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Final Report on Updated Background Screening Levels

Plant Site, 1&2 SOEP and STEP, and 3&4 EHP
Colstrip Steam Electric Power Station
Colstrip, Montana

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Prepared for

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GLOSSARY

AOC	Administrative Order on Consent
bgs	below ground surface
BSL	Baseline Screening Level
CCRAWP	Cleanup Criteria and Risk Assessment Work Plan
COI	Constituent of Interest
DL	Detection Limit
EHP	Evaporation Holding Pond
Ford Canty	Ford Canty & Associates, Inc.
Hydrometrics	Hydrometrics, Inc.
MDEQ	Montana Department of Environmental Quality
ND	Non-detect
Neptune	Neptune and Company, Inc.
PAM	Partitioning around medoids
PC	Principal Component
PCA	Principal Component Analysis
PPLM	PPL Montana, LLC
RF	Random Forests
SES	Steam Electric Station
SOEP	Stage One Evaporation Pond
STEP	Stage Two Evaporation Pond
Talen	Talen Montana, LLC
UCL	Upper Confidence Limit
USEPA	United States Environmental Protection Agency
UTL	Upper Tolerance Limit
WECO	Western Energy Company

Executive Summary

This report presents calculated baseline screening levels (BSLs) for evaluating potential groundwater impacts from the Colstrip Steam Electric Power Station (SES) located in Colstrip, Montana (the Facility). BSLs cover the Plant Site area (Plant Site), the Units 1&2 Stage I and II Evaporation Pond (SOEP and STEP) areas, and the Units 3&4 Effluent Holding Pond areas. Arcadis (2007) previously calculated BSLs for the Plant Site and Units 1&2 SOEP and STEP areas. Exponent previously calculated draft BSLs for the Units 3&4 Effluent Holding Pond (Exponent, April 18, 2011). Since that time considerably more data have been collected by various parties within the vicinity of the SES. Subsequent to approval of the BSLs Work Plan (Neptune and Company, Inc. 2015), data have been added to the available database, statistical evaluations have been performed, and revised BSLs have been calculated. The following objectives were achieved during the course of the data evaluation and BSL development:

1) Confirmed and updated the unimpacted status of wells (relative to SES closed loop wastewater operations) and groundwater samples from those wells used in previous developments of groundwater BSLs.
2) Identified additional wells that provide background data that were not previously included and evaluated them for inclusion in the groundwater background database.
3) Determined that the list of analytes with BSLs can be expanded based on the updated groundwater data.
4) Determined if BSLs are appropriate for site-wide use
5) Grouped stratigraphic units as possible, and practical, for BSLs calculation
6) Compiled and evaluated surface water data for exploratory data analysis and subsequent BSL calculation.
7) Updated statistical methodologies used in previous BSL calculation.
8) Presented updated BSLs.

Note that the BSLs Work Plan (Neptune 2015) offered some options for exploratory data analysis and methods for BSL calculations depending on the statistic of interest. Some clarification was provided after the BSLs Work Plan was approved; that is, the preferred BSLs were defined in consultation with the MDEQ as the 95th upper confidence bound on the 90th percentile of the baseline data. This statistic is often termed an upper tolerance limit (UTL), which, in this case can be written as a 95/90 UTL.

It was also noted in the BSLs Work Plan that the data would ultimately determine the statistical methods used for BSL calculations. Some options were offered in the BSLs Work Plan, but with the expectation that the data would drive the approach. In particular, it was noted that recent regulatory guidance would be followed, but that these methods would be augmented as necessary depending on the specifics of the available data. Various methods were considered, including some not described in the BSLs Work Plan, and, in consultation with the MDEQ, methods were agreed upon that are presented in this report. The sheer magnitude of the data led to consideration of some innovative methods for identifying background data, and data challenges (e.g., many non-detects, few data points) also led to using statistical methods that are robust to such challenges.

For the large groundwater dataset, a Random Forests (RF) clustering approach followed by expert review of cluster assignments is used to determine a baseline dataset from which BSLs can be estimated. BSLs are calculated for five different stratigraphic layers (Alluvium, Spoils, Clinker, Coal-Related, and SubMcKay).

For the smaller surface water dataset, the background data selected are those from four locations upstream of Colstrip, where the locations are chosen by subject matter experts, and choices are made based on sample location conditions, the number of sampling events, and the restriction that locations must be upstream from the Colstrip facility.

A bootstrapping method coupled with a Gehan-based ranking system to account for multiple detection limits within the non-detect data was used to estimate the background screening levels. This approach requires no assumptions about the distribution of the data.

Updated background screening levels are reported in Tables 7 and 9 for groundwater and surface water, respectively.

1.0 Introduction

Hydrometrics, Inc. (Hydrometrics), on behalf of Talen Montana, LLC (Talen; Formerly PPL Montana, LLC (PPLM)), retained Neptune and Company, Inc. (Neptune) to produce updated Background Screening Levels (BSL) for the Colstrip Steam Electric Power Station (SES) located in Colstrip, Montana (the Facility). The updated BSLs cover the Plant Site area (Plant Site), the Units 1&2 Stage I Evaporation Pond (SOEP), Stage II Evaporation Pond (STEP) area (1&2 Area), and Units 3&4 Evaporation Holding Pond (3&4 EHP) area.

On August 3, 2012, PPLM and the Montana Department of Environmental Quality (MDEQ) entered into an Administrative Order on Consent (AOC) Regarding Impacts Related to Wastewater Facilities Comprising the Closed-Loop System at the Colstrip SES (MDEQ/PPLM Montana, 2012).

As defined by the AOC, cleanup criteria for the constituents of interest (COIs) will be determined as follows (emphasis added):

> "For each COI in ground or surface water, except for the evaluation for ecological receptors, the applicable standard contained in the most current version of Circular DEQ-7 Montana Numeric Water Quality Standards ("DEQ-7"), the USEPA maximum contaminant level, the risk-based screening level contained in the most current version of Montana Risk-Based Guidance for Petroleum Releases, *whichever* is more stringent; and, for COIs for which there is not a DEQ-7 standard, a maximum contaminant level, or a risk-based screening level contained in the Montana Risk-Based Guidance for Petroleum Releases, the tap water screening level contained in the most current version of USEPA Regional Screening Levels for Chemical Constituents at Superfund Sites, **except that no criterion may be more stringent than the background or unaffected reference areas concentrations**; and
>
> For each COI in ground or surface water that may impact an ecological receptor, an acceptable ecological risk determined using the most current versions of standard USEPA ecological risk assessment guidance if the criteria set pursuant to (1) above are not adequate to protect ecological receptors, **except that no criterion may be more stringent than the background or unaffected reference areas concentrations**".

BSLs for groundwater have previously been proposed (Exponent 2011, Arcadis 2007, Maxim 2004). In the current work, Neptune presents updated BSLs for groundwater and surface water for the Colstrip SES. This Updated BSL Report is a companion to the Cleanup Criteria and Risk Assessment Work Plan (CCRAWP) currently being updated by Ford Canty & Associates, Inc. (Ford Canty) and Neptune based on initial comments from the MDEQ. As such, the results of the BSL statistical analyses presented here will be used to support the human health and ecological risk assessments. BSLs may be used to support initial identification of chemicals of potential concern in human health and ecological risk assessments, to evaluate groundwater impacts, and as a tool to help define cleanup levels where none exist.

1.1 Facility Description

A description of the Colstrip SES, hereafter called the Facility, is provided because BSLs need to be responsive to potential sources of contamination and to the different geologic and hydrologic conditions at the site. In particular, different groundwater datasets are developed for different stratigraphic layers. The transport mechanisms and the flow direction of groundwater between these layers can affect the background concentrations between some of these layers. In addition to environmental conditions, existing groundwater capture systems can have a significant influence on the flow of groundwater on and near the site. In particular, they can limit flow directly downgradient of the capture systems, which can affect background concentrations in different layers.

The Facility is located near the city of Colstrip, which lies within Rosebud County in the south central area of the state of Montana. Colstrip was established in the early 1920’s to provide coal for Northern Pacific Railways locomotives. Mining ceased in the area in the late 1950’s as diesel fuel replace coal as a fuel source for the locomotives. Mining resumed in the early 1970’s to provide coal for the Colstrip Steam Electric Station, and other facilities. Coal mining, ranching, urbanization, and electrical generation are the primary land uses in the immediate Colstrip area.

The Facility consists of four power-generating units (Figure 1). Units 1 and 2 are 333 megawatts each and began operation in the mid-1970s. Units 3 and 4 are 805 megawatts each and began operation in 1984 and 1986, respectively. Talen is the operator of the Facility, which is co-owned by Talen, PacifiCorp, Puget Sound Energy, Inc., Portland General Electric Company, Avista Corporation, and NorthWestern Corporation (Hydrometrics 2015).

The Facility generates electricity through the combustion of coal. Fly ash, a by-product of coal combustion, is removed by air scrubber systems to reduce emissions. Bottom ash collects at the bottom of the boiler. Fly ash, bottom ash, and Facility wastewaters contain constituents of the original coal. A closed-loop process water/scrubber system is used at the Facility to minimize impacts to water resources in the area (the Facility is zero discharge). Ash- and water-based liquid wastes from the generating plants are impounded in ponds designed and constructed to control seepage losses. The Plant Site pond system includes ponds that serve all four generating units in various capacities. Fly ash disposal is not currently conducted on the Plant Site, but rather in holding ponds to the northwest of the Plant Site at the 1&2 Area and to the east of the Plant Site at Units 3&4 Effluent Holding Pond. Fly ash deposited during previous operations remains in the closed Plant Site Units 1&2 Pond A.

Coal mining in the Colstrip area is accomplished by strip mining. This involves removal of the strata that overlies the coal, referred to as overburden. The overburden is blasted with explosives to make removal of the rock possible with the use of mining equipment. The coal is then typically blasted prior to removal. Following removal of the coal, the overburden from the next cut is removed and placed in the pit. This material is referred to as spoil.

1.1.1 Geology

Stratigraphy in the Colstrip area consists of, from the surface downward, the Fort Union Formation, Hell Creek/Lance Formation, Fox Hills Sandstone, and Bearpaw Shale. The Fort

Union Formation is divided into three members; the upper Tongue River Member, the middle Lebo Shale Member, and the lower Tullock Member. The Tongue River Member is at the surface in the Colstrip area. The deeper Lebo Shale, and then the Tullock Members are exposed to the north. At Colstrip, the total thickness of the Fort Union Formation is about 650 feet. Figure 1 is a cross section that illustrates the geology in the Units 1&2 Stage I & II Evaporation Ponds area.

The Fort Union Formation consists of alternating and intercalated deposits of shale, claystone, mudstone, siltstone, sandstone, carbonaceous shale and coal. The formation was deposited in a fluvial system of meandering, braided, and anastomosed streams near the basin center and by alluvial fans at the margins. The fluvial systems were typically oriented northeast-southwest. (Flores and Ethridge 1985 as cited in Hydrometrics 2015).

Numerous coal seams are present in the Tongue River Member of the Fort Union Formation, the result of peat deposits that accumulated in swampy areas and channels. The main coal seams of interest near Colstrip are the sub-bituminous Rosebud (~ 24 feet thick) and McKay seams (~ 8-10 feet thick). The Rosebud Coal, however, is the only seam mined in the Facility area due to quality of the McKay Seam which makes it undesirable for use in many coal-fired boilers. Both the Rosebud and McKay coals contain natural vertical fracturing (cleats) generally oriented perpendicular to the bedding plane. Bedrock beneath the McKay coal stratigraphy is referred to as sub-McKay.

The Rosebud Coal, and in some places the McKay Coal has undergone *in situ* burning in the Colstrip area. Burned areas can be identified by red cap rock on hills around the region. Burning of the coal baked the overlying strata. As a result of the burning, the coal volume was reduced leaving a void for the overlying rock to collapse into, or slowly settle into over time. The thermally altered rock is referred to as clinker or scoria. Collapse of the rock resulted in secondary porosity (fractures). Permeability varies but is typically very high and depends on the amount of fine-grained sediments that has moved vertically into the available pore spaces and the degree and nature of fracturing. No clinker has been confirmed on the Plant Site proper but it does occur at the SOEP/STEP (Figures 2 and 3) and Units 3&4 Effluent Holding Pond areas.

Alluvium is present in the drainage bottoms. Figure 2 includes two cross sections illustrating the shallow geology along the Creek. The ancestral East Fork Armells Creek eroded through the shallow bedrock, including the Rosebud and McKay Coals, and in some places into the sub-McKay deposits (Figure 3).

1.1.2 Hydrology and Hydrogeology

Groundwater is found in multiple layers of stratum in the area. These include, in a general descending order:

- Fill – Typically earthen material that is used to fill depressions, backfill excavations or build up areas to create mounds or change the grade or elevation of the ground. Examples of fill are spoil placed back into a mine pit or standing on the edge of a pit, soil or aggregate placed in excavated areas, and fill placed to level roadways or parking lots, etc. Any disturbed soil that has been reworked, placed in another location, or disturbed and contoured would also be considered fill. In most cases, fill is above the groundwater table. However, in some instances, such as spoil, groundwater is present in the fill.

  - Spoil – Silt, clay, sandstone, coal fragments, formerly overburden units that have been used to backfill areas where the Rosebud Coal was mined. The spoil were formed as a result of strip mining of the Rosebud Coal seam. Strip mining involves removing overburden material (sedimentary rocks that overlie the coal) and placing it in the previously mined pit. The coal is then removed. The removed overburden is referred to as spoil. Groundwater flow directions in spoil are typically consistent with the area topography, or the orientation of the bottom of the pit until regional flow is re-established.

- Alluvium – Poorly sorted clay, silt, sand and gravel deposited by fluvial processes in drainage bottoms. The most significant alluvial deposits occur under East Fork Armells Creek, Cow Creek, South Fork Cow Creek, Stocker Creek, and Pony Creek. Groundwater flows down the drainages under gradients that are typically similar to the topography. Minor alluvial deposits are also present in tributaries. A basal gravel, comprised of clinker, is often present in the alluvium. Clinker fragments are typically also found throughout finer-grained alluvial deposits. Alluvium is usually saturated within a few feet of ground surface in the East Fork Armells Creek vicinity but may be unsaturated for all or part of the year in its tributaries and the upper reaches of the Cow Creek basins.

- Colluvium – Colluvium is slope deposits, which have been transported downslope by fluvial or gravitational means. Colluvium in the Colstrip area is most often a silty clay or clayey silt composition, although coarser deposits may be present locally. Colluvium is frequently inter-fingered with the alluvial deposits along the edge of floodplains. Groundwater is typically not present or is only present in small amounts in the colluvium.

- Rosebud Overburden – Bedrock units of the Fort Union Formation comprised of siltstone, claystone, shales, and fine-grained sandstone typically overlay Rosebud Coal. Groundwater is often present in the overburden units in the Plant Site Area and south of the Stage I Evaporation Pond area. Flow typically is in a direction similar to topography where groundwater is present.

- Rosebud Coal – Cleated coal with thickness on the order of 20 to 25 feet. This coal seam has been mined throughout much of the eastern portion of the Plant Site, south and southwest of the Stage I & II Evaporation Ponds, and west of the Units 3&4 Effluent Holding Pond.

  Groundwater levels (if present) in the Rosebud Coal drop as mining approaches, or pre-mining dewatering is conducted. Recharge of spoil groundwater begins once the pit is backfilled. Recharge is either laterally from adjacent coal (if the coal is wet), drainage into the spoil from adjoining overburden (if water is present), from infiltration of precipitation, or a combination. Additional information regarding groundwater flow can be obtained through review of recent annual hydrologic monitoring reports (Hydrometrics, 2015a), and in site-specific AOC reports (Hydrometrics, 2013a, 2013b, 2015b). A detailed explanation of Colstrip, Montana Coal mining can be found in (Roberts et al, 1999). Groundwater flow in the coal is described in numerous permit documents for the Big Sky and Rosebud Mines.

  - Clinker – Also referred to as scoria and baked shale – Comprised of thermally altered and collapsed overburden (sandstone, siltstone, shale, etc.) formed by the burning of previously underlying coal. Clinker is generally quite permeable, a function of the secondary porosity caused by fracturing. Natural groundwater is typically not present in clinker in any of the three areas due to this high permeability.

- Rosebud-McKay Interburden – Typically consisting of siltstone and shale although isolated sandstone deposits may also be present. The thickness of the interburden, and the presence of groundwater varies throughout the area. The thickness typically ranges from less than one foot to more than 10 feet. Groundwater in the interburden generally flows in a direction similar to the Rosebud Coal.
- McKay Coal – Cleated coal with a thickness of 7 to 14 feet, but most often 8 to 9 feet. The McKay Coal is a widespread hydrostratigraphic unit in the Colstrip area as it is often saturated with groundwater. The McKay is absent, however, in areas along the western margin of the Plant site where it has been eroded, under much of the Stage I & II Evaporation Ponds, and in lower elevations in the Units 3&4 Effluent Holding Pond.
- Sub-McKay – Fort Union Strata consisting of interbedded claystone, siltstone, fine-sandstones, and thin coal seams. Channel sands are not uncommon. Multiple intervals of water bearing sandstone and siltstone are present. The shallower sub-McKay sandstone (first water under McKay Coal) is typically targeted for water supply wells. However, deeper intervals are also targeted in some areas where the shallower sands are dry or only contain limited amounts of groundwater or the shallower units have been removed by erosion. Sub-McKay sandstones are used for water supply aquifers in the Colstrip area. Yields from wells completed in sub-McKay sandstones in the Colstrip area vary from less than one gpm to more than 20 gpm.

Shallow groundwater flow directions are locally changed by the operation of current capture systems. For example, under non-pumping conditions at both the Plant Site and the 1&2 Area, shallow groundwater flow is generally expected to mirror the topography with flow towards the Creek and discharge into the alluvium along the Creek where the shallow bedrock units have been eroded by the ancestral East Fork Armells Creek. Under pumping conditions, overall shallow groundwater flow is locally diverted and interrupted by the capture systems (Figures 4 and 5). Groundwater flow is affected in a similar manner in the SOEP, STEP, and Units 3&4 Effluent Holding Pond areas.

Deep groundwater in the sub-McKay units generally flows to the northeast under a regional gradient toward the Yellowstone River.

Lateral variations in groundwater flow conditions might exist near mine spoil. If the hydraulic conductivity of the spoil is higher than the adjacent deposits, the spoil will act as a drain. Conversely, if the spoil hydraulic conductivity is lower, an impediment to flow will occur. Spoils are present in the eastern portion of the Plant Site. In general, permeability of the spoil is similar to the adjacent bedrock. However, spoil with a higher permeability is present north and west of the Units 3&4 Bottom Ash Ponds. This results in the high yield (~50 gallons per minute [gpm]) of the Western Energy Company (WECO) well. The WECO well was installed to lower the groundwater level below a coal crusher at the Rosebud Mine. The well was advanced to the base of the mine spoil (60 feet below ground surface [bgs]) and five feet into the underlying interburden (bedrock) to a depth of 65 feet. Spoil occurs west and southwest of the Units 3&4 Effluent Holding Pond but does not affect groundwater flow in the vicinity of the pond. Some active, or open, coal mine pits are also present. These pits act as groundwater drains when they intersect the water table.

Several indicator parameters are used to evaluate potential process wastewater impacts to groundwater at the Facility. These include specific conductance (SC), sulfate, dissolved boron, chloride, and the ratio of calcium to magnesium. Process water at the facility is typically highly conductive, and contains high concentrations of chloride, sulfate, and boron. In addition, the water is also high in the amount of magnesium as compared to calcium (the exception is water in bottom ash ponds which typically contains higher calcium than magnesium concentrations). The parameters are good indicators because the levels of these constituents are much higher than typically observed in ambient waters.

Existing groundwater capture systems in the areas where the highest concentrations of indicator parameters have been observed (both in the shallow units and in the McKay Coal) limit migration of impacted groundwater away from the Facility. At the Plant Site, capture wells are located downgradient of the Units 1&2 A Pond, Units 1&2 B Pond, Units 1&2 Bottom Ash Ponds, Units 1-4 Sediment Retention Pond, North Cooling Tower Blowdown Pond C, and South Cooling Tower Blowdown Pond C. Additional capture wells are located at the former Brine Ponds, Unit 3&4 Drain Collection Pond, and Units 3&4 Bottom Ash Ponds. Consequently, the Plant Site capture wells are located between the various ponds and East Fork Armells Creek. There is a small area with groundwater flow from the Plant Site toward the Cow Creek drainage basin near the Units 3&4 Bottom Ash Ponds. In the 1&2 Area, capture wells are located downgradient of the STEP dam between the dam and East Fork Armells Creek. In both locations the capture wells are designed to capture shallow groundwater prior to it reaching the creek. Groundwater capture is being conducted in the Units 3&4 Effluent Holding Pond in the alluvium downgradient from the Main Dam, the Saddle Dam, and in South Fork Cow Creek. Groundwater recovery is being conducted in the clinker along the south and southwest sides of the Units 3&4 Effluent Holding Pond. Groundwater recovery is being conducted from the sub-McKay sandstone directly north of the Units 3&4 Effluent Holding Pond and northeast of the pond.

1.1.3 Surface Water

East Fork Armells Creek

At the Plant Site and the 1&2 Area, the nearest natural surface water is East Fork Armells Creek. At the Units 3&4 EHP, the nearest surface water is Cow Creek. Regionally, the Creek is an intermittent stream, but it generally flows continuously through the town of Colstrip along the western edge of the Plant Site and along the eastern edge of the 1&2 Area. Surface water flow upstream and downstream of Colstrip is observed only in response to storm water or precipitation runoff events. Flow in the Creek varies throughout the year in response to runoff from precipitation, lawn watering, snowmelt, and plant growth. The Creek adjacent to the Plant Site and through the town of Colstrip is generally shallow and slow moving with abundant emergent aquatic vegetation present during the summer months.

At the Plant Site, the topography slopes downward from the Plant Site to the west/northwest toward the Creek. Colstrip SES is a zero-discharge facility, so there are no direct wastewater discharge points from the Plant to the Creek. Shallow groundwater from most of the Plant Site and the 1&2 Area flows in the direction of the Creek, though as discussed previously, a series of capture wells limit migration of groundwater to the Creek.

Water quality in the creek is affected by numerous activities and natural variations. These include but are not limited to:

- Influence from Castle Rock Lake.
- Influence from changes in runoff patterns to the creek due to industrialization or urbanization
- Influences from development of sports facilities including ball fields and golf courses.
- Influence of runoff from the townsite that involves lawn maintenance, road maintenance, highway management, etc.
- Influences from plant site capture systems and past seepage
- Seepage from the City of Colstrip Treated Sewage Lagoons and storage ponds.
- Influence from upstream mining and interruption in surface water and groundwater flow to the creek

Cow Creek, South Fork Cow Creek, Pony Creek

Other major drainages at the facility include Cow Creek and South Fork Cow Creek. These drainages are ephemeral in the headwaters. That is, there is only flow during response to snowmelt or precipitation runoff. Pony Creek is north of the Units 3&4 Effluent Holding Pond, and is also ephemeral. Water quality data are available from these drainages. However, the data are highly variable, and as such, are not considered useful for calculation of BSLs.

1.2 Previous Investigations

There have been two previous investigations of groundwater background conditions at the Plant Site and the 1&2 Area and one previous investigation at the Units 3&4 Effluent Holding Pond:

- A preliminary investigation of the 1&2 Area groundwater (Maxim 2004)
- A 2007 update of the Plant Site and 1&2 Area groundwater investigation (Arcadis 2007)
- A preliminary investigation of Units 3&4 EHP groundwater (Exponent 2011)

A preliminary statistical analysis of Plant Site and 1&2 Area groundwater data was conducted by Maxim Technologies in 2004 (Maxim 2004). Maxim identified a total of 59 wells in the area of the Plant Site and 1&2 Area that were deemed “unimpacted” by Facility operations and were included in the background analysis. The Maxim analyses divided wells into two groupings: “shallow” and “all wells.”

The statistical analysis previously performed by Maxim (2004) included the following steps:

1. Graphical analysis of the data distribution based on histograms, probability plots, and trend plots (scatter plots of concentrations against time).

2. Calculation of summary statistics, including the standard deviation, mean, median, minimum, maximum, range, and the sample sizes (including detects and non-detects). Non-detect (ND) values were taken to be the reporting limits.
3. Calculation of BSL values based on the 95 percent upper confidence limit on the mean (95 UCL) using a parametric method that assumes that data are normally distributed. The rationale for using the 95 UCL was attributed to USEPA's 1992 guidance, Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities (Addendum to Interim Final Guidance, July).
4. Trend plot analysis based on linear regression performed on concentration/time profiles.

Subsequent site investigations identified several areas for improvement in the identification of background groundwater samples for the Plant Site and SOEP/STEP areas. As a result, an effort was undertaken by Arcadis in 2007 to re-evaluate unimpacted wells identified by Maxim. This reevaluation resulted in the removal of 18 wells and the addition of 33 others, bringing the total number of unimpacted wells to 74. Arcadis divided wells into three stratigraphic units (Bedrock, Alluvium, and Spoils). Wells that were completed in both the spoils and the bedrock were added to the Spoils dataset, and wells that were completed in both the alluvium and bedrock were added to the Alluvium dataset. The final unimpacted dataset evaluated by Arcadis included 15 Alluvium wells, 43 Bedrock wells, and 16 Spoils wells.

The Arcadis analyses evaluated 41 different analytes. Arcadis used the 95 percent confidence interval of the 95th percentile (95/95 upper tolerance limit, or UTL) to represent the BSL. However, sample sizes were considered sufficient for calculating 95/95 UTLs for only 16 analytes in Bedrock wells, and 4 analytes in Alluvial wells. No 95/95 UTLs could be calculated for Spoils wells. When sample sizes were not sufficient to calculate 95/95 UTLs, Arcadis used the maximum detected concentration (after outlier analysis) in the unimpacted wells to represent the BSL. Additional refinements to the Maxim analysis included the following:

1. Statistical procedures for identifying and testing outliers were added.
2. NDs were explicitly incorporated in the statistical analysis using non-parametric statistical approaches designed for left censored data. ND values were taken to be the reporting limits.
3. Trend analyses were conducted for the statistical evaluation of trends, including evaluations for seasonal cycles.
4. Additional analytes were included in the analyses to evaluate potential site impacts.
5. Suspect values were removed from the dataset prior to performing the statistical analysis (e.g., duplicate entries).

Additionally, an investigation by Exponent (2011) analyzed background groundwater conditions at Units 3&4 EHP by looking at samples taken prior to October 1, 1983. Results were presented in an external memorandum for the three stratigraphic units used by Arcadis (2007) with the separation of coal layers into a fourth unit called Coal. 95/95 UTLs were also used to estimate BSL values in this investigation, resulting in values for 23 analytes each in Alluvium, Bedrock, and Coal wells; and 37 analytes in Spoils wells. The statistical approach was similar to Arcadis (2007) in that outlier tests were performed, non-parametric UTLs were calculated, and the maximum detected concentration was used as the BSL when sample sizes were insufficient for bootstrapping.

Groundwater well data have been collected for more than seven years since the time that BSLs were last calculated for the Plant Site and SOEP/STEP areas and five years since preliminary BSLs were estimated for the Units 3&4 EHP. In addition, the conceptual model of the site continues to improve as more information becomes available. The current investigation includes an assessment of the wells that were used in the initial evaluation, as well as the updating of the BSLs developed in earlier investigations to include new data and potential data that were previously undiscovered.

1.3 Summary of Current Approach

Draft groundwater BSLs have been calculated previously for the Units 3&4 Effluent Holding Pond, but final BSLs have not been approved by MDEQ. In this study, site-wide data are used, including data from the Units 3&4 Effluent Holding Pond. An additional component of the present investigation is evaluation of stratigraphic layers used for BSL calculations. The possibility of developing BSLs for surface water is also evaluated, since earlier investigations did not address surface water. East Fork Armells Creek has been sampled since the mid-1980s, but sampling locations include only four locations that can be considered upstream of the Plant's influence. This is because upstream of the town of Colstrip, East Fork Armells Creek experiences intermittent flow. Part of the current investigation is to explore additional upstream locations and calculate surface water BSLs if enough data exist.

The broad objectives of the current investigation are as follows:

- Confirm and update the unimpacted status of wells (relative to SES closed loop wastewater operations) and groundwater samples from those wells used in previous developments of groundwater BSLs.
- Identify additional wells that provide background data that were not previously included, and evaluate them for inclusion in the groundwater background database.
- Determine if the list of analytes with BSLs can be expanded based on the updated groundwater data.
- Determine if BSLs are appropriate for site-wide use.
- Group stratigraphic units, where possible and practical, for BSL calculation.
- Compile and evaluate surface water data for exploratory data analysis and subsequent consideration for BSL calculation.
- Update statistical methodologies for calculating BSLs.
- Present updated BSLs.

The development of updated groundwater and surface water BSLs starts with the formation of a suitable dataset, including samples gained since the previous investigations, and data from previously unused sources such as the Montana Bureau of Mines and Geology. The complete dataset includes samples that represent baseline conditions, but also many samples that have might have been impacted by site operations, and thus should be excluded from BSL calculations. Experts familiar with the site and its history have some prior knowledge that could assist in making this distinction. However, because this knowledge is sparse compared to the size and complexity of the dataset, it is not possible to evaluate each sample individually to determine whether or not to include it in BSL calculations. Instead, a statistical clustering approach involving the Random Forests (RF) algorithm is adopted to classify the dataset into two groups—background and non-background—based on a suite of analyte concentrations and other sample characteristics. Expert assessment is then used to evaluate and refine the automated classification, resulting in a final baseline dataset that is consistent with both (1) prior knowledge of the site and surrounding off-site impacts, and (2) the mathematical characteristics of the groundwater data. BSLs were calculated from this baseline dataset.

The RF algorithm is a form of machine learning—a broad area of computer science used to understand and model large, complex datasets. RF is well-suited to analyzing the Facility groundwater data because it can efficiently handle large datasets (here, more than 600,000 groundwater samples) with many variables (over 200 different analytes appear as measured quantities in the samples) and with a high degree of omission (many samples have measurements for only three or four dozen analytes, for instance)—characteristics that by contrast would create obstacles for traditional statistical classification methods. The RF method is also robust to extreme values and to skewness in the data distributions, which is important because the concentration distributions for many analytes are strongly right-skewed. RF has been used in a wide variety of environmental applications, including predicting tree species distribution (Mellor *et al.* 2013, Prasad *et al.* 2006, Evans & Cushman 2009), forest carbon stores (Mascaro *et al.* 2014), air temperature (Ho *et al.* 2014), ecological classifications (Cutler *et al.* 2007), and groundwater quality (Rodriguez-Galiano *et al*. 2014, Anning *et al.* 2012). RF has also been used in predicting medical diagnoses (Wolfe *et al.* 2010) and gene selection (Díaz-Uriarte & Alvarez de Andrés 2006). Further details about the method are provided in Section 4 and Appendix A, and a simplified example of the RF clustering approach applied in this investigation is provided in Appendix B.

It is worth noting that the approach described here leads to a baseline/non-baseline determination for each sample, not just each sample location (i.e. well). Using the sample as the unit of evaluation allows for only a part of a well's historical sampling record to be used in BSL calculations. In other words, if the sampling record of a well shows effects of contamination in the latter half of the record, the first half of the record could still be used for BSL calculations. However, once a well shows evidence of impacts, no samples at later dates are used.

In summary, the approach to calculating groundwater BSLs is outlined in the following steps, discussed in further detail below:

1. Data preprocessing to combine data from various sources.
2. Identification and separation of groundwater and surface water sampling locations.
3. Determination of sample similarities using the RF algorithm.
4. Clustering of samples into background and non-background groups based on the RF-determined similarities.
5. Expert review of clusters to establish baseline and impacted assignments.
6. Calculation of BSLs based on baseline samples.

The approach for analyzing surface water is different, because surface water samples are limited to a relatively small number of locations on East Fork Armells Creek appropriate for inclusion in the baseline dataset. Specifically, locations are limited to those upstream of the Facility with enough samples and continuous flows. Because of the small number of potential sample locations, samples are assessed on a location-by-location basis, and samples from four locations are identified for use in baseline surface water calculations.

1.4 Clarification of *background* and *baseline* definitions

In this report, a number of distinct but similar terms are used to refer to groups of samples. As noted above, the present analysis involves first separating samples into two groups using the RF algorithm. These groups are referred to as *background* and *non-background*, as they are expected to generally correspond to samples that represent background conditions on-site, and those that do not, respectively. However, the ultimate goal of the analysis is to identify a *baseline* dataset that (1) reflects not only background conditions on-site, but also all upgradient conditions (contaminated and not), and (2) conforms to all prior site knowledge. To produce such a baseline dataset, the RF-identified sample groupings are reviewed by experts, who begin with the background group and then add or remove individual samples based on knowledge of the history of the site and its surrounds (see Section 4.3 for details). The term *non-impacted* is used interchangeably with baseline, as samples in the baseline dataset are thought to be unimpacted by site activities. By contrast, the term *impacted* refers to samples that are not part of the baseline dataset, i.e. those with concentrations and water quality profiles that are indicative of facility process water impacts.

2.0 Data Preprocessing

Water quality data from both groundwater and surface water sites were provided by Hydrometrics, Inc. (Hydrometrics) as Excel (Microsoft) spreadsheets from several sources: Talen Montana LLC, Rosebud Mine (Westmoreland, formerly Western Energy), Big Sky Mine, Battelle, and the Montana Bureau of Mines and Geology (2015). These data are combined into a single dataset and stored as a data table in a PostgreSQL database (PostgreSQL 9.3 PostgreSQL Global Development Group). To combine the data from various sources, the spreadsheets are read into the open-source statistical software R (R Core Team 2015) as comma-delimited files and processed to standardize column names and field entries (such as units, analyte names, stratigraphic layer, well purpose, and detect flags). Additional columns are added to distinguish groundwater samples from surface water samples and to incorporate well metadata (such as status) found in other files. In total, this results in a dataset of 641,793 data points from 2,206 wells for 285 analytes, over a timeframe spanning from August 8, 1972 to June 30, 2015.

2.1 Development of a Groundwater Dataset

To develop a groundwater dataset, surface water locations are removed. Next, to ensure data are representative of the environment in which the Facility is located, a spatial constraint is applied to omit data west of the Rosebud Mine, south of the Big Sky Mine, north of Pony Creek, and east of the confluence of Cow Creek with South Fork Cow Creek. Samples from process sites, dam sumps, interception trenches, test holes, boring holes, and pits are removed. Also removed are dry wells, wells with process water impacts (as evidenced by the indicator analytes), wells at poor locations (directly down gradient of dam collection sumps, for example), wells with no logs or questionable completion information, and/or wells with histories that made their water quality record suspect. One such example is well PSW-1, which was perforated from the bottom up during the original installation. Remaining wells are reviewed with Hydrometrics on a well-by-well basis, along with bore logs and/or construction information, to confirm their stratigraphic layer and suitability for inclusion in further analysis. Analyte concentrations are not considered at this point in process. A majority of wells reviewed at this point are currently monitoring or capture wells. Some wells are currently identified as capture system wells, but in the past were monitoring wells and have since been converted to a capture well to mitigate identified process water contamination. Data from capture wells were only used prior to any detected impacts. Therefore, the data used from wells identified as 'capture wells' in the dataset represent natural groundwater conditions from their time as monitoring wells and are not skewed either through dilution or from process water impacts.

Wells without construction information, without well logs, or with information that suggested they were completed over more than one layer are filtered out. Represented among the remaining wells are eleven different stratigraphic layers: Alluvium, Colluvium, Shallow, Spoils, Clinker, Rosebud Overburden, Rosebud Coal, Interburden, McKay Coal, SubMcKay, and SubMcKay Deep.

For groundwater data, these filtering steps result in a dataset with 139 unique analytes. This dataset is further reduced to 47 analytes to be analyzed by the RF clustering process, including all but one analyte (field conductivity was omitted) from the most recent previous investigation (Arcadis 2007), plus seven additional analytes. The resulting groundwater dataset contains 384,569 data points from 1,333 wells, with sampling dates from March 23, 1973 to June 30, 2015. All groundwater samples for metals, calcium, magnesium, potassium, and sodium are filtered. Data availability by analyte and stratigraphic layer can be found in Table 1. Analytes not carried forward are summarized by data availability in Appendix I.

2.2 Development of a Surface Water Dataset

The first step in the creation of a surface water dataset for BSLs estimation is to rule out samples from sampling locations previously identified as groundwater locations. After also excluding additional sampling locations, such as springs and mine or city outfalls, all samples remaining under consideration are from sampling locations on East Fork Armells Creek, the surface water source that flows through the Site. Of those locations, only sampling locations upstream of the Plant Site are retained. Additional remaining locations are ruled out if they are ephemeral, run-off, out falls, springs, seeps, or ponded water, and based on discussion with MDEQ personnel. The final surface water dataset contains four locations, 72 samples, 39 of the 47 analytes considered in the groundwater dataset (does not include antimony, nitrite, nitrate, phosphate, titanium, silica, silver or tin), and a temporal span of February 14, 1981 to October 15, 2015. Surface water metals are separated into filtered and unfiltered groups. Data availability by analyte can be found in Table 2.

3.0 Exploratory Data Analysis

Because the goal of the analysis is the development of site-wide BSLs, the data are not split into separate datasets for different site sub-areas. However, the groundwater data are split into separate datasets based on stratigraphic layers. Initially, eleven layers are considered (Alluvium, Colluvium, Shallow, Spoils, Clinker, Rosebud Overburden, Rosebud Coal, Interburden, McKay

Coal, SubMcKay, and SubMcKay Deep). Several of these layers are grouped together as follows:

- Alluvium, Colluvium, and Shallow are combined into one stratigraphic unit, called Alluvium. Wells previously excluded because they bridged the Alluvium/Colluvium layer are included in this subunit of data as well.
- SubMcKay and SubMcKay Deep are combined and called SubMcKay.

The decisions to combine stratigraphic layers are based on data availability, stratigraphic position, and a qualitative assessment of approximate similarity of analyte concentrations (e.g., boxplots shown in Figures 6-11). Layers that have relatively few samples are combined when qualitative exploratory analysis provides sufficient justification. Only layers that are in contact with each other are considered for combination (e.g., SubMcKay is not considered for combination with Alluvium, because they are not normally in contact with one another), and then only if they exhibit basic similarities (e.g., coal layers are not combined with SubMcKay strata). Note that in some cases there are analyte concentration differences between combined layers (e.g., longer upper-end tails for SubMcKay than SubMcKay Deep). Overall, however, other considerations supported combining strata (e.g. SubMcKay and SubMcKay Deep are similar in water quality), and the increased sample sizes that result are deemed to outweigh any possible benefits of keeping the layers separate (e.g. the Colluvium and Shallow datasets contain only 88 and 49 sampling events, respectively, but the combined Alluvium-Colluvium-Shallow dataset contains >6500 samples).

Boxplots, histograms, and Q-Q plots for each of the resulting eight combined stratigraphic units can be found in Appendix D. In all plots non-detects are plotted at their reported detection limits using a hollow circle while detected values are plotted using a filled circle. This differentiates non-detects from detects, while maintaining the actual reported values for visualization of the data.

Because the groundwater dataset spans over 40 years, detection limit values are also plotted over time in order to examine the potential for changes in analytic techniques over time to affect analyses (Appendix D).

Surface water concentrations over time are plotted by analyte and sampling location for each of the four selected locations (AR-12, SW-55, SW-60, and SW-75; Appendix E). Time series plots, Q-Q plots, and histograms are presented by analyte (Appendix E). Conceptually, all samples from these locations represent upstream baseline conditions unimpacted by SES operations. A tabular summary of this baseline dataset is provided in Appendix H and a map of its spatial extent is provided in Figure 25.

4.0 Identification of Baseline Groundwater Data

For each of the eight stratigraphic groundwater datasets, three basic steps are involved in establishing the baseline groundwater dataset for that unit. The first two steps are statistical—first to apply the RF algorithm (Breiman 2001, Liaw & Wiener 2002), and second to use the RF output to cluster samples into two groups, differentiating background concentrations from elevated concentrations. The third step involves a sample-by-sample review of the clusters to ensure that BSLs represent baseline conditions (on-site and upgradient) rather than only background conditions, and that samples that are suspected of contamination based on prior knowledge are excluded from BSL calculations.

In the first step of the analysis, RF is used to calculate a similarity measure for samples based on their multivariate suite of analytes, which can then be used as an input to the clustering algorithm described below. Qualities of the RF process that make it especially appropriate for this purpose are its insensitivity to extremes in the dataset and its ability to compare variables with different ranges and units (scale invariance). In addition, RF does not require data to be normalized or otherwise transformed to meet particular distributional assumptions. Because of this flexibility, the RF analysis is able to use virtually all of the data included in the groundwater dataset described above. Among the few exceptions are field-measured specific conductance and pH, which are deemed too highly correlated with the equivalent lab-measured variables (note however that while the field-measured values are not included in the RF analysis, BSLs are calculated for them after baseline samples have been identified). Sampling date and location (spatial coordinates) were included in preliminary RF runs, but they were not found to be important predictors of similarity and complicated subsequent analysis, so these variables are also left out of the final RF analysis.

Because some analytes are measured much less frequently than others, the RF analysis starts by filling in missing values using a process called RF imputation, which uses information from other samples to fill in realistic values for missing data. The performance of this method is tested by: omitting non-missing data, imputing values for the omitted data, and then comparing the imputed and known values. Based on this evaluation, analytes with at least 500 non-missing values are deemed reliable; analytes with fewer non-missing values are not used in the initial clustering assignments of samples to impacted and unimpacted groups. Table 3 shows the analytes dropped from each stratigraphic unit for this step. Imputed values are used only to facilitate the RF clustering procedure. They are not used to calculate BSLs.

After imputation, another RF process is used to generate a sample similarity matrix for each stratigraphic unit. In this step, RF makes thousands of comparisons between the groundwater data and a carefully formed synthetic (i.e., created by the algorithm) dataset, in order to learn about patterns of variability in the real data. These patterns are summarized by the similarity matrix output by the algorithm, which quantifies the relatedness between each pair of samples in the groundwater dataset. The similarity matrix is then input to a clustering algorithm called partitioning around medoids (PAM). The PAM clustering algorithm clusters samples that have high similarity values, while separating those with low similarity into different clusters, ultimately arriving at an optimal solution in which all samples are more closely related to the samples in their own cluster than to any others. In this study, PAM is used to distinguish two clusters, assumed to represent background and non-background samples.

Because the RF/PAM clustering algorithm does not take into account prior knowledge about other upstream sources that might affect some of the wells and samples, subsequent expert review is intended, and is necessary, to transform the PAM-identified background and non-background clusters into baseline and impacted datasets. To do this, experienced hydrogeologists familiar with the history and geology of the Facility and its surrounds reviewed the statistically-defined clusters to identify any misclassified samples, i.e. samples classified as background that should be omitted from the baseline dataset, and those classified as non-background that should be included as baseline data. The fact that expert review was use to refine clustering results should not be viewed as a shortcoming of the analysis, but rather as a unique means of leveraging both expert site knowledge and the quantitative power of machine learning methods. Indeed, expert review indicated that the algorithmic approach performed well, by confirming that the majority of the background and non-background cluster assignments matched expert opinion for those samples where site knowledge allowed such judgment to be made. Furthermore, a relatively small fraction of the dataset was ultimately reassigned during expert review: 3,479 background samples were classified to the impacted group, and 1,468 non-background samples to the baseline group (12 and 5% of all samples, respectively). More broadly speaking, classifying samples based on known site conditions, site history, groundwater flow, and knowledge of local and site hydrogeology is consistent with general practice.

The result of the combined RF analysis, PAM clustering, and expert review processes is a collection of samples defined as the baseline (on-site background plus baseline upgradient) dataset, which is then used for BSL determinations. Note that because of localized conditions in isolated areas, BSLs calculated under this evaluation may not be representative of conditions in every location at the facility. One example is the McKay Coal in the 3&4 EHP area, where naturally high concentrations of indictor parameters exist locally. In these isolated areas, a ‘multiple lines of evidence’ approach would best be utilized to evaluate impacts to the area. Such evaluation would be conducted on a case-by-case basis. Figure 18 shows the spatial distribution of baseline and impacted wells, and others that contain baseline samples from early in their history but subsequently become impacted. A more detailed description of the steps taken to identify the baseline dataset is provided below (sections 4.1 through 4.4) and in Appendix A.

4.1 Random Forests Analysis

4.1.1 Overview

RF is a machine-learning algorithm that makes use of modern computing power to iteratively identify relationships among observations of multivariate data. It can be used to classify samples from unknown groups based on patterns “learned” from a training dataset where sample grouping is known (i.e. supervised RF), or to partition samples into groups when no training data are available (i.e. unsupervised RF). This study uses both types of analysis—RF imputation is a supervised algorithm, whereas sample similarity is computed with unsupervised RF.

RF results are the aggregate of numerous decision trees, which are analytical devices constructed by repeatedly splitting a dataset into smaller and smaller groups, or nodes. For each split, samples are separated into one node or the other in such a way as to minimize the variance, or spread, among samples in the newly created nodes. Each resulting node is then split using this same criterion, and so on until a node is either homogeneous (no variance) or meets a preset minimum node size criteria (five samples, in this analysis), at which point splitting stops along that branch. Because the algorithm aims to minimize within-node variance, nodes tend to become more homogeneous the further down the branches of the tree they are located. The samples that comprise the end nodes where the splitting has stopped are termed leaves.

The decision rules for splitting the nodes of a decision tree are determined separately for every node in the tree. Each rule may be based on any predictor variable in the model, but only a random subset of variables is considered at any given node (hence the algorithm's name *Random* Forests). For each variable considered, the rule is to split the node at a certain value—e.g., if the variable is magnesium and the value is 100 mg/L, then samples with magnesium concentration <100 mg/L go into one of the newly created nodes, and those with magnesium concentration >100 mg/L go into the other. The RF algorithm considers all such rules for a given node, and retains the one that results in the lowest within-node variance.

Once all splitting rules have been defined for a tree in the RF, it can be used to predict a response value for any sample by running the sample through the decision nodes and comparing it to the previously classified samples in the same leaf the unknown sample falls into. Predictions thus made by each individual tree in the RF can then be averaged to obtain a final prediction. The advantage of RF analysis over a single decision tree arises from the randomization of the trees it contains—since each tree is unique, RF is less prone to overfitting, and its predictions therefore tend to be more robust than those of any one tree.

4.1.2 Random Forests Imputation

As noted above, the first step in the RF cluster analysis is to fill in or "impute" missing data. The imputed values are not used in computing BSLs, but are necessary for maximizing the amount of data available for the RF dissimilarity analysis (see Section 4.1.3). Although imputed values add no new information (they are calculated entirely from non-missing data), they benefit the analysis by allowing all of the non-missing data to inform RF dissimilarity.

RF imputation works by replacing missing values based on the relationship between known values. This is conceptually the same approach as predicting missing values by parametric regression methods, but RF imputation often achieves better results than parametric (or mixed-type) methods, especially when the input dataset is complex and high-dimensional (Shah *et al.* 2014, Stekhoven & Buehlmann 2012).

In RF imputation, the basic approach is to impute missing values for one analyte by predicting them with an RF built from all other analytes. For each of the eight stratigraphic units of input data, a separate imputation was performed using an iterative process in which missing values are estimated and re-estimated until the sequence of estimates converges. Prior to the first iteration, missing values for each analyte are initially filled in with the mean of the non-missing values for that analyte. For every iteration thereafter, RF targets analytes one at a time to improve the estimate of imputed values. For each analyte, the algorithm selects only those samples that did not originally have a missing value. From this set of samples, an RF model is generated, which aims to predict the target analyte based on its relationships to all other analytes in the dataset. Once constructed, this model is used to fill in the missing values of the target analyte again. The new value tends to be more accurate on each successive iteration of the imputation algorithm.

A cycle of updating each analyte once represents a single iteration. Once completed, results from the current iteration are compared to the previous iteration. The algorithm proceeds as long as the imputed values are changing appreciably from one iteration to the next; once they have converged, the RF process is stopped and the results of the final iteration are output. This output, which now contains an imputed estimate in place of every originally missing value, is used as the input in the next process, the generation of an RF dissimilarity matrix.

The imputation process is implemented in this study using the *missForest* package in R (Stekhoven & Buehlmann 2012, Stekhoven 2013).

4.1.3 Random Forests Dissimilarity

A slightly different application of RF is used to generate similarity matrices for clustering the samples via unsupervised learning. In this approach, RF compares the input data to a synthetic (artificial) dataset. The synthetic data are generated by randomly scrambling the real input data. The synthetic version thus contains the same variables with similar values, but the scrambling removes any relationship or correlation between concentration values within a sample. For example, it may be common in the original dataset for samples with high concentrations of arsenic to also have high concentrations of uranium; this correlation would not exist in the scrambled dataset. The algorithm now has two versions of the input data, one with the relationships between measured variables intact (the original data) and one without these relationships (the synthetic data). The original and synthetic data are labeled as such, and then combined. The RF algorithm is then used to build trees that distinguish the original and synthetic samples. In doing so, the algorithm effectively learns about the relationships in the original dataset by contrasting it to the synthetic data. It should be emphasized that, like the imputed values descried above, while the synthetic data are an important component of this step in the analysis, they are not retained or analyzed further after the algorithm is complete.

The RF unsupervised learning algorithm aggregates results from a large group of decision trees that aim to distinguish among the real and synthetic samples. In classification problems there is no variance to minimize *per se*, but RF uses the analogous criterion of attempting to maximize the homogeneity within each group produced by a split at a node. That is, each split in the RF unsupervised learning algorithm attempts to put mostly real observations in one group and mostly synthetic observations in the other group. At the end of the analysis, the degree to which each input variable contributed to this goal can be summarized by an importance score (Appendix F.1). Variables with high importance were more often able to provide the best possible split in terms of maximizing node homogeneity, when considered across all nodes in all trees in the RF.

In this RF application, the critical output of each decision tree is the similarity matrix, which is defined based on a simple rule: two samples are similar if they are classified in the same leaf of the tree, and dissimilar if they fall in different leaves. Each tree creates a similarity matrix crossing all samples with each other, and fills in a value of 1 for every pair that are similar, and a 0 for all dissimilar pairs. After all trees have been constructed, their similarity matrices are averaged together to get a composite similarity score between each pair of samples. Note that proximities are only calculated for the real samples, not the synthetic portion of the data used to help construct the RF. For the baseline dataset fifty forests are included in this simulation, each with 1,000 trees. This results in a total of 50,000 trees. The rationale for not simply running 50,000 trees in one forest is that each time a new forest is created, the input data is scrambled anew, lessening the chance that any one version of the scrambled data will impact the overall results.

The RF approach is unique in that it imposes no restrictions on the structure, distribution, or covariance of the data to be clustered, or the scale differences between variables or observations and, hence, offers a powerful and flexible means for identifying natural groupings in complex datasets. The approach was implemented using the *randomForest* package in R (Liaw & Wiener 2002, Liaw *et al.* 2015).

4.2 PAM Clustering

The similarity matrix produced by the RF process is used as input to the PAM clustering algorithm, which clusters the samples into groups based on the similarity values stored in the matrix. For this study, the number of groups is pre-specified as two: one for background and the other for non-background samples. PAM attempts to locate "medoids"—central values for a group of multivariate data points—around which to define the background and non-background clusters. For any such pair of medoids, samples are defined as "background" if they are closer to the background medoid than to the non-background medoid, and vice versa. The PAM algorithm works by searching for the pair of medoids that maximizes the overall similarity between sample points and the medoid of their assigned cluster. This process effectively separates the samples into the most distinct clusters possible. The approach was used to cluster samples into two groups for each of the eight stratigraphic units. A more in-depth description can be found in Appendix A.6.

PAM results can be visualized in a variety of ways. Appendix F.2 illustrates variability within and between clusters for the five most important analytes (as determined by RF variable importance scores) for each stratum. Appendix F.3 gives a similar view, but with sample variability condensed via principal component analysis (PCA) onto two principal component (PC) axes. These results show that in general, a large proportion of the variability in the data (~40%, depending on strata) can be explained by a single PC axis. Furthermore, for most strata the two clusters identified by RF/PAM are largely distinct along this axis, and numerous analytes are highly correlated to it as well. This indicates that the dominant pattern in the data is that background and non-background samples have relatively low and high (respectively) concentrations for most analytes. There is some overlap between the clusters in the two-dimensional PCA space illustrated, especially for strata with fewer samples. Nevertheless, overall the PCA results indicate that the RF/PAM-identified clusters are (1) largely distinct, and (2) intuitive in terms of separating high vs. low analyte concentrations. These findings, along with the general correspondence of clustering outcomes with expert opinion (see next section), build confidence in the machine learning approach used to provide the initial separation of samples into background vs. non-background groups.

4.3 Cluster Review

Review of the clustering results was performed by subject matter experts with extensive experience at the Facility, its history, use and geology. The expert review was not limited to the five constituents with the highest importance ranking as output from the random forest clustering algorithm. The review included consideration of past site activities, known events, well location and other factors that could potentially reclassify well data for the impacted or non-impacted datasets. For example, some samples classified by RF/PAM as non-background are upgradient of the Facility, and thus can be considered a baseline condition for the Facility and should be included in the baseline dataset. More generally, the expert review was used to screen for wells and individual groundwater samples that could have been misclassified by the machine learning process for a variety of reasons, and as a method to verify the initial PAM clustering results.

Upon review, several specific actions were possible for a given sample or group thereof:

1) No action; that is, a sample in the background cluster was retained in the baseline dataset, or a sample in the non-background cluster remained excluded from baseline.
2) An entire well could be omitted from the baseline dataset if it was onsite and in a known impacted area based on site history and events.
3) Specific samples from a well classified in the background cluster could be omitted from the baseline dataset based on specific dates related to the history of the site and the spatial location of the well. For example, if there was a single high value from a well then all sample results after the date of that value were omitted from baseline.
4) An entire well could be included in the baseline dataset, regardless of RF/PAM classification, if it was known to be in an unimpacted area off-site (such as reclaimed areas northeast of the site) or upgradient of the site with potential impacts to the groundwater quality of the site from other sources.
5) Samples from a well classified as non-background could be moved into the baseline dataset based on review of the data (primarily indicator analytes). Typically these were wells with samples that bounce around from cluster to cluster throughout the time period of record.

The expert review process was iterative and went through several rounds, some in response to comments from MDEQ. In total, the expert review process results in 17% of 29,675 samples being switched from their PAM-assigned group. The result is a group of samples that generally reflects the natural relatedness among samples (as determined by RF and PAM), while also conforming to prior knowledge of experts familiar with the site and its history. These samples are collectively defined as the baseline groundwater dataset, and used hereafter in the definition of groundwater BSLs.

A complete list of samples that were moved from their PAM-assigned clusters to create the baseline dataset, and the criteria used to make such moves, are provided in Appendix J.

4.4 Baseline Groundwater Dataset Finalization

Because one of the objectives of the current investigation is to calculate BSLs for a practical number of stratigraphic units, another review of the data across stratigraphic layers is done. Only the baseline data are used in this review in order to identify which units share similar baseline conditions and could therefore be combined for calculations of BSLs. A visual comparison of boxplots of RF stratigraphic units was performed (Figures 12-17), resulting in the four coal-related units (Rosebud Overburden, Rosebud Coal, Interburden, and McKay Coal) being combined into a single unit termed “Coal-Related.” Other units were left separate, resulting in five final units: Alluvium, Spoils, Clinker, Coal-Related, and SubMcKay. Figure 19 shows the spatial distribution of baseline wells across these final groundwater units, as well as the four baseline surface water sites. The Clinker baseline dataset is spatially limited in comparison to the other units (Figure 21). This is because the Clinker is so well drained that it does not contain much water. Overall the Clinker stratigraphic layer represents a small portion of the groundwater dataset. The spatial extent of the Alluvium, Spoils, Coal-Related, and SubMcKay baseline datasets is shown if Figures 20, 22, 23, and 24 respectively. Note that the sub-McKay may contain water in different positions in the depositional sequence. Sub-McKay wells are typically completed in the first water bearing interval below the McKay Coal. Where the first groundwater below the McKay Coal is encountered may vary over short lateral distances.

A comparison of this dataset to previous BSL datasets (Exponent 2011, Arcadis 2007, Maxim 2004) is provided in Table 6. The statistical summary of the current investigation dataset is provided in Table 5 and is comparable to Tables 2-5 in the previous Exponent investigation (2001), Table 5 in the previous Arcadis investigation (2007), and Table 3 in the previous Maxim investigation (2004).

Tables in Appendix H summarize the data in this final dataset as well as the data not used for BSL determination.

4.5 Sources of Uncertainty

There are various sources of uncertainty in the analysis, which ultimately may have impacted the final estimated BSLs. These are associated with the statistical methods used, the expert opinion used to classify data from background status into baseline status, and the data available.

The RF and PAM clustering methods were used to classify the data into background and non-background categories. Some misclassification could occur at this stage, but is considered to have minimal effect on the final results.

- First, the original analyte concentration data contain non-detects and, inevitably, measurement errors, both of which would lead to error in the computed RF proximity and therefore potential misclassification by PAM. In particular, it is likely that ND values have declined over time, which would lend a positive bias to samples collected earlier in the site history. However, it should be noted that the BSL dataset is quite large, containing hundreds of thousands of samples from >1,000 wells, for dozens of analytes. The RF analysis takes all samples into account simultaneously, and the RF proximities that ultimately drive clustering are based on the multivariate relationships among all analytes. For a given stratigraphic layer, usuallythe RF is most sensitive to a smaller number of analytes, which often includes TDS, sulfate, magnesium, and boron, which are frequently detected and reported (see Appendix F). Thus, while there are many sources of error that can influence individual samples, RF results based on the complete dataset are expected to be relatively robust, and uncertainties in the final BSLs due to censoring and other measurement errors are expected to be minor.
- Another shortcoming of the sample data is that samples were collected with variable intensity in both space and time, and analytes were included in some samples and not others. As a result, some samples and time periods are represented more than others within the dataset. While a more deliberate and balanced design would be preferable from a statistical standpoint, it is less critical for the nonparametric RF approach taken here. The RF-imputed data (across space, time, and analyte) inherently add some uncertainty, because they stand in for data that are missing from the original dataset. While imputed

values are not used in BSL calculations, they can influence the RF algorithm. The influence is likely to be small because the RF and PAM results presented in Appendix F show that a few of the analytes are most important for classifying the samples. In addition, when and where the samples were collected were not important factors in the RF and PAM results. While it is acknowledged that unbalanced sampling probably might influence the results, in practice the resulting uncertainty is likely to be small.

- The RF algorithm itself adds additional uncertainty since it is based on random sampling. However, the large forest size used in this study should minimize that uncertainty. Another potential source of error is the assumption of a two-cluster PAM model. As discussed in Appendix A (Section A.6.4), there is a good *a priori* justification for this assumption, and exploratory analysis did not provide a compelling reason to increase the number of clusters. Furthermore, there is generally good separation between the two identified clusters for each stratum (e.g., see Appendix F.3), providing additional support for the decision. Nevertheless, the separation is clearly imperfect, which indicates that the two-cluster model is indeed a simplified representation of reality. Some samples—especially those in the area of overlap between the two clusters—may therefore be misclassified by background status simply because they must be fit into one cluster or the other. However, the background classification is a pre-cursor to the baseline classification that supports final BSL calculations. The background classification is used primarily to help the domain expert separate the data into baseline and non-baseline categories. The impact of such misclassification errors are likely to be minimized by the expert data review and baseline classification process.

The expert review process allows the possibility for human error, either in the form of reclassifying a sample that was really in the correct cluster initially, or by failing to catch and correct a sample that was misclassified by the machine-learning algorithm. Considering the breadth and depth of expert site knowledge entailed, however, it is expected that the review process corrected far more classification errors than it created. The background classification was used to support the expert's review of about 30,000 samples, but the primary goal was to classify according to baseline conditions. The final data were classified based on expert opinion, and were used directly in the BSL calculations without further consideration of uncertainty. In effect the baseline data identified through this process are the data used to estimate BSLs.

Finally, some of the BSLs presented in Section 5 are estimated from smaller sample sizes (between 10 and 30 samples) than others (over 30 samples). This is because some analytes were sampled more frequently than others over time, but also less frequently in non-impacted locations. BSLs are presented for these analytes, but there is more uncertainty in these estimates than in others drawn from a larger sample size. A list of these analytes is provided in Section 5.2. BSLs are estimated as the 95th upper confidence bound on the 90th percentile. BSLs are calculated essentially as an estimate of the 90th percentile plus a multiple of the estimated standard deviation of the data – the latter depends on the number of data points, and, in general is greater when there are fewer data points. The expert opinion approach often limited datasets perhaps more than was necessary – in general there was a tendency to remove data from baseline because the baseline dataset was considered large enough to not warrant inclusion of perhaps more uncertain data. Consequently, some additional uncertainty is incorporated in the BSLs by eliminating data from the baseline dataset that could, perhaps, have been included. This trade-off was considered reasonable, albeit arbitrary, and has the net effect of perhaps increasing some BSLs.

The data generation process involving RF, PAM clustering and expert opinion could be evaluated for contributions to uncertainty, but this is not straightforward. Running RF and subsequent PAM clustering many times in some form of bootstrap is technically appealing, but computationally infeasible for this project. Other approaches to machine learning and clustering could, perhaps, have been attempted to see if the results are similar. However, ultimately the RF and PAM clustering were used to establish a starting point for expert opinion, and were not intended to be purely definitive. The intention was to minimize the amount of work that the "expert" would need to do in order to classify the approximately 30,000 data records. The expert opinion could be challenged, and other experts brought in to provide peer review or even consensus expert knowledge in a form of group elicitation. However, the expert used for this work is uniquely qualified in terms of history of the site, in which case, it was considered doubtful that other experts could provide information as useful. The consequence is that the baseline data are generated through a process that include RF, PAM clustering and expert opinion, with the emphasis on the latter. As such, the data are used directly to estimate UTLs (BSLs) as would be the case for any other site with background or relevant baseline data.

5.0 Baseline Screening Levels

In the current investigation, BSLs are represented statistically as the 95th upper confidence bound on the 90th percentile of concentrations for an analyte as observed in the baseline dataset. This is often referred to as a 95/90 upper tolerance limit (UTL). Note as described in the BSLs Workplan (Neptune, 2015), use of this statistic for BSLs for Colstrip is consistent with the methodology used by MDEQ for calculating background threshold values for inorganic constituents in Montana surface soils (MDEQ, 2013). The only appropriate use of the BSLs is near real-time comparison of individual data points from the Site as they are collected to help identify impacts or to support near real-time cleanup decisions. These BSLs should not be used to support comparisons with other statistics from site data, such as mean concentations, upper confidence bounds on mean concentrations, or percentiles, and should not be used as a surrogate for statistical background comparisons that require comparison of site and background distributions.

Bootstrapping (Efron 1993) works by drawing sets of values with replacement from observed samples many times, creating a simulation from the empirical data. Each realization of the sampling procedure provides an estimate of a desired sample statistic, here the 90th percentile. Each estimate is different, which creates a distribution for the 90th percentile. The 95th percentile of this distribution is interpreted as the 95th upper confidence bound of the 90th percentile.

Gehan ranking is a method used to account for censored data, such as detection limits. It is commonly used when performing nonparametric significance tests, such as the Wilcoxon rank sum test (Gehan 1965, Gilbert 1987, Helsel 2005, Martinez & Naranjo 2010, USEPA 2013), but its applications are much broader (e.g.. trend detection in water quality data, regression analysis, survival analysis). Gehan ranking treats non-detects as potentially representing any value less than the reported detection limit. The true value is unknown, but it has a maximum limit. All values (detects and non-detects) are ordered (i.e. ranked) lowest to highest based on their reported values and detection status. For each value, a new rank is determined by averaging all possible ranks the value could have. For example, a non-detect value may be originally ranked higher than a detect value, but the true value could be less, so this results in multiple possible ranks that are then averaged.

As an example of this approach, suppose there are four sample results with values [10, 20, 30, 40], and suppose the first and third sample results are non-detects [<10, 20, <30, 40]. Gehan ranking assigns the following ranks [1.5, 2.5, 2, 4]. That is, the first sample (<10) might be the lowest value sample, or the second lowest value (because of the non-detect at <30). The second sample (20) could occupy the 2^{nd} or 3^{rd} ranking position, hence its average rank is 2.5. The third sample (< 30) could occupy one of the first three ranking positions, hence its average rank is 2. Percentiles can then be computed based on the Gehan ranks of the data values. The final sample (40) can only be in the fourth position, regardless of the true values of the two non-detects.

To estimate a 95/90 UTL, the dataset is resampled with replacement, the samples are reordered according to the Gehan ranking scheme, and the 90th percentile is calculated. Each bootstrap realization is Gehan ranked and provides a different estimate of the 90^{th} percentile, which creates a distribution of the 90^{th} percentile. The 95^{th} percentile of this simulated distribution of 90^{th} percentiles results in a 95/90 UTL, which is used as the BSL. Non-detects are valued at the reporting limit for the purpose of calculating the 95th percentile. In cases where the UTL is likely affected by non-detect values, the resulting BSLs have been flagged as described in the next section (5.1). A detailed example is shown in Appendix G.

The benefits of the non-parametric approach described here are that it makes no distributional assumptions, and addresses non-detects with multiple detection limits. By contrast, estimation of 95/90 UTLs using parametric methods depends heavily on underlying distributional assumptions, and deviations from those assumptions can lead to poor 95/90 UTL estimates. However, because of the relative novelty of applying Gehan ranking to UTLs, two additional, more common methods of addressing non-detects were also applied: replacing non-detects with their reported detection limits (DL), and replacing them with 1/2 DL. After replacing the ND values, 95/90 UTLs were computed from these alternate datasets using the same bootstrap procedure described above (but omitting the Gehan ranking step, since non-detects were already handled by the DL or 1/2 DL replacement). The alternate UTLs are presented alongside the Gehan rank-based BSLs in Tables 8 and 10, solely for the purpose of comparison; they are not recommended for use in risk assessment. Tables 8 and 10 also show Circular DEQ-7 Human Health Standards for comparison.

The methodology used to calculate 95/90 UTLs combined bootstrapping with Gehan ranking and was implemented in R.

5.1 Calculation of BSLs

For each analyte in each of the five stratigraphic units and in surface water, 90th percentiles and BSLs (95/90 UTLs) are computed, unless there are insufficient data to support BSL estimation. In cases in which where there were less than 10 samples, no BSL and no 90th percentile were calculated. It is common in environmental statistics to require sufficient useful data to perform reliable statistical analysis. In principle a mean and standard deviation can be estimated from two data points, but the estimation is not likely to be statistically reliable in the sense that a different two data points could provide very different estimates. Some consideration was given to the number of data points that might be needed for the calculation of BSLs. A decision was made that BSLs should not be presented if there are less than 10 data points in representing an analyte and/or stratigraphic unit. From a purely statistical standpoint, this is still too few data points to compute a 95/90 UTL (the resulting confidence bound will in fact be less than 95%). However, the error can be expected to yield BSL estimates that are biased low (i.e., they would be higher if a larger sample size was available), which is conservative from a screening perspective. This was deemed preferable to setting a stricter sample size criterion and thus ending up with fewer BSLs. Table 4 summarizes the analytes across the stratigraphic units that have enough data points.

A large proportion of non-detects in a dataset can also make statistical analysis unreliable. For estimation of the 90th percentile, constraining the frequency of non-detects in the upper part of the data distribution is reasonable. Instead of applying additional rules that limit the number of BSL calculations performed, the decision was made to calculate BSLs for all analyte and stratigraphic unit combinations (with at least 10 data points, as noted above) and then flag certain 95/90 UTLs values according to the impact of the non-detects on the estimation.

For many of the datasets the non-detects are in the lower part of the data distribution and, hence, have no impact on estimation of the 95/90 UTL. In some cases, there are many non-detects, some of which appear in the upper part of the distribution, or even include the maximum reported value. This leads to three categories of calculated BSL values:

1. BSLs that are not impacted by non-detects. These BSLs are not flagged, and are considered the most reliable BSL estimates.
2. BSLs that are impacted by large-valued non-detects, identified when the BSL is less than the 90th percentile of the reported values (calculated with ND values set equal to their reporting limits). These BSLs are flagged as less reliable estimates.
3. BSLs that are the maximum reported value and this value is a non-detect. These BSLs are flagged as less reliable estimates.

These categories are identified in the BSLs comparison table (Tables 8 and 10) and in Tables 5 and 9. No shading applies to Category 1. Blue shading applies to Category 2. Orange shading applies to Category 3.

Note that Tables 5, 8, and 9 also flag estimated 90th percentiles (in yellow) that contain non-detects in the top 20% of reported values. This means some non-detects likely impact the BSL estimation, even if the specific conditions for categories 2 and 3 above are not met, and therefore again the BSL should be interpreted with some caution. In some cases all of the data for a specific analyte and/or stratigraphic unit may have been non-detects. Note that the 90th percentile estimates reported are based on the same baseline data as the computed BSLs, but they use the reporting limit for ND values and therefore may be biased high, and may even be greater than the maximum detected value.

In summary, the approach used in this analysis emphasized determining BSLs despite data limitations, in accordance with guidance from MDEQ. While BSLs derived from a small number of data points or confounded by non-detects are less reliable, by definition these BSLs are likely to refer to analytes that are rarely measured and/or rarely detected, and thus are unlikely to drive cleanup criteria decision. Nevertheless, the various flagging criteria described herein (and indicated with shading in results tables) serve as reminders that some of the reported BSLs were determined from limited data. It is thus advised that risk assessments that depend on BSLs reported here view flagged BSLs with caution.

There are options for considering a different statistic to represent the upper end of baseline conditions when the BSL is not calculated or is unreliable. These options include the estimated 90^{th} percentile and the maximum detected concentration reported in the baseline dataset. These are not ideal substitutions for an upper bound of the 90th percentile, and they cannot overcome the fundamental limitations of small sample size and/or a high proportion of non-detects. While these statistics do provide options for representing the upper bounds of a dataset in lieu of additional data collection, they should only be used with this caveat in mind.

5.2 Results

Table 1 lists the analytes and stratigraphic units for which there are sufficient data to estimate groundwater BSL calculations. A summary of the BSLs and the data used for their estimation is presented in Tables 5 and 7 for groundwater and Table 9 for surface water. In Tables 8 and 10, the reported BSLs are compared to other metrics, including the 95/90 UTLs based on replacing non-detects with DL and 1/2 DL (as described in Section 5.0), and the MDEQ Circular DEQ-7 standards for human health (MDEQ 2012). Again, it is emphasized that only the BSLs based on Gehan rank (Tables 5, 7, and 9)—not the alternate metrics presented for comparison purposes in Tables 8 and 10—are recommended for use in risk assessments

The recommended groundwater BSLs are presented in Table 7. Empty cells indicate that no BSL was calculated because there was not enough available baseline data (i.e., <10 samples, as described above). Highlighting is used to separate those combinations that clearly support groundwater BSL calculations from those for which the non-detects have an impact and thus result in less reliable estimations. If there is no shading in the cell, then the estimate is considered reliable (Category 1 in Section 5.1). The orange and blue highlighted results are considered less reliable. The estimated BSLs in these cases are impacted by non-detects. In effect the BSL might represent a detection limit, rather than concentration data.

Highlighted BSL results indicate one of two unique cases for which the given BSL value requires careful consideration. In the blue shaded cases (Category 2 in the Section 5.1) the estimated BSLs are less than the 90^{th} percentile, as computed using the detection limit for non-detects. An example of this is lead within SubMcKay (Table 5). In this case, there are numerous large-valued non-detects within the dataset, and the maximum non-detect is nearly as great as the maximum detect value. Large-valued non-detects can affect estimation of the bootstrapped 90^{th} percentiles, but the impact (i.e., whether the ND values draw the estimated BSL up or down) depends on where the non-detects are in the original ordering of the data.

In the orange shaded cases (Category 3 in Section 5.1), the BSLs correspond to the largest reported value and that value is also a non-detect. This generally occurs when the maximum value is a non-detect and the detect frequency is low. However, this condition is hard to predict because it also depends on the specific distribution of non-detects among the detected values. An example is titanium within the Alluvium unit. Table 5 shows the largest value in this case is 0.1, and it is a non-detect. Even with Gehan ranking, this value gets chosen enough times in the bootstrapping simulations as the 90th percentile that it becomes the BSL. The large number of non-detects relative to detects in this titanium dataset makes interpretation of the BSL and the 90th percentile difficult. For this and other flagged BSLs shown, further analysis and care should be taken when used in a risk assessment.

Yellow shading is used for the 90th percentile estimates in Tables 5, 8, 9, and 10 when there are any non-detects in the top 20% of the reported values. In some cases, the 90th percentile is shaded yellow, but no additional shading is present in the BSL column. In these cases, careful interpretation of the BSL value is still recommended, because the BSL might be representative of detection limits rather than actual concentrations, even though it is not subject to the more severe influence of non-detects categorized in Section 5.1. An example is molybdenum in the Alluvium stratigraphic unit (Table 5). In this case, the BSL is certainly affected by non-detect values, and in fact this molybdenum dataset has a detect frequency of only 7 percent. Thus, although the BSL is not flagged by the more specific criteria outlined in Section 5.1, the suggested interpretation is that baseline conditions are poorly resolved and the BSL should therefore not be applied.

Because the BSLs will be applied only if they exceed human health or ecological standards (see Tables 8 and 10 for these), shaded BSLs are only of real concern where they exceed these standards. In the case of the molybdenum example above, there are no Circular DEQ-7 human health standards. So while the reported BSL for alluvial molybdenum should be interpreted carefully, it has little bearing on applied screening levels.

Nevertheless, there are some groundwater BSLs that exceed the human health standards *and* are flagged for potential effects of non-detect values. These are:

- Tin in Alluvium,
- Nickel in Alluvium,
- Beryllium in Spoils and Coal,
- Cadmium in Spoils
- Lead in Spoils and Clinker,
- Mercury in Spoils,
- Nitrite in Coal,
- Thallium in Spoils, Coal and SubMcKay

The alluvial tin and nickel BSL is the maximum non-detected value, as are the BSLs for beryllium and nitrite in Coal, lead in Spoils, and mercury in Spoils. Beryllium concentrations in Spoils are all non-detects except one. Thallium has no detects in Spoils, Coal or SubMcKay. In these cases the high proportion of non-detects indicates the BSLs are primarily calculated based on detection limits and not measured concentrations. The BSL for lead in Spoils is based on a 30% detection frequency, the highest of any of the analytes listed above. However, the fact that the BSL (using rank-based non-detects) is less than the 90th percentile (using the reporting limit for non-detects) suggests it too is influenced by non-detects and should be interpreted with caution. The same interpretation could be taken for cadmium in Spoils.

Additionally, some BSLs, while not flagged as potentially less reliable, may have additional uncertainty due to being calculated from a smaller sample size (between 10 and 30 samples) than other BSLs (from 30 or more samples). A list of analytes with this type of BSL is organized by stratigraphic unit and given below. Analytes in bold are also flagged as being unduly affected by non-detects.

- Alluvium: **nitrite** and phosphorus
- Spoils: cobalt, **nitrite**, **nitrite + nitrate**, and **thallium**
- Clinker: aluminum, **cadmium**, **copper**, fluoride, iron, **lead**, manganese, **mercury**, **nickel**, nitrite + nitrate, orthophosphate, pH (Field), vanadium, and **zinc**
- Coal: **nitrite**
- SubMcKay: *none*

The BSL for chloride in Alluvium should also be interpreted with care. An analysis of the interaction between surface water and the Alluvium has not been done, but site and synoptic run For use in a risk assessment, the surface water dataset would be improved by additional sampling, especially at upgradient locations. reports indicate chloride sources in shallow groundwater may be from off-site sources in surface water. The disparity between the Alluvium and surface water BSLs for chloride (49 vs. 239 mg/L) indicate that the BSL for chloride may not capture all impacts unrelated to site activities.

In surface water, only mercury exceeds the human health standard and has a BSL that may be affected by non-detect values. In this case, the BSL is a non-detect value and the real baseline concentration is lower. Regarding the surface water BSLs, it should be noted that although an attempt was made to rule out truly ephemeral locations, some of the retained locations are from upstream areas where East Fork Armells Creek is thought to be of a potentially ephemeral nature. This, combined with the limited quantity of surface water data overall, suggest care should be exercised in applying the reported surface water BSLs. For use in a risk assessment, the surface water dataset would be improved by additional sampling, especially at upgradient locations.

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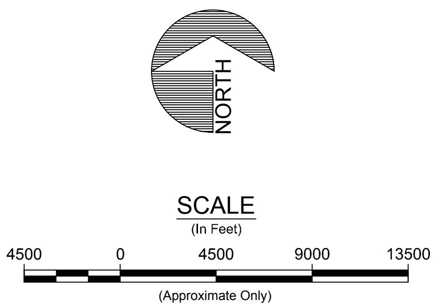
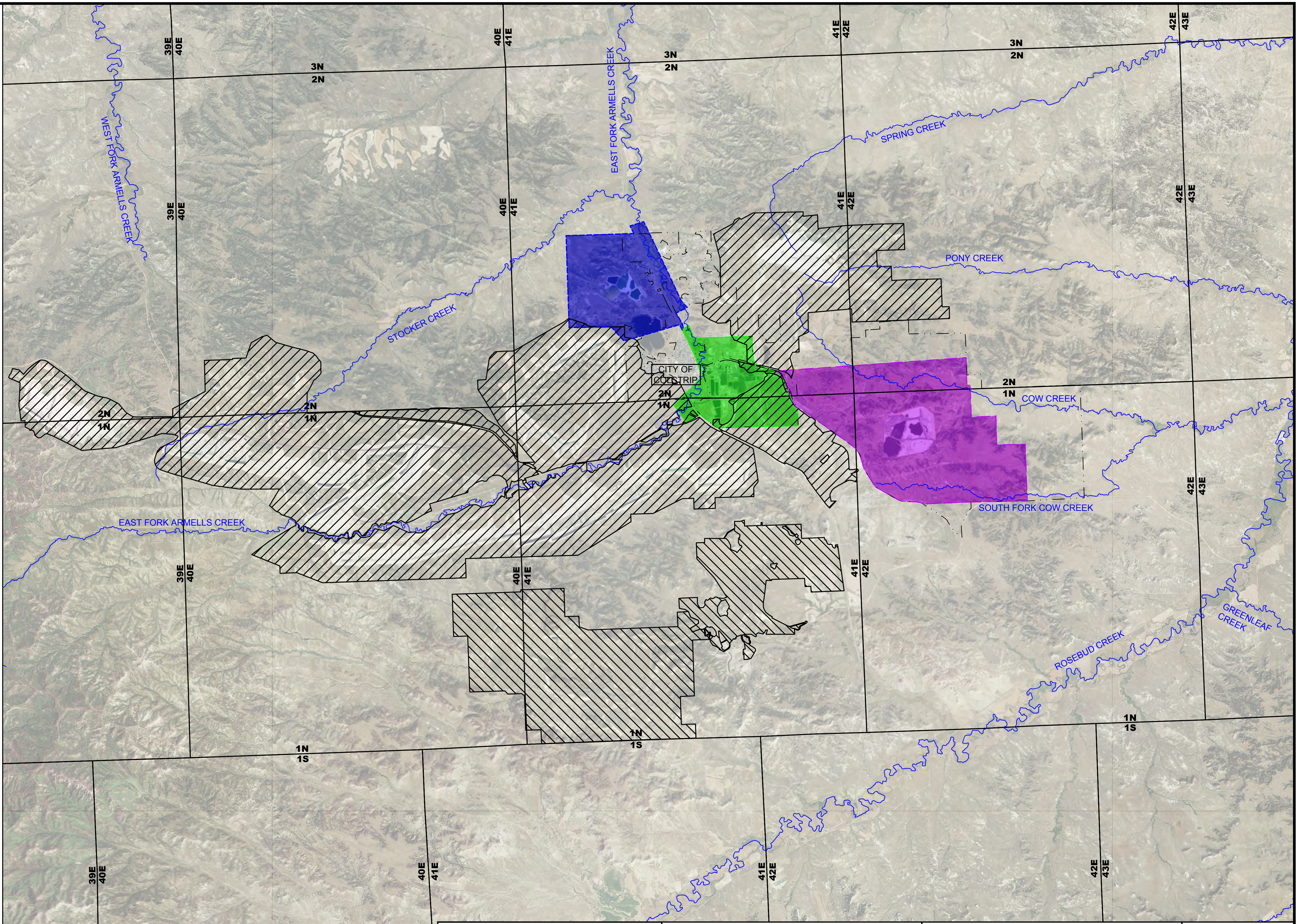
FIGURES

Figure 1. Map of the Facility



LEGEND

▧	BIG SKY COAL MINE (2006 PERMIT BOUNDARY)
▨	ROSEBUD COAL MINE (2006 PERMIT BOUNDARY)
———	TOWNSHIP BOUNDARY
— · · —	TALEN PROPERTY BOUNDARY
———	NAMED STREAM
🟩	PLANT SITE AOC AREA
🟦	STEP AOC AREA
🟪	EHP AOC AREA



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TALEN MONTANA, LLC

MAP OF THE FACILITY

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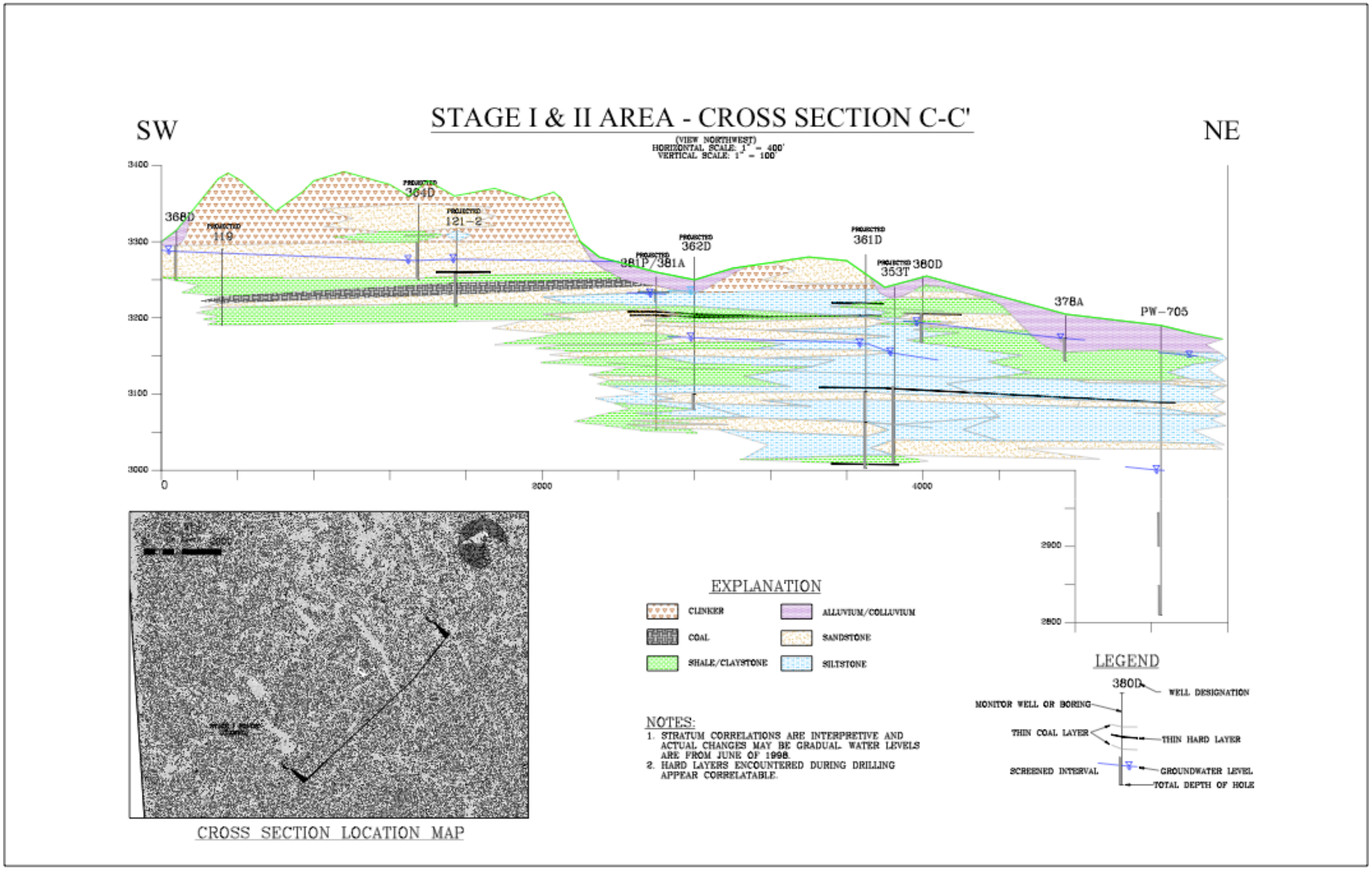
Figure 2. Geologic Cross Section of the Units 1&2 Stage I & II Evaporation Ponds Area



NOTES:

1. STRATUM CORRELATIONS ARE INTERPRETIVE AND ACTUAL CHANGES MAY BE GRADUAL. WATER LEVELS ARE FROM JUNE OF 1998.
2. HARD LAYERS ENCOUNTERED DURING DRILLING APPEAR CORRELATABLE.

Figure 3. North-South Geologic Cross Sections Along East Fork Armells Creek

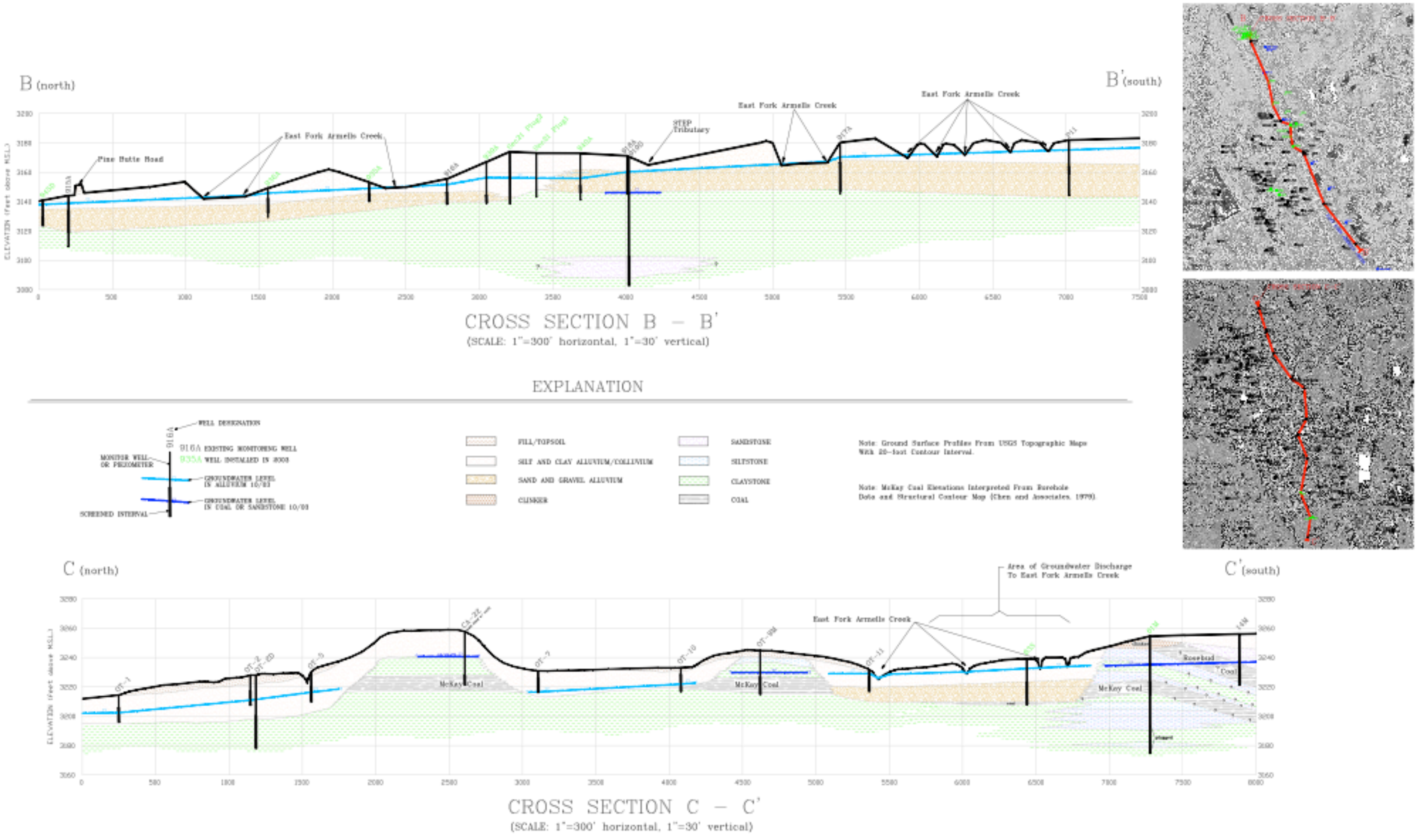


Figure 4. Plant Site Capture System Effects on Shallow Groundwater (data through fall of 2014)

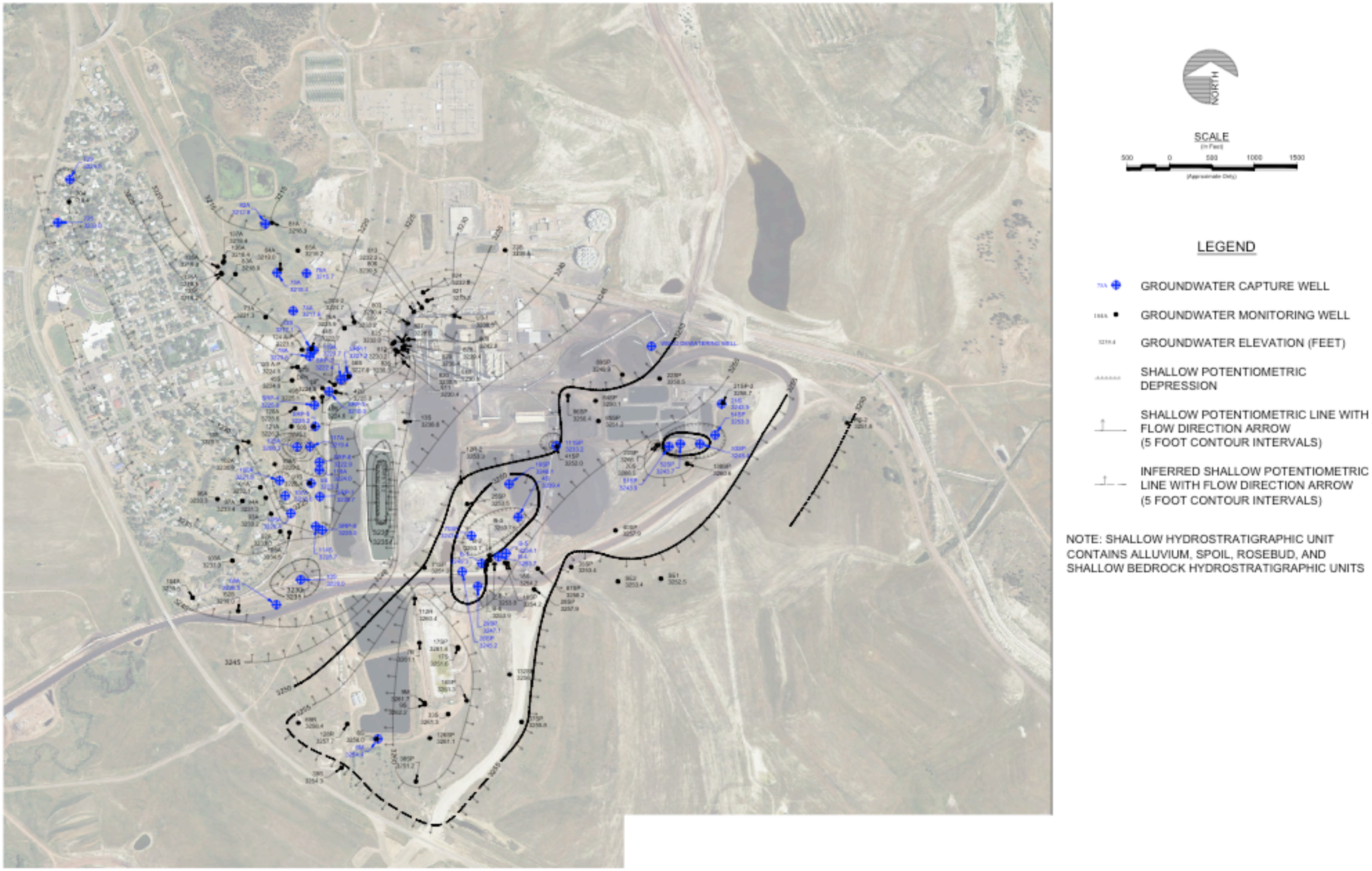


Figure 5. 1&2 Area Capture System Effects on Shallow Groundwater (data through fall 2014)

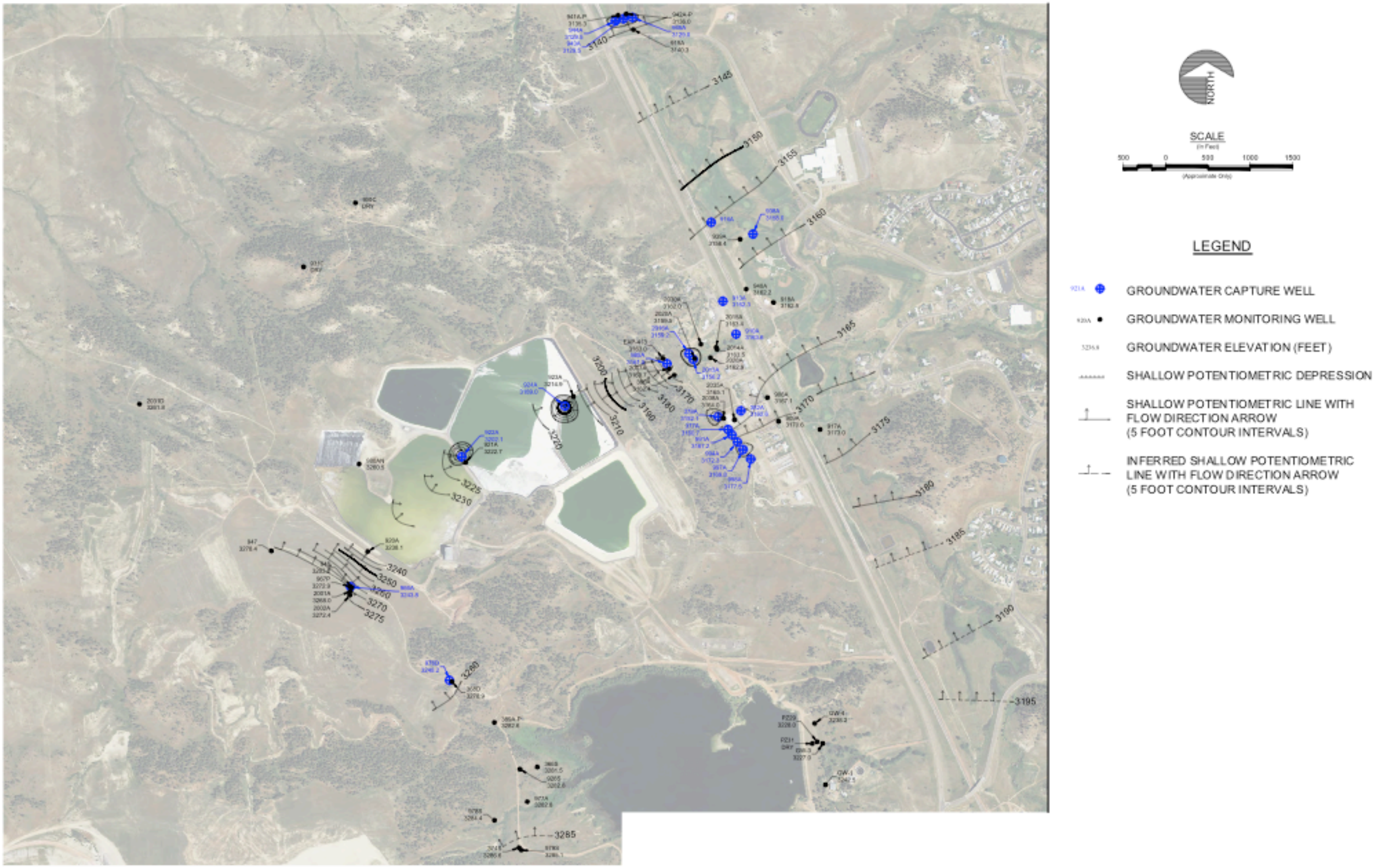


Figure 6. Boron Comparison Across the Initial 11 Stratigraphic Units

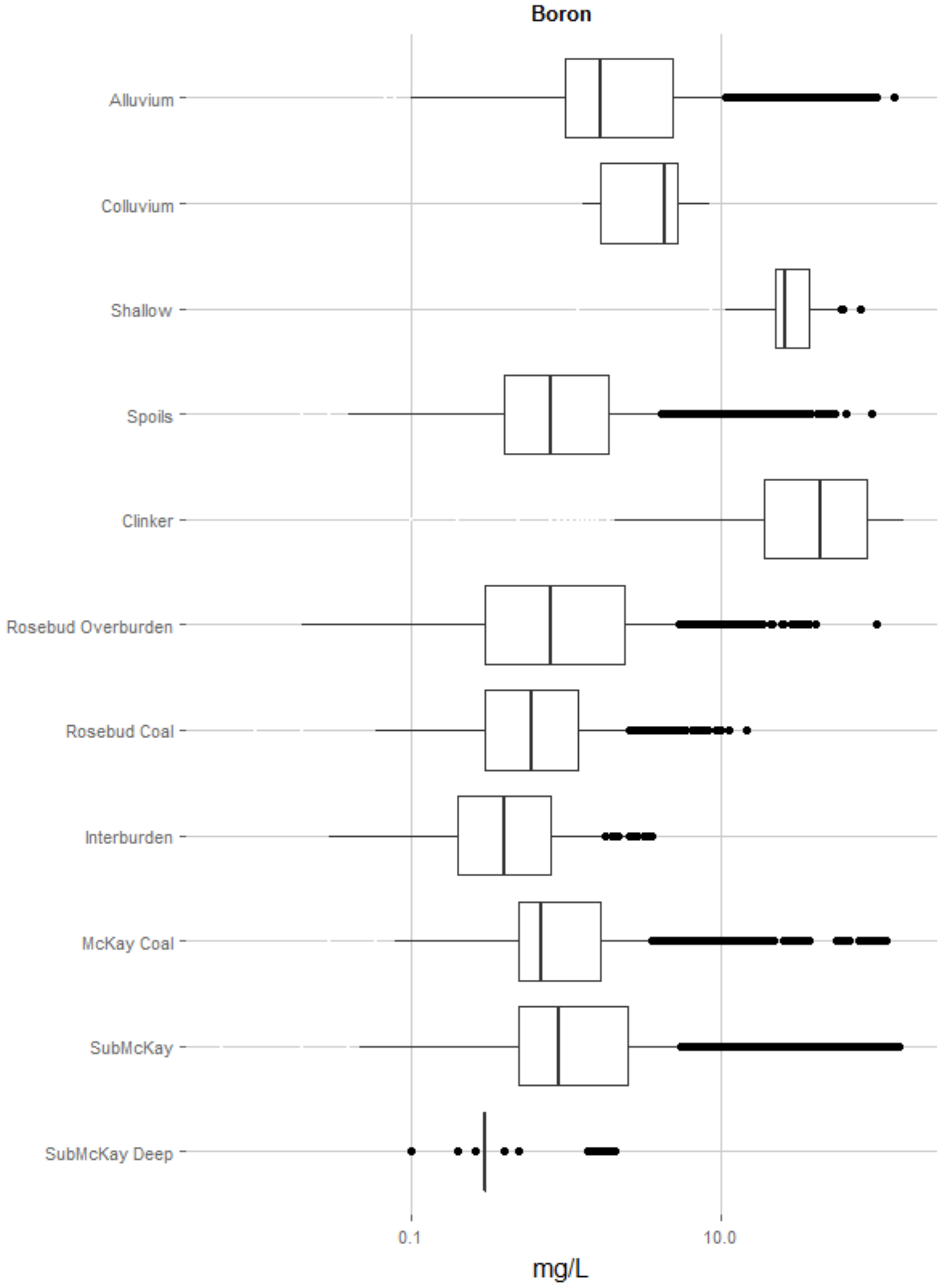


Figure 7. Calcium Comparison Across the Initial 11 Stratigraphic Units

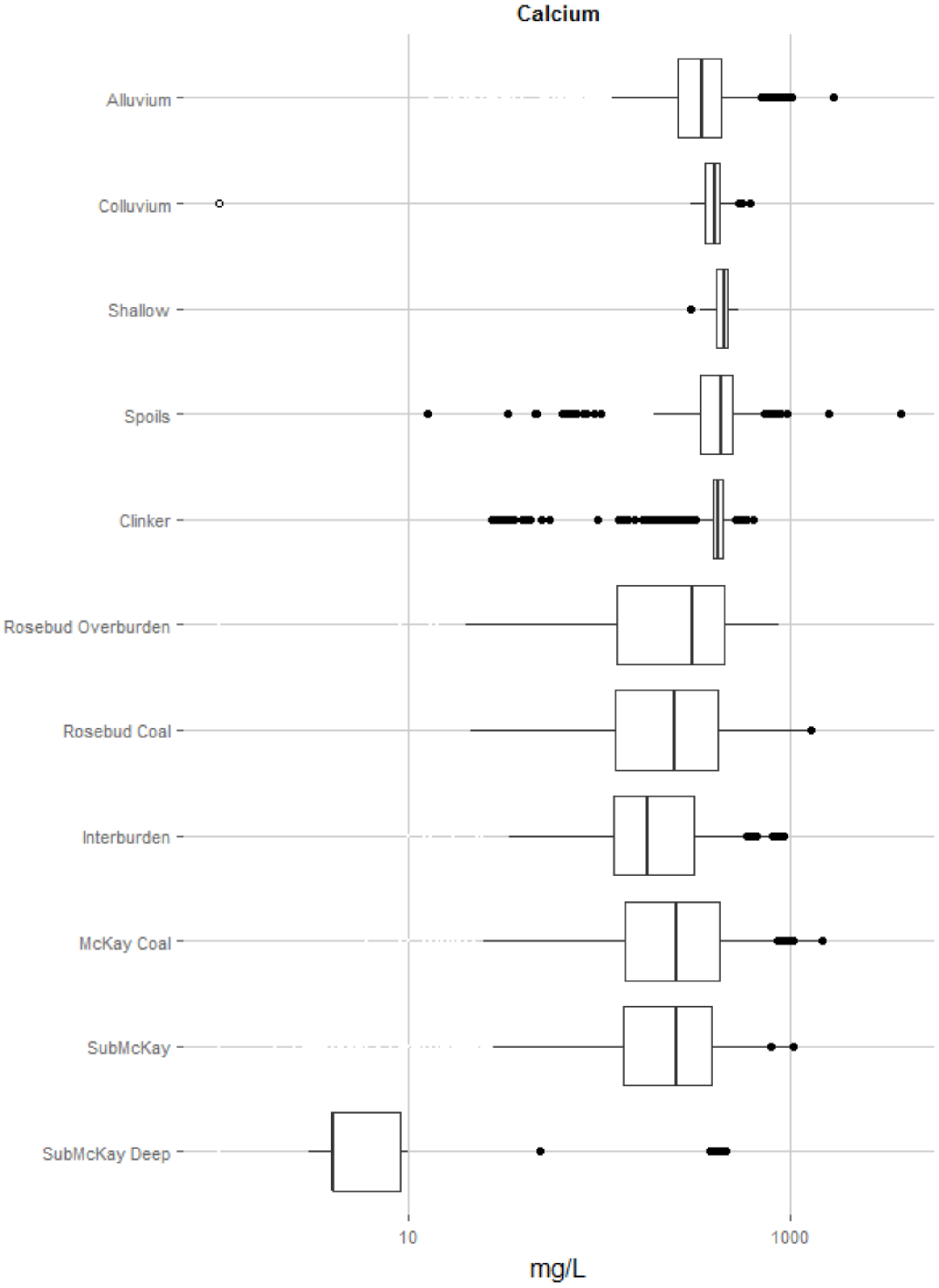


Figure 8. Chloride Comparison Across the Initial 11 Stratigraphic Units

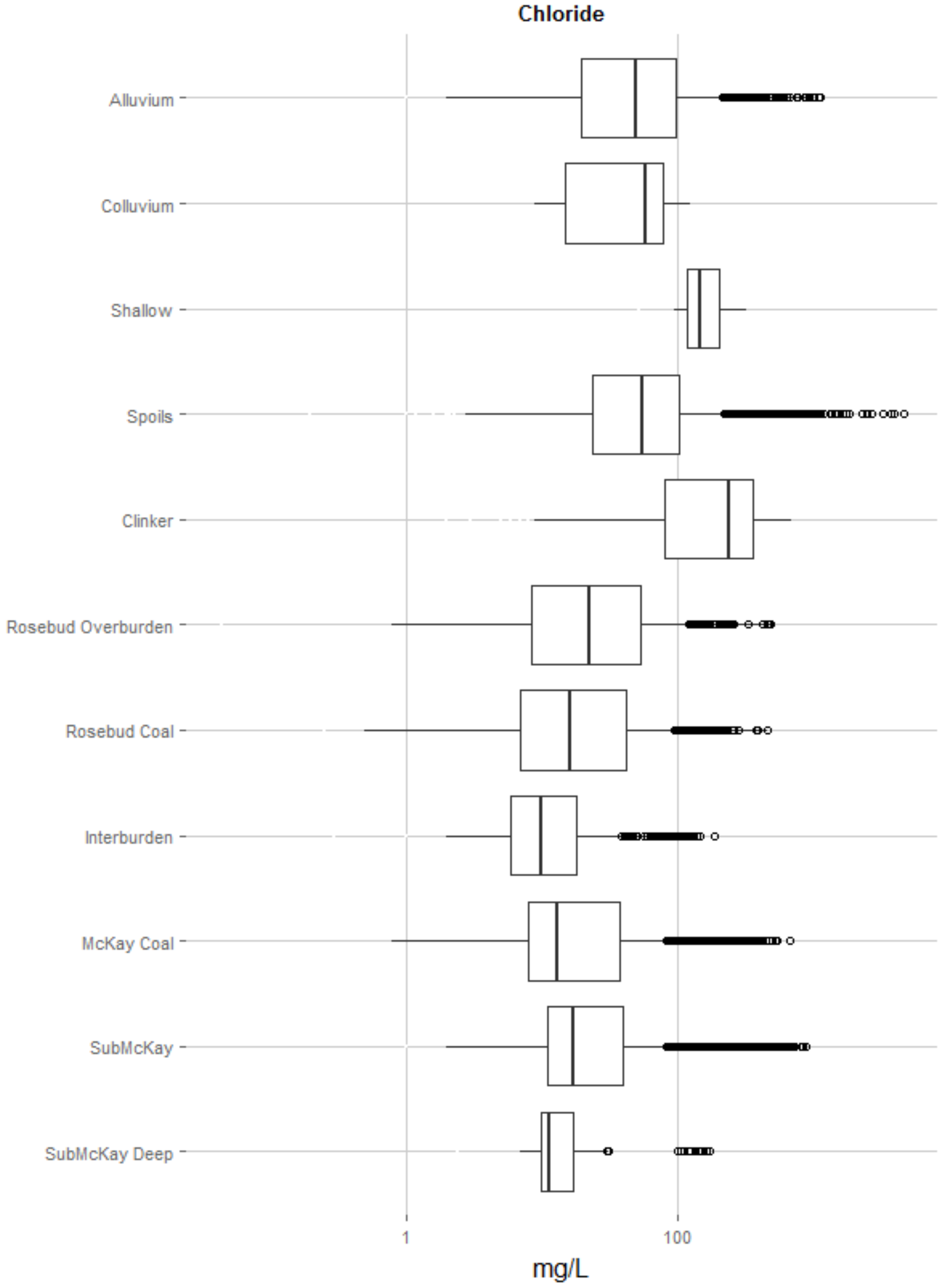


Figure 9. Magnesium Comparison Across the Initial 11 Stratigraphic Units

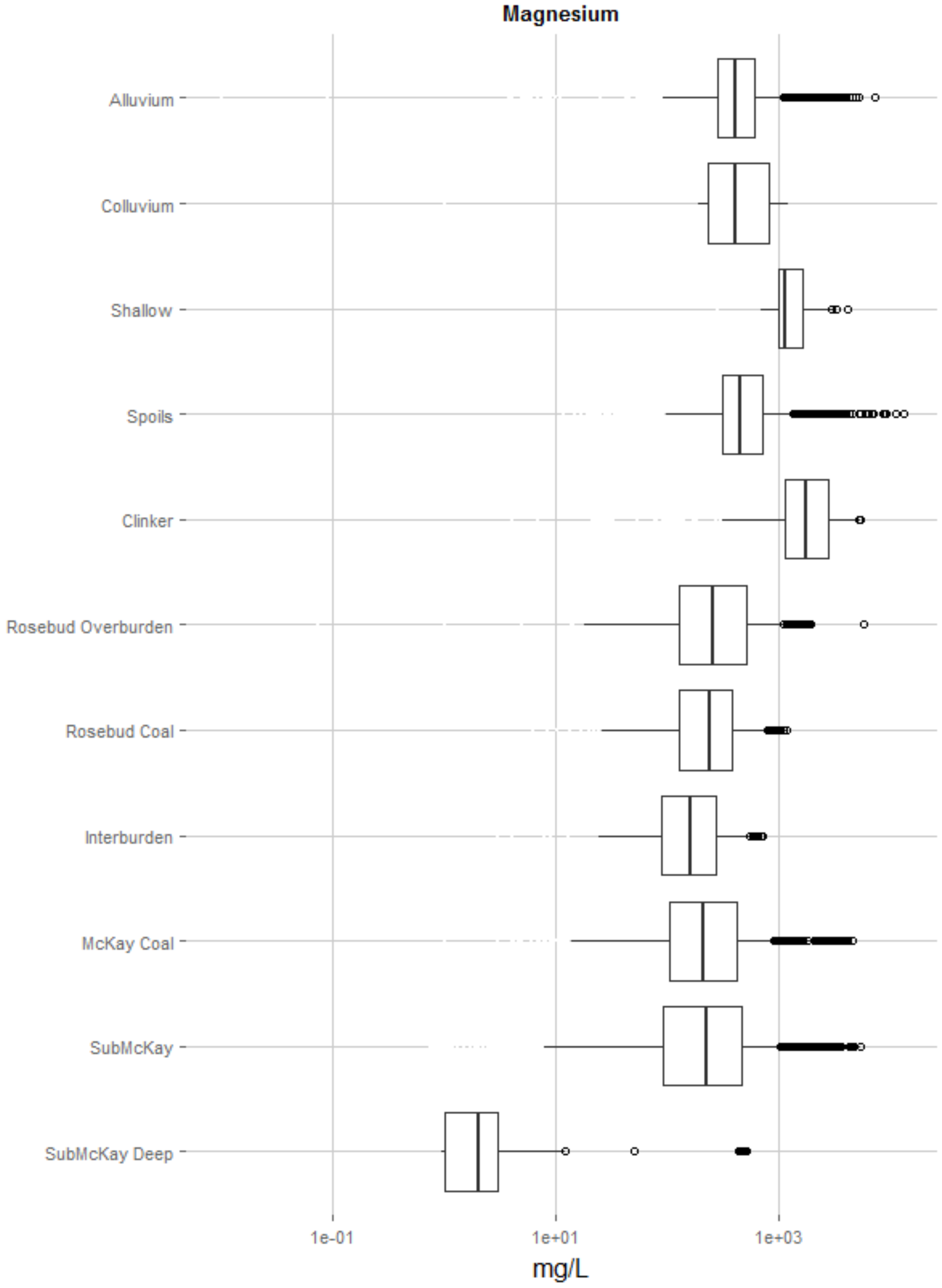


Figure 10. Laboratory SC Comparison Across the Initial 11 Stratigraphic Units

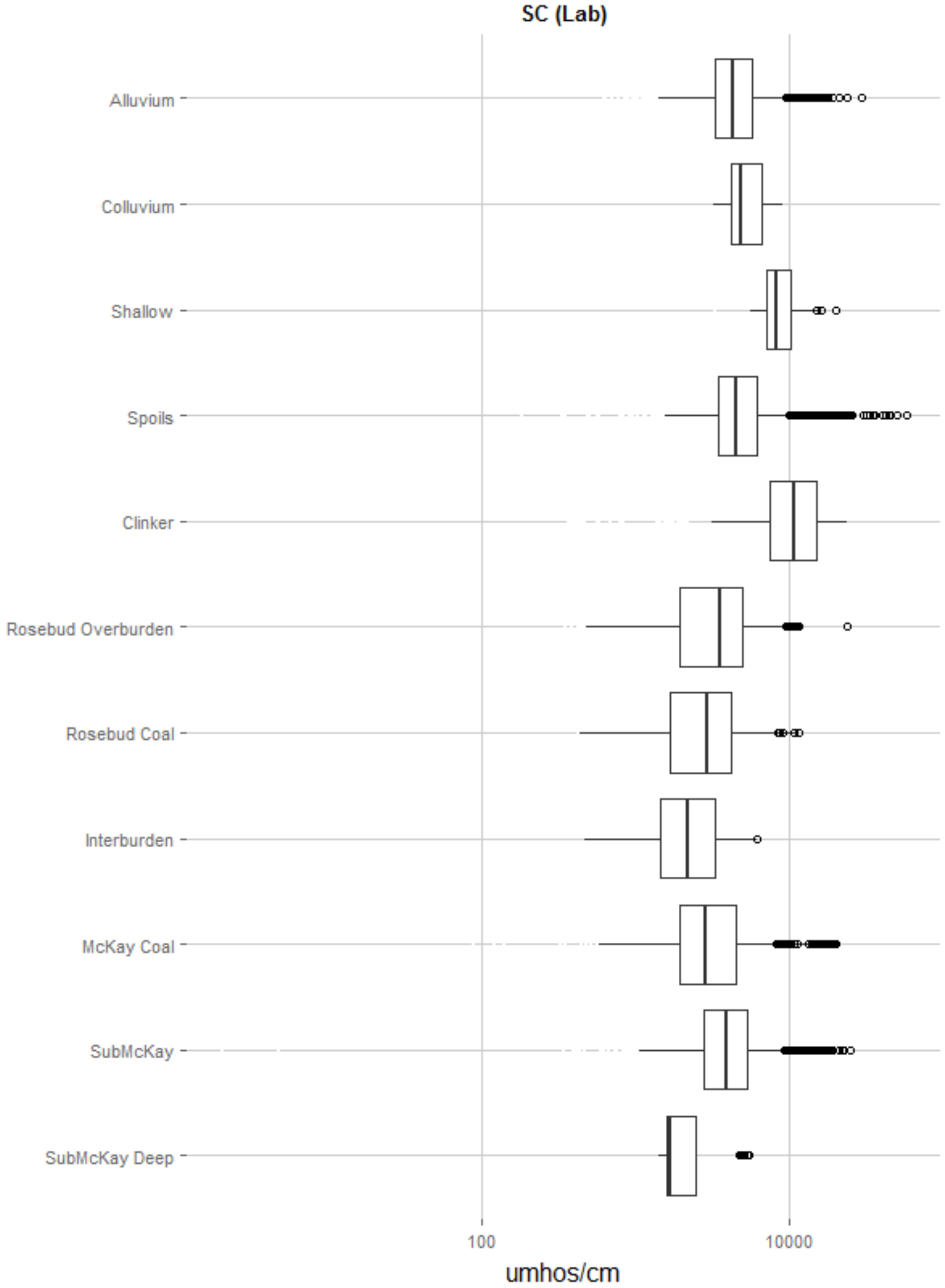


Figure 11. Sulfate Comparison Across the Initial 11 Stratigraphic Units

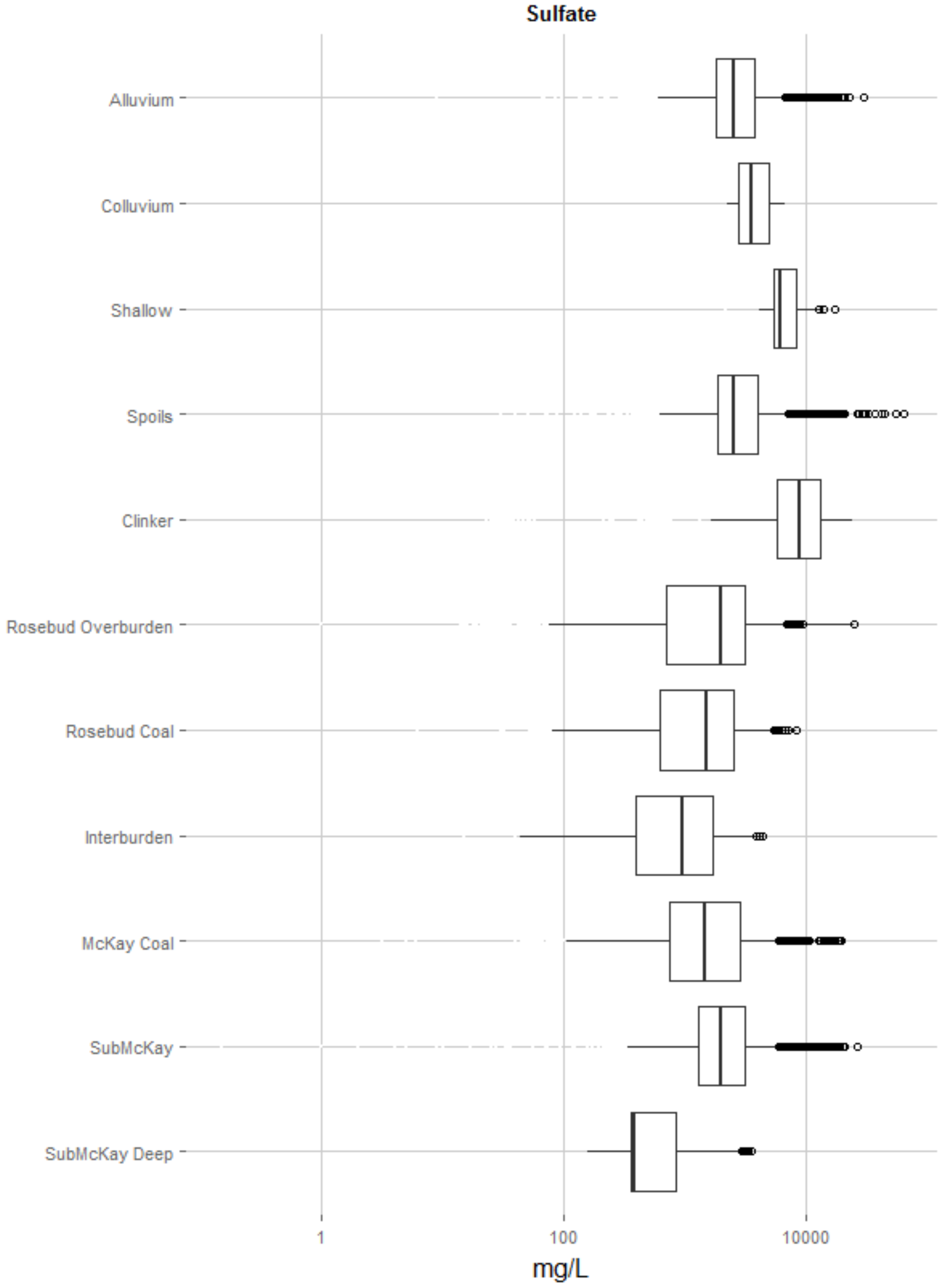


Figure 12. Boron Boxplots of Groundwater Baseline Data

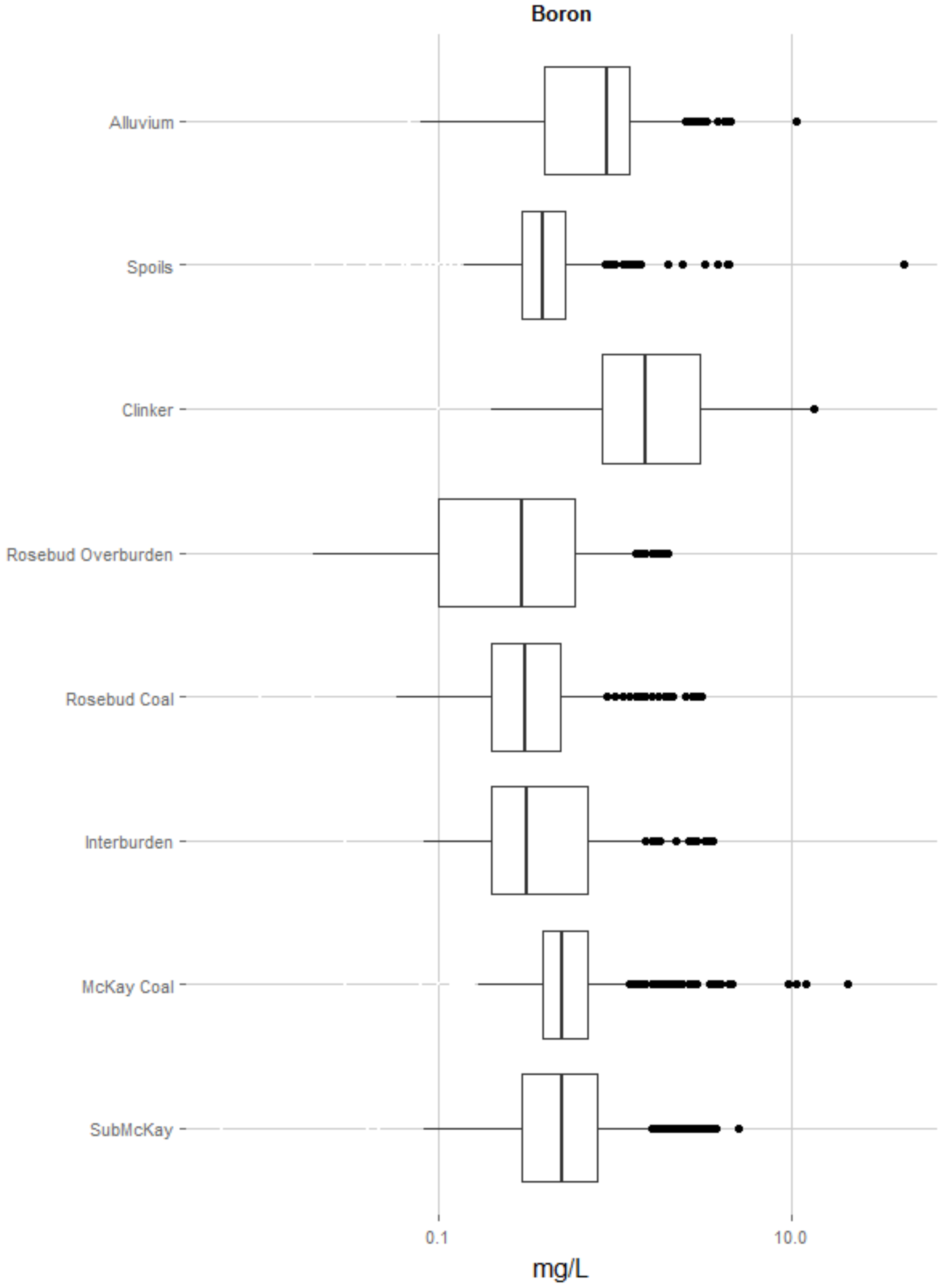


Figure 13. Calcium Boxplots of Groundwater Baseline Data

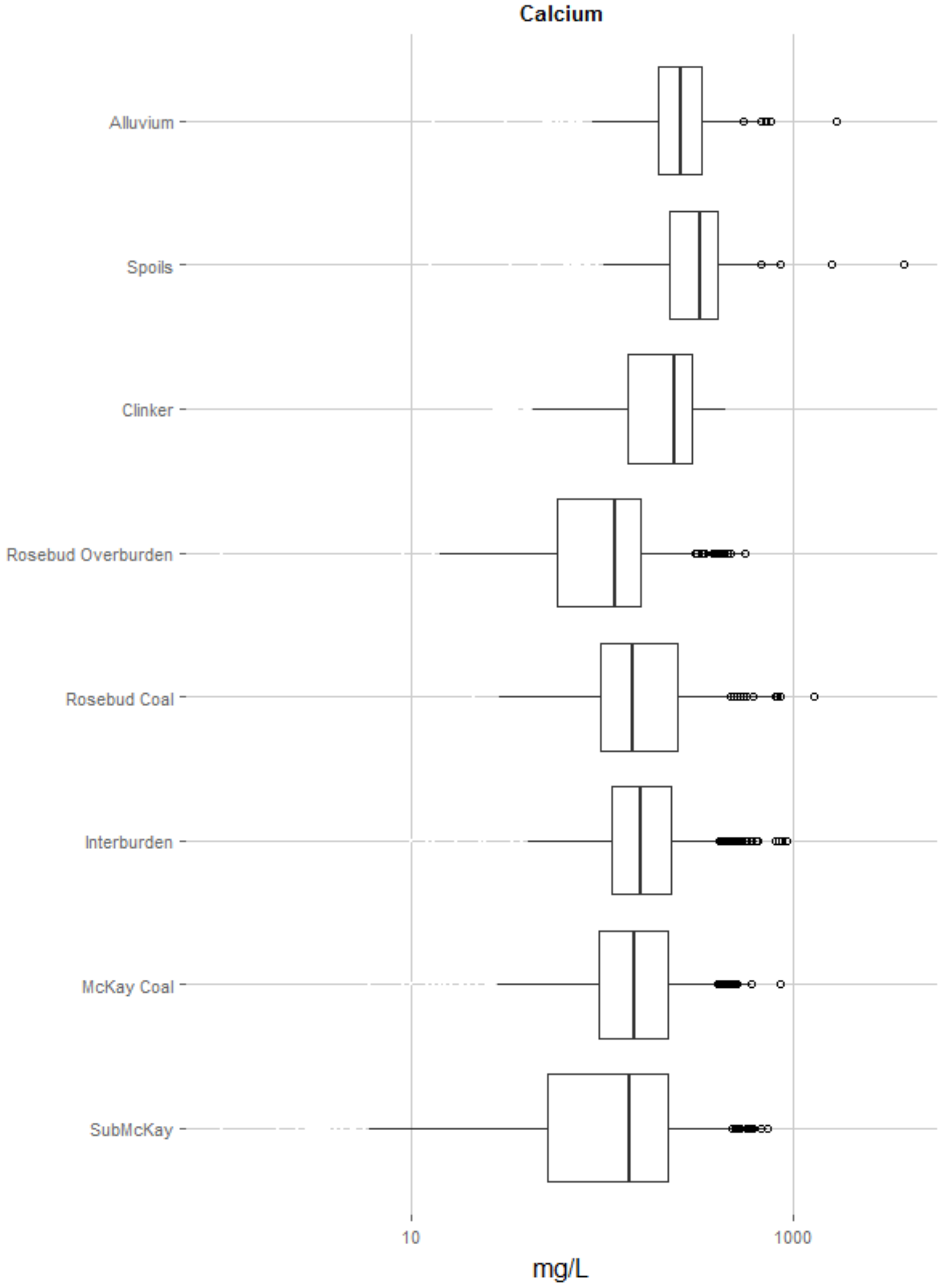


Figure 14. Chloride Boxplots of Groundwater Baseline Data

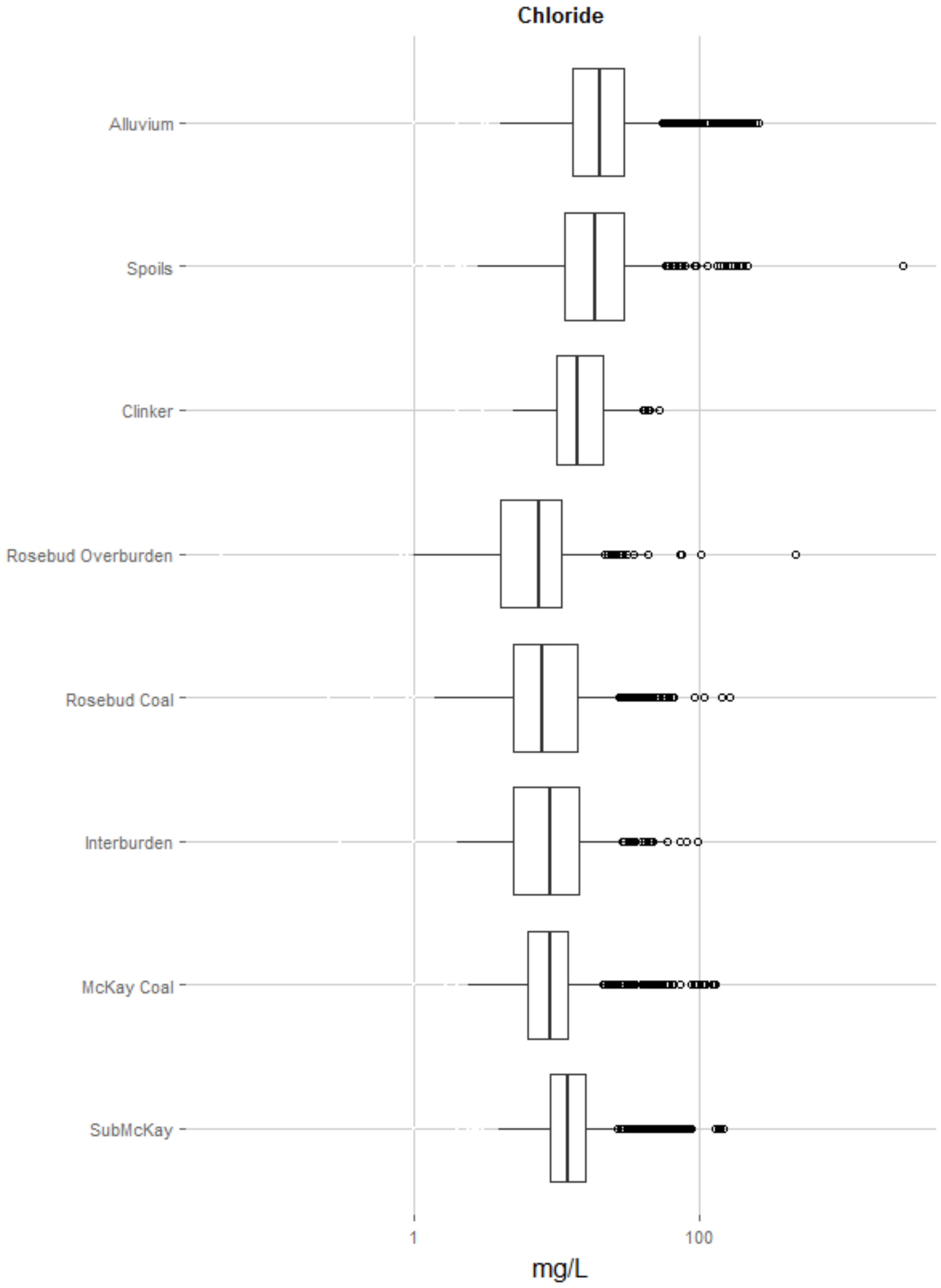


Figure 15. Magnesium Boxplots of Groundwater Baseline Data

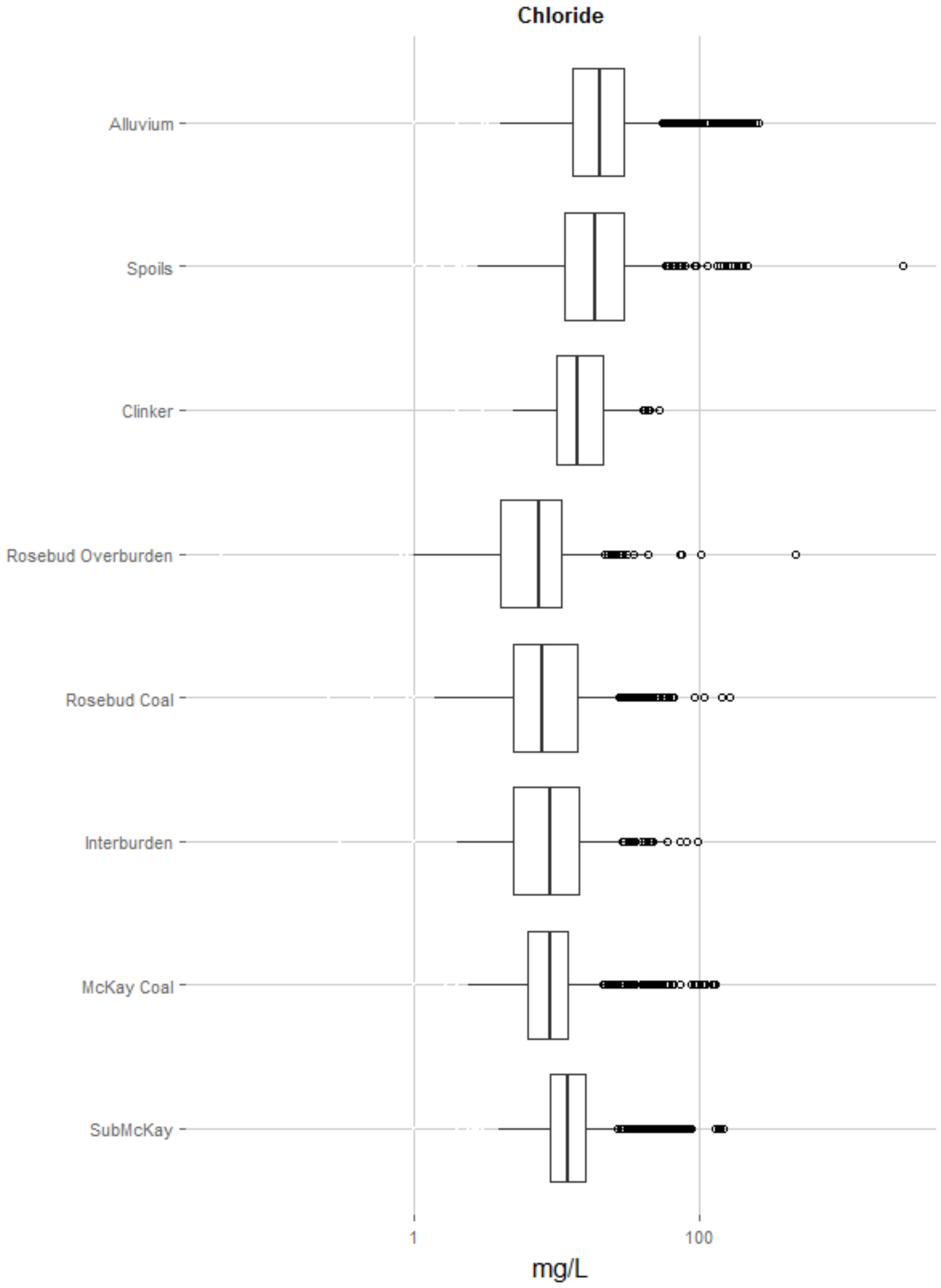


Figure 16. Laboratory SC Boxplots of Groundwater Baseline Data

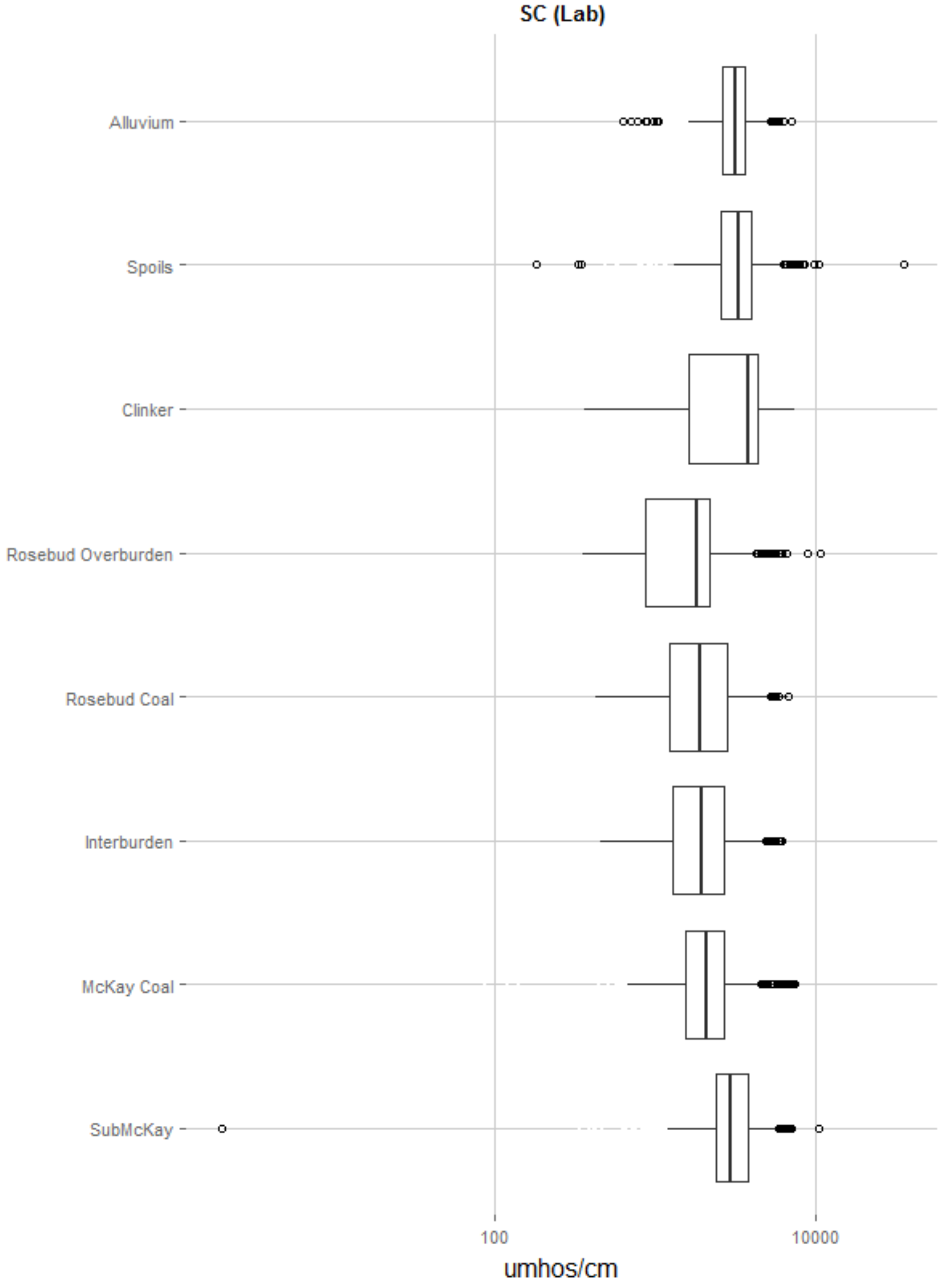


Figure 17. Sulfate Boxplots of Groundwater Baseline Data

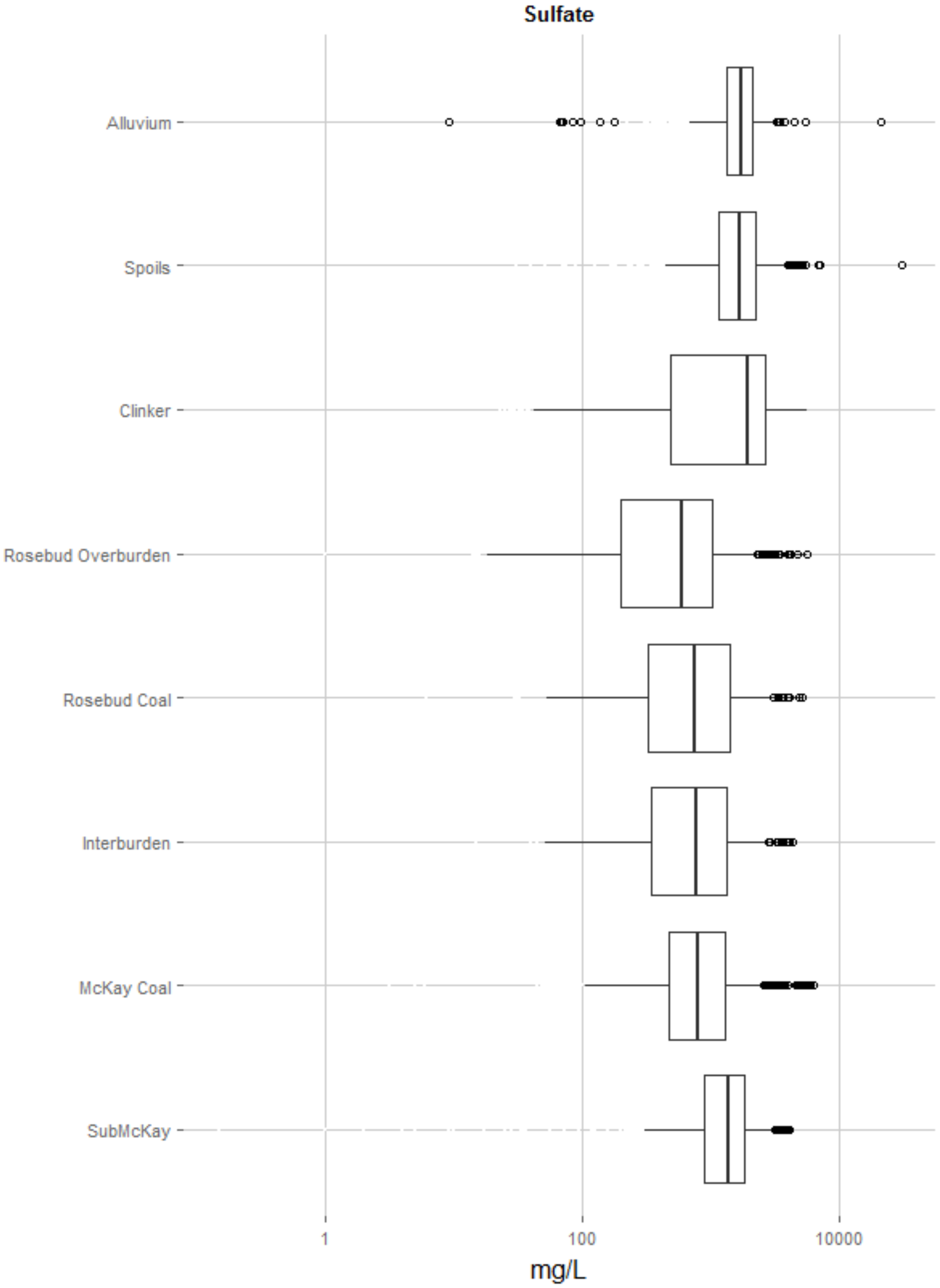
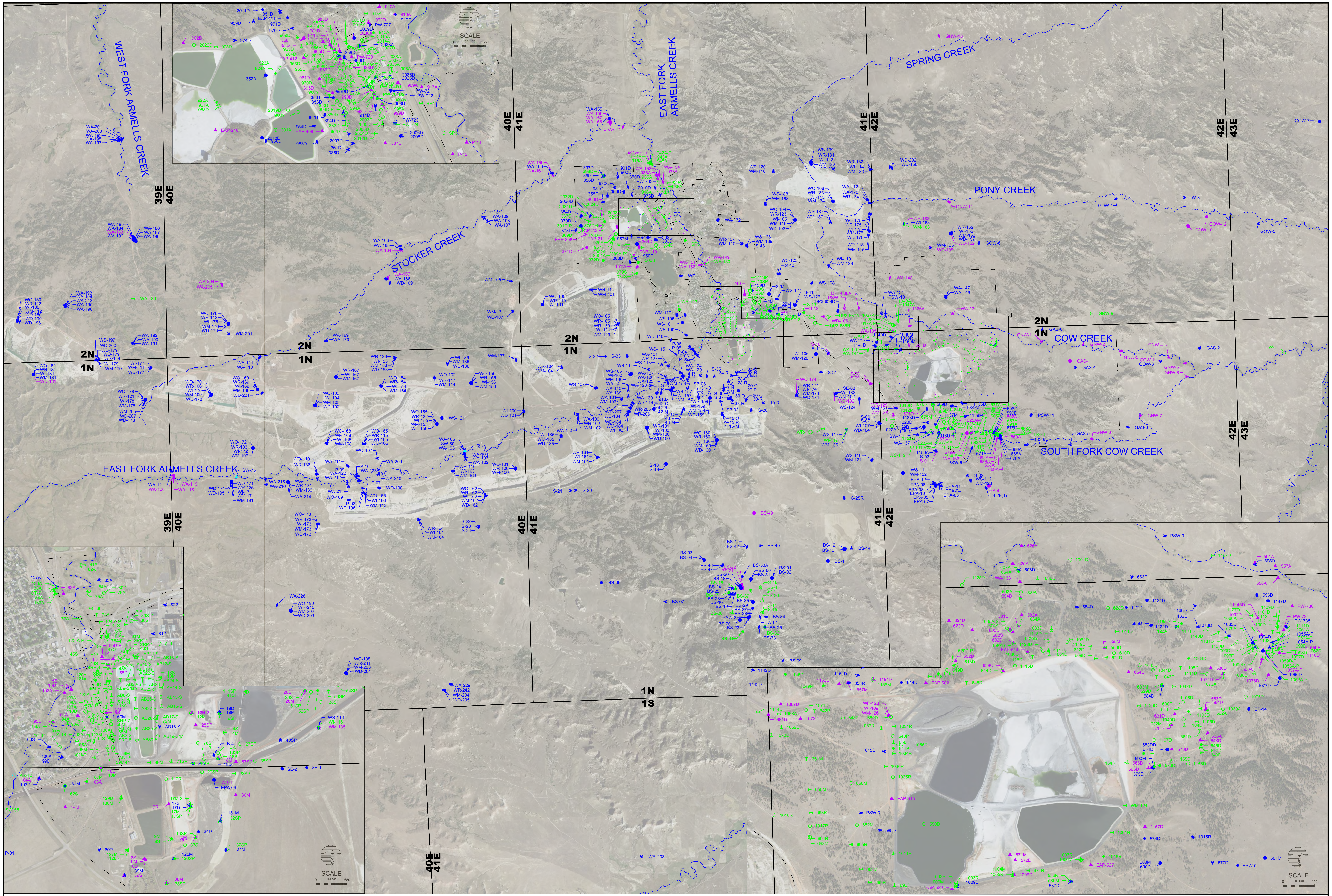


Figure 18. Map of All Sample Sites



LEGEND

—	TOWNSHIP BOUNDARY	●	BSL WELL GROUP ALL DATA USED	▲	SURFACE WATER BSL GROUP
- · -	TALEN PROPERTY BOUNDARY	●	BSL WELL GROUP PARTIAL DATA USED	⊕	NON BSL WELL GROUP
—	NAMED CREEK				

NORTH

SCALE
(In Feet)
2800 0 2800 5600 8400
(Approximate Only)

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Consulting Scientists and Engineers
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5602 Hesper Rd
(406) 656-1172

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ALL SITES

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FIGURE
18

UPDATE TIME: 12:13 PM
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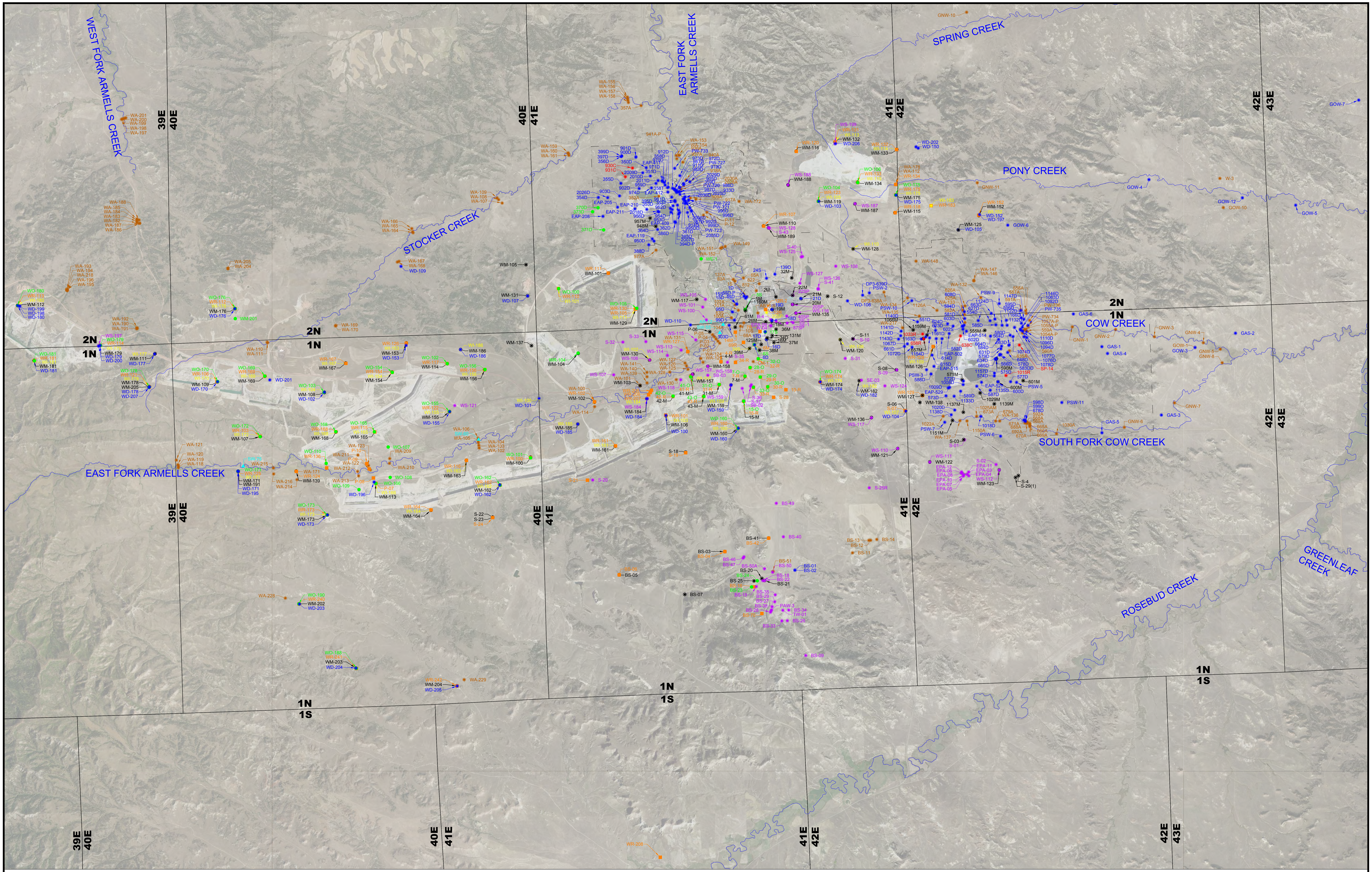
Figure 19. Map of Wells with Samples used in BSL Calculations by Stratigraphic Unit



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─	TOWNSHIP BOUNDARY	▲ SW-60	SURFACE WATER BSL GROUP
- -	TALEN PROPERTY BOUNDARY	● WA-121	ALLUVIAL WELL BSL GROUP
─	NAMED CREEK	● 931C	CLINKER WELL BSL GROUP
● WO-107	ROSEBUD OVERBURDEN - COAL RELATED WELL BSL GROUP	■ WR-242	ROSEBUD COAL - COAL RELATED WELL BSL GROUP
● WI-186	INTERBURDEN RELATED - COAL RELATED WELL BSL GROUP	▣ WM-204	MCKAY COAL - COAL RELATED WELL BSL GROUP
● WS-121	SPOIL WELL BSL GROUP	● WD-181	SUB MCKAY WELL BSL GROUP

NORTH

SCALE
(In Feet)
2800 0 2800 5600 8400
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BSL WELL GROUPS

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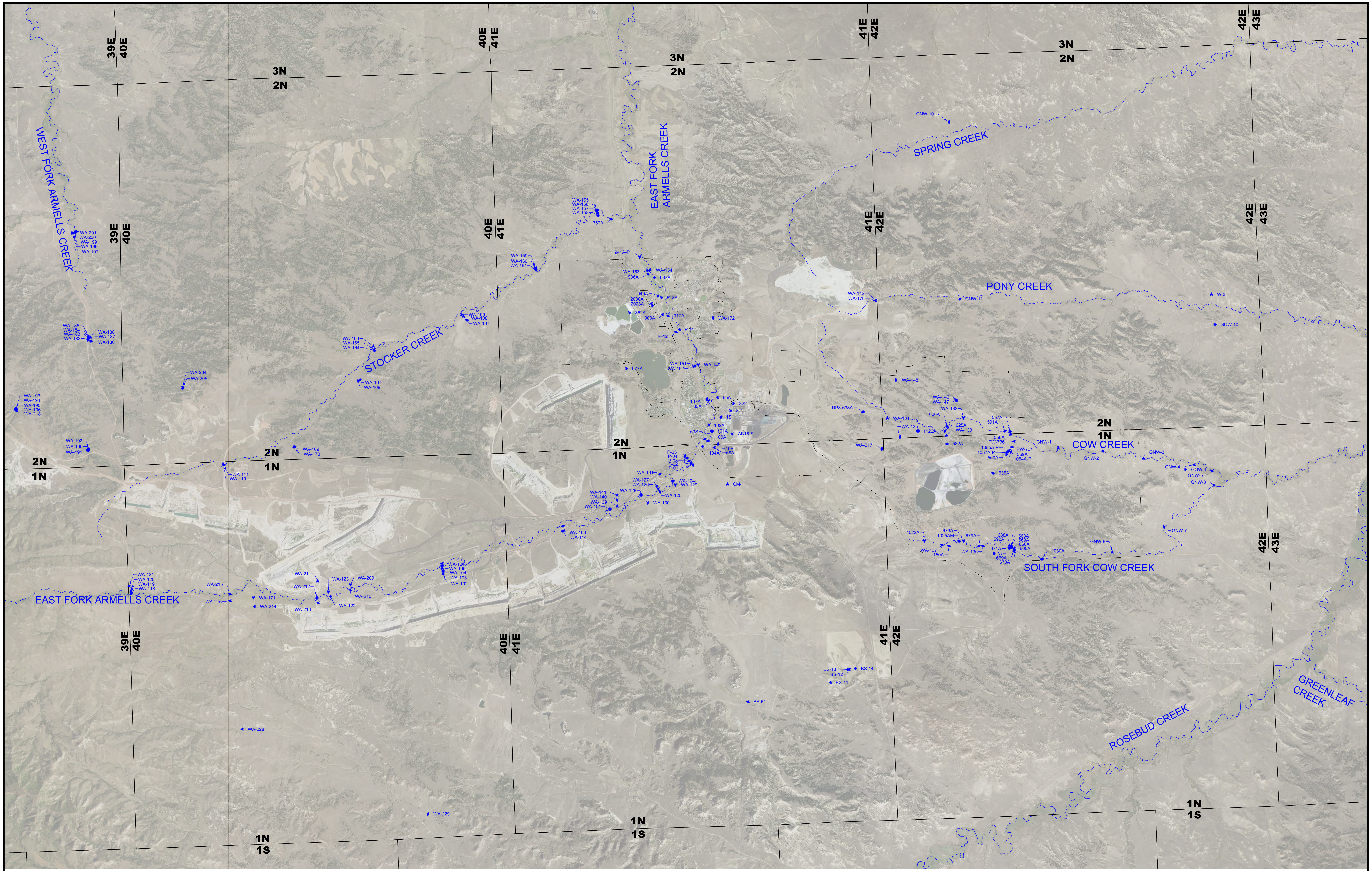
FIGURE
19

Figure 20. Map of Wells with Samples used in BSL Calculations for the Alluvium Stratigraphic Unit



LEGEND

NORTH

SCALE
(In Feet)
4500 0 4500 9000 13500
(Approximate Only)

—	TOWNSHIP BOUNDARY
— · —	TALEN PROPERTY BOUNDARY
—	NAMED CREEK
◉ WA-121	BACKGROUND SCREENING LEVEL (BSL) ALLUVIAL WELL

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ALLUVIUM GROUP

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1207100B016 BSL
AUTOCAD 2000 DRAWING (DWG)
FIGURE
20

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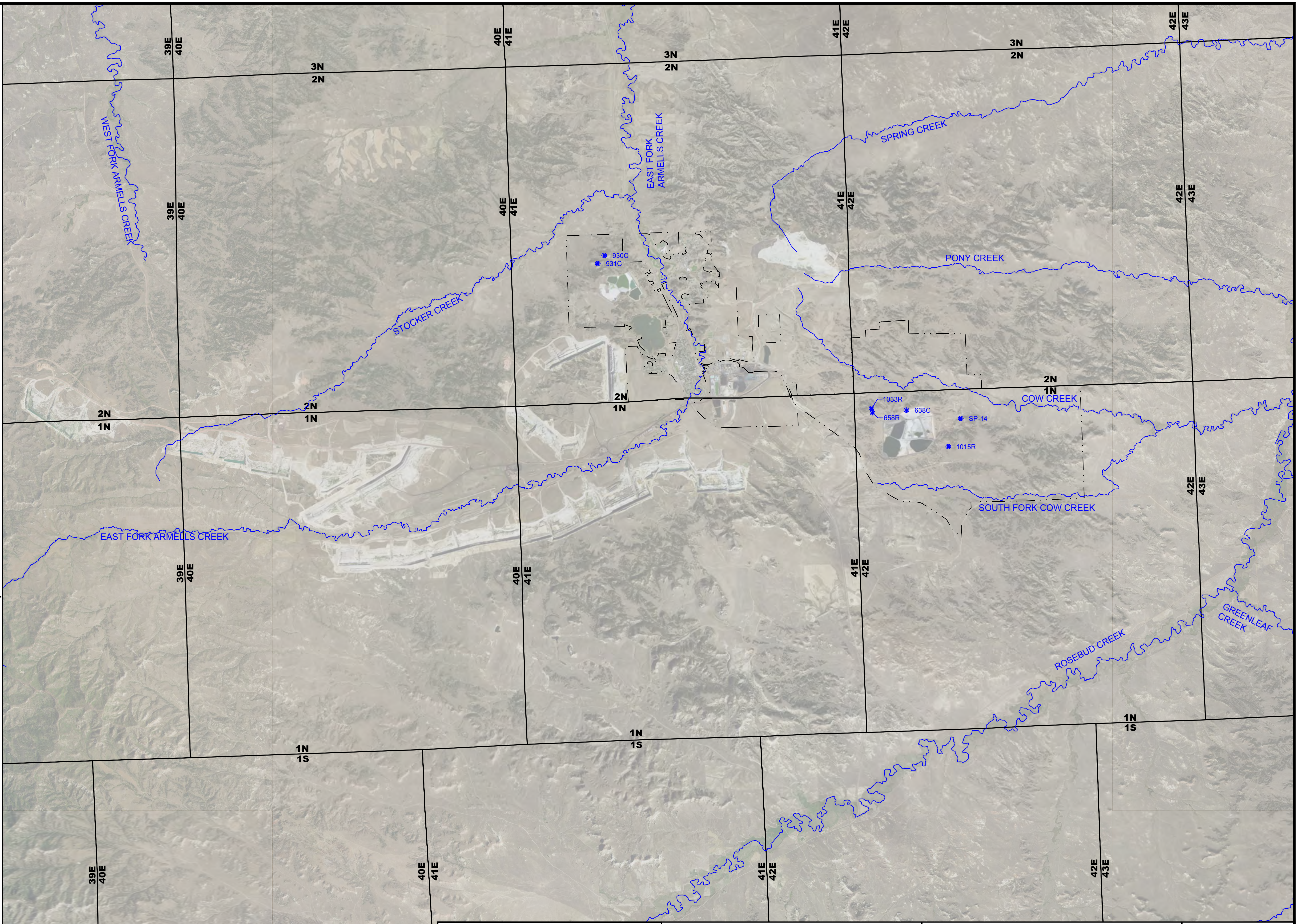
Figure 21. Map of Wells with Samples used in BSL Calculations for the Clinker Stratigraphic Unit

NORTH

SCALE
(In Feet)
4500 0 4500 9000 13500
(Approximate Only)

LEGEND

———	TOWNSHIP BOUNDARY
— · · —	TALEN PROPERTY BOUNDARY
———	NAMED CREEK
◉930C	BACKGROUND SCREENING LEVEL (BSL) CLINKER WELL



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CLINKER GROUP

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FIGURE
21

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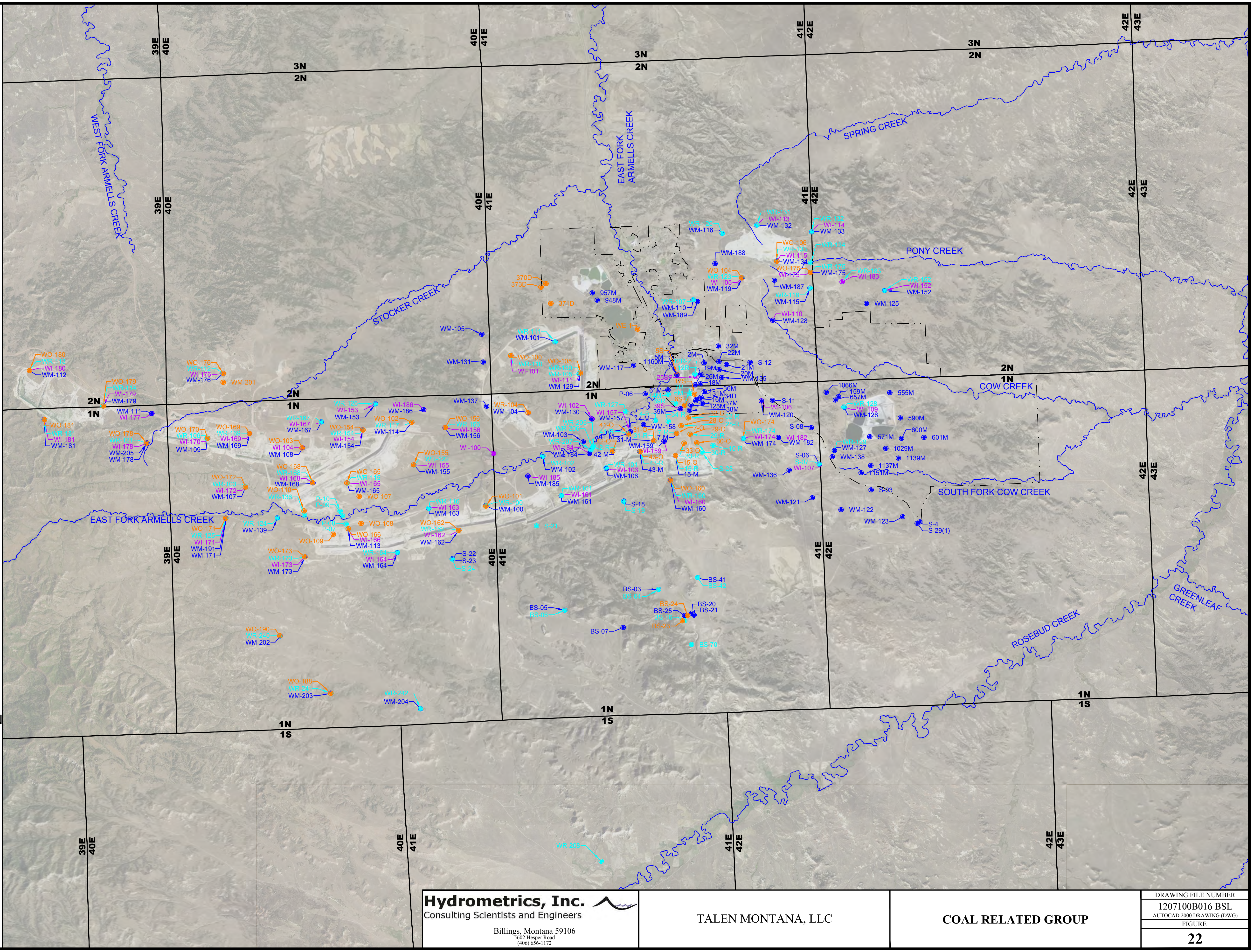
Figure 22. Map of Wells with Samples used in BSL Calculations for the Coal-Related Stratigraphic Unit

NORTH

SCALE
(In Feet)
4500 0 4500 9000 13500
(Approximate Only)

LEGEND

───	TOWNSHIP BOUNDARY
— · · —	TALEN PROPERTY BOUNDARY
───	NAMED CREEK
◉WO-181	BACKGROUND SCREENING LEVEL (BSL) COAL RELATED GROUP - OVERBURDEN WELL
◉WR-181	BSL COAL RELATED GROUP - ROSEBUD WELL
◉WI-181	BSL COAL RELATED GROUP - INTERBURDEN WELL
◉WM-181	BSL COAL RELATED GROUP - MCKAY WELL



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UPDATE TIME: 10:16 AM
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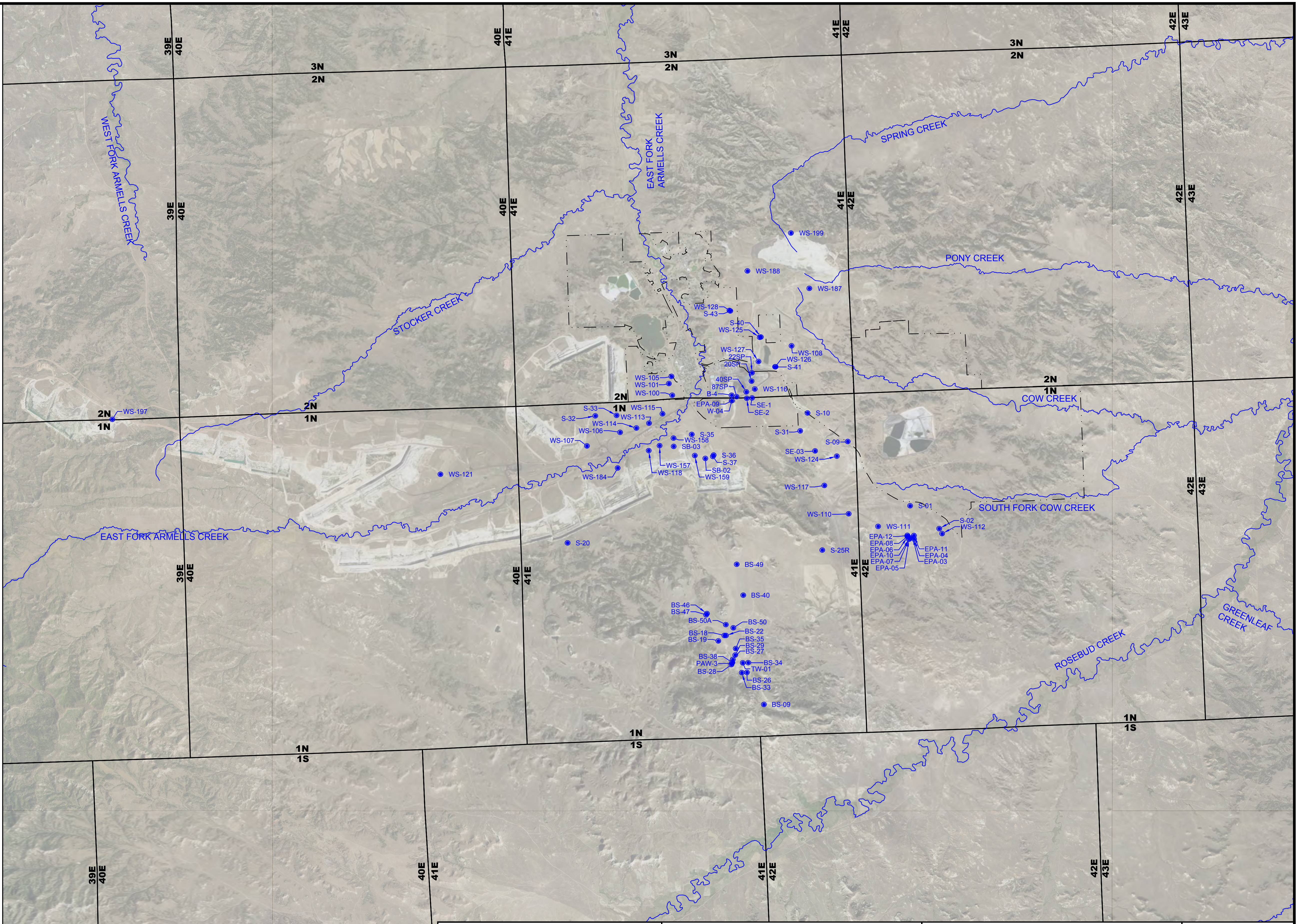
Figure 23. Map of Wells with Samples used in BSL Calculations for the Spoils Stratigraphic Unit

NORTH

SCALE
(In Feet)
4500 0 4500 9000 13500
(Approximate Only)

LEGEND

———	TOWNSHIP BOUNDARY
— · · —	TALEN PROPERTY BOUNDARY
———	NAMED CREEK
◉WS-197	BACKGROUND SCREENING LEVEL (BSL) SPOIL WELL



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SPOIL GROUP

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FIGURE
23

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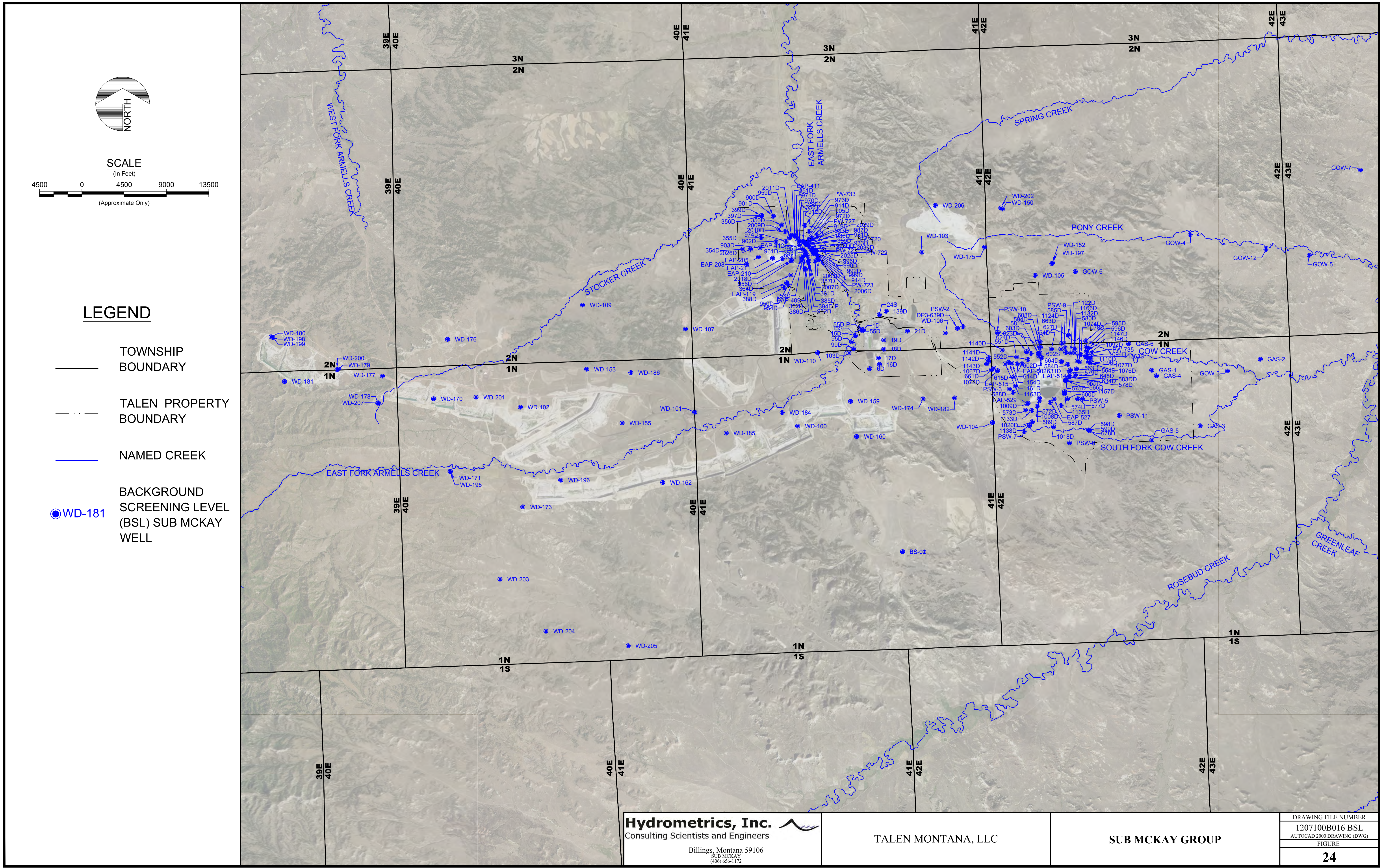
Figure 24. Map of Wells with Samples used in BSL Calculations for the SubMcKay Stratigraphic Unit



LEGEND

──	TOWNSHIP BOUNDARY
— · · —	TALEN PROPERTY BOUNDARY
──	NAMED CREEK
◉WD-181	BACKGROUND SCREENING LEVEL (BSL) SUB MCKAY WELL

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SUB MCKAY GROUP

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AUTOCAD 2000 DRAWING (DWG)
FIGURE
24

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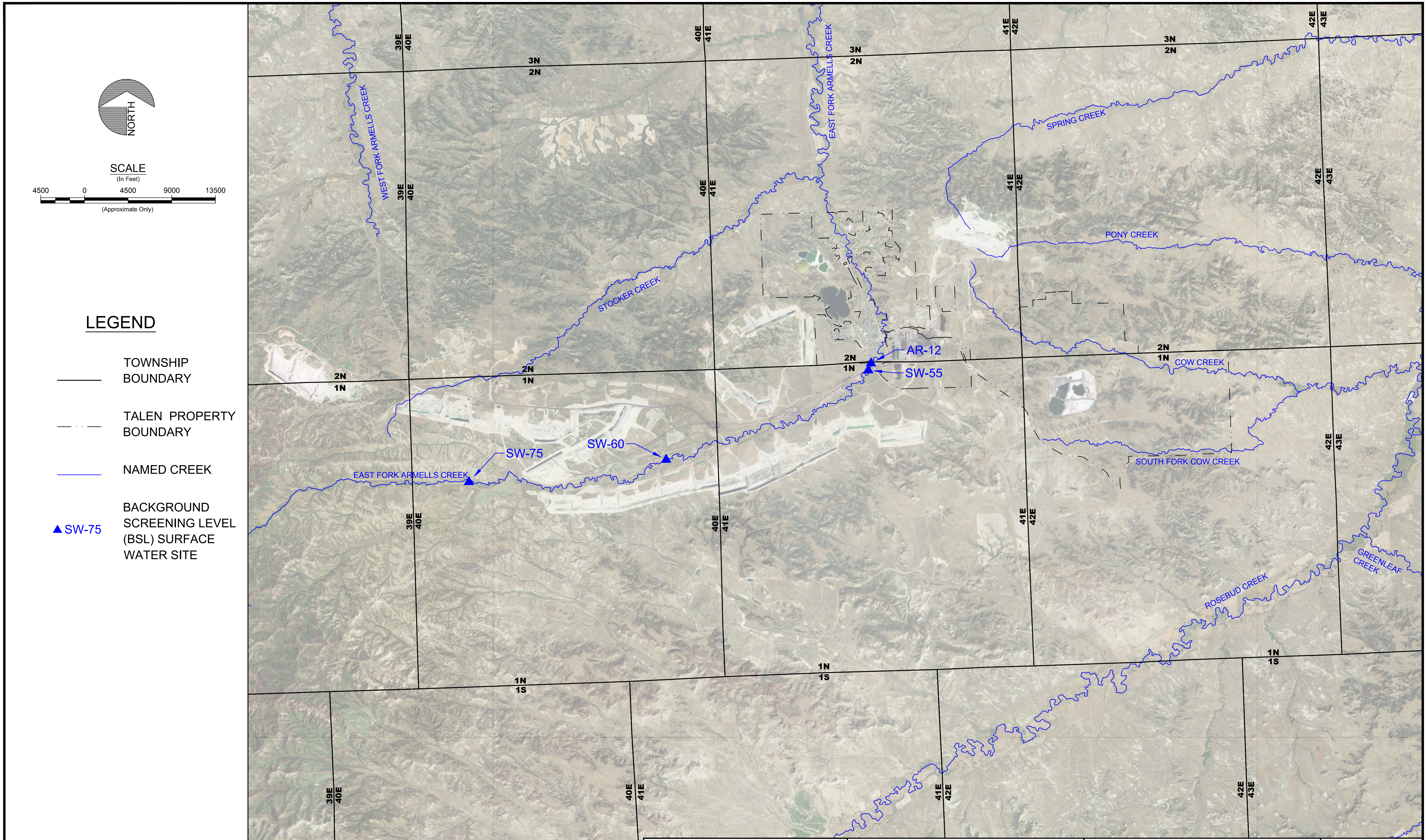
Figure 25. Map of Sites with Samples used in BSL Calculations for Surface Water



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SUB MCKAY
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SURFACE WATER GROUP

DRAWING FILE NUMBER
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AUTOCAD 2000 DRAWING (DWG)
FIGURE
25

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TABLES

Table 1. Groundwater Data Availability for each Analyte and Stratigraphic Unit

Analyte	Alluvium	Clinker	Colluvium	Interburden	McKay Coal	Rosebud Coal	Rosebud Overburden	Shallow	Spoils	SubMcKay	SubMcKay Deep	Total
Aluminum	1534	29	2	476	1159	580	298	2	519	1187	21	5807
Ammonia	126	1	2	26	54	31	28	0	32	53	0	353
Antimony	112	0	2	0	40	26	0	2	61	55	0	298
Arsenic	508	7	2	175	388	181	92	2	306	404	1	2066
Barium	304	9	2	7	88	30	16	2	83	178	0	719
Beryllium	217	7	0	6	80	25	13	0	63	108	1	520
Boron	6470	701	86	654	3706	1203	1170	47	1692	8353	104	24186
Bromide	2308	367	25	55	917	183	187	35	580	3278	44	7979
Cadmium	1571	33	2	476	1212	674	377	2	521	1202	22	6092
Calcium	6532	701	86	658	3808	1267	1186	47	1774	8405	104	24568
Chloride	6550	696	84	652	3703	1257	1172	47	1745	8292	102	24300
Chromium	325	7	2	20	182	71	19	6	247	287	3	1169
Cobalt	188	7	0	7	60	18	14	0	41	103	0	438
Copper	1350	30	2	337	1021	600	348	2	413	1077	21	5201
Fluoride	1889	40	8	506	1706	857	556	6	838	1979	26	8411
Iron	1892	37	7	508	1721	866	564	6	806	2071	29	8507
Lead	1569	30	2	478	1222	681	380	2	508	1338	22	6232
Lithium	79	2	0	0	122	59	5	0	256	24	0	547
Magnesium	6531	701	86	658	3806	1267	1186	47	1773	8402	104	24561
Manganese	1856	40	7	488	1688	804	552	6	786	2087	29	8343
Mercury	1470	62	4	314	885	397	245	8	219	1441	27	5072
Molybdenum	265	6	2	7	147	54	15	2	224	126	1	849
Nickel	667	29	2	59	535	245	154	2	289	787	21	2790
Nitrate	199	0	0	2	238	221	98	0	320	136	1	1215
Nitrite	120	0	0	0	17	13	0	0	26	117	1	294
Nitrite + Nitrate	1680	47	7	67	928	232	241	32	279	2205	33	5751
Orthophosphate	1238	22	0	357	889	458	223	0	353	999	20	4559

Table 1 continued

Analyte	Alluvium	Clinker	Colluvium	Interburden	McKay Coal	Rosebud Coal	Rosebud Overburden	Shallow	Spoils	SubMcKay	SubMcKay Deep	Total
pH (Field)	1409	77	10	57	580	167	117	38	523	1236	17	4231
pH (Lab)	6559	702	86	668	3832	1273	1197	47	1811	8411	104	24690
Phosphate	160	0	0	91	199	187	132	0	90	91	0	950
Phosphorus	81	0	0	0	1	1	0	0	0	2	0	85
Potassium	5960	655	56	604	3220	1132	945	47	1532	7193	90	21434
SC (Field)	3692	537	43	311	1854	504	480	43	1054	4742	55	13315
SC (Laboratory)	6590	702	84	657	3832	1282	1200	45	1808	8419	104	24723
Selenium	5596	700	84	512	3398	931	1003	47	1523	7945	104	21843
Silica	278	0	0	0	187	101	6	0	331	139	0	1042
Silver	142	0	0	0	104	56	1	0	230	64	0	597
Sodium	6533	701	86	658	3810	1265	1186	47	1789	8409	104	24588
Strontium	276	10	0	7	151	56	15	0	232	149	0	896
Sulfate	6498	696	84	653	3781	1270	1181	47	1747	8319	102	24378
TDS	6991	701	86	872	4156	1558	1328	47	1932	8482	104	26257
Thallium	111	7	0	7	53	13	14	0	32	56	0	293
Tin	103	0	0	0	43	20	1	0	103	49	0	319
Titanium	143	2	0	0	86	48	2	0	209	67	0	557
Vanadium	1301	30	0	332	907	449	239	0	381	1065	21	4725
Zinc	1838	38	7	512	1680	822	563	6	737	1923	28	8154
Zirconium	70	2	0	0	87	48	3	0	209	21	0	440

Table 2. Surface Water Data Availability for each Analyte

Analyte	Fraction	AR-12	SW-55	SW-60	SW-75	Total
Aluminum	Total	5	16	14	15	50
Ammonia	Total	6	8	0	3	17
Arsenic	Total	5	8	0	3	16
Barium	Total	1	0	0	0	1
Beryllium	Total	5	0	0	0	5
Boron	Total	8	10	14	14	46
Bromide	Total	6	0	0	0	6
Cadmium	Total	5	16	14	12	47
Chromium	Total	1	12	14	15	42
Cobalt	Total	1	0	0	0	1
Copper	Total	5	16	15	15	51
Fluoride	Total	4	10	14	11	39
Iron	Total	5	16	14	17	52
Lead	Total	4	16	14	15	49
Lithium	Total	1	0	0	0	1
Manganese	Total	5	11	0	10	26
Mercury	Total	8	12	14	12	46
Molybdenum	Total	1	0	0	0	1
Nickel	Total	5	8	0	3	16
Nitrite + Nitrate	Total	8	0	0	0	8
Orthophosphate	Total	0	10	14	12	36
pH (Field)	No Measure	8	41	0	5	54
pH (Lab)	No Measure	7	16	14	18	55
Phosphate	Total	0	8	0	3	11
Phosphorus	Total	3	0	0	0	3
SC (Field)	No Measure	8	41	0	10	59
SC (Lab)	No Measure	8	16	14	12	50
Selenium	Total	8	16	14	15	53
Strontium	Total	5	0	0	0	5
Thallium	Total	5	0	0	0	5
Vanadium	Total	4	16	14	15	49
Zinc	Total	5	16	14	15	50
Zirconium	Total	1	0	0	0	1
Aluminum	Dissolved	3	16	14	15	48
Arsenic	Dissolved	3	8	0	3	14
Barium	Dissolved	1	0	0	0	1
Beryllium	Dissolved	3	0	0	0	3
Boron	Dissolved	7	16	1	18	42
Cadmium	Dissolved	3	16	14	12	45
Calcium	Dissolved	8	16	14	18	56
Chloride	Dissolved	0	16	14	17	47
Chromium	Dissolved	1	12	14	15	42
Cobalt	Dissolved	1	0	0	0	1
Copper	Dissolved	3	16	14	15	48
Fluoride	Dissolved	0	6	0	3	9
Iron	Dissolved	4	16	14	16	50
Lead	Dissolved	2	16	14	15	47
Lithium	Dissolved	1	0	0	0	1
Magnesium	Dissolved	8	16	14	18	56

Table 2 continued

Analyte	Fraction	AR-12	SW-55	SW-60	SW-75	Total
Manganese	Dissolved	4	16	14	15	49
Mercury	Dissolved	4	12	14	12	42
Molybdenum	Dissolved	1	0	0	0	1
Nickel	Dissolved	4	8	0	3	15
Orthophosphate	Dissolved	0	2	0	2	4
Potassium	Dissolved	8	16	14	18	56
Selenium	Dissolved	6	16	14	15	51
Sodium	Dissolved	8	16	14	18	56
Strontium	Dissolved	3	0	0	0	3
Sulfate	Dissolved	0	16	14	17	47
TDS	Dissolved	0	18	28	16	62
Thallium	Dissolved	3	0	0	0	3
Vanadium	Dissolved	2	16	14	15	47
Zinc	Dissolved	3	16	14	15	48
Zirconium	Dissolved	1	0	0	0	1

Table 3. Analytes Excluded from Random Forests Step by Stratigraphic Unit

	Analytes Excluded from RF
Alluvium	Ammonia, Antimony, Barium, Beryllium, Chromium, Cobalt, Lithium, Molybdenum, Nitrate, Nitrite, pH (Field), Phosphate, Phosphorus, SC (Field), Silica, Silver, Strontium, Thallium, Tin, Titanium, Zirconium
Spoils	Ammonia, Antimony, Arsenic, Barium, Beryllium, Chromium, Cobalt, Copper, Lithium, Mercury, Molybdenum, Nickel, Nitrate, Nitrite, Nitrite + Nitrate, Orthophosphate, pH (Field), Phosphate, Phosphorus, SC (Field), Silica, Silver, Strontium, Thallium, Tin, Titanium, Vanadium, Zirconium
Clinker	Aluminum, Ammonia, Antimony, Arsenic, Barium, Beryllium, Bromide, Cadmium, Chromium, Cobalt, Copper, Fluoride, Iron, Lead, Lithium, Manganese, Mercury, Molybdenum, Nickel, Nitrate, Nitrite, Nitrite + Nitrate, Orthophosphate, pH (Field), Phosphate, Phosphorus, SC (Field), Strontium, Thallium, Titanium, Vanadium, Zirconium
Rosebud Overburden	Aluminum, Ammonia, Antimony, Arsenic, Barium, Beryllium, Bromide, Cadmium, Chromium, Cobalt, Copper, Lead, Lithium, Mercury, Molybdenum, Nickel, Nitrate, Nitrite, Nitrite + Nitrate, Orthophosphate, pH (Field), Phosphate, Phosphorus, SC (Field), Silica, Silver, Strontium, Thallium, Tin, Titanium, Vanadium, Zirconium
Rosebud Coal	Ammonia, Antimony, Arsenic, Barium, Beryllium, Bromide, Chromium, Cobalt, Lithium, Mercury, Molybdenum, Nickel, Nitrate, Nitrite, Nitrite + Nitrate, pH (Field), Phosphate, Phosphorus, SC (Field), Silica, Silver, Strontium, Thallium, Tin, Titanium, Zirconium
Interburden	Ammonia, Antimony, Arsenic, Barium, Beryllium, Bromide, Chromium, Cobalt, Copper, Lithium, Mercury, Molybdenum, Nickel, Nitrate, Nitrite, Nitrite + Nitrate, Orthophosphate, pH (Field), Phosphate, Phosphorus, SC (Field), Silica, Silver, Strontium, Thallium, Tin, Titanium, Vanadium, Zirconium
McKay Coal	Ammonia, Antimony, Arsenic, Barium, Beryllium, Chromium, Cobalt, Lithium, Molybdenum, Nitrate, Nitrite, pH (Field), Phosphate, Phosphorus, SC (Field), Silica, Silver, Strontium, Thallium, Tin, Titanium, Zirconium
SubMcKay	Ammonia, Antimony, Arsenic, Barium, Beryllium, Chromium, Cobalt, Lithium, Molybdenum, Nitrate, Nitrite, pH (Field), Phosphate, Phosphorus, SC (Field), Silica, Silver, Strontium, Thallium, Tin, Titanium, Zirconium

Table 4. Available Groundwater BSL Calculations

Analyte	Alluvium	Spoils	Clinker	Coal-Related	SubMcKay
Aluminum	X	X	X	X	X
Ammonia	X	X	1	X	X
Antimony	X	X	1	X	X
Arsenic	X	X	1	X	X
Barium	X	X	1	X	X
Beryllium	X	X	1	X	X
Boron	X	X	X	X	X
Bromide	X	X	X	X	X
Cadmium	X	X	X	X	X
Calcium	X	X	X	X	X
Chloride	X	X	X	X	X
Chromium	X	X	1	X	X
Cobalt	X	X	1	X	X
Copper	X	X	X	X	X
Fluoride	X	X	X	X	X
Iron	X	X	X	X	X
Lead	X	X	X	X	X
Lithium	X	X	1	X	1
Magnesium	X	X	X	X	X
Manganese	X	X	X	X	X
Mercury	X	X	X	X	X
Molybdenum	X	X	1	X	X
Nickel	X	X	X	X	X
Nitrate	X	X	1	X	X
Nitrite	X	X	1	X	X
Nitrite + Nitrate	X	X	X	X	X
Orthophosphate	X	X	X	X	X
pH (Field)	X	X	X	X	X
pH (Laboratory)	X	X	X	X	X
Phosphate	X	X	1	X	X
Phosphorus	X	1	1	1	1
Potassium	X	X	X	X	X
SC (Field)	X	X	X	X	X
SC (Laboratory)	X	X	X	X	X
Selenium	X	X	X	X	X
Silica	X	X	1	X	X
Silver	X	X	1	X	X
Sodium	X	X	X	X	X
Strontium	X	X	1	X	X
Sulfate	X	X	X	X	X
TDS	X	X	X	X	X
Thallium	X	X	1	X	X
Tin	X	X	1	X	X
Titanium	X	X	1	X	X
Vanadium	X	X	X	X	X
Zinc	X	X	X	X	X
Zirconium	X	X	1	X	1

[1] Analyte did not have enough data (at least 10 samples) to calculate a BSL for the unit

Table 5. Groundwater Data and Analysis: Summary Statistics, 90th Percentiles, and BSLs

					Non-detects		Detects					
Analyte	**Stratigraphic Unit**	**Number of Wells**	**Total Number of Samples**	**Detect Freq. (%)**	**Number of Samples**	**Range**	**Number of Samples**	**Range**	**Median**	**Mean**	**90th Percentile**	**BSL**
Aluminum	Alluvium	130	1114	33.7	739	0.001-2	375	0-5.2	0.11	0.3044	0.3	0.3
Ammonia	Alluvium	28	35	31.4	24	0.05-0.05	11	0.0666-0.6	0.21	0.2224	0.2188	0.415
Antimony	Alluvium	22	92	2.2	90	0.0005-0.2	2	0.0027-0.25	0.12635	0.1264	0.15	0.2
Arsenic	Alluvium	68	335	43	191	0-2	144	0-0.3	0.005	0.0366	0.3	0.005
Barium	Alluvium	28	167	83.8	27	0.001-0.2	140	0-0.2	0.012	0.0155	0.0254	0.024
Beryllium	Alluvium	29	115	0	115	0.0002-0.02	0				0.003	0.005
Boron	Alluvium	179	1908	98.8	23	0-0.5	1885	0.069-10.5	0.9	0.9378	1.5	1.6
Bromide	Alluvium	42	184	12	162	0.05-10	22	0.1-2.2	1	0.9558	5	5
Cadmium	Alluvium	136	1131	33.7	750	0-0.025	381	0-0.05	0.003	0.0045	0.01	0.005
Calcium	Alluvium	182	1944	100	0		1944	13-1700	256	262.4995	375	379
Chloride	Alluvium	181	1942	99.1	17	1-50	1925	0-260	20	27.5677	48	49
Chromium	Alluvium	46	160	15	136	0.0005-0.1	24	0-0.0283	0.0055	0.0078	0.03	0.1
Cobalt	Alluvium	24	108	17.6	89	0.0005-0.02	19	0.00024-0.0022	0.00072	0.0009	0.02	0.02
Copper	Alluvium	132	970	17.4	801	0.0005-0.1	169	0-0.42	0.01	0.0207	0.02	0.0102
Fluoride	Alluvium	137	1289	97.6	31	0.1-2.5	1258	0-7.29	0.31	0.4070	0.63	0.63
Iron	Alluvium	143	1286	42.7	737	0.002-0.1	549	0-6.75	0.06	0.2736	0.185	0.23
Lead	Alluvium	138	1130	17.1	937	0-1	193	0-0.15	0.01	0.0183	0.03	0.01
Lithium	Alluvium	10	38	100	0		38	0.015-0.143	0.0539	0.0617	0.0938	0.12
Magnesium	Alluvium	182	1944	99.8	3	0.01-0.01	1941	0-856	272	277.1360	386.7	394
Manganese	Alluvium	143	1206	58.4	502	0.001-0.1	704	0-4.61	0.1	0.3201	0.52	0.61
Mercury	Alluvium	143	905	5.1	859	0.00002-0.3	46	0-0.004	0.0001	0.0004	0.001	0.001
Molybdenum	Alluvium	32	142	7	132	0.001-0.2	10	0.001-0.003	0.0025	0.0022	0.04	0.1
Nickel	Alluvium	70	427	15.5	361	0.0005-0.3	66	0-0.07	0.00604	0.0151	0.03	0.3
Nitrate	Alluvium	19	77	74	20	0.01-1	57	0.01-20.3	0.32	1.9996	4.112	6.08
Nitrite	Alluvium	21	24	12.5	21	0.02-0.5	3	0.04-0.92	0.08	0.3467	0.5	0.92
Nitrite + Nitrate	Alluvium	75	588	86.1	82	0.01-0.15	506	0-10.1	0.37	0.8857	2.04	2.5
Orthophosphate	Alluvium	126	936	68.5	295	0.0001-2	641	0-18	0.05	0.2432	0.39	0.4
pH (Field)	Alluvium	81	231	100	0		231	6-8.1	7.15	7.1439	7.5	7.5
pH (Laboratory)	Alluvium	182	1973	100	0		1973	6.5-8.44	7.4	7.4345	7.8	7.8
Phosphate	Alluvium	47	144	94.4	8	0.001-0.4	136	0-15	0.0775	0.6793	0.868	0.98
Phosphorus	Alluvium	14	14	92.9	1	0.4-0.4	13	0.01-0.72	0.44	0.4177	0.685	0.72
Potassium	Alluvium	181	1759	99.8	4	12.5-12.5	1755	0-100	9	9.7266	16	16.1
SC (Field)	Alluvium	138	778	100	0		778	5-7770	3120.5	3112.2398	4270	4330
SC (Laboratory)	Alluvium	182	1967	100	0		1967	624-6960	3130	3150.9270	4230	4270

🟨 Non-detects in top 20% of data
🟧 BSL = max non-detect
🟦 BSL < 90th percentile

Notes: All units are mg/L, except SC which is µmhos/cm and pH which is standard units. BSL values in non-shaded cells are deemed the most reliable, whereas shading indicates potential influence from non-detect values. For details regarding shading criteria, see Section 5.1.

Table 5 continued

					Non-detects		Detects					
Analyte	**Stratigraphic Unit**	**Number of Wells**	**Total Number of Samples**	**Detect Freq. (%)**	**Number of Samples**	**Range**	**Number of Samples**	**Range**	**Median**	**Mean**	**90th Percentile**	**BSL**
Selenium	Alluvium	176	1580	26.4	1163	0.0001-5	417	0-0.11	0.007	0.0095	0.009	0.009
Silica	Alluvium	26	186	100	0		186	3-32.1	20.95	19.4293	27.05	27.6
Silver	Alluvium	23	114	7	106	0.001-0.03	8	0.004-0.03	0.0085	0.0104	0.03	0.03
Sodium	Alluvium	181	1946	99.9	1	0.01-0.01	1945	14-938	166	198.5337	320	342
Strontium	Alluvium	25	165	100	0		165	0-16.999	6.25	6.3217	8.616	10.6
Sulfate	Alluvium	181	1949	100	0		1949	9-21270	1740	1738.9650	2500	2530
TDS	Alluvium	183	2371	100	0		2371	348-7860	2843.5	2857.4950	4077	4120
Thallium	Alluvium	11	30	0	30	0.0003-0.5	0				0.095	0.0005
Tin	Alluvium	18	91	6.6	85	0.0005-0.03	6	0.0005-1.3	0.36	0.5218	0.03	0.03
Titanium	Alluvium	20	107	24.3	81	0.001-0.1	26	0.004-0.052	0.012	0.0182	0.0158	0.019
Vanadium	Alluvium	131	941	10	847	0.0001-1	94	0-0.3	0.01	0.0466	1	1
Zinc	Alluvium	135	1250	62	475	0-0.03	775	0-2.09	0.03	0.0735	0.11	0.12
Zirconium	Alluvium	9	34	2.9	33	0.0005-0.1	1	0.0309-0.0309	0.0309	0.0309	0.02	0.1
Aluminum	Spoils	76	424	42.7	243	0.004-0.3	181	0.004-18.7	0.1	0.2702	0.2	0.215
Ammonia	Spoils	26	32	87.5	4	0.05-0.05	28	0.13-4.49	0.9255	1.1594	1.793	3.04
Antimony	Spoils	19	47	23.4	36	0.001-0.2	11	0.22-0.6	0.32	0.3518	0.332	0.4
Arsenic	Spoils	62	267	61	104	0-0.01	163	0.00000053-0.013	0.0012	0.0020	0.005	0.005
Barium	Spoils	31	58	93.1	4	0.005-0.02	54	0.0002-3.2	0.02635	0.1085	0.115	0.27
Beryllium	Spoils	19	48	2.1	47	0.0005-0.02	1	0.005-0.005	0.005	0.0050	0.005	0.02
Boron	Spoils	83	513	97.5	13	0-0.3	500	0.05-42.7	0.397	0.5486	0.778	0.8
Bromide	Spoils	43	169	21.3	133	0.094-10	36	0.061-2.4	0.205	0.6209	2.08	1
Cadmium	Spoils	76	426	28.4	305	0-0.02	121	0.000044-0.047	0.00201	0.0057	0.0085	0.006
Calcium	Spoils	85	580	100	0		580	12.5-3821	326.5	326.8640	468.1	477
Chloride	Spoils	84	579	99.7	2	10-20	577	1-2700	18.8	30.4235	49	52
Chromium	Spoils	47	184	45.7	100	0.001-0.1	84	0.002-0.09	0.01	0.0148	0.02	0.025
Cobalt	Spoils	13	29	79.3	6	0.0009-0.02	23	0.0015-0.0232	0.014	0.0133	0.02136	0.0232
Copper	Spoils	76	318	44.7	176	0.0005-0.02	142	0.000103-0.13	0.015	0.0209	0.03	0.038
Fluoride	Spoils	81	517	83.4	86	0-2.5	431	0-4.133	0.17	0.3166	0.394	0.4
Iron	Spoils	80	493	81.7	90	0-0.1	403	0-19.9	0.171	0.8999	1.416	2
Lead	Spoils	75	424	33.5	282	0.0001-4	142	0.000031-0.27	0.01	0.0421	0.08	0.08
Lithium	Spoils	44	189	94.2	11	0.002-0.25	178	0.002-0.9	0.05681	0.0607	0.0892	0.09
Magnesium	Spoils	85	579	100	0		579	11.6-6000	318	345.3065	471.2	497
Manganese	Spoils	80	474	97	14	0-0.02	460	0-7.3	0.81	1.0659	2.191	2.48
Mercury	Spoils	35	128	10.9	114	0.0003-0.005	14	0.00009-0.2	0.0004	0.0147	0.001	0.005

🟨 Non-detects in top 20% of data
🟧 BSL = max non-detect
🟦 BSL < 90th percentile

Notes: All units are mg/L, except SC which is µmhos/cm and pH which is standard units. BSL values in non-shaded cells are deemed the most reliable, whereas shading indicates potential influence from non-detect values. For details regarding shading criteria, see Section 5.1.

Table 5 continued

					Non-detects		Detects					
Analyte	**Stratigraphic Unit**	**Number of Wells**	**Total Number of Samples**	**Detect Freq. (%)**	**Number of Samples**	**Range**	**Number of Samples**	**Range**	**Median**	**Mean**	**90th Percentile**	**BSL**
Molybdenum	Spoils	43	164	29.3	116	0.001-0.1	48	0.0014-0.37	0.03	0.0658	0.05	0.059
Nickel	Spoils	70	208	68.8	65	0.0005-0.05	143	0.00059-0.15	0.03	0.0392	0.07	0.0816
Nitrate	Spoils	48	246	74.4	63	0-0.5	183	0.004-44	0.17	1.2934	1.685	2.588
Nitrite	Spoils	13	18	0	18	0.05-0.5	0				0.325	0.5
Nitrite + Nitrate	Spoils	14	18	77.8	4	0.05-0.25	14	0.05-9.8	0.545	1.2404	1.464	9.8
Orthophosphate	Spoils	65	270	59.3	110	0.003-2.5	160	0.01-13.2	0.1	0.5166	1	1
pH (Field)	Spoils	71	207	100	0		207	6-8.8	6.7	6.7872	7.1	7.2
pH (Laboratory)	Spoils	85	608	100	0		608	5.6-8.5	7.1	7.1958	7.8	7.8
Phosphate	Spoils	26	90	100	0		90	0.01-18	0.13	0.8683	1.919	3.9
Phosphorus	Spoils	0	0		0		0					
Potassium	Spoils	84	580	99.1	5	12.5-12.5	575	0-320	11.6	11.7162	17.5	18
SC (Field)	Spoils	79	415	100	0		415	350-34200	3250	3352.9542	4496	4810
SC (Laboratory)	Spoils	85	605	100	0		605	181.3-35000	3293	3426.0241	4520	4780
Selenium	Spoils	77	365	21.4	287	0.0001-0.01	78	0.0001-0.029	0.001485	0.0034	0.005	0.0024
Silica	Spoils	47	253	100	0		253	3.6-30	14	14.7912	20.4	21.4
Silver	Spoils	42	169	21.9	132	0.001-0.01	37	0.001-0.076	0.01	0.0176	0.01	0.015
Sodium	Spoils	85	594	100	0		594	1.18-4270	122.5	167.7567	290.7	321
Strontium	Spoils	42	170	100	0		170	0.0052-20	8.795	8.1782	13.34	14.5
Sulfate	Spoils	84	580	100	0		580	30.2-30700	1670	1827.4141	2690	2840.9
TDS	Spoils	85	729	100	0		729	220.0771-48500	2920	3140.3434	4530	4738
Thallium	Spoils	12	23	0	23	0.001-0.05	0				0.025	0.05
Tin	Spoils	30	79	41.8	46	0.0005-0.005	33	0.0006-4.88	0.16	0.4839	0.738	1.01
Titanium	Spoils	40	151	64.2	54	0.001-1	97	0.001-0.062	0.012	0.0185	0.05	0.041
Vanadium	Spoils	73	290	28.6	207	0.0001-1	83	0.00011-2.2	0.0057	0.0374	0.2	0.01373
Zinc	Spoils	77	433	79.7	88	0-0.02	345	0.00000729-3	0.032	0.1558	0.32	0.39
Zirconium	Spoils	40	151	15.9	127	0.0009-0.1	24	0.004-1.3	0.01265	0.0752	0.05	0.015
Aluminum	Clinker	1	23	21.7	18	0.1-0.1	5	0.2-1.2	0.8	0.7800	0.78	1.2
Ammonia	Clinker	0	0		0		0					
Antimony	Clinker	0	0		0		0					
Arsenic	Clinker	0	0		0		0					
Barium	Clinker	0	0		0		0					
Beryllium	Clinker	0	0		0		0					
Boron	Clinker	7	115	92.2	9	0.1-0.1	106	0.1-13.3	2	2.1198	3.6	3.9
Bromide	Clinker	4	32	0	32	0.5-10	0				5	10

🟨 Non-detects in top 20% of data 🟧 BSL = max non-detect 🟦 BSL < 90th percentile

Notes: All units are mg/L, except SC which is µmhos/cm and pH which is standard units. BSL values in non-shaded cells are deemed the most reliable, whereas shading indicates potential influence from non-detect values. For details regarding shading criteria, see Section 5.1.

Table 5 continued

					Non-detects		Detects					
Analyte	Stratigraphic Unit	Number of Wells	Total Number of Samples	Detect Freq. (%)	Number of Samples	Range	Number of Samples	Range	Median	Mean	90th Percentile	BSL
Cadmium	Clinker	1	23	39.1	14	0.001-0.005	9	0.002-0.01	0.003	0.0046	0.0066	0.01
Calcium	Clinker	7	115	100	0		115	27-443	239	210.6174	338	367
Chloride	Clinker	7	113	100	0		113	2-53	14	15.7788	25.8	30
Chromium	Clinker	0	0		0		0					
Cobalt	Clinker	0	0		0		0					
Copper	Clinker	1	23	8.7	21	0.01-0.02	2	0.01-0.02	0.015	0.0150	0.02	0.02
Fluoride	Clinker	1	28	100	0		28	0.38-0.81	0.565	0.5511	0.636	0.81
Iron	Clinker	1	28	67.9	9	0.03-0.05	19	0.05-1.45	0.08	0.2184	0.33	1.45
Lead	Clinker	1	23	4.3	22	0.01-0.02	1	0.01-0.01	0.01	0.0100	0.02	0.02
Lithium	Clinker	0	0		0		0					
Magnesium	Clinker	7	115	100	0		115	4-1040	186	264.7043	493.2	524
Manganese	Clinker	1	28	89.3	3	0.02-0.02	25	0.02-0.67	0.21	0.2260	0.414	0.67
Mercury	Clinker	4	28	0	28	0.0005-0.001	0				0.001	0.001
Molybdenum	Clinker	0	0		0		0					
Nickel	Clinker	1	20	5	19	0.01-0.03	1	0.15-0.15	0.15	0.1500	0.03	0.15
Nitrate	Clinker	0	0		0		0					
Nitrite	Clinker	0	0		0		0					
Nitrite + Nitrate	Clinker	4	27	22.2	21	0.05-0.05	6	0.1-1.24	0.26	0.4150	0.248	1.24
Orthophosphate	Clinker	1	22	59.1	9	0.01-0.01	13	0.01-0.27	0.02	0.0569	0.077	0.27
pH (Field)	Clinker	4	12	100	0		12	6.4-8.3	7.42	7.3458	7.96	8.3
pH (Laboratory)	Clinker	7	115	100	0		115	6.4-8.4	7.8	7.7348	8.16	8.2
Phosphate	Clinker	0	0		0		0					
Phosphorus	Clinker	0	0		0		0					
Potassium	Clinker	7	97	100	0		97	3-61	12	14.9175	27	30
SC (Field)	Clinker	5	56	100	0		56	268-6200	1605	2095.3446	4345	4700
SC (Laboratory)	Clinker	7	115	100	0		115	366-7420	3760	3025.2957	4916	5110
Selenium	Clinker	7	115	20	92	0.005-0.005	23	0.005-0.048	0.008	0.0114	0.008	0.01
Silica	Clinker	0	0		0		0					
Silver	Clinker	0	0		0		0					
Sodium	Clinker	7	115	100	0		115	8-695	237	231.8435	553	586
Strontium	Clinker	0	0		0		0					
Sulfate	Clinker	7	113	100	0		113	23-5700	1930	1664.0708	3024	3140
TDS	Clinker	7	119	100	0		119	201-8130	3380	2826.5546	4798	5010
Thallium	Clinker	0	0		0		0					

🟨	Non-detects in top 20% of data	🟧	BSL = max non-detect	🟦	BSL < 90th percentile

Notes: All units are mg/L, except SC which is µmhos/cm and pH which is standard units. BSL values in non-shaded cells are deemed the most reliable, whereas shading indicates potential influence from non-detect values. For details regarding shading criteria, see Section 5.1.

Table 5 continued

					Non-detects		Detects					
Analyte	**Stratigraphic Unit**	**Number of Wells**	**Total Number of Samples**	**Detect Freq. (%)**	**Number of Samples**	**Range**	**Number of Samples**	**Range**	**Median**	**Mean**	**90th Percentile**	**BSL**
Tin	Clinker	0	0		0		0					
Titanium	Clinker	0	0		0		0					
Vanadium	Clinker	1	23	13	20	0.1-1	3	0.06-0.07	0.06	0.0633	0.1	1
Zinc	Clinker	1	28	32.1	19	0.01-0.02	9	0.01-0.07	0.03	0.0367	0.04	0.07
Zirconium	Clinker	0	0		0		0					
Aluminum	Coal-Related	263	1914	35.4	1236	0.001-2	678	0-13	0.1	0.2175	0.2	0.2
Ammonia	Coal-Related	93	126	84.1	20	0.05-0.1	106	0.06-142	0.4405	1.9699	1.2	1.95
Antimony	Coal-Related	23	33	9.1	30	0.0002-0.2	3	0.0021-0.39	0.2	0.1974	0.2	0.2
Arsenic	Coal-Related	165	673	44.6	373	0-0.1	300	0-0.1	0.004745	0.0039	0.005	0.005
Barium	Coal-Related	25	68	95.6	3	0.005-0.1	65	0.005-0.24	0.0185	0.0387	0.1	0.128
Beryllium	Coal-Related	27	61	0	61	0.0002-0.05	0				0.005	0.0005
Boron	Coal-Related	320	3314	94.4	185	0-1	3129	0-20.4	0.43	0.5758	1	1
Bromide	Coal-Related	51	377	5.6	356	0.015-10	21	0.068-2.2	0.8	0.7985	2.32	10
Cadmium	Coal-Related	295	2139	21.8	1672	0-0.02	467	0-0.24	0.001	0.0038	0.005	0.002
Calcium	Coal-Related	324	3427	100	1	1-1	3426	0-1287	142	173.4883	349	360
Chloride	Coal-Related	321	3338	99.1	30	1-20	3308	0-481	8	11.4359	20	21
Chromium	Coal-Related	70	167	29.3	118	0.0002-0.02	49	0-0.0691	0.01	0.0109	0.02	0.0146
Cobalt	Coal-Related	14	45	66.7	15	0.0002-0.01	30	0.00024-0.00357	0.000835	0.0012	0.00324	0.0034
Copper	Coal-Related	291	1782	34.1	1175	0.0005-0.02	607	0-0.66	0.02	0.0239	0.03	0.03
Fluoride	Coal-Related	306	2525	94.6	137	0-35	2388	0-13	0.22	0.2784	0.47	0.49
Iron	Coal-Related	307	2525	69.9	761	0.002-0.1	1764	0-54.6	0.15	0.7405	1.1936	1.27
Lead	Coal-Related	298	2157	21.6	1692	0-1.0001	465	0-0.37	0.01	0.0174	0.02	0.01
Lithium	Coal-Related	30	96	93.8	6	0.006-1	90	0.002-0.08	0.046	0.0440	0.067	0.072
Magnesium	Coal-Related	324	3427	100	1	1-1	3426	0-1150	122	166.4060	294.4	309
Manganese	Coal-Related	304	2397	94.9	123	0.005-0.11	2274	0-361	0.1175	0.4360	0.44	0.48
Mercury	Coal-Related	252	1289	2.6	1256	0.00005-0.005	33	0-0.002	0.00032	0.0005	0.001	0.001
Molybdenum	Coal-Related	31	115	20.9	91	0.0002-0.04	24	0.001-0.15	0.007	0.0198	0.04	0.02
Nickel	Coal-Related	176	627	33.7	416	0.0005-0.1	211	0.00000196-0.56	0.0087	0.0166	0.03	0.02
Nitrate	Coal-Related	72	447	83.4	74	0.01-2.5	373	0-3.7	0.09	0.2403	0.4772	0.6
Nitrite	Coal-Related	13	17	5.9	16	0.05-2.5	1	0.17-0.17	0.17	0.1700	0.35	2.5
Nitrite + Nitrate	Coal-Related	65	481	50.9	236	0.01-0.2	245	0.02-24.1	0.15	0.7863	0.75	0.95
Orthophosphate	Coal-Related	242	1446	76.3	342	0.01-2.5	1104	0-23	0.04	0.2063	0.19	0.19
pH (Field)	Coal-Related	144	351	100	0		351	5-19.5	7.17	7.1999	7.7	7.7
pH (Laboratory)	Coal-Related	325	3462	100	1	0-0	3461	0-9.8	7.4	7.4487	8	8

🟨 Non-detects in top 20% of data
🟧 BSL = max non-detect
🟦 BSL < 90th percentile

Notes: All units are mg/L, except SC which is µmhos/cm and pH which is standard units. BSL values in non-shaded cells are deemed the most reliable, whereas shading indicates potential influence from non-detect values. For details regarding shading criteria, see Section 5.1.

Table 5 continued

					Non-detects		Detects					
Analyte	**Stratigraphic Unit**	**Number of Wells**	**Total Number of Samples**	**Detect Freq. (%)**	**Number of Samples**	**Range**	**Number of Samples**	**Range**	**Median**	**Mean**	**90th Percentile**	**BSL**
Phosphate	Coal-Related	134	574	88.9	64	0.001-0.01	510	0-26	0.03	0.2299	0.13	0.17
Phosphorus	Coal-Related	2	2	100	0		2	0.06-17	8.53	8.5300		
Potassium	Coal-Related	322	3073	98.8	36	0-12.5	3037	0-68.5	7	7.6376	13	13.6
SC (Field)	Coal-Related	266	1460	100	0		1460	0.23-21636	2034	2275.1953	3870.7	3997
SC (Laboratory)	Coal-Related	325	3434	100	0		3434	0-10600	1979	2197.3798	3757	3860
Selenium	Coal-Related	290	2505	10.4	2244	0.0001-0.05	261	0-7.4	0.006	0.0389	0.005	0.01
Silica	Coal-Related	36	183	99.5	1	0.05-0.05	182	0-42	16.05	17.1650	22.3	23.3
Silver	Coal-Related	30	88	21.6	69	0.0002-0.01	19	0.003-0.031	0.01	0.0119	0.01	0.019
Sodium	Coal-Related	324	3426	100	0		3426	0-1700	122	168.5579	369	396
Strontium	Coal-Related	33	119	100	0		119	0.01479-115.6	6.61	7.5171	13.248	14.071
Sulfate	Coal-Related	325	3410	100	1	1-1	3409	0-6390	755	1017.0038	2080	2150
TDS	Coal-Related	326	4428	100	2	10-20	4426	0-10000	1520	1838.5153	3330	3445
Thallium	Coal-Related	12	38	0	38	0.0002-0.005	0				0.0013	0.0003
Tin	Coal-Related	24	38	55.3	17	0.0002-0.005	21	0.001-2.5	0.33	0.5620	0.745	1.7
Titanium	Coal-Related	21	69	60.9	27	0.001-0.2	42	0.001-0.043	0.013	0.0159	0.0264	0.035
Vanadium	Coal-Related	253	1421	13.2	1234	0.0001-1	187	0-1.21	0.003	0.0385	1	1
Zinc	Coal-Related	301	2461	85.4	359	0-0.3	2102	0-8.61	0.08	0.3052	0.73	0.79
Zirconium	Coal-Related	21	70	21.4	55	0.0002-0.1	15	0.005-0.048	0.018	0.0202	0.055	0.03
Aluminum	SubMcKay	117	911	27.8	658	0.001-2	253	0.001-6.8	0.1	0.2819	0.2	0.3
Ammonia	SubMcKay	24	49	91.8	4	0.05-0.1	45	0.0809-7.8	0.47	1.1055	2.72	3.54
Antimony	SubMcKay	11	49	0	49	0.002-0.15	0				0.15	0.15
Arsenic	SubMcKay	64	340	28.8	242	0-0.5	98	0.0001-0.3	0.001505	0.0120	0.3	0.005
Barium	SubMcKay	21	158	77.8	35	0.001-0.2	123	0-0.3	0.009	0.0225	0.2	0.09
Beryllium	SubMcKay	19	91	0	91	0.0002-0.003	0				0.003	0.0002
Boron	SubMcKay	244	4059	98.3	67	0-5	3992	0.00599-5	0.5	0.6558	1.2	1.2
Bromide	SubMcKay	129	1108	4.2	1062	0.066-10	46	0.061-60.7	0.113	1.7649	5	5
Cadmium	SubMcKay	120	921	27.8	665	0-0.025	256	0.0000837-0.025	0.002	0.0031	0.005	0.003
Calcium	SubMcKay	246	4090	100	2	1-1	4088	1-729	139.5	148.0082	298	303
Chloride	SubMcKay	246	4040	99.5	22	0-20	4018	1-150	12	14.4314	22	23
Chromium	SubMcKay	46	228	12.3	200	0.001-0.1	28	0-0.05	0.003	0.0054	0.03	0.1
Cobalt	SubMcKay	16	88	36.4	56	0.00006-0.02	32	0.000060.00125	0.00022	0.0004	0.02	0.00066
Copper	SubMcKay	116	824	16.5	688	0.0004-0.05	136	0.00000157-0.414	0.01	0.0213	0.02	0.05
Fluoride	SubMcKay	130	1382	98.4	22	0.02-2.5	1360	0.03-4.8	0.48	0.8237	2.1	2.11
Iron	SubMcKay	143	1508	73.7	397	0.003-0.1	1111	0-12.6	0.5	1.0531	2.41	2.56

🟨 Non-detects in top 20% of data
🟧 BSL = max non-detect
🟦 BSL < 90th percentile

Notes: All units are mg/L, except SC which is µmhos/cm and pH which is standard units. BSL values in non-shaded cells are deemed the most reliable, whereas shading indicates potential influence from non-detect values. For details regarding shading criteria, see Section 5.1.

Table 5 continued

					Non-detects		Detects					
Analyte	**Stratigraphic Unit**	**Number of Wells**	**Total Number of Samples**	**Detect Freq. (%)**	**Number of Samples**	**Range**	**Number of Samples**	**Range**	**Median**	**Mean**	**90th Percentile**	**BSL**
Lead	SubMcKay	132	1033	16.4	864	0-0.1	169	0.0000494-0.06	0.01	0.0114	0.02	0.01
Lithium	SubMcKay	3	5	100	0		5	0.02-0.055	0.048	0.0422		
Magnesium	SubMcKay	246	4087	99.4	26	1-3	4061	0-672	99	120.5206	261.4	271
Manganese	SubMcKay	141	1524	83.9	246	0.002-0.1	1278	0-1.83	0.07	0.1157	0.23	0.26
Mercury	SubMcKay	195	1005	2.4	981	0.00005-0.03	24	0-0.004	0.0001	0.0006	0.001	0.001
Molybdenum	SubMcKay	21	97	16.5	81	0.001-0.07	16	0.001-0.032	0.0015	0.0061	0.04	0.004
Nickel	SubMcKay	91	611	13.3	530	0.0005-0.03	81	0-0.1	0.0023	0.0106	0.03	0.03
Nitrate	SubMcKay	16	94	36.2	60	0.01-0.5	34	0.05-2.14	0.645	0.7029	0.818	0.88
Nitrite	SubMcKay	14	90	1.1	89	0.01-0.5	1	0.06-0.06	0.06	0.0600	0.05	0.05
Nitrite + Nitrate	SubMcKay	190	1378	43.2	783	0.01-0.05	595	0-44	0.23	0.5854	0.623	0.7
Orthophosphate	SubMcKay	103	744	58.1	312	0.005-2	432	0-297	0.04	0.8173	0.1	0.1
pH (Field)	SubMcKay	167	588	100	0		588	5.58-10.3	7.3	7.3856	8.1	8.2
pH (Laboratory)	SubMcKay	243	4095	100	0		4095	6.3-12.1	7.5	7.5832	8.2	8.27
Phosphate	SubMcKay	29	82	78	18	0.001-0.4	64	0.0032-17.7	0.145	1.3786	3.485	6
Phosphorus	SubMcKay	2	2	0	2	0.4-0.4	0					
Potassium	SubMcKay	244	3388	99.5	17	1-12.5	3371	0-84	9	9.8313	16	16
SC (Field)	SubMcKay	202	1975	100	0		1975	320-1e+08	3069	53814.3205	4380	4469
SC (Laboratory)	SubMcKay	246	4095	100	1	1750-1750	4094	2-10400	2950	3115.1271	4470	4540
Selenium	SubMcKay	242	3703	8.4	3393	0.0005-5	310	0.000409-0.138	0.007	0.0093	0.005	0.005
Silica	SubMcKay	14	110	100	0		110	2.8-23.5	7.585	8.6406	16.93	18.1
Silver	SubMcKay	11	48	0	48	0.001-0.03	0				0.03	0.03
Sodium	SubMcKay	246	4090	100	0		4090	0-1707	410.5	473.5812	922.1	943
Strontium	SubMcKay	20	122	99.2	1	0.002-0.002	121	0.03-6	1.43	1.9562	4.931	5.06
Sulfate	SubMcKay	246	4058	99.5	20	1-10	4038	0-4120	1380	1410.9755	2163	2190
TDS	SubMcKay	244	4161	100	1	10-10	4160	112-11700	2390	2480.7902	3640	3670
Thallium	SubMcKay	6	42	0	42	0.0003-1	0				0.5	0.0003
Tin	SubMcKay	9	44	4.5	42	0.03-0.03	2	0.03-0.04	0.035	0.0350	0.03	0.03
Titanium	SubMcKay	12	49	32.7	33	0.001-0.1	16	0-0.015	0.0085	0.0089	0.0112	0.012
Vanadium	SubMcKay	115	814	13.9	701	0.0001-1	113	0.000000228-0.2	0.0061	0.0309	0.2	1
Zinc	SubMcKay	128	1388	85.9	196	0-1.01	1192	0-5.45	0.09	0.2751	0.623	0.69
Zirconium	SubMcKay	2	4	0	4	0.008-0.02	0					

🟨 Non-detects in top 20% of data 🟧 BSL = max non-detect 🟦 BSL < 90th percentile

Notes: All units are mg/L, except SC which is µmhos/cm and pH which is standard units. BSL values in non-shaded cells are deemed the most reliable, whereas shading indicates potential influence from non-detect values. For details regarding shading criteria, see Section 5.1.

Table 6. Comparison of Data used Across BSL Investigations

Investigations	**Maxim (2004)**	**Arcadis (2007)**	**Exponent (2011)**	**Neptune (2016)**
Date Range of Data	1979 - 2003	5/23/1974 - 10/26/2005	before 10/1/1983	3/23/1973 - 5/18/2015
Areas Covered	Stage I & II Evaporation Ponds, Plant Site	Stage I & II Evaporation Ponds, Plant Site	Units 3&4 Effluent Holding Ponds	Stage I & II Evaporation Ponds, Plant Site, Units 3&4 Effluent Holding Ponds
	# wells (# records)	*# wells (# records)*	*# wells (# records)*	*# wells (# records)*
Alluvium	X	15 (1,621)	15 (877)	184 (37,827)
Shallow	31 (3,939)	X	X	X
Spoils	X	16 (1,203)	26 (2,533)	85 (13,894)
Clinker	X	X	X	7 (1,671)
Coal-Related	X	X	12 (560)	326 (65,625)
SubMcKay	X	X	X	246 (63,372)
Bedrock	X	43 (5,272)	19 (1,051)	X
Total	59 (10,262)[1]	74 (8,096)	72 (5,021)	848 (182,389)

[1] Maxim (2004) calculated baselines for a 'Shallow' category and an 'All' category that also included the 'Shallow' wells

Table 7. Groundwater BSL Values for Each Analyte and Stratigraphic Unit

Analyte	**Alluvium**	**Spoils**	**Clinker**	**Coal-Related**	**SubMcKay**
Aluminum	0.3	0.215	1.2	0.2	0.3
Ammonia	0.415	3.04		1.95	3.54
Antimony	0.2	0.4		0.2	0.15
Arsenic	0.005	0.005		0.005	0.005
Barium	0.024	0.27		0.128	0.09
Beryllium	0.005	0.02		0.0005	0.0002
Boron	1.6	0.8	3.9	1	1.2
Bromide	5	1	10	10	5
Cadmium	0.005	0.006	0.01	0.002	0.003
Calcium	379	477	367	360	303
Chloride	49	52	30	21	23
Chromium	0.1	0.025		0.0146	0.1
Cobalt	0.02	0.0232		0.0034	0.00066
Copper	0.0102	0.038	0.02	0.03	0.05
Fluoride	0.63	0.4	0.81	0.49	2.11
Iron	0.23	2	1.45	1.27	2.56
Lead	0.01	0.08	0.02	0.01	0.01
Lithium	0.12	0.09		0.072	
Magnesium	394	497	524	309	271
Manganese	0.61	2.48	0.67	0.48	0.26
Mercury	0.001	0.005	0.001	0.001	0.001
Molybdenum	0.1	0.059		0.02	0.004
Nickel	0.3	0.0816	0.15	0.02	0.03
Nitrate	6.08	2.588		0.6	0.88
Nitrite	0.92	0.5		2.5	0.05
Nitrite + Nitrate	2.5	9.8	1.24	0.95	0.7
Orthophosphate	0.4	1	0.27	0.19	0.1
pH (Field)	7.5	7.2	8.3	7.7	8.2
pH (Laboratory)	7.8	7.8	8.2	8	8.27
Phosphate	0.98	3.9		0.17	6
Phosphorus	0.72				
Potassium	16.1	18	30	13.6	16
SC (Field)	4330	4810	4700	3997	4469
SC (Laboratory)	4270	4780	5110	3860	4540
Selenium	0.009	0.0024	0.01	0.01	0.005
Silica	27.6	21.4		23.3	18.1
Silver	0.03	0.015		0.019	0.03
Sodium	342	321	586	396	943
Strontium	10.6	14.5		14.071	5.06
Sulfate	2530	2840.9	3140	2150	2190
TDS	4120	4738	5010	3445	3670
Thallium	0.0005	0.05		0.0003	0.0003
Tin	0.03	1.01		1.7	0.03
Titanium	0.019	0.041		0.035	0.012
Vanadium	1	0.01373	1	1	1
Zinc	0.12	0.39	0.07	0.79	0.69
Zirconium	0.1	0.015		0.03	

🟧 BSL = max non-detect 🟦 BSL < 90th percentile

Note: BSL values in non-colored cells are valid according to the criteria outlined in Section 5.1.

Table 8. Groundwater BSL Comparisons

Analyte	Stratigraphic Unit	90th Percentile	BSL (DL)	BSL (1/2 DL)	BSL (Gehan)	Circular DEQ-7 Human Health Standards (HHS)
Aluminum	Alluvium	0.3	0.3	0.3	0.3	No HHS
Ammonia	Alluvium	0.2188	0.415	0.415	0.415	No HHS
Antimony	Alluvium	0.15	0.15	0.075	0.2	6
Arsenic	Alluvium	0.3	0.3	0.15	0.005	0.01
Barium	Alluvium	0.0254	0.1	0.05	0.024	1
Beryllium	Alluvium	0.003	0.003	0.0015	0.005	0.004
Boron	Alluvium	1.5	1.6	1.6	1.6	No HHS
Bromide	Alluvium	5	5	2.5	5	No HHS
Cadmium	Alluvium	0.01	0.01	0.01	0.005	0.005
Calcium	Alluvium	375	379	379	379	No HHS
Chloride	Alluvium	48	49.36	49	49	No HHS
Chromium	Alluvium	0.03	0.03	0.015	0.1	0.1
Cobalt	Alluvium	0.02	0.02	0.01	0.02	No HHS
Copper	Alluvium	0.02	0.02	0.01	0.0102	1.3
Fluoride	Alluvium	0.63	0.662	0.65	0.63	4
Iron	Alluvium	0.185	0.23	0.23	0.23	No HHS
Lead	Alluvium	0.03	0.05	0.04	0.01	0.015
Lithium	Alluvium	0.0938	0.1095	0.12	0.12	No HHS
Magnesium	Alluvium	386.7	394.7	394	394	No HHS
Manganese	Alluvium	0.52	0.605	0.605	0.61	No HHS
Mercury	Alluvium	0.001	0.001	0.0005	0.001	0.002
Molybdenum	Alluvium	0.04	0.04	0.02	0.1	No HHS
Nickel	Alluvium	0.03	0.03	0.015	0.3	0.1
Nitrate	Alluvium	4.112	6.08	6.08	6.08	10
Nitrite	Alluvium	0.5	0.794	0.719	0.92	1
Nitrite + Nitrate	Alluvium	2.04	2.493	2.495	2.5	10
Orthophosphate	Alluvium	0.39	0.46	0.445	0.4	No HHS
pH (Field)	Alluvium	7.5	7.5	7.5	7.5	No HHS
pH (Laboratory)	Alluvium	7.8	7.8	7.8	7.8	No HHS
Phosphate	Alluvium	0.868	0.971	0.971	0.98	No HHS
Phosphorus	Alluvium	0.685	0.72	0.72	0.72	No HHS
Potassium	Alluvium	16	16.02	16.02	16.1	No HHS
SC (Field)	Alluvium	4270	4330	4330	4330	No HHS
SC (Laboratory)	Alluvium	4230	4270	4270	4270	No HHS
Selenium	Alluvium	0.009	0.00903	0.009	0.009	0.05
Silica	Alluvium	27.05	27.5	27.5	27.6	No HHS
Silver	Alluvium	0.03	0.03	0.015	0.03	100
Sodium	Alluvium	320	342	342	342	No HHS
Strontium	Alluvium	8.616	10.6	10.6	10.6	4
Sulfate	Alluvium	2500	2530	2530	2530	No HHS
TDS	Alluvium	4077	4120	4120	4120	No HHS
Thallium	Alluvium	0.095	0.5	0.25	0.0005	0.002
Tin	Alluvium	0.03	0.03	0.015	0.03	No HHS
Titanium	Alluvium	0.0158	0.0366	0.0366	0.019	No HHS
Vanadium	Alluvium	1	1	0.5	1	No HHS
Zinc	Alluvium	0.11	0.121	0.12	0.12	2
Zirconium	Alluvium	0.02	0.0309	0.0309	0.1	No HHS

🟧	BSL = max non-detect	🟦	BSL < 90th percentile
🟨	Failed BSL rules (see Section 5.1)		DL = Detection Limit

Note: All units are mg/L except SC which are μmhos/cm and pH which are standard units.
Note: The methodology for the 90th percentile and the DL, ½ DL, and Gehan BSLs is explained in section 5.0.
Shading indicates potential influence from non-detect values. For details regarding shading criteria, see Section 5.1.

Table 8 continued

Analyte	Stratigraphic Unit	90th Percentile	BSL (DL)	BSL (1/2 DL)	BSL (Gehan)	Circular DEQ-7 Human Health Standards (HHS)
Aluminum	Spoils	0.2	0.22	0.2105	0.215	No HHS
Ammonia	Spoils	1.793	3.04	3.04	3.04	No HHS
Antimony	Spoils	0.332	0.4	0.4	0.4	6
Arsenic	Spoils	0.005	0.005	0.005	0.005	0.01
Barium	Spoils	0.115	0.228	0.228	0.27	1
Beryllium	Spoils	0.005	0.01	0.005	0.02	0.004
Boron	Spoils	0.778	0.8	0.8	0.8	No HHS
Bromide	Spoils	2.08	5	2.5	1	No HHS
Cadmium	Spoils	0.0085	0.01	0.007	0.006	0.005
Calcium	Spoils	468.1	477.1	477.1	477	No HHS
Chloride	Spoils	49	52	52	52	No HHS
Chromium	Spoils	0.02	0.0264	0.0264	0.025	0.1
Cobalt	Spoils	0.02136	0.02248	0.02248	0.0232	No HHS
Copper	Spoils	0.03	0.0373	0.0373	0.038	1.3
Fluoride	Spoils	0.394	0.42	0.41	0.4	4
Iron	Spoils	1.416	1.992	1.992	2	No HHS
Lead	Spoils	0.08	0.09	0.08	0.08	0.015
Lithium	Spoils	0.0892	0.09528	0.0912	0.09	No HHS
Magnesium	Spoils	471.2	496.2	496.2	497	No HHS
Manganese	Spoils	2.191	2.474	2.474	2.48	No HHS
Mercury	Spoils	0.001	0.001	0.000515	0.005	0.002
Molybdenum	Spoils	0.05	0.07	0.059	0.059	No HHS
Nickel	Spoils	0.07	0.0816	0.0816	0.0816	0.1
Nitrate	Spoils	1.685	2.444	2.444	2.588	10
Nitrite	Spoils	0.325	0.5	0.25	0.5	1
Nitrite + Nitrate	Spoils	1.464	9.8	9.8	9.8	10
Orthophosphate	Spoils	1	1.366	1.255	1	No HHS
pH (Field)	Spoils	7.1	7.188	7.188	7.2	No HHS
pH (Laboratory)	Spoils	7.8	7.8	7.8	7.8	No HHS
Phosphate	Spoils	1.919	3.92	3.92	3.9	No HHS
Phosphorus	Spoils					No HHS
Potassium	Spoils	17.5	18	18	18	No HHS
SC (Field)	Spoils	4496	4810	4802	4810	No HHS
SC (Laboratory)	Spoils	4520	4780	4780	4780	No HHS
Selenium	Spoils	0.005	0.005	0.00462	0.0024	0.05
Silica	Spoils	20.4	21.4	21.34	21.4	No HHS
Silver	Spoils	0.01	0.013	0.013	0.015	100
Sodium	Spoils	290.7	320.1	320.1	321	No HHS
Strontium	Spoils	13.34	14.5	14.5	14.5	4
Sulfate	Spoils	2690	2841.81	2841.81	2840.9	No HHS
TDS	Spoils	4530	4738	4738	4738	No HHS
Thallium	Spoils	0.025	0.05	0.025	0.05	0.002
Tin	Spoils	0.738	0.88	0.88	1.01	No HHS
Titanium	Spoils	0.05	0.1	0.05	0.041	No HHS
Vanadium	Spoils	0.2	0.2	0.1	0.01373	No HHS
Zinc	Spoils	0.32	0.39	0.39	0.39	2
Zirconium	Spoils	0.05	0.05	0.041	0.015	No HHS

🟧 BSL = max non-detect 🟦 BSL < 90th percentile
🟨 Failed BSL rules (see Section 5.1) DL = Detection Limit

Note: All units are mg/L except SC which are µmhos/cm and pH which are standard units.
Note: The methodology for the 90th percentile and the DL, ½ DL, and Gehan BSLs is explained in section 5.0.
Shading indicates potential influence from non-detect values. For details regarding shading criteria, see Section 5.1.

Table 8 continued

Analyte	Stratigraphic Unit	90th Percentile	BSL (DL)	BSL (1/2 DL)	BSL (Gehan)	Circular DEQ-7 Human Health Standards (HHS)
Aluminum	Clinker	0.78	1.16	1.16	1.2	No HHS
Ammonia	Clinker					No HHS
Antimony	Clinker					6
Arsenic	Clinker					0.01
Barium	Clinker					1
Beryllium	Clinker					0.004
Boron	Clinker	3.6	3.9	3.9	3.9	No HHS
Bromide	Clinker	5	10	5	10	No HHS
Cadmium	Clinker	0.0066	0.0094	0.0094	0.01	0.005
Calcium	Clinker	338	367	367	367	No HHS
Chloride	Clinker	25.8	30	30	30	No HHS
Chromium	Clinker					0.1
Cobalt	Clinker					No HHS
Copper	Clinker	0.02	0.02	0.018	0.02	1.3
Fluoride	Clinker	0.636	0.74	0.74	0.81	4
Iron	Clinker	0.33	0.841	0.841	1.45	No HHS
Lead	Clinker	0.02	0.02	0.01	0.02	0.015
Lithium	Clinker					No HHS
Magnesium	Clinker	493.2	524	526	524	No HHS
Manganese	Clinker	0.414	0.67	0.67	0.67	No HHS
Mercury	Clinker	0.001	0.001	0.0005	0.001	0.002
Molybdenum	Clinker					No HHS
Nickel	Clinker	0.03	0.15	0.15	0.15	0.1
Nitrate	Clinker					10
Nitrite	Clinker					1
Nitrite + Nitrate	Clinker	0.248	0.814	0.688	1.24	10
Orthophosphate	Clinker	0.077	0.262	0.262	0.27	No HHS
pH (Field)	Clinker	7.96	8.3	8.3	8.3	No HHS
pH (Laboratory)	Clinker	8.16	8.2	8.2	8.2	No HHS
Phosphate	Clinker					No HHS
Phosphorus	Clinker					No HHS
Potassium	Clinker	27	29.4	29.4	30	No HHS
SC (Field)	Clinker	4345	4625	4625	4700	No HHS
SC (Laboratory)	Clinker	4916	5110	5110	5110	No HHS
Selenium	Clinker	0.008	0.01	0.01	0.01	0.05
Silica	Clinker					No HHS
Silver	Clinker					100
Sodium	Clinker	553	596.4	586	586	No HHS
Strontium	Clinker					4
Sulfate	Clinker	3024	3140	3140	3140	No HHS
TDS	Clinker	4798	5010	5010	5010	No HHS
Thallium	Clinker					0.002
Tin	Clinker					No HHS
Titanium	Clinker					No HHS
Vanadium	Clinker	0.1	0.84	0.42	1	No HHS
Zinc	Clinker	0.04	0.056	0.056	0.07	2
Zirconium	Clinker					No HHS

🟧	BSL = max non-detect	🟦	BSL < 90th percentile
🟨	Failed BSL rules (see Section 5.1)		DL = Detection Limit

Note: All units are mg/L except SC which are µmhos/cm and pH which are standard units.
Note: The methodology for the 90th percentile and the DL, ½ DL, and Gehan BSLs is explained in section 5.0.
Shading indicates potential influence from non-detect values. For details regarding shading criteria, see Section 5.1.

Table 8 continued

Analyte	Stratigraphic Unit	90th Percentile	BSL (DL)	BSL (1/2 DL)	BSL (Gehan)	Circular DEQ-7 Human Health Standards (HHS)
Aluminum	Coal-Related	0.2	0.2	0.2	0.2	No HHS
Ammonia	Coal-Related	1.2	1.775	1.775	1.95	No HHS
Antimony	Coal-Related	0.2	0.2	0.2	0.2	6
Arsenic	Coal-Related	0.005	0.005	0.005	0.005	0.01
Barium	Coal-Related	0.1	0.1161	0.1161	0.128	1
Beryllium	Coal-Related	0.005	0.005	0.0025	0.0005	0.004
Boron	Coal-Related	1	1	1	1	No HHS
Bromide	Coal-Related	2.32	5	2.5	10	No HHS
Cadmium	Coal-Related	0.005	0.005	0.003	0.002	0.005
Calcium	Coal-Related	349	359.4	359	360	No HHS
Chloride	Coal-Related	20	21	21	21	No HHS
Chromium	Coal-Related	0.02	0.02	0.014	0.0146	0.1
Cobalt	Coal-Related	0.00324	0.00357	0.0034	0.0034	No HHS
Copper	Coal-Related	0.03	0.03	0.03	0.03	1.3
Fluoride	Coal-Related	0.47	0.5	0.49	0.49	4
Iron	Coal-Related	1.1936	1.27	1.27	1.27	No HHS
Lead	Coal-Related	0.02	0.02	0.01	0.01	0.015
Lithium	Coal-Related	0.067	0.072	0.072	0.072	No HHS
Magnesium	Coal-Related	294.4	309	309	309	No HHS
Manganese	Coal-Related	0.44	0.48	0.48	0.48	No HHS
Mercury	Coal-Related	0.001	0.001	0.0005	0.001	0.002
Molybdenum	Coal-Related	0.04	0.04	0.02	0.02	No HHS
Nickel	Coal-Related	0.03	0.03	0.02	0.02	0.1
Nitrate	Coal-Related	0.4772	0.606	0.612	0.6	10
Nitrite	Coal-Related	0.35	2.5	1.25	2.5	1
Nitrite + Nitrate	Coal-Related	0.75	0.95	0.95	0.95	10
Orthophosphate	Coal-Related	0.19	0.2	0.2	0.19	No HHS
pH (Field)	Coal-Related	7.7	7.73	7.7	7.7	No HHS
pH (Laboratory)	Coal-Related	8	8	8	8	No HHS
Phosphate	Coal-Related	0.13	0.17	0.17	0.17	No HHS
Phosphorus	Coal-Related					No HHS
Potassium	Coal-Related	13	13.4	13.56	13.6	No HHS
SC (Field)	Coal-Related	3870.7	3997.3	3997.3	3997	No HHS
SC (Laboratory)	Coal-Related	3757	3857	3860	3860	No HHS
Selenium	Coal-Related	0.005	0.005	0.004764	0.01	0.05
Silica	Coal-Related	22.3	23.24	23.24	23.3	No HHS
Silver	Coal-Related	0.01	0.0134	0.0134	0.019	100
Sodium	Coal-Related	369	396	396	396	No HHS
Strontium	Coal-Related	13.248	14.071	14.071	14.071	4
Sulfate	Coal-Related	2080	2152	2152	2150	No HHS
TDS	Coal-Related	3330	3440.5	3441.85	3445	No HHS
Thallium	Coal-Related	0.0013	0.005	0.0025	0.0003	0.002
Tin	Coal-Related	0.745	1.7	1.653	1.7	No HHS
Titanium	Coal-Related	0.0264	0.0366	0.0366	0.035	No HHS
Vanadium	Coal-Related	1	1	0.5	1	No HHS
Zinc	Coal-Related	0.73	0.8	0.8	0.79	2
Zirconium	Coal-Related	0.055	0.1	0.05	0.03	No HHS

🟧	BSL = max non-detect	🟦	BSL < 90th percentile
🟨	Failed BSL rules (see Section 5.1)		DL = Detection Limit

Note: All units are mg/L except SC which are µmhos/cm and pH which are standard units.

Note: The methodology for the 90th percentile and the DL, ½ DL, and Gehan BSLs is explained in section 5.0. Shading indicates potential influence from non-detect values. For details regarding shading criteria, see Section 5.1.

Table 8 continued

Analyte	Stratigraphic Unit	90th Percentile	BSL (DL)	BSL (1/2 DL)	BSL (Gehan)	Circular DEQ-7 Human Health Standards (HHS)
Aluminum	SubMcKay	0.2	0.3	0.3	0.3	No HHS
Ammonia	SubMcKay	2.72	3.54	3.54	3.54	No HHS
Antimony	SubMcKay	0.15	0.15	0.075	0.15	6
Arsenic	SubMcKay	0.3	0.3	0.15	0.005	0.01
Barium	SubMcKay	0.2	0.2	0.1	0.09	1
Beryllium	SubMcKay	0.003	0.003	0.0015	0.0002	0.004
Boron	SubMcKay	1.2	1.2	1.2	1.2	No HHS
Bromide	SubMcKay	5	5	2.5	5	No HHS
Cadmium	SubMcKay	0.005	0.006	0.006	0.003	0.005
Calcium	SubMcKay	298	303	303	303	No HHS
Chloride	SubMcKay	22	23	23	23	No HHS
Chromium	SubMcKay	0.03	0.03	0.015	0.1	0.1
Cobalt	SubMcKay	0.02	0.02	0.01	0.00066	No HHS
Copper	SubMcKay	0.02	0.02	0.01	0.05	1.3
Fluoride	SubMcKay	2.1	2.25	2.181	2.11	4
Iron	SubMcKay	2.41	2.543	2.546	2.56	No HHS
Lead	SubMcKay	0.02	0.02	0.02	0.01	0.015
Lithium	SubMcKay					No HHS
Magnesium	SubMcKay	261.4	271	271	271	No HHS
Manganese	SubMcKay	0.23	0.257	0.257	0.26	No HHS
Mercury	SubMcKay	0.001	0.001	0.0005	0.001	0.002
Molybdenum	SubMcKay	0.04	0.04	0.02	0.004	No HHS
Nickel	SubMcKay	0.03	0.03	0.015	0.03	0.1
Nitrate	SubMcKay	0.818	0.877	0.877	0.88	10
Nitrite	SubMcKay	0.05	0.05	0.025	0.05	1
Nitrite + Nitrate	SubMcKay	0.623	0.7	0.7	0.7	10
Orthophosphate	SubMcKay	0.1	0.12	0.12	0.1	No HHS
pH (Field)	SubMcKay	8.1	8.2	8.2	8.2	No HHS
pH (Laboratory)	SubMcKay	8.2	8.266	8.27	8.27	No HHS
Phosphate	SubMcKay	3.485	5.94	5.94	6	No HHS
Phosphorus	SubMcKay					No HHS
Potassium	SubMcKay	16	16	16	16	No HHS
SC (Field)	SubMcKay	4380	4456	4460	4469	No HHS
SC (Laboratory)	SubMcKay	4470	4540	4540	4540	No HHS
Selenium	SubMcKay	0.005	0.005	0.0025	0.005	0.05
Silica	SubMcKay	16.93	18.1	18.1	18.1	No HHS
Silver	SubMcKay	0.03	0.03	0.015	0.03	100
Sodium	SubMcKay	922.1	943	943.1	943	No HHS
Strontium	SubMcKay	4.931	5.054	5.054	5.06	4
Sulfate	SubMcKay	2163	2190	2190	2190	No HHS
TDS	SubMcKay	3640	3670	3670	3670	No HHS
Thallium	SubMcKay	0.5	0.5	0.25	0.0003	0.002
Tin	SubMcKay	0.03	0.03	0.0255	0.03	No HHS
Titanium	SubMcKay	0.0112	0.015	0.0188	0.012	No HHS
Vanadium	SubMcKay	0.2	0.2	0.1	1	No HHS
Zinc	SubMcKay	0.623	0.69	0.69	0.69	2
Zirconium	SubMcKay					No HHS

🟧	BSL = max non-detect	🟦	BSL < 90th percentile
🟨	Failed BSL rules (see Section 5.1)		DL = Detection Limit

Note: All units are mg/L except SC which are µmhos/cm and pH which are standard units.
Note: The methodology for the 90th percentile and the DL, ½ DL, and Gehan BSLs is explained in section 5.0.
Shading indicates potential influence from non-detect values. For details regarding shading criteria, see Section 5.1.

Table 9. Surface Water Data and Analysis: Summary Statistics, 90th Percentiles, and BSLs

					Non-Detects		Detects					
Analyte	Fraction	Number of Sites	Total Number of Samples	Detect Freq. (%)	Number of Samples	Range	Number of Samples	Range	Median	Mean	90th Percentile	BSL
Aluminum	Total	4	50	98	1	0.03-0.03	49	0.0074-309	1	13.0321	34.71	42.1
Ammonia	Total	3	17	35.3	11	0.02-0.05	6	0.06-124	0.2225	20.838	0.3538	124
Arsenic	Total	3	16	100	0		16	0.00095-0.056	0.001295	0.0058	0.009735	0.056
Barium	Total	1	1	100	0		1	0.62-0.62	0.62	0.62		
Beryllium	Total	1	5	0	5	2e-04-0.002	0					
Boron	Total	4	46	67.4	15	0.1-0.2	31	0.0858-1.08	0.41	0.4306	0.67	0.88
Bromide	Total	1	6	33.3	4	0.5-1	2	1-2.6	1.8	1.8		
Cadmium	Total	4	47	29.8	33	3e-05-0.005	14	1e-04-0.004	0.001	0.0013	0.005	0.005
Calcium	Total	0	0		0		0					
Chloride	Total	0	0		0		0					
Chromium	Total	4	42	54.8	19	5e-04-0.02	23	0-0.41	0.01	0.0351	0.05	0.062
Cobalt	Total	1	1	100	0		1	0.0058-0.0058	0.0058	0.0058		
Copper	Total	4	51	64.7	18	5e-04-0.02	33	1.56e-06-0.86	0.02	0.0656	0.09	0.21
Fluoride	Total	4	39	79.5	8	0.1-1	31	0.04-0.3	0.13	0.1506	0.258	0.44
Iron	Total	4	52	100	0		52	0.088-344	1.14	15.8319	39.23	67.15
Lead	Total	4	49	53.1	23	1e-04-0.02	26	0-0.24	0.02165	0.0423	0.062	0.13
Lithium	Total	1	1	100	0		1	0.14-0.14	0.14	0.14		
Magnesium	Total	0	0		0		0					
Manganese	Total	3	26	100	0		26	0.028-5.08	0.4	0.8477	2.04	3.68
Mercury	Total	4	46	15.2	39	5e-05-0.001	7	2e-04-0.001	0.001	0.0007	0.001	0.001
Molybdenum	Total	1	1	0	1	0.01-0.01	0					
Nickel	Total	3	16	75	4	0.002-0.002	12	0-0.064	0.00251	0.0097	0.01735	0.064
Nitrite + Nitrate	Total	1	8	100	0		8	0.01-0.3	0.05	0.10125		
Orthophosphate	Total	3	36	91.7	3	0.02-0.02	33	0.0051-2.02	0.13	0.2228	0.41	0.62
pH (Field)	No Measure	3	54	100	0		54	7-8.72	7.67	7.6115	7.94	8.072
pH (Lab)	No Measure	4	55	100	0		55	0.5-8.3	7.7	7.5056	8.186	8.206
Phosphate	Total	2	11	100	0		11	0.017-0.286	0.033	0.0943	0.21	0.286
Phosphorus	Total	1	3	100	0		3	0.017-0.9	0.02	0.3123		
Potassium	Total	0	0		0		0					
SC (Field)	No Measure	3	59	100	0		59	59-7160	4310	3848.2542	5522	5747.4
SC (Lab)	No Measure	4	50	100	0		50	68-5890	981	1859.6	4184	5560

🟨 Failed BSL rules (see Section 5.1) 🟧 BSL = max non-detect 🟦 BSL < 90th percentile

Notes: All units are mg/L, except SC which is µmhos/cm and pH which is standard units. BSL values in non-shaded cells are deemed the most reliable, whereas shading indicates potential influence from non-detect values. For details regarding shading criteria, see Section 5.1.

Table 9 continued

					Non-Detects		Detects					
Analyte	Fraction	Number of Sites	Total Number of Samples	Detect Freq. (%)	Number of Samples	Range	Number of Samples	Range	Median	Mean	90th Percentile	BSL
Selenium	Total	4	53	32.1	36	5e-04-0.005	17	7e-07-0.01	0.004	0.0044	0.005	0.01
Sodium	Total	0	0		0		0					
Strontium	Total	1	5	100	0		5	6.23-11.8	7.95	8.762		
Sulfate	Total	0	0		0		0					
TDS	Total	0	0		0		0					
Thallium	Total	1	5	20	4	3e-04-0.001	1	6e-04-6e-04	0.0006	0.0006		
Vanadium	Total	4	49	40.8	29	1e-04-1	20	1e-06-0.18	0.065	0.0553	1	1
Zinc	Total	4	50	76	12	0.005-0.01	38	7.36e-06-0.99	0.065	0.1566	0.302	0.64
Zirconium	Total	1	1	0	1	0.05-0.05	0					
Aluminum	Dissolved	4	48	70.8	14	0.004-0.1	34	1.68e-05-12	0.1	0.7345	0.43	0.7
Ammonia	Dissolved	0	0		0		0					
Arsenic	Dissolved	3	14	100	0		14	7.5e-07-0.004	0.001	0.0013	0.00221	0.004
Barium	Dissolved	1	1	100	0		1	0.52-0.52	0.52	0.52		
Beryllium	Dissolved	1	3	0	3	2e-04-0.002	0					
Boron	Dissolved	4	42	81	8	0.1-0.1	34	0.0771-1.2	0.4	0.4443	0.78	0.99
Bromide	Dissolved	0	0		0		0					
Cadmium	Dissolved	4	45	31.1	31	8e-05-0.005	14	0-0.004	0.001	0.0009	0.005	0.005
Calcium	Dissolved	4	56	100	0		56	3-396	46.45	126.0161	310	351.5
Chloride	Dissolved	3	47	91.5	4	1-1	43	1-228	4	36.81	138.4	152
Chromium	Dissolved	4	42	33.3	28	5e-04-0.02	14	0.001-0.05	0.01	0.0108	0.02	0.02
Cobalt	Dissolved	1	1	100	0		1	0.0041-0.0041	0.0041	0.0041		
Copper	Dissolved	4	48	50	24	5e-04-0.02	24	1.35e-06-0.1	0.01	0.0159	0.02	0.03
Fluoride	Dissolved	2	9	77.8	2	0.1-0.1	7	0.09-0.41	0.2	0.2466		
Iron	Dissolved	4	50	86	7	0.05-0.1	43	1e-05-14.2	0.12	1.3129	1.712	11.6
Lead	Dissolved	4	47	29.8	33	1e-04-0.02	14	2.34e-07-0.02	0.01	0.0091	0.02	0.02
Lithium	Dissolved	1	1	100	0		1	0.12-0.12	0.12	0.12		
Magnesium	Dissolved	4	56	98.2	1	1-1	55	1-586	19	153.5018	399	476.5
Manganese	Dissolved	4	49	69.4	15	0.005-0.02	34	0.01-2.6	0.1695	0.3221	0.4768	1.07
Mercury	Dissolved	4	42	16.7	35	5e-05-0.001	7	2e-04-0.001	0.001	0.0007	0.001	0.001
Molybdenum	Dissolved	1	1	0	1	0.01-0.01	0					
Nickel	Dissolved	3	15	80	3	0.002-0.002	12	9e-04-0.012	0.002135	0.0037	0.00904	0.012

🟨 Failed BSL rules (see Section 5.1) 🟧 BSL = max non-detect 🟦 BSL < 90th percentile

Notes: All units are mg/L, except SC which is µmhos/cm and pH which is standard units. BSL values in non-shaded cells are deemed the most reliable, whereas shading indicates potential influence from non-detect values. For details regarding shading criteria, see Section 5.1.

Table 9 continued

					Non-Detects		Detects					
Analyte	**Fraction**	**Number of Sites**	**Total Number of Samples**	**Detect Freq. (%)**	**Number of Samples**	**Range**	**Number of Samples**	**Range**	**Median**	**Mean**	**90th Percentile**	**BSL**
Nitrite + Nitrate	Dissolved	0	0		0		0					
Orthophosphate	Dissolved	2	4	0	4	0.02-0.02	0					
pH (Field)	Dissolved	0	0		0		0					
pH (Lab)	Dissolved	0	0		0		0					
Phosphate	Dissolved	0	0		0		0					
Phosphorus	Dissolved	0	0		0		0					
Potassium	Dissolved	4	56	100	0		56	1-49	7	9.7375	16.9	19.95
SC (Field)	Dissolved	0	0		0		0					
SC (Lab)	Dissolved	0	0		0		0					
Selenium	Dissolved	4	51	35.3	33	5e-04-0.005	18	0-0.01	0.00445	0.0045	0.005	0.01
Sodium	Dissolved	4	56	91.1	5	1-1	51	1-348	29.7	91.8392	232.5	247.5
Strontium	Dissolved	1	3	100	0		3	6.33-9.72	7.53	7.86		
Sulfate	Dissolved	3	47	100	0		47	2-2260	49	564.6809	1924	2090
TDS	Dissolved	3	62	100	0		62	0-4020	175.5	733.0323	2688	3420
Thallium	Dissolved	1	3	0	3	3e-04-5e-04	0					
Vanadium	Dissolved	4	47	40.4	28	1e-04-1	19	9.35e-07-0.1	0.05	0.0449	1	1
Zinc	Dissolved	4	48	52.1	23	0.005-0.02	25	9e-04-0.34	0.02	0.0458	0.063	0.08
Zirconium	Dissolved	1	1	0	1	0.05-0.05	0					

🟨 Failed BSL rules (see Section 5.1) 🟧 BSL = max non-detect 🟦 BSL < 90th percentile

Notes: All units are mg/L, except SC which is µmhos/cm and pH which is standard units. BSL values in non-shaded cells are deemed the most reliable, whereas shading indicates potential influence from non-detect values. For details regarding shading criteria, see Section 5.1.

Table 10. Surface Water BSL Comparisons

Analyte	Fraction	90th Percentile	BSL (DL)	BSL (1/2 DL)	BSL (Gehan)	Circular DEQ-7 Human Health Standards	Circular DEQ-7 Aquatic Life Standards Acute	Chronic
Aluminum	Total	34.71	42.8	42.1	42.1			
Ammonia	Total	0.3538	124	124	124			
Arsenic	Total	0.009735	0.056	0.056	0.056	0.01	0.34	0.15
Barium	Total					1		
Beryllium	Total					0.004		
Boron	Total	0.67	0.695	0.88	0.88			
Bromide	Total							
Cadmium	Total	0.005	0.005	0.0025	0.005	0.005	0.00873	0.00239
Calcium	Total							
Chloride	Total							
Chromium	Total	0.05	0.0609	0.077	0.062	0.1	5.61	0.268
Cobalt	Total							
Copper	Total	0.09	0.21	0.21	0.21	1.3	0.0517	0.0305
Fluoride	Total	0.258	0.6	0.3	0.44			
Iron	Total	39.23	67.15	67.15	67.15			1
Lead	Total	0.062	0.13	0.13	0.13	0.015	0.477	0.0186
Lithium	Total							
Magnesium	Total							
Manganese	Total	2.04	3.68	3.68	3.68			
Mercury	Total	0.001		0.001	0.001	0.00005	0.0017	0.00091
Molybdenum	Total							
Nickel	Total	0.01735	0.064	0.064	0.064	0.1	1.52	0.168
Nitrite + Nitrate	Total					10		
Orthophosphate	Total	0.41	0.62	0.62	0.62			
pH (Field)	No Measure	7.94	7.961	8.072	8.072			
pH (Lab)	No Measure	8.186	8.206	8.206	8.206			
Phosphate	Total	0.21	0.286	0.286	0.286			
Phosphorus	Total							
Potassium	Total							
SC (Field)	No Measure	5522	5840	5747.4	5747.4			
SC (Lab)	No Measure	4184	5560	5560	5560			
Selenium	Total	0.005		0.01	0.01	0.05	0.02	0.005
Sodium	Total							
Strontium	Total					4		
Sulfate	Total							
TDS	Total							
Thallium	Total					0.00024		
Vanadium	Total	1	1	0.5	1			
Zinc	Total	0.302	0.64	0.64	0.64	2	0.387	0.387
Zirconium	Total							

🟧 BSL = max non-detect 🟦 BSL < 90th percentile

🟨 Failed BSL rules (see Section 5.1) DL = Detection Limit

⬜ Values adjusted to the maximum hardness of 400 mg/L

Notes: All units are mg/L, except SC which is µmhos/cm and pH which is standard units. The methodology for the 90th percentile and the DL, ½ DL, and Gehan BSLs is explained in section 5.0. Non-gray shading indicates potential influence from non-detect values. For details regarding shading criteria, see Section 5.1.

Table 10 continued

Analyte	Fraction	90th Percentile	BSL (DL)	BSL (1/2 DL)	BSL (Gehan)	Circular DEQ-7 Human Health Standards	Circular DEQ-7 Aquatic Life Standards Chronic	Acute
Aluminum	Dissolved	0.43	0.7	0.7	0.7	Not Applicable.	0.75	0.087
Ammonia	Dissolved							
Arsenic	Dissolved	0.00221	0.004	0.004	0.004			
Barium	Dissolved							
Beryllium	Dissolved							
Boron	Dissolved	0.78	0.971	0.99	0.99			
Bromide	Dissolved							
Cadmium	Dissolved	0.005	0.005	0.0025	0.005			
Calcium	Dissolved	310	351.5	351.5	351.5			
Chloride	Dissolved	138.4	157.2	152	152			
Chromium	Dissolved	0.02		0.0217	0.02			
Cobalt	Dissolved							
Copper	Dissolved	0.02	0.0137	0.03	0.03			
Fluoride	Dissolved							
Iron	Dissolved	1.712	11.81	11.6	11.6			
Lead	Dissolved	0.02	0.0104	0.011	0.02			
Lithium	Dissolved							
Magnesium	Dissolved	399	476.5	476.5	476.5			
Manganese	Dissolved	0.4768	1.07	1.07	1.07			
Mercury	Dissolved	0.001		0.001	0.001			
Molybdenum	Dissolved							
Nickel	Dissolved	0.00904	0.012	0.012	0.012			
Nitrite + Nitrate	Dissolved							
Orthophosphate	Dissolved							
pH (Field)	Dissolved							
pH (Lab)	Dissolved							
Phosphate	Dissolved							
Phosphorus	Dissolved							
Potassium	Dissolved	16.9	19.95	19.95	19.95			
SC (Field)	Dissolved							
SC (Lab)	Dissolved							
Selenium	Dissolved	0.005		0.01	0.01			
Sodium	Dissolved	232.5	247.5	247.5	247.5			
Strontium	Dissolved							
Sulfate	Dissolved	1924	2090	2090	2090			
TDS	Dissolved	2688	3420	3420	3420			
Thallium	Dissolved							
Vanadium	Dissolved	1	1	0.5	1			
Zinc	Dissolved	0.063	0.08	0.08	0.08			
Zirconium	Dissolved							

🟧	BSL = max non-detect	🟦	BSL < 90th percentile
🟨	Failed BSL rules (see Section 5.1)		DL = Detection Limit

Notes: All units are mg/L, except SC which is µmhos/cm and pH which is standard units. The methodology for the 90th percentile and the DL, ½ DL, and Gehan BSLs is explained in section 5.0. Shading indicates potential influence from non-detect values. For details regarding shading criteria, see Section 5.1.

Appendix A The Random Forests Classification Algorithm

A.1 Decision trees

A.1.1 Overview and terminology

An explanation of Random Forests (RF) analysis must start with the *decision trees* that comprise them. Decision trees are a simple but powerful tool for performing statistical classification[1]. Like other classification methods, the goal of decision tree analysis is to model a categorical response as a function of predictor variables. Decision trees are particularly flexible in the patterns they can identify, requiring no assumptions about the shape of predictor-response relationships. They also benefit from an ability to efficiently handle large multivariate datasets.

In general terms, the decision tree algorithm proceeds by repeatedly splitting the dataset into two groups based on predictor variables. At each branching point (*node*), the data may be divided at any location on any predictor variable; the algorithm considers all possibilities and chooses the one that provides the best separation between the resulting groups (*children*), where "best" may be defined by various criteria. This process proceeds until the final groups (*leaves*) contain observations of a single class. As discussed below, the RF algorithm essentially consists of producing many such trees for a single problem, and averaging the results to obtain a robust solution.

A.1.2 Decision tree learning

In this analysis the criterion for splitting decision tree nodes is based on the Gini Impurity Index (G) of the parent and potential child nodes. If the node under consideration consists of n observations in P classes, where each class corresponds to a value of the response variable, and n_p is the number of observations in the pth class, then the Gini Index G for that node is defined as:

$$G = \sum_{p=1}^{P} \frac{n_p}{n}\left(1 - \frac{n_p}{n}\right). \tag{1}$$

Based on this definition, G is minimized (and equal to 0) when all observations in the node are of the same class, and increases when the observations in the node are spread more evenly among the different classes. Other splitting criteria may be used in decision tree classification (e.g. statistical permutation tests), but they all represent a measure differentiating pure from well-mixed classes.

The Gini-based splitting process begins by computing an initial Gini Index for the *parent* node (that is, the node to be split). Then, for all predictor variables available, every unique binary

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[1] Decision trees and Random Forests can also be used for regression problems when the response variable is continuous. However, in the use case described herein the response of interest is categorical; for simplicity, discussion is therefore restricted to classification problems throughout this appendix.

partition is considered—that is, splitting between the first and second lowest values of the variable, then between the second and third lowest values, etc. For each proposed split, samples with values below the split value are assigned to one new child node, and samples above the split value to a second child node. The Gini Index for each child node is then computed, and the final Gini score for the proposed split is the average of these two values, weighted by the number of observations in each node. After considering all possible variable and value splits, the one that makes the greatest reduction in the Gini Index is retained. The splitting process is then repeated until all nodes contain samples of a single class (and thus total Gini Index is 0).

A.2 Random Forests

A.2.1 Motivation of the Random Forests approach

While decision trees are very effective at modeling complex data relationships, they have two notable drawbacks. First, individual decision trees may have a tendency to be overfit—in other words, they conform too closely to the particular samples represented in the training dataset. While this makes their fit (in terms of R^2 or similar metrics) very good, it renders them less accurate at classifying new samples. In addition, decision trees on their own can only be used in classification problems; they cannot be applied to clustering problems like the one addressed in this study, where the class identities of training samples are unknown.

RF is an extension of the decision tree framework that addresses both of these limitations. Put simply, RF produces a collection of numerous decision trees (i.e., a forest), each based on a different random permutation of the training data. Results from all trees in the collection are averaged to make predictions, rather than allowing any one tree to dictate the analysis. The randomness in the procedure reduces overfitting, leading to more robust predictions. In addition, the RF algorithm provides a powerful measure of relatedness or *proximity* among samples. As discussed below, this last feature allows RF to be used in clustering problems.

This study employs the RF algorithm first introduced by Breiman (2001), which is the most widely used variant today. In his foundational introduction of the method, Breiman showed that it has accuracy at least as good as other ensemble decision tree algorithms, is robust to outliers and noise, and is computationally efficient compared to alternatives. The basic algorithm is implemented using the *randomForest* R package (Liaw *et al.* 2015), and the RF clustering approach is based on recommendations of Shi and Horvath (2006).

A.2.2 The Random Forests algorithm

Consider a dataset of N training samples consisting of the $N \times 1$ response vector of categorical class labels $\boldsymbol{y}$, along with K predictor variables contained in the $N \times K$ matrix $\boldsymbol{X}$. To create a model for predicting $\boldsymbol{y}$ from $\boldsymbol{X}$, the RF algorithm first creates M trees (where M is typically on the order of 10^3–10^4), with randomness injected among them at two different levels. First, each tree is constructed from a random draw of N observations selected with replacement from the training dataset. That is, for each tree a vector $\boldsymbol{\varphi}$ of N indices is first drawn randomly (with replacement) from the integers [1, N]. Then, the responses and predictors to be fit by the tree, $\tilde{\boldsymbol{y}}$ and $\tilde{\boldsymbol{X}}$ (respectively), are defined as:

$$\tilde{y} = \left[y_{\varphi_1}, y_{\varphi_2}, \dots y_{\varphi_N}\right] \tag{2}$$

$$\widetilde{\boldsymbol{X}} = \begin{bmatrix} x_{\varphi_1,1} & \cdots & x_{\varphi_1,K} \\ \vdots & \ddots & \vdots \\ x_{\varphi_N,1} & \cdots & x_{\varphi_N,K} \end{bmatrix} \quad (3$$

This scheme allows individual training samples to contribute more or less to model fit in each of the *M* random decision trees. This property prevents unusual samples or spurious relationships among a few particular samples from dominating the final outcome of the model.

The second random element in the Breiman RF algorithm enters at the node level. Unlike the single-tree analysis described above in Section A1.2, individual trees in an RF analysis are not formed by exhaustively searching for the best split at every node. Instead, for each split the algorithm considers K' predictor variables randomly selected from the *K* available predictors in $\boldsymbol{X}$ (typically, $K' \sim \sqrt{K}$), and chooses the best possible split from among these *K'* predictors. The result of this additional randomization is that different variables are considered in each tree and each node, which allows for a wider range of influences from each variable on the final model. For example, early splits on the most important predictors might dominate trees built with the full $\boldsymbol{X}$, consistently overwhelming substantial but comparatively subtle effects of one or more other predictors. By randomly omitting the dominant predictors from some splits, these effects will be evident in at least some of the trees in the forest.

A.2.3 Products of the Random Forests algorithm

A.2.3.1 Predictions

Once an RF model has been constructed, it can be used to make predictions of class membership for samples from the training data or other datasets. Given an observed sample with predictors $\boldsymbol{x}^*$, the class of the sample y^* (which may or may not actually be known) can be predicted by any individual decision tree by passing the sample through every split in the tree according to the values in $\boldsymbol{x}^*$. By following the splitting rules in the tree, the new sample will end up in the leaf containing the sample from the training data that it is most similar to. The class of that sample is thus the obvious prediction for the new sample's predicted y^*. When predicting from an RF model, the most common approach is to assign y^* to the most frequently predicted class across all trees in the forest (i.e. a "majority wins" vote for the predicted class). Alternatively, the proportion of votes for each class can be retained, and interpreted as probabilities of class membership that reflect uncertainty in the model.

RF predictions are clearly useful when data are available with known values for predictor variables, but whose class membership is unknown. Such scenarios arise when attempting to extrapolate or forecast in space or time, or when predictors are easy to measure but class membership is difficult to ascertain. In addition, predictions on the training set itself offer insights into the accuracy of RF classification, by comparing the predicted and known classes of observations in the training data to obtain various error metrics (e.g. percentage of samples classified incorrectly). This analysis can be conducted using the complete training dataset to produce a classical error estimate. Alternatively, predictions can be made for only those samples that were omitted from each tree due to randomization[2], leading to an *out-of-bag* (OOB) error rate akin to cross-validation in other analyses.

A.2.3.2 Proximity

Another important output of an RF analysis—especially in the context of unsupervised learning problems—is the proximity matrix, which represents the similarity among observations in the training data. To construct this matrix, an $N \times N$ matrix $\boldsymbol{Q}$ is first initialized with zeros in every entry. After building each tree in the forest, any training sample used in constructing the tree will already have been placed into a leaf node; for the purpose of calculating $\boldsymbol{Q}$, the OOB samples are sorted through the tree as well, as if they were being predicted (*as described above*). Then, for each pair of samples the entry q_{ij} in $\boldsymbol{Q}$ is incremented by 1 if the i^{th} and j^{th} sample have been placed into the same leaf node. Finally, at the end of the analysis, the entire matrix is divided by the number of trees in the forest. In other words,

$$q_{ij} = \frac{1}{M} \sum_{m=1}^{M} I_{sameleaf}(i, j) \tag{4}$$

where $I_{sameleaf}(i, j)$ is an indicator function returning 1 if observations i and j share the same leaf node in tree m, and 0 otherwise.

As indicated, at the end of the RF algorithm, $\boldsymbol{Q}$ contains the proportion of trees in which each pair of observations shared a leaf node during the analysis. This matrix represents similarity among the samples that automatically takes into account the relationships among variables that have been identified by the RF model. Thus, this approach offers a powerful means to obtain a measure of proximity among samples that—like RF itself—reflects complex and nonlinear data structure, is robust to skewed or otherwise unusual data distributions, and has no requirements for the scale of the predictor variables.

A.3 Imputing missing data using Random Forests

Most clustering methods cannot include samples with missing values. Thus, in a real dataset where values are missing, typically entire rows and/or columns must be removed until all missing values have been omitted from the analysis. The clustering approach based on RF proximity described herein is no exception to this rule. However, the RF framework includes an approach for filling in or *imputing* missing data. This analysis employs a method introduced by Stekhoven and Buehlmann (2012) and implemented in the R package *missForest*. The approach has proven to be quite accurate in tests on real datasets with known values artificially removed.

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[2] The distribution for the number of occurrences of each training sample in a single randomly constructed tree is *Binomial* (N, $1/N$). The probability of being omitted entirely from a given tree converges fairly rapidly to $e^{-1} \sim 0.37$ as N increases. Thus, in any particular tree in a Random Forests analysis approximately one third of samples are naturally left out by the randomization procedure.

Thus the potential inaccuracies from imputation are considered preferable to the guaranteed loss of information that results when missing values are simply omitted.

The first RF imputation algorithm was introduced by Breiman (2001) along with the RF method itself. In this approach, missing values in each $\boldsymbol{x}_{\cdot k}$ (i.e., the k^{th} column of $\boldsymbol{X}$) are filled in with an initial guess of the median or mode of $\boldsymbol{x}_{\cdot k}$ (for continuous or categorical $\boldsymbol{x}_{\cdot k}$, respectively). RF analysis is conducted using the completed $\boldsymbol{X}$, and then each filled-in (i.e. initially missing) entry is replaced by the proximity-weighted mean of all non-missing values for that variable. That is, the imputed value of a particular missing entry x_{ik} in $\boldsymbol{X}$ is updated to:

$$x_{ik} = \frac{\sum_{j \in j_{obs,k}} q_{ij} x_{jk}}{\sum_{j \in j_{obs,k}} q_{ij}} \tag{5}$$

where $j_{obs,k}$ is the set of indices of all non-missing values of $\boldsymbol{x}_{\cdot k}$, and the weights q_{ij} are entries in the proximity matrix $\boldsymbol{Q}$ (*see above*) resulting from the RF analysis. Thus, the samples that are most similar to $\boldsymbol{x}_{i\cdot}$ (i.e., the i^{th} row of $\boldsymbol{X}$), contribute the most to the imputed value for missing x_{ik}. After all imputed values have been thus updated, a new RF is constructed and the imputation process repeated. These iterations are repeated a user-specified number of times, and in practice tend towards stable imputed values within ~5 iterations.

A limitation of this approach is that it requires a response variable **y** with no missing values. This is problematic in unsupervised learning problems, which by definition have no response variable. This study therefore implements an updated variant introduced by Stekhoven (2013). The method again begins by initially filling in missing values for any variable with the median of the non-missing entries for that variable. Then, over multiple iterations, the imputed values for each variable are updated based on an RF model that attempts to predict those values from the other variables in the dataset. Specifically, in each iteration the following steps are performed:

1. Select a variable in $\boldsymbol{X}$ to update. Denote that variable $\boldsymbol{x}^*$, and denote the matrix of all other variables as $\boldsymbol{X}^*$.
2. Define the vector $\boldsymbol{\varphi}$ as the set of all indices to *non-imputed* values in $\boldsymbol{x}^*$ (i.e., the values that were not missing in the original dataset), and define the complementary vector $\boldsymbol{\varphi'}$ as indices to the *imputed* values in $\boldsymbol{x}^*$.
3. Define a training dataset in which the response variable is the set of non-imputed values in $\boldsymbol{x}^*$, denoted $\boldsymbol{x}^*_{\boldsymbol{\varphi}}$. The predictors are the corresponding rows of $\boldsymbol{X}^*$, denoted $\boldsymbol{X}^*_{\boldsymbol{\varphi}\cdot}$. Note that $\boldsymbol{X}^*_{\boldsymbol{\varphi}\cdot}$ may contain imputed values, but $\boldsymbol{x}^*_{\boldsymbol{\varphi}}$ consists of actually observed data by definition.
4. Use RF to construct a model for the training dataset, i.e., an RF model that uses $\boldsymbol{X}^*_{\boldsymbol{\varphi}\cdot}$ to predict $\boldsymbol{x}^*_{\boldsymbol{\varphi}}$ in the training data. Since RF handles any combination of continuous and categorical data, no special treatment of any of the variables is necessary.
5. Use the fitted RF to predict $\boldsymbol{x}^*_{\boldsymbol{\varphi'}}$ (the originally missing values in $\boldsymbol{x}^*$) from $\boldsymbol{X}^*_{\boldsymbol{\varphi'}\cdot}$ (the corresponding rows in $\boldsymbol{X}^*$, which again may contain both observed and imputed data). These predictions become the new imputed values for $\boldsymbol{x}^*$.
6. Repeat steps 1–5 for all variables in $\boldsymbol{X}$. Variables are updated in order from greatest to least number of imputed (originally missing) values.

These iterations are repeated until the imputed values converge, as indicated by a stopping criterion based on the difference between imputed values from one iteration to the next.

A.4 Random Forests for unsupervised learning

A.4.1 Rationale and overview

As discussed above, the RF algorithm is designed to model known class labels as a function of predictors, i.e. problems of *supervised learning*. However, RF (and some other supervised learning techniques) may also be used for *unsupervised learning* (clustering) problems. To do this, synthetic data are constructed with specific properties based on real samples from the unlabeled data of interest. The real and synthetic data are labeled as such, and combined into a single dataset. The RF algorithm is then run on this combined dataset in attempt to classify real vs. synthetic data on the basis of available predictors. In effect, the synthetic data serve as a null hypothesis about the relationships among predictor variables in the real dataset. If these relationships are strong, then the real and synthetic data will be easily distinguishable and the attempt to classify them using RF will have high accuracy. The proximity matrix generated by the RF will reflect these relationships, which can then be fed into additional analyses, such as clustering.

A.4.2 Generating synthetic data to facilitate unsupervised learning with the Random Forests algorithm

In order to serve as a meaningful null hypothesis, the synthetic data should have a similar distribution as the real data, but lack the covariance structure that ultimately indicates which samples are most similar. Thus one reasonable approach for generating the synthetic data is to draw randomly and uniformly from the hyperrectangle that bounds all predictor variable values in the real dataset. However, Shi and Horvath (2006) obtained better results from the simpler approach of randomly drawing synthetic observations from independent marginal distributions of each observed predictor. Thus, this latter approach is followed here.

Specifically, to generate a synthetic dataset corresponding to N real samples with known values for K predictors (but unknown class labels), the first step is to draw an $N \times K$ matrix of indices $\boldsymbol{\Phi}$ randomly (with replacement) from the integers $[1, N]$. A synthetic data matrix $\widetilde{\boldsymbol{X}}$ may then be defined based on these indices and the $N \times K$ matrix $\boldsymbol{X}$ of real samples:

$$\widetilde{\boldsymbol{X}} = \begin{bmatrix} x_{\phi_{11},1} & \cdots & x_{\phi_{1K},K} \\ \vdots & \ddots & \vdots \\ x_{\phi_{N1},1} & \cdots & x_{\phi_{NK},K} \end{bmatrix} \tag{6}$$

Thus, as desired the synthetic and real data have the same marginal distributions (each $\widetilde{\boldsymbol{x}}_{\cdot k}$ has the same distribution as the corresponding $\boldsymbol{x}_{\cdot k}$ from which it was derived), but the former by definition will fail to capture any dependence structure among the real $\boldsymbol{x}_{\cdot k}$.

Finally, the complete dataset for RF analysis is constructed by appending the real and synthetic data into a $(2N) \times K$ predictor matrix $\boldsymbol{X}^*$, and generating a corresponding $(2N) \times 1$ class label vector $\boldsymbol{y}^*$:

$$\boldsymbol{X}' = \begin{bmatrix} \boldsymbol{X} \\ \widetilde{\boldsymbol{X}} \end{bmatrix} \tag{7}$$

$$\boldsymbol{y}' = [y_1 \;\; y_2 \;\; \dots \;\; y_{2N}] \tag{8}$$

$$y_i = \begin{cases} 1, i \leq N \text{ (i.e., } \boldsymbol{x}'_{i\cdot} \text{ is a real data row)} \\ 0, i > N \text{ (i.e., } \boldsymbol{x}'_{i\cdot} \text{ is a synthetic data row)} \end{cases} \tag{9}$$

Since the RF modeling of $\boldsymbol{y}'$ as a function of $\boldsymbol{X}'$ depends on randomly chosen values in $\widetilde{\boldsymbol{X}}$, unsupervised learning results will differ from one analysis to the next depending on the particular realization of $\widetilde{\boldsymbol{X}}$. To avoid spurious outcomes, it is therefore recommended to repeat the analysis for multiple forests, each with a newly randomized $\widetilde{\boldsymbol{X}}$. Predictions of class membership and proximities can then be averaged across the multiple forests, avoiding undue influence of any one synthetic dataset. Shi and Horvath (2006) found that analysis of ~10 forests was sufficient to give robust results.

A.5 Random Forests proximity as a distance metric

The basis of any clustering method is a distance matrix, which contains the distances between every pair of samples being clustered. Conceptually, the distance metric used in this context can be any quantity that represents how dissimilar observations are. The most common metric is the Euclidean distance. Continuing from above, in which the data being analyzed are contained in an *N* x *K* matrix $\boldsymbol{X}$, the Euclidean distance between samples $\boldsymbol{x}_{i\cdot}$and $\boldsymbol{x}_{j\cdot}$ (i.e., the i^{th} and j^{th} rows of $\boldsymbol{X}$) is defined as

$$d(\boldsymbol{x}_{i\cdot}, \boldsymbol{x}_{j\cdot}) = \sqrt{(x_{i1} - x_{j1})^2 + (x_{i2} - \boldsymbol{x}_{j2})^2 + \cdots + (x_{iK} - x_{jK})^2} \tag{10}$$

That is, Euclidean distance is the *K*-dimensional extension of Pythagoras' formula for physical distance measured in 2- or 3-dimensional space.

Euclidean distance is a common and intuitive metric on which to base cluster analysis, but it comes with one important caveat: it is not straightforward to compute when predictors include binary or factor data, or when they are measured on different scales. The former may be coded into numeric values, and the latter may be transformed in a variety of ways to normalize scale. However, these options require subjective choices that inevitably influence Euclidean distance calculations.

As an alternative to Euclidean distance, the RF proximity matrix $\boldsymbol{Q}$ can be converted to the dissimilarity matrix $\boldsymbol{Q'}$ by a simple transformation of each entry:

$$q'_{ij} = \sqrt{1 - q_{ij}} \tag{11}$$

This formulation[3] yields a matrix that meets all the criteria of a distance matrix—namely, all elements are nonnegative, and elements on the diagonal are equal to zero. Unlike other distance metrics, however, it inherits benefits of the RF approach including scale invariance, robustness to extreme values, and the ability to incorporate a mix of numerical and factor variables.

A.6 Clustering data by Partitioning Around Medoids

A.6.1 Overview and motivation

Mathematically, the RF dissimilarity matrix ***Q'*** described above is in fact a Euclidean distance matrix[4], which means that the simple and common k-means clustering method could be applied to it. However, this project implements the alternative Partitioning Around Medoids (PAM) approach. PAM is a variant of the k-medoids algorithm, and as suggested by the name it is conceptually similar to k-means, but more analogous to a statistical median than mean. In support of this analogy, the main advantage of PAM over k-means is that it is more robust to outliers, and thus should in general result in predictions (e.g., when assigning newly obtained samples to a background vs. non-background cluster) that are accurate more often. The drawback of PAM is that it relies on a computationally expensive algorithm, but it has been found to be tractable for this project.

The PAM algorithm creates clusters by seeking samples from a dataset that will serve as the central points, or *medoids*, for k distinct clusters. For any set of medoids, the remaining samples may be partitioned by adding them to whichever cluster they are nearest to, in terms of distance to the medoid. The distance metric can be any measure; this analysis uses the RF dissimilarity matrix ***Q'*** defined above. The goal of PAM is to identify clusters such that the total distance of all samples to their cluster's medoid is as small as possible.

A.6.2 Mathematical formulation

Formally, Kaufman and Rousseeuw (1987) defined the problem by letting $\boldsymbol{u}$ and $\boldsymbol{V}$ be binary variables such that:

$$u_i = \begin{cases} 1, u_i \text{ is a medoid} \\ 0, u_i \text{ is not a medoid} \end{cases} \tag{12}$$

---

[3] Some analysts omit the square root from the definition of elements in ***Q'*** (for example, the *randomForest* R package (Liaw *et al.* 2015) computes dissimilarity this way). It is unclear why this difference exists in the literature. This analysis uses the definition provided here, but in general it has very little effect on clustering outcomes (in this analysis, <0.5% of classifications change if the square root is omitted).

[4] This can be shown by demonstrating that ***Q*** is positive-semidefinite with entries in the range [0, 1] and diagonal elements equal to 1. For any such matrix, the transformation in Eqn. (**11**) yields a dissimilarity matrix that meets the definition of Euclidean (Gower & Legendre 1986).

$$v_{ij} = \begin{cases} 1, v_{ij} \text{ is assigned to the cluster with medoid } u_i \\ 0, v_{ij} \text{ is assigned to a different cluster} \end{cases} \tag{13}$$

Prescribing the rules:

$$\sum_i u_i = k \tag{14}$$

$$\sum_i v_{ij} = 1 \tag{15}$$

$$v_{ij} \leq u_i \tag{16}$$

In other words, there are exactly k clusters, each sample belongs to exactly one of them, and a sample's associated medoid can only be another sample that is in fact a medoid.

The goal is then simply to minimize the quantity

$$\sum_i \sum_j q'_{ij} \, v_{ij} \tag{17}$$

where q'_{ij} are entries in ***Q'*** representing the dissimilarity between samples *i* and *j*. This quantity represents the total dissimilarity for a given partitioning of the dataset.

A.6.3 The PAM algorithm for minimizing dissimilarity

For a given choice of *k* medoids, minimizing total dissimilarity is simply a matter of assigning each sample to the cluster whose medoid is least dissimilar to itself, which can be obtained directly from ***Q'***. Thus, the real computational challenge of the PAM algorithm is choosing the best set of medoids to use. In practice, this is achieved in two phases.

In the *build* phase of the PAM approach, initial guesses for the *k* medoids are made sequentially. The first medoid chosen is the one that minimizes the total dissimilarity between itself and all other samples. That is, letting i_1 denote the index of the sample selected as the first medoid, i_1 is chosen such that

$$\sum_j q'_{i_1 j} = \min_i \sum_j q'_{ij} \tag{18}$$

The second medoid is likewise chosen to minimize the sum of distances from each sample to the nearer of the two selected medoids, and so on until *k* medoids have been selected.

The *build* procedure is designed to find good initial medoid guesses, but it is unlikely to find the best set. Thus, in the second phase of the algorithm, called the *swap* phase, each medoid is considered in turn to assess whether it should be replaced by a different sample (i.e., set u_i for the currently selected medoid to 0, and set another u_i to 1 in its place). All possible swaps are considered, and the one that makes the greatest reduction in total dissimilarity is retained. The swap phase is repeated until there are no swaps for any medoid that would further reduce total dissimilarity.

A.6.4 Selecting the number of clusters

Finally, as with any cluster analysis, the choice of k is somewhat subjective. Various quantitative criteria may be used for selecting the number of clusters to use for any particular dataset, but none is universally considered a best practice and the different criteria may often lead to conflicting values for k. Moreover, an "automatic" method may suggest a number of clusters that is inappropriate for the problem at hand.

A preferable alternative approach is to select k based on *a priori* knowledge. In this project, for example, the goal of the clustering step is to separate two types of water samples—background vs. non-background. This separation provides a starting point from which expert site knowledge is used to define *baseline* and *non-baseline* groups, where the primary distinction between background and baseline is that background samples are unimpacted, while baseline samples are unimpacted *by SES operations*. (So samples taken upgradient of the site should be baseline, whether or not they exhibit background characteristics, while samples taken from wells known to be impacted should be non-baseline, even if they exhibit low metal concentrations.) While more than two clusters could have been chosen for the partitioning algorithm, the ultimate goal is two sets of samples, so partitioning into two clusters makes sense. Further, final assignments to baseline and non-baseline groups were based on expert judgement and site knowledge—all samples were reviewed to confirm or change the cluster assignment—so initiating the expert review process with more than two clusters would not change the final results for the baseline and non-baseline groups, but would make the process of arriving at those two groups more cumbersome.

Nonetheless, partitions into three and four clusters were developed and examined for exploratory purposes (*results not shown*). In most stratigraphic layers, a third cluster resulted in a "middle" cluster, where a relatively small portion of samples from each of the two clusters in a two-cluster partition moved to a third cluster that was between the original two. In a few stratigraphic layers, a third cluster essentially split one of the clusters from the two-cluster partition. Generally, the third cluster was not helpful in moving from background/non-background clusters to baseline/non-baseline groups since all three clusters still needed expert examination. Four clusters were more difficult to interpret relative to two- or three-cluster partitions, and again provided no particular advantage over the two-cluster partition as a starting point for expert review.

Appendix B Random Forests Example

The following example has been designed to illustrate the steps of the Random Forests (RF) clustering approach used in this investigation. The data used for this purpose were randomly generated to represent measurements of boron and calcium for samples from both impacted and unimpacted locations. The real data are measured on a much larger list of variables, and do not necessarily exhibit such clear separation between impacted and unimpacted samples. However, this simple example offers a clearer view of the RF clustering process than the real, and far more complicated, data could. The example data are illustrated in Figure **B-1**:

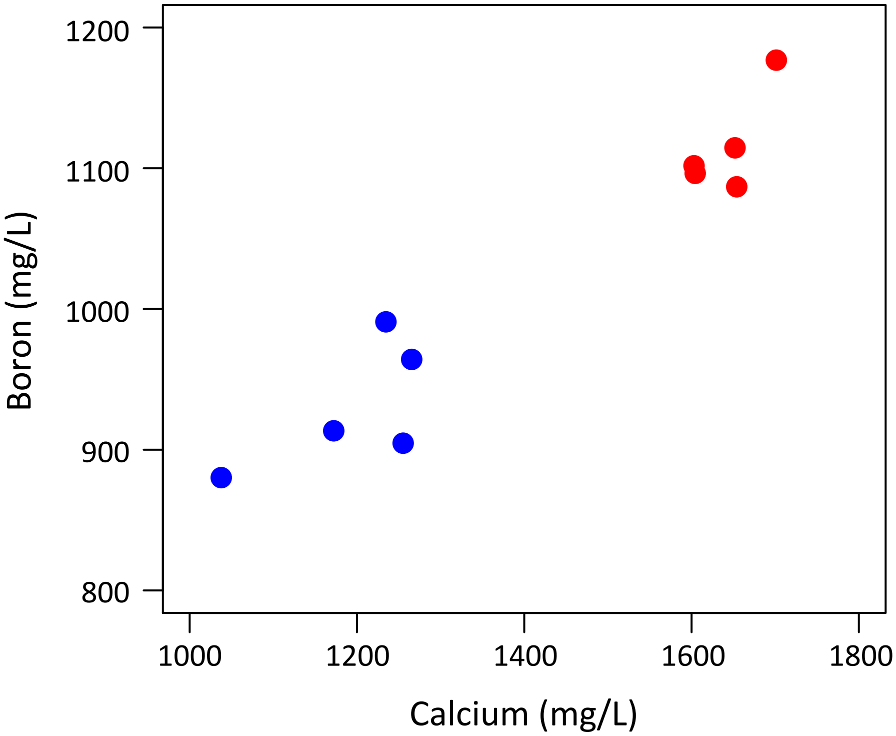

Figure B-1. Example dataset randomly generated to represent water samples from “impacted” (red) and “unimpacted” (blue) wells, measured for Boron and Calcium. These data were made up for the purpose of the illustration—results from this example should not be taken to imply anything about true values of Boron or Calcium in impacted versus unimpacted water samples.

Note that the samples have been color-coded based on the “true” grouping prescribed for the purpose of the example. However, the crux of the clustering problem in this study is that, in fact, the true impacted status of the samples is unknown. To reflect this, in subsequent figures the data are not distinguished by color.

The first step in the RF clustering algorithm is to generate a synthetic dataset by making random draws from the values of each variable in the real data[5]. An example is shown in Figure **B-2**.

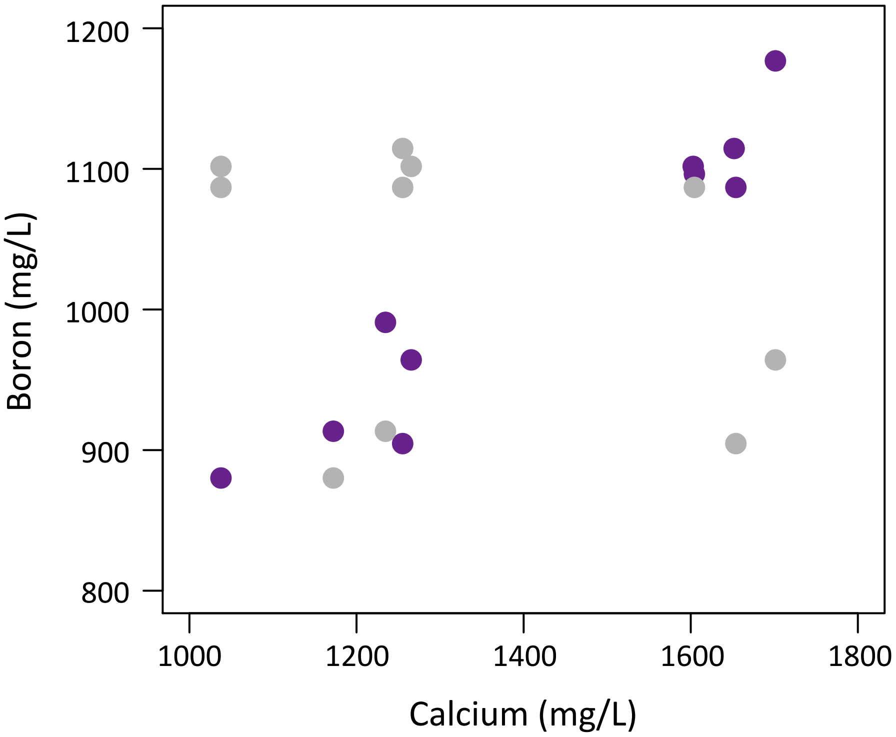

Figure B-2. The first step in the Random Forests clustering algorithm is to generate a synthetic dataset (grey), based on the real data of interest (purple). Note that the latter are the same data as in Fig. 1, recolored to reflect that the true impacted versus unimpacted status of the samples is unknown during a typical analysis.

As can be seen here, the RF clustering algorithm calls for generating the same number of synthetic samples as there are in the real dataset (in this case, 10). Because the synthetic data were drawn randomly from each variable *independently*, they do not exhibit the same correlation structure as the real data. In this example, values for Boron and Calcium are correlated in the real data—that is, high values for one variable tend to be associated with high values for the other, and vice versa. By contrast, the synthetic data are just as likely to have high values of one variable paired with low values of the other. Ultimately, it is this distinction—structure in the real data, versus none in the synthetic—that allows the RF analysis to "learn" about the nature of the real data.

The next step in the method is to construct an RF model that tries to separate the real and synthetic data. An RF is comprised of hundreds or thousands of decision trees, mathematical

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[5] In this appendix, the 10 data points shown in Fig. B-1 are considered the "real" data. While these data were in fact fabricated for this illustrative example, they represent real samples that might be collected from the field. Most importantly, they exhibit correlation structure among the measured variables (in this case, high values of Boron are associated with high values of Calcium, and vice versa), as would be typical for real field data. By contrast, the "synthetic" data generated as part of the RF clustering algorithm (grey dots in Fig. B-2) show no such relationship.

devices that attempt to classify a group of samples by splitting it repeatedly based on the values of measured variables. An example of one such tree is shown here:

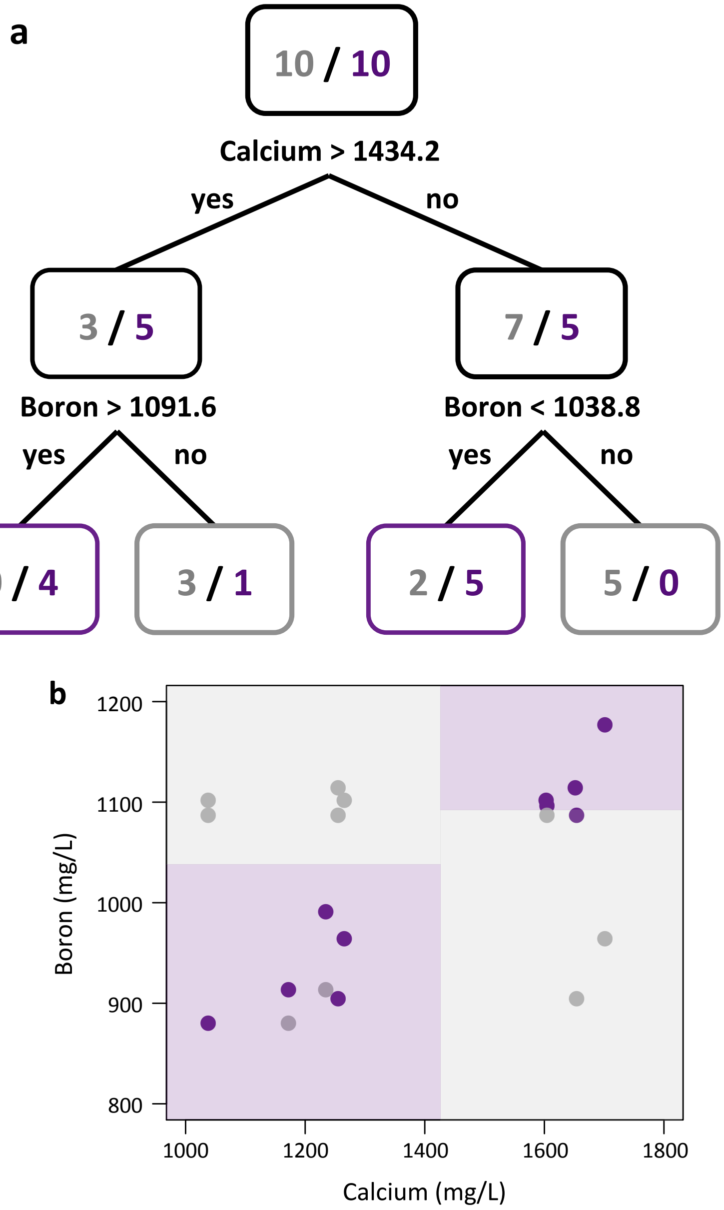

Figure B-3. A Random Forests analysis consists of a collection of many individual decision trees. One such tree is illustrated here. (a) The tree, in which boxes represent *nodes* containing real and/or synthetic samples (shown by purple and grey numbers, respectively). The tree is built by splitting each node based on a particular value for one of the variables in the dataset (criteria beneath boxes). The final *leaf* nodes are assigned to whichever class they predominantly contain (colored outlines); these are the classes the tree would predict for samples classified into each leaf based on the splitting criteria. (b) An alternative representation of the tree. The splits in (a) are translated into divisions along the calcium and boron axes, which together define regions in which the tree predicts samples are either real (purple) or synthetic (grey). In both (a) and (b), samples whose color matches the leaf / region in which they fall have been correctly classified by the tree (17/20, in this example); the remaining samples (3/20) have been misclassified.

The tree in Figure **B-3**a was produced in steps. In the first step, there are 10 samples labeled "real" and 10 labeled "synthetic". The decision tree algorithm considered all possible "splits" along the Calcium and Boron axes, and found that the best[6] possible split was on Calcium, at a value of 1434.2 mg/L. Defining this split produced two new groups, each of which is somewhat more segregated than the original. The process was then repeated to split each of the resulting groups further, leading to four total groups or "leaves" that are fairly homogeneous in terms of their real versus synthetic makeup[7]. In Figure **B-3**a, the leaves are color-coded to match the class to which the majority of their observations belong. For each leaf, this is the tree's prediction of class membership for any sample that belongs in that particular leaf based on the classification rules defined by the tree.

For this simple example with only two measured variables, the decision tree can also be illustrated in the scatterplot of the data. As shown in Figure **B-3**b, each split in the decision tree corresponds to dividing the data plane horizontally or vertically, and the four shaded regions defined by these divisions correspond to the four leaves of the tree. In both views, it is clear that classification is not perfect—two synthetic samples are predicted to be real in the lower left quadrant, and one real sample is identified as synthetic in the lower right. However, there is enough structure in the real data that the RF predictions are accurate for the majority of samples, which is all that is required to obtain meaningful clustering results.

The next step in the RF clustering algorithm is to construct a proximity matrix from the decision trees used to classify the real and synthetic data. Again, the single tree from above (Figure **B-3**) is used for illustration. In Figure **B-4**a, the data are again illustrated with shading to indicate the tree's real and synthetic class predictions. Labels have been added to the real data for clarity, and the synthetic data have been removed as they are not considered further in the analysis once their role in constructing the decision trees has been fulfilled.

Figure **B-4**b shows the proximity matrix for the example decision tree. In this matrix, each row and column represents one of the samples, such that every entry in the matrix corresponds to a pair of samples (e.g., the entry in the third row and fourth column represents Sample 3 paired with Sample 4). Entries are defined to be *1* if the pair of samples they represent are classified into the same leaf in the decision tree, and *0* otherwise. This is again easy to illustrate in the scatterplot of the data in Figure **B-4**a—sample pairs receive a *1* if they are in the same shaded region, and a *0* if not. Note that every diagonal entry of the matrix must contain a *1* by this definition of proximity, since every sample is in the same leaf/shaded region as itself. Note also that such a proximity matrix is symmetrical (that is, the entry [i, j] is equal to entry [j, i] for any row/column numbers *i* and *j*), but for clarity only half of the example matrix is filled in.

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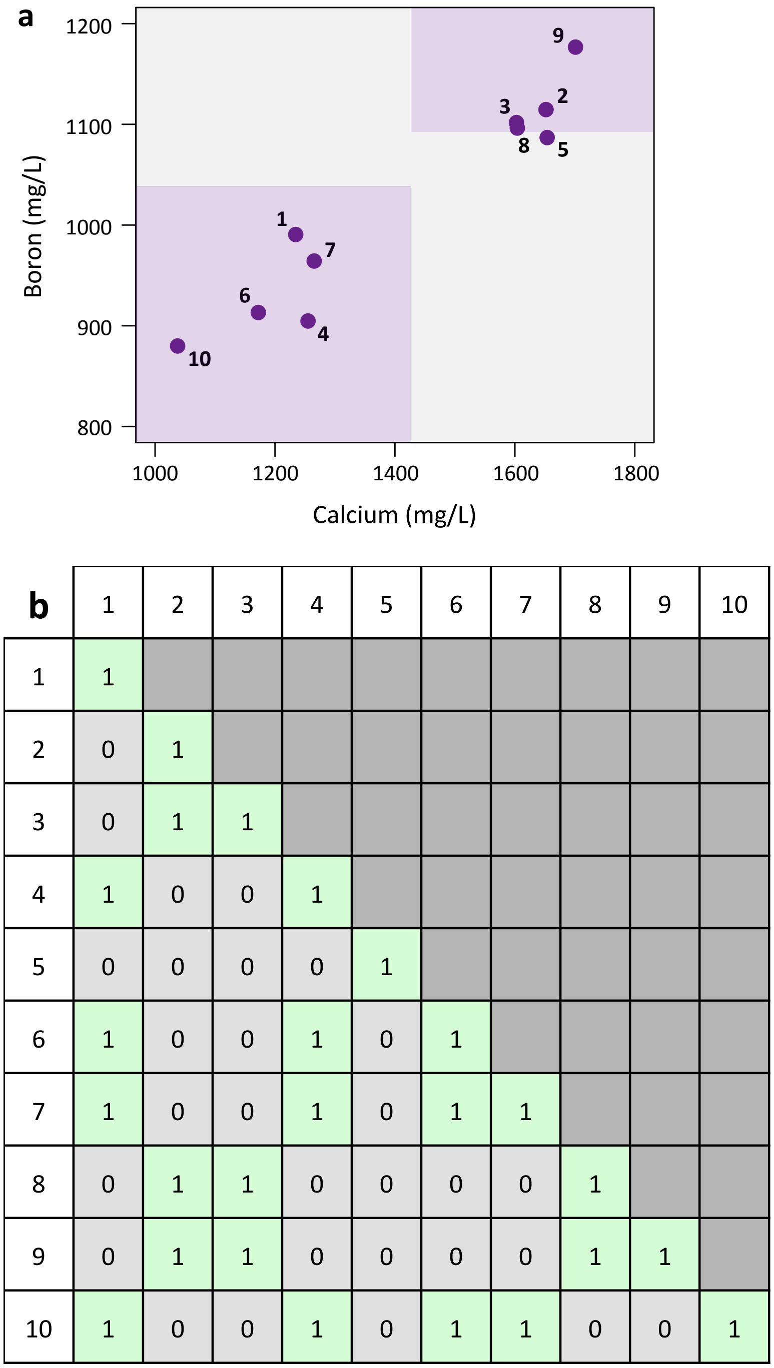
[6] In terms of making each of the resulting groups as homogeneous as possible.

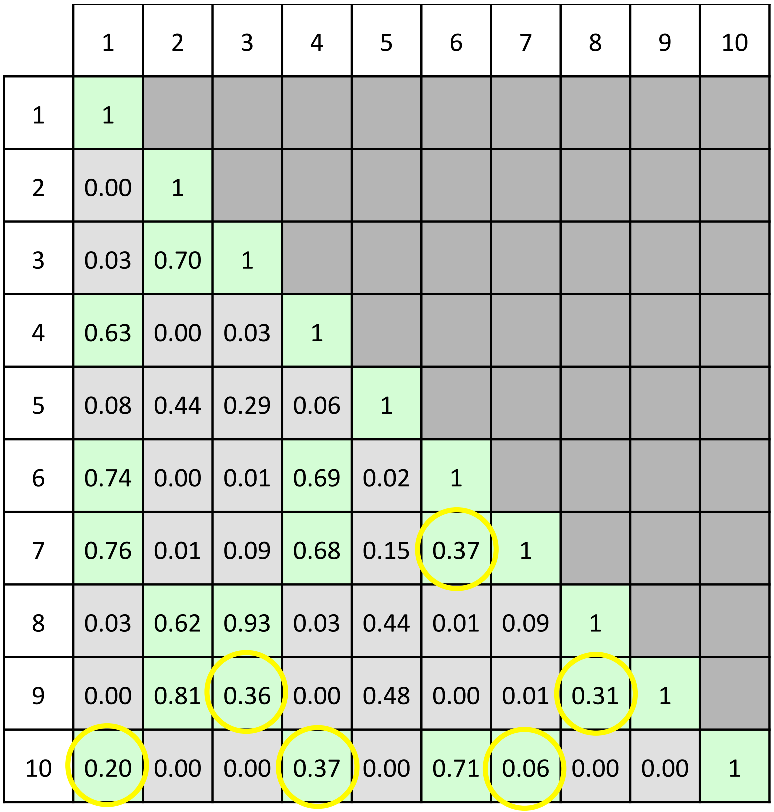
[7] In practice, the tree-building algorithm actually proceeds further, until all leaves contain only one class of observation. For the purpose of this example, however, this partial tree provides a better illustration of key concepts.



b	1	2	3	4	5	6	7	8	9	10
1	1									
2	0	1								
3	0	1	1							
4	1	0	0	1						
5	0	0	0	0	1					
6	1	0	0	1	0	1				
7	1	0	0	1	0	1	1			
8	0	1	1	0	0	0	0	1		
9	0	1	1	0	0	0	0	1	1	
10	1	0	0	1	0	1	1	0	0	1

Figure B-4. Decision trees are used to construct a proximity matrix. (a) The data from Fig. 3b, with synthetic samples removed for clarity (they are used only for tree construction, and discarded thereafter), and sample numbers added for reference. (b) The proximity matrix for the data, in which row and column numbers correspond to the sample numbers in (a). Each entry in the matrix is *1* (shaded green) if it corresponds to a pair of samples that are classified in the same leaf node in the decision tree (i.e., fall into the same shaded region in (a)), and *0* otherwise (shaded light grey). For clarity, only half of the symmetric proximity matrix is filled in here.

As noted above, an RF analysis consists of repeating the tree-building and proximity-calculating steps many times[8]. To obtain a final proximity matrix the matrices from all trees are averaged together. A *1* or *0* in the final matrix would indicate samples that were classified together in all or none of the trees, respectively. In practice, most entries in the final matrix will be somewhere in between, and thus represent the degree of similarity (that is, *proximity*) between each pair of samples. The final RF proximity matrix for this example dataset is shown here:



	1	2	3	4	5	6	7	8	9	10
1	1									
2	0.00	1								
3	0.03	0.70	1							
4	0.63	0.00	0.03	1						
5	0.08	0.44	0.29	0.06	1					
6	0.74	0.00	0.01	0.69	0.02	1				
7	0.76	0.01	0.09	0.68	0.15	0.37	1			
8	0.03	0.62	0.93	0.03	0.44	0.01	0.09	1		
9	0.00	0.81	0.36	0.00	0.48	0.00	0.01	0.31	1	
10	0.20	0.00	0.00	0.37	0.00	0.71	0.06	0.00	0.00	1

Figure B-5. A Random Forests proximity matrix is the mean across proximity matrices generated by many decision trees, which differ from one another due to random factors introduced into the analysis. The result for this example is shown here. Shading indicating same (green) or different (light grey) leaf node classification is retained from the single tree's proximity matrix shown in Fig. 4b. In most cases, the Random Forests outcome agrees with the individual tree, as indicated by the former showing a high value for sample pairs that were in the same leaf node in the example tree, and vice versa. Some samples that were classified together in the single tree, however, have relatively low (<0.5) proximity according to the Random Forests output (yellow circles). In general, the latter is more reliable because it is based on many trees, and thus avoids overfitting that may be associated with any one of them.

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[8] As described in Appendix A, each tree in the forest has randomness added to it in several ways. This prevents the trees from being identical, and in general leads to better predictive power for a Random Forests analysis than for any one decision tree alone. Incidentally, it is also the origin of the name *Random* Forest.

This matrix is shaded to match the proximity scores from the single decision tree shown above. Thus it can be seen that most of the samples that were classified together in the example tree have high proximity overall in the RF results, and vice versa. There are exceptions however (circled in yellow), reflecting that a single tree may have a tendency to conform too closely to the particular dataset at hand (i.e., to be "overfit"). In general, where the RF differs from the single tree, the former can be expected to yield more robust information about the dataset. For example, the individual tree classified Sample 10 together with Samples 1 and 7, whereas the RF indicates that Sample 10 is only weakly related to these samples. Visual inspection of Fig. 4a would seem to support the RF interpretation—Samples 1 and 7 are not much closer to Sample 10 than they are to the cluster in the upper right quadrant of the plot.

The final step in RF clustering is to use the proximity matrix as input to the Partitioning Around Medoids (PAM) algorithm. PAM searches among a set of samples with known proximity to one another, to identify the samples that are most representative of natural groupings in the data. In this example, for instance, PAM was run to identify two clusters, which might be conceptualized to represent impacted and unimpacted samples (the rationale used in this study). The algorithm considered different pairs of samples to serve as the central points or *medoids* of these clusters, and for each possible pair calculated an overall score representing how similar all the other samples are to their nearest medoid.

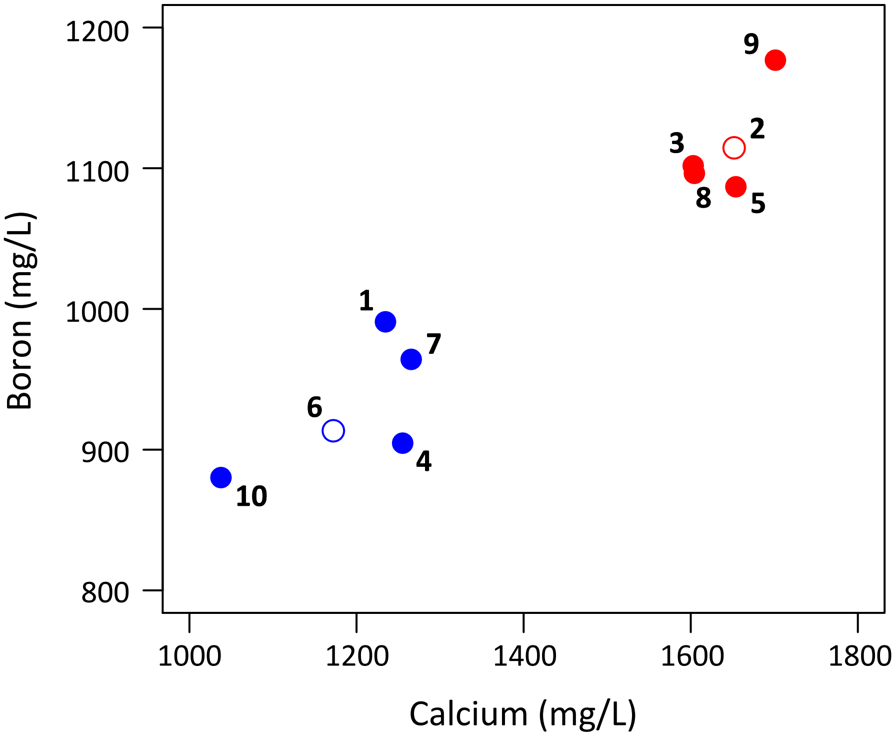


Figure B-6. In the final step of the clustering analysis, the Random Forests proximity matrix (Figure B-5) is used as input to a Partitioning Around Medoids (PAM) algorithm. PAM divides a dataset into a specified number of clusters (two, in this example) by identifying samples to serve as the center points ("medoids") of each cluster. Once medoids are chosen, samples are assigned to the cluster whose medoid they are nearest to, according to the proximity matrix. The algorithm searches for the optimal medoids around which to cluster (open circles), defined as those that maximize the total proximity between each sample and its assigned medoid. In this example, PAM identifies the same two clusters (red and blue dots) that were actually imposed in this artificial dataset (Figure B-1).

As shown in Figure **B-6**, for this example Samples 2 and 6 were identified as the best medoids to represent a two-cluster partitioning of the data. Assigning the remaining samples to their nearest medoid results in a visually intuitive clustering that in fact corresponds to the known model used to generate the data for this example (Figure **B-1**). Thus, the completed RF clustering algorithm was able to obtain an accurate clustering pattern for the data in this test case where the true clusters were known. While it is impossible to be sure of clustering outcomes in the real analysis, where true impacted versus unimpacted status is unknown, reliable performance in test cases such as the one illustrated here builds confidence that the approach is robust.

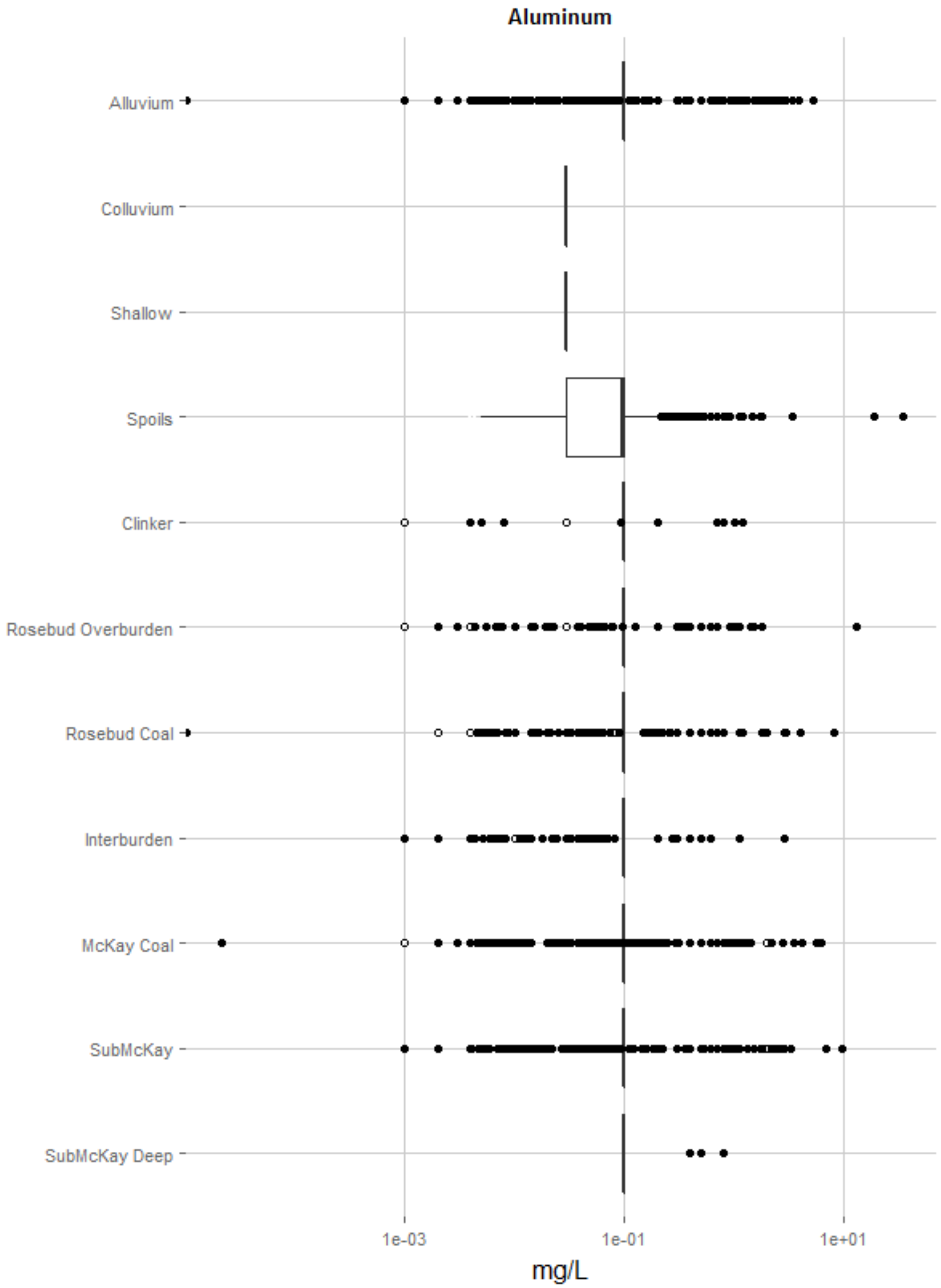
Finally, it is worth acknowledging that the example shown here is intentionally contrived to illustrate the RF clustering method. In this simple case, the clusters identified by the algorithm are quite distinct, and could easily have been obtained by various other, less complicated techniques. However, in a real dataset, with perhaps thousands of samples measured on dozens of variables, results will not be so obvious. Careful analysis has shown RF clustering to have distinct advantages over alternative methods in these cases, but demonstrating those advantages is beyond the scope of this simple example.

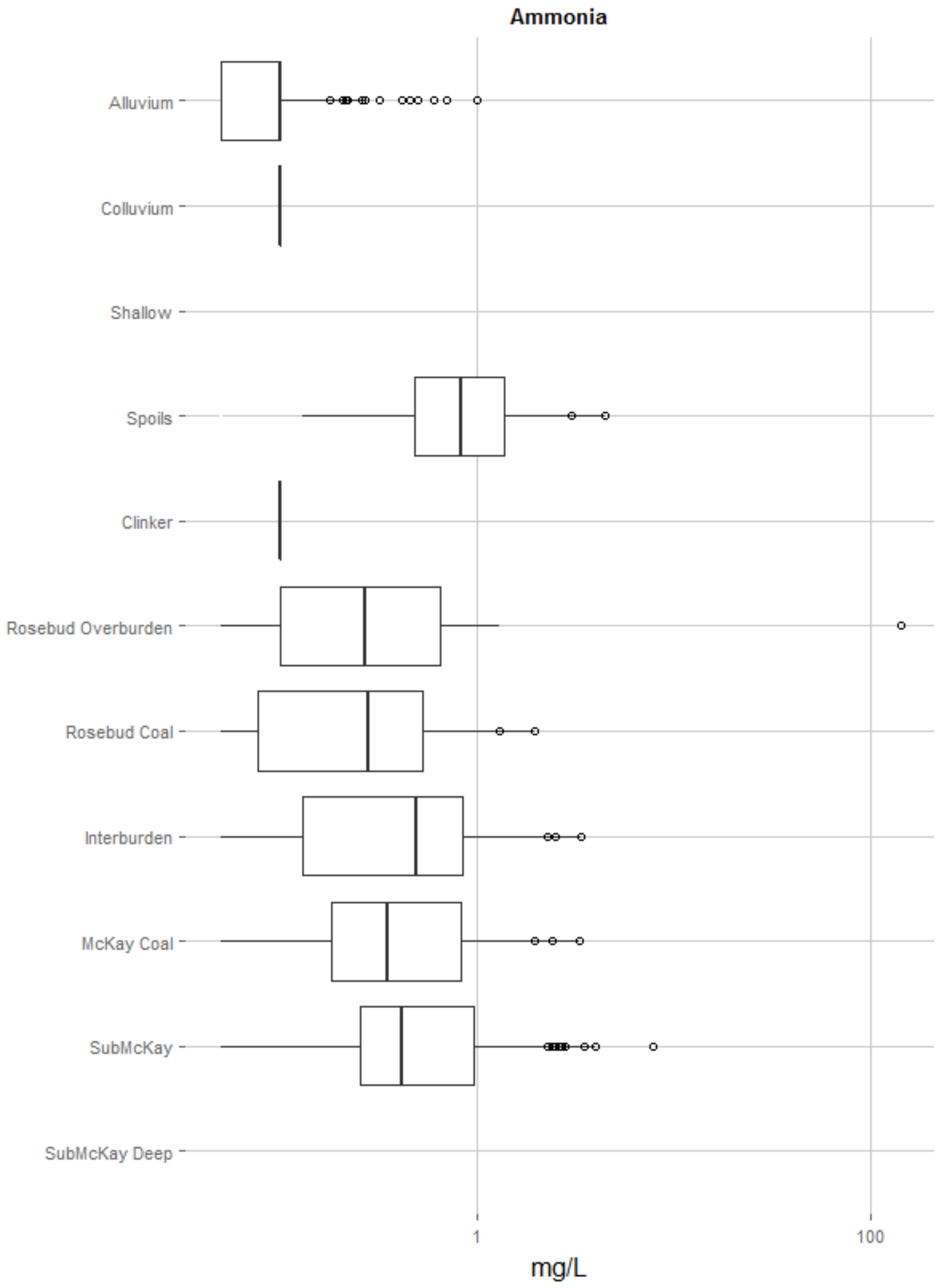
Appendix C Boxplots for Initial Stratigraphic Layers

The data used to produce the plots in Appendix C are the groundwater data used in Random Forests, as described in Section 2.1, with stratigraphic unit among the eleven initial layers: “Alluvium”, “Colluvium”, “Shallow”, “Spoils”, “Clinker”, “Rosebud Overburden”, “Rosebud Coal”, “Interburden”, “McKay Coal”, “SubMcKay”, and “SubMcKay Deep”.

For each chemical for which BSLs are estimated, and for each geologic unit, there is a boxplot of the measured data. The boxplots are presented on a logarithmic scale. These plots are discussed in Section 3 of the report.

Boxplots are a method of representing the distribution of a dataset. The top and bottom of the box in the boxplot represent the Inter-Quartile Range (IQR), identified by the 75th and 25th percentiles of the data, respectively. The horizontal line in the middle of the box represents the 50th percentile (the median). Vertical lines (called whiskers) extend to last data point which is no more than 1.5*IQR from the box. Data points beyond the whiskers are represented by circles. Open circles represent nondetects.


Aluminum
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1e-03
1e-01
1e+01
mg/L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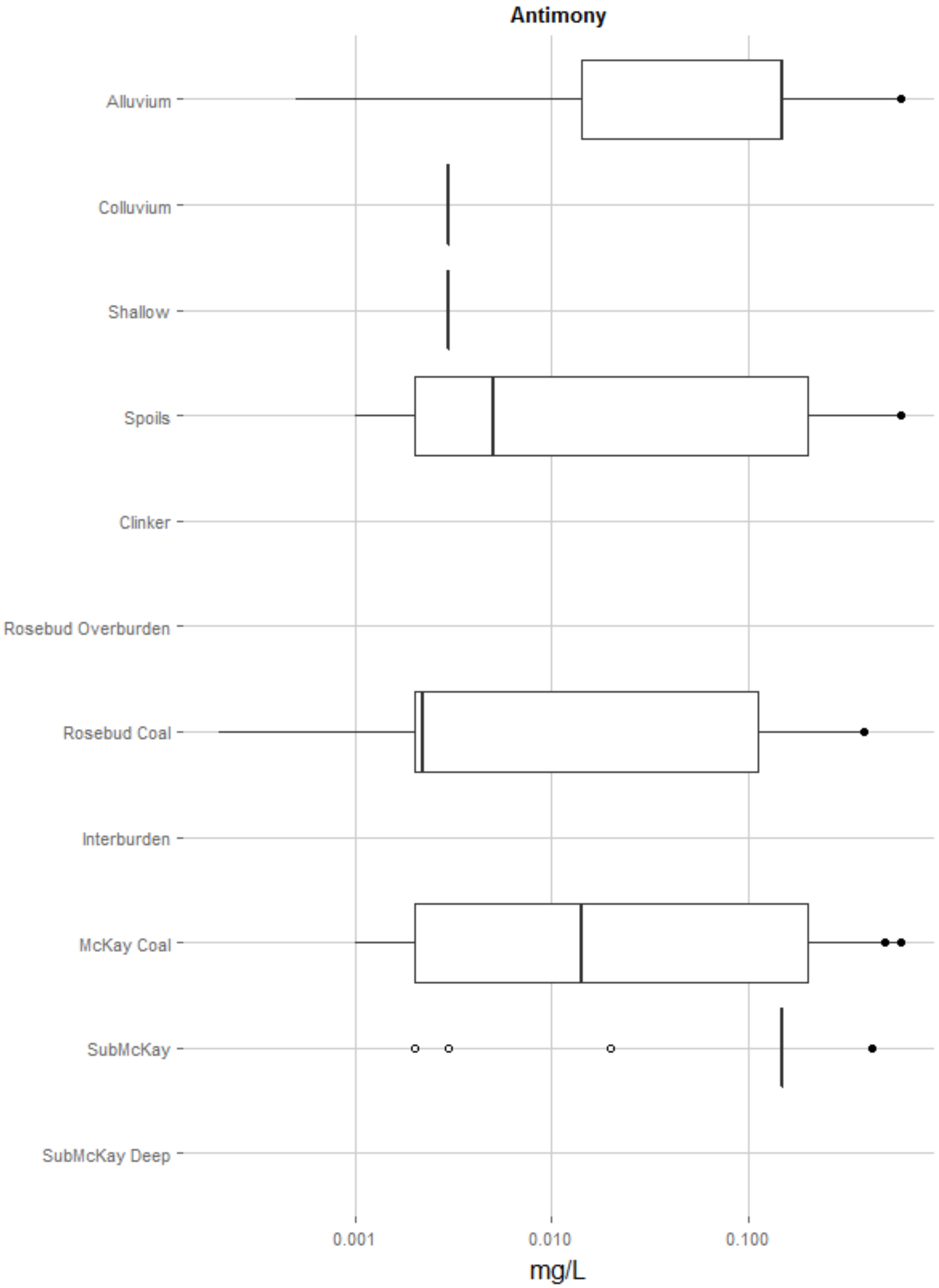
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1
100
mg/L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Colluvium
Shallow
Spoils
Clinker
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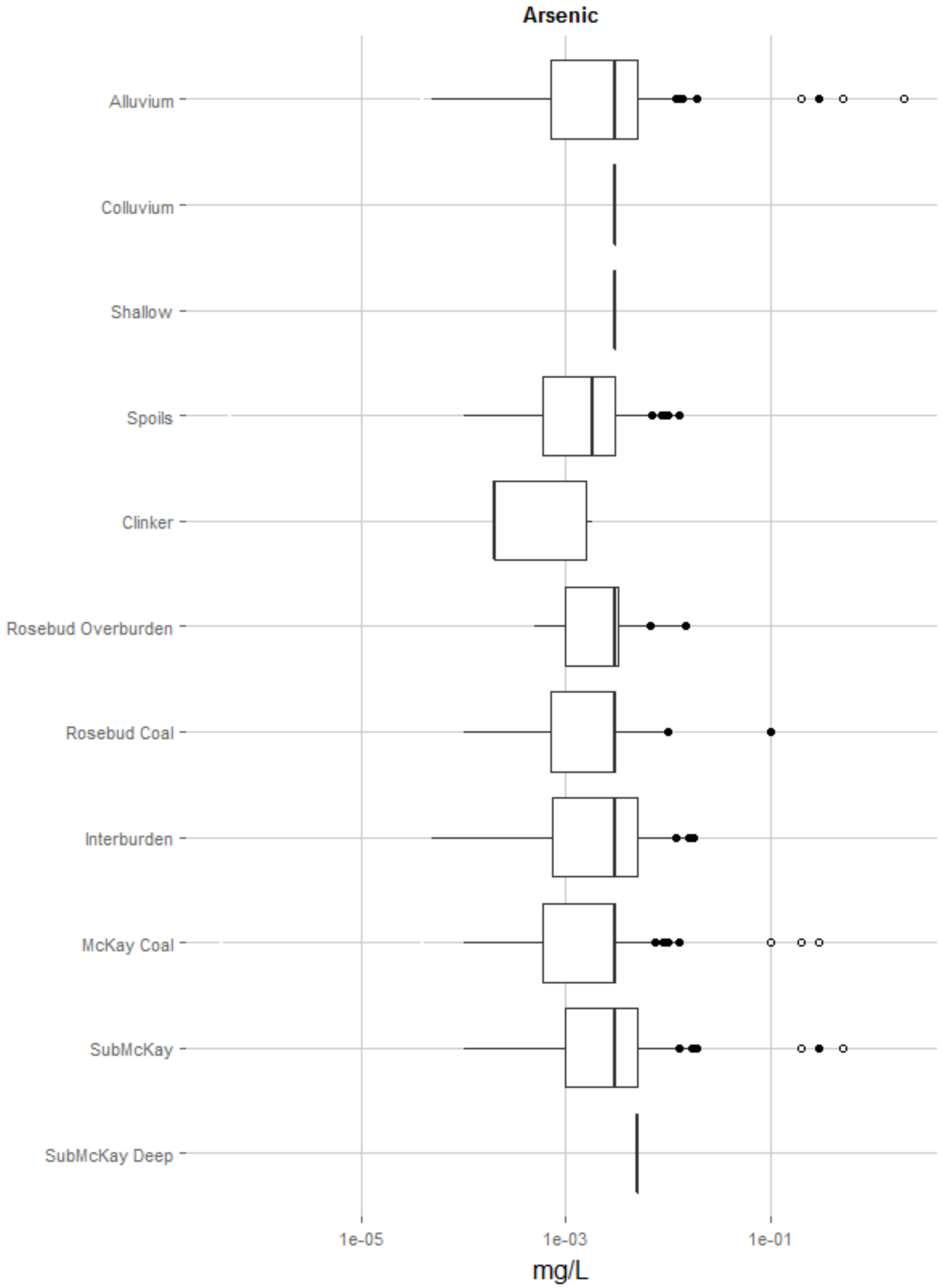
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.001
0.010
0.100
mg/L


Arsenic
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Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
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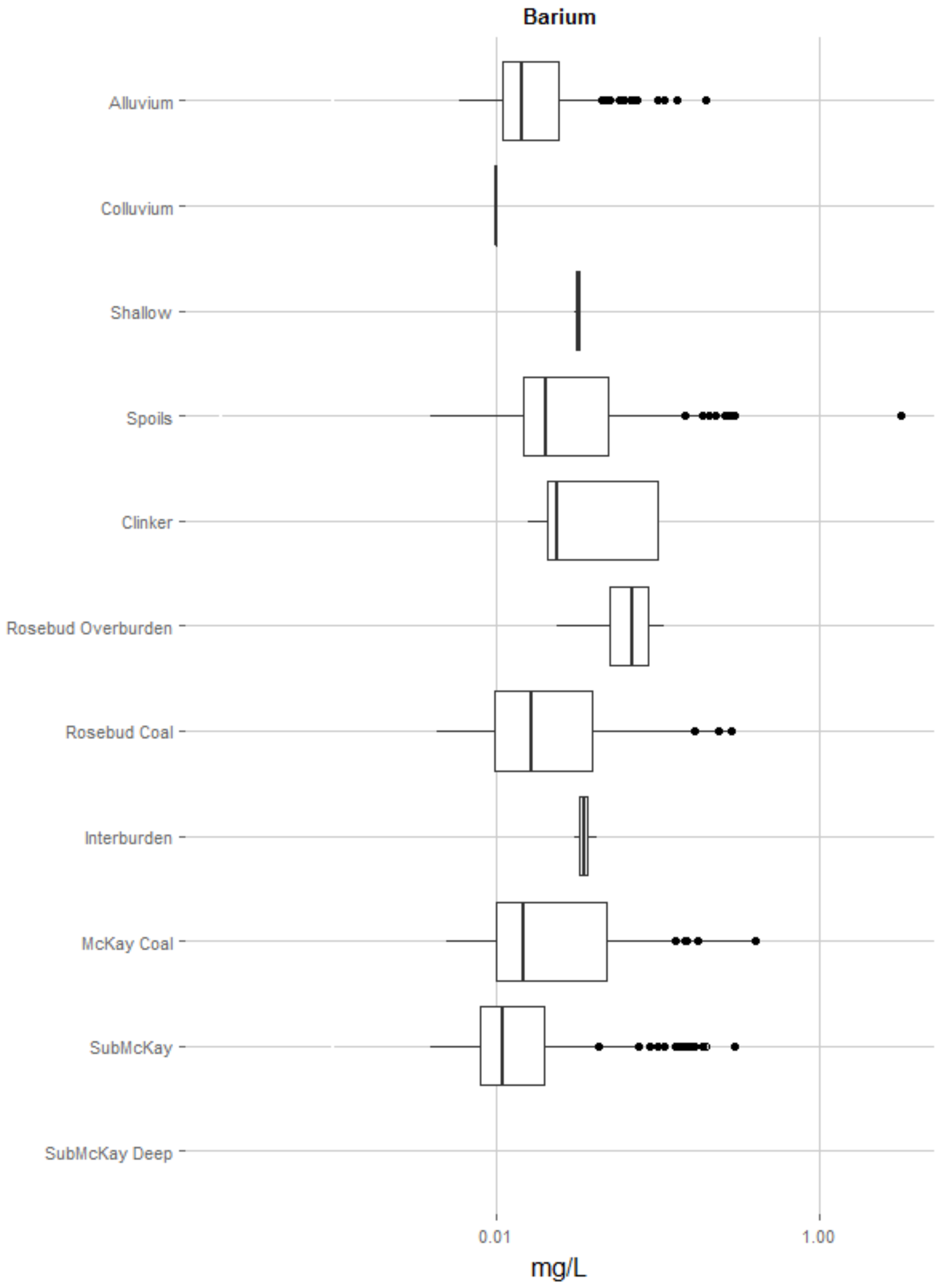
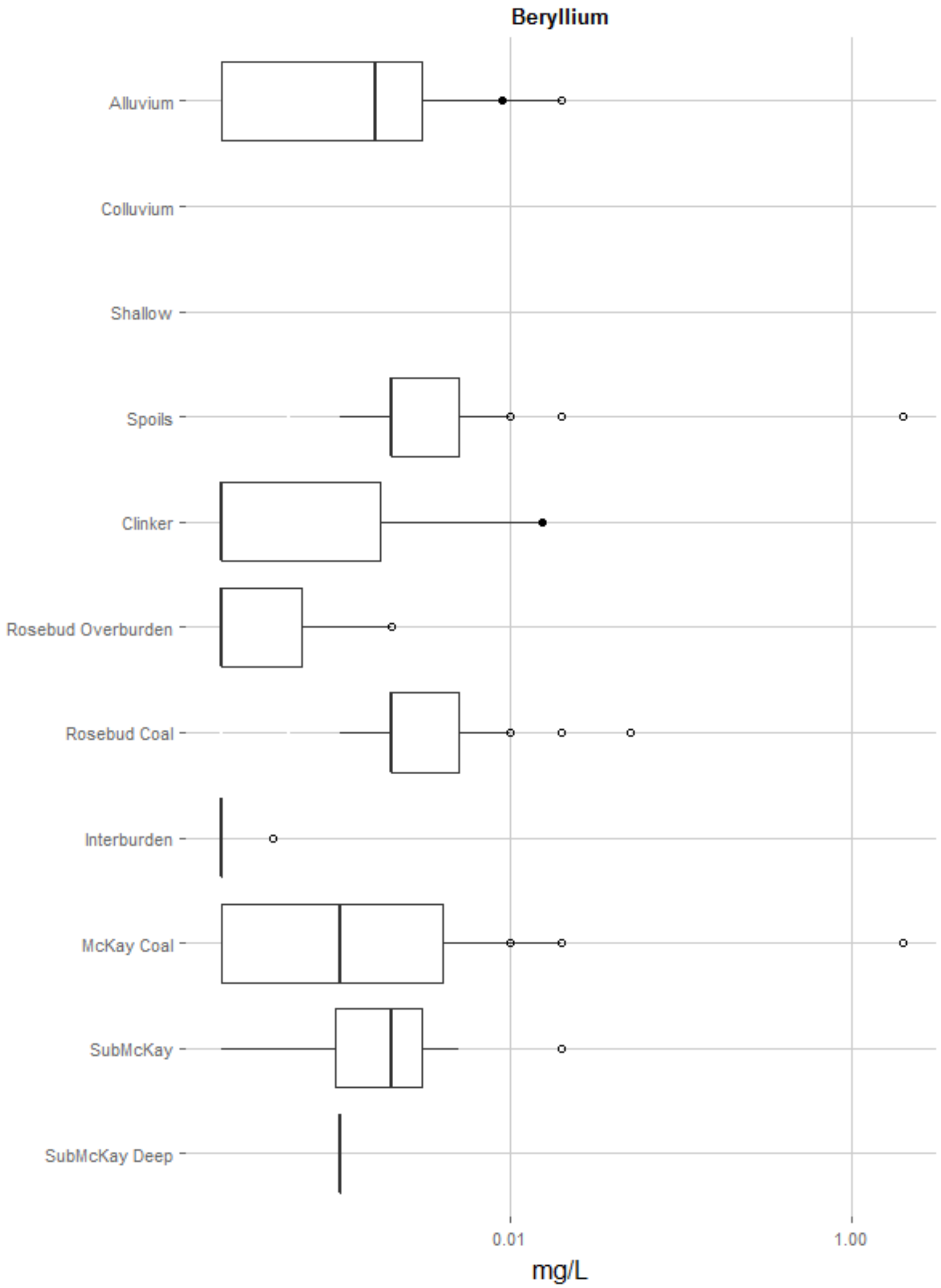
1e-03
1e-01
mg/L


Barium
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.01
1.00
mg/L


Beryllium
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
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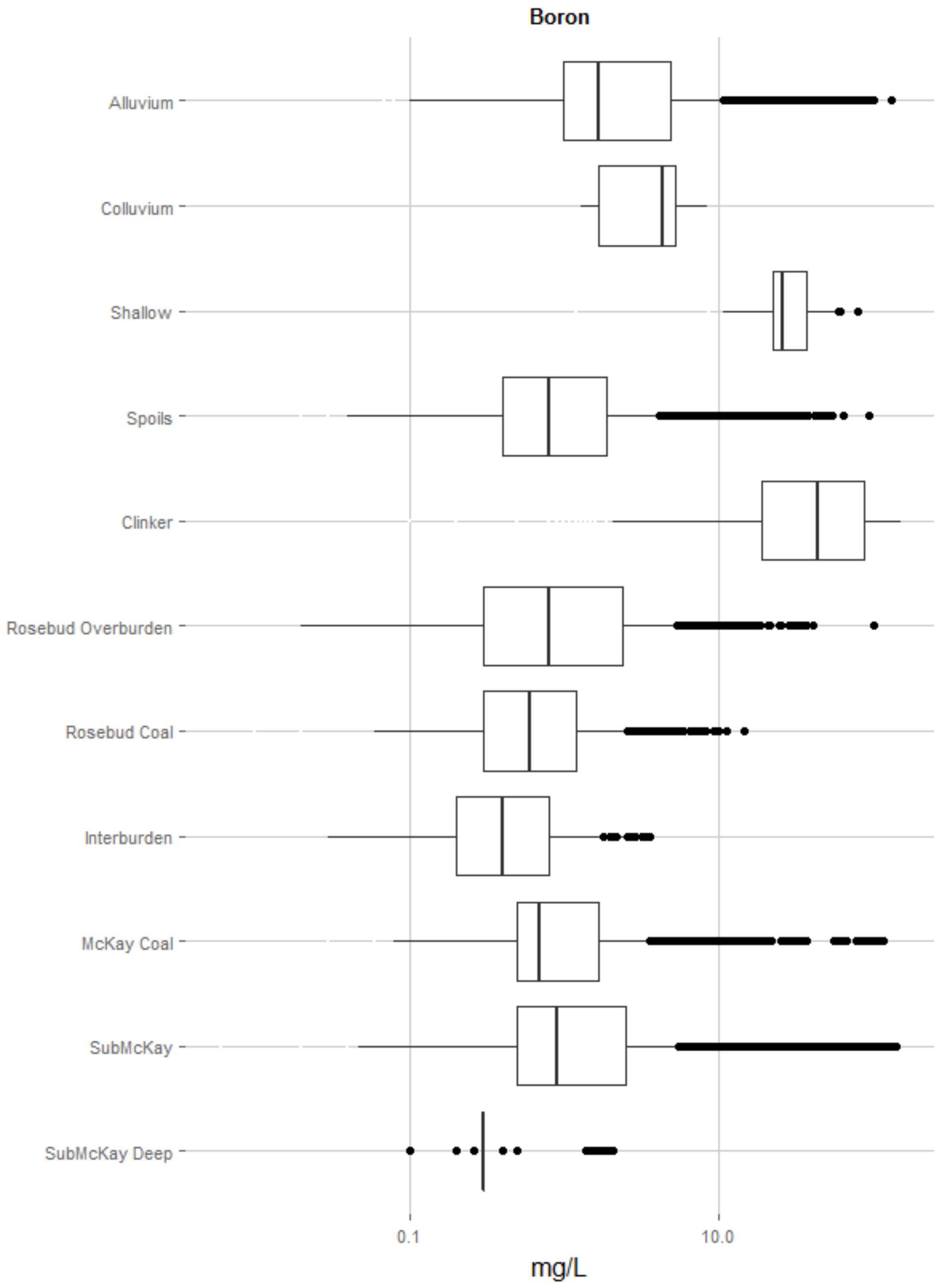
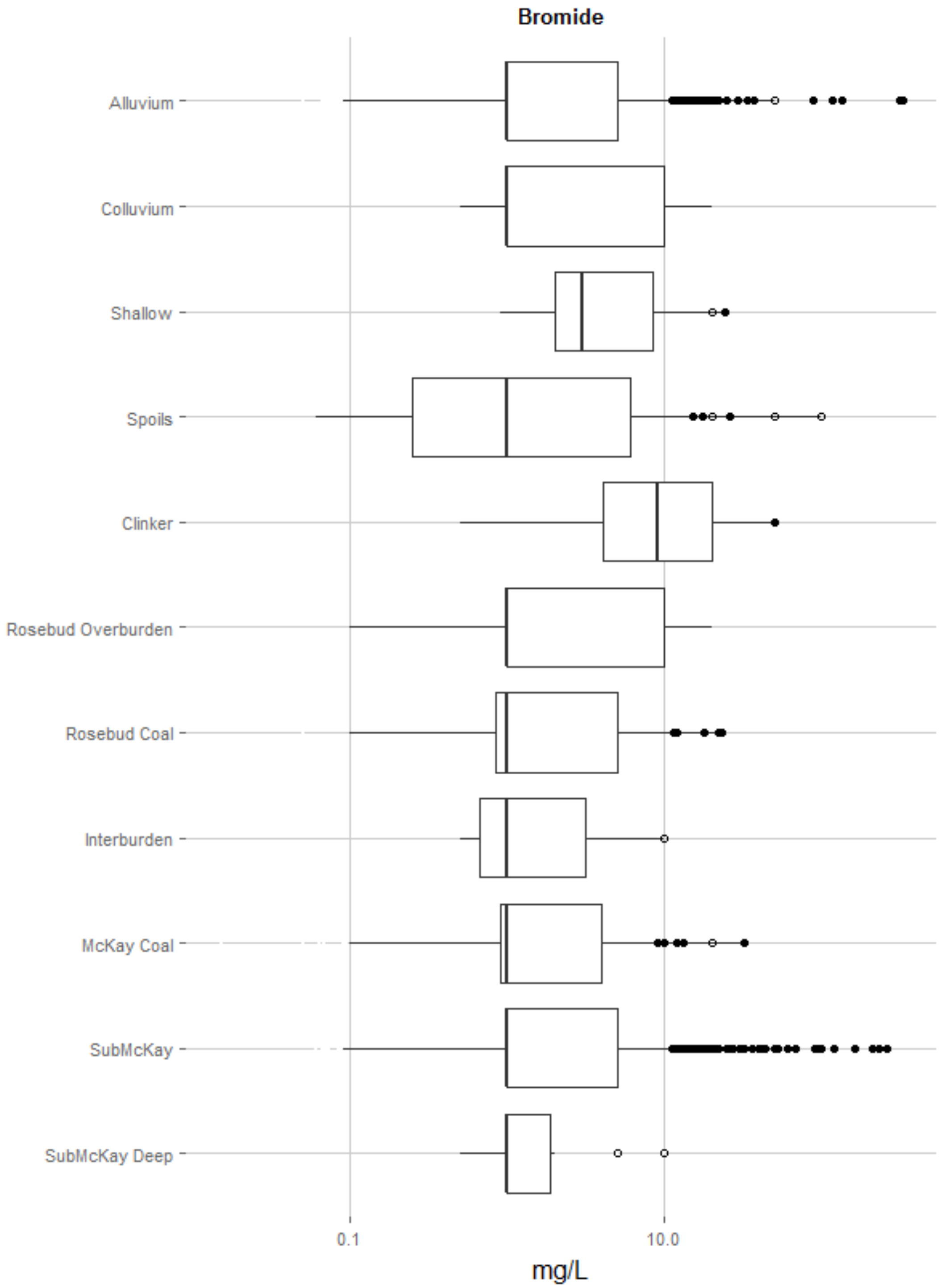
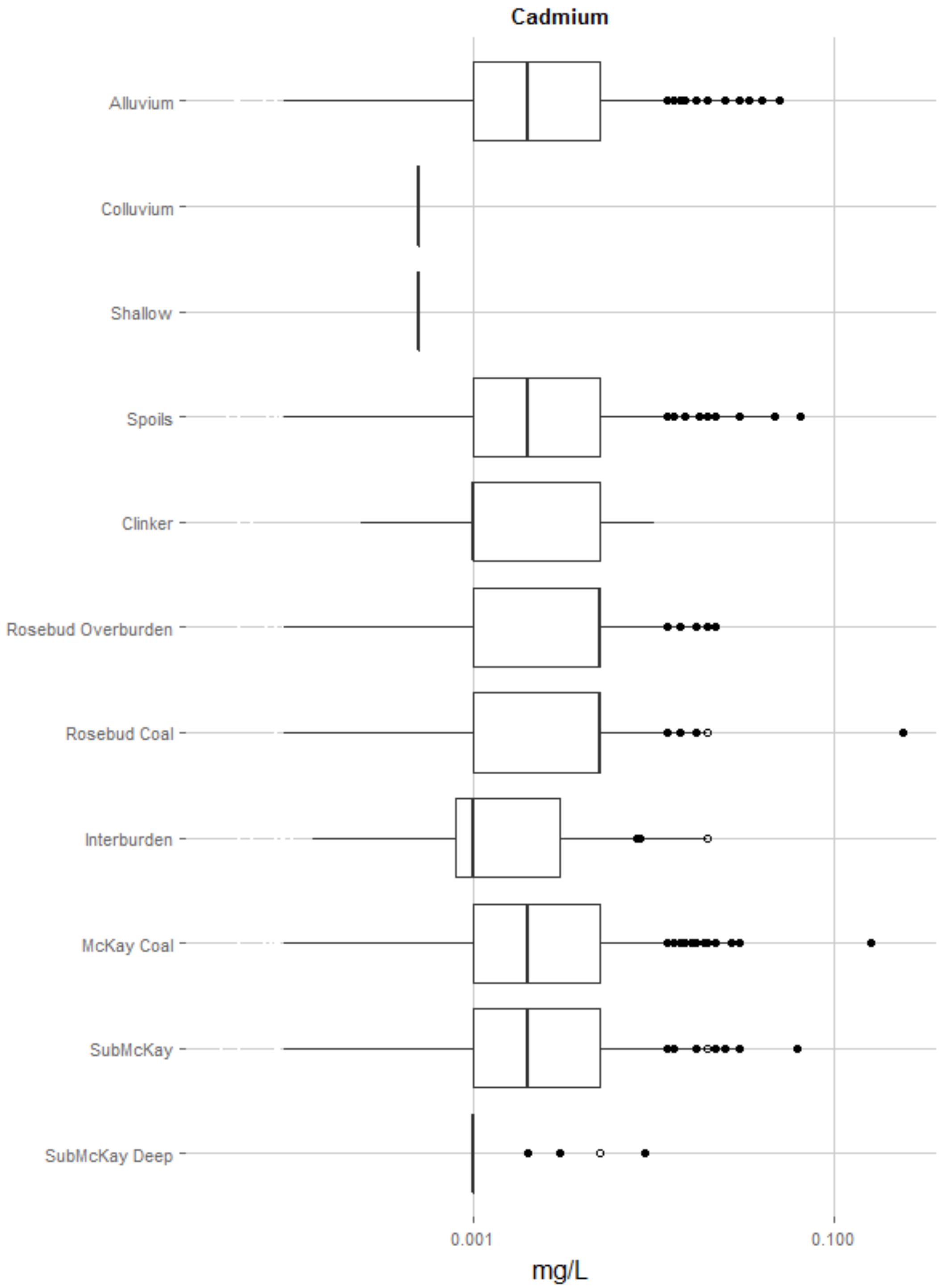
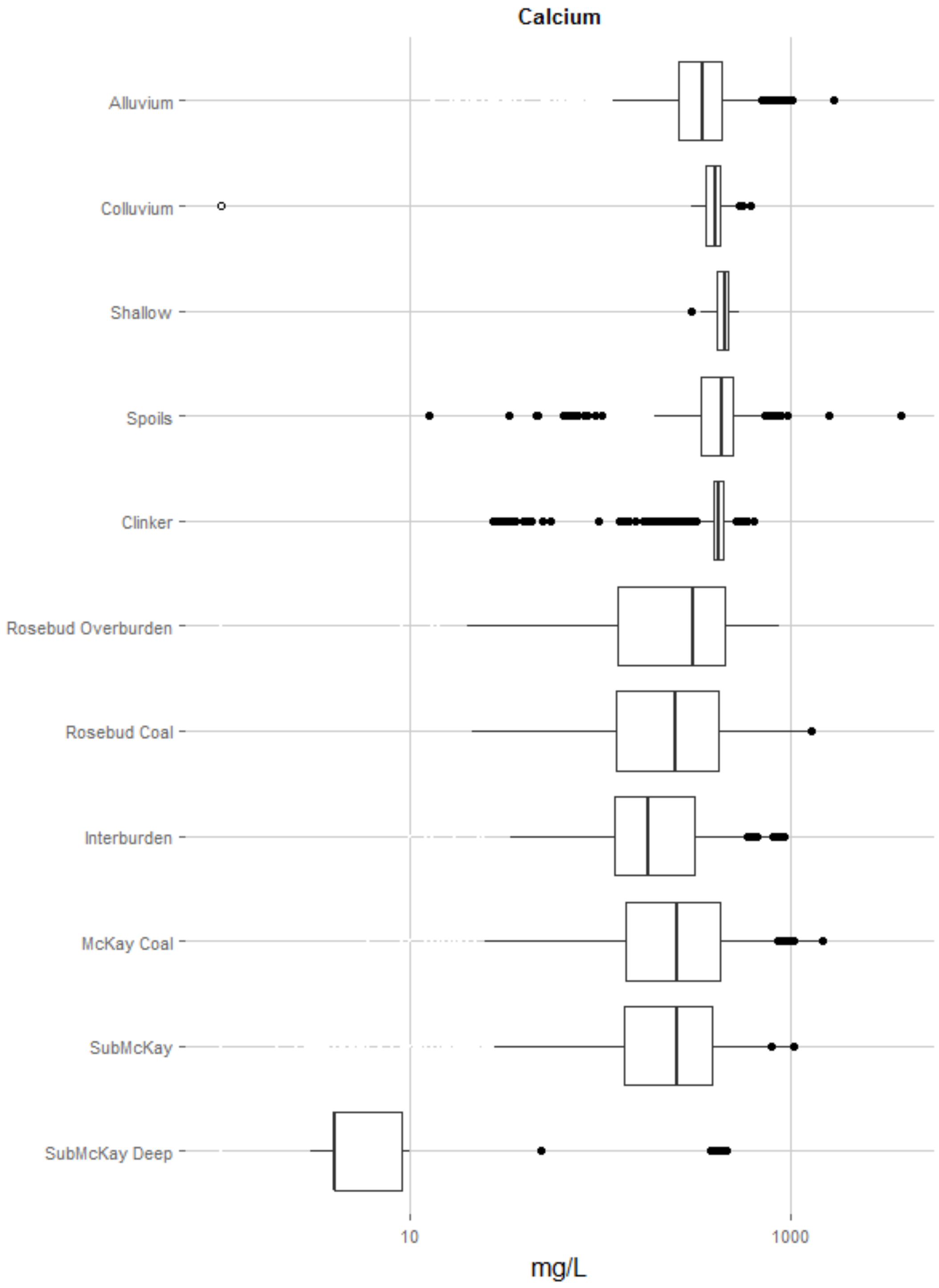
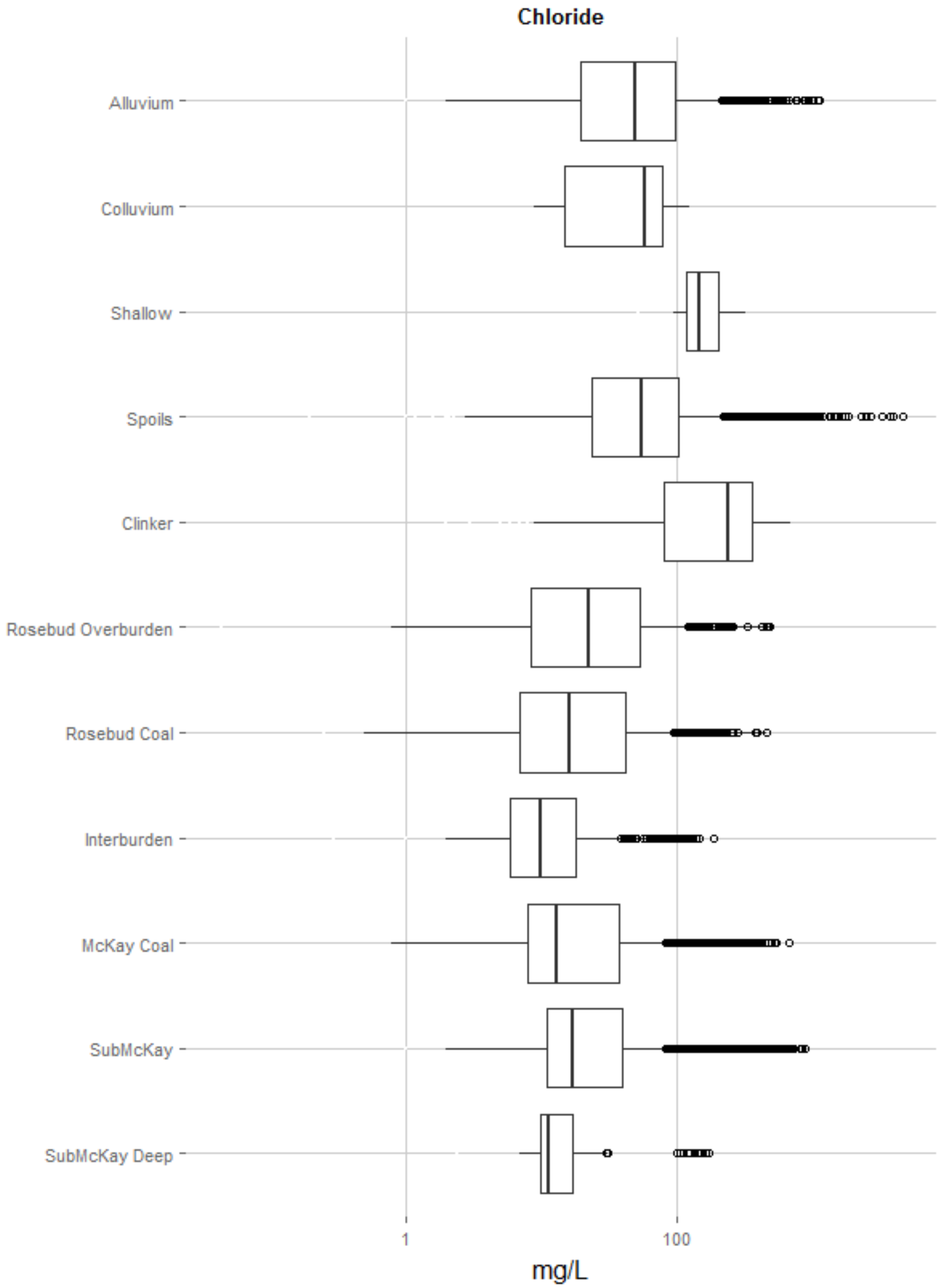
0.01
1.00
mg/L

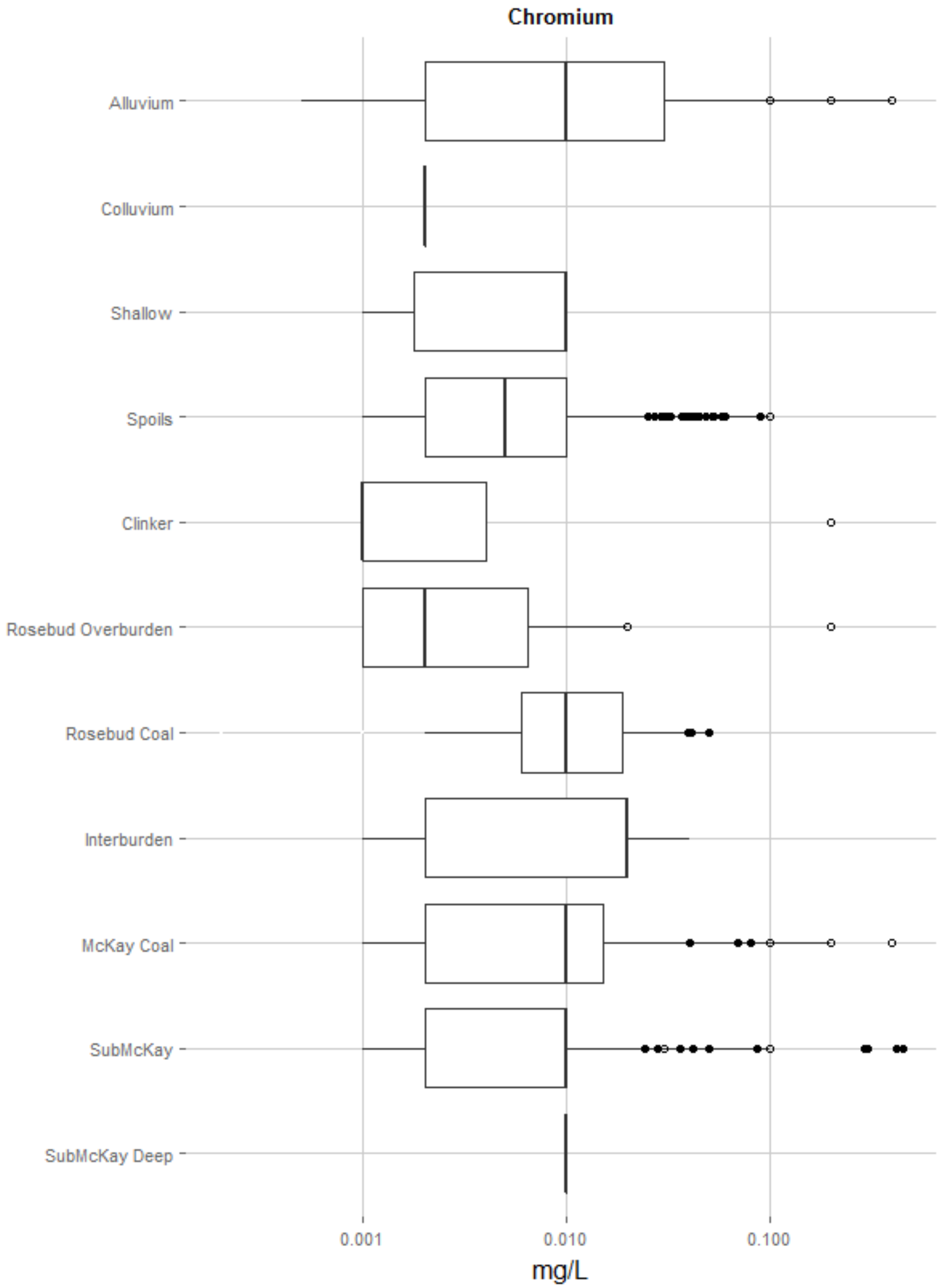

Boron
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.1
10.0
mg/L

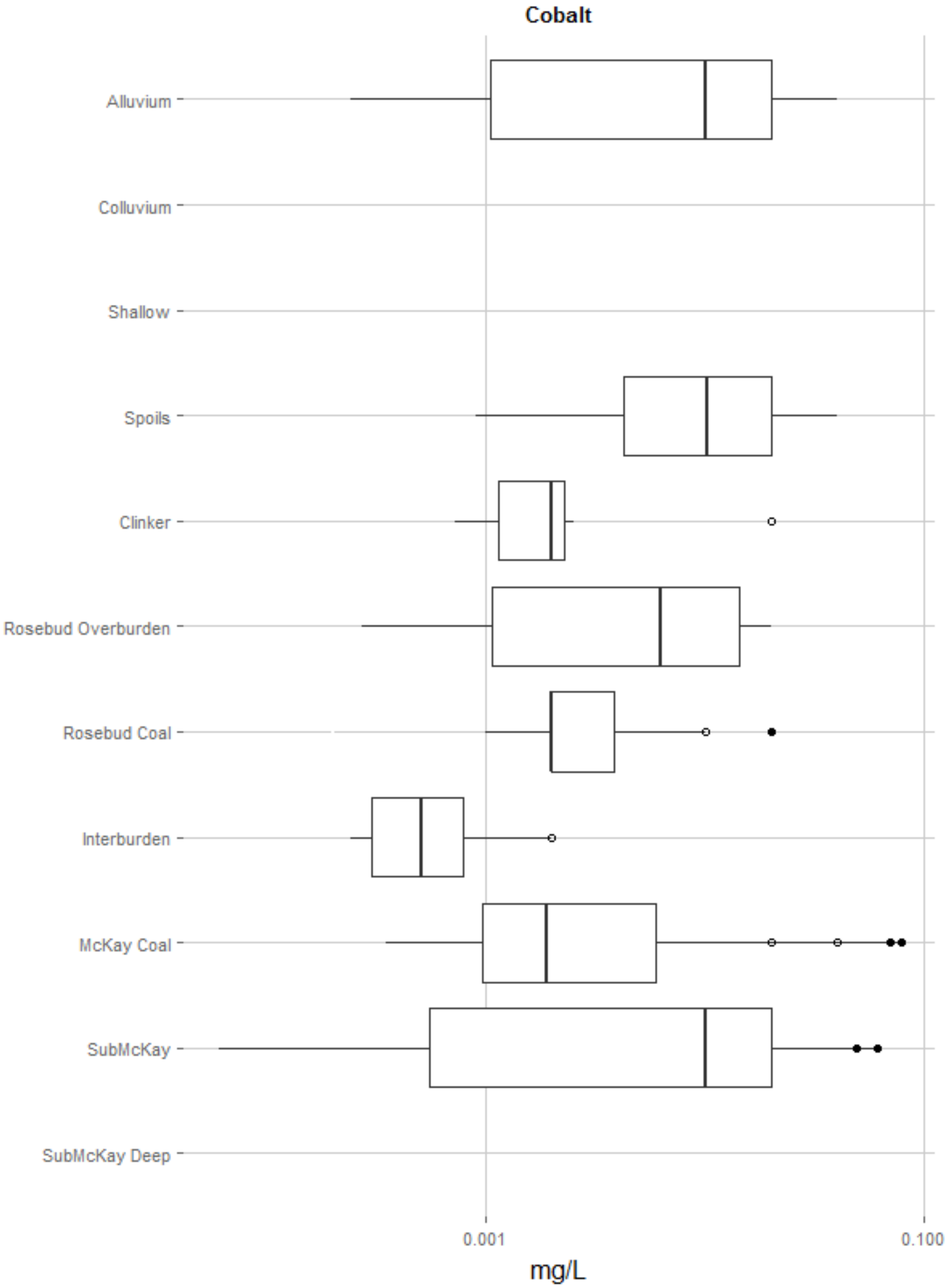

Bromide
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.1
10.0
mg/L

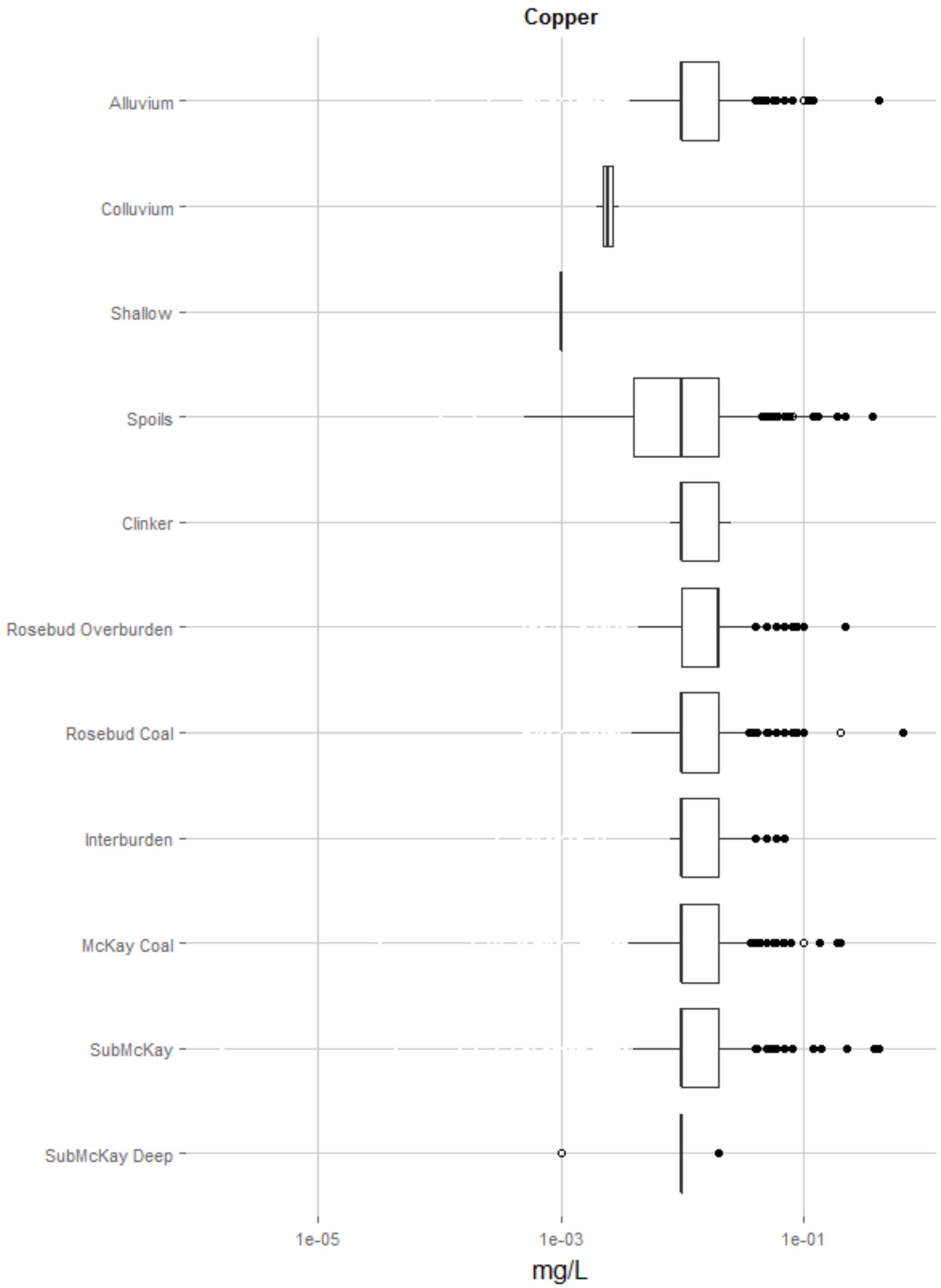

Cadmium
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.001
0.100
mg/L

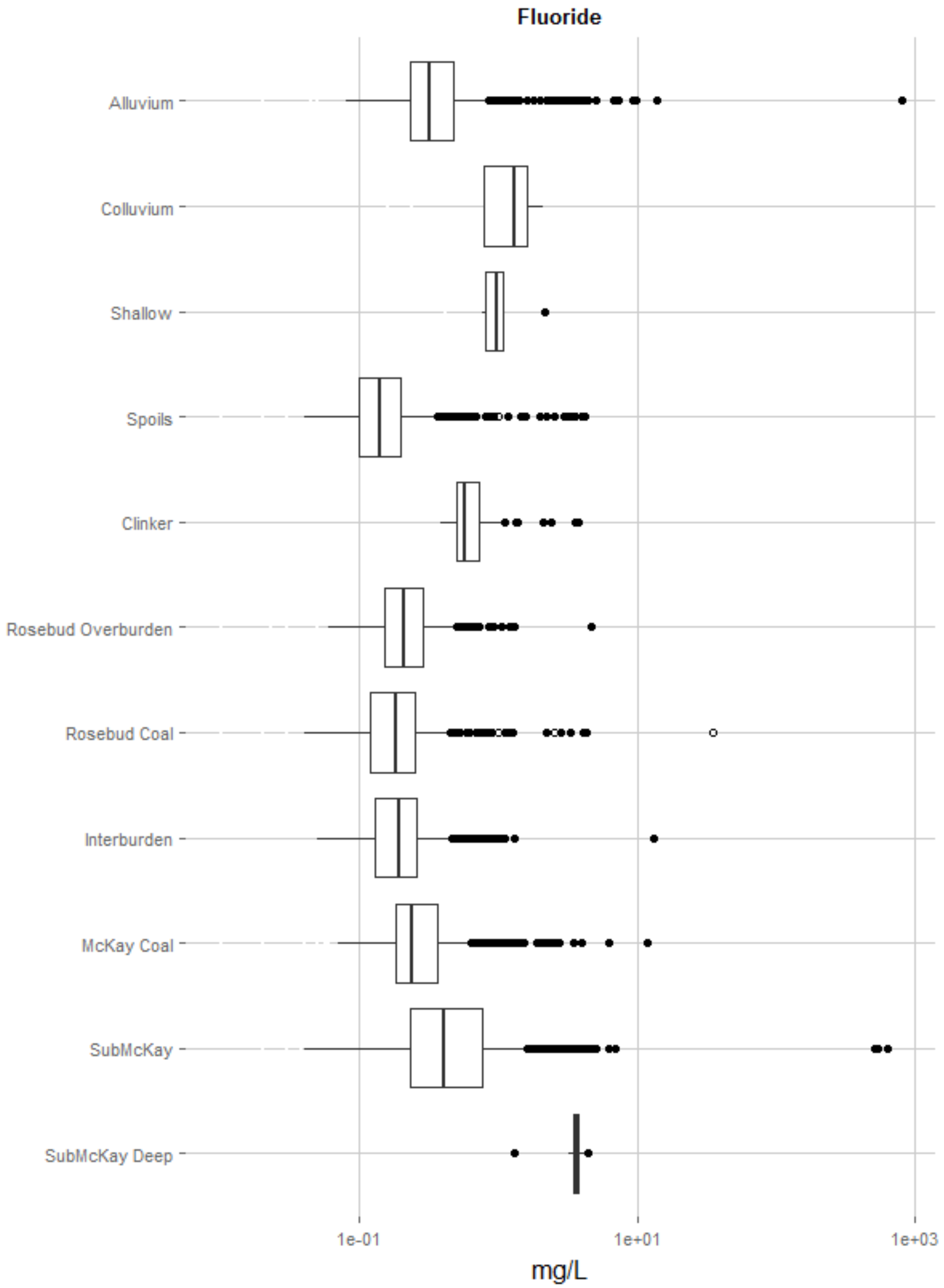

Calcium
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
10
1000
mg/L

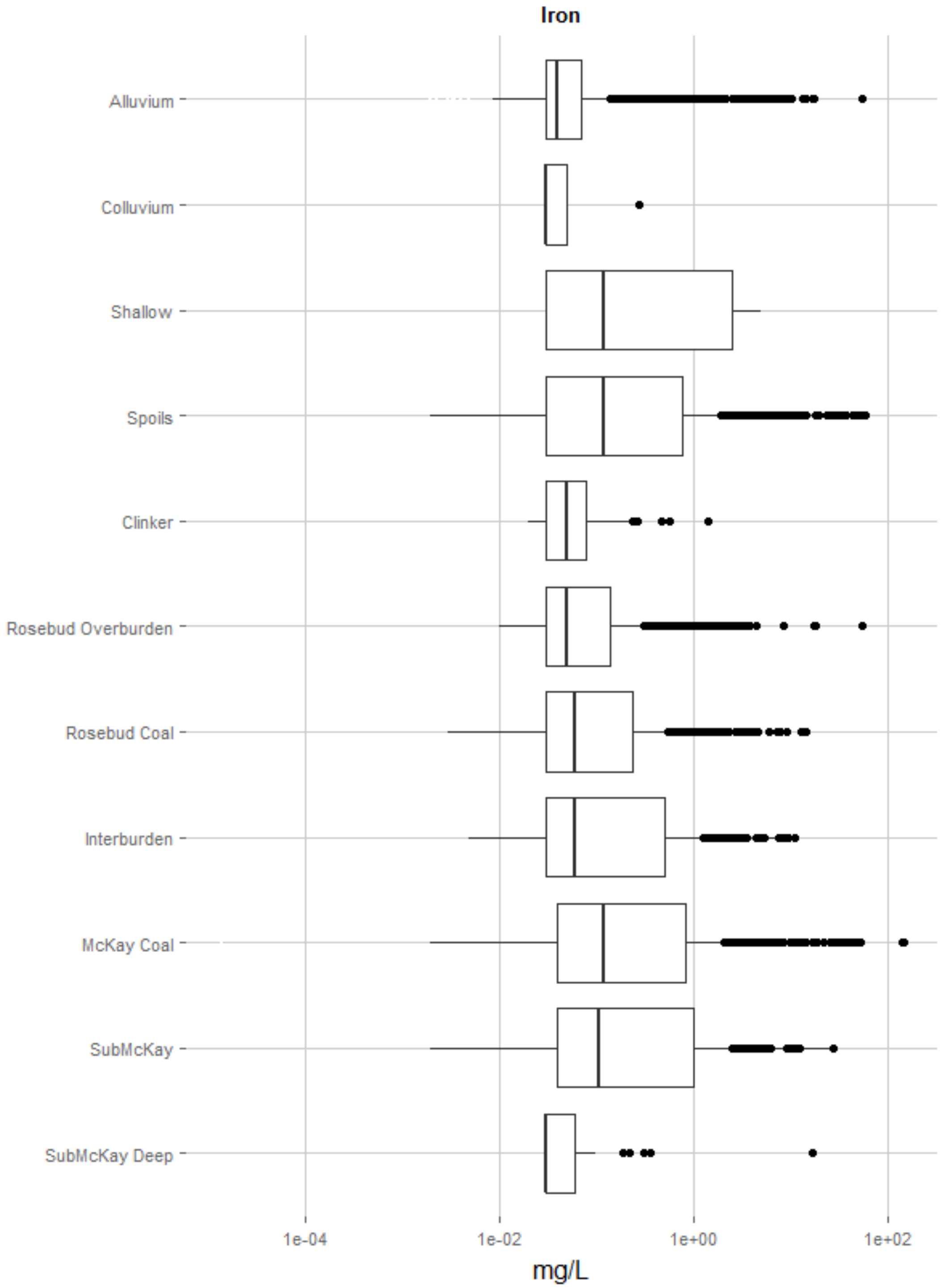

Chloride
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1
100
mg/L

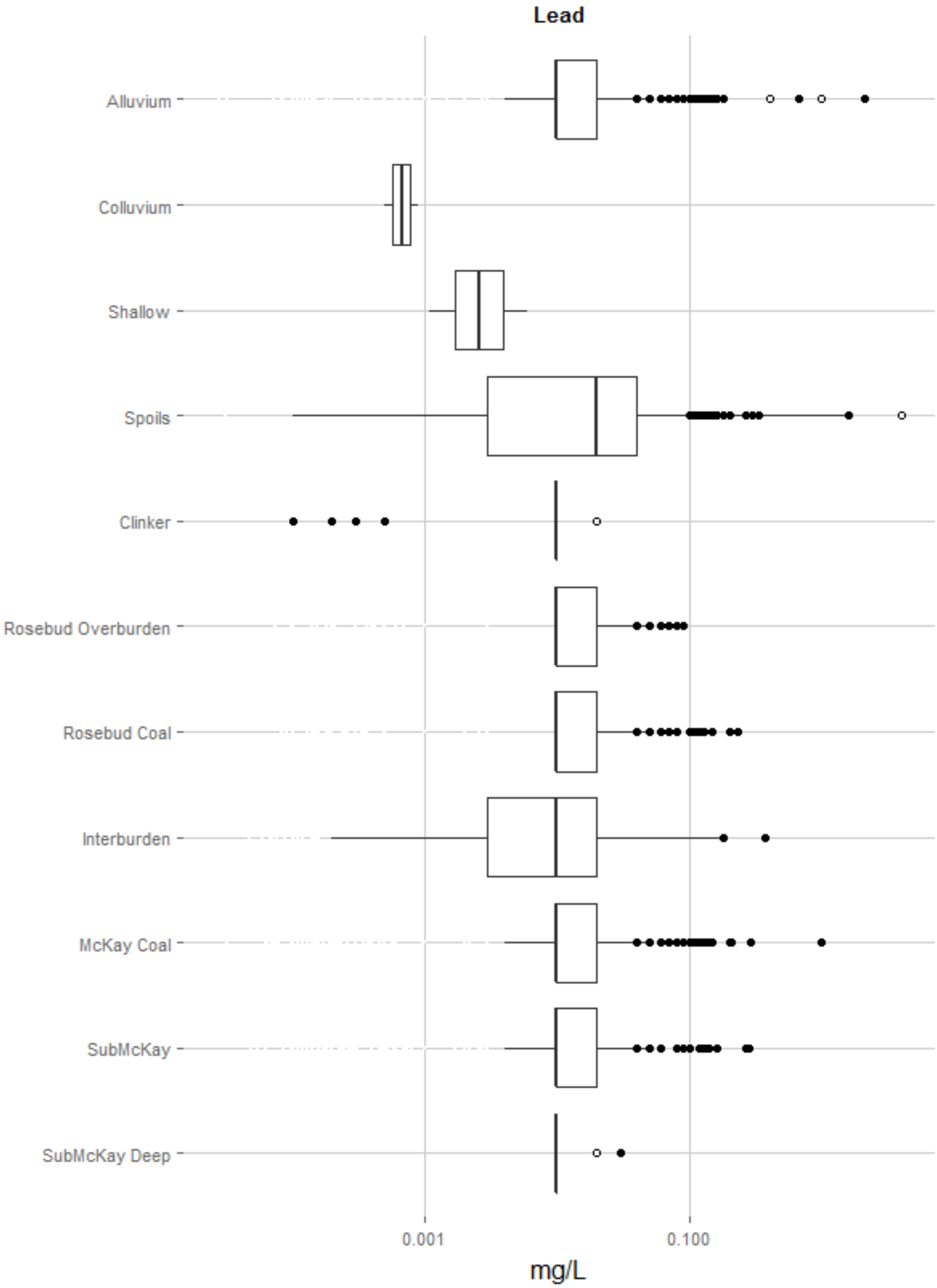

Chromium
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.001
0.010
0.100
mg/L

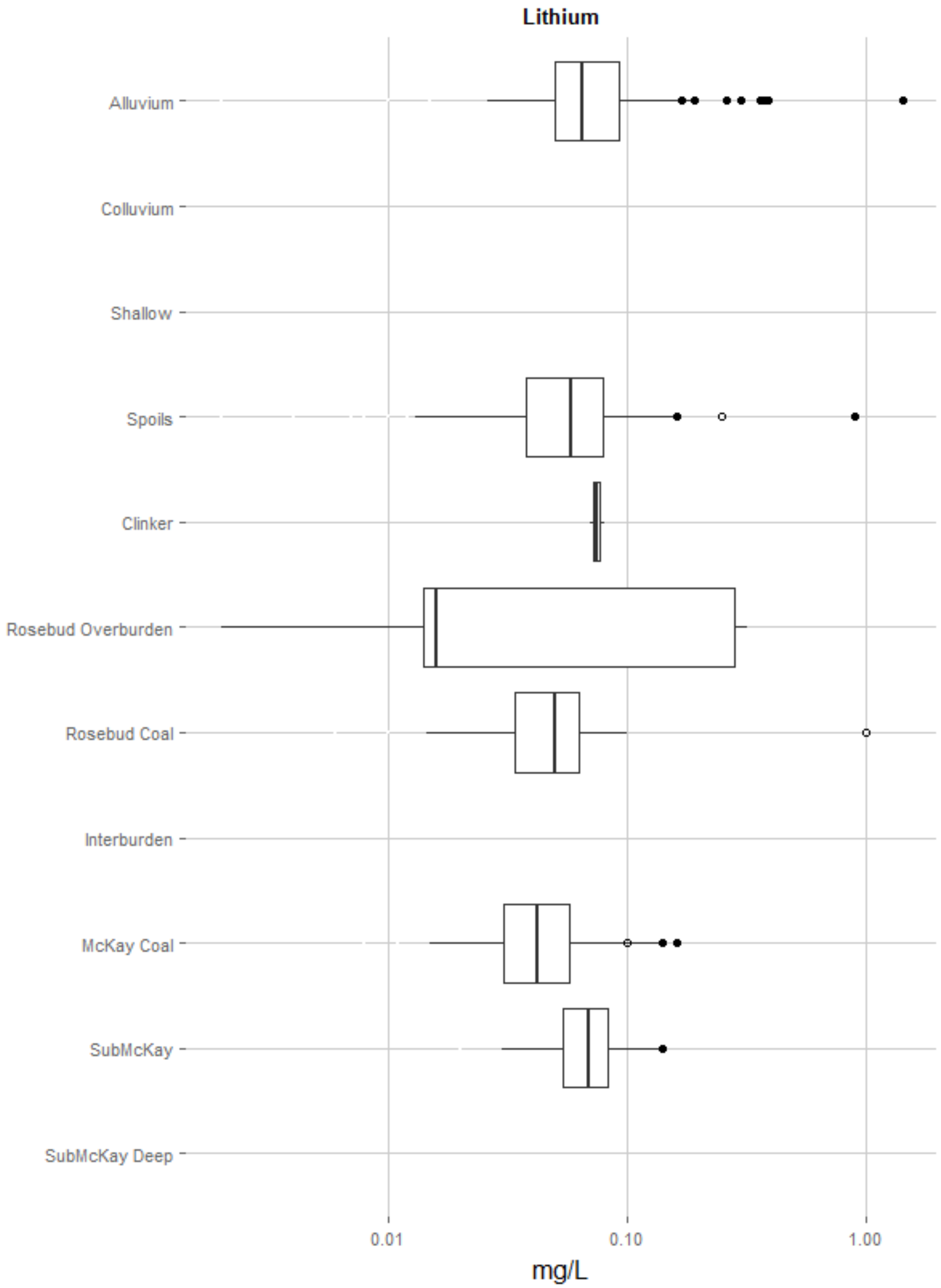

Cobalt
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.001
0.100
mg/L

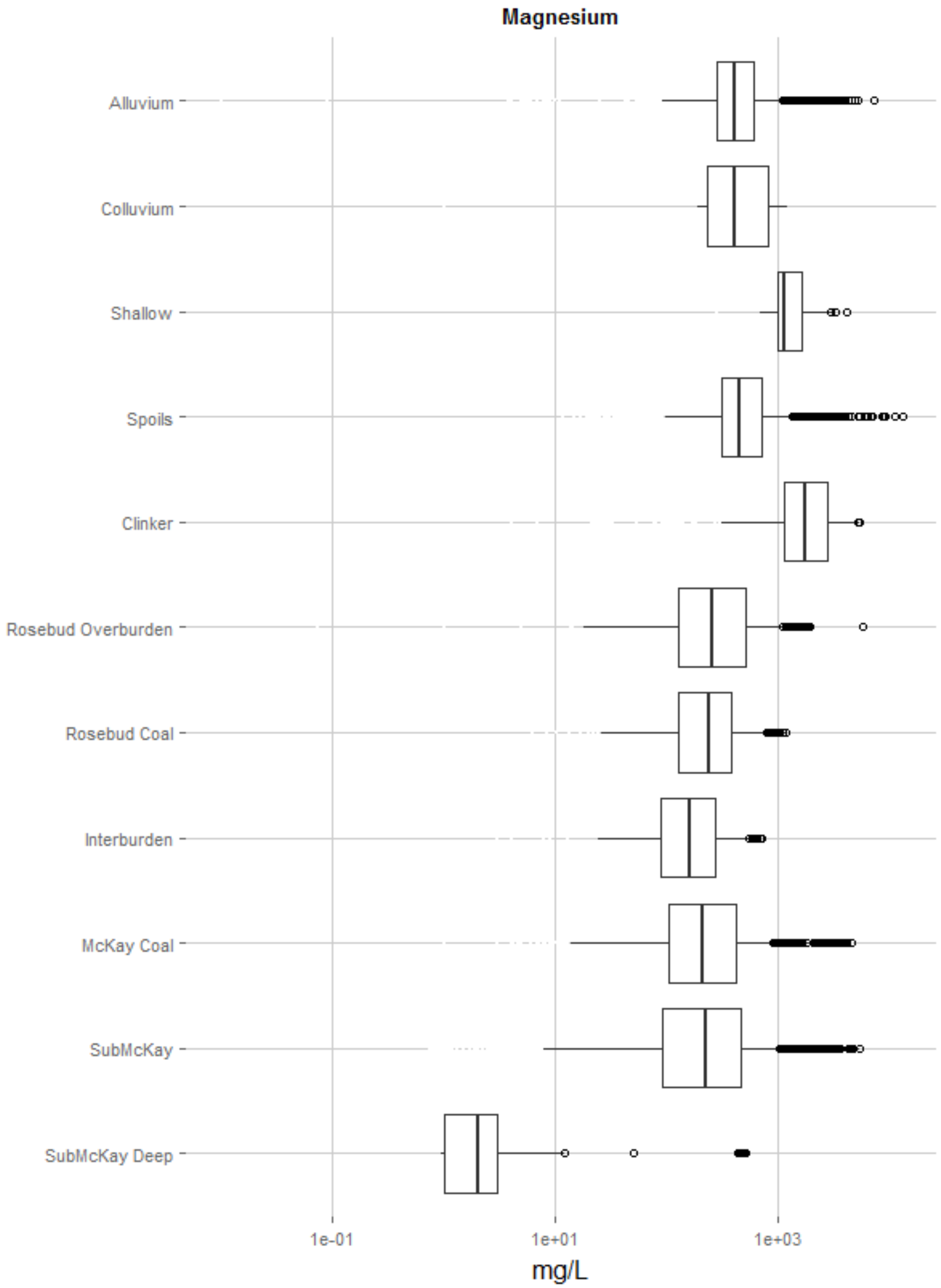

Copper
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1e-05
1e-03
1e-01
mg/L

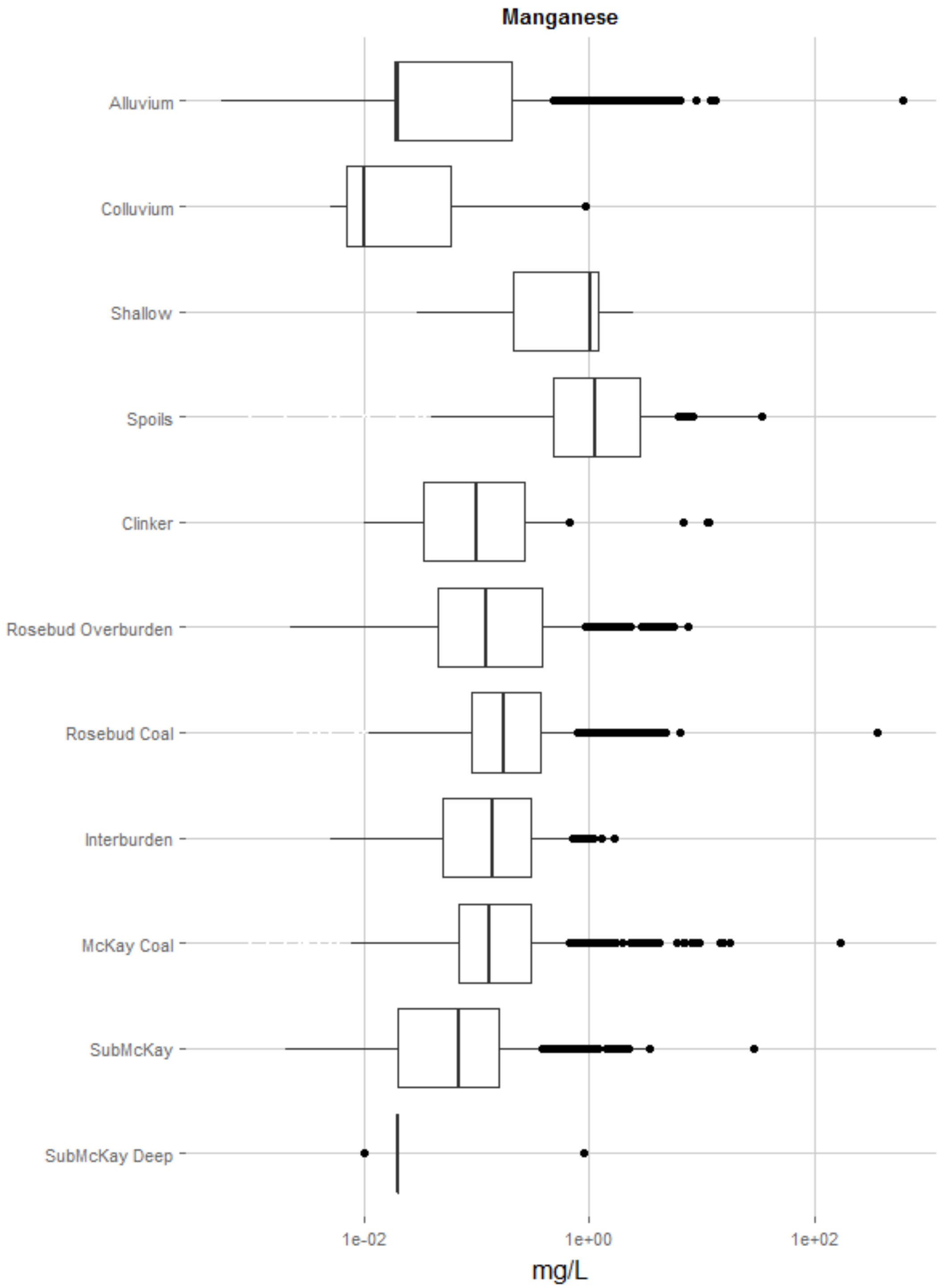

Fluoride
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1e-01
1e+01
1e+03
mg/L

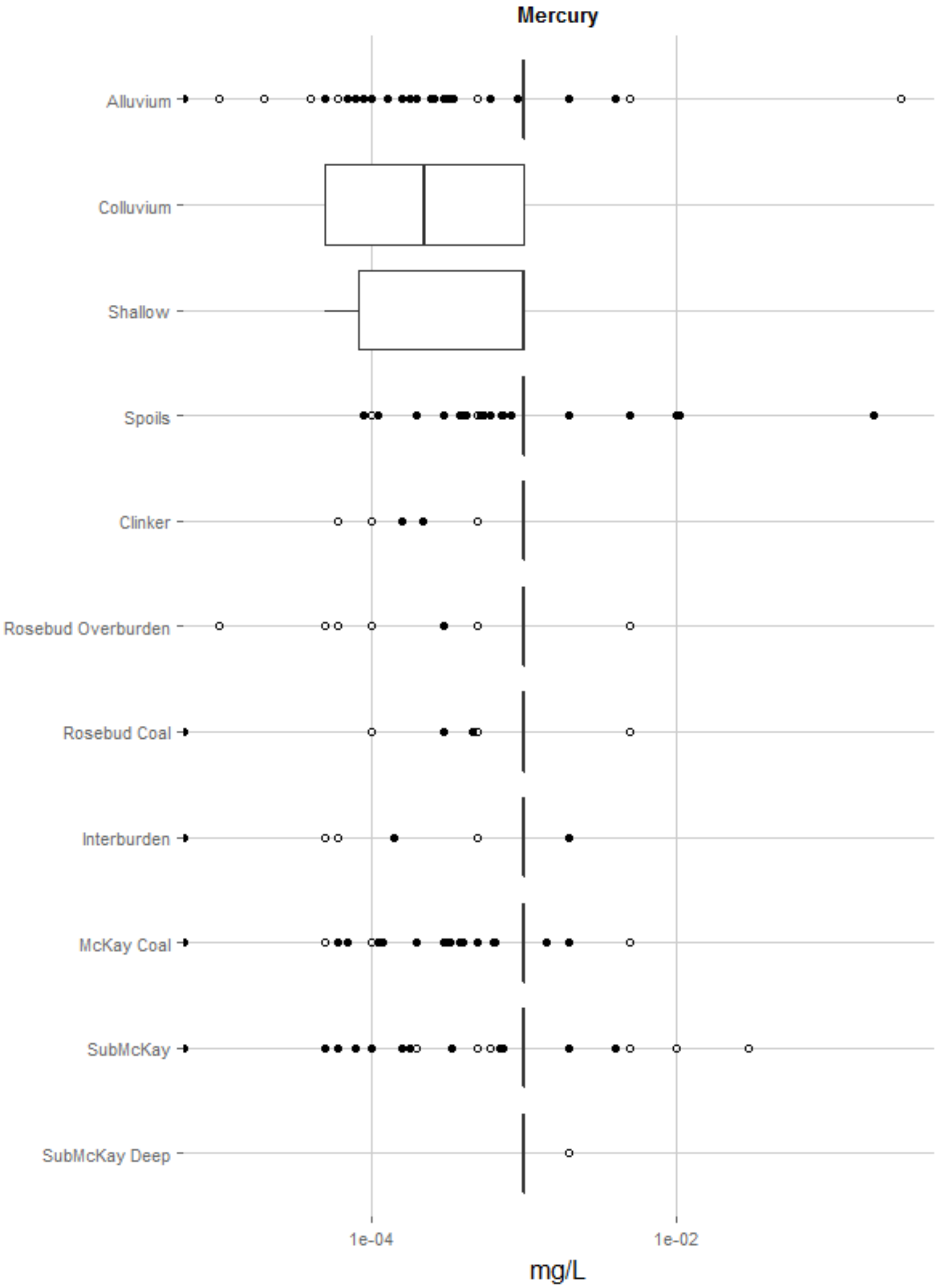

Iron
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1e-04
1e-02
1e+00
1e+02
mg/L

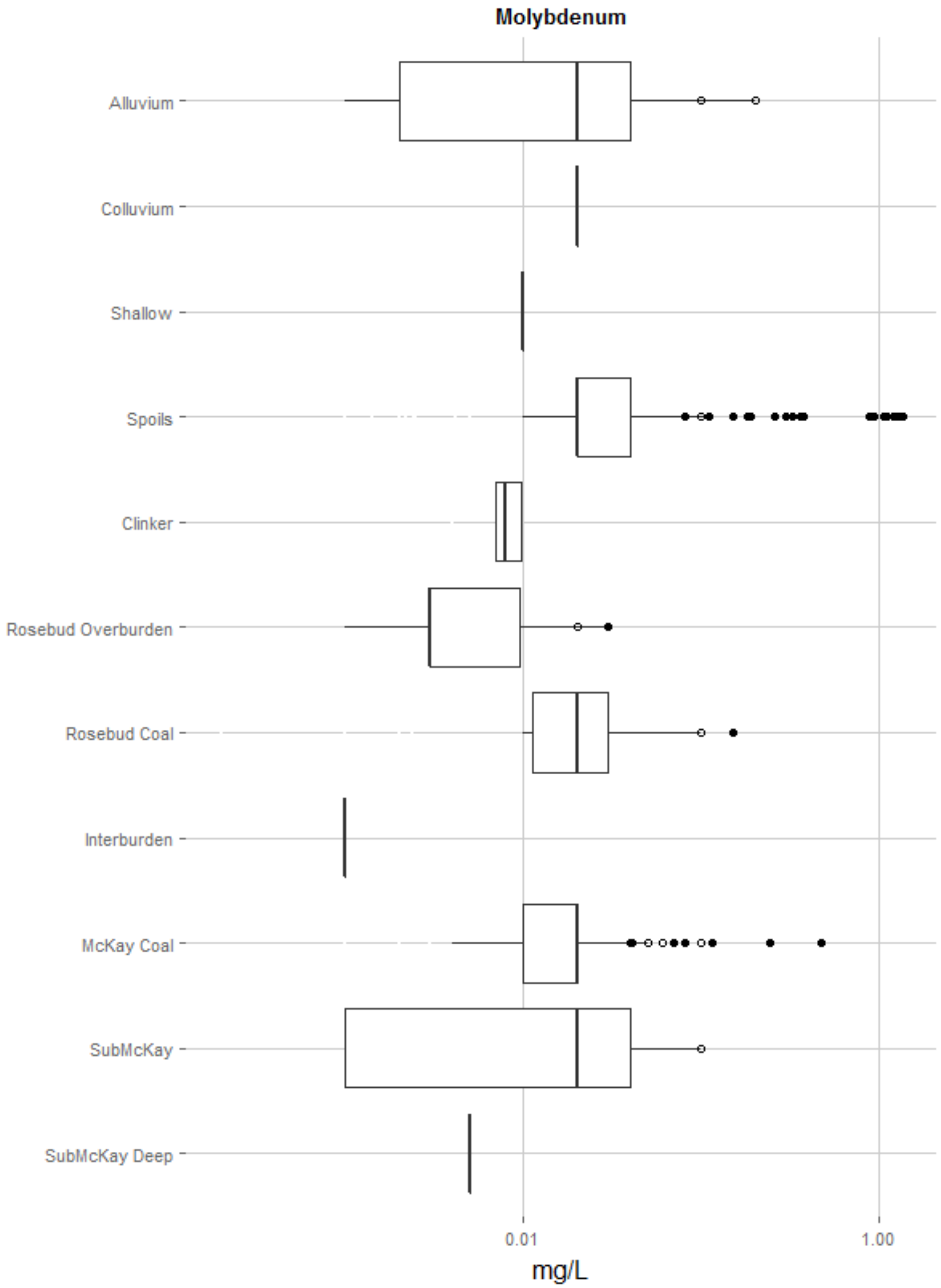

Lead
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.001
0.100
mg/L

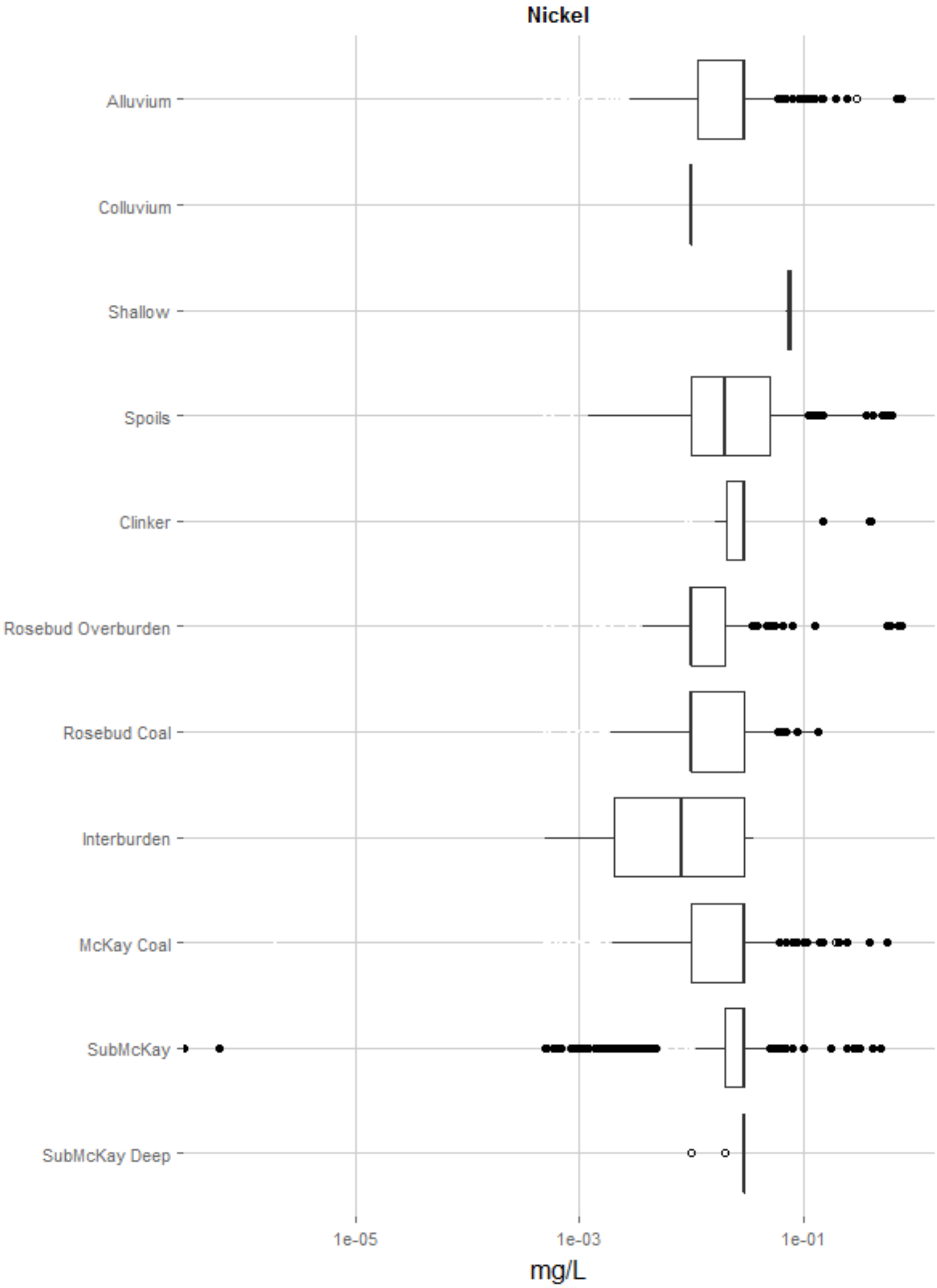

Lithium
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.01
0.10
1.00
mg/L

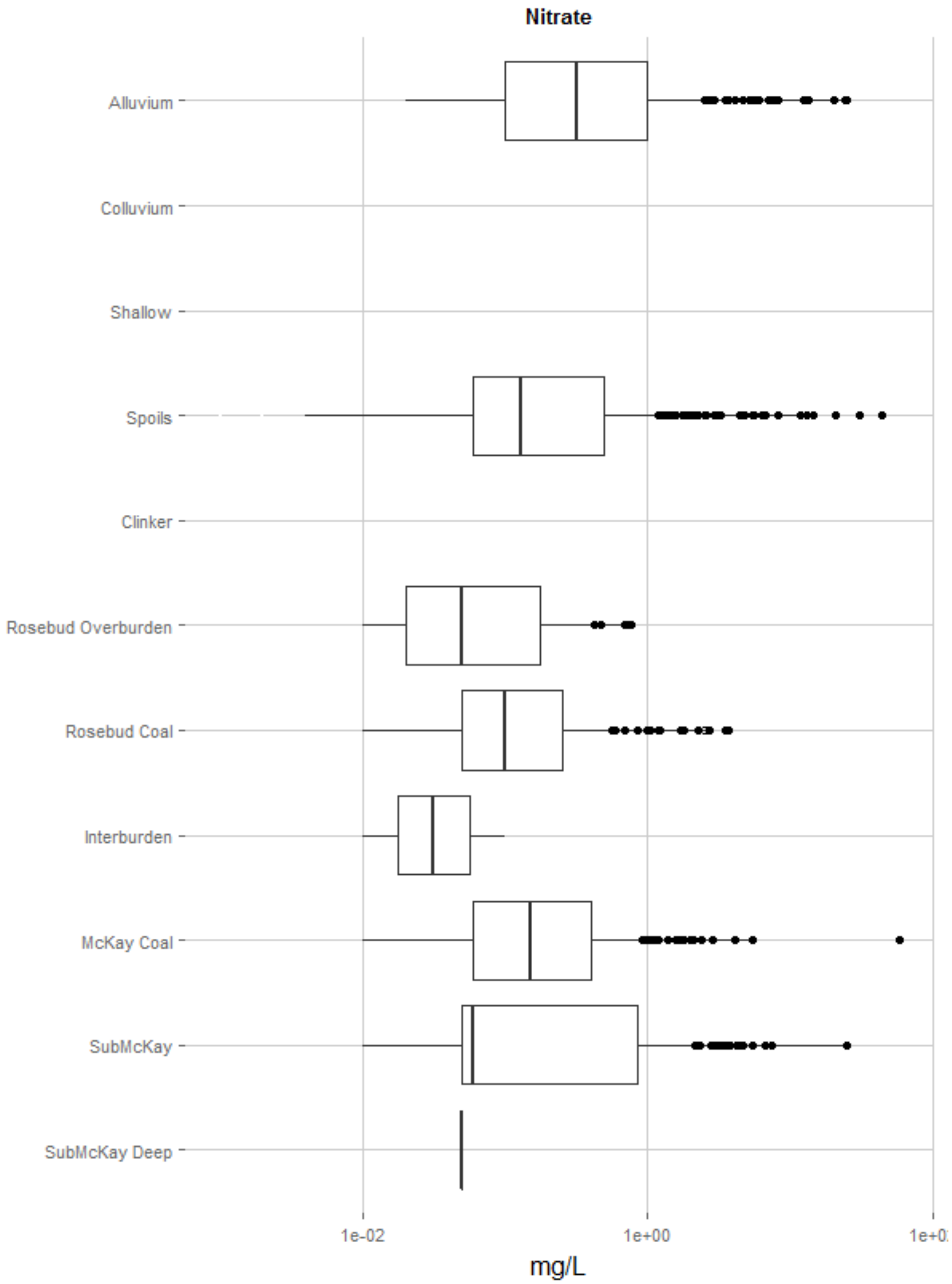

Magnesium
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1e-01
1e+01
1e+03
mg/L

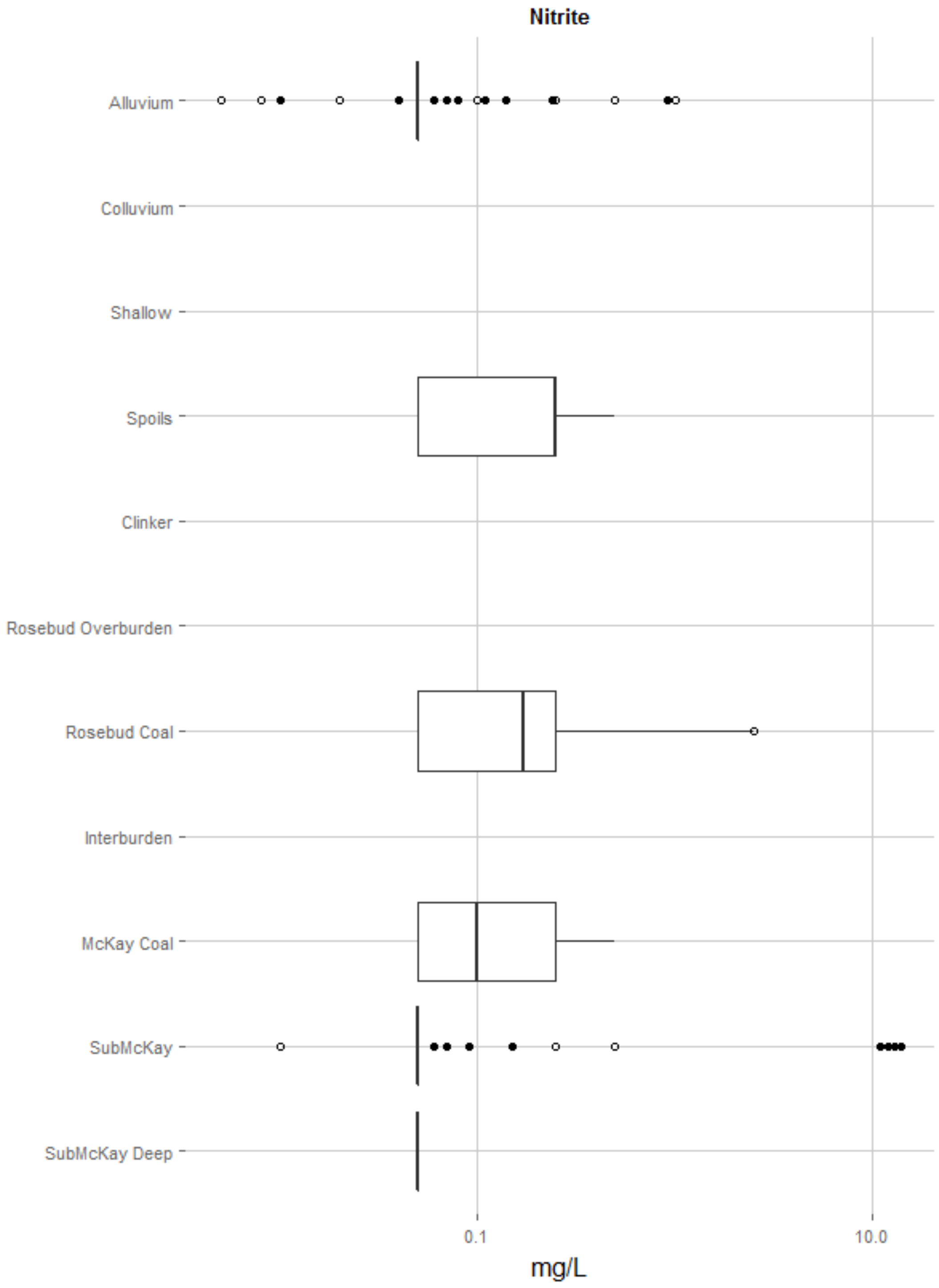

Manganese
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1e-02
1e+00
1e+02
mg/L

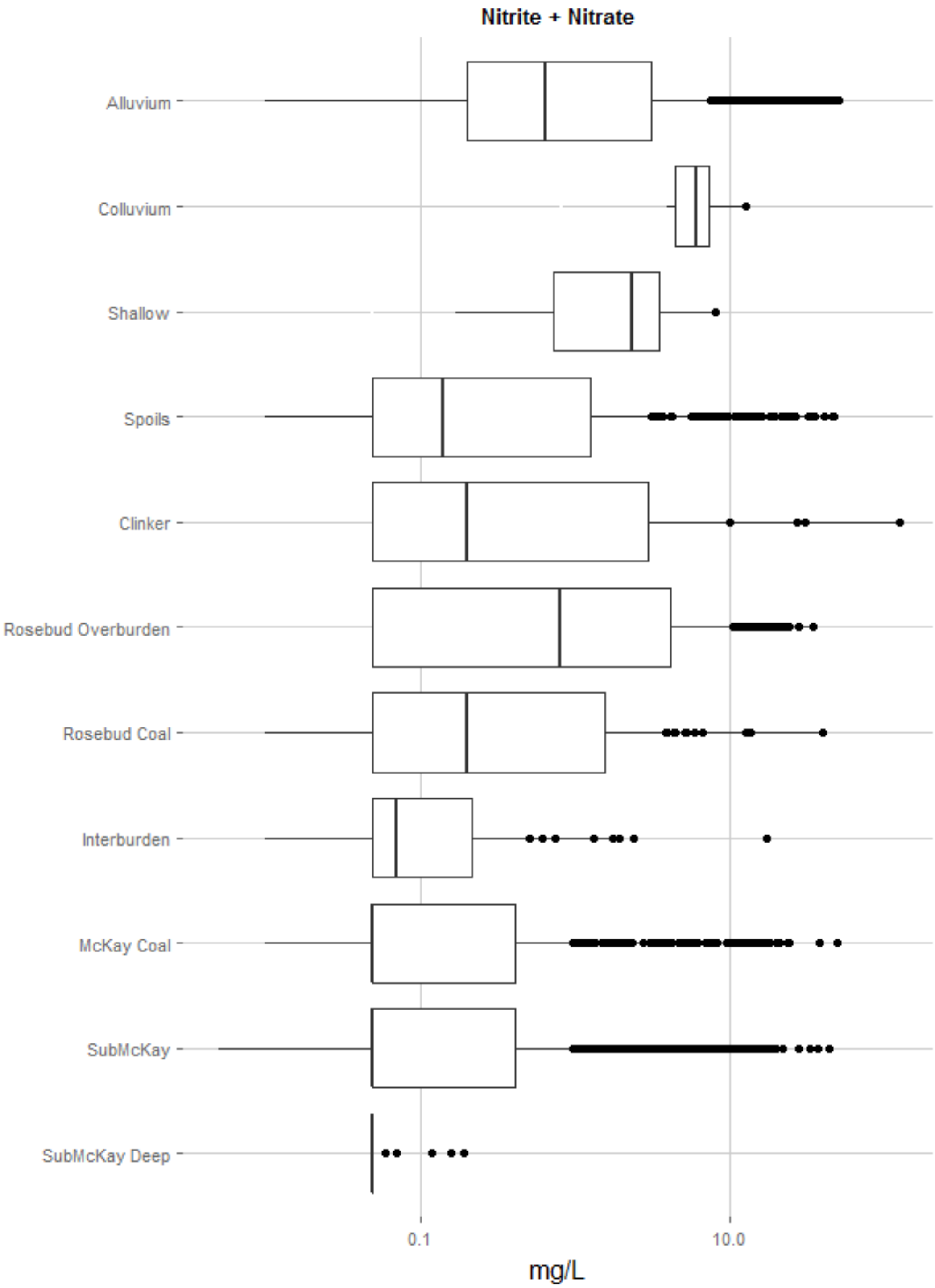

Mercury
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1e-04
1e-02
mg/L

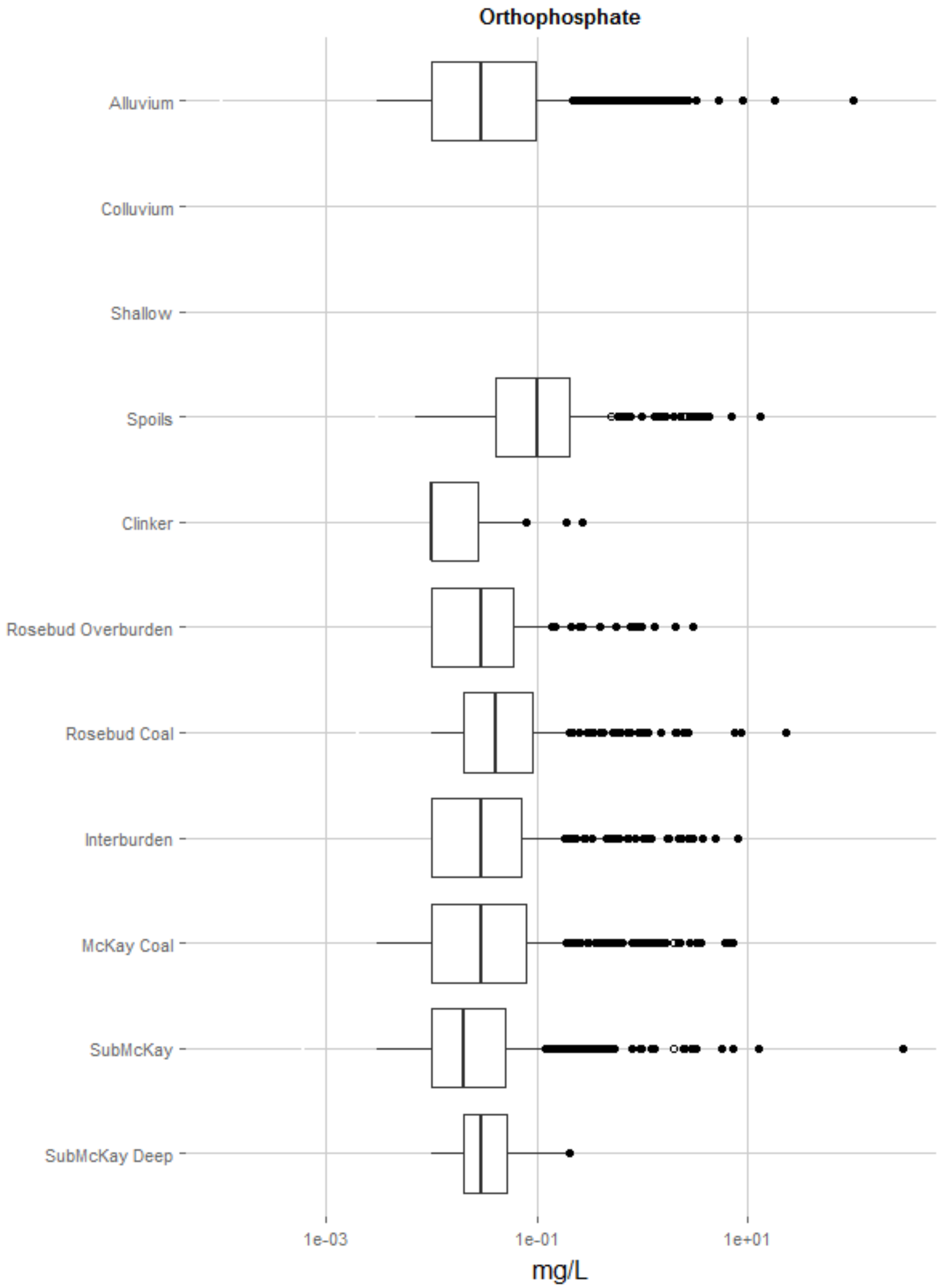

Molybdenum
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.01
1.00
mg/L

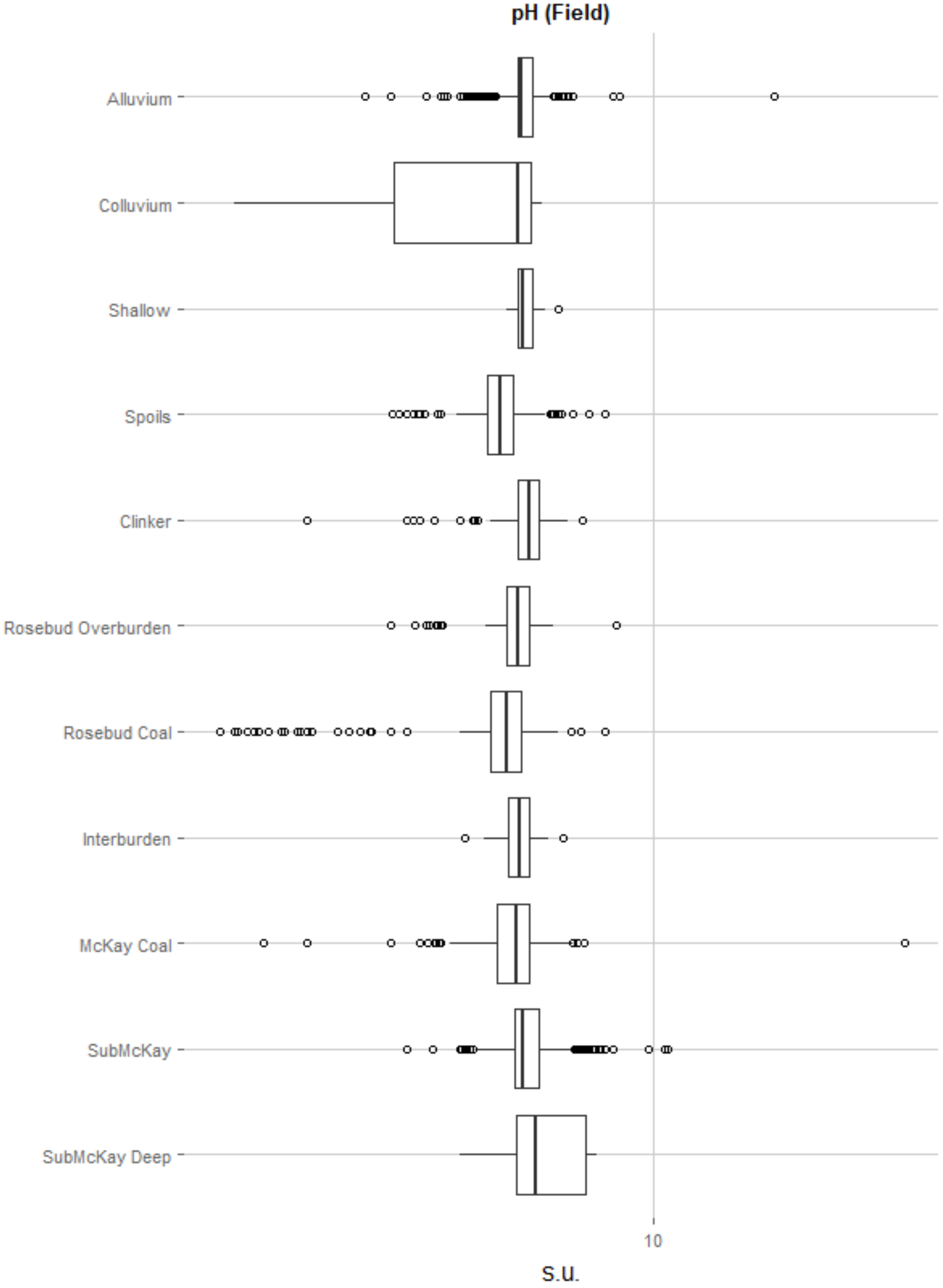

Nickel
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1e-05
1e-03
1e-01
mg/L

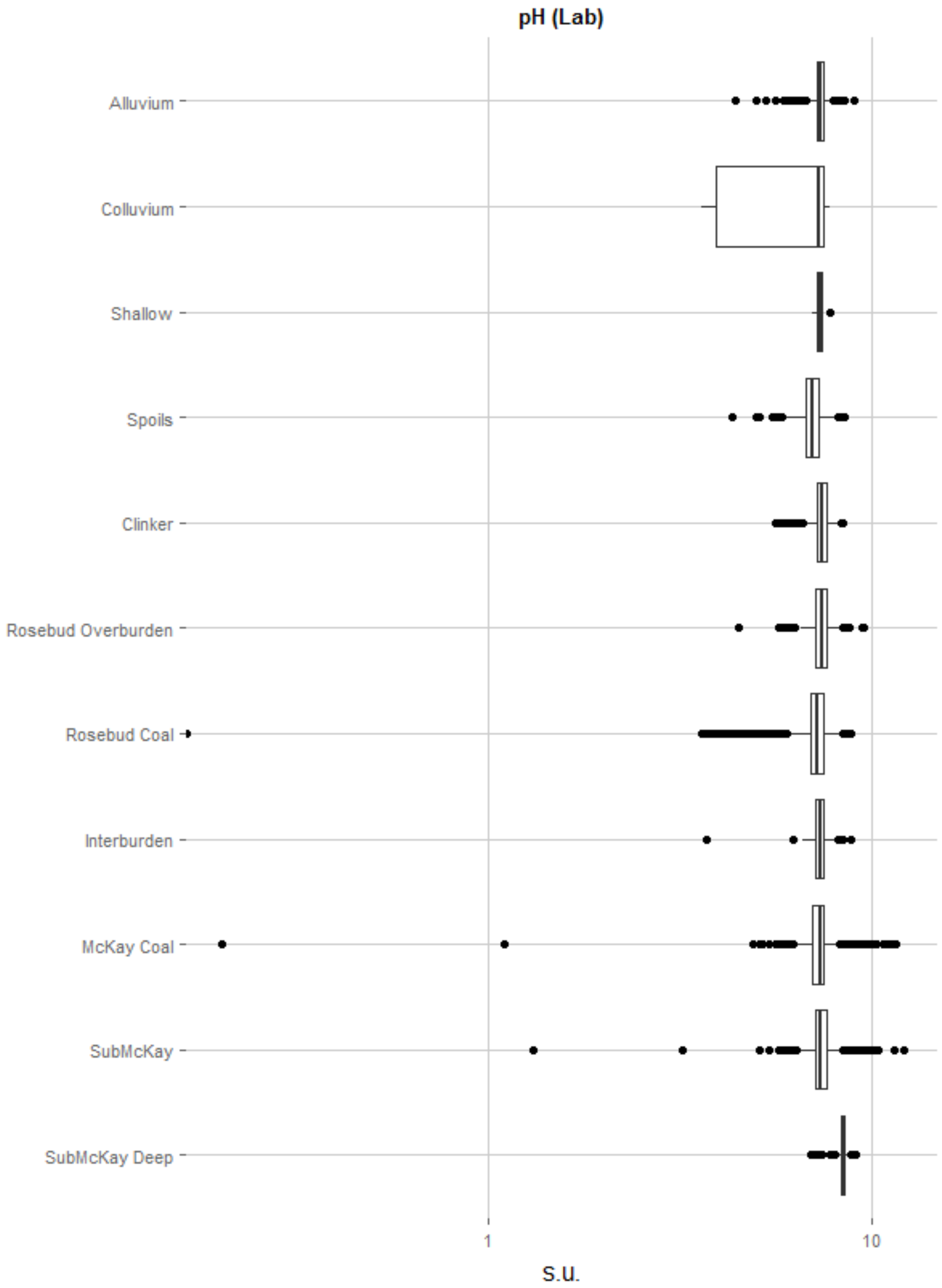

Nitrate
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1e-02
1e+00
1e+0
mg/L

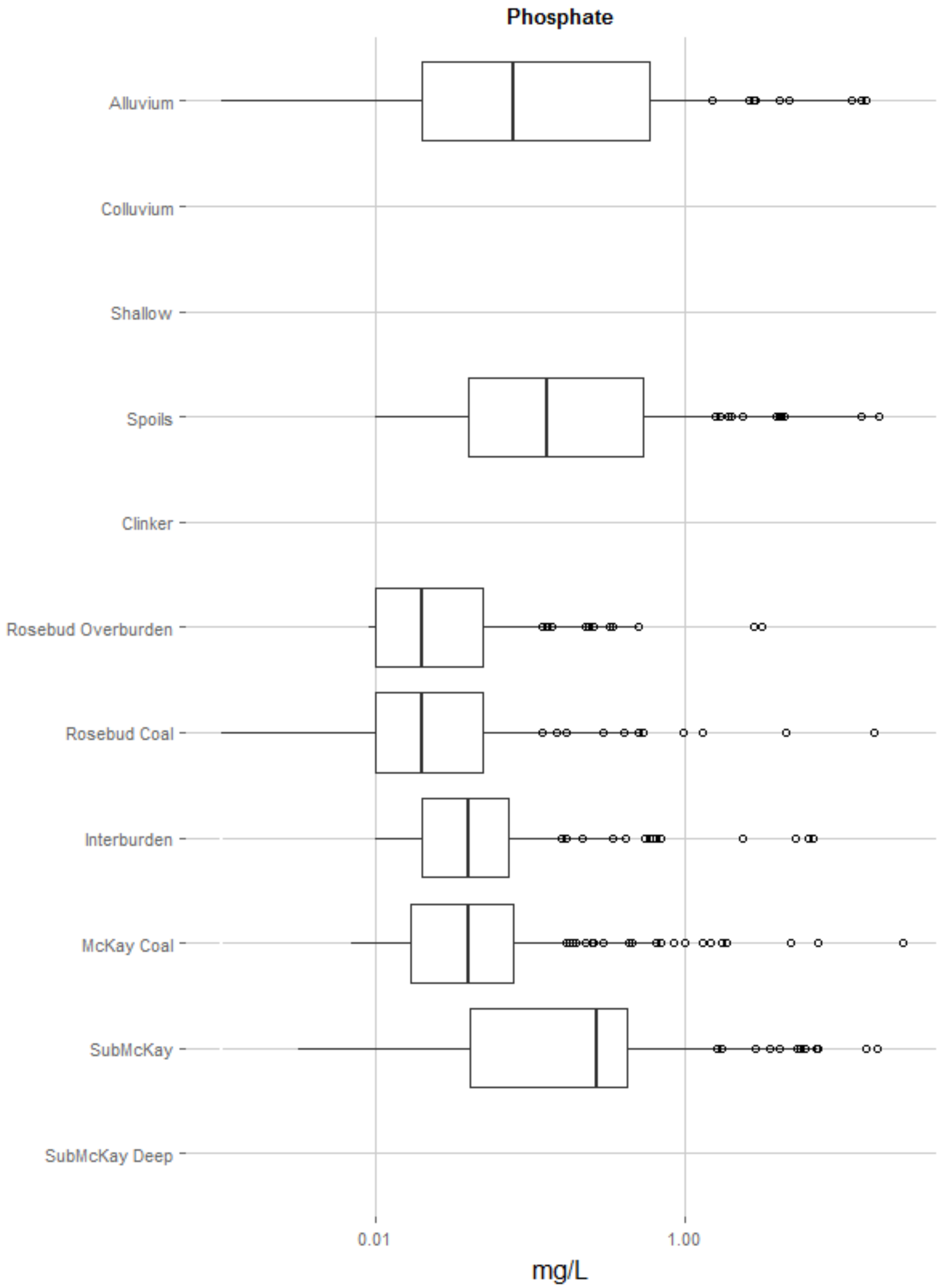

Nitrite
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.1
10.0
mg/L

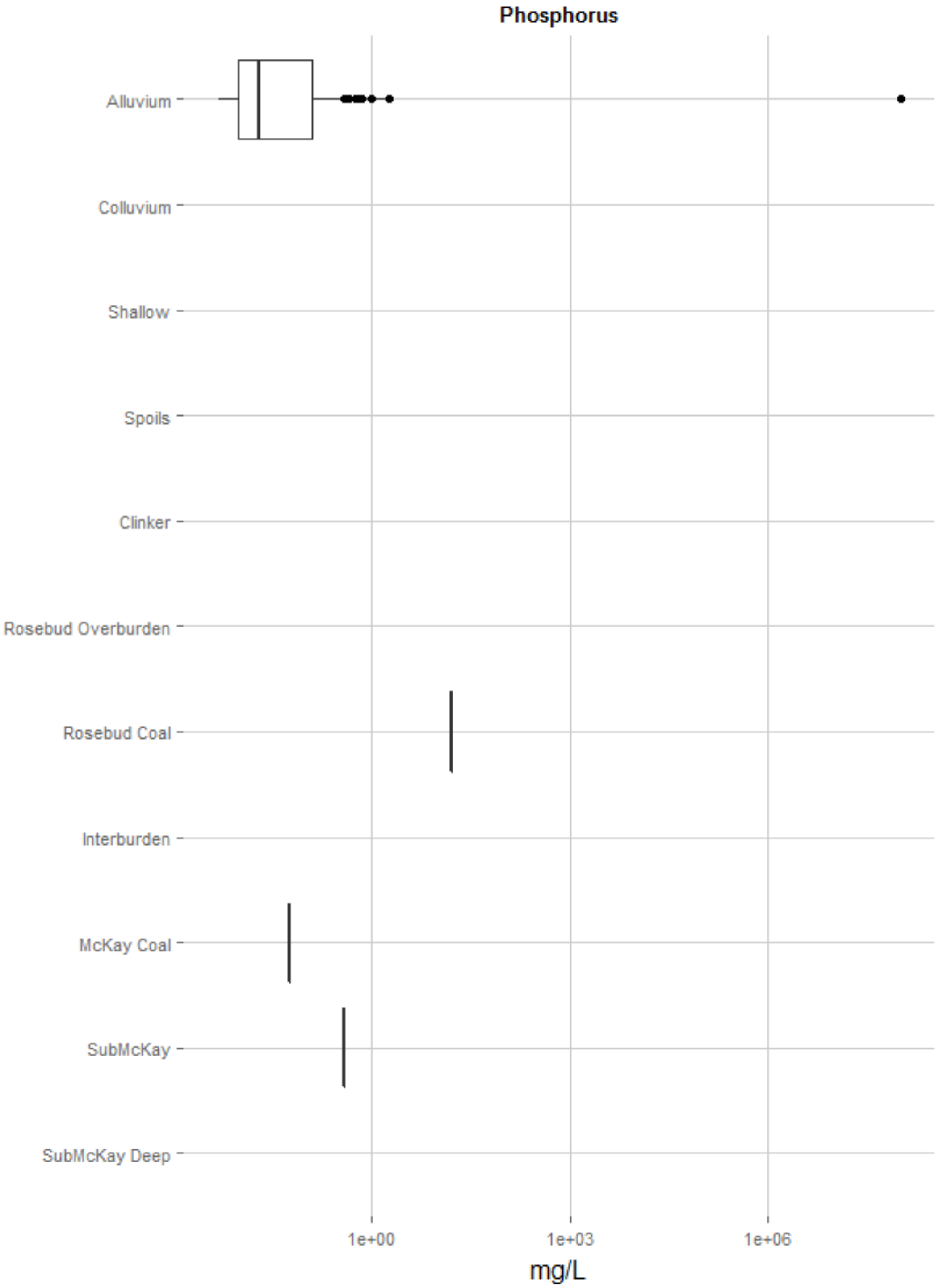

Nitrite + Nitrate
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.1
10.0
mg/L

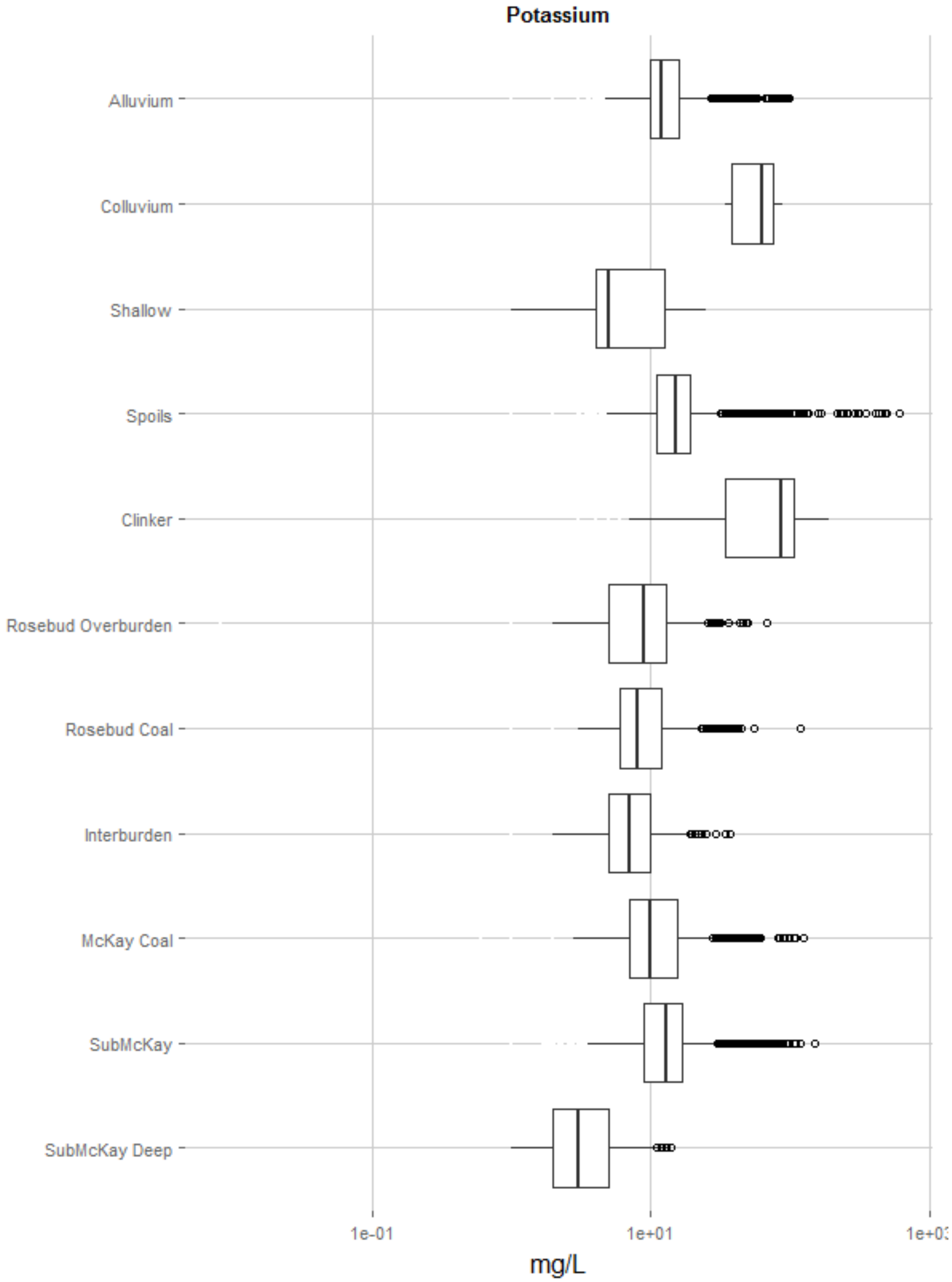

Orthophosphate
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1e-03
1e-01
1e+01
mg/L

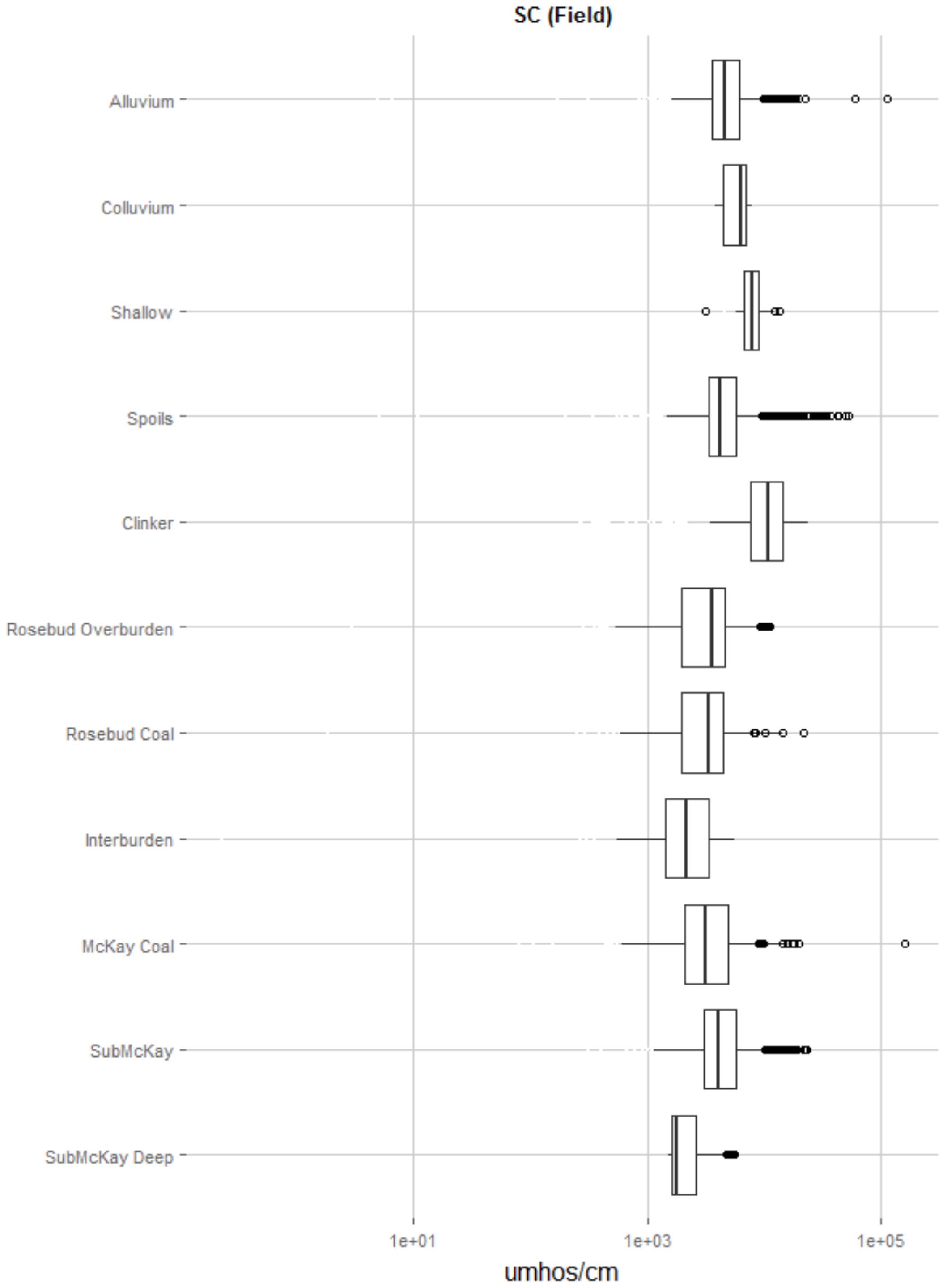

pH (Field)
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
10
s.u.

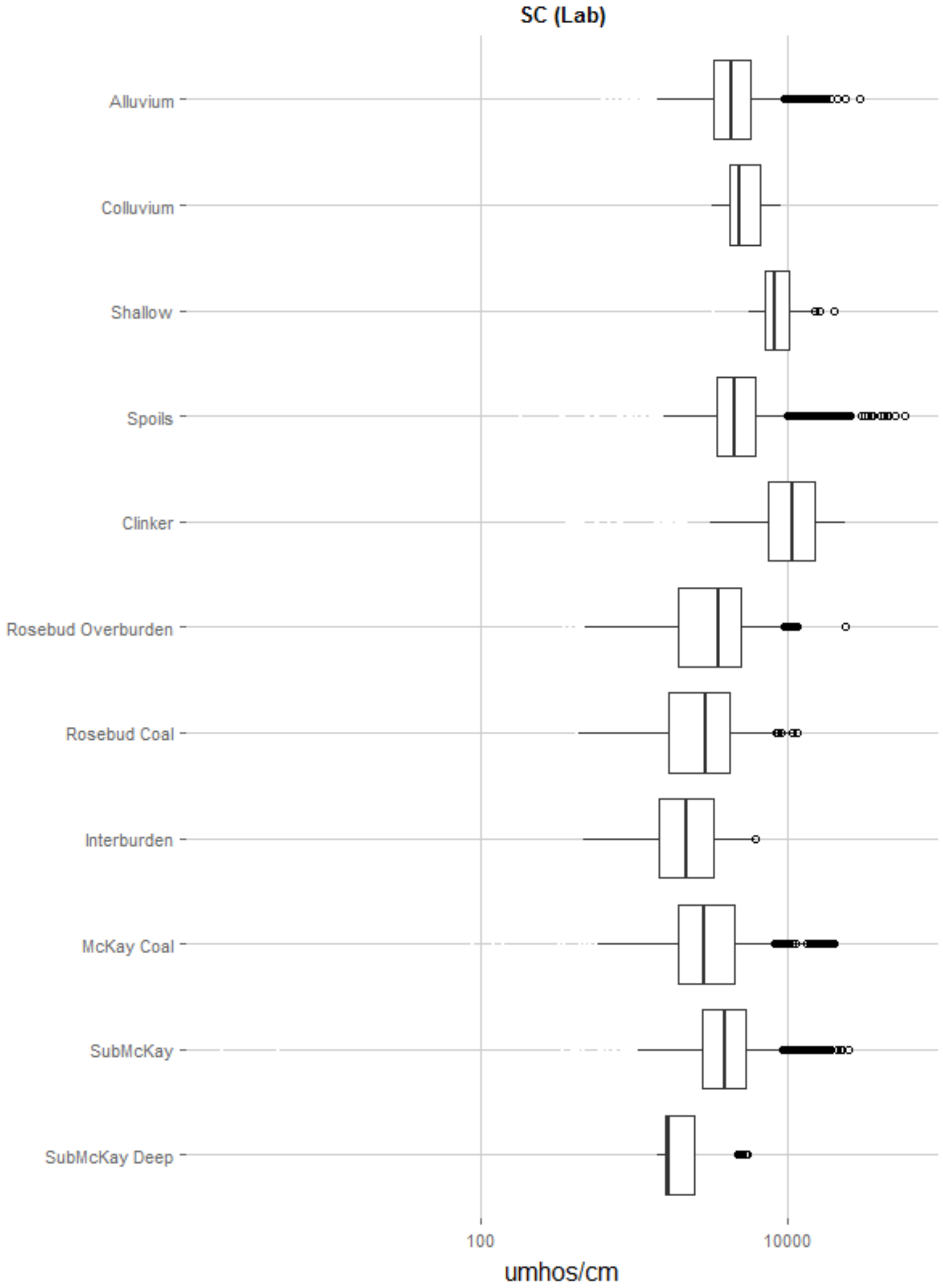

pH (Lab)
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1
10
s.u.

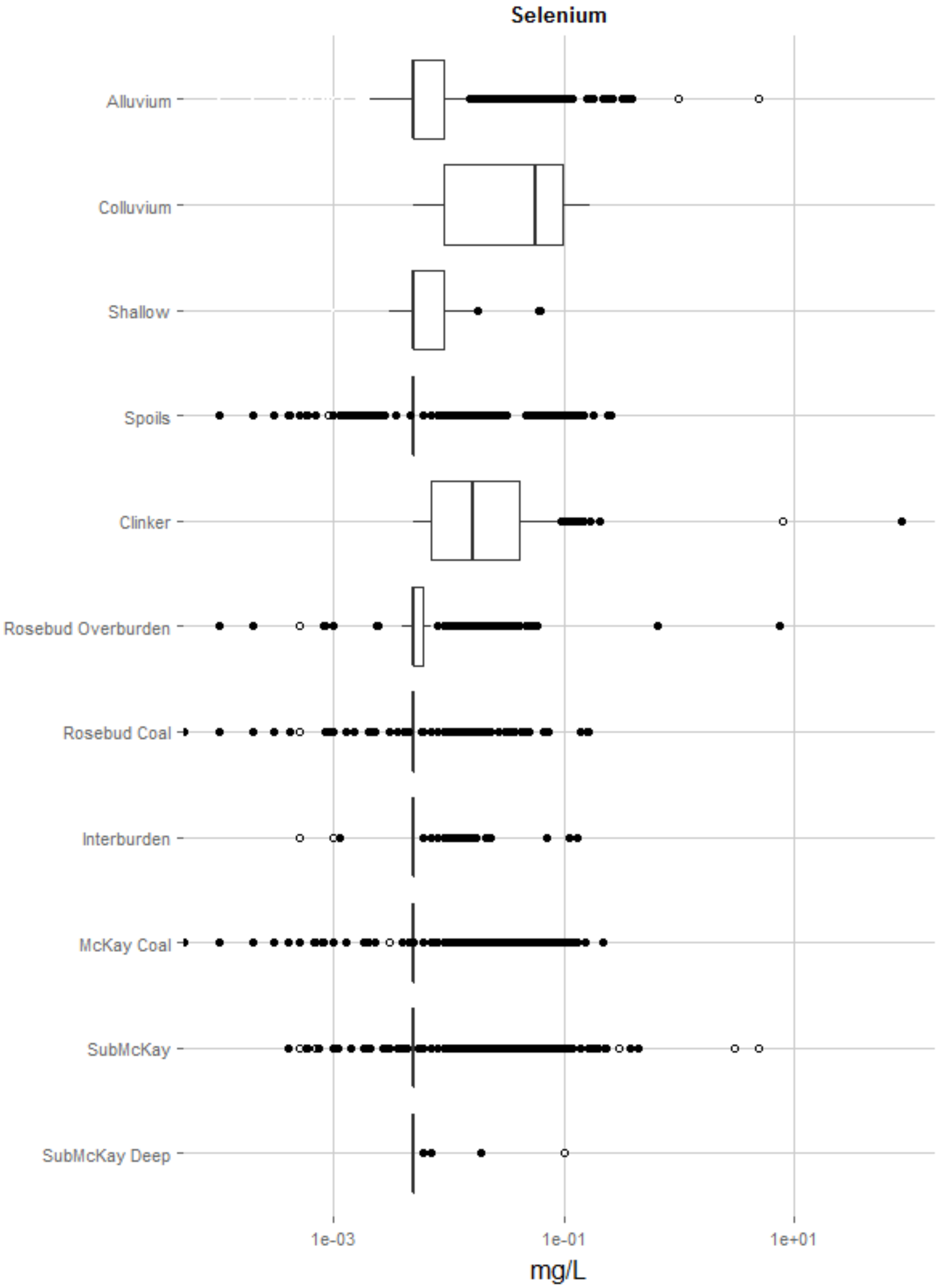

Phosphate
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.01
1.00
mg/L

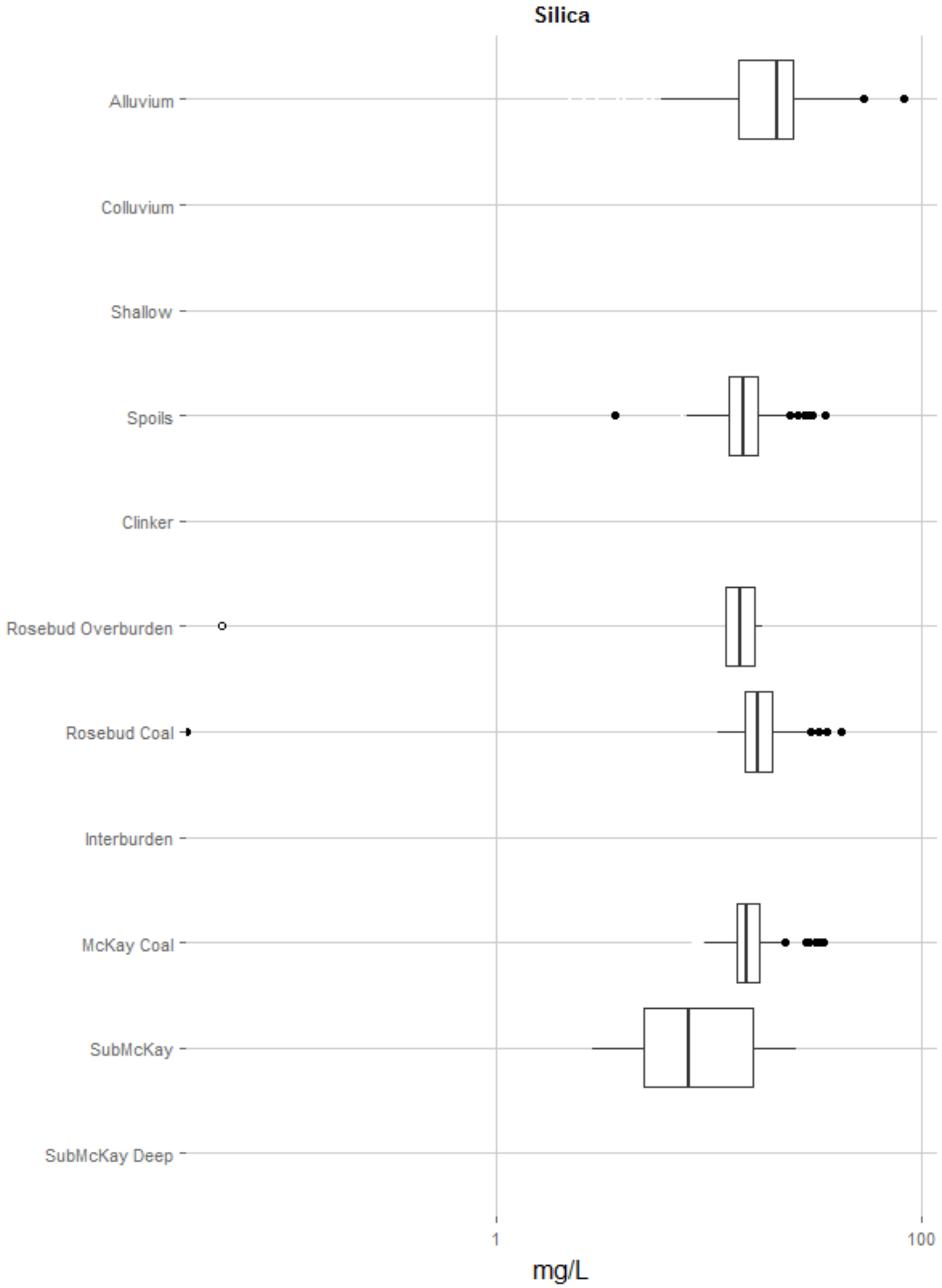

Phosphorus
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1e+00
1e+03
1e+06
mg/L

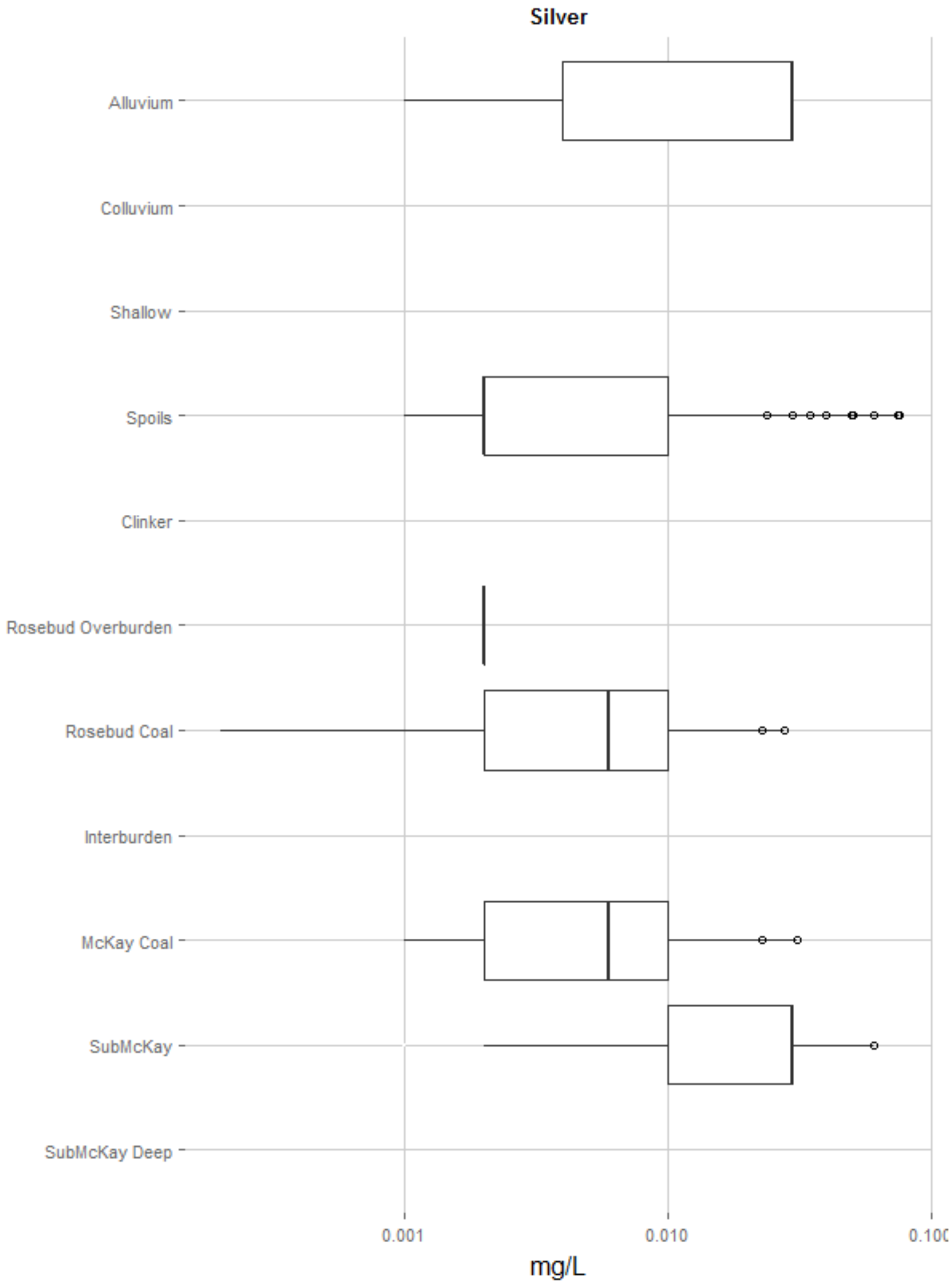

Potassium
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1e-01
1e+01
1e+03
mg/L

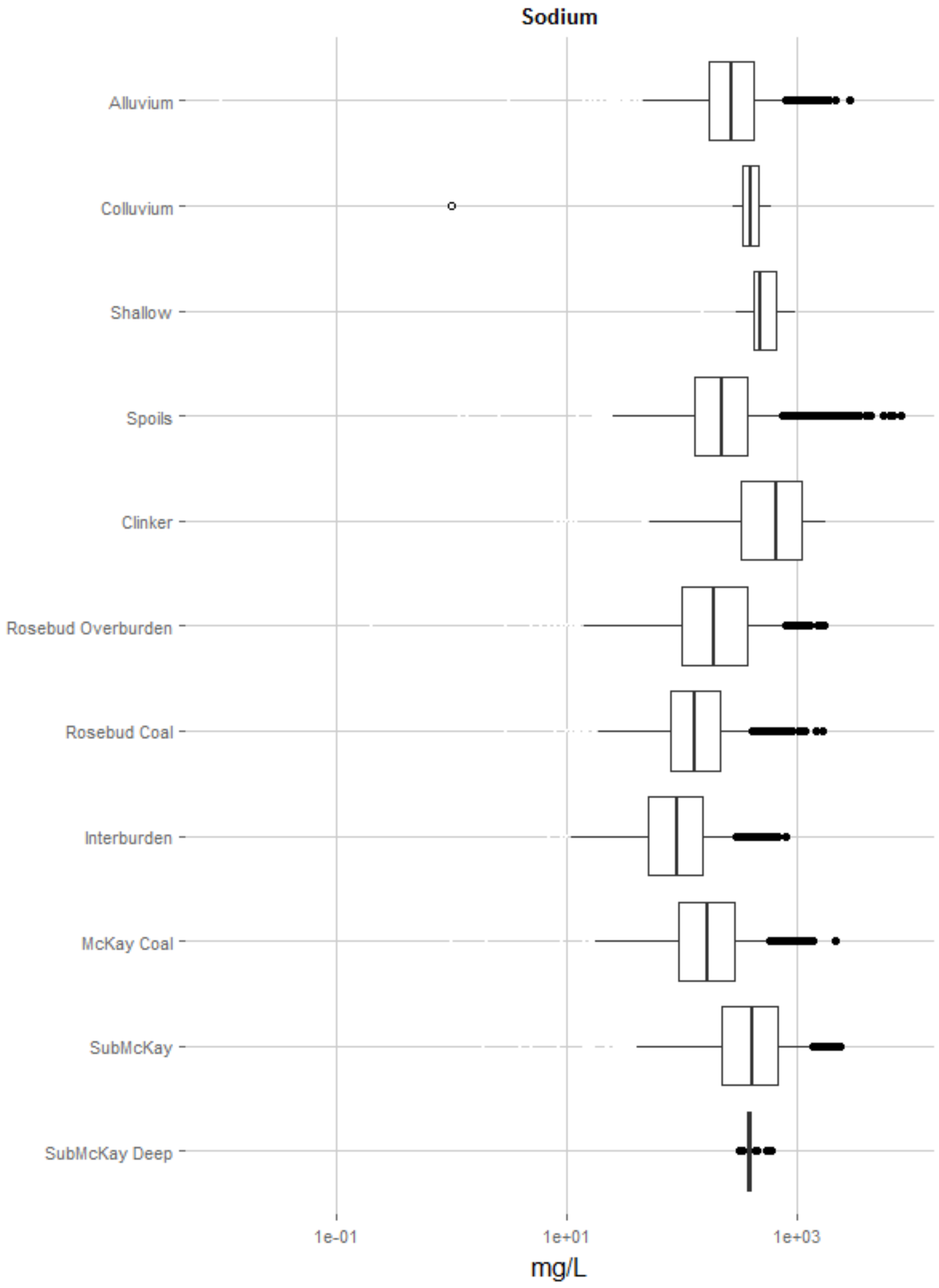

SC (Field)
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1e+01
1e+03
1e+05
umhos/cm

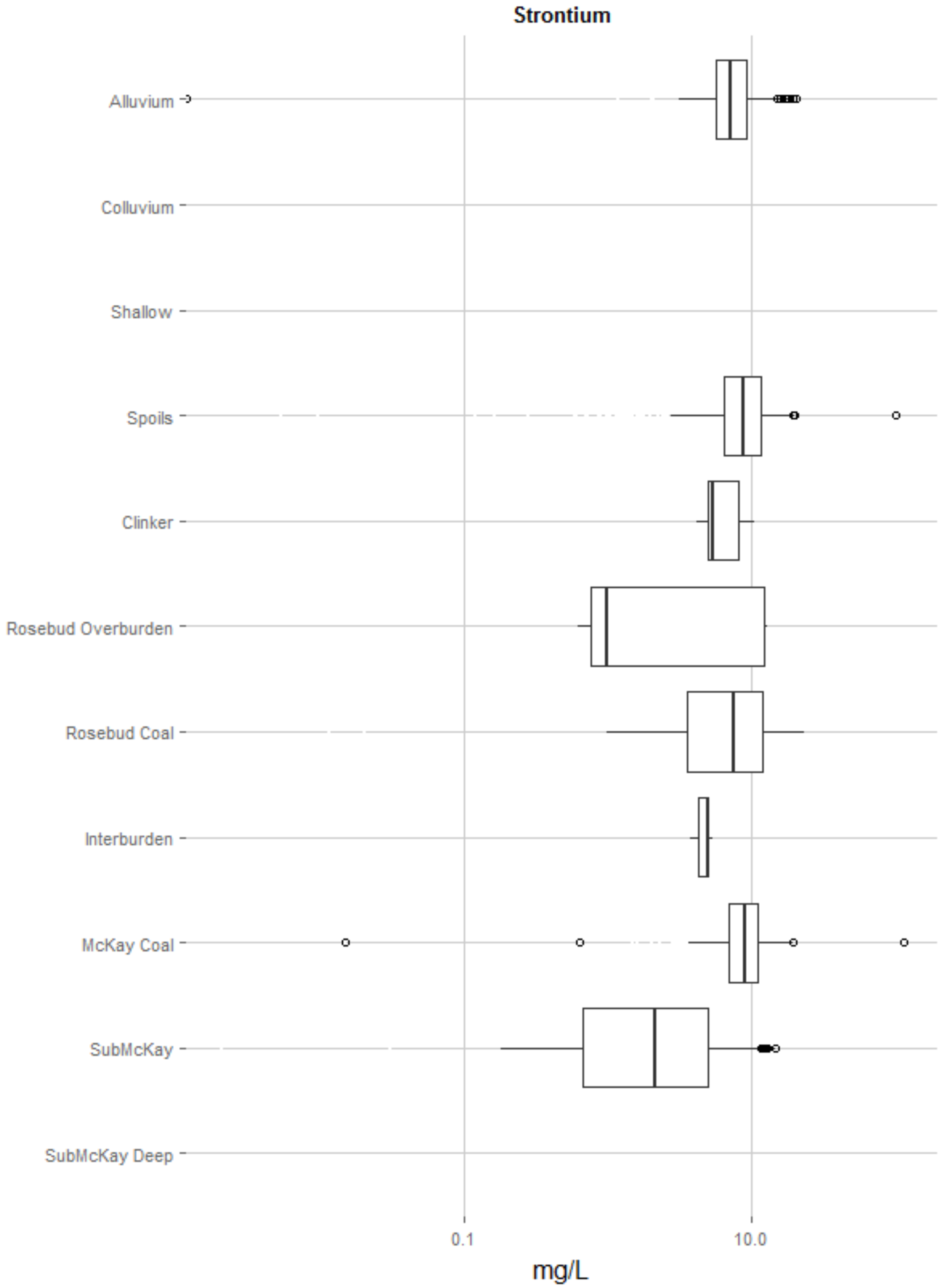

SC (Lab)
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
100
10000
umhos/cm

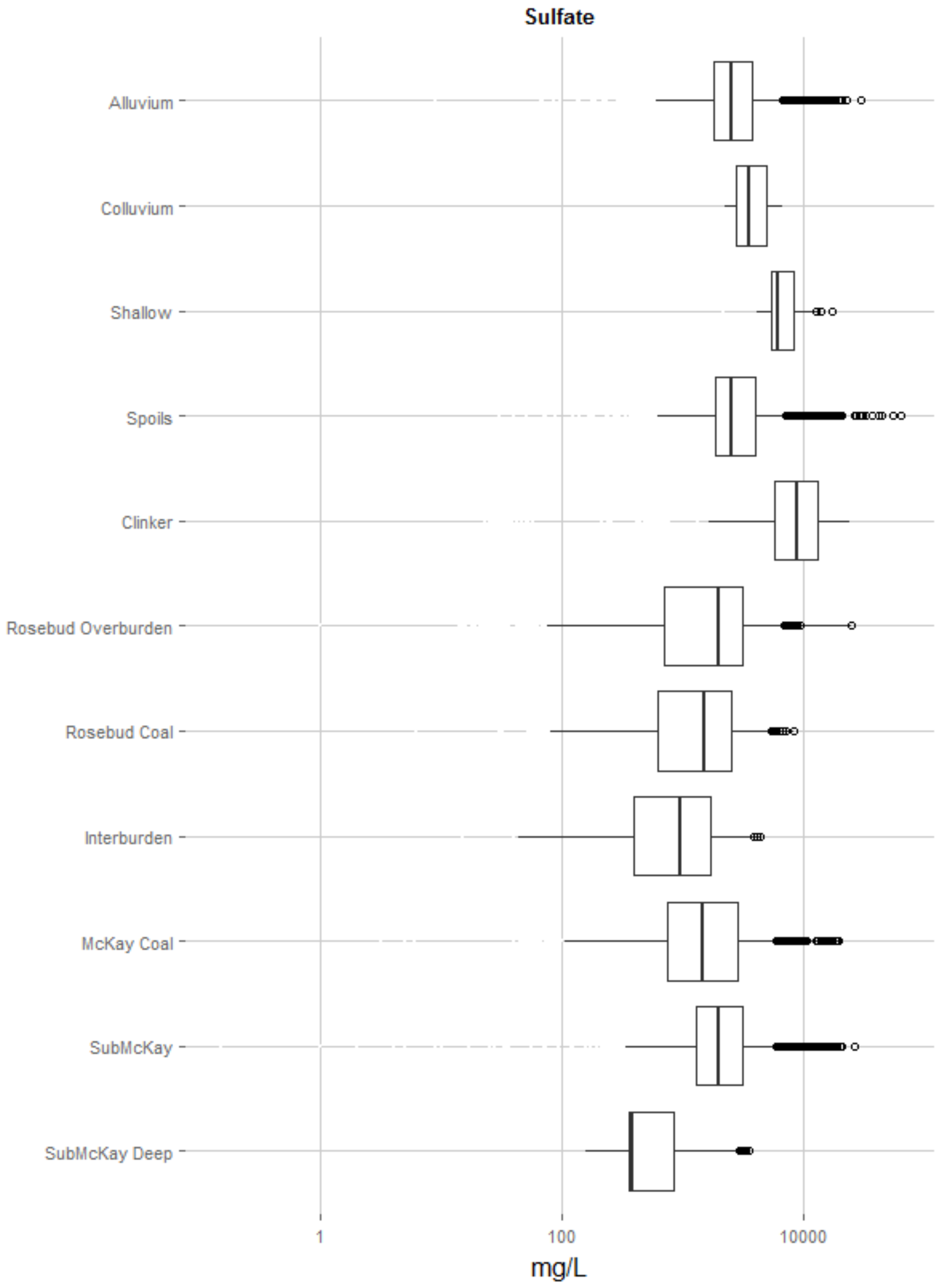

Selenium
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1e-03
1e-01
1e+01
mg/L

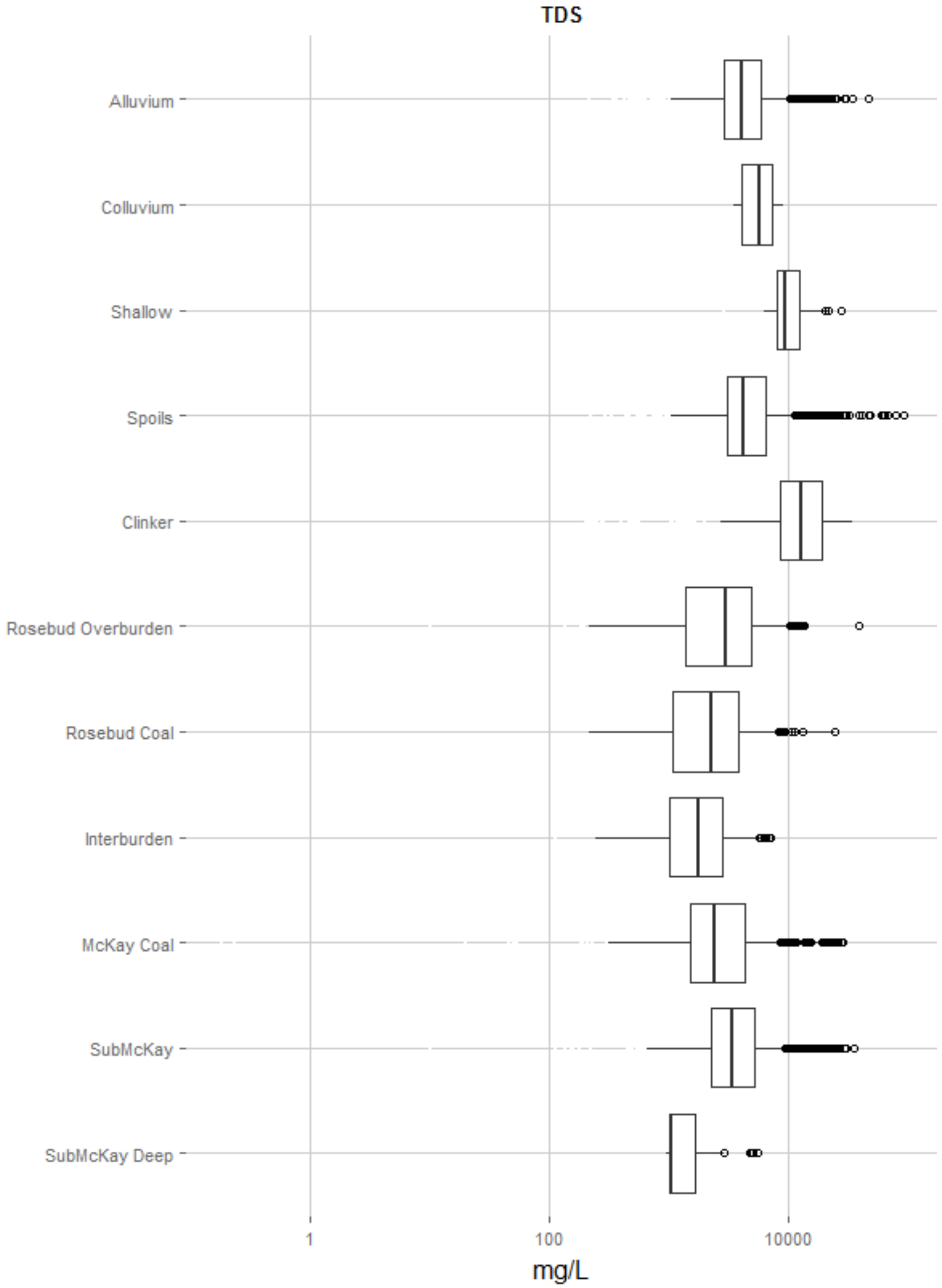

Silica
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1
100
mg/L

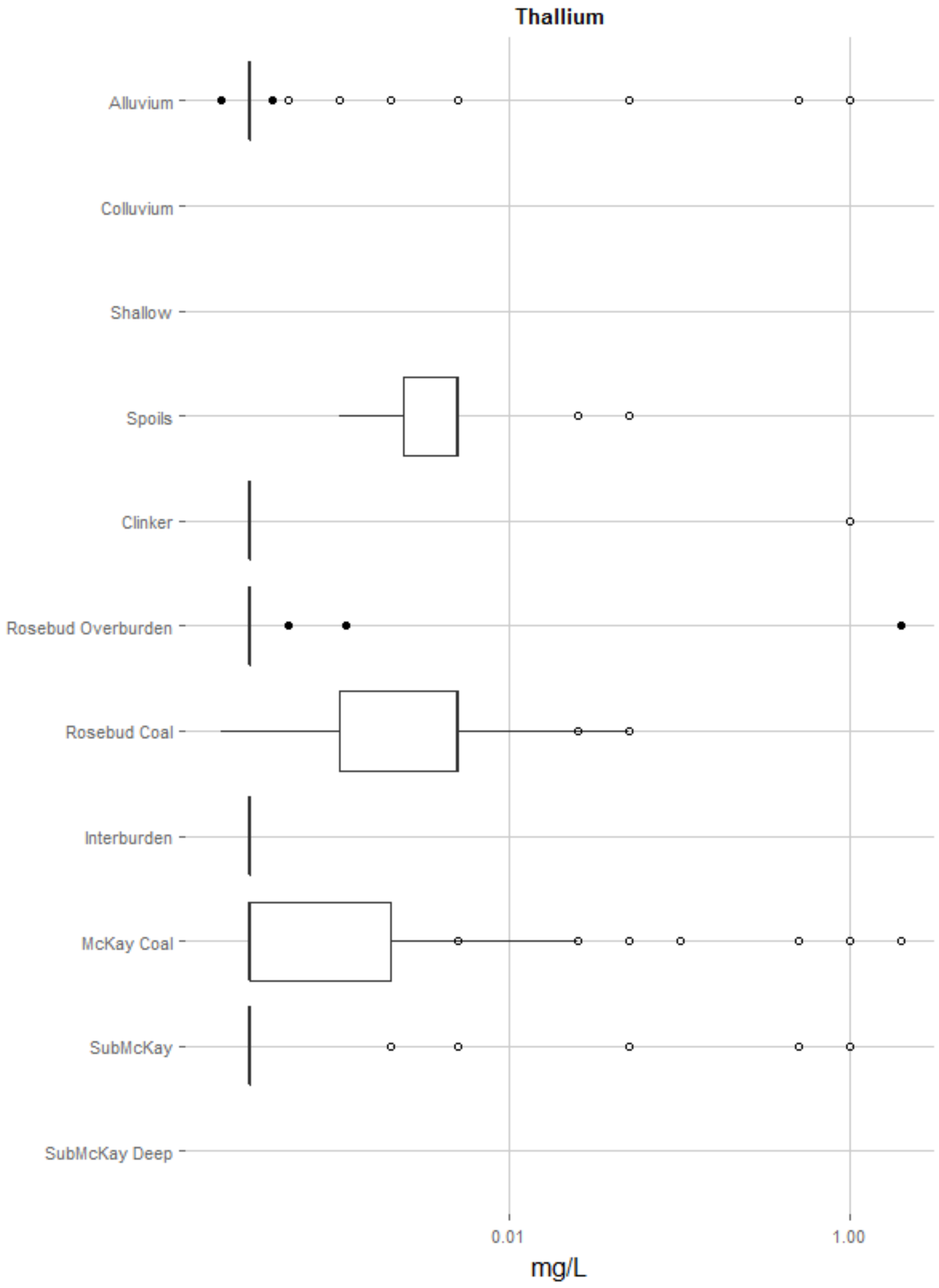

Silver
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.001
0.010
0.10
mg/L

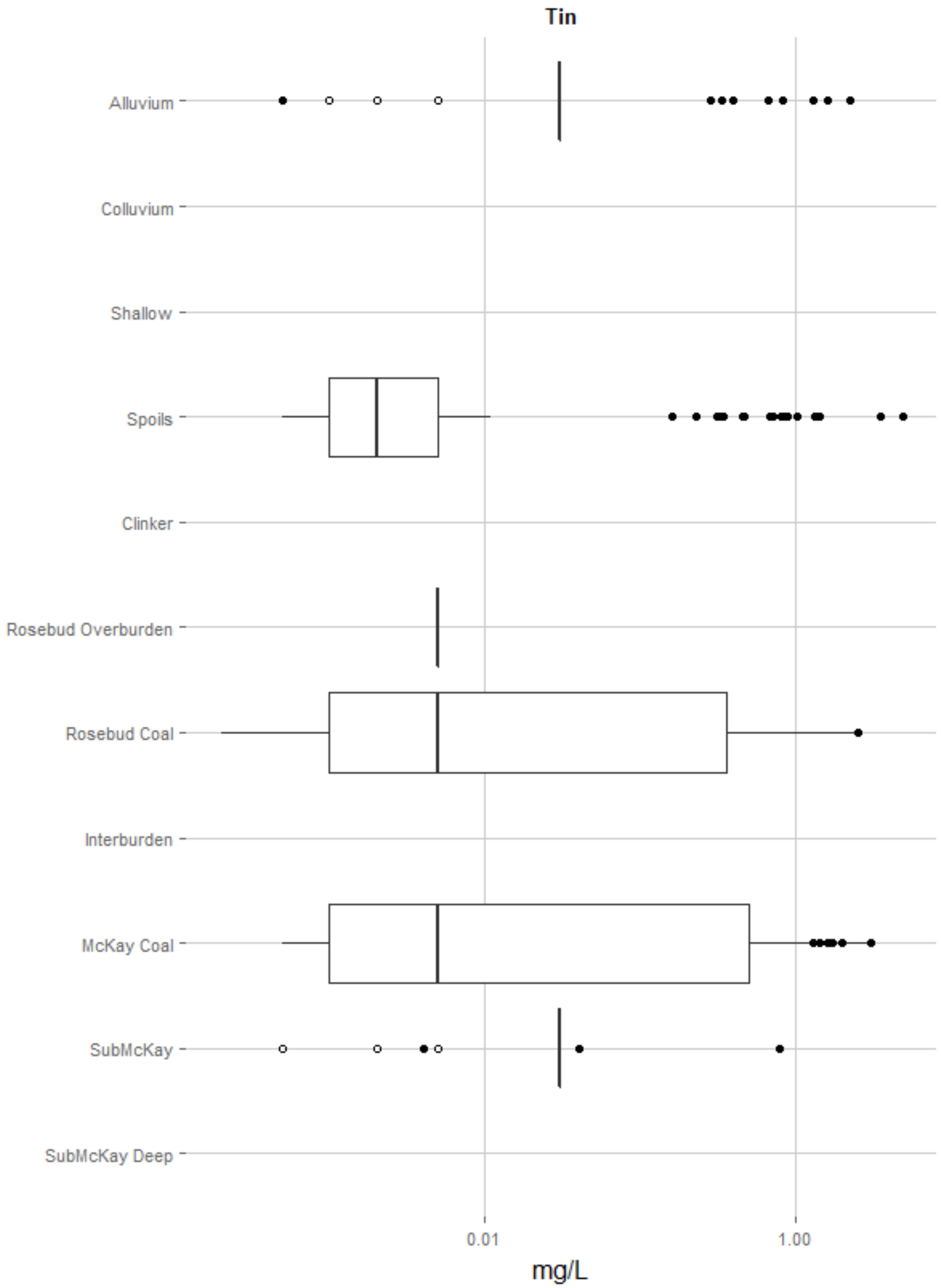

Sodium
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1e-01
1e+01
1e+03
mg/L

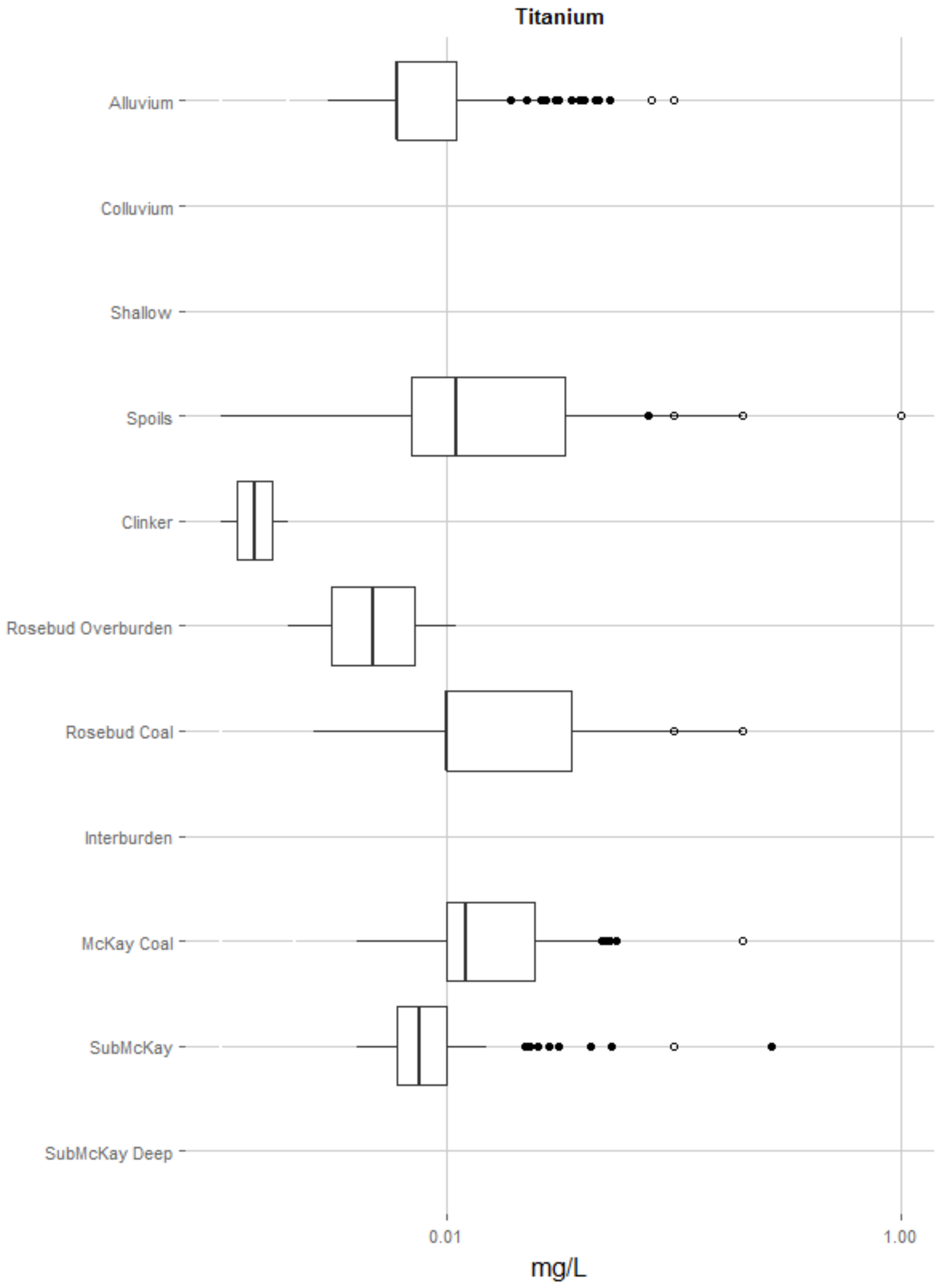

Strontium
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.1
10.0
mg/L

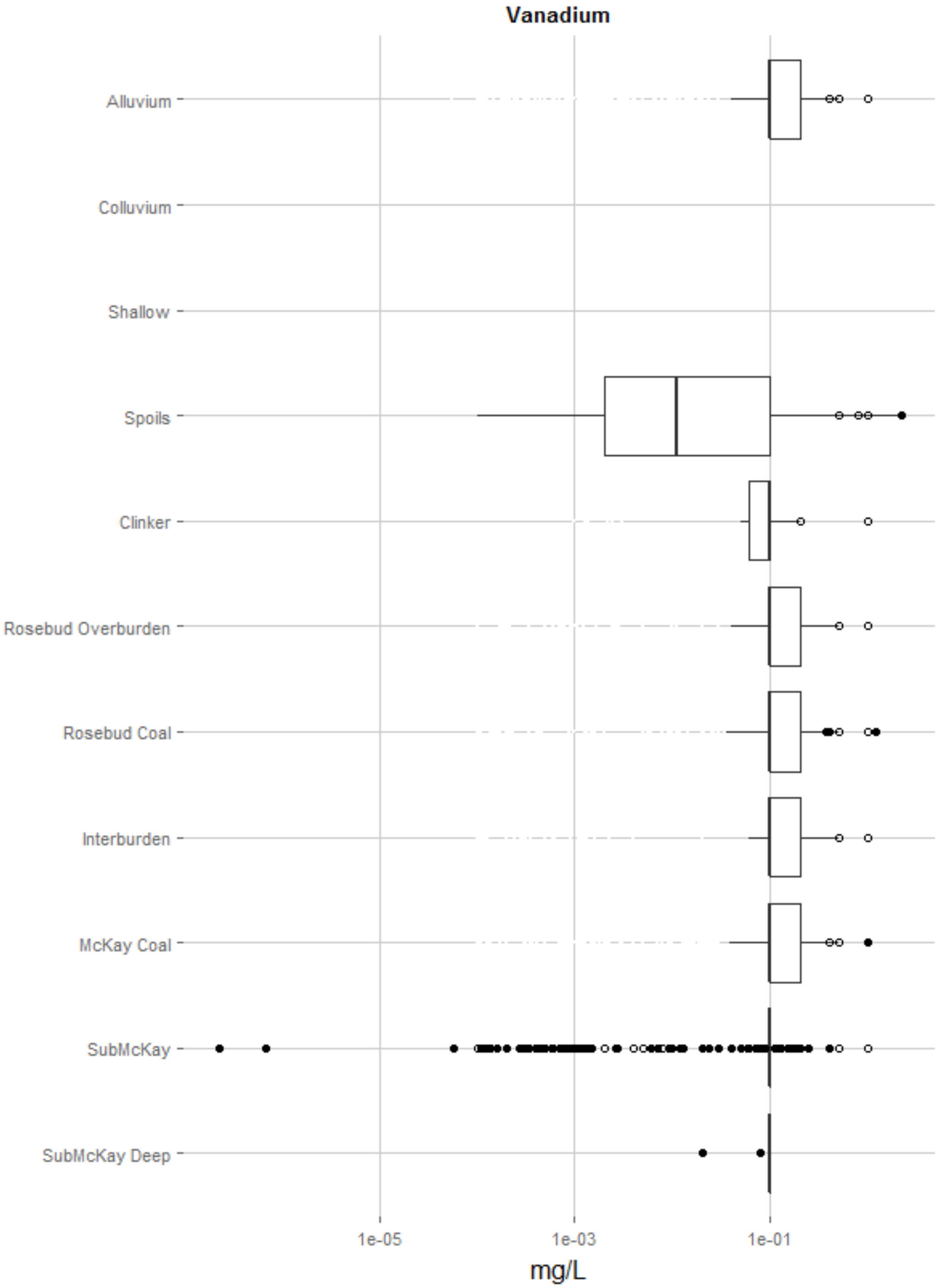

Sulfate
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1
100
10000
mg/L

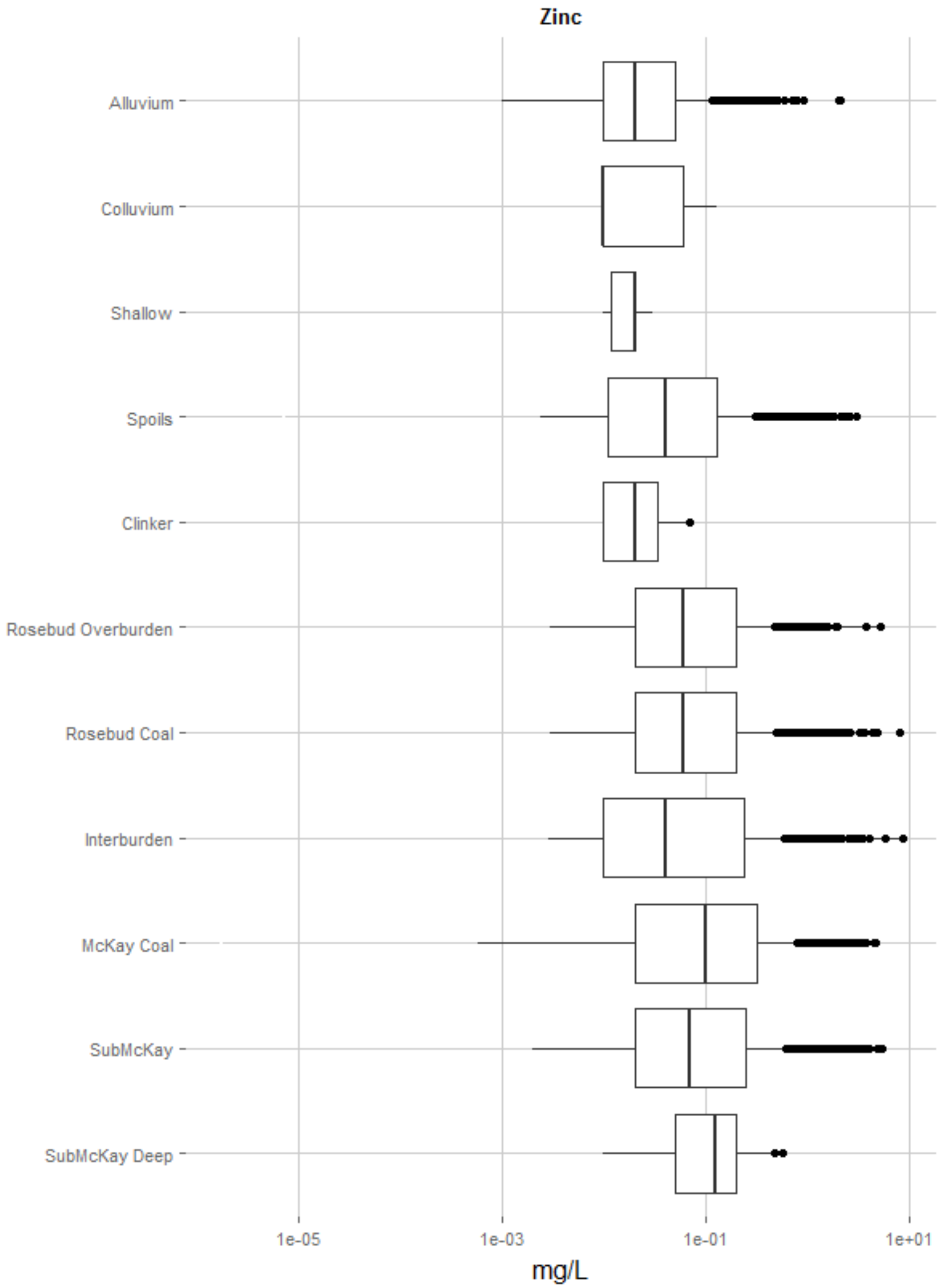

TDS
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1
100
10000
mg/L

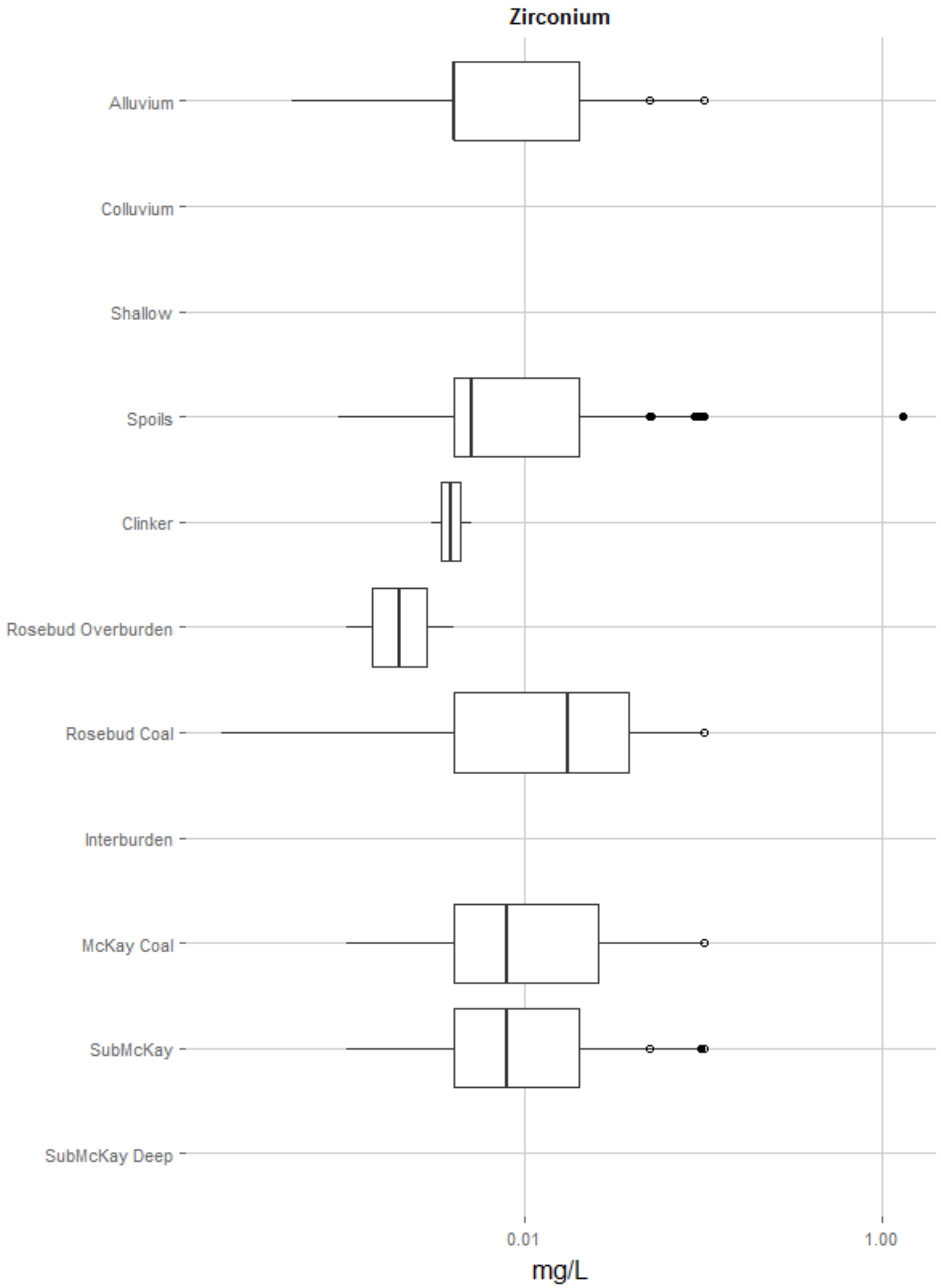

Thallium
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.01
1.00
mg/L


Tin
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.01
1.00
mg/L


Titanium
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.01
1.00
mg/L


Vanadium
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1e-05
1e-03
1e-01
mg/L


Zinc
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
1e-05
1e-03
1e-01
1e+01
mg/L


Zirconium
Alluvium
Colluvium
Shallow
Spoils
Clinker
Rosebud Overburden
Rosebud Coal
Interburden
McKay Coal
SubMcKay
SubMcKay Deep
0.01
1.00
mg/L

Appendix D EDA Plots for Combined Stratigraphic Units

The data used to produce the plots in Appendix D are the groundwater data used in Random Forests, as described in Section 2.1, with stratigraphic units collapsed to eight layers:

- Alluvium (including Alluvium, Alluvium/Colluvium, Colluvium, and Shallow)
- Spoils
- Clinker
- Rosebud Overburden
- Rosebud Coal
- Interburden
- McKay Coal
- SubMcKay (including SubMcKay and SubMcKay Deep)

D.1 Collections for each chemical and stratigraphic unit

A collection of six plots is presented for each chemical/stratigraphic unit combination:

- A histogram on standard scale, with non-detects represented in gray, detects in black,
- A histogram on logarithmic scale, with non-detects represented in gray, detects in black,
- A boxplot on standard scale, with non-detects represented as hollow circles, detects as filled circles,
- A boxplot on logarithmic scale, with non-detects represented as hollow circles, detects as filled circles,
- A QQ plot, with non-detects represented as open circles, detects as filled circles, and
- A time series plot of detection limits.

Histograms are a method for representing the distribution of a dataset. Values are binned and the height of each bar indicates number of samples in the bin described by the placement of each bar along the horizontal axis.

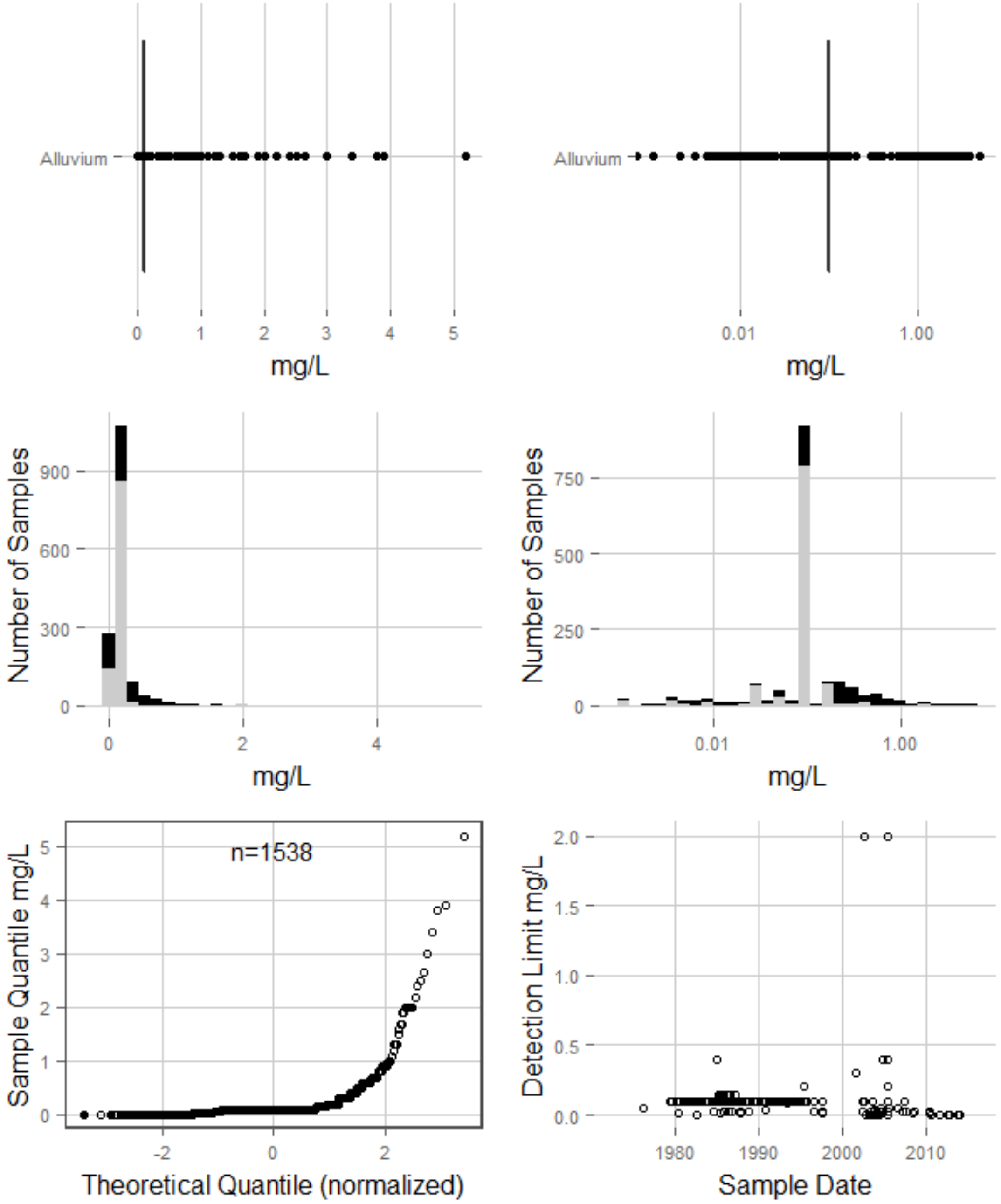
Boxplots are another method of representing the distribution of a dataset. The top and bottom of the box in the boxplot represent the Inter-Quartile Range (IQR), identified by the 75th and 25th percentiles of the data, respectively. The horizontal line in the middle of the box represents the 50th percentile (the median). Vertical lines (called whiskers) extend to last data point which is no more than 1.5*IQR from the box. Data points beyond the whiskers are represented by circles.

A Q-Q plot is a way to check how normal a dataset is. It involves graphing the quantiles of a dataset against the quantiles of the standard normal probability distribution. If the data are normally distributed, then the plotted pairs will follow a straight line. Histograms plot the frequency of observations within consecutive, equally sized intervals of concentrations. They provide a discrete estimate of the shape of the distribution of a dataset.

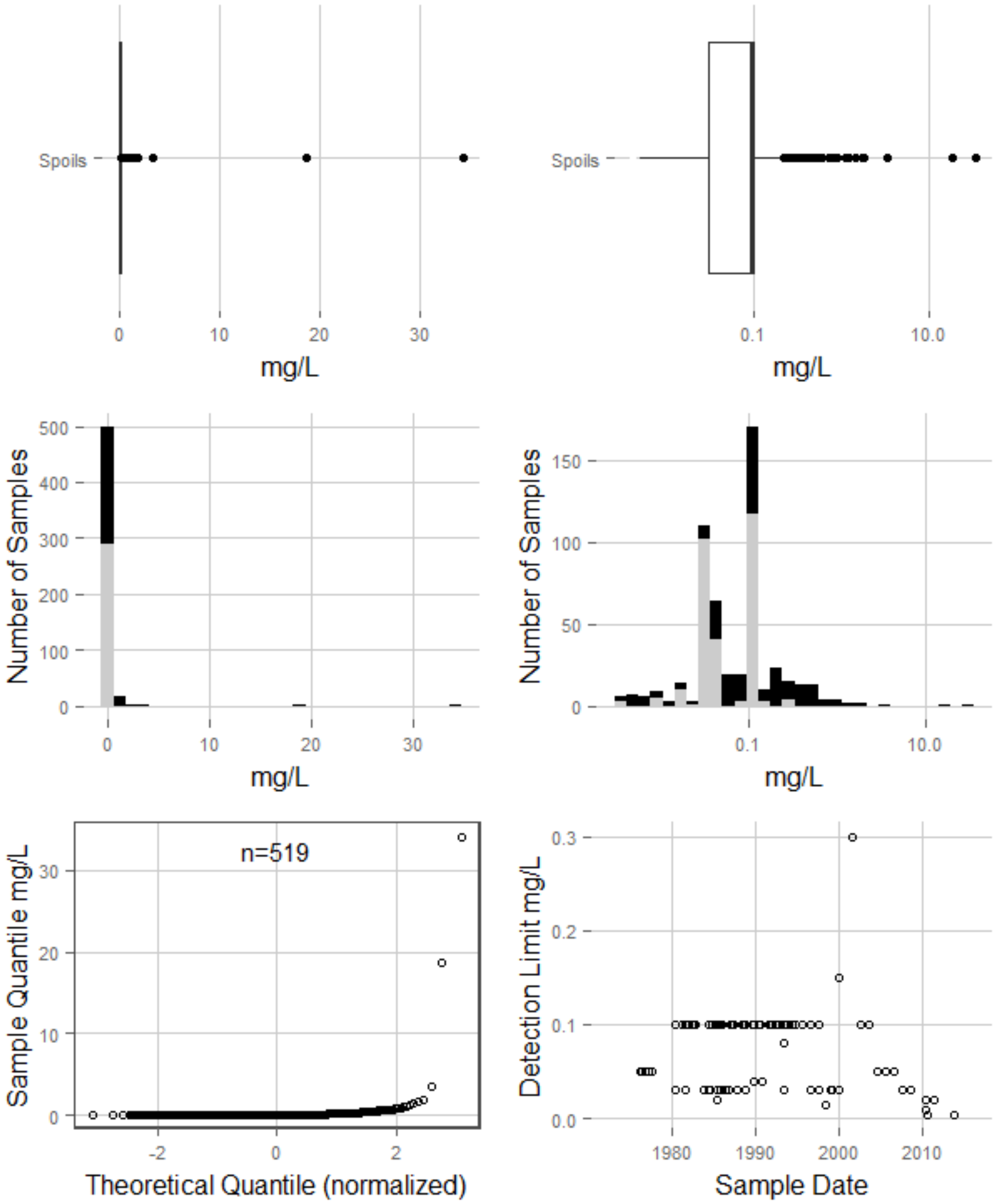
The time series plot shows detection limits versus sampling date.

These plots are discussed in Section 3 of the report.

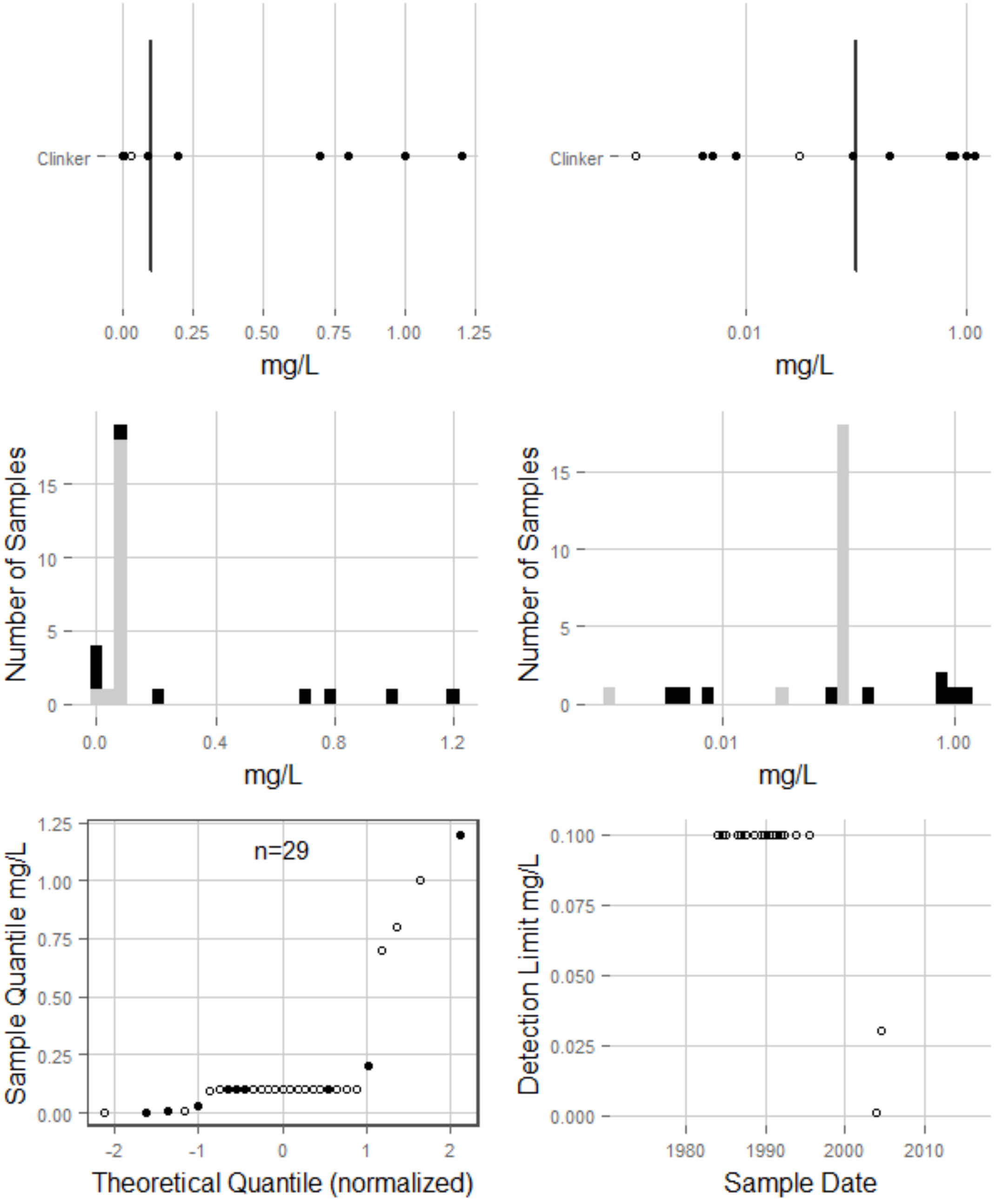
Aluminum
Alluvium

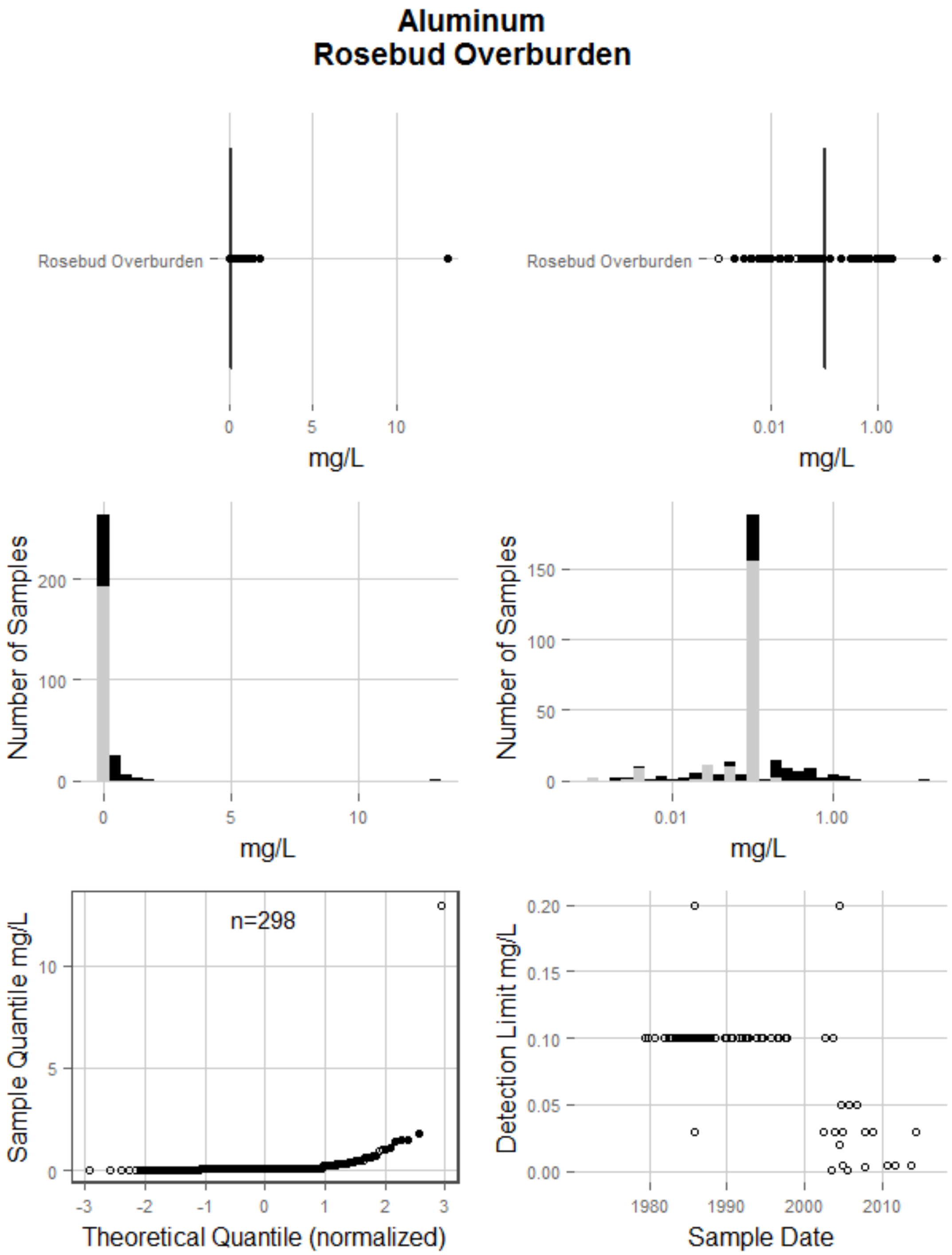


Aluminum
Spoils

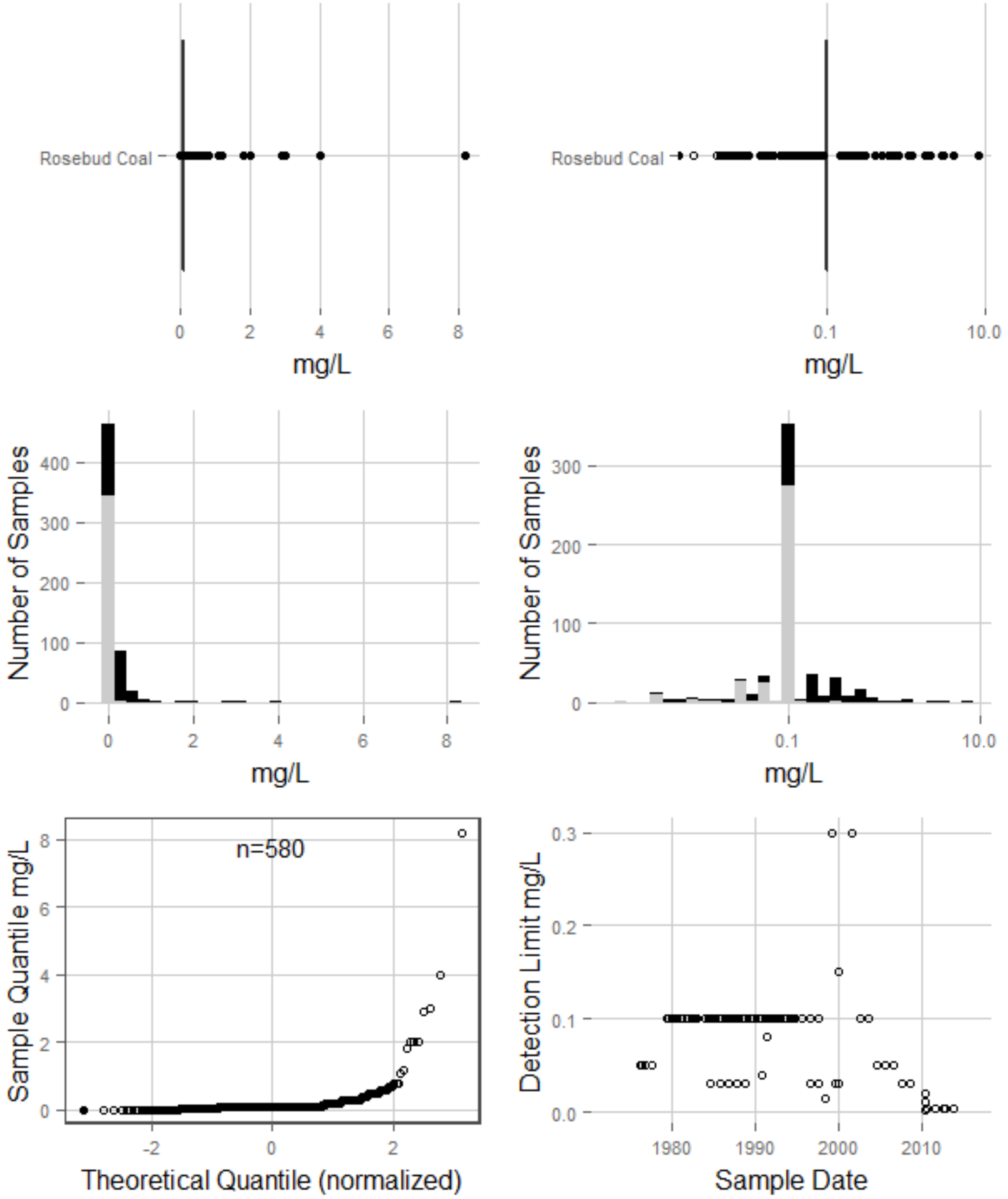


Aluminum Clinker

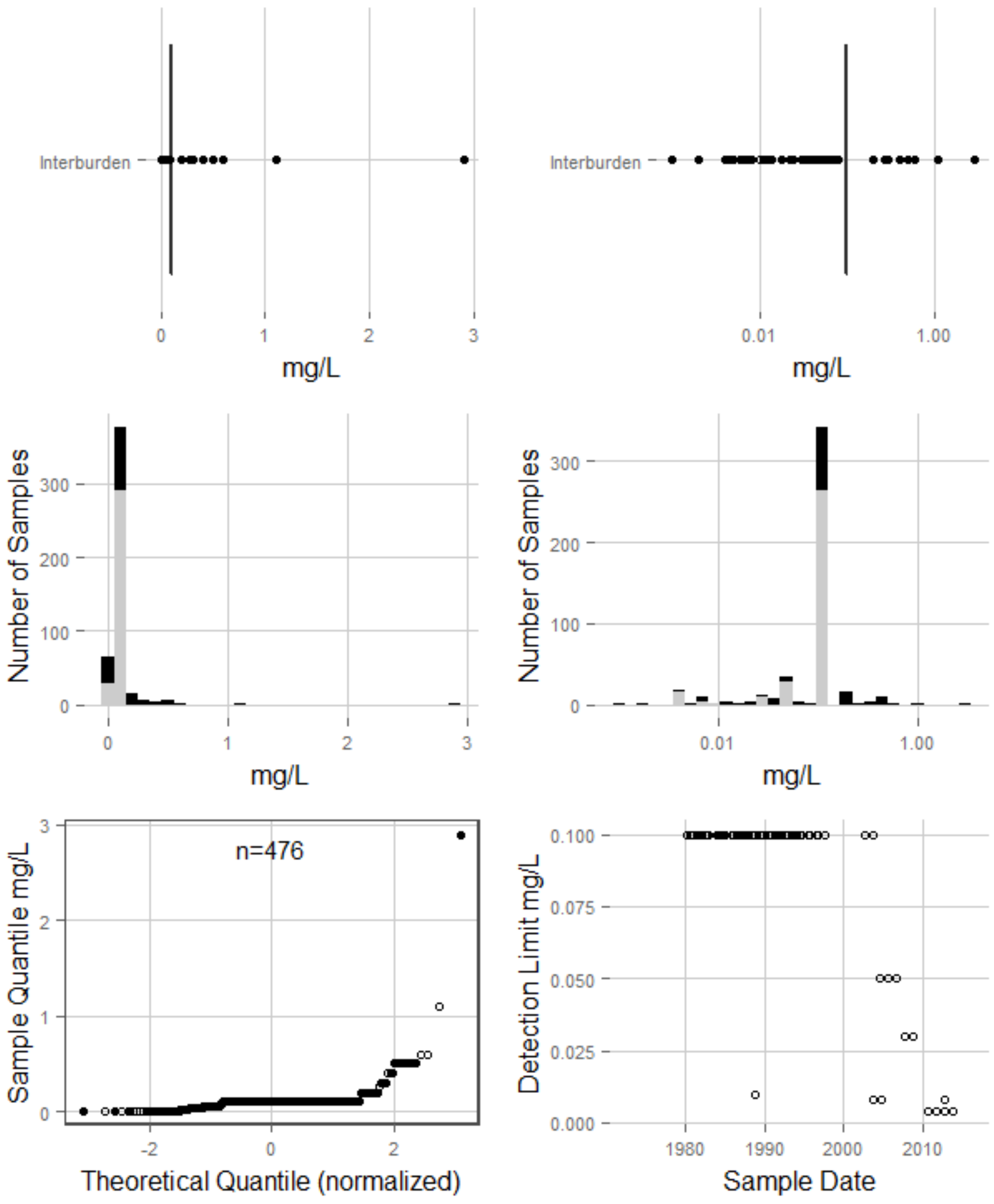



Aluminum
Rosebud Overburden
Rosebud Overburden
0
5
10
mg/L
Rosebud Overburden
0.01
1.00
mg/L
Number of Samples
200
100
0
0
5
10
mg/L
Number of Samples
150
100
50
0
0.01
1.00
mg/L
Sample Quantile mg/L
n=298
10
5
0
-3
-2
-1
0
1
2
3
Theoretical Quantile (normalized)
Detection Limit mg/L
0.20
0.15
0.10
0.05
0.00
1980
1990
2000
2010
Sample Date

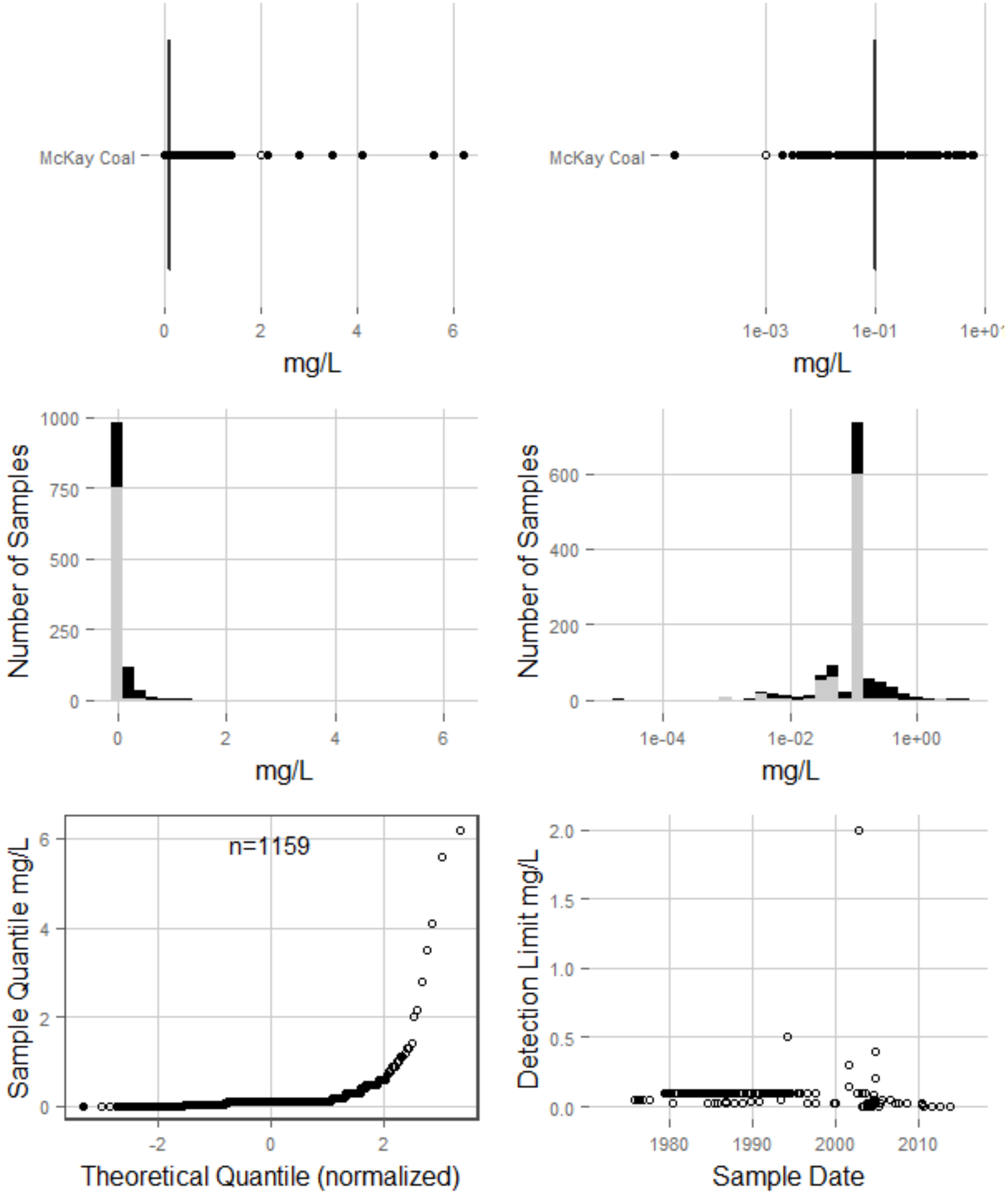
Aluminum
Rosebud Coal



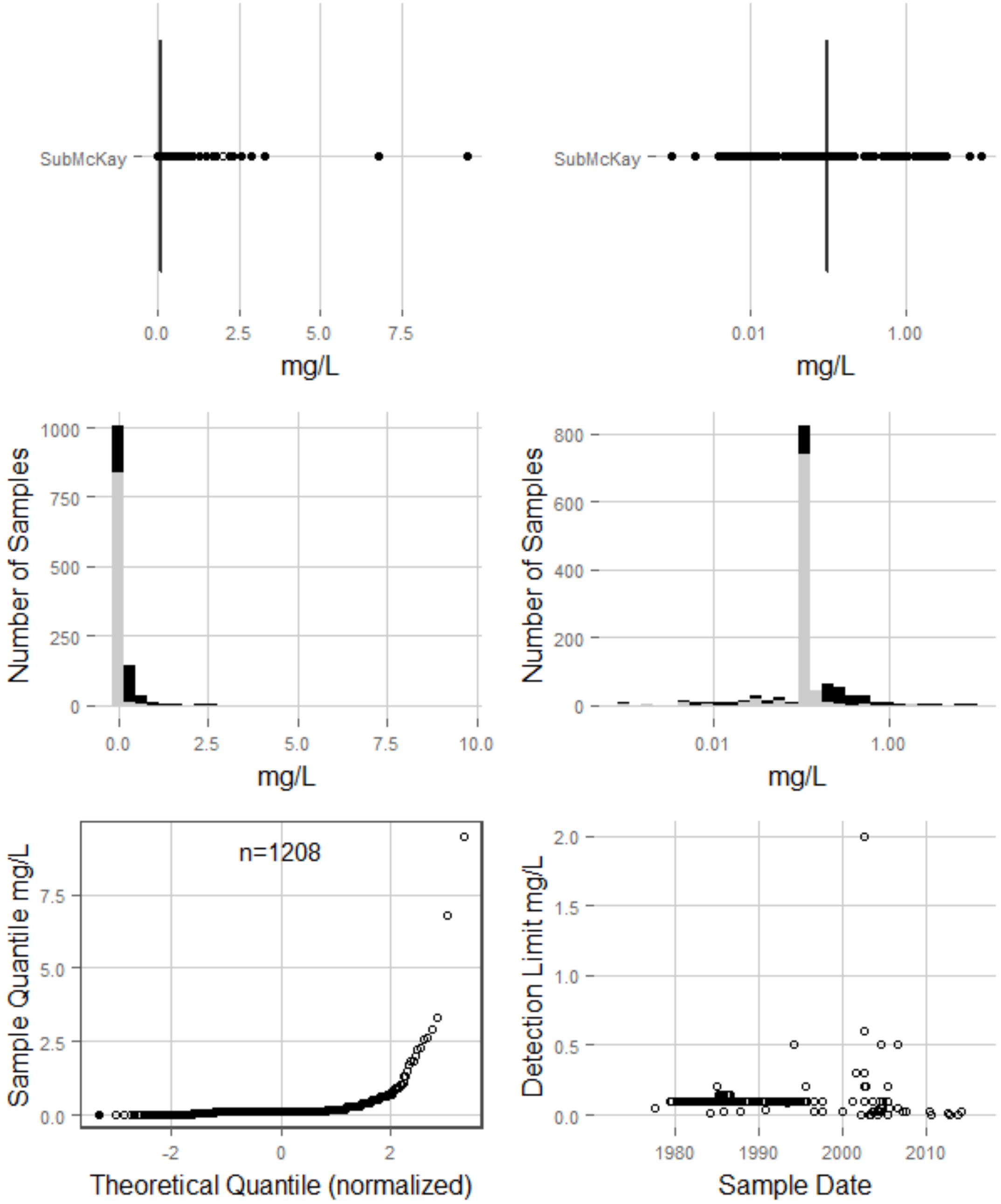
Aluminum
Interburden



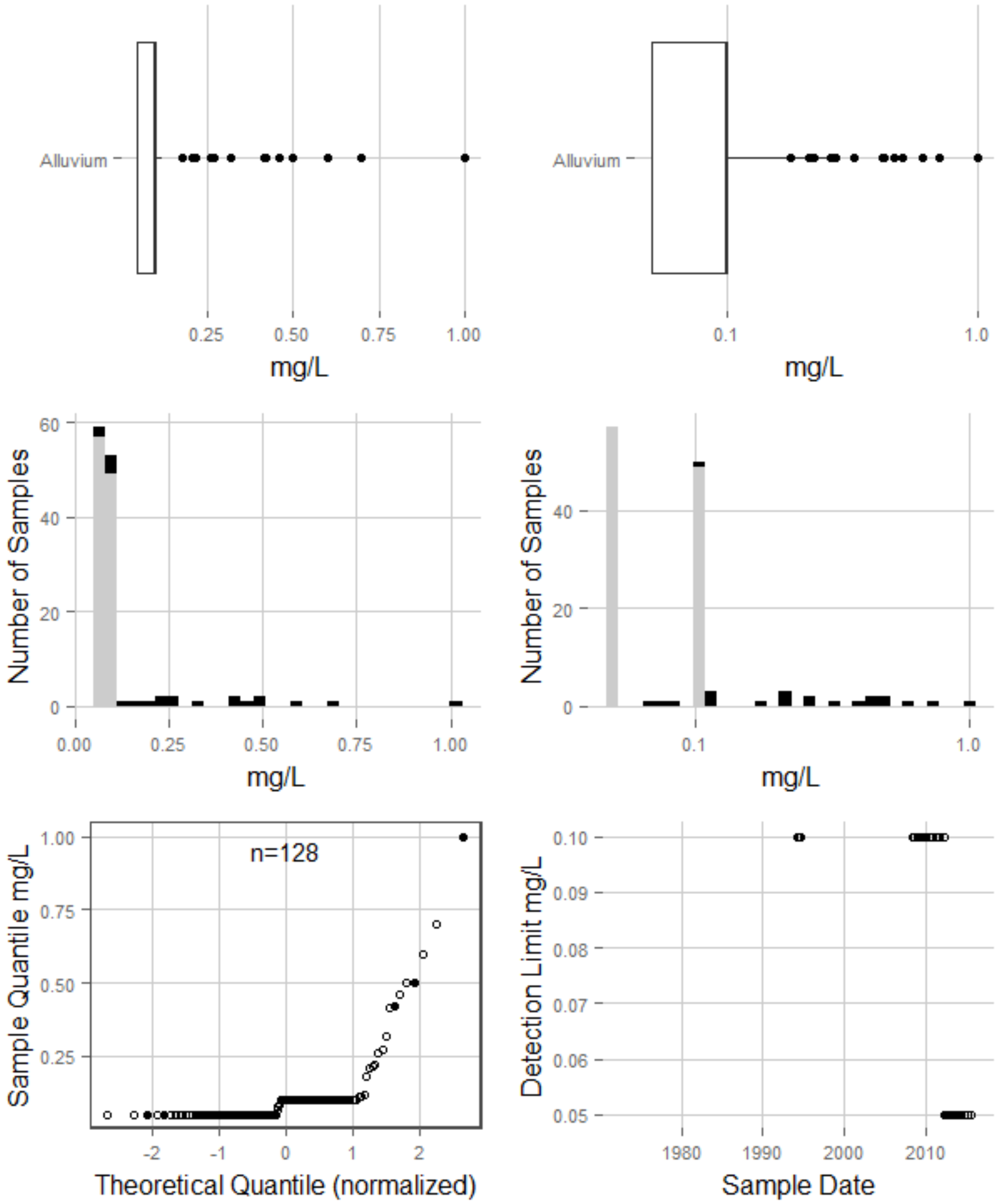
Aluminum
McKay Coal



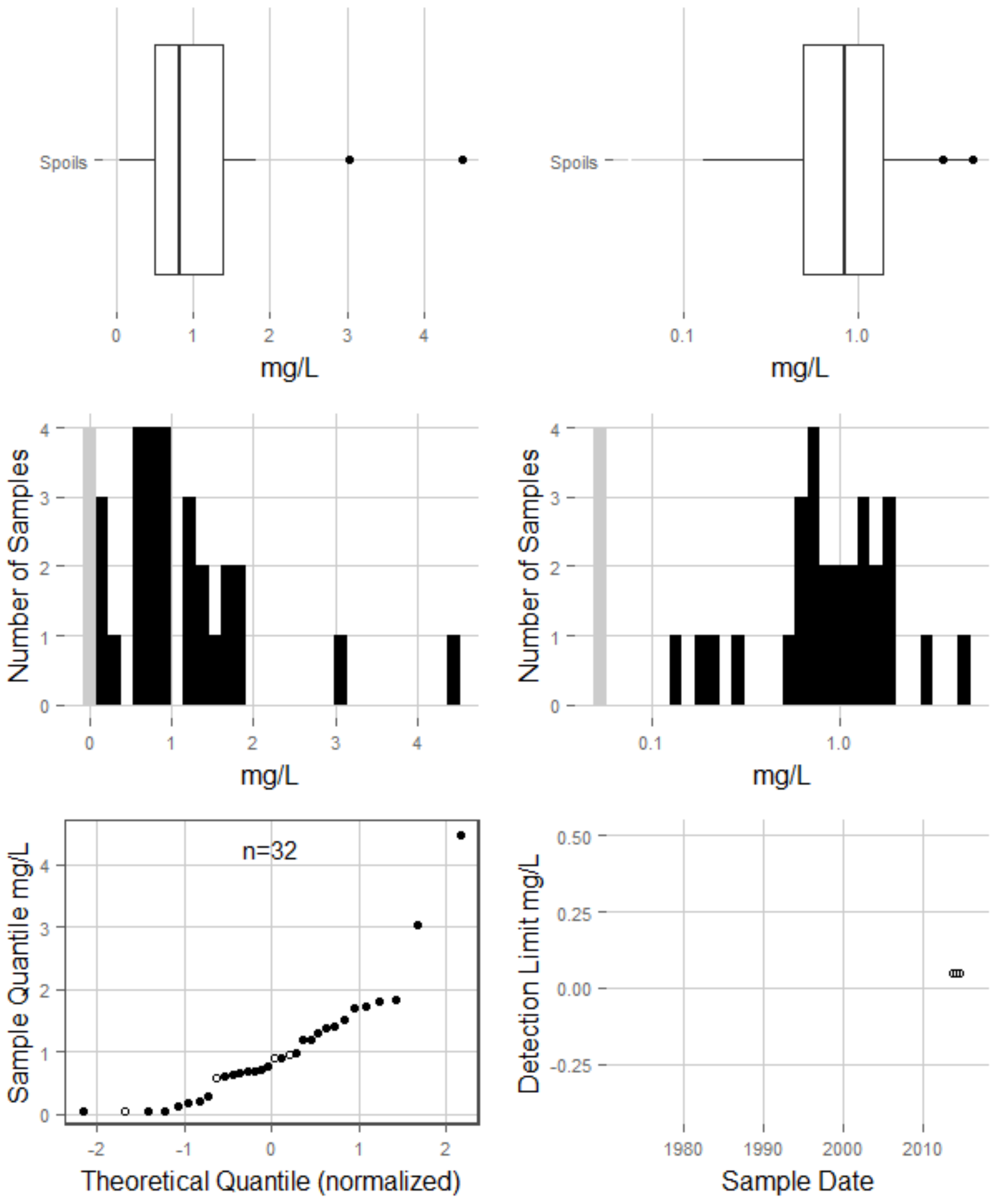
Aluminum
SubMcKay



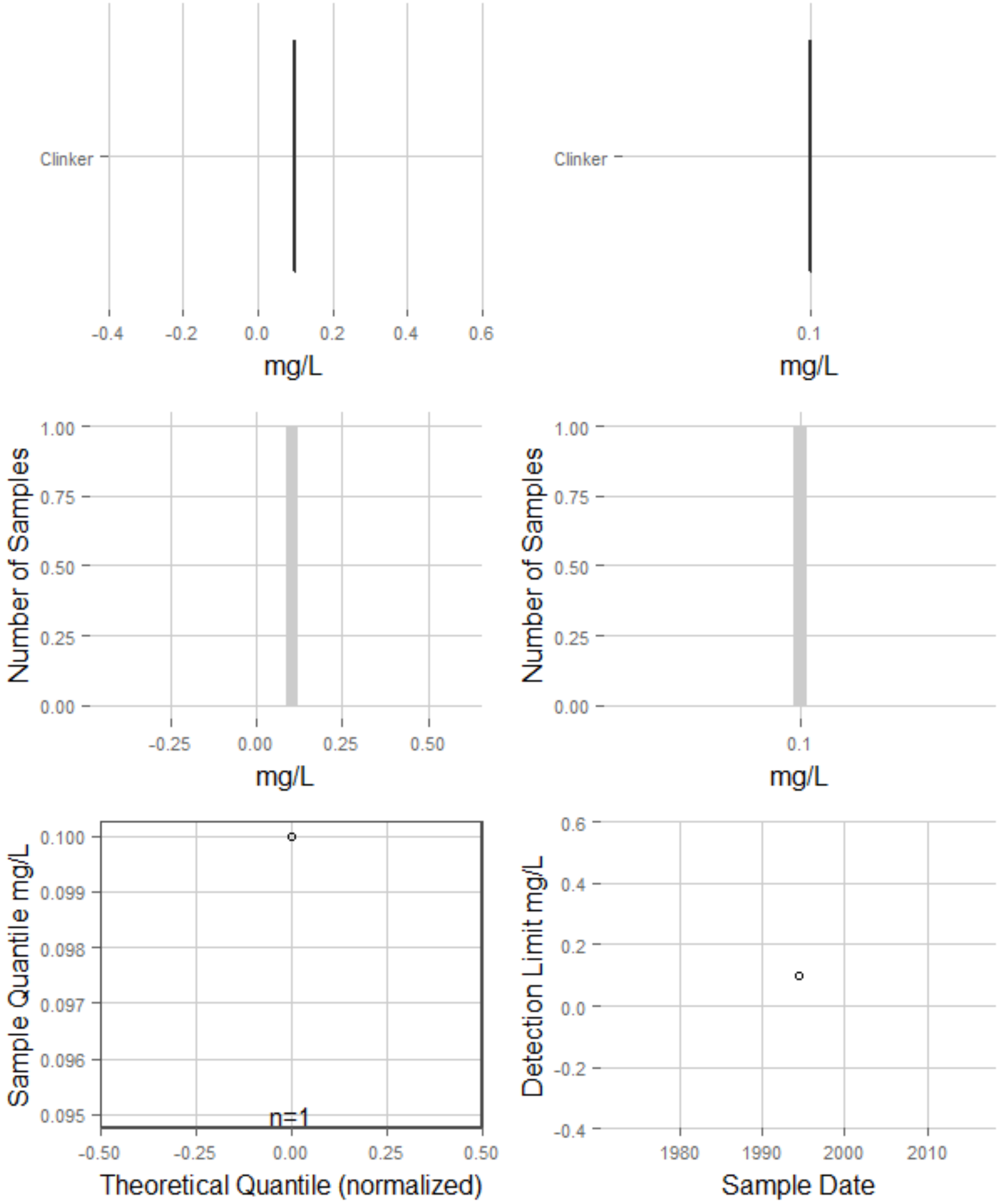
Ammonia
Alluvium



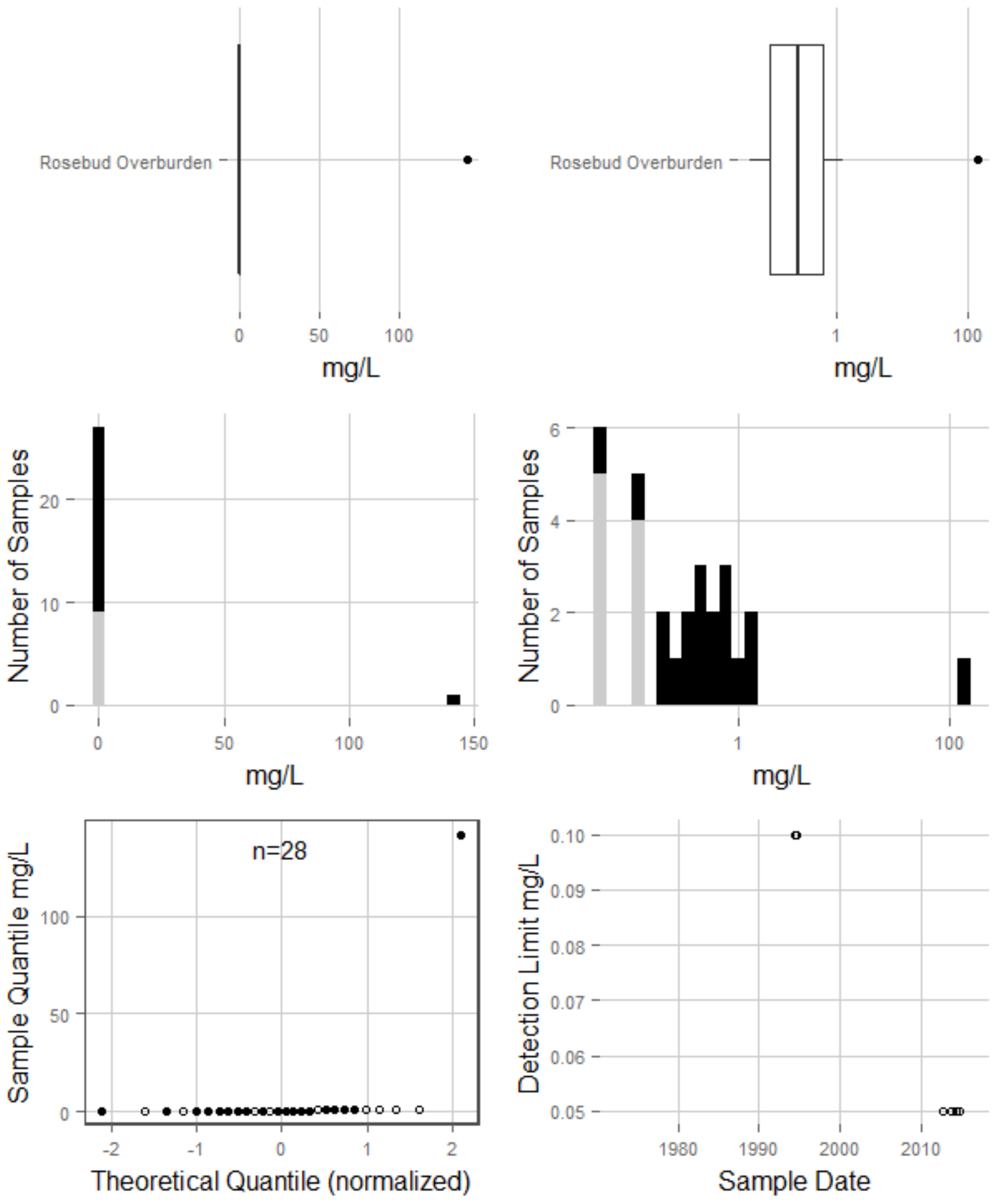
Ammonia
Spoils



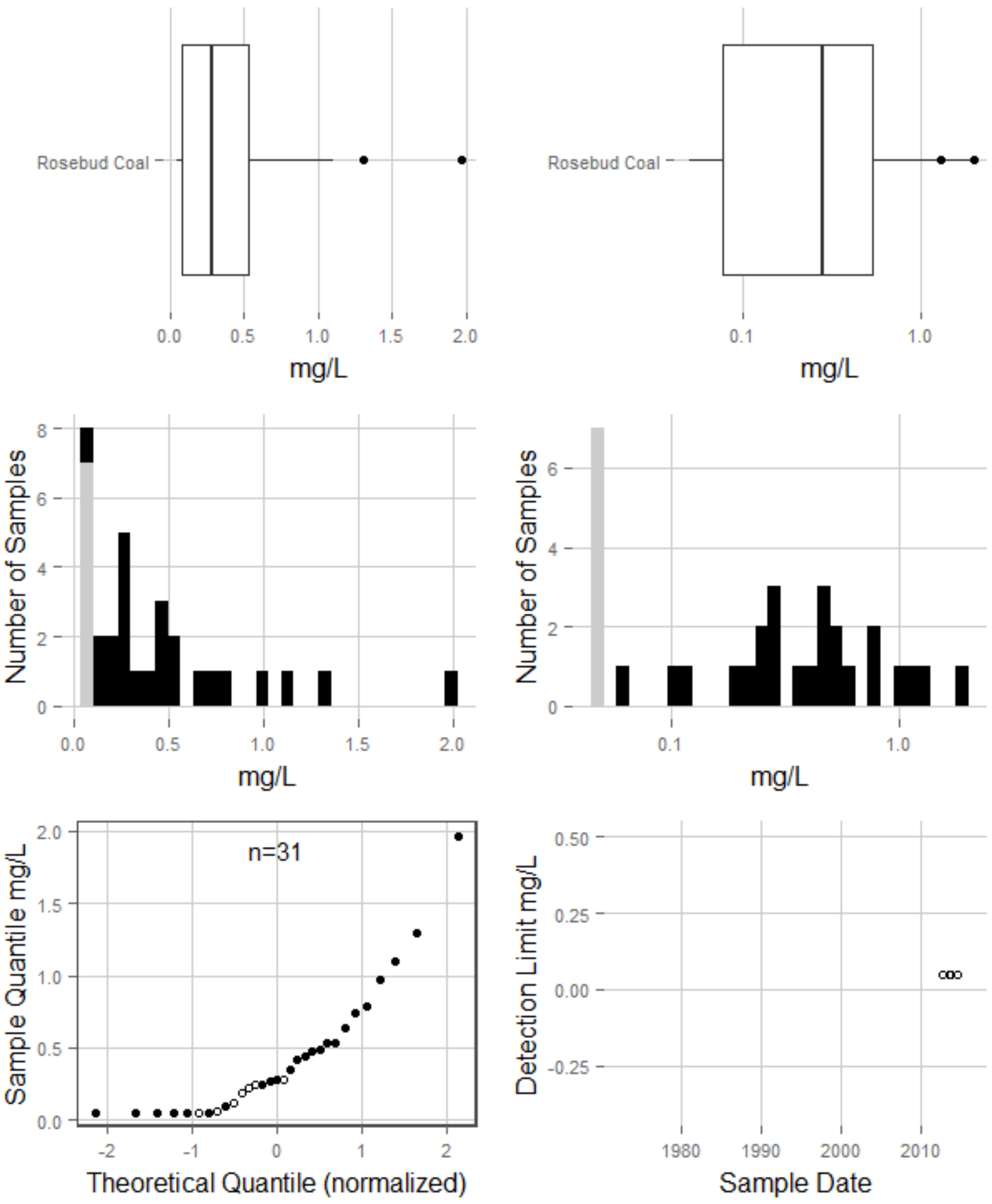
Ammonia
Clinker



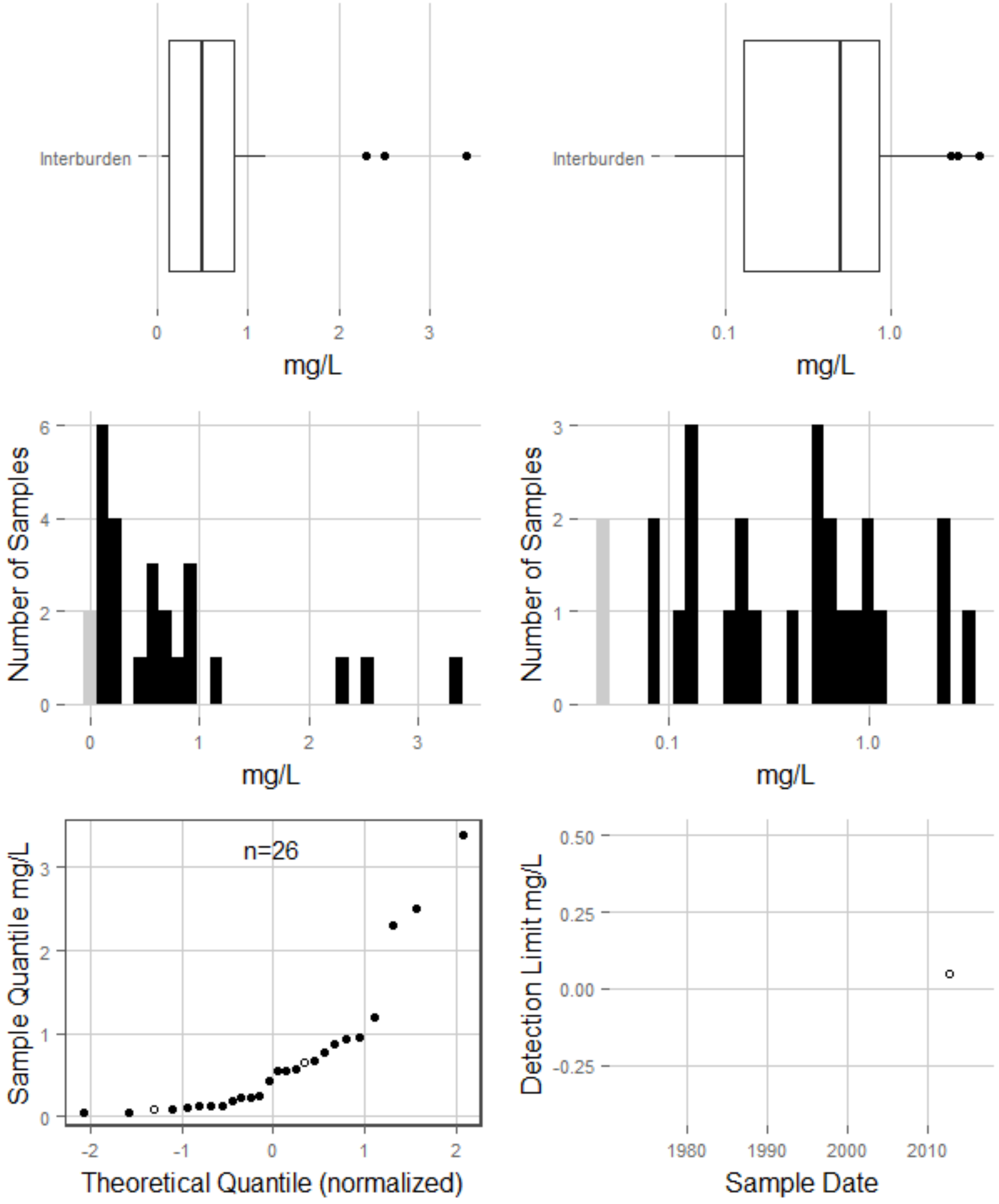
Ammonia
Rosebud Overburden



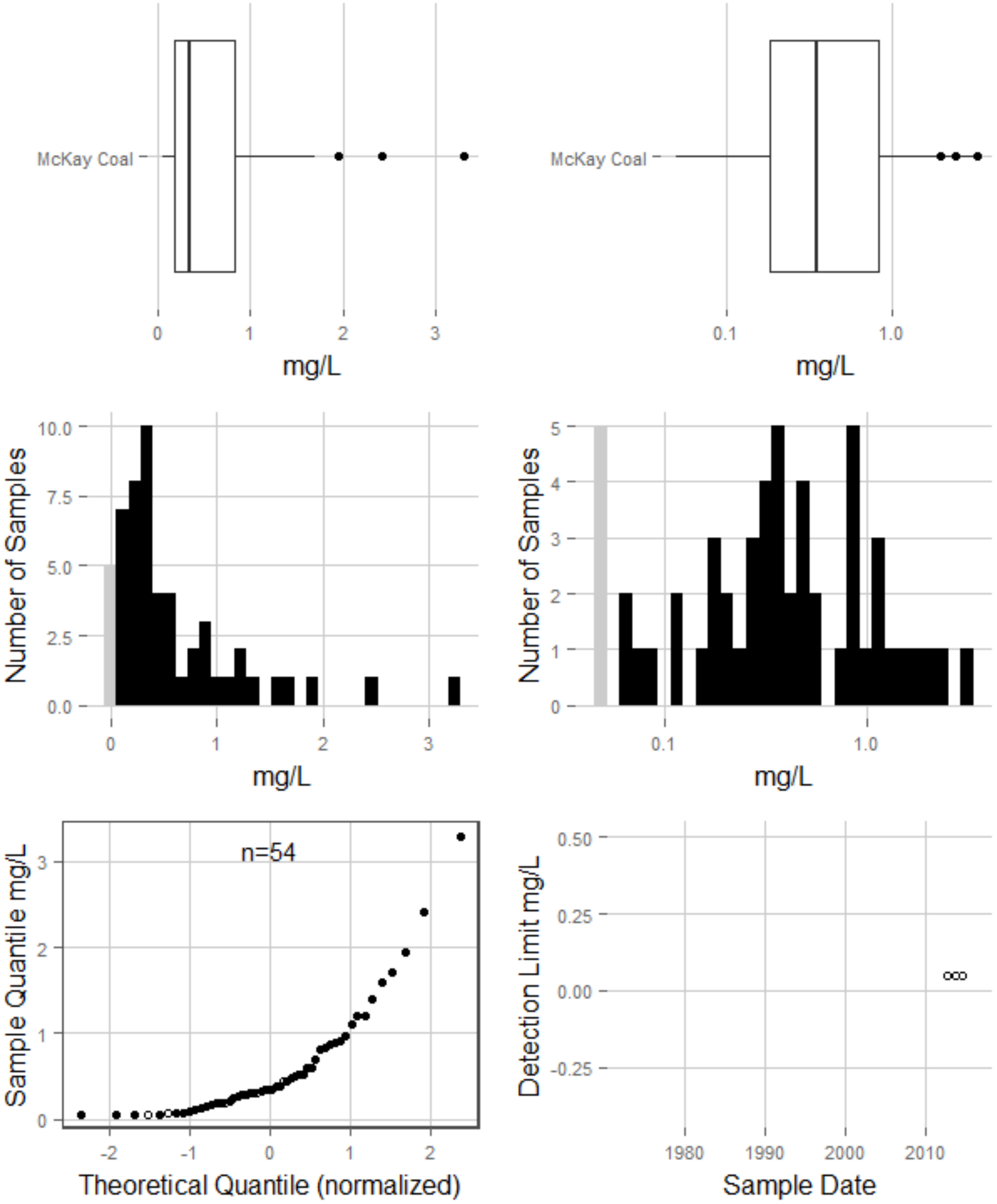
Ammonia
Rosebud Coal



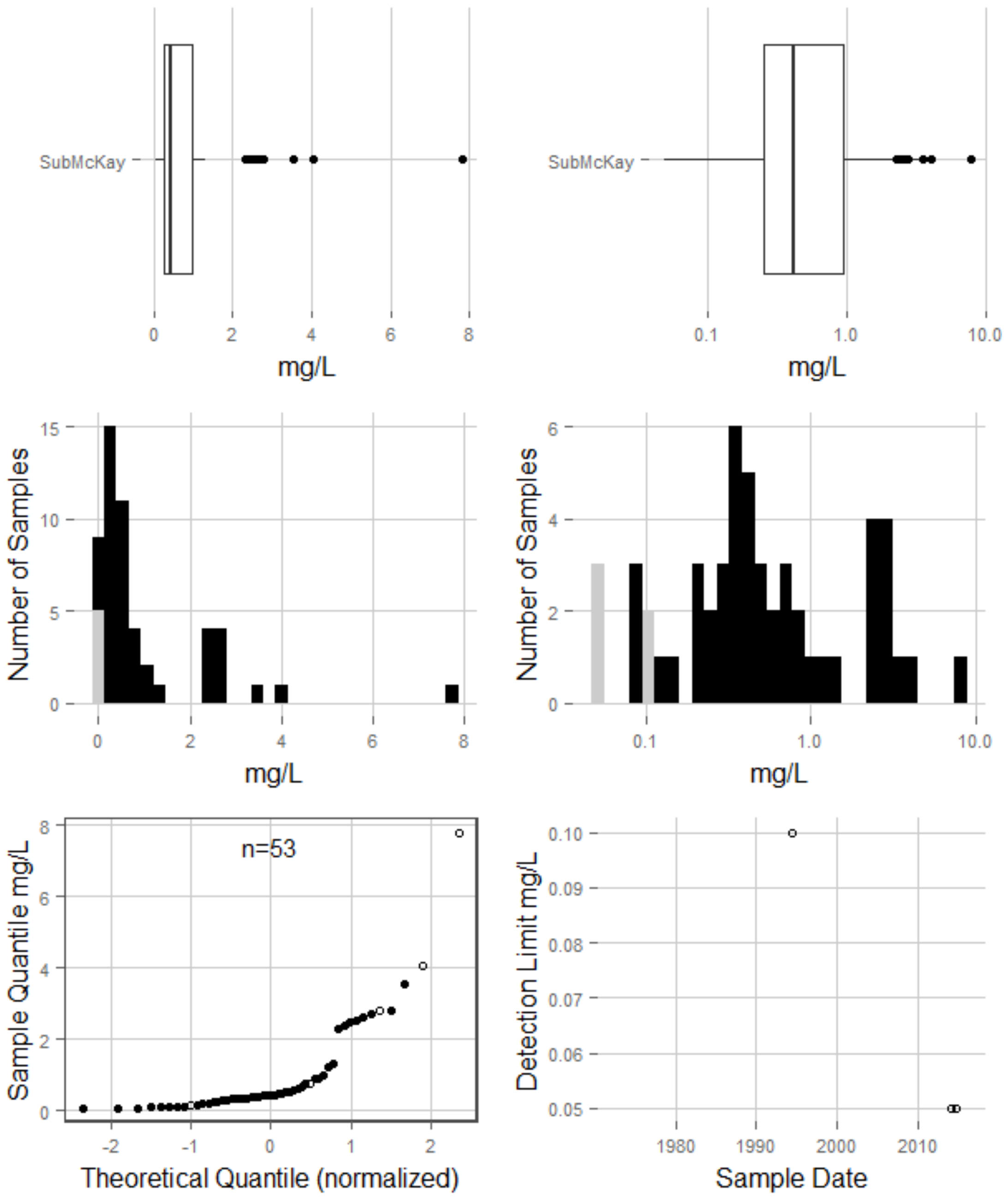
Ammonia
Interburden



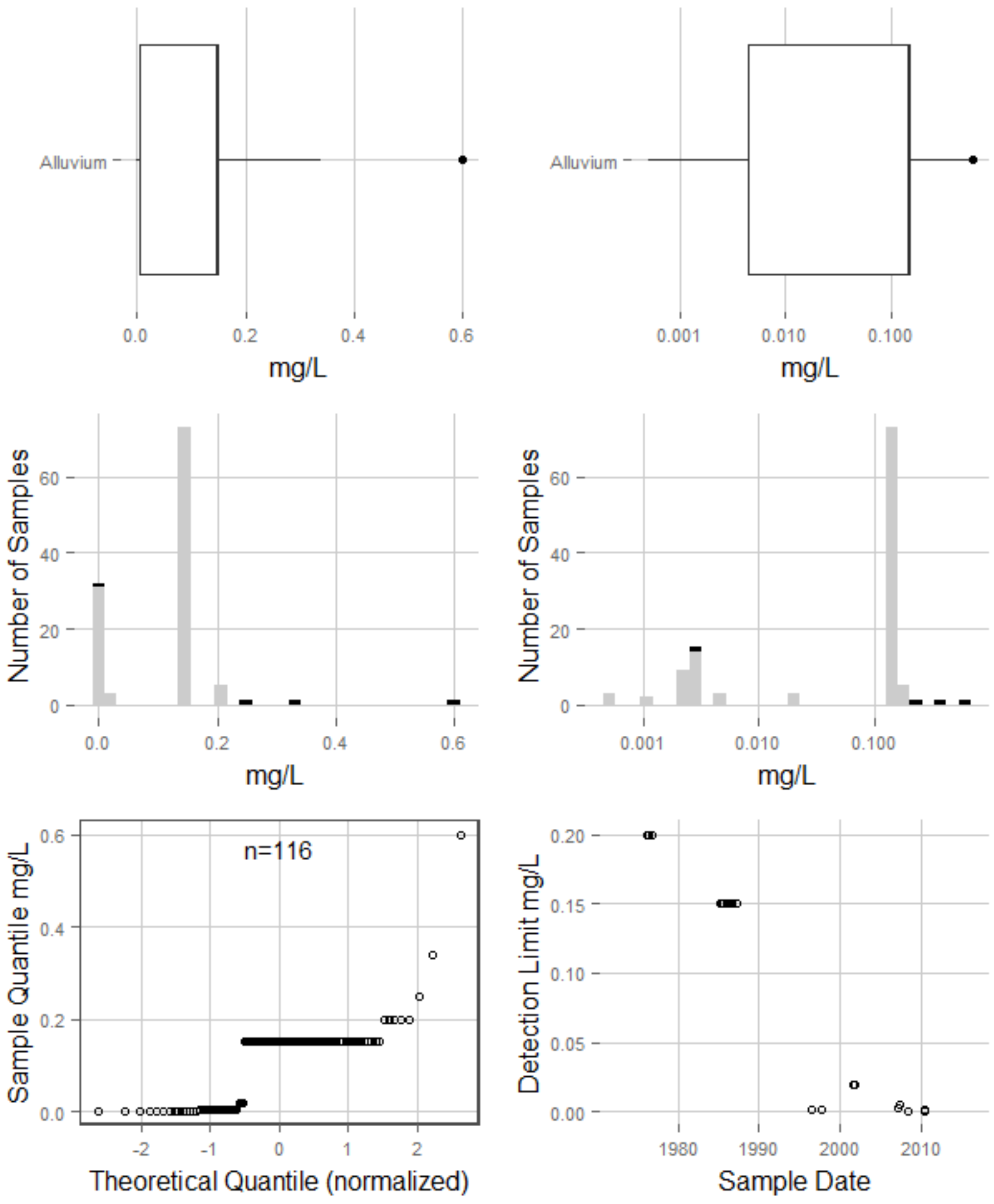
Ammonia
McKay Coal

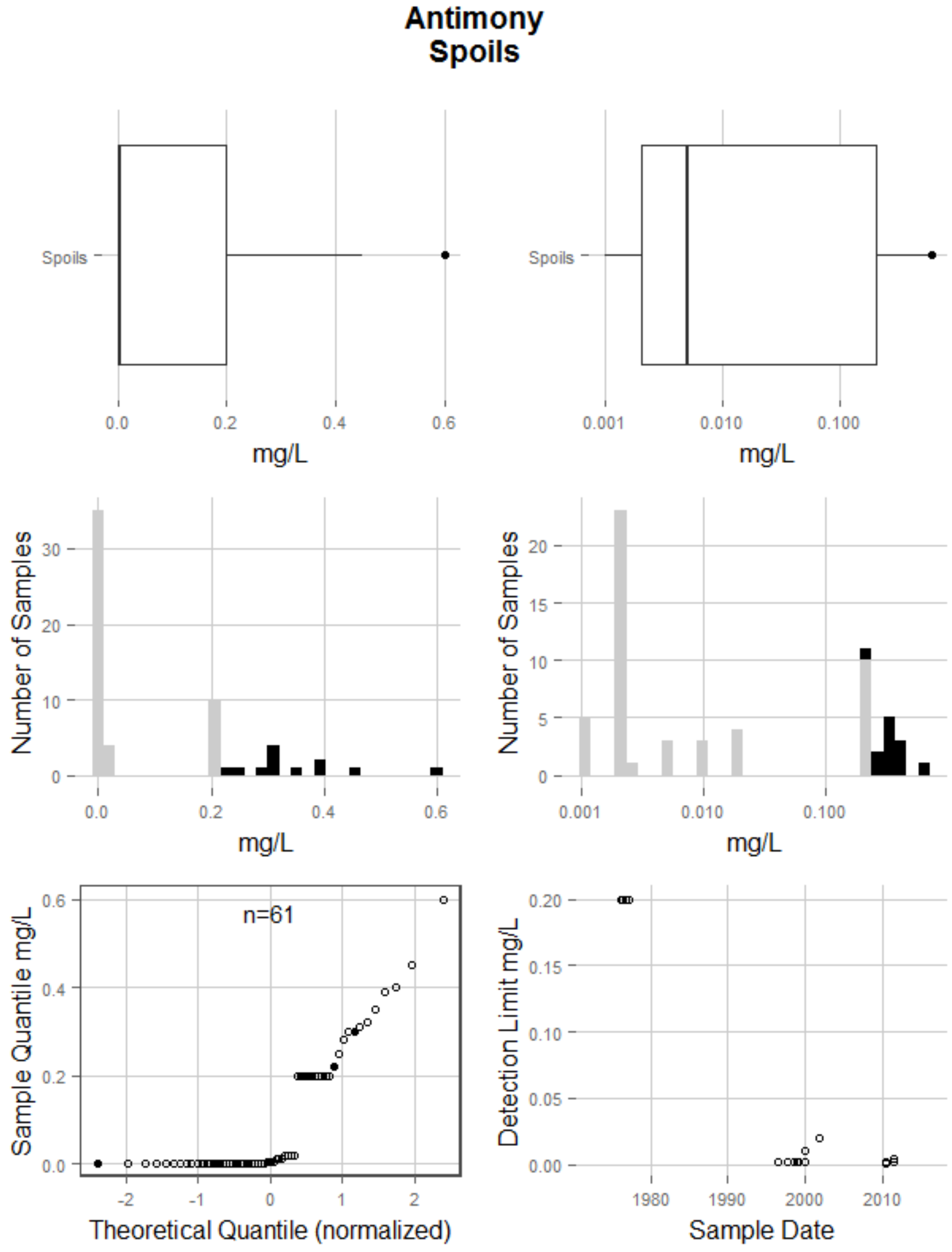


Ammonia
SubMcKay



Antimony
Alluvium

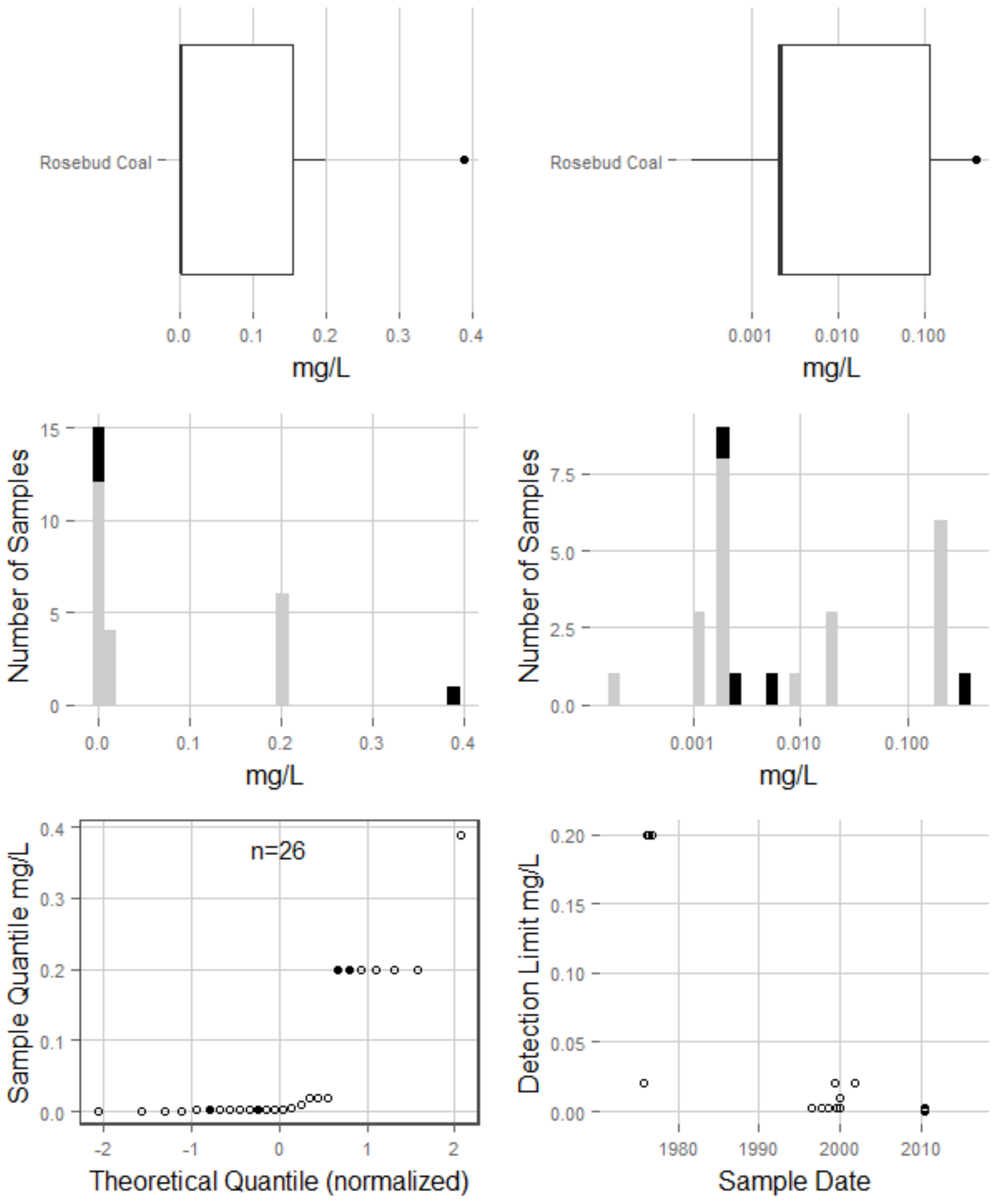



Antimony
Spoils
Spoils
0.0
0.2
0.4
0.6
mg/L
Spoils
0.001
0.010
0.100
mg/L
Number of Samples
0
10
20
30
0.0
0.2
0.4
0.6
mg/L
Number of Samples
0
5
10
15
20
0.001
0.010
0.100
mg/L
Sample Quantile mg/L
0.0
0.2
0.4
0.6
n=61
-2
-1
0
1
2
Theoretical Quantile (normalized)
Detection Limit mg/L
0.00
0.05
0.10
0.15
0.20
1980
1990
2000
2010
Sample Date

Antimony
Clinker
No data

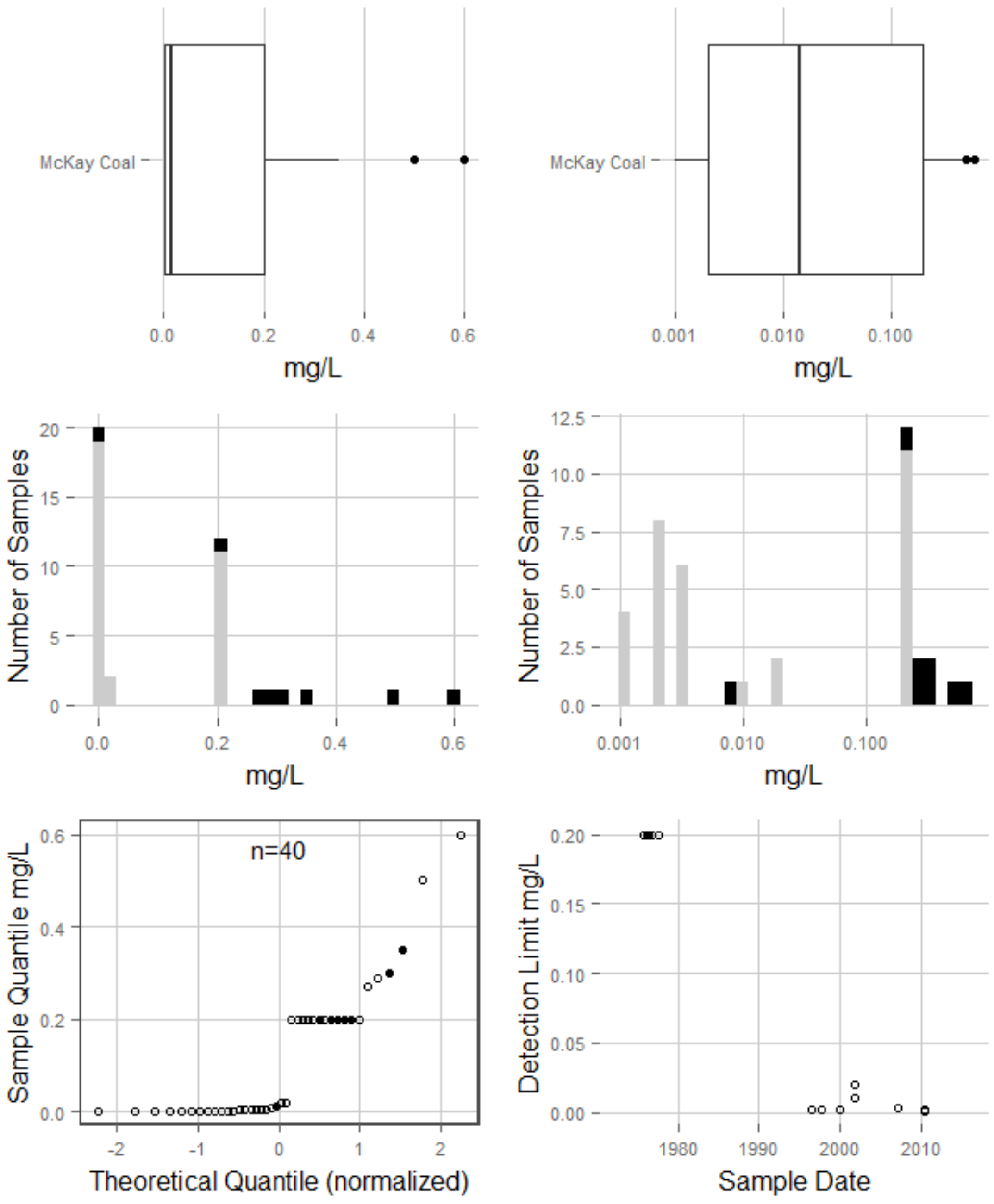
Antimony
Rosebud Overburden
No data

Antimony
Rosebud Coal

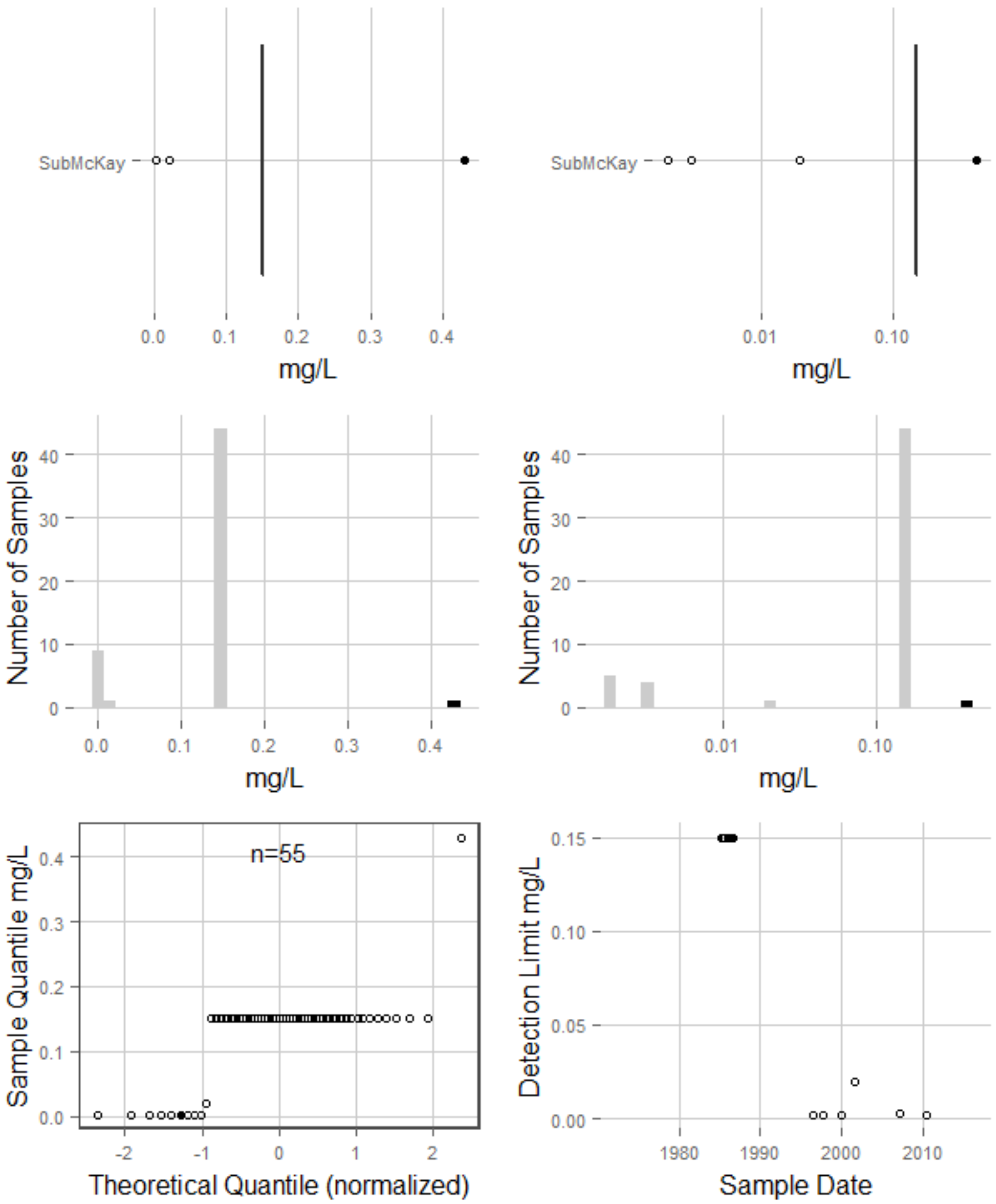


Antimony
Interburden
No data

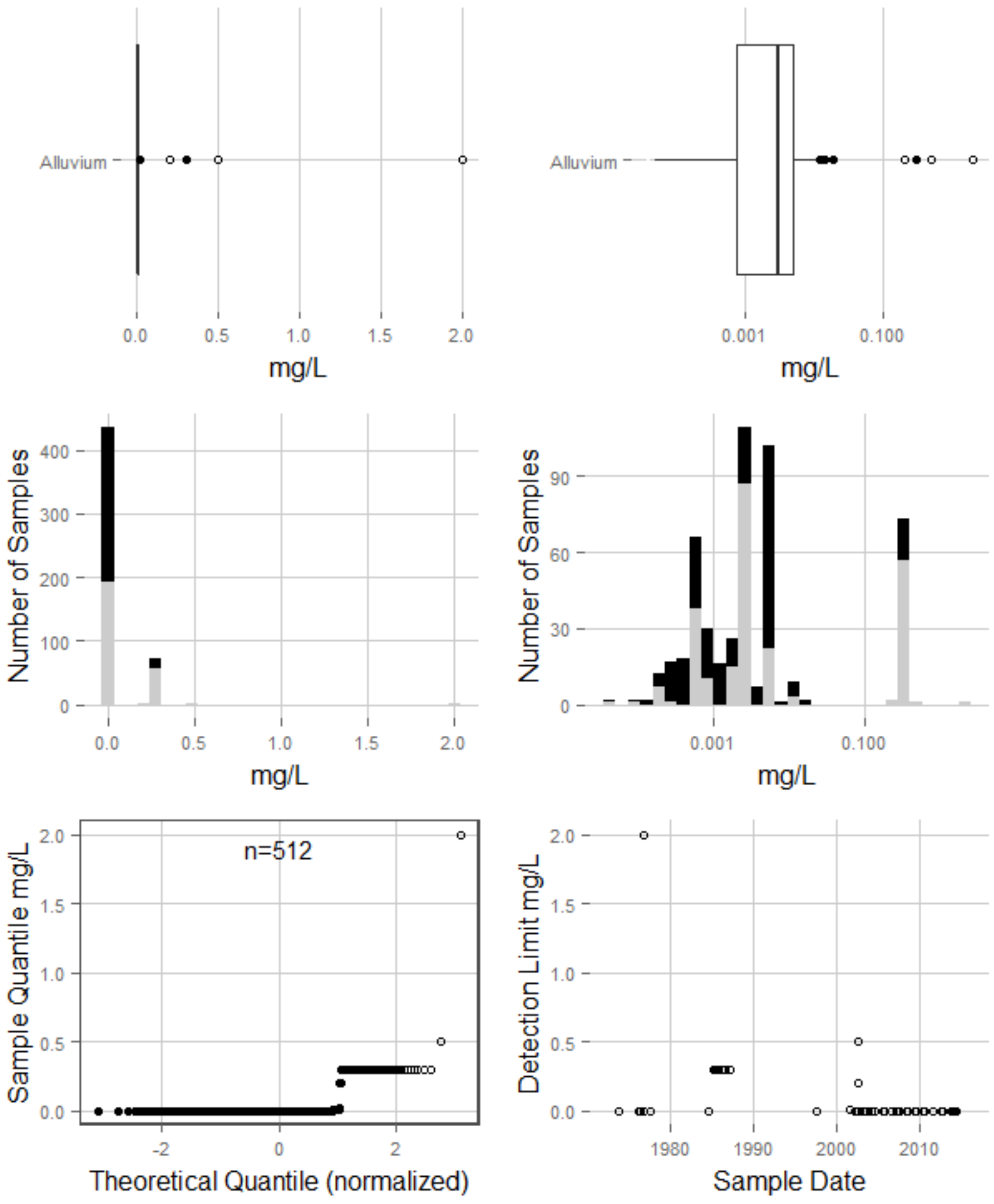
Antimony
McKay Coal



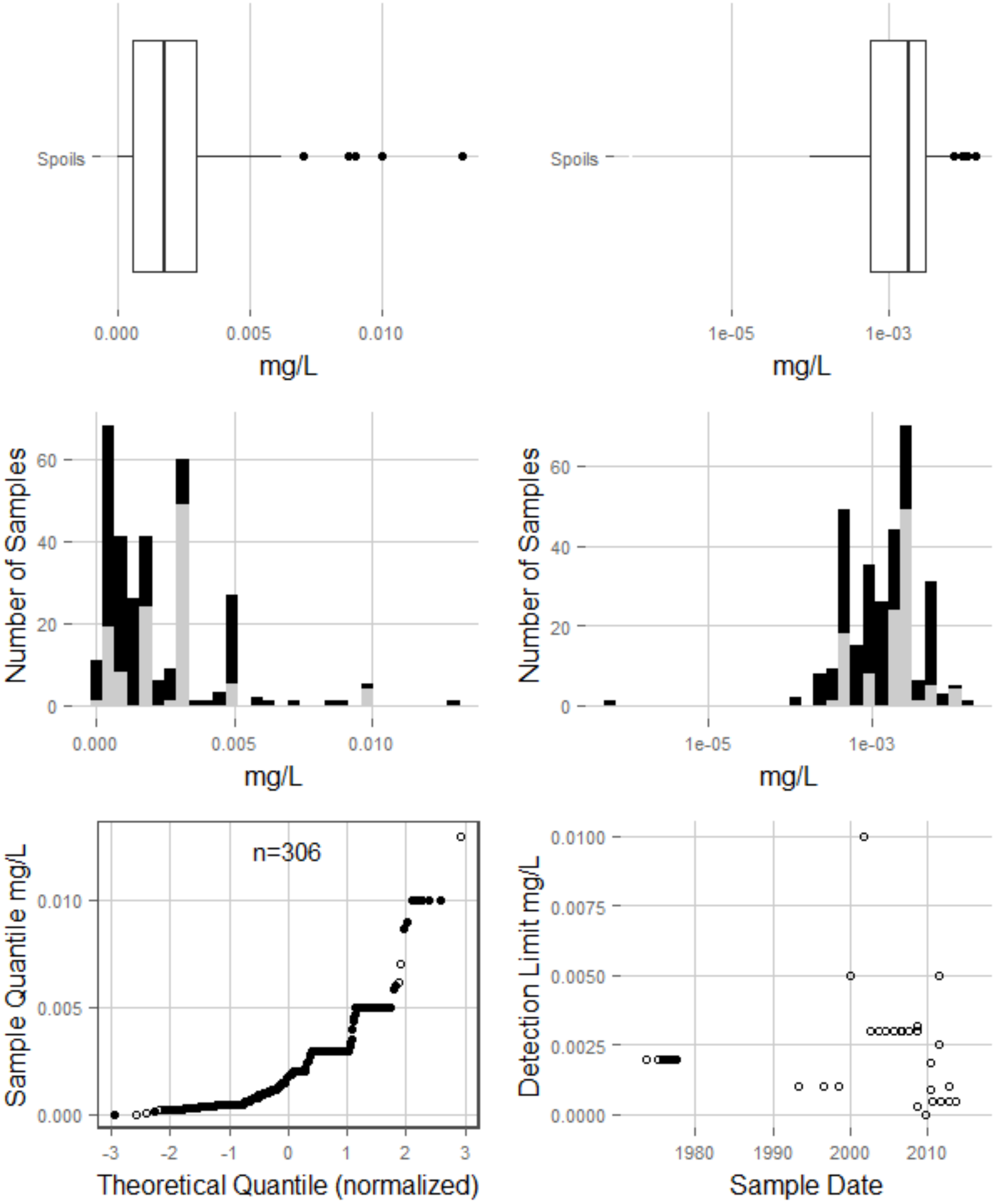
Antimony
SubMcKay



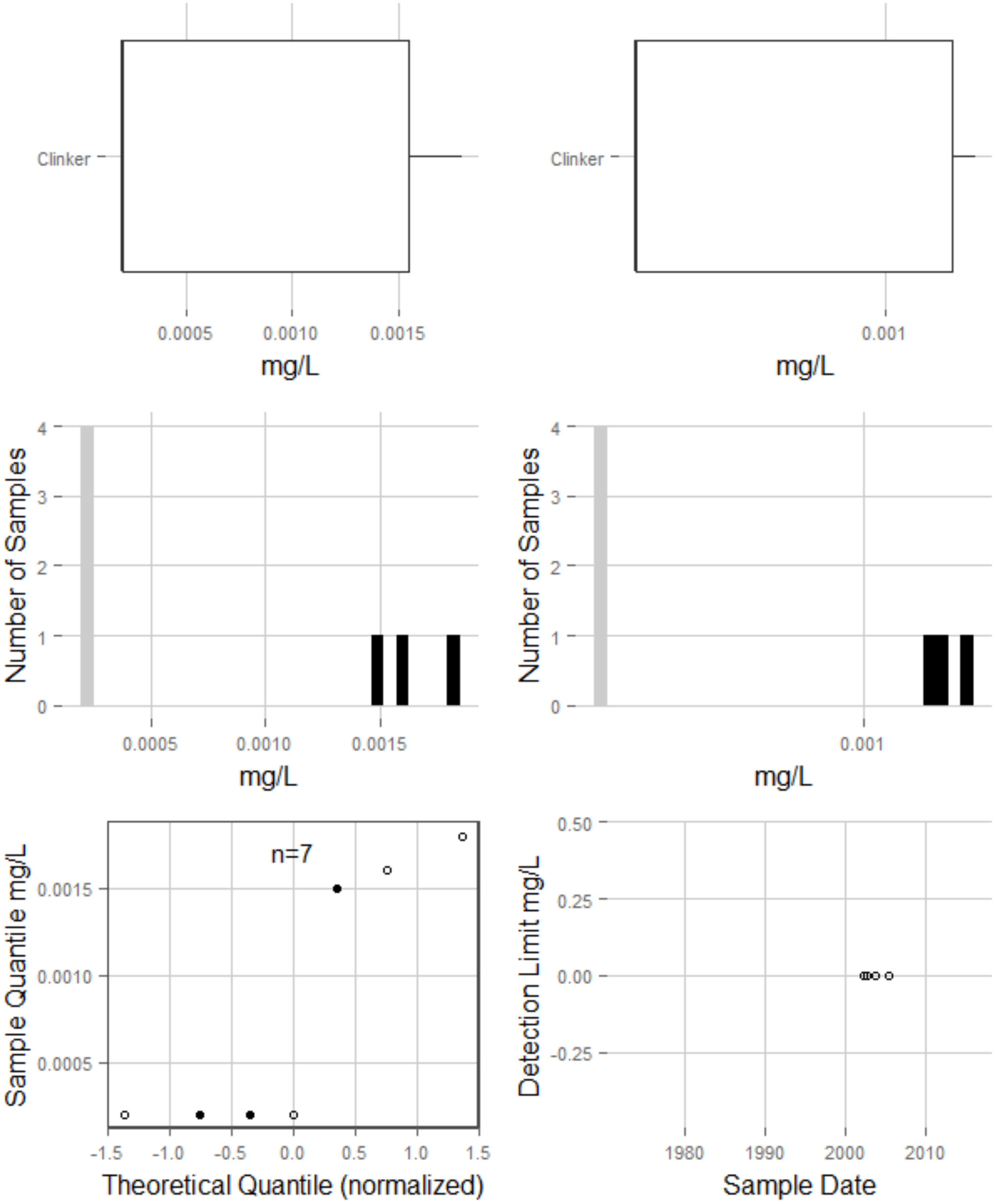
Arsenic
Alluvium



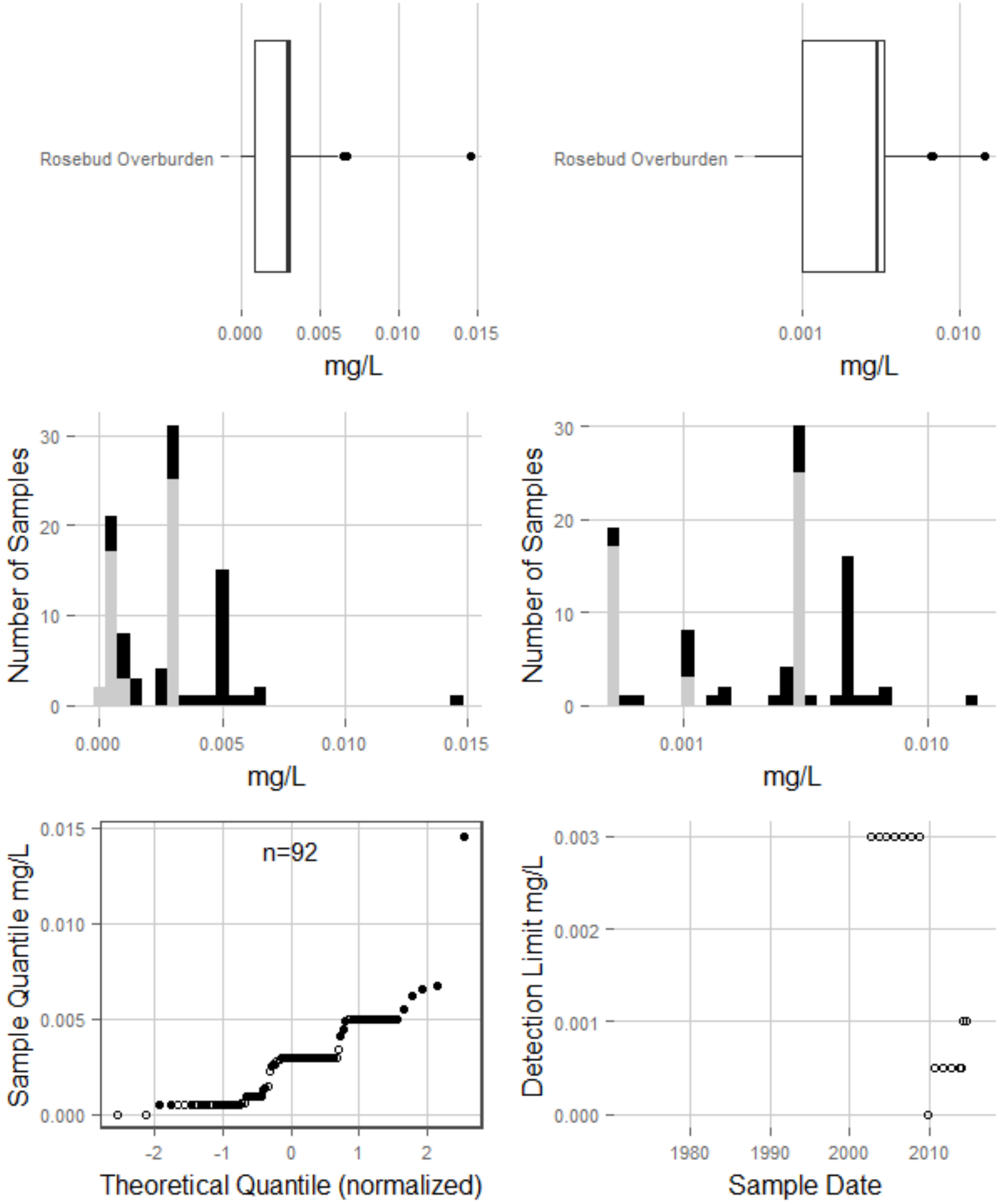
Arsenic
Spoils



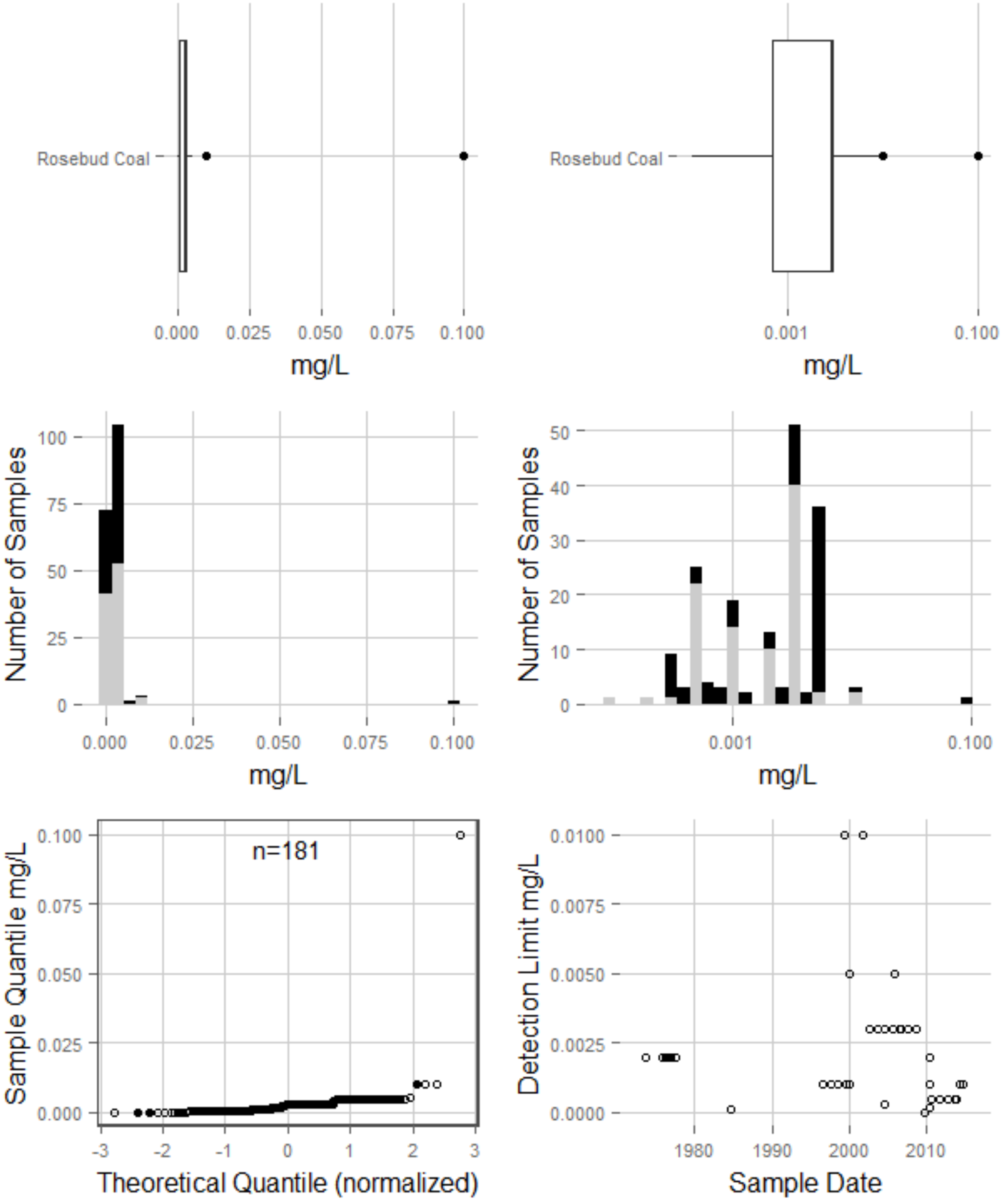
Arsenic
Clinker



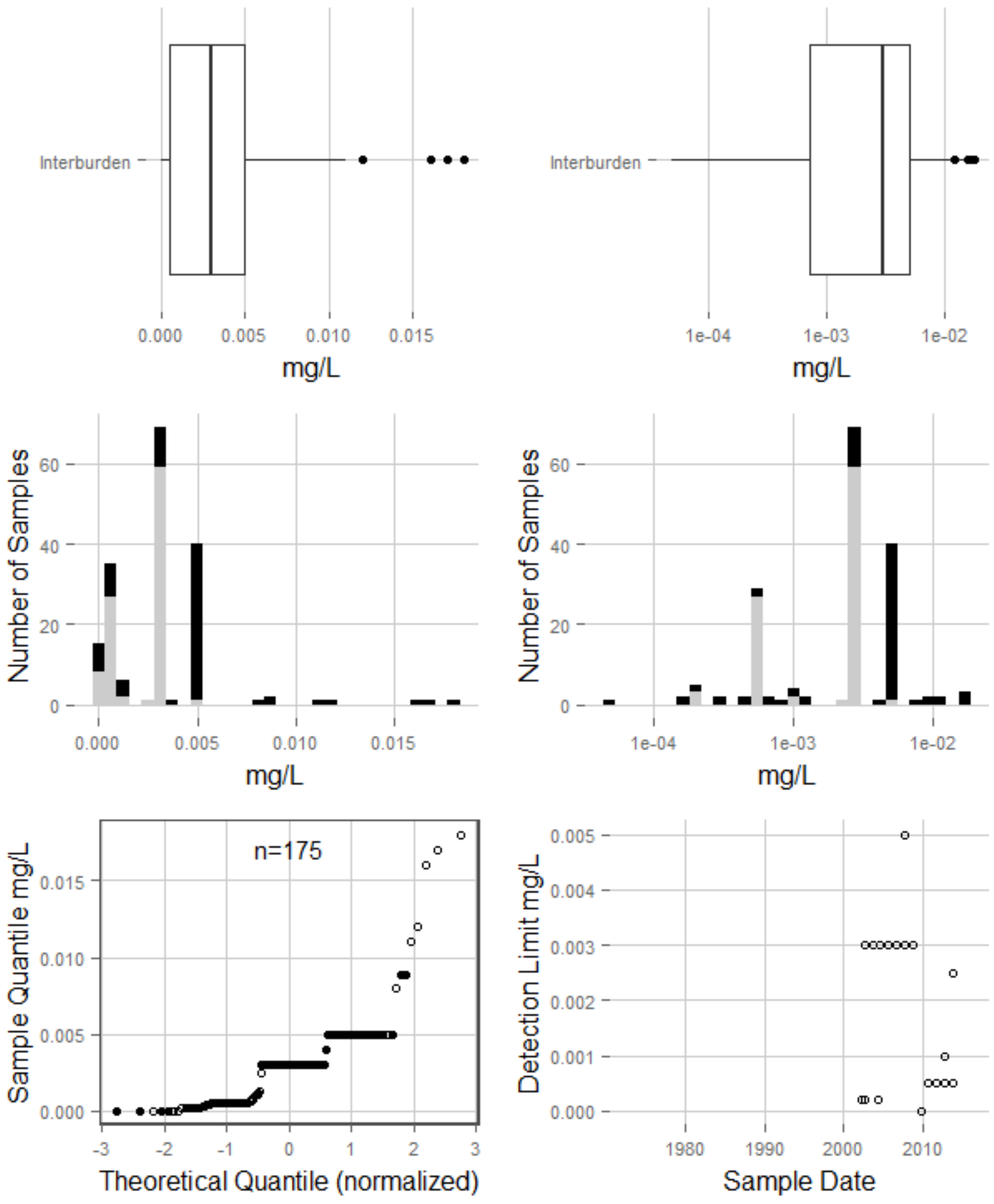
Arsenic
Rosebud Overburden



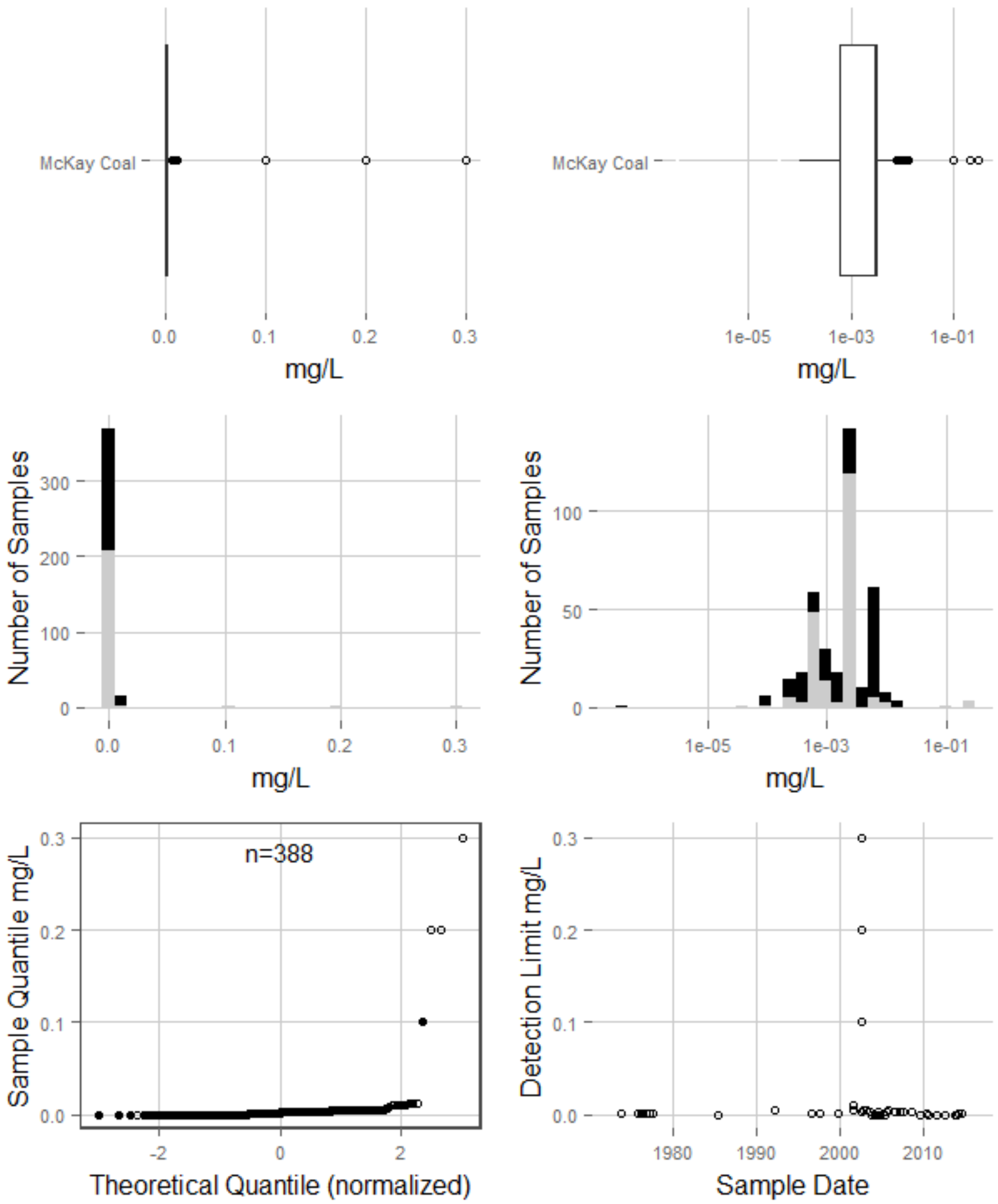
Arsenic
Rosebud Coal



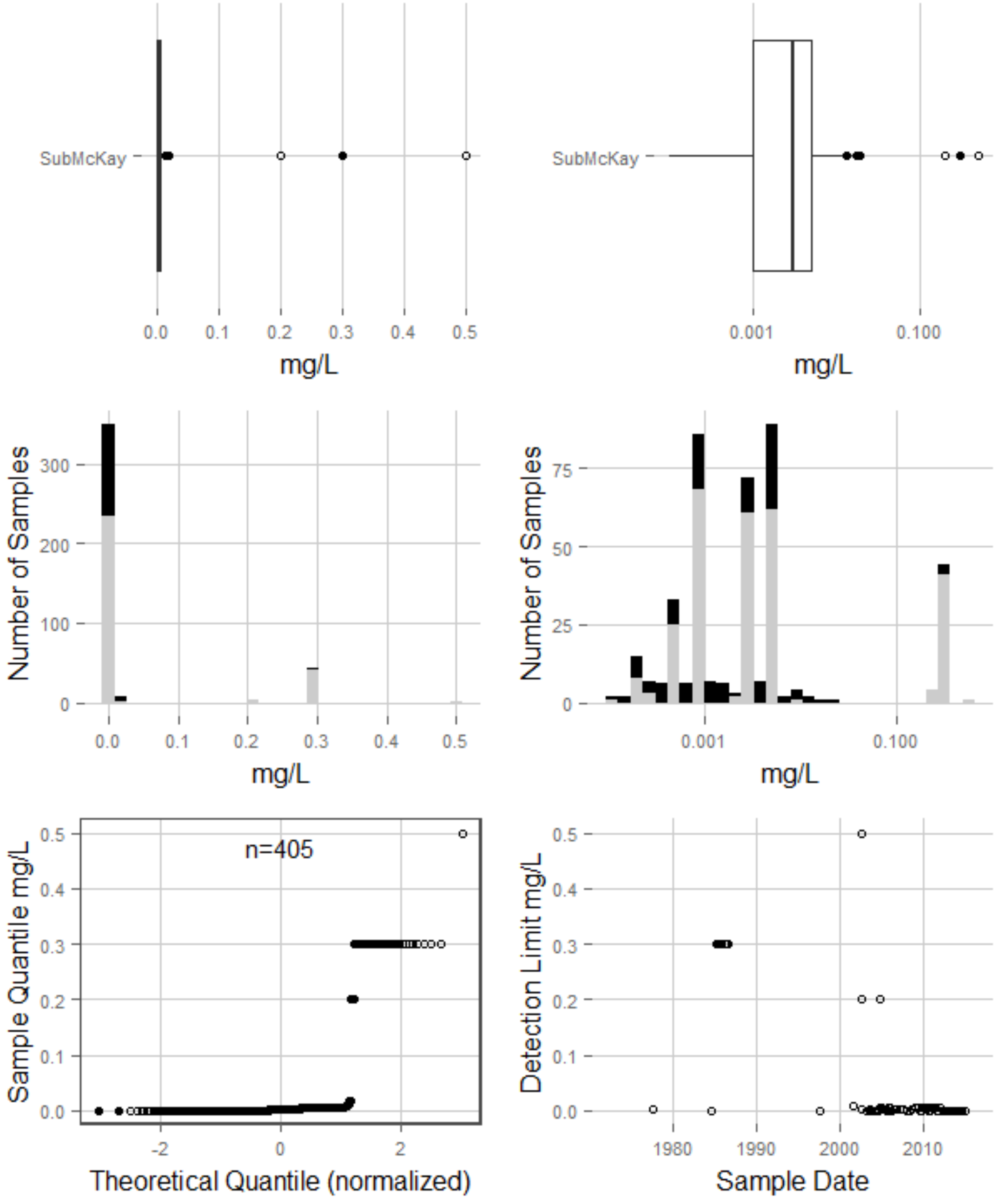
Arsenic
Interburden



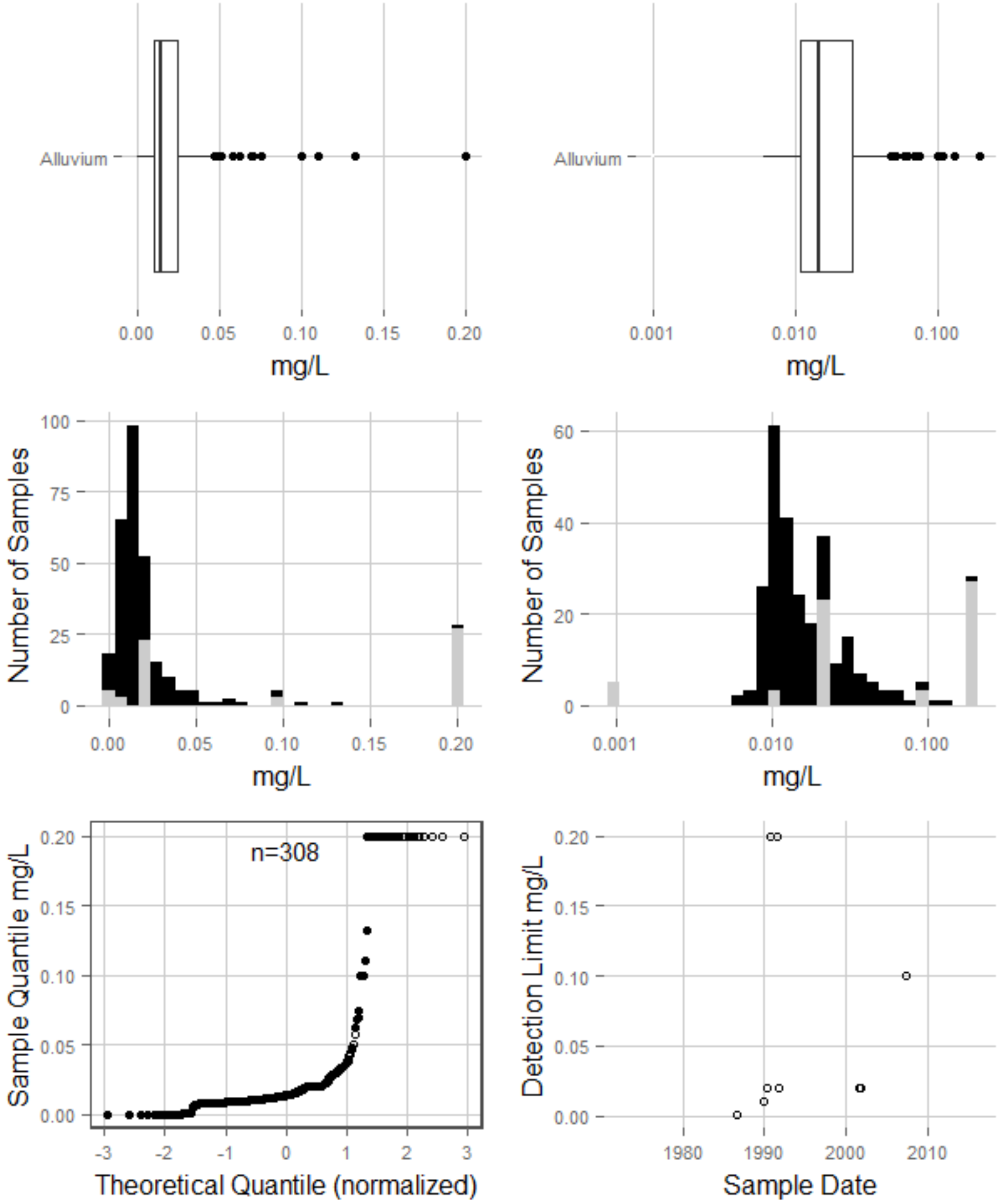
Arsenic
McKay Coal



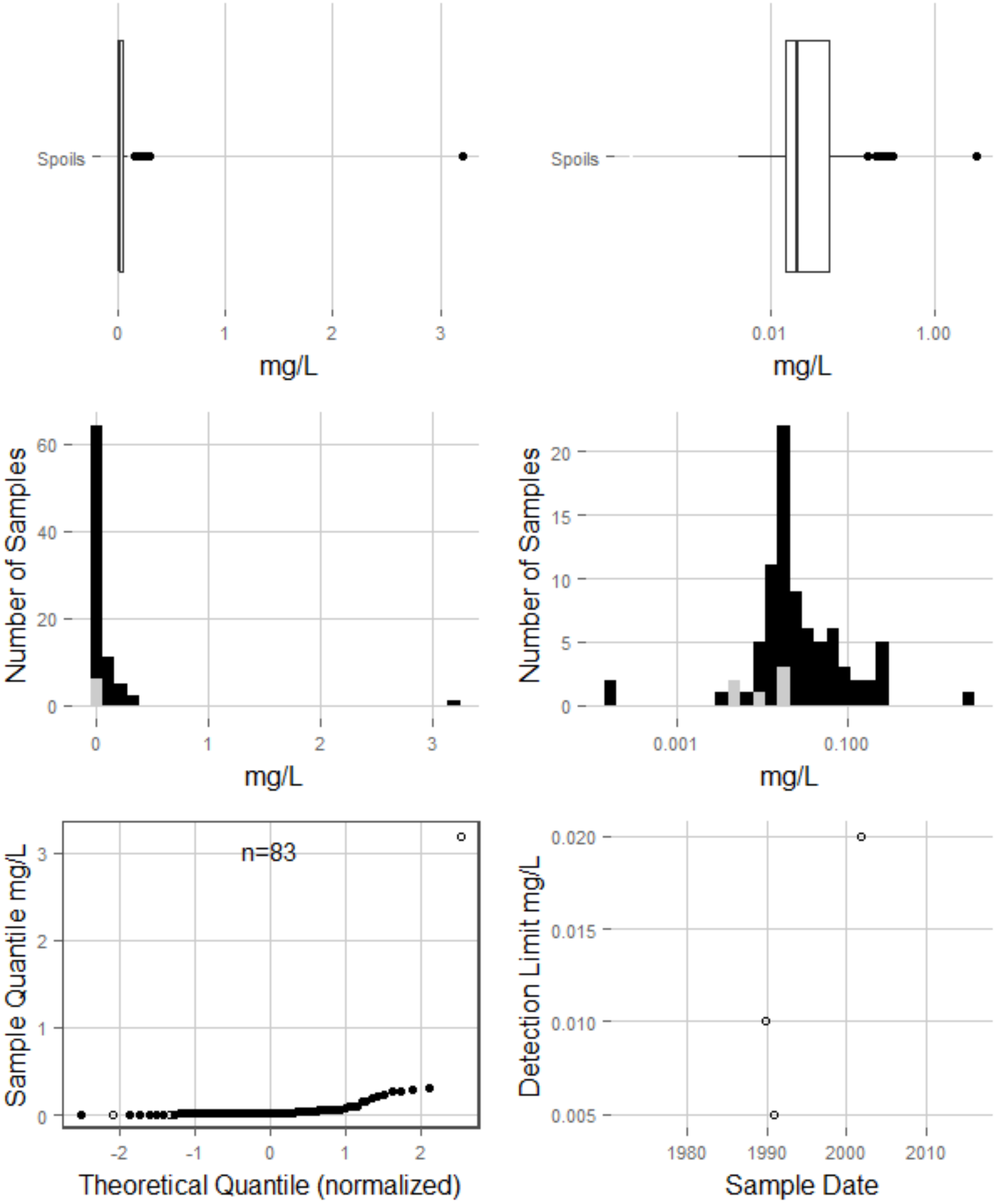
Arsenic
SubMcKay



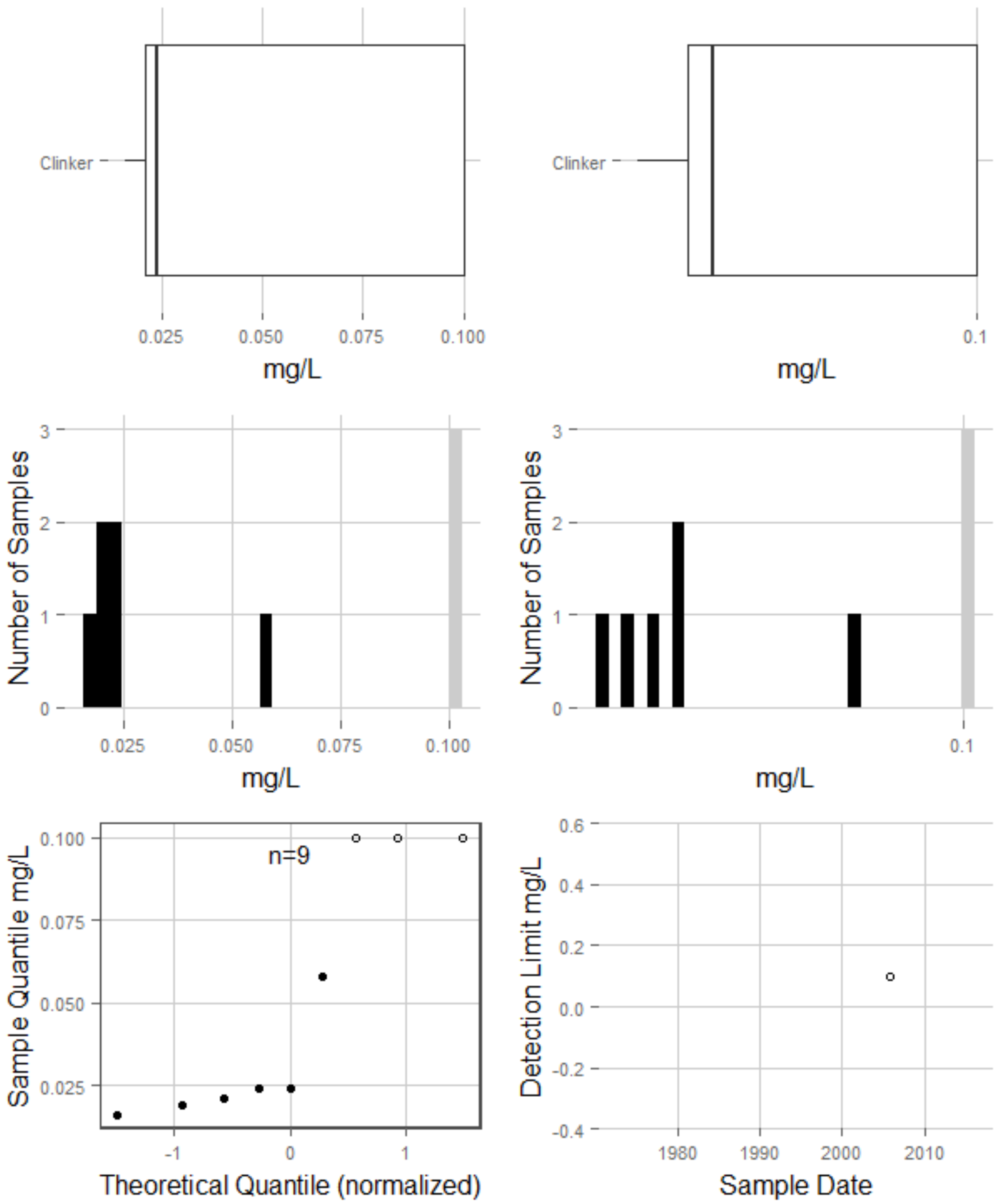
Barium
Alluvium



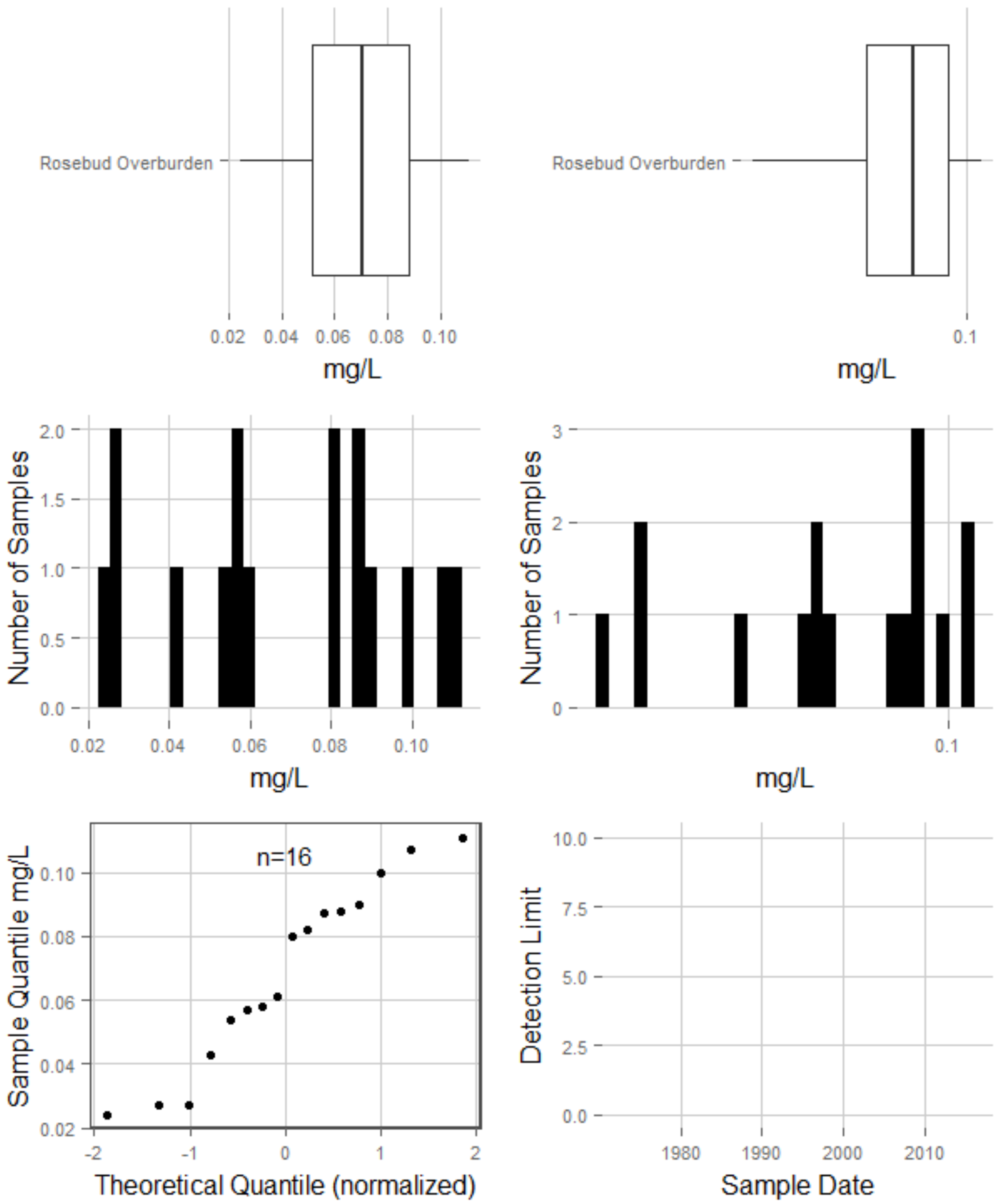
Barium
Spoils

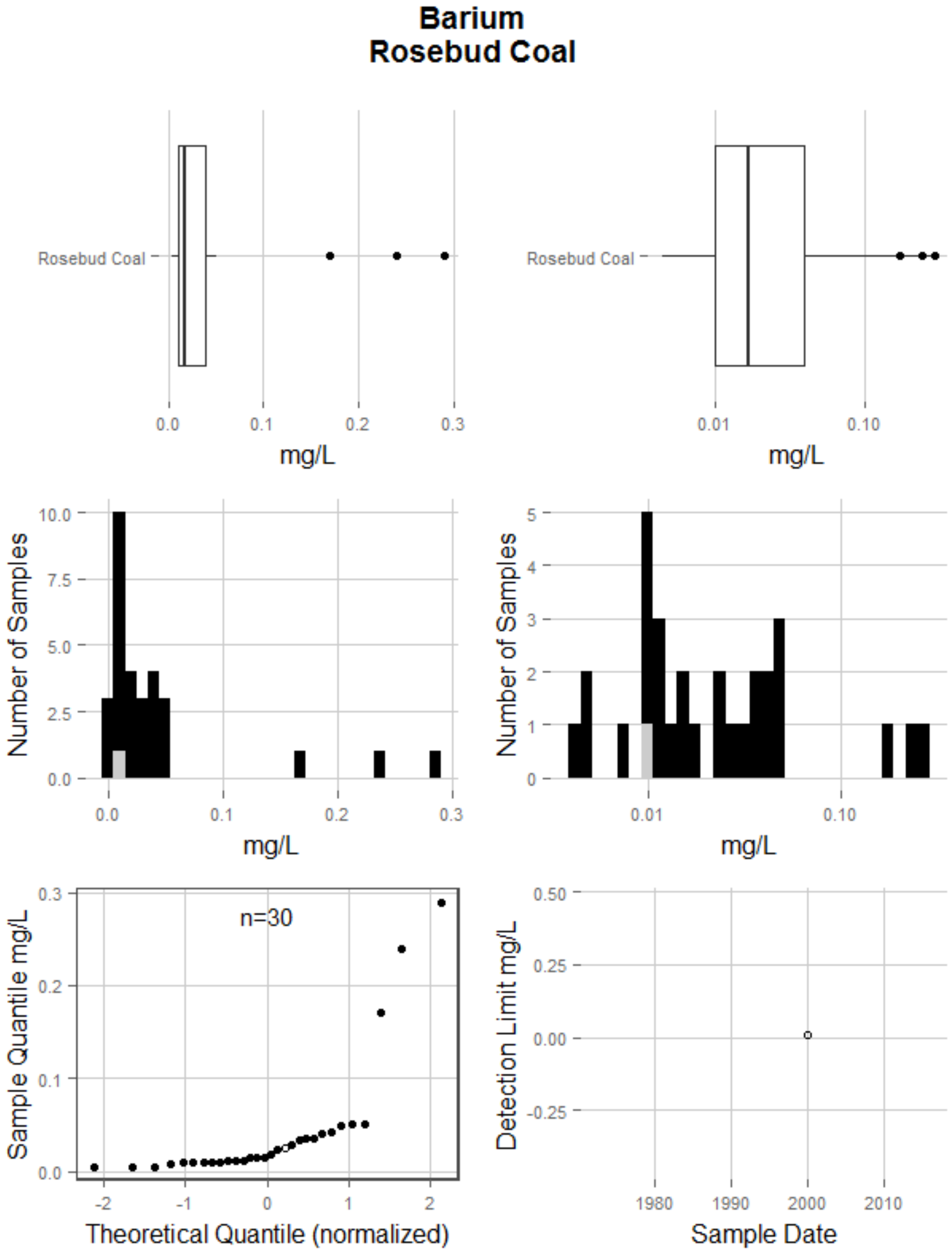


Barium
Clinker

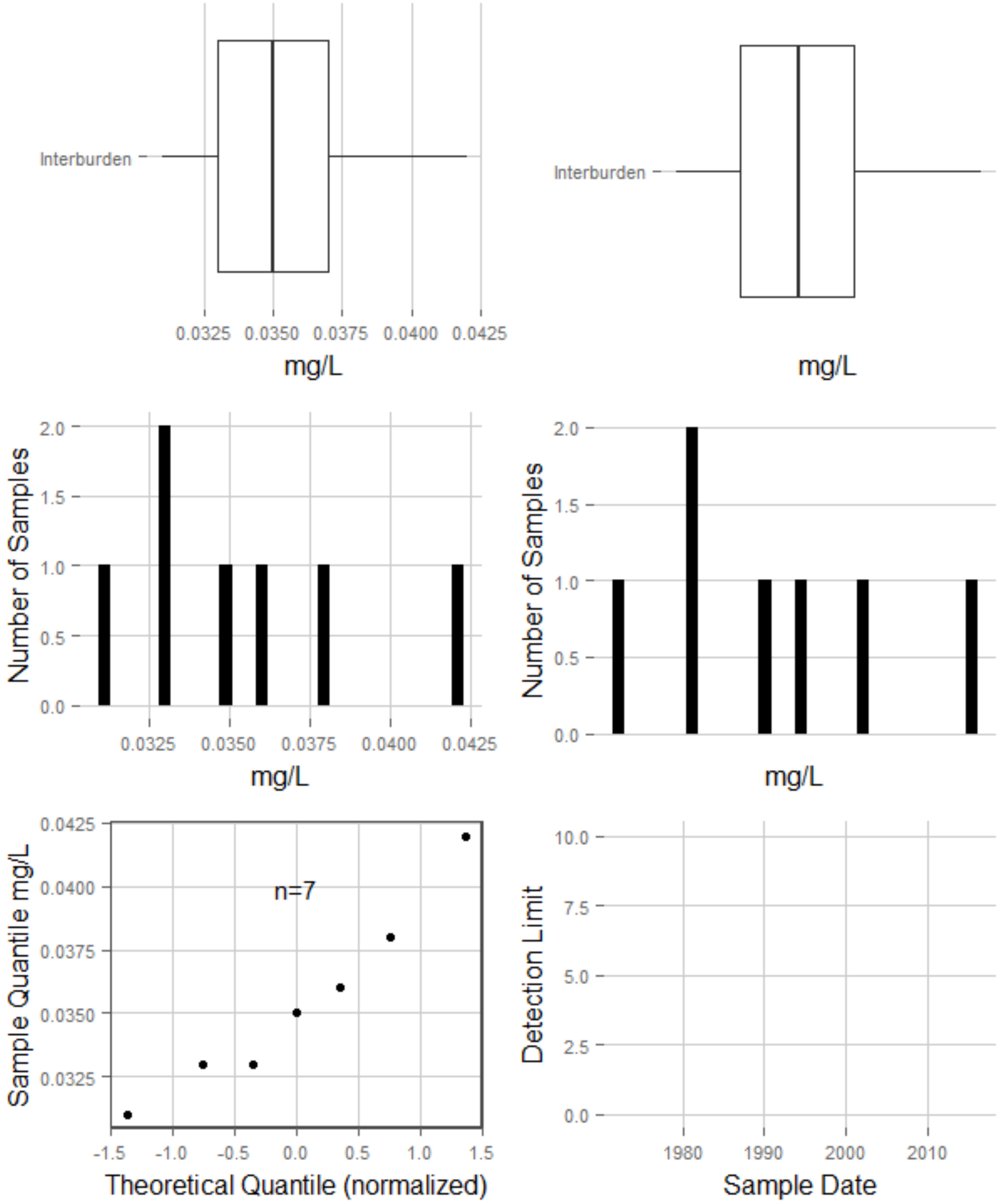


Barium
Rosebud Overburden

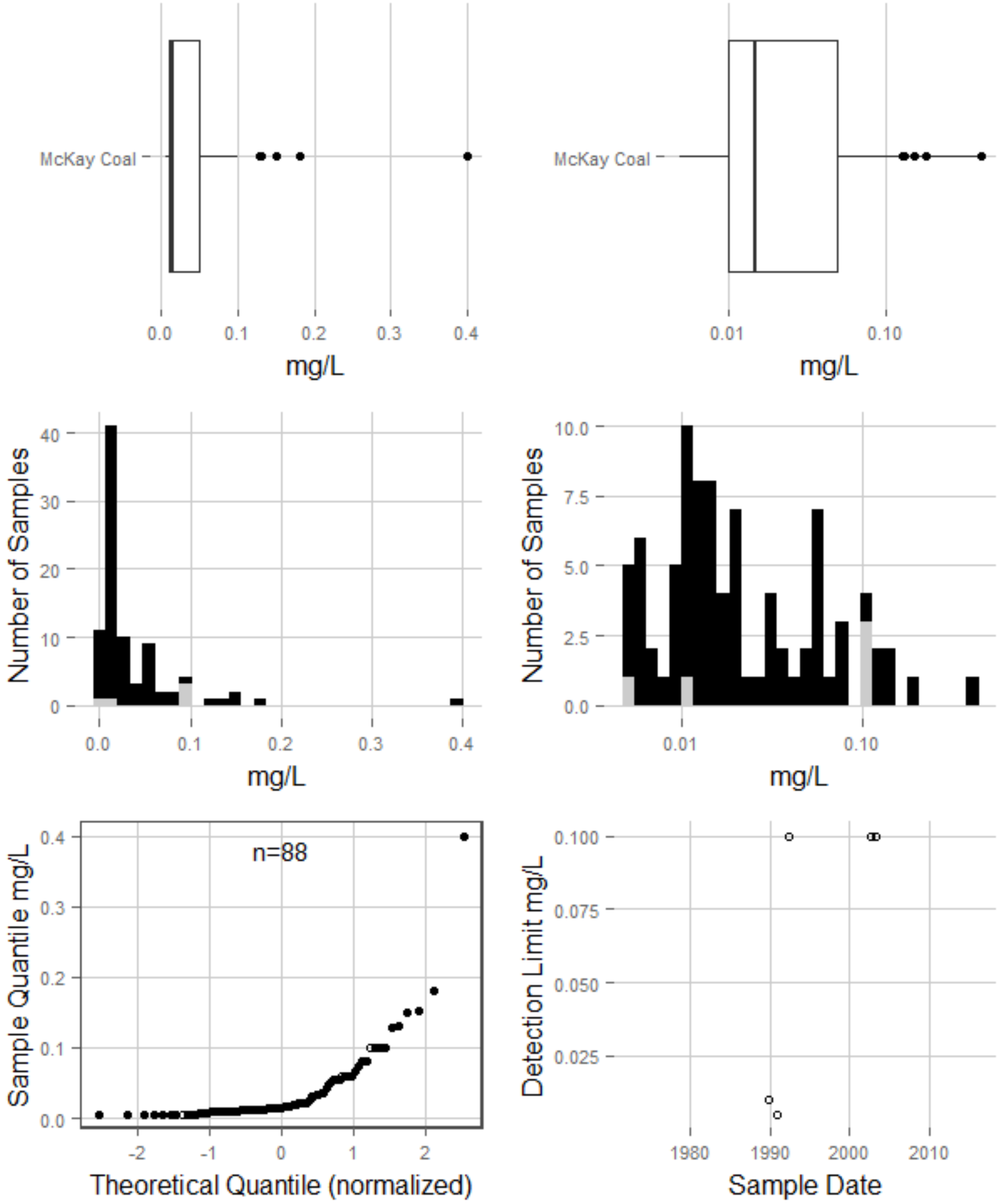



Barium
Rosebud Coal
Rosebud Coal
0.0
0.1
0.2
0.3
mg/L
Rosebud Coal
0.01
0.10
mg/L
Number of Samples
10.0
7.5
5.0
2.5
0.0
0.0
0.1
0.2
0.3
mg/L
Number of Samples
5
4
3
2
1
0
0.01
0.10
mg/L
Sample Quantile mg/L
0.3
0.2
0.1
0.0
n=30
-2
-1
0
1
2
Theoretical Quantile (normalized)
Detection Limit mg/L
0.50
0.25
0.00
-0.25
1980
1990
2000
2010
Sample Date

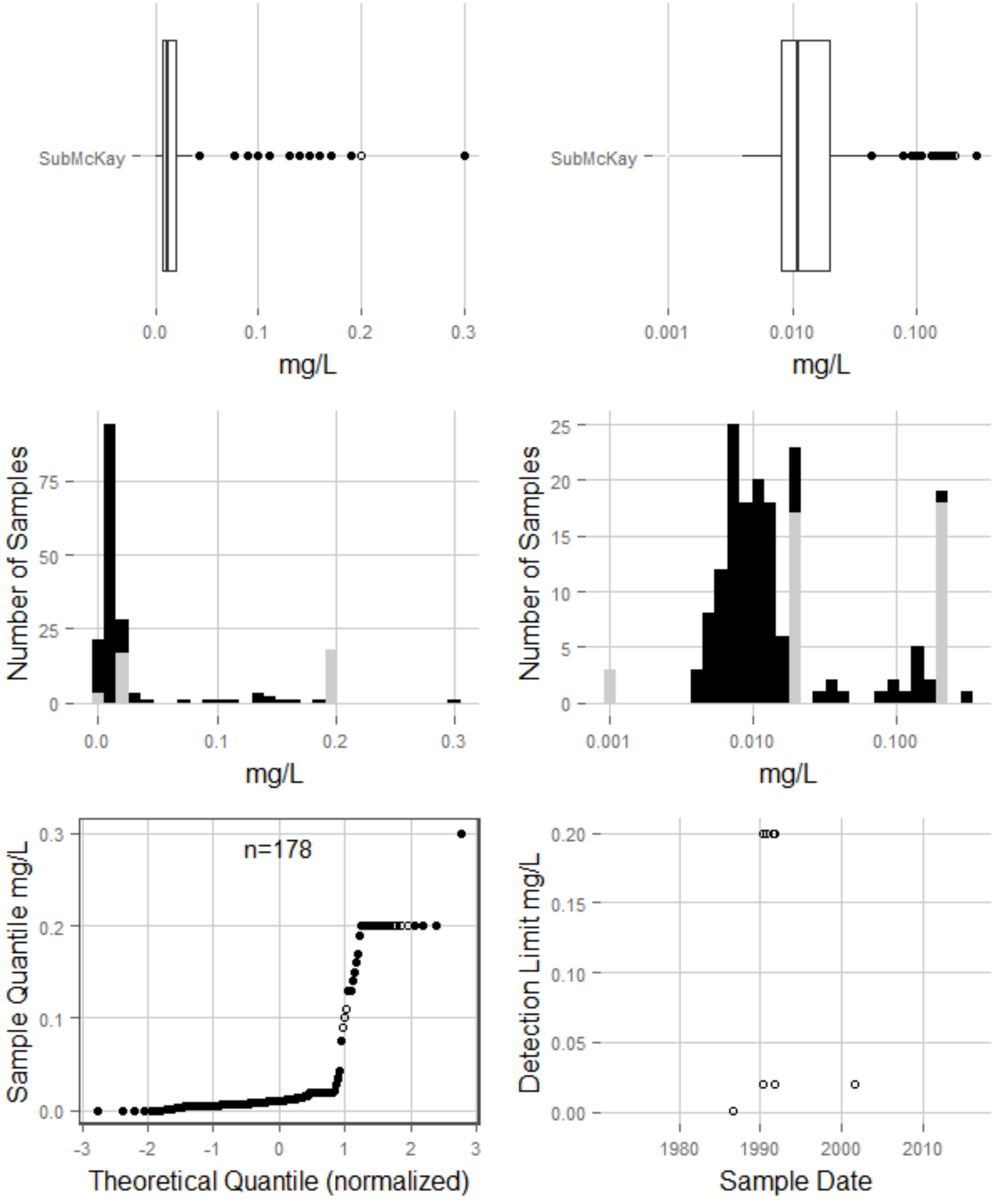
Barium
Interburden



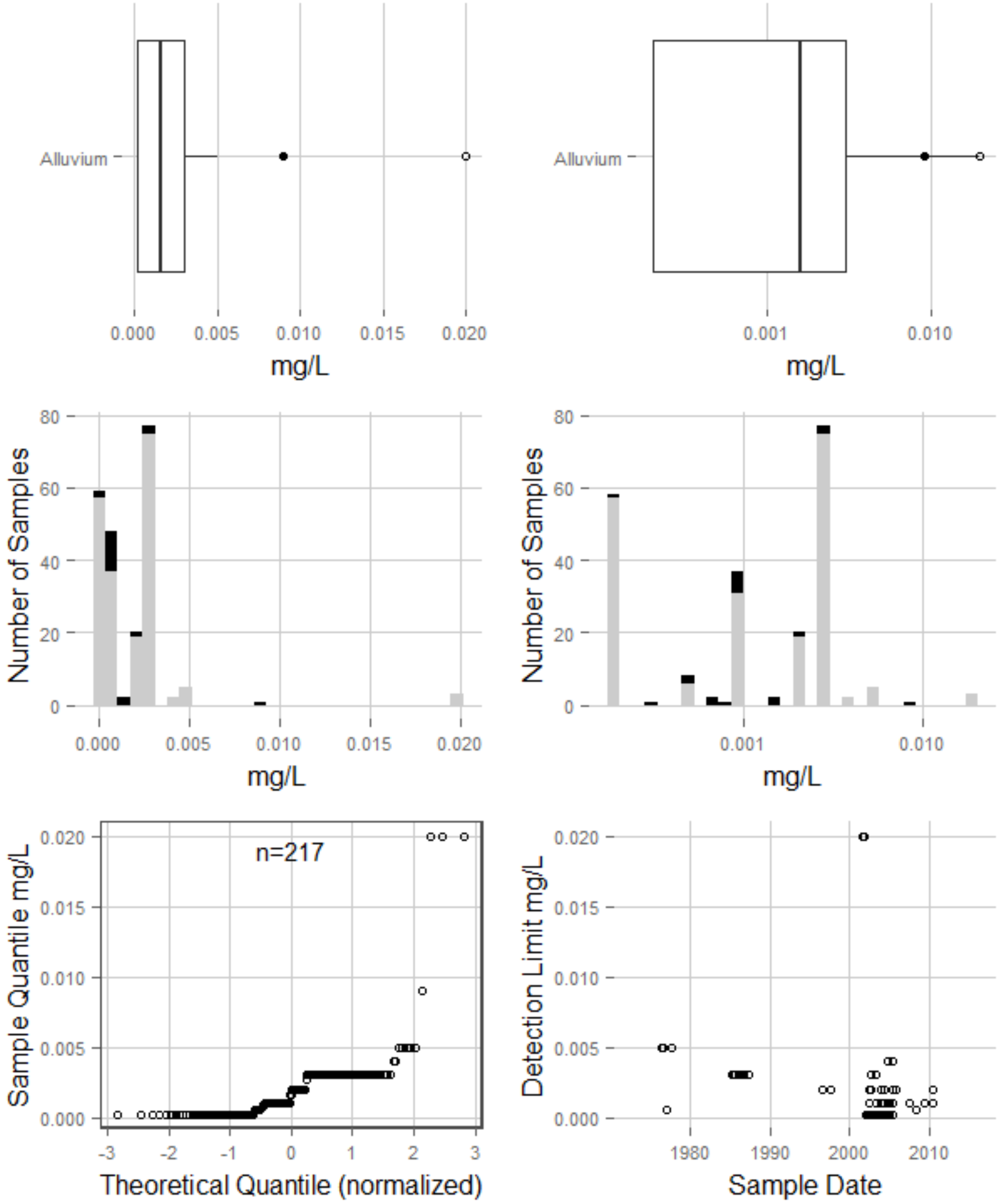
Barium
McKay Coal



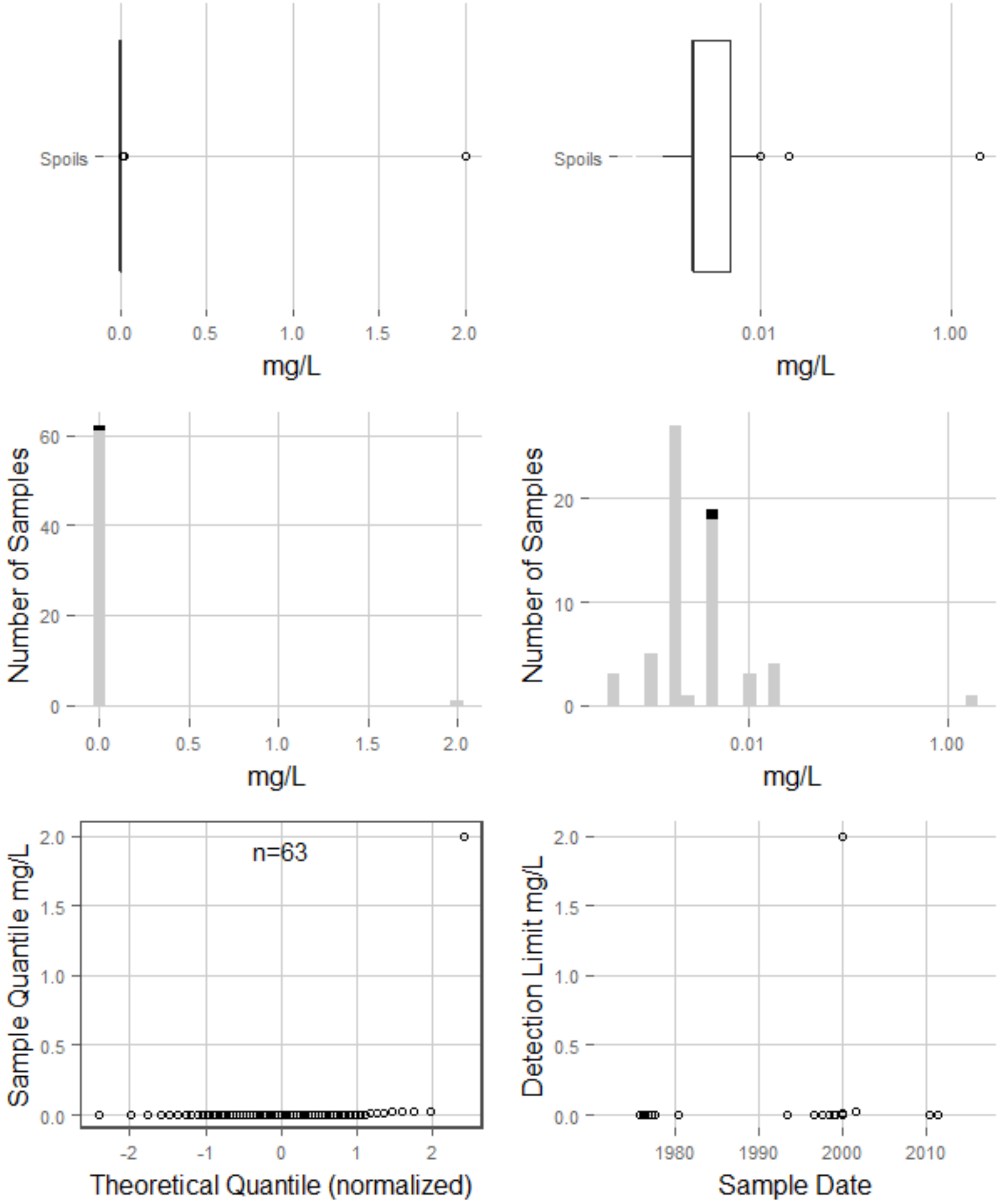
Barium
SubMcKay



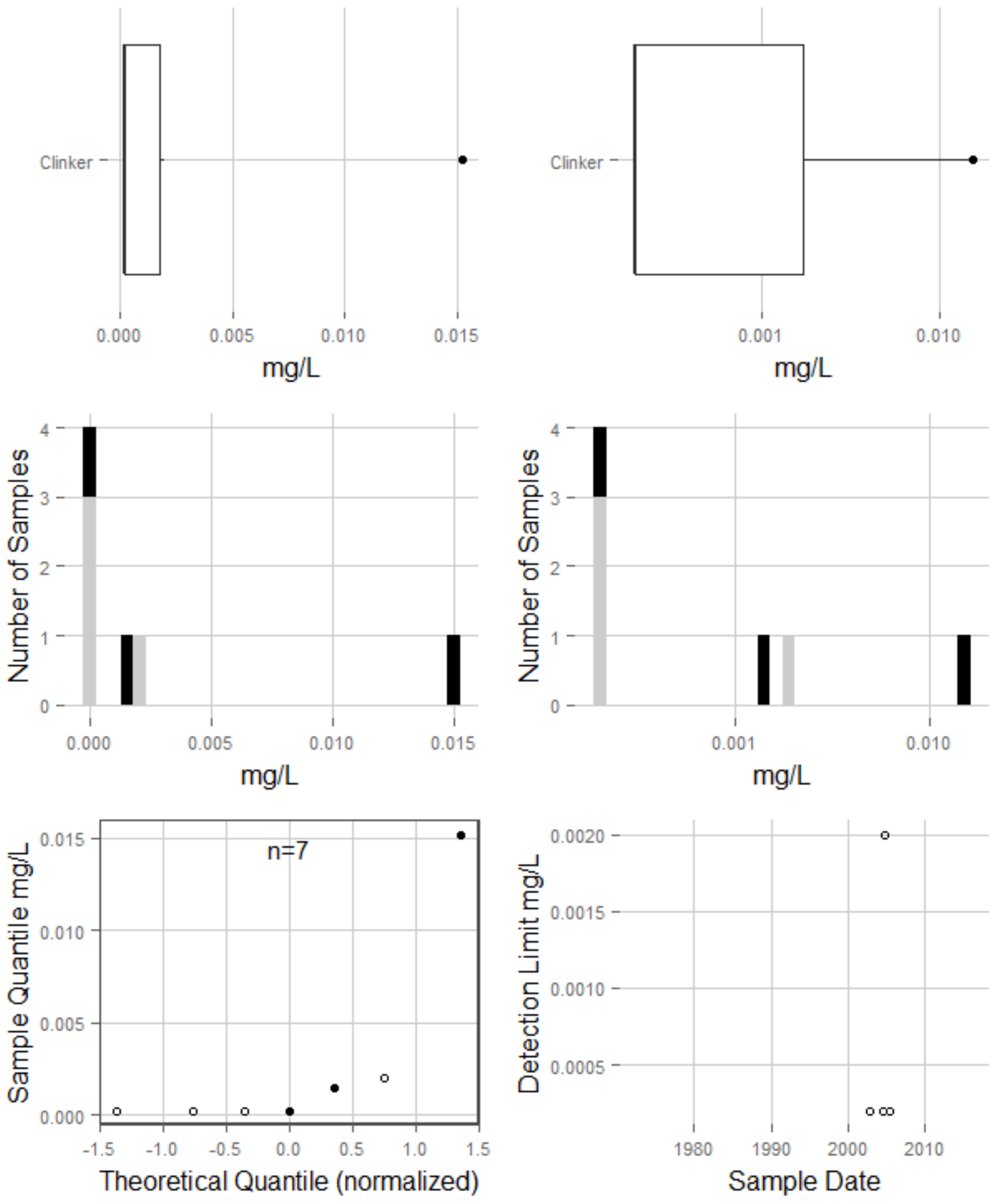
Beryllium
Alluvium



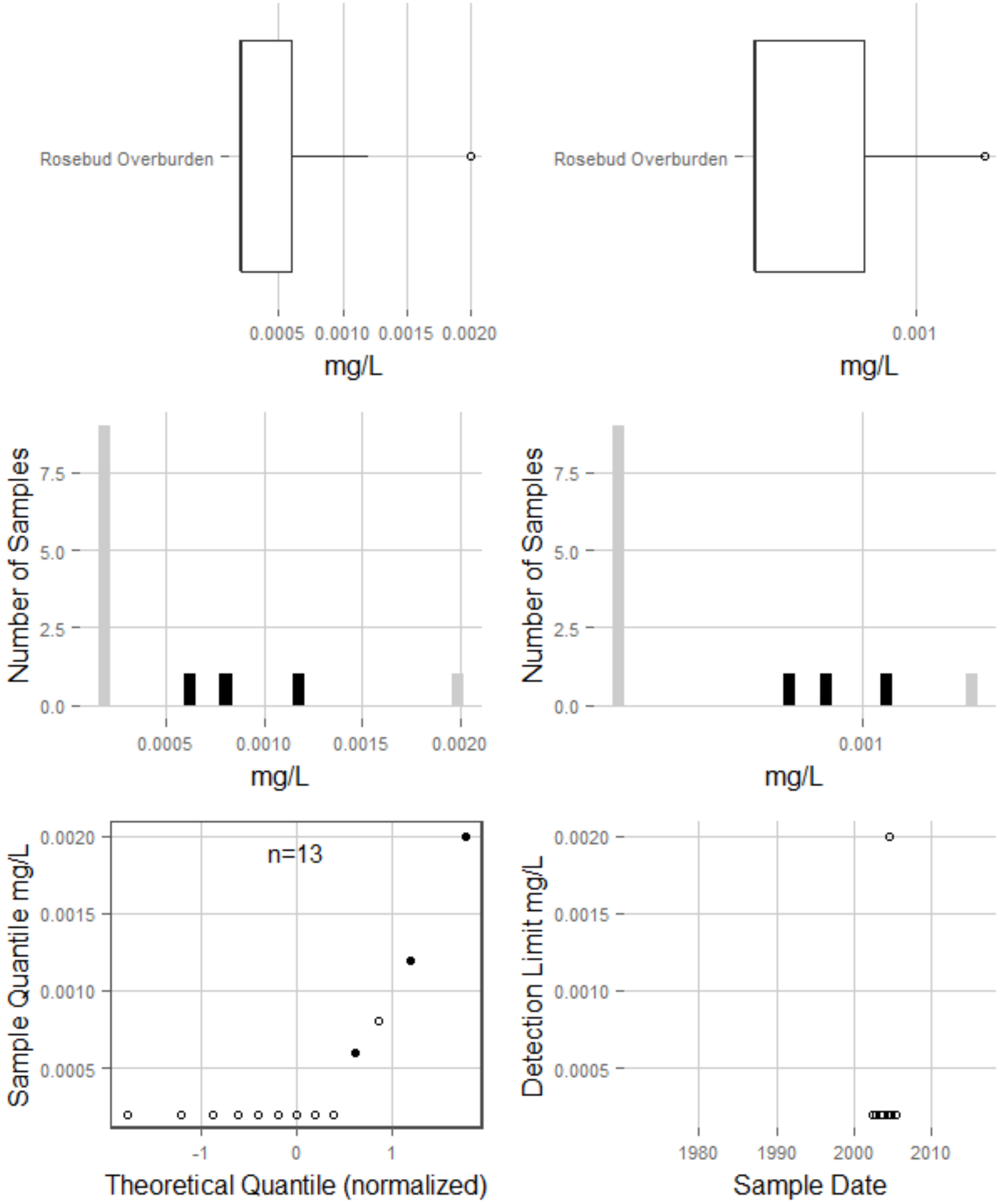
Beryllium
Spoils



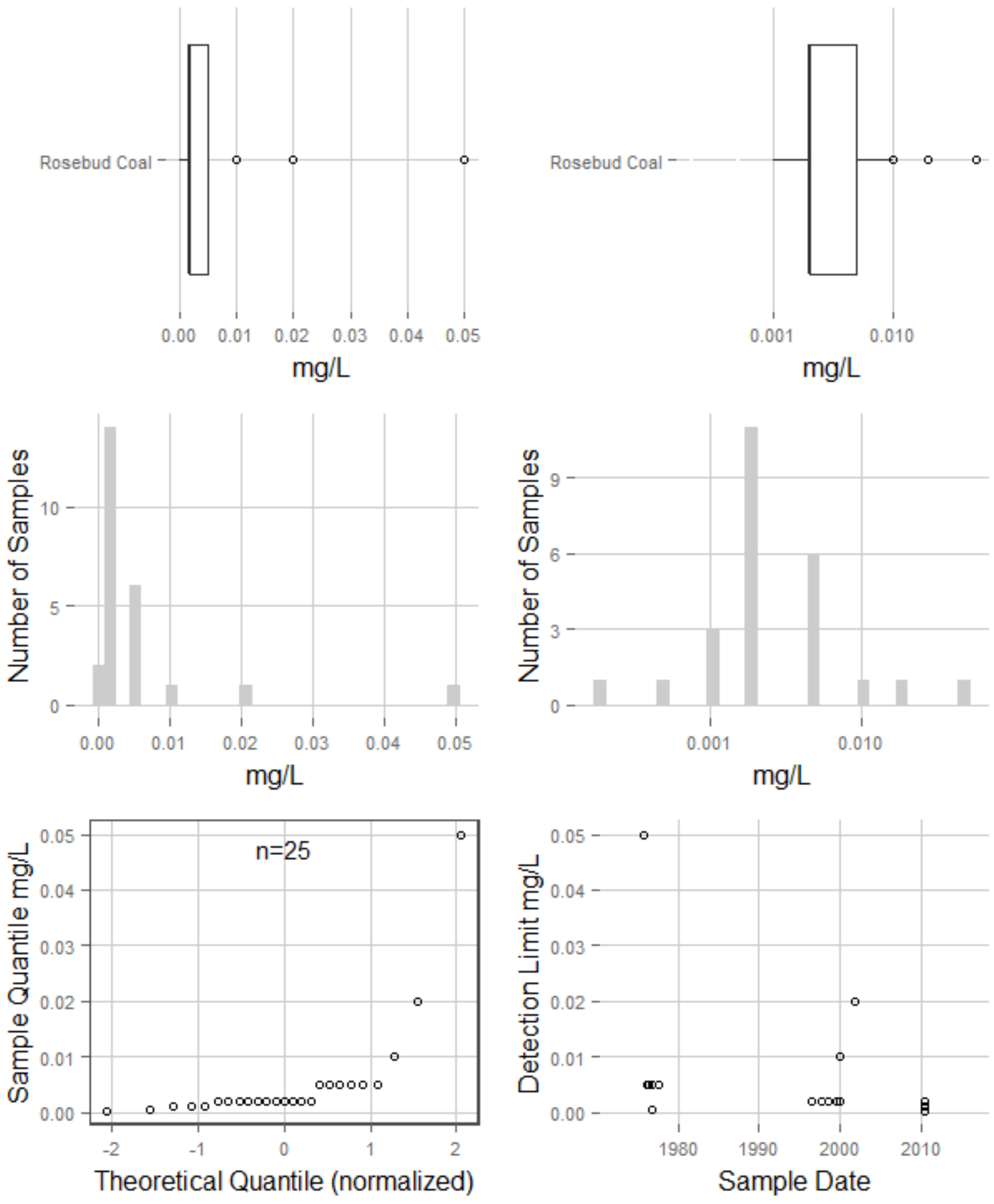
Beryllium
Clinker



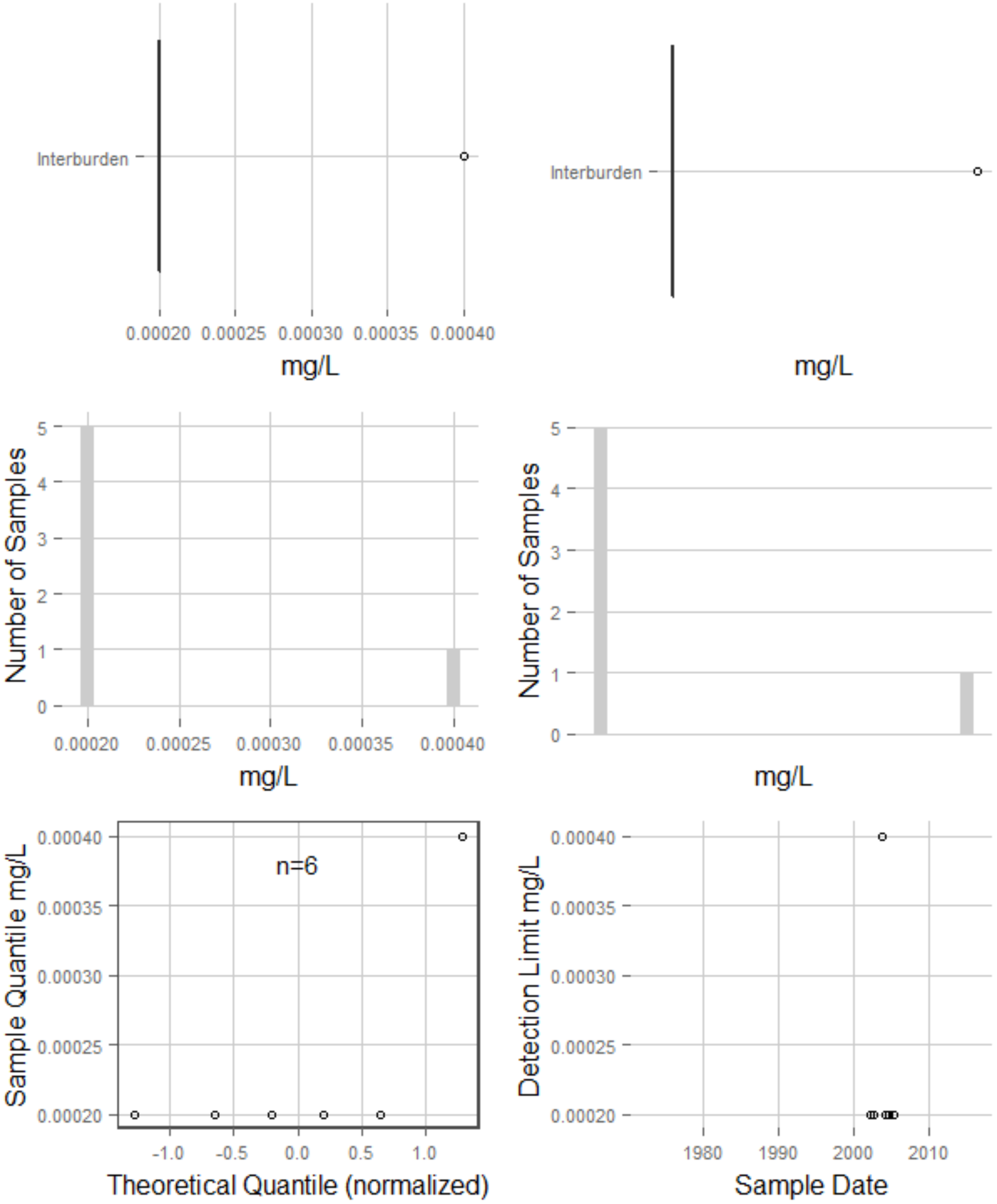
Beryllium
Rosebud Overburden



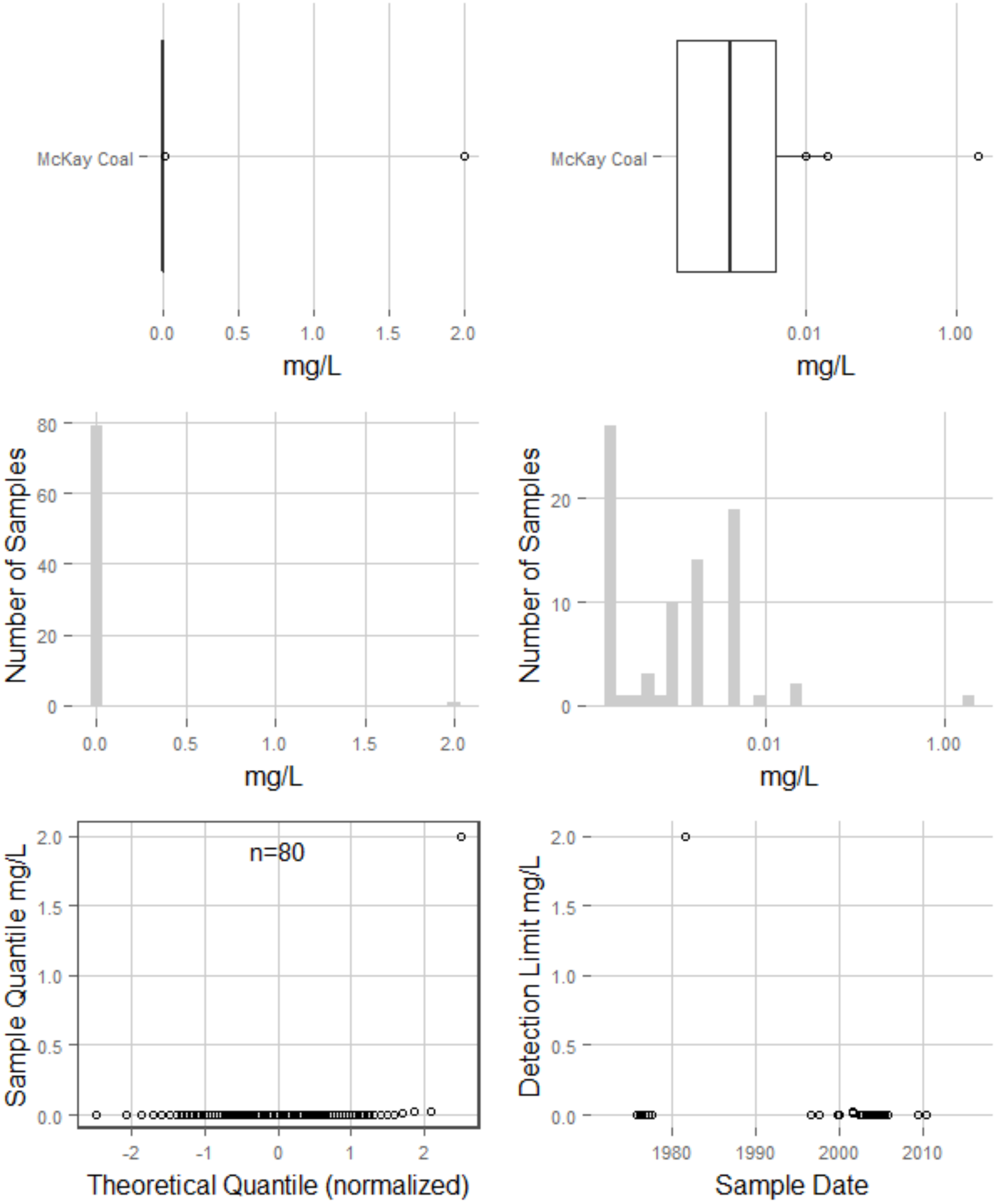
Beryllium
Rosebud Coal



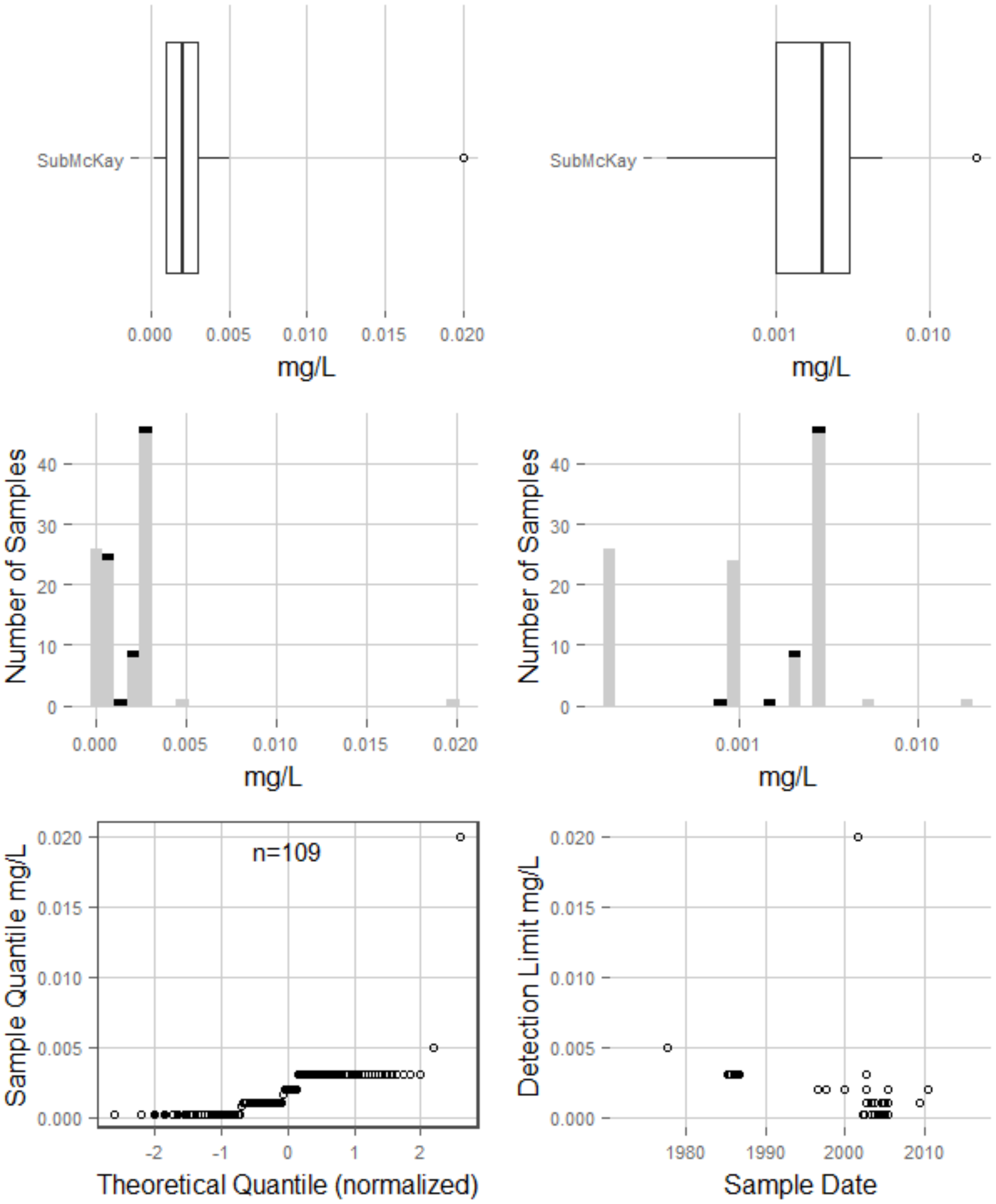
Beryllium
Interburden



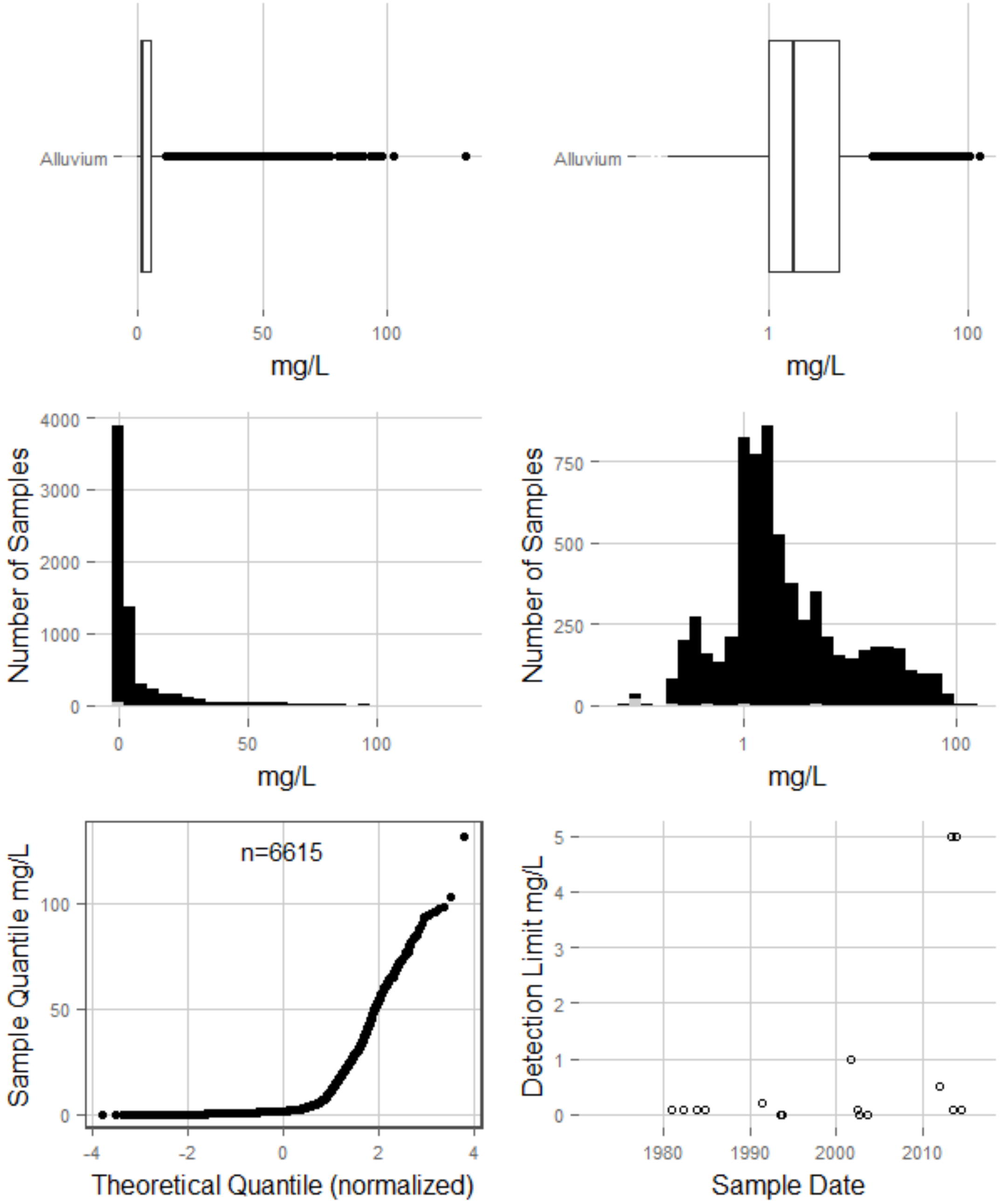
Beryllium
McKay Coal



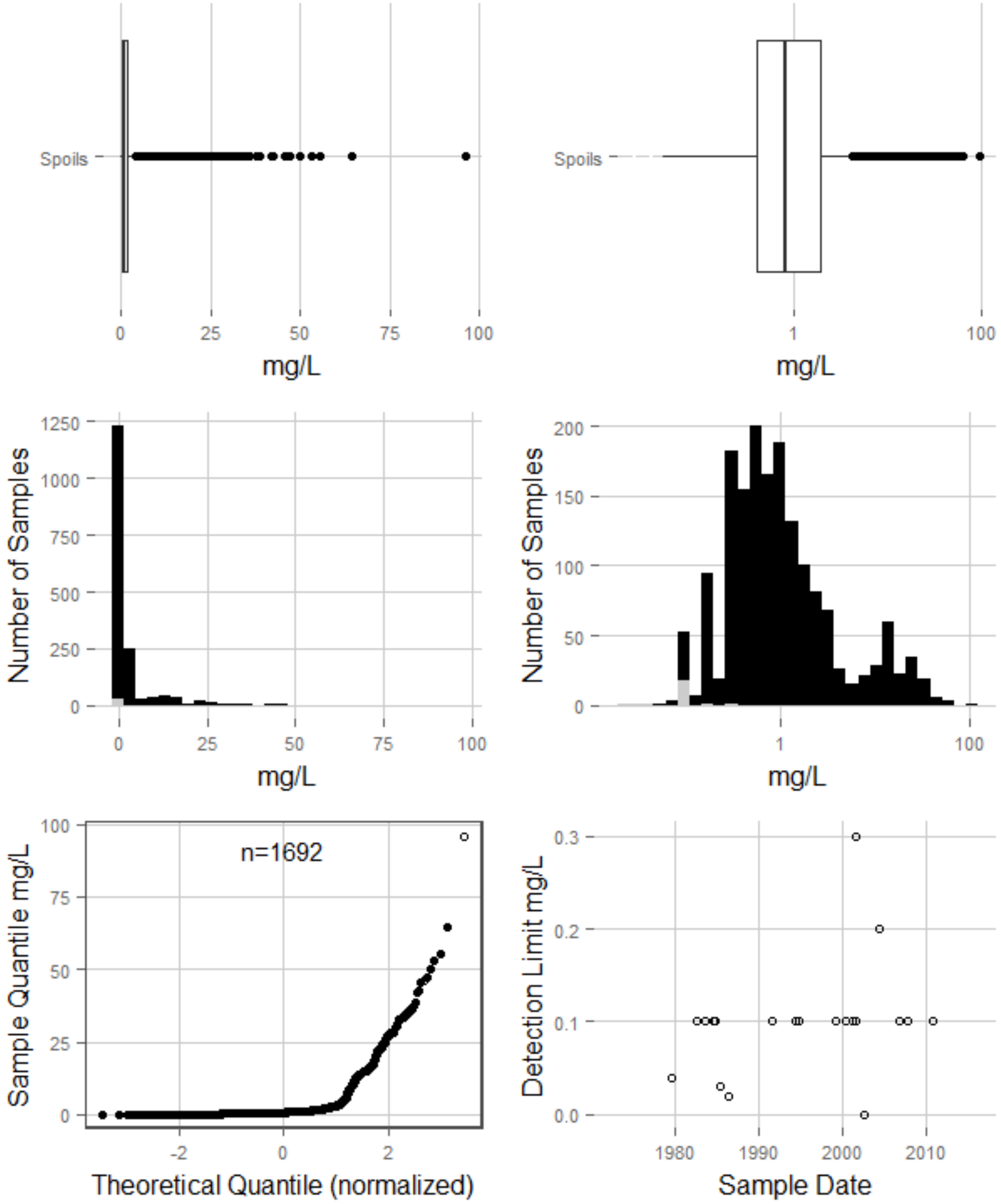
Beryllium
SubMcKay



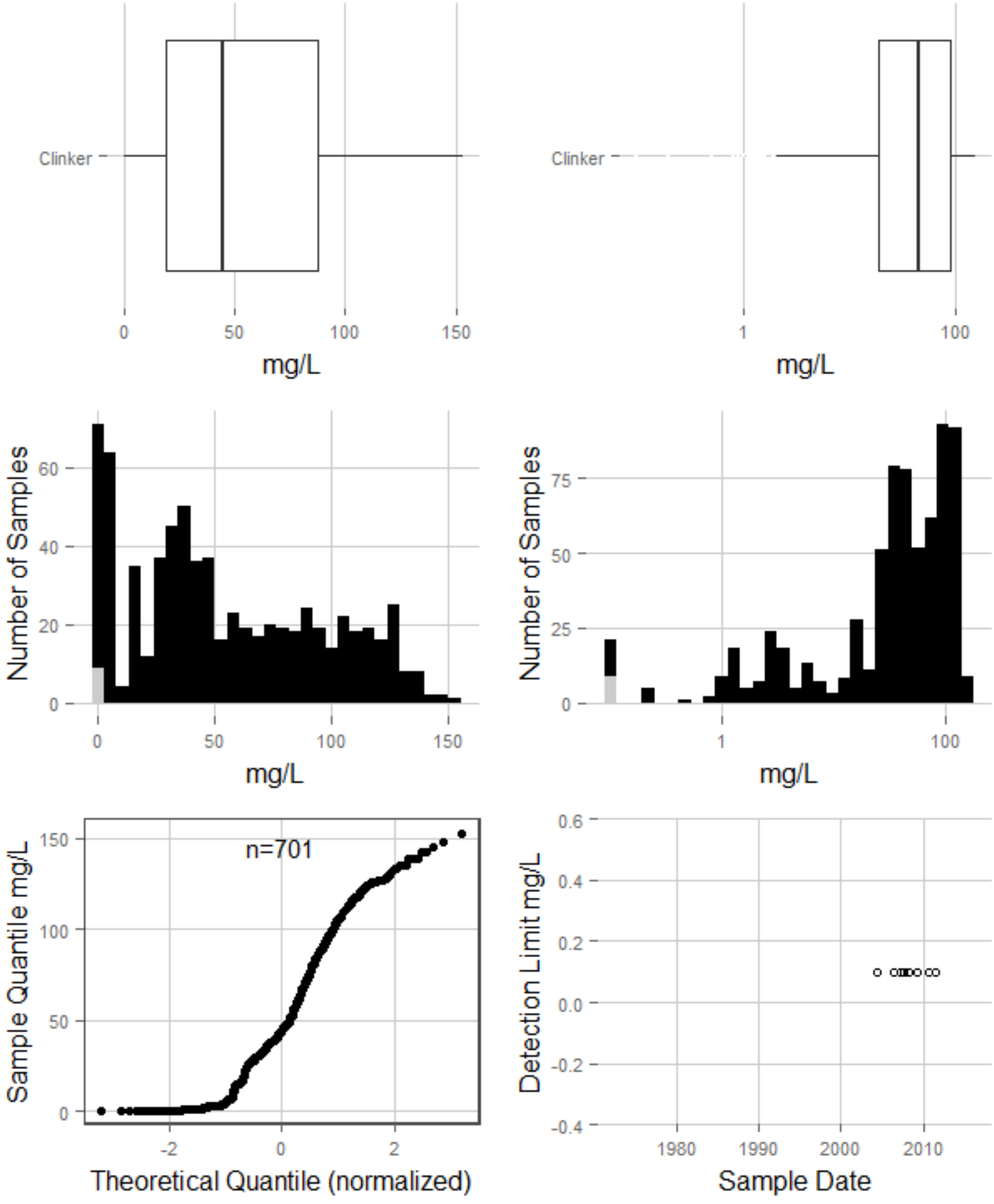
Boron
Alluvium



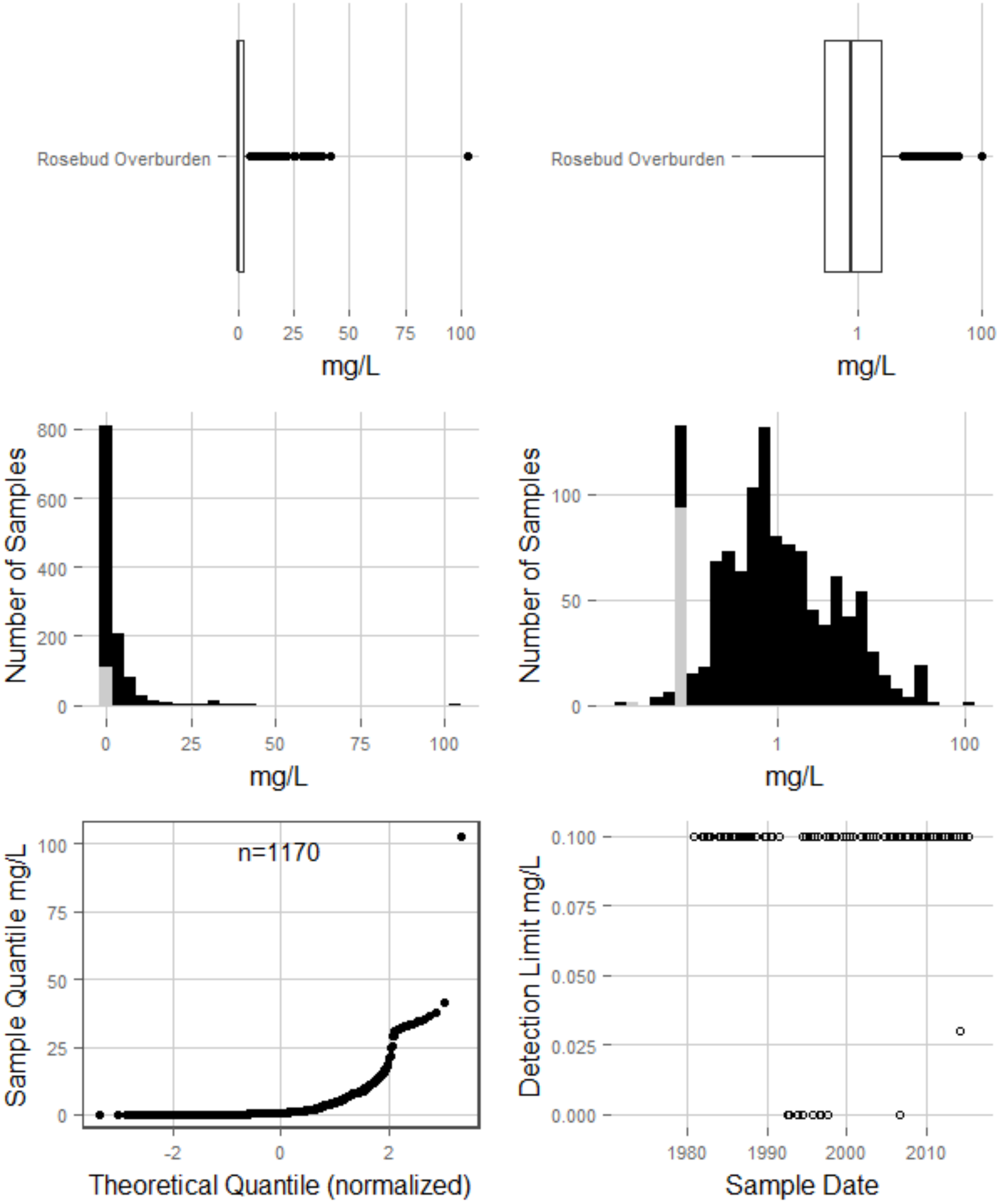
Boron
Spoils



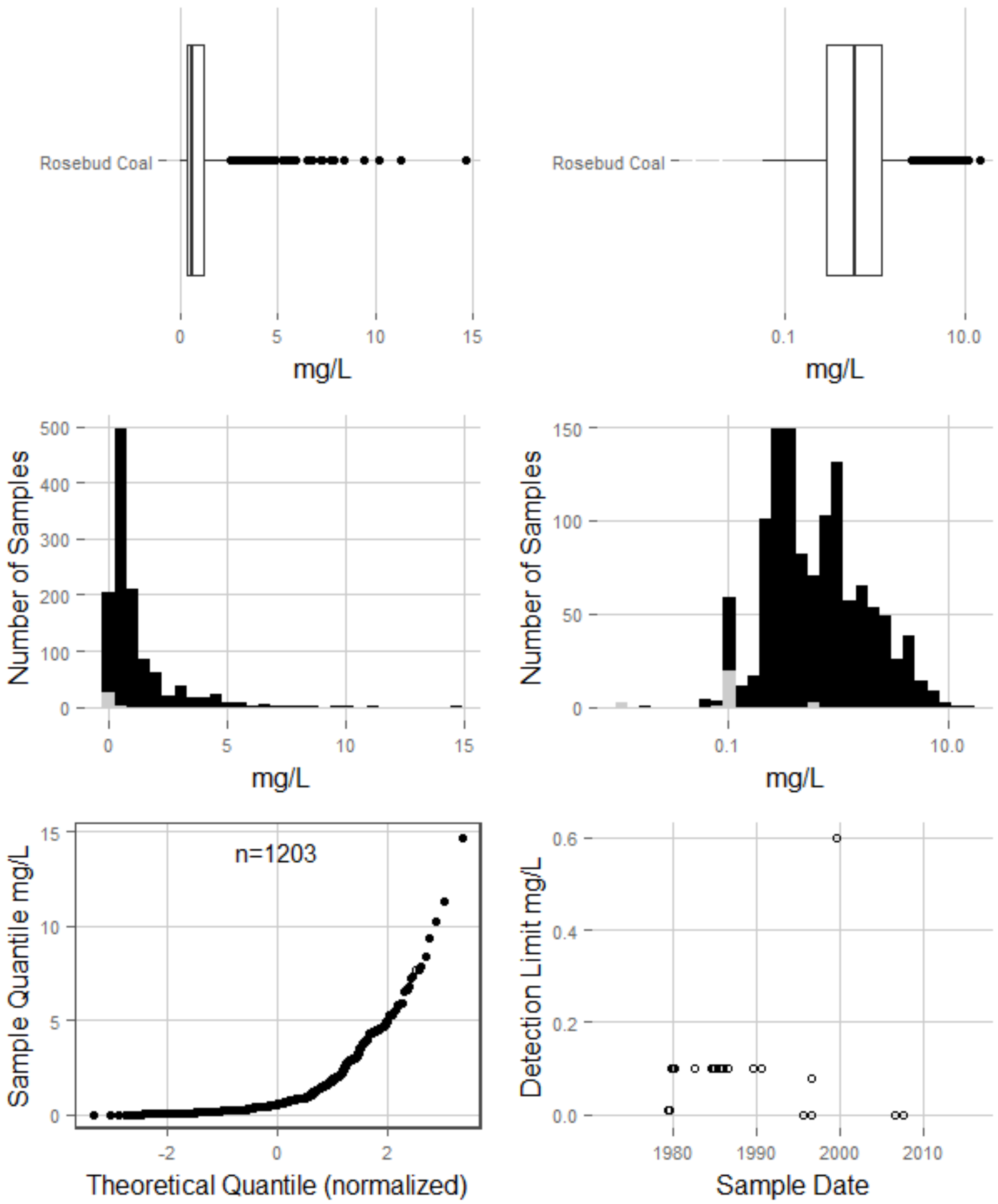
Boron
Clinker



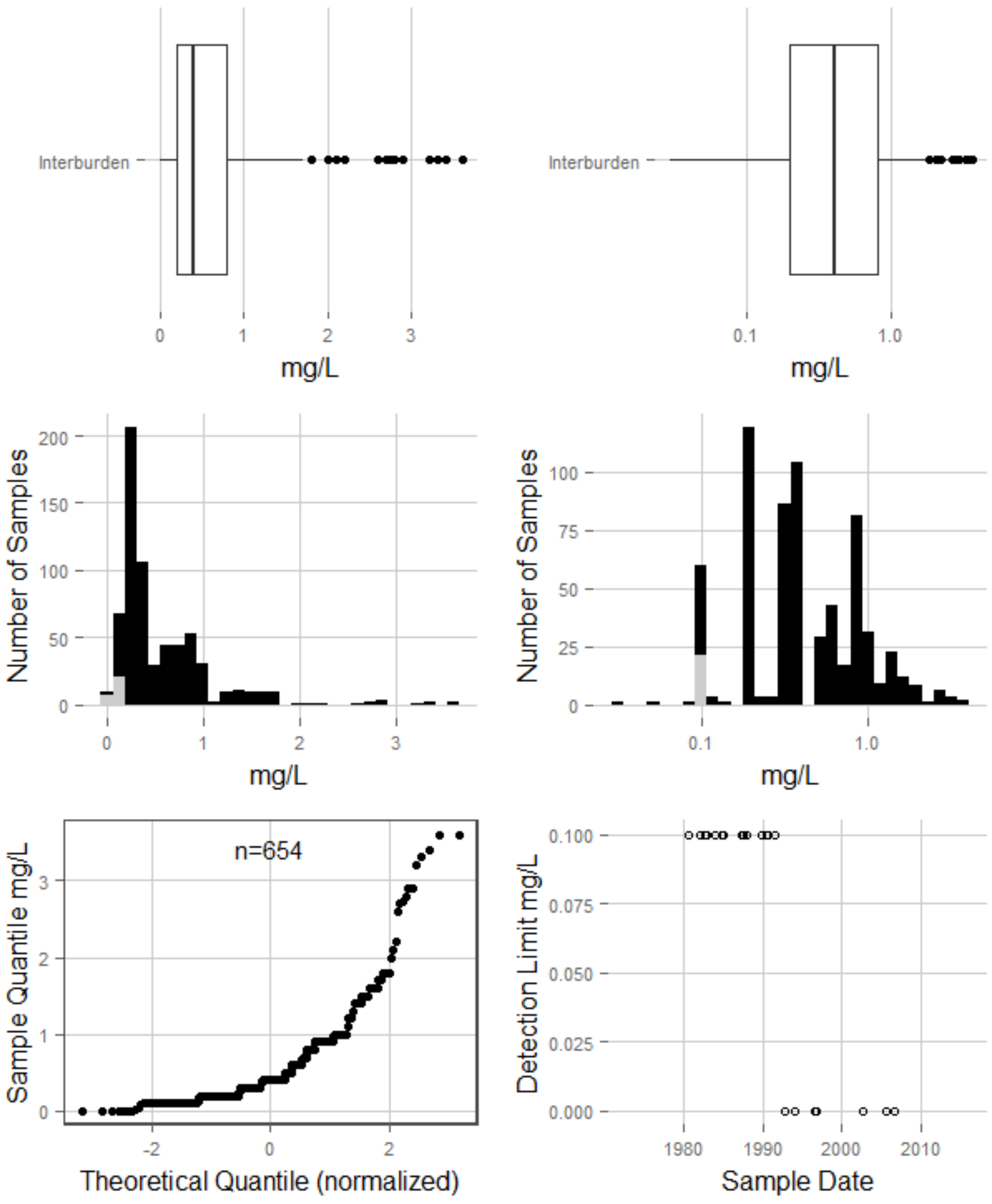
Boron
Rosebud Overburden



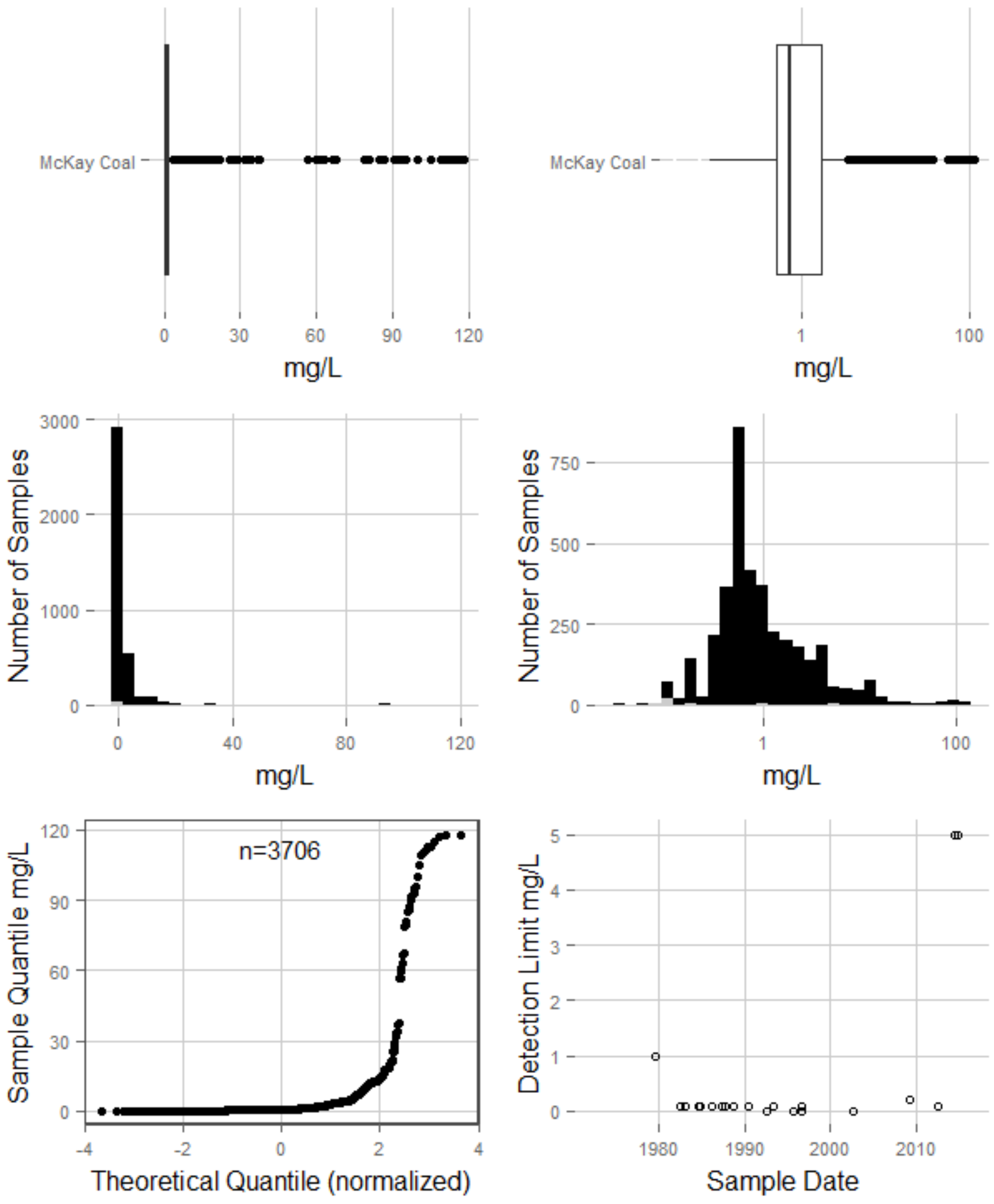
Boron
Rosebud Coal



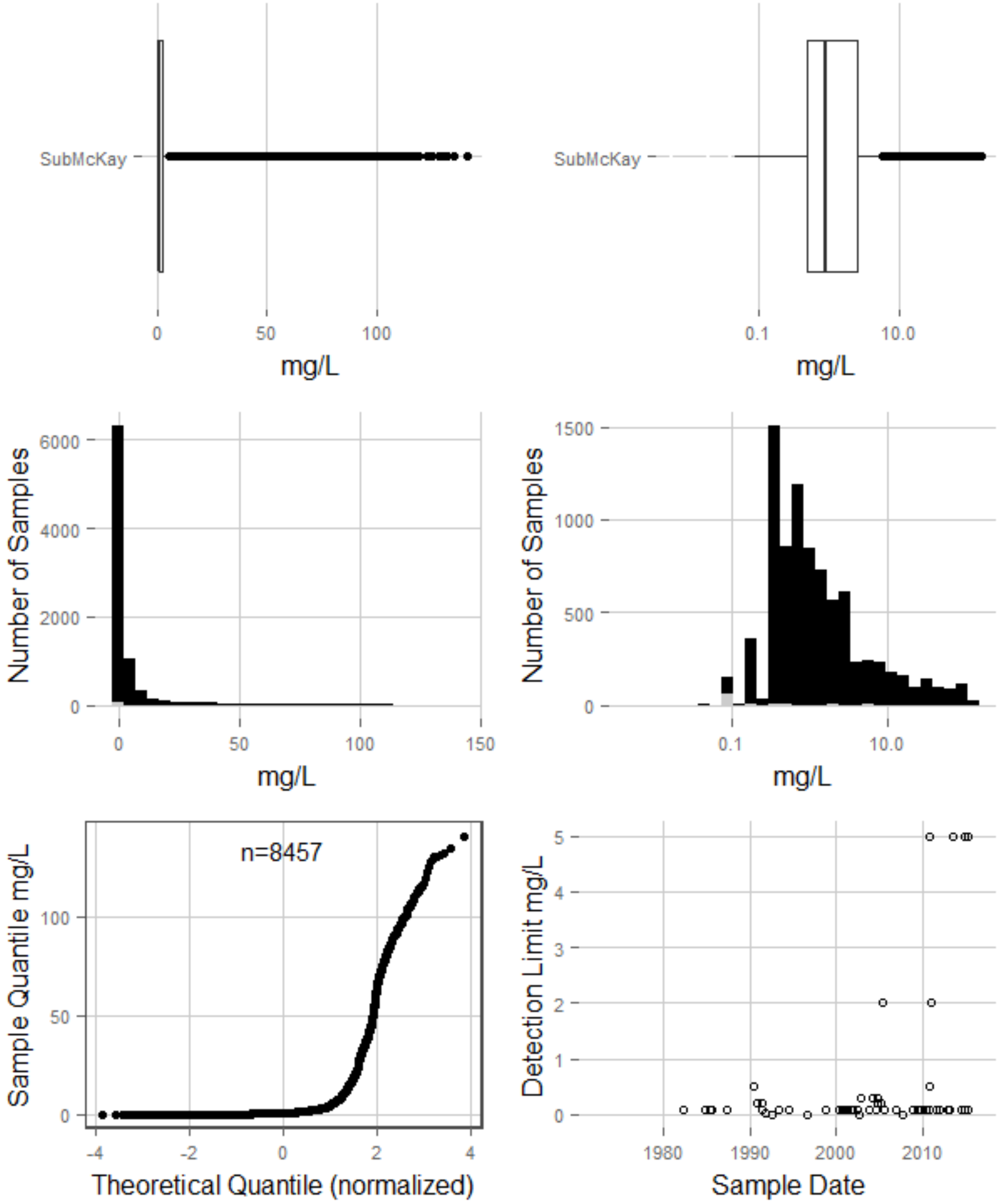
Boron
Interburden



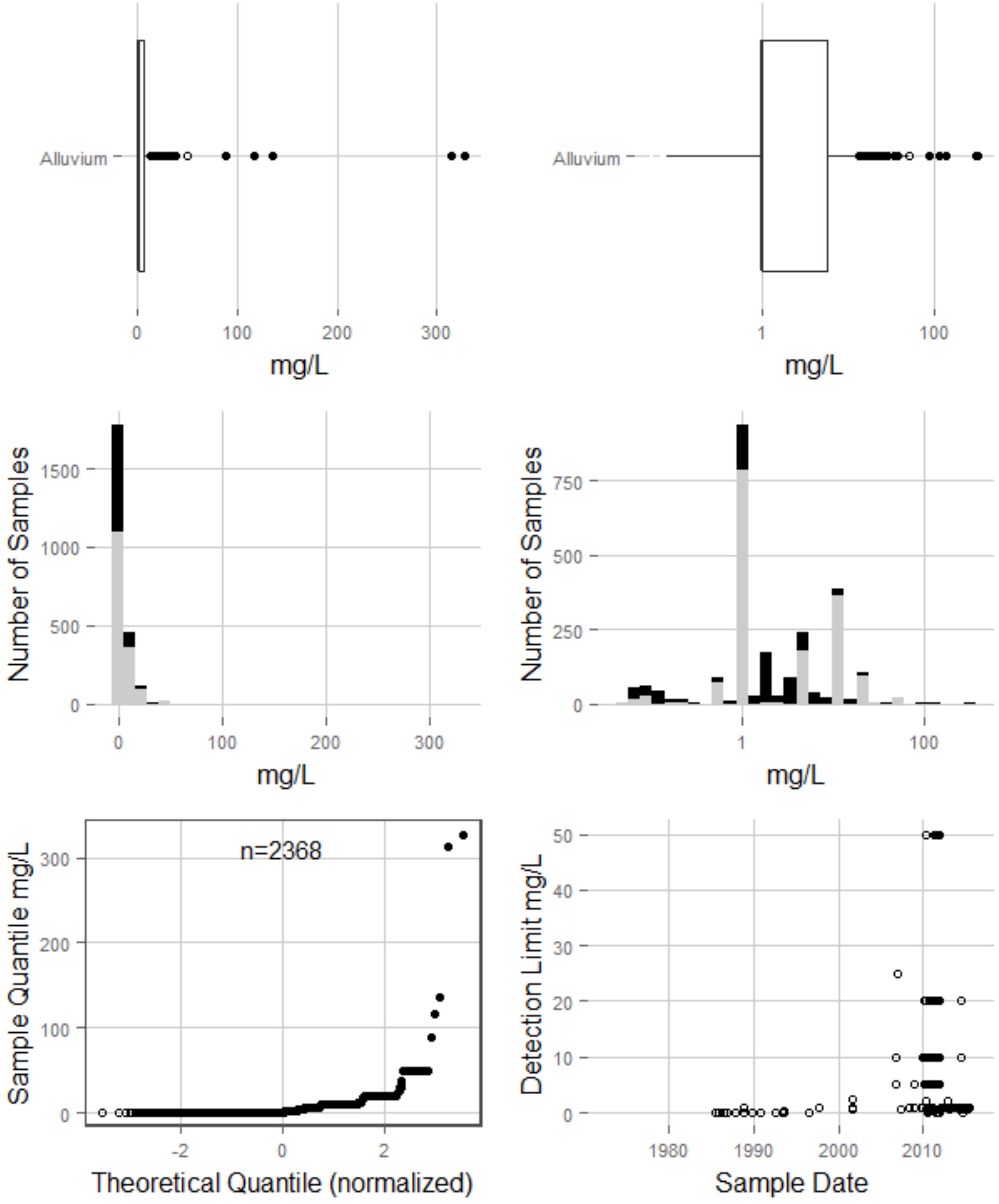
Boron
McKay Coal



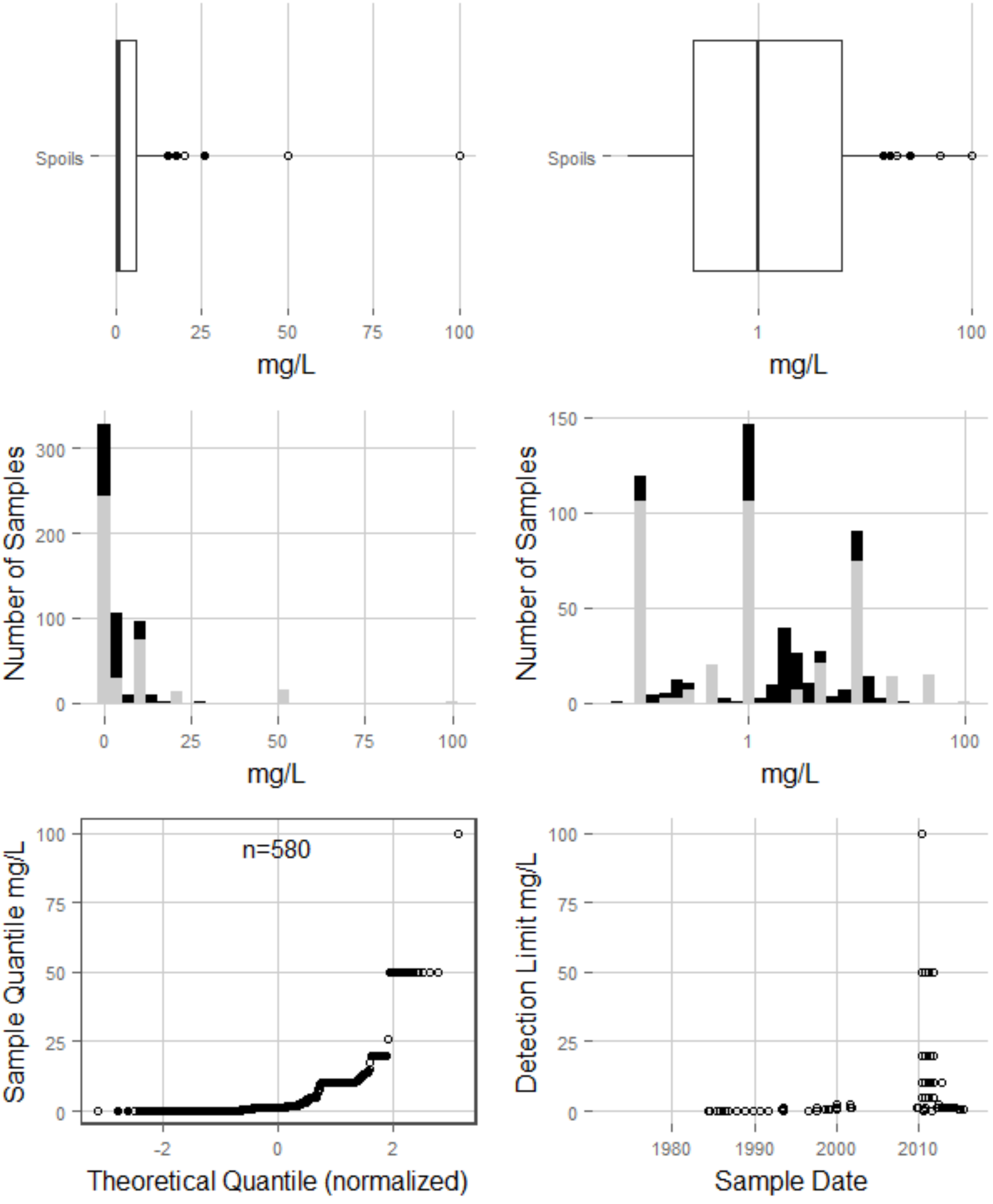
Boron
SubMcKay



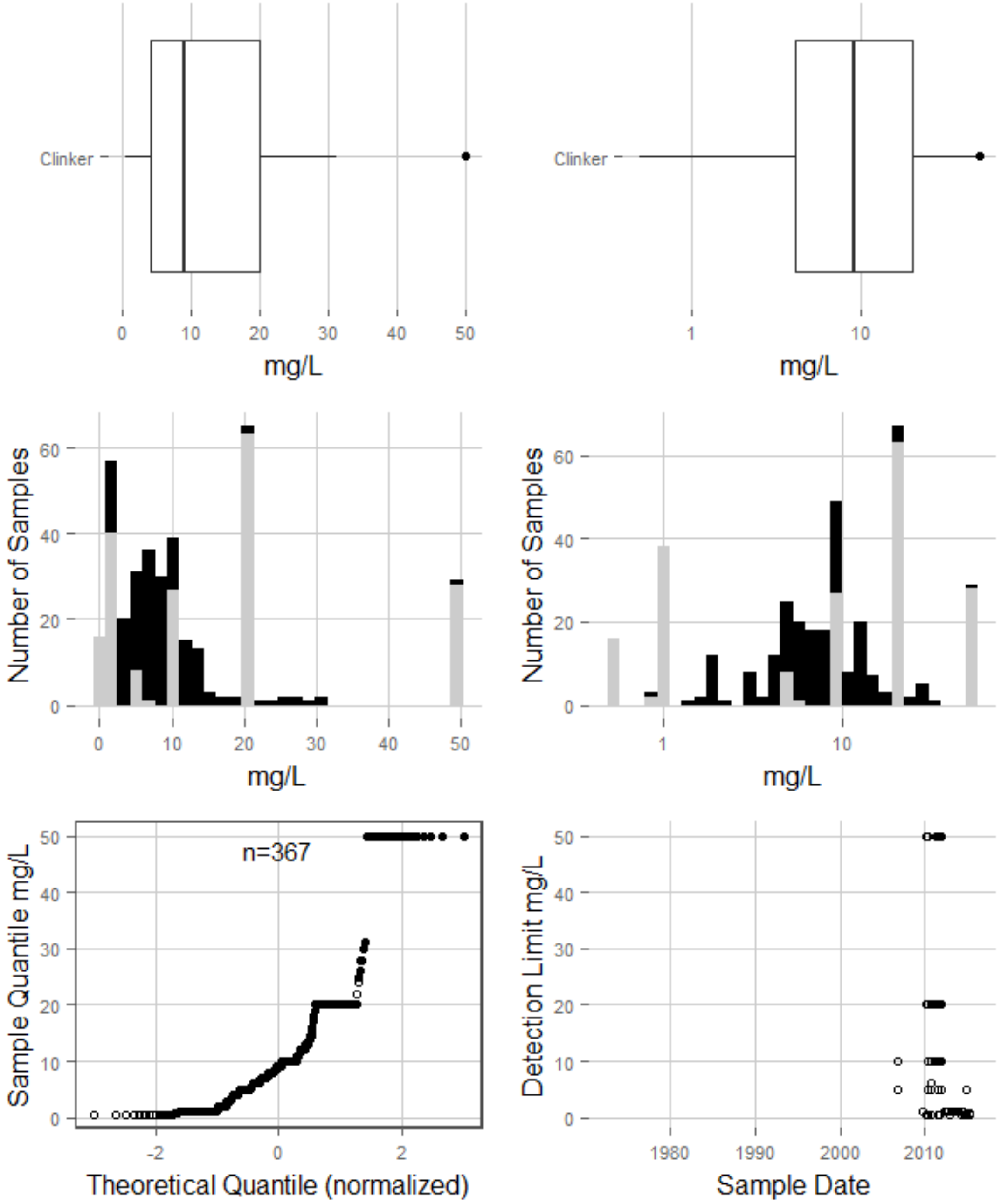
Bromide
Alluvium



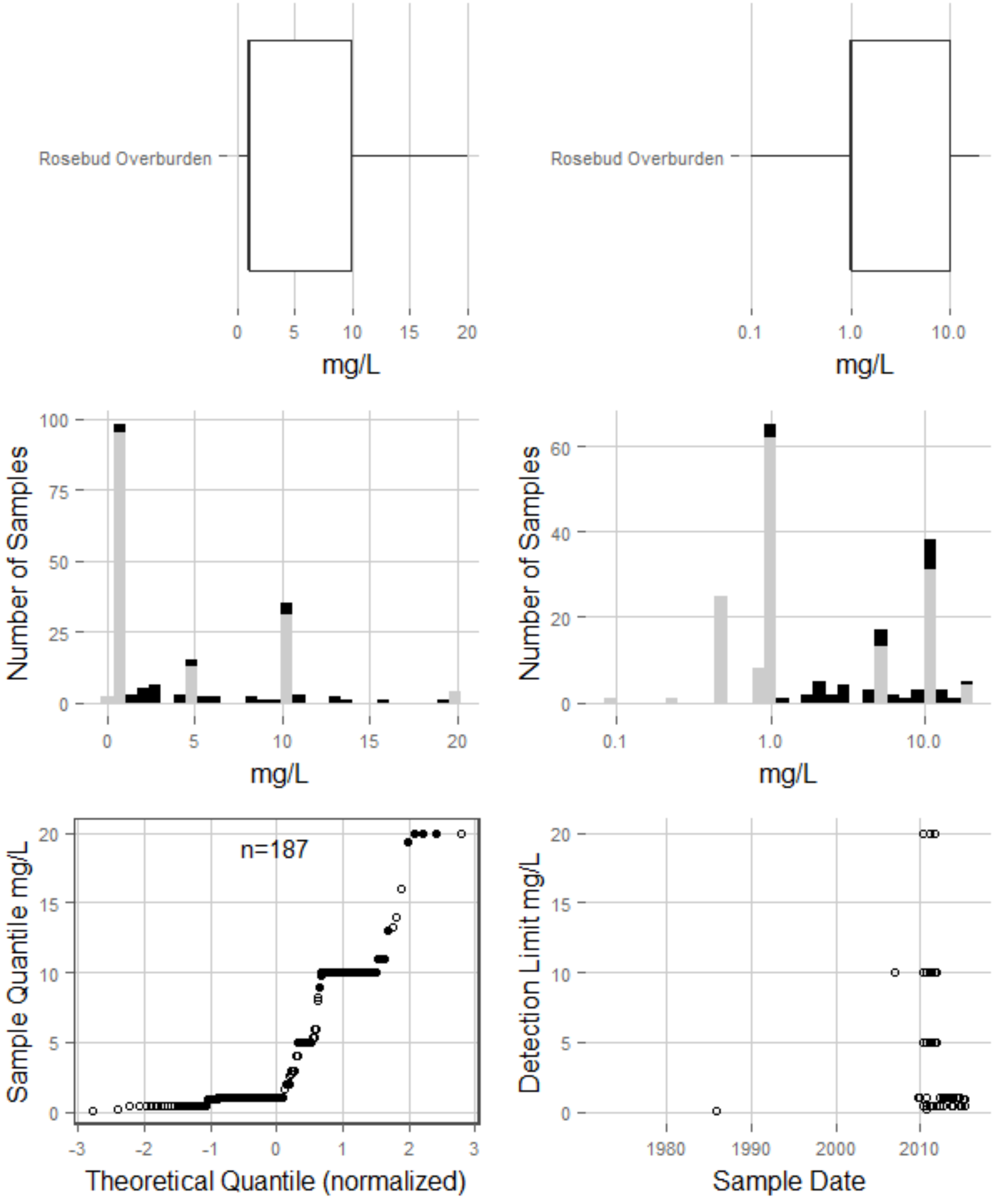
Bromide
Spoils



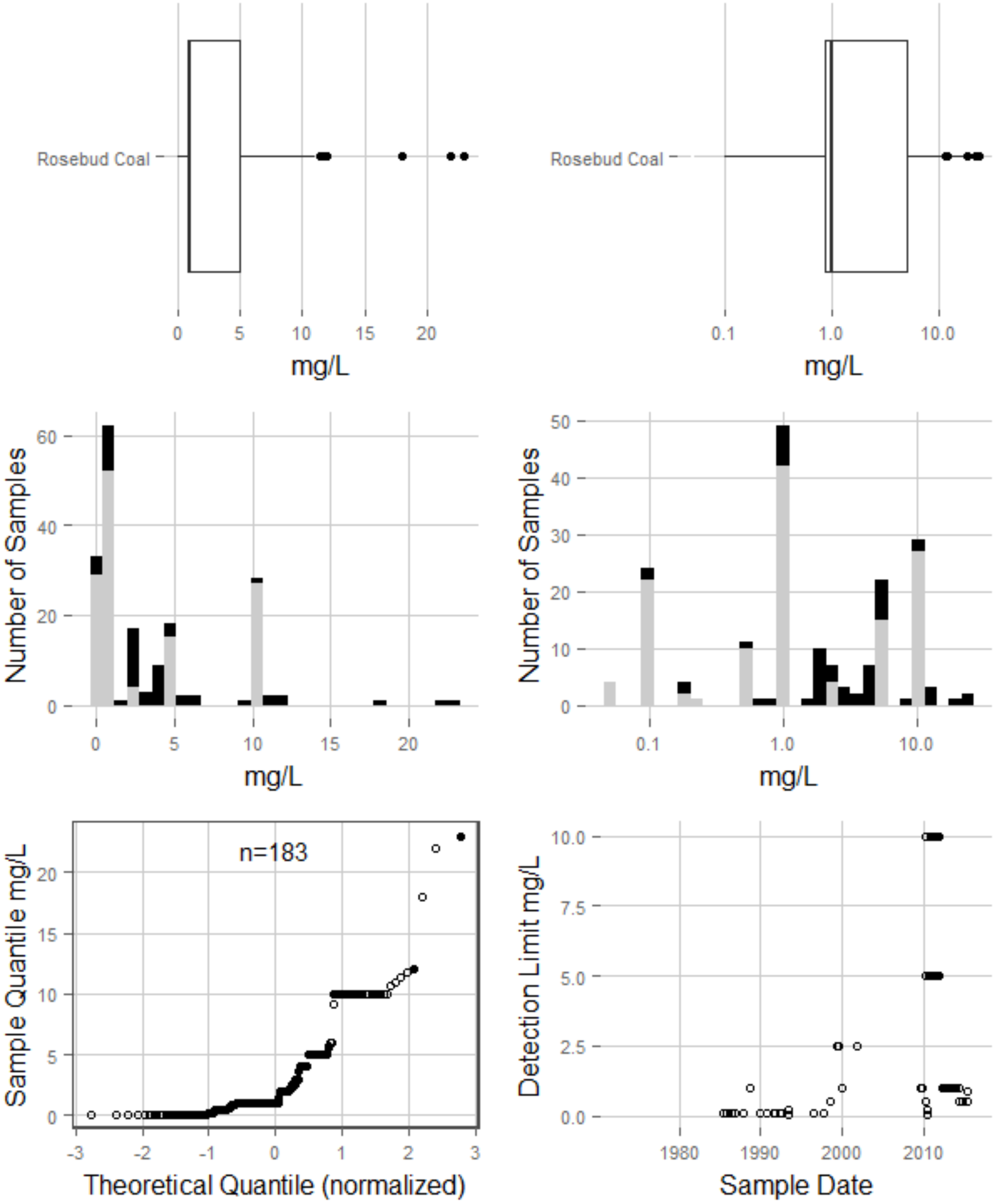
Bromide
Clinker



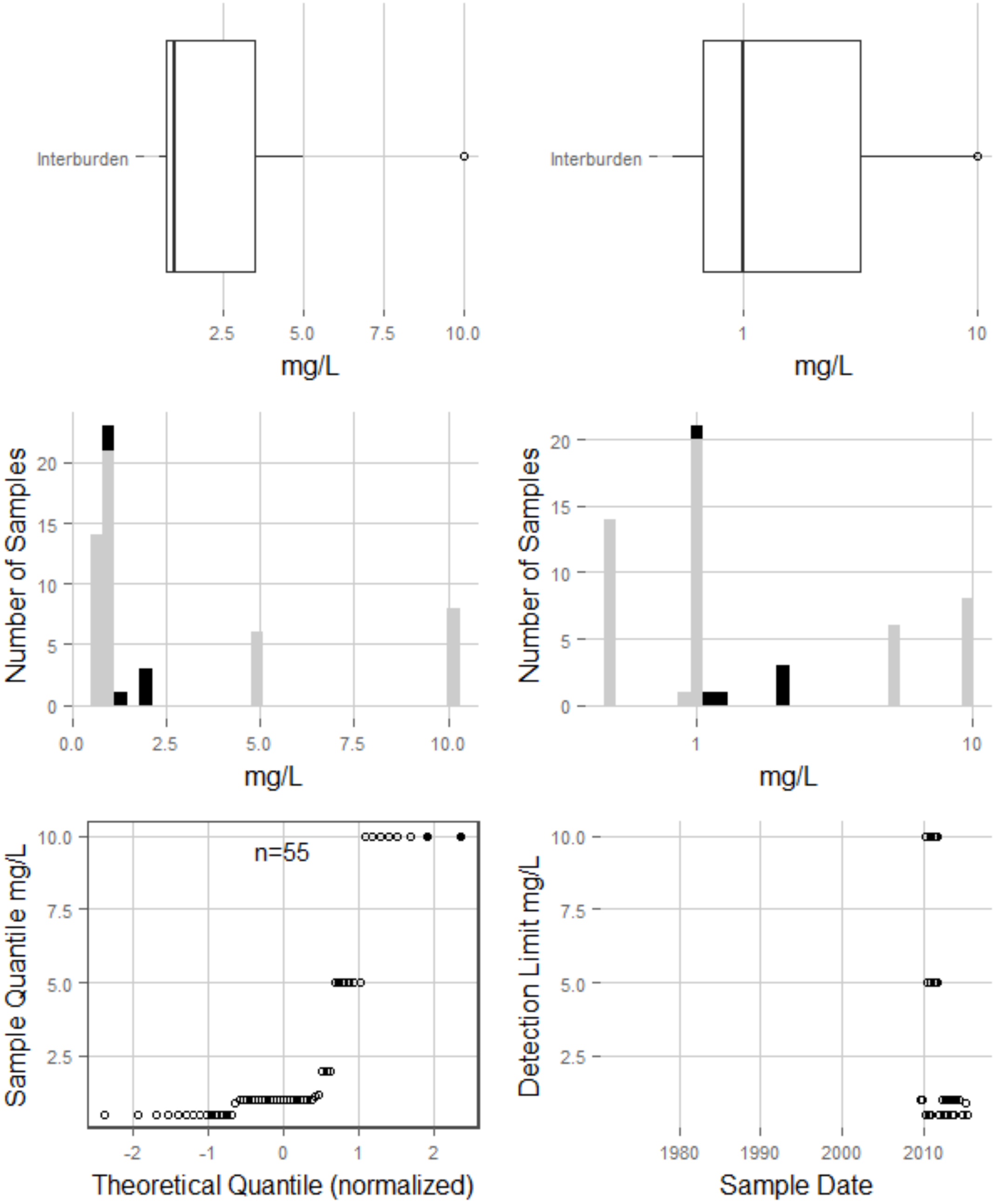
Bromide
Rosebud Overburden



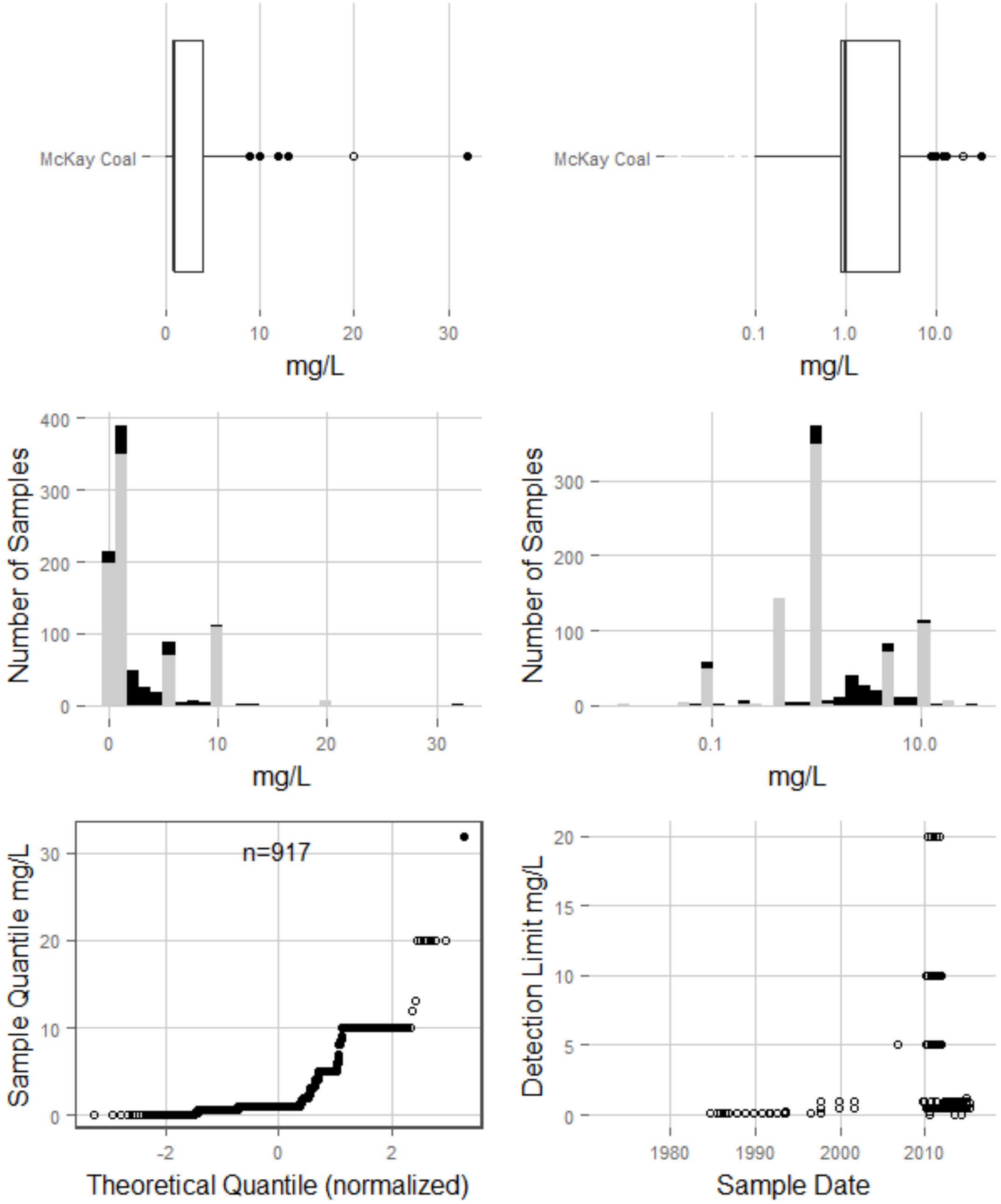
Bromide
Rosebud Coal



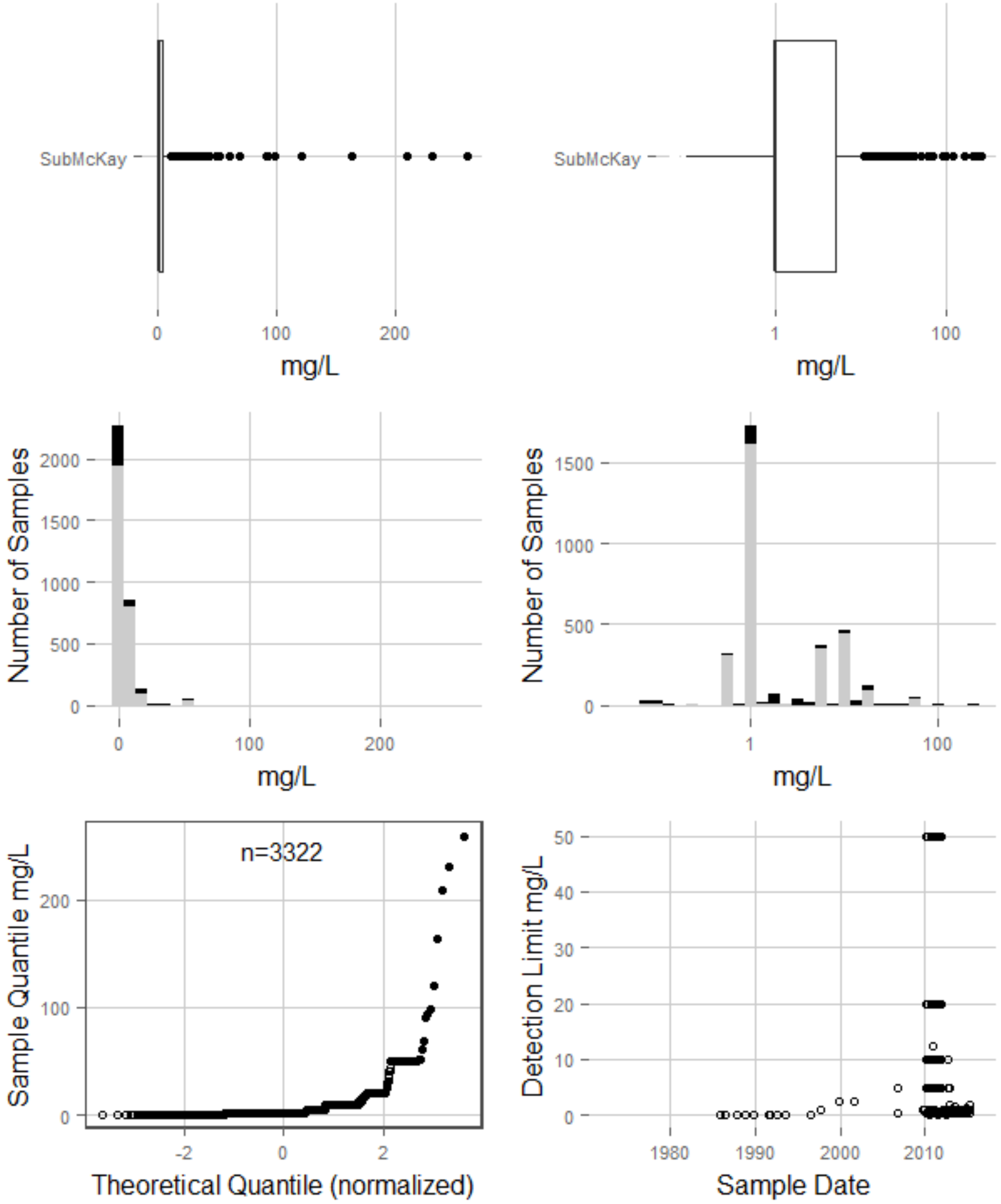
Bromide
Interburden



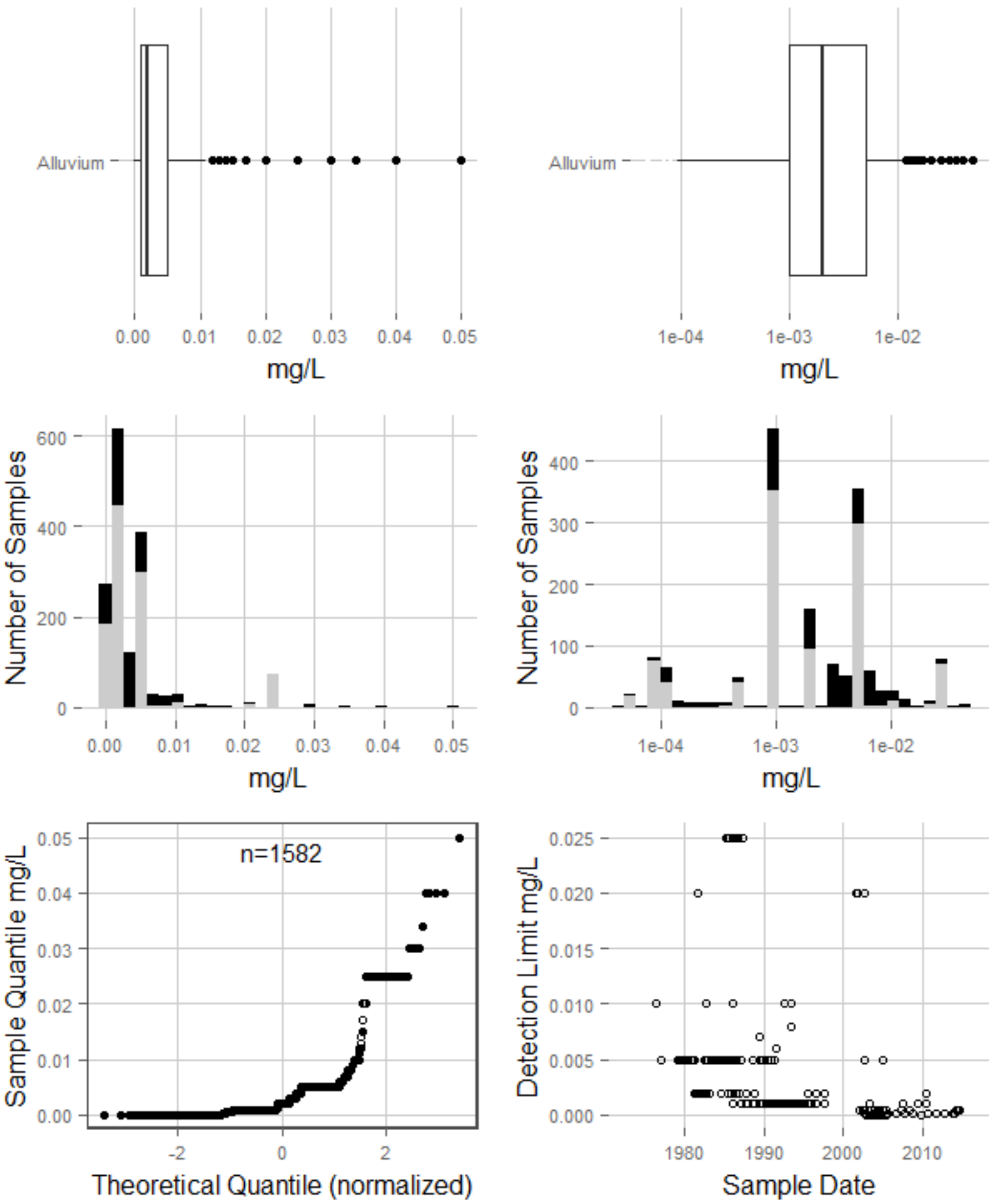
Bromide
McKay Coal



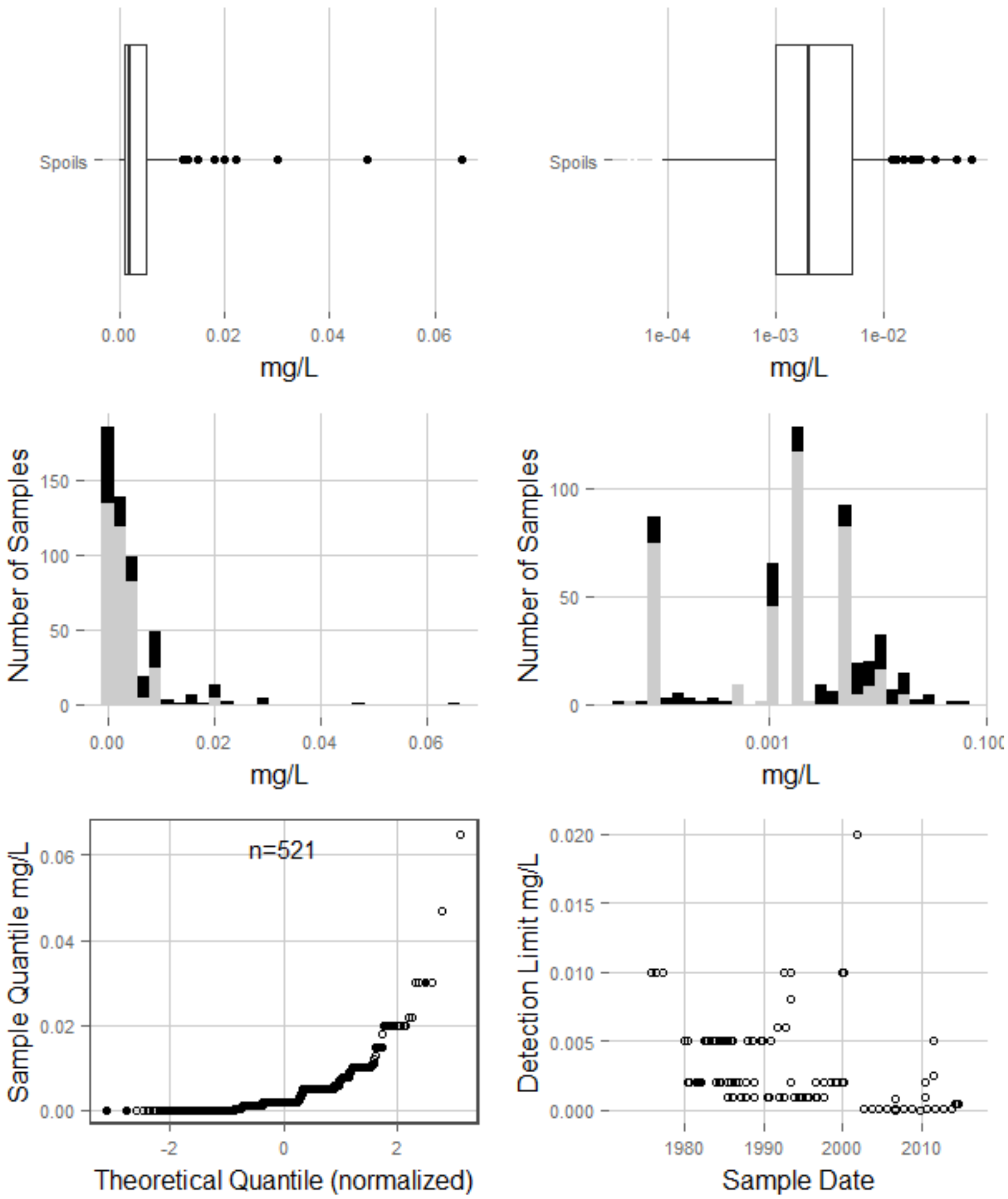
Bromide
SubMcKay



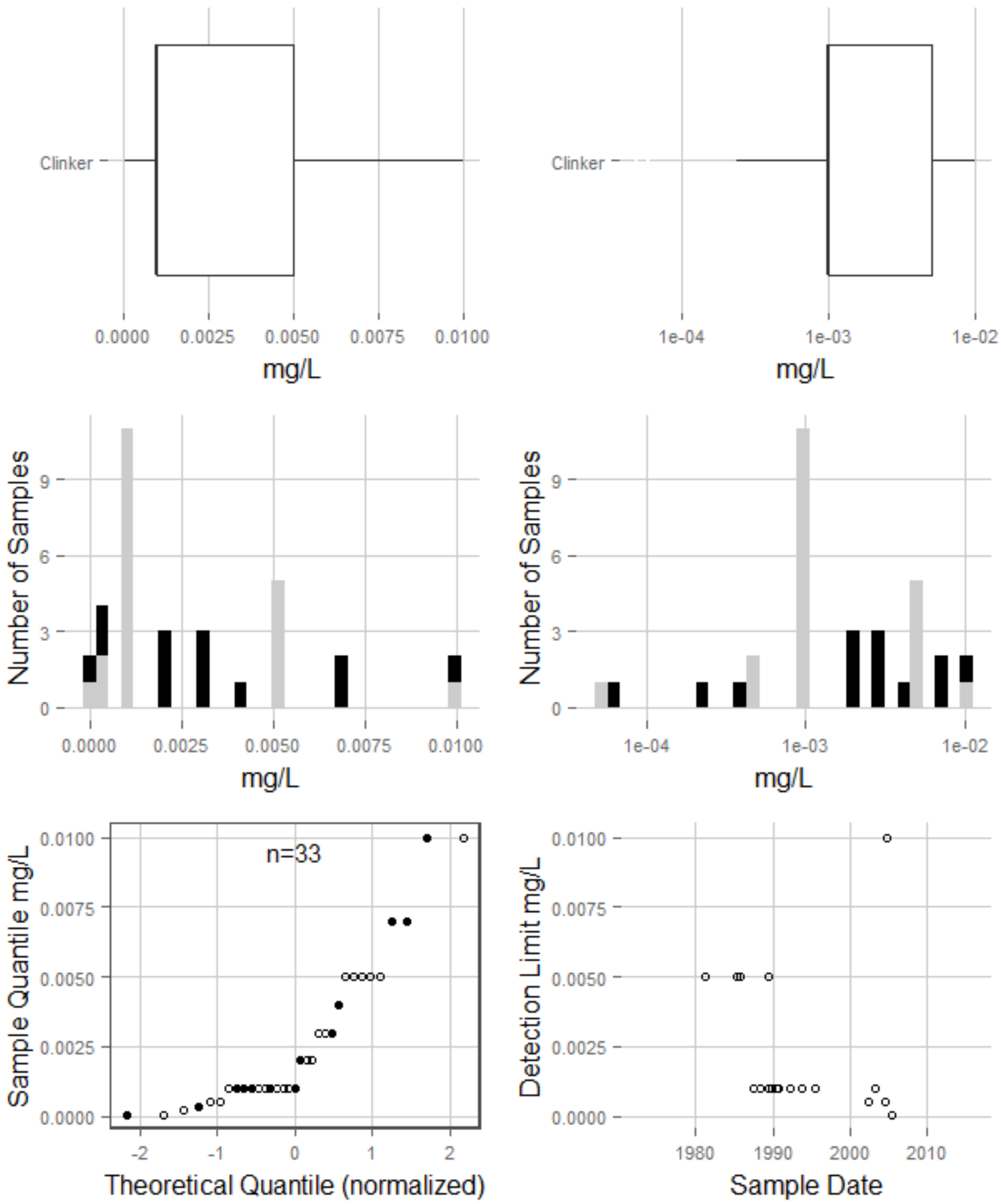
Cadmium
Alluvium



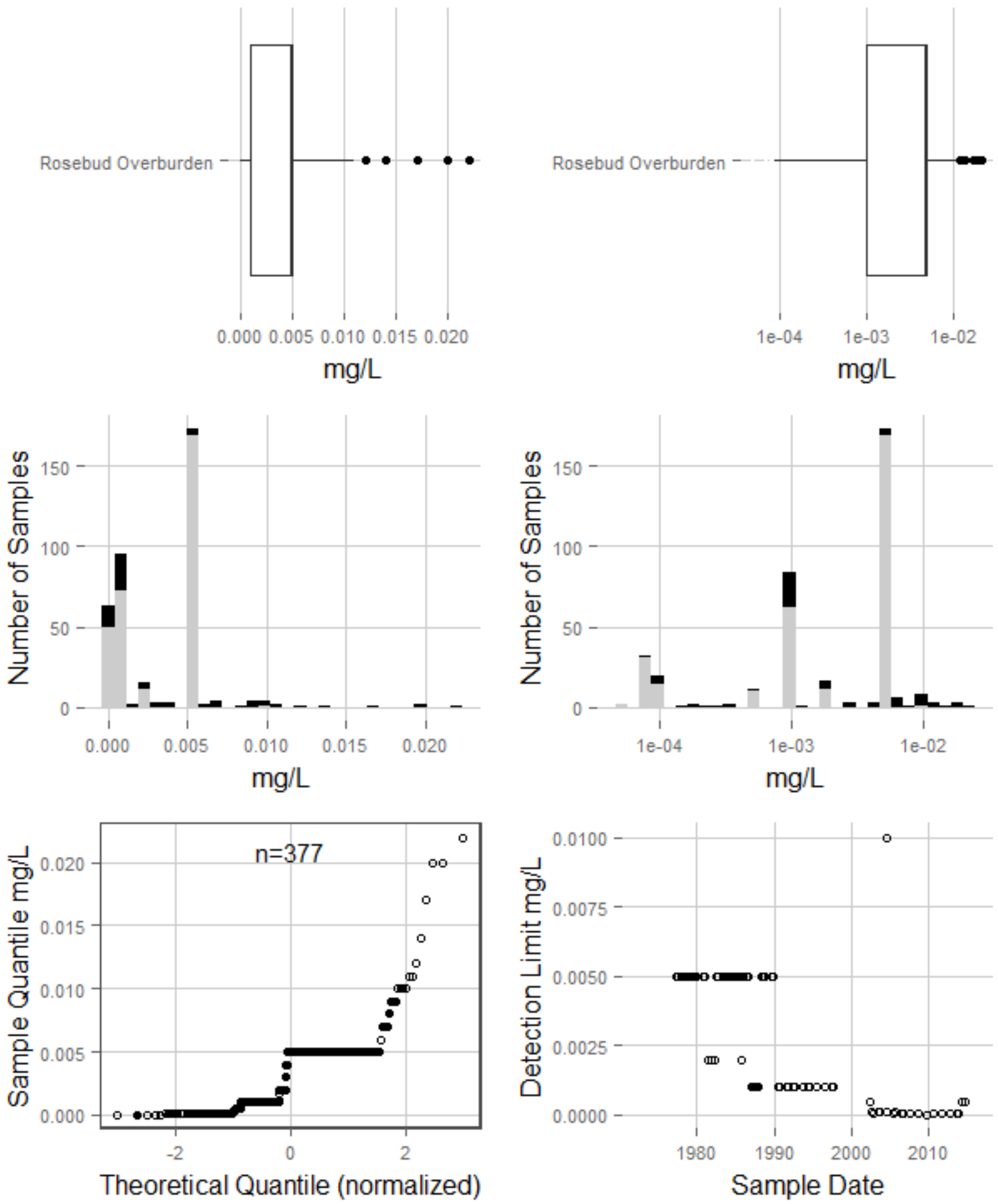
Cadmium
Spoils



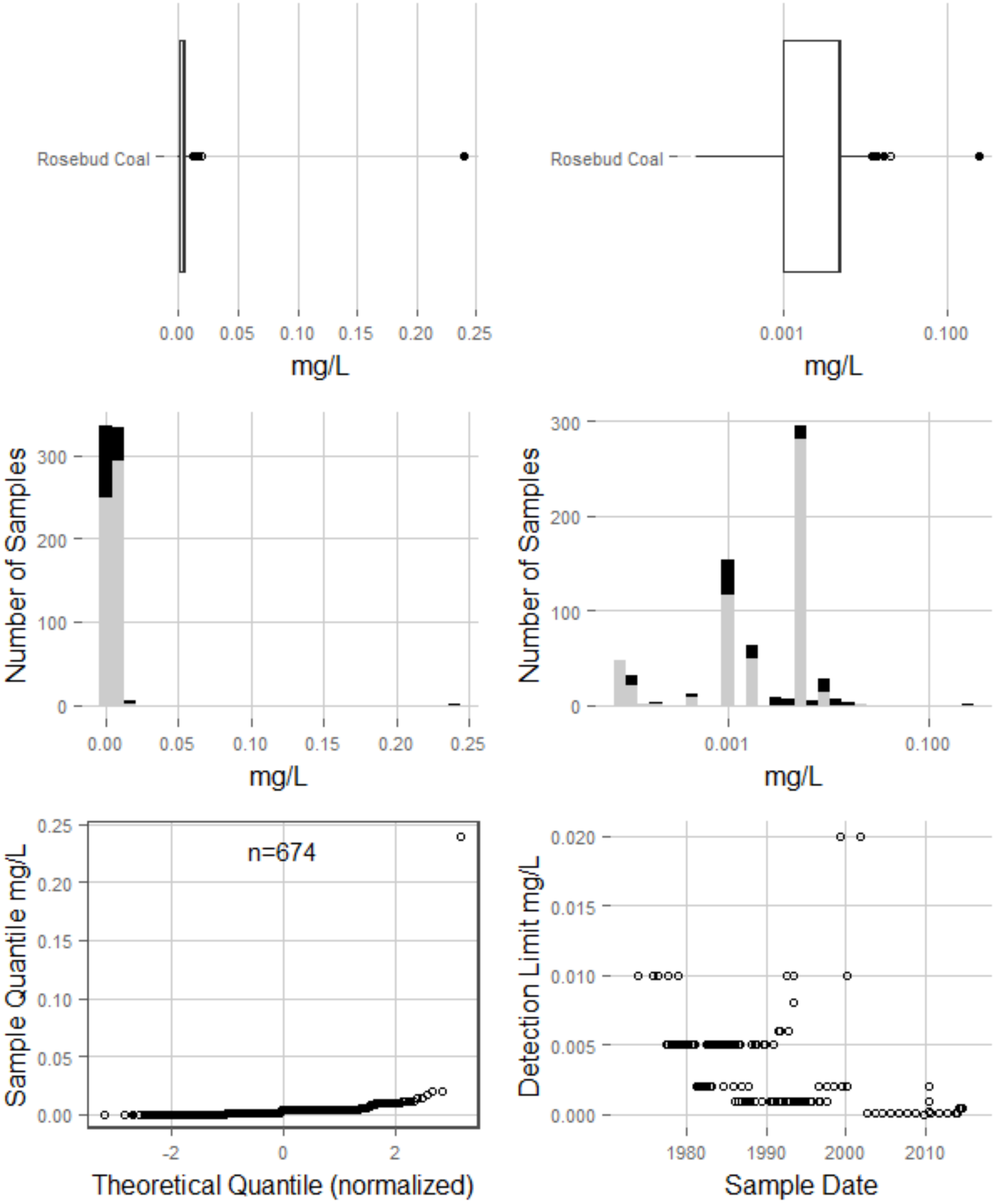
Cadmium
Clinker



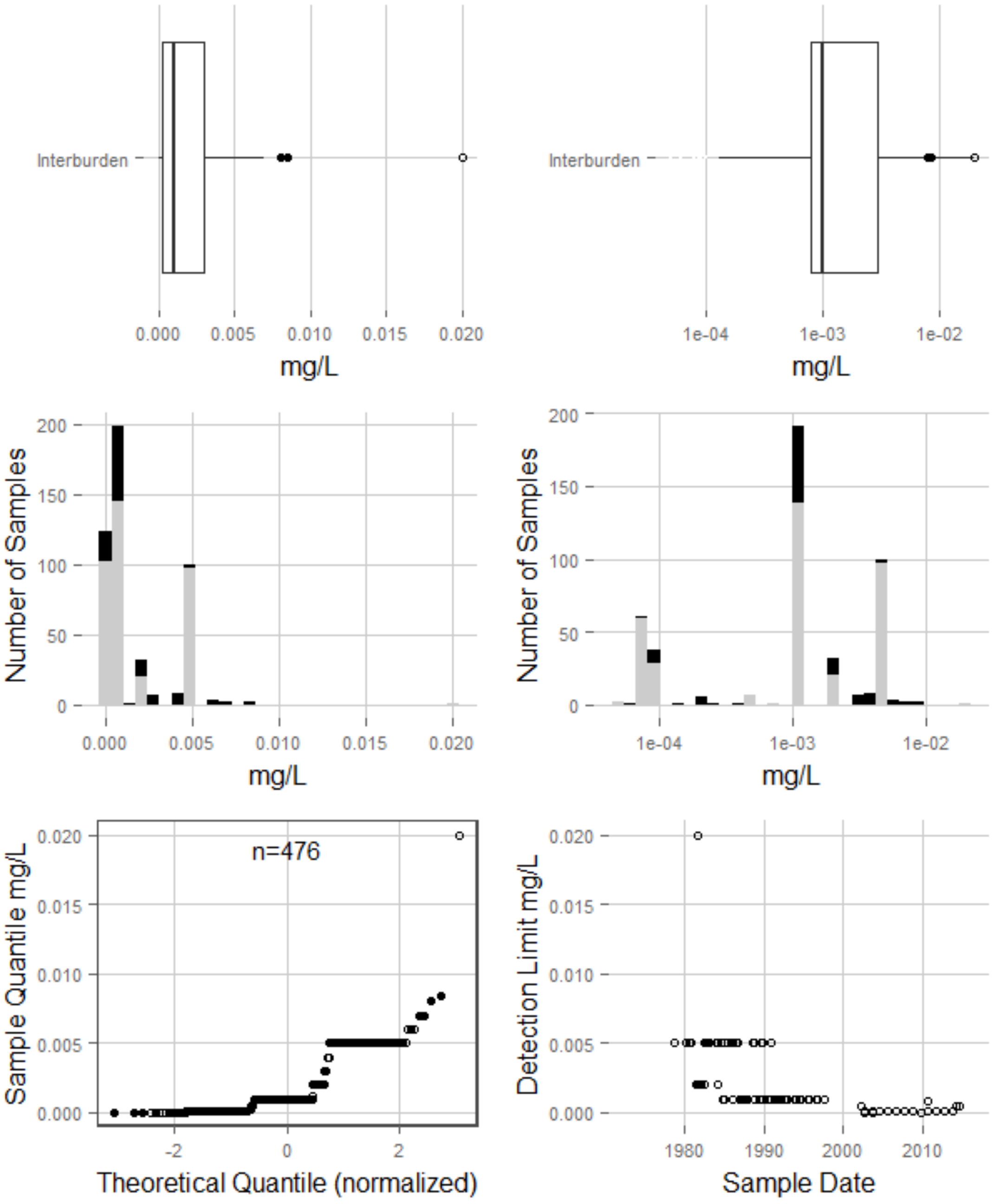
Cadmium
Rosebud Overburden



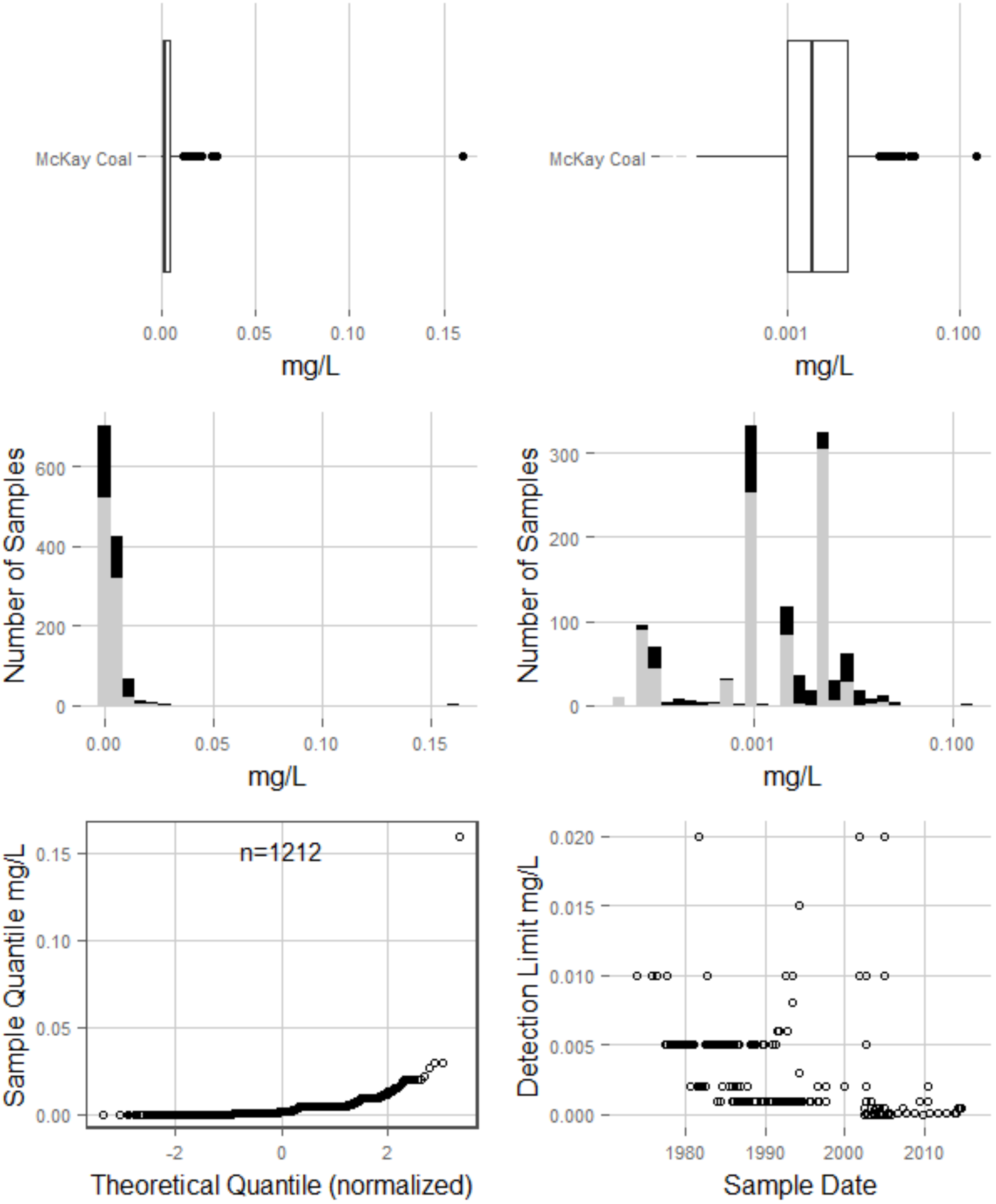
Cadmium
Rosebud Coal



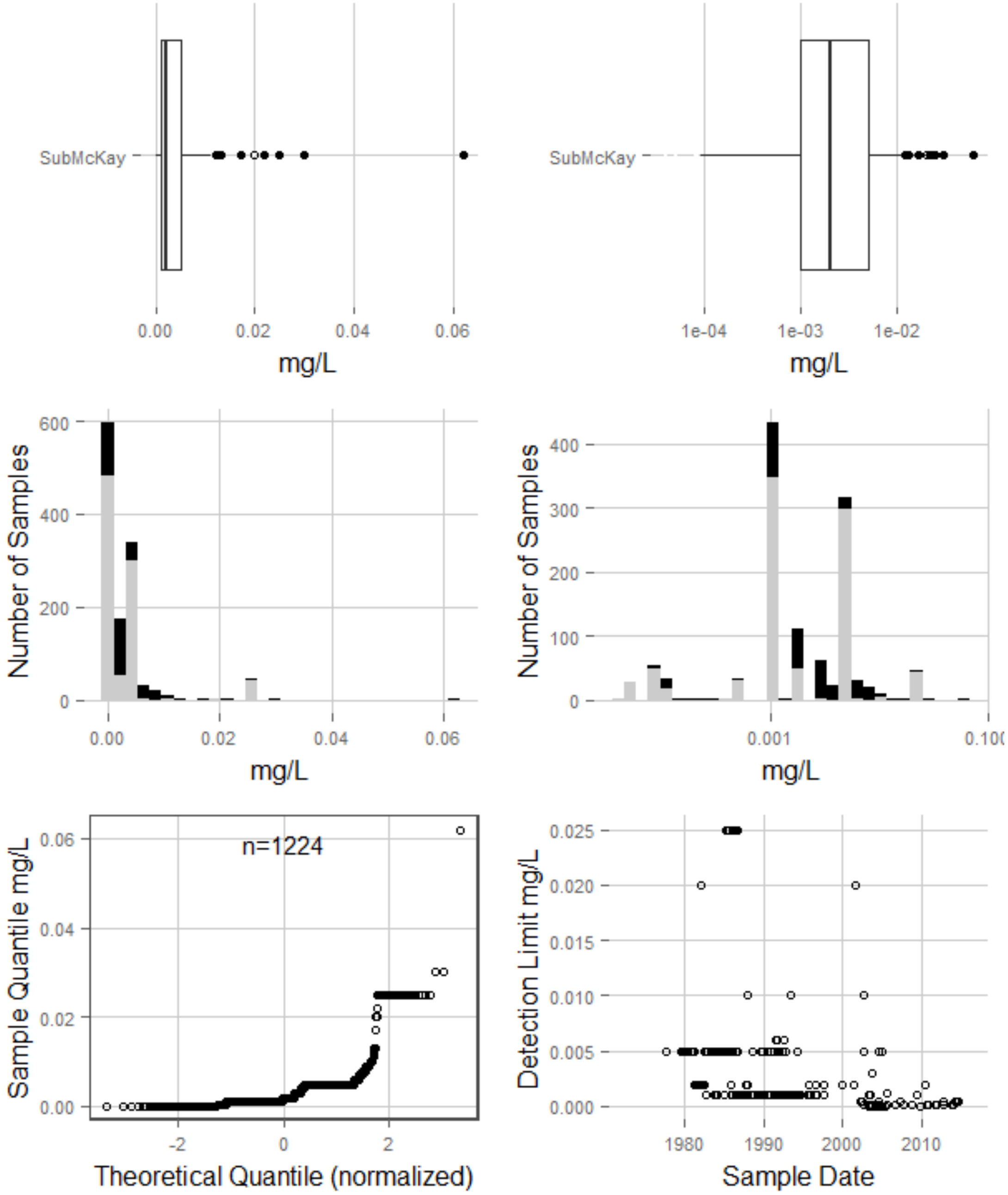
Cadmium
Interburden



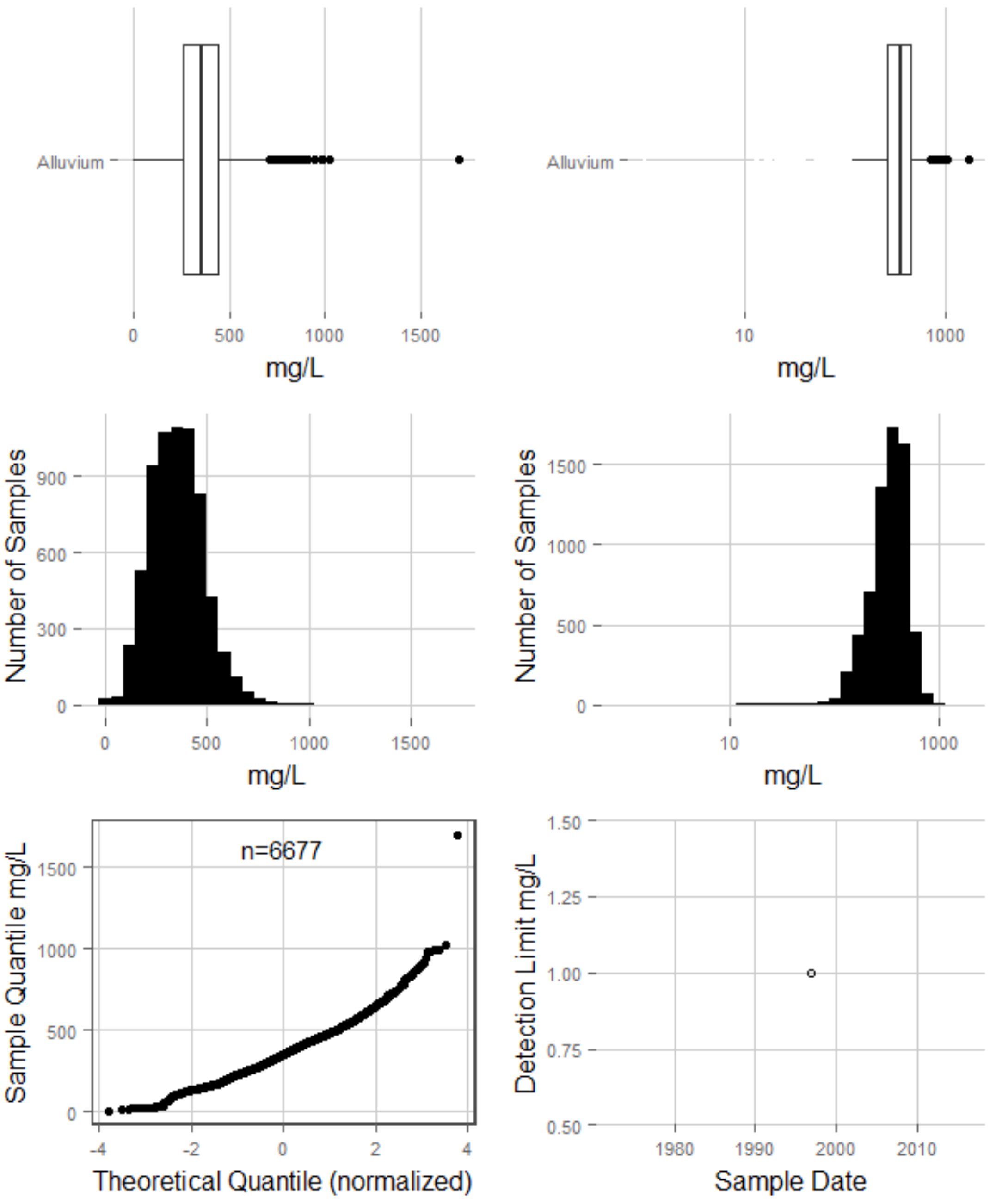
Cadmium
McKay Coal

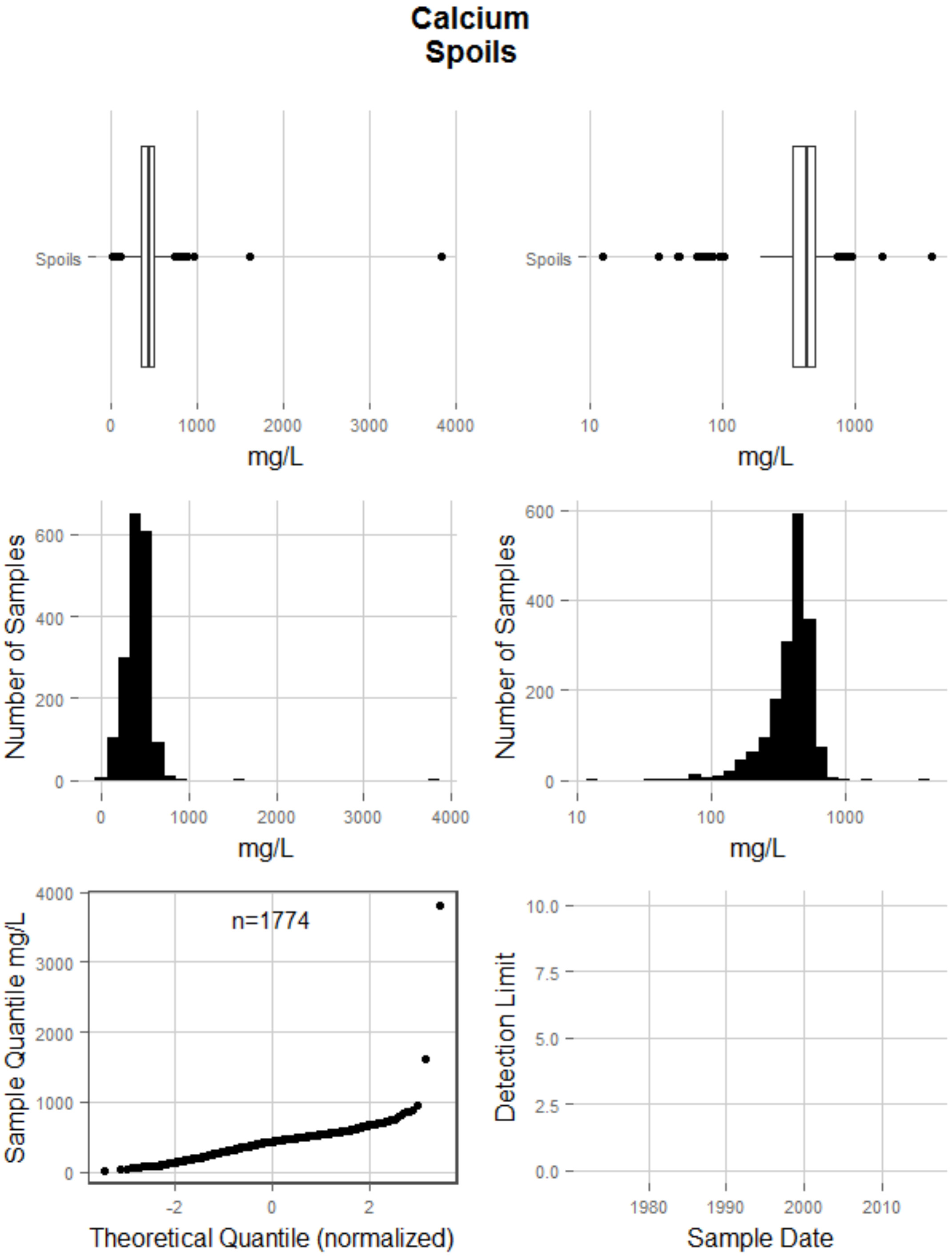


Cadmium
SubMcKay

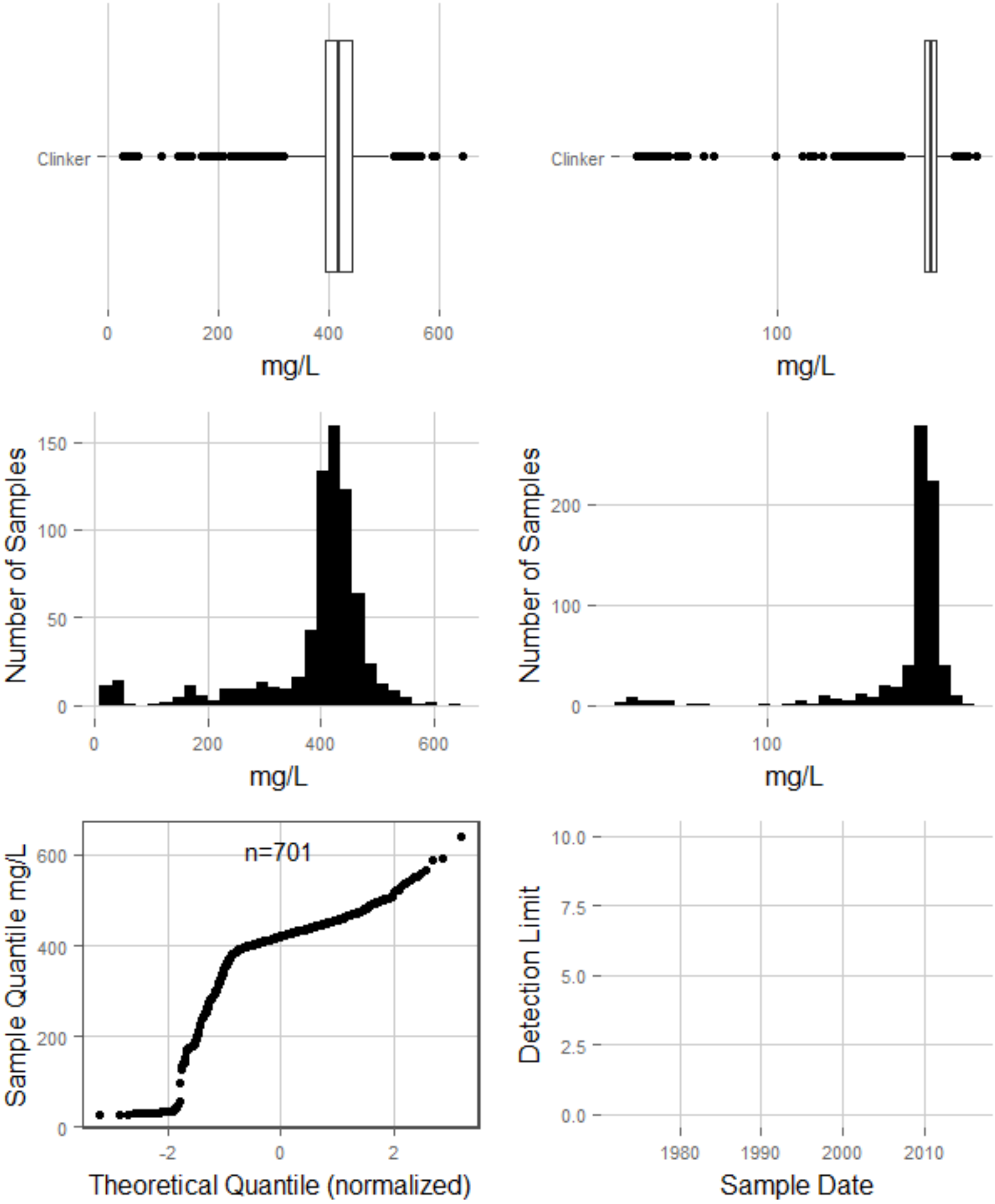


Calcium
Alluvium

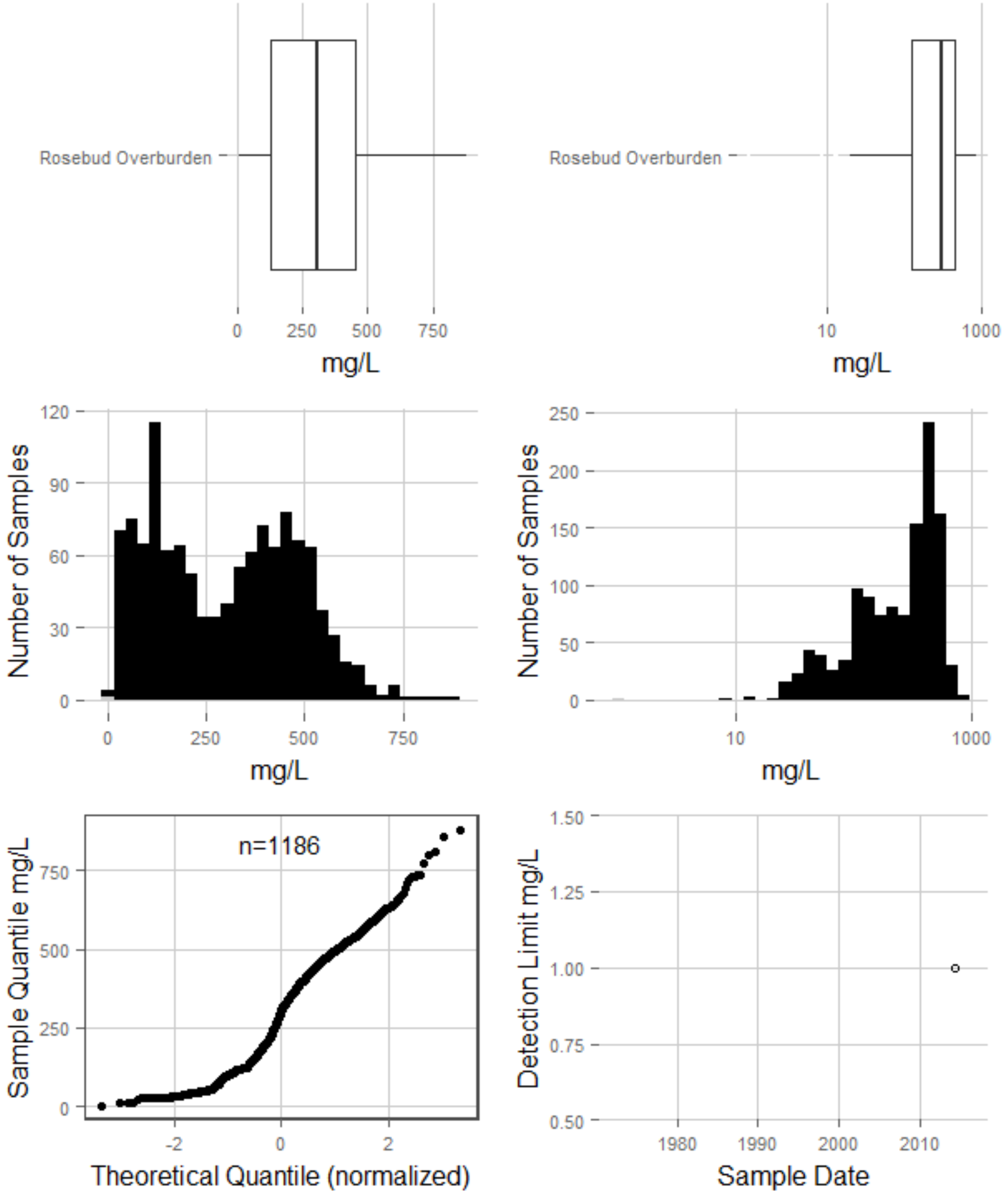



Calcium
Spoils
Spoils
0
1000
2000
3000
4000
mg/L
Spoils
10
100
1000
mg/L
Number of Samples
0
200
400
600
0
1000
2000
3000
4000
mg/L
Number of Samples
0
200
400
600
10
100
1000
mg/L
Sample Quantile mg/L
0
1000
2000
3000
4000
n=1774
-2
0
2
Theoretical Quantile (normalized)
Detection Limit
0.0
2.5
5.0
7.5
10.0
1980
1990
2000
2010
Sample Date

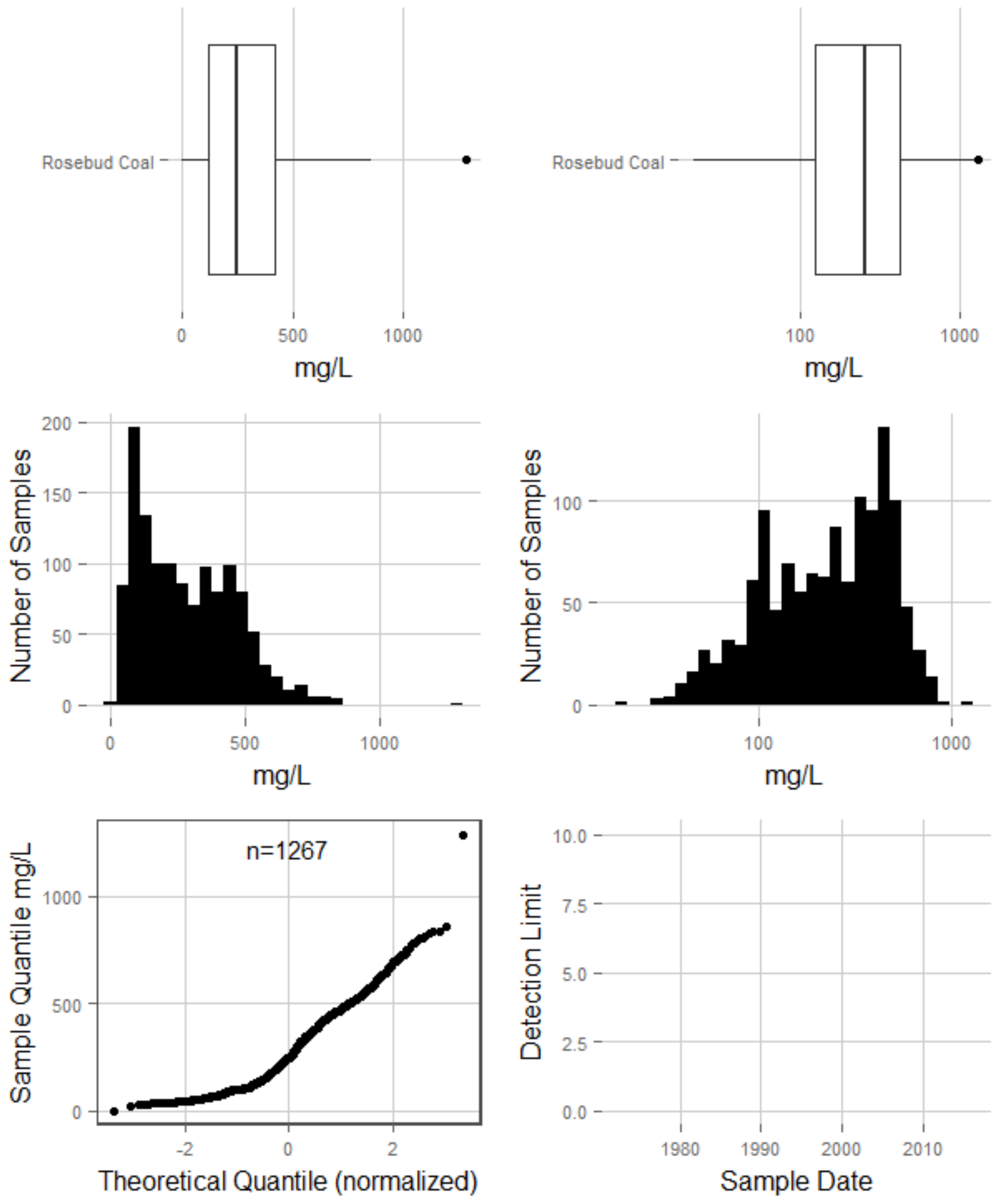
Calcium
Clinker



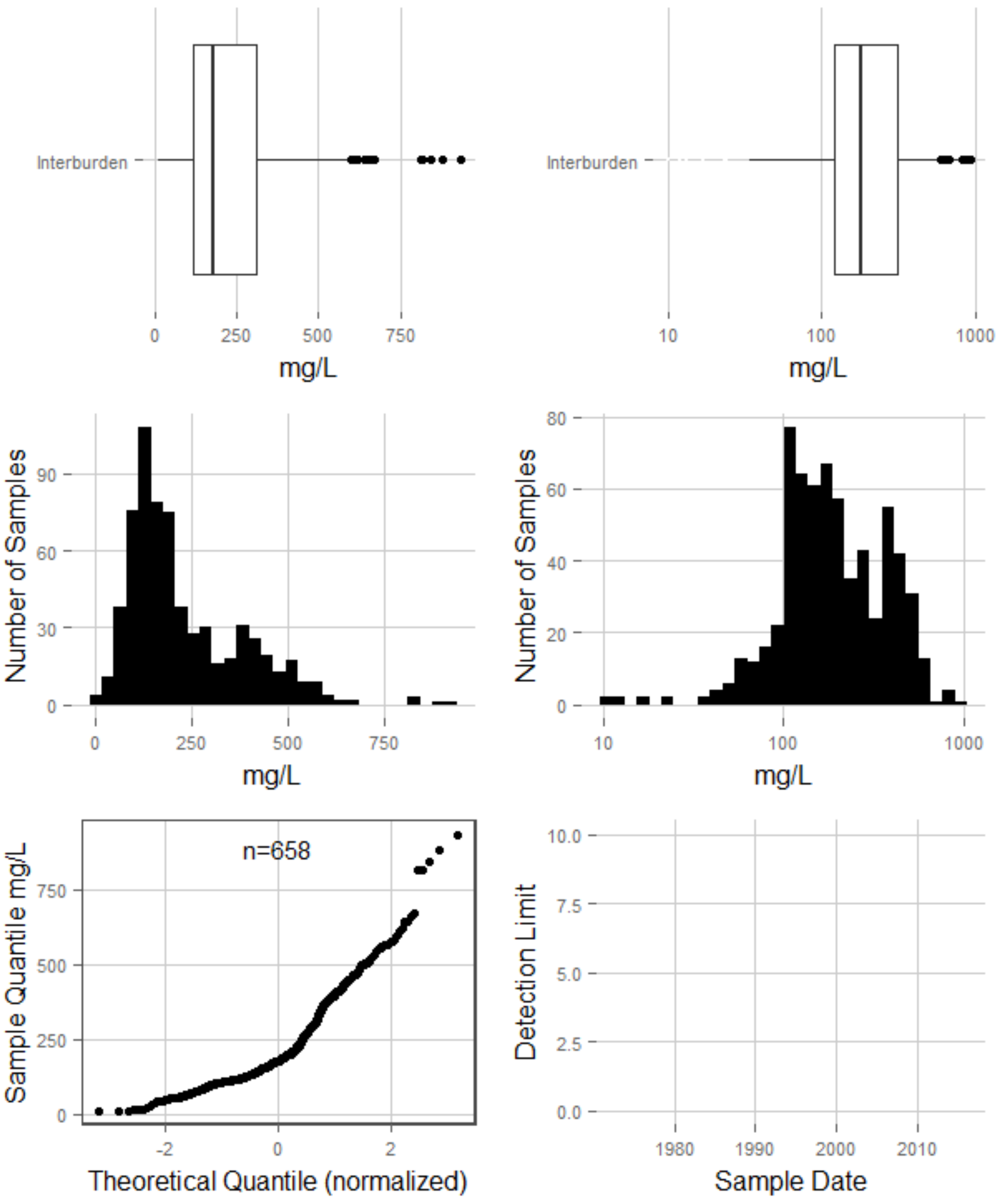
Calcium
Rosebud Overburden



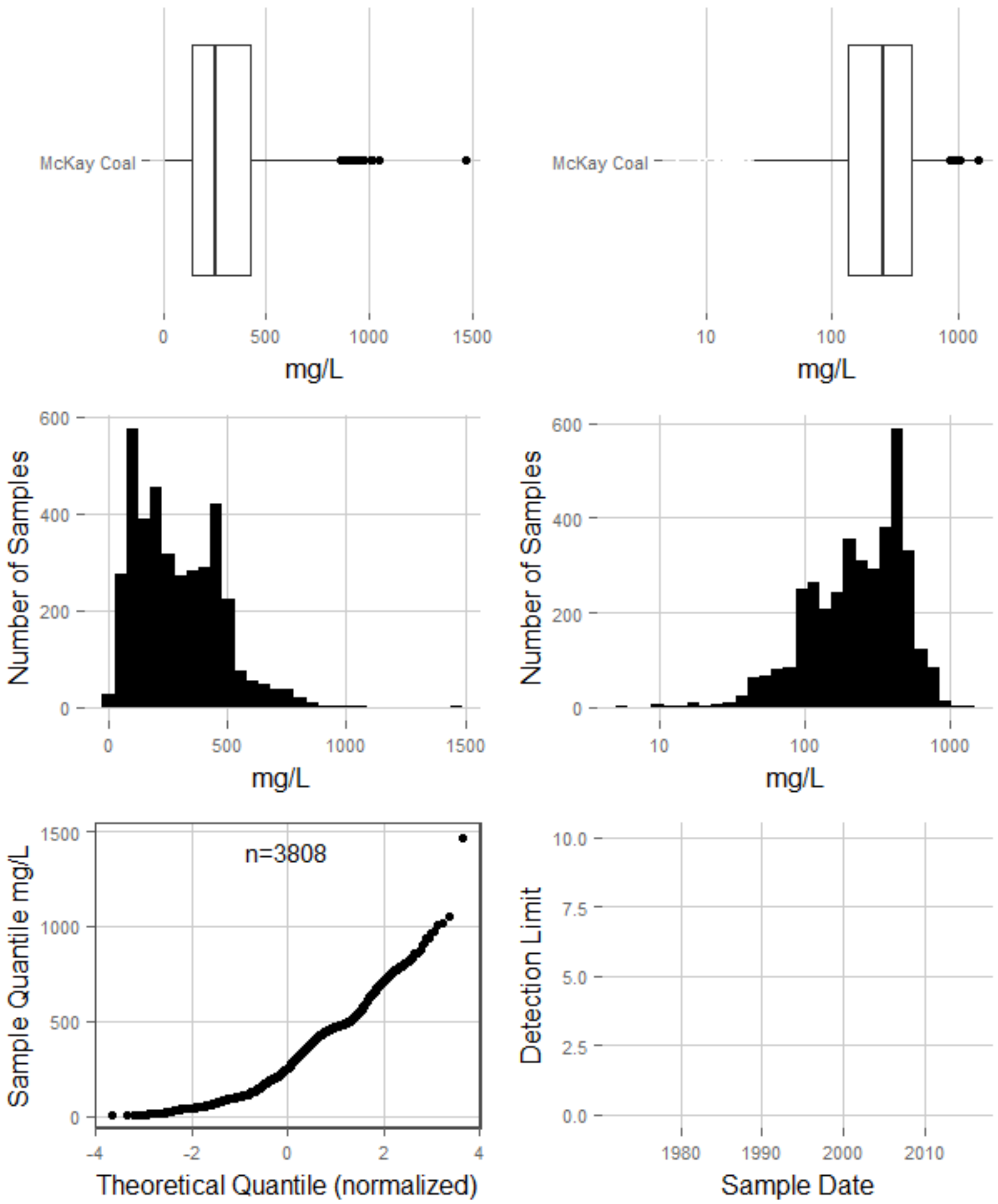
Calcium
Rosebud Coal



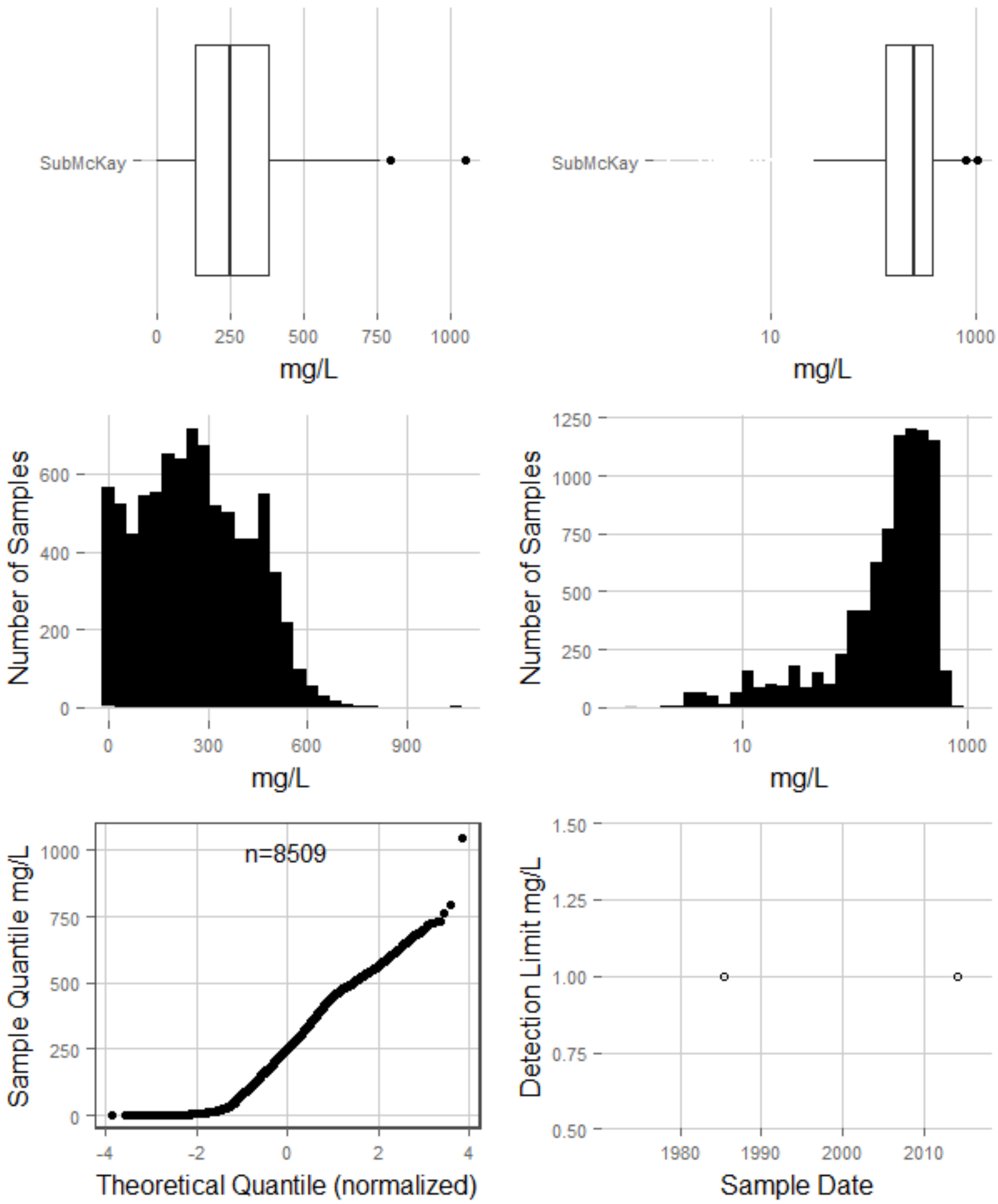
Calcium
Interburden



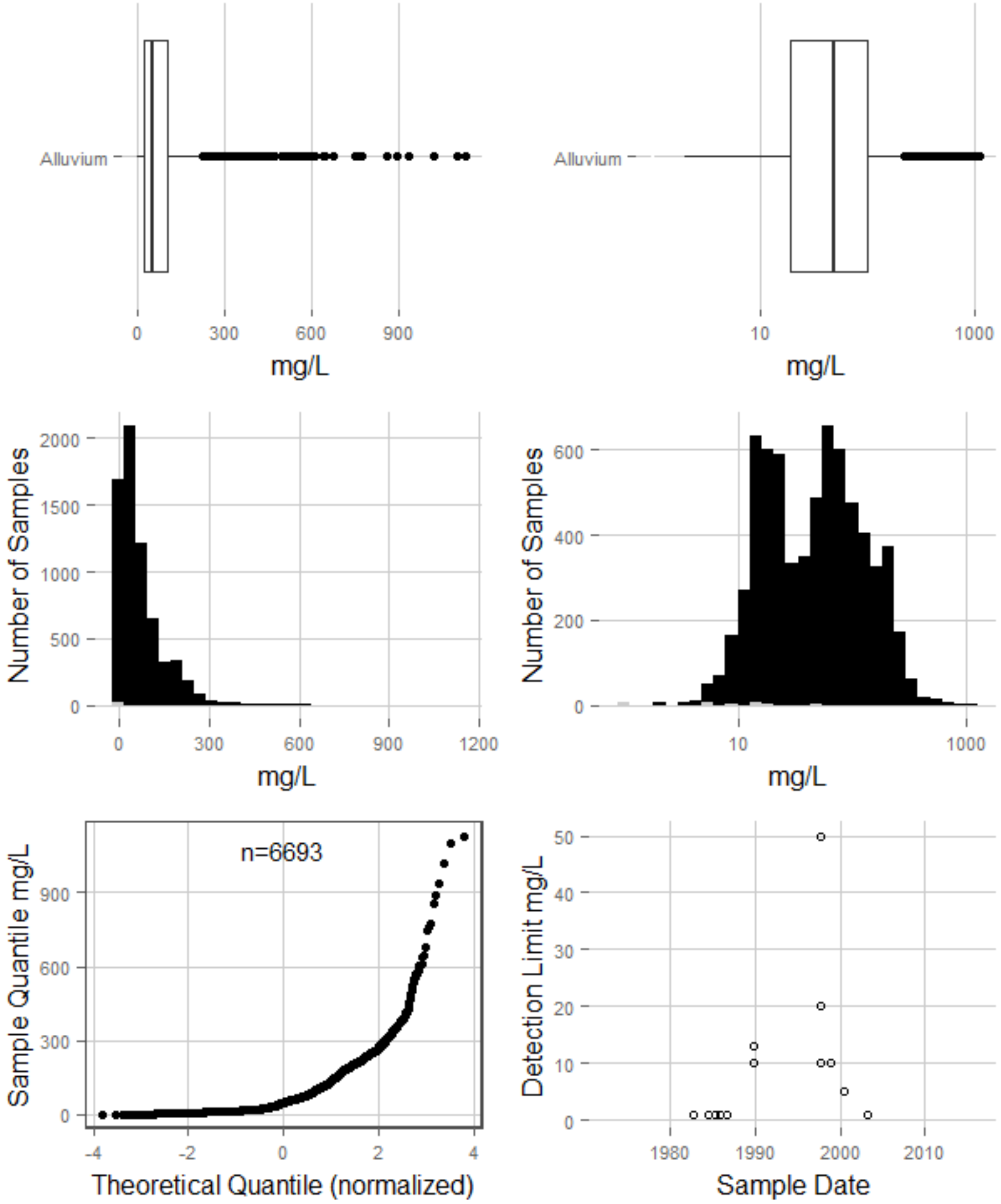
Calcium
McKay Coal



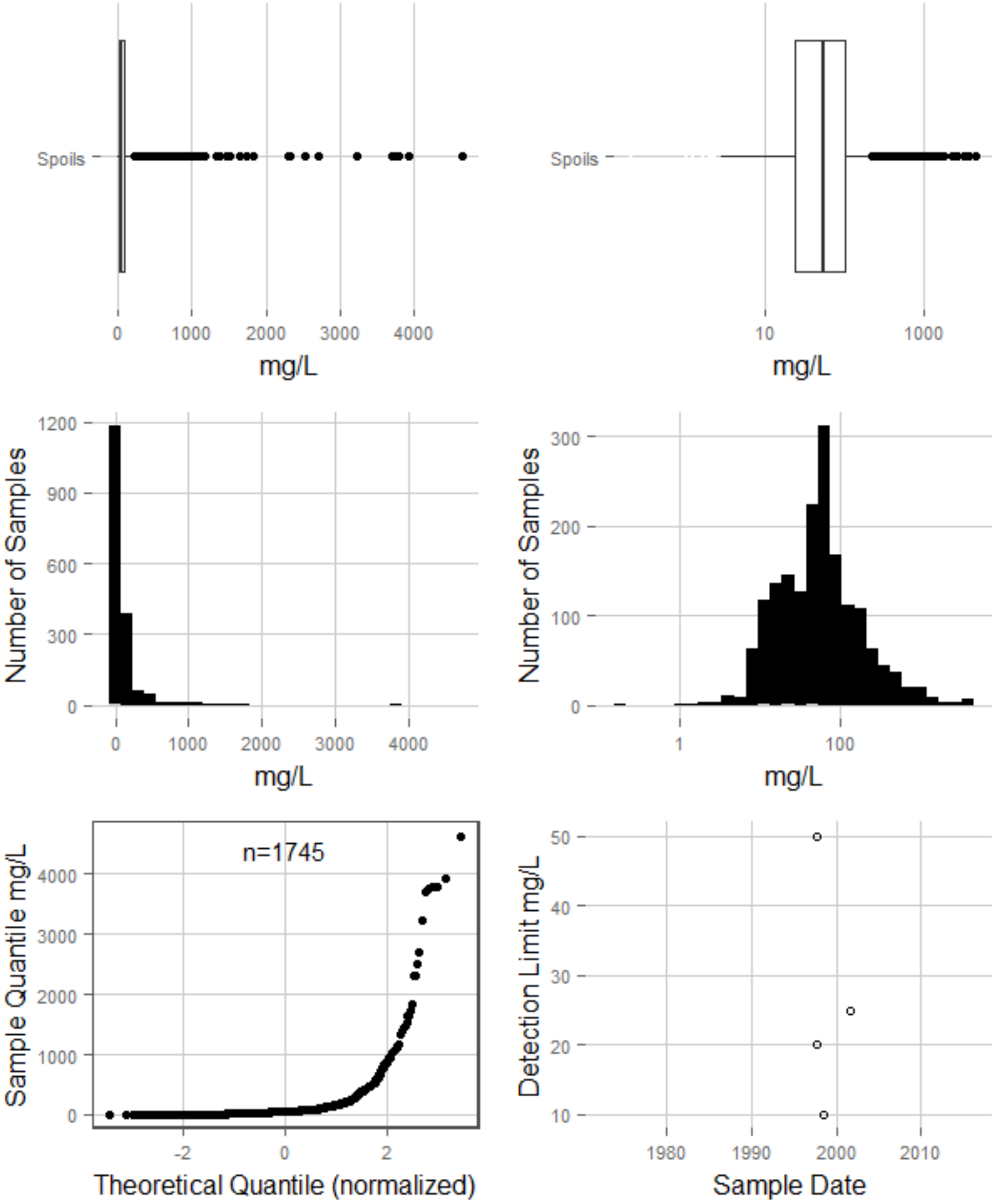
Calcium
SubMcKay



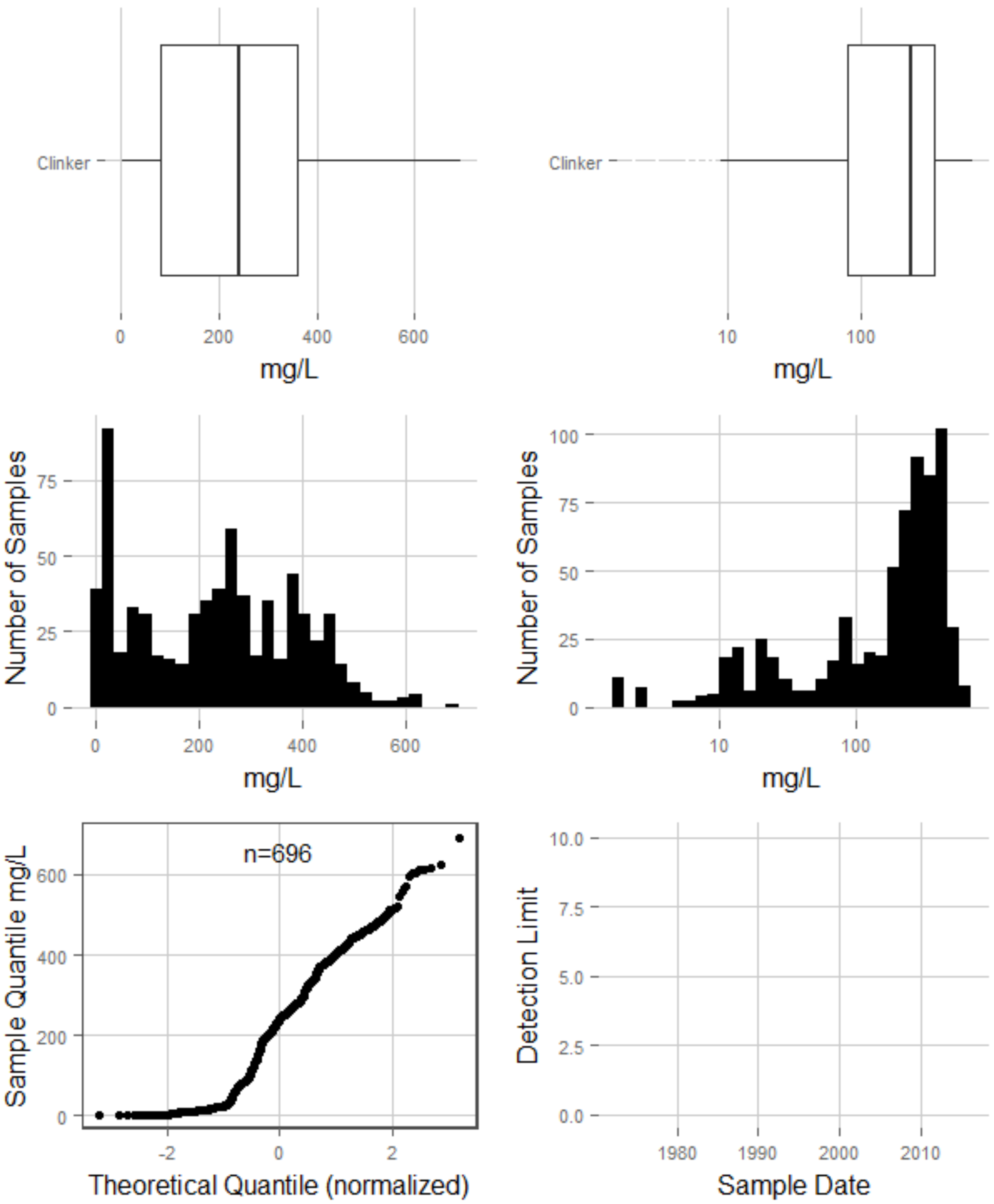
Chloride
Alluvium



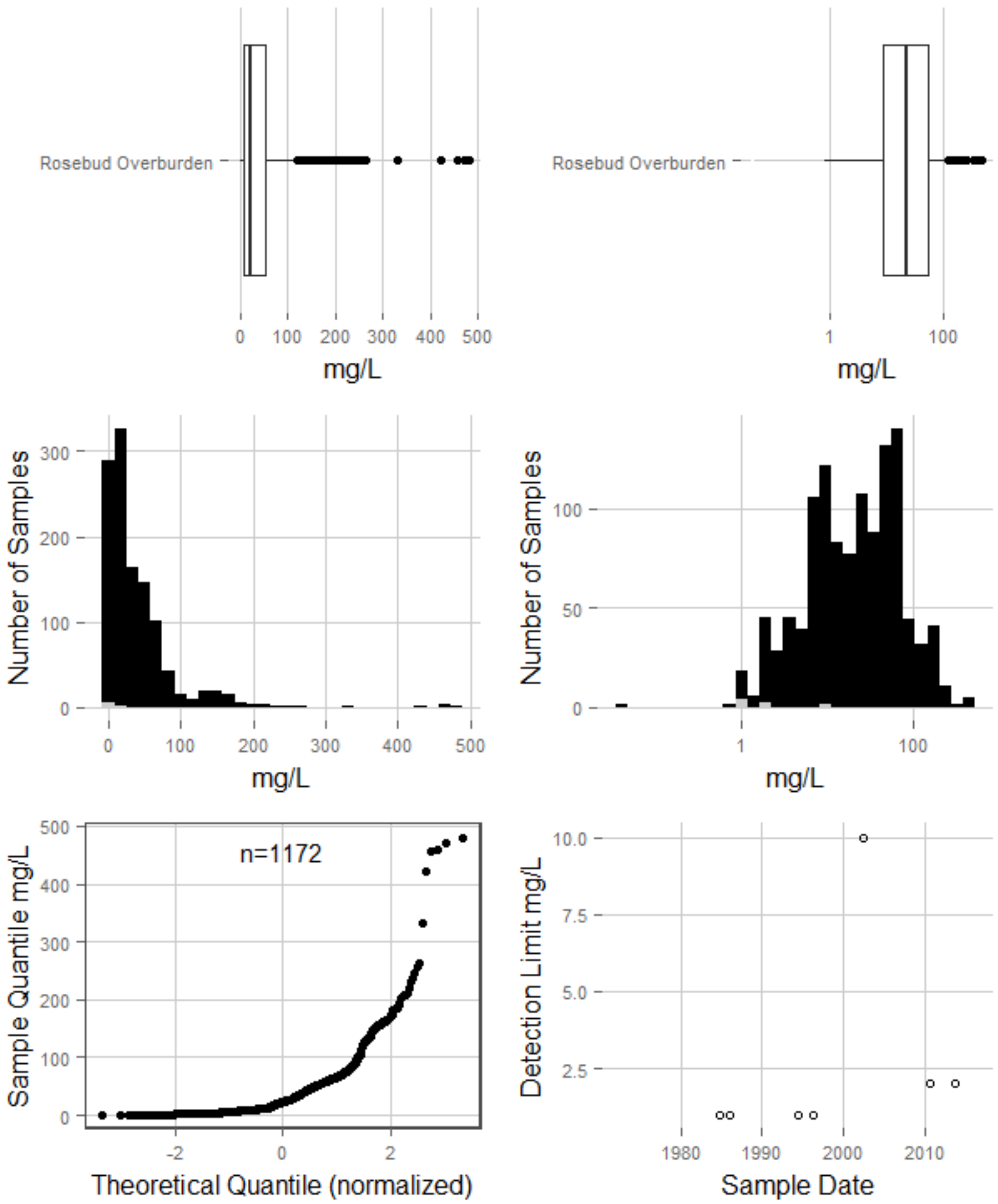
Chloride
Spoils



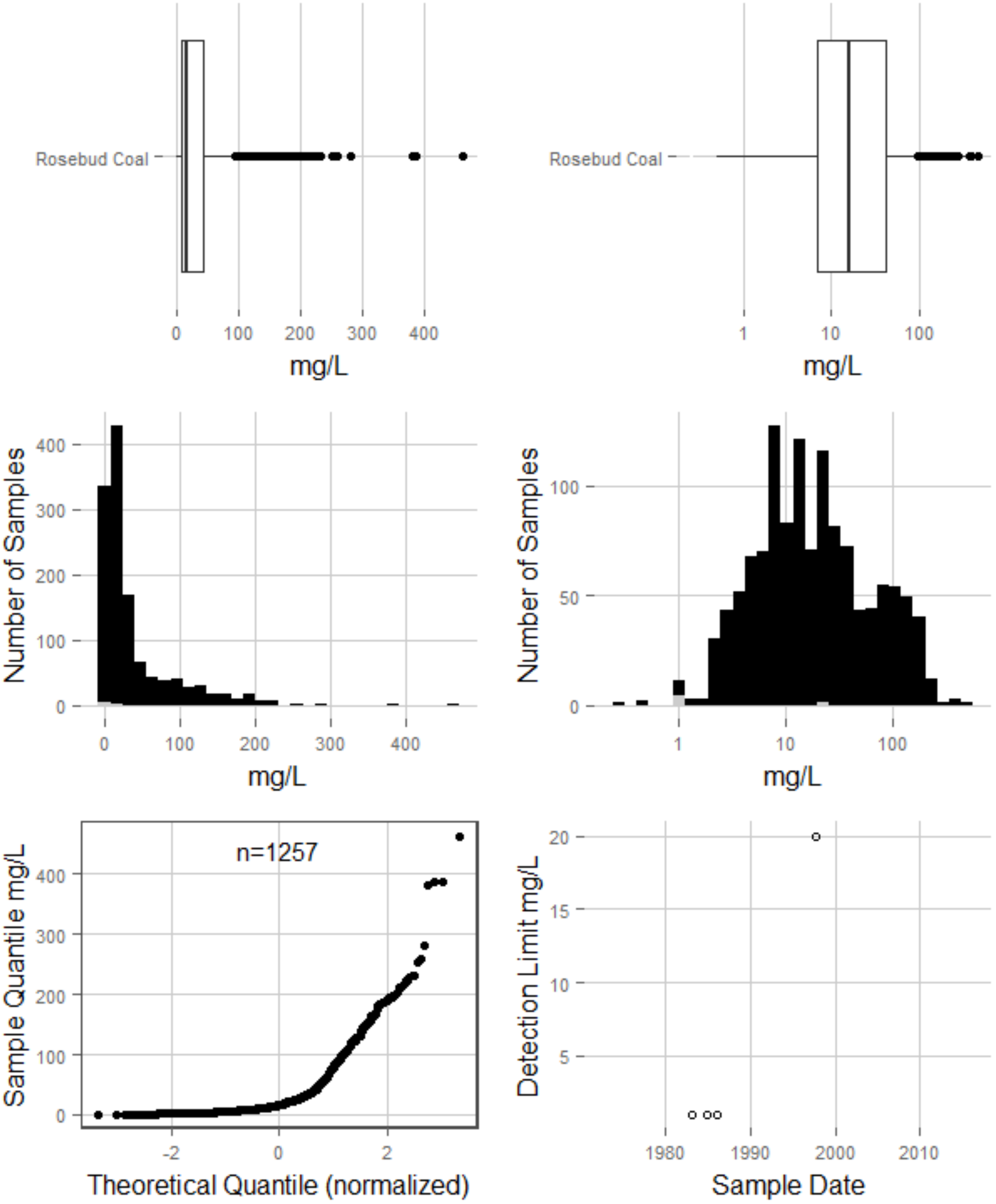
Chloride
Clinker



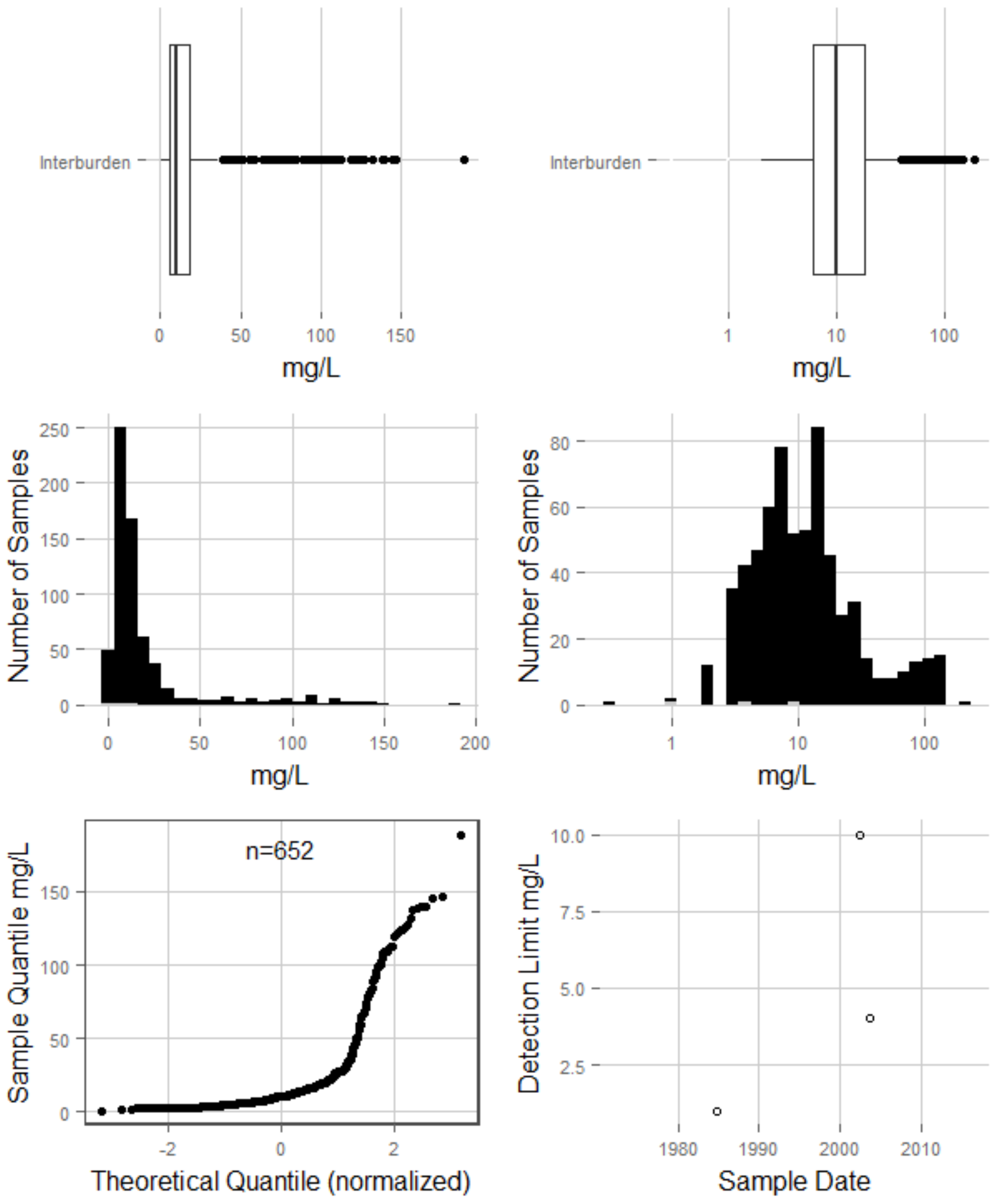
Chloride
Rosebud Overburden



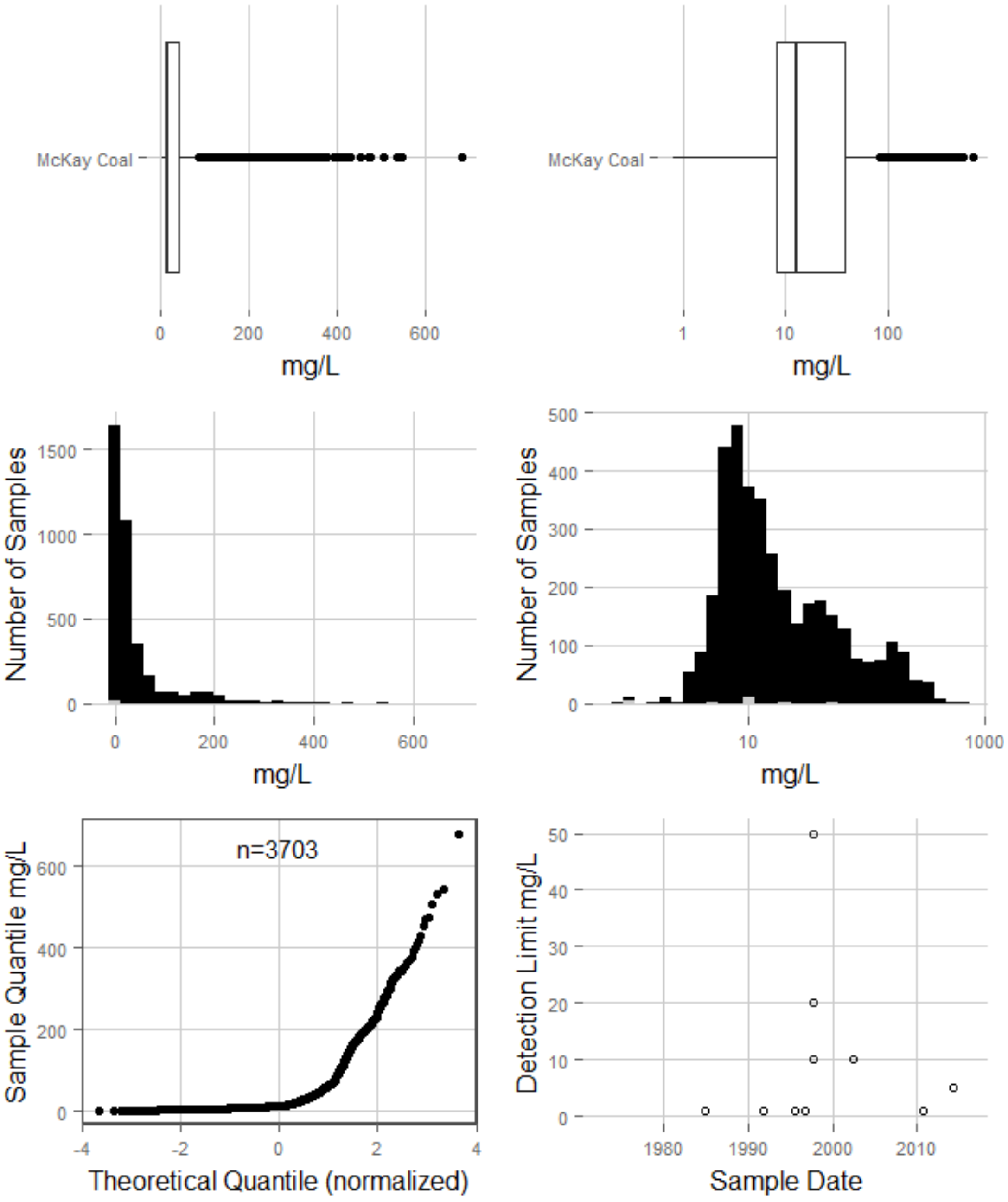
Chloride
Rosebud Coal



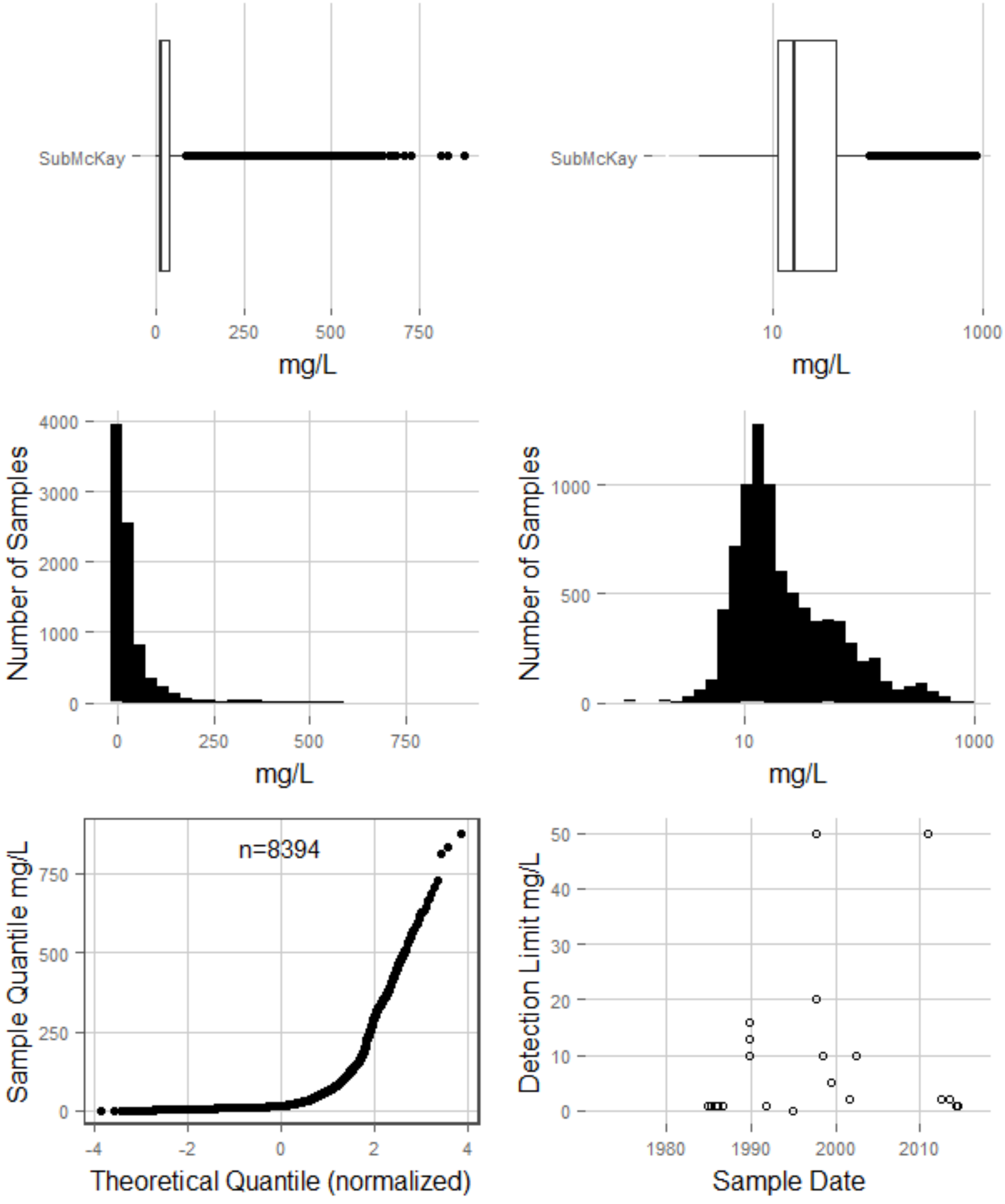
Chloride
Interburden



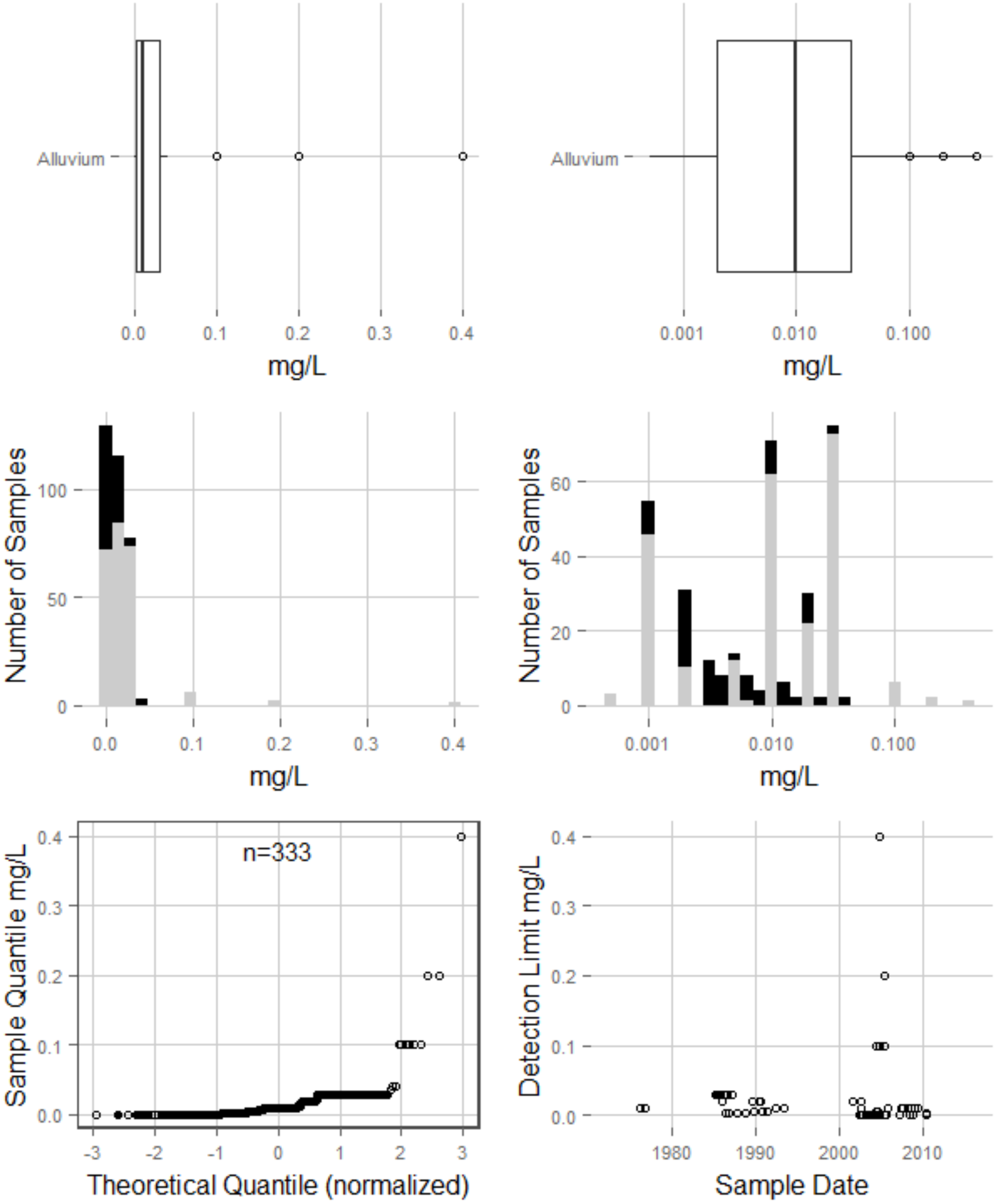
Chloride
McKay Coal



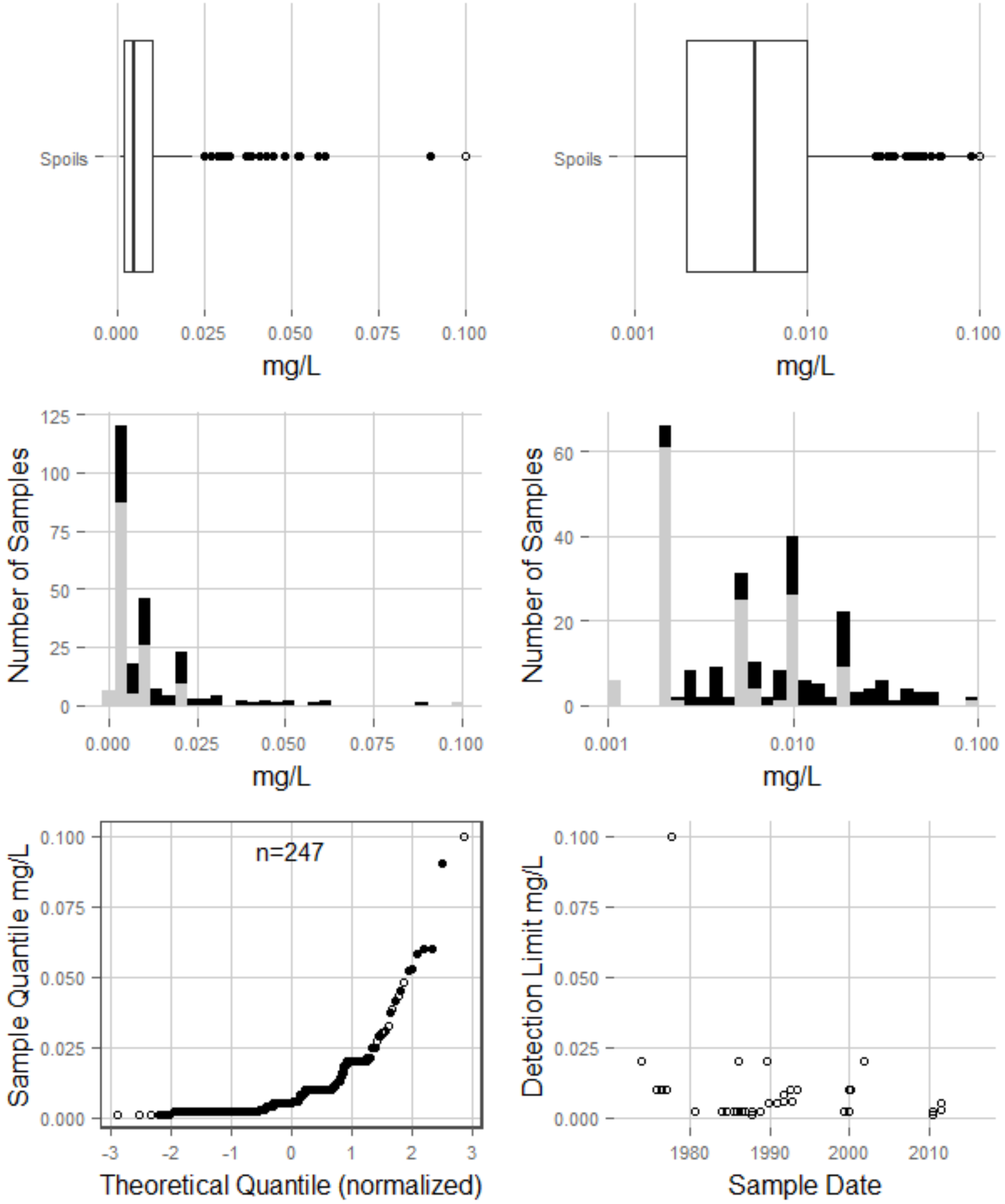
Chloride
SubMcKay



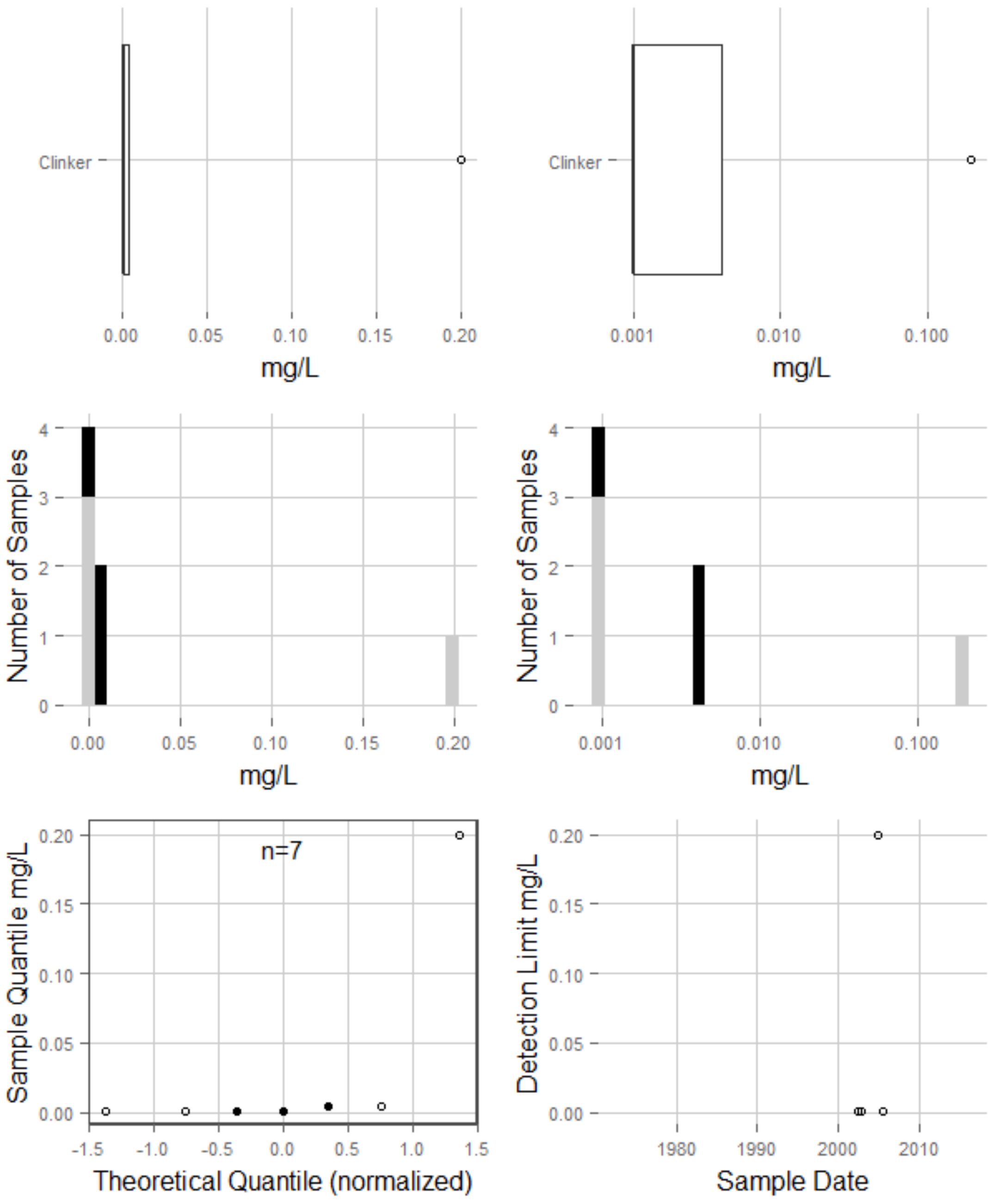
Chromium
Alluvium



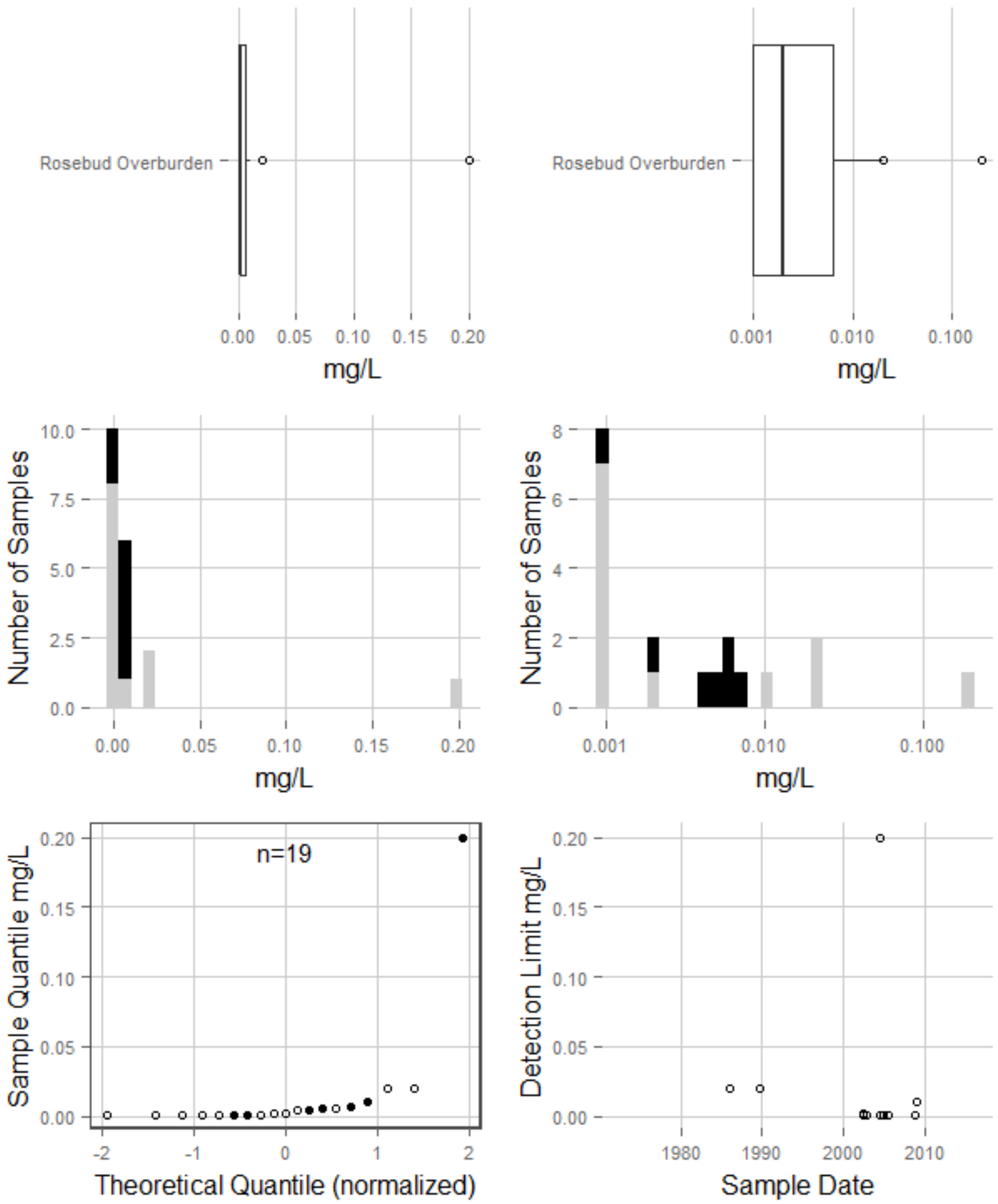
Chromium
Spoils



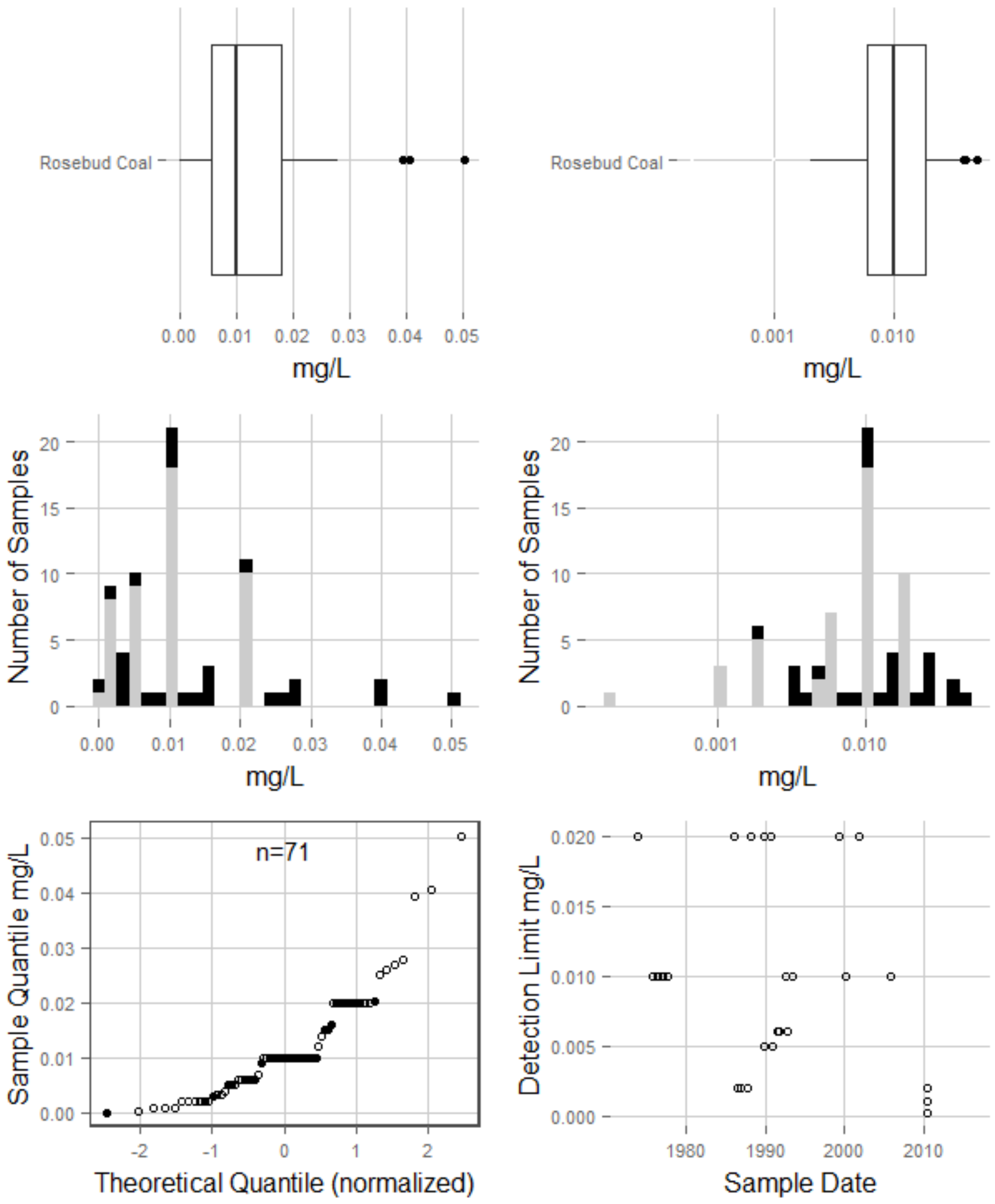
Chromium
Clinker



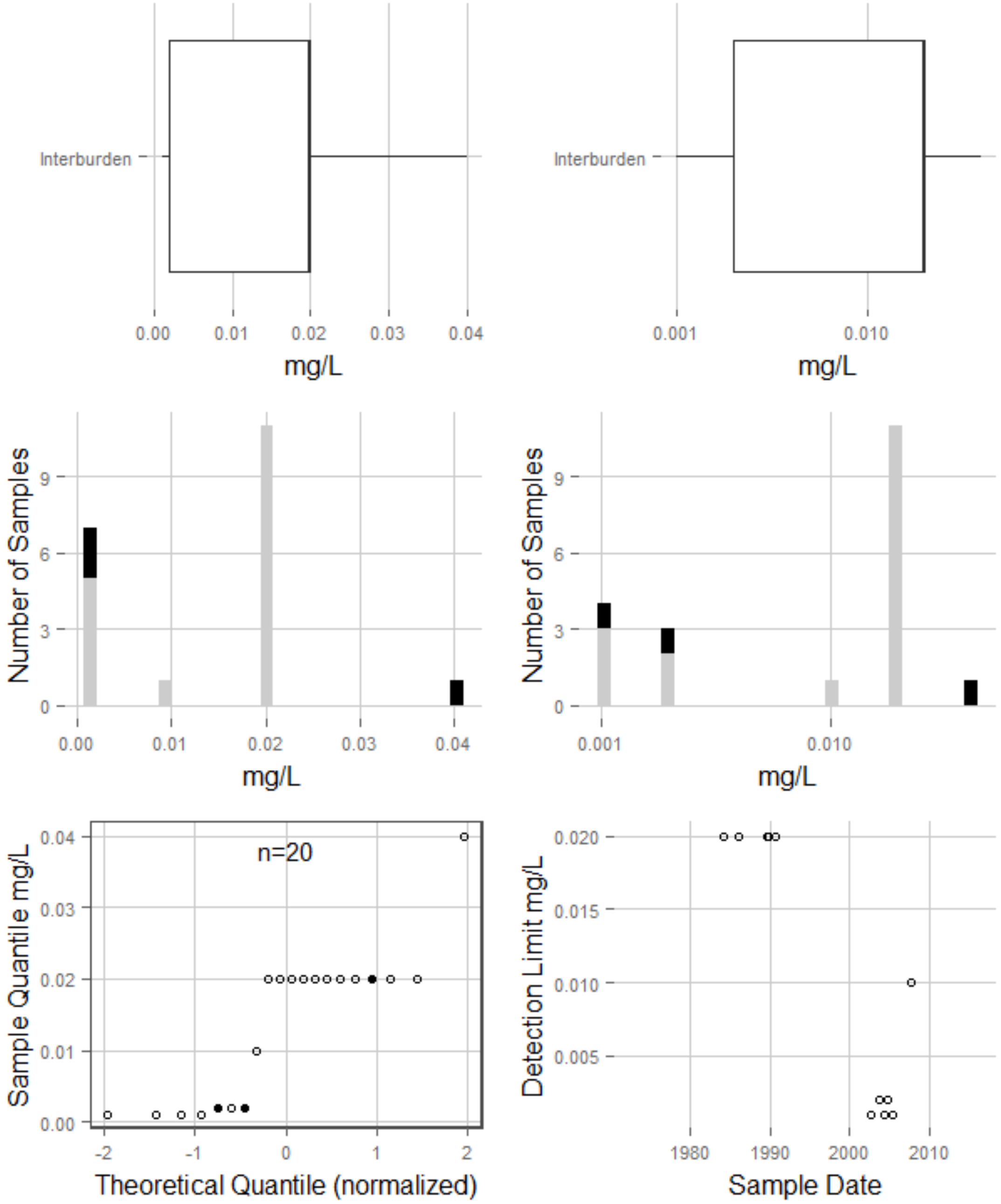
Chromium
Rosebud Overburden



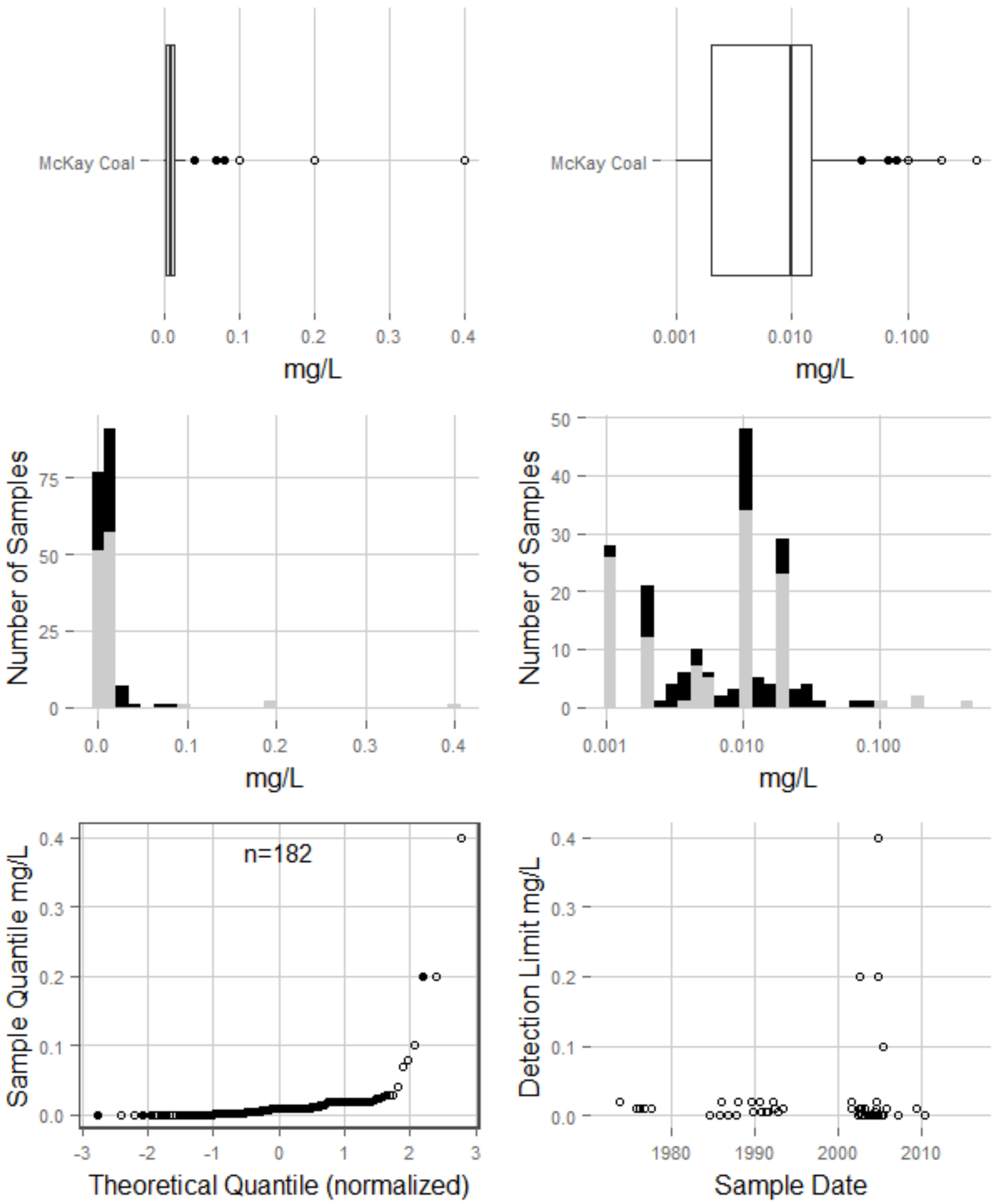
Chromium
Rosebud Coal

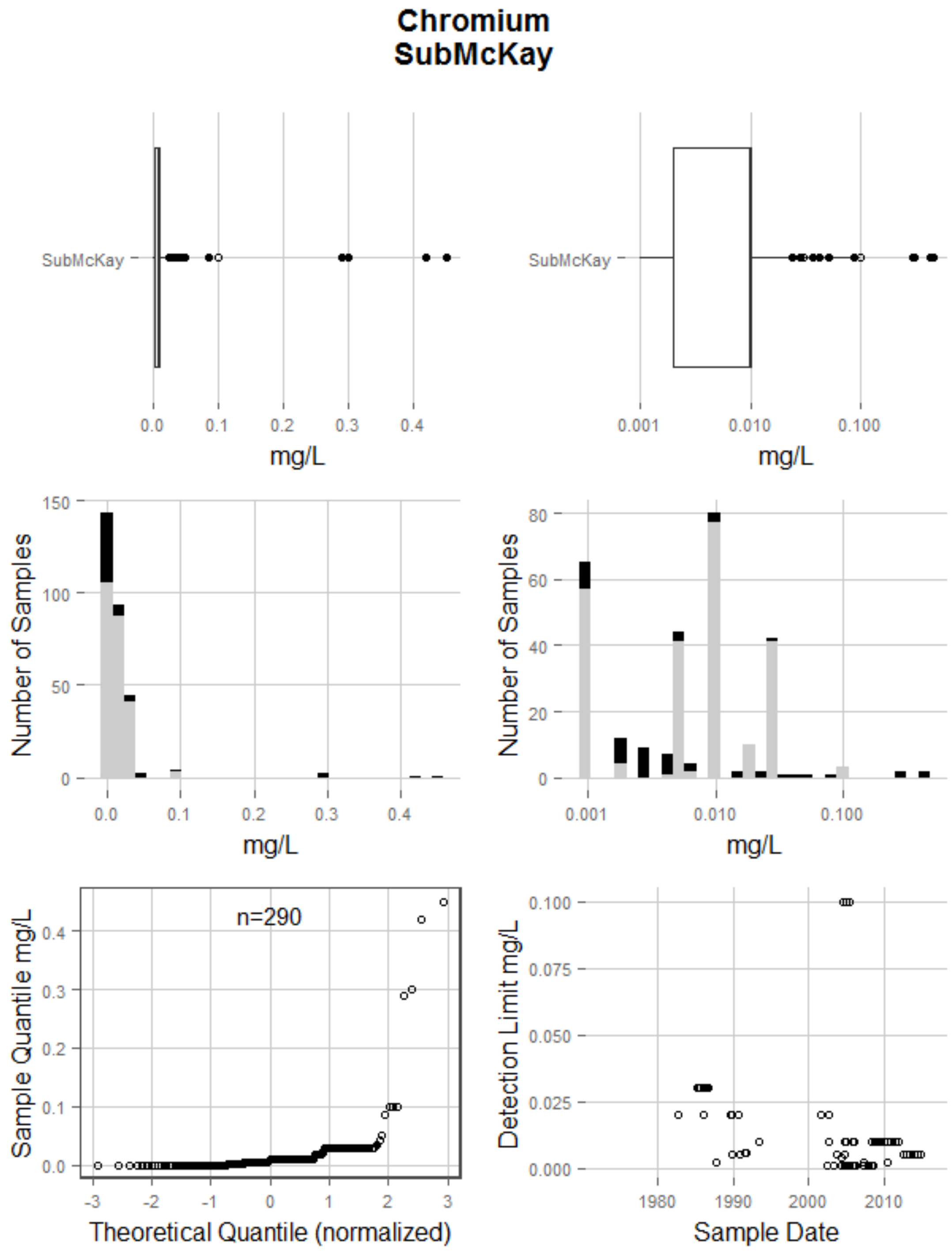


Chromium
Interburden

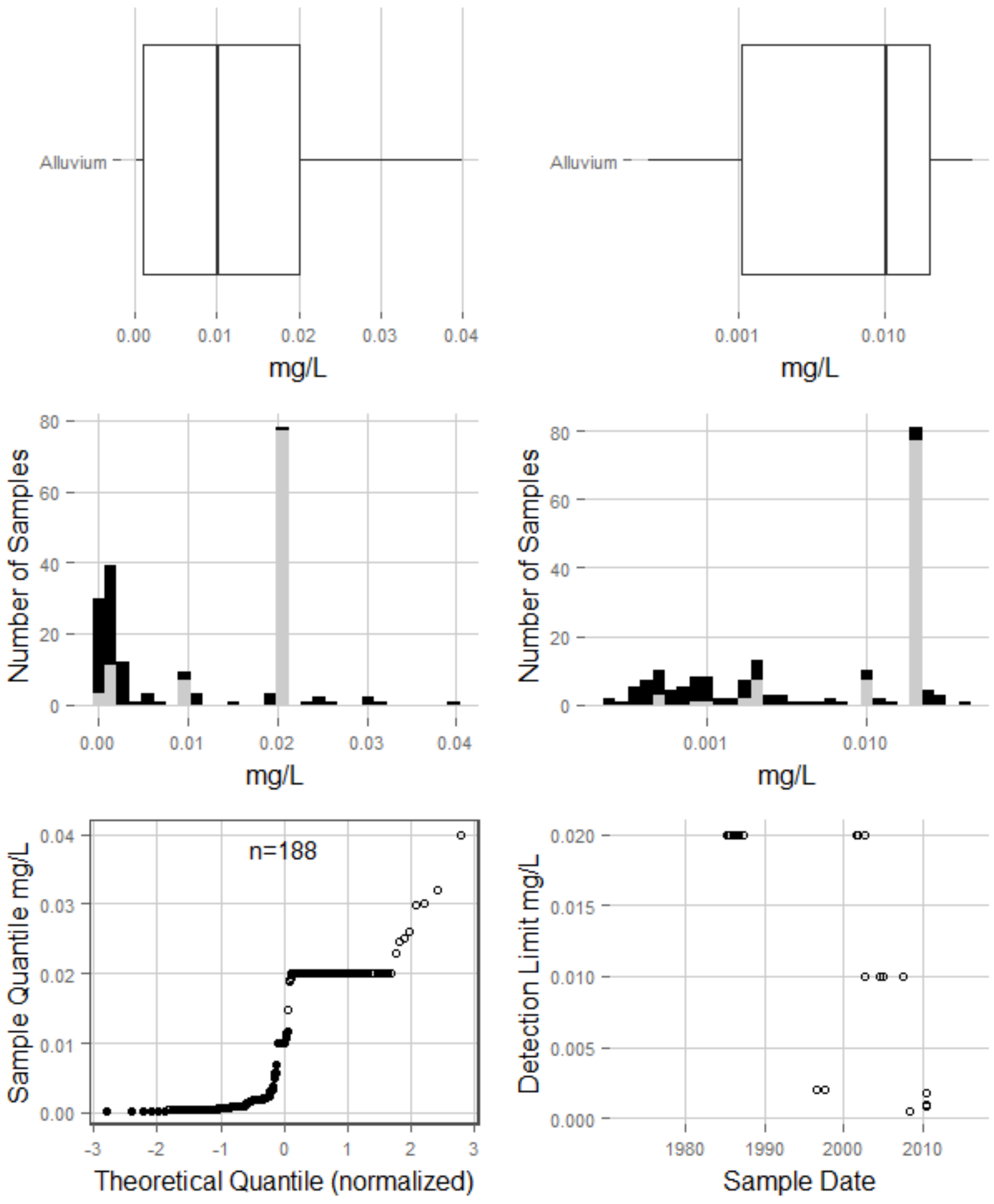


Chromium
McKay Coal

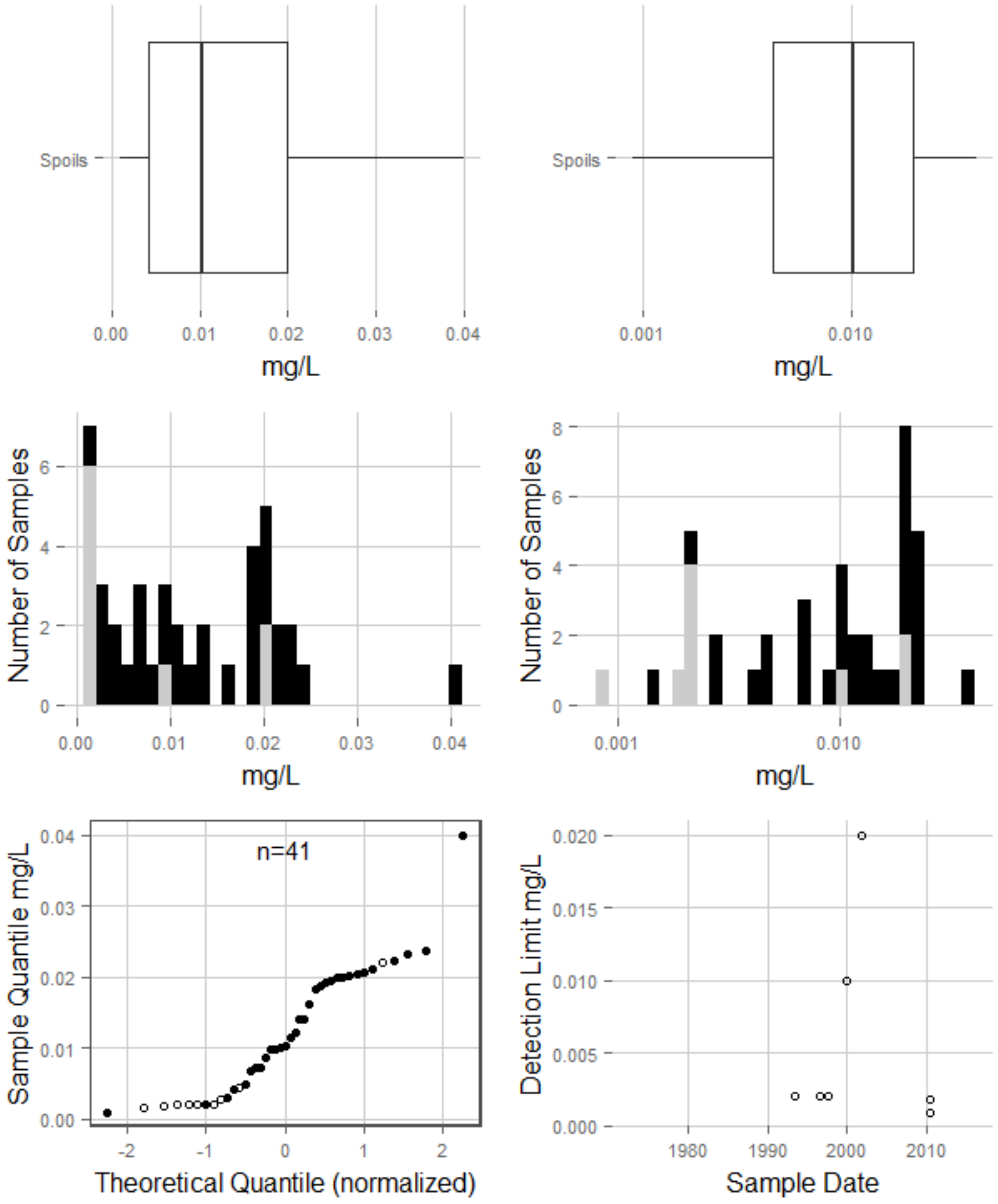



Chromium
SubMcKay
SubMcKay
0.0
0.1
0.2
0.3
0.4
mg/L
SubMcKay
0.001
0.010
0.100
mg/L
150
100
50
0
Number of Samples
0.0
0.1
0.2
0.3
0.4
mg/L
80
60
40
20
0
Number of Samples
0.001
0.010
0.100
mg/L
n=290
0.4
0.3
0.2
0.1
0.0
Sample Quantile mg/L
-3
-2
-1
0
1
2
3
Theoretical Quantile (normalized)
0.100
0.075
0.050
0.025
0.000
Detection Limit mg/L
1980
1990
2000
2010
Sample Date

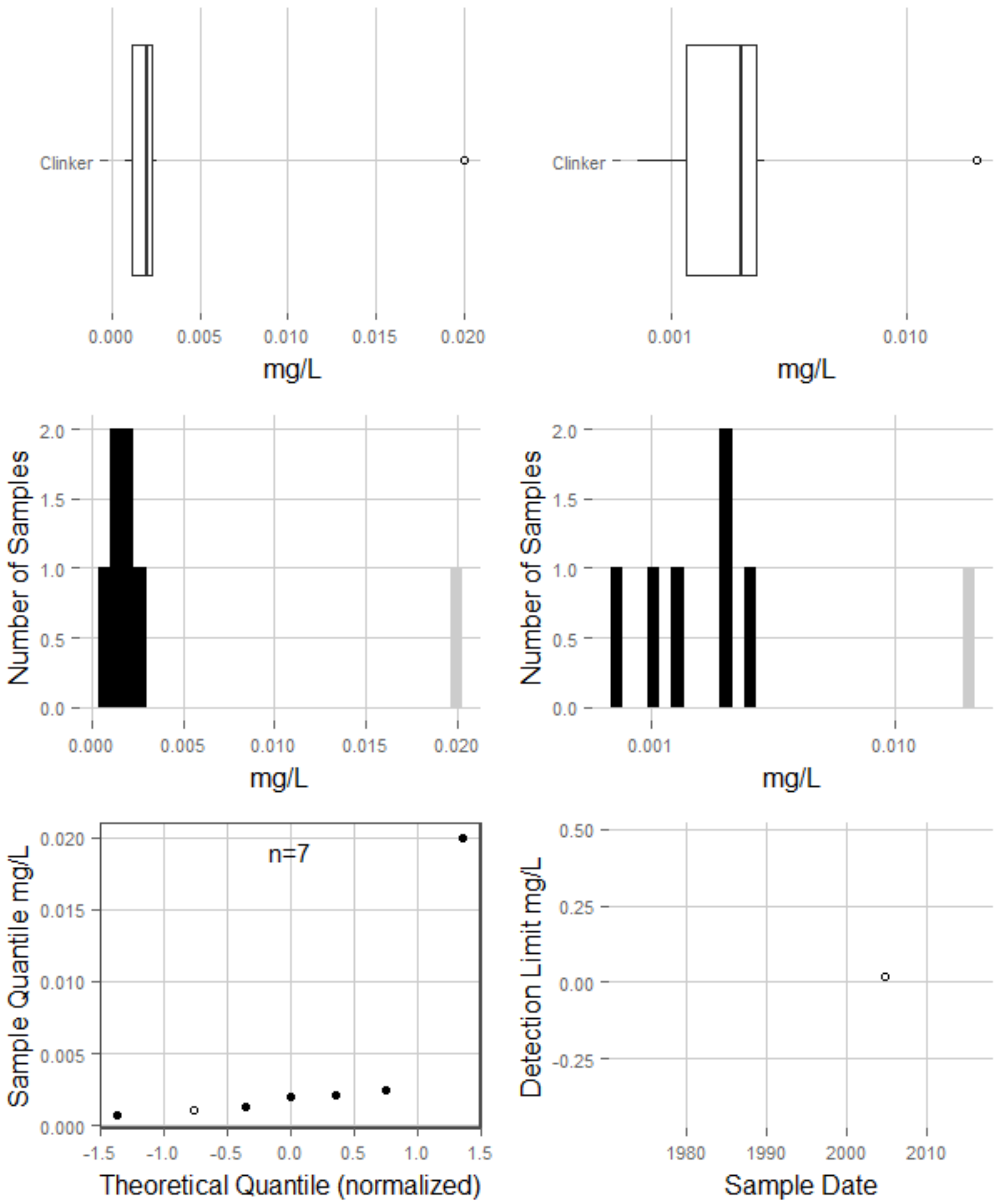
Cobalt
Alluvium



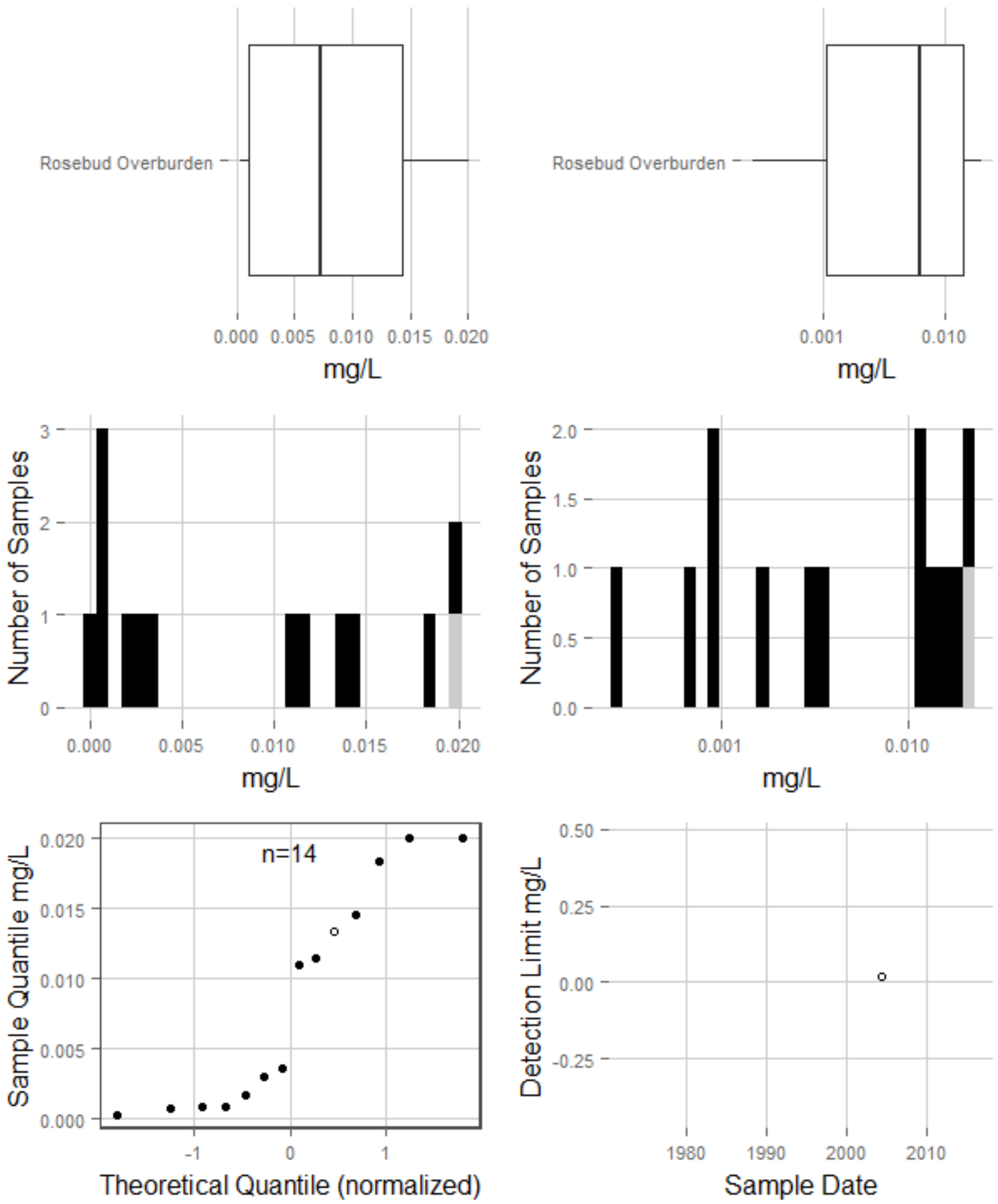
Cobalt
Spoils



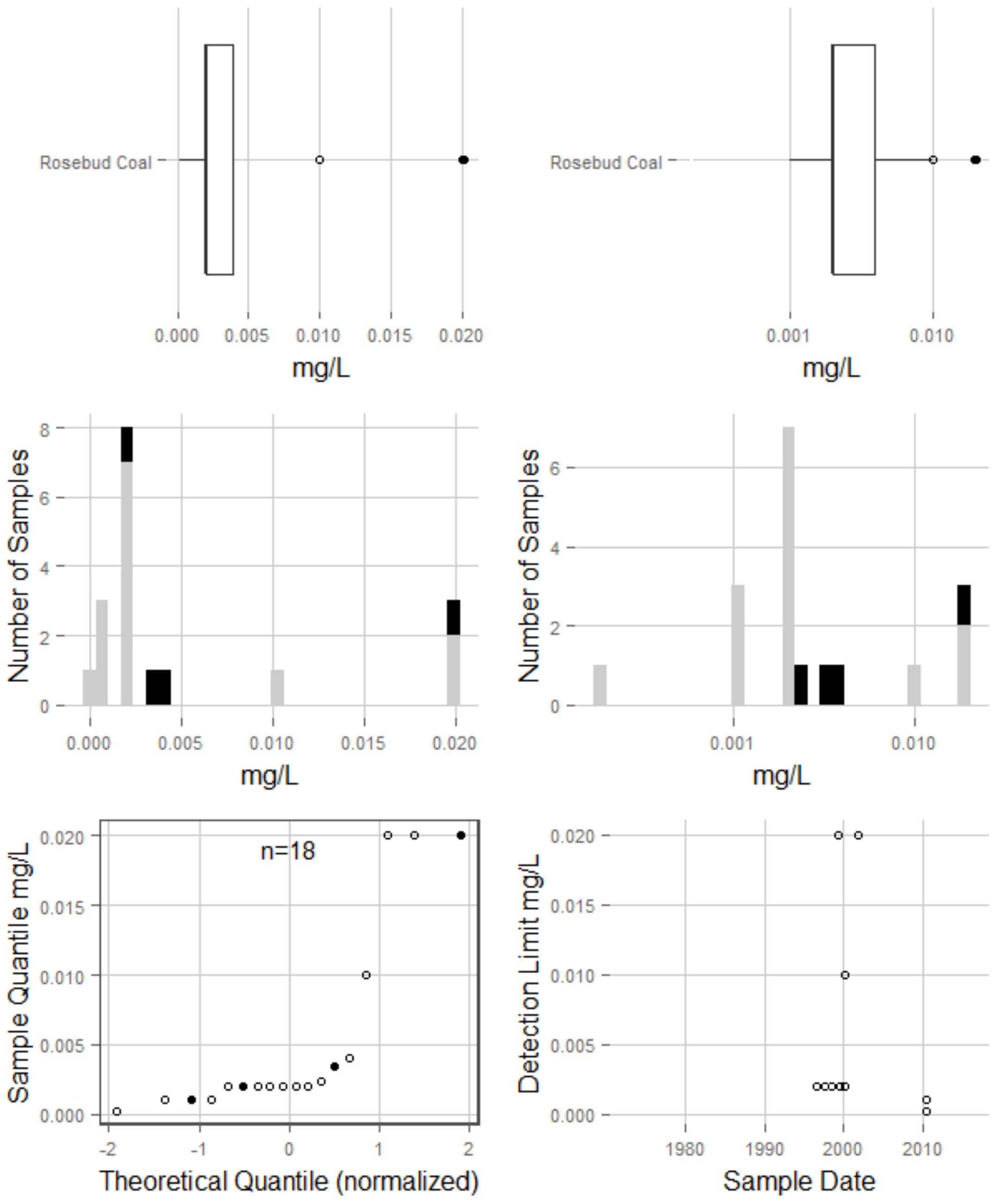
Cobalt
Clinker



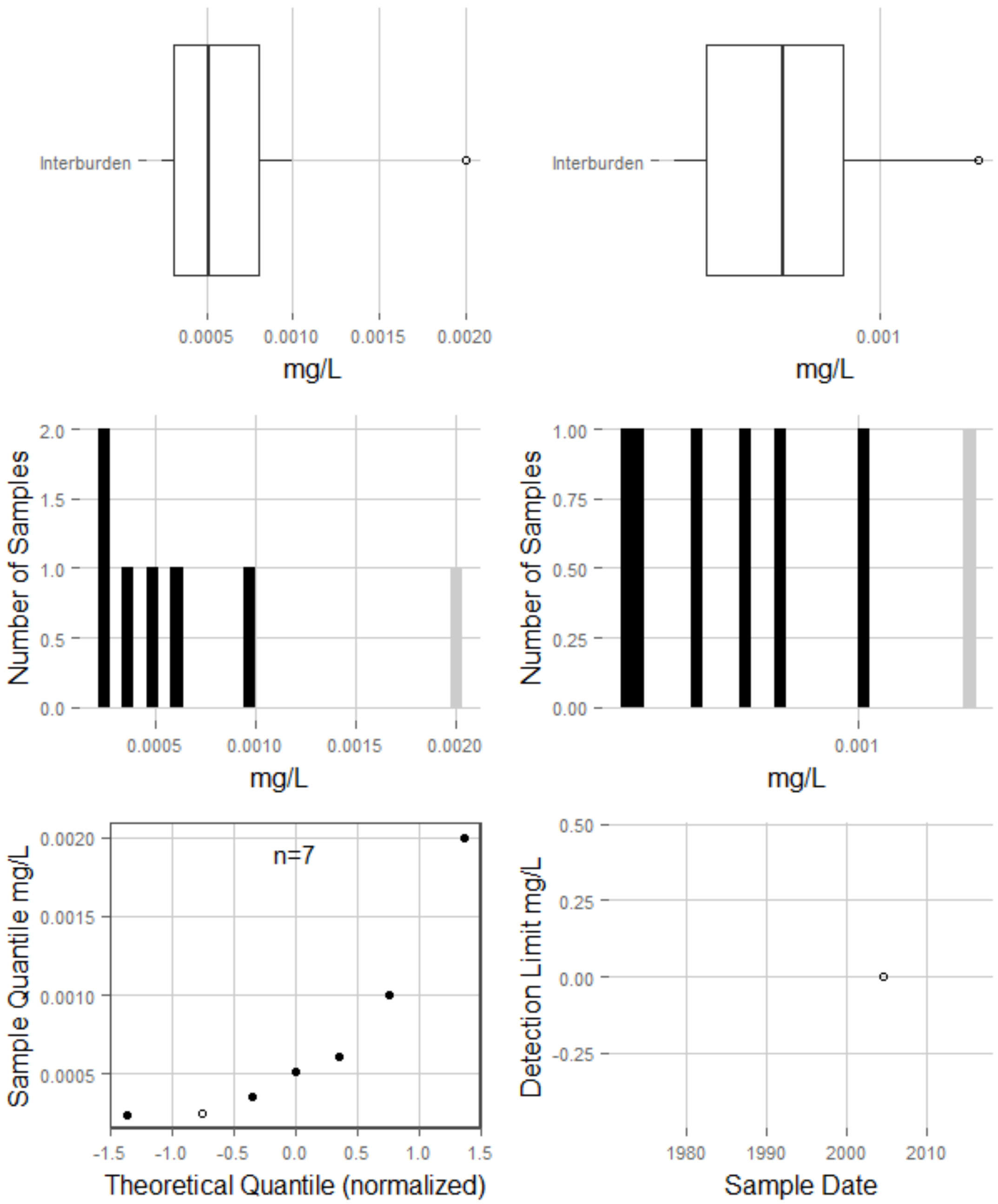
Cobalt
Rosebud Overburden



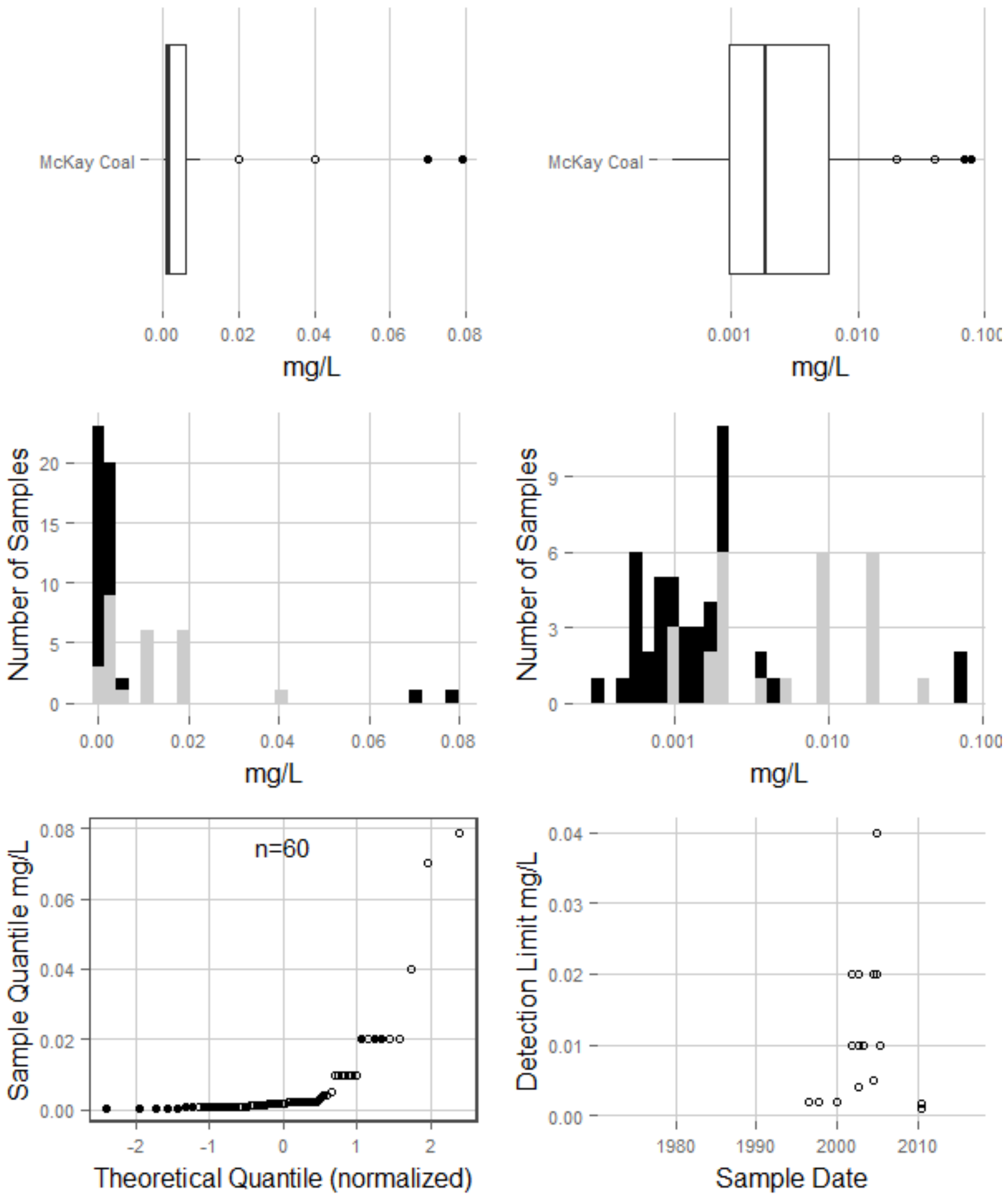
Cobalt
Rosebud Coal



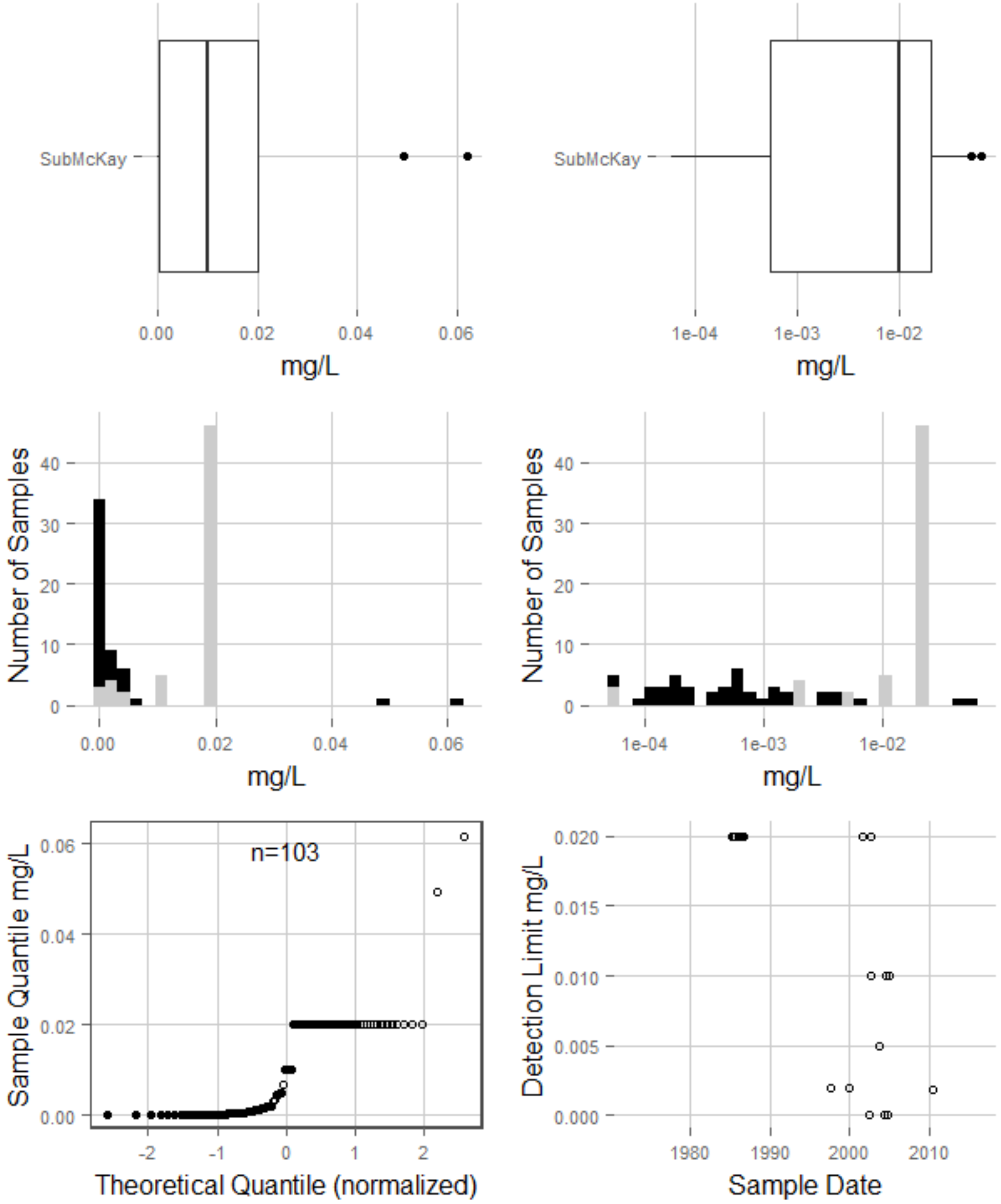
Cobalt
Interburden



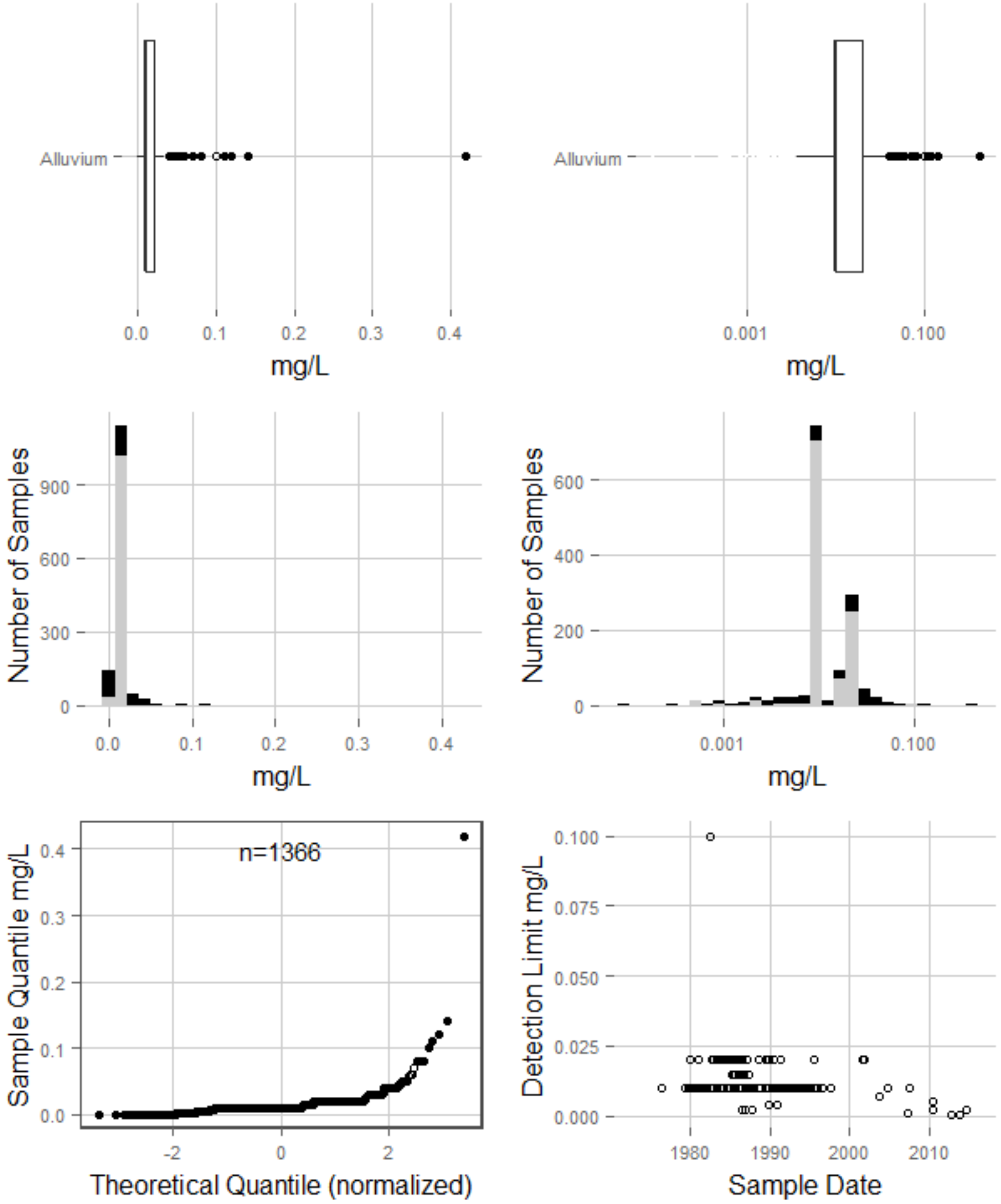
Cobalt
McKay Coal



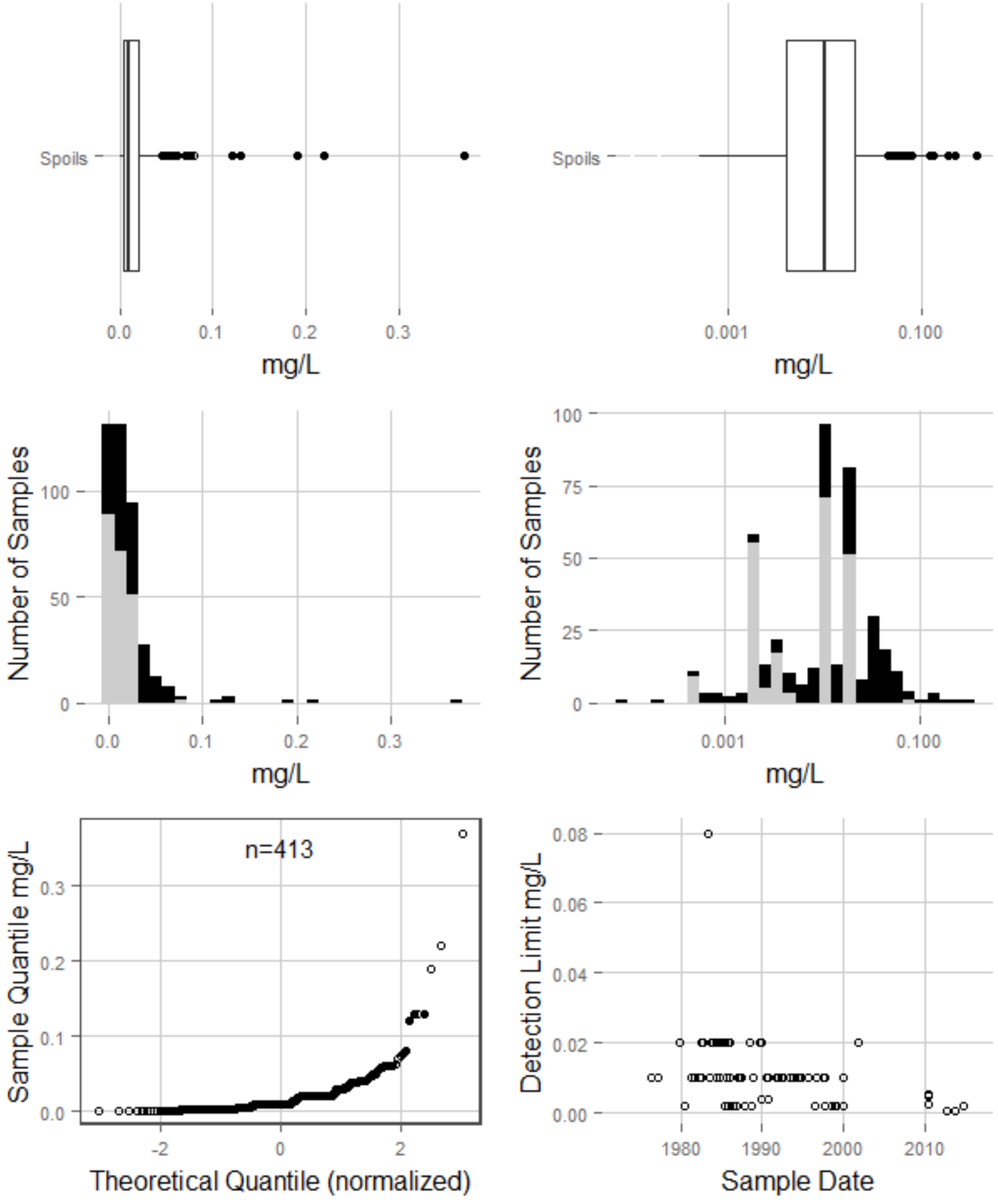
Cobalt
SubMcKay



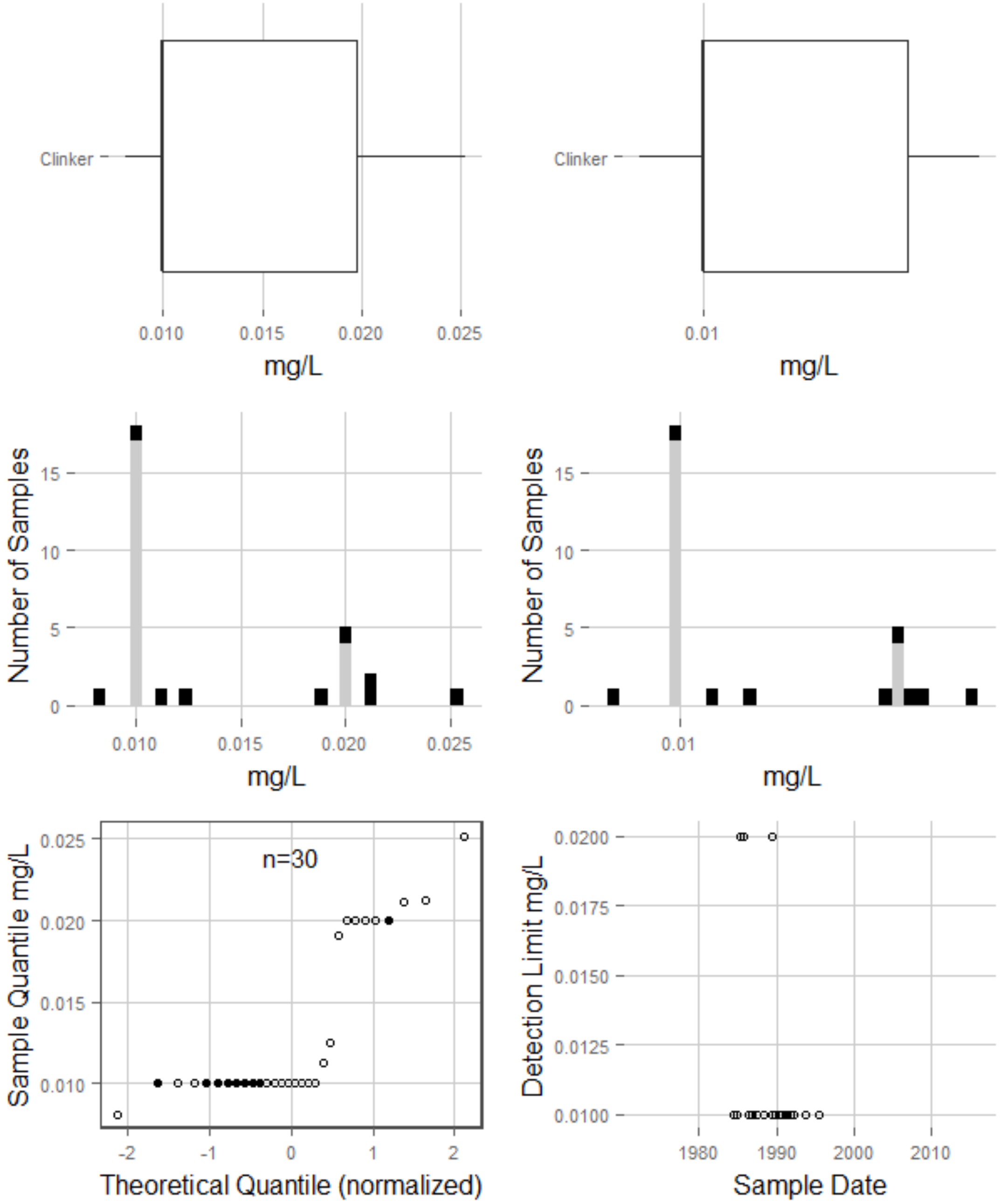
Copper
Alluvium



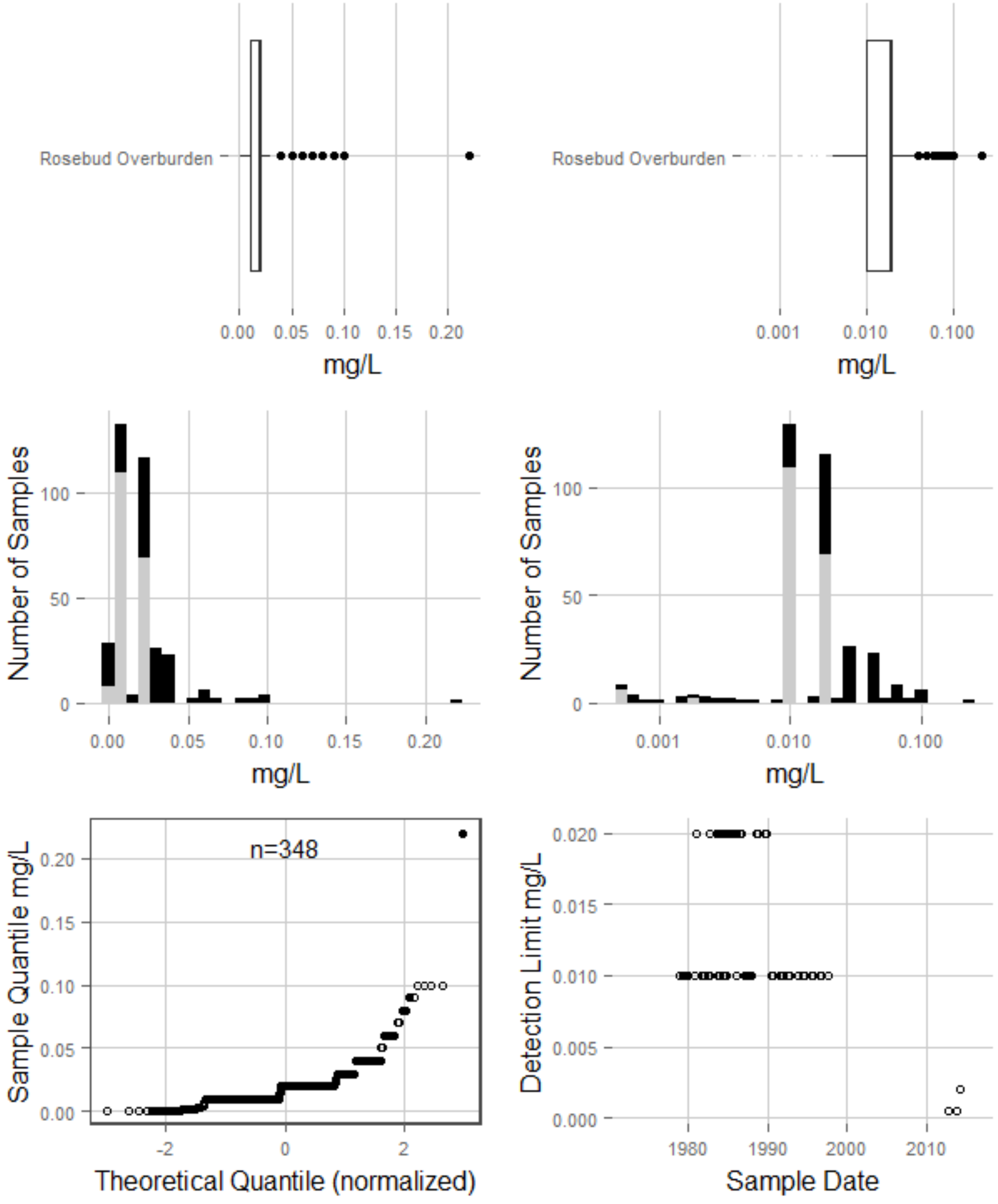
Copper
Spoils



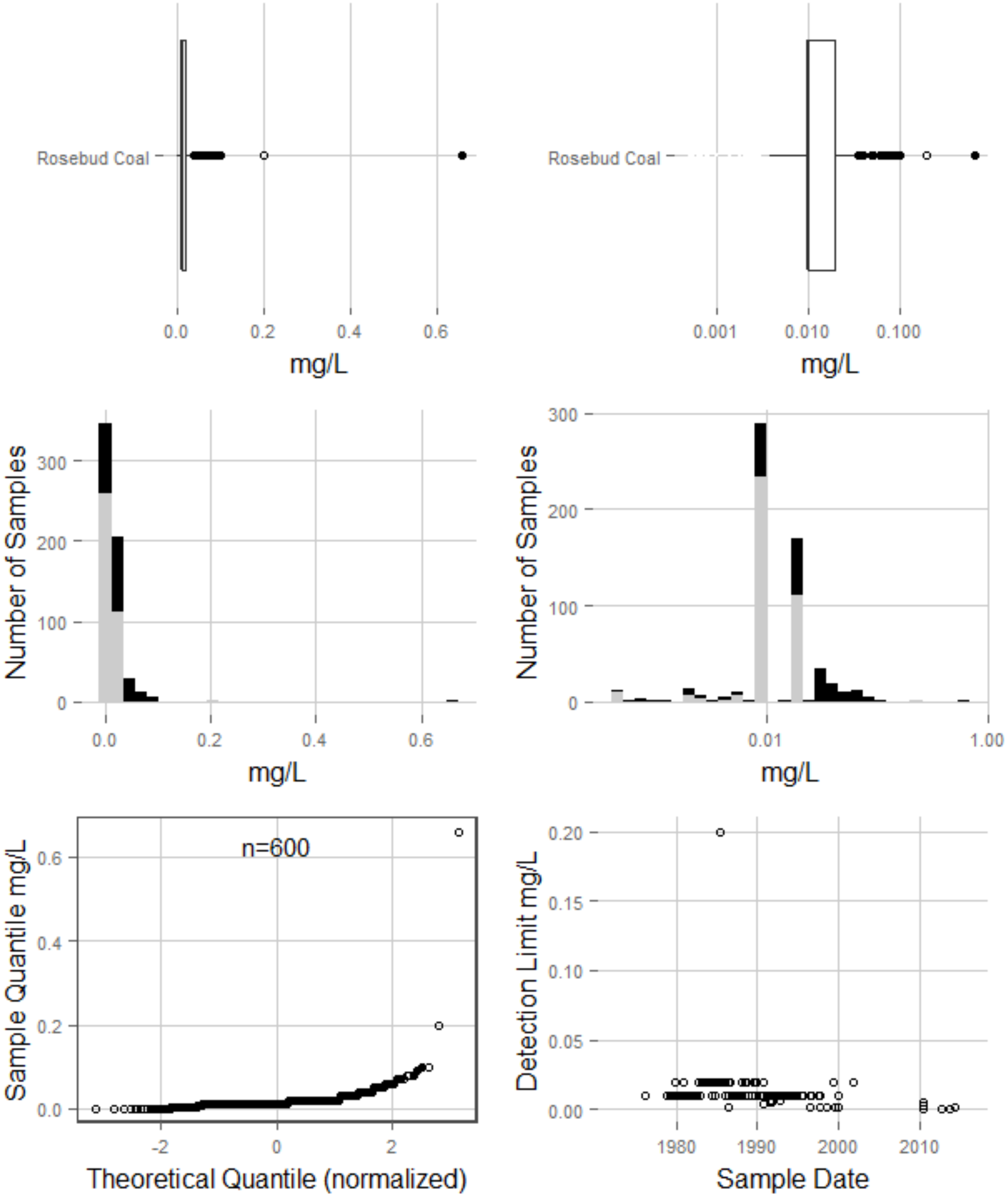
Copper
Clinker



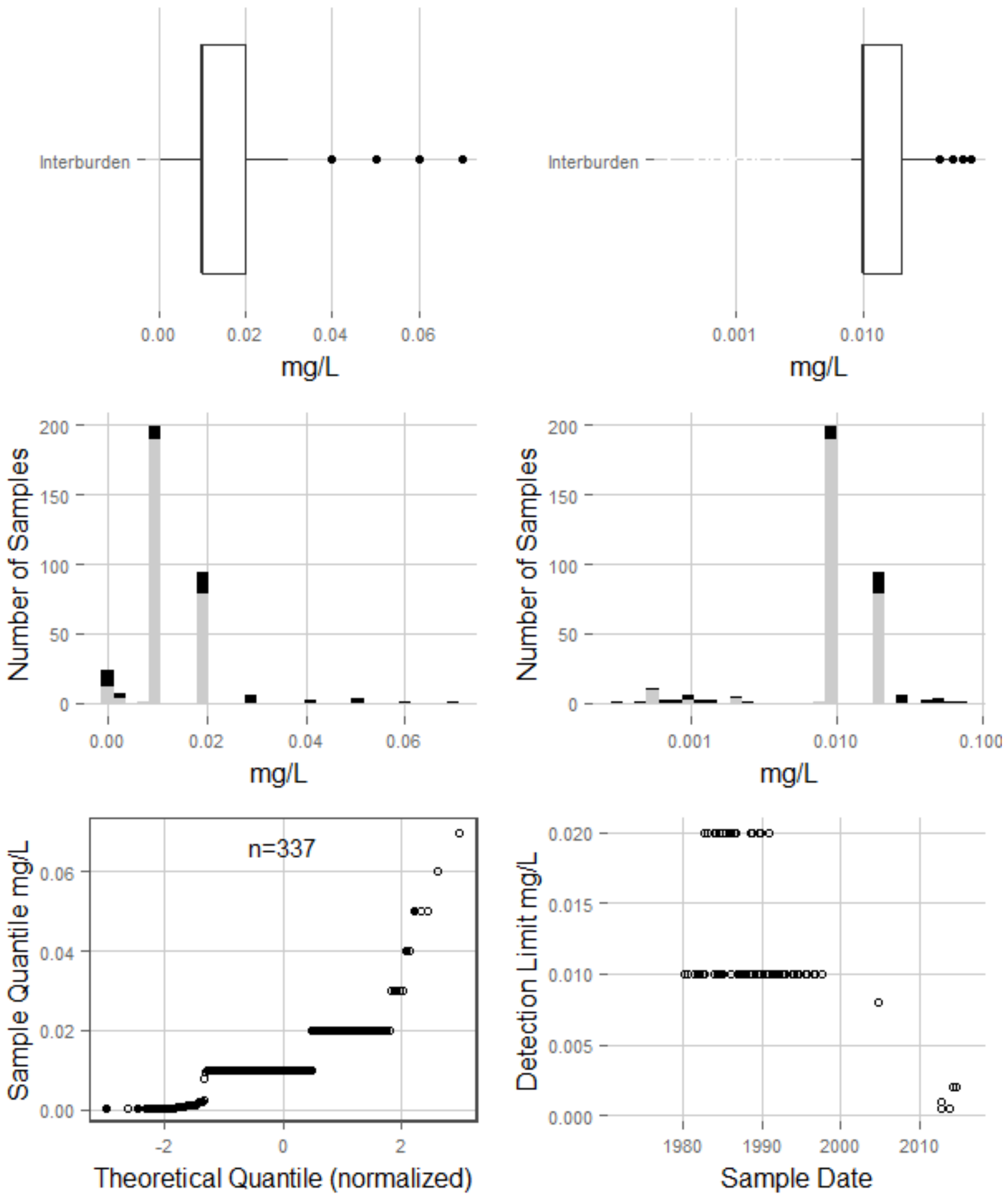
Copper
Rosebud Overburden



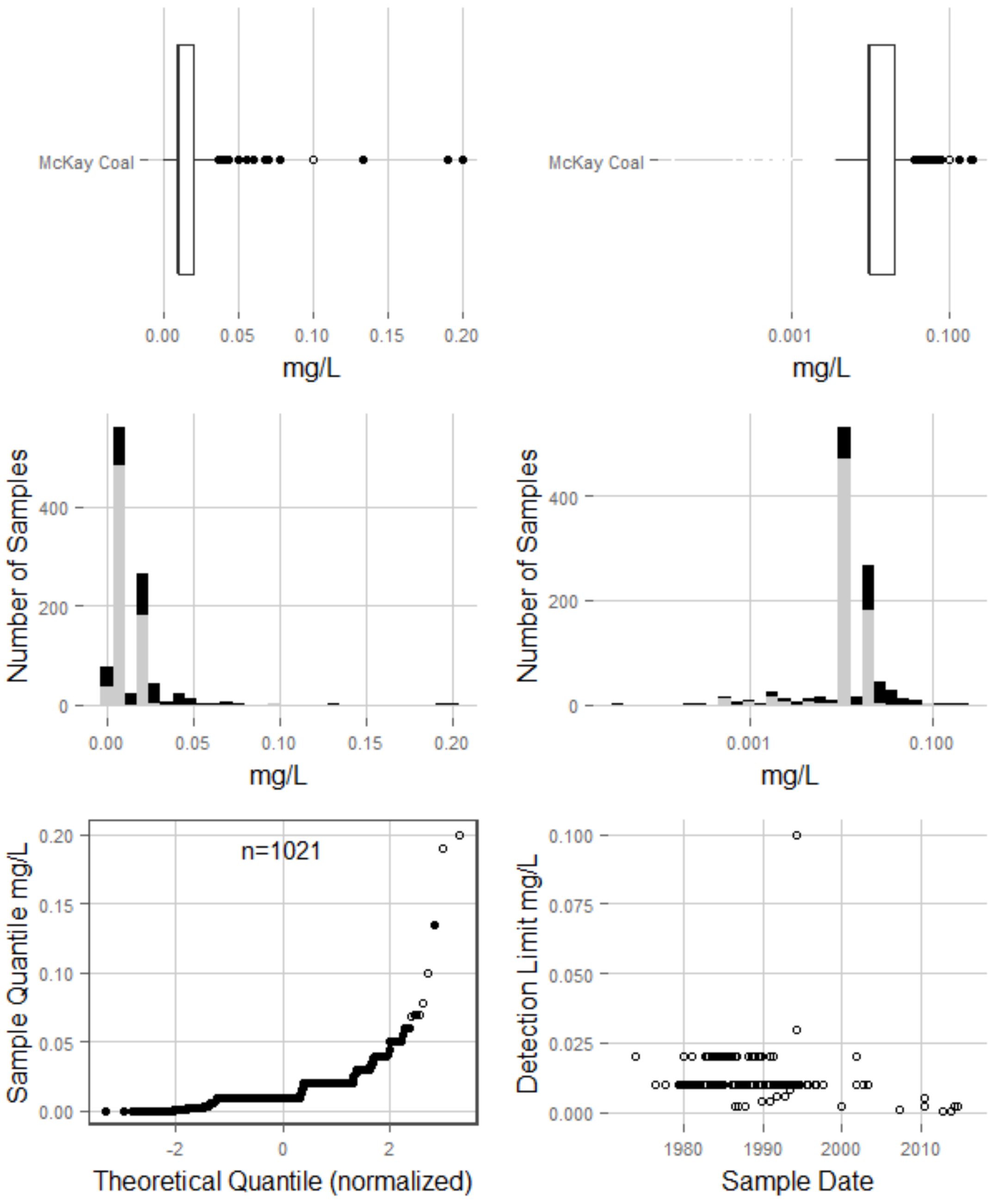
Copper
Rosebud Coal



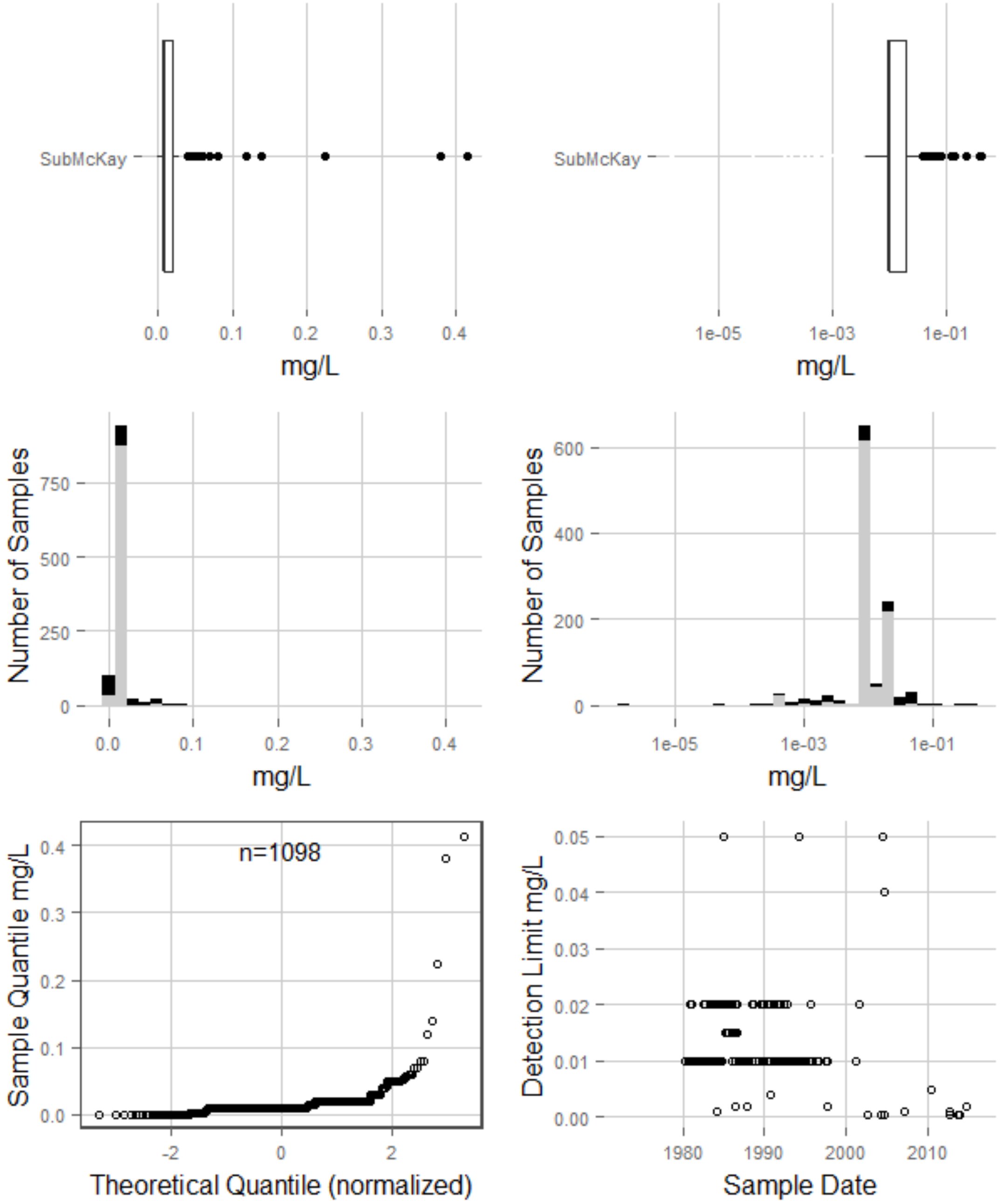
Copper
Interburden



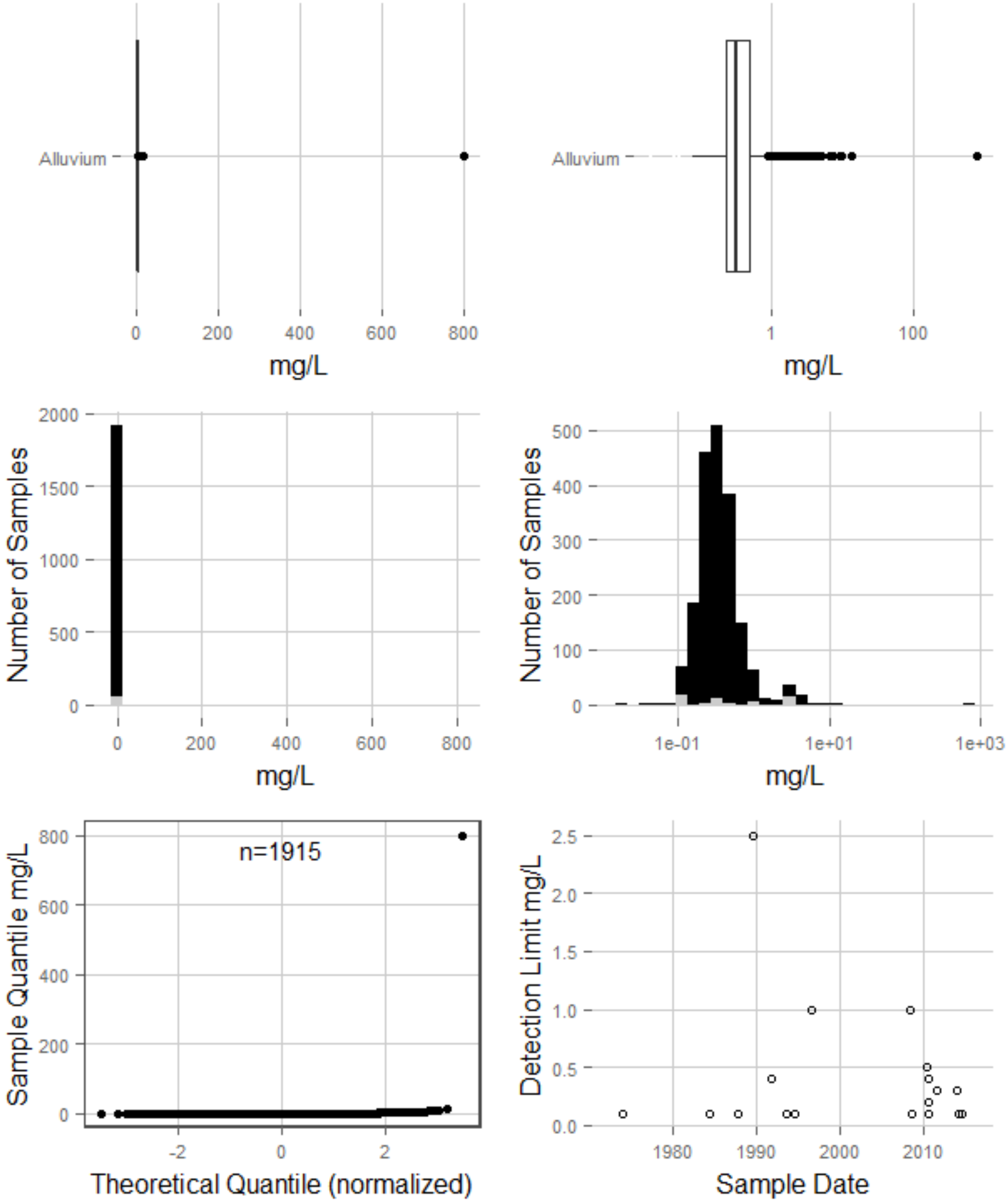
Copper
McKay Coal



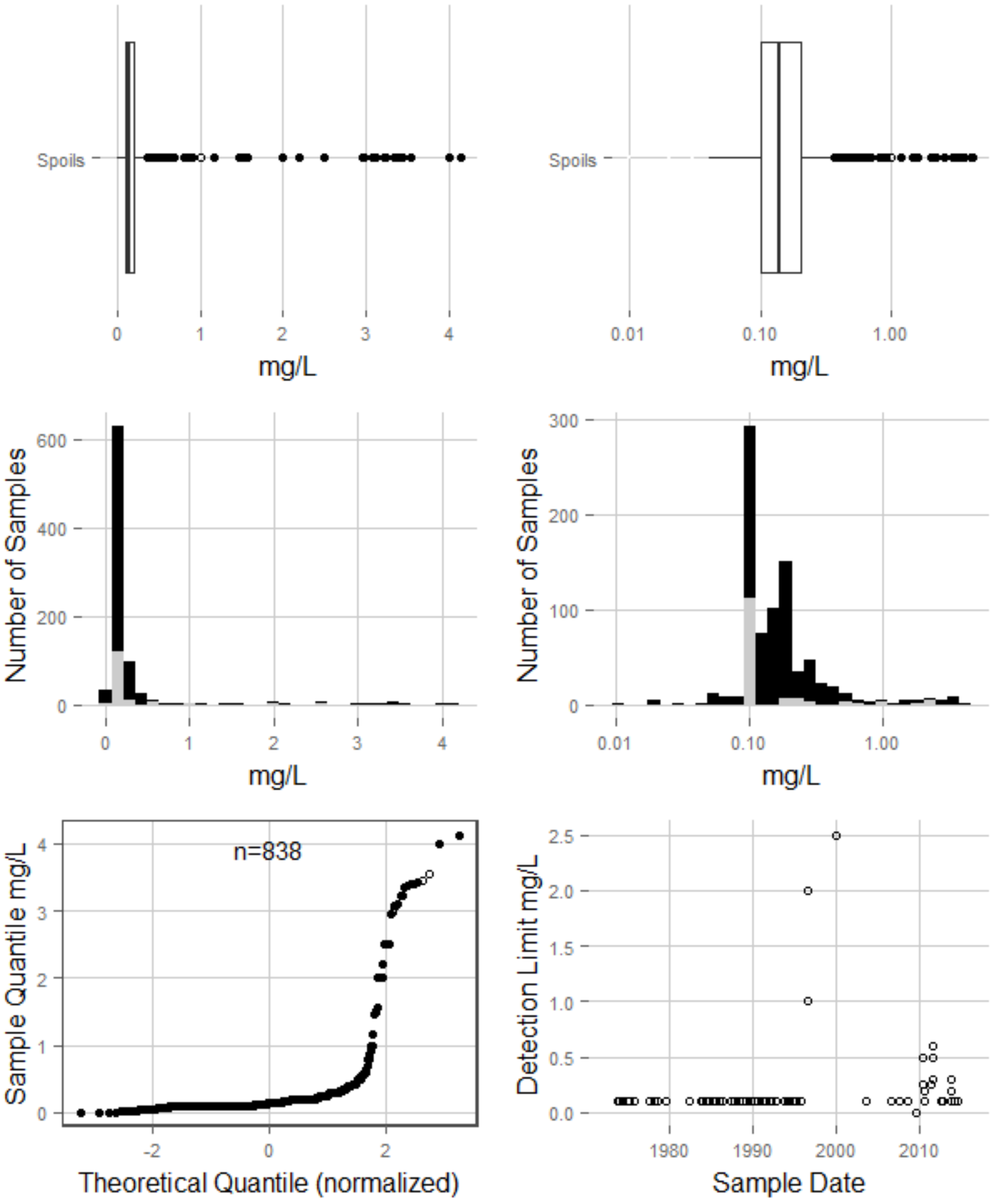
Copper
SubMcKay



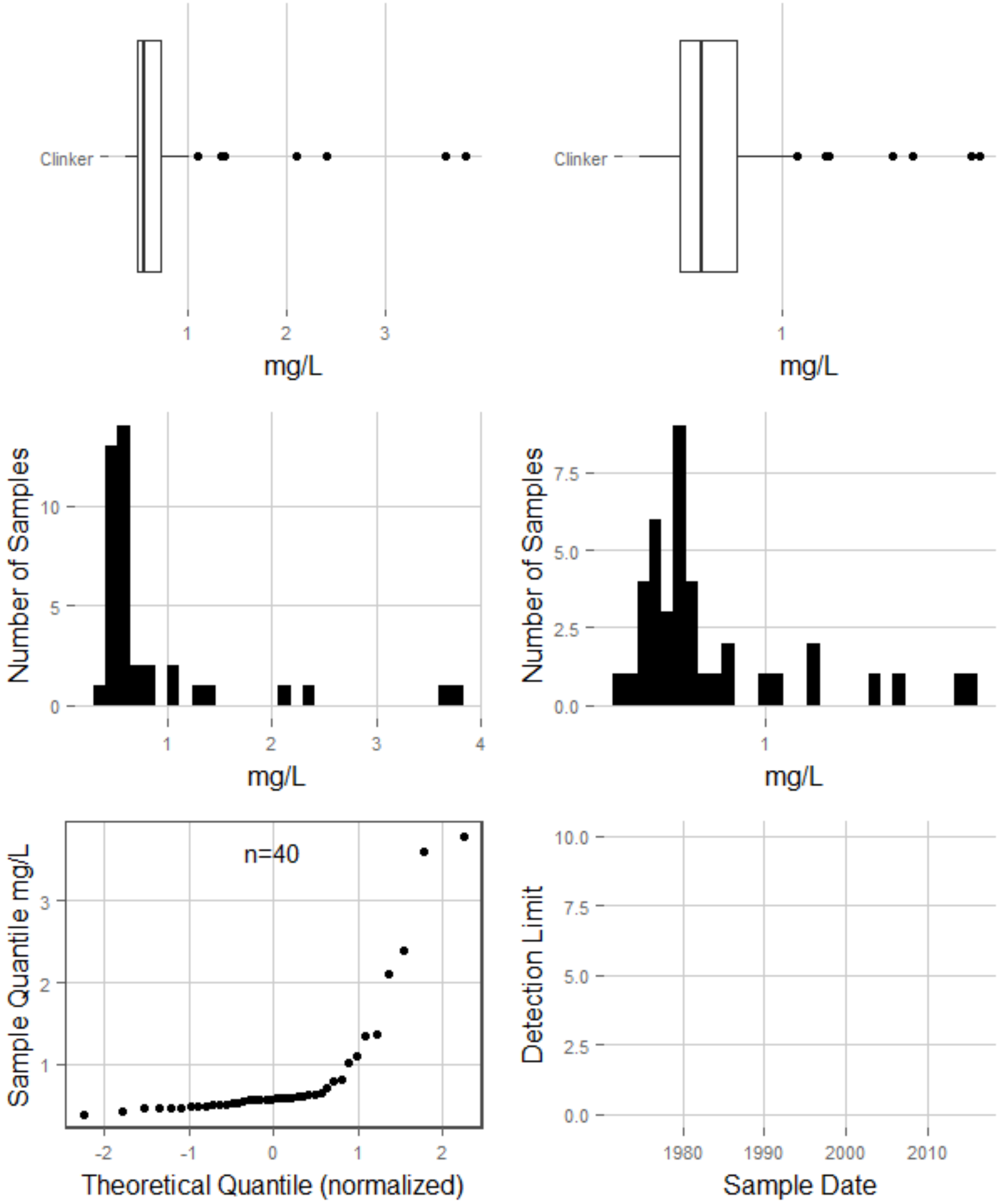
Fluoride
Alluvium



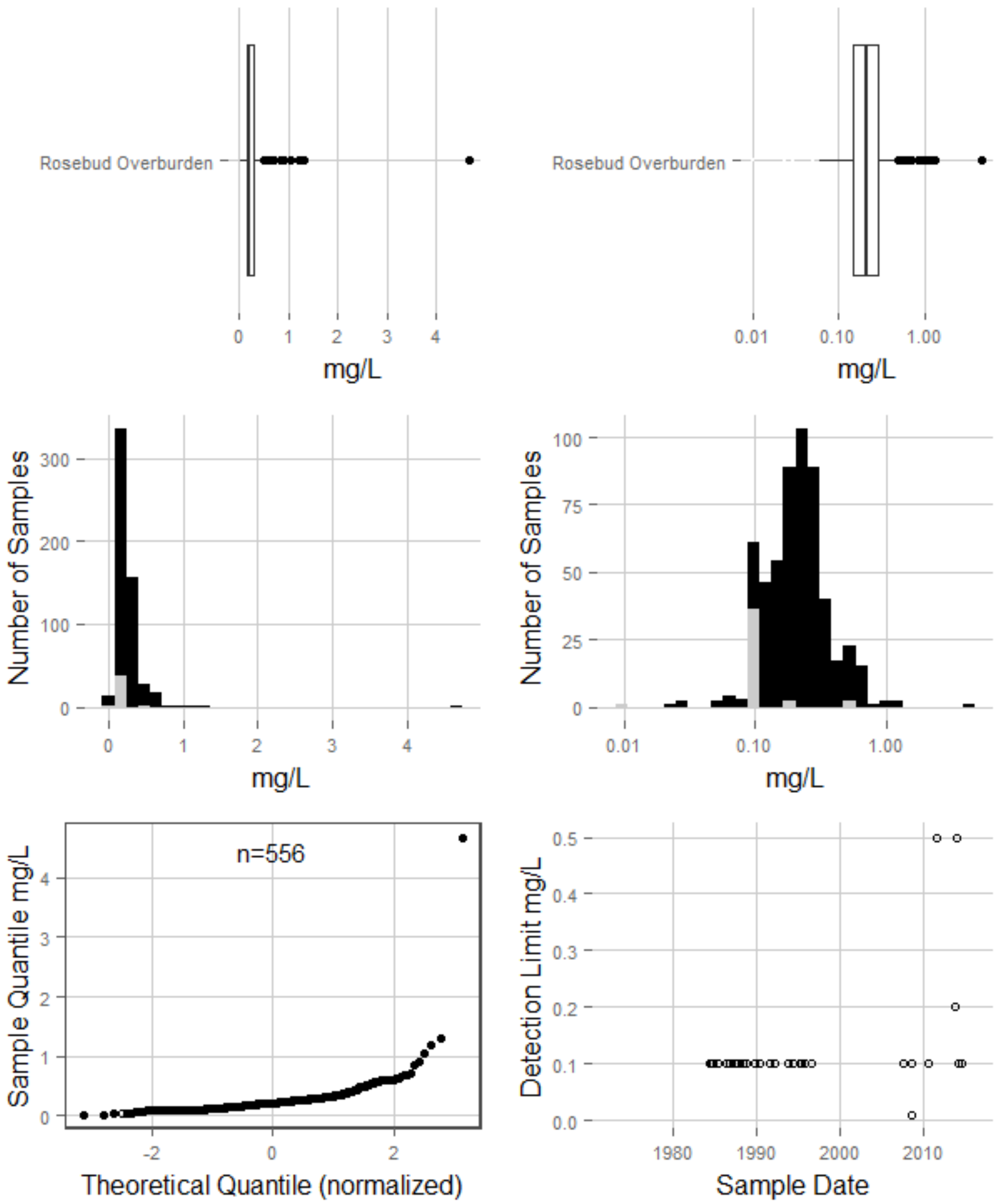
Fluoride
Spoils



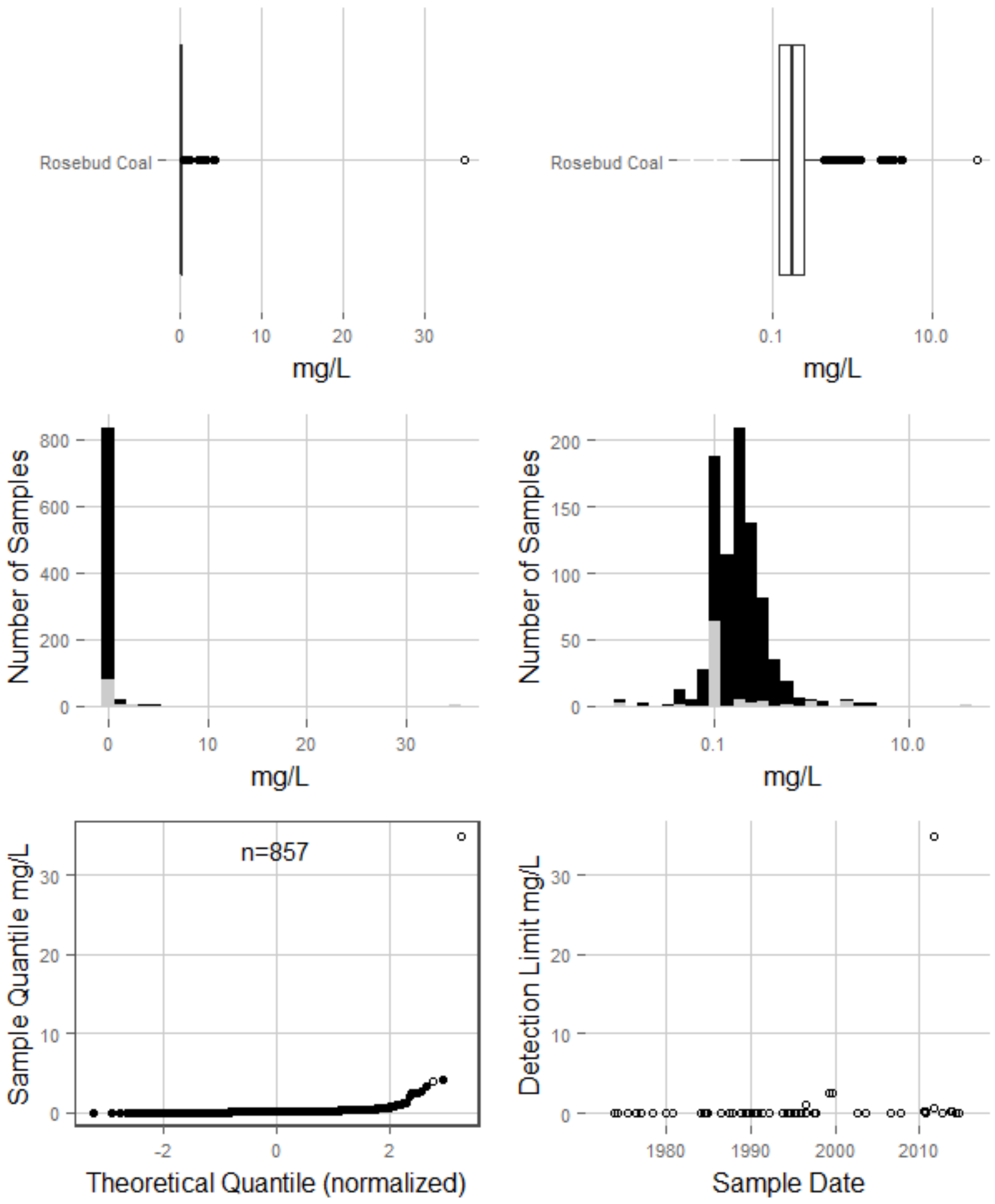
Fluoride
Clinker



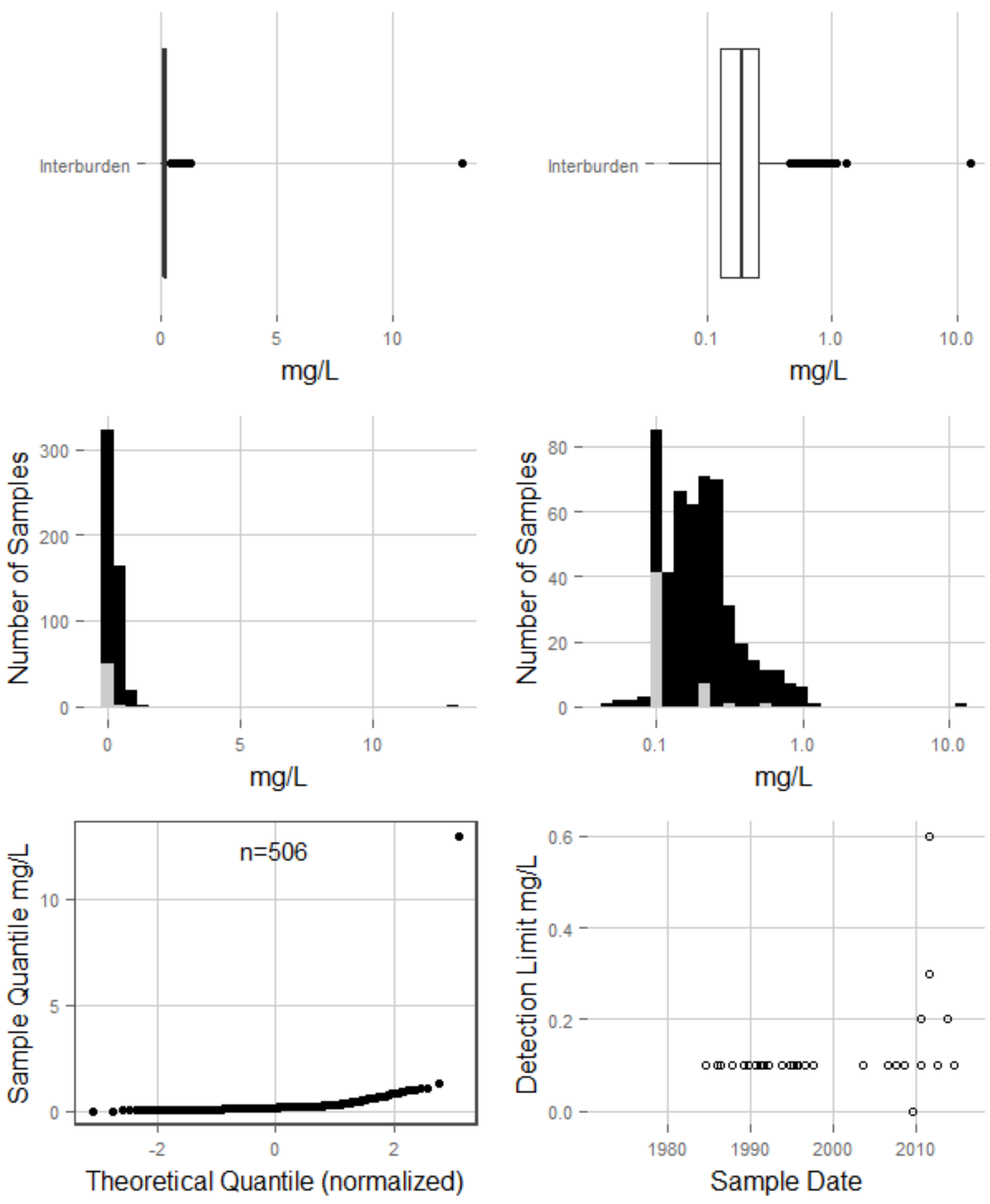
Fluoride
Rosebud Overburden



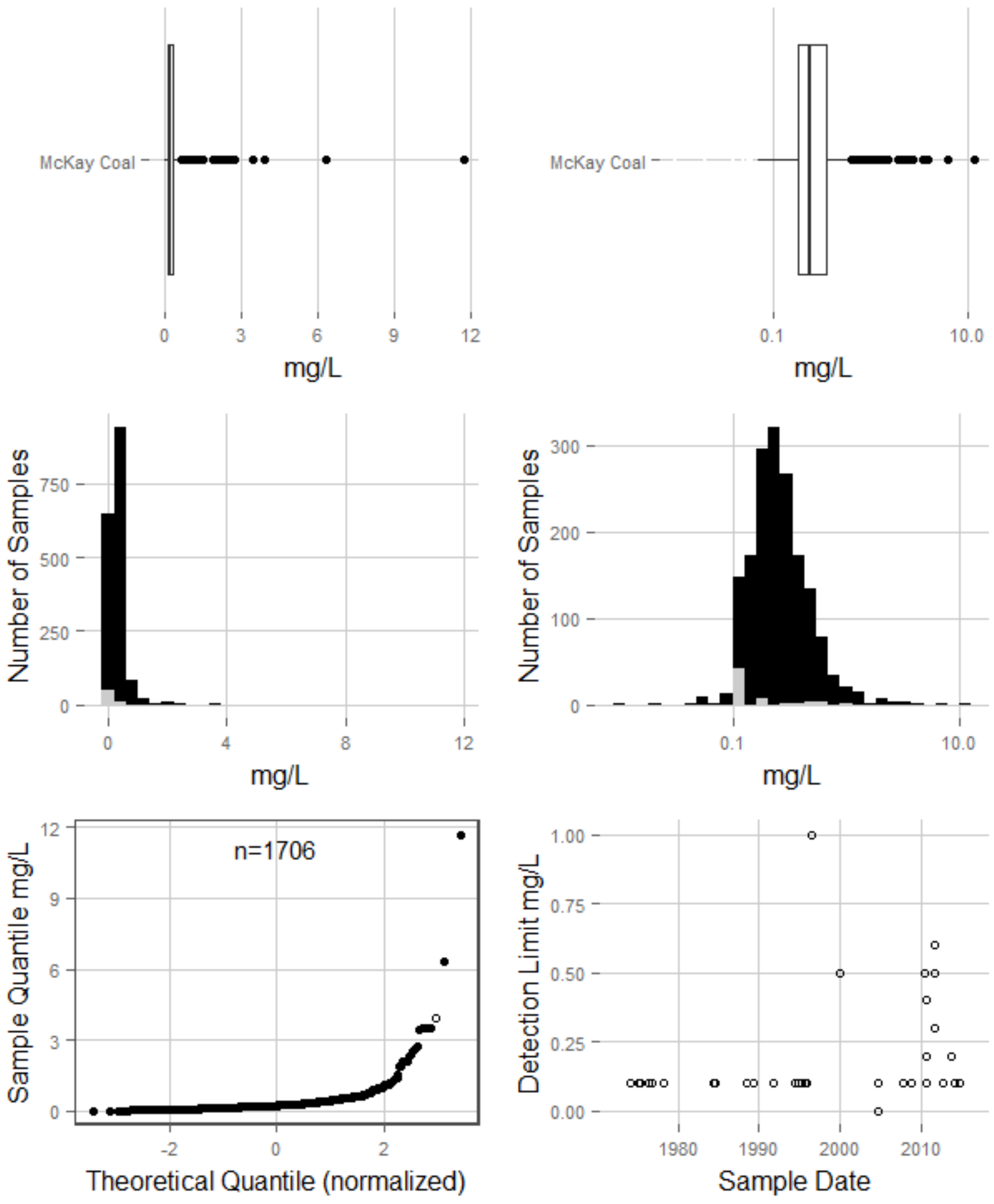
Fluoride
Rosebud Coal



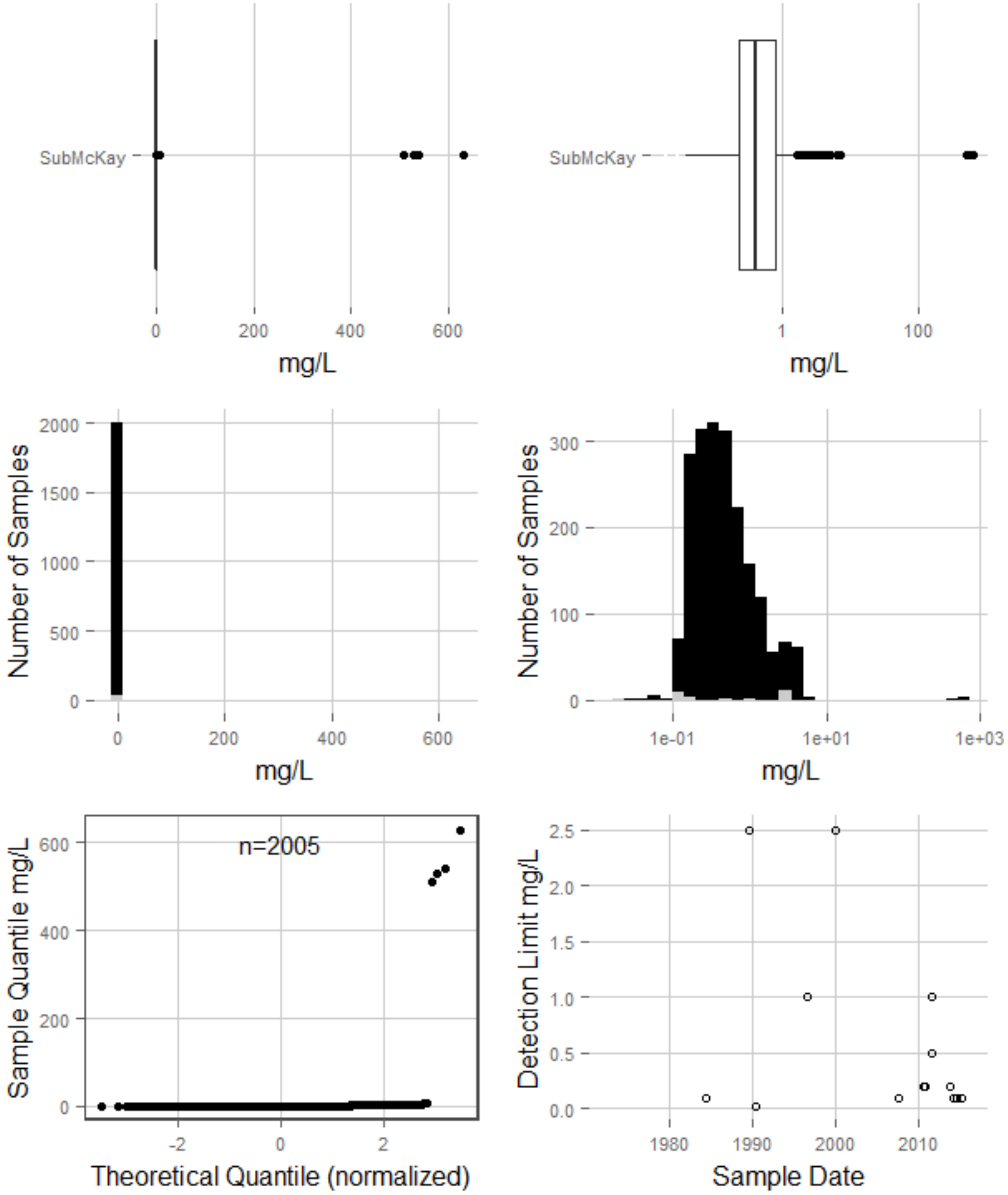
Fluoride
Interburden



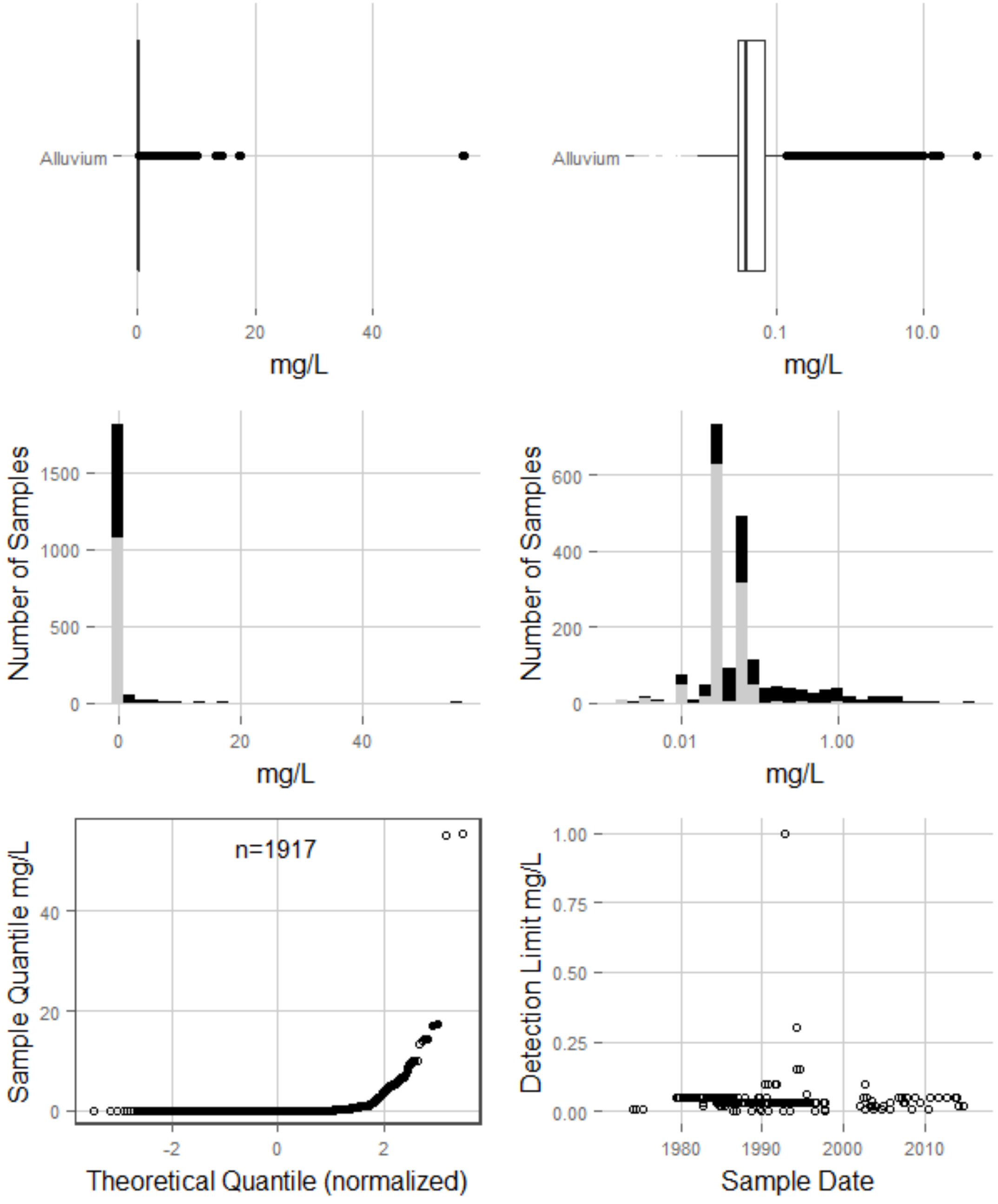
Fluoride
McKay Coal



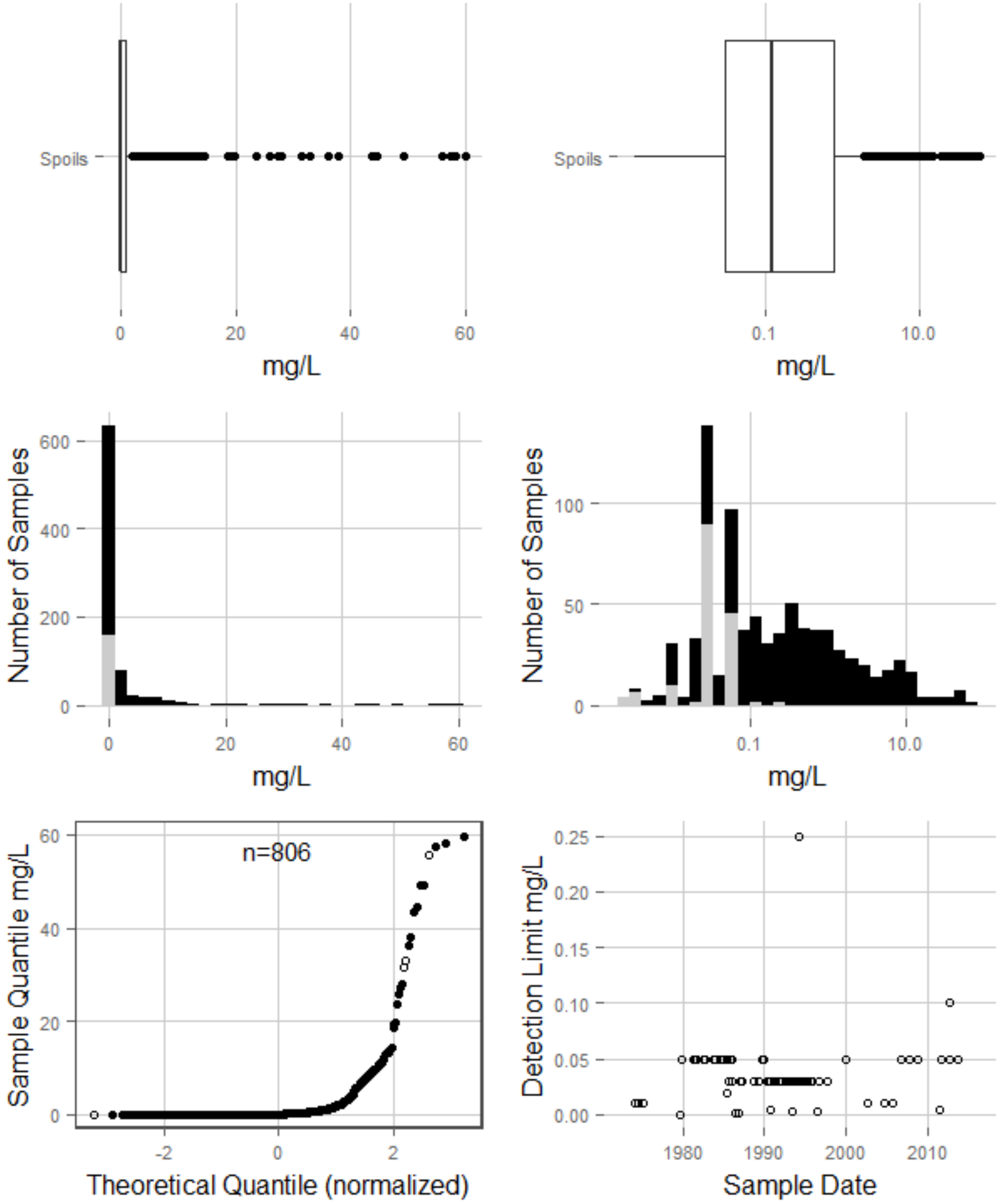
Fluoride
SubMcKay



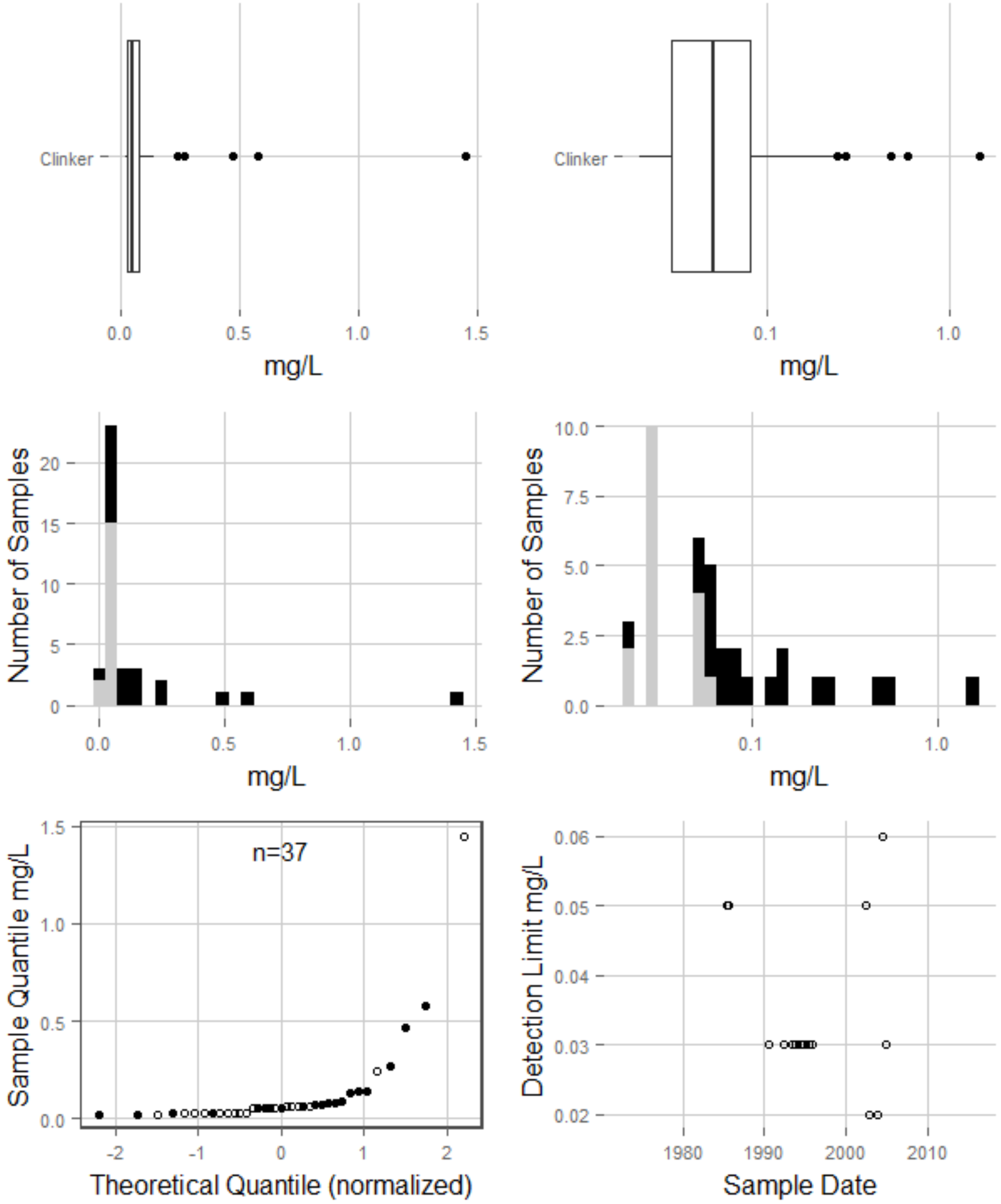
Iron
Alluvium



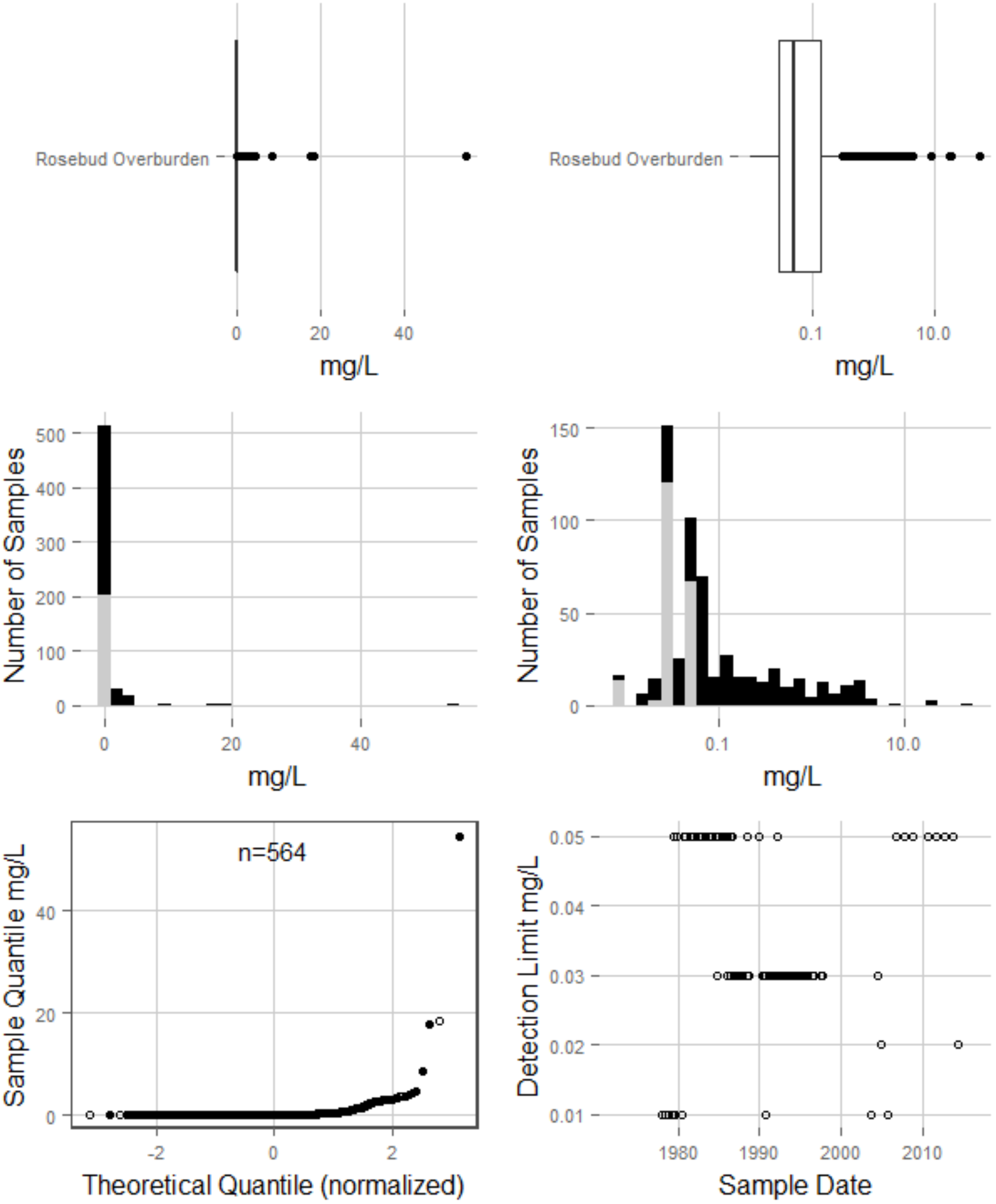
Iron
Spoils


Spoils
0
20
40
60
mg/L
Spoils
0.1
10.0
mg/L
Number of Samples
600
400
200
0
0
20
40
60
mg/L
Number of Samples
100
50
0
0.1
10.0
mg/L
Sample Quantile mg/L
60
40
20
0
n=806
-2
0
2
Theoretical Quantile (normalized)
Detection Limit mg/L
0.25
0.20
0.15
0.10
0.05
0.00
1980
1990
2000
2010
Sample Date

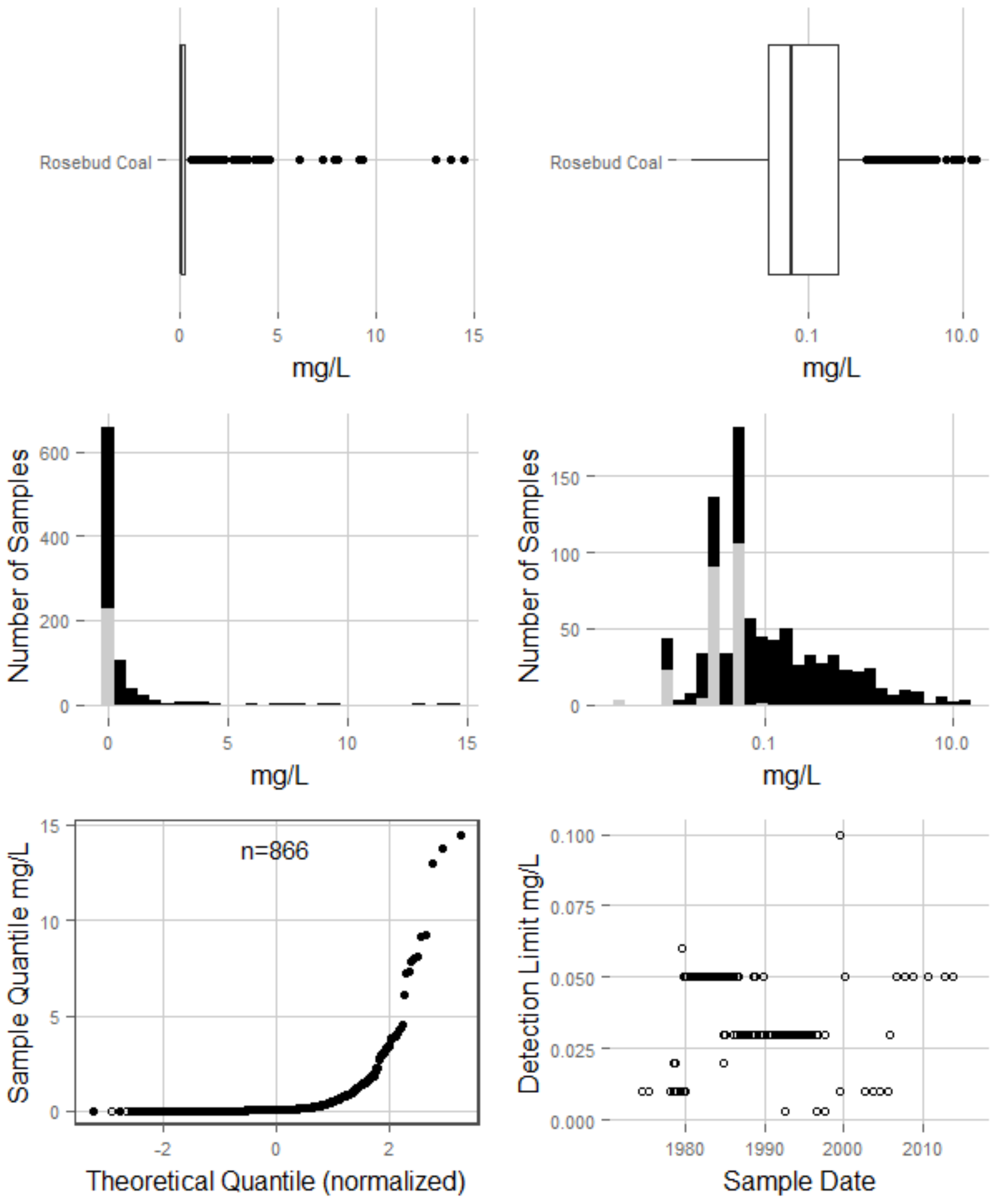
Iron
Clinker



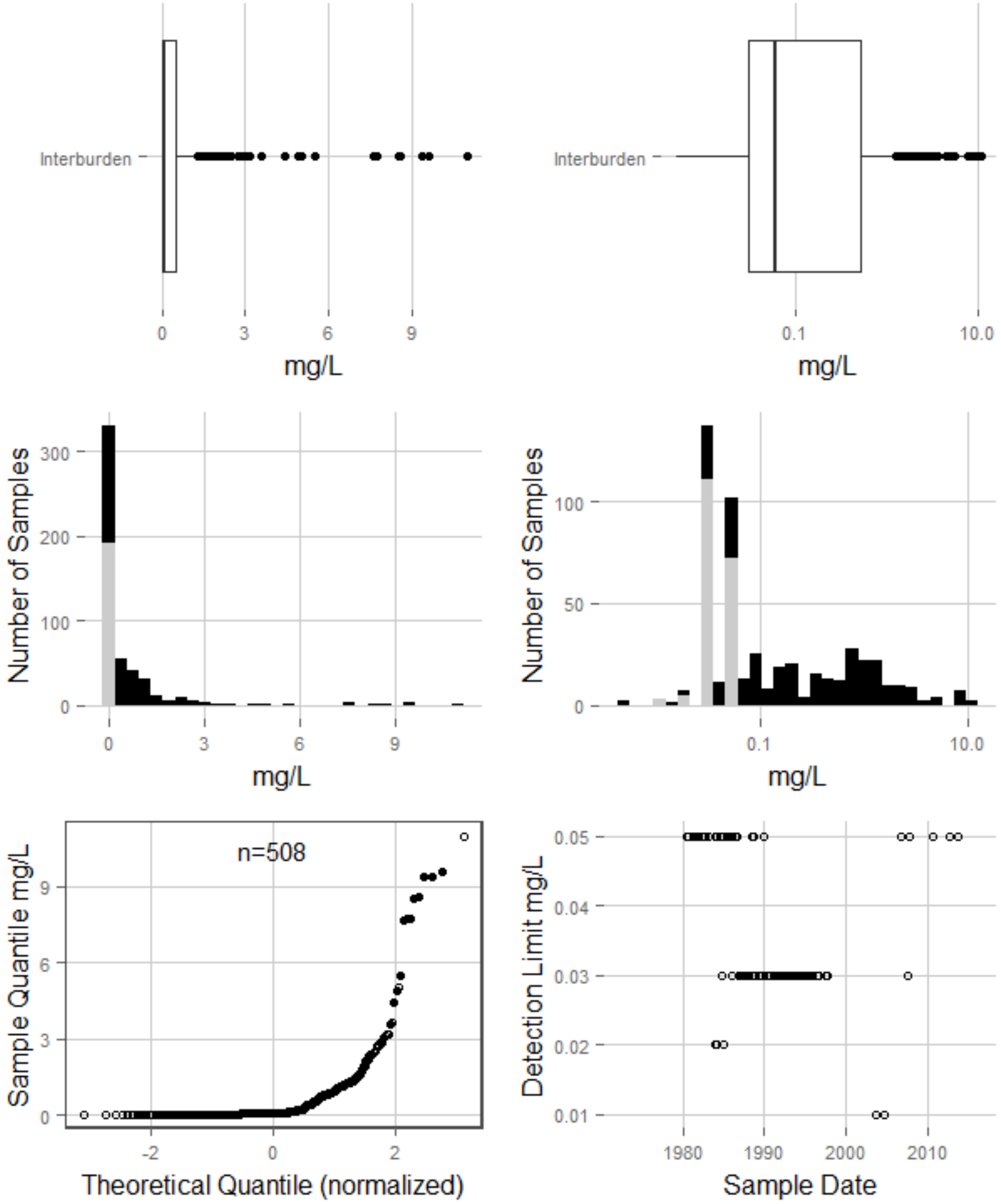
Iron
Rosebud Overburden



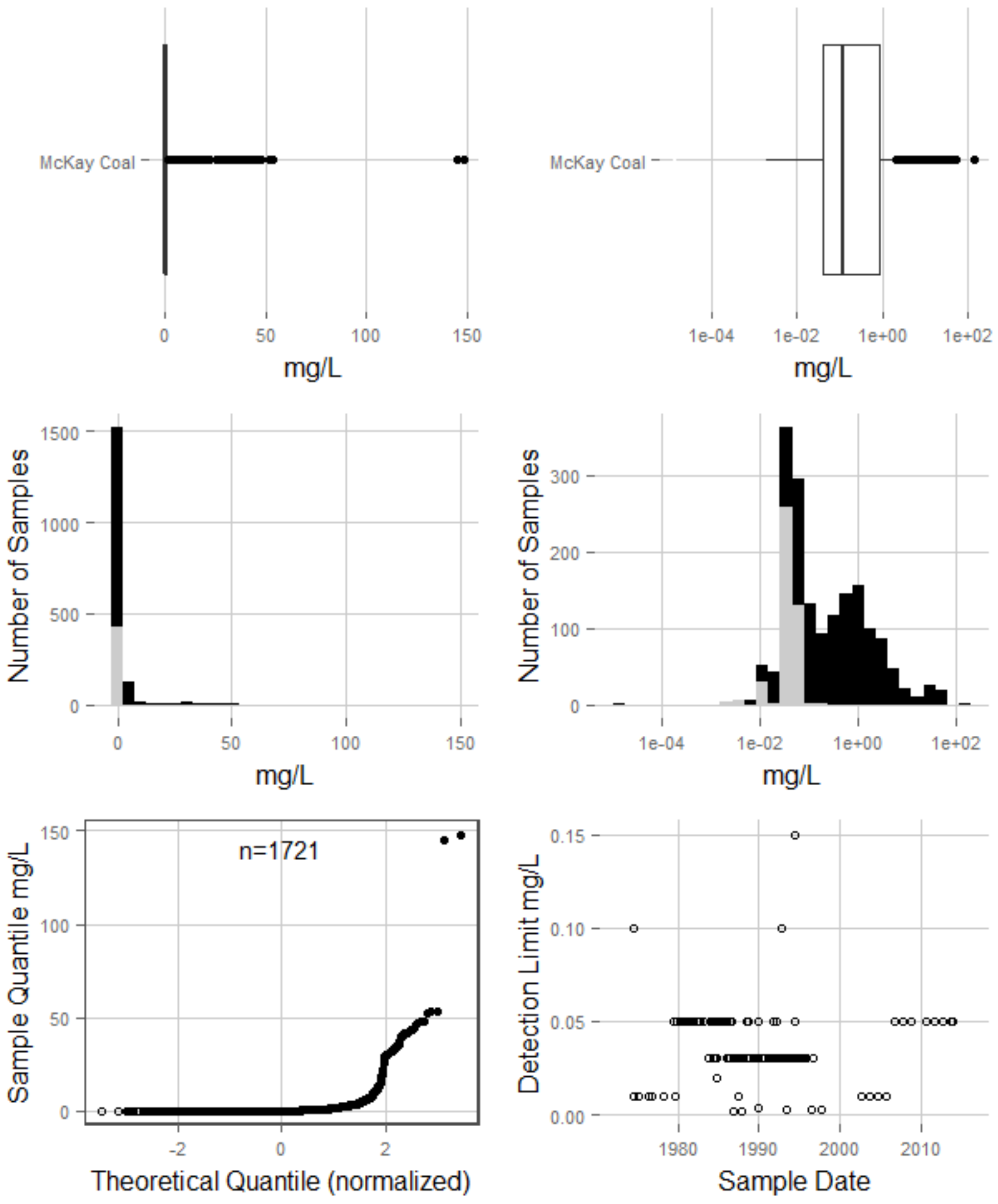
Iron
Rosebud Coal



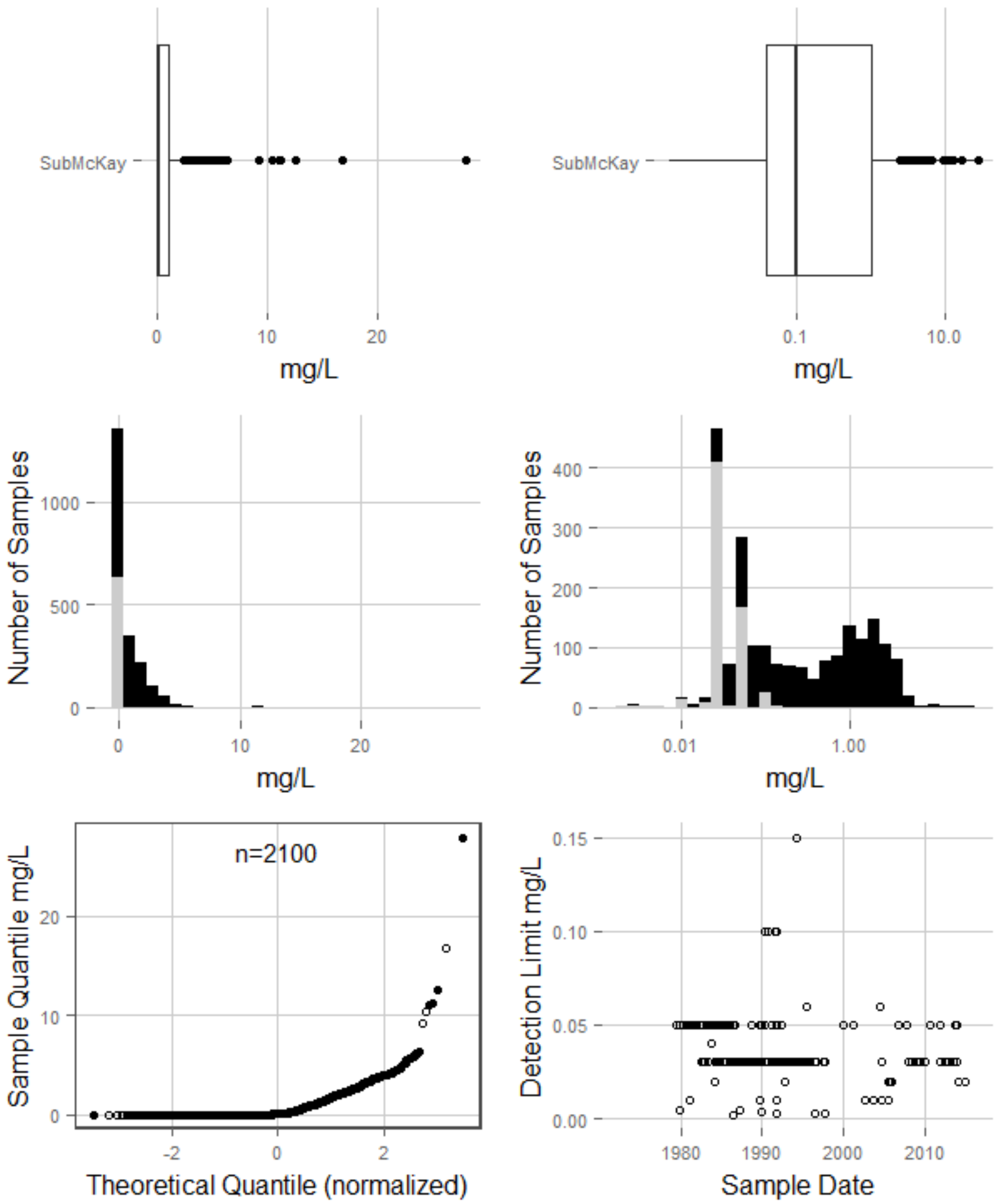
Iron
Interburden



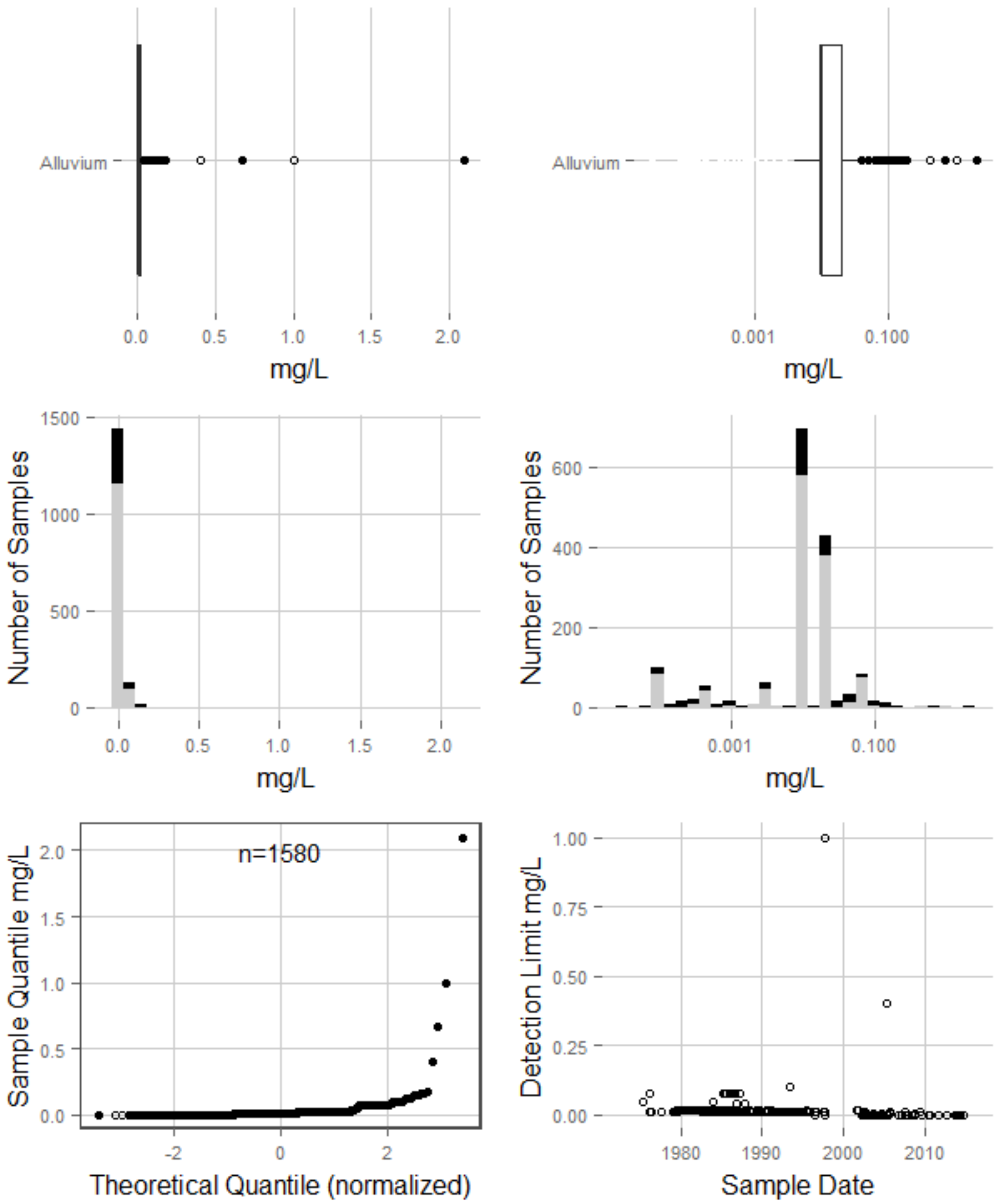
Iron
McKay Coal



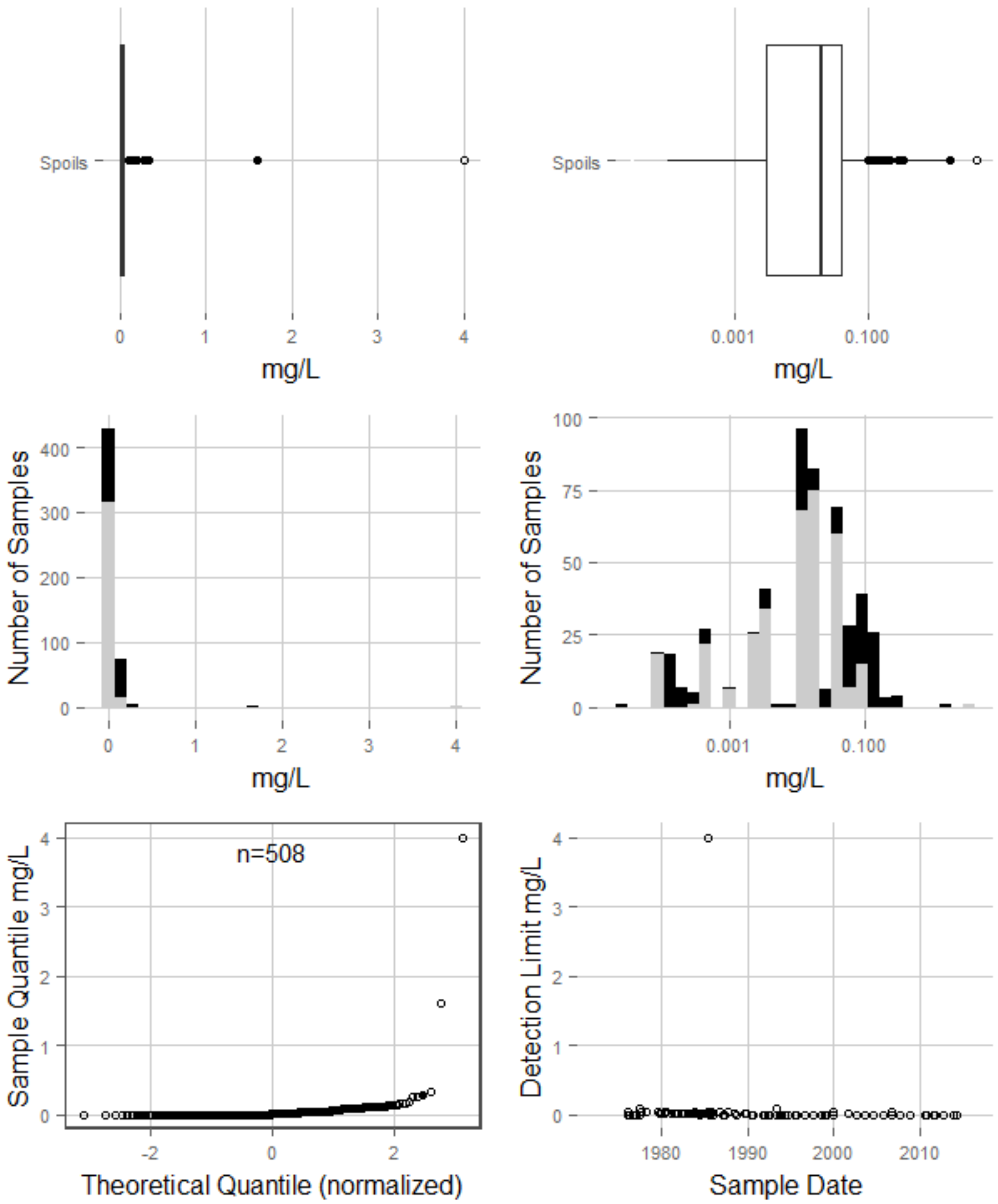
Iron
SubMcKay



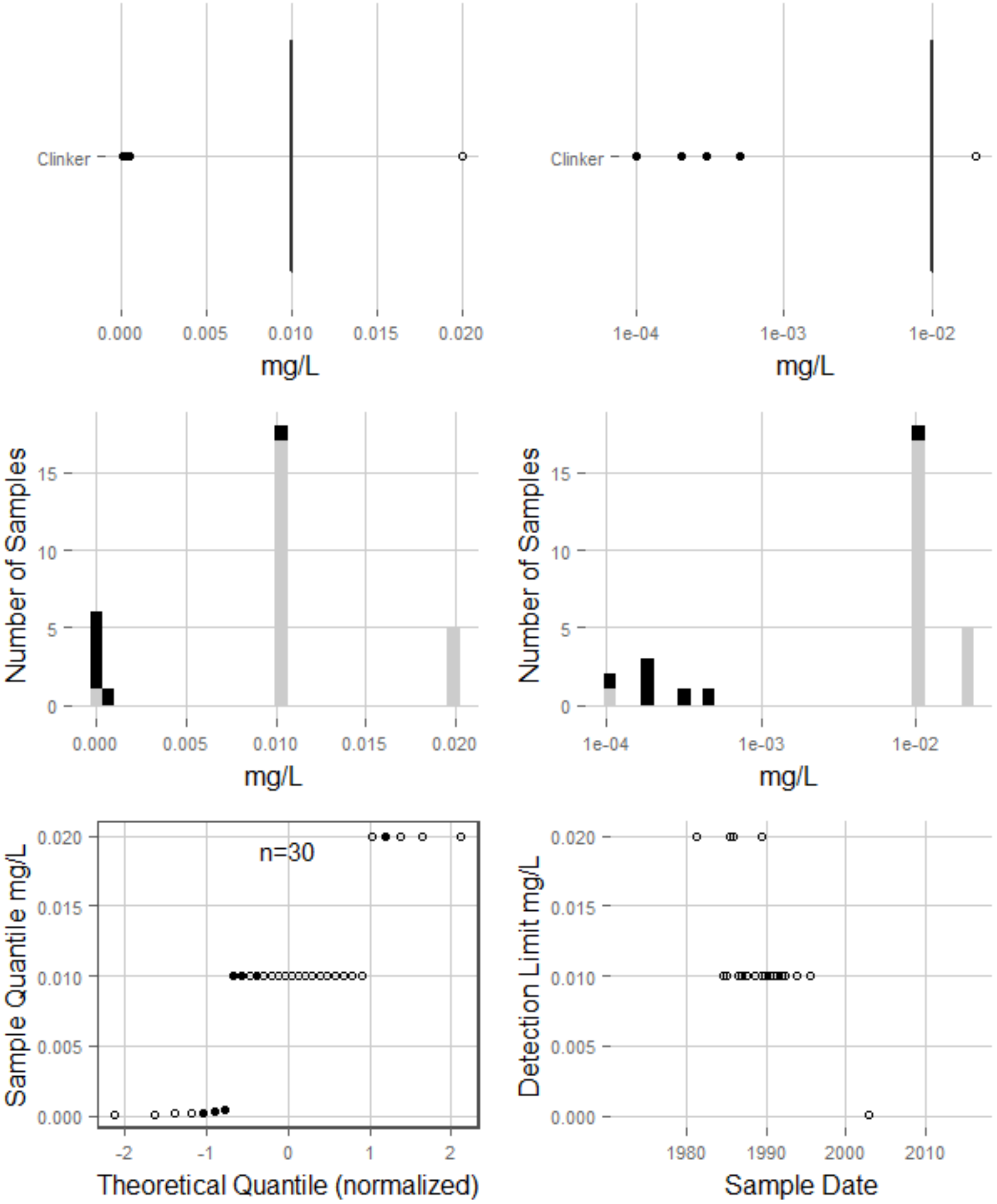
Lead
Alluvium



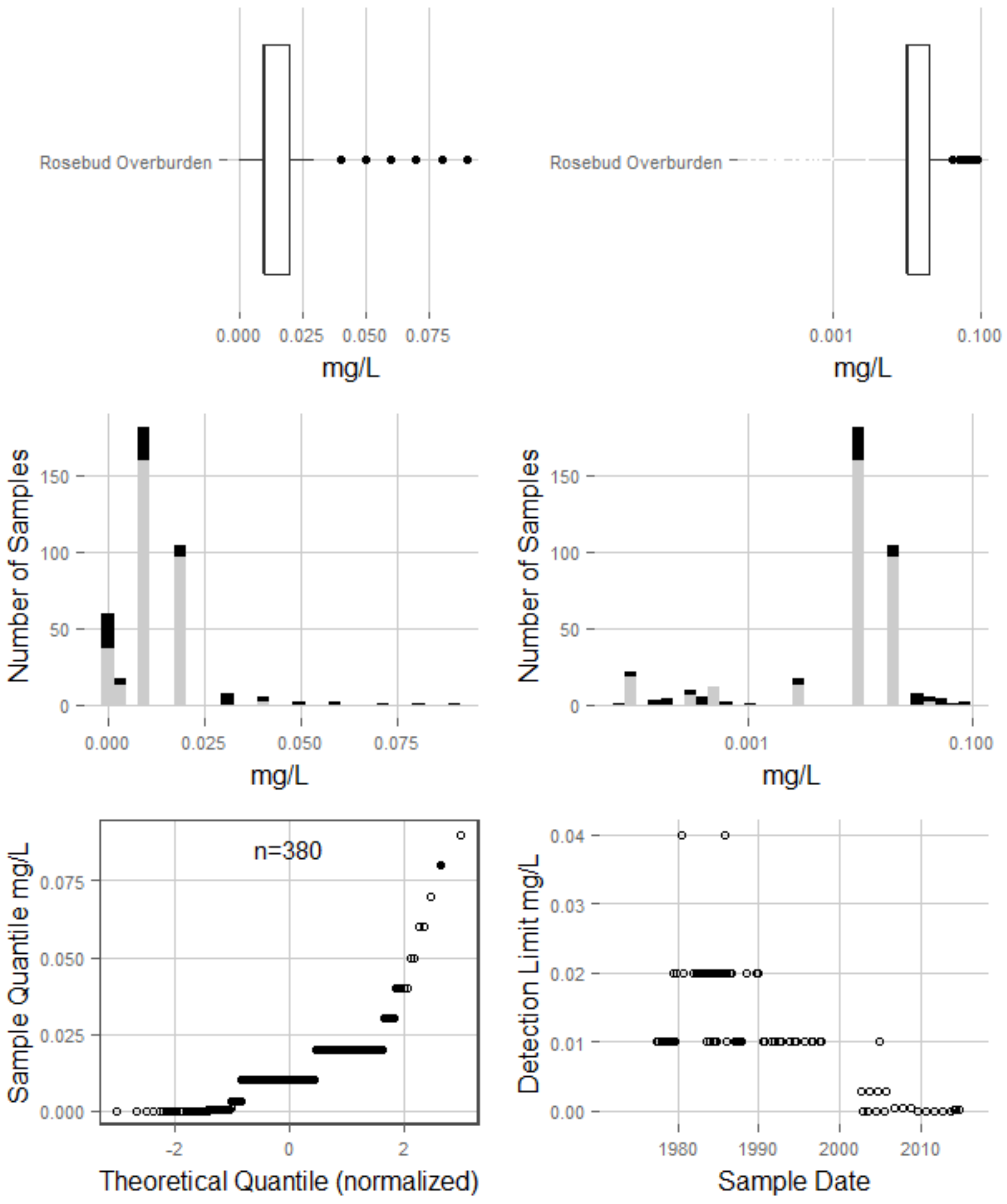
Lead
Spoils


Spoils
0
1
2
3
4
mg/L
Spoils
0.001
0.100
mg/L
Number of Samples
400
300
200
100
0
0
1
2
3
4
mg/L
Number of Samples
100
75
50
25
0
0.001
0.100
mg/L
Sample Quantile mg/L
n=508
4
3
2
1
0
-2
0
2
Theoretical Quantile (normalized)
Detection Limit mg/L
4
3
2
1
0
1980
1990
2000
2010
Sample Date

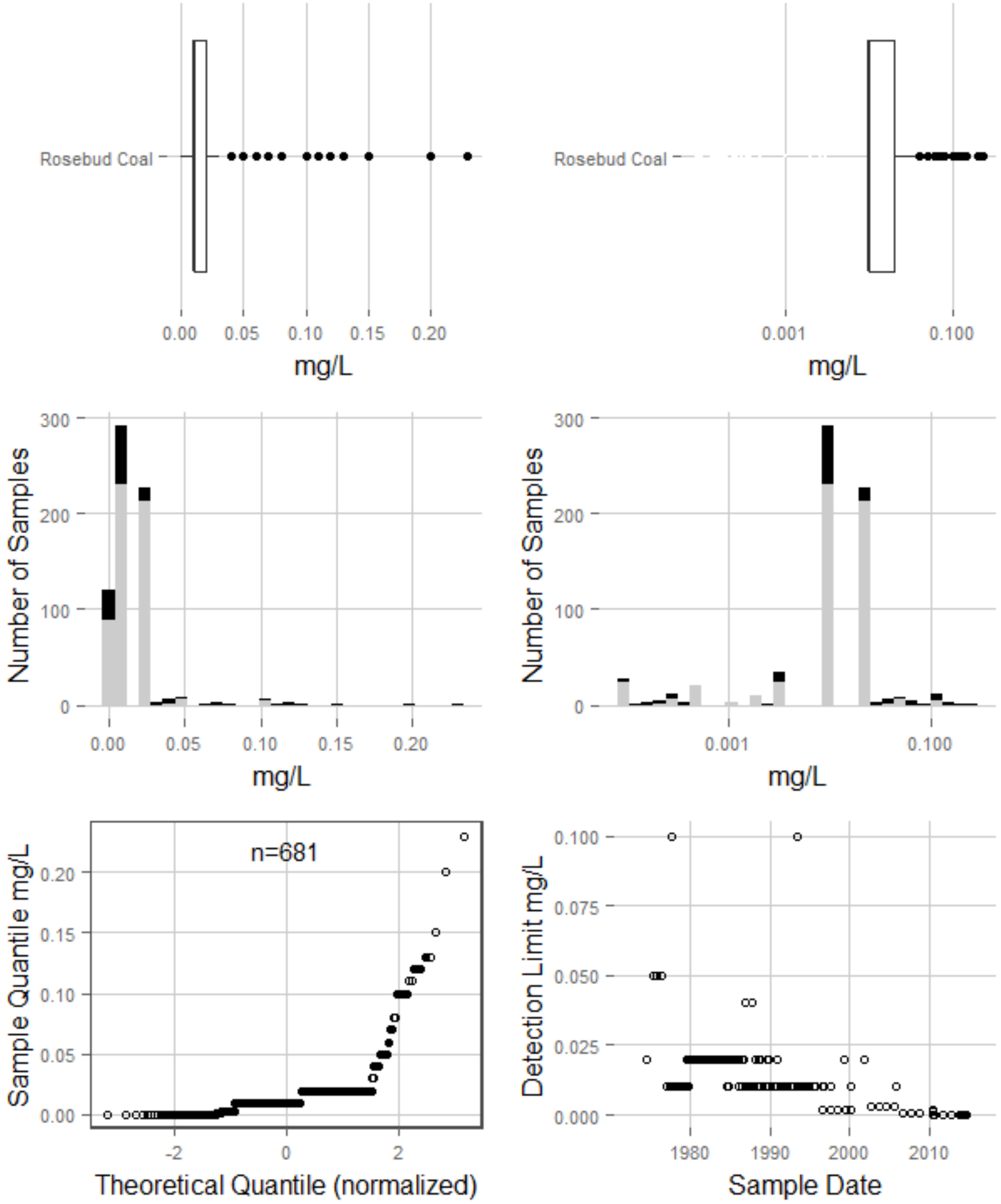
Lead
Clinker



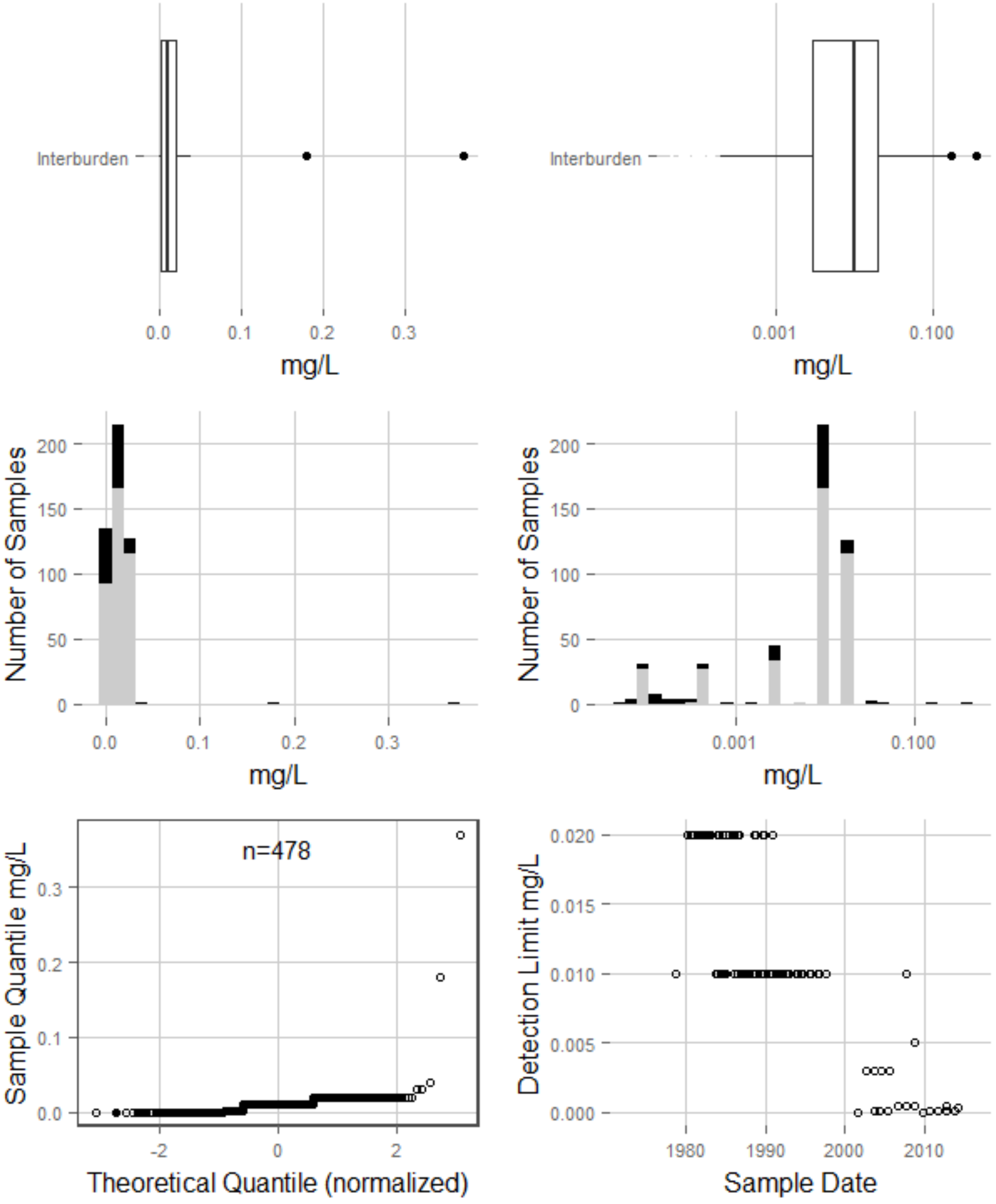
Lead
Rosebud Overburden



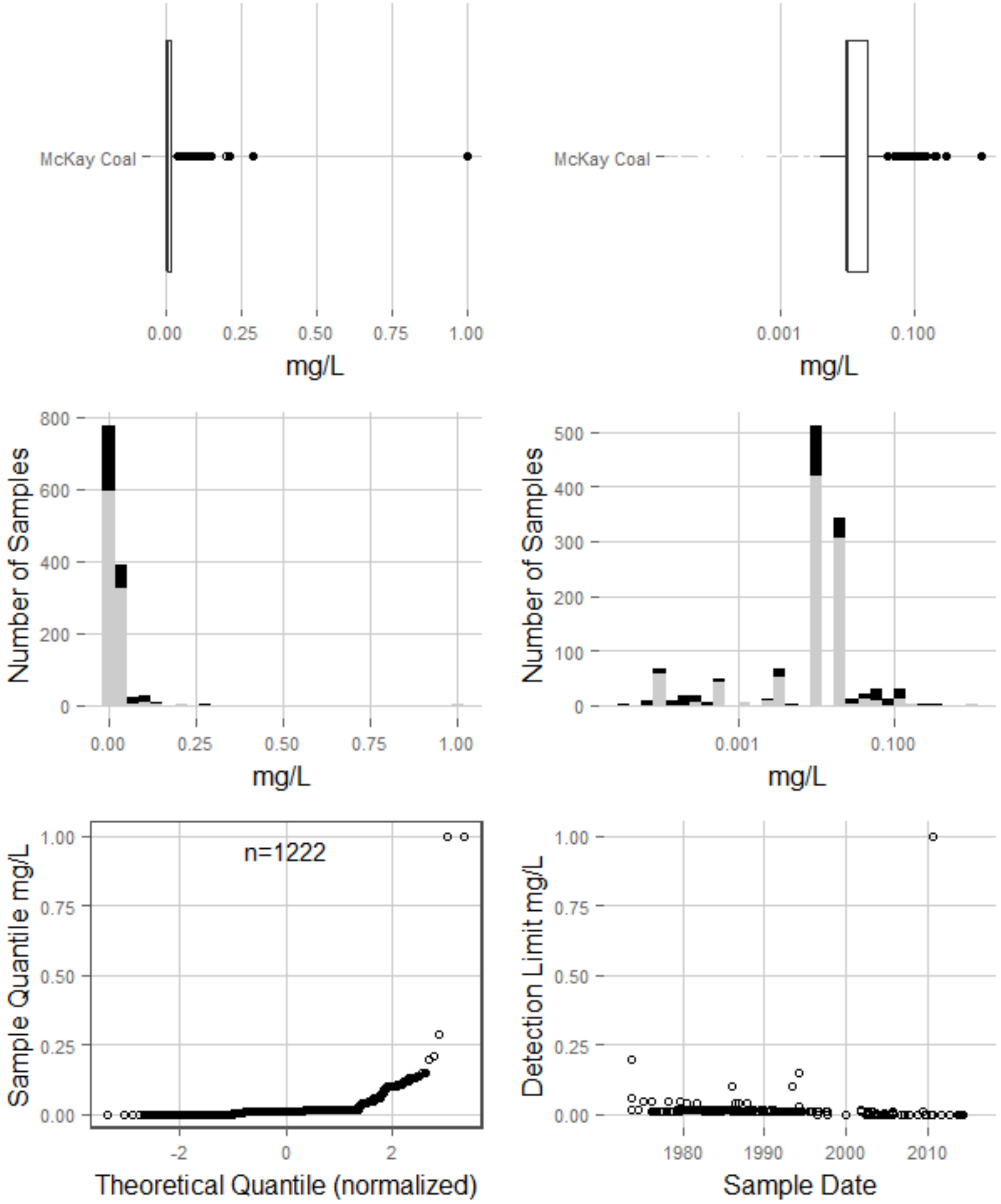
Lead
Rosebud Coal



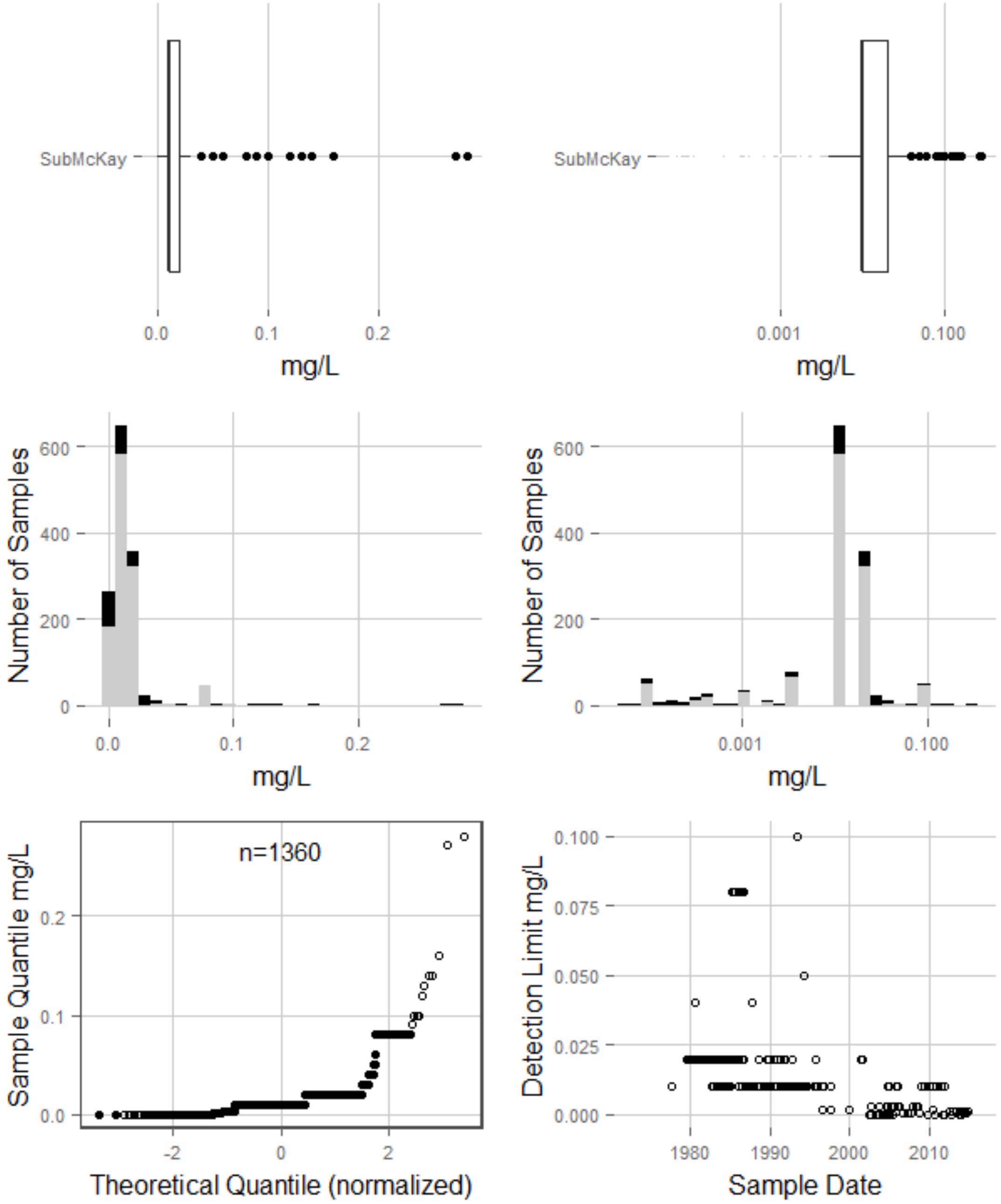
Lead
Interburden



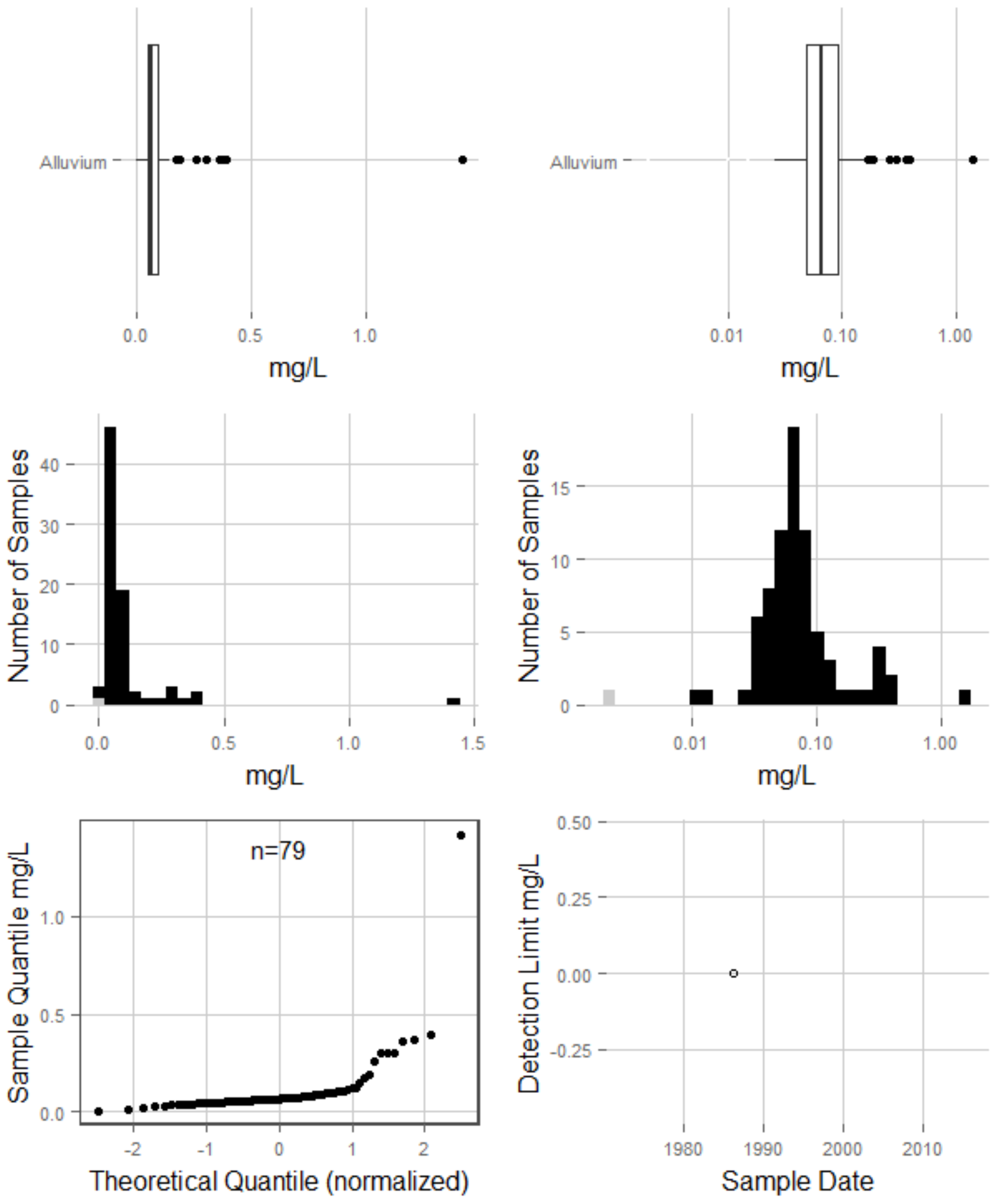
Lead
McKay Coal



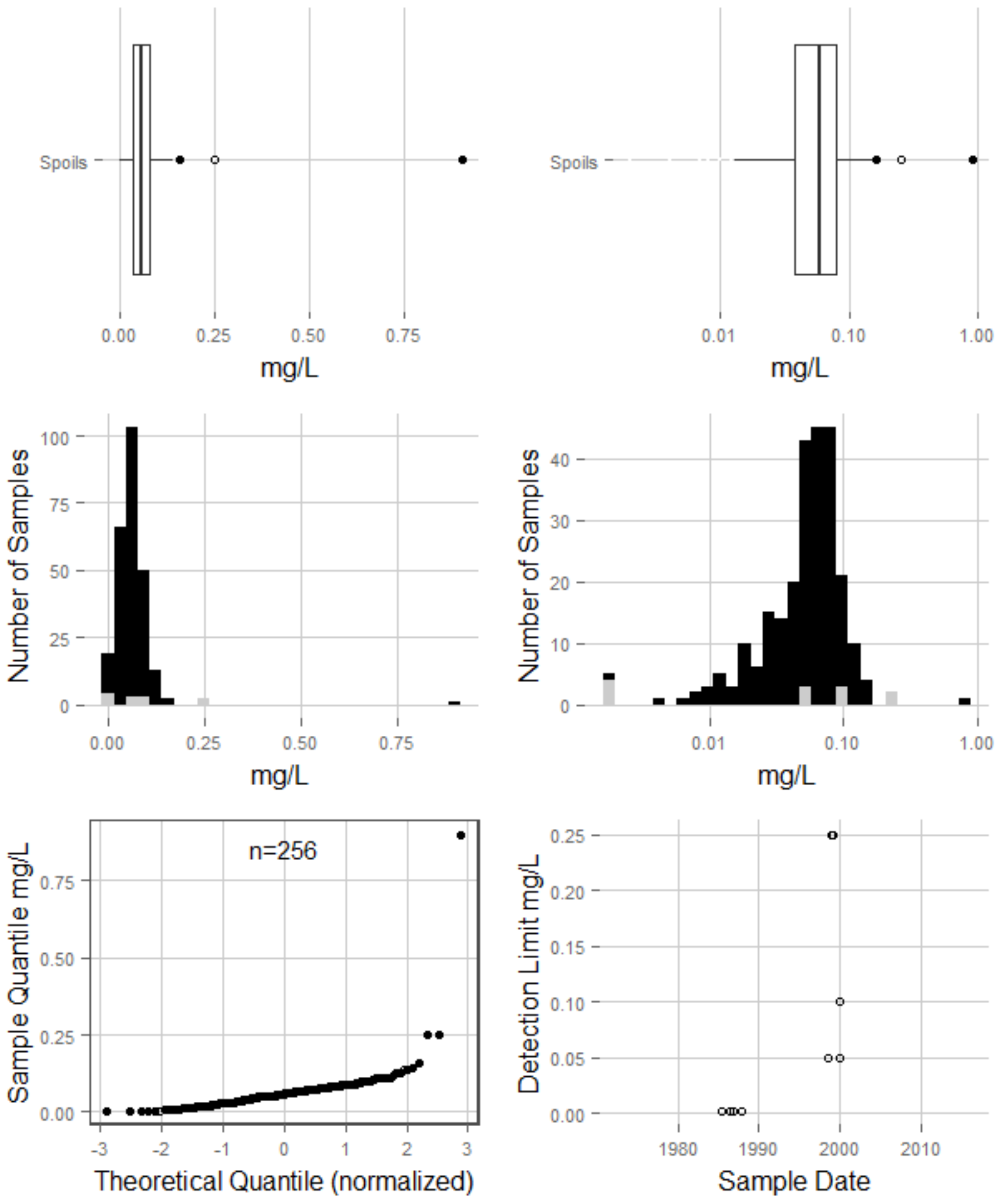
Lead
SubMcKay



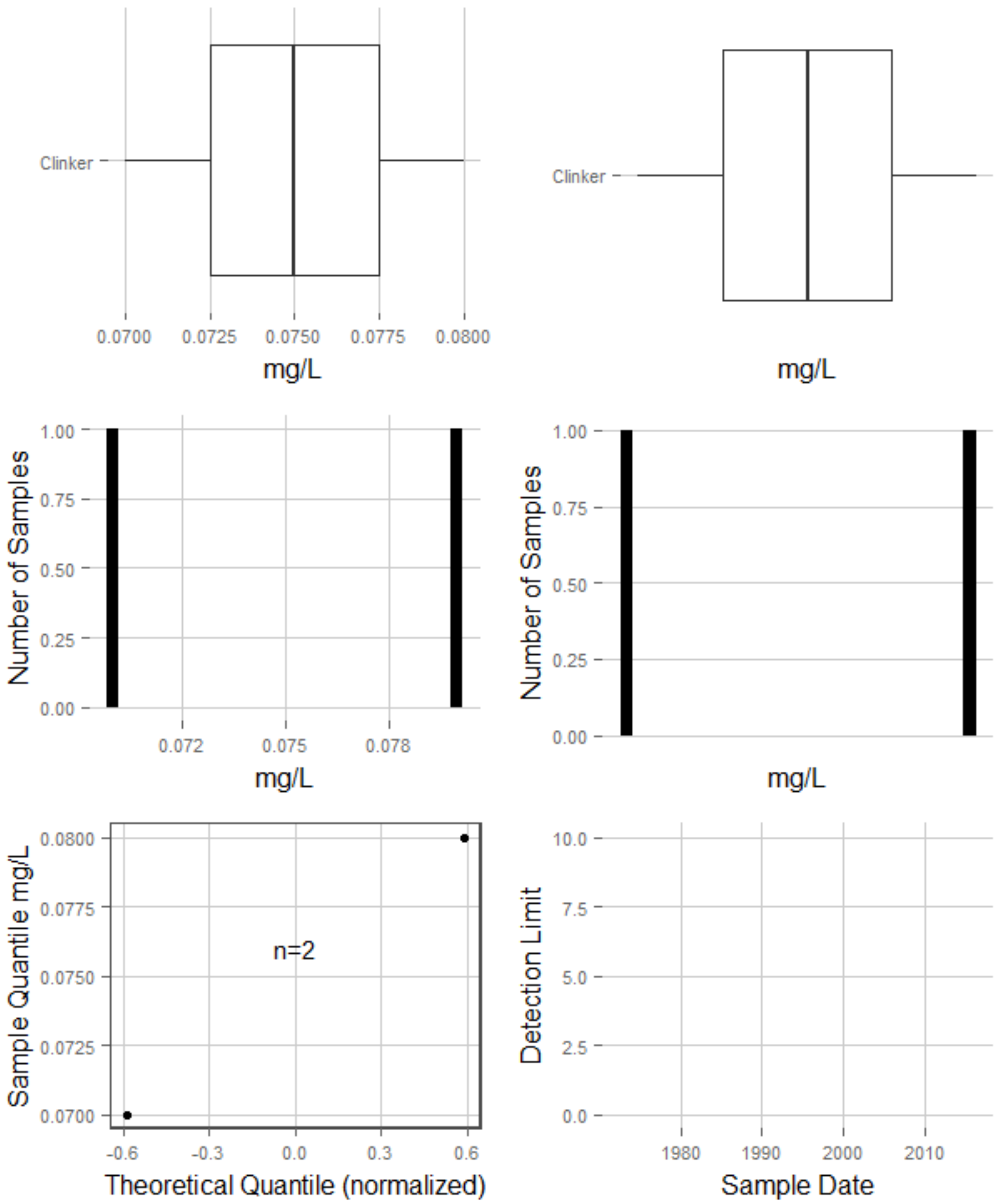
Lithium
Alluvium



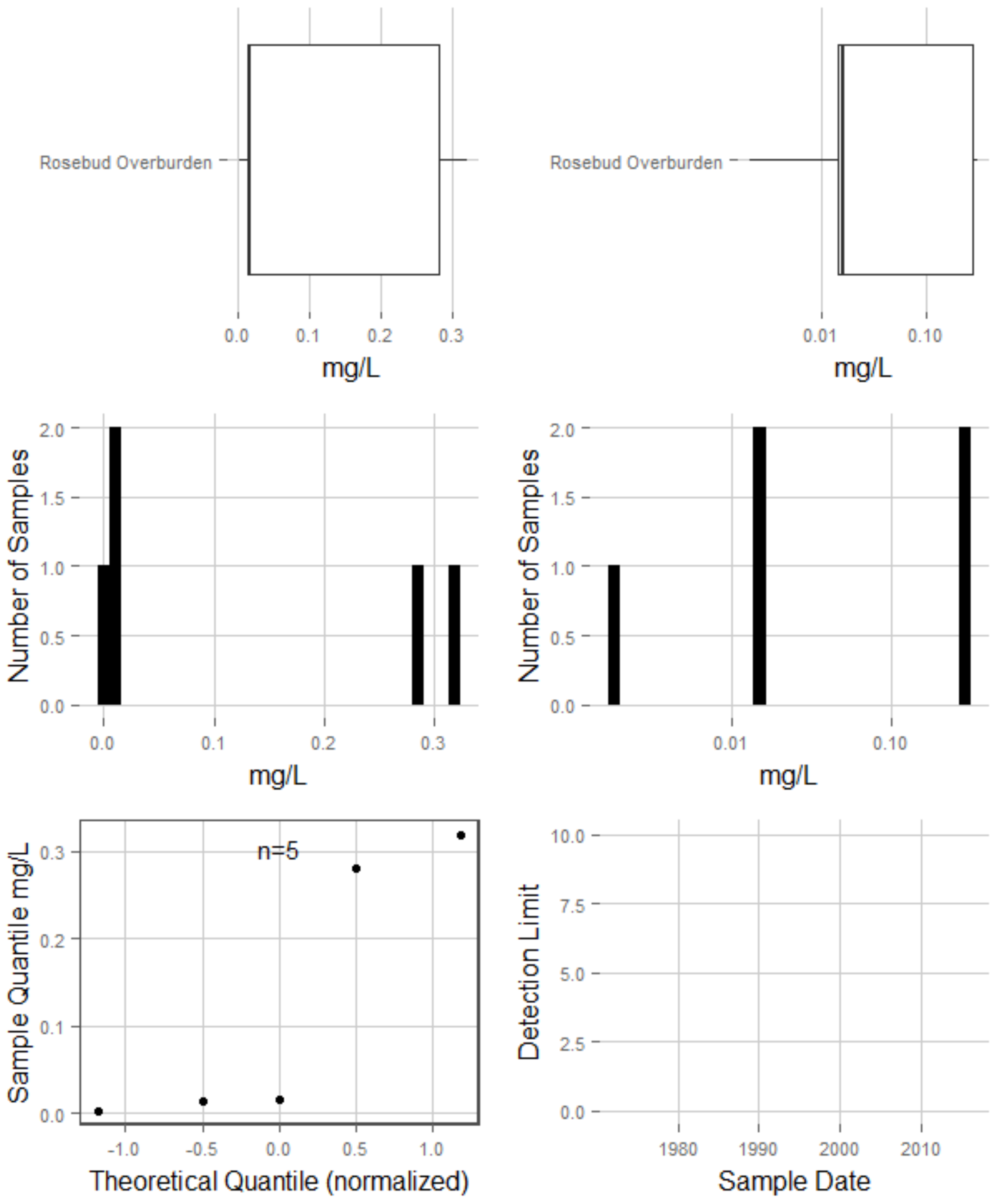
Lithium
Spoils



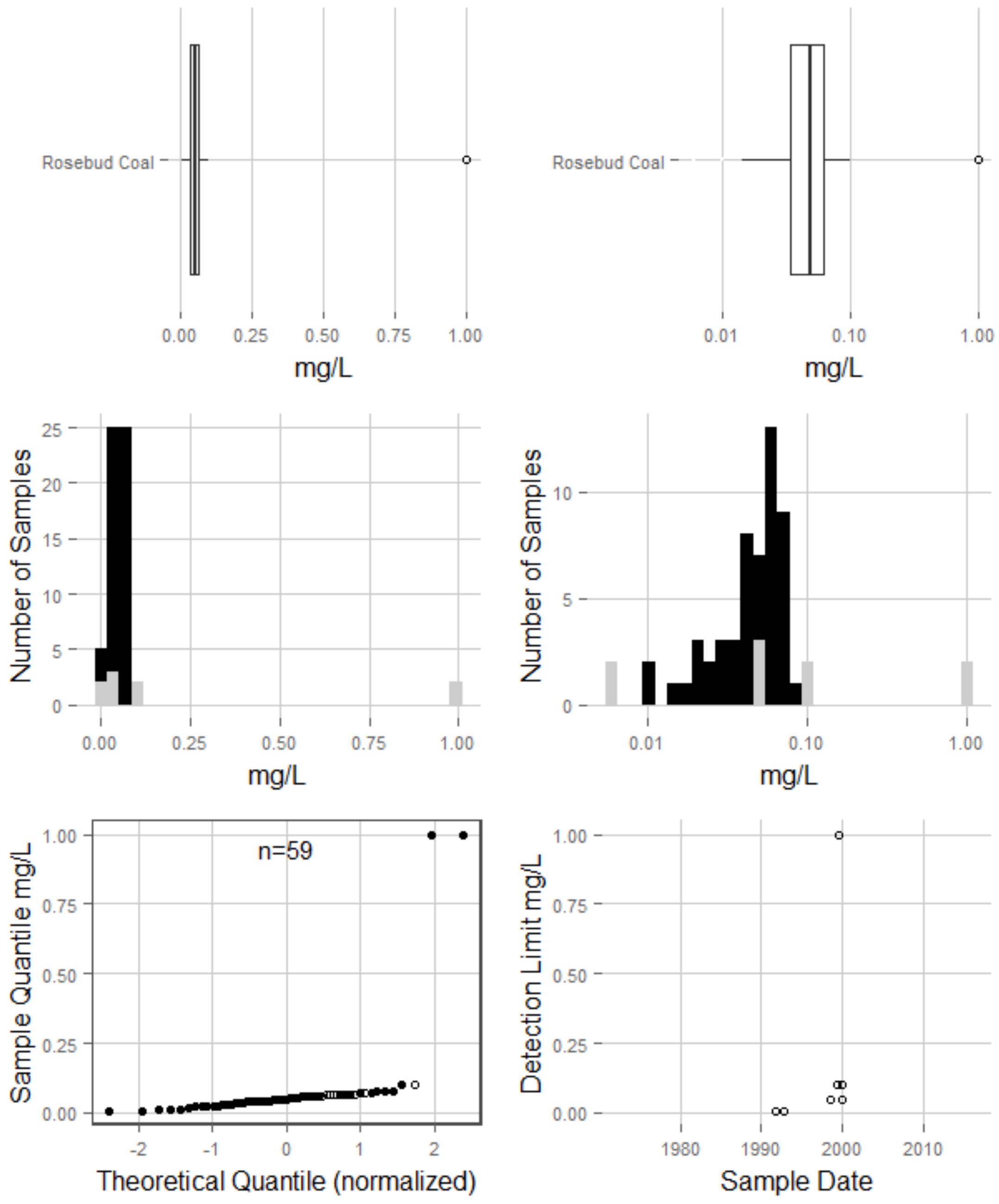
Lithium
Clinker



Lithium
Rosebud Overburden

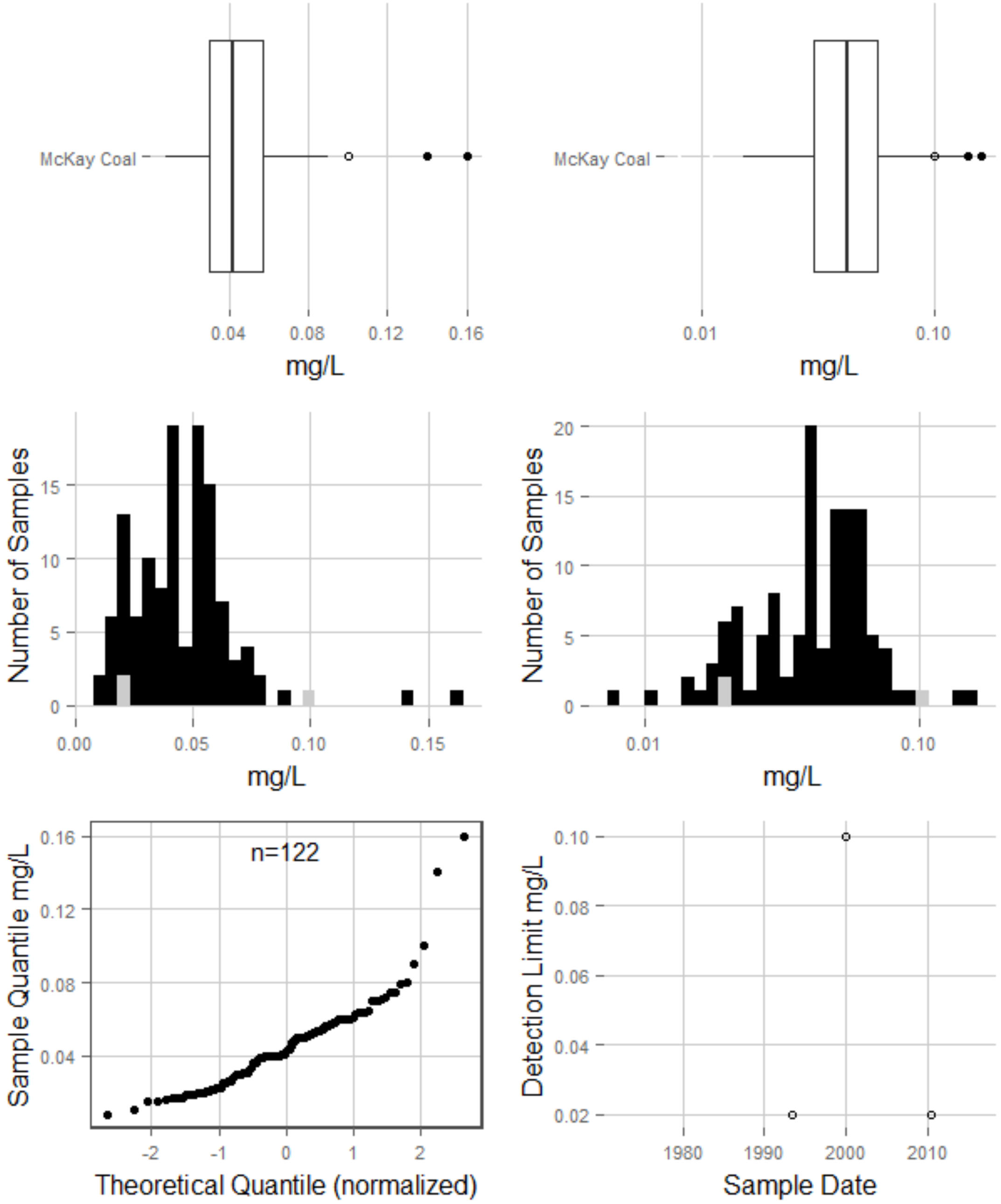


Lithium
Rosebud Coal

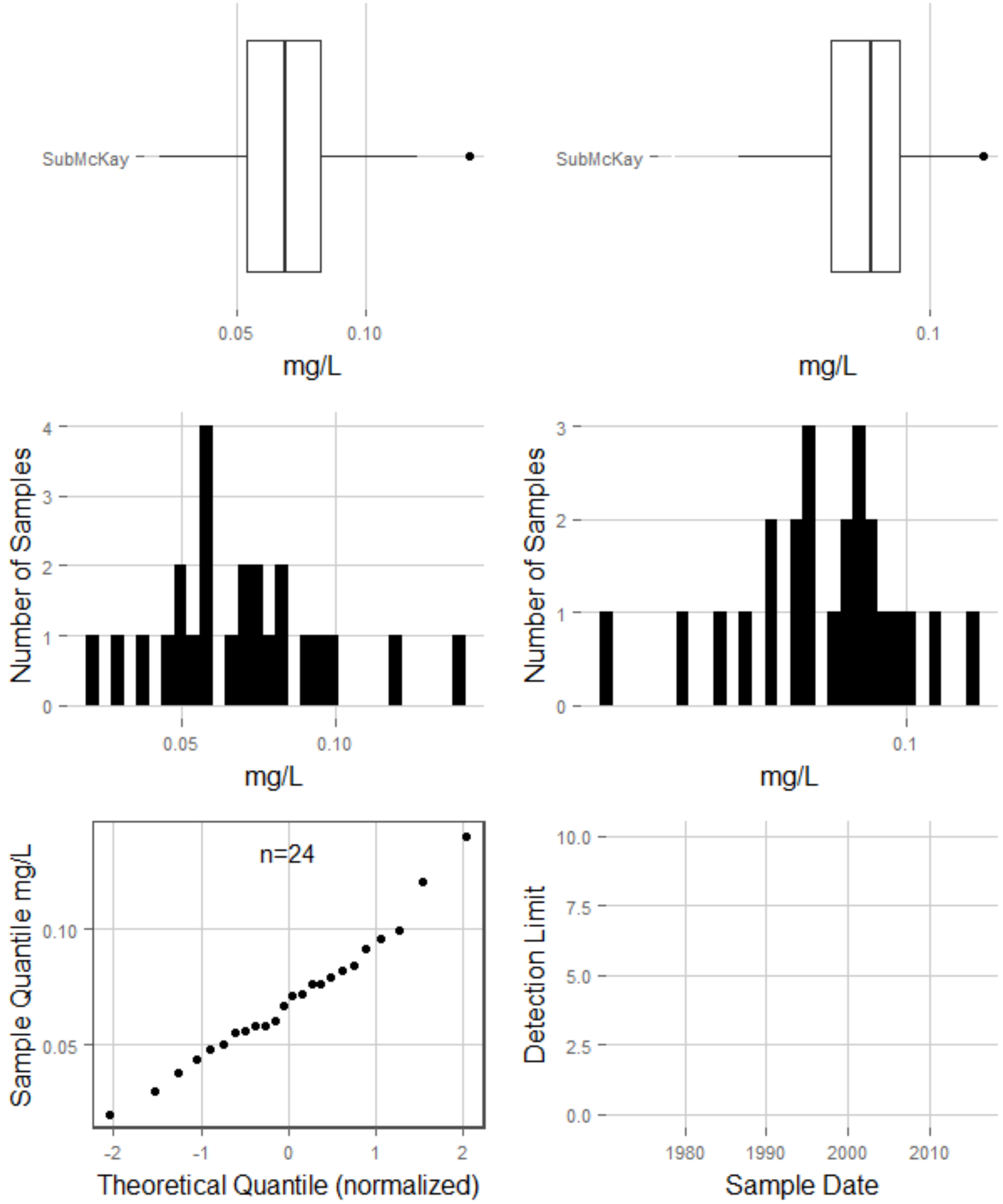


Lithium
Interburden
No data

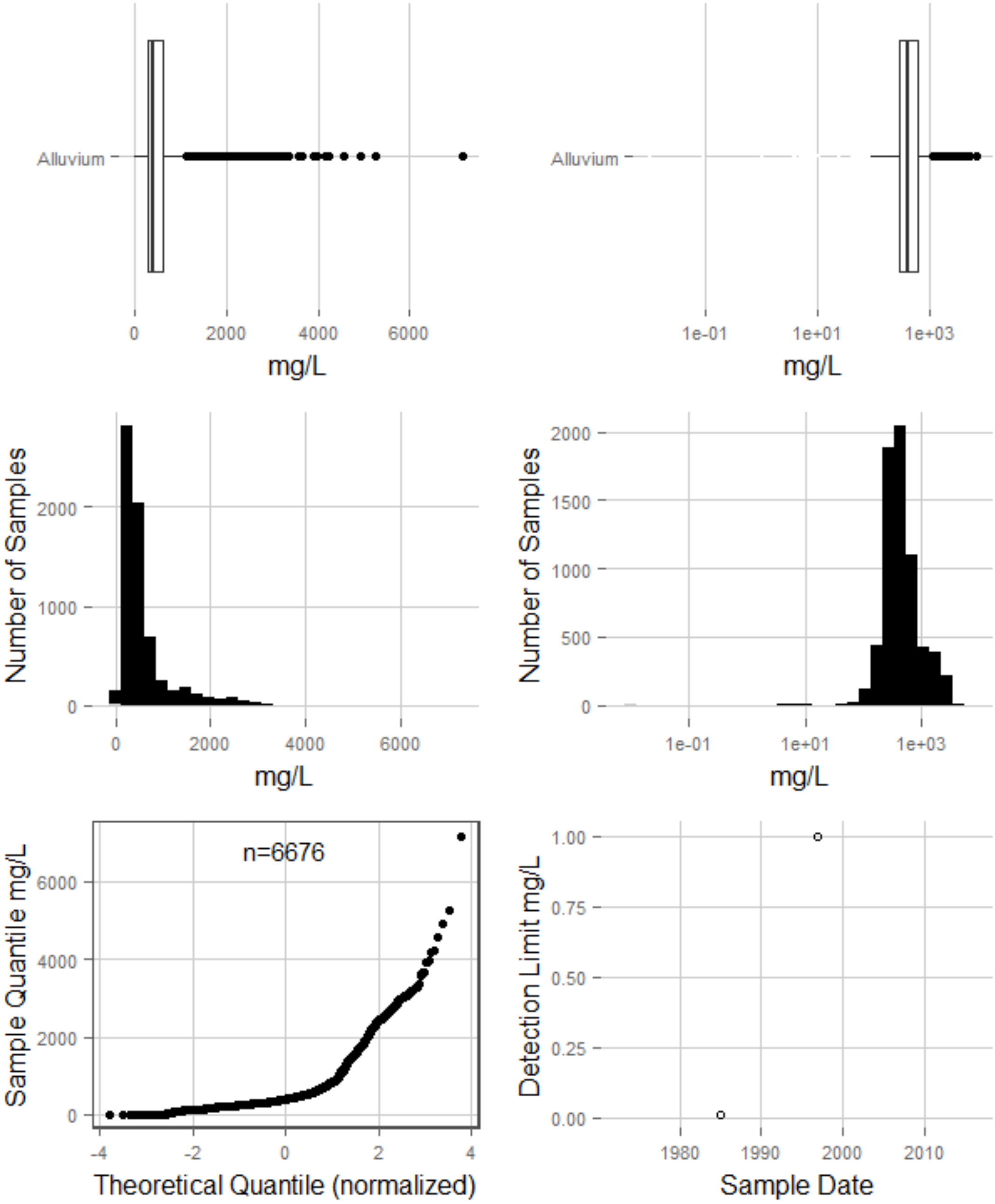
Lithium
McKay Coal



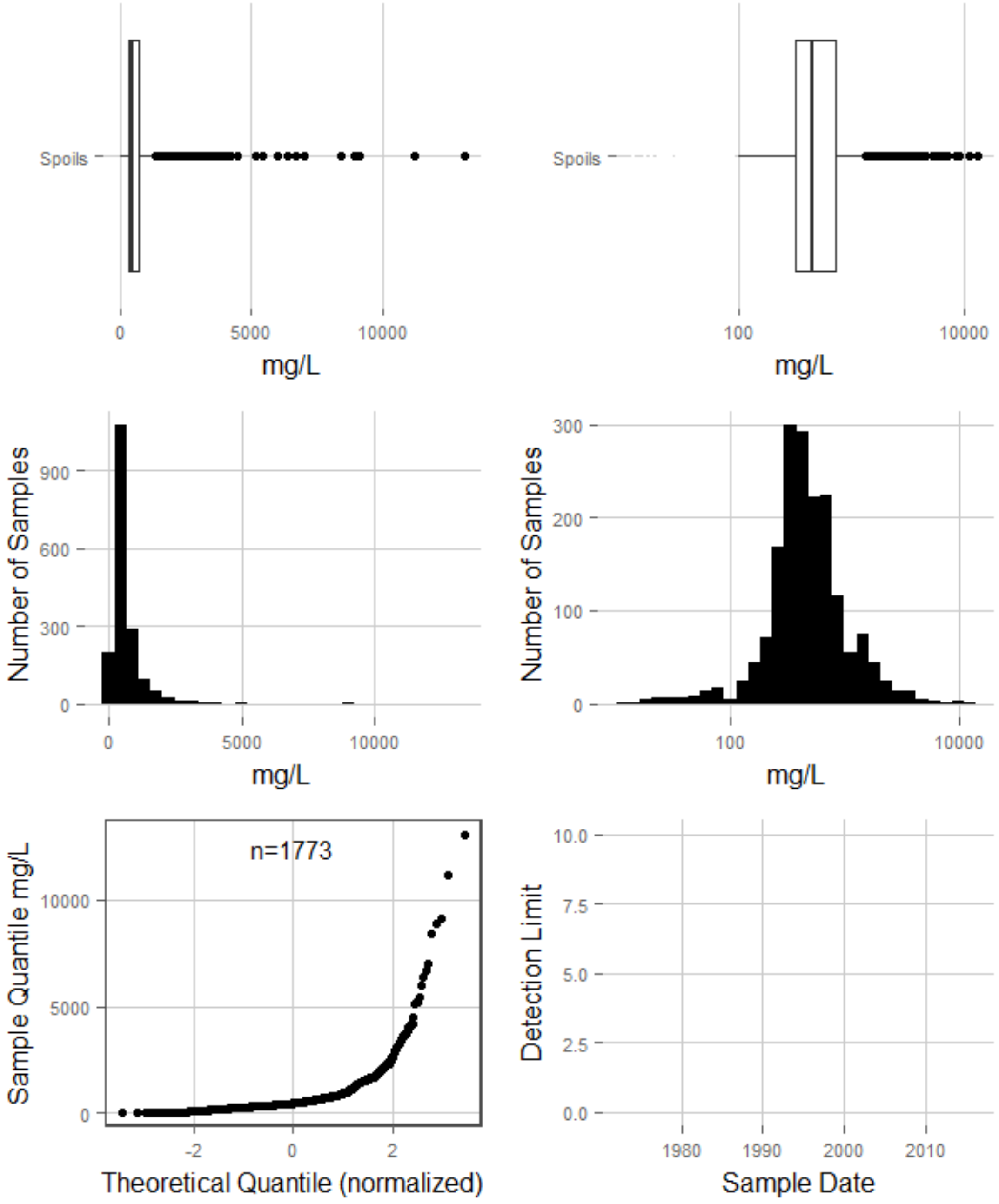
Lithium
SubMcKay



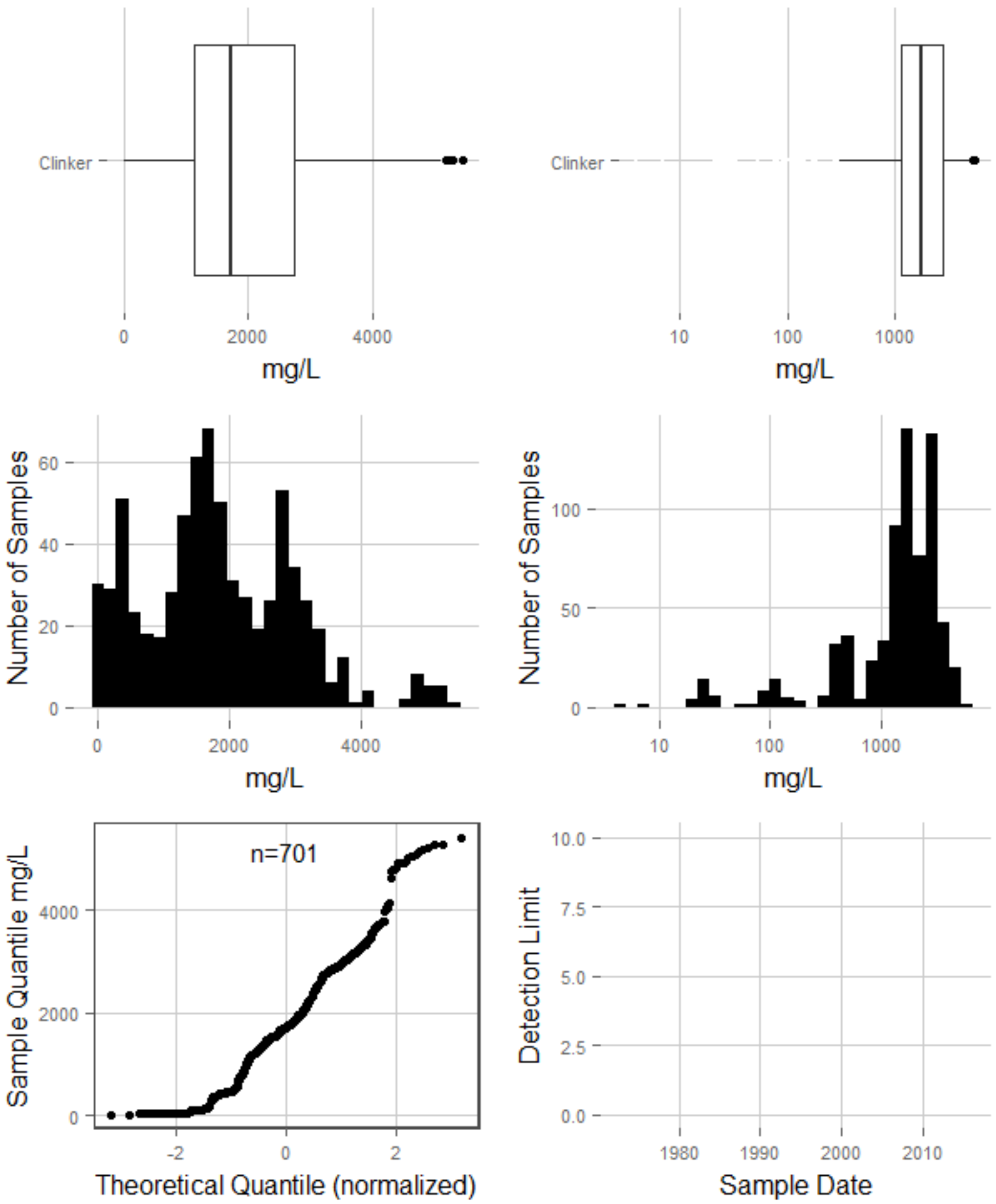
Magnesium
Alluvium



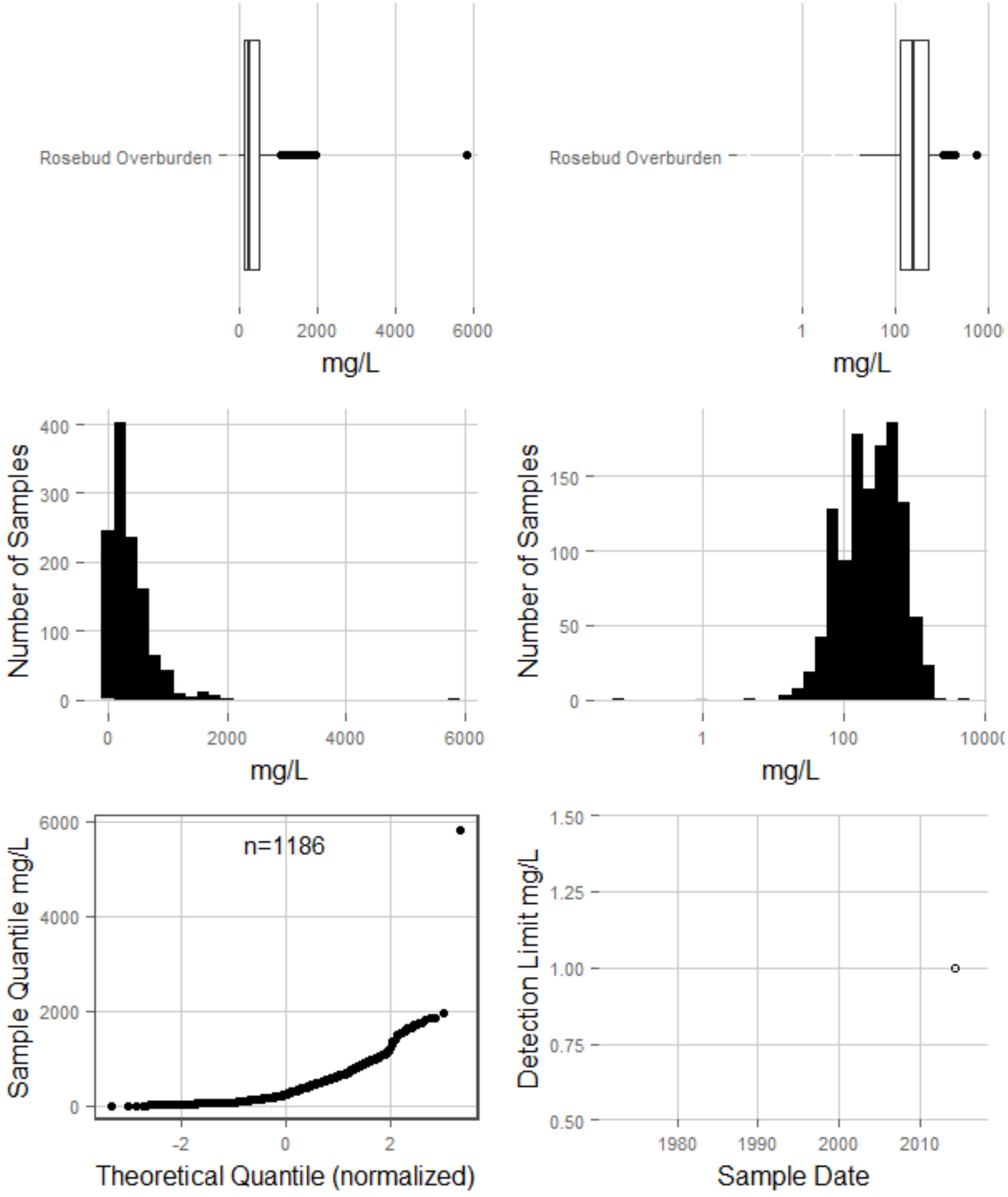
Magnesium
Spoils



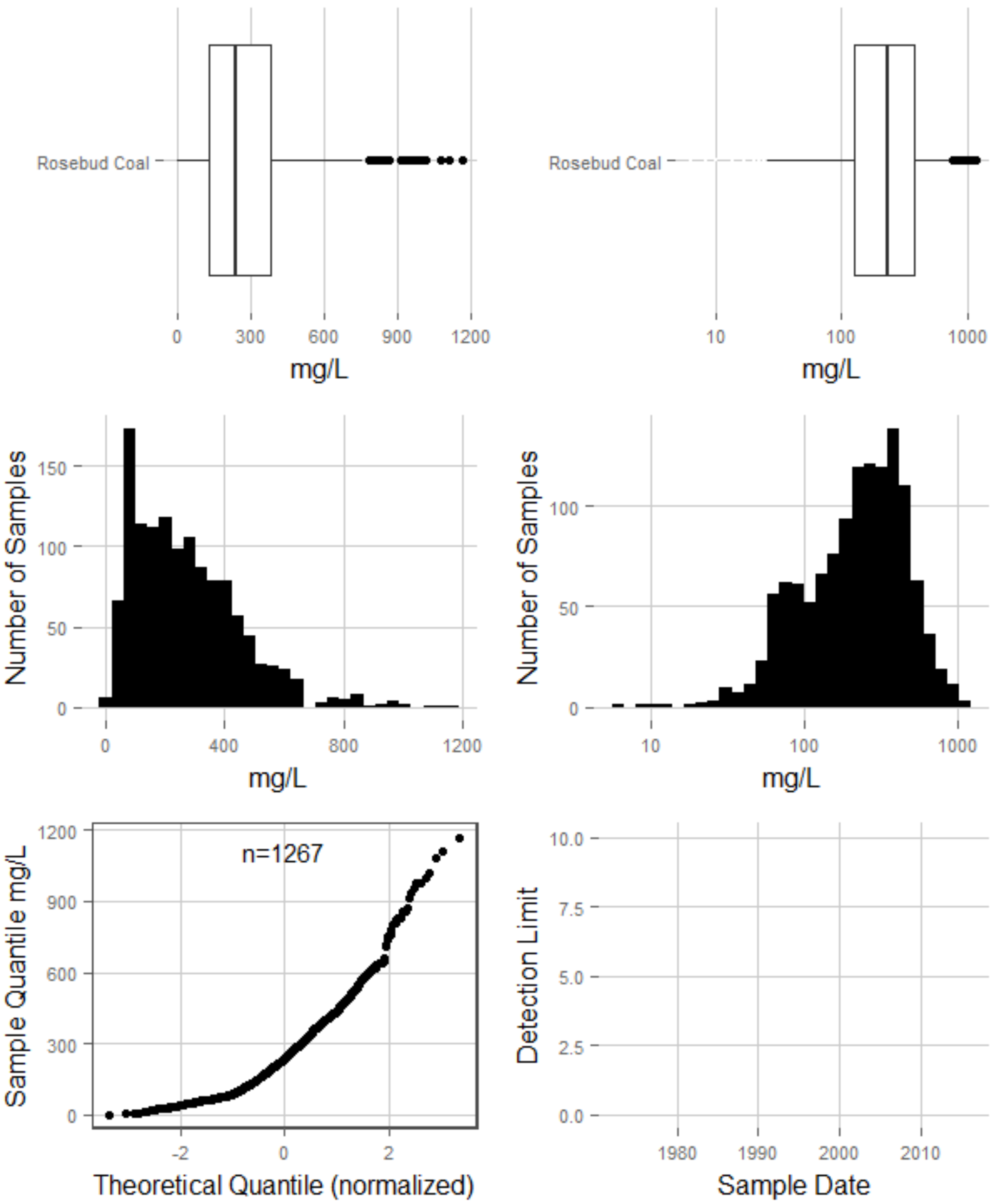
Magnesium
Clinker



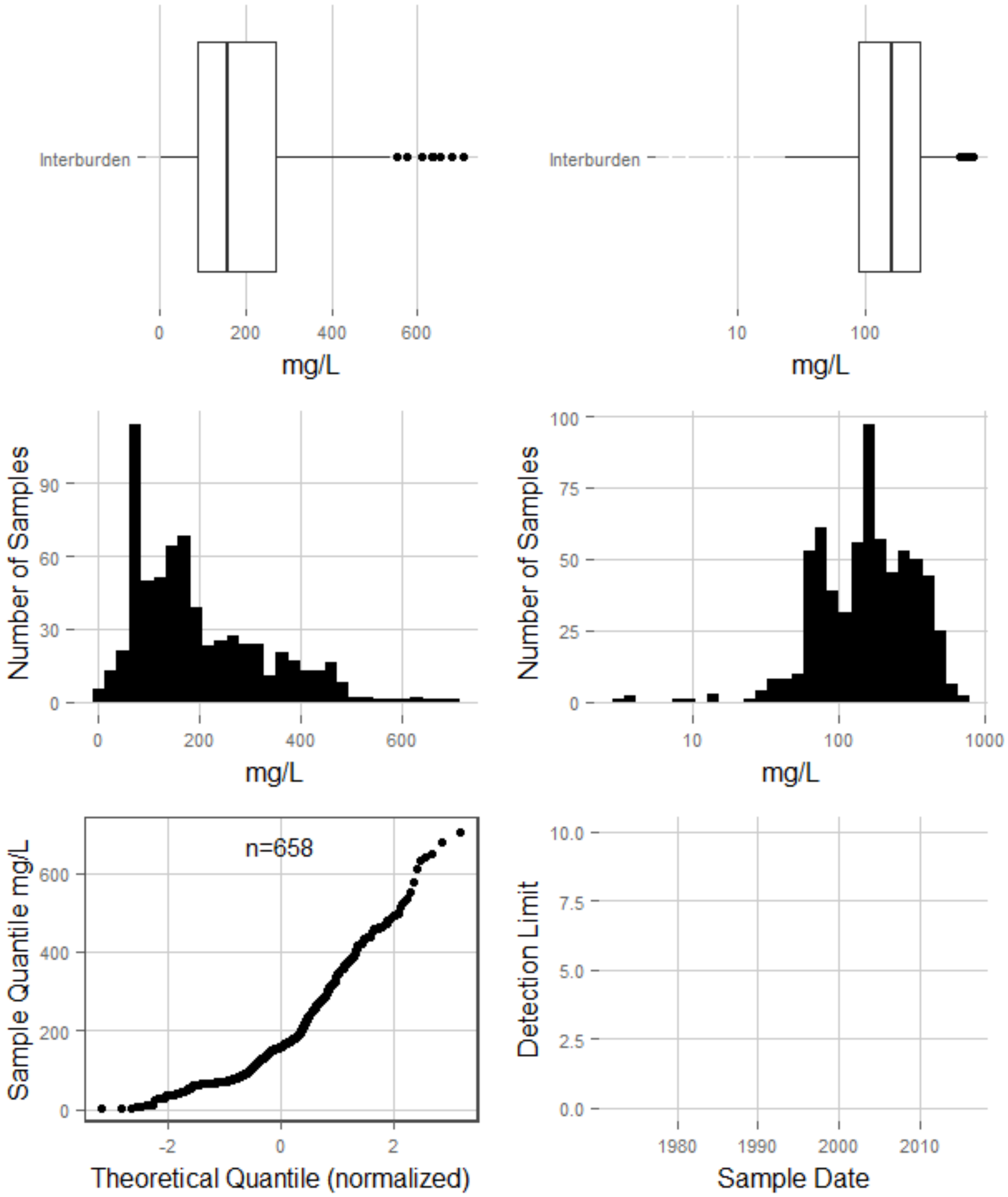
Magnesium
Rosebud Overburden



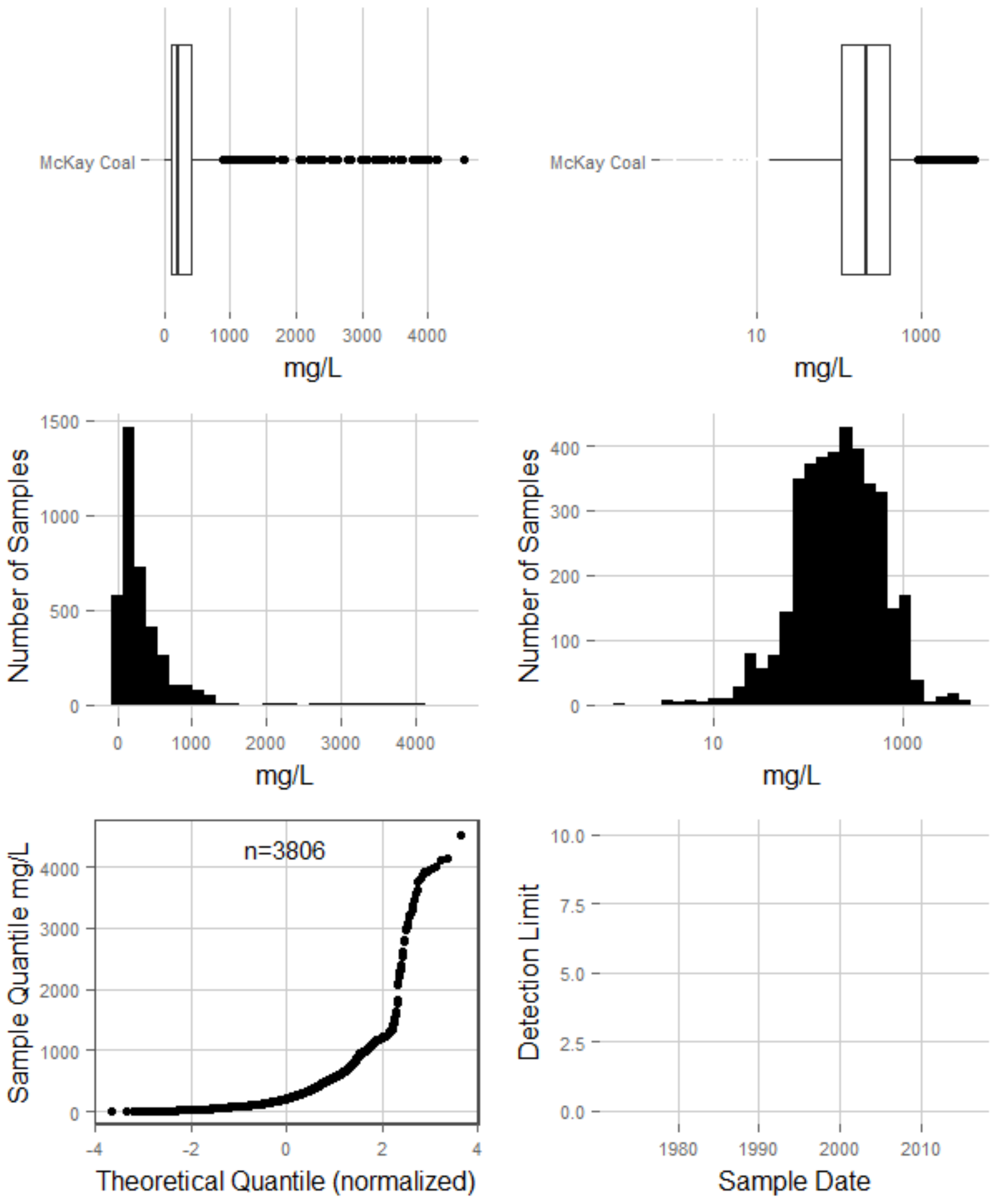
Magnesium
Rosebud Coal



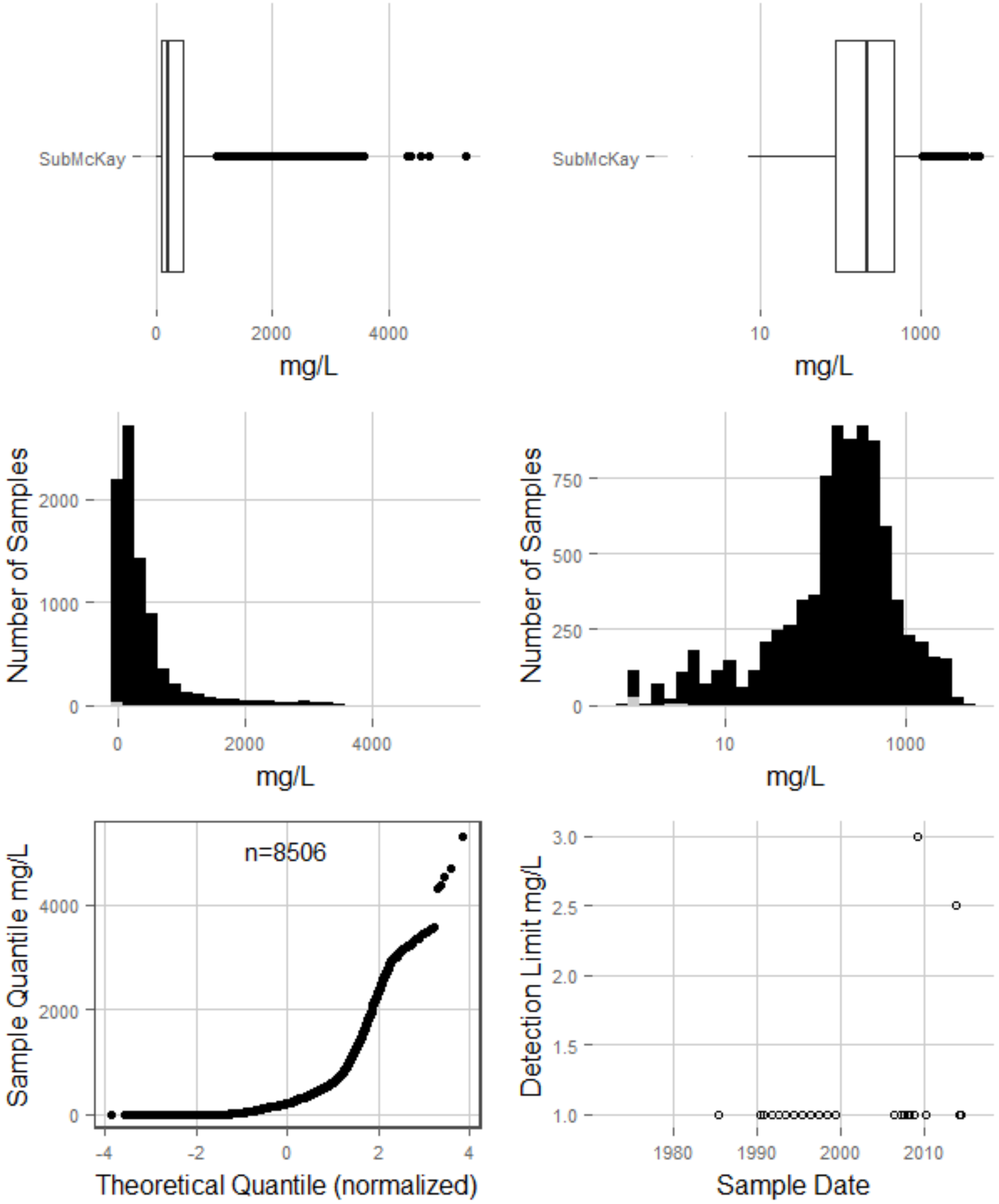
Magnesium
Interburden

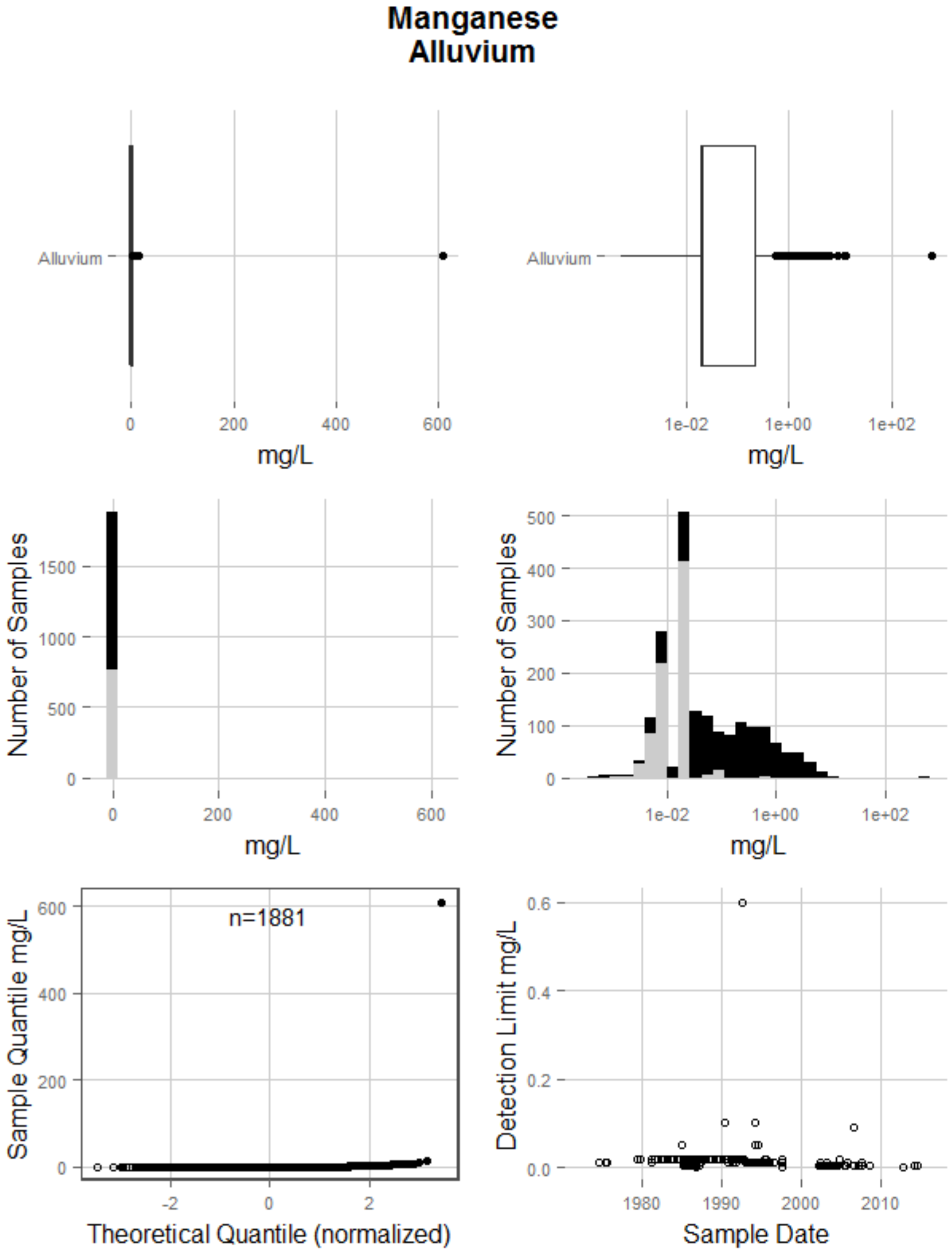


Magnesium
McKay Coal

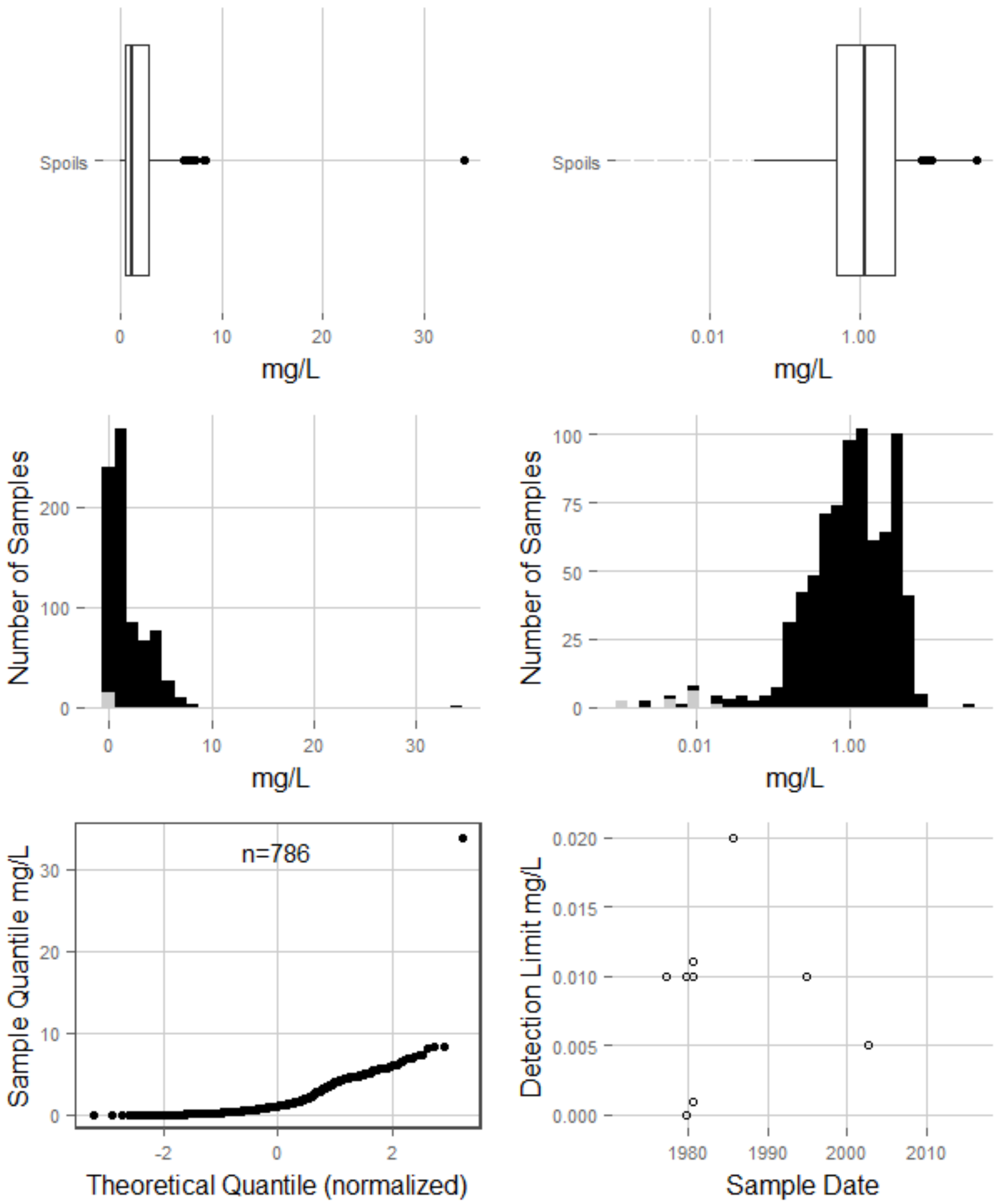


Magnesium
SubMcKay

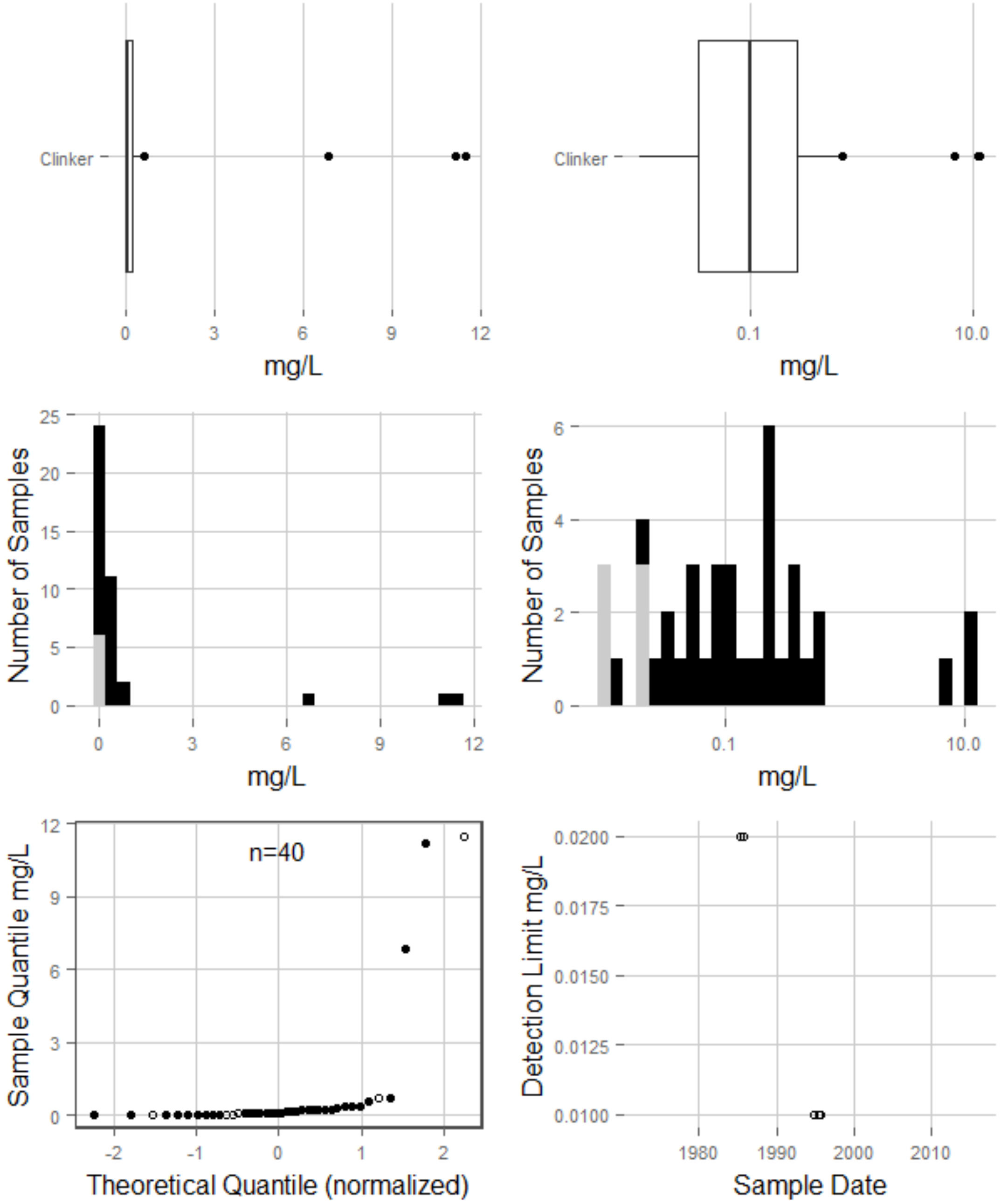



Manganese
Alluvium
Alluvium
0
200
400
600
mg/L
Alluvium
1e-02
1e+00
1e+02
mg/L
Number of Samples
0
500
1000
1500
0
200
400
600
mg/L
Number of Samples
0
100
200
300
400
500
1e-02
1e+00
1e+02
mg/L
Sample Quantile mg/L
0
200
400
600
n=1881
-2
0
2
Theoretical Quantile (normalized)
Detection Limit mg/L
0.0
0.2
0.4
0.6
1980
1990
2000
2010
Sample Date

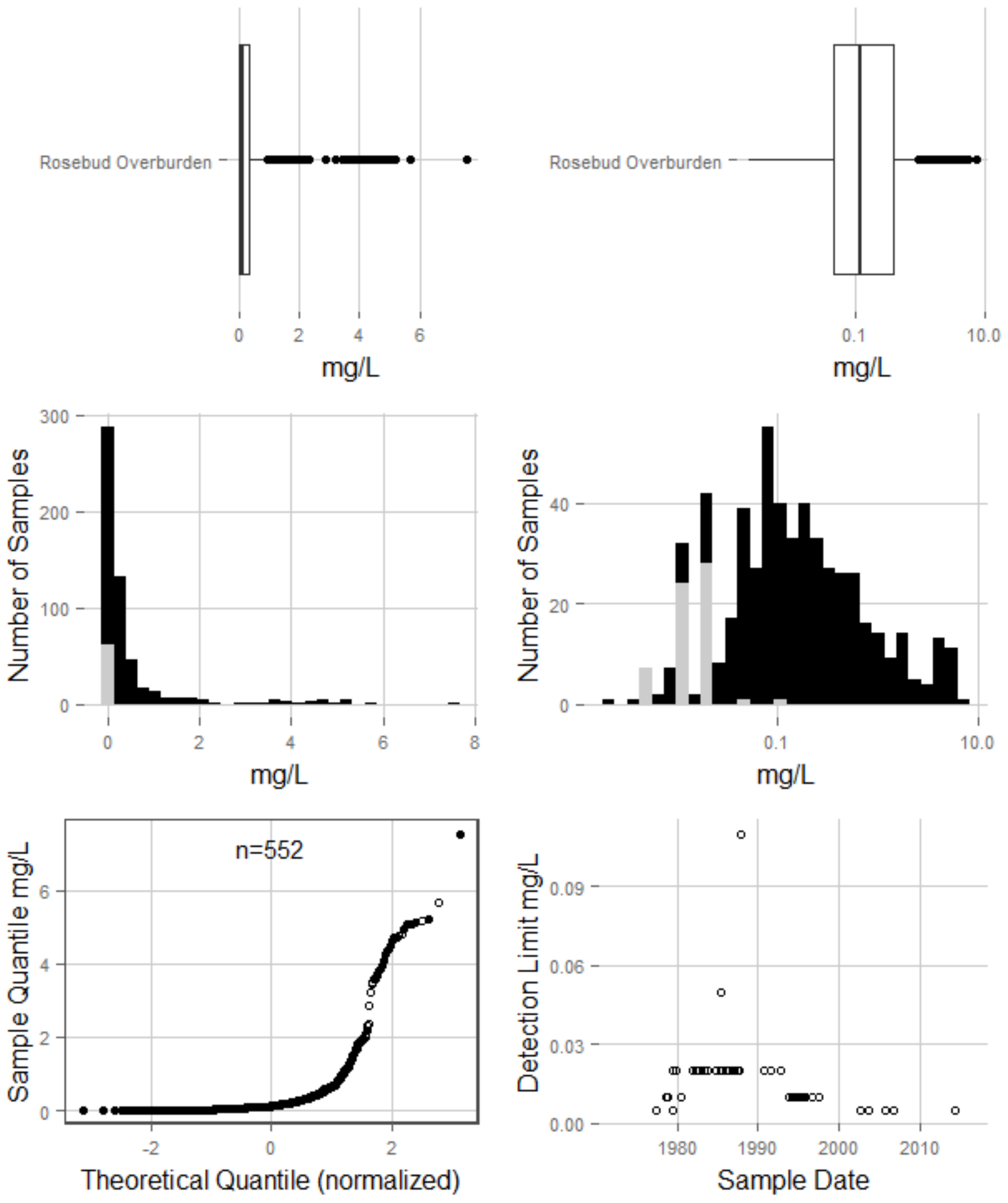
Manganese
Spoils



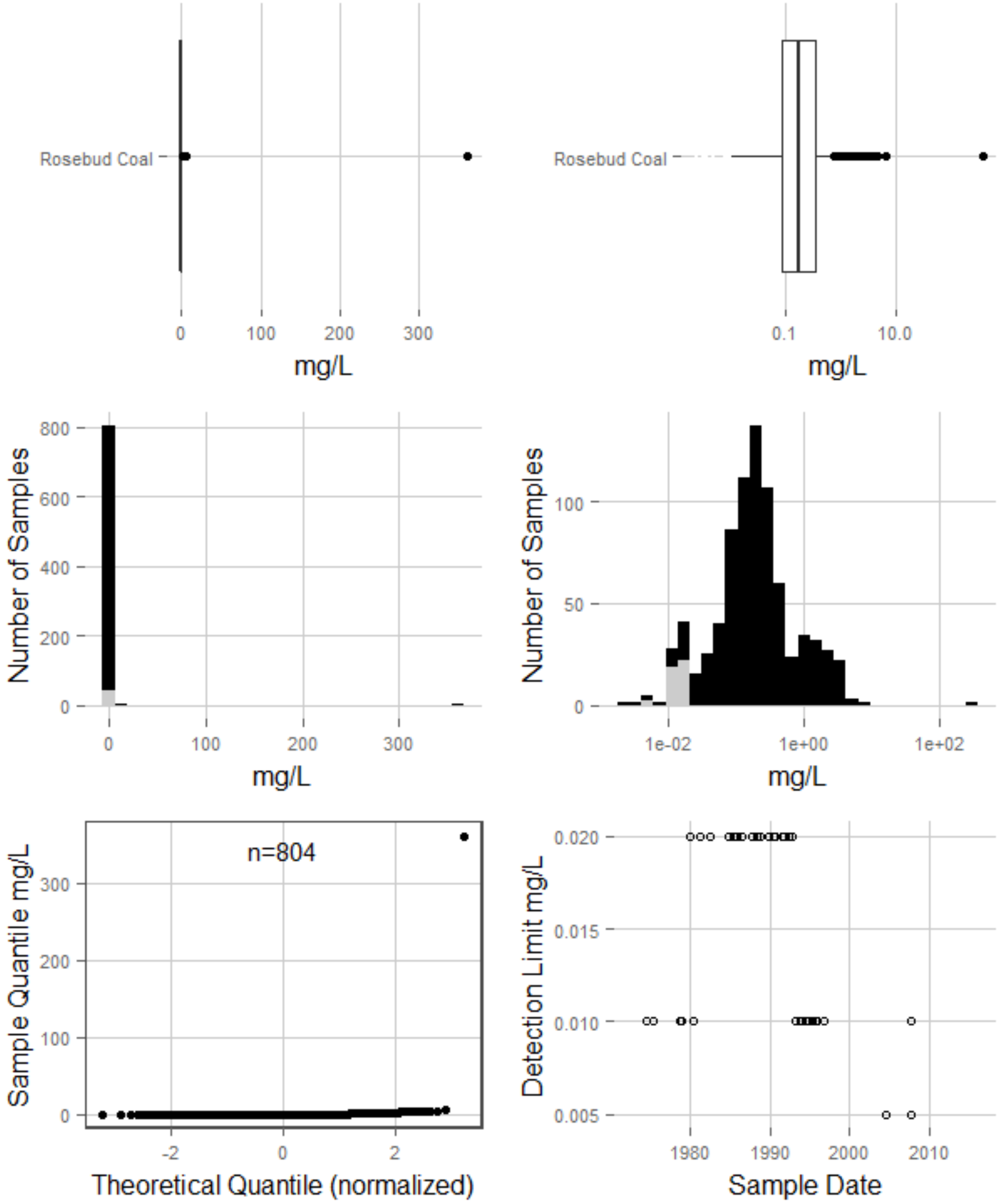
Manganese
Clinker



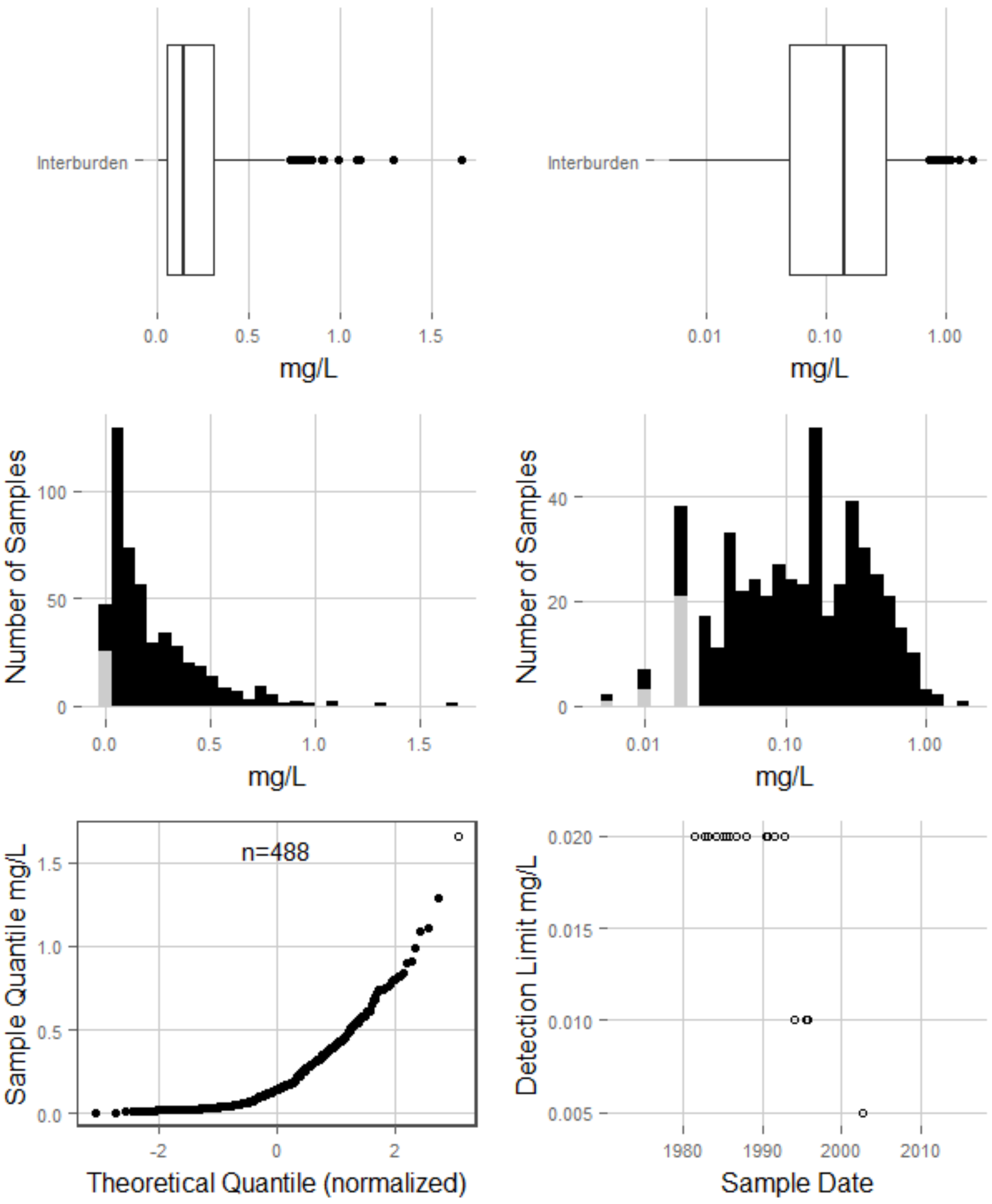
Manganese
Rosebud Overburden



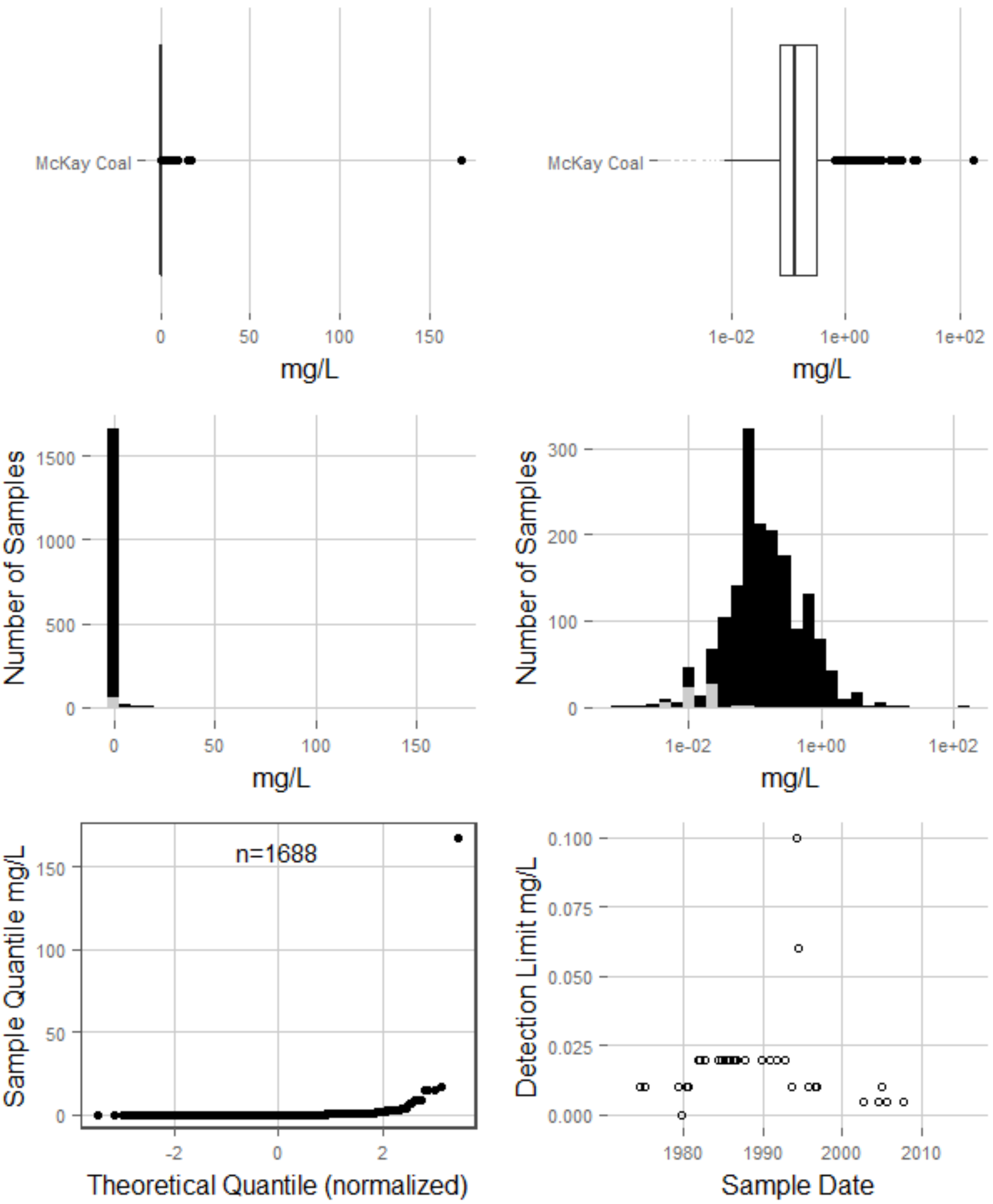
Manganese
Rosebud Coal



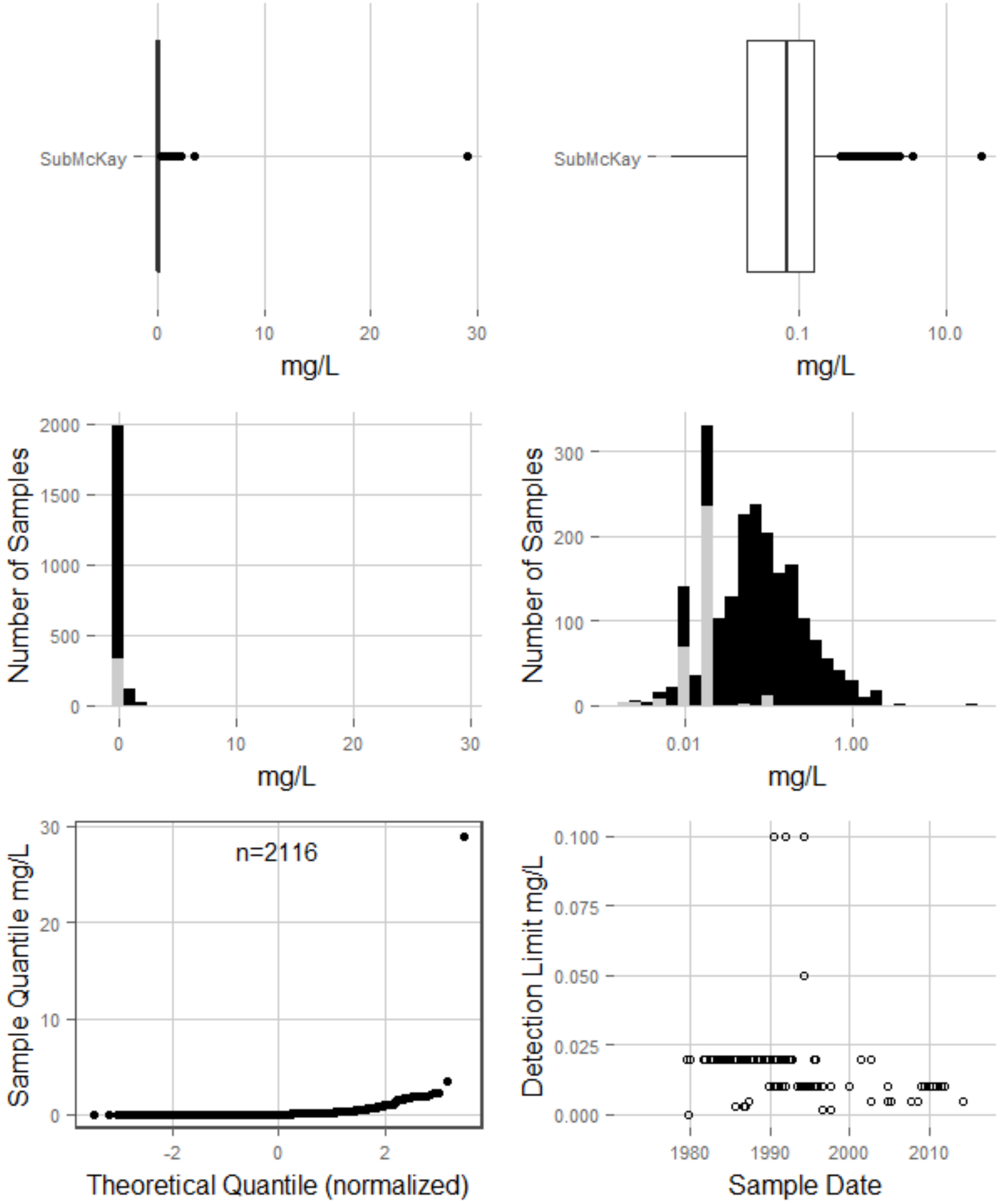
Manganese
Interburden



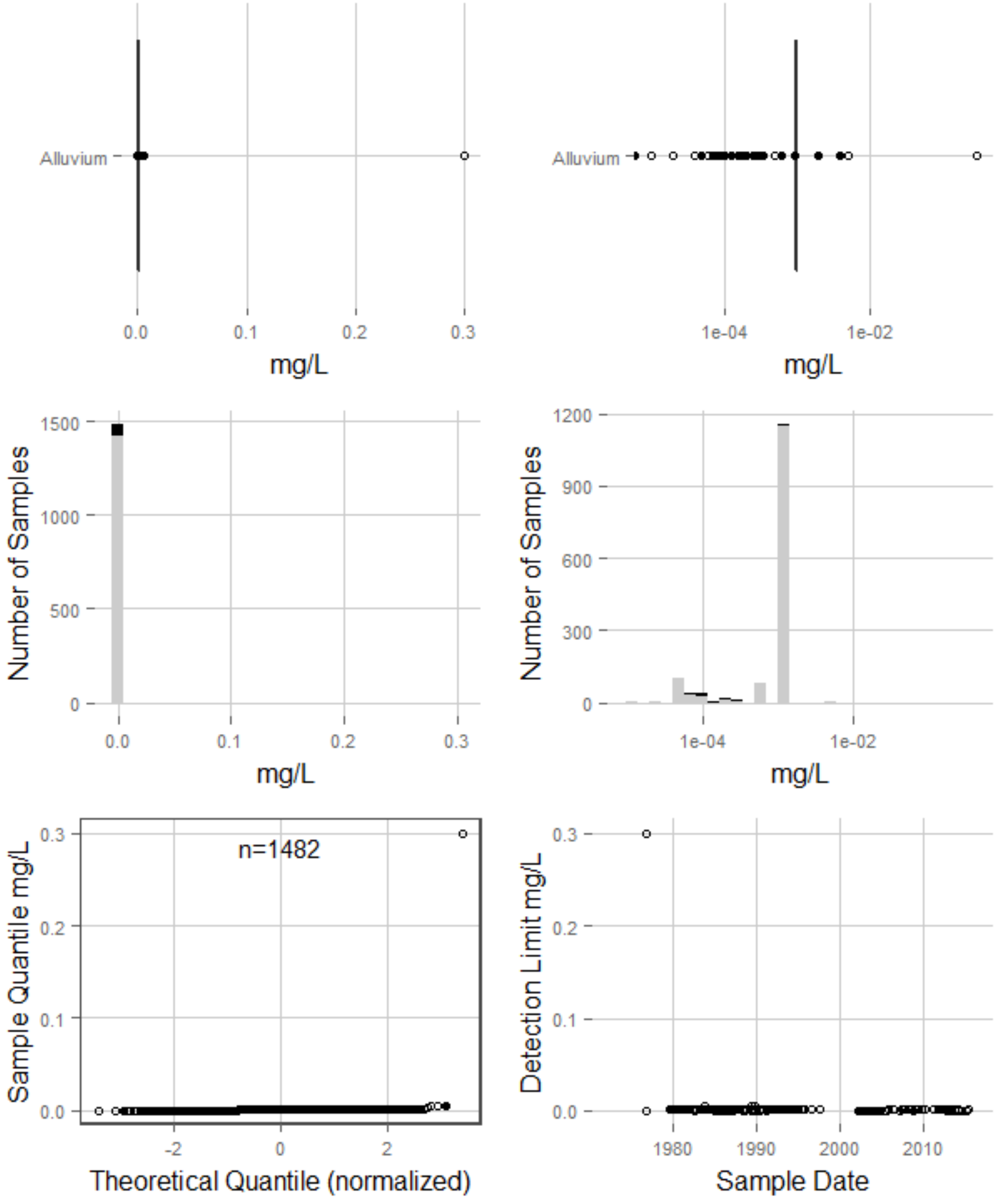
Manganese
McKay Coal



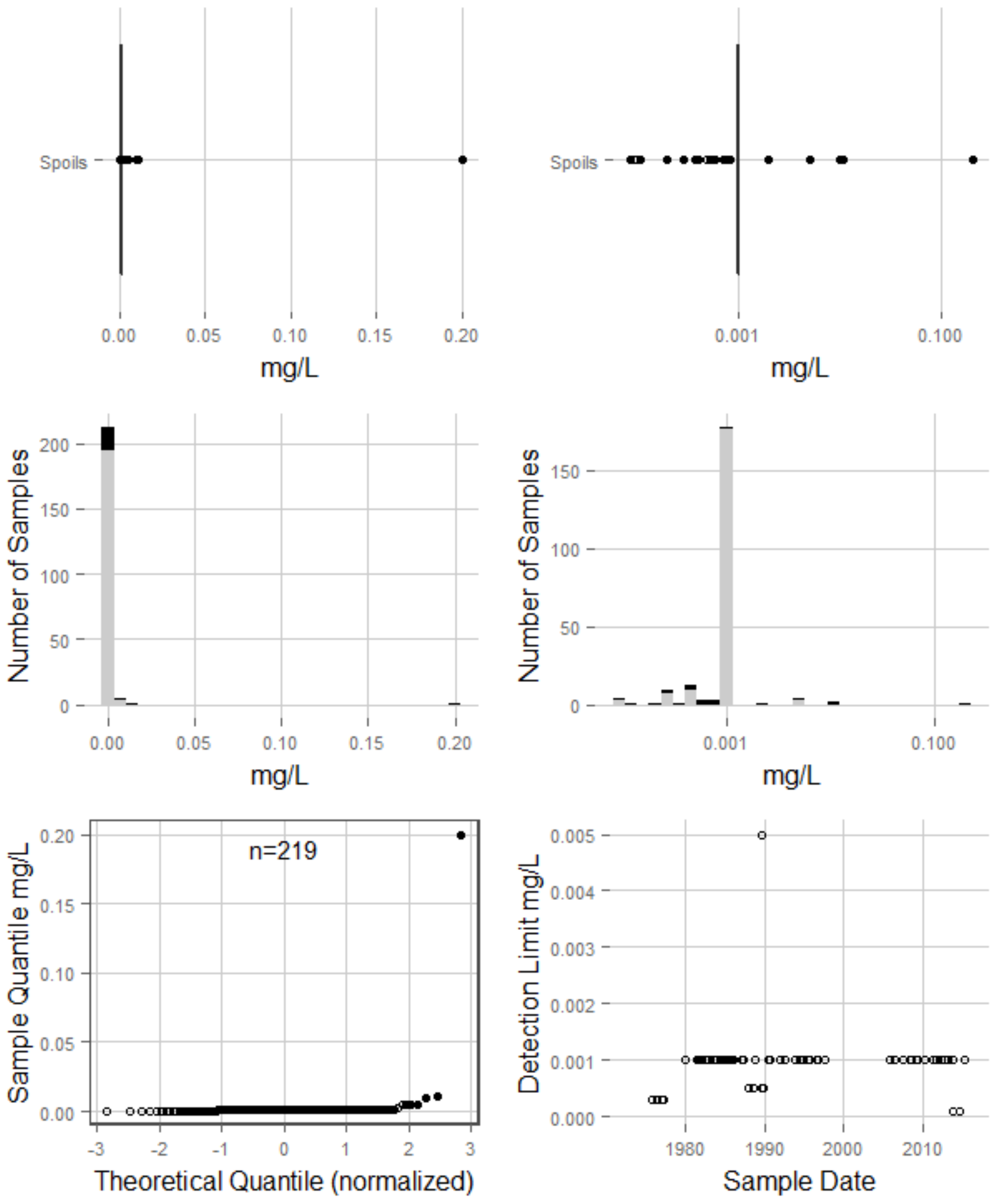
Manganese
SubMcKay



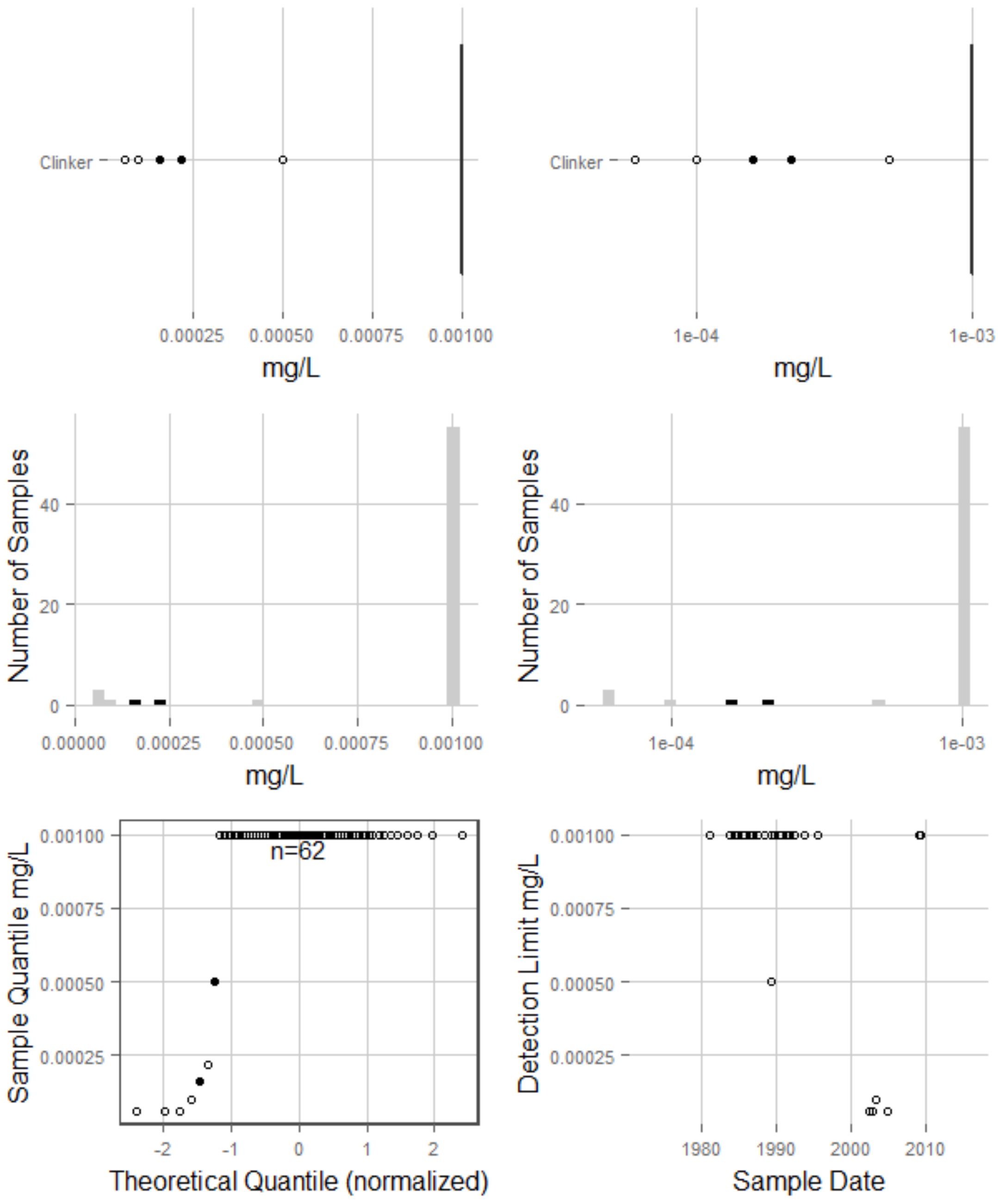
Mercury
Alluvium



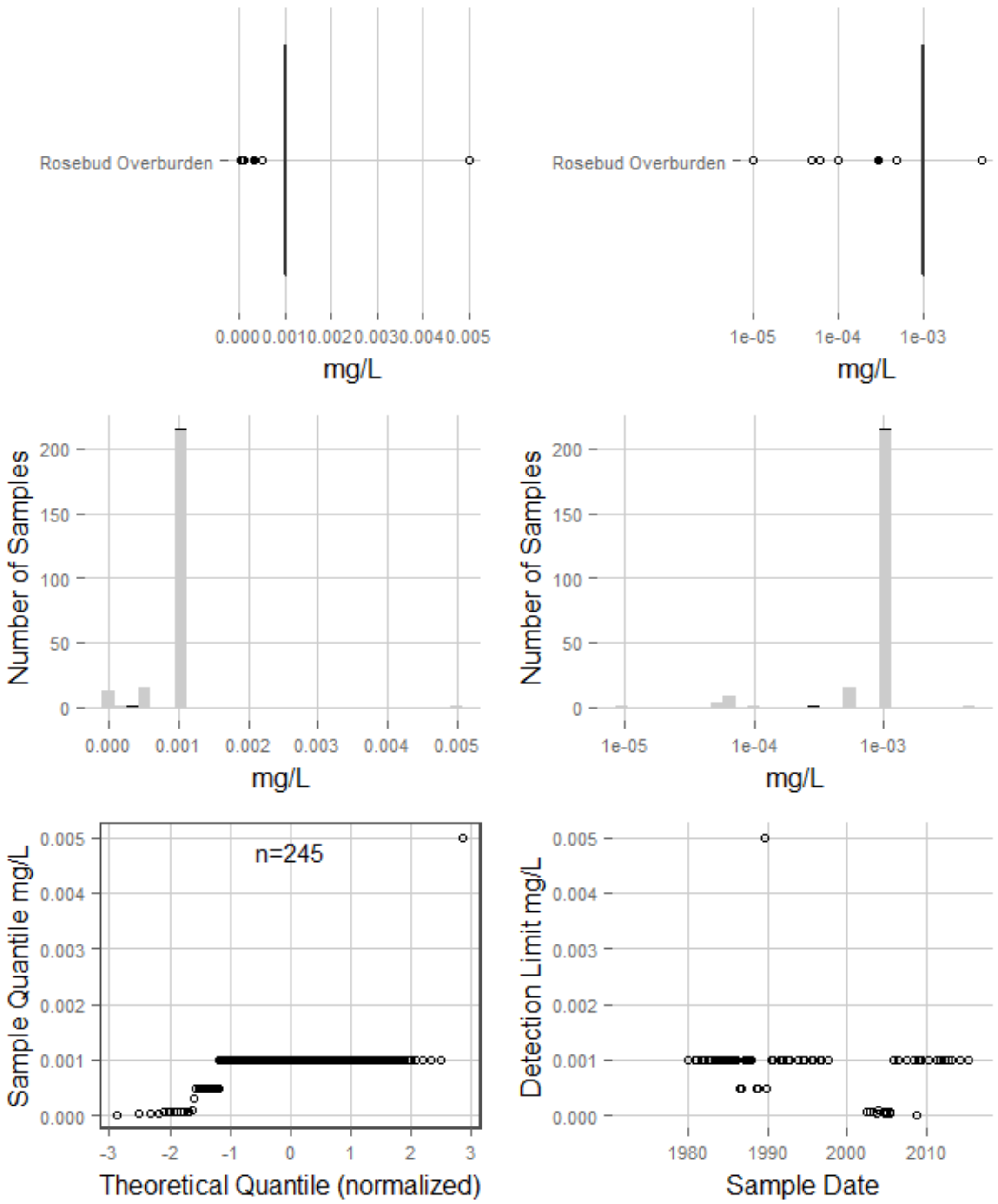
Mercury
Spoils



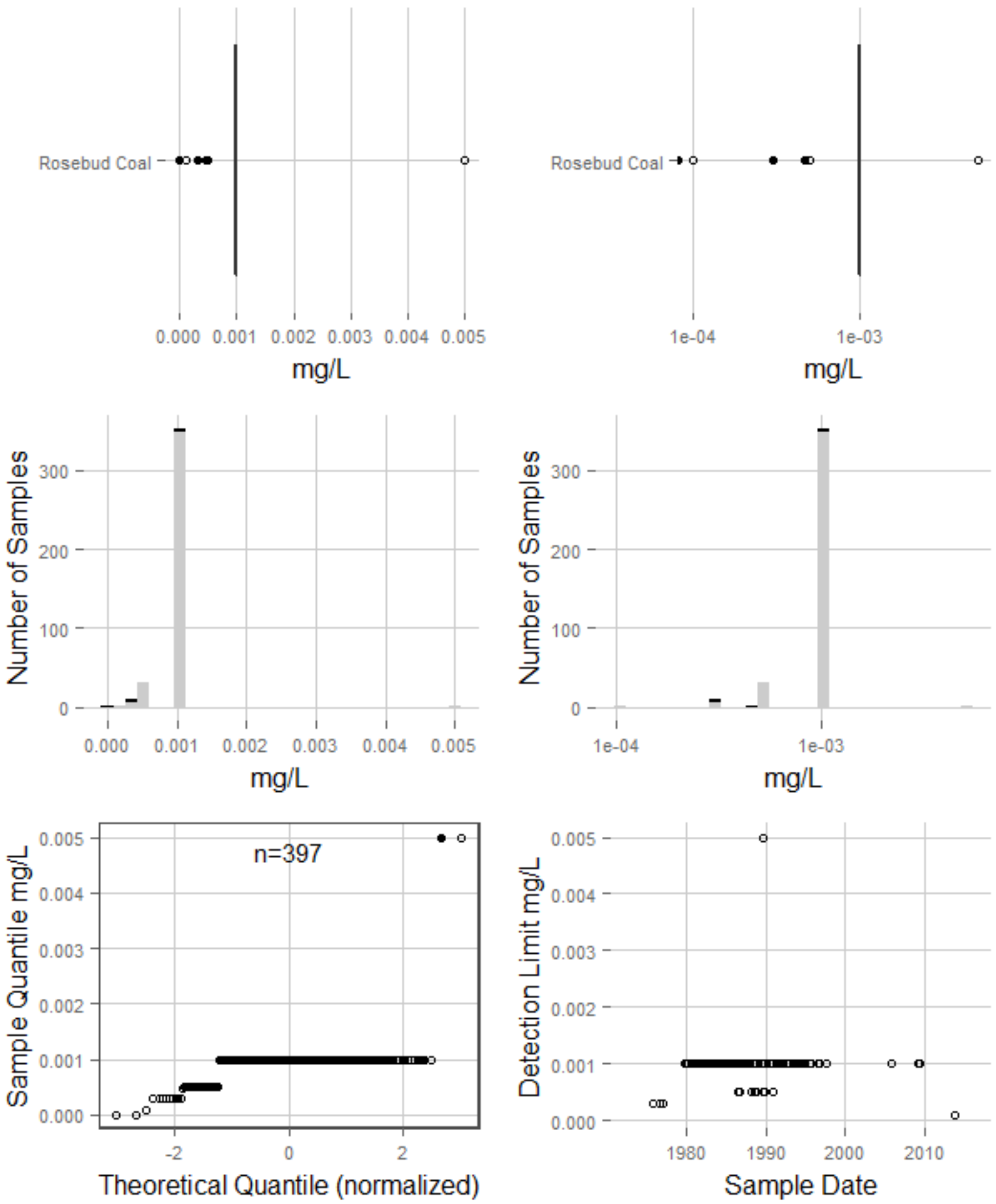
Mercury
Clinker



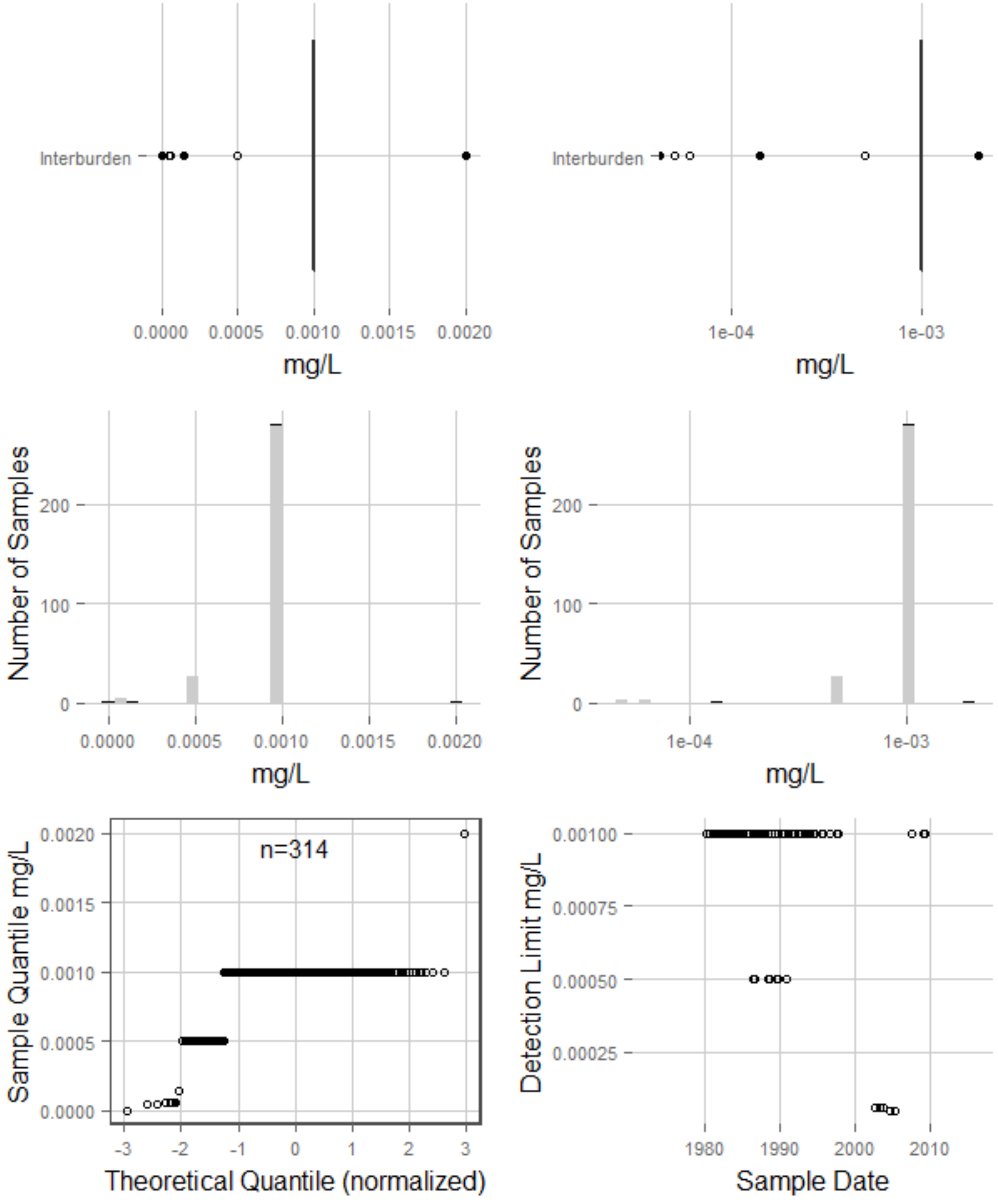
Mercury
Rosebud Overburden



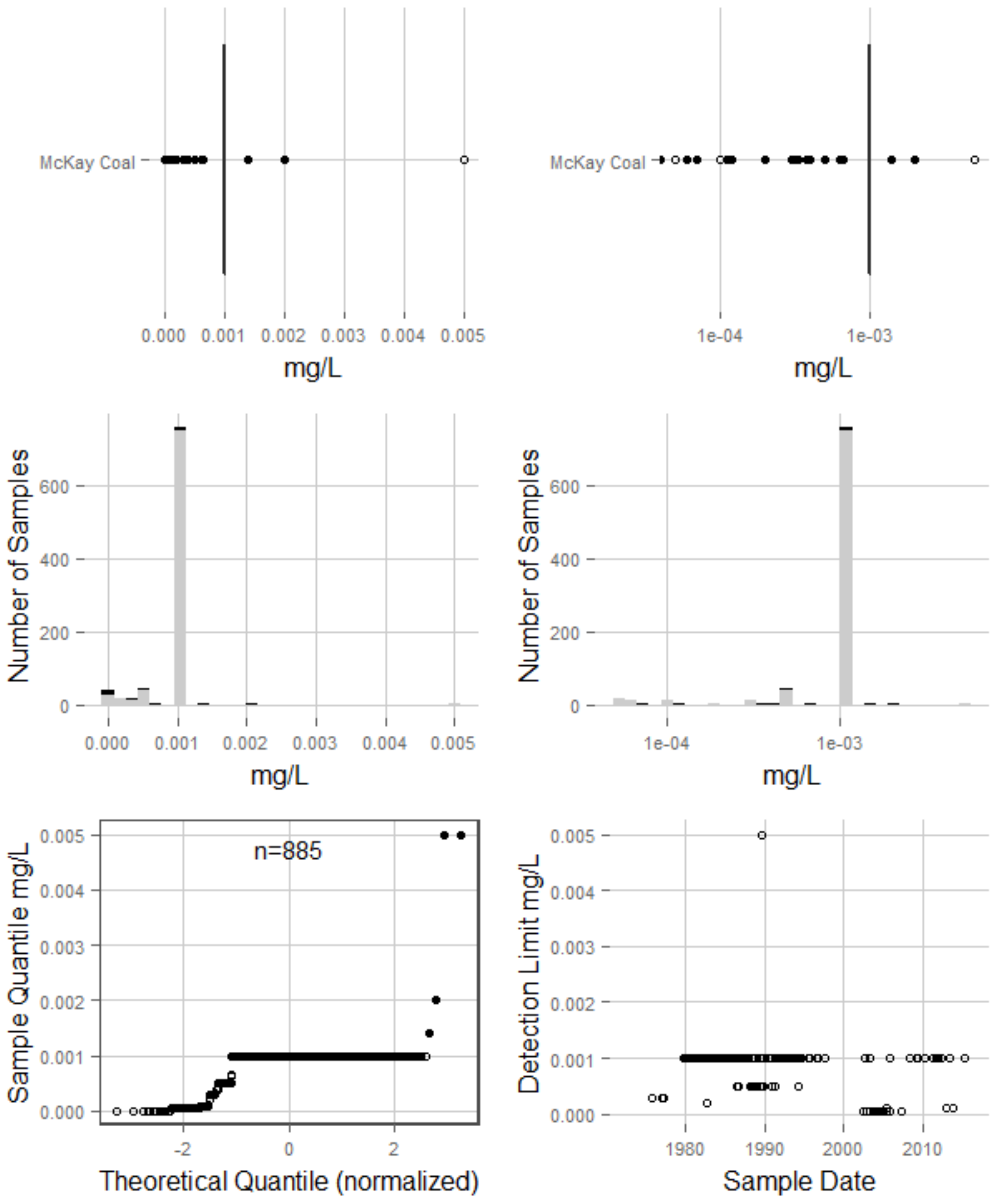
Mercury
Rosebud Coal



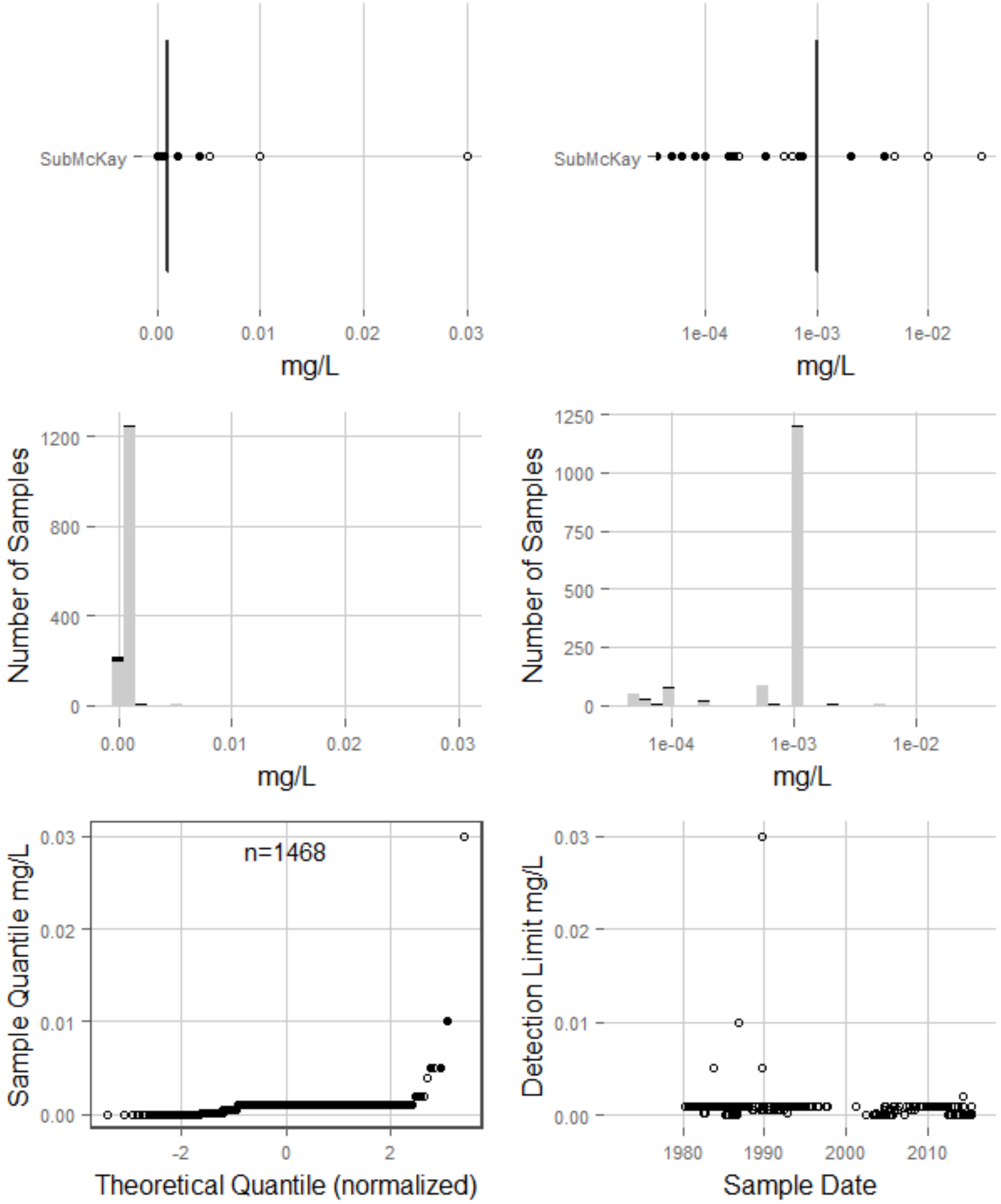
Mercury
Interburden



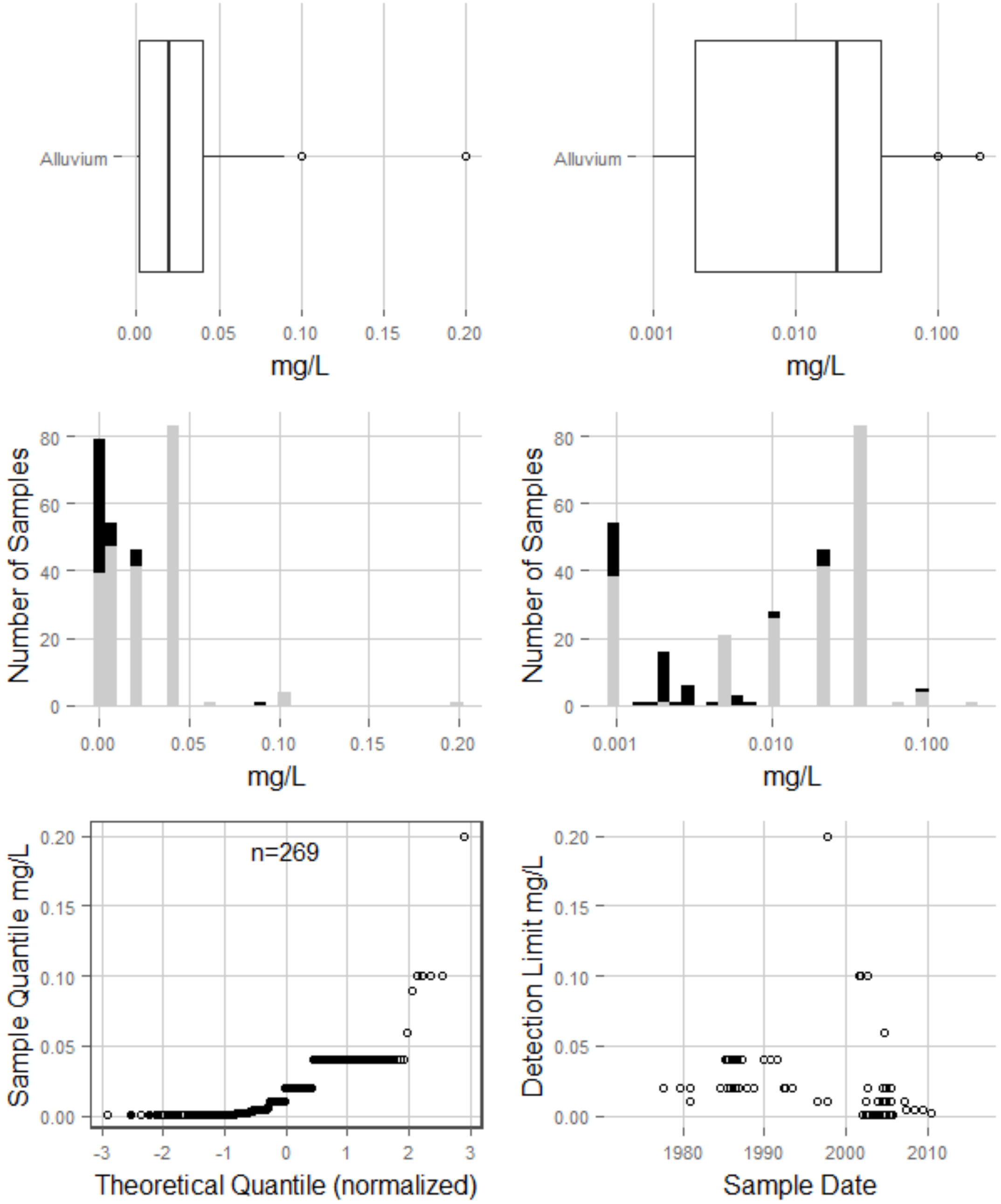
Mercury
McKay Coal



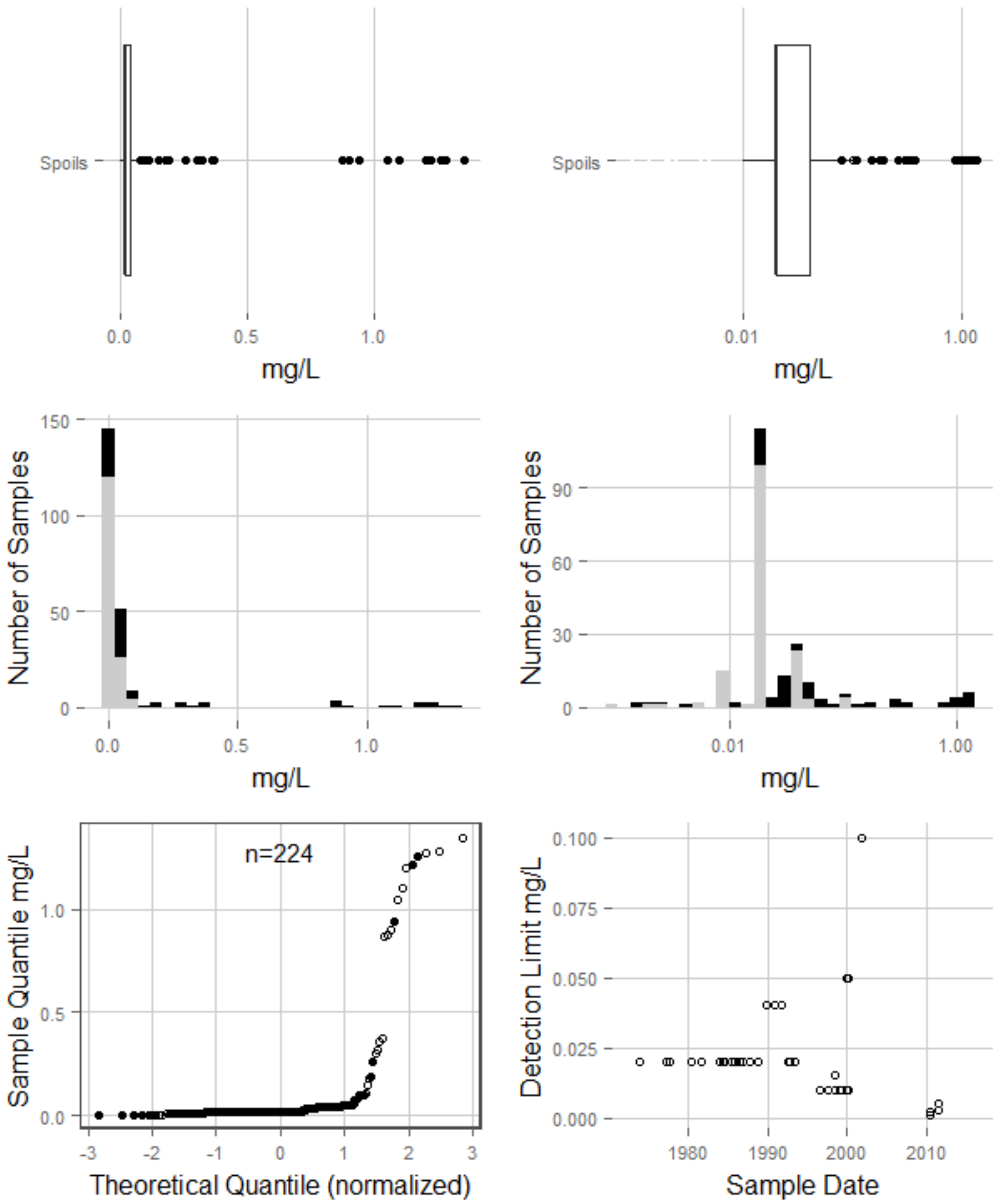
Mercury
SubMcKay



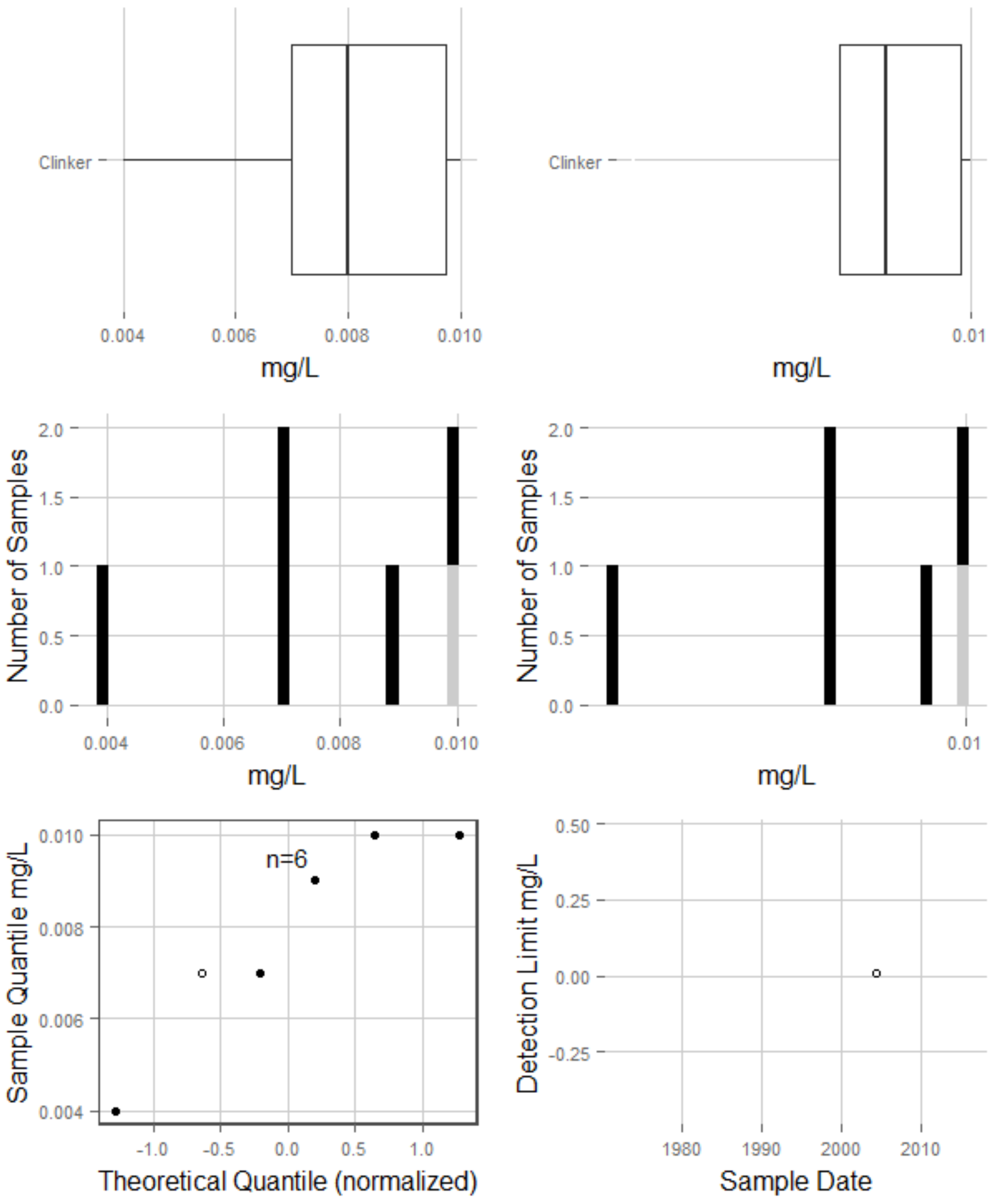
Molybdenum
Alluvium



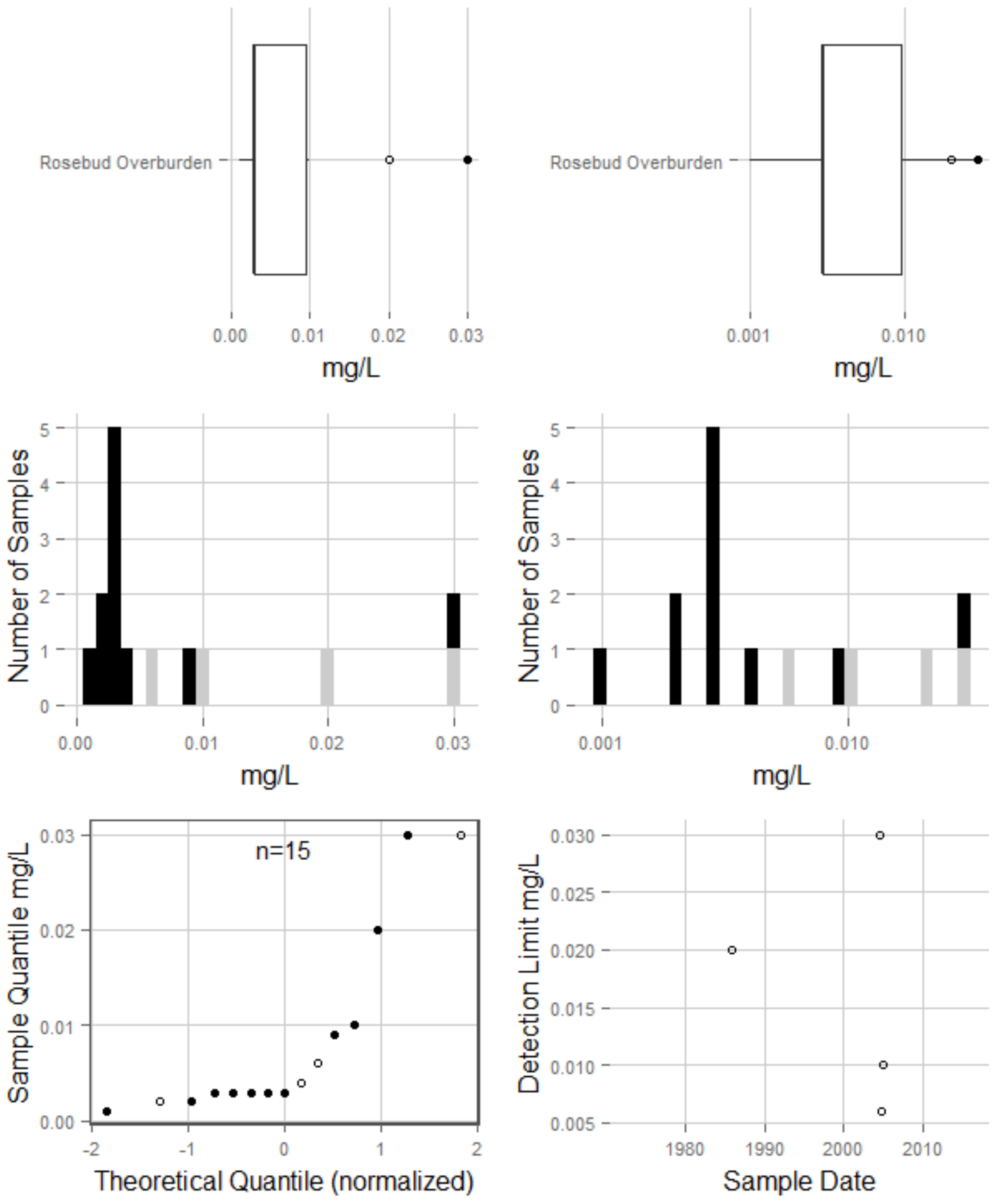
Molybdenum
Spoils



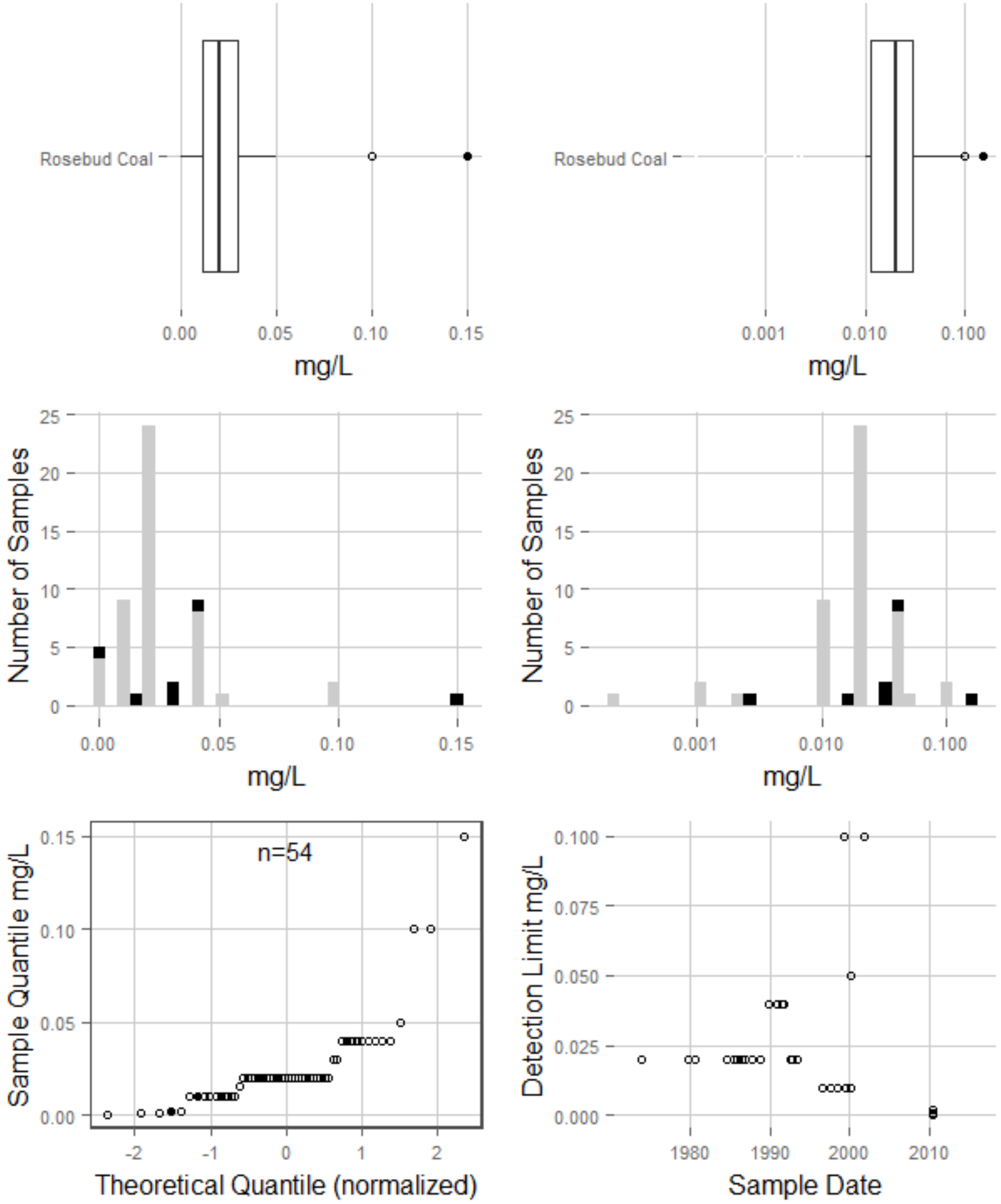
Molybdenum
Clinker



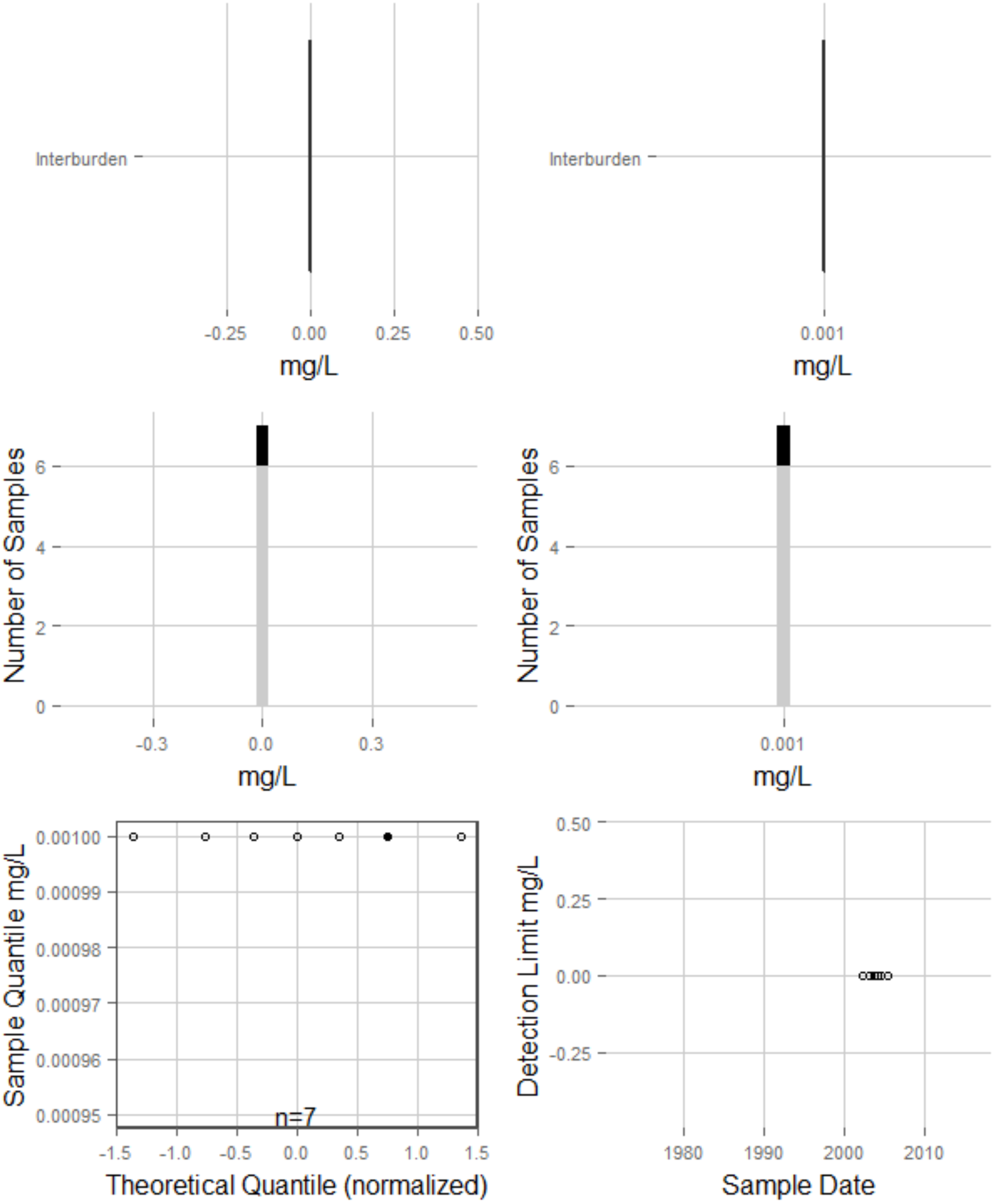
Molybdenum
Rosebud Overburden



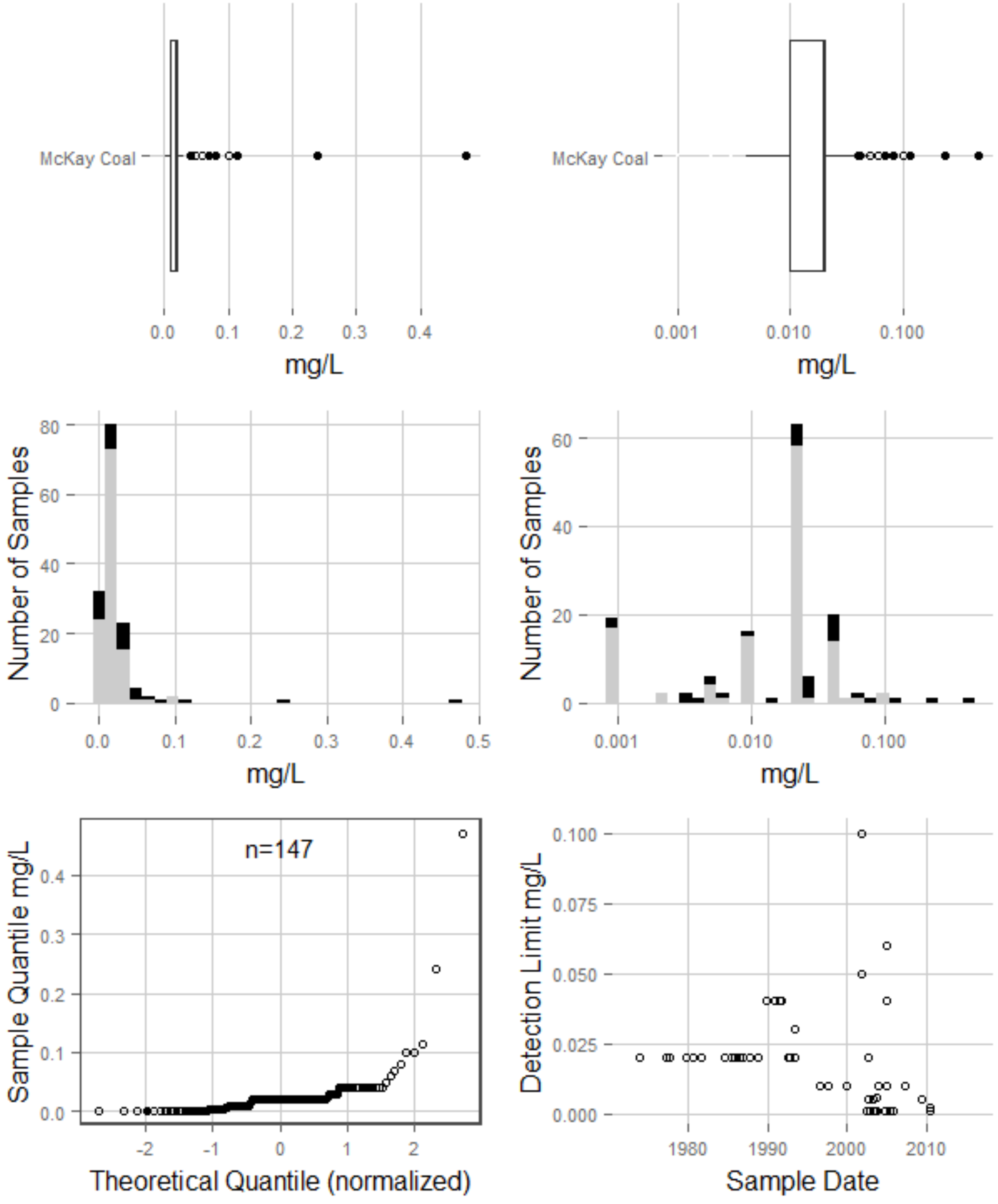
Molybdenum
Rosebud Coal



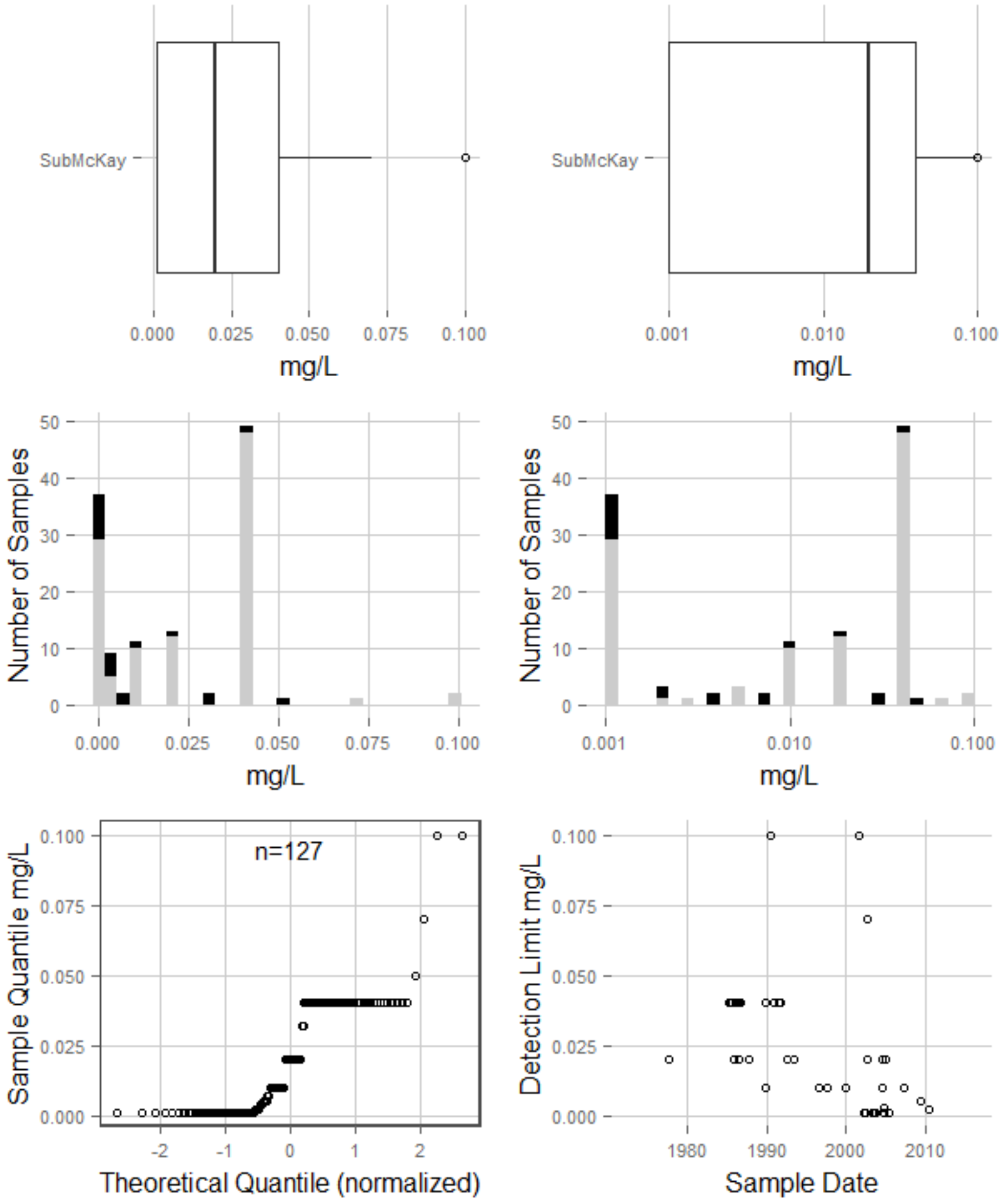
Molybdenum
Interburden



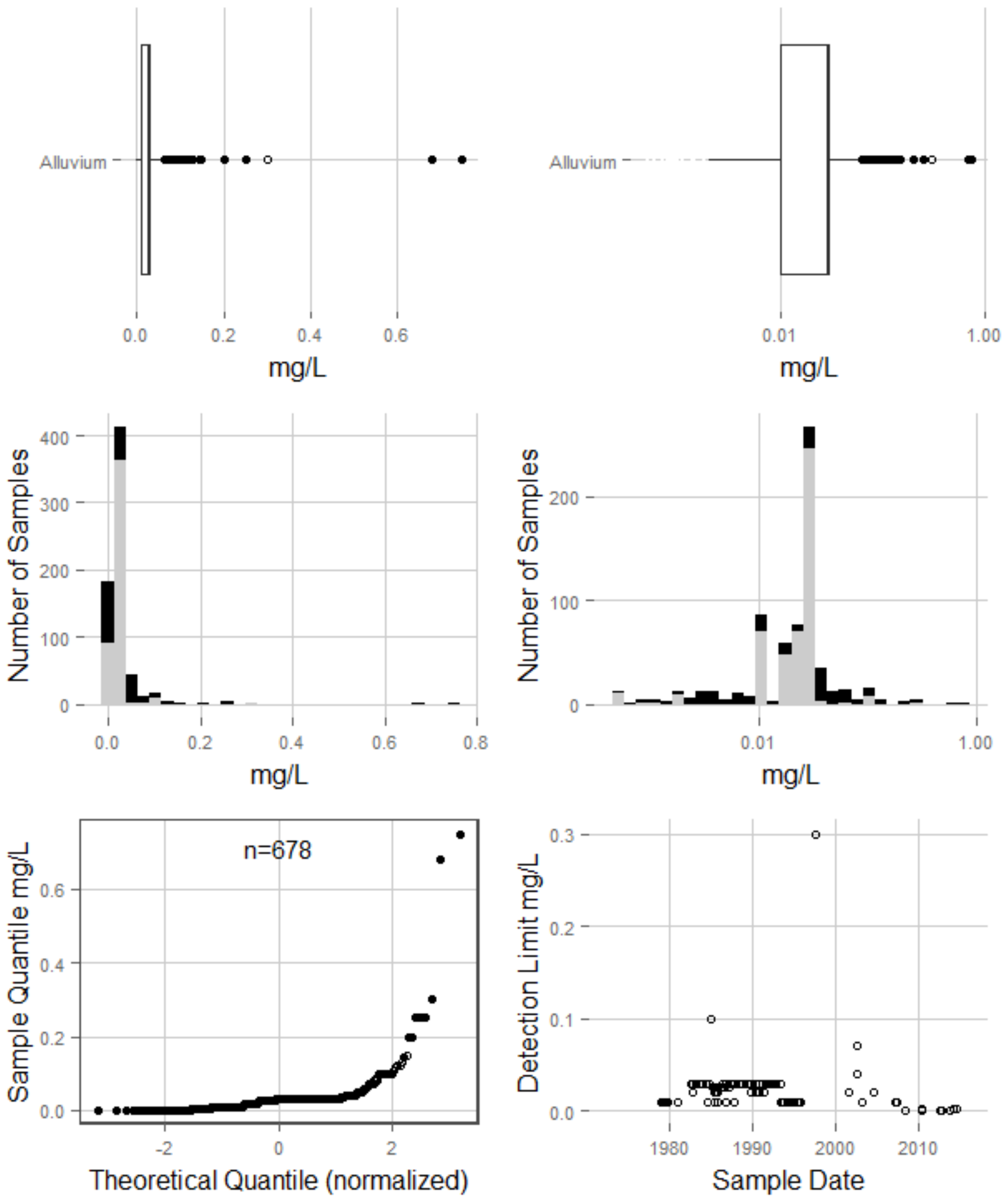
Molybdenum
McKay Coal



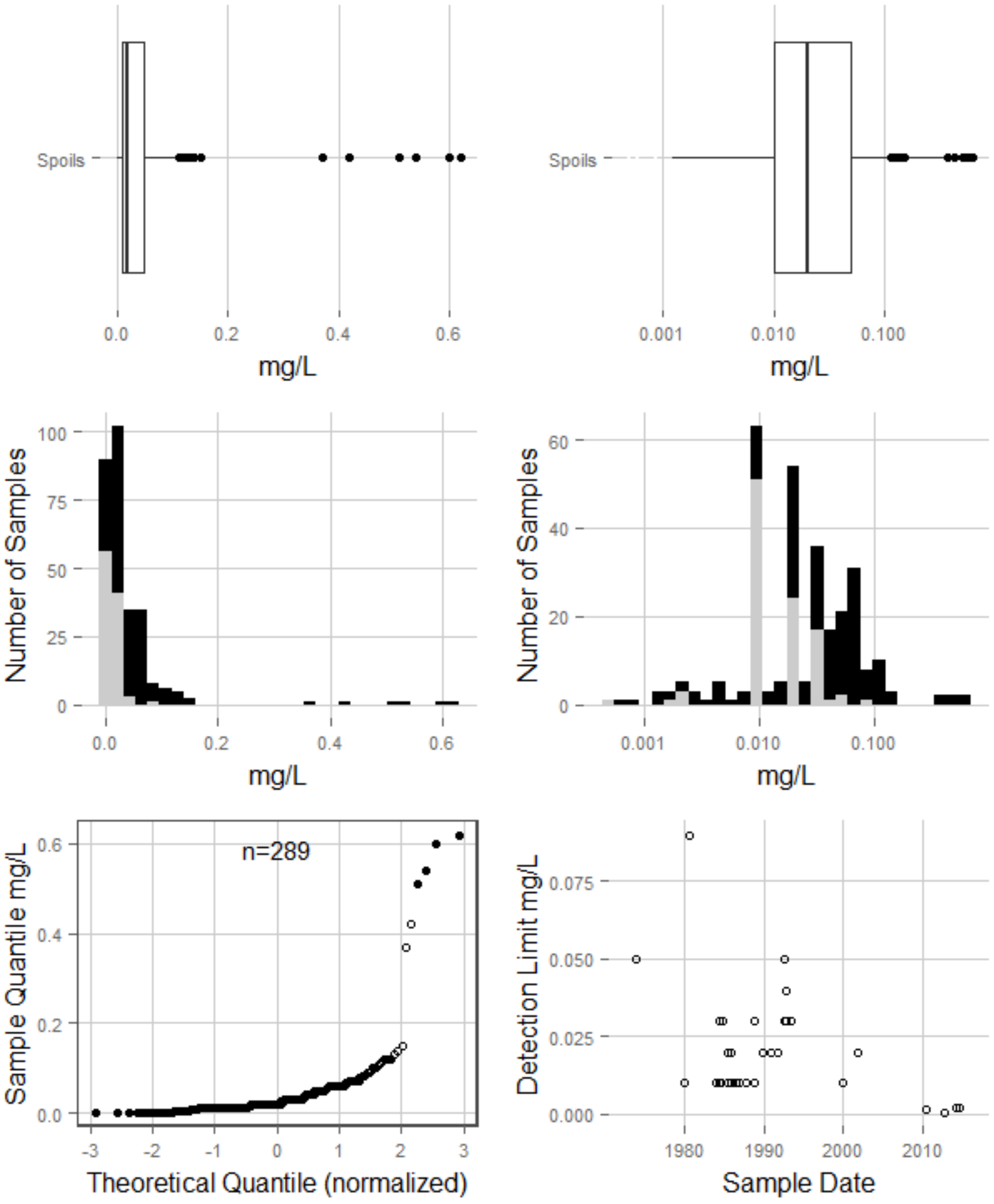
Molybdenum
SubMcKay



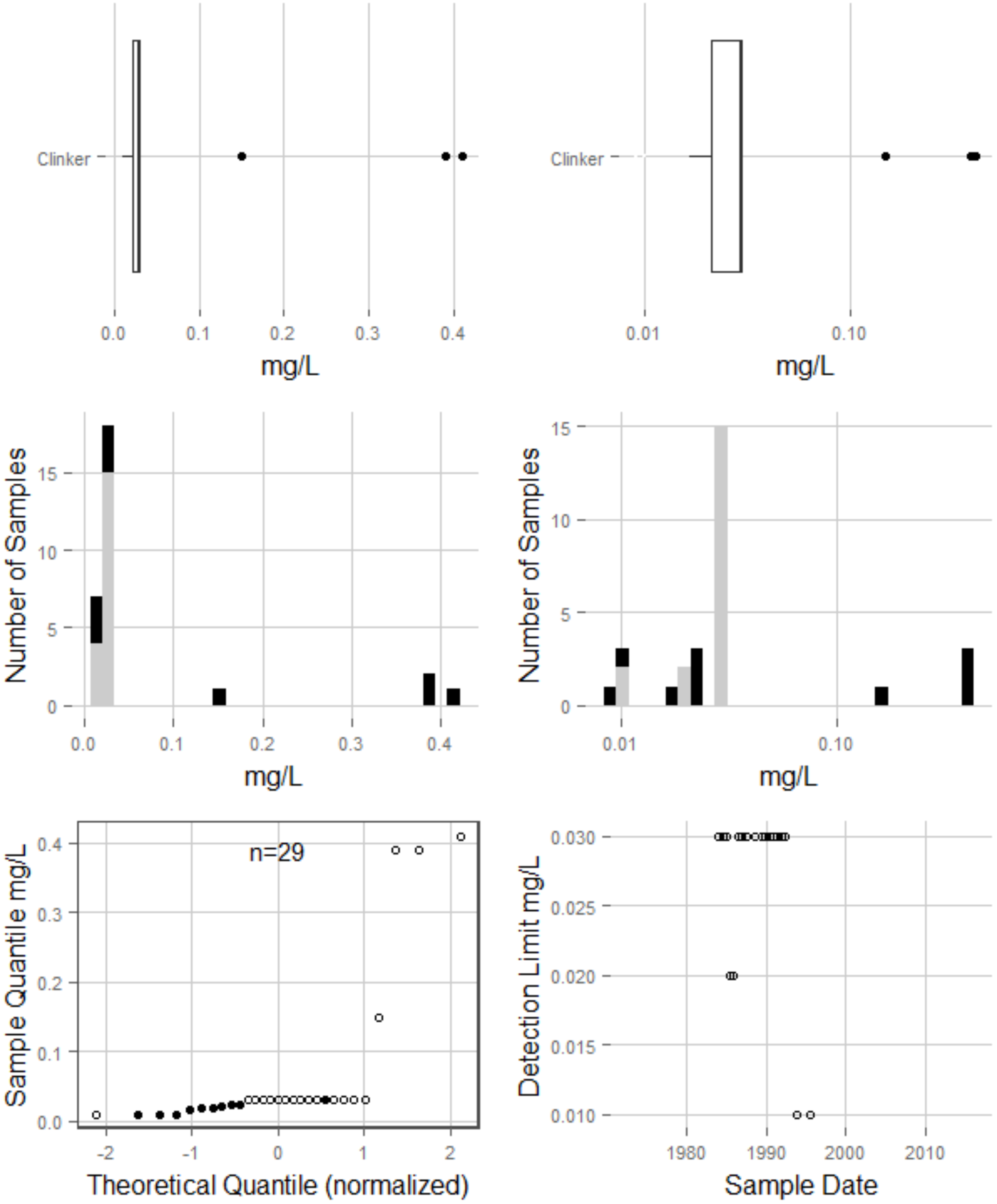
Nickel
Alluvium



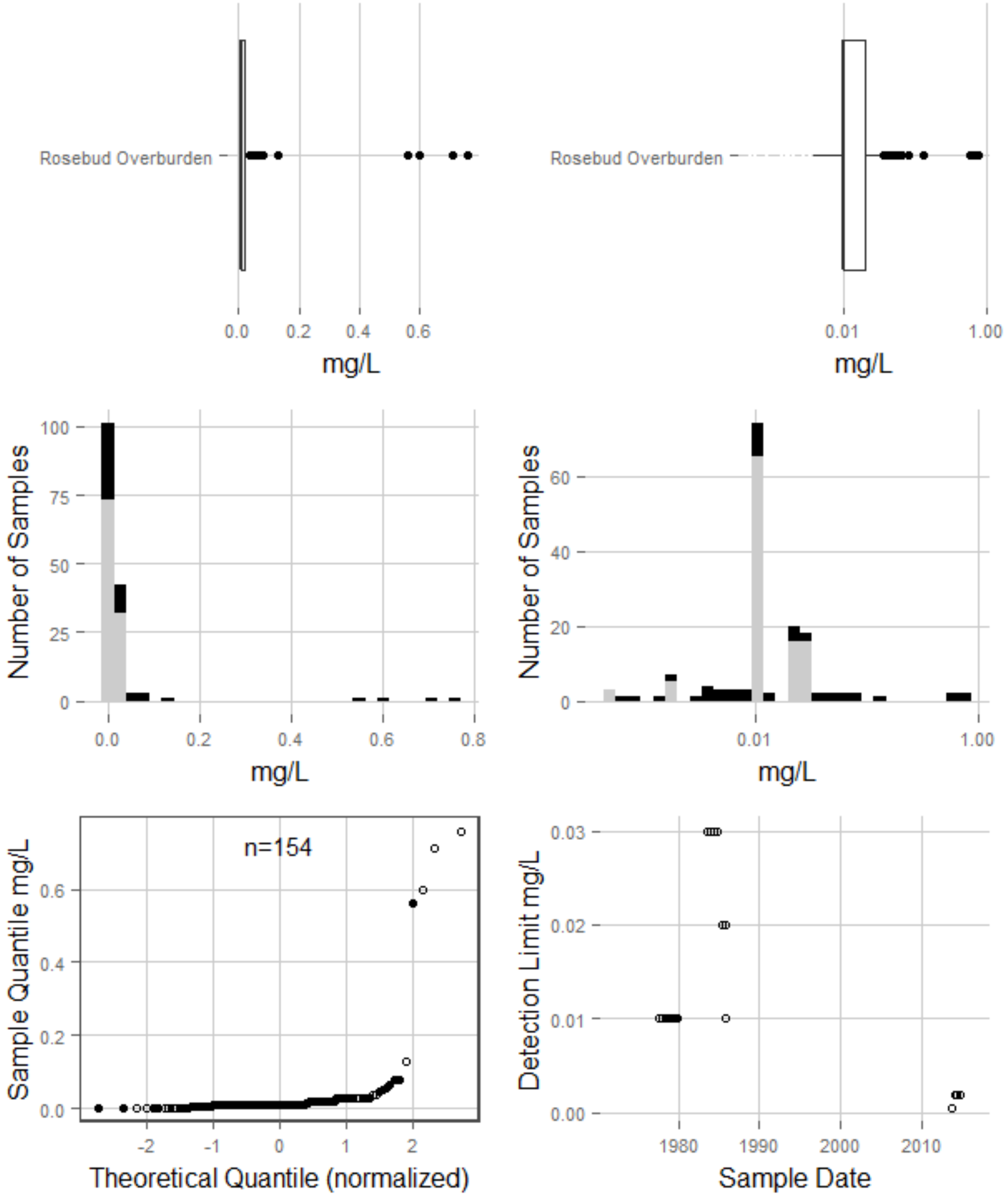
Nickel
Spoils



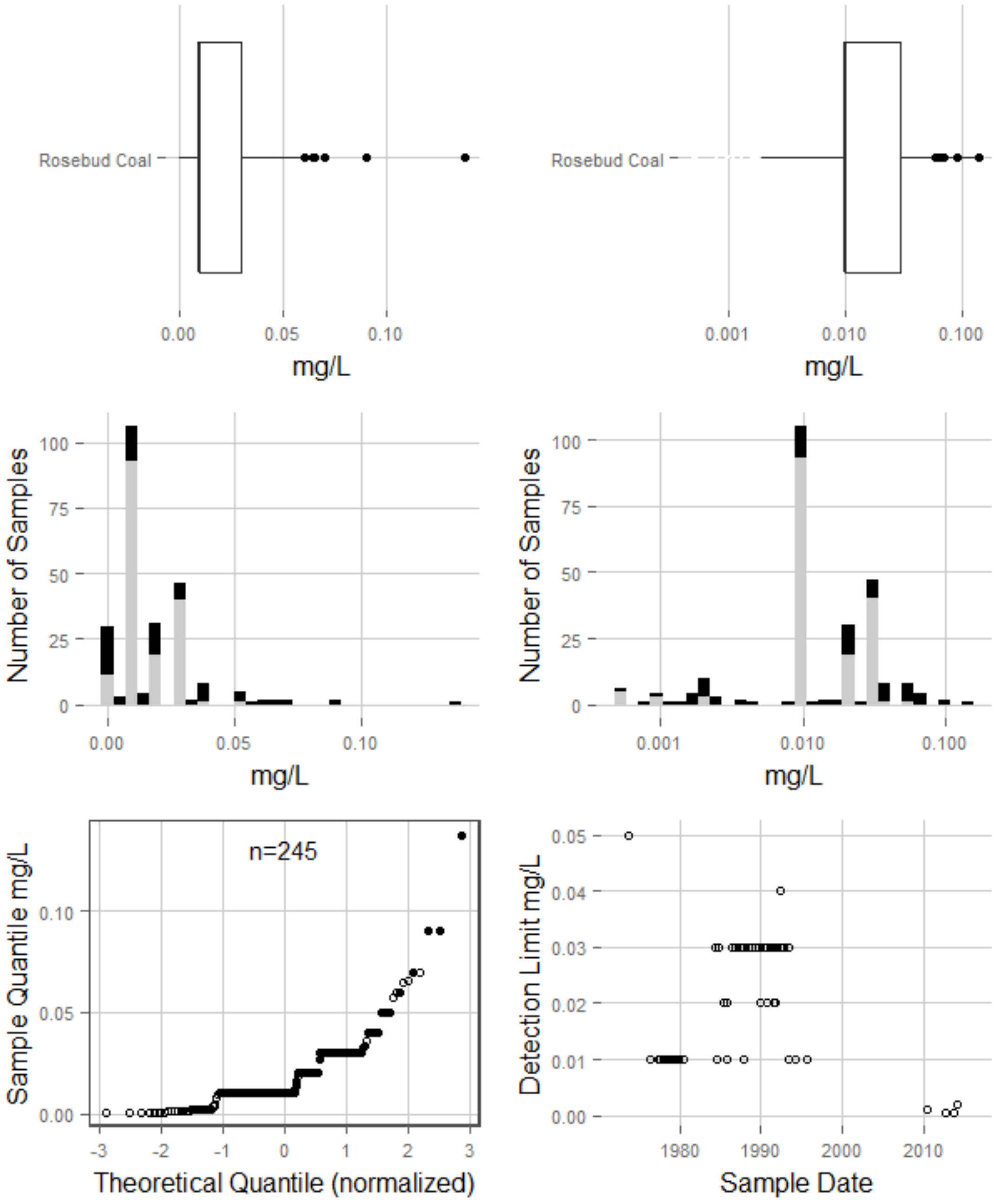
Nickel
Clinker



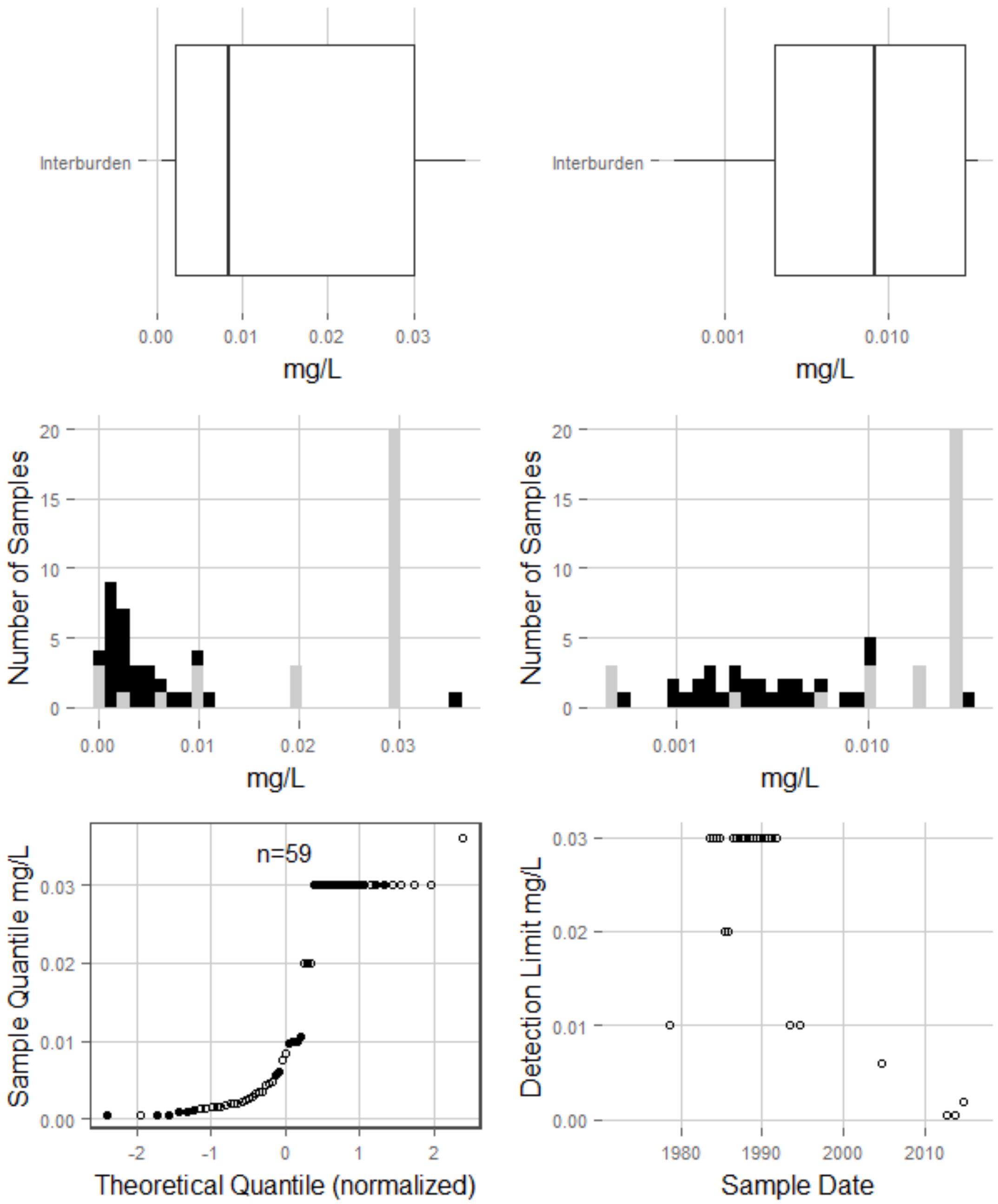
Nickel
Rosebud Overburden



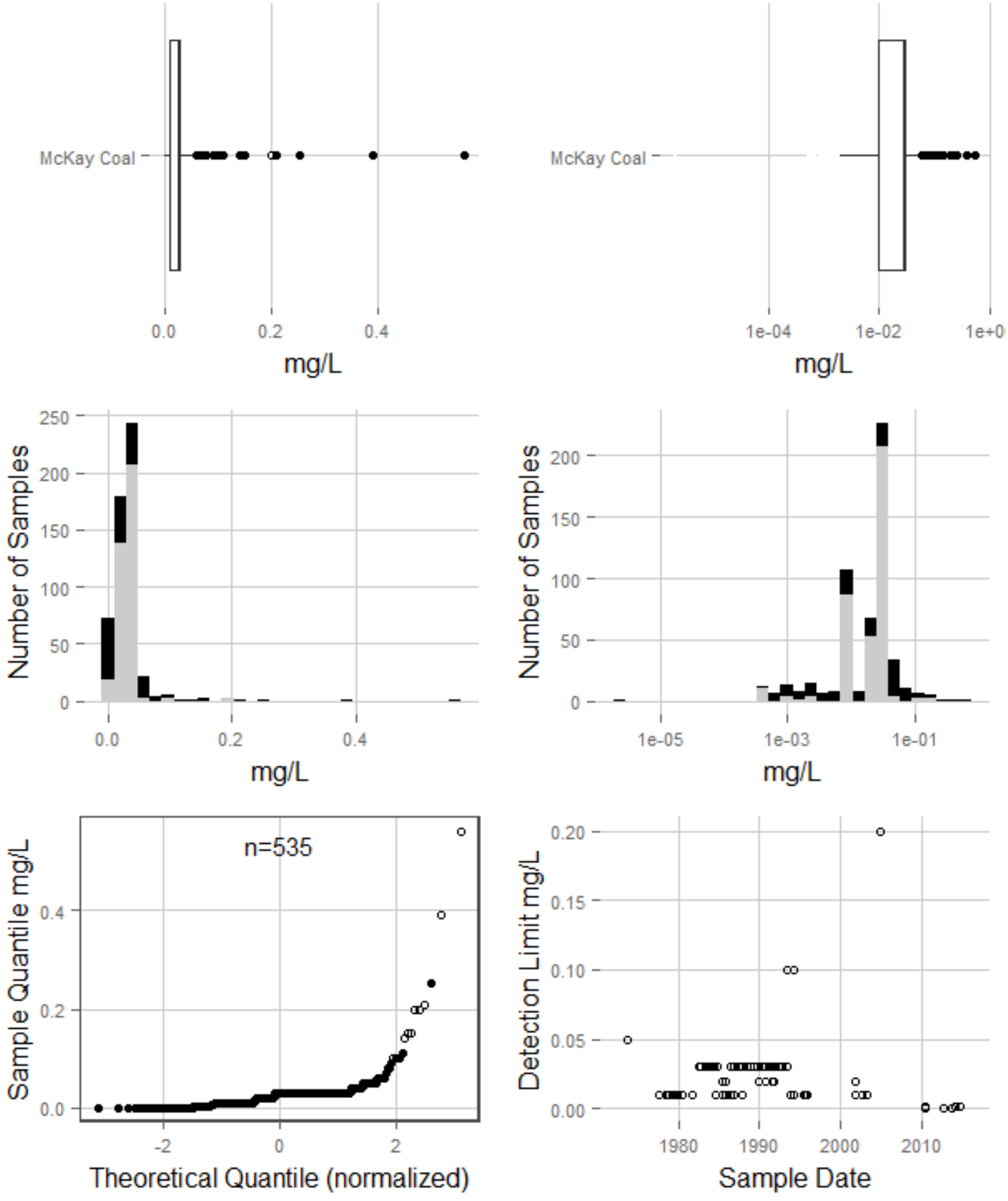
Nickel
Rosebud Coal



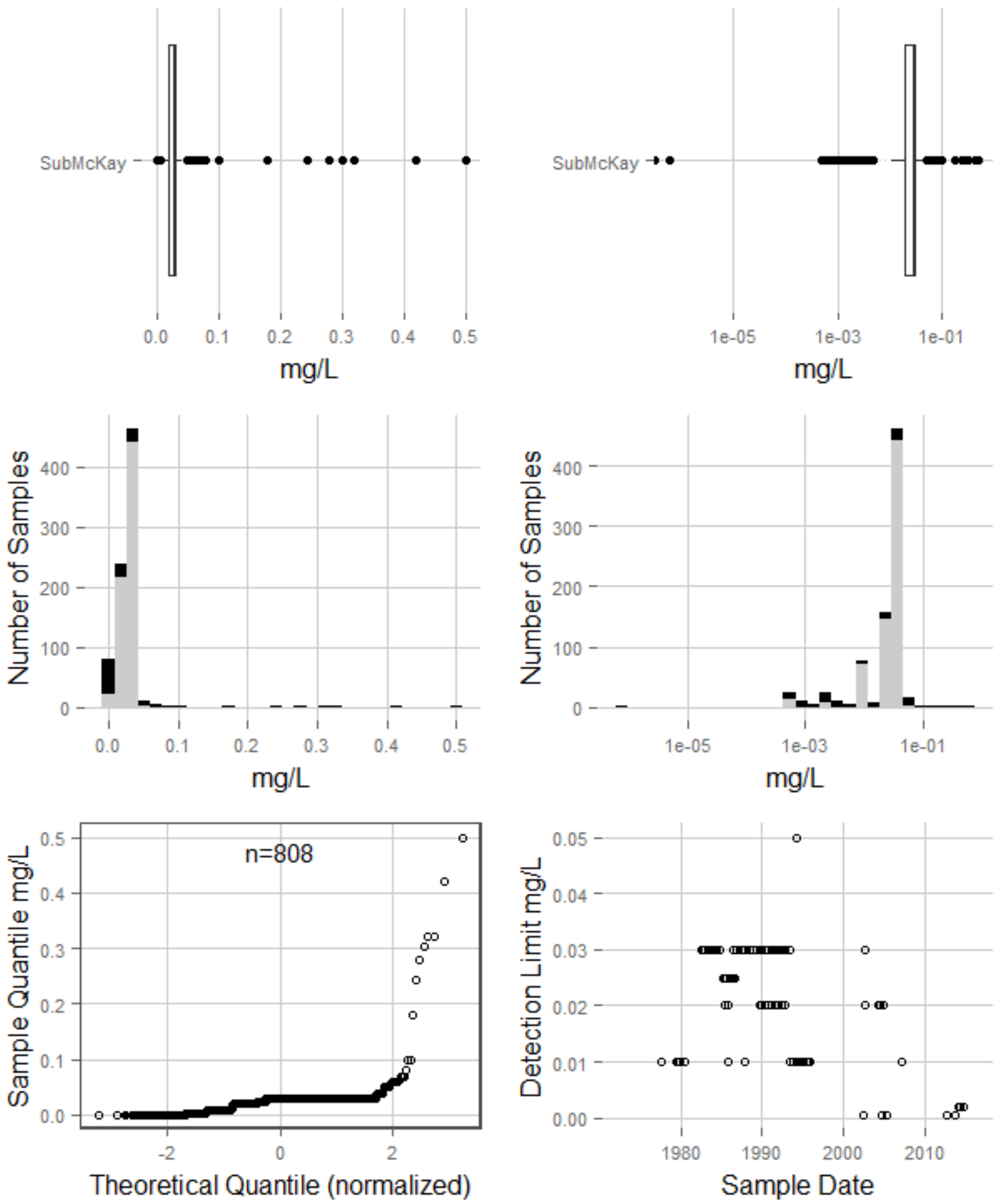
Nickel
Interburden



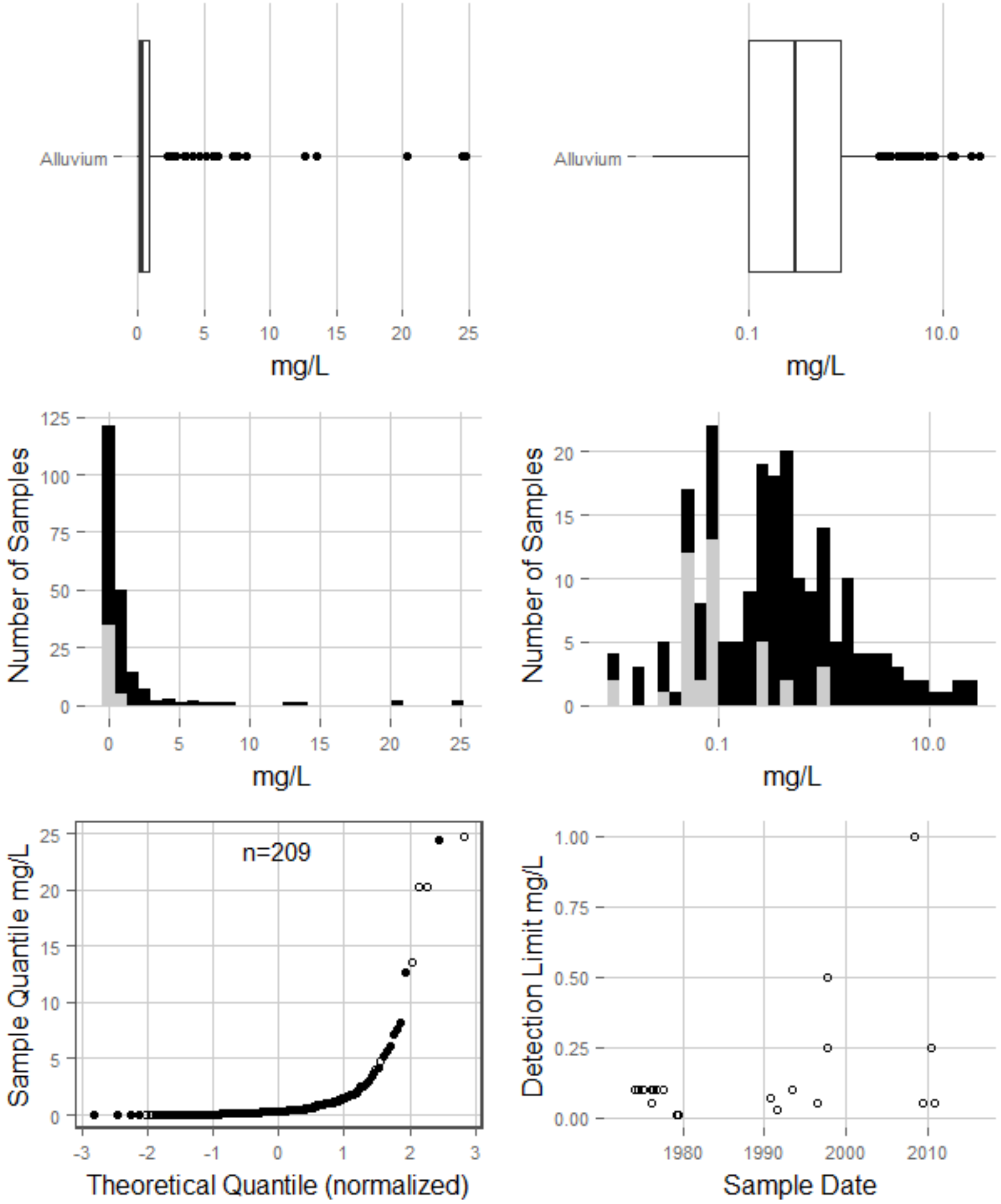
Nickel
McKay Coal



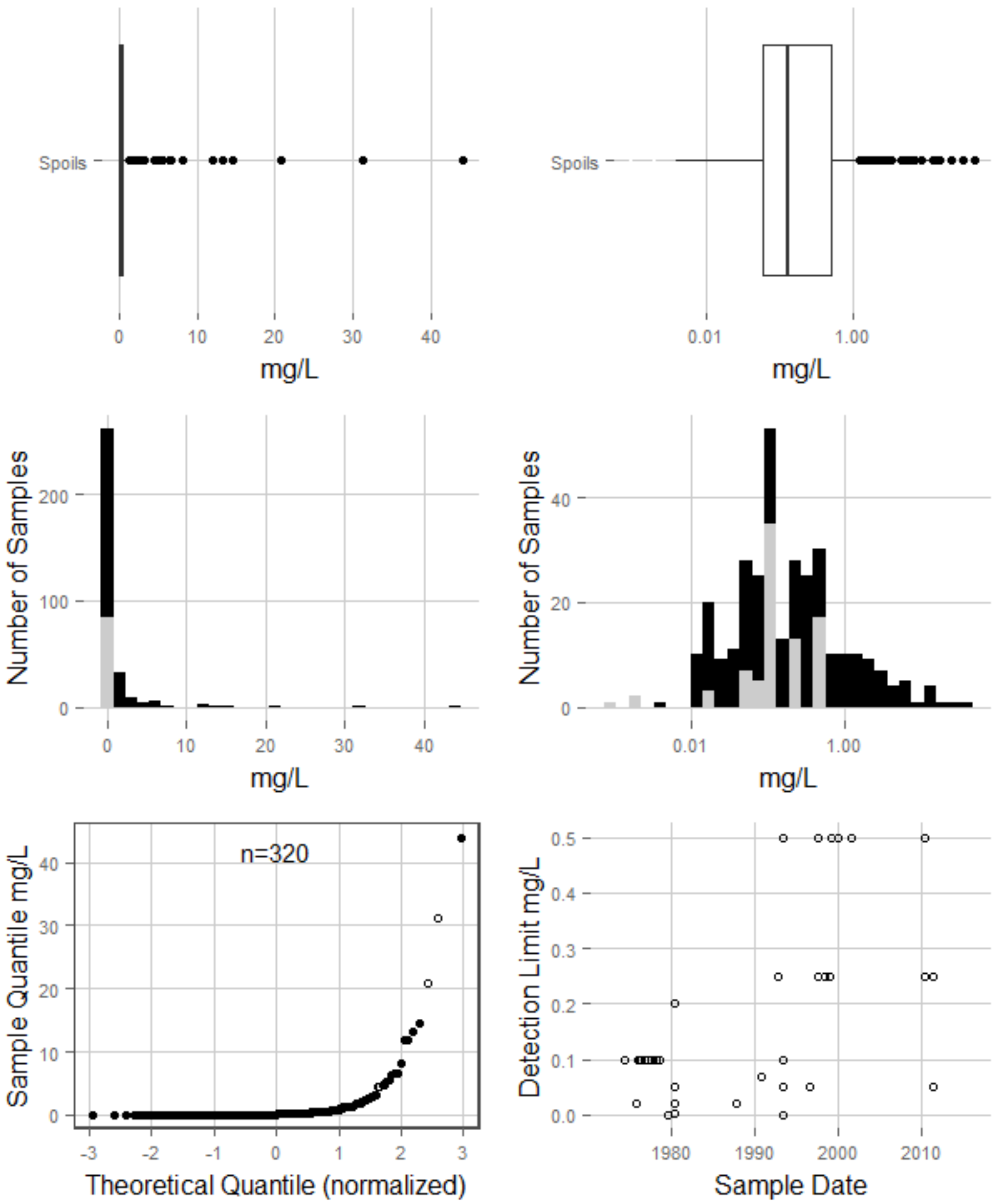
Nickel
SubMcKay



Nitrate
Alluvium

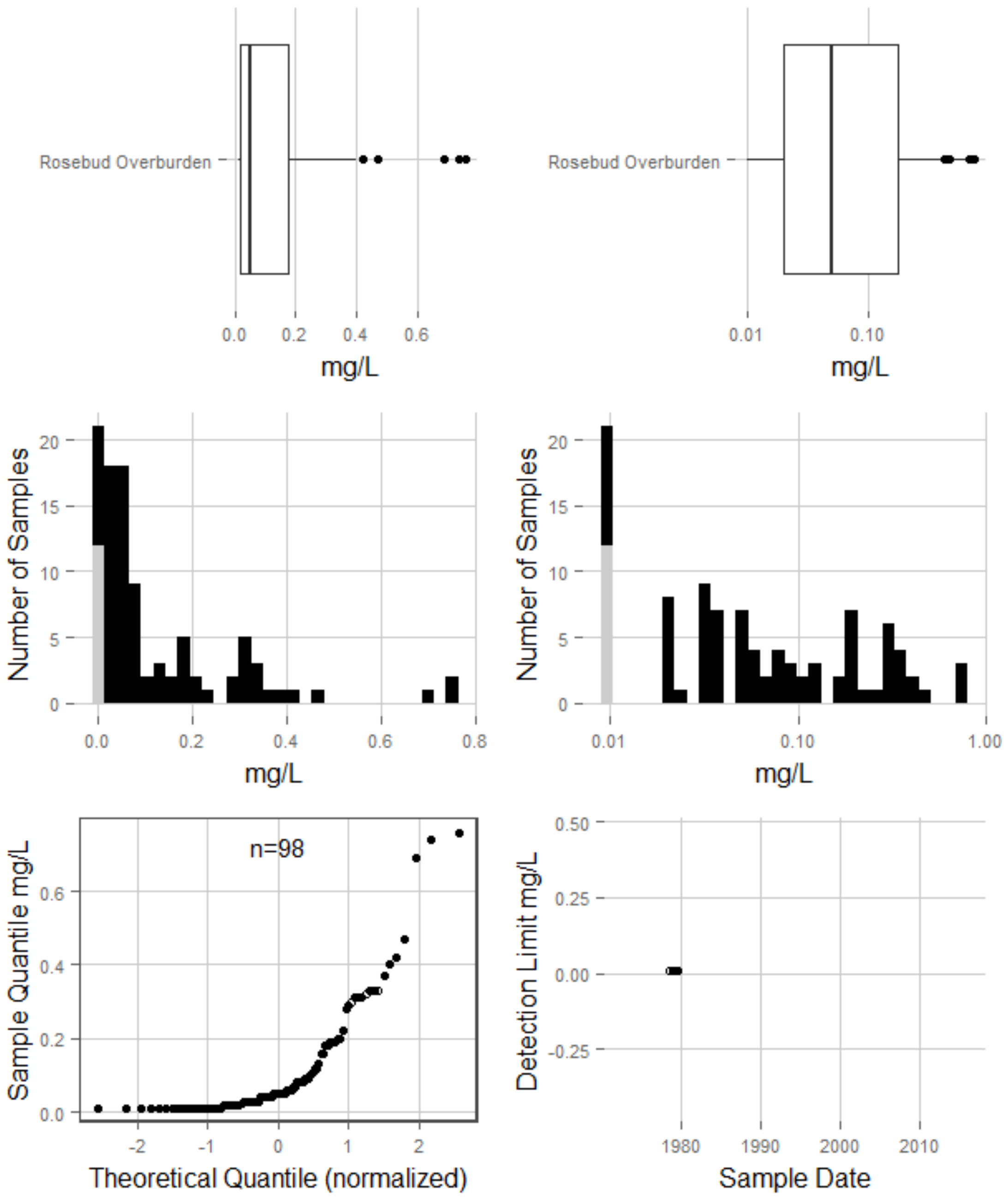


Nitrate
Spoils

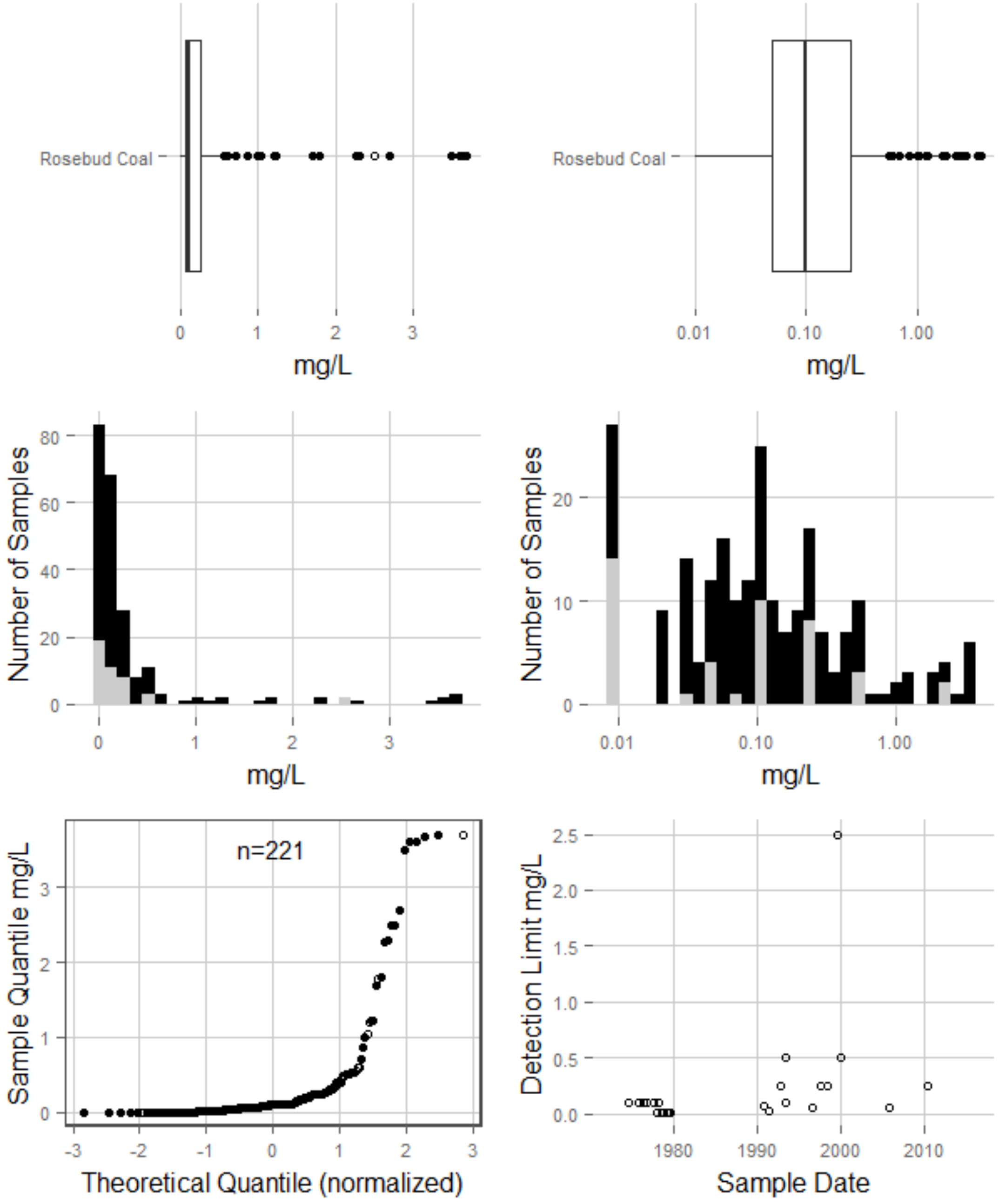


Nitrate
Clinker
No data

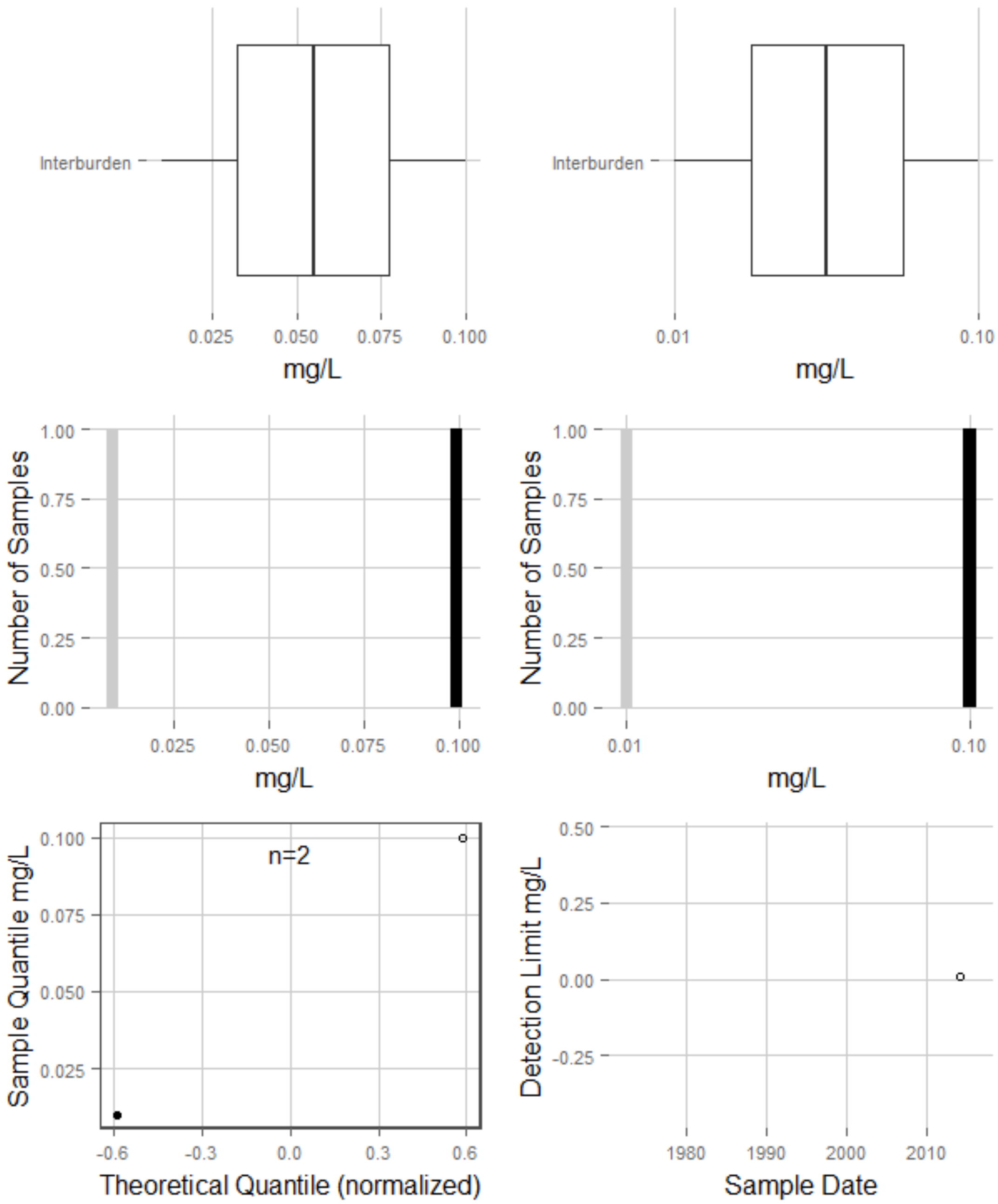
Nitrate
Rosebud Overburden



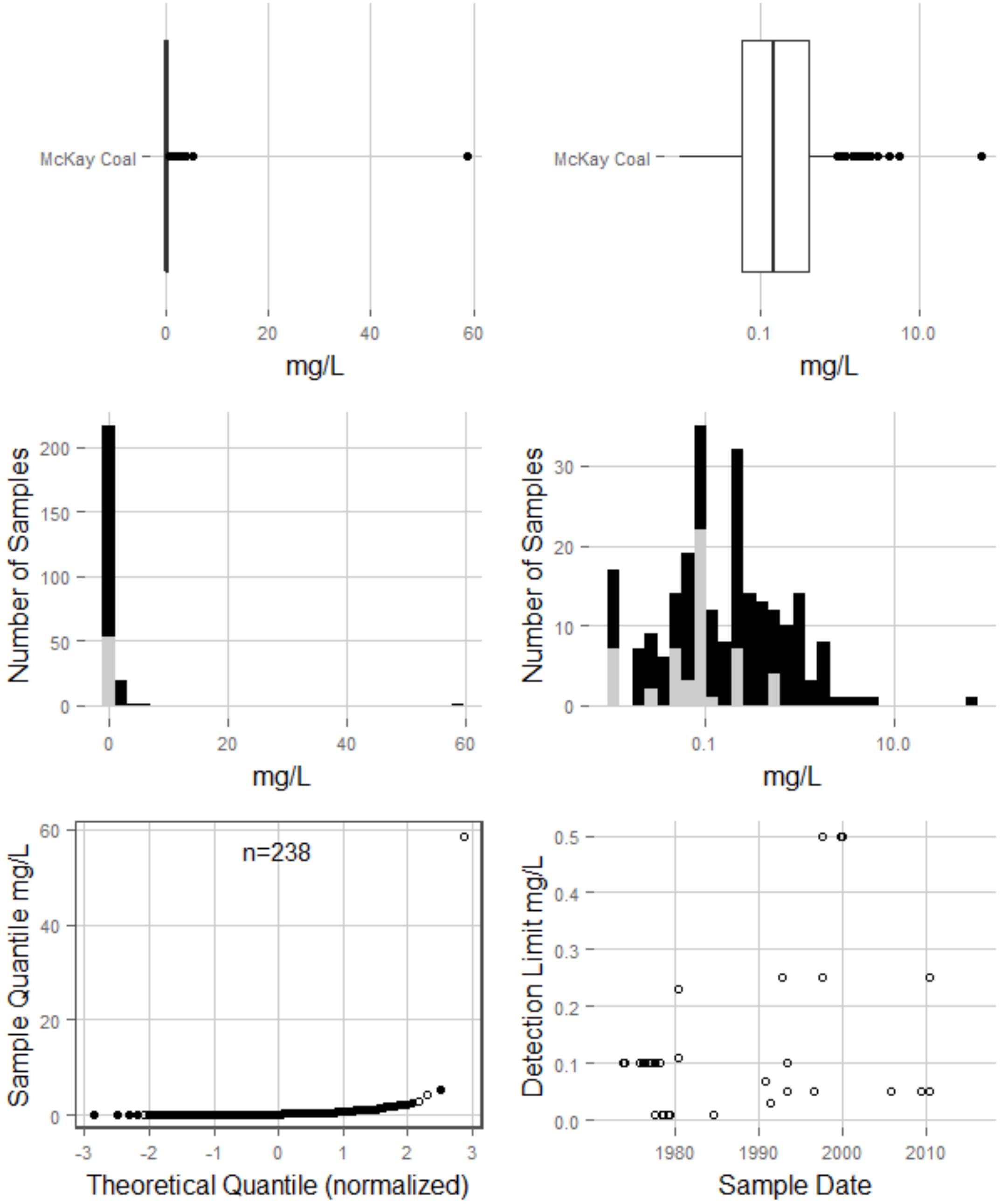
Nitrate
Rosebud Coal



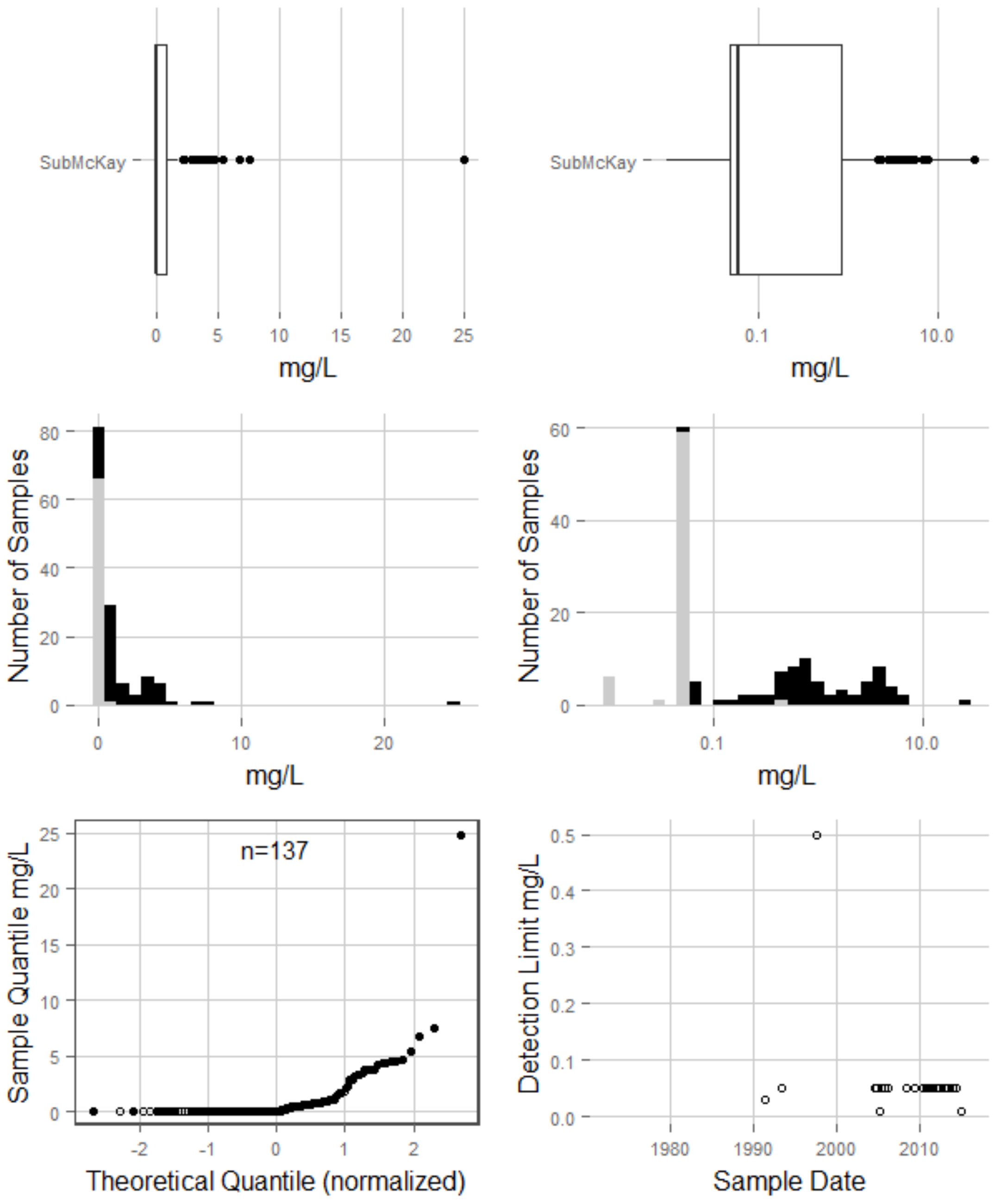
Nitrate
Interburden



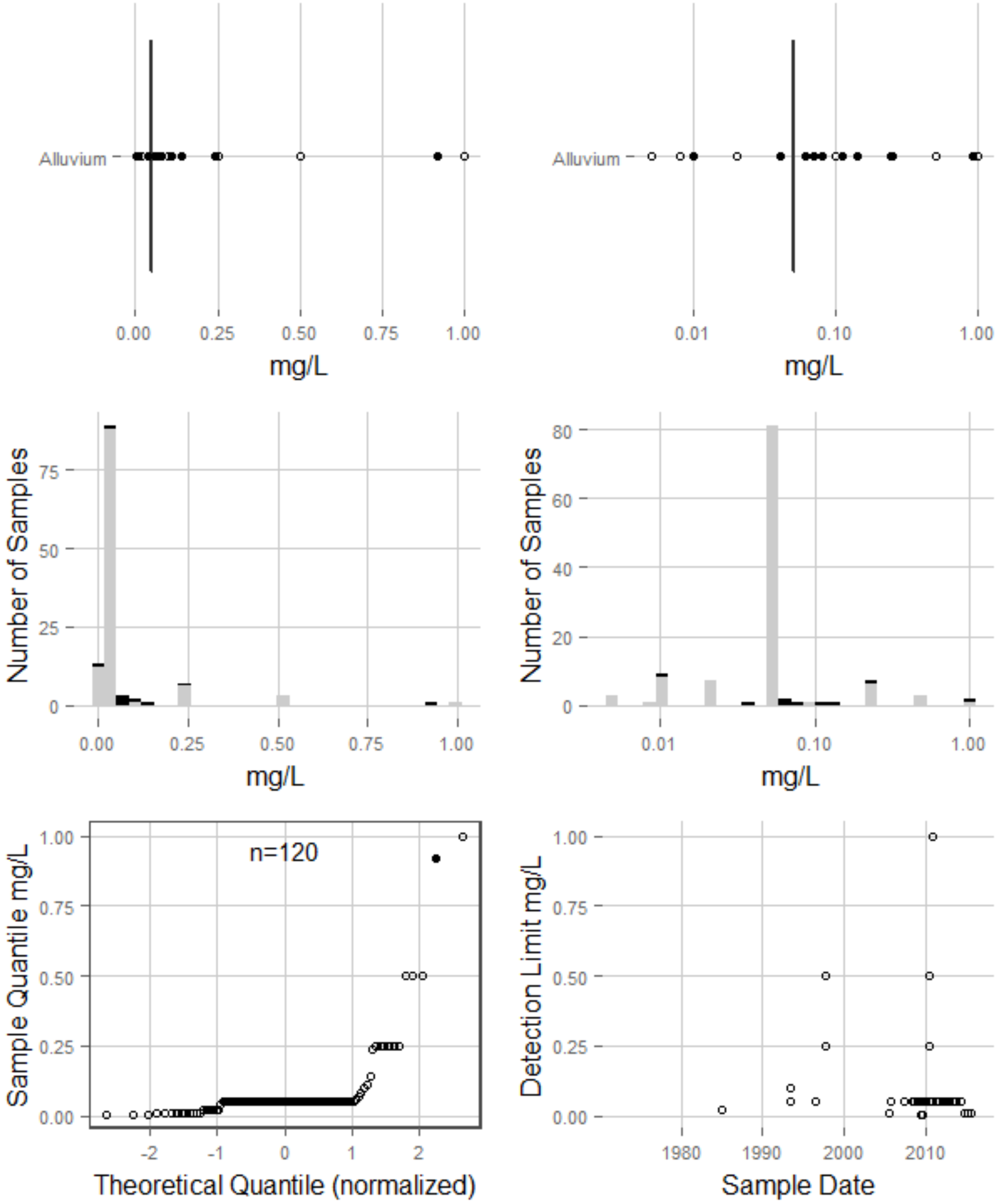
Nitrate
McKay Coal



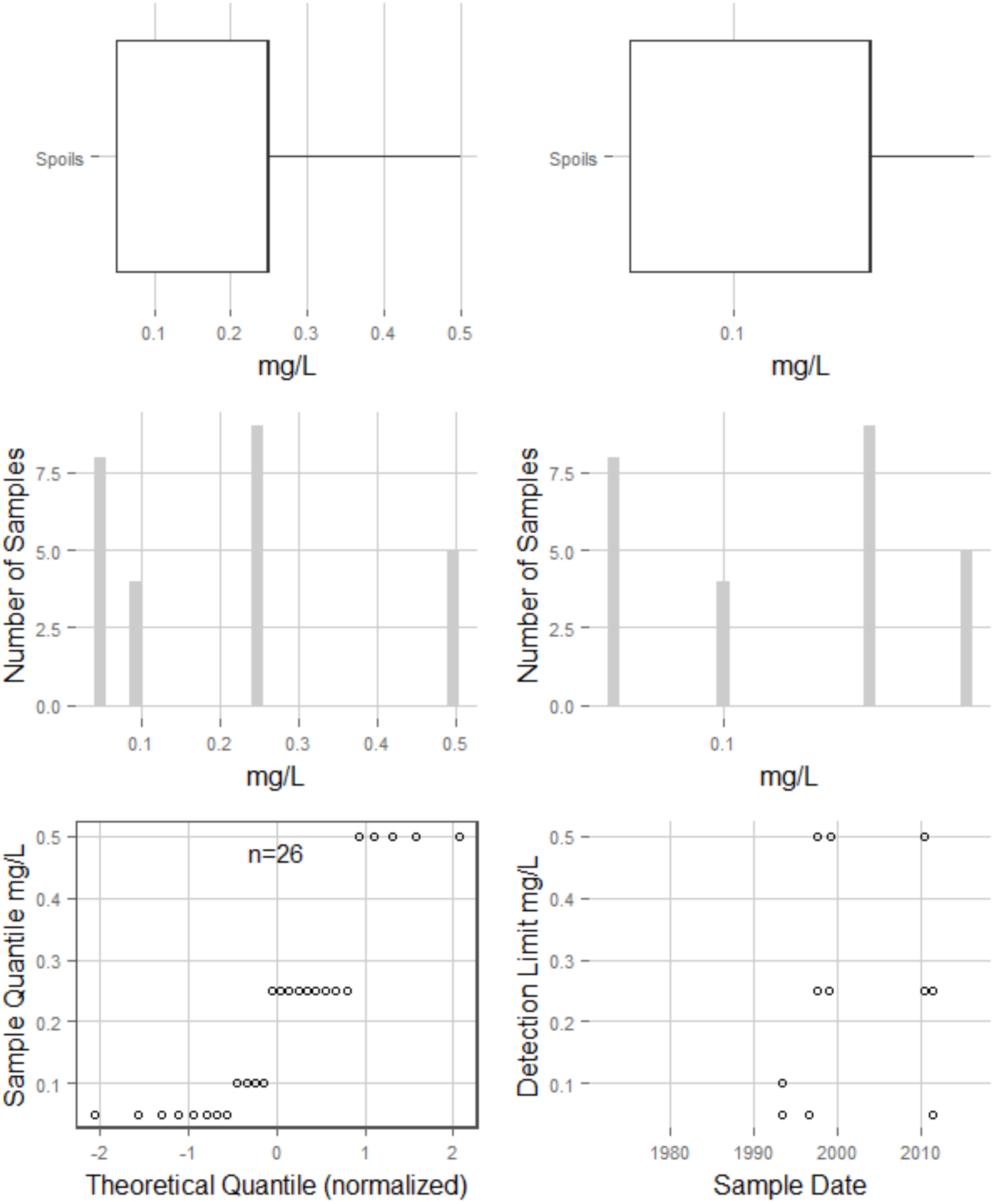
Nitrate
SubMcKay



Nitrite
Alluvium



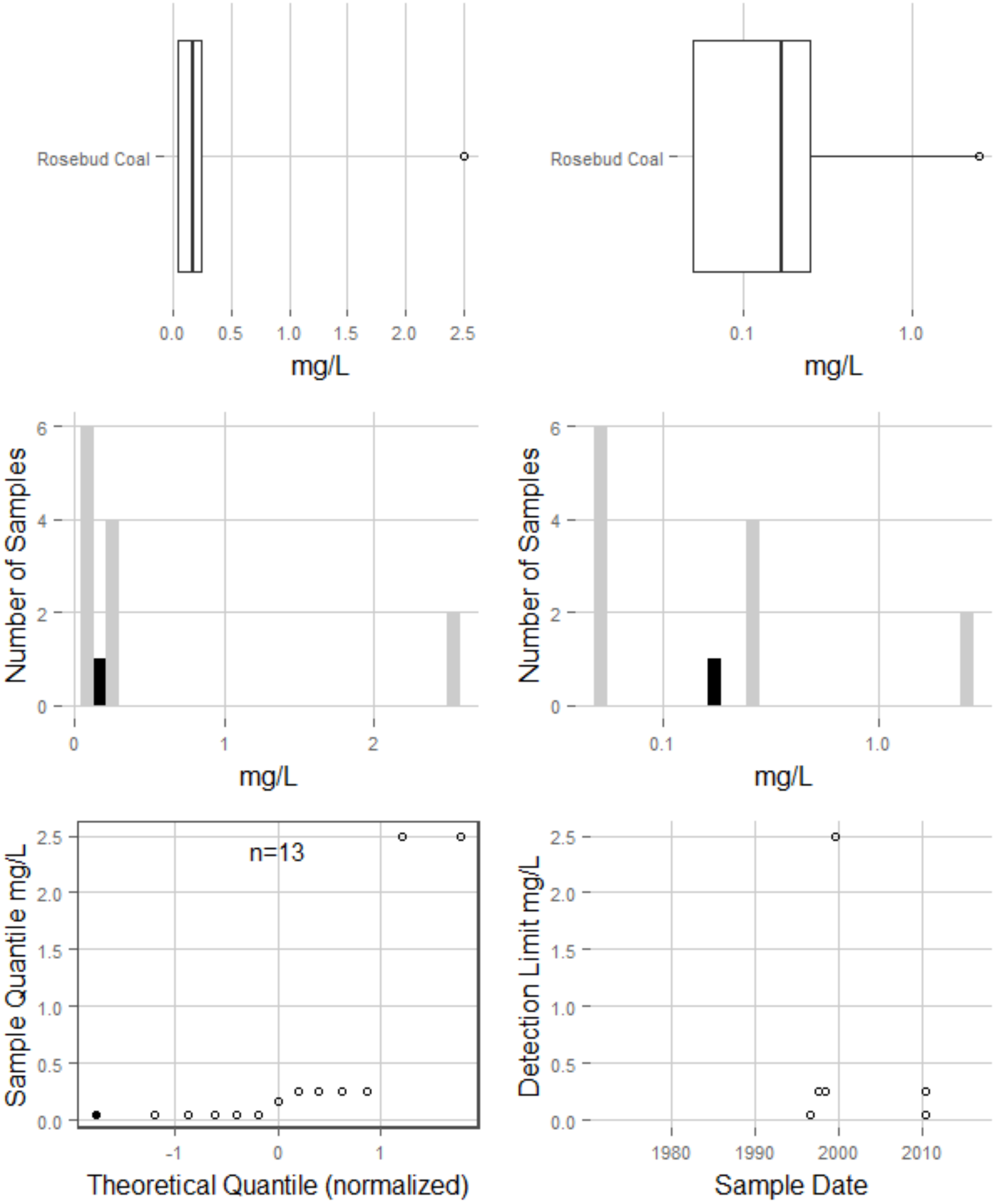
Nitrite
Spoils



Nitrite
Clinker
No data

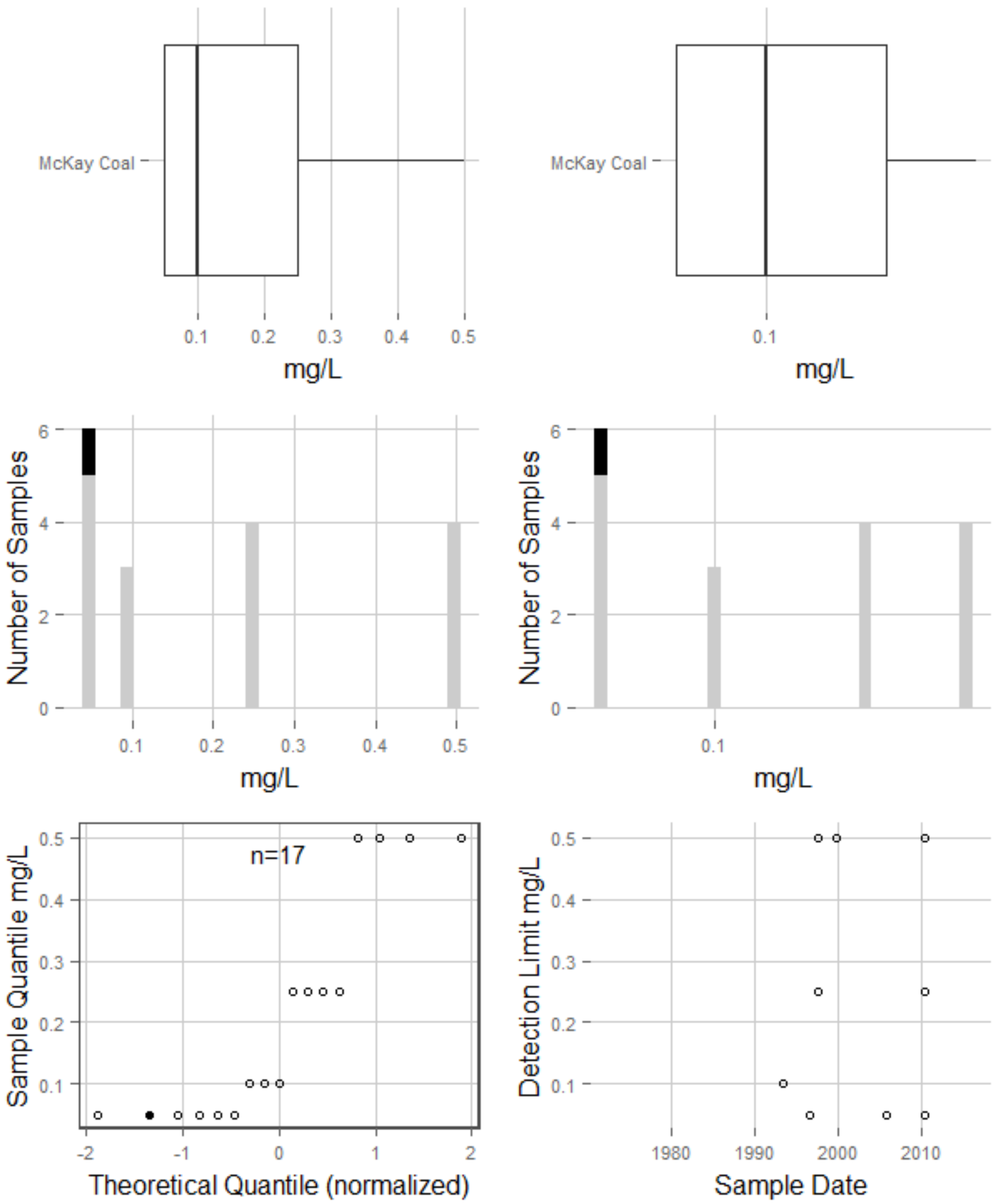
Nitrite
Rosebud Overburden
No data

Nitrite
Rosebud Coal

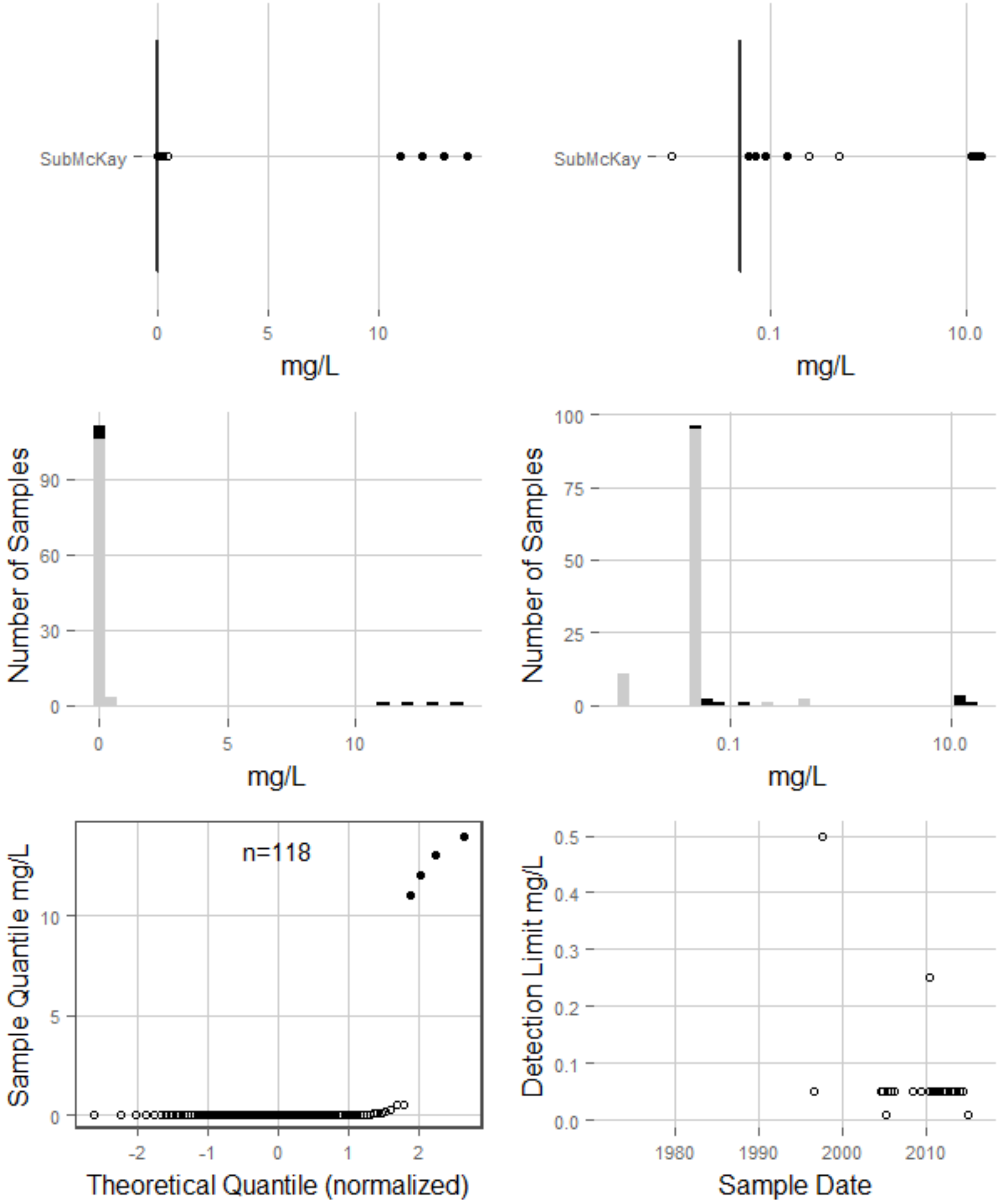


Nitrite
Interburden
No data

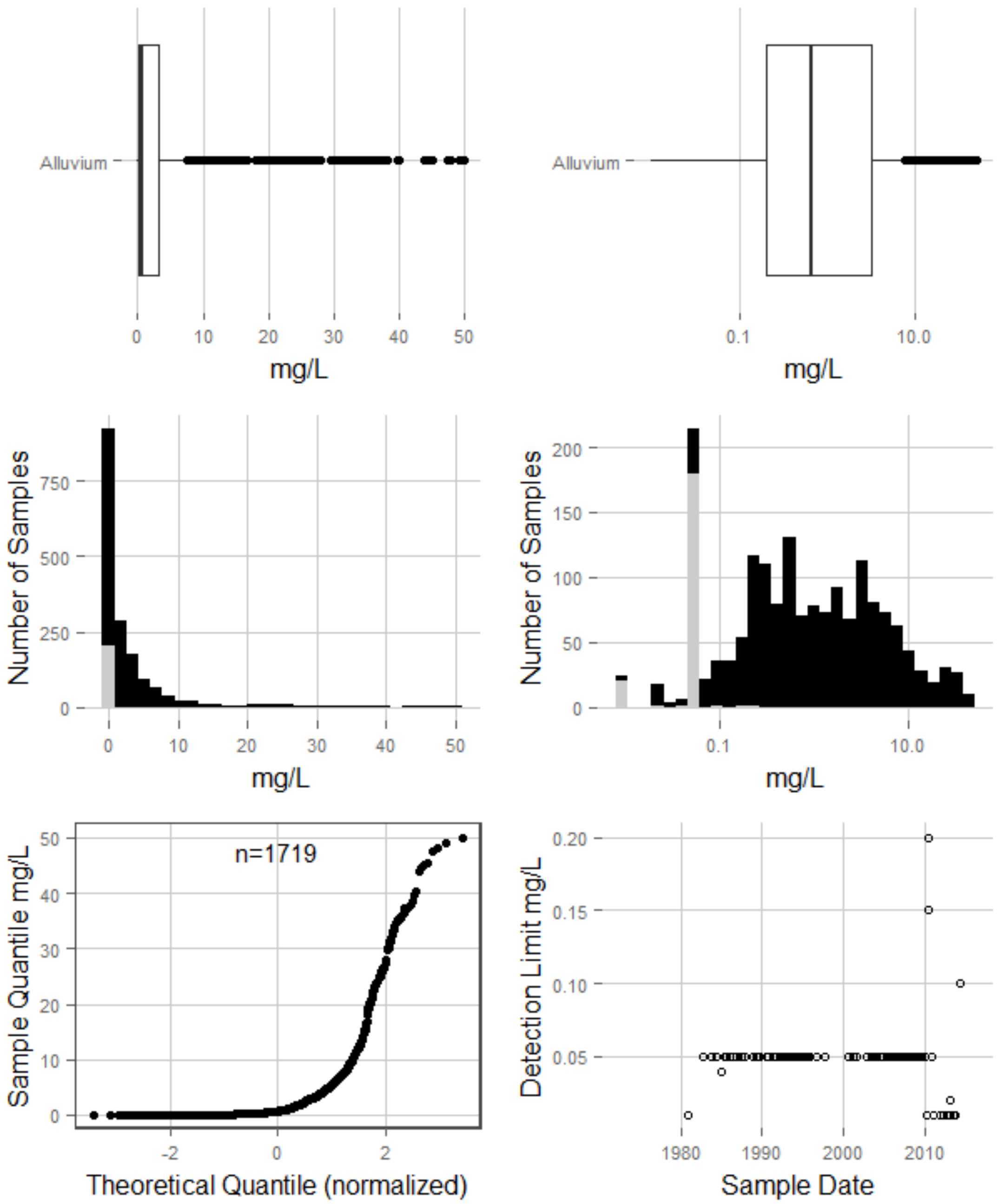
Nitrite
McKay Coal



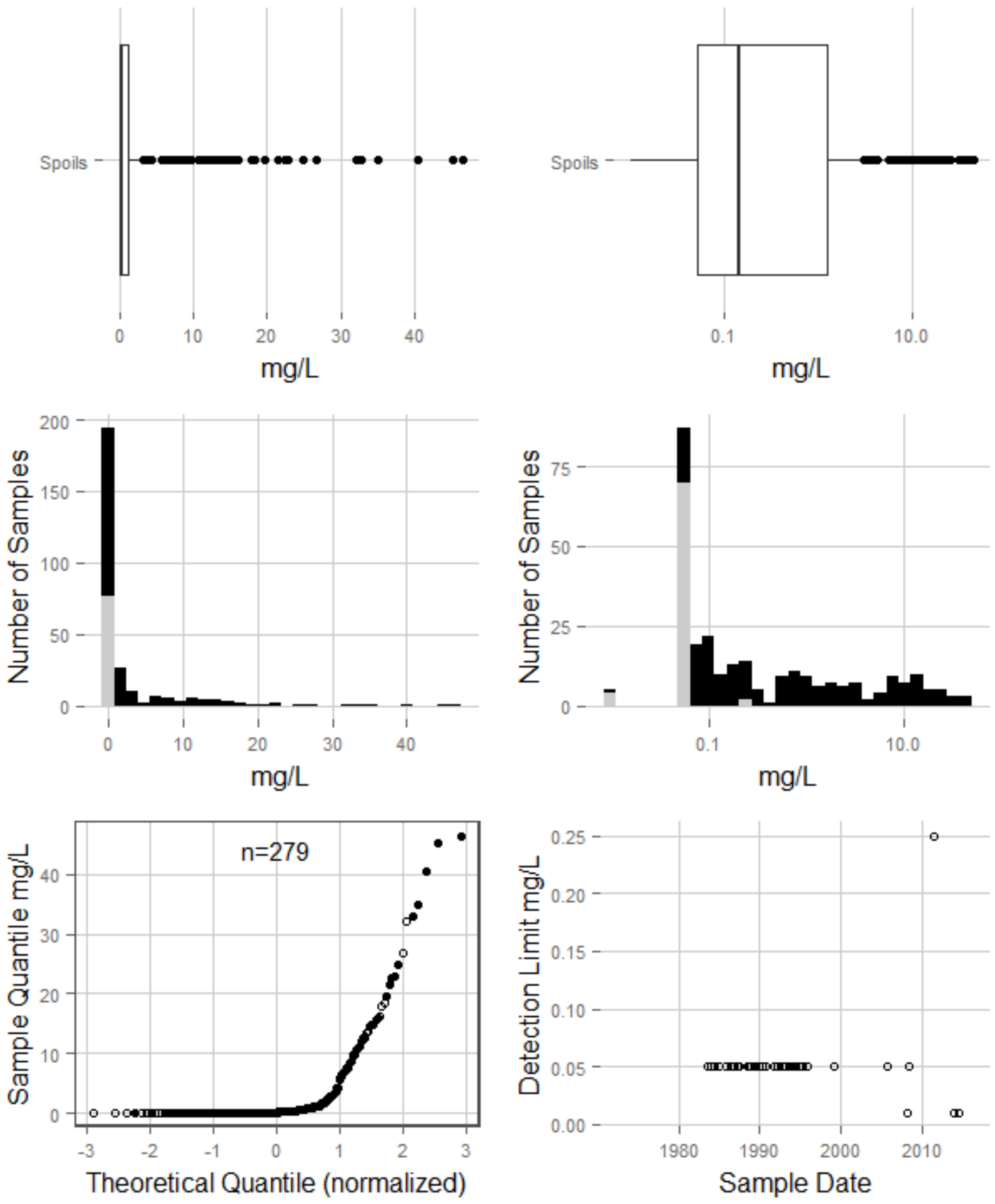
Nitrite
SubMcKay



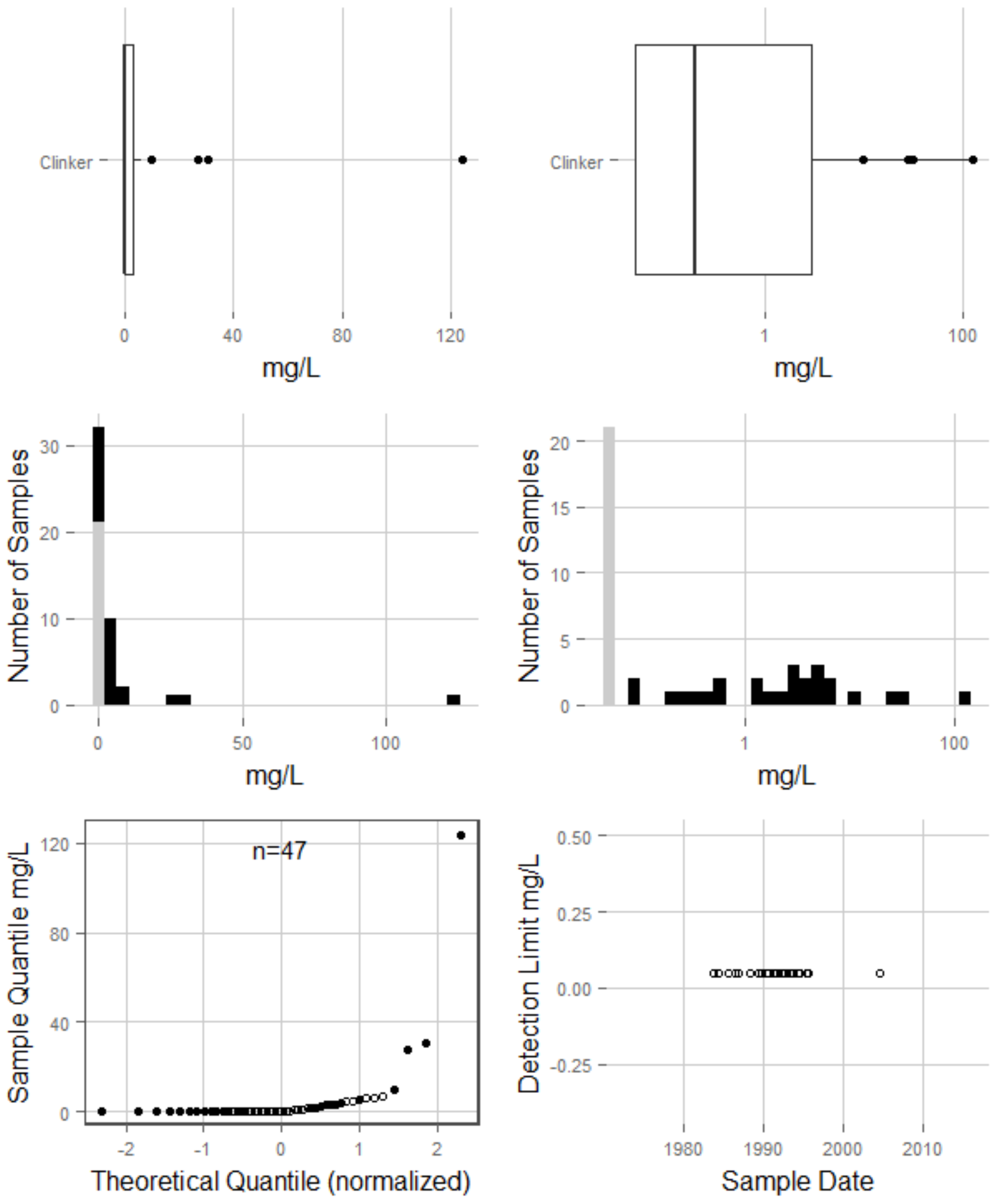
Nitrite + Nitrate
Alluvium



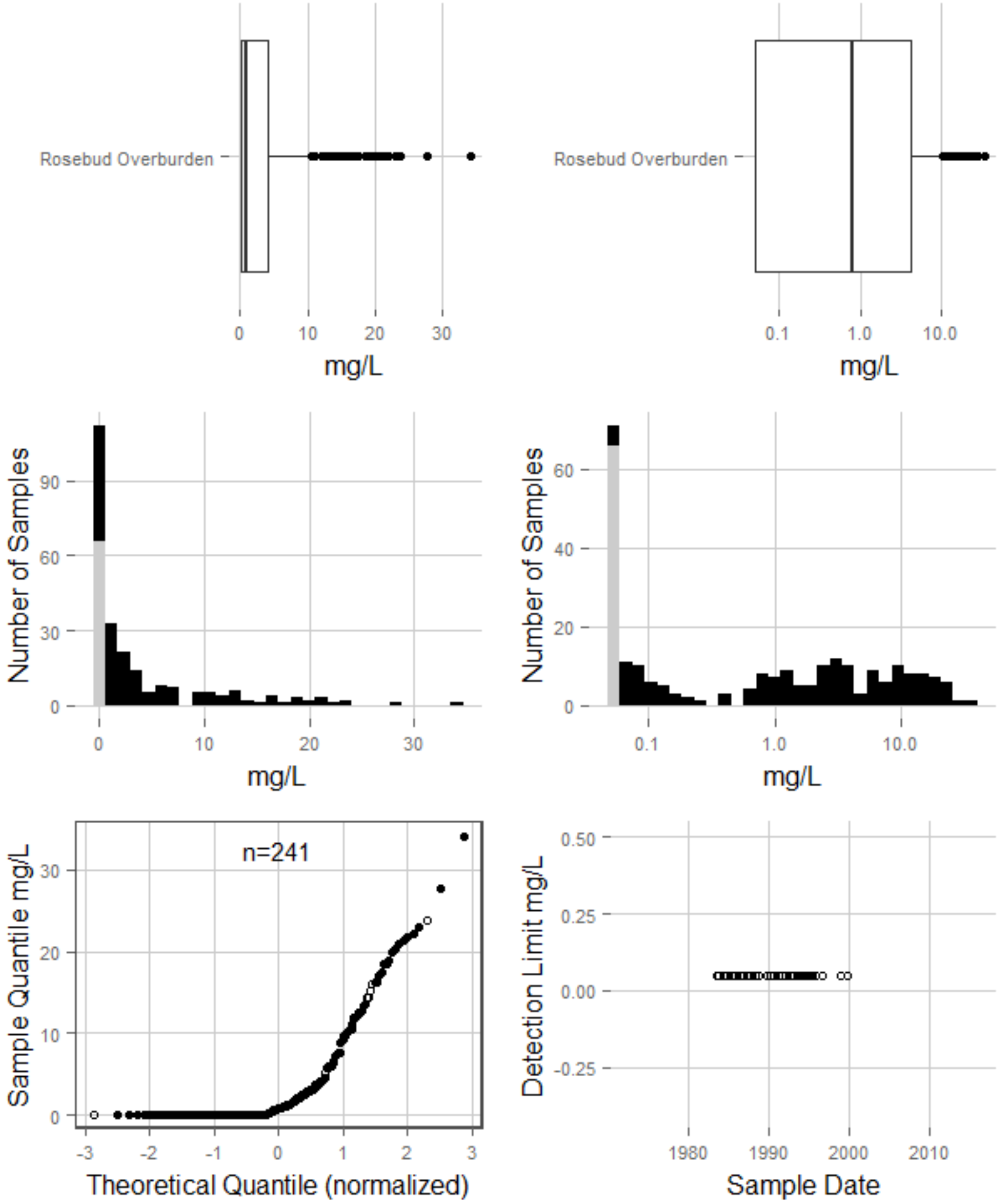
Nitrite + Nitrate
Spoils



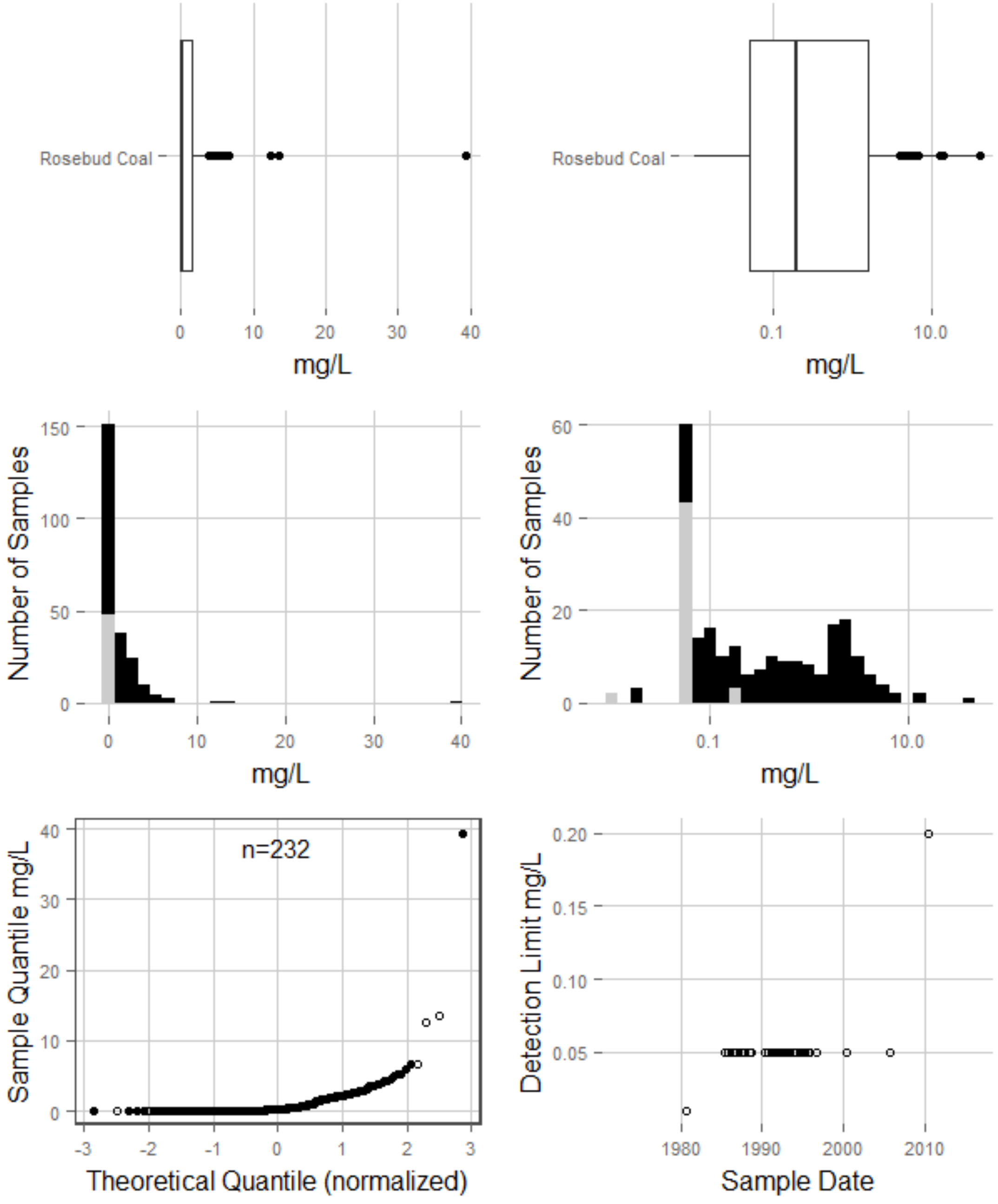
Nitrite + Nitrate
Clinker



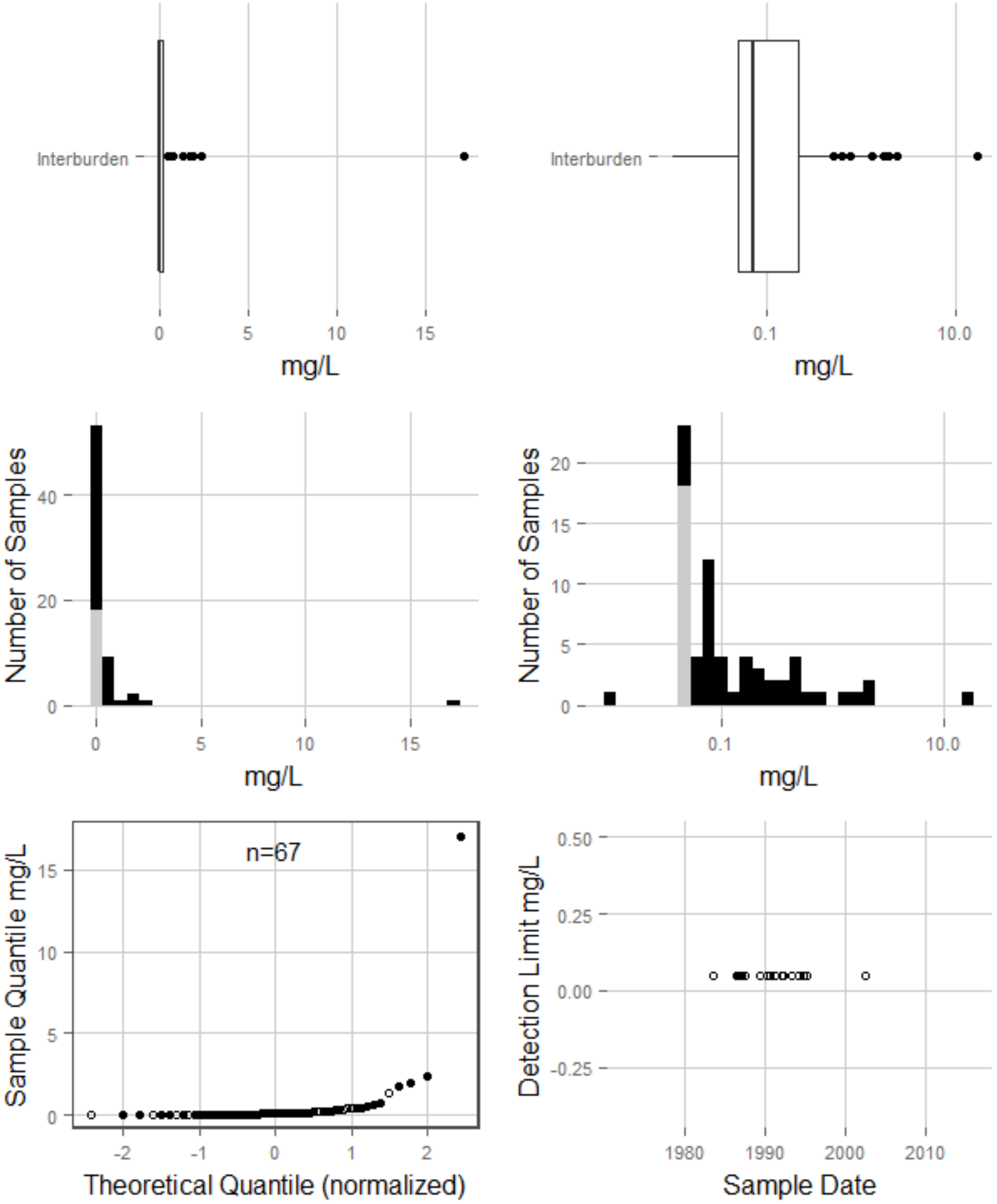
Nitrite + Nitrate
Rosebud Overburden



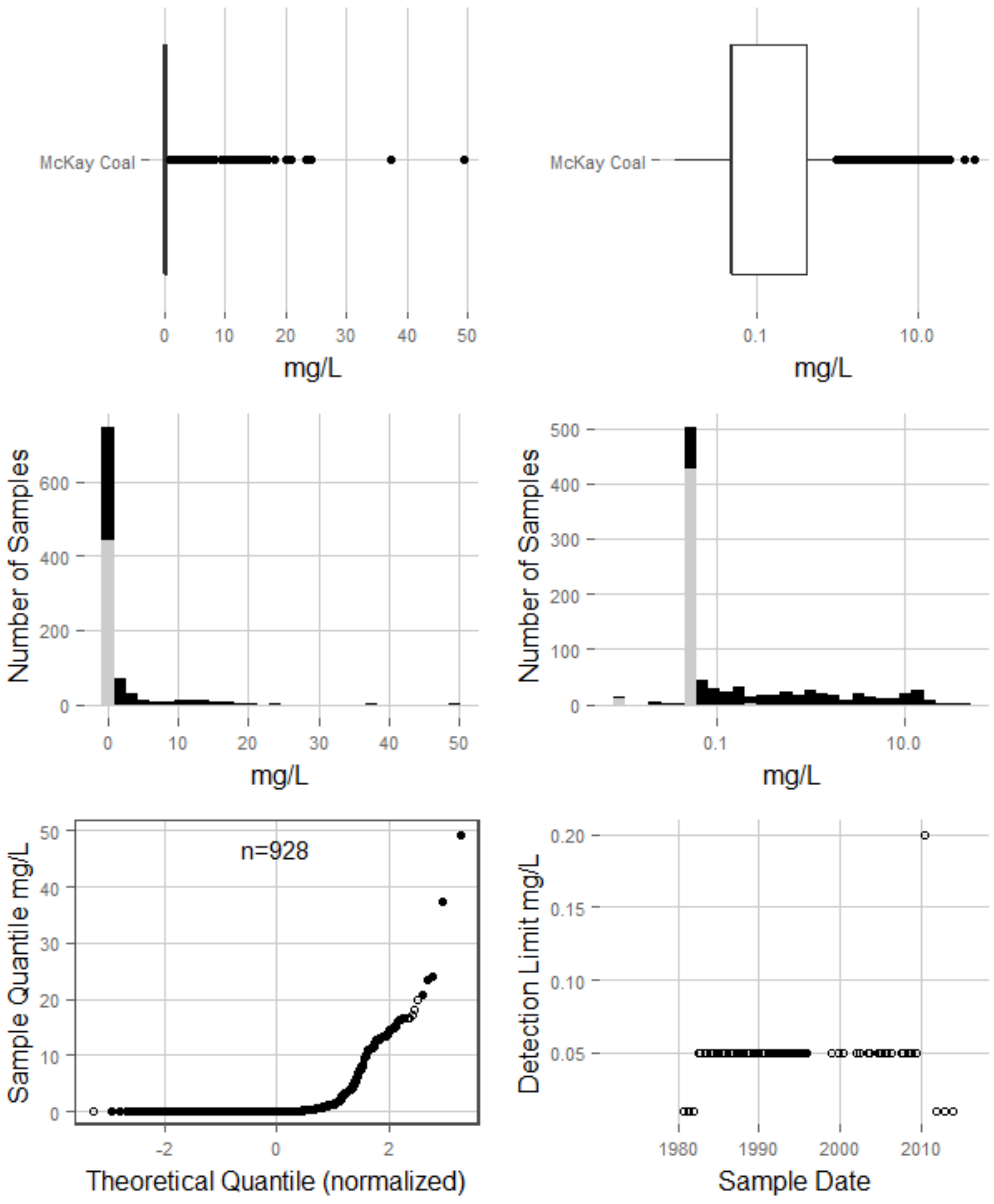
Nitrite + Nitrate
Rosebud Coal



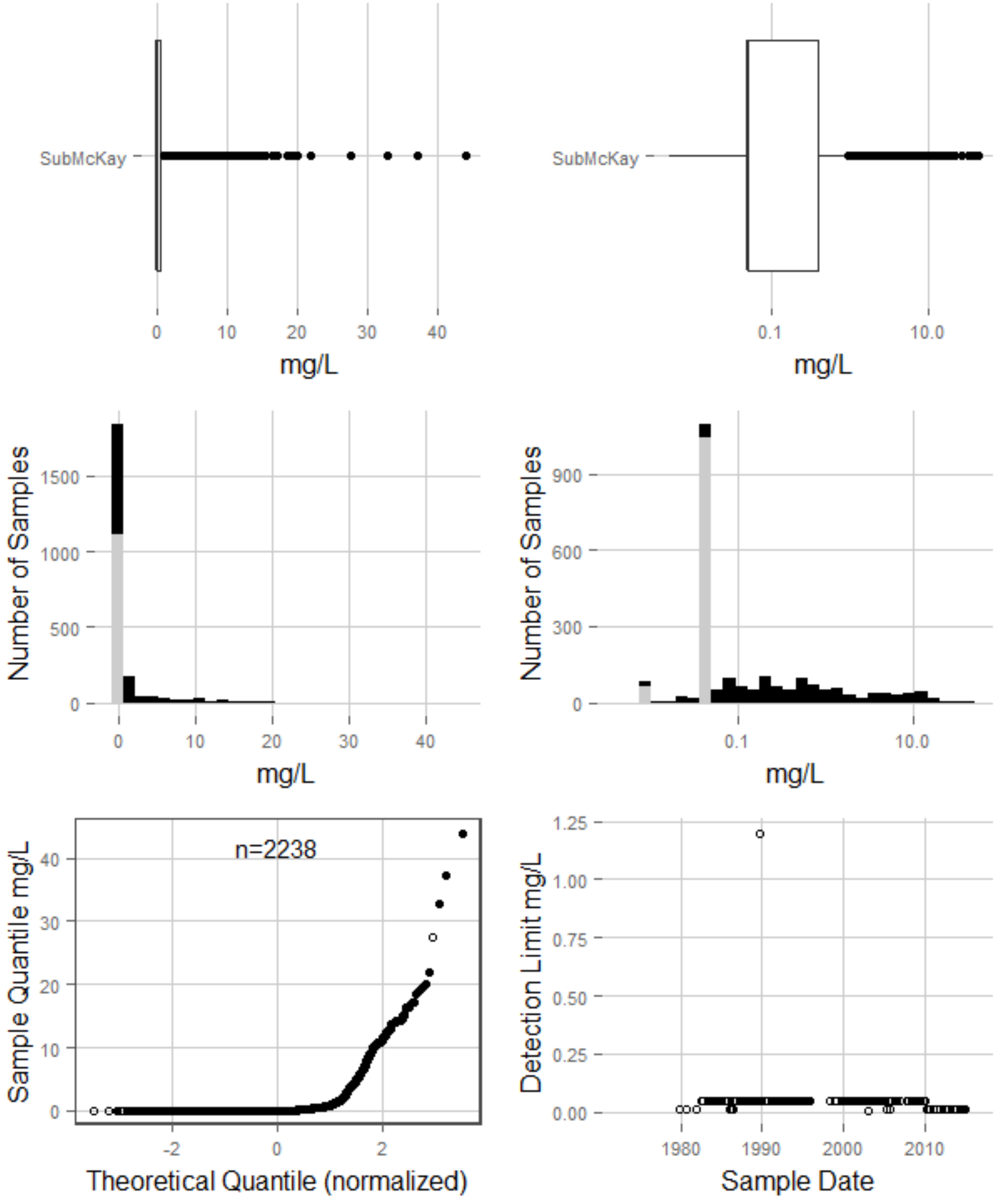
Nitrite + Nitrate
Interburden



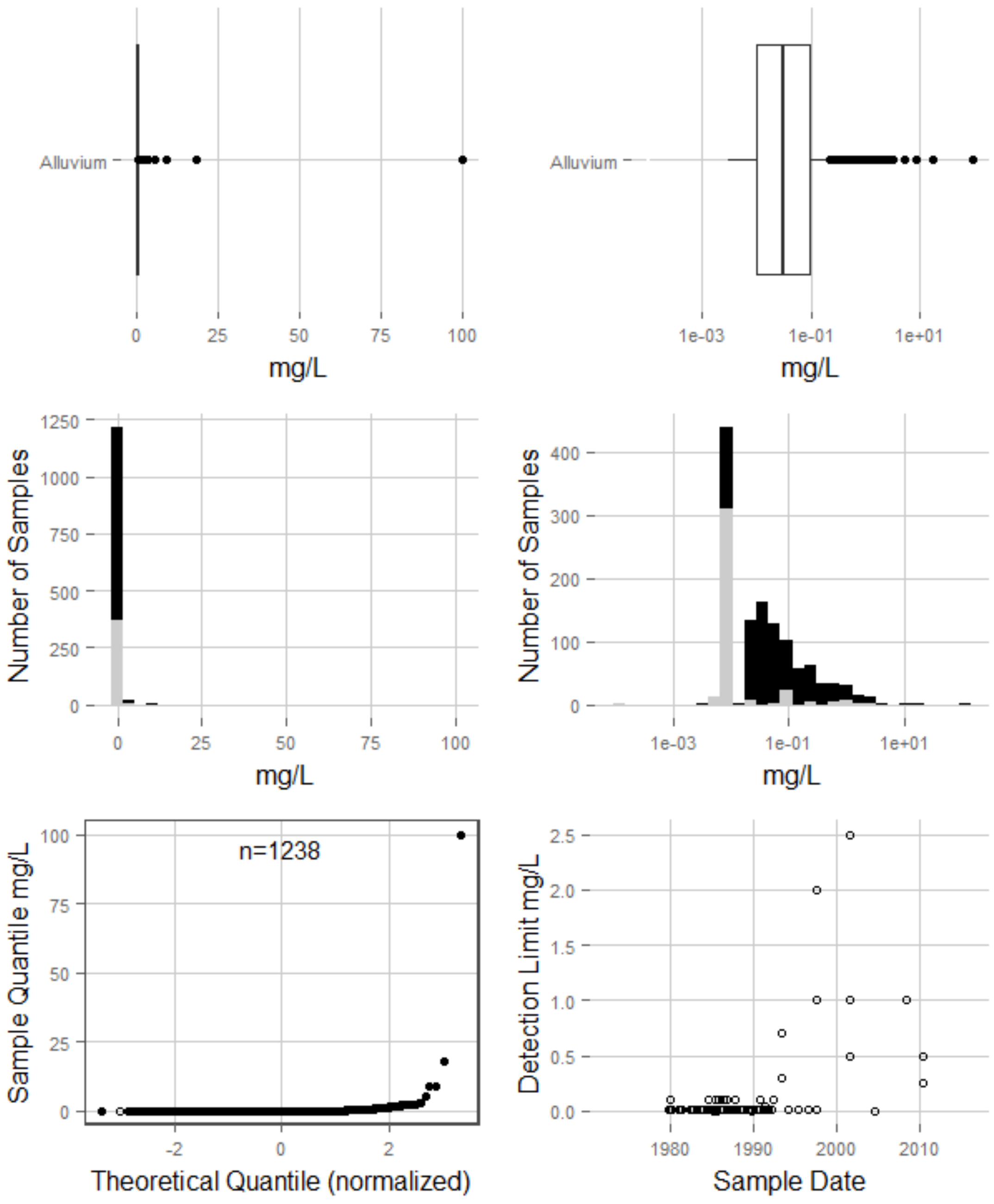
Nitrite + Nitrate
McKay Coal



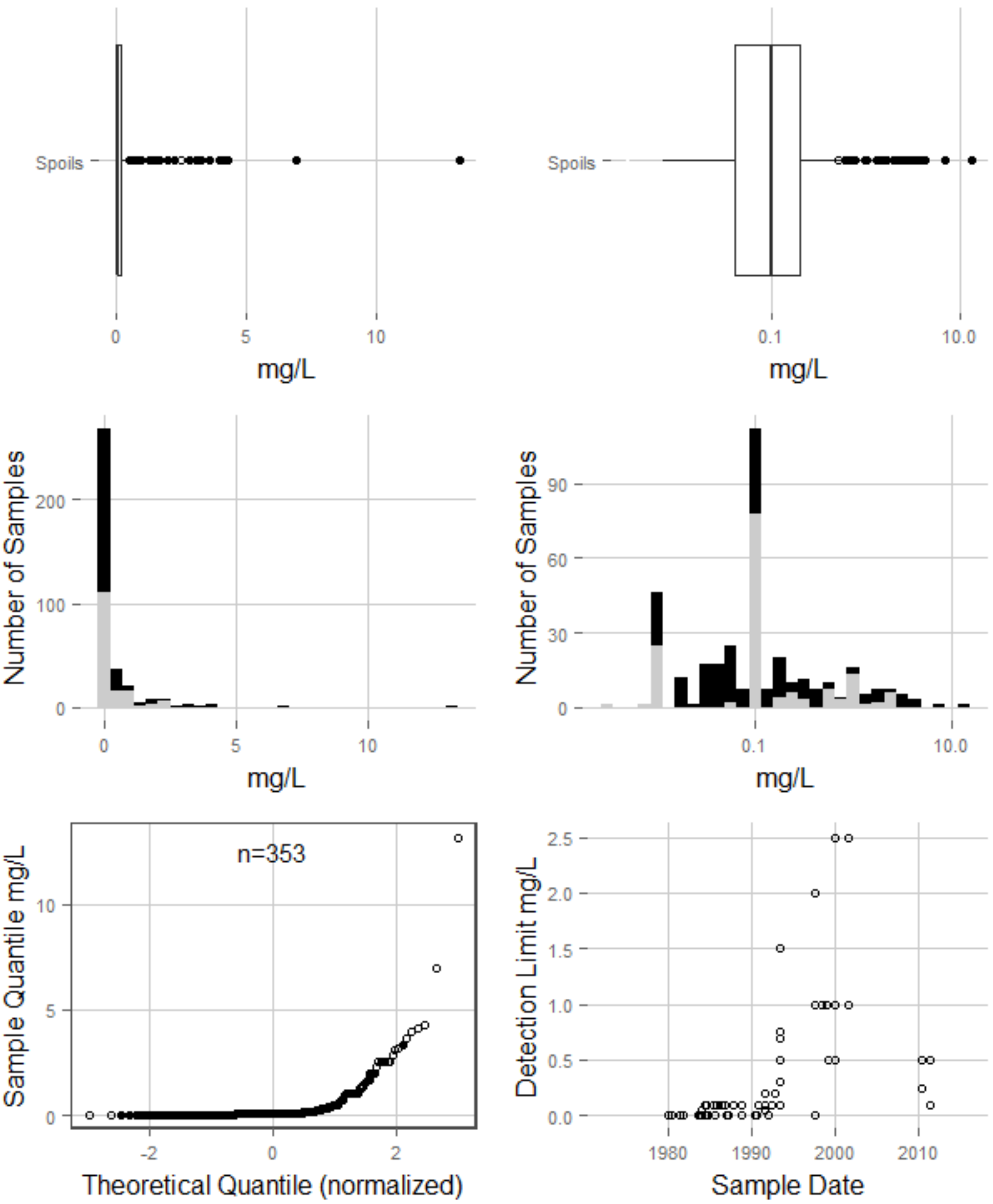
Nitrite + Nitrate
SubMcKay



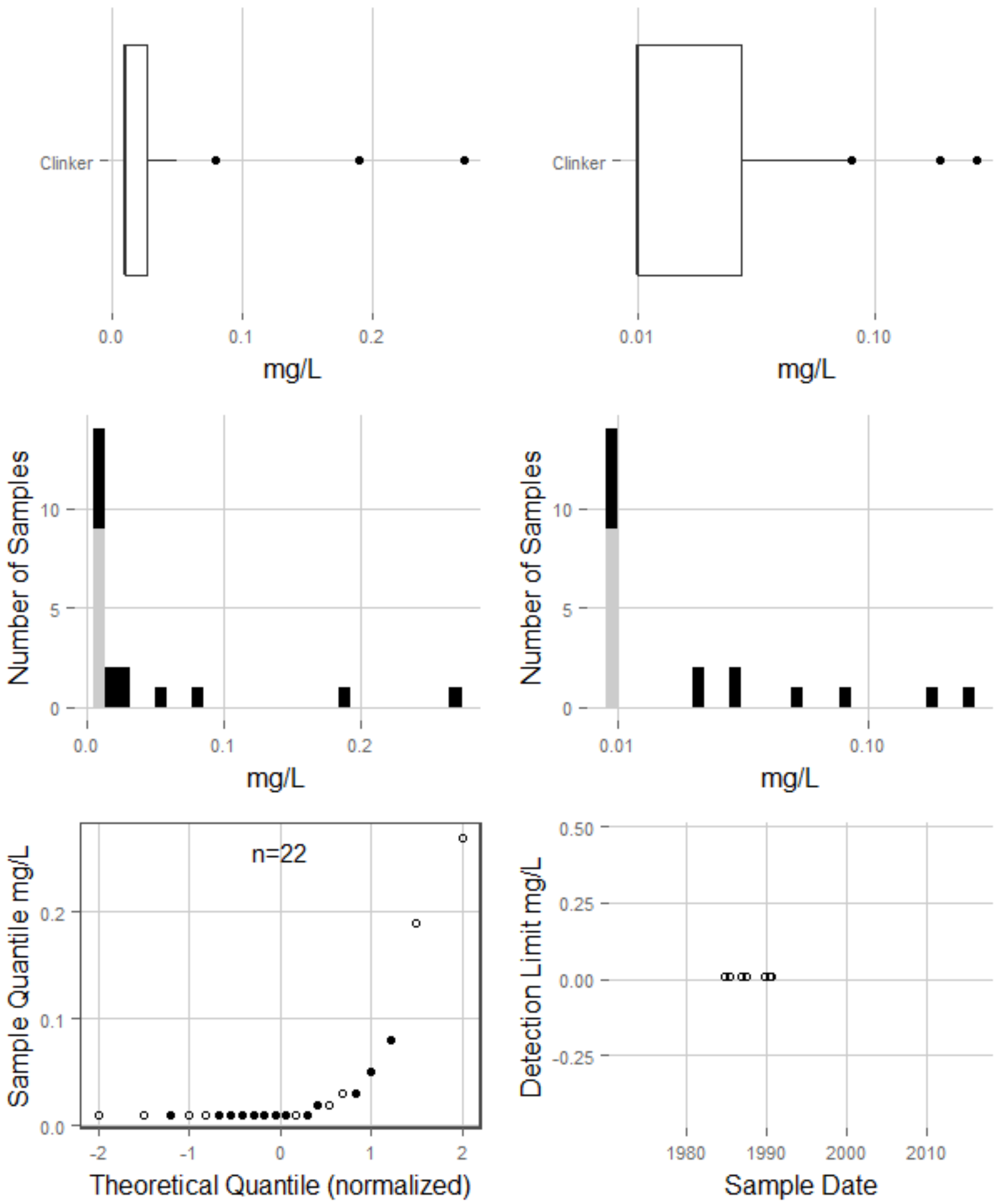
Orthophosphate
Alluvium



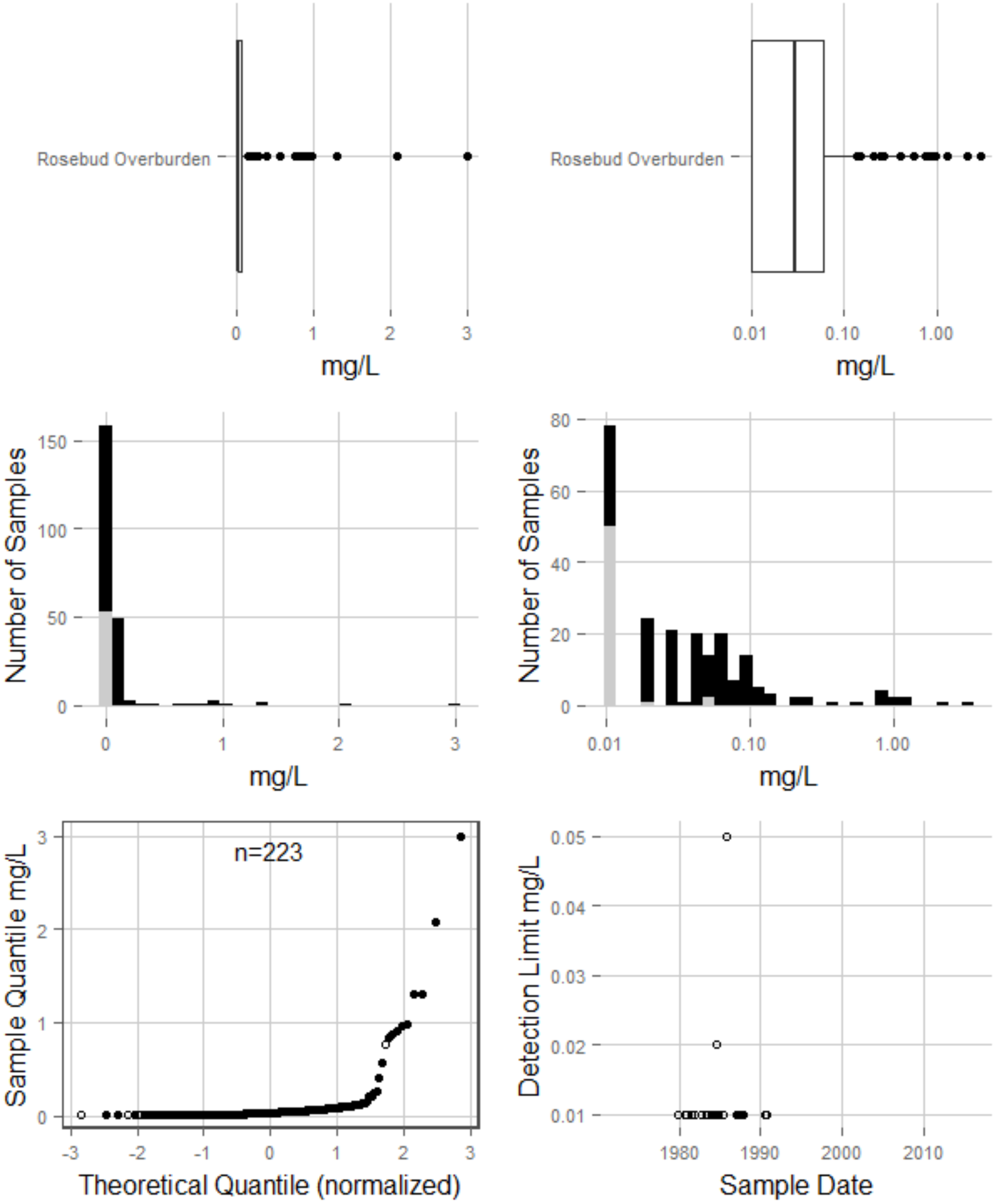
Orthophosphate
Spoils



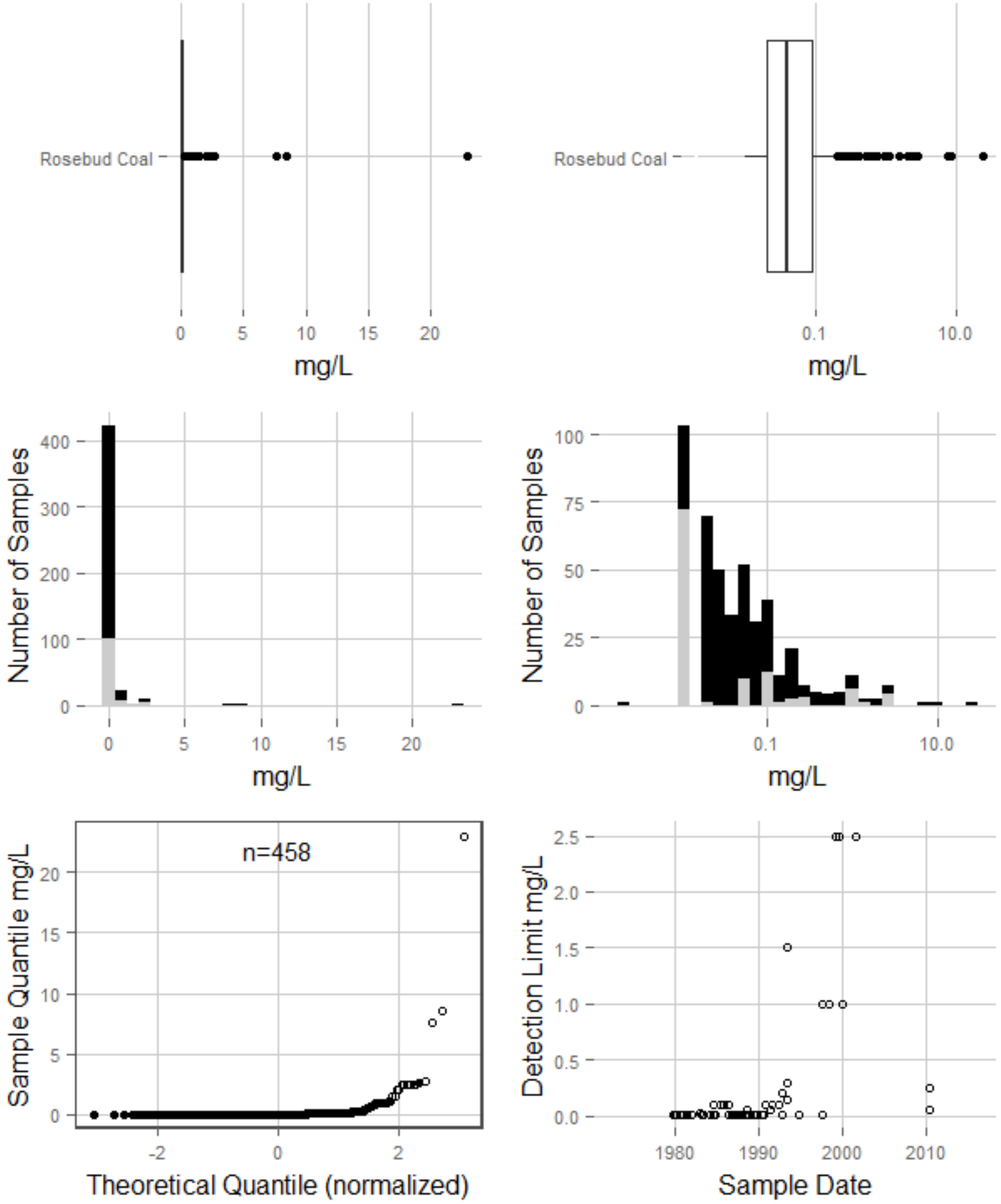
Orthophosphate
Clinker



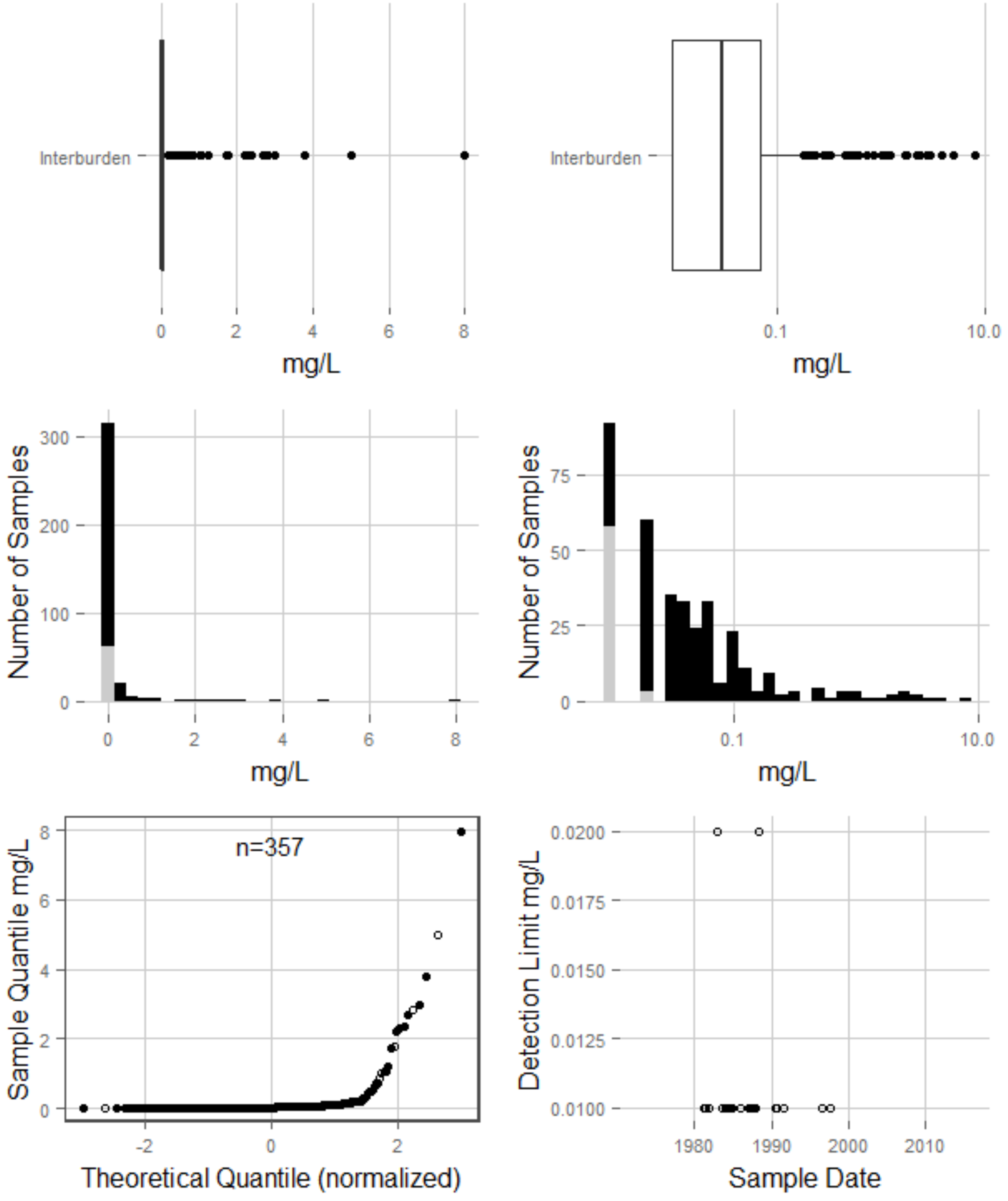
Orthophosphate
Rosebud Overburden



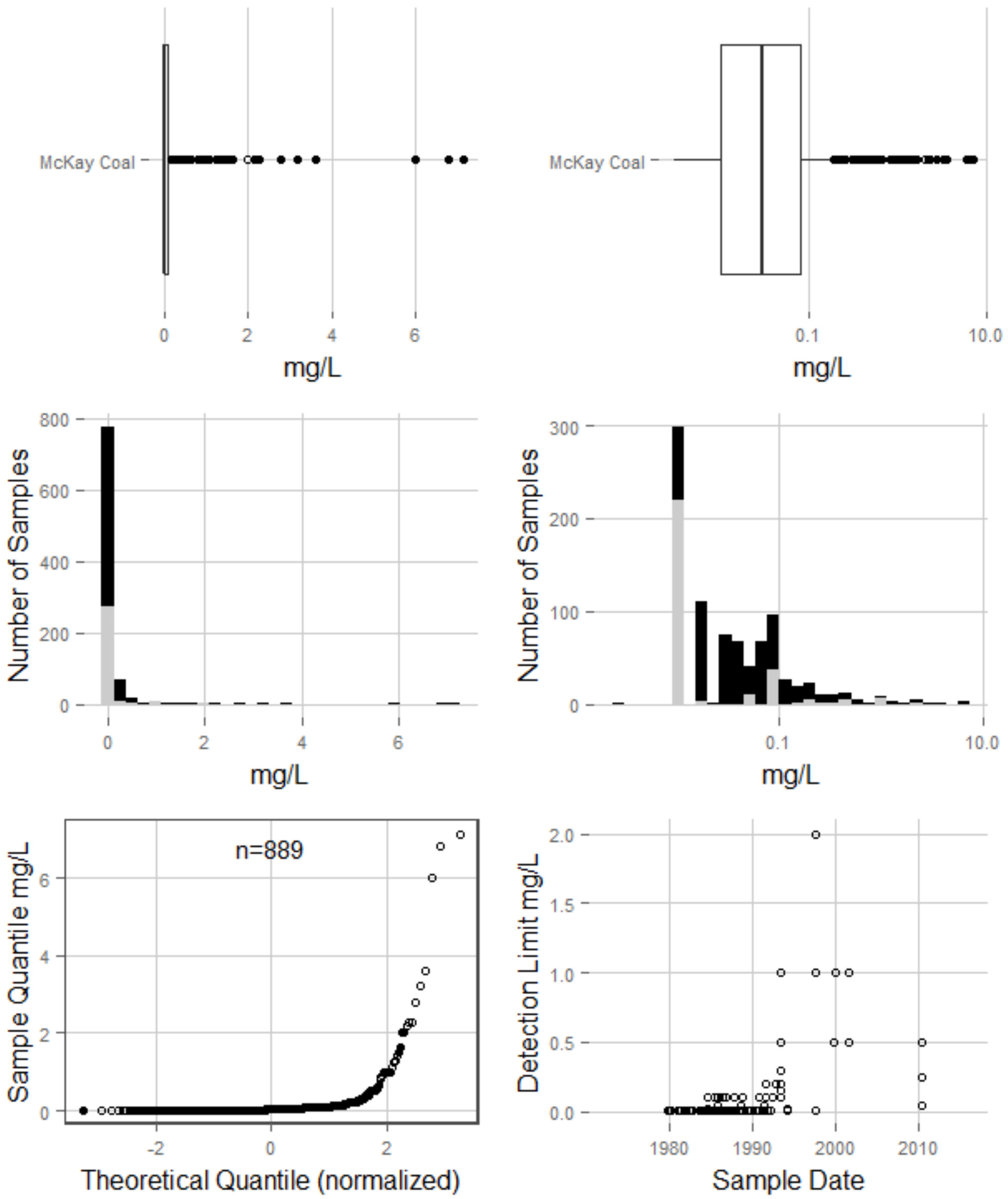
Orthophosphate
Rosebud Coal



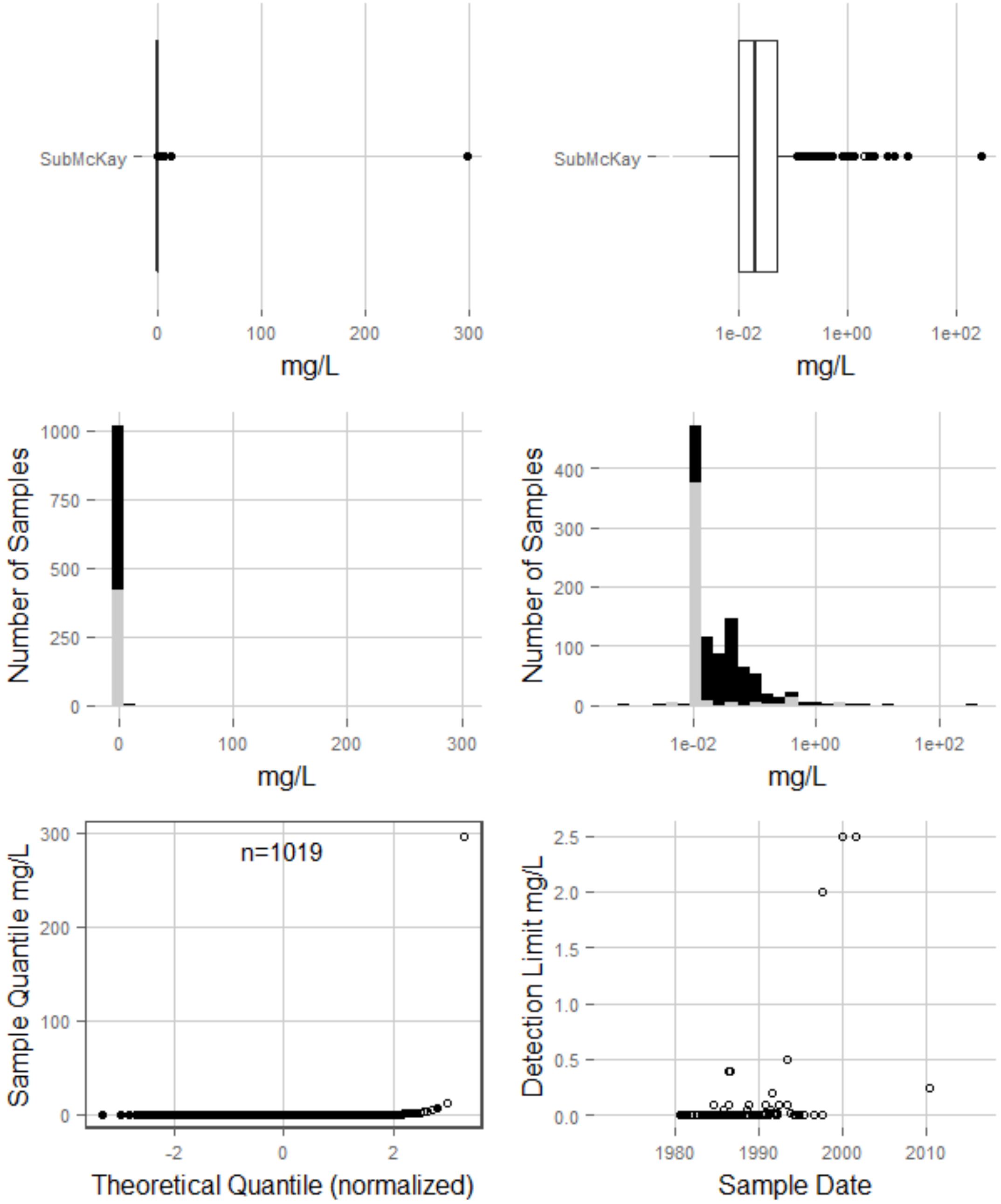
Orthophosphate
Interburden



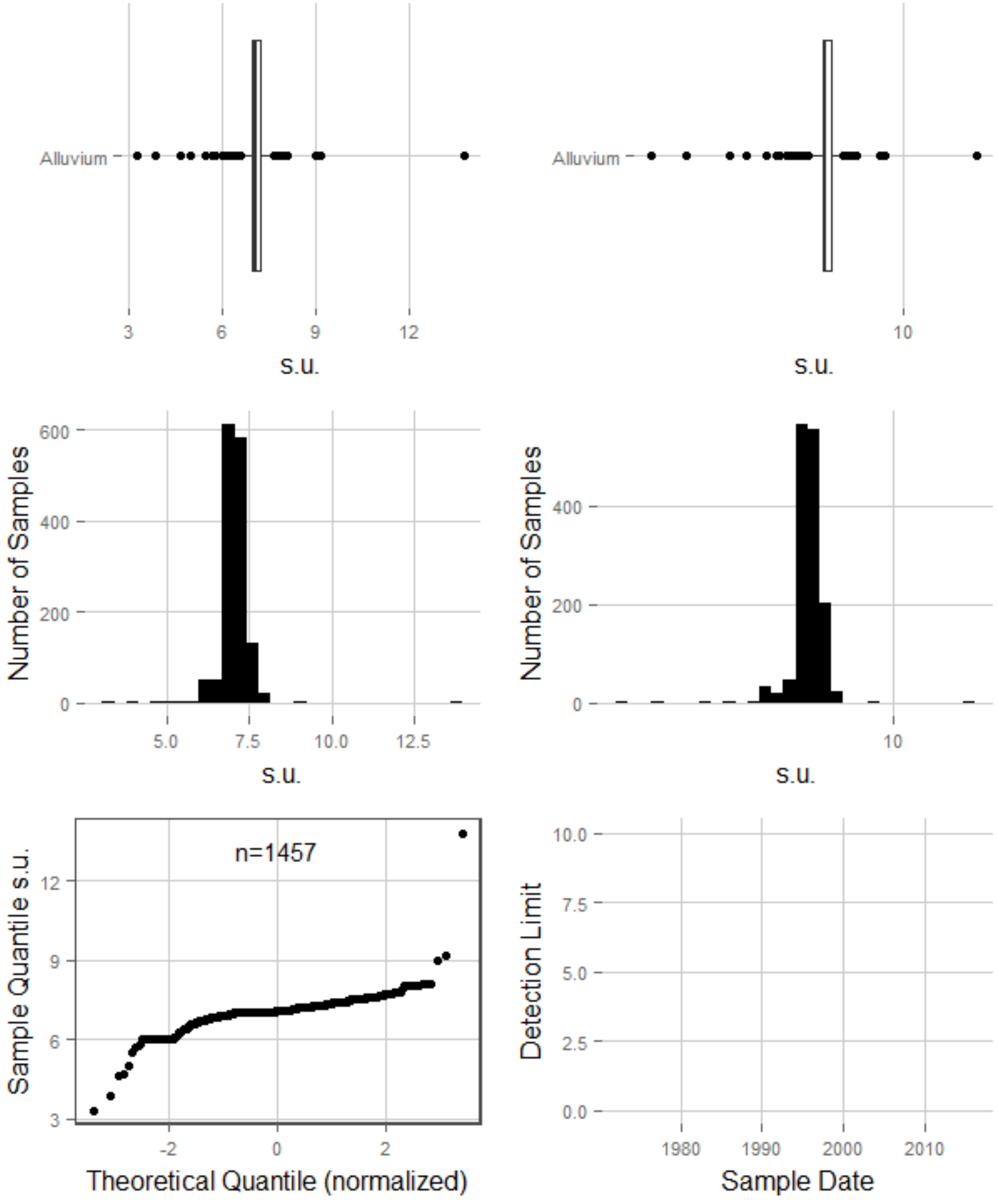
Orthophosphate
McKay Coal



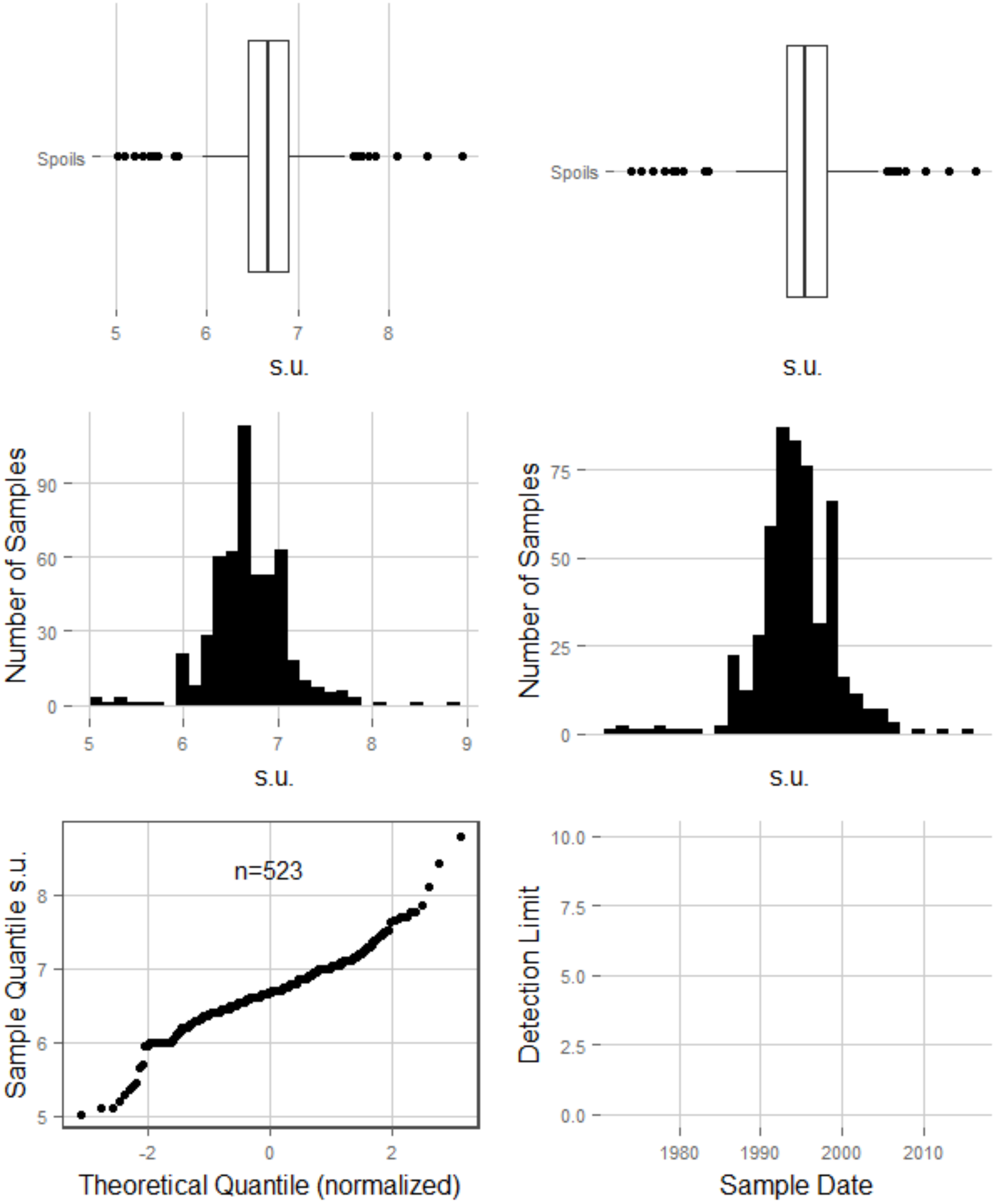
Orthophosphate
SubMcKay



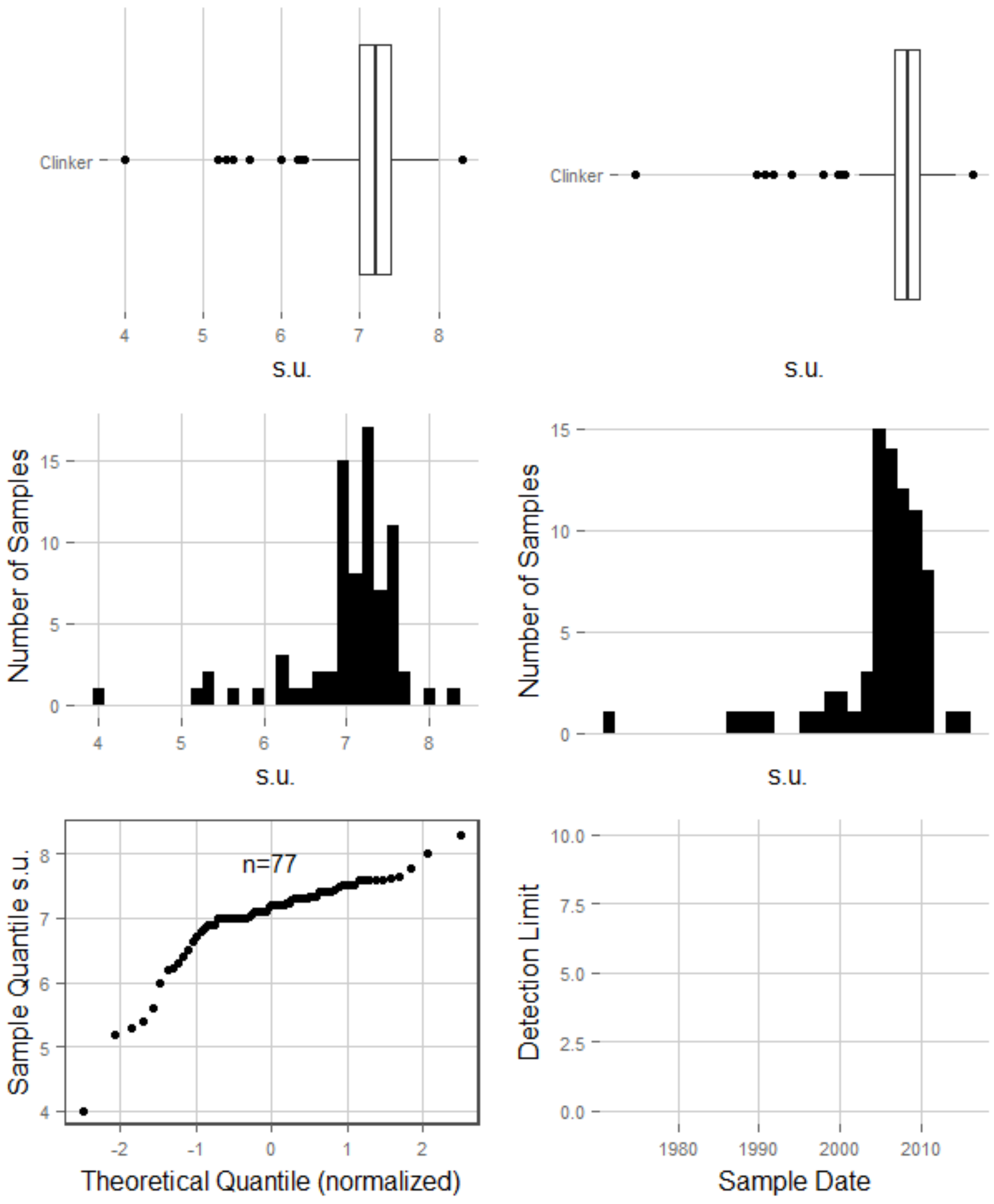
pH (Field)
Alluvium



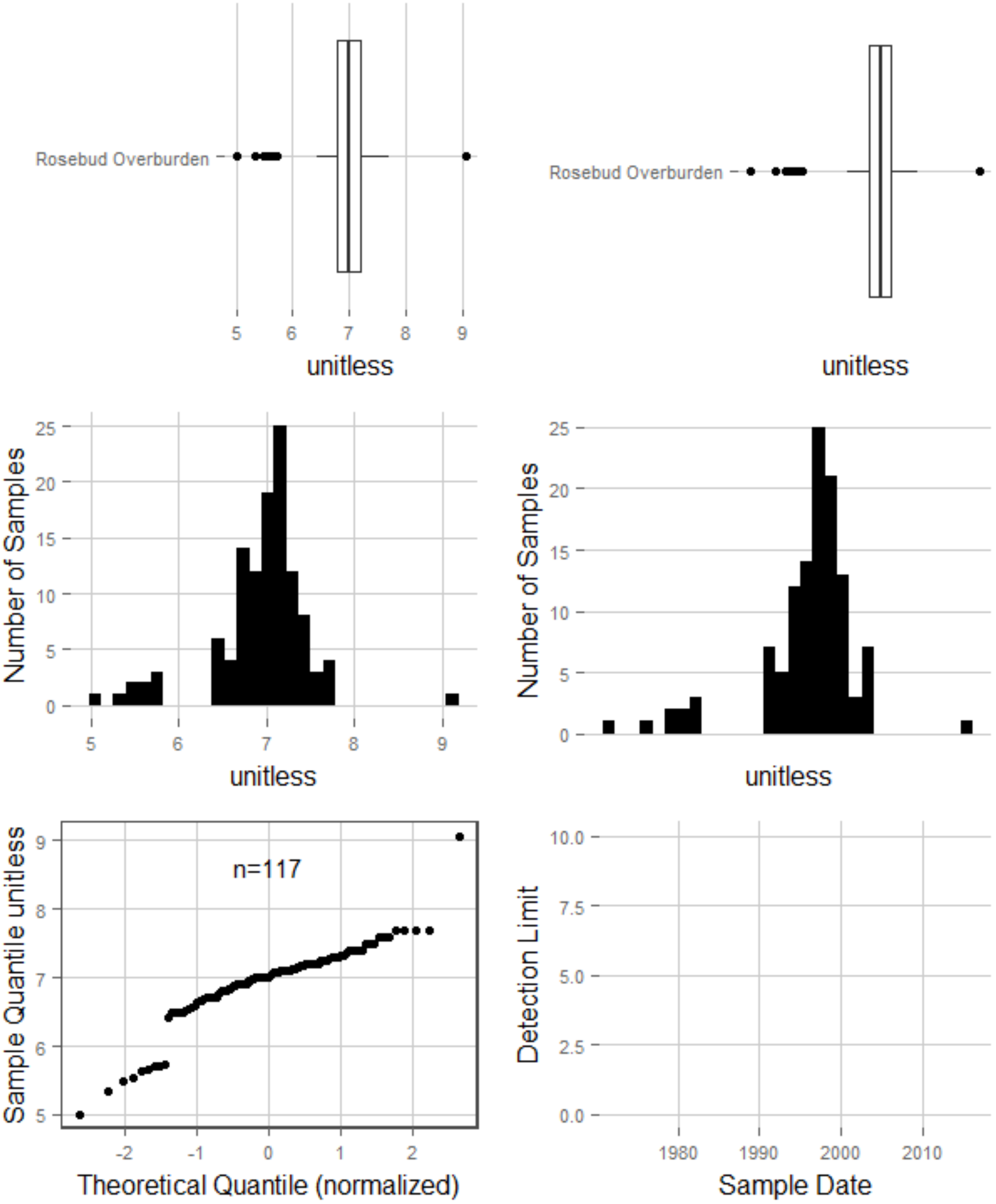
pH (Field)
Spoils



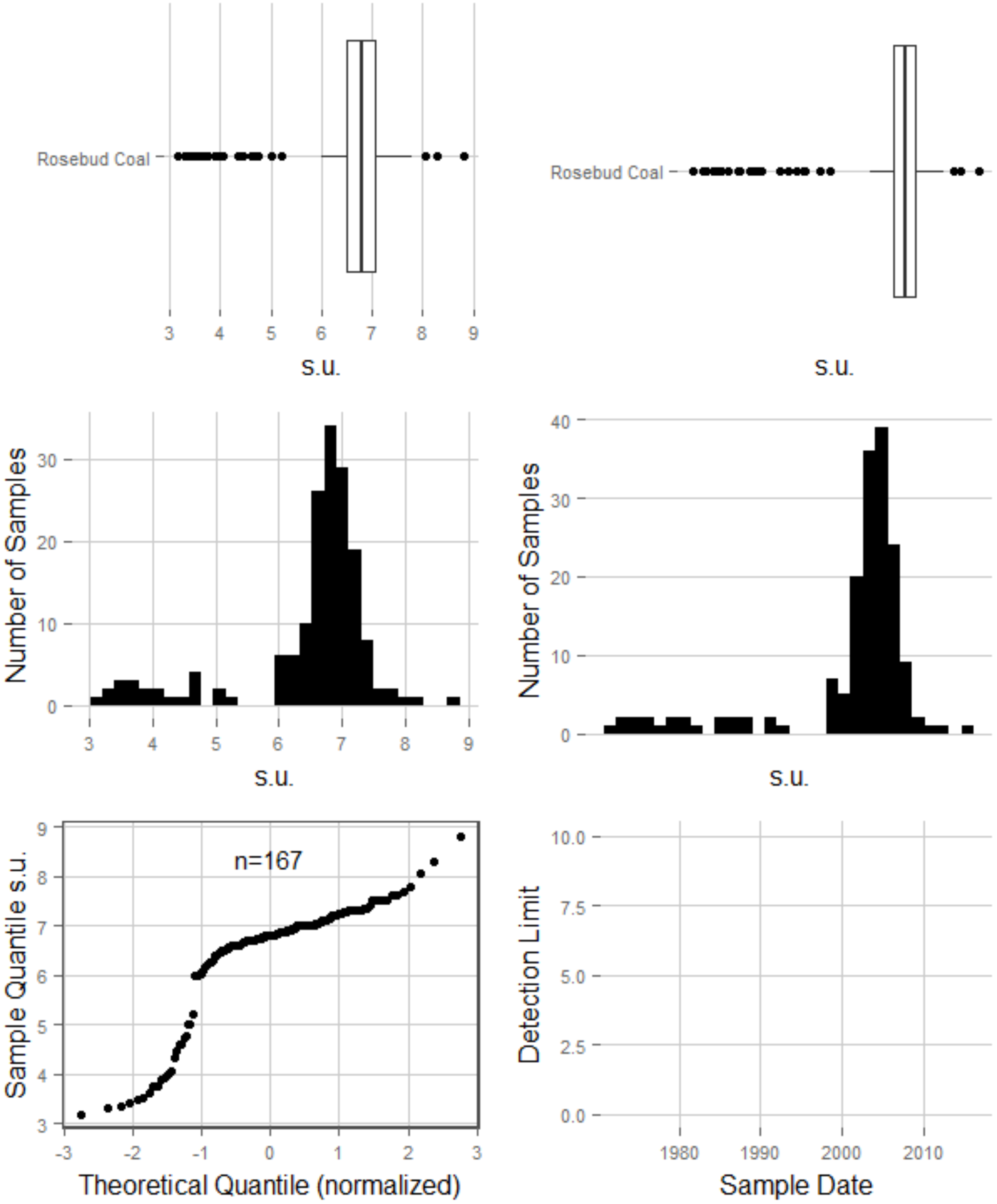
pH (Field)
Clinker



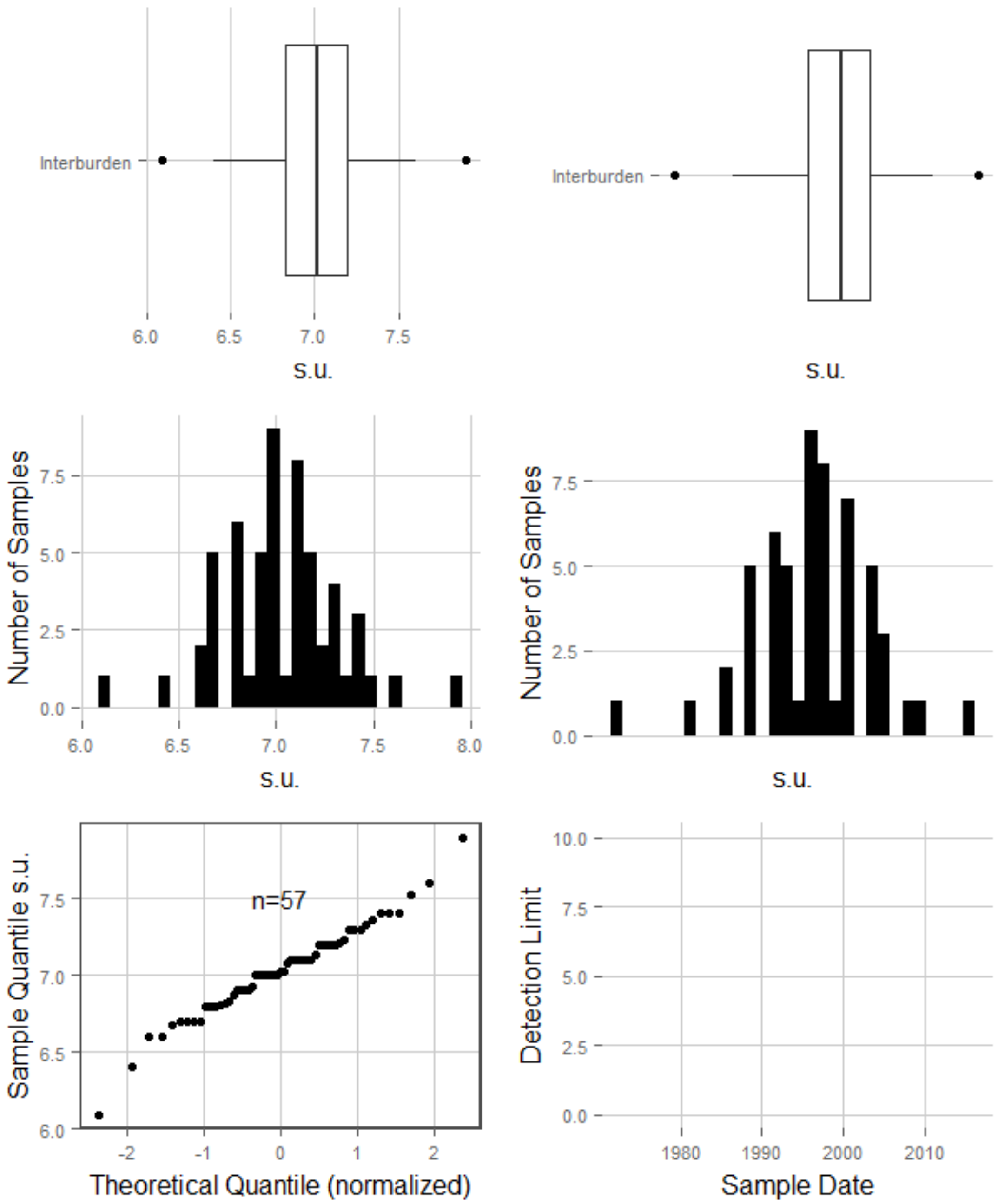
pH (Field)
Rosebud Overburden



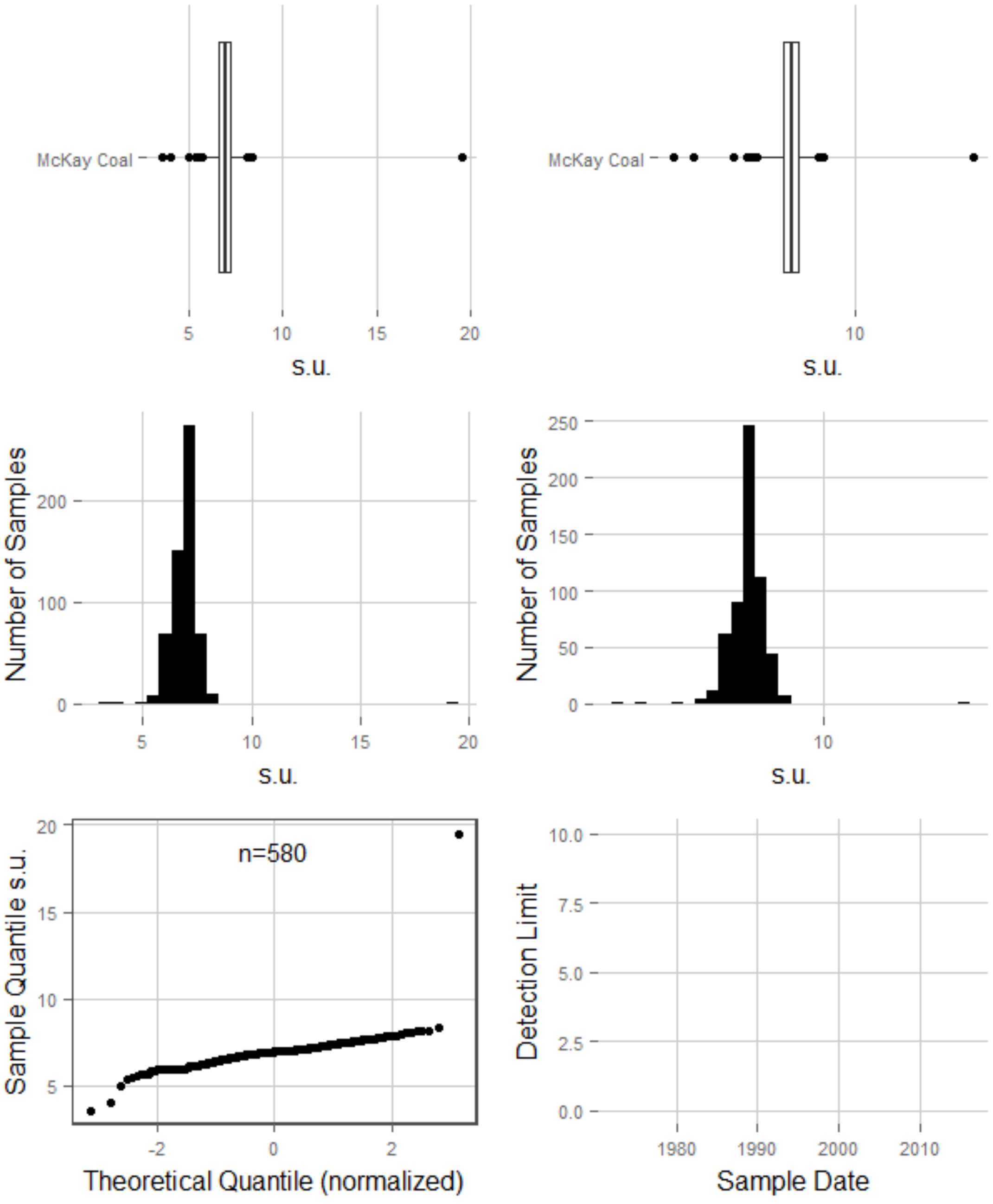
pH (Field)
Rosebud Coal



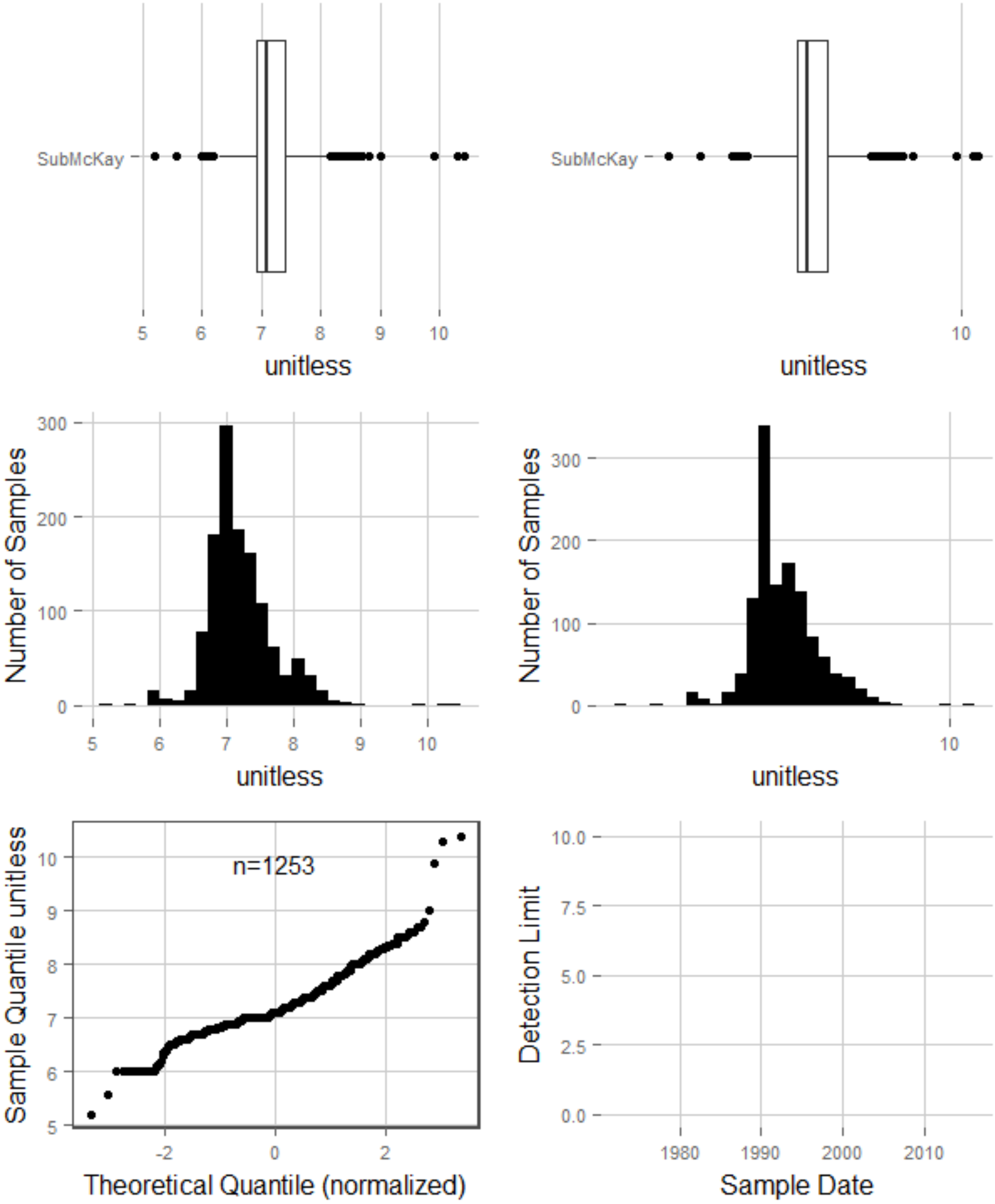
pH (Field)
Interburden



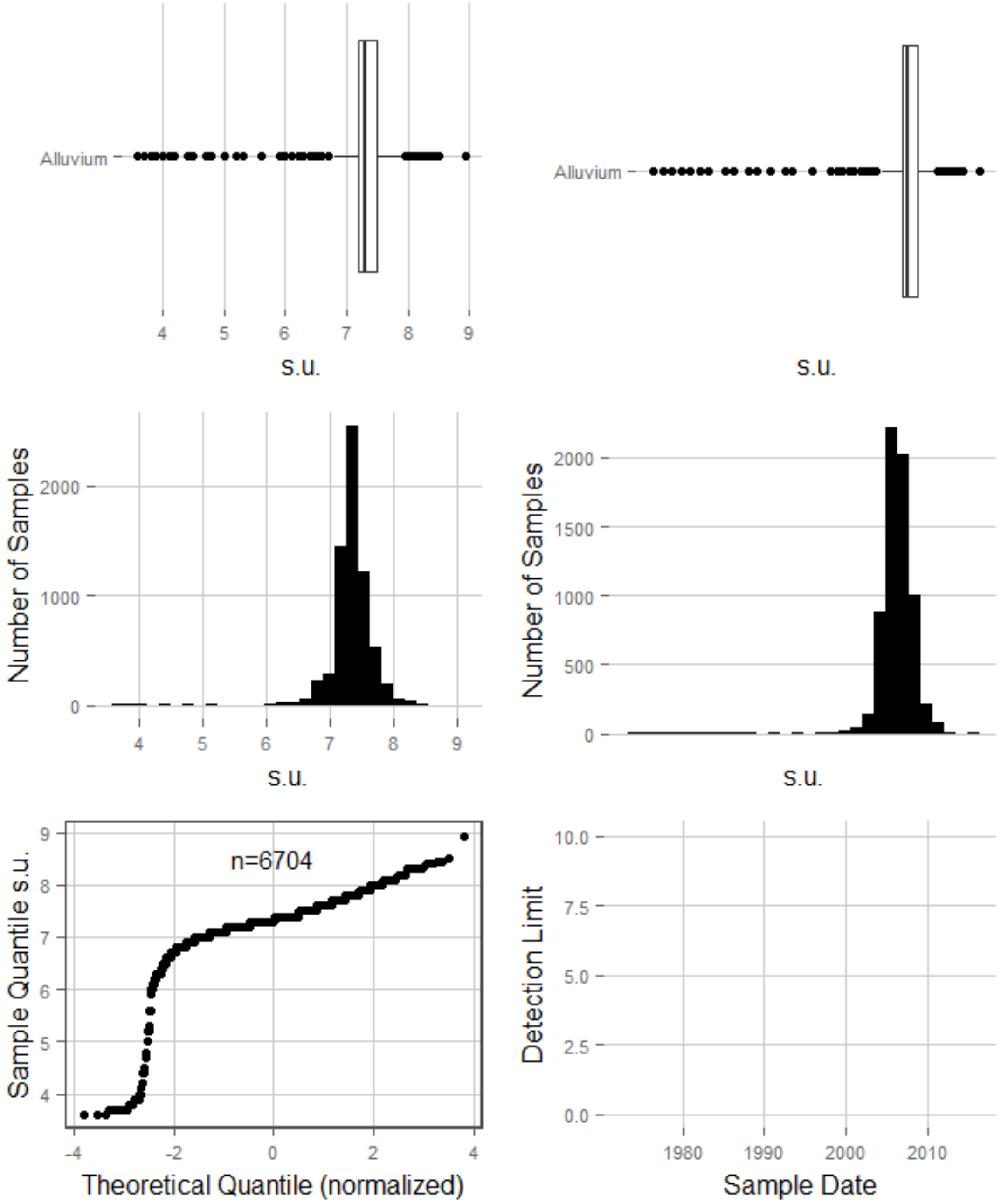
pH (Field)
McKay Coal



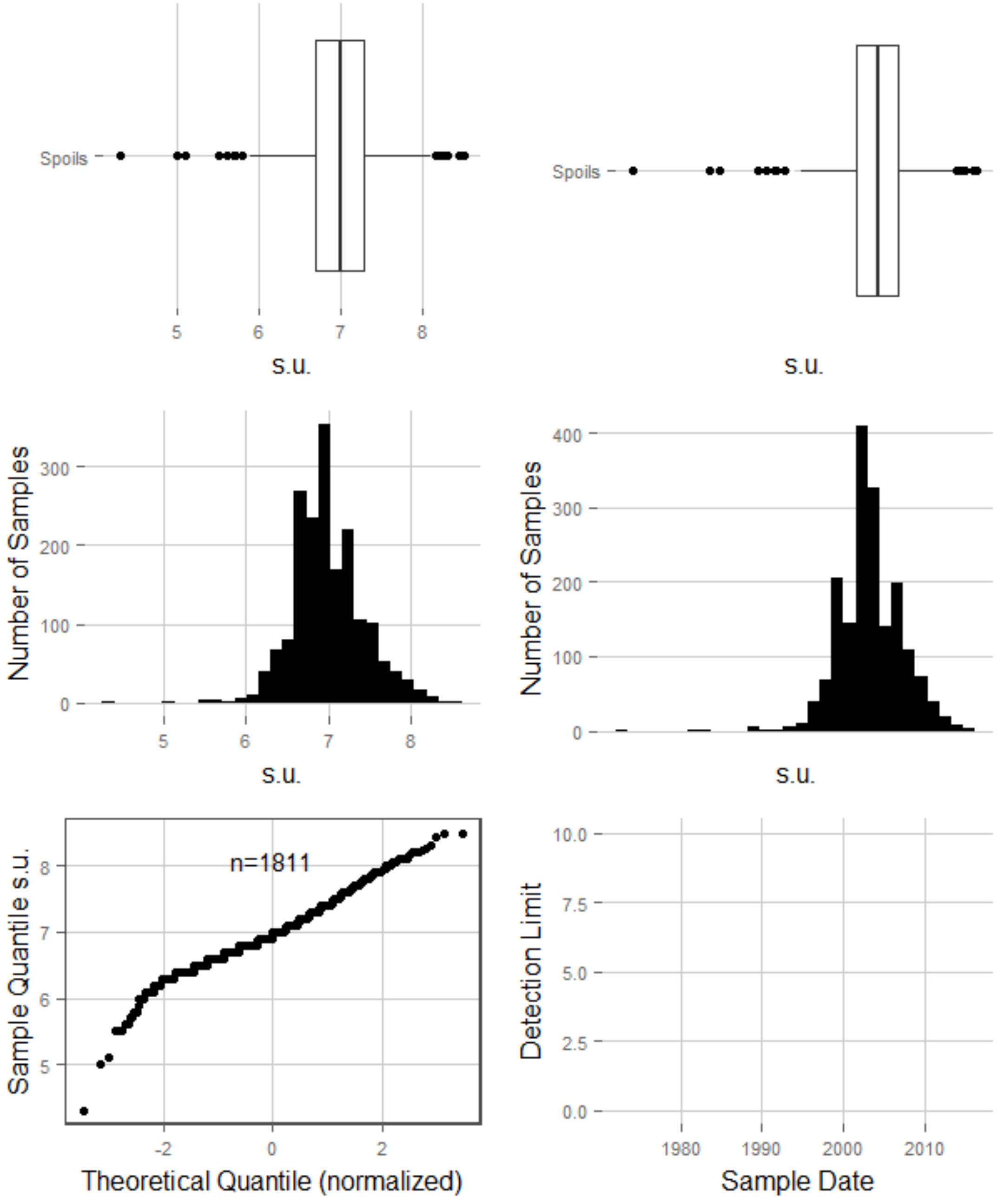
pH (Field)
SubMcKay



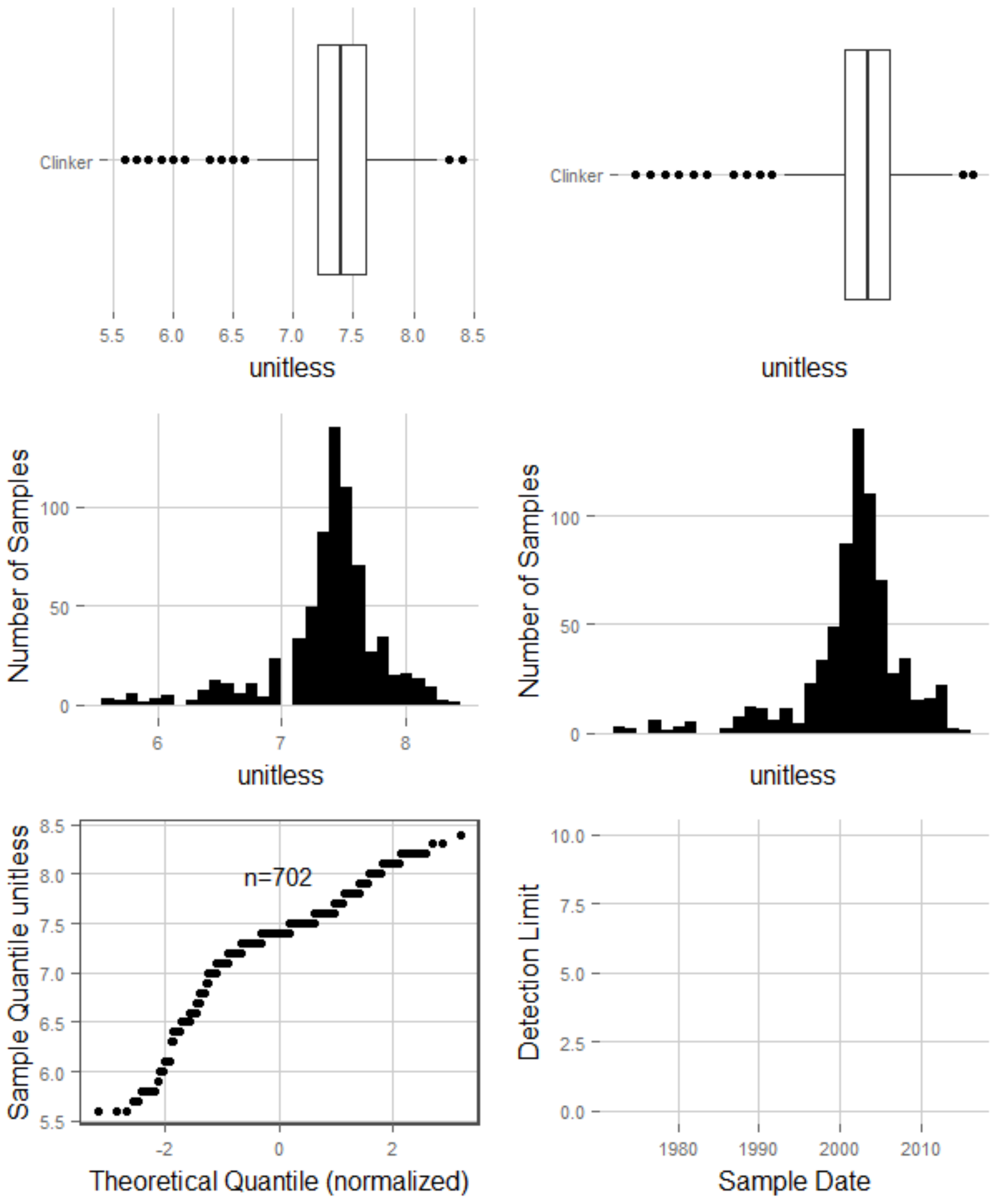
pH (Lab)
Alluvium



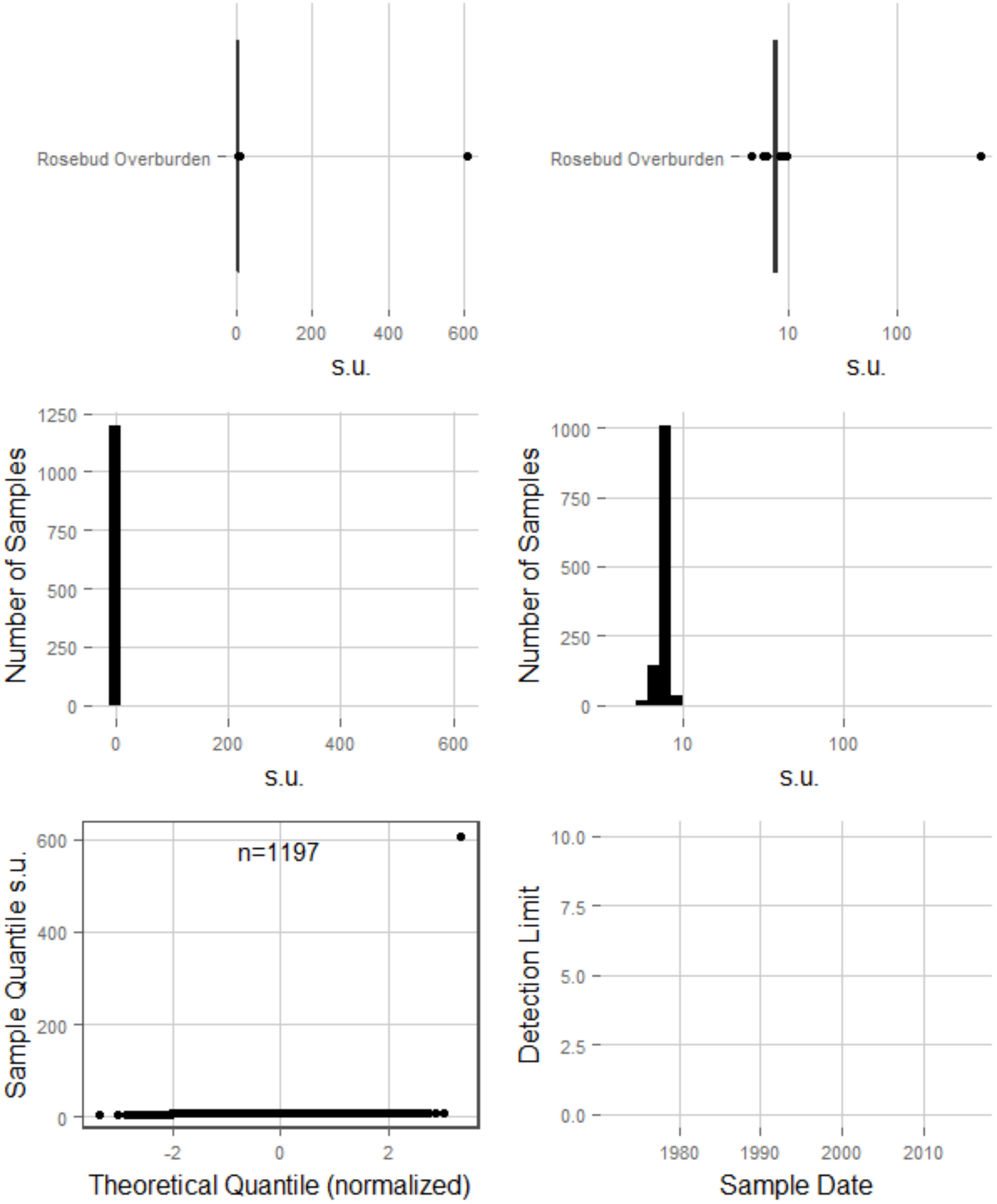
pH (Lab)
Spoils



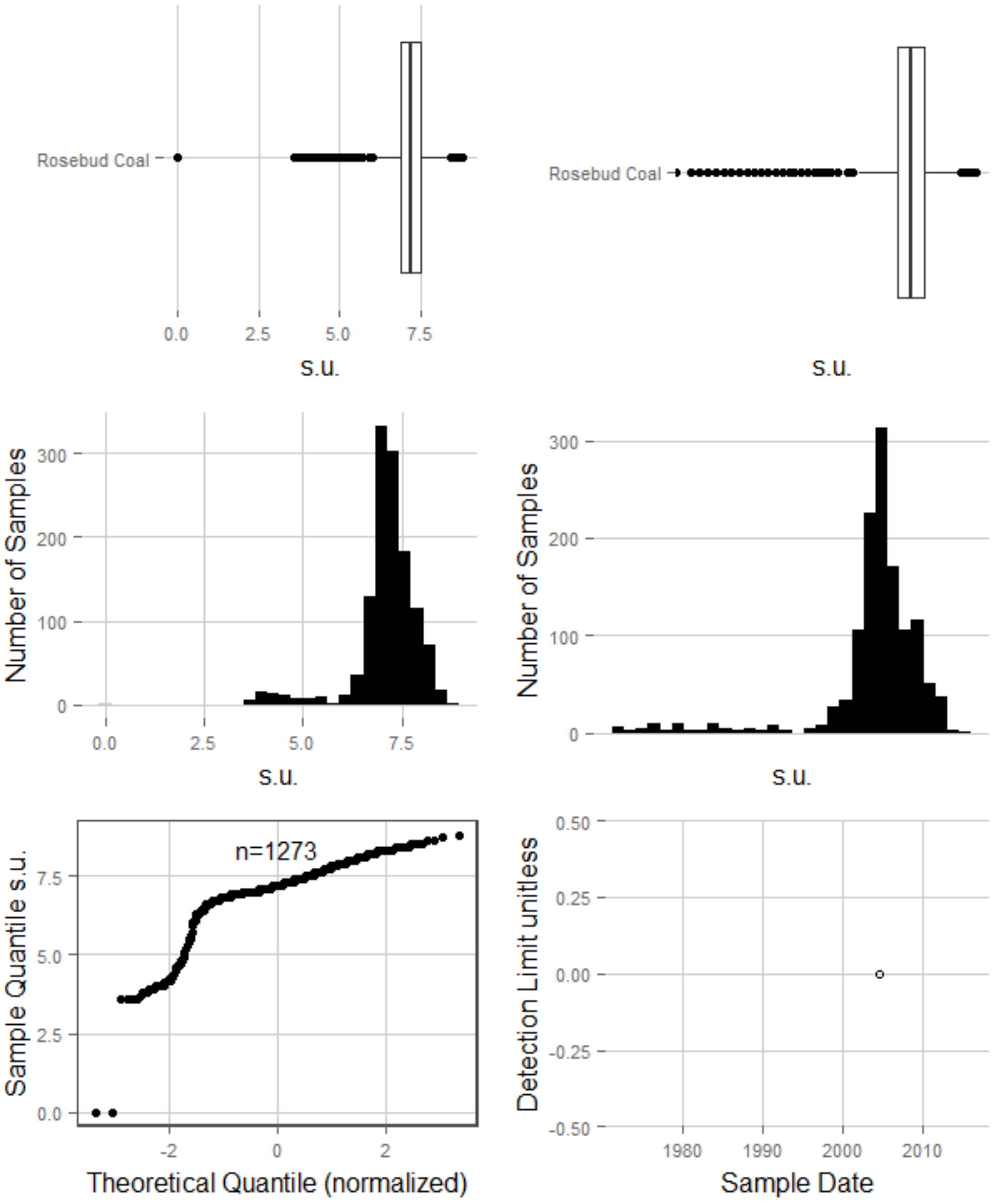
pH (Lab)
Clinker



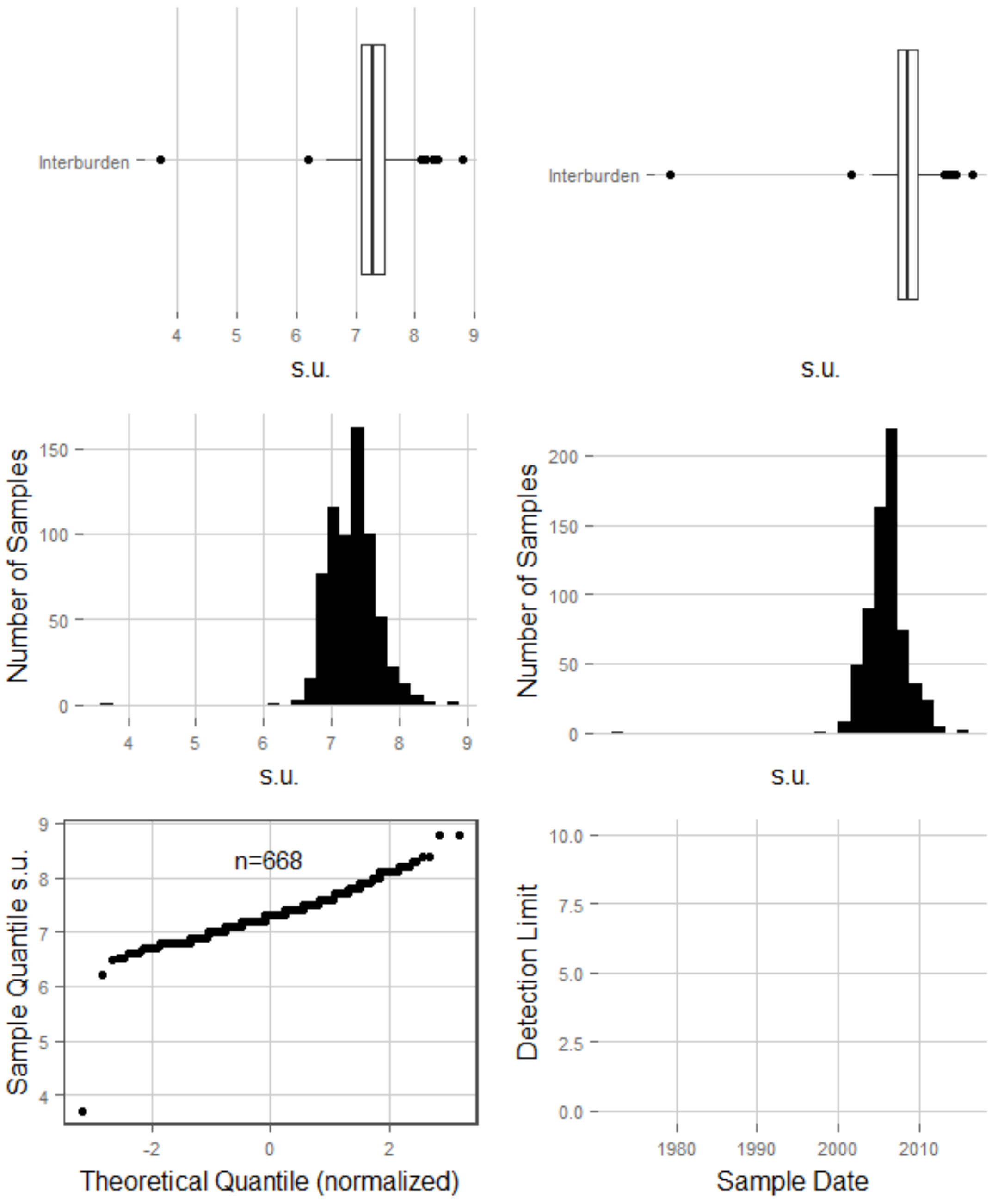
pH (Lab)
Rosebud Overburden



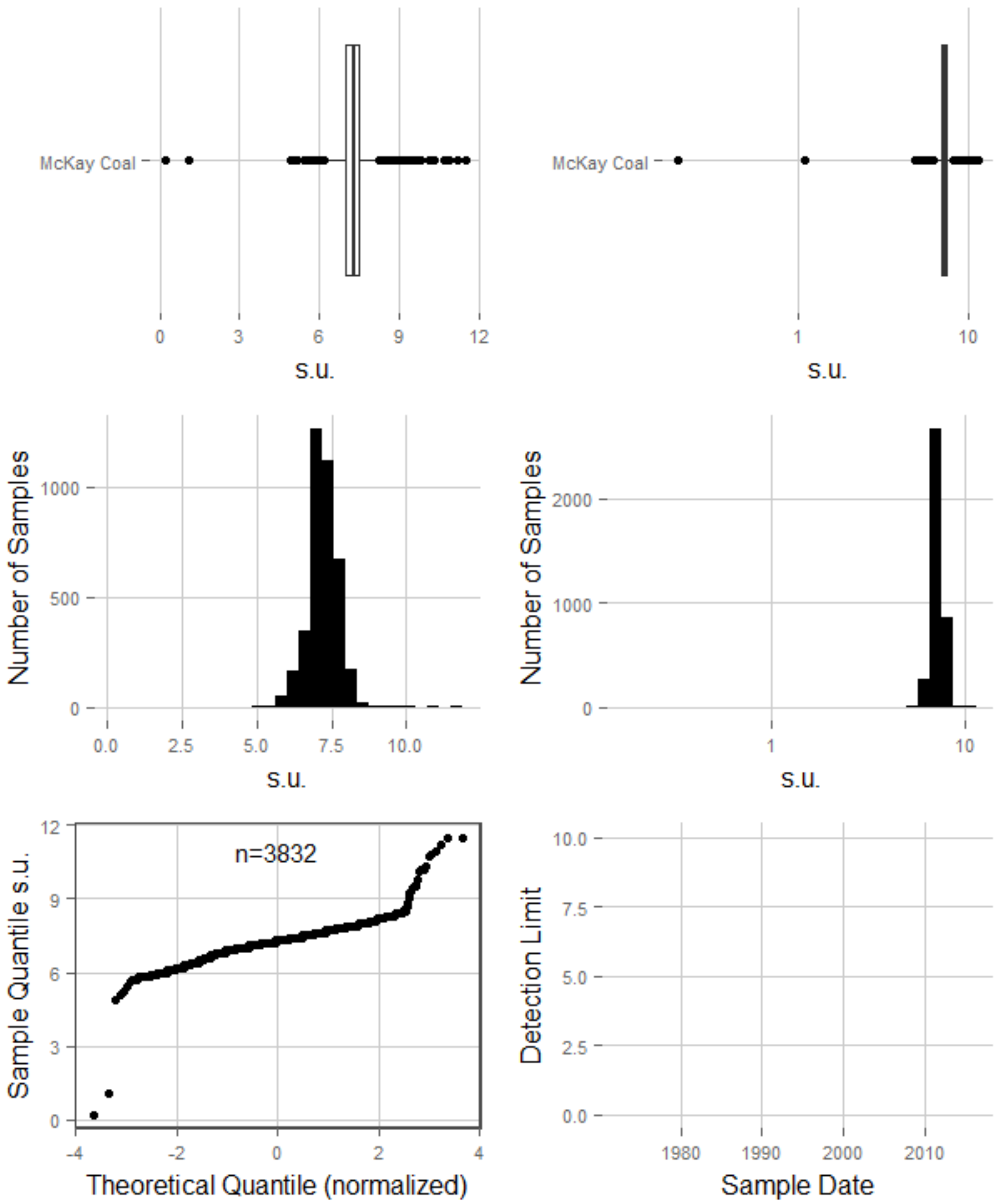
pH (Lab)
Rosebud Coal



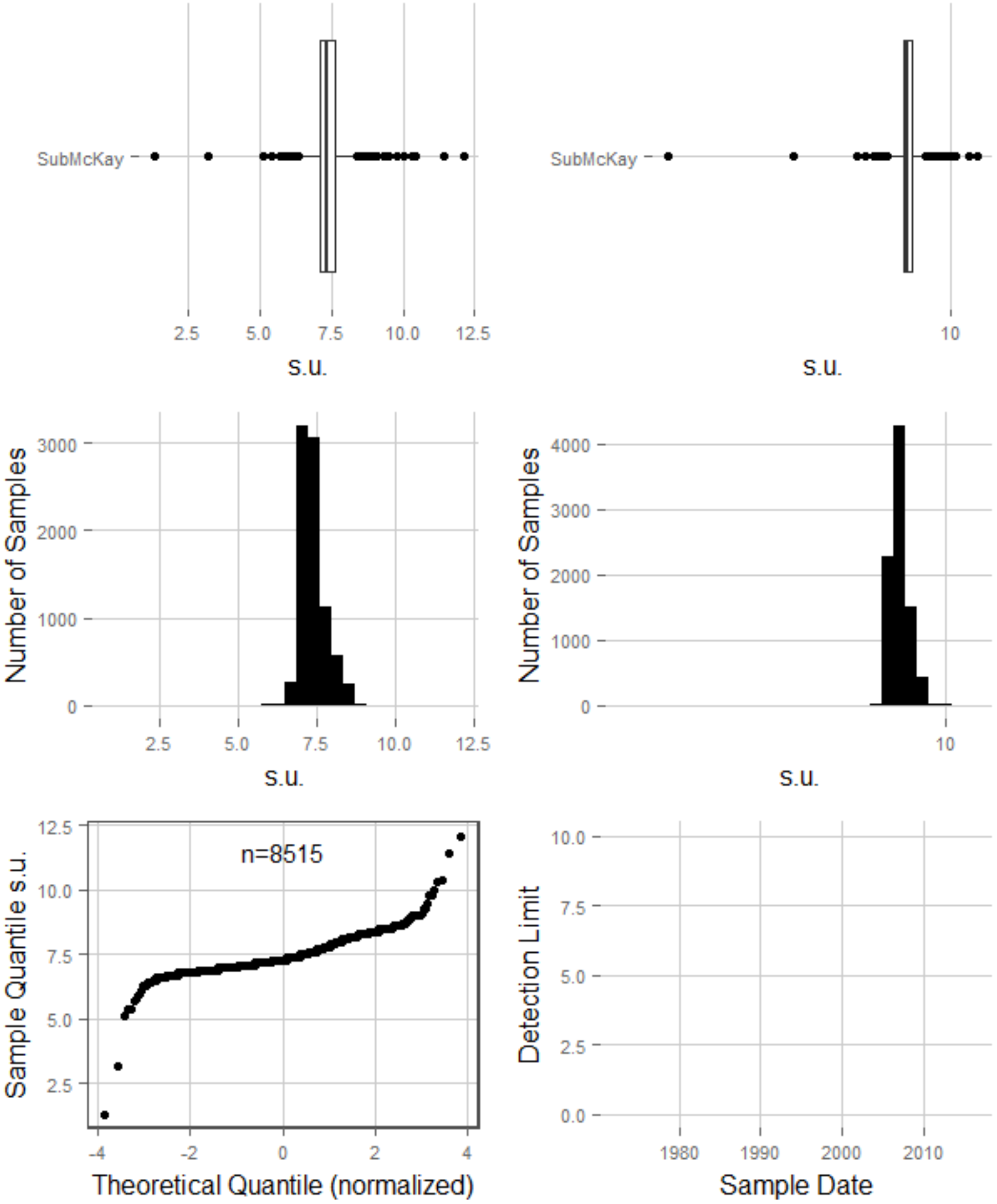
pH (Lab)
Interburden



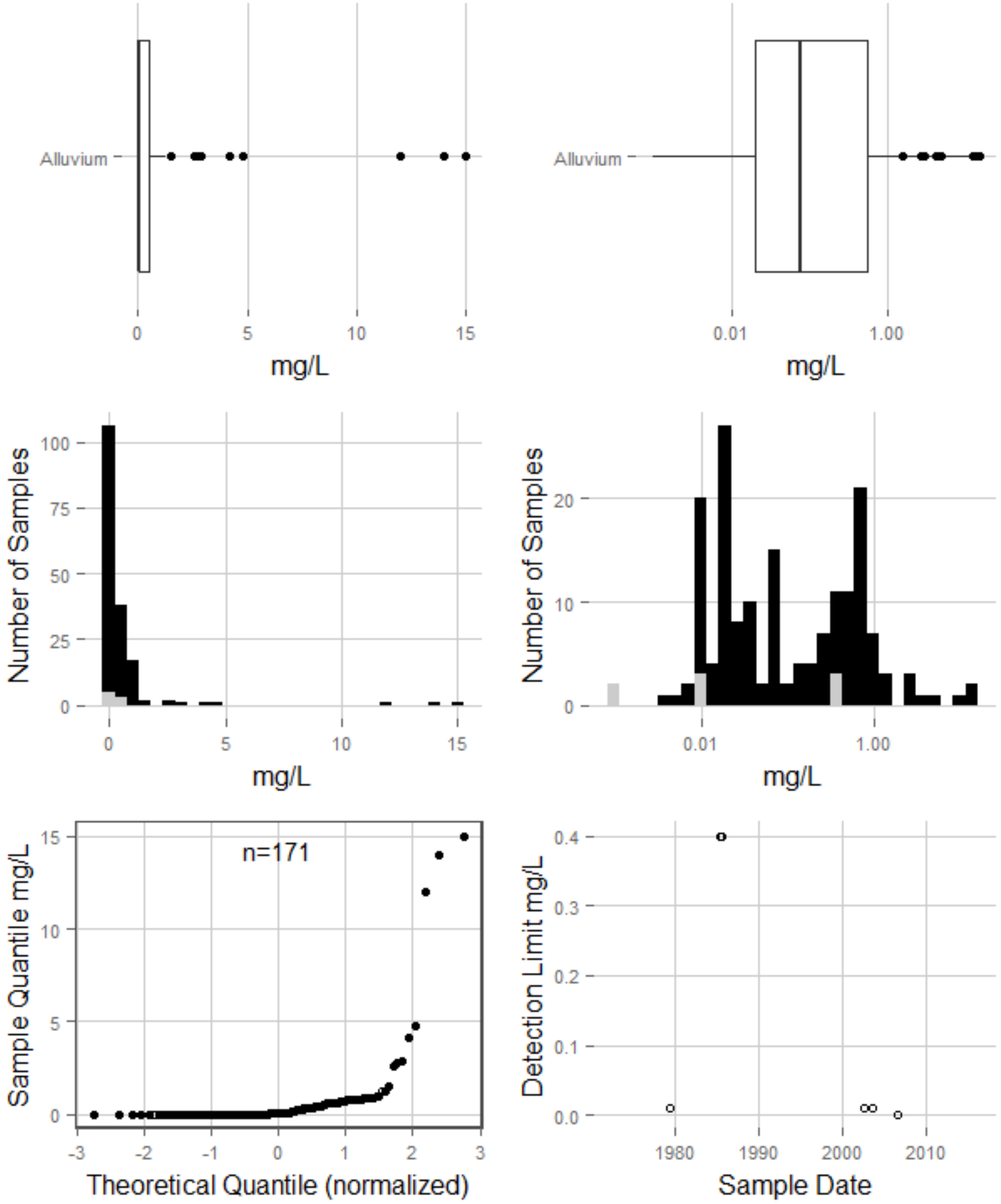
pH (Lab)
McKay Coal



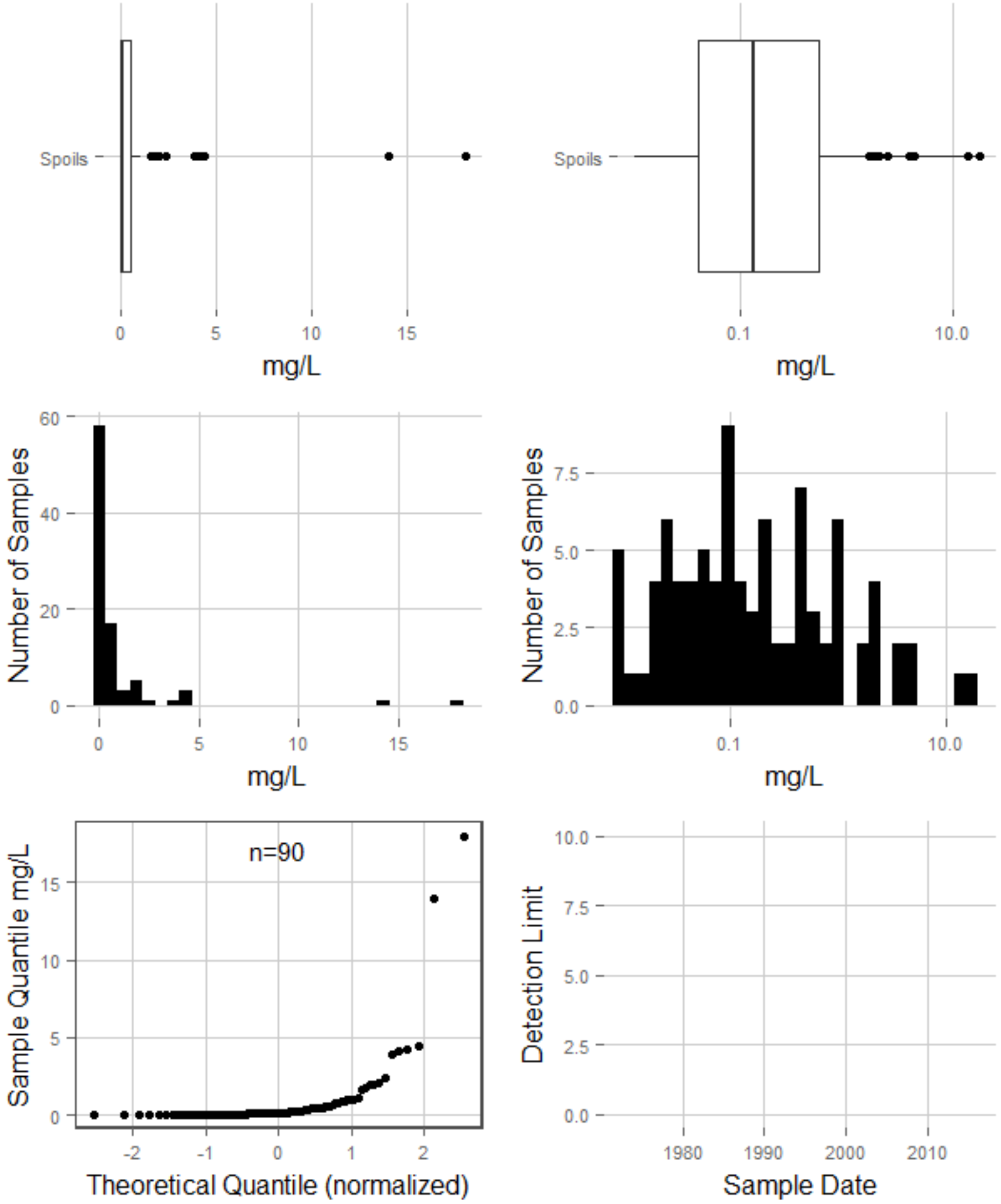
pH (Lab)
SubMcKay



Phosphate
Alluvium

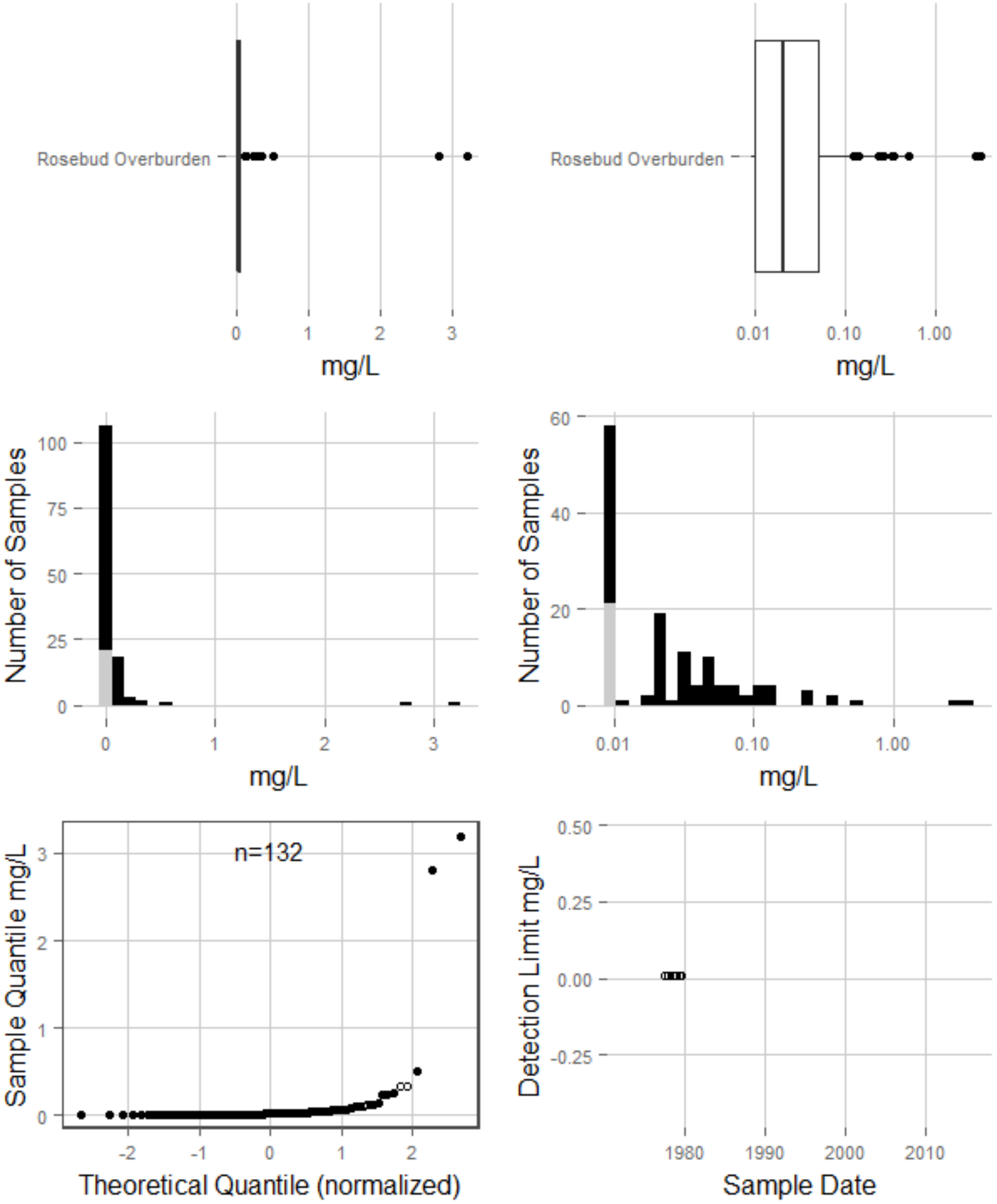


Phosphate
Spoils

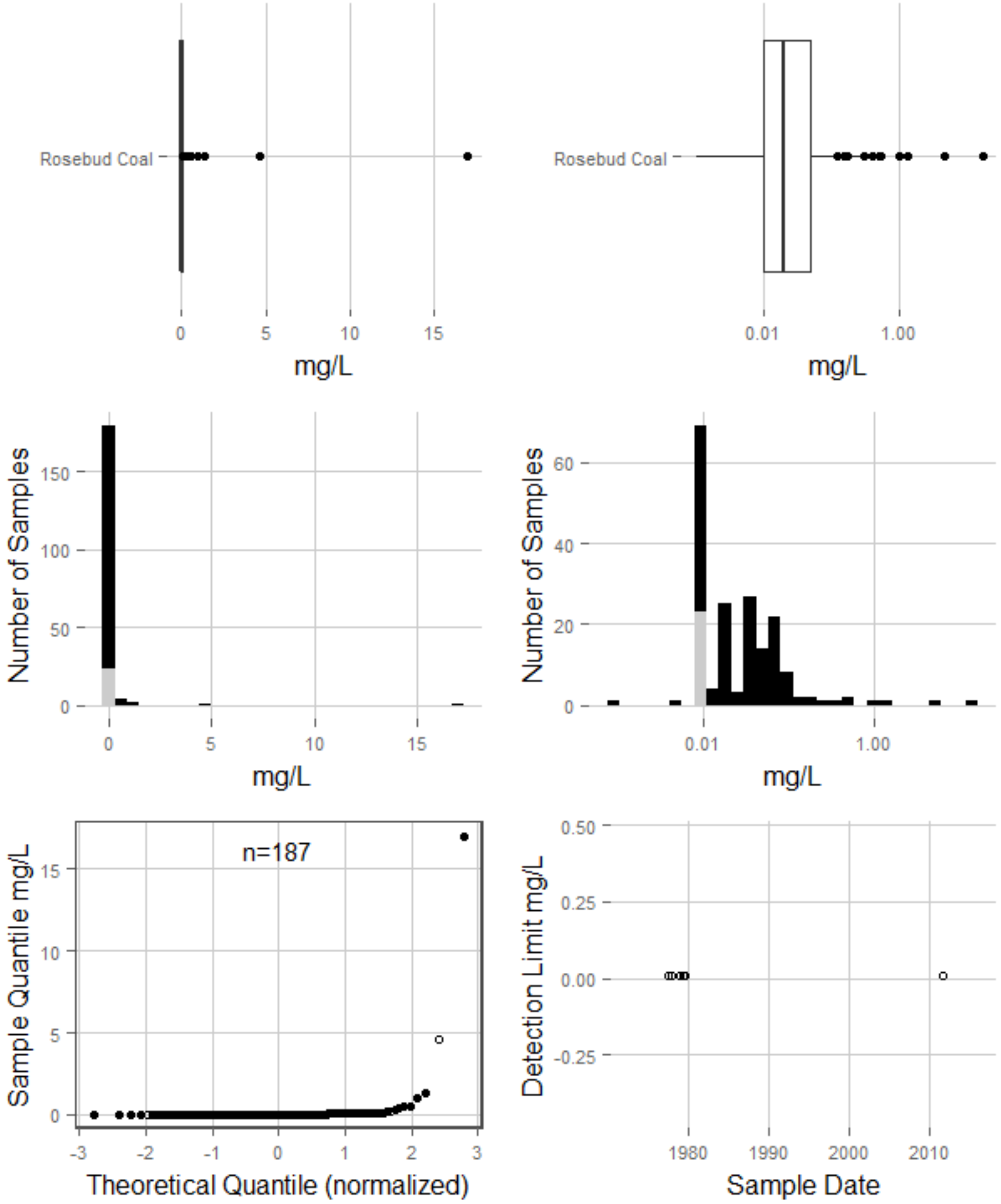


Phosphate
Clinker
No data

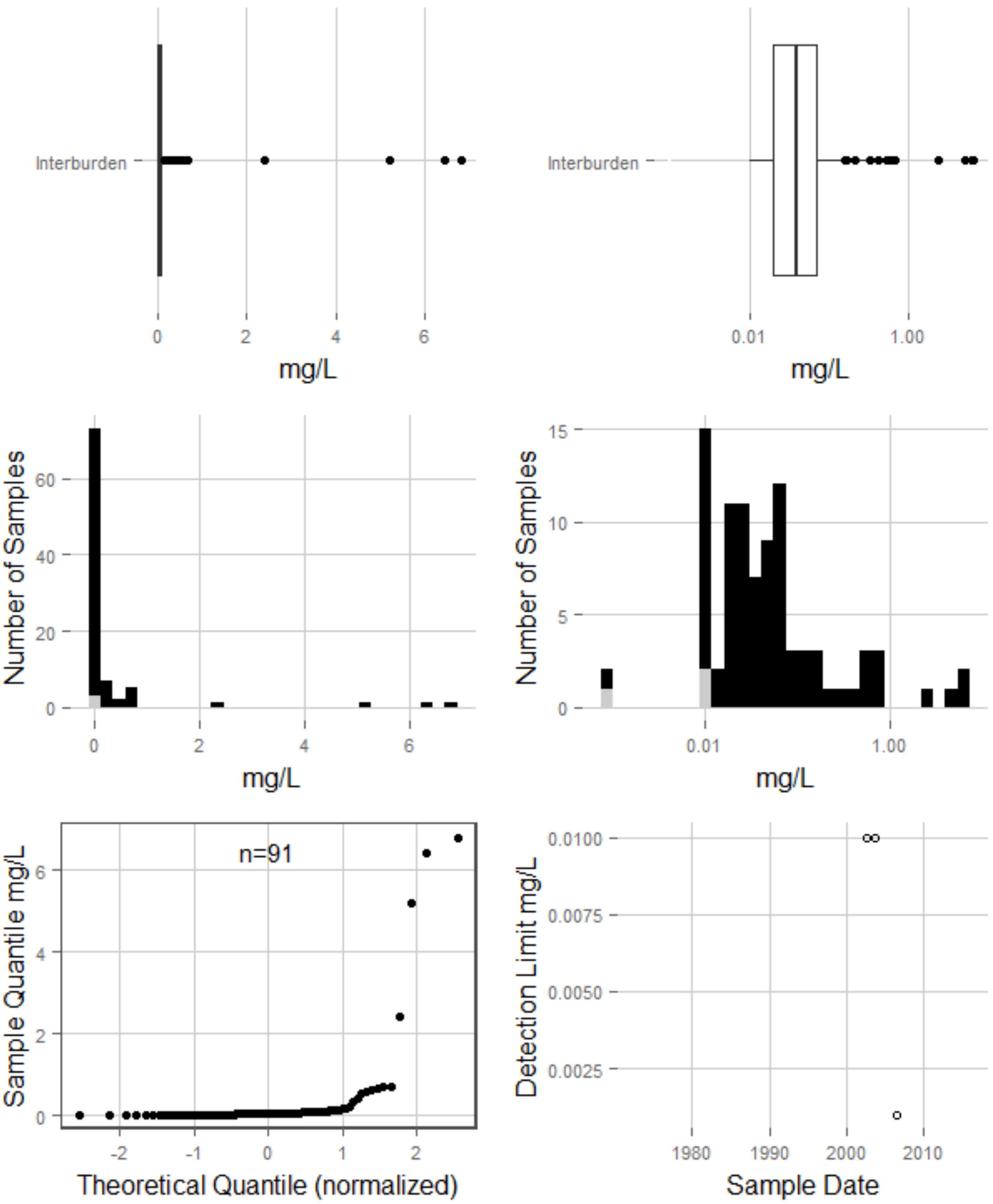
Phosphate
Rosebud Overburden



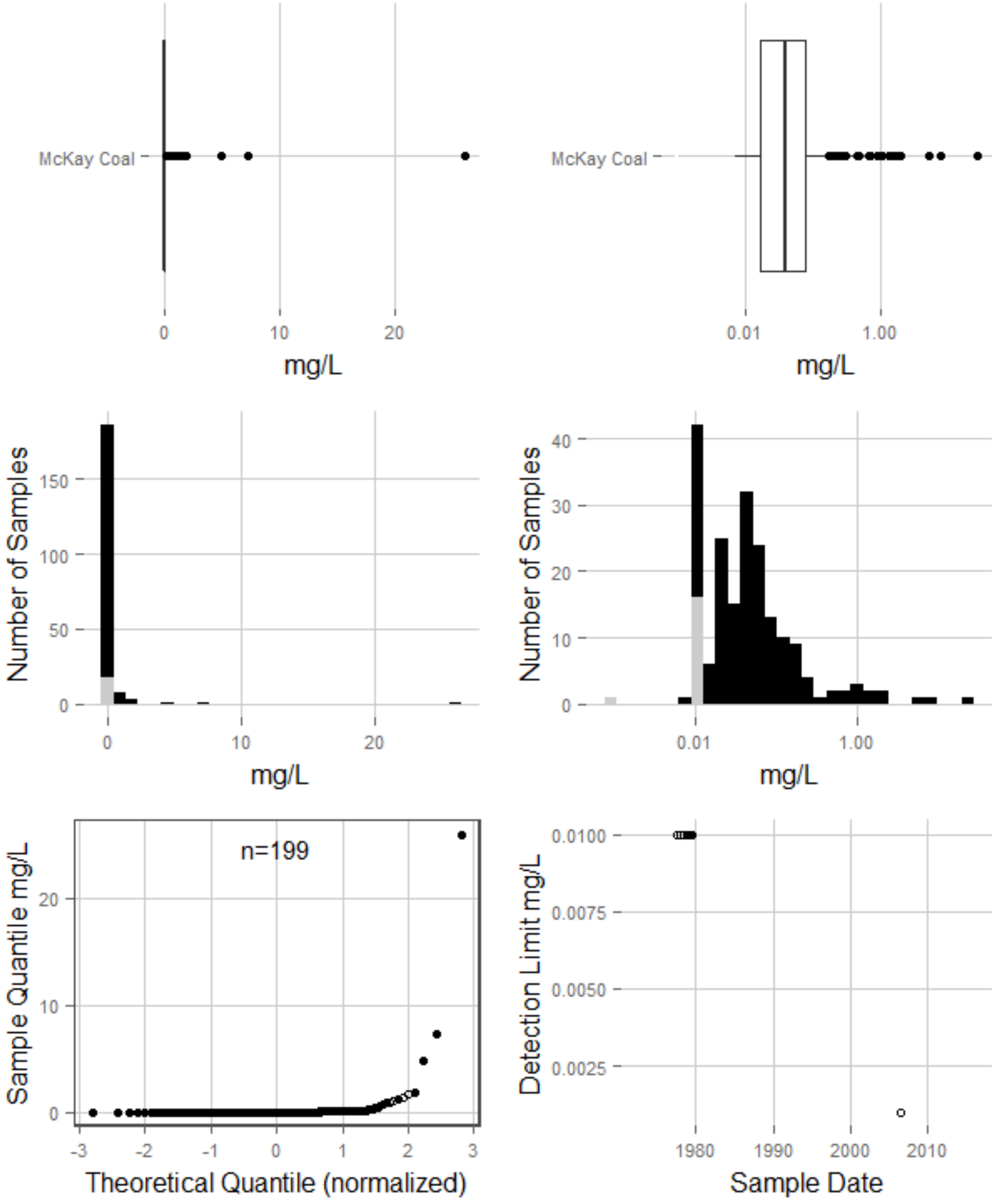
Phosphate
Rosebud Coal



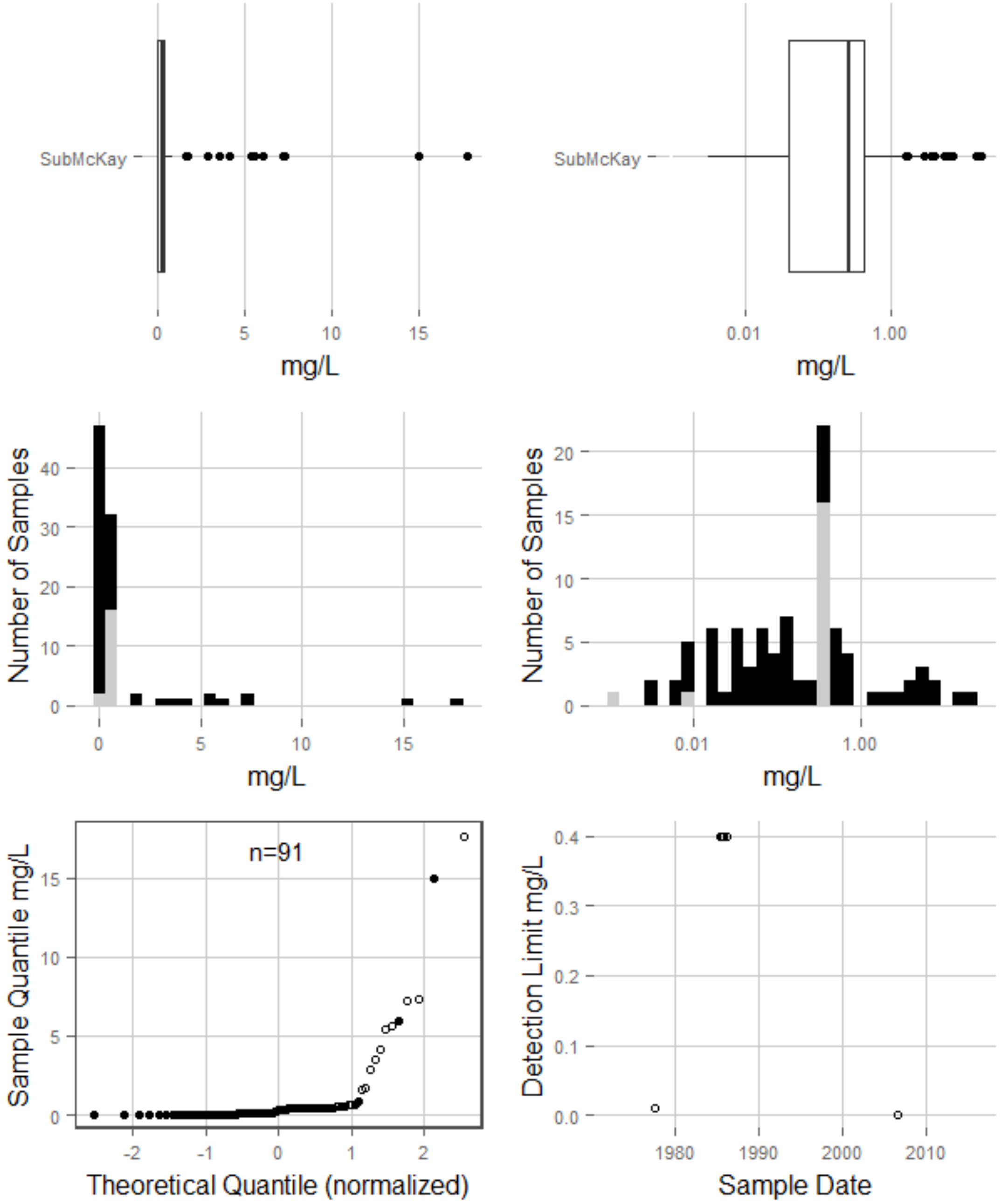
Phosphate
Interburden



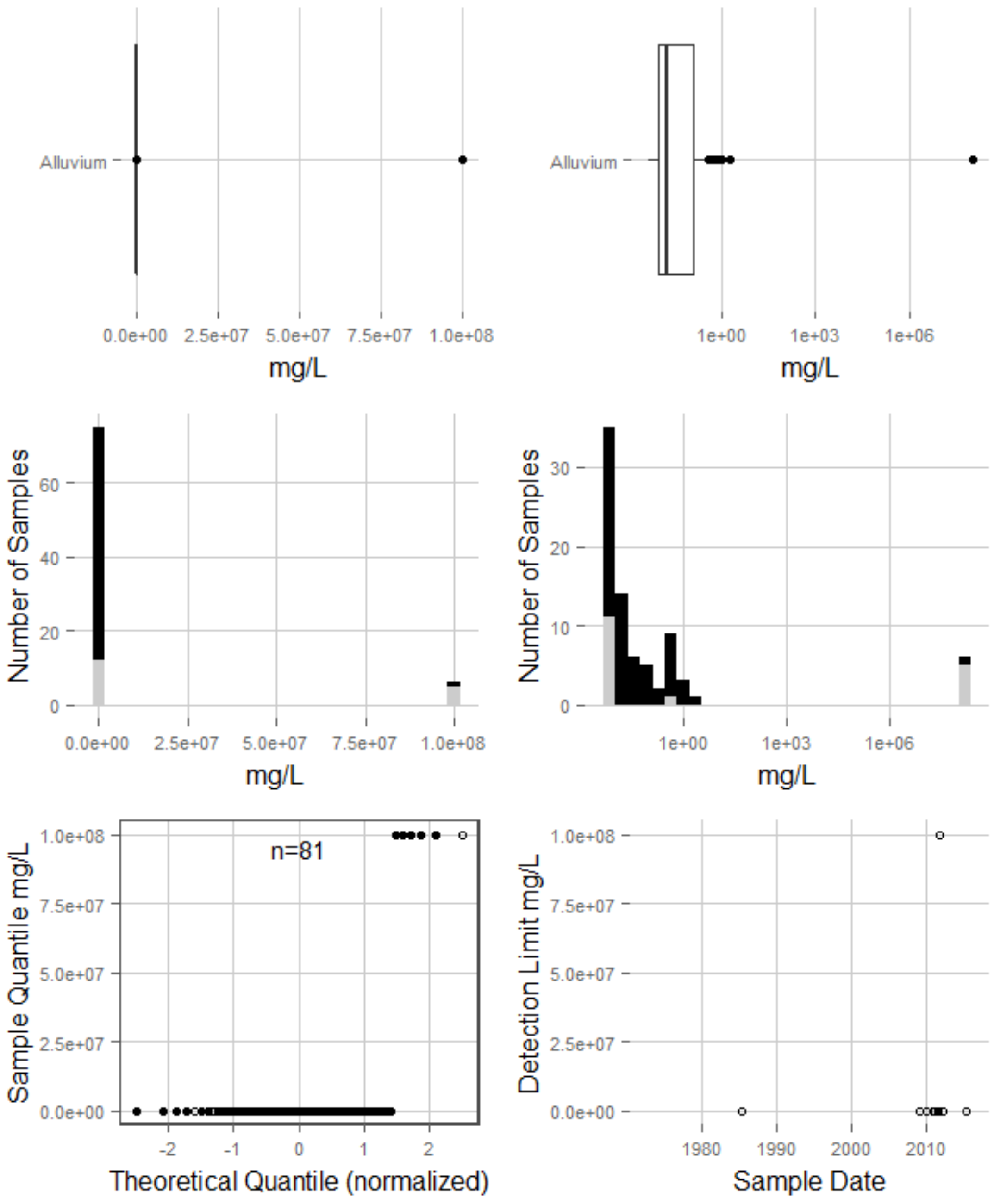
Phosphate
McKay Coal



Phosphate
SubMcKay



Phosphorus
Alluvium

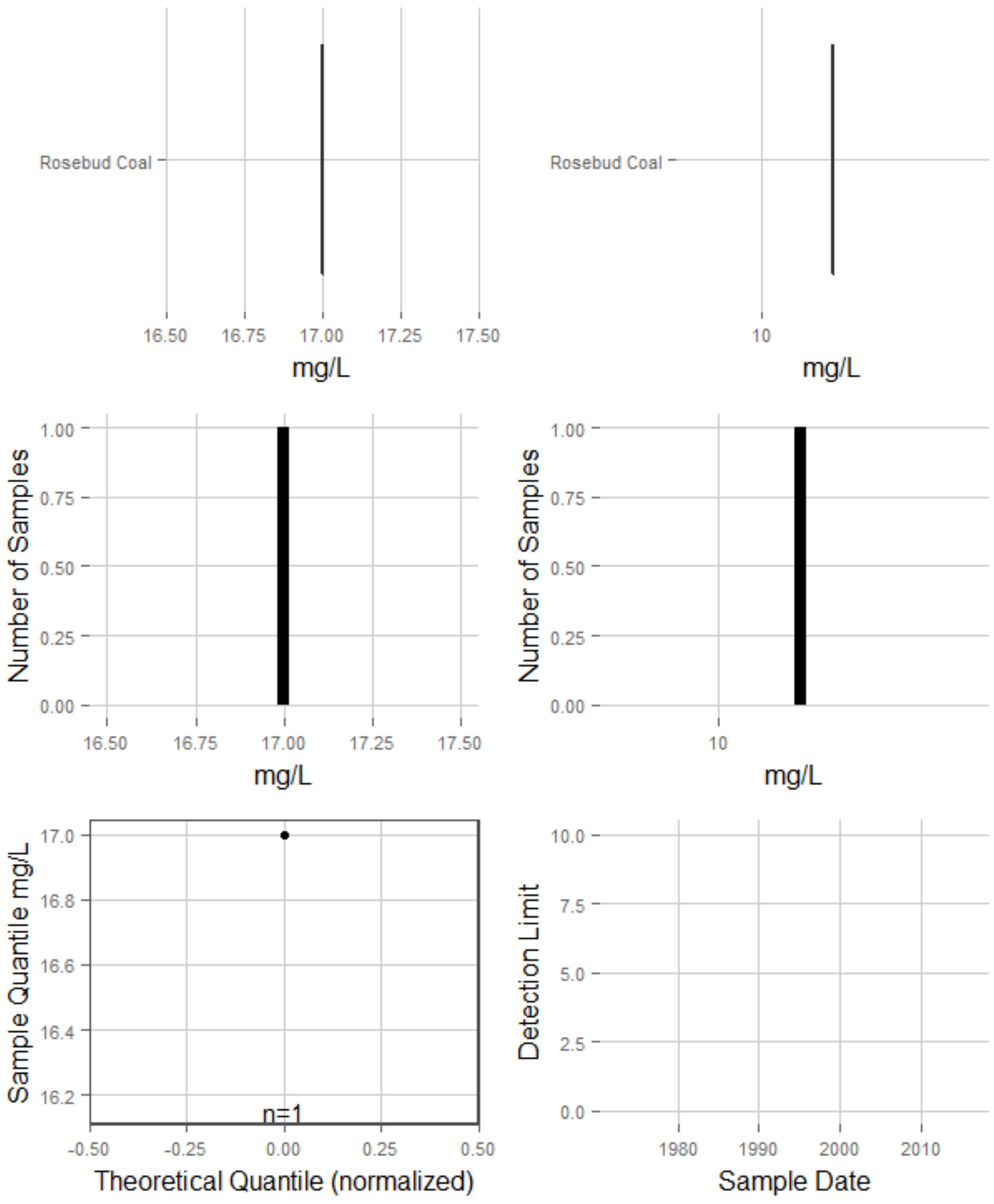


Phosphorus
Spoils
No data

Phosphorus
Clinker
No data

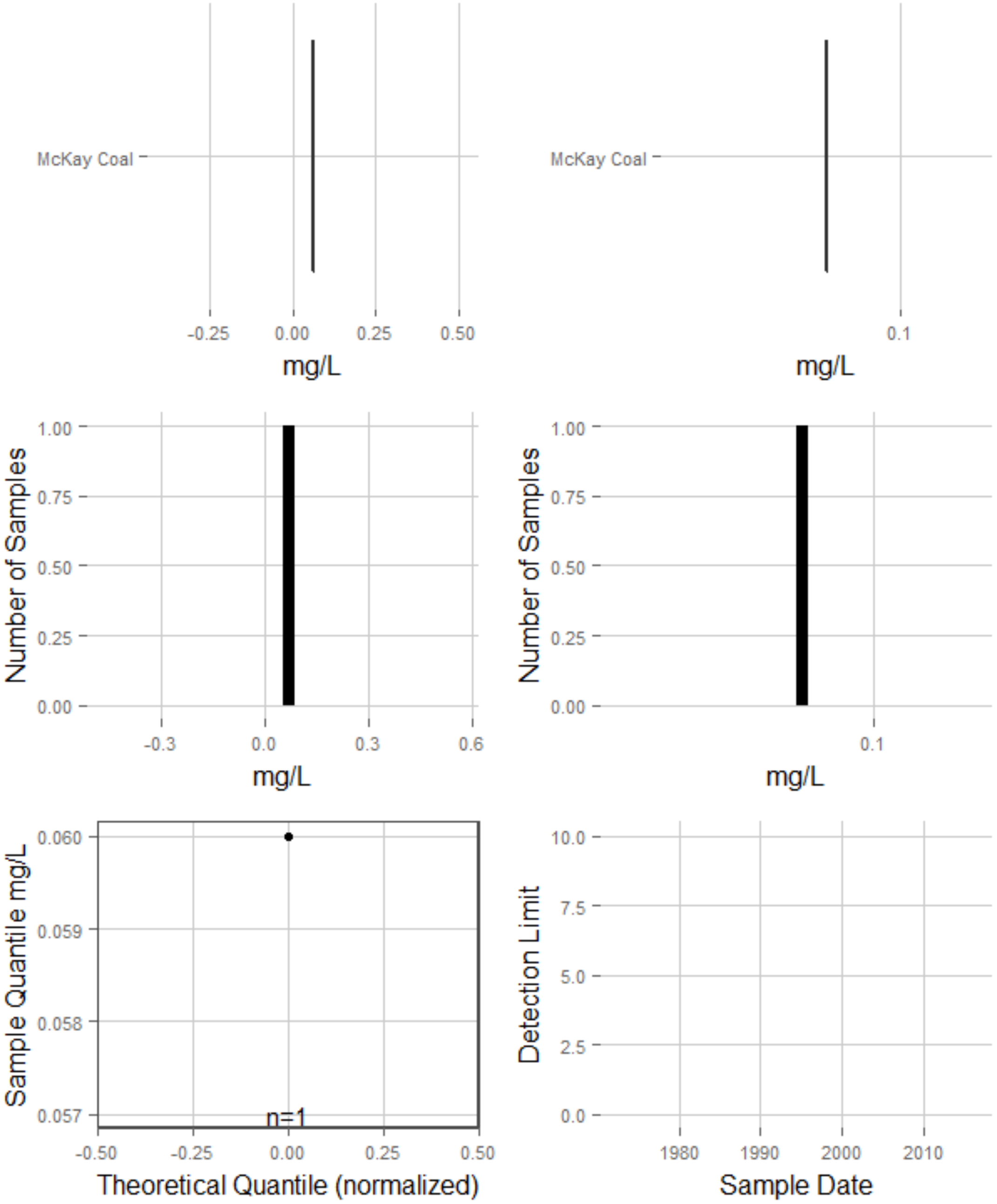
Phosphorus
Rosebud Overburden
No data

Phosphorus
Rosebud Coal

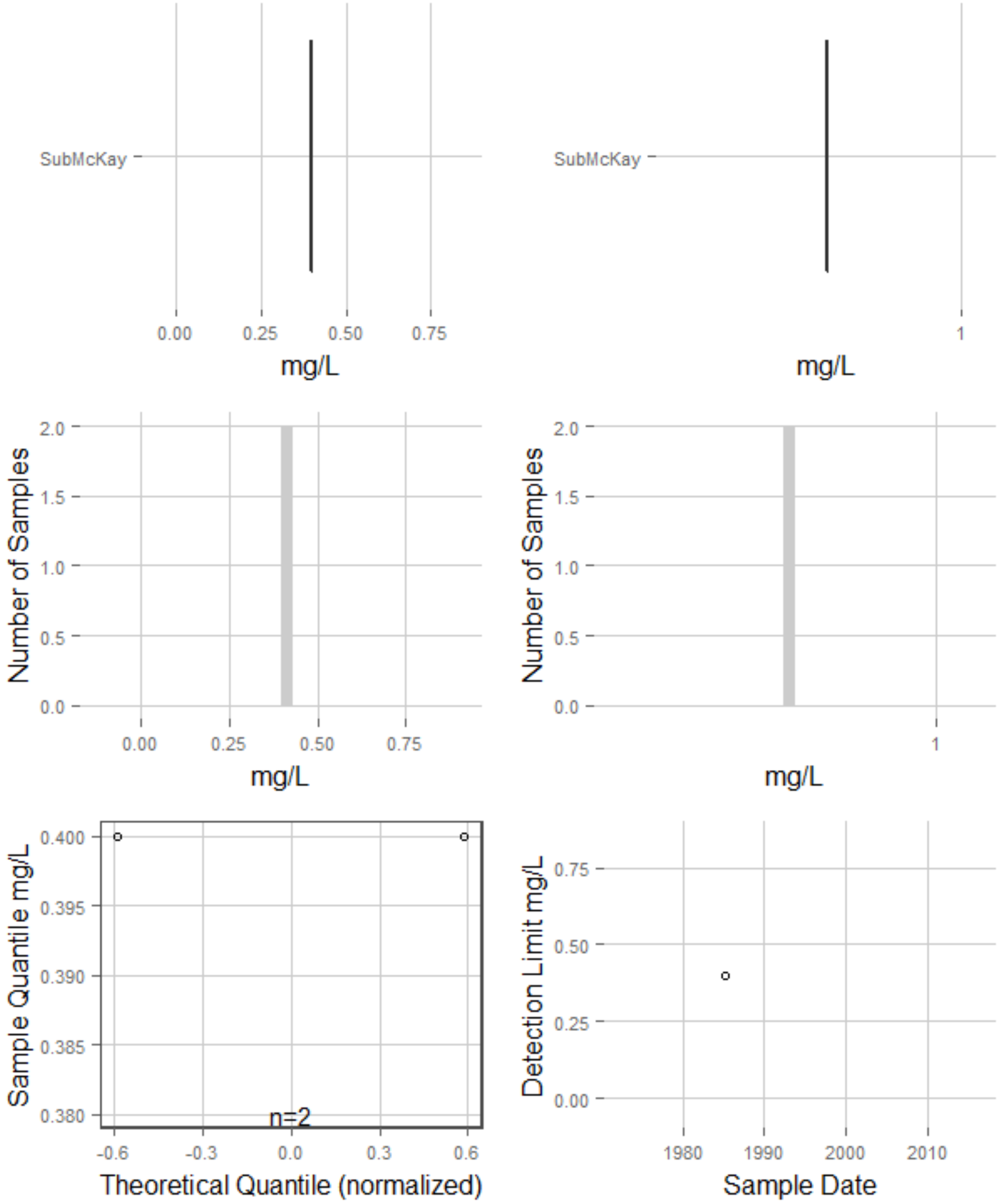


Phosphorus
Interburden
No data

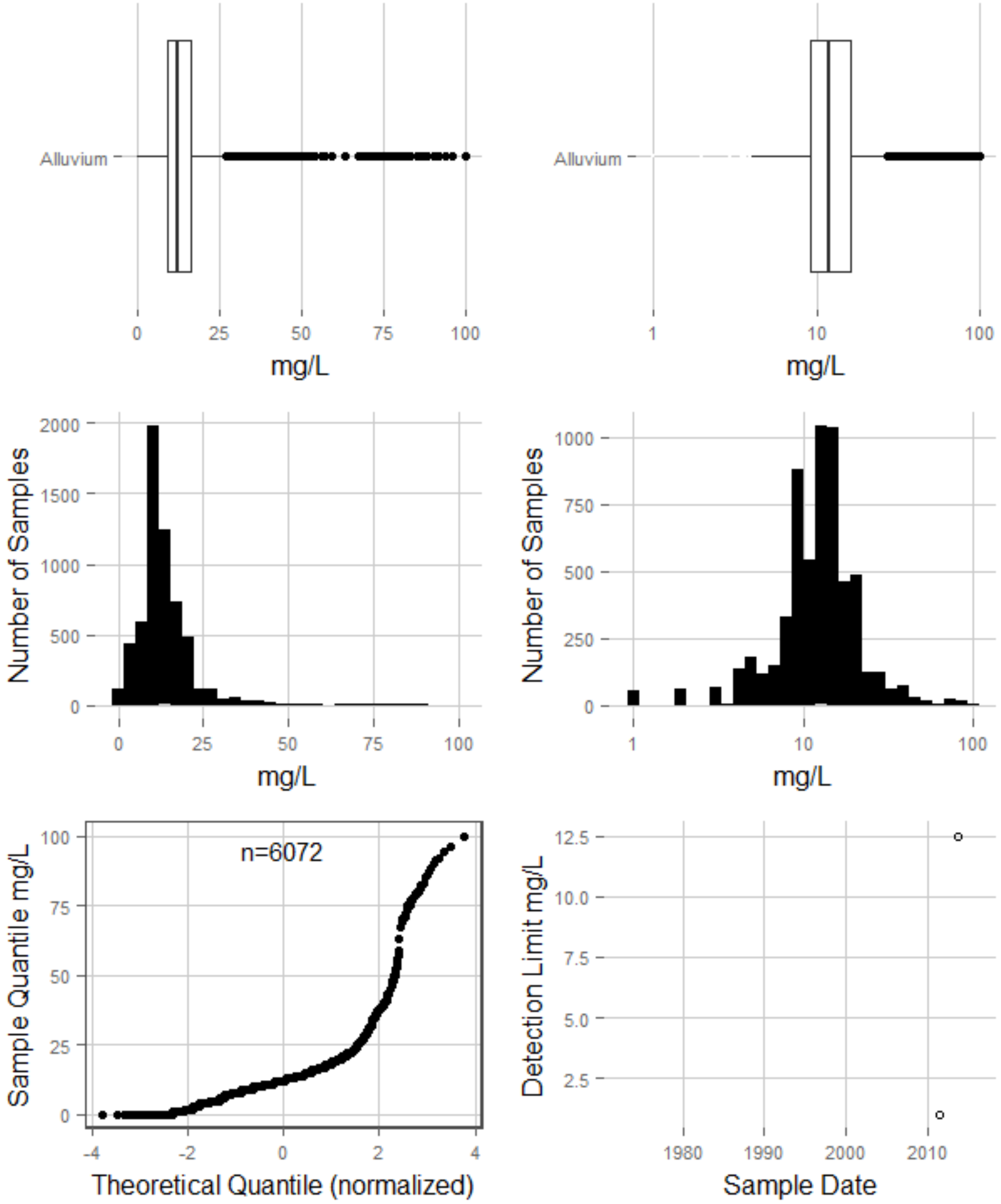
Phosphorus
McKay Coal



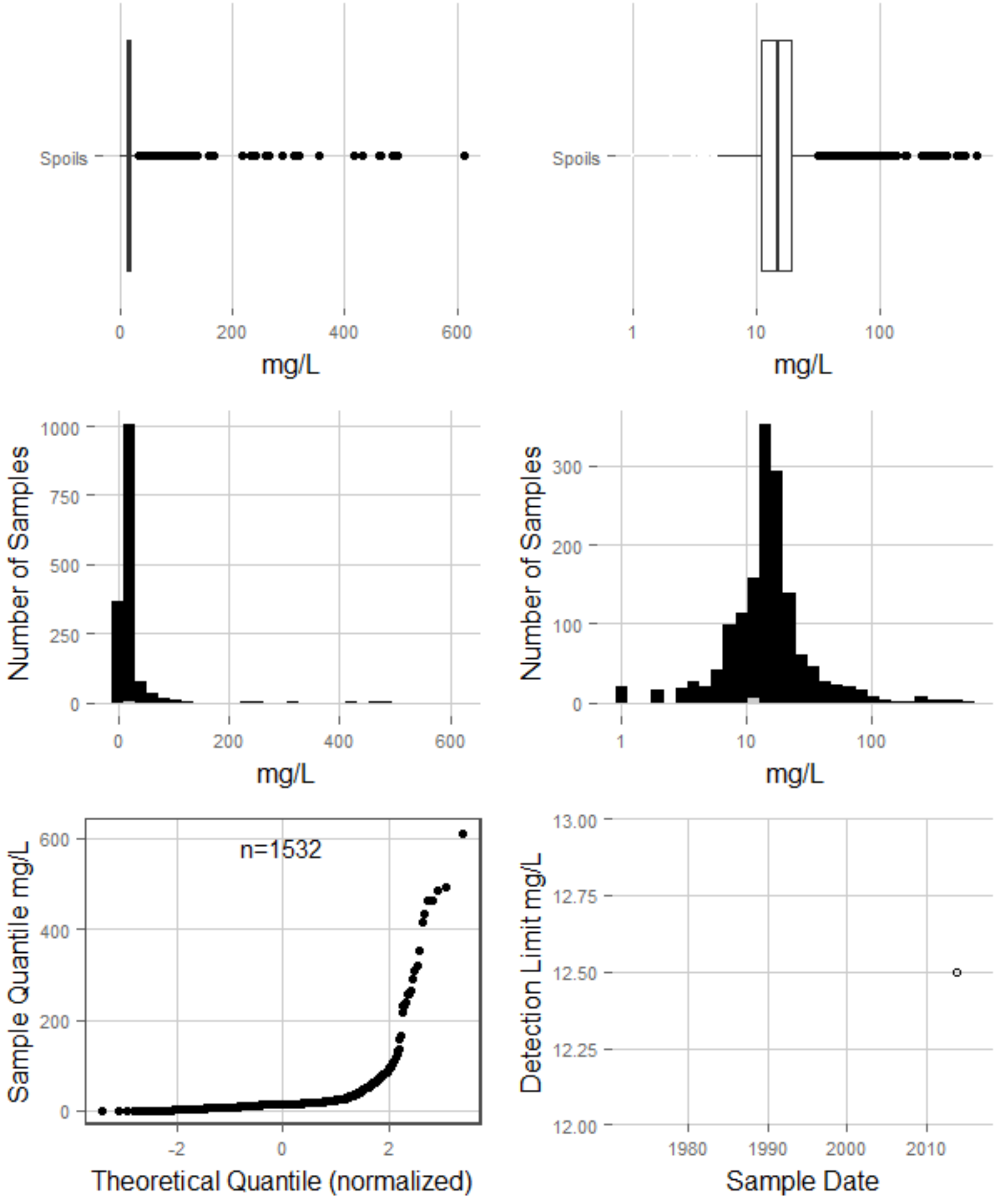
Phosphorus
SubMcKay



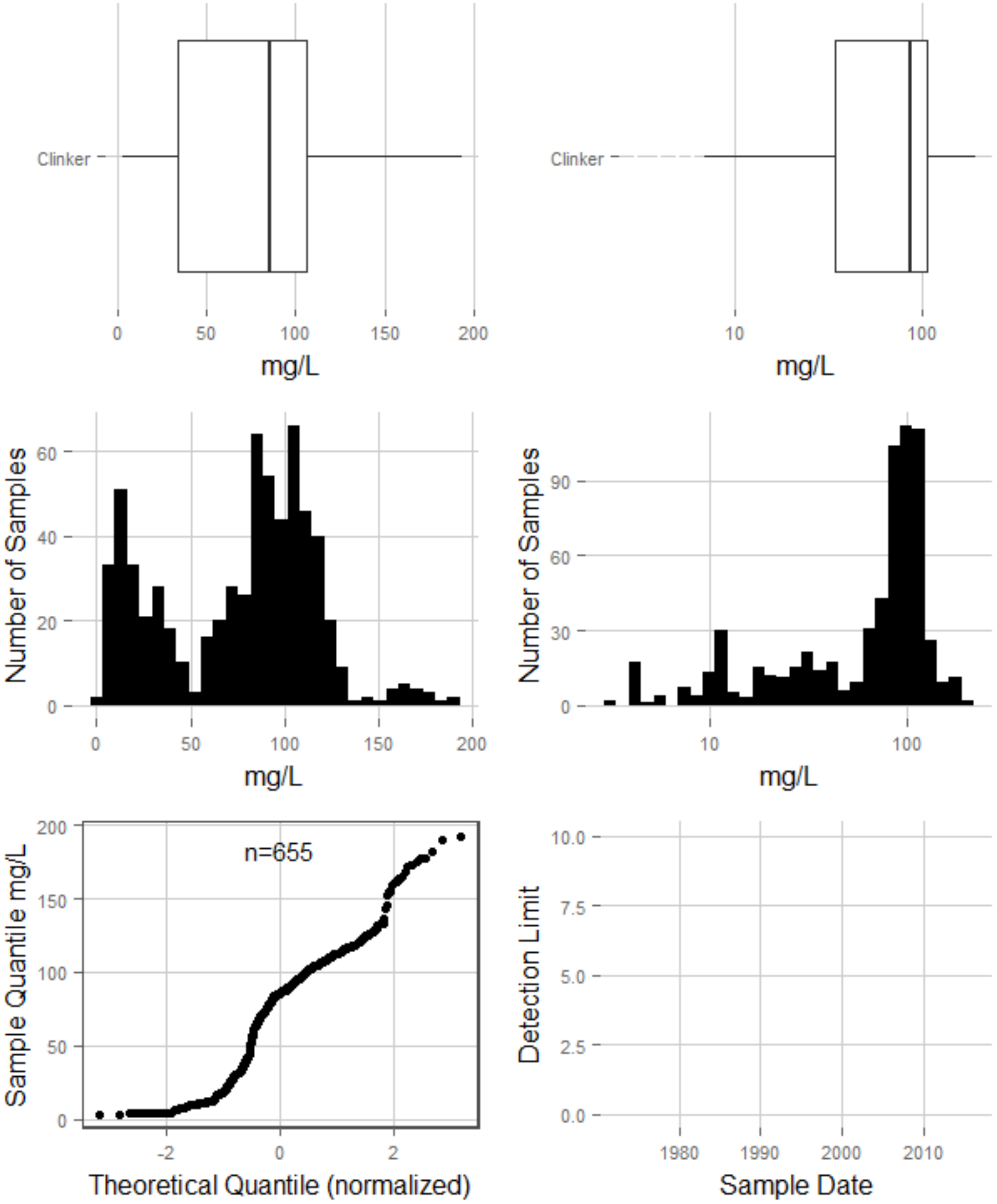
Potassium
Alluvium



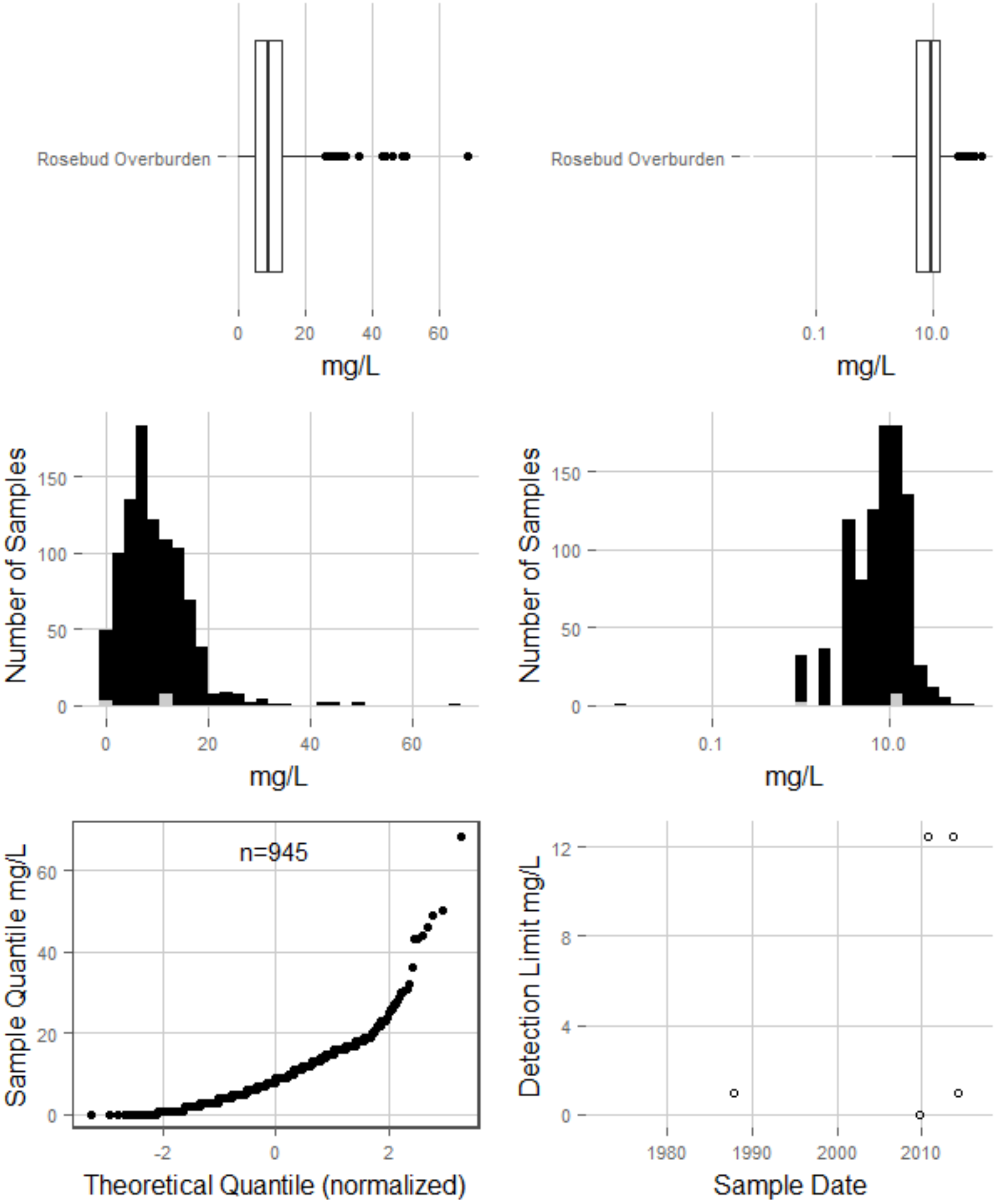
Potassium
Spoils



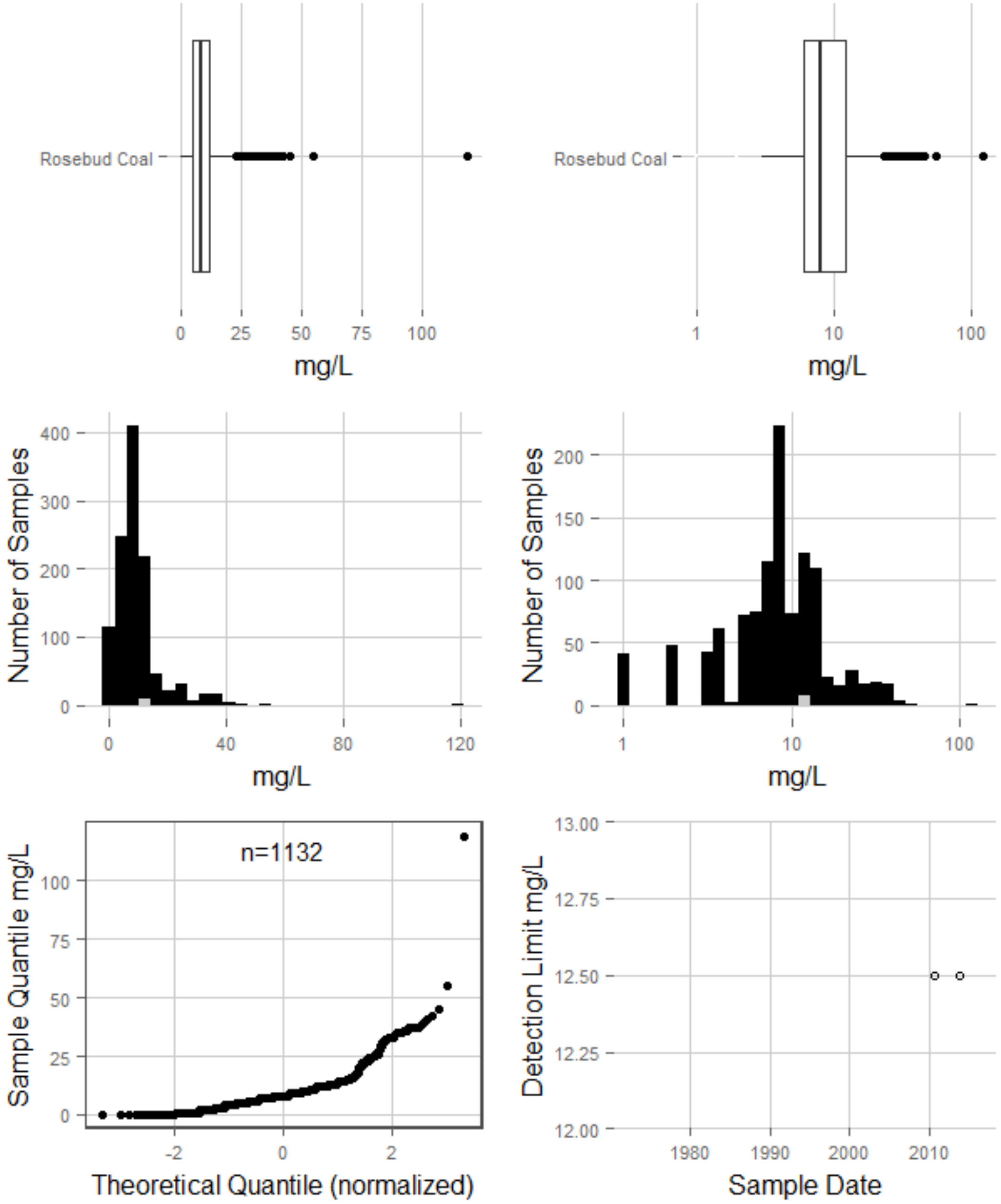
Potassium
Clinker



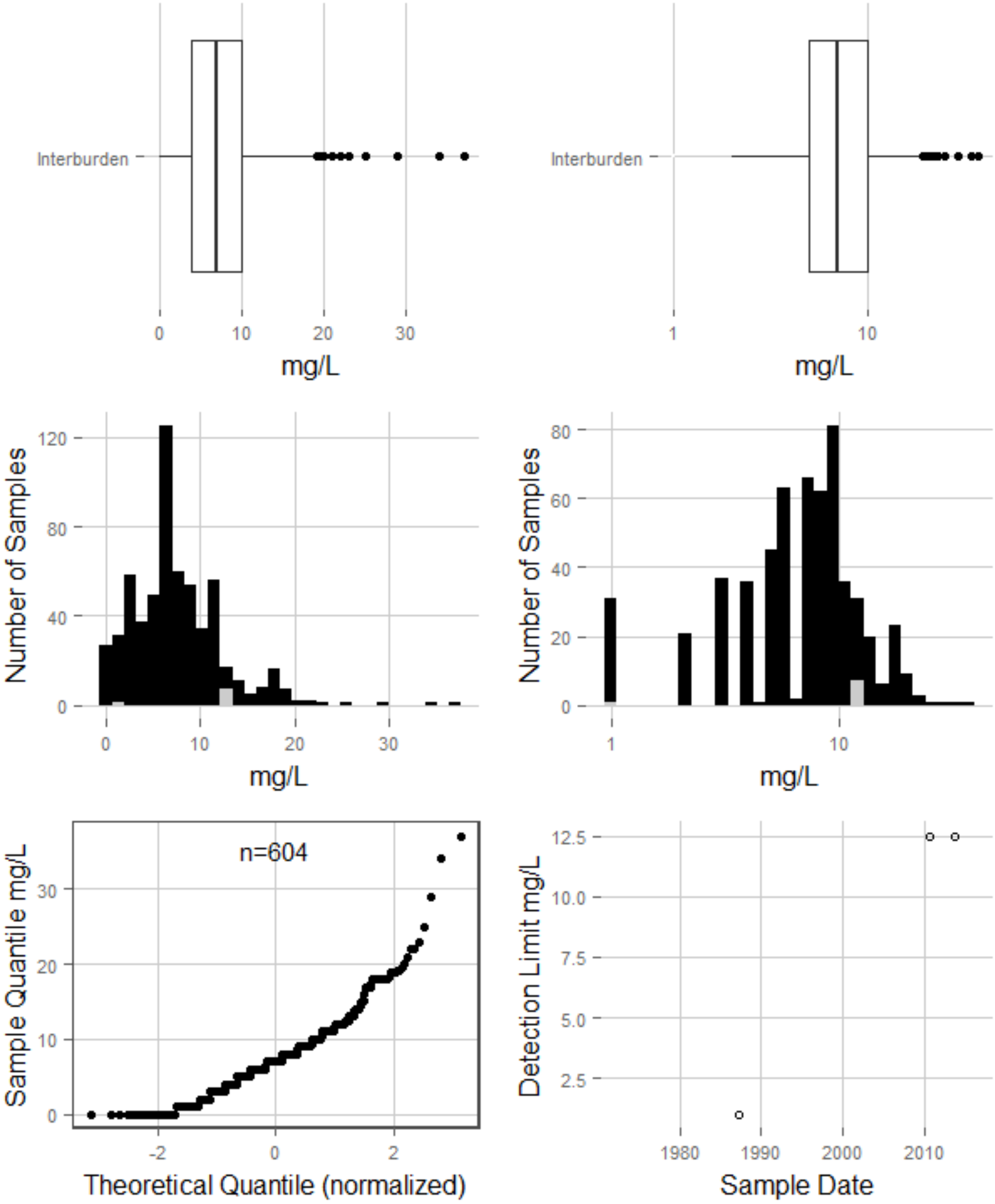
Potassium
Rosebud Overburden



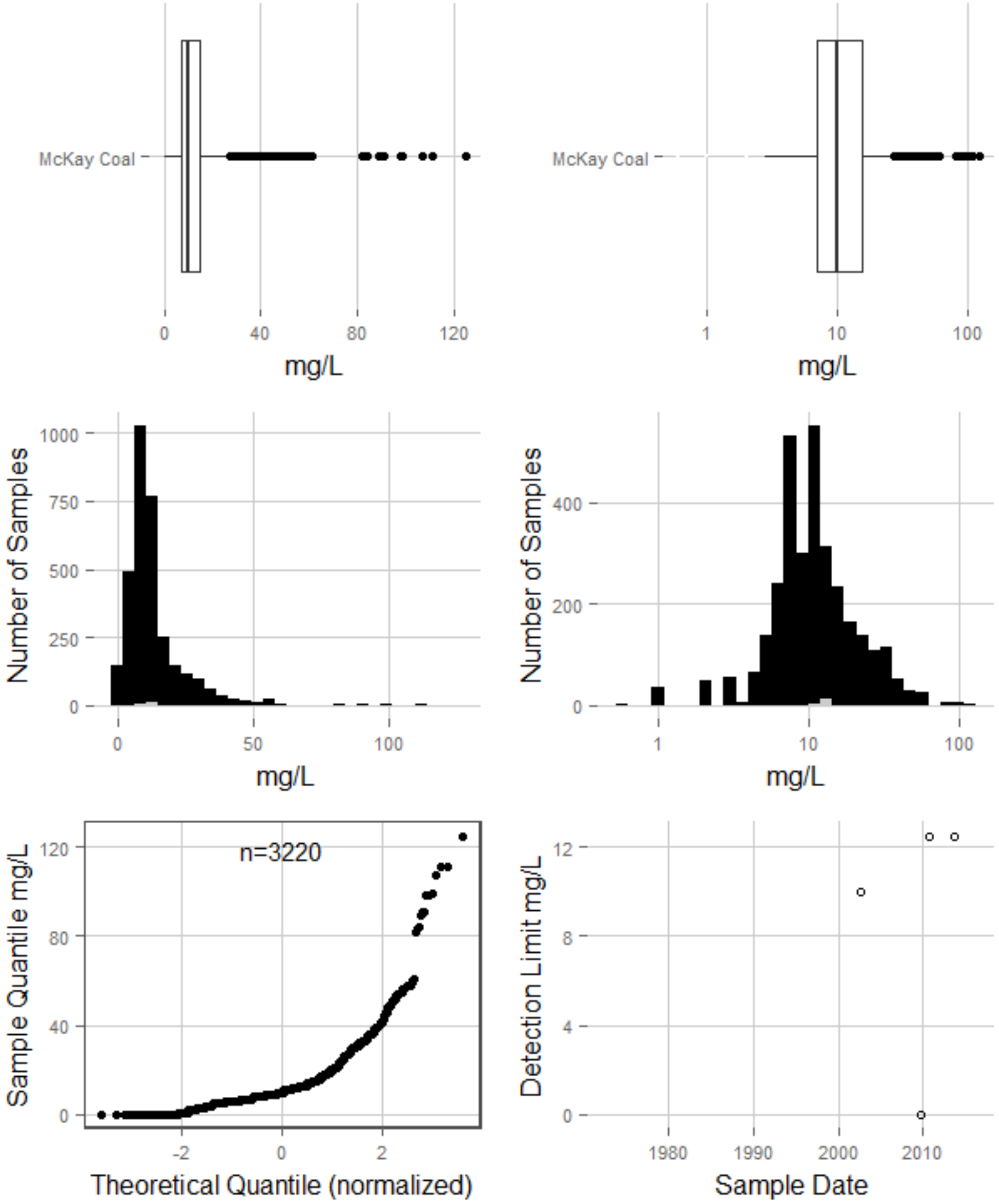
Potassium
Rosebud Coal



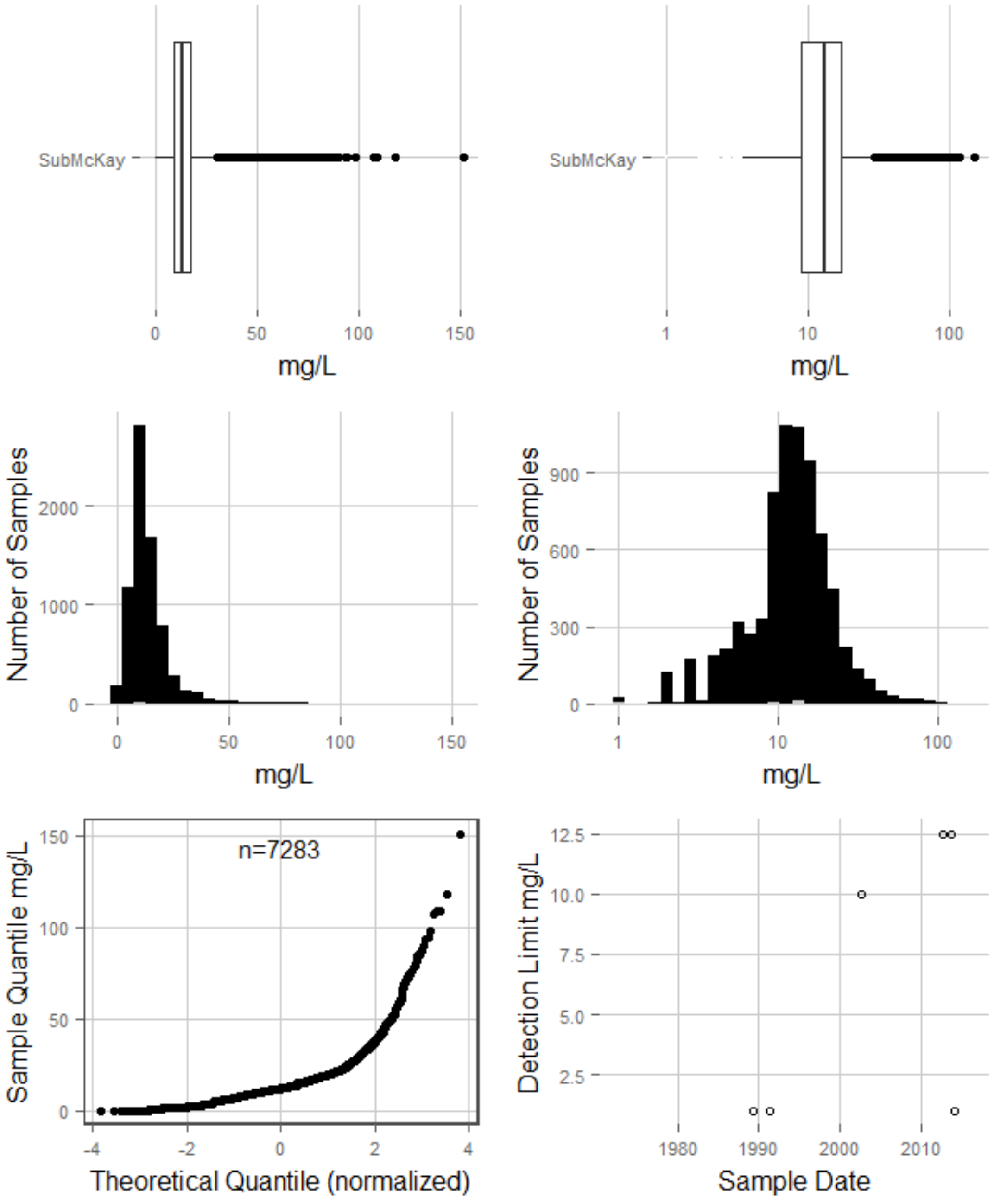
Potassium
Interburden



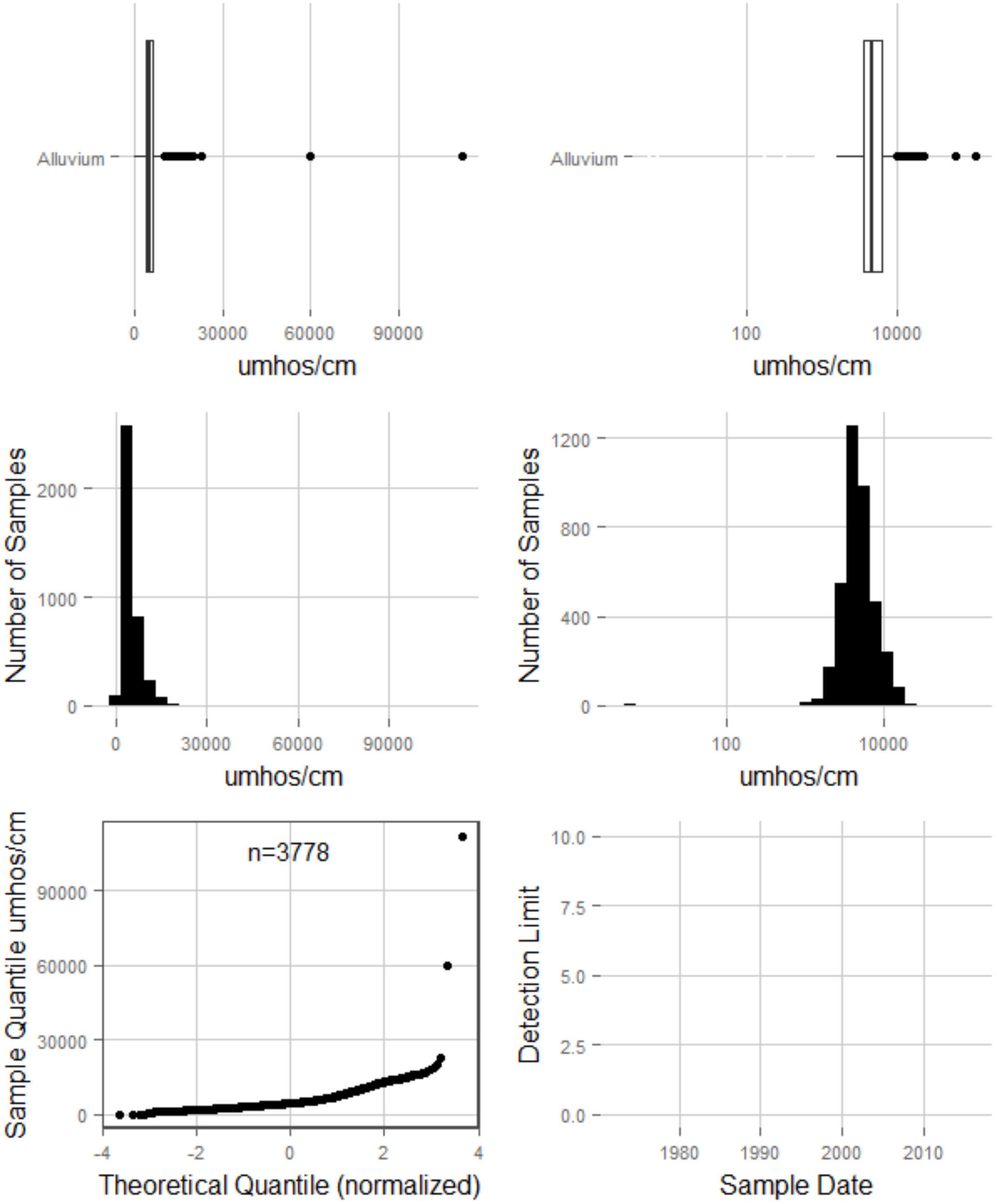
Potassium
McKay Coal

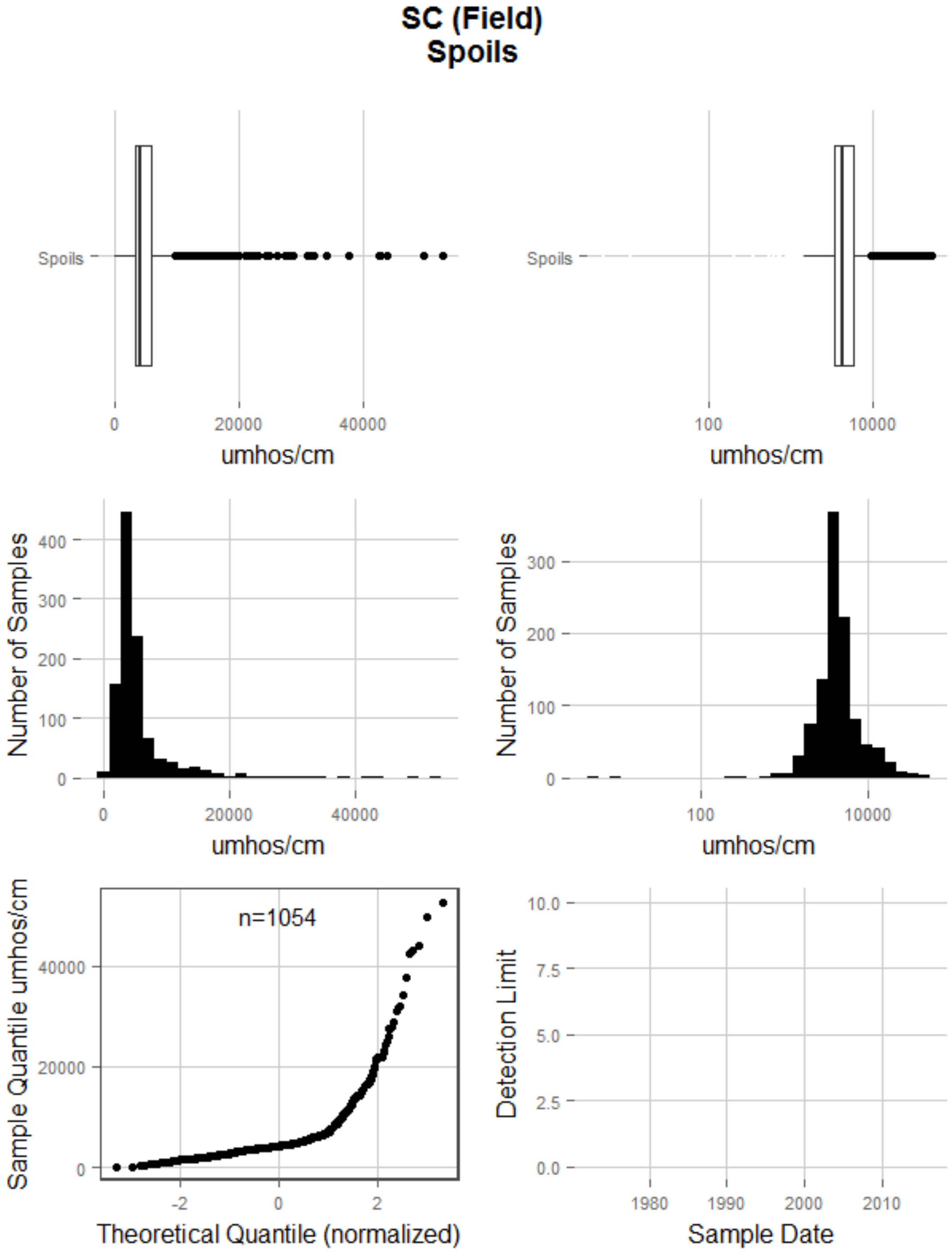


Potassium
SubMcKay



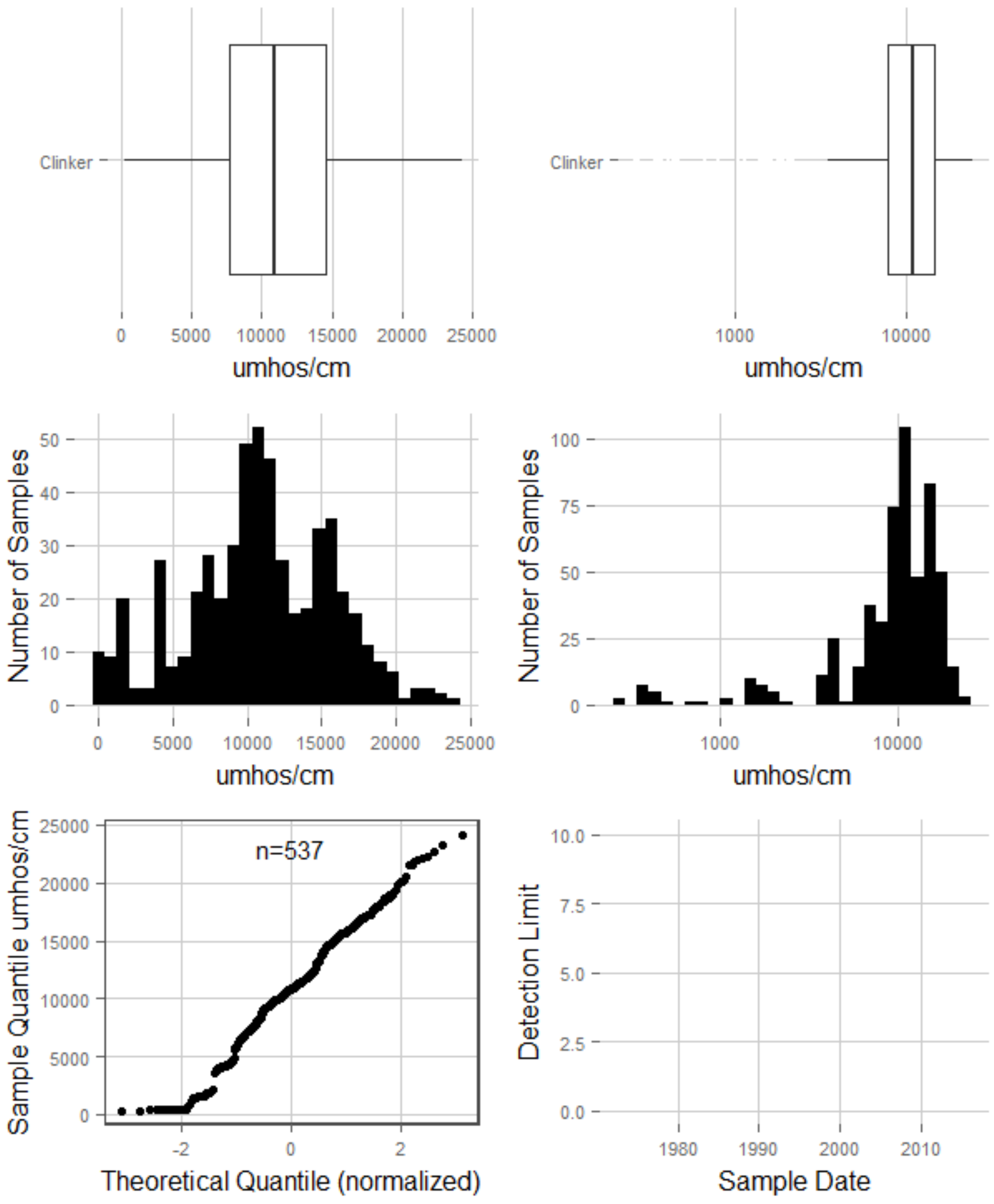
SC (Field)
Alluvium



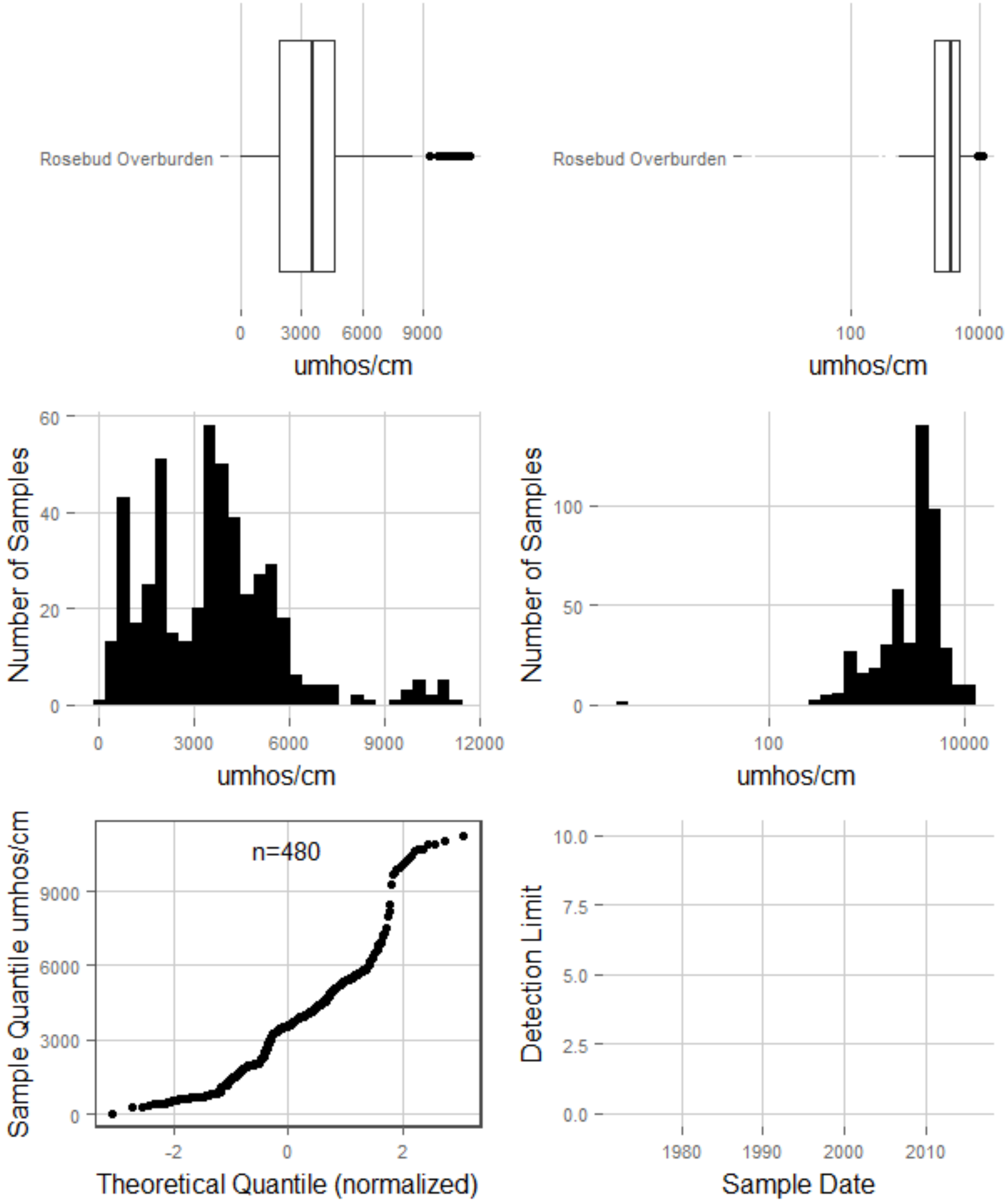


SC (Field)
Spoils

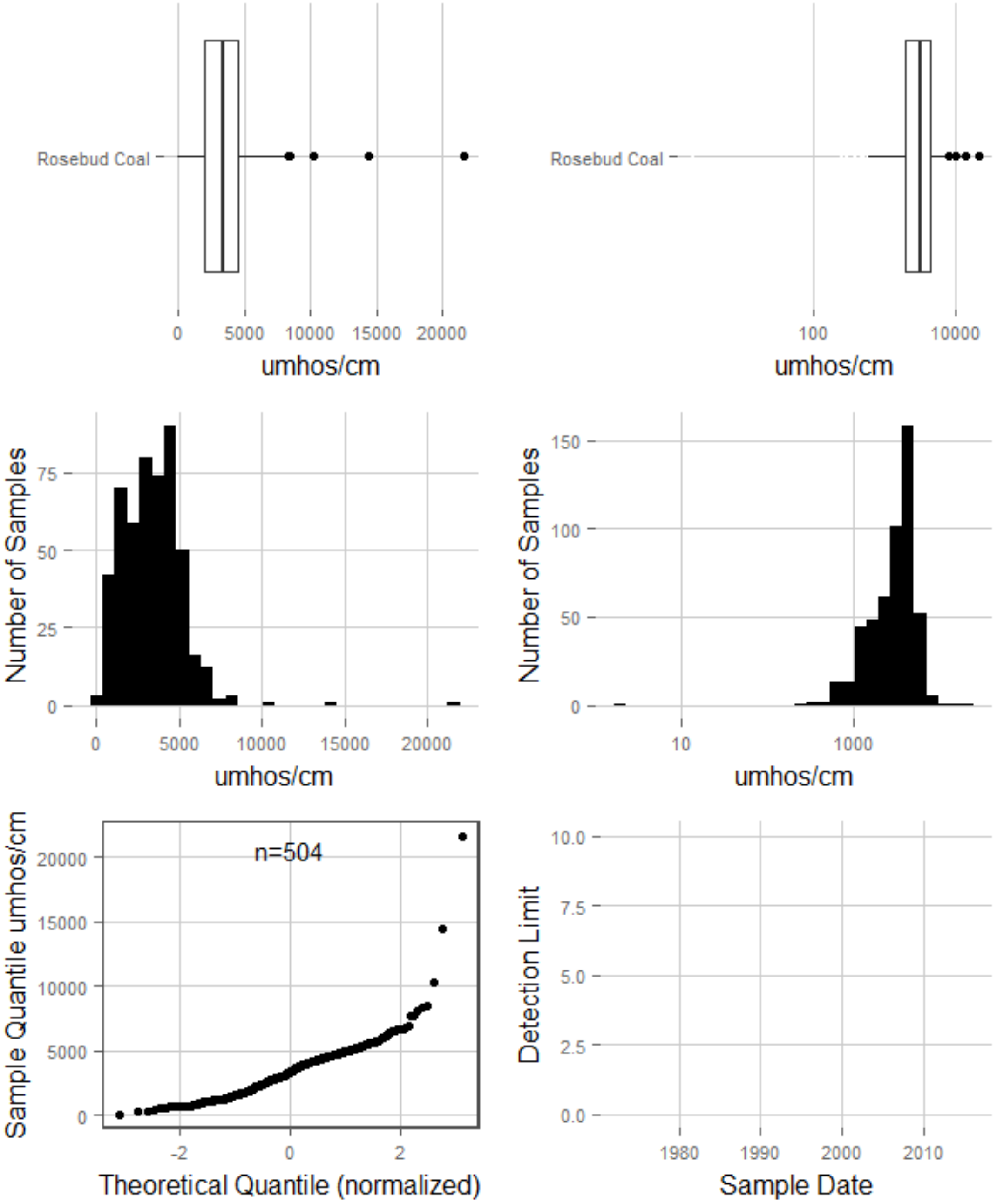
SC (Field)
Clinker



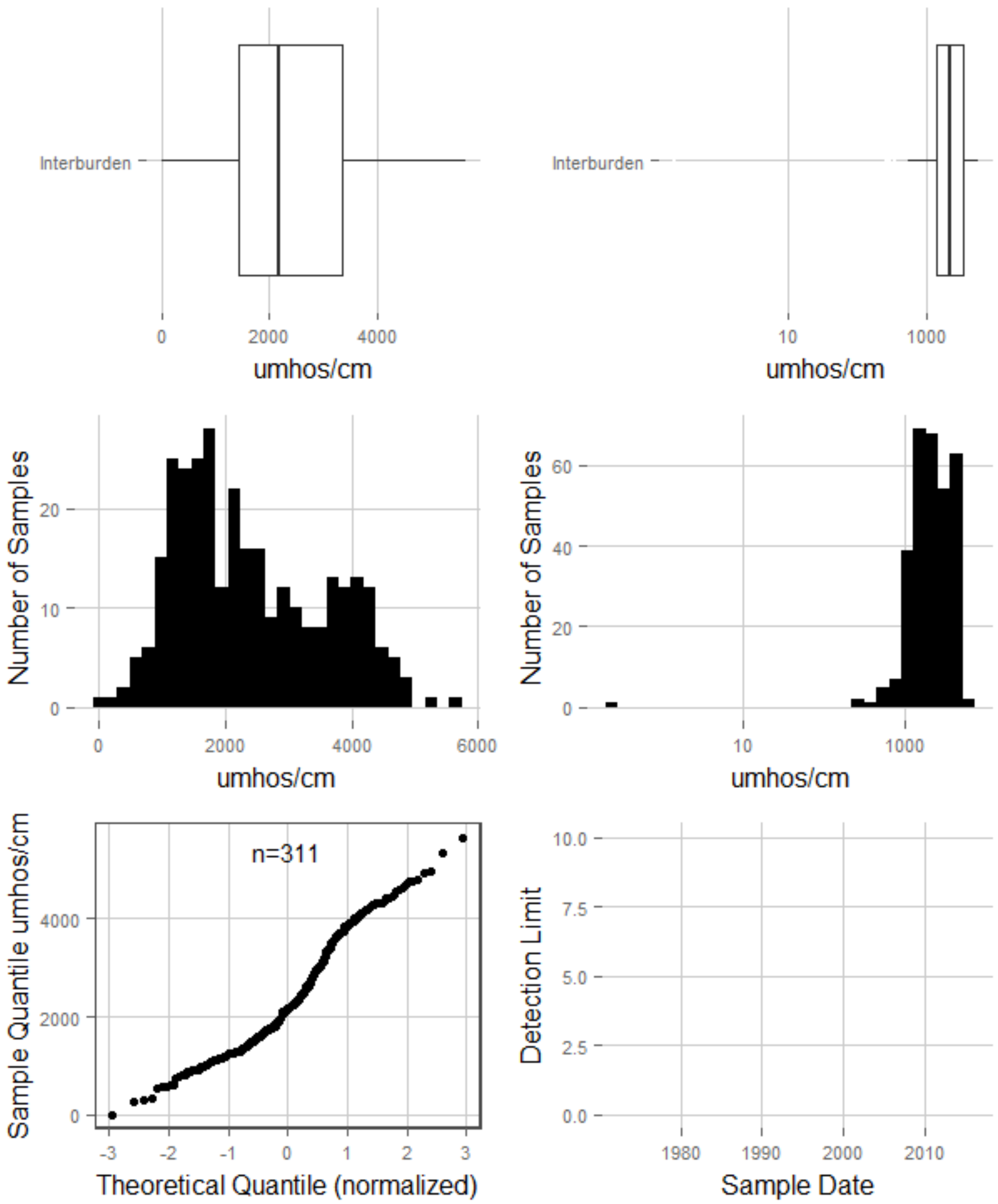
SC (Field)
Rosebud Overburden



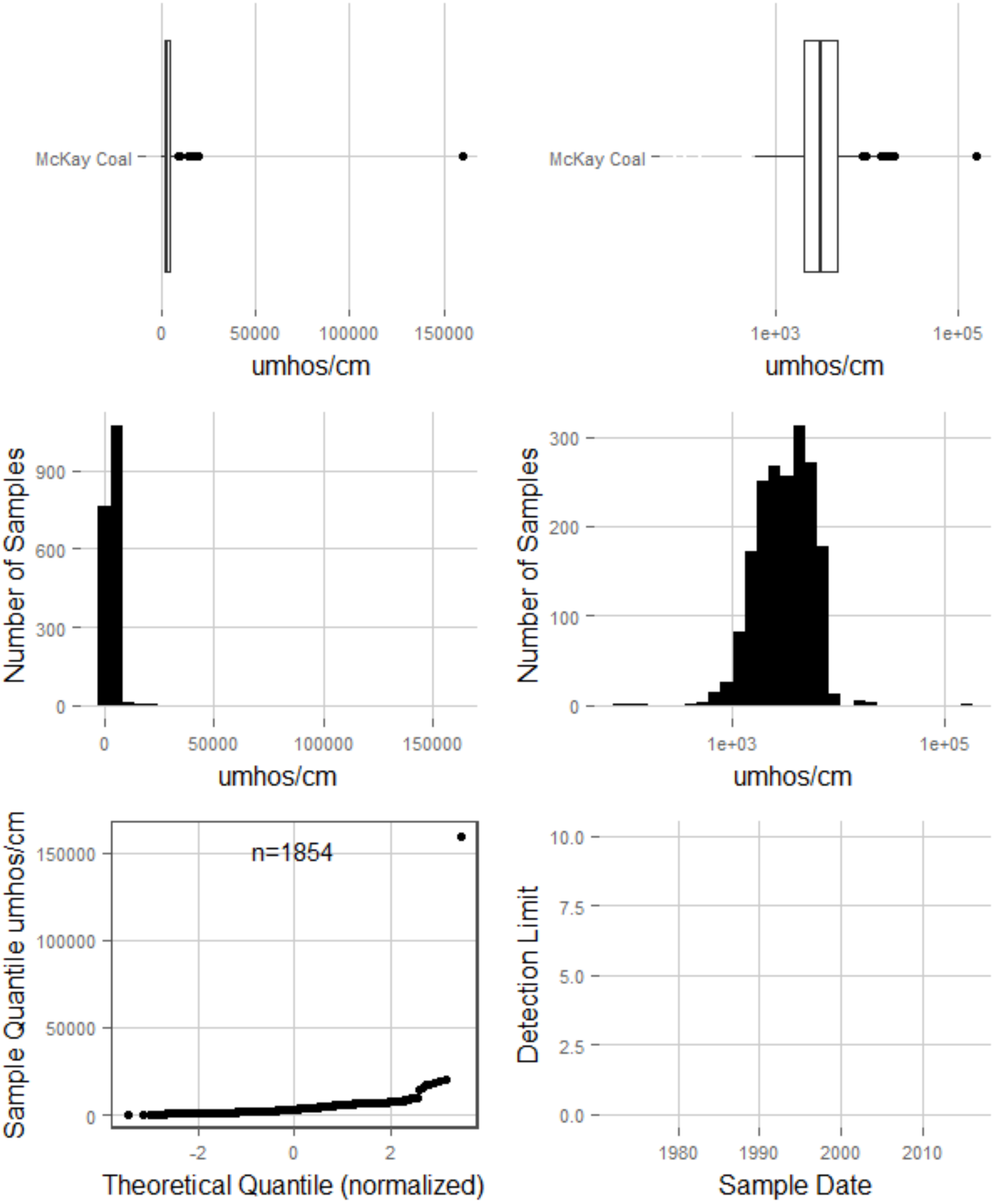
SC (Field)
Rosebud Coal



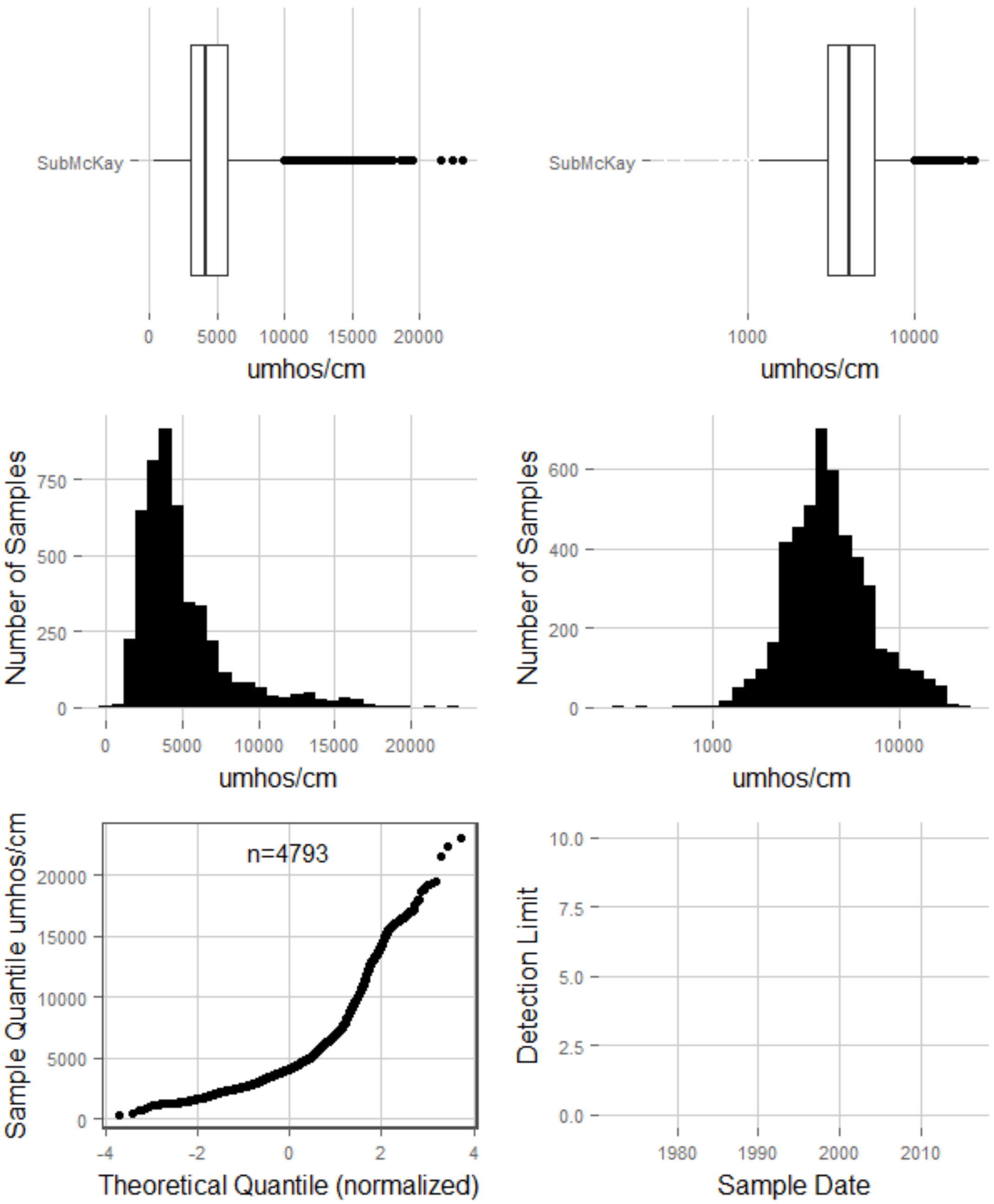
SC (Field)
Interburden



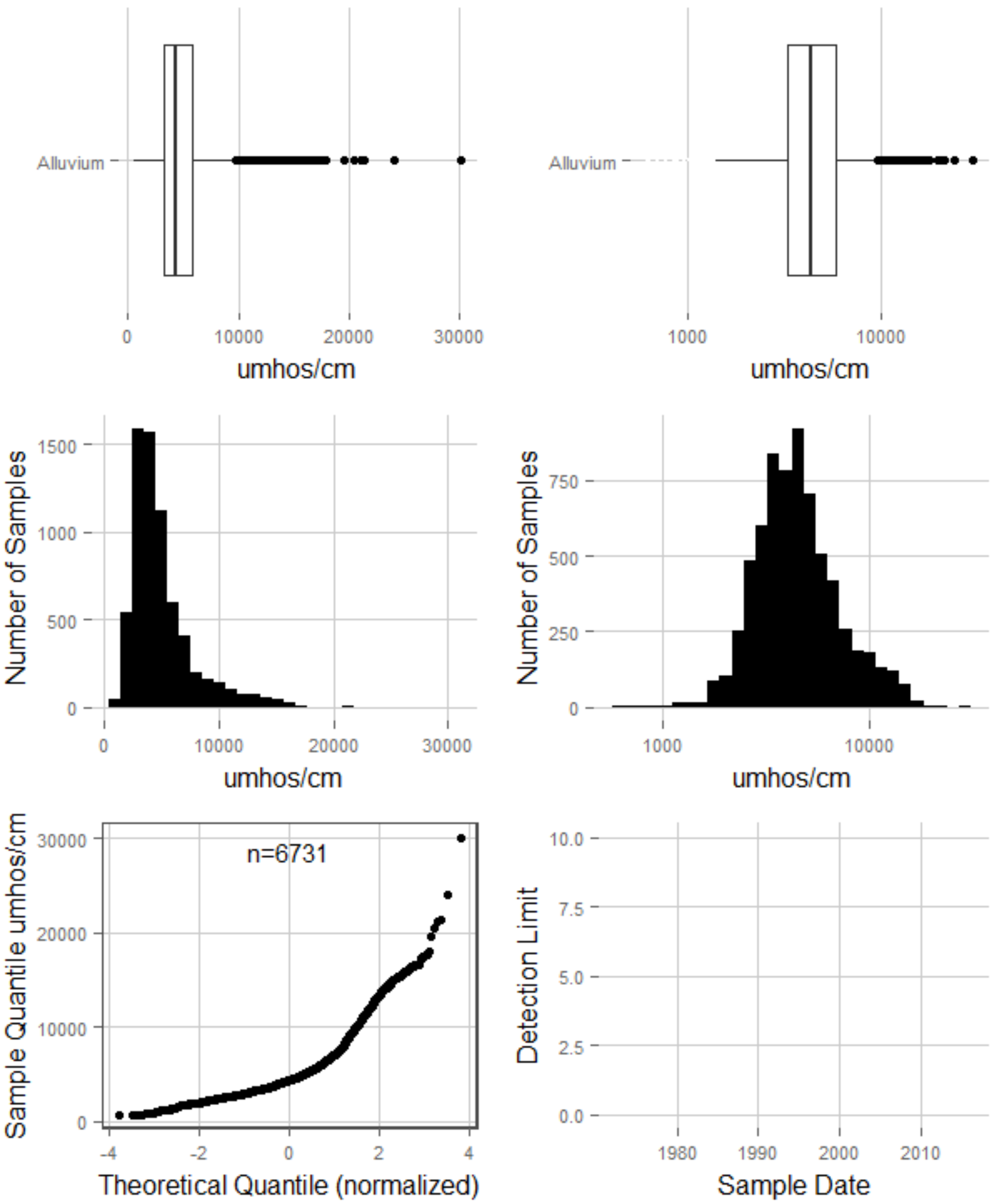
SC (Field)
McKay Coal



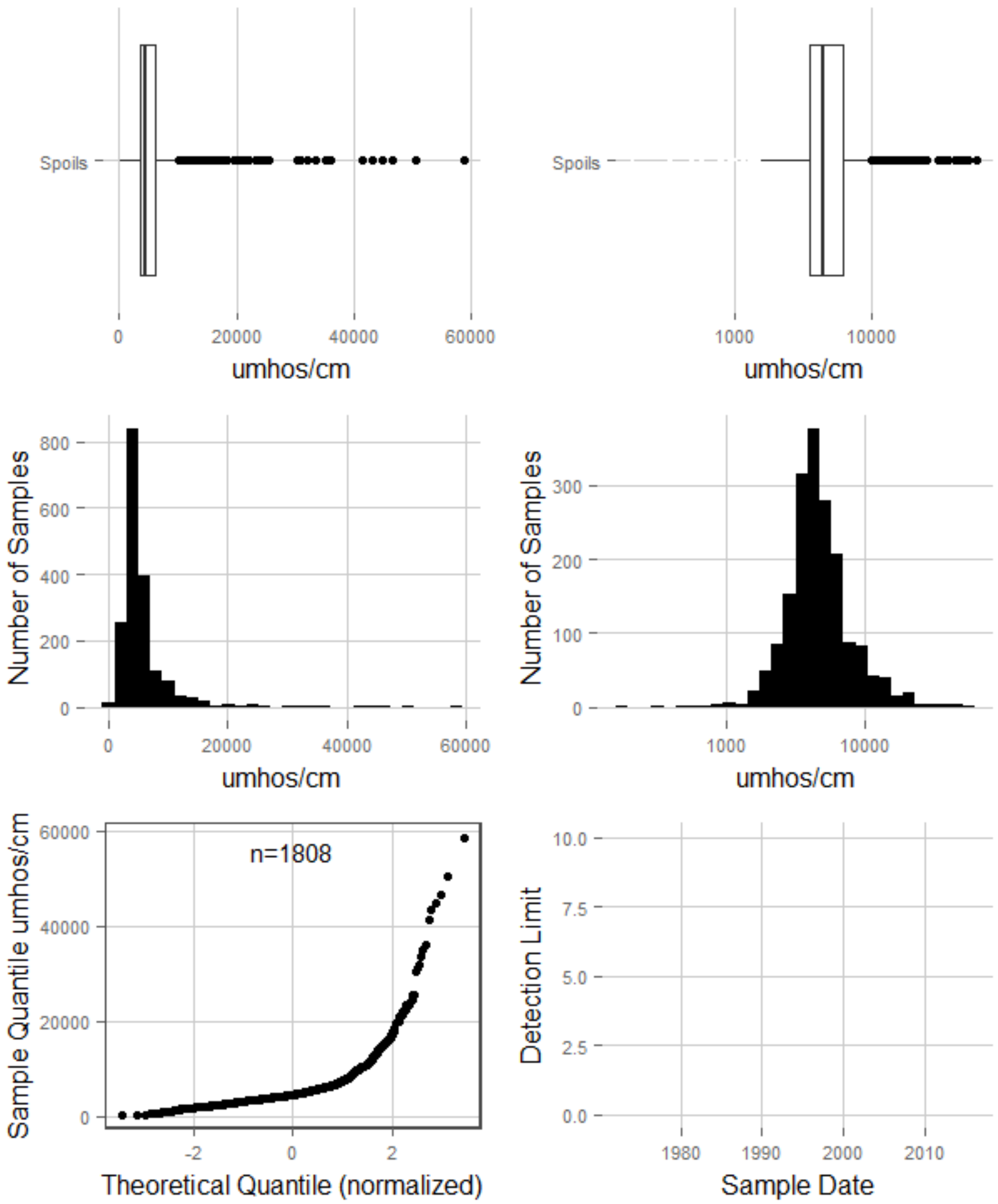
SC (Field)
SubMcKay



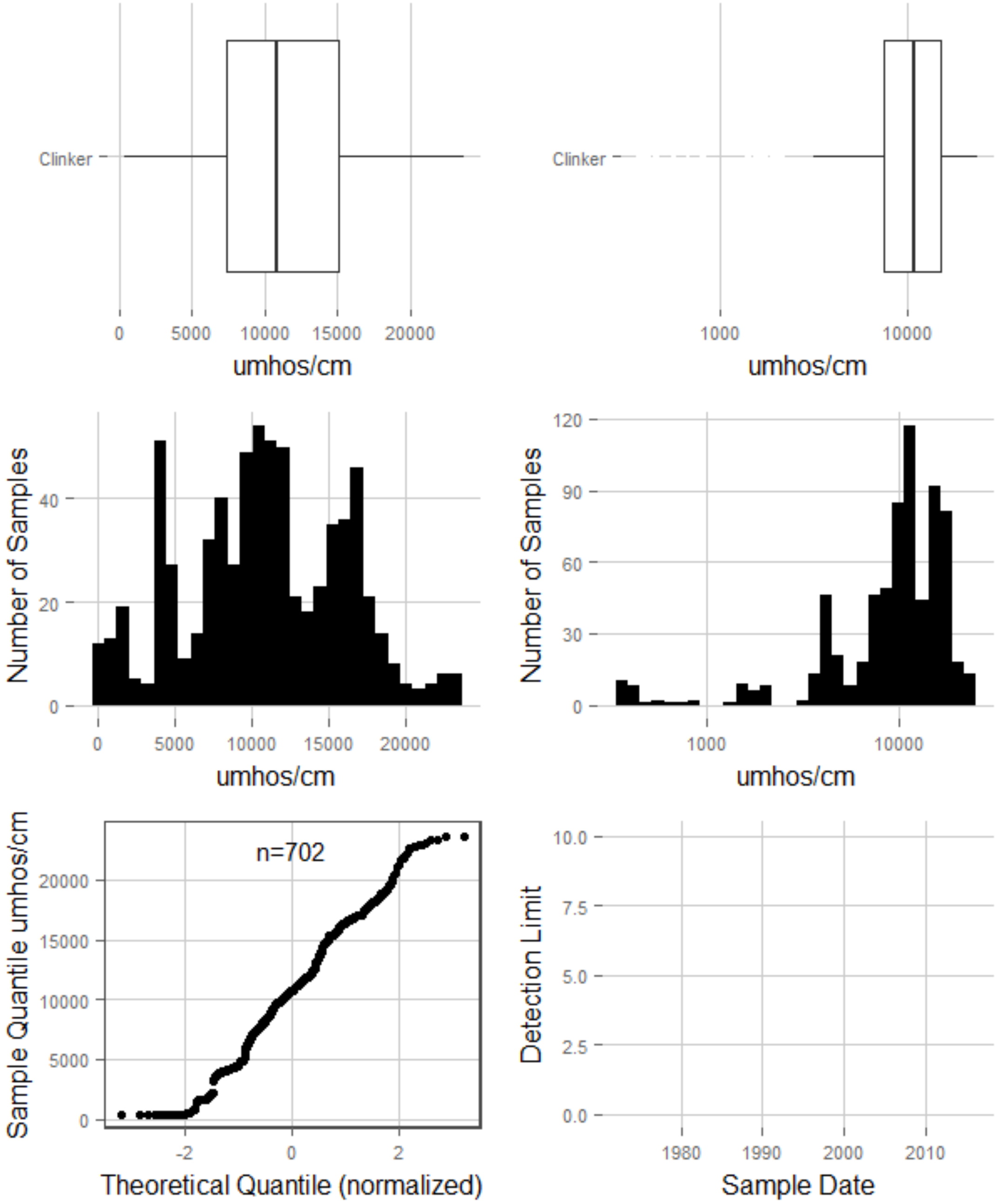
SC (Lab)
Alluvium

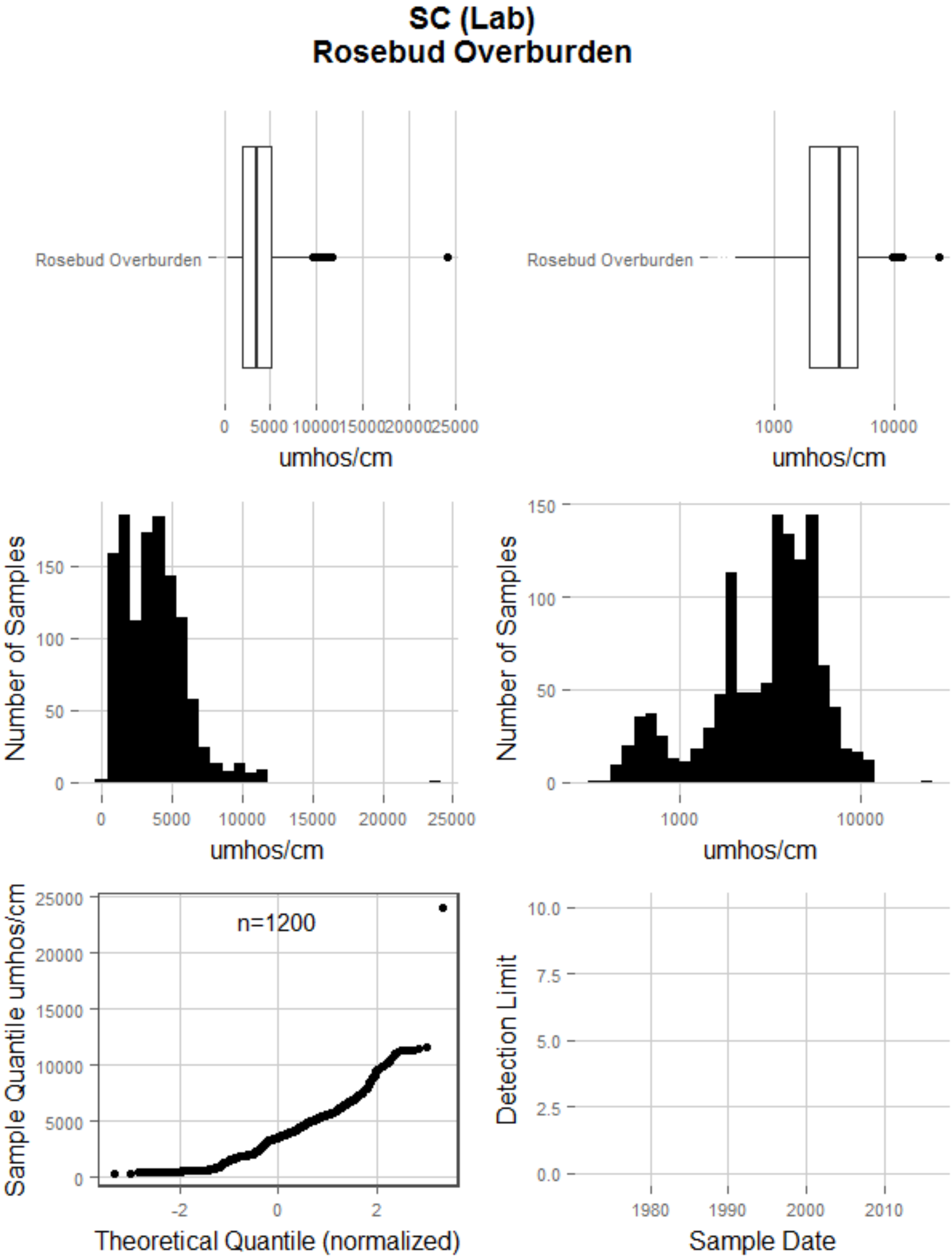


SC (Lab)
Spoils

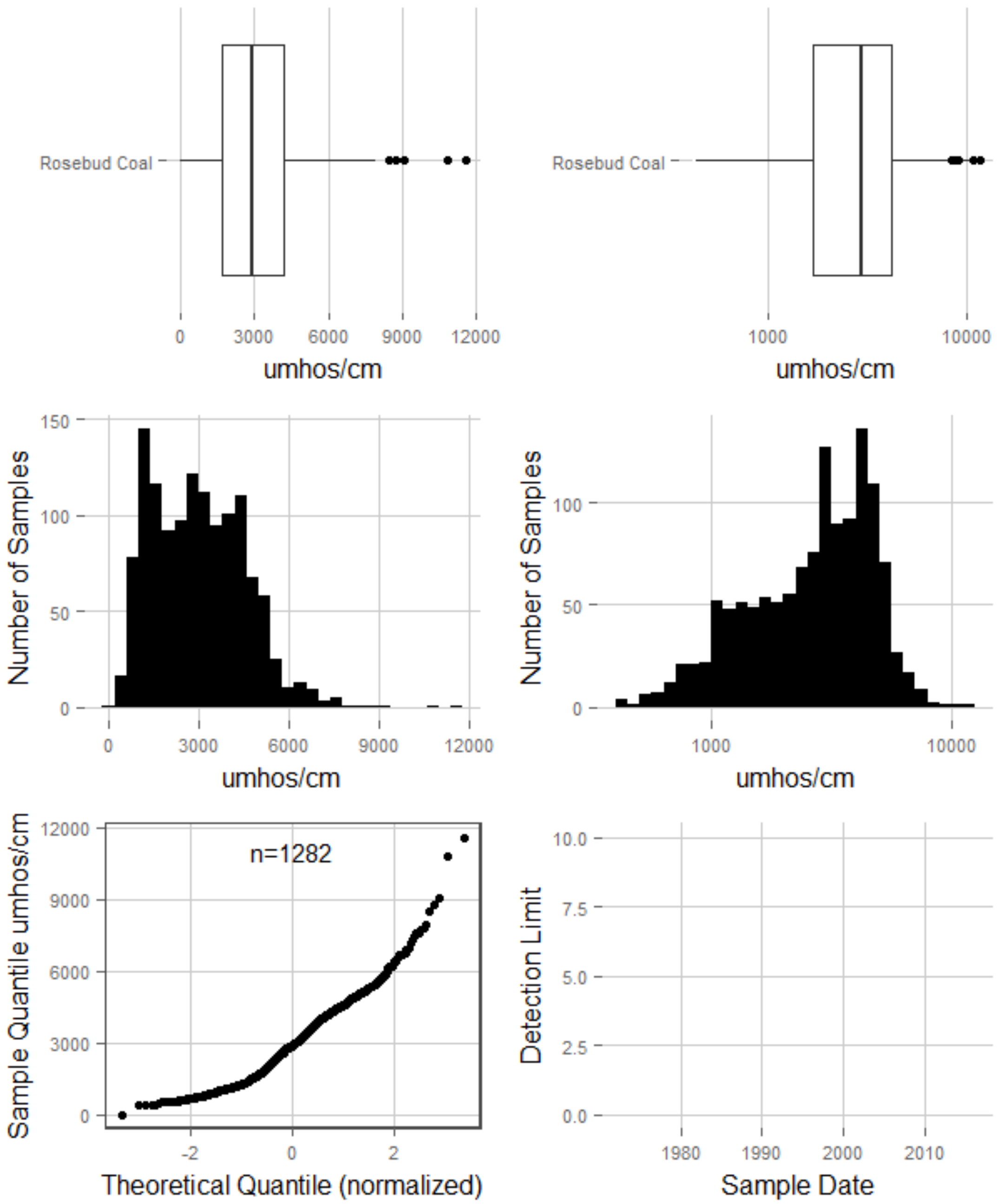


SC (Lab)
Clinker

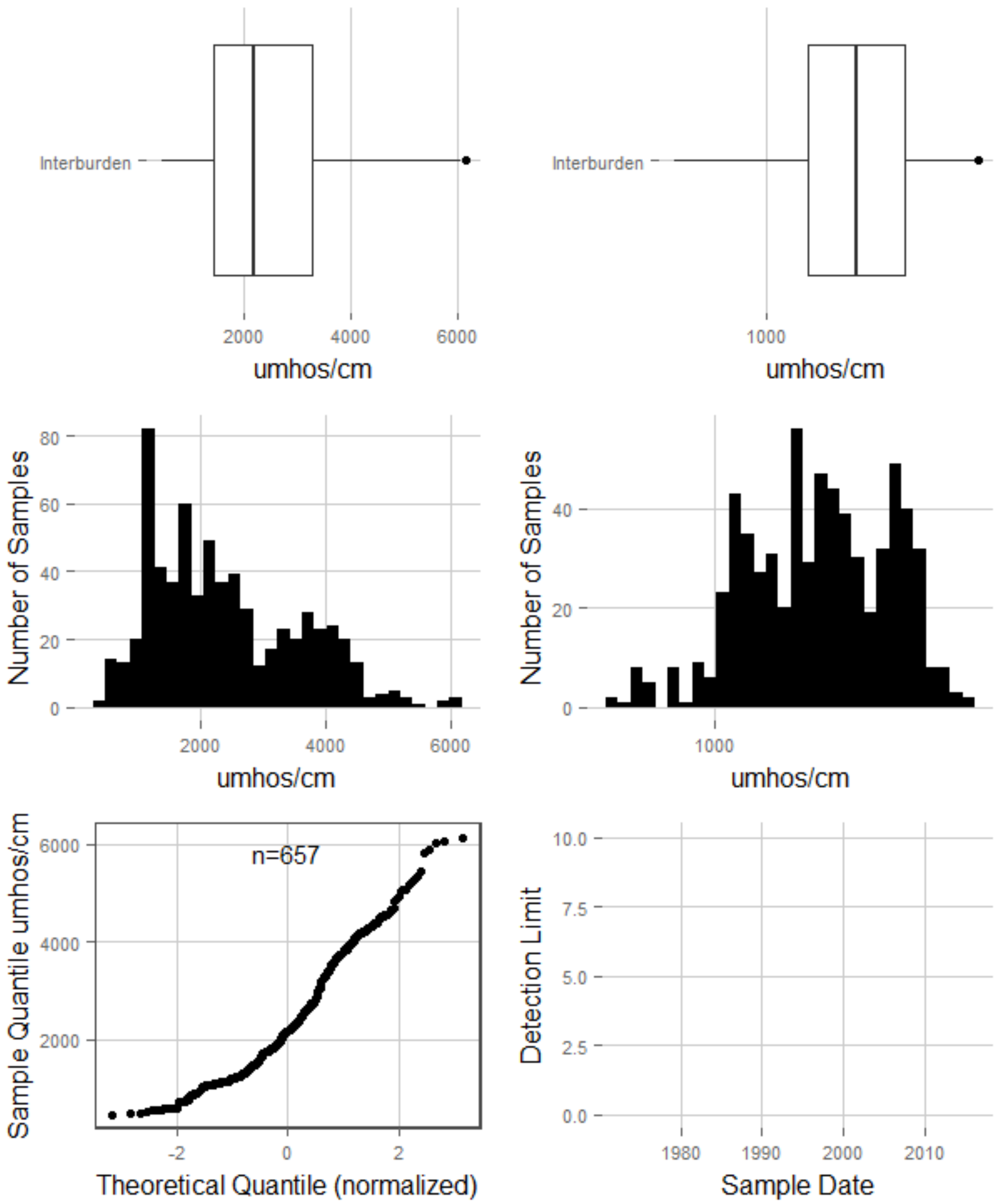



SC (Lab)
Rosebud Overburden
Rosebud Overburden
0
5000
10000
15000
20000
25000
umhos/cm
Rosebud Overburden
1000
10000
umhos/cm
Number of Samples
0
50
100
150
0
5000
10000
15000
20000
25000
umhos/cm
Number of Samples
0
50
100
150
1000
10000
umhos/cm
Sample Quantile umhos/cm
0
5000
10000
15000
20000
25000
n=1200
-2
0
2
Theoretical Quantile (normalized)
Detection Limit
0.0
2.5
5.0
7.5
10.0
1980
1990
2000
2010
Sample Date

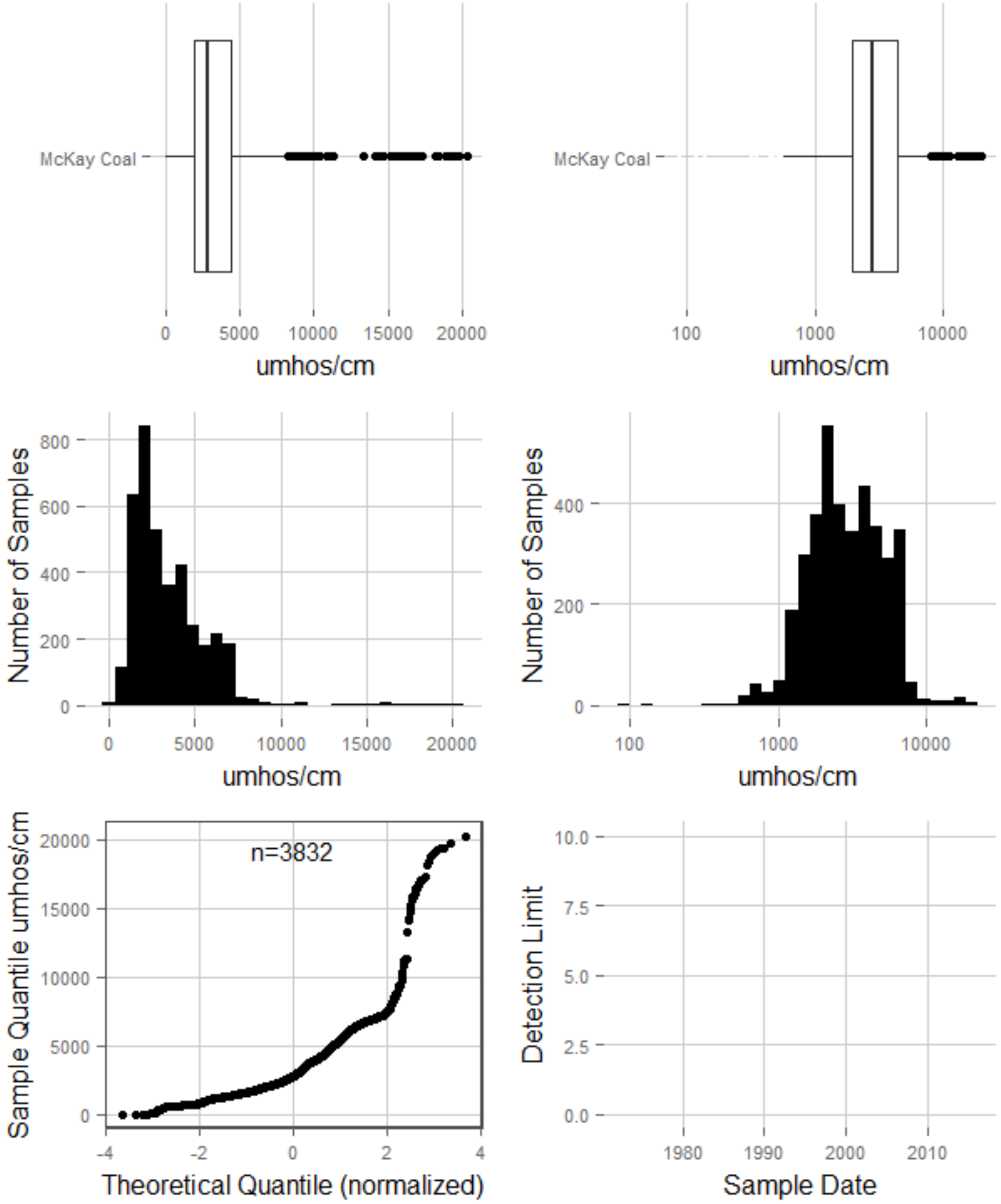
SC (Lab)
Rosebud Coal



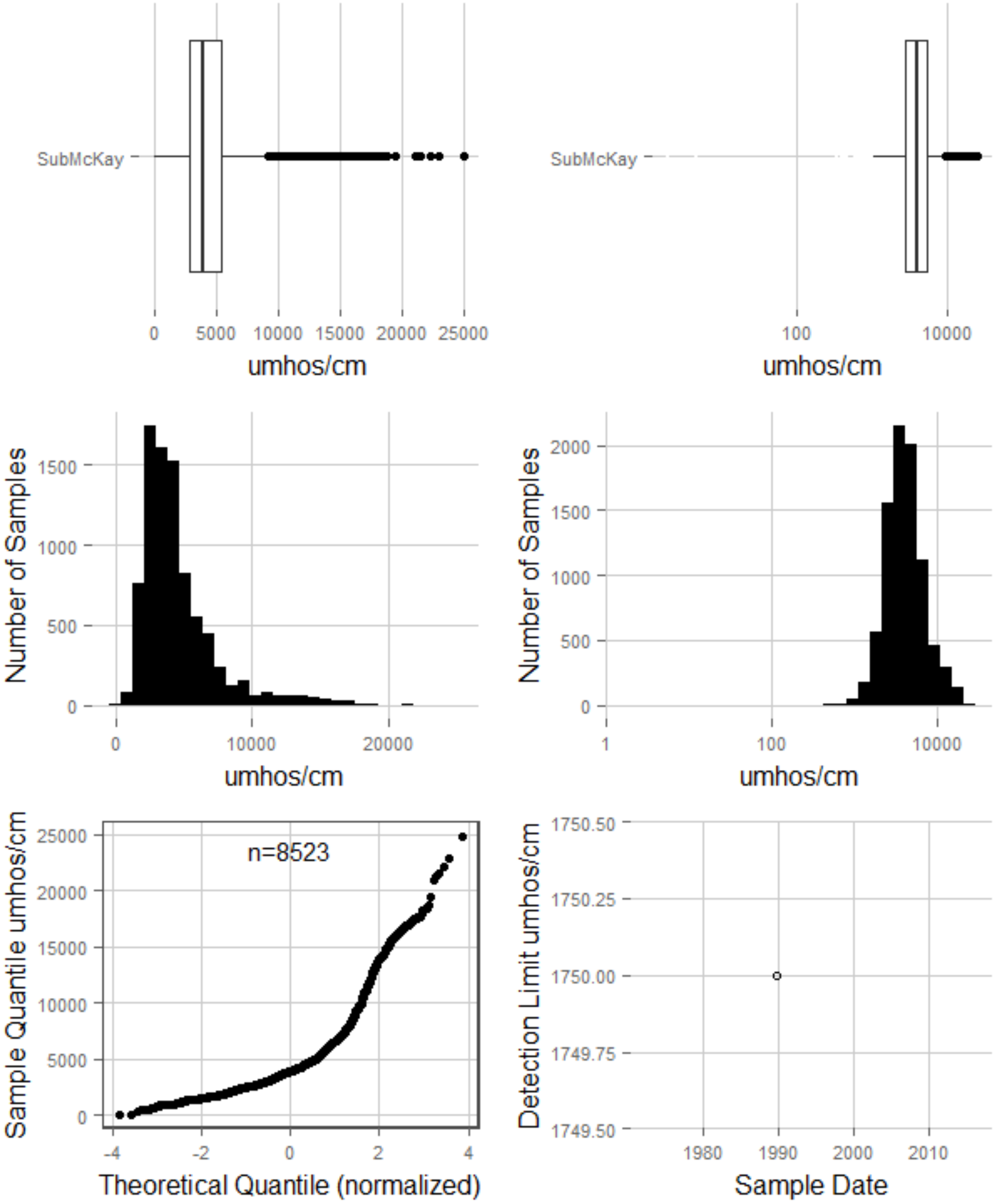
SC (Lab)
Interburden



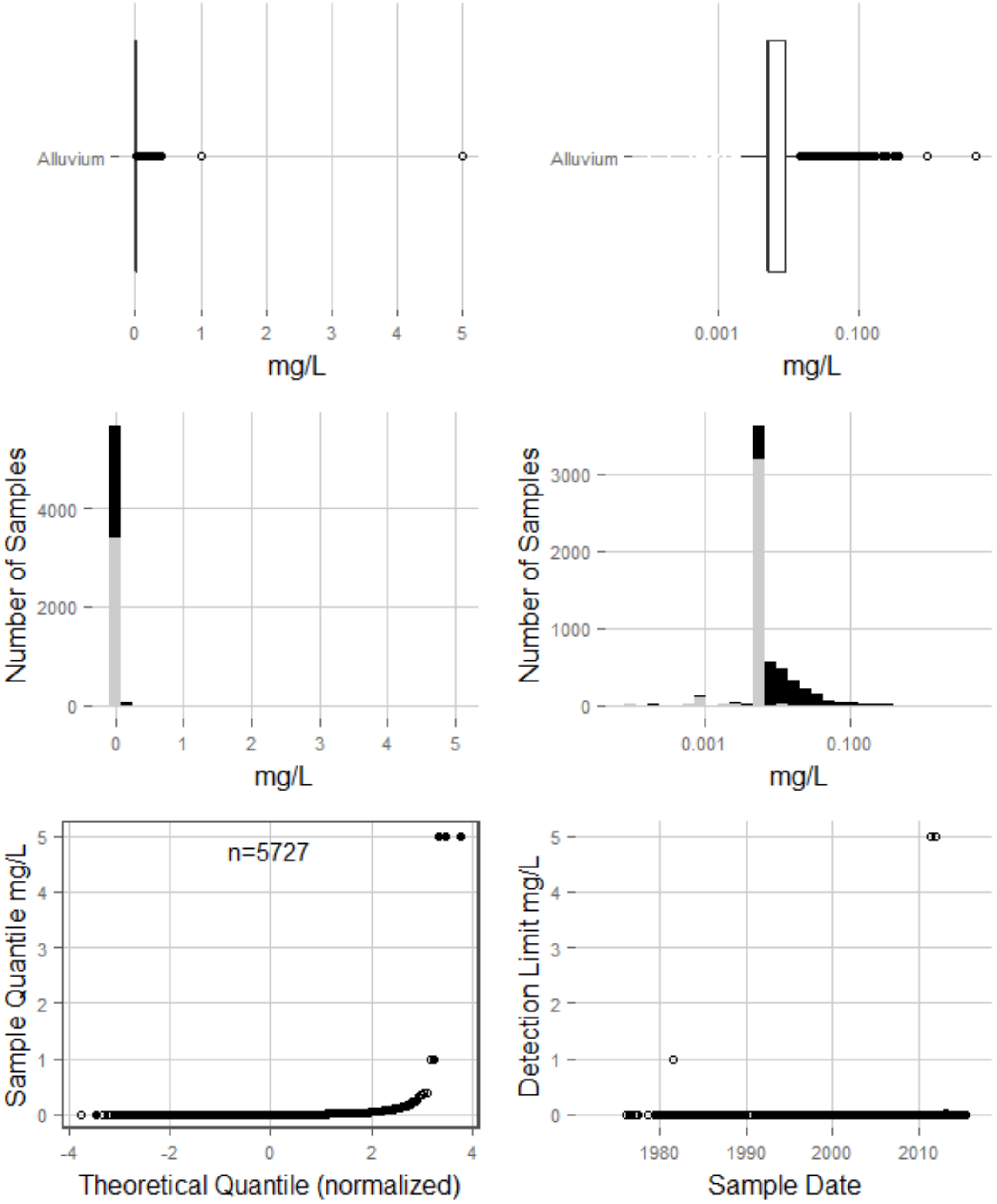
SC (Lab)
McKay Coal



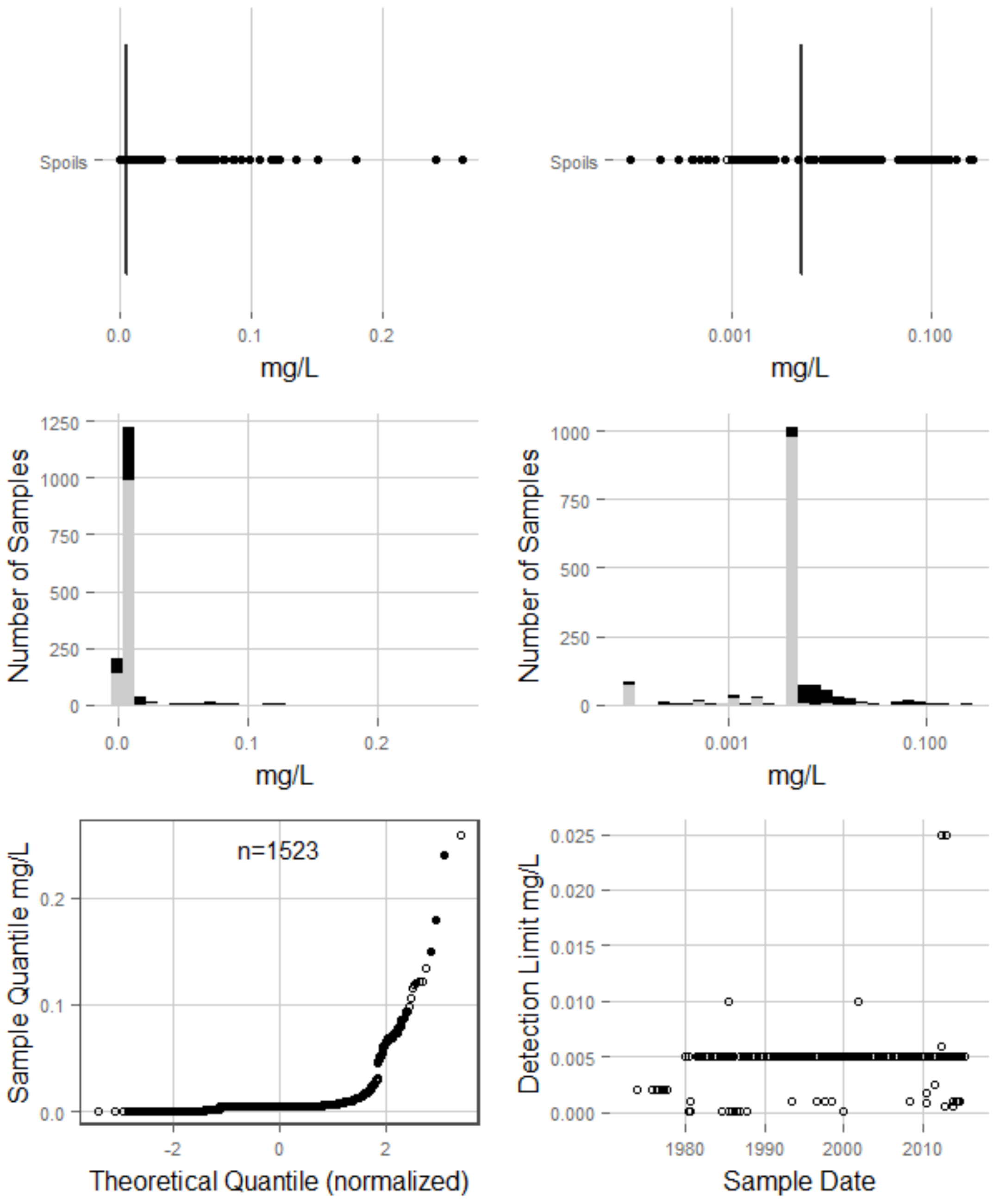
SC (Lab)
SubMcKay



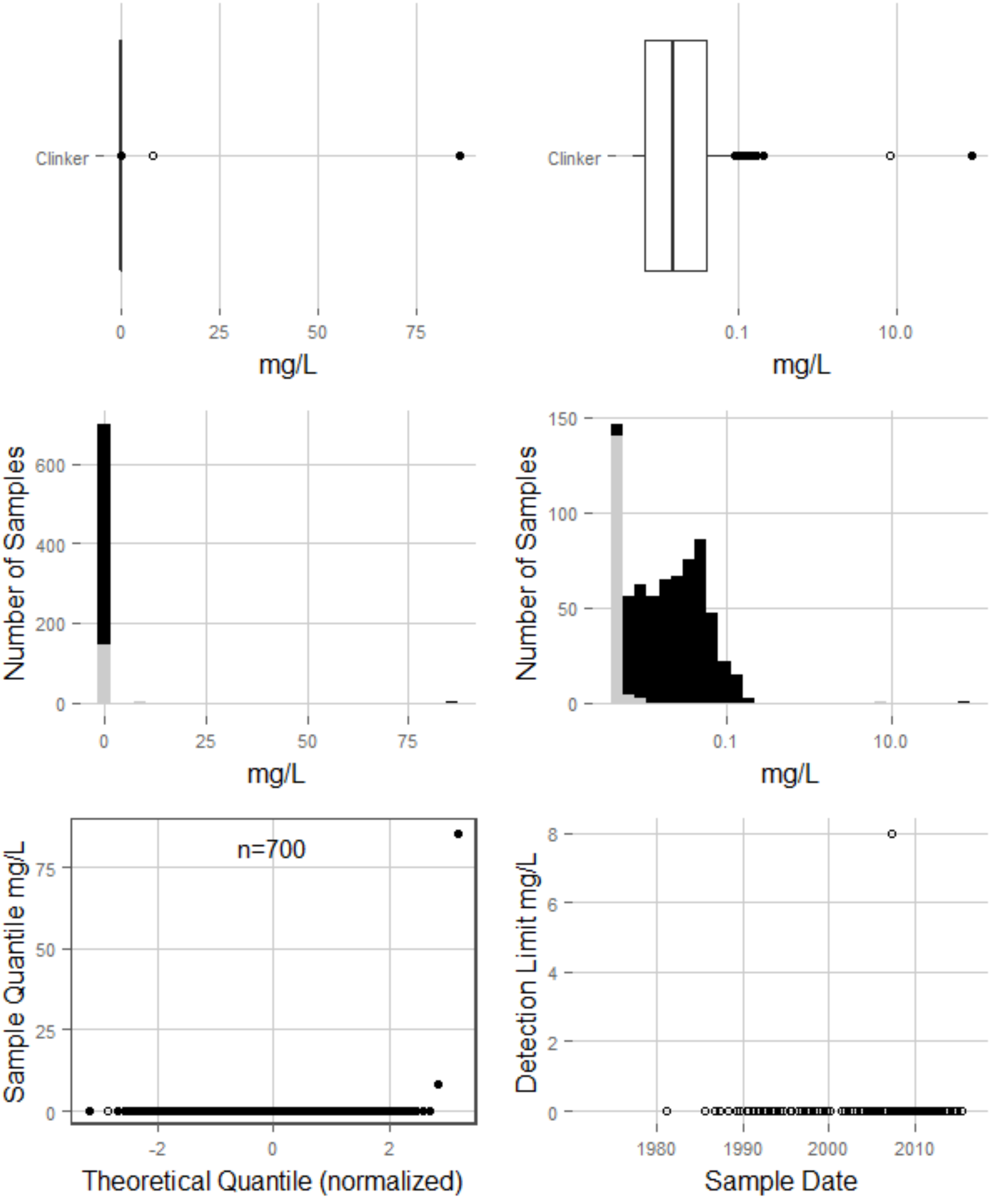
Selenium
Alluvium



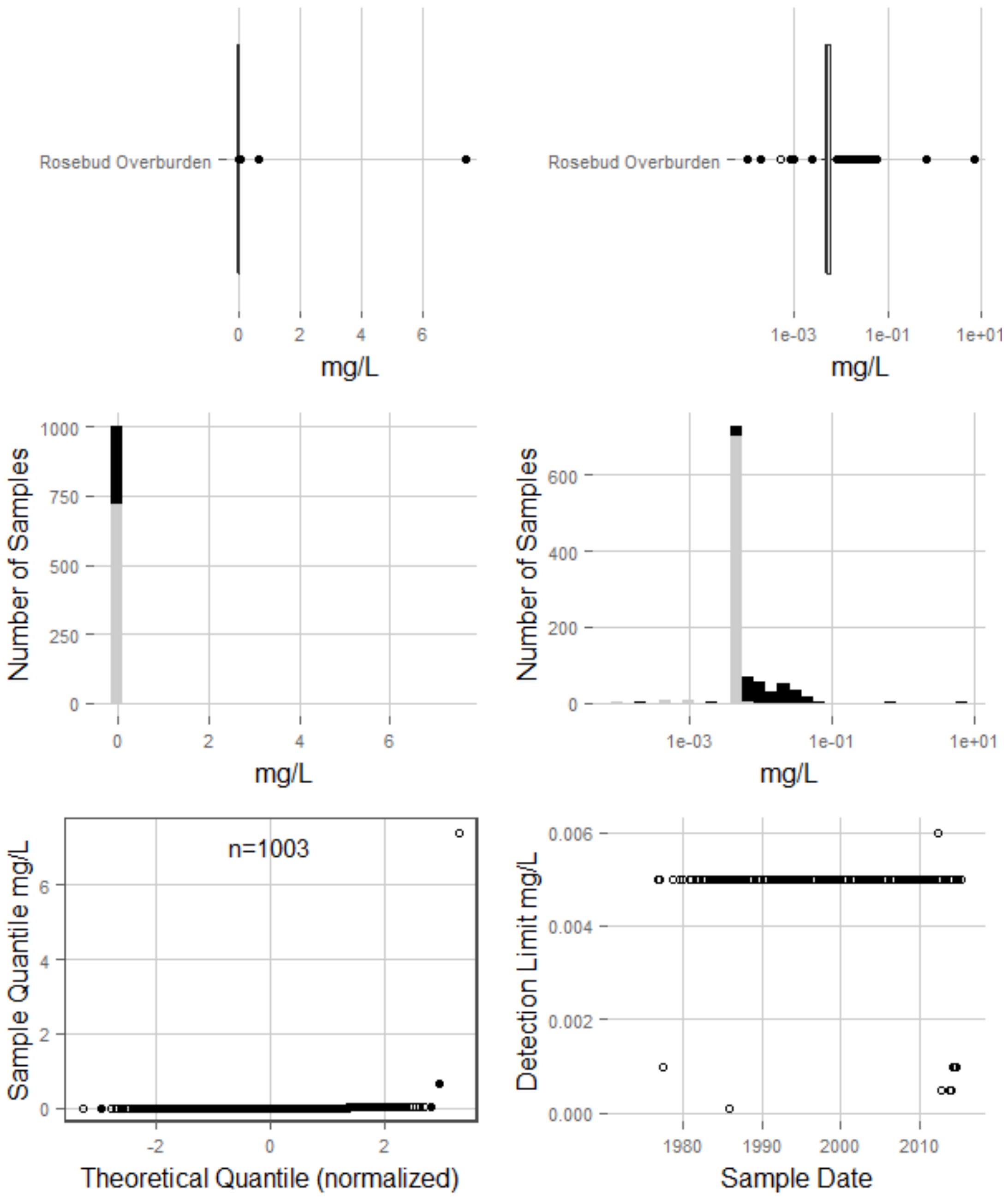
Selenium
Spoils



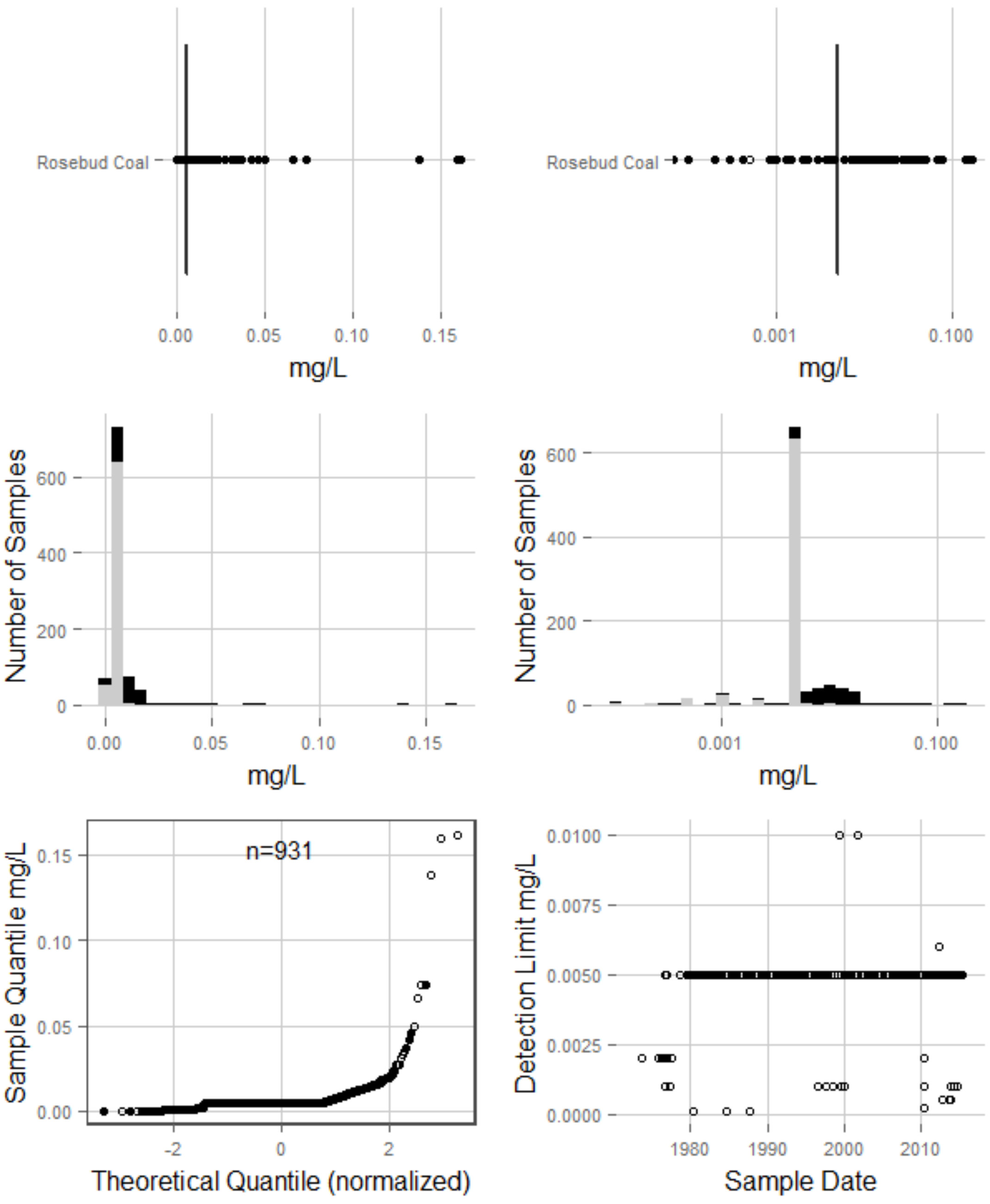
Selenium
Clinker



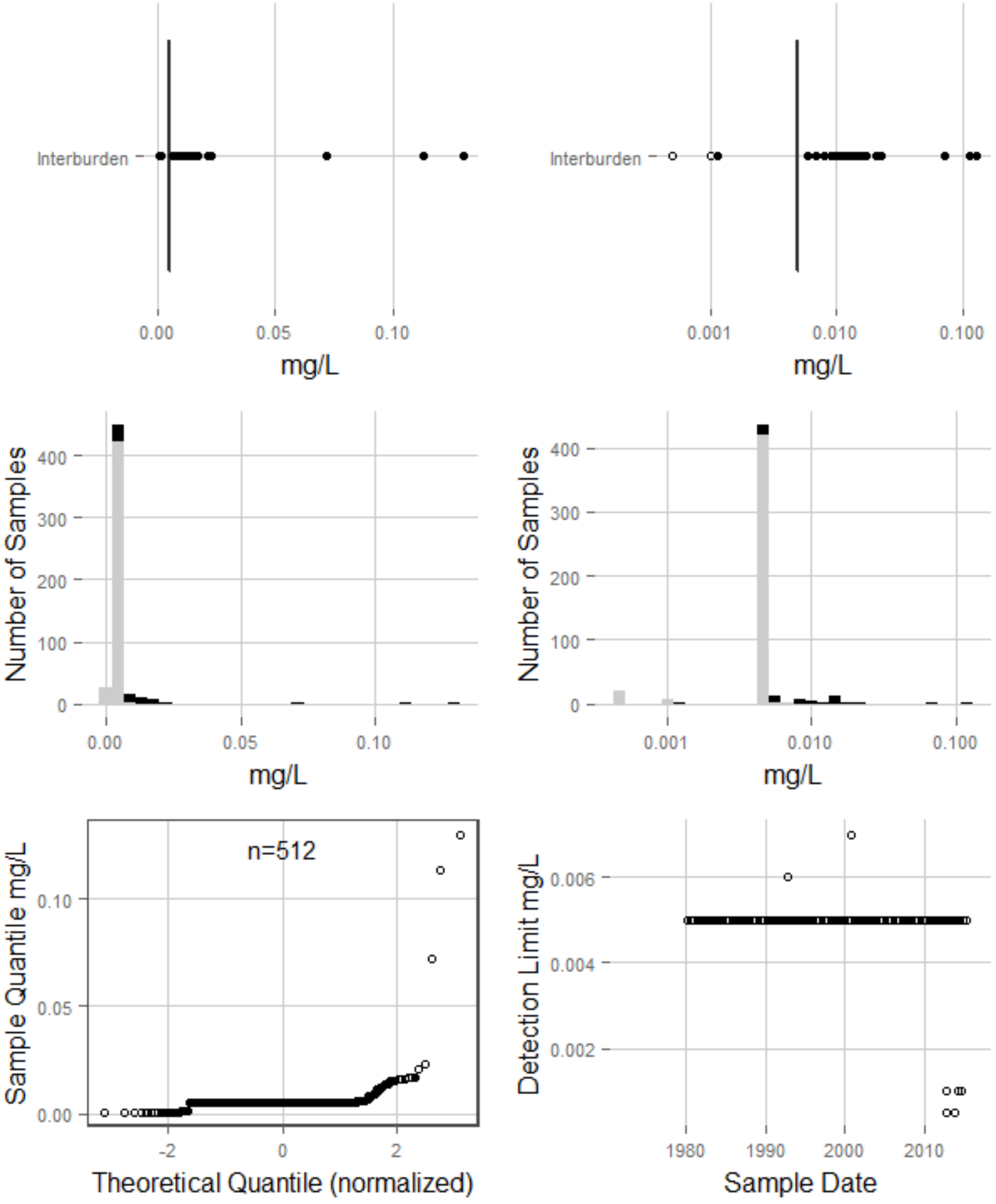
Selenium
Rosebud Overburden



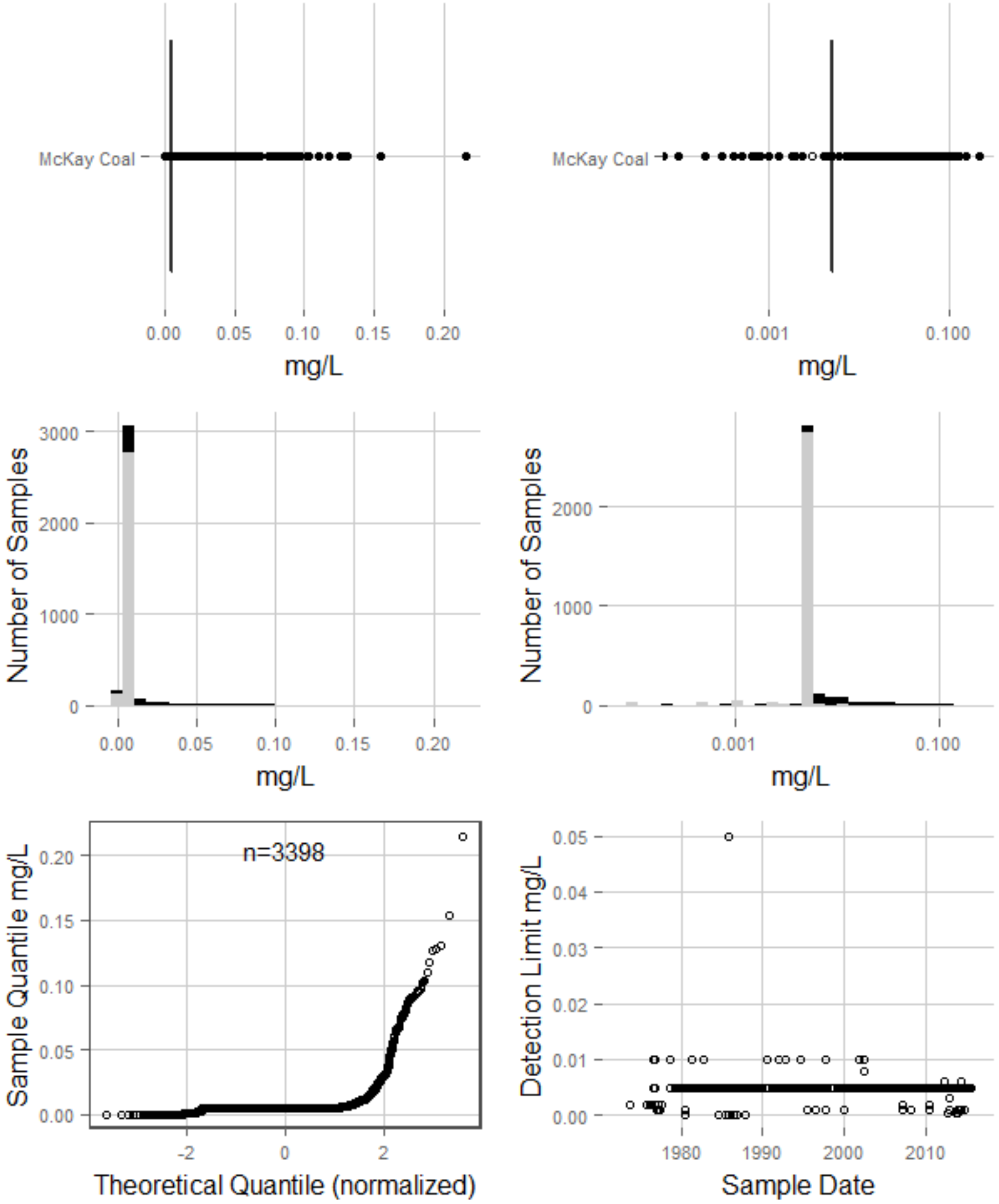
Selenium
Rosebud Coal



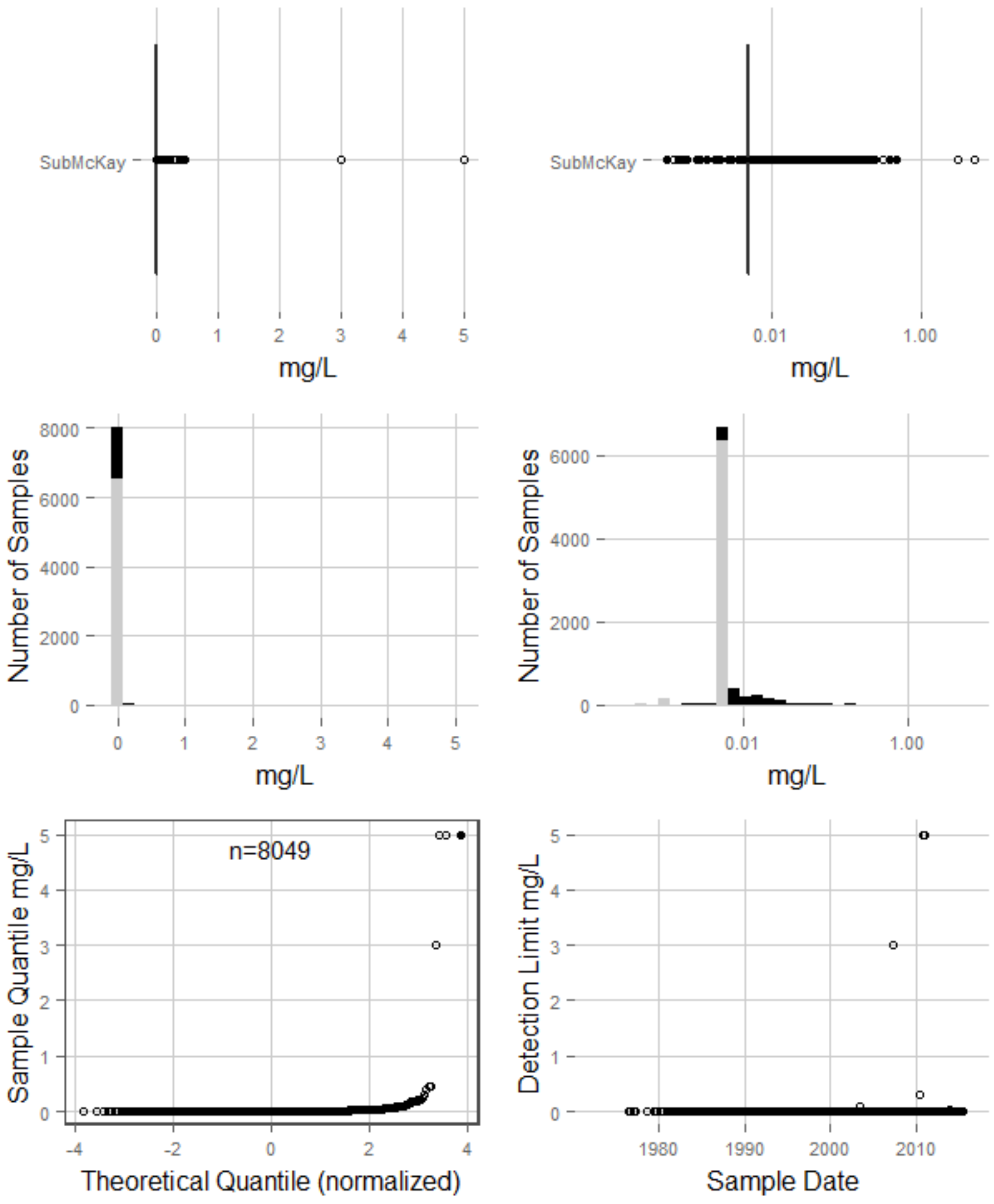
Selenium
Interburden



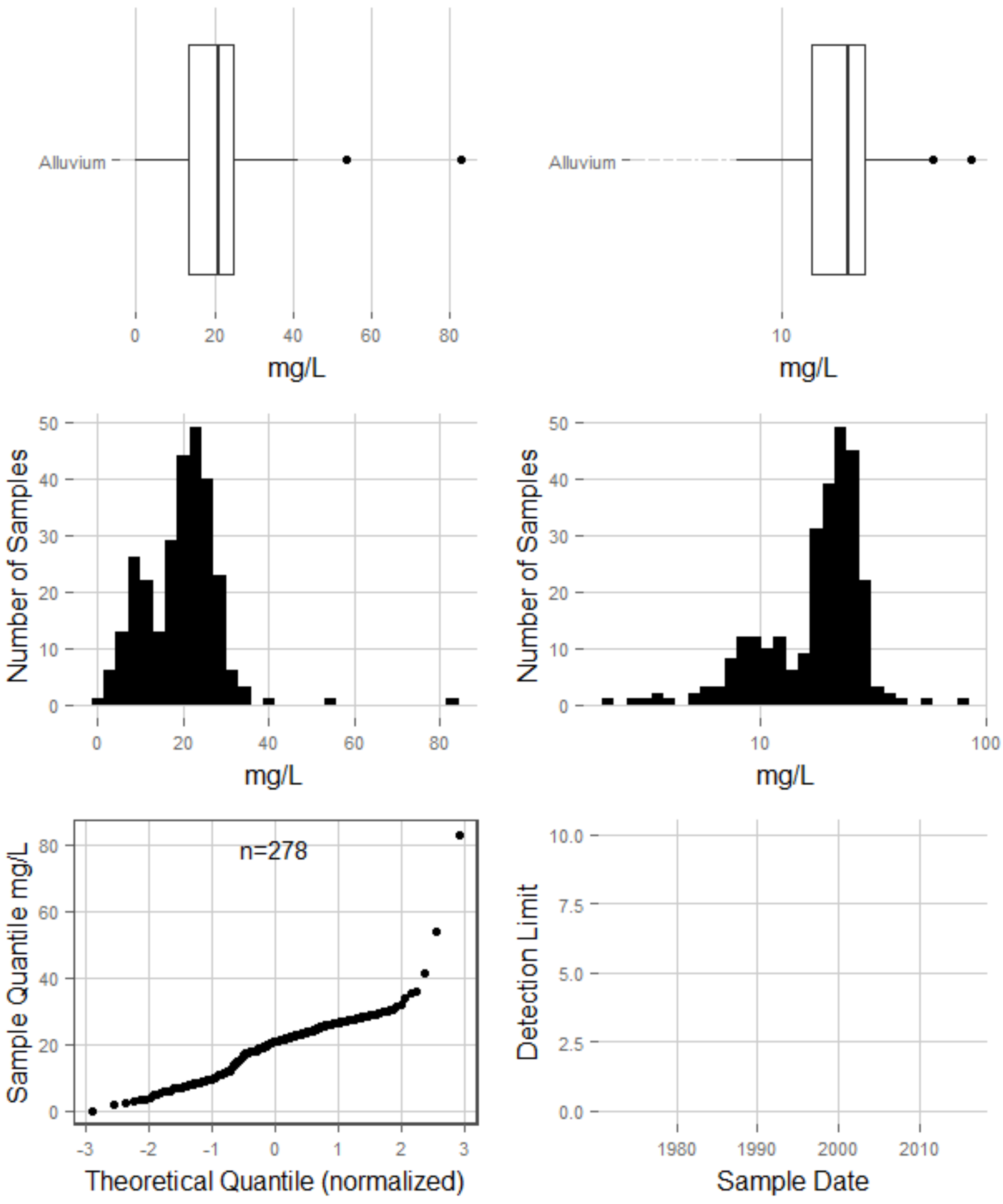
Selenium
McKay Coal



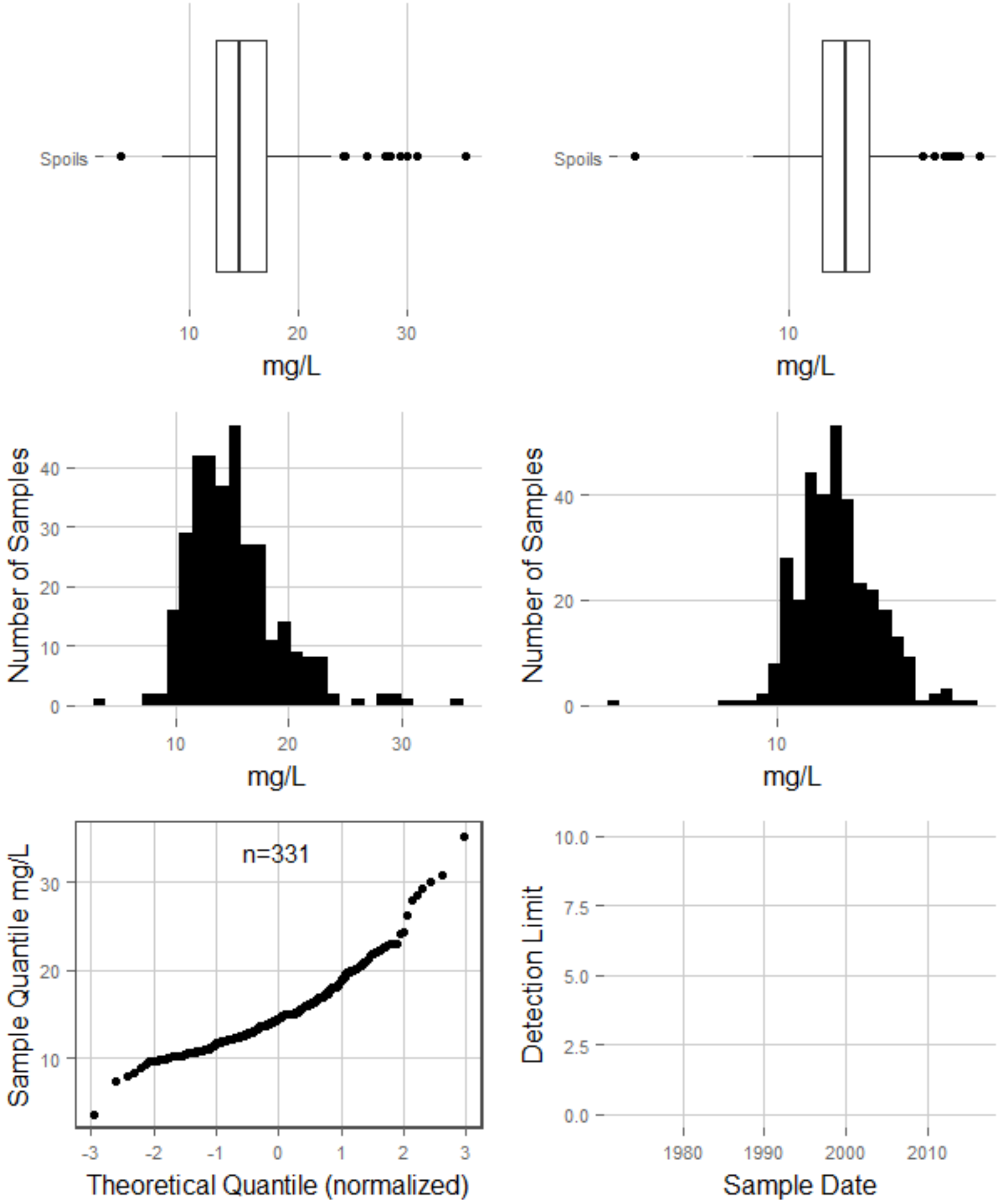
Selenium
SubMcKay



Silica
Alluvium

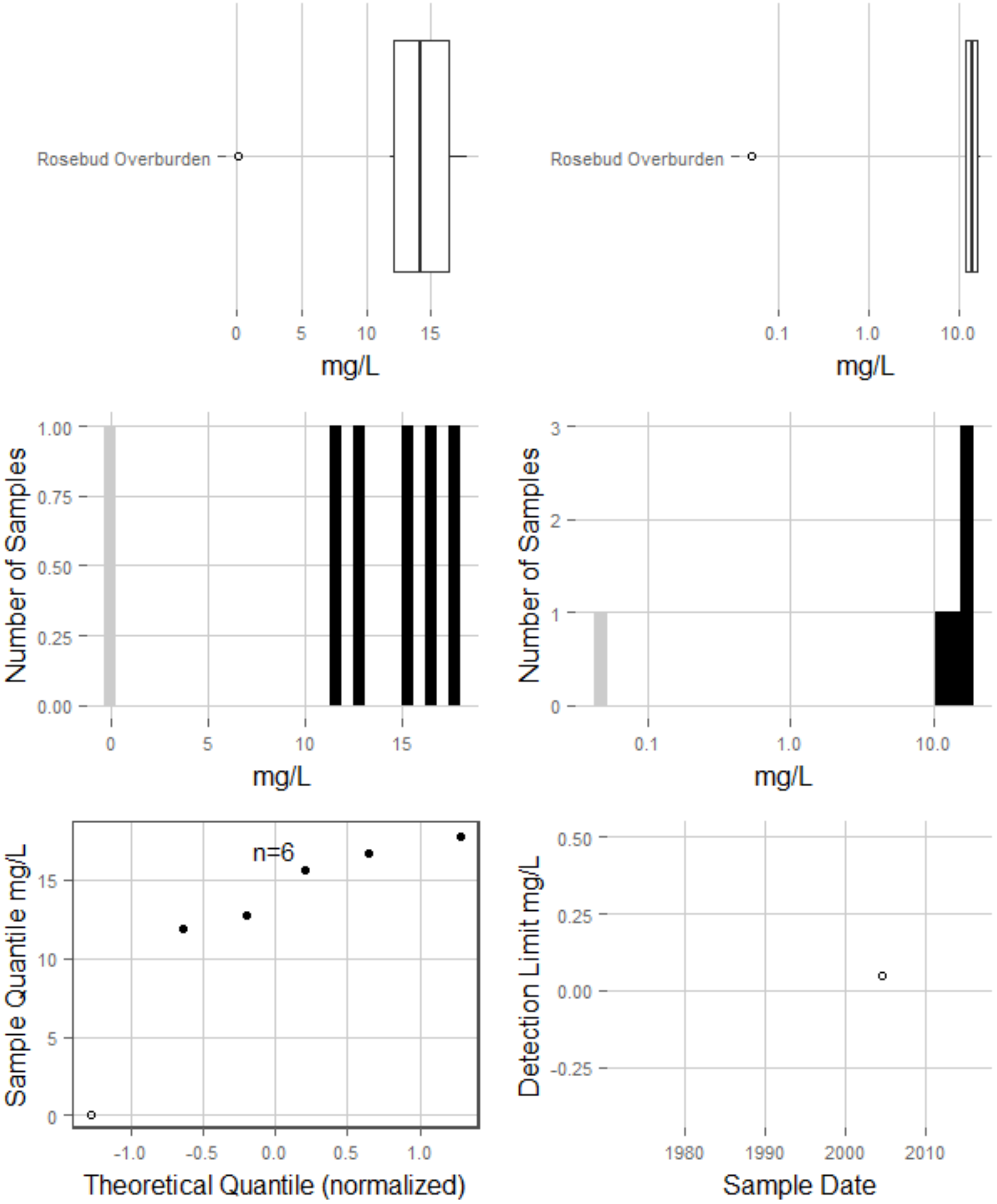


Silica
Spoils

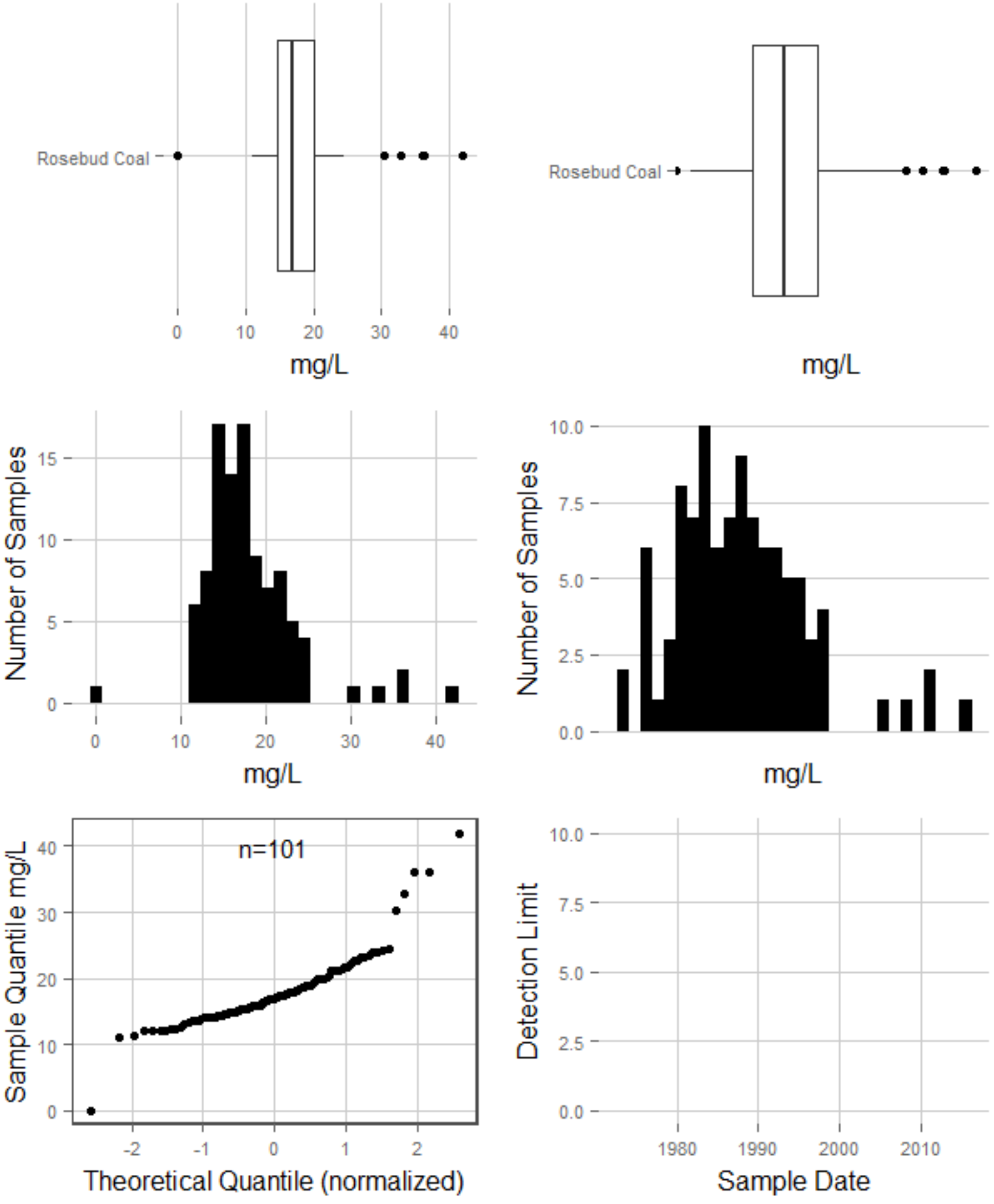


Silica
Clinker
No data

Silica
Rosebud Overburden

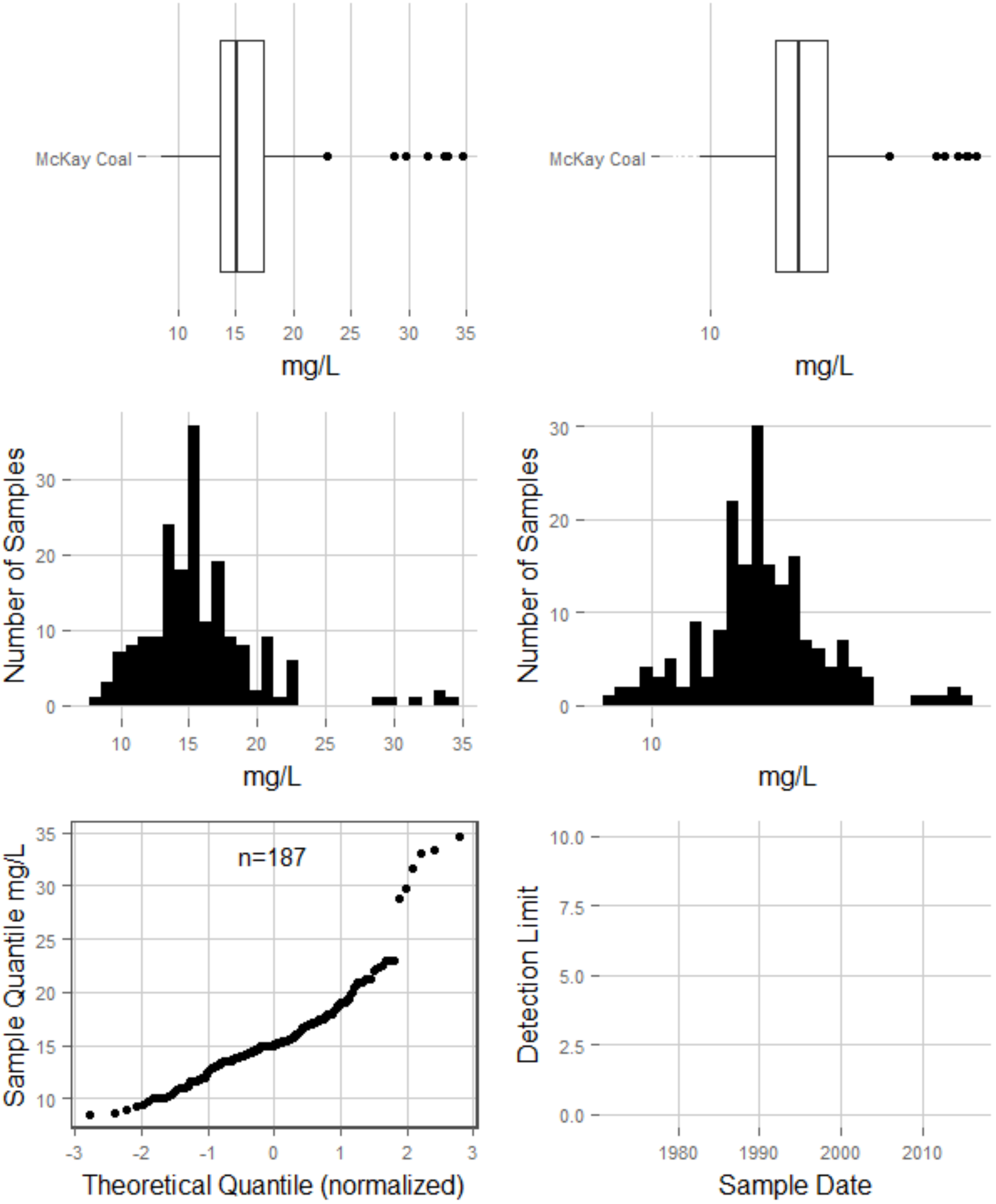


Silica
Rosebud Coal

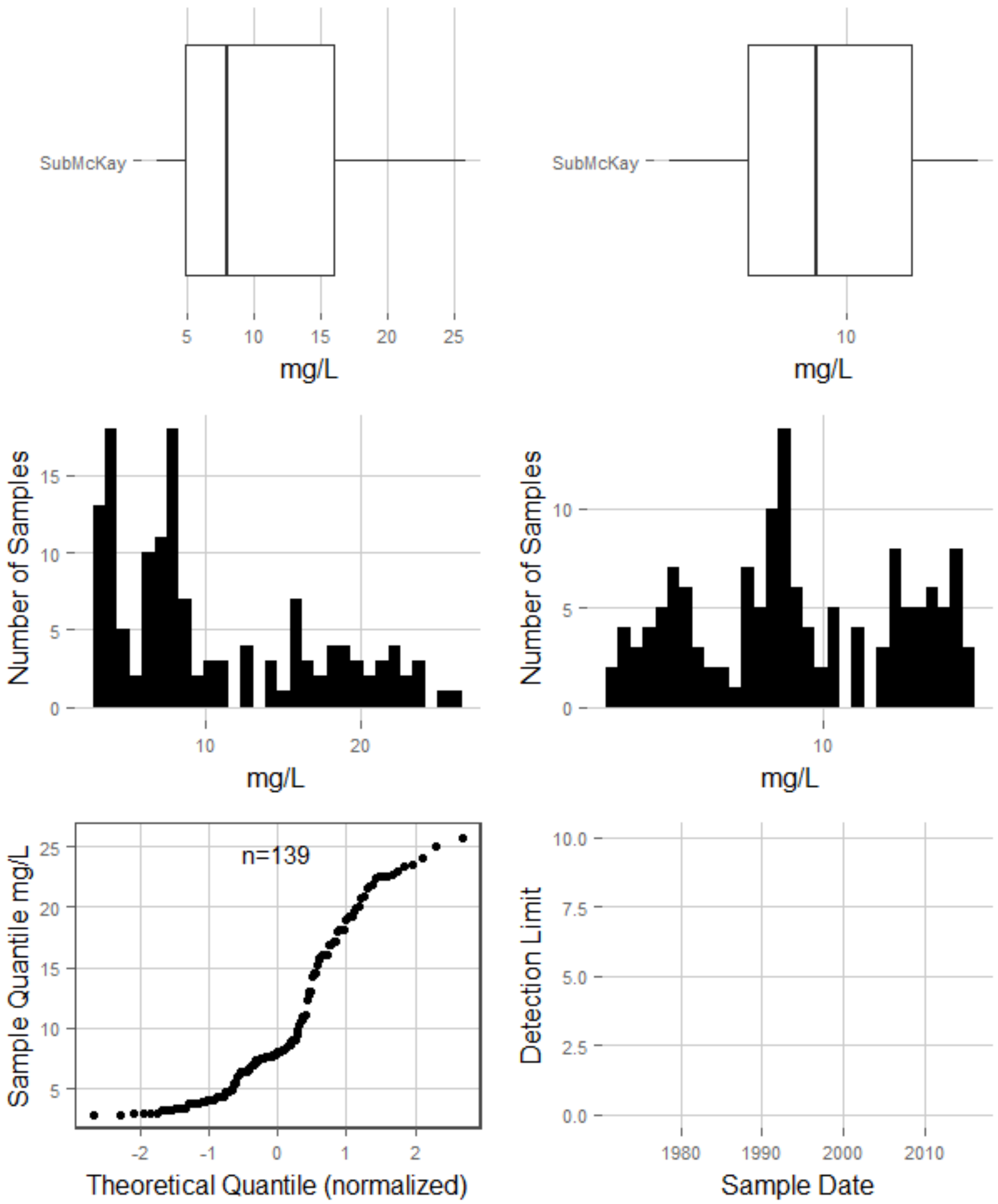


Silica
Interburden
No data

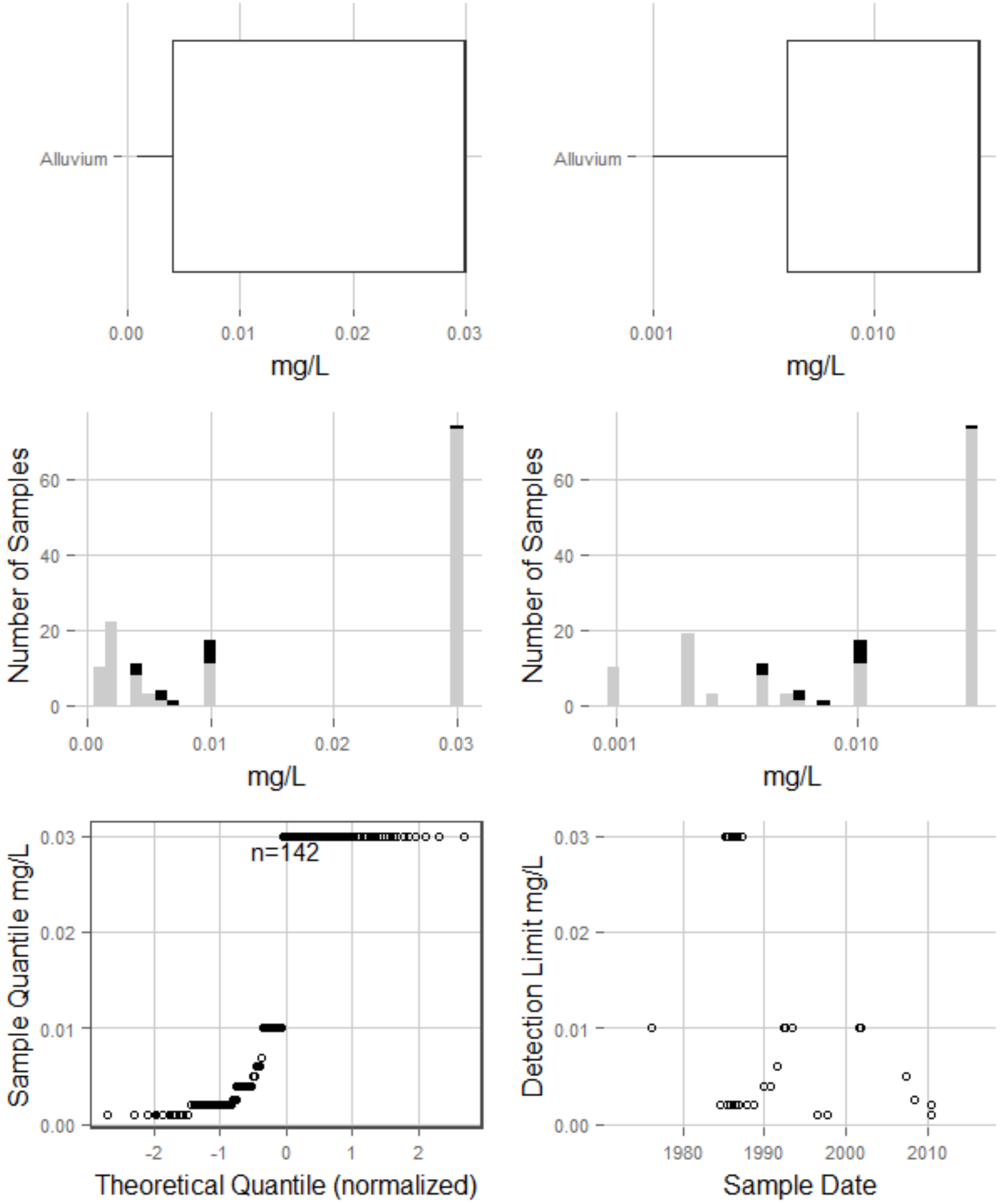
Silica
McKay Coal



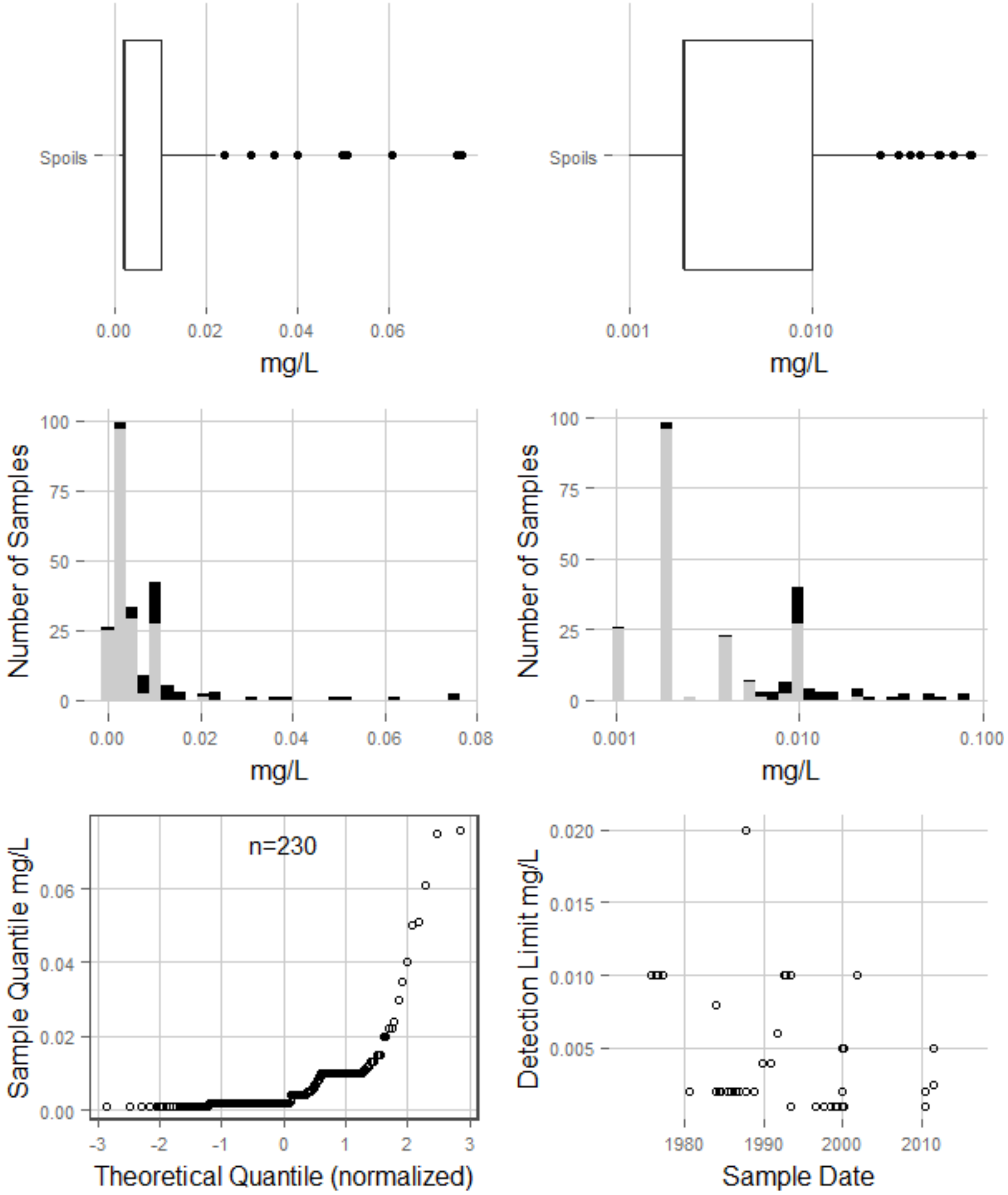
Silica
SubMcKay



Silver
Alluvium

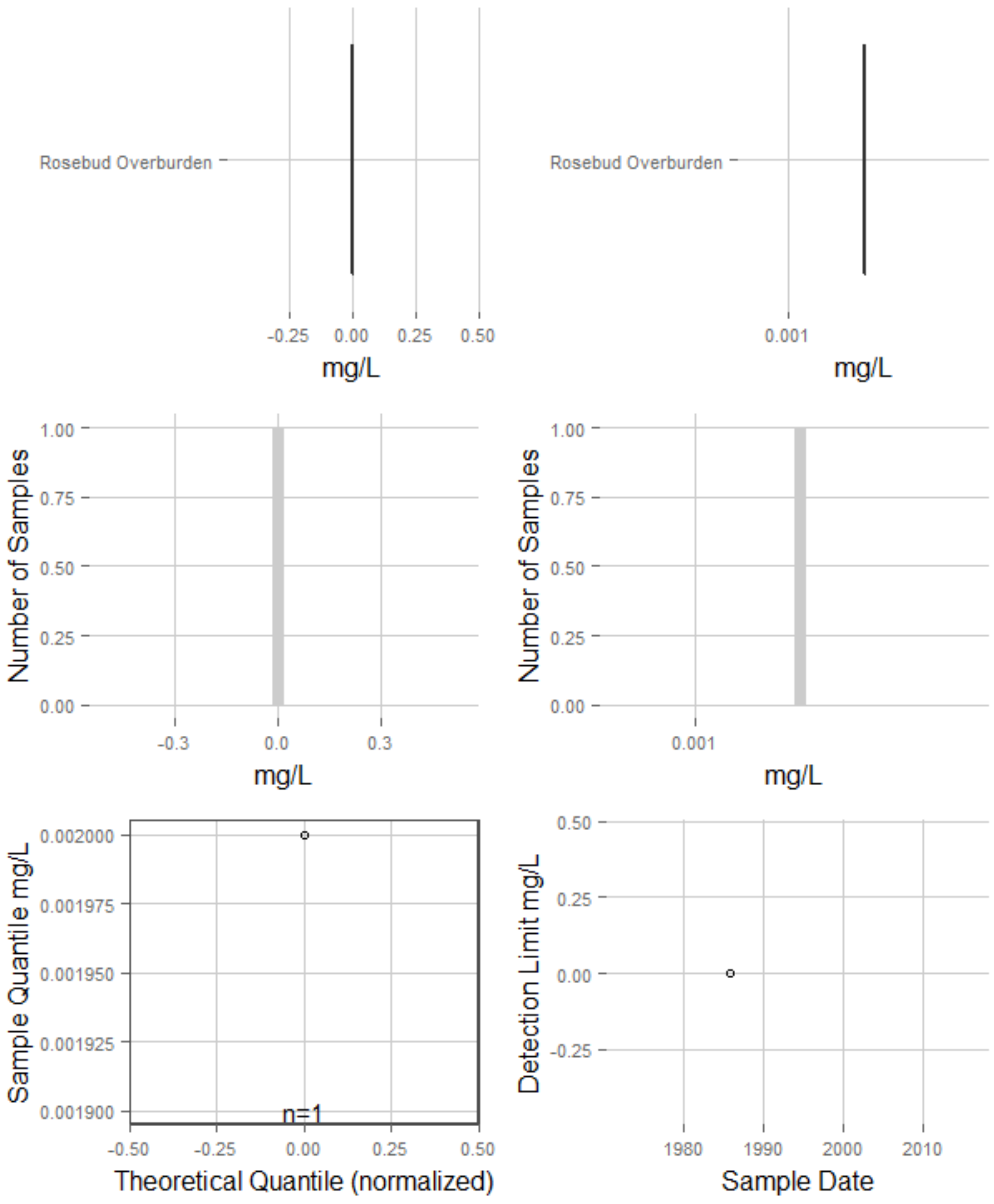


Silver
Spoils

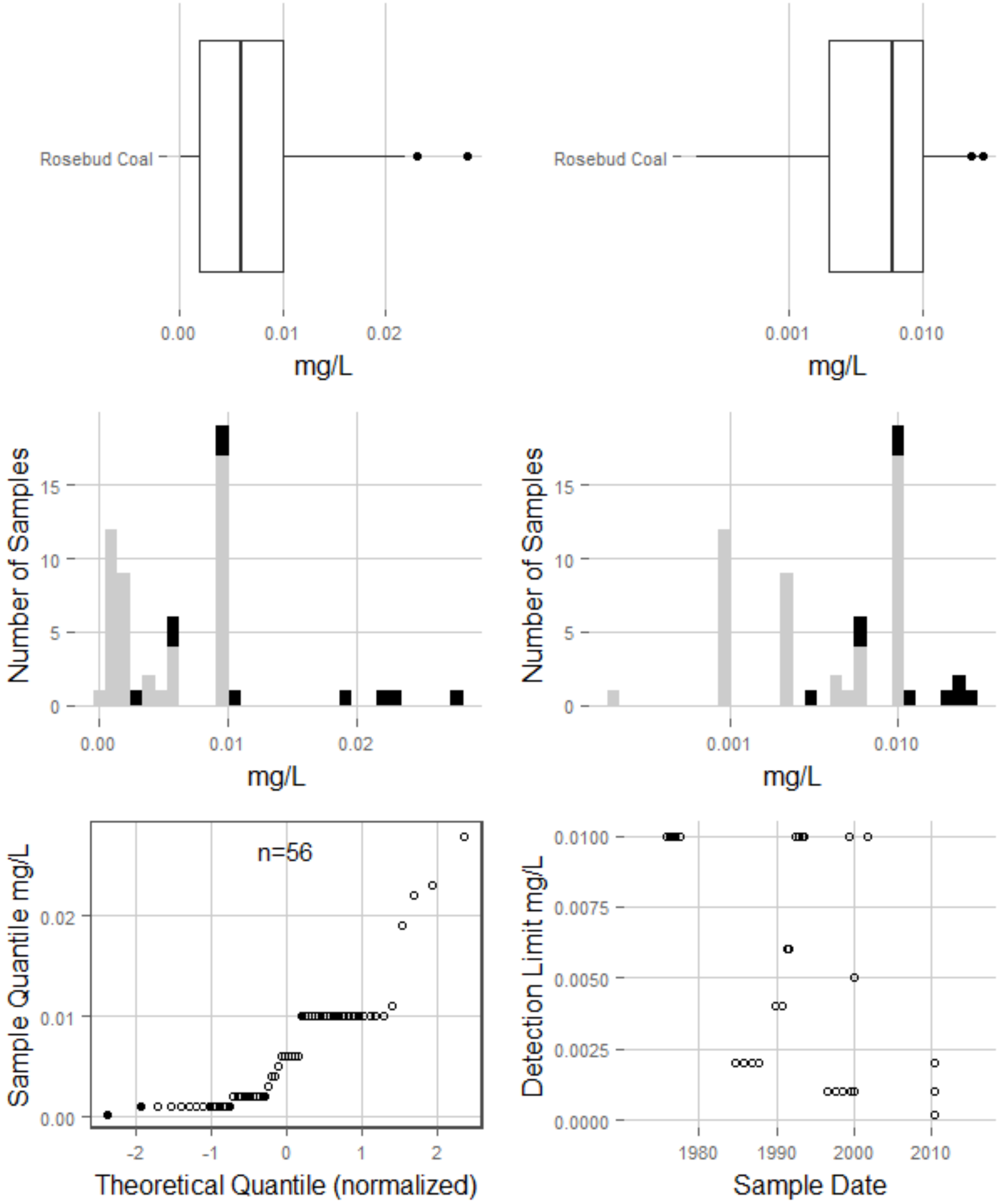


Silver
Clinker
No data

Silver
Rosebud Overburden

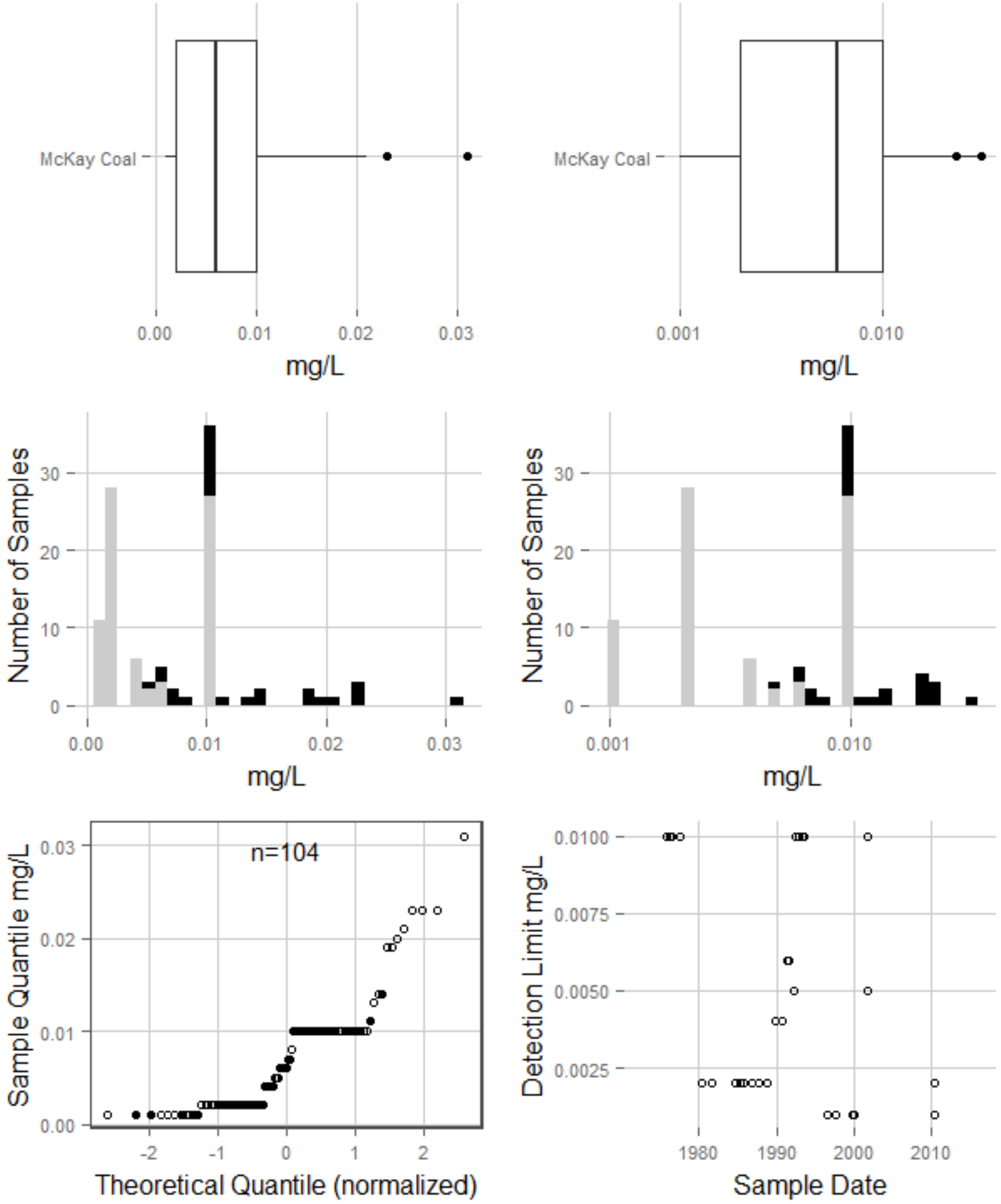


Silver
Rosebud Coal

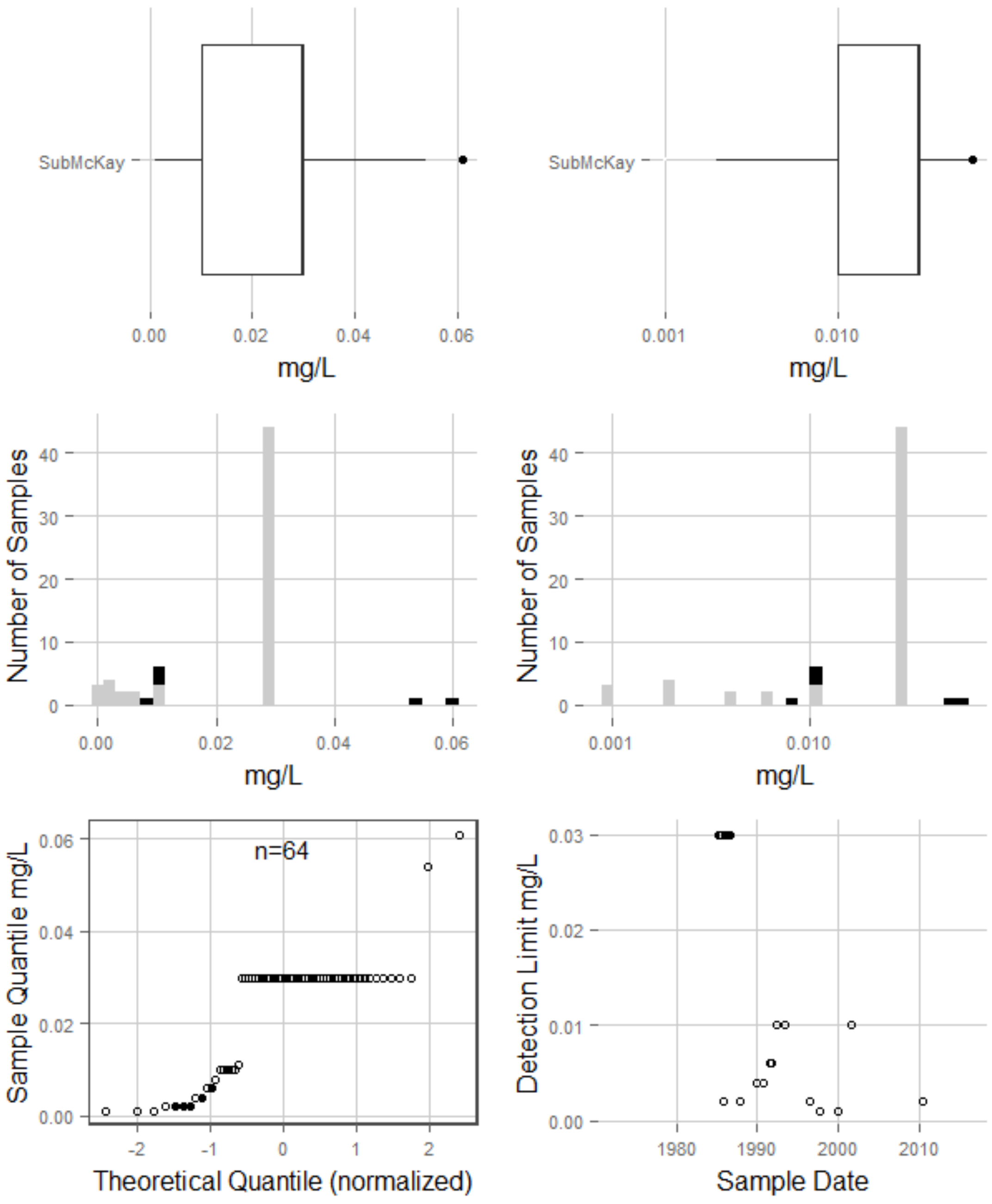


Silver
Interburden
No data

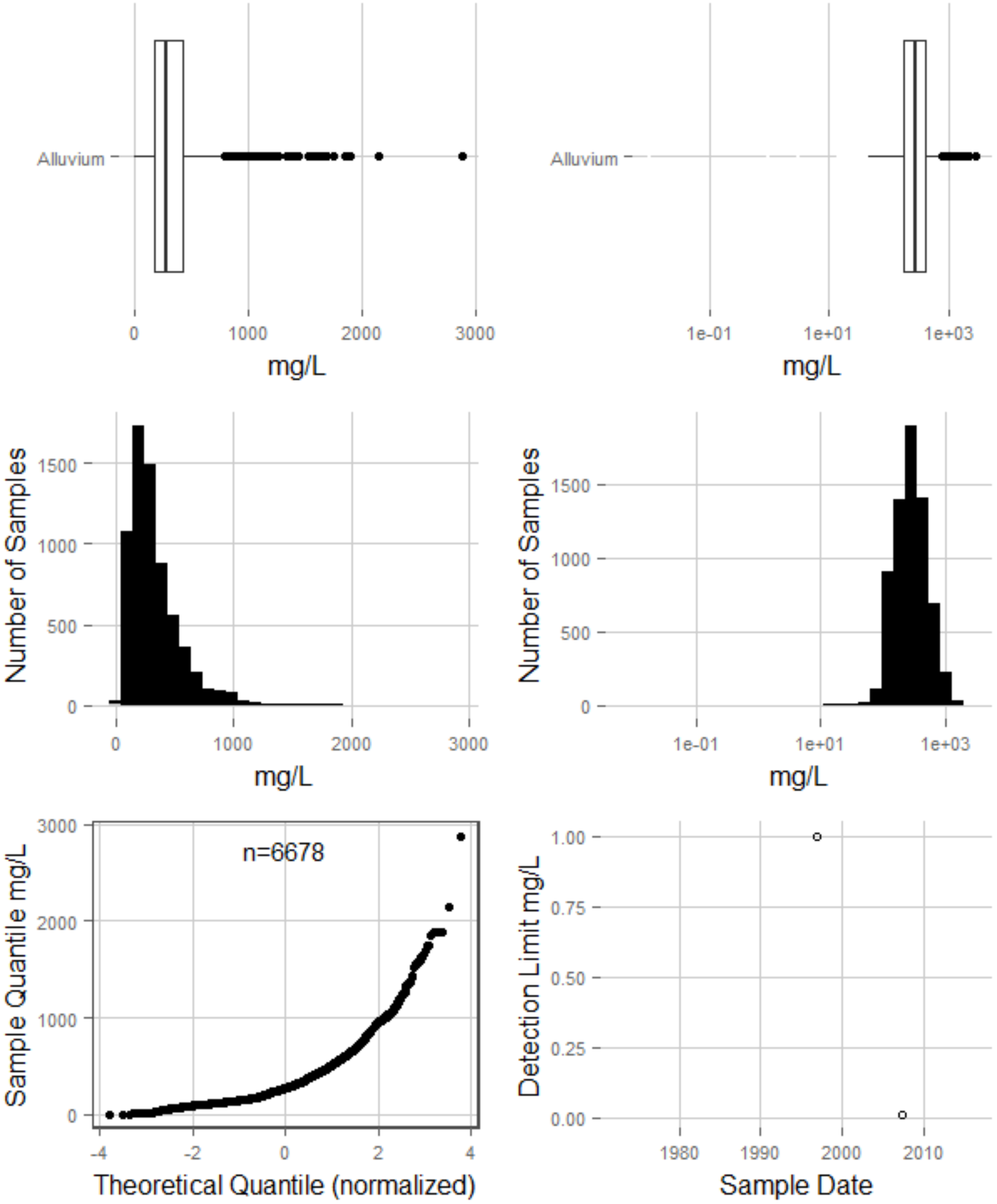
Silver
McKay Coal



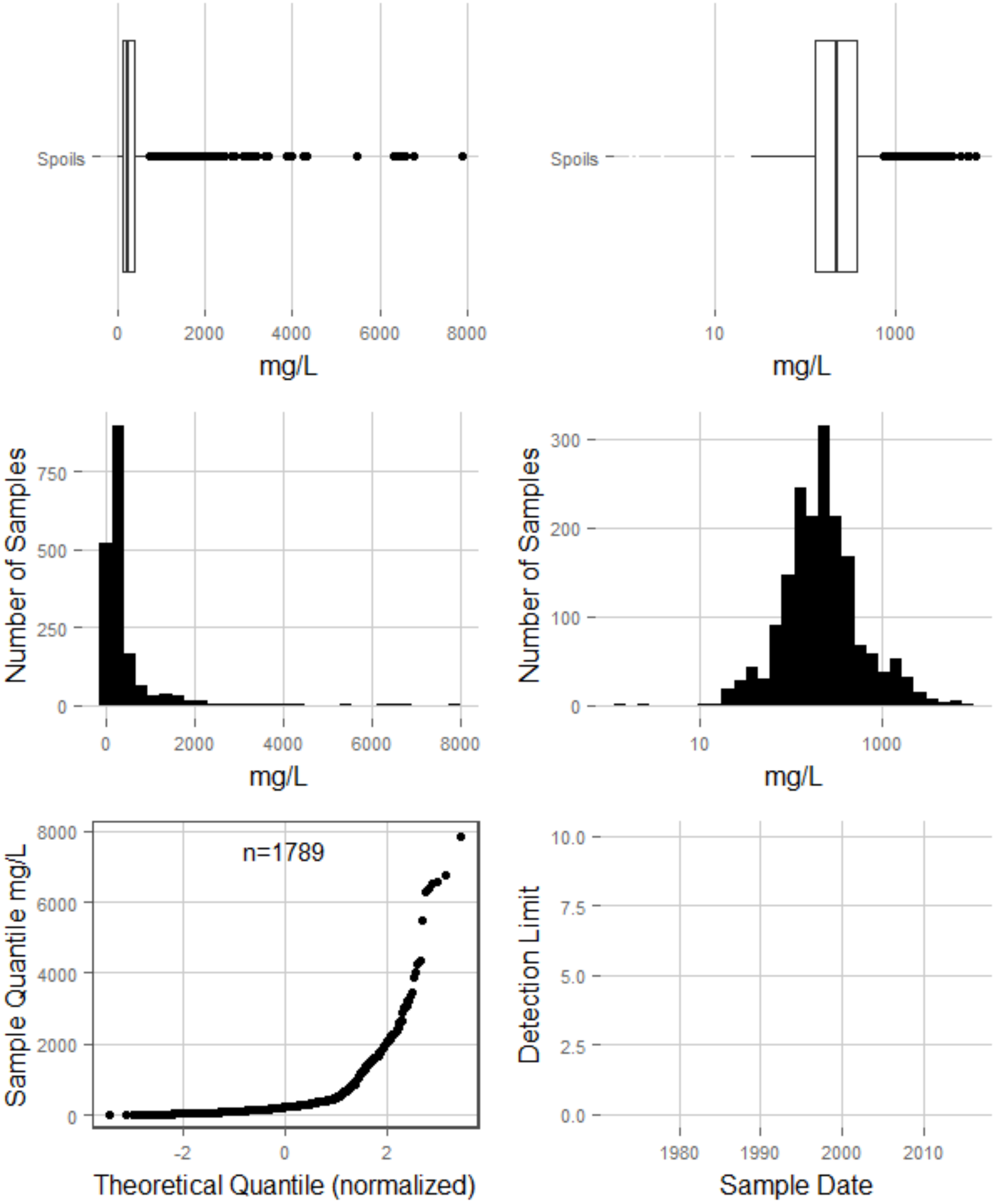
Silver
SubMcKay



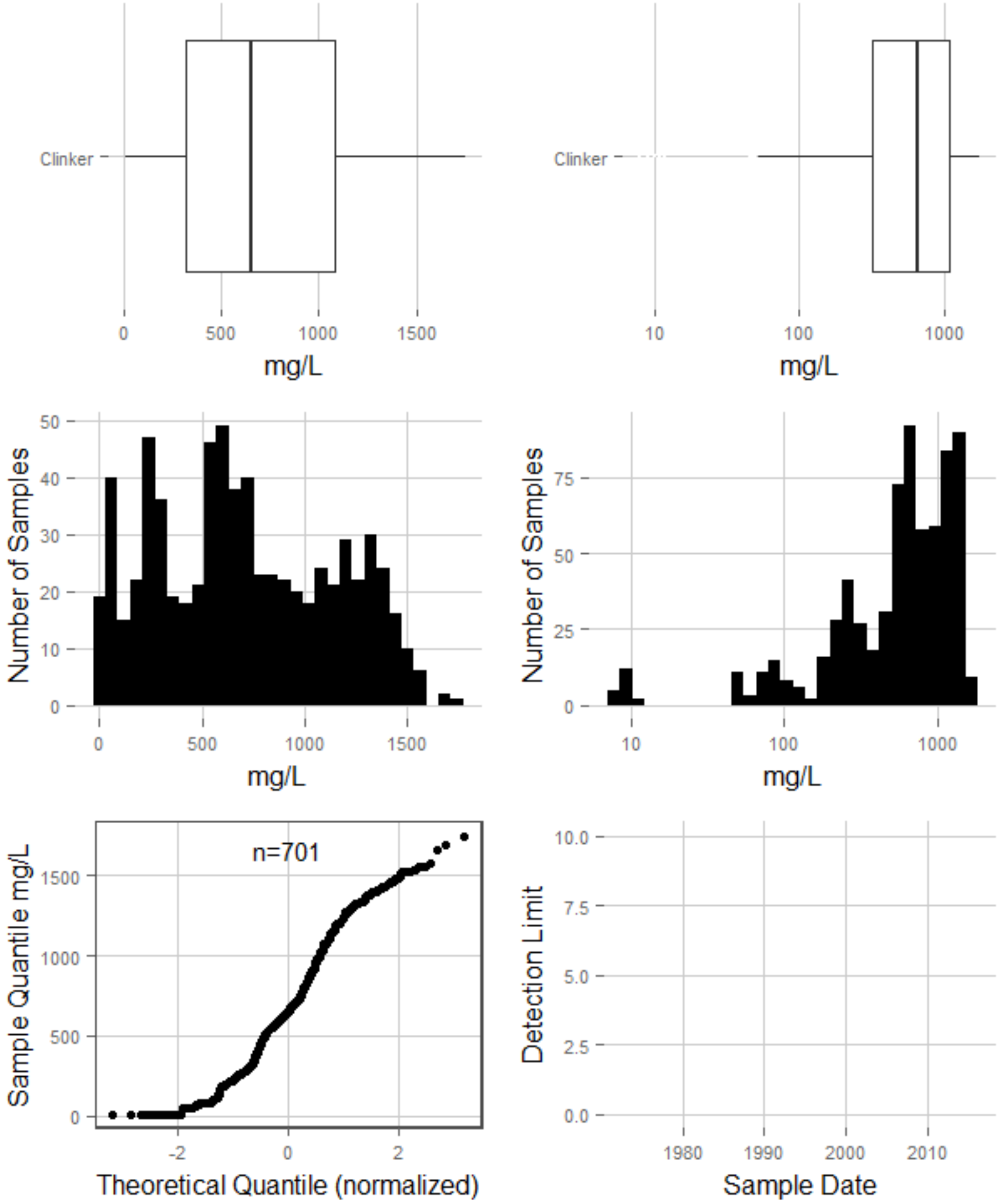
Sodium
Alluvium



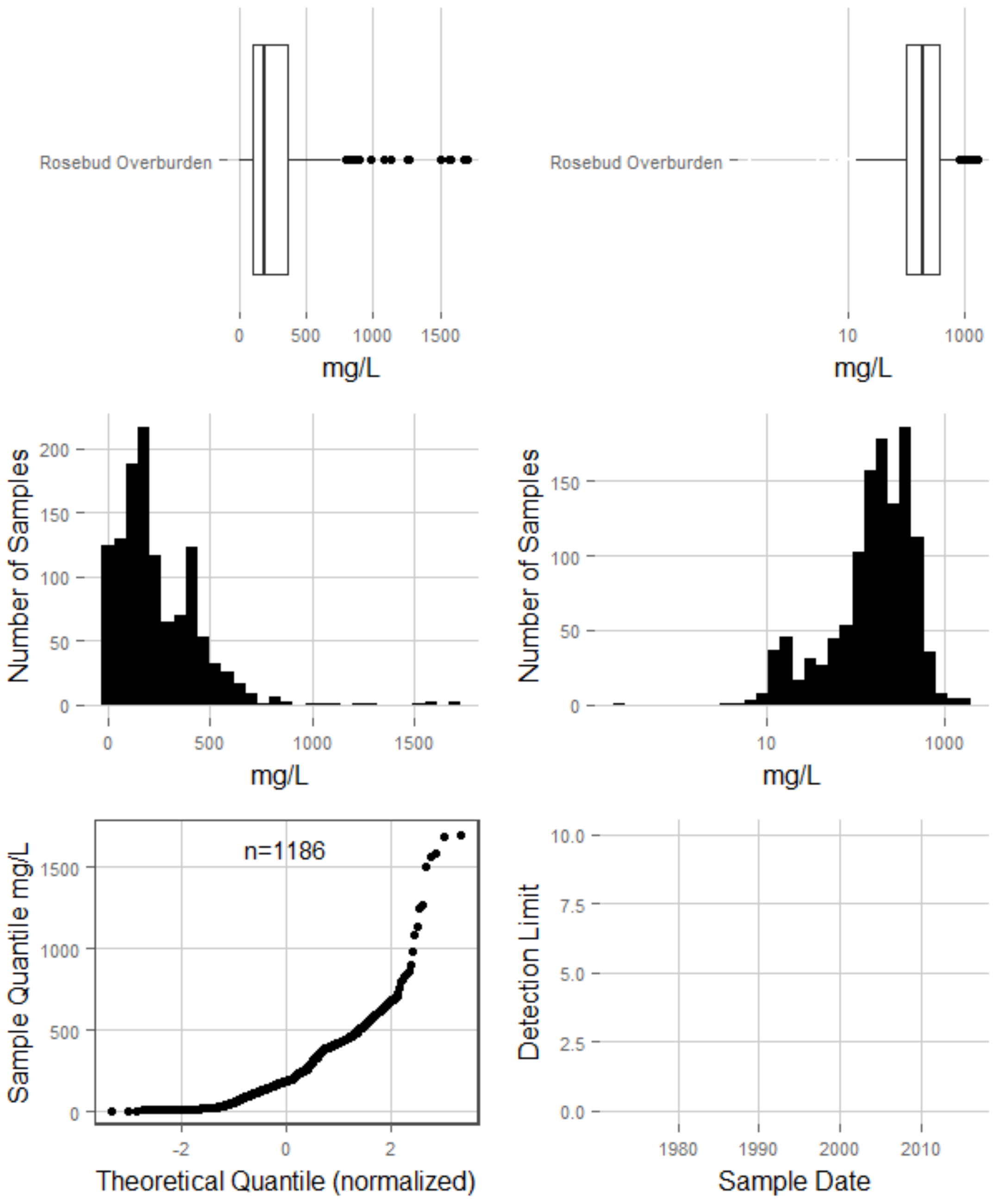
Sodium
Spoils



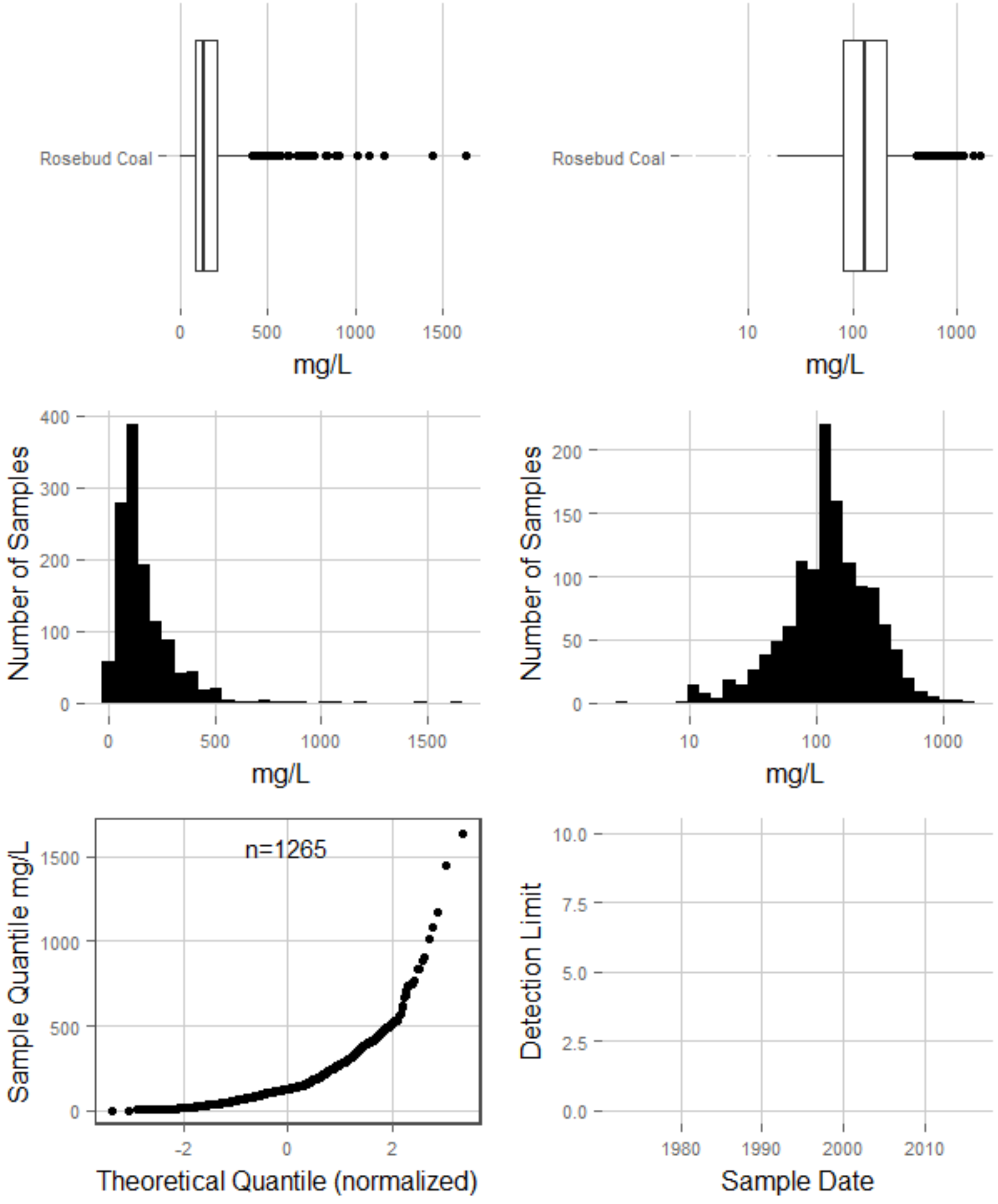
Sodium
Clinker



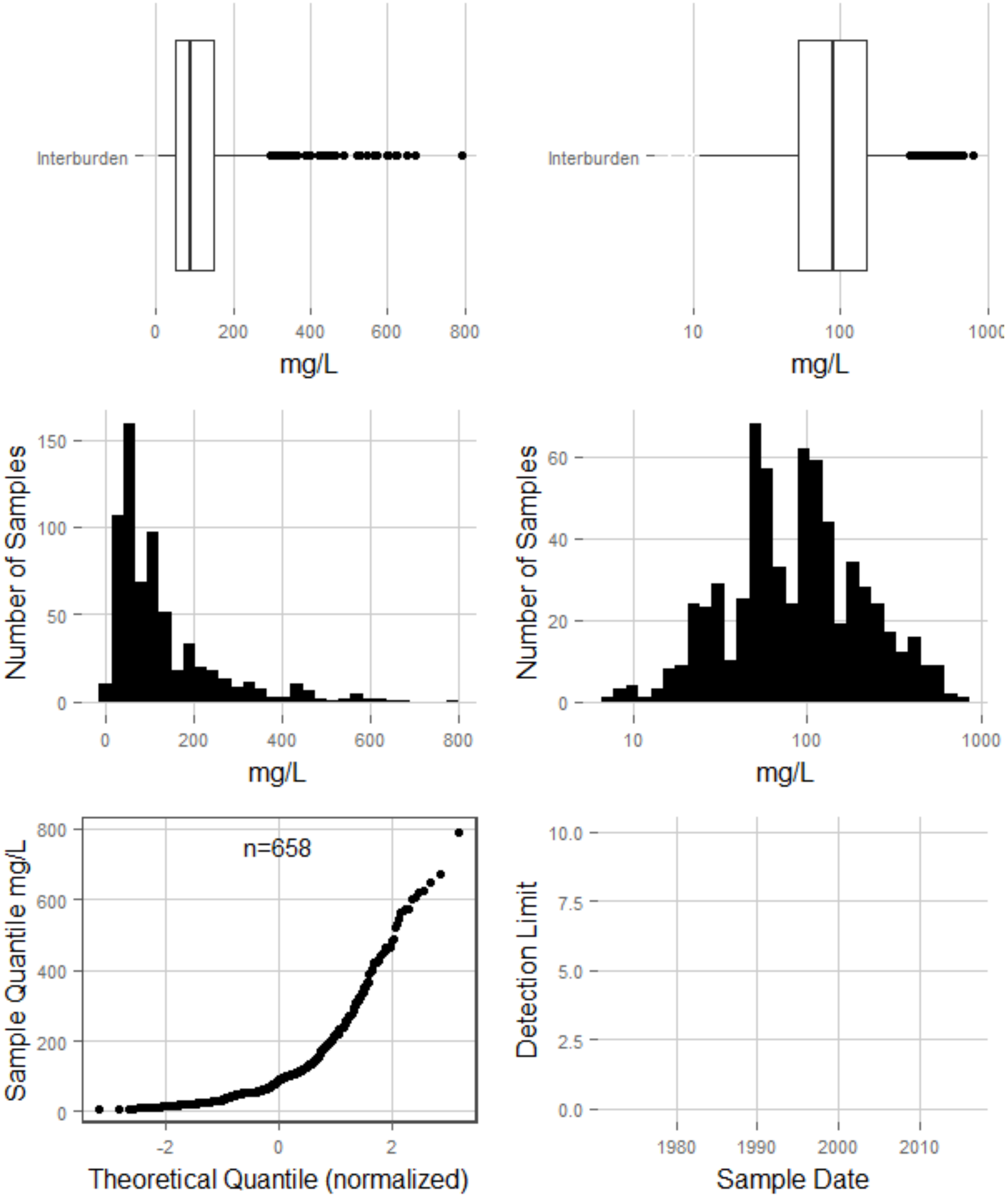
Sodium
Rosebud Overburden



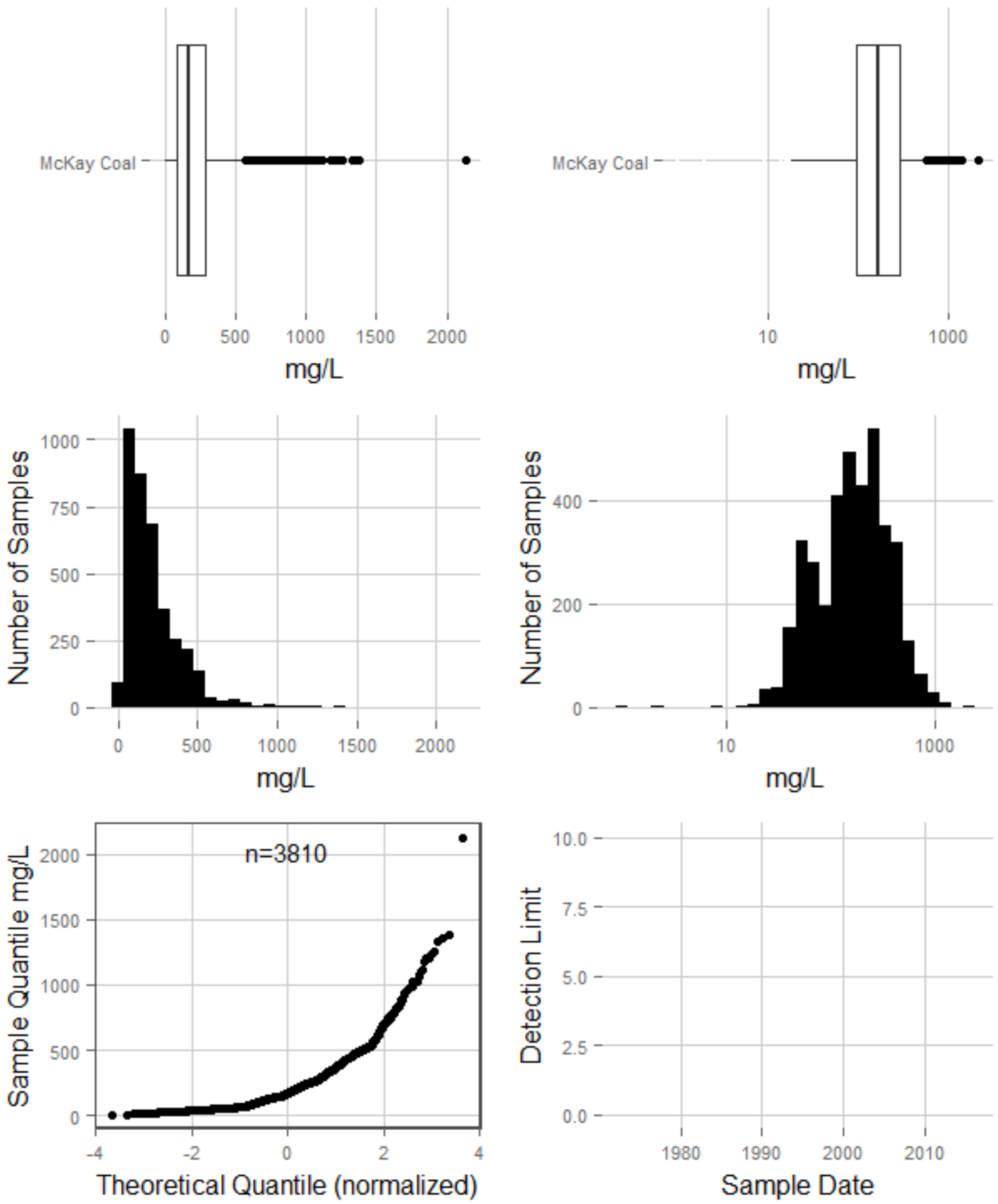
Sodium
Rosebud Coal



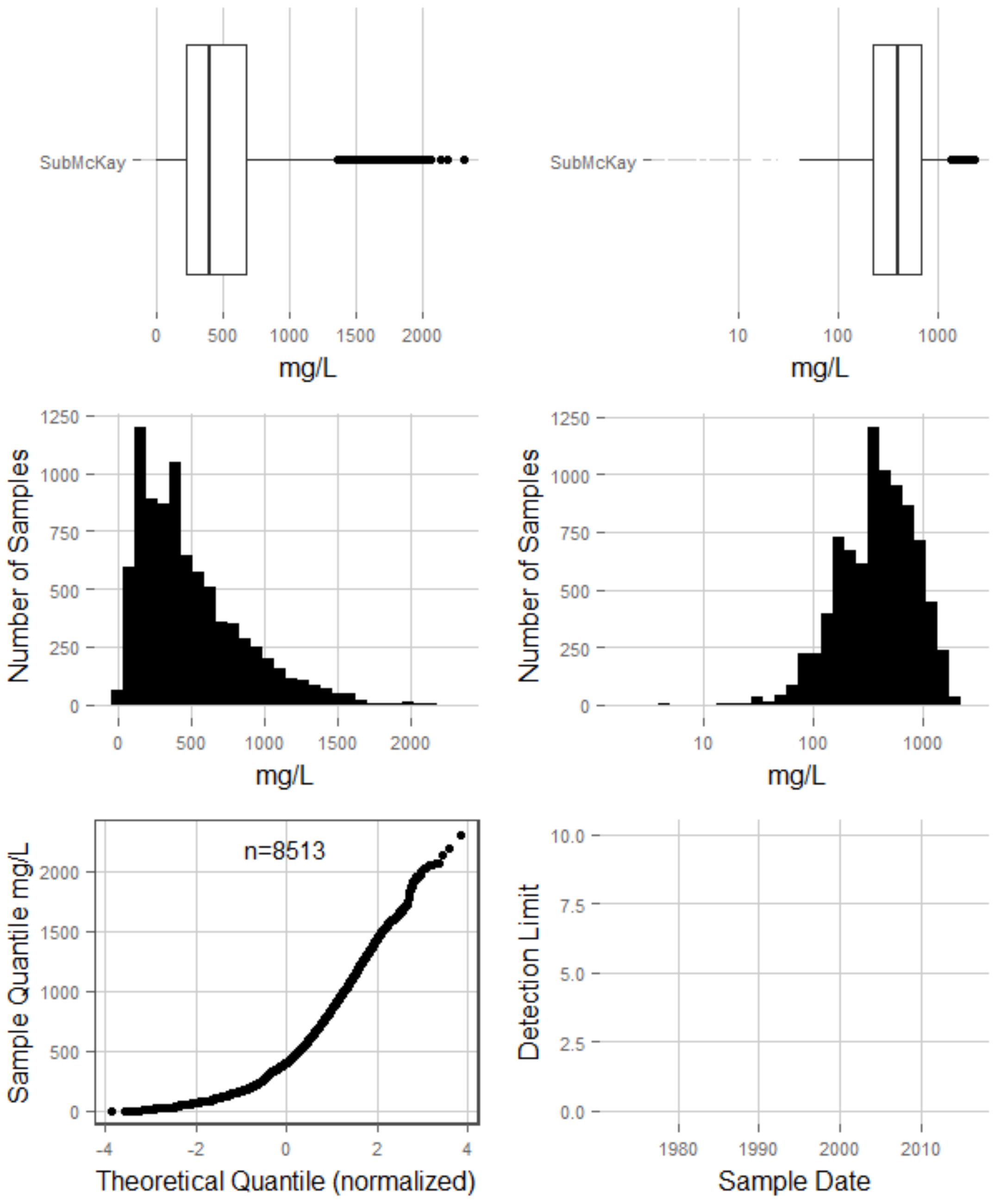
Sodium
Interburden



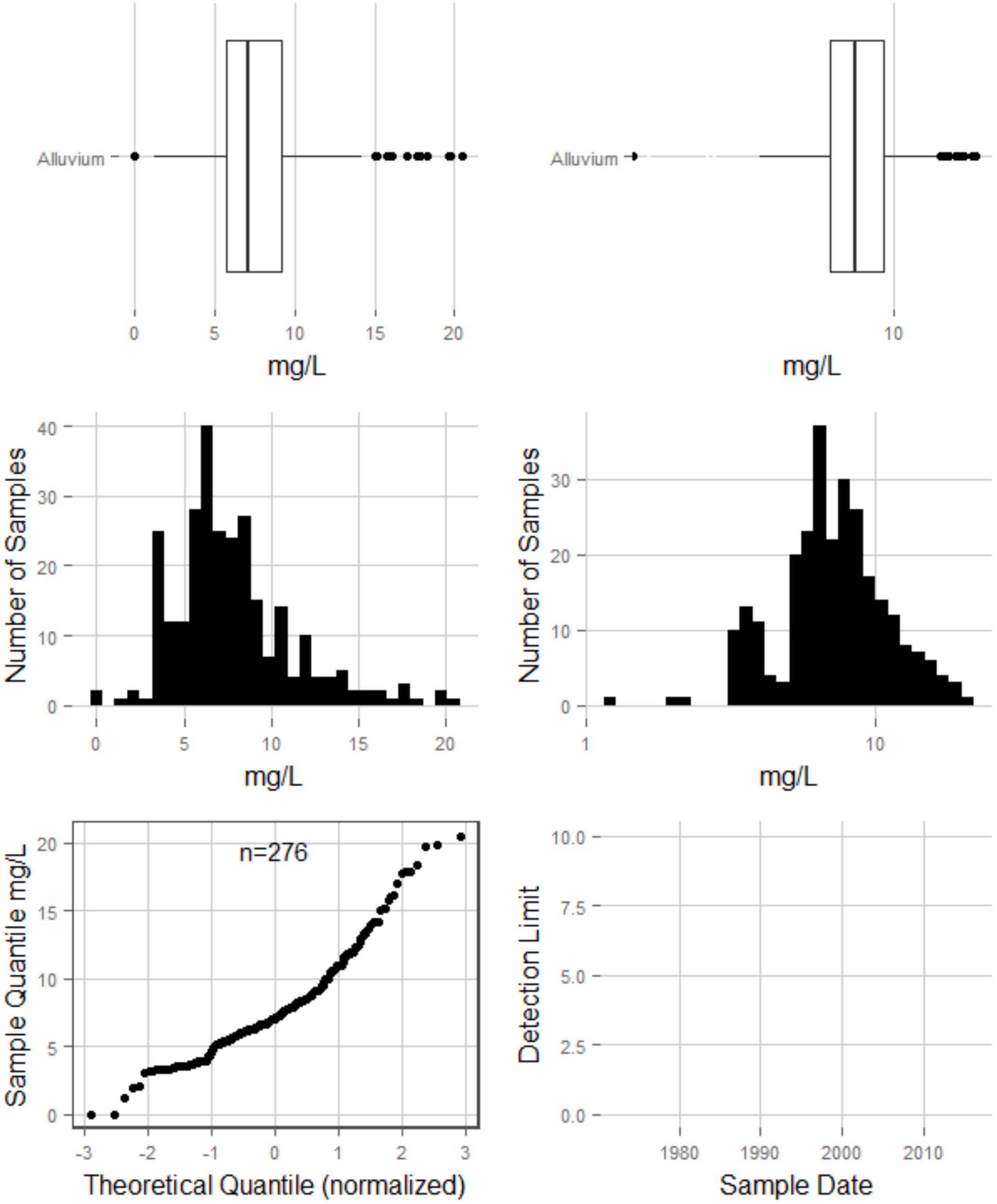
Sodium
McKay Coal



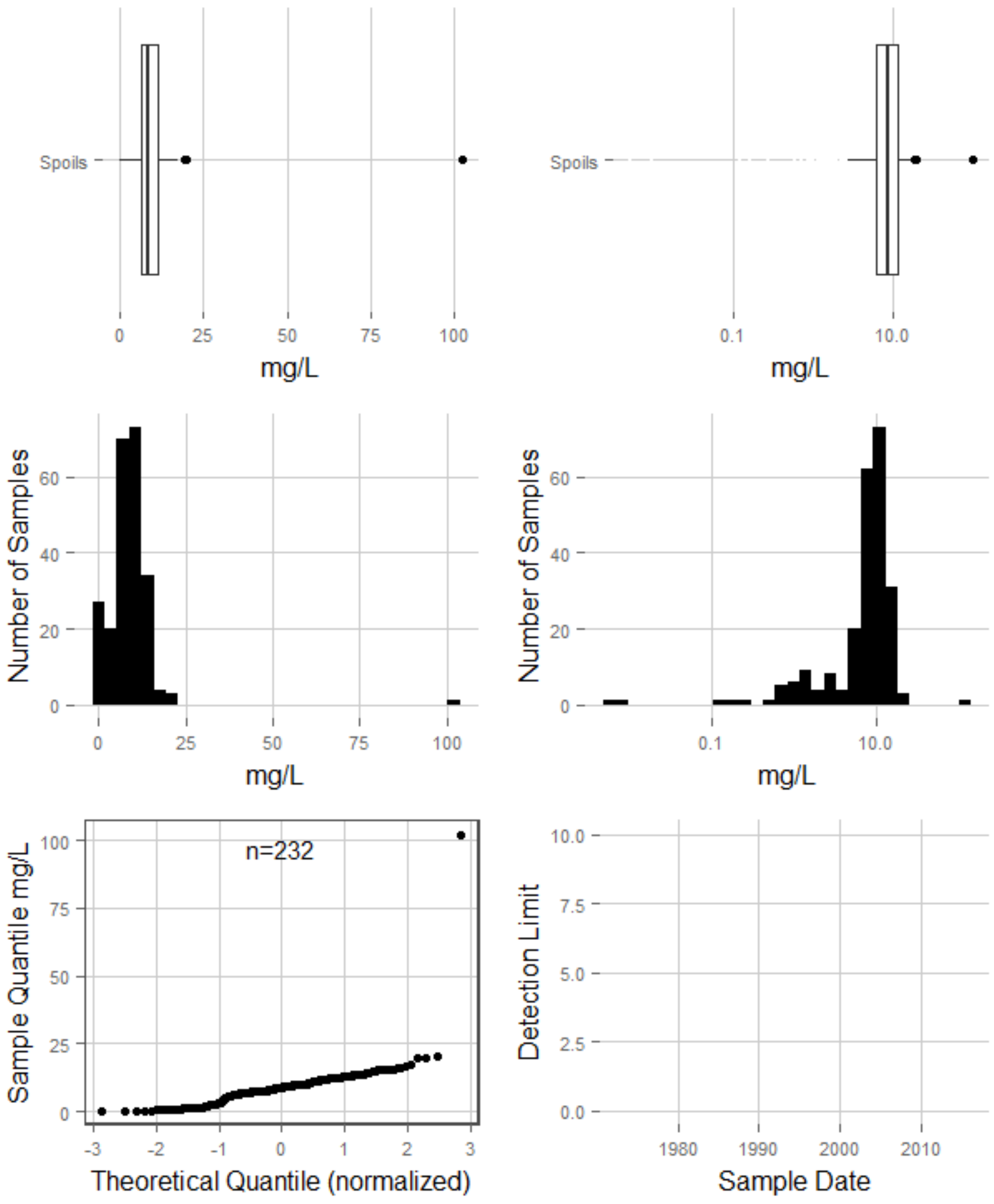
Sodium
SubMcKay



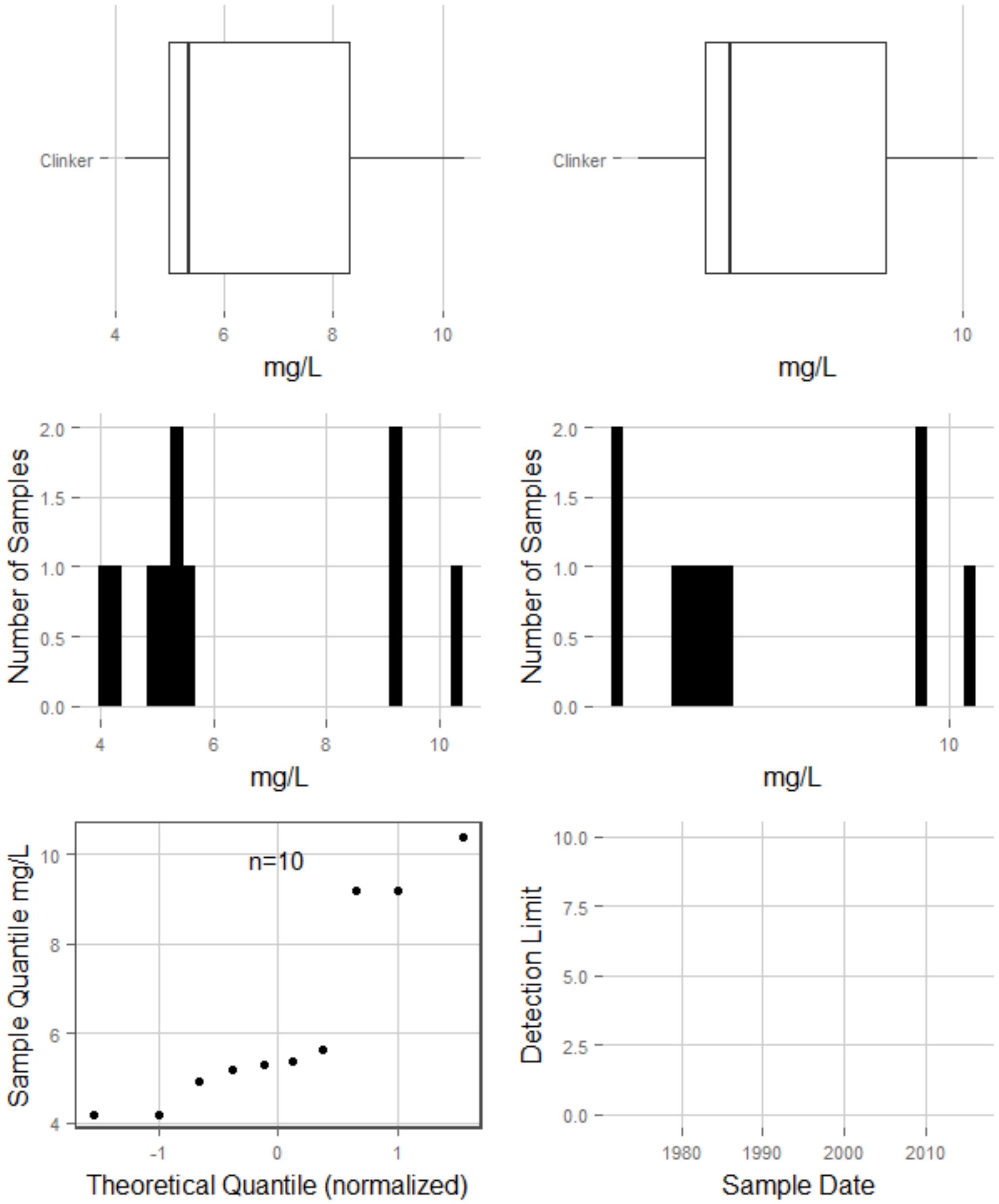
Strontium
Alluvium



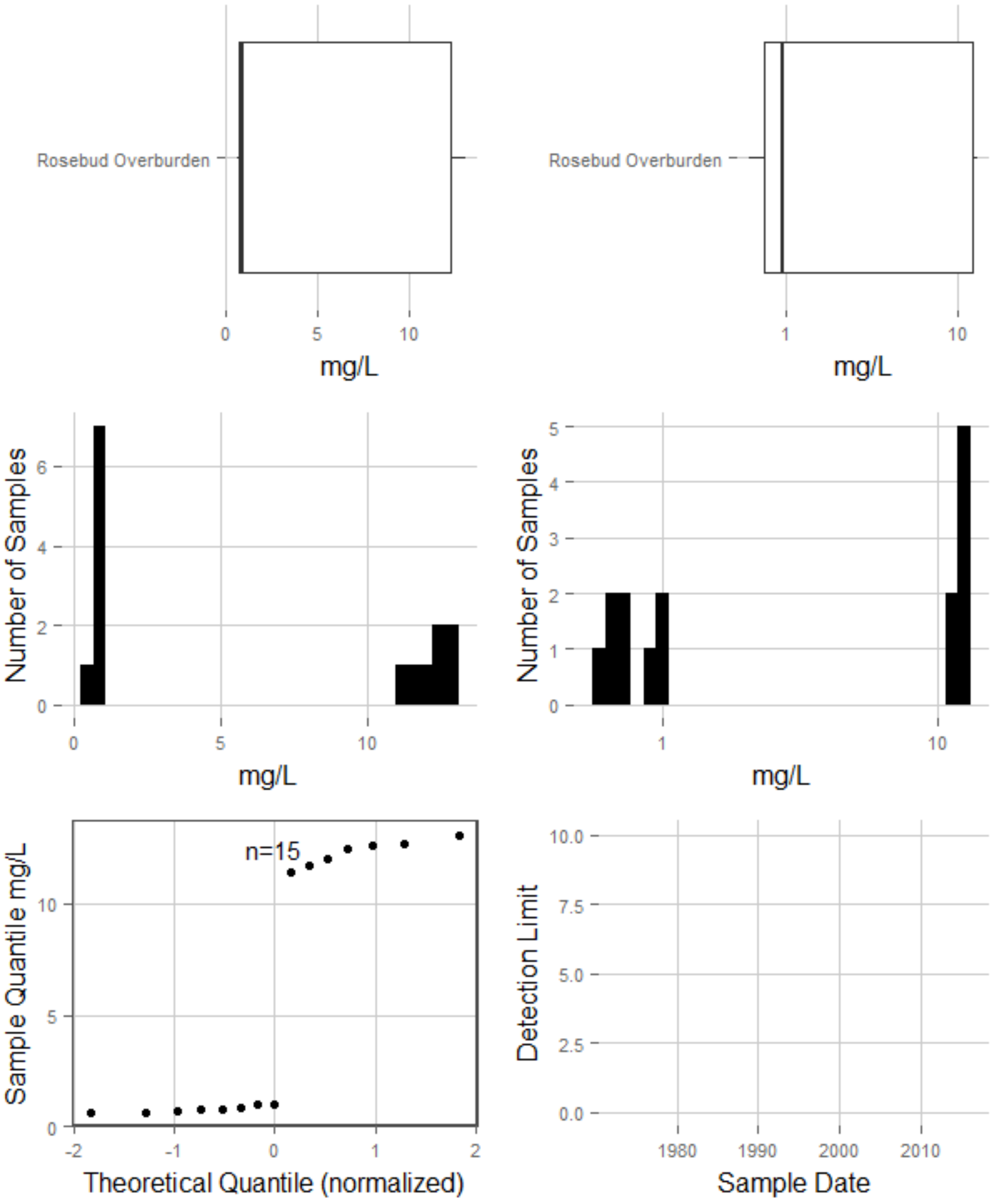
Strontium
Spoils



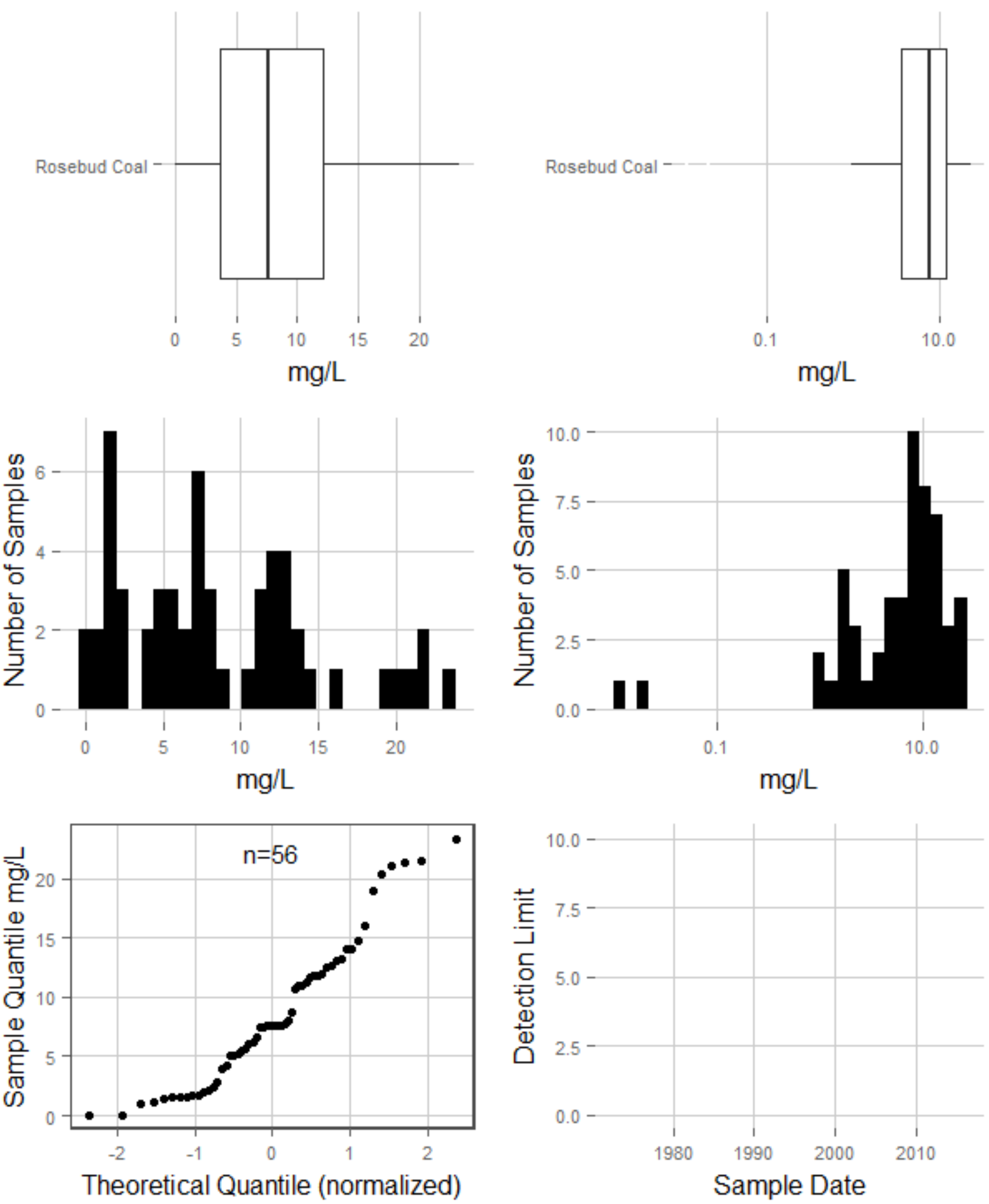
Strontium
Clinker



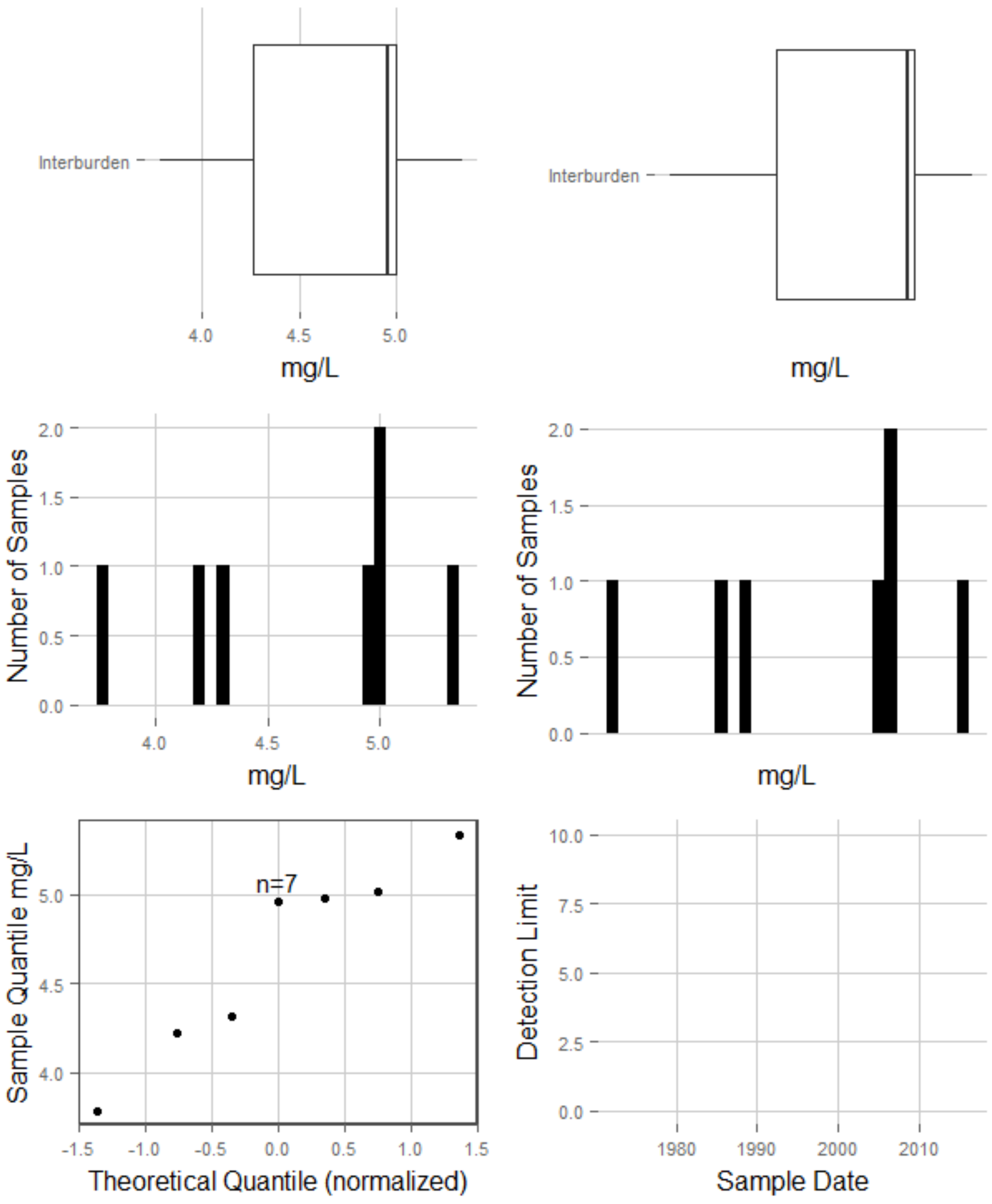
Strontium
Rosebud Overburden



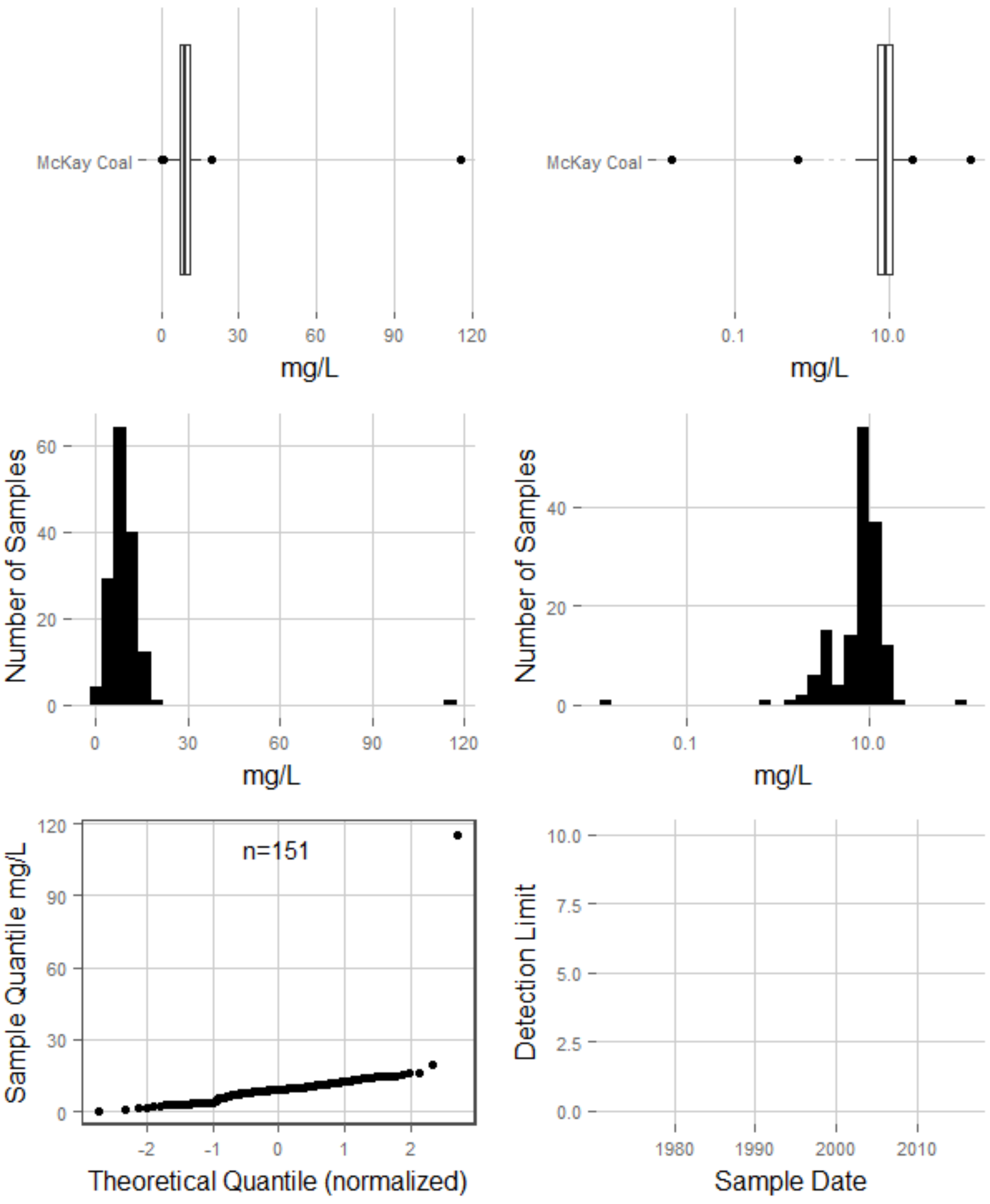
Strontium
Rosebud Coal



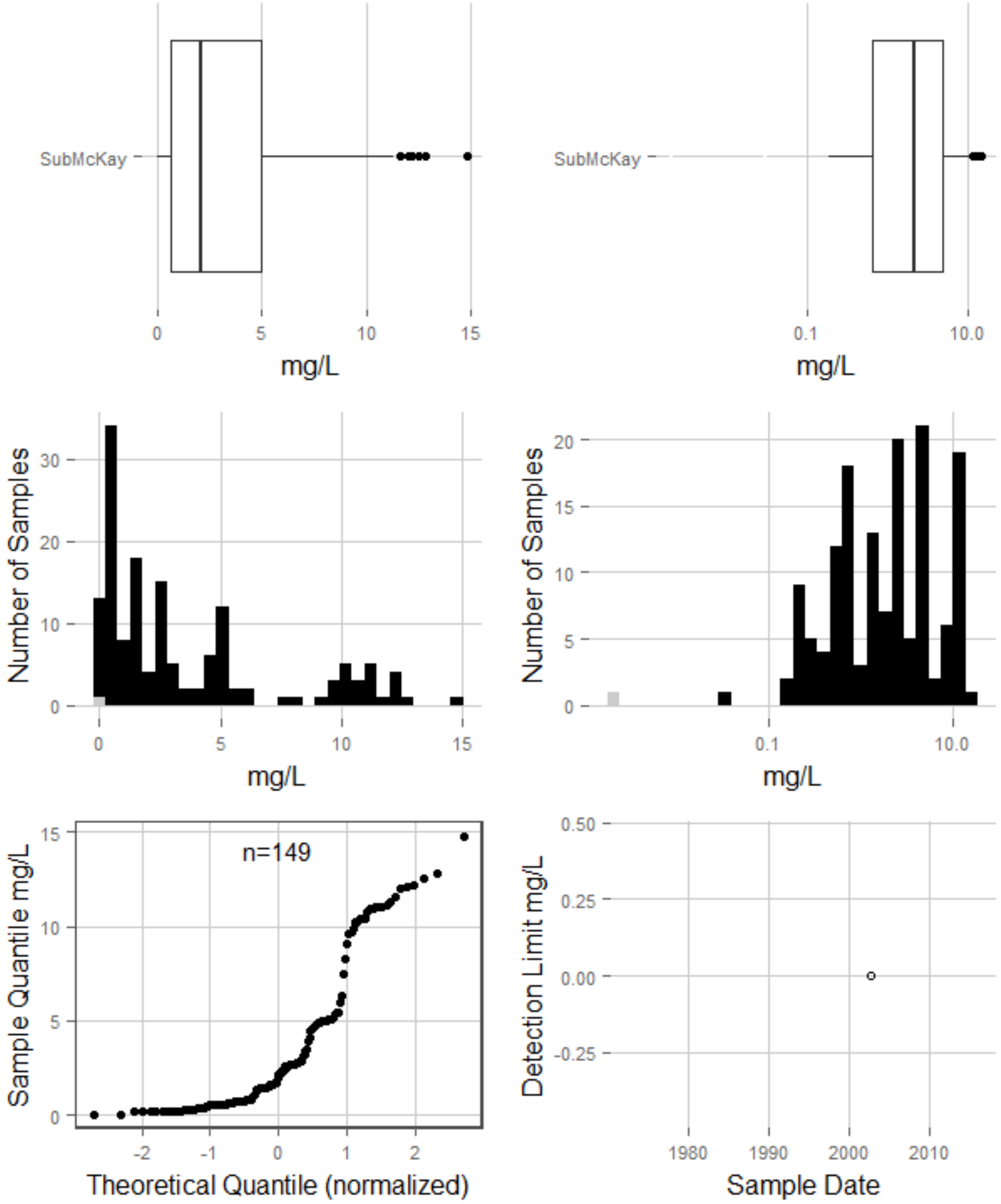
Strontium
Interburden



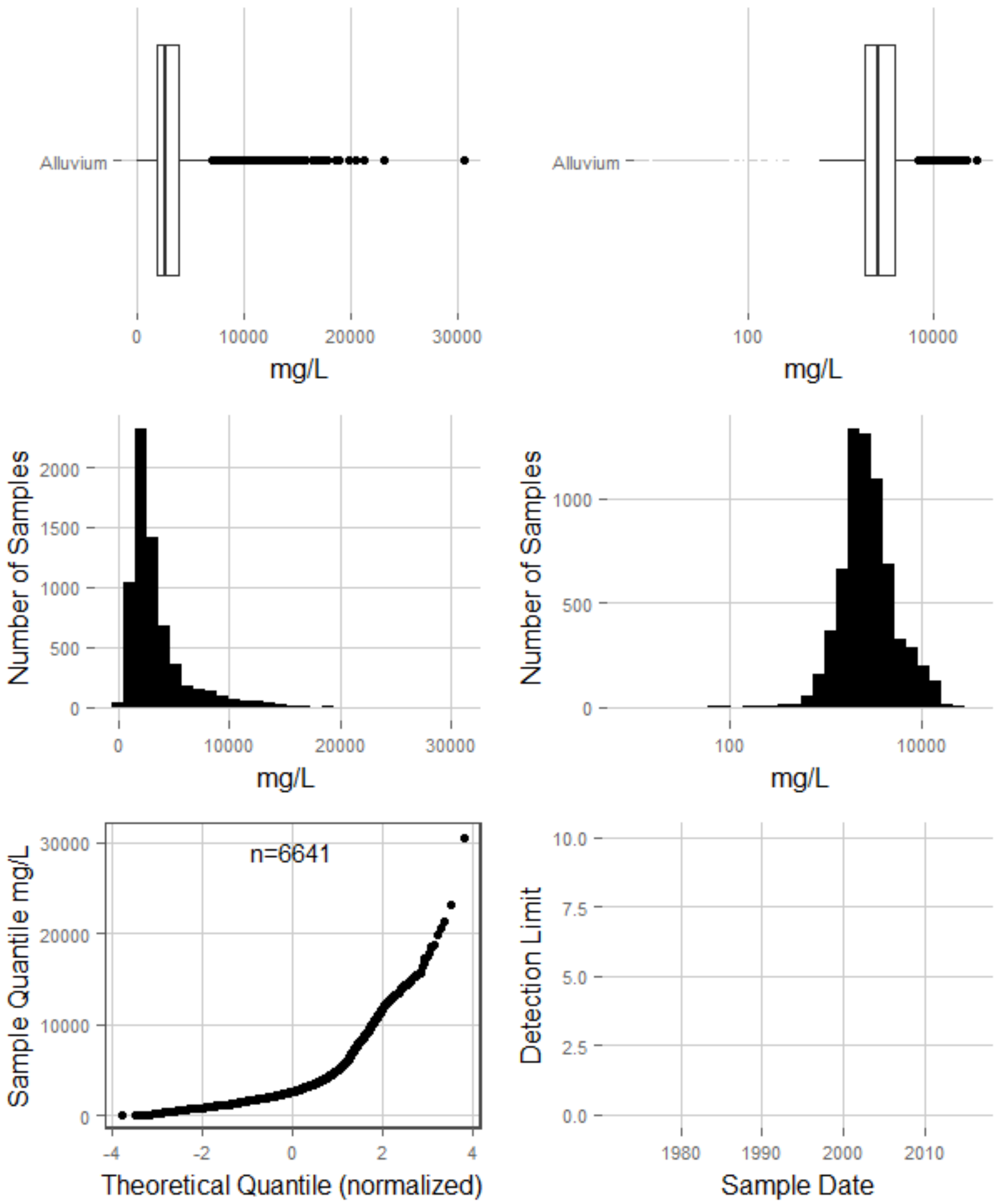
Strontium
McKay Coal

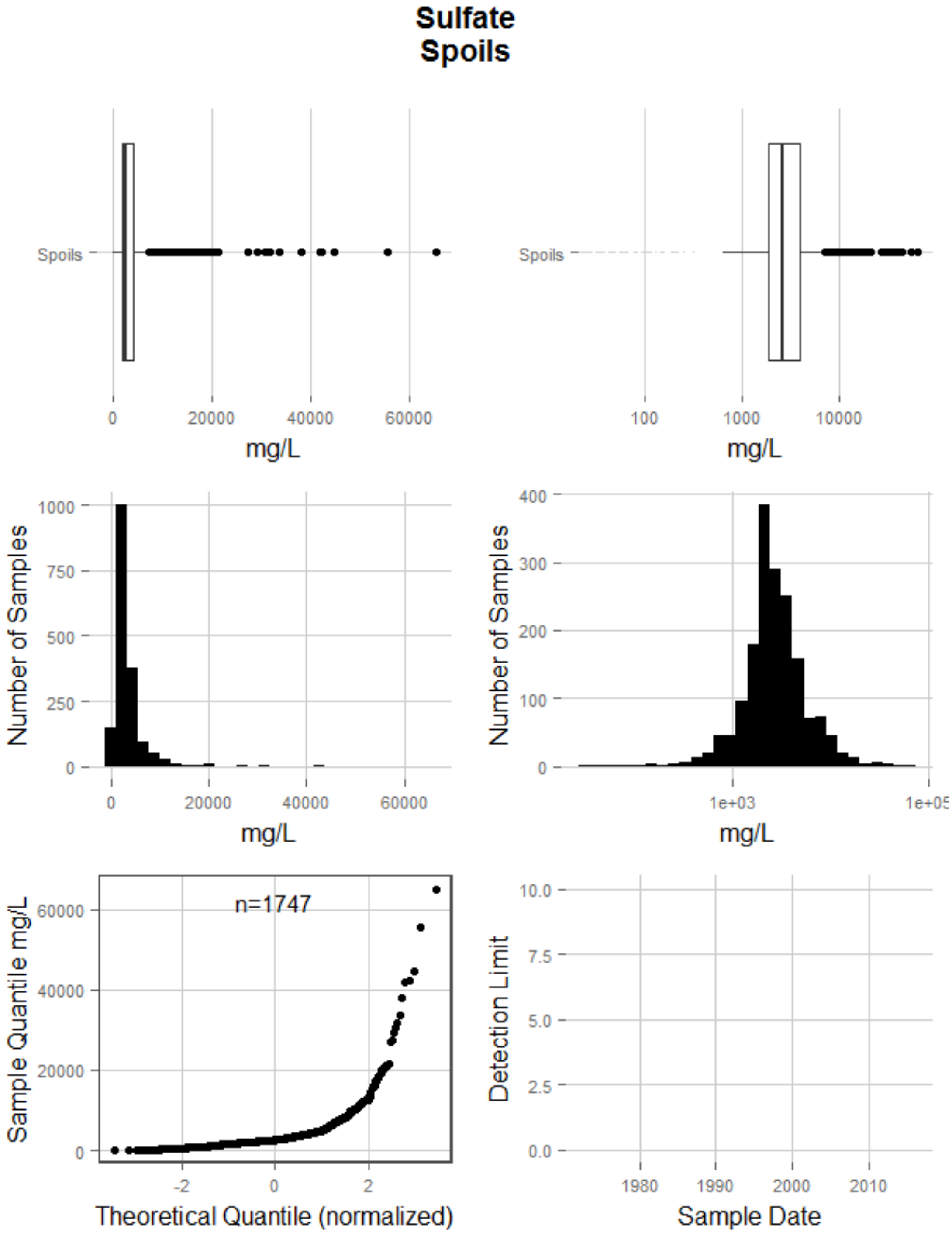


Strontium
SubMcKay

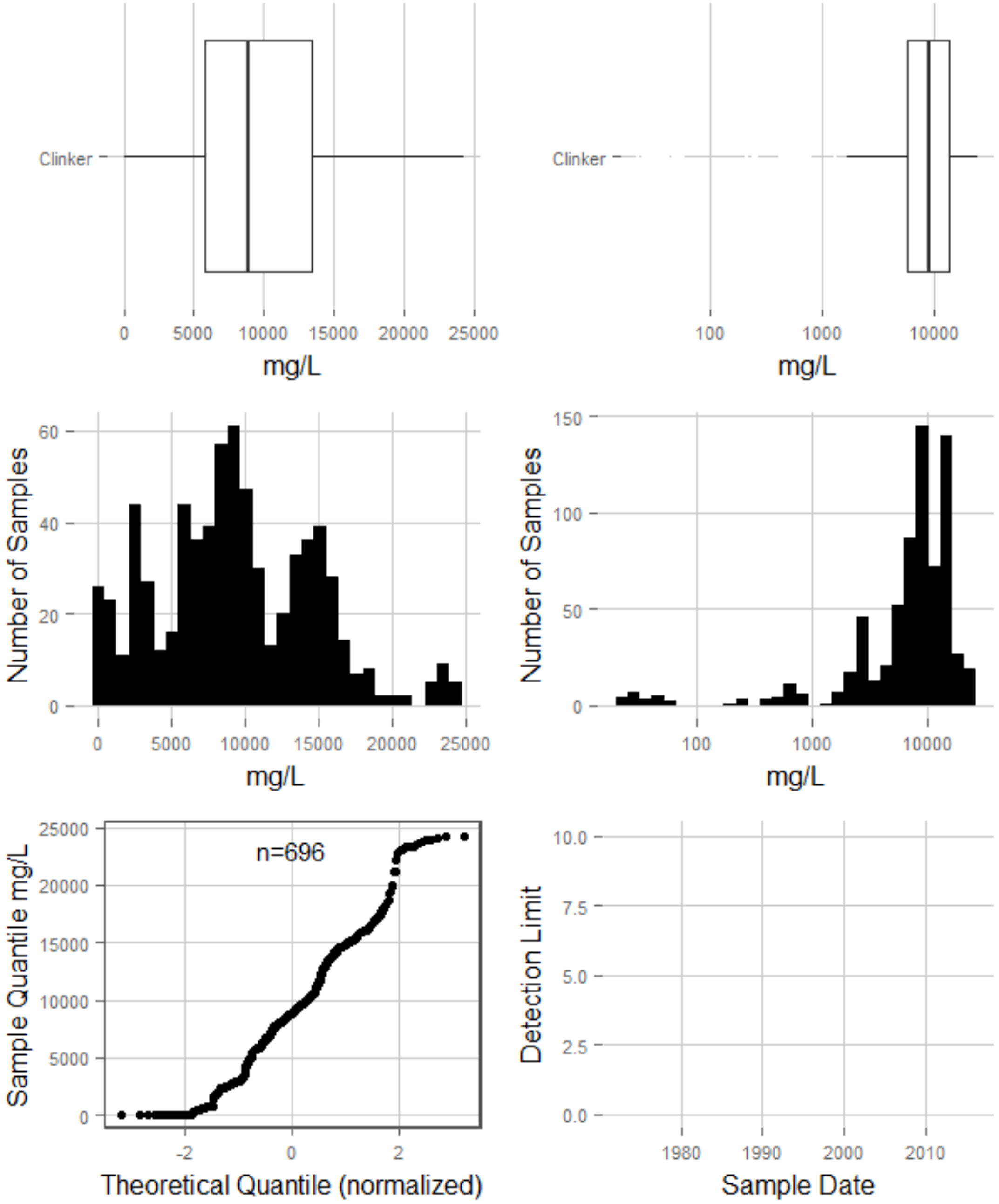


Sulfate
Alluvium

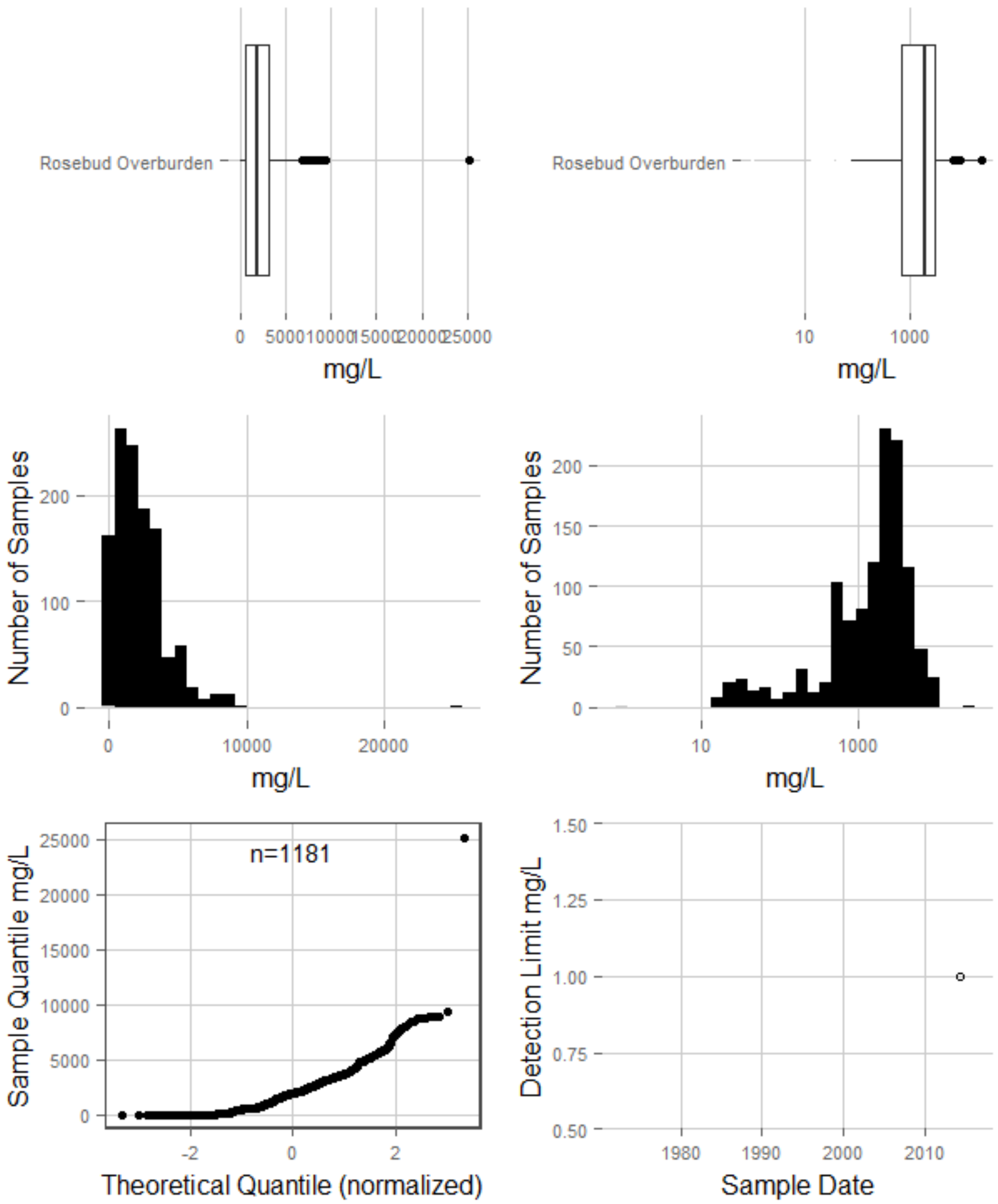



Sulfate
Spoils
Spoils
0
20000
40000
60000
mg/L
Spoils
100
1000
10000
mg/L
Number of Samples
1000
750
500
250
0
0
20000
40000
60000
mg/L
Number of Samples
400
300
200
100
0
1e+03
1e+05
mg/L
Sample Quantile mg/L
60000
40000
20000
0
n=1747
-2
0
2
Theoretical Quantile (normalized)
Detection Limit
10.0
7.5
5.0
2.5
0.0
1980
1990
2000
2010
Sample Date

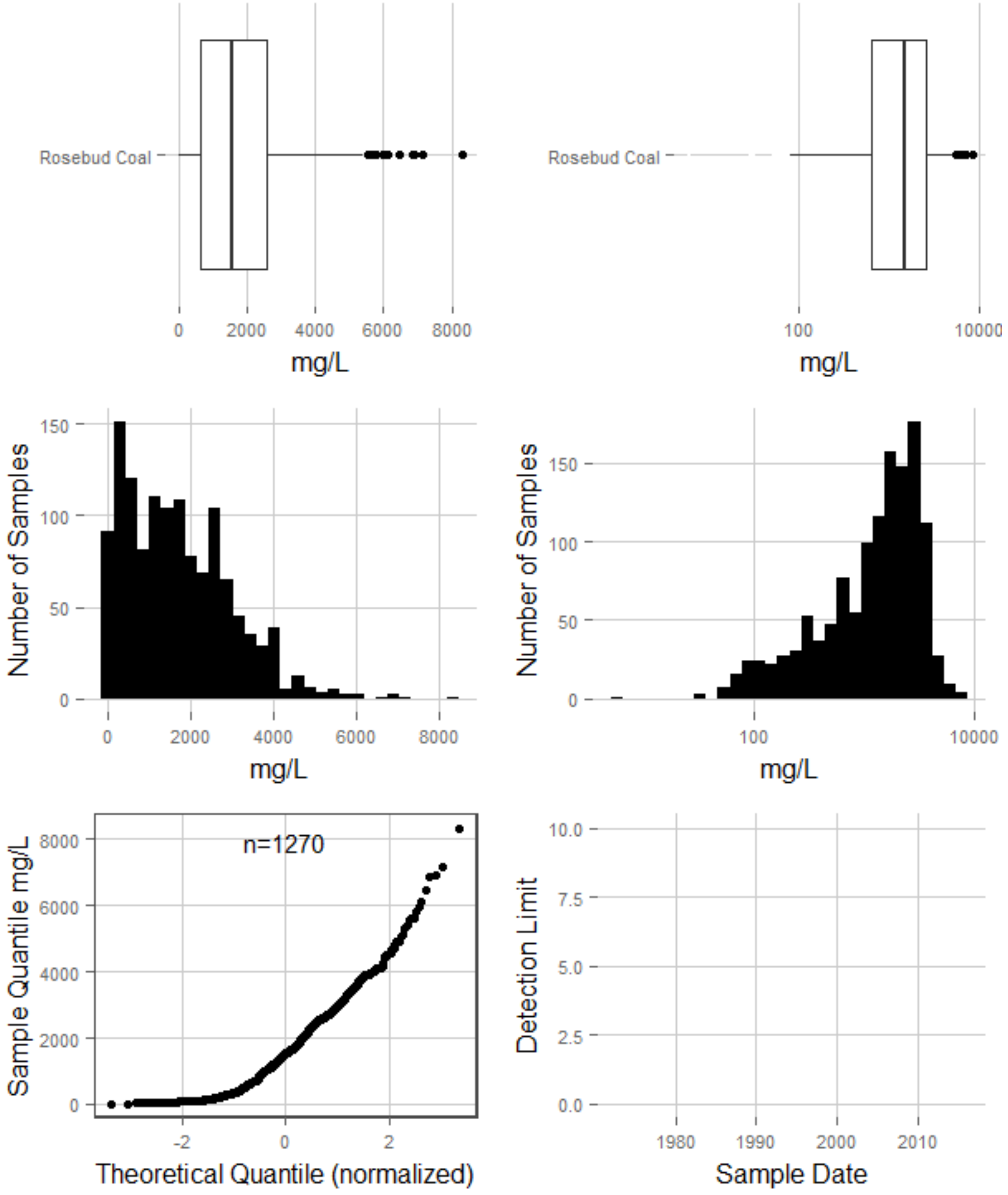
Sulfate
Clinker



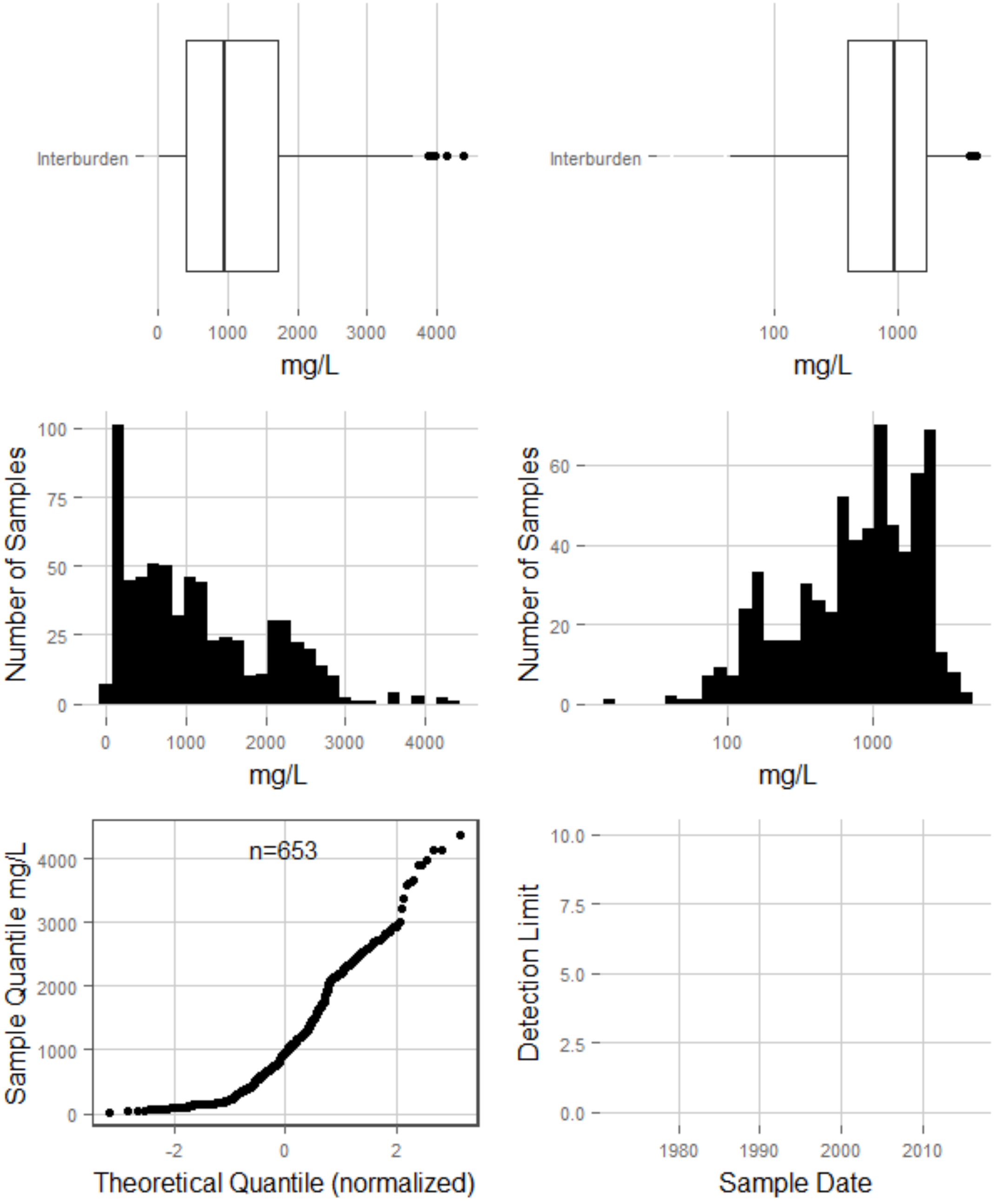
Sulfate
Rosebud Overburden



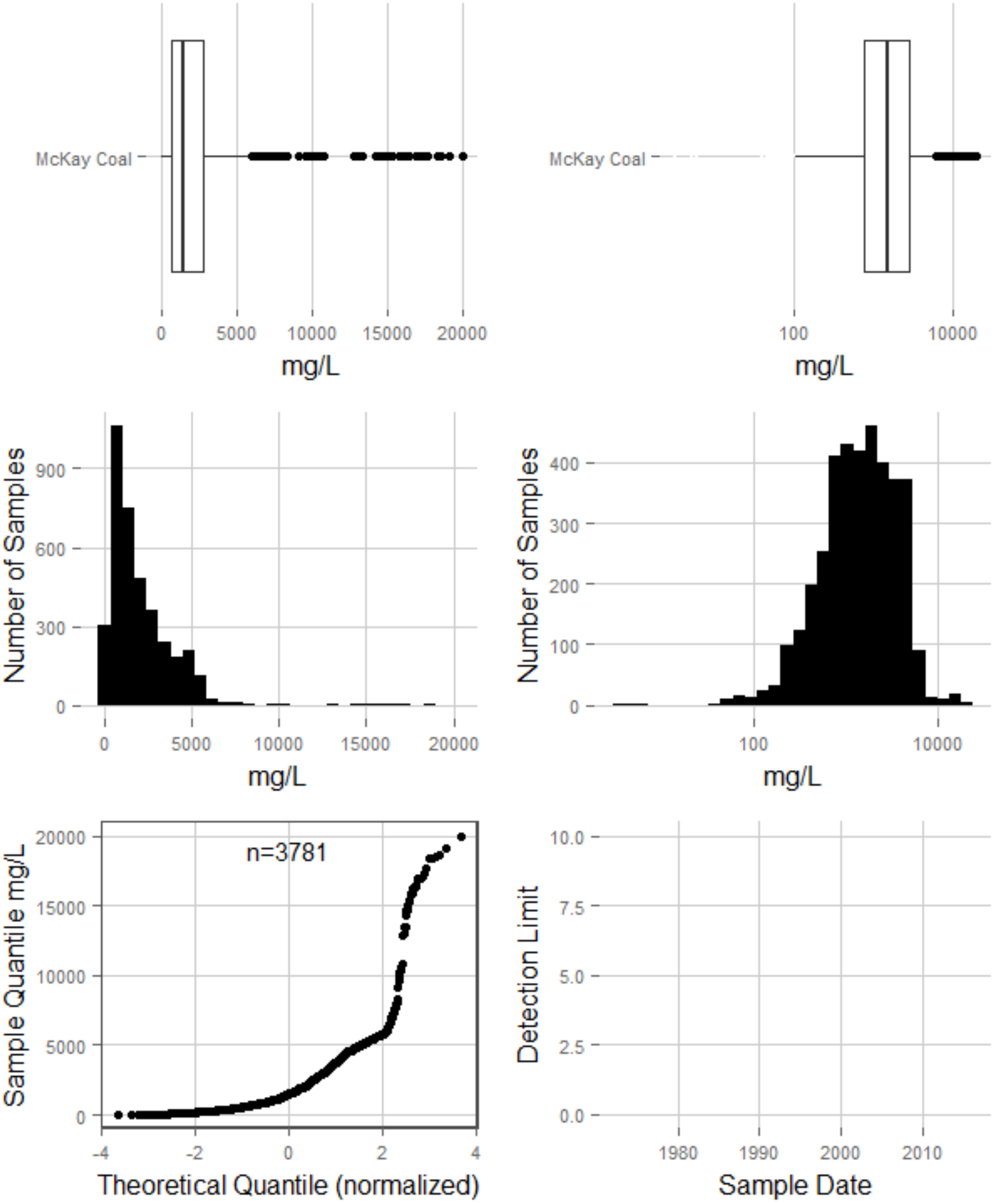
Sulfate
Rosebud Coal



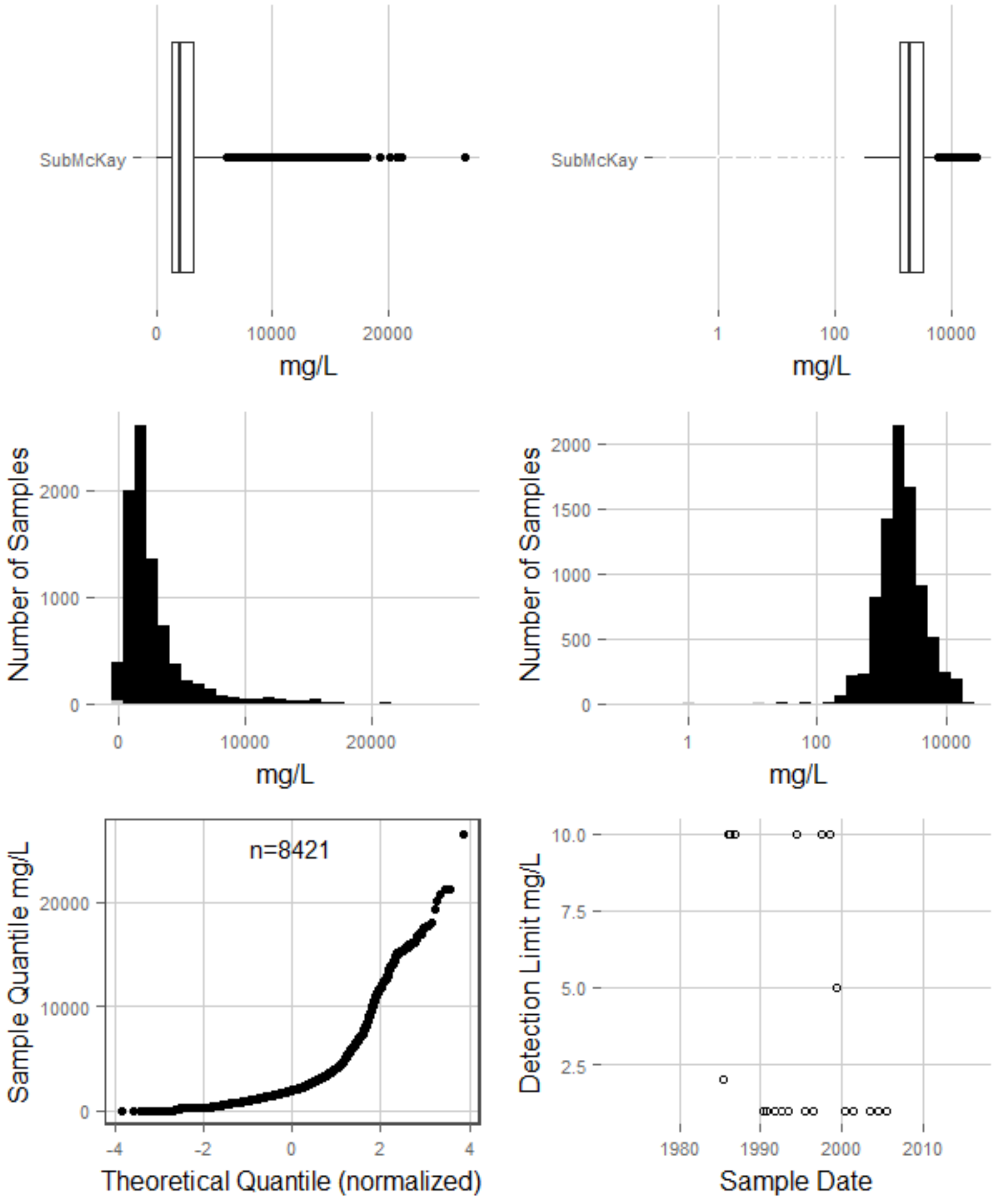
Sulfate
Interburden



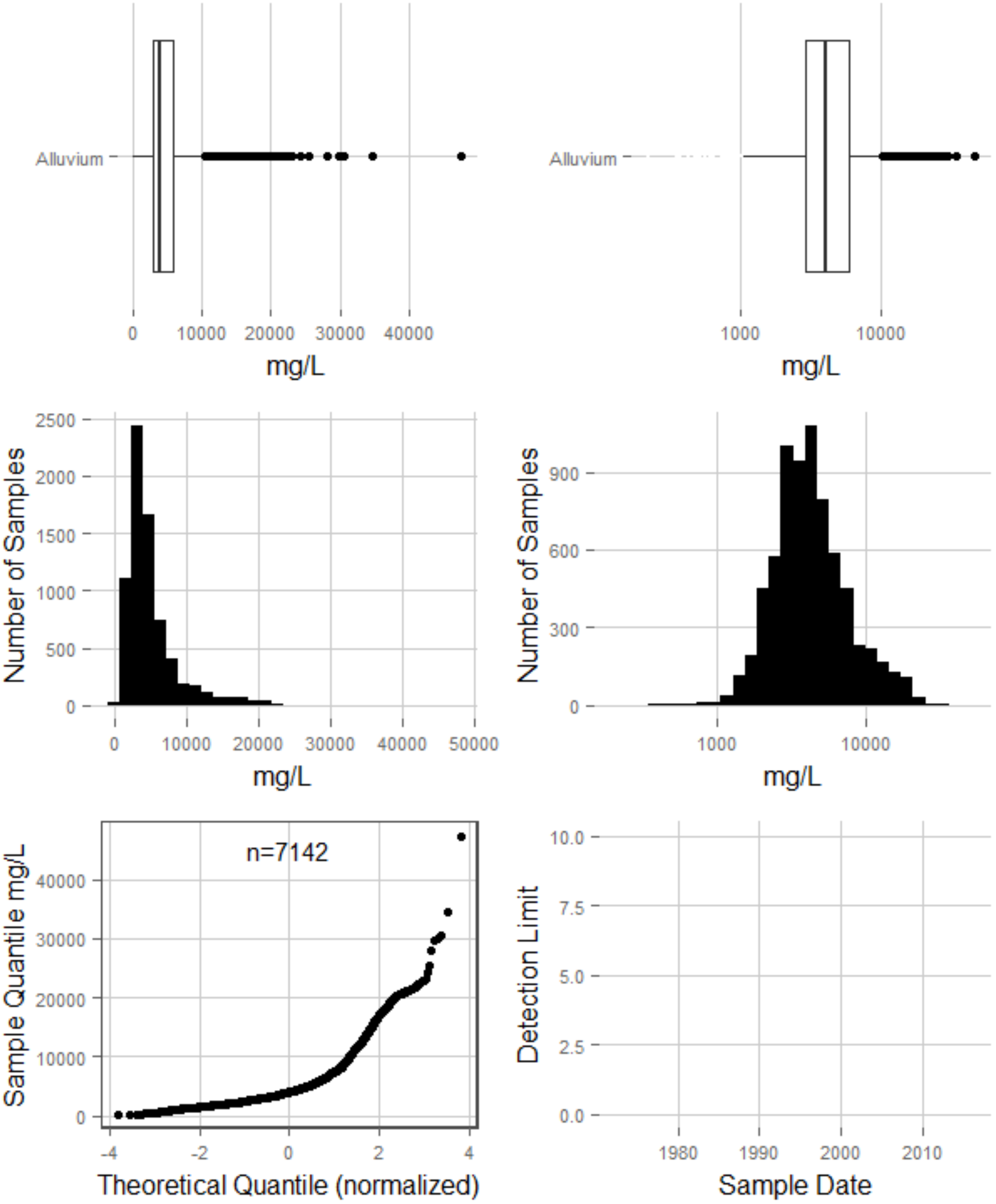
Sulfate
McKay Coal



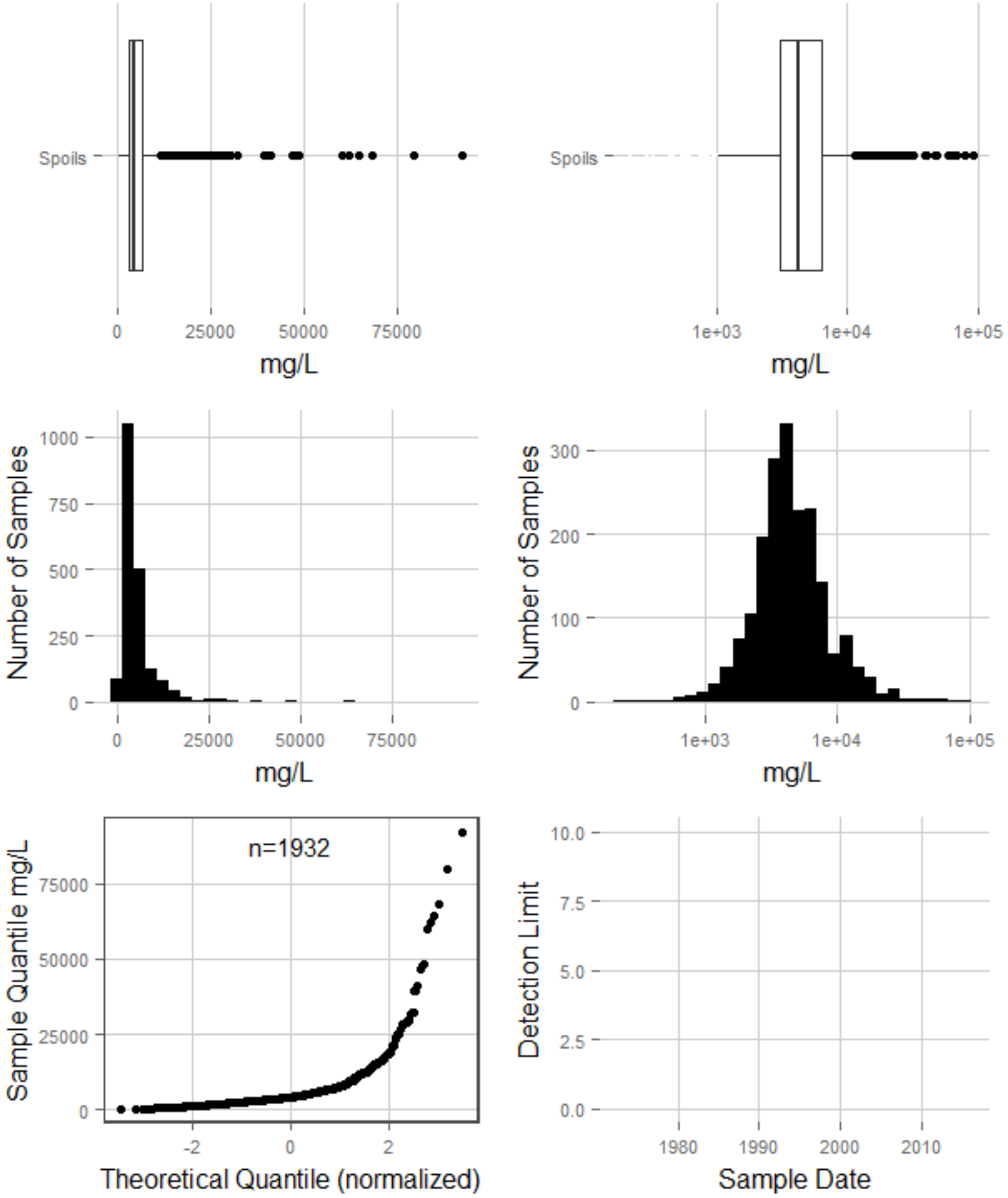
Sulfate
SubMcKay



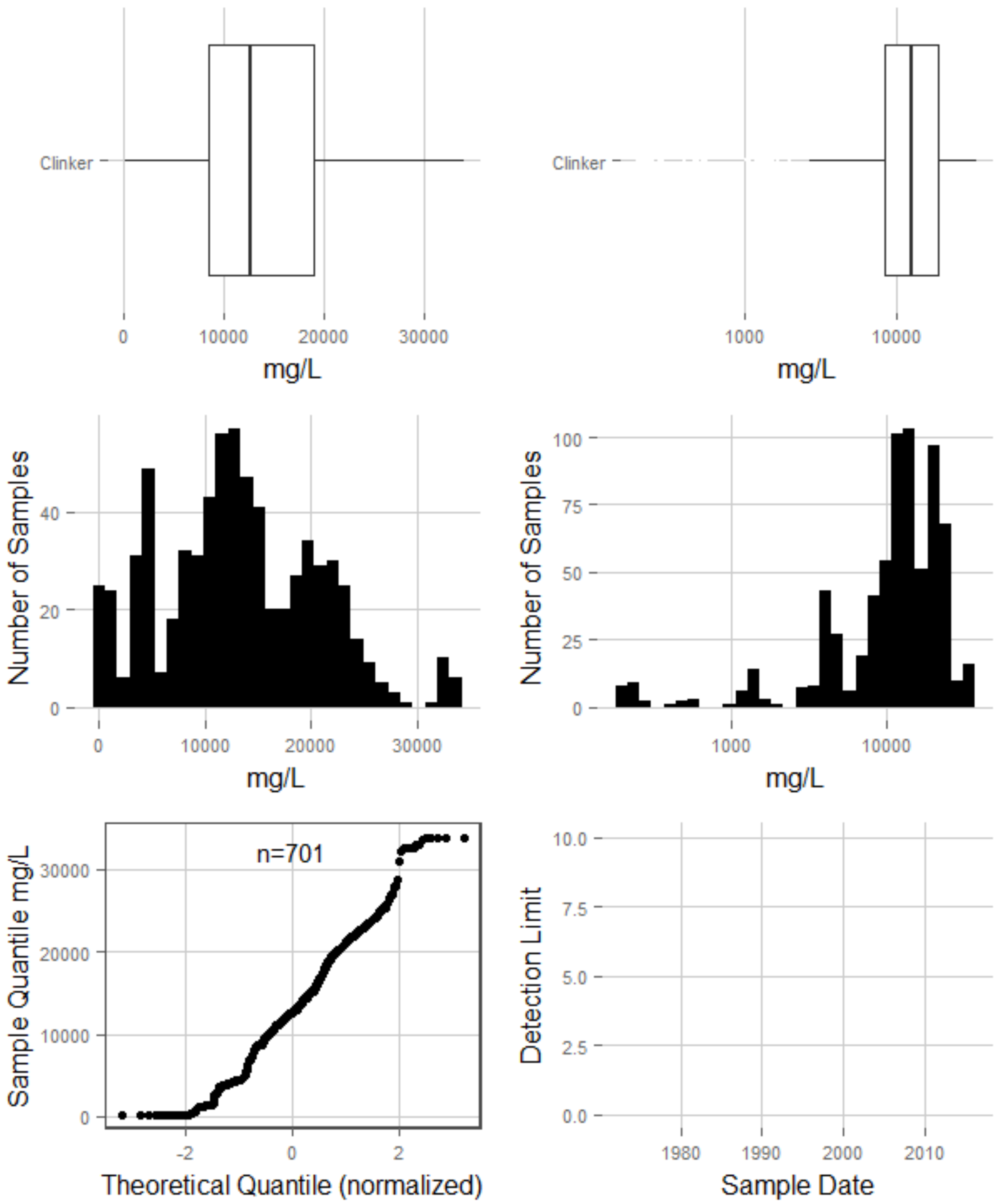
TDS
Alluvium



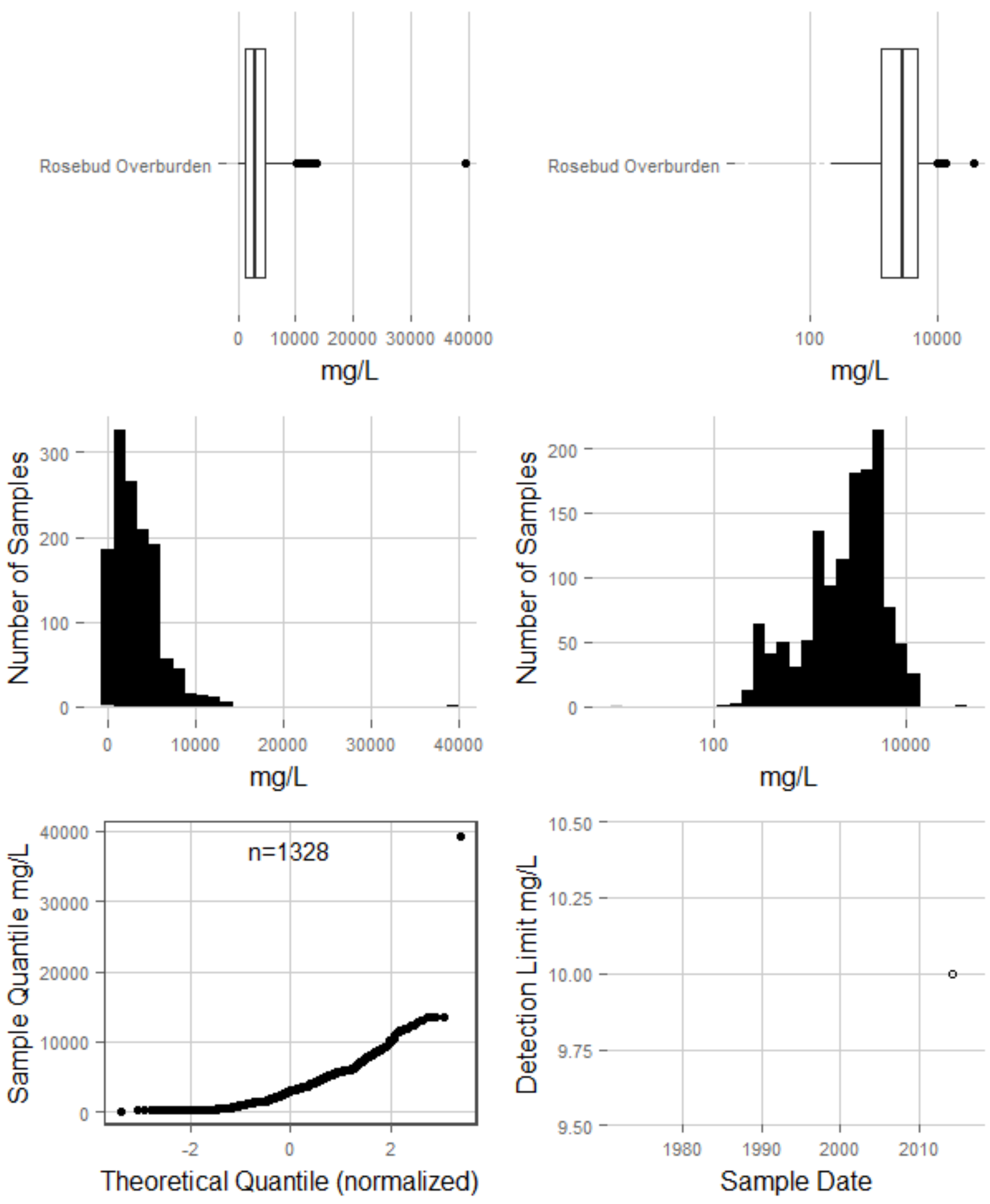
TDS
Spoils


Spoils
0
25000
50000
75000
mg/L
Spoils
1e+03
1e+04
1e+05
mg/L
Number of Samples
1000
750
500
250
0
0
25000
50000
75000
mg/L
Number of Samples
300
200
100
0
1e+03
1e+04
1e+05
mg/L
Sample Quantile mg/L
75000
50000
25000
0
n=1932
-2
0
2
Theoretical Quantile (normalized)
Detection Limit
10.0
7.5
5.0
2.5
0.0
1980
1990
2000
2010
Sample Date

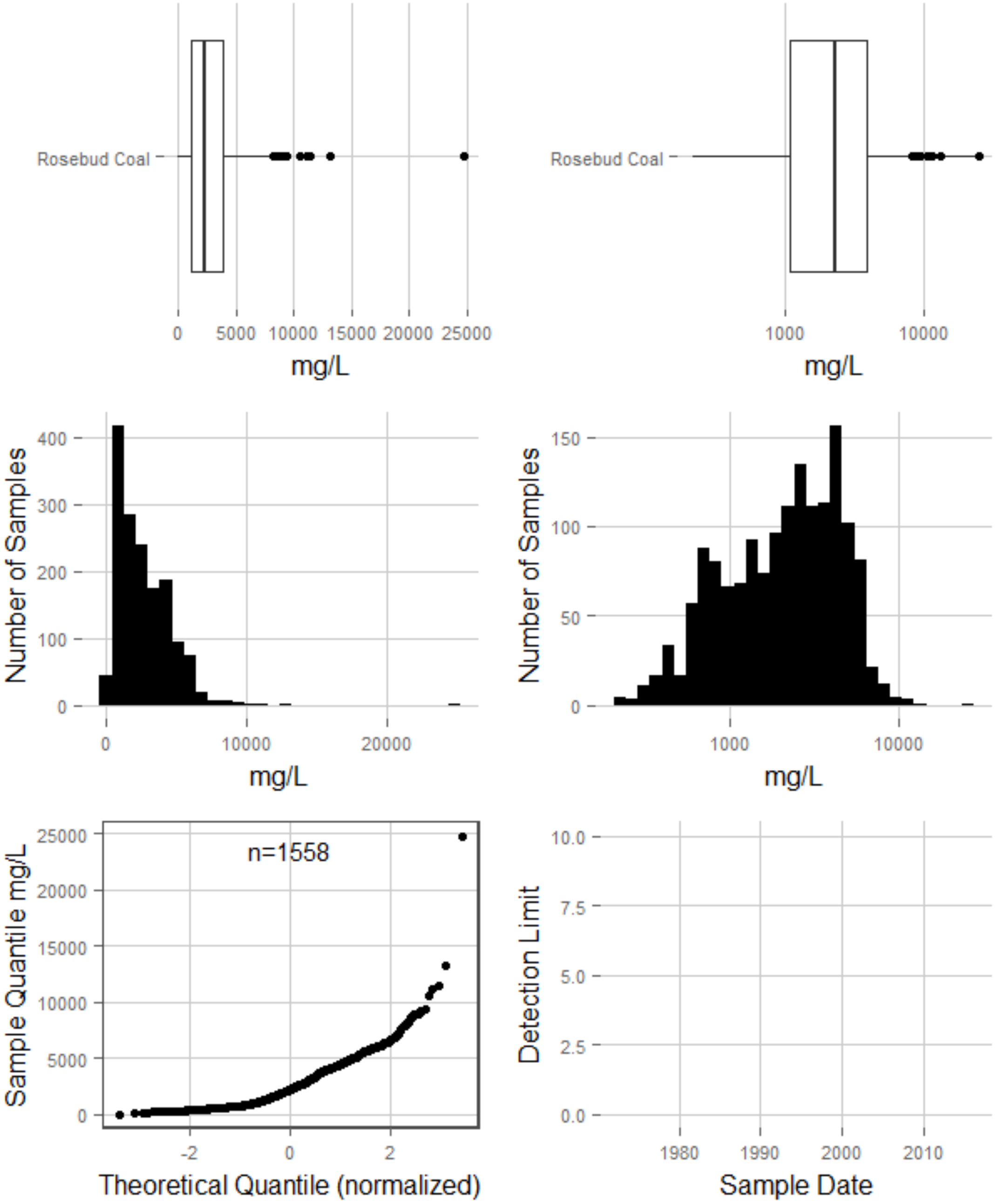
TDS
Clinker


Clinker
0
10000
20000
30000
mg/L
Clinker
1000
10000
mg/L
Number of Samples
0
20
40
0
10000
20000
30000
mg/L
Number of Samples
0
25
50
75
100
1000
10000
mg/L
Sample Quantile mg/L
0
10000
20000
30000
n=701
-2
0
2
Theoretical Quantile (normalized)
Detection Limit
0.0
2.5
5.0
7.5
10.0
1980
1990
2000
2010
Sample Date

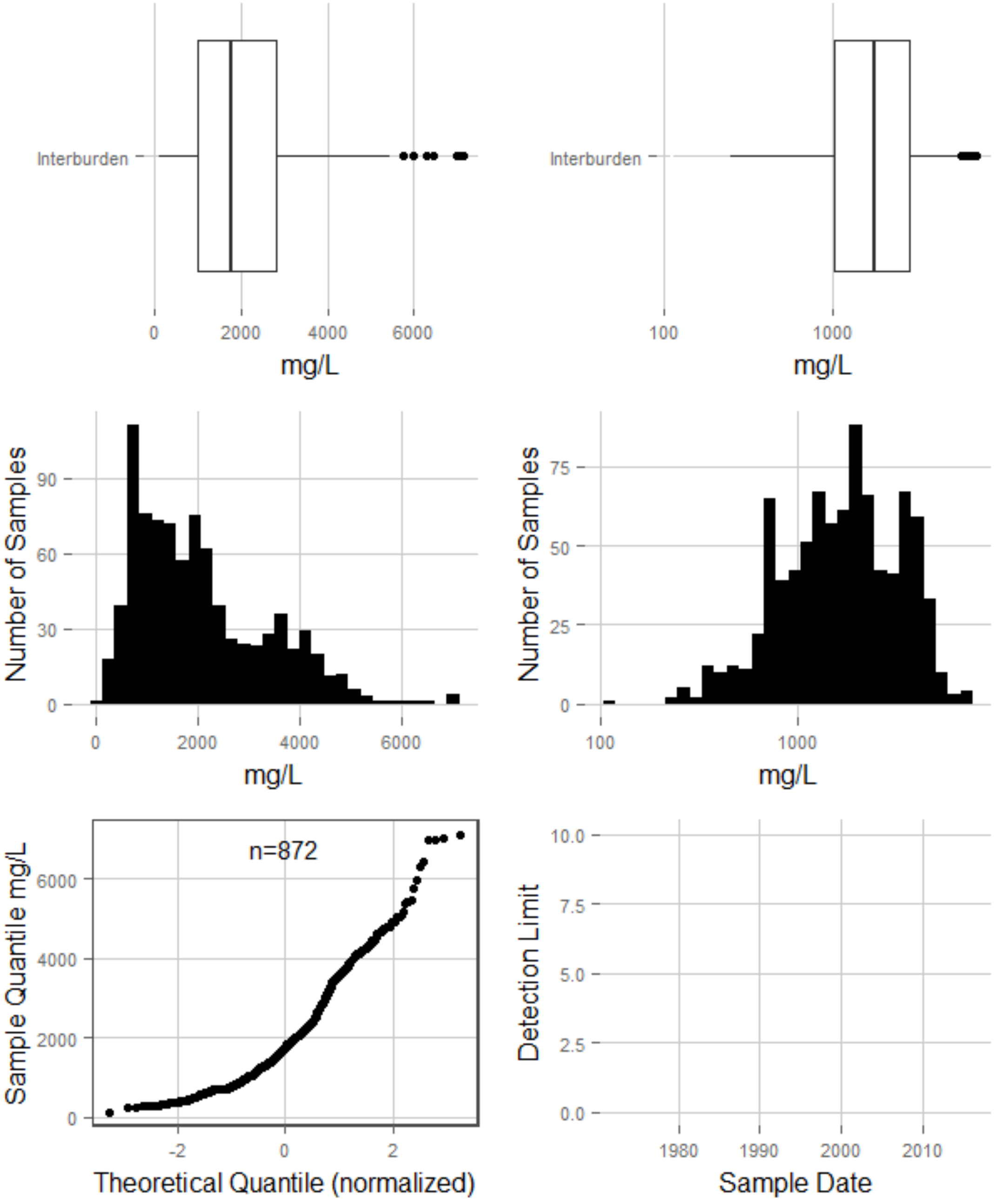
TDS
Rosebud Overburden



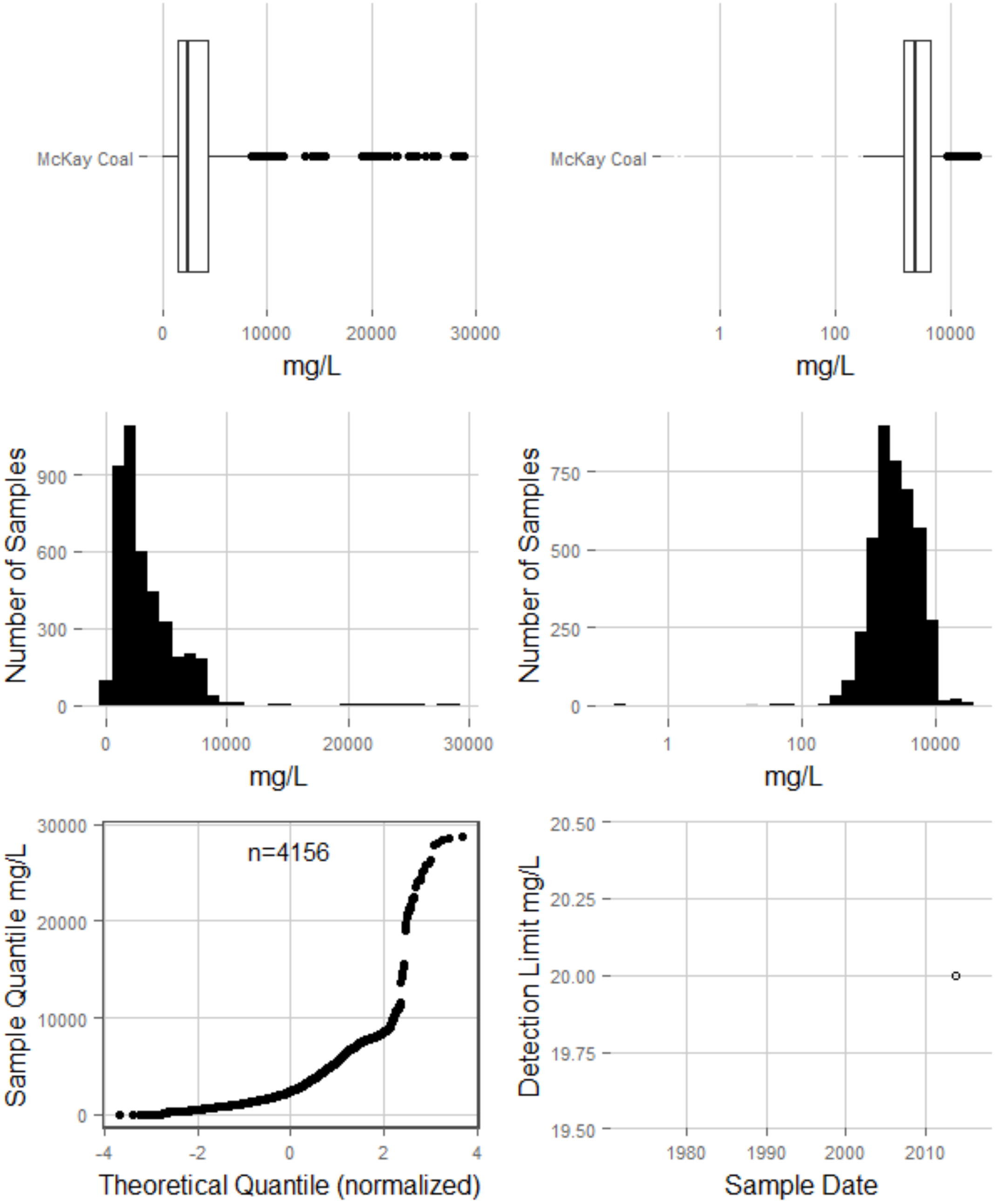
TDS
Rosebud Coal



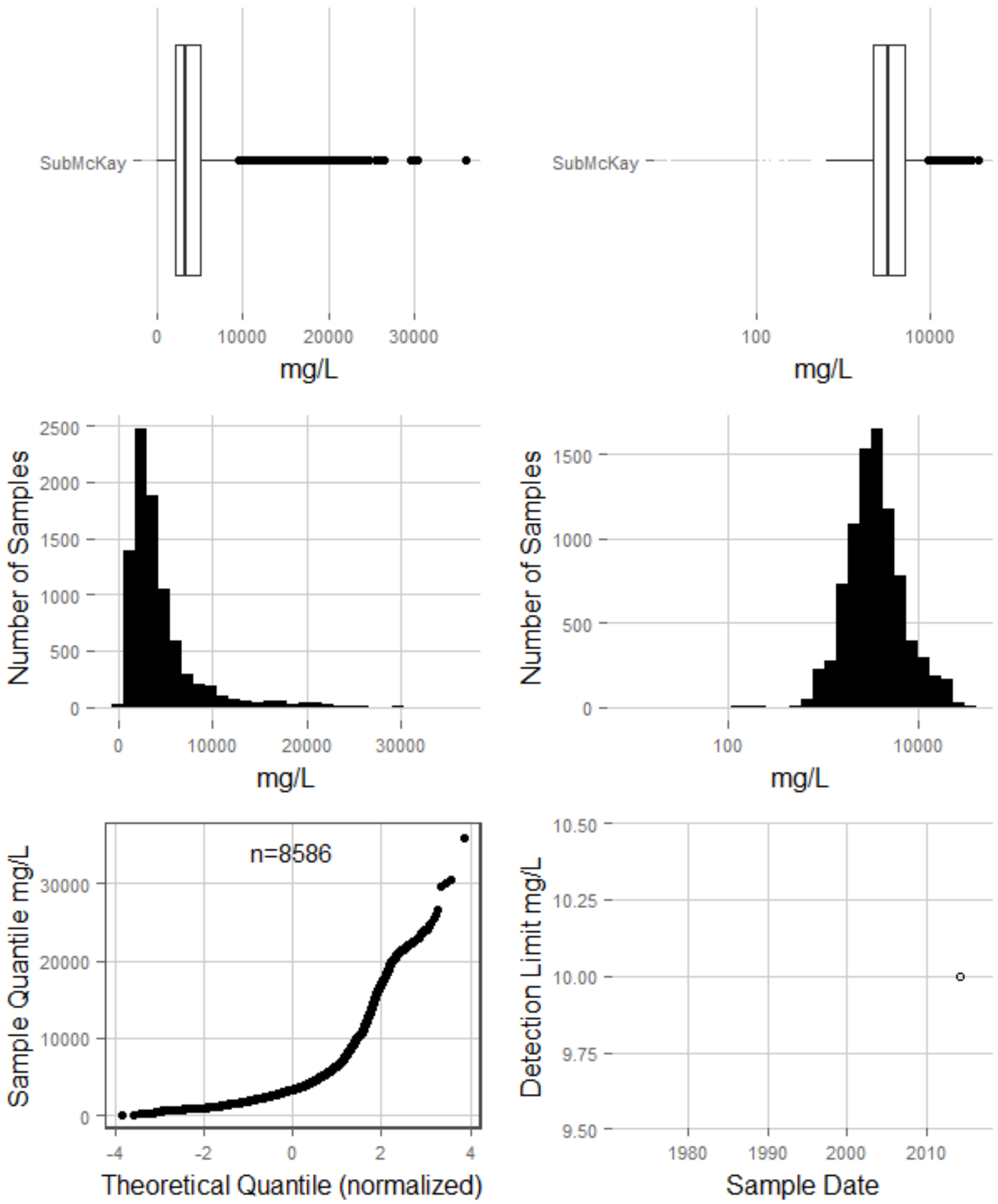
TDS
Interburden



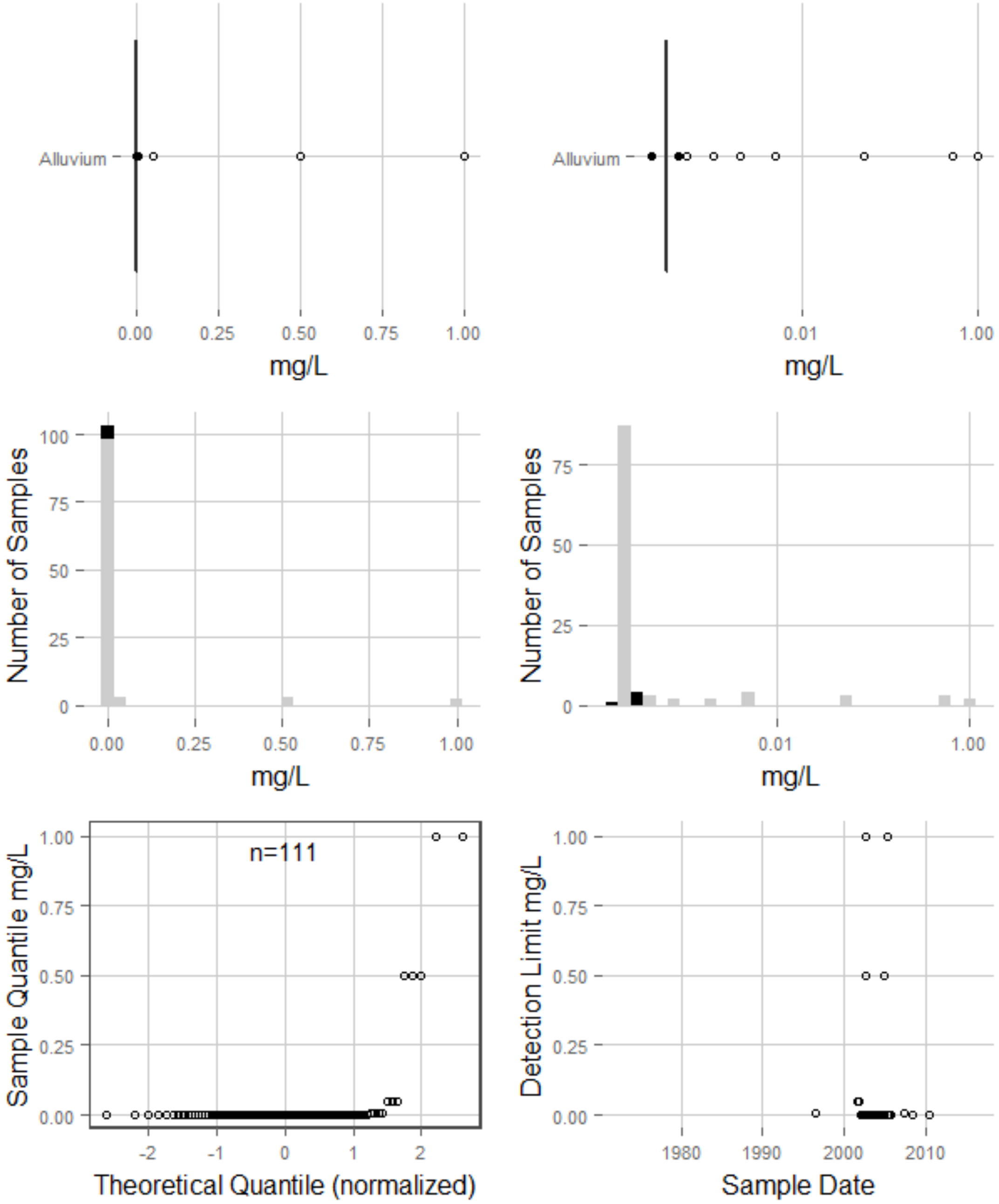
TDS
McKay Coal



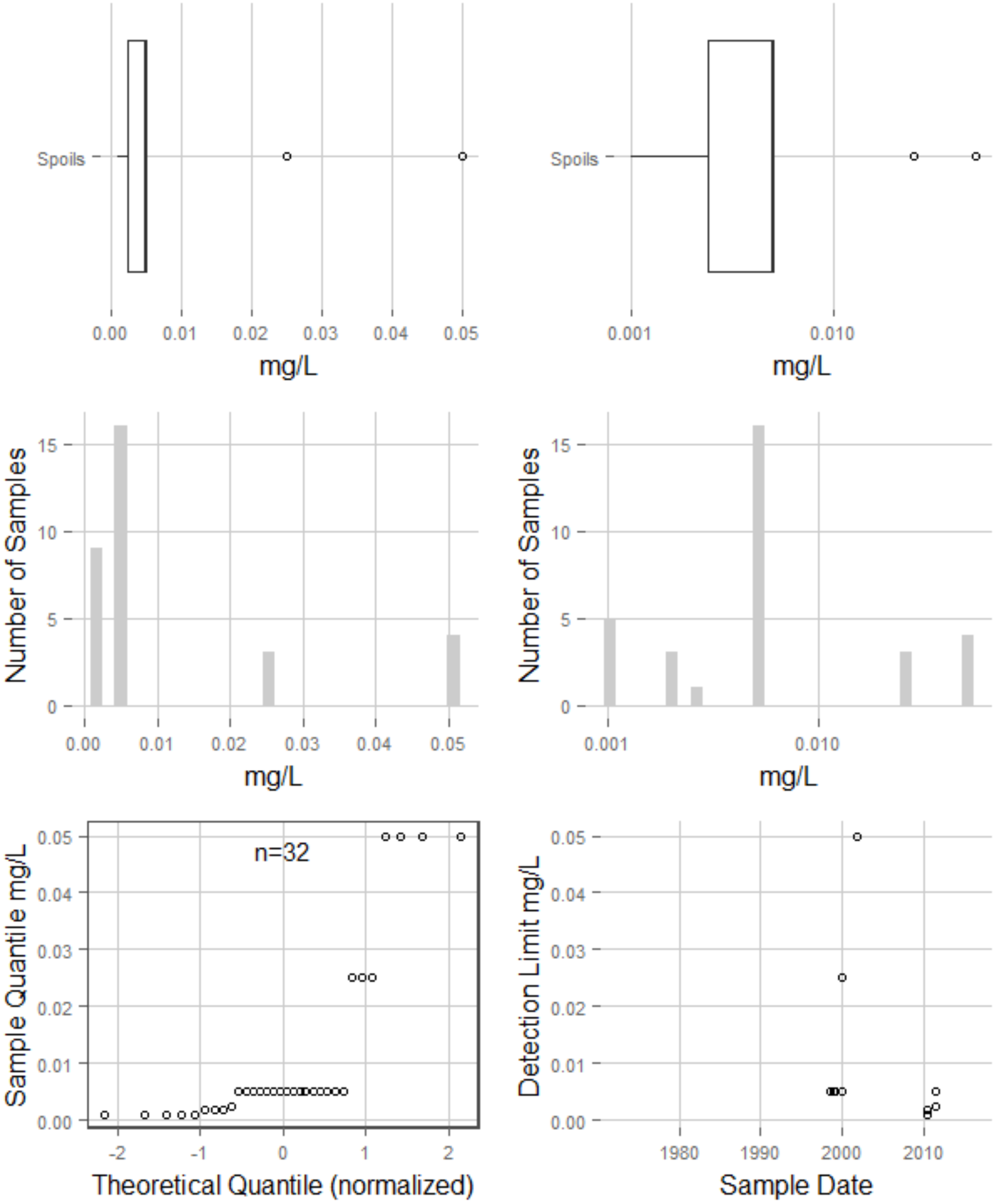
TDS
SubMcKay



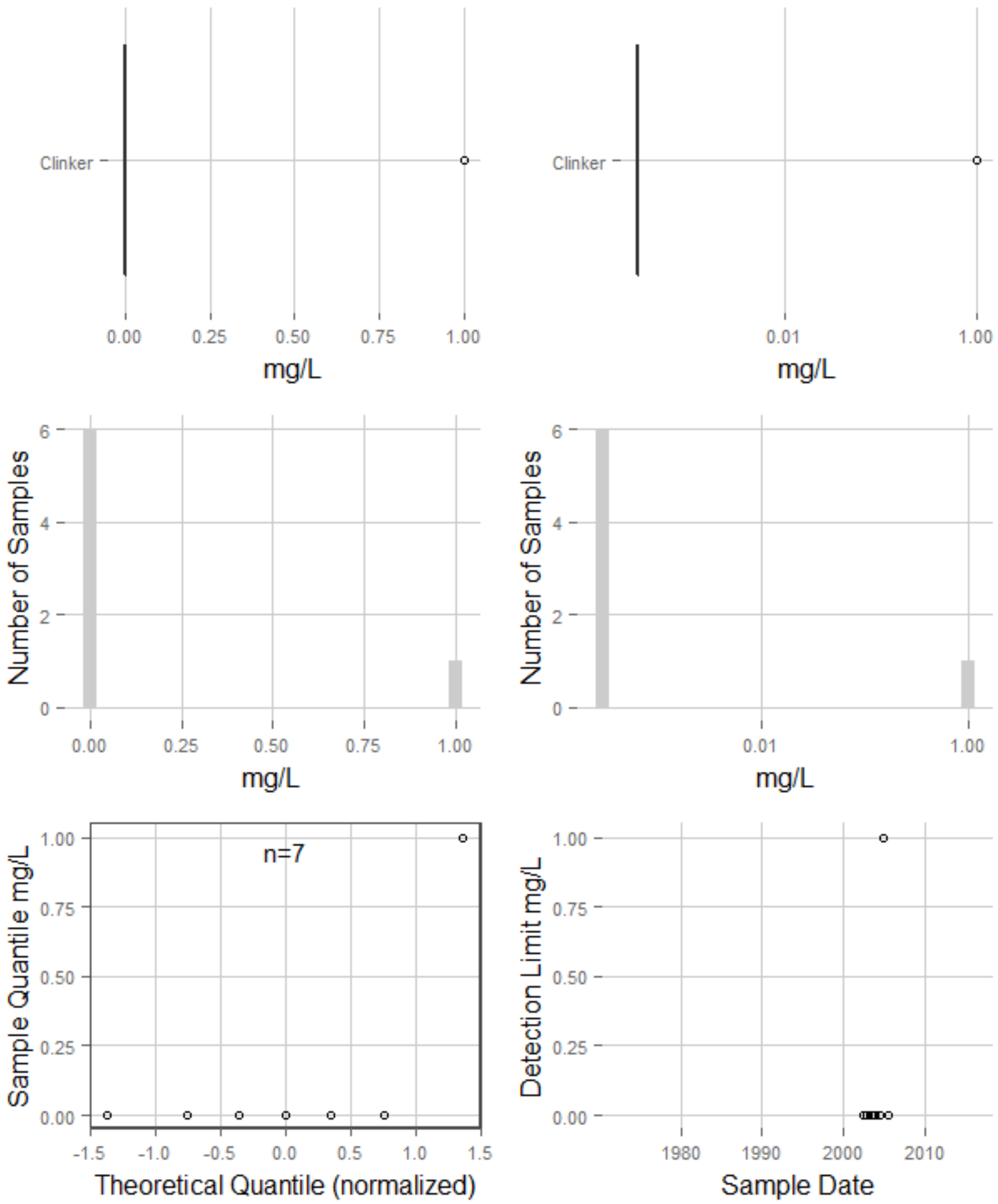
Thallium
Alluvium



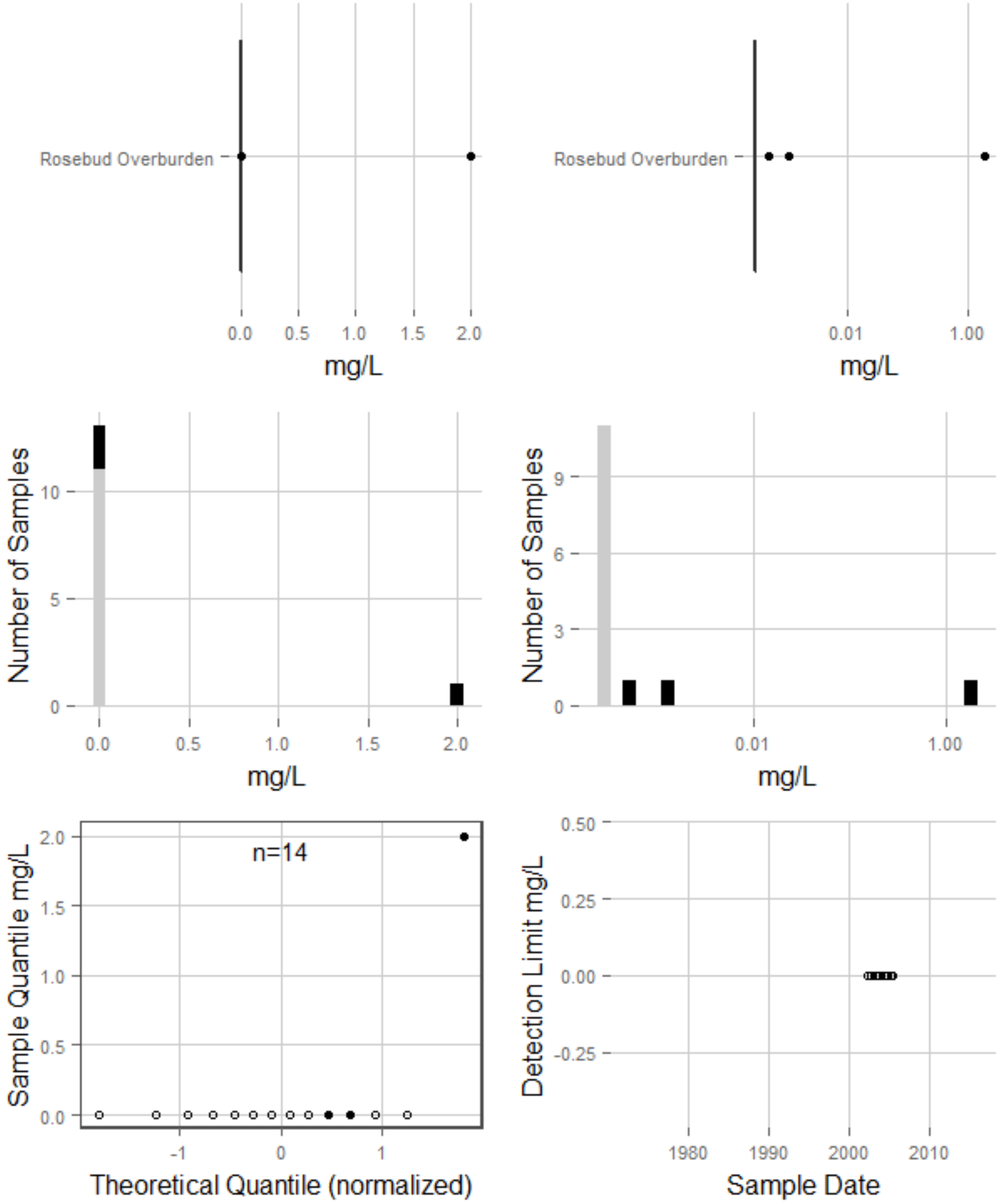
Thallium
Spoils



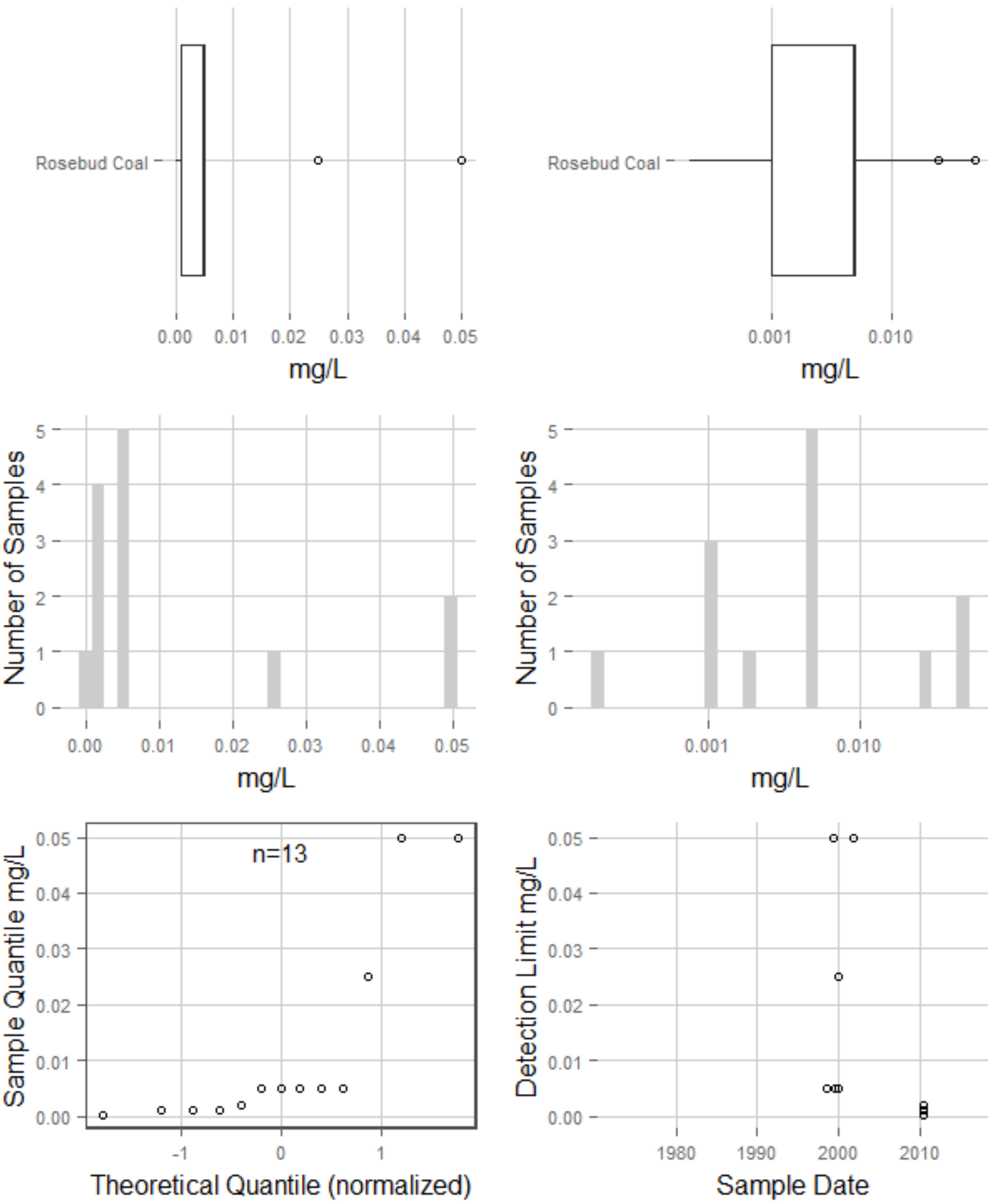
Thallium
Clinker



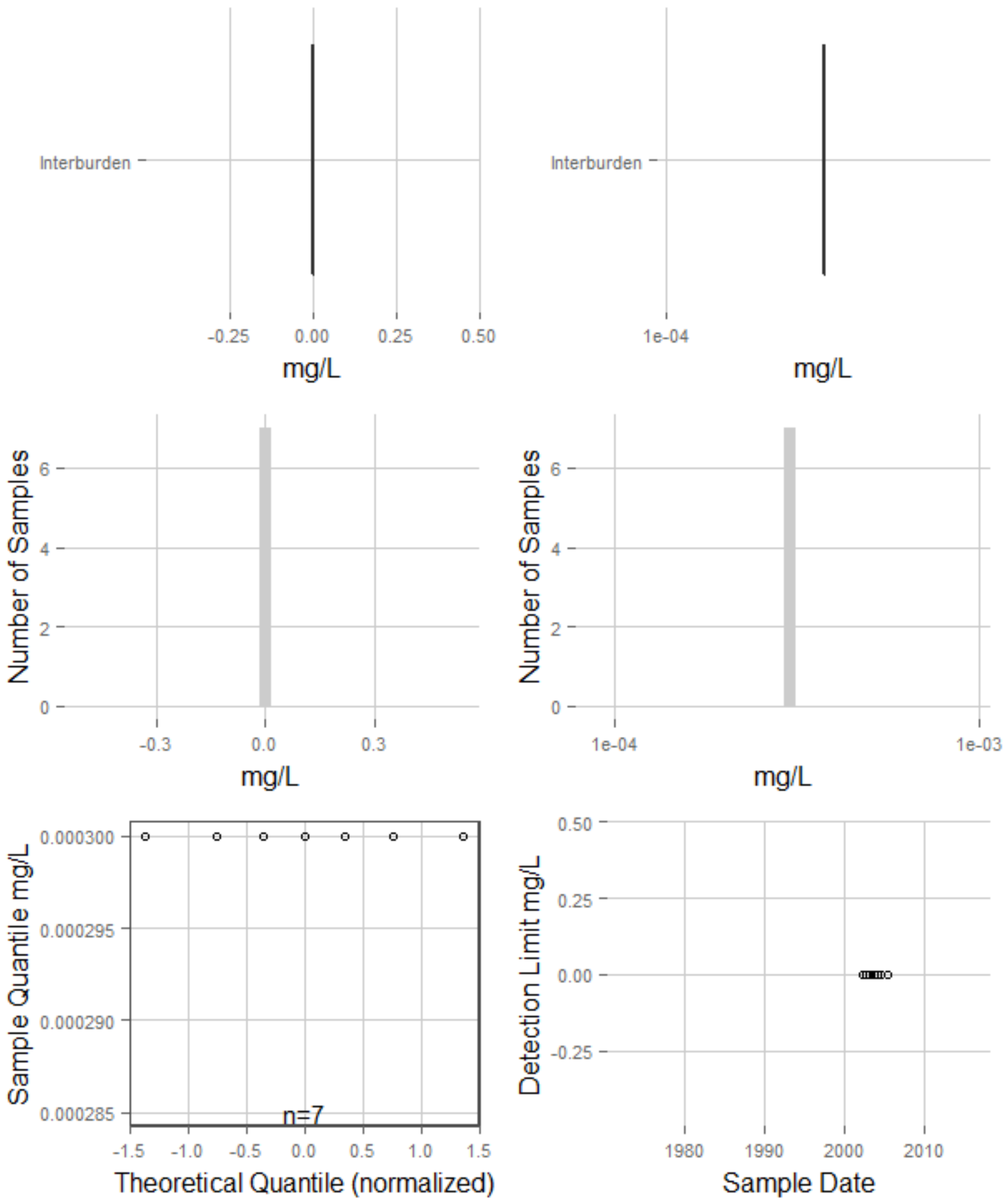
Thallium
Rosebud Overburden



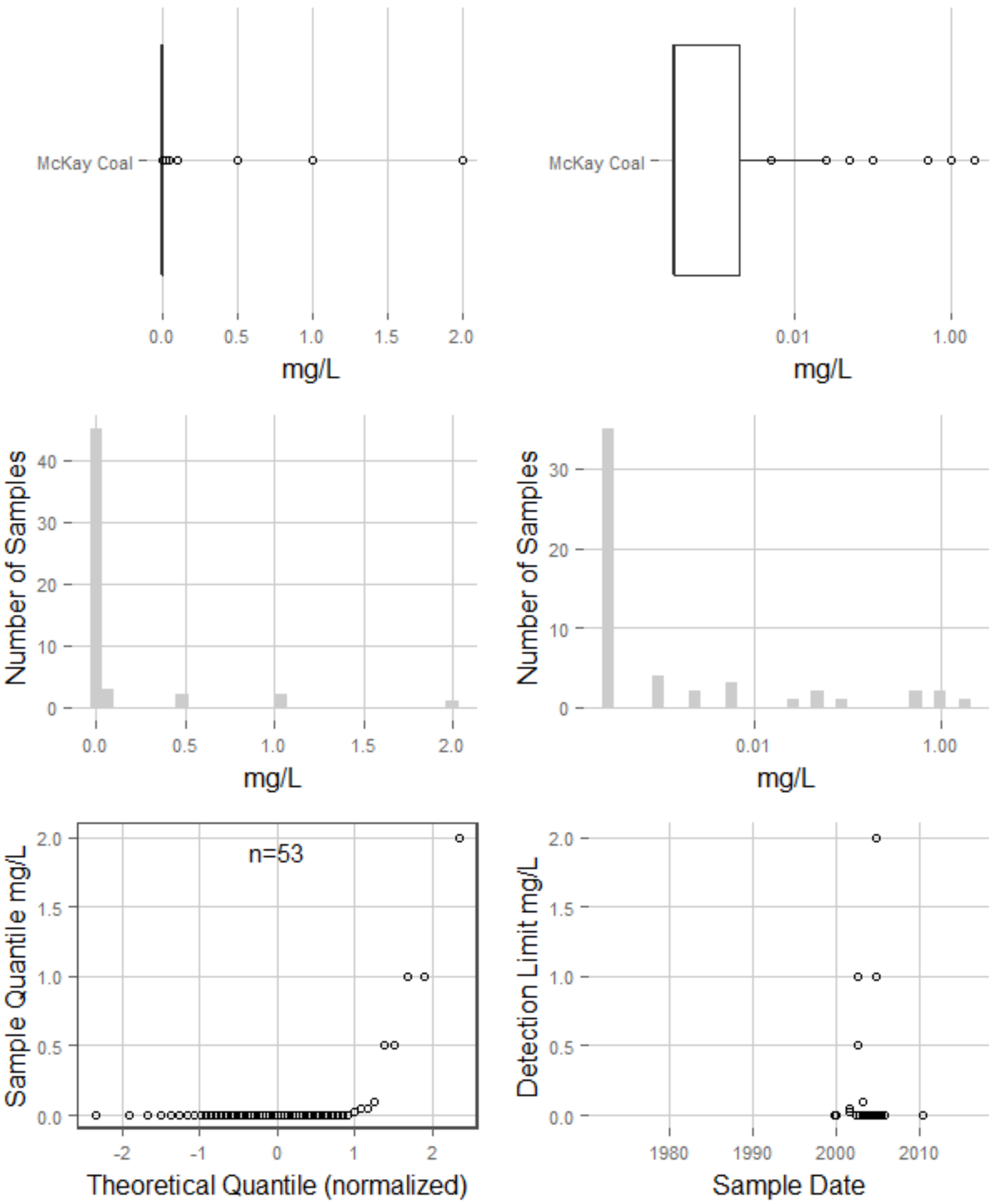
Thallium
Rosebud Coal



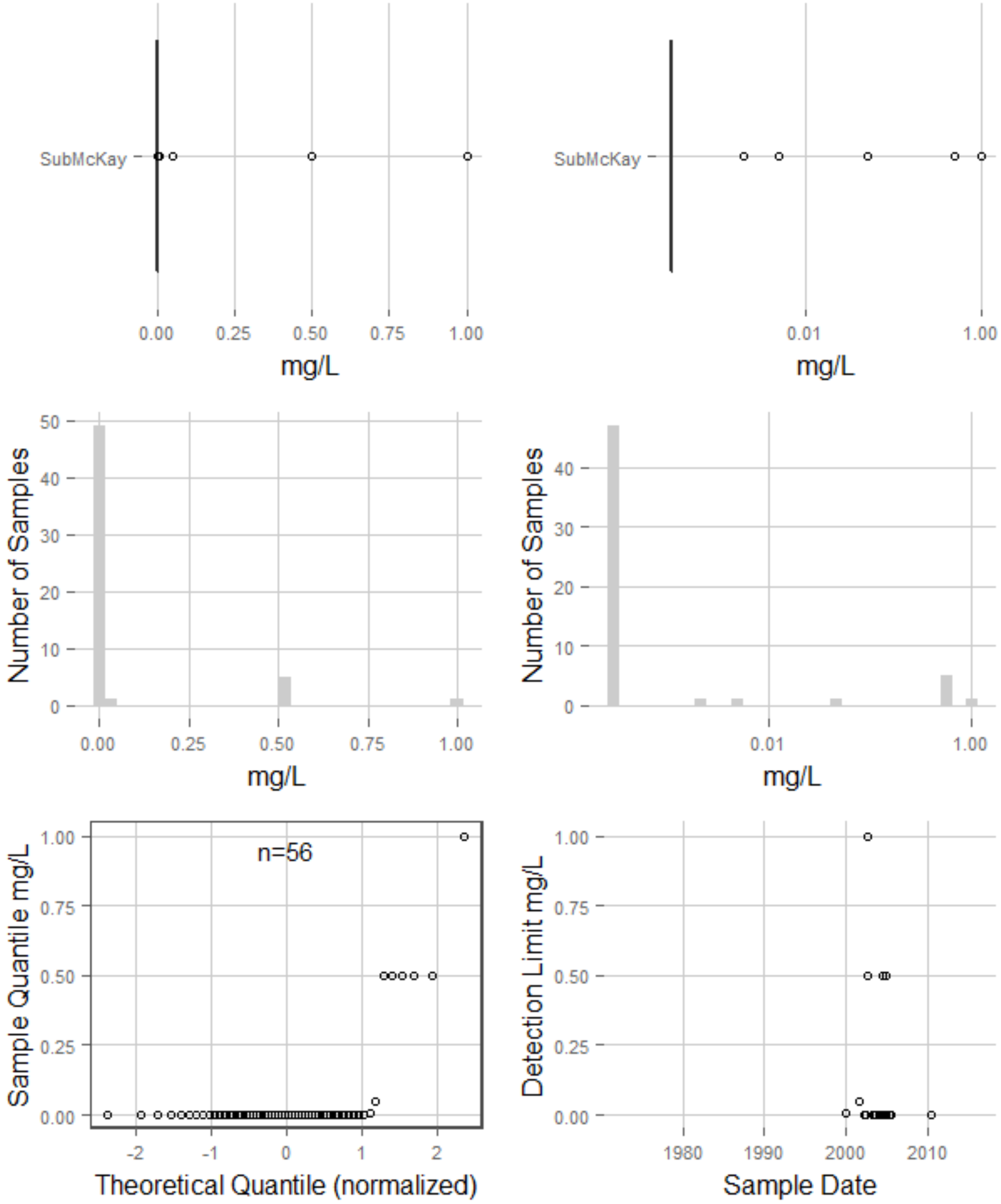
Thallium
Interburden



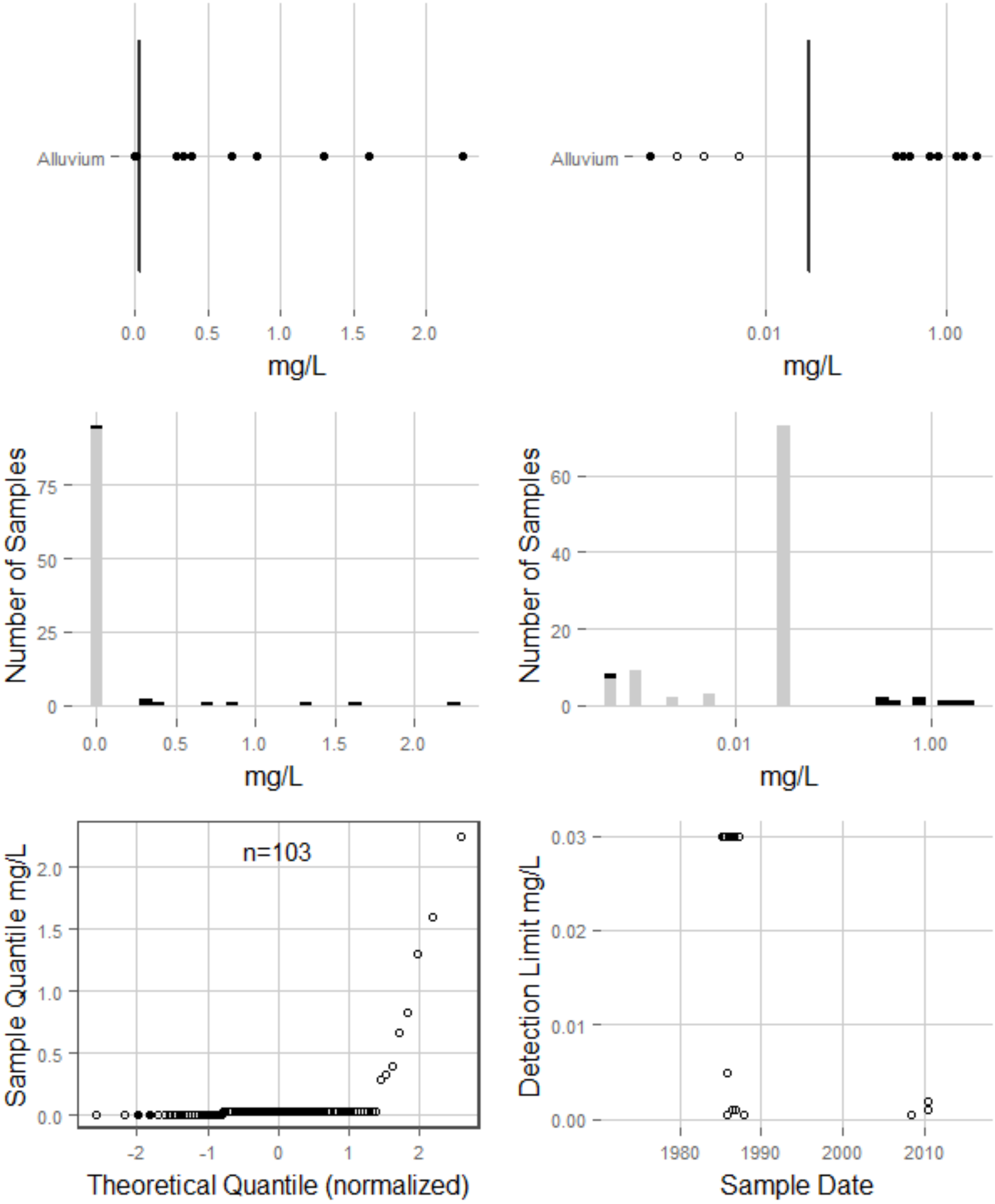
Thallium
McKay Coal



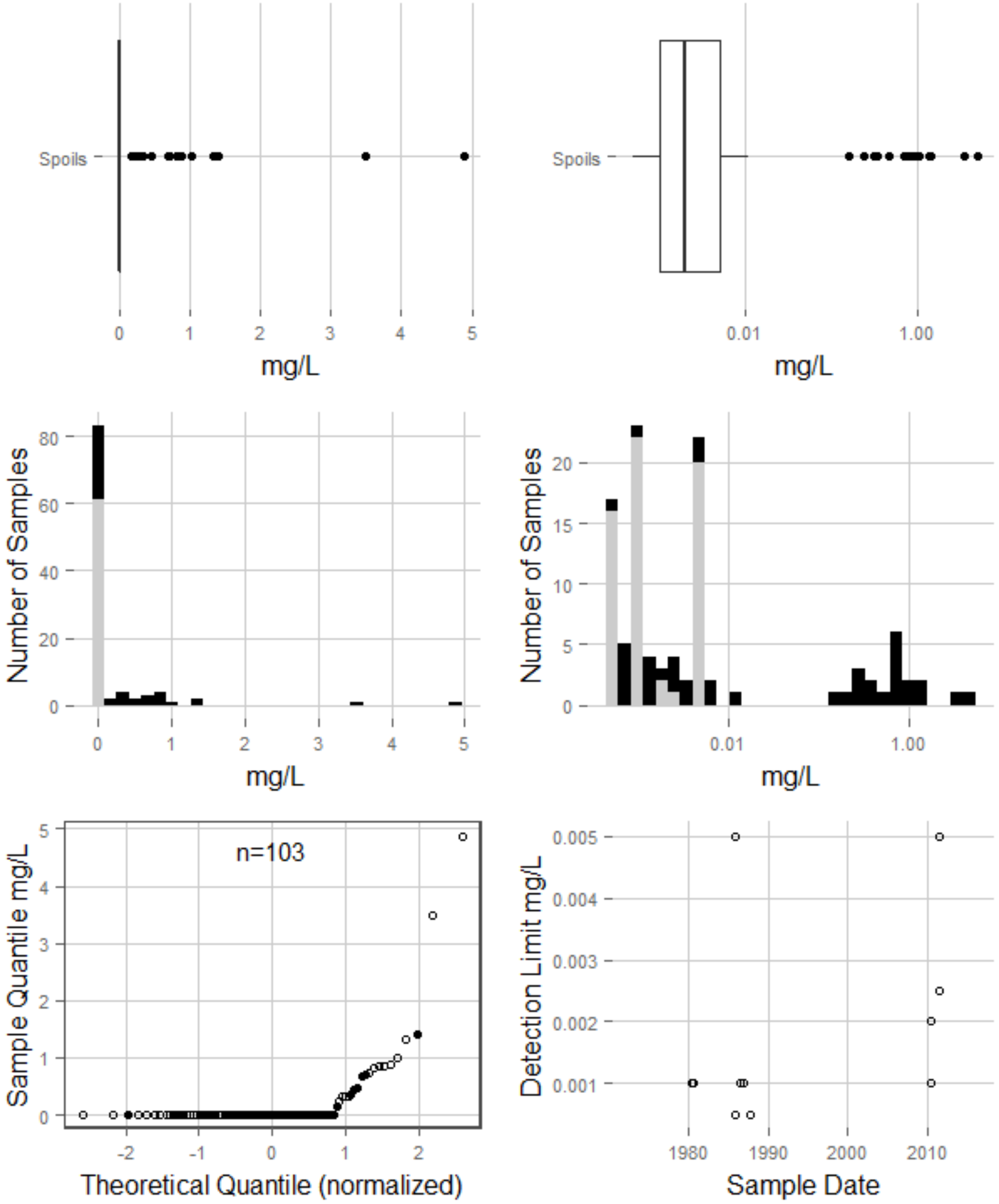
Thallium
SubMcKay



Tin
Alluvium

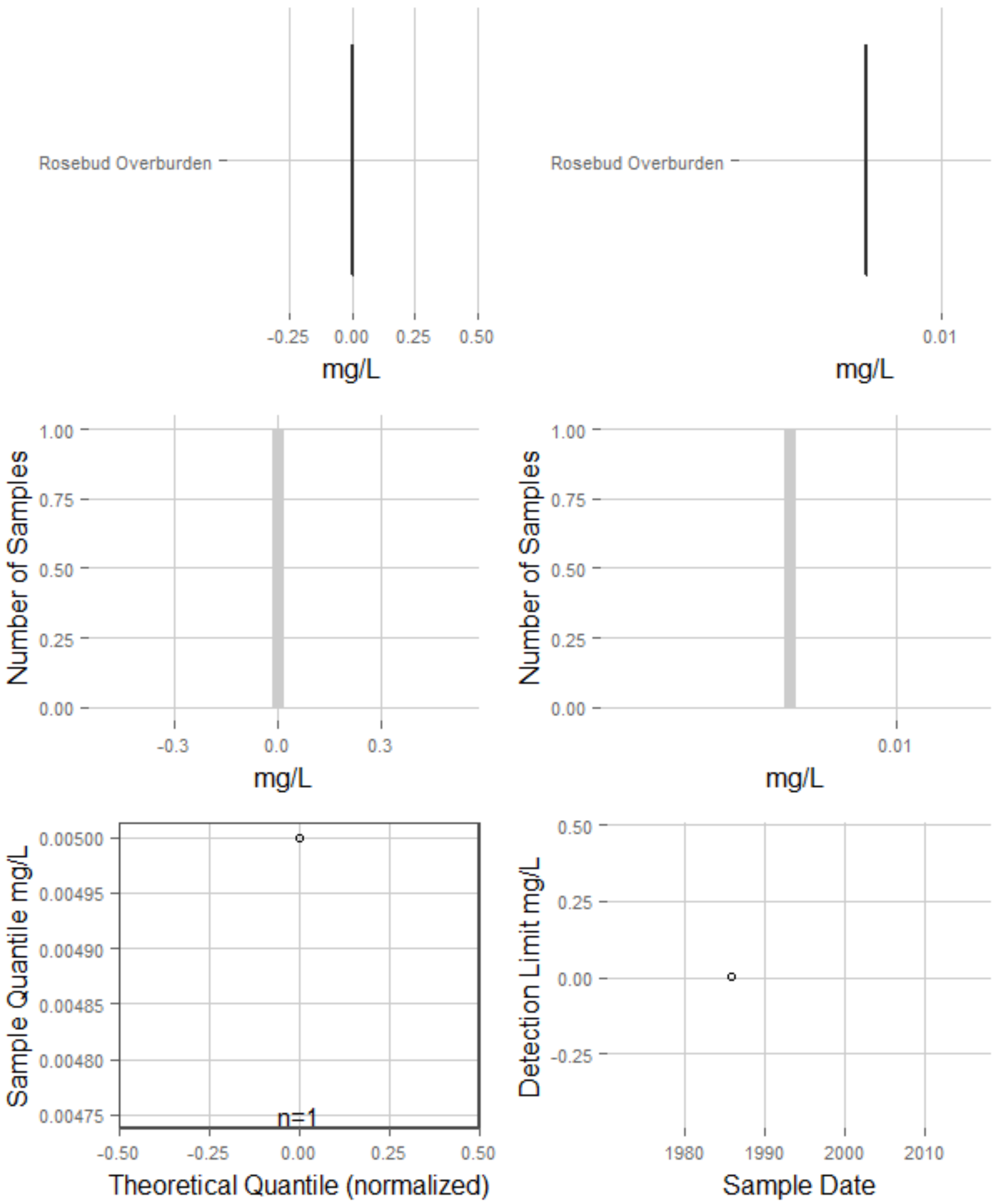


Tin
Spoils

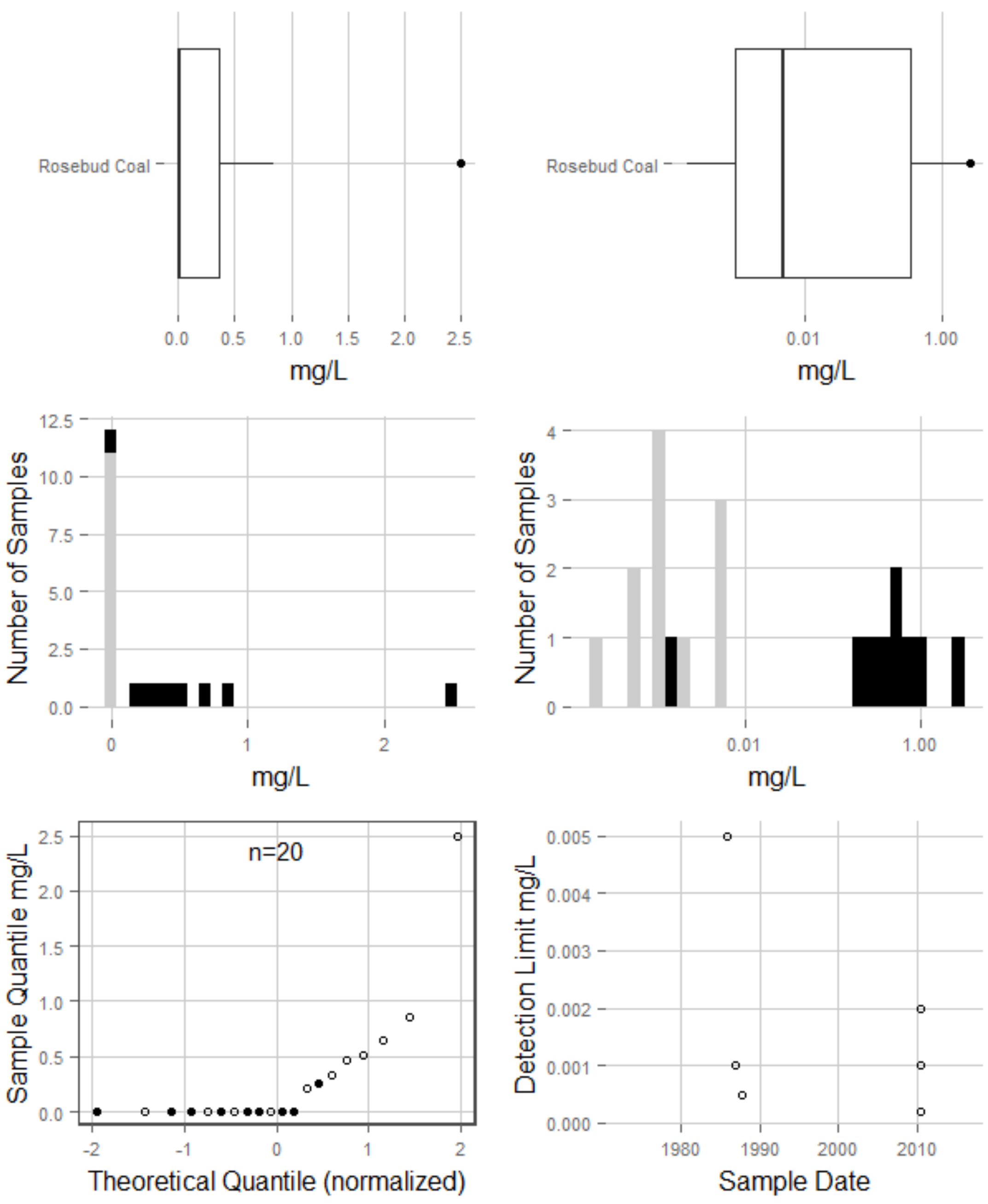

Spoils
0
1
2
3
4
5
mg/L
Spoils
0.01
1.00
mg/L
Number of Samples
80
60
40
20
0
0
1
2
3
4
5
mg/L
Number of Samples
20
15
10
5
0
0.01
1.00
mg/L
Sample Quantile mg/L
5
4
3
2
1
0
n=103
-2
-1
0
1
2
Theoretical Quantile (normalized)
Detection Limit mg/L
0.005
0.004
0.003
0.002
0.001
1980
1990
2000
2010
Sample Date

Tin
Clinker
No data

Tin
Rosebud Overburden

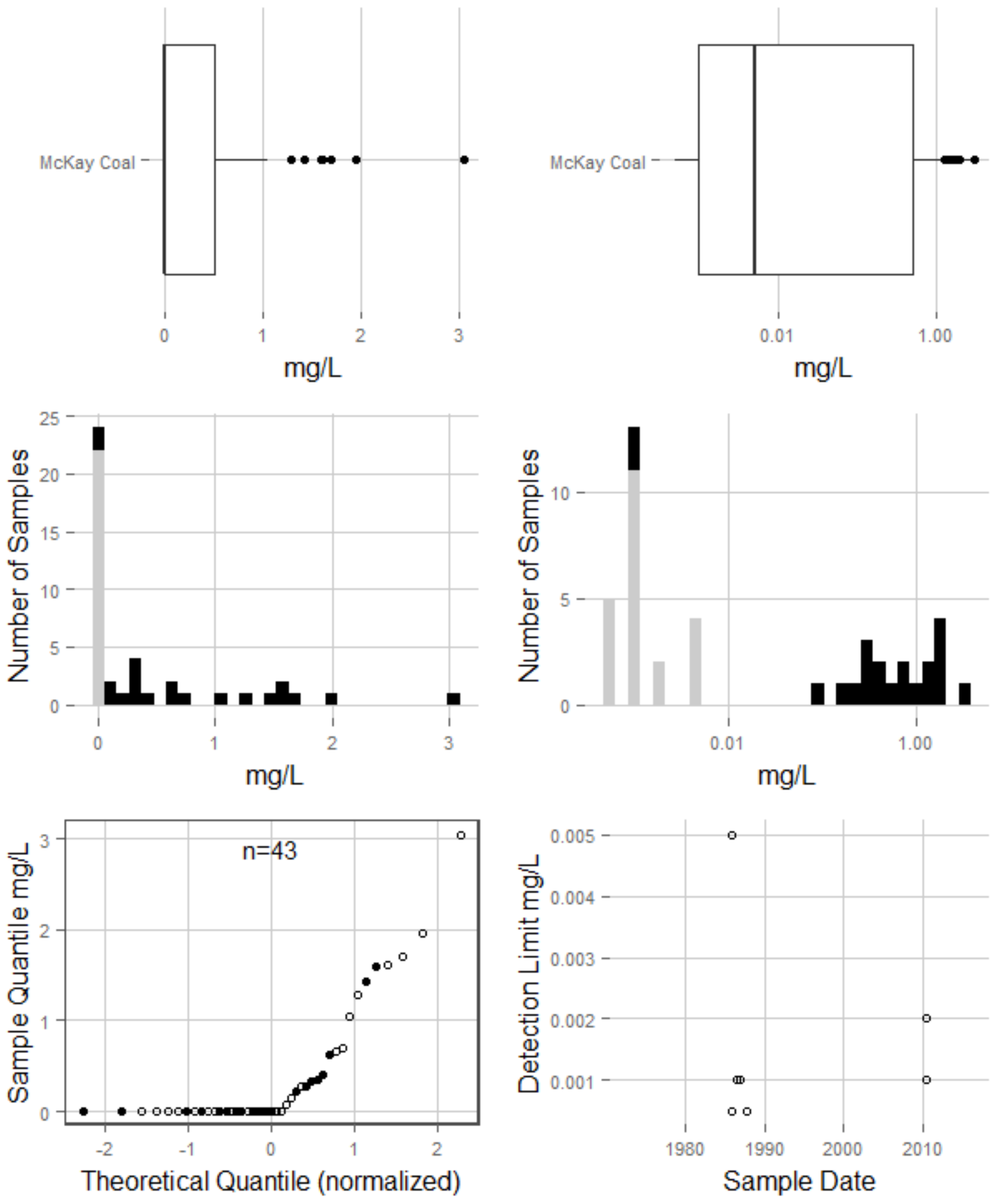


Tin
Rosebud Coal

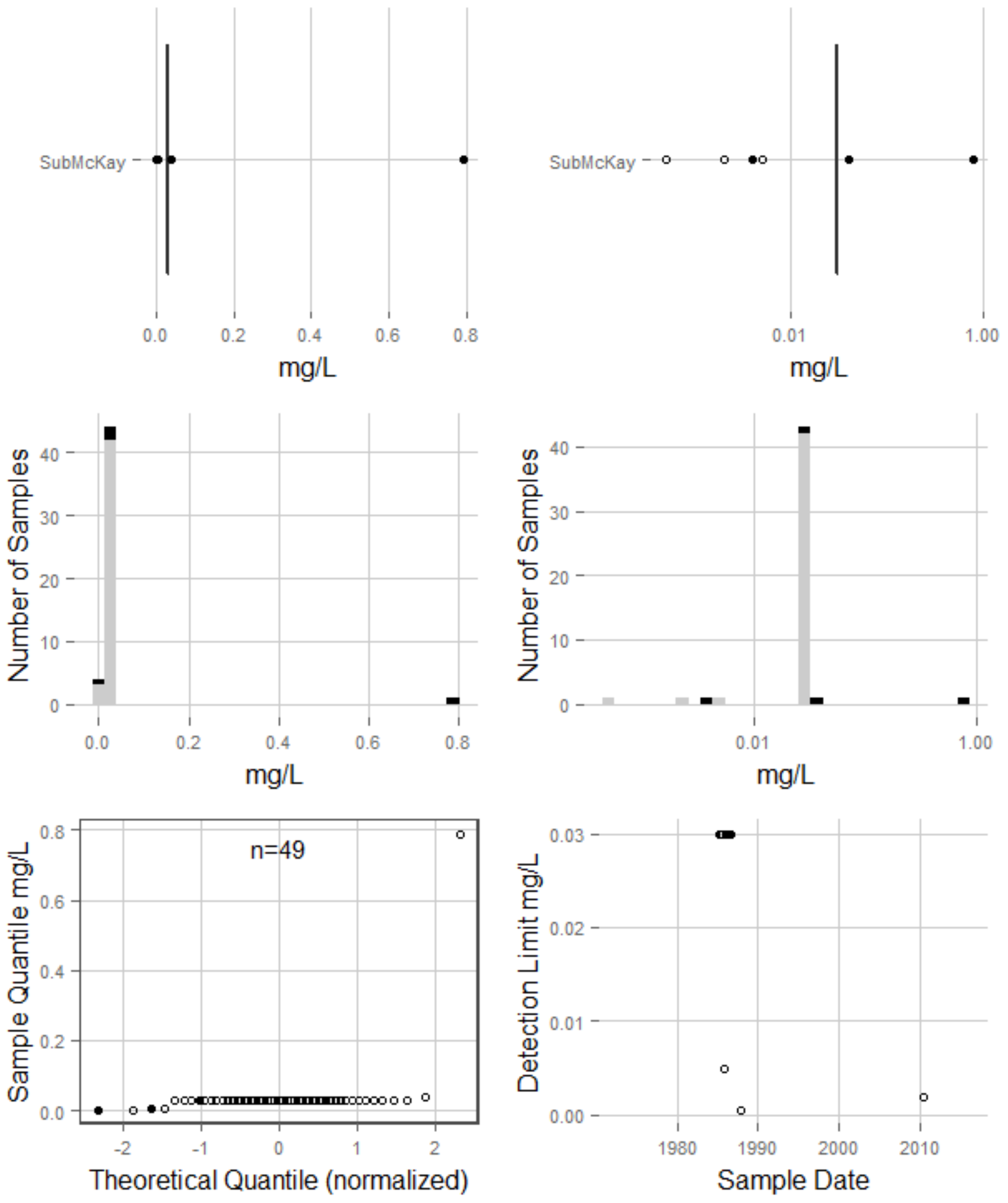


Tin
Interburden
No data

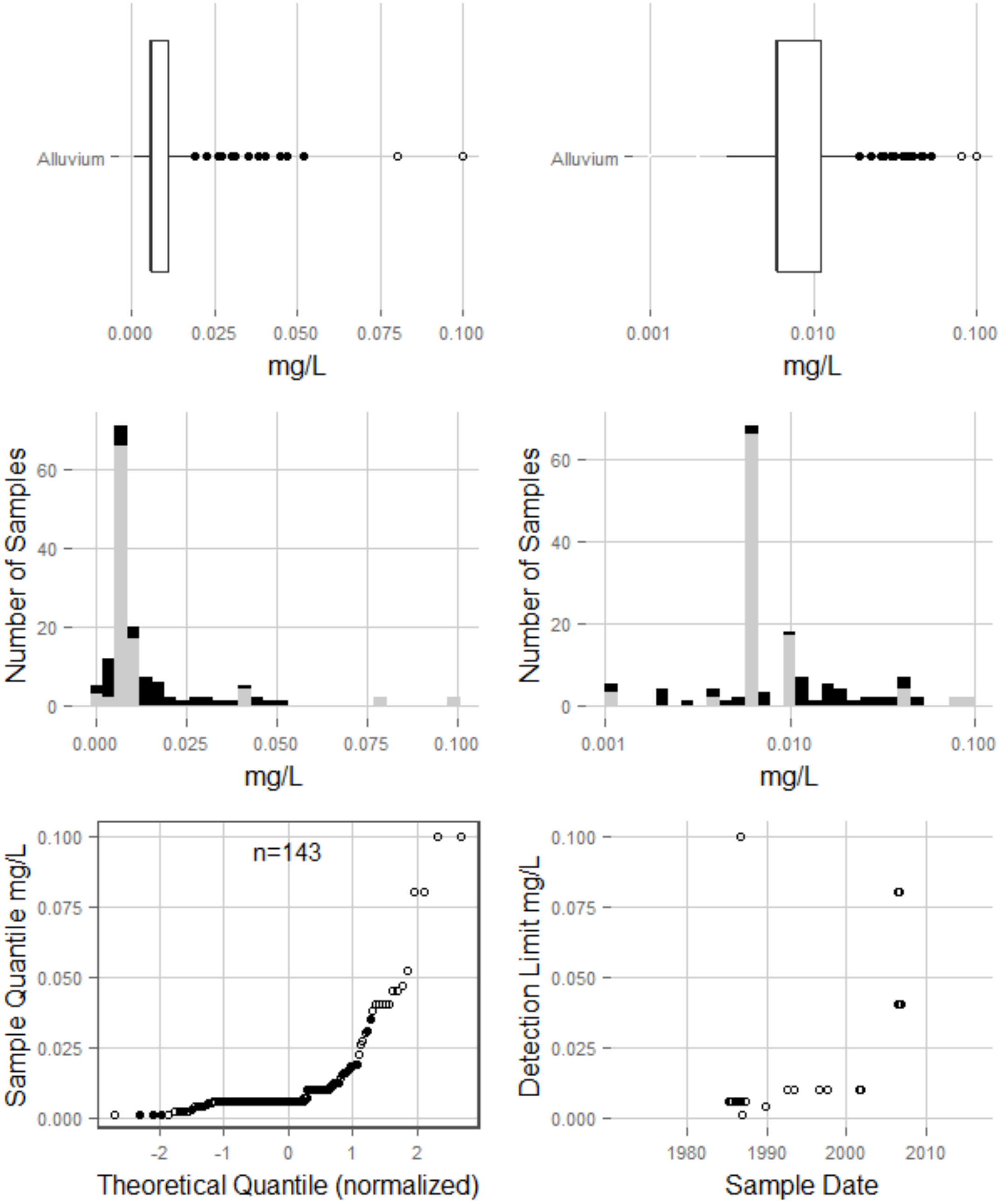
Tin
McKay Coal



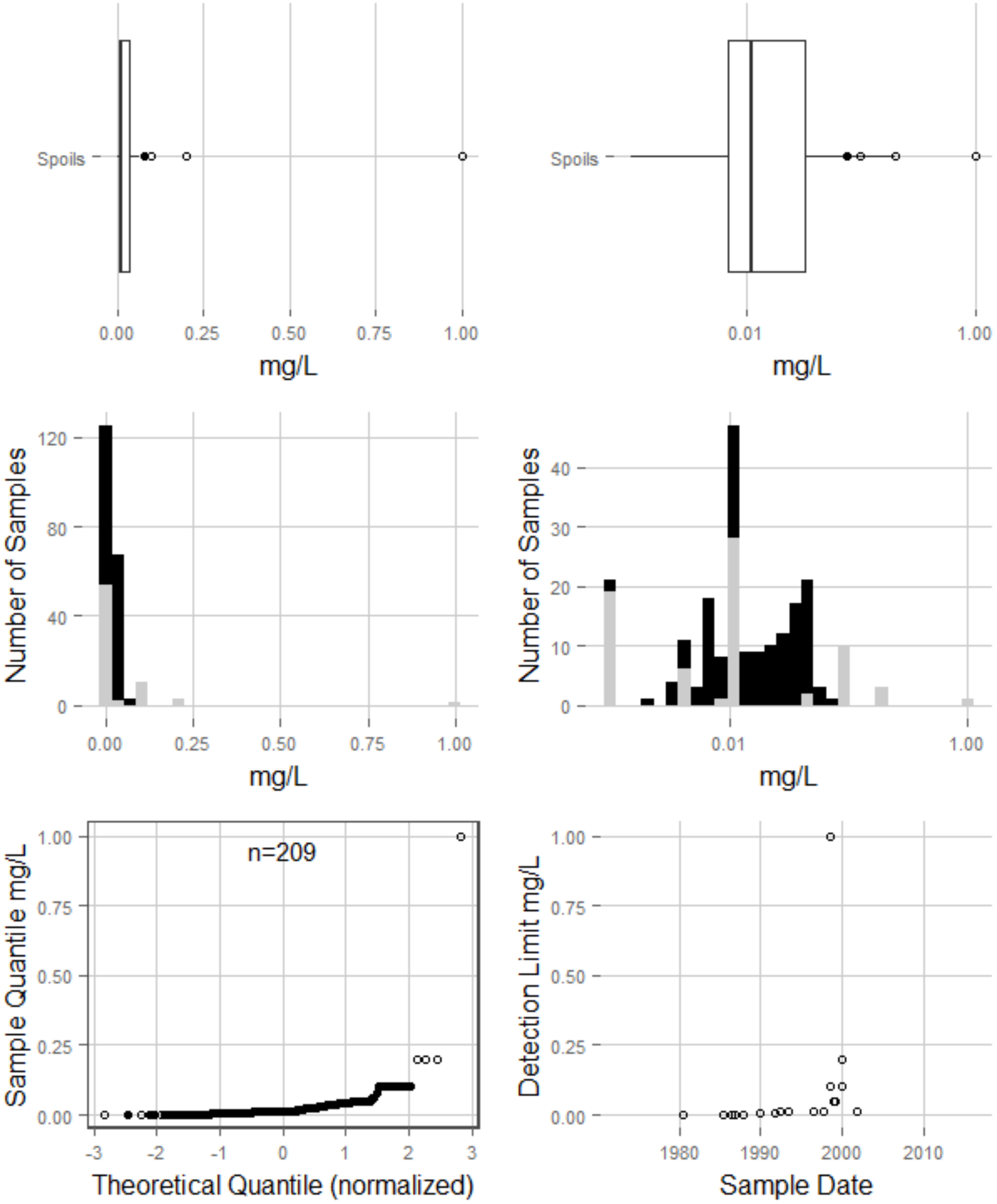
Tin
SubMcKay



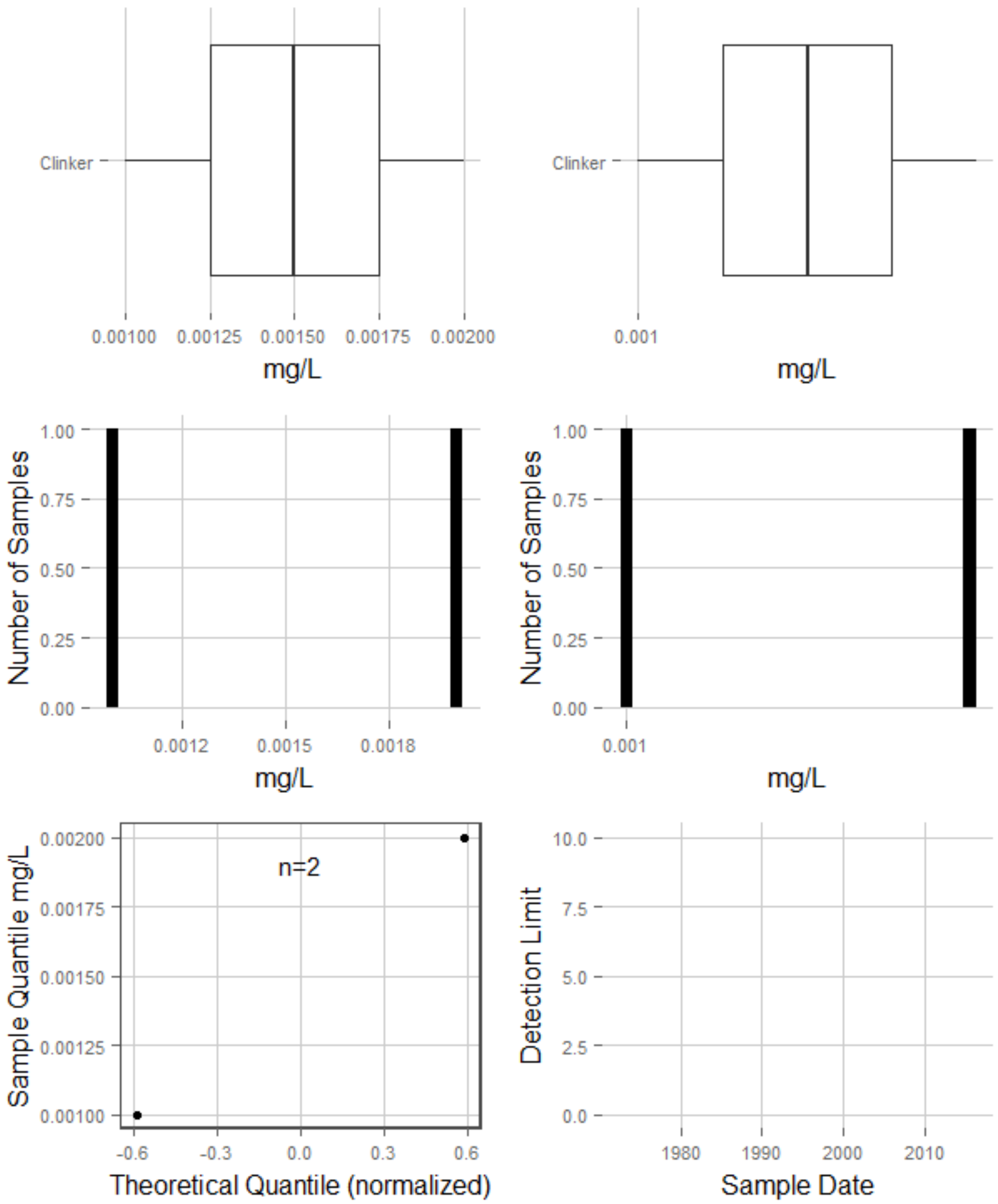
Titanium
Alluvium



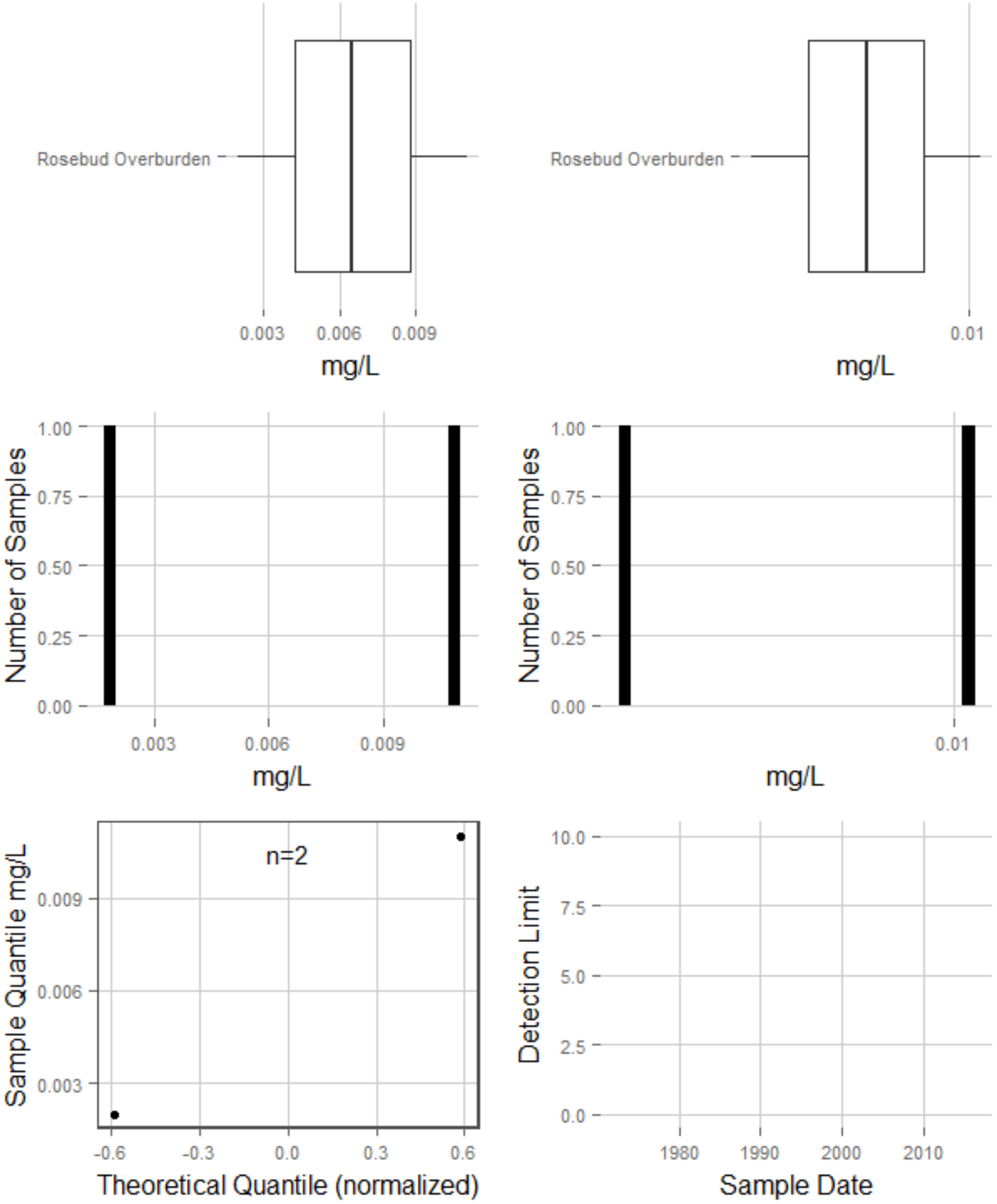
Titanium
Spoils



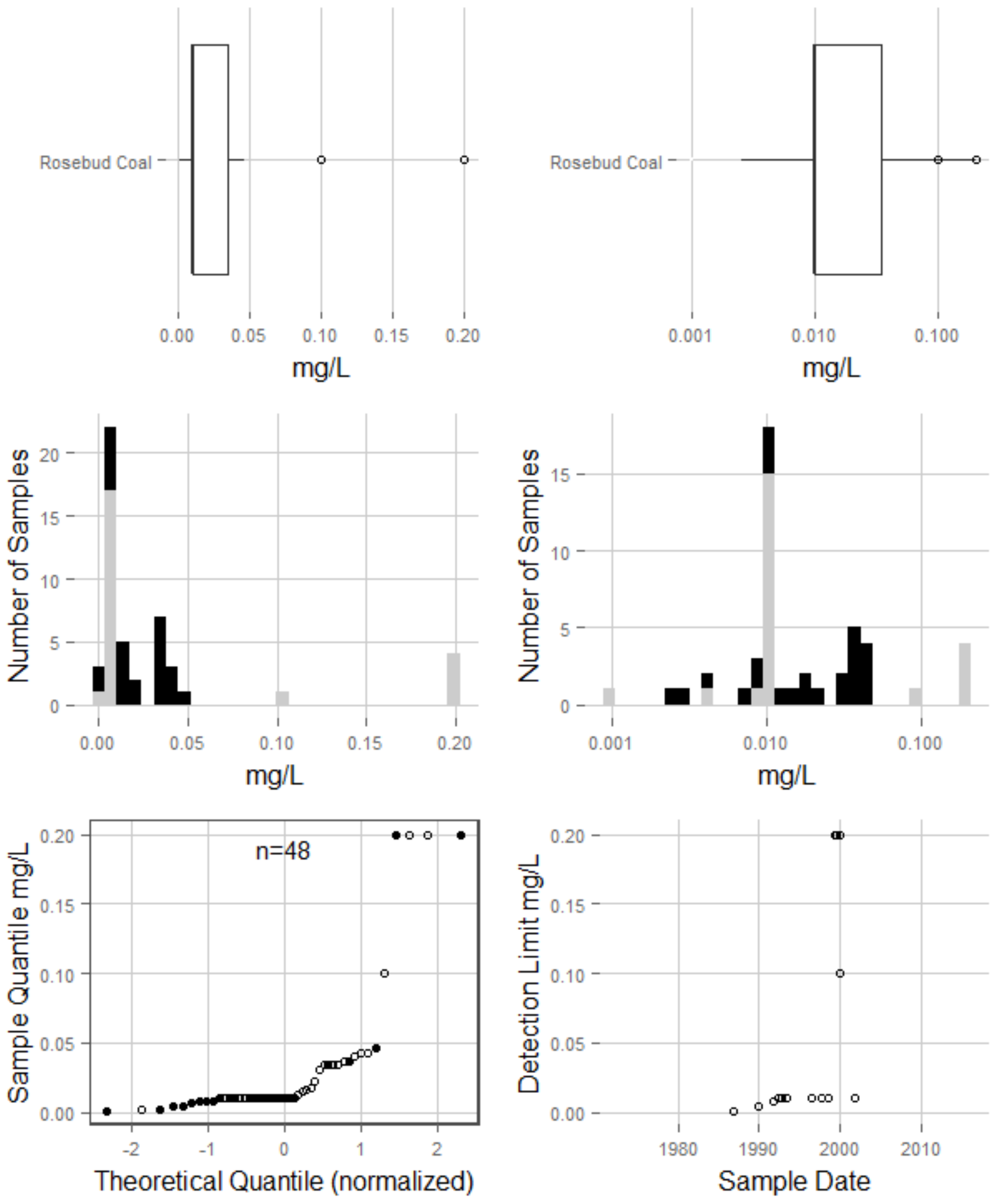
Titanium
Clinker



Titanium
Rosebud Overburden

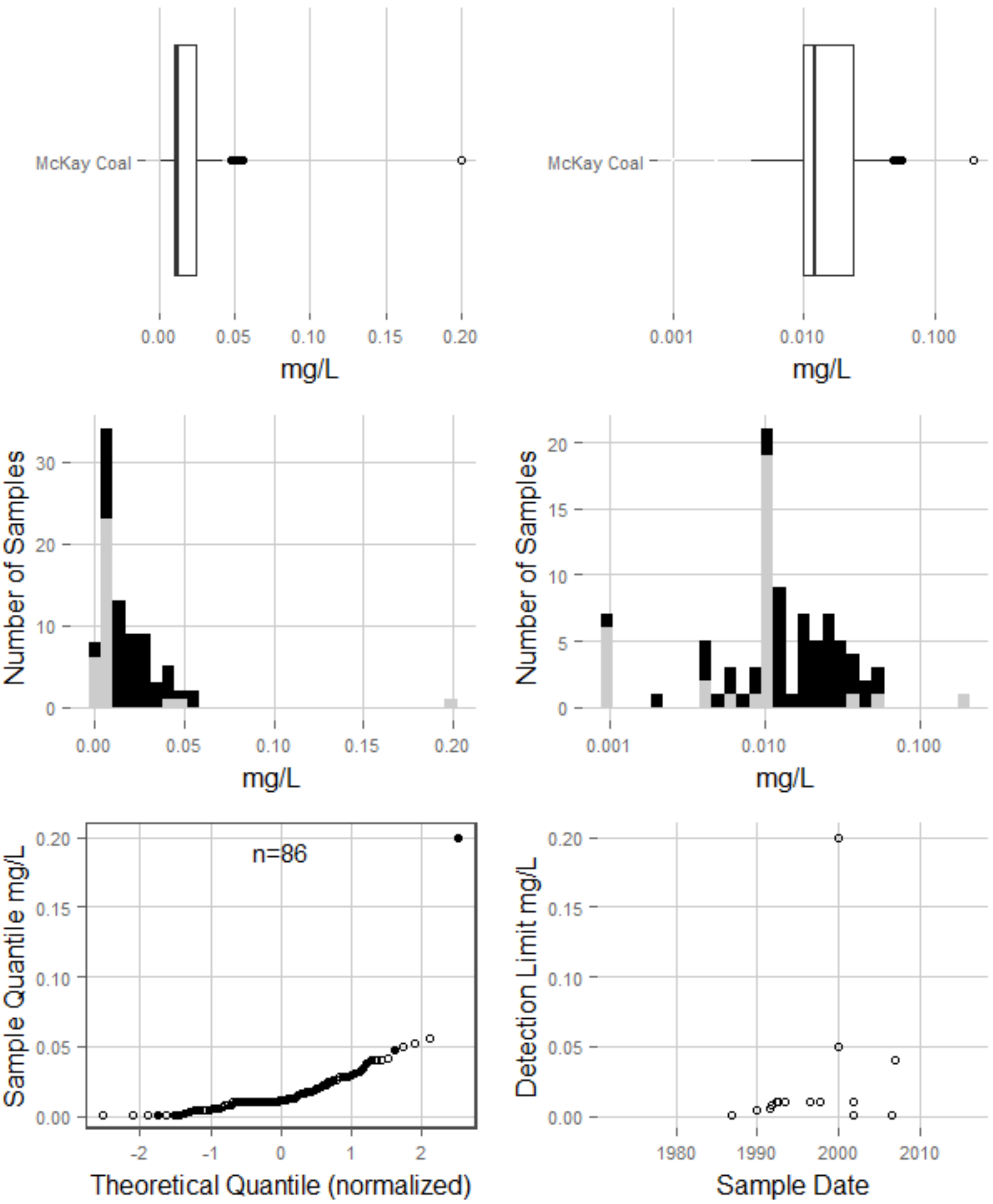


Titanium
Rosebud Coal

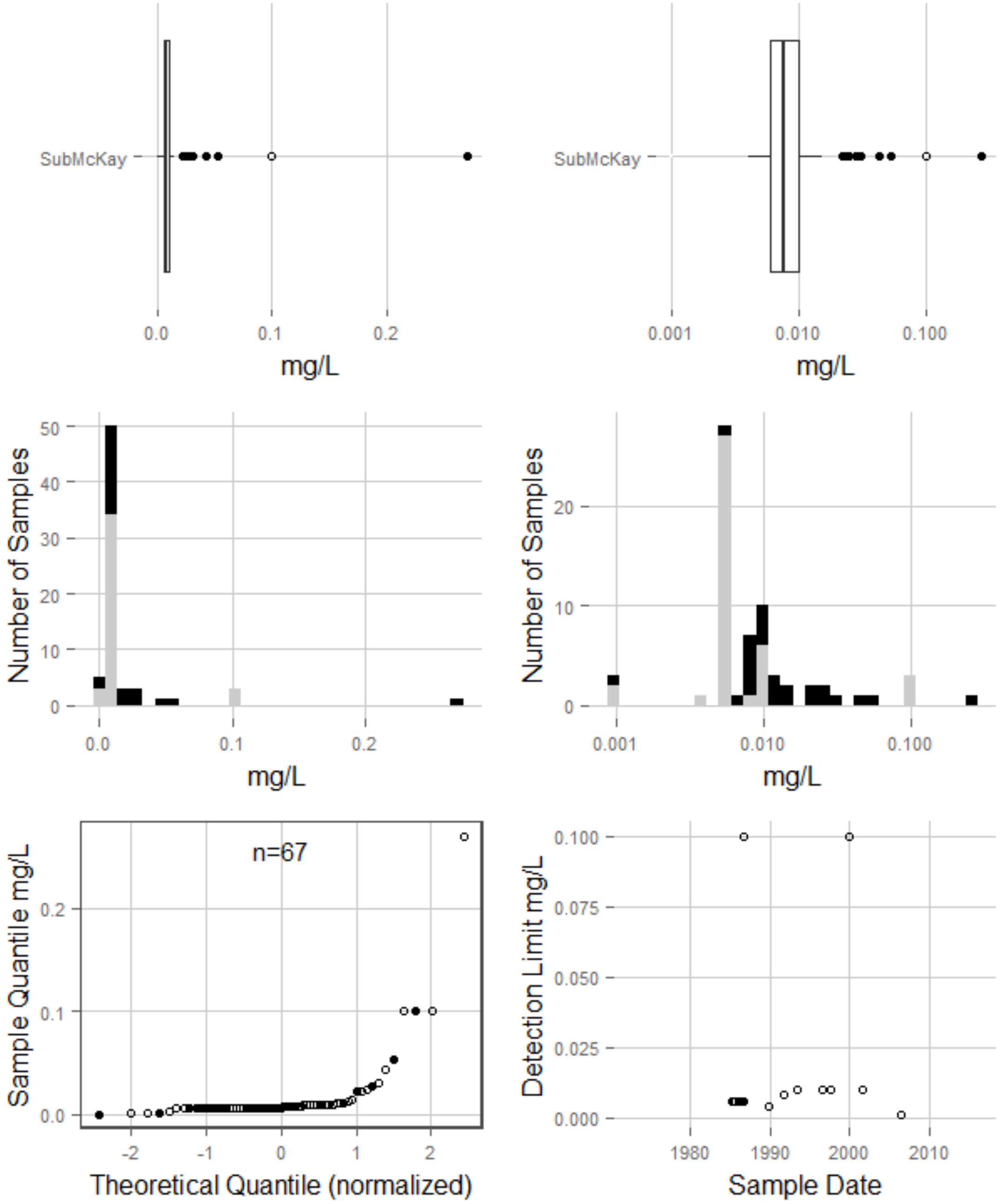


Titanium
Interburden
No data

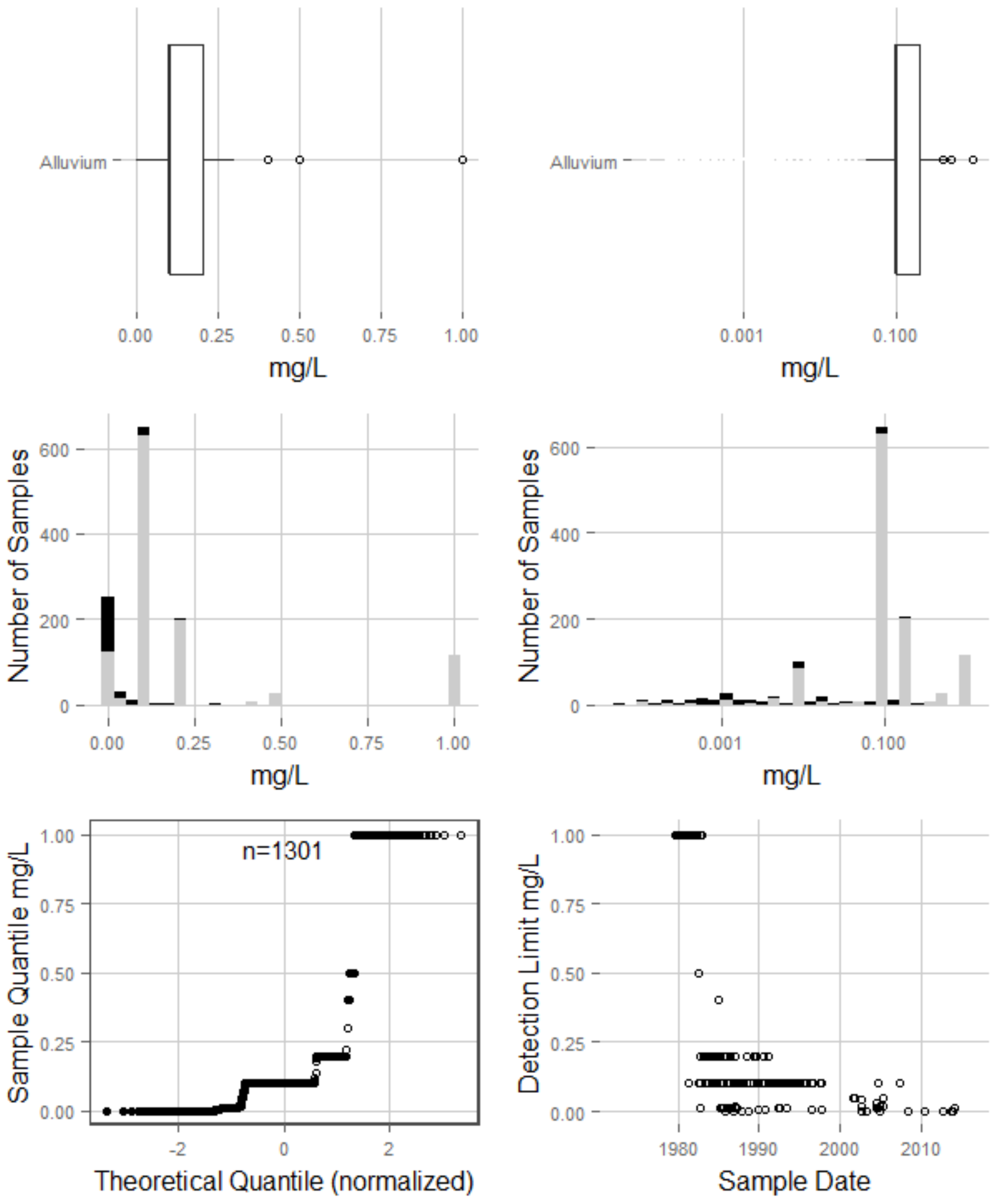
Titanium
McKay Coal



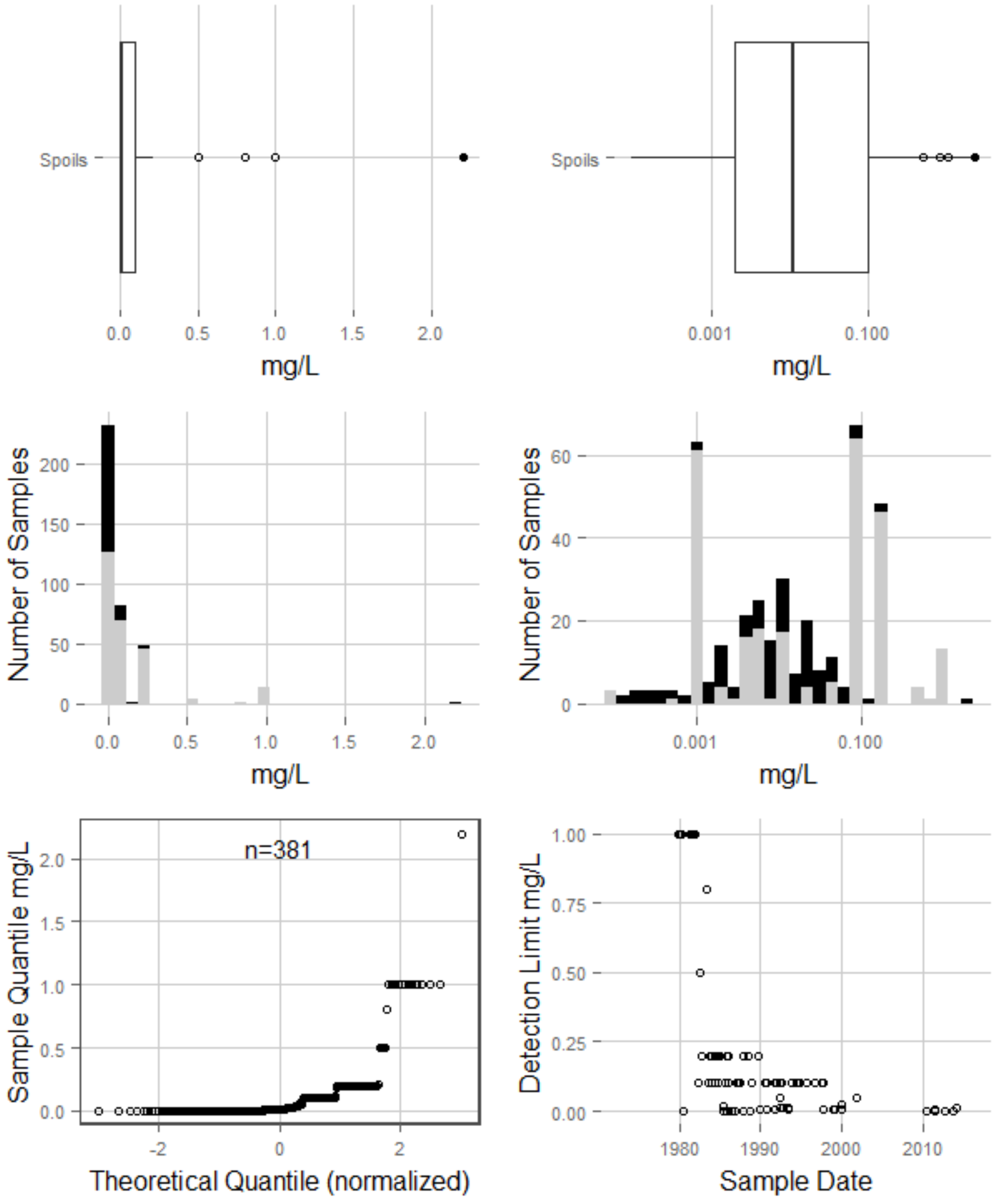
Titanium
SubMcKay



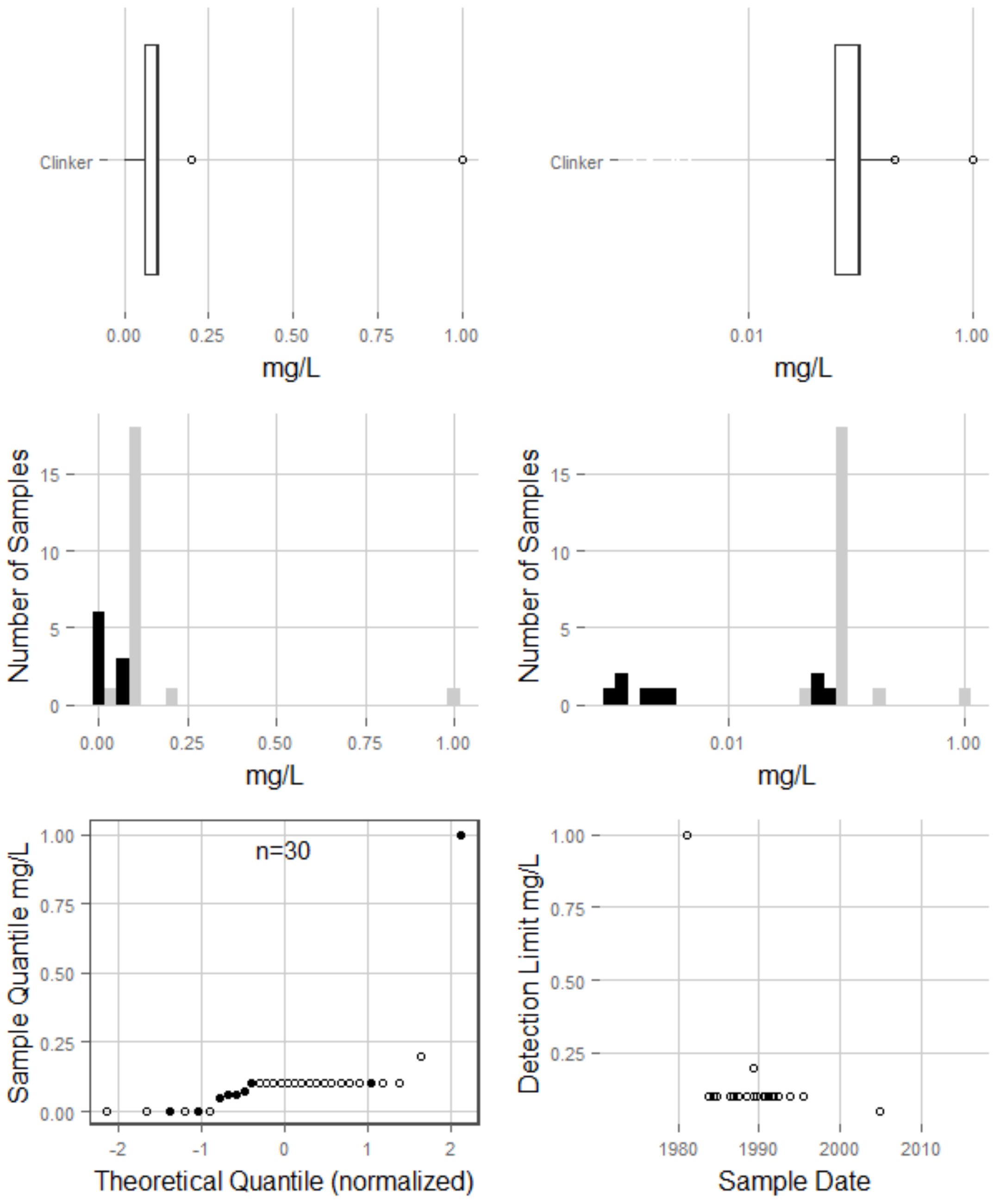
Vanadium
Alluvium



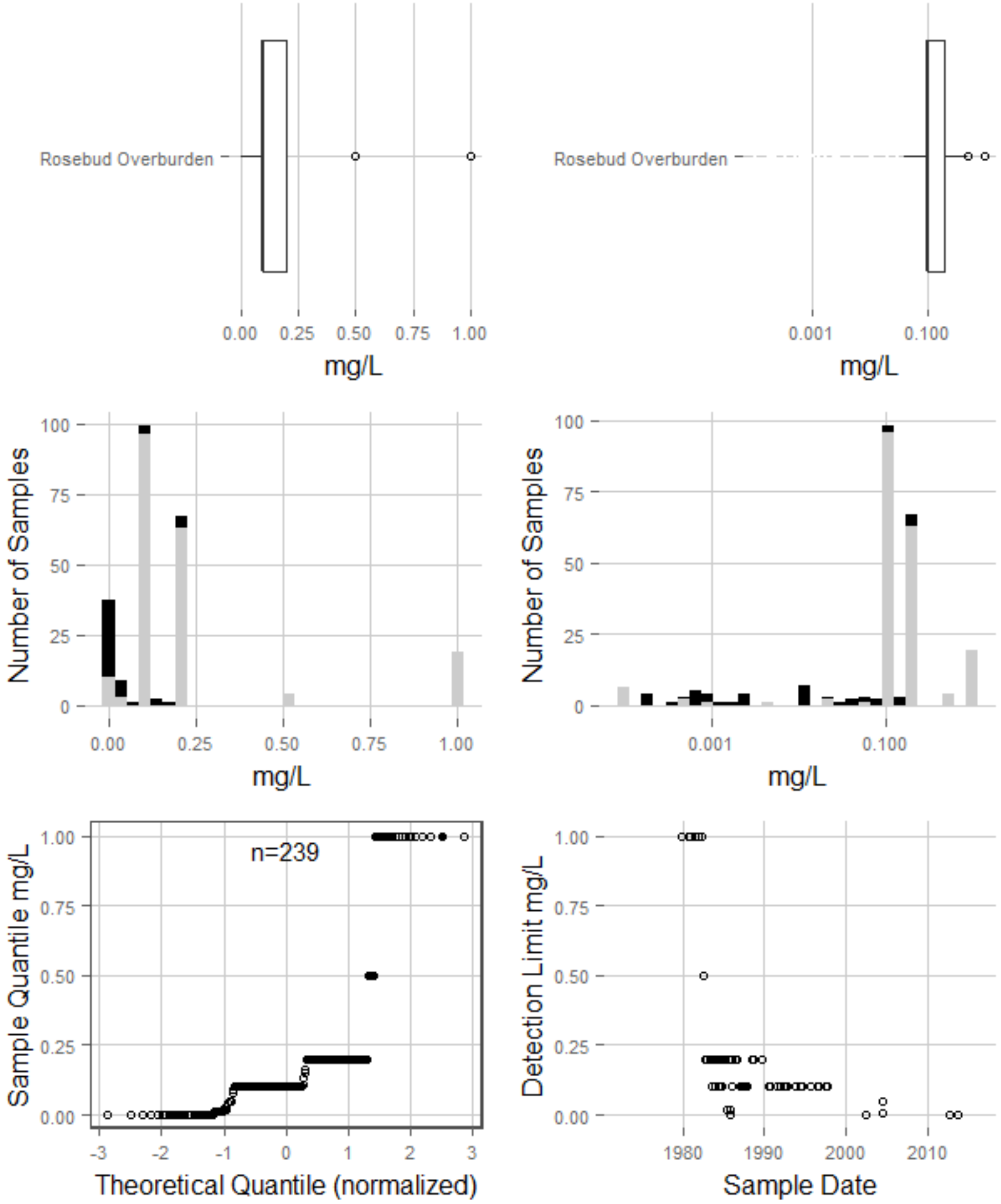
Vanadium
Spoils



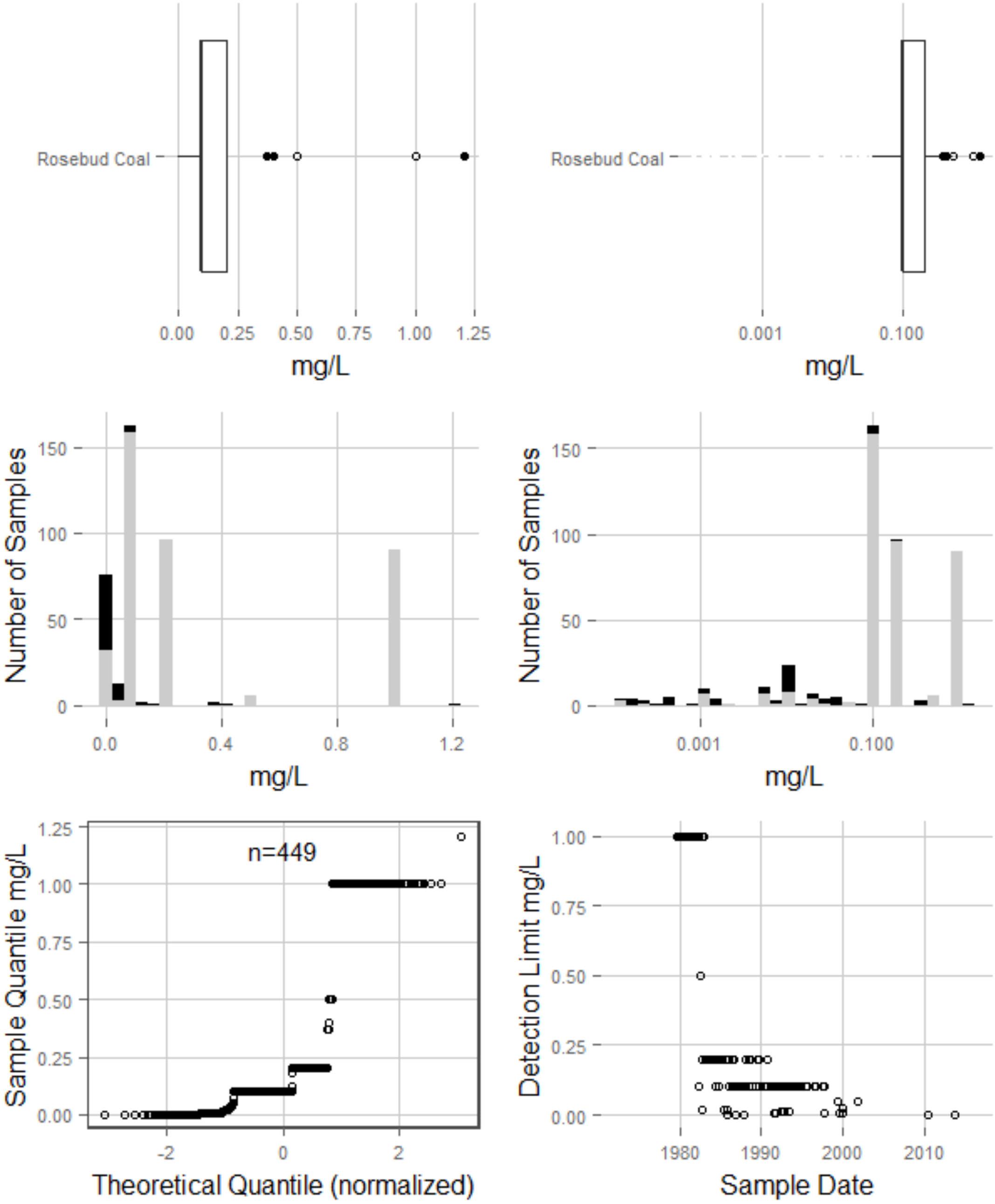
Vanadium
Clinker



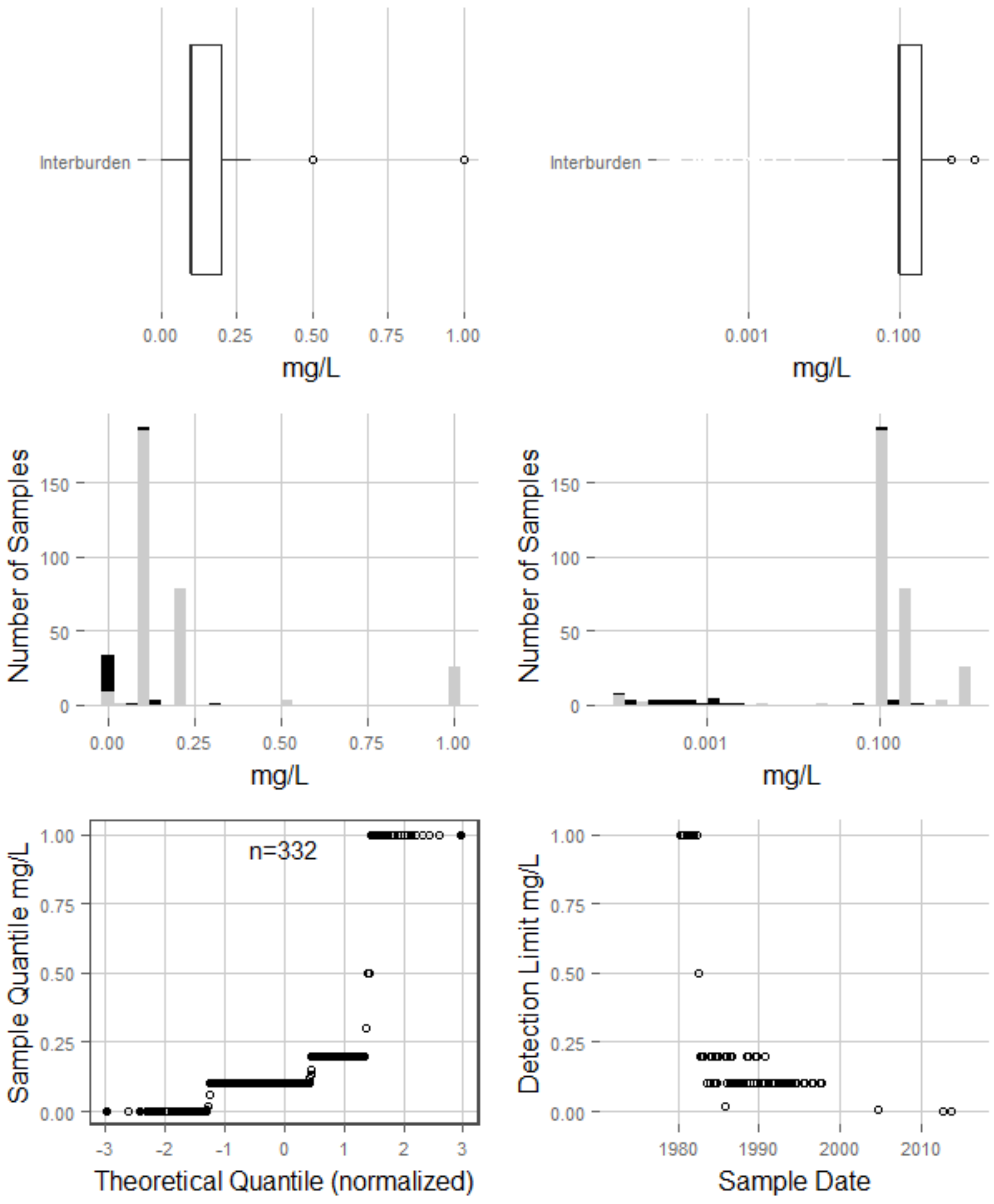
Vanadium
Rosebud Overburden



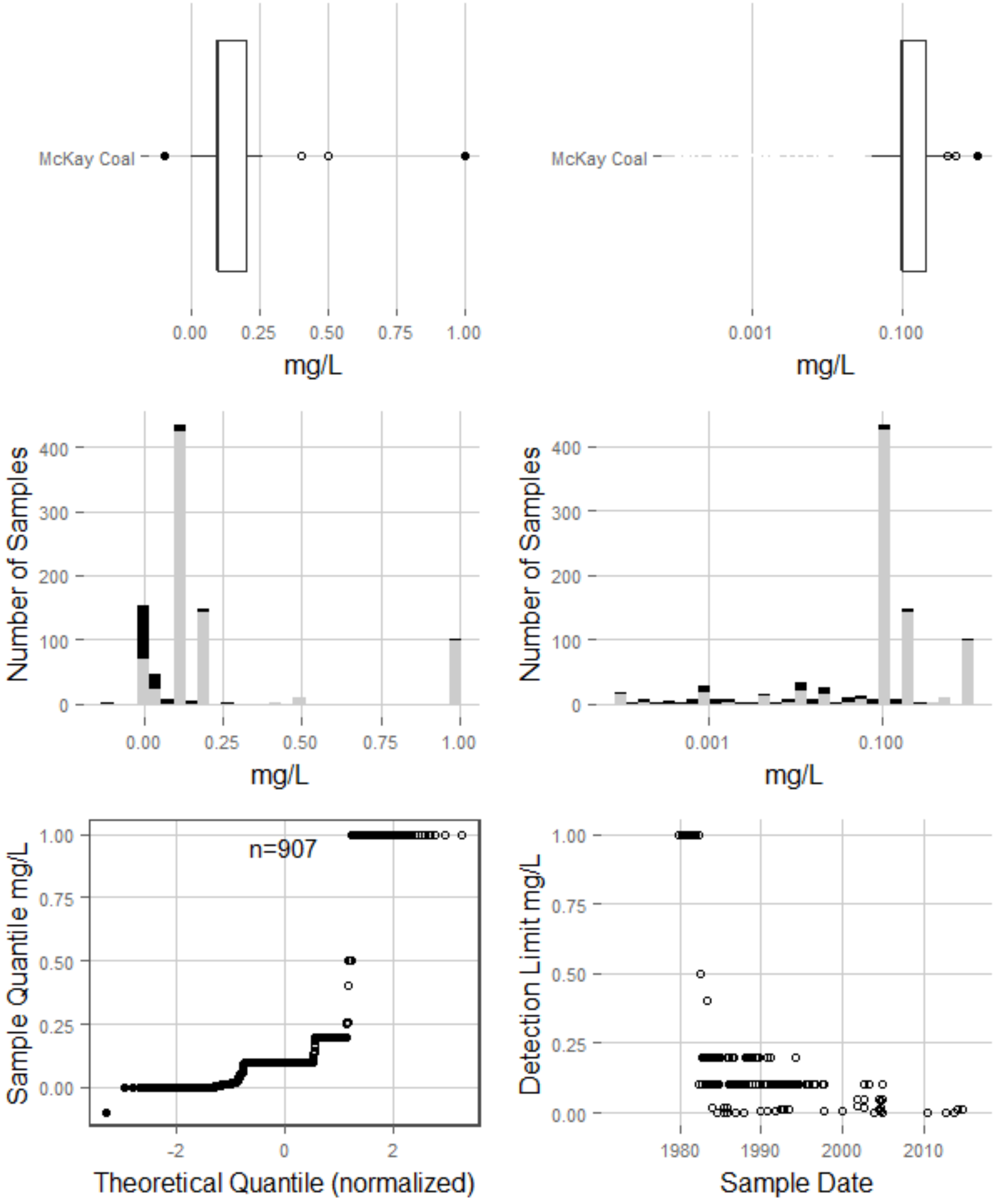
Vanadium
Rosebud Coal



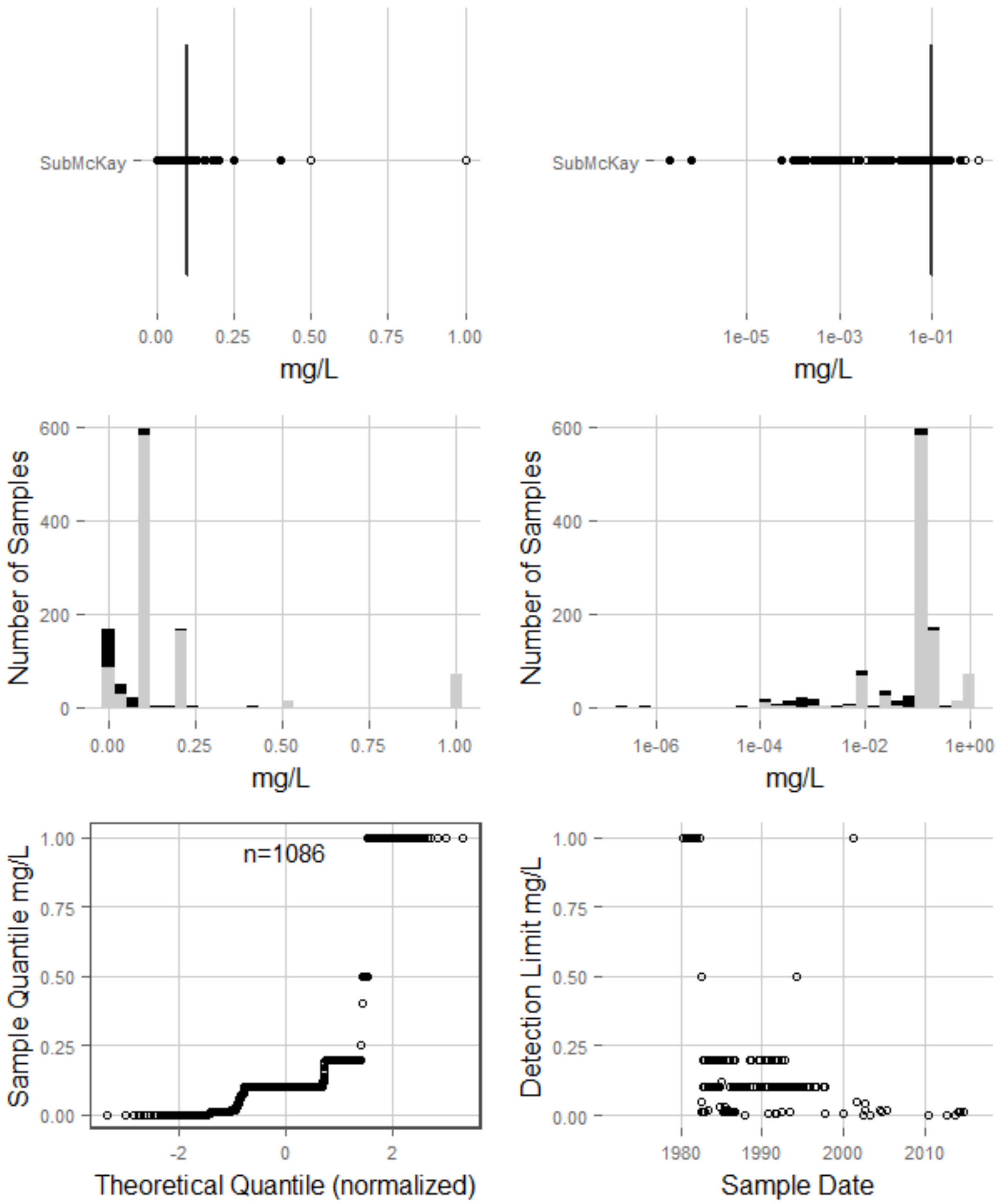
Vanadium
Interburden



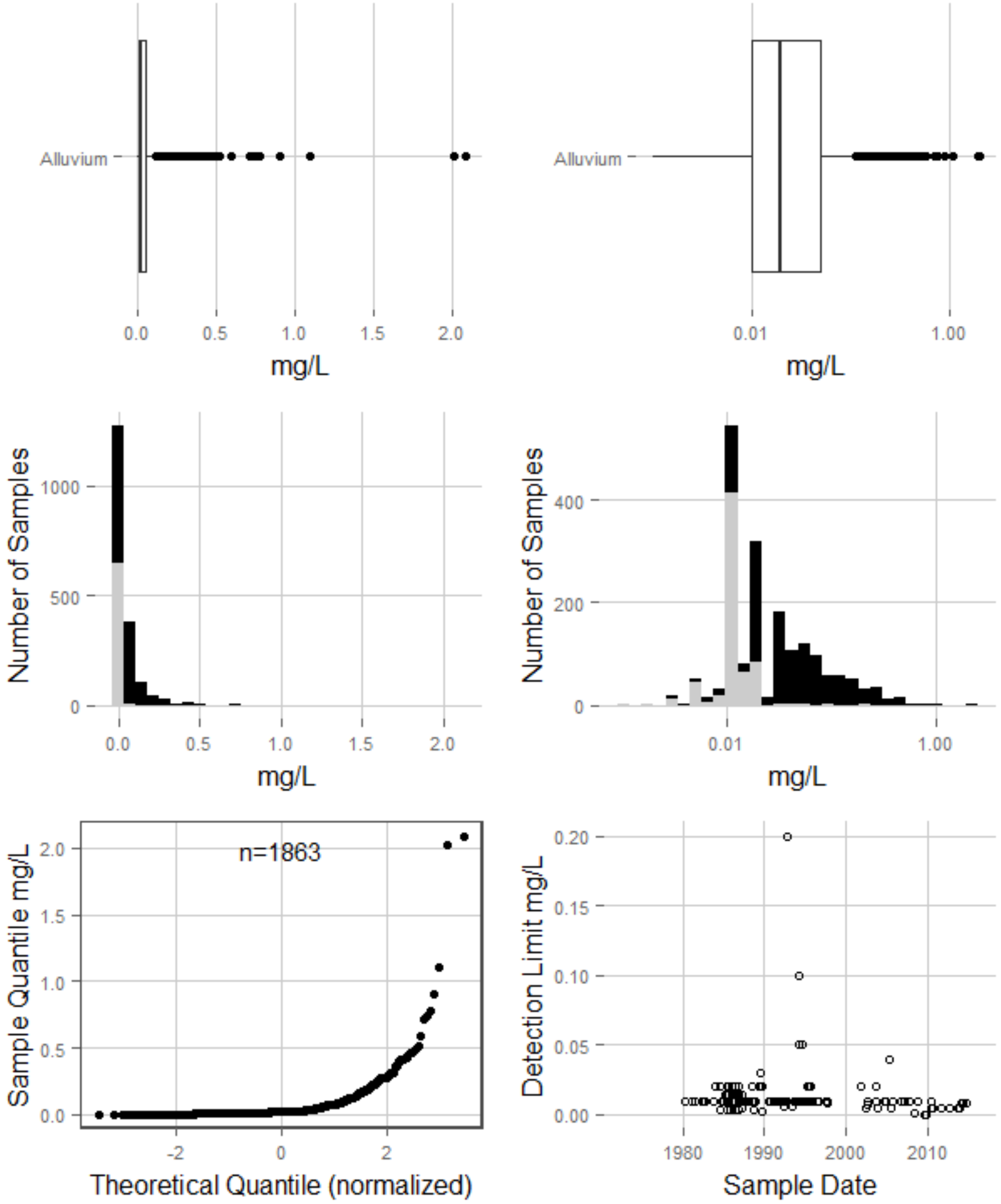
Vanadium
McKay Coal



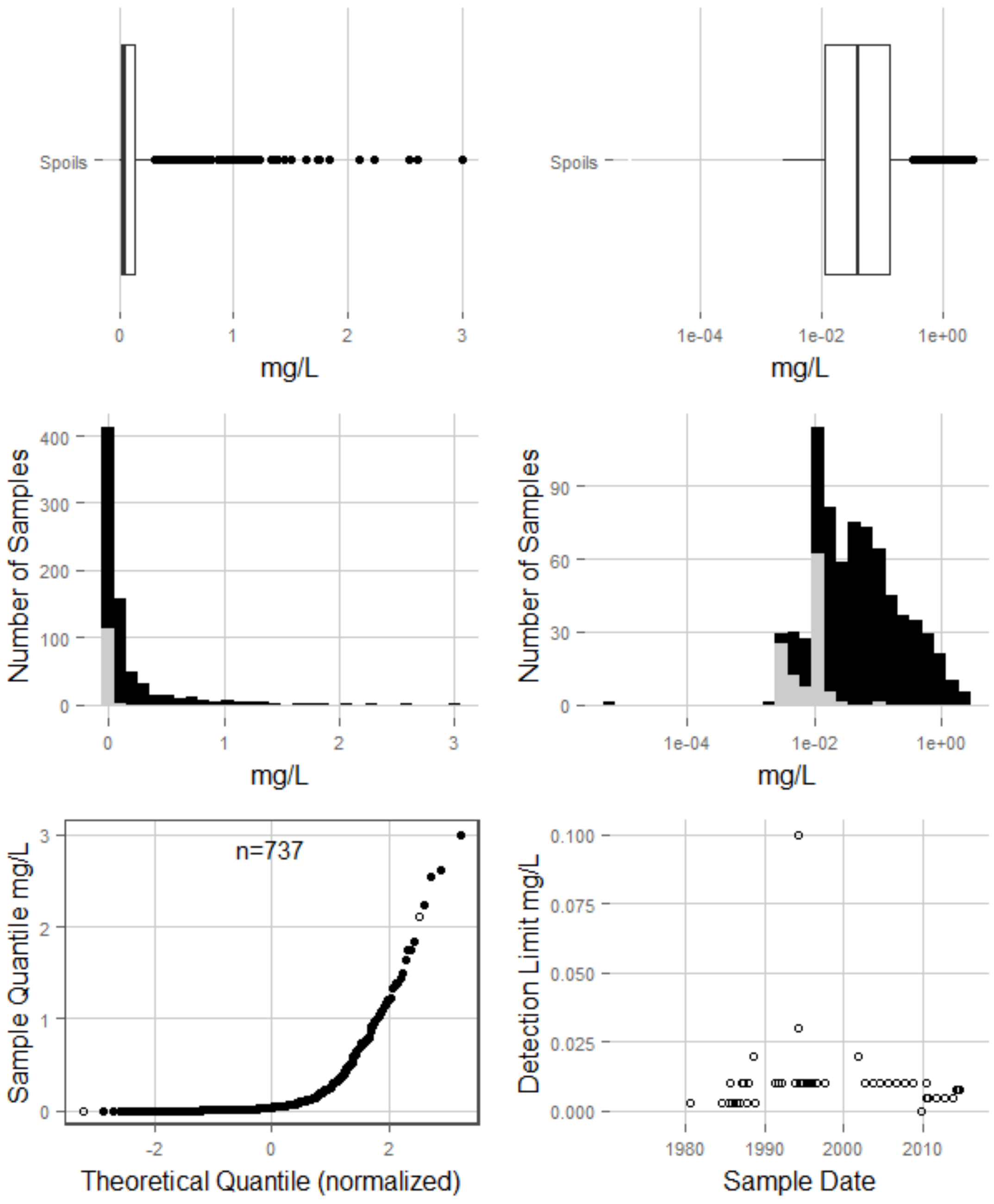
Vanadium
SubMcKay



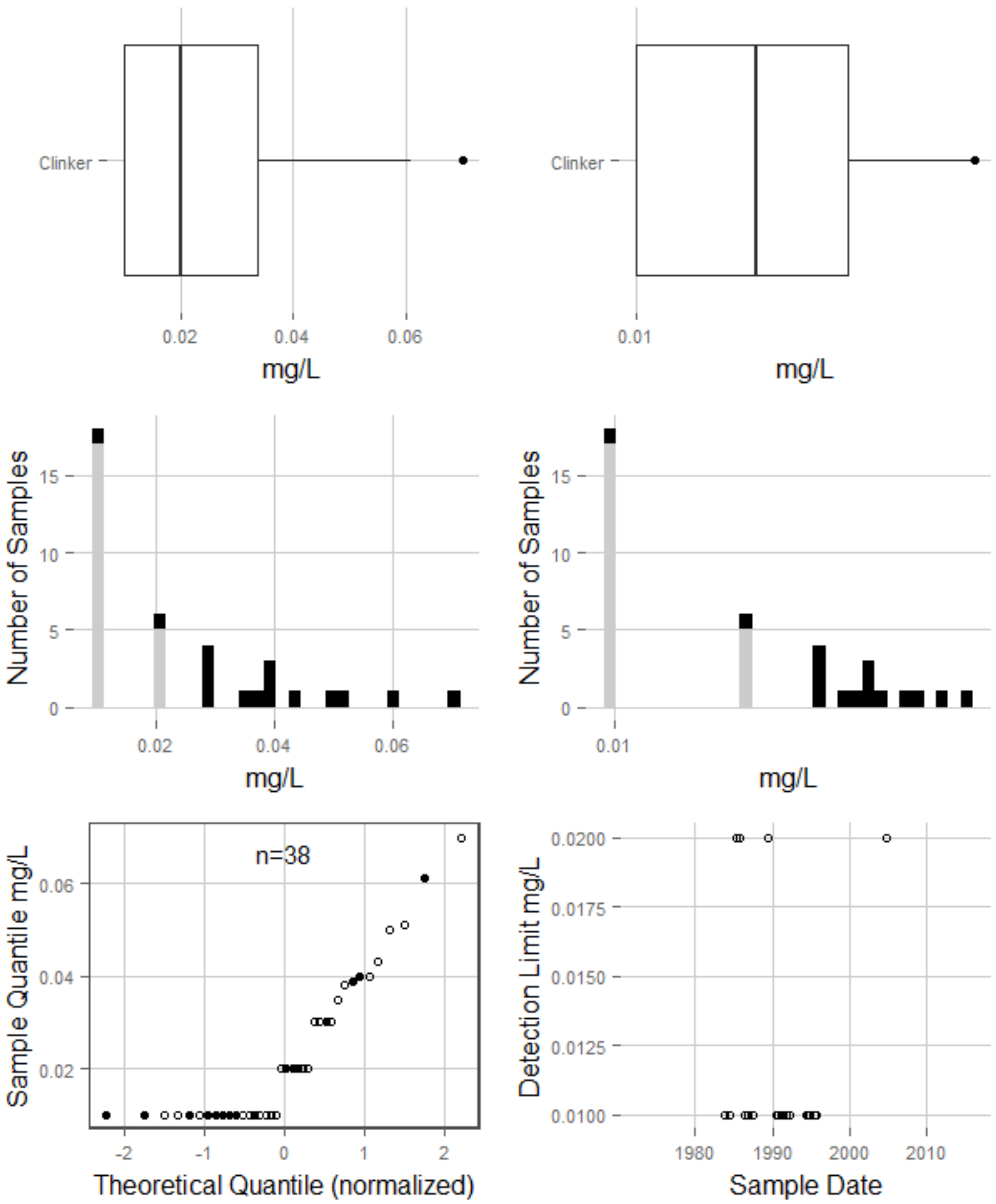
Zinc
Alluvium



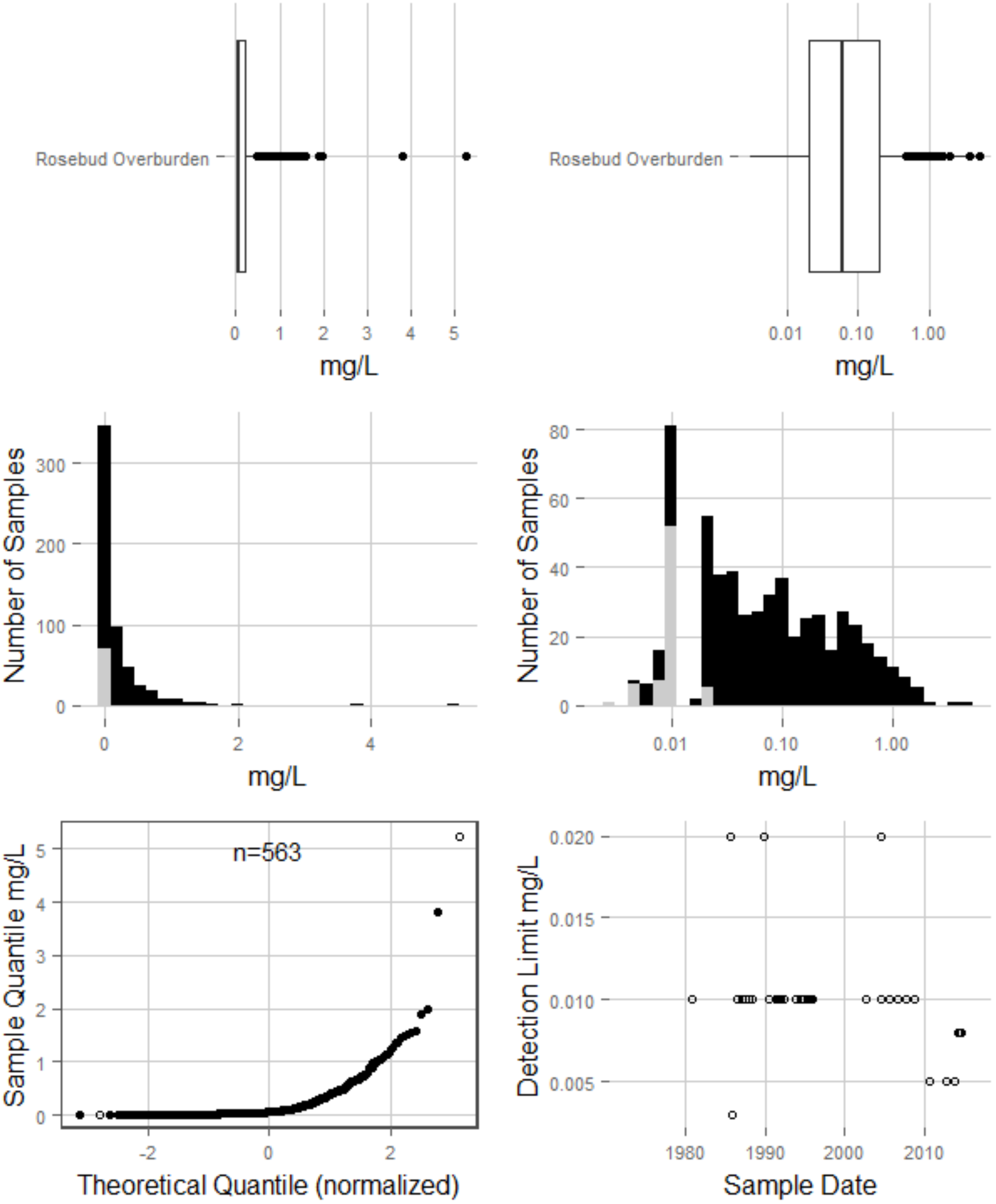
Zinc
Spoils


Spoils
0
1
2
3
mg/L
Spoils
1e-04
1e-02
1e+00
mg/L
Number of Samples
400
300
200
100
0
0
1
2
3
mg/L
Number of Samples
90
60
30
0
1e-04
1e-02
1e+00
mg/L
Sample Quantile mg/L
n=737
3
2
1
0
-2
0
2
Theoretical Quantile (normalized)
Detection Limit mg/L
0.100
0.075
0.050
0.025
0.000
1980
1990
2000
2010
Sample Date

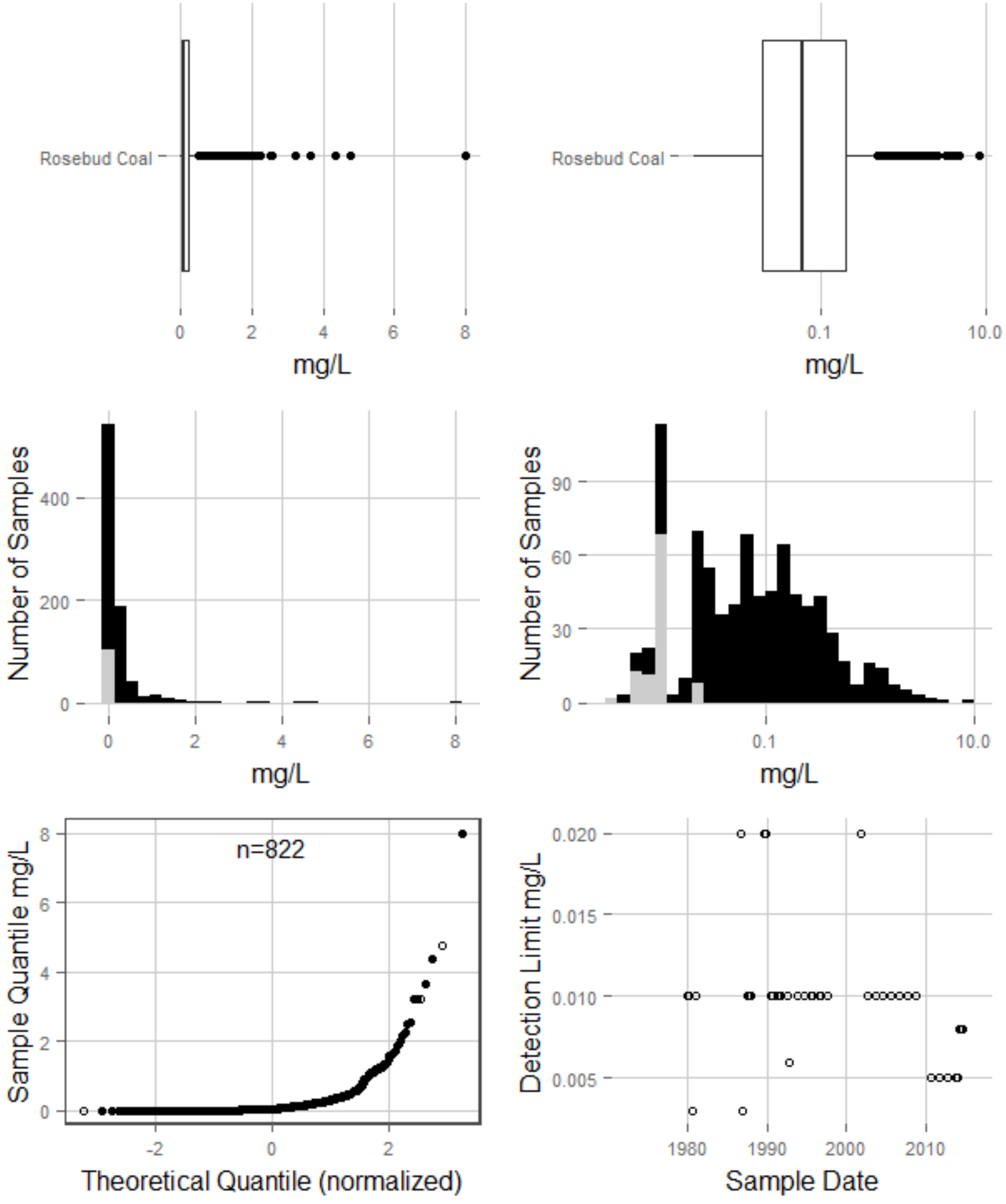
Zinc
Clinker



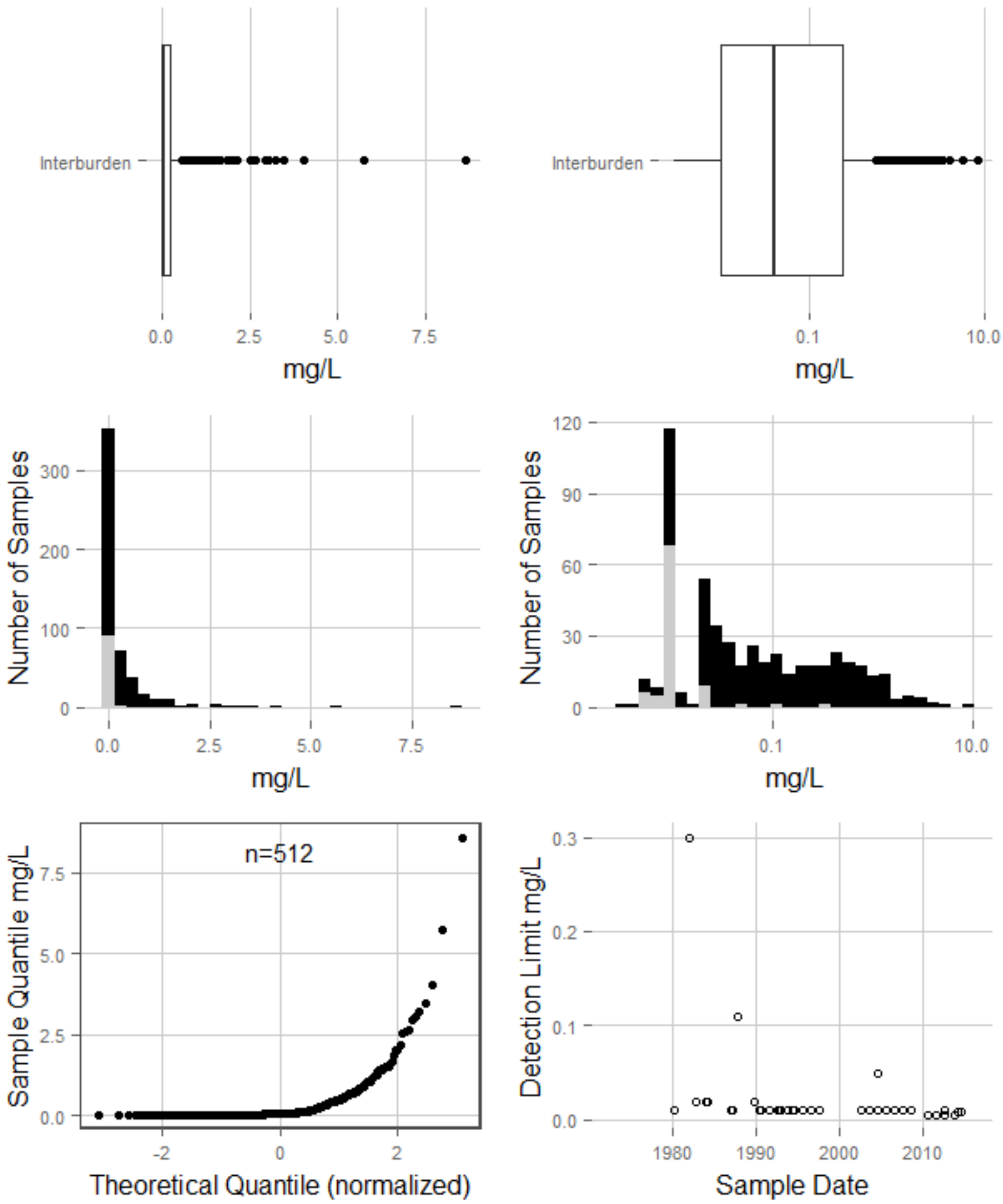
Zinc
Rosebud Overburden



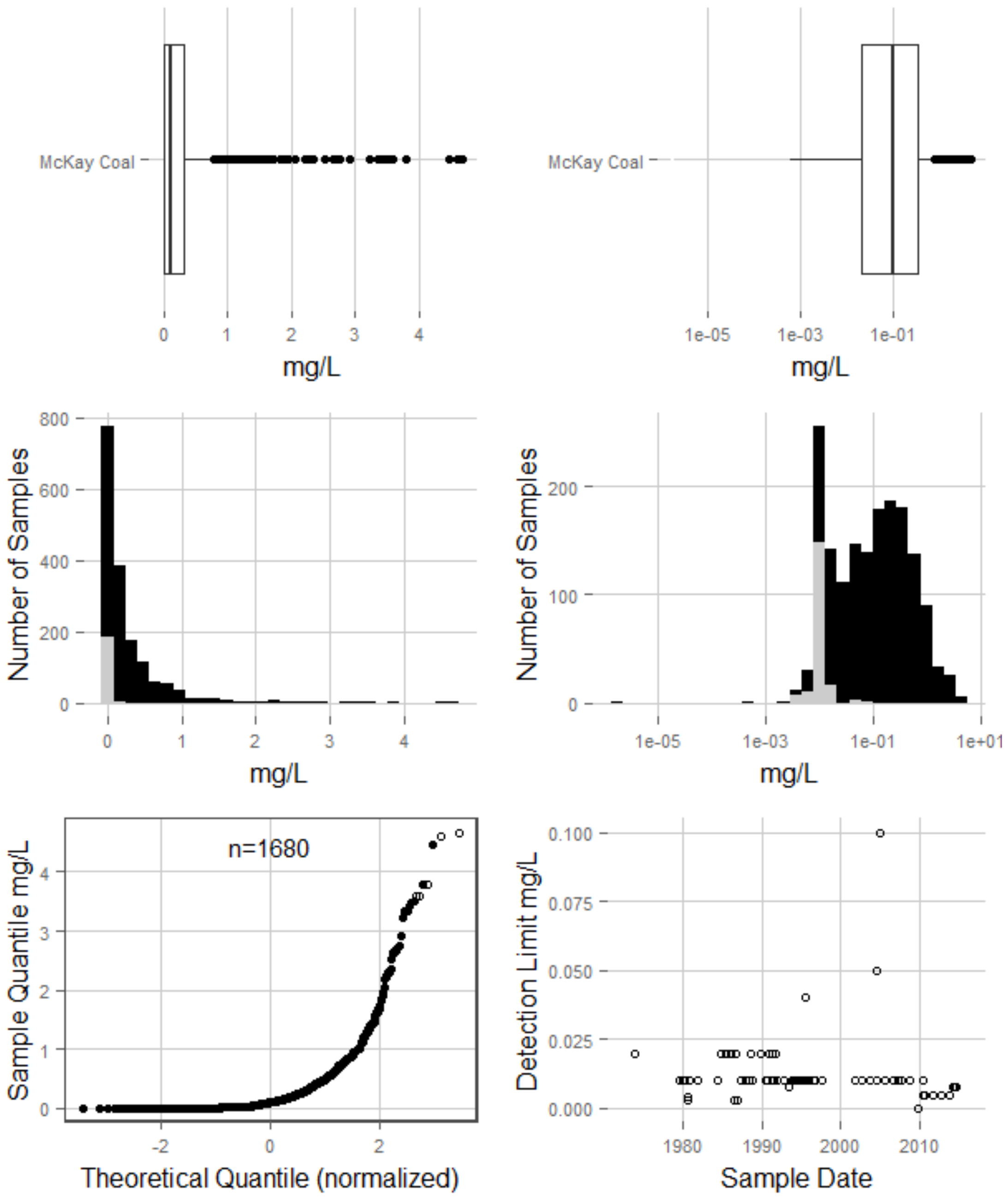
Zinc
Rosebud Coal



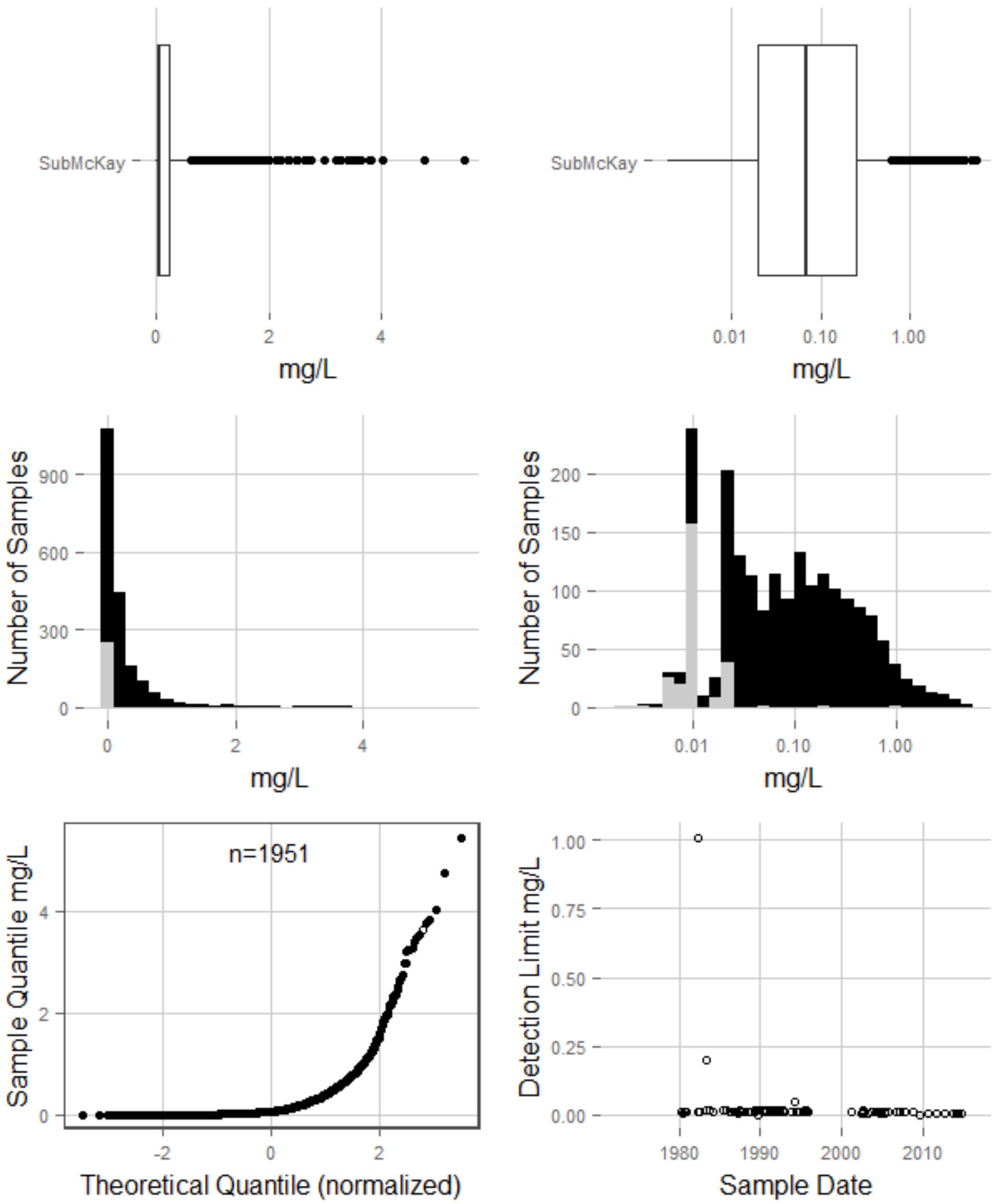
Zinc
Interburden



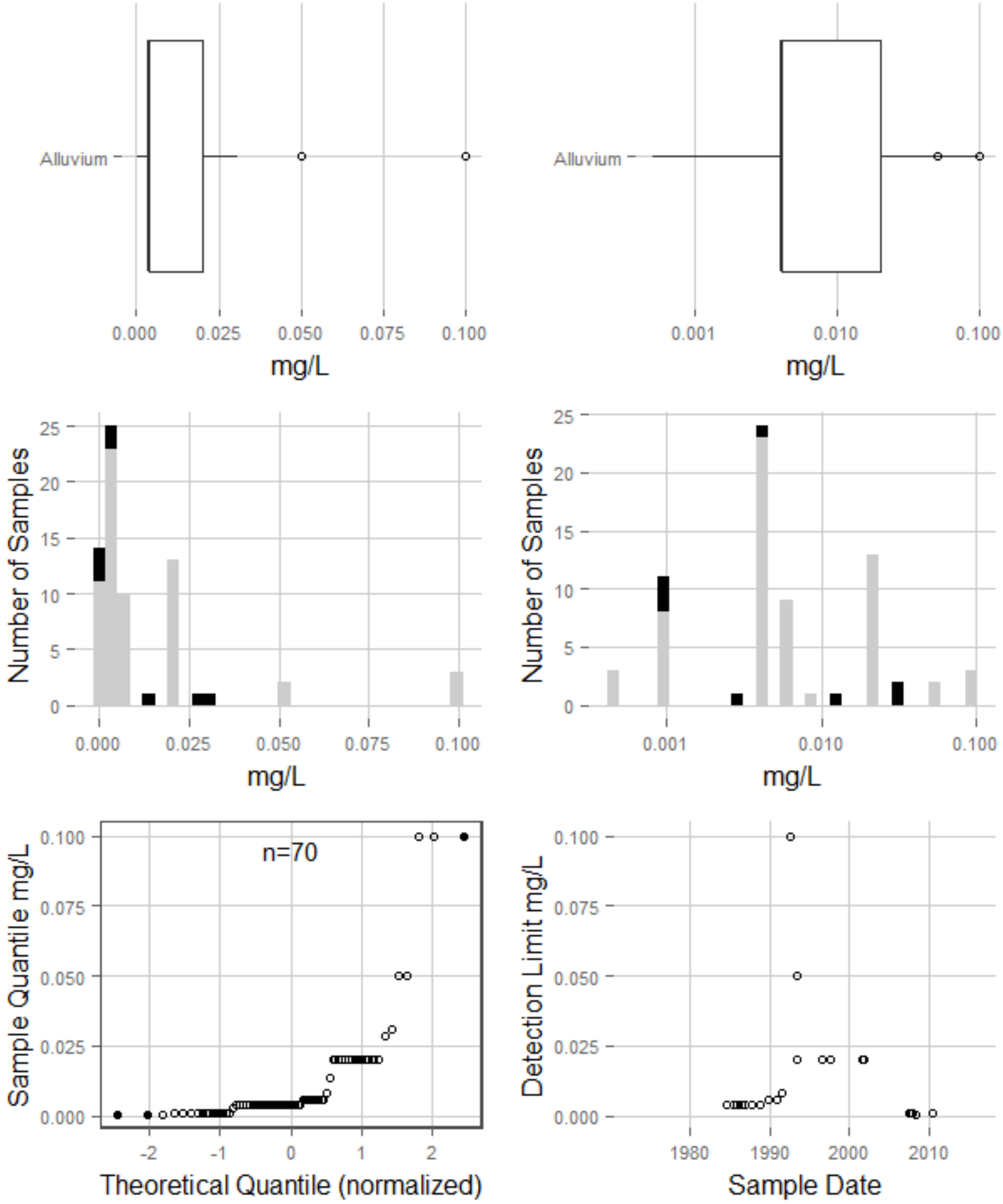
Zinc
McKay Coal



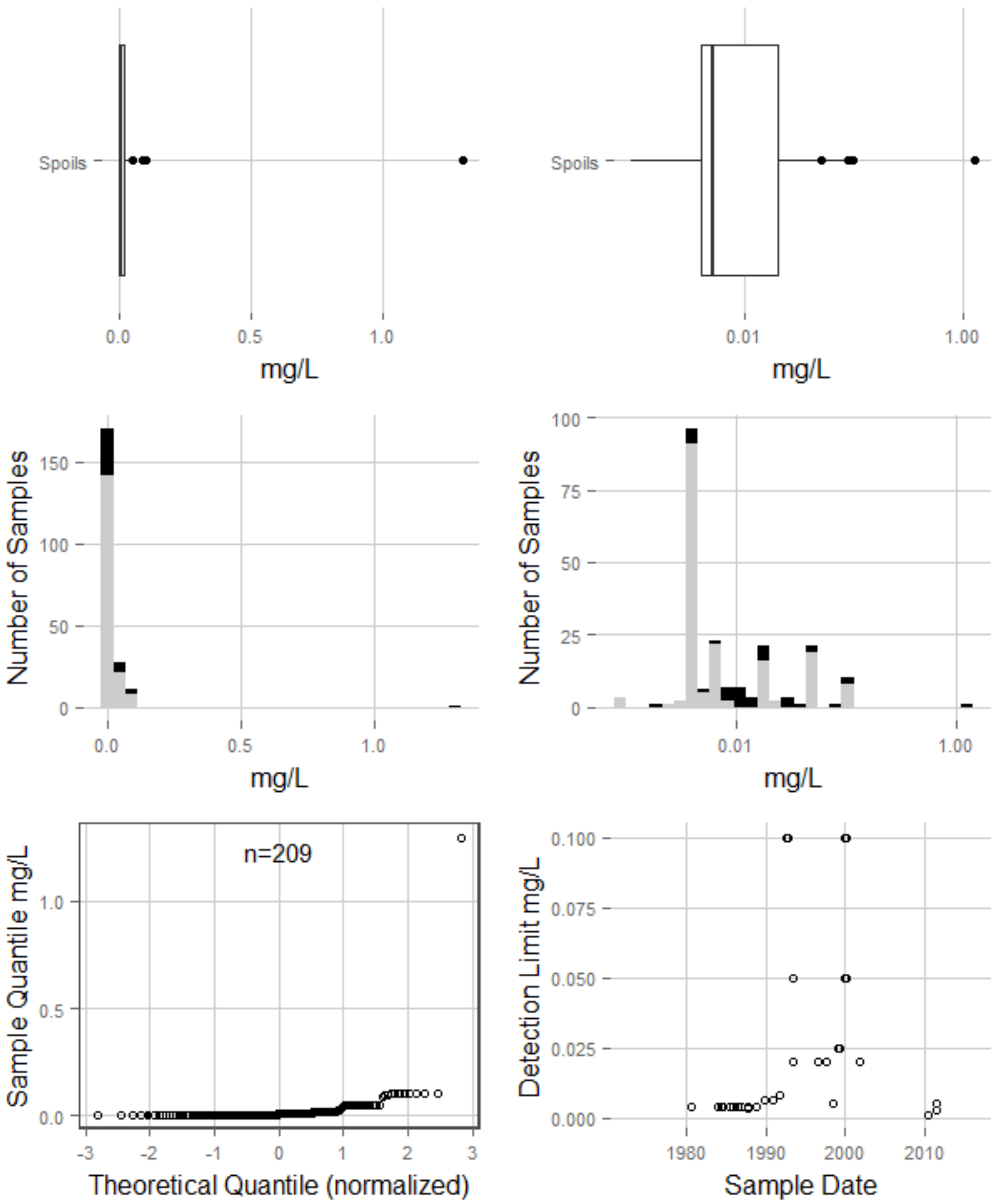
Zinc
SubMcKay



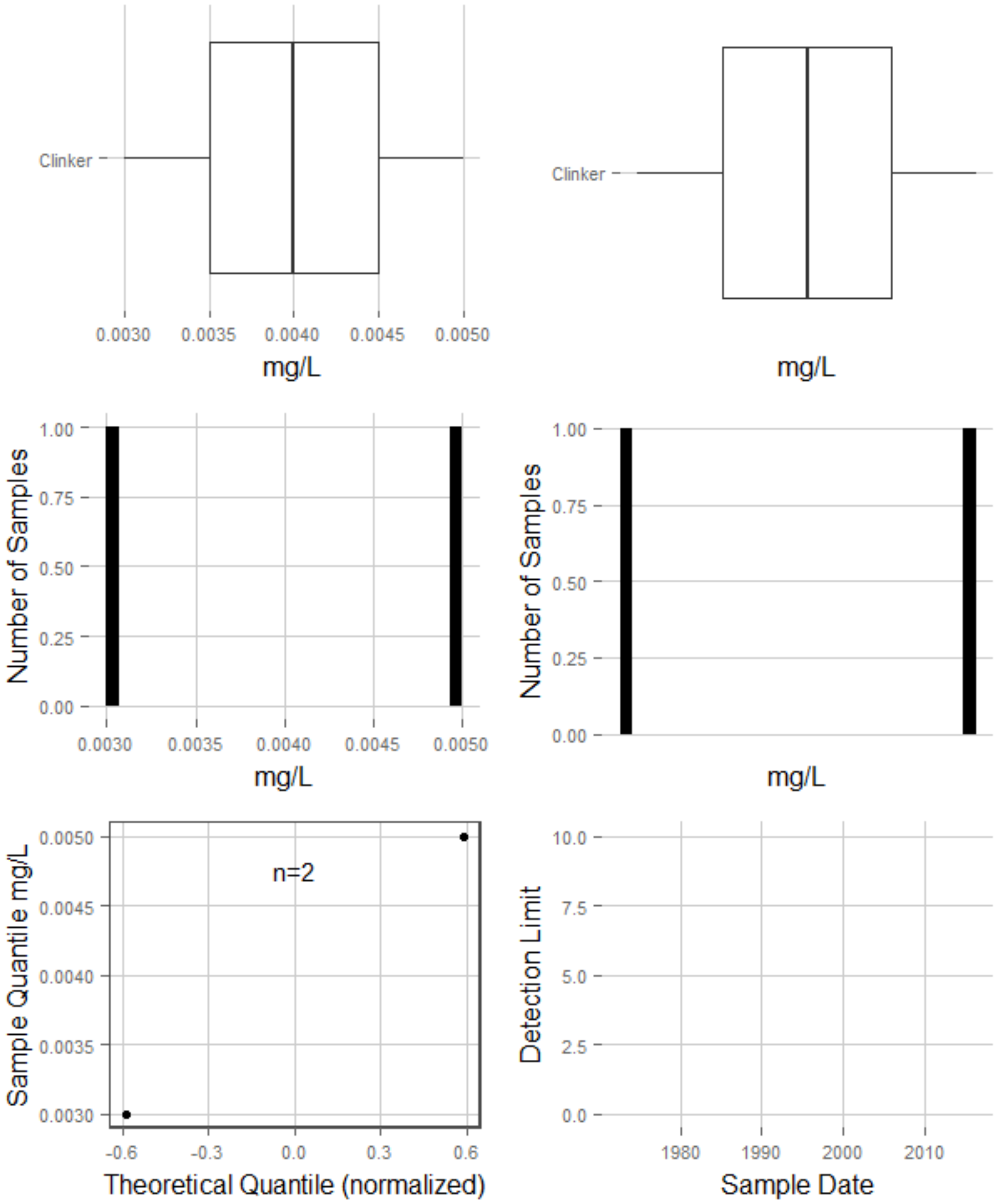
Zirconium
Alluvium



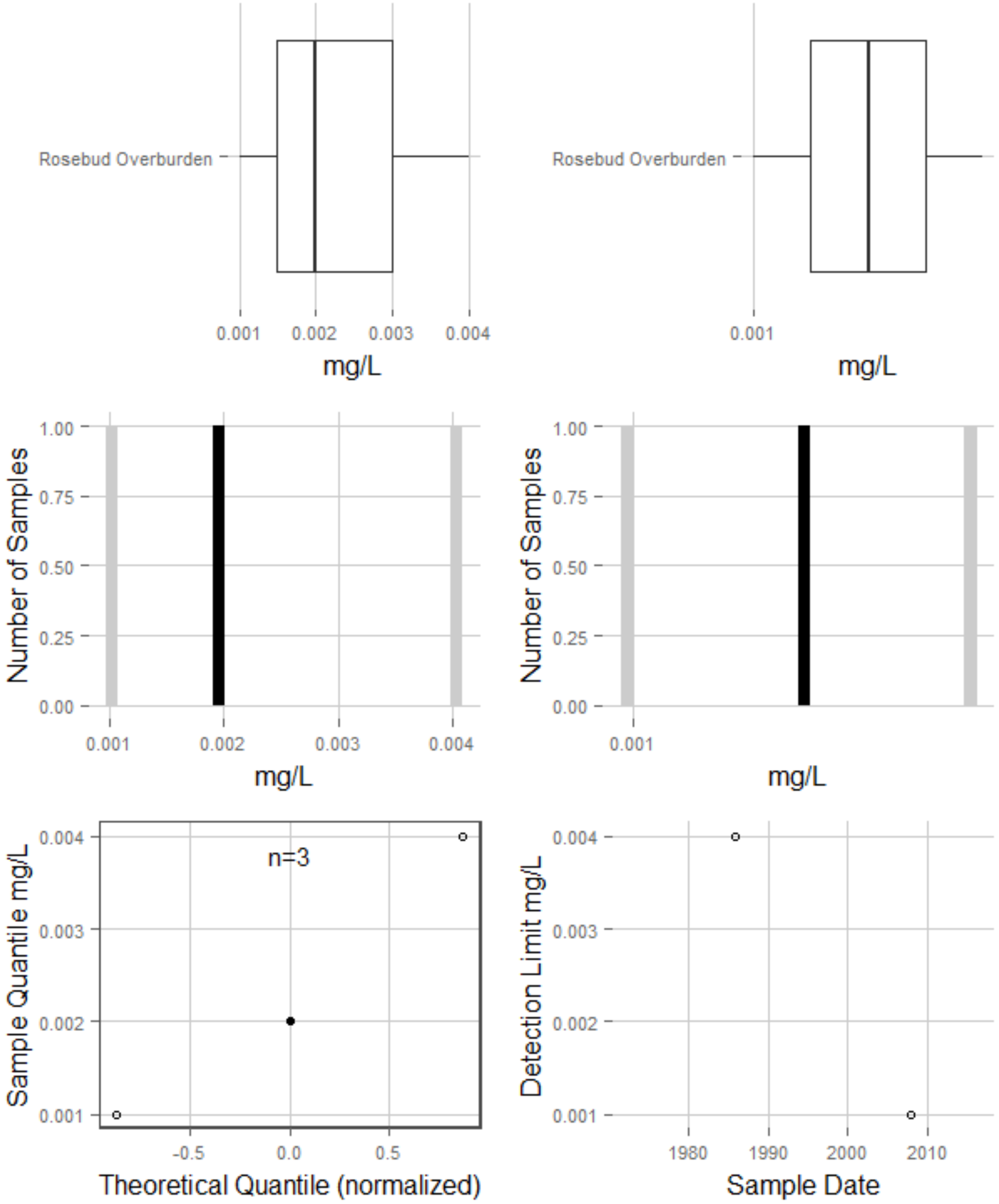
Zirconium
Spoils



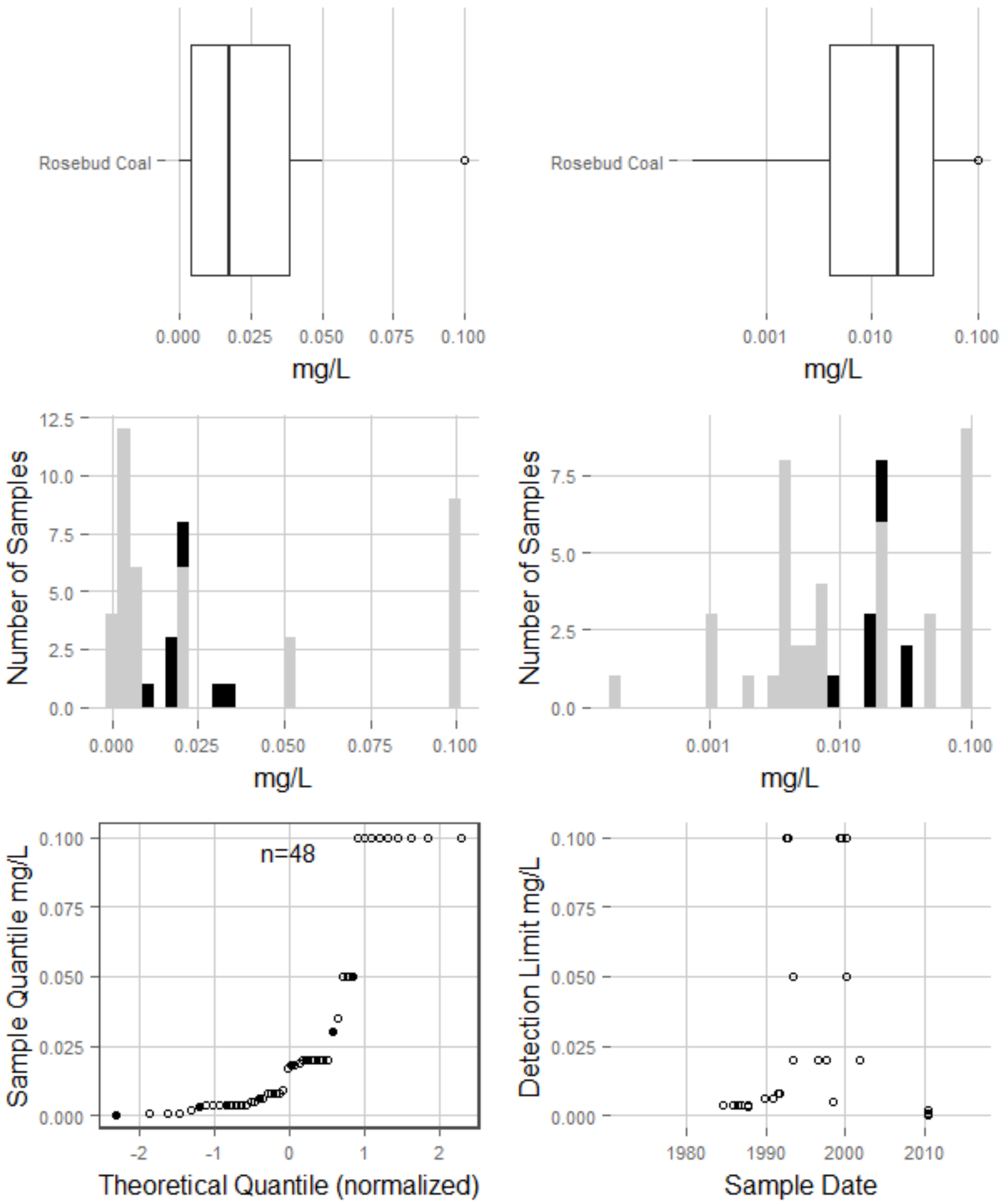
Zirconium
Clinker



Zirconium
Rosebud Overburden

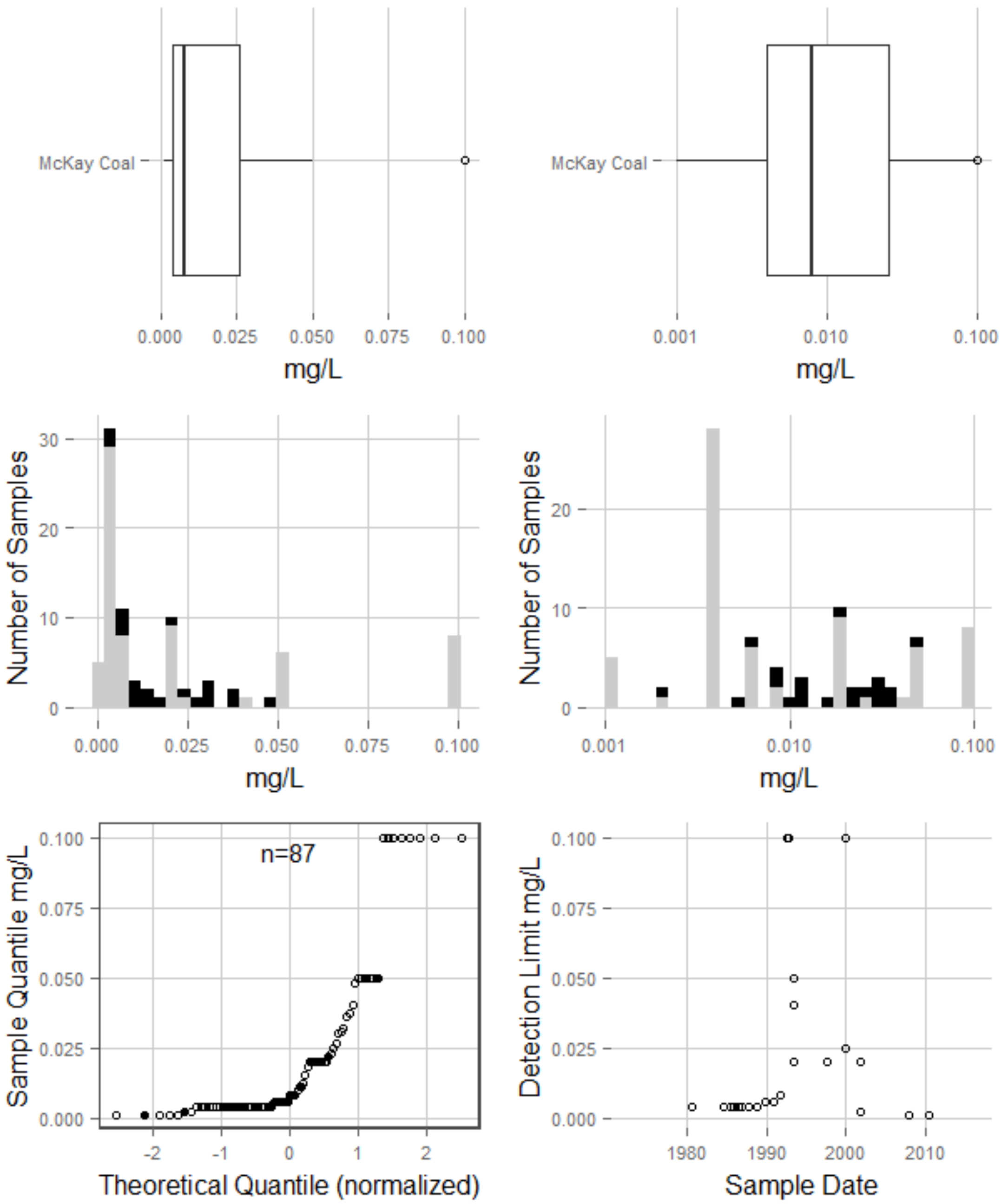


Zirconium
Rosebud Coal

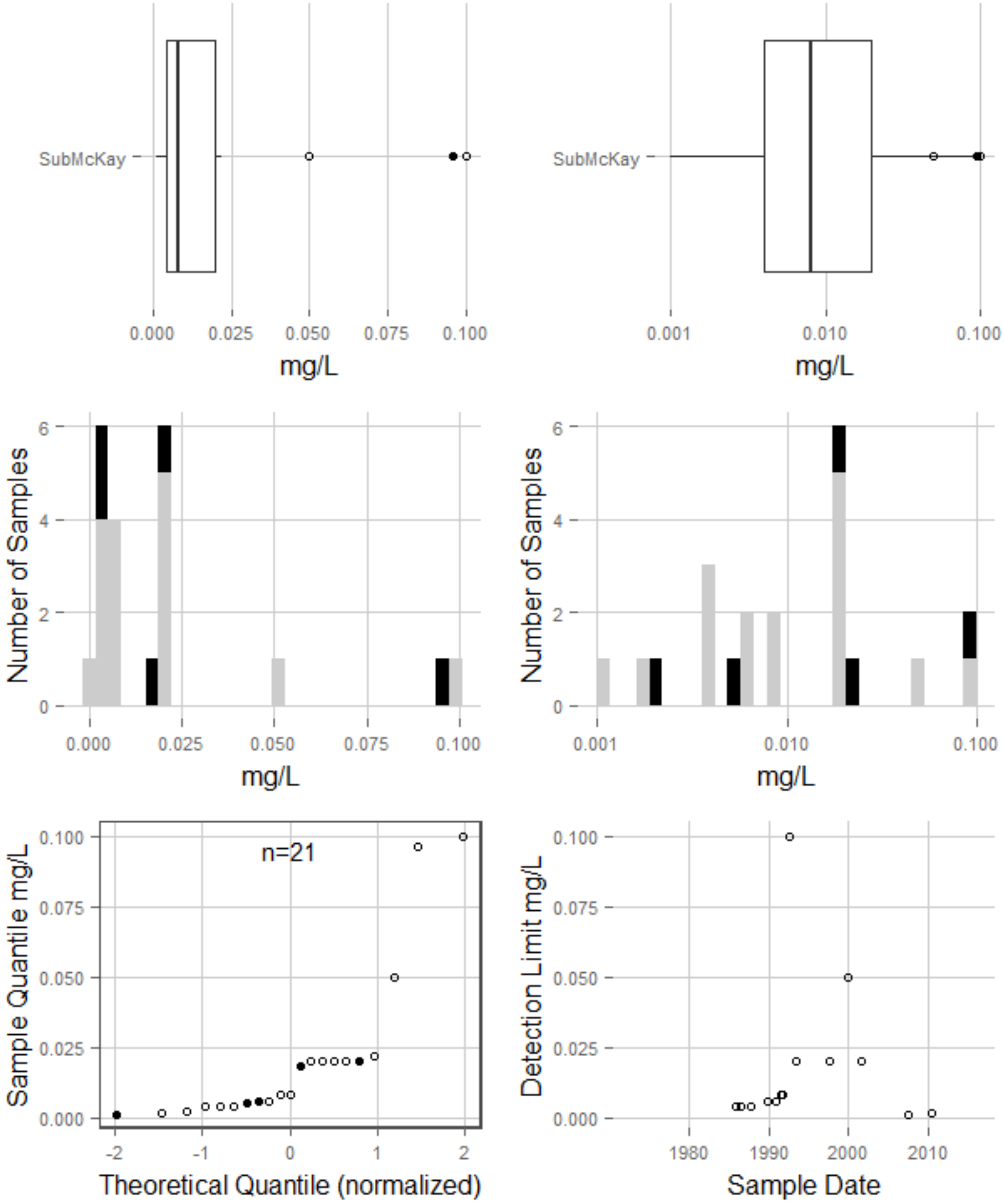


Zirconium
Interburden
No data

Zirconium
McKay Coal

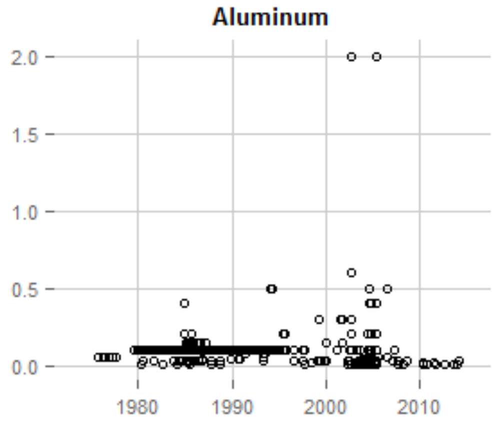


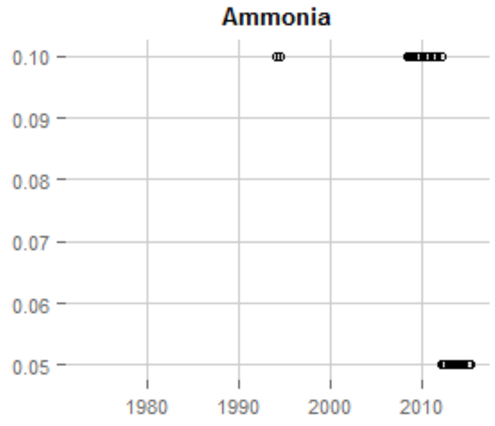
Zirconium
SubMcKay

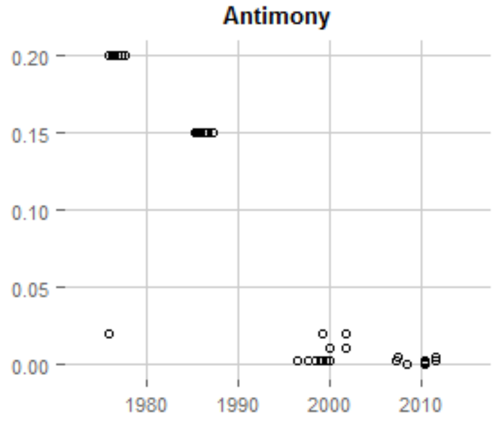


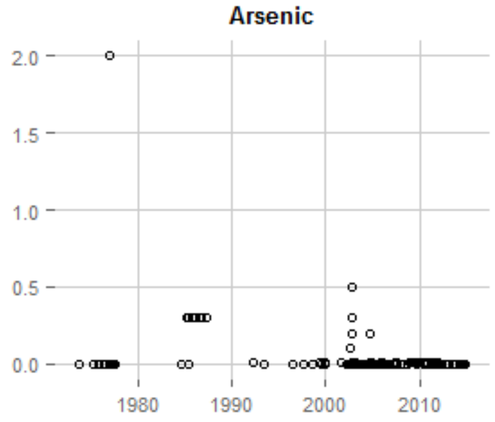
D.2 Detection Limits

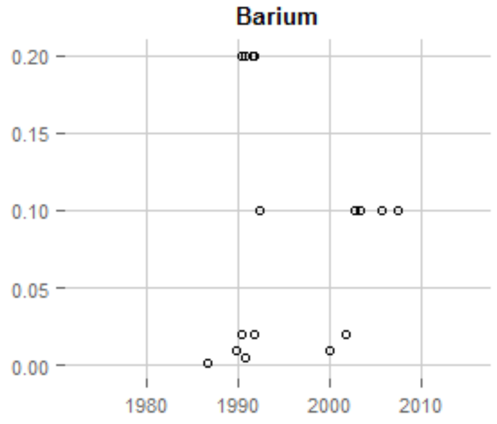
The time series in this section show detection limits versus sample dates.

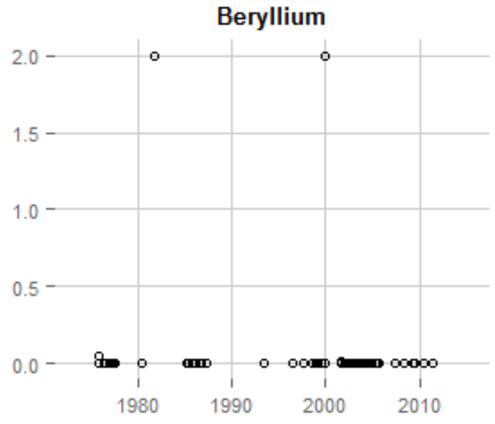

Aluminum
2.0
1.5
1.0
0.5
0.0
1980
1990
2000
2010

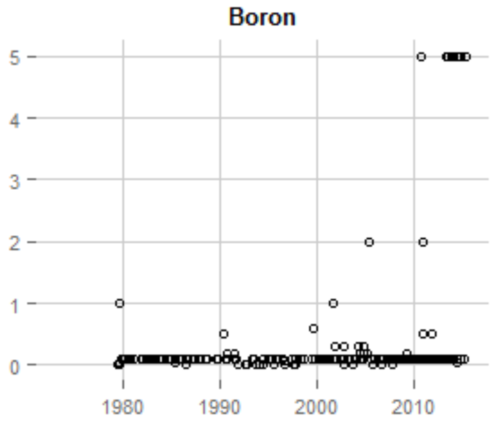

Ammonia
0.10
0.09
0.08
0.07
0.06
0.05
1980
1990
2000
2010


Antimony
0.20
0.15
0.10
0.05
0.00
1980
1990
2000
2010

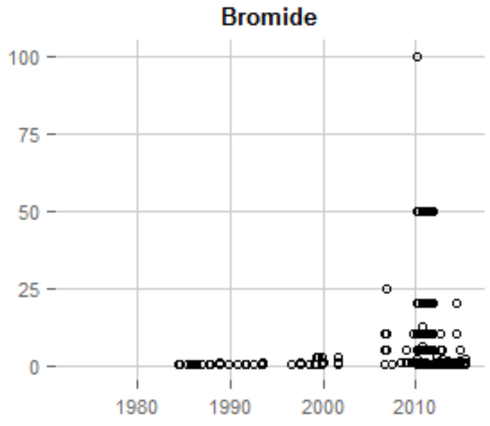

Arsenic
2.0
1.5
1.0
0.5
0.0
1980
1990
2000
2010


Barium
0.20
0.15
0.10
0.05
0.00
1980
1990
2000
2010

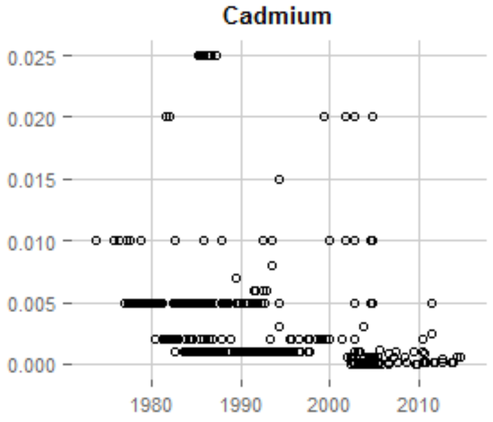

Beryllium
2.0
1.5
1.0
0.5
0.0
1980
1990
2000
2010



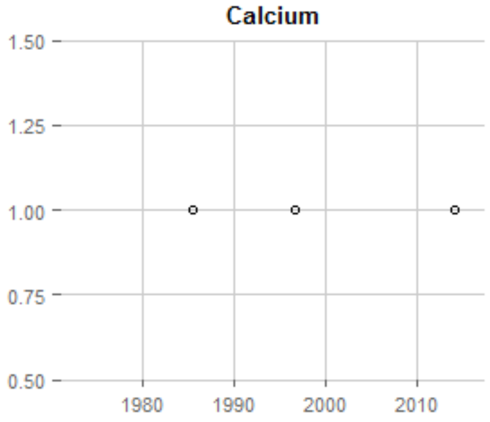
Boron



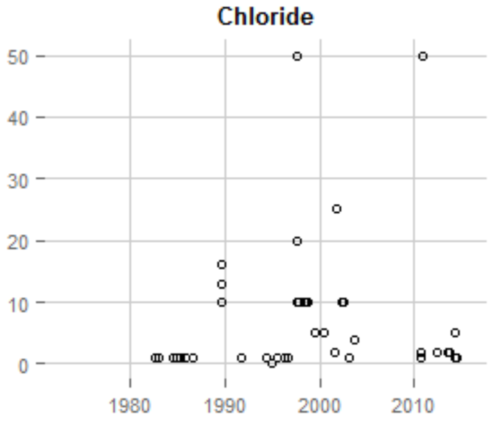
Bromide



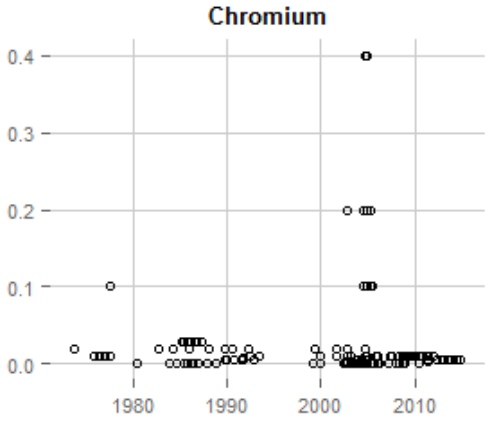
Cadmium



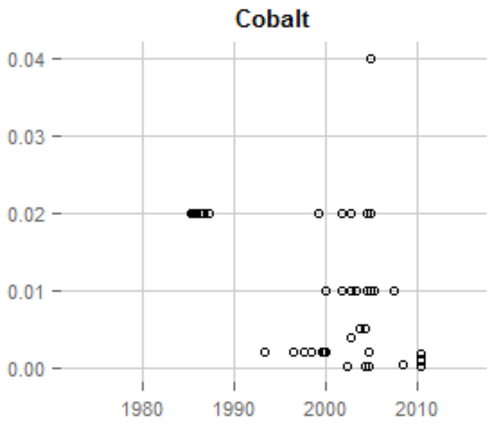
Calcium

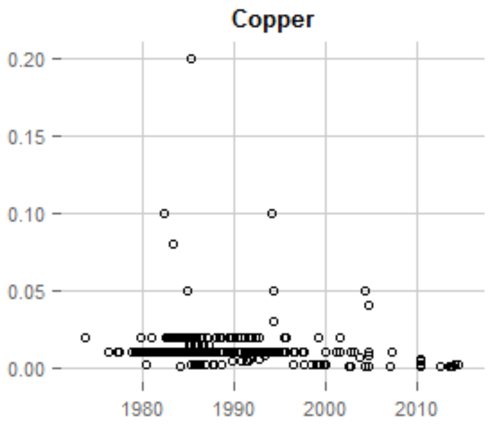


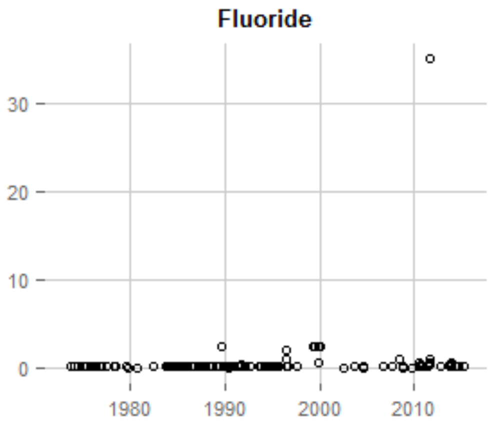
Chloride

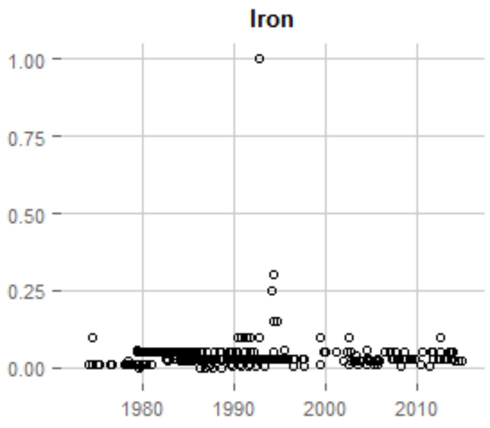


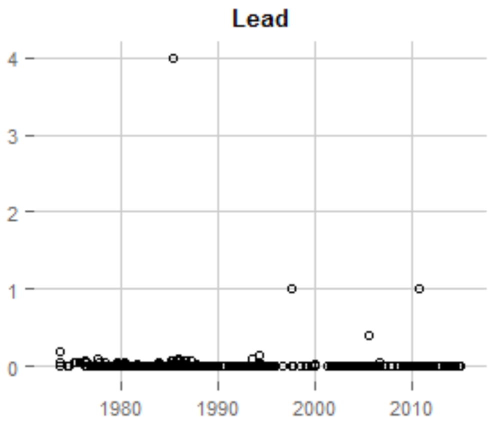
Chromium

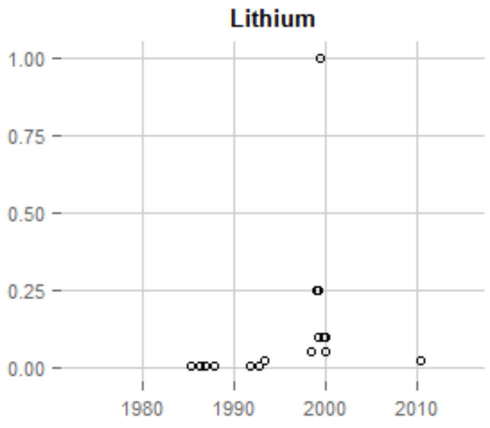

Cobalt
0.04
0.03
0.02
0.01
0.00
1980
1990
2000
2010

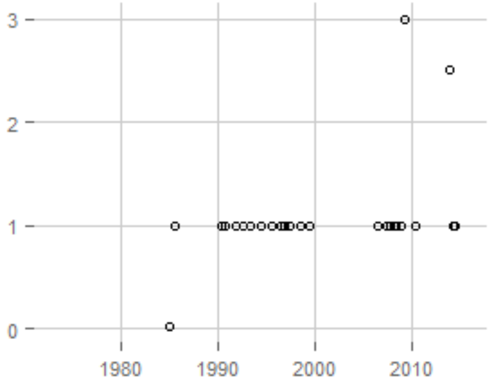

Copper
0.20
0.15
0.10
0.05
0.00
1980
1990
2000
2010

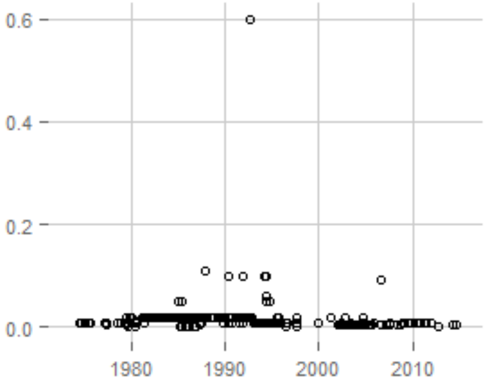

Fluoride
30
20
10
0
1980
1990
2000
2010

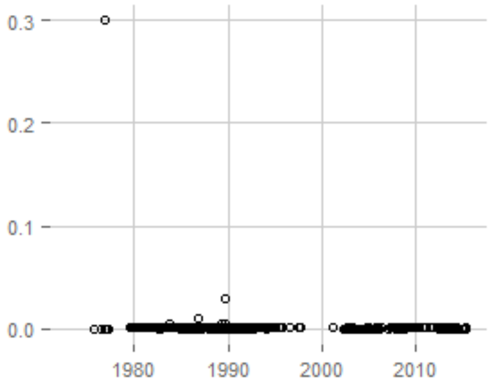

Iron
1.00
0.75
0.50
0.25
0.00
1980
1990
2000
2010

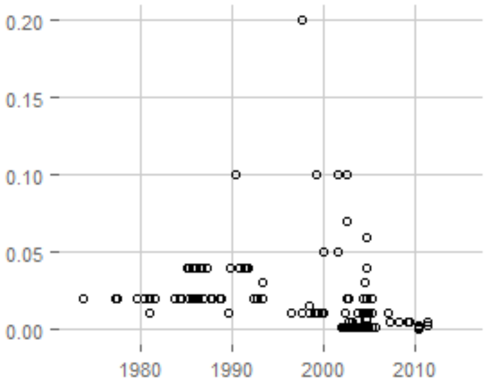

Lead
4
3
2
1
0
1980
1990
2000
2010

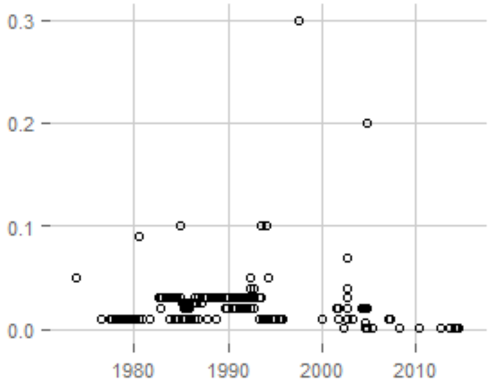

Lithium
1.00
0.75
0.50
0.25
0.00
1980
1990
2000
2010

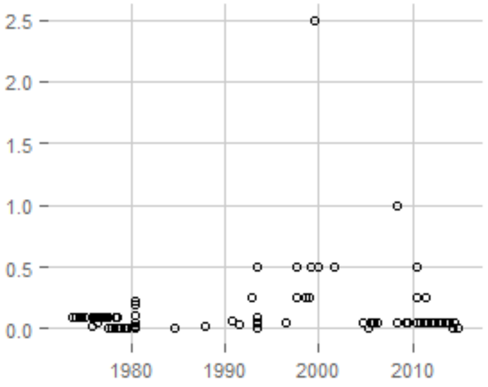

Magnesium

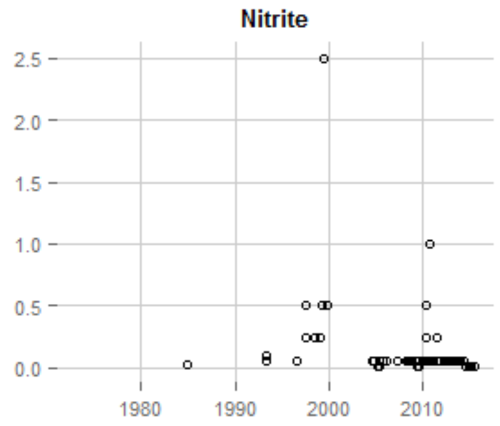

Manganese

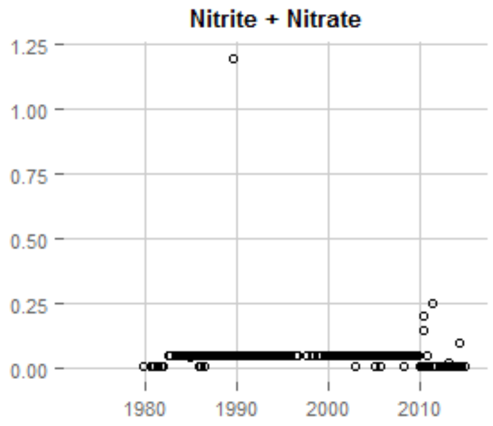

Mercury

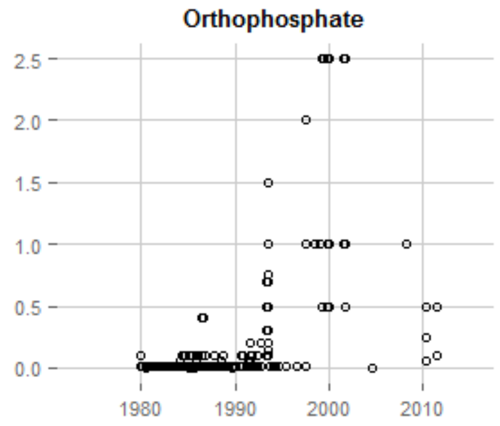

Molybdenum

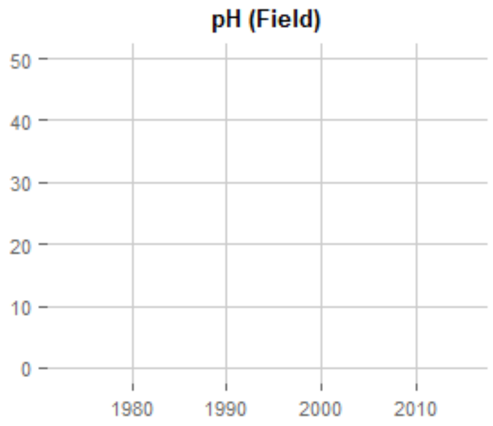

Nickel

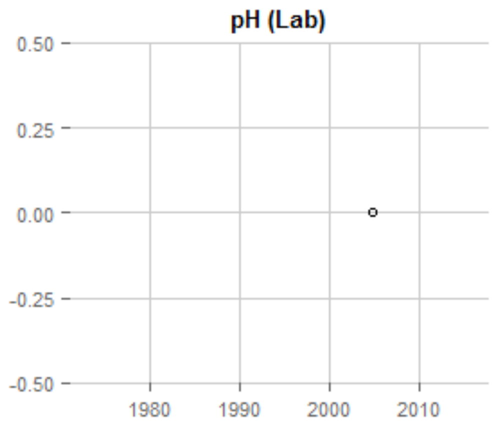

Nitrate

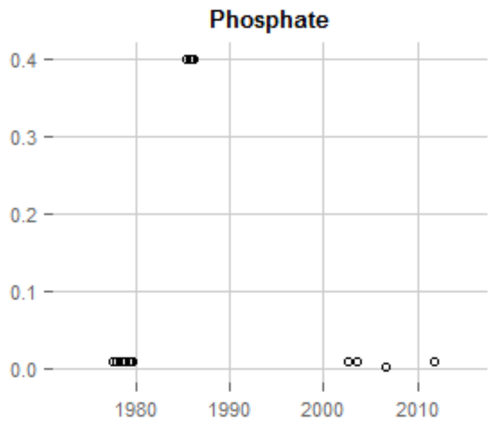

Nitrite
2.5
2.0
1.5
1.0
0.5
0.0
1980
1990
2000
2010


Nitrite + Nitrate
1.25
1.00
0.75
0.50
0.25
0.00
1980
1990
2000
2010

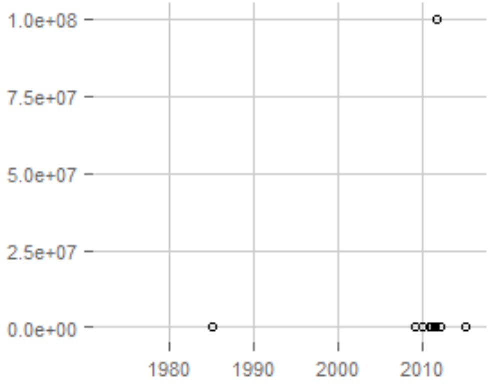

Orthophosphate
2.5
2.0
1.5
1.0
0.5
0.0
1980
1990
2000
2010


pH (Field)
50
40
30
20
10
0
1980
1990
2000
2010

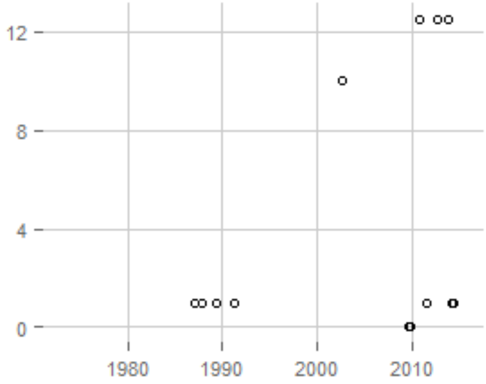

pH (Lab)
0.50
0.25
0.00
-0.25
-0.50
1980
1990
2000
2010


Phosphate
0.4
0.3
0.2
0.1
0.0
1980
1990
2000
2010

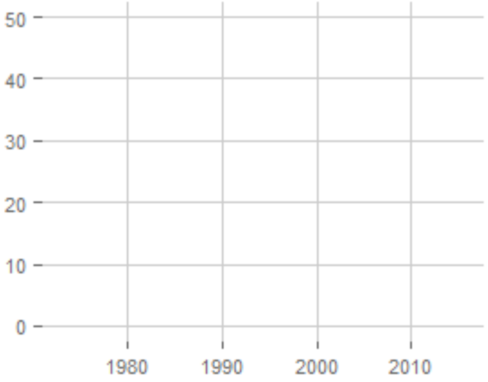
Phosphorus



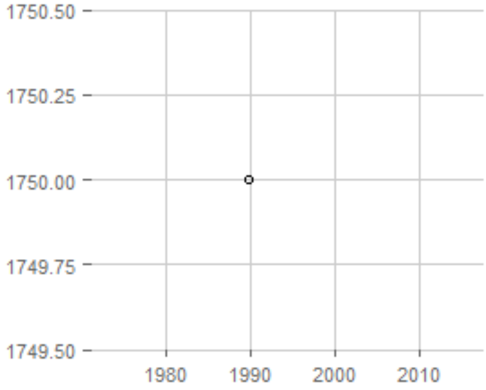
Potassium



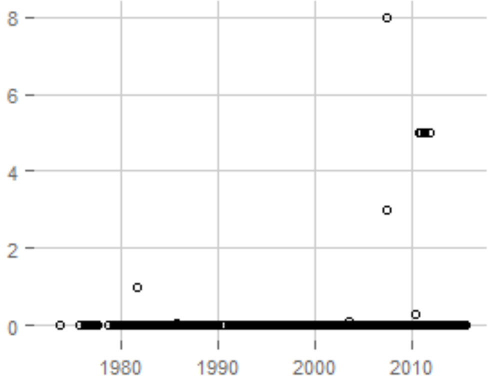
SC (Field)



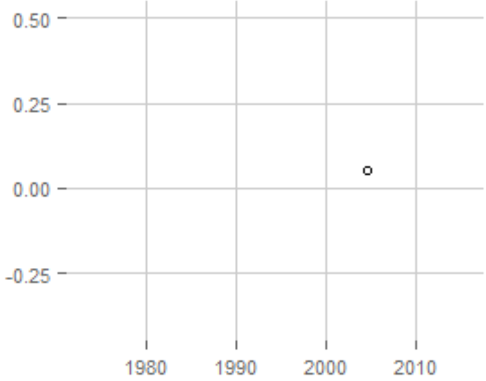
SC (Lab)

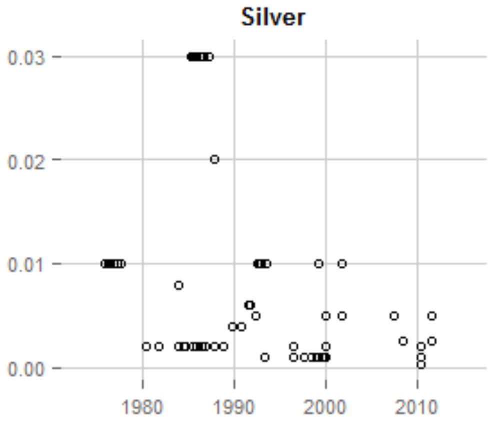


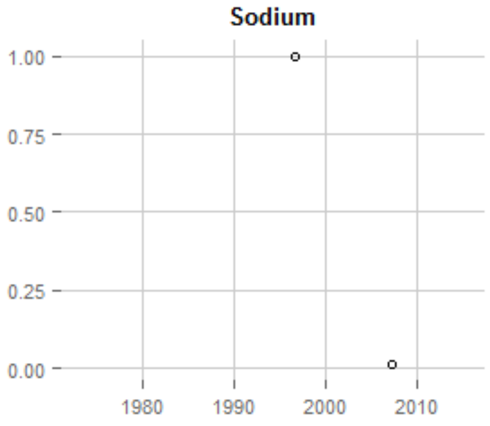
Selenium

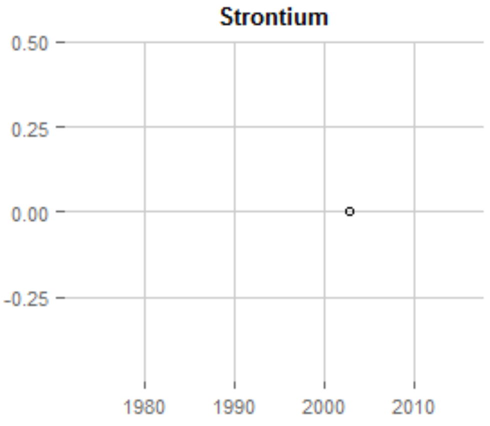


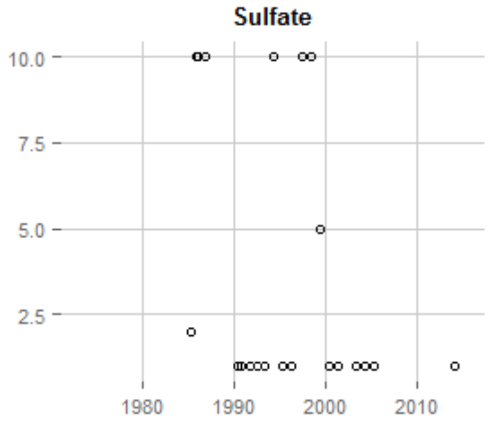
Silica

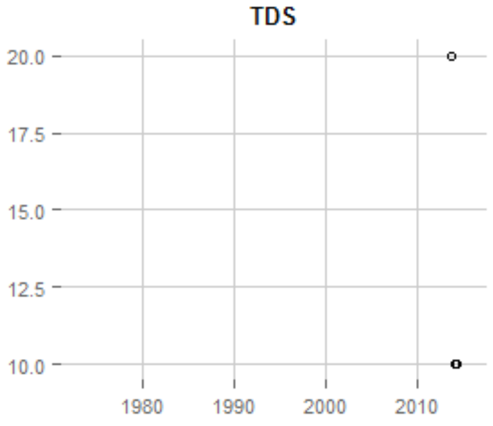


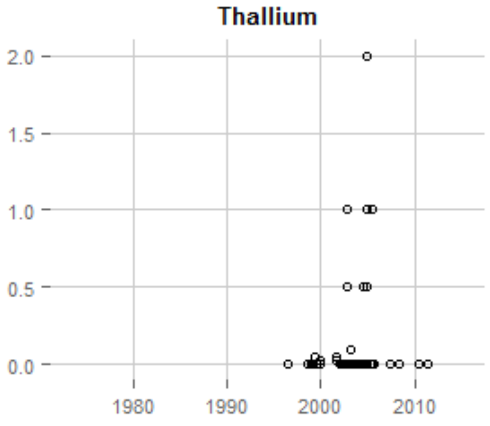

Silver
0.03
0.02
0.01
0.00
1980
1990
2000
2010


Sodium
1.00
0.75
0.50
0.25
0.00
1980
1990
2000
2010

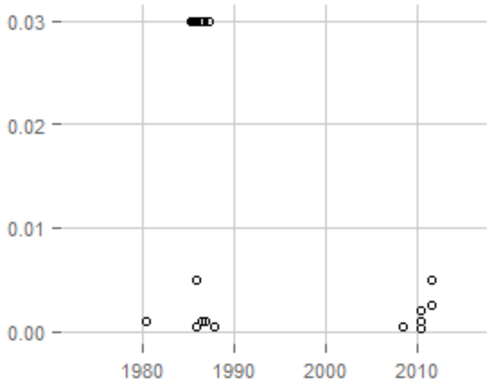

Strontium
0.50
0.25
0.00
-0.25
1980
1990
2000
2010


Sulfate
10.0
7.5
5.0
2.5
1980
1990
2000
2010

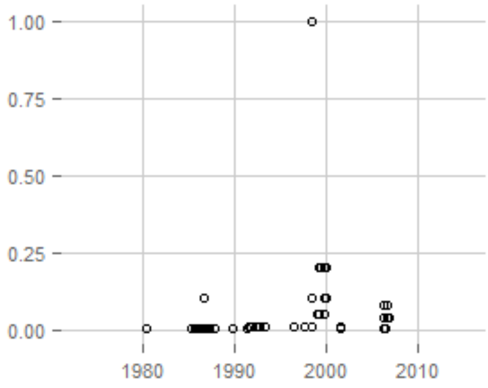

TDS
20.0
17.5
15.0
12.5
10.0
1980
1990
2000
2010


Thallium
2.0
1.5
1.0
0.5
0.0
1980
1990
2000
2010

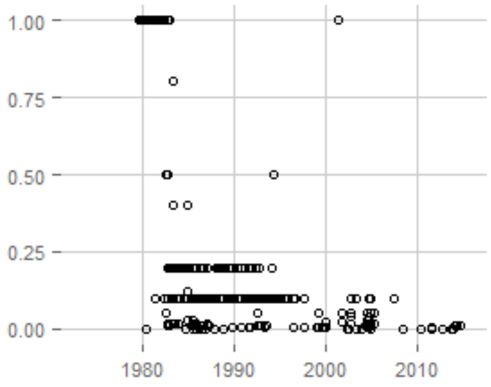
Tin



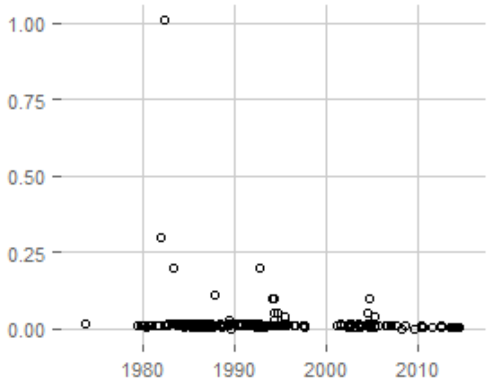
Titanium



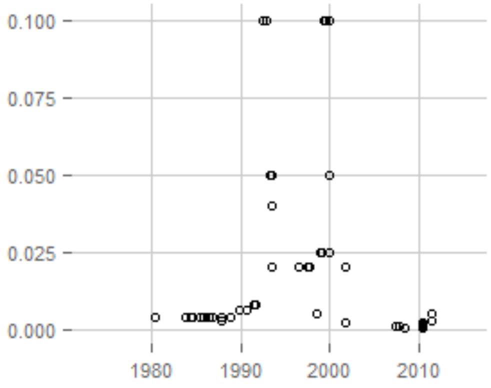
Vanadium



Zinc



Zirconium



Appendix E EDA Plots for Surface Water

The data presented in Appendix E are surface water data used to estimate BSLs. They are described in Section , and are specifically from sites SW-75, SW-60, SW-55, and AR-12.

For each chemical, five plots are shown:

- A histogram on standard scale, with nondetects represented in gray, detects in black,
- A histogram on logarithmic scale, with nondetects represented in gray, detects in black,
- A time series plot of measured values, colored by well,
- A time series plot of measured values on logarithmic scale, colored by well, and
- A QQ plot, with nondetects represented as hollow circles, detects as filled circles.

Histograms are a method for representing the distribution of a dataset. Values are binned and the height of each bar indicates number of samples in the bin described by the placement of each bar along the horizontal axis.

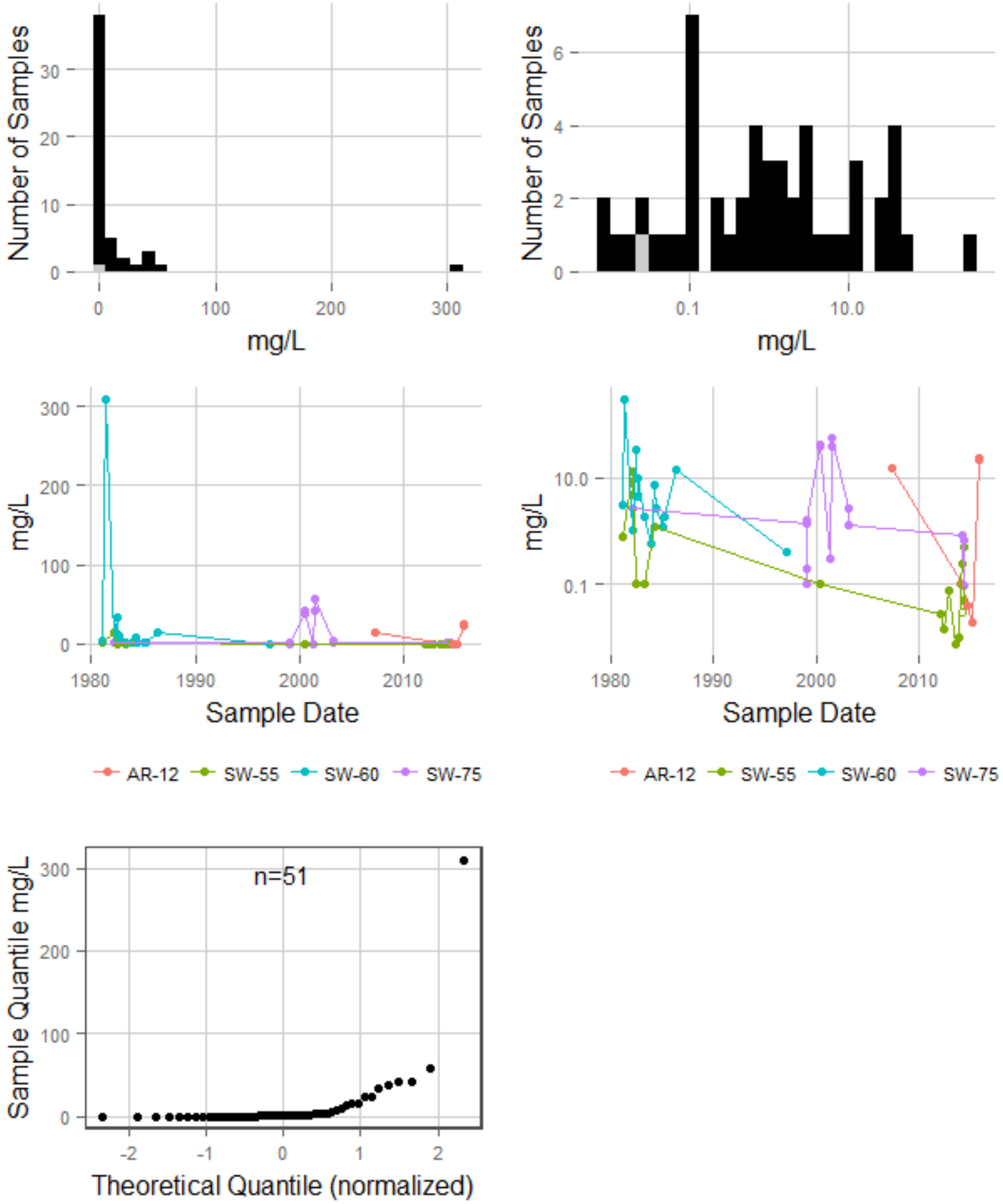
Boxplots are another method of representing the distribution of a dataset. The top and bottom of the box in the boxplot represent the Inter-Quartile Range (IQR), identified by the 75th and 25th percentiles of the data, respectively. The horizontal line in the middle of the box represents the 50th percentile (the median). Vertical lines (called whiskers) extend to last data point which is no more than 1.5*IQR from the box. Data points beyond the whiskers are represented by circles.

The time series plot values against sample dates in order to see any trends over time.

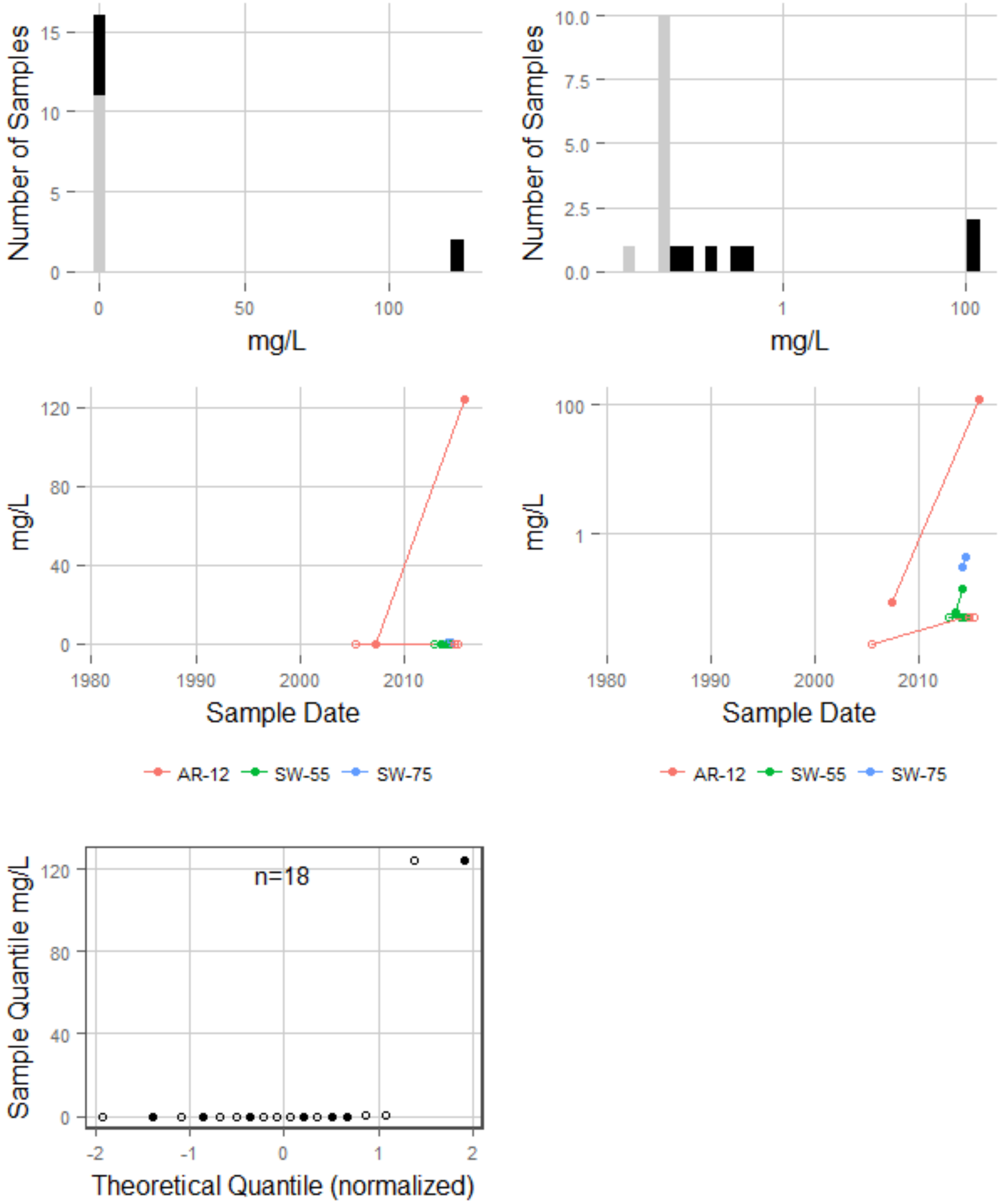
A Q-Q plot is a way to check how normal a dataset is. It involves graphing the quantiles of a dataset against the quantiles of the standard normal probability distribution. If the data are normally distributed, then the plotted pairs will follow a straight line. Histograms plot the frequency of observations within consecutive, equally sized intervals of concentrations. They provide a discrete estimate of the shape of the distribution of a dataset.

Surface water plots are discussed in Section 3.0 of the report.

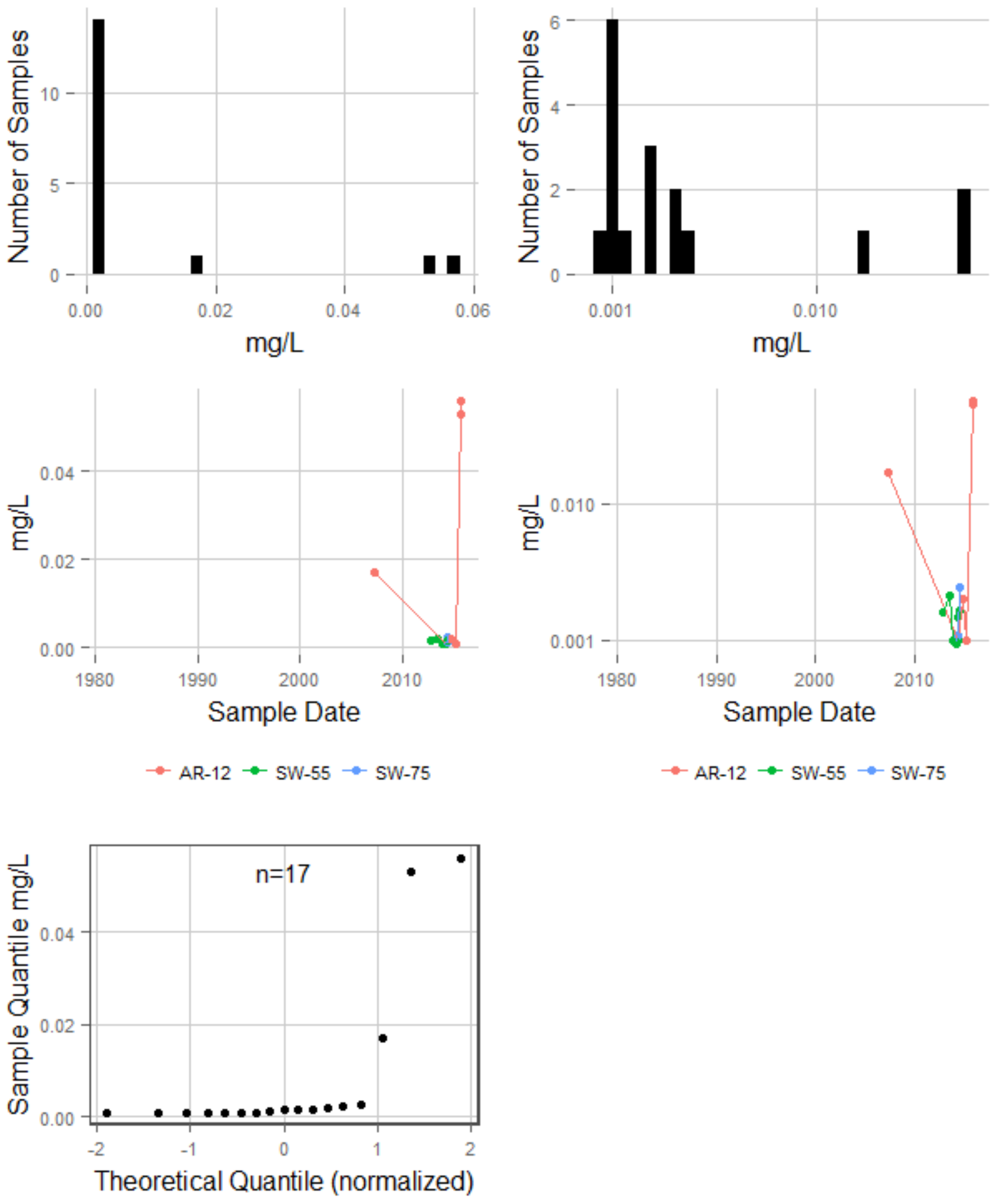
Aluminum


Number of Samples
30
20
10
0
0
100
200
300
mg/L
Number of Samples
6
4
2
0
0.1
10.0
mg/L
mg/L
300
200
100
0
1980
1990
2000
2010
Sample Date
mg/L
10.0
0.1
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
300
200
100
0
n=51
-2
-1
0
1
2
Theoretical Quantile (normalized)

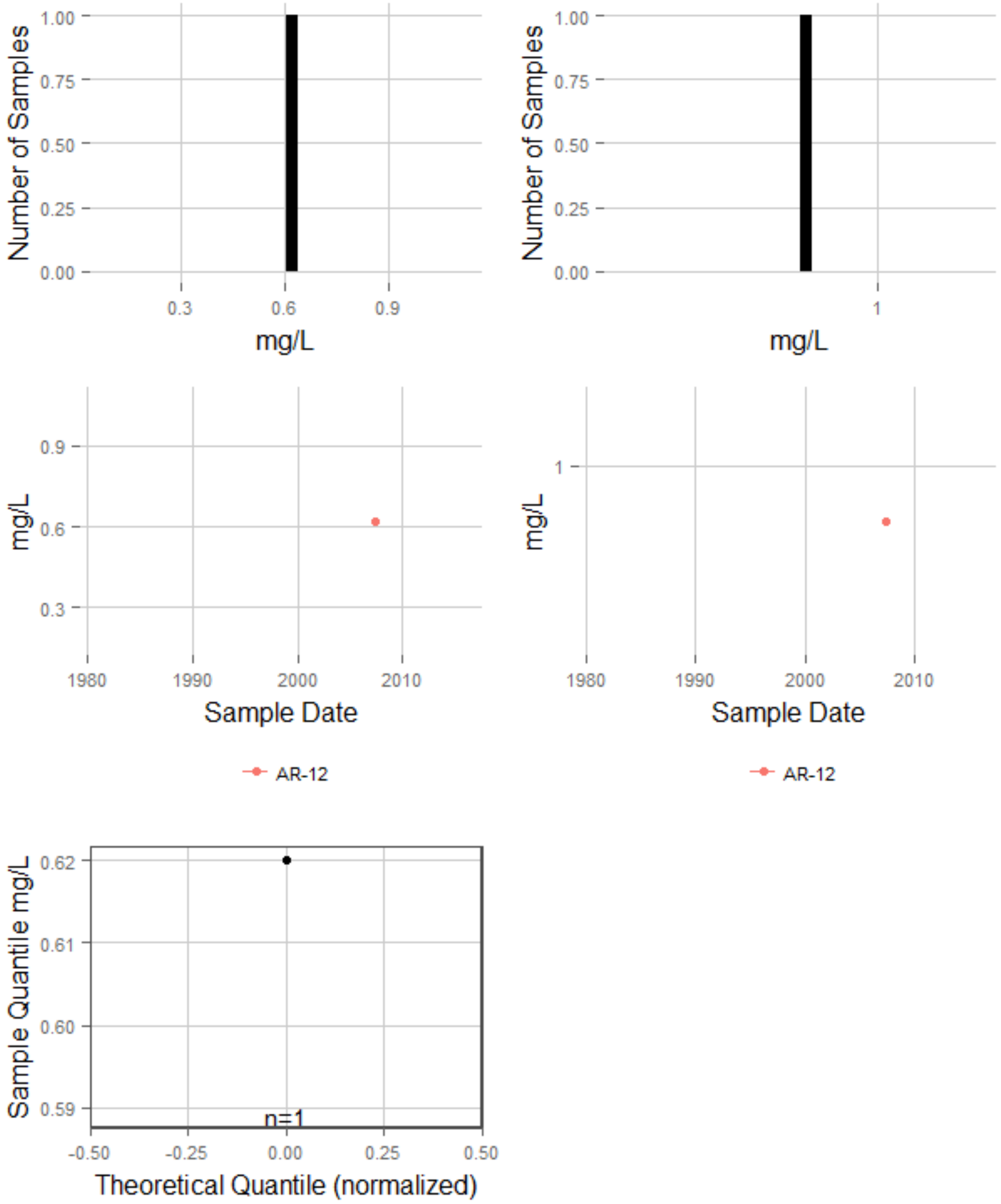
Ammonia


Number of Samples
15
10
5
0
0
50
100
mg/L
Number of Samples
10.0
7.5
5.0
2.5
0.0
1
100
mg/L
mg/L
120
80
40
0
1980
1990
2000
2010
Sample Date
mg/L
100
1
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-75
AR-12
SW-55
SW-75
Sample Quantile mg/L
120
80
40
0
n=18
-2
-1
0
1
2
Theoretical Quantile (normalized)

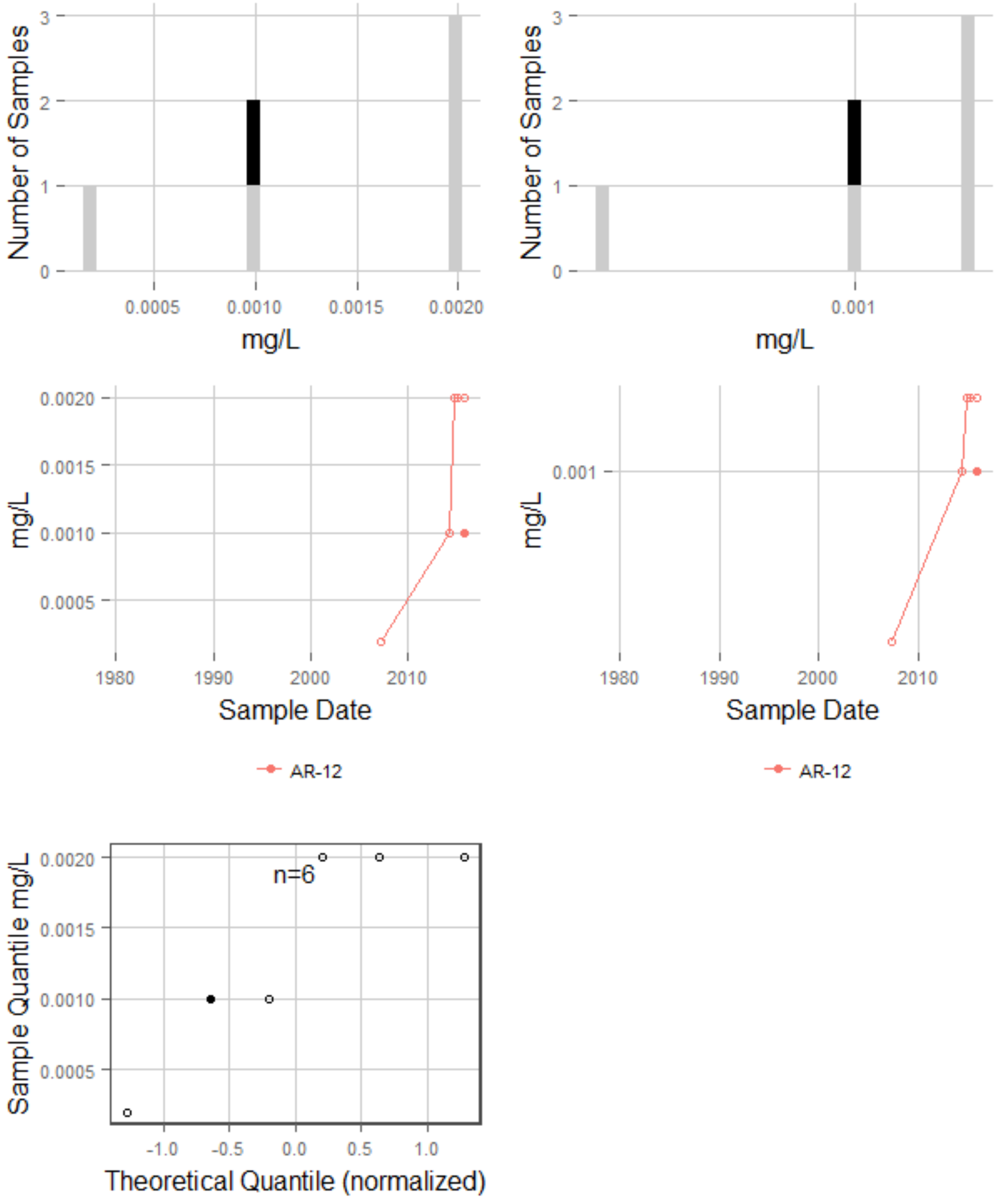
Arsenic


Number of Samples
0
5
10
0.00
0.02
0.04
0.06
mg/L
Number of Samples
0
2
4
6
0.001
0.010
mg/L
mg/L
0.00
0.02
0.04
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-75
mg/L
0.001
0.010
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-75
Sample Quantile mg/L
0.00
0.02
0.04
n=17
-2
-1
0
1
2
Theoretical Quantile (normalized)

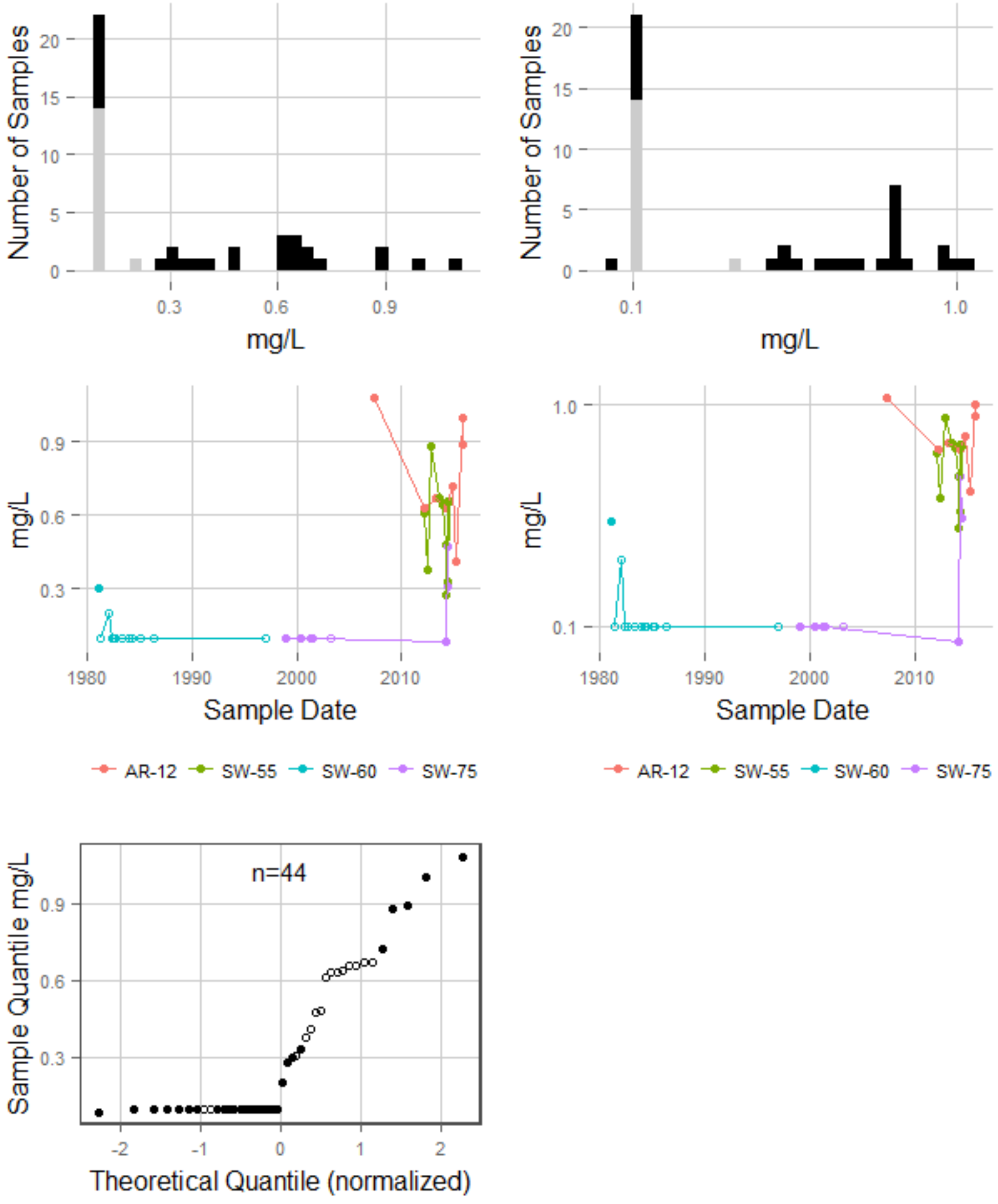
Barium


Number of Samples
1.00
0.75
0.50
0.25
0.00
0.3
0.6
0.9
mg/L
Number of Samples
1.00
0.75
0.50
0.25
0.00
1
mg/L
mg/L
0.9
0.6
0.3
1980
1990
2000
2010
Sample Date
AR-12
mg/L
1
1980
1990
2000
2010
Sample Date
AR-12
Sample Quantile mg/L
0.62
0.61
0.60
0.59
n=1
-0.50
-0.25
0.00
0.25
0.50
Theoretical Quantile (normalized)

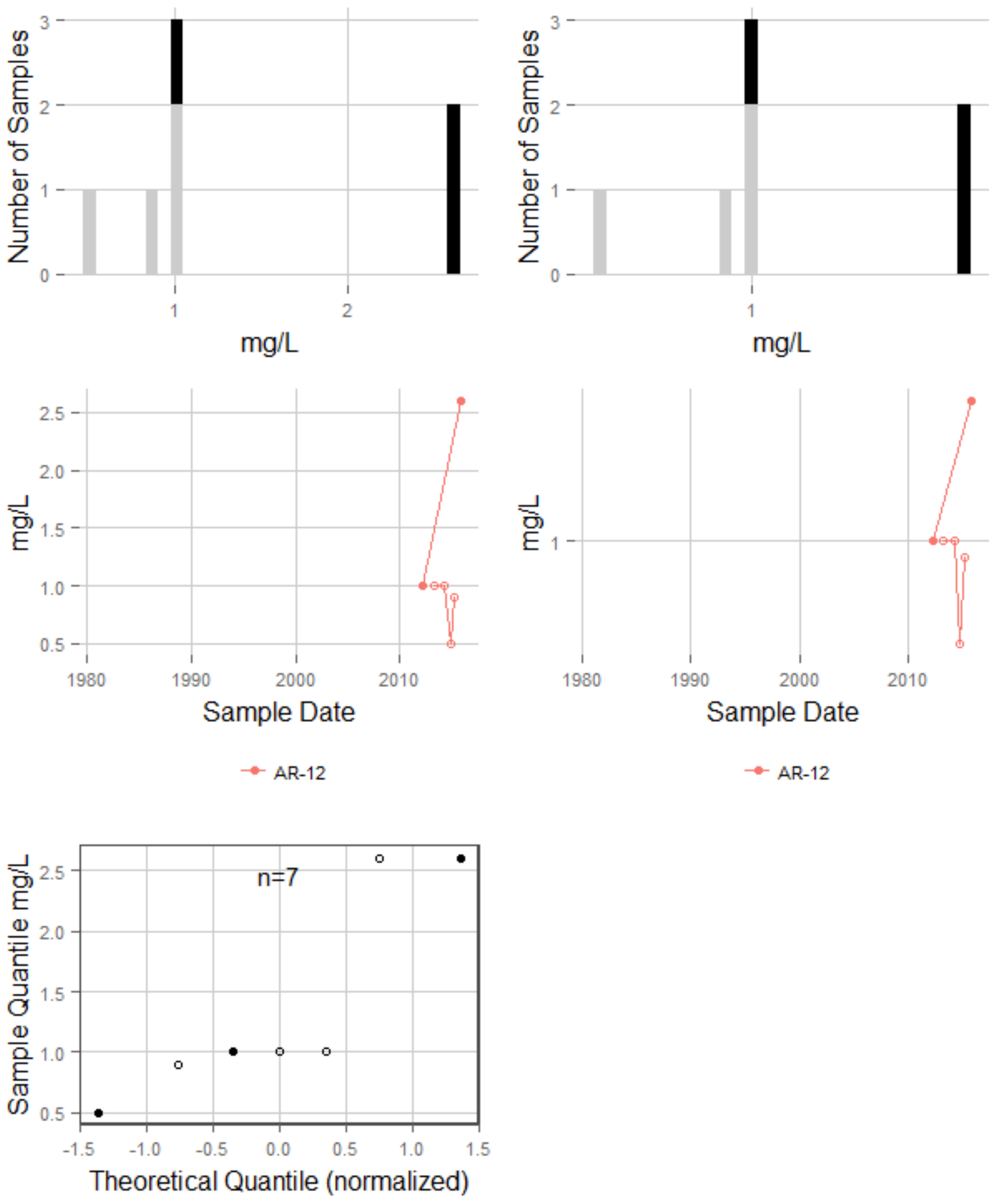
Beryllium


Number of Samples
0
1
2
3
0.0005
0.0010
0.0015
0.0020
mg/L
Number of Samples
0
1
2
3
0.001
mg/L
mg/L
0.0020
0.0015
0.0010
0.0005
1980
1990
2000
2010
Sample Date
AR-12
mg/L
0.001
1980
1990
2000
2010
Sample Date
AR-12
Sample Quantile mg/L
0.0020
0.0015
0.0010
0.0005
n=6
-1.0
-0.5
0.0
0.5
1.0
Theoretical Quantile (normalized)

Boron

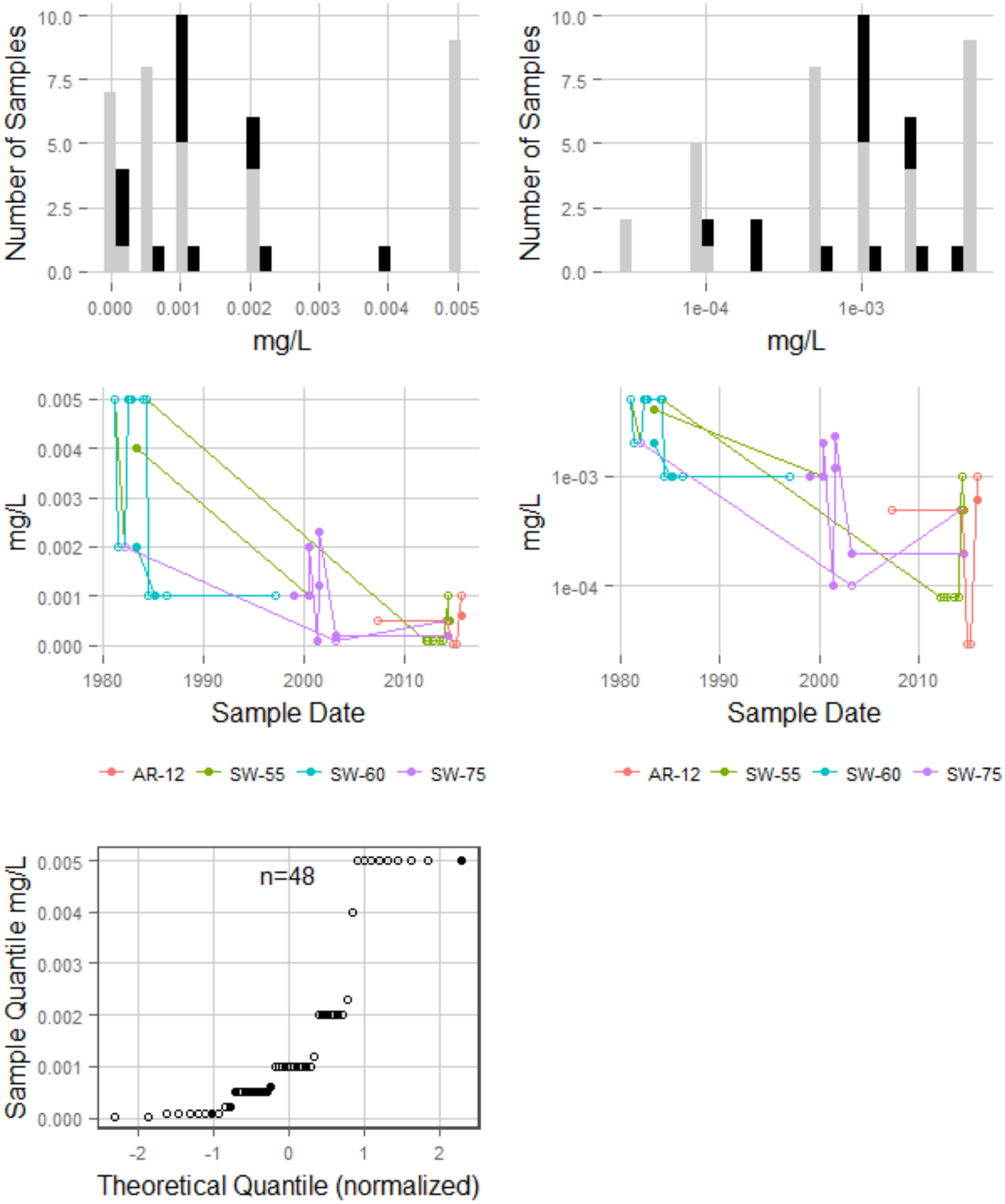

Number of Samples
20
15
10
5
0
0.3
0.6
0.9
mg/L
Number of Samples
20
15
10
5
0
0.1
1.0
mg/L
mg/L
0.9
0.6
0.3
1980
1990
2000
2010
Sample Date
mg/L
1.0
0.1
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
n=44
0.9
0.6
0.3
-2
-1
0
1
2
Theoretical Quantile (normalized)

Bromide

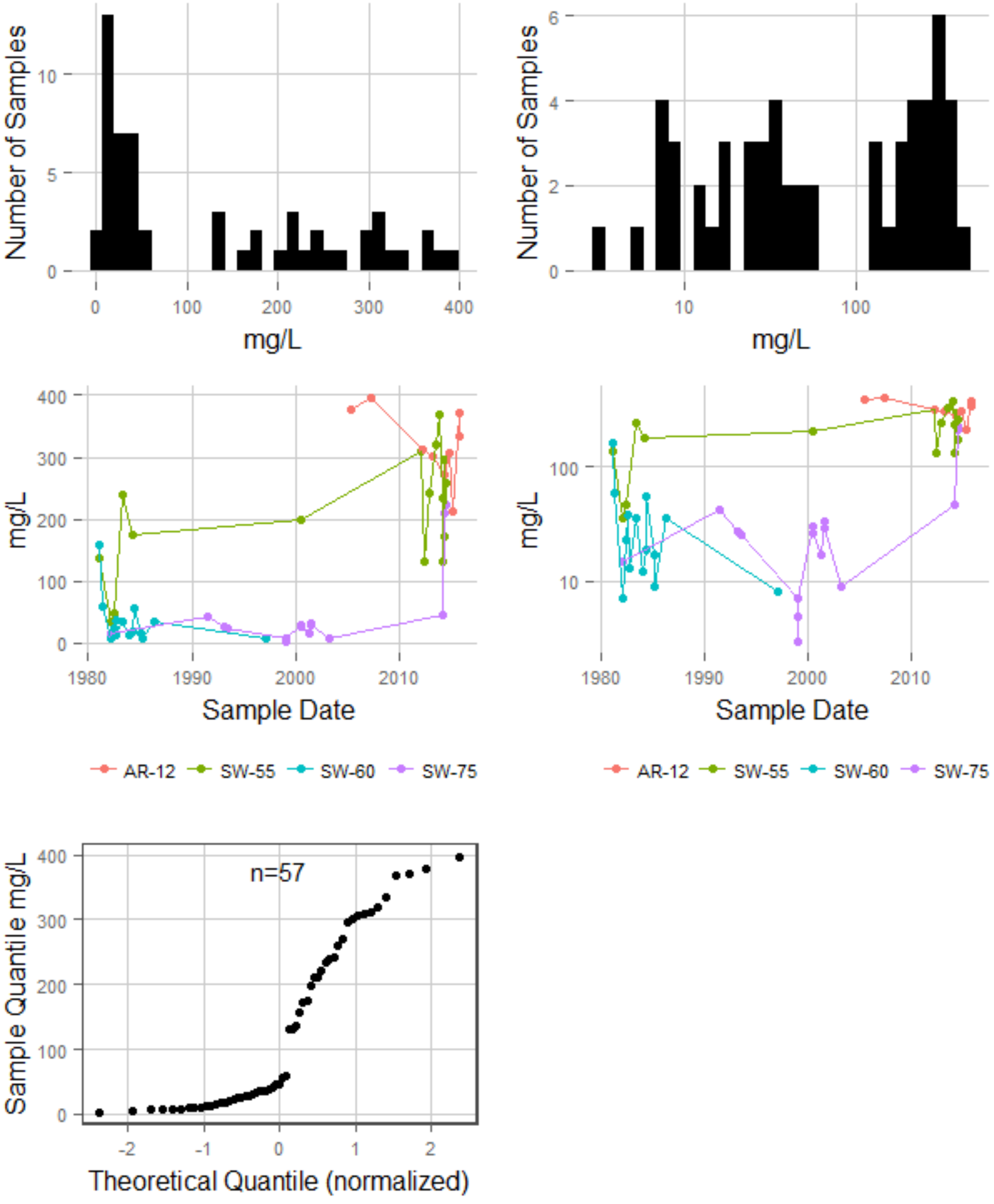


Number of Samples
0
1
2
3
1
2
mg/L
Number of Samples
0
1
2
3
1
mg/L
mg/L
0.5
1.0
1.5
2.0
2.5
1980
1990
2000
2010
Sample Date
AR-12
mg/L
1
1980
1990
2000
2010
Sample Date
AR-12
Sample Quantile mg/L
0.5
1.0
1.5
2.0
2.5
n=7
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantile (normalized)

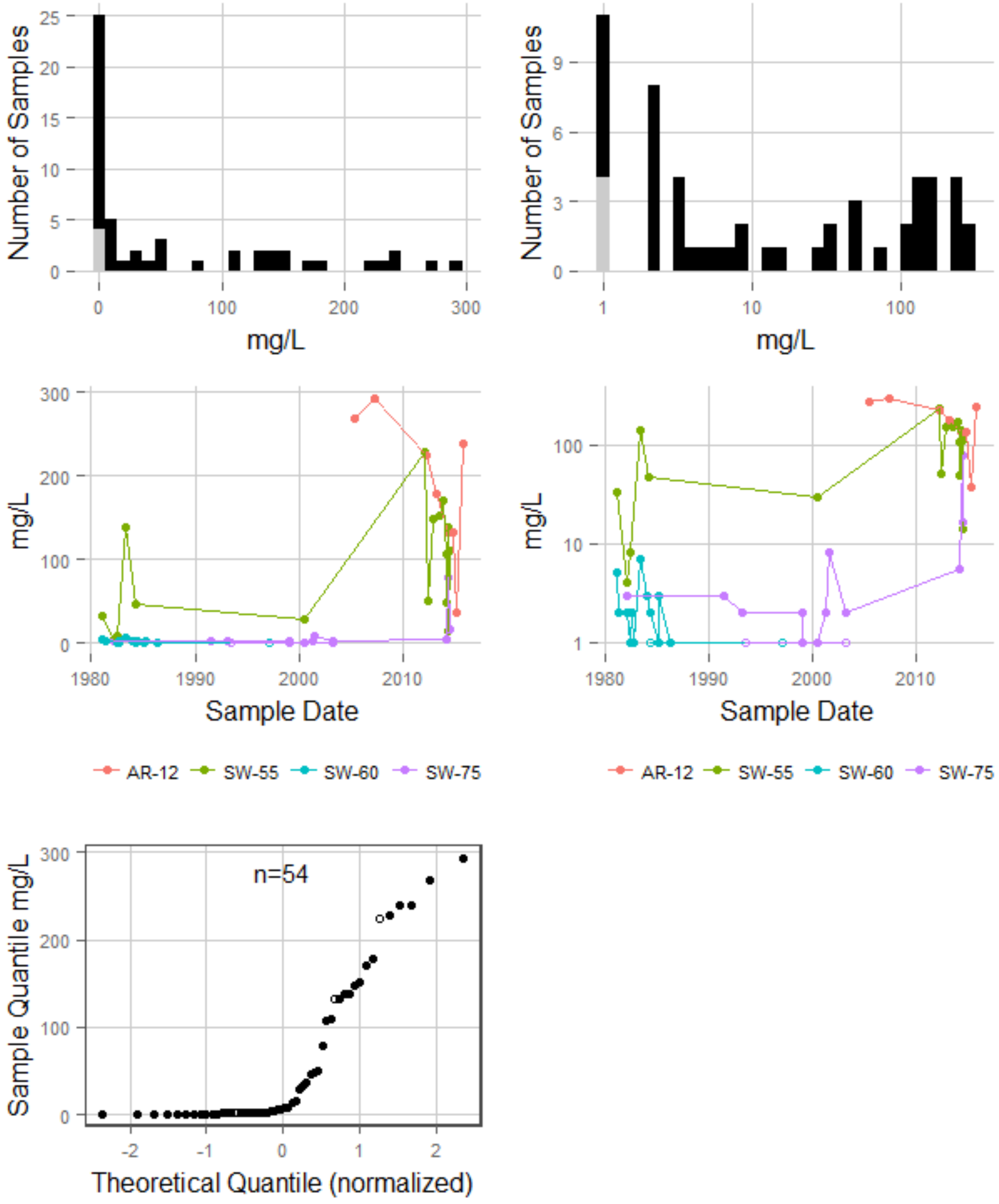
Cadmium


Number of Samples
10.0
7.5
5.0
2.5
0.0
0.000
0.001
0.002
0.003
0.004
0.005
mg/L
Number of Samples
10.0
7.5
5.0
2.5
0.0
1e-04
1e-03
mg/L
mg/L
0.005
0.004
0.003
0.002
0.001
0.000
1980
1990
2000
2010
Sample Date
mg/L
1e-03
1e-04
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
n=48
0.005
0.004
0.003
0.002
0.001
0.000
-2
-1
0
1
2
Theoretical Quantile (normalized)

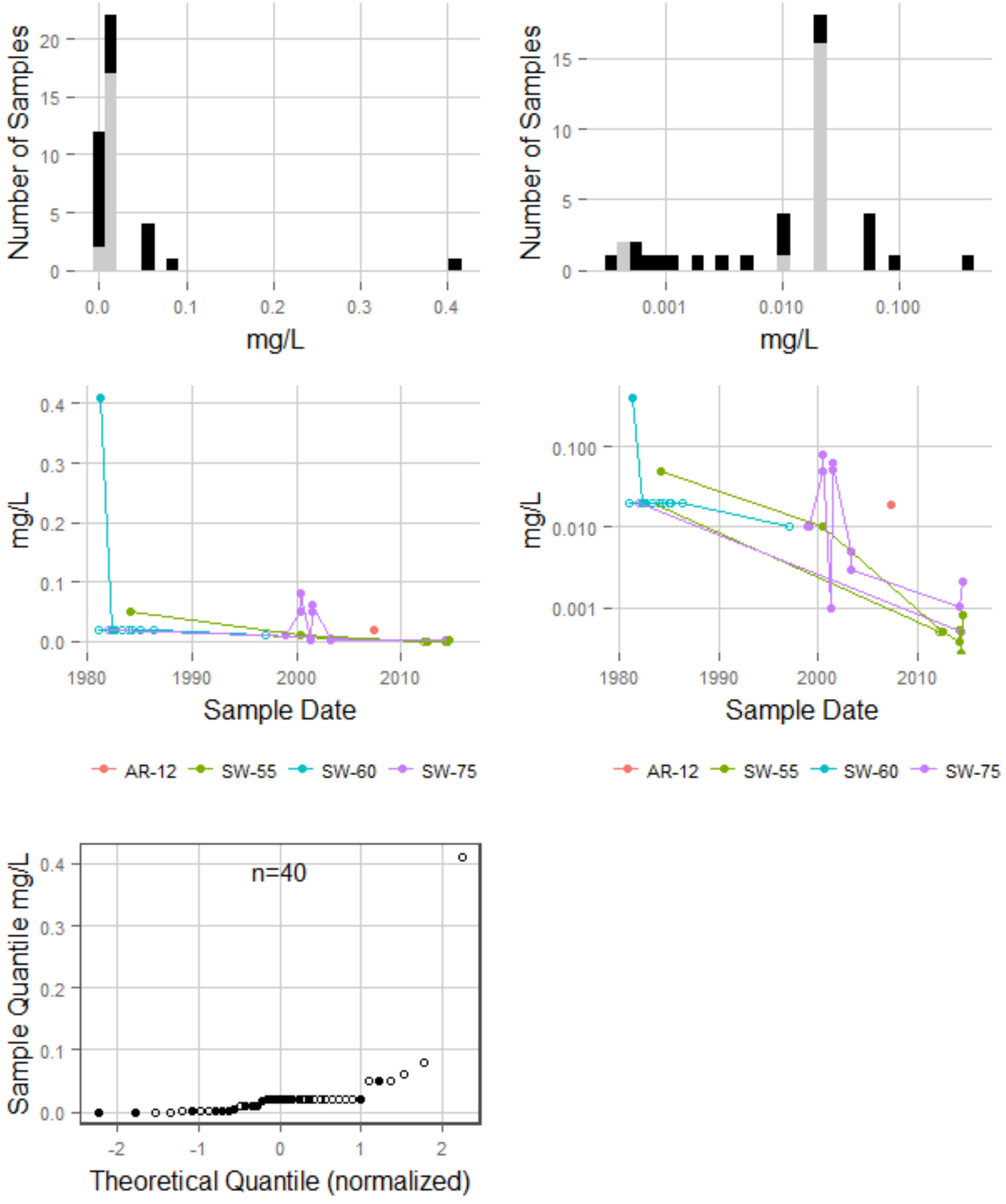
Calcium


Number of Samples
0
5
10
0
100
200
300
400
mg/L
Number of Samples
0
2
4
6
10
100
mg/L
mg/L
0
100
200
300
400
1980
1990
2000
2010
Sample Date
mg/L
10
100
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
0
100
200
300
400
n=57
-2
-1
0
1
2
Theoretical Quantile (normalized)

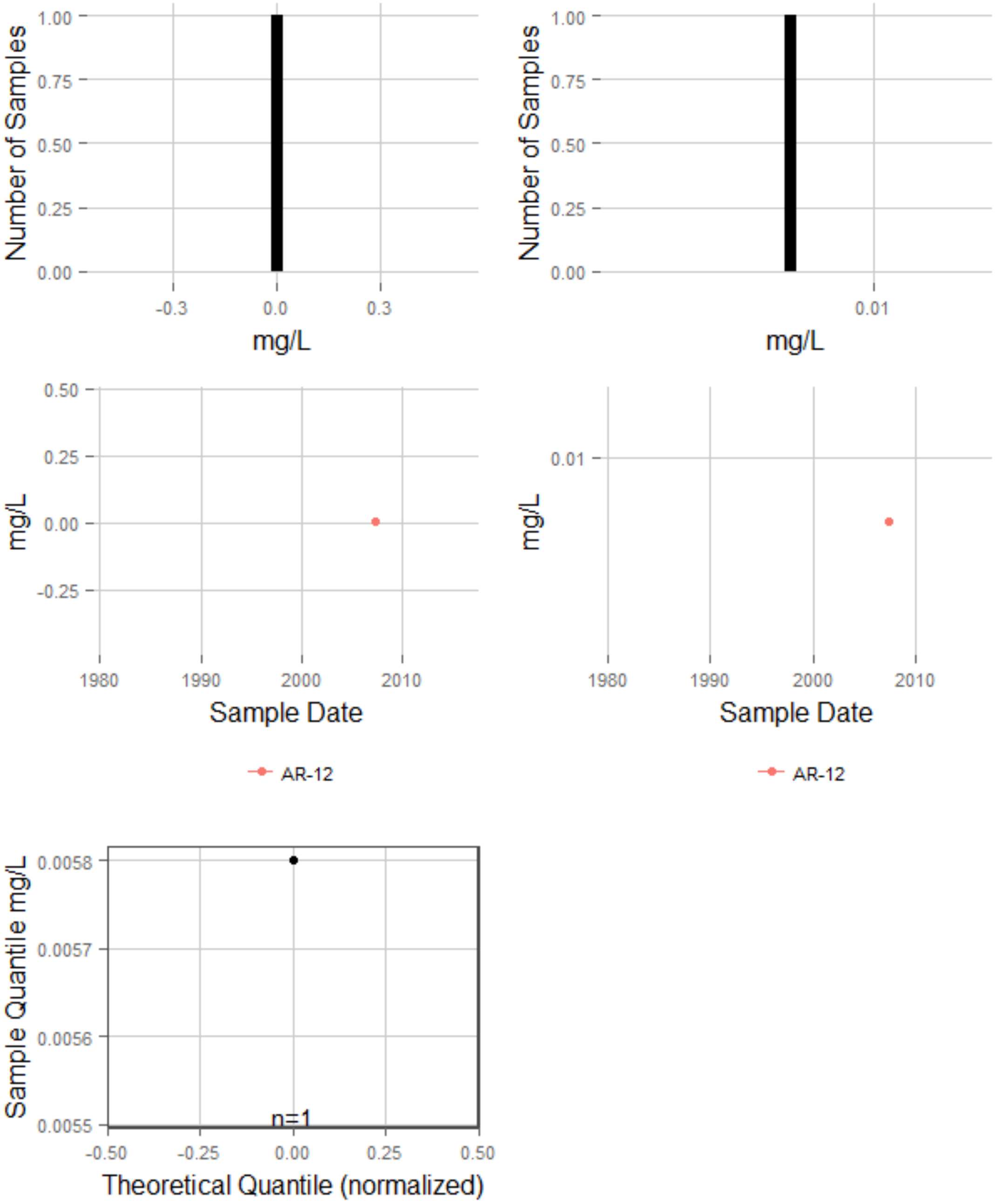
Chloride


Number of Samples
25
20
15
10
5
0
0
100
200
300
mg/L
Number of Samples
9
6
3
0
1
10
100
mg/L
mg/L
300
200
100
0
1980
1990
2000
2010
Sample Date
mg/L
100
10
1
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
300
200
100
0
n=54
-2
-1
0
1
2
Theoretical Quantile (normalized)

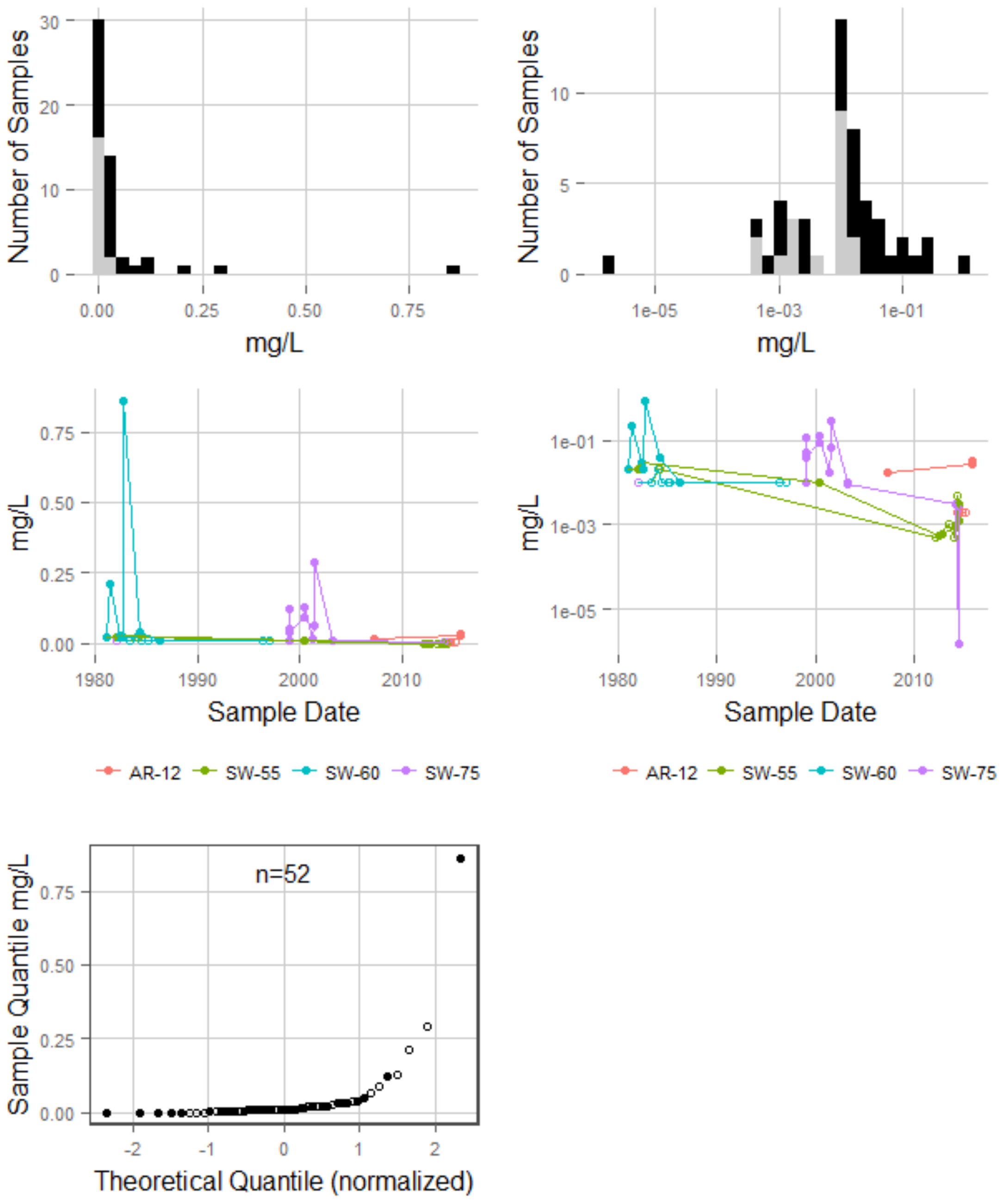
Chromium


Number of Samples
20
15
10
5
0
0.0
0.1
0.2
0.3
0.4
mg/L
Number of Samples
15
10
5
0
0.001
0.010
0.100
mg/L
mg/L
0.4
0.3
0.2
0.1
0.0
1980
1990
2000
2010
Sample Date
mg/L
0.100
0.010
0.001
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
n=40
0.4
0.3
0.2
0.1
0.0
-2
-1
0
1
2
Theoretical Quantile (normalized)

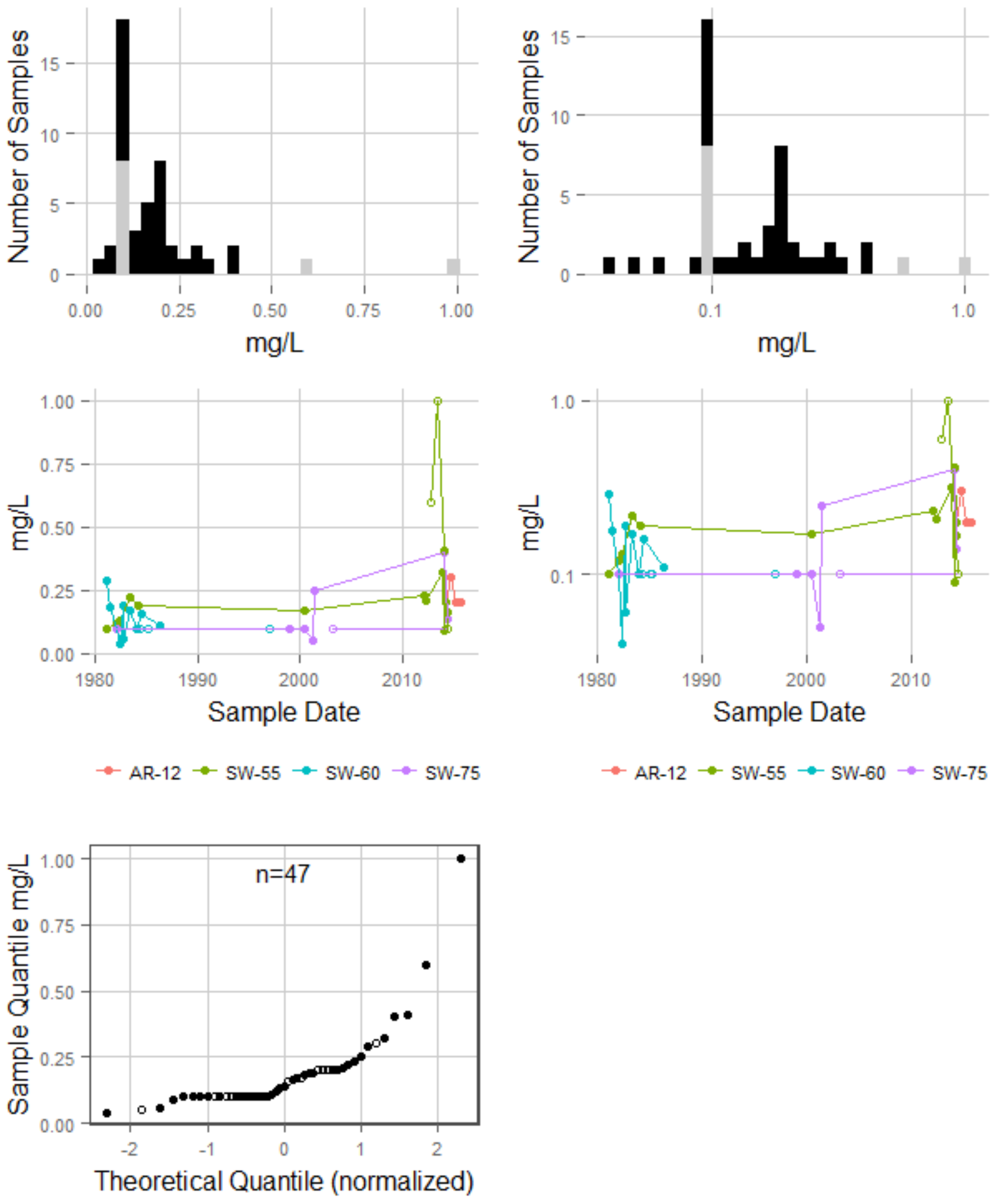
Cobalt


Number of Samples
1.00
0.75
0.50
0.25
0.00
-0.3
0.0
0.3
mg/L
Number of Samples
1.00
0.75
0.50
0.25
0.00
0.01
mg/L
mg/L
0.50
0.25
0.00
-0.25
1980
1990
2000
2010
Sample Date
AR-12
mg/L
0.01
1980
1990
2000
2010
Sample Date
AR-12
Sample Quantile mg/L
0.0058
0.0057
0.0056
0.0055
n=1
-0.50
-0.25
0.00
0.25
0.50
Theoretical Quantile (normalized)

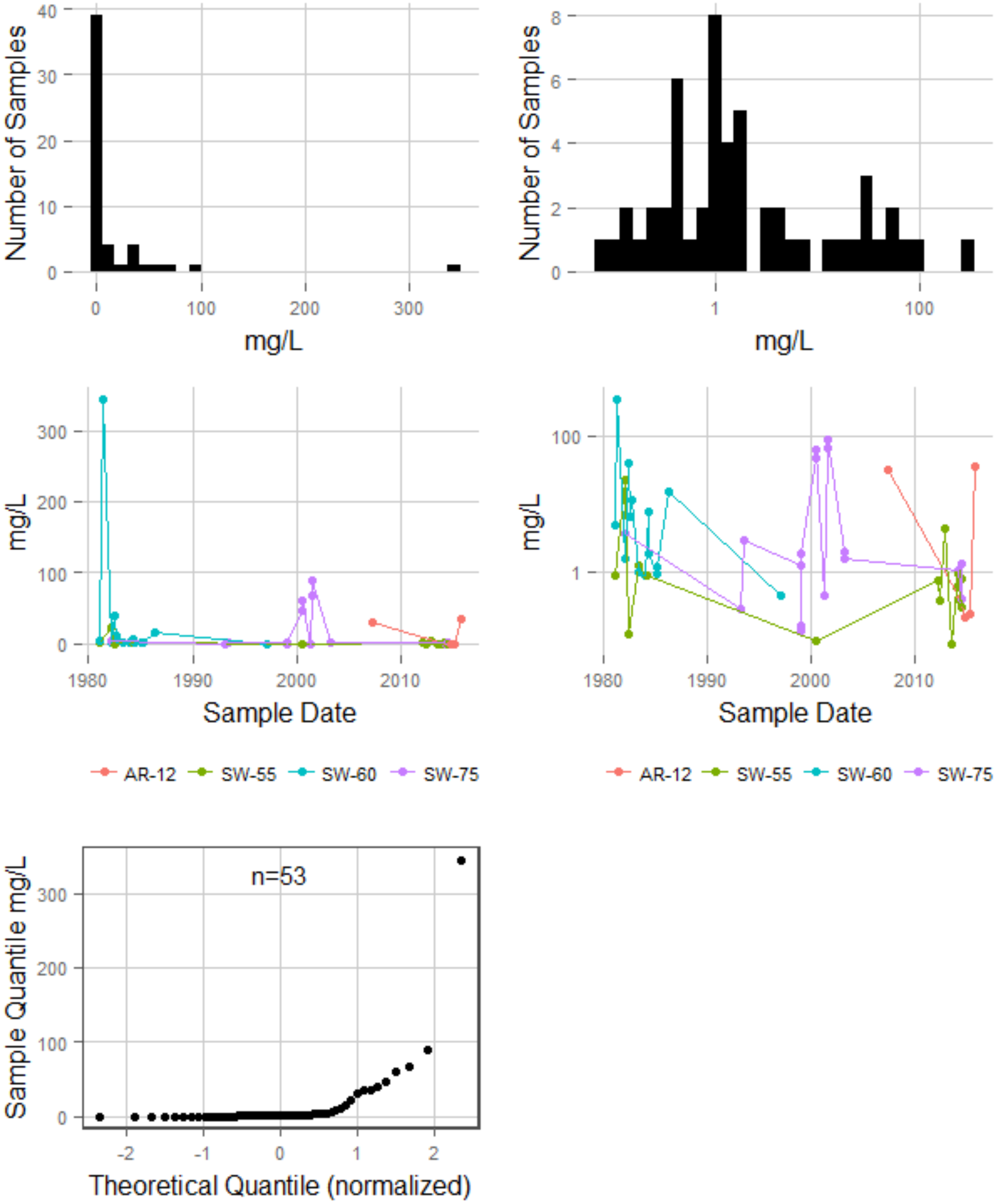
Copper


Number of Samples
30
20
10
0
0.00
0.25
0.50
0.75
mg/L
Number of Samples
10
5
0
1e-05
1e-03
1e-01
mg/L
mg/L
0.75
0.50
0.25
0.00
1980
1990
2000
2010
Sample Date
mg/L
1e-01
1e-03
1e-05
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
n=52
0.75
0.50
0.25
0.00
-2
-1
0
1
2
Theoretical Quantile (normalized)

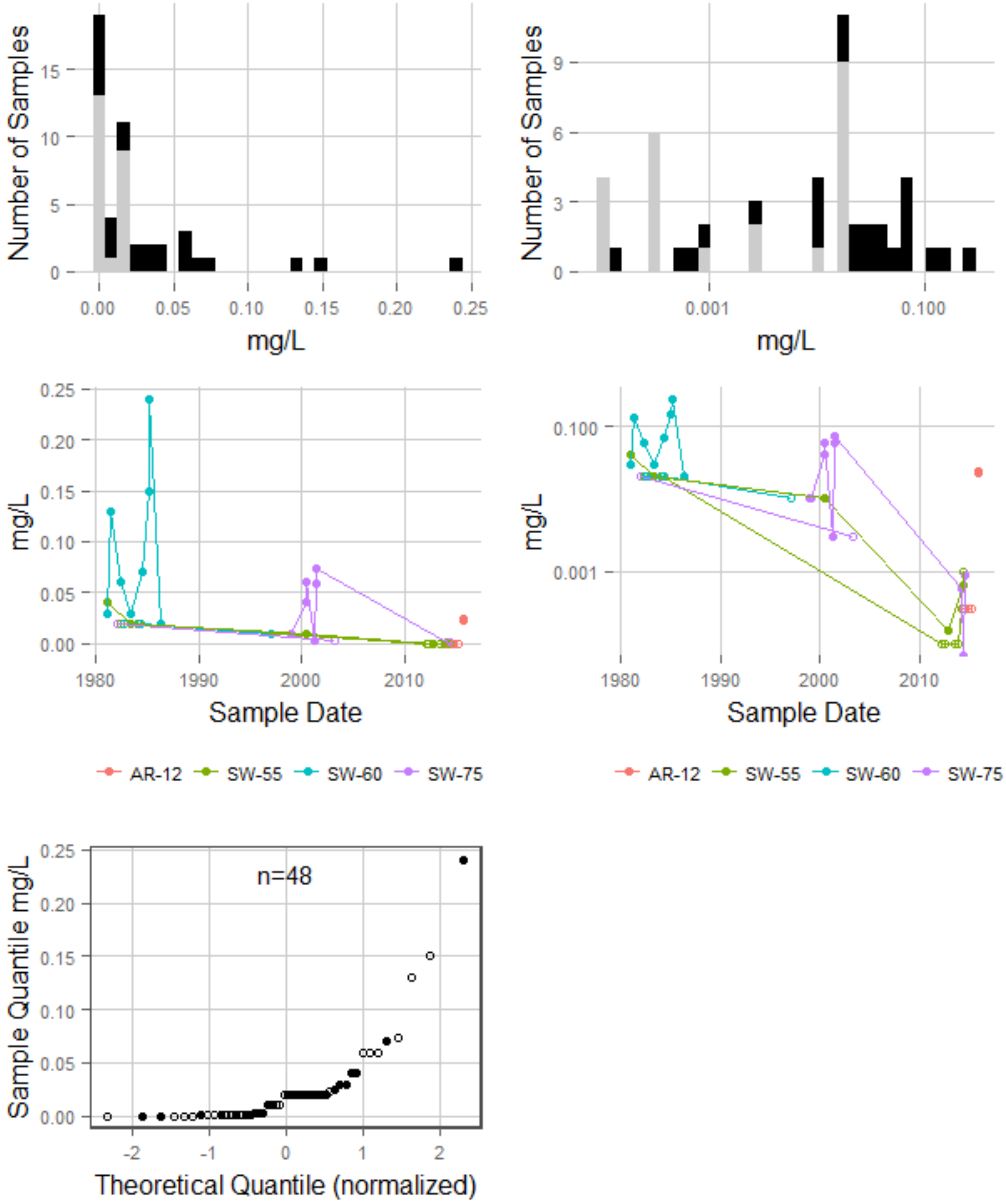
Fluoride


Number of Samples
0
5
10
15
0.00
0.25
0.50
0.75
1.00
mg/L
Number of Samples
0
5
10
15
0.1
1.0
mg/L
mg/L
0.00
0.25
0.50
0.75
1.00
1980
1990
2000
2010
Sample Date
mg/L
0.1
1.0
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
0.00
0.25
0.50
0.75
1.00
n=47
-2
-1
0
1
2
Theoretical Quantile (normalized)

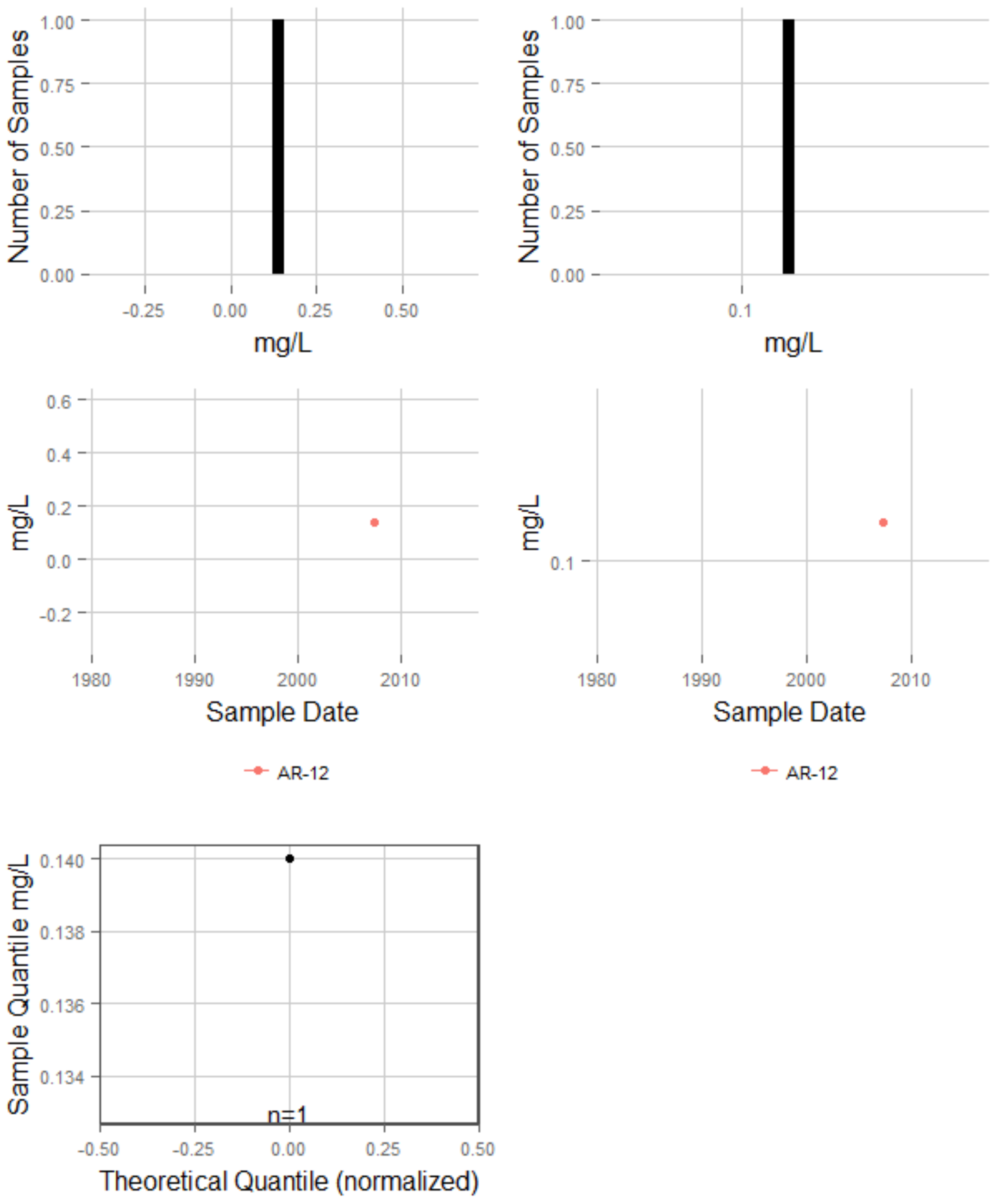
Iron


Number of Samples
40
30
20
10
0
0
100
200
300
mg/L
Number of Samples
8
6
4
2
0
1
100
mg/L
mg/L
300
200
100
0
1980
1990
2000
2010
Sample Date
mg/L
100
1
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
n=53
300
200
100
0
-2
-1
0
1
2
Theoretical Quantile (normalized)

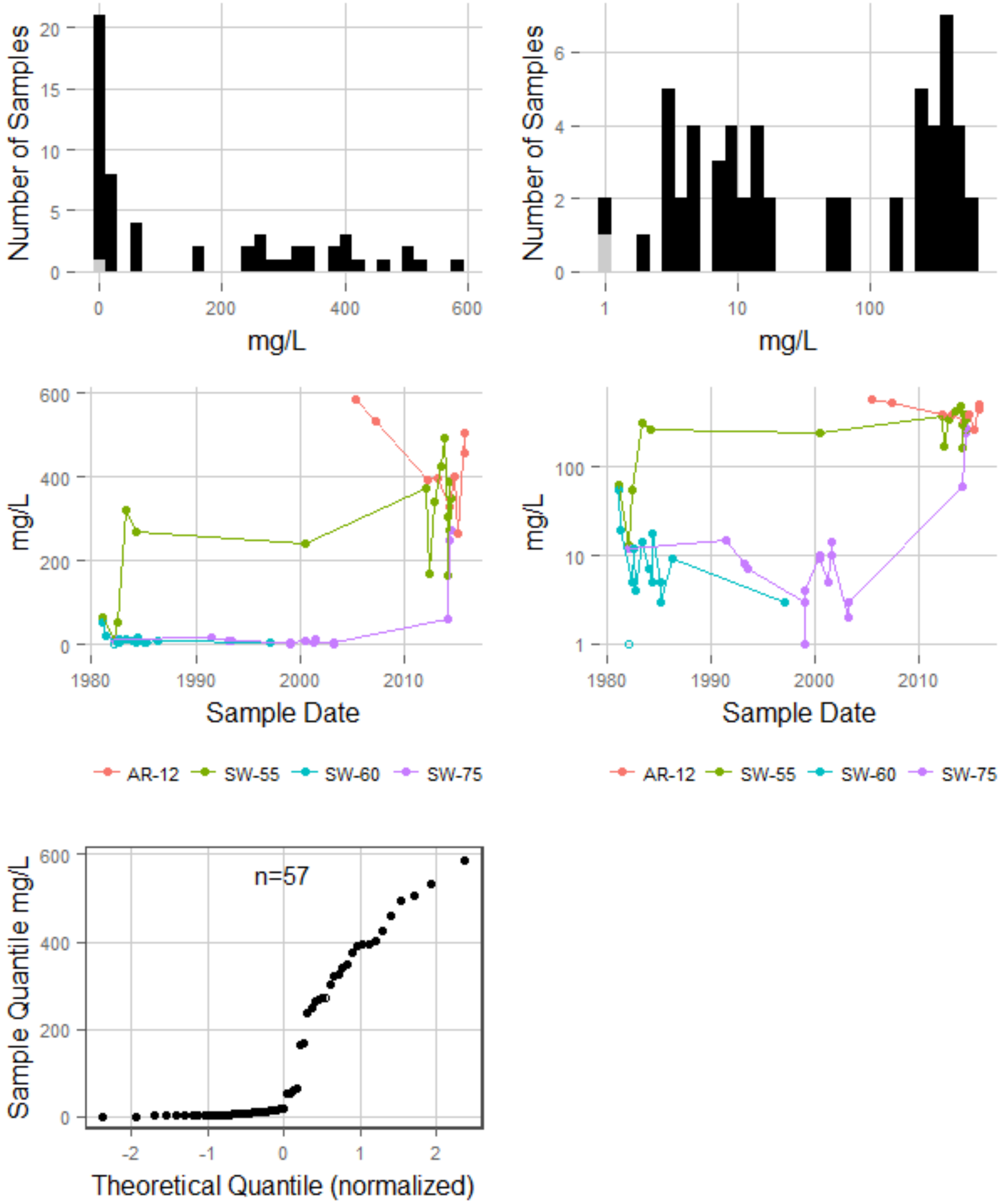
Lead


Number of Samples
0
5
10
15
0.00
0.05
0.10
0.15
0.20
0.25
mg/L
Number of Samples
0
3
6
9
0.001
0.100
mg/L
mg/L
0.00
0.05
0.10
0.15
0.20
0.25
1980
1990
2000
2010
Sample Date
mg/L
0.001
0.100
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
0.00
0.05
0.10
0.15
0.20
0.25
n=48
-2
-1
0
1
2
Theoretical Quantile (normalized)

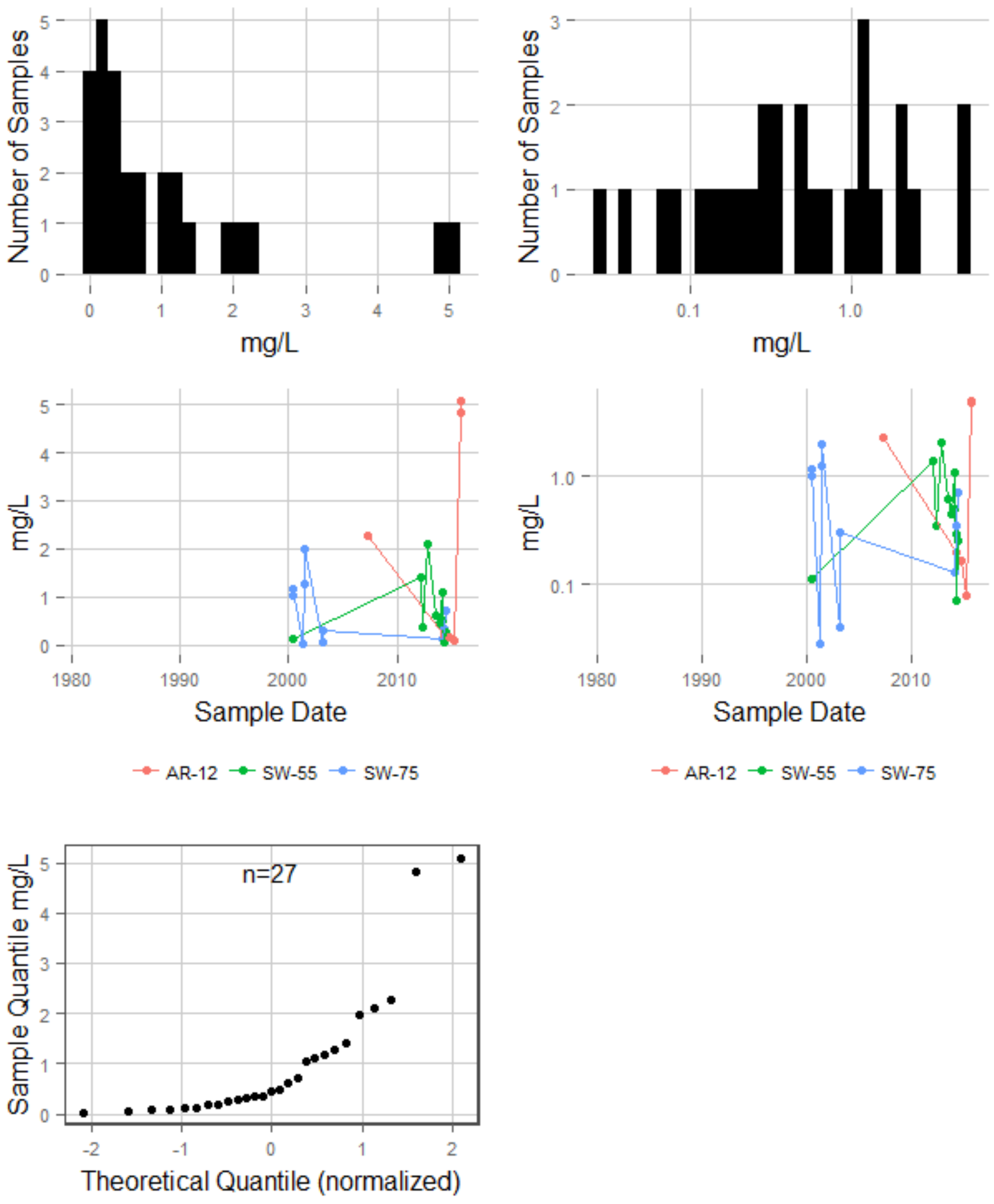
Lithium


Number of Samples
1.00
0.75
0.50
0.25
0.00
-0.25
0.00
0.25
0.50
mg/L
Number of Samples
1.00
0.75
0.50
0.25
0.00
0.1
mg/L
mg/L
0.6
0.4
0.2
0.0
-0.2
1980
1990
2000
2010
Sample Date
AR-12
mg/L
0.1
1980
1990
2000
2010
Sample Date
AR-12
Sample Quantile mg/L
0.140
0.138
0.136
0.134
n=1
-0.50
-0.25
0.00
0.25
0.50
Theoretical Quantile (normalized)

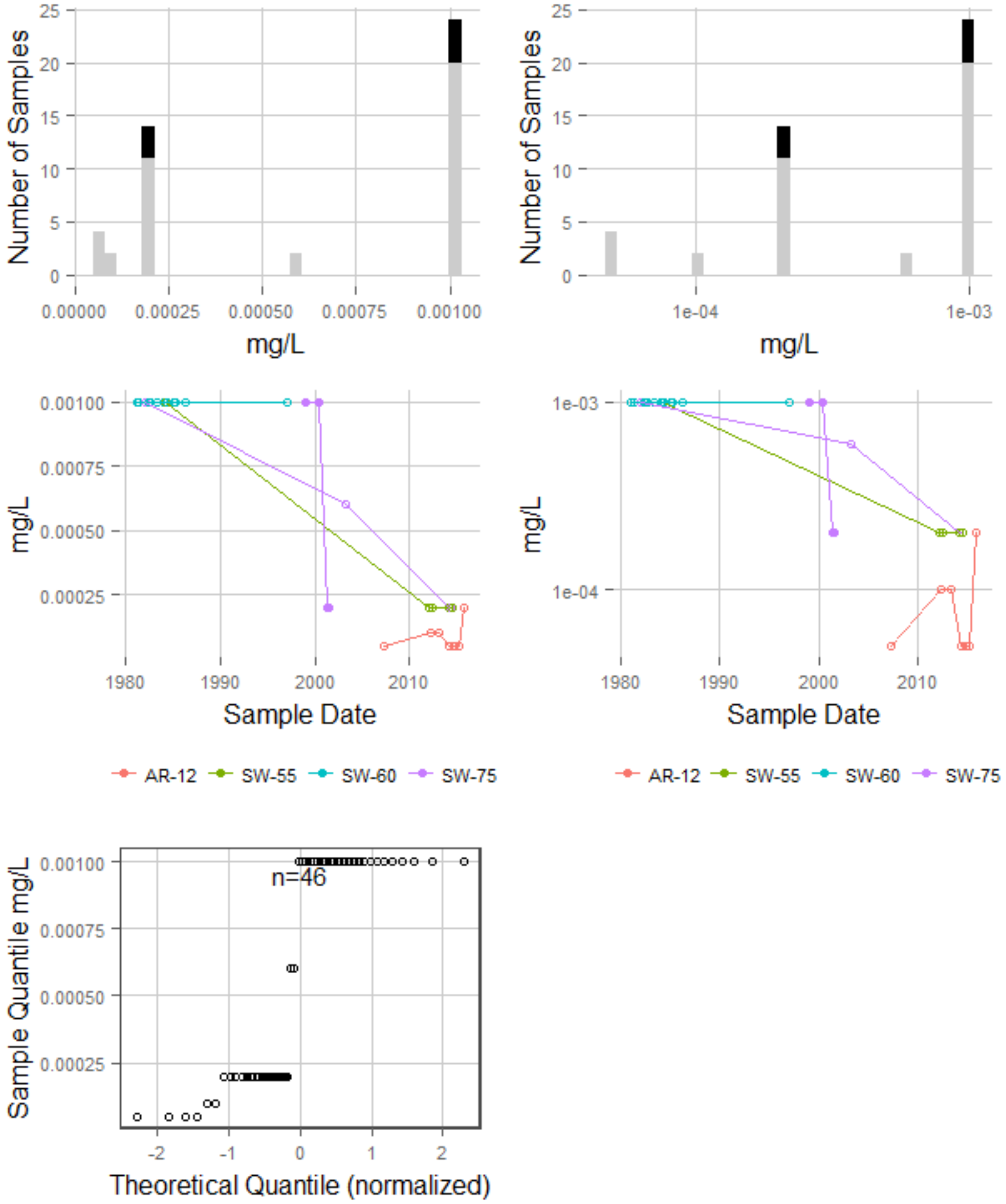
Magnesium


Number of Samples
0
5
10
15
20
0
200
400
600
mg/L
Number of Samples
0
2
4
6
1
10
100
mg/L
mg/L
0
200
400
600
1980
1990
2000
2010
Sample Date
mg/L
1
10
100
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
0
200
400
600
n=57
-2
-1
0
1
2
Theoretical Quantile (normalized)

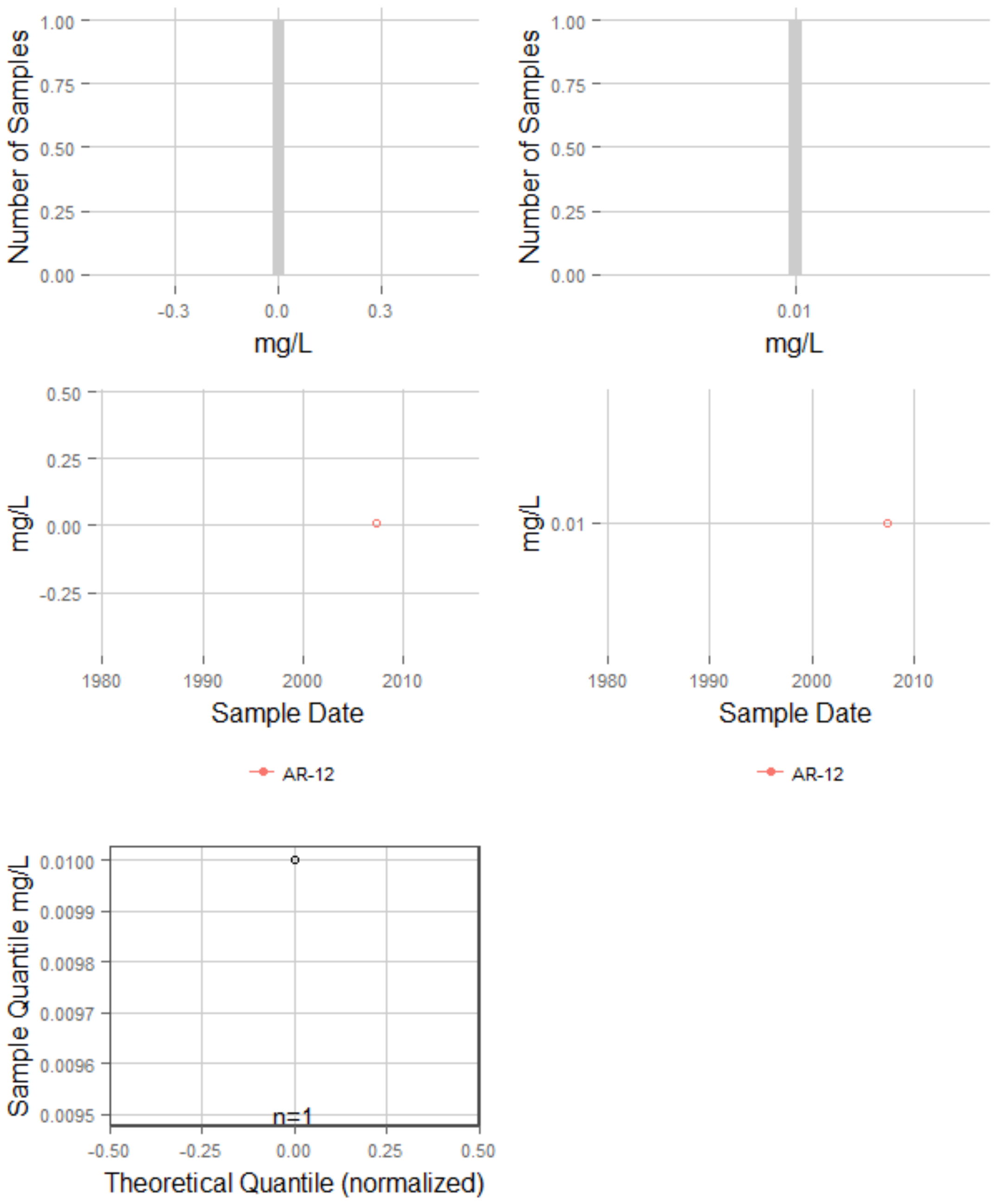
Manganese


Number of Samples
5
4
3
2
1
0
0
1
2
3
4
5
mg/L
Number of Samples
3
2
1
0
0.1
1.0
mg/L
mg/L
5
4
3
2
1
0
1980
1990
2000
2010
Sample Date
mg/L
1.0
0.1
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-75
AR-12
SW-55
SW-75
Sample Quantile mg/L
n=27
5
4
3
2
1
0
-2
-1
0
1
2
Theoretical Quantile (normalized)

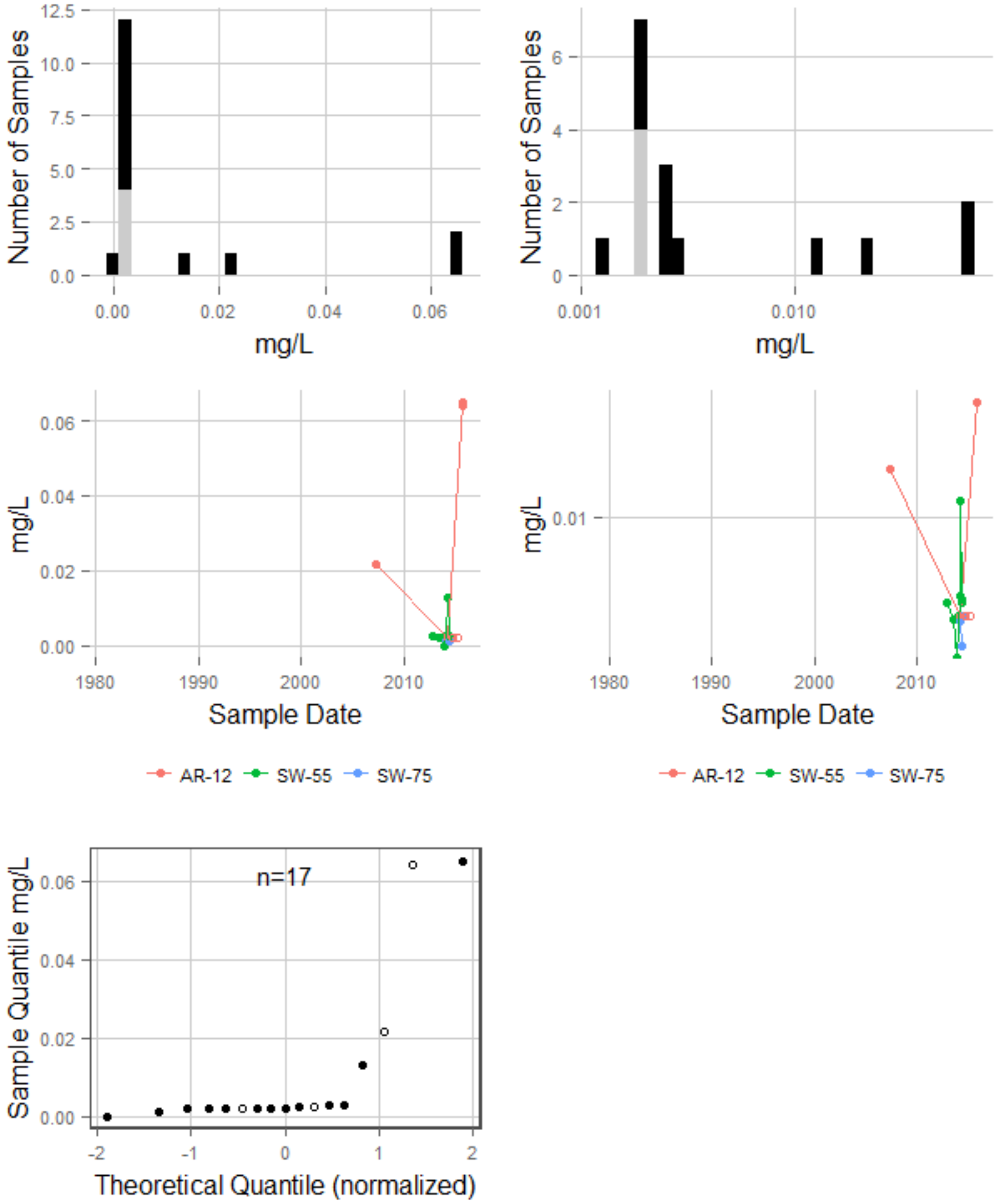
Mercury


Number of Samples
25
20
15
10
5
0
0.00000
0.00025
0.00050
0.00075
0.00100
mg/L
1e-04
1e-03
mg/L
mg/L
0.00100
0.00075
0.00050
0.00025
1980
1990
2000
2010
Sample Date
1e-03
1e-04
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
n=46
-2
-1
0
1
2
Theoretical Quantile (normalized)

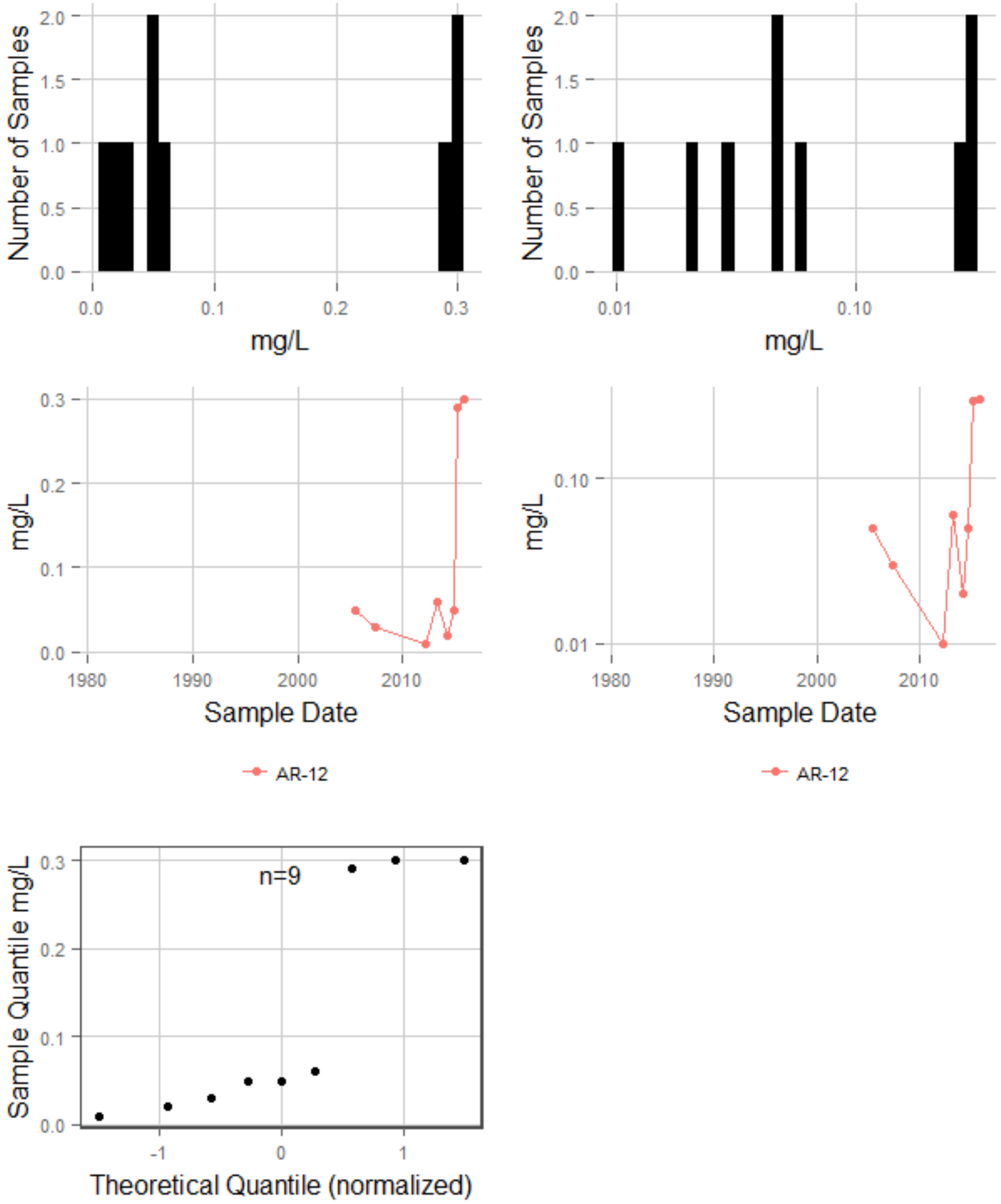
Molybdenum


Number of Samples
1.00
0.75
0.50
0.25
0.00
-0.3
0.0
0.3
mg/L
Number of Samples
1.00
0.75
0.50
0.25
0.00
0.01
mg/L
mg/L
0.50
0.25
0.00
-0.25
1980
1990
2000
2010
Sample Date
AR-12
mg/L
0.01
1980
1990
2000
2010
Sample Date
AR-12
Sample Quantile mg/L
0.0100
0.0099
0.0098
0.0097
0.0096
0.0095
n=1
-0.50
-0.25
0.00
0.25
0.50
Theoretical Quantile (normalized)

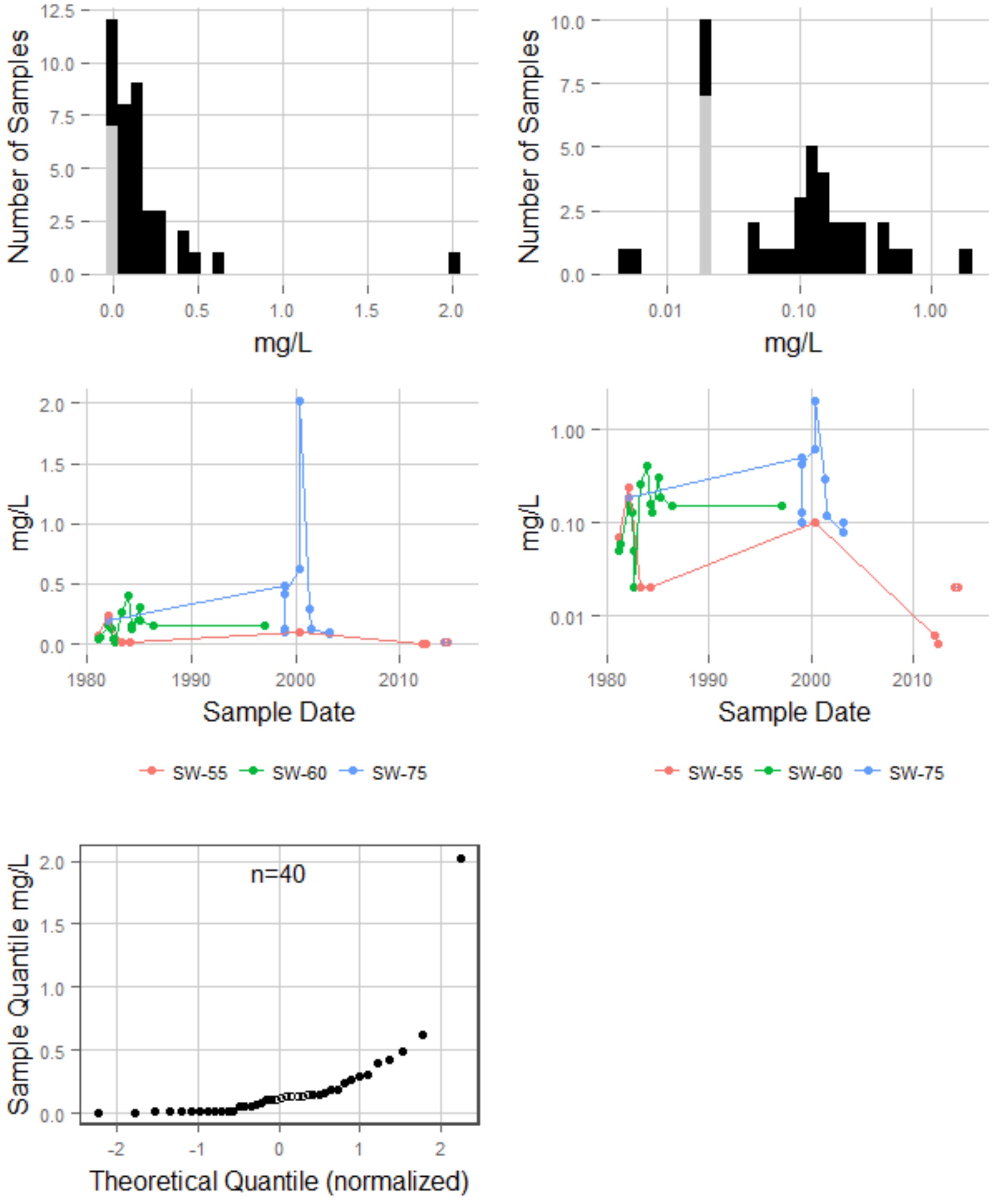
Nickel


Number of Samples
12.5
10.0
7.5
5.0
2.5
0.0
0.00
0.02
0.04
0.06
mg/L
Number of Samples
6
4
2
0
0.001
0.010
mg/L
mg/L
0.06
0.04
0.02
0.00
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-75
mg/L
0.01
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-75
Sample Quantile mg/L
n=17
0.06
0.04
0.02
0.00
-2
-1
0
1
2
Theoretical Quantile (normalized)

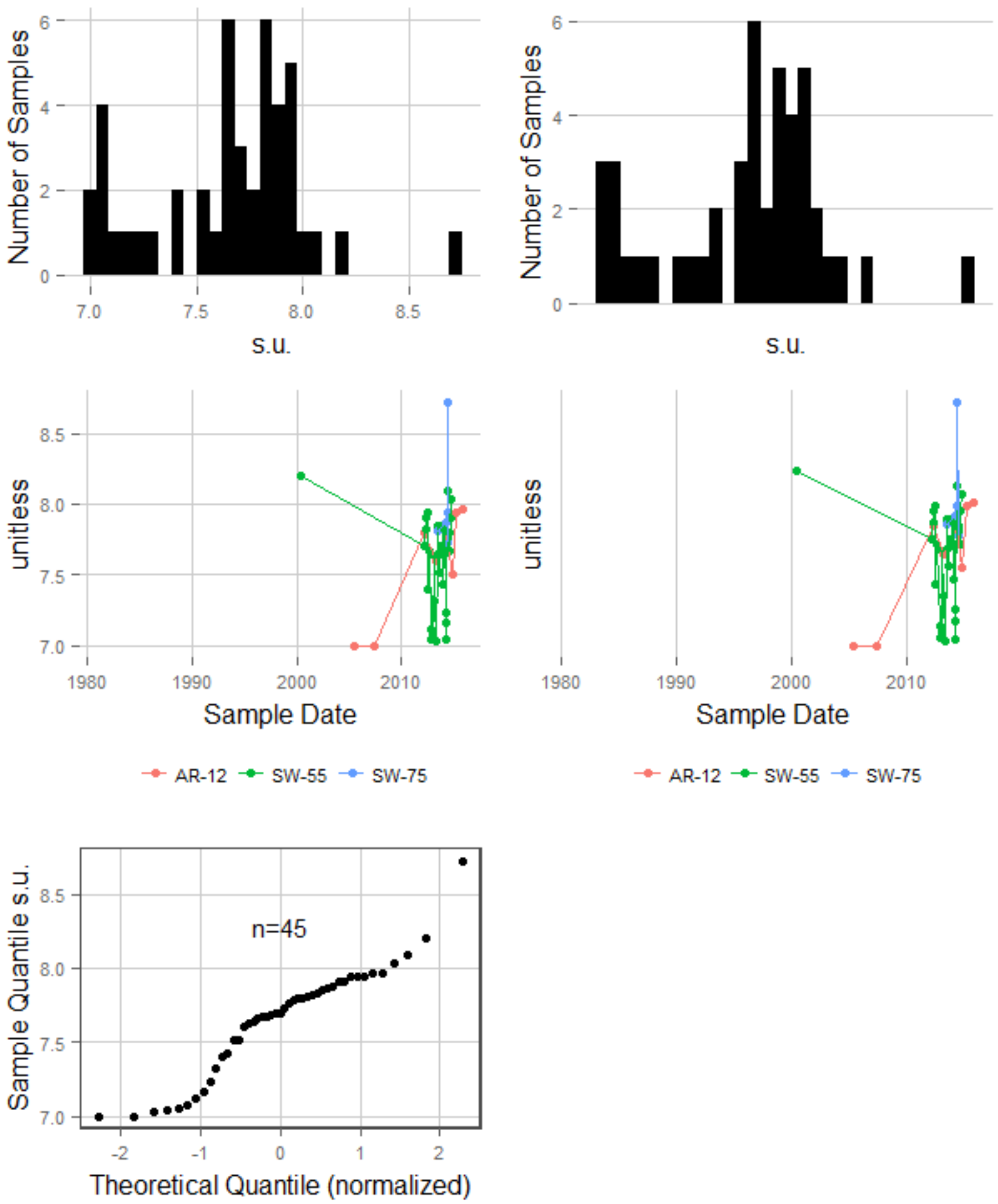
Nitrite + Nitrate



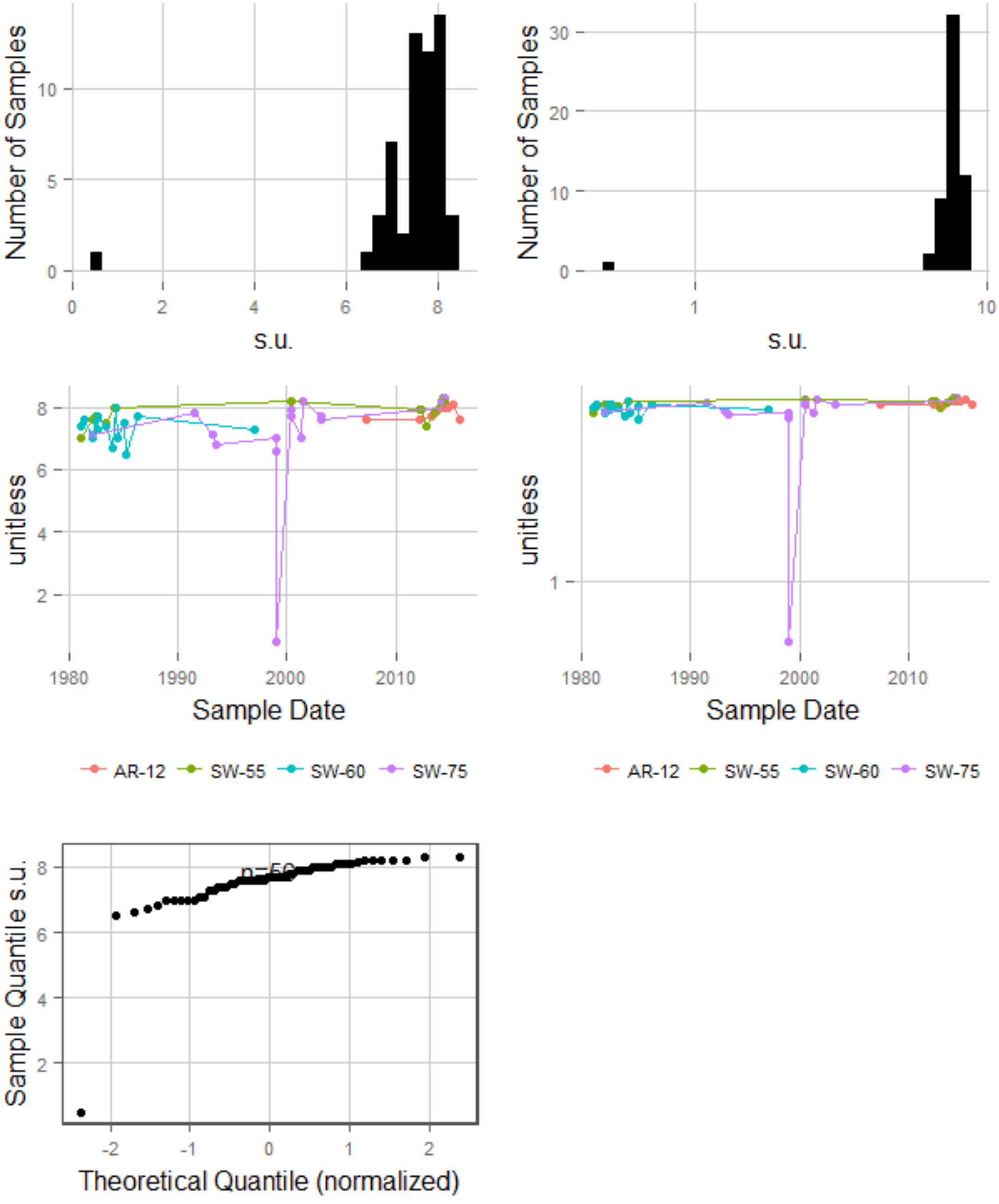
Orthophosphate



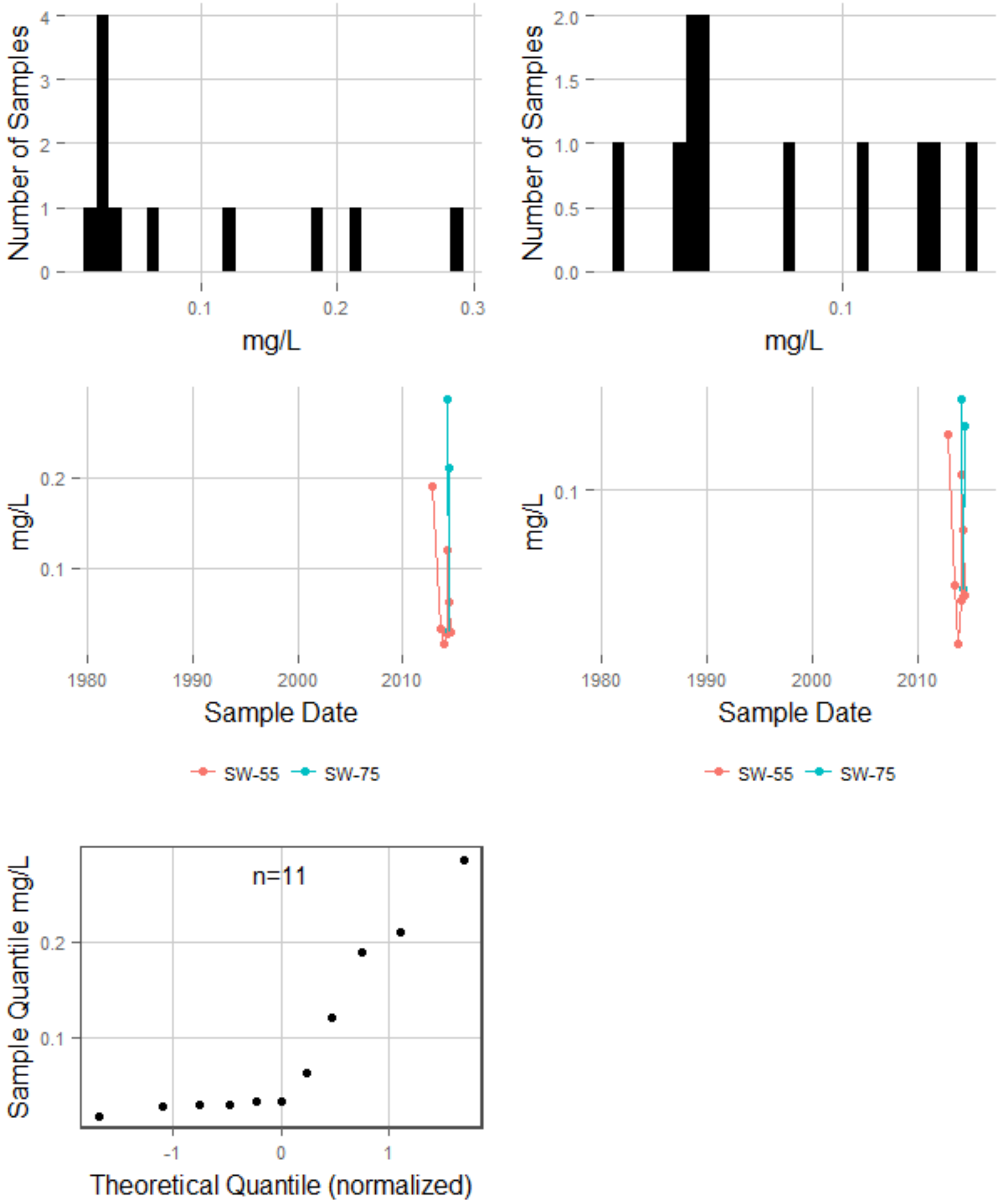
pH (Field)


Number of Samples
0
2
4
6
7.0
7.5
8.0
8.5
s.u.
Number of Samples
0
2
4
6
s.u.
unitless
7.0
7.5
8.0
8.5
1980
1990
2000
2010
Sample Date
unitless
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-75
AR-12
SW-55
SW-75
Sample Quantile s.u.
7.0
7.5
8.0
8.5
n=45
-2
-1
0
1
2
Theoretical Quantile (normalized)

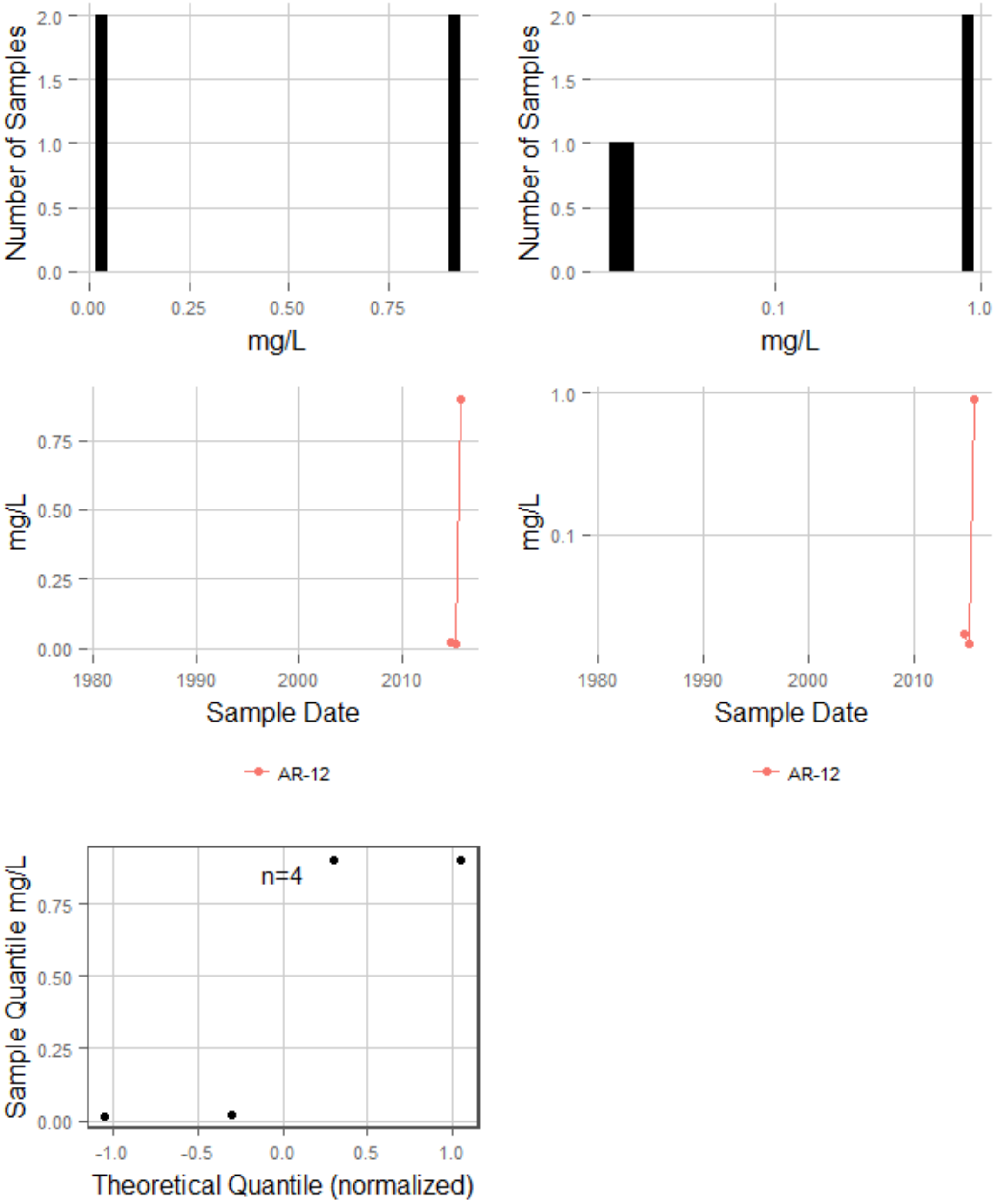
pH (Lab)


Number of Samples
10
5
0
0
2
4
6
8
s.u.
Number of Samples
30
20
10
0
1
10
s.u.
unitless
8
6
4
2
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
unitless
1
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
Sample Quantile s.u.
8
6
4
2
n=56
-2
-1
0
1
2
Theoretical Quantile (normalized)

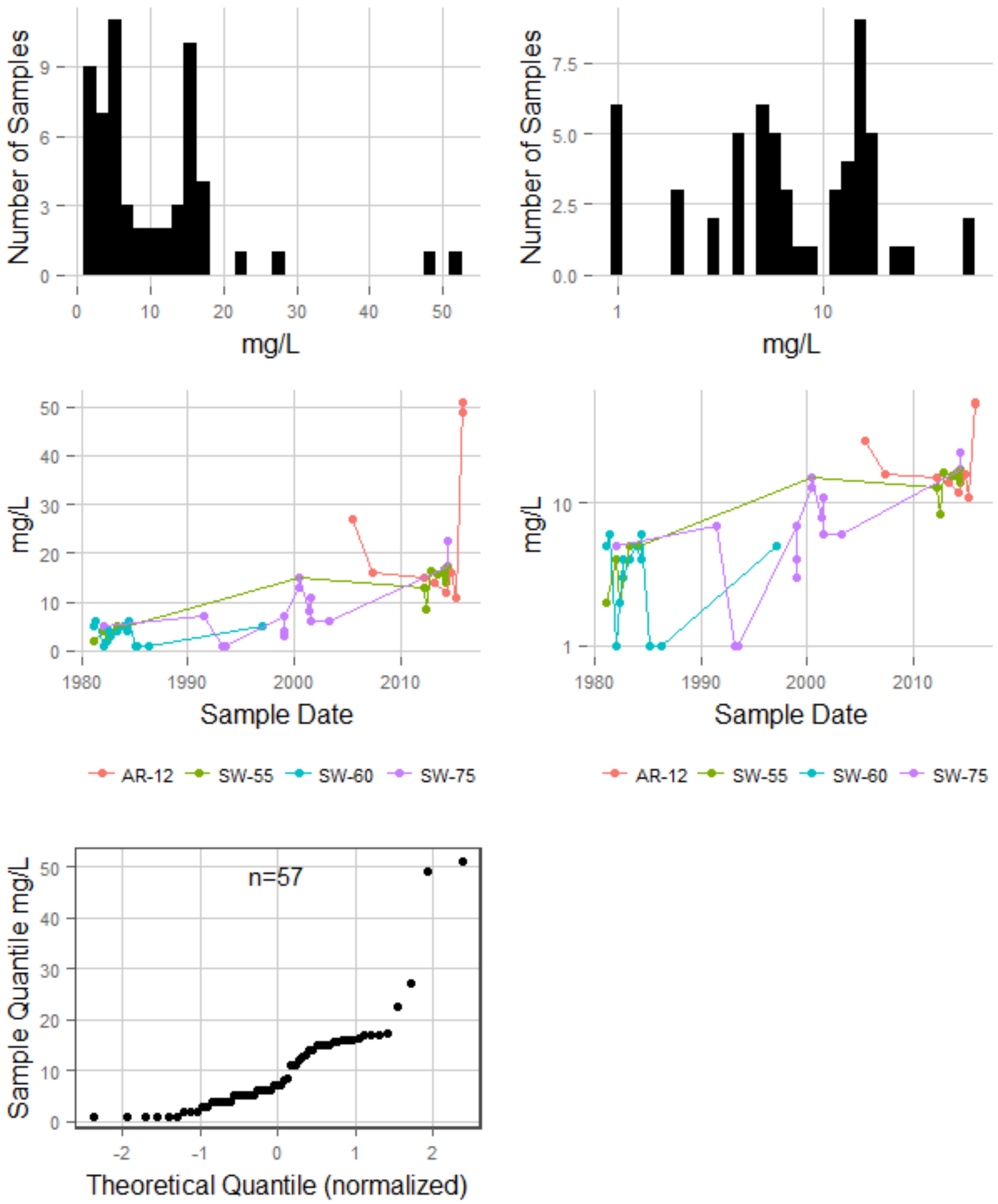
Phosphate


Number of Samples
4
3
2
1
0
0.1
0.2
0.3
mg/L
Number of Samples
2.0
1.5
1.0
0.5
0.0
0.1
mg/L
mg/L
0.2
0.1
1980
1990
2000
2010
Sample Date
SW-55
SW-75
mg/L
0.1
1980
1990
2000
2010
Sample Date
SW-55
SW-75
Sample Quantile mg/L
n=11
0.2
0.1
-1
0
1
Theoretical Quantile (normalized)

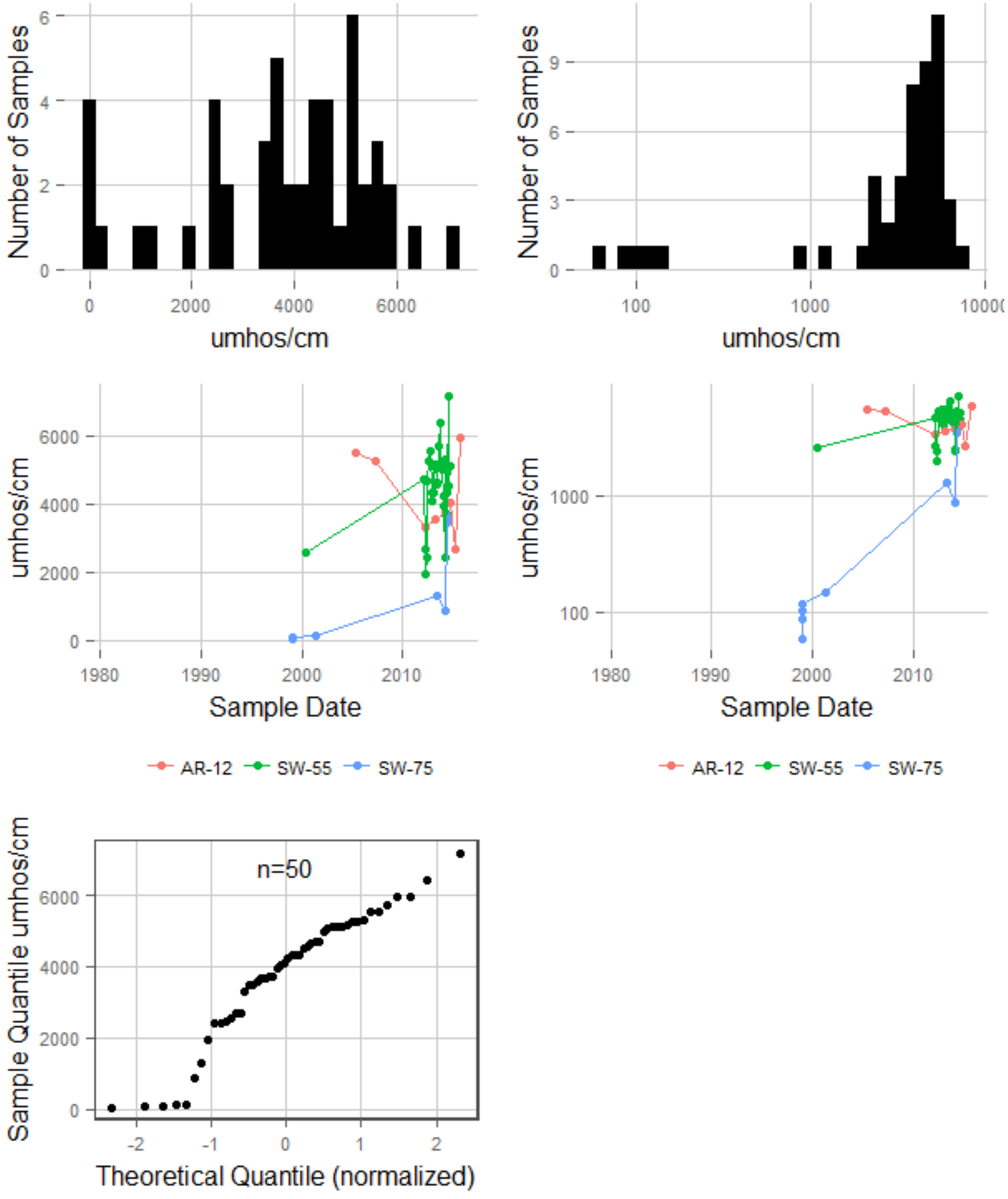
Phosphorus


Number of Samples
2.0
1.5
1.0
0.5
0.0
0.00
0.25
0.50
0.75
mg/L
Number of Samples
0.1
1.0
mg/L
mg/L
0.75
0.50
0.25
0.00
1980
1990
2000
2010
Sample Date
AR-12
mg/L
1.0
0.1
Sample Date
AR-12
Sample Quantile mg/L
n=4
-1.0
-0.5
0.0
0.5
1.0
Theoretical Quantile (normalized)

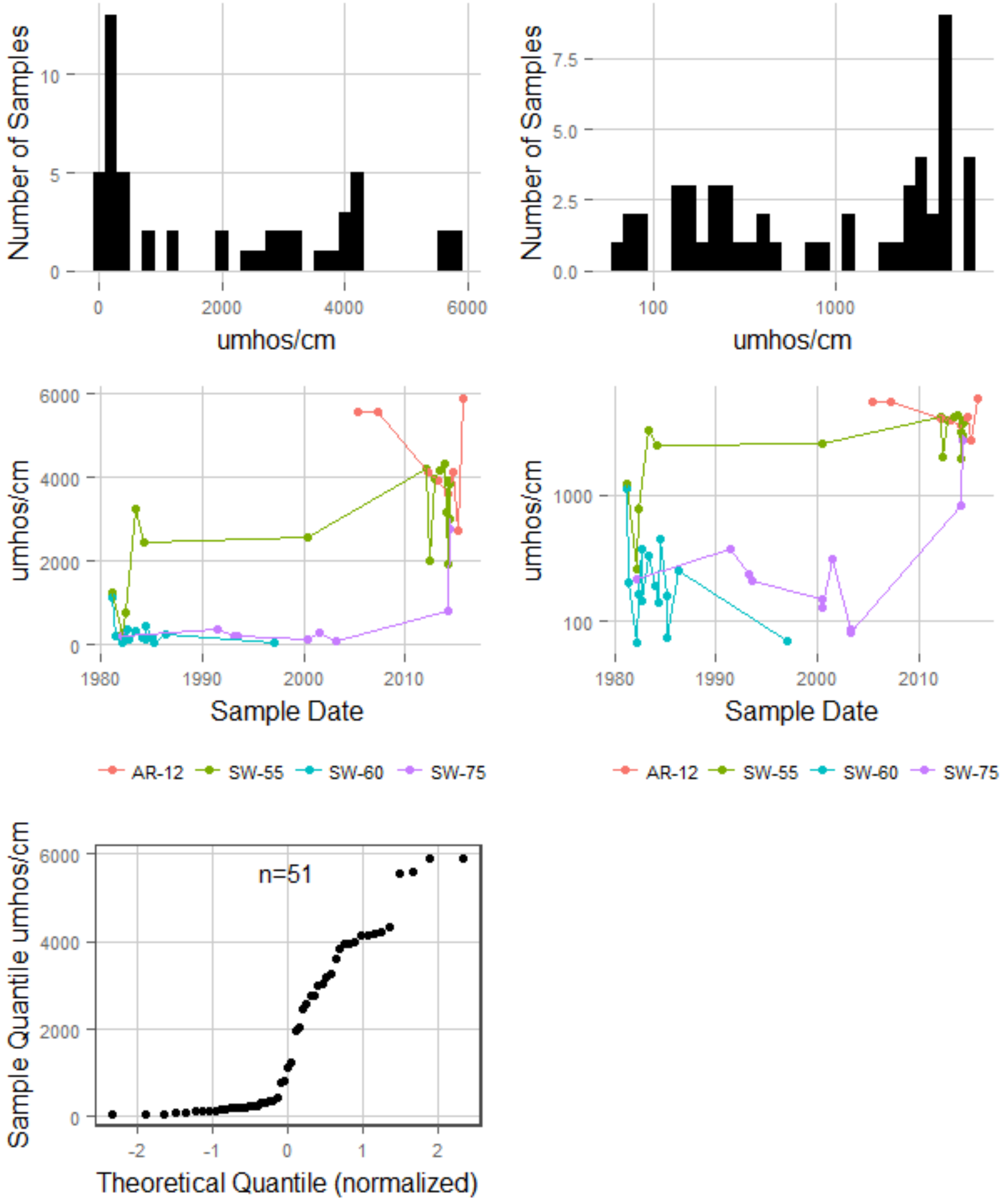
Potassium


Number of Samples
0
3
6
9
0
10
20
30
40
50
mg/L
Number of Samples
0.0
2.5
5.0
7.5
1
10
mg/L
mg/L
0
10
20
30
40
50
1980
1990
2000
2010
Sample Date
mg/L
1
10
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
0
10
20
30
40
50
n=57
-2
-1
0
1
2
Theoretical Quantile (normalized)

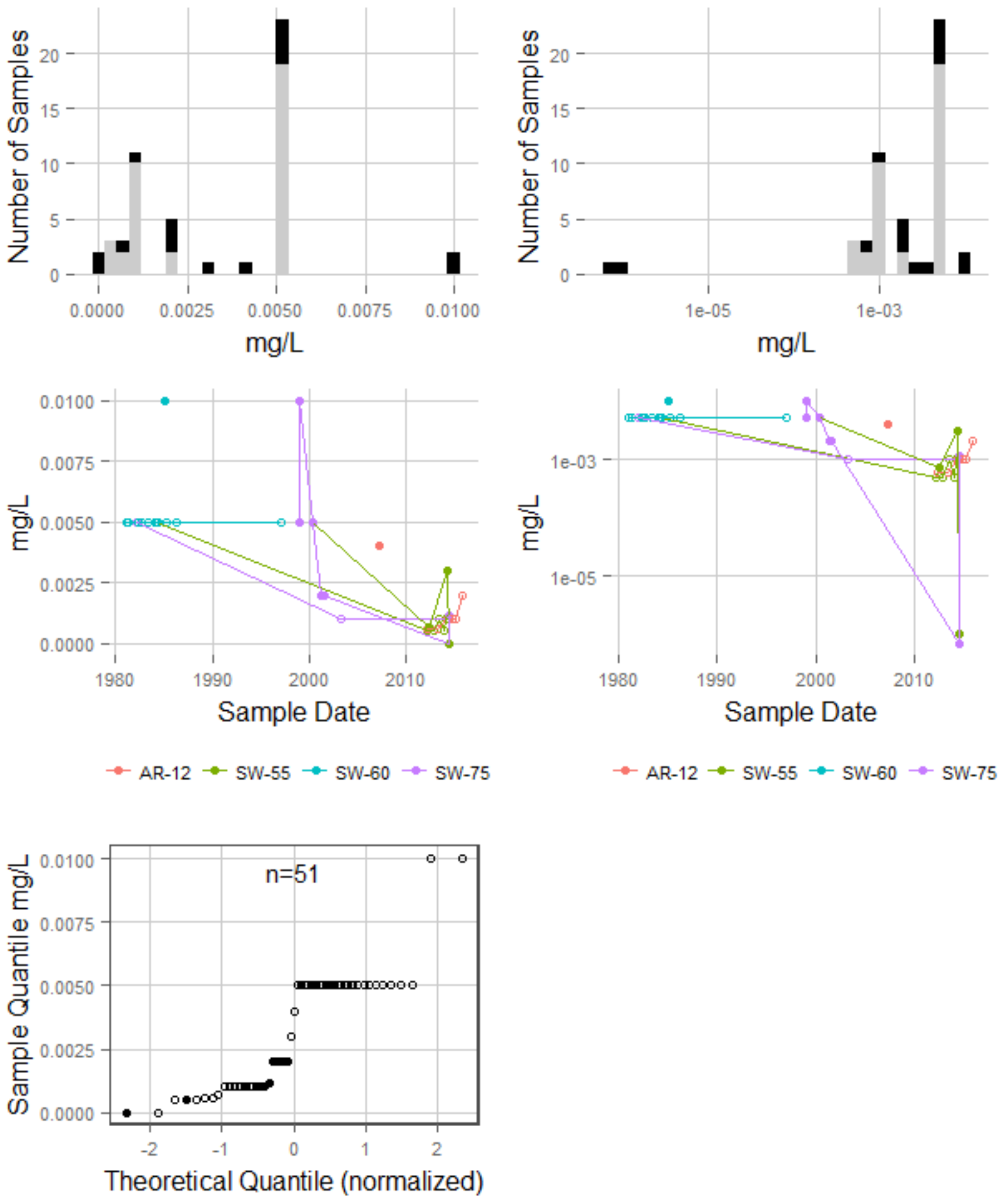
SC (Field)


Number of Samples
0
2
4
6
0
2000
4000
6000
umhos/cm
Number of Samples
0
3
6
9
100
1000
10000
umhos/cm
umhos/cm
0
2000
4000
6000
1980
1990
2000
2010
Sample Date
umhos/cm
100
1000
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-75
AR-12
SW-55
SW-75
Sample Quantile umhos/cm
0
2000
4000
6000
n=50
-2
-1
0
1
2
Theoretical Quantile (normalized)

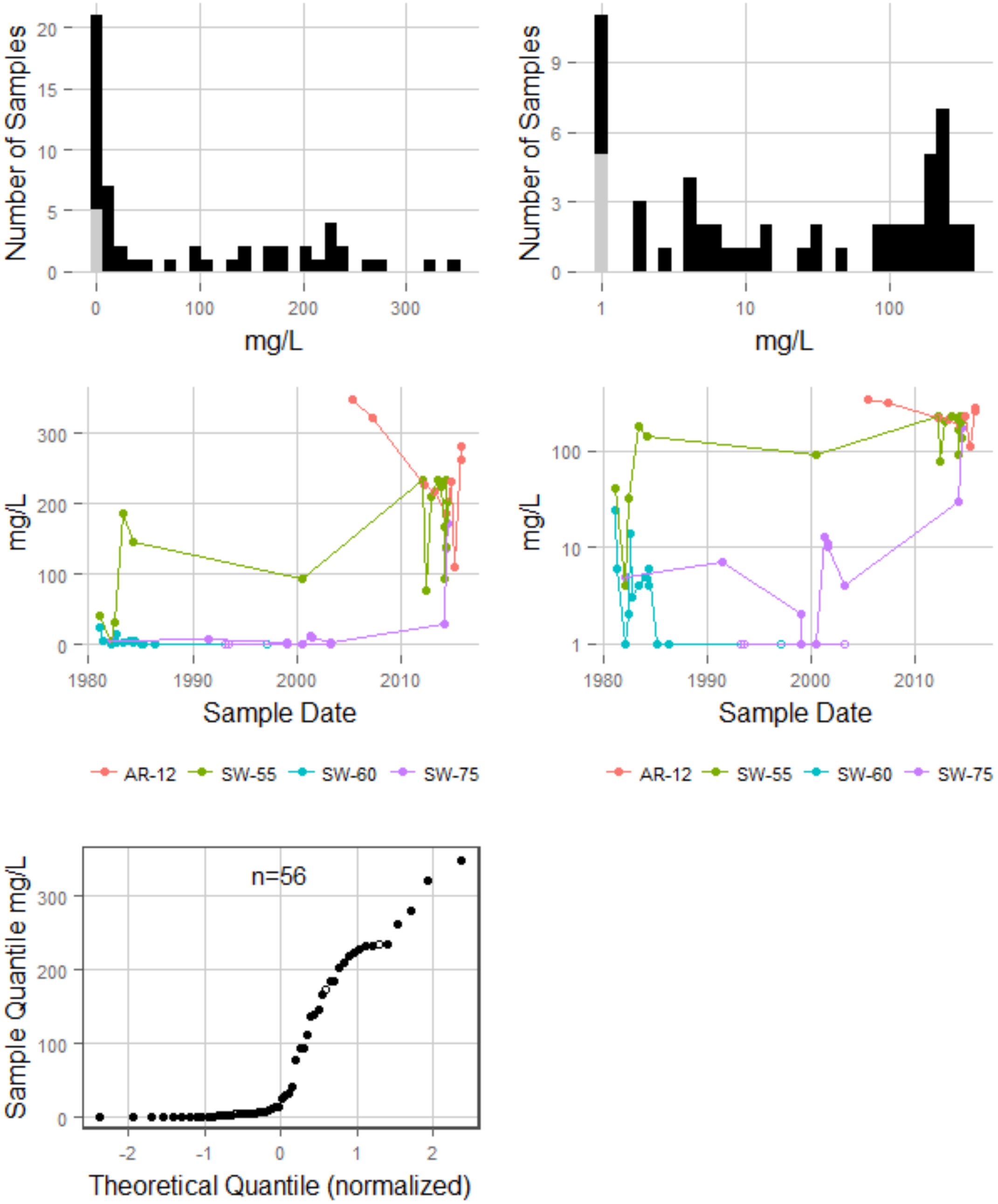
SC (Lab)


Number of Samples
10
5
0
0
2000
4000
6000
umhos/cm
Number of Samples
7.5
5.0
2.5
0.0
100
1000
umhos/cm
umhos/cm
6000
4000
2000
0
1980
1990
2000
2010
Sample Date
umhos/cm
1000
100
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
Sample Quantile umhos/cm
6000
4000
2000
0
n=51
-2
-1
0
1
2
Theoretical Quantile (normalized)

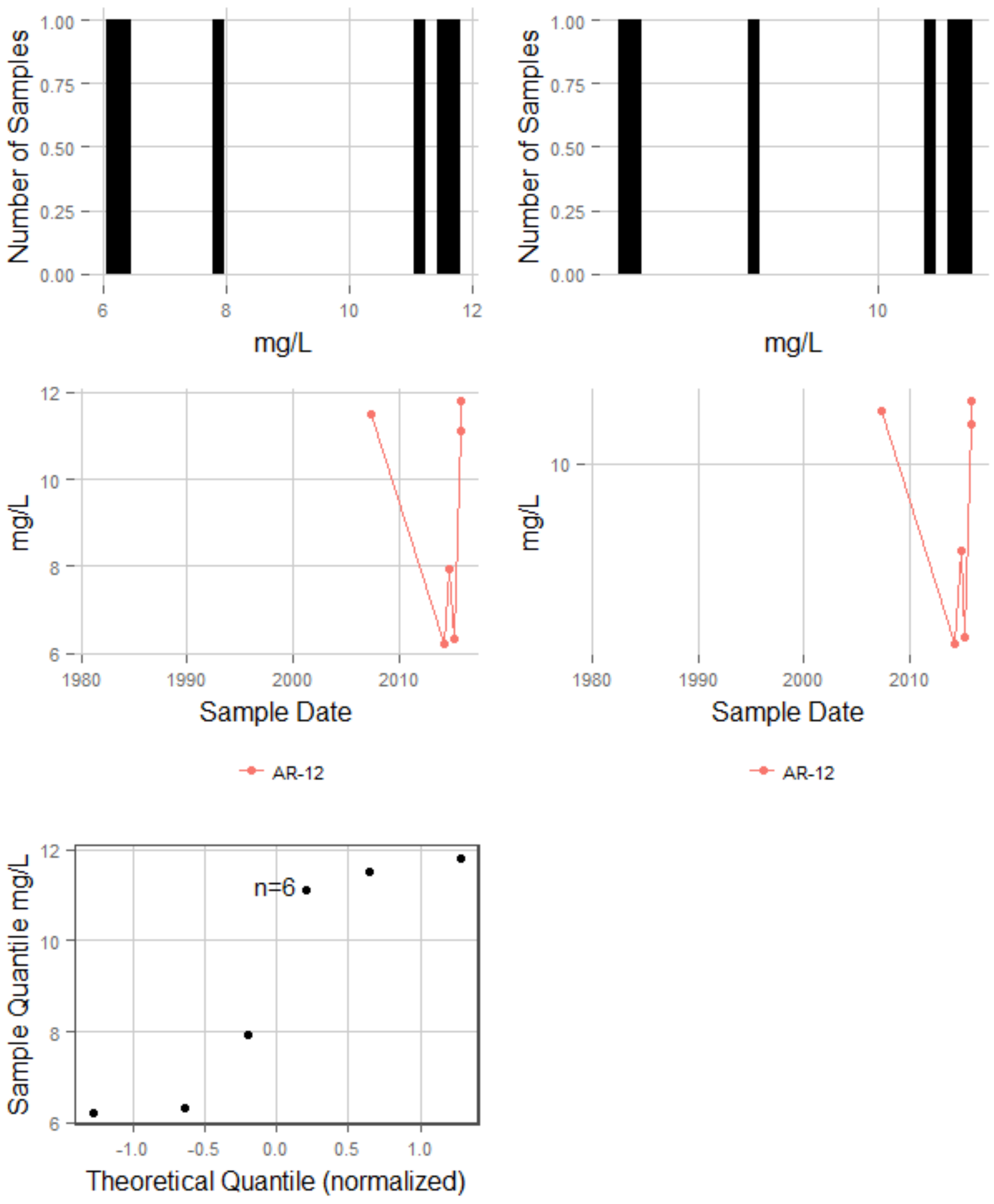
Selenium


Number of Samples
20
15
10
5
0
0.0000
0.0025
0.0050
0.0075
0.0100
mg/L
Number of Samples
20
15
10
5
0
1e-05
1e-03
mg/L
mg/L
0.0100
0.0075
0.0050
0.0025
0.0000
1980
1990
2000
2010
Sample Date
mg/L
1e-03
1e-05
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
0.0100
0.0075
0.0050
0.0025
0.0000
n=51
-2
-1
0
1
2
Theoretical Quantile (normalized)

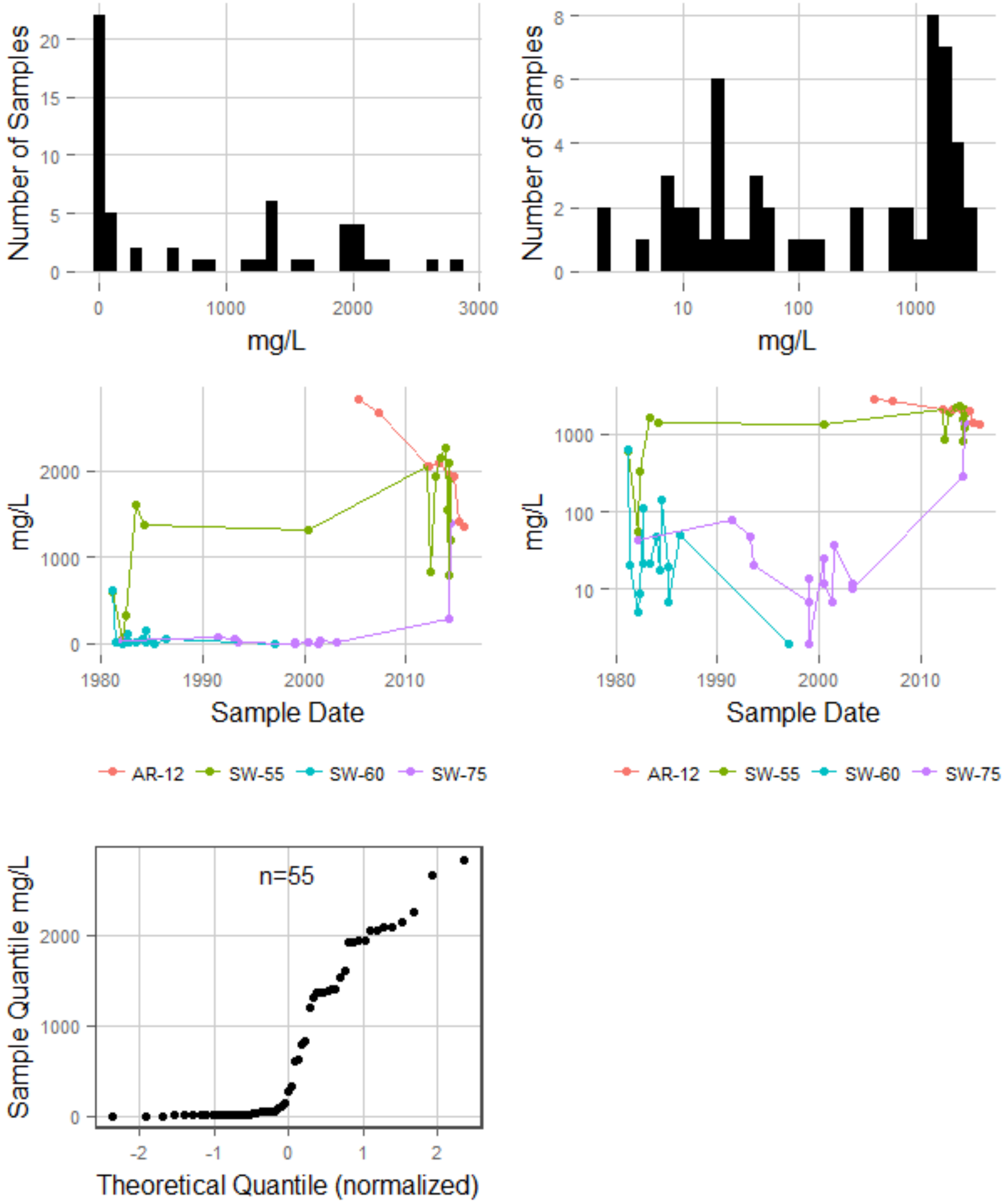
Sodium


Number of Samples
20
15
10
5
0
0
100
200
300
mg/L
Number of Samples
9
6
3
0
1
10
100
mg/L
mg/L
300
200
100
0
1980
1990
2000
2010
Sample Date
mg/L
100
10
1
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
n=56
300
200
100
0
-2
-1
0
1
2
Theoretical Quantile (normalized)

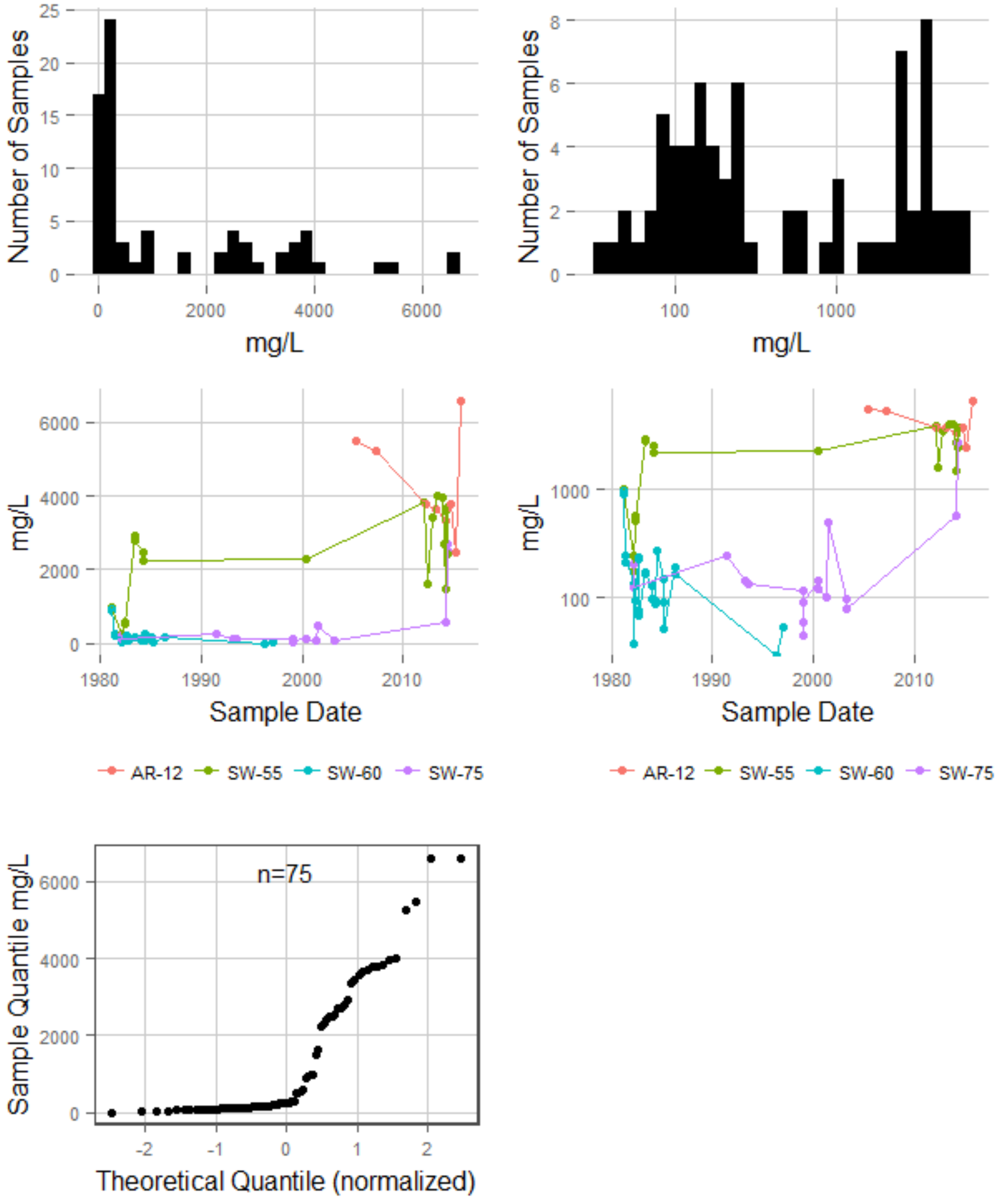
Strontium


Number of Samples
1.00
0.75
0.50
0.25
0.00
6
8
10
12
mg/L
Number of Samples
1.00
0.75
0.50
0.25
0.00
10
mg/L
mg/L
12
10
8
6
1980
1990
2000
2010
Sample Date
AR-12
mg/L
10
1980
1990
2000
2010
Sample Date
AR-12
Sample Quantile mg/L
12
10
8
6
n=6
-1.0
-0.5
0.0
0.5
1.0
Theoretical Quantile (normalized)

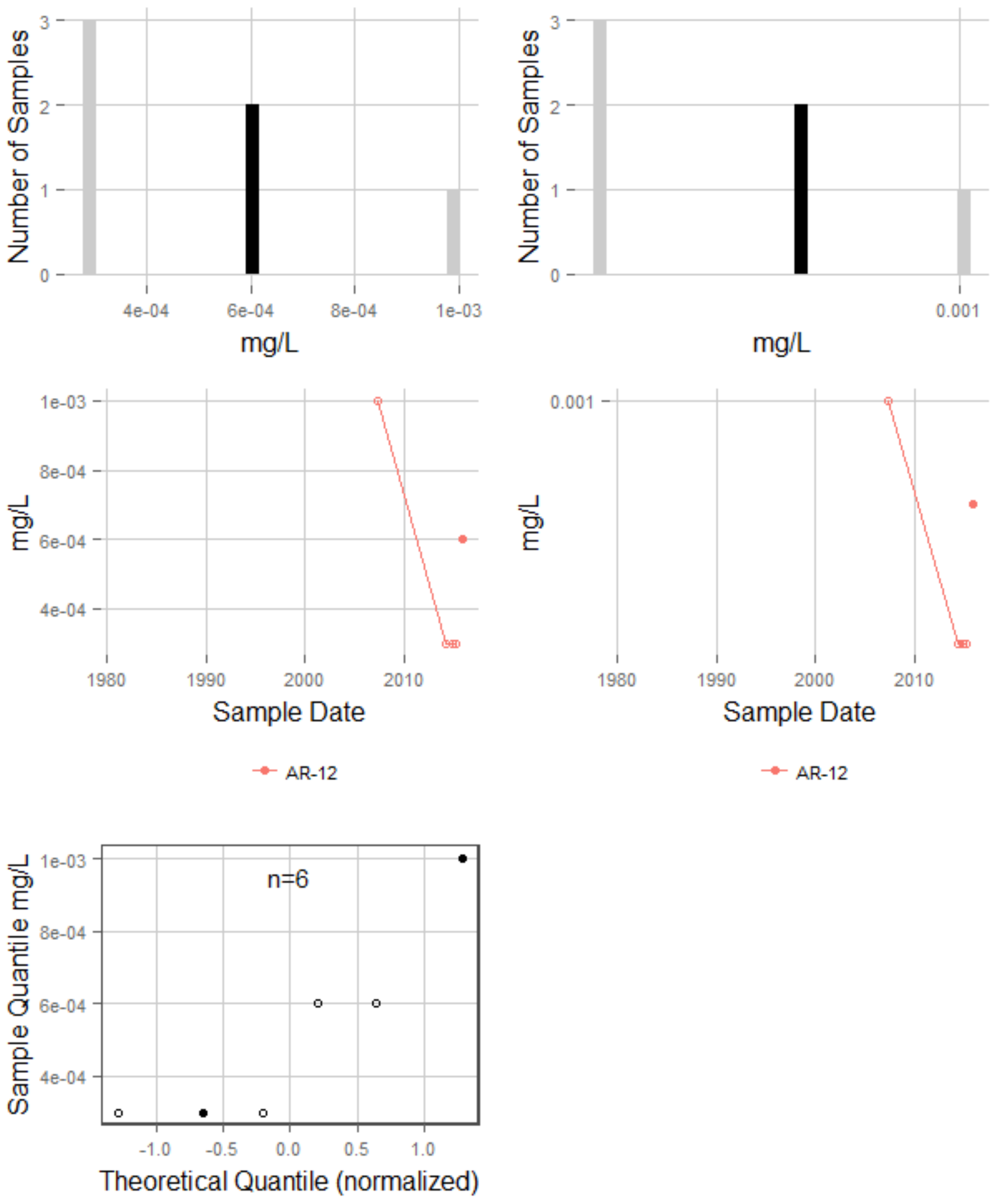
Sulfate


Number of Samples
0
5
10
15
20
0
1000
2000
3000
mg/L
Number of Samples
0
2
4
6
8
10
100
1000
mg/L
mg/L
0
1000
2000
1980
1990
2000
2010
Sample Date
mg/L
10
100
1000
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
n=55
Sample Quantile mg/L
0
1000
2000
-2
-1
0
1
2
Theoretical Quantile (normalized)

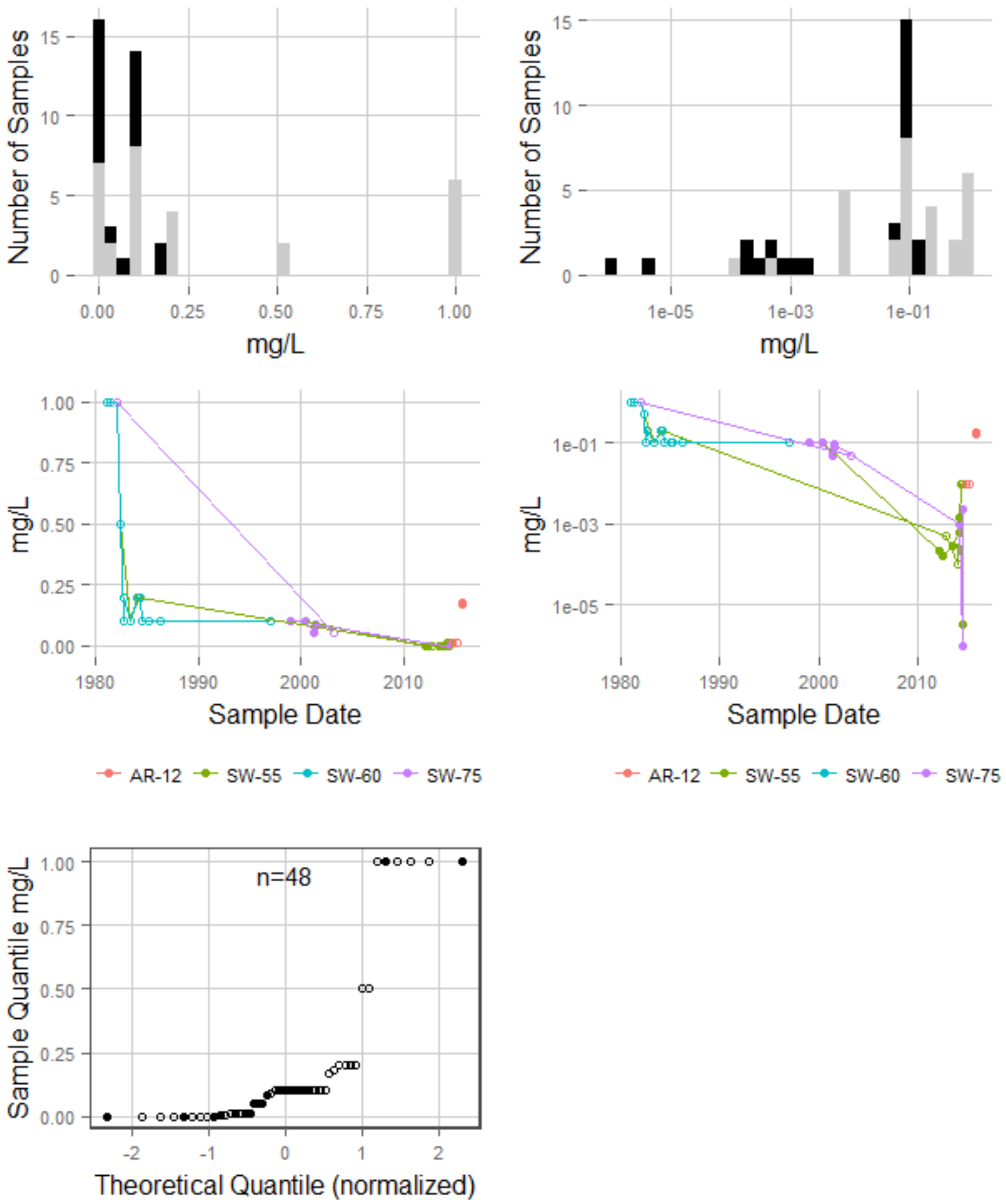
TDS


Number of Samples
25
20
15
10
5
0
0
2000
4000
6000
mg/L
Number of Samples
8
6
4
2
0
100
1000
mg/L
mg/L
6000
4000
2000
0
1980
1990
2000
2010
Sample Date
mg/L
1000
100
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
6000
4000
2000
0
n=75
-2
-1
0
1
2
Theoretical Quantile (normalized)

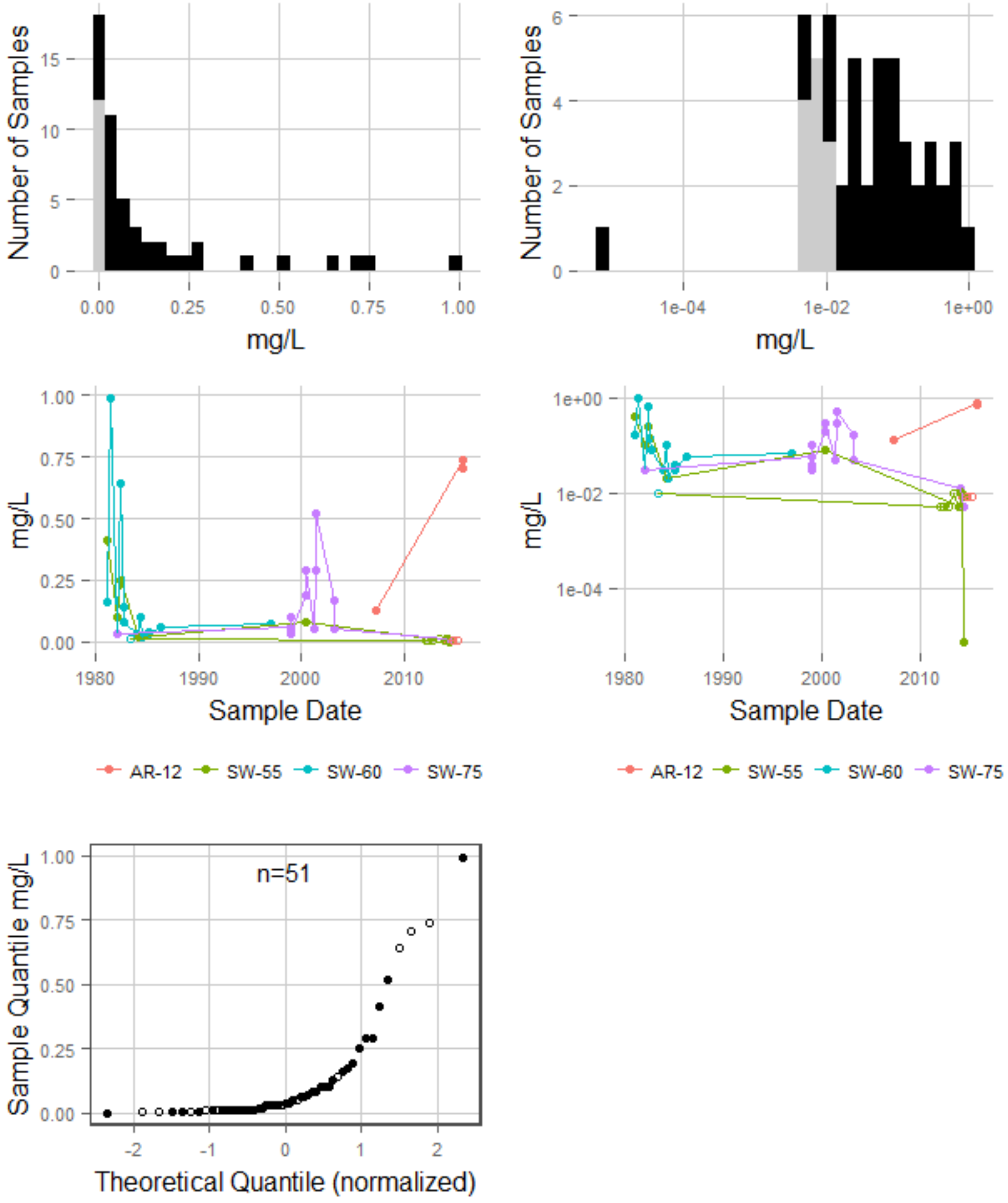
Thallium


Number of Samples
0
1
2
3
4e-04
6e-04
8e-04
1e-03
mg/L
Number of Samples
0
1
2
3
0.001
mg/L
mg/L
1e-03
8e-04
6e-04
4e-04
1980
1990
2000
2010
Sample Date
AR-12
mg/L
0.001
1980
1990
2000
2010
Sample Date
AR-12
Sample Quantile mg/L
1e-03
8e-04
6e-04
4e-04
n=6
-1.0
-0.5
0.0
0.5
1.0
Theoretical Quantile (normalized)

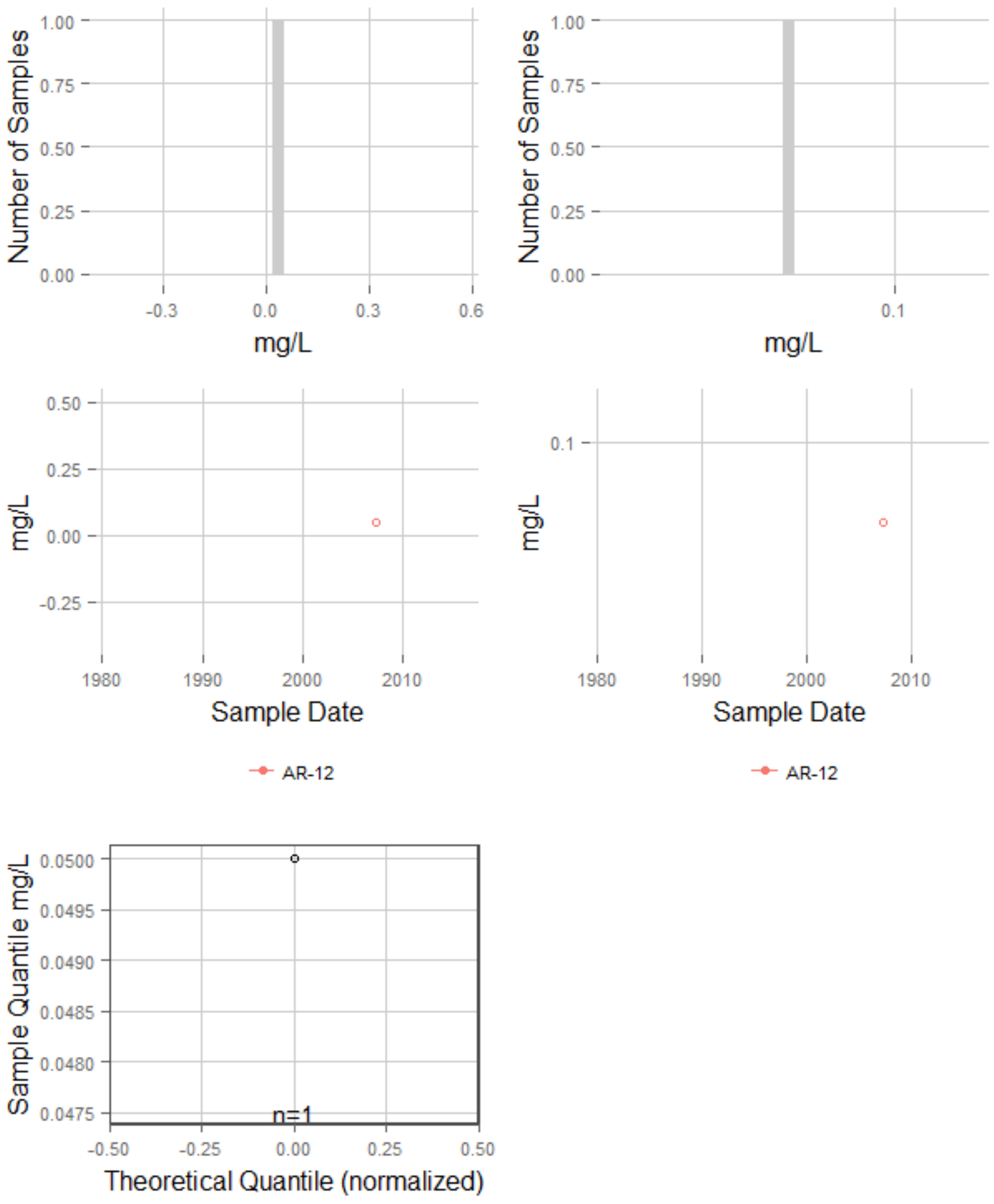
Vanadium


Number of Samples
15
10
5
0
0.00
0.25
0.50
0.75
1.00
mg/L
Number of Samples
15
10
5
0
1e-05
1e-03
1e-01
mg/L
mg/L
1.00
0.75
0.50
0.25
0.00
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
mg/L
1e-01
1e-03
1e-05
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
1.00
0.75
0.50
0.25
0.00
n=48
-2
-1
0
1
2
Theoretical Quantile (normalized)

Zinc


Number of Samples
15
10
5
0
0.00
0.25
0.50
0.75
1.00
mg/L
Number of Samples
6
4
2
0
1e-04
1e-02
1e+00
mg/L
mg/L
1.00
0.75
0.50
0.25
0.00
1980
1990
2000
2010
Sample Date
mg/L
1e+00
1e-02
1e-04
1980
1990
2000
2010
Sample Date
AR-12
SW-55
SW-60
SW-75
AR-12
SW-55
SW-60
SW-75
Sample Quantile mg/L
1.00
0.75
0.50
0.25
0.00
n=51
-2
-1
0
1
2
Theoretical Quantile (normalized)

Zirconium


Number of Samples
1.00
0.75
0.50
0.25
0.00
-0.3
0.0
0.3
0.6
mg/L
Number of Samples
1.00
0.75
0.50
0.25
0.00
0.1
mg/L
mg/L
0.50
0.25
0.00
-0.25
1980
1990
2000
2010
Sample Date
AR-12
mg/L
0.1
1980
1990
2000
2010
Sample Date
AR-12
Sample Quantile mg/L
0.0500
0.0495
0.0490
0.0485
0.0480
0.0475
n=1
-0.50
-0.25
0.00
0.25
0.50
Theoretical Quantile (normalized)

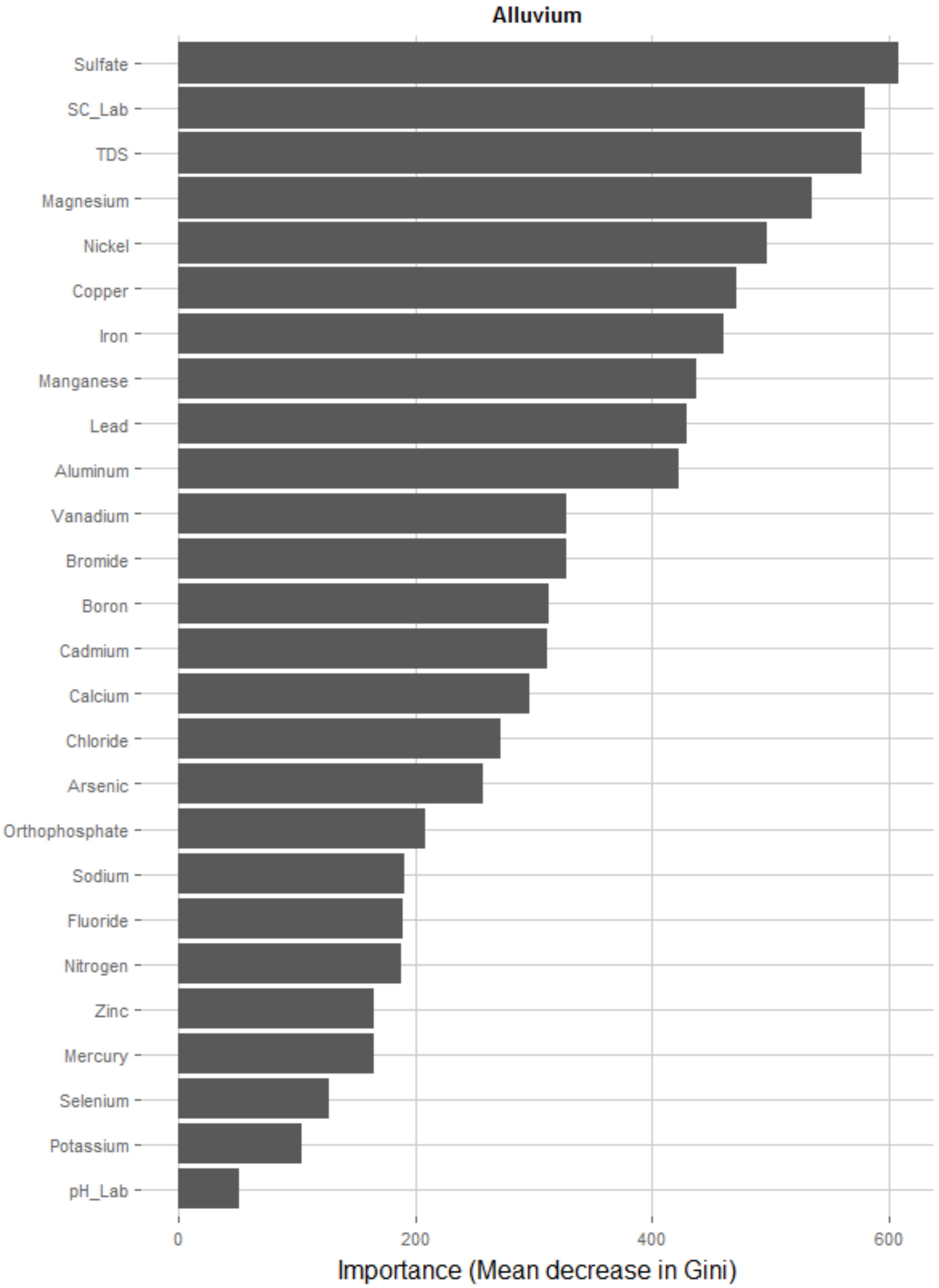
Appendix F Random Forests Plots

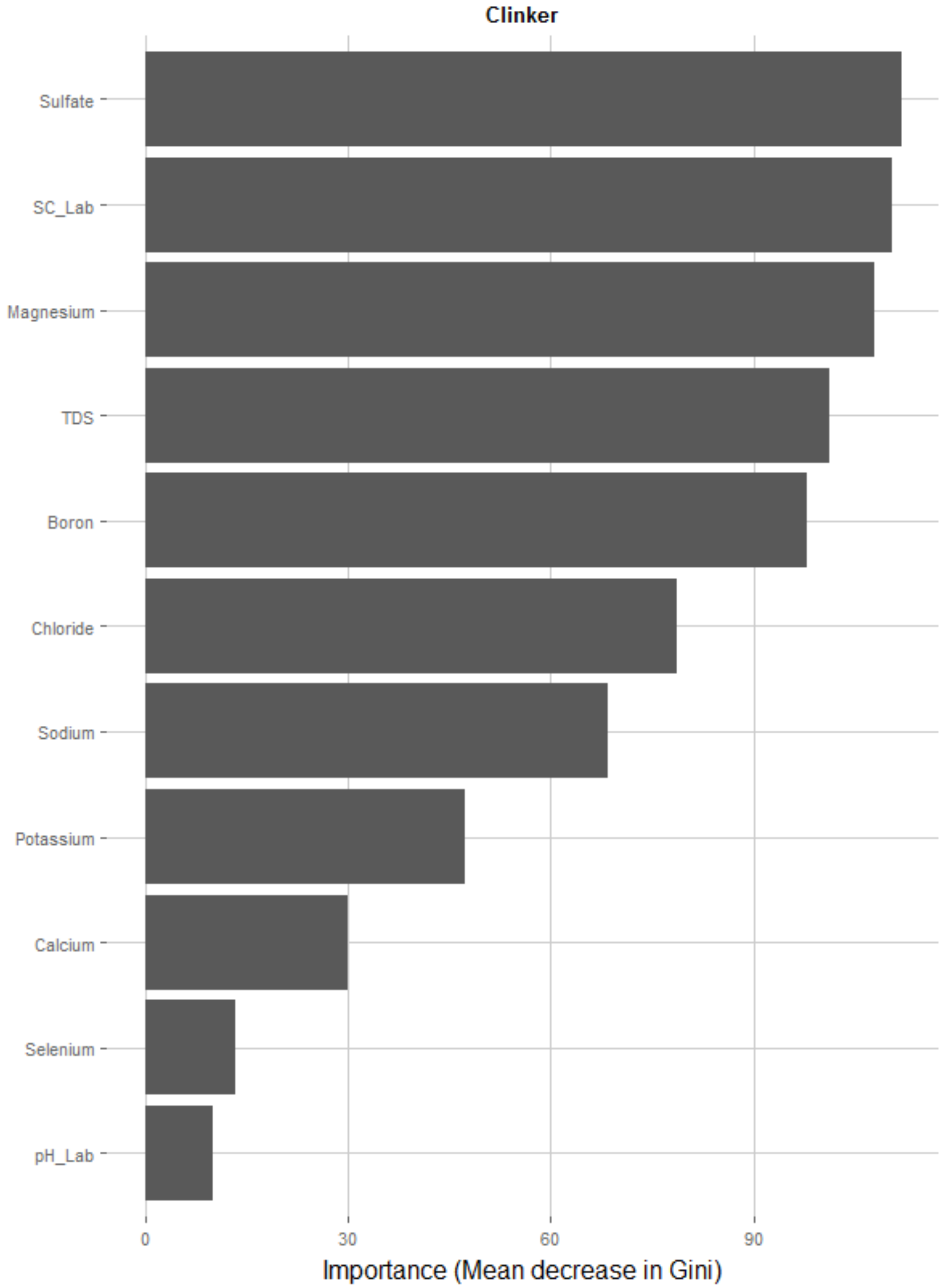
Appendix F contains plots illustrating the results of RF and PAM.

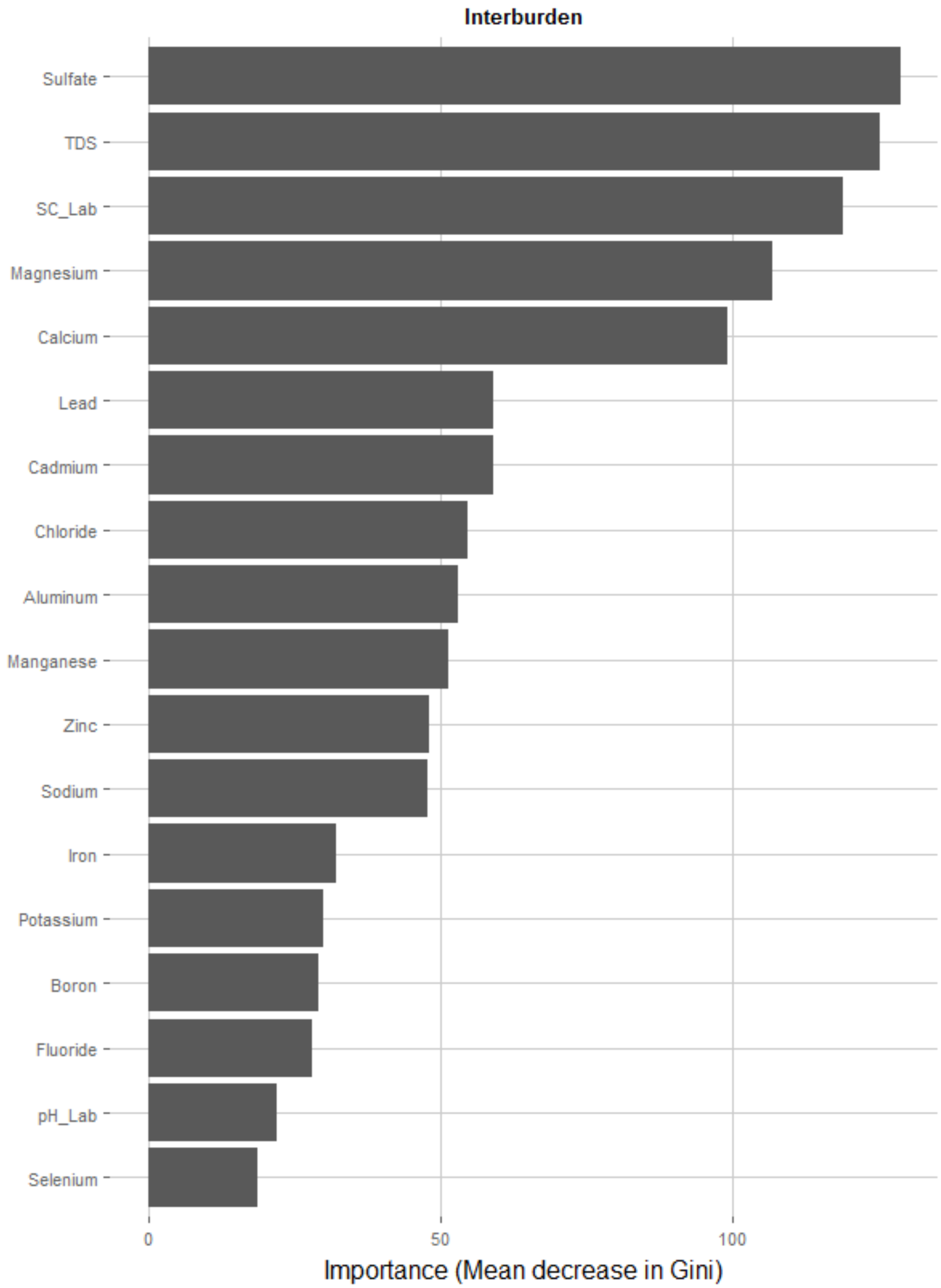
These results are discussed in Section 4.

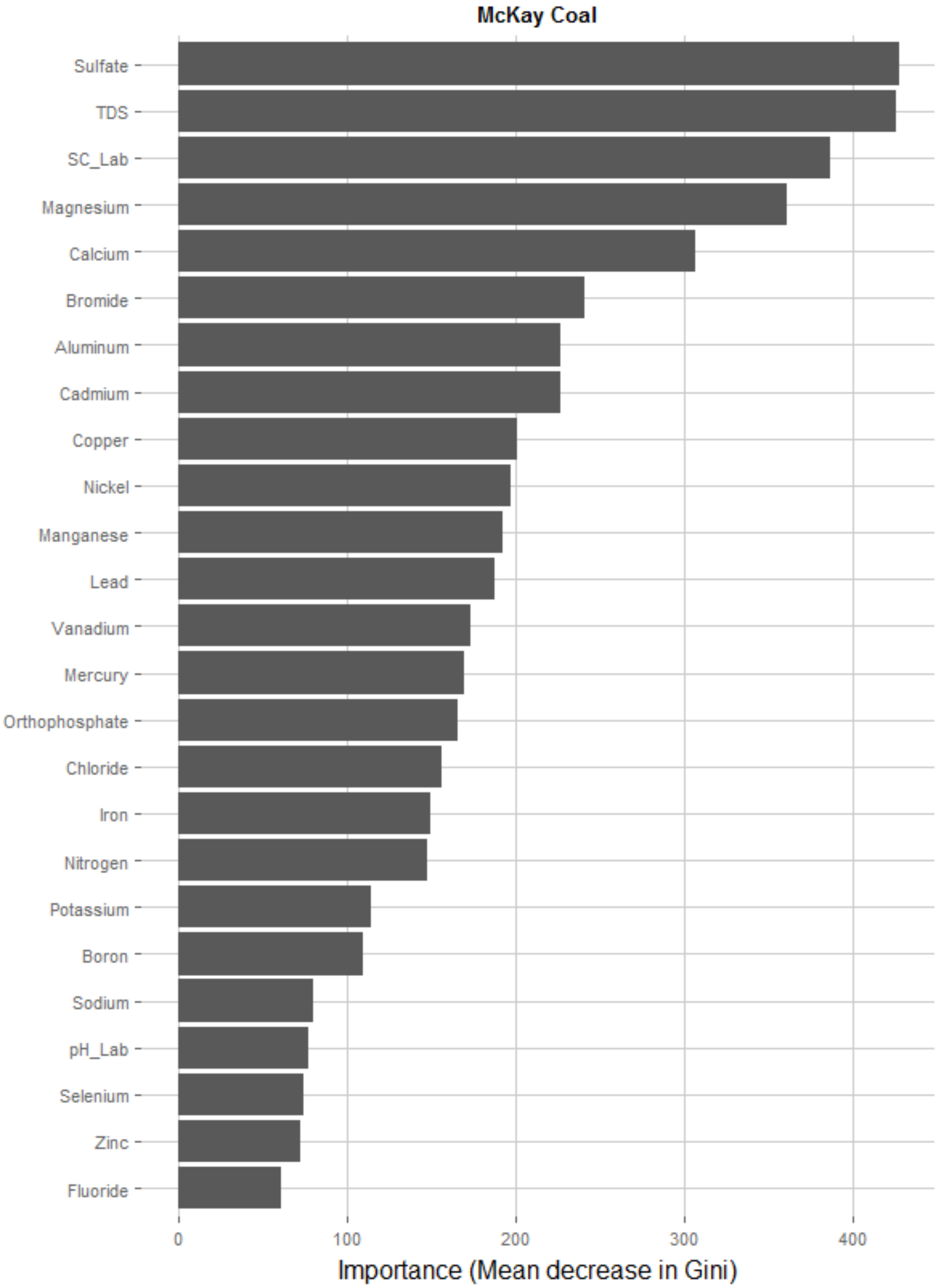
F.1 VARIABLE IMPORTANCE

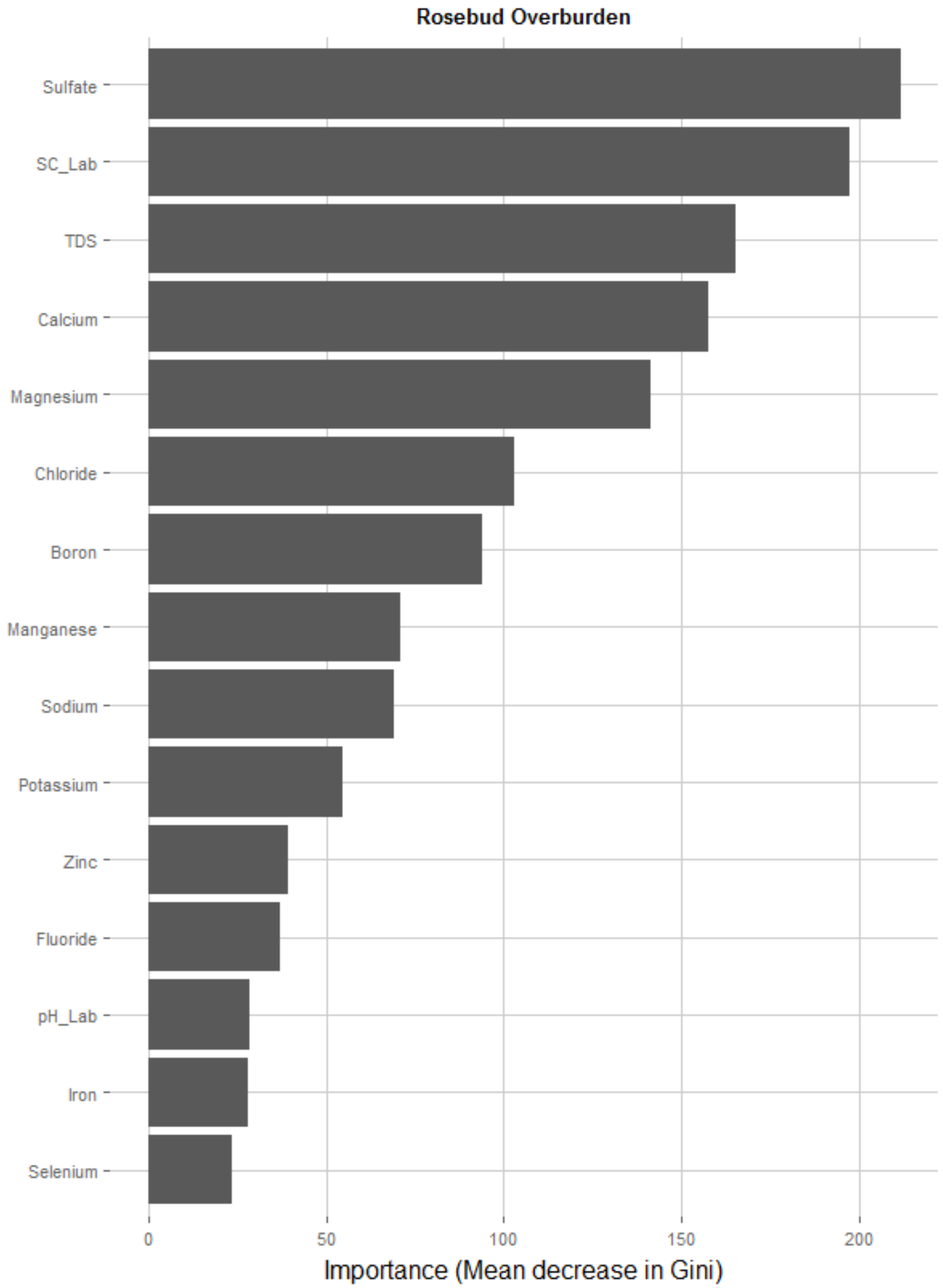
Appendix F.1 shows importance plots that come from Random Forest (RF) clustering of groundwater data in each stratigraphic unit. The plots illustrate how much individual variables contribute to the overall structure of the groundwater data (larger importance values indicate a greater contribution).

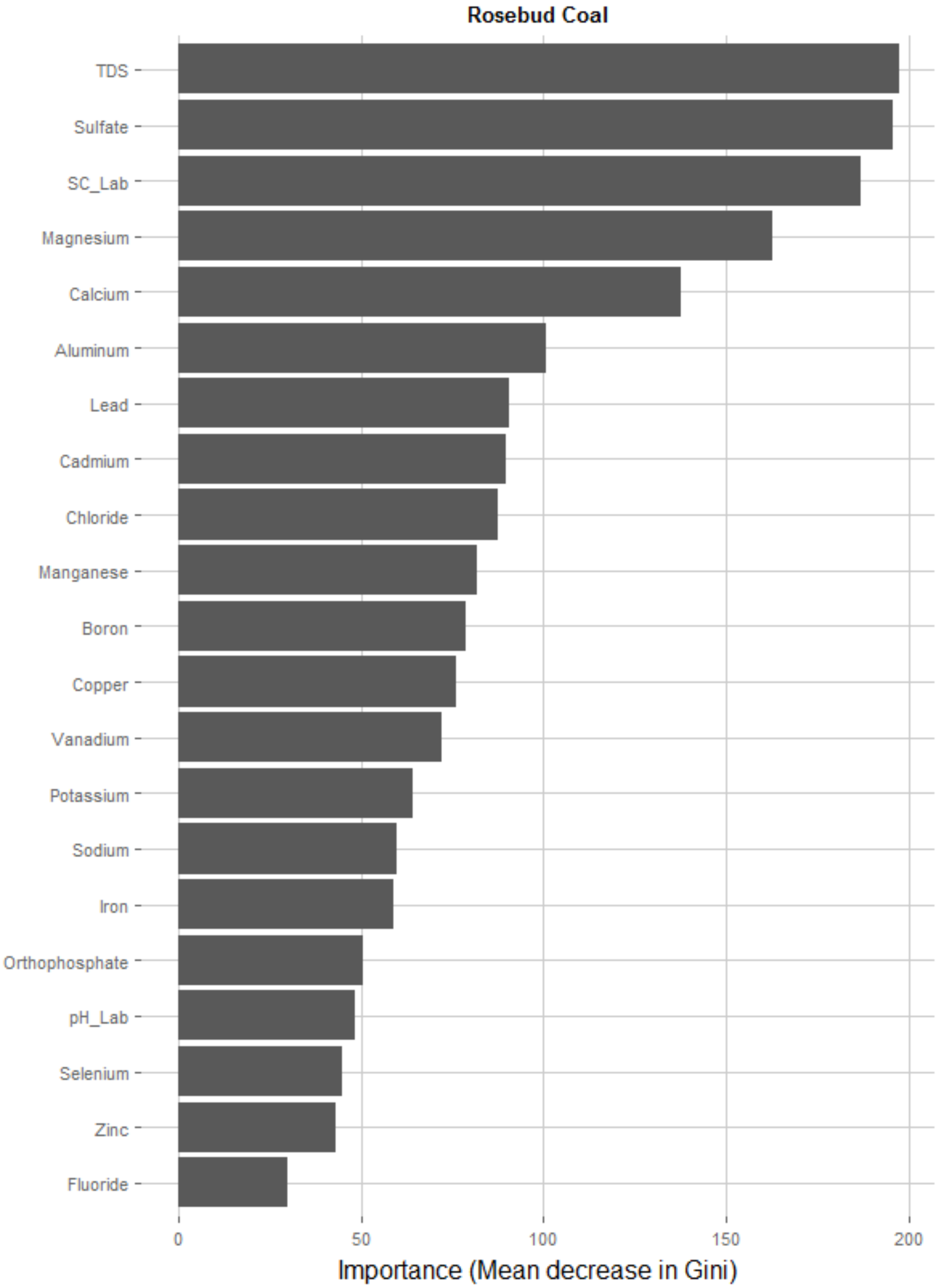

Alluvium
Sulfate
SC_Lab
TDS
Magnesium
Nickel
Copper
Iron
Manganese
Lead
Aluminum
Vanadium
Bromide
Boron
Cadmium
Calcium
Chloride
Arsenic
Orthophosphate
Sodium
Fluoride
Nitrogen
Zinc
Mercury
Selenium
Potassium
pH_Lab
0
200
400
600
Importance (Mean decrease in Gini)

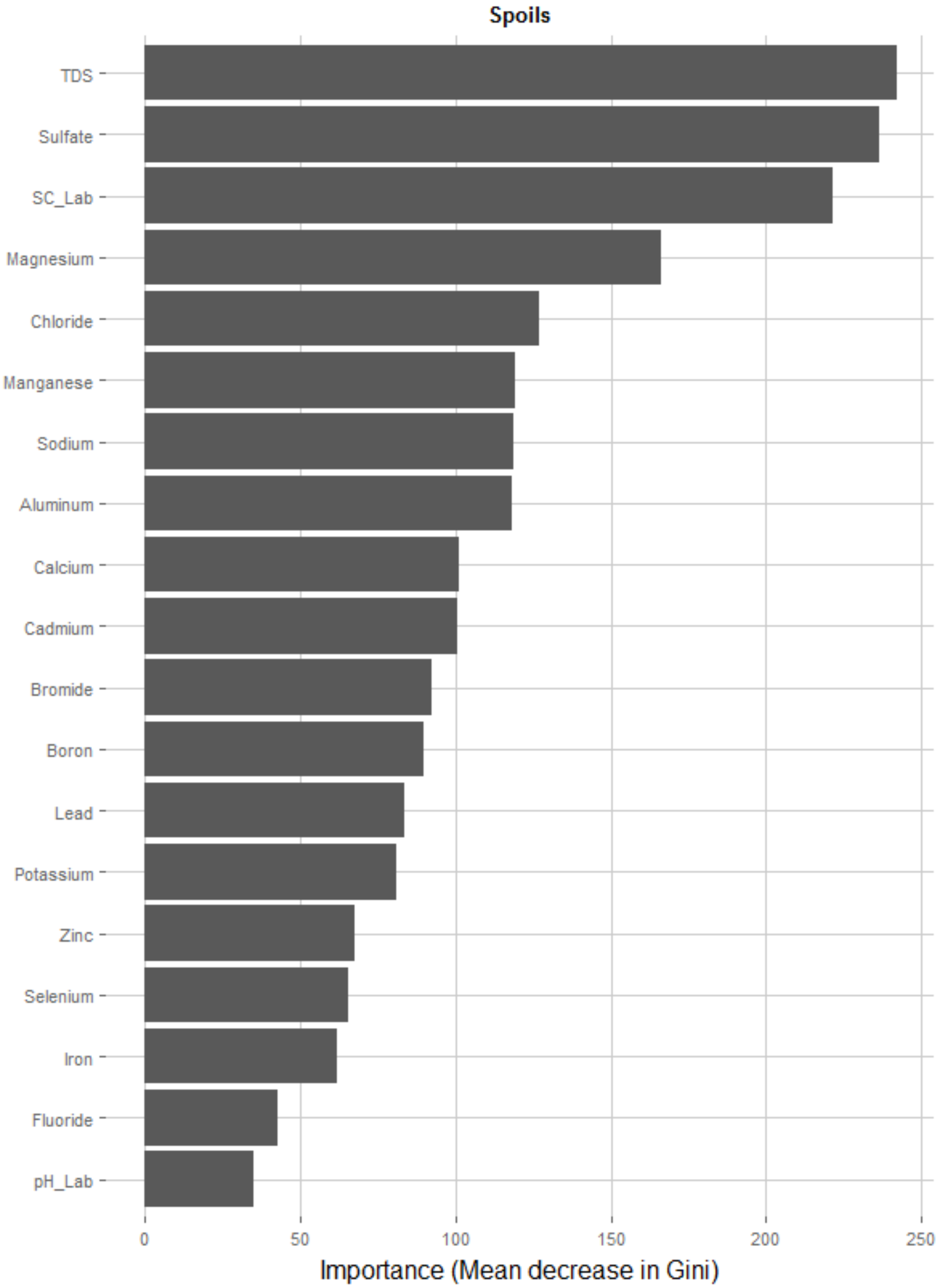

Clinker
Sulfate
SC_Lab
Magnesium
TDS
Boron
Chloride
Sodium
Potassium
Calcium
Selenium
pH_Lab
0
30
60
90
Importance (Mean decrease in Gini)

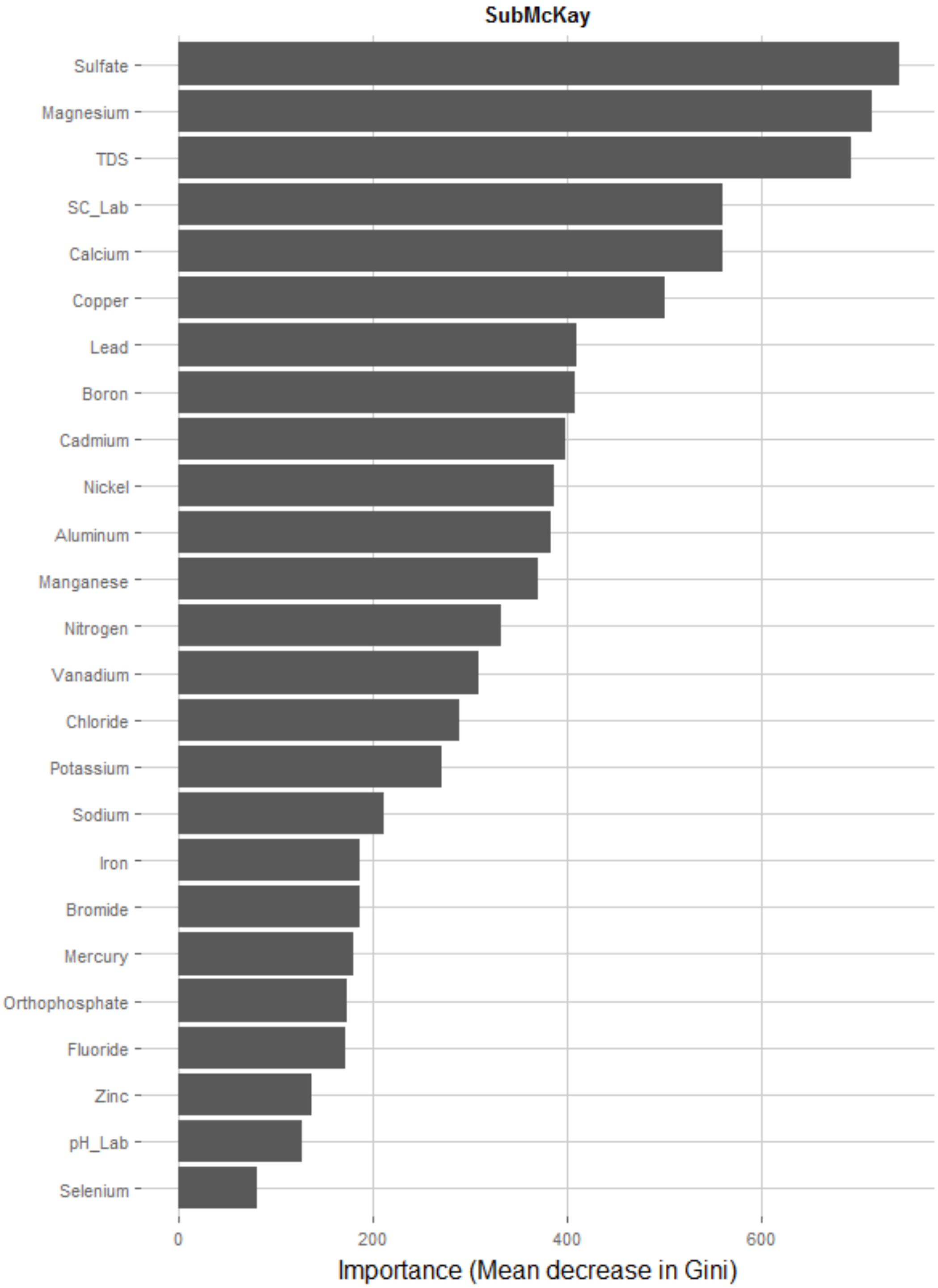

Interburden
Sulfate
TDS
SC_Lab
Magnesium
Calcium
Lead
Cadmium
Chloride
Aluminum
Manganese
Zinc
Sodium
Iron
Potassium
Boron
Fluoride
pH_Lab
Selenium
0
50
100
Importance (Mean decrease in Gini)


McKay Coal
Sulfate
TDS
SC_Lab
Magnesium
Calcium
Bromide
Aluminum
Cadmium
Copper
Nickel
Manganese
Lead
Vanadium
Mercury
Orthophosphate
Chloride
Iron
Nitrogen
Potassium
Boron
Sodium
pH_Lab
Selenium
Zinc
Fluoride
0
100
200
300
400
Importance (Mean decrease in Gini)


Rosebud Overburden
Sulfate
SC_Lab
TDS
Calcium
Magnesium
Chloride
Boron
Manganese
Sodium
Potassium
Zinc
Fluoride
pH_Lab
Iron
Selenium
0
50
100
150
200
Importance (Mean decrease in Gini)

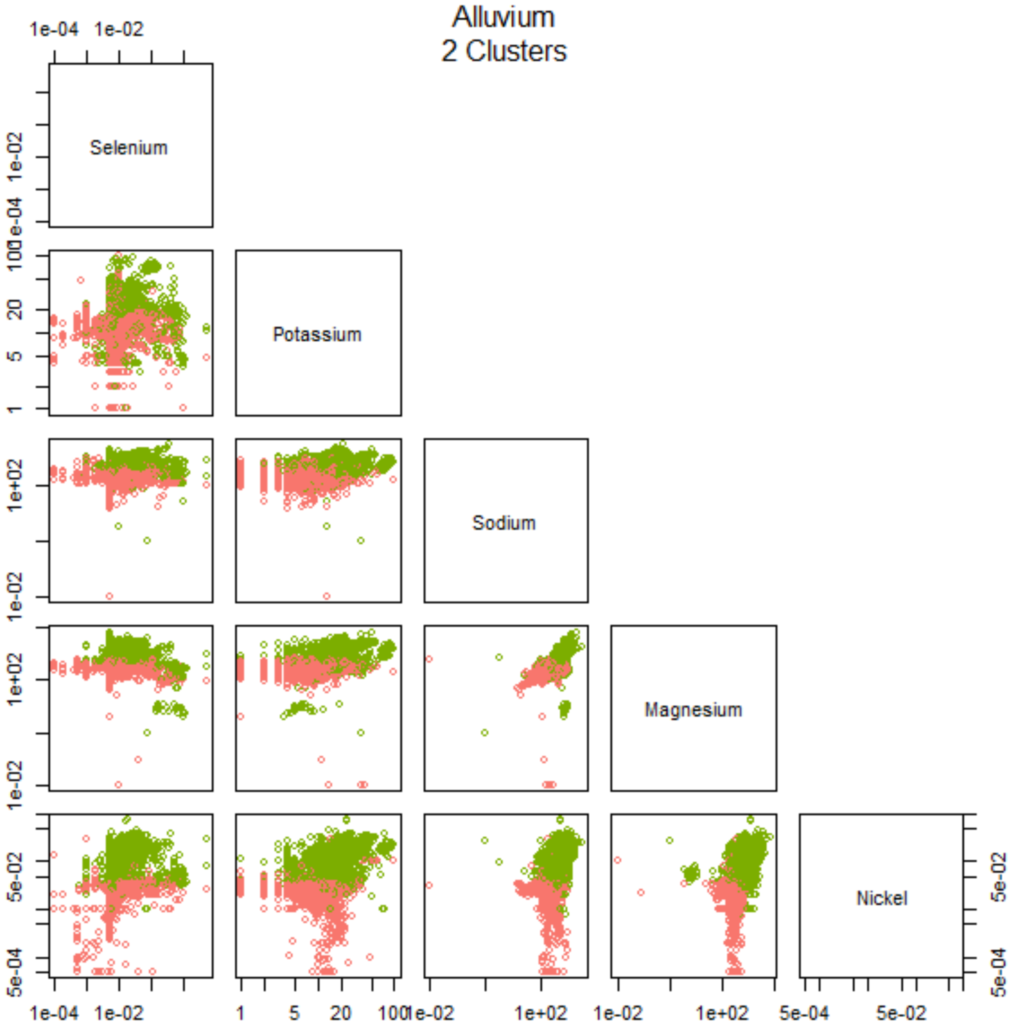

Rosebud Coal
TDS
Sulfate
SC_Lab
Magnesium
Calcium
Aluminum
Lead
Cadmium
Chloride
Manganese
Boron
Copper
Vanadium
Potassium
Sodium
Iron
Orthophosphate
pH_Lab
Selenium
Zinc
Fluoride
0
50
100
150
200
Importance (Mean decrease in Gini)

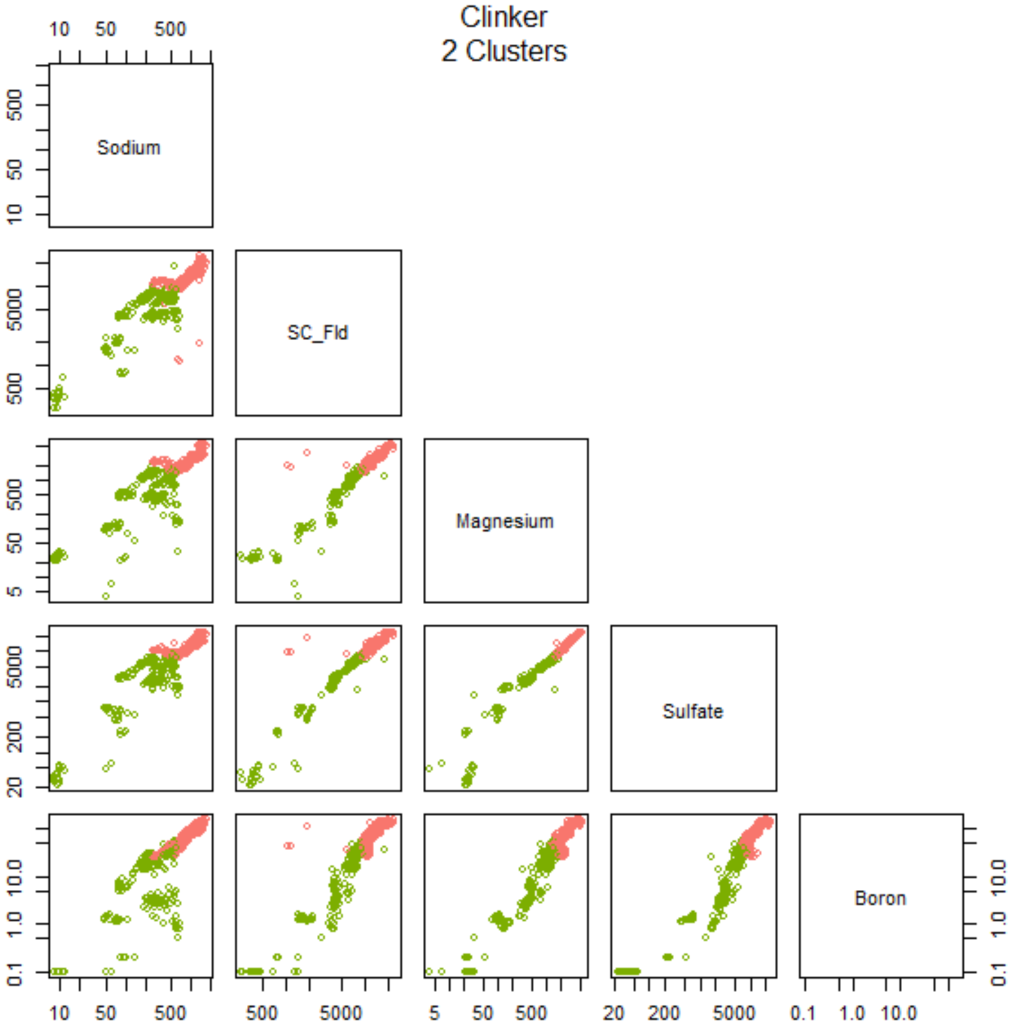

Spoils
TDS
Sulfate
SC_Lab
Magnesium
Chloride
Manganese
Sodium
Aluminum
Calcium
Cadmium
Bromide
Boron
Lead
Potassium
Zinc
Selenium
Iron
Fluoride
pH_Lab
0
50
100
150
200
250
Importance (Mean decrease in Gini)

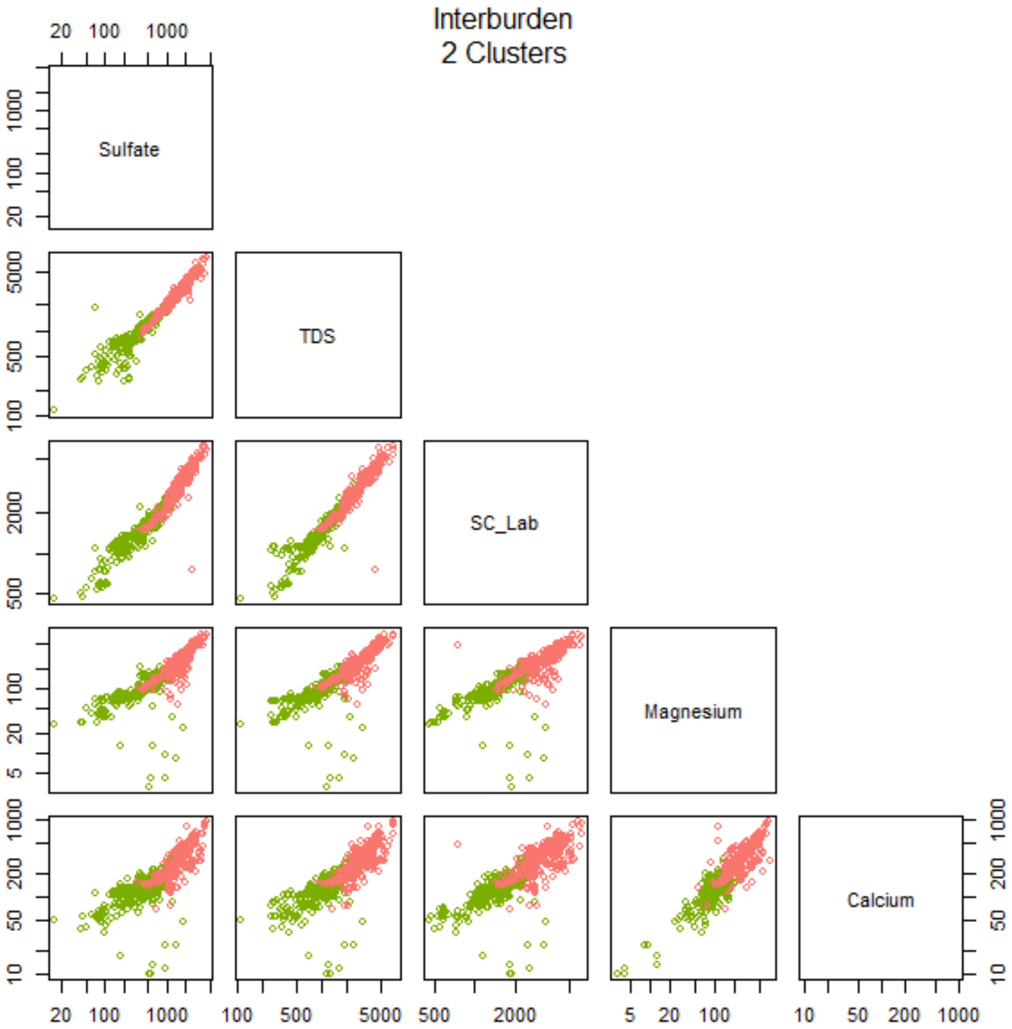

SubMcKay
Sulfate
Magnesium
TDS
SC_Lab
Calcium
Copper
Lead
Boron
Cadmium
Nickel
Aluminum
Manganese
Nitrogen
Vanadium
Chloride
Potassium
Sodium
Iron
Bromide
Mercury
Orthophosphate
Fluoride
Zinc
pH_Lab
Selenium
0
200
400
600
Importance (Mean decrease in Gini)

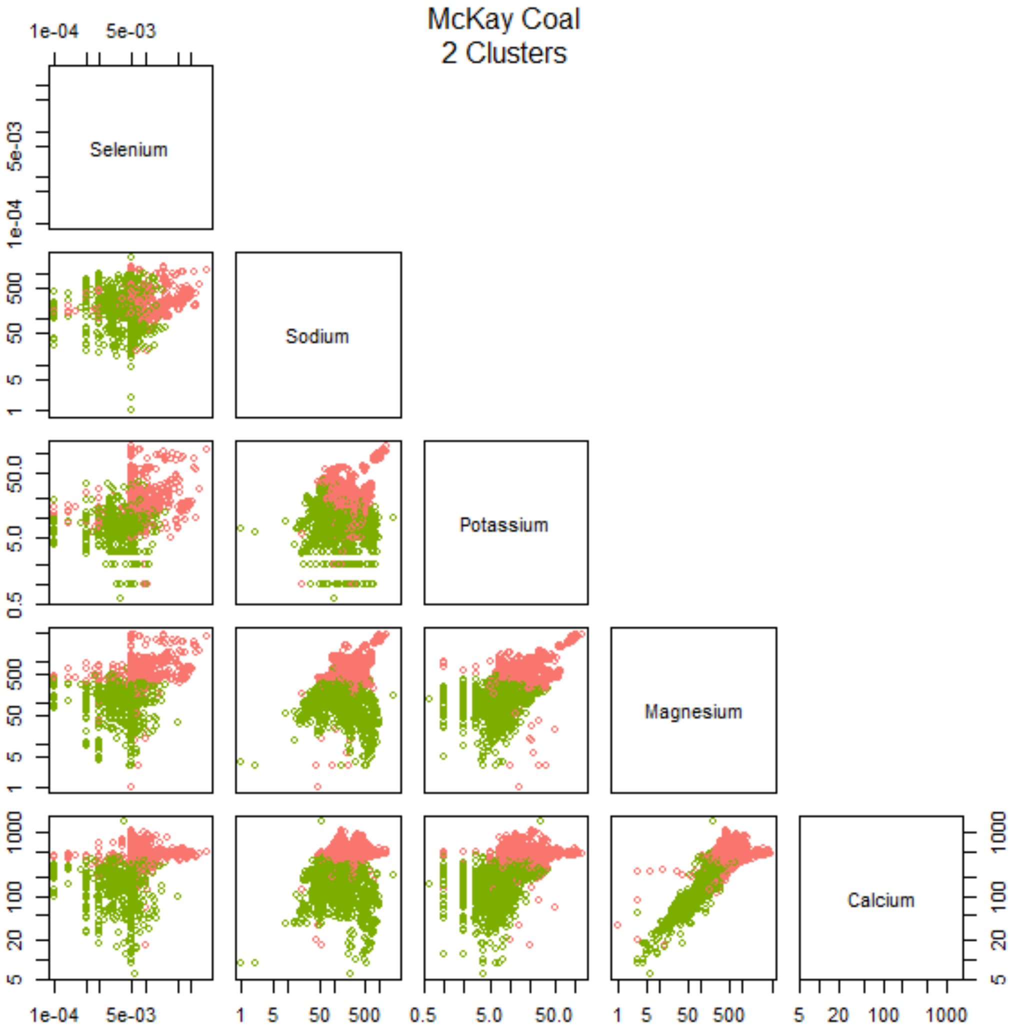
F.2 SCATTERPLOTS OF IMPORTANT ANALYTES BY CLUSTER

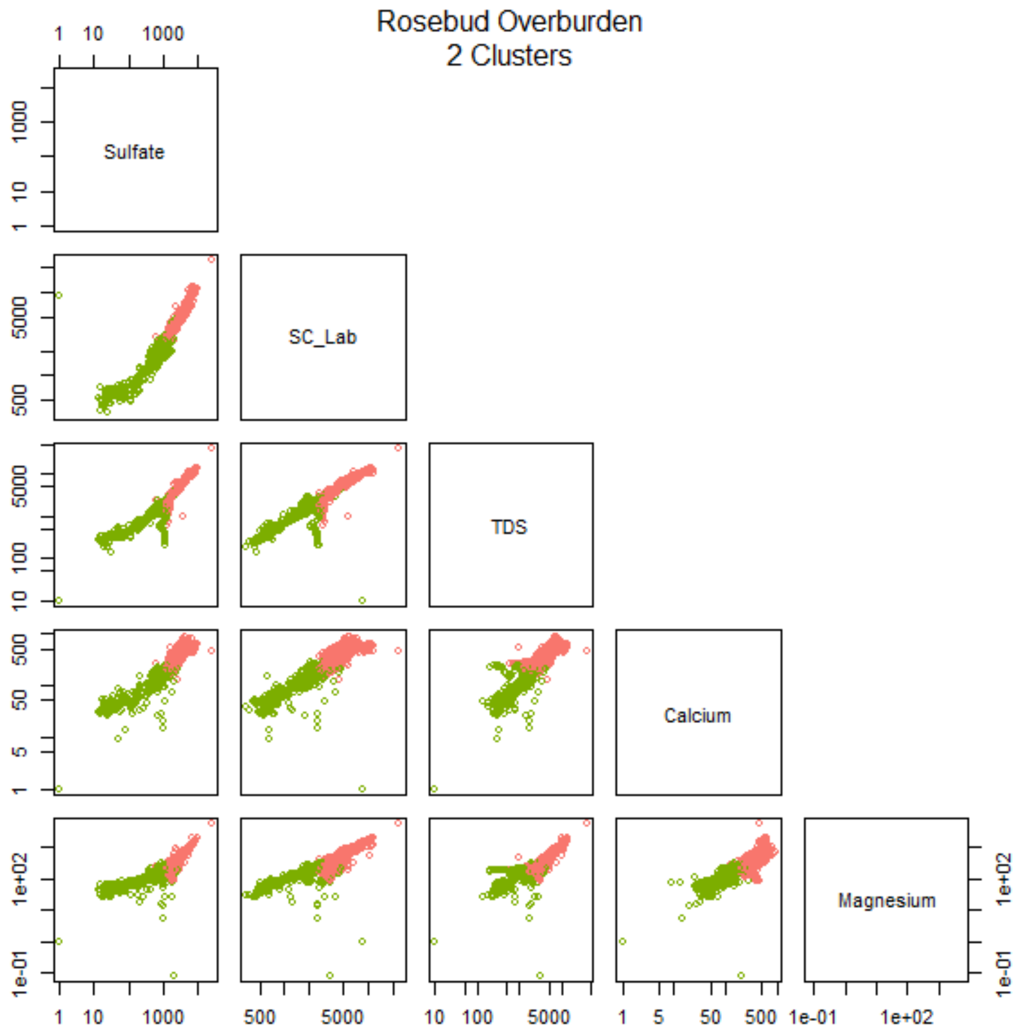
Appendix F.2 contains matrices of scatterplots for the five most important analytes as determined by the RF importance scores, organized by stratigraphic unit. In the scatterplots, points are colored by the cluster determined by Partitioning Around Medoid (PAM) results.

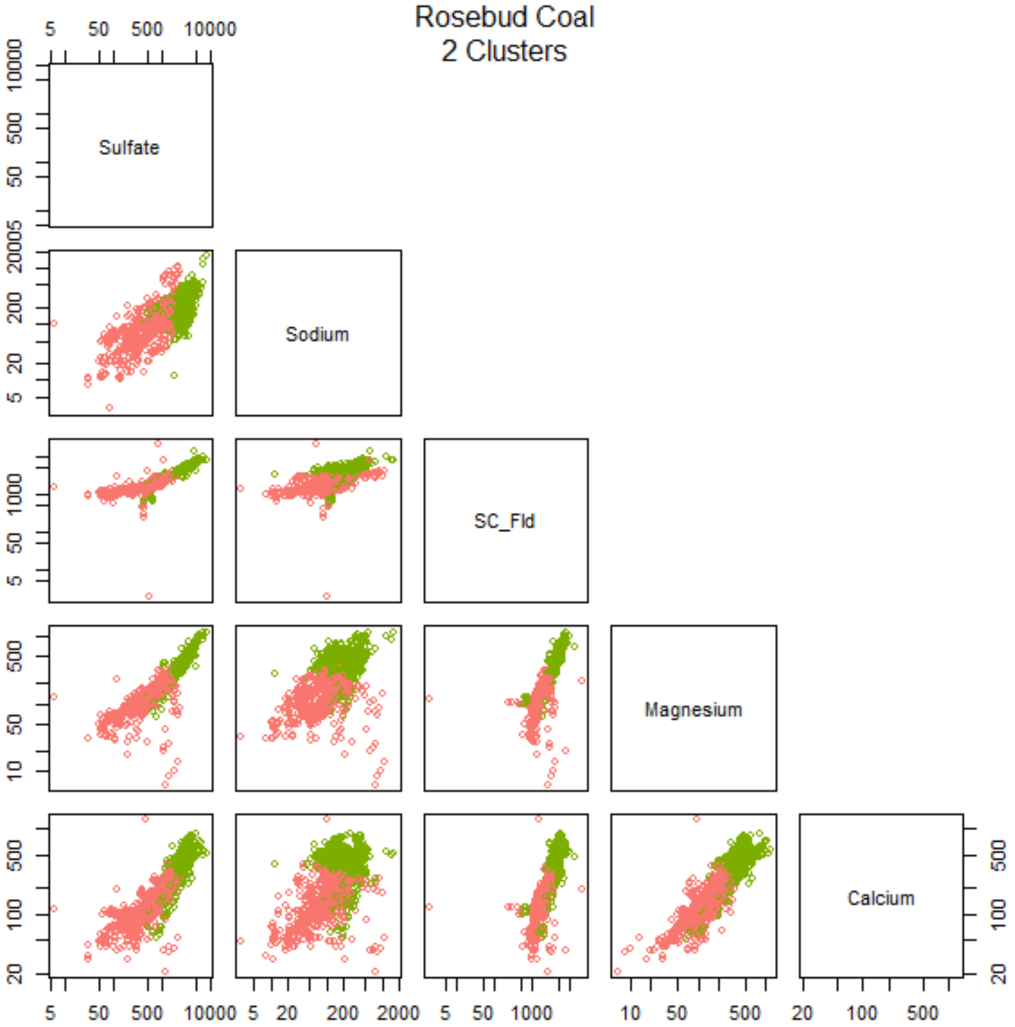

Alluvium
2 Clusters
Selenium
Potassium
Sodium
Magnesium
Nickel
1e-04
1e-02
1
5
20
100
1e-02
1e+02
5e-04
5e-02

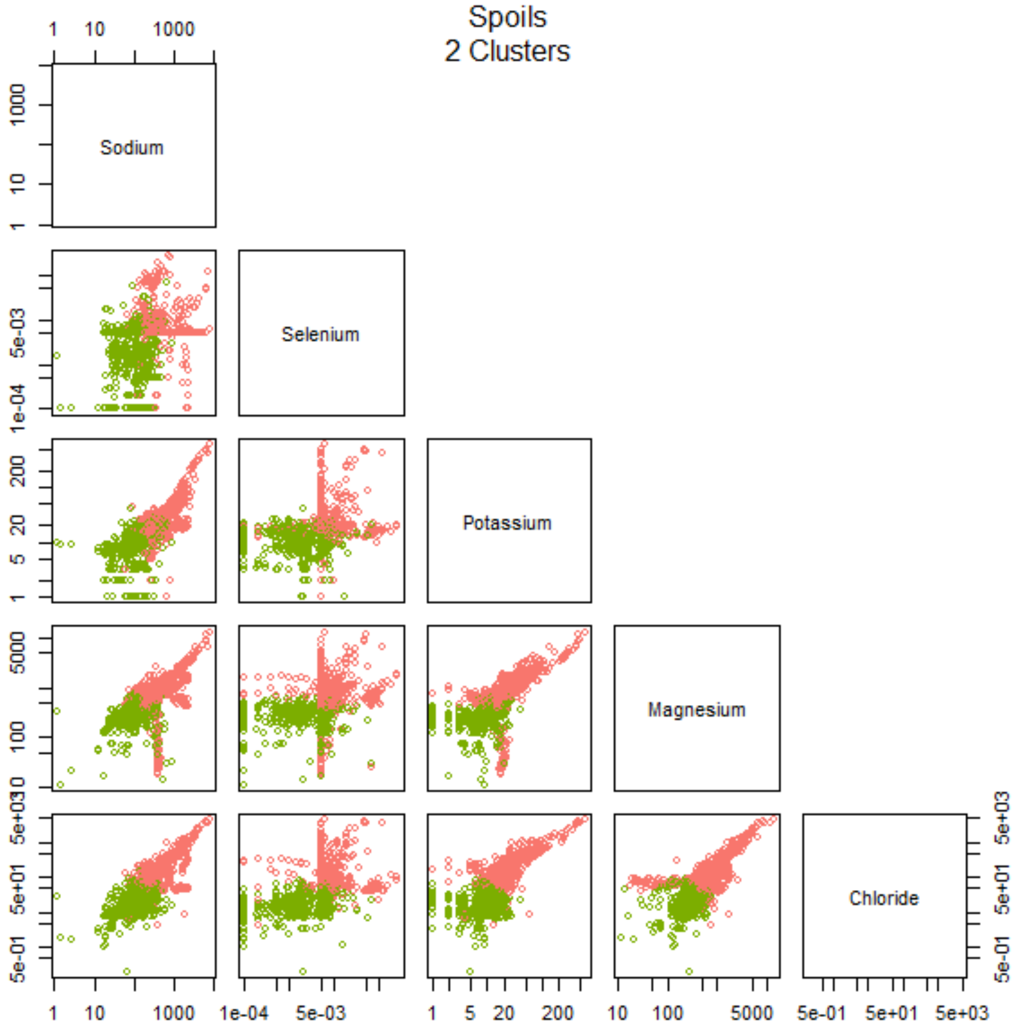

Clinker
2 Clusters
Sodium
SC_Fld
Magnesium
Sulfate
Boron
10
50
500
5000
5
20
200
0.1
1.0
10.0

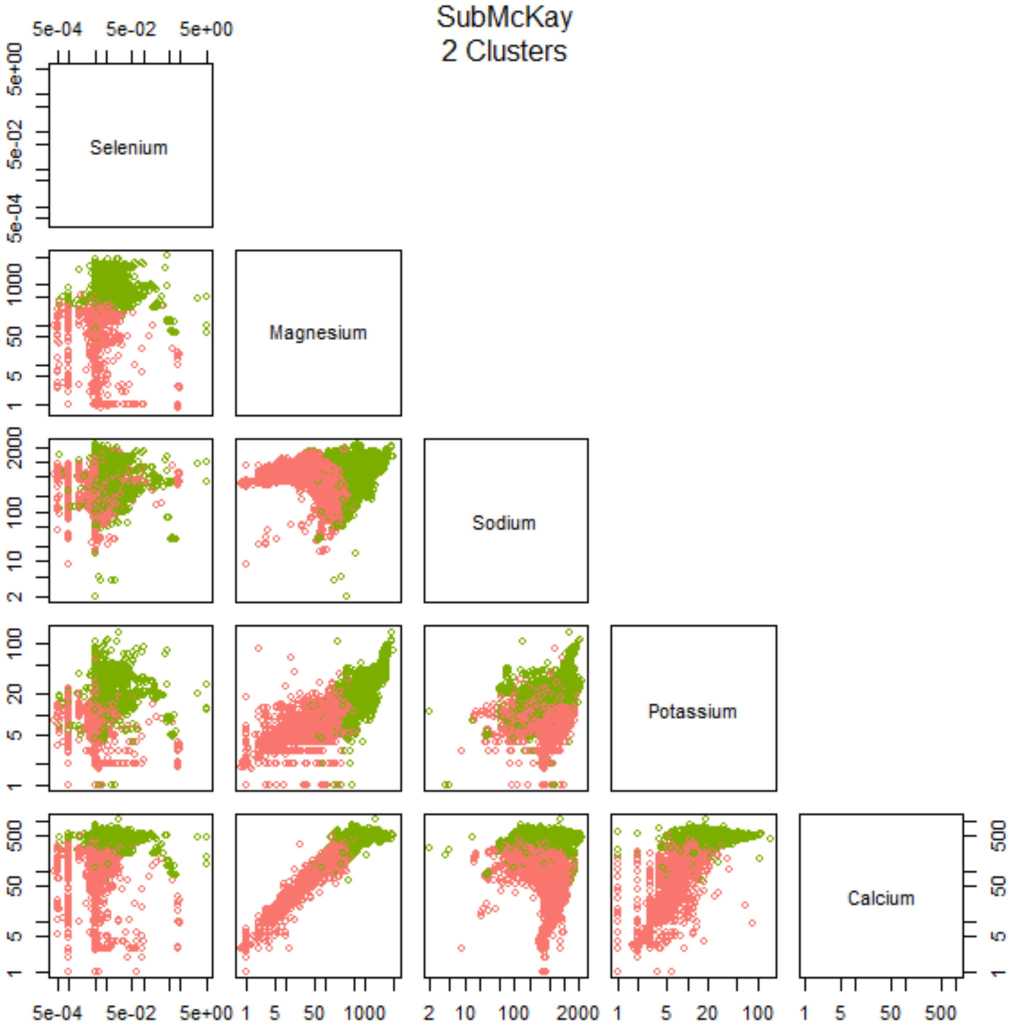

Interburden
2 Clusters
Sulfate
TDS
SC_Lab
Magnesium
Calcium
20
100
1000
5000
500
2000
5
10
50
200


McKay Coal
2 Clusters
Selenium
Sodium
Potassium
Magnesium
Calcium
1e-04
5e-03
1
5
50
500
0.5
5.0
50.0
20
100
1000


Rosebud Overburden
2 Clusters
Sulfate
SC_Lab
TDS
Calcium
Magnesium
1
10
1000
500
5000
10
100
5000
1
5
50
500
1e-01
1e+02


Rosebud Coal
2 Clusters
Sulfate
Sodium
SC_Fld
Magnesium
Calcium
5
50
500
10000
20005
200
20
5
1000
50
5
500
50
10
500
100
20
5
50
500
10000
5
20
200
2000
5
50
1000
10
50
500
20
100
500

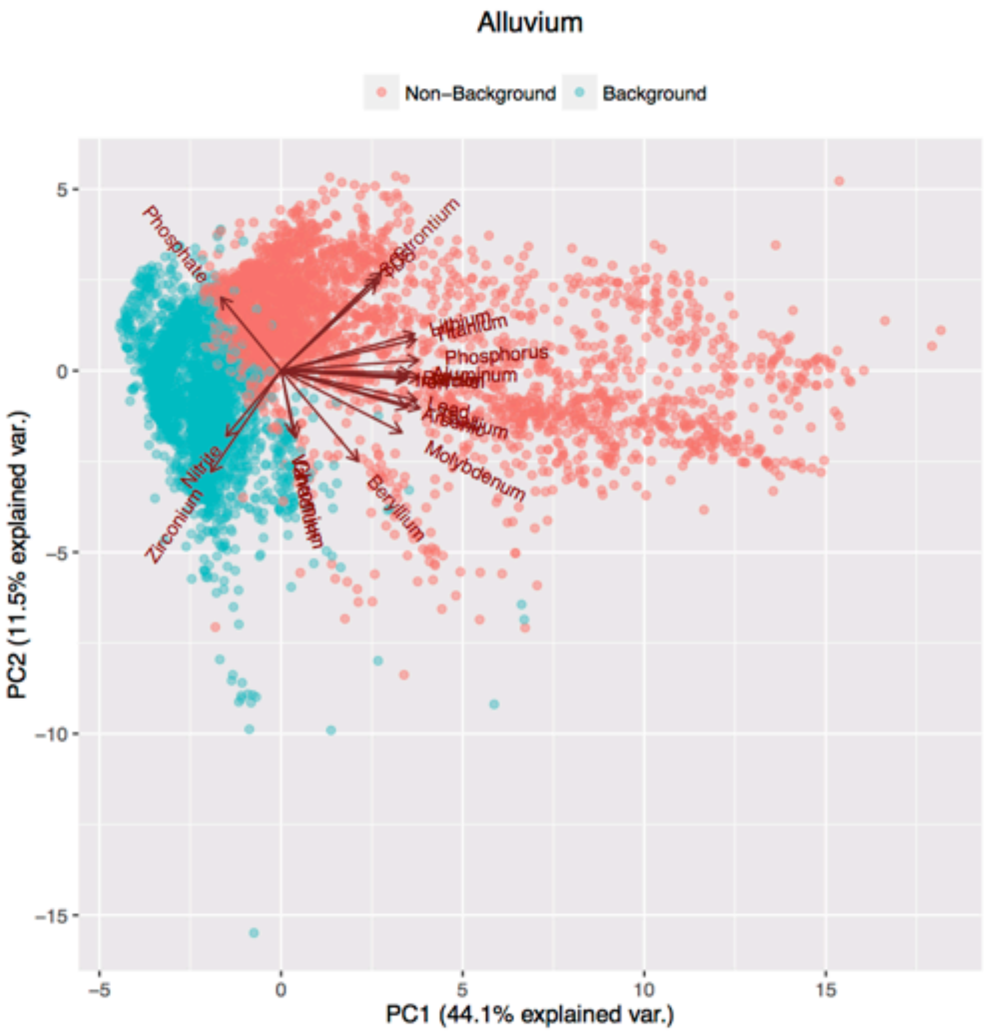

Spoils
2 Clusters
Sodium
Selenium
Potassium
Magnesium
Chloride
1
10
1000
1e-04
5e-03
5
20
200
100
5000
5e-01
5e+01
5e+03


SubMcKay
2 Clusters
Selenium
Magnesium
Sodium
Potassium
Calcium
5e-04
5e-02
5e+00
1
5
50
1000
2
10
100
2000
20
500

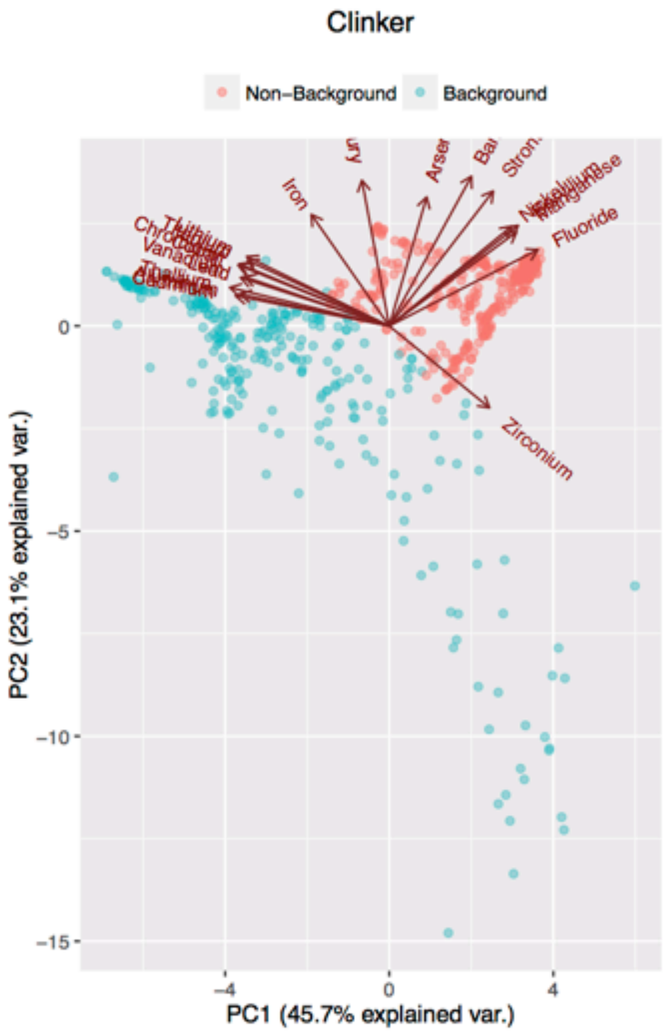
F.3 PRINCIPAL COMPONENT ANALYSIS OF CLUSTERING RESULTS

Appendix F.3 gives another view of the clustering results, this time with the variability in analyte concentrations summarized using principal component analysis (PCA). PCA distills variability in a multivariate dataset into dominant modes of variation known as principal component (PC) axes. Here, sample data are plotted against the first two PC axes (PC1 and PC2), which account for the large majority of variability in samples (the percent variability explained by each axis is noted in the axis labels). Samples (dots) are colored according to the cluster they were assigned to by RF/PAM. Analyte variables are represented by arrows, which indicate the degree to which the analytes correlate to PC1 and PC2, and these correlations (known as “loadings”) are tabulated below the plots. For clarity, plots show only the top ten analytes for each axis (i.e., the ten analytes that correlate most strongly to PC1 and PC2, which are often partially overlapping sets).

These results show that in general, a large proportion of the variability in the data (~40-50%, depending on strata) can be explained by a single PC axis. Furthermore, for most strata the two clusters identified by RF/PAM are largely distinct along this axis, and numerous analytes are highly correlated to it as well. This indicates that the dominant pattern in the data is that background and non-background samples have relatively low and high (respectively) concentrations for most analytes. There is some overlap between the clusters in the two-dimensional PCA spaces illustrated, especially for strata with fewer samples. Nevertheless, overall the PCA results indicate that the RF/PAM-identified clusters are (1) largely distinct, and (2) intuitive in terms of separating high vs. low analyte concentrations. These findings, along with the general correspondence of clustering outcomes with expert opinion, build confidence in the machine learning approach used to provide the initial separation of samples into background vs. non-background groups.

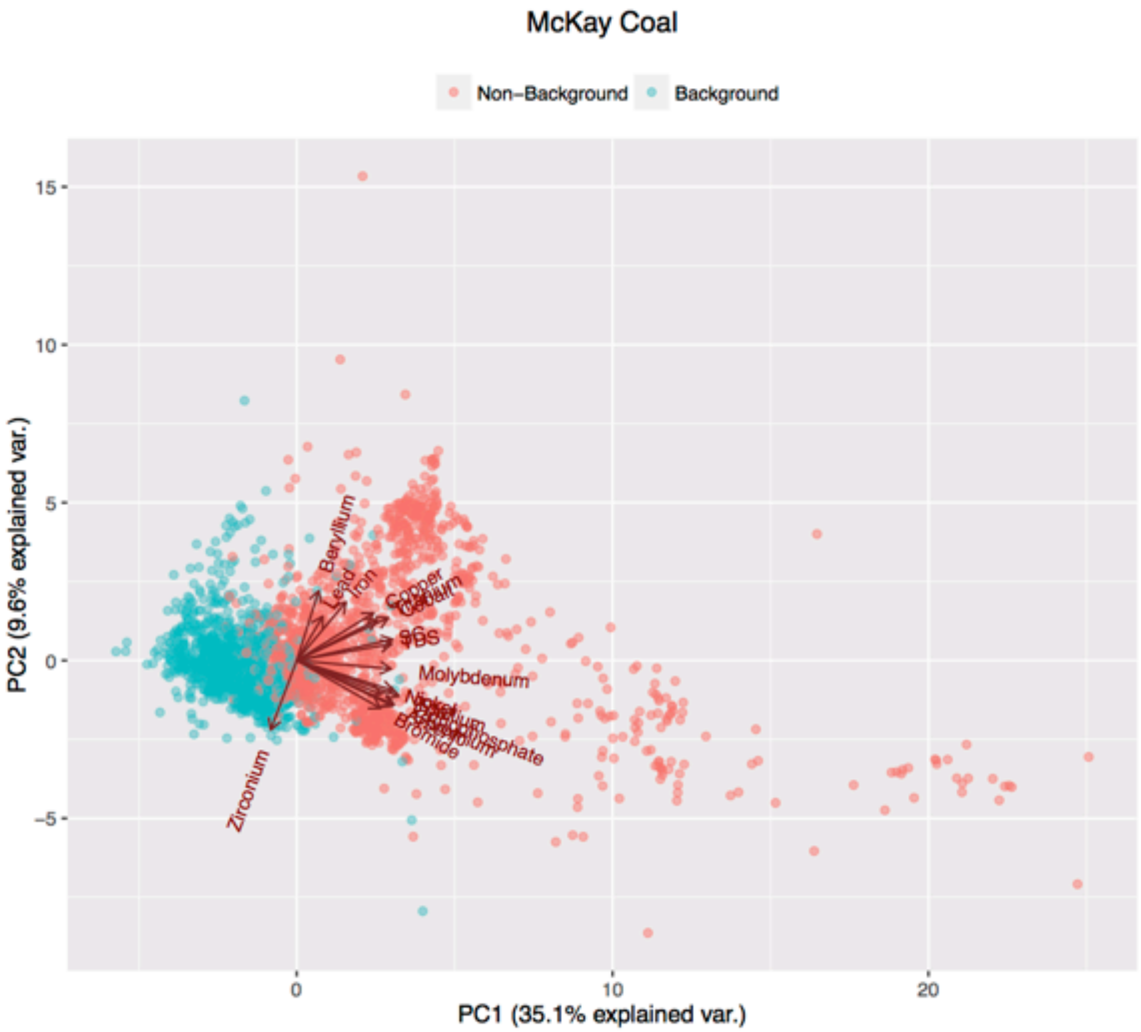


PC1 Loadings			PC2 Loadings	
0.241	Thallium		–0.344	Zirconium
0.240	Nickel		0.334	Strontium
0.238	Phosphorus		0.316	SC
0.235	Lead		–0.308	Beryllium
0.234	Titanium		0.299	TDS
0.232	Lithium		0.249	Phosphate
0.223	Aluminum		–0.228	Chromium
0.219	Barium		–0.223	Nitrite
0.218	Arsenic		–0.212	Vanadium
0.218	Iron		–0.210	Molybdenum

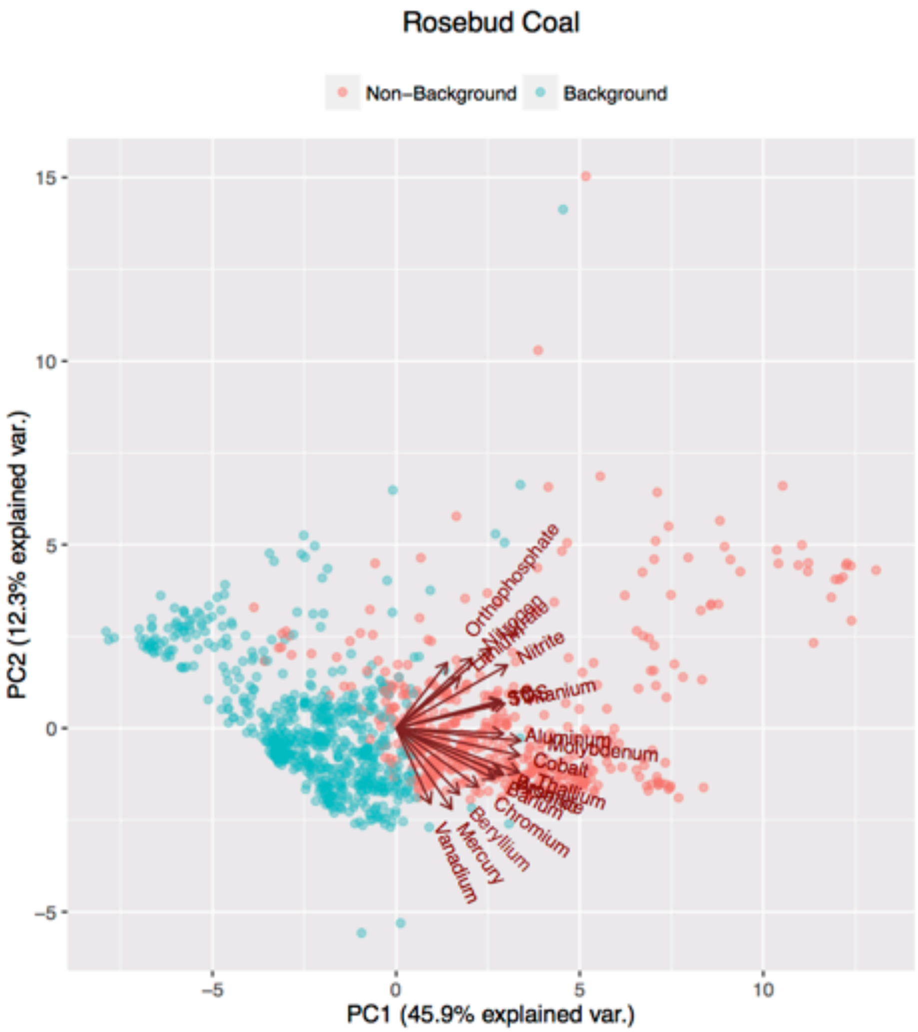


PC1 Loadings			PC2 Loadings	
–0.275	Thallium		0.363	Barium
–0.265	Cadmium		0.353	Mercury
–0.261	Cobalt		0.327	Strontium
–0.259	Chromium		0.312	Arsenic
–0.257	Aluminum		0.270	Iron
–0.256	Lead		0.244	Beryllium
0.256	Fluoride		0.241	Nickel
–0.249	Vanadium		0.228	Manganese
–0.246	Lithium		–0.198	Zirconium
–0.244	Titanium		0.185	Fluoride

PC1 Loadings			PC2 Loadings	
0.515	Strontium		–0.680	Chromium
–0.501	Beryllium		–0.666	Nickel
–0.471	Bromide		–0.248	Cobalt
0.466	Barium		0.137	Barium
0.179	Cobalt		–0.099	Beryllium
0.088	Nickel		0.066	Strontium
0.068	Chromium		–0.005	Bromide

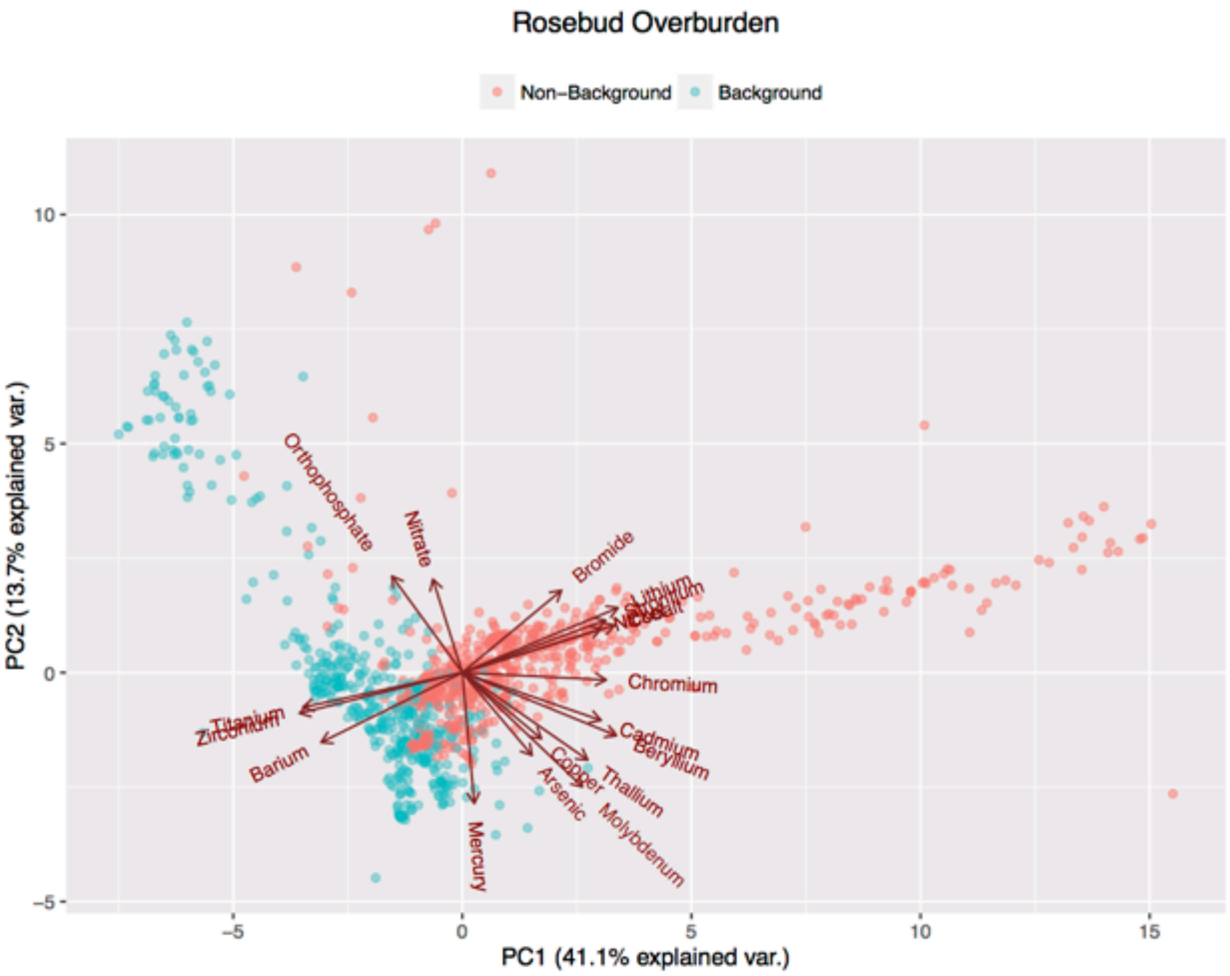


PC1 Loadings			PC2 Loadings	
0.269	Thallium		0.351	Beryllium
0.256	Chromium		–0.349	Zirconium
0.254	Nickel		0.295	Iron
0.253	Arsenic		–0.241	Bromide
0.252	SC		0.239	Copper
0.250	TDS		–0.229	Arsenic
0.248	Molybdenum		0.222	Lead
0.241	Cobalt		–0.222	Chromium
0.222	Orthophosphate		0.214	Cobalt
0.221	Bromide		0.205	Titanium

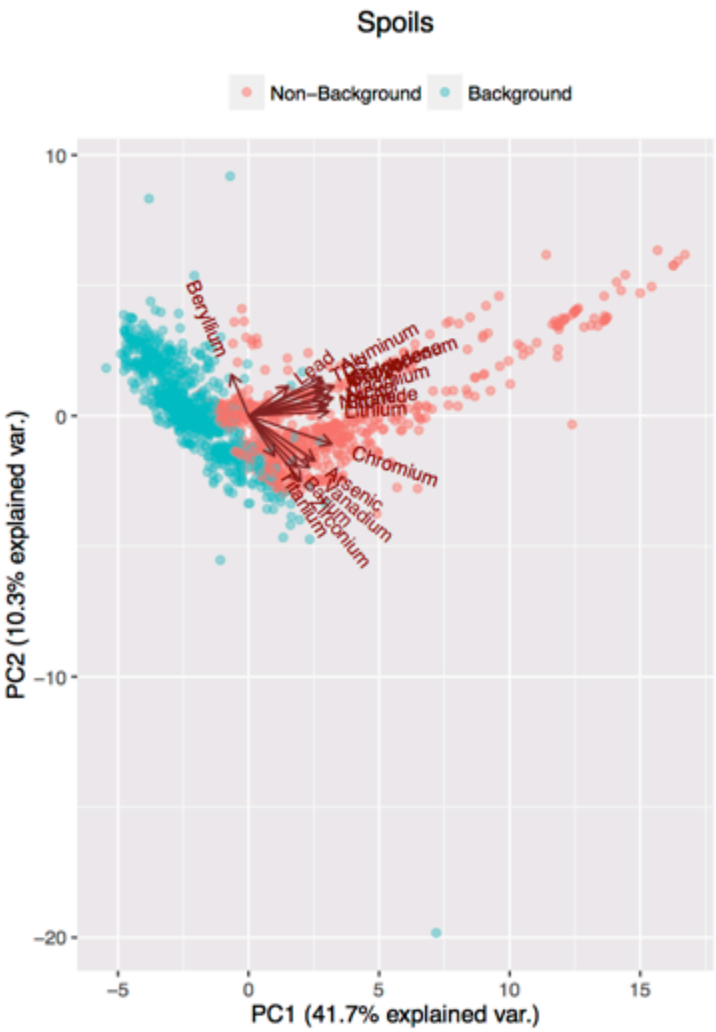


Rosebud Coal

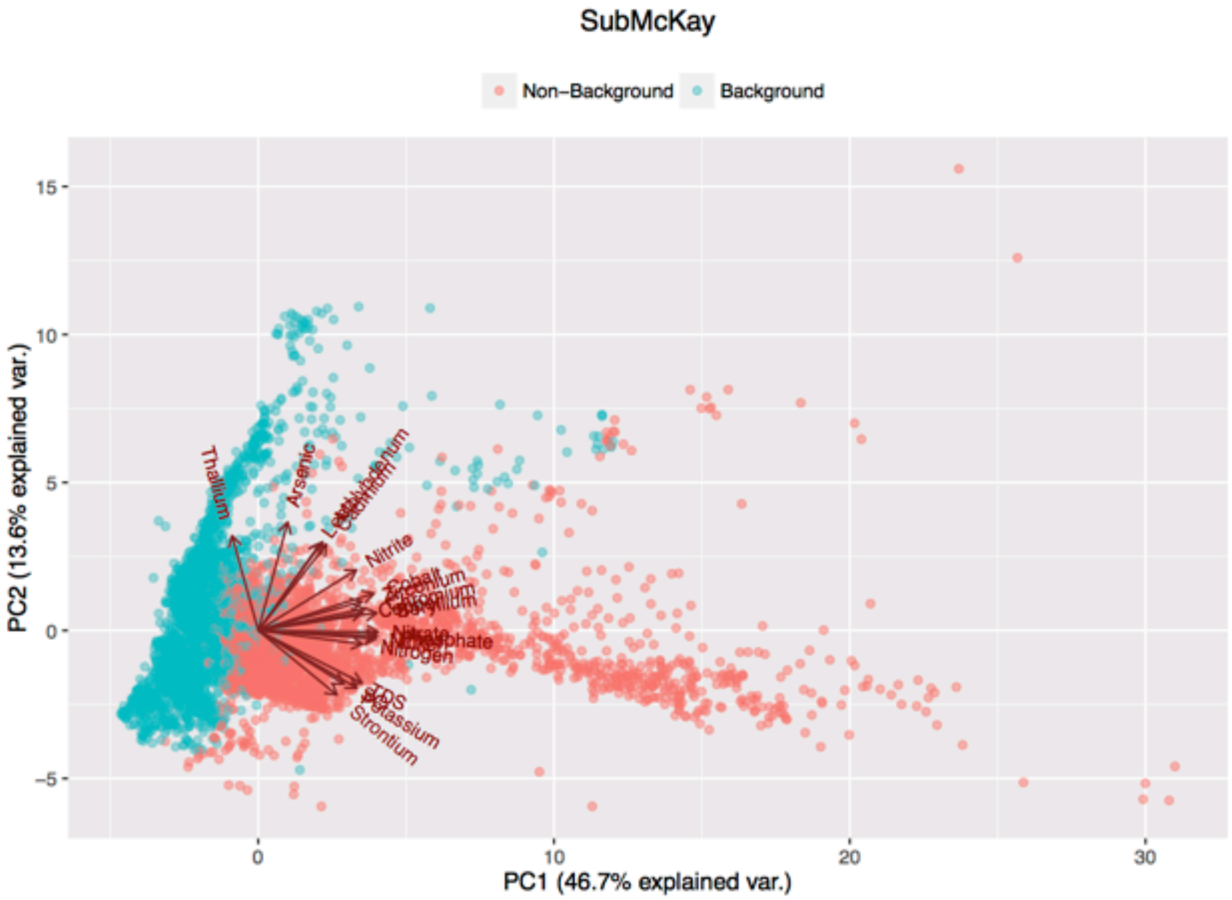
PC1 Loadings		PC2 Loadings	
0.268	Molybdenum	−0.337	Mercury
0.266	Cobalt	0.332	Nitrate
0.266	Thallium	−0.313	Vanadium
0.240	Nitrite	0.291	Nitrogen
0.234	Titanium	−0.275	Beryllium
0.232	Arsenic	0.273	Orthophosphate
0.231	Aluminum	0.262	Nitrite
0.226	SC	−0.244	Chromium
0.226	TDS	0.213	Lithium
0.224	Bromide	−0.211	Barium



PC1 Loadings			PC2 Loadings	
–0.286	Zirconium		–0.398	Mercury
–0.280	Titanium		–0.348	Molybdenum
0.274	Lithium		0.293	Orthophosphate
0.271	Beryllium		0.284	Nitrate
0.268	Cobalt		–0.266	Thallium
0.253	Chromium		–0.252	Arsenic
0.252	Strontium		0.250	Bromide
–0.248	Barium		–0.212	Barium
0.244	Nickel		–0.201	Copper
0.244	Cadmium		0.197	Lithium



PC1 Loadings			PC2 Loadings	
0.260	Copper		−0.402	Zirconium
0.257	Nickel		−0.319	Vanadium
0.253	Chromium		−0.315	Barium
0.244	Lithium		−0.275	Arsenic
0.243	Cadmium		0.254	Beryllium
0.242	Bromide		−0.247	Titanium
0.234	Molybdenum		0.238	Aluminum
0.233	Nitrate		0.215	TDS
0.228	TDS		0.182	Lead
0.223	Manganese		0.182	Copper



PC1 Loadings			PC2 Loadings	
0.241	Nitrate		0.403	Arsenic
0.239	Phosphate		0.353	Thallium
0.239	Beryllium		0.329	Molybdenum
0.237	Nickel		0.323	Lead
0.232	Cobalt		0.321	Cadmium
0.215	Chromium		–0.240	Strontium
0.210	Copper		0.226	Nitrite
0.210	Nitrogen		–0.214	SC
0.209	TDS		–0.199	Potassium
0.209	Zirconium		–0.196	TDS

Appendix G Gehan Ranking Example

G.1 Rank for uncensored datasets

To avoid distributional assumptions, some statistical methods are based on the *ranks* of observations rather than on their measured values. Using ranks instead of measured values allows the methods to be more robust to outlying observations, which can be especially useful when working with skewed data. As a simple example, consider measured values {0.01, 2.30, 78.1, 0.14, 0.05}. The rank of each observation is simply its position when the list is sorted from least to greatest, as shown in Table G11.

Table G11. Example 1 dataset with ranks

Value	0.01	0.05	0.14	2.30	78.1
Rank	1	2	3	4	5

When there are ties in the measured or observed values, and a repeated value has multiple positions in the ordered dataset, the simplest ranking scheme assigns the average position to ties. In the example shown in Table G12, the average of positions 1 and 2, namely 1.5, is assigned as the rank for both 0.01 values, and the average of positions 3, 4, and 5, namely 4, is assigned as the rank of all three 0.82 values.

Table G12. Example 2 dataset with ranks

Value	0.01	0.01	0.82	0.82	0.82
Position	1	2	3	4	5
Rank	1.5	1.5	4	4	4

G.2 Gehan Rank for censored datasets

When there are non-detects in a dataset, Gehan rank assigns the average of the positions a value could take in the ordered dataset if the censored value were known. Table G13 shows a dataset with nine values, four of which are censored. The first step in determining the Gehan ranks is to order the values in the natural way, and assign a starting position to each observation, as shown in Table G13.

Table G13. Example 3 dataset with starting positions

Value	<10	<10	20	<30	30	30	<40	50	60	90
Starting Position	1	2	3	4	5	6	7	8	9	10

The next step is to understand what positions each value could take if the true values for the censored observations were known. Table G14 illustrates some of the possibilities. The first row shows the basic initial ordering. To understand the next three rows, note that a value known to be <30 could be anything less than 30, and so could take any of the earlier positions, potentially forcing the observed value of 20 and/or the censored values of <10 to higher positions. Similarly, the censored value represented by <40 could fall in any position between 1 and 7, and orderings from 5 onward in Table G14 represent some of the possibilities.

To determine the Gehan rank of a censored value, consider the censored values and the positions they could take. For instance, <30 could take any of the first four positions, and could also take the fifth position if <40 represents a value that is less than the value represented by <30. In general, a censored value can take any position up to and including its starting position, and can take positions beyond its starting position when there are non-detects with larger starting positions. The possible positions for a non-detect in starting position k are $1, 2, \dots, k, k + 1, \dots, k + r$, where r is the number of non-detects with starting positions greater than k. The average of these is $(k + r + 1)/2$, which is then the Gehan rank assigned to a censored value in starting position k.

Next consider the uncensored values. The possible positions of uncensored values are bounded below by the starting position. The measured value of 20, for instance, will always be larger than the two censored values of <10 and <10, so its smallest possible position is 3rd. However the uncensored value of 20 might also be larger than censored values with larger initial positions than 20 itself, meaning 20 could take the 4th position if one of the censored values <30 or <40 is in fact smaller than 20, or the 5th position if both <30 and <40 are smaller than 20. Similarly, 30 could take its initial starting positions (5th or 6th) or one larger (7th), where the latter happens if the censored value <40 is in fact less than 30. The uncensored values 50, 60, and 90 will always have the 8th, 9th, and 10th positions respectively. In general, the possible positions for a non-detect in starting position k are $k, k + 1, \dots, k + r$, where r is the number of non-detects with starting positions greater than k. The average of these is $k + r/2$, unless the uncensored value in position k is a tie, in which case the starting position k is replaced by the average starting position of the tied values.

Table G14. Possible orderings of Example 3 dataset

Ordering	Position									
	1	2	3	4	5	6	7	8	9	10
1	<10	<10	20	<30	30	30	<40	50	60	90
2	<10	<10	<30	20	30	30	<40	50	60	90
3	<10	<30	<10	20	30	30	<40	50	60	90
4	<30	<10	<10	20	30	30	<40	50	60	90
5	<10	<10	20	<30	30	<40	30	50	60	90
6	<10	<10	<30	20	30	<40	30	50	60	90
7	<10	<30	<10	20	30	<40	30	50	60	90
8	<30	<10	<10	20	30	<40	30	50	60	90
9	<10	<10	20	<30	<40	30	30	50	60	90
10	<10	<10	<30	20	<40	30	30	50	60	90
11	<10	<30	<10	20	<40	30	30	50	60	90
12	<30	<10	<10	20	<40	30	30	50	60	90
...										
28	<40	<30	<10	<10	20	30	30	50	60	90

A summary of the Example 3 values, their starting positions, their possible positions, and their Gehan ranks (the average of the possible positions) is shown in Table G15.

Table G15. Gehan ranks for Example 3 dataset

Value	**<10**	**<10**	**20**	**<30**	**30**	**30**	**<40**	**50**	**60**	**90**
Starting Position	1	2	3	4	5	6	7	8	9	10
Possible Positions	1,2,3,4	1,2,3,4	3,4,5	1,2,3,4,5	5,6,7	5,6,7	1,2,3,4, 5,6,7	8	9	10
Gehan Rank	2.5	2.5	4	3	6	6	4	8	9	10

G.3 Percentiles for uncensored datasets

There are many algorithms for estimating quantiles for uncensored datasets. If the $p * 100$ percentile of a dataset of size n is desired for $0 \leq p \leq 1$, each algorithm will specify the $p * 100$ percentile as an observation in the dataset or as an interpolation between two consecutive values in the ordered dataset. Here we are primarily interested in the situation where $p = 0.90$.
Let $\lfloor \cdot \rfloor$ denote the floor function, so $\lfloor k \rfloor$ is the largest integer less than or equal to k, and let $\lceil \cdot \rceil$ denote the ceiling function, so $\lceil k \rceil$ is the smallest integer greater than or equal to k. When k is an integer, the floor and ceiling of k are the same; when k is not an integer, the floor and ceiling are the integers immediately below and above k, respectively.

One simple algorithm, and the one employed throughout the process of estimating BSLs via Gehan ranking and bootstrapping, simply takes the $p * 100$ of a dataset of size n to be the $\lceil p * n \rceil$th observation in the ordered dataset. For a dataset of size 10, the 90th percentile is then the 9th observation in the ordered dataset. Table G16 shows an example (ordered) dataset with the 90th percentile in bold. For a dataset with 155 values, the 90th percentile will be the observation in the $\lceil 0.90 * 155 \rceil$th, or 140th spot in the ordered dataset.

Table G16. Example 4 dataset, with 90th percentile in bold.

Example 4 dataset	8	10	20	22	30	30	36	40	**60**	90

G.4 Percentiles for censored datasets using Gehan Ranking

The Example 3 dataset and the Gehan ranks of the observations (as shown also shown in Table G15) are repeated in Table G17.

Table G17. The Example 3 dataset with Gehan ranks

Value	**<10**	**<10**	**20**	**<30**	**30**	**30**	**<40**	**50**	**60**	**90**
Gehan Rank	2.5	2.5	4	3	6	6	4	8	9	10

Reordering the values according to the Gehan rank assignment (with ties determined by the original values) results in the ordered dataset shown in Table G18.

Table G18. The Example 3 dataset, ordered according to Gehan rank

Value	**<10**	**<10**	**<30**	**20**	**<40**	**30**	**30**	**50**	**60**	**90**
Gehan Rank	2.5	2.5	3	4	4	6	6	8	9	10

In this case, the 90th percentile would be estimated as the observation in the 9th spot, where the ordering is dictated by Gehan ranking, namely 60. If the $\lceil p * n \rceil$th spot is a non-detect, the p*100th percentile would be the detection limit provided for the non-detect. Note that when the censored values are all in the lower 80% of the ordered dataset, which is the most common situation, the 90th percentile computed using Gehan ranking coincides with the 90th percentile computed using the detection limit for censored values.

Note that there are several algorithms for computing, or estimating, quantiles/percentiles from data. The one used here is simple, but it is biased high (the ten data points in the example correspond to the 10^{th} through 100^{th} percentiles). An alternative is to assume the data points correspond to the 0^{th} through the 90^{th} percentiles, or to provide symmetry, and make them the 5^{th}, 15^{th}, …. , 95^{th} percentiles. Some algorithms linearly interpolate to estimate a pth percentile when $p * n$, where n is the number of data points, is not an integer. When there are many data points, as there are for most analyte and stratigraphic layer combinations in the Colstrip dataset, the actual method for calculation does not have a large effect on the estimated quantile values.

G.5 Bootstrapped UTLs

The 95% upper confidence limit on the 90th percentile from a dataset is computed by bootstrapping 90th percentiles, and then taking the 95th percentile from the bootstrapped statistics. The process is illustrated with the Example 3 dataset.

Each bootstrap iteration involves drawing 10 observations, with replacement, from the original dataset. A bootstrap sample from the Example 3 dataset is shown in Table G19.

Table G19. Bootstrap Sample 1 for Example 3 dataset

Bootstrap Sample 1	**20**	**<30**	**30**	**<40**	**<40**	**<40**	**50**	**60**	**90**	**90**

The Gehan ranks are computed and shown in Table G20.

Table G20. Bootstrap Sample 1 with Gehan ranks for Example 3 dataset

Bootstrap Sample 1	**20**	**<30**	**30**	**<40**	**<40**	**<40**	**50**	**60**	**90**	**90**
Gehan Rank	**3**	**3**	**4.5**	**3.5**	**3.5**	**3.5**	**7**	**8**	**9.5**	**9.5**

When the dataset is reordered according to the Gehan ranks, the 9th position is 90, which is the estimated 90th percentile.

Taking another bootstrap sample, and computing Gehan ranks, gives the sample and ranks shown in Table G21:

Table G21. Bootstrap Sample 2 with Gehan ranks for Example 3 dataset

Bootstrap Sample 2	**<10**	**<10**	**<10**	**20**	**<30**	**30**	**30**	**50**	**50**	**60**
Gehan Rank	**2.5**	**2.5**	**2.5**	**4.5**	**3**	**6.5**	**6.5**	**8.5**	**8.5**	**10**

When the dataset is reordered according to the Gehan ranks, the 9th position is 50, which is the estimated 90th percentile.

The process of resampling and finding the 90th percentile of the resampled dataset is repeated many times (10,000 in the computations made here), and the 90th percentile from each iteration is recorded, leading to a set of 10,000 estimates of the 90th percentile, the first two of which, from the examples above, are 90 and 50. A set of 10,000 results are shown in Figure G7.

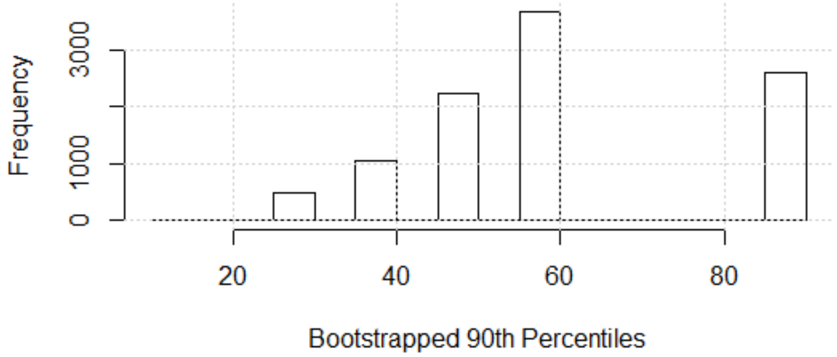


Figure G7. Histogram of bootstrapped 90th percentile values for Example 3 dataset

The 95th percentile from the bootstrapped statistics is 90. Thus, the 90/95 UTL, which is taken to be the BSL, is 90 for this dataset.

The finite discrete nature of the possibilities is clear when there are so few samples in the original dataset. However, when there are many samples, the bootstrapped distribution tends to “fill in” a lot more, and the 95th percentile of the bootstrapped data can appear to come from a near-continuous distribution. This also depends on the number of non-detects in the original dataset and the positions of those non-detects relative to the detected values.

Appendix H Data Summary Tables

Table H-1. Summary of Groundwater Baseline Data

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
100A	Alluvium	13	225	5/5/09	5/6/15
101A	Alluvium	2	37	5/5/09	11/2/09
1022A	Alluvium	37	560	7/27/05	3/27/15
1025AM	Alluvium	1	22	10/12/05	10/12/05
102A	Alluvium	3	64	5/5/09	4/13/10
1030A	Alluvium	19	266	8/8/06	5/7/15
104A	Alluvium	1	25	5/6/09	5/6/09
1054A-P	Alluvium	1	12	3/15/08	3/15/08
1055A-P	Alluvium	2	14	12/18/07	3/17/08
1057A-P	Alluvium	1	2	12/18/07	12/18/07
10S	Alluvium	9	91	8/27/76	8/17/77
1126A	Alluvium	1	15	8/25/10	8/25/10
1150A	Alluvium	6	95	11/20/12	3/31/15
137A	Alluvium	4	56	11/22/13	5/4/15
1S	Alluvium	12	122	8/25/76	9/21/77
2028A	Alluvium	6	81	11/8/12	3/18/15
2030A	Alluvium	4	53	5/15/13	9/20/14
352A	Alluvium	8	161	1/28/84	11/10/11
357A	Alluvium	22	396	11/20/84	10/17/95
553A	Alluvium	2	48	8/31/82	10/30/82
557A	Alluvium	58	977	8/19/82	9/9/10
558A	Alluvium	56	1042	8/19/82	9/17/09
559A	Alluvium	56	1035	8/18/82	9/17/09
560A	Alluvium	34	676	8/27/82	3/31/99
568A	Alluvium	37	740	8/20/82	4/20/00
569A	Alluvium	46	892	8/19/82	10/13/04
582A	Alluvium	7	171	1/27/84	11/7/86
591A	Alluvium	48	741	6/9/87	9/9/10
592A	Alluvium	34	531	6/8/87	9/27/04
625A	Alluvium	20	220	9/23/99	9/23/09
626A	Alluvium	8	79	9/23/99	9/17/03
635A	Alluvium	12	137	2/9/00	5/15/01
63S	Alluvium	14	196	12/15/03	5/11/15
65A	Alluvium	21	270	7/29/04	4/29/15
665A	Alluvium	1	14	10/29/04	10/29/04
666A	Alluvium	1	12	1/11/05	1/11/05
669A	Alluvium	1	12	10/29/04	10/29/04
670A	Alluvium	1	12	10/29/04	10/29/04
671A	Alluvium	1	12	10/29/04	10/29/04
673A	Alluvium	1	14	10/29/04	10/29/04
679A	Alluvium	2	25	11/23/04	9/27/05
688A	Alluvium	8	96	5/19/06	9/28/09
689A	Alluvium	5	60	9/29/05	6/3/11
68A	Alluvium	1	22	10/14/05	10/14/05
692A	Alluvium	1	12	4/13/10	4/13/10
812	Alluvium	1	14	5/12/15	5/12/15
822	Alluvium	1	14	5/12/15	5/12/15
83A	Alluvium	1	14	8/22/07	8/22/07

Table H-1 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
909A	Alluvium	15	155	9/24/99	10/18/06
917A	Alluvium	19	309	7/26/00	10/13/09
918A	Alluvium	19	221	7/26/00	9/15/09
936A	Alluvium	1	1	7/22/03	7/22/03
937A	Alluvium	3	23	7/22/03	5/30/06
940A	Alluvium	12	165	11/26/03	10/13/09
941A-P	Alluvium	4	47	3/19/04	5/9/07
977A	Alluvium	1	20	8/15/07	8/15/07
AB18-S	Alluvium	1	16	9/9/96	9/9/96
BS-11	Alluvium	2	47	8/28/75	10/26/89
BS-12	Alluvium	1	15	8/28/75	8/28/75
BS-13	Alluvium	4	118	8/28/75	8/18/97
BS-14	Alluvium	7	240	8/28/75	6/14/10
BS-51	Alluvium	2	70	10/4/90	8/19/97
CM-1	Alluvium	12	225	2/9/79	12/9/80
DP3-638A	Alluvium	9	136	9/18/07	3/31/15
GNW-1	Alluvium	41	681	12/11/84	9/29/04
GNW-10	Alluvium	3	37	9/18/89	6/10/09
GNW-11	Alluvium	1	15	5/23/90	5/23/90
GNW-2	Alluvium	12	343	12/11/84	5/21/90
GNW-3	Alluvium	12	344	12/11/84	5/21/90
GNW-4	Alluvium	13	361	12/11/84	5/21/90
GNW-5	Alluvium	12	380	12/11/84	5/21/90
GNW-6	Alluvium	12	343	12/11/84	5/23/90
GNW-7	Alluvium	50	713	12/11/84	9/28/09
GNW-8	Alluvium	35	588	12/11/84	10/1/01
GOW-1	Alluvium	11	317	9/10/84	4/1/87
GOW-10	Alluvium	5	156	9/10/84	9/1/86
GOW-11	Alluvium	9	244	9/10/84	9/12/89
P-01	Alluvium	21	667	7/12/74	6/22/10
P-02	Alluvium	13	316	4/15/75	5/13/08
P-03	Alluvium	17	400	5/16/75	8/27/14
P-04	Alluvium	25	569	5/16/75	8/27/14
P-05	Alluvium	20	514	5/16/75	9/21/11
P-11	Alluvium	4	151	5/16/75	2/3/81
P-12	Alluvium	1	43	5/16/75	5/16/75
PW-730	Alluvium	1	37	5/23/07	5/23/07
PW-732	Alluvium	1	37	5/23/07	5/23/07
PW-734	Alluvium	2	30	6/18/09	9/29/09
PW-736	Alluvium	2	48	6/18/09	9/29/09
W-3	Alluvium	6	117	12/6/85	6/18/91
WA-100	Alluvium	2	44	11/16/79	9/17/93
WA-101	Alluvium	23	427	3/23/81	9/24/12
WA-102	Alluvium	4	49	9/9/81	1/28/87
WA-103	Alluvium	14	229	11/15/79	7/30/96
WA-104	Alluvium	20	350	11/15/79	9/25/13
WA-105	Alluvium	19	341	8/3/79	7/30/96
WA-106	Alluvium	15	252	11/15/79	7/30/96

Table H-1 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
WA-107	Alluvium	1	23	5/20/86	5/20/86
WA-108	Alluvium	10	162	11/20/79	7/18/96
WA-109	Alluvium	17	355	11/16/79	8/27/14
WA-110	Alluvium	11	162	11/16/79	7/23/95
WA-111	Alluvium	17	292	11/16/79	7/11/01
WA-112	Alluvium	2	44	12/5/79	5/6/82
WA-114	Alluvium	16	292	5/6/82	9/19/12
WA-118	Alluvium	3	68	11/8/80	5/2/82
WA-119	Alluvium	2	45	11/8/80	12/9/85
WA-120	Alluvium	1	23	8/28/81	8/28/81
WA-121	Alluvium	1	23	8/28/81	8/28/81
WA-122	Alluvium	14	189	11/7/80	11/20/91
WA-123	Alluvium	4	69	11/7/80	8/5/91
WA-124	Alluvium	27	442	12/9/80	8/27/14
WA-125	Alluvium	6	116	12/9/80	4/13/00
WA-126	Alluvium	21	336	12/4/80	9/25/13
WA-127	Alluvium	18	276	12/4/80	8/28/02
WA-128	Alluvium	27	435	8/6/81	9/19/12
WA-129	Alluvium	10	156	10/2/81	7/23/01
WA-130	Alluvium	21	327	3/23/81	8/27/02
WA-131	Alluvium	14	263	5/12/82	9/19/12
WA-132	Alluvium	18	563	4/24/81	7/14/89
WA-133	Alluvium	11	400	4/24/81	11/7/86
WA-134	Alluvium	33	550	4/21/81	9/19/12
WA-135	Alluvium	17	489	4/24/81	6/8/88
WA-136	Alluvium	56	1143	5/12/81	12/9/04
WA-137	Alluvium	98	1767	5/12/81	3/27/15
WA-139	Alluvium	10	350	9/9/82	7/20/01
WA-140	Alluvium	1	23	9/9/82	9/9/82
WA-141	Alluvium	1	23	9/9/82	9/9/82
WA-146	Alluvium	15	244	8/6/82	9/26/13
WA-147	Alluvium	3	61	9/14/89	9/22/11
WA-148	Alluvium	2	46	8/18/82	8/17/84
WA-149	Alluvium	2	25	8/3/82	5/11/83
WA-151	Alluvium	1	23	8/3/82	8/3/82
WA-152	Alluvium	3	26	8/3/82	5/9/84
WA-153	Alluvium	3	47	8/4/82	12/8/83
WA-154	Alluvium	7	116	8/4/82	7/11/89
WA-155	Alluvium	13	291	8/12/82	9/19/12
WA-156	Alluvium	5	92	8/12/82	7/6/89
WA-157	Alluvium	2	47	8/11/82	12/17/85
WA-158	Alluvium	5	93	8/11/82	7/6/89
WA-159	Alluvium	1	23	8/12/82	8/12/82
WA-160	Alluvium	15	283	8/14/82	9/24/13
WA-161	Alluvium	2	46	8/14/82	9/17/84
WA-164	Alluvium	3	47	8/14/82	3/17/86
WA-165	Alluvium	11	163	8/15/82	7/23/95
WA-166	Alluvium	6	93	8/15/82	11/22/91

Table H-1 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
WA-167	Alluvium	2	46	8/16/82	7/5/85
WA-168	Alluvium	13	238	8/16/82	9/24/13
WA-169	Alluvium	18	334	8/17/82	8/27/14
WA-170	Alluvium	11	186	8/17/82	7/23/95
WA-171	Alluvium	10	179	6/10/88	9/20/12
WA-172	Alluvium	15	282	10/18/82	9/27/13
WA-178	Alluvium	1	23	6/23/88	6/23/88
WA-182	Alluvium	4	48	5/11/84	7/16/96
WA-183	Alluvium	1	13	12/2/83	12/2/83
WA-184	Alluvium	9	106	12/2/83	7/16/96
WA-185	Alluvium	8	117	12/2/83	7/19/95
WA-186	Alluvium	8	139	5/11/84	9/24/12
WA-187	Alluvium	9	110	12/2/83	7/16/96
WA-188	Alluvium	7	96	5/11/84	7/16/96
WA-190	Alluvium	13	214	5/11/84	9/24/13
WA-191	Alluvium	7	95	5/11/84	7/19/95
WA-192	Alluvium	7	95	5/11/84	7/19/95
WA-193	Alluvium	6	72	5/11/84	7/20/95
WA-194	Alluvium	7	94	5/11/84	7/20/95
WA-195	Alluvium	8	118	5/11/84	7/16/96
WA-196	Alluvium	9	135	5/11/84	9/15/99
WA-197	Alluvium	10	161	11/28/83	7/16/96
WA-198	Alluvium	11	184	11/29/83	7/16/96
WA-199	Alluvium	16	286	11/29/83	9/24/12
WA-200	Alluvium	10	156	11/29/83	7/16/96
WA-201	Alluvium	10	161	12/1/83	7/16/96
WA-204	Alluvium	2	45	12/1/83	6/24/85
WA-205	Alluvium	1	22	12/1/83	12/1/83
WA-209	Alluvium	8	97	7/25/85	8/27/96
WA-210	Alluvium	11	162	7/26/85	8/27/96
WA-211	Alluvium	7	92	8/19/85	8/5/93
WA-212	Alluvium	9	118	1/15/87	8/8/96
WA-213	Alluvium	9	139	8/16/85	7/25/95
WA-214	Alluvium	14	242	7/29/85	9/25/13
WA-215	Alluvium	15	243	8/19/85	8/26/14
WA-216	Alluvium	4	46	8/20/85	8/1/90
WA-217	Alluvium	6	118	8/21/02	8/27/14
WA-218	Alluvium	4	83	8/27/03	9/24/12
WA-228	Alluvium	4	124	12/17/13	8/26/14
WA-229	Alluvium	4	100	12/16/13	8/26/14
20SP	Spoils	1	8	6/14/01	6/14/01
22SP	Spoils	1	24	8/19/83	8/19/83
40SP	Spoils	43	553	8/27/93	4/29/15
87SP	Spoils	2	27	6/19/08	3/28/09
B-4	Spoils	20	280	12/21/94	4/28/15
BS-09	Spoils	1	18	8/15/79	8/15/79
BS-18	Spoils	4	106	3/28/78	10/14/87
BS-19	Spoils	9	255	4/5/76	6/15/93

Table H-1 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
BS-22	Spoils	7	170	4/5/76	5/29/80
BS-26	Spoils	8	271	7/14/78	7/6/11
BS-27	Spoils	13	428	3/4/77	6/16/10
BS-28	Spoils	15	505	11/19/76	6/15/10
BS-29	Spoils	7	216	3/28/78	1/4/00
BS-33	Spoils	8	227	3/28/78	10/15/87
BS-34	Spoils	7	185	7/21/77	10/25/89
BS-35	Spoils	9	289	3/28/78	7/6/11
BS-38	Spoils	8	282	3/28/78	6/15/10
BS-40	Spoils	10	255	4/6/77	10/8/87
BS-46	Spoils	1	32	8/12/81	8/12/81
BS-47	Spoils	2	65	8/13/81	2/1/84
BS-49	Spoils	2	72	10/23/86	10/8/87
BS-50	Spoils	2	72	10/23/86	10/8/87
BS-50A	Spoils	2	63	9/12/91	10/28/92
EPA-03	Spoils	4	120	4/14/76	10/6/88
EPA-04	Spoils	1	32	10/29/92	10/29/92
EPA-05	Spoils	2	71	5/29/85	10/24/85
EPA-06	Spoils	1	22	4/24/81	4/24/81
EPA-07	Spoils	2	71	5/29/85	10/24/85
EPA-08	Spoils	1	39	6/5/80	6/5/80
EPA-09	Spoils	3	104	5/29/85	10/2/90
EPA-10	Spoils	9	308	3/30/78	7/22/96
EPA-11	Spoils	3	103	6/4/80	10/24/85
EPA-12	Spoils	5	163	3/30/78	11/9/89
PAW-3	Spoils	1	40	7/2/98	7/2/98
S-01	Spoils	15	471	9/25/73	3/30/78
S-02	Spoils	19	341	9/25/73	8/18/81
S-09	Spoils	4	91	3/30/78	12/18/79
S-10	Spoils	1	23	3/30/78	3/30/78
S-20	Spoils	1	33	9/10/91	9/10/91
S-25R	Spoils	6	230	5/13/93	6/16/10
S-31	Spoils	6	203	11/4/83	6/10/93
S-32	Spoils	1	43	6/14/10	6/14/10
S-33	Spoils	3	26	9/27/88	8/3/95
S-35	Spoils	9	198	11/1/83	8/4/95
S-36	Spoils	7	229	8/19/82	6/10/93
S-37	Spoils	5	165	8/19/82	10/3/90
S-40	Spoils	1	40	12/7/99	12/7/99
S-41	Spoils	2	80	12/8/99	9/20/01
S-43	Spoils	1	40	12/8/99	12/8/99
SB-02	Spoils	4	136	10/23/86	10/3/90
SB-03	Spoils	8	267	5/23/84	6/10/93
SE-03	Spoils	9	310	5/22/84	6/9/93
SE-1	Spoils	7	85	7/3/01	4/10/14
SE-2	Spoils	7	85	7/3/01	4/10/14
TW-01	Spoils	3	64	4/13/76	6/4/80
W-04	Spoils	1	15	3/23/73	3/23/73

Table H-1 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
BS-22	Spoils	7	170	4/5/76	5/29/80
BS-26	Spoils	8	271	7/14/78	7/6/11
BS-27	Spoils	13	428	3/4/77	6/16/10
BS-28	Spoils	15	505	11/19/76	6/15/10
BS-29	Spoils	7	216	3/28/78	1/4/00
BS-33	Spoils	8	227	3/28/78	10/15/87
BS-34	Spoils	7	185	7/21/77	10/25/89
BS-35	Spoils	9	289	3/28/78	7/6/11
BS-38	Spoils	8	282	3/28/78	6/15/10
BS-40	Spoils	10	255	4/6/77	10/8/87
BS-46	Spoils	1	32	8/12/81	8/12/81
BS-47	Spoils	2	65	8/13/81	2/1/84
BS-49	Spoils	2	72	10/23/86	10/8/87
BS-50	Spoils	2	72	10/23/86	10/8/87
BS-50A	Spoils	2	63	9/12/91	10/28/92
EPA-03	Spoils	4	120	4/14/76	10/6/88
EPA-04	Spoils	1	32	10/29/92	10/29/92
EPA-05	Spoils	2	71	5/29/85	10/24/85
EPA-06	Spoils	1	22	4/24/81	4/24/81
EPA-07	Spoils	2	71	5/29/85	10/24/85
EPA-08	Spoils	1	39	6/5/80	6/5/80
EPA-09	Spoils	3	104	5/29/85	10/2/90
EPA-10	Spoils	9	308	3/30/78	7/22/96
EPA-11	Spoils	3	103	6/4/80	10/24/85
EPA-12	Spoils	5	163	3/30/78	11/9/89
PAW-3	Spoils	1	40	7/2/98	7/2/98
S-01	Spoils	15	471	9/25/73	3/30/78
S-02	Spoils	19	341	9/25/73	8/18/81
S-09	Spoils	4	91	3/30/78	12/18/79
S-10	Spoils	1	23	3/30/78	3/30/78
S-20	Spoils	1	33	9/10/91	9/10/91
S-25R	Spoils	6	230	5/13/93	6/16/10
S-31	Spoils	6	203	11/4/83	6/10/93
S-32	Spoils	1	43	6/14/10	6/14/10
S-33	Spoils	3	26	9/27/88	8/3/95
S-35	Spoils	9	198	11/1/83	8/4/95
S-36	Spoils	7	229	8/19/82	6/10/93
S-37	Spoils	5	165	8/19/82	10/3/90
S-40	Spoils	1	40	12/7/99	12/7/99
S-41	Spoils	2	80	12/8/99	9/20/01
S-43	Spoils	1	40	12/8/99	12/8/99
SB-02	Spoils	4	136	10/23/86	10/3/90
SB-03	Spoils	8	267	5/23/84	6/10/93
SE-03	Spoils	9	310	5/22/84	6/9/93
SE-1	Spoils	7	85	7/3/01	4/10/14
SE-2	Spoils	7	85	7/3/01	4/10/14
TW-01	Spoils	3	64	4/13/76	6/4/80
W-04	Spoils	1	15	3/23/73	3/23/73

Table H-1 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
42-O	Rosebud Overburden	10	184	4/11/79	12/10/80
43-O	Rosebud Overburden	10	183	3/1/79	12/9/80
5S	Rosebud Overburden	1	11	8/27/76	8/27/76
6S	Rosebud Overburden	1	11	8/25/76	8/25/76
7-O	Rosebud Overburden	1	21	4/27/77	4/27/77
BS-23	Rosebud Overburden	3	70	3/28/78	10/29/85
BS-24	Rosebud Overburden	2	34	3/28/78	5/29/80
WE-1	Rosebud Overburden	1	6	9/4/85	9/4/85
WM-201	Rosebud Overburden	3	75	9/24/12	8/27/14
WO-100	Rosebud Overburden	6	94	9/22/82	9/22/87
WO-101	Rosebud Overburden	8	141	9/24/80	8/5/95
WO-102	Rosebud Overburden	3	69	9/9/82	9/18/87
WO-103	Rosebud Overburden	6	94	9/23/80	7/21/92
WO-104	Rosebud Overburden	7	117	9/25/80	4/6/87
WO-105	Rosebud Overburden	16	291	9/23/82	4/16/14
WO-106	Rosebud Overburden	6	51	5/10/83	8/19/96
WO-107	Rosebud Overburden	5	91	8/22/85	9/15/92
WO-108	Rosebud Overburden	5	70	8/22/85	8/21/96
WO-109	Rosebud Overburden	6	93	8/23/85	8/8/96
WO-110	Rosebud Overburden	7	136	8/22/85	8/6/97
WO-154	Rosebud Overburden	5	72	12/10/81	2/13/87
WO-155	Rosebud Overburden	3	48	12/9/81	9/30/87
WO-156	Rosebud Overburden	5	70	12/4/81	9/28/87
WO-160	Rosebud Overburden	12	217	8/24/82	9/27/13
WO-162	Rosebud Overburden	13	200	9/2/82	8/28/14
WO-165	Rosebud Overburden	7	96	9/1/82	8/21/96
WO-166	Rosebud Overburden	8	135	9/23/85	7/29/98
WO-168	Rosebud Overburden	14	255	8/4/82	9/20/11
WO-169	Rosebud Overburden	7	116	10/17/82	7/30/97
WO-170	Rosebud Overburden	8	135	11/7/82	7/22/98
WO-171	Rosebud Overburden	13	220	11/5/82	9/20/12
WO-172	Rosebud Overburden	11	218	11/2/82	9/24/13
WO-173	Rosebud Overburden	15	282	11/7/82	9/25/13
WO-174	Rosebud Overburden	1	24	12/18/85	12/18/85
WO-175	Rosebud Overburden	9	115	5/10/83	8/30/00
WO-176	Rosebud Overburden	1	23	6/22/88	6/22/88
WO-178	Rosebud Overburden	12	196	1/29/84	9/20/12
WO-179	Rosebud Overburden	12	218	2/15/84	8/22/06
WO-180	Rosebud Overburden	1	22	3/1/84	3/1/84
WO-181	Rosebud Overburden	12	236	2/16/84	9/24/13
WO-188	Rosebud Overburden	4	100	12/17/13	8/26/14
WO-190	Rosebud Overburden	4	100	12/16/13	8/26/14
WR-104	Rosebud Overburden	15	281	11/6/79	9/25/13
10-R	Rosebud Coal	13	243	8/22/78	12/10/80
12R	Rosebud Coal	7	155	11/27/79	10/15/83
12R-2	Rosebud Coal	2	32	10/13/88	4/27/89
14M	Rosebud Coal	24	384	8/27/76	10/20/84
15-R	Rosebud Coal	16	309	7/23/77	12/10/80

Table H-1 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
28-R	Rosebud Coal	1	19	4/29/77	4/29/77
29-R	Rosebud Coal	1	18	4/27/77	4/27/77
30-R	Rosebud Coal	20	391	4/29/77	12/10/80
31-R	Rosebud Coal	18	344	4/28/77	12/10/80
32-R	Rosebud Coal	25	459	4/26/77	8/14/96
33-R	Rosebud Coal	8	161	4/29/77	11/29/78
34-R	Rosebud Coal	3	58	4/29/77	7/22/77
4-R	Rosebud Coal	7	141	4/20/77	8/17/78
41-R	Rosebud Coal	12	225	11/30/78	12/10/80
42-R	Rosebud Coal	10	186	4/11/79	12/10/80
43-R	Rosebud Coal	10	180	3/1/79	12/9/80
69R	Rosebud Coal	20	307	10/14/05	4/29/15
6M	Rosebud Coal	2	30	8/25/76	10/5/76
7-R	Rosebud Coal	1	20	4/27/77	4/27/77
7R	Rosebud Coal	1	30	8/26/76	8/26/76
BS-04	Rosebud Coal	1	31	4/5/76	4/5/76
BS-06	Rosebud Coal	5	177	9/12/91	6/22/10
BS-16	Rosebud Coal	2	47	6/4/76	3/28/78
BS-42	Rosebud Coal	2	47	7/21/77	3/28/78
BS-70	Rosebud Coal	2	81	7/30/99	1/5/00
P-07	Rosebud Coal	3	119	5/16/75	9/19/91
P-08	Rosebud Coal	13	477	5/16/75	7/23/96
P-09	Rosebud Coal	2	89	5/16/75	11/19/76
P-10	Rosebud Coal	2	63	5/16/75	6/20/91
S-07	Rosebud Coal	2	87	7/20/77	6/6/80
S-19	Rosebud Coal	4	134	7/12/74	6/14/10
S-21	Rosebud Coal	4	99	11/8/79	6/19/91
S-24	Rosebud Coal	5	203	5/29/75	6/23/10
S-28	Rosebud Coal	4	129	5/16/75	12/18/79
WR-100	Rosebud Coal	10	185	8/6/79	8/5/95
WR-101	Rosebud Coal	8	148	8/6/79	11/30/83
WR-102	Rosebud Coal	2	44	11/8/79	12/12/79
WR-103	Rosebud Coal	15	307	12/3/79	9/24/13
WR-105	Rosebud Coal	9	138	12/3/79	7/21/92
WR-106	Rosebud Coal	8	139	12/5/79	8/31/99
WR-107	Rosebud Coal	7	92	12/5/79	7/17/90
WR-110	Rosebud Coal	8	138	11/1/79	9/22/87
WR-111	Rosebud Coal	5	87	11/1/79	9/13/89
WR-112	Rosebud Coal	6	90	12/5/79	8/20/02
WR-113	Rosebud Coal	8	138	12/3/79	7/23/97
WR-114	Rosebud Coal	11	190	12/3/79	9/5/07
WR-115	Rosebud Coal	8	117	11/17/79	8/21/96
WR-116	Rosebud Coal	7	134	11/28/79	9/8/94
WR-117	Rosebud Coal	5	113	11/17/79	9/18/87
WR-118	Rosebud Coal	4	68	12/5/79	5/12/87
WR-120	Rosebud Coal	3	25	6/8/88	10/1/91
WR-121	Rosebud Coal	9	150	12/3/79	8/22/06
WR-122	Rosebud Coal	6	114	7/16/80	10/24/89

Table H-1 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
WR-123	Rosebud Coal	8	139	10/23/81	7/16/90
WR-124	Rosebud Coal	14	264	11/8/80	9/25/13
WR-125	Rosebud Coal	19	347	11/11/80	9/20/12
WR-126	Rosebud Coal	14	285	3/23/81	9/24/13
WR-127	Rosebud Coal	16	300	12/31/81	8/27/14
WR-128	Rosebud Coal	29	806	4/24/81	9/14/94
WR-129	Rosebud Coal	1	2	9/25/82	9/25/82
WR-130	Rosebud Coal	15	295	5/26/82	4/16/14
WR-131	Rosebud Coal	5	28	10/5/83	6/29/92
WR-132	Rosebud Coal	4	50	12/19/85	8/10/95
WR-133	Rosebud Coal	10	142	8/14/81	8/19/96
WR-134	Rosebud Coal	2	44	9/23/11	8/28/14
WR-136	Rosebud Coal	12	232	8/22/85	9/25/13
WR-152	Rosebud Coal	10	202	12/1/81	10/28/99
WR-154	Rosebud Coal	6	74	12/14/81	2/13/87
WR-156	Rosebud Coal	7	96	12/4/81	9/29/87
WR-160	Rosebud Coal	14	264	8/24/82	9/19/12
WR-161	Rosebud Coal	10	156	8/23/82	9/5/01
WR-162	Rosebud Coal	14	243	9/2/82	9/20/12
WR-164	Rosebud Coal	13	220	10/19/82	9/20/12
WR-167	Rosebud Coal	3	69	8/4/82	7/28/86
WR-168	Rosebud Coal	15	280	8/4/82	9/25/13
WR-169	Rosebud Coal	7	112	10/16/82	8/18/99
WR-173	Rosebud Coal	14	266	11/1/82	9/25/13
WR-174	Rosebud Coal	12	216	1/21/83	9/27/13
WR-175	Rosebud Coal	11	179	10/26/82	8/23/99
WR-181	Rosebud Coal	13	261	2/17/84	9/24/12
WR-183	Rosebud Coal	1	24	12/16/85	12/16/85
WR-205	Rosebud Coal	13	240	12/10/85	8/27/14
WR-206	Rosebud Coal	2	42	8/13/97	7/27/00
WR-207	Rosebud Coal	3	56	8/11/98	7/23/01
WR-208	Rosebud Coal	6	114	7/12/99	8/28/02
WR-240	Rosebud Coal	4	100	12/16/13	8/26/14
WR-241	Rosebud Coal	4	100	12/17/13	8/20/14
WR-242	Rosebud Coal	4	100	12/16/13	8/26/14
25SP	Interburden	8	178	8/18/83	10/21/86
39S	Interburden	42	510	11/29/94	4/28/15
WI-100	Interburden	3	58	10/31/79	9/10/82
WI-101	Interburden	7	116	12/30/81	9/22/87
WI-102	Interburden	14	240	10/17/83	8/27/14
WI-103	Interburden	4	61	7/15/80	12/2/83
WI-104	Interburden	8	117	9/23/80	7/20/92
WI-105	Interburden	7	116	12/17/81	7/24/90
WI-106	Interburden	15	285	7/13/78	9/18/12
WI-107	Interburden	13	236	9/12/82	9/26/13
WI-109	Interburden	65	1367	4/24/81	9/23/10
WI-110	Interburden	15	288	5/12/81	9/27/13
WI-111	Interburden	18	313	8/16/81	4/16/14

Table H-1 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
WI-113	Interburden	16	228	8/15/81	8/18/03
WI-114	Interburden	9	135	9/25/82	9/25/01
WI-115	Interburden	11	166	8/14/81	8/19/96
WI-152	Interburden	13	248	12/1/81	10/5/99
WI-153	Interburden	16	302	12/15/81	9/21/12
WI-154	Interburden	5	51	12/15/81	2/13/87
WI-155	Interburden	4	70	12/9/81	10/6/87
WI-156	Interburden	5	71	12/9/81	9/30/87
WI-157	Interburden	14	241	8/16/82	9/26/13
WI-159	Interburden	16	264	8/22/82	8/28/14
WI-160	Interburden	14	263	10/26/82	9/19/12
WI-161	Interburden	10	158	8/23/82	9/5/01
WI-162	Interburden	14	220	1/21/83	9/20/12
WI-163	Interburden	8	137	9/1/82	7/14/94
WI-164	Interburden	14	242	10/19/82	9/20/12
WI-165	Interburden	10	163	9/1/82	8/21/96
WI-166	Interburden	8	116	9/23/85	8/21/96
WI-167	Interburden	3	68	8/5/82	9/20/85
WI-168	Interburden	15	286	8/4/82	9/24/12
WI-169	Interburden	8	134	10/17/82	9/21/98
WI-170	Interburden	9	154	11/7/82	8/31/99
WI-171	Interburden	15	262	11/5/82	9/20/12
WI-172	Interburden	13	239	11/2/82	9/24/13
WI-173	Interburden	13	238	11/1/82	9/20/12
WI-174	Interburden	13	238	1/21/83	9/27/13
WI-175	Interburden	11	183	10/26/82	8/23/99
WI-176	Interburden	11	179	1/24/84	9/15/00
WI-177	Interburden	11	192	1/24/84	9/5/07
WI-178	Interburden	12	196	1/29/84	9/20/12
WI-179	Interburden	12	218	2/15/84	8/23/06
WI-180	Interburden	15	259	1/29/84	9/5/07
WI-181	Interburden	11	216	2/16/84	9/24/13
WI-182	Interburden	12	219	12/17/85	9/18/12
WI-183	Interburden	6	88	12/18/85	8/7/01
WI-184	Interburden	15	268	12/7/85	8/27/14
WI-185	Interburden	13	241	12/8/85	9/19/12
WI-186	Interburden	12	212	12/11/85	9/24/13
1029M	McKay Coal	19	245	5/4/06	4/24/15
1066M	McKay Coal	14	222	11/21/08	4/16/15
1137M	McKay Coal	8	107	11/22/11	3/31/15
1139M	McKay Coal	8	119	11/22/11	3/31/15
1151M	McKay Coal	6	93	11/21/12	3/31/15
1159M	McKay Coal	4	56	10/17/13	4/15/15
1160M	McKay Coal	4	68	10/17/13	4/22/15
125M	McKay Coal	4	58	11/22/13	4/28/15
131M	McKay Coal	3	44	11/22/13	4/27/15
15-M	McKay Coal	16	292	7/23/77	12/10/80
16M	McKay Coal	8	179	8/18/83	10/22/86

Table H-1 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
18M	McKay Coal	4	97	8/19/83	6/1/84
19M	McKay Coal	64	931	8/17/83	5/7/15
20M	McKay Coal	37	572	8/18/83	3/12/02
21M	McKay Coal	65	927	8/18/83	4/29/15
22M	McKay Coal	65	995	8/19/83	5/4/15
26M	McKay Coal	64	897	1/29/84	5/7/15
2M	McKay Coal	19	395	3/28/79	5/19/88
31-M	McKay Coal	17	318	4/28/77	12/10/80
32M	McKay Coal	16	297	11/10/87	4/26/95
34D	McKay Coal	54	760	10/23/88	4/28/15
36M	McKay Coal	17	210	8/24/93	9/10/01
37M	McKay Coal	44	535	9/1/93	4/28/15
38M	McKay Coal	42	516	8/24/93	4/2/14
39M	McKay Coal	44	551	8/24/93	4/28/15
4-M	McKay Coal	7	141	4/20/77	8/17/78
41-M	McKay Coal	9	162	3/1/79	9/4/80
42-M	McKay Coal	10	174	4/11/79	12/10/80
43-M	McKay Coal	11	193	11/14/77	12/9/80
555M	McKay Coal	3	72	8/27/82	5/20/83
571M	McKay Coal	3	72	8/11/82	4/23/83
590M	McKay Coal	59	947	6/5/86	4/23/15
5M	McKay Coal	14	166	8/27/76	11/27/79
600M	McKay Coal	57	857	11/10/87	4/24/15
601M	McKay Coal	50	811	10/5/90	5/11/15
61M	McKay Coal	22	283	9/29/03	4/29/15
657M	McKay Coal	2	23	9/15/03	4/22/04
7-M	McKay Coal	1	18	4/27/77	4/27/77
948M	McKay Coal	11	155	8/25/04	3/16/15
957M	McKay Coal	20	280	8/18/04	3/17/15
BS-03	McKay Coal	1	32	10/1/75	10/1/75
BS-05	McKay Coal	5	177	9/12/91	6/22/10
BS-07	McKay Coal	4	135	10/9/90	8/20/97
BS-20	McKay Coal	5	133	10/1/75	9/13/91
BS-21	McKay Coal	4	99	4/5/76	3/28/78
BS-25	McKay Coal	6	182	6/4/76	6/15/93
BS-41	McKay Coal	1	15	3/28/78	3/28/78
P-06	McKay Coal	8	309	5/16/75	6/22/10
S-03	McKay Coal	17	626	9/25/73	6/9/93
S-06	McKay Coal	10	357	9/25/73	6/9/93
S-08	McKay Coal	7	189	9/25/73	5/7/82
S-11	McKay Coal	5	157	9/25/73	10/22/86
S-12	McKay Coal	6	180	9/25/73	3/30/78
S-18	McKay Coal	3	106	7/12/74	6/15/10
S-22	McKay Coal	3	131	11/19/76	6/23/10
S-23	McKay Coal	2	88	4/14/75	11/19/76
S-29(1)	McKay Coal	2	71	8/16/84	10/22/86
S-4	McKay Coal	2	33	9/25/73	6/6/74
WM-100	McKay Coal	11	207	10/31/79	8/28/96

Table H-1 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
WM-101	McKay Coal	8	149	11/1/79	9/1/88
WM-102	McKay Coal	4	90	11/8/79	9/22/82
WM-103	McKay Coal	14	260	8/7/79	9/25/13
WM-104	McKay Coal	14	261	11/6/79	8/27/14
WM-105	McKay Coal	15	317	11/1/79	9/19/12
WM-106	McKay Coal	7	129	12/18/79	7/26/89
WM-107	McKay Coal	12	213	12/3/79	9/24/13
WM-108	McKay Coal	9	137	12/3/79	7/22/92
WM-109	McKay Coal	5	108	12/5/79	9/1/99
WM-110	McKay Coal	7	114	12/5/79	7/17/90
WM-111	McKay Coal	11	195	12/3/79	8/22/06
WM-112	McKay Coal	12	215	12/3/79	9/5/07
WM-113	McKay Coal	8	115	12/5/79	8/21/96
WM-114	McKay Coal	3	68	11/20/79	9/18/87
WM-115	McKay Coal	3	45	12/5/79	5/13/87
WM-116	McKay Coal	5	71	12/30/81	8/10/95
WM-117	McKay Coal	1	22	8/9/84	8/9/84
WM-119	McKay Coal	8	138	12/31/81	7/25/90
WM-120	McKay Coal	13	238	9/30/81	9/26/13
WM-121	McKay Coal	12	218	9/10/81	9/18/12
WM-122	McKay Coal	13	241	9/10/81	9/18/12
WM-123	McKay Coal	13	237	9/11/81	9/26/13
WM-125	McKay Coal	17	311	4/23/81	9/17/12
WM-126	McKay Coal	5	212	4/24/81	6/17/84
WM-127	McKay Coal	75	1536	5/12/81	5/7/15
WM-128	McKay Coal	18	484	5/12/81	9/18/12
WM-129	McKay Coal	17	295	8/16/81	4/16/14
WM-130	McKay Coal	16	285	8/16/81	8/27/14
WM-131	McKay Coal	1	23	5/26/82	5/26/82
WM-132	McKay Coal	14	205	8/16/81	8/9/01
WM-133	McKay Coal	9	156	5/7/82	8/22/02
WM-134	McKay Coal	11	162	8/14/81	1/19/01
WM-135	McKay Coal	6	94	8/13/81	9/30/93
WM-136	McKay Coal	13	240	5/18/82	9/18/12
WM-137	McKay Coal	2	46	5/27/82	12/7/85
WM-138	McKay Coal	3	94	12/16/81	5/10/83
WM-139	McKay Coal	15	263	10/20/82	9/25/13
WM-152	McKay Coal	11	224	12/1/81	10/18/99
WM-153	McKay Coal	15	265	12/17/81	9/21/12
WM-154	McKay Coal	6	73	12/17/81	6/4/87
WM-155	McKay Coal	4	49	12/15/81	10/5/87
WM-156	McKay Coal	7	96	12/9/81	9/29/87
WM-157	McKay Coal	5	60	8/16/82	5/24/88
WM-158	McKay Coal	14	254	8/7/82	9/26/13
WM-159	McKay Coal	15	242	8/22/82	8/28/14
WM-160	McKay Coal	6	114	1/21/83	10/19/92
WM-161	McKay Coal	9	138	8/23/82	10/3/00
WM-162	McKay Coal	15	238	10/17/82	9/25/13

Table H-1 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
WM-163	McKay Coal	7	136	9/1/82	7/14/94
WM-164	McKay Coal	13	219	10/18/82	9/20/12
WM-165	McKay Coal	10	162	9/1/82	8/21/96
WM-167	McKay Coal	3	69	8/5/82	7/29/86
WM-168	McKay Coal	14	260	8/3/82	8/27/14
WM-169	McKay Coal	7	116	10/28/82	7/30/97
WM-171	McKay Coal	11	179	11/5/82	9/26/01
WM-173	McKay Coal	14	263	10/20/82	8/27/14
WM-174	McKay Coal	12	220	11/8/82	9/27/13
WM-175	McKay Coal	11	160	11/1/82	9/3/98
WM-176	McKay Coal	11	199	2/15/84	8/20/02
WM-178	McKay Coal	13	240	2/16/84	9/20/12
WM-179	McKay Coal	11	194	2/15/84	9/5/07
WM-181	McKay Coal	13	258	2/17/84	9/25/14
WM-182	McKay Coal	7	148	10/26/87	9/18/12
WM-184	McKay Coal	16	291	12/8/85	8/27/14
WM-185	McKay Coal	14	263	12/10/85	9/19/12
WM-186	McKay Coal	13	237	12/10/85	9/24/13
WM-187	McKay Coal	5	104	8/22/02	8/28/14
WM-188	McKay Coal	5	104	8/22/02	8/28/14
WM-189	McKay Coal	5	104	8/22/02	8/29/14
WM-191	McKay Coal	4	83	8/11/04	9/24/13
WM-202	McKay Coal	4	100	12/16/13	8/26/14
WM-203	McKay Coal	4	100	12/17/13	8/26/14
WM-204	McKay Coal	4	100	12/16/13	8/26/14
WM-205	McKay Coal	4	100	12/18/13	8/27/14
1008D	SubMcKay	4	49	1/28/05	9/26/06
1009D	SubMcKay	21	280	1/28/05	5/12/15
1018D	SubMcKay	21	282	7/26/05	4/3/15
1020D	SubMcKay	20	267	7/26/05	5/13/15
103D	SubMcKay	13	189	5/6/09	5/6/15
1063D	SubMcKay	15	219	6/18/08	4/28/15
1067D	SubMcKay	2	27	11/20/08	3/14/09
1072D	SubMcKay	2	27	11/20/08	4/15/09
1074D	SubMcKay	5	65	12/11/08	9/9/10
1076D	SubMcKay	5	66	12/11/08	10/5/10
1077D	SubMcKay	14	195	12/12/08	4/28/15
1078D	SubMcKay	14	183	12/12/08	4/28/15
1092D	SubMcKay	5	69	9/30/09	9/14/11
1094D	SubMcKay	12	170	10/1/09	4/29/15
1096D	SubMcKay	12	182	10/1/09	4/29/15
1110D	SubMcKay	1	15	4/8/10	4/8/10
1122D	SubMcKay	10	131	8/25/10	4/28/15
1124D	SubMcKay	10	159	8/26/10	4/23/15
1132D	SubMcKay	9	151	6/21/11	4/28/15
1133D	SubMcKay	8	110	11/21/11	4/23/15
1135D	SubMcKay	8	108	11/22/11	4/14/15
1138D	SubMcKay	8	107	11/22/11	3/31/15

Table H-1 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
1140D	SubMcKay	6	82	8/22/12	4/20/15
1141D	SubMcKay	6	94	8/22/12	5/13/15
1142D	SubMcKay	6	94	8/24/12	4/23/15
1143D	SubMcKay	6	82	8/22/12	4/22/15
1146D	SubMcKay	5	81	11/27/12	10/10/14
1147D	SubMcKay	6	80	11/27/12	4/27/15
1154D	SubMcKay	2	30	10/9/13	5/28/14
1157D	SubMcKay	3	43	11/22/13	10/9/14
1161D	SubMcKay	4	56	10/17/13	4/21/15
1163D	SubMcKay	1	16	10/17/13	10/17/13
1166D	SubMcKay	3	41	7/30/14	4/28/15
139D	SubMcKay	1	14	5/11/15	5/11/15
15D	SubMcKay	11	115	8/27/76	9/20/77
15S	SubMcKay	8	88	10/5/76	7/12/77
16D	SubMcKay	8	179	8/17/83	10/23/86
17D	SubMcKay	66	1001	8/19/83	4/27/15
18D	SubMcKay	66	941	8/19/83	5/5/15
19D	SubMcKay	36	633	8/17/83	6/14/01
1D	SubMcKay	44	787	11/9/76	10/24/95
2005D	SubMcKay	11	147	4/20/10	3/17/15
2006D	SubMcKay	11	159	4/20/10	3/18/15
2007D	SubMcKay	11	160	4/20/10	3/10/15
2009D	SubMcKay	10	154	11/15/10	3/12/15
2010D	SubMcKay	10	142	11/15/10	3/12/15
2011D	SubMcKay	10	167	11/15/10	3/12/15
2018D	SubMcKay	9	133	7/29/11	3/25/15
2025D	SubMcKay	6	83	8/23/12	3/11/15
2026D	SubMcKay	6	107	8/23/12	3/11/15
2029D	SubMcKay	6	81	11/7/12	3/17/15
2036D	SubMcKay	3	42	4/8/14	3/9/15
21D	SubMcKay	65	878	8/18/83	4/29/15
24S	SubMcKay	5	123	8/17/83	5/30/85
350D	SubMcKay	64	979	1/28/84	5/15/15
351D	SubMcKay	65	1006	1/28/84	3/13/15
353D	SubMcKay	11	227	1/29/84	5/24/89
353T	SubMcKay	53	786	11/4/88	3/10/15
354D	SubMcKay	61	926	11/21/84	3/11/15
355D	SubMcKay	61	919	11/21/84	3/11/15
356D	SubMcKay	34	537	11/20/84	6/12/06
358D	SubMcKay	55	814	6/8/86	10/10/13
358T	SubMcKay	4	61	6/7/06	5/24/12
359D	SubMcKay	53	742	10/22/88	3/9/15
361D	SubMcKay	53	716	10/22/88	3/10/15
362D	SubMcKay	54	733	10/23/88	3/20/15
364D	SubMcKay	10	147	6/27/94	9/29/98
385D	SubMcKay	17	207	11/13/98	3/23/15
386D	SubMcKay	17	206	11/20/98	3/18/15
387D	SubMcKay	14	157	11/14/98	5/25/09

Table H-1 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
388D	SubMcKay	25	290	11/20/98	3/24/15
394D-P	SubMcKay	10	129	6/6/06	3/10/15
395D	SubMcKay	1	13	2/17/99	2/17/99
397D	SubMcKay	13	174	10/26/99	3/11/15
399D	SubMcKay	13	162	10/26/99	3/11/15
551D	SubMcKay	31	697	8/13/82	4/29/97
552D	SubMcKay	16	381	8/20/82	10/10/89
554D	SubMcKay	67	1220	8/27/82	4/23/15
55D	SubMcKay	1	13	6/12/02	6/12/02
55D-P	SubMcKay	1	13	6/12/02	6/12/02
563D	SubMcKay	39	573	8/31/82	9/13/00
564D	SubMcKay	59	1060	8/27/82	9/22/04
565D	SubMcKay	4	84	8/30/82	3/18/08
566D	SubMcKay	3	72	8/31/82	4/21/83
572D	SubMcKay	3	72	8/11/82	5/20/83
573D	SubMcKay	3	72	8/12/82	4/22/83
574D	SubMcKay	66	1236	9/28/82	4/24/15
575D	SubMcKay	4	98	11/4/83	6/13/85
577D	SubMcKay	65	1048	10/11/83	4/24/15
578D	SubMcKay	42	751	10/11/83	11/14/01
579D	SubMcKay	17	405	6/15/84	4/16/92
580D	SubMcKay	55	898	10/13/83	10/5/10
581D	SubMcKay	3	71	10/13/83	11/11/84
583DD	SubMcKay	64	1132	1/30/84	5/18/15
584D	SubMcKay	63	1157	1/27/84	4/28/15
585D	SubMcKay	63	1196	1/27/84	5/5/15
587D	SubMcKay	64	1104	1/27/84	4/10/15
588D	SubMcKay	60	1003	5/26/86	4/3/15
589D	SubMcKay	59	1000	5/26/86	4/10/15
594D	SubMcKay	2	40	11/10/87	6/10/88
595D	SubMcKay	55	1040	11/3/87	4/27/15
596D	SubMcKay	55	947	10/30/87	4/27/15
598D	SubMcKay	8	219	11/3/87	3/11/91
599D	SubMcKay	59	1163	11/3/87	3/31/15
600D	SubMcKay	1	16	11/10/87	11/10/87
602D	SubMcKay	8	195	10/24/88	4/13/92
602S	SubMcKay	1	51	9/22/93	9/22/93
603D	SubMcKay	10	251	10/24/88	5/10/93
608D	SubMcKay	47	648	11/19/91	4/21/15
614D	SubMcKay	18	226	11/15/98	5/11/15
615D	SubMcKay	19	226	11/20/98	4/15/15
623D	SubMcKay	15	184	9/18/99	9/30/10
624D	SubMcKay	17	207	9/23/99	10/26/11
627D	SubMcKay	25	296	9/23/99	5/5/15
631D	SubMcKay	5	85	2/9/00	6/13/00
634D	SubMcKay	40	493	2/9/00	5/4/15
648D	SubMcKay	2	23	6/11/02	9/24/02
661D	SubMcKay	1	12	9/23/04	9/23/04

Table H-1 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
663D	SubMcKay	12	166	9/23/04	4/23/15
664D	SubMcKay	1	12	9/23/04	9/23/04
678D	SubMcKay	21	292	11/4/04	3/31/15
6D	SubMcKay	6	133	6/20/79	11/3/83
900D	SubMcKay	11	156	10/31/99	3/11/15
901D	SubMcKay	12	245	10/27/99	3/11/15
902D	SubMcKay	7	83	10/26/99	5/23/10
903D	SubMcKay	1	13	10/26/99	10/26/99
905D	SubMcKay	1	13	9/24/99	9/24/99
911D	SubMcKay	1	13	10/27/99	10/27/99
912D	SubMcKay	21	230	10/27/99	10/8/09
914D	SubMcKay	11	141	1/26/00	3/25/15
919D	SubMcKay	30	367	7/26/00	3/20/15
933D	SubMcKay	6	68	10/21/03	5/21/07
950D	SubMcKay	11	156	8/24/04	3/26/15
952D	SubMcKay	11	168	8/25/04	5/15/15
953D	SubMcKay	11	145	8/25/04	3/25/15
954D	SubMcKay	9	119	8/24/04	7/12/11
956D	SubMcKay	9	118	8/18/04	7/12/11
959D	SubMcKay	12	155	2/1/05	3/12/15
95D	SubMcKay	4	100	5/5/09	10/7/10
961D	SubMcKay	1	21	6/3/05	6/3/05
970D	SubMcKay	20	261	12/20/05	3/2/15
971D	SubMcKay	20	275	12/20/05	3/13/15
972D	SubMcKay	4	70	4/14/06	5/28/09
973D	SubMcKay	10	149	4/14/06	3/25/15
974D	SubMcKay	11	147	5/4/06	3/12/15
981D	SubMcKay	5	65	10/25/07	10/7/09
983D	SubMcKay	4	52	10/26/07	5/27/09
986D	SubMcKay	16	222	10/26/07	3/9/15
987D	SubMcKay	6	78	10/31/07	5/10/10
990D	SubMcKay	1	16	4/17/08	4/17/08
992D	SubMcKay	1	16	4/16/08	4/16/08
995DD	SubMcKay	15	214	4/17/08	3/26/15
996D	SubMcKay	14	198	9/4/08	3/26/15
999D	SubMcKay	13	186	9/4/08	9/3/14
99D	SubMcKay	13	189	5/5/09	5/6/15
BS-01	SubMcKay	1	32	9/12/91	9/12/91
BS-02	SubMcKay	3	105	6/20/91	8/21/97
DP3-639D	SubMcKay	14	219	2/8/00	5/8/15
EAP-119	SubMcKay	8	81	8/31/76	8/17/77
EAP-205	SubMcKay	16	335	8/31/76	10/19/85
EAP-208	SubMcKay	7	73	8/31/76	3/11/77
EAP-210	SubMcKay	1	14	6/24/79	6/24/79
EAP-211	SubMcKay	1	18	6/22/79	6/22/79
EAP-409	SubMcKay	11	242	8/14/79	5/19/84
EAP-411	SubMcKay	73	1095	8/14/79	3/24/15
EAP-412	SubMcKay	8	172	8/13/79	10/5/82

Table H-1 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
EAP-502	SubMcKay	2	33	5/18/82	5/15/01
EAP-508	SubMcKay	2	46	4/22/82	11/3/82
EAP-514	SubMcKay	1	23	5/18/82	5/18/82
EAP-515	SubMcKay	6	89	5/18/82	4/3/08
EAP-522	SubMcKay	2	46	4/22/82	11/4/82
EAP-527	SubMcKay	1	23	5/18/82	5/18/82
EAP-528	SubMcKay	2	45	4/22/82	11/4/82
EAP-529	SubMcKay	1	23	5/18/82	5/18/82
GAS-1	SubMcKay	47	613	12/1/85	9/29/09
GAS-2	SubMcKay	33	475	12/1/85	6/3/14
GAS-3	SubMcKay	33	480	12/1/85	6/3/14
GAS-4	SubMcKay	19	225	10/29/86	10/15/03
GAS-5	SubMcKay	12	147	9/12/89	10/1/97
GAS-6	SubMcKay	10	117	9/18/89	6/16/98
GOW-12	SubMcKay	8	222	9/10/84	5/22/90
GOW-3	SubMcKay	38	612	9/10/84	6/4/14
GOW-4	SubMcKay	37	602	9/10/84	6/4/14
GOW-5	SubMcKay	24	419	6/1/85	6/14/06
GOW-6	SubMcKay	34	520	9/10/84	6/3/14
GOW-7	SubMcKay	4	126	6/1/85	10/30/86
PSW-10	SubMcKay	2	30	11/11/11	7/10/12
PSW-11	SubMcKay	1	16	9/9/14	9/9/14
PSW-2	SubMcKay	10	105	2/8/00	3/26/07
PSW-3	SubMcKay	12	161	7/22/04	5/8/15
PSW-5	SubMcKay	3	48	4/28/05	5/4/10
PSW-6	SubMcKay	11	156	6/3/05	5/13/15
PSW-7	SubMcKay	13	168	7/27/05	5/12/15
PSW-9	SubMcKay	8	106	7/23/09	5/6/15
PW-720	SubMcKay	1	23	8/10/82	8/10/82
PW-721	SubMcKay	23	487	10/9/02	12/11/14
PW-722	SubMcKay	23	471	10/9/02	12/11/14
PW-723	SubMcKay	23	452	10/9/02	12/11/14
PW-727	SubMcKay	22	494	6/17/04	12/11/14
PW-733	SubMcKay	14	346	4/23/08	12/11/14
PW-735	SubMcKay	13	197	6/18/09	9/24/14
WD-100	SubMcKay	3	46	3/14/80	12/7/83
WD-101	SubMcKay	3	68	3/23/81	9/22/82
WD-102	SubMcKay	9	137	9/23/80	8/23/90
WD-103	SubMcKay	8	138	12/29/81	7/23/90
WD-104	SubMcKay	15	241	10/13/83	9/26/13
WD-105	SubMcKay	3	68	4/23/81	7/29/83
WD-106	SubMcKay	3	47	4/24/81	5/12/87
WD-107	SubMcKay	13	263	8/13/81	9/27/13
WD-109	SubMcKay	12	240	8/16/82	9/24/12
WD-110	SubMcKay	1	24	9/7/82	9/7/82
WD-150	SubMcKay	13	247	10/1/81	10/10/00
WD-152	SubMcKay	1	23	12/1/81	12/1/81
WD-153	SubMcKay	14	242	12/17/81	9/21/12

Table H-1 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
WD-155	SubMcKay	3	47	12/3/81	10/5/87
WD-159	SubMcKay	18	289	8/21/82	9/19/12
WD-160	SubMcKay	14	259	10/26/82	9/27/13
WD-162	SubMcKay	5	71	10/17/82	6/26/86
WD-170	SubMcKay	9	156	11/7/82	9/23/99
WD-171	SubMcKay	10	159	11/5/82	8/25/03
WD-173	SubMcKay	9	161	10/20/82	8/19/92
WD-174	SubMcKay	14	263	11/8/82	8/29/14
WD-175	SubMcKay	10	143	10/28/82	9/3/97
WD-176	SubMcKay	10	174	2/14/84	11/29/01
WD-177	SubMcKay	9	174	2/15/84	9/7/05
WD-178	SubMcKay	10	211	2/15/84	9/15/09
WD-179	SubMcKay	12	212	7/24/77	9/6/07
WD-180	SubMcKay	10	195	9/25/85	9/7/05
WD-181	SubMcKay	1	22	2/16/84	2/16/84
WD-182	SubMcKay	1	24	10/24/85	10/24/85
WD-184	SubMcKay	15	271	8/30/85	8/27/14
WD-185	SubMcKay	15	281	12/8/85	9/19/12
WD-186	SubMcKay	14	257	12/9/85	9/24/13
WD-195	SubMcKay	4	82	9/16/09	9/20/12
WD-196	SubMcKay	4	82	9/17/09	9/20/12
WD-197	SubMcKay	4	82	9/17/09	9/18/12
WD-198	SubMcKay	4	96	11/9/11	8/26/14
WD-199	SubMcKay	3	75	9/24/12	8/27/14
WD-200	SubMcKay	3	75	9/24/12	8/27/14
WD-201	SubMcKay	3	75	9/24/12	8/26/14
WD-202	SubMcKay	3	75	9/18/12	8/28/14
WD-203	SubMcKay	4	100	12/16/13	8/26/14
WD-204	SubMcKay	4	100	12/17/13	8/26/14
WD-205	SubMcKay	5	125	12/4/13	8/26/14
WD-206	SubMcKay	3	75	3/20/14	8/28/14
WD-207	SubMcKay	4	100	12/18/13	8/28/14

Subtotals	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
	Alluvium	2,084	37,827	7/12/74	5/12/15
	Spoils	631	13,894	3/23/73	4/29/15
	Clinker	110	1,671	3/10/81	5/4/15
	Rosebud Overburden	547	9,121	8/25/76	4/27/15
	Rosebud Coal	726	14,240	7/12/74	4/29/15
	Interburden	636	11,050	7/13/78	4/28/15
	McKay Coal	1,788	31,214	9/25/73	5/11/15
	SubMcKay	3,933	63,372	8/27/76	5/18/15

Totals	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
	All	10,455	182,389	3/23/73	5/18/15

Table H-2. Summary of Groundwater Non-Baseline Data

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
1019AM	Alluvium	36	539	7/26/05	3/27/15
101A	Alluvium	11	151	4/13/10	5/6/15
1021A	Alluvium	38	628	7/27/05	3/27/15
1023AM	Alluvium	39	592	7/27/05	3/27/15
1024AM	Alluvium	21	290	10/12/05	3/5/15
1025AM	Alluvium	21	268	12/6/05	3/5/15
1026AM	Alluvium	20	275	10/12/05	4/3/15
1027A	Alluvium	13	171	5/4/06	4/20/15
1028A	Alluvium	20	273	5/4/06	4/20/15
102A	Alluvium	10	137	10/5/10	5/6/15
1039A	Alluvium	16	220	11/7/07	3/4/15
1047A	Alluvium	16	245	11/1/07	4/21/15
1048A	Alluvium	16	209	11/1/07	4/21/15
104A	Alluvium	12	164	11/5/09	5/6/15
1051A	Alluvium	5	64	12/18/07	9/20/09
1052A-P	Alluvium	15	193	12/18/07	4/29/15
1053A-P	Alluvium	2	26	12/18/07	3/15/08
1056A-P	Alluvium	5	64	12/18/07	5/27/14
1057A-P	Alluvium	3	38	3/15/08	6/7/11
1059D-P	Alluvium	4	51	12/18/07	3/19/09
105A	Alluvium	13	187	6/24/09	5/6/15
1065A	Alluvium	15	210	11/21/08	3/5/15
1068A	Alluvium	14	209	11/20/08	3/4/15
106A	Alluvium	11	206	6/24/09	4/29/15
1073A	Alluvium	14	206	12/11/08	4/29/15
1079A	Alluvium	14	195	1/22/09	3/5/15
107A	Alluvium	13	188	6/24/09	4/27/15
1084A	Alluvium	13	172	6/10/09	3/4/15
1088A	Alluvium	2	27	6/8/10	6/7/11
108A	Alluvium	13	212	6/24/09	4/27/15
109A	Alluvium	13	188	6/24/09	5/6/15
10S	Alluvium	73	1232	9/20/77	4/28/15
1123A	Alluvium	10	142	8/26/10	4/28/15
1126A	Alluvium	9	143	6/15/11	4/14/15
1136A	Alluvium	8	106	11/22/11	5/12/15
114S	Alluvium	3	43	11/27/12	4/27/15
1153A	Alluvium	4	56	6/18/13	3/5/15
1167D	Alluvium	3	41	7/30/14	4/28/15
117A	Alluvium	5	71	11/27/12	4/27/15
118A	Alluvium	5	70	11/27/12	4/28/15
119A	Alluvium	6	85	11/27/12	4/27/15
120A	Alluvium	5	70	12/13/12	5/7/15
121A	Alluvium	5	82	12/13/12	5/7/15
122A	Alluvium	5	71	12/13/12	4/27/15
123 A-P	Alluvium	5	70	2/21/13	5/11/15
124 A-P	Alluvium	5	70	2/21/13	5/11/15
133A	Alluvium	4	56	11/22/13	5/4/15
134A	Alluvium	4	56	11/22/13	5/4/15

Table H-2 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
135A	Alluvium	4	56	11/22/13	5/4/15
136A	Alluvium	4	56	11/22/13	5/4/15
1S	Alluvium	74	1374	6/18/79	4/29/15
2001A	Alluvium	13	172	6/26/09	3/16/15
2002A	Alluvium	13	184	7/2/09	3/16/15
2013A	Alluvium	9	120	7/29/11	3/3/15
2014A	Alluvium	9	120	7/29/11	3/20/15
2015A	Alluvium	9	120	7/29/11	3/20/15
2016A	Alluvium	9	120	7/29/11	3/3/15
2017A	Alluvium	9	120	7/29/11	3/9/15
2020A	Alluvium	8	108	11/11/11	3/20/15
2030A	Alluvium	1	13	3/24/15	3/24/15
2035A	Alluvium	3	42	4/8/14	3/9/15
2038A	Alluvium	3	42	4/8/14	3/9/15
30S	Alluvium	29	406	11/10/87	9/11/01
30S-2	Alluvium	26	364	10/23/02	5/5/15
357A	Alluvium	39	456	5/16/96	3/26/15
360A	Alluvium	54	689	10/22/88	3/9/15
366S	Alluvium	43	554	6/29/94	3/17/15
374S	Alluvium	41	494	8/26/94	3/17/15
377A	Alluvium	27	435	4/24/98	3/2/15
378A	Alluvium	26	398	4/24/98	3/2/15
381A	Alluvium	20	289	4/23/98	7/12/11
382A	Alluvium	32	492	4/24/98	3/3/15
389A-P	Alluvium	16	193	11/2/99	3/16/15
42S	Alluvium	42	548	8/26/94	4/29/15
43S	Alluvium	40	479	8/26/94	4/27/15
44S	Alluvium	20	289	10/31/05	5/11/15
45S	Alluvium	41	513	8/26/94	5/7/15
46S	Alluvium	14	178	3/29/01	5/12/15
47S	Alluvium	18	237	3/29/01	5/11/15
48S	Alluvium	19	263	3/29/01	4/29/15
49S	Alluvium	19	262	3/29/01	4/29/15
50S	Alluvium	21	314	3/29/01	5/11/15
557A	Alluvium	9	118	5/25/11	4/27/15
558A	Alluvium	11	156	4/20/10	4/27/15
559A	Alluvium	11	144	4/20/10	4/27/15
560A	Alluvium	72	1325	9/16/99	5/13/15
562A	Alluvium	4	49	7/10/07	9/17/11
568A	Alluvium	49	670	9/27/00	3/30/15
569A	Alluvium	54	769	11/11/04	3/30/15
582A	Alluvium	56	998	6/9/87	5/13/15
591A	Alluvium	9	119	6/6/11	4/27/15
592A	Alluvium	36	547	10/12/04	3/30/15
593A	Alluvium	57	861	11/9/87	4/22/15
604A	Alluvium	47	694	10/24/88	8/30/12
605A	Alluvium	21	520	10/24/88	9/16/98
605A-2	Alluvium	34	407	2/17/99	5/20/15

Table H-2 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
606A	Alluvium	53	899	10/24/88	4/22/15
607A	Alluvium	47	618	11/19/91	4/21/15
617A-P	Alluvium	11	141	4/26/04	4/20/15
625A	Alluvium	11	158	3/31/10	4/21/15
626A	Alluvium	24	302	4/19/04	4/21/15
635A	Alluvium	60	792	7/16/01	4/16/15
64A	Alluvium	21	270	7/29/04	4/29/15
654A	Alluvium	27	348	7/2/02	3/4/15
667A	Alluvium	1	14	10/29/04	10/29/04
668A	Alluvium	3	41	10/29/04	8/16/11
669A	Alluvium	2	28	11/11/04	2/8/05
672A	Alluvium	13	161	10/29/04	3/31/15
673A	Alluvium	47	700	5/4/05	3/27/15
679A	Alluvium	23	328	5/20/06	3/30/15
680A	Alluvium	21	269	11/23/04	3/5/15
681A	Alluvium	20	267	11/23/04	3/5/15
682A	Alluvium	1	14	11/23/04	11/23/04
683A	Alluvium	19	252	11/23/04	3/5/15
684A	Alluvium	5	63	11/23/04	8/18/11
685A	Alluvium	13	162	11/23/04	3/5/15
686A	Alluvium	35	526	11/23/04	3/30/15
687A	Alluvium	30	425	11/23/04	3/30/15
688A	Alluvium	4	53	4/13/10	4/13/12
689A	Alluvium	1	13	8/16/11	8/16/11
68A	Alluvium	18	271	6/23/06	4/29/15
690A	Alluvium	8	109	9/29/05	8/16/11
691A	Alluvium	21	279	9/27/05	3/5/15
692A	Alluvium	1	13	9/5/12	9/5/12
73A	Alluvium	18	251	12/14/06	4/29/15
74A	Alluvium	19	250	12/14/06	4/27/15
75A	Alluvium	18	240	12/14/06	4/27/15
76A	Alluvium	18	276	12/14/06	5/5/15
78A	Alluvium	17	248	12/14/06	4/27/15
79A	Alluvium	18	240	12/14/06	4/27/15
811	Alluvium	1	14	5/12/15	5/12/15
81A	Alluvium	17	238	7/25/07	4/29/15
82A	Alluvium	17	227	7/25/07	4/27/15
83A	Alluvium	15	200	3/10/08	5/5/15
908A	Alluvium	17	239	9/24/99	3/18/15
909A	Alluvium	17	243	5/9/07	3/18/15
910A	Alluvium	28	412	9/24/99	4/3/15
913A	Alluvium	31	412	10/27/99	3/24/15
915A	Alluvium	30	356	7/25/00	3/18/15
916A	Alluvium	30	354	7/25/00	3/3/15
917A	Alluvium	11	157	4/27/10	3/23/15
918A	Alluvium	11	145	5/17/10	3/20/15
91S	Alluvium	26	382	11/21/08	6/29/15
920A	Alluvium	21	286	8/22/00	3/24/15

Table H-2 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
921A	Alluvium	21	270	8/22/00	3/23/15
922A	Alluvium	21	295	8/22/00	3/2/15
923A	Alluvium	20	268	8/23/00	3/25/15
924A	Alluvium	21	309	8/23/00	3/2/15
92A	Alluvium	13	188	5/5/09	5/6/15
935A	Alluvium	35	452	7/22/03	6/30/15
936A	Alluvium	33	443	11/19/03	6/30/15
937A	Alluvium	29	397	10/13/06	6/30/15
938A	Alluvium	23	300	11/26/03	3/23/15
939A	Alluvium	12	165	1/16/04	3/20/15
93A	Alluvium	13	236	5/5/09	5/6/15
940A	Alluvium	11	157	4/27/10	3/23/15
941A-P	Alluvium	16	217	10/15/07	3/18/15
942A-P	Alluvium	20	254	3/19/04	3/18/15
943A	Alluvium	25	326	1/16/04	3/3/15
944A	Alluvium	22	300	1/16/04	3/3/15
945A	Alluvium	23	294	1/16/04	3/3/15
94A	Alluvium	13	188	5/5/09	5/6/15
96A	Alluvium	13	201	5/5/09	5/6/15
977A	Alluvium	16	220	10/24/07	3/17/15
97A	Alluvium	13	201	5/5/09	5/6/15
985A	Alluvium	16	222	10/26/07	3/2/15
991A	Alluvium	15	193	4/16/08	3/2/15
994A	Alluvium	15	192	4/17/08	3/2/15
997A	Alluvium	13	174	9/4/08	3/2/15
998A	Alluvium	11	160	9/4/08	3/2/15
AB1-S	Alluvium	1	16	9/9/96	9/9/96
AB10-S	Alluvium	4	60	9/9/96	4/16/14
AB11-S	Alluvium	3	46	9/9/96	4/16/14
AB12-S	Alluvium	1	14	4/16/14	4/16/14
AB13-S	Alluvium	2	30	9/9/96	4/17/14
AB14-S	Alluvium	4	60	9/9/96	4/22/14
AB15-S	Alluvium	1	16	9/9/96	9/9/96
AB16-S	Alluvium	3	44	9/9/96	4/22/14
AB17-S	Alluvium	3	44	9/9/96	4/22/14
AB19-S/M	Alluvium	4	60	9/8/96	4/22/14
AB2-S	Alluvium	4	60	9/10/96	4/22/14
AB20-S	Alluvium	4	60	9/8/96	4/21/14
AB22-S	Alluvium	4	60	9/8/96	4/22/14
AB23-S	Alluvium	3	45	9/8/96	4/13/12
AB24-S	Alluvium	2	46	9/8/96	12/17/08
AB25-S	Alluvium	4	60	9/8/96	4/21/14
AB26-S	Alluvium	4	60	9/8/96	4/21/14
AB27-S	Alluvium	4	60	9/7/96	4/21/14
AB28-S	Alluvium	4	60	9/8/96	4/22/14
AB29-S	Alluvium	4	72	9/7/96	4/22/14
AB3-S	Alluvium	4	60	9/10/96	4/22/14
AB30-S	Alluvium	2	32	9/7/96	12/18/08

Table H-2 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
AB4-S	Alluvium	4	60	9/10/96	4/22/14
AB7-S	Alluvium	4	60	9/9/96	4/17/14
AB8-S	Alluvium	4	60	9/9/96	4/17/14
AB9-S/M	Alluvium	5	114	9/9/96	4/17/14
BS-43	Alluvium	1	15	3/28/78	3/28/78
CA-18	Alluvium	1	14	5/12/15	5/12/15
DP-5IT	Alluvium	24	322	7/20/01	4/20/15
DP3-637A	Alluvium	22	286	2/8/00	5/15/15
DP3-638A	Alluvium	1	14	6/29/15	6/29/15
GNW-1	Alluvium	20	210	6/6/05	9/24/14
GNW-10	Alluvium	4	44	6/8/11	6/4/14
GNW-11	Alluvium	26	280	10/16/90	9/24/14
GNW-2	Alluvium	49	515	10/16/90	9/24/14
GNW-3	Alluvium	49	515	10/16/90	9/24/14
GNW-4	Alluvium	49	515	10/16/90	9/24/14
GNW-5	Alluvium	48	504	10/17/90	9/24/14
GNW-6	Alluvium	50	525	10/18/90	9/23/14
GNW-7	Alluvium	10	110	6/10/10	9/24/14
GNW-8	Alluvium	26	270	6/4/02	9/24/14
GNW-9	Alluvium	28	312	9/12/89	6/3/14
GOW-1	Alluvium	50	537	9/12/89	6/24/14
GOW-10	Alluvium	2	34	10/30/86	4/1/87
GOW-11	Alluvium	22	257	10/18/90	9/23/14
OT-12	Alluvium	18	318	6/30/94	5/6/15
OT-7	Alluvium	16	243	6/30/94	5/7/15
P-11	Alluvium	12	375	5/6/82	6/14/10
P-12	Alluvium	16	491	8/31/81	6/14/10
PW-704D1	Alluvium	3	42	11/9/12	9/19/14
PW-731	Alluvium	1	37	5/23/07	5/23/07
PW-734	Alluvium	7	70	6/8/11	9/24/14
PW-736	Alluvium	11	137	5/18/10	9/24/14
S-05	Alluvium	18	616	9/25/73	6/9/93
S-17	Alluvium	1	14	2/4/74	2/4/74
SP3	Alluvium	9	114	3/3/03	3/23/15
SP4	Alluvium	14	189	3/3/03	4/6/13
SP5	Alluvium	3	35	11/11/02	8/8/03
SRP-1	Alluvium	9	130	3/17/94	4/28/15
SRP-2	Alluvium	20	269	12/15/95	5/19/15
SRP-3	Alluvium	21	280	12/15/95	4/27/15
SRP-4	Alluvium	24	332	12/15/95	4/27/15
SRP-5	Alluvium	23	311	12/15/95	5/19/15
SRP-6	Alluvium	19	267	5/27/99	4/28/15
SRP-7	Alluvium	19	257	5/27/99	4/28/15
SRP-8	Alluvium	19	245	5/27/99	4/28/15
TR-P1	Alluvium	18	228	5/19/06	3/31/15
W-1	Alluvium	56	639	12/7/85	9/24/14
WA-118	Alluvium	15	260	10/3/83	9/24/13
WA-119	Alluvium	2	25	6/10/88	7/21/95

Table H-2 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
WA-120	Alluvium	1	1	6/10/88	6/10/88
WA-132	Alluvium	15	239	8/9/90	8/28/14
WA-133	Alluvium	61	916	1/15/87	5/6/15
WA-135	Alluvium	58	929	6/21/88	4/20/15
WA-136	Alluvium	54	836	3/8/05	3/30/15
WA-142	Alluvium	77	1599	12/14/81	4/20/15
WA-144	Alluvium	9	141	8/5/82	8/12/96
WA-145	Alluvium	14	270	8/5/82	12/7/11
WA-148	Alluvium	13	206	3/26/86	9/17/12
WA-149	Alluvium	8	117	5/9/84	8/2/95
WA-150	Alluvium	10	142	8/3/82	8/2/95
WA-151	Alluvium	18	296	5/11/83	8/13/01
WA-152	Alluvium	8	138	7/19/84	8/2/95
WA-153	Alluvium	9	155	7/19/84	8/28/02
WA-154	Alluvium	4	69	8/6/91	7/26/95
WA-156	Alluvium	3	47	8/28/91	8/2/95
WA-157	Alluvium	6	93	9/23/87	8/2/95
WA-158	Alluvium	3	47	8/28/91	8/2/95
WA-159	Alluvium	9	138	3/17/86	7/18/96
WA-161	Alluvium	7	94	3/17/86	7/18/96
WA-164	Alluvium	5	105	1/16/87	9/24/12
WA-167	Alluvium	6	93	9/23/87	7/23/95
WA-183	Alluvium	10	141	5/11/84	7/6/96
WA-189	Alluvium	8	119	5/11/84	7/16/96
WA-204	Alluvium	11	189	9/6/88	9/24/13
WA-205	Alluvium	8	117	5/11/84	7/23/95
111SP	Spoils	11	163	11/12/09	4/28/15
126SP	Spoils	4	58	11/21/13	4/28/15
132SP	Spoils	3	44	11/22/13	4/27/15
138SP	Spoils	3	44	7/30/14	4/29/15
140SP	Spoils	1	14	5/11/15	5/11/15
141SP	Spoils	1	14	5/11/15	5/11/15
16SP	Spoils	60	799	6/6/85	4/27/15
17SP	Spoils	65	1019	8/17/83	4/27/15
18SP	Spoils	67	940	8/18/83	5/5/15
19SP	Spoils	47	626	10/4/88	4/28/15
20SP	Spoils	18	236	8/2/01	5/4/15
21SP-2	Spoils	44	541	11/11/93	4/29/15
22SP	Spoils	40	520	5/9/90	5/4/15
26SP	Spoils	62	881	5/17/84	4/28/15
27SP	Spoils	52	675	4/28/89	5/5/15
28SP	Spoils	59	774	11/21/84	4/29/15
29SP	Spoils	59	821	11/21/84	4/28/15
33S	Spoils	54	735	10/23/88	4/28/15
37SP	Spoils	46	550	9/1/93	4/28/15
38SP	Spoils	43	530	5/20/94	4/27/15
41SP	Spoils	43	556	10/4/93	5/12/15
4S	Spoils	71	1071	11/19/79	4/28/15

Table H-2 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
51SP	Spoils	15	185	7/20/01	4/28/15
52SP	Spoils	15	185	7/20/01	4/29/15
53SP	Spoils	14	175	7/20/01	4/29/15
54SP	Spoils	18	218	7/20/01	4/29/15
70SP	Spoils	19	273	6/20/06	4/28/15
71SP	Spoils	19	296	6/20/06	5/7/15
84SP	Spoils	15	214	6/19/08	5/4/15
85SP	Spoils	8	111	6/19/08	5/4/15
86SP	Spoils	8	111	6/19/08	5/4/15
87SP	Spoils	6	84	4/16/10	5/4/15
89SP	Spoils	8	111	6/19/08	5/4/15
B-1	Spoils	22	343	12/21/94	4/28/15
B-5	Spoils	16	225	10/18/85	4/28/15
BS-22	Spoils	12	414	8/15/84	6/23/10
BS-36	Spoils	8	255	3/28/78	7/6/11
BS-37	Spoils	11	347	3/28/78	7/6/11
BS-49	Spoils	7	250	10/12/88	6/15/10
PS-2	Spoils	5	75	6/13/02	4/22/14
S-01	Spoils	16	542	8/14/79	1/1/00
S-09	Spoils	1	11	10/19/05	10/19/05
S-10	Spoils	3	106	10/22/86	6/10/93
S-15	Spoils	8	297	6/4/80	6/15/10
U3-1	Spoils	21	310	11/2/05	5/7/15
U3-3	Spoils	10	149	6/14/07	5/7/15
W-04	Spoils	7	212	5/23/74	7/20/77
WS-119	Spoils	1	23	11/13/84	11/13/84
1001R	Clinker	20	277	11/23/05	3/5/15
1002R	Clinker	20	262	9/20/05	5/20/15
1003R	Clinker	20	289	9/20/05	5/8/15
1005R	Clinker	21	292	1/25/05	4/22/15
1007R	Clinker	20	252	11/23/05	5/13/15
1011R	Clinker	20	255	9/21/05	4/3/15
1013R	Clinker	1	14	1/28/05	1/28/05
1016R	Clinker	2	23	11/23/05	5/17/06
1017R	Clinker	20	279	10/12/05	3/5/15
1031R	Clinker	16	221	11/6/07	3/4/15
1034R	Clinker	16	209	11/6/07	3/4/15
1035R	Clinker	16	220	11/6/07	5/12/15
1036R	Clinker	16	221	11/7/07	4/10/15
1037R	Clinker	16	209	11/7/07	3/4/15
1085R	Clinker	11	158	9/24/09	10/14/14
1120C	Clinker	10	147	8/26/10	5/4/15
1164R	Clinker	1	13	5/20/15	5/20/15
368D	Clinker	42	641	7/1/94	3/16/15
586R	Clinker	19	267	5/16/06	5/15/15
638C	Clinker	9	126	9/26/07	10/28/11
640P	Clinker	26	320	6/21/01	4/16/15
641P	Clinker	21	267	6/22/01	4/16/15

Table H-2 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
642P	Clinker	28	374	6/25/01	4/14/15
643P	Clinker	13	163	6/27/01	10/14/14
656R	Clinker	20	267	9/15/03	3/4/15
674R	Clinker	20	266	9/21/05	4/22/15
676R	Clinker	16	203	11/4/04	5/7/14
694R	Clinker	20	267	12/30/04	3/5/15
695R	Clinker	21	279	12/30/04	3/5/15
696R	Clinker	16	212	12/30/04	5/14/14
698R	Clinker	20	252	9/22/05	4/17/15
699R	Clinker	20	255	9/22/05	4/15/15
13S	Rosebud Overburden	87	1267	8/25/76	5/6/15
18S	Rosebud Overburden	64	903	8/17/83	5/5/15
20S	Rosebud Overburden	63	945	8/18/83	5/4/15
21S	Rosebud Overburden	64	943	8/17/83	4/28/15
23S	Rosebud Overburden	65	944	8/19/83	5/5/15
369D	Rosebud Overburden	42	501	6/28/94	3/2/15
371D	Rosebud Overburden	35	429	9/25/97	3/12/15
372D	Rosebud Overburden	41	495	8/27/94	3/12/15
392D	Rosebud Overburden	25	299	2/9/99	3/10/15
5S	Rosebud Overburden	83	1325	10/4/76	4/27/15
62S	Rosebud Overburden	23	295	9/29/03	4/29/15
6S	Rosebud Overburden	34	482	4/26/77	10/17/14
9S	Rosebud Overburden	49	621	10/21/85	4/27/15
AB21-S	Rosebud Overburden	2	32	9/8/96	12/17/08
WO-174	Rosebud Overburden	9	150	9/20/88	9/18/12
1010R	Rosebud Coal	21	267	1/25/05	5/11/15
112R	Rosebud Coal	9	138	7/29/11	4/27/15
128R	Rosebud Coal	4	58	11/21/13	4/28/15
12R	Rosebud Coal	5	103	5/18/84	10/26/86
12R-2	Rosebud Coal	42	564	10/31/89	5/7/15
14M	Rosebud Coal	62	874	5/23/85	4/29/15
6M	Rosebud Coal	85	1239	1/10/77	4/28/15
7R	Rosebud Coal	83	1213	10/5/76	4/27/15
90R	Rosebud Coal	8	123	9/4/08	5/11/15
9M	Rosebud Coal	75	1155	9/6/78	4/27/15
BS-15	Rosebud Coal	5	139	3/28/78	6/15/93
BS-17	Rosebud Coal	2	58	3/28/78	6/23/10
BS-30	Rosebud Coal	10	328	7/21/77	1/6/00
BS-31	Rosebud Coal	5	157	3/28/78	7/2/98
DP3-636R	Rosebud Coal	14	185	2/8/00	5/13/15
S-13	Rosebud Coal	14	413	9/25/73	6/22/10
WR-108	Rosebud Coal	14	280	10/31/79	9/26/13
WR-128	Rosebud Coal	43	599	5/25/95	4/17/15
WR-129	Rosebud Coal	73	1286	6/19/84	5/7/15
WR-183	Rosebud Coal	5	64	9/27/88	8/7/01
25SP	Interburden	58	829	5/20/87	5/7/15
39S	Interburden	2	34	8/24/93	5/24/94
590I	Interburden	3	36	5/3/00	6/1/11

Table H-2 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
979S	Interburden	16	227	8/16/07	3/17/15
WI-109	Interburden	10	156	6/14/11	4/20/15
WI-116	Interburden	19	341	7/29/81	4/10/14
WI-117	Interburden	14	261	5/20/82	9/26/13
1000M	McKay Coal	21	280	1/25/05	5/11/15
1004M	McKay Coal	21	266	1/25/05	5/13/15
1006M	McKay Coal	21	281	1/25/05	5/8/15
1012M	McKay Coal	21	279	1/28/05	5/11/15
1032M	McKay Coal	16	222	11/1/07	4/16/15
1049M	McKay Coal	16	210	11/12/07	4/16/15
10M	McKay Coal	81	1293	8/27/76	6/29/15
113M	McKay Coal	4	57	11/27/12	4/27/15
1149M	McKay Coal	6	105	11/20/12	3/31/15
1158M	McKay Coal	4	56	10/17/13	4/16/15
115M	McKay Coal	5	71	11/27/12	4/27/15
116M	McKay Coal	5	85	11/27/12	4/27/15
121-2	McKay Coal	51	763	12/28/89	3/13/15
127M	McKay Coal	4	58	11/22/13	4/28/15
12M	McKay Coal	85	1271	8/30/76	5/7/15
130M	McKay Coal	4	58	11/22/13	4/28/15
13M	McKay Coal	87	1265	8/25/76	5/6/15
16M	McKay Coal	58	789	5/23/87	4/27/15
17M	McKay Coal	65	930	8/19/83	4/27/15
17M-2	McKay Coal	2	24	11/20/98	11/10/99
18M	McKay Coal	64	875	10/31/84	5/5/15
20M	McKay Coal	25	324	5/21/03	5/4/15
23M	McKay Coal	66	986	8/18/83	5/5/15
31M	McKay Coal	56	766	11/10/87	4/17/14
35SP	McKay Coal	43	556	8/31/93	4/28/15
36M	McKay Coal	28	362	6/13/02	4/28/15
38M	McKay Coal	3	41	11/20/14	4/27/15
4M	McKay Coal	74	1164	6/21/79	5/5/15
555M	McKay Coal	64	1065	10/13/83	5/7/15
56M-P	McKay Coal	20	269	6/12/02	5/11/15
571M	McKay Coal	40	782	10/12/83	9/23/03
57M-P	McKay Coal	25	407	6/14/02	5/7/15
586M	McKay Coal	45	1004	1/27/84	5/26/05
589M	McKay Coal	40	800	6/5/86	5/26/05
58M	McKay Coal	20	254	6/13/02	6/29/15
58M-P	McKay Coal	20	261	6/12/02	5/11/15
59M	McKay Coal	19	248	6/13/02	4/28/15
59M-P	McKay Coal	21	333	6/14/02	5/7/15
5M	McKay Coal	68	1071	9/17/80	4/29/15
60M-P	McKay Coal	23	302	6/14/02	5/7/15
632M	McKay Coal	40	475	2/9/00	5/1/15
633M	McKay Coal	36	450	2/9/00	5/11/15
650M	McKay Coal	22	288	6/14/02	4/14/15
651M	McKay Coal	14	173	6/14/02	4/3/15

Table H-2 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
652M	McKay Coal	14	171	6/14/02	4/15/15
653M	McKay Coal	14	195	6/14/02	4/15/15
655M	McKay Coal	21	275	9/25/02	4/15/15
657M	McKay Coal	23	291	10/14/04	5/5/15
675M	McKay Coal	22	282	11/4/04	5/13/15
677M	McKay Coal	22	281	11/4/04	4/10/15
67M	McKay Coal	20	308	10/13/05	4/29/15
693M	McKay Coal	21	278	12/30/04	4/15/15
72M	McKay Coal	18	274	11/15/06	5/11/15
88M	McKay Coal	8	123	6/19/08	5/11/15
98M	McKay Coal	14	210	5/6/09	4/27/15
BS-21	McKay Coal	6	193	5/29/80	6/15/93
BS-32	McKay Coal	7	219	3/28/78	10/5/90
S-08	McKay Coal	3	78	5/12/86	10/19/05
S-12	McKay Coal	10	322	8/14/79	6/22/10
S-14	McKay Coal	20	549	9/25/73	6/15/10
S-4	McKay Coal	32	872	9/30/75	9/21/01
U3-2R	McKay Coal	21	197	8/28/99	5/5/15
WA-113	McKay Coal	15	287	12/18/85	8/27/14
WM-124	McKay Coal	73	1448	4/22/81	5/9/14
WM-126	McKay Coal	74	1401	11/10/84	4/17/15
WM-135	McKay Coal	13	233	8/6/95	4/10/14
WM-138	McKay Coal	37	907	11/5/83	9/17/12
WM-183	McKay Coal	3	56	4/5/88	9/25/01
1008D	SubMcKay	17	243	4/24/07	5/7/15
1038D	SubMcKay	15	217	11/7/07	4/29/15
1040D	SubMcKay	11	142	11/6/07	4/28/14
1041D	SubMcKay	16	241	11/6/07	5/6/15
1042D	SubMcKay	16	209	11/6/07	5/7/15
1043D	SubMcKay	16	209	11/2/07	5/5/15
1044D	SubMcKay	16	221	11/2/07	5/6/15
1045D	SubMcKay	16	221	11/2/07	4/23/15
1062D	SubMcKay	5	88	6/18/08	11/5/13
1064D	SubMcKay	15	208	6/18/08	4/29/15
1067D	SubMcKay	12	158	9/2/09	4/14/15
1069D	SubMcKay	14	196	11/21/08	4/14/15
1070D	SubMcKay	14	184	11/20/08	4/14/15
1071D	SubMcKay	14	197	11/21/08	4/14/15
1072D	SubMcKay	12	158	9/2/09	4/14/15
1074D	SubMcKay	9	143	6/3/11	5/1/15
1075D	SubMcKay	14	181	12/11/08	5/4/15
1076D	SubMcKay	9	117	6/7/11	4/28/15
1080D	SubMcKay	13	185	6/25/09	3/4/15
1081D	SubMcKay	13	172	6/25/09	3/4/15
1082D	SubMcKay	13	174	6/25/09	5/14/15
1083D	SubMcKay	12	171	6/25/09	3/4/15
1086D	SubMcKay	13	172	6/10/09	4/22/15
1087D	SubMcKay	13	195	6/25/09	5/20/15

Table H-2 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
1089D	SubMcKay	13	183	6/24/09	3/5/15
1090D	SubMcKay	13	196	6/24/09	3/5/15
1091D	SubMcKay	13	185	6/25/09	4/21/15
1092D	SubMcKay	8	114	7/12/12	4/28/15
1093D	SubMcKay	12	162	10/1/09	3/5/15
1095D	SubMcKay	12	161	10/1/09	3/5/15
1097D	SubMcKay	10	136	10/1/09	3/5/15
1098D	SubMcKay	12	161	10/1/09	4/3/15
1099D	SubMcKay	11	162	10/1/09	3/5/15
1100D	SubMcKay	11	148	10/1/09	3/4/15
1101D	SubMcKay	12	176	10/1/09	3/5/15
1102D	SubMcKay	12	172	10/1/09	3/5/15
1103D	SubMcKay	12	159	10/1/09	5/1/15
1104D	SubMcKay	12	158	9/30/09	5/4/15
1105D	SubMcKay	12	170	10/1/09	5/4/15
1106D	SubMcKay	12	159	10/1/09	5/1/15
1107D	SubMcKay	12	159	9/30/09	4/24/15
1108D	SubMcKay	12	196	2/17/10	4/29/15
1109D	SubMcKay	11	143	4/7/10	4/27/15
110D	SubMcKay	13	224	6/24/09	5/6/15
1110D	SubMcKay	10	128	10/6/10	4/29/15
1111D	SubMcKay	9	118	4/8/10	4/29/15
1112D	SubMcKay	3	42	4/7/10	11/3/13
1113D	SubMcKay	11	155	4/7/10	4/28/15
1114D	SubMcKay	11	146	4/8/10	5/6/15
1115D	SubMcKay	10	133	8/18/10	3/4/15
1116D	SubMcKay	10	170	8/18/10	4/22/15
1117D	SubMcKay	10	158	8/19/10	5/6/15
1118D	SubMcKay	10	135	8/19/10	5/7/15
1119D	SubMcKay	10	135	8/26/10	5/6/15
1121D	SubMcKay	10	142	8/19/10	4/28/15
1125D	SubMcKay	10	134	8/26/10	4/21/15
1127D	SubMcKay	10	147	8/25/10	3/4/15
1128D	SubMcKay	9	119	8/17/11	3/4/15
1129D	SubMcKay	9	119	8/17/11	3/4/15
1130D	SubMcKay	9	117	6/21/11	5/8/15
1131D	SubMcKay	9	128	6/21/11	5/11/15
1134D	SubMcKay	8	121	11/21/11	4/24/15
1144D	SubMcKay	6	82	8/22/12	4/14/15
1145D	SubMcKay	6	80	8/22/12	5/7/15
1146D	SubMcKay	1	12	4/27/15	4/27/15
1148D	SubMcKay	5	67	11/28/12	4/3/15
1152D	SubMcKay	6	81	11/20/12	5/12/15
1154D	SubMcKay	2	26	9/23/14	4/16/15
1155D	SubMcKay	4	56	10/10/13	4/23/15
1156D	SubMcKay	4	54	10/10/13	5/4/15
1157D	SubMcKay	1	13	4/24/15	4/24/15
1163D	SubMcKay	3	40	5/28/14	4/16/15

Table H-2 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
1165D	SubMcKay	3	41	7/30/14	4/28/15
129D	SubMcKay	4	58	11/22/13	4/28/15
15D	SubMcKay	74	1180	9/6/78	5/6/15
15S	SubMcKay	77	1177	8/27/76	5/6/15
16D	SubMcKay	8	157	5/23/87	4/24/91
1D	SubMcKay	41	494	8/30/76	4/27/15
2000D	SubMcKay	15	213	9/4/08	3/3/15
2003D	SubMcKay	11	172	4/20/10	3/3/15
2004D	SubMcKay	12	159	4/20/10	3/10/15
2008D	SubMcKay	10	133	8/18/10	3/3/15
2012D	SubMcKay	10	134	12/14/10	3/10/15
2019D	SubMcKay	8	107	11/16/11	3/2/15
2021D	SubMcKay	8	109	11/11/11	3/3/15
2022D	SubMcKay	6	83	8/23/12	3/13/15
2023D	SubMcKay	6	83	8/24/12	3/13/15
2024D	SubMcKay	3	56	8/23/12	9/20/13
2027D	SubMcKay	6	81	11/8/12	3/18/15
2031D	SubMcKay	5	69	6/18/13	3/11/15
2032D	SubMcKay	5	69	6/18/13	3/11/15
2033D	SubMcKay	5	69	6/18/13	3/12/15
2034D	SubMcKay	3	42	4/8/14	3/9/15
2037D	SubMcKay	3	54	4/8/14	3/9/15
24S	SubMcKay	60	874	10/6/85	5/5/15
358D	SubMcKay	3	40	4/28/14	3/11/15
358T	SubMcKay	1	14	4/28/14	4/28/14
364D	SubMcKay	32	399	5/19/99	3/16/15
367D	SubMcKay	42	530	6/27/94	3/23/15
375D	SubMcKay	32	374	9/25/98	3/2/15
376D	SubMcKay	32	408	9/25/98	3/2/15
379D	SubMcKay	29	353	4/23/98	3/2/15
380D	SubMcKay	27	406	4/22/98	3/3/15
383D	SubMcKay	27	327	11/13/98	3/3/15
384D	SubMcKay	17	227	11/14/98	3/20/15
387D	SubMcKay	6	80	5/22/10	3/10/15
391D-P	SubMcKay	12	165	6/13/06	3/12/15
393D	SubMcKay	25	327	2/9/99	3/3/15
395D	SubMcKay	31	377	11/3/99	3/10/15
396D-P	SubMcKay	12	152	6/6/06	3/10/15
398D	SubMcKay	23	266	10/26/99	3/11/15
550D	SubMcKay	19	475	8/10/82	3/21/91
551D	SubMcKay	36	446	9/16/97	4/17/15
552D	SubMcKay	52	799	5/23/90	6/2/15
556D	SubMcKay	61	981	11/12/84	4/3/15
55D	SubMcKay	22	281	5/28/03	4/27/15
55D-P	SubMcKay	1	14	5/14/12	5/14/12
563D	SubMcKay	30	364	12/19/00	5/13/15
564D	SubMcKay	21	285	5/23/05	5/4/15
565D	SubMcKay	3	39	5/26/10	6/4/14

Table H-2 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
566D	SubMcKay	74	1206	6/13/85	4/23/15
56D	SubMcKay	20	259	6/13/02	4/28/15
572D	SubMcKay	63	1043	10/12/83	4/22/15
573D	SubMcKay	64	1103	10/11/83	5/15/15
576D	SubMcKay	4	87	3/18/08	5/28/14
578D	SubMcKay	32	401	12/18/01	4/27/15
579D	SubMcKay	60	787	9/18/92	5/1/15
580D	SubMcKay	9	118	6/7/11	4/29/15
581D	SubMcKay	46	792	6/6/85	9/23/09
594D	SubMcKay	54	803	8/12/88	5/4/15
602D	SubMcKay	4	61	9/21/92	6/8/11
602S	SubMcKay	40	508	4/13/94	4/22/15
603D	SubMcKay	43	555	9/20/93	4/3/15
609D	SubMcKay	20	253	4/21/98	10/9/13
610D	SubMcKay	26	419	4/22/98	3/4/15
611D	SubMcKay	25	303	4/22/98	5/7/15
612D	SubMcKay	25	303	4/23/98	5/5/15
613D	SubMcKay	22	334	11/15/98	3/5/15
616D	SubMcKay	23	295	11/20/98	3/5/15
618D	SubMcKay	31	385	2/11/99	3/4/15
619D	SubMcKay	19	242	2/12/99	3/4/15
620D-P	SubMcKay	8	118	3/24/08	4/21/15
621D	SubMcKay	21	289	2/18/99	3/4/15
623D	SubMcKay	9	121	6/14/11	4/20/15
624D	SubMcKay	7	93	7/11/12	4/20/15
628D	SubMcKay	26	352	9/23/99	5/5/15
629D	SubMcKay	45	588	2/9/00	5/5/15
630D	SubMcKay	49	592	2/9/00	5/5/15
631D	SubMcKay	41	524	7/9/00	5/4/15
644D	SubMcKay	19	253	7/19/01	3/4/15
645D	SubMcKay	19	250	7/19/01	5/13/15
646D	SubMcKay	29	369	7/20/01	3/4/15
647D	SubMcKay	27	328	7/20/01	3/4/15
648D	SubMcKay	23	318	9/15/03	3/4/15
649D	SubMcKay	23	308	6/11/02	4/27/15
659D	SubMcKay	12	153	9/23/04	5/14/15
661D	SubMcKay	11	163	9/28/05	4/14/15
662D	SubMcKay	21	264	9/23/04	5/4/15
664D	SubMcKay	12	152	9/13/05	5/6/15
66D	SubMcKay	21	308	8/18/04	4/29/15
6D	SubMcKay	63	911	5/16/84	4/28/15
77D	SubMcKay	18	253	12/14/06	5/11/15
80D	SubMcKay	18	261	12/14/06	4/29/15
902D	SubMcKay	5	69	5/6/11	3/13/15
903D	SubMcKay	12	177	6/13/06	3/13/15
904D	SubMcKay	24	306	9/24/99	3/9/15
905D	SubMcKay	18	244	6/7/06	3/2/15
906D	SubMcKay	20	267	9/24/99	3/2/15

Table H-2 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
907D	SubMcKay	30	385	9/24/99	3/18/15
911D	SubMcKay	21	274	4/16/03	3/2/15
912D	SubMcKay	11	145	5/5/10	3/9/15
927D	SubMcKay	27	338	7/20/01	3/2/15
928D	SubMcKay	27	336	7/20/01	3/2/15
929D	SubMcKay	24	317	6/12/02	3/11/15
932D	SubMcKay	21	285	10/21/03	3/2/15
933D	SubMcKay	15	195	4/24/08	3/2/15
934D	SubMcKay	22	275	10/21/03	3/2/15
951D	SubMcKay	14	183	8/25/04	3/23/15
955D	SubMcKay	14	213	8/19/04	7/12/11
958D	SubMcKay	21	324	8/25/04	3/2/15
95D	SubMcKay	9	124	4/6/11	5/6/15
960D	SubMcKay	20	264	6/1/05	3/3/15
961D	SubMcKay	18	263	6/6/06	3/3/15
962D	SubMcKay	20	264	6/2/05	3/2/15
963D	SubMcKay	20	286	6/2/05	3/2/15
964D	SubMcKay	21	290	6/2/05	3/25/15
965D	SubMcKay	20	264	6/1/05	3/13/15
967P	SubMcKay	16	205	5/28/07	3/16/15
968D	SubMcKay	19	251	10/13/05	3/3/15
969D	SubMcKay	20	277	10/14/05	3/2/15
972D	SubMcKay	6	81	5/17/10	3/17/15
975D	SubMcKay	11	158	5/4/06	3/12/15
981D	SubMcKay	11	156	5/5/10	3/9/15
982D	SubMcKay	16	221	10/25/07	3/10/15
983D	SubMcKay	12	158	10/16/09	3/9/15
984D	SubMcKay	16	222	10/26/07	4/3/15
987D	SubMcKay	10	143	10/29/10	3/2/15
988D	SubMcKay	16	222	10/26/07	3/2/15
989D	SubMcKay	16	222	10/26/07	3/2/15
990D	SubMcKay	14	187	12/4/08	3/26/15
992D	SubMcKay	14	176	12/29/08	3/18/15
993D	SubMcKay	16	212	4/17/08	3/2/15
999D	SubMcKay	1	13	3/17/15	3/17/15
EAP-119	SubMcKay	74	1194	9/19/77	3/2/15
EAP-205	SubMcKay	58	851	6/7/86	3/2/15
EAP-208	SubMcKay	76	1169	4/25/77	3/2/15
EAP-210	SubMcKay	15	248	11/18/79	11/25/86
EAP-211	SubMcKay	16	342	11/18/79	5/25/87
EAP-409	SubMcKay	5	104	10/21/84	11/26/86
EAP-412	SubMcKay	9	196	5/19/83	6/5/87
EAP-413	SubMcKay	72	1085	8/13/79	3/10/15
EAP-502	SubMcKay	6	75	5/26/06	6/25/12
EAP-514	SubMcKay	16	205	5/15/01	5/14/15
EAP-515	SubMcKay	14	197	9/29/08	5/14/15
EAP-527	SubMcKay	7	100	5/15/01	5/28/14
EAP-529	SubMcKay	5	70	11/9/86	11/11/04

Table H-2 continued

Well	Stratigraphic Unit	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
GAS-1	SubMcKay	10	110	6/9/10	9/24/14
GAS-7	SubMcKay	5	59	9/13/89	6/10/08
GOW-12	SubMcKay	24	254	10/15/90	6/4/14
PSW-2	SubMcKay	16	228	9/18/07	3/31/15
PSW-4A	SubMcKay	28	458	11/7/07	3/27/15
PSW-8	SubMcKay	2	26	12/9/05	5/18/10
PW-704D2	SubMcKay	3	42	11/7/12	9/15/14
PW-720	SubMcKay	5	98	6/16/04	12/19/05
PW-724	SubMcKay	16	323	10/9/02	6/22/11
S-16	SubMcKay	22	657	9/25/73	6/15/10
WD-105	SubMcKay	13	222	10/4/83	9/26/13
WD-106	SubMcKay	21	338	7/10/90	9/18/12
WD-152	SubMcKay	11	220	12/13/84	9/25/01
WD-181	SubMcKay	2	45	12/15/84	7/27/88
WD-182	SubMcKay	12	214	9/22/88	9/27/13
Subtotals	**Stratigraphic Unit**	**Number of Sampling Events**	**Number of Data Points**	**Minimum Sampling Date**	**Maximum Sampling Date**
	Alluvium	4,622	66,046	9/25/73	6/30/15
	Spoils	1,146	17,133	5/23/74	5/12/15
	Clinker	557	7,500	7/1/94	5/20/15
	Rosebud Overburden	686	9,631	8/25/76	5/6/15
	Rosebud Coal	579	9,243	9/25/73	5/13/15
	Interburden	122	1,884	7/29/81	5/7/15
	McKay Coal	1,964	31,069	9/25/73	6/29/15
	SubMcKay	4,195	59,674	9/25/73	6/2/15
Totals	**Stratigraphic Unit**	**Number of Sampling Events**	**Number of Data Points**	**Minimum Sampling Date**	**Maximum Sampling Date**
	All	13,871	202,180	9/25/73	6/30/15

Table H-3. Summary of Surface Water Baseline Data

Sampling Location	Fraction	Number of Sampling Events	Number of Data Points	Minimum Sampling Date	Maximum Sampling Date
AR-12	Total	8	120	5/27/05	10/15/15
SW-55	Total	16	225	2/14/81	6/19/14
SW-60	Total	15	183	2/14/81	1/29/97
SW-75	Total	12	205	2/15/82	6/5/14
AR-12	No Measure	8	31	5/27/05	10/15/15
SW-55	No Measure	39	114	2/14/81	9/30/14
SW-60	No Measure	14	28	2/14/81	1/29/97
SW-75	No Measure	16	45	2/15/82	6/5/14
AR-12	Dissolved	8	95	5/27/05	10/15/15
SW-55	Dissolved	16	322	2/14/81	6/19/14
SW-60	Dissolved	15	267	2/14/81	1/29/97
SW-75	Dissolved	13	311	2/15/82	6/5/14

Appendix I Data Availability Tables for Analytes not Carried Forward

Numbers shown in Tables I-1 and I-2 are the number of samples analyzed for each analyte for the specified stratigraphic layer.

Table I-1. Groundwater Analytes not Carried Forward

Analyte	Alluvium	Clinker	Colluvium	Inter-burden	McKay Coal	Rosebud Coal	Rosebud Overburden	Shallow	Spoils	SubMcKay	SubMcKay Deep	Total
1-Methylnaphthalene	2	0	0	0	0	0	0	0	0	0	0	2
2-Butanone	3	0	0	0	0	0	0	0	0	0	0	3
2-Methylnaphthalene	2	0	0	0	0	0	0	0	0	0	0	2
Acenaphthene	2	0	0	0	0	0	0	0	0	0	0	2
Acenaphthylene	2	0	0	0	0	0	0	0	0	0	0	2
Acidity as CaCO3	743	9	2	20	237	79	54	27	77	479	8	1735
Acidity, Hydrogen Ion	670	0	0	299	430	300	160	0	143	223	0	2225
Alkalinity	997	4	0	445	909	654	333	0	596	344	0	4282
Alkalinity as CaCO3	4957	653	55	160	2336	509	637	47	946	7013	89	17402
Ammonium	0	0	0	0	1	0	0	0	0	0	0	1
Anthracene	2	0	0	0	0	0	0	0	0	0	0	2
Bacteria, E Coli	69	0	0	0	0	0	0	0	0	0	0	69
Benzene	6	0	0	0	4	0	0	0	0	0	0	10
Benzoanthracene	2	0	0	0	0	0	0	0	0	0	0	2
Benzofluoranthene	4	0	0	0	0	0	0	0	0	0	0	4
Benzoperylene	2	0	0	0	0	0	0	0	0	0	0	2
Benzopyrene	2	0	0	0	0	0	0	0	0	0	0	2
Bicarbonate as HCO3	5249	658	55	606	3097	1080	964	47	1253	7070	90	20169
C11-C22 Aromatics	2	0	0	0	0	0	0	0	0	0	0	2
C19-C36 Aliphatics	2	0	0	0	0	0	0	0	0	0	0	2
C5-C8 Aliphatics	3	0	0	0	2	0	0	0	0	0	0	5
C9-C10 Aromatics	3	0	0	0	2	0	0	0	0	0	0	5
C9-C12 Aliphatics	3	0	0	0	2	0	0	0	0	0	0	5
C9-C18 Aliphatics	2	0	0	0	0	0	0	0	0	0	0	2
Carbonate as CO3	5107	649	54	584	3018	913	802	47	1440	6782	89	19485
Cerium	7	0	0	0	6	5	0	0	12	1	0	31
Cesium	7	0	0	0	6	5	0	0	12	1	0	31
Chromium	6	0	0	0	0	0	0	0	0	0	0	6
Chrysene	2	0	0	0	0	0	0	0	0	0	0	2
Cyanide	3	0	0	0	0	0	0	0	0	0	0	3
Dibenz Anthracene	2	0	0	0	0	0	0	0	0	0	0	2
Ethylbenzene	6	0	0	0	4	0	0	0	0	0	0	10
Ethylene Glycol	3	0	0	0	0	0	0	0	0	0	0	3
Extractable Hydrocarbons	5	0	0	0	7	0	0	0	0	0	0	12
Fluoranthene	2	0	0	0	0	0	0	0	0	0	0	2
Fluorene	2	0	0	0	0	0	0	0	0	0	0	2
Gallium	7	0	0	0	6	5	0	0	12	1	0	31

Table I-1 continued

Analyte	Alluvium	Clinker	Colluvium	Interburden	McKay Coal	Rosebud Coal	Rosebud Overburden	Shallow	Spoils	SubMcKay	SubMcKay Deep	Total
Hardness	990	4	0	441	898	647	329	0	591	344	0	4244
Hardness as CaCO3	1782	119	13	78	1073	262	279	33	366	2413	38	6456
HCO3	86	0	0	0	157	80	5	0	290	26	0	644
Hexachlorobenzene	3	0	0	0	0	0	0	0	0	0	0	3
Hydrazine	3	0	0	0	0	0	0	0	0	0	0	3
Hydrogen Isotope	5	0	1	1	7	1	1	0	2	2	0	20
Hydroxide	155	0	0	54	94	55	34	0	56	117	0	565
Indenopyrene	2	0	0	0	0	0	0	0	0	0	0	2
Inorganic Nitrogen	894	4	0	443	673	434	247	0	274	316	0	3285
Iodide	0	0	0	0	0	0	1	0	0	7	0	8
Lanthanum	7	0	0	0	6	5	0	0	12	1	0	31
M-P Xylene	6	0	0	0	2	0	0	0	0	0	0	8
Methyl Tert-Butyl Ether	3	0	0	0	4	0	0	0	0	0	0	7
Naphthalene	5	0	0	0	3	0	0	0	0	0	0	8
Neodymium	7	0	0	0	6	5	0	0	12	1	0	31
Niobium	7	0	0	0	6	5	0	0	12	1	0	31
O-Xylene	6	0	0	0	2	0	0	0	0	0	0	8
Oil & Grease	5	0	0	0	0	1	0	0	0	1	0	7
Oxygen	0	0	0	0	1	0	0	0	0	0	0	1
Oxygen Isotope	4	0	1	1	7	1	1	0	2	3	0	20
Palladium	7	0	0	0	6	5	0	0	12	1	0	31
Petroleum Hydrocarbons	0	0	0	0	2	0	0	0	0	0	0	2
Phenanthrene	2	0	0	0	0	0	0	0	0	0	0	2
Praseodymium	7	0	0	0	6	5	0	0	12	1	0	31
Purgeable Hydrocarbons	3	0	0	0	2	0	0	0	0	0	0	5
Pyrene	2	0	0	0	0	0	0	0	0	0	0	2
Rubidium	7	0	0	0	6	5	0	0	12	1	0	31
Salinity	2	0	0	0	1	0	0	0	0	2	0	5
Settleable Solids	0	0	0	0	0	1	0	0	0	0	0	1
Sigma	7	0	0	0	2	0	0	0	0	0	0	9
Silicon	3	3	0	0	0	0	0	0	0	0	0	6
Sodium Adsorption Ratio	1645	32	6	508	1679	847	548	0	839	1750	27	7881
Sulfate Isotope	8	0	1	1	0	1	1	0	1	0	0	13
Sum of Anions	56	0	0	31	66	35	25	0	43	57	0	313
Sum of Cations	56	0	0	31	66	35	25	0	43	57	0	313
Sum of Constituents	86	0	0	0	160	80	5	0	290	29	0	650
Thorium	7	0	0	0	6	5	0	0	12	1	0	31

Table I-1 continued

Analyte	Alluvium	Clinker	Colluvium	Interburden	McKay Coal	Rosebud Coal	Rosebud Overburden	Shallow	Spoils	SubMcKay	SubMcKay Deep	Total
Toluene	6	0	0	0	4	0	0	0	0	0	0	10
Total Kjeldahl Nitrogen A	75	0	0	0	0	0	0	0	0	0	0	75
Total Suspended Solids	4	0	0	5	3	3	0	0	0	5	0	20
Total Xylene	6	0	0	0	4	0	0	0	0	0	0	10
Tungsten	7	0	0	0	6	5	0	0	12	1	0	31
Turbidity	51	3	0	10	48	6	15	0	7	79	2	221
Uranium	10	0	0	0	9	6	0	0	16	2	0	43
Water Temperature	1540	87	10	66	815	229	159	39	660	1543	24	5172

Table I-2. Surface Water Analytes not Carried Forward

Analyte	Fraction	AR-12	SW-55	SW-60	SW-75	Total
Alkalinity	Total	0	10	0	15	25
Bicarbonate as HCO3	Total	0	7	0	0	7
Carbonate as CO3	Total	0	11	14	5	30
Chromium	Total	1	0	0	0	1
Hardness	Total	0	11	0	16	27
Hydroxide	Total	0	10	0	5	15
Inorganic Nitrogen	Total	0	12	14	13	39
Nutrient-Nitrogen	Total	0	8	0	3	11
Oil & Grease	Total	0	14	13	4	31
Settleable Solids	Total	0	4	1	10	15
Sum of Anions	Total	0	9	1	3	13
Sum of Cations	Total	0	9	1	3	13
Total Suspended Solids	Total	0	20	14	24	58
Turbidity	Total	0	2	0	2	4
Oxygen	Dissolved	3	0	0	0	3
Sodium Adsorption Ratio	Dissolved	0	2	14	2	18
Acidity as CaCO3	No Measure	4	0	0	0	4
Acidity, Hydrogen Ion	No Measure	0	11	13	13	37
Alkalinity	No Measure	0	6	14	2	22
Alkalinity as CaCO3	No Measure	8	0	0	0	8
Bicarbonate as HCO3	No Measure	8	9	14	17	48
Carbonate as CO3	No Measure	8	0	0	0	8
Flow	No Measure	5	0	0	0	5
Hardness	No Measure	0	5	14	2	21
Hardness as CaCO3	No Measure	5	0	0	0	5
Hydrogen Isotope	No Measure	1	0	0	0	1
Inorganic Nitrogen	No Measure	0	4	0	1	5
Nitrogen	No Measure	3	0	0	0	3
Oil & Grease	No Measure	2	0	0	0	2
Oxidation Reduction Potential	No Measure	1	0	0	0	1
Oxygen	No Measure	3	0	0	0	3
Oxygen Isotope	No Measure	1	0	0	0	1
Settleable Solids	No Measure	0	2	0	2	4
Sodium Adsorption Ratio	No Measure	2	13	0	16	31
Total Kjeldahl Nitrogen A	No Measure	1	0	0	0	1
Total Suspended Solids	No Measure	5	0	0	0	5
Turbidity	No Measure	0	10	13	12	35
Water Temperature	No Measure	8	40	0	5	53

Appendix J Expert Review Documentation

Table J-1. Samples Moved During Expert Review

Well ID	Sample Date	Target Interval	Direction	Criteria
100A	4/12/10	Alluvium	Non-background to baseline.	No impacts observed
100A	10/6/10	Alluvium	Non-background to baseline	No impacts observed
100A	3/31/11	Alluvium	Non-background to baseline	No impacts observed
100A	10/12/11	Alluvium	Non-background to baseline	No impacts observed
101A	4/3/12	Alluvium	Background to Impacted.	Prior samples have shown impacts
101A	10/18/12	Alluvium	Background to impacted	Prior samples have shown impacts
101A	4/24/13	Alluvium	Background to impacted	Prior samples have shown impacts
101A	10/23/13	Alluvium	Background to impacted	Prior samples have shown impacts
101A	11/18/14	Alluvium	Background to impacted	Prior samples have shown impacts
1021A	3/20/12	Alluvium	Background to impacted	Prior samples have shown impacts
1021A	9/27/12	Alluvium	Background to impacted	Prior samples have shown impacts
1021A	12/12/12	Alluvium	Background to impacted	Prior samples have shown impacts
1021A	6/3/14	Alluvium	Background to impacted	Prior samples have shown impacts
1021A	12/3/14	Alluvium	Background to impacted	Prior samples have shown impacts
1021A	3/27/15	Alluvium	Background to impacted	Prior samples have shown impacts
1022A	6/13/07	Alluvium	Non-background to baseline	No impacts observed
1022A	9/19/07	Alluvium	Non-background to baseline	No impacts observed
1022A	12/12/07	Alluvium	Non-background to baseline	No impacts observed
1022A	3/11/08	Alluvium	Non-background to baseline	No impacts observed
1022A	6/26/08	Alluvium	Non-background to baseline	No impacts observed
1022A	9/12/08	Alluvium	Non-background to baseline	No impacts observed
1022A	12/11/08	Alluvium	Non-background to baseline	No impacts observed
1022A	3/18/09	Alluvium	Non-background to baseline	No impacts observed
1022A	6/2/09	Alluvium	Non-background to baseline	No impacts observed
1022A	3/23/10	Alluvium	Non-background to baseline	No impacts observed
1022A	6/16/10	Alluvium	Non-background to baseline	No impacts observed
1022A	9/23/10	Alluvium	Non-background to baseline	No impacts observed
1022A	3/3/11	Alluvium	Non-background to baseline	No impacts observed
1022A	6/2/11	Alluvium	Non-background to baseline	No impacts observed
1022A	8/26/11	Alluvium	Non-background to baseline	No impacts observed
1022A	12/7/11	Alluvium	Non-background to baseline	No impacts observed
1025AM	9/29/09	Alluvium	Background to impacted	Prior samples have shown impacts
1025AM	10/13/10	Alluvium	Background to impacted	Prior samples have shown impacts
1025AM	4/10/12	Alluvium	Background to impacted	Prior samples have shown impacts
1025AM	9/5/12	Alluvium	Background to impacted	Prior samples have shown impacts
1025AM	3/25/13	Alluvium	Background to impacted	Prior samples have shown impacts
1025AM	10/1/13	Alluvium	Background to impacted	Prior samples have shown impacts
1025AM	5/28/14	Alluvium	Background to impacted	Prior samples have shown impacts
1025AM	8/19/14	Alluvium	Background to impacted	Prior samples have shown impacts
1025AM	3/5/15	Alluvium	Background to impacted	Prior samples have shown impacts
1027A	5/10/07	Alluvium	Background to impacted	Prior samples have shown impacts
1027A	6/13/07	Alluvium	Background to impacted	Prior samples have shown impacts
1027A	3/11/09	Alluvium	Background to impacted	Prior samples have shown impacts
1028A	4/20/15	Alluvium	Background to impacted	Prior samples have shown impacts
102A	4/4/12	Alluvium	Background to impacted	Prior samples have shown impacts
102A	4/24/13	Alluvium	Background to impacted	Prior samples have shown impacts
102A	4/23/14	Alluvium	Background to impacted	Prior samples have shown impacts
102A	11/17/14	Alluvium	Background to impacted	Prior samples have shown impacts
102A	5/6/15	Alluvium	Background to impacted	Prior samples have shown impacts
1030A	8/17/11	Alluvium	Non-background to baseline	No impacts observed
1039A	5/24/13	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
1039A	11/2/13	Alluvium	Background to impacted	Prior samples have shown impacts
1039A	6/30/14	Alluvium	Background to impacted	Prior samples have shown impacts
1039A	3/4/15	Alluvium	Background to impacted	Prior samples have shown impacts
1047A	11/1/07	Alluvium	Background to impacted	Shows potential impacts
1047A	3/19/08	Alluvium	Background to impacted	Impacts observed
1047A	9/17/08	Alluvium	Background to impacted	Impacts observed
1047A	3/10/09	Alluvium	Background to impacted	Impacts observed
1047A	9/22/09	Alluvium	Background to impacted	Impacts observed
1047A	12/9/12	Alluvium	Background to impacted	Impacts observed
1047A	6/14/13	Alluvium	Background to impacted	Impacts observed
1047A	9/26/14	Alluvium	Background to impacted	Impacts observed
1047A	4/21/15	Alluvium	Background to impacted	Impacts observed
1048A	11/1/07	Alluvium	Background to impacted	Shows potential impacts and is below drain pit 5
1048A	3/19/08	Alluvium	Background to impacted	Impacts observed
1048A	7/10/12	Alluvium	Background to impacted	Impacts observed
1048A	12/9/12	Alluvium	Background to impacted	Impacts observed
1048A	10/20/13	Alluvium	Background to impacted	Impacts observed
1048A	5/9/14	Alluvium	Background to impacted	Impacts observed
104A	11/18/14	Alluvium	Background to impacted	Prior samples have shown impacts
1052A-P	3/15/08	Alluvium	Background to impacted	Prior samples have shown impacts
1052A-P	9/15/08	Alluvium	Background to impacted	Prior samples have shown impacts
1052A-P	3/19/09	Alluvium	Background to impacted	Prior samples have shown impacts
1052A-P	9/20/09	Alluvium	Background to impacted	Prior samples have shown impacts
1052A-P	7/11/12	Alluvium	Background to impacted	Prior samples have shown impacts
1052A-P	6/10/13	Alluvium	Background to impacted	Prior samples have shown impacts
1052A-P	11/5/13	Alluvium	Background to impacted	Prior samples have shown impacts
1052A-P	4/28/14	Alluvium	Background to impacted	Prior samples have shown impacts
1052A-P	10/3/14	Alluvium	Background to impacted	Prior samples have shown impacts
1052A-P	4/29/15	Alluvium	Background to impacted	Prior samples have shown impacts
1056A-P	3/21/09	Alluvium	Background to impacted	Prior samples have shown impacts
1059D-P	9/15/08	Alluvium	Background to impacted	Prior samples have shown impacts
1059D-P	3/19/09	Alluvium	Background to impacted	Prior samples have shown impacts
1065A	11/21/08	Alluvium	Background to impacted	Capture Well samples
1065A	4/7/09	Alluvium	Background to impacted	Capture Well samples
1065A	6/2/09	Alluvium	Background to impacted	Capture Well samples
1065A	9/29/09	Alluvium	Background to impacted	Capture Well samples
1065A	4/11/12	Alluvium	Background to impacted	Impacts observed
1065A	9/5/12	Alluvium	Background to impacted	Impacts observed
1065A	3/25/13	Alluvium	Background to impacted	Impacts observed
1065A	10/1/13	Alluvium	Background to impacted	Impacts observed
1065A	5/28/14	Alluvium	Background to impacted	Impacts observed
1065A	10/22/14	Alluvium	Background to impacted	Impacts observed
1065A	3/5/15	Alluvium	Background to impacted	Impacts observed
107A	9/11/14	Alluvium	Background to impacted	Prior samples have shown impacts
107A	4/27/15	Alluvium	Background to impacted	Prior samples have shown impacts
10S	11/10/76	Alluvium	Non-background to baseline	No impacts observed
10S	5/17/77	Alluvium	Non-background to baseline	No impacts observed
10S	5/29/03	Alluvium	Background to impacted	Prior samples have shown impacts
10S	11/11/03	Alluvium	Background to impacted	Prior samples have shown impacts
1126A	7/10/12	Alluvium	Background to impacted	Prior samples have shown impacts
1126A	12/9/12	Alluvium	Background to impacted	Prior samples have shown impacts
1126A	6/15/13	Alluvium	Background to impacted	Prior samples have shown impacts
1126A	10/20/13	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	**Sample Date**	**Target Interval**	**Direction**	**Criteria**
1126A	5/9/14	Alluvium	Background to impacted	Prior samples have shown impacts
1126A	9/26/14	Alluvium	Background to impacted	Prior samples have shown impacts
1126A	4/14/15	Alluvium	Background to impacted	Prior samples have shown impacts
1153A	5/28/14	Alluvium	Background to impacted	Prior samples have shown impacts
121A	10/17/13	Alluvium	Background to impacted	Prior samples have shown impacts
2013A	3/13/13	Alluvium	Background to impacted	Prior samples have shown impacts
2013A	9/17/13	Alluvium	Background to impacted	Prior samples have shown impacts
2013A	5/20/14	Alluvium	Background to impacted	Prior samples have shown impacts
2013A	8/6/14	Alluvium	Background to impacted	Prior samples have shown impacts
2013A	3/3/15	Alluvium	Background to impacted	Prior samples have shown impacts
2014A	11/28/12	Alluvium	Background to impacted	Prior samples have shown impacts
2014A	5/15/13	Alluvium	Background to impacted	Prior samples have shown impacts
2014A	9/17/13	Alluvium	Background to impacted	Prior samples have shown impacts
2014A	3/20/15	Alluvium	Background to impacted	Prior samples have shown impacts
2015A	5/15/13	Alluvium	Background to impacted	Prior samples have shown impacts
2015A	9/17/13	Alluvium	Background to impacted	Prior samples have shown impacts
2020A	11/28/12	Alluvium	Background to impacted	Prior samples have shown impacts
2020A	5/15/13	Alluvium	Background to impacted	Prior samples have shown impacts
2020A	9/17/13	Alluvium	Background to impacted	Prior samples have shown impacts
2020A	4/27/14	Alluvium	Background to impacted	Prior samples have shown impacts
2020A	9/15/14	Alluvium	Background to impacted	Prior samples have shown impacts
2020A	3/20/15	Alluvium	Background to impacted	Prior samples have shown impacts
352A	1/28/84	Alluvium	Non-background to baseline	No impacts observed
357A	10/22/96	Alluvium	Background to impacted	Prior samples have shown impacts
357A	5/20/97	Alluvium	Background to impacted	Prior samples have shown impacts
357A	9/23/97	Alluvium	Background to impacted	Prior samples have shown impacts
357A	4/23/98	Alluvium	Background to impacted	Prior samples have shown impacts
357A	9/24/98	Alluvium	Background to impacted	Prior samples have shown impacts
357A	5/20/99	Alluvium	Background to impacted	Prior samples have shown impacts
357A	10/11/99	Alluvium	Background to impacted	Prior samples have shown impacts
357A	5/10/00	Alluvium	Background to impacted	Prior samples have shown impacts
357A	10/16/00	Alluvium	Background to impacted	Prior samples have shown impacts
357A	9/25/01	Alluvium	Background to impacted	Prior samples have shown impacts
357A	10/22/01	Alluvium	Background to impacted	Prior samples have shown impacts
357A	5/30/02	Alluvium	Background to impacted	Prior samples have shown impacts
357A	10/17/02	Alluvium	Background to impacted	Prior samples have shown impacts
357A	5/14/03	Alluvium	Background to impacted	Prior samples have shown impacts
357A	10/22/03	Alluvium	Background to impacted	Prior samples have shown impacts
357A	7/13/04	Alluvium	Background to impacted	Prior samples have shown impacts
357A	11/8/04	Alluvium	Background to impacted	Prior samples have shown impacts
357A	6/20/05	Alluvium	Background to impacted	Prior samples have shown impacts
357A	10/26/05	Alluvium	Background to impacted	Prior samples have shown impacts
357A	6/15/06	Alluvium	Background to impacted	Prior samples have shown impacts
357A	10/27/06	Alluvium	Background to impacted	Prior samples have shown impacts
357A	5/10/07	Alluvium	Background to impacted	Prior samples have shown impacts
357A	10/24/07	Alluvium	Background to impacted	Prior samples have shown impacts
357A	4/15/08	Alluvium	Background to impacted	Prior samples have shown impacts
357A	11/19/08	Alluvium	Background to impacted	Prior samples have shown impacts
357A	5/6/09	Alluvium	Background to impacted	Prior samples have shown impacts
357A	9/8/09	Alluvium	Background to impacted	Prior samples have shown impacts
357A	4/28/10	Alluvium	Background to impacted	Prior samples have shown impacts
357A	9/20/10	Alluvium	Background to impacted	Prior samples have shown impacts
357A	7/16/12	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
357A	11/28/12	Alluvium	Background to impacted	Prior samples have shown impacts
357A	6/26/13	Alluvium	Background to impacted	Prior samples have shown impacts
357A	10/18/13	Alluvium	Background to impacted	Prior samples have shown impacts
357A	5/29/14	Alluvium	Background to impacted	Prior samples have shown impacts
357A	9/15/14	Alluvium	Background to impacted	Prior samples have shown impacts
357A	3/26/15	Alluvium	Background to impacted	Prior samples have shown impacts
360A	5/19/89	Alluvium	Background to impacted	Prior samples have shown impacts
360A	10/15/89	Alluvium	Background to impacted	Prior samples have shown impacts
360A	5/15/90	Alluvium	Background to impacted	Prior samples have shown impacts
360A	9/27/90	Alluvium	Background to impacted	Prior samples have shown impacts
360A	5/15/91	Alluvium	Background to impacted	Prior samples have shown impacts
360A	10/9/91	Alluvium	Background to impacted	Prior samples have shown impacts
360A	4/20/93	Alluvium	Background to impacted	Prior samples have shown impacts
360A	11/30/93	Alluvium	Background to impacted	Prior samples have shown impacts
360A	6/16/94	Alluvium	Background to impacted	Prior samples have shown impacts
360A	10/27/94	Alluvium	Background to impacted	Prior samples have shown impacts
360A	5/22/95	Alluvium	Background to impacted	Prior samples have shown impacts
360A	10/16/95	Alluvium	Background to impacted	Prior samples have shown impacts
360A	5/20/96	Alluvium	Background to impacted	Prior samples have shown impacts
360A	10/10/96	Alluvium	Background to impacted	Prior samples have shown impacts
360A	5/21/97	Alluvium	Background to impacted	Prior samples have shown impacts
360A	9/24/97	Alluvium	Background to impacted	Prior samples have shown impacts
360A	5/8/98	Alluvium	Background to impacted	Prior samples have shown impacts
360A	9/29/98	Alluvium	Background to impacted	Prior samples have shown impacts
360A	5/24/99	Alluvium	Background to impacted	Prior samples have shown impacts
360A	11/1/99	Alluvium	Background to impacted	Prior samples have shown impacts
360A	4/27/00	Alluvium	Background to impacted	Prior samples have shown impacts
360A	10/23/00	Alluvium	Background to impacted	Prior samples have shown impacts
360A	10/17/01	Alluvium	Background to impacted	Prior samples have shown impacts
360A	4/16/03	Alluvium	Background to impacted	Prior samples have shown impacts
382A	9/6/12	Alluvium	Background to impacted	Prior samples have shown impacts
382A	3/13/13	Alluvium	Background to impacted	Prior samples have shown impacts
382A	9/25/13	Alluvium	Background to impacted	Prior samples have shown impacts
382A	6/19/14	Alluvium	Background to impacted	Prior samples have shown impacts
382A	3/3/15	Alluvium	Background to impacted	Prior samples have shown impacts
389A-P	4/26/00	Alluvium	Background to impacted	Prior samples have shown impacts
389A-P	6/5/02	Alluvium	Background to impacted	Prior samples have shown impacts
389A-P	5/15/03	Alluvium	Background to impacted	Prior samples have shown impacts
389A-P	6/3/04	Alluvium	Background to impacted	Prior samples have shown impacts
389A-P	6/6/05	Alluvium	Background to impacted	Prior samples have shown impacts
389A-P	6/1/06	Alluvium	Background to impacted	Prior samples have shown impacts
389A-P	4/9/08	Alluvium	Background to impacted	Prior samples have shown impacts
389A-P	5/7/09	Alluvium	Background to impacted	Prior samples have shown impacts
389A-P	5/7/12	Alluvium	Background to impacted	Prior samples have shown impacts
389A-P	6/25/13	Alluvium	Background to impacted	Prior samples have shown impacts
389A-P	4/24/14	Alluvium	Background to impacted	Prior samples have shown impacts
389A-P	3/16/15	Alluvium	Background to impacted	Prior samples have shown impacts
45S	11/13/03	Alluvium	Background to impacted	Prior samples have shown impacts
45S	11/16/04	Alluvium	Background to impacted	Prior samples have shown impacts
45S	5/16/05	Alluvium	Background to impacted	Prior samples have shown impacts
45S	11/21/06	Alluvium	Background to impacted	Prior samples have shown impacts
45S	6/10/07	Alluvium	Background to impacted	Prior samples have shown impacts
45S	10/25/07	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
48S	10/25/07	Alluvium	Background to impacted	Prior samples have shown impacts
49S	10/25/07	Alluvium	Background to impacted	Prior samples have shown impacts
49S	10/16/08	Alluvium	Background to impacted	Prior samples have shown impacts
557A	7/9/12	Alluvium	Background to impacted	Prior samples have shown impacts
557A	12/21/12	Alluvium	Background to impacted	Prior samples have shown impacts
557A	6/12/13	Alluvium	Background to impacted	Prior samples have shown impacts
557A	11/1/13	Alluvium	Background to impacted	Prior samples have shown impacts
557A	4/27/14	Alluvium	Background to impacted	Prior samples have shown impacts
557A	10/6/14	Alluvium	Background to impacted	Prior samples have shown impacts
557A	4/27/15	Alluvium	Background to impacted	Prior samples have shown impacts
558A	9/9/10	Alluvium	Background to impacted	Prior samples have shown impacts
558A	6/6/11	Alluvium	Background to impacted	Prior samples have shown impacts
558A	7/9/12	Alluvium	Background to impacted	Prior samples have shown impacts
558A	12/4/12	Alluvium	Background to impacted	Prior samples have shown impacts
558A	6/12/13	Alluvium	Background to impacted	Prior samples have shown impacts
558A	11/2/13	Alluvium	Background to impacted	Prior samples have shown impacts
558A	4/27/14	Alluvium	Background to impacted	Prior samples have shown impacts
558A	10/6/14	Alluvium	Background to impacted	Prior samples have shown impacts
558A	4/27/15	Alluvium	Background to impacted	Prior samples have shown impacts
559A	9/9/10	Alluvium	Background to impacted	Prior samples have shown impacts
559A	7/9/12	Alluvium	Background to impacted	Prior samples have shown impacts
559A	12/4/12	Alluvium	Background to impacted	Prior samples have shown impacts
559A	6/12/13	Alluvium	Background to impacted	Prior samples have shown impacts
559A	11/2/13	Alluvium	Background to impacted	Prior samples have shown impacts
559A	4/27/14	Alluvium	Background to impacted	Prior samples have shown impacts
559A	10/7/14	Alluvium	Background to impacted	Prior samples have shown impacts
559A	4/27/15	Alluvium	Background to impacted	Prior samples have shown impacts
560A	3/16/00	Alluvium	Background to impacted	Prior samples have shown impacts
560A	4/18/00	Alluvium	Background to impacted	Prior samples have shown impacts
560A	5/9/00	Alluvium	Background to impacted	Prior samples have shown impacts
560A	6/14/00	Alluvium	Background to impacted	Prior samples have shown impacts
560A	7/10/00	Alluvium	Background to impacted	Prior samples have shown impacts
560A	9/14/00	Alluvium	Background to impacted	Prior samples have shown impacts
560A	11/13/00	Alluvium	Background to impacted	Prior samples have shown impacts
560A	12/18/00	Alluvium	Background to impacted	Prior samples have shown impacts
560A	2/13/01	Alluvium	Background to impacted	Prior samples have shown impacts
560A	2/14/01	Alluvium	Background to impacted	Prior samples have shown impacts
560A	7/16/01	Alluvium	Background to impacted	Prior samples have shown impacts
560A	10/17/01	Alluvium	Background to impacted	Prior samples have shown impacts
560A	11/12/01	Alluvium	Background to impacted	Prior samples have shown impacts
560A	11/14/01	Alluvium	Background to impacted	Prior samples have shown impacts
560A	12/18/01	Alluvium	Background to impacted	Prior samples have shown impacts
560A	1/16/02	Alluvium	Background to impacted	Prior samples have shown impacts
560A	2/18/02	Alluvium	Background to impacted	Prior samples have shown impacts
560A	3/18/02	Alluvium	Background to impacted	Prior samples have shown impacts
560A	4/23/02	Alluvium	Background to impacted	Prior samples have shown impacts
560A	5/15/02	Alluvium	Background to impacted	Prior samples have shown impacts
560A	6/27/02	Alluvium	Background to impacted	Prior samples have shown impacts
560A	7/31/02	Alluvium	Background to impacted	Prior samples have shown impacts
560A	8/20/02	Alluvium	Background to impacted	Prior samples have shown impacts
560A	9/16/02	Alluvium	Background to impacted	Prior samples have shown impacts
560A	10/22/02	Alluvium	Background to impacted	Prior samples have shown impacts
560A	11/19/02	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
560A	12/18/02	Alluvium	Background to impacted	Prior samples have shown impacts
560A	1/28/03	Alluvium	Background to impacted	Prior samples have shown impacts
560A	2/27/03	Alluvium	Background to impacted	Prior samples have shown impacts
560A	3/26/03	Alluvium	Background to impacted	Prior samples have shown impacts
560A	4/23/03	Alluvium	Background to impacted	Prior samples have shown impacts
560A	5/12/03	Alluvium	Background to impacted	Prior samples have shown impacts
560A	6/18/03	Alluvium	Background to impacted	Prior samples have shown impacts
560A	7/23/03	Alluvium	Background to impacted	Prior samples have shown impacts
560A	8/13/03	Alluvium	Background to impacted	Prior samples have shown impacts
560A	9/15/03	Alluvium	Background to impacted	Prior samples have shown impacts
560A	10/16/03	Alluvium	Background to impacted	Prior samples have shown impacts
560A	11/18/03	Alluvium	Background to impacted	Prior samples have shown impacts
560A	12/10/03	Alluvium	Background to impacted	Prior samples have shown impacts
560A	1/28/04	Alluvium	Background to impacted	Prior samples have shown impacts
560A	2/25/04	Alluvium	Background to impacted	Prior samples have shown impacts
560A	3/30/04	Alluvium	Background to impacted	Prior samples have shown impacts
560A	4/23/04	Alluvium	Background to impacted	Prior samples have shown impacts
560A	5/27/04	Alluvium	Background to impacted	Prior samples have shown impacts
560A	6/28/04	Alluvium	Background to impacted	Prior samples have shown impacts
560A	9/23/04	Alluvium	Background to impacted	Prior samples have shown impacts
560A	5/24/05	Alluvium	Background to impacted	Prior samples have shown impacts
560A	4/26/06	Alluvium	Background to impacted	Prior samples have shown impacts
560A	5/1/07	Alluvium	Background to impacted	Prior samples have shown impacts
560A	9/17/08	Alluvium	Background to impacted	Prior samples have shown impacts
568A	5/17/01	Alluvium	Background to impacted	Prior samples have shown impacts
568A	5/16/02	Alluvium	Background to impacted	Prior samples have shown impacts
568A	9/26/02	Alluvium	Background to impacted	Prior samples have shown impacts
568A	4/24/03	Alluvium	Background to impacted	Prior samples have shown impacts
568A	9/29/03	Alluvium	Background to impacted	Prior samples have shown impacts
568A	5/13/04	Alluvium	Background to impacted	Prior samples have shown impacts
568A	9/27/04	Alluvium	Background to impacted	Prior samples have shown impacts
568A	4/25/05	Alluvium	Background to impacted	Prior samples have shown impacts
568A	7/7/05	Alluvium	Background to impacted	Prior samples have shown impacts
568A	1/11/06	Alluvium	Background to impacted	Prior samples have shown impacts
568A	12/15/06	Alluvium	Background to impacted	Prior samples have shown impacts
568A	3/13/07	Alluvium	Background to impacted	Prior samples have shown impacts
568A	6/13/07	Alluvium	Background to impacted	Prior samples have shown impacts
568A	3/3/11	Alluvium	Background to impacted	Prior samples have shown impacts
568A	6/3/14	Alluvium	Background to impacted	Prior samples have shown impacts
569A	7/7/05	Alluvium	Background to impacted	Prior samples have shown impacts
569A	8/1/05	Alluvium	Background to impacted	Prior samples have shown impacts
569A	2/23/06	Alluvium	Background to impacted	Prior samples have shown impacts
569A	3/15/06	Alluvium	Background to impacted	Prior samples have shown impacts
569A	6/14/06	Alluvium	Background to impacted	Prior samples have shown impacts
569A	9/13/06	Alluvium	Background to impacted	Prior samples have shown impacts
569A	3/13/07	Alluvium	Background to impacted	Prior samples have shown impacts
569A	6/13/07	Alluvium	Background to impacted	Prior samples have shown impacts
569A	9/19/07	Alluvium	Background to impacted	Prior samples have shown impacts
569A	12/12/07	Alluvium	Background to impacted	Prior samples have shown impacts
569A	3/11/08	Alluvium	Background to impacted	Prior samples have shown impacts
569A	6/26/08	Alluvium	Background to impacted	Prior samples have shown impacts
569A	9/12/08	Alluvium	Background to impacted	Prior samples have shown impacts
569A	12/11/08	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
569A	3/18/09	Alluvium	Background to impacted	Prior samples have shown impacts
569A	6/2/09	Alluvium	Background to impacted	Prior samples have shown impacts
569A	12/3/09	Alluvium	Background to impacted	Prior samples have shown impacts
569A	3/23/10	Alluvium	Background to impacted	Prior samples have shown impacts
569A	6/16/10	Alluvium	Background to impacted	Prior samples have shown impacts
569A	9/23/10	Alluvium	Background to impacted	Prior samples have shown impacts
569A	12/28/10	Alluvium	Background to impacted	Prior samples have shown impacts
569A	3/3/11	Alluvium	Background to impacted	Prior samples have shown impacts
569A	6/2/11	Alluvium	Background to impacted	Prior samples have shown impacts
569A	3/6/12	Alluvium	Background to impacted	Prior samples have shown impacts
569A	6/21/12	Alluvium	Background to impacted	Prior samples have shown impacts
569A	9/27/12	Alluvium	Background to impacted	Prior samples have shown impacts
569A	12/13/12	Alluvium	Background to impacted	Prior samples have shown impacts
569A	2/28/13	Alluvium	Background to impacted	Prior samples have shown impacts
569A	6/12/13	Alluvium	Background to impacted	Prior samples have shown impacts
569A	9/18/13	Alluvium	Background to impacted	Prior samples have shown impacts
569A	12/31/13	Alluvium	Background to impacted	Prior samples have shown impacts
569A	3/5/14	Alluvium	Background to impacted	Prior samples have shown impacts
569A	6/3/14	Alluvium	Background to impacted	Prior samples have shown impacts
569A	7/31/14	Alluvium	Background to impacted	Prior samples have shown impacts
569A	12/3/14	Alluvium	Background to impacted	Prior samples have shown impacts
569A	3/30/15	Alluvium	Background to impacted	Prior samples have shown impacts
591A	7/9/12	Alluvium	Background to impacted	Prior samples have shown impacts
591A	12/20/12	Alluvium	Background to impacted	Prior samples have shown impacts
591A	6/12/13	Alluvium	Background to impacted	Prior samples have shown impacts
591A	11/1/13	Alluvium	Background to impacted	Prior samples have shown impacts
591A	4/27/14	Alluvium	Background to impacted	Prior samples have shown impacts
591A	10/6/14	Alluvium	Background to impacted	Prior samples have shown impacts
591A	4/27/15	Alluvium	Background to impacted	Prior samples have shown impacts
592A	5/18/06	Alluvium	Background to impacted	Prior samples have shown impacts
592A	3/30/15	Alluvium	Background to impacted	Prior samples have shown impacts
593A	7/9/12	Alluvium	Background to impacted	Prior samples have shown impacts
593A	6/16/13	Alluvium	Background to impacted	Prior samples have shown impacts
593A	5/7/14	Alluvium	Background to impacted	Prior samples have shown impacts
606A	3/20/91	Alluvium	Background to impacted	Impacts observed
606A	4/13/94	Alluvium	Background to impacted	Impacts observed
606A	9/15/94	Alluvium	Background to impacted	Impacts observed
606A	6/20/95	Alluvium	Background to impacted	Impacts observed
606A	9/20/95	Alluvium	Background to impacted	Impacts observed
606A	5/29/96	Alluvium	Background to impacted	Impacts observed
606A	10/22/96	Alluvium	Background to impacted	Impacts observed
606A	4/22/97	Alluvium	Background to impacted	Impacts observed
606A	5/20/98	Alluvium	Background to impacted	Impacts observed
606A	9/16/98	Alluvium	Background to impacted	Impacts observed
606A	3/31/99	Alluvium	Background to impacted	Impacts observed
606A	4/8/03	Alluvium	Background to impacted	Impacts observed
606A	5/18/05	Alluvium	Background to impacted	Impacts observed
606A	3/21/07	Alluvium	Background to impacted	Impacts observed
606A	3/24/08	Alluvium	Background to impacted	Impacts observed
606A	4/15/09	Alluvium	Background to impacted	Impacts observed
606A	4/2/10	Alluvium	Background to impacted	Impacts observed
606A	6/8/11	Alluvium	Background to impacted	Impacts observed
606A	7/9/12	Alluvium	Background to impacted	Impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
606A	12/18/12	Alluvium	Background to impacted	Impacts observed
606A	6/16/13	Alluvium	Background to impacted	Impacts observed
606A	10/30/13	Alluvium	Background to impacted	Impacts observed
606A	5/7/14	Alluvium	Background to impacted	Impacts observed
606A	9/26/14	Alluvium	Background to impacted	Impacts observed
607A	11/19/91	Alluvium	Background to impacted	Impacts observed
607A	4/9/92	Alluvium	Background to impacted	Impacts observed
607A	9/21/92	Alluvium	Background to impacted	Impacts observed
607A	9/16/93	Alluvium	Background to impacted	Impacts observed
607A	4/12/94	Alluvium	Background to impacted	Impacts observed
607A	9/20/94	Alluvium	Background to impacted	Impacts observed
607A	6/20/95	Alluvium	Background to impacted	Impacts observed
607A	9/19/95	Alluvium	Background to impacted	Impacts observed
607A	5/29/96	Alluvium	Background to impacted	Impacts observed
607A	4/23/97	Alluvium	Background to impacted	Impacts observed
607A	5/20/98	Alluvium	Background to impacted	Impacts observed
607A	9/16/98	Alluvium	Background to impacted	Impacts observed
607A	3/31/99	Alluvium	Background to impacted	Impacts observed
607A	9/21/99	Alluvium	Background to impacted	Impacts observed
607A	3/29/00	Alluvium	Background to impacted	Impacts observed
607A	5/24/01	Alluvium	Background to impacted	Impacts observed
607A	4/25/02	Alluvium	Background to impacted	Impacts observed
607A	4/8/03	Alluvium	Background to impacted	Impacts observed
607A	5/18/05	Alluvium	Background to impacted	Impacts observed
607A	9/13/05	Alluvium	Background to impacted	Impacts observed
607A	5/8/06	Alluvium	Background to impacted	Impacts observed
607A	9/13/06	Alluvium	Background to impacted	Impacts observed
607A	3/20/07	Alluvium	Background to impacted	Impacts observed
607A	9/20/07	Alluvium	Background to impacted	Impacts observed
607A	3/22/08	Alluvium	Background to impacted	Impacts observed
607A	9/9/08	Alluvium	Background to impacted	Impacts observed
607A	3/14/09	Alluvium	Background to impacted	Impacts observed
607A	9/23/09	Alluvium	Background to impacted	Impacts observed
607A	7/9/12	Alluvium	Background to impacted	Impacts observed
607A	6/15/13	Alluvium	Background to impacted	Impacts observed
607A	10/30/13	Alluvium	Background to impacted	Impacts observed
607A	5/7/14	Alluvium	Background to impacted	Impacts observed
607A	9/26/14	Alluvium	Background to impacted	Impacts observed
607A	4/21/15	Alluvium	Background to impacted	Impacts observed
617A-P	3/24/09	Alluvium	Background to impacted	Prior samples have shown impacts
617A-P	4/20/15	Alluvium	Background to impacted	Prior samples have shown impacts
625A	7/11/12	Alluvium	Background to impacted	Prior samples have shown impacts
625A	12/9/12	Alluvium	Background to impacted	Prior samples have shown impacts
625A	6/15/13	Alluvium	Background to impacted	Prior samples have shown impacts
625A	10/30/13	Alluvium	Background to impacted	Prior samples have shown impacts
625A	5/9/14	Alluvium	Background to impacted	Prior samples have shown impacts
625A	9/26/14	Alluvium	Background to impacted	Prior samples have shown impacts
625A	4/21/15	Alluvium	Background to impacted	Prior samples have shown impacts
626A	5/18/05	Alluvium	Background to impacted	Prior samples have shown impacts
626A	9/13/05	Alluvium	Background to impacted	Prior samples have shown impacts
626A	5/8/06	Alluvium	Background to impacted	Prior samples have shown impacts
626A	3/20/07	Alluvium	Background to impacted	Prior samples have shown impacts
626A	3/22/08	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
626A	9/9/08	Alluvium	Background to impacted	Prior samples have shown impacts
626A	3/15/09	Alluvium	Background to impacted	Prior samples have shown impacts
626A	6/16/09	Alluvium	Background to impacted	Prior samples have shown impacts
626A	9/23/09	Alluvium	Background to impacted	Prior samples have shown impacts
626A	7/9/12	Alluvium	Background to impacted	Prior samples have shown impacts
626A	12/18/12	Alluvium	Background to impacted	Prior samples have shown impacts
626A	6/15/13	Alluvium	Background to impacted	Prior samples have shown impacts
626A	10/20/13	Alluvium	Background to impacted	Prior samples have shown impacts
626A	5/9/14	Alluvium	Background to impacted	Prior samples have shown impacts
626A	9/26/14	Alluvium	Background to impacted	Prior samples have shown impacts
626A	4/21/15	Alluvium	Background to impacted	Prior samples have shown impacts
635A	10/25/01	Alluvium	Background to impacted	Prior samples have shown impacts
635A	11/12/01	Alluvium	Background to impacted	Prior samples have shown impacts
635A	11/13/01	Alluvium	Background to impacted	Prior samples have shown impacts
635A	11/14/01	Alluvium	Background to impacted	Prior samples have shown impacts
635A	1/16/02	Alluvium	Background to impacted	Prior samples have shown impacts
635A	2/18/02	Alluvium	Background to impacted	Prior samples have shown impacts
635A	3/14/02	Alluvium	Background to impacted	Prior samples have shown impacts
635A	4/22/02	Alluvium	Background to impacted	Prior samples have shown impacts
635A	5/15/02	Alluvium	Background to impacted	Prior samples have shown impacts
635A	6/27/02	Alluvium	Background to impacted	Prior samples have shown impacts
635A	7/30/02	Alluvium	Background to impacted	Prior samples have shown impacts
635A	8/19/02	Alluvium	Background to impacted	Prior samples have shown impacts
635A	9/16/02	Alluvium	Background to impacted	Prior samples have shown impacts
635A	10/21/02	Alluvium	Background to impacted	Prior samples have shown impacts
635A	11/19/02	Alluvium	Background to impacted	Prior samples have shown impacts
635A	12/18/02	Alluvium	Background to impacted	Prior samples have shown impacts
635A	1/27/03	Alluvium	Background to impacted	Prior samples have shown impacts
635A	2/27/03	Alluvium	Background to impacted	Prior samples have shown impacts
635A	3/27/03	Alluvium	Background to impacted	Prior samples have shown impacts
635A	4/23/03	Alluvium	Background to impacted	Prior samples have shown impacts
635A	5/12/03	Alluvium	Background to impacted	Prior samples have shown impacts
635A	6/18/03	Alluvium	Background to impacted	Prior samples have shown impacts
635A	7/22/03	Alluvium	Background to impacted	Prior samples have shown impacts
635A	8/13/03	Alluvium	Background to impacted	Prior samples have shown impacts
635A	9/15/03	Alluvium	Background to impacted	Prior samples have shown impacts
635A	10/15/03	Alluvium	Background to impacted	Prior samples have shown impacts
635A	11/18/03	Alluvium	Background to impacted	Prior samples have shown impacts
635A	12/10/03	Alluvium	Background to impacted	Prior samples have shown impacts
635A	1/28/04	Alluvium	Background to impacted	Prior samples have shown impacts
635A	2/25/04	Alluvium	Background to impacted	Prior samples have shown impacts
635A	3/31/04	Alluvium	Background to impacted	Prior samples have shown impacts
635A	5/27/04	Alluvium	Background to impacted	Prior samples have shown impacts
635A	6/29/04	Alluvium	Background to impacted	Prior samples have shown impacts
635A	9/28/04	Alluvium	Background to impacted	Prior samples have shown impacts
635A	9/8/05	Alluvium	Background to impacted	Prior samples have shown impacts
635A	4/26/06	Alluvium	Background to impacted	Prior samples have shown impacts
635A	9/13/07	Alluvium	Background to impacted	Prior samples have shown impacts
635A	5/15/08	Alluvium	Background to impacted	Prior samples have shown impacts
635A	9/24/08	Alluvium	Background to impacted	Prior samples have shown impacts
635A	4/20/09	Alluvium	Background to impacted	Prior samples have shown impacts
635A	9/11/09	Alluvium	Background to impacted	Prior samples have shown impacts
635A	5/4/10	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
635A	6/1/11	Alluvium	Background to impacted	Prior samples have shown impacts
635A	9/21/11	Alluvium	Background to impacted	Prior samples have shown impacts
635A	7/8/12	Alluvium	Background to impacted	Prior samples have shown impacts
635A	12/2/12	Alluvium	Background to impacted	Prior samples have shown impacts
635A	6/8/13	Alluvium	Background to impacted	Prior samples have shown impacts
63S	12/15/03	Alluvium	Non-background to baseline	Upgradient of Facility
63S	6/8/04	Alluvium	Non-background to baseline	No impacts observed
63S	11/18/04	Alluvium	Non-background to baseline	No impacts observed
63S	6/23/05	Alluvium	Non-background to baseline	No impacts observed
63S	5/9/07	Alluvium	Non-background to baseline	No impacts observed
63S	11/21/07	Alluvium	Non-background to baseline	No impacts observed
63S	4/28/08	Alluvium	Non-background to baseline	No impacts observed
63S	4/6/09	Alluvium	Non-background to baseline	No impacts observed
63S	4/12/10	Alluvium	Non-background to baseline	No impacts observed
63S	4/6/11	Alluvium	Non-background to baseline	No impacts observed
63S	5/15/12	Alluvium	Non-background to baseline	No impacts observed
63S	4/25/13	Alluvium	Non-background to baseline	No impacts observed
63S	4/23/14	Alluvium	Non-background to baseline	No impacts observed
64A	10/15/12	Alluvium	Background to impacted	Prior samples have shown impacts
64A	4/2/13	Alluvium	Background to impacted	Prior samples have shown impacts
64A	10/15/13	Alluvium	Background to impacted	Prior samples have shown impacts
64A	4/7/14	Alluvium	Background to impacted	Prior samples have shown impacts
64A	10/22/14	Alluvium	Background to impacted	Prior samples have shown impacts
64A	4/29/15	Alluvium	Background to impacted	Prior samples have shown impacts
654A	9/20/07	Alluvium	Background to impacted	Prior samples have shown impacts
654A	3/22/08	Alluvium	Background to impacted	Prior samples have shown impacts
654A	9/9/08	Alluvium	Background to impacted	Prior samples have shown impacts
654A	4/15/09	Alluvium	Background to impacted	Prior samples have shown impacts
654A	9/23/09	Alluvium	Background to impacted	Prior samples have shown impacts
654A	4/4/12	Alluvium	Background to impacted	Prior samples have shown impacts
654A	8/30/12	Alluvium	Background to impacted	Prior samples have shown impacts
654A	3/18/13	Alluvium	Background to impacted	Prior samples have shown impacts
654A	10/8/13	Alluvium	Background to impacted	Prior samples have shown impacts
654A	6/2/14	Alluvium	Background to impacted	Prior samples have shown impacts
654A	3/4/15	Alluvium	Background to impacted	Prior samples have shown impacts
65A	6/23/05	Alluvium	Non-background to baseline	No impacts observed
65A	6/22/06	Alluvium	Non-background to baseline	No impacts observed
65A	11/21/06	Alluvium	Non-background to baseline	No impacts observed
65A	6/19/07	Alluvium	Non-background to baseline	No impacts observed
65A	11/14/07	Alluvium	Non-background to baseline	No impacts observed
65A	5/21/08	Alluvium	Non-background to baseline	No impacts observed
65A	10/28/08	Alluvium	Non-background to baseline	No impacts observed
65A	4/14/10	Alluvium	Non-background to baseline	No impacts observed
65A	10/4/10	Alluvium	Non-background to baseline	No impacts observed
65A	3/17/11	Alluvium	Non-background to baseline	No impacts observed
65A	10/5/11	Alluvium	Non-background to baseline	No impacts observed
65A	10/15/12	Alluvium	Non-background to baseline	No impacts observed
65A	4/2/13	Alluvium	Non-background to baseline	No impacts observed
65A	10/15/13	Alluvium	Non-background to baseline	No impacts observed
65A	4/7/14	Alluvium	Non-background to baseline	No impacts observed
65A	10/22/14	Alluvium	Non-background to baseline	No impacts observed
65A	4/29/15	Alluvium	Non-background to baseline	No impacts observed
668A	6/3/11	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
669A	2/8/05	Alluvium	Background to impacted	Prior samples have shown impacts
672A	4/16/07	Alluvium	Background to impacted	Prior samples have shown impacts
679A	6/14/06	Alluvium	Background to impacted	Prior samples have shown impacts
679A	9/13/06	Alluvium	Background to impacted	Prior samples have shown impacts
679A	3/13/07	Alluvium	Background to impacted	Prior samples have shown impacts
679A	3/18/09	Alluvium	Background to impacted	Prior samples have shown impacts
679A	6/2/09	Alluvium	Background to impacted	Prior samples have shown impacts
679A	3/1/13	Alluvium	Background to impacted	Prior samples have shown impacts
679A	3/30/15	Alluvium	Background to impacted	Prior samples have shown impacts
680A	9/29/05	Alluvium	Background to impacted	Prior samples have shown impacts
680A	4/16/07	Alluvium	Background to impacted	Prior samples have shown impacts
680A	9/23/08	Alluvium	Background to impacted	Prior samples have shown impacts
680A	5/28/14	Alluvium	Background to impacted	Prior samples have shown impacts
686A	9/13/06	Alluvium	Background to impacted	Prior samples have shown impacts
686A	3/14/07	Alluvium	Background to impacted	Prior samples have shown impacts
686A	12/3/09	Alluvium	Background to impacted	Prior samples have shown impacts
686A	9/27/12	Alluvium	Background to impacted	Prior samples have shown impacts
686A	12/12/12	Alluvium	Background to impacted	Prior samples have shown impacts
686A	6/3/14	Alluvium	Background to impacted	Prior samples have shown impacts
686A	7/31/14	Alluvium	Background to impacted	Prior samples have shown impacts
686A	3/30/15	Alluvium	Background to impacted	Prior samples have shown impacts
688A	4/13/12	Alluvium	Background to impacted	Prior samples have shown impacts
68A	12/11/06	Alluvium	Background to impacted	Prior samples have shown impacts
68A	4/21/14	Alluvium	Background to impacted	Prior samples have shown impacts
690A	10/2/06	Alluvium	Background to impacted	Prior samples have shown impacts
690A	4/16/07	Alluvium	Background to impacted	Prior samples have shown impacts
690A	9/12/07	Alluvium	Background to impacted	Prior samples have shown impacts
691A	4/8/09	Alluvium	Background to impacted	Prior samples have shown impacts
691A	5/28/14	Alluvium	Background to impacted	Prior samples have shown impacts
73A	11/2/07	Alluvium	Background to impacted	Prior samples have shown impacts
73A	5/19/08	Alluvium	Background to impacted	Prior samples have shown impacts
73A	10/28/08	Alluvium	Background to impacted	Prior samples have shown impacts
73A	4/25/09	Alluvium	Background to impacted	Prior samples have shown impacts
73A	10/16/09	Alluvium	Background to impacted	Prior samples have shown impacts
73A	4/9/12	Alluvium	Background to impacted	Prior samples have shown impacts
73A	10/17/12	Alluvium	Background to impacted	Prior samples have shown impacts
73A	4/1/13	Alluvium	Background to impacted	Prior samples have shown impacts
73A	10/15/13	Alluvium	Background to impacted	Prior samples have shown impacts
73A	4/8/14	Alluvium	Background to impacted	Prior samples have shown impacts
73A	10/22/14	Alluvium	Background to impacted	Prior samples have shown impacts
73A	4/29/15	Alluvium	Background to impacted	Prior samples have shown impacts
74A	10/17/13	Alluvium	Background to impacted	Prior samples have shown impacts
75A	10/28/08	Alluvium	Background to impacted	Prior samples have shown impacts
75A	4/28/09	Alluvium	Background to impacted	Prior samples have shown impacts
75A	10/16/09	Alluvium	Background to impacted	Prior samples have shown impacts
75A	3/28/12	Alluvium	Background to impacted	Prior samples have shown impacts
75A	10/2/12	Alluvium	Background to impacted	Prior samples have shown impacts
75A	4/1/13	Alluvium	Background to impacted	Prior samples have shown impacts
75A	10/17/13	Alluvium	Background to impacted	Prior samples have shown impacts
75A	4/16/14	Alluvium	Background to impacted	Prior samples have shown impacts
75A	9/11/14	Alluvium	Background to impacted	Prior samples have shown impacts
75A	4/27/15	Alluvium	Background to impacted	Prior samples have shown impacts
81A	10/16/09	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
81A	4/4/12	Alluvium	Background to impacted	Prior samples have shown impacts
81A	10/15/12	Alluvium	Background to impacted	Prior samples have shown impacts
81A	4/1/13	Alluvium	Background to impacted	Prior samples have shown impacts
81A	10/15/13	Alluvium	Background to impacted	Prior samples have shown impacts
82A	10/28/08	Alluvium	Background to impacted	Prior samples have shown impacts
82A	4/16/09	Alluvium	Background to impacted	Prior samples have shown impacts
82A	10/16/09	Alluvium	Background to impacted	Prior samples have shown impacts
82A	3/28/12	Alluvium	Background to impacted	Prior samples have shown impacts
82A	10/2/12	Alluvium	Background to impacted	Prior samples have shown impacts
82A	4/1/13	Alluvium	Background to impacted	Prior samples have shown impacts
82A	10/17/13	Alluvium	Background to impacted	Prior samples have shown impacts
82A	4/16/14	Alluvium	Background to impacted	Prior samples have shown impacts
82A	9/11/14	Alluvium	Background to impacted	Prior samples have shown impacts
82A	4/27/15	Alluvium	Background to impacted	Prior samples have shown impacts
83A	10/28/08	Alluvium	Background to impacted	Prior samples have shown impacts
83A	4/16/09	Alluvium	Background to impacted	Prior samples have shown impacts
83A	4/9/12	Alluvium	Background to impacted	Prior samples have shown impacts
83A	10/17/12	Alluvium	Background to impacted	Prior samples have shown impacts
83A	4/1/13	Alluvium	Background to impacted	Prior samples have shown impacts
83A	10/15/13	Alluvium	Background to impacted	Prior samples have shown impacts
83A	4/9/14	Alluvium	Background to impacted	Prior samples have shown impacts
83A	10/22/14	Alluvium	Background to impacted	Prior samples have shown impacts
83A	5/5/15	Alluvium	Background to impacted	Prior samples have shown impacts
908A	6/25/02	Alluvium	Background to impacted	Prior samples have shown impacts
908A	6/2/04	Alluvium	Background to impacted	Prior samples have shown impacts
908A	6/14/05	Alluvium	Background to impacted	Prior samples have shown impacts
908A	5/9/07	Alluvium	Background to impacted	Prior samples have shown impacts
908A	6/13/12	Alluvium	Background to impacted	Prior samples have shown impacts
908A	5/15/13	Alluvium	Background to impacted	Prior samples have shown impacts
908A	5/1/14	Alluvium	Background to impacted	Prior samples have shown impacts
908A	3/18/15	Alluvium	Background to impacted	Prior samples have shown impacts
909A	10/10/07	Alluvium	Background to impacted	Prior samples have shown impacts
909A	5/19/08	Alluvium	Background to impacted	Prior samples have shown impacts
909A	9/30/08	Alluvium	Background to impacted	Prior samples have shown impacts
909A	10/15/09	Alluvium	Background to impacted	Prior samples have shown impacts
909A	6/13/12	Alluvium	Background to impacted	Prior samples have shown impacts
909A	11/30/12	Alluvium	Background to impacted	Prior samples have shown impacts
909A	5/15/13	Alluvium	Background to impacted	Prior samples have shown impacts
909A	9/17/13	Alluvium	Background to impacted	Prior samples have shown impacts
909A	5/1/14	Alluvium	Background to impacted	Prior samples have shown impacts
909A	9/12/14	Alluvium	Background to impacted	Prior samples have shown impacts
909A	3/18/15	Alluvium	Background to impacted	Prior samples have shown impacts
910A	6/15/06	Alluvium	Background to impacted	Prior samples have shown impacts
910A	3/15/07	Alluvium	Background to impacted	Prior samples have shown impacts
910A	5/10/07	Alluvium	Background to impacted	Prior samples have shown impacts
910A	10/24/07	Alluvium	Background to impacted	Prior samples have shown impacts
910A	10/15/08	Alluvium	Background to impacted	Prior samples have shown impacts
910A	5/6/09	Alluvium	Background to impacted	Prior samples have shown impacts
910A	10/8/09	Alluvium	Background to impacted	Prior samples have shown impacts
910A	9/10/12	Alluvium	Background to impacted	Prior samples have shown impacts
910A	3/13/13	Alluvium	Background to impacted	Prior samples have shown impacts
910A	9/27/13	Alluvium	Background to impacted	Prior samples have shown impacts
910A	5/20/14	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
910A	8/5/14	Alluvium	Background to impacted	Prior samples have shown impacts
910A	4/3/15	Alluvium	Background to impacted	Prior samples have shown impacts
913A	6/1/05	Alluvium	Background to impacted	Prior samples have shown impacts
913A	10/26/05	Alluvium	Background to impacted	Prior samples have shown impacts
913A	6/15/06	Alluvium	Background to impacted	Prior samples have shown impacts
913A	10/27/06	Alluvium	Background to impacted	Prior samples have shown impacts
913A	3/15/07	Alluvium	Background to impacted	Prior samples have shown impacts
913A	5/10/07	Alluvium	Background to impacted	Prior samples have shown impacts
913A	10/24/07	Alluvium	Background to impacted	Prior samples have shown impacts
913A	4/25/08	Alluvium	Background to impacted	Prior samples have shown impacts
913A	11/20/08	Alluvium	Background to impacted	Prior samples have shown impacts
913A	10/15/09	Alluvium	Background to impacted	Prior samples have shown impacts
913A	6/13/12	Alluvium	Background to impacted	Prior samples have shown impacts
913A	12/18/12	Alluvium	Background to impacted	Prior samples have shown impacts
913A	3/13/13	Alluvium	Background to impacted	Prior samples have shown impacts
913A	9/27/13	Alluvium	Background to impacted	Prior samples have shown impacts
913A	4/30/14	Alluvium	Background to impacted	Prior samples have shown impacts
913A	9/17/14	Alluvium	Background to impacted	Prior samples have shown impacts
913A	3/24/15	Alluvium	Background to impacted	Prior samples have shown impacts
915A	4/4/13	Alluvium	Background to impacted	Prior samples have shown impacts
915A	9/12/14	Alluvium	Background to impacted	Prior samples have shown impacts
916A	5/31/05	Alluvium	Background to impacted	Prior samples have shown impacts
916A	3/4/09	Alluvium	Background to impacted	Prior samples have shown impacts
916A	9/1/10	Alluvium	Background to impacted	Prior samples have shown impacts
916A	3/18/13	Alluvium	Background to impacted	Prior samples have shown impacts
916A	6/30/14	Alluvium	Background to impacted	Prior samples have shown impacts
916A	3/3/15	Alluvium	Background to impacted	Prior samples have shown impacts
917A	9/16/10	Alluvium	Background to impacted	Prior samples have shown impacts
917A	5/31/12	Alluvium	Background to impacted	Prior samples have shown impacts
917A	10/2/12	Alluvium	Background to impacted	Prior samples have shown impacts
917A	4/3/13	Alluvium	Background to impacted	Prior samples have shown impacts
917A	9/17/13	Alluvium	Background to impacted	Prior samples have shown impacts
917A	4/27/14	Alluvium	Background to impacted	Prior samples have shown impacts
917A	9/15/14	Alluvium	Background to impacted	Prior samples have shown impacts
917A	3/23/15	Alluvium	Background to impacted	Prior samples have shown impacts
918A	9/18/10	Alluvium	Background to impacted	Prior samples have shown impacts
918A	5/30/12	Alluvium	Background to impacted	Prior samples have shown impacts
918A	9/30/12	Alluvium	Background to impacted	Prior samples have shown impacts
918A	4/6/13	Alluvium	Background to impacted	Prior samples have shown impacts
918A	9/11/13	Alluvium	Background to impacted	Prior samples have shown impacts
918A	4/27/14	Alluvium	Background to impacted	Prior samples have shown impacts
918A	9/16/14	Alluvium	Background to impacted	Prior samples have shown impacts
918A	3/20/15	Alluvium	Background to impacted	Prior samples have shown impacts
935A	11/10/04	Alluvium	Background to impacted	Prior samples have shown impacts
935A	5/31/05	Alluvium	Background to impacted	Prior samples have shown impacts
935A	5/30/06	Alluvium	Background to impacted	Prior samples have shown impacts
935A	10/13/06	Alluvium	Background to impacted	Prior samples have shown impacts
935A	3/25/08	Alluvium	Background to impacted	Prior samples have shown impacts
935A	9/2/08	Alluvium	Background to impacted	Prior samples have shown impacts
935A	12/10/08	Alluvium	Background to impacted	Prior samples have shown impacts
935A	3/4/09	Alluvium	Background to impacted	Prior samples have shown impacts
935A	9/15/09	Alluvium	Background to impacted	Prior samples have shown impacts
935A	12/21/09	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
935A	6/15/10	Alluvium	Background to impacted	Prior samples have shown impacts
935A	9/1/10	Alluvium	Background to impacted	Prior samples have shown impacts
935A	11/3/10	Alluvium	Background to impacted	Prior samples have shown impacts
935A	3/14/11	Alluvium	Background to impacted	Prior samples have shown impacts
935A	6/24/11	Alluvium	Background to impacted	Prior samples have shown impacts
935A	10/5/11	Alluvium	Background to impacted	Prior samples have shown impacts
935A	3/29/12	Alluvium	Background to impacted	Prior samples have shown impacts
935A	7/5/12	Alluvium	Background to impacted	Prior samples have shown impacts
935A	9/27/12	Alluvium	Background to impacted	Prior samples have shown impacts
935A	12/27/12	Alluvium	Background to impacted	Prior samples have shown impacts
935A	3/28/13	Alluvium	Background to impacted	Prior samples have shown impacts
935A	7/1/13	Alluvium	Background to impacted	Prior samples have shown impacts
935A	10/13/13	Alluvium	Background to impacted	Prior samples have shown impacts
935A	5/9/14	Alluvium	Background to impacted	Prior samples have shown impacts
935A	9/18/14	Alluvium	Background to impacted	Prior samples have shown impacts
935A	3/30/15	Alluvium	Background to impacted	Prior samples have shown impacts
936A	11/8/04	Alluvium	Background to impacted	Prior samples have shown impacts
936A	5/31/05	Alluvium	Background to impacted	Prior samples have shown impacts
936A	5/30/06	Alluvium	Background to impacted	Prior samples have shown impacts
936A	10/13/06	Alluvium	Background to impacted	Prior samples have shown impacts
936A	3/19/07	Alluvium	Background to impacted	Prior samples have shown impacts
936A	9/10/07	Alluvium	Background to impacted	Prior samples have shown impacts
936A	3/25/08	Alluvium	Background to impacted	Prior samples have shown impacts
936A	6/24/08	Alluvium	Background to impacted	Prior samples have shown impacts
936A	9/2/08	Alluvium	Background to impacted	Prior samples have shown impacts
936A	12/10/08	Alluvium	Background to impacted	Prior samples have shown impacts
936A	3/4/09	Alluvium	Background to impacted	Prior samples have shown impacts
936A	6/29/09	Alluvium	Background to impacted	Prior samples have shown impacts
936A	9/15/09	Alluvium	Background to impacted	Prior samples have shown impacts
936A	12/21/09	Alluvium	Background to impacted	Prior samples have shown impacts
936A	6/15/10	Alluvium	Background to impacted	Prior samples have shown impacts
936A	9/1/10	Alluvium	Background to impacted	Prior samples have shown impacts
936A	11/3/10	Alluvium	Background to impacted	Prior samples have shown impacts
936A	3/14/11	Alluvium	Background to impacted	Prior samples have shown impacts
936A	6/21/11	Alluvium	Background to impacted	Prior samples have shown impacts
936A	10/5/11	Alluvium	Background to impacted	Prior samples have shown impacts
936A	3/29/12	Alluvium	Background to impacted	Prior samples have shown impacts
936A	7/5/12	Alluvium	Background to impacted	Prior samples have shown impacts
936A	9/27/12	Alluvium	Background to impacted	Prior samples have shown impacts
936A	12/27/12	Alluvium	Background to impacted	Prior samples have shown impacts
936A	3/28/13	Alluvium	Background to impacted	Prior samples have shown impacts
936A	7/1/13	Alluvium	Background to impacted	Prior samples have shown impacts
936A	10/13/13	Alluvium	Background to impacted	Prior samples have shown impacts
936A	5/9/14	Alluvium	Background to impacted	Prior samples have shown impacts
936A	9/18/14	Alluvium	Background to impacted	Prior samples have shown impacts
936A	3/30/15	Alluvium	Background to impacted	Prior samples have shown impacts
937A	6/24/08	Alluvium	Background to impacted	Prior samples have shown impacts
937A	6/15/10	Alluvium	Background to impacted	Prior samples have shown impacts
937A	10/13/13	Alluvium	Background to impacted	Prior samples have shown impacts
938A	11/26/03	Alluvium	Background to impacted	Impacts observed
938A	11/9/04	Alluvium	Background to impacted	Impacts observed
938A	5/31/05	Alluvium	Background to impacted	Impacts observed
938A	10/26/05	Alluvium	Background to impacted	Impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
938A	5/30/06	Alluvium	Background to impacted	Impacts observed
938A	10/13/06	Alluvium	Background to impacted	Impacts observed
938A	5/10/07	Alluvium	Background to impacted	Capture Well samples
938A	10/15/07	Alluvium	Background to impacted	Capture Well samples
938A	5/13/08	Alluvium	Background to impacted	Capture Well samples
938A	9/30/08	Alluvium	Background to impacted	Capture Well samples
938A	5/6/09	Alluvium	Background to impacted	Capture Well samples
938A	10/13/09	Alluvium	Background to impacted	Capture Well samples
938A	10/27/10	Alluvium	Background to impacted	Capture Well samples
938A	7/11/12	Alluvium	Background to impacted	Capture Well samples
938A	9/10/12	Alluvium	Background to impacted	Capture Well samples
938A	3/18/13	Alluvium	Background to impacted	Capture Well samples
938A	9/17/13	Alluvium	Background to impacted	Capture Well samples
938A	5/1/14	Alluvium	Background to impacted	Capture Well samples
938A	9/17/14	Alluvium	Background to impacted	Capture Well samples
938A	3/23/15	Alluvium	Background to impacted	Impacts observed
939A	1/16/04	Alluvium	Background to impacted	Impacts observed
939A	5/30/06	Alluvium	Background to impacted	Impacts observed
939A	5/10/07	Alluvium	Background to impacted	Capture Well samples
939A	10/15/07	Alluvium	Background to impacted	Capture Well samples
939A	5/19/08	Alluvium	Background to impacted	Capture Well samples
939A	5/6/09	Alluvium	Background to impacted	Capture Well samples
939A	7/11/12	Alluvium	Background to impacted	Impacts observed
939A	4/4/13	Alluvium	Background to impacted	Impacts observed
939A	5/1/14	Alluvium	Background to impacted	Impacts observed
939A	3/20/15	Alluvium	Background to impacted	Impacts observed
940A	9/18/10	Alluvium	Background to impacted	Prior samples have shown impacts
940A	7/11/12	Alluvium	Background to impacted	Prior samples have shown impacts
940A	10/2/12	Alluvium	Background to impacted	Prior samples have shown impacts
940A	4/4/13	Alluvium	Background to impacted	Prior samples have shown impacts
940A	9/17/13	Alluvium	Background to impacted	Prior samples have shown impacts
940A	4/26/14	Alluvium	Background to impacted	Prior samples have shown impacts
940A	9/17/14	Alluvium	Background to impacted	Prior samples have shown impacts
940A	3/23/15	Alluvium	Background to impacted	Prior samples have shown impacts
941A-P	4/15/08	Alluvium	Background to impacted	Prior samples have shown impacts
941A-P	10/14/08	Alluvium	Background to impacted	Prior samples have shown impacts
941A-P	5/6/09	Alluvium	Background to impacted	Prior samples have shown impacts
941A-P	10/7/09	Alluvium	Background to impacted	Prior samples have shown impacts
941A-P	5/8/12	Alluvium	Background to impacted	Prior samples have shown impacts
941A-P	9/30/12	Alluvium	Background to impacted	Prior samples have shown impacts
941A-P	4/4/13	Alluvium	Background to impacted	Prior samples have shown impacts
941A-P	4/26/14	Alluvium	Background to impacted	Prior samples have shown impacts
941A-P	9/12/14	Alluvium	Background to impacted	Prior samples have shown impacts
943A	3/19/04	Alluvium	Background to impacted	Prior samples have shown impacts
943A	10/14/08	Alluvium	Background to impacted	Prior samples have shown impacts
943A	10/8/09	Alluvium	Background to impacted	Prior samples have shown impacts
943A	5/20/14	Alluvium	Background to impacted	Prior samples have shown impacts
944A	3/19/04	Alluvium	Background to impacted	Prior samples have shown impacts
944A	6/1/05	Alluvium	Background to impacted	Prior samples have shown impacts
944A	6/15/06	Alluvium	Background to impacted	Prior samples have shown impacts
944A	4/15/08	Alluvium	Background to impacted	Prior samples have shown impacts
944A	10/14/08	Alluvium	Background to impacted	Prior samples have shown impacts
944A	5/6/09	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
944A	10/8/09	Alluvium	Background to impacted	Prior samples have shown impacts
944A	3/22/12	Alluvium	Background to impacted	Prior samples have shown impacts
944A	9/10/12	Alluvium	Background to impacted	Prior samples have shown impacts
944A	3/13/13	Alluvium	Background to impacted	Prior samples have shown impacts
944A	5/20/14	Alluvium	Background to impacted	Prior samples have shown impacts
944A	10/22/14	Alluvium	Background to impacted	Prior samples have shown impacts
944A	3/3/15	Alluvium	Background to impacted	Prior samples have shown impacts
945A	3/22/12	Alluvium	Background to impacted	Prior samples have shown impacts
945A	3/13/13	Alluvium	Background to impacted	Prior samples have shown impacts
945A	3/3/15	Alluvium	Background to impacted	Prior samples have shown impacts
94A	5/5/09	Alluvium	Background to impacted	Location is near to and downgradient from a capture well
94A	4/3/12	Alluvium	Background to impacted	Impacts observed
94A	10/18/12	Alluvium	Background to impacted	Impacts observed
94A	4/24/13	Alluvium	Background to impacted	Impacts observed
94A	10/23/13	Alluvium	Background to impacted	Impacts observed
94A	4/22/14	Alluvium	Background to impacted	Impacts observed
94A	11/18/14	Alluvium	Background to impacted	Impacts observed
94A	5/6/15	Alluvium	Background to impacted	Impacts observed
96A	5/5/09	Alluvium	Background to impacted	Impacts observed
96A	11/5/09	Alluvium	Background to impacted	Impacts observed
977A	4/4/08	Alluvium	Background to impacted	Prior samples have shown impacts
977A	10/31/09	Alluvium	Background to impacted	Prior samples have shown impacts
977A	5/9/12	Alluvium	Background to impacted	Prior samples have shown impacts
977A	11/19/12	Alluvium	Background to impacted	Prior samples have shown impacts
977A	6/25/13	Alluvium	Background to impacted	Prior samples have shown impacts
977A	10/19/13	Alluvium	Background to impacted	Prior samples have shown impacts
977A	4/24/14	Alluvium	Background to impacted	Prior samples have shown impacts
977A	9/9/14	Alluvium	Background to impacted	Prior samples have shown impacts
977A	3/17/15	Alluvium	Background to impacted	Prior samples have shown impacts
97A	5/5/09	Alluvium	Background to impacted	Impacts observed
97A	11/5/09	Alluvium	Background to impacted	Impacts observed
97A	5/6/15	Alluvium	Background to impacted	Impacts observed
991A	5/26/09	Alluvium	Background to impacted	Prior samples have shown impacts
991A	10/3/09	Alluvium	Background to impacted	Prior samples have shown impacts
991A	3/16/12	Alluvium	Background to impacted	Prior samples have shown impacts
991A	12/18/12	Alluvium	Background to impacted	Prior samples have shown impacts
991A	3/13/13	Alluvium	Background to impacted	Prior samples have shown impacts
991A	9/25/13	Alluvium	Background to impacted	Prior samples have shown impacts
991A	5/13/14	Alluvium	Background to impacted	Prior samples have shown impacts
991A	8/6/14	Alluvium	Background to impacted	Prior samples have shown impacts
991A	3/2/15	Alluvium	Background to impacted	Prior samples have shown impacts
994A	10/5/09	Alluvium	Background to impacted	Prior samples have shown impacts
994A	3/20/12	Alluvium	Background to impacted	Prior samples have shown impacts
994A	9/6/12	Alluvium	Background to impacted	Prior samples have shown impacts
994A	9/25/13	Alluvium	Background to impacted	Prior samples have shown impacts
994A	5/13/14	Alluvium	Background to impacted	Prior samples have shown impacts
994A	8/5/14	Alluvium	Background to impacted	Prior samples have shown impacts
994A	3/2/15	Alluvium	Background to impacted	Prior samples have shown impacts
998A	6/30/14	Alluvium	Background to impacted	Prior samples have shown impacts
998A	8/5/14	Alluvium	Background to impacted	Prior samples have shown impacts
DP-5IT	6/2/11	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	10/5/05	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	6/13/06	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
GNW-1	10/5/06	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	6/12/07	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	10/11/07	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	6/10/08	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	10/9/08	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	6/9/09	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	9/29/09	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	6/9/10	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	9/28/10	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	6/10/11	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	9/28/11	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	6/6/12	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	9/26/12	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	6/11/13	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	9/24/13	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	6/4/14	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-1	9/24/14	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	10/20/91	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	7/13/92	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	5/11/93	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	5/18/94	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	6/6/95	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	6/5/96	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	6/3/97	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	6/16/98	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	6/2/99	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	6/13/00	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	5/30/01	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	6/5/02	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	6/11/03	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	6/8/04	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	6/7/05	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	6/13/06	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	6/13/07	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	6/11/08	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	6/10/09	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	9/28/11	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-11	6/6/12	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	10/19/91	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	7/12/92	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	10/19/92	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	5/10/93	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	10/19/93	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	5/17/94	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	10/12/94	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	6/6/95	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	10/18/95	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	6/4/96	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	10/15/96	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	6/3/97	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	9/30/97	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	6/16/98	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	10/14/98	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
GNW-2	6/2/99	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	6/13/00	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	6/9/04	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	9/29/04	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	6/13/07	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	10/11/07	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	6/10/08	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	10/9/08	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	6/9/09	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	9/29/09	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	6/7/11	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-2	9/24/13	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	10/19/91	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	7/13/92	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	10/20/92	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	5/10/93	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	10/19/93	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	5/17/94	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	10/12/94	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	6/5/95	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	10/18/95	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	6/4/96	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	10/15/96	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	6/3/97	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	9/30/97	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	6/15/98	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	10/15/98	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	6/2/99	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	10/13/99	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	6/13/00	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	10/3/00	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	10/14/02	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	6/9/04	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	9/29/04	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	6/6/05	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	10/5/06	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	6/13/07	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	10/11/07	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	6/10/08	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	10/9/08	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	6/9/09	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	9/28/09	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	6/9/10	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	6/7/11	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	9/26/12	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	9/24/13	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-3	6/4/14	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	10/19/91	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	7/12/92	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	10/20/92	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	5/10/93	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	10/19/93	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	5/17/94	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
GNW-4	10/12/94	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	6/5/95	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	10/18/95	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	6/4/96	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	10/15/96	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	6/3/97	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	9/30/97	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	6/15/98	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	10/15/98	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	6/2/99	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	10/12/99	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	6/12/00	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	10/3/00	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	6/4/02	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	10/14/02	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	6/10/03	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	10/14/03	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	6/9/04	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	9/29/04	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	6/6/05	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	10/5/05	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	6/12/06	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	10/4/06	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	6/13/07	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	10/11/07	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	6/10/08	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	10/9/08	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	6/9/09	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	9/29/09	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	6/9/10	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-4	6/11/13	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	10/19/91	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	7/12/92	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	10/20/92	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	5/10/93	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	10/19/93	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	5/17/94	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	10/11/94	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	6/5/95	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	10/17/95	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	6/4/96	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	10/15/96	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	6/3/97	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	9/30/97	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	6/15/98	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	10/15/98	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	6/2/99	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	10/12/99	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	6/12/00	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	5/29/01	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	6/5/02	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	10/14/02	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	6/7/04	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
GNW-5	9/29/04	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	6/6/05	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	6/12/06	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	10/4/06	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	6/13/07	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	10/11/07	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	6/10/08	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	10/8/08	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	6/9/09	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	9/29/09	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	6/9/10	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	9/26/12	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-5	9/24/13	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	10/20/91	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	10/20/92	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	5/10/93	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	10/19/93	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	5/16/94	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	10/11/94	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	6/5/95	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	10/17/95	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	6/4/96	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	10/15/96	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	6/2/97	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	9/30/97	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	6/15/98	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	10/14/98	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	6/2/99	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	10/12/99	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	6/12/00	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	10/3/00	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	5/29/01	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	10/1/01	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	6/4/02	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	10/14/02	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	6/10/03	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	10/14/03	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	6/7/04	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	9/29/04	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	10/5/05	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	10/21/05	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	6/12/06	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	10/4/06	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	6/11/07	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	10/11/07	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	6/10/08	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	10/8/08	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	6/8/09	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	9/28/09	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	6/8/10	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	9/27/10	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	6/7/11	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	9/27/11	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
GNW-6	6/5/12	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	9/23/13	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-6	9/23/14	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-7	6/8/11	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-7	9/28/11	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-7	9/26/12	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-7	6/11/13	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-7	9/24/13	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-7	6/4/14	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-7	9/24/14	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	10/14/02	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	6/10/03	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	10/14/03	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	6/7/04	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	9/29/04	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	6/6/05	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	10/5/05	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	6/12/06	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	10/4/06	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	6/11/07	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	10/11/07	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	6/10/08	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	10/8/08	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	6/9/09	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	9/28/09	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	6/8/10	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	6/7/11	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	9/27/11	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	6/5/12	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	9/26/12	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	6/11/13	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	9/24/13	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	6/4/14	Alluvium	Background to impacted	Prior samples have shown impacts
GNW-8	9/24/14	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	10/19/91	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	7/12/92	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	10/20/92	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	5/10/93	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	5/17/94	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	10/12/94	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	6/5/95	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	10/18/95	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	6/4/96	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	10/16/96	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	6/3/97	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	9/30/97	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	6/15/98	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	10/15/98	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	6/2/99	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	10/13/99	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	6/13/00	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	10/3/00	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	10/2/01	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
GOW-1	6/5/02	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	10/14/02	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	6/10/03	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	10/14/03	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	6/7/04	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	9/29/04	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	6/6/05	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	10/5/05	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	6/12/06	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	10/5/06	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	6/12/07	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	10/11/07	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	6/10/08	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	10/9/08	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	6/9/09	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	9/29/09	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	6/8/10	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	9/28/10	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	6/7/11	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	9/28/11	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	9/26/12	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	9/24/13	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-1	6/4/14	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-10	4/1/87	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	6/18/91	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	10/20/91	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	10/19/92	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	5/10/93	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	6/12/06	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	10/4/06	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	6/11/07	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	10/11/07	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	6/9/08	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	10/8/08	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	6/8/09	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	9/28/09	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	6/8/10	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	9/27/10	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	6/7/11	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	9/27/11	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	9/25/12	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	6/11/13	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	6/3/14	Alluvium	Background to impacted	Prior samples have shown impacts
GOW-11	9/23/14	Alluvium	Background to impacted	Prior samples have shown impacts
OT-12	3/15/07	Alluvium	Background to impacted	Prior samples have shown impacts
OT-12	10/23/13	Alluvium	Background to impacted	Prior samples have shown impacts
OT-12	4/23/14	Alluvium	Background to impacted	Prior samples have shown impacts
P-01	6/24/91	Alluvium	Non-background to baseline	No impacts observed
P-05	11/20/79	Alluvium	Non-background to baseline	No impacts observed
P-05	5/20/80	Alluvium	Non-background to baseline	No impacts observed
P-11	2/3/81	Alluvium	Non-background to baseline	No impacts observed
P-11	5/6/82	Alluvium	Background to impacted	Prior samples have shown impacts
P-11	9/24/82	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
P-11	10/6/82	Alluvium	Background to impacted	Prior samples have shown impacts
P-11	8/14/84	Alluvium	Background to impacted	Prior samples have shown impacts
P-11	5/15/85	Alluvium	Background to impacted	Prior samples have shown impacts
P-11	10/25/85	Alluvium	Background to impacted	Prior samples have shown impacts
P-11	5/13/86	Alluvium	Background to impacted	Prior samples have shown impacts
P-11	10/8/87	Alluvium	Background to impacted	Prior samples have shown impacts
P-11	10/1/90	Alluvium	Background to impacted	Prior samples have shown impacts
P-11	9/6/01	Alluvium	Background to impacted	Prior samples have shown impacts
P-11	10/13/09	Alluvium	Background to impacted	Prior samples have shown impacts
P-11	6/14/10	Alluvium	Background to impacted	Prior samples have shown impacts
P-12	5/15/85	Alluvium	Background to impacted	Prior samples have shown impacts
P-12	10/25/85	Alluvium	Background to impacted	Prior samples have shown impacts
P-12	5/13/86	Alluvium	Background to impacted	Prior samples have shown impacts
P-12	10/5/88	Alluvium	Background to impacted	Prior samples have shown impacts
P-12	11/14/89	Alluvium	Background to impacted	Prior samples have shown impacts
P-12	6/22/92	Alluvium	Background to impacted	Prior samples have shown impacts
P-12	6/10/93	Alluvium	Background to impacted	Prior samples have shown impacts
P-12	7/23/96	Alluvium	Background to impacted	Prior samples have shown impacts
P-12	8/21/97	Alluvium	Background to impacted	Prior samples have shown impacts
P-12	9/6/01	Alluvium	Background to impacted	Prior samples have shown impacts
P-12	11/7/02	Alluvium	Background to impacted	Prior samples have shown impacts
P-12	12/17/02	Alluvium	Background to impacted	Prior samples have shown impacts
P-12	10/13/09	Alluvium	Background to impacted	Prior samples have shown impacts
P-12	6/14/10	Alluvium	Background to impacted	Prior samples have shown impacts
PW-736	5/18/10	Alluvium	Background to impacted	Prior samples have shown impacts
PW-736	6/10/10	Alluvium	Background to impacted	Prior samples have shown impacts
PW-736	6/10/11	Alluvium	Background to impacted	Prior samples have shown impacts
PW-736	9/28/11	Alluvium	Background to impacted	Prior samples have shown impacts
PW-736	6/6/12	Alluvium	Background to impacted	Prior samples have shown impacts
PW-736	9/26/12	Alluvium	Background to impacted	Prior samples have shown impacts
PW-736	6/12/13	Alluvium	Background to impacted	Prior samples have shown impacts
PW-736	9/24/13	Alluvium	Background to impacted	Prior samples have shown impacts
PW-736	6/4/14	Alluvium	Background to impacted	Prior samples have shown impacts
PW-736	9/24/14	Alluvium	Background to impacted	Prior samples have shown impacts
S-05	9/25/73	Alluvium	Background to impacted	Prior samples have shown impacts
S-05	6/4/76	Alluvium	Background to impacted	Prior samples have shown impacts
S-05	10/7/76	Alluvium	Background to impacted	Prior samples have shown impacts
S-05	10/31/79	Alluvium	Background to impacted	Prior samples have shown impacts
S-05	12/18/79	Alluvium	Background to impacted	Prior samples have shown impacts
S-05	3/12/80	Alluvium	Background to impacted	Prior samples have shown impacts
S-05	9/4/81	Alluvium	Background to impacted	Prior samples have shown impacts
S-05	10/22/86	Alluvium	Background to impacted	Prior samples have shown impacts
S-05	10/6/87	Alluvium	Background to impacted	Prior samples have shown impacts
S-05	10/3/90	Alluvium	Background to impacted	Prior samples have shown impacts
S-05	6/22/92	Alluvium	Background to impacted	Prior samples have shown impacts
S-05	6/9/93	Alluvium	Background to impacted	Prior samples have shown impacts
SRP-4	4/3/13	Alluvium	Background to impacted	Prior samples have shown impacts
TR-P1	9/12/07	Alluvium	Background to impacted	Prior samples have shown impacts
TR-P1	3/31/15	Alluvium	Background to impacted	Prior samples have shown impacts
W-1	9/1/86	Alluvium	Background to impacted	Prior samples have shown impacts
W-1	9/29/87	Alluvium	Background to impacted	Prior samples have shown impacts
W-1	6/4/97	Alluvium	Background to impacted	Prior samples have shown impacts
W-1	6/7/05	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
W-1	6/12/07	Alluvium	Background to impacted	Prior samples have shown impacts
W-1	6/9/09	Alluvium	Background to impacted	Prior samples have shown impacts
W-3	10/17/90	Alluvium	Non-background to baseline	No impacts observed
W-3	6/18/91	Alluvium	Non-background to baseline	No impacts observed
WA-100	11/16/79	Alluvium	Non-background to baseline	No impacts observed
WA-101	5/11/83	Alluvium	Non-background to baseline	No impacts observed
WA-101	7/18/83	Alluvium	Non-background to baseline	No impacts observed
WA-101	5/10/84	Alluvium	Non-background to baseline	No impacts observed
WA-101	11/6/84	Alluvium	Non-background to baseline	No impacts observed
WA-101	12/10/85	Alluvium	Non-background to baseline	No impacts observed
WA-101	8/31/88	Alluvium	Non-background to baseline	No impacts observed
WA-101	7/26/89	Alluvium	Non-background to baseline	No impacts observed
WA-101	6/24/91	Alluvium	Non-background to baseline	No impacts observed
WA-101	7/27/95	Alluvium	Non-background to baseline	No impacts observed
WA-101	7/29/96	Alluvium	Non-background to baseline	No impacts observed
WA-101	8/13/97	Alluvium	Non-background to baseline	No impacts observed
WA-102	9/9/81	Alluvium	Non-background to baseline	No impacts observed
WA-102	9/30/83	Alluvium	Non-background to baseline	No impacts observed
WA-102	3/17/86	Alluvium	Non-background to baseline	No impacts observed
WA-102	1/28/87	Alluvium	Non-background to baseline	No impacts observed
WA-103	11/15/79	Alluvium	Non-background to baseline	No impacts observed
WA-103	3/11/80	Alluvium	Non-background to baseline	No impacts observed
WA-103	5/22/80	Alluvium	Non-background to baseline	No impacts observed
WA-103	7/30/96	Alluvium	Non-background to baseline	No impacts observed
WA-104	11/15/79	Alluvium	Non-background to baseline	No impacts observed
WA-104	3/11/80	Alluvium	Non-background to baseline	No impacts observed
WA-105	8/3/79	Alluvium	Non-background to baseline	No impacts observed
WA-105	11/15/79	Alluvium	Non-background to baseline	No impacts observed
WA-105	12/19/79	Alluvium	Non-background to baseline	No impacts observed
WA-105	3/11/80	Alluvium	Non-background to baseline	No impacts observed
WA-105	5/22/80	Alluvium	Non-background to baseline	No impacts observed
WA-106	7/14/92	Alluvium	Non-background to baseline	No impacts observed
WA-106	7/30/96	Alluvium	Non-background to baseline	No impacts observed
WA-107	5/20/86	Alluvium	Non-background to baseline	Upgradient of Facility
WA-108	11/20/79	Alluvium	Non-background to baseline	No impacts observed
WA-108	2/19/80	Alluvium	Non-background to baseline	Upgradient of Facility
WA-110	5/10/84	Alluvium	Non-background to baseline	No impacts observed
WA-110	8/31/88	Alluvium	Non-background to baseline	No impacts observed
WA-110	6/26/91	Alluvium	Non-background to baseline	No impacts observed
WA-111	5/10/84	Alluvium	Non-background to baseline	No impacts observed
WA-111	8/31/88	Alluvium	Non-background to baseline	No impacts observed
WA-112	5/6/82	Alluvium	Non-background to baseline	No impacts observed
WA-114	5/6/82	Alluvium	Non-background to baseline	No impacts observed
WA-114	5/11/83	Alluvium	Non-background to baseline	No impacts observed
WA-114	7/19/84	Alluvium	Non-background to baseline	No impacts observed
WA-118	12/15/83	Alluvium	Background to impacted	Prior samples have shown impacts
WA-118	7/18/84	Alluvium	Background to impacted	Prior samples have shown impacts
WA-118	12/9/85	Alluvium	Background to impacted	Prior samples have shown impacts
WA-118	7/13/89	Alluvium	Background to impacted	Prior samples have shown impacts
WA-118	8/6/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-118	7/21/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-118	7/20/98	Alluvium	Background to impacted	Prior samples have shown impacts
WA-118	7/16/01	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
WA-118	8/11/04	Alluvium	Background to impacted	Prior samples have shown impacts
WA-118	9/5/07	Alluvium	Background to impacted	Prior samples have shown impacts
WA-118	9/14/10	Alluvium	Background to impacted	Prior samples have shown impacts
WA-118	9/24/13	Alluvium	Background to impacted	Prior samples have shown impacts
WA-119	7/21/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-121	8/28/81	Alluvium	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WA-122	12/17/83	Alluvium	Non-background to baseline	No impacts observed
WA-122	11/23/84	Alluvium	Non-background to baseline	No impacts observed
WA-122	12/11/85	Alluvium	Non-background to baseline	No impacts observed
WA-124	9/24/82	Alluvium	Non-background to baseline	No impacts observed
WA-124	5/11/83	Alluvium	Non-background to baseline	No impacts observed
WA-124	9/30/83	Alluvium	Non-background to baseline	No impacts observed
WA-124	5/10/84	Alluvium	Non-background to baseline	No impacts observed
WA-124	5/19/88	Alluvium	Non-background to baseline	No impacts observed
WA-124	8/5/91	Alluvium	Non-background to baseline	No impacts observed
WA-125	12/9/80	Alluvium	Non-background to baseline	No impacts observed
WA-126	5/10/84	Alluvium	Non-background to baseline	No impacts observed
WA-126	5/25/88	Alluvium	Non-background to baseline	No impacts observed
WA-126	8/5/91	Alluvium	Non-background to baseline	No impacts observed
WA-127	5/11/83	Alluvium	Non-background to baseline	No impacts observed
WA-127	5/10/84	Alluvium	Non-background to baseline	No impacts observed
WA-127	8/5/91	Alluvium	Non-background to baseline	No impacts observed
WA-128	5/11/83	Alluvium	Non-background to baseline	No impacts observed
WA-128	5/10/84	Alluvium	Non-background to baseline	No impacts observed
WA-128	7/13/90	Alluvium	Non-background to baseline	No impacts observed
WA-129	10/2/81	Alluvium	Non-background to baseline	No impacts observed
WA-129	2/6/87	Alluvium	Non-background to baseline	No impacts observed
WA-129	9/1/88	Alluvium	Non-background to baseline	No impacts observed
WA-129	8/5/91	Alluvium	Non-background to baseline	No impacts observed
WA-130	8/6/81	Alluvium	Non-background to baseline	No impacts observed
WA-130	5/11/83	Alluvium	Non-background to baseline	No impacts observed
WA-130	5/10/84	Alluvium	Non-background to baseline	No impacts observed
WA-130	1/16/87	Alluvium	Non-background to baseline	No impacts observed
WA-130	7/12/88	Alluvium	Non-background to baseline	No impacts observed
WA-130	8/23/90	Alluvium	Non-background to baseline	No impacts observed
WA-130	7/30/96	Alluvium	Non-background to baseline	No impacts observed
WA-132	10/5/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-132	5/10/94	Alluvium	Background to impacted	Prior samples have shown impacts
WA-132	9/22/94	Alluvium	Background to impacted	Prior samples have shown impacts
WA-132	6/22/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-132	8/5/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-132	9/21/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-132	5/23/96	Alluvium	Background to impacted	Prior samples have shown impacts
WA-132	7/31/96	Alluvium	Background to impacted	Prior samples have shown impacts
WA-132	11/5/96	Alluvium	Background to impacted	Prior samples have shown impacts
WA-132	4/29/97	Alluvium	Background to impacted	Prior samples have shown impacts
WA-132	9/16/97	Alluvium	Background to impacted	Prior samples have shown impacts
WA-132	9/18/08	Alluvium	Background to impacted	Prior samples have shown impacts
WA-132	9/22/11	Alluvium	Background to impacted	Prior samples have shown impacts
WA-132	8/28/14	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	11/7/86	Alluvium	Non-background to baseline	No impacts observed
WA-133	6/9/87	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	10/27/87	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
WA-133	6/11/88	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	6/21/88	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	8/12/88	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	10/24/88	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	5/21/89	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	10/14/89	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	11/22/89	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	7/12/90	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	7/18/90	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	5/17/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	9/22/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	9/15/94	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	6/20/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	9/20/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	8/12/96	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	5/20/98	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	9/16/98	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	3/31/99	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	7/13/99	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	5/15/01	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	8/23/02	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	5/23/05	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	9/20/06	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	3/22/07	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	3/22/08	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	9/18/08	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	9/22/11	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	7/9/12	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	12/18/12	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	6/16/13	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	10/30/13	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	5/28/14	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	8/28/14	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	9/26/14	Alluvium	Background to impacted	Prior samples have shown impacts
WA-133	5/6/15	Alluvium	Background to impacted	Prior samples have shown impacts
WA-134	3/27/86	Alluvium	Non-background to baseline	No impacts observed
WA-134	8/31/88	Alluvium	Non-background to baseline	No impacts observed
WA-134	8/5/91	Alluvium	Non-background to baseline	No impacts observed
WA-135	11/3/88	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	5/19/89	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	10/14/89	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	5/24/90	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	7/13/90	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	10/4/90	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	3/12/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	9/30/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	4/16/92	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	6/9/92	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	9/17/92	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	5/12/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	9/22/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	4/11/94	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	9/29/94	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
WA-135	6/29/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	9/21/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	8/12/96	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	4/29/97	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	9/16/97	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	8/12/98	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	11/8/99	Alluvium	Background to impacted	Prior samples have shown impacts
WA-135	4/13/00	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	4/6/05	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	4/25/05	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	5/4/05	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	6/3/05	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	7/7/05	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	8/1/05	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	9/9/05	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	12/6/05	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	3/13/07	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	9/18/08	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	12/11/08	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	3/18/09	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	6/18/09	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	9/10/09	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	12/3/09	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	12/28/10	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	3/3/11	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	9/22/11	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	3/6/12	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	6/21/12	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	9/27/12	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	12/12/12	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	2/28/13	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	6/12/13	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	9/18/13	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	12/31/13	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	3/5/14	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	6/3/14	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	8/29/14	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	12/3/14	Alluvium	Background to impacted	Prior samples have shown impacts
WA-136	3/30/15	Alluvium	Background to impacted	Prior samples have shown impacts
WA-137	7/11/84	Alluvium	Non-background to baseline	No impacts observed, long stable record
WA-137	9/19/07	Alluvium	Non-background to baseline	No impacts observed, long stable record
WA-137	3/23/10	Alluvium	Non-background to baseline	No impacts observed, long stable record
WA-137	9/23/10	Alluvium	Non-background to baseline	No impacts observed, long stable record
WA-137	6/2/11	Alluvium	Non-background to baseline	No impacts observed, long stable record
WA-137	8/26/11	Alluvium	Non-background to baseline	No impacts observed, long stable record
WA-137	12/7/11	Alluvium	Non-background to baseline	No impacts observed, long stable record
WA-139	12/6/85	Alluvium	Non-background to baseline	No impacts observed
WA-139	5/19/88	Alluvium	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
WA-139	8/1/89	Alluvium	Non-background to baseline	No impacts observed
WA-139	8/5/91	Alluvium	Non-background to baseline	No impacts observed
WA-139	8/9/96	Alluvium	Non-background to baseline	No impacts observed
WA-142	12/14/81	Alluvium	Background to impacted	Downgradient of drain pit 5. Well installed to investigate overflow of pond.
WA-142	9/9/82	Alluvium	Background to impacted	Downgradient of drain pit 5. Well installed to investigate overflow of pond.
WA-142	4/7/83	Alluvium	Background to impacted	Downgradient of drain pit 5. Well installed to investigate overflow of pond.
WA-142	11/6/83	Alluvium	Background to impacted	Downgradient of drain pit 5. Well installed to investigate overflow of pond.
WA-142	6/15/84	Alluvium	Background to impacted	Impacts observed
WA-142	11/10/84	Alluvium	Background to impacted	Impacts observed
WA-142	6/11/85	Alluvium	Background to impacted	Impacts observed
WA-142	9/11/85	Alluvium	Background to impacted	Impacts observed
WA-142	5/22/86	Alluvium	Background to impacted	Impacts observed
WA-142	10/27/86	Alluvium	Background to impacted	Impacts observed
WA-142	1/15/87	Alluvium	Background to impacted	Impacts observed
WA-142	6/9/87	Alluvium	Background to impacted	Impacts observed
WA-142	10/30/87	Alluvium	Background to impacted	Impacts observed
WA-142	6/7/88	Alluvium	Background to impacted	Impacts observed
WA-142	6/21/88	Alluvium	Background to impacted	Impacts observed
WA-142	11/2/88	Alluvium	Background to impacted	Impacts observed
WA-142	5/19/89	Alluvium	Background to impacted	Impacts observed
WA-142	10/14/89	Alluvium	Background to impacted	Impacts observed
WA-142	5/24/90	Alluvium	Background to impacted	Impacts observed
WA-142	7/13/90	Alluvium	Background to impacted	Impacts observed
WA-142	10/4/90	Alluvium	Background to impacted	Impacts observed
WA-142	3/12/91	Alluvium	Background to impacted	Impacts observed
WA-142	9/27/91	Alluvium	Background to impacted	Impacts observed
WA-142	4/14/92	Alluvium	Background to impacted	Impacts observed
WA-142	6/10/92	Alluvium	Background to impacted	Impacts observed
WA-142	9/17/92	Alluvium	Background to impacted	Impacts observed
WA-142	5/12/93	Alluvium	Background to impacted	Impacts observed
WA-142	9/22/93	Alluvium	Background to impacted	Impacts observed
WA-142	4/11/94	Alluvium	Background to impacted	Impacts observed
WA-142	9/29/94	Alluvium	Background to impacted	Impacts observed
WA-142	6/29/95	Alluvium	Background to impacted	Impacts observed
WA-142	9/21/95	Alluvium	Background to impacted	Impacts observed
WA-142	8/12/96	Alluvium	Background to impacted	Impacts observed
WA-142	7/13/99	Alluvium	Background to impacted	Impacts observed
WA-142	5/21/02	Alluvium	Background to impacted	Impacts observed
WA-142	8/23/02	Alluvium	Background to impacted	Impacts observed
WA-142	4/10/03	Alluvium	Background to impacted	Impacts observed
WA-142	9/18/03	Alluvium	Background to impacted	Impacts observed
WA-142	4/26/04	Alluvium	Background to impacted	Impacts observed
WA-142	10/14/04	Alluvium	Background to impacted	Impacts observed
WA-142	9/9/05	Alluvium	Background to impacted	Impacts observed
WA-142	9/15/05	Alluvium	Background to impacted	Impacts observed
WA-142	9/18/08	Alluvium	Background to impacted	Impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
WA-142	9/22/11	Alluvium	Background to impacted	Impacts observed
WA-142	8/28/14	Alluvium	Background to impacted	Impacts observed
WA-142	4/20/15	Alluvium	Background to impacted	Impacts observed
WA-144	8/5/82	Alluvium	Background to impacted	Downgradient of drain pit 5. Well installed to investigate overflow of pond.
WA-144	3/24/86	Alluvium	Background to impacted	Impacts observed
WA-144	1/15/87	Alluvium	Background to impacted	Impacts observed
WA-144	12/3/87	Alluvium	Background to impacted	Downgradient of drain pit 5. Well installed to investigate overflow of pond.
WA-144	6/21/88	Alluvium	Background to impacted	Downgradient of drain pit 5. Well installed to investigate overflow of pond.
WA-144	7/13/90	Alluvium	Background to impacted	Impacts observed
WA-144	7/18/90	Alluvium	Background to impacted	Downgradient of drain pit 5. Well installed to investigate overflow of pond.
WA-144	6/8/92	Alluvium	Background to impacted	Downgradient of drain pit 5. Well installed to investigate overflow of pond.
WA-144	8/12/96	Alluvium	Background to impacted	Downgradient of drain pit 5. Well installed to investigate overflow of pond.
WA-145	8/5/82	Alluvium	Background to impacted	Impacts observed
WA-146	3/24/86	Alluvium	Non-background to baseline	No impacts observed
WA-146	6/21/88	Alluvium	Non-background to baseline	No impacts observed
WA-146	8/31/88	Alluvium	Non-background to baseline	No impacts observed
WA-146	8/6/91	Alluvium	Non-background to baseline	No impacts observed
WA-146	8/7/95	Alluvium	Non-background to baseline	No impacts observed
WA-146	8/12/96	Alluvium	Non-background to baseline	Upgradient of Facility
WA-148	2/11/87	Alluvium	Background to impacted	Prior samples have shown impacts
WA-148	6/21/88	Alluvium	Background to impacted	Prior samples have shown impacts
WA-148	8/31/88	Alluvium	Background to impacted	Prior samples have shown impacts
WA-148	7/11/90	Alluvium	Background to impacted	Prior samples have shown impacts
WA-148	8/6/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-148	8/14/92	Alluvium	Background to impacted	Prior samples have shown impacts
WA-148	6/30/94	Alluvium	Background to impacted	Prior samples have shown impacts
WA-148	8/7/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-148	8/12/96	Alluvium	Background to impacted	Prior samples have shown impacts
WA-148	8/21/97	Alluvium	Background to impacted	Prior samples have shown impacts
WA-148	5/16/00	Alluvium	Background to impacted	Prior samples have shown impacts
WA-148	9/17/12	Alluvium	Background to impacted	Prior samples have shown impacts
WA-149	7/19/84	Alluvium	Background to impacted	Prior samples have shown impacts
WA-149	7/11/85	Alluvium	Background to impacted	Prior samples have shown impacts
WA-149	5/23/88	Alluvium	Background to impacted	Prior samples have shown impacts
WA-149	7/10/89	Alluvium	Background to impacted	Prior samples have shown impacts
WA-149	8/6/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-149	8/10/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-149	8/2/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-150	5/11/83	Alluvium	Background to impacted	Prior samples have shown impacts
WA-150	5/9/84	Alluvium	Background to impacted	Prior samples have shown impacts
WA-150	7/19/84	Alluvium	Background to impacted	Prior samples have shown impacts
WA-150	7/18/85	Alluvium	Background to impacted	Prior samples have shown impacts
WA-150	5/23/88	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
WA-150	7/10/89	Alluvium	Background to impacted	Prior samples have shown impacts
WA-150	8/6/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-150	8/10/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-150	8/2/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	8/3/82	Alluvium	Non-background to baseline	No impacts observed
WA-151	5/11/83	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	5/9/84	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	7/19/84	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	9/11/84	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	6/5/85	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	7/11/85	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	5/23/88	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	7/11/89	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	8/6/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	8/10/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	8/2/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	8/11/98	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	10/28/99	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	12/9/99	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	1/13/00	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	2/18/00	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	4/19/00	Alluvium	Background to impacted	Prior samples have shown impacts
WA-151	8/13/01	Alluvium	Background to impacted	Prior samples have shown impacts
WA-152	7/19/84	Alluvium	Background to impacted	Prior samples have shown impacts
WA-152	6/14/85	Alluvium	Background to impacted	Prior samples have shown impacts
WA-152	8/6/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-152	11/15/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-152	8/10/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-152	8/2/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-153	12/8/83	Alluvium	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WA-153	7/19/84	Alluvium	Background to impacted	Prior samples have shown impacts
WA-153	9/20/85	Alluvium	Background to impacted	Prior samples have shown impacts
WA-153	5/23/88	Alluvium	Background to impacted	Prior samples have shown impacts
WA-153	7/11/89	Alluvium	Background to impacted	Prior samples have shown impacts
WA-153	8/6/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-153	9/10/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-153	8/2/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-153	8/28/02	Alluvium	Background to impacted	Prior samples have shown impacts
WA-154	7/11/89	Alluvium	Non-background to baseline	No impacts observed
WA-154	8/6/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-154	11/19/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-154	9/10/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-154	7/26/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-156	9/1/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-156	8/2/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-157	7/6/89	Alluvium	Background to impacted	Prior samples have shown impacts
WA-157	11/19/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-157	9/1/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-157	8/2/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-158	11/19/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-158	8/2/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-159	2/10/87	Alluvium	Background to impacted	Prior samples have shown impacts
WA-159	3/2/87	Alluvium	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
WA-159	7/20/90	Alluvium	Background to impacted	Prior samples have shown impacts
WA-159	12/17/92	Alluvium	Background to impacted	Prior samples have shown impacts
WA-159	9/20/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-159	9/6/94	Alluvium	Background to impacted	Prior samples have shown impacts
WA-159	7/18/96	Alluvium	Background to impacted	Prior samples have shown impacts
WA-160	3/17/86	Alluvium	Non-background to baseline	No impacts observed
WA-160	8/10/92	Alluvium	Non-background to baseline	No impacts observed
WA-160	7/18/96	Alluvium	Non-background to baseline	No impacts observed
WA-161	1/16/87	Alluvium	Background to impacted	Prior samples have shown impacts
WA-161	6/16/88	Alluvium	Background to impacted	Prior samples have shown impacts
WA-161	8/29/90	Alluvium	Background to impacted	Prior samples have shown impacts
WA-161	6/10/92	Alluvium	Background to impacted	Prior samples have shown impacts
WA-161	7/18/96	Alluvium	Background to impacted	Prior samples have shown impacts
WA-164	7/18/96	Alluvium	Background to impacted	Prior samples have shown impacts
WA-164	7/31/97	Alluvium	Background to impacted	Prior samples have shown impacts
WA-164	9/15/09	Alluvium	Background to impacted	Prior samples have shown impacts
WA-164	9/24/12	Alluvium	Background to impacted	Prior samples have shown impacts
WA-167	7/6/89	Alluvium	Background to impacted	Prior samples have shown impacts
WA-167	8/27/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-167	11/22/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-167	9/7/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-167	7/23/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-169	8/17/82	Alluvium	Non-background to baseline	No impacts observed
WA-171	6/10/88	Alluvium	Non-background to baseline	No impacts observed
WA-171	9/3/91	Alluvium	Non-background to baseline	No impacts observed
WA-183	12/2/83	Alluvium	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WA-183	5/11/84	Alluvium	Background to impacted	Prior samples have shown impacts
WA-183	11/29/84	Alluvium	Background to impacted	Prior samples have shown impacts
WA-183	12/12/85	Alluvium	Background to impacted	Prior samples have shown impacts
WA-183	5/29/86	Alluvium	Background to impacted	Prior samples have shown impacts
WA-183	6/1/88	Alluvium	Background to impacted	Prior samples have shown impacts
WA-183	7/9/90	Alluvium	Background to impacted	Prior samples have shown impacts
WA-183	8/4/92	Alluvium	Background to impacted	Prior samples have shown impacts
WA-183	10/8/92	Alluvium	Background to impacted	Prior samples have shown impacts
WA-183	5/19/94	Alluvium	Background to impacted	Prior samples have shown impacts
WA-185	12/2/83	Alluvium	Non-background to baseline	No impacts observed
WA-185	11/29/84	Alluvium	Non-background to baseline	No impacts observed
WA-186	5/11/84	Alluvium	Non-background to baseline	No impacts observed
WA-186	7/23/97	Alluvium	Non-background to baseline	Upgradient of Facility
WA-189	9/13/84	Alluvium	Background to impacted	Prior samples have shown impacts
WA-189	5/30/85	Alluvium	Background to impacted	Prior samples have shown impacts
WA-189	6/8/88	Alluvium	Background to impacted	Prior samples have shown impacts
WA-189	9/4/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-189	8/30/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-189	7/18/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-189	7/16/96	Alluvium	Background to impacted	Prior samples have shown impacts
WA-190	5/11/84	Alluvium	Non-background to baseline	No impacts observed
WA-190	6/8/88	Alluvium	Non-background to baseline	No impacts observed
WA-191	5/11/84	Alluvium	Non-background to baseline	No impacts observed
WA-191	6/8/88	Alluvium	Non-background to baseline	No impacts observed
WA-191	9/4/91	Alluvium	Non-background to baseline	No impacts observed
WA-192	5/11/84	Alluvium	Non-background to baseline	No impacts observed
WA-192	6/8/88	Alluvium	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
WA-194	5/11/84	Alluvium	Non-background to baseline	No impacts observed
WA-195	7/20/95	Alluvium	Non-background to baseline	No impacts observed
WA-200	12/11/84	Alluvium	Non-background to baseline	No impacts observed
WA-201	12/1/83	Alluvium	Non-background to baseline	No impacts observed
WA-201	12/9/84	Alluvium	Non-background to baseline	No impacts observed
WA-201	8/21/87	Alluvium	Non-background to baseline	No impacts observed
WA-201	9/7/89	Alluvium	Non-background to baseline	No impacts observed
WA-201	7/19/95	Alluvium	Non-background to baseline	No impacts observed
WA-201	7/16/96	Alluvium	Non-background to baseline	Upgradient of Facility
WA-204	7/26/89	Alluvium	Background to impacted	Prior samples have shown impacts
WA-204	10/8/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-204	9/15/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-204	7/23/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-204	8/19/98	Alluvium	Background to impacted	Prior samples have shown impacts
WA-204	7/18/01	Alluvium	Background to impacted	Prior samples have shown impacts
WA-204	8/12/04	Alluvium	Background to impacted	Prior samples have shown impacts
WA-204	9/6/07	Alluvium	Background to impacted	Prior samples have shown impacts
WA-204	9/13/10	Alluvium	Background to impacted	Prior samples have shown impacts
WA-204	9/24/13	Alluvium	Background to impacted	Prior samples have shown impacts
WA-205	12/10/84	Alluvium	Background to impacted	Prior samples have shown impacts
WA-205	6/24/85	Alluvium	Background to impacted	Prior samples have shown impacts
WA-205	9/6/88	Alluvium	Background to impacted	Prior samples have shown impacts
WA-205	7/25/89	Alluvium	Background to impacted	Prior samples have shown impacts
WA-205	10/8/91	Alluvium	Background to impacted	Prior samples have shown impacts
WA-205	12/14/93	Alluvium	Background to impacted	Prior samples have shown impacts
WA-205	7/23/95	Alluvium	Background to impacted	Prior samples have shown impacts
WA-209	7/25/85	Alluvium	Non-background to baseline	No impacts observed
WA-209	1/15/87	Alluvium	Non-background to baseline	No impacts observed
WA-209	7/5/89	Alluvium	Non-background to baseline	No impacts observed
WA-209	8/7/90	Alluvium	Non-background to baseline	No impacts observed
WA-209	7/17/92	Alluvium	Non-background to baseline	No impacts observed
WA-211	8/7/90	Alluvium	Non-background to baseline	No impacts observed
WA-211	8/4/92	Alluvium	Non-background to baseline	No impacts observed
WA-214	7/29/85	Alluvium	Non-background to baseline	No impacts observed
WA-214	1/15/87	Alluvium	Non-background to baseline	No impacts observed
WA-214	7/13/89	Alluvium	Non-background to baseline	No impacts observed
WA-214	7/31/90	Alluvium	Non-background to baseline	No impacts observed
WA-214	8/4/92	Alluvium	Non-background to baseline	No impacts observed
WA-215	1/15/87	Alluvium	Non-background to baseline	No impacts observed
WA-215	7/31/90	Alluvium	Non-background to baseline	No impacts observed
WA-215	8/4/92	Alluvium	Non-background to baseline	No impacts observed
WA-215	8/20/96	Alluvium	Non-background to baseline	No impacts observed
WA-216	1/15/87	Alluvium	Non-background to baseline	No impacts observed
WA-216	7/31/90	Alluvium	Non-background to baseline	No impacts observed
WA-217	6/27/11	Alluvium	Non-background to baseline	No impacts observed
CM-1	4/10/79	Alluvium/Colluvium	Non-background to baseline	No impacts observed
CM-1	6/13/79	Alluvium/Colluvium	Non-background to baseline	Upgradient of Facility
CM-1	7/18/79	Alluvium/Colluvium	Non-background to baseline	Upgradient of Facility
CM-1	11/14/79	Alluvium/Colluvium	Non-background to baseline	Upgradient of Facility
CM-1	2/27/80	Alluvium/Colluvium	Non-background to baseline	Upgradient of Facility
CM-1	12/9/80	Alluvium/Colluvium	Non-background to baseline	Upgradient of Facility
1001R	3/5/15	Clinker	Background to impacted	Prior samples have shown impacts
1005R	1/25/05	Clinker	Background to impacted	Process water from 2004 leakage

Well ID	Sample Date	Target Interval	Direction	Criteria
1005R	9/20/05	Clinker	Background to impacted	Impacts observed
1005R	5/15/06	Clinker	Background to impacted	Process water from 2004 leakage
1005R	9/26/06	Clinker	Background to impacted	Process water from 2004 leakage
1005R	4/24/07	Clinker	Background to impacted	Process water from 2004 leakage
1005R	9/30/07	Clinker	Background to impacted	Process water from 2004 leakage
1005R	3/28/08	Clinker	Background to impacted	Process water from 2004 leakage
1005R	9/20/08	Clinker	Background to impacted	Process water from 2004 leakage
1005R	3/17/09	Clinker	Background to impacted	Process water from 2004 leakage
1005R	9/9/09	Clinker	Background to impacted	Process water from 2004 leakage
1005R	3/23/10	Clinker	Background to impacted	Process water from 2004 leakage
1005R	9/21/10	Clinker	Background to impacted	Process water from 2004 leakage
1005R	5/25/11	Clinker	Background to impacted	Process water from 2004 leakage
1005R	8/30/11	Clinker	Background to impacted	Process water from 2004 leakage
1005R	7/1/12	Clinker	Background to impacted	Process water from 2004 leakage
1005R	12/18/12	Clinker	Background to impacted	Process water from 2004 leakage
1005R	6/5/13	Clinker	Background to impacted	Process water from 2004 leakage
1005R	11/27/13	Clinker	Background to impacted	Process water from 2004 leakage
1005R	5/10/14	Clinker	Background to impacted	Process water from 2004 leakage
1005R	10/21/14	Clinker	Background to impacted	Process water from 2004 leakage
1005R	4/22/15	Clinker	Background to impacted	Process water from 2004 leakage
1007R	5/26/11	Clinker	Background to impacted	Prior samples have shown impacts
1007R	6/2/14	Clinker	Background to impacted	Prior samples have shown impacts
1007R	8/27/14	Clinker	Background to impacted	Prior samples have shown impacts
1007R	5/13/15	Clinker	Background to impacted	Prior samples have shown impacts
1011R	11/3/11	Clinker	Background to impacted	Prior samples have shown impacts
1011R	6/24/12	Clinker	Background to impacted	Prior samples have shown impacts
1011R	12/19/12	Clinker	Background to impacted	Prior samples have shown impacts
1011R	5/14/14	Clinker	Background to impacted	Prior samples have shown impacts
1011R	10/13/14	Clinker	Background to impacted	Prior samples have shown impacts
1011R	4/3/15	Clinker	Background to impacted	Prior samples have shown impacts
1013R	1/28/05	Clinker	Background to impacted	Process water from 2004 leakage
1016R	5/17/06	Clinker	Background to impacted	Prior samples have shown impacts
1017R	10/8/13	Clinker	Background to impacted	Prior samples have shown impacts
1017R	5/29/14	Clinker	Background to impacted	Prior samples have shown impacts
1017R	8/19/14	Clinker	Background to impacted	Prior samples have shown impacts
1017R	3/5/15	Clinker	Background to impacted	Prior samples have shown impacts
1035R	9/3/09	Clinker	Background to impacted	Prior samples have shown impacts
1036R	12/1/13	Clinker	Background to impacted	Prior samples have shown impacts
1036R	5/9/14	Clinker	Background to impacted	Prior samples have shown impacts
1036R	4/10/15	Clinker	Background to impacted	Prior samples have shown impacts
1120C	11/10/11	Clinker	Background to impacted	Prior samples have shown impacts
1120C	7/11/12	Clinker	Background to impacted	Prior samples have shown impacts
1120C	12/19/12	Clinker	Background to impacted	Prior samples have shown impacts
368D	7/1/94	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	11/15/94	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	6/27/95	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	10/18/95	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	5/13/96	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	10/15/96	Clinker	Background to impacted	Groundwater impacted from Stage I

Well ID	Sample Date	Target Interval	Direction	Criteria
				pond
368D	5/22/97	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	9/25/97	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	5/12/98	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	9/25/98	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	5/25/99	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	10/28/99	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	4/25/00	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	10/12/00	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	10/16/01	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	6/5/02	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	10/14/02	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	5/14/03	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	10/20/03	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	7/13/04	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	11/9/04	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	6/6/05	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	10/20/05	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	6/14/06	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	10/25/06	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	5/28/07	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	10/23/07	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	4/14/08	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	10/1/08	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	5/7/09	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	9/30/09	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	5/11/10	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	10/18/10	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	4/15/11	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	11/9/11	Clinker	Background to impacted	Groundwater impacted from Stage I

Well ID	Sample Date	Target Interval	Direction	Criteria
				pond
368D	5/15/12	Clinker	Background to impacted	Impacts observed
368D	10/4/12	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	5/7/13	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	10/17/13	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	4/24/14	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	9/9/14	Clinker	Background to impacted	Groundwater impacted from Stage I pond
368D	3/16/15	Clinker	Background to impacted	Groundwater impacted from Stage I pond
586R	9/23/08	Clinker	Background to impacted	Groundwater impacted from Stage I pond
586R	6/26/12	Clinker	Background to impacted	Groundwater impacted from Stage I pond
586R	12/17/12	Clinker	Background to impacted	Groundwater impacted from Stage I pond
586R	6/21/13	Clinker	Background to impacted	Groundwater impacted from Stage I pond
586R	11/30/13	Clinker	Background to impacted	Groundwater impacted from Stage I pond
638C	9/26/07	Clinker	Background to impacted	Prior samples have shown impacts
638C	3/13/08	Clinker	Background to impacted	Prior samples have shown impacts
638C	9/10/08	Clinker	Background to impacted	Prior samples have shown impacts
638C	3/16/09	Clinker	Background to impacted	Prior samples have shown impacts
638C	9/11/09	Clinker	Background to impacted	Prior samples have shown impacts
638C	3/25/10	Clinker	Background to impacted	Prior samples have shown impacts
638C	9/14/10	Clinker	Background to impacted	Prior samples have shown impacts
638C	6/14/11	Clinker	Background to impacted	Prior samples have shown impacts
638C	10/28/11	Clinker	Background to impacted	Prior samples have shown impacts
642P	5/10/14	Clinker	Background to impacted	Impacts observed
643P	9/28/10	Clinker	Background to impacted	Prior samples have shown impacts
643P	6/15/11	Clinker	Background to impacted	Prior samples have shown impacts
643P	11/8/11	Clinker	Background to impacted	Prior samples have shown impacts
643P	10/14/14	Clinker	Background to impacted	Prior samples have shown impacts
694R	9/19/07	Clinker	Background to impacted	Prior samples have shown impacts
694R	3/26/08	Clinker	Background to impacted	Prior samples have shown impacts
694R	9/17/08	Clinker	Background to impacted	Prior samples have shown impacts
694R	3/18/09	Clinker	Background to impacted	Prior samples have shown impacts
694R	9/3/09	Clinker	Background to impacted	Prior samples have shown impacts
694R	3/24/10	Clinker	Background to impacted	Prior samples have shown impacts
694R	9/13/10	Clinker	Background to impacted	Prior samples have shown impacts
694R	5/26/11	Clinker	Background to impacted	Prior samples have shown impacts
694R	11/2/11	Clinker	Background to impacted	Prior samples have shown impacts
694R	4/4/12	Clinker	Background to impacted	Prior samples have shown impacts
694R	8/28/12	Clinker	Background to impacted	Prior samples have shown impacts
694R	3/25/13	Clinker	Background to impacted	Prior samples have shown impacts
694R	10/8/13	Clinker	Background to impacted	Prior samples have shown impacts
694R	5/29/14	Clinker	Background to impacted	Prior samples have shown impacts
694R	8/19/14	Clinker	Background to impacted	Prior samples have shown impacts
694R	3/5/15	Clinker	Background to impacted	Prior samples have shown impacts
696R	5/15/06	Clinker	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
696R	9/30/06	Clinker	Background to impacted	Prior samples have shown impacts
696R	4/21/07	Clinker	Background to impacted	Prior samples have shown impacts
696R	9/20/07	Clinker	Background to impacted	Prior samples have shown impacts
696R	4/7/08	Clinker	Background to impacted	Prior samples have shown impacts
696R	9/23/08	Clinker	Background to impacted	Prior samples have shown impacts
696R	3/23/09	Clinker	Background to impacted	Prior samples have shown impacts
696R	9/11/09	Clinker	Background to impacted	Prior samples have shown impacts
696R	3/30/10	Clinker	Background to impacted	Prior samples have shown impacts
696R	9/27/10	Clinker	Background to impacted	Prior samples have shown impacts
696R	5/24/11	Clinker	Background to impacted	Prior samples have shown impacts
696R	11/4/11	Clinker	Background to impacted	Prior samples have shown impacts
696R	6/27/12	Clinker	Background to impacted	Prior samples have shown impacts
696R	5/14/14	Clinker	Background to impacted	Prior samples have shown impacts
698R	5/25/11	Clinker	Background to impacted	Impacts observed
698R	11/7/11	Clinker	Background to impacted	Impacts observed
698R	6/24/12	Clinker	Background to impacted	Impacts observed
698R	12/11/12	Clinker	Background to impacted	Impacts observed
698R	6/4/13	Clinker	Background to impacted	Impacts observed
698R	12/1/13	Clinker	Background to impacted	Impacts observed
698R	5/9/14	Clinker	Background to impacted	Impacts observed
698R	10/1/14	Clinker	Background to impacted	Impacts observed
698R	4/17/15	Clinker	Background to impacted	Impacts observed
374S	10/13/95	Colluvium	Background to impacted	Prior samples have shown impacts
25SP	11/3/87	Interburden	Background to impacted	Prior samples have shown impacts
25SP	10/5/88	Interburden	Background to impacted	Prior samples have shown impacts
25SP	4/27/89	Interburden	Background to impacted	Prior samples have shown impacts
25SP	10/20/89	Interburden	Background to impacted	Prior samples have shown impacts
25SP	4/17/90	Interburden	Background to impacted	Prior samples have shown impacts
25SP	9/19/90	Interburden	Background to impacted	Prior samples have shown impacts
39S	8/24/93	Interburden	Background to impacted	The first two samples are likely affected by drilling water
39S	11/29/94	Interburden	Non-background to baseline	No impacts observed
39S	3/21/95	Interburden	Non-background to baseline	No impacts observed
39S	10/26/95	Interburden	Non-background to baseline	No impacts observed
39S	4/9/96	Interburden	Non-background to baseline	No impacts observed
39S	9/24/96	Interburden	Non-background to baseline	No impacts observed
39S	4/17/97	Interburden	Non-background to baseline	No impacts observed
39S	10/16/97	Interburden	Non-background to baseline	No impacts observed
39S	4/15/98	Interburden	Non-background to baseline	No impacts observed
39S	10/1/98	Interburden	Non-background to baseline	No impacts observed
39S	4/22/99	Interburden	Non-background to baseline	No impacts observed
39S	11/10/99	Interburden	Non-background to baseline	No impacts observed
39S	5/23/00	Interburden	Non-background to baseline	No impacts observed
39S	10/25/00	Interburden	Non-background to baseline	No impacts observed
39S	3/29/01	Interburden	Non-background to baseline	No impacts observed
39S	9/10/01	Interburden	Non-background to baseline	No impacts observed
39S	6/13/02	Interburden	Non-background to baseline	No impacts observed
39S	11/5/02	Interburden	Non-background to baseline	No impacts observed
39S	5/28/03	Interburden	Non-background to baseline	No impacts observed
39S	11/6/03	Interburden	Non-background to baseline	No impacts observed
39S	5/18/04	Interburden	Non-background to baseline	No impacts observed
39S	10/20/04	Interburden	Non-background to baseline	No impacts observed
39S	6/20/05	Interburden	Non-background to baseline	No impacts observed
39S	11/16/05	Interburden	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
39S	6/26/06	Interburden	Non-background to baseline	No impacts observed
39S	11/9/06	Interburden	Non-background to baseline	No impacts observed
39S	6/18/07	Interburden	Non-background to baseline	No impacts observed
39S	11/13/07	Interburden	Non-background to baseline	No impacts observed
39S	5/12/08	Interburden	Non-background to baseline	No impacts observed
39S	11/3/08	Interburden	Non-background to baseline	No impacts observed
39S	4/8/09	Interburden	Non-background to baseline	No impacts observed
39S	10/29/09	Interburden	Non-background to baseline	No impacts observed
39S	4/20/10	Interburden	Non-background to baseline	No impacts observed
39S	10/5/10	Interburden	Non-background to baseline	No impacts observed
39S	3/17/11	Interburden	Non-background to baseline	No impacts observed
39S	10/5/11	Interburden	Non-background to baseline	No impacts observed
39S	4/10/12	Interburden	Non-background to baseline	No impacts observed
39S	10/4/12	Interburden	Non-background to baseline	No impacts observed
39S	4/9/13	Interburden	Non-background to baseline	No impacts observed
39S	10/2/13	Interburden	Non-background to baseline	No impacts observed
39S	4/2/14	Interburden	Non-background to baseline	No impacts observed
39S	10/17/14	Interburden	Non-background to baseline	No impacts observed
39S	4/28/15	Interburden	Non-background to baseline	No impacts observed
WI-100	10/31/79	Interburden	Non-background to baseline	No impacts observed
WI-100	3/14/80	Interburden	Non-background to baseline	No impacts observed
WI-100	9/10/82	Interburden	Non-background to baseline	No impacts observed
WI-101	12/30/81	Interburden	Non-background to baseline	Upgradient of plant site
WI-101	10/5/83	Interburden	Non-background to baseline	No impacts observed
WI-101	12/16/83	Interburden	Non-background to baseline	Upgradient of plant site
WI-101	5/10/84	Interburden	Non-background to baseline	No impacts observed
WI-101	8/9/84	Interburden	Non-background to baseline	Upgradient of plant site
WI-101	12/9/85	Interburden	Non-background to baseline	Upgradient of plant site
WI-101	9/22/87	Interburden	Non-background to baseline	Upgradient of plant site
WI-102	10/17/83	Interburden	Non-background to baseline	No impacts observed
WI-102	12/8/83	Interburden	Non-background to baseline	Upgradient of plant site
WI-102	12/6/85	Interburden	Non-background to baseline	Upgradient of plant site
WI-102	5/24/88	Interburden	Non-background to baseline	No impacts observed
WI-102	10/9/91	Interburden	Non-background to baseline	No impacts observed
WI-102	11/11/91	Interburden	Non-background to baseline	Upgradient of plant site
WI-102	11/16/93	Interburden	Non-background to baseline	Upgradient of plant site
WI-102	7/27/95	Interburden	Non-background to baseline	Upgradient of plant site
WI-102	8/4/99	Interburden	Non-background to baseline	Upgradient of plant site
WI-102	8/21/02	Interburden	Non-background to baseline	Upgradient of plant site
WI-102	9/18/08	Interburden	Non-background to baseline	Upgradient of plant site
WI-102	9/21/11	Interburden	Non-background to baseline	Upgradient of plant site
WI-102	8/27/14	Interburden	Non-background to baseline	Upgradient of plant site
WI-103	10/3/83	Interburden	Non-background to baseline	No impacts observed
WI-104	9/23/80	Interburden	Non-background to baseline	Upgradient of plant site
WI-104	5/3/83	Interburden	Non-background to baseline	No impacts observed
WI-104	11/25/84	Interburden	Non-background to baseline	Upgradient of plant site
WI-104	1/16/87	Interburden	Non-background to baseline	No impacts observed
WI-104	8/16/88	Interburden	Non-background to baseline	Upgradient of plant site
WI-104	8/24/90	Interburden	Non-background to baseline	No impacts observed
WI-104	8/31/90	Interburden	Non-background to baseline	Upgradient of plant site
WI-104	7/20/92	Interburden	Non-background to baseline	Upgradient of plant site
WI-105	10/4/83	Interburden	Non-background to baseline	No impacts observed
WI-106	7/13/78	Interburden	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
WI-106	9/30/81	Interburden	Non-background to baseline	No impacts observed
WI-106	9/23/82	Interburden	Non-background to baseline	No impacts observed
WI-106	1/16/87	Interburden	Non-background to baseline	No impacts observed
WI-106	7/6/88	Interburden	Non-background to baseline	No impacts observed
WI-106	7/9/90	Interburden	Non-background to baseline	No impacts observed
WI-106	7/26/90	Interburden	Non-background to baseline	No impacts observed
WI-106	7/27/92	Interburden	Non-background to baseline	No impacts observed
WI-106	8/14/96	Interburden	Non-background to baseline	No impacts observed
WI-106	8/25/97	Interburden	Non-background to baseline	No impacts observed
WI-106	8/19/03	Interburden	Non-background to baseline	No impacts observed
WI-106	8/24/06	Interburden	Non-background to baseline	No impacts observed
WI-106	9/16/09	Interburden	Non-background to baseline	No impacts observed
WI-106	9/18/12	Interburden	Non-background to baseline	No impacts observed
WI-107	1/16/87	Interburden	Non-background to baseline	No impacts observed
WI-107	7/7/88	Interburden	Non-background to baseline	No impacts observed
WI-107	7/9/90	Interburden	Non-background to baseline	No impacts observed
WI-107	8/14/96	Interburden	Non-background to baseline	No impacts observed
WI-107	8/11/98	Interburden	Non-background to baseline	No impacts observed
WI-107	8/6/01	Interburden	Non-background to baseline	No impacts observed
WI-107	9/10/07	Interburden	Non-background to baseline	No impacts observed
WI-107	9/16/10	Interburden	Non-background to baseline	No impacts observed
WI-107	9/26/13	Interburden	Non-background to baseline	No impacts observed
WI-109	11/3/11	Interburden	Background to impacted	Prior samples have shown impacts
WI-109	7/11/12	Interburden	Background to impacted	Prior samples have shown impacts
WI-109	9/17/12	Interburden	Background to impacted	Prior samples have shown impacts
WI-109	12/20/12	Interburden	Background to impacted	Prior samples have shown impacts
WI-109	6/20/13	Interburden	Background to impacted	Prior samples have shown impacts
WI-109	5/28/14	Interburden	Background to impacted	Prior samples have shown impacts
WI-110	5/12/81	Interburden	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
WI-110	2/17/87	Interburden	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
WI-110	7/12/90	Interburden	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
WI-110	6/24/92	Interburden	Non-background to baseline	No impacts observed
WI-110	10/8/92	Interburden	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
WI-110	9/8/94	Interburden	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
WI-110	7/29/96	Interburden	Non-background to baseline	No impacts observed
WI-110	8/17/98	Interburden	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
WI-110	8/9/01	Interburden	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
WI-110	7/1/02	Interburden	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
WI-110	8/10/04	Interburden	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
WI-110	9/10/07	Interburden	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
WI-110	9/16/10	Interburden	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
WI-110	9/27/13	Interburden	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
WI-111	8/16/81	Interburden	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
WI-111	9/26/82	Interburden	Non-background to baseline	No impacts observed
WI-111	10/13/83	Interburden	Non-background to baseline	No impacts observed
WI-111	1/16/87	Interburden	Non-background to baseline	No impacts observed
WI-111	8/13/90	Interburden	Non-background to baseline	No impacts observed
WI-111	8/28/96	Interburden	Non-background to baseline	No impacts observed
WI-111	9/8/05	Interburden	Non-background to baseline	No impacts observed
WI-113	8/15/81	Interburden	Non-background to baseline	Upgradient of plant site
WI-113	9/25/82	Interburden	Non-background to baseline	No impacts observed
WI-113	10/5/83	Interburden	Non-background to baseline	No impacts observed
WI-113	12/18/83	Interburden	Non-background to baseline	Upgradient of plant site
WI-113	5/9/84	Interburden	Non-background to baseline	No impacts observed
WI-113	8/9/84	Interburden	Non-background to baseline	Upgradient of plant site
WI-113	3/27/86	Interburden	Non-background to baseline	No impacts observed
WI-113	5/12/87	Interburden	Non-background to baseline	Upgradient of plant site
WI-113	7/23/90	Interburden	Non-background to baseline	Upgradient of plant site
WI-113	6/29/92	Interburden	Non-background to baseline	No impacts observed
WI-113	11/27/92	Interburden	Non-background to baseline	Upgradient of plant site
WI-113	7/25/94	Interburden	Non-background to baseline	Upgradient of plant site
WI-113	8/21/96	Interburden	Non-background to baseline	No impacts observed
WI-113	8/25/97	Interburden	Non-background to baseline	Upgradient of plant site
WI-113	7/7/00	Interburden	Non-background to baseline	Upgradient of plant site
WI-113	8/18/03	Interburden	Non-background to baseline	Upgradient of plant site
WI-114	9/25/82	Interburden	Non-background to baseline	No impacts observed
WI-114	9/26/84	Interburden	Non-background to baseline	Upgradient of plant site
WI-114	12/19/85	Interburden	Non-background to baseline	Upgradient of plant site
WI-114	6/8/88	Interburden	Non-background to baseline	No impacts observed
WI-114	10/1/91	Interburden	Non-background to baseline	No impacts observed
WI-114	10/1/93	Interburden	Non-background to baseline	Upgradient of plant site
WI-114	8/10/95	Interburden	Non-background to baseline	Upgradient of plant site
WI-114	9/9/98	Interburden	Non-background to baseline	Upgradient of plant site
WI-114	9/25/01	Interburden	Non-background to baseline	Upgradient of plant site
WI-115	8/14/81	Interburden	Non-background to baseline	Upgradient of plant site
WI-115	5/12/82	Interburden	Non-background to baseline	Upgradient of plant site
WI-115	5/10/83	Interburden	Non-background to baseline	No impacts observed
WI-115	8/16/84	Interburden	Non-background to baseline	Upgradient of plant site
WI-115	9/26/84	Interburden	Non-background to baseline	Upgradient of plant site
WI-115	3/27/86	Interburden	Non-background to baseline	No impacts observed
WI-115	5/12/87	Interburden	Non-background to baseline	Upgradient of plant site
WI-115	3/31/92	Interburden	Non-background to baseline	No impacts observed
WI-115	8/10/95	Interburden	Non-background to baseline	Upgradient of plant site
WI-115	8/19/96	Interburden	Non-background to baseline	No impacts observed
WI-116	7/29/81	Interburden	Background to impacted	This is the first sample. The rest of the samples were excluded and this one is likely better quality due to drilling water.
WI-152	12/1/81	Interburden	Non-background to baseline	Upgradient of plant site
WI-152	5/13/82	Interburden	Non-background to baseline	Upgradient of plant site
WI-152	12/13/84	Interburden	Non-background to baseline	Upgradient of plant site
WI-152	2/20/86	Interburden	Non-background to baseline	Upgradient of plant site
WI-152	2/26/87	Interburden	Non-background to baseline	Upgradient of plant site
WI-152	9/15/95	Interburden	Non-background to baseline	Upgradient of plant site
WI-152	7/29/96	Interburden	Non-background to baseline	Upgradient of plant site
WI-152	8/5/97	Interburden	Non-background to baseline	Upgradient of plant site
WI-153	12/15/81	Interburden	Non-background to baseline	Upgradient of plant site

Well ID	Sample Date	Target Interval	Direction	Criteria
WI-153	9/26/82	Interburden	Non-background to baseline	No impacts observed
WI-153	9/28/87	Interburden	Non-background to baseline	Upgradient of plant site
WI-153	10/31/89	Interburden	Non-background to baseline	Upgradient of plant site
WI-153	7/8/91	Interburden	Non-background to baseline	Upgradient of plant site
WI-153	11/18/93	Interburden	Non-background to baseline	Upgradient of plant site
WI-153	7/24/95	Interburden	Non-background to baseline	No impacts observed
WI-153	8/29/96	Interburden	Non-background to baseline	Upgradient of plant site
WI-153	8/6/97	Interburden	Non-background to baseline	Upgradient of plant site
WI-153	7/2/00	Interburden	Non-background to baseline	Upgradient of plant site
WI-153	8/25/03	Interburden	Non-background to baseline	Upgradient of plant site
WI-153	8/23/06	Interburden	Non-background to baseline	Upgradient of plant site
WI-153	9/15/09	Interburden	Non-background to baseline	Upgradient of plant site
WI-153	9/16/10	Interburden	Non-background to baseline	Upgradient of plant site
WI-153	9/21/11	Interburden	Non-background to baseline	Upgradient of plant site
WI-153	9/21/12	Interburden	Non-background to baseline	Upgradient of plant site
WI-154	9/26/82	Interburden	Non-background to baseline	No impacts observed
WI-154	5/3/83	Interburden	Non-background to baseline	No impacts observed
WI-154	5/11/84	Interburden	Non-background to baseline	No impacts observed
WI-154	2/13/87	Interburden	Non-background to baseline	No impacts observed
WI-155	12/9/81	Interburden	Non-background to baseline	No impacts observed
WI-155	9/23/82	Interburden	Non-background to baseline	No impacts observed
WI-157	8/16/82	Interburden	Non-background to baseline	Upgradient of plant site
WI-157	9/30/83	Interburden	Non-background to baseline	No impacts observed
WI-157	10/22/85	Interburden	Non-background to baseline	Upgradient of plant site
WI-157	5/24/88	Interburden	Non-background to baseline	No impacts observed
WI-157	9/5/89	Interburden	Non-background to baseline	Upgradient of plant site
WI-157	10/10/91	Interburden	Non-background to baseline	No impacts observed
WI-157	11/3/93	Interburden	Non-background to baseline	Upgradient of plant site
WI-157	8/1/95	Interburden	Non-background to baseline	Upgradient of plant site
WI-157	9/14/98	Interburden	Non-background to baseline	Upgradient of plant site
WI-157	9/4/01	Interburden	Non-background to baseline	Upgradient of plant site
WI-157	8/10/04	Interburden	Non-background to baseline	Upgradient of plant site
WI-157	9/6/07	Interburden	Non-background to baseline	Upgradient of plant site
WI-157	9/15/10	Interburden	Non-background to baseline	Upgradient of plant site
WI-157	9/26/13	Interburden	Non-background to baseline	Upgradient of plant site
WI-159	8/22/82	Interburden	Non-background to baseline	Upgradient of plant site
WI-159	9/30/83	Interburden	Non-background to baseline	No impacts observed
WI-159	12/7/83	Interburden	Non-background to baseline	Upgradient of plant site
WI-159	5/10/84	Interburden	Non-background to baseline	No impacts observed
WI-159	7/18/84	Interburden	Non-background to baseline	Upgradient of plant site
WI-159	12/11/85	Interburden	Non-background to baseline	Upgradient of plant site
WI-159	5/24/88	Interburden	Non-background to baseline	No impacts observed
WI-159	10/9/91	Interburden	Non-background to baseline	No impacts observed
WI-159	9/20/93	Interburden	Non-background to baseline	Upgradient of plant site
WI-159	8/4/95	Interburden	Non-background to baseline	Upgradient of plant site
WI-159	8/10/99	Interburden	Non-background to baseline	Upgradient of plant site
WI-159	8/27/02	Interburden	Non-background to baseline	Upgradient of plant site
WI-159	9/8/05	Interburden	Non-background to baseline	Upgradient of plant site
WI-159	9/17/08	Interburden	Non-background to baseline	Upgradient of plant site
WI-159	9/21/11	Interburden	Non-background to baseline	Upgradient of plant site
WI-159	8/28/14	Interburden	Non-background to baseline	Upgradient of plant site
WI-160	3/11/92	Interburden	Non-background to baseline	No impacts observed
WI-160	8/26/96	Interburden	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
WI-160	8/12/97	Interburden	Non-background to baseline	No impacts observed
WI-161	5/6/83	Interburden	Non-background to baseline	No impacts observed
WI-161	5/10/84	Interburden	Non-background to baseline	No impacts observed
WI-161	7/26/90	Interburden	Non-background to baseline	No impacts observed
WI-162	1/21/83	Interburden	Non-background to baseline	No impacts observed
WI-162	5/5/83	Interburden	Non-background to baseline	No impacts observed
WI-162	8/7/84	Interburden	Non-background to baseline	No impacts observed
WI-162	6/26/86	Interburden	Non-background to baseline	No impacts observed
WI-162	7/14/92	Interburden	Non-background to baseline	No impacts observed
WI-162	8/27/96	Interburden	Non-background to baseline	No impacts observed
WI-163	9/1/82	Interburden	Non-background to baseline	No impacts observed
WI-163	10/3/83	Interburden	Non-background to baseline	No impacts observed
WI-164	10/19/82	Interburden	Non-background to baseline	Upgradient of plant site
WI-164	3/26/86	Interburden	Non-background to baseline	No impacts observed
WI-164	7/14/86	Interburden	Non-background to baseline	Upgradient of plant site
WI-164	7/19/90	Interburden	Non-background to baseline	Upgradient of plant site
WI-164	7/17/92	Interburden	Non-background to baseline	No impacts observed
WI-164	12/2/92	Interburden	Non-background to baseline	Upgradient of plant site
WI-164	6/15/94	Interburden	Non-background to baseline	Upgradient of plant site
WI-164	8/27/96	Interburden	Non-background to baseline	No impacts observed
WI-164	8/26/97	Interburden	Non-background to baseline	Upgradient of plant site
WI-165	9/1/82	Interburden	Non-background to baseline	No impacts observed
WI-165	5/4/83	Interburden	Non-background to baseline	No impacts observed
WI-165	5/11/84	Interburden	Non-background to baseline	No impacts observed
WI-165	8/17/84	Interburden	Non-background to baseline	No impacts observed
WI-165	7/21/86	Interburden	Non-background to baseline	No impacts observed
WI-165	9/15/88	Interburden	Non-background to baseline	No impacts observed
WI-165	8/10/90	Interburden	Non-background to baseline	No impacts observed
WI-165	8/21/96	Interburden	Non-background to baseline	No impacts observed
WI-166	9/23/85	Interburden	Non-background to baseline	Upgradient of plant site
WI-166	6/24/86	Interburden	Non-background to baseline	Upgradient of plant site
WI-166	9/6/88	Interburden	Non-background to baseline	No impacts observed
WI-166	6/29/90	Interburden	Non-background to baseline	Upgradient of plant site
WI-166	6/29/92	Interburden	Non-background to baseline	No impacts observed
WI-166	12/14/92	Interburden	Non-background to baseline	Upgradient of plant site
WI-166	9/1/94	Interburden	Non-background to baseline	Upgradient of plant site
WI-166	8/21/96	Interburden	Non-background to baseline	No impacts observed
WI-167	8/5/82	Interburden	Non-background to baseline	Upgradient of plant site
WI-168	8/4/82	Interburden	Non-background to baseline	Upgradient of plant site
WI-168	3/25/86	Interburden	Non-background to baseline	No impacts observed
WI-168	7/24/86	Interburden	Non-background to baseline	Upgradient of plant site
WI-168	11/23/87	Interburden	Non-background to baseline	Upgradient of plant site
WI-168	10/27/89	Interburden	Non-background to baseline	Upgradient of plant site
WI-168	8/8/91	Interburden	Non-background to baseline	Upgradient of plant site
WI-168	11/30/93	Interburden	Non-background to baseline	Upgradient of plant site
WI-168	7/24/95	Interburden	Non-background to baseline	No impacts observed
WI-168	8/8/96	Interburden	Non-background to baseline	Upgradient of plant site
WI-168	8/27/97	Interburden	Non-background to baseline	Upgradient of plant site
WI-168	6/5/00	Interburden	Non-background to baseline	Upgradient of plant site
WI-168	8/27/03	Interburden	Non-background to baseline	Upgradient of plant site
WI-168	8/28/06	Interburden	Non-background to baseline	Upgradient of plant site
WI-168	9/17/09	Interburden	Non-background to baseline	Upgradient of plant site
WI-168	9/24/12	Interburden	Non-background to baseline	Upgradient of plant site

Well ID	Sample Date	Target Interval	Direction	Criteria
WI-169	10/17/82	Interburden	Non-background to baseline	Upgradient of plant site
WI-169	5/19/87	Interburden	Non-background to baseline	Upgradient of plant site
WI-169	7/4/90	Interburden	Non-background to baseline	Upgradient of plant site
WI-169	6/29/92	Interburden	Non-background to baseline	No impacts observed
WI-171	11/5/82	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-171	9/30/83	Interburden	Non-background to baseline	No impacts observed
WI-171	12/15/83	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-171	3/12/86	Interburden	Non-background to baseline	No impacts observed
WI-171	7/22/86	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-171	10/14/87	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-171	12/22/93	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-171	7/22/95	Interburden	Non-background to baseline	No impacts observed
WI-171	8/20/96	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-171	6/5/00	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-171	8/25/03	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-171	8/12/04	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-171	8/22/06	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-171	9/16/09	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-171	9/20/12	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-172	11/2/82	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-172	3/14/84	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-172	1/19/87	Interburden	Non-background to baseline	No impacts observed
WI-172	9/9/88	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-172	7/31/90	Interburden	Non-background to baseline	No impacts observed
WI-172	8/2/90	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-172	8/8/96	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-172	9/28/98	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-172	9/27/01	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-172	8/12/04	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-172	9/6/07	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-172	9/14/10	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-172	9/24/13	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-173	11/1/82	Interburden	Non-background to baseline	No impacts observed
WI-173	5/3/83	Interburden	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
WI-173	11/23/84	Interburden	Non-background to baseline	No impacts observed
WI-173	6/25/86	Interburden	Non-background to baseline	No impacts observed
WI-173	8/7/90	Interburden	Non-background to baseline	No impacts observed
WI-173	8/21/96	Interburden	Non-background to baseline	No impacts observed
WI-173	9/3/97	Interburden	Non-background to baseline	No impacts observed
WI-174	1/21/83	Interburden	Non-background to baseline	Upgradient of plant site in undisturbed area
WI-174	12/17/85	Interburden	Non-background to baseline	Upgradient of plant site in undisturbed area
WI-174	9/20/88	Interburden	Non-background to baseline	No impacts observed
WI-174	10/9/91	Interburden	Non-background to baseline	No impacts observed
WI-174	8/8/95	Interburden	Non-background to baseline	Upgradient of plant site in undisturbed area
WI-175	5/10/83	Interburden	Non-background to baseline	No impacts observed
WI-175	7/13/90	Interburden	Non-background to baseline	No impacts observed
WI-175	7/31/97	Interburden	Non-background to baseline	No impacts observed
WI-176	1/24/84	Interburden	Non-background to baseline	No impacts observed
WI-176	1/14/87	Interburden	Non-background to baseline	No impacts observed
WI-176	6/17/88	Interburden	Non-background to baseline	No impacts observed
WI-176	11/10/89	Interburden	Non-background to baseline	No impacts observed
WI-176	7/31/90	Interburden	Non-background to baseline	No impacts observed
WI-176	7/17/96	Interburden	Non-background to baseline	No impacts observed
WI-176	7/30/97	Interburden	Non-background to baseline	No impacts observed
WI-177	1/24/84	Interburden	Non-background to baseline	No impacts observed
WI-177	11/25/84	Interburden	Non-background to baseline	No impacts observed
WI-177	3/11/86	Interburden	Non-background to baseline	No impacts observed
WI-177	7/29/91	Interburden	Non-background to baseline	No impacts observed
WI-177	7/20/95	Interburden	Non-background to baseline	No impacts observed
WI-177	8/12/04	Interburden	Non-background to baseline	No impacts observed
WI-178	1/29/84	Interburden	Non-background to baseline	Upgradient of plant site
WI-178	5/11/84	Interburden	Non-background to baseline	No impacts observed
WI-178	1/19/87	Interburden	Non-background to baseline	No impacts observed
WI-178	6/23/88	Interburden	Non-background to baseline	Upgradient of plant site
WI-178	7/31/90	Interburden	Non-background to baseline	No impacts observed
WI-178	8/20/92	Interburden	Non-background to baseline	Upgradient of plant site
WI-178	7/18/96	Interburden	Non-background to baseline	Upgradient of plant site
WI-178	10/6/99	Interburden	Non-background to baseline	Upgradient of plant site
WI-178	8/26/03	Interburden	Non-background to baseline	Upgradient of plant site
WI-178	8/23/06	Interburden	Non-background to baseline	Upgradient of plant site
WI-178	9/15/09	Interburden	Non-background to baseline	Upgradient of plant site
WI-178	9/20/12	Interburden	Non-background to baseline	Upgradient of plant site
WI-179	2/15/84	Interburden	Non-background to baseline	Upgradient of plant site
WI-179	12/11/84	Interburden	Non-background to baseline	Upgradient of plant site
WI-179	1/19/87	Interburden	Non-background to baseline	No impacts observed
WI-179	6/28/88	Interburden	Non-background to baseline	Upgradient of plant site
WI-179	8/13/90	Interburden	Non-background to baseline	No impacts observed
WI-179	7/17/96	Interburden	Non-background to baseline	Upgradient of plant site
WI-179	7/23/97	Interburden	Non-background to baseline	Upgradient of plant site
WI-180	1/29/84	Interburden	Non-background to baseline	No impacts observed
WI-180	5/11/84	Interburden	Non-background to baseline	No impacts observed
WI-180	9/25/85	Interburden	Non-background to baseline	No impacts observed
WI-180	6/3/88	Interburden	Non-background to baseline	No impacts observed
WI-180	7/17/89	Interburden	Non-background to baseline	No impacts observed
WI-180	9/4/91	Interburden	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
WI-180	10/5/93	Interburden	Non-background to baseline	No impacts observed
WI-180	7/18/95	Interburden	Non-background to baseline	No impacts observed
WI-180	7/17/96	Interburden	Non-background to baseline	No impacts observed
WI-180	9/23/99	Interburden	Non-background to baseline	No impacts observed
WI-181	2/16/84	Interburden	Non-background to baseline	Upgradient of plant site
WI-181	12/27/84	Interburden	Non-background to baseline	Upgradient of plant site
WI-181	7/22/88	Interburden	Non-background to baseline	Upgradient of plant site
WI-181	7/26/90	Interburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WI-181	8/10/92	Interburden	Non-background to baseline	Upgradient of plant site
WI-181	8/7/96	Interburden	Non-background to baseline	Upgradient of plant site
WI-181	10/10/00	Interburden	Non-background to baseline	Upgradient of plant site
WI-181	8/12/04	Interburden	Non-background to baseline	Upgradient of plant site
WI-181	9/5/07	Interburden	Non-background to baseline	Upgradient of plant site
WI-181	9/15/10	Interburden	Non-background to baseline	Upgradient of plant site
WI-181	9/24/13	Interburden	Non-background to baseline	Upgradient of plant site
WI-182	12/17/85	Interburden	Non-background to baseline	Upgradient of plant site
WI-182	9/22/88	Interburden	Non-background to baseline	Upgradient of plant site
WI-182	10/9/91	Interburden	Non-background to baseline	Upgradient of plant site
WI-182	11/5/91	Interburden	Non-background to baseline	Upgradient of plant site
WI-182	9/24/93	Interburden	Non-background to baseline	Upgradient of plant site
WI-182	8/7/95	Interburden	Non-background to baseline	Upgradient of plant site
WI-182	8/19/97	Interburden	Non-background to baseline	Upgradient of plant site
WI-182	7/9/00	Interburden	Non-background to baseline	Upgradient of plant site
WI-182	8/20/03	Interburden	Non-background to baseline	Upgradient of plant site
WI-182	8/25/06	Interburden	Non-background to baseline	Upgradient of plant site
WI-182	9/16/09	Interburden	Non-background to baseline	Upgradient of plant site
WI-182	9/18/12	Interburden	Non-background to baseline	Upgradient of plant site
WI-183	10/16/91	Interburden	Non-background to baseline	Upgradient of plant site
WI-184	12/7/85	Interburden	Non-background to baseline	No impacts observed
WI-184	2/12/87	Interburden	Non-background to baseline	No impacts observed
WI-184	8/9/96	Interburden	Non-background to baseline	No impacts observed
WI-184	8/5/99	Interburden	Non-background to baseline	No impacts observed
WI-184	12/14/99	Interburden	Non-background to baseline	No impacts observed
WI-184	1/17/00	Interburden	Non-background to baseline	No impacts observed
WI-184	2/8/00	Interburden	Non-background to baseline	No impacts observed
WI-184	8/28/02	Interburden	Non-background to baseline	No impacts observed
WI-184	9/8/05	Interburden	Non-background to baseline	Upgradient of plant site
WI-184	9/17/08	Interburden	Non-background to baseline	Upgradient of plant site
WI-184	9/21/11	Interburden	Non-background to baseline	Upgradient of plant site
WI-184	8/27/14	Interburden	Non-background to baseline	Upgradient of plant site
WI-185	12/8/85	Interburden	Non-background to baseline	No impacts observed
WI-185	2/9/87	Interburden	Non-background to baseline	No impacts observed
WI-185	8/22/96	Interburden	Non-background to baseline	No impacts observed
WI-185	8/13/97	Interburden	Non-background to baseline	No impacts observed
WI-186	8/21/96	Interburden	Non-background to baseline	No impacts observed
WI-186	7/23/98	Interburden	Non-background to baseline	Upgradient of plant site
WI-186	7/11/01	Interburden	Non-background to baseline	Upgradient of plant site
WI-186	8/11/04	Interburden	Non-background to baseline	Upgradient of plant site
WI-186	9/5/07	Interburden	Non-background to baseline	Upgradient of plant site
WI-186	9/14/10	Interburden	Non-background to baseline	Upgradient of plant site
WI-186	9/24/13	Interburden	Non-background to baseline	Upgradient of plant site
1006M	9/21/05	McKay Coal	Background to impacted	Prior samples have shown impacts
1006M	5/16/06	McKay Coal	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
1006M	9/21/06	McKay Coal	Background to impacted	Prior samples have shown impacts
1006M	4/25/07	McKay Coal	Background to impacted	Prior samples have shown impacts
1006M	10/1/07	McKay Coal	Background to impacted	Prior samples have shown impacts
1006M	3/25/08	McKay Coal	Background to impacted	Prior samples have shown impacts
1006M	9/20/08	McKay Coal	Background to impacted	Prior samples have shown impacts
1006M	3/17/09	McKay Coal	Background to impacted	Prior samples have shown impacts
1006M	9/10/09	McKay Coal	Background to impacted	Prior samples have shown impacts
1006M	3/23/10	McKay Coal	Background to impacted	Prior samples have shown impacts
1006M	9/22/10	McKay Coal	Background to impacted	Prior samples have shown impacts
1006M	5/26/11	McKay Coal	Background to impacted	Prior samples have shown impacts
1006M	9/1/11	McKay Coal	Background to impacted	Prior samples have shown impacts
1006M	7/8/12	McKay Coal	Background to impacted	Prior samples have shown impacts
1006M	12/17/12	McKay Coal	Background to impacted	Prior samples have shown impacts
1006M	6/5/13	McKay Coal	Background to impacted	Prior samples have shown impacts
1006M	11/24/13	McKay Coal	Background to impacted	Prior samples have shown impacts
1006M	10/22/14	McKay Coal	Background to impacted	Prior samples have shown impacts
1006M	5/8/15	McKay Coal	Background to impacted	Prior samples have shown impacts
1032M	3/12/09	McKay Coal	Background to impacted	Prior samples have shown impacts
1032M	3/17/10	McKay Coal	Background to impacted	Prior samples have shown impacts
1032M	9/27/10	McKay Coal	Background to impacted	Prior samples have shown impacts
1032M	11/2/11	McKay Coal	Background to impacted	Prior samples have shown impacts
1032M	12/1/12	McKay Coal	Background to impacted	Prior samples have shown impacts
1032M	6/19/13	McKay Coal	Background to impacted	Prior samples have shown impacts
1032M	10/26/13	McKay Coal	Background to impacted	Prior samples have shown impacts
1032M	4/16/15	McKay Coal	Background to impacted	Prior samples have shown impacts
1066M	11/21/08	McKay Coal	Non-background to baseline	Hi SC but all other parameters low, no large changes throughout record
1066M	3/12/09	McKay Coal	Non-background to baseline	Hi SC but all other parameters low, no large changes throughout record
1066M	9/2/09	McKay Coal	Non-background to baseline	Hi SC but all other parameters low, no large changes throughout record
1066M	3/17/10	McKay Coal	Non-background to baseline	Hi SC but all other parameters low, no large changes throughout record
1066M	9/28/10	McKay Coal	Non-background to baseline	Hi SC but all other parameters low, no large changes throughout record
1066M	6/13/11	McKay Coal	Non-background to baseline	Hi SC but all other parameters low, no large changes throughout record
1066M	11/1/11	McKay Coal	Non-background to baseline	Hi SC but all other parameters low, no large changes throughout record
1066M	7/11/12	McKay Coal	Non-background to baseline	Hi SC but all other parameters low, no large changes throughout record
1066M	12/1/12	McKay Coal	Non-background to baseline	Hi SC but all other parameters low, no large changes throughout record
1066M	6/19/13	McKay Coal	Non-background to baseline	Hi SC but all other parameters low, no large changes throughout record
1066M	10/26/13	McKay Coal	Non-background to baseline	Hi SC but all other parameters low, no large changes throughout record
1066M	5/11/14	McKay Coal	Non-background to baseline	Hi SC but all other parameters low, no large changes throughout record
1066M	10/15/14	McKay Coal	Non-background to baseline	Hi SC but all other parameters low, no large changes throughout record
1066M	4/16/15	McKay Coal	Non-background to baseline	Hi SC but all other parameters low, no large changes throughout record
10M	2/8/77	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	3/10/77	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	4/26/77	McKay Coal	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
10M	5/17/77	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	6/8/77	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	7/12/77	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	8/17/77	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	9/20/77	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	9/6/78	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	6/19/79	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	9/12/80	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	12/11/80	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	6/27/81	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	11/11/81	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	6/24/82	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	11/1/83	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	5/18/84	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	10/18/84	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	10/17/85	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	5/25/86	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	10/24/86	McKay Coal	Background to impacted	Prior samples have shown impacts
10M	5/22/87	McKay Coal	Background to impacted	Prior samples have shown impacts
1139M	11/22/11	McKay Coal	Non-background to baseline	Water quality is constant, downgradient of 1029M which was included in background
1139M	6/25/12	McKay Coal	Non-background to baseline	Water quality is constant, downgradient of 1029M which was included in background
1139M	12/1/12	McKay Coal	Non-background to baseline	Water quality is constant, downgradient of 1029M which was included in background
1139M	6/24/13	McKay Coal	Non-background to baseline	Water quality is constant, downgradient of 1029M which was included in background
1139M	11/24/13	McKay Coal	Non-background to baseline	Water quality is constant, downgradient of 1029M which was included in background
1139M	5/1/14	McKay Coal	Non-background to baseline	Water quality is constant, downgradient of 1029M which was included in background
1139M	10/13/14	McKay Coal	Non-background to baseline	Water quality is constant, downgradient of 1029M which was included in background
1139M	3/31/15	McKay Coal	Non-background to baseline	Water quality is constant, downgradient of 1029M which was included in background
1149M	6/24/13	McKay Coal	Background to impacted	Prior samples have shown impacts
1149M	11/20/13	McKay Coal	Background to impacted	Prior samples have shown impacts
1149M	5/7/14	McKay Coal	Background to impacted	Prior samples have shown impacts
1149M	10/9/14	McKay Coal	Background to impacted	Prior samples have shown impacts
1149M	3/31/15	McKay Coal	Background to impacted	Prior samples have shown impacts
1151M	11/21/12	McKay Coal	Non-background to baseline	Water quality is constant, downgradient of 1029M which was included in background
1159M	10/17/13	McKay Coal	Non-background to baseline	Water quality is constant, downgradient of 1029M which was included in background
1159M	5/11/14	McKay Coal	Non-background to baseline	Water quality is constant, downgradient of 1029M which was

Well ID	Sample Date	Target Interval	Direction	Criteria
				included in background
1159M	9/23/14	McKay Coal	Non-background to baseline	Water quality is constant, downgradient of 1029M which was included in background
1159M	4/15/15	McKay Coal	Non-background to baseline	Water quality is constant, downgradient of 1029M which was included in background
1160M	10/17/13	McKay Coal	Non-background to baseline	Water quality is constant, downgradient of 1029M which was included in background
1160M	5/11/14	McKay Coal	Non-background to baseline	Water quality is constant, downgradient of 1029M which was included in background
1160M	9/23/14	McKay Coal	Non-background to baseline	Water quality is constant, downgradient of 1029M which was included in background
1160M	4/22/15	McKay Coal	Non-background to baseline	Water quality is constant, downgradient of 1029M which was included in background
121-2	5/17/90	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	9/21/90	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	5/14/91	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	9/26/91	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	4/30/92	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	9/9/92	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	4/20/93	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	11/22/93	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	6/7/94	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	10/27/94	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	5/15/95	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	10/16/95	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	5/22/97	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	9/29/97	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	5/12/98	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	9/29/98	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	5/19/99	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	10/28/99	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	4/26/00	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	10/17/00	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	10/16/01	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	6/5/02	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	10/14/02	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	5/15/03	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	10/20/03	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	6/3/04	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	11/1/04	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	6/6/05	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	10/19/05	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	5/31/06	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	10/23/06	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	5/28/07	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	10/11/07	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	5/13/08	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	10/3/08	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	5/7/09	McKay Coal	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
121-2	9/29/09	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	5/17/10	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	9/20/10	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	5/3/11	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	11/14/11	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	5/7/12	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	10/3/12	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	5/7/13	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	10/17/13	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	4/24/14	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	9/9/14	McKay Coal	Background to impacted	Prior samples have shown impacts
121-2	3/13/15	McKay Coal	Background to impacted	Prior samples have shown impacts
12M	8/30/76	McKay Coal	Background to impacted	Impacts observed
12M	10/6/76	McKay Coal	Background to impacted	Impacts observed
12M	11/9/76	McKay Coal	Background to impacted	Impacts observed
12M	2/8/77	McKay Coal	Background to impacted	Impacts observed
12M	3/9/77	McKay Coal	Background to impacted	Impacts observed
12M	4/25/77	McKay Coal	Background to impacted	Impacts observed
12M	5/16/77	McKay Coal	Background to impacted	Impacts observed
12M	6/6/77	McKay Coal	Background to impacted	Impacts observed
12M	7/12/77	McKay Coal	Background to impacted	Impacts observed
12M	8/17/77	McKay Coal	Background to impacted	Impacts observed
12M	9/21/77	McKay Coal	Background to impacted	Impacts observed
12M	9/6/78	McKay Coal	Background to impacted	Impacts observed
12M	6/19/79	McKay Coal	Background to impacted	Impacts observed
12M	11/27/79	McKay Coal	Background to impacted	Impacts observed
12M	9/18/80	McKay Coal	Background to impacted	Impacts observed
12M	12/16/80	McKay Coal	Background to impacted	Impacts observed
12M	6/27/81	McKay Coal	Background to impacted	Impacts observed
12M	11/10/81	McKay Coal	Background to impacted	Impacts observed
12M	6/24/82	McKay Coal	Background to impacted	Impacts observed
12M	10/7/82	McKay Coal	Background to impacted	Impacts observed
12M	5/26/83	McKay Coal	Background to impacted	Impacts observed
12M	11/3/83	McKay Coal	Background to impacted	Impacts observed
12M	5/16/84	McKay Coal	Background to impacted	Impacts observed
12M	10/18/84	McKay Coal	Background to impacted	Impacts observed
12M	5/23/85	McKay Coal	Background to impacted	Impacts observed
12M	10/17/85	McKay Coal	Background to impacted	Impacts observed
12M	5/23/86	McKay Coal	Background to impacted	Impacts observed
12M	10/23/86	McKay Coal	Background to impacted	Impacts observed
12M	5/21/87	McKay Coal	Background to impacted	Impacts observed
12M	10/31/87	McKay Coal	Background to impacted	Impacts observed
12M	5/24/88	McKay Coal	Background to impacted	Impacts observed
12M	10/13/88	McKay Coal	Background to impacted	Impacts observed
12M	5/3/89	McKay Coal	Background to impacted	Impacts observed
12M	10/31/89	McKay Coal	Background to impacted	Impacts observed
12M	4/17/90	McKay Coal	Background to impacted	Impacts observed
12M	9/14/90	McKay Coal	Background to impacted	Impacts observed
12M	4/16/91	McKay Coal	Background to impacted	Impacts observed
12M	9/18/91	McKay Coal	Background to impacted	Impacts observed
12M	3/10/92	McKay Coal	Background to impacted	Impacts observed
12M	10/12/92	McKay Coal	Background to impacted	Impacts observed
12M	3/18/93	McKay Coal	Background to impacted	Impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
12M	10/14/93	McKay Coal	Background to impacted	Impacts observed
12M	3/30/94	McKay Coal	Background to impacted	Impacts observed
12M	10/19/94	McKay Coal	Background to impacted	Impacts observed
12M	4/18/95	McKay Coal	Background to impacted	Impacts observed
12M	10/24/95	McKay Coal	Background to impacted	Impacts observed
12M	9/18/96	McKay Coal	Background to impacted	Impacts observed
12M	4/17/97	McKay Coal	Background to impacted	Impacts observed
12M	10/21/97	McKay Coal	Background to impacted	Impacts observed
12M	4/10/98	McKay Coal	Background to impacted	Impacts observed
12M	10/16/98	McKay Coal	Background to impacted	Impacts observed
12M	4/14/99	McKay Coal	Background to impacted	Impacts observed
12M	11/16/99	McKay Coal	Background to impacted	Impacts observed
12M	5/25/00	McKay Coal	Background to impacted	Impacts observed
12M	11/9/00	McKay Coal	Background to impacted	Impacts observed
12M	5/30/01	McKay Coal	Background to impacted	Impacts observed
12M	7/20/01	McKay Coal	Background to impacted	Impacts observed
12M	6/11/02	McKay Coal	Background to impacted	Impacts observed
12M	10/23/02	McKay Coal	Background to impacted	Has prior impacts
12M	5/21/03	McKay Coal	Background to impacted	Has prior impacts
12M	11/18/03	McKay Coal	Background to impacted	Has prior impacts
12M	6/8/04	McKay Coal	Background to impacted	Has prior impacts
12M	11/15/04	McKay Coal	Background to impacted	Has prior impacts
12M	6/22/05	McKay Coal	Background to impacted	Has prior impacts
12M	11/3/05	McKay Coal	Background to impacted	Has prior impacts
12M	6/20/06	McKay Coal	Background to impacted	Has prior impacts
12M	11/15/06	McKay Coal	Background to impacted	Has prior impacts
12M	6/11/07	McKay Coal	Background to impacted	Has prior impacts
12M	11/15/07	McKay Coal	Background to impacted	Has prior impacts
12M	5/5/08	McKay Coal	Background to impacted	Has prior impacts
12M	10/29/08	McKay Coal	Background to impacted	Has prior impacts
12M	3/25/09	McKay Coal	Background to impacted	Has prior impacts
12M	11/3/09	McKay Coal	Background to impacted	Has prior impacts
12M	4/14/10	McKay Coal	Background to impacted	Has prior impacts
12M	10/12/10	McKay Coal	Background to impacted	Has prior impacts
12M	3/23/11	McKay Coal	Background to impacted	Has prior impacts
12M	10/6/11	McKay Coal	Background to impacted	Has prior impacts
12M	4/2/12	McKay Coal	Background to impacted	Has prior impacts
12M	10/16/12	McKay Coal	Background to impacted	Has prior impacts
12M	4/2/13	McKay Coal	Background to impacted	Has prior impacts
12M	10/10/13	McKay Coal	Background to impacted	Has prior impacts
12M	4/4/14	McKay Coal	Background to impacted	Has prior impacts
12M	10/15/14	McKay Coal	Background to impacted	Has prior impacts
12M	5/7/15	McKay Coal	Background to impacted	Has prior impacts
13M	8/25/76	McKay Coal	Background to impacted	Prior samples have shown impacts
13M	10/6/76	McKay Coal	Background to impacted	Prior samples have shown impacts
13M	1/10/77	McKay Coal	Background to impacted	Prior samples have shown impacts
13M	3/9/77	McKay Coal	Background to impacted	Prior samples have shown impacts
13M	5/16/77	McKay Coal	Background to impacted	Prior samples have shown impacts
13M	6/7/77	McKay Coal	Background to impacted	Prior samples have shown impacts
13M	8/16/77	McKay Coal	Background to impacted	Prior samples have shown impacts
16M	11/1/87	McKay Coal	Background to impacted	Prior samples have shown impacts
16M	10/11/88	McKay Coal	Background to impacted	Prior samples have shown impacts
16M	5/1/89	McKay Coal	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
17M	8/19/83	McKay Coal	Background to impacted	Impacts observed
17M	11/17/83	McKay Coal	Background to impacted	Impacts observed
17M	6/1/84	McKay Coal	Background to impacted	Impacts observed
17M	10/31/84	McKay Coal	Background to impacted	Impacts observed
17M	6/5/85	McKay Coal	Background to impacted	Impacts observed
17M	10/13/85	McKay Coal	Background to impacted	Impacts observed
17M	5/24/86	McKay Coal	Background to impacted	Impacts observed
17M	10/24/86	McKay Coal	Background to impacted	Impacts observed
17M	5/20/87	McKay Coal	Background to impacted	Impacts observed
17M	11/3/87	McKay Coal	Background to impacted	Impacts observed
17M	6/1/88	McKay Coal	Background to impacted	Impacts observed
17M	10/11/88	McKay Coal	Background to impacted	Impacts observed
17M	4/28/89	McKay Coal	Background to impacted	Impacts observed
17M	11/1/89	McKay Coal	Background to impacted	Impacts observed
17M	4/25/90	McKay Coal	Background to impacted	Impacts observed
17M	9/13/90	McKay Coal	Background to impacted	Impacts observed
17M	4/22/91	McKay Coal	Background to impacted	Impacts observed
17M	9/20/91	McKay Coal	Background to impacted	Impacts observed
17M	3/20/92	McKay Coal	Background to impacted	Impacts observed
17M	10/23/92	McKay Coal	Background to impacted	Impacts observed
17M	3/23/93	McKay Coal	Background to impacted	Impacts observed
17M	10/19/93	McKay Coal	Background to impacted	Impacts observed
17M	3/31/94	McKay Coal	Background to impacted	Has prior impacts
17M	10/19/94	McKay Coal	Background to impacted	Has prior impacts
17M	3/21/95	McKay Coal	Background to impacted	Has prior impacts
17M-2	11/10/99	McKay Coal	Background to impacted	Prior samples have shown impacts
18M	10/15/85	McKay Coal	Background to impacted	Prior samples have shown impacts
18M	5/24/86	McKay Coal	Background to impacted	Prior samples have shown impacts
18M	10/24/86	McKay Coal	Background to impacted	Prior samples have shown impacts
18M	11/2/87	McKay Coal	Background to impacted	Prior samples have shown impacts
18M	4/28/89	McKay Coal	Background to impacted	Prior samples have shown impacts
18M	10/22/97	McKay Coal	Background to impacted	Prior samples have shown impacts
18M	4/10/98	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	11/18/03	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	5/20/04	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	10/20/04	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	5/15/05	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	11/21/05	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	6/19/06	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	11/14/06	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	6/14/07	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	11/19/07	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	4/30/08	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	11/19/08	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	4/2/09	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	11/11/09	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	4/16/10	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	10/13/10	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	3/23/11	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	10/4/11	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	4/12/12	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	10/17/12	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	4/4/13	McKay Coal	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
20M	10/9/13	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	4/7/14	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	10/24/14	McKay Coal	Background to impacted	Prior samples have shown impacts
20M	5/4/15	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	10/31/87	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	5/20/88	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	9/30/88	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	4/20/89	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	4/26/89	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	10/31/89	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	4/30/90	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	9/19/90	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	4/17/91	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	9/24/91	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	3/27/92	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	10/20/92	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	4/7/93	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	10/20/93	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	4/26/94	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	11/17/94	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	4/19/95	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	10/30/95	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	4/22/97	McKay Coal	Background to impacted	Prior samples have shown impacts
23M	10/28/97	McKay Coal	Background to impacted	Prior samples have shown impacts
36M	11/6/03	McKay Coal	Background to impacted	Prior samples have shown impacts
38M	11/21/14	McKay Coal	Background to impacted	Prior samples have shown impacts
38M	4/27/15	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	6/28/81	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	12/1/81	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	6/23/82	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/6/82	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	5/18/83	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/15/83	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	5/16/84	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/18/84	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	5/23/85	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/17/85	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	5/24/86	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/21/86	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	5/21/87	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/31/87	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	5/25/88	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/5/88	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	4/27/89	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/31/89	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	4/18/90	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	9/14/90	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	4/16/91	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	9/18/91	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	3/12/92	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/20/92	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	3/23/93	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/20/93	McKay Coal	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
4M	4/26/94	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/20/94	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	3/23/95	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/26/95	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	3/28/96	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	9/19/96	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	4/17/97	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/21/97	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	4/17/98	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/16/98	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	4/29/99	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	11/16/99	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	5/25/00	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	11/8/00	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	5/29/01	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	7/19/01	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	5/28/02	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	11/12/03	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	5/26/04	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	8/26/04	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	11/12/04	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	6/22/05	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	11/7/05	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	6/16/06	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/24/06	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	6/21/07	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/22/08	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	4/14/10	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/12/10	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/12/11	McKay Coal	Background to impacted	Prior samples have shown impacts
4M	10/3/12	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	8/27/82	McKay Coal	Non-background to baseline	Include samples prior to pond use
555M	10/31/82	McKay Coal	Non-background to baseline	Include samples prior to pond use
555M	5/20/83	McKay Coal	Non-background to baseline	Include samples prior to pond use
555M	11/12/84	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	6/7/85	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	10/6/85	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	5/25/86	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	11/8/86	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	6/7/87	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	10/28/87	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	6/8/88	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	10/25/88	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	5/20/89	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	10/11/89	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	6/6/90	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	10/2/90	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	3/15/91	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	10/15/91	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	4/15/92	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	9/17/92	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	9/28/93	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	5/25/95	McKay Coal	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
555M	10/22/96	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	5/20/98	McKay Coal	Background to impacted	Prior samples have shown impacts
555M	5/7/15	McKay Coal	Background to impacted	Prior samples have shown impacts
571M	8/11/82	McKay Coal	Non-background to baseline	Include samples prior to pond use
571M	10/30/82	McKay Coal	Non-background to baseline	Include samples prior to pond use
571M	4/23/83	McKay Coal	Non-background to baseline	Include samples prior to pond use
586M	5/21/02	McKay Coal	Background to impacted	Prior samples have shown impacts
586M	4/10/03	McKay Coal	Background to impacted	Prior samples have shown impacts
5M	6/24/82	McKay Coal	Background to impacted	Prior samples have shown impacts
5M	5/23/87	McKay Coal	Background to impacted	Prior samples have shown impacts
61M	9/29/03	McKay Coal	Non-background to baseline	No facility impacts at this location
61M	6/30/04	McKay Coal	Non-background to baseline	No facility impacts at this location
61M	11/18/04	McKay Coal	Non-background to baseline	No impacts observed
61M	6/23/05	McKay Coal	Non-background to baseline	No impacts observed
61M	6/23/06	McKay Coal	Non-background to baseline	No impacts observed
61M	6/19/07	McKay Coal	Non-background to baseline	No impacts observed
61M	11/21/07	McKay Coal	Non-background to baseline	No impacts observed
61M	4/28/08	McKay Coal	Non-background to baseline	No impacts observed
61M	11/10/08	McKay Coal	Non-background to baseline	No impacts observed
61M	4/6/09	McKay Coal	Non-background to baseline	No impacts observed
61M	11/2/09	McKay Coal	Non-background to baseline	No impacts observed
61M	3/17/10	McKay Coal	Non-background to baseline	No impacts observed
61M	4/15/10	McKay Coal	Non-background to baseline	No impacts observed
61M	10/6/10	McKay Coal	Non-background to baseline	No impacts observed
61M	10/4/11	McKay Coal	Non-background to baseline	No impacts observed
61M	4/11/12	McKay Coal	Non-background to baseline	No impacts observed
61M	10/23/12	McKay Coal	Non-background to baseline	No impacts observed
61M	4/22/13	McKay Coal	Non-background to baseline	No impacts observed
61M	10/8/13	McKay Coal	Non-background to baseline	No impacts observed
61M	4/10/14	McKay Coal	Non-background to baseline	No impacts observed
61M	10/19/14	McKay Coal	Non-background to baseline	No impacts observed
61M	4/29/15	McKay Coal	Non-background to baseline	No impacts observed
633M	12/19/01	McKay Coal	Background to impacted	Prior samples have shown impacts
657M	9/15/03	McKay Coal	Non-background to baseline	No impacts observed
657M	4/22/04	McKay Coal	Non-background to baseline	No impacts observed
677M	9/28/05	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	5/17/06	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	10/3/06	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	4/17/07	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	9/13/07	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	4/1/08	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	9/22/08	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	3/23/09	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	9/28/09	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	4/13/10	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	10/13/10	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	5/27/11	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	8/25/11	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	6/26/12	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	12/3/12	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	6/24/13	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	11/24/13	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	5/1/14	McKay Coal	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
677M	10/13/14	McKay Coal	Background to impacted	Prior samples have shown impacts
677M	4/10/15	McKay Coal	Background to impacted	Prior samples have shown impacts
67M	10/13/05	McKay Coal	Background to impacted	Impacts observed
67M	4/28/08	McKay Coal	Background to impacted	Impacts observed
67M	11/10/08	McKay Coal	Background to impacted	Impacts observed
67M	4/6/09	McKay Coal	Background to impacted	Impacts observed
72M	6/11/07	McKay Coal	Background to impacted	Prior samples have shown impacts
72M	11/3/09	McKay Coal	Background to impacted	Prior samples have shown impacts
72M	10/13/10	McKay Coal	Background to impacted	Prior samples have shown impacts
72M	3/28/11	McKay Coal	Background to impacted	Prior samples have shown impacts
72M	10/13/11	McKay Coal	Background to impacted	Prior samples have shown impacts
72M	3/29/12	McKay Coal	Background to impacted	Prior samples have shown impacts
72M	10/3/12	McKay Coal	Background to impacted	Prior samples have shown impacts
72M	4/3/13	McKay Coal	Background to impacted	Prior samples have shown impacts
72M	4/9/14	McKay Coal	Background to impacted	Prior samples have shown impacts
72M	5/11/15	McKay Coal	Background to impacted	Prior samples have shown impacts
88M	4/2/13	McKay Coal	Background to impacted	Prior samples have shown impacts
88M	5/11/15	McKay Coal	Background to impacted	Prior samples have shown impacts
957M	8/18/04	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	6/8/06	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	10/25/06	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	5/16/07	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	10/23/07	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	4/14/08	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	10/2/08	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	5/2/09	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	10/12/09	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	5/13/10	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	10/18/10	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	5/3/11	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	11/9/11	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	5/7/12	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	10/3/12	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	4/19/13	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	10/16/13	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	5/29/14	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
957M	9/3/14	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond

Well ID	Sample Date	Target Interval	Direction	Criteria
957M	3/17/15	McKay Coal	Non-background to baseline	Constant water quality, downgradient of surge pond
BS-21	8/15/84	McKay Coal	Background to impacted	Prior samples have shown impacts
BS-21	5/16/85	McKay Coal	Background to impacted	Prior samples have shown impacts
BS-21	10/28/85	McKay Coal	Background to impacted	Prior samples have shown impacts
BS-21	5/15/86	McKay Coal	Background to impacted	Prior samples have shown impacts
BS-21	6/15/93	McKay Coal	Background to impacted	Prior samples have shown impacts
BS-25	3/28/78	McKay Coal	Non-background to baseline	No facility impacts at this location
BS-25	6/15/93	McKay Coal	Non-background to baseline	No impacts observed
S-03	6/9/93	McKay Coal	Non-background to baseline	No impacts observed
S-08	9/25/73	McKay Coal	Non-background to baseline	Include samples prior to pond use
S-08	6/6/74	McKay Coal	Non-background to baseline	Include samples prior to pond use
S-08	3/30/78	McKay Coal	Non-background to baseline	Include samples prior to pond use
S-08	5/12/86	McKay Coal	Background to impacted	Prior samples have shown impacts
S-08	10/29/92	McKay Coal	Background to impacted	Prior samples have shown impacts
S-12	10/30/79	McKay Coal	Background to impacted	Prior samples have shown impacts
S-12	12/18/79	McKay Coal	Background to impacted	Prior samples have shown impacts
S-12	10/6/82	McKay Coal	Background to impacted	Prior samples have shown impacts
S-12	10/22/86	McKay Coal	Background to impacted	Prior samples have shown impacts
S-12	6/22/92	McKay Coal	Background to impacted	Prior samples have shown impacts
S-12	6/10/93	McKay Coal	Background to impacted	Prior samples have shown impacts
S-12	11/16/99	McKay Coal	Background to impacted	Prior samples have shown impacts
S-12	9/20/01	McKay Coal	Background to impacted	Prior samples have shown impacts
S-12	6/22/10	McKay Coal	Background to impacted	Prior samples have shown impacts
S-14	2/19/77	McKay Coal	Background to impacted	Prior samples have shown impacts
S-14	7/21/77	McKay Coal	Background to impacted	Prior samples have shown impacts
S-14	3/28/78	McKay Coal	Background to impacted	Prior samples have shown impacts
S-14	6/15/10	McKay Coal	Background to impacted	Prior samples have shown impacts
S-4	10/24/85	McKay Coal	Background to impacted	Prior samples have shown impacts
S-4	10/5/87	McKay Coal	Background to impacted	Prior samples have shown impacts
S-4	10/5/88	McKay Coal	Background to impacted	Prior samples have shown impacts
S-4	10/1/90	McKay Coal	Background to impacted	Prior samples have shown impacts
S-4	9/19/91	McKay Coal	Background to impacted	Prior samples have shown impacts
S-4	6/23/92	McKay Coal	Background to impacted	Prior samples have shown impacts
S-4	6/11/93	McKay Coal	Background to impacted	Prior samples have shown impacts
S-4	9/20/01	McKay Coal	Background to impacted	Prior samples have shown impacts
WA-113	2/25/86	McKay Coal	Background to impacted	Prior samples have shown impacts
WA-113	5/23/88	McKay Coal	Background to impacted	Prior samples have shown impacts
WA-113	8/5/91	McKay Coal	Background to impacted	Prior samples have shown impacts
WA-113	8/4/93	McKay Coal	Background to impacted	Prior samples have shown impacts
WA-113	7/27/95	McKay Coal	Background to impacted	Prior samples have shown impacts
WA-113	9/5/96	McKay Coal	Background to impacted	Prior samples have shown impacts
WA-113	9/10/99	McKay Coal	Background to impacted	Prior samples have shown impacts
WA-113	8/26/02	McKay Coal	Background to impacted	Prior samples have shown impacts
WA-113	9/8/05	McKay Coal	Background to impacted	Prior samples have shown impacts
WA-113	9/18/08	McKay Coal	Background to impacted	Prior samples have shown impacts
WA-113	9/22/11	McKay Coal	Background to impacted	Prior samples have shown impacts
WA-113	8/27/14	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-105	8/28/96	McKay Coal	Non-background to baseline	No impacts observed
WM-107	9/11/88	McKay Coal	Non-background to baseline	No impacts observed
WM-107	8/8/96	McKay Coal	Non-background to baseline	No impacts observed
WM-108	5/3/83	McKay Coal	Non-background to baseline	No impacts observed
WM-116	12/30/81	McKay Coal	Non-background to baseline	No impacts observed
WM-116	8/10/95	McKay Coal	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
WM-124	4/22/81	McKay Coal	Background to impacted	Impacts observed
WM-124	12/31/81	McKay Coal	Background to impacted	Impacts observed
WM-124	9/13/82	McKay Coal	Background to impacted	Impacts observed
WM-124	11/5/83	McKay Coal	Background to impacted	Impacts observed
WM-124	6/17/84	McKay Coal	Background to impacted	Impacts observed
WM-124	11/10/84	McKay Coal	Background to impacted	Impacts observed
WM-124	6/14/85	McKay Coal	Background to impacted	Impacts observed
WM-124	10/5/85	McKay Coal	Background to impacted	Impacts observed
WM-124	5/25/86	McKay Coal	Background to impacted	Impacts observed
WM-124	11/8/86	McKay Coal	Background to impacted	Impacts observed
WM-124	6/9/87	McKay Coal	Background to impacted	Impacts observed
WM-124	10/29/87	McKay Coal	Background to impacted	Impacts observed
WM-124	11/3/87	McKay Coal	Background to impacted	Impacts observed
WM-124	6/11/88	McKay Coal	Background to impacted	Impacts observed
WM-124	11/2/88	McKay Coal	Background to impacted	Impacts observed
WM-124	5/19/89	McKay Coal	Background to impacted	Impacts observed
WM-124	10/14/89	McKay Coal	Background to impacted	Impacts observed
WM-124	6/5/90	McKay Coal	Background to impacted	Impacts observed
WM-124	10/2/90	McKay Coal	Background to impacted	Impacts observed
WM-124	3/15/91	McKay Coal	Background to impacted	Impacts observed
WM-124	7/22/91	McKay Coal	Background to impacted	Impacts observed
WM-124	10/11/91	McKay Coal	Background to impacted	Impacts observed
WM-124	4/16/92	McKay Coal	Background to impacted	Impacts observed
WM-124	9/18/92	McKay Coal	Background to impacted	Impacts observed
WM-124	5/12/93	McKay Coal	Background to impacted	Impacts observed
WM-124	11/11/93	McKay Coal	Background to impacted	Impacts observed
WM-124	4/20/94	McKay Coal	Background to impacted	Impacts observed
WM-124	9/27/94	McKay Coal	Background to impacted	Impacts observed
WM-124	6/23/95	McKay Coal	Background to impacted	Impacts observed
WM-124	8/6/95	McKay Coal	Background to impacted	Impacts observed
WM-124	9/20/95	McKay Coal	Background to impacted	Impacts observed
WM-124	5/23/96	McKay Coal	Background to impacted	Impacts observed
WM-124	8/13/96	McKay Coal	Background to impacted	Impacts observed
WM-124	10/22/96	McKay Coal	Background to impacted	Impacts observed
WM-124	4/24/97	McKay Coal	Background to impacted	Impacts observed
WM-124	9/11/97	McKay Coal	Background to impacted	Impacts observed
WM-124	5/20/98	McKay Coal	Background to impacted	Impacts observed
WM-124	9/18/98	McKay Coal	Background to impacted	Impacts observed
WM-124	3/31/99	McKay Coal	Background to impacted	Impacts observed
WM-124	9/13/99	McKay Coal	Background to impacted	Impacts observed
WM-124	9/14/99	McKay Coal	Background to impacted	Impacts observed
WM-124	3/29/00	McKay Coal	Background to impacted	Impacts observed
WM-124	9/21/00	McKay Coal	Background to impacted	Impacts observed
WM-124	5/16/01	McKay Coal	Background to impacted	Impacts observed
WM-124	4/24/02	McKay Coal	Background to impacted	Impacts observed
WM-124	8/23/02	McKay Coal	Background to impacted	Impacts observed
WM-124	9/24/02	McKay Coal	Background to impacted	Impacts observed
WM-124	4/3/03	McKay Coal	Background to impacted	Impacts observed
WM-124	9/24/03	McKay Coal	Background to impacted	Impacts observed
WM-124	4/22/04	McKay Coal	Background to impacted	Impacts observed
WM-124	9/23/04	McKay Coal	Background to impacted	Impacts observed
WM-124	5/20/05	McKay Coal	Background to impacted	Impacts observed
WM-124	9/9/05	McKay Coal	Background to impacted	Impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
WM-124	9/23/05	McKay Coal	Background to impacted	Impacts observed
WM-124	5/1/06	McKay Coal	Background to impacted	Location is inside the cutoff wall
WM-124	9/18/07	McKay Coal	Background to impacted	Location is inside the cutoff wall
WM-124	9/18/08	McKay Coal	Background to impacted	Impacts observed
WM-124	4/25/09	McKay Coal	Background to impacted	Impacts observed
WM-124	9/22/11	McKay Coal	Background to impacted	Impacts observed
WM-126	11/10/84	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-126	6/13/85	McKay Coal	Background to impacted	No impacts observed
WM-126	10/3/85	McKay Coal	Background to impacted	No impacts observed
WM-126	5/25/86	McKay Coal	Background to impacted	No impacts observed
WM-126	10/27/86	McKay Coal	Background to impacted	No impacts observed
WM-126	6/9/87	McKay Coal	Background to impacted	No impacts observed
WM-126	10/20/87	McKay Coal	Background to impacted	No impacts observed
WM-126	10/27/87	McKay Coal	Background to impacted	No impacts observed
WM-126	5/18/88	McKay Coal	Background to impacted	No impacts observed
WM-126	10/24/88	McKay Coal	Background to impacted	No impacts observed
WM-126	5/20/89	McKay Coal	Background to impacted	No impacts observed
WM-126	9/14/89	McKay Coal	Background to impacted	No impacts observed
WM-126	10/14/89	McKay Coal	Background to impacted	No impacts observed
WM-126	5/24/90	McKay Coal	Background to impacted	No impacts observed
WM-126	9/27/90	McKay Coal	Background to impacted	No impacts observed
WM-126	3/13/91	McKay Coal	Background to impacted	No impacts observed
WM-126	7/11/91	McKay Coal	Background to impacted	No impacts observed
WM-126	10/18/91	McKay Coal	Background to impacted	No impacts observed
WM-126	4/13/92	McKay Coal	Background to impacted	No impacts observed
WM-126	9/18/92	McKay Coal	Background to impacted	No impacts observed
WM-126	9/21/92	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-126	4/29/93	McKay Coal	Background to impacted	No impacts observed
WM-126	9/22/93	McKay Coal	Background to impacted	No impacts observed
WM-126	11/19/93	McKay Coal	Background to impacted	No impacts observed
WM-126	4/12/94	McKay Coal	Background to impacted	No impacts observed
WM-126	9/14/94	McKay Coal	Background to impacted	No impacts observed
WM-126	5/25/95	McKay Coal	Background to impacted	No impacts observed
WM-126	8/6/95	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-126	9/14/95	McKay Coal	Background to impacted	No impacts observed
WM-126	5/30/96	McKay Coal	Background to impacted	No impacts observed
WM-126	8/13/96	McKay Coal	Background to impacted	No impacts observed
WM-126	10/22/96	McKay Coal	Background to impacted	No impacts observed
WM-126	4/30/97	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-126	9/11/97	McKay Coal	Background to impacted	No impacts observed
WM-126	5/20/98	McKay Coal	Background to impacted	No impacts observed
WM-126	8/12/98	McKay Coal	Background to impacted	No impacts observed
WM-126	9/16/98	McKay Coal	Background to impacted	No impacts observed
WM-126	3/31/99	McKay Coal	Background to impacted	No impacts observed
WM-126	9/14/99	McKay Coal	Background to impacted	No impacts observed
WM-126	4/11/00	McKay Coal	Background to impacted	No impacts observed
WM-126	9/21/00	McKay Coal	Background to impacted	No impacts observed
WM-126	5/16/01	McKay Coal	Background to impacted	No impacts observed
WM-126	8/7/01	McKay Coal	Background to impacted	No impacts observed
WM-126	4/24/02	McKay Coal	Background to impacted	No impacts observed
WM-126	9/25/02	McKay Coal	Background to impacted	No impacts observed
WM-126	4/3/03	McKay Coal	Background to impacted	No impacts observed
WM-126	9/24/03	McKay Coal	Background to impacted	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
WM-126	4/23/04	McKay Coal	Background to impacted	No impacts observed
WM-126	8/10/04	McKay Coal	Background to impacted	No impacts observed
WM-126	9/23/04	McKay Coal	Background to impacted	No impacts observed
WM-126	5/26/05	McKay Coal	Background to impacted	No impacts observed
WM-126	9/15/05	McKay Coal	Background to impacted	No impacts observed
WM-126	9/10/07	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-126	9/26/07	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-126	9/9/08	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-126	3/18/10	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-126	9/16/10	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-126	9/26/13	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-127	5/12/81	McKay Coal	Non-background to baseline	Sample prior to EHP startup
WM-127	8/15/81	McKay Coal	Non-background to baseline	Sample prior to EHP startup
WM-127	9/14/82	McKay Coal	Non-background to baseline	Sample prior to EHP startup
WM-127	6/17/84	McKay Coal	Non-background to baseline	No impacts observed
WM-127	11/9/84	McKay Coal	Non-background to baseline	No impacts observed
WM-127	6/14/85	McKay Coal	Non-background to baseline	No impacts observed
WM-127	10/5/85	McKay Coal	Non-background to baseline	No impacts observed
WM-127	5/22/86	McKay Coal	Non-background to baseline	No impacts observed
WM-127	11/8/86	McKay Coal	Non-background to baseline	No impacts observed
WM-127	1/15/87	McKay Coal	Non-background to baseline	No impacts observed
WM-127	6/8/87	McKay Coal	Non-background to baseline	No impacts observed
WM-127	10/30/87	McKay Coal	Non-background to baseline	No impacts observed
WM-127	6/9/88	McKay Coal	Non-background to baseline	No impacts observed
WM-127	7/1/88	McKay Coal	Non-background to baseline	No impacts observed
WM-127	11/4/88	McKay Coal	Non-background to baseline	No impacts observed
WM-127	5/20/89	McKay Coal	Non-background to baseline	No impacts observed
WM-127	10/14/89	McKay Coal	Non-background to baseline	No impacts observed
WM-127	6/6/90	McKay Coal	Non-background to baseline	No impacts observed
WM-127	8/13/90	McKay Coal	Non-background to baseline	No impacts observed
WM-127	10/3/90	McKay Coal	Non-background to baseline	No impacts observed
WM-127	4/3/91	McKay Coal	Non-background to baseline	No impacts observed
WM-127	10/9/91	McKay Coal	Non-background to baseline	No impacts observed
WM-127	4/24/92	McKay Coal	Non-background to baseline	No impacts observed
WM-127	7/22/92	McKay Coal	Non-background to baseline	No impacts observed
WM-127	9/29/92	McKay Coal	Non-background to baseline	No impacts observed
WM-127	5/20/93	McKay Coal	Non-background to baseline	No impacts observed
WM-127	10/29/93	McKay Coal	Non-background to baseline	No impacts observed
WM-127	3/16/94	McKay Coal	Non-background to baseline	No impacts observed
WM-127	9/29/94	McKay Coal	Non-background to baseline	No impacts observed
WM-127	5/25/95	McKay Coal	Non-background to baseline	No impacts observed
WM-127	10/13/95	McKay Coal	Non-background to baseline	No impacts observed
WM-127	5/21/96	McKay Coal	Non-background to baseline	No impacts observed
WM-127	8/13/96	McKay Coal	Non-background to baseline	No impacts observed
WM-127	10/22/96	McKay Coal	Non-background to baseline	No impacts observed
WM-127	4/24/97	McKay Coal	Non-background to baseline	No impacts observed
WM-127	9/16/97	McKay Coal	Non-background to baseline	No impacts observed
WM-127	5/20/98	McKay Coal	Non-background to baseline	No impacts observed
WM-127	9/16/98	McKay Coal	Non-background to baseline	No impacts observed
WM-127	4/8/99	McKay Coal	Non-background to baseline	No impacts observed
WM-127	9/14/99	McKay Coal	Non-background to baseline	No impacts observed
WM-127	10/28/99	McKay Coal	Non-background to baseline	No impacts observed
WM-127	4/11/00	McKay Coal	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
WM-127	9/21/00	McKay Coal	Non-background to baseline	No impacts observed
WM-127	5/16/01	McKay Coal	Non-background to baseline	No impacts observed
WM-127	5/23/02	McKay Coal	Non-background to baseline	No impacts observed
WM-127	9/25/02	McKay Coal	Non-background to baseline	No impacts observed
WM-127	4/2/03	McKay Coal	Non-background to baseline	No impacts observed
WM-127	8/19/03	McKay Coal	Non-background to baseline	No impacts observed
WM-127	9/24/03	McKay Coal	Non-background to baseline	No impacts observed
WM-127	4/23/04	McKay Coal	Non-background to baseline	No impacts observed
WM-127	9/23/04	McKay Coal	Non-background to baseline	No impacts observed
WM-127	5/26/05	McKay Coal	Non-background to baseline	No impacts observed
WM-127	9/27/05	McKay Coal	Non-background to baseline	No impacts observed
WM-127	5/10/06	McKay Coal	Non-background to baseline	No impacts observed
WM-127	8/24/06	McKay Coal	Non-background to baseline	No impacts observed
WM-127	9/22/06	McKay Coal	Non-background to baseline	No impacts observed
WM-127	3/27/07	McKay Coal	Non-background to baseline	No impacts observed
WM-127	7/30/07	McKay Coal	Non-background to baseline	No impacts observed
WM-127	3/18/08	McKay Coal	Non-background to baseline	No impacts observed
WM-127	9/9/08	McKay Coal	Non-background to baseline	No impacts observed
WM-127	3/15/09	McKay Coal	Non-background to baseline	No impacts observed
WM-127	9/1/09	McKay Coal	Non-background to baseline	No impacts observed
WM-127	9/16/09	McKay Coal	Non-background to baseline	No impacts observed
WM-127	3/17/10	McKay Coal	Non-background to baseline	No impacts observed
WM-127	9/30/10	McKay Coal	Non-background to baseline	No impacts observed
WM-127	5/27/11	McKay Coal	Non-background to baseline	No impacts observed
WM-127	8/29/11	McKay Coal	Non-background to baseline	No impacts observed
WM-127	6/29/12	McKay Coal	Non-background to baseline	No impacts observed
WM-127	9/17/12	McKay Coal	Non-background to baseline	No impacts observed
WM-127	12/18/12	McKay Coal	Non-background to baseline	No impacts observed
WM-127	6/26/13	McKay Coal	Non-background to baseline	No impacts observed
WM-127	12/1/13	McKay Coal	Non-background to baseline	No impacts observed
WM-127	5/28/14	McKay Coal	Non-background to baseline	No impacts observed
WM-127	10/21/14	McKay Coal	Non-background to baseline	No impacts observed
WM-127	5/7/15	McKay Coal	Non-background to baseline	No impacts observed
WM-129	9/16/98	McKay Coal	Non-background to baseline	No impacts observed
WM-130	8/16/81	McKay Coal	Non-background to baseline	No impacts observed
WM-132	8/16/81	McKay Coal	Non-background to baseline	In Pony Creek, no potential facility impacts
WM-132	5/7/82	McKay Coal	Non-background to baseline	In Pony Creek, no potential facility impacts
WM-132	10/5/83	McKay Coal	Non-background to baseline	No impacts observed
WM-132	12/18/83	McKay Coal	Non-background to baseline	In Pony Creek, no potential facility impacts
WM-132	5/9/84	McKay Coal	Non-background to baseline	No impacts observed
WM-132	7/17/84	McKay Coal	Non-background to baseline	In Pony Creek, no potential facility impacts
WM-132	3/27/86	McKay Coal	Non-background to baseline	No impacts observed
WM-132	5/11/87	McKay Coal	Non-background to baseline	In Pony Creek, no potential facility impacts
WM-132	7/23/90	McKay Coal	Non-background to baseline	In Pony Creek, no potential facility impacts
WM-132	6/29/92	McKay Coal	Non-background to baseline	No impacts observed
WM-132	11/25/92	McKay Coal	Non-background to baseline	In Pony Creek, no potential facility impacts
WM-132	8/20/96	McKay Coal	Non-background to baseline	No impacts observed
WM-133	5/7/82	McKay Coal	Non-background to baseline	In Pony Creek, no potential facility

Well ID	Sample Date	Target Interval	Direction	Criteria
				impacts
WM-133	12/19/85	McKay Coal	Non-background to baseline	In Pony Creek, no potential facility impacts
WM-135	9/10/07	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-137	5/27/82	McKay Coal	Non-background to baseline	No impacts observed
WM-137	12/7/85	McKay Coal	Non-background to baseline	No impacts observed
WM-138	12/16/81	McKay Coal	Non-background to baseline	Include samples prior to pond use
WM-138	5/15/82	McKay Coal	Non-background to baseline	Include samples prior to pond use
WM-138	11/5/83	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	5/10/84	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	6/16/84	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	6/12/85	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	11/8/86	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	1/15/87	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	6/6/87	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	10/30/87	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	6/9/88	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	7/1/88	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	11/3/88	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	5/19/89	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	10/14/89	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	6/5/90	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	8/13/90	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	8/22/90	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	10/3/90	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	4/4/91	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	10/8/91	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	7/30/92	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	9/28/92	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	8/13/96	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	7/1/00	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	8/19/03	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	8/24/06	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	9/16/09	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-138	9/17/12	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-153	9/26/82	McKay Coal	Non-background to baseline	No impacts observed
WM-157	9/30/83	McKay Coal	Non-background to baseline	No impacts observed
WM-175	11/1/82	McKay Coal	Non-background to baseline	No impacts observed
WM-181	12/27/84	McKay Coal	Non-background to baseline	Upgradient of Facility
WM-181	7/28/88	McKay Coal	Non-background to baseline	Upgradient of Facility
WM-183	9/9/98	McKay Coal	Background to impacted	Prior samples have shown impacts
WM-183	9/25/01	McKay Coal	Background to impacted	Prior samples have shown impacts
10-R	11/14/79	Rosebud Coal	Non-background to baseline	No impacts observed
14M	8/27/76	Rosebud Coal	Non-background to baseline	No impacts observed
14M	10/6/76	Rosebud Coal	Non-background to baseline	No impacts observed
14M	11/10/76	Rosebud Coal	Non-background to baseline	No impacts observed
14M	2/9/77	Rosebud Coal	Non-background to baseline	No impacts observed
14M	3/10/77	Rosebud Coal	Non-background to baseline	No impacts observed
14M	4/26/77	Rosebud Coal	Non-background to baseline	No impacts observed
14M	5/17/77	Rosebud Coal	Non-background to baseline	No impacts observed
14M	9/20/77	Rosebud Coal	Non-background to baseline	No impacts observed
14M	9/6/78	Rosebud Coal	Non-background to baseline	No impacts observed
14M	6/21/79	Rosebud Coal	Non-background to baseline	No impacts observed
14M	11/28/79	Rosebud Coal	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
14M	12/11/80	Rosebud Coal	Non-background to baseline	No impacts observed
14M	6/27/81	Rosebud Coal	Non-background to baseline	No impacts observed
14M	11/12/81	Rosebud Coal	Non-background to baseline	No impacts observed
14M	6/24/82	Rosebud Coal	Non-background to baseline	No impacts observed
14M	10/7/82	Rosebud Coal	Non-background to baseline	No impacts observed
14M	5/20/83	Rosebud Coal	Non-background to baseline	No impacts observed
14M	10/16/83	Rosebud Coal	Non-background to baseline	No impacts observed
14M	5/18/84	Rosebud Coal	Non-background to baseline	No impacts observed
14M	10/20/84	Rosebud Coal	Non-background to baseline	No impacts observed
69R	4/14/10	Rosebud Coal	Non-background to baseline	No impacts observed
69R	3/31/11	Rosebud Coal	Non-background to baseline	No impacts observed
69R	10/17/14	Rosebud Coal	Non-background to baseline	No impacts observed
6M	2/10/77	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	3/8/77	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	4/26/77	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	5/17/77	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	9/20/77	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	9/6/78	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	6/21/79	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	11/28/79	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	9/17/80	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	12/16/80	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	6/29/81	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	11/12/81	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	6/23/82	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	10/6/82	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	5/18/83	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	10/16/83	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	5/16/84	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	10/19/84	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	10/18/85	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	5/24/86	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	5/19/87	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	6/2/88	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	10/11/88	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	5/1/89	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	4/24/90	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	9/11/90	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	3/19/92	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	3/22/93	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	10/19/93	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	4/27/94	Rosebud Coal	Background to impacted	Prior samples have shown impacts
6M	10/19/94	Rosebud Coal	Background to impacted	Prior samples have shown impacts
7R	8/26/76	Rosebud Coal	Non-background to baseline	No impacts observed
7R	10/5/76	Rosebud Coal	Background to impacted	Prior samples have shown impacts
7R	1/10/77	Rosebud Coal	Background to impacted	Prior samples have shown impacts
7R	5/17/77	Rosebud Coal	Background to impacted	Prior samples have shown impacts
7R	6/7/77	Rosebud Coal	Background to impacted	Prior samples have shown impacts
7R	7/11/77	Rosebud Coal	Background to impacted	Prior samples have shown impacts
7R	8/16/77	Rosebud Coal	Background to impacted	Prior samples have shown impacts
BS-17	6/23/10	Rosebud Coal	Background to impacted	Prior samples have shown impacts
DP3-636R	9/18/07	Rosebud Coal	Background to impacted	Prior samples have shown impacts
DP3-	3/12/09	Rosebud Coal	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
636R				
DP3-636R	6/16/11	Rosebud Coal	Background to impacted	Prior samples have shown impacts
DP3-636R	7/10/12	Rosebud Coal	Background to impacted	Prior samples have shown impacts
P-07	5/16/75	Rosebud Coal	Non-background to baseline	No impacts observed
P-08	4/14/76	Rosebud Coal	Non-background to baseline	Upgradient of plant site
P-08	8/13/84	Rosebud Coal	Non-background to baseline	Upgradient of plant site
P-08	5/16/85	Rosebud Coal	Non-background to baseline	Upgradient of plant site
P-08	10/23/85	Rosebud Coal	Non-background to baseline	Upgradient of plant site
P-08	5/14/86	Rosebud Coal	Non-background to baseline	Upgradient of plant site
P-08	10/7/87	Rosebud Coal	Non-background to baseline	Upgradient of plant site
P-08	10/6/88	Rosebud Coal	Non-background to baseline	Upgradient of plant site
P-08	11/14/89	Rosebud Coal	Non-background to baseline	Upgradient of plant site
P-08	10/4/90	Rosebud Coal	Non-background to baseline	Upgradient of plant site
P-08	6/24/92	Rosebud Coal	Non-background to baseline	Upgradient of plant site
P-08	6/14/93	Rosebud Coal	Non-background to baseline	Upgradient of plant site
P-08	7/23/96	Rosebud Coal	Non-background to baseline	Upgradient of plant site
P-09	11/19/76	Rosebud Coal	Non-background to baseline	Upgradient of plant site
S-07	7/20/77	Rosebud Coal	Non-background to baseline	Sample prior to EHP startup
S-07	6/6/80	Rosebud Coal	Non-background to baseline	Sample prior to EHP startup
S-13	2/4/75	Rosebud Coal	Background to impacted	Prior samples have shown impacts
S-28	5/16/75	Rosebud Coal	Non-background to baseline	No impacts observed
WR-100	5/19/88	Rosebud Coal	Non-background to baseline	No impacts observed
WR-100	10/10/91	Rosebud Coal	Non-background to baseline	No impacts observed
WR-101	10/3/83	Rosebud Coal	Non-background to baseline	No impacts observed
WR-103	12/3/79	Rosebud Coal	Non-background to baseline	No impacts observed
WR-103	11/11/80	Rosebud Coal	Non-background to baseline	No impacts observed
WR-103	5/18/82	Rosebud Coal	Non-background to baseline	No impacts observed
WR-103	7/29/86	Rosebud Coal	Non-background to baseline	No impacts observed
WR-103	9/1/88	Rosebud Coal	Non-background to baseline	No impacts observed
WR-103	8/6/90	Rosebud Coal	Non-background to baseline	No impacts observed
WR-103	7/27/92	Rosebud Coal	Non-background to baseline	No impacts observed
WR-103	8/8/96	Rosebud Coal	Non-background to baseline	No impacts observed
WR-103	8/27/97	Rosebud Coal	Non-background to baseline	No impacts observed
WR-103	10/4/00	Rosebud Coal	Non-background to baseline	No impacts observed
WR-103	8/12/04	Rosebud Coal	Non-background to baseline	No impacts observed
WR-103	9/5/07	Rosebud Coal	Non-background to baseline	No impacts observed
WR-103	9/14/10	Rosebud Coal	Non-background to baseline	No impacts observed
WR-103	9/24/13	Rosebud Coal	Non-background to baseline	No impacts observed
WR-106	7/26/95	Rosebud Coal	Non-background to baseline	No impacts observed
WR-110	10/5/83	Rosebud Coal	Non-background to baseline	No impacts observed
WR-110	5/10/84	Rosebud Coal	Non-background to baseline	No impacts observed
WR-111	9/13/89	Rosebud Coal	Non-background to baseline	No impacts observed
WR-113	6/3/88	Rosebud Coal	Non-background to baseline	No impacts observed
WR-113	9/4/91	Rosebud Coal	Non-background to baseline	No impacts observed
WR-116	3/28/83	Rosebud Coal	Non-background to baseline	No impacts observed
WR-116	7/17/92	Rosebud Coal	Non-background to baseline	No impacts observed
WR-121	12/3/79	Rosebud Coal	Non-background to baseline	No impacts observed
WR-121	6/4/87	Rosebud Coal	Non-background to baseline	No impacts observed
WR-121	7/18/96	Rosebud Coal	Non-background to baseline	No impacts observed
WR-121	7/24/97	Rosebud Coal	Non-background to baseline	No impacts observed
WR-126	9/28/87	Rosebud Coal	Non-background to baseline	No impacts observed
WR-126	10/30/89	Rosebud Coal	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
WR-126	8/29/96	Rosebud Coal	Non-background to baseline	No impacts observed
WR-126	7/23/98	Rosebud Coal	Non-background to baseline	No impacts observed
WR-126	7/11/01	Rosebud Coal	Non-background to baseline	No impacts observed
WR-126	9/5/07	Rosebud Coal	Non-background to baseline	Upgradient of plant site
WR-126	9/14/10	Rosebud Coal	Non-background to baseline	Upgradient of plant site
WR-126	9/24/13	Rosebud Coal	Non-background to baseline	Upgradient of plant site
WR-127	6/5/87	Rosebud Coal	Non-background to baseline	No impacts observed
WR-127	11/7/89	Rosebud Coal	Non-background to baseline	No impacts observed
WR-127	8/1/90	Rosebud Coal	Non-background to baseline	No impacts observed
WR-127	11/25/92	Rosebud Coal	Non-background to baseline	No impacts observed
WR-127	9/7/94	Rosebud Coal	Non-background to baseline	No impacts observed
WR-127	8/4/99	Rosebud Coal	Non-background to baseline	No impacts observed
WR-127	8/27/02	Rosebud Coal	Non-background to baseline	No impacts observed
WR-127	9/8/05	Rosebud Coal	Non-background to baseline	No impacts observed
WR-127	9/18/08	Rosebud Coal	Non-background to baseline	No impacts observed
WR-127	9/21/11	Rosebud Coal	Non-background to baseline	No impacts observed
WR-128	5/25/95	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	9/14/95	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	10/22/96	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	4/30/97	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	8/19/97	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	9/11/97	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	5/20/98	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	3/31/99	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	9/14/99	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	4/11/00	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	7/7/00	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	9/21/00	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	5/16/01	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	4/24/02	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	4/2/03	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	8/18/03	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	9/24/03	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	4/23/04	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	9/23/04	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	5/26/05	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	9/15/05	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	8/24/06	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	9/25/06	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	3/29/07	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	9/9/08	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	9/16/09	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	3/18/10	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-128	9/17/12	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-129	9/25/82	Rosebud Coal	Non-background to baseline	Include samples prior to pond use
WR-129	8/13/90	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-131	3/27/86	Rosebud Coal	Non-background to baseline	No impacts observed
WR-131	5/11/87	Rosebud Coal	Non-background to baseline	No impacts observed
WR-132	12/19/85	Rosebud Coal	Non-background to baseline	In Pony Creek, no potential facility impacts
WR-132	6/8/88	Rosebud Coal	Non-background to baseline	No impacts observed
WR-132	10/1/91	Rosebud Coal	Non-background to baseline	No impacts observed
WR-132	8/10/95	Rosebud Coal	Non-background to baseline	In Pony Creek, no potential facility impacts

Well ID	**Sample Date**	**Target Interval**	**Direction**	**Criteria**
WR-133	5/10/83	Rosebud Coal	Non-background to baseline	No impacts observed
WR-133	3/27/86	Rosebud Coal	Non-background to baseline	No impacts observed
WR-134	9/23/11	Rosebud Coal	Non-background to baseline	No impacts observed
WR-134	8/28/14	Rosebud Coal	Non-background to baseline	No impacts observed
WR-156	9/30/83	Rosebud Coal	Non-background to baseline	No impacts observed
WR-161	5/6/83	Rosebud Coal	Non-background to baseline	No impacts observed
WR-161	5/10/84	Rosebud Coal	Non-background to baseline	No impacts observed
WR-161	7/26/90	Rosebud Coal	Non-background to baseline	No impacts observed
WR-164	8/27/96	Rosebud Coal	Non-background to baseline	No impacts observed
WR-168	11/23/87	Rosebud Coal	Non-background to baseline	No impacts observed
WR-168	10/27/89	Rosebud Coal	Non-background to baseline	No impacts observed
WR-168	8/11/04	Rosebud Coal	Non-background to baseline	No impacts observed
WR-169	10/16/82	Rosebud Coal	Non-background to baseline	No impacts observed
WR-169	5/15/87	Rosebud Coal	Non-background to baseline	No impacts observed
WR-175	3/31/92	Rosebud Coal	Non-background to baseline	No impacts observed
WR-181	2/17/84	Rosebud Coal	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WR-181	12/27/84	Rosebud Coal	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WR-181	7/20/88	Rosebud Coal	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WR-181	8/1/90	Rosebud Coal	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WR-181	8/11/92	Rosebud Coal	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WR-181	7/17/96	Rosebud Coal	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WR-181	7/23/97	Rosebud Coal	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WR-181	9/14/00	Rosebud Coal	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WR-181	8/27/03	Rosebud Coal	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WR-181	8/22/06	Rosebud Coal	Non-background to baseline	Upgradient of plant site
WR-181	9/17/09	Rosebud Coal	Non-background to baseline	Upgradient of plant site
WR-181	9/24/12	Rosebud Coal	Non-background to baseline	Upgradient of plant site
WR-183	10/16/91	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-183	8/9/95	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-183	8/17/98	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-183	8/7/01	Rosebud Coal	Background to impacted	Prior samples have shown impacts
WR-205	7/27/95	Rosebud Coal	Non-background to baseline	No impacts observed
WR-205	9/17/08	Rosebud Coal	Non-background to baseline	No impacts observed
WR-205	8/27/14	Rosebud Coal	Non-background to baseline	No impacts observed
15-O	4/29/77	Rosebud Overburden	Non-background to baseline	No impacts observed
15-O	7/23/77	Rosebud Overburden	Non-background to baseline	No impacts observed
15-O	4/10/79	Rosebud Overburden	Non-background to baseline	No impacts observed
15-O	5/14/79	Rosebud Overburden	Non-background to baseline	No impacts observed
15-O	5/28/80	Rosebud Overburden	Non-background to baseline	No impacts observed
15-O	12/10/80	Rosebud Overburden	Non-background to baseline	No impacts observed
20S	4/17/98	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
20S	5/20/04	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
31-O	4/28/77	Rosebud Overburden	Non-background to baseline	No impacts observed
31-O	7/24/77	Rosebud Overburden	Non-background to baseline	No impacts observed
31-O	7/12/78	Rosebud Overburden	Non-background to baseline	No impacts observed
31-O	8/23/78	Rosebud Overburden	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
31-O	11/29/78	Rosebud Overburden	Non-background to baseline	No impacts observed
31-O	2/28/79	Rosebud Overburden	Non-background to baseline	No impacts observed
31-O	4/10/79	Rosebud Overburden	Non-background to baseline	No impacts observed
31-O	5/14/79	Rosebud Overburden	Non-background to baseline	No impacts observed
31-O	11/14/79	Rosebud Overburden	Non-background to baseline	No impacts observed
31-O	5/28/80	Rosebud Overburden	Non-background to baseline	No impacts observed
32-O	7/23/77	Rosebud Overburden	Non-background to baseline	No impacts observed
32-O	2/9/79	Rosebud Overburden	Non-background to baseline	Upgradient of Facility
32-O	5/14/79	Rosebud Overburden	Non-background to baseline	Upgradient of Facility
32-O	11/14/79	Rosebud Overburden	Non-background to baseline	Upgradient of Facility
32-O	1/16/87	Rosebud Overburden	Non-background to baseline	No impacts observed
32-O	6/16/88	Rosebud Overburden	Non-background to baseline	Upgradient of Facility
32-O	7/26/90	Rosebud Overburden	Non-background to baseline	No impacts observed
32-O	8/9/90	Rosebud Overburden	Non-background to baseline	Upgradient of Facility
32-O	6/5/92	Rosebud Overburden	Non-background to baseline	No impacts observed
32-O	8/14/96	Rosebud Overburden	Non-background to baseline	No impacts observed
371D	4/29/98	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
371D	9/25/98	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
371D	5/26/99	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
41-O	7/18/79	Rosebud Overburden	Non-background to baseline	No impacts observed
41-O	11/14/79	Rosebud Overburden	Non-background to baseline	No impacts observed
41-O	2/27/80	Rosebud Overburden	Non-background to baseline	No impacts observed
41-O	5/28/80	Rosebud Overburden	Non-background to baseline	No impacts observed
43-O	4/10/79	Rosebud Overburden	Non-background to baseline	No impacts observed
43-O	6/12/79	Rosebud Overburden	Non-background to baseline	No impacts observed
43-O	7/18/79	Rosebud Overburden	Non-background to baseline	No impacts observed
6S	6/7/77	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
6S	6/23/82	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
6S	10/6/82	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
6S	5/18/83	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
6S	10/18/85	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
6S	5/24/86	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
6S	4/27/94	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
6S	3/23/95	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
9S	10/27/95	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
WO-100	10/5/83	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-100	5/10/84	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-101	5/19/88	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-101	10/10/91	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-103	9/23/80	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-103	9/10/82	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-103	5/3/83	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-103	7/13/84	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-103	8/23/90	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-104	10/4/83	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-104	5/9/84	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-105	9/23/82	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-105	5/12/83	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-105	10/13/83	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-105	8/17/84	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-105	5/14/87	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-105	3/23/92	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-105	8/28/96	Rosebud Overburden	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
WO-105	9/19/12	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-105	4/16/14	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-106	5/10/83	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-106	3/27/86	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-106	3/31/92	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-106	8/19/96	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-107	8/6/92	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-108	7/17/92	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-108	8/21/96	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-109	8/4/92	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-109	8/8/96	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-110	8/22/85	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-110	8/6/92	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-154	5/3/83	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-154	5/11/84	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-155	9/25/82	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-156	9/26/82	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-156	5/10/84	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-160	3/11/92	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-160	8/26/96	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-162	5/5/83	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-162	5/11/84	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-162	7/7/86	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-162	7/14/92	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-162	8/27/96	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-165	5/4/83	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-165	5/11/84	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-165	8/10/90	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-165	8/21/96	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-166	9/23/85	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-166	6/24/86	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-166	9/6/88	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-166	10/18/91	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-168	8/4/82	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-168	3/25/86	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-168	7/24/86	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-168	11/23/87	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-168	10/27/89	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-168	7/24/95	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-169	5/19/87	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-169	6/29/92	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-169	7/31/96	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-170	3/12/86	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-170	7/26/95	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-171	11/5/82	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-171	9/30/83	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-171	12/15/83	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-171	3/12/86	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-171	10/12/87	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-171	7/21/95	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-171	8/20/96	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-172	11/2/82	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-172	9/13/88	Rosebud Overburden	Non-background to baseline	Upgradient of plant site

Well ID	Sample Date	Target Interval	Direction	Criteria
WO-172	7/30/90	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-172	8/6/90	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-172	8/8/96	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-172	8/27/97	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-172	10/4/00	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-172	9/24/13	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-173	11/7/82	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-173	5/3/83	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-173	8/16/84	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-173	6/24/86	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-173	8/7/90	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-173	8/21/96	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-174	9/21/93	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
WO-174	8/8/95	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
WO-174	10/5/99	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
WO-174	8/20/03	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
WO-174	8/24/06	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
WO-174	9/16/09	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
WO-174	9/18/12	Rosebud Overburden	Background to impacted	Prior samples have shown impacts
WO-175	5/10/83	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-175	5/9/84	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-175	3/31/92	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-175	8/19/96	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-176	6/22/88	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-178	1/29/84	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-178	5/11/84	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-178	1/19/87	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-178	6/23/88	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-178	7/31/90	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-178	8/20/92	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-178	7/18/96	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-178	10/28/99	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-178	8/26/03	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-178	8/23/06	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-178	9/15/09	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-178	9/20/12	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-179	1/19/87	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-179	8/13/90	Rosebud Overburden	Non-background to baseline	No impacts observed
WO-180	3/1/84	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-181	2/16/84	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-181	12/27/84	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-181	6/29/88	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-181	7/26/90	Rosebud Overburden	Non-background to baseline	Upgradient of plant site and mine, in undisturbed area
WO-181	8/12/92	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-181	7/17/96	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-181	9/30/98	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-181	9/26/01	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-181	8/12/04	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-181	9/5/07	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-181	9/15/10	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-181	9/24/13	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-188	12/17/13	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WO-188	3/21/14	Rosebud Overburden	Non-background to baseline	Upgradient of plant site

Well ID	Sample Date	Target Interval	Direction	Criteria
WO-188	5/12/14	Rosebud Overburden	Non-background to baseline	Upgradient of plant site
WR-104	12/7/85	Rosebud Overburden	Non-background to baseline	No impacts observed
WR-104	9/1/88	Rosebud Overburden	Non-background to baseline	No impacts observed
WR-104	9/12/89	Rosebud Overburden	Non-background to baseline	No impacts observed
WR-104	10/15/91	Rosebud Overburden	Non-background to baseline	No impacts observed
91S	6/29/15	Shallow	Background to impacted	Prior samples have shown impacts
16SP	11/1/87	Spoils	Background to impacted	Impacts observed
17SP	10/24/06	Spoils	Background to impacted	Impacts observed
18SP	10/22/97	Spoils	Background to impacted	Impacts observed
18SP	4/28/99	Spoils	Background to impacted	Impacts observed
18SP	11/16/99	Spoils	Background to impacted	Impacts observed
18SP	11/2/00	Spoils	Background to impacted	Impacts observed
18SP	5/31/01	Spoils	Background to impacted	Impacts observed
18SP	6/20/01	Spoils	Background to impacted	Impacts observed
18SP	7/3/01	Spoils	Background to impacted	Impacts observed
18SP	11/2/01	Spoils	Background to impacted	Impacts observed
18SP	5/28/02	Spoils	Background to impacted	Impacts observed
18SP	10/24/02	Spoils	Background to impacted	Impacts observed
18SP	5/21/03	Spoils	Background to impacted	Impacts observed
18SP	11/11/03	Spoils	Background to impacted	Impacts observed
18SP	5/25/04	Spoils	Background to impacted	Impacts observed
18SP	10/22/04	Spoils	Background to impacted	Impacts observed
18SP	5/14/05	Spoils	Background to impacted	Impacts observed
18SP	11/7/05	Spoils	Background to impacted	Impacts observed
18SP	6/18/06	Spoils	Background to impacted	Impacts observed
18SP	10/27/06	Spoils	Background to impacted	Impacts observed
18SP	6/12/07	Spoils	Background to impacted	Impacts observed
18SP	11/9/07	Spoils	Background to impacted	Impacts observed
18SP	4/29/08	Spoils	Background to impacted	Impacts observed
18SP	10/22/08	Spoils	Background to impacted	Impacts observed
18SP	4/4/09	Spoils	Background to impacted	Impacts observed
18SP	10/19/09	Spoils	Background to impacted	Impacts observed
18SP	4/15/10	Spoils	Background to impacted	Impacts observed
18SP	10/12/10	Spoils	Background to impacted	Impacts observed
18SP	3/15/11	Spoils	Background to impacted	Impacts observed
18SP	10/7/11	Spoils	Background to impacted	Impacts observed
18SP	4/12/12	Spoils	Background to impacted	Impacts observed
18SP	10/17/12	Spoils	Background to impacted	Impacts observed
18SP	4/4/13	Spoils	Background to impacted	Impacts observed
18SP	10/10/13	Spoils	Background to impacted	Impacts observed
18SP	4/3/14	Spoils	Background to impacted	Impacts observed
18SP	10/20/14	Spoils	Background to impacted	Impacts observed
18SP	5/5/15	Spoils	Background to impacted	Impacts observed
19SP	6/1/99	Spoils	Background to impacted	Impacts observed
20SP	3/13/02	Spoils	Background to impacted	Prior samples have shown impacts
20SP	10/18/07	Spoils	Background to impacted	Prior samples have shown impacts
20SP	4/10/08	Spoils	Background to impacted	Prior samples have shown impacts
20SP	11/19/08	Spoils	Background to impacted	Prior samples have shown impacts
20SP	4/2/09	Spoils	Background to impacted	Prior samples have shown impacts
20SP	11/11/09	Spoils	Background to impacted	Prior samples have shown impacts
20SP	4/22/10	Spoils	Background to impacted	Prior samples have shown impacts
20SP	10/13/10	Spoils	Background to impacted	Prior samples have shown impacts
20SP	3/23/11	Spoils	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
20SP	10/4/11	Spoils	Background to impacted	Prior samples have shown impacts
20SP	4/12/12	Spoils	Background to impacted	Prior samples have shown impacts
20SP	10/17/12	Spoils	Background to impacted	Prior samples have shown impacts
20SP	4/4/13	Spoils	Background to impacted	Prior samples have shown impacts
20SP	10/9/13	Spoils	Background to impacted	Prior samples have shown impacts
20SP	4/7/14	Spoils	Background to impacted	Prior samples have shown impacts
20SP	10/21/14	Spoils	Background to impacted	Prior samples have shown impacts
20SP	5/4/15	Spoils	Background to impacted	Prior samples have shown impacts
21SP-2	11/11/93	Spoils	Background to impacted	Impacts observed
21SP-2	5/17/94	Spoils	Background to impacted	Impacts observed
21SP-2	11/19/94	Spoils	Background to impacted	Impacts observed
21SP-2	3/21/95	Spoils	Background to impacted	Impacts observed
21SP-2	10/25/95	Spoils	Background to impacted	Impacts observed
21SP-2	4/2/96	Spoils	Background to impacted	Impacts observed
21SP-2	9/18/96	Spoils	Background to impacted	Impacts observed
21SP-2	4/16/98	Spoils	Background to impacted	Proximal to a pond and capture well
21SP-2	10/14/98	Spoils	Background to impacted	Proximal to a pond and capture well
21SP-2	4/28/99	Spoils	Background to impacted	Proximal to a pond and capture well
21SP-2	11/16/99	Spoils	Background to impacted	Proximal to a pond and capture well
21SP-2	10/31/00	Spoils	Background to impacted	Impacts observed
21SP-2	6/14/01	Spoils	Background to impacted	Impacts observed
21SP-2	6/10/02	Spoils	Background to impacted	Impacts observed
21SP-2	10/22/02	Spoils	Background to impacted	Impacts observed
21SP-2	5/21/03	Spoils	Background to impacted	Impacts observed
21SP-2	10/31/03	Spoils	Background to impacted	Impacts observed
21SP-2	10/22/04	Spoils	Background to impacted	Impacts observed
21SP-2	6/18/06	Spoils	Background to impacted	Impacts observed
21SP-2	10/29/09	Spoils	Background to impacted	Impacts observed
21SP-2	10/13/10	Spoils	Background to impacted	Impacts observed
21SP-2	10/13/11	Spoils	Background to impacted	Impacts observed
21SP-2	4/9/14	Spoils	Background to impacted	Impacts observed
22SP	4/23/91	Spoils	Background to impacted	No impacts observed
22SP	9/16/91	Spoils	Background to impacted	No impacts observed
22SP	10/26/92	Spoils	Background to impacted	No impacts observed
22SP	3/31/93	Spoils	Background to impacted	No impacts observed
22SP	10/21/93	Spoils	Background to impacted	No impacts observed
22SP	5/18/94	Spoils	Background to impacted	No impacts observed
22SP	11/19/94	Spoils	Background to impacted	No impacts observed
22SP	3/22/95	Spoils	Background to impacted	No impacts observed
22SP	6/27/01	Spoils	Background to impacted	Prior samples have shown impacts
22SP	9/10/01	Spoils	Background to impacted	Prior samples have shown impacts
22SP	10/24/02	Spoils	Background to impacted	Prior samples have shown impacts
22SP	10/20/04	Spoils	Background to impacted	Prior samples have shown impacts
22SP	11/21/05	Spoils	Background to impacted	Prior samples have shown impacts
22SP	11/4/09	Spoils	Background to impacted	Prior samples have shown impacts
28SP	5/27/88	Spoils	Background to impacted	Prior samples have shown impacts
28SP	9/23/88	Spoils	Background to impacted	Prior samples have shown impacts
28SP	10/27/95	Spoils	Background to impacted	Prior samples have shown impacts
28SP	4/9/96	Spoils	Background to impacted	Prior samples have shown impacts
28SP	9/26/96	Spoils	Background to impacted	Prior samples have shown impacts
28SP	4/2/97	Spoils	Background to impacted	Prior samples have shown impacts
28SP	10/21/97	Spoils	Background to impacted	Prior samples have shown impacts
28SP	4/9/98	Spoils	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
28SP	10/2/98	Spoils	Background to impacted	Prior samples have shown impacts
28SP	5/12/99	Spoils	Background to impacted	Prior samples have shown impacts
28SP	11/11/99	Spoils	Background to impacted	Prior samples have shown impacts
28SP	5/23/00	Spoils	Background to impacted	Prior samples have shown impacts
28SP	9/11/01	Spoils	Background to impacted	Prior samples have shown impacts
28SP	10/25/01	Spoils	Background to impacted	Prior samples have shown impacts
28SP	6/12/02	Spoils	Background to impacted	Prior samples have shown impacts
28SP	5/22/03	Spoils	Background to impacted	Prior samples have shown impacts
28SP	11/4/03	Spoils	Background to impacted	Prior samples have shown impacts
28SP	5/19/04	Spoils	Background to impacted	Prior samples have shown impacts
28SP	11/18/04	Spoils	Background to impacted	Prior samples have shown impacts
28SP	6/16/05	Spoils	Background to impacted	Prior samples have shown impacts
28SP	11/9/05	Spoils	Background to impacted	Prior samples have shown impacts
28SP	6/26/06	Spoils	Background to impacted	Prior samples have shown impacts
28SP	11/22/06	Spoils	Background to impacted	Prior samples have shown impacts
28SP	6/16/07	Spoils	Background to impacted	Prior samples have shown impacts
28SP	11/13/07	Spoils	Background to impacted	Prior samples have shown impacts
28SP	5/11/08	Spoils	Background to impacted	Prior samples have shown impacts
28SP	11/2/08	Spoils	Background to impacted	Prior samples have shown impacts
28SP	4/22/13	Spoils	Background to impacted	Prior samples have shown impacts
28SP	10/1/13	Spoils	Background to impacted	Prior samples have shown impacts
28SP	5/2/14	Spoils	Background to impacted	Prior samples have shown impacts
28SP	10/23/14	Spoils	Background to impacted	Prior samples have shown impacts
28SP	4/29/15	Spoils	Background to impacted	Prior samples have shown impacts
29SP	10/25/01	Spoils	Background to impacted	Prior samples have shown impacts
29SP	4/6/09	Spoils	Background to impacted	Prior samples have shown impacts
29SP	10/27/09	Spoils	Background to impacted	Prior samples have shown impacts
29SP	9/28/10	Spoils	Background to impacted	Prior samples have shown impacts
29SP	4/21/14	Spoils	Background to impacted	Prior samples have shown impacts
29SP	11/12/14	Spoils	Background to impacted	Prior samples have shown impacts
33S	10/27/95	Spoils	Background to impacted	Prior samples have shown impacts
33S	4/17/98	Spoils	Background to impacted	Prior samples have shown impacts
33S	5/18/04	Spoils	Background to impacted	Prior samples have shown impacts
33S	6/25/06	Spoils	Background to impacted	Prior samples have shown impacts
33S	10/24/06	Spoils	Background to impacted	Prior samples have shown impacts
37SP	11/29/94	Spoils	Background to impacted	Prior samples have shown impacts
37SP	4/3/96	Spoils	Background to impacted	Prior samples have shown impacts
37SP	9/24/96	Spoils	Background to impacted	Prior samples have shown impacts
37SP	5/15/97	Spoils	Background to impacted	Prior samples have shown impacts
37SP	10/16/97	Spoils	Background to impacted	Prior samples have shown impacts
37SP	4/10/98	Spoils	Background to impacted	Prior samples have shown impacts
37SP	10/1/98	Spoils	Background to impacted	Prior samples have shown impacts
37SP	4/22/99	Spoils	Background to impacted	Prior samples have shown impacts
37SP	11/17/99	Spoils	Background to impacted	Prior samples have shown impacts
37SP	6/21/00	Spoils	Background to impacted	Prior samples have shown impacts
37SP	11/8/00	Spoils	Background to impacted	Prior samples have shown impacts
37SP	3/28/01	Spoils	Background to impacted	Prior samples have shown impacts
37SP	9/10/01	Spoils	Background to impacted	Prior samples have shown impacts
37SP	6/13/02	Spoils	Background to impacted	Prior samples have shown impacts
37SP	10/22/02	Spoils	Background to impacted	Prior samples have shown impacts
37SP	5/29/03	Spoils	Background to impacted	Prior samples have shown impacts
37SP	11/6/03	Spoils	Background to impacted	Prior samples have shown impacts
37SP	5/17/04	Spoils	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
37SP	10/25/04	Spoils	Background to impacted	Prior samples have shown impacts
37SP	6/20/05	Spoils	Background to impacted	Prior samples have shown impacts
37SP	11/17/05	Spoils	Background to impacted	Prior samples have shown impacts
37SP	5/1/06	Spoils	Background to impacted	Prior samples have shown impacts
37SP	11/6/06	Spoils	Background to impacted	Prior samples have shown impacts
37SP	6/16/07	Spoils	Background to impacted	Prior samples have shown impacts
37SP	11/9/07	Spoils	Background to impacted	Prior samples have shown impacts
37SP	5/20/08	Spoils	Background to impacted	Prior samples have shown impacts
37SP	10/30/08	Spoils	Background to impacted	Prior samples have shown impacts
37SP	5/2/09	Spoils	Background to impacted	Prior samples have shown impacts
37SP	11/5/09	Spoils	Background to impacted	Prior samples have shown impacts
37SP	4/21/10	Spoils	Background to impacted	Prior samples have shown impacts
37SP	10/7/10	Spoils	Background to impacted	Prior samples have shown impacts
37SP	10/11/11	Spoils	Background to impacted	Prior samples have shown impacts
37SP	4/11/12	Spoils	Background to impacted	Prior samples have shown impacts
37SP	10/23/12	Spoils	Background to impacted	Prior samples have shown impacts
37SP	4/23/13	Spoils	Background to impacted	Prior samples have shown impacts
37SP	10/1/13	Spoils	Background to impacted	Prior samples have shown impacts
37SP	4/10/14	Spoils	Background to impacted	Prior samples have shown impacts
37SP	11/20/14	Spoils	Background to impacted	Prior samples have shown impacts
37SP	11/21/14	Spoils	Background to impacted	Prior samples have shown impacts
37SP	4/28/15	Spoils	Background to impacted	Prior samples have shown impacts
41SP	5/20/94	Spoils	Background to impacted	Impacts observed
41SP	11/18/94	Spoils	Background to impacted	Impacts observed
41SP	4/19/95	Spoils	Background to impacted	Impacts observed
41SP	10/25/95	Spoils	Background to impacted	Impacts observed
51SP	7/20/01	Spoils	Background to impacted	Capture well samples
51SP	5/22/03	Spoils	Background to impacted	Capture well samples
51SP	6/7/04	Spoils	Background to impacted	Capture well samples
51SP	9/6/05	Spoils	Background to impacted	Capture well samples
52SP	5/22/03	Spoils	Background to impacted	Capture well samples
52SP	6/7/04	Spoils	Background to impacted	Capture well samples
53SP	7/20/01	Spoils	Background to impacted	Capture well samples
53SP	5/22/03	Spoils	Background to impacted	Capture well samples
53SP	6/7/04	Spoils	Background to impacted	Capture well samples
53SP	9/6/05	Spoils	Background to impacted	Capture well samples
54SP	6/27/02	Spoils	Background to impacted	Capture well samples
54SP	5/22/03	Spoils	Background to impacted	Capture well samples
54SP	12/1/03	Spoils	Background to impacted	Capture well samples
54SP	6/7/04	Spoils	Background to impacted	Capture well samples
54SP	11/18/04	Spoils	Background to impacted	Capture well samples
54SP	9/6/05	Spoils	Background to impacted	Capture well samples
54SP	6/23/06	Spoils	Background to impacted	Capture well samples
87SP	3/28/11	Spoils	Background to impacted	Prior samples have shown impacts
87SP	5/15/12	Spoils	Background to impacted	Prior samples have shown impacts
87SP	4/3/13	Spoils	Background to impacted	Prior samples have shown impacts
87SP	4/9/14	Spoils	Background to impacted	Prior samples have shown impacts
87SP	5/4/15	Spoils	Background to impacted	Prior samples have shown impacts
B-4	12/21/94	Spoils	Non-background to baseline	No impacts observed
B-4	6/22/99	Spoils	Non-background to baseline	No impacts observed
B-4	5/30/05	Spoils	Non-background to baseline	No impacts observed
B-4	11/15/06	Spoils	Non-background to baseline	No impacts observed
B-4	6/12/07	Spoils	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
B-4	11/20/07	Spoils	Non-background to baseline	No impacts observed
B-4	4/29/08	Spoils	Non-background to baseline	No impacts observed
B-4	4/13/10	Spoils	Non-background to baseline	No impacts observed
B-4	9/29/11	Spoils	Non-background to baseline	No impacts observed
B-4	9/11/14	Spoils	Non-background to baseline	No impacts observed
B-4	4/28/15	Spoils	Non-background to baseline	No impacts observed
B-5	4/15/05	Spoils	Background to impacted	Prior samples have shown impacts
B-5	11/20/07	Spoils	Background to impacted	Prior samples have shown impacts
B-5	4/29/08	Spoils	Background to impacted	Prior samples have shown impacts
B-5	4/4/09	Spoils	Background to impacted	Prior samples have shown impacts
B-5	4/13/10	Spoils	Background to impacted	Prior samples have shown impacts
B-5	3/15/11	Spoils	Background to impacted	Prior samples have shown impacts
B-5	3/28/12	Spoils	Background to impacted	Prior samples have shown impacts
B-5	4/4/13	Spoils	Background to impacted	Prior samples have shown impacts
B-5	4/16/14	Spoils	Background to impacted	Prior samples have shown impacts
B-5	11/11/14	Spoils	Background to impacted	Prior samples have shown impacts
BS-19	8/15/79	Spoils	Non-background to baseline	No impacts observed
BS-22	4/5/76	Spoils	Non-background to baseline	Off-site
BS-22	6/4/76	Spoils	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
BS-22	2/19/77	Spoils	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
BS-22	7/21/77	Spoils	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
BS-22	3/28/78	Spoils	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
BS-22	8/15/79	Spoils	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
BS-22	5/29/80	Spoils	Non-background to baseline	Off-site, variation in water quality likely due to mine spoil recharge
BS-36	5/14/85	Spoils	Background to impacted	Prior samples have shown impacts
BS-36	10/28/85	Spoils	Background to impacted	Prior samples have shown impacts
BS-36	10/9/87	Spoils	Background to impacted	Prior samples have shown impacts
BS-36	10/25/89	Spoils	Background to impacted	Prior samples have shown impacts
BS-36	12/30/99	Spoils	Background to impacted	Prior samples have shown impacts
BS-36	7/6/11	Spoils	Background to impacted	Prior samples have shown impacts
BS-37	8/16/84	Spoils	Background to impacted	Prior samples have shown impacts
BS-37	5/16/85	Spoils	Background to impacted	Prior samples have shown impacts
BS-37	10/29/85	Spoils	Background to impacted	Prior samples have shown impacts
BS-37	5/15/86	Spoils	Background to impacted	Prior samples have shown impacts
BS-37	10/9/87	Spoils	Background to impacted	Prior samples have shown impacts
BS-37	10/8/90	Spoils	Background to impacted	Prior samples have shown impacts
BS-37	6/15/93	Spoils	Background to impacted	Prior samples have shown impacts
BS-37	1/1/00	Spoils	Background to impacted	Prior samples have shown impacts
BS-37	7/6/11	Spoils	Background to impacted	Prior samples have shown impacts
BS-49	10/24/89	Spoils	Background to impacted	Prior samples have shown impacts
BS-49	10/4/90	Spoils	Background to impacted	Prior samples have shown impacts
BS-49	6/16/93	Spoils	Background to impacted	Prior samples have shown impacts
BS-49	8/19/97	Spoils	Background to impacted	Prior samples have shown impacts
BS-49	6/15/10	Spoils	Background to impacted	Prior samples have shown impacts
EPA-06	4/24/81	Spoils	Non-background to baseline	No impacts observed
S-01	8/14/79	Spoils	Background to impacted	Prior samples have shown impacts
S-01	6/5/80	Spoils	Background to impacted	Prior samples have shown impacts
S-01	8/18/81	Spoils	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
S-01	8/14/84	Spoils	Background to impacted	Prior samples have shown impacts
S-01	5/28/85	Spoils	Background to impacted	Prior samples have shown impacts
S-01	10/24/85	Spoils	Background to impacted	Prior samples have shown impacts
S-01	5/12/86	Spoils	Background to impacted	Prior samples have shown impacts
S-01	10/5/87	Spoils	Background to impacted	Prior samples have shown impacts
S-01	10/5/88	Spoils	Background to impacted	Prior samples have shown impacts
S-01	11/9/89	Spoils	Background to impacted	Prior samples have shown impacts
S-01	10/2/90	Spoils	Background to impacted	Prior samples have shown impacts
S-01	9/20/91	Spoils	Background to impacted	Prior samples have shown impacts
S-01	6/22/92	Spoils	Background to impacted	Prior samples have shown impacts
S-01	6/9/93	Spoils	Background to impacted	Prior samples have shown impacts
S-01	7/22/96	Spoils	Background to impacted	Prior samples have shown impacts
S-01	1/1/00	Spoils	Background to impacted	Prior samples have shown impacts
S-10	3/30/78	Spoils	Non-background to baseline	Include samples prior to pond use
S-10	10/22/86	Spoils	Background to impacted	Prior samples have shown impacts
S-10	10/6/87	Spoils	Background to impacted	Prior samples have shown impacts
S-10	6/10/93	Spoils	Background to impacted	Prior samples have shown impacts
S-15	12/10/99	Spoils	Background to impacted	Prior samples have shown impacts
S-15	6/15/10	Spoils	Background to impacted	Prior samples have shown impacts
U3-1	12/13/10	Spoils	Background to impacted	Prior samples have shown impacts
U3-3	6/14/07	Spoils	Background to impacted	Impacts observed
U3-3	11/19/07	Spoils	Background to impacted	Impacts observed
U3-3	3/27/08	Spoils	Background to impacted	Impacts observed
U3-3	7/14/08	Spoils	Background to impacted	Location is within the plant site
U3-3	5/30/09	Spoils	Background to impacted	Location is within the plant site
U3-3	4/15/10	Spoils	Background to impacted	Location is within the plant site
U3-3	4/6/11	Spoils	Background to impacted	Location is within the plant site
U3-3	5/16/12	Spoils	Background to impacted	Location is within the plant site
U3-3	4/4/13	Spoils	Background to impacted	Location is within the plant site
U3-3	5/7/15	Spoils	Background to impacted	Location is within the plant site
W-04	10/1/75	Spoils	Background to impacted	Prior samples have shown impacts
W-04	1/12/76	Spoils	Background to impacted	Prior samples have shown impacts
W-04	4/6/76	Spoils	Background to impacted	Prior samples have shown impacts
W-04	6/3/76	Spoils	Background to impacted	Prior samples have shown impacts
W-04	11/18/76	Spoils	Background to impacted	Prior samples have shown impacts
W-04	7/20/77	Spoils	Background to impacted	Prior samples have shown impacts
WS-101	6/18/82	Spoils	Non-background to baseline	Upgradient of Facility
WS-101	5/14/87	Spoils	Non-background to baseline	Upgradient of Facility
WS-108	9/12/82	Spoils	Non-background to baseline	Upgradient of Facility
WS-108	2/11/87	Spoils	Non-background to baseline	Upgradient of Facility
WS-114	9/25/82	Spoils	Non-background to baseline	No impacts observed
WS-115	8/7/97	Spoils	Non-background to baseline	No impacts observed
WS-121	8/11/04	Spoils	Non-background to baseline	No impacts observed
WS-121	9/6/07	Spoils	Non-background to baseline	No impacts observed
WS-121	9/15/10	Spoils	Non-background to baseline	No impacts observed
WS-127	9/29/99	Spoils	Non-background to baseline	Upgradient of Facility
WS-127	8/23/02	Spoils	Non-background to baseline	Upgradient of Facility
WS-127	9/8/05	Spoils	Non-background to baseline	Upgradient of Facility
WS-127	9/18/08	Spoils	Non-background to baseline	Upgradient of Facility
WS-127	9/23/11	Spoils	Non-background to baseline	Upgradient of Facility
WS-127	8/29/14	Spoils	Non-background to baseline	Upgradient of Facility
WS-158	9/30/83	Spoils	Non-background to baseline	No impacts observed
WS-158	11/30/83	Spoils	Non-background to baseline	Upgradient of plant site

Well ID	Sample Date	Target Interval	Direction	Criteria
WS-158	8/7/84	Spoils	Non-background to baseline	Upgradient of plant site
WS-158	3/28/86	Spoils	Non-background to baseline	No impacts observed
WS-158	12/4/87	Spoils	Non-background to baseline	Upgradient of plant site
WS-158	11/10/89	Spoils	Non-background to baseline	Upgradient of plant site
WS-158	12/6/91	Spoils	Non-background to baseline	Upgradient of plant site
WS-158	11/11/93	Spoils	Non-background to baseline	Upgradient of plant site
WS-158	8/1/95	Spoils	Non-background to baseline	No impacts observed
WS-158	8/26/96	Spoils	Non-background to baseline	Upgradient of plant site
WS-158	8/13/97	Spoils	Non-background to baseline	Upgradient of plant site
WS-158	8/21/03	Spoils	Non-background to baseline	Upgradient of plant site
WS-158	8/23/06	Spoils	Non-background to baseline	Upgradient of plant site
WS-158	9/16/09	Spoils	Non-background to baseline	Upgradient of plant site
WS-158	9/19/12	Spoils	Non-background to baseline	Upgradient of plant site
1072D	3/18/10	SubMcKay	Background to impacted	Prior samples have shown impacts
1072D	9/23/10	SubMcKay	Background to impacted	Prior samples have shown impacts
1074D	9/13/11	SubMcKay	Background to impacted	Prior samples have shown impacts
1074D	7/10/12	SubMcKay	Background to impacted	Prior samples have shown impacts
1074D	12/19/12	SubMcKay	Background to impacted	Prior samples have shown impacts
1074D	6/8/13	SubMcKay	Background to impacted	Prior samples have shown impacts
1074D	11/11/13	SubMcKay	Background to impacted	Prior samples have shown impacts
1074D	5/14/14	SubMcKay	Background to impacted	Prior samples have shown impacts
1074D	10/6/14	SubMcKay	Background to impacted	Prior samples have shown impacts
1074D	5/1/15	SubMcKay	Background to impacted	Prior samples have shown impacts
1076D	7/13/12	SubMcKay	Background to impacted	Prior samples have shown impacts
1076D	12/20/12	SubMcKay	Background to impacted	Prior samples have shown impacts
1076D	4/28/14	SubMcKay	Background to impacted	Prior samples have shown impacts
1092D	7/17/12	SubMcKay	Background to impacted	Prior samples have shown impacts
1092D	12/5/12	SubMcKay	Background to impacted	Prior samples have shown impacts
1092D	6/11/13	SubMcKay	Background to impacted	Prior samples have shown impacts
1092D	11/5/13	SubMcKay	Background to impacted	Prior samples have shown impacts
1092D	4/28/14	SubMcKay	Background to impacted	Prior samples have shown impacts
1092D	10/7/14	SubMcKay	Background to impacted	Prior samples have shown impacts
1092D	4/28/15	SubMcKay	Background to impacted	Prior samples have shown impacts
1100D	3/20/13	SubMcKay	Background to impacted	Prior samples have shown impacts
1100D	6/30/14	SubMcKay	Background to impacted	Prior samples have shown impacts
1100D	8/27/14	SubMcKay	Background to impacted	Prior samples have shown impacts
1100D	3/4/15	SubMcKay	Background to impacted	Prior samples have shown impacts
1101D	3/20/13	SubMcKay	Background to impacted	Prior samples have shown impacts
1101D	3/5/15	SubMcKay	Background to impacted	Prior samples have shown impacts
1107D	9/30/09	SubMcKay	Background to impacted	Variable water quality and adjacent to EHP
1113D	6/8/11	SubMcKay	Background to impacted	Prior samples have shown impacts
1113D	9/10/11	SubMcKay	Background to impacted	Prior samples have shown impacts
1113D	7/17/12	SubMcKay	Background to impacted	Prior samples have shown impacts
1113D	12/4/12	SubMcKay	Background to impacted	Prior samples have shown impacts
1113D	6/12/13	SubMcKay	Background to impacted	Prior samples have shown impacts
1113D	11/3/13	SubMcKay	Background to impacted	Prior samples have shown impacts
1113D	4/28/14	SubMcKay	Background to impacted	Prior samples have shown impacts
1113D	10/4/14	SubMcKay	Background to impacted	Prior samples have shown impacts
1113D	4/28/15	SubMcKay	Background to impacted	Prior samples have shown impacts
1119D	10/17/11	SubMcKay	Background to impacted	Prior samples have shown impacts
1119D	6/21/12	SubMcKay	Background to impacted	Prior samples have shown impacts
1119D	12/20/12	SubMcKay	Background to impacted	Prior samples have shown impacts
1119D	6/28/13	SubMcKay	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
1119D	11/16/13	SubMcKay	Background to impacted	Prior samples have shown impacts
1119D	5/28/14	SubMcKay	Background to impacted	Prior samples have shown impacts
1119D	10/20/14	SubMcKay	Background to impacted	Prior samples have shown impacts
1119D	5/6/15	SubMcKay	Background to impacted	Prior samples have shown impacts
1127D	3/20/13	SubMcKay	Background to impacted	Prior samples have shown impacts
1127D	11/2/13	SubMcKay	Background to impacted	Prior samples have shown impacts
1127D	6/9/14	SubMcKay	Background to impacted	Prior samples have shown impacts
1127D	8/27/14	SubMcKay	Background to impacted	Prior samples have shown impacts
1127D	3/4/15	SubMcKay	Background to impacted	Prior samples have shown impacts
1134D	6/26/12	SubMcKay	Background to impacted	Prior samples have shown impacts
1134D	12/19/12	SubMcKay	Background to impacted	Prior samples have shown impacts
1134D	6/26/13	SubMcKay	Background to impacted	Prior samples have shown impacts
1134D	11/30/13	SubMcKay	Background to impacted	Prior samples have shown impacts
1134D	5/28/14	SubMcKay	Background to impacted	Prior samples have shown impacts
1134D	10/10/14	SubMcKay	Background to impacted	Prior samples have shown impacts
1134D	4/24/15	SubMcKay	Background to impacted	Prior samples have shown impacts
1154D	4/16/15	SubMcKay	Background to impacted	Prior samples have shown impacts
1163D	9/22/14	SubMcKay	Background to impacted	Prior samples have shown impacts
1163D	4/16/15	SubMcKay	Background to impacted	Prior samples have shown impacts
129D	11/22/13	SubMcKay	Background to impacted	Impacts observed
129D	4/2/14	SubMcKay	Background to impacted	Impacts observed
15D	6/19/79	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	11/27/79	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	9/12/80	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	12/10/80	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	6/26/81	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	11/11/81	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	6/24/82	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/7/82	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	5/26/83	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	11/3/83	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	5/18/84	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/19/84	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	5/23/85	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/18/85	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	5/25/86	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/23/86	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	5/22/87	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	11/2/87	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	6/3/88	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/14/88	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	5/5/89	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	11/3/89	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	5/1/90	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	9/14/90	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	4/26/91	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	9/25/91	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	3/27/92	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/26/92	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	4/15/93	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/26/93	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	5/23/94	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	11/22/94	SubMcKay	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
15D	4/26/95	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/31/95	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	5/9/96	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/9/96	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	4/22/97	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/28/97	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	4/21/98	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/21/98	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	5/13/99	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	11/16/99	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	6/15/00	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	11/9/00	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	5/31/01	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	6/25/01	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	6/15/02	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/31/02	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	5/29/03	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	11/13/03	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	6/8/04	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	11/9/04	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	6/24/05	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	11/2/05	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	6/23/06	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/23/06	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	5/9/07	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/16/07	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	5/19/08	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/7/08	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	4/23/09	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/15/09	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	4/13/10	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/5/10	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	4/6/11	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/12/11	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	4/4/12	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/16/12	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	4/24/13	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	10/22/13	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	4/23/14	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	11/17/14	SubMcKay	Background to impacted	Prior samples have shown impacts
15D	5/6/15	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	8/27/76	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	9/20/77	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	9/6/78	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	6/19/79	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	11/27/79	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	9/12/80	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	12/11/80	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	6/26/81	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	11/11/81	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	6/24/82	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	10/7/82	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	5/23/83	SubMcKay	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
15S	11/3/83	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	5/18/84	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	10/19/84	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	5/23/85	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	10/17/85	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	5/25/86	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	10/23/86	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	5/22/87	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	11/2/87	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	6/3/88	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	10/14/88	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	5/5/89	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	11/3/89	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	4/30/90	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	9/14/90	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	4/26/91	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	9/25/91	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	3/27/92	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	10/26/92	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	4/15/93	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	10/26/93	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	5/23/94	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	11/22/94	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	4/26/95	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	10/31/95	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	10/9/96	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	10/28/97	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	5/13/99	SubMcKay	Background to impacted	Prior samples have shown impacts
15S	5/31/01	SubMcKay	Background to impacted	Prior samples have shown impacts
1D	8/30/76	SubMcKay	Background to impacted	Prior samples have shown impacts
1D	10/4/76	SubMcKay	Background to impacted	This samplie is affected by drilling water
1D	9/18/96	SubMcKay	Background to impacted	Prior samples have shown impacts
1D	4/16/97	SubMcKay	Background to impacted	Prior samples have shown impacts
1D	10/27/97	SubMcKay	Background to impacted	Prior samples have shown impacts
1D	4/7/98	SubMcKay	Background to impacted	Prior samples have shown impacts
1D	10/15/98	SubMcKay	Background to impacted	Prior samples have shown impacts
1D	5/12/99	SubMcKay	Background to impacted	Prior samples have shown impacts
1D	5/25/00	SubMcKay	Background to impacted	Prior samples have shown impacts
1D	10/30/02	SubMcKay	Background to impacted	Prior samples have shown impacts
2006D	10/29/10	SubMcKay	Non-background to baseline	No impacts observed
2006D	11/10/11	SubMcKay	Non-background to baseline	No impacts observed
2006D	5/2/12	SubMcKay	Non-background to baseline	No impacts observed
2006D	10/8/12	SubMcKay	Non-background to baseline	No impacts observed
2006D	5/6/13	SubMcKay	Non-background to baseline	No impacts observed
2006D	10/7/13	SubMcKay	Non-background to baseline	No impacts observed
2006D	9/11/14	SubMcKay	Non-background to baseline	No impacts observed
2006D	3/18/15	SubMcKay	Non-background to baseline	No impacts observed
2009D	5/5/11	SubMcKay	Non-background to baseline	No impacts observed
2009D	11/9/11	SubMcKay	Non-background to baseline	No impacts observed
2009D	5/25/12	SubMcKay	Non-background to baseline	No impacts observed
2009D	11/16/12	SubMcKay	Non-background to baseline	No impacts observed
2009D	6/24/13	SubMcKay	Non-background to baseline	No impacts observed
2009D	10/12/13	SubMcKay	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
2009D	4/30/14	SubMcKay	Non-background to baseline	No impacts observed
2009D	9/10/14	SubMcKay	Non-background to baseline	No impacts observed
2009D	3/12/15	SubMcKay	Non-background to baseline	No impacts observed
2010D	5/3/11	SubMcKay	Non-background to baseline	No impacts observed
2010D	11/9/11	SubMcKay	Non-background to baseline	No impacts observed
2010D	5/29/12	SubMcKay	Non-background to baseline	No impacts observed
2010D	9/10/14	SubMcKay	Non-background to baseline	No impacts observed
2011D	5/5/11	SubMcKay	Non-background to baseline	No impacts observed
2018D	3/25/15	SubMcKay	Non-background to baseline	No impacts observed
2027D	5/15/13	SubMcKay	Background to impacted	Prior samples have shown impacts
2031D	4/25/14	SubMcKay	Background to impacted	Prior samples have shown impacts
2034D	9/16/14	SubMcKay	Background to impacted	Prior samples have shown impacts
2034D	3/9/15	SubMcKay	Background to impacted	Prior samples have shown impacts
24S	6/3/86	SubMcKay	Background to impacted	No impacts observed
24S	10/21/86	SubMcKay	Background to impacted	No impacts observed
24S	5/23/87	SubMcKay	Background to impacted	No impacts observed
24S	11/2/87	SubMcKay	Background to impacted	No impacts observed
24S	5/18/88	SubMcKay	Background to impacted	No impacts observed
24S	9/30/88	SubMcKay	Background to impacted	No impacts observed
24S	4/26/89	SubMcKay	Background to impacted	No impacts observed
24S	11/1/89	SubMcKay	Background to impacted	No impacts observed
24S	4/23/90	SubMcKay	Background to impacted	No impacts observed
24S	9/21/90	SubMcKay	Background to impacted	No impacts observed
24S	4/17/91	SubMcKay	Background to impacted	No impacts observed
24S	9/25/91	SubMcKay	Background to impacted	No impacts observed
24S	3/27/92	SubMcKay	Background to impacted	No impacts observed
24S	10/20/92	SubMcKay	Background to impacted	No impacts observed
24S	4/7/93	SubMcKay	Background to impacted	No impacts observed
24S	10/20/93	SubMcKay	Background to impacted	No impacts observed
24S	4/27/94	SubMcKay	Background to impacted	No impacts observed
24S	11/22/94	SubMcKay	Background to impacted	No impacts observed
24S	10/30/95	SubMcKay	Background to impacted	No impacts observed
350D	1/28/84	SubMcKay	Non-background to baseline	No impacts observed
350D	5/17/84	SubMcKay	Non-background to baseline	No impacts observed
350D	10/20/84	SubMcKay	Non-background to baseline	No impacts observed
350D	6/15/94	SubMcKay	Non-background to baseline	No impacts observed
350D	10/21/99	SubMcKay	Non-background to baseline	No impacts observed
350D	10/10/02	SubMcKay	Non-background to baseline	No impacts observed
350D	10/17/05	SubMcKay	Non-background to baseline	No impacts observed
350D	10/15/09	SubMcKay	Non-background to baseline	No impacts observed
350D	5/18/10	SubMcKay	Non-background to baseline	No impacts observed
350D	5/5/11	SubMcKay	Non-background to baseline	No impacts observed
350D	11/9/11	SubMcKay	Non-background to baseline	No impacts observed
350D	6/19/12	SubMcKay	Non-background to baseline	No impacts observed
350D	9/12/14	SubMcKay	Non-background to baseline	No impacts observed
350D	5/15/15	SubMcKay	Non-background to baseline	No impacts observed
351D	1/28/84	SubMcKay	Non-background to baseline	No impacts observed
351D	5/19/84	SubMcKay	Non-background to baseline	No impacts observed
351D	10/20/84	SubMcKay	Non-background to baseline	No impacts observed
351D	10/20/85	SubMcKay	Non-background to baseline	No impacts observed
351D	11/17/93	SubMcKay	Non-background to baseline	No impacts observed
351D	5/11/04	SubMcKay	Non-background to baseline	No impacts observed
351D	5/18/10	SubMcKay	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
351D	5/6/11	SubMcKay	Non-background to baseline	No impacts observed
351D	11/14/11	SubMcKay	Non-background to baseline	No impacts observed
354D	6/26/13	SubMcKay	Non-background to baseline	No impacts observed
355D	6/5/87	SubMcKay	Non-background to baseline	No impacts observed
356D	10/17/95	SubMcKay	Non-background to baseline	No impacts observed
356D	6/4/02	SubMcKay	Non-background to baseline	No impacts observed
358D	9/5/14	SubMcKay	Background to impacted	Prior samples have shown impacts
358D	3/11/15	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	10/28/99	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	4/26/00	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	10/17/00	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	10/16/01	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	10/20/03	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	11/1/04	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	6/1/06	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	10/26/06	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	5/16/07	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	10/11/07	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	4/9/08	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	9/30/08	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	5/7/09	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	5/20/10	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	11/9/11	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	5/7/12	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	10/3/12	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	5/7/13	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	10/17/13	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	4/24/14	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	9/9/14	SubMcKay	Background to impacted	Prior samples have shown impacts
364D	3/16/15	SubMcKay	Background to impacted	Prior samples have shown impacts
375D	5/13/03	SubMcKay	Background to impacted	Prior samples have shown impacts
375D	6/14/06	SubMcKay	Background to impacted	Prior samples have shown impacts
375D	10/20/06	SubMcKay	Background to impacted	Prior samples have shown impacts
375D	5/28/07	SubMcKay	Background to impacted	Prior samples have shown impacts
375D	10/17/07	SubMcKay	Background to impacted	Prior samples have shown impacts
375D	4/14/08	SubMcKay	Background to impacted	Prior samples have shown impacts
380D	6/16/05	SubMcKay	Background to impacted	Prior samples have shown impacts
384D	11/3/99	SubMcKay	Background to impacted	Prior samples have shown impacts
384D	4/17/03	SubMcKay	Background to impacted	Prior samples have shown impacts
384D	6/3/04	SubMcKay	Background to impacted	Prior samples have shown impacts
384D	5/9/09	SubMcKay	Background to impacted	Prior samples have shown impacts
384D	5/20/10	SubMcKay	Background to impacted	Prior samples have shown impacts
384D	5/7/13	SubMcKay	Background to impacted	Prior samples have shown impacts
384D	5/29/14	SubMcKay	Background to impacted	Prior samples have shown impacts
384D	3/20/15	SubMcKay	Background to impacted	Prior samples have shown impacts
387D	4/18/11	SubMcKay	Background to impacted	Prior samples have shown impacts
387D	5/1/12	SubMcKay	Background to impacted	Prior samples have shown impacts
387D	5/4/13	SubMcKay	Background to impacted	Prior samples have shown impacts
387D	4/25/14	SubMcKay	Background to impacted	Prior samples have shown impacts
387D	3/10/15	SubMcKay	Background to impacted	Prior samples have shown impacts
391D-P	5/6/13	SubMcKay	Background to impacted	Prior samples have shown impacts
391D-P	3/12/15	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	6/4/02	SubMcKay	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
398D	10/10/02	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	5/14/03	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	10/9/03	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	5/11/04	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	11/10/04	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	6/15/05	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	10/17/05	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	6/12/06	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	10/25/06	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	5/17/07	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	10/2/07	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	4/17/08	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	5/20/09	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	5/18/10	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	5/5/11	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	5/22/12	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	6/24/13	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	4/28/14	SubMcKay	Background to impacted	Prior samples have shown impacts
398D	3/11/15	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	5/22/98	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	9/18/98	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	3/29/99	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	9/21/99	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	4/13/00	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	3/29/01	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	4/19/01	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	5/23/02	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	9/19/02	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	4/23/03	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	9/18/03	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	4/26/04	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	10/14/04	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	5/27/05	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	9/15/05	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	5/9/06	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	5/14/08	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	9/17/08	SubMcKay	Background to impacted	Prior samples have shown impacts
551D	4/21/09	SubMcKay	Background to impacted	Prior samples have shown impacts
556D	11/8/86	SubMcKay	Background to impacted	Prior samples have shown impacts
556D	6/9/87	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	5/15/01	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	3/14/02	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	9/16/02	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	3/27/03	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	9/11/03	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	3/31/04	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	9/23/04	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	5/24/05	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	9/15/05	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	4/26/06	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	9/19/06	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	5/2/07	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	9/18/07	SubMcKay	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
563D	3/12/08	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	9/15/08	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	3/21/09	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	9/19/09	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	4/7/10	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	10/5/10	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	9/17/11	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	7/11/12	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	12/7/12	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	12/21/12	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	6/8/13	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	11/25/13	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	5/28/14	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	10/17/14	SubMcKay	Background to impacted	Prior samples have shown impacts
563D	5/13/15	SubMcKay	Background to impacted	Prior samples have shown impacts
564D	8/27/82	SubMcKay	Non-background to baseline	No impact until 2005
564D	10/31/82	SubMcKay	Non-background to baseline	No impact until 2005
564D	4/21/83	SubMcKay	Non-background to baseline	No impact until 2005
564D	10/12/83	SubMcKay	Non-background to baseline	No impact until 2005
564D	6/15/84	SubMcKay	Non-background to baseline	No impact until 2005
564D	11/9/84	SubMcKay	Non-background to baseline	No impact until 2005
564D	6/13/85	SubMcKay	Non-background to baseline	No impact until 2005
564D	10/5/85	SubMcKay	Non-background to baseline	No impact until 2005
564D	5/21/86	SubMcKay	Non-background to baseline	No impact until 2005
564D	11/7/86	SubMcKay	Non-background to baseline	No impact until 2005
564D	11/2/88	SubMcKay	Non-background to baseline	No impact until 2005
564D	4/17/92	SubMcKay	Non-background to baseline	No impact until 2005
564D	11/11/93	SubMcKay	Non-background to baseline	No impact until 2005
564D	4/20/94	SubMcKay	Non-background to baseline	No impact until 2005
564D	6/23/95	SubMcKay	Non-background to baseline	No impact until 2005
564D	9/20/95	SubMcKay	Non-background to baseline	No impact until 2005
564D	5/23/96	SubMcKay	Non-background to baseline	No impact until 2005
564D	10/31/96	SubMcKay	Non-background to baseline	No impact until 2005
564D	4/30/97	SubMcKay	Non-background to baseline	No impact until 2005
564D	9/17/97	SubMcKay	Non-background to baseline	No impact until 2005
564D	5/20/98	SubMcKay	Non-background to baseline	No impact until 2005
564D	9/18/98	SubMcKay	Non-background to baseline	No impact until 2005
564D	3/31/99	SubMcKay	Non-background to baseline	No impact until 2005
564D	9/16/99	SubMcKay	Non-background to baseline	No impact until 2005
564D	3/16/00	SubMcKay	Non-background to baseline	No impact until 2005
564D	4/18/00	SubMcKay	Non-background to baseline	No impact until 2005
564D	5/9/00	SubMcKay	Non-background to baseline	No impact until 2005
564D	6/14/00	SubMcKay	Non-background to baseline	No impact until 2005
564D	7/10/00	SubMcKay	Non-background to baseline	No impact until 2005
564D	8/14/00	SubMcKay	Non-background to baseline	No impact until 2005
564D	9/13/00	SubMcKay	Non-background to baseline	No impact until 2005
564D	10/11/00	SubMcKay	Non-background to baseline	No impact until 2005
564D	11/14/00	SubMcKay	Non-background to baseline	No impact until 2005
564D	12/19/00	SubMcKay	Non-background to baseline	No impact until 2005
564D	5/17/01	SubMcKay	Non-background to baseline	No impact until 2005
564D	12/18/01	SubMcKay	Non-background to baseline	No impact until 2005
564D	3/13/02	SubMcKay	Non-background to baseline	No impact until 2005
564D	6/28/02	SubMcKay	Non-background to baseline	No impact until 2005

Well ID	Sample Date	Target Interval	Direction	Criteria
564D	9/16/02	SubMcKay	Non-background to baseline	No impact until 2005
564D	12/18/02	SubMcKay	Non-background to baseline	No impact until 2005
564D	3/27/03	SubMcKay	Non-background to baseline	No impact until 2005
564D	6/18/03	SubMcKay	Non-background to baseline	No impact until 2005
564D	9/11/03	SubMcKay	Non-background to baseline	No impact until 2005
564D	12/10/03	SubMcKay	Non-background to baseline	No impact until 2005
564D	3/31/04	SubMcKay	Non-background to baseline	No impact until 2005
564D	6/28/04	SubMcKay	Non-background to baseline	No impact until 2005
564D	9/22/04	SubMcKay	Non-background to baseline	No impact until 2005
565D	8/30/82	SubMcKay	Non-background to baseline	No impacts observed until 2010
565D	10/28/82	SubMcKay	Non-background to baseline	No impacts observed until 2010
565D	4/21/83	SubMcKay	Non-background to baseline	No impacts observed until 2010
565D	3/18/08	SubMcKay	Non-background to baseline	No impacts observed until 2010
566D	8/31/82	SubMcKay	Non-background to baseline	Prior to operations
566D	10/28/82	SubMcKay	Non-background to baseline	Prior to operations
566D	4/21/83	SubMcKay	Non-background to baseline	Prior to operations
566D	5/21/86	SubMcKay	Background to impacted	Prior samples have shown impacts
566D	6/6/87	SubMcKay	Background to impacted	Prior samples have shown impacts
566D	6/7/88	SubMcKay	Background to impacted	Prior samples have shown impacts
566D	10/24/88	SubMcKay	Background to impacted	Prior samples have shown impacts
566D	5/17/89	SubMcKay	Background to impacted	Prior samples have shown impacts
566D	10/12/89	SubMcKay	Background to impacted	Prior samples have shown impacts
566D	5/23/90	SubMcKay	Background to impacted	Prior samples have shown impacts
566D	10/3/90	SubMcKay	Background to impacted	Prior samples have shown impacts
566D	3/18/91	SubMcKay	Background to impacted	Prior samples have shown impacts
566D	9/28/93	SubMcKay	Background to impacted	Prior samples have shown impacts
566D	6/26/95	SubMcKay	Background to impacted	Prior samples have shown impacts
572D	8/11/82	SubMcKay	Non-background to baseline	Prior to operations
572D	1/2/83	SubMcKay	Non-background to baseline	Prior to operations
572D	5/20/83	SubMcKay	Non-background to baseline	Prior to operations
572D	10/29/87	SubMcKay	Background to impacted	Prior samples have shown impacts
572D	6/9/88	SubMcKay	Background to impacted	Prior samples have shown impacts
572D	5/19/89	SubMcKay	Background to impacted	Prior samples have shown impacts
572D	10/3/90	SubMcKay	Background to impacted	Prior samples have shown impacts
572D	5/11/93	SubMcKay	Background to impacted	Prior samples have shown impacts
572D	9/26/94	SubMcKay	Background to impacted	Prior samples have shown impacts
573D	8/12/82	SubMcKay	Non-background to baseline	Prior to operations
573D	10/29/82	SubMcKay	Non-background to baseline	Prior to operations
573D	4/22/83	SubMcKay	Non-background to baseline	Prior to operations
573D	6/10/88	SubMcKay	Background to impacted	Prior samples have shown impacts
573D	11/4/88	SubMcKay	Background to impacted	Prior samples have shown impacts
573D	5/20/89	SubMcKay	Background to impacted	Prior samples have shown impacts
573D	10/14/89	SubMcKay	Background to impacted	Prior samples have shown impacts
573D	5/23/90	SubMcKay	Background to impacted	Prior samples have shown impacts
573D	10/4/90	SubMcKay	Background to impacted	Prior samples have shown impacts
573D	3/14/91	SubMcKay	Background to impacted	Prior samples have shown impacts
573D	10/9/91	SubMcKay	Background to impacted	Prior samples have shown impacts
573D	3/16/94	SubMcKay	Background to impacted	Prior samples have shown impacts
573D	10/13/95	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	3/18/02	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	9/16/02	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	3/27/03	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	6/19/03	SubMcKay	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
578D	9/11/03	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	12/10/03	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	3/31/04	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	6/29/04	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	9/28/04	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	5/20/05	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	9/8/05	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	5/22/06	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	9/14/06	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	5/1/07	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	9/13/07	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	5/14/08	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	9/24/08	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	4/20/09	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	9/10/09	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	5/25/10	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	9/8/10	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	6/1/11	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	9/21/11	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	6/8/13	SubMcKay	Background to impacted	Prior samples have shown impacts
578D	11/23/13	SubMcKay	Background to impacted	Prior samples have shown impacts
579D	5/17/93	SubMcKay	Background to impacted	No impacts observed
579D	5/12/94	SubMcKay	Background to impacted	No impacts observed
579D	9/21/94	SubMcKay	Background to impacted	No impacts observed
579D	6/23/95	SubMcKay	Background to impacted	No impacts observed
579D	9/20/95	SubMcKay	Background to impacted	No impacts observed
579D	5/22/96	SubMcKay	Background to impacted	No impacts observed
579D	10/31/96	SubMcKay	Background to impacted	No impacts observed
579D	9/17/97	SubMcKay	Background to impacted	No impacts observed
579D	5/14/98	SubMcKay	Background to impacted	No impacts observed
579D	9/18/98	SubMcKay	Background to impacted	No impacts observed
579D	3/31/99	SubMcKay	Background to impacted	No impacts observed
579D	9/15/99	SubMcKay	Background to impacted	No impacts observed
579D	3/16/00	SubMcKay	Background to impacted	No impacts observed
579D	4/18/00	SubMcKay	Background to impacted	No impacts observed
579D	5/9/00	SubMcKay	Background to impacted	No impacts observed
579D	6/13/00	SubMcKay	Background to impacted	No impacts observed
579D	7/9/00	SubMcKay	Background to impacted	No impacts observed
579D	8/14/00	SubMcKay	Background to impacted	No impacts observed
579D	10/10/00	SubMcKay	Background to impacted	Prior samples have shown impacts
579D	11/14/00	SubMcKay	Background to impacted	Prior samples have shown impacts
579D	12/19/00	SubMcKay	Background to impacted	Prior samples have shown impacts
579D	10/17/01	SubMcKay	Background to impacted	Prior samples have shown impacts
579D	6/27/02	SubMcKay	Background to impacted	Prior samples have shown impacts
579D	12/17/02	SubMcKay	Background to impacted	Prior samples have shown impacts
579D	3/26/03	SubMcKay	Background to impacted	Prior samples have shown impacts
579D	6/18/03	SubMcKay	Background to impacted	Prior samples have shown impacts
579D	3/30/04	SubMcKay	Background to impacted	Prior samples have shown impacts
579D	6/28/04	SubMcKay	Background to impacted	Prior samples have shown impacts
579D	5/23/05	SubMcKay	Background to impacted	Prior samples have shown impacts
579D	9/7/05	SubMcKay	Background to impacted	Prior samples have shown impacts
579D	4/26/06	SubMcKay	Background to impacted	Prior samples have shown impacts
579D	9/18/06	SubMcKay	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
580D	7/10/12	SubMcKay	Background to impacted	Prior samples have shown impacts
580D	12/19/12	SubMcKay	Background to impacted	Prior samples have shown impacts
580D	6/8/13	SubMcKay	Background to impacted	Prior samples have shown impacts
580D	11/11/13	SubMcKay	Background to impacted	Prior samples have shown impacts
580D	5/14/14	SubMcKay	Background to impacted	Prior samples have shown impacts
580D	4/29/15	SubMcKay	Background to impacted	Prior samples have shown impacts
594D	10/25/88	SubMcKay	Background to impacted	Prior samples have shown impacts
594D	5/21/89	SubMcKay	Background to impacted	Prior samples have shown impacts
594D	10/14/89	SubMcKay	Background to impacted	Prior samples have shown impacts
594D	3/18/91	SubMcKay	Background to impacted	Prior samples have shown impacts
594D	9/30/91	SubMcKay	Background to impacted	Prior samples have shown impacts
602S	9/22/93	SubMcKay	Non-background to baseline	No impacts observed
602S	6/21/95	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	9/15/94	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	9/16/98	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	3/31/99	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	9/21/99	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	4/25/00	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	9/21/00	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	5/23/01	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	4/25/02	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	9/23/02	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	4/15/03	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	9/17/03	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	4/21/04	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	9/29/04	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	5/18/05	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	9/13/05	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	5/9/06	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	9/13/06	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	3/21/07	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	9/25/07	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	3/22/08	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	9/11/08	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	3/14/09	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	9/23/09	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	3/31/10	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	9/14/10	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	6/8/11	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	10/26/11	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	7/9/12	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	12/17/12	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	6/26/13	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	10/30/13	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	5/8/14	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	9/29/14	SubMcKay	Background to impacted	Prior samples have shown impacts
603D	4/3/15	SubMcKay	Background to impacted	Prior samples have shown impacts
614D	4/19/00	SubMcKay	Non-background to baseline	No impacts observed
614D	9/26/00	SubMcKay	Non-background to baseline	No impacts observed
614D	4/24/02	SubMcKay	Non-background to baseline	No impacts observed
614D	4/15/03	SubMcKay	Non-background to baseline	No impacts observed
614D	4/26/04	SubMcKay	Non-background to baseline	No impacts observed
614D	5/18/05	SubMcKay	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
614D	5/11/06	SubMcKay	Non-background to baseline	No impacts observed
614D	6/15/12	SubMcKay	Non-background to baseline	No impacts observed
614D	5/27/14	SubMcKay	Non-background to baseline	No impacts observed
614D	5/11/15	SubMcKay	Non-background to baseline	No impacts observed
615D	11/20/98	SubMcKay	Non-background to baseline	No impacts observed
615D	11/8/99	SubMcKay	Non-background to baseline	No impacts observed
615D	4/19/00	SubMcKay	Non-background to baseline	No impacts observed
615D	9/26/00	SubMcKay	Non-background to baseline	No impacts observed
615D	4/24/02	SubMcKay	Non-background to baseline	No impacts observed
615D	4/15/03	SubMcKay	Non-background to baseline	No impacts observed
615D	9/25/03	SubMcKay	Non-background to baseline	No impacts observed
615D	4/22/04	SubMcKay	Non-background to baseline	No impacts observed
615D	5/27/05	SubMcKay	Non-background to baseline	No impacts observed
615D	5/13/06	SubMcKay	Non-background to baseline	No impacts observed
615D	4/26/07	SubMcKay	Non-background to baseline	No impacts observed
615D	3/26/08	SubMcKay	Non-background to baseline	No impacts observed
615D	4/21/09	SubMcKay	Non-background to baseline	No impacts observed
615D	5/26/10	SubMcKay	Non-background to baseline	No impacts observed
615D	5/25/11	SubMcKay	Non-background to baseline	No impacts observed
615D	6/15/12	SubMcKay	Non-background to baseline	No impacts observed
615D	6/20/13	SubMcKay	Non-background to baseline	No impacts observed
615D	5/27/14	SubMcKay	Non-background to baseline	No impacts observed
615D	4/15/15	SubMcKay	Non-background to baseline	No impacts observed
627D	4/12/00	SubMcKay	Non-background to baseline	No impacts observed
627D	4/20/04	SubMcKay	Non-background to baseline	No impacts observed
627D	5/24/05	SubMcKay	Non-background to baseline	No impacts observed
627D	3/19/08	SubMcKay	Non-background to baseline	No impacts observed
627D	9/21/09	SubMcKay	Non-background to baseline	No impacts observed
627D	4/7/10	SubMcKay	Non-background to baseline	No impacts observed
627D	6/7/11	SubMcKay	Non-background to baseline	No impacts observed
627D	10/24/11	SubMcKay	Non-background to baseline	No impacts observed
627D	7/9/12	SubMcKay	Non-background to baseline	No impacts observed
627D	12/18/12	SubMcKay	Non-background to baseline	No impacts observed
627D	6/29/13	SubMcKay	Non-background to baseline	No impacts observed
627D	5/8/14	SubMcKay	Non-background to baseline	No impacts observed
627D	5/5/15	SubMcKay	Non-background to baseline	No impacts observed
628D	10/15/14	SubMcKay	Background to impacted	Prior samples have shown impacts
629D	3/28/00	SubMcKay	Background to impacted	Impacts observed
629D	4/18/00	SubMcKay	Background to impacted	Impacts observed
629D	5/9/00	SubMcKay	Background to impacted	Impacts observed
629D	6/14/00	SubMcKay	Background to impacted	Impacts observed
629D	7/10/00	SubMcKay	Background to impacted	Impacts observed
629D	8/15/00	SubMcKay	Background to impacted	Impacts observed
629D	9/14/00	SubMcKay	Background to impacted	Impacts observed
629D	10/11/00	SubMcKay	Background to impacted	Impacts observed
629D	11/15/00	SubMcKay	Background to impacted	Impacts observed
629D	5/24/01	SubMcKay	Background to impacted	Impacts observed
629D	3/14/02	SubMcKay	Background to impacted	Impacts observed
629D	9/16/02	SubMcKay	Background to impacted	Impacts observed
629D	12/18/02	SubMcKay	Background to impacted	Impacts observed
629D	3/26/03	SubMcKay	Background to impacted	Impacts observed
629D	6/19/03	SubMcKay	Background to impacted	Impacts observed
629D	9/11/03	SubMcKay	Background to impacted	Impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
629D	3/31/04	SubMcKay	Background to impacted	Impacts observed
629D	6/28/04	SubMcKay	Background to impacted	Impacts observed
629D	5/19/05	SubMcKay	Background to impacted	Impacts observed
629D	9/8/05	SubMcKay	Background to impacted	Impacts observed
629D	4/25/06	SubMcKay	Background to impacted	Impacts observed
629D	9/21/06	SubMcKay	Background to impacted	Impacts observed
629D	3/12/08	SubMcKay	Background to impacted	Impacts observed
629D	9/14/08	SubMcKay	Background to impacted	Impacts observed
629D	4/13/09	SubMcKay	Background to impacted	Impacts observed
629D	9/28/10	SubMcKay	Background to impacted	Impacts observed
629D	7/9/12	SubMcKay	Background to impacted	Impacts observed
629D	12/19/12	SubMcKay	Background to impacted	Impacts observed
630D	3/16/00	SubMcKay	Background to impacted	Impacts observed
630D	4/17/00	SubMcKay	Background to impacted	Impacts observed
630D	8/14/00	SubMcKay	Background to impacted	Impacts observed
630D	10/11/00	SubMcKay	Background to impacted	Impacts observed
630D	11/15/00	SubMcKay	Background to impacted	Impacts observed
630D	6/26/01	SubMcKay	Background to impacted	Impacts observed
630D	10/25/01	SubMcKay	Background to impacted	Impacts observed
630D	12/18/01	SubMcKay	Background to impacted	Impacts observed
630D	3/13/02	SubMcKay	Background to impacted	Impacts observed
630D	9/16/02	SubMcKay	Background to impacted	Impacts observed
630D	3/26/03	SubMcKay	Background to impacted	Impacts observed
630D	6/19/03	SubMcKay	Background to impacted	Impacts observed
630D	9/11/03	SubMcKay	Background to impacted	Impacts observed
630D	12/10/03	SubMcKay	Background to impacted	Impacts observed
630D	9/23/04	SubMcKay	Background to impacted	Impacts observed
630D	5/23/05	SubMcKay	Background to impacted	Impacts observed
630D	9/14/05	SubMcKay	Background to impacted	Impacts observed
630D	4/24/06	SubMcKay	Background to impacted	Impacts observed
630D	9/18/06	SubMcKay	Background to impacted	Impacts observed
630D	9/18/07	SubMcKay	Background to impacted	Impacts observed
630D	3/12/08	SubMcKay	Background to impacted	Impacts observed
630D	9/15/08	SubMcKay	Background to impacted	Impacts observed
630D	3/19/09	SubMcKay	Background to impacted	Impacts observed
630D	10/4/10	SubMcKay	Background to impacted	Impacts observed
630D	7/9/12	SubMcKay	Background to impacted	Impacts observed
630D	4/29/14	SubMcKay	Background to impacted	Impacts observed
631D	6/13/00	SubMcKay	Non-background to baseline	No impacts observed
631D	7/9/00	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	8/15/00	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	9/14/00	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	10/10/00	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	11/14/00	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	12/19/00	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	5/14/01	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	10/25/01	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	12/17/02	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	3/26/03	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	6/19/03	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	3/30/04	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	6/29/04	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	9/30/04	SubMcKay	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
631D	5/24/05	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	9/8/05	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	5/26/06	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	9/18/07	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	5/15/08	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	9/15/08	SubMcKay	Background to impacted	Prior samples have shown impacts
631D	4/20/09	SubMcKay	Background to impacted	Prior samples have shown impacts
634D	2/9/00	SubMcKay	Non-background to baseline	No impacts observed
634D	3/27/00	SubMcKay	Non-background to baseline	No impacts observed
634D	4/18/00	SubMcKay	Non-background to baseline	No impacts observed
634D	5/9/00	SubMcKay	Non-background to baseline	No impacts observed
634D	6/14/00	SubMcKay	Non-background to baseline	No impacts observed
634D	7/10/00	SubMcKay	Non-background to baseline	No impacts observed
634D	8/14/00	SubMcKay	Non-background to baseline	No impacts observed
634D	9/13/00	SubMcKay	Non-background to baseline	No impacts observed
634D	10/10/00	SubMcKay	Non-background to baseline	No impacts observed
634D	11/15/00	SubMcKay	Non-background to baseline	No impacts observed
634D	12/20/00	SubMcKay	Non-background to baseline	No impacts observed
634D	5/14/01	SubMcKay	Non-background to baseline	No impacts observed
634D	10/25/01	SubMcKay	Non-background to baseline	No impacts observed
634D	3/19/02	SubMcKay	Non-background to baseline	No impacts observed
634D	9/16/02	SubMcKay	Non-background to baseline	No impacts observed
634D	3/27/03	SubMcKay	Non-background to baseline	No impacts observed
634D	9/15/03	SubMcKay	Non-background to baseline	No impacts observed
634D	3/31/04	SubMcKay	Non-background to baseline	No impacts observed
634D	9/30/04	SubMcKay	Non-background to baseline	No impacts observed
634D	5/20/05	SubMcKay	Non-background to baseline	No impacts observed
634D	9/8/05	SubMcKay	Non-background to baseline	No impacts observed
634D	5/22/06	SubMcKay	Non-background to baseline	No impacts observed
634D	9/14/06	SubMcKay	Non-background to baseline	No impacts observed
634D	4/30/07	SubMcKay	Non-background to baseline	No impacts observed
634D	9/17/07	SubMcKay	Non-background to baseline	No impacts observed
634D	5/14/08	SubMcKay	Non-background to baseline	No impacts observed
634D	9/24/08	SubMcKay	Non-background to baseline	No impacts observed
634D	9/10/09	SubMcKay	Non-background to baseline	No impacts observed
634D	4/6/10	SubMcKay	Non-background to baseline	No impacts observed
634D	9/8/10	SubMcKay	Non-background to baseline	No impacts observed
634D	6/1/11	SubMcKay	Non-background to baseline	No impacts observed
634D	9/22/11	SubMcKay	Non-background to baseline	No impacts observed
634D	7/6/12	SubMcKay	Non-background to baseline	No impacts observed
634D	12/2/12	SubMcKay	Non-background to baseline	No impacts observed
634D	6/6/13	SubMcKay	Non-background to baseline	No impacts observed
634D	11/23/13	SubMcKay	Non-background to baseline	No impacts observed
634D	5/12/14	SubMcKay	Non-background to baseline	No impacts observed
634D	9/29/14	SubMcKay	Non-background to baseline	No impacts observed
634D	5/4/15	SubMcKay	Non-background to baseline	No impacts observed
646D	6/4/14	SubMcKay	Background to impacted	Prior samples have shown impacts
66D	11/2/07	SubMcKay	Background to impacted	Prior samples have shown impacts
66D	5/21/08	SubMcKay	Background to impacted	Prior samples have shown impacts
66D	10/28/08	SubMcKay	Background to impacted	Prior samples have shown impacts
66D	4/18/09	SubMcKay	Background to impacted	Prior samples have shown impacts
66D	10/15/09	SubMcKay	Background to impacted	Prior samples have shown impacts
66D	4/14/10	SubMcKay	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
66D	10/4/10	SubMcKay	Background to impacted	Prior samples have shown impacts
66D	3/16/11	SubMcKay	Background to impacted	Prior samples have shown impacts
66D	10/5/11	SubMcKay	Background to impacted	Prior samples have shown impacts
66D	4/9/12	SubMcKay	Background to impacted	Prior samples have shown impacts
66D	10/17/12	SubMcKay	Background to impacted	Prior samples have shown impacts
66D	4/1/13	SubMcKay	Background to impacted	Prior samples have shown impacts
66D	10/15/13	SubMcKay	Background to impacted	Prior samples have shown impacts
66D	4/9/14	SubMcKay	Background to impacted	Prior samples have shown impacts
66D	10/22/14	SubMcKay	Background to impacted	Prior samples have shown impacts
66D	4/29/15	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	10/18/84	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	5/22/85	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	10/16/85	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	5/23/86	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	10/21/86	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	5/19/87	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	11/1/87	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	6/2/88	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	10/13/88	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	5/4/89	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	11/3/89	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	5/18/90	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	9/11/90	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	4/15/91	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	9/20/91	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	3/19/92	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	10/22/92	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	3/22/93	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	10/19/93	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	4/27/94	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	10/19/94	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	3/23/95	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	3/21/96	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	9/24/96	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	4/15/97	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	10/27/97	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	4/17/98	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	9/30/98	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	4/14/99	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	11/10/99	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	5/24/00	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	10/27/00	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	5/29/01	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	7/20/01	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	6/12/02	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	11/5/02	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	5/22/03	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	11/10/03	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	5/17/04	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	11/10/04	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	5/17/05	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	11/3/05	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	6/25/06	SubMcKay	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
6D	10/24/06	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	6/18/07	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	10/16/07	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	5/11/08	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	10/21/08	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	4/25/09	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	10/18/09	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	10/5/10	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	10/6/11	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	10/4/12	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	10/2/13	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	4/2/14	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	11/12/14	SubMcKay	Background to impacted	Prior samples have shown impacts
6D	4/28/15	SubMcKay	Background to impacted	Prior samples have shown impacts
902D	6/14/12	SubMcKay	Background to impacted	Prior samples have shown impacts
902D	6/26/13	SubMcKay	Background to impacted	Prior samples have shown impacts
902D	4/29/14	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	4/27/00	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	6/6/02	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	4/16/03	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	10/21/03	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	7/1/04	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	6/7/05	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	6/6/06	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	5/24/07	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	10/7/08	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	5/23/09	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	10/20/10	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	11/7/11	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	4/25/12	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	11/18/12	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	4/30/13	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	9/18/13	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	4/26/14	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	9/2/14	SubMcKay	Background to impacted	Prior samples have shown impacts
904D	3/9/15	SubMcKay	Background to impacted	Prior samples have shown impacts
912D	10/20/10	SubMcKay	Background to impacted	Prior samples have shown impacts
912D	4/25/12	SubMcKay	Background to impacted	Prior samples have shown impacts
912D	11/18/12	SubMcKay	Background to impacted	Prior samples have shown impacts
912D	4/30/13	SubMcKay	Background to impacted	Prior samples have shown impacts
912D	9/18/13	SubMcKay	Background to impacted	Prior samples have shown impacts
912D	4/26/14	SubMcKay	Background to impacted	Prior samples have shown impacts
912D	9/4/14	SubMcKay	Background to impacted	Prior samples have shown impacts
912D	3/9/15	SubMcKay	Background to impacted	Prior samples have shown impacts
928D	6/1/05	SubMcKay	Background to impacted	Prior samples have shown impacts
928D	6/5/06	SubMcKay	Background to impacted	Prior samples have shown impacts
928D	10/23/06	SubMcKay	Background to impacted	Prior samples have shown impacts
928D	5/21/07	SubMcKay	Background to impacted	Prior samples have shown impacts
928D	10/18/07	SubMcKay	Background to impacted	Prior samples have shown impacts
928D	4/24/08	SubMcKay	Background to impacted	Prior samples have shown impacts
928D	10/9/08	SubMcKay	Background to impacted	Prior samples have shown impacts
928D	5/27/09	SubMcKay	Background to impacted	Prior samples have shown impacts
928D	5/10/10	SubMcKay	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
928D	9/19/10	SubMcKay	Background to impacted	Prior samples have shown impacts
928D	3/20/12	SubMcKay	Background to impacted	Prior samples have shown impacts
928D	9/6/12	SubMcKay	Background to impacted	Prior samples have shown impacts
928D	3/2/15	SubMcKay	Background to impacted	Prior samples have shown impacts
933D	4/24/08	SubMcKay	Background to impacted	Prior samples have shown impacts
933D	10/9/08	SubMcKay	Background to impacted	Prior samples have shown impacts
933D	5/27/09	SubMcKay	Background to impacted	Prior samples have shown impacts
933D	10/4/09	SubMcKay	Background to impacted	Prior samples have shown impacts
933D	5/10/10	SubMcKay	Background to impacted	Prior samples have shown impacts
933D	10/21/10	SubMcKay	Background to impacted	Prior samples have shown impacts
933D	10/31/11	SubMcKay	Background to impacted	Prior samples have shown impacts
933D	3/16/12	SubMcKay	Background to impacted	Prior samples have shown impacts
933D	9/10/12	SubMcKay	Background to impacted	Prior samples have shown impacts
933D	3/13/13	SubMcKay	Background to impacted	Prior samples have shown impacts
933D	5/13/14	SubMcKay	Background to impacted	Prior samples have shown impacts
933D	3/2/15	SubMcKay	Background to impacted	Prior samples have shown impacts
951D	9/23/04	SubMcKay	Background to impacted	Prior samples have shown impacts
951D	6/3/05	SubMcKay	Background to impacted	Prior samples have shown impacts
951D	6/6/06	SubMcKay	Background to impacted	Prior samples have shown impacts
951D	10/25/06	SubMcKay	Background to impacted	Prior samples have shown impacts
951D	5/25/07	SubMcKay	Background to impacted	Prior samples have shown impacts
951D	5/16/08	SubMcKay	Background to impacted	Prior samples have shown impacts
951D	5/28/09	SubMcKay	Background to impacted	Prior samples have shown impacts
951D	5/23/10	SubMcKay	Background to impacted	Prior samples have shown impacts
951D	4/18/11	SubMcKay	Background to impacted	Prior samples have shown impacts
951D	6/19/12	SubMcKay	Background to impacted	Prior samples have shown impacts
951D	6/26/13	SubMcKay	Background to impacted	Prior samples have shown impacts
951D	4/30/14	SubMcKay	Background to impacted	Prior samples have shown impacts
951D	3/23/15	SubMcKay	Background to impacted	Prior samples have shown impacts
958D	3/23/12	SubMcKay	Background to impacted	Prior samples have shown impacts
958D	9/6/12	SubMcKay	Background to impacted	Prior samples have shown impacts
958D	5/10/13	SubMcKay	Background to impacted	Prior samples have shown impacts
958D	5/12/14	SubMcKay	Background to impacted	Prior samples have shown impacts
958D	3/2/15	SubMcKay	Background to impacted	Prior samples have shown impacts
95D	10/7/10	SubMcKay	Non-background to baseline	No impacts observed
95D	4/6/11	SubMcKay	Background to impacted	Prior samples have shown impacts
95D	10/12/11	SubMcKay	Background to impacted	Prior samples have shown impacts
95D	4/3/12	SubMcKay	Background to impacted	Prior samples have shown impacts
95D	10/16/12	SubMcKay	Background to impacted	Prior samples have shown impacts
95D	4/24/13	SubMcKay	Background to impacted	Prior samples have shown impacts
95D	10/23/13	SubMcKay	Background to impacted	Prior samples have shown impacts
95D	4/22/14	SubMcKay	Background to impacted	Prior samples have shown impacts
95D	11/17/14	SubMcKay	Background to impacted	Prior samples have shown impacts
95D	5/6/15	SubMcKay	Background to impacted	Prior samples have shown impacts
972D	6/5/12	SubMcKay	Background to impacted	Prior samples have shown impacts
972D	6/26/13	SubMcKay	Background to impacted	Prior samples have shown impacts
972D	5/1/14	SubMcKay	Background to impacted	Prior samples have shown impacts
972D	3/17/15	SubMcKay	Background to impacted	Prior samples have shown impacts
975D	10/23/07	SubMcKay	Background to impacted	Prior samples have shown impacts
975D	5/5/09	SubMcKay	Background to impacted	Prior samples have shown impacts
975D	6/13/12	SubMcKay	Background to impacted	Prior samples have shown impacts
975D	6/26/13	SubMcKay	Background to impacted	Prior samples have shown impacts
981D	10/21/10	SubMcKay	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
981D	4/19/11	SubMcKay	Background to impacted	Prior samples have shown impacts
981D	4/25/12	SubMcKay	Background to impacted	Prior samples have shown impacts
981D	11/27/12	SubMcKay	Background to impacted	Prior samples have shown impacts
981D	4/30/13	SubMcKay	Background to impacted	Prior samples have shown impacts
981D	9/18/13	SubMcKay	Background to impacted	Prior samples have shown impacts
981D	3/9/15	SubMcKay	Background to impacted	Prior samples have shown impacts
983D	9/19/10	SubMcKay	Background to impacted	Prior samples have shown impacts
987D	10/29/10	SubMcKay	Background to impacted	Prior samples have shown impacts
987D	4/13/11	SubMcKay	Background to impacted	Prior samples have shown impacts
987D	3/15/12	SubMcKay	Background to impacted	Prior samples have shown impacts
987D	5/8/13	SubMcKay	Background to impacted	Prior samples have shown impacts
987D	9/25/13	SubMcKay	Background to impacted	Prior samples have shown impacts
987D	8/5/14	SubMcKay	Background to impacted	Prior samples have shown impacts
987D	3/2/15	SubMcKay	Background to impacted	Prior samples have shown impacts
990D	5/27/09	SubMcKay	Background to impacted	Prior samples have shown impacts
990D	10/8/09	SubMcKay	Background to impacted	Prior samples have shown impacts
990D	5/22/10	SubMcKay	Background to impacted	Prior samples have shown impacts
990D	10/21/10	SubMcKay	Background to impacted	Prior samples have shown impacts
990D	4/19/11	SubMcKay	Background to impacted	Prior samples have shown impacts
990D	11/12/11	SubMcKay	Background to impacted	Prior samples have shown impacts
990D	6/6/12	SubMcKay	Background to impacted	Prior samples have shown impacts
990D	11/25/12	SubMcKay	Background to impacted	Prior samples have shown impacts
990D	5/10/13	SubMcKay	Background to impacted	Prior samples have shown impacts
990D	10/17/13	SubMcKay	Background to impacted	Prior samples have shown impacts
990D	4/30/14	SubMcKay	Background to impacted	Prior samples have shown impacts
990D	10/29/14	SubMcKay	Background to impacted	Prior samples have shown impacts
990D	3/26/15	SubMcKay	Background to impacted	Prior samples have shown impacts
992D	5/26/09	SubMcKay	Background to impacted	Prior samples have shown impacts
992D	10/8/09	SubMcKay	Background to impacted	Prior samples have shown impacts
992D	5/22/10	SubMcKay	Background to impacted	Prior samples have shown impacts
992D	10/21/10	SubMcKay	Background to impacted	Prior samples have shown impacts
992D	4/18/11	SubMcKay	Background to impacted	Prior samples have shown impacts
992D	11/7/11	SubMcKay	Background to impacted	Prior samples have shown impacts
992D	5/1/12	SubMcKay	Background to impacted	Prior samples have shown impacts
992D	10/13/12	SubMcKay	Background to impacted	Prior samples have shown impacts
992D	5/4/13	SubMcKay	Background to impacted	Prior samples have shown impacts
992D	9/14/13	SubMcKay	Background to impacted	Prior samples have shown impacts
992D	4/25/14	SubMcKay	Background to impacted	Prior samples have shown impacts
992D	9/3/14	SubMcKay	Background to impacted	Prior samples have shown impacts
992D	3/18/15	SubMcKay	Background to impacted	Prior samples have shown impacts
993D	6/2/08	SubMcKay	Background to impacted	Prior samples have shown impacts
993D	12/29/08	SubMcKay	Background to impacted	Prior samples have shown impacts
993D	5/25/09	SubMcKay	Background to impacted	Prior samples have shown impacts
993D	10/5/09	SubMcKay	Background to impacted	Prior samples have shown impacts
993D	10/21/10	SubMcKay	Background to impacted	Prior samples have shown impacts
993D	4/13/11	SubMcKay	Background to impacted	Prior samples have shown impacts
993D	11/1/11	SubMcKay	Background to impacted	Prior samples have shown impacts
993D	3/20/12	SubMcKay	Background to impacted	Prior samples have shown impacts
993D	9/6/12	SubMcKay	Background to impacted	Prior samples have shown impacts
993D	3/13/13	SubMcKay	Background to impacted	Prior samples have shown impacts
993D	9/25/13	SubMcKay	Background to impacted	Prior samples have shown impacts
993D	5/13/14	SubMcKay	Background to impacted	Prior samples have shown impacts
993D	8/5/14	SubMcKay	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
993D	3/2/15	SubMcKay	Background to impacted	Prior samples have shown impacts
999D	9/3/14	SubMcKay	Non-background to baseline	No impacts observed
999D	3/17/15	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-208	5/17/77	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-208	6/6/77	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-208	7/11/77	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-208	8/16/77	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-208	9/19/77	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-211	9/20/80	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-211	12/23/80	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-211	6/25/81	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-211	11/13/81	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-211	6/22/82	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-211	5/24/83	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-211	11/3/83	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-211	5/19/84	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-211	5/29/85	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-211	10/19/85	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-211	6/5/86	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-211	11/25/86	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-211	5/25/87	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-409	5/29/85	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-409	10/20/85	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-409	6/7/86	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-409	11/26/86	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	8/27/80	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	1/12/81	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	6/29/81	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	11/11/81	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	6/23/82	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	10/5/82	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	5/19/83	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	11/2/83	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	10/20/84	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	5/29/85	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	6/7/86	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	12/17/86	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	5/25/87	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	5/16/88	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	11/4/88	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	5/22/89	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	5/15/90	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	9/26/90	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	5/15/91	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	10/9/91	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	5/7/92	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	9/11/92	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	4/20/93	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	11/30/93	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	6/15/94	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	10/27/94	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	10/10/96	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-413	5/15/00	SubMcKay	Background to impacted	Prior samples have shown impacts

Well ID	Sample Date	Target Interval	Direction	Criteria
EAP-527	9/15/04	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-527	11/12/04	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-527	3/31/08	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-527	4/19/10	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-527	6/25/12	SubMcKay	Background to impacted	Prior samples have shown impacts
EAP-529	5/18/82	SubMcKay	Non-background to baseline	Prior to operations
GAS-7	6/10/08	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	10/21/91	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	7/14/92	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	5/11/93	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	5/18/94	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	6/6/95	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	6/5/96	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	6/4/97	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	6/17/98	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	6/3/99	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	6/14/00	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	5/30/01	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	6/5/02	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	6/11/03	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	6/8/04	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	6/7/05	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	6/14/06	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	6/13/07	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	6/12/08	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	9/30/09	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	9/28/11	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	9/26/12	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	9/24/13	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-12	6/4/14	SubMcKay	Background to impacted	Prior samples have shown impacts
GOW-3	6/10/10	SubMcKay	Non-background to baseline	No impacts observed
GOW-3	6/8/11	SubMcKay	Non-background to baseline	No impacts observed
GOW-3	9/26/12	SubMcKay	Non-background to baseline	No impacts observed
GOW-3	6/12/13	SubMcKay	Non-background to baseline	No impacts observed
GOW-3	6/4/14	SubMcKay	Non-background to baseline	No impacts observed
GOW-6	6/9/10	SubMcKay	Non-background to baseline	No impacts observed
GOW-6	6/8/11	SubMcKay	Non-background to baseline	No impacts observed
GOW-6	6/6/12	SubMcKay	Non-background to baseline	No impacts observed
GOW-6	6/12/13	SubMcKay	Non-background to baseline	No impacts observed
GOW-6	6/3/14	SubMcKay	Non-background to baseline	No impacts observed
PSW-2	6/2/09	SubMcKay	Background to impacted	Prior samples have shown impacts
PSW-2	5/19/10	SubMcKay	Background to impacted	Prior samples have shown impacts
PSW-2	9/28/10	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-720	9/22/04	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-720	12/14/04	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-720	6/23/05	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-720	12/19/05	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-721	6/15/04	SubMcKay	Non-background to baseline	Higher sodium levels in this deep bedrock interval do not indicate impacts
PW-721	6/22/11	SubMcKay	Non-background to baseline	Higher sodium levels in this deep bedrock interval do not indicate impacts
PW-722	6/15/04	SubMcKay	Non-background to baseline	Higher sodium levels in this deep

Well ID	Sample Date	Target Interval	Direction	Criteria
				bedrock interval do not indicate impacts
PW-723	12/17/08	SubMcKay	Non-background to baseline	No impacts observed
PW-723	6/22/11	SubMcKay	Non-background to baseline	Impacts observed
PW-724	6/15/04	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-724	9/22/04	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-724	12/16/04	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-724	3/16/05	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-724	6/24/05	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-724	9/30/05	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-724	12/20/05	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-724	12/19/07	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-724	6/10/08	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-724	12/17/08	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-724	6/9/09	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-724	12/16/09	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-724	6/29/10	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-724	12/14/10	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-724	6/22/11	SubMcKay	Background to impacted	Prior samples have shown impacts
PW-735	6/18/09	SubMcKay	Non-background to baseline	No impacts observed
PW-735	9/29/09	SubMcKay	Non-background to baseline	No impacts observed
PW-735	5/18/10	SubMcKay	Non-background to baseline	No impacts observed
PW-735	6/9/10	SubMcKay	Non-background to baseline	No impacts observed
PW-735	9/28/10	SubMcKay	Non-background to baseline	No impacts observed
PW-735	6/10/11	SubMcKay	Non-background to baseline	No impacts observed
PW-735	9/28/11	SubMcKay	Non-background to baseline	No impacts observed
PW-735	6/6/12	SubMcKay	Non-background to baseline	No impacts observed
PW-735	9/26/12	SubMcKay	Non-background to baseline	No impacts observed
PW-735	6/11/13	SubMcKay	Non-background to baseline	No impacts observed
PW-735	9/24/13	SubMcKay	Non-background to baseline	No impacts observed
PW-735	6/4/14	SubMcKay	Non-background to baseline	No impacts observed
PW-735	9/24/14	SubMcKay	Non-background to baseline	No impacts observed
S-16	7/21/77	SubMcKay	Background to impacted	Prior samples have shown impacts
S-16	6/5/80	SubMcKay	Background to impacted	Prior samples have shown impacts
S-16	7/23/96	SubMcKay	Background to impacted	Prior samples have shown impacts
S-16	6/15/10	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-100	3/14/80	SubMcKay	Non-background to baseline	No impacts observed
WD-100	10/3/83	SubMcKay	Non-background to baseline	No impacts observed
WD-101	3/23/81	SubMcKay	Non-background to baseline	No impacts observed
WD-101	5/14/82	SubMcKay	Non-background to baseline	No impacts observed
WD-101	9/22/82	SubMcKay	Non-background to baseline	No impacts observed
WD-102	3/16/81	SubMcKay	Non-background to baseline	No impacts observed
WD-102	5/3/83	SubMcKay	Non-background to baseline	No impacts observed
WD-102	1/16/87	SubMcKay	Non-background to baseline	No impacts observed
WD-103	12/29/81	SubMcKay	Non-background to baseline	No impacts observed
WD-103	5/23/83	SubMcKay	Non-background to baseline	No impacts observed
WD-103	10/4/83	SubMcKay	Non-background to baseline	No impacts observed
WD-103	12/19/83	SubMcKay	Non-background to baseline	No impacts observed
WD-103	5/9/84	SubMcKay	Non-background to baseline	No impacts observed
WD-104	10/13/83	SubMcKay	Non-background to baseline	No impacts observed
WD-104	12/18/83	SubMcKay	Non-background to baseline	No impacts observed
WD-104	5/10/84	SubMcKay	Non-background to baseline	No impacts observed
WD-104	1/16/87	SubMcKay	Non-background to baseline	No impacts observed
WD-104	7/9/90	SubMcKay	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
WD-105	12/18/83	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-105	8/9/84	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-105	3/27/86	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-105	12/2/87	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-105	9/15/89	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-105	11/3/93	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-105	8/9/95	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-105	8/20/96	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-105	9/3/98	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-105	9/25/01	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-105	8/22/03	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-105	9/26/13	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	5/12/87	SubMcKay	Non-background to baseline	No impacts observed
WD-106	7/10/90	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	10/8/92	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	5/26/94	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	7/28/94	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	9/14/94	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	6/29/95	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	10/31/95	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	6/3/96	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	8/13/96	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	10/22/96	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	5/13/97	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	8/19/97	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	9/16/97	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	1/4/00	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	6/7/00	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	9/28/00	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	8/19/03	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	8/24/06	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	9/17/09	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-106	9/18/12	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-107	8/13/81	SubMcKay	Non-background to baseline	No impacts observed
WD-107	5/15/87	SubMcKay	Non-background to baseline	No impacts observed
WD-109	8/16/82	SubMcKay	Non-background to baseline	No impacts observed
WD-109	12/16/85	SubMcKay	Non-background to baseline	No impacts observed
WD-109	9/23/87	SubMcKay	Non-background to baseline	No impacts observed
WD-109	7/17/89	SubMcKay	Non-background to baseline	Upgradient of Facility
WD-109	10/15/91	SubMcKay	Non-background to baseline	No impacts observed
WD-110	9/7/82	SubMcKay	Non-background to baseline	No impacts observed
WD-150	10/1/81	SubMcKay	Non-background to baseline	No impacts observed
WD-150	9/24/82	SubMcKay	Non-background to baseline	No impacts observed
WD-150	7/17/84	SubMcKay	Non-background to baseline	No impacts observed
WD-150	2/26/87	SubMcKay	Non-background to baseline	No impacts observed
WD-150	10/11/90	SubMcKay	Non-background to baseline	No impacts observed
WD-150	10/28/92	SubMcKay	Non-background to baseline	No impacts observed
WD-150	9/28/93	SubMcKay	Non-background to baseline	No impacts observed
WD-150	9/20/94	SubMcKay	Non-background to baseline	No impacts observed
WD-150	9/15/95	SubMcKay	Non-background to baseline	No impacts observed
WD-150	7/30/96	SubMcKay	Non-background to baseline	No impacts observed
WD-150	8/6/97	SubMcKay	Non-background to baseline	No impacts observed
WD-150	10/10/00	SubMcKay	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
WD-152	2/26/87	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-152	10/12/90	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-152	11/4/92	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-152	9/28/93	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-152	9/20/94	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-152	9/15/95	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-152	7/29/96	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-152	8/5/97	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-152	7/1/98	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-152	9/25/01	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-155	2/20/86	SubMcKay	Non-background to baseline	No impacts observed
WD-155	10/5/87	SubMcKay	Non-background to baseline	No impacts observed
WD-159	8/21/82	SubMcKay	Non-background to baseline	No impacts observed
WD-159	9/30/83	SubMcKay	Non-background to baseline	No impacts observed
WD-159	12/7/83	SubMcKay	Non-background to baseline	No impacts observed
WD-159	5/10/84	SubMcKay	Non-background to baseline	No impacts observed
WD-159	7/18/84	SubMcKay	Non-background to baseline	No impacts observed
WD-159	12/10/85	SubMcKay	Non-background to baseline	No impacts observed
WD-159	5/24/88	SubMcKay	Non-background to baseline	No impacts observed
WD-159	9/7/89	SubMcKay	Non-background to baseline	No impacts observed
WD-159	6/23/92	SubMcKay	Non-background to baseline	No impacts observed
WD-159	8/12/97	SubMcKay	Non-background to baseline	No impacts observed
WD-160	10/26/82	SubMcKay	Non-background to baseline	No impacts observed
WD-160	11/7/84	SubMcKay	Non-background to baseline	No impacts observed
WD-160	8/26/96	SubMcKay	Non-background to baseline	No impacts observed
WD-162	5/5/83	SubMcKay	Non-background to baseline	No impacts observed
WD-162	5/11/84	SubMcKay	Non-background to baseline	No impacts observed
WD-162	8/7/84	SubMcKay	Non-background to baseline	No impacts observed
WD-170	3/12/86	SubMcKay	Non-background to baseline	No impacts observed
WD-170	11/9/89	SubMcKay	Non-background to baseline	No impacts observed
WD-170	7/26/95	SubMcKay	Non-background to baseline	No impacts observed
WD-171	11/5/82	SubMcKay	Non-background to baseline	No impacts observed
WD-171	9/30/83	SubMcKay	Non-background to baseline	No impacts observed
WD-171	3/12/86	SubMcKay	Non-background to baseline	No impacts observed
WD-171	7/23/86	SubMcKay	Non-background to baseline	No impacts observed
WD-171	8/20/96	SubMcKay	Non-background to baseline	No impacts observed
WD-173	10/20/82	SubMcKay	Non-background to baseline	No impacts observed
WD-173	5/3/83	SubMcKay	Non-background to baseline	No impacts observed
WD-173	8/16/84	SubMcKay	Non-background to baseline	No impacts observed
WD-173	6/25/86	SubMcKay	Non-background to baseline	No impacts observed
WD-173	3/26/87	SubMcKay	Non-background to baseline	No impacts observed
WD-173	8/5/88	SubMcKay	Non-background to baseline	No impacts observed
WD-173	8/7/90	SubMcKay	Non-background to baseline	No impacts observed
WD-175	10/28/82	SubMcKay	Non-background to baseline	No impacts observed
WD-175	5/10/83	SubMcKay	Non-background to baseline	No impacts observed
WD-175	5/9/84	SubMcKay	Non-background to baseline	No impacts observed
WD-175	5/6/87	SubMcKay	Non-background to baseline	No impacts observed
WD-175	9/3/97	SubMcKay	Non-background to baseline	No impacts observed
WD-176	2/14/84	SubMcKay	Non-background to baseline	No impacts observed
WD-176	11/25/84	SubMcKay	Non-background to baseline	No impacts observed
WD-176	1/14/87	SubMcKay	Non-background to baseline	No impacts observed
WD-176	11/2/89	SubMcKay	Non-background to baseline	No impacts observed
WD-176	7/17/96	SubMcKay	Non-background to baseline	No impacts observed

Well ID	Sample Date	Target Interval	Direction	Criteria
WD-177	2/15/84	SubMcKay	Non-background to baseline	No impacts observed
WD-177	11/24/84	SubMcKay	Non-background to baseline	No impacts observed
WD-177	7/18/96	SubMcKay	Non-background to baseline	No impacts observed
WD-178	2/15/84	SubMcKay	Non-background to baseline	No impacts observed
WD-178	12/10/84	SubMcKay	Non-background to baseline	No impacts observed
WD-178	7/18/96	SubMcKay	Non-background to baseline	No impacts observed
WD-178	9/3/97	SubMcKay	Non-background to baseline	No impacts observed
WD-179	2/15/84	SubMcKay	Non-background to baseline	No impacts observed
WD-179	12/11/84	SubMcKay	Non-background to baseline	No impacts observed
WD-179	1/19/87	SubMcKay	Non-background to baseline	No impacts observed
WD-179	7/20/88	SubMcKay	Non-background to baseline	No impacts observed
WD-179	8/13/90	SubMcKay	Non-background to baseline	No impacts observed
WD-179	7/17/96	SubMcKay	Non-background to baseline	No impacts observed
WD-180	7/24/89	SubMcKay	Non-background to baseline	No impacts observed
WD-180	7/18/95	SubMcKay	Non-background to baseline	No impacts observed
WD-181	2/16/84	SubMcKay	Non-background to baseline	No impacts observed
WD-181	12/15/84	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-181	7/27/88	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-182	10/24/85	SubMcKay	Non-background to baseline	No impacts observed
WD-182	8/30/89	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-182	11/5/91	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-182	9/27/93	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-182	8/8/95	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-182	7/1/98	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-182	9/27/01	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-182	8/10/04	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-182	9/10/07	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-182	9/16/10	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-182	9/27/13	SubMcKay	Background to impacted	Prior samples have shown impacts
WD-184	3/11/92	SubMcKay	Non-background to baseline	No impacts observed
WD-185	12/8/85	SubMcKay	Non-background to baseline	No impacts observed
WD-185	2/6/87	SubMcKay	Non-background to baseline	No impacts observed
WD-185	3/11/92	SubMcKay	Non-background to baseline	No impacts observed
WD-185	8/14/97	SubMcKay	Non-background to baseline	No impacts observed
WD-186	3/12/92	SubMcKay	Non-background to baseline	No impacts observed

Appendix K Electronic Data File

(see attached electronic data packet)