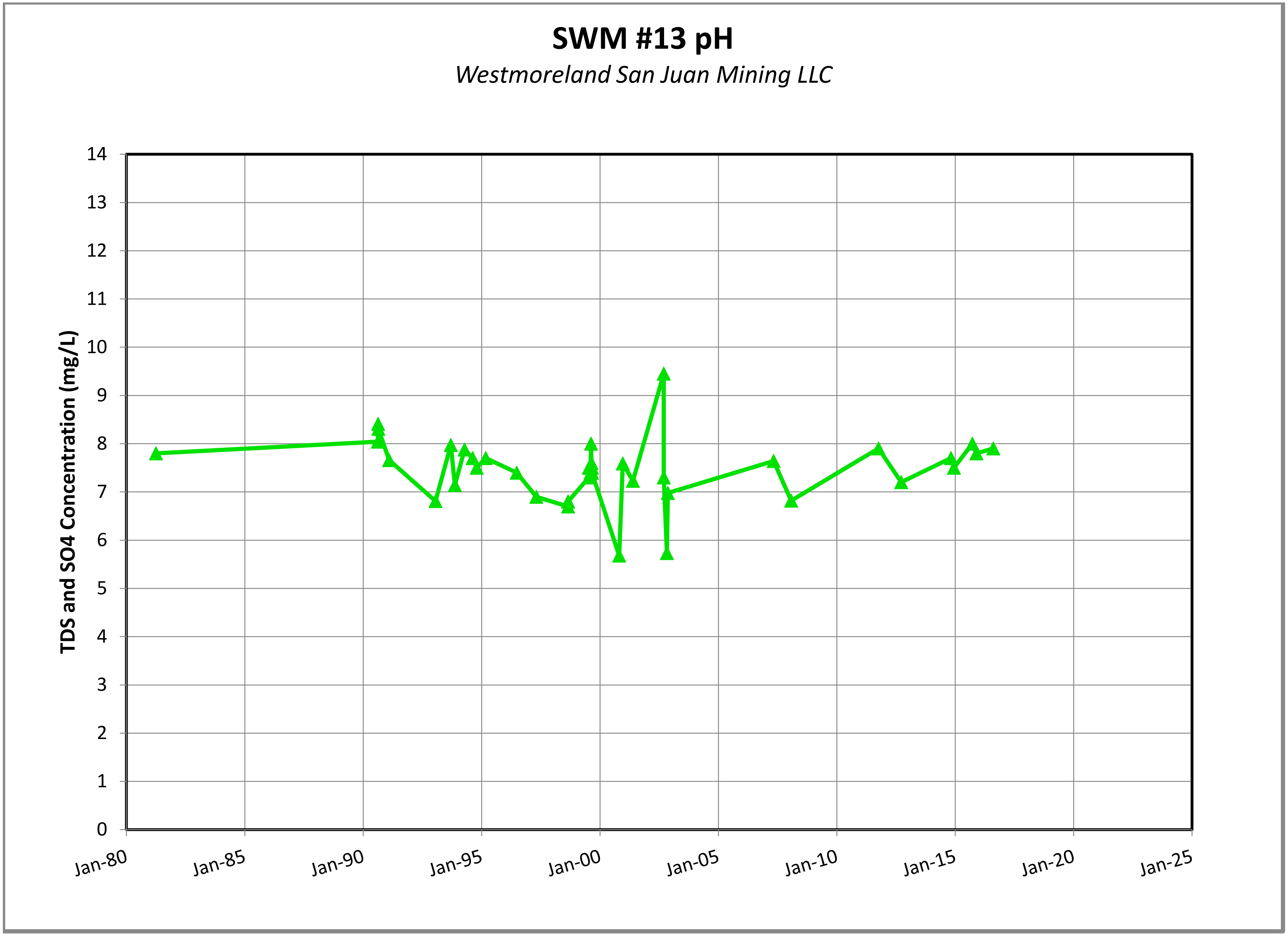
SWM #11 pH
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25

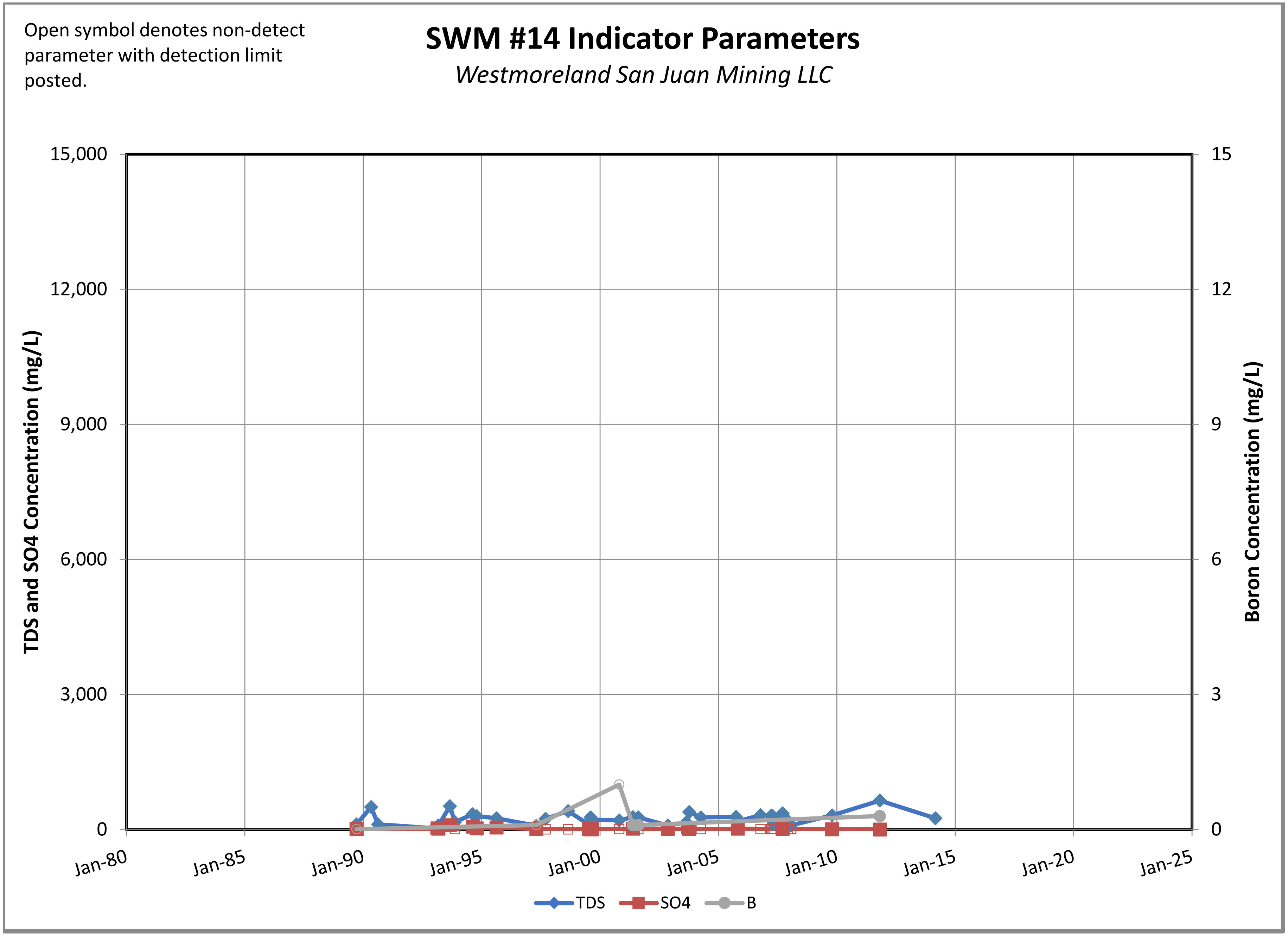

Open symbol denotes non-detect parameter with detection limit posted.
SWM #12 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
15,000
12,000
9,000
6,000
3,000
0
15
12
9
6
3
0
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25
TDS
SO4
B


SWM #12 pH
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25

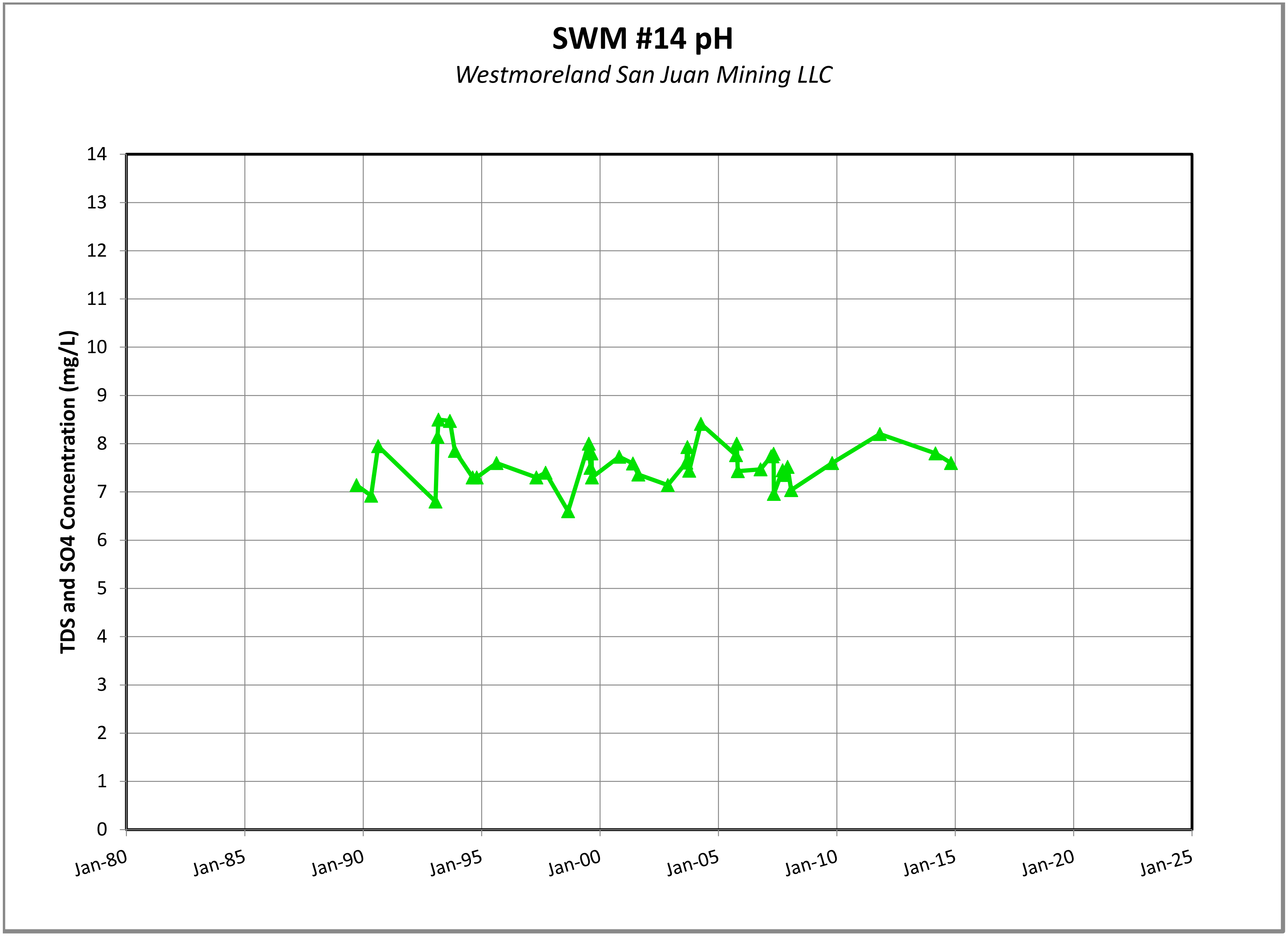
Open symbol denotes non-detect parameter with detection limit posted.




SWM #13 pH
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25



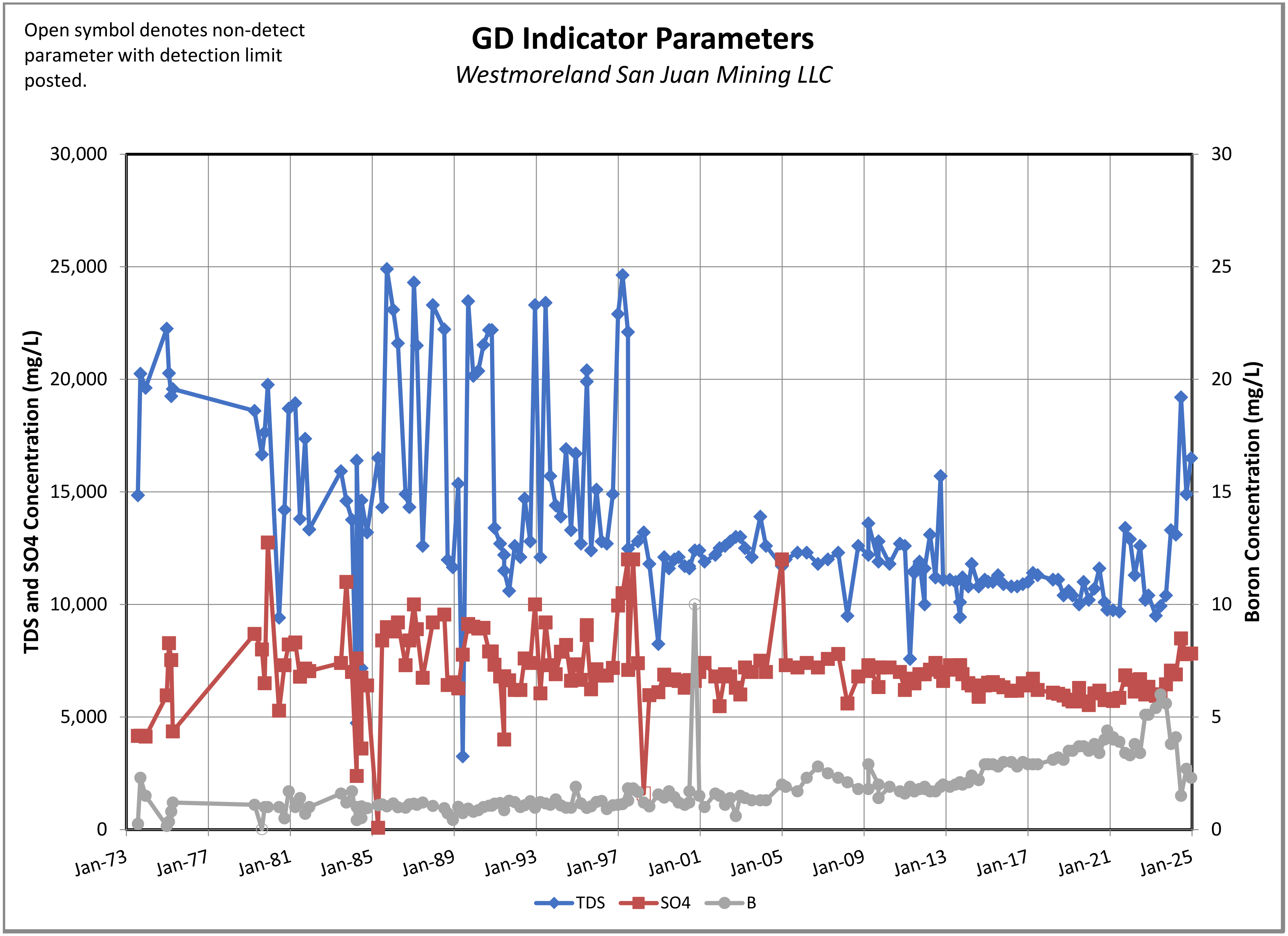
Open symbol denotes non-detect parameter with detection limit posted.
SWM #14 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
15,000
12,000
9,000
6,000
3,000
0
15
12
9
6
3
0
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25
TDS
SO4
B

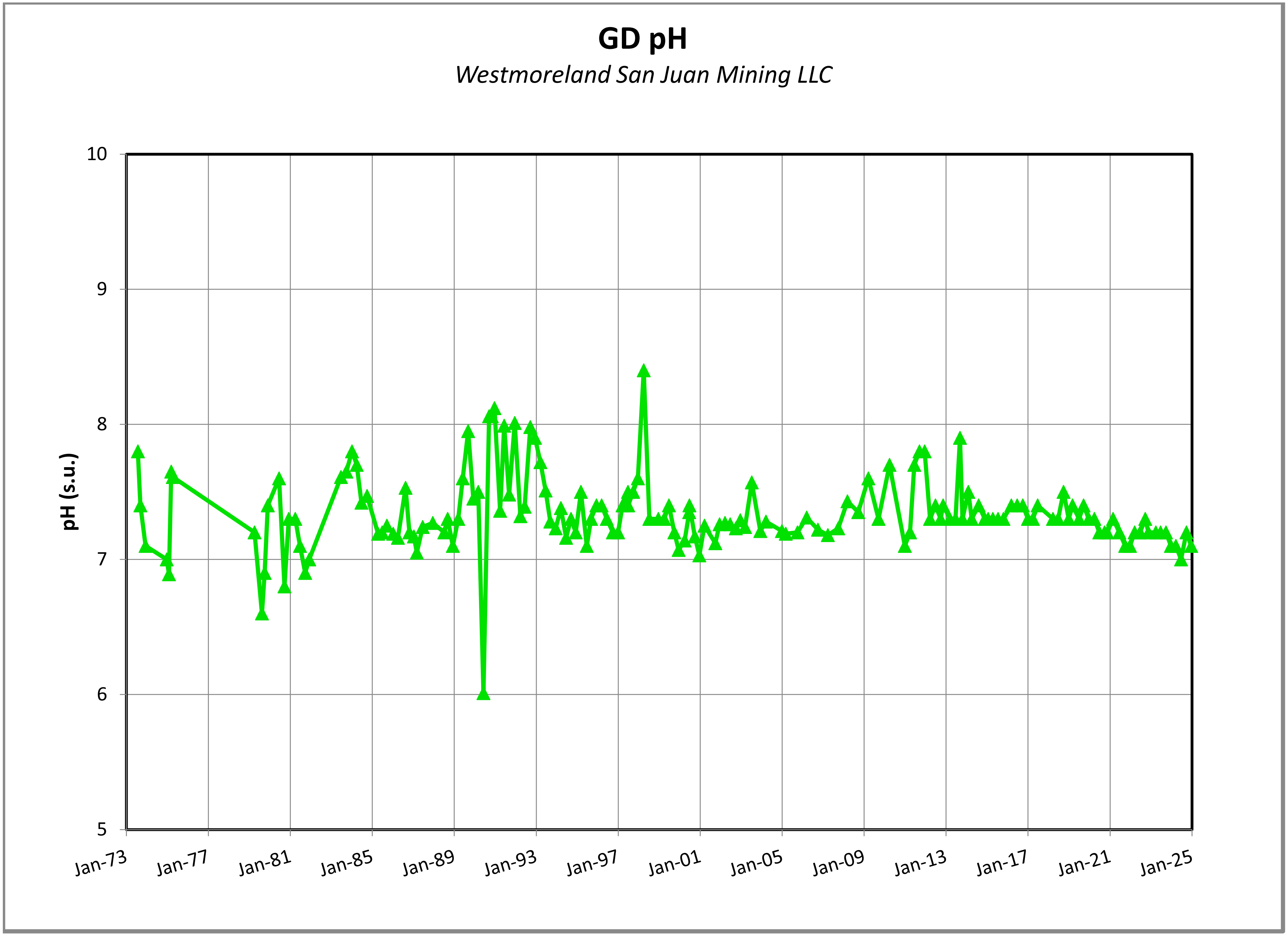


SWM #14 pH
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Jan-80
Jan-85
Jan-90
Jan-95
Jan-00
Jan-05
Jan-10
Jan-15
Jan-20
Jan-25

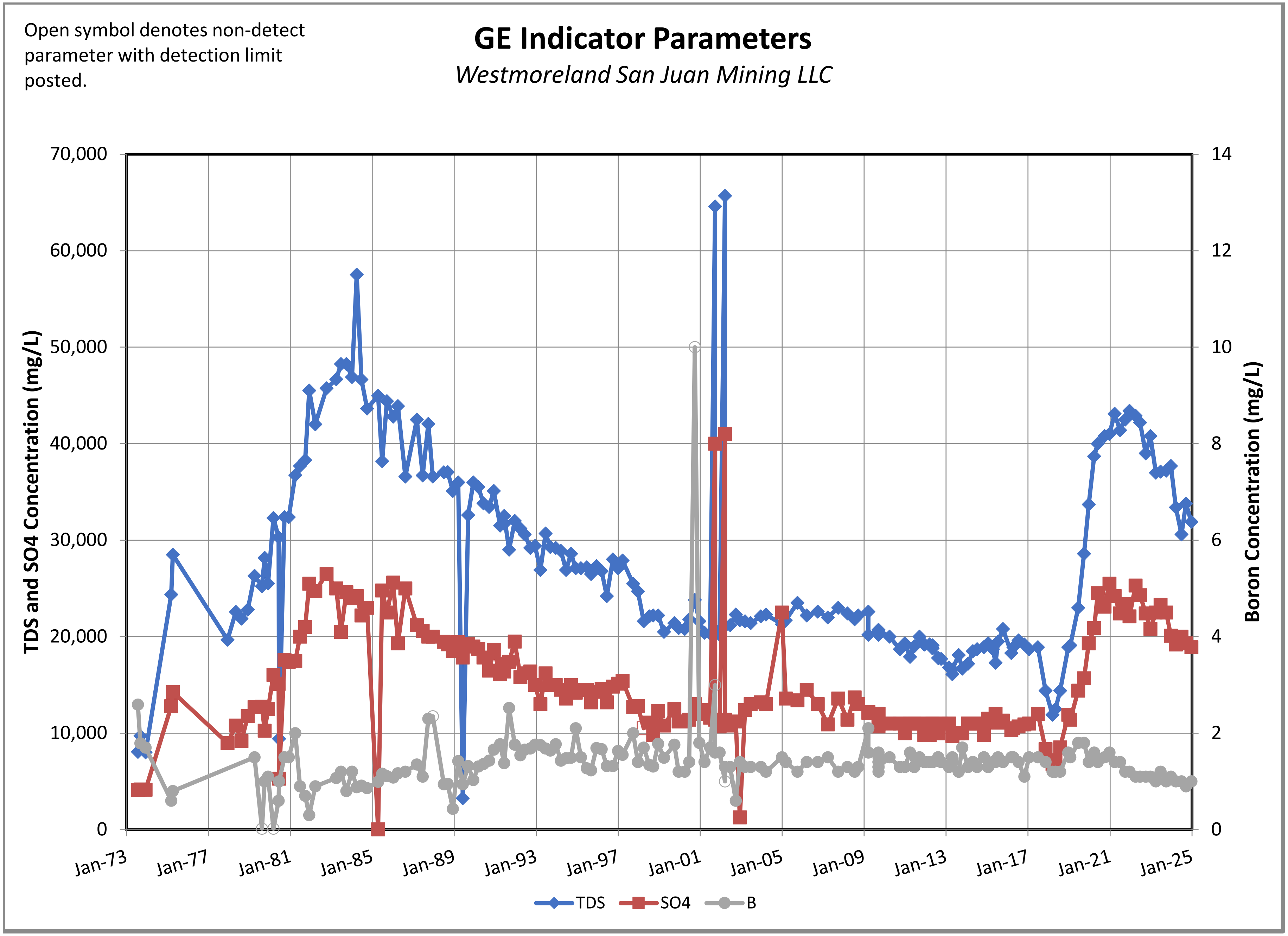
Alluvial Groundwater

DBS&A
a Geo-Logic Company

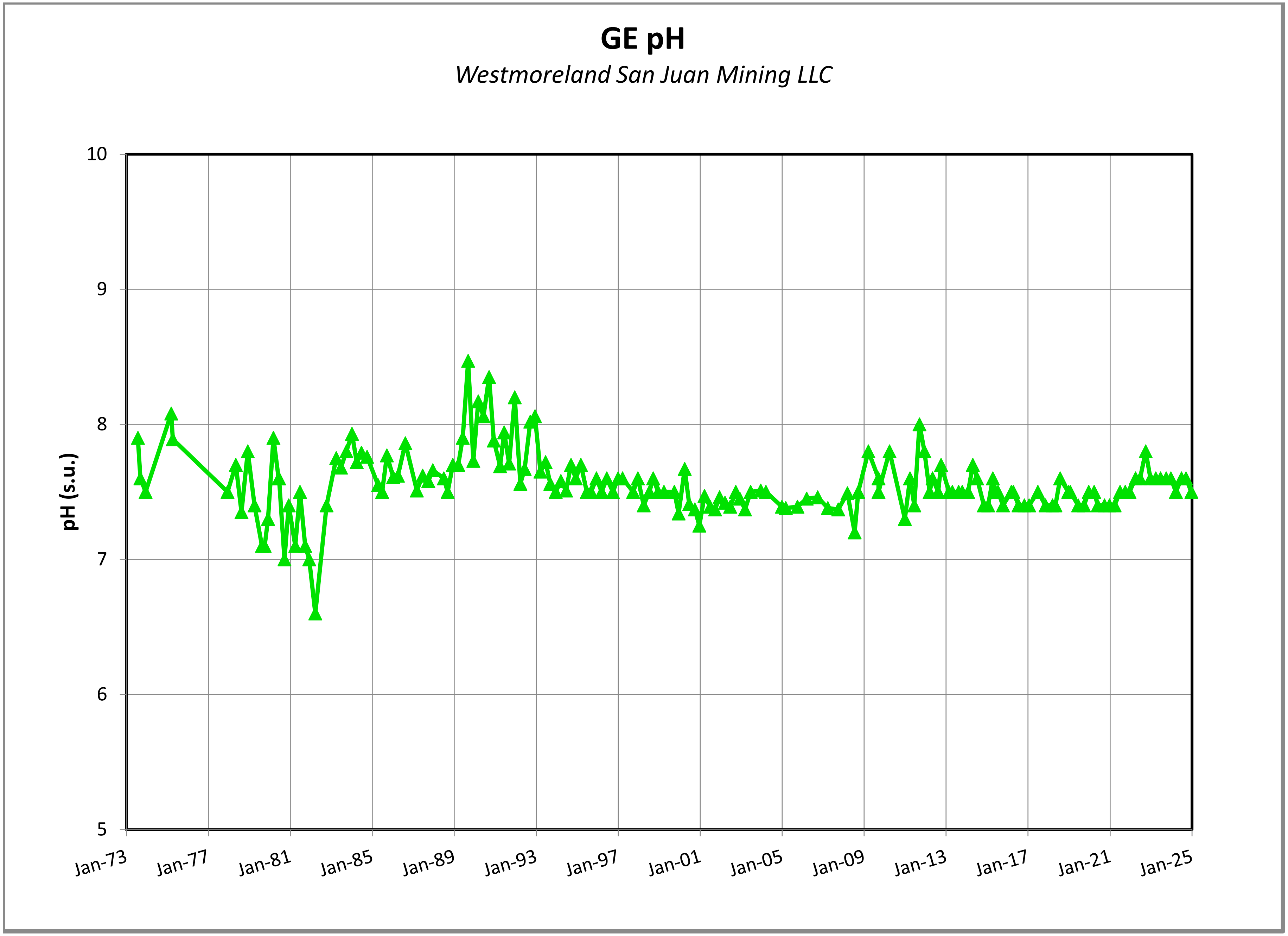

Open symbol denotes non-detect parameter with detection limit posted.
GD Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
30,000
25,000
20,000
15,000
10,000
5,000
0
30
25
20
15
10
5
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B

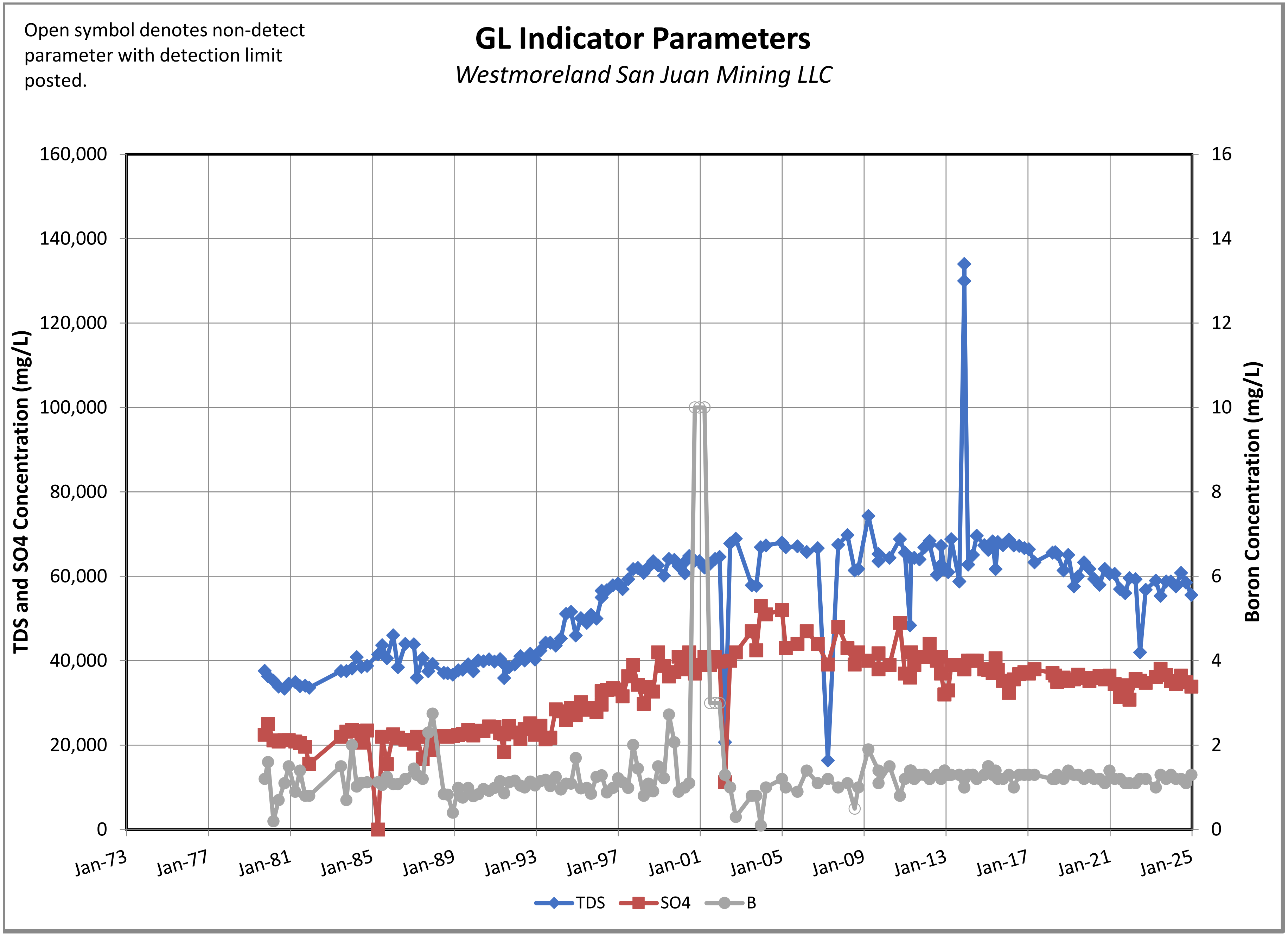


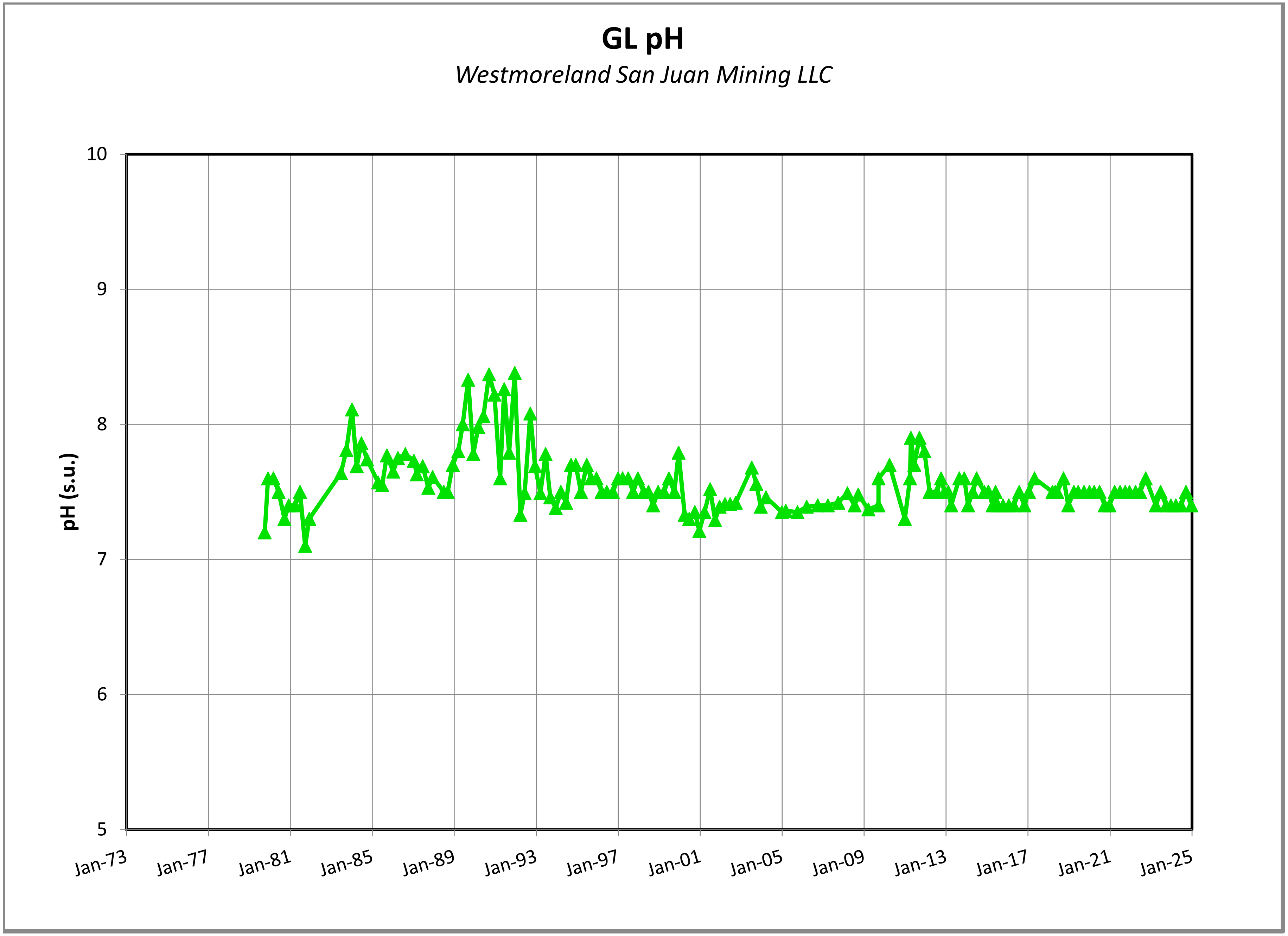
GD pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25



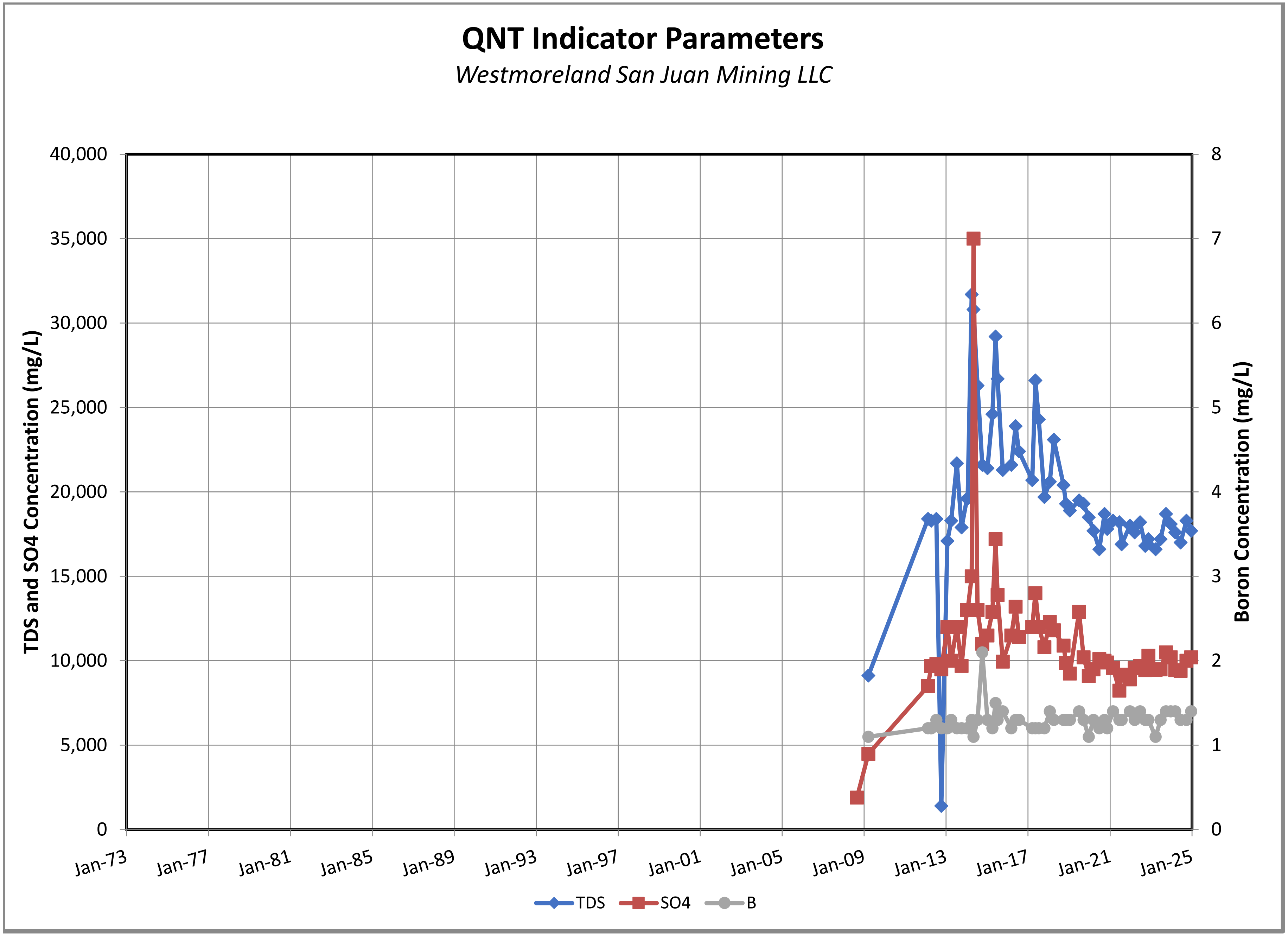
Open symbol denotes non-detect parameter with detection limit posted.
GE Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
14
12
10
8
6
4
2
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B

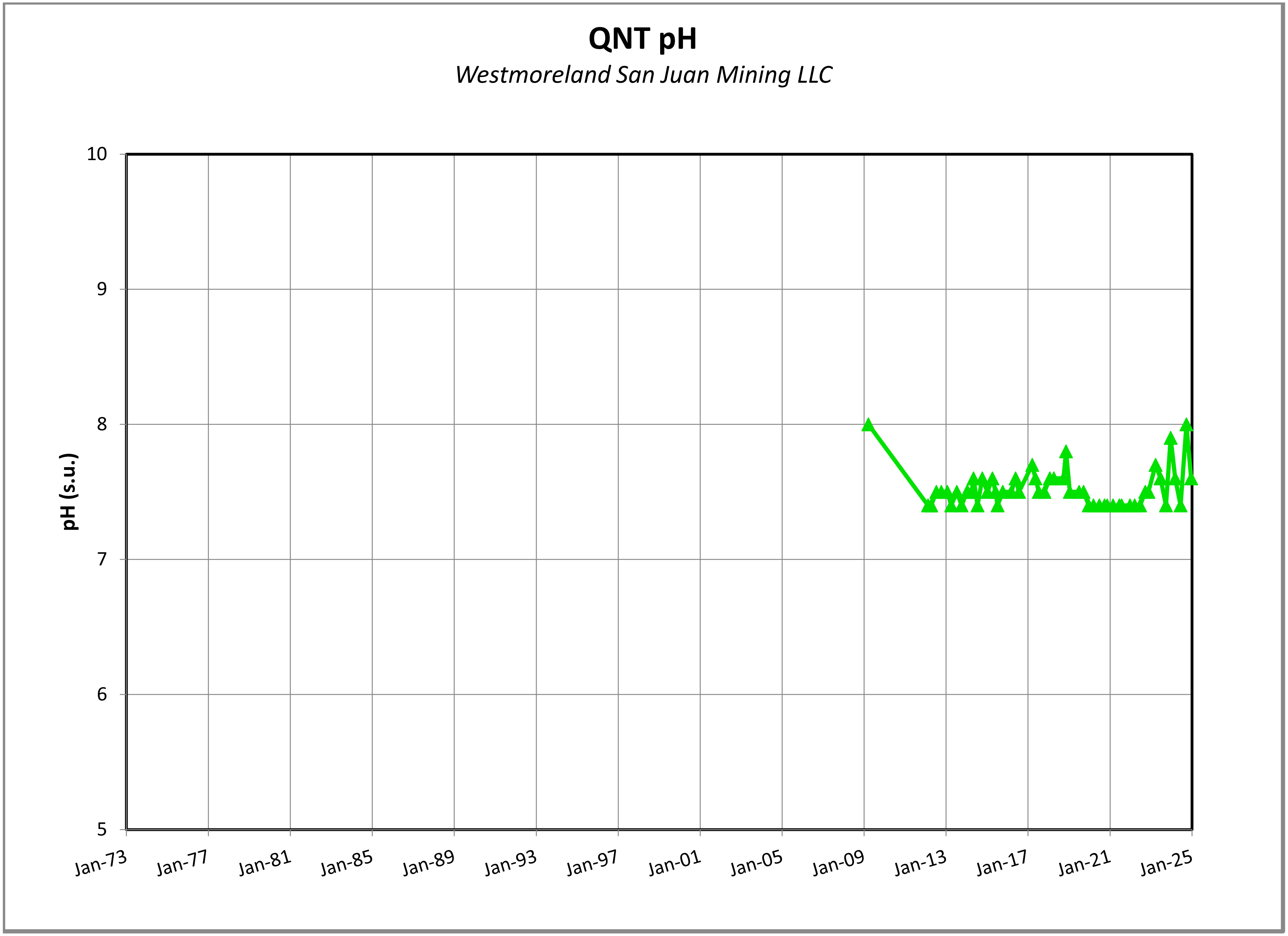

GE pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25

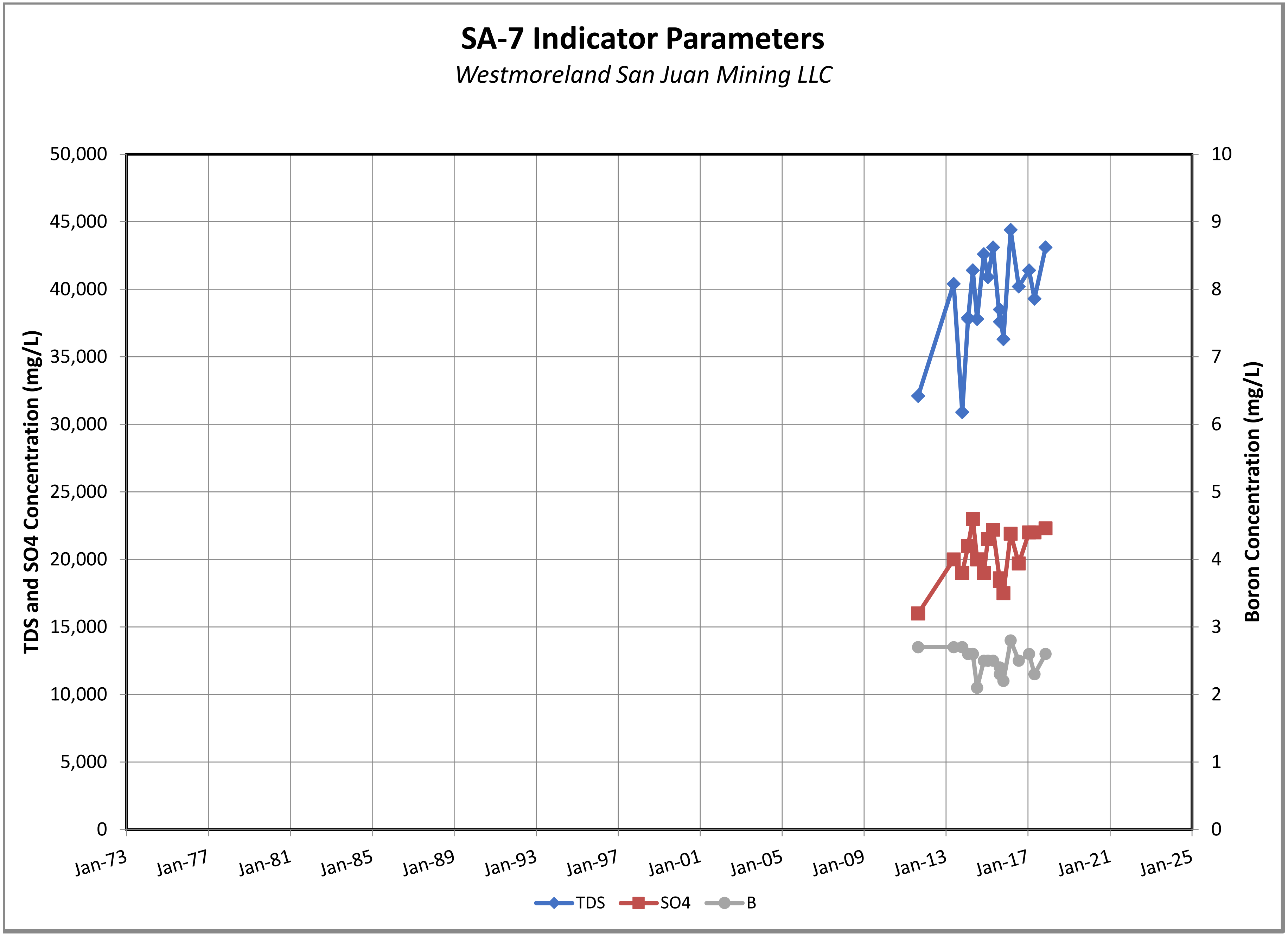

Open symbol denotes non-detect parameter with detection limit posted.
GL Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
16
14
12
10
8
6
4
2
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B



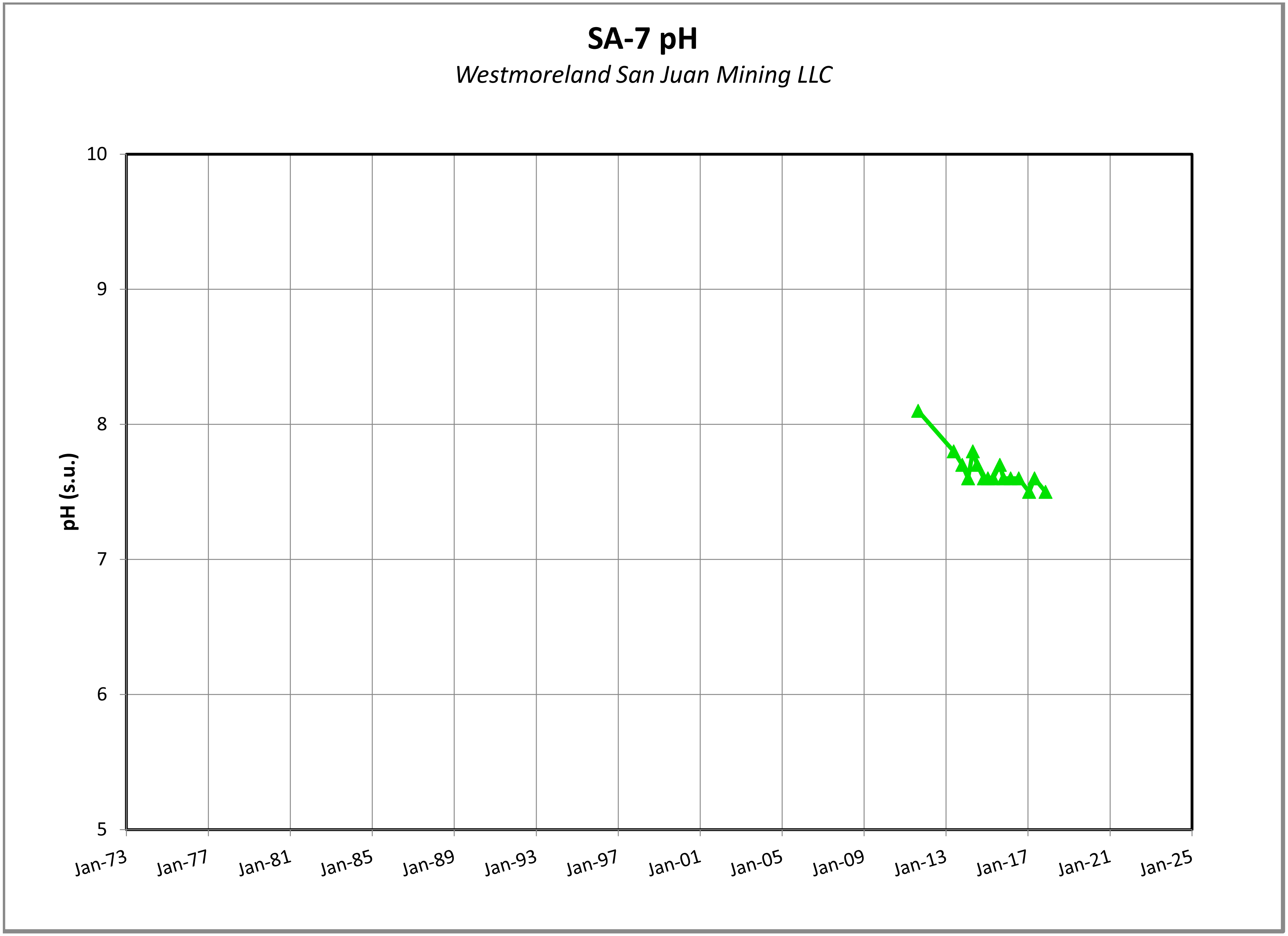
GL pH
Westmoreland San Juan Mining LLC
10
9
8
7
6
5
pH (s.u.)
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25

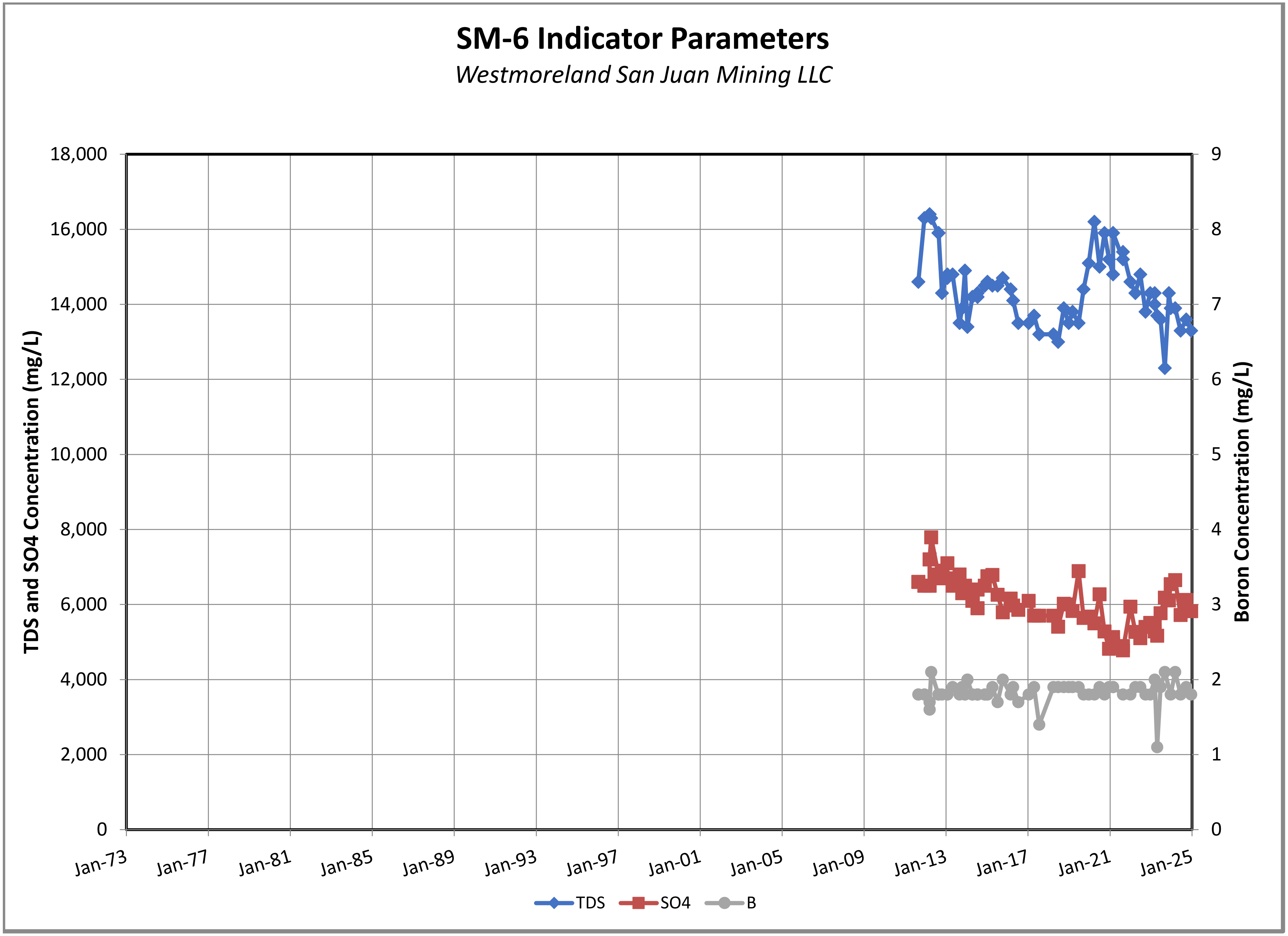

QNT Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
8
7
6
5
4
3
2
1
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B

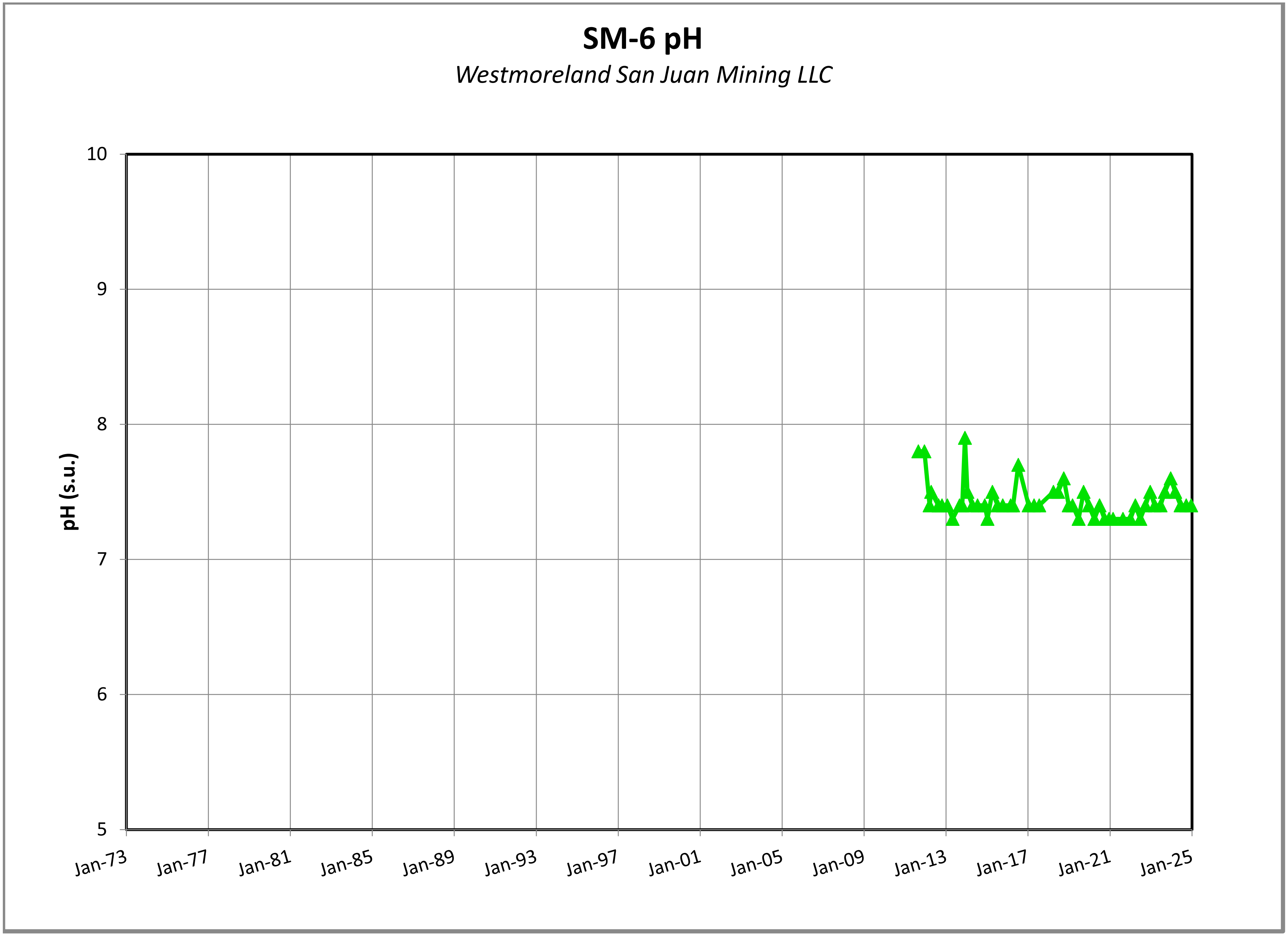

QNT pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25



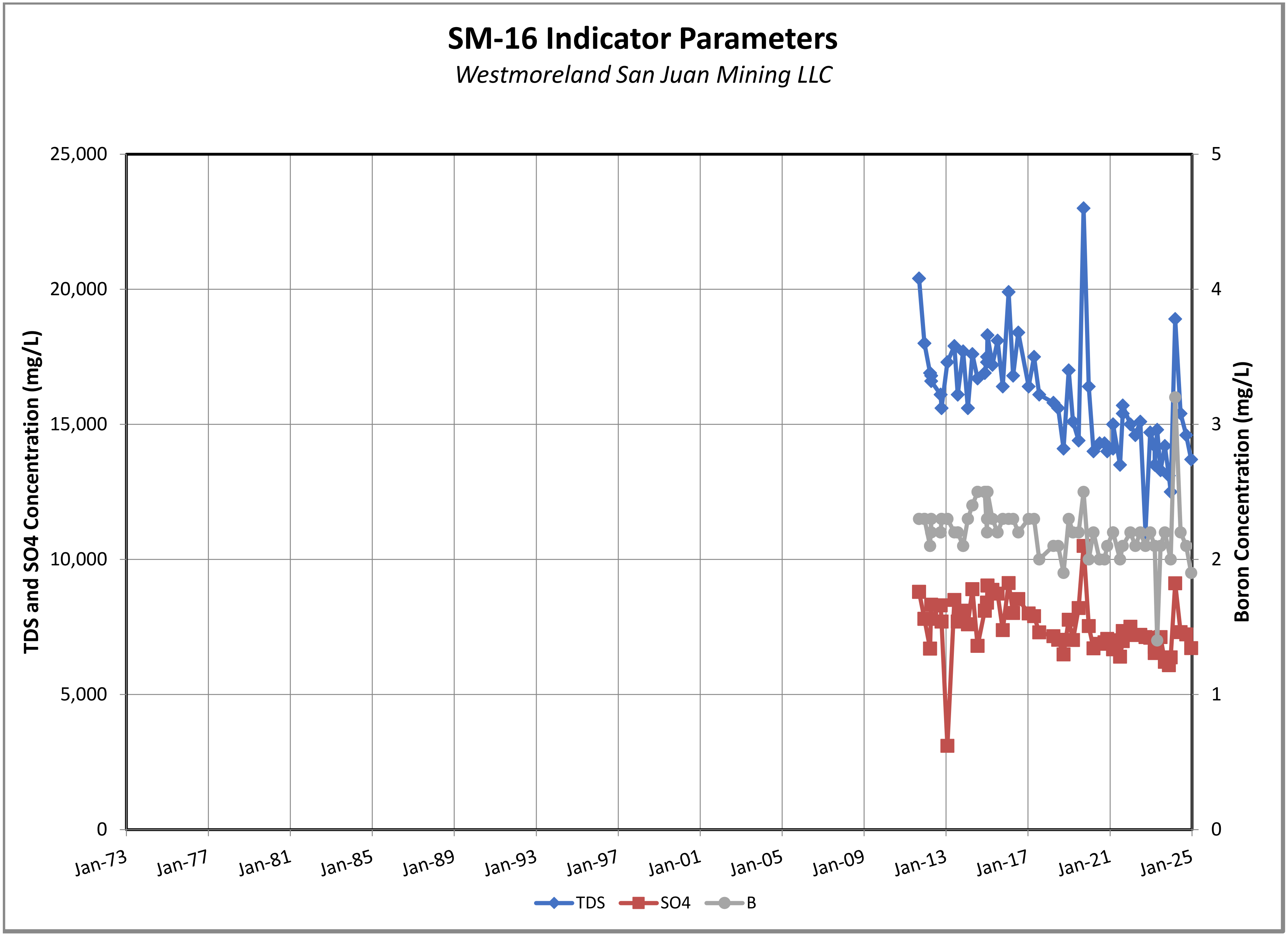
SA-7 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
10
9
8
7
6
5
4
3
2
1
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B

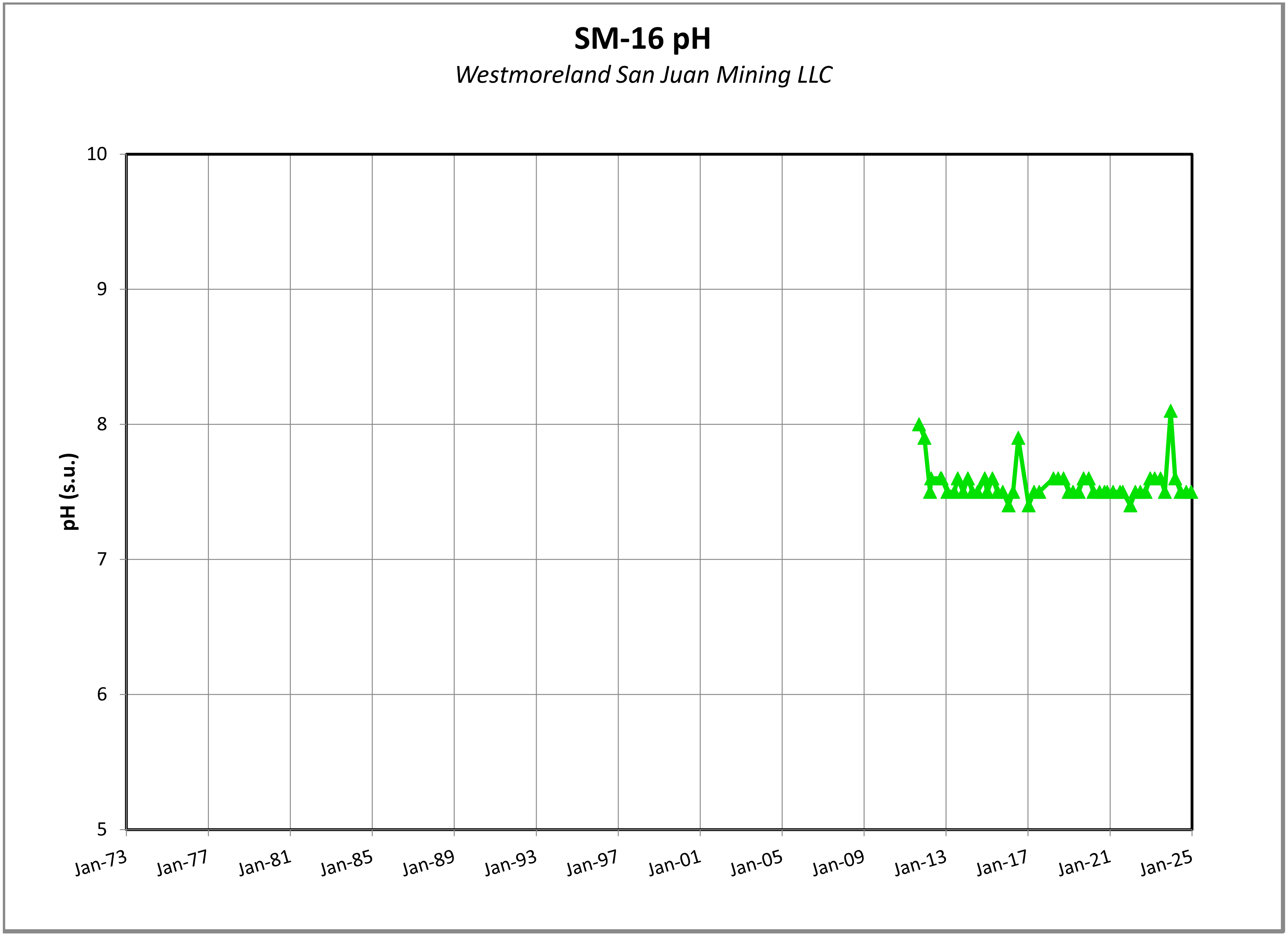

SA-7 pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25


SM-6 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
9
8
7
6
5
4
3
2
1
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B



SM-6 pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25

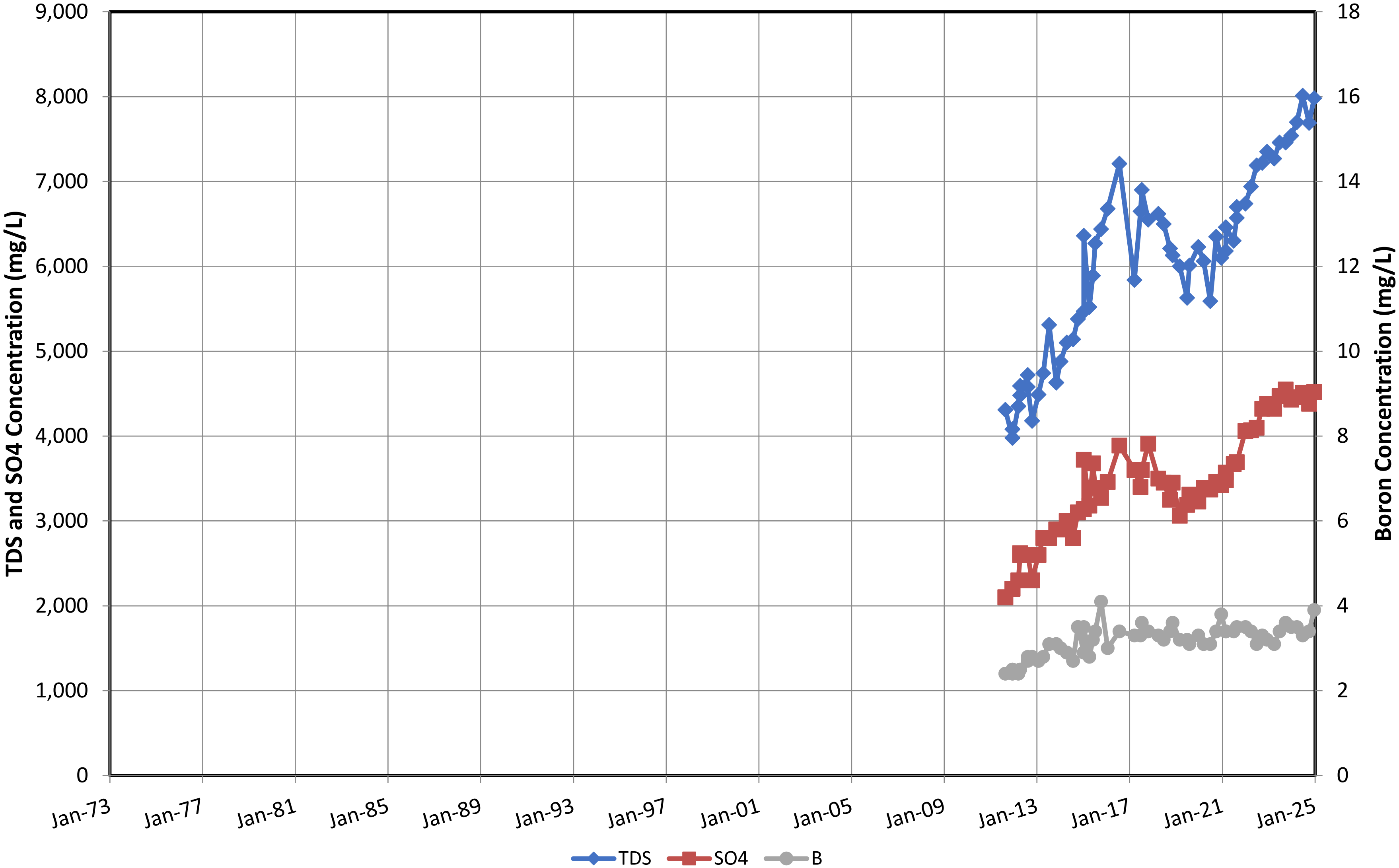

SM-16 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
25,000
20,000
15,000
10,000
5,000
0
5
4
3
2
1
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B

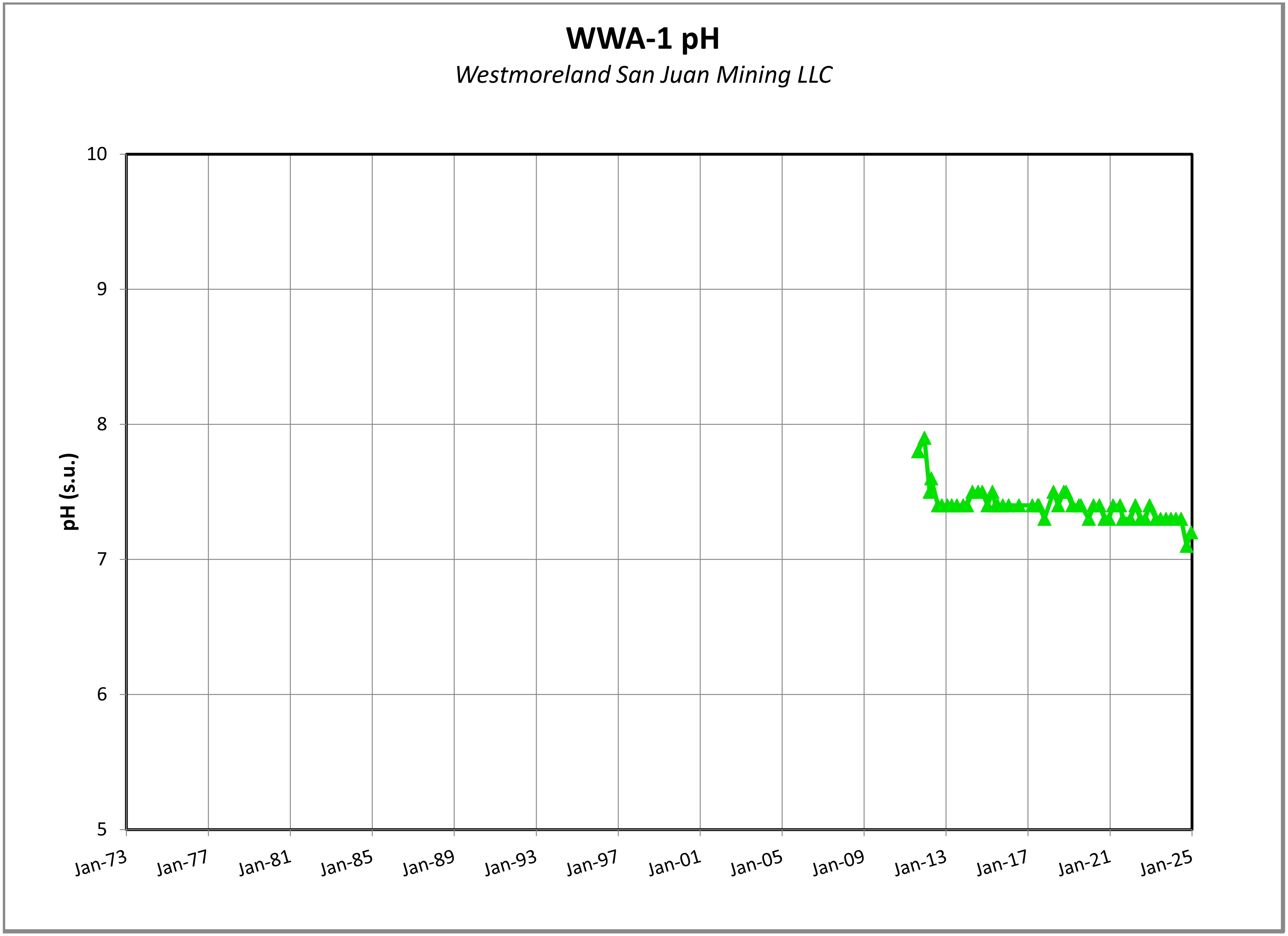


SM-16 pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25

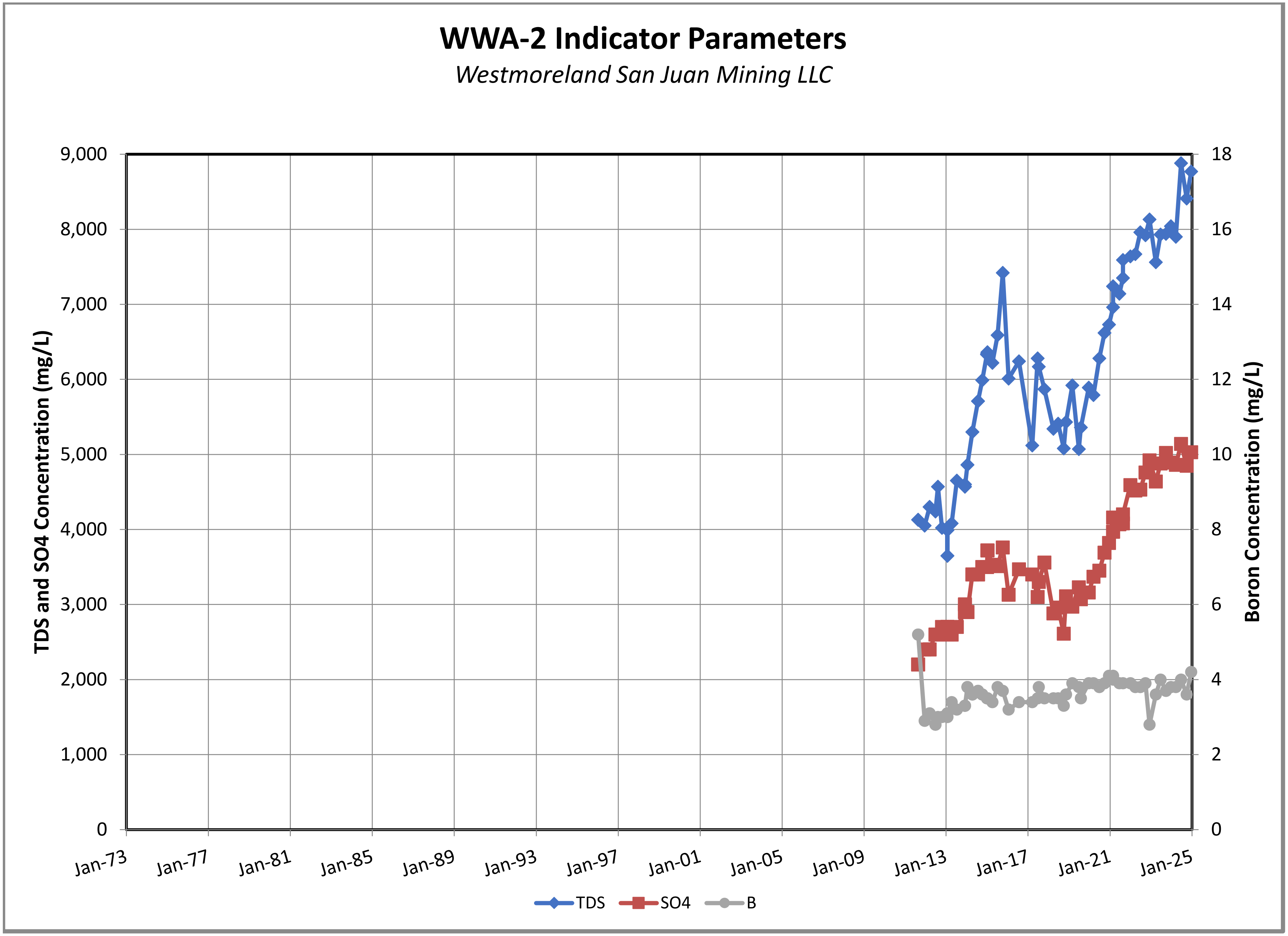
WWA-1 Indicator Parameters

Westmoreland San Juan Mining LLC

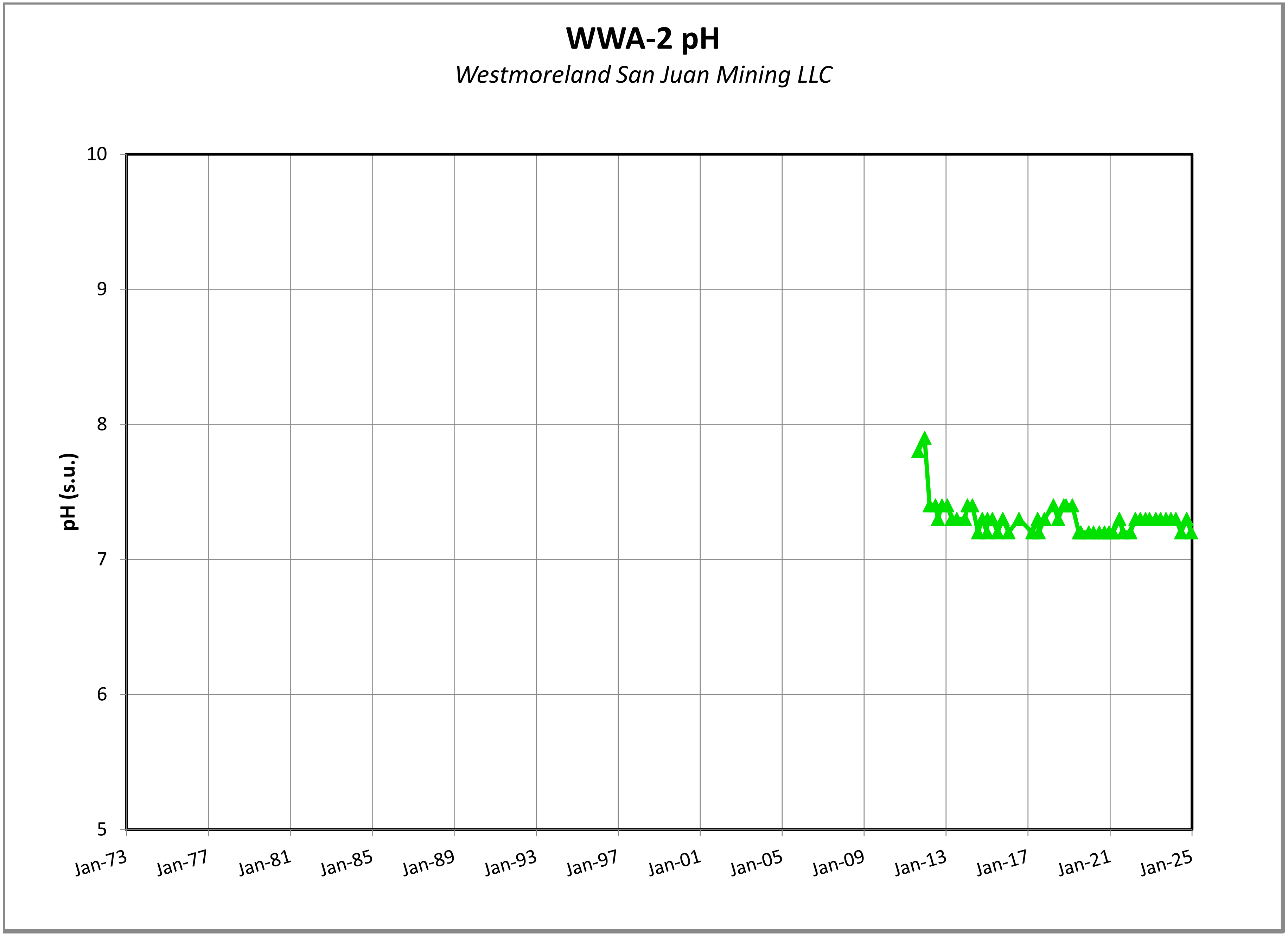




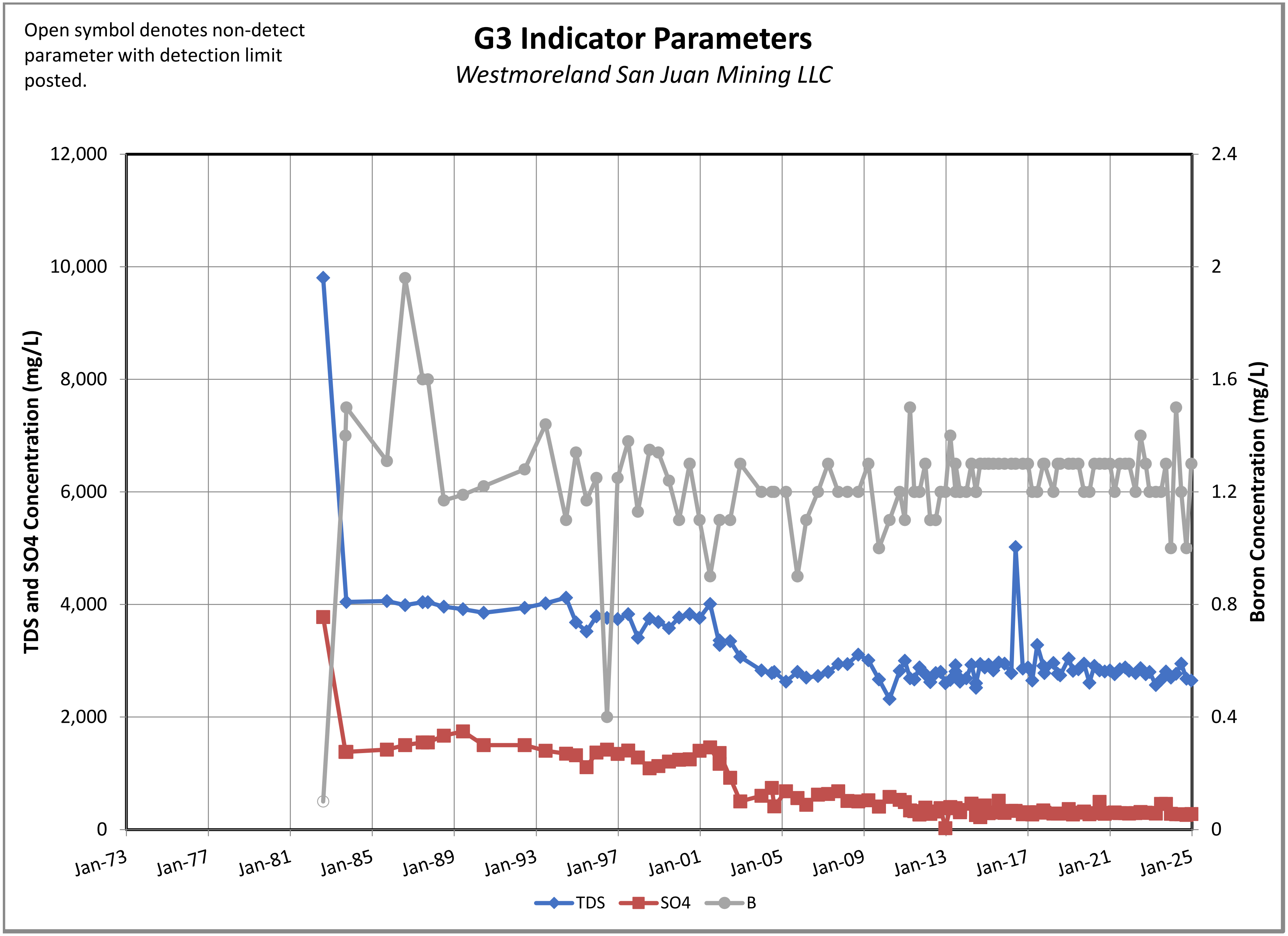
WWA-1 pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25

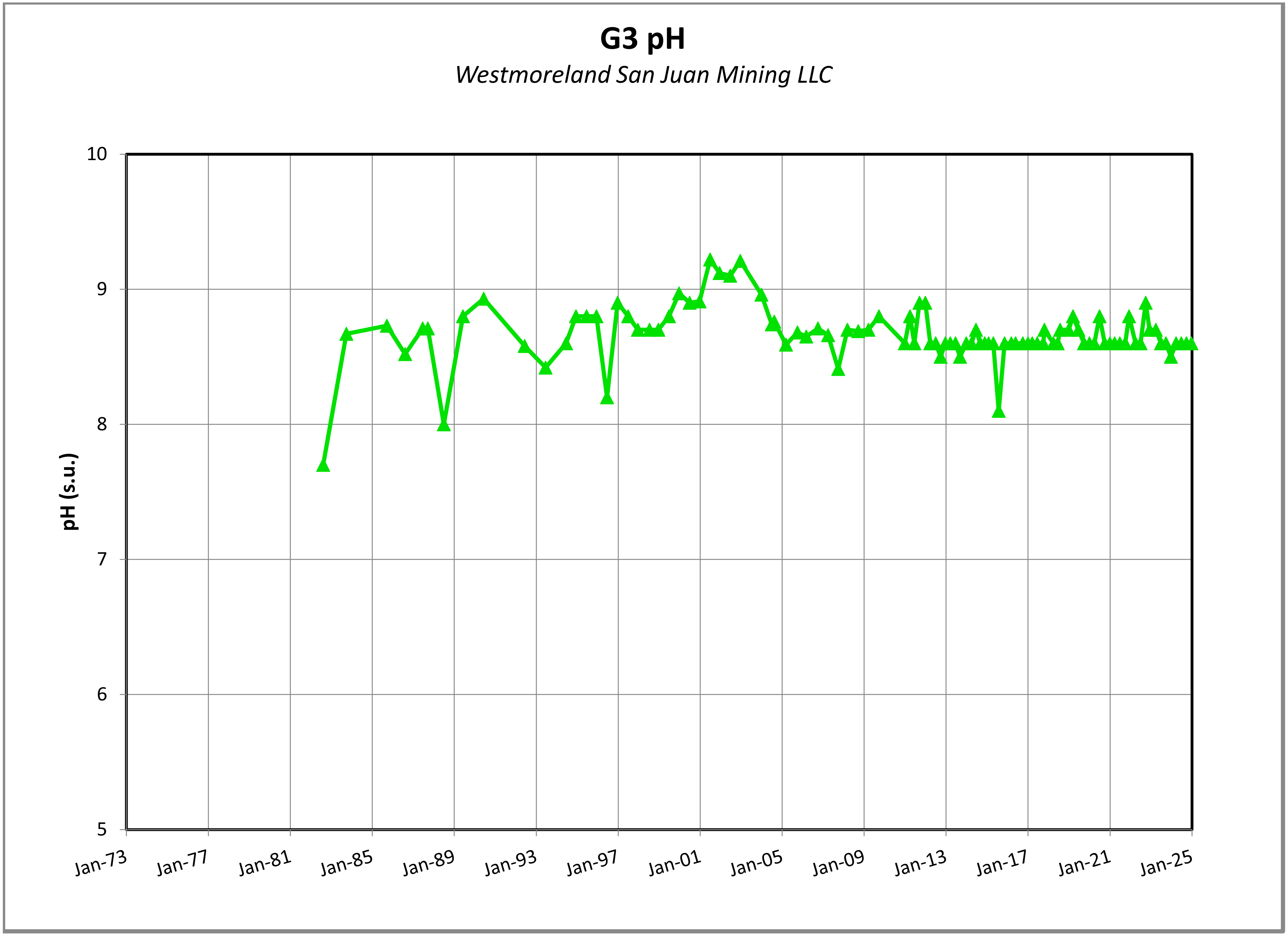


WWA-2 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
18
16
14
12
10
8
6
4
2
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B


WWA-2 pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25

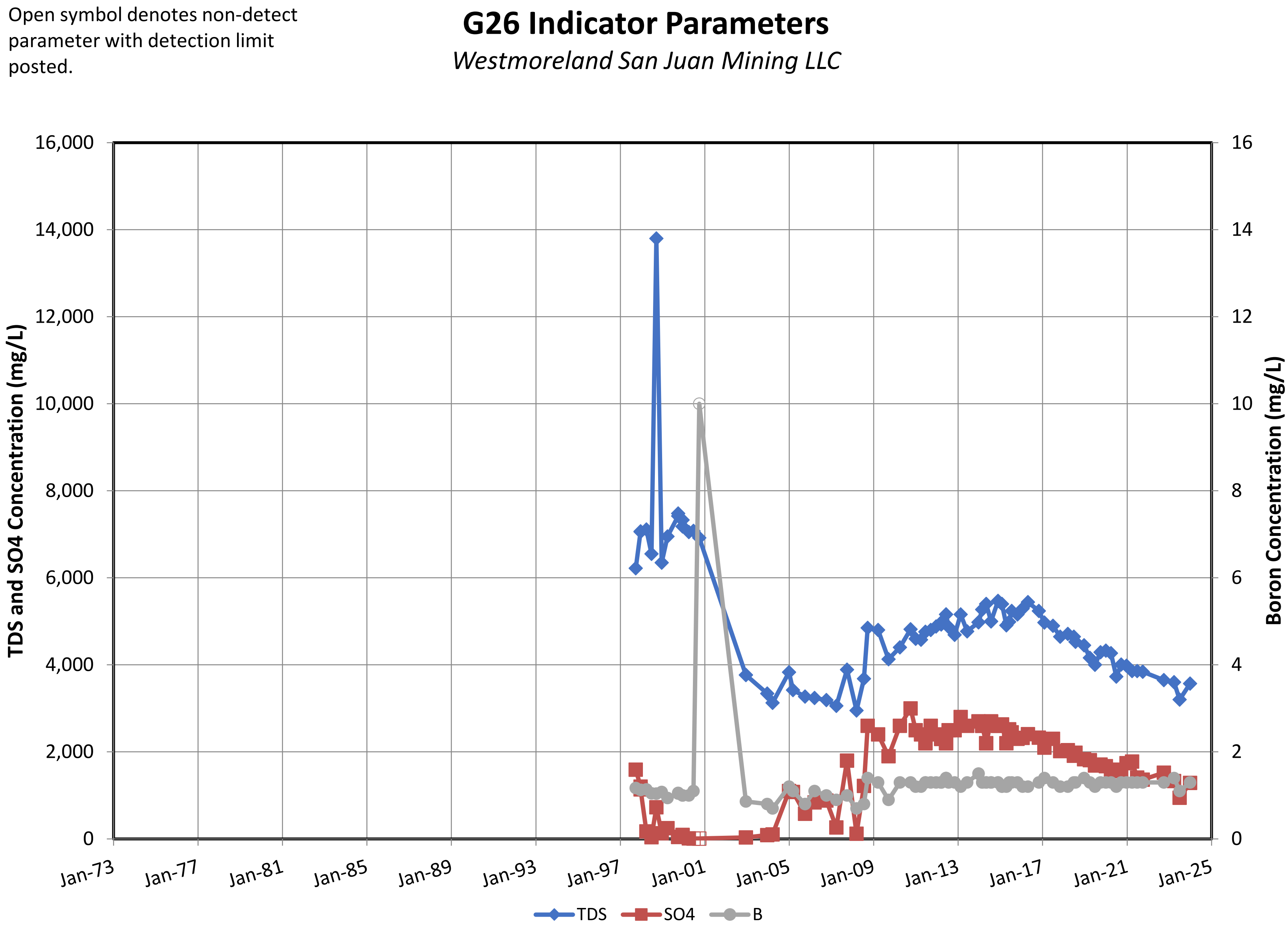
Fruitland Formation

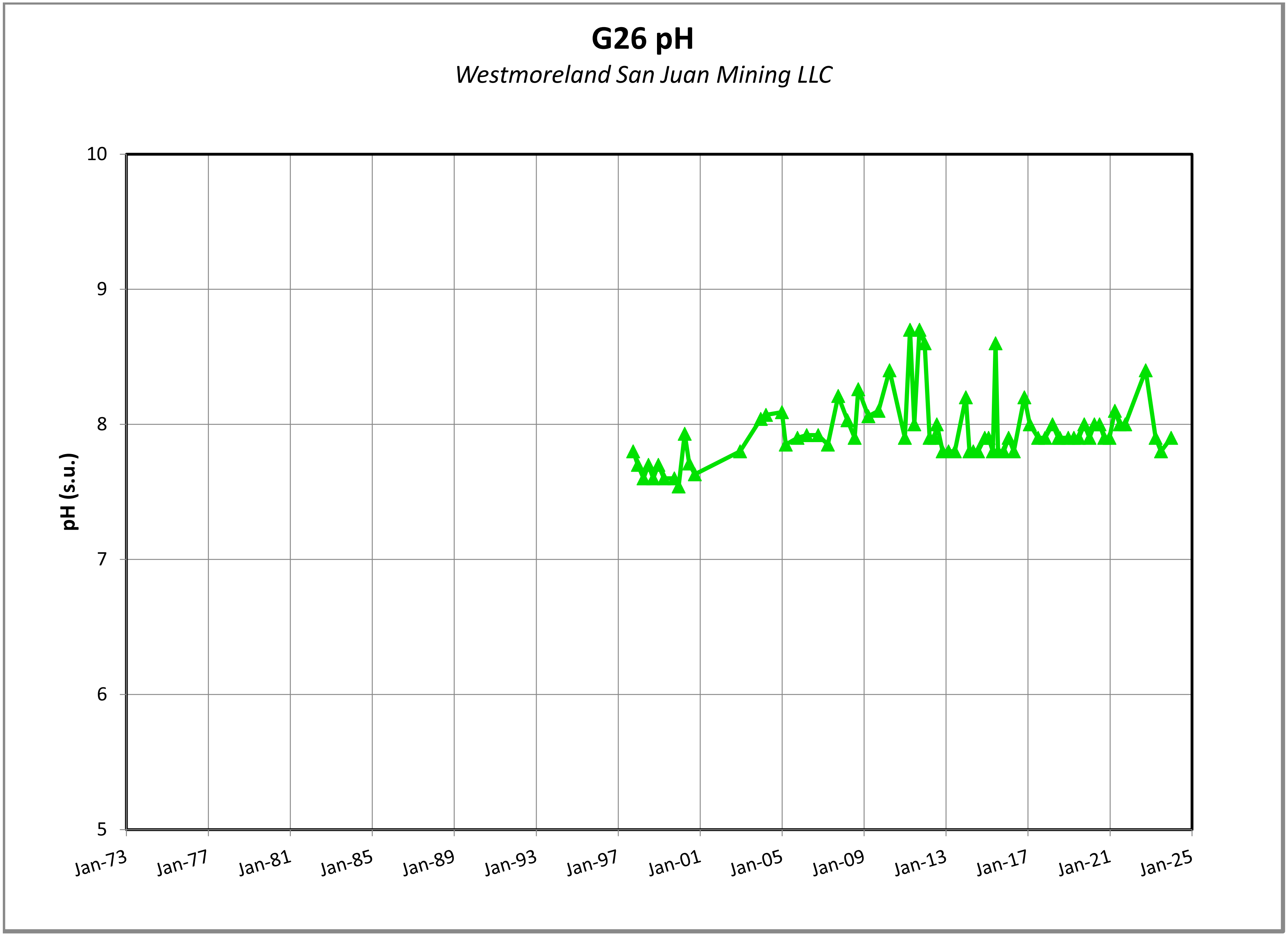

Open symbol denotes non-detect parameter with detection limit posted.
G3 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
12,000
10,000
8,000
6,000
4,000
2,000
0
2.4
2
1.6
1.2
0.8
0.4
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B



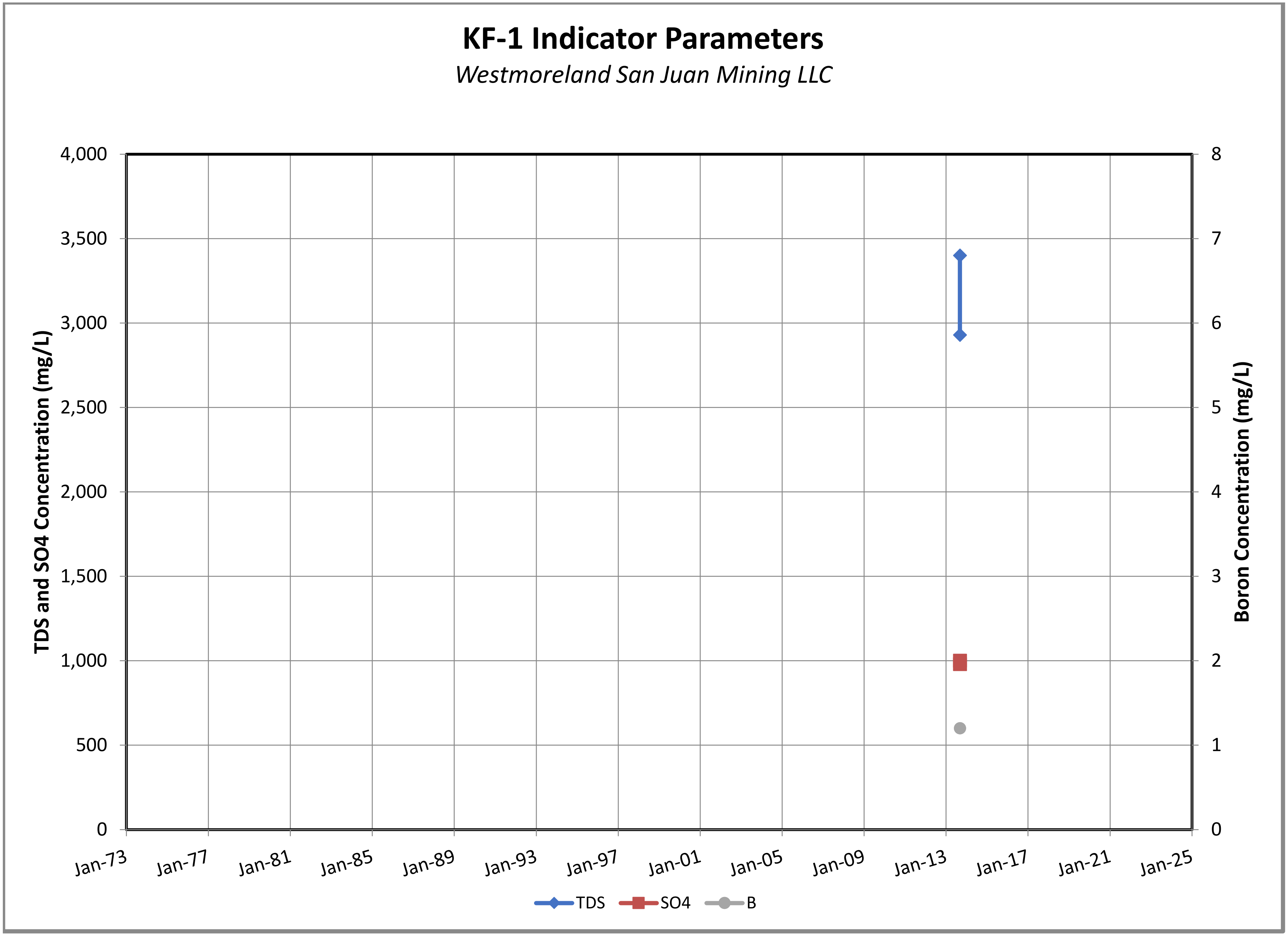
G3 pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25

Open symbol denotes non-detect parameter with detection limit posted.

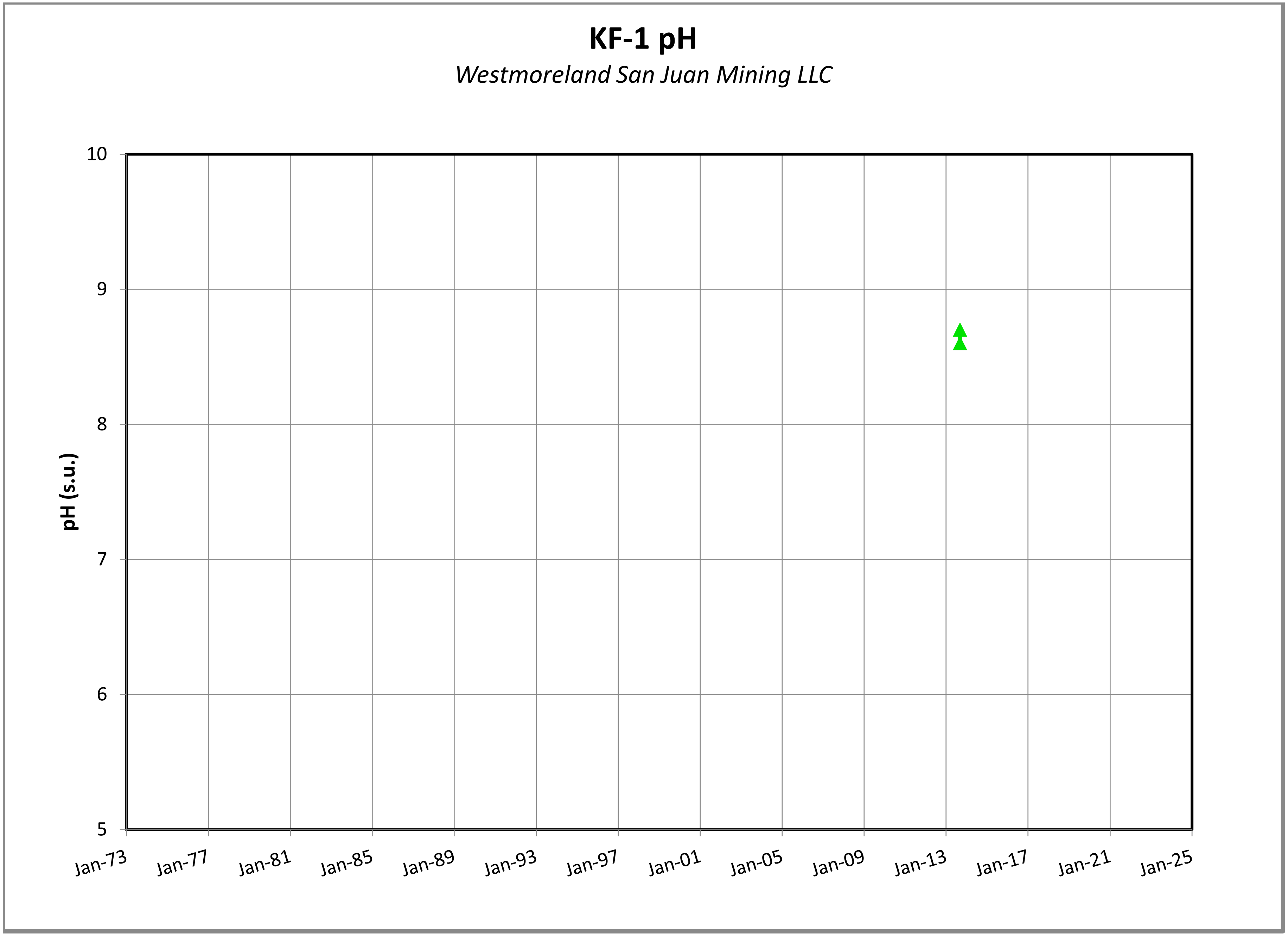




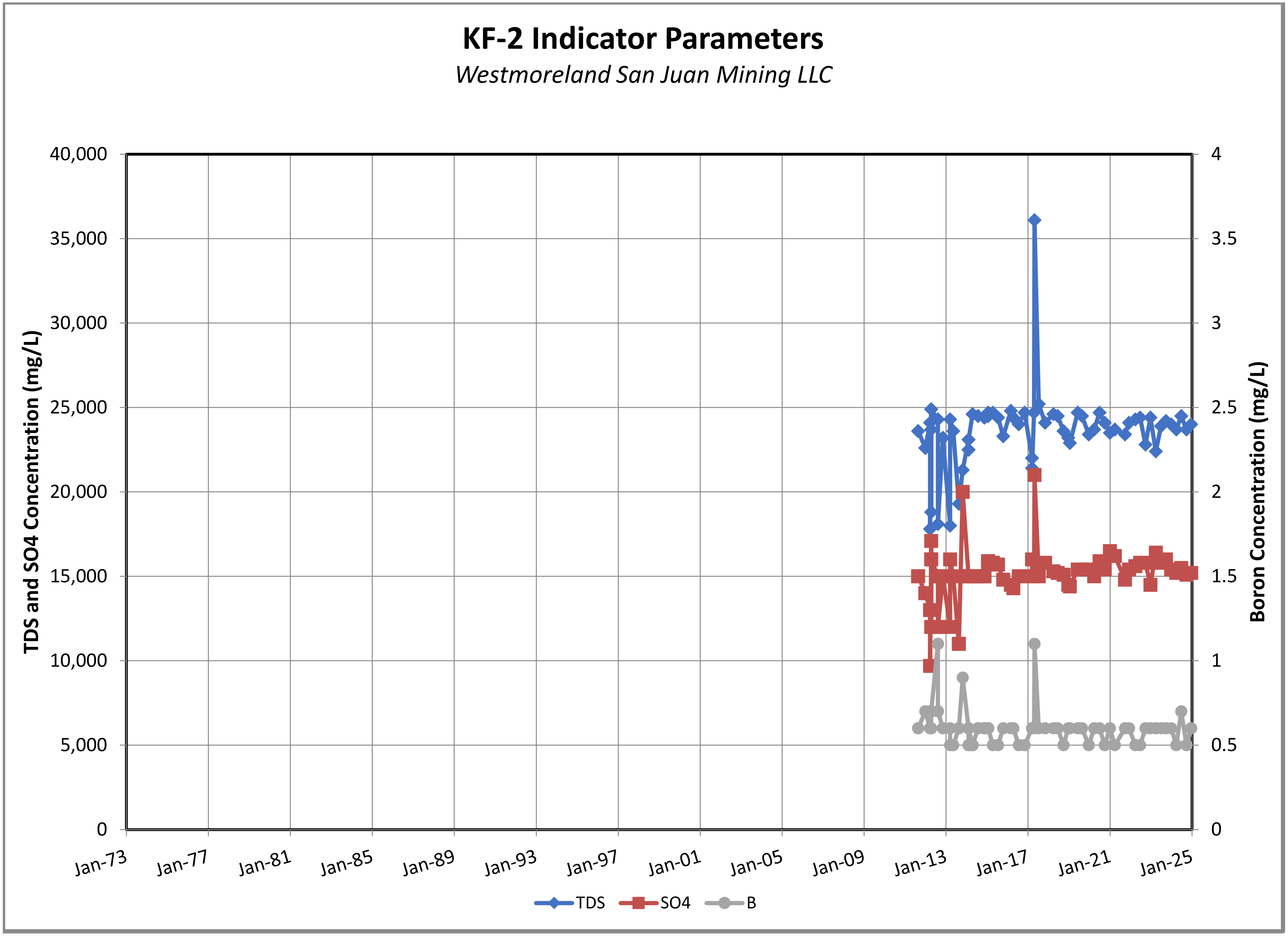
G26 pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25



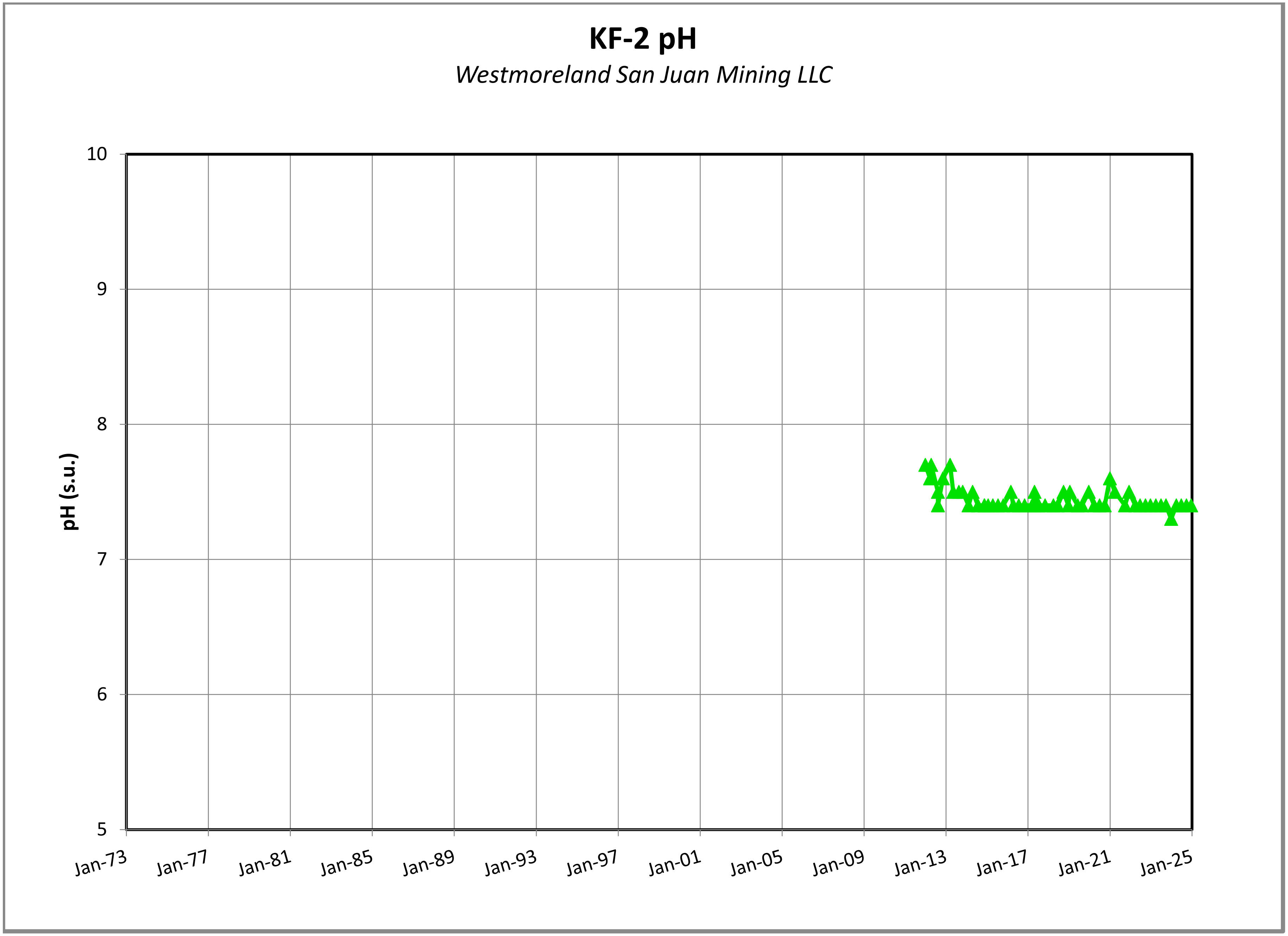
KF-1 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
8
7
6
5
4
3
2
1
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B

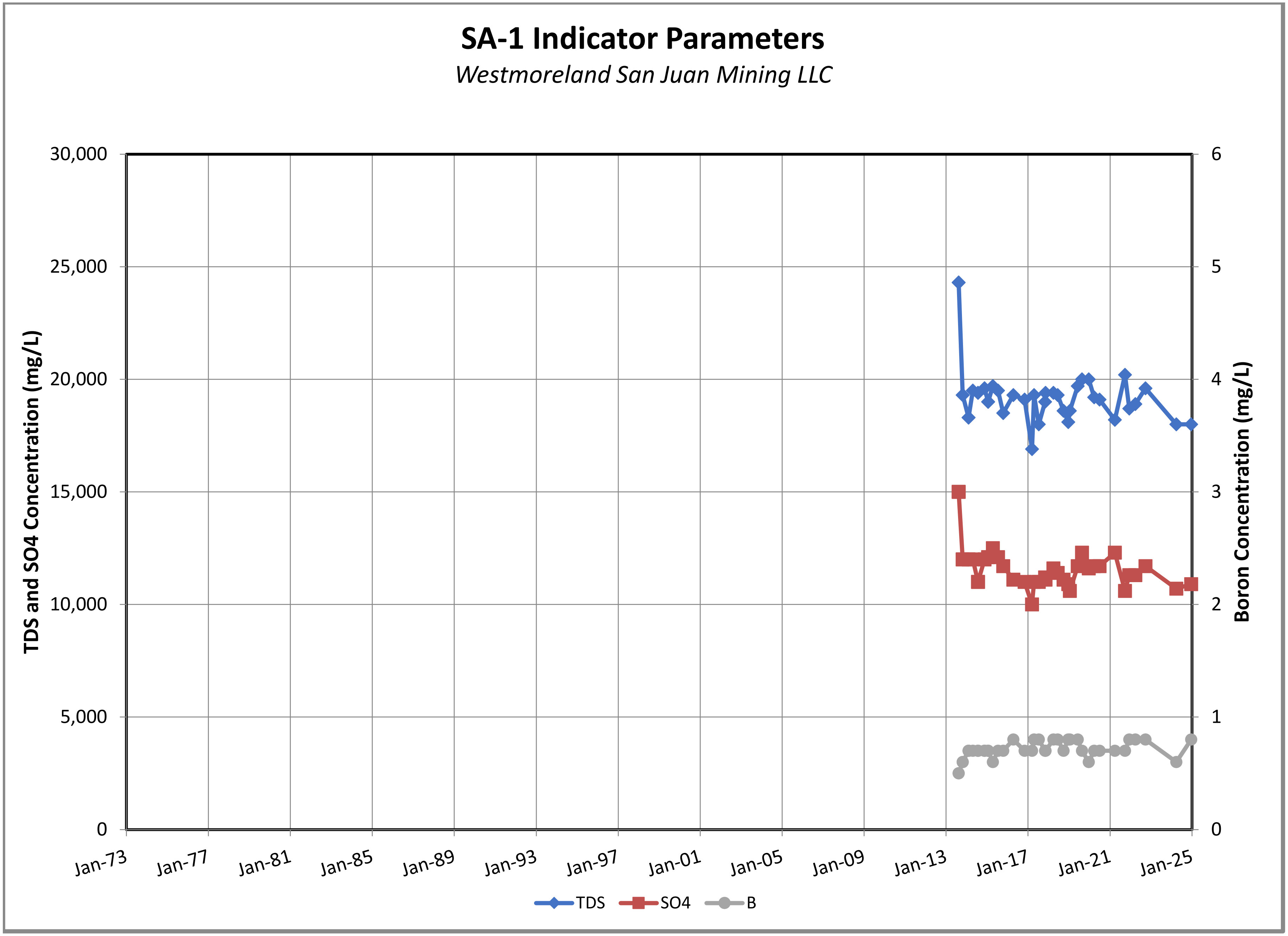


KF-1 pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25

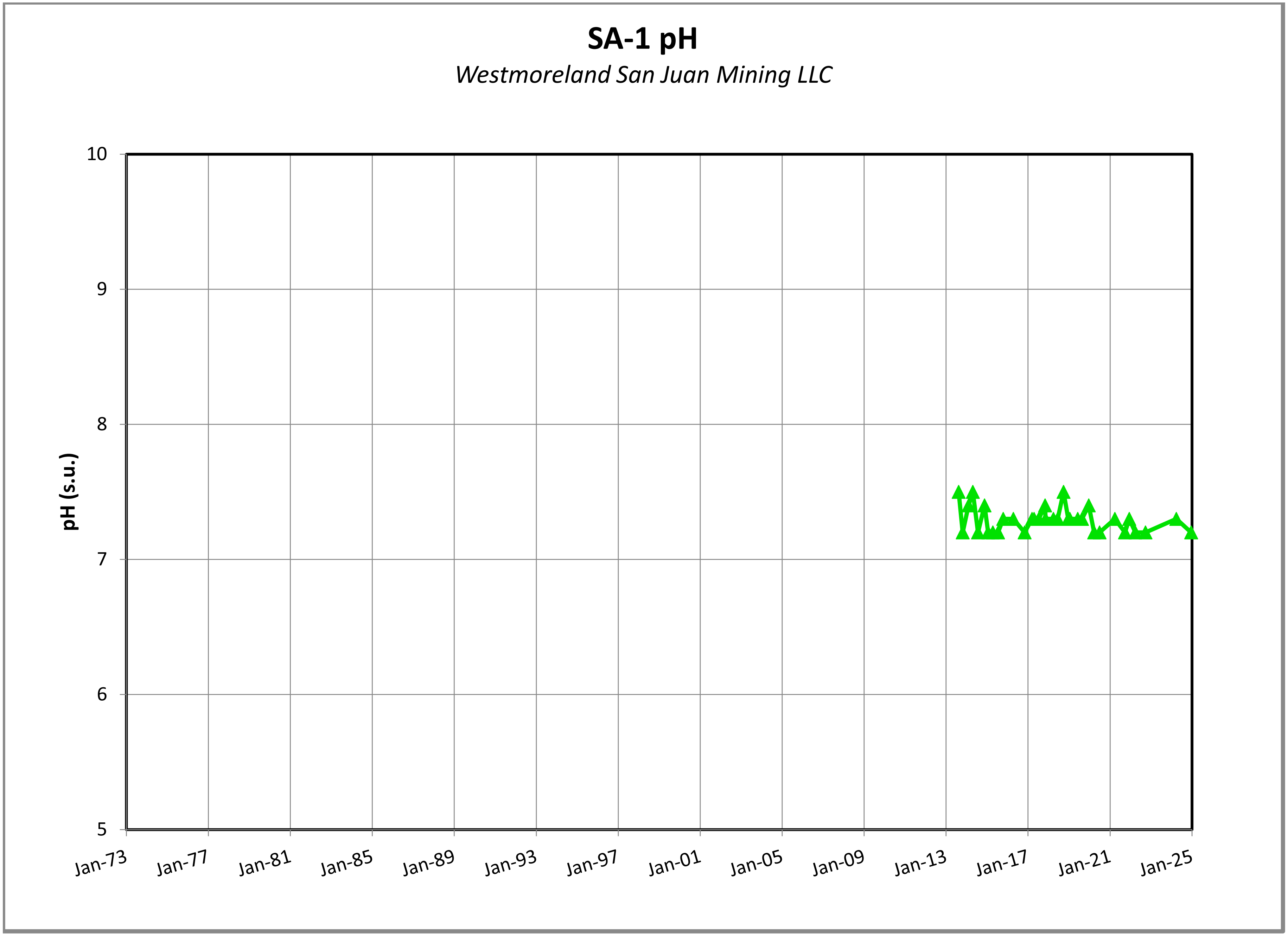


KF-2 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B

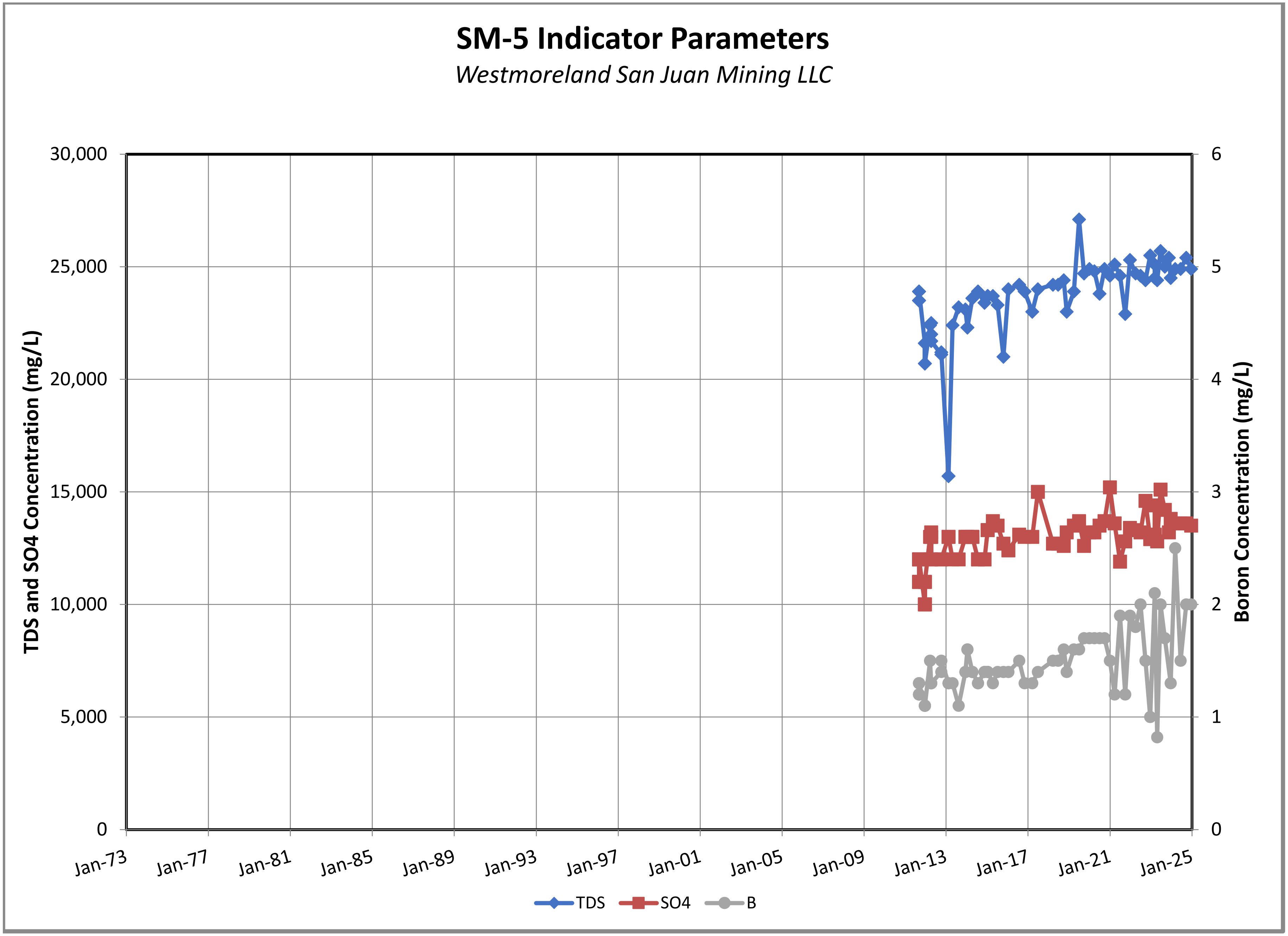

KF-2 pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25

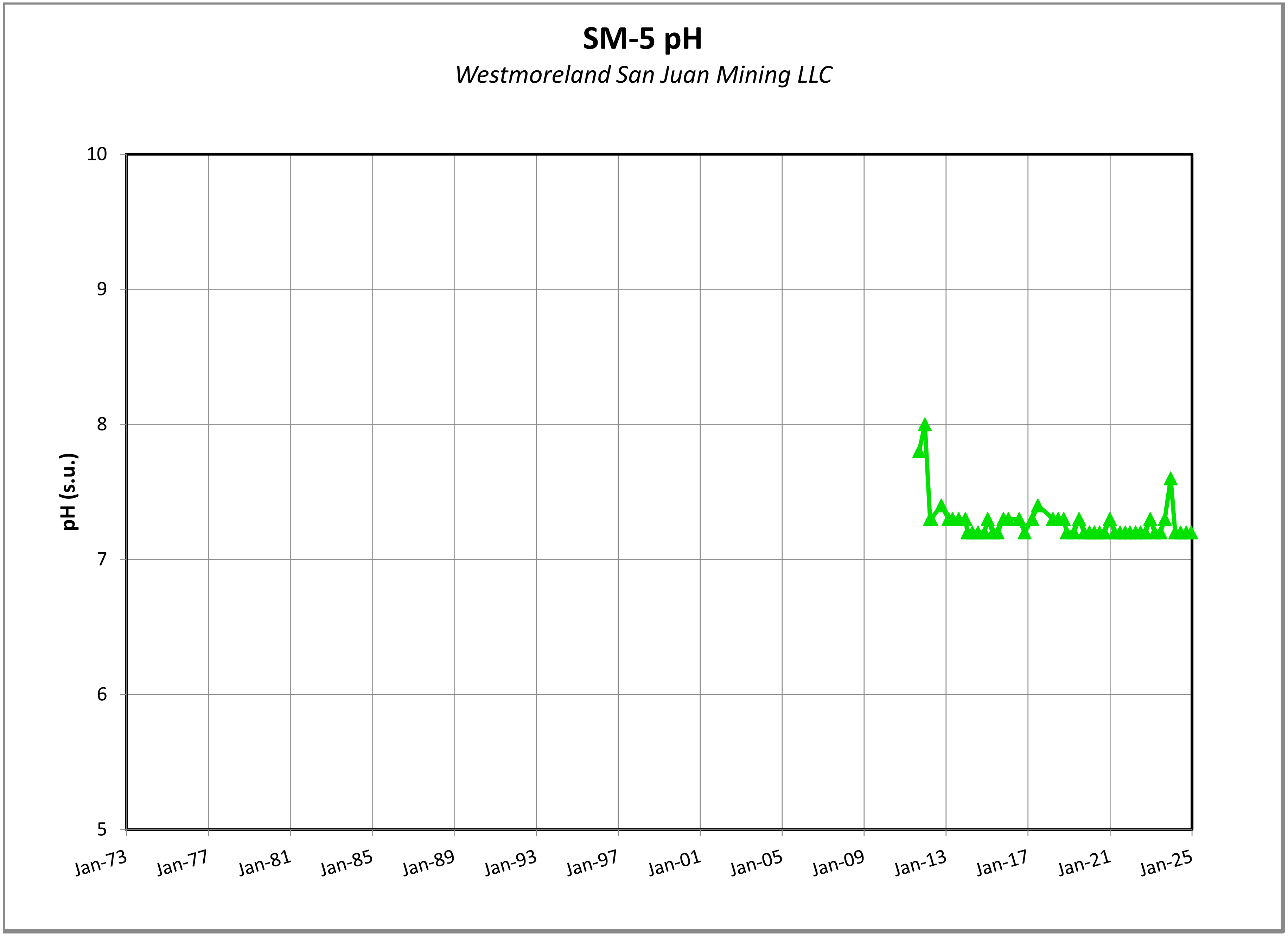


SA-1 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
30,000
25,000
20,000
15,000
10,000
5,000
0
6
5
4
3
2
1
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B



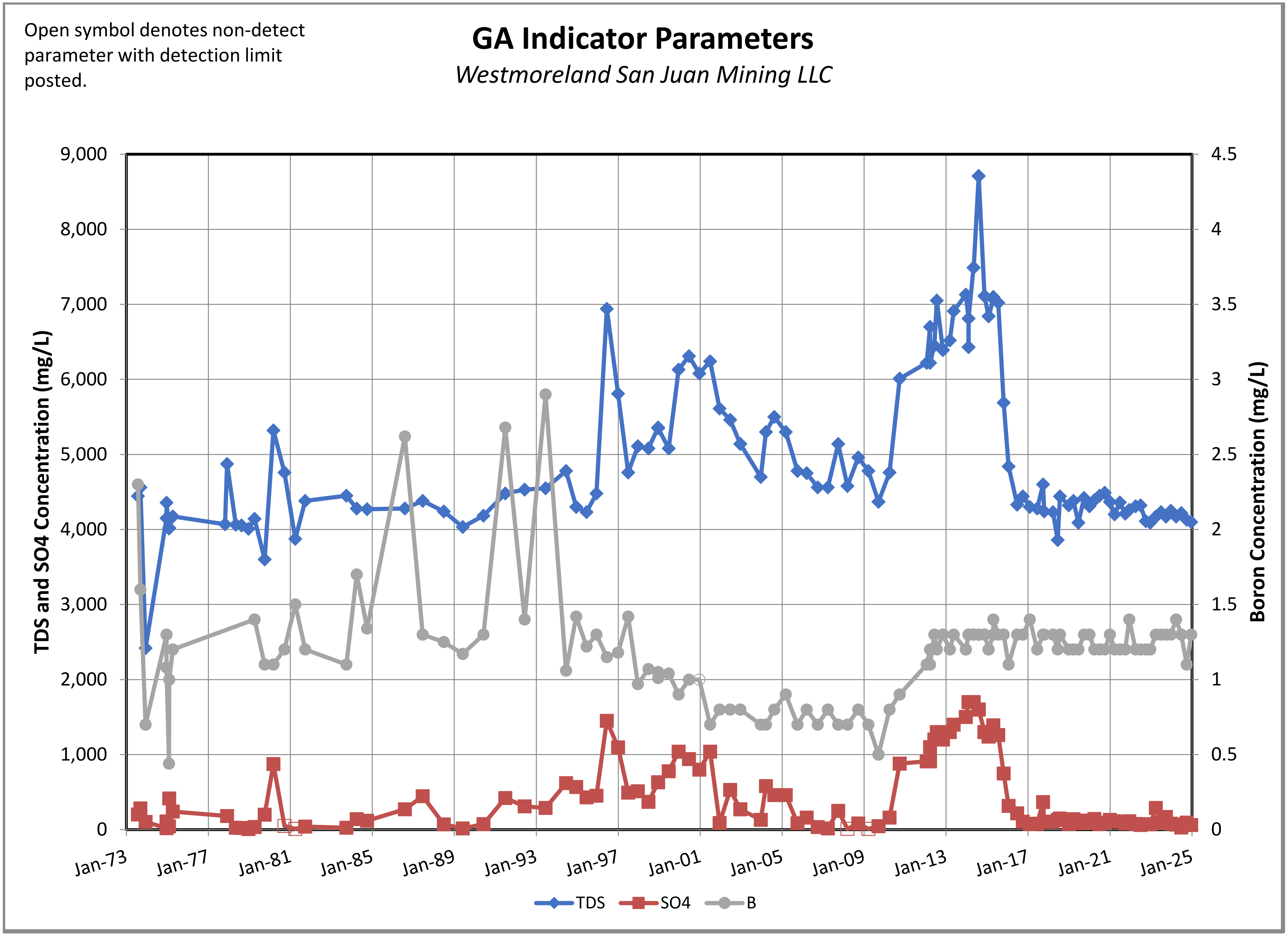
SA-1 pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25

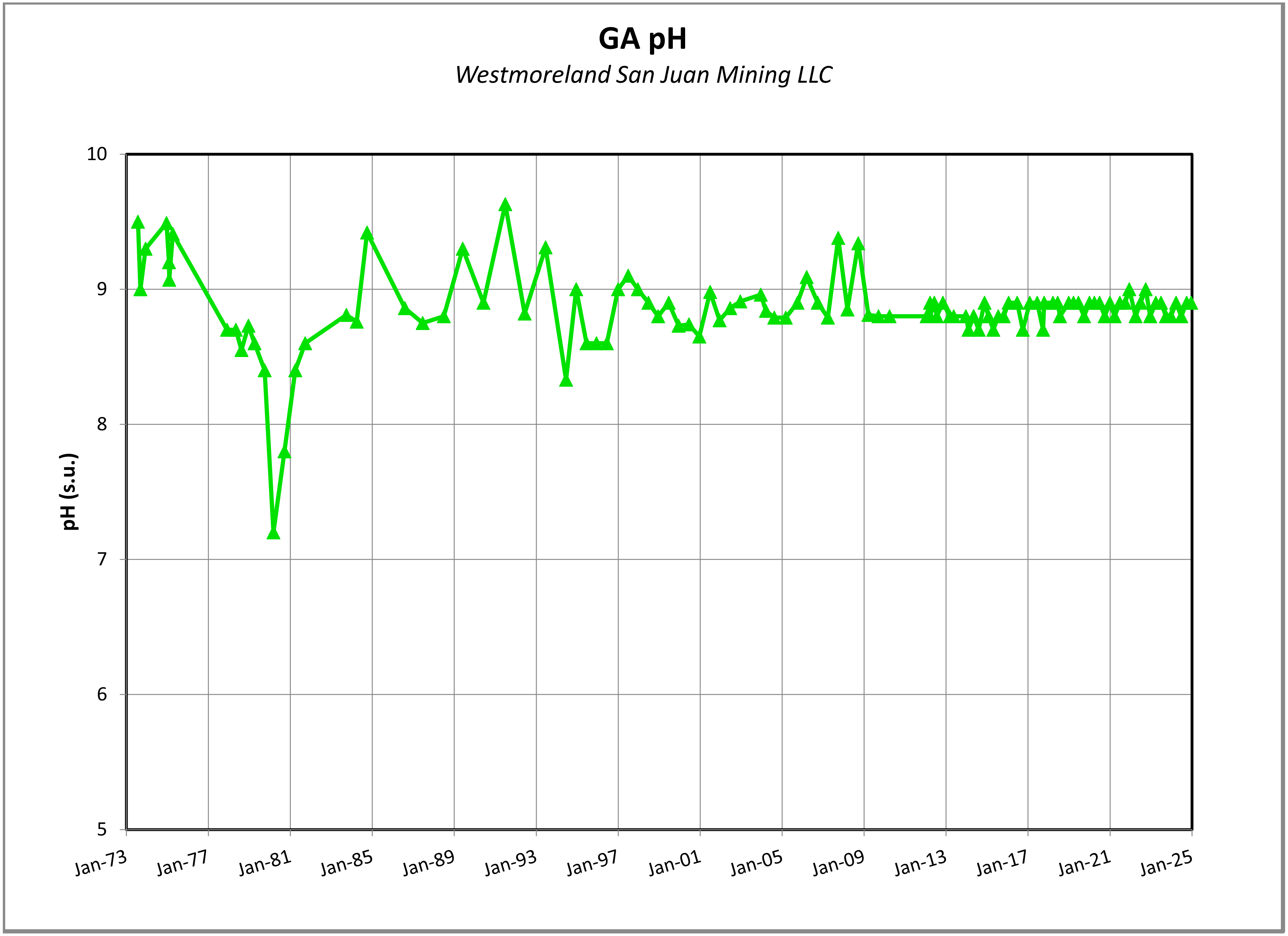

SM-5 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
30,000
25,000
20,000
15,000
10,000
5,000
0
6
5
4
3
2
1
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B

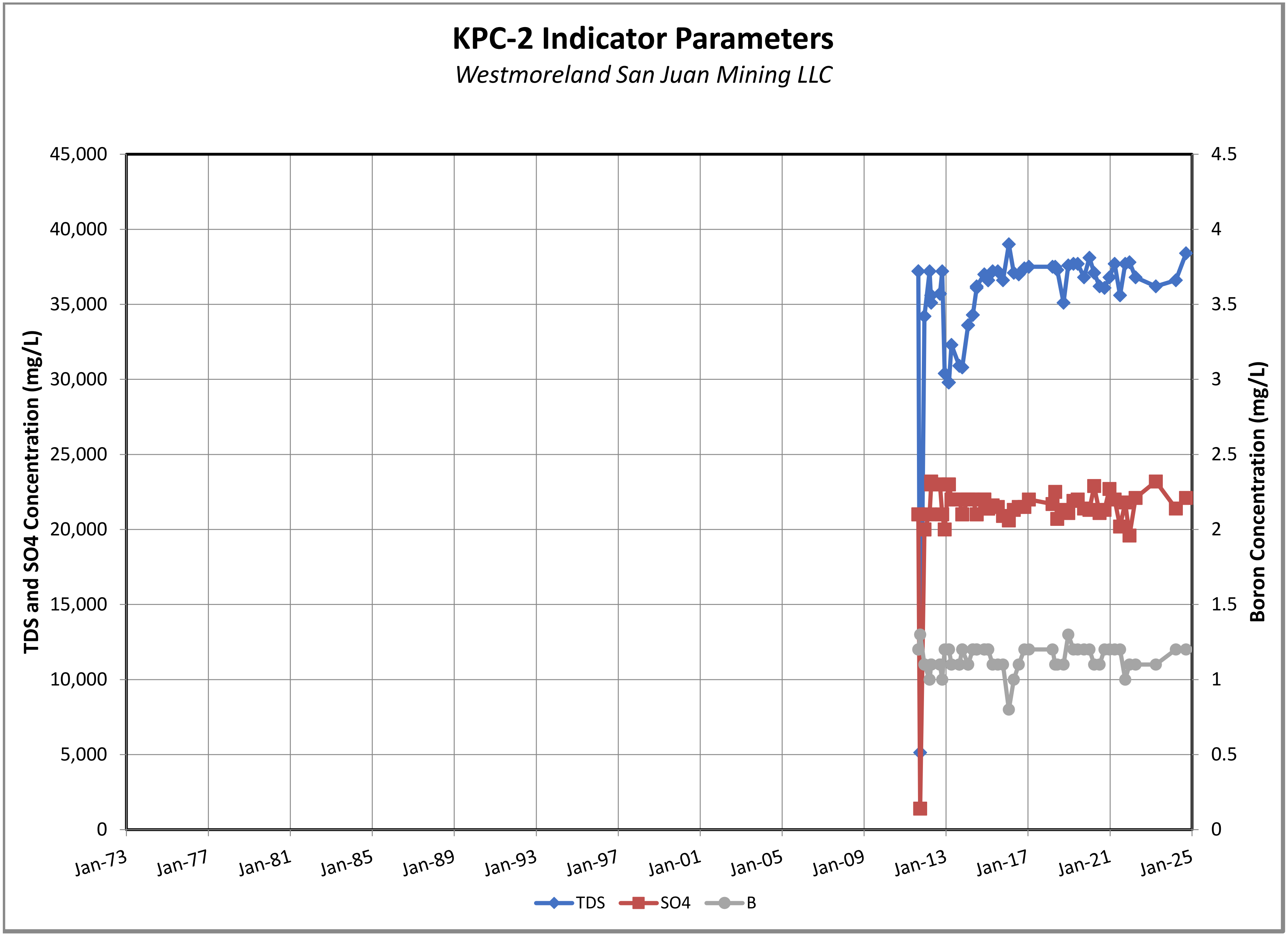

SM-5 pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25

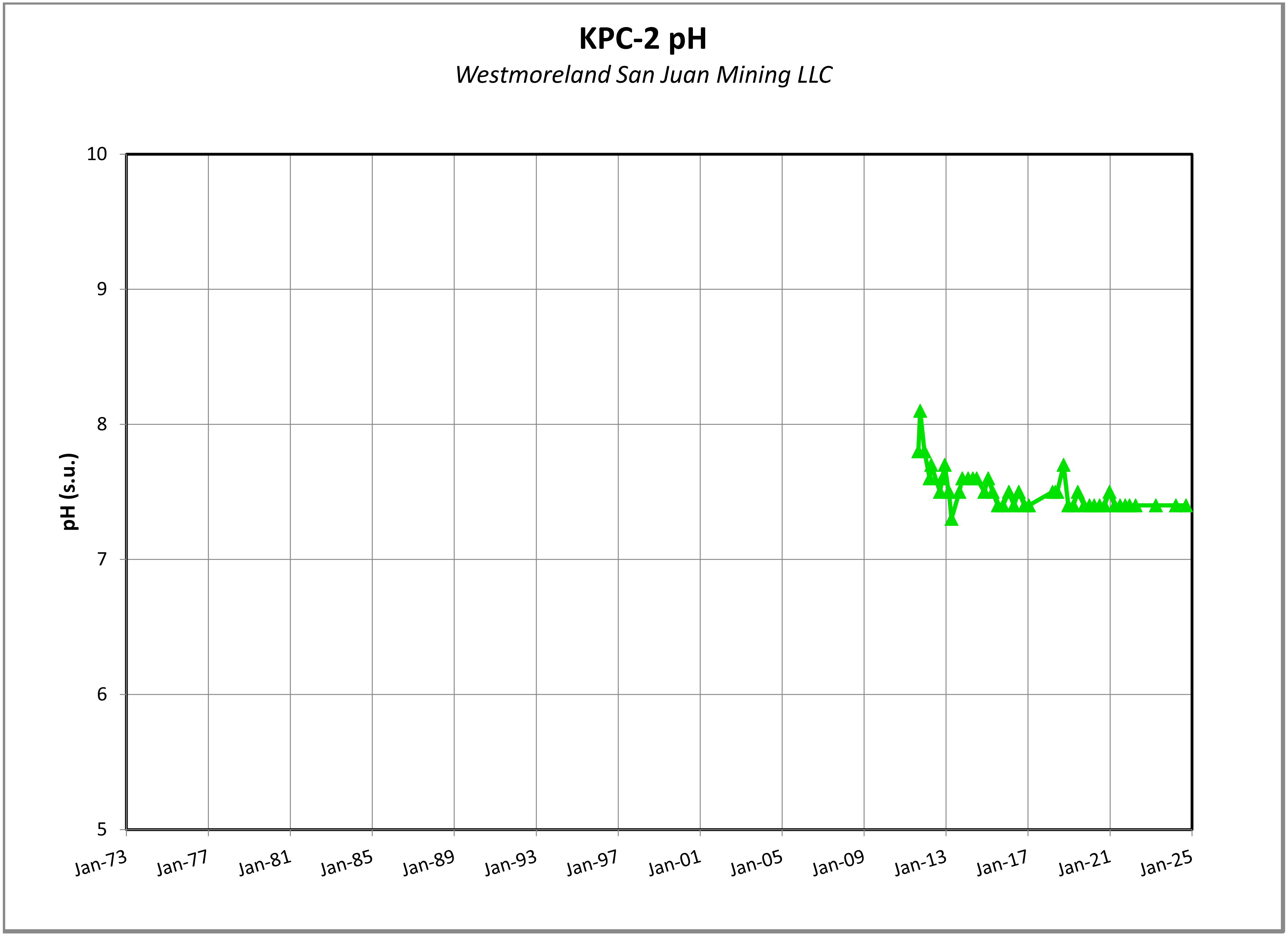
Pictured Cliffs Sandstone

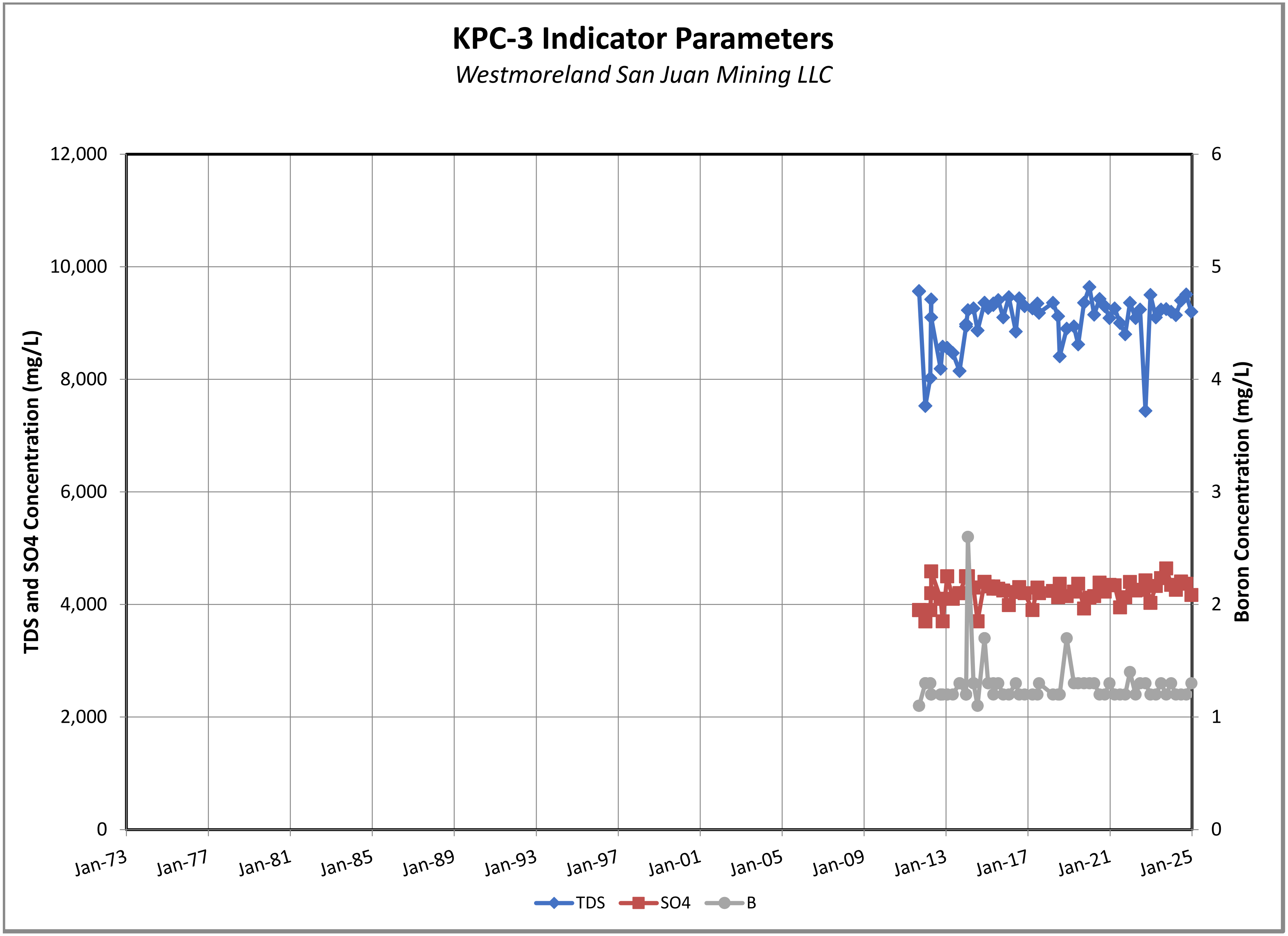
DBS&A
a Geo-Logic Company

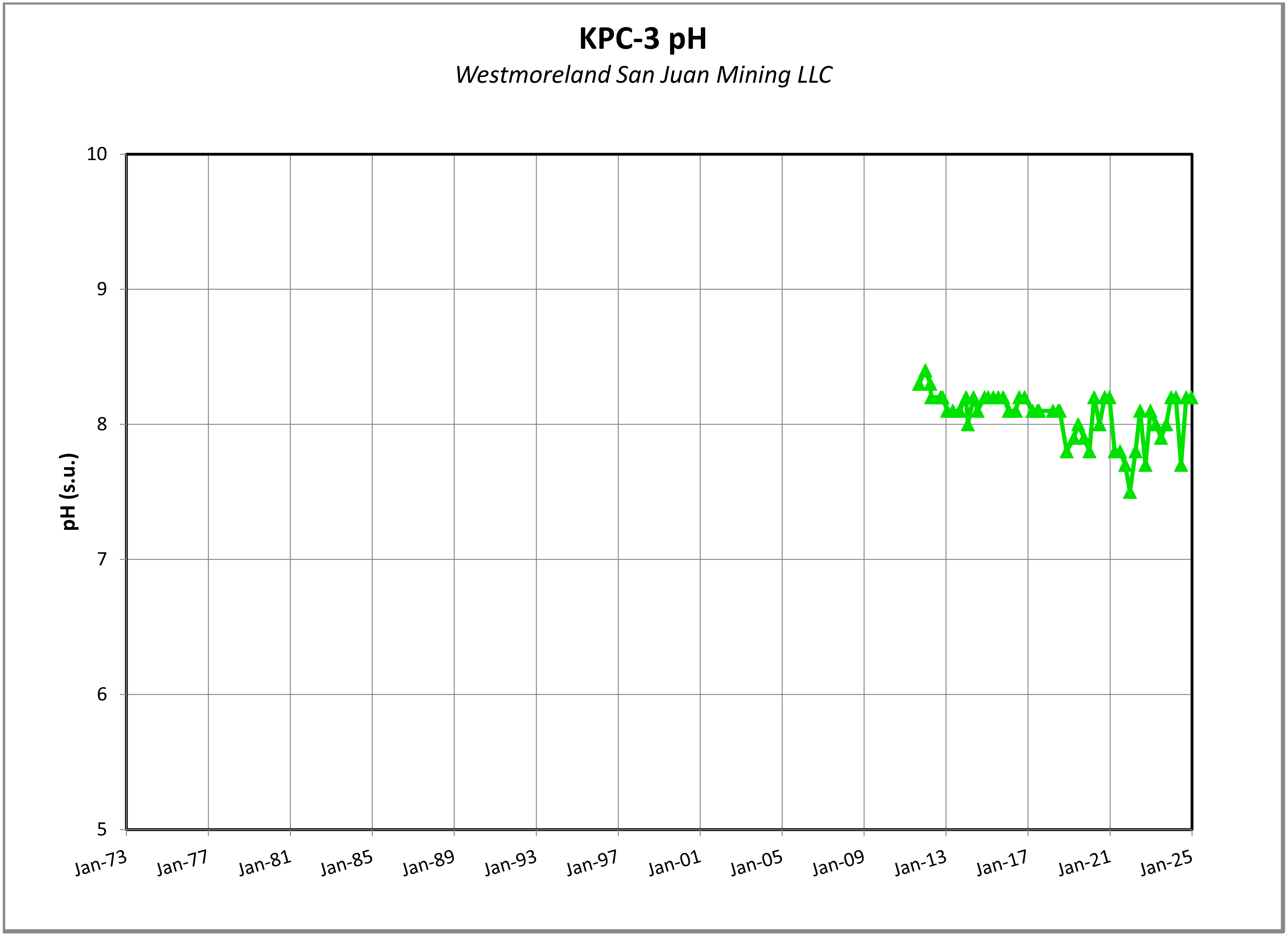

Open symbol denotes non-detect parameter with detection limit posted.
GA Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B

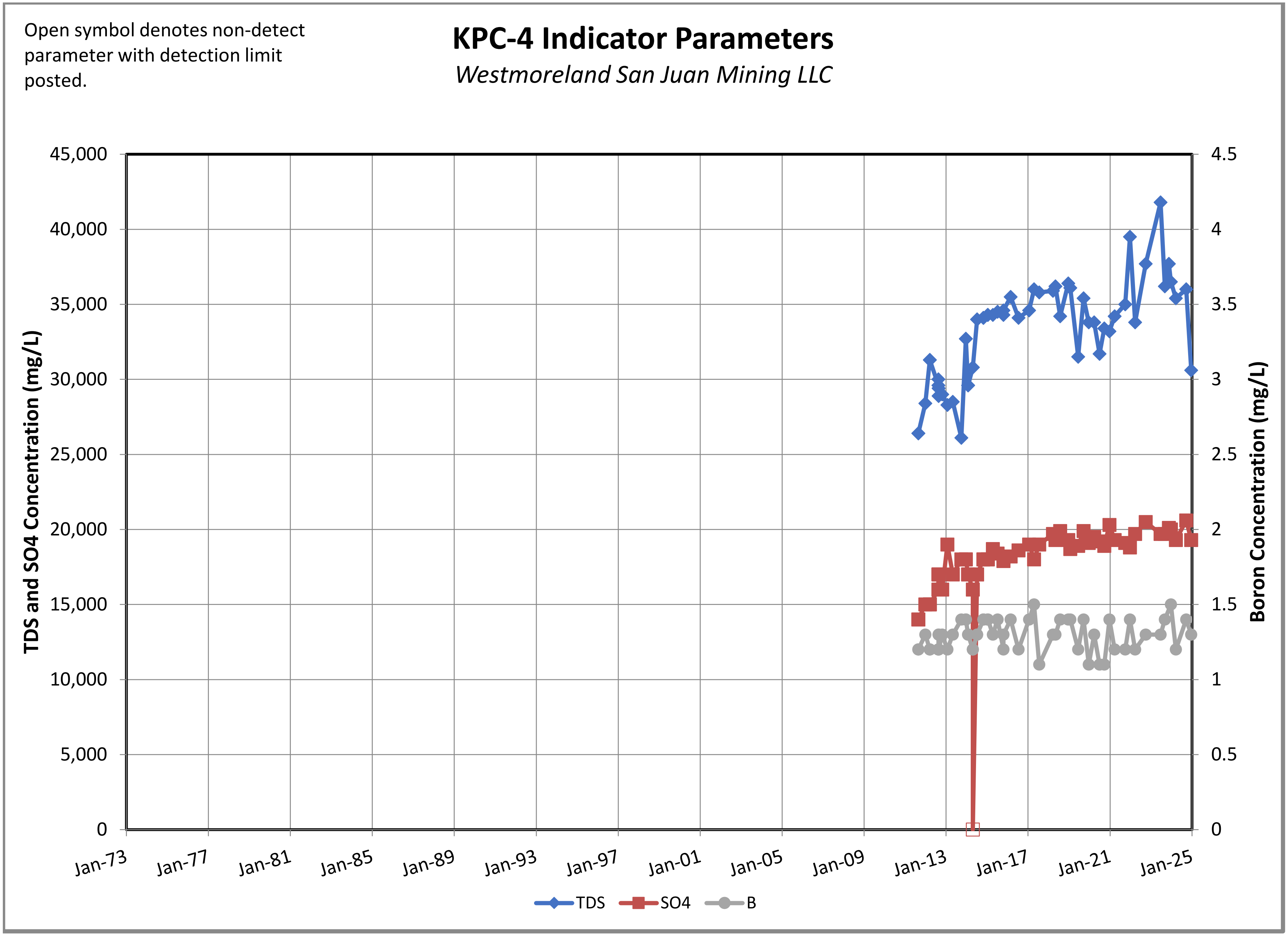

GA pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25


KPC-2 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B

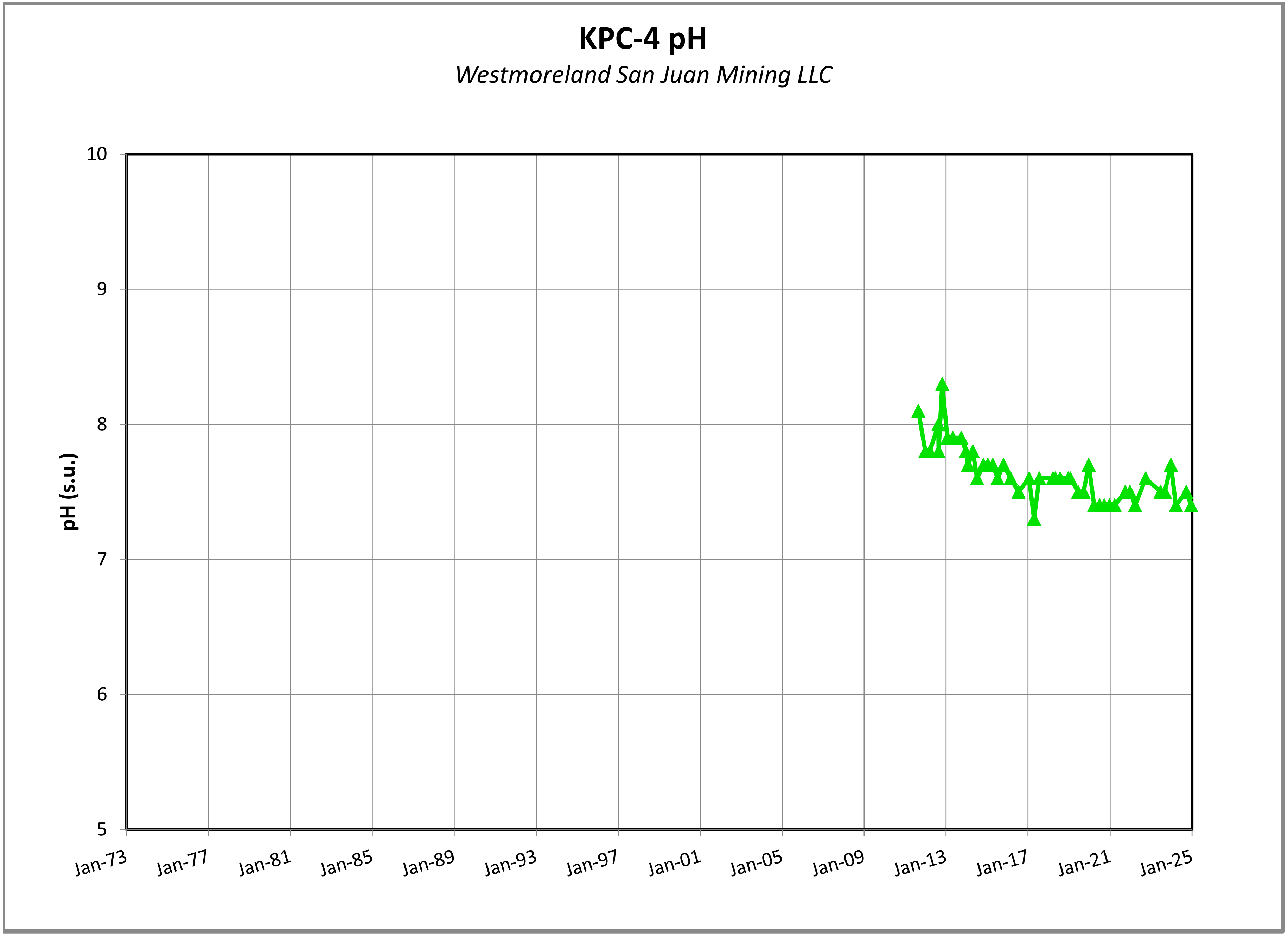

KPC-2 pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25


KPC-3 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
12,000
10,000
8,000
6,000
4,000
2,000
0
6
5
4
3
2
1
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B

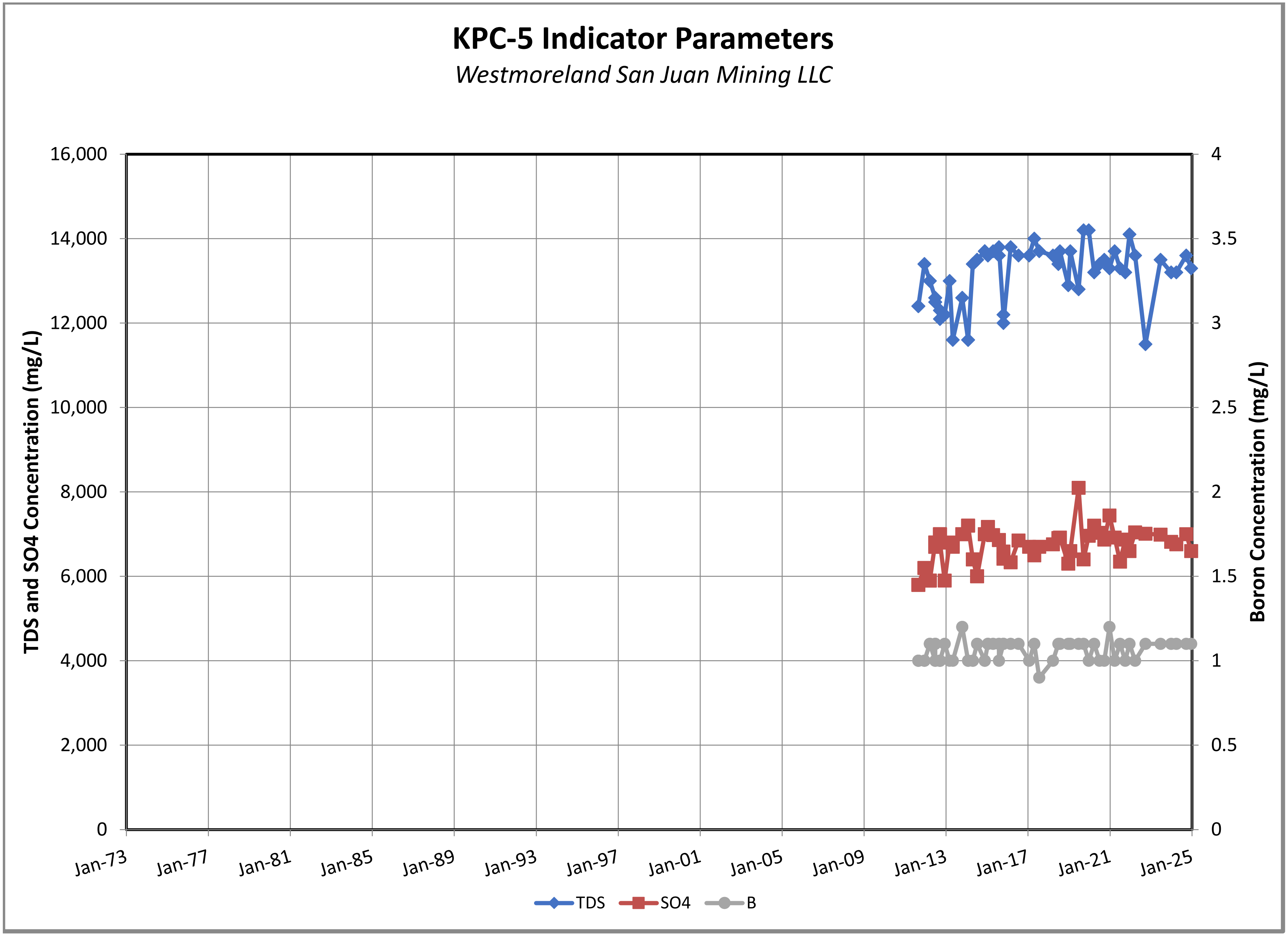

KPC-3 pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25

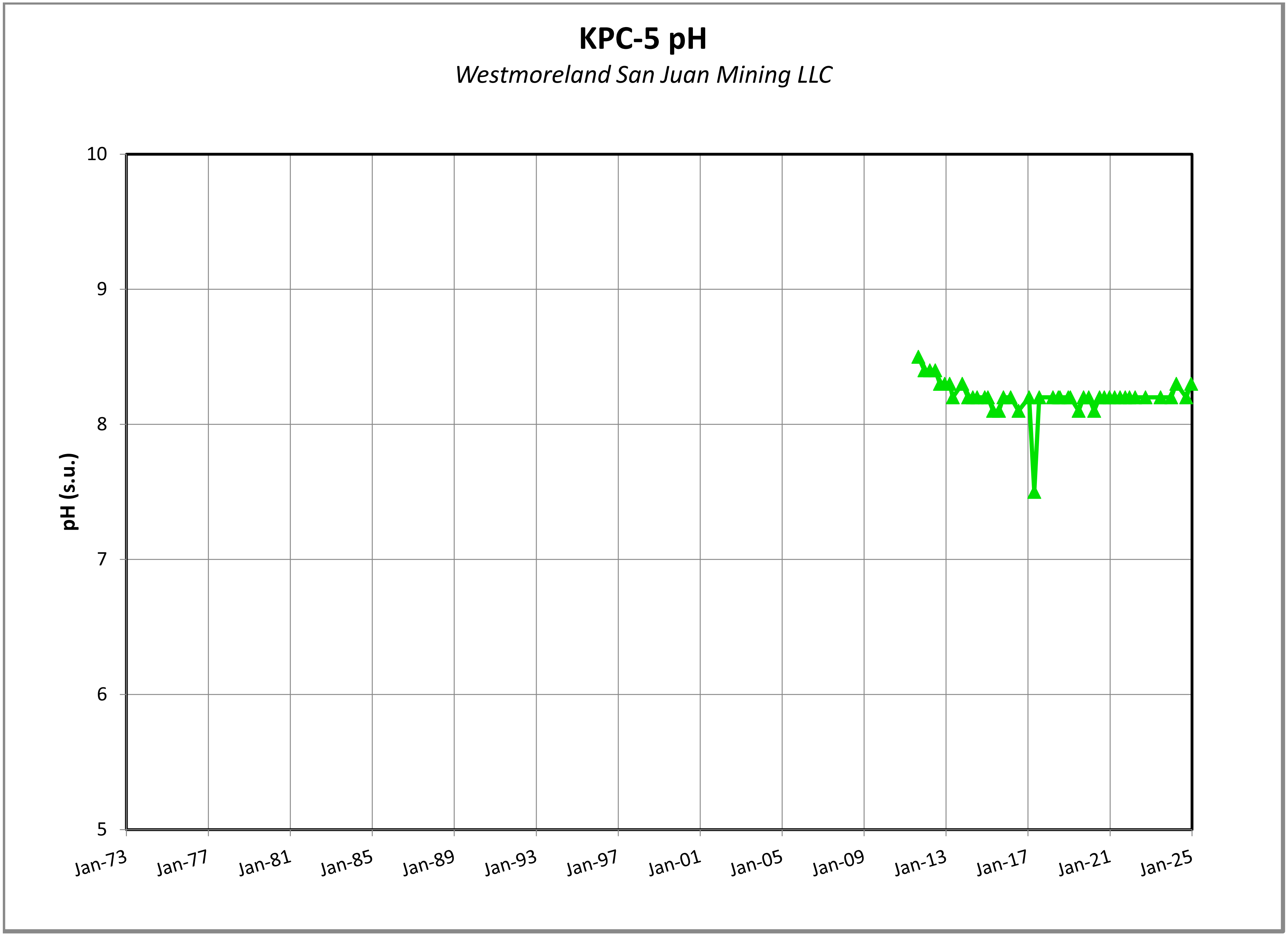


Open symbol denotes non-detect parameter with detection limit posted.
KPC-4 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B

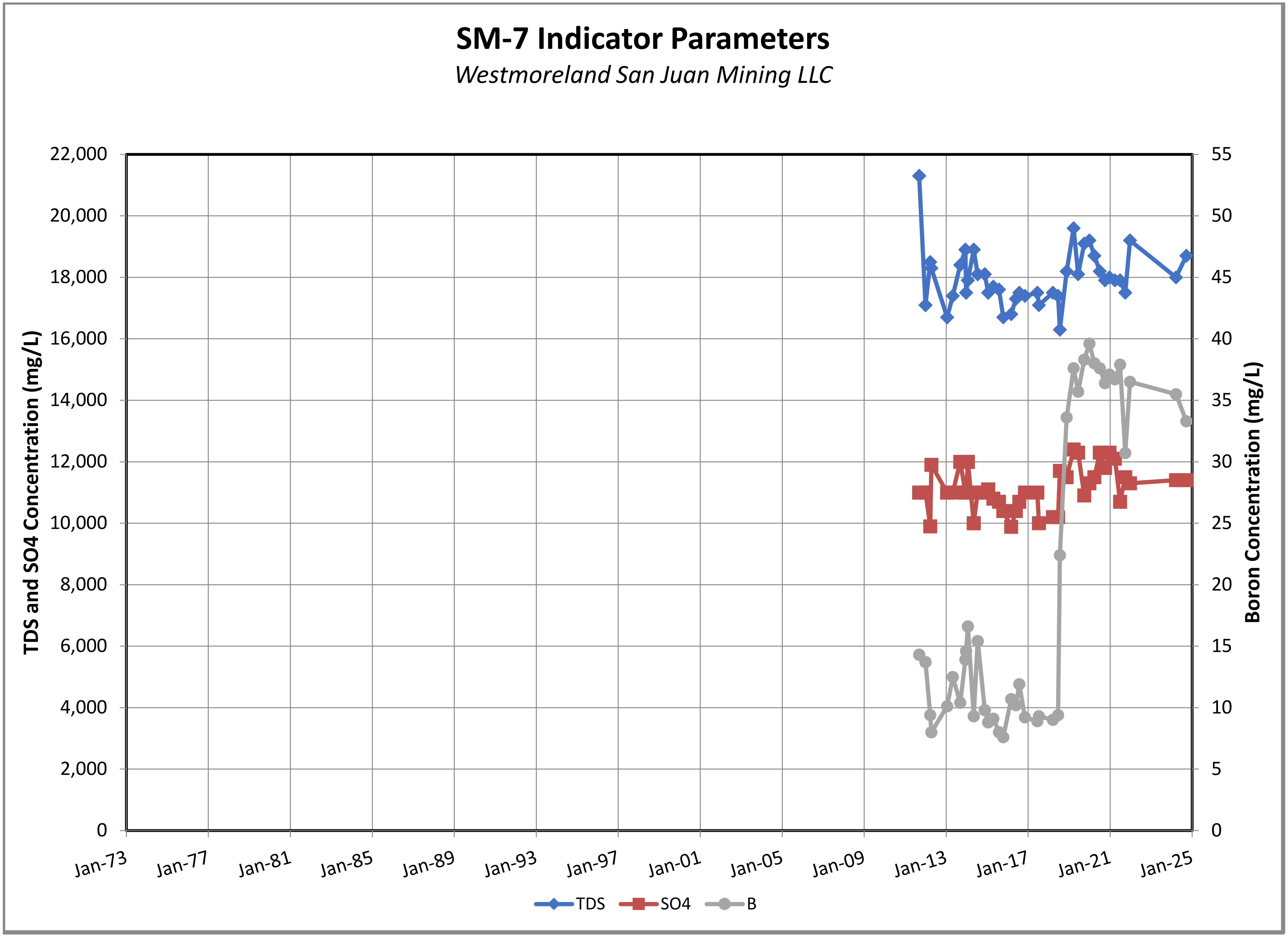


KPC-4 pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25

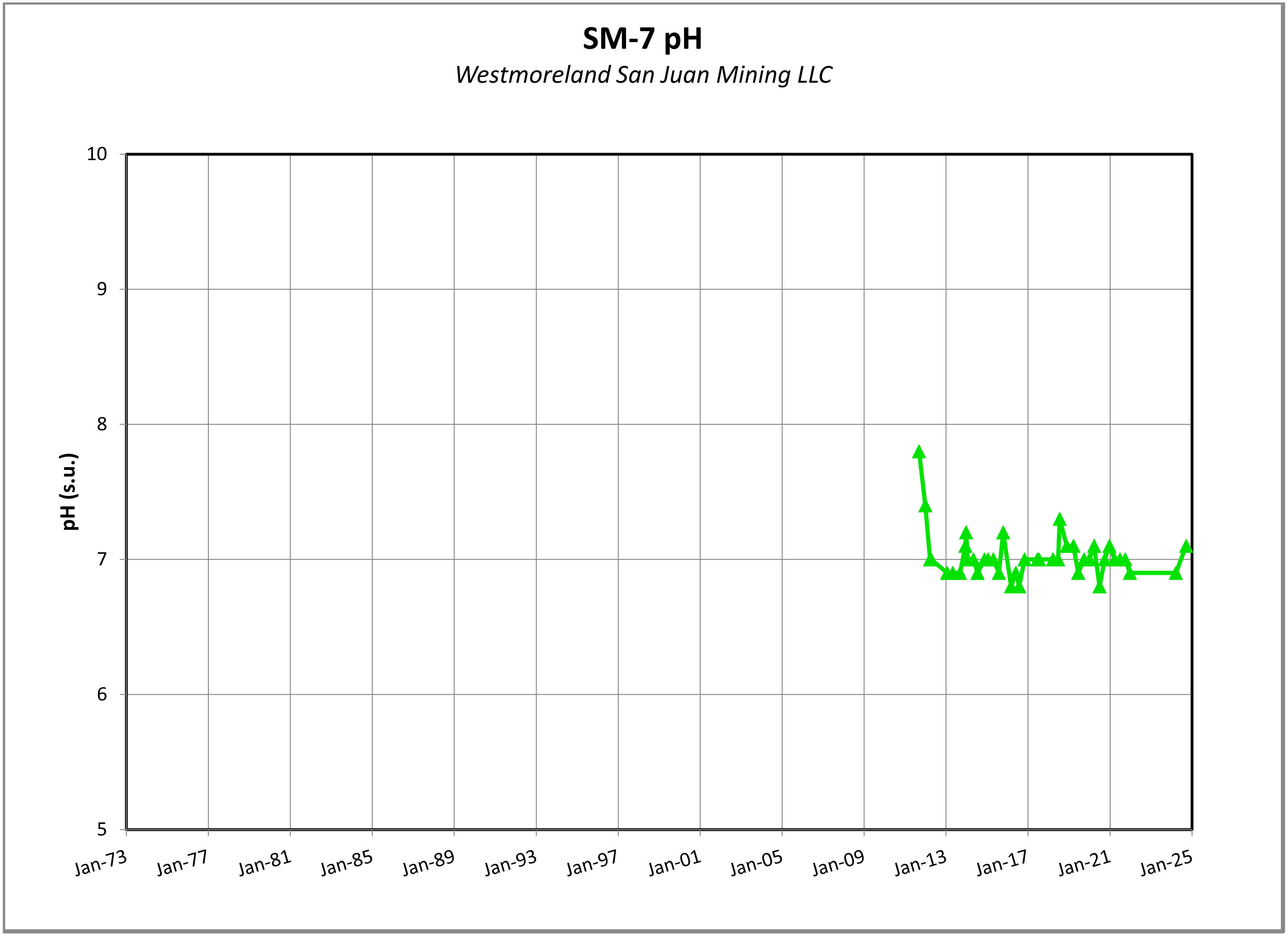

KPC-5 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B



KPC-5 pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25



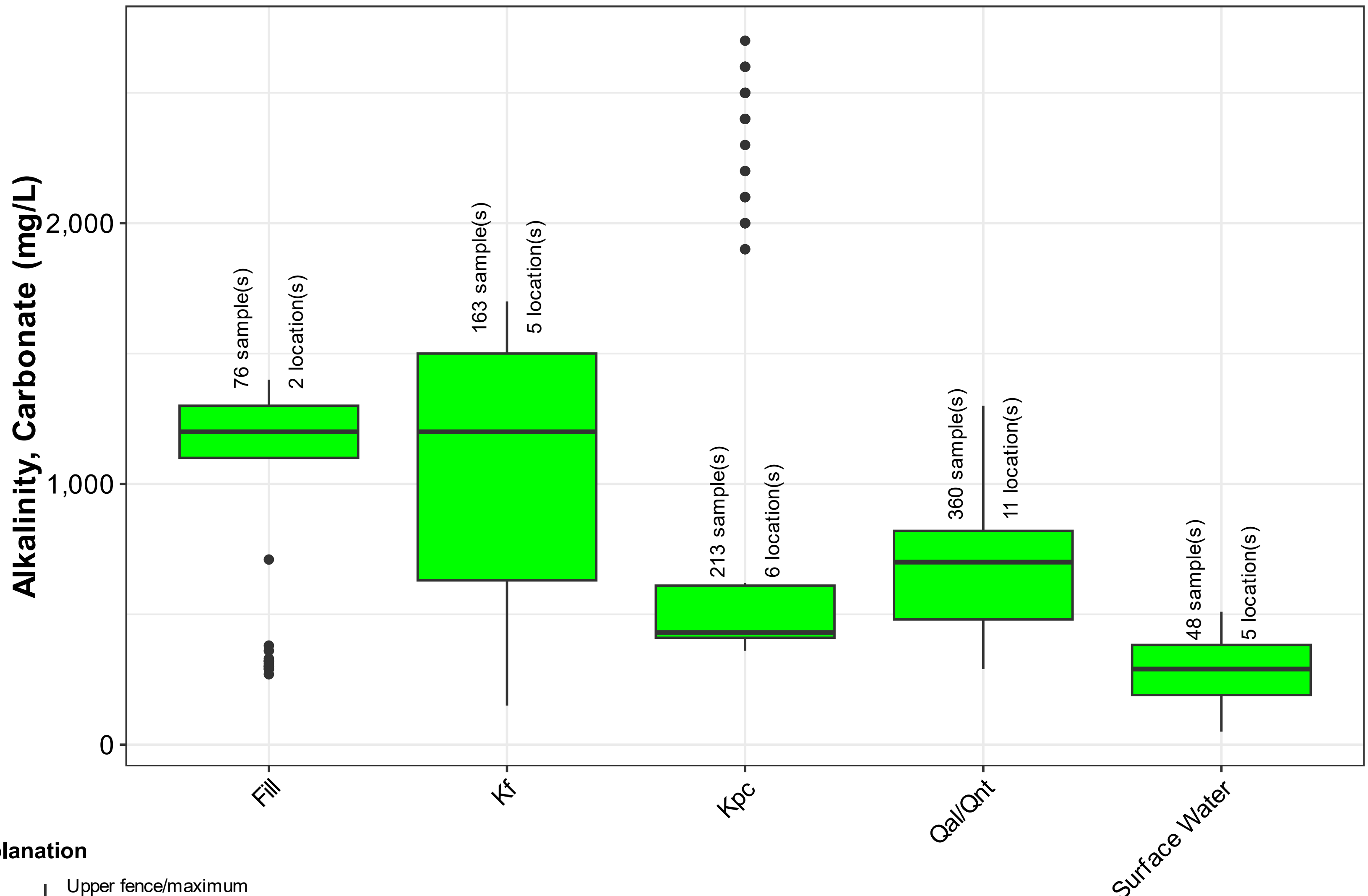
SM-7 Indicator Parameters
Westmoreland San Juan Mining LLC
TDS and SO4 Concentration (mg/L)
Boron Concentration (mg/L)
22,000
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
55
50
45
40
35
30
25
20
15
10
5
0
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25
TDS
SO4
B


SM-7 pH
Westmoreland San Juan Mining LLC
pH (s.u.)
10
9
8
7
6
5
Jan-73
Jan-77
Jan-81
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Jan-21
Jan-25

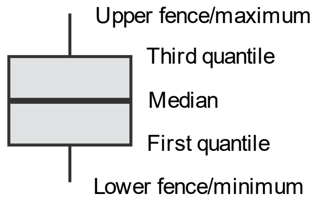
Appendix E

Box and Whisker Comparison Plots for Each Water Quality Analyte

DBS&A
a Geo-Logic Company



Explanation

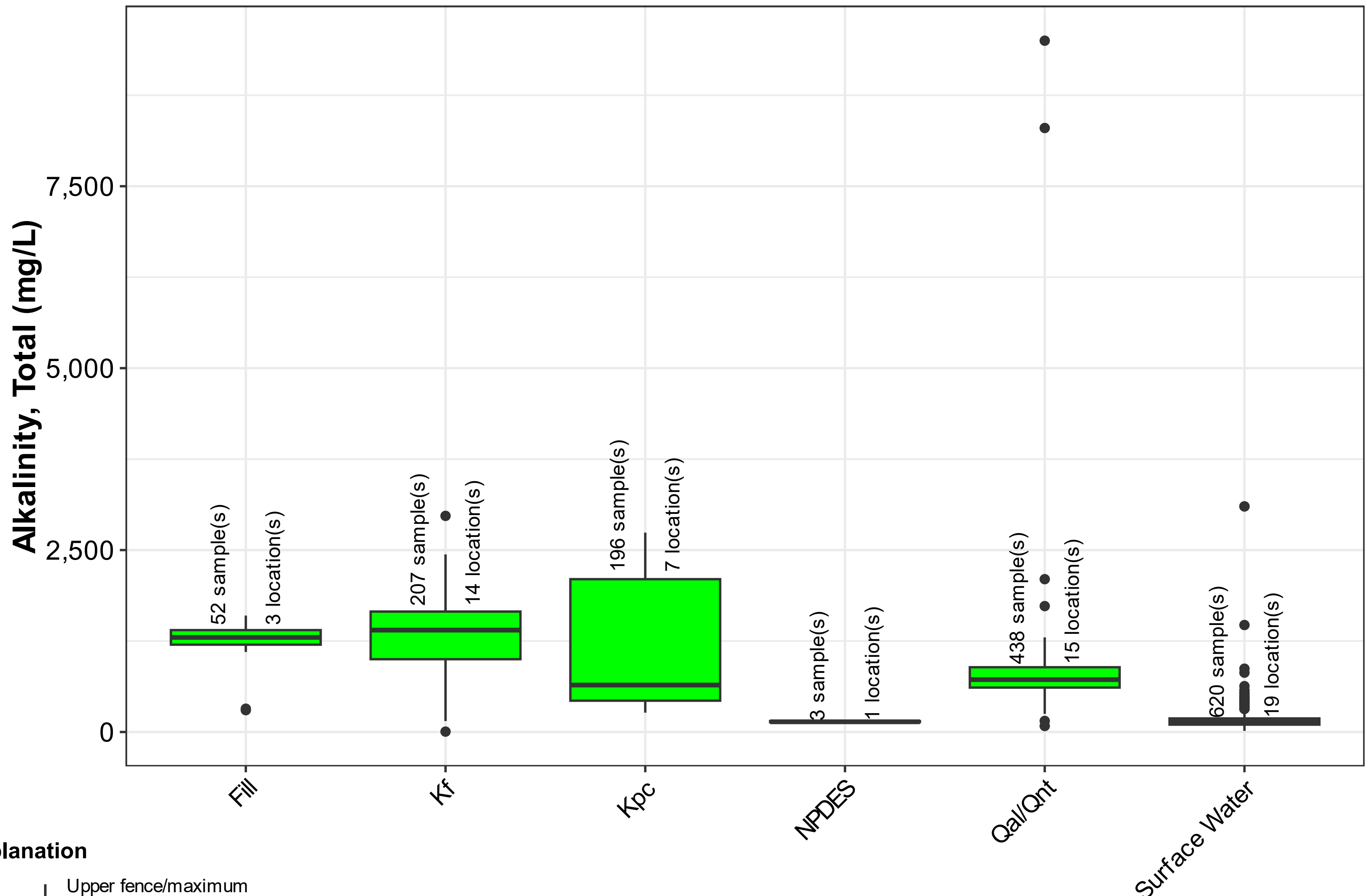


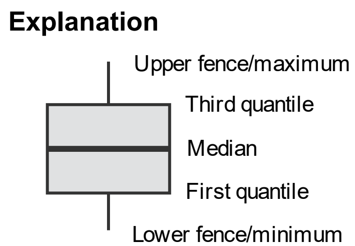
Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE

Box and Whisker Comparison Plot

Alkalinity, Carbonate

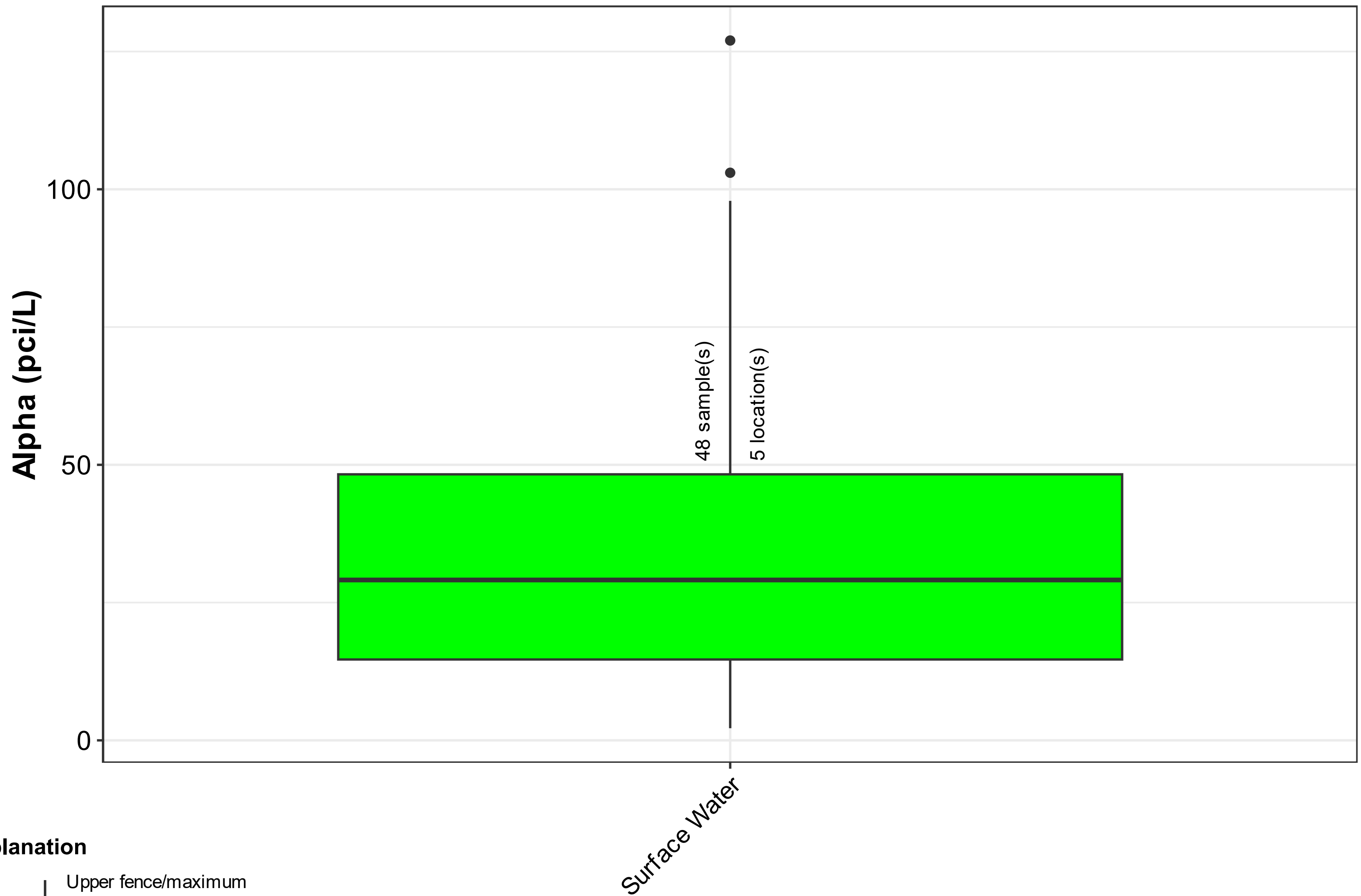




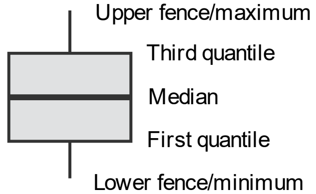
Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Alkalinity, Total

DBS&A a Geo-Logic Company
6/10/2025 DB24.1140



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

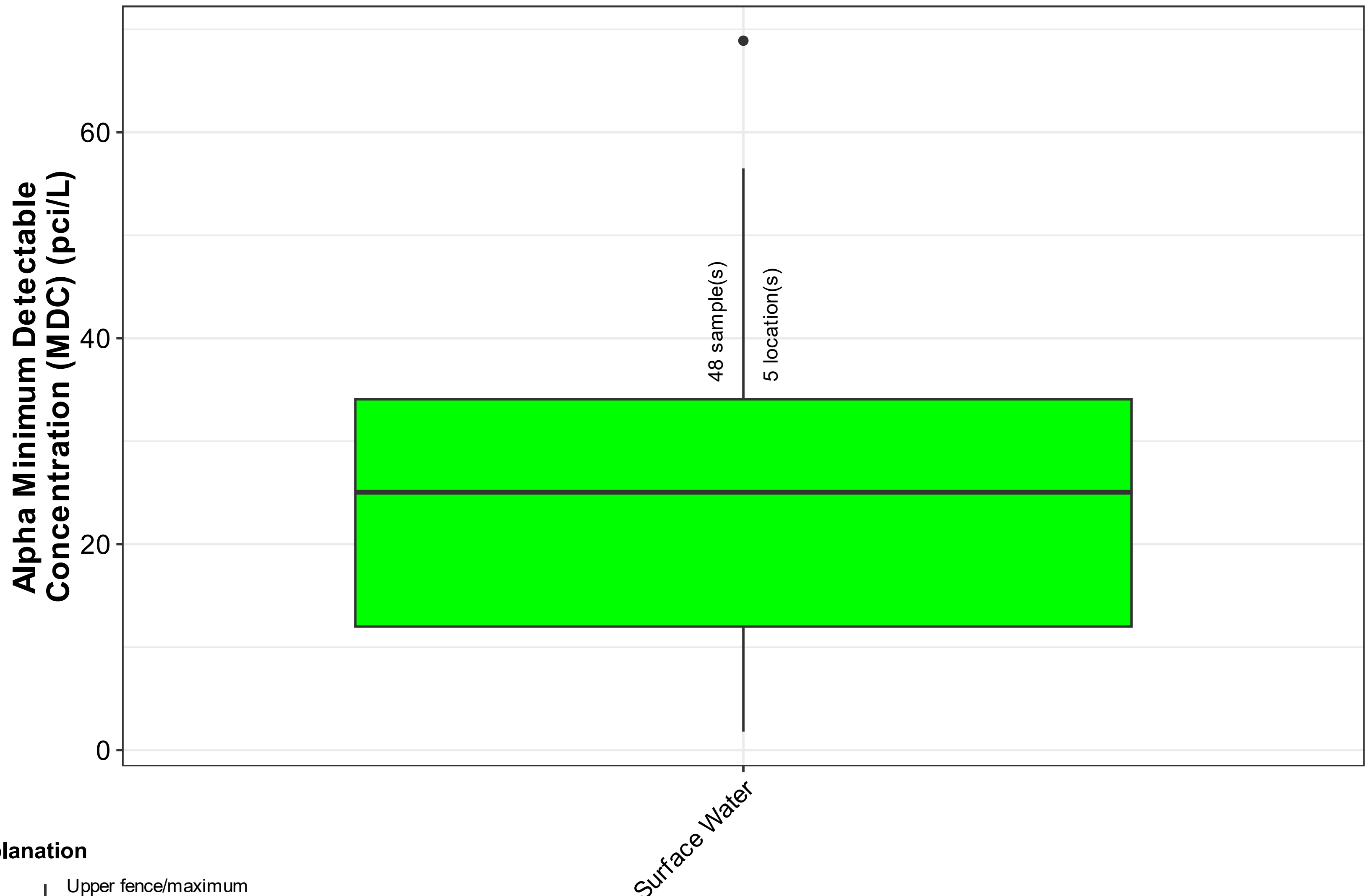
SAN JUAN MINE

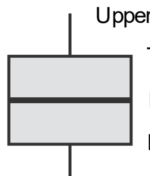
Box and Whisker Comparison Plot

Alpha

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140





Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

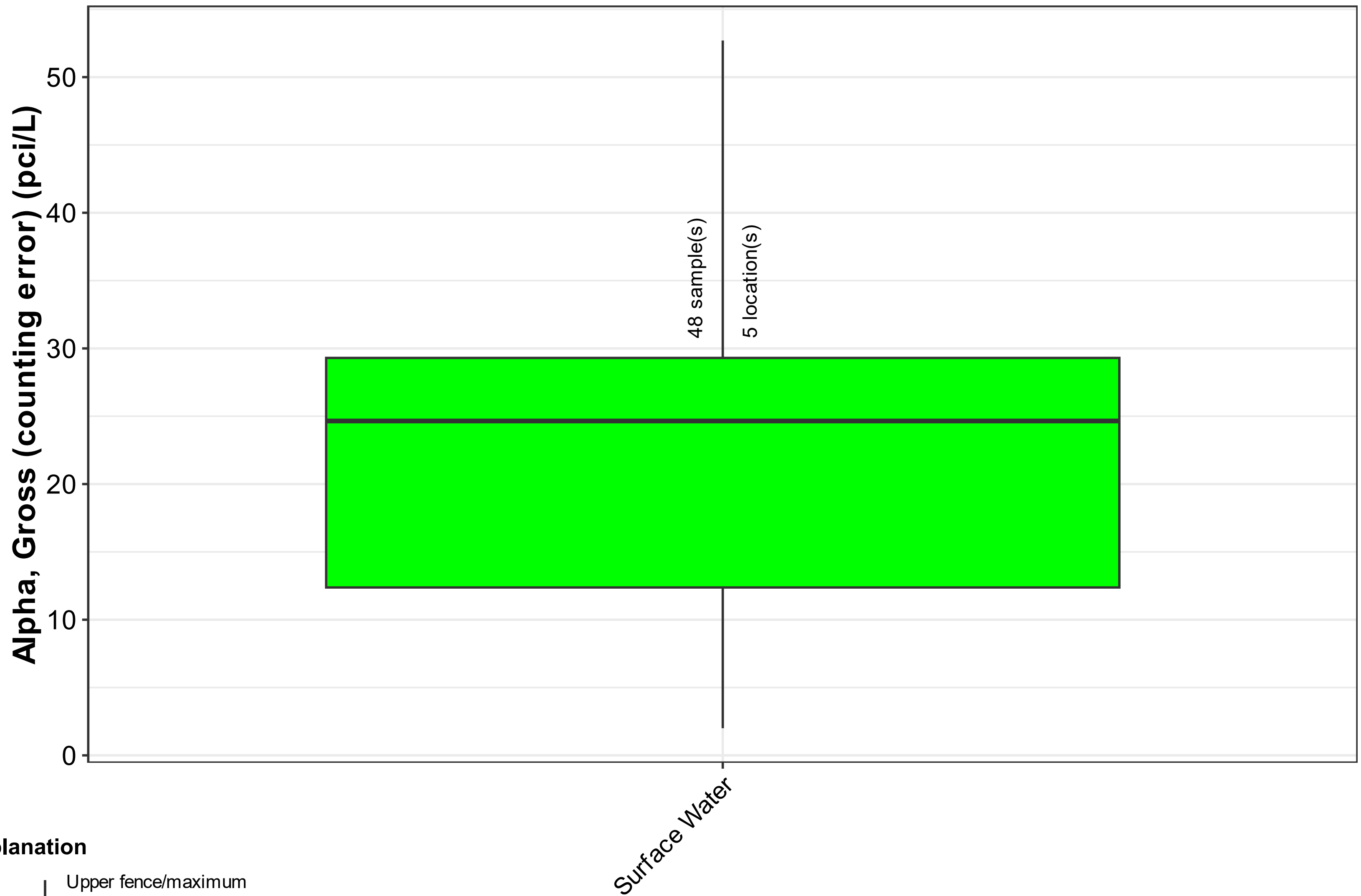
SAN JUAN MINE

Box and Whisker Comparison Plot

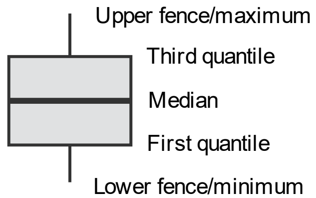
Alpha Minimum Detectable Concentration (MDC)

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

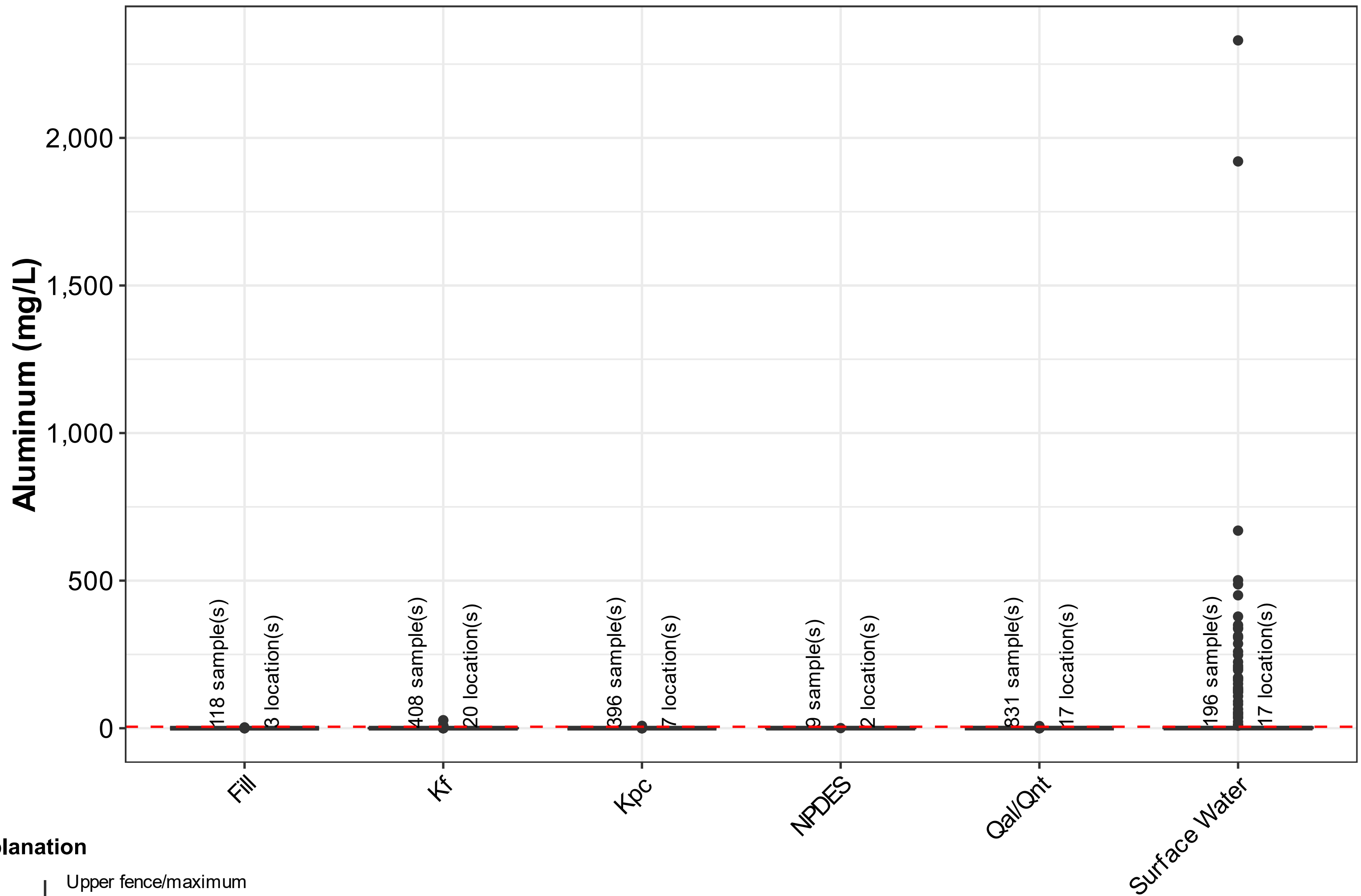
SAN JUAN MINE

Box and Whisker Comparison Plot

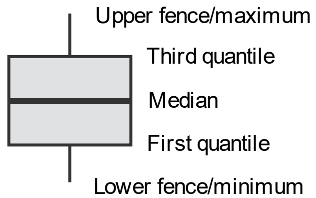
Alpha, Gross (counting error)

DBS&A a Geo-Logic Company

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

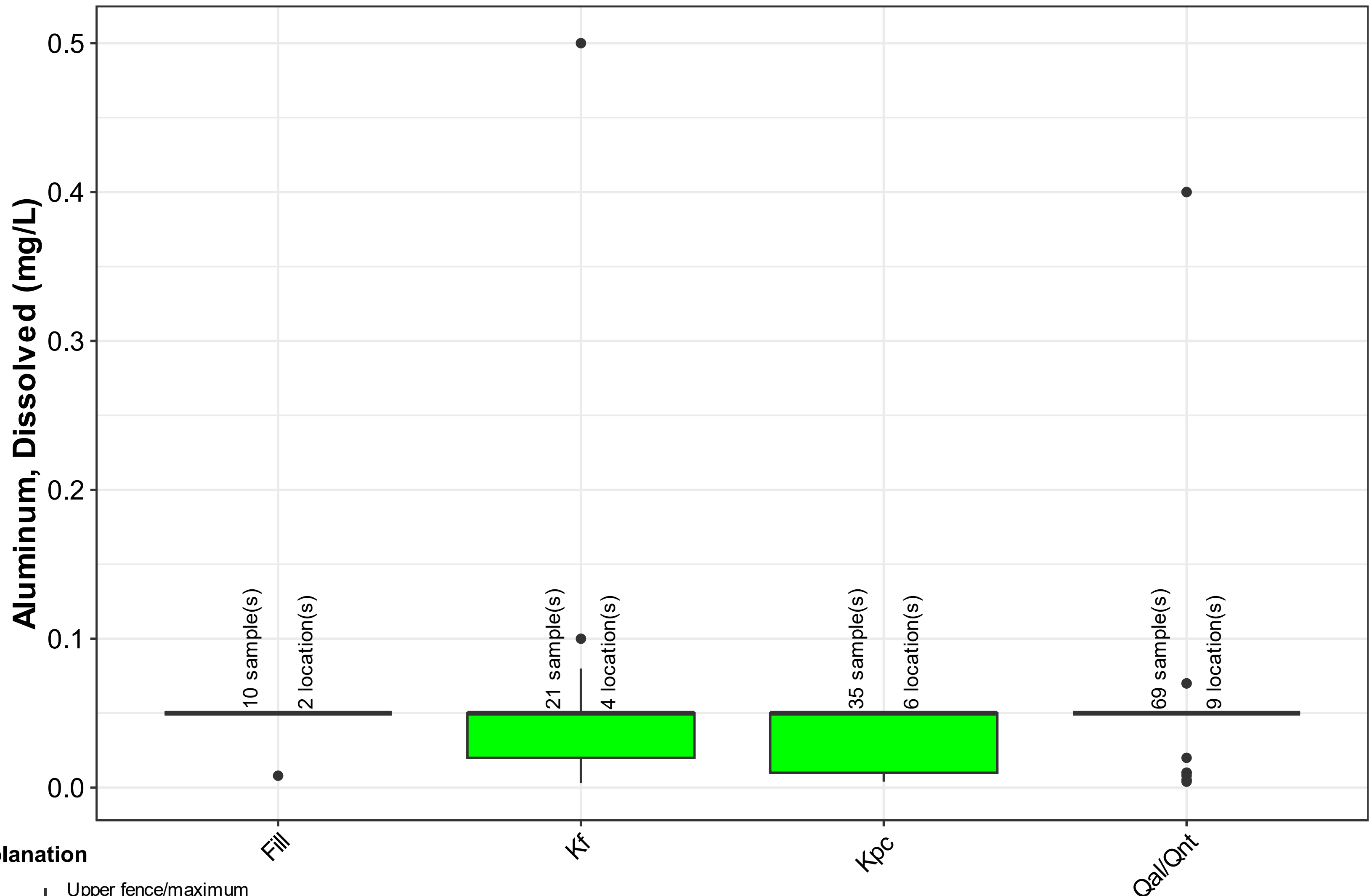
SAN JUAN MINE

Box and Whisker Comparison Plot

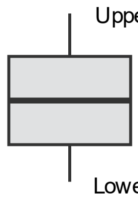
Aluminum

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

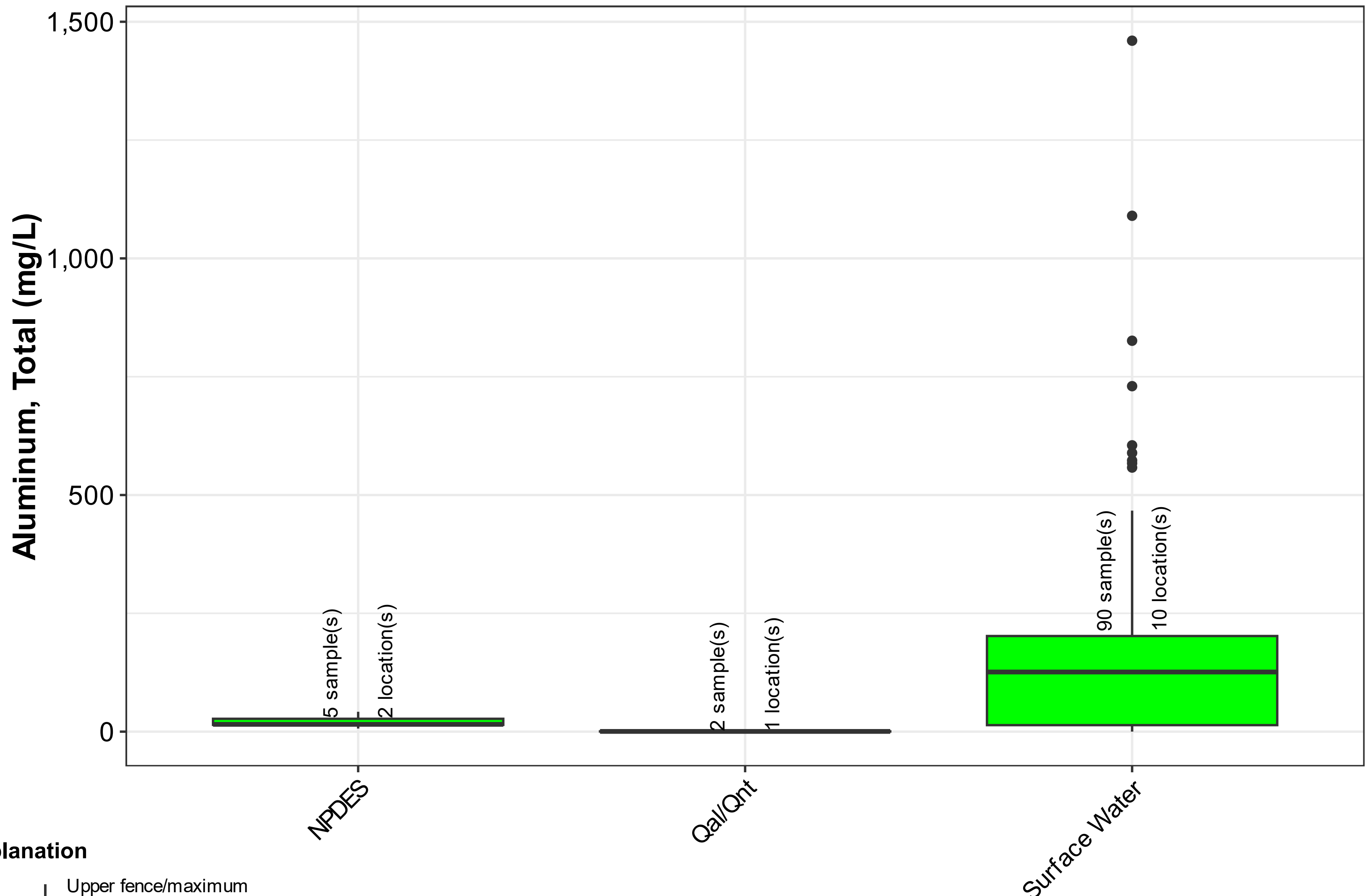
SAN JUAN MINE

Box and Whisker Comparison Plot

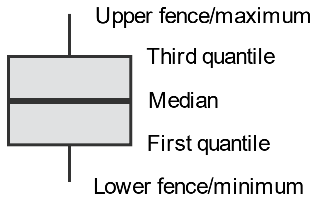
Aluminum, Dissolved

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

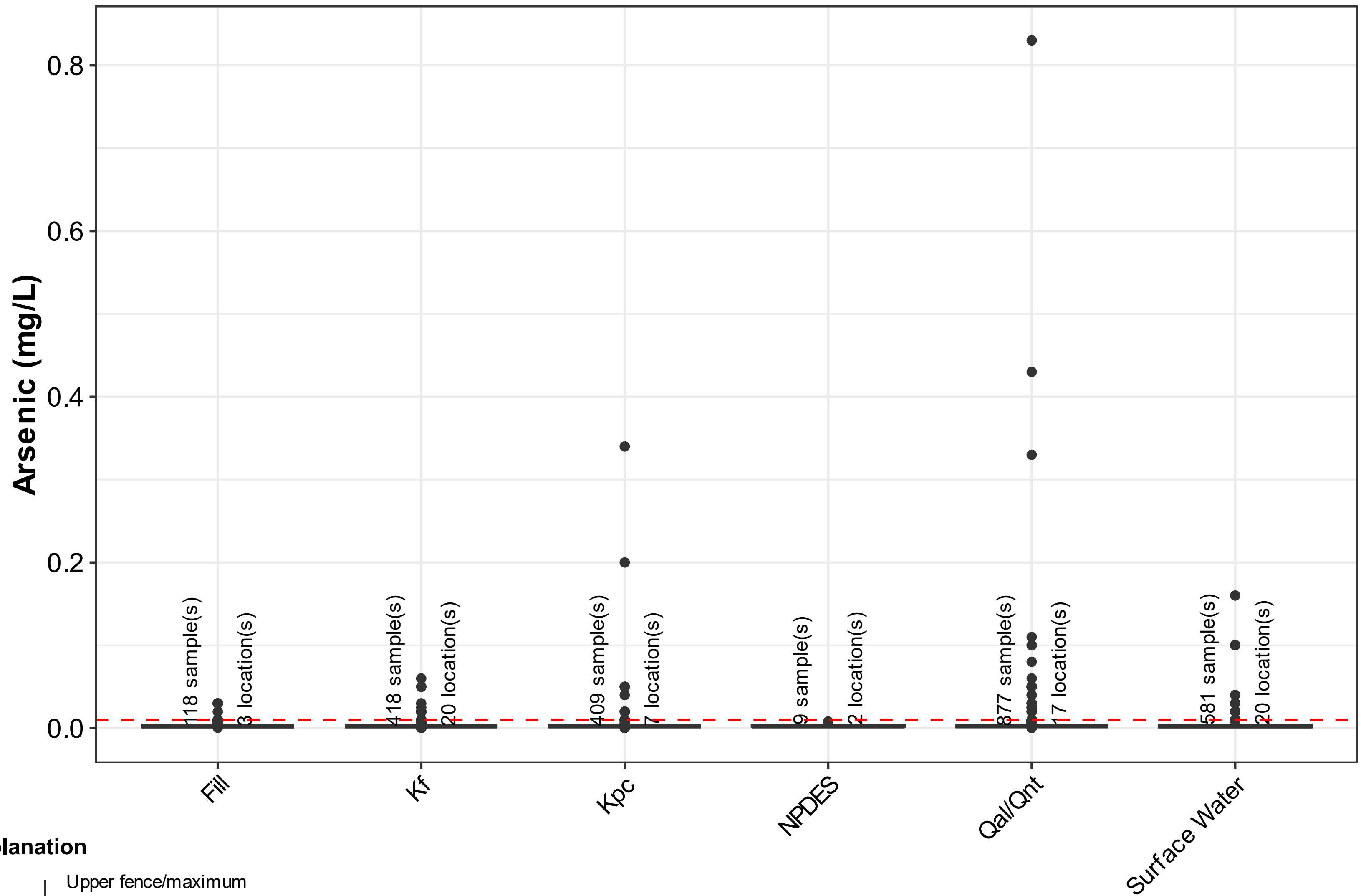
SAN JUAN MINE

Box and Whisker Comparison Plot

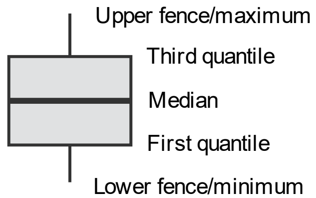
Aluminum, Total

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



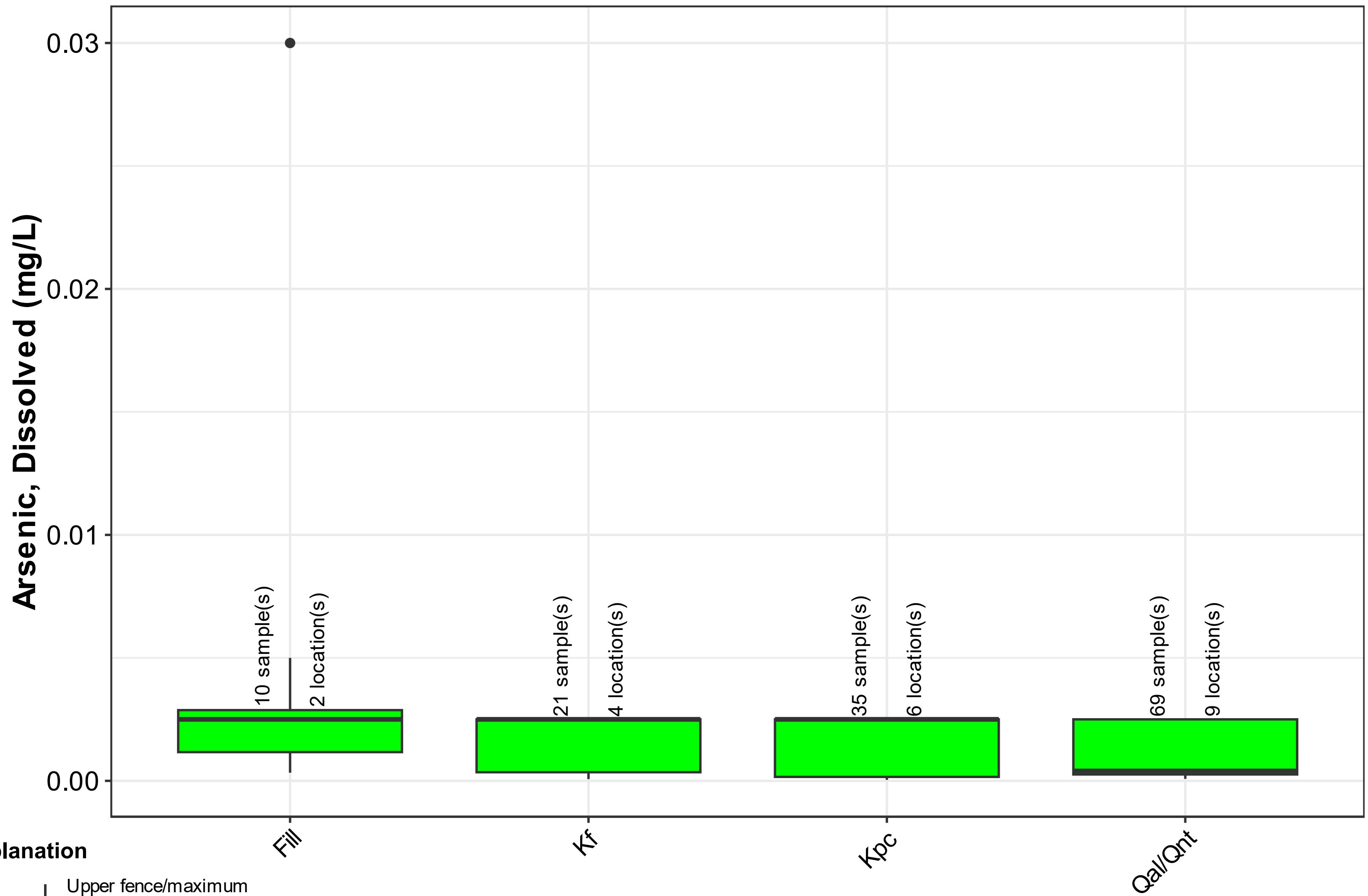
Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE

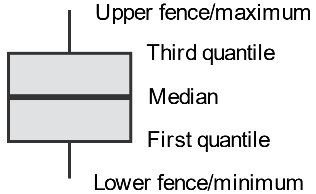
Box and Whisker Comparison Plot

Arsenic

DBS&A
a Geo-Logic Company



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

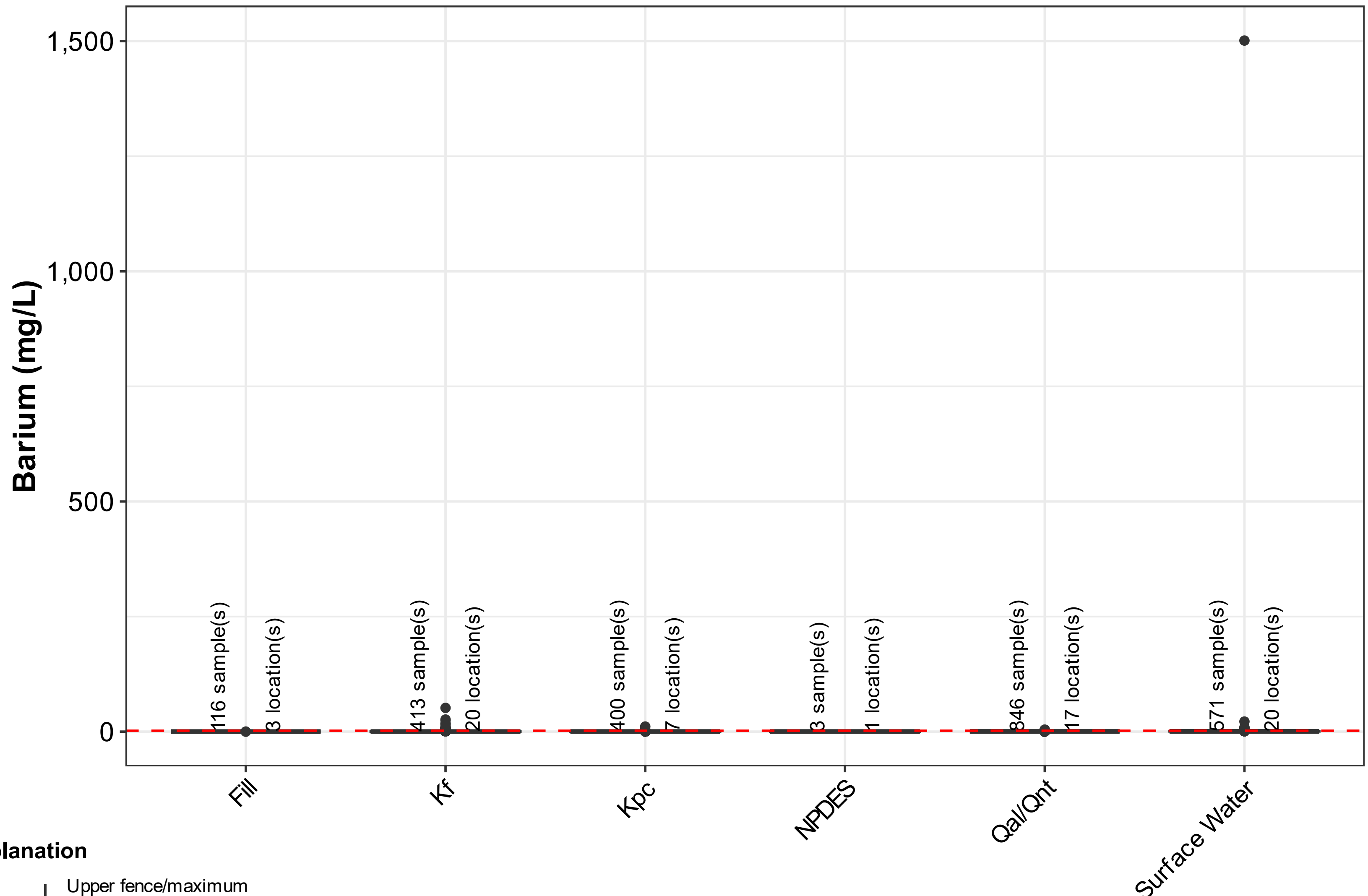
SAN JUAN MINE

Box and Whisker Comparison Plot

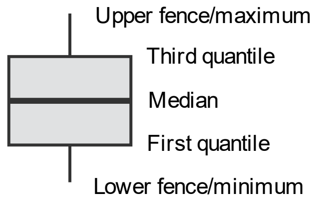
Arsenic, Dissolved

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



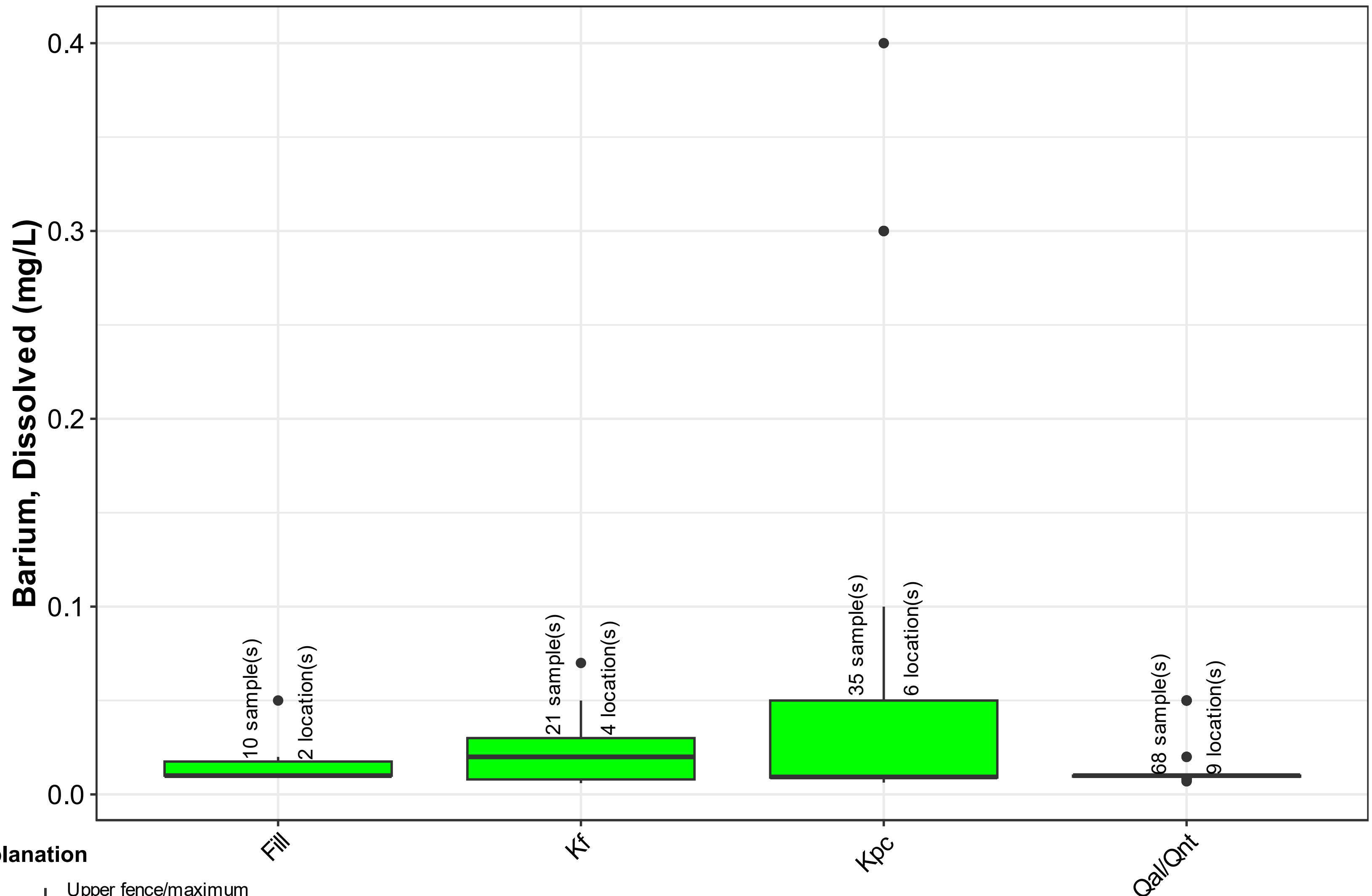
Explanation



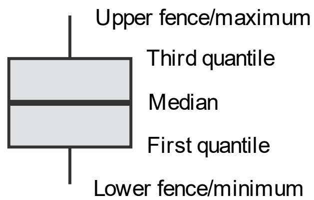
Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Barium

DBS&A
a Geo-Logic Company



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

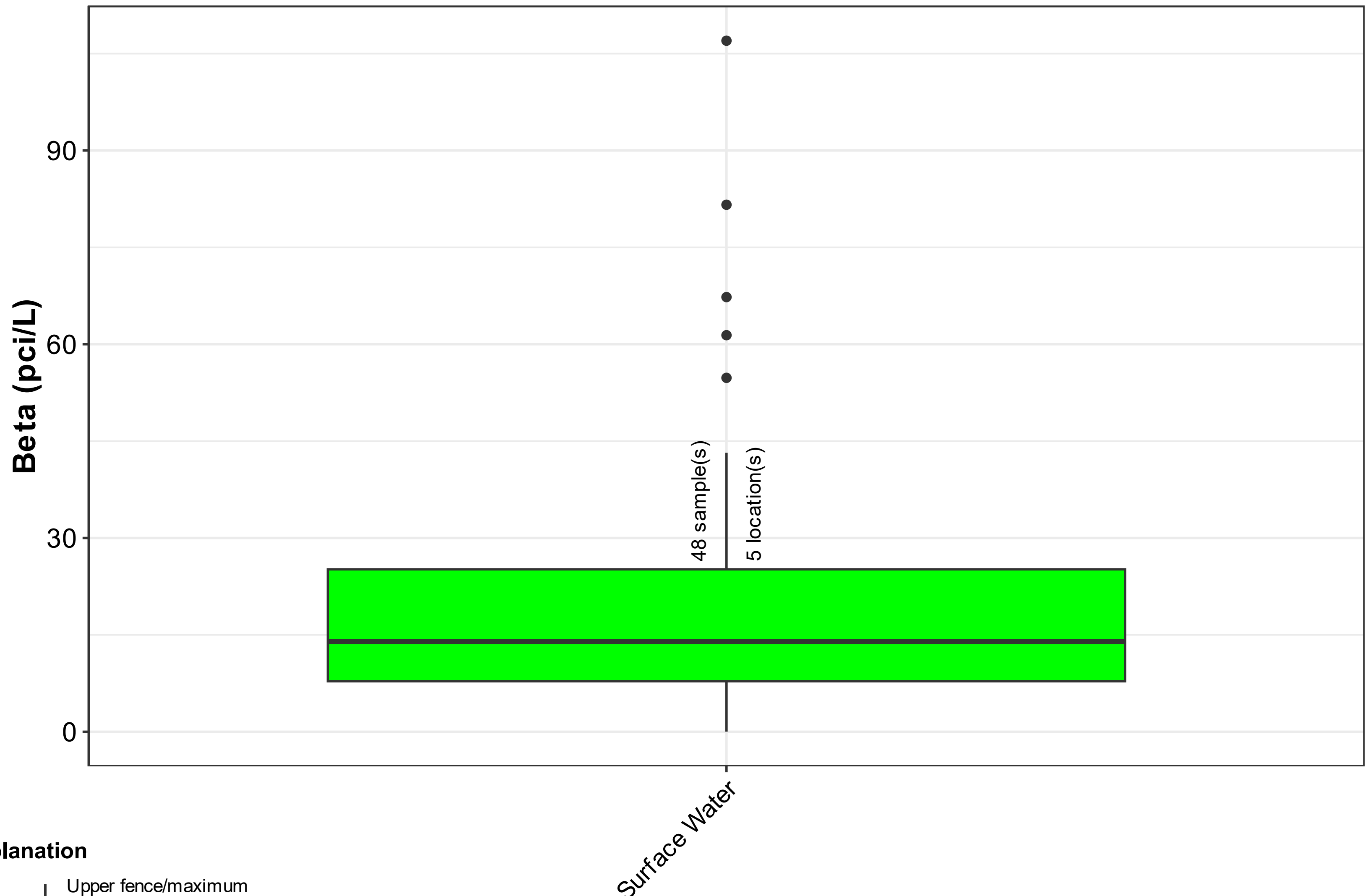
SAN JUAN MINE

Box and Whisker Comparison Plot

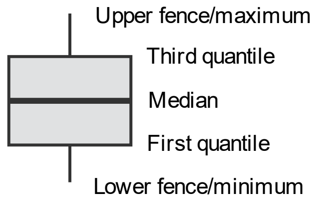
Barium, Dissolved

DBS&A
a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:

1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE

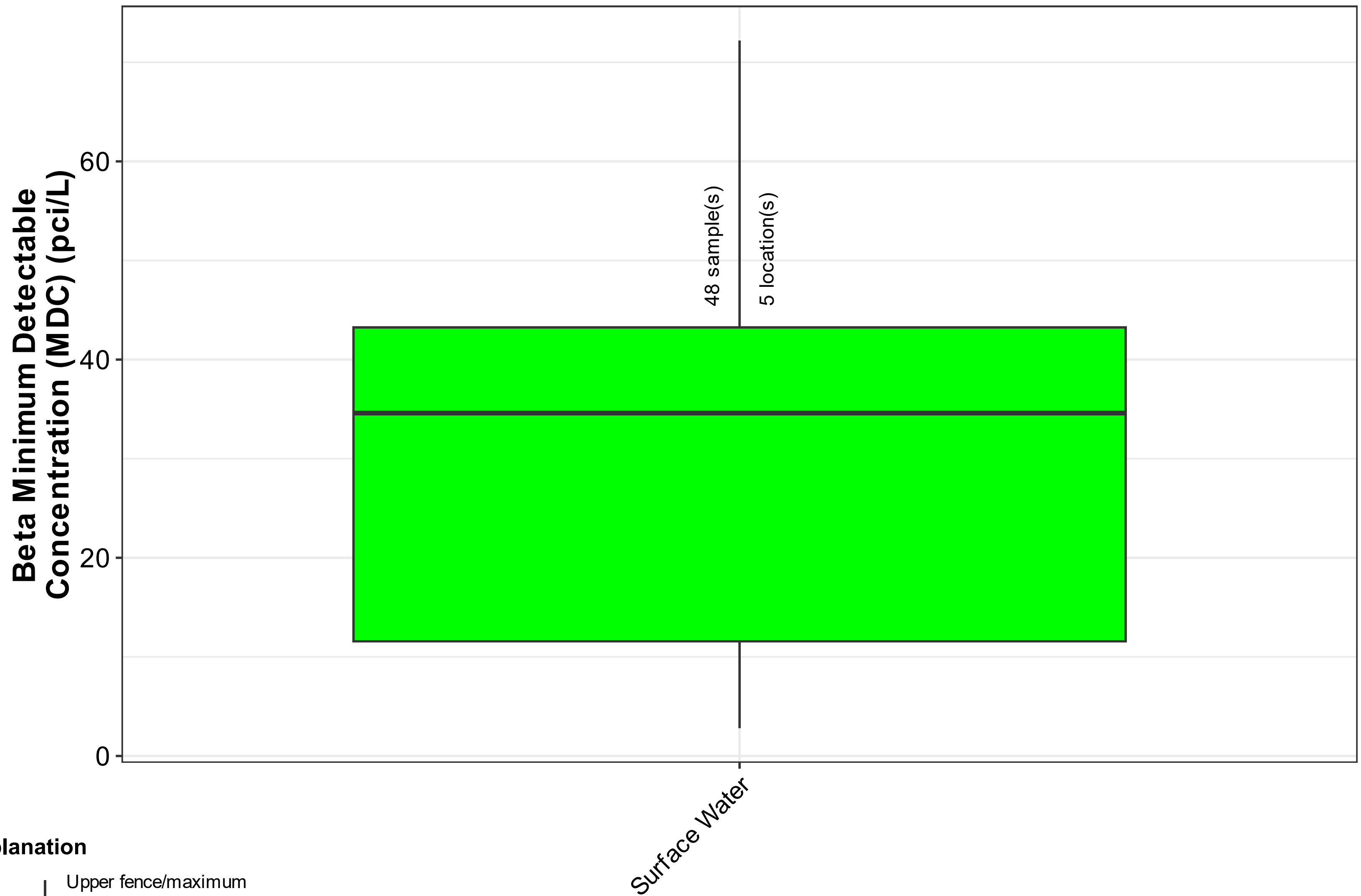
Box and Whisker Comparison Plot

Beta

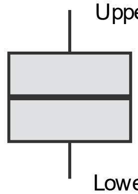
DBS&A a Geo-Logic Company

6/10/2025 DB24.1140

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE

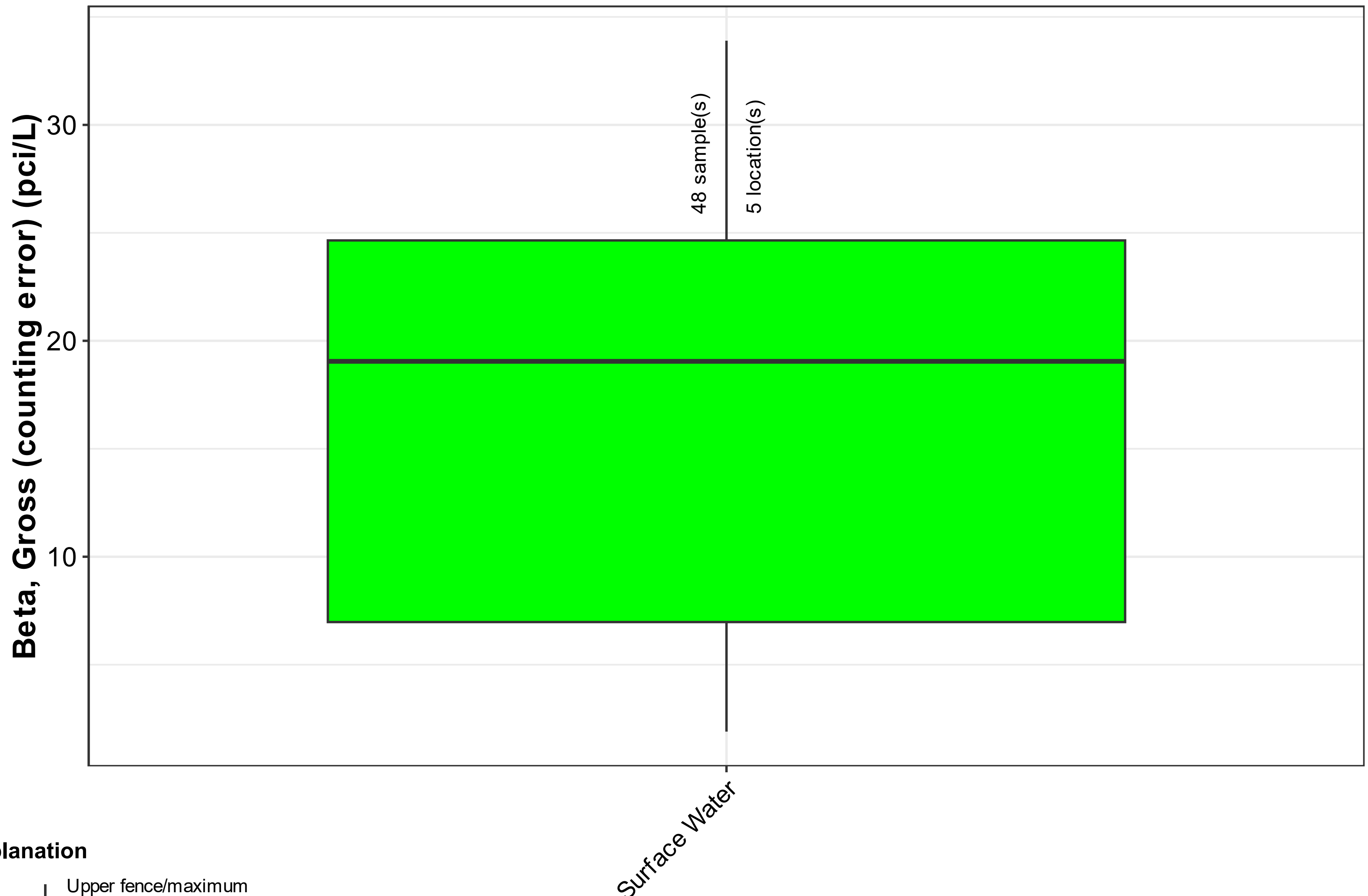
Box and Whisker Comparison Plot

Beta Minimum Detectable Concentration (MDC)

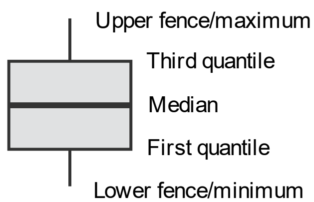
DBS&A a Geo-Logic Company

6/10/2025 DB24.1140

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

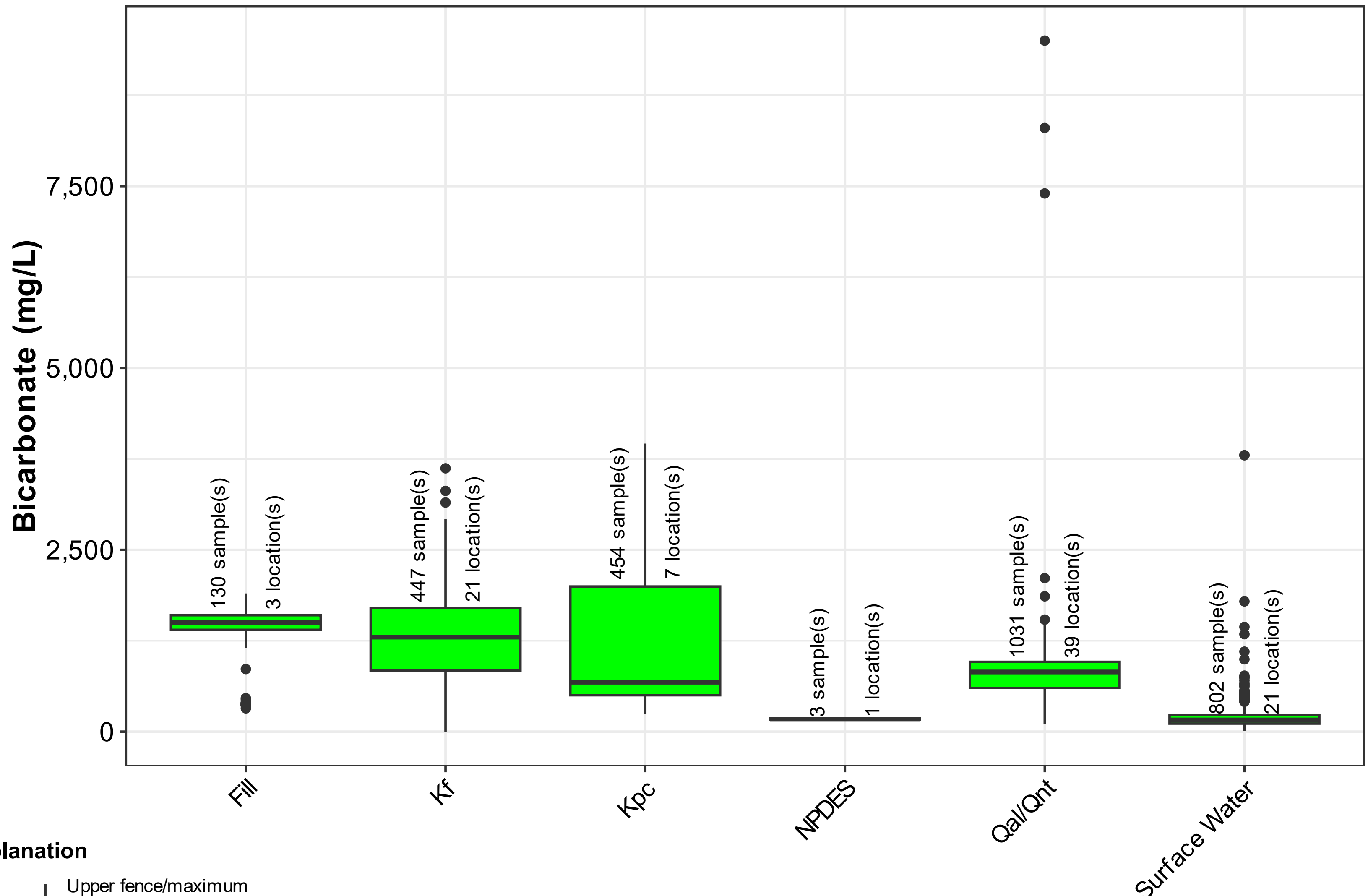
SAN JUAN MINE

Box and Whisker Comparison Plot

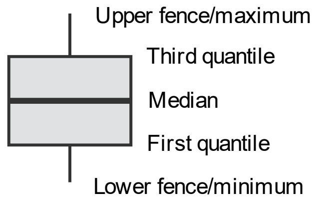
Beta, Gross (counting error)

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



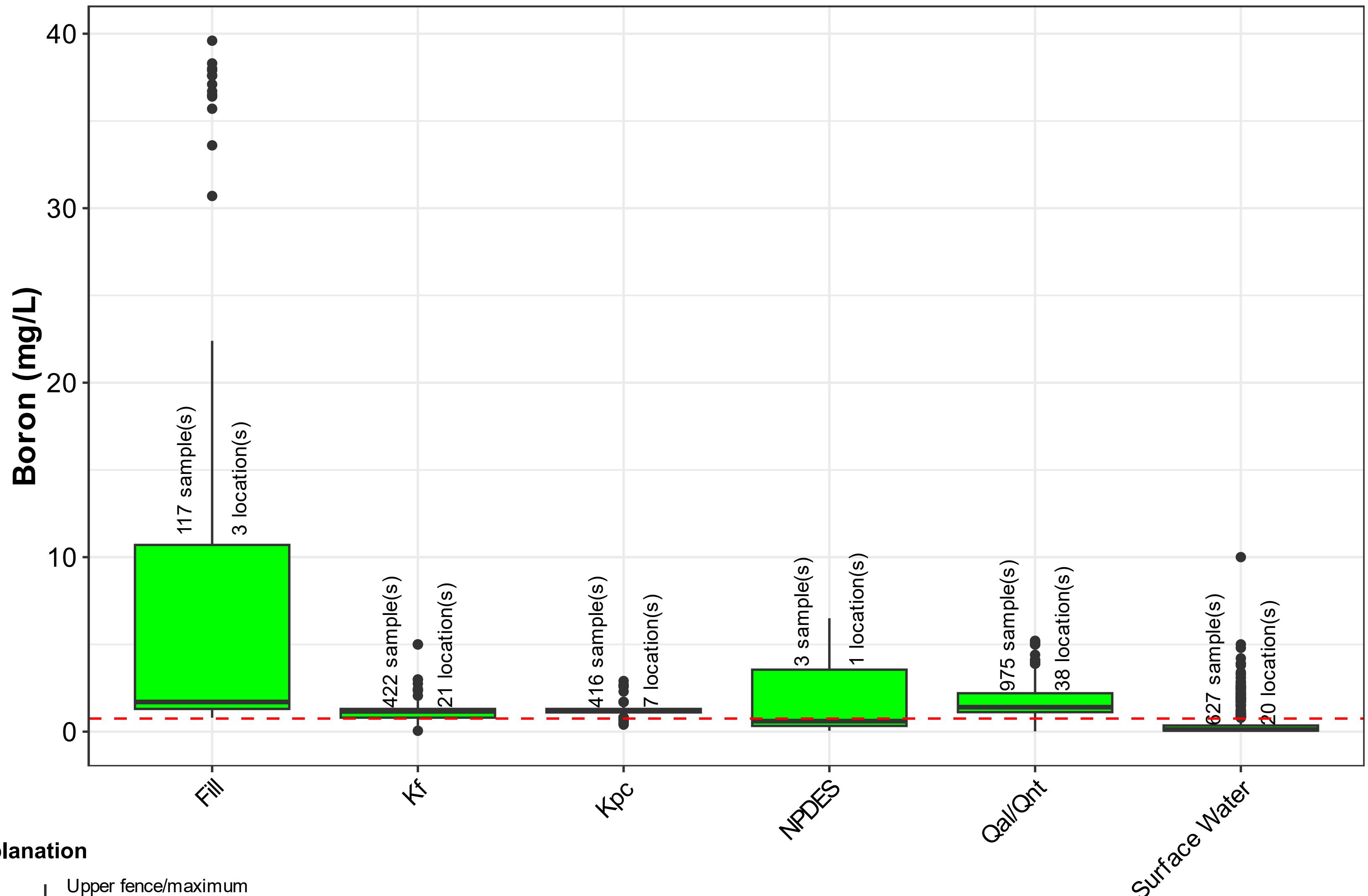
Explanation



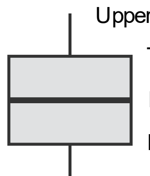
Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Bicarbonate

DBS&A a Geo-Logic Company



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

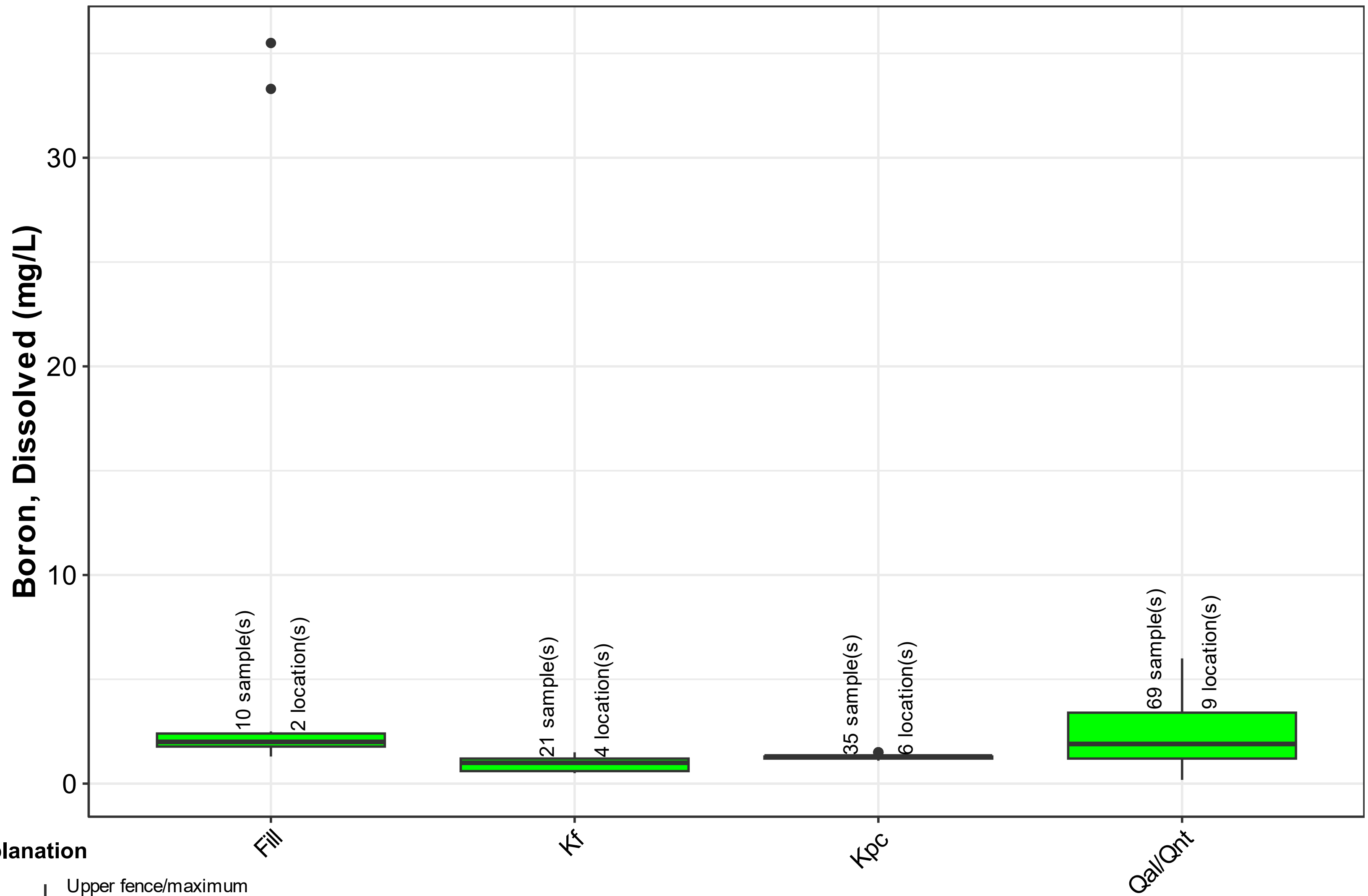
SAN JUAN MINE

Box and Whisker Comparison Plot

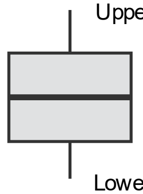
Boron

DBS&A
a Geo-Logic Company

6/10/2025 DB24.1140



Explanation

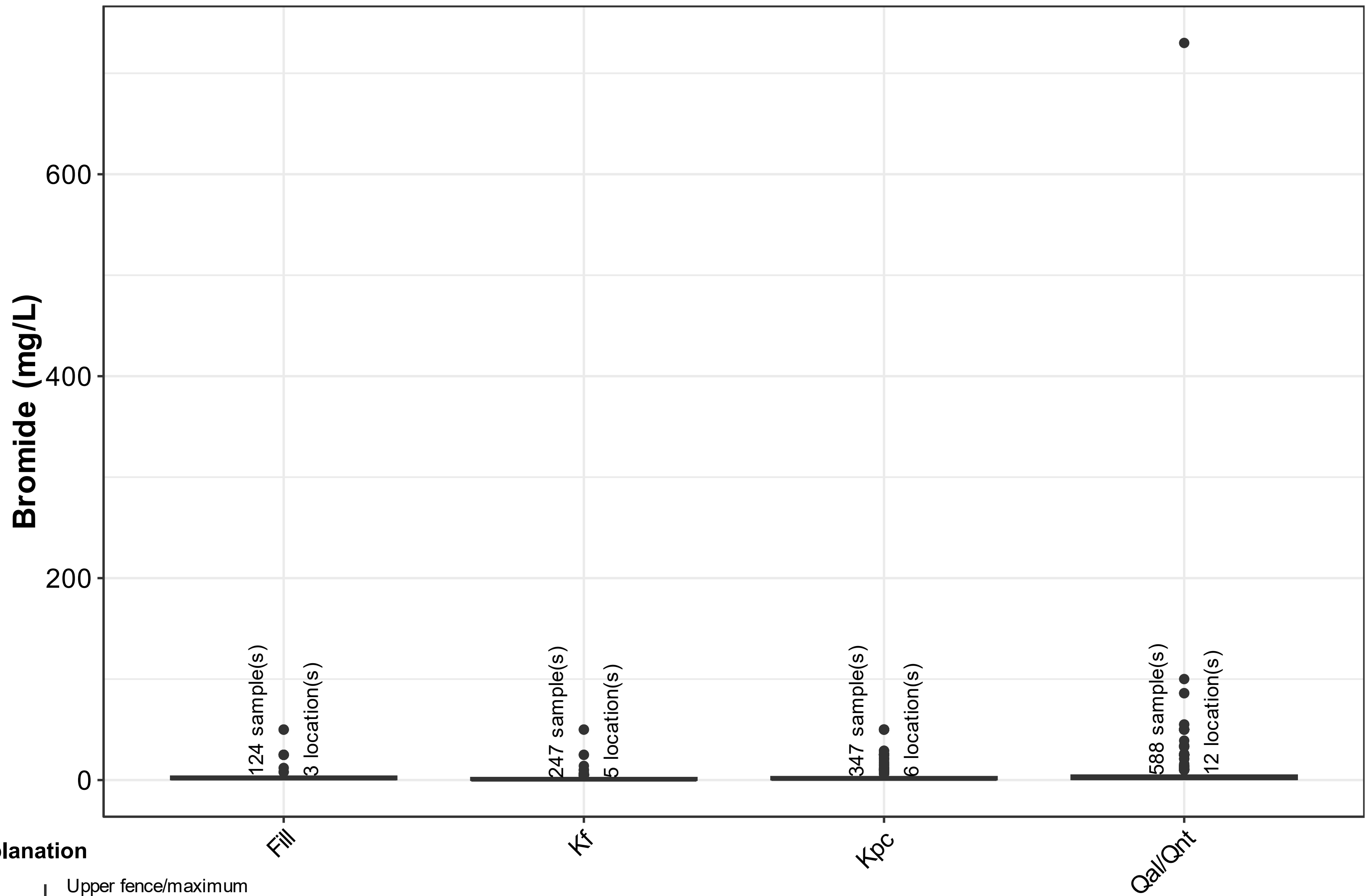


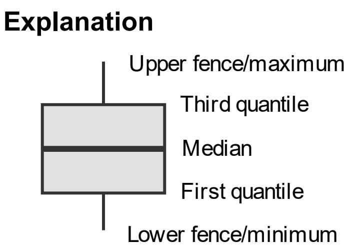
Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Boron, Dissolved

DBS&A
a Geo-Logic Company

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm





Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
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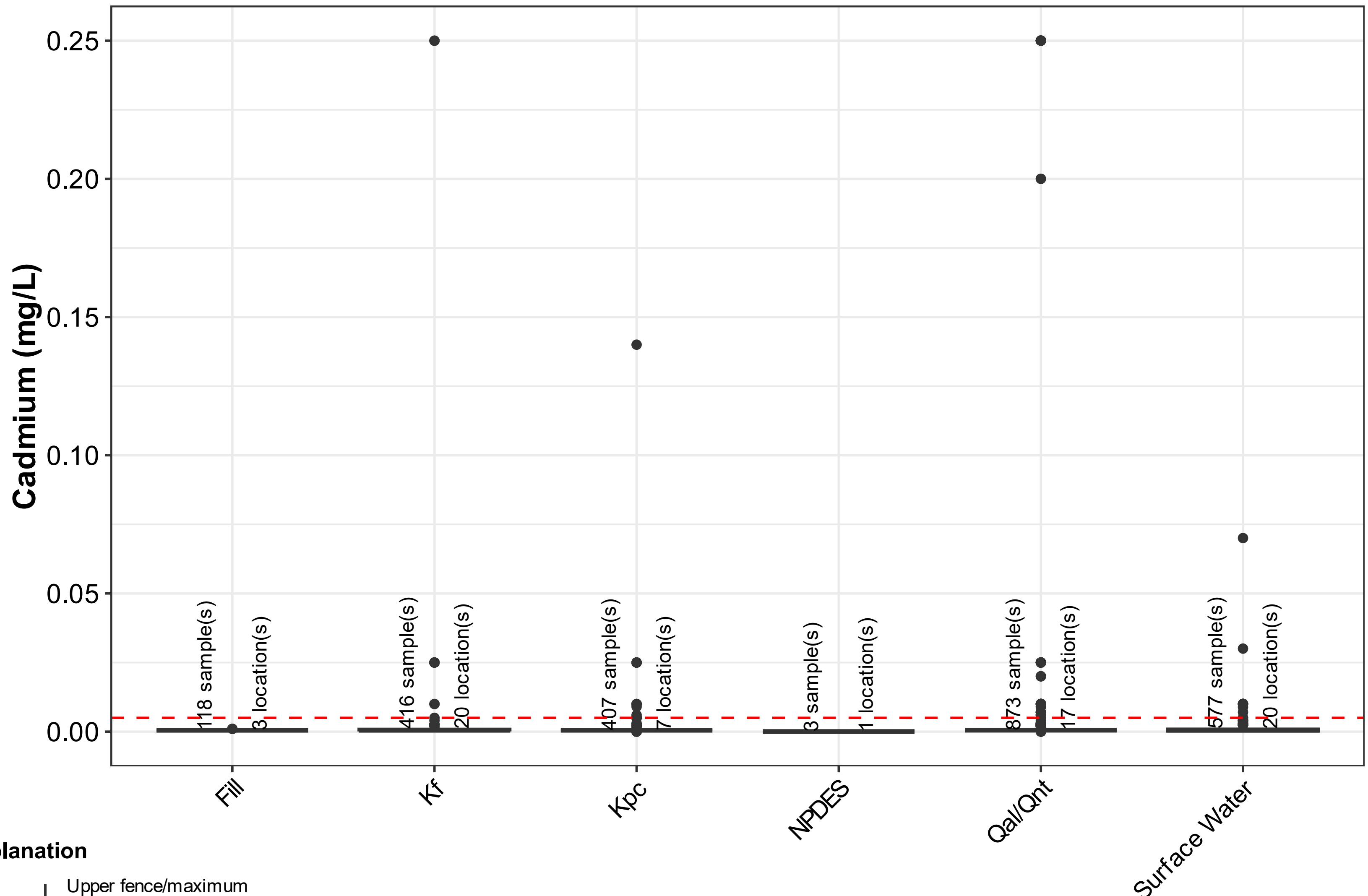
4. Outlier values shown as points.

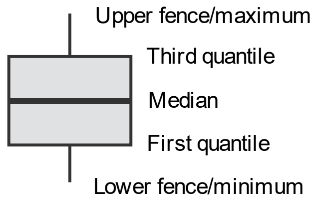
SAN JUAN MINE
Box and Whisker Comparison Plot
Bromide

DBS&A
a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
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4. Outlier values shown as points.

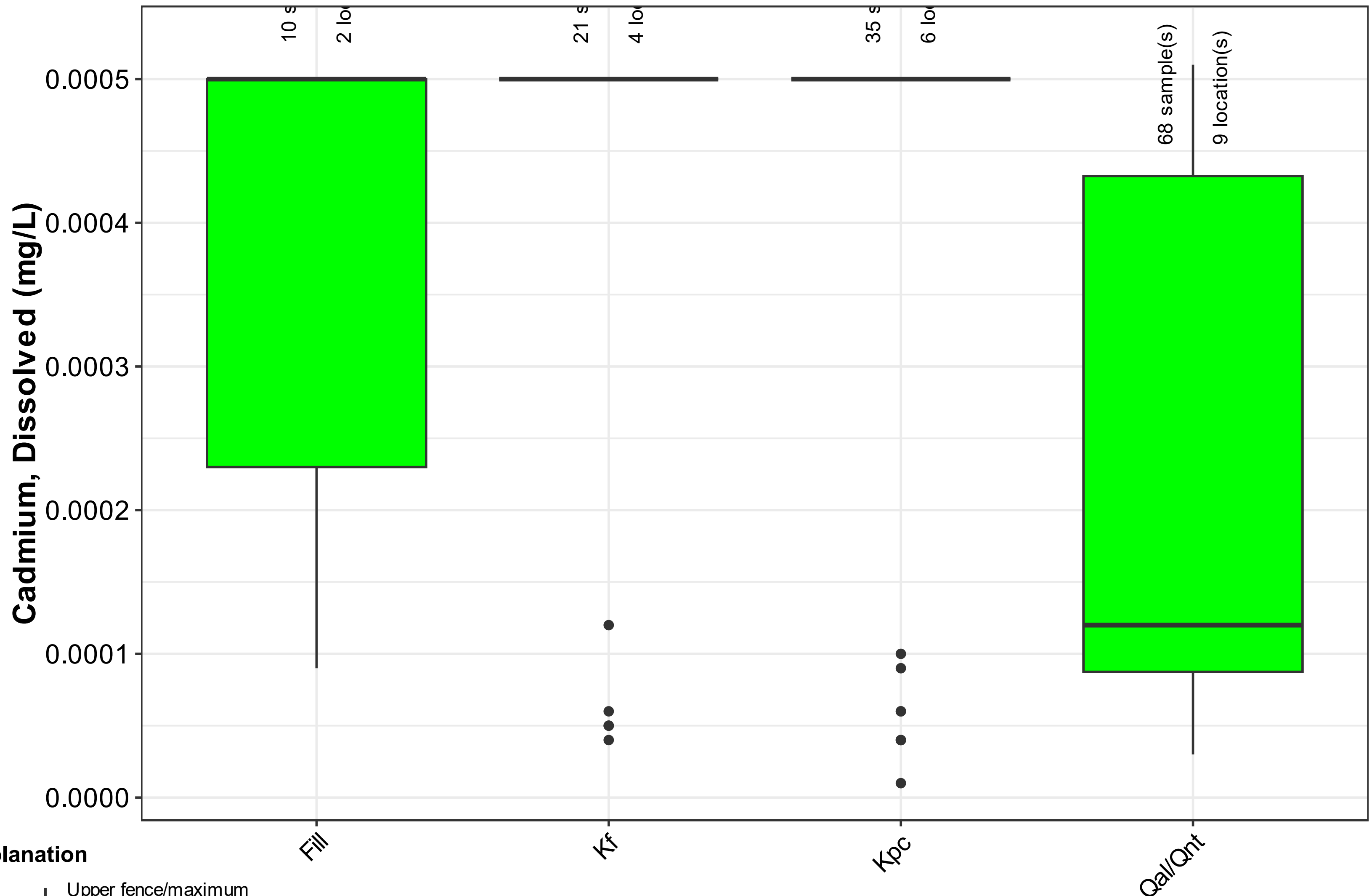
SAN JUAN MINE

Box and Whisker Comparison Plot

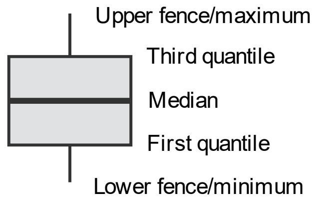
Cadmium

DBS&A
a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
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4. Outlier values shown as points.

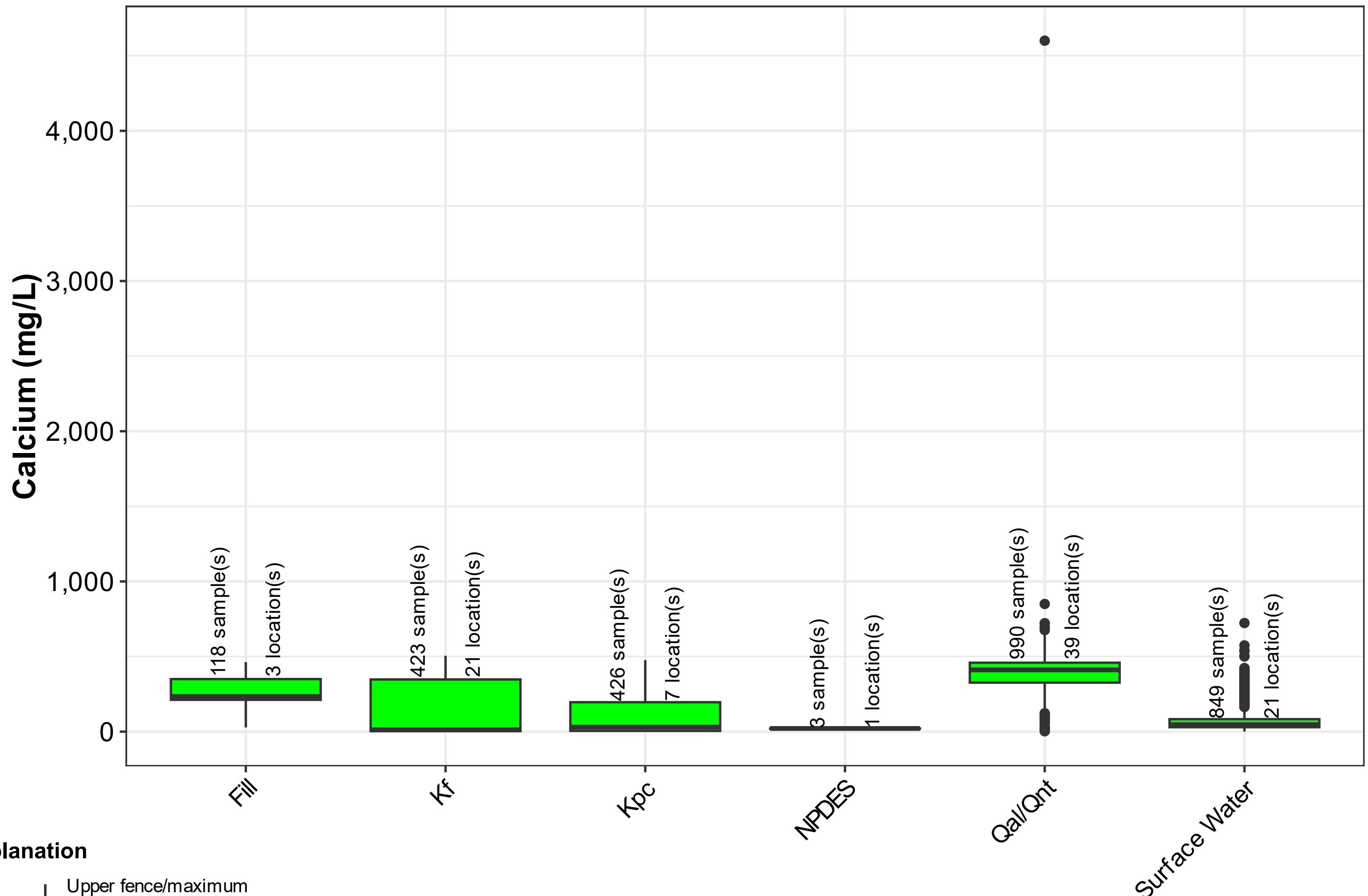
SAN JUAN MINE

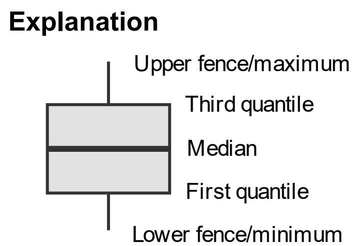
Box and Whisker Comparison Plot

Cadmium, Dissolved

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140





Notes:
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2. Non-detect values approximated as 1/2 the detection limit.
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4. Outlier values shown as points.

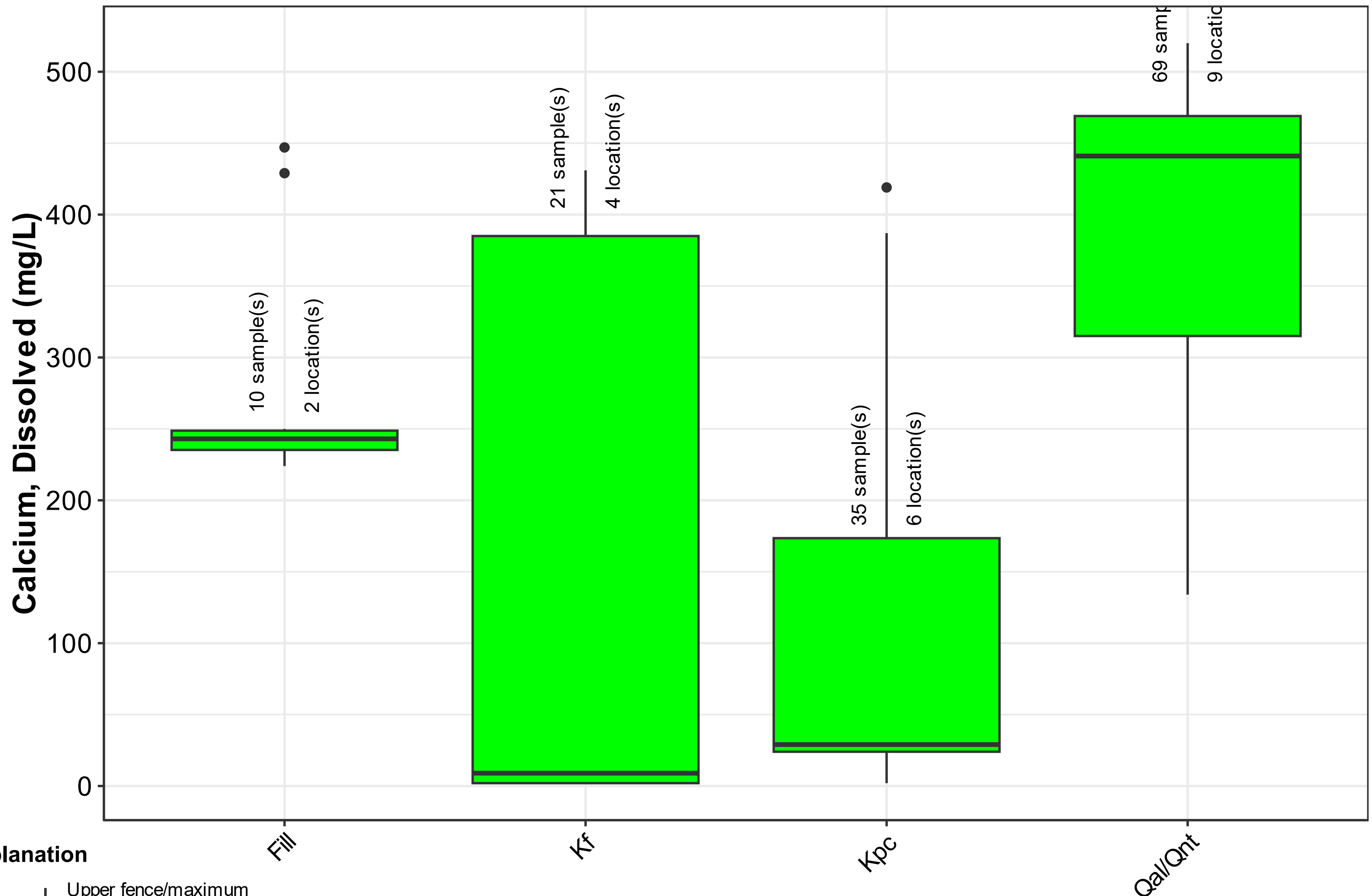
SAN JUAN MINE

Box and Whisker Comparison Plot

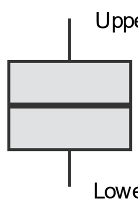
Calcium

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:
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2. Non-detect values approximated as 1/2 the detection limit.
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SAN JUAN MINE

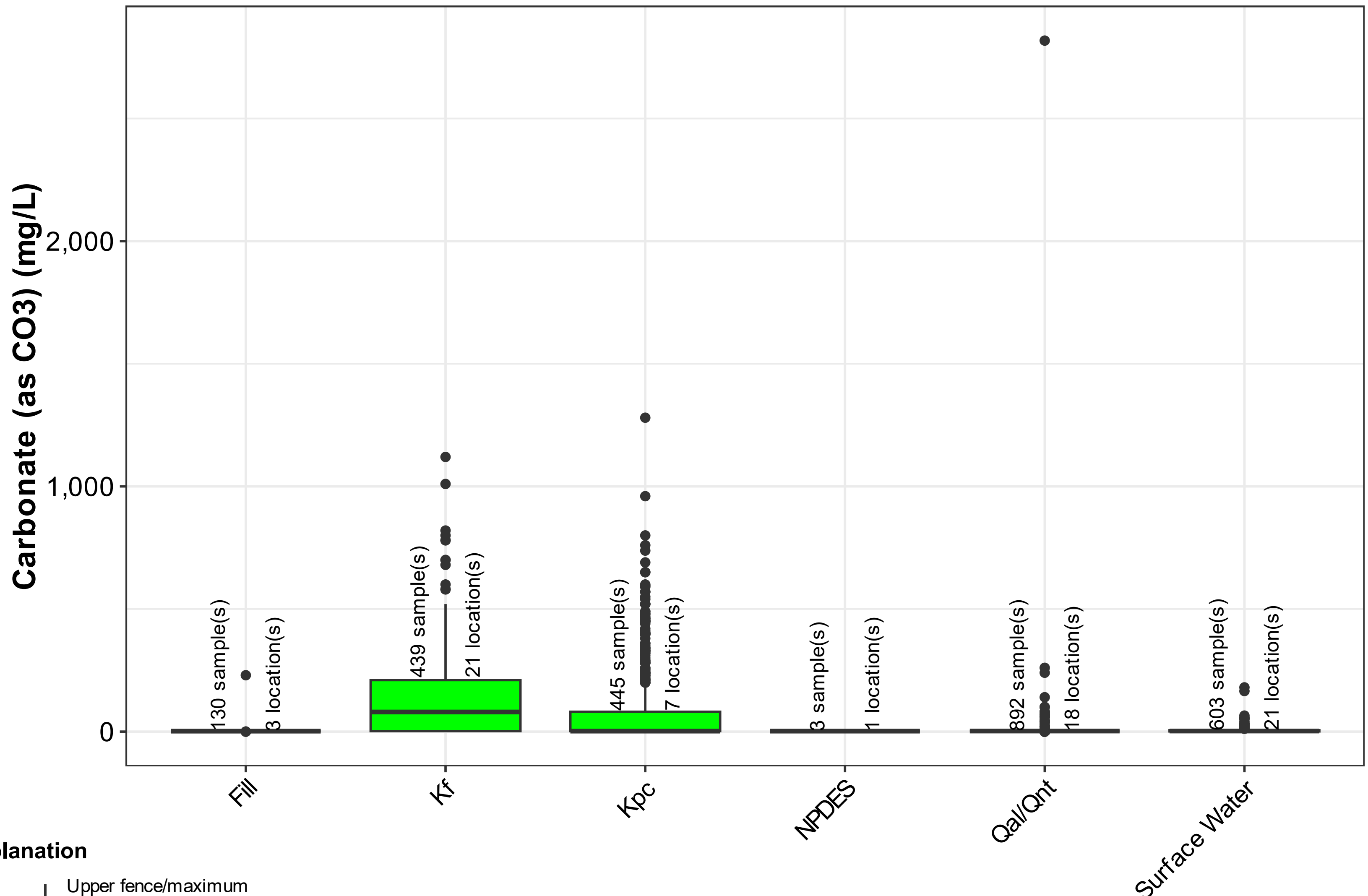
Box and Whisker Comparison Plot

Calcium, Dissolved

DBS&A
a Geo-Logic Company

6/10/2025 DB24.1140

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm



Explanation

Upper fence/maximum
Third quantile
Median
First quantile
Lower fence/minimum

Notes:
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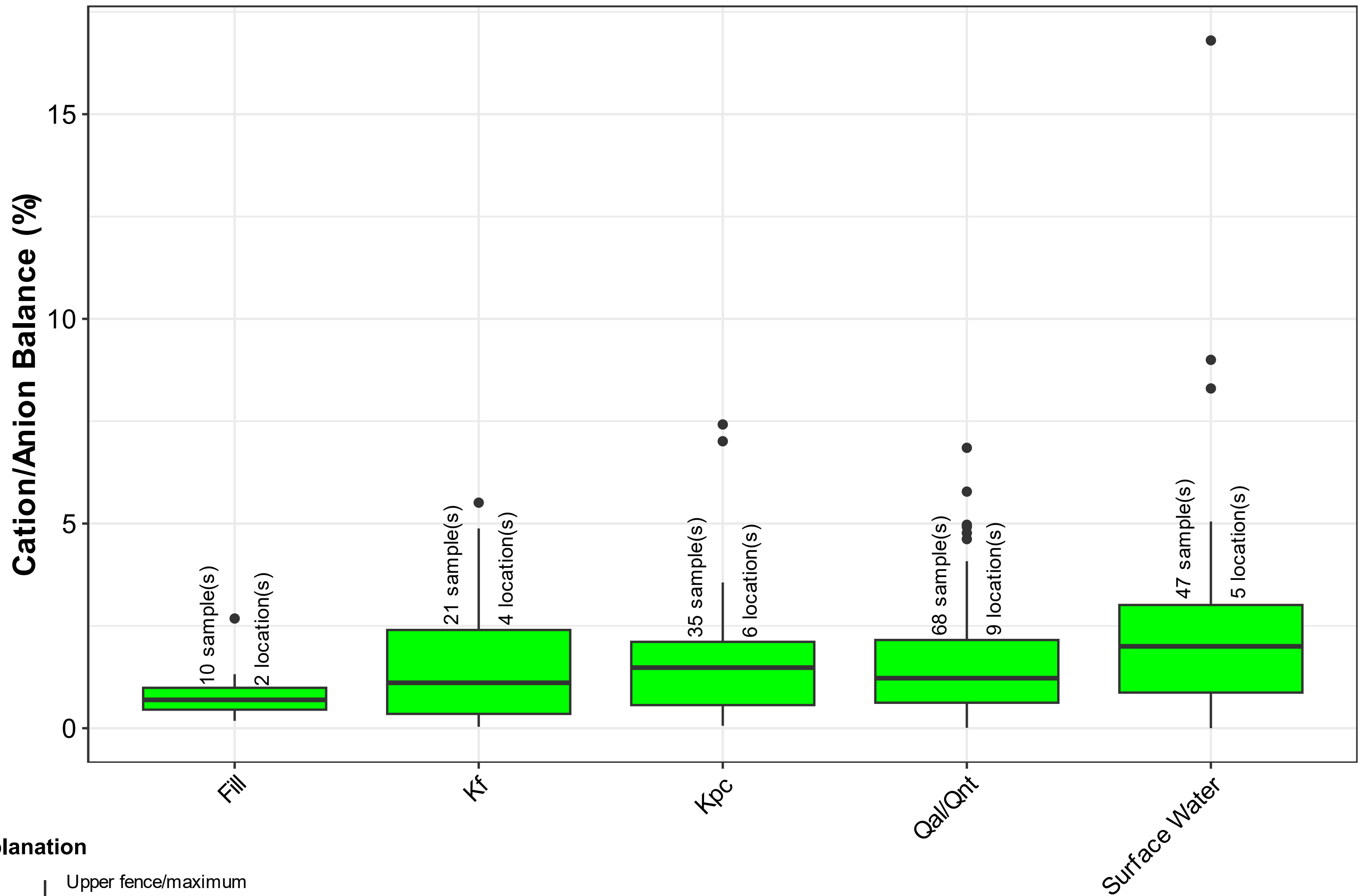
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Carbonate (as CO3)

DBS&A
a Geo-Logic Company
6/10/2025 DB24.1140



Explanation

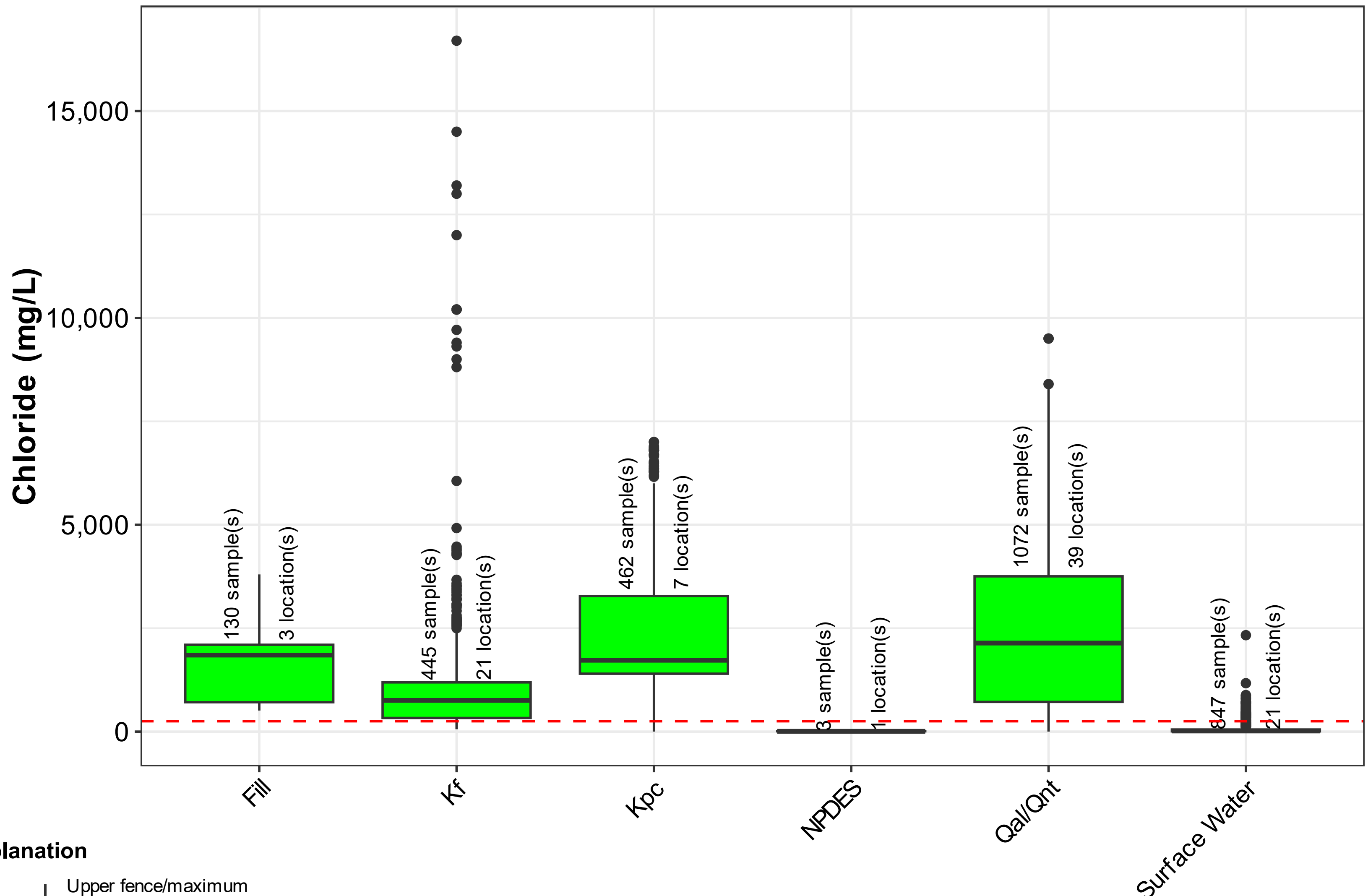
Upper fence/maximum
Third quantile
Median
First quantile
Lower fence/minimum

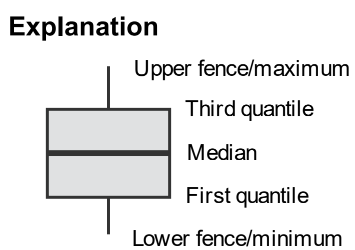
Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Cation/Anion Balance

DBS&A
a Geo-Logic Company

6/10/2025 DB24.1140





Notes:

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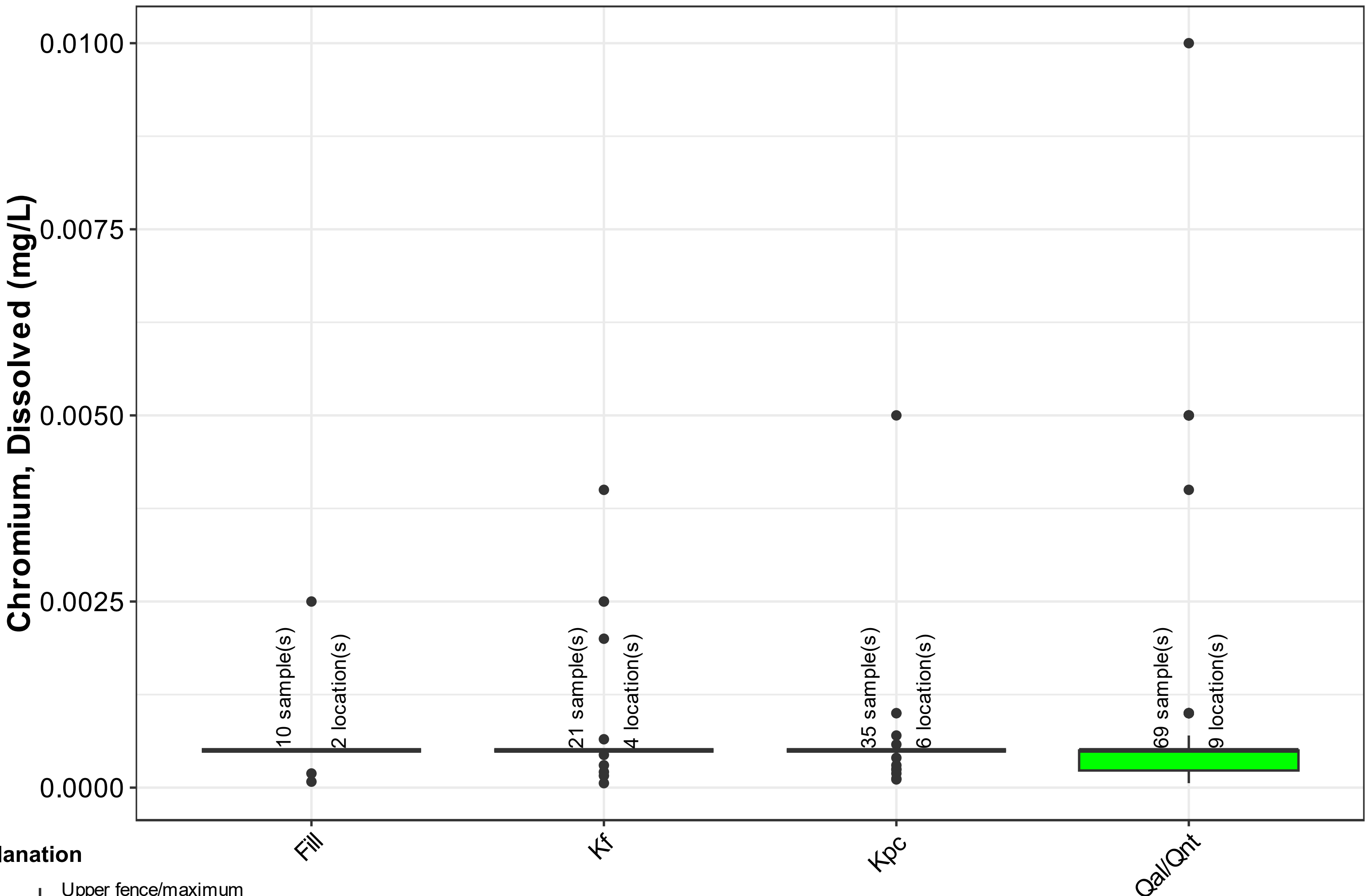
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

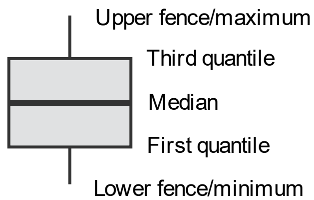
SAN JUAN MINE
Box and Whisker Comparison Plot
Chloride

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

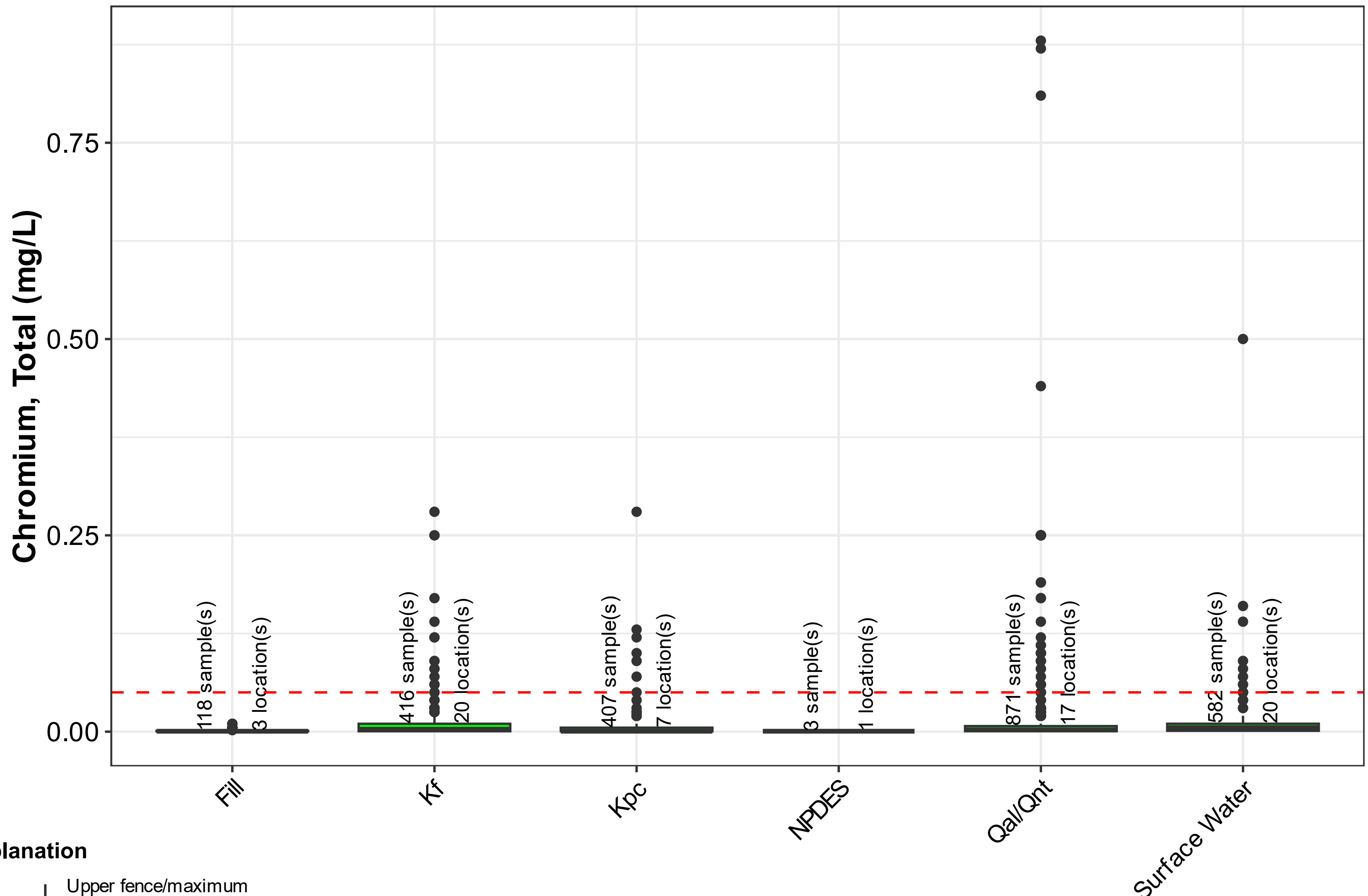
SAN JUAN MINE

Box and Whisker Comparison Plot

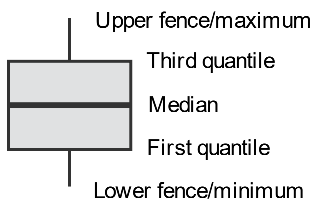
Chromium, Dissolved

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE

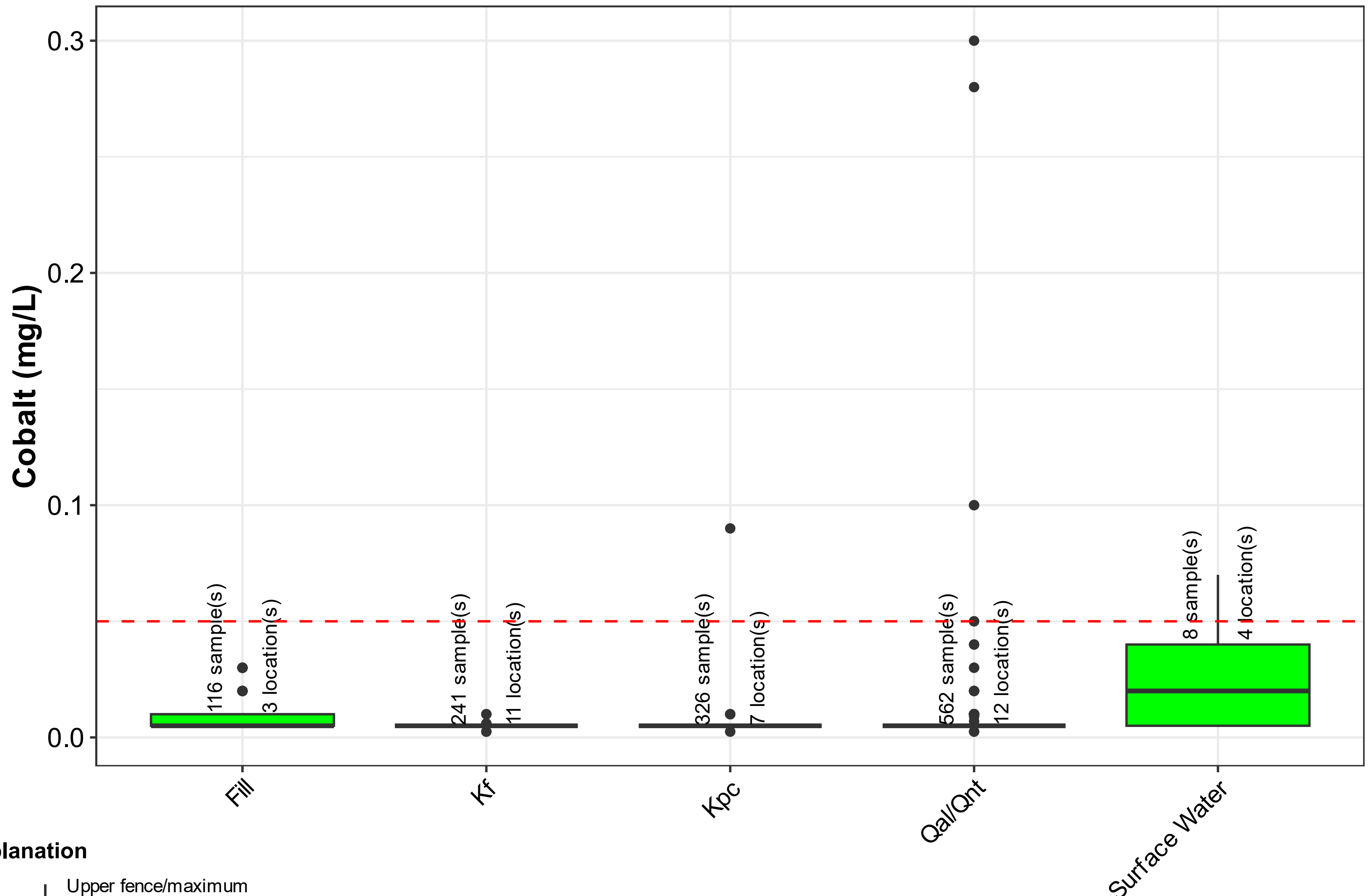
Box and Whisker Comparison Plot

Chromium, Total

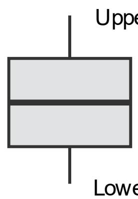
DBS&A
a Geo-Logic Company

6/10/2025 DB24.1140

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm



Explanation



Notes:
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2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

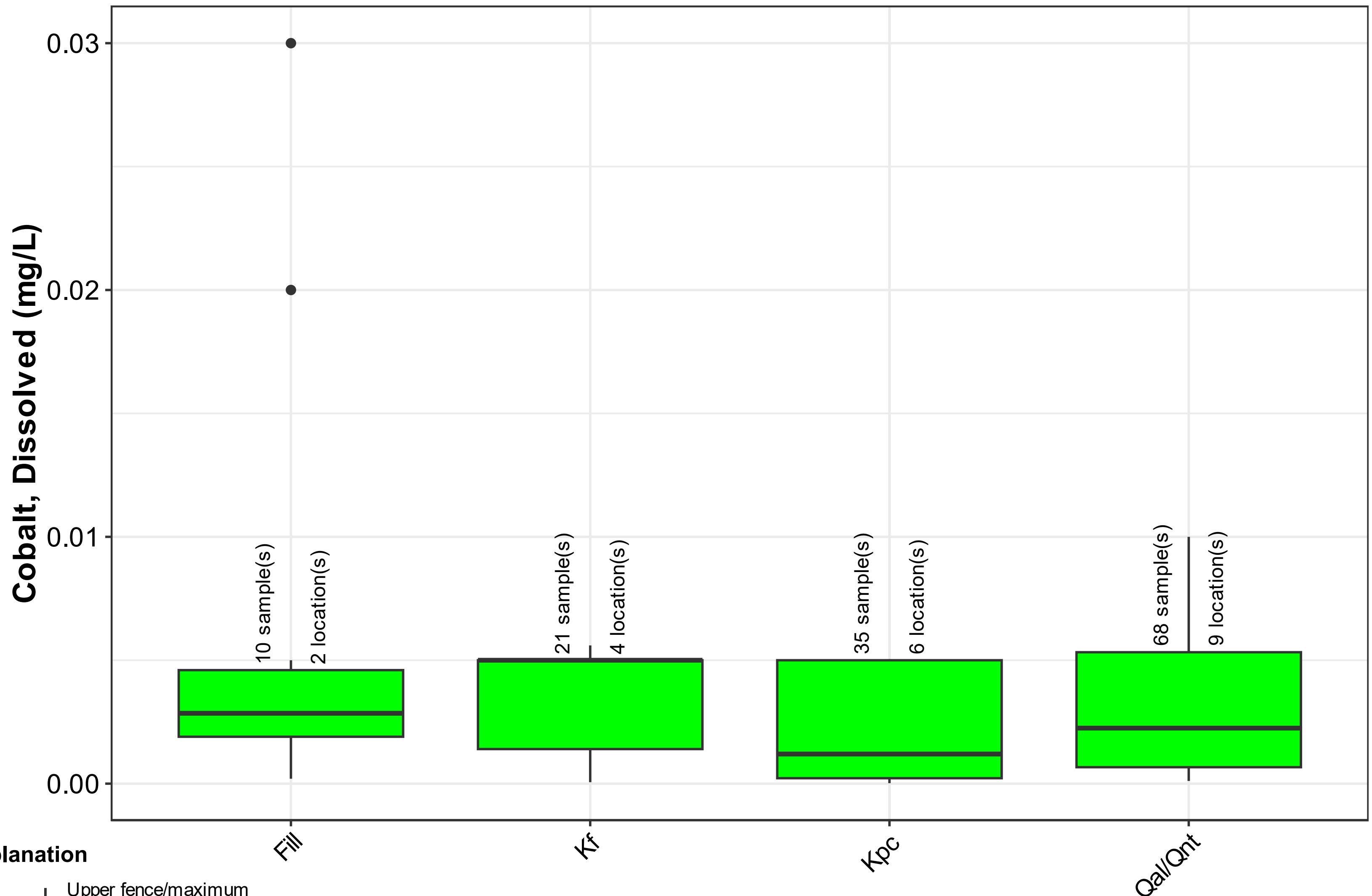
SAN JUAN MINE

Box and Whisker Comparison Plot

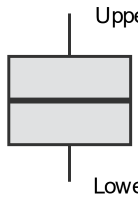
Cobalt

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation

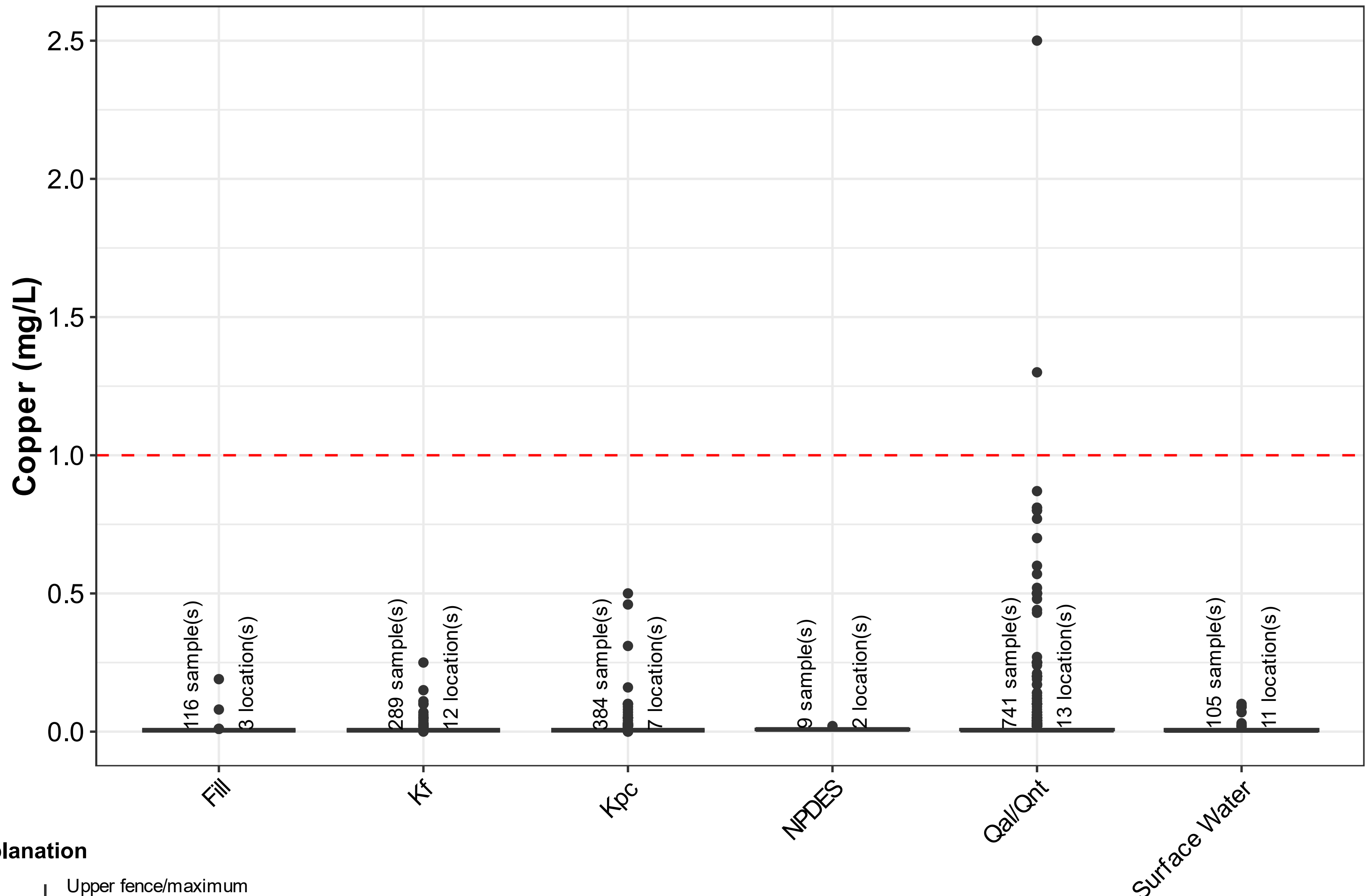


Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

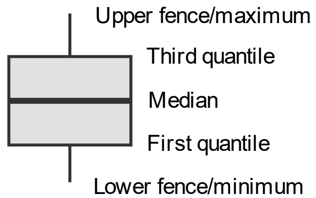
SAN JUAN MINE

Box and Whisker Comparison Plot

Cobalt, Dissolved



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

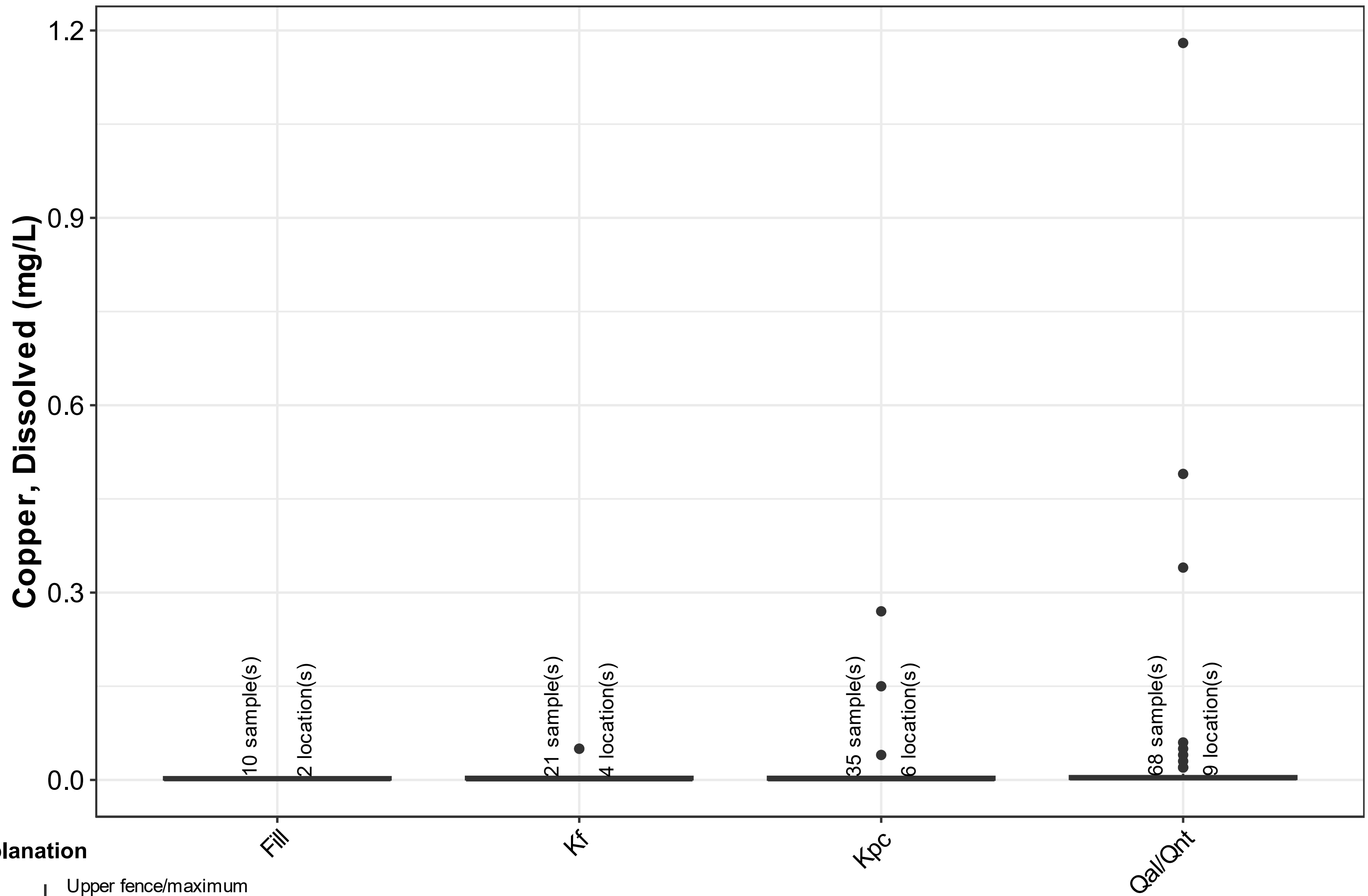
SAN JUAN MINE

Box and Whisker Comparison Plot

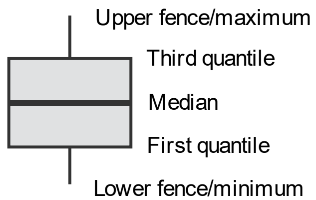
Copper

DBS&A
a Geo-Logic Company

6/10/2025 DB24.1140



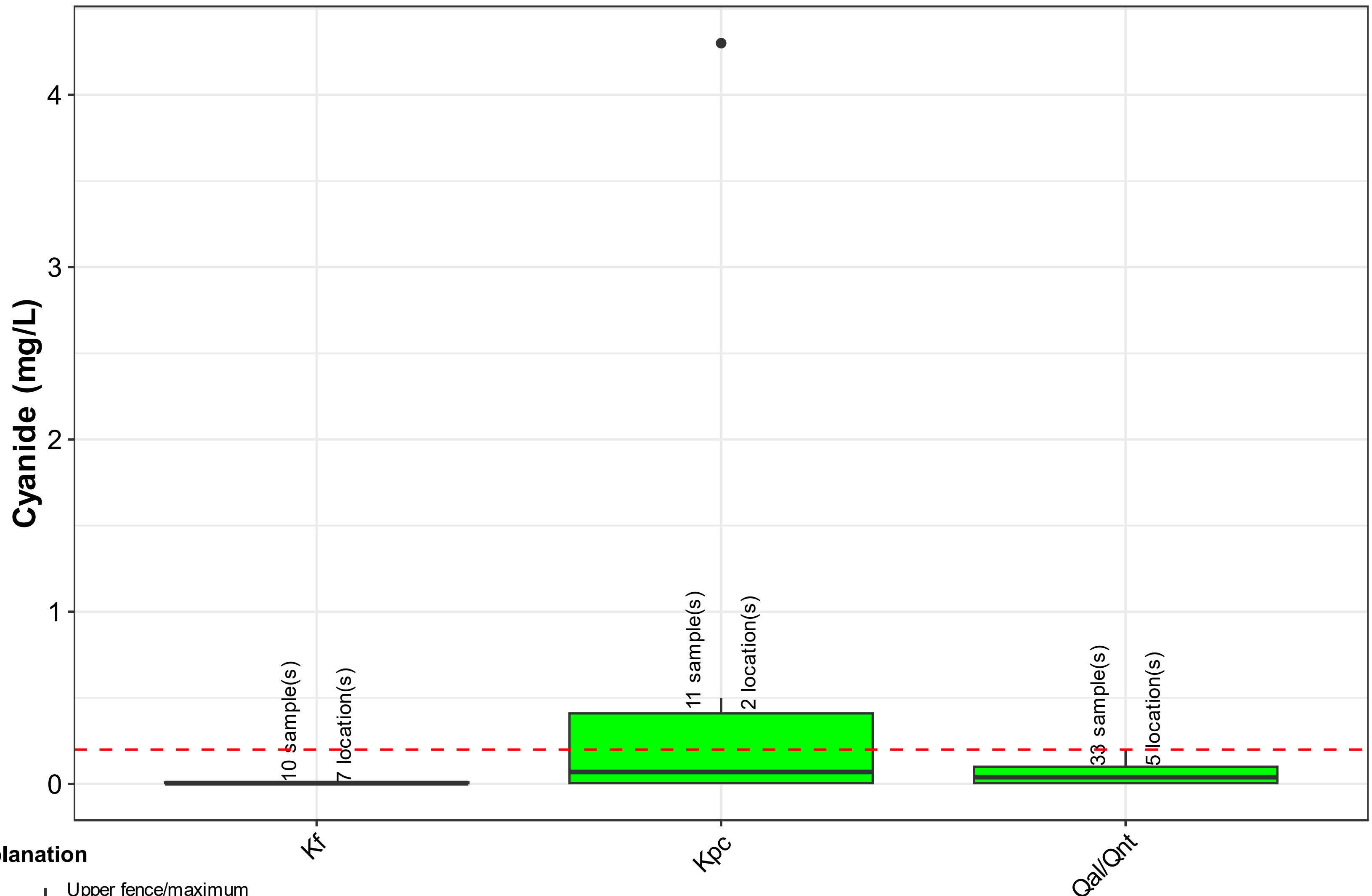
Explanation



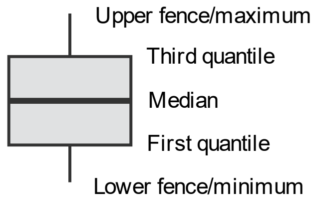
Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Copper, Dissolved

DBS&A
a Geo-Logic Company



Explanation

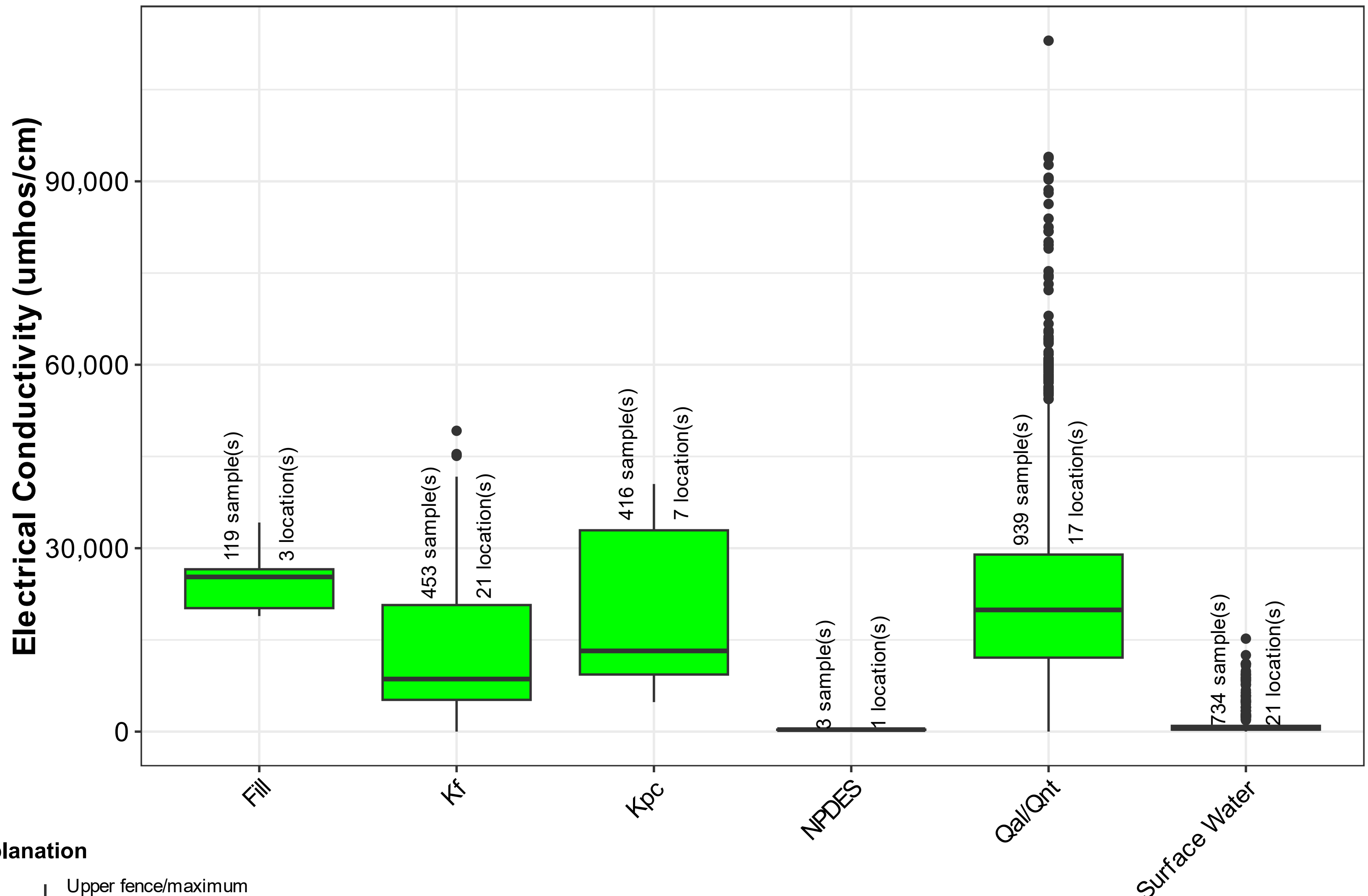


Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

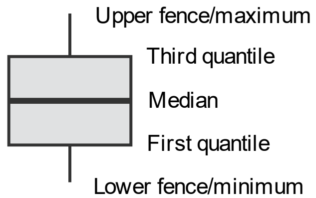
SAN JUAN MINE
Box and Whisker Comparison Plot
Cyanide

DBS&A
a Geo-Logic Company

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm



Explanation



Notes:
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4. Outlier values shown as points.

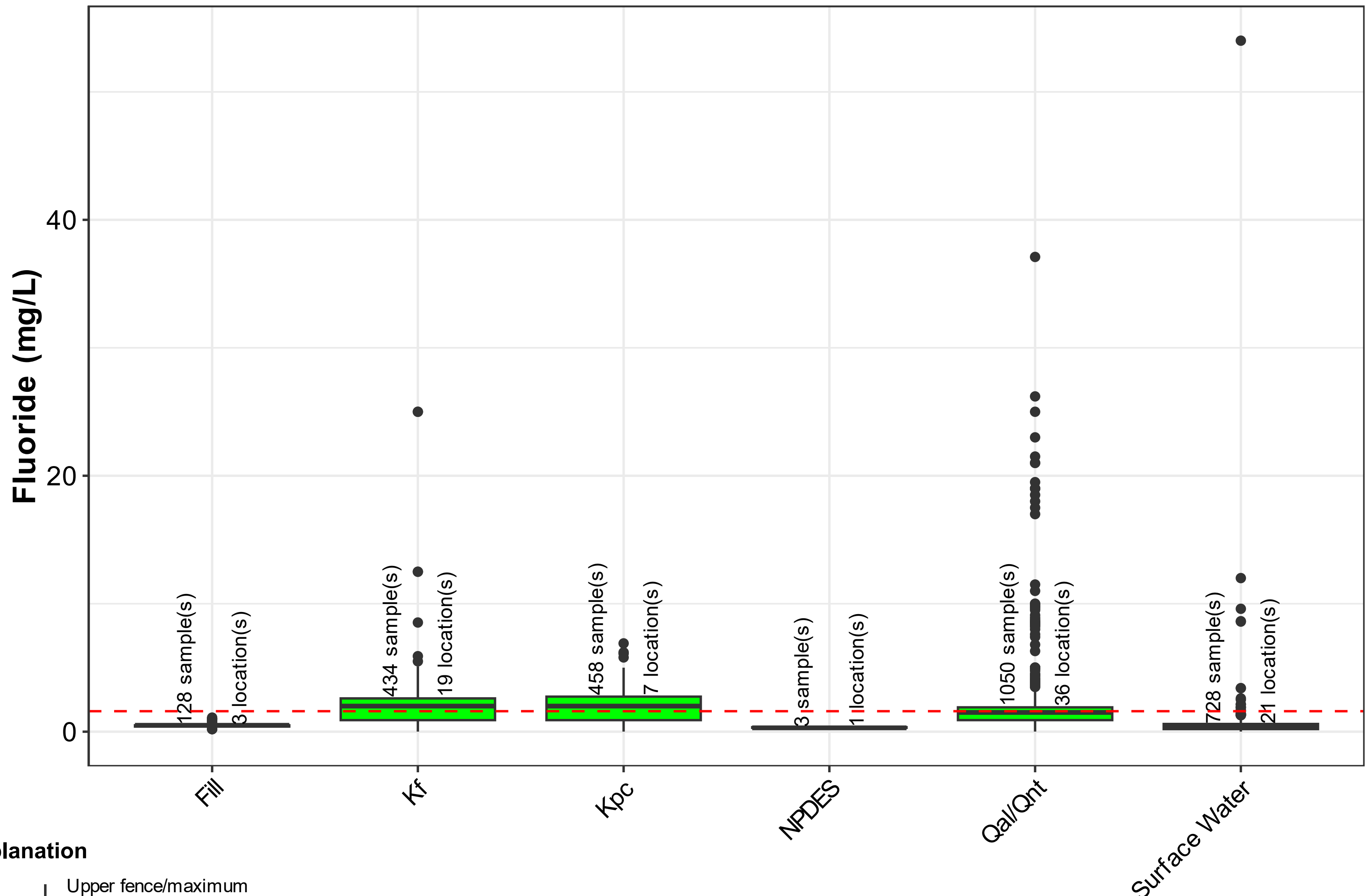
SAN JUAN MINE

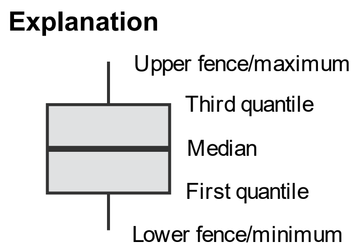
Box and Whisker Comparison Plot

Electrical Conductivity

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140





Notes:
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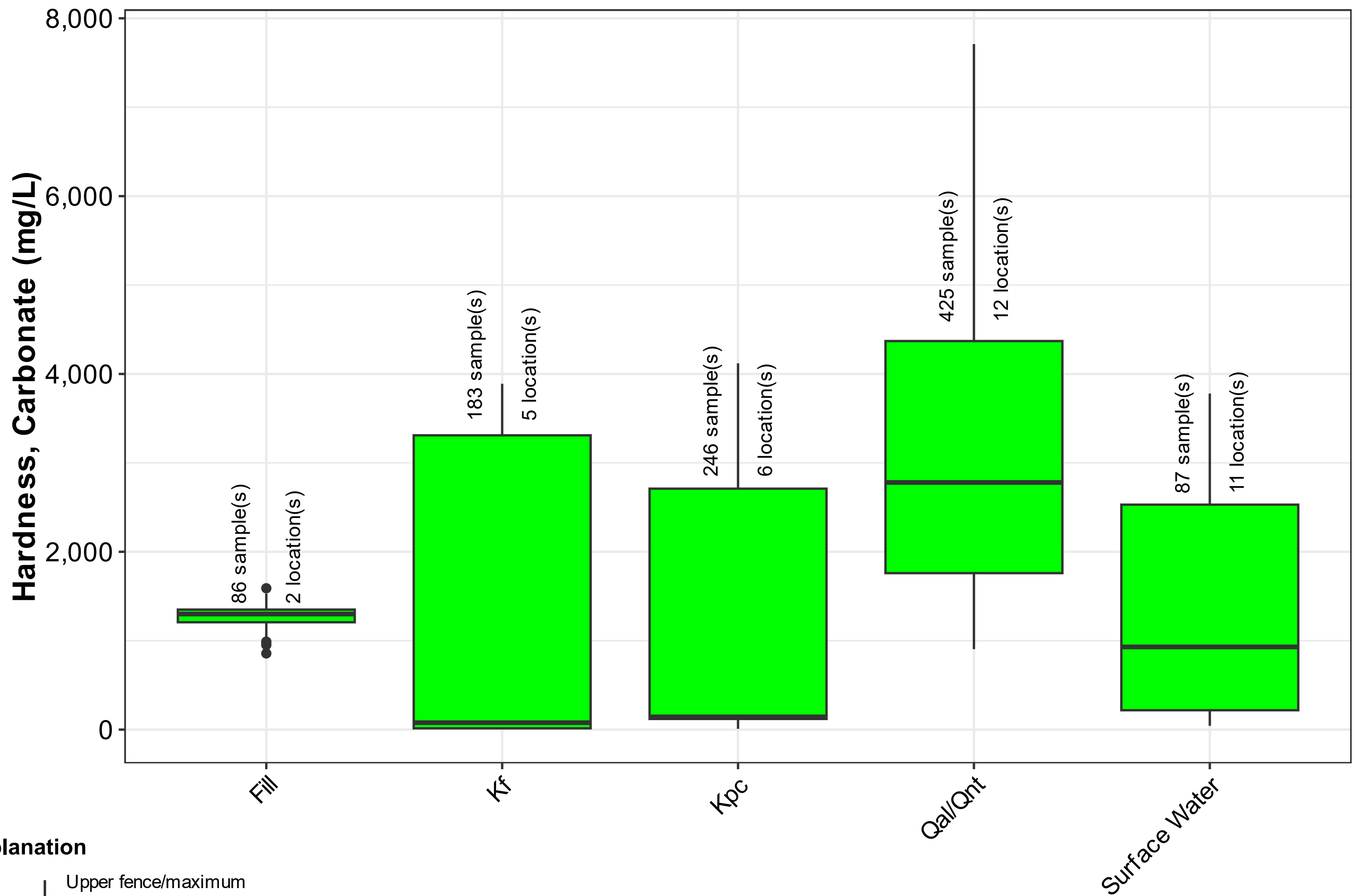
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Fluoride

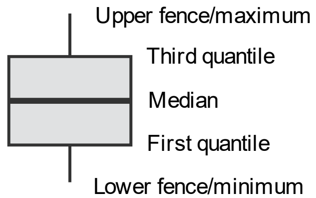
DBS&A a Geo-Logic Company

6/10/2025 DB24.1140

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm



Explanation



Notes:
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3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

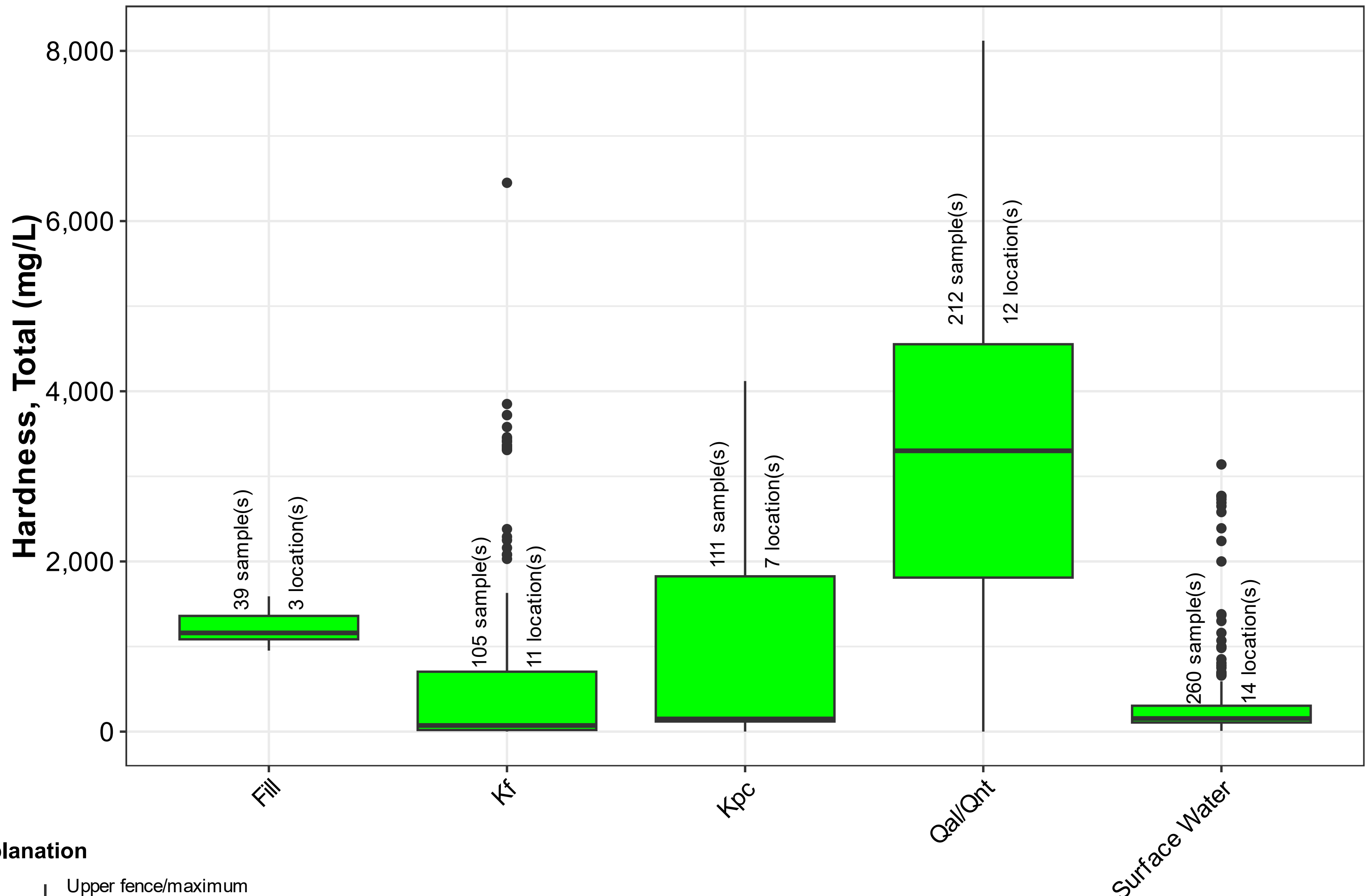
SAN JUAN MINE

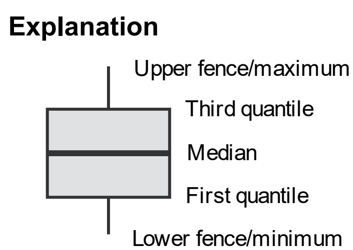
Box and Whisker Comparison Plot

Hardness, Carbonate

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140





Notes:
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4. Outlier values shown as points.

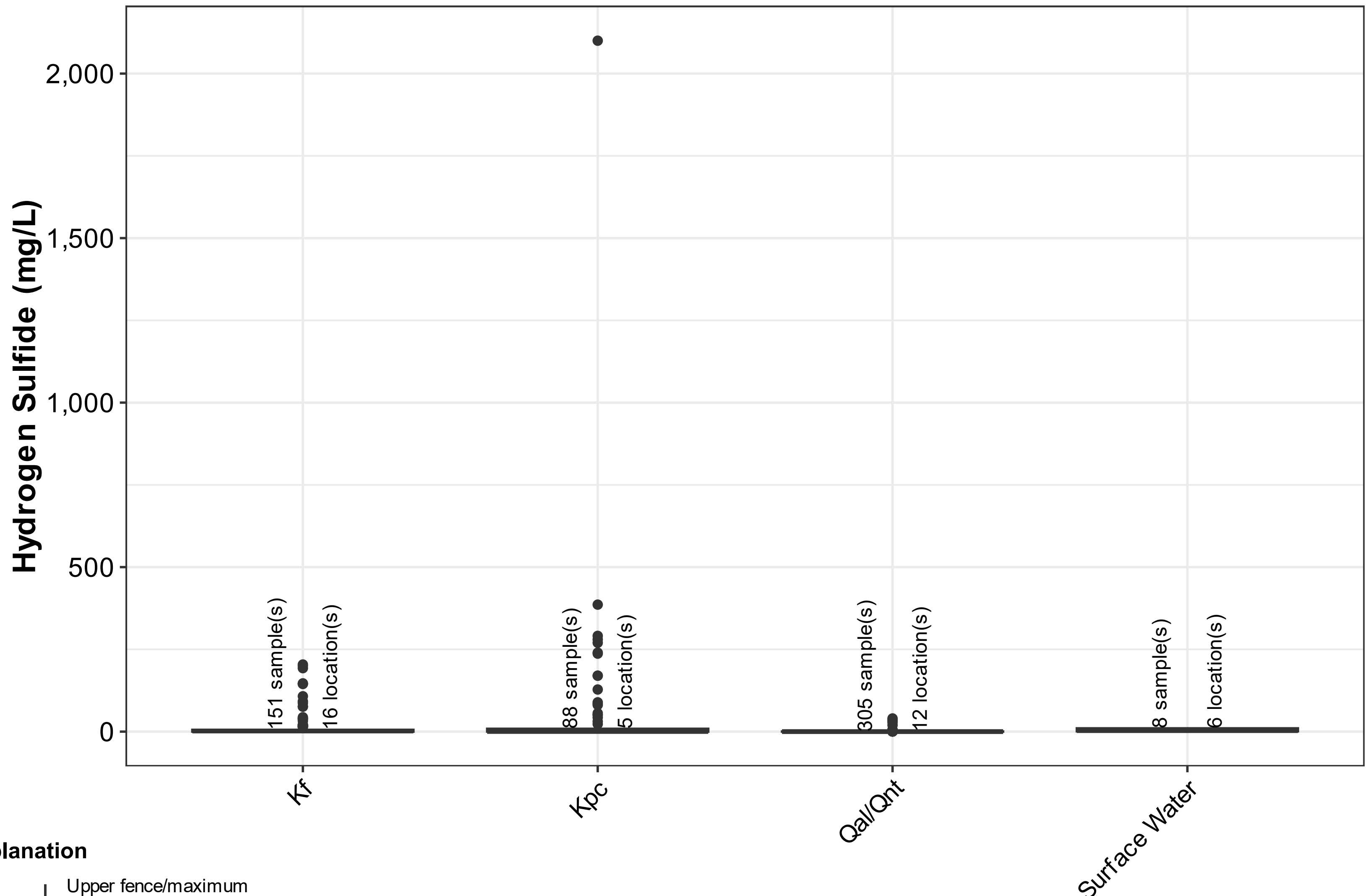
SAN JUAN MINE

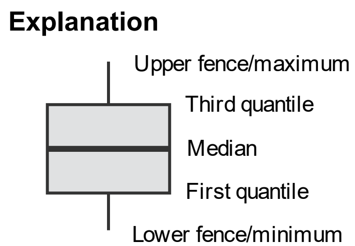
Box and Whisker Comparison Plot

Hardness, Total

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140





Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
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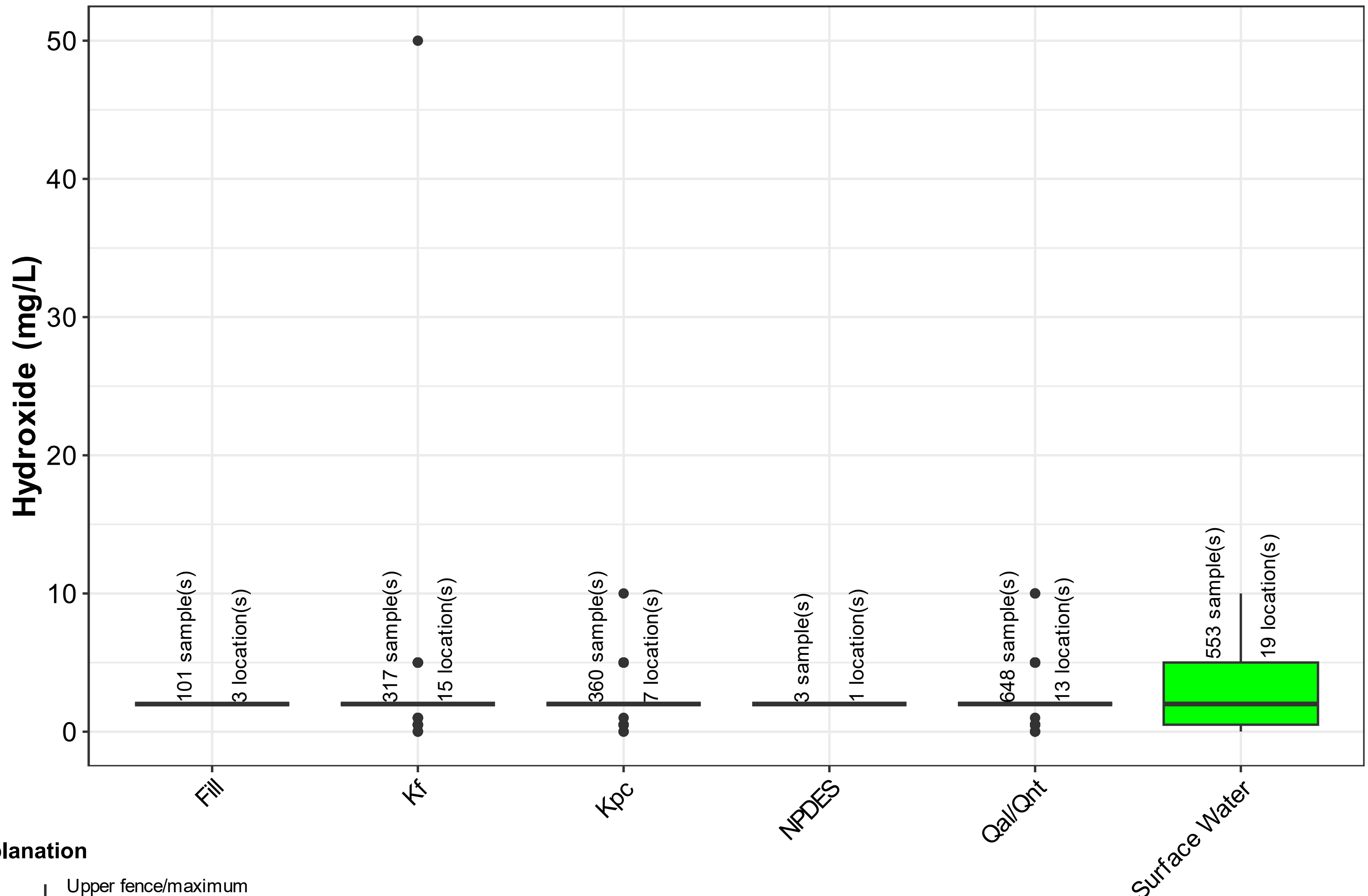
4. Outlier values shown as points.

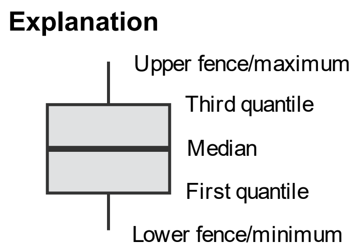
SAN JUAN MINE

Box and Whisker Comparison Plot

Hydrogen Sulfide

DBS&A a Geo-Logic Company





Notes:

1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
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4. Outlier values shown as points.

SAN JUAN MINE

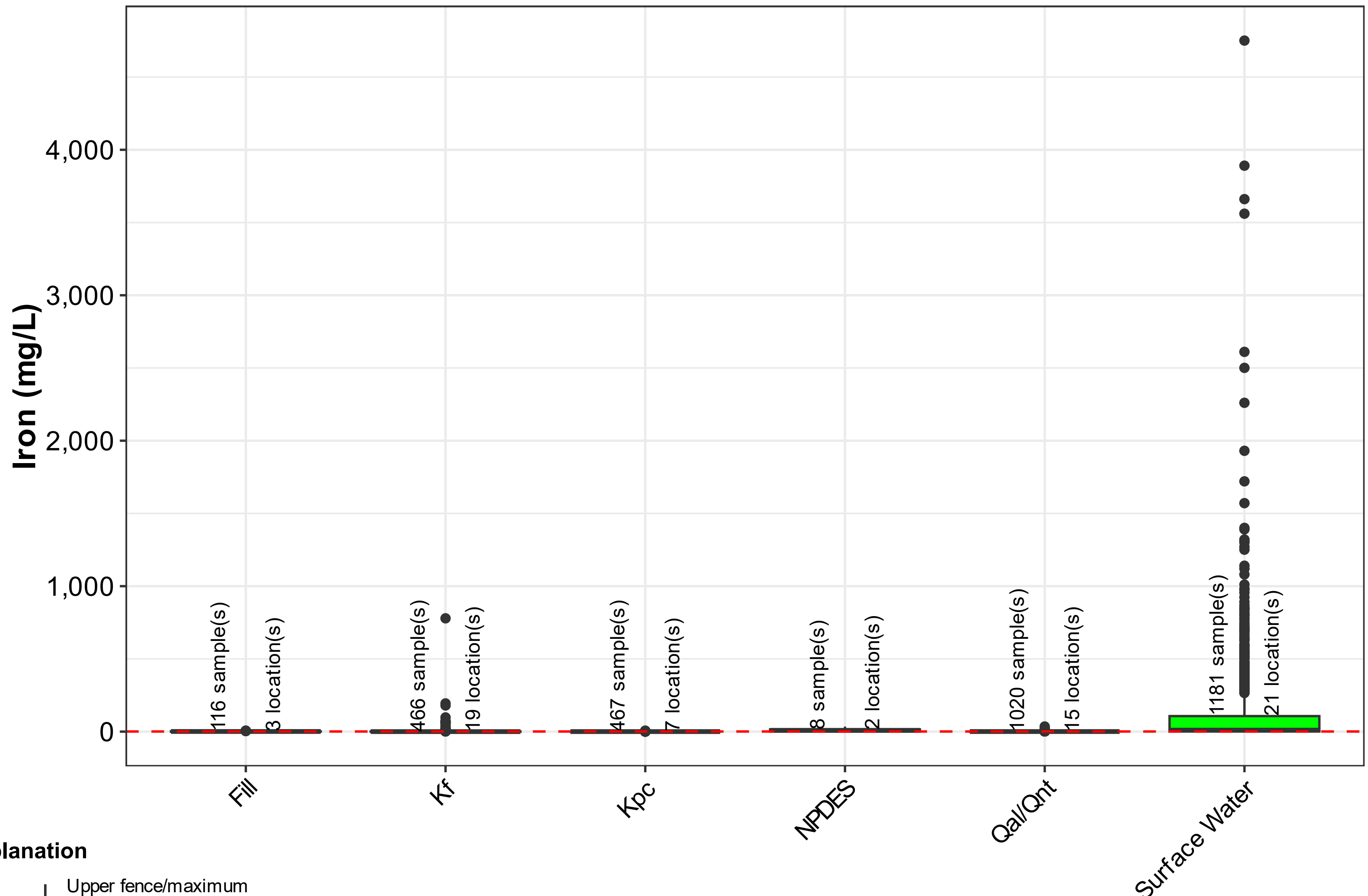
Box and Whisker Comparison Plot

Hydroxide

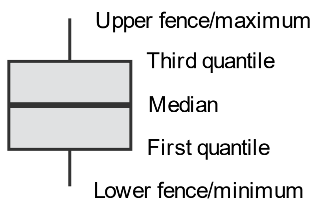
DBS&A a Geo-Logic Company

6/10/2025 DB24.1140

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
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4. Outlier values shown as points.

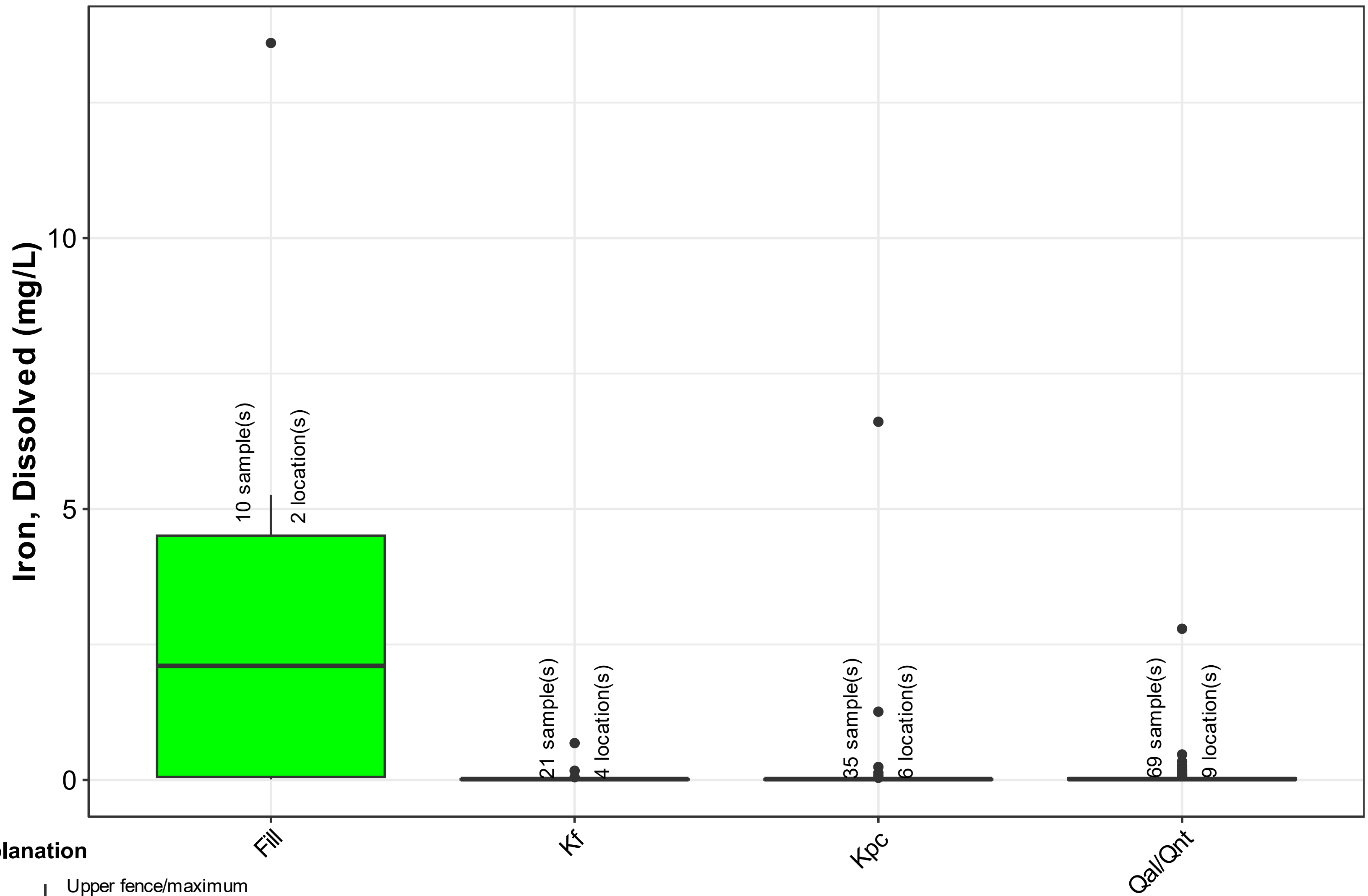
SAN JUAN MINE

Box and Whisker Comparison Plot

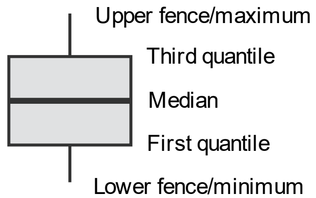
Iron

DBS&A
a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:

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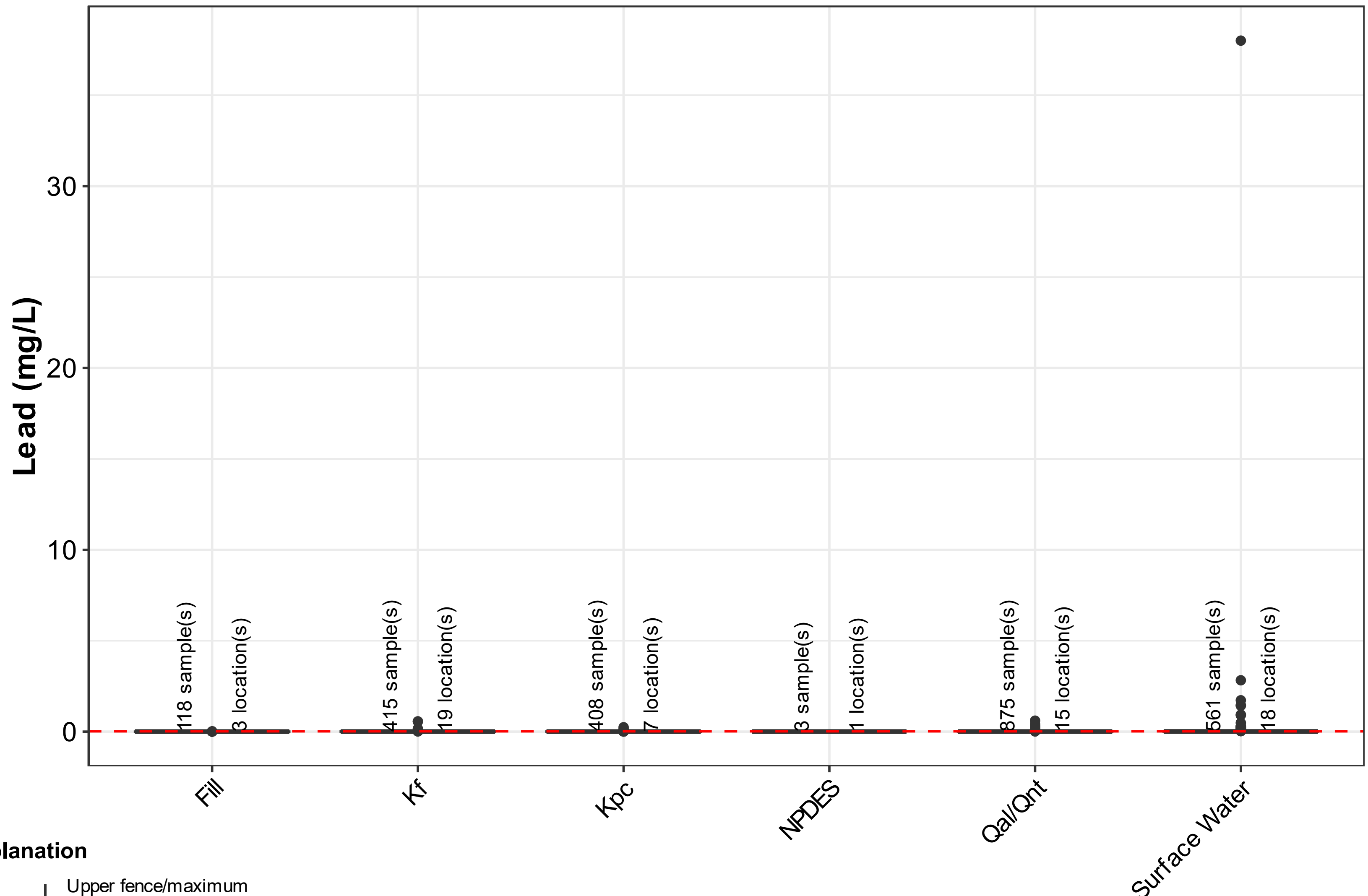
4. Outlier values shown as points.

SAN JUAN MINE

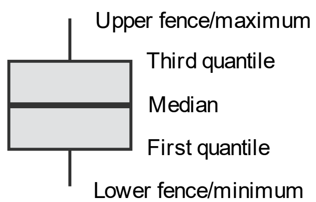
Box and Whisker Comparison Plot

Iron, Dissolved

DBS&A a Geo-Logic Company



Explanation



Notes:
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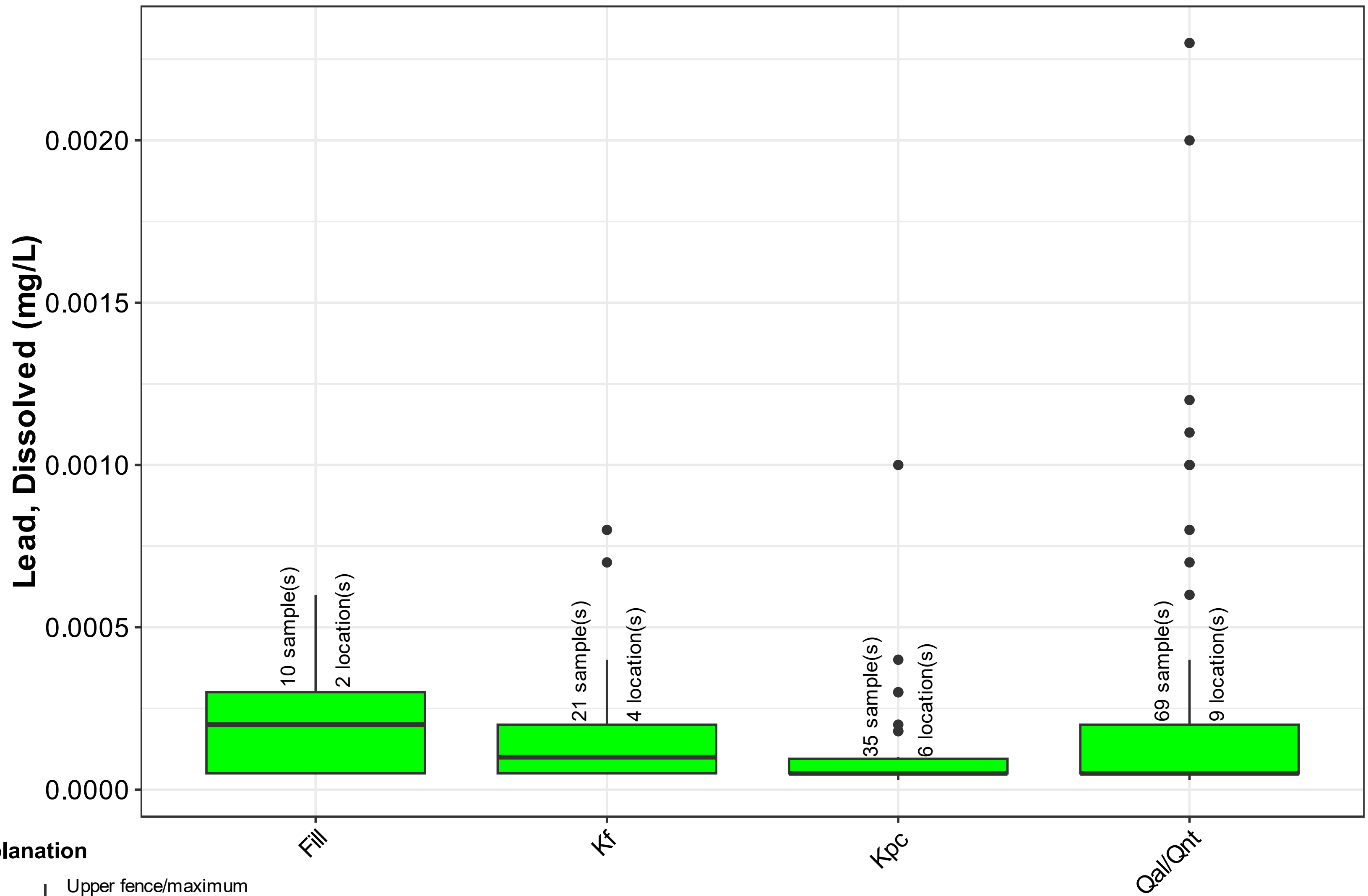
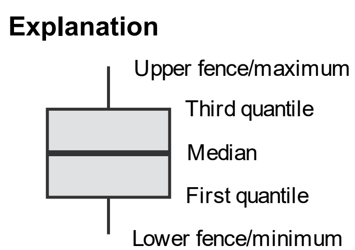
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Lead

DBS&A
a Geo-Logic Company
6/10/2025 DB24.1140





Notes:
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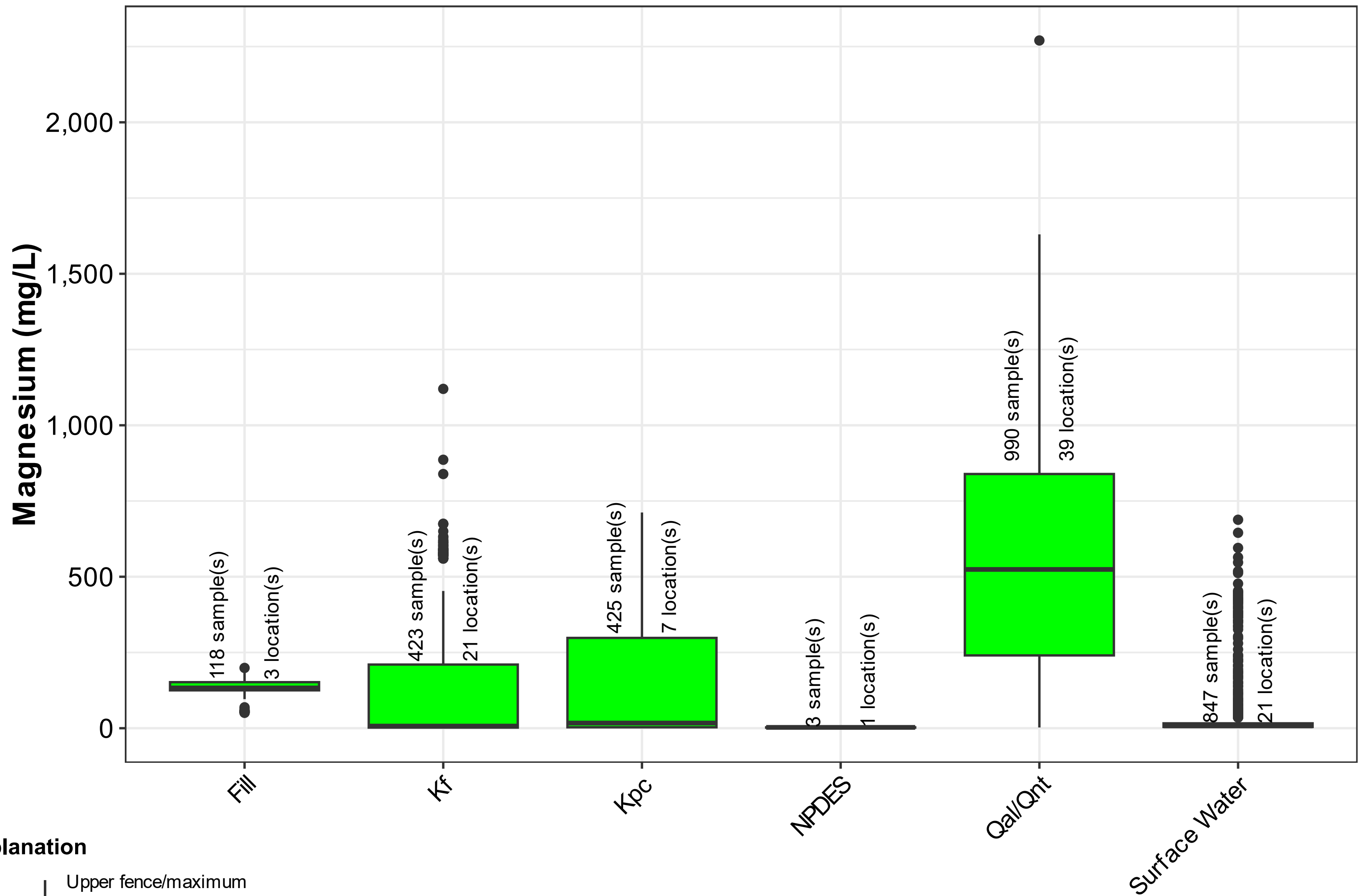
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Lead, Dissolved

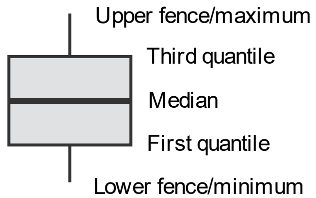
DBS&A a Geo-Logic Company

6/10/2025 DB24.1140

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm



Explanation



Notes:
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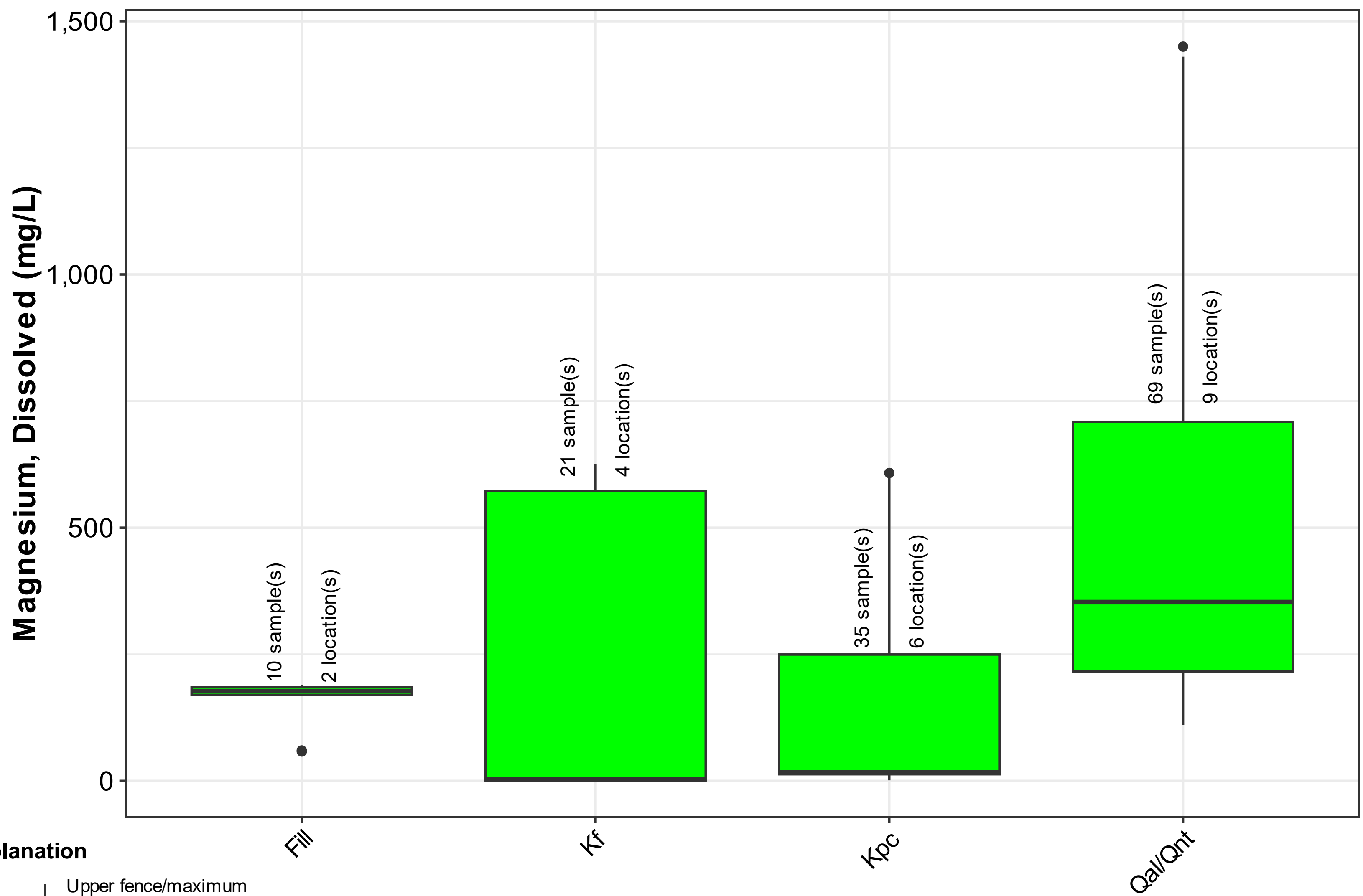
SAN JUAN MINE
Box and Whisker Comparison Plot
Magnesium

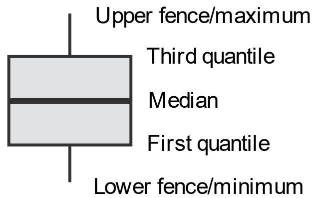
DBS&A
a Geo-Logic Company

6/10/2025 DB24.1140

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm



Explanation



Notes:
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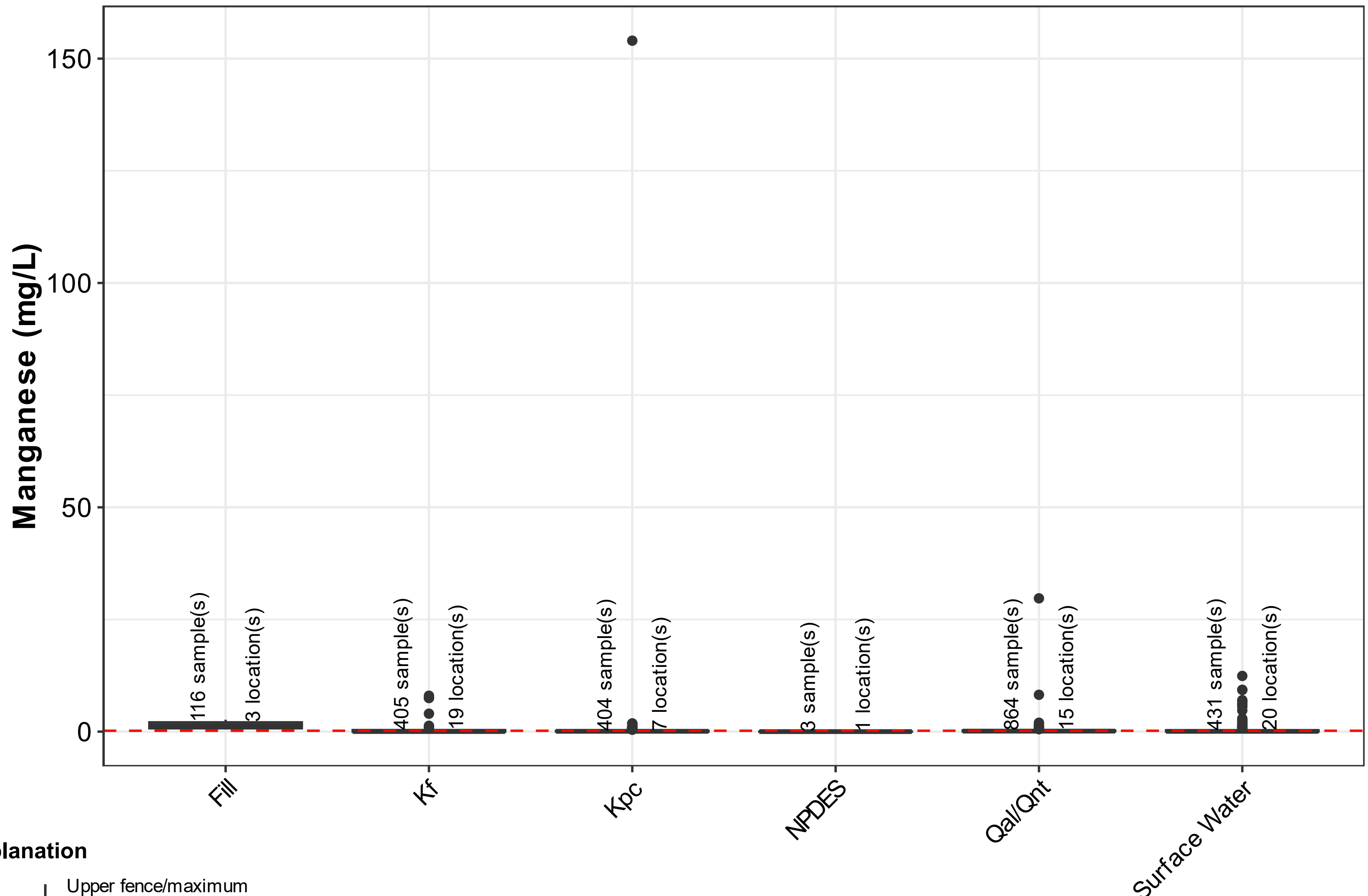
SAN JUAN MINE

Box and Whisker Comparison Plot

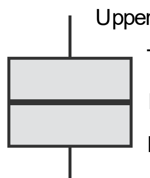
Magnesium, Dissolved

DBS&A
a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



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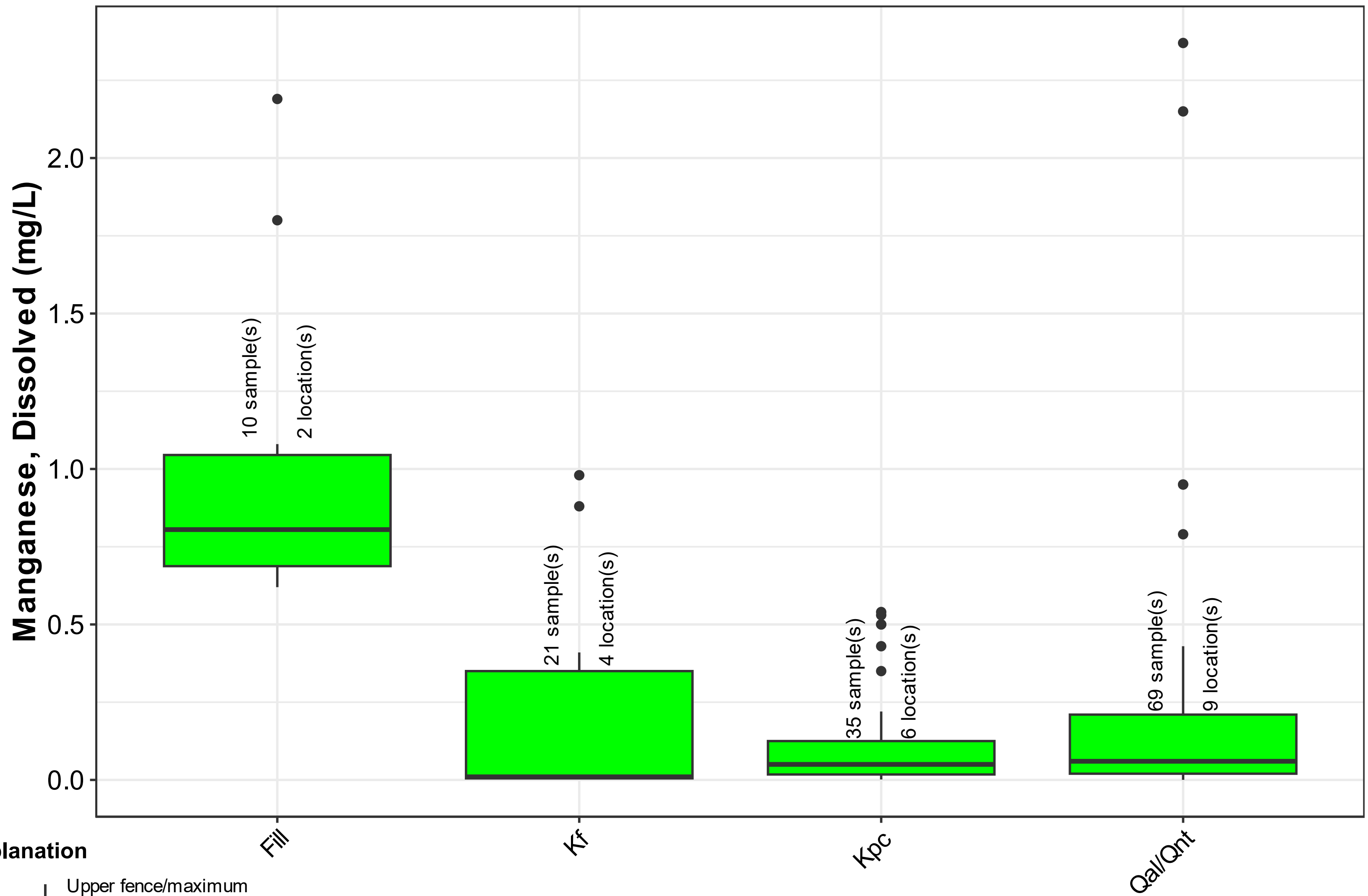
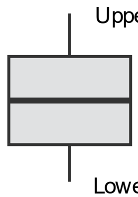
SAN JUAN MINE
Box and Whisker Comparison Plot
Manganese

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:
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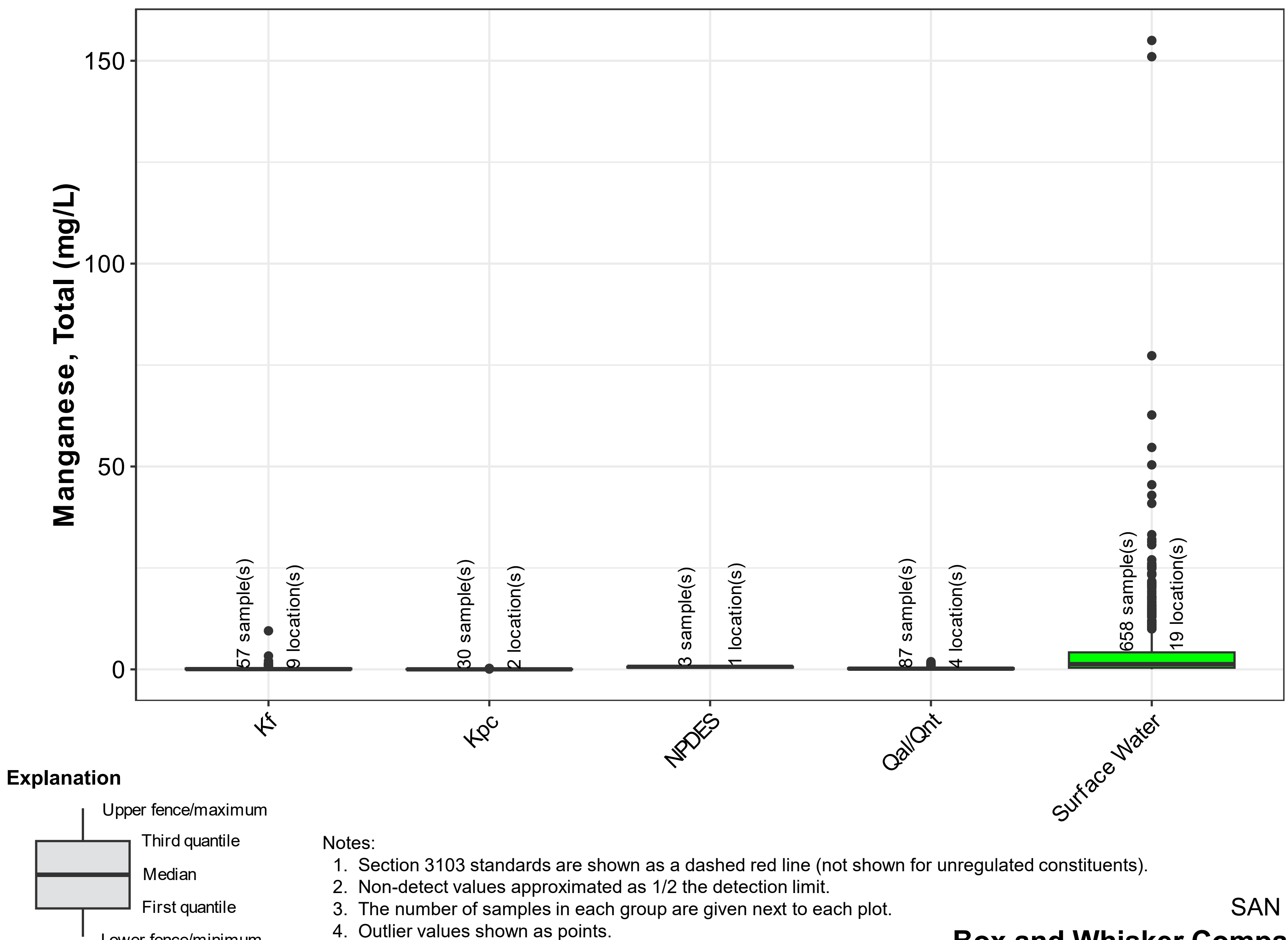
SAN JUAN MINE

Box and Whisker Comparison Plot

Manganese, Dissolved

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



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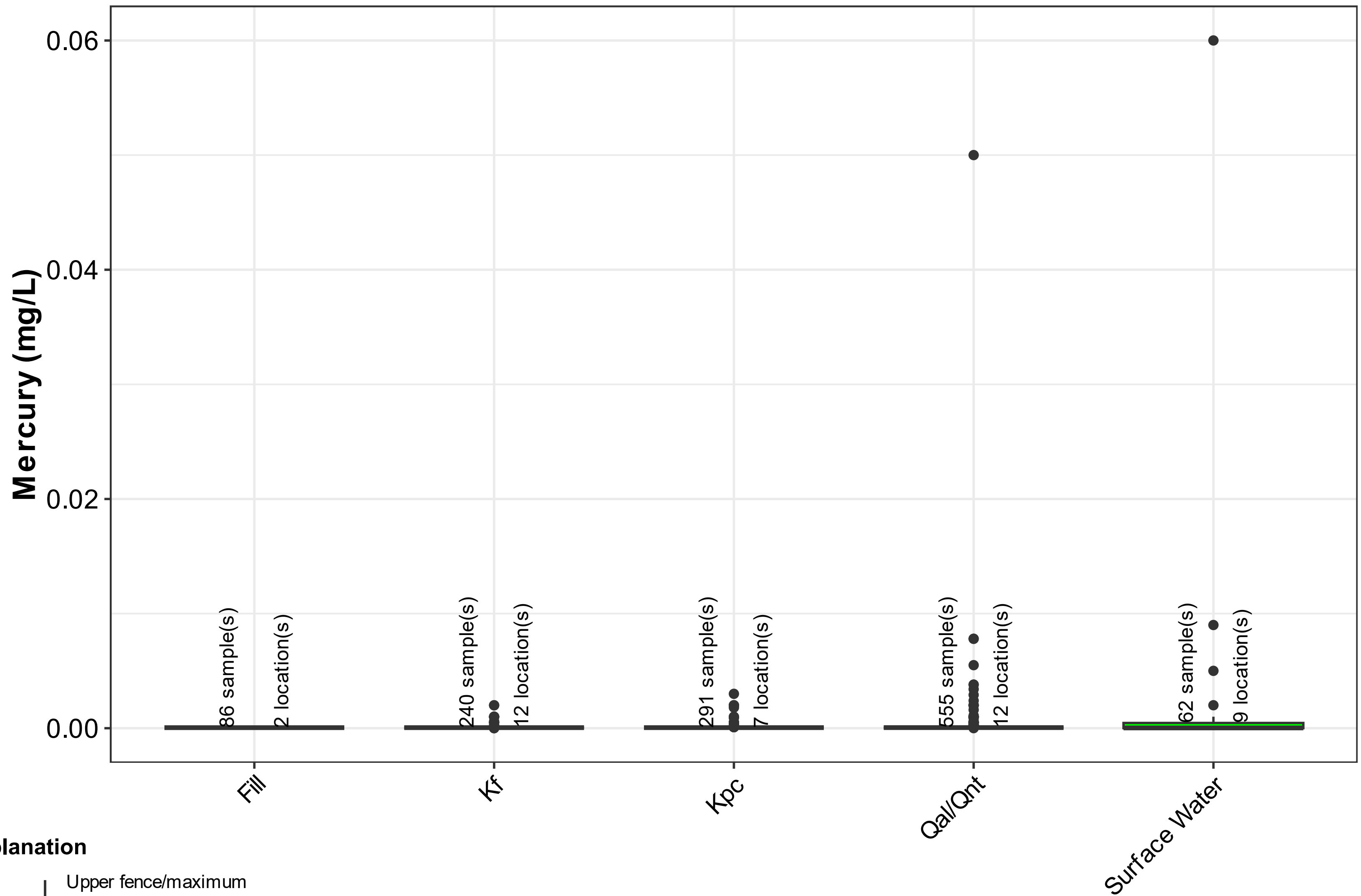
SAN JUAN MINE

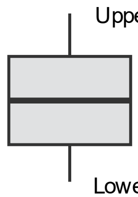
Box and Whisker Comparison Plot

Manganese, Total

DBS&A
a Geo-Logic Company

6/10/2025 DB24.1140





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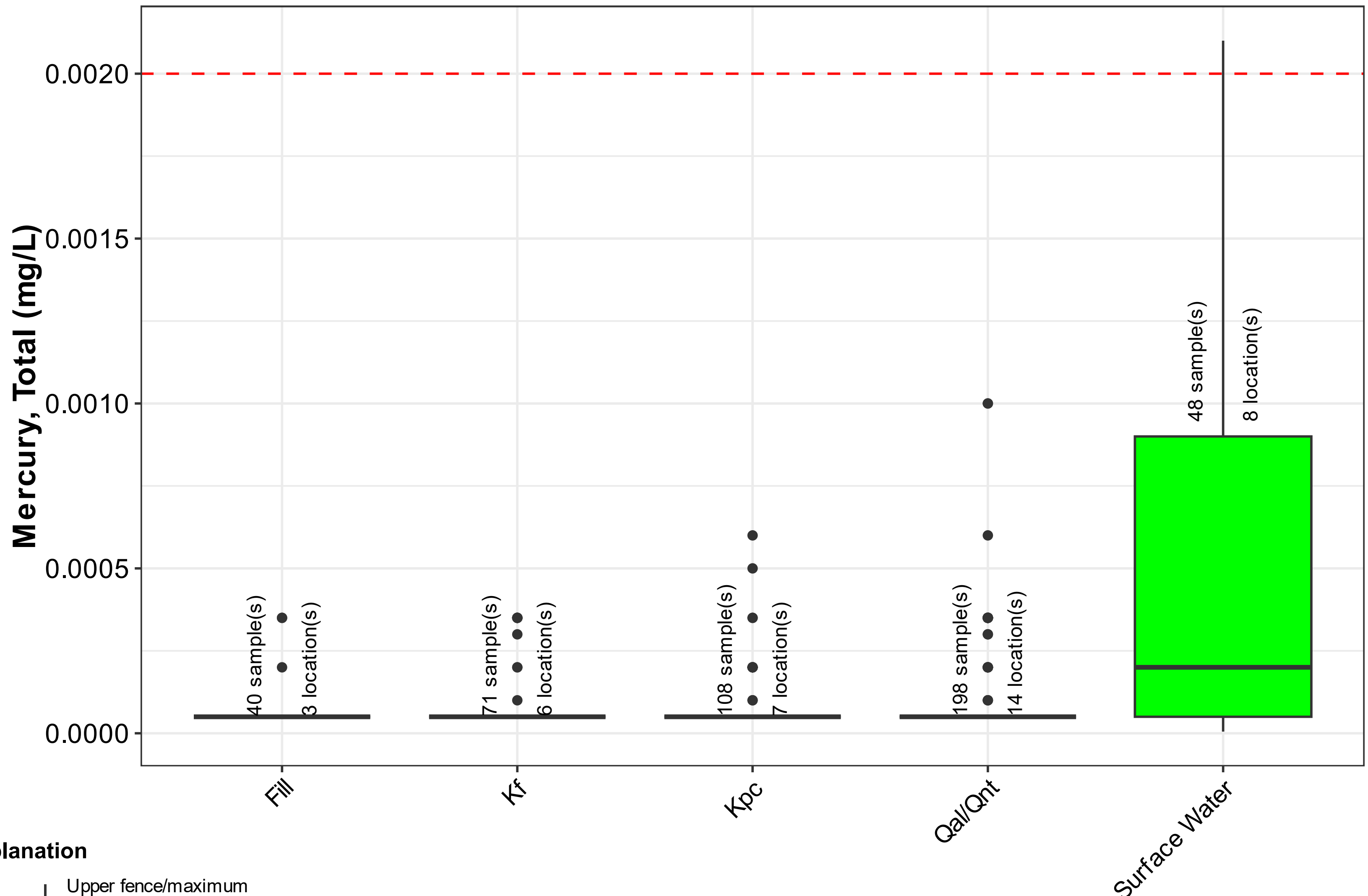
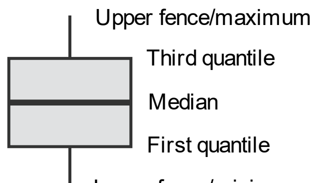
SAN JUAN MINE
Box and Whisker Comparison Plot
Mercury

DBS&A a Geo-Logic Company
6/10/2025 DB24.1140



Explanation



Notes:
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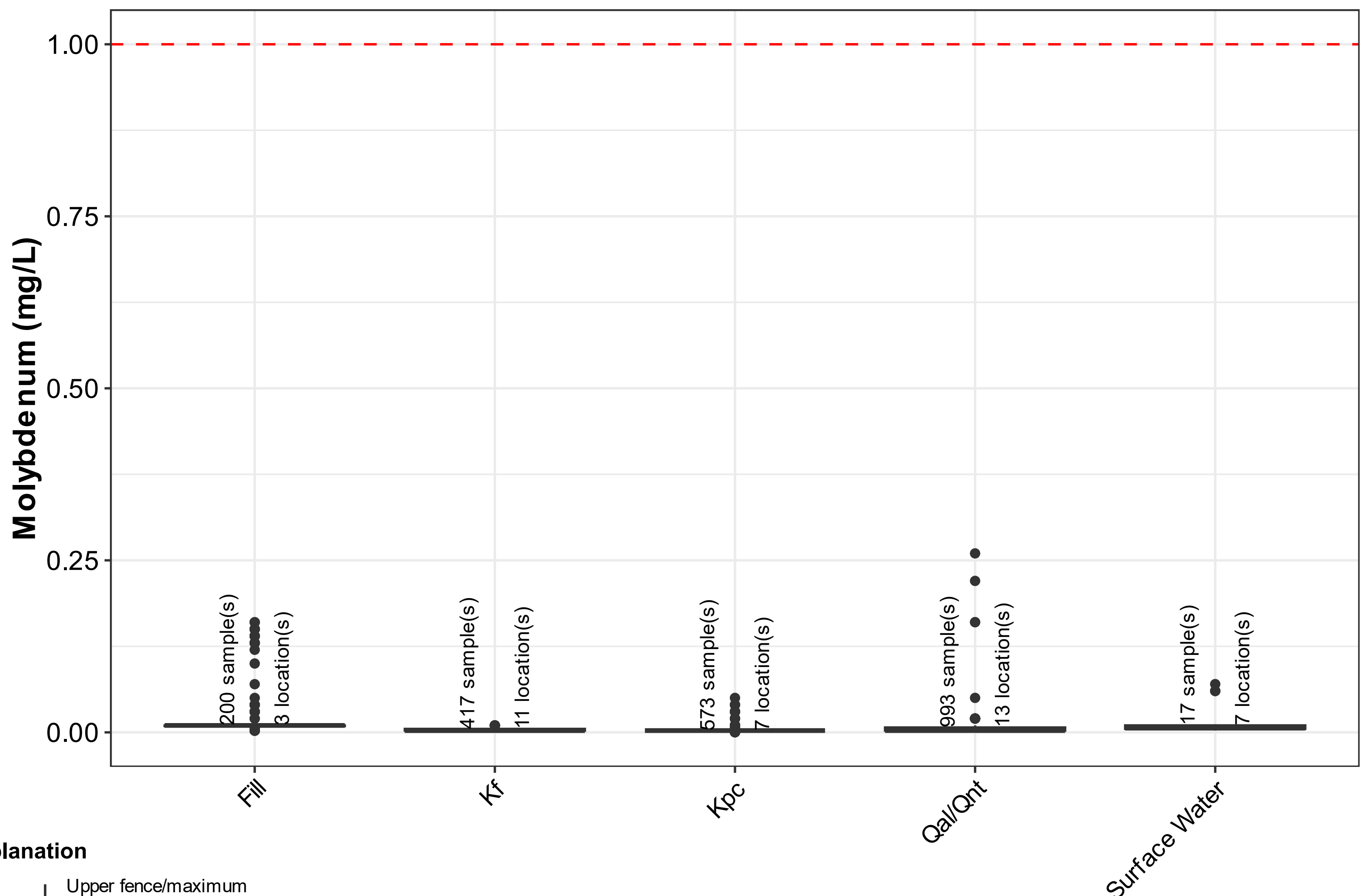
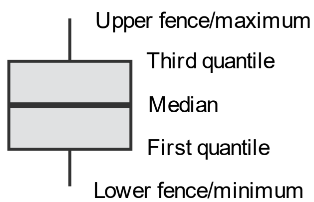
SAN JUAN MINE
Box and Whisker Comparison Plot
Mercury, Total

DBS&A a Geo-Logic Company

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm



Explanation



Notes:
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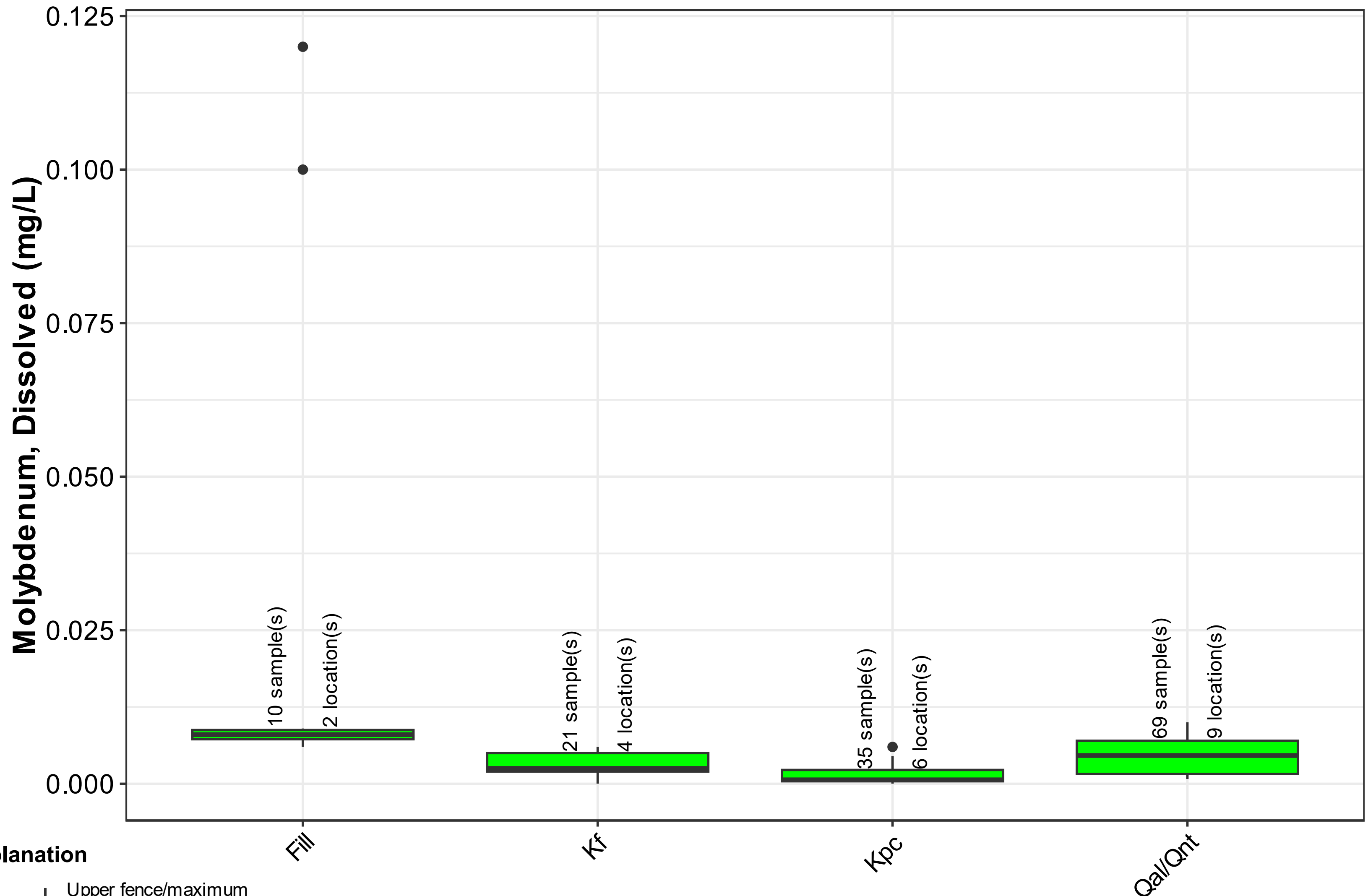
SAN JUAN MINE

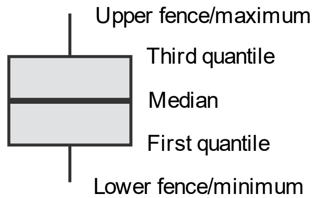
Box and Whisker Comparison Plot

Molybdenum

DBS&A
a Geo-Logic Company

6/10/2025 DB24.1140





Notes:
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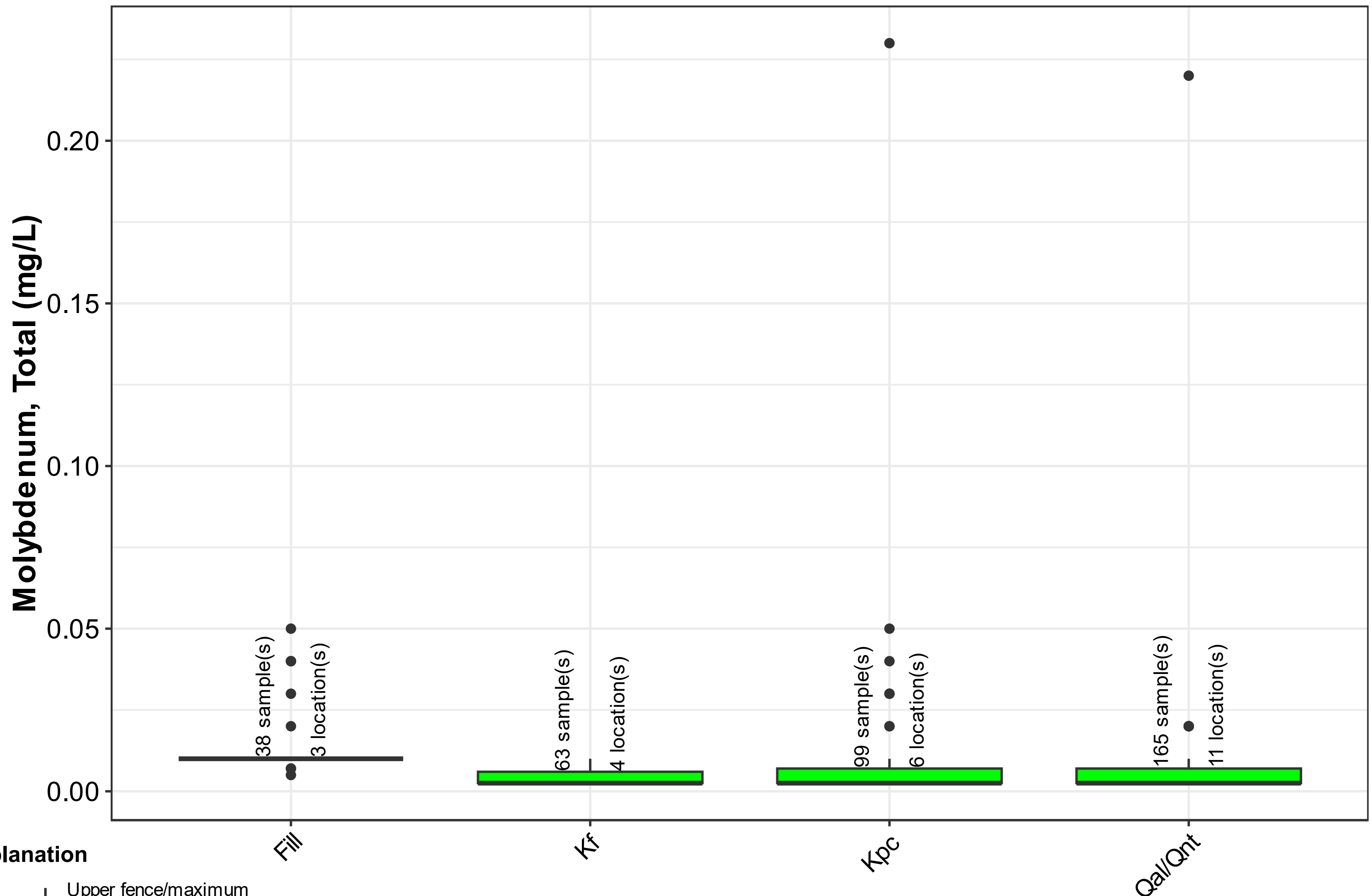
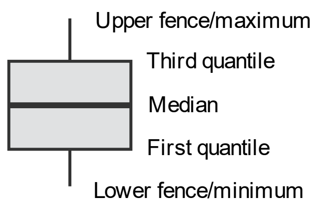
SAN JUAN MINE
Box and Whisker Comparison Plot
Molybdenum, Dissolved

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:
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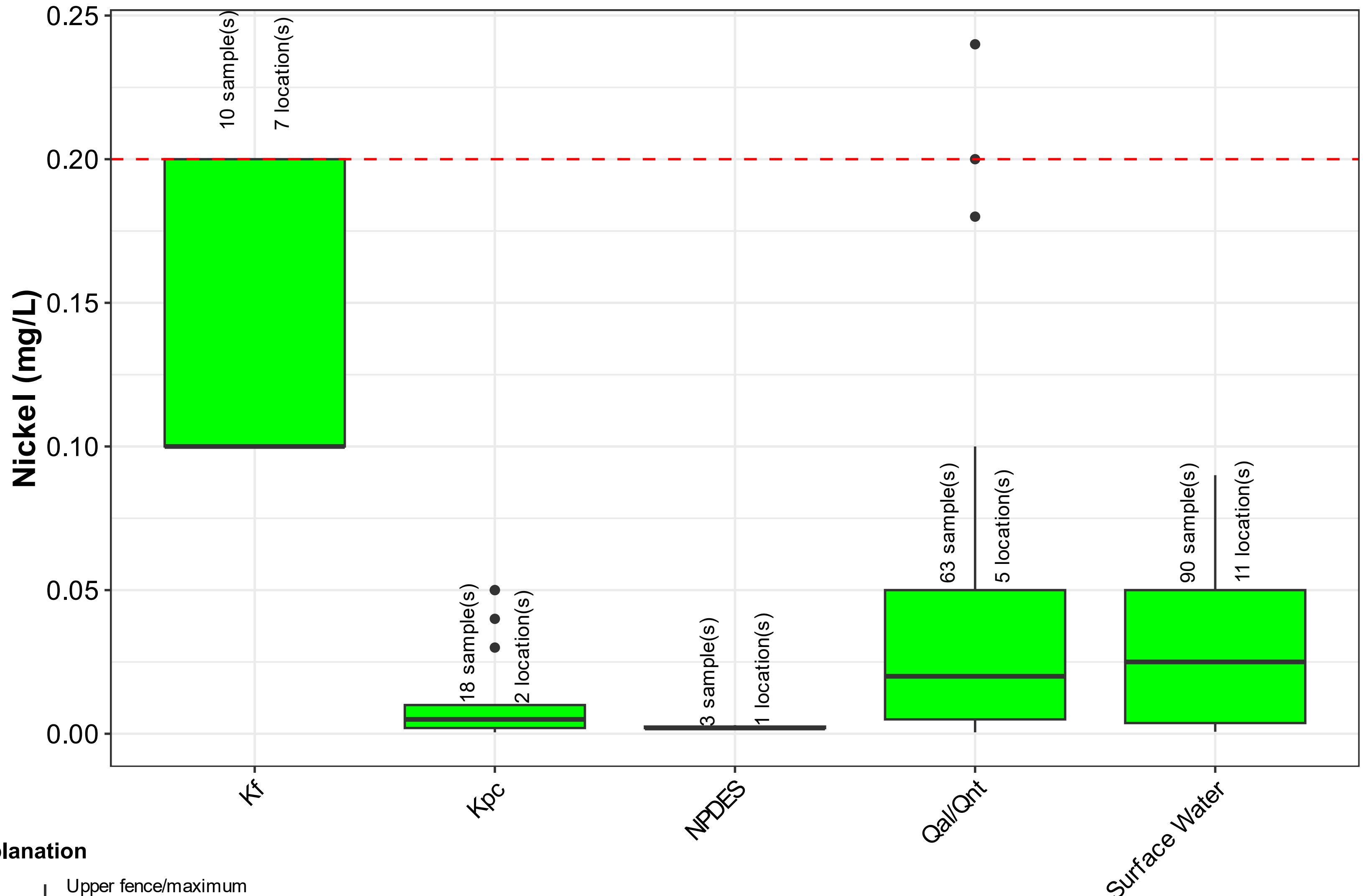
4. Outlier values shown as points.

SAN JUAN MINE

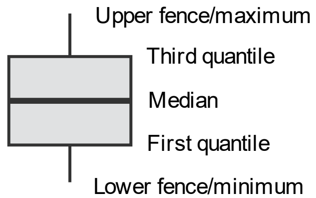
Box and Whisker Comparison Plot

Molybdenum, Total

DBS&A a Geo-Logic Company



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
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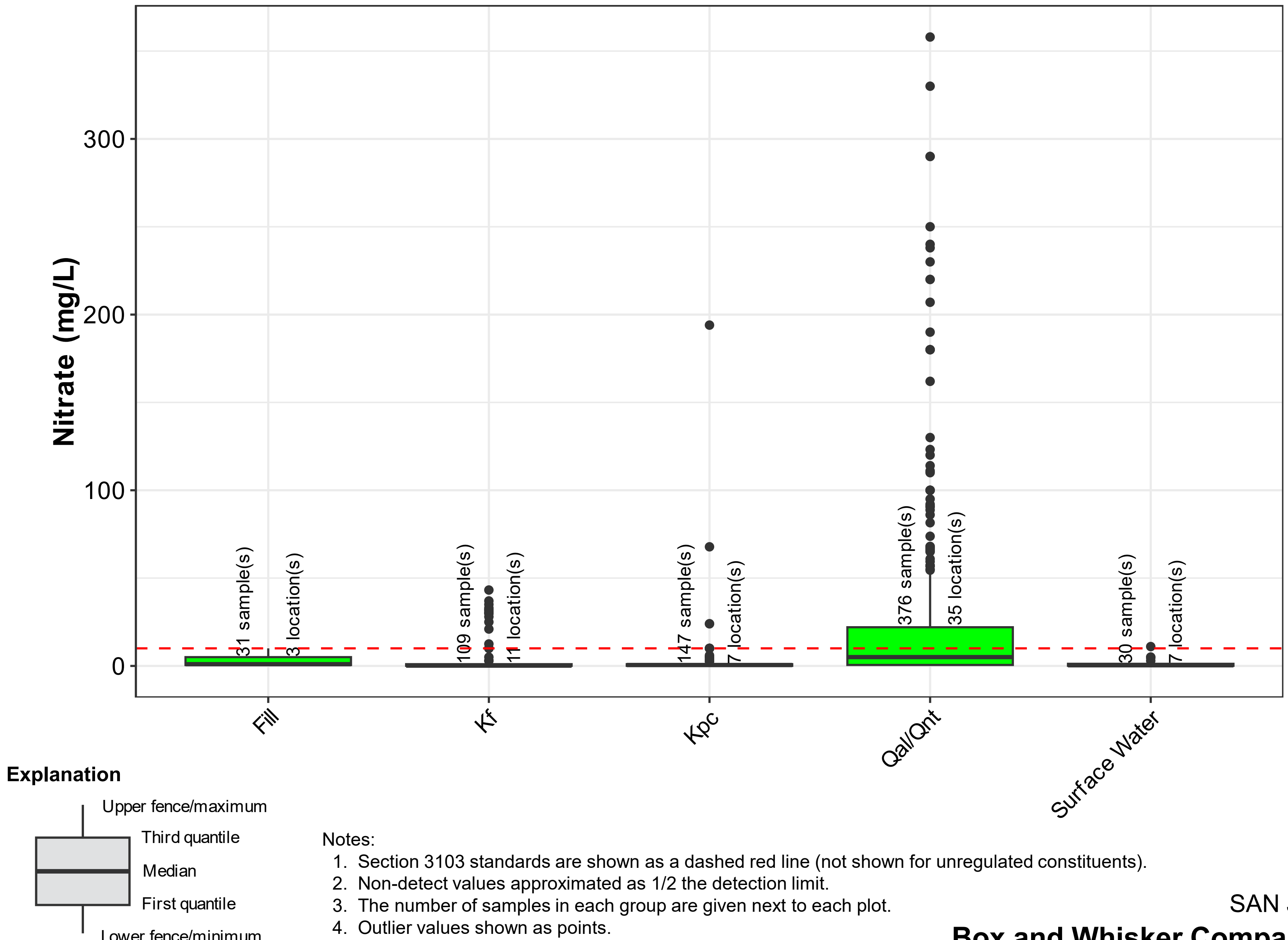
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Nickel

DBS&A a Geo-Logic Company



Notes:

1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

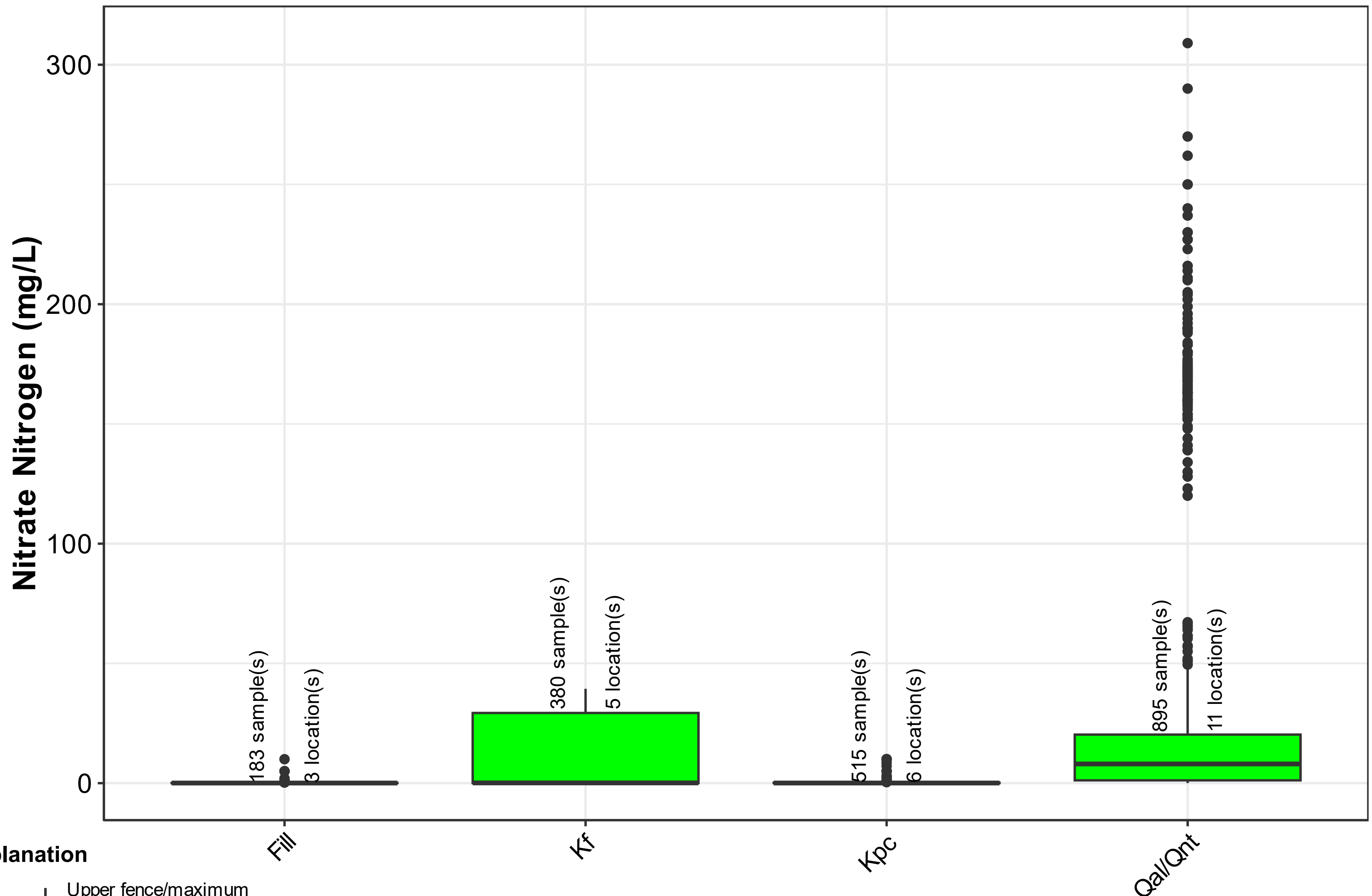
SAN JUAN MINE

Box and Whisker Comparison Plot

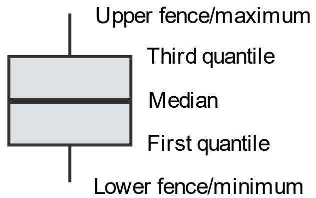
Nitrate

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
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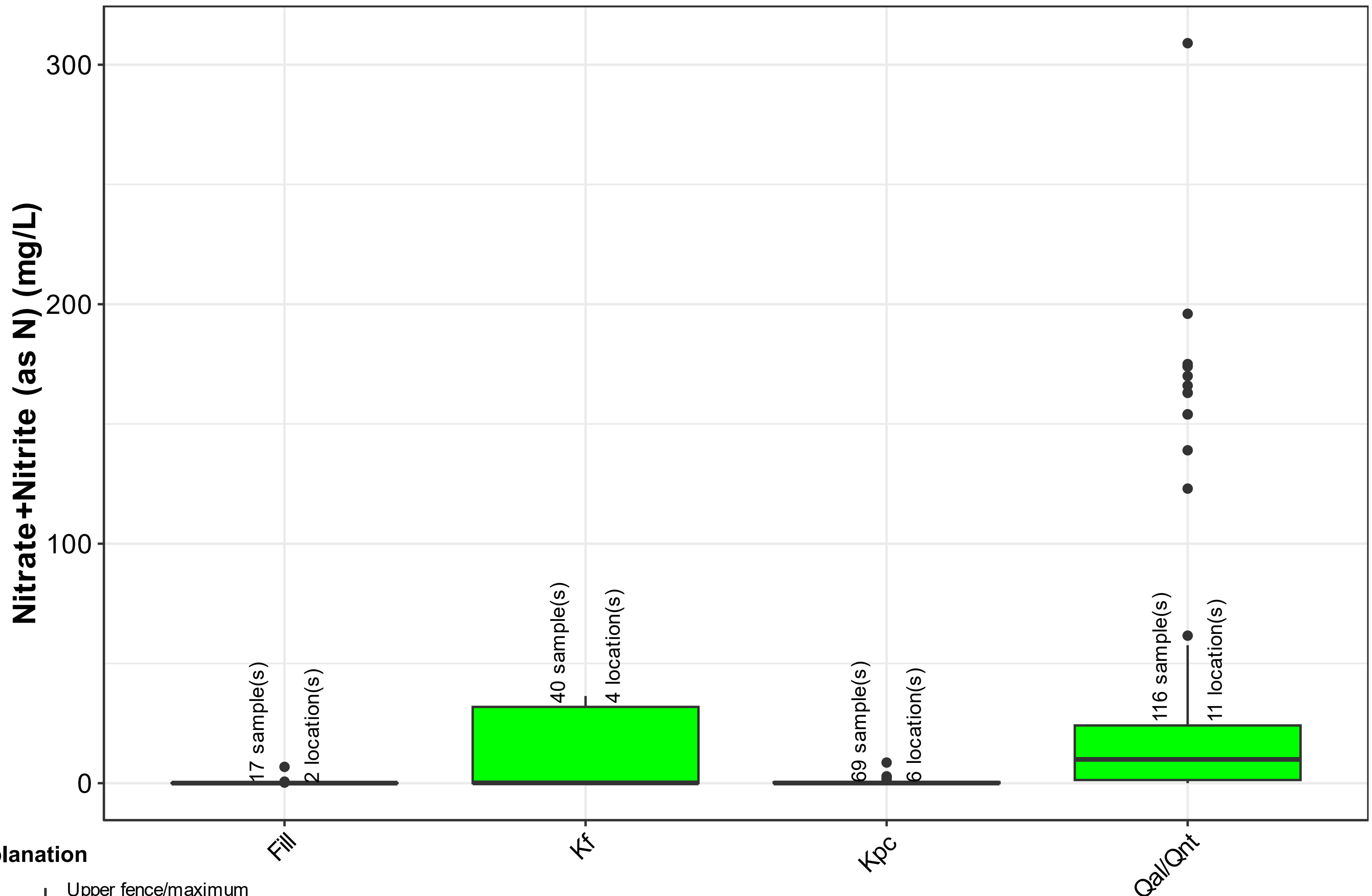
4. Outlier values shown as points.

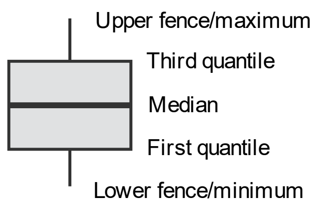
SAN JUAN MINE
Box and Whisker Comparison Plot
Nitrate Nitrogen

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



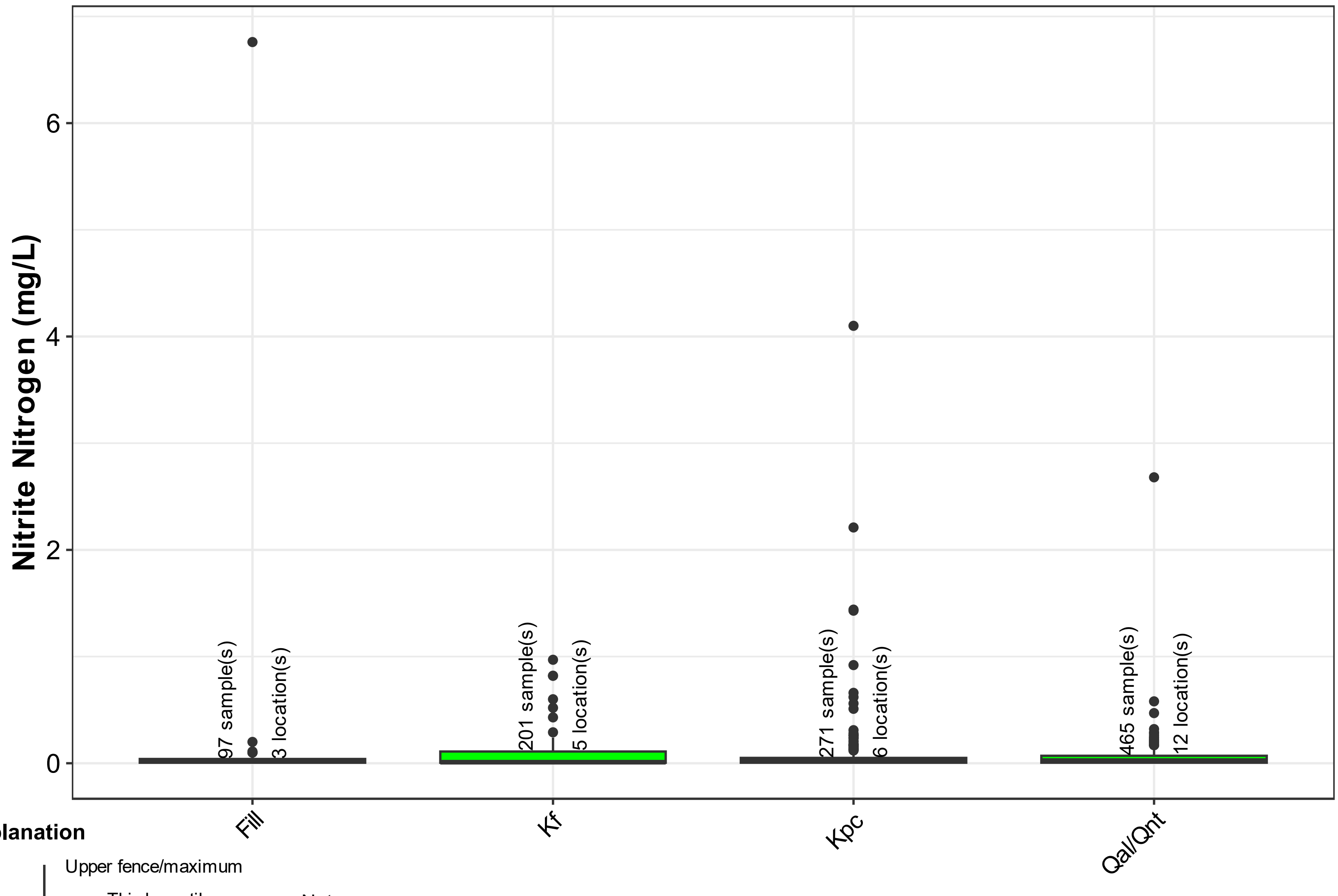
Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

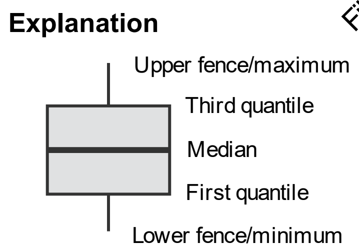
SAN JUAN MINE

Box and Whisker Comparison Plot

Nitrate+Nitrite (as N)

DBS&A a Geo-Logic Company





Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

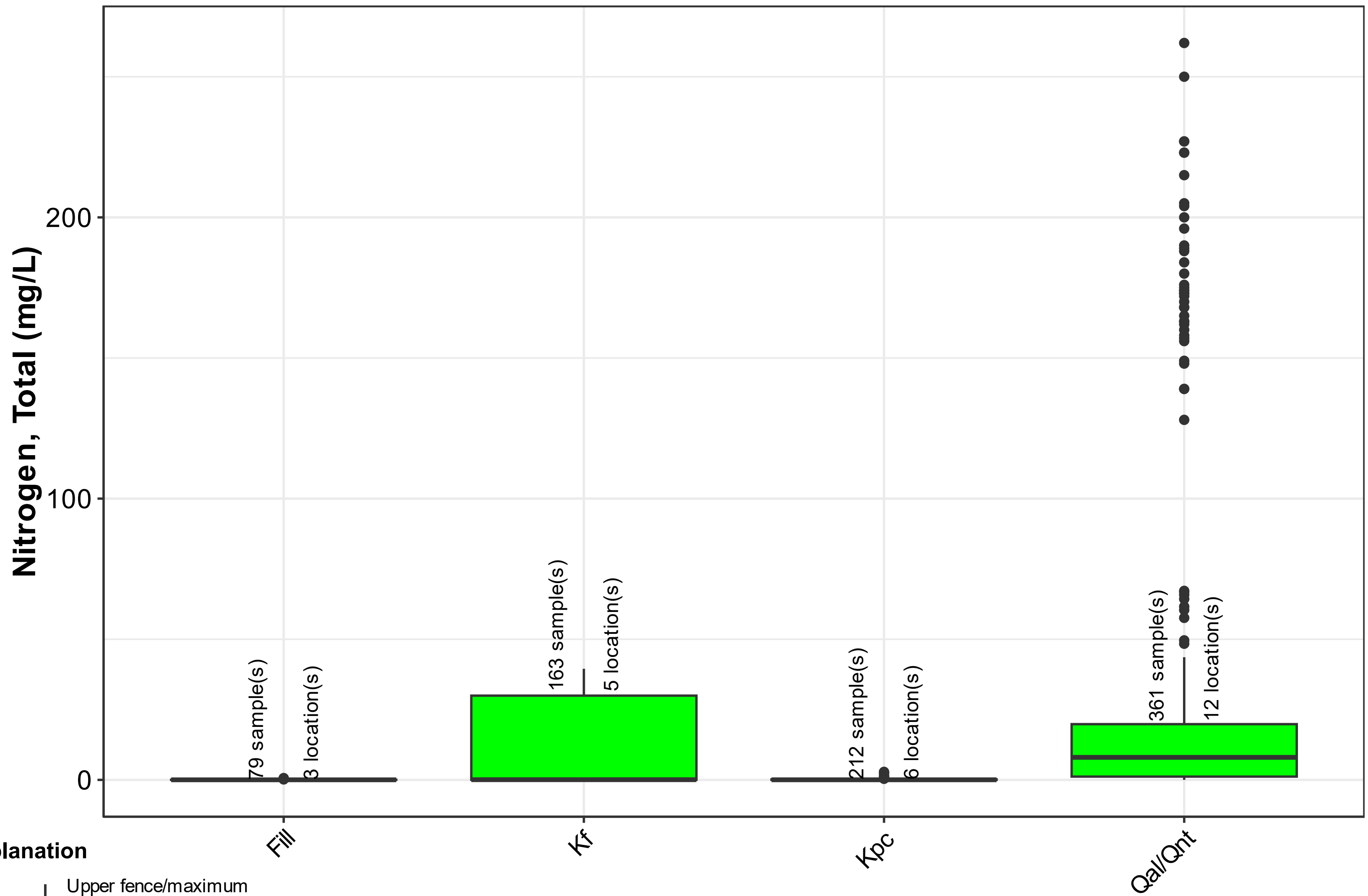
SAN JUAN MINE

Box and Whisker Comparison Plot

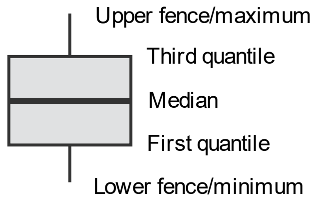
Nitrite Nitrogen

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation

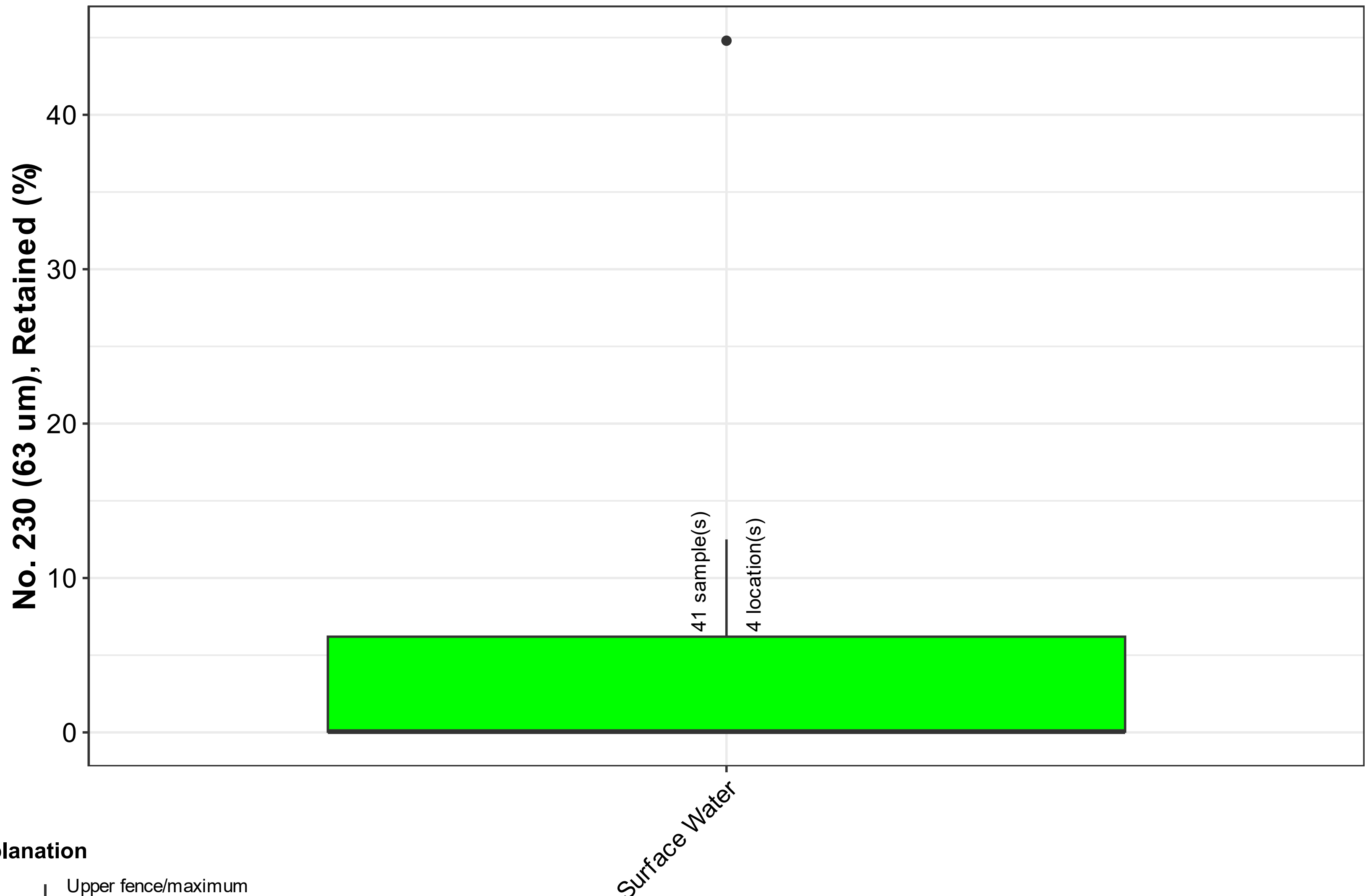


Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

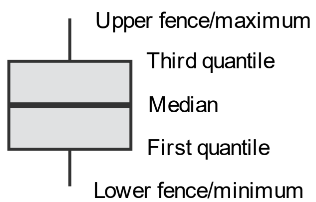
SAN JUAN MINE
Box and Whisker Comparison Plot
Nitrogen, Total

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation

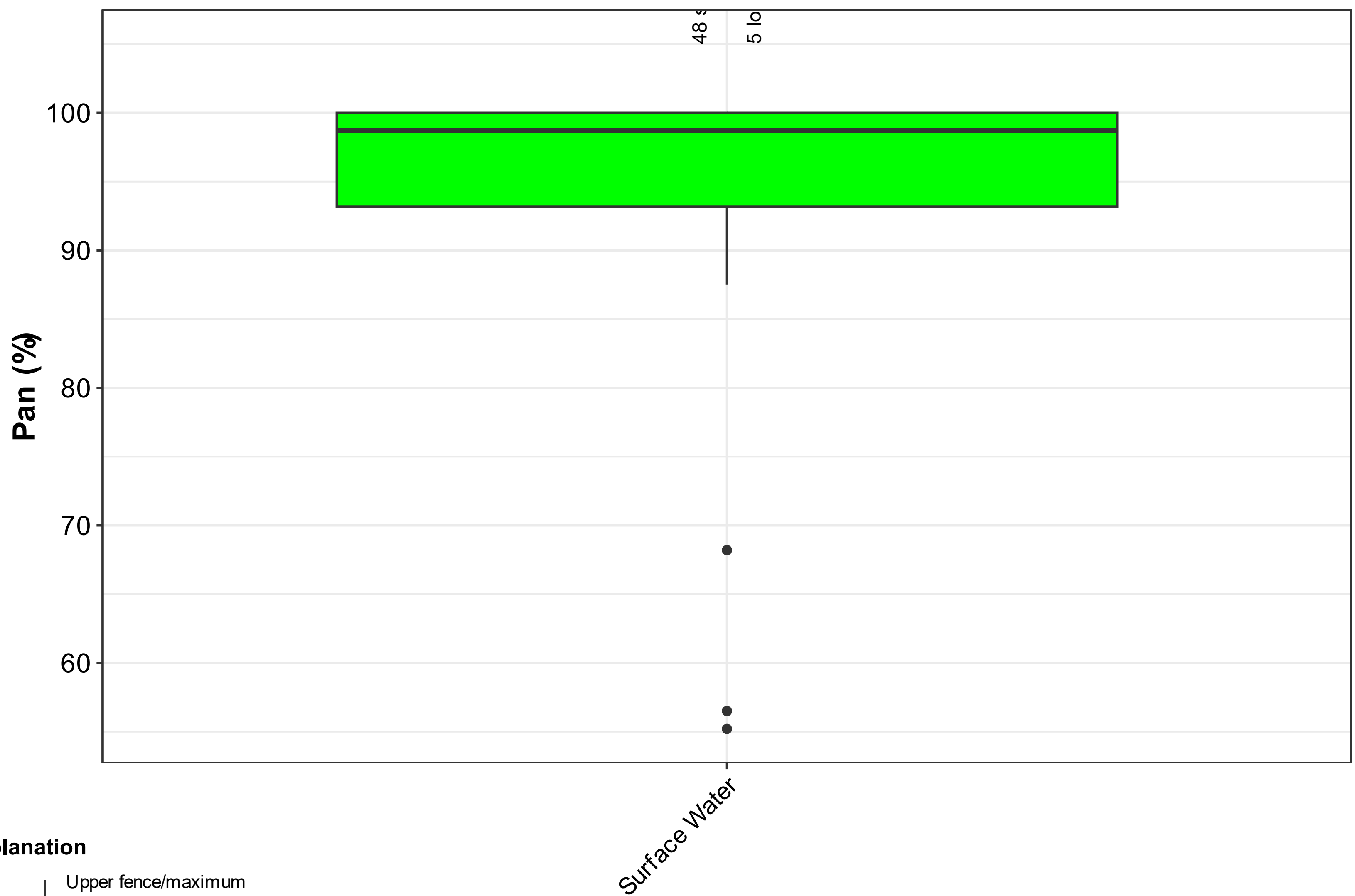


Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

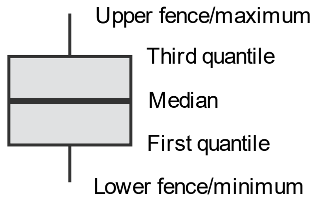
SAN JUAN MINE

Box and Whisker Comparison Plot

No. 230 (63 um), Retained



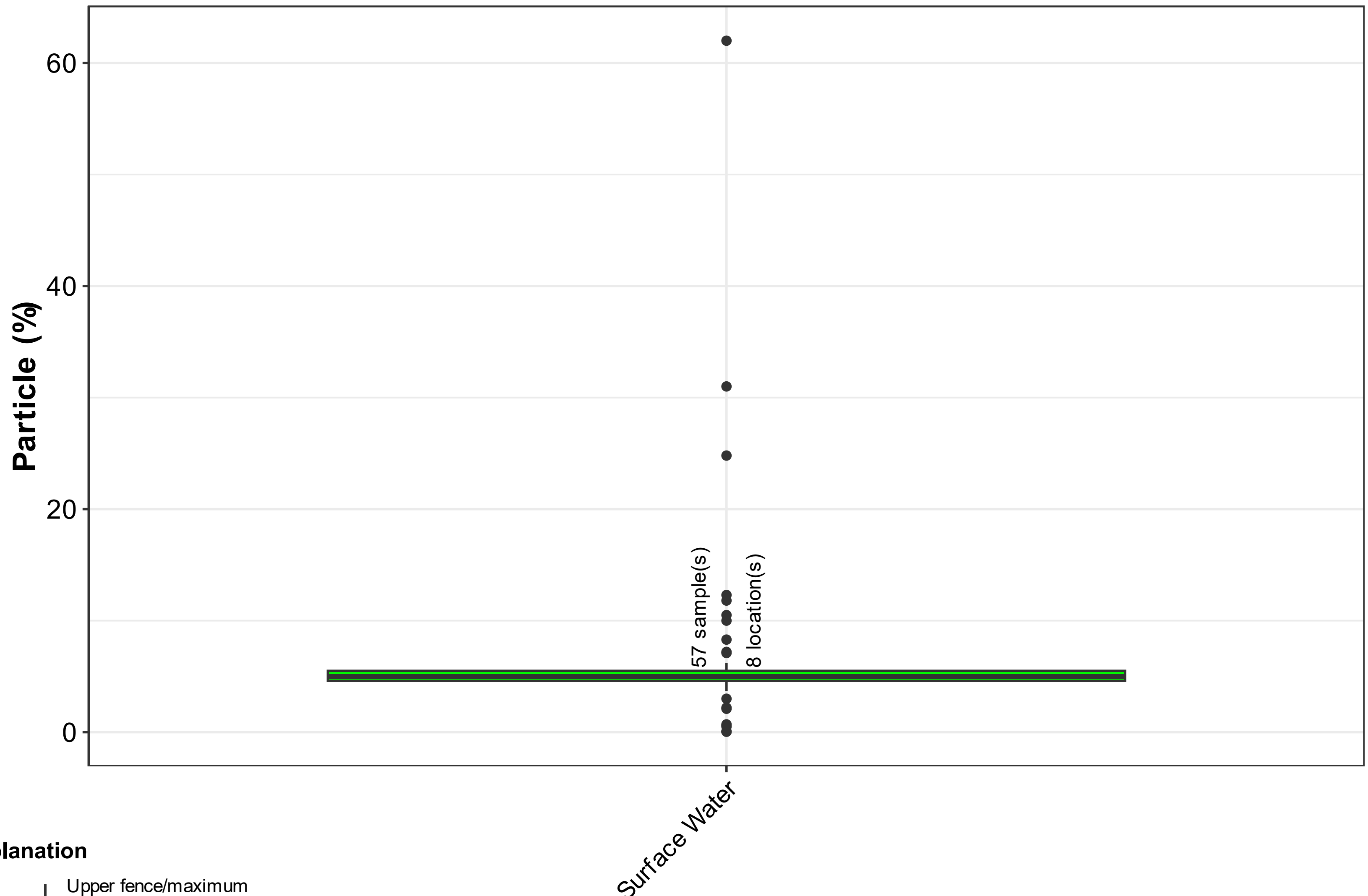
Explanation



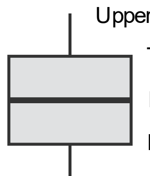
Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Pan

DBS&A a Geo-Logic Company

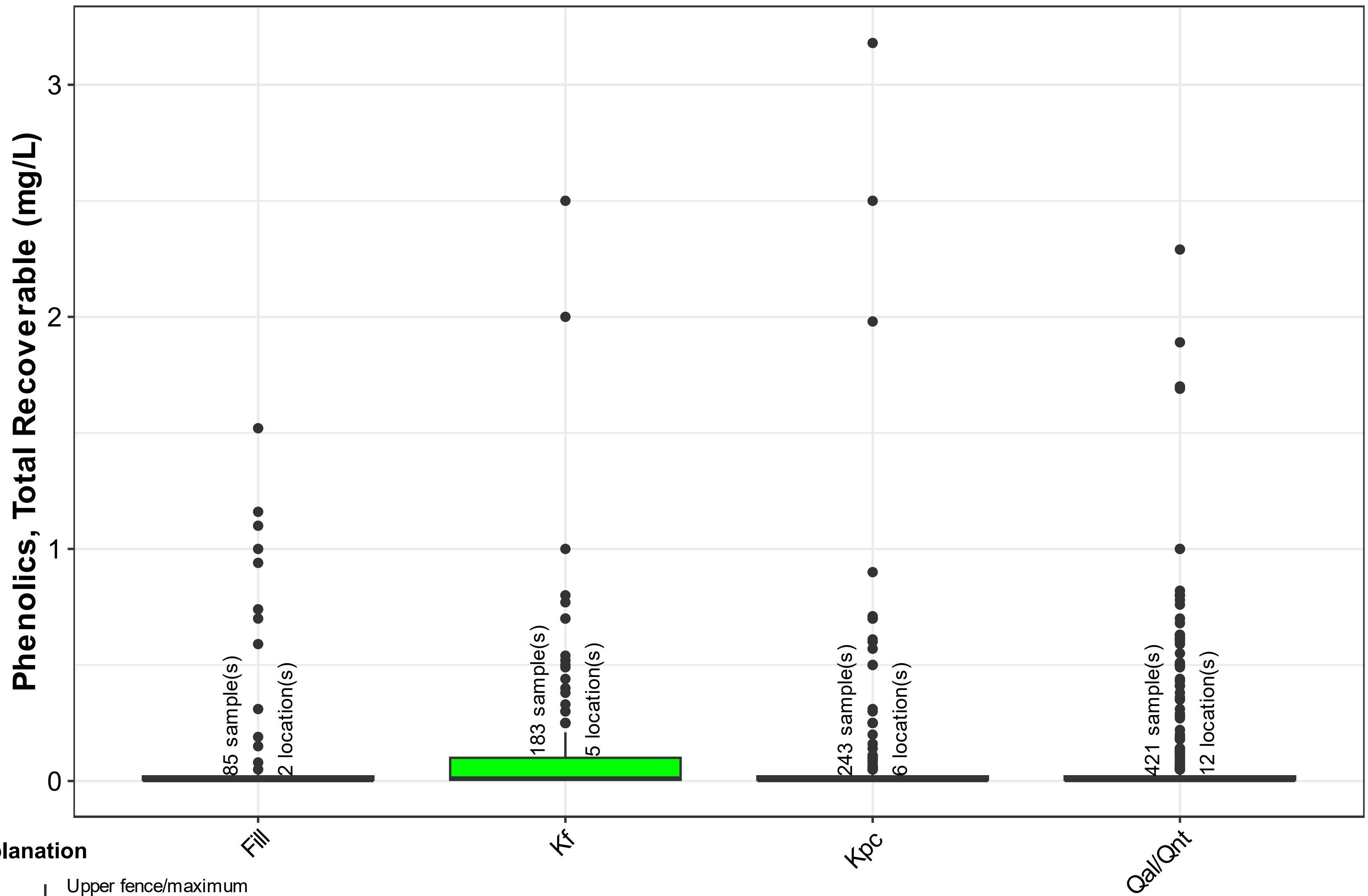


Explanation

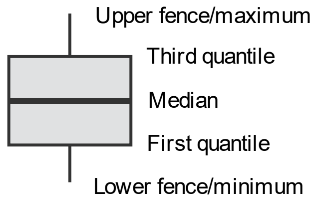


Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Particle



Explanation



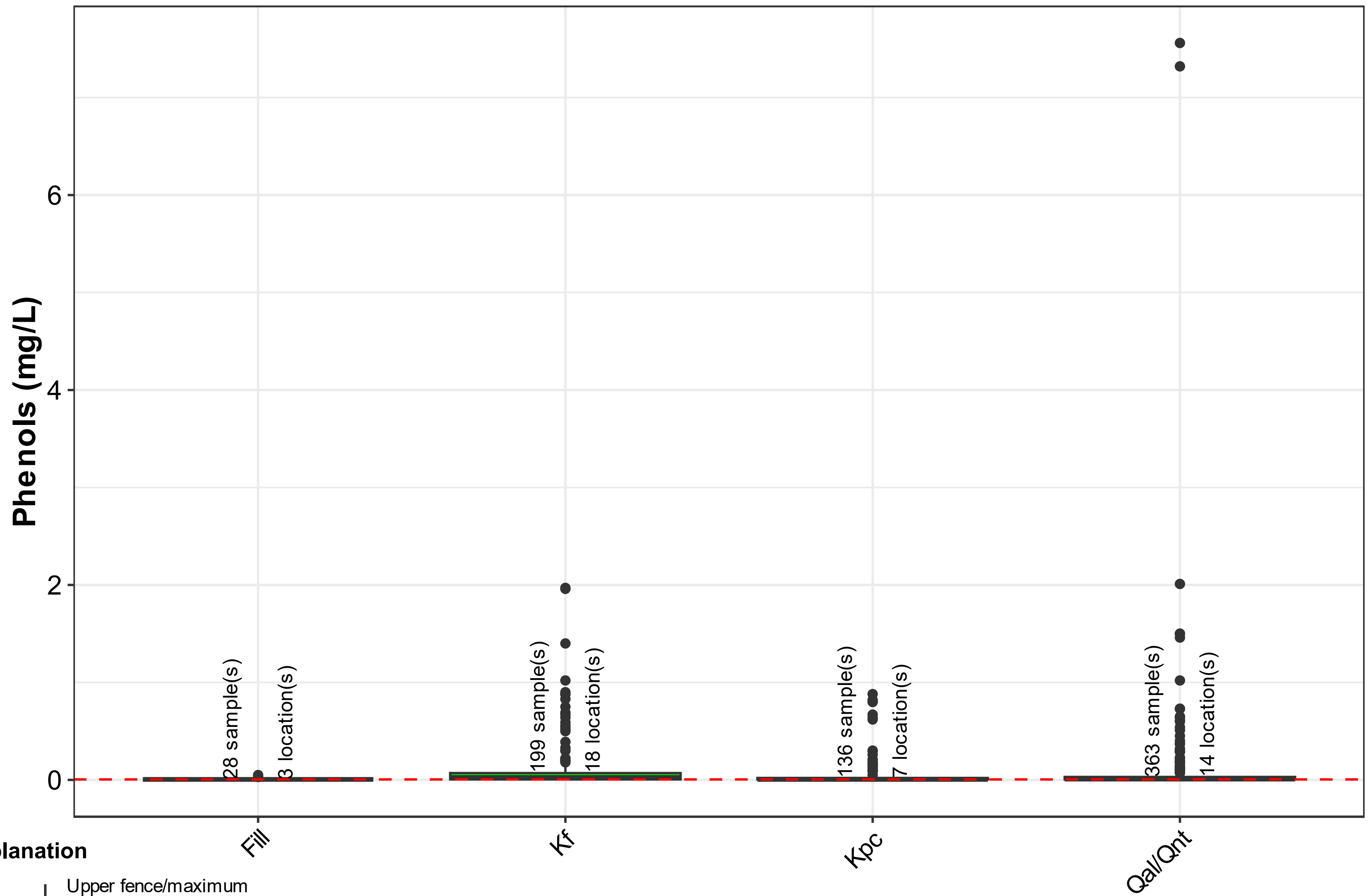
Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE

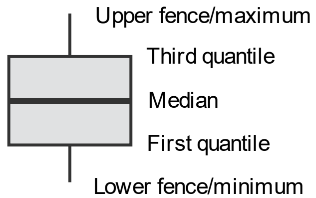
Box and Whisker Comparison Plot
Phenolics, Total Recoverable

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



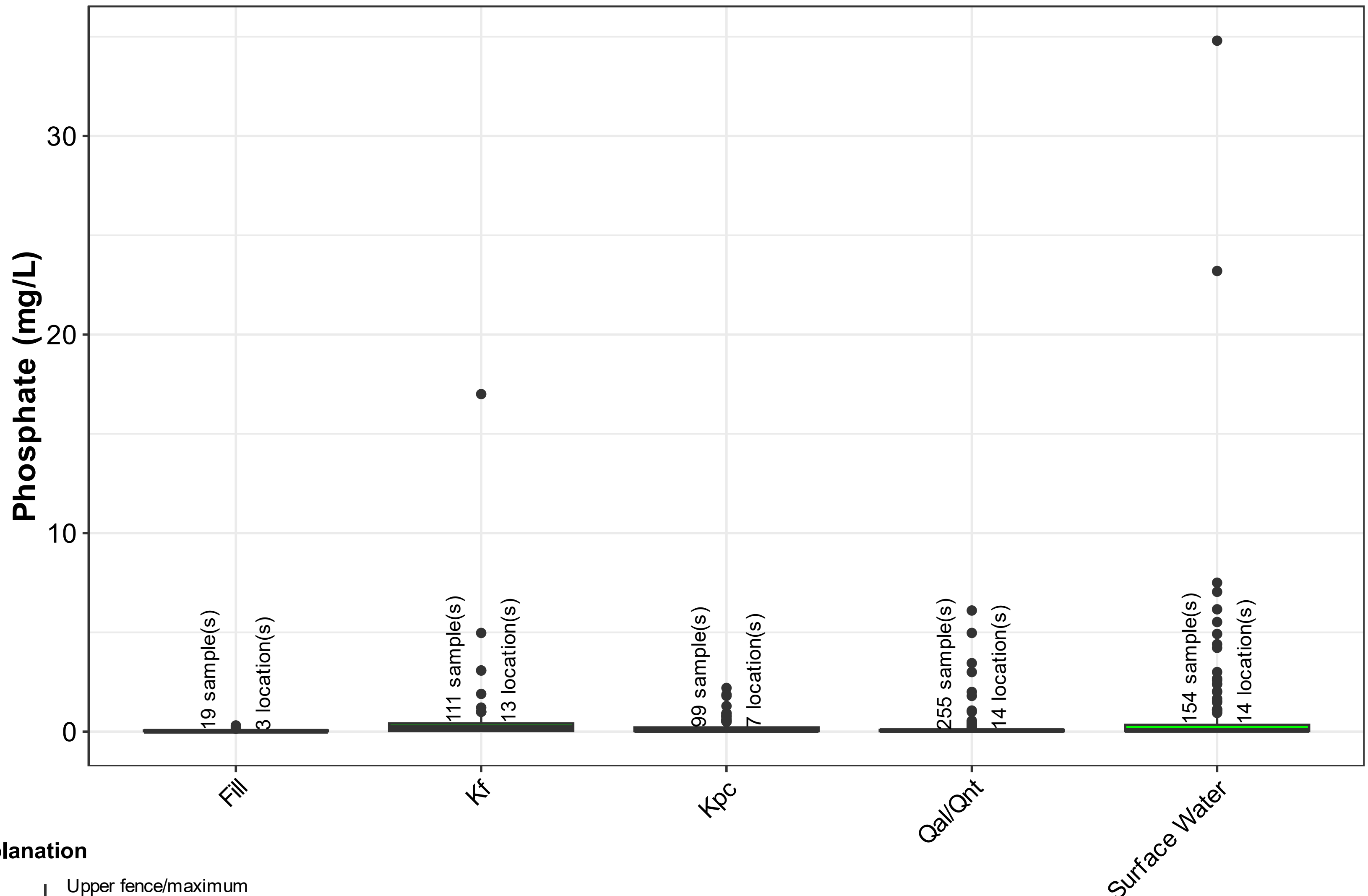
Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE

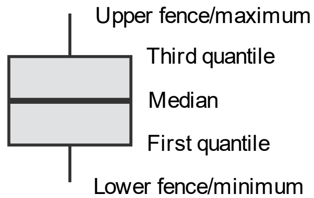
Box and Whisker Comparison Plot

Phenols

DBS&A
a Geo-Logic Company



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
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4. Outlier values shown as points.

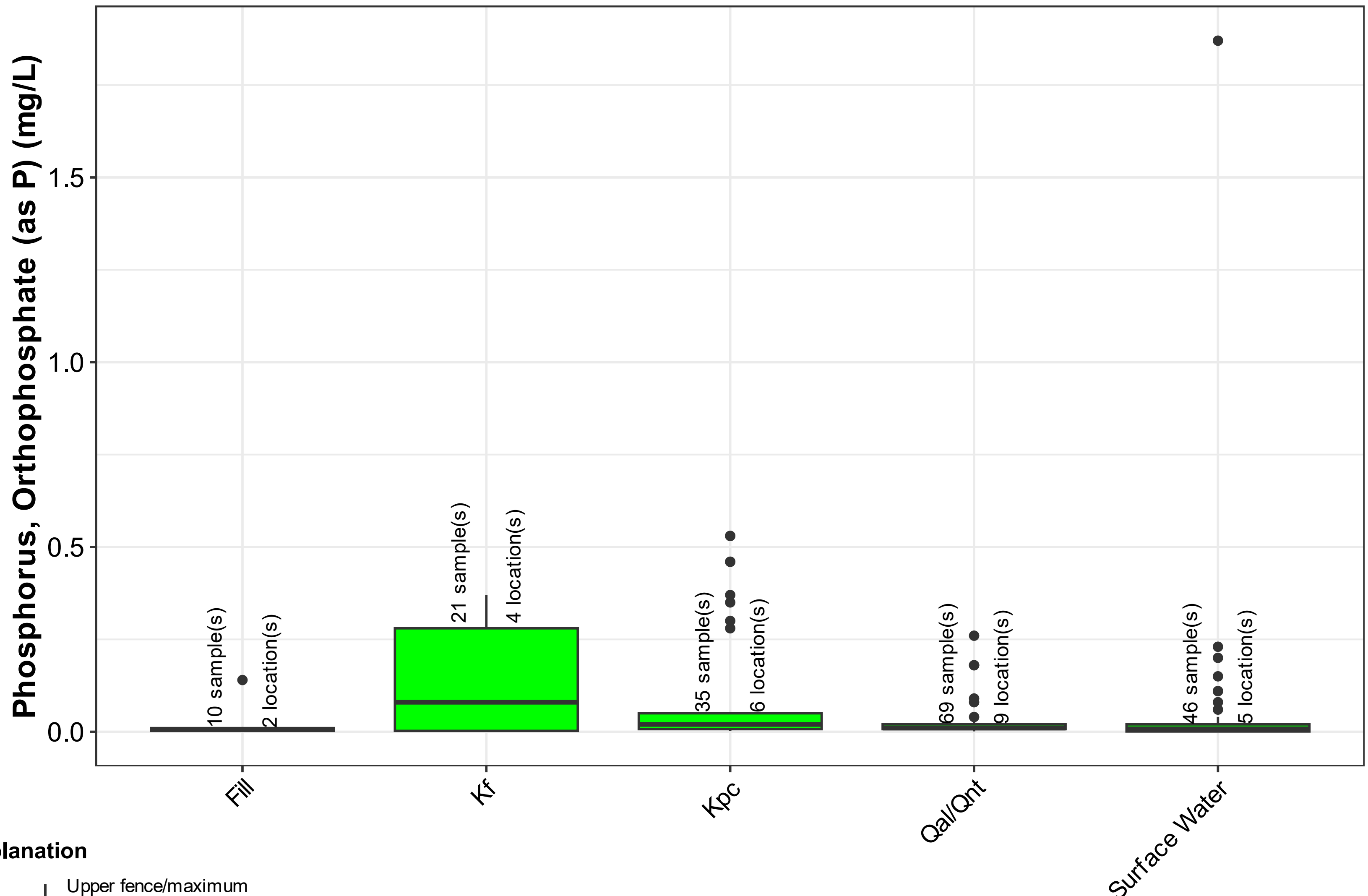
SAN JUAN MINE

Box and Whisker Comparison Plot

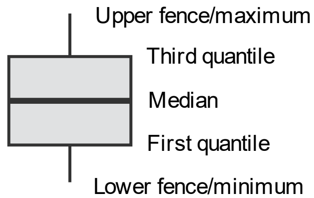
Phosphate

DBS&A
a Geo-Logic Company

6/10/2025 DB24.1140



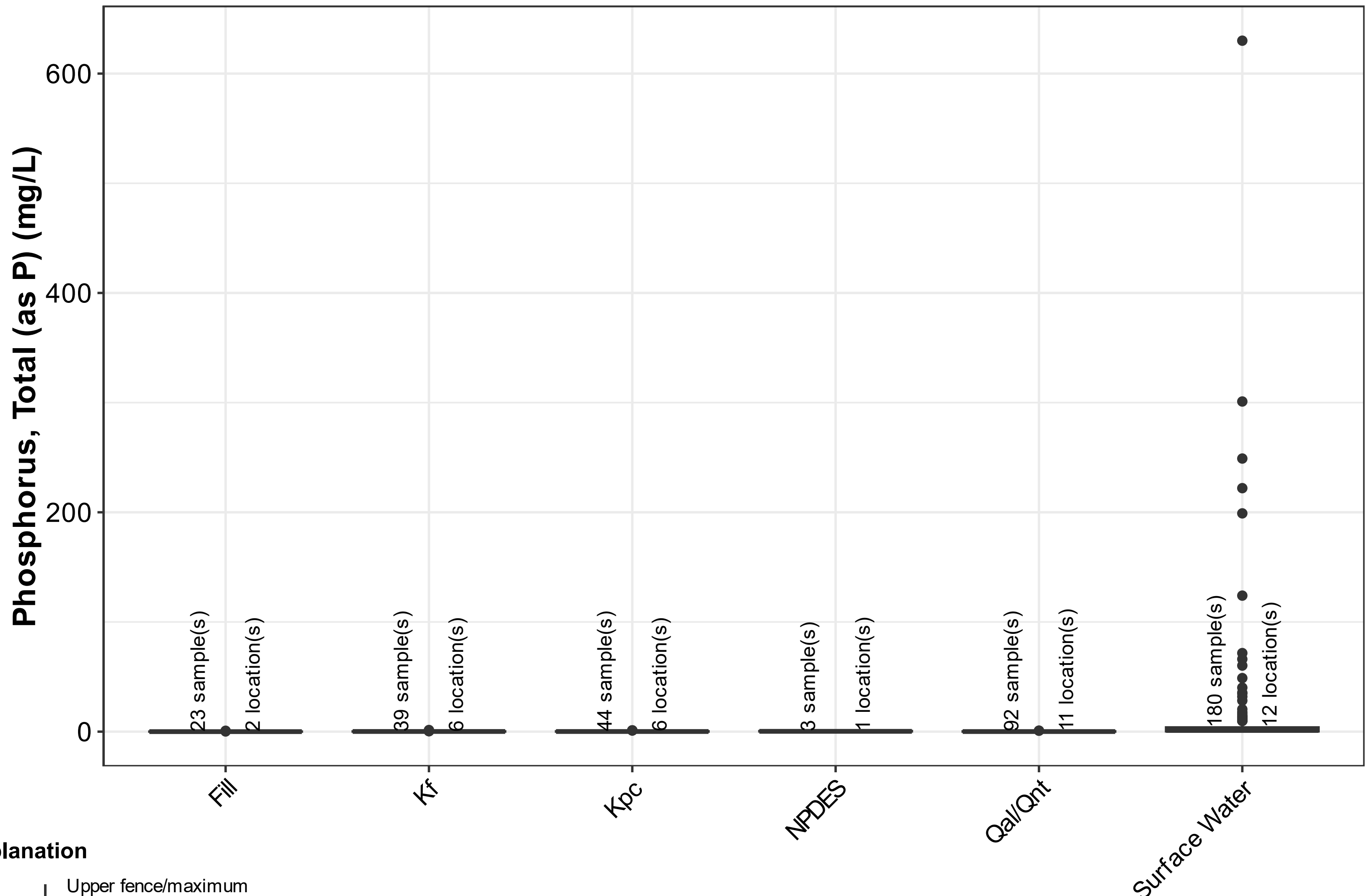
Explanation



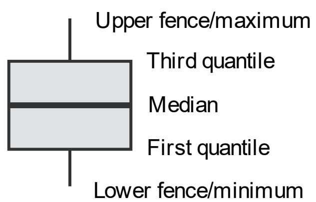
Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Phosphorus, Orthophosphate (as P)

DBS&A
a Geo-Logic Company



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

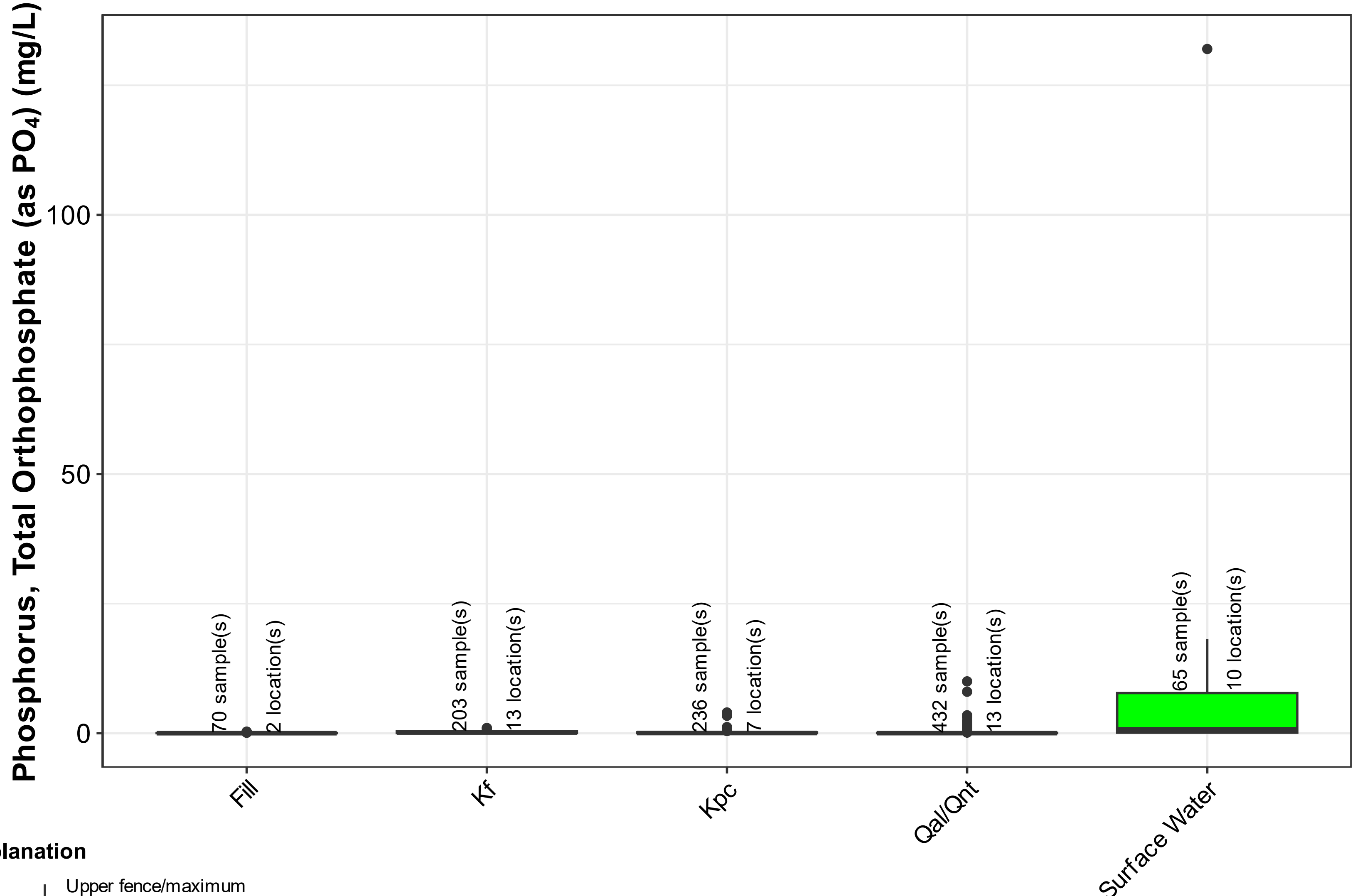
SAN JUAN MINE

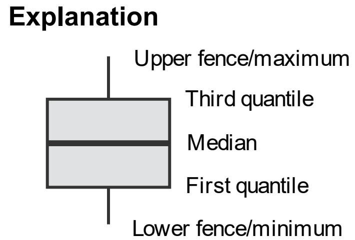
Box and Whisker Comparison Plot

Phosphorus, Total (as P)

DBS&A
a Geo-Logic Company

6/10/2025 DB24.1140



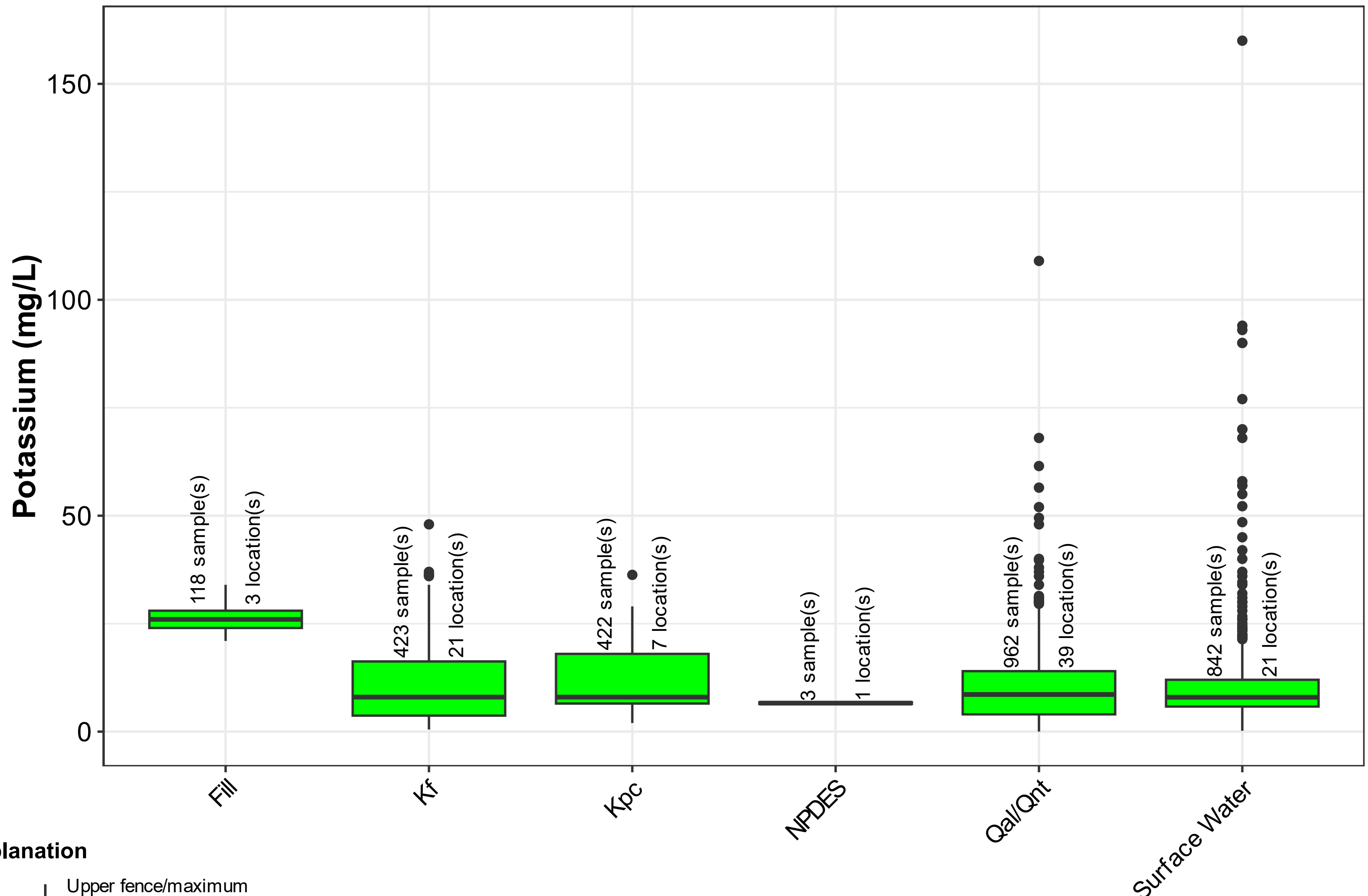


Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

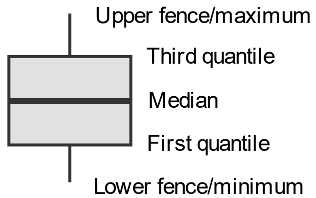
SAN JUAN MINE

Box and Whisker Comparison Plot

Phosphorus, Total Orthophosphate (as PO4)



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
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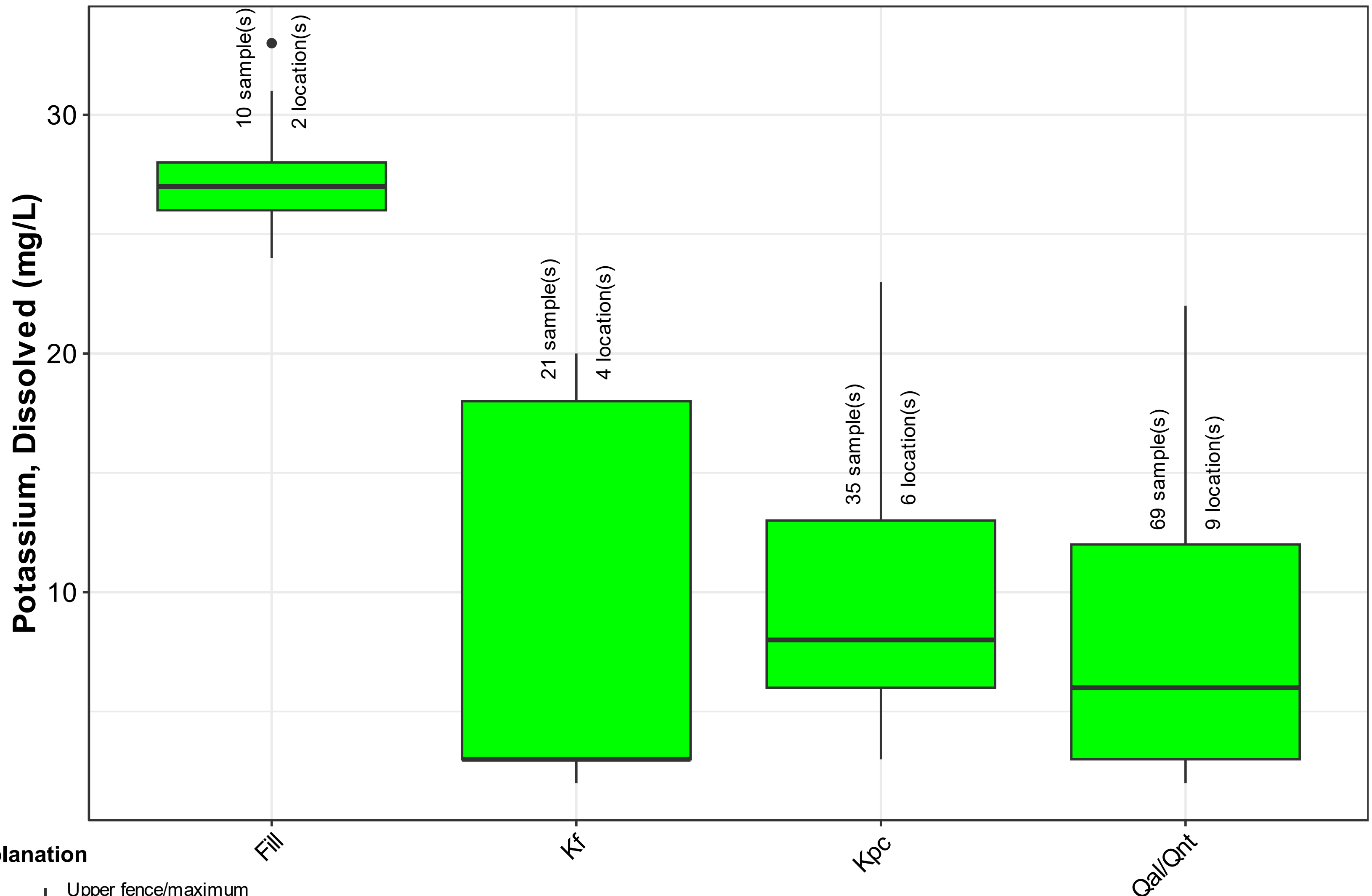
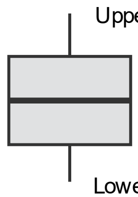
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Potassium

DBS&A
a Geo-Logic Company



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

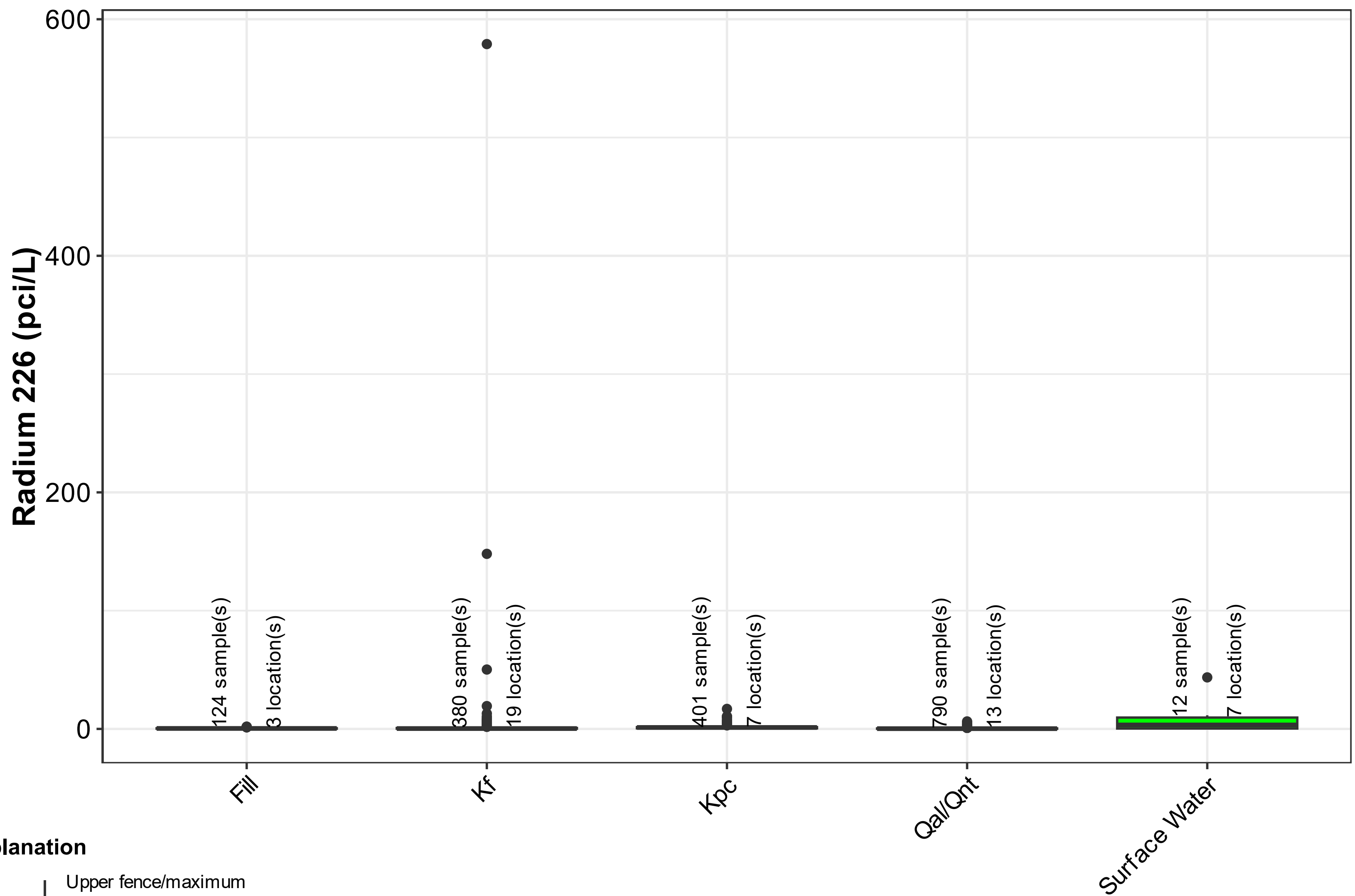
SAN JUAN MINE

Box and Whisker Comparison Plot

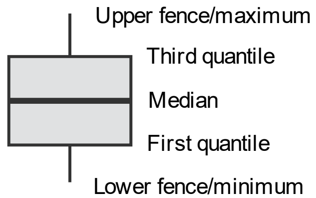
Potassium, Dissolved

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
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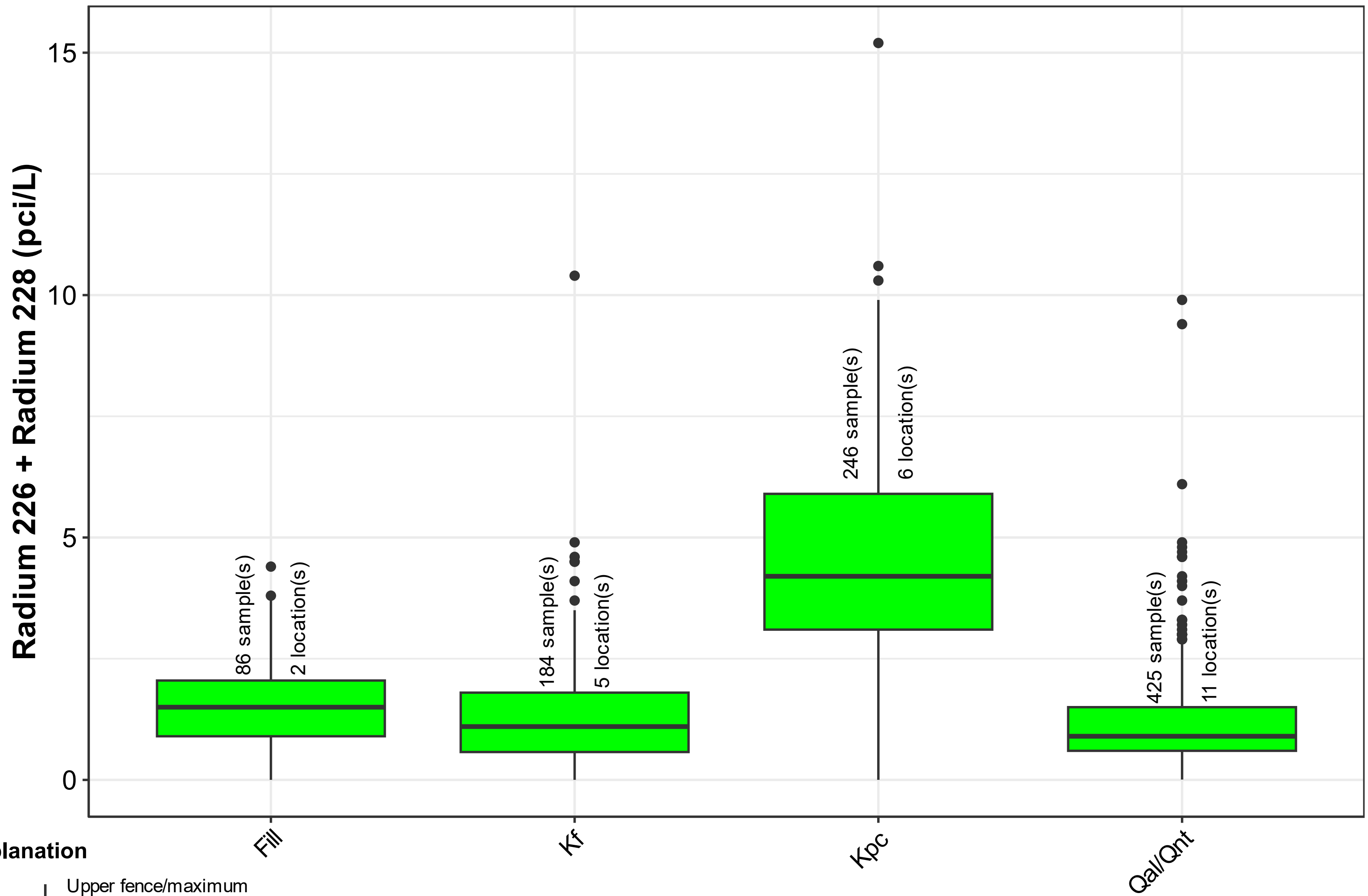
SAN JUAN MINE

Box and Whisker Comparison Plot

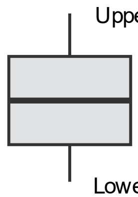
Radium 226

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:
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2. Non-detect values approximated as 1/2 the detection limit.
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4. Outlier values shown as points.

SAN JUAN MINE

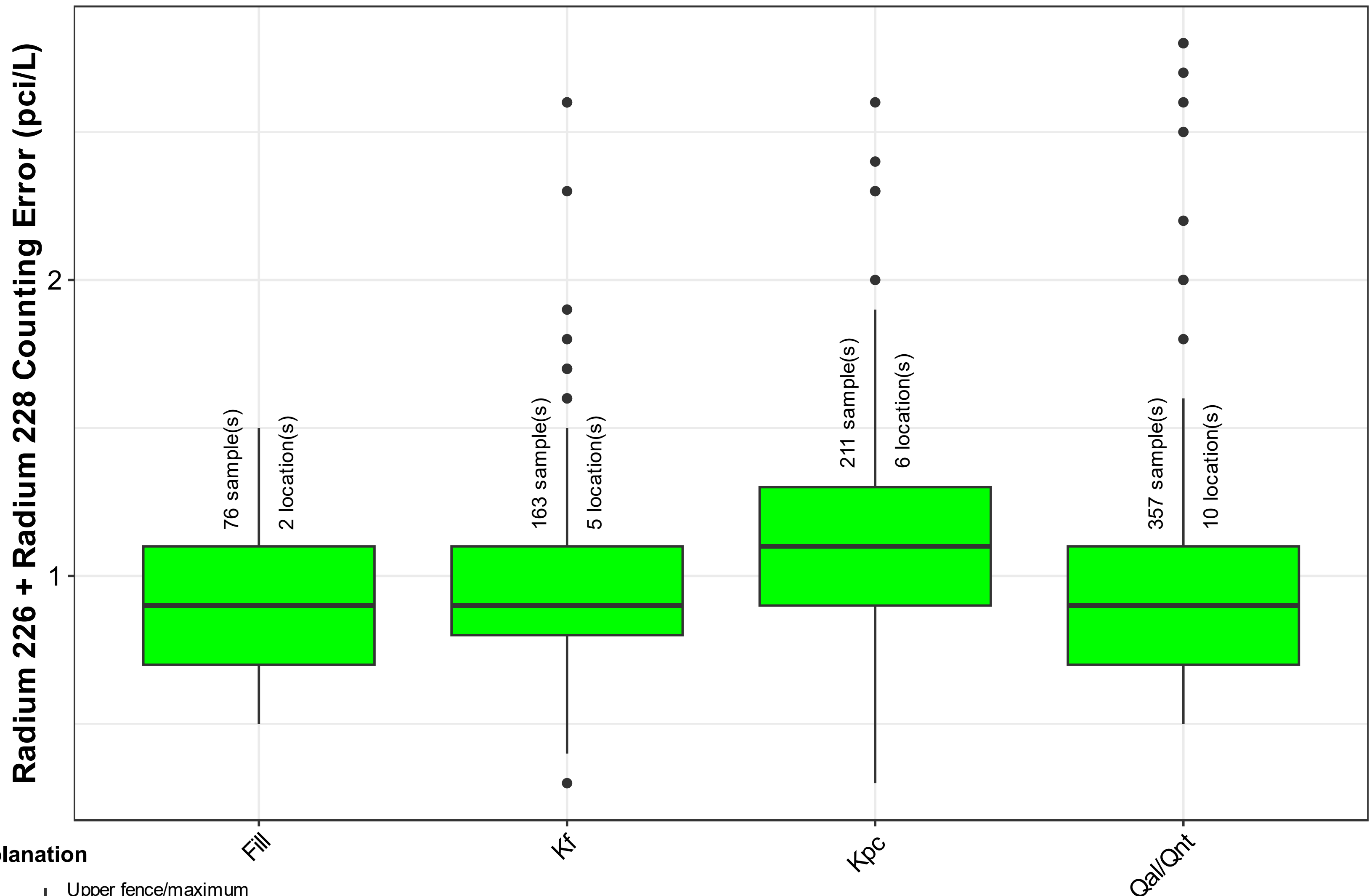
Box and Whisker Comparison Plot

Radium 226 + Radium 228

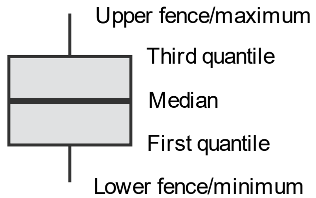
DBS&A a Geo-Logic Company

6/10/2025 DB24.1140

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm



Explanation



Notes:
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2. Non-detect values approximated as 1/2 the detection limit.
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4. Outlier values shown as points.

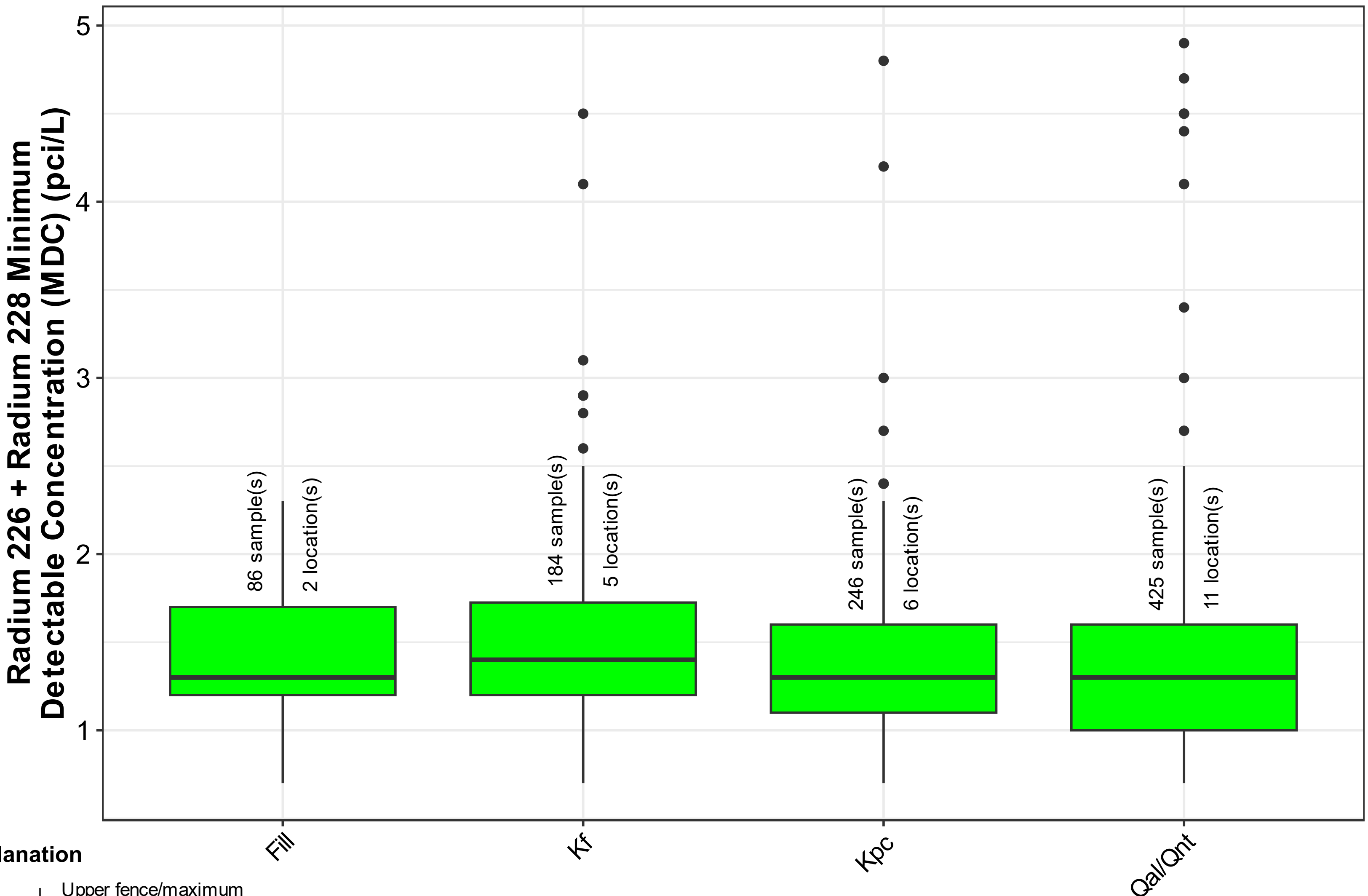
SAN JUAN MINE

Box and Whisker Comparison Plot

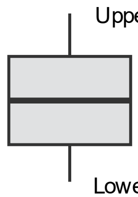
Radium 226 + Radium 228 Counting Error

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation

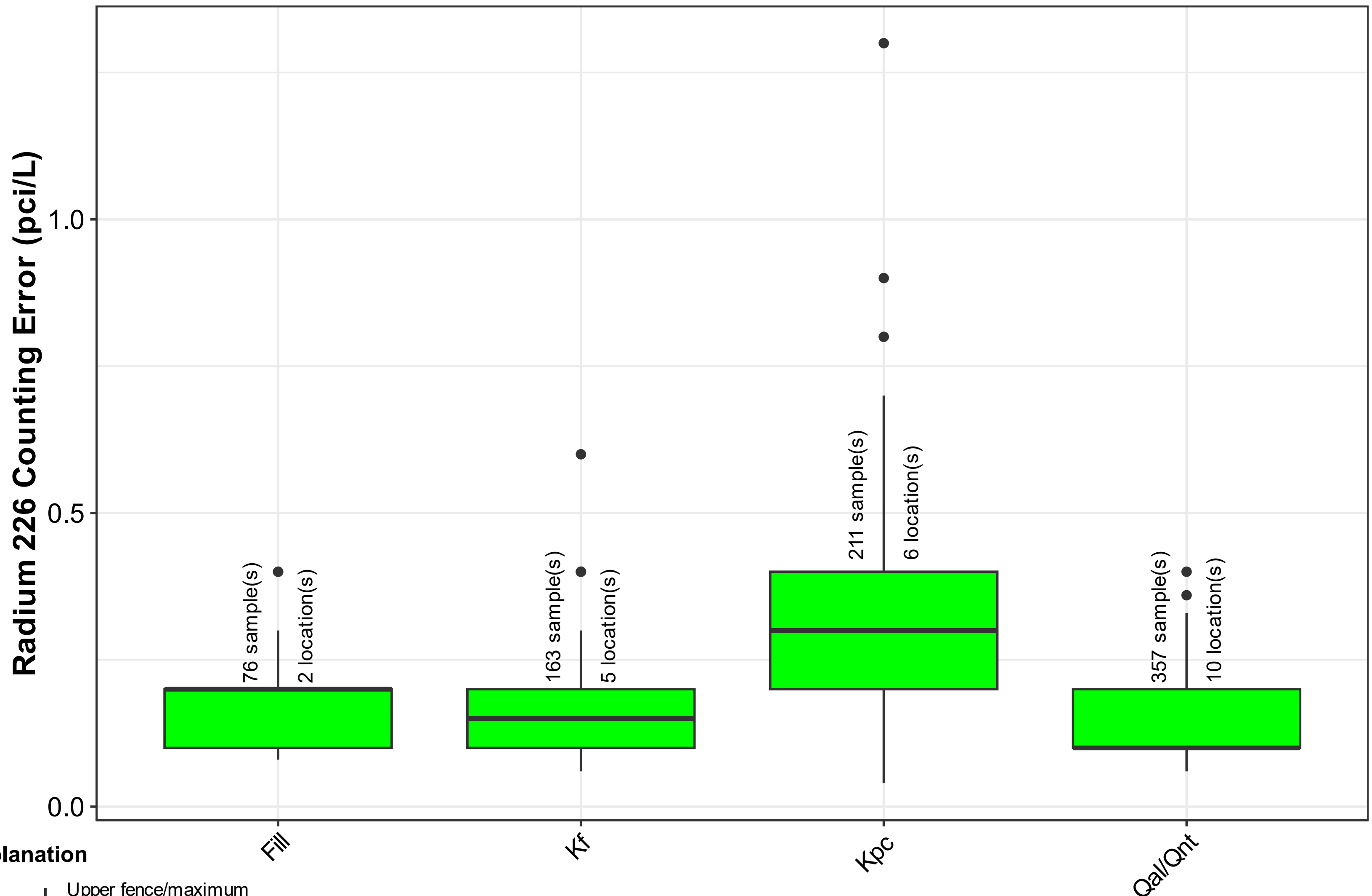


Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

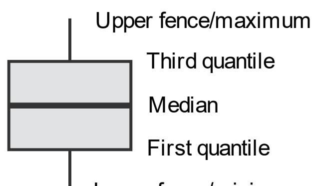
SAN JUAN MINE

Box and Whisker Comparison Plot

Radium 226 + Radium 228 Minimum Detectable Concentration (MDC)



Explanation



Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

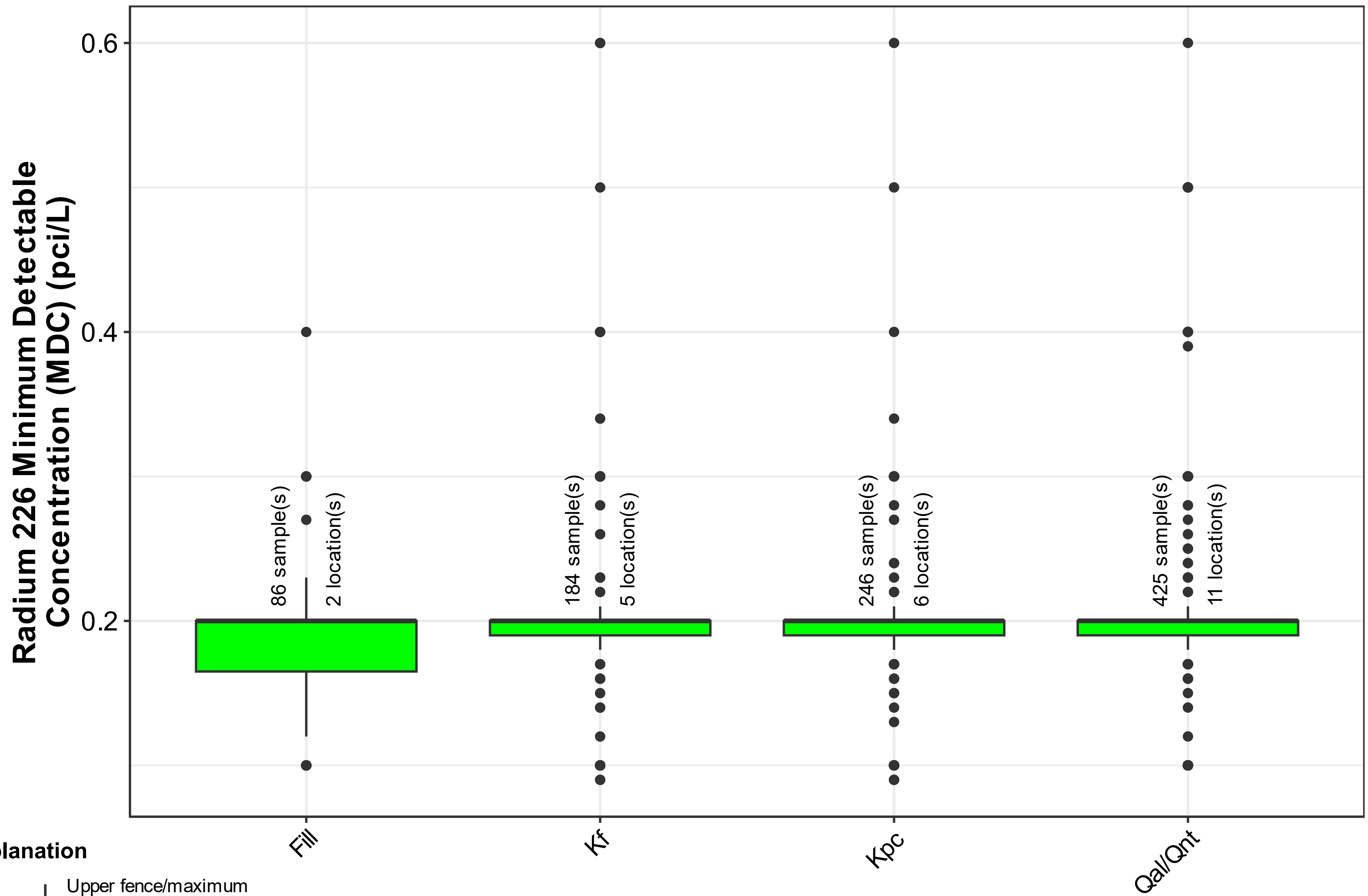
SAN JUAN MINE

Box and Whisker Comparison Plot

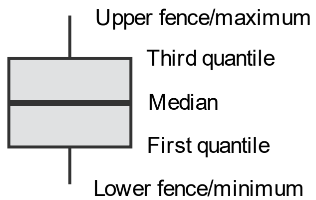
Radium 226 Counting Error

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation

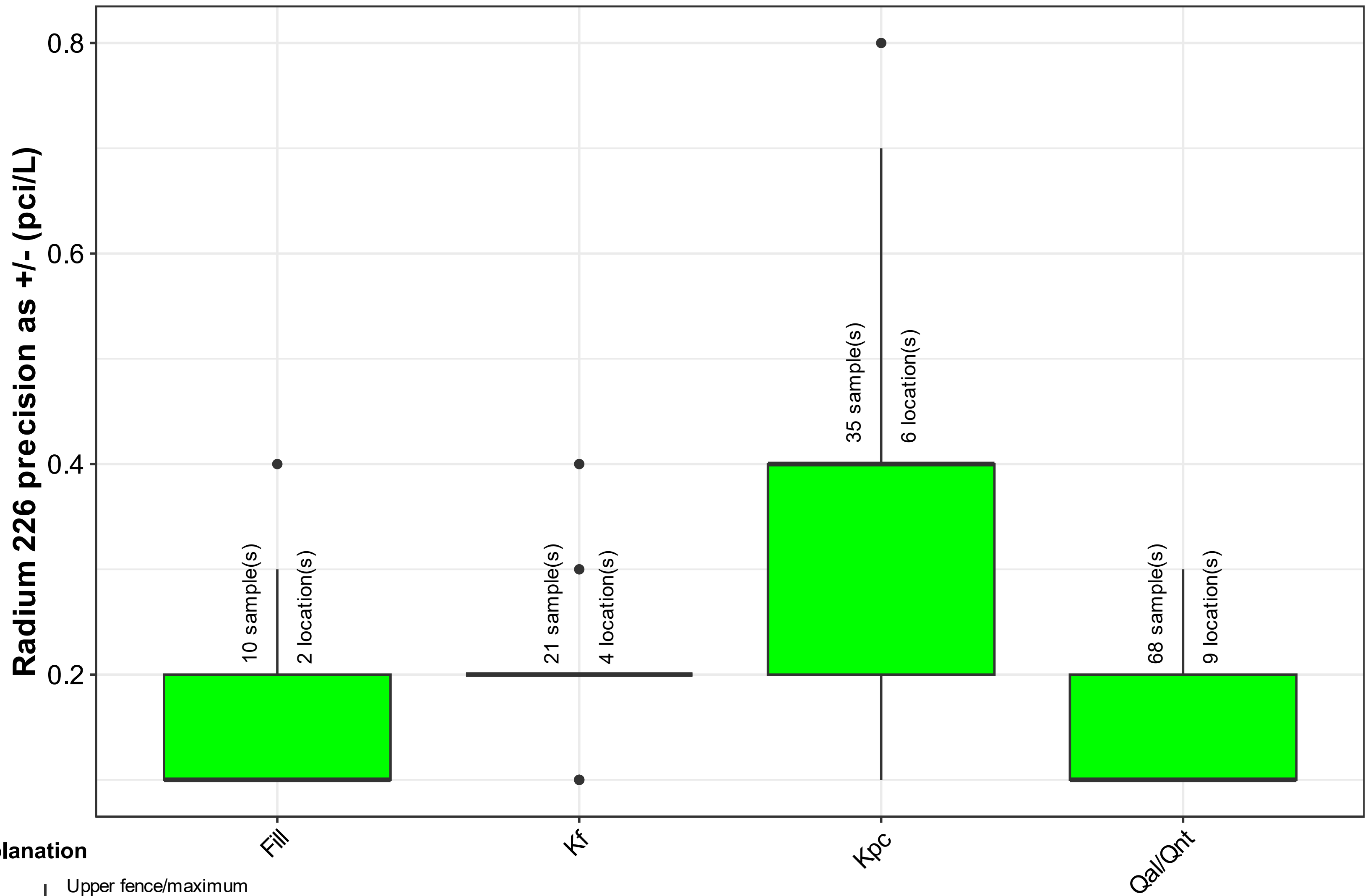


Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

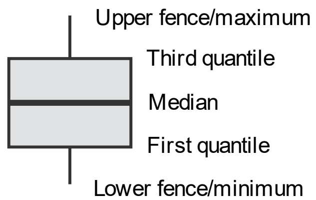
SAN JUAN MINE

Box and Whisker Comparison Plot

Radium 226 Minimum Detectable Concentration (MDC)



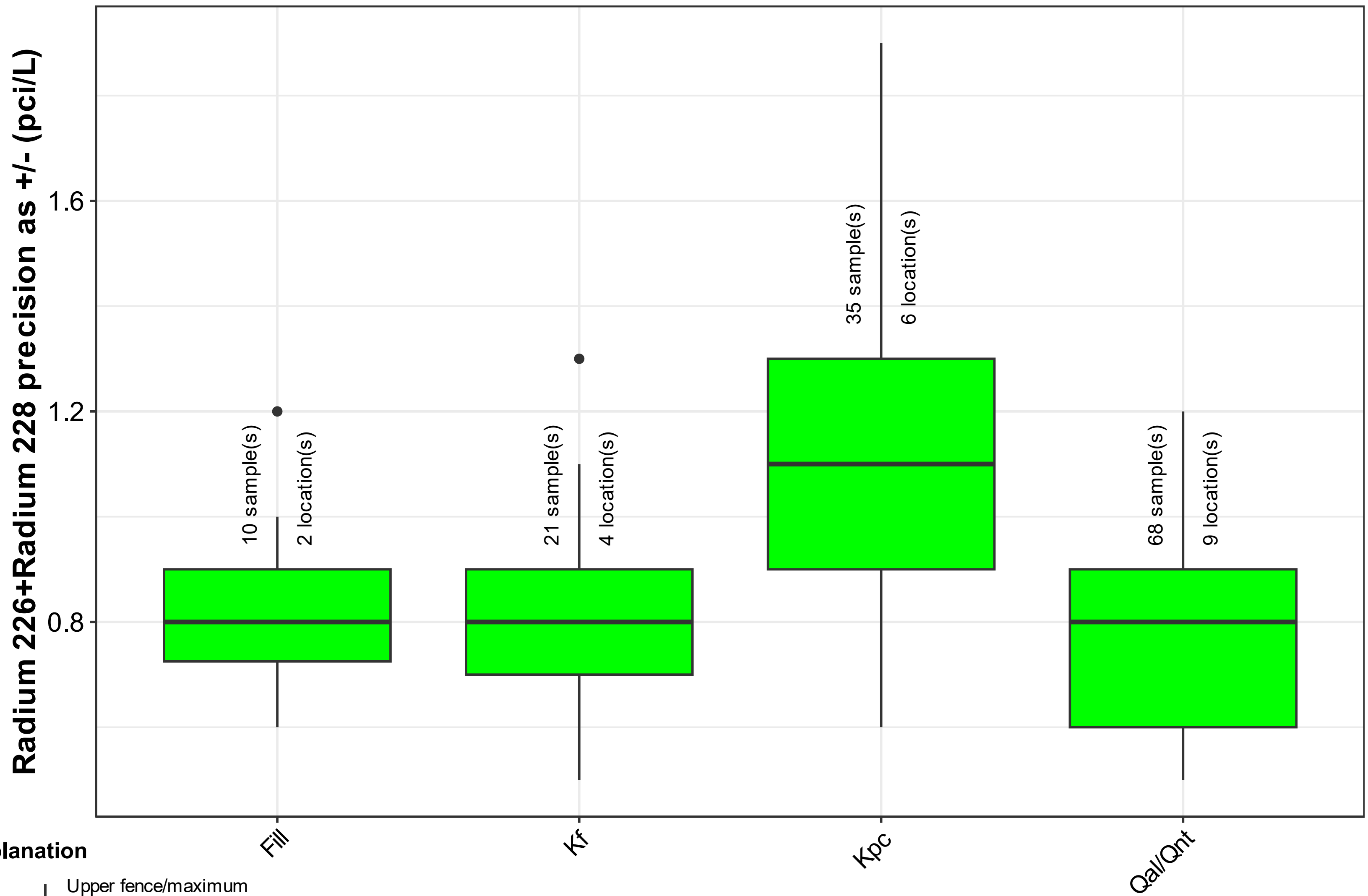
Explanation



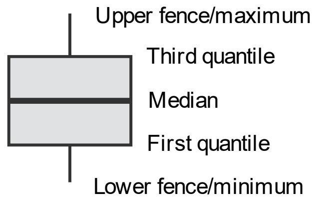
Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Radium 226 precision as +/-

DBS&A
a Geo-Logic Company
6/10/2025 DB24.1140



Explanation



Notes:

1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

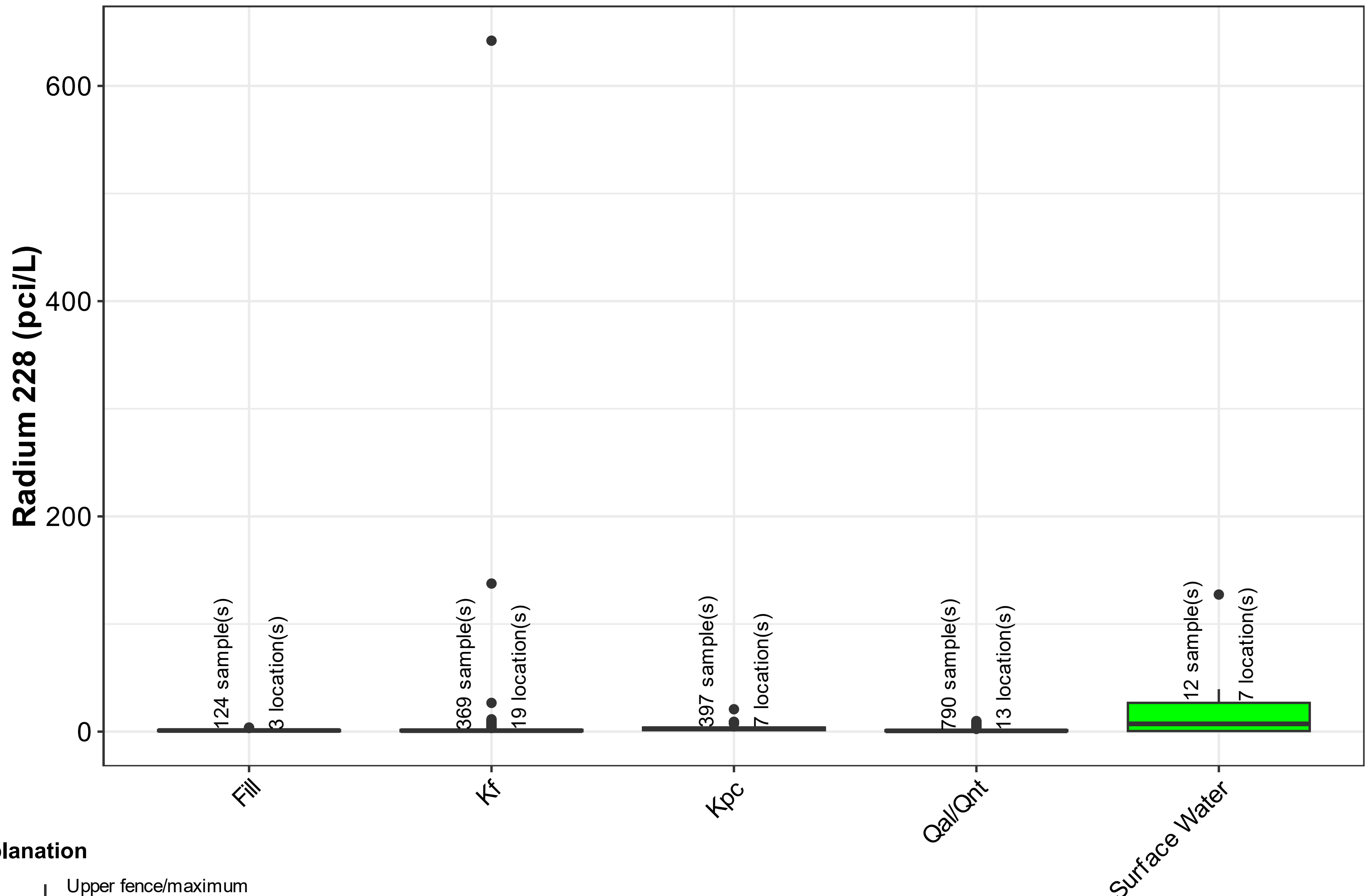
SAN JUAN MINE

Box and Whisker Comparison Plot

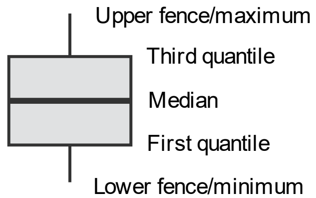
Radium 226+Radium 228 precision as +/-

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:

1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE

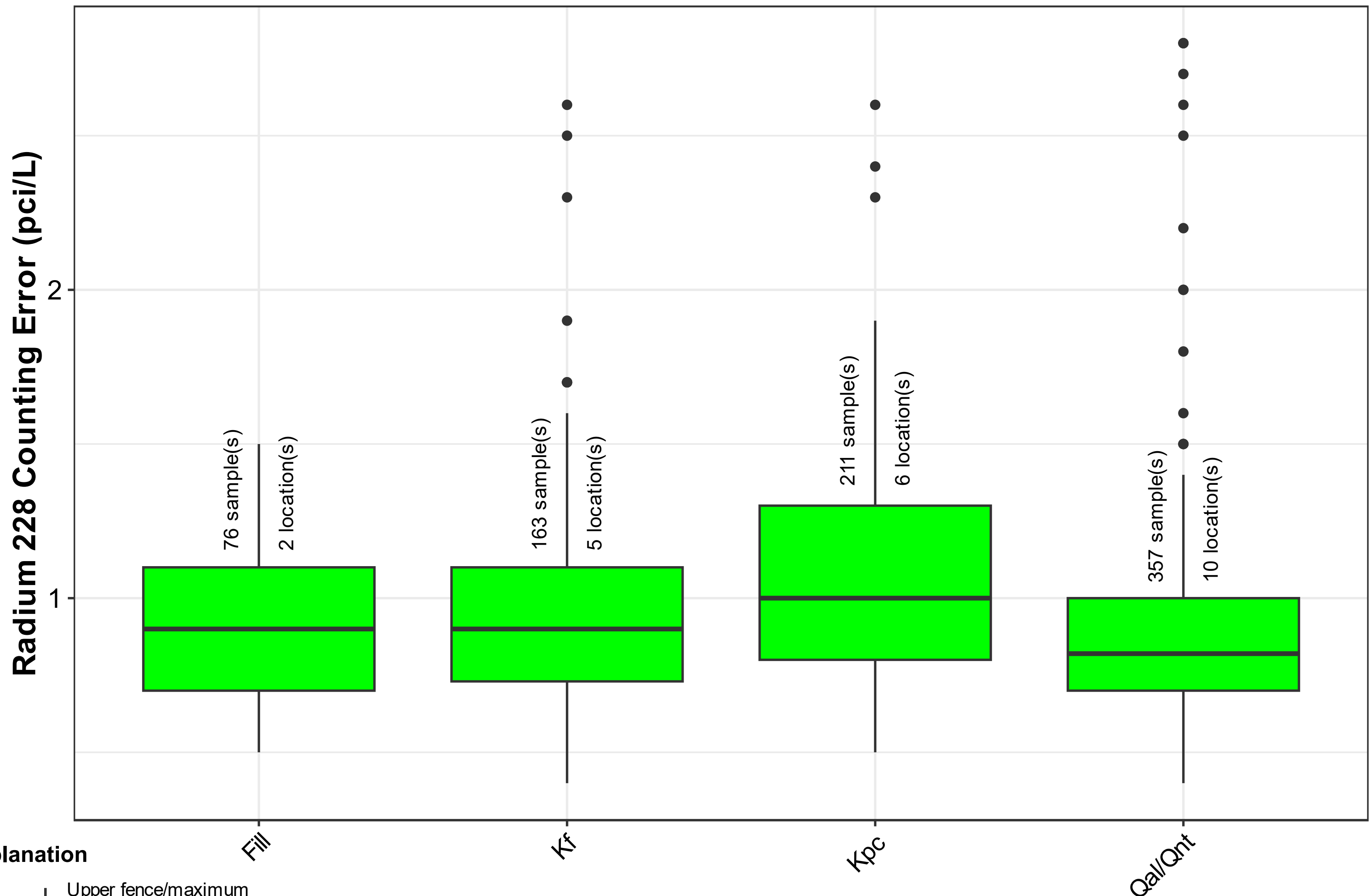
Box and Whisker Comparison Plot

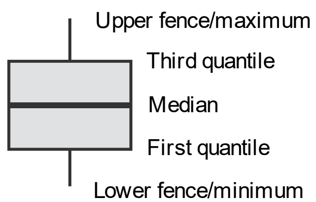
Radium 228

DBS&A

a Geo-Logic Company

6/10/2025 DB24.1140





Notes:

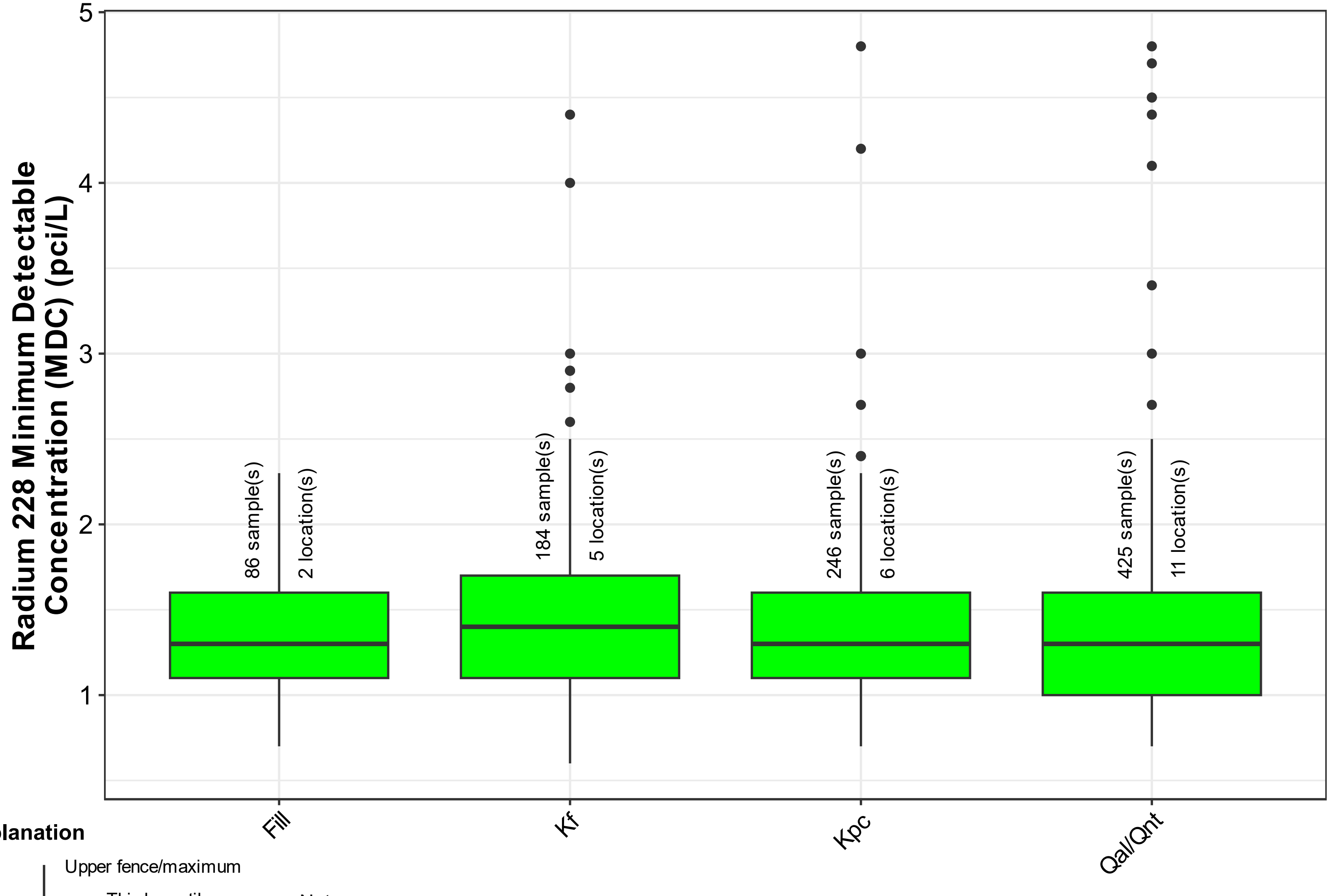
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE

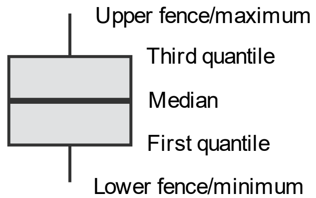
Box and Whisker Comparison Plot

Radium 228 Counting Error

DBS&A a Geo-Logic Company



Explanation



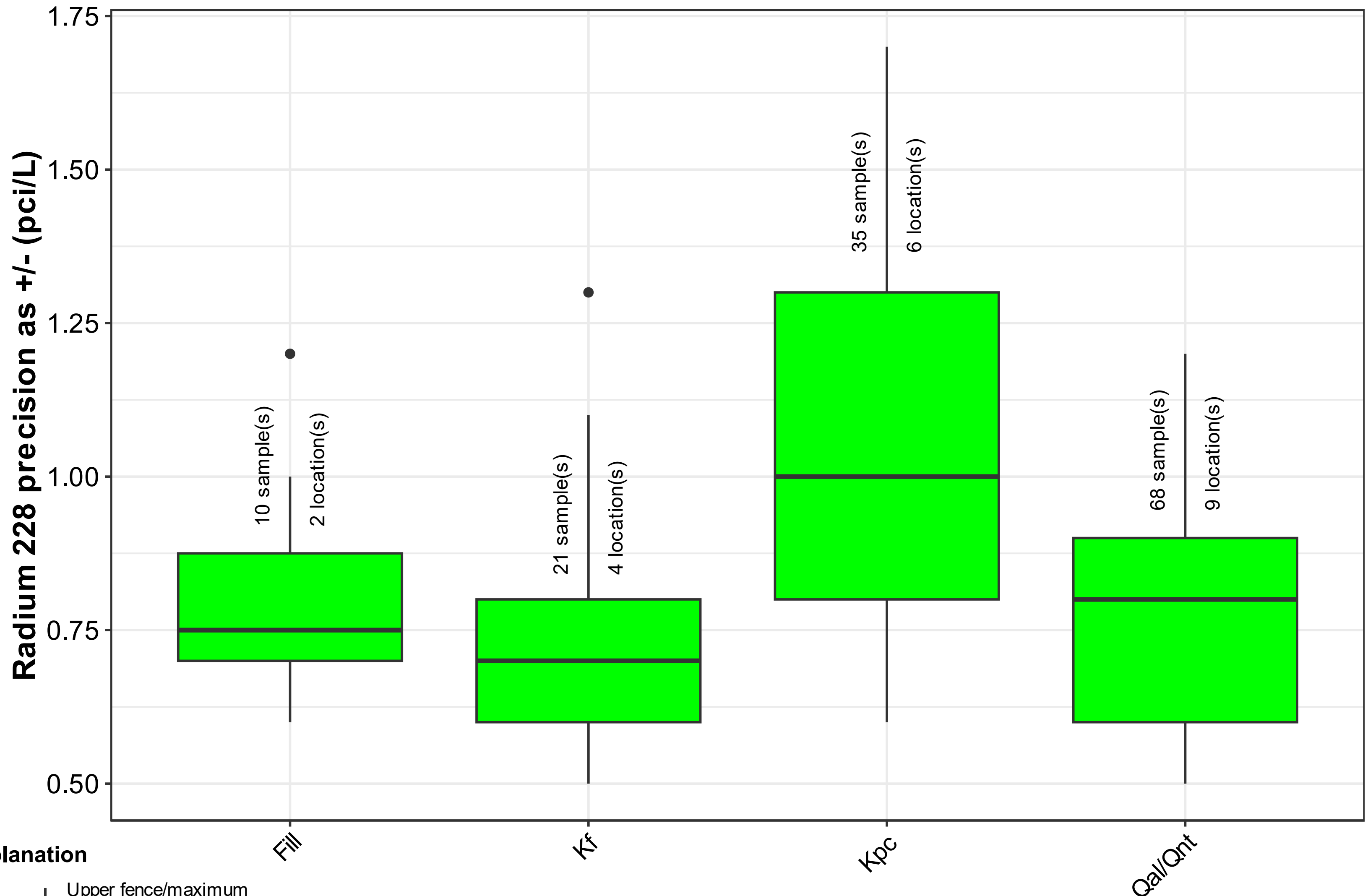
Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE

Box and Whisker Comparison Plot

Radium 228 Minimum Detectable Concentration (MDC)

DBS&A
a Geo-Logic Company



Explanation

Notes:

1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

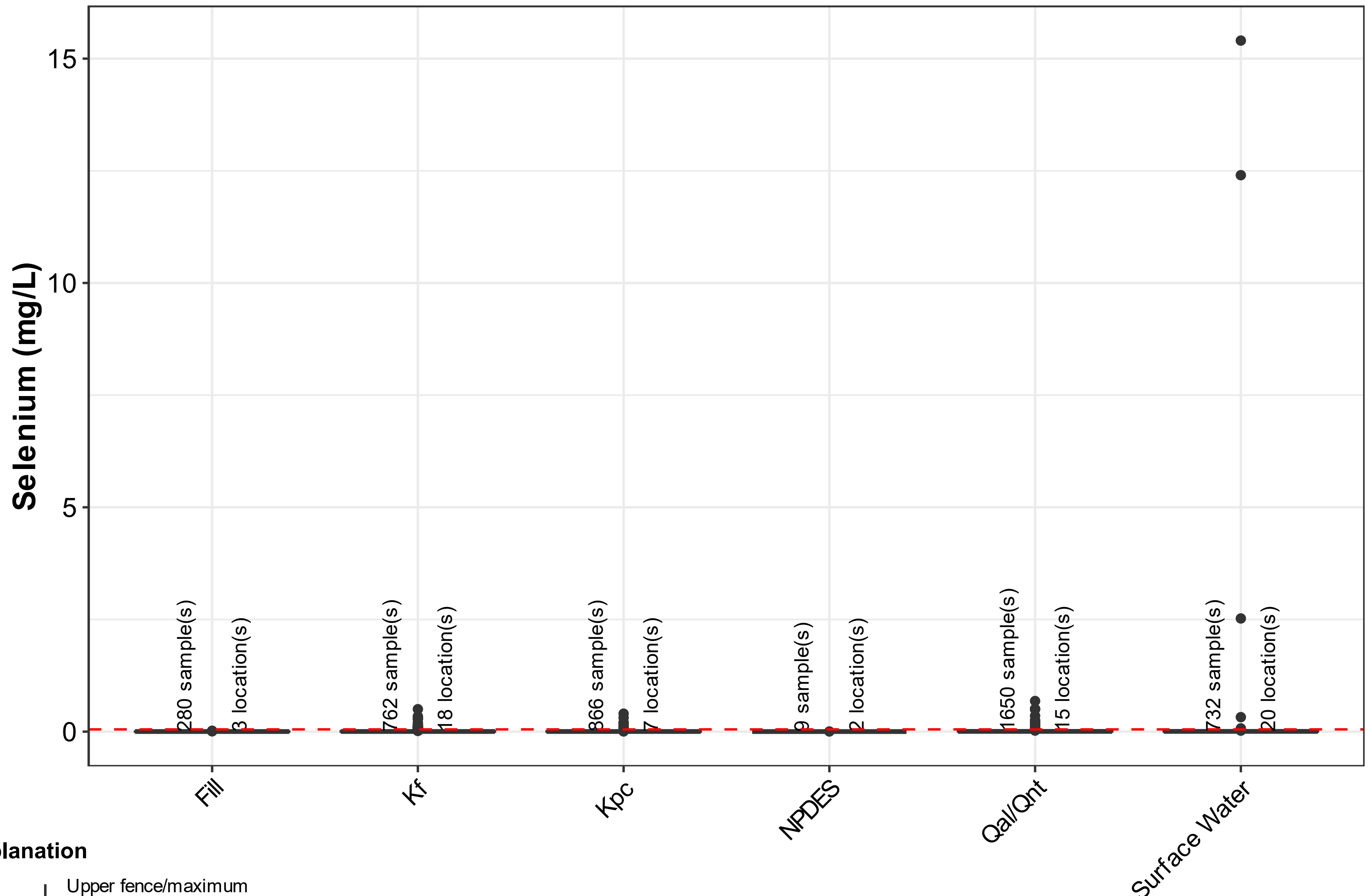
SAN JUAN MINE

Box and Whisker Comparison Plot

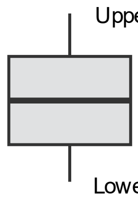
Radium 228 precision as +/-

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:

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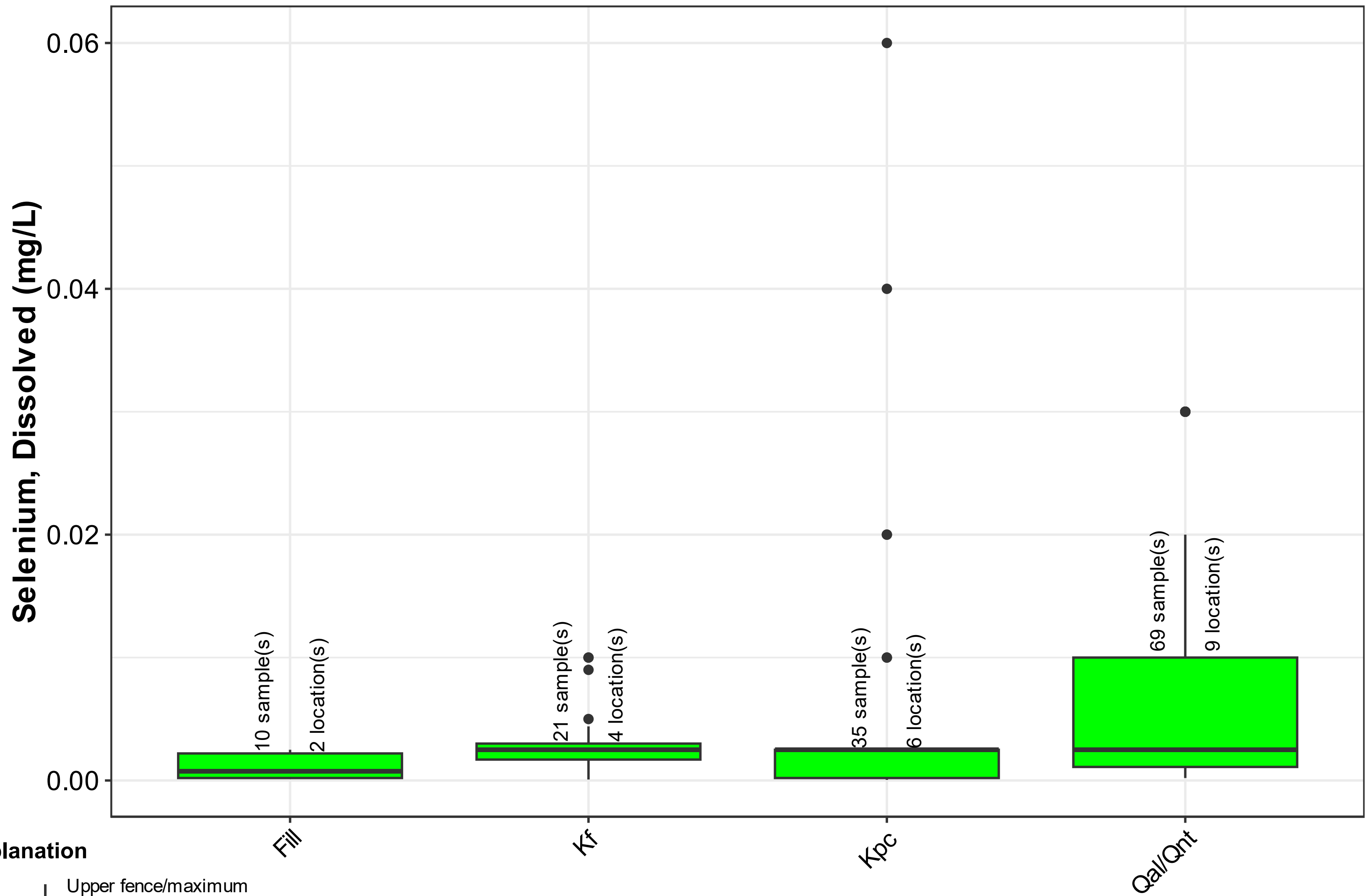
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE

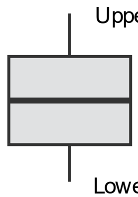
Box and Whisker Comparison Plot

Selenium

DBS&A a Geo-Logic Company



Explanation



Notes:
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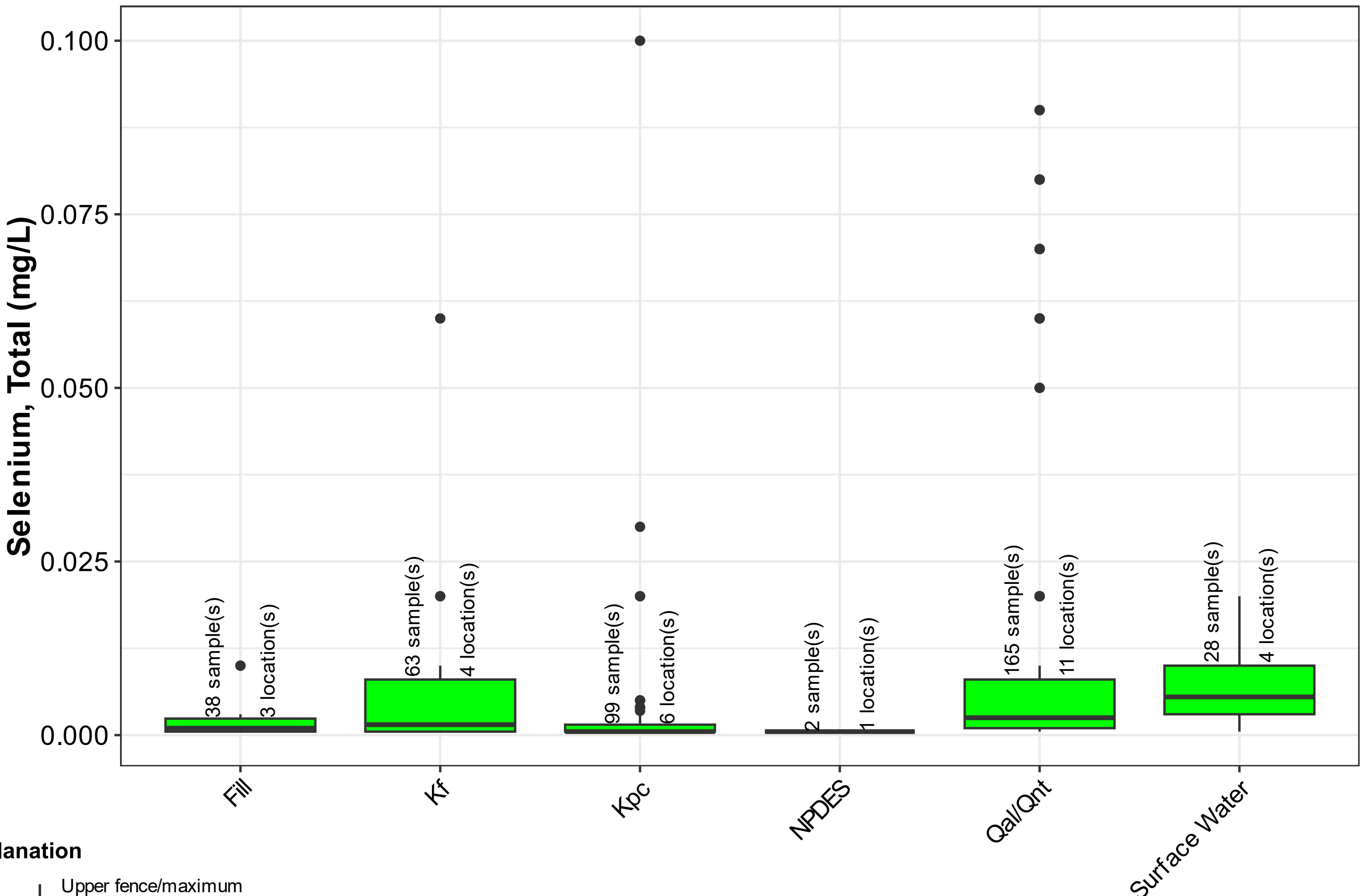
4. Outlier values shown as points.

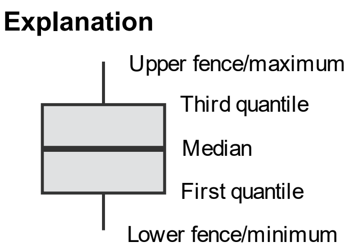
SAN JUAN MINE

Box and Whisker Comparison Plot

Selenium, Dissolved

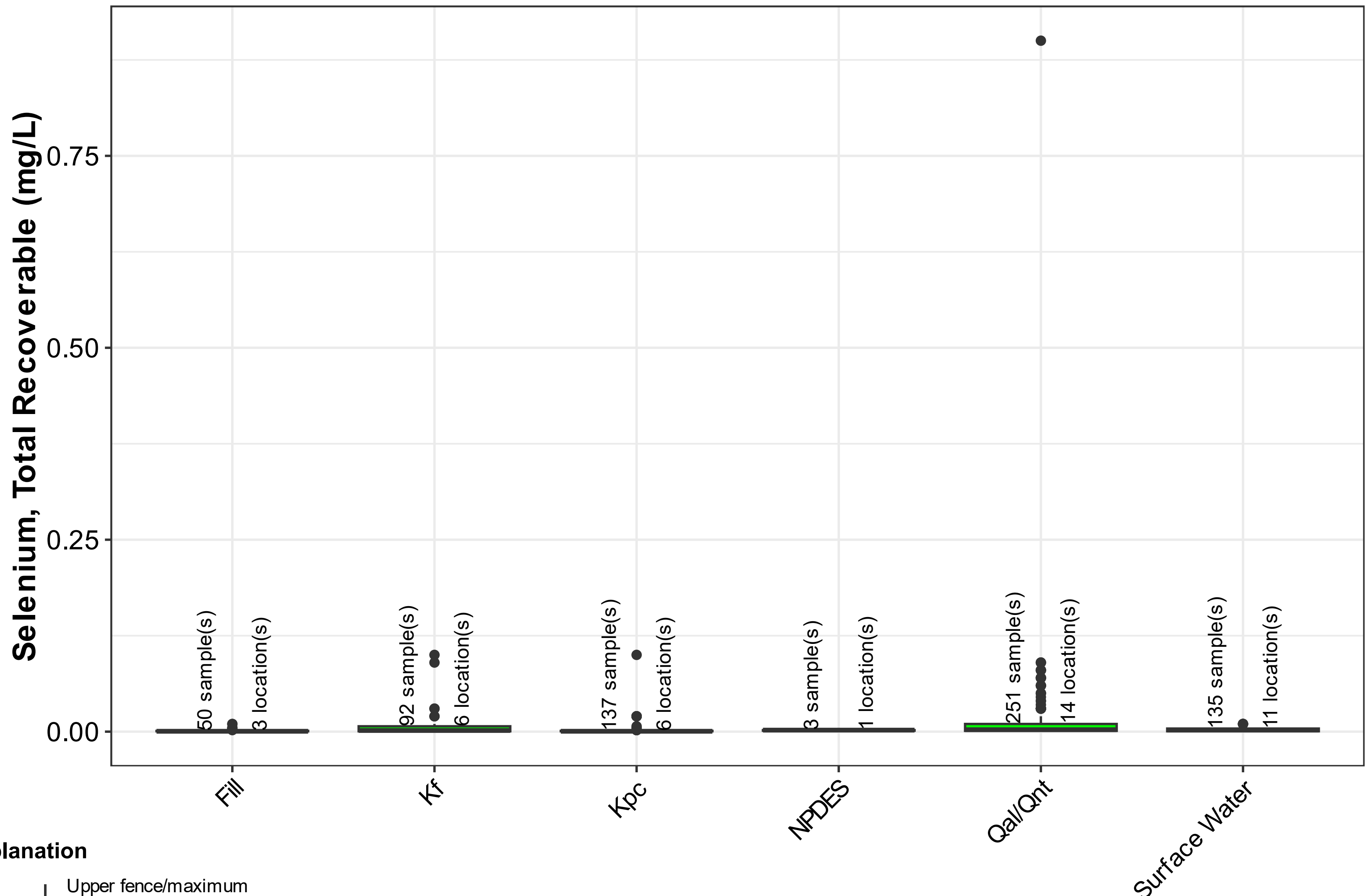
DBS&A a Geo-Logic Company



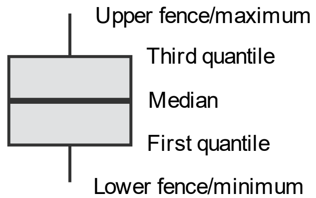


Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Selenium, Total



Explanation



Notes:
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4. Outlier values shown as points.

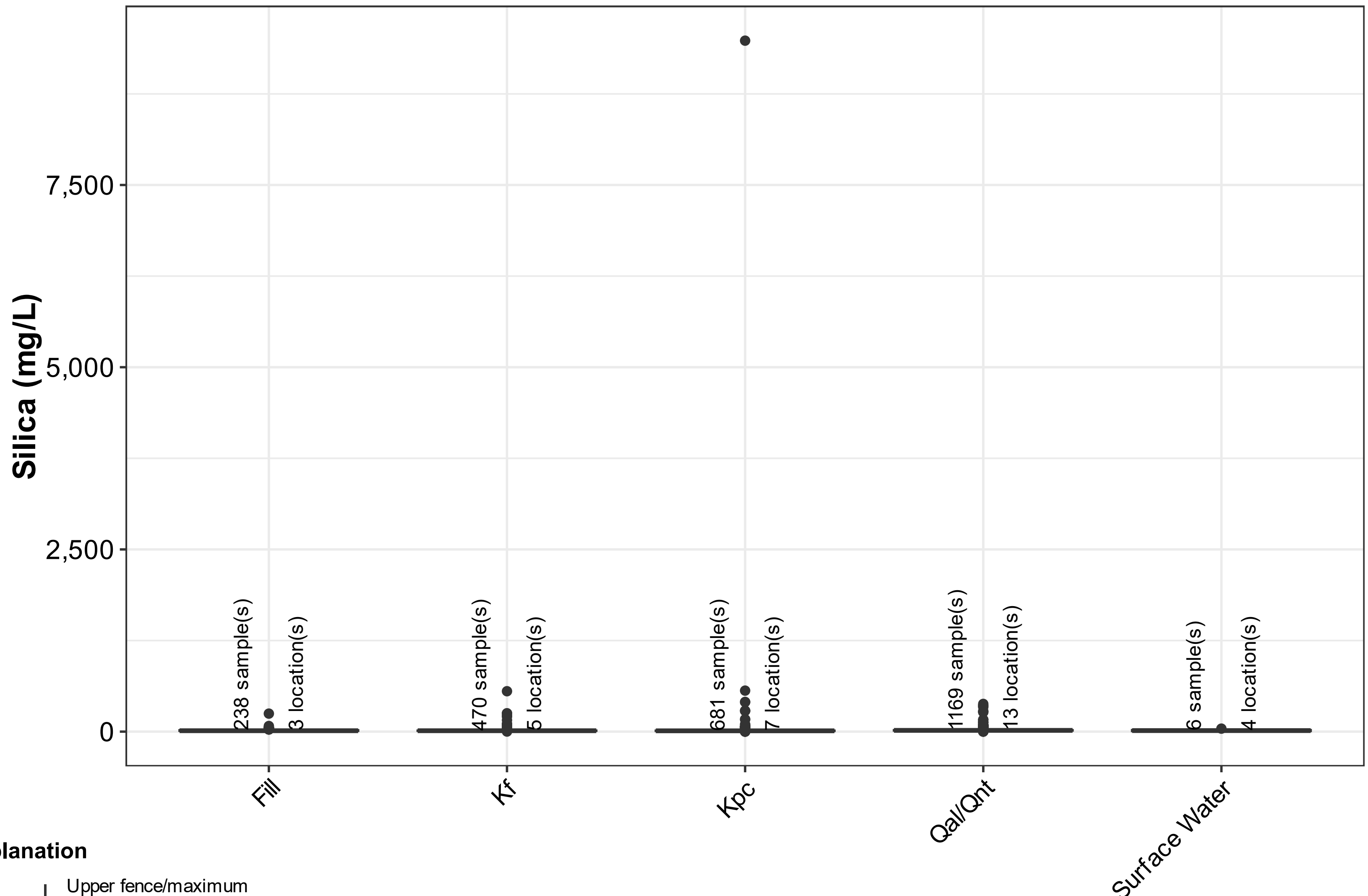
SAN JUAN MINE

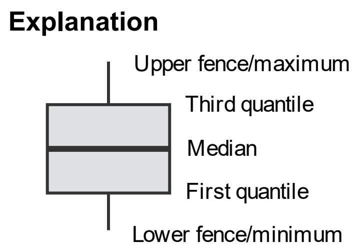
Box and Whisker Comparison Plot

Selenium, Total Recoverable

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140





Notes:
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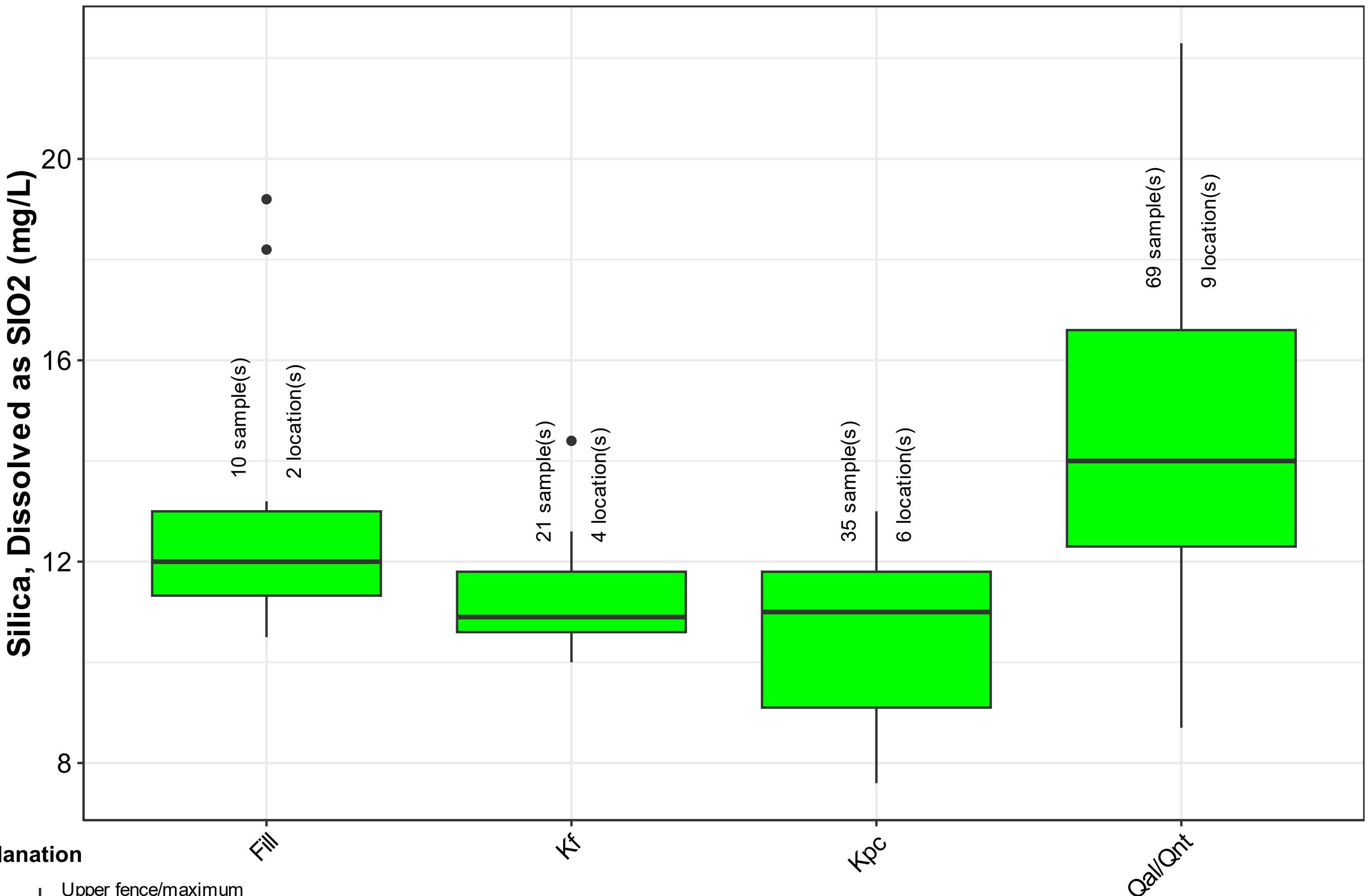
4. Outlier values shown as points.

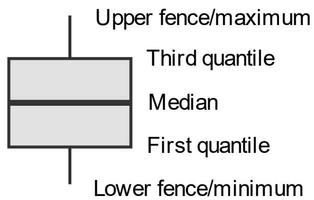
SAN JUAN MINE

Box and Whisker Comparison Plot

Silica



Explanation



Notes:

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2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

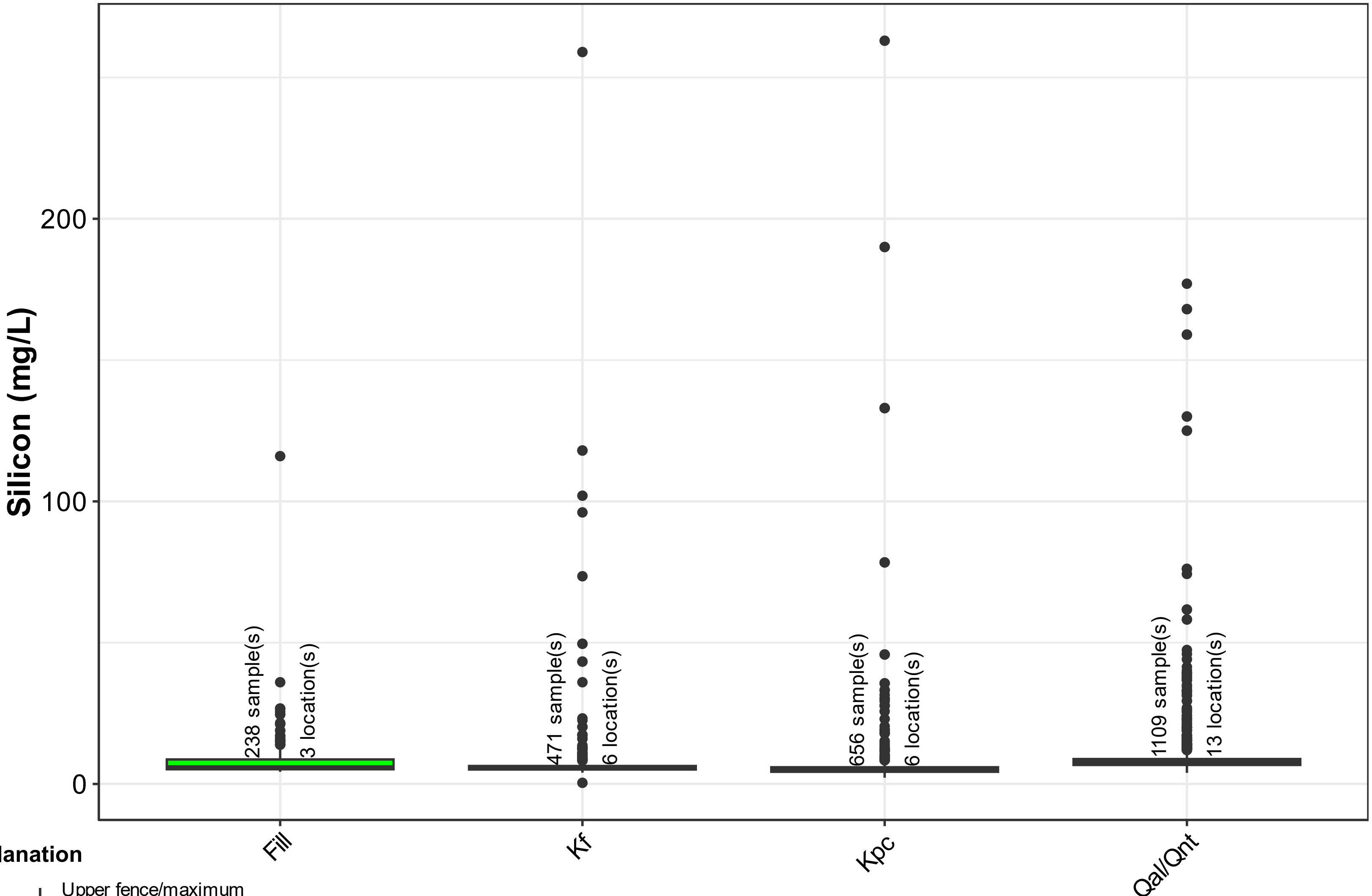
SAN JUAN MINE

Box and Whisker Comparison Plot

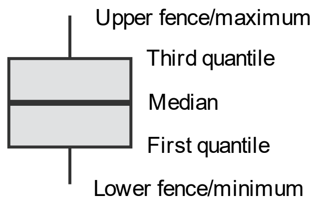
Silica, Dissolved as SIO2

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:
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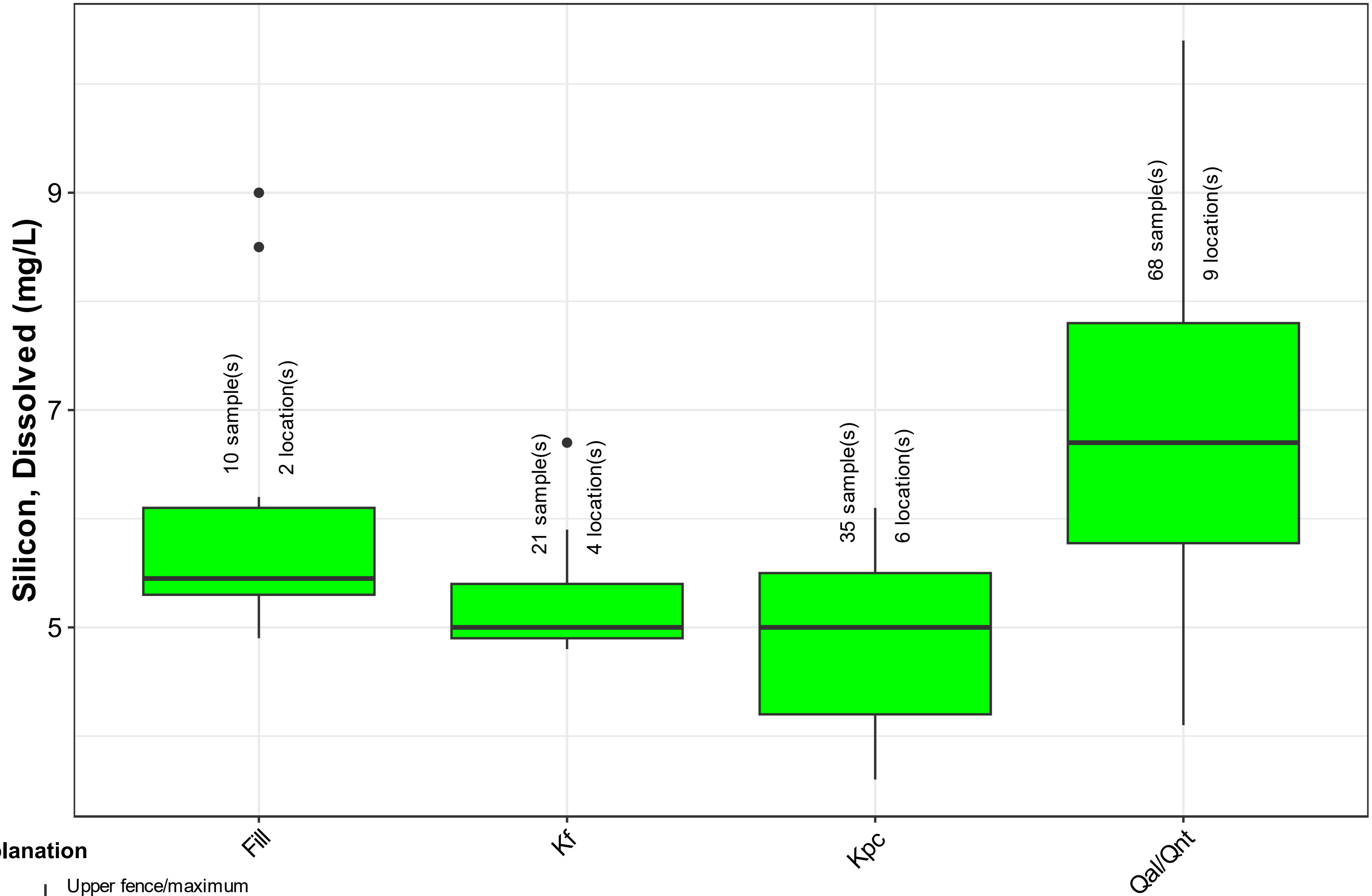
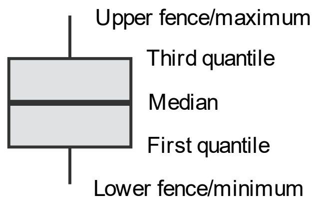
4. Outlier values shown as points.

SAN JUAN MINE
Box and Whisker Comparison Plot
Silicon

DBS&A a Geo-Logic Company



Explanation



Notes:

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4. Outlier values shown as points.

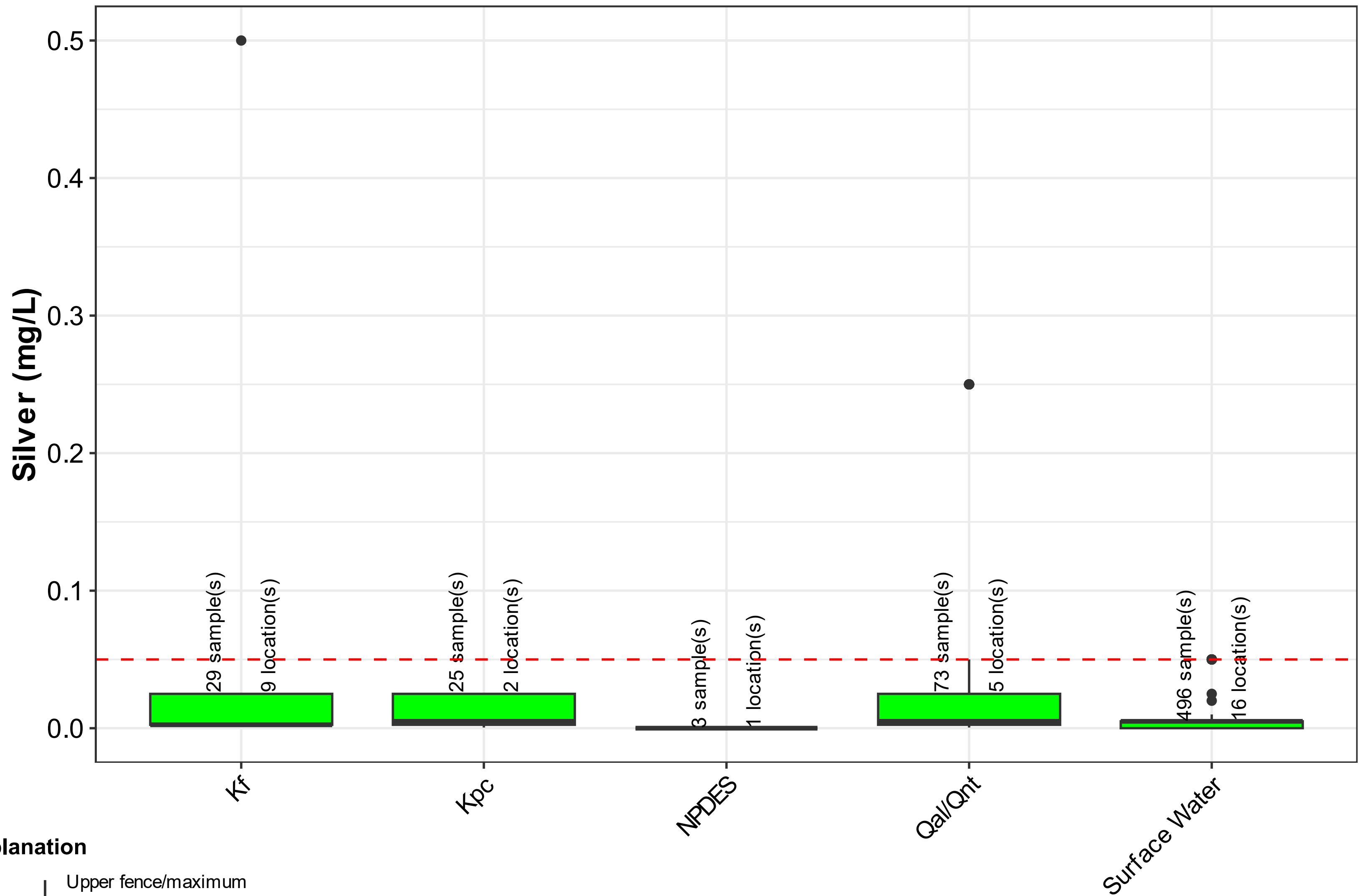
SAN JUAN MINE

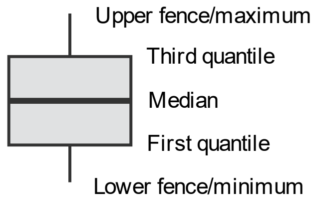
Box and Whisker Comparison Plot

Silicon, Dissolved

DBS&A a Geo-Logic Company

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm





Notes:
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2. Non-detect values approximated as 1/2 the detection limit.
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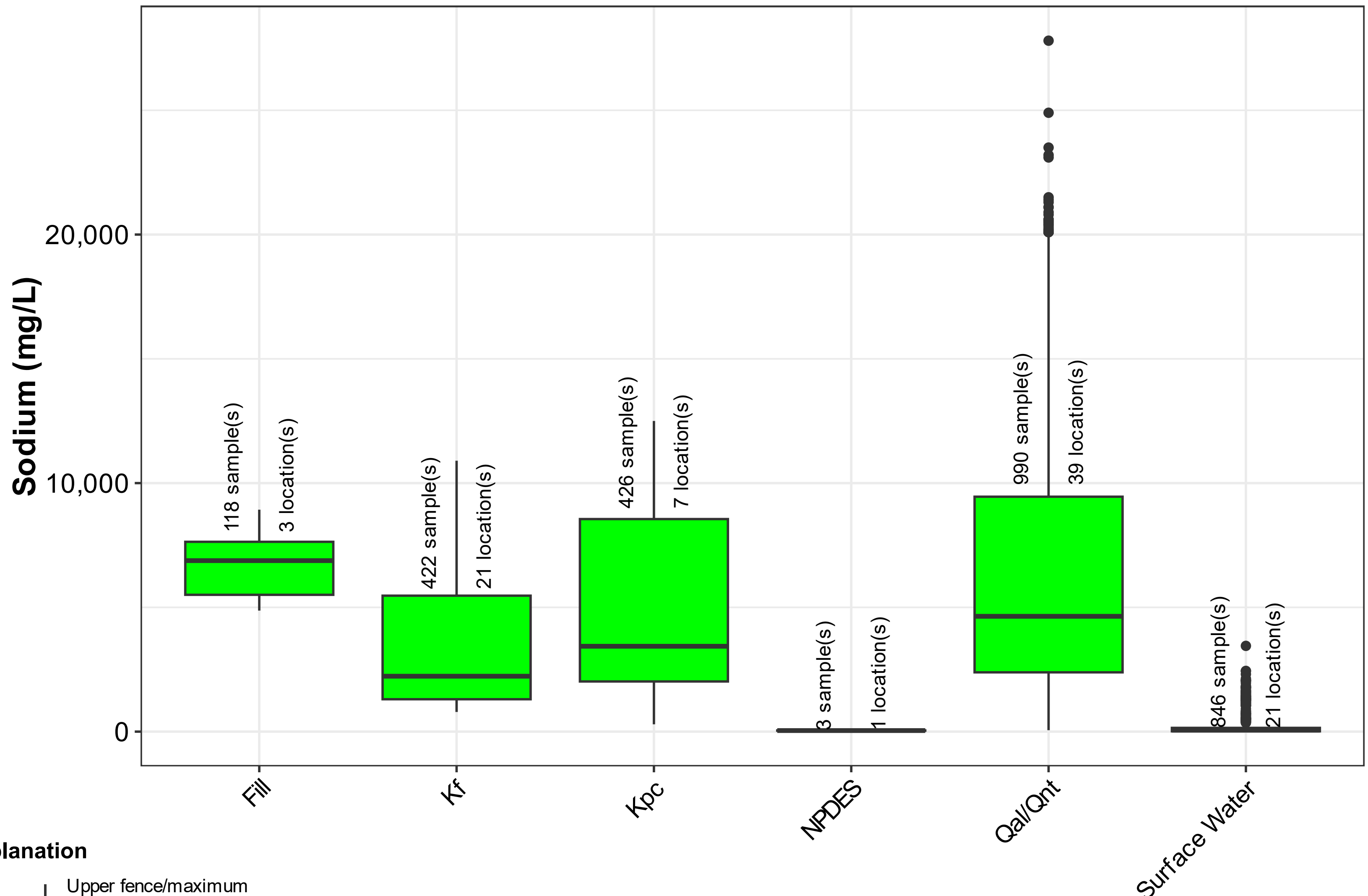
4. Outlier values shown as points.

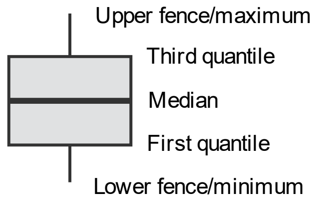
SAN JUAN MINE
Box and Whisker Comparison Plot
Silver

DBS&A
a Geo-Logic Company
6/10/2025 DB24.1140

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm



Explanation



Notes:

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2. Non-detect values approximated as 1/2 the detection limit.
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4. Outlier values shown as points.

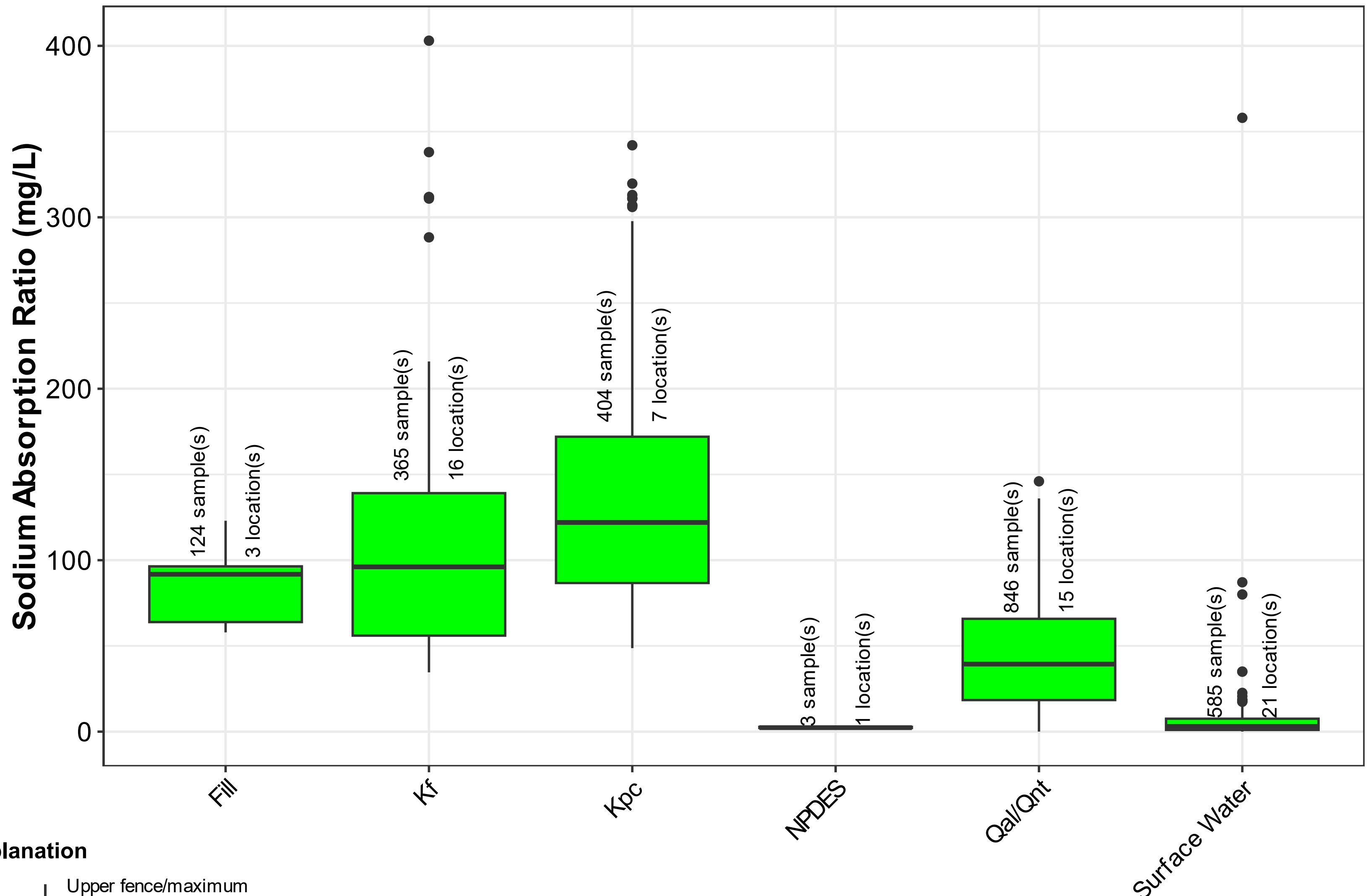
SAN JUAN MINE

Box and Whisker Comparison Plot

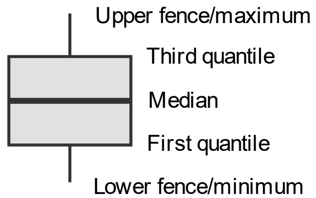
Sodium

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:
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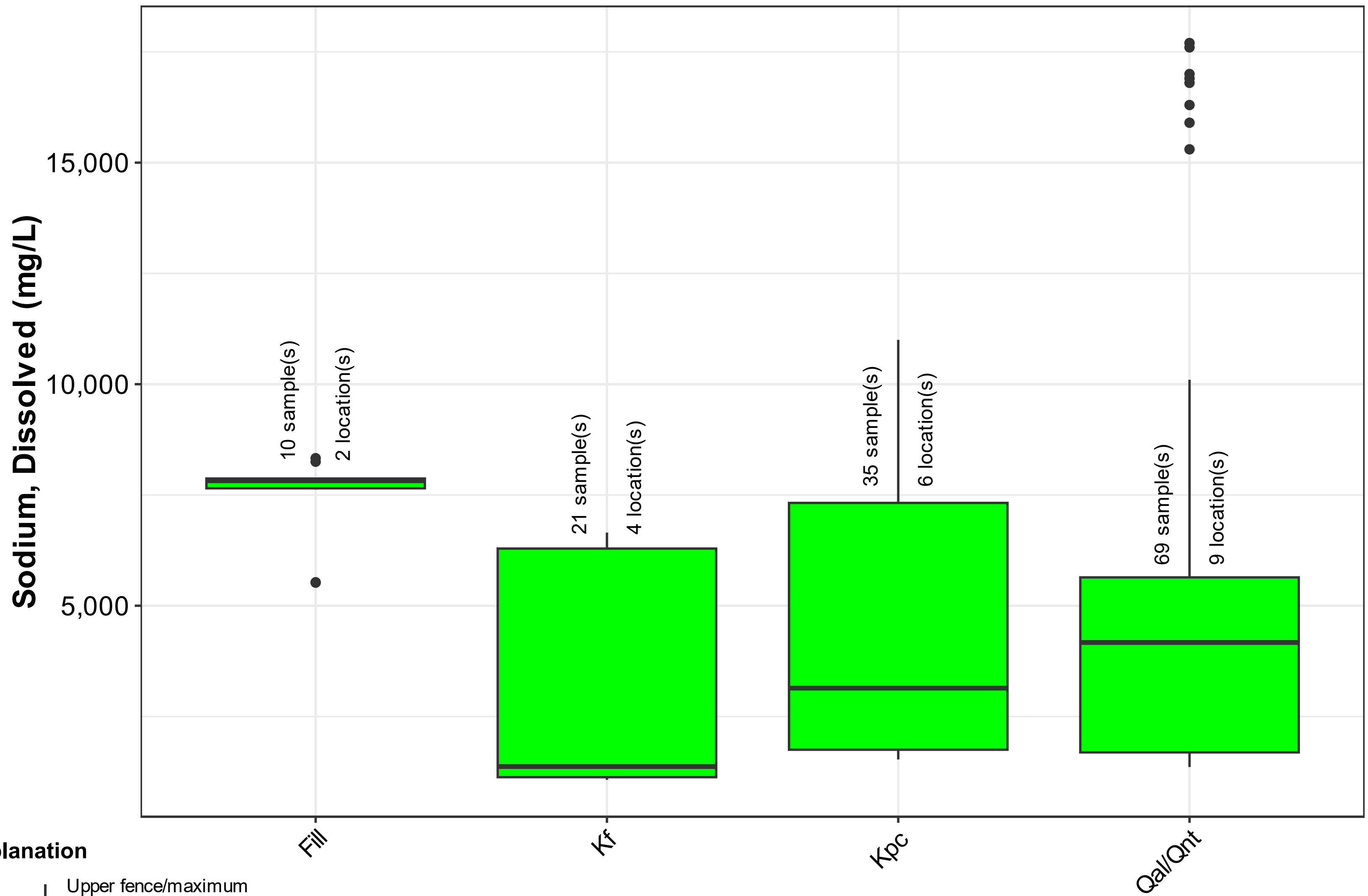
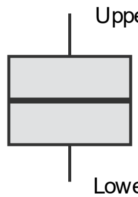
SAN JUAN MINE
Box and Whisker Comparison Plot
Sodium Absorption Ratio

DBS&A a Geo-Logic Company



Explanation



Notes:
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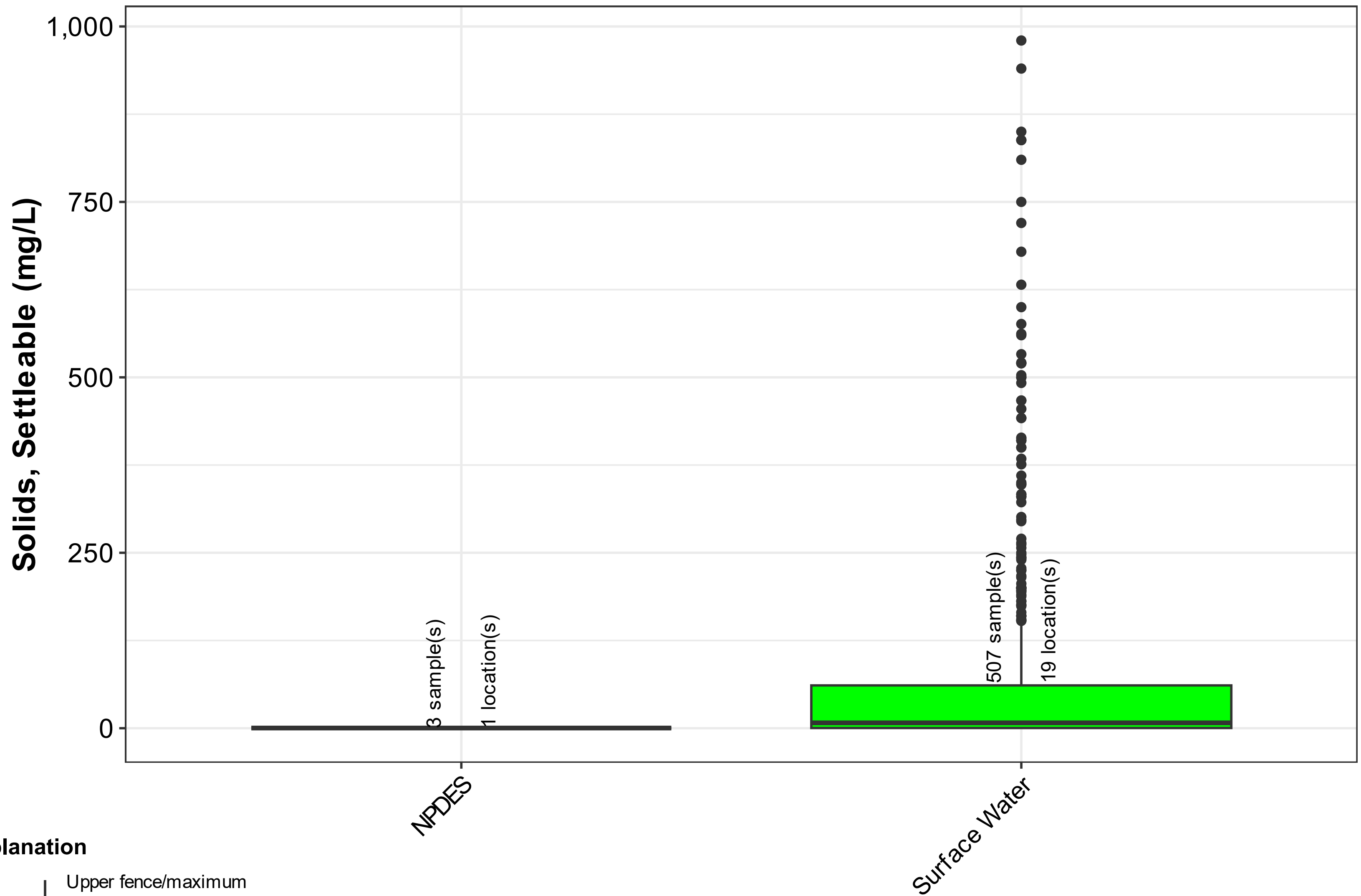
SAN JUAN MINE

Box and Whisker Comparison Plot

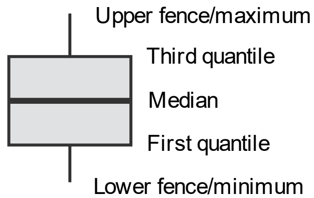
Sodium, Dissolved

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:
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SAN JUAN MINE

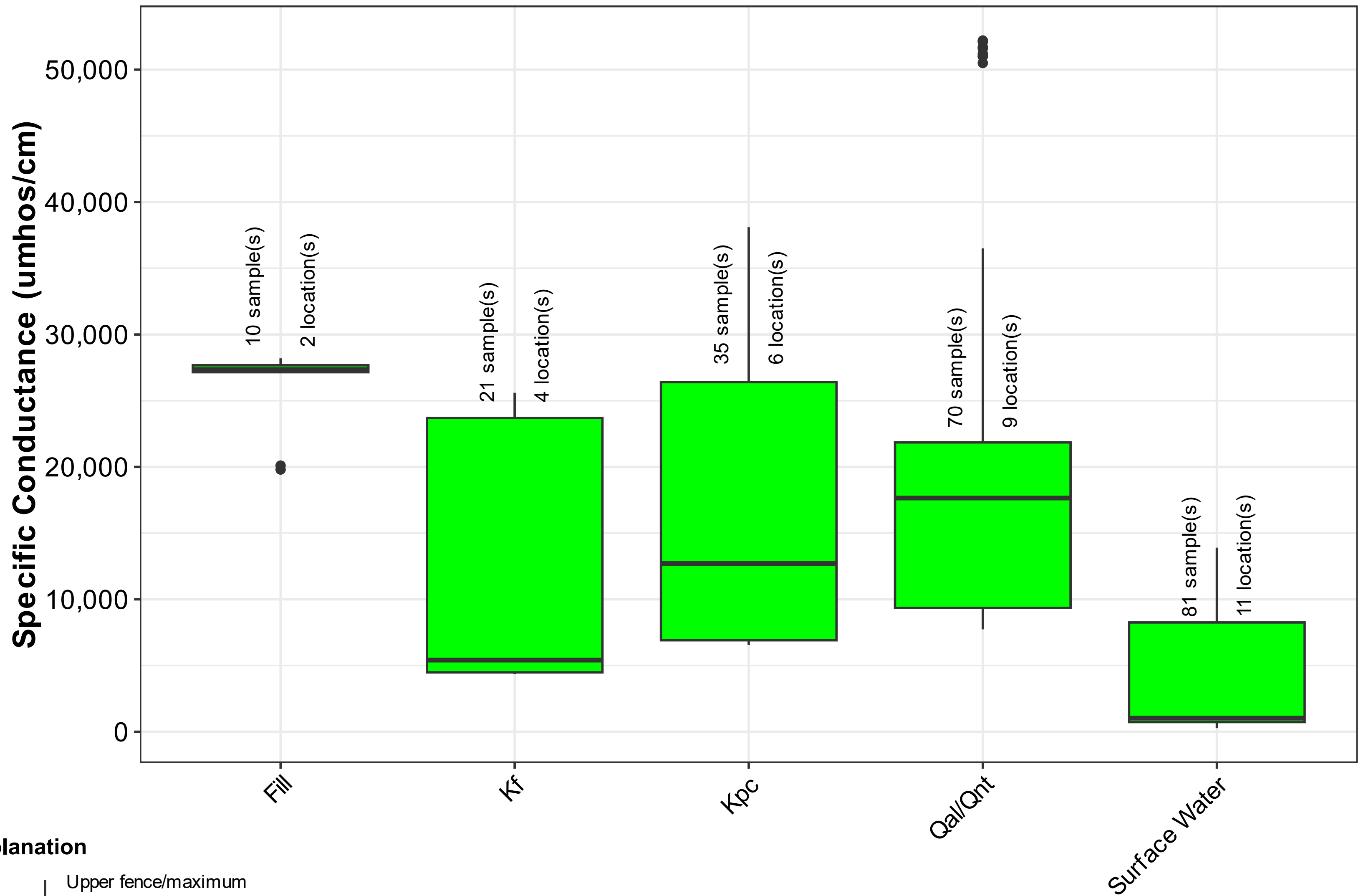
Box and Whisker Comparison Plot

Solids, Settleable

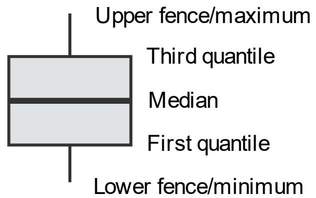
DBS&A a Geo-Logic Company

6/10/2025 DB24.1140

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm



Explanation



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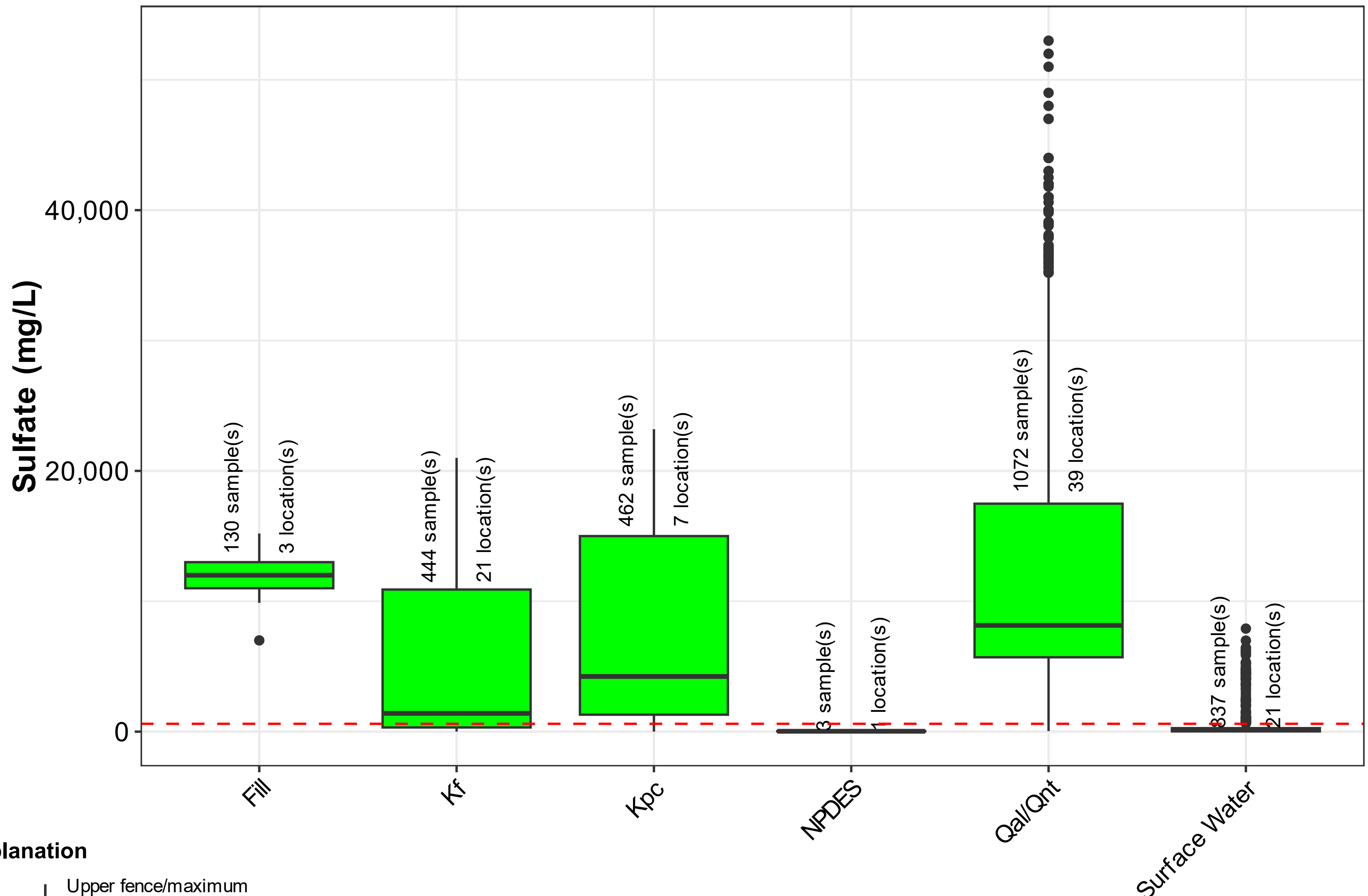
SAN JUAN MINE

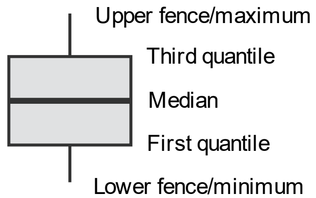
Box and Whisker Comparison Plot
Specific Conductance

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



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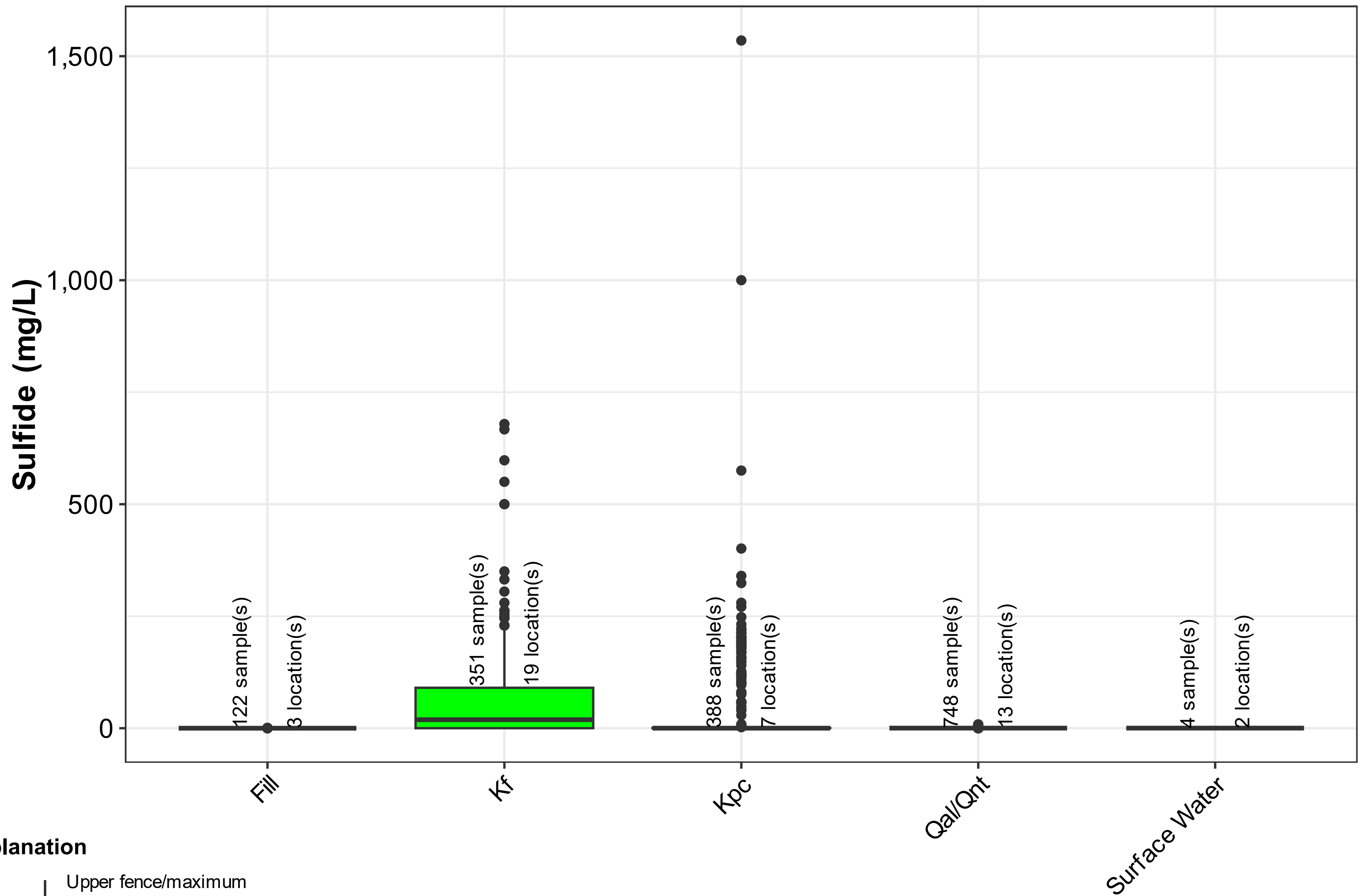
SAN JUAN MINE

Box and Whisker Comparison Plot

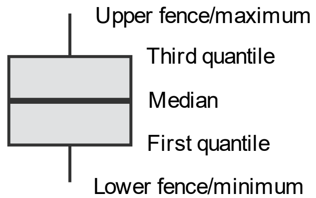
Sulfate

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



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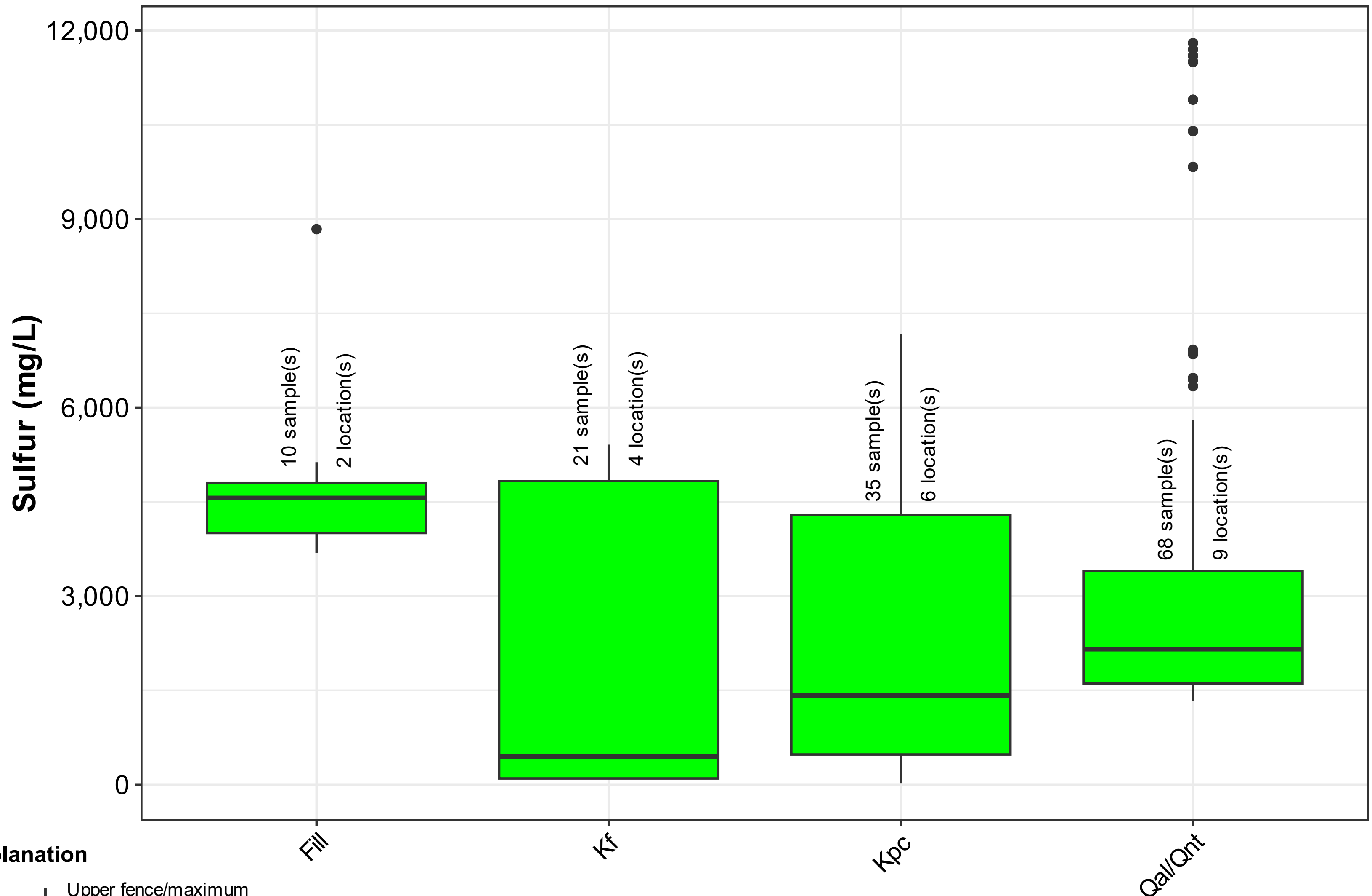
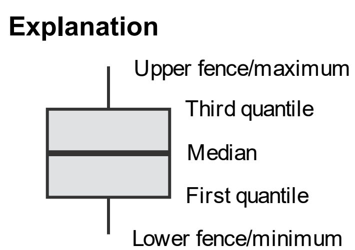
SAN JUAN MINE

Box and Whisker Comparison Plot

Sulfide





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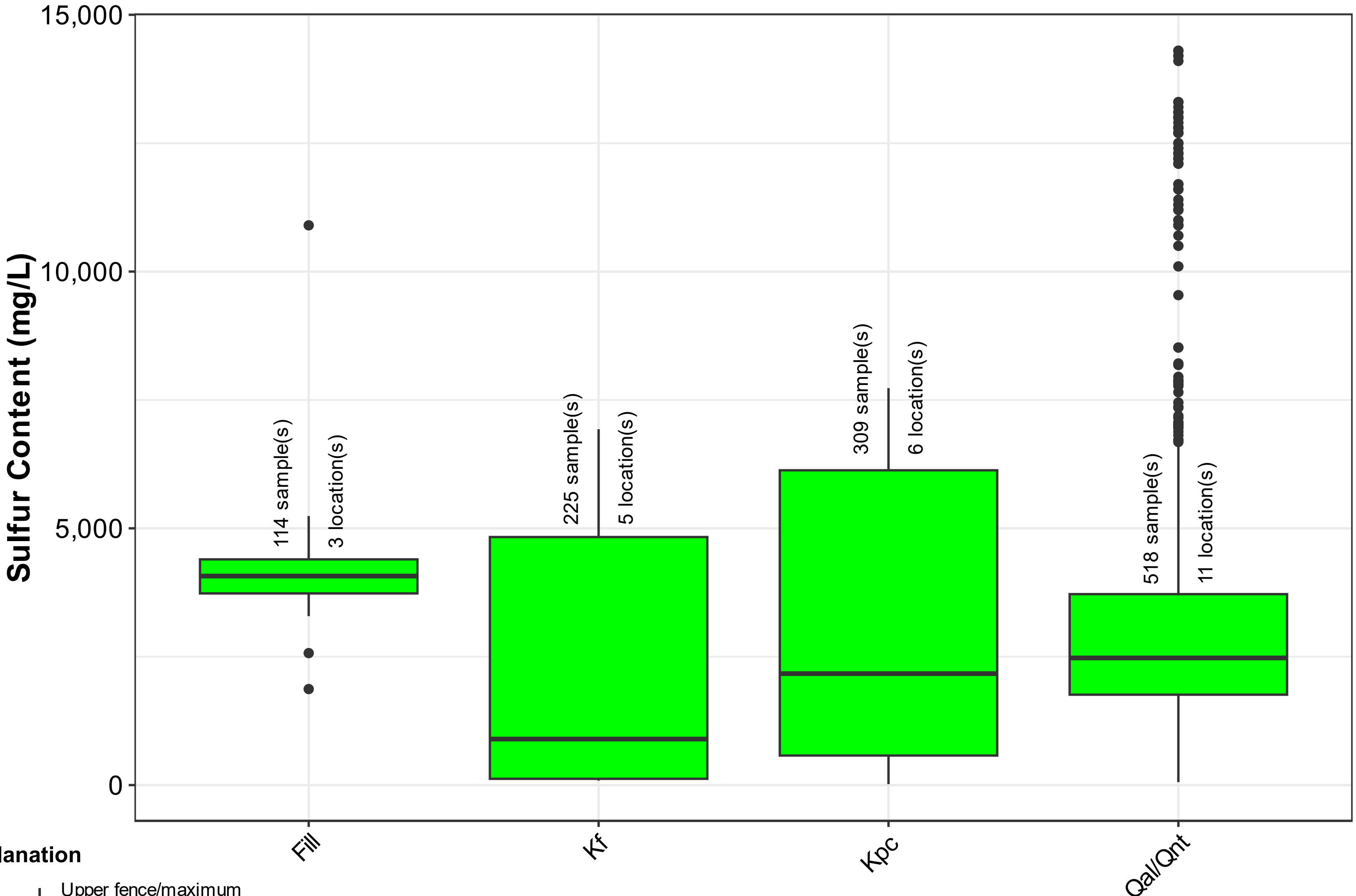
SAN JUAN MINE

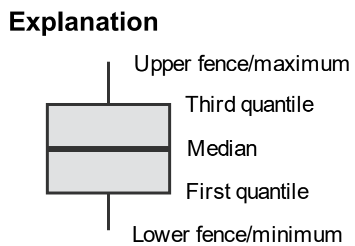
Box and Whisker Comparison Plot

Sulfur

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140





Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
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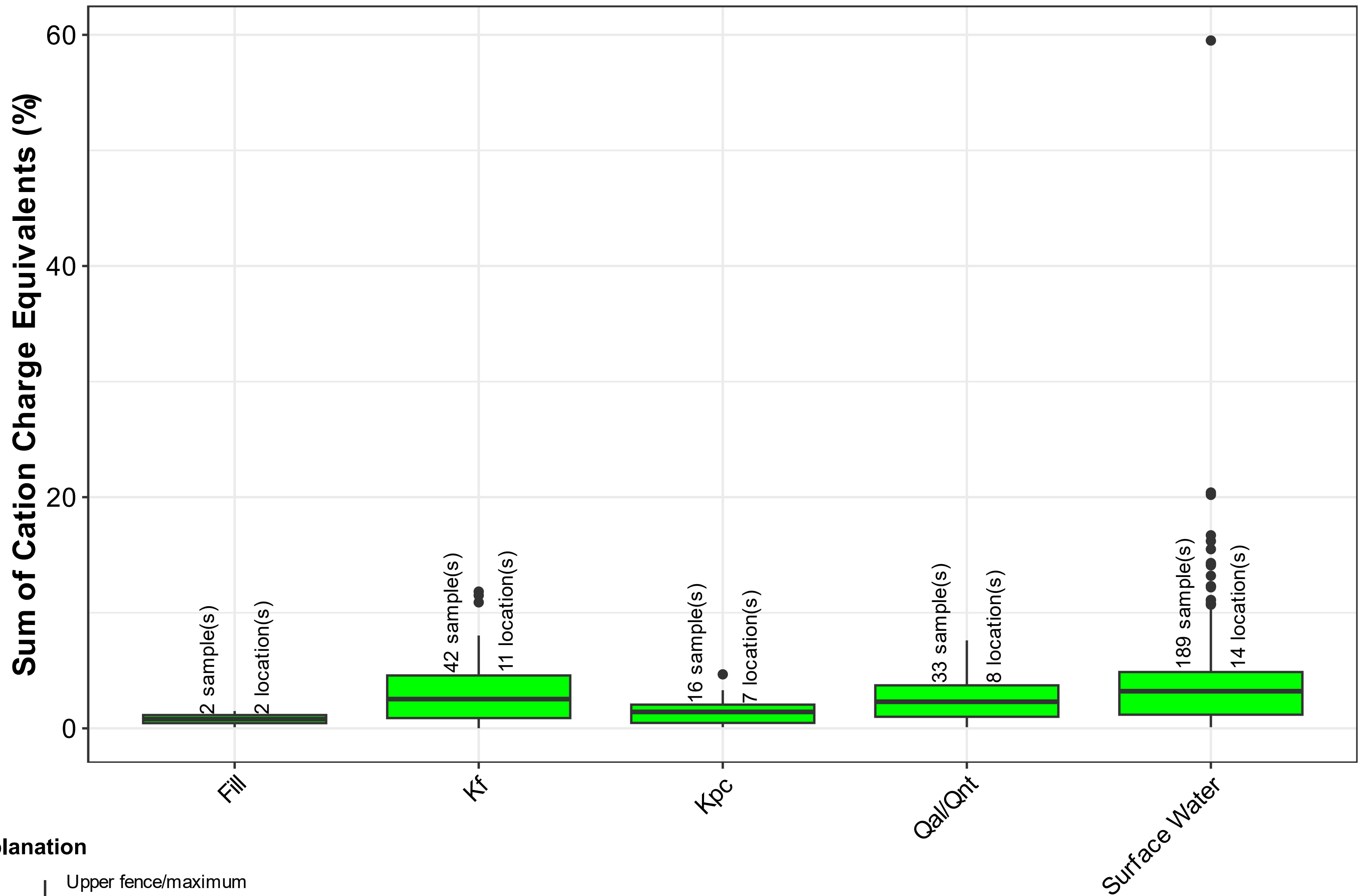
SAN JUAN MINE

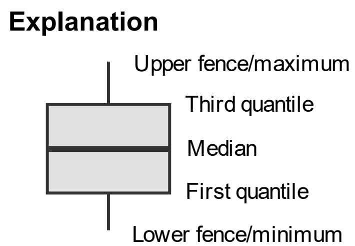
Box and Whisker Comparison Plot

Sulfur Content

DBS&A
a Geo-Logic Company

6/10/2025 DB24.1140





Notes:
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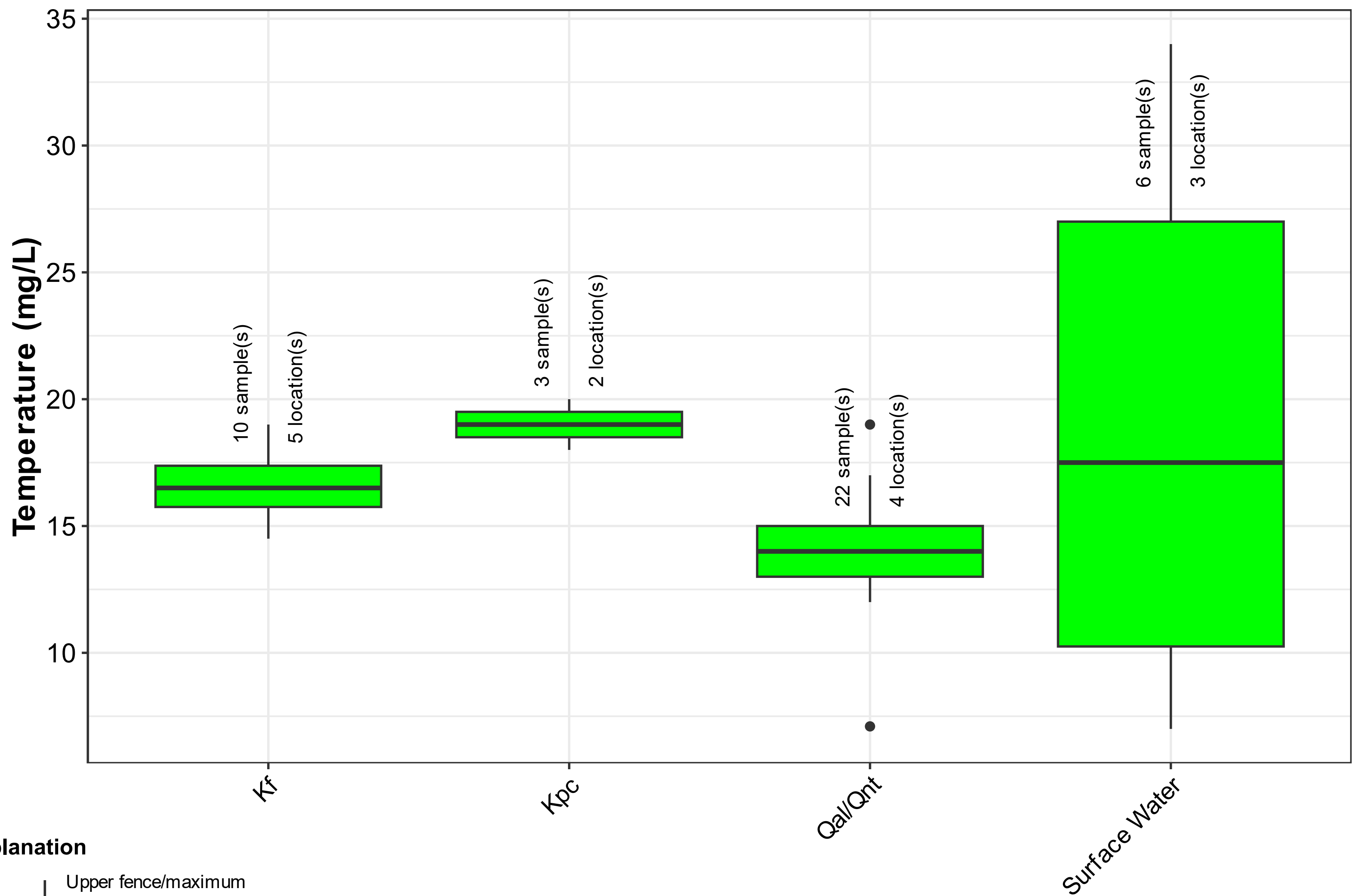
SAN JUAN MINE

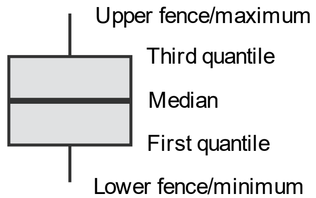
Box and Whisker Comparison Plot
Sum of Cation Charge Equivalents

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:
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4. Outlier values shown as points.

SAN JUAN MINE

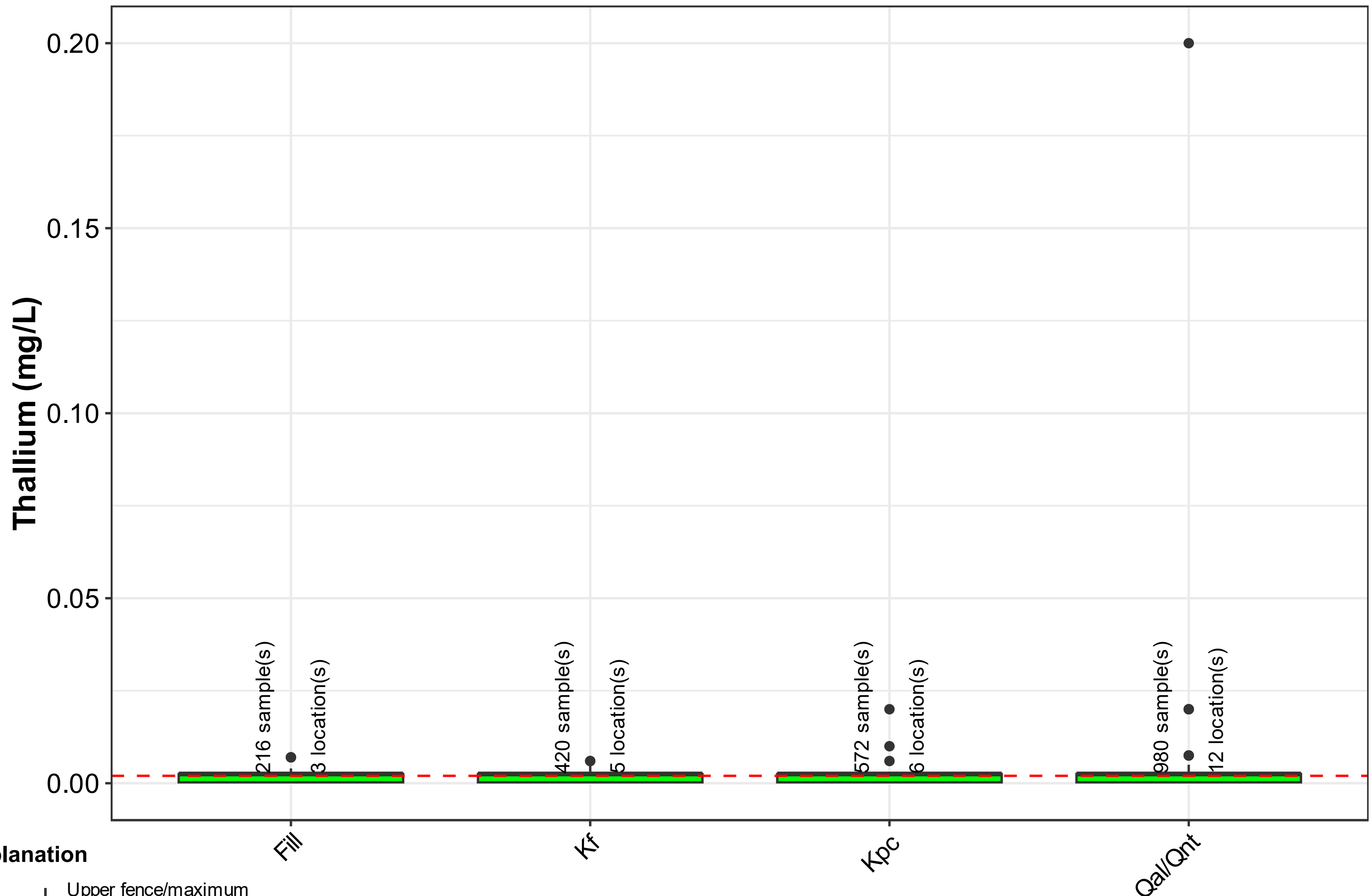
Box and Whisker Comparison Plot

Temperature

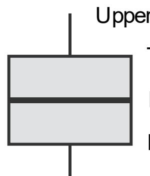
DBS&A

a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



Notes:

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2. Non-detect values approximated as 1/2 the detection limit.
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4. Outlier values shown as points.

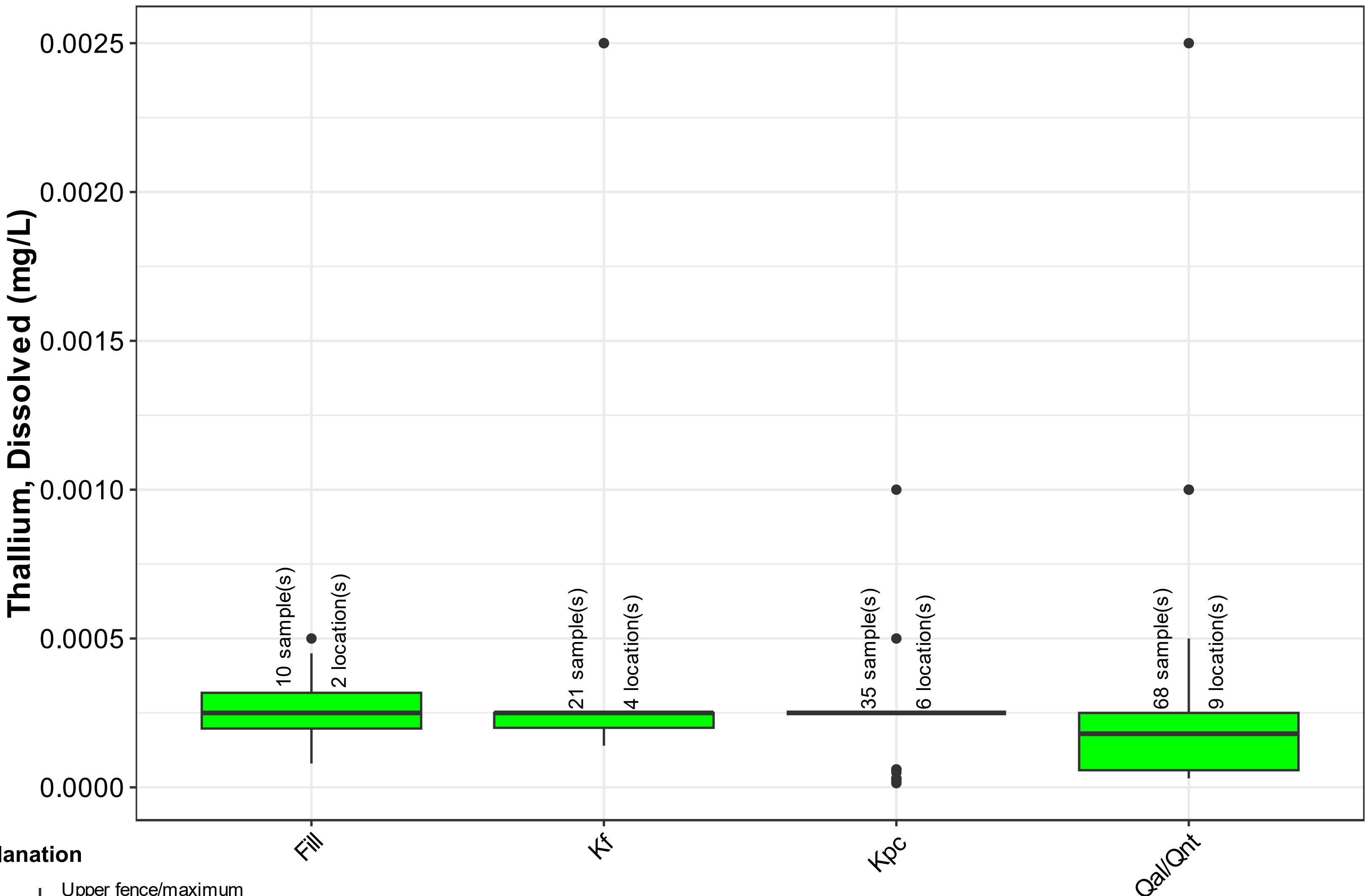
SAN JUAN MINE

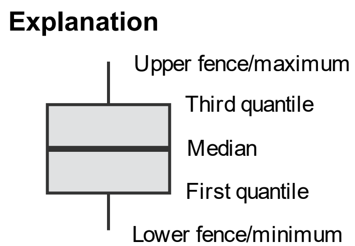
Box and Whisker Comparison Plot

Thallium

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140





Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
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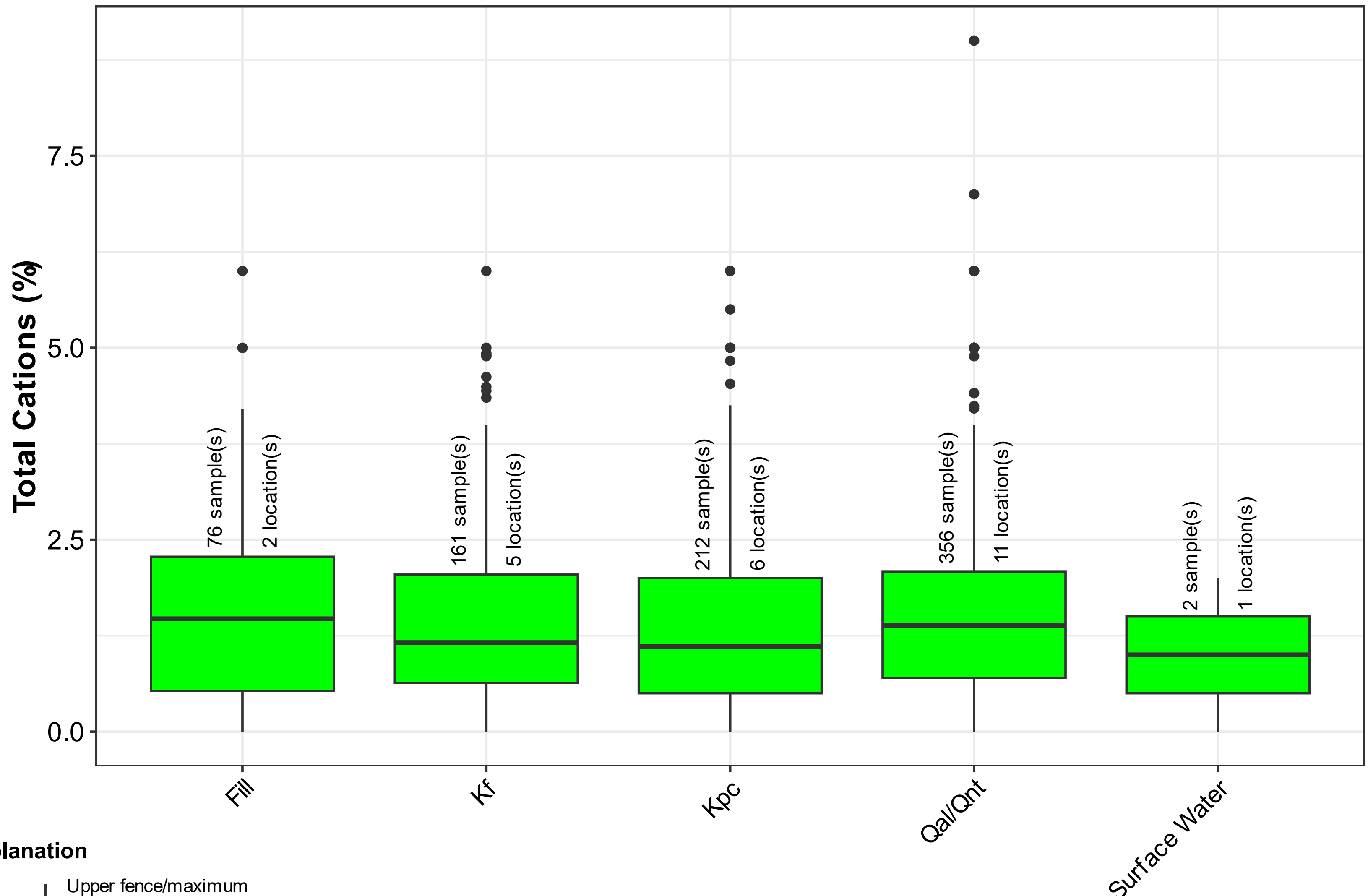
SAN JUAN MINE

Box and Whisker Comparison Plot

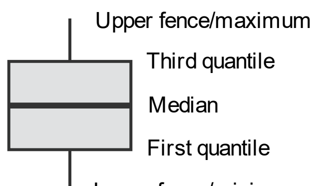
Thallium, Dissolved

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



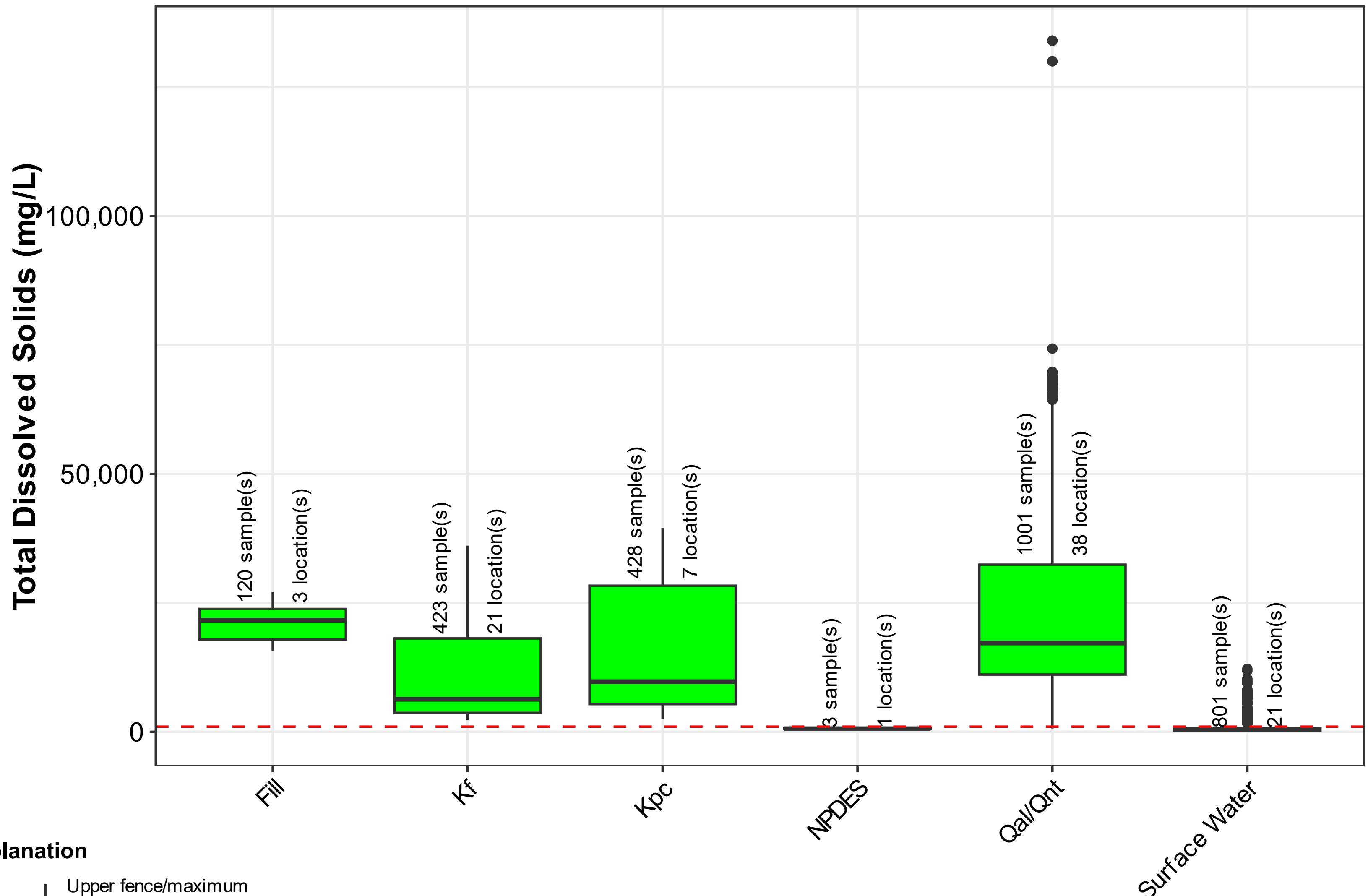
Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE

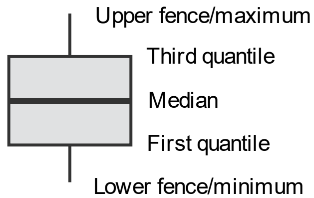
Box and Whisker Comparison Plot

Total Cations

DBS&A a Geo-Logic Company



Explanation

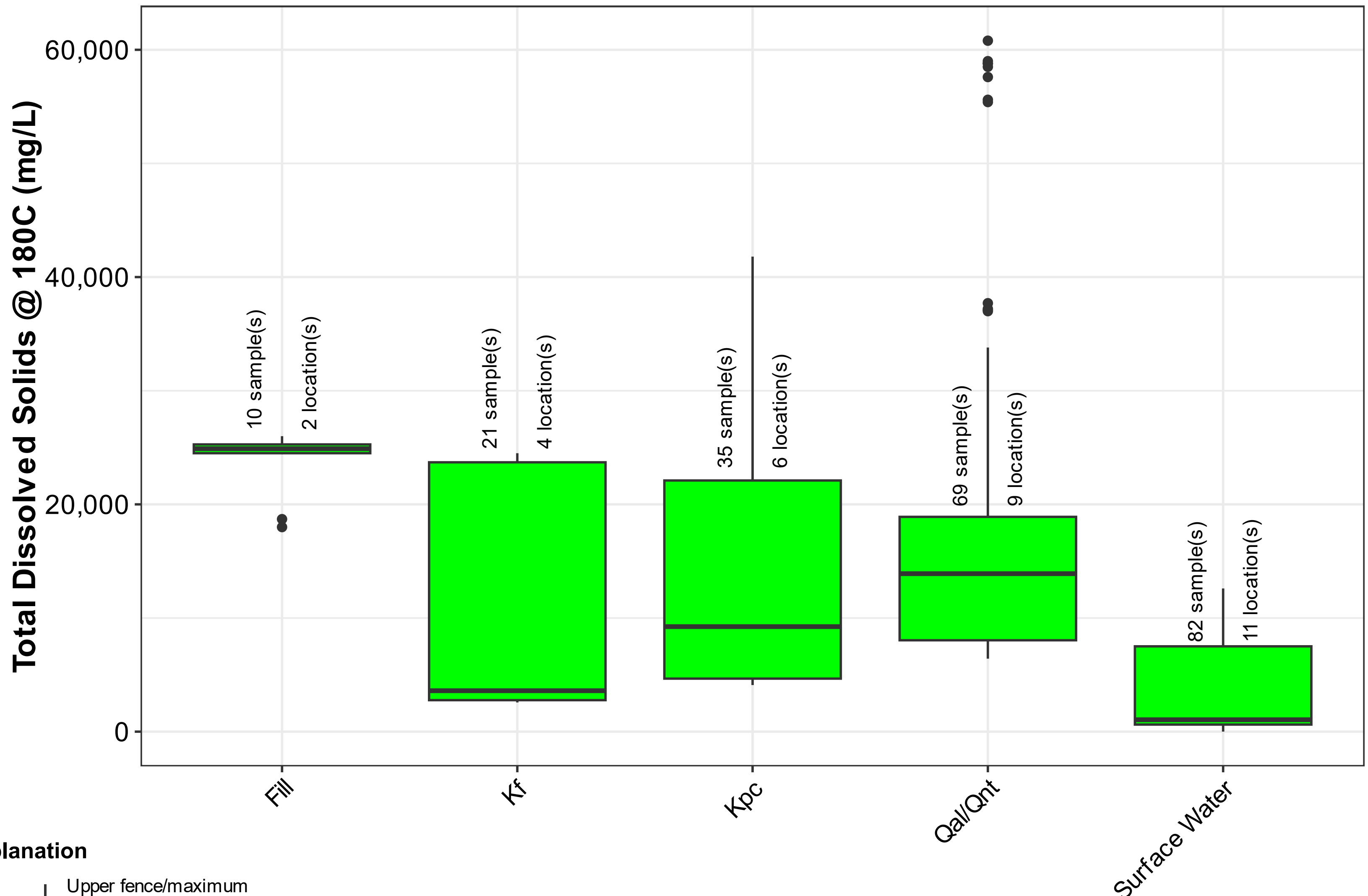


Notes:
1. Section 3103 standards are shown as a dashed red line (not shown for unregulated constituents).
2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

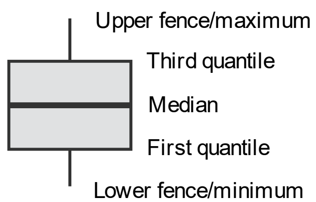
SAN JUAN MINE

Box and Whisker Comparison Plot

Total Dissolved Solids



Explanation



Notes:

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2. Non-detect values approximated as 1/2 the detection limit.
3. The number of samples in each group are given next to each plot.
4. Outlier values shown as points.

SAN JUAN MINE

Box and Whisker Comparison Plot
Total Dissolved Solids @ 180C

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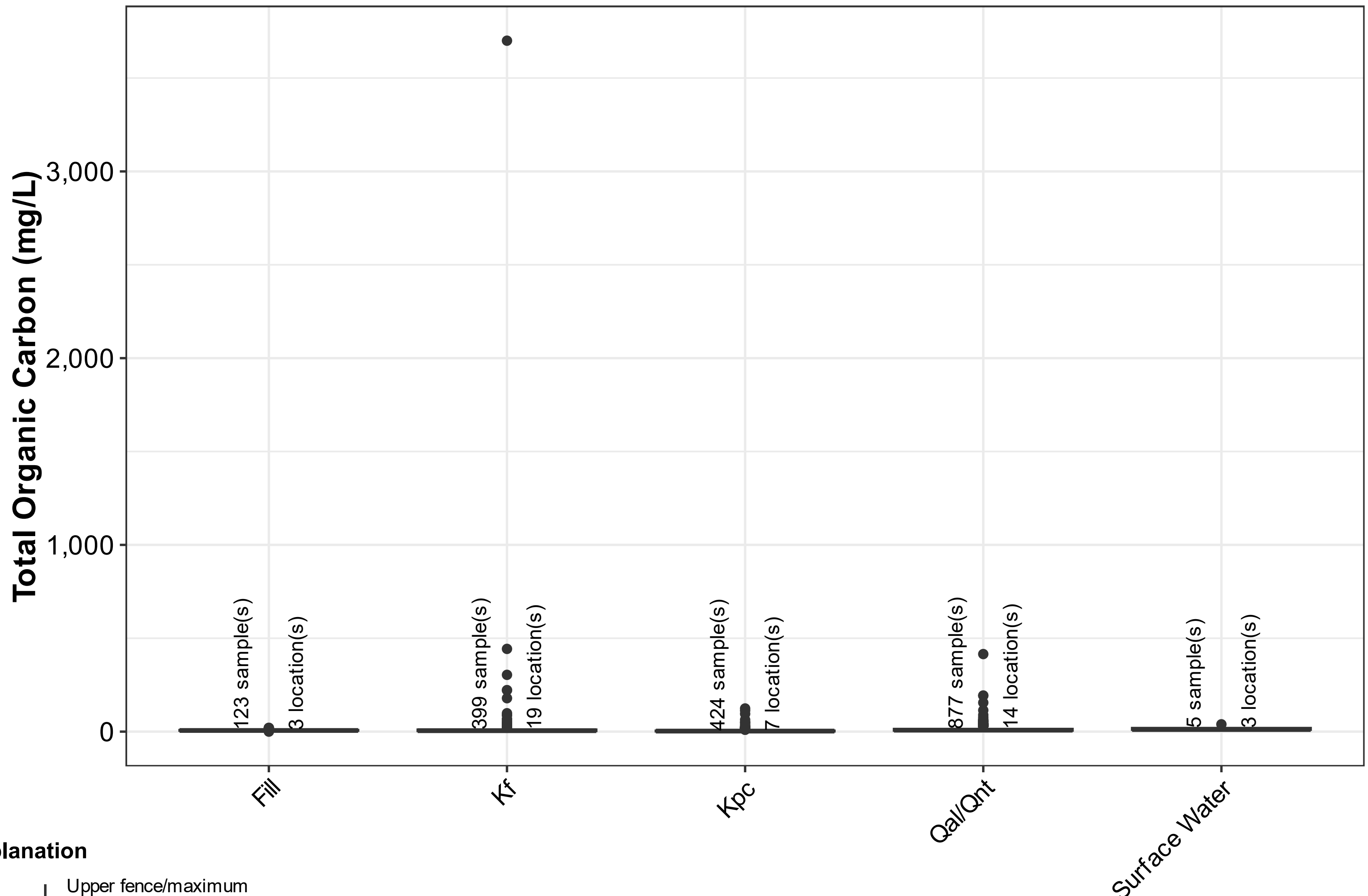
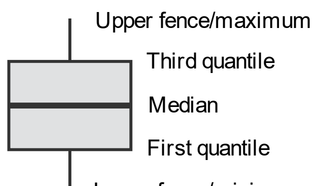
a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



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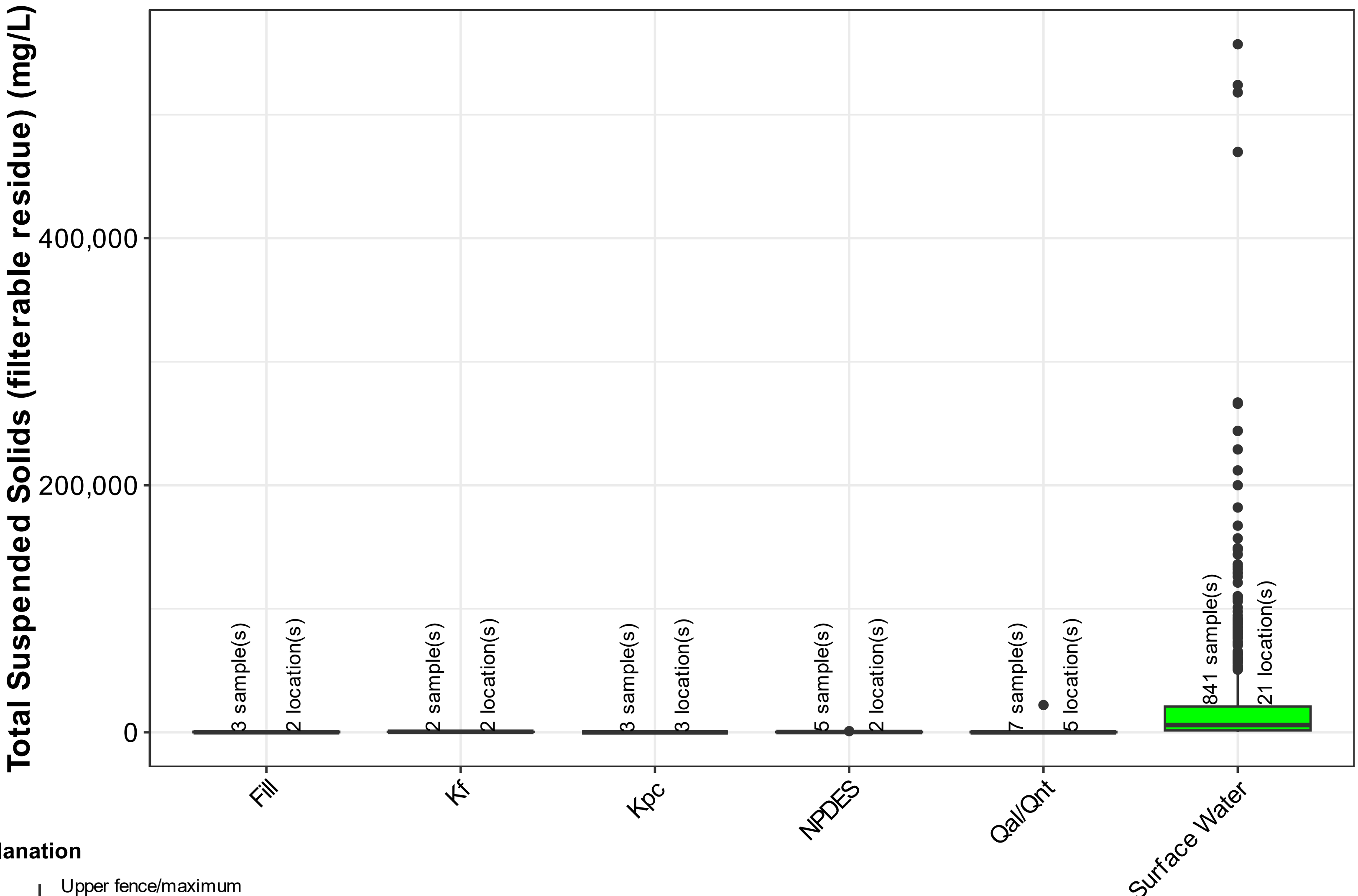
SAN JUAN MINE

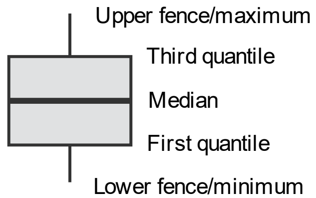
Box and Whisker Comparison Plot

Total Organic Carbon

DBS&A a Geo-Logic Company



Explanation



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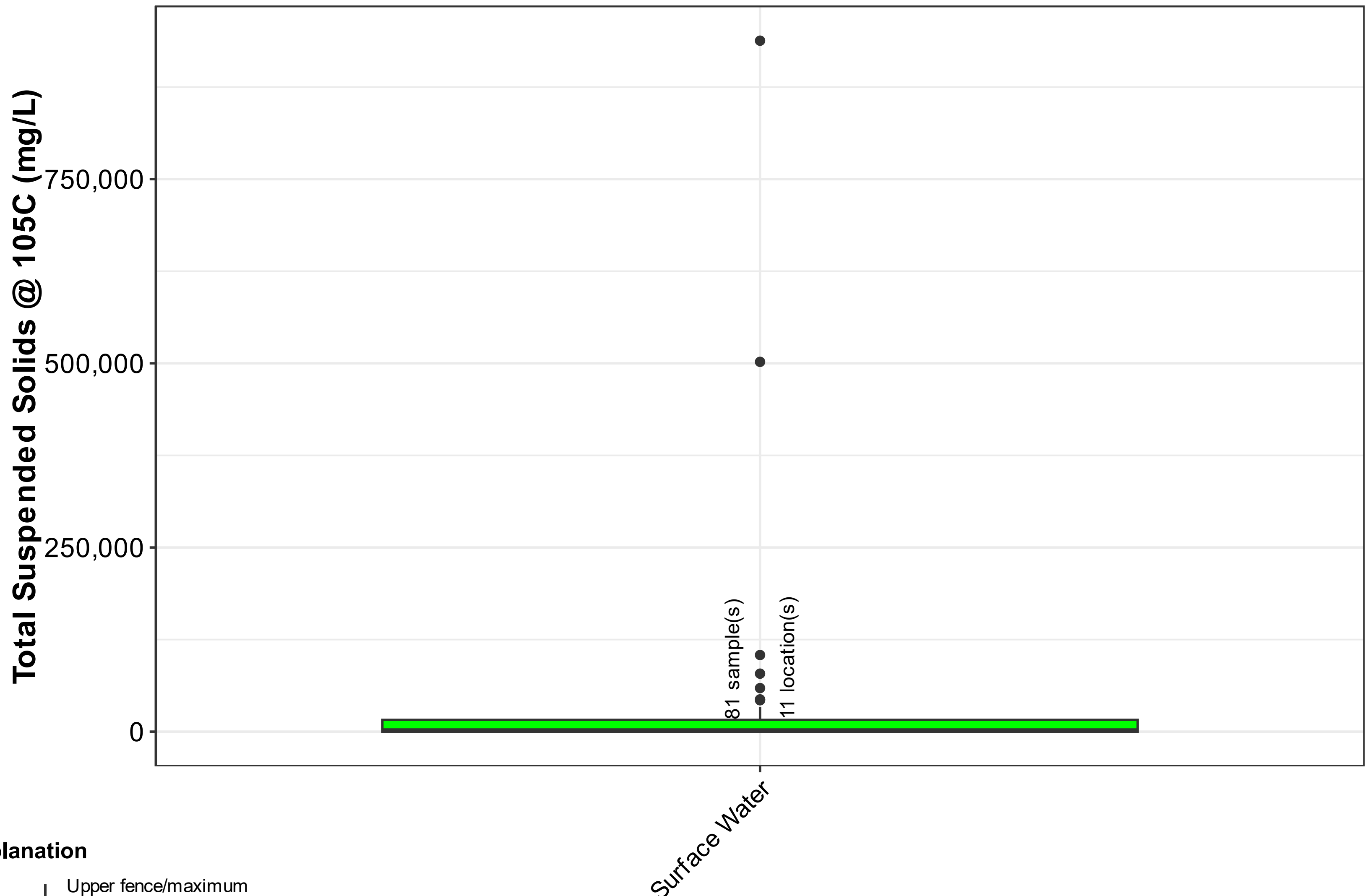
SAN JUAN MINE

Box and Whisker Comparison Plot

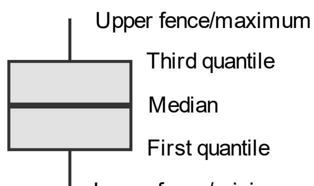
Total Suspended Solids (filterable residue)

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



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4. Outlier values shown as points.

SAN JUAN MINE

Box and Whisker Comparison Plot

Total Suspended Solids @ 105C

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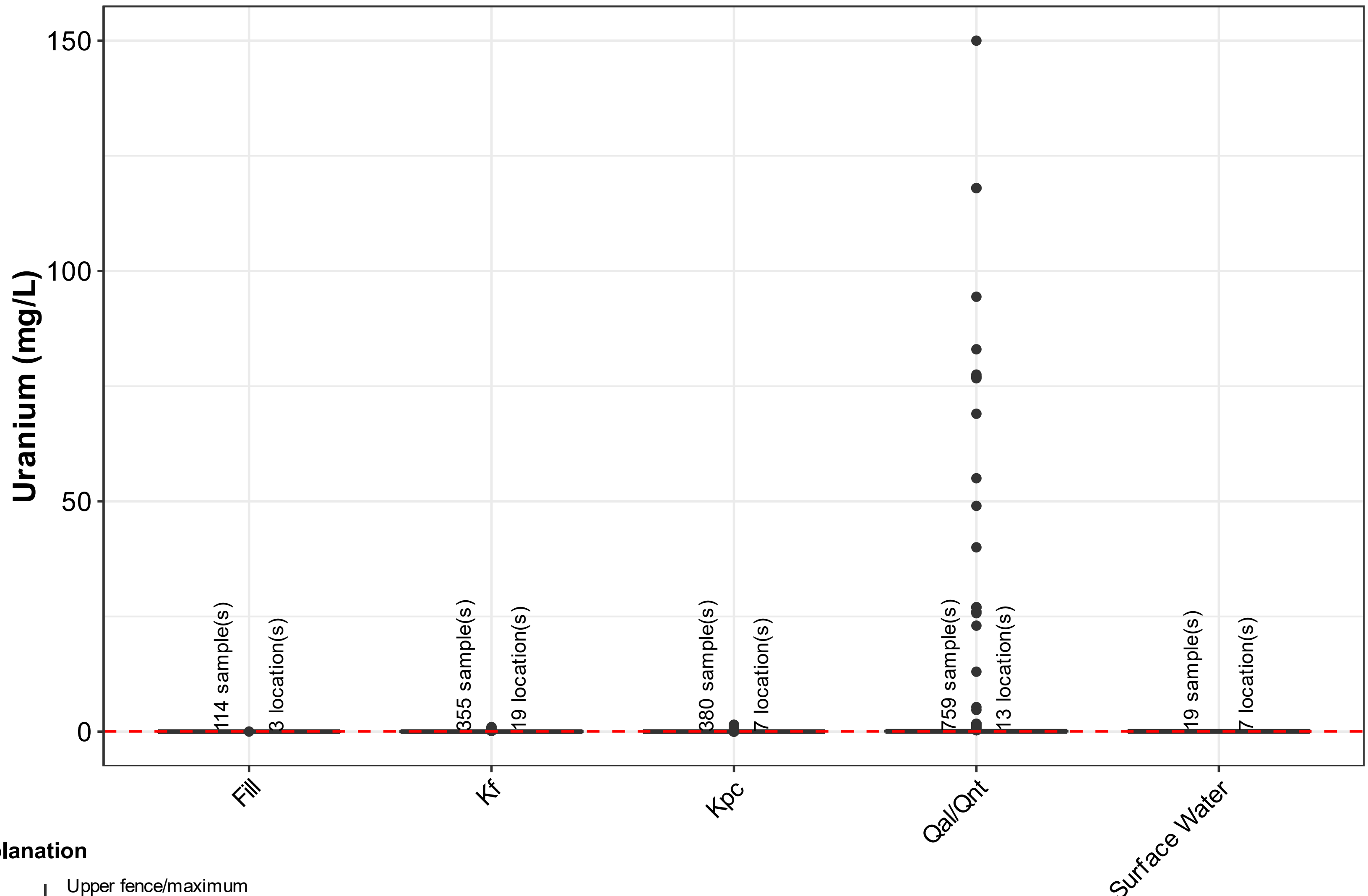
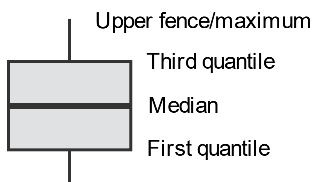
6/10/2025 DB24.1140



Explanation



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SAN JUAN MINE

Box and Whisker Comparison Plot

Uranium

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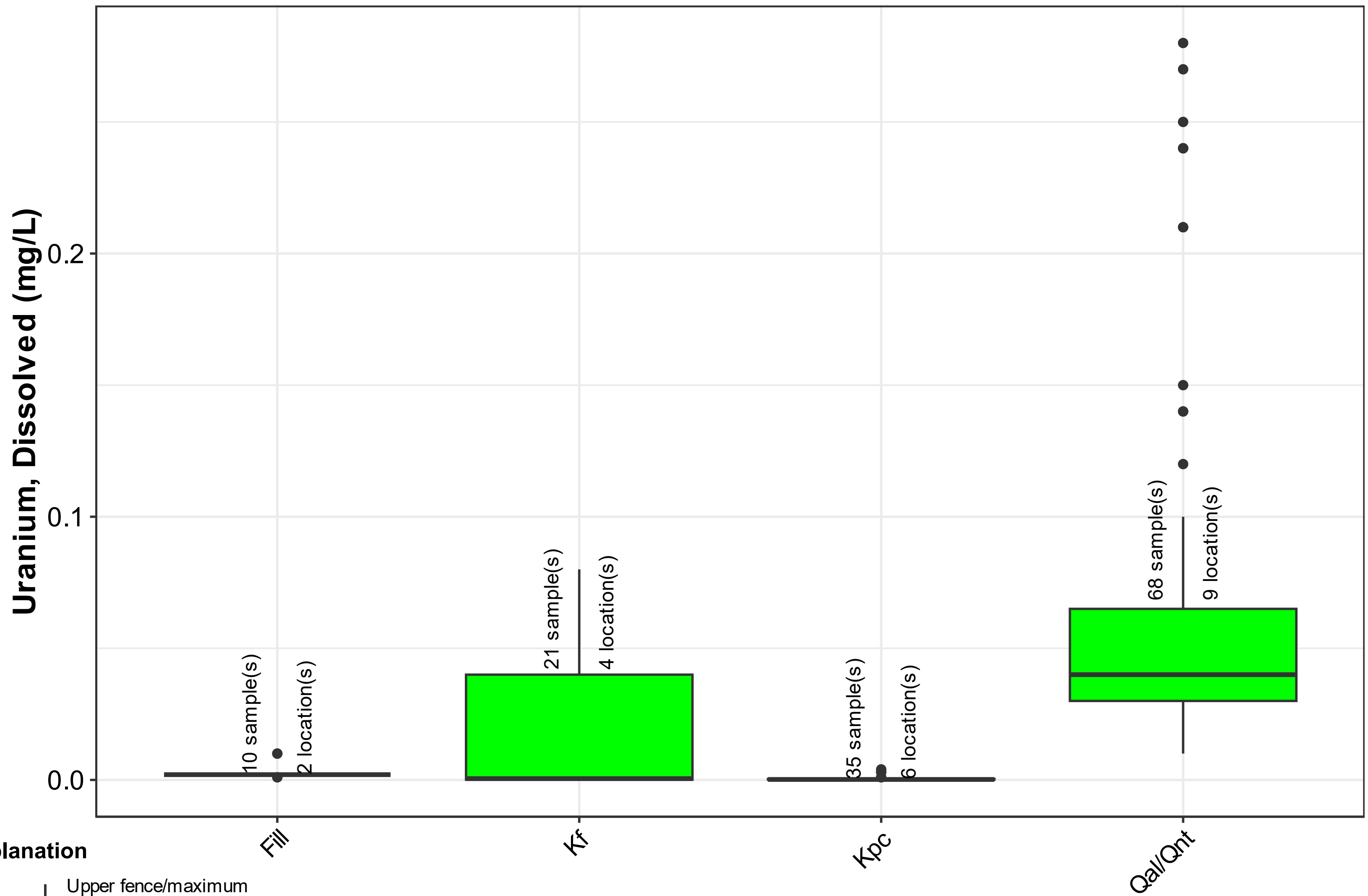
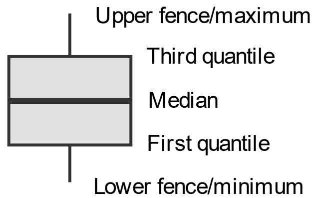
6/10/2025 DB24.1140



Explanation



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SAN JUAN MINE

Box and Whisker Comparison Plot

Uranium, Dissolved

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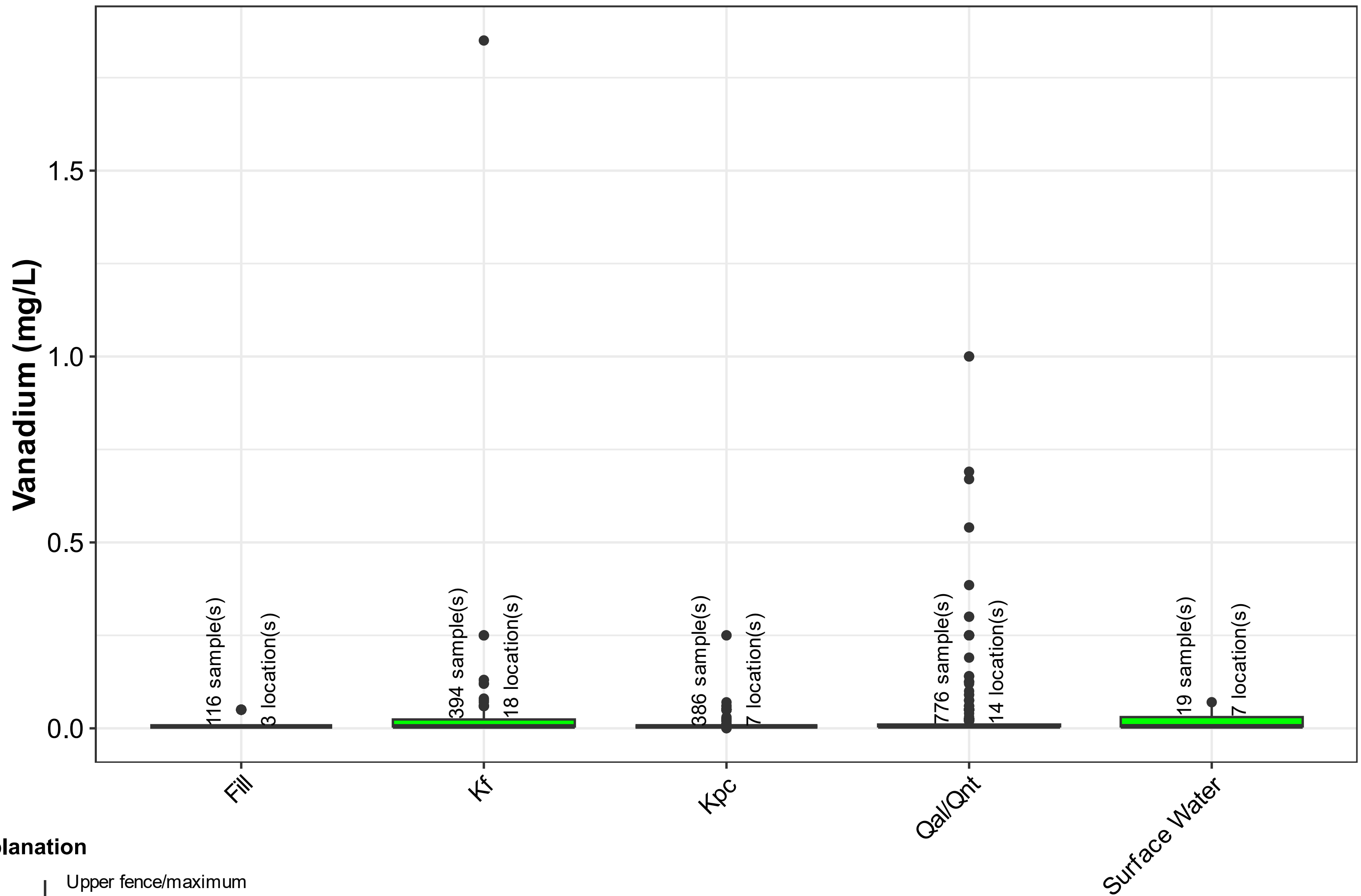
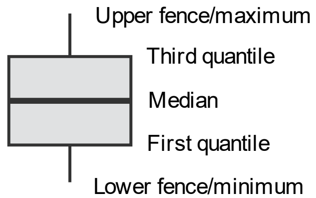
6/10/2025 DB24.1140



Explanation



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SAN JUAN MINE

Box and Whisker Comparison Plot

Vanadium

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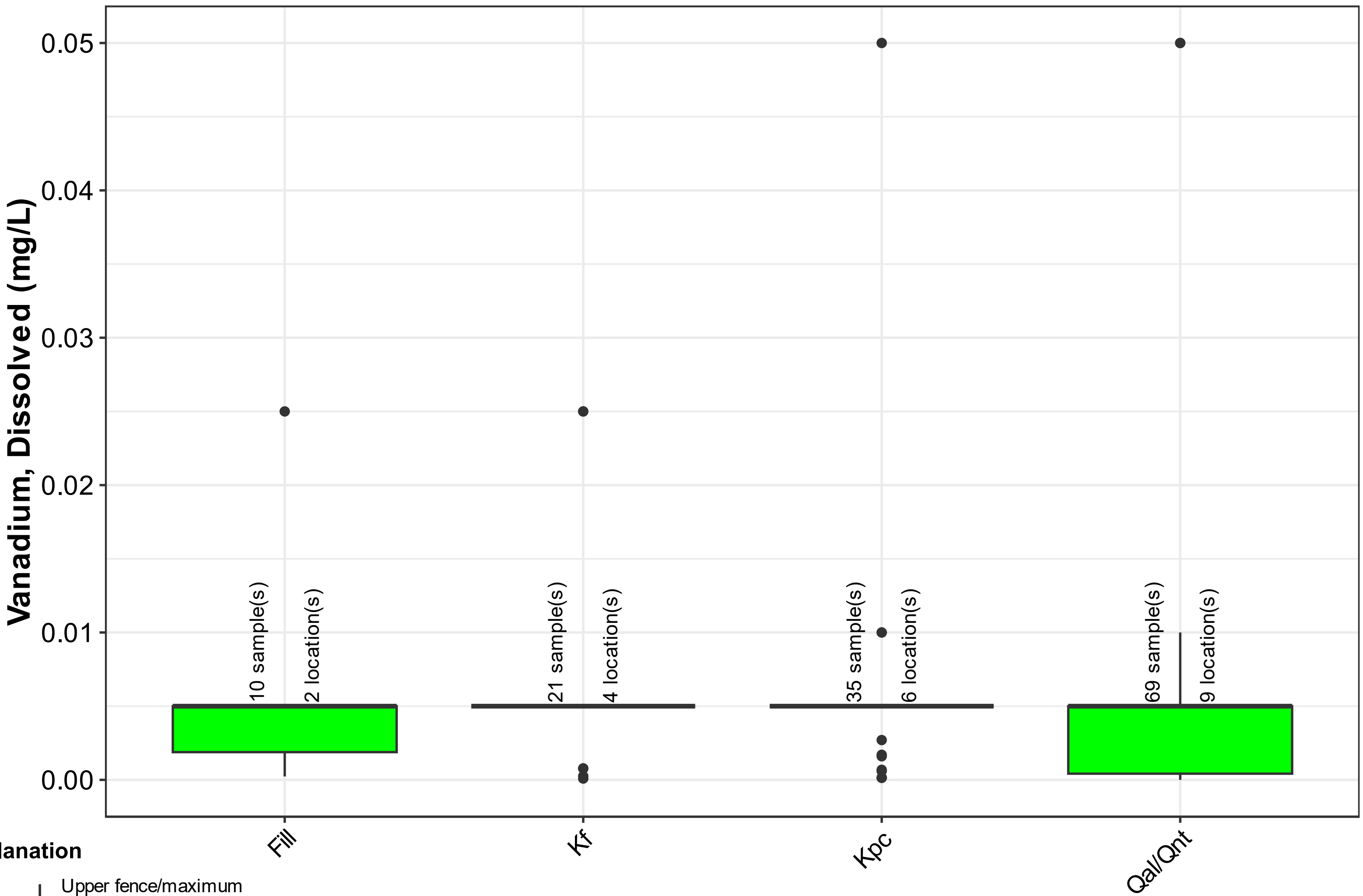
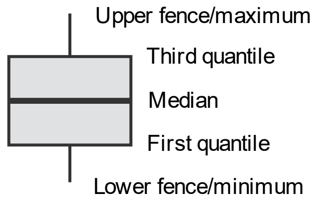
a Geo-Logic Company

S:\Projects\DB24.1140_EMNRD_NM_San_Juan_Mine\Analysis\R\AppD\App D Boxplots.pptm



Explanation



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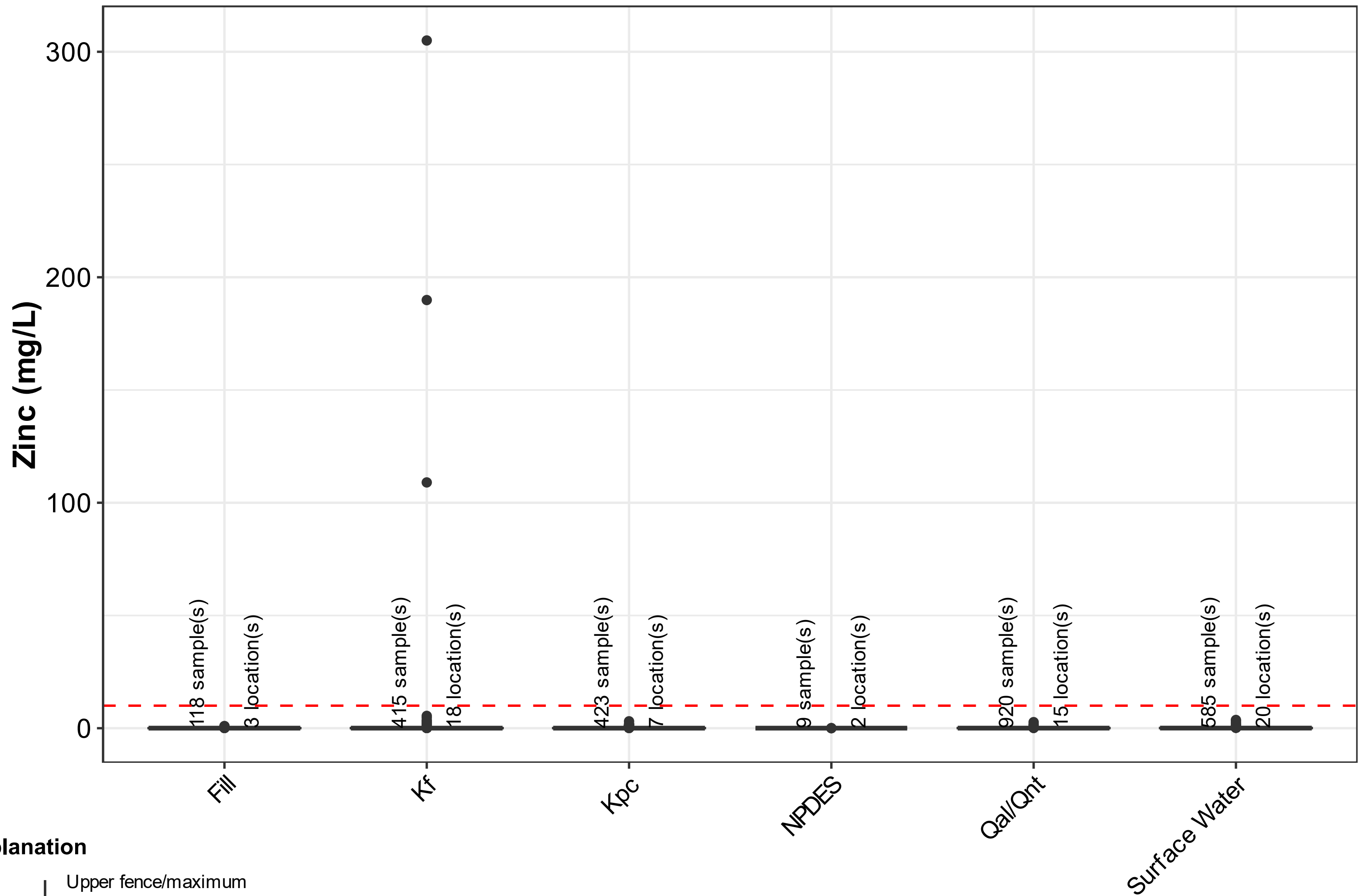
SAN JUAN MINE

Box and Whisker Comparison Plot

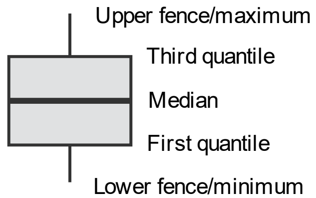
Vanadium, Dissolved

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



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SAN JUAN MINE

Box and Whisker Comparison Plot

Zinc

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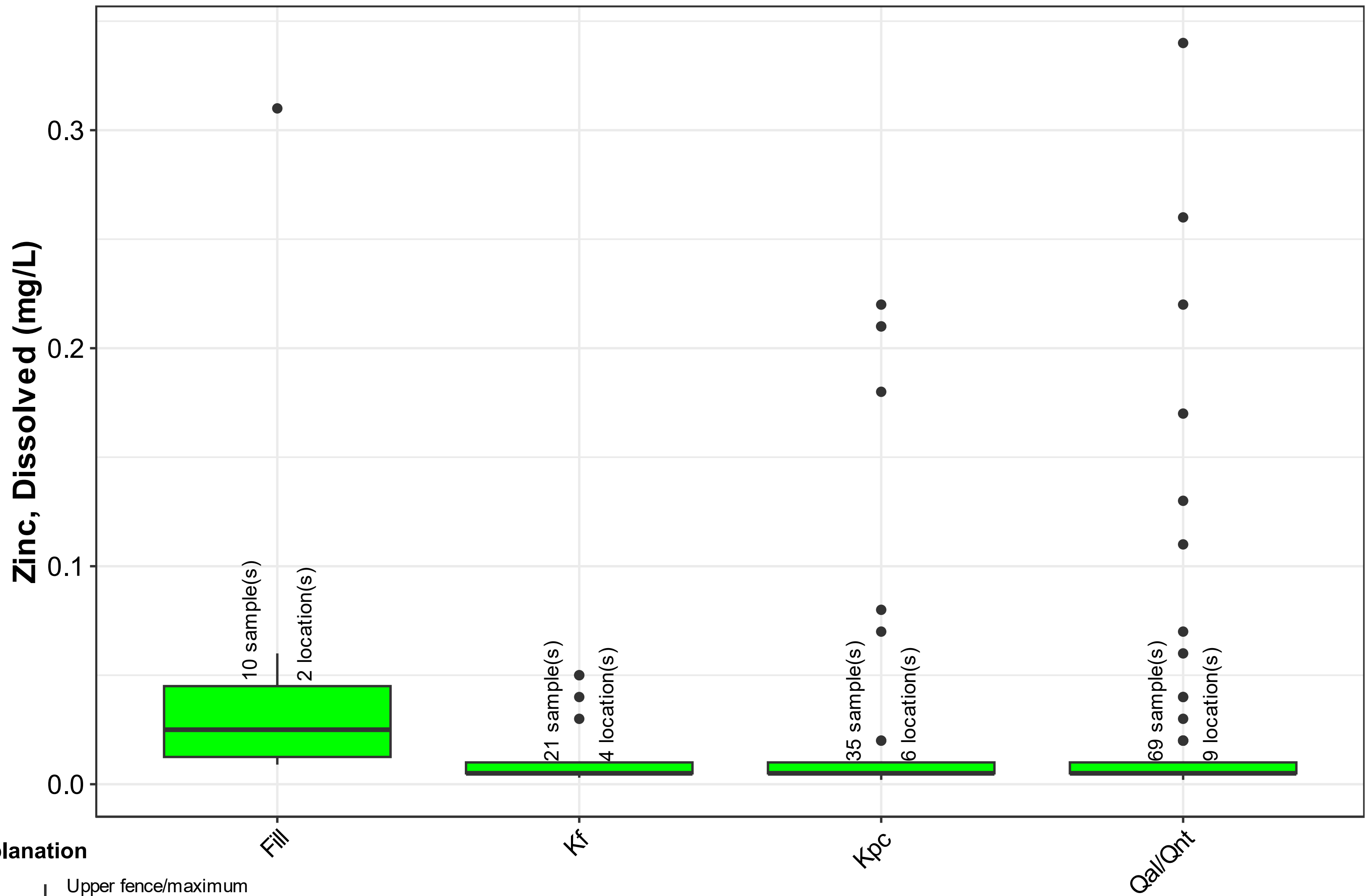
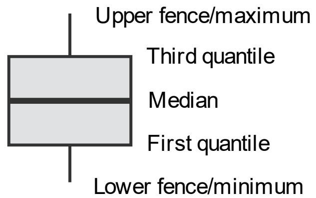
6/10/2025 DB24.1140



Explanation



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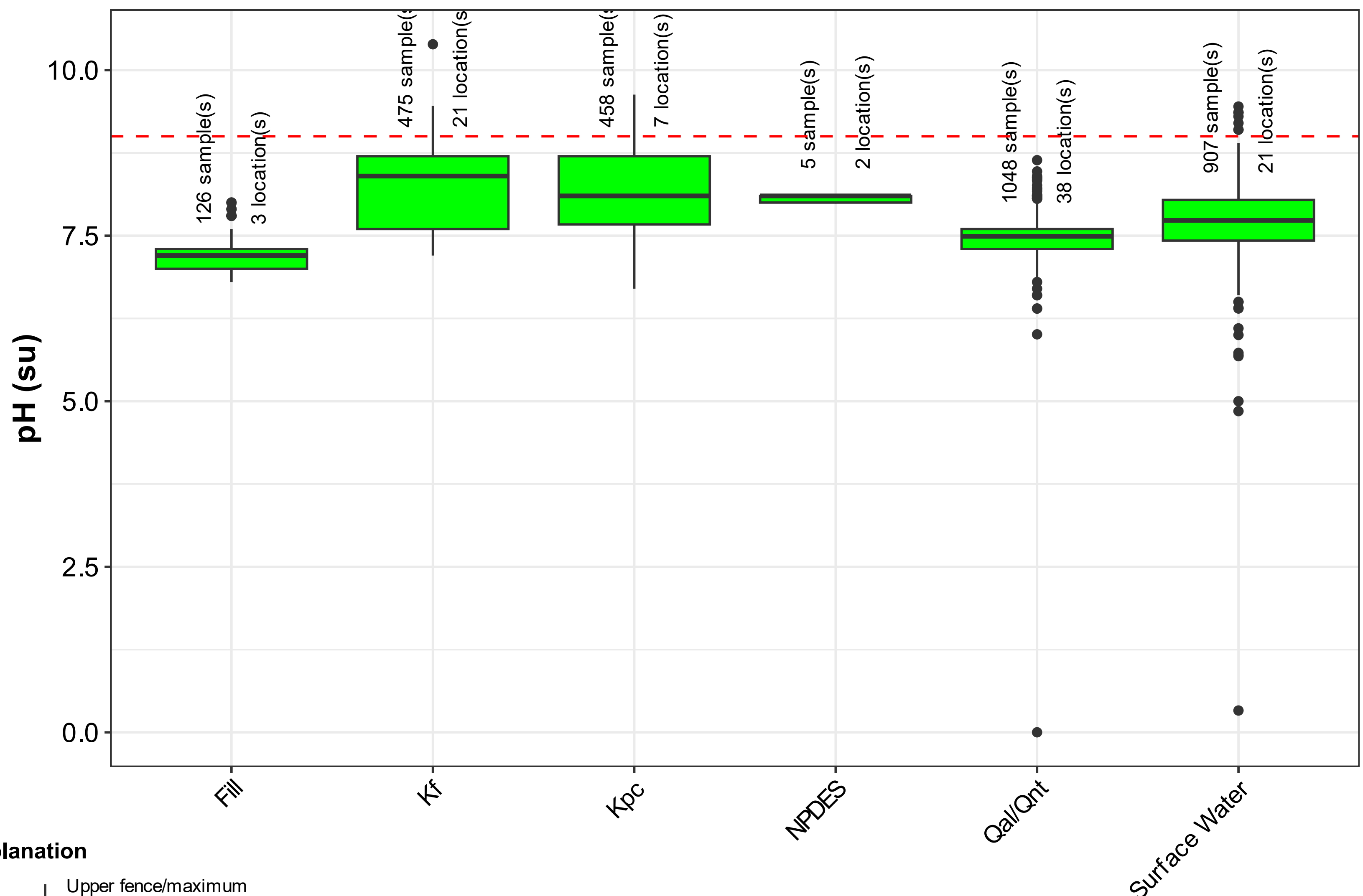
SAN JUAN MINE

Box and Whisker Comparison Plot

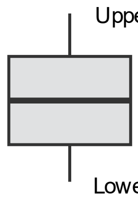
Zinc, Dissolved

DBS&A a Geo-Logic Company

6/10/2025 DB24.1140



Explanation



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SAN JUAN MINE
Box and Whisker Comparison Plot
pH

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6/10/2025 DB24.1140

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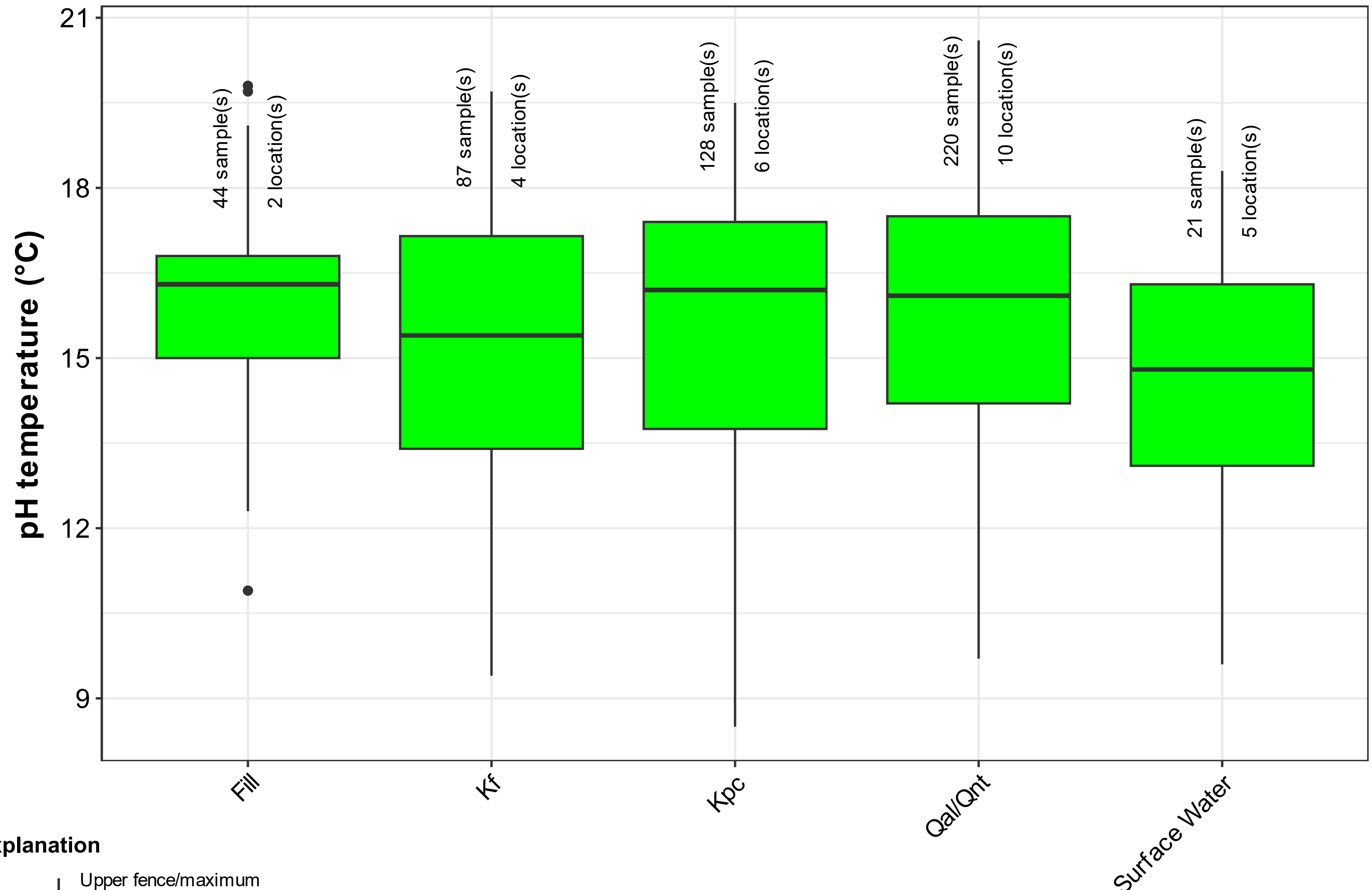
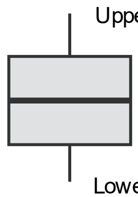


Explanation



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SAN JUAN MINE

Box and Whisker Comparison Plot

pH temperature

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6/10/2025 DB24.1140

Appendix F

Calculations of Groundwater Fluxes for Comparison to San Juan River Flow

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Calculation Cover Sheet

Project Name San Juan Mine Project Number DB24.1140

Calculation Number 1 Discipline Hydrology No. of Sheets 1

PROJECT: San Juan Mine
SITE: San Juan Mine; No. 8 Coal Seam Groundwater
SUBJECT: Discharge of mine-site water from the No. 8 Coal Seam to the San Juan River
SOURCES OF DATA: 1. Stewart, 2018 2. Westmoreland, 2019
SOURCES OF FORMULAE & REFERENCES: 1. Fetter, C. W. (1994), *Applied Hydrogeology*

☐ Preliminary Calculation ☒ Final Calculation Supersedes Calculation No. 0

Rev. No.	Revision	Calculation By	Date	Checked By	Date	Approved By	Date
0	Preliminary	LR	6/23/2025				
1	Final	EW	6/23/2025	JM	6/23/2025		

Calculation Sheet

Project No. DB24.1140 Date 6/23/2025

Subject Discharge Calculations Sheet 1 of 1

By Ethan Williams Checked By Jessica Myers Calculation No. 1

1. Purpose

Determine the discharge of mine-impacted water from the No. 8 Coal Seam to the alluvium of the San Juan River

2. Given

- Cross-Sectional Width of Mining Activities (w) ≅ 30,000 ft
- Hydraulic Gradient ($\frac{dh}{dl}$) = 0.015
- Geometric Mean Transmissivity (T) = 0.242 $\frac{}{day}$

3. Assumptions

- Consistent hydraulic gradient ($\frac{dh}{dl}$) of 0.015 ft/ft throughout the region, similar to the structural dip of the No. 8 coal seam in the mine area (Stewart, 2018)
- Transmissivity of the No. 8 coal seam between the mine and the San Juan River is consistent with the geometric mean transmissivity of the No. 8 Coal Seam presented in in *SJM Permit 19-01* (Westmoreland, 2019).
- Southeastern groundwater flow (inferred pre-development condition).
- No. 8 Coal Seam cross sectional area in complete hydraulic connection with the San Juan River or its alluvium.

4. Method

In order to determine the discharge of water (Q), Darcy's Law can be utilized,

$$Q = K * A * \frac{dh}{dl} \#Eq.(1)$$

where A represents the cross-sectional area of mining activities, and K the hydraulic conductivity. Transmissivity (T) is defined as

$$T = K * b \#Eq.(2)$$

where b represents the saturated thickness of the aquifer. Because the cross-sectional area is defined as $b * w$, Eq. (2) can be substituted into Darcy's law [Eq. (1)] to determine the discharge with the given information, as shown in Eq. (3):

$$Q = T * w * \frac{dh}{dl} \#Eq. (3)$$

5. Solution

$$Q = T * w * \frac{dh}{dl} = 0.242 \left[\frac{ft^2}{day}\right] * 30{,}000[ft] * 0.015 \left[\frac{ft}{ft}\right] = \mathbf{108.9} \frac{\boldsymbol{ft^3}}{\boldsymbol{day}}$$

Result in gallons per day (gal/day):

$$Q = 108.9 \frac{ft^3}{day} * 7.4805 \left[\frac{gal}{ft^3}\right] = \mathbf{814.6265} \frac{\boldsymbol{gal}}{\boldsymbol{day}}$$

Result in gallons per minute (gal/min):

$$Q = 814.6265 \left[\frac{gal}{day}\right] * \frac{1}{1440} \left[\frac{day}{min}\right] = \mathbf{0.5657} \frac{\boldsymbol{gal}}{\boldsymbol{min}}$$

Result in acre-feet/year:

$$Q = 108.9 \left[\frac{ft^3}{day}\right] * \frac{1}{43560} \left[\frac{acre}{ft^2}\right] * 365 \left[\frac{day}{year}\right] = \mathbf{0.91} \frac{\boldsymbol{acre * feet}}{\boldsymbol{year}}$$

Appendix G

NMED Map with Proposed Additional Monitor Well Locations

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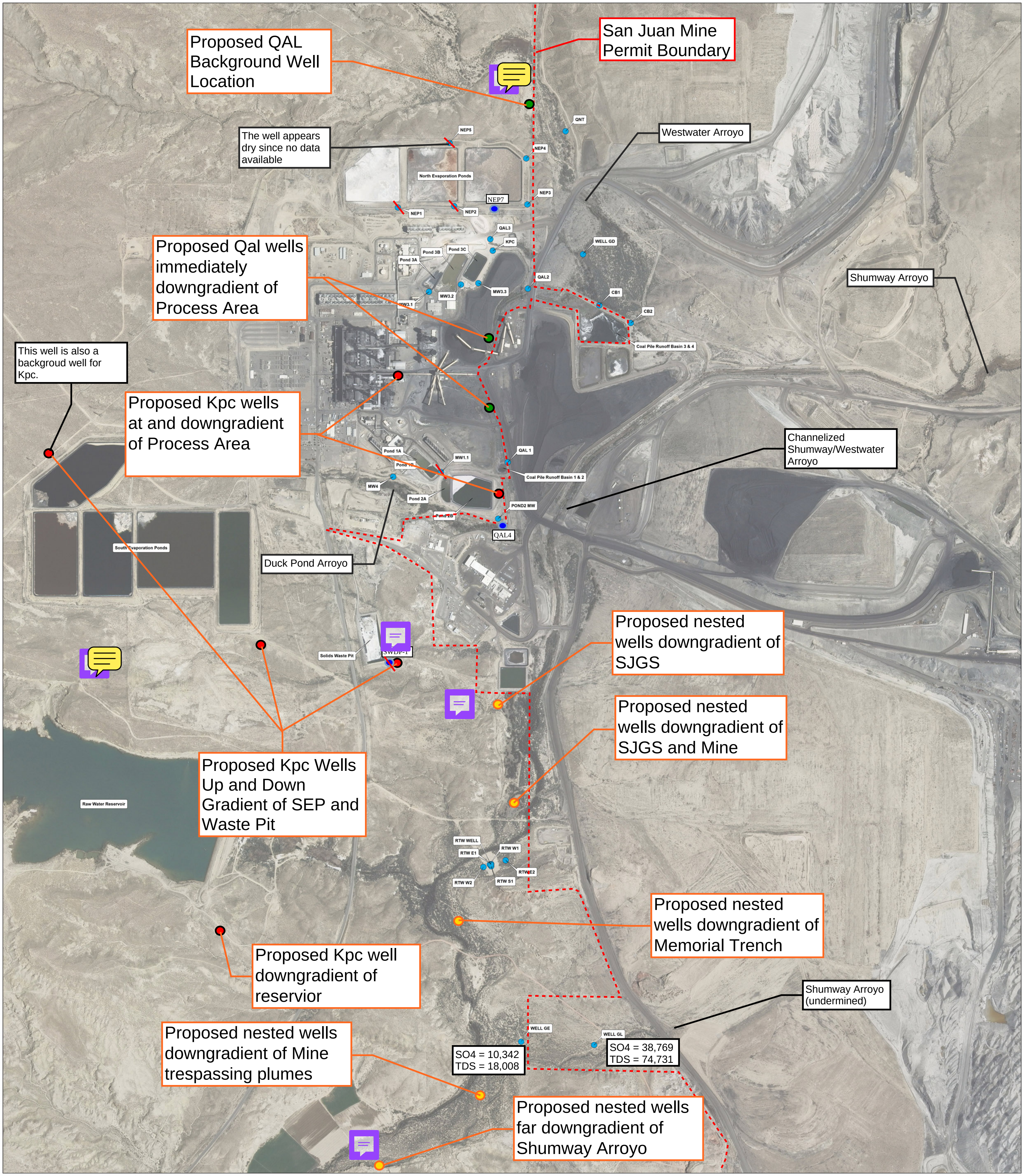

San Juan Generating Station Monitoring Well Map

Monitoring Well

Feet
0 200 400 800

N

Aerial Photography:
USDA NAPP 2009

Map Created by J. Evaskovich
October 13, 2010