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RGC Report No: 183009/1

Department of Industry, Tourism, and Trade
Northern Territory Government
Australia

Attention: Jackie Hartnett
Project Director, Rum Jungle Rehabilitation

RE: Information Request (IR) Response: Groundwater contaminant transport and uncertainty analysis

1 General

This Robertson GeoConsultants Inc. (RGC) letter report provides a response to Information Request (IR) #2, “Groundwater contaminant transport and uncertainty analysis”, from the federal Department of Agriculture, Water, and the Environment (DAWE).

This letter report was requested by the Northern Territory (NT) Department of Industry, Tourism, and Trade (DITT), which is preparing a response to IRs provided by DAWE as part of their review of the Environmental Impact Statement (EIS) for the former Rum Jungle Mine Site.

2 Information Request

The IR (#2), from a letter from the DAWE dated December 7th, 2021, is quoted here:

The Department [DAWE] is of the view that further groundwater modelling and monitoring data is required to determine whether, and to what extent, geologic faults and fractures may act as hydraulic barriers to contaminant transport across the Rum Jungle mine site and on a regional scale. As previously requested, please provide the results of further groundwater modelling and monitoring. These results should include determination of transmissive capacities for faults and *fractures across a plausible range of hydraulic conductivities, as well as identify any potential contaminant pathways.*

Although the information request only refers to faults and fractures as potential "hydraulic barriers", this response addresses the more general uncertainty of these geological structures on groundwater flow and solute transport, either by representing a hydraulic barrier and/or a preferential flow path.

3 Background

A numerical flow and transport model ("groundwater model") for the Rum Jungle Mine Site ("the Site") has been developed iteratively since 2010 by RGC to support rehabilitation planning. The groundwater model is a numerical representation of a conceptual hydrogeological model that was last updated in 2019 to include information from hydrogeological and geotechnical field investigations completed in 2018 (see SRK, 2020). The groundwater model provides a good representation of the inferred (site-wide) groundwater flow field, seasonal fluctuations in groundwater levels, and the general observed distribution of sulphate (SO_4) and copper (Cu) concentrations in groundwater across the Site. The groundwater model also successfully simulates the elevated SO_4 and Cu concentrations (up to 1000 mg/L Cu) that have persisted in a portion of the Copper Extraction Pad Area (CEPA) since the 1970s (see RGC, 2019, for further details).

The current iteration of the groundwater model does not explicitly represent any of the mapped faults at the Site as hydraulic barriers or preferential flowpaths. This was done because hydraulic testing results, observed head responses for monitoring wells, and local inferred flow fields near the fault alignments suggest that the hydraulic properties of the faults are similar to surrounding bedrock. Hence modelling objectives could be achieved without adding complexity to the groundwater model. However, the possibility that faults at the Site could represent hydraulic barriers (and therefore impede groundwater flows) and/or preferential flowpaths for groundwater cannot be ruled out entirely. Accordingly, RGC has represented some faults and contact zones in bedrock as low-permeable and high-permeable features in previous versions of the groundwater model, mainly to investigate potential implications for contaminant transport. For instance, in 2012, RGC represented the Central Shear Zone as a more permeable feature along which groundwater flows preferentially between the Main Pit and the Intermediate Pit across the CEPA.

This involved assigning a higher hydraulic conductivity (K) to bedrock along a single row of cells that corresponds with the mapped fault. This was done before information from the 2018 hydrogeological investigation was available, which RGC incorporated into the latest model conceptualization and calibration. RGC also utilized the MODFLOW Horizontal Flow Barrier (HFB) package in a previous version of the flow model to represent a low-permeable fault beneath the Intermediate Waste Rock Dump (WRD). This was done to better simulate the observed drawdown in groundwater levels at bore RN022081 during a de-watering trial for the Intermediate Pit. The trial was completed in 2008 as part of hydrogeological investigations of the adjacent Browns Oxide mine site. However, the HFB was not required to achieve an adequate representation (using the most recent data) of groundwater levels in the vicinity of the Intermediate WRD. Hence it was removed in the latest iteration of the groundwater model.

In this letter report, RGC has summarized previous information and monitoring data that are relevant to contaminant transport near and along faults and fracture zones on Site. Also provided are additional groundwater simulations that illustrate the potential implications of assuming preferential groundwater flow and/or the impedance of groundwater flow by these features, particularly with respect to contaminant loads to the East Branch of the Finniss River (EBFR). The key objective of this letter report is to document RGC's rationale for not explicitly representing faults in the latest numerical groundwater model. The scope of this letter report is based, in part, on a telephone meeting with DAWE staff on November 22nd, 2021, during which DAWE staff reiterated their request to see a summary of previously collected data and the results from additional groundwater simulations that tested the assumptions made about hydraulic properties of faults identified by others at the Site.

4 Document Organization

The remainder of this document is subdivided into the following sections:

- *Section 5. Supporting Information.* This section provides details on the groundwater monitoring network and construction details for monitoring bores for future reference in this report.
- *Section 6. Conceptual Model Overview.* This section summarizes key aspects of the conceptual hydrogeological model for the Site, with particular emphasis on aspects of the

model that are pertinent to the local groundwater flow regime near mapped faults and fracture zones.

- *Section 7. Groundwater Simulations from Calibrated Model.* This section summarizes key aspects of the calibrated numerical groundwater model, or "current conditions" model (status 2019) that are relevant to the discussion of groundwater flow and contaminant transport near faults at the Site.
- *Section 8. Additional Groundwater Simulations for Fault Areas.* This section provides additional groundwater simulations prepared for this IR response to illustrate the implications of representing selected faults as hydraulic barriers or preferential flow paths for groundwater flow and contaminant transport at the Rum Jungle site.
- *Section 9. Conclusions.* This section compiles the conclusions from this letter report for consideration and further discussion with the DAWE staff and other stakeholders and regulators, if needed.

5 Supporting Information

Figure 1 shows the locations of groundwater monitoring bores superimposed on lithology, as requested by DAWE staff during the telephone meeting on November 22nd, 2021. The groundwater monitoring network consists of 43 historic monitoring bores referred to by their Registration Number (RN) and 117 MB bores installed in 2010, 2012, 2014, 2017, and 2018. Construction details for the RN and MB bore series are provided in **Appendix A.** Hydraulic testing results are summarized in **Appendix B**. There are several faults with a south-west to north-east trend and north-south trend within the study area (**Figure 1**), mostly at the lithological contact between different bedrock formations. The locations of these faults appear in the geology maps provided to RGC by the DITT in 2010 when RGC was retained for Stage 1 of the Rum Jungle Rehabilitation Project.

The Giant's Reef Fault is a major regional fault that is mapped (at a 100,000:1 map scale) between the contact between the Rum Jungle Complex and the other lithological units in the central mining area, i.e., Coomalie Dolostone, Whites Formation, and Geolsec Formation. The Giant's Reef Fault trends from the northeast to the southwest and cuts across the entire Site. The solid line representing the Giant's Reef Fault in **Figure 1** is the location as it appears in regional maps. RGC adjusted the local alignment of the fault, so it is consistent with the screened lithologies for monitoring wells near the Main WRD. The adjusted location is represented by a dashed line that represents the inferred location of the fault. The other major fault is the east-west trending fault between the Main Pit and the Intermediate Pit, along which each of the ore bodies on site and the Browns ore body occurs. Other mapped faults, e.g., towards Dyson's Area, trend in a NNE to SSW direction and terminate along the Giant's Reef Fault. Site-specific information that is available on the hydraulic characteristics of these faults and surrounding bedrock is discussed in Section 6.

6 Conceptual Model Overview

This section summarizes information from the conceptual hydrogeological model that is pertinent to the discussion of faults at the Site. Observations that support the representation of faults as neither hydraulic barriers, nor conduits for groundwater flow are emphasized, including water level time trends, previous hydraulic testing data, and the persistence of elevated SO_4 and Cu concentrations in the CEPA.

6.1 Model Domain and Inferred Groundwater Flow Fields

Figure 2 shows the boundaries of the conceptual (and numerical) model domain with elevation contours for the Site. The model domain is defined by local topographic highs and low-lying drainage features so cross-boundary flows into the groundwater system are assumed to be negligible (see RGC, 2019). **Figure 3** shows the inferred site-wide groundwater flow field during the Dry Season. It also shows the model domain boundary (in red), which is conceptualized to represent a No-Flow boundary along which there are no cross-boundary groundwater flows into or out of the model domain.

The flooded Main Pit and Intermediate Pit cut deeply into bedrock in the central mining area and therefore interact significantly with groundwater in adjacent zones of the bedrock aquifer. The Main Pit and Intermediate Pit have been flooded since open pit mining operations ceased approximately 50 years ago. Pit water levels are controlled by inlet and outlet weir structures installed in 1985 as part of initial site rehabilitation. Hence the groundwater flow regime in the central mining area has reached post mining steady-state conditions, with a predictable annual groundwater level response being recorded each year for the period of intensive routine monitoring between 2010 to 2018.

The Browns Pit (< 30 m deep), located immediately west of the Site, is the shallowest of the three open pits within the model domain. The Browns Pit is actively de-watered and is conceptualized to be a local sink for groundwater (see RGC, 2019). The cone of depression that is inferred around the Browns Pit induces a more south-westerly flow of groundwater west of the Intermediate Pit near the EBFR (see **Figure 3**). Observed groundwater levels and the inferred flow field in the CEPA for December 2018 (**Figure 4**) indicate that groundwater head contours run perpendicular to the inferred fault alignment. Due to orientation of the fault being parallel to the flow field direction the hydraulic characteristics of the fault cannot be readily inferred from the flow field.

6.2 Seasonal Groundwater Level Response Near Mapped Faults

Groundwater level time trends have been thoroughly reviewed during each stage of conceptual model development. The key objective of each review has been to better understand the main factors that control groundwater levels, including seasonal recharge by rainfall infiltration and fluctuations in the water levels in the flooded Main Pit and Intermediate Pit. RGC also evaluated the potential influence of mapped faults during its analysis of observed groundwater level time trends. A groundwater level (head) response that would suggest an enhancement or reduction in bedrock permeability near a mapped fault alignment is not observed for any of the monitoring bores at the Site. Instead, observed groundwater levels in the immediate vicinity of mapped faults show the same response compared to bores located at greater distance from the faults in different directions and distances from the fault (see RGC, 2019).

The similar head response for bores located near mapped fault alignments is well-illustrated by time trends for monitoring bores RN023790 and RN023793 in Dyson's Area (**Figure 5**). Note, the map inset shows the location of these bores (and others) along with the mapped fault alignments in Dyson's Area and local lithology. Observed heads are shown with circles and simulated heads from the calibrated "current conditions" model are shown with continuous blue lines for reference. Bores RN023790 and RN023793 show the same head response, i.e., 2 to 3 m, and seasonal trends despite being approximately 550m apart and separated by three mapped faults.

Groundwater level time trends for bores RN022036 (Geolsec Formation), RN023790 (Coomalie Dolostone) and DO21 (shallow backfill materials in Dyson's Pit) provide another illustration of the similar head response in bores separated by mapped faults, as groundwater levels for both bores fluctuate by approximately 6 m and the same seasonal head response is observed. Bores RN023790 and DO21 are approximately 370 m apart and at different distances from the Giant's Reef Fault.

Figure 6 and **Figure 7** show observed and simulated water levels in the central mining area and the Old Tailings Dam area, respectively. Groundwater levels in these areas also show similar seasonal variability, regardless of their proximity to any of the inferred nearby faults. For example, trends for monitoring bores near the Main Shear Zone (MB10-10 and MB12-35) are similar to bore RN23056, which is located approximately 150 m away (**Figure 6**). Water level trends for bores MB14-02D and MB14-06D are also very similar despite being approximately 570 m apart and across two mapped faults (**Figure 7**).

In summary, mapped faults do not appear to influence the head response for nearby bores. Instead, fluctuations in groundwater recharge by rainfall and the permeability of the screened bedrock unit are the key factors that control the head response. This interpretation is most supported by the available groundwater level data and was therefore incorporated into RGC's conceptual (and numerical) hydrogeological model for the Site (see RGC, 2019).

6.3 Hydraulic Testing Results for Bedrock near Main Shear Zone

The conceptual hydrogeological model was updated in 2019 (RGC, 2019) to include additional information from hydrogeological field investigations in 2017 and 2018 and additional routine monitoring data collected by the DITT since RGC (2016) was prepared. As part of the conceptual model update, the influence of the fault that runs between the Main Pit and the Intermediate Pit was reviewed. Available hydraulic testing results strongly suggest that this fault does not have any significant influence on groundwater conditions in the CEPA. This is consistent with RGC's interpretation of a seven-day pumping test completed in 2012 for production bore PB12-33 (near the inferred fault alignment), which only required standard analytical solutions that assumes homogenous and isotropic aquifer properties to reproduce observed drawdowns, as opposed to a more complex or specific solution that would be needed for drawdowns influenced by barriers or secondary porosity associated with a faults.

In 2018, SRK completed a drilling program at the western rim of the Main Pit to characterize ground conditions at the proposed pit push-back area of interest for a future pit backfilling operation (SRK, 2020). **Figure 8** shows the lithology and structural features exposed at the Main

Pit along with drilling details and encountered units for the three drillholes 18DH01 to 18DH03. The drillholes collar locations, orientations and inclinations were selected with the intent of intersecting lithological contact surfaces.

Drillhole 18DH01 was completed with a total depth of 50.7 m and targeted the contact across the Talcose Slate and Dolomite. Interbedded layers of dolerite, schist and shale were encountered (interval 4.5m to 20.0 m) overlying Dolomite. SRK inferred these layers to be possibly bracketed within the Talcose Slate unit, or possibly represent a transition zone to the underlying Dolomite (SRK, 2020). SRK considered that the target lithological contact was intercepted at this drillhole.

Drillhole 18DH02 was completed with a total depth of 51.2 m and targeted the Slate contacts across the Main Shear Zone Schist unit, which is interpreted to represent the fault of interest that runs between the two pits. There is, however, a discrepancy between previous (potentially regional) mapping of the location of the Main Shear Zone and the lithology identified by SRK. SRK did not identify slate in the 18DH02 drillhole core, so has inferred that this drillhole was drilled entirely within the Main Shear Zone Schist unit and that the target contact was not encountered.

Drillhole 18DH03 was completed with a total depth of 86.7 m and targeted the contacts across the Mudstone and Dolomite. A 3.5 m layer of highly weathered and broken material, was encountered overlying Dolomite with a sharp contact at about 17 m. It was uncertain if these materials represent a Quartz Breccia unit or a weathered zone of the underlying Dolomite. SRK infers that the Mudstone unit was not encountered.

The hydraulic testing results at 18DH02 indicated a low-yielding bedrock with K values ranging from 2×10^{-7} m/s to 7×10^{-7} m/s. The estimated K at drillhole 18DH01 (for Shale and Dolomite) was 1×10^{-6} m/s, and at 18DH03 (for Dolomitic Quartzite) was 7×10^{-8} m/s. These drilling and hydraulic testing results strongly indicate that the estimated K of the shear zone and targeted contact surfaces is within the average K range of the surrounding bedrock. Hence the only field investigation that specifically targeted a fault and other contact surfaces at the Site found no evidence for higher or lower permeability for these structural features.

6.4 Persistent Groundwater Quality Impacts in CEPA

Groundwater in the CEPA is impacted by significant losses of highly acidic and metal-rich liquor that occurred from a historic heap leaching operation set up to process copper ore from the Intermediate ore body in the 1970s. Very high Cu concentrations (up to 1000 mg/L Cu) in local groundwater in the CEPA have persisted since the 1970s and are restricted to groundwater in a small area of the CEPA (see **Figure 9**). The Cu concentrations have not been diluted since liquor was lost in the 1970s based on Cu concentrations measured in pregnant liquor at the time. Also, the spatial extent of elevated SO_4 and Cu concentrations in groundwater does not coincide with the location of the mapped fault in this area. The very high concentrations suggest the Cu and SO_4 in this area are not being flushed by groundwater flows across the CEPA and thus that the Central Shear Zone is not inferred to represent a preferential flow path for groundwater.

7 Groundwater Simulations from Calibrated Model

The groundwater system at the Site exhibits a high degree of complexity, including a strong seasonality in recharge and groundwater flow, and highly heterogeneous sub-surface conditions that are typical for fractured bedrock. There are also a range of contaminant sources, some of which are no longer active, but are represented in the historical model. As for any model, the complexity of the site features had to be reduced in the conceptual model such that the key features are represented but being simple enough to allow representation by a numerical model of groundwater flow and solute transport. This is standard practice at any site and is particularly relevant at a legacy site such as Rum Jungle, where there is a wealth of data to interpret and conceptualize.

Groundwater model development was an iterative process that began in 2011 during Phase I of the Rum Jungle Rehabilitation Project, when the initial conceptual hydrogeological model for the site was developed. A numerical groundwater flow model was subsequently produced in 2012 and a transport model, based on an average steady-state flow field, was incorporated into the groundwater model in 2016 (see RGC, 2016), and a fully transient flow and transport model was developed in 2019 to support the EIS (RGC, 2019). The latest flow and transport models (status 2019) were set up in two phases. The first phase ("historic" flow and transport model) was set up to run for a period of 25 years prior to rehabilitation, i.e. nominally the period from January 1960 to December 1984. The historic model was run as a steady state flow, transient transport simulation with 25 annual transport time steps. The second phase ("current" flow and transport model) was set up to run for a period of 34 years following initial site rehabilitation, i.e. the period from January 1985 to December 2018. This current phase was run as a transient flow and transport simulation with 408 monthly stress periods.

The principle of parsimony was followed during calibration of the 2019 model, i.e. an effort was made to keep the model complexity to the minimum needed to account for the observed data. Hundreds of calibration runs were completed to calibrate the 2012 and 2016 groundwater models and the update in 2019 required 46 calibration iterations. A trial-and-error calibration procedure was followed until a satisfactory match to all calibration targets was achieved. Material properties (K, Ss and Sy), as well as recharge and evapotranspiration rates were varied. The zonation of K, recharge and evapotranspiration were also adjusted, and additional zones introduced to the model as part of calibration. The model zonation for K represented the main lithological units of the different bedrock formations (**Figure 10**). An extensive effort was made to refine the spatial distribution of simulated SO_4 and Cu concentrations ("plumes") in the CEPA to be consistent with the inferred SO_4 and Cu plumes prior to rehabilitation in the 1980s and the refined extent of these plumes based on investigations in 2018.

The calibration of a numerical model is typically considered good if the normalized root mean square of the errors (NRMSE) is less than 5%. The calculated NRMSE values for the full calibration period, the Dry Season and the Wet Season data sets are 3.8%, 4.7% and 1.3%, respectively. The computed NRMS values are well below the target NRMS of 5% suggesting good calibration to head targets. The respective residual means are -0.26 m, 0.54 m and 0.32 m, respectively. These statistics and visual inspection of the scatter plots suggest that the residuals do not show any systematic bias across the observed head range and lie largely on average within the acceptable range of +/- 2m. The water balance error for the calibrated transient model is very small (i.e. 0.07 L/s or 0.04%).

The simulated flow fields (**Figure 11**) from the calibrated model compare reasonably well with the inferred groundwater flow fields defined in the conceptual hydrogeological model. The heads simulated by the calibrated flow model match the seasonal variations in observed groundwater levels very well, including the sharp rise in groundwater levels typically observed during the onset of the wet season and the long, gradual recession during the dry season (see above, **Figures 5, 6,**

and 7). The simulated groundwater flows to the EBFR and overall water balance fall within the upper and lower bounds estimated from the conceptual model (see RGC, 2019, for further details). The simulated current load balance for SO_4 agrees reasonably well with the conceptual SO_4 load balance for current conditions. The simulated SO_4 load (1,458 t/year) is approximately 28% higher than the current SO_4 load in groundwater estimated using known point sources (1,138 t/year) but is about 22% lower than observed sulphate loading to the EBFR (1,840 t/year). The simulated current copper load from groundwater to surface water (3.1 t/year) is in good agreement with observed total copper load in the EBFR (2.7 t/year), which represents groundwater and seepage loads at the Site.

The above summary of calibration results indicate that the calibrated model represents the key processes driving the system with satisfactory calibration to all calibration constraints, without the need to explicitly represent faults in the model.

8 Additional Groundwater Simulations for Fault Areas

8.1 Sensitivity Analysis for Current Conditions

RGC completed six additional modelling scenarios for the IR to investigate the influence of faults along three selected alignments. The scenarios assumed faults behave either as hydraulic barriers or preferential pathways for groundwater. Three fault alignments (A, B and C) were selected for this purpose. These alignments are shown in **Figure 12** and additional details on each alignment are provided in **Table 1**. Two scenarios were simulated at each alignment, one as a hydraulic barrier (Scenarios 1, 3 and 5) and the other as a high-permeability flow conduit (Scenarios 2, 4 and 6). Each scenario was run for both SO_4 and Cu, i.e., a total of 12 scenario simulations (**Table 2**).

For all scenarios, model changes were made to both the “historic” flow and transport model, which is set up to run for a period of 25 years prior to rehabilitation, and the “current conditions” model, i.e. the same time periods used for the calibrated model. Fault alignments were represented in Layers 3, 4, and 5 in the model, which represent shallow bedrock. The MODFLOW HFB package, with a nominal barrier width of 10 m and K of 1×10^{-9} m/s, was used to represent an alignment as a hydraulic barrier. A K value of 1×10^{-3} m/s was assigned to alignments to represent a fault as a preferential flowpath for groundwater.

Simulations for Scenarios 1 to 5 show no significant changes on simulated flow fields, time trends or calibration statistics of heads compared to the calibrated model (**Figure 13**), with only local differences in simulated heads in the immediate vicinity of the simulated faults. In contrast, Scenario 6, simulating a high-K fault along Alignment C (Giant's Reef Fault) showed significant deterioration in head calibration statistics, driven by the significant mismatch between simulated and observed heads in the Dyson's area (**Figure 14**).

Simulated SO_4 and Cu plumes in groundwater for Scenarios 1 to 6 are shown in **Figure 15** to **Figure 20**. Simulated plumes from the calibrated "current conditions" model are shown in each figure for comparison. Observations from the six scenarios are summarized in **Table 3**. Simulated SO_4 and Cu loads for the six scenarios are summarized in **Table 4** and **Table 5**, respectively. Complete results are provided in **Appendix C**.

Table 1

Fault Alignments for Additional Model Runs

Alignment		Description
A	Fault Between Pits	This alignment starts approximately 200 m northeast of the Main Pit and extends across the CEPA to the Intermediate Pit and Browns Pit. The total length of this alignment is approximately 1350 m. The represented stretch of Alignment A located between the Main and Intermediate pits generally agrees with the inferred location of the shear zone based on pit wall mapping (SRK, 2020), with an offset of ~ 35-40m to the north of the fault alignment mapped on the pit geology map.
B	Fault Near Main and Intermediate WRDs	This alignment begins southwest of the Intermediate WRD and extends approximately 250 m east of the Main Pit. This alignment cross cuts the major contaminant plumes originating from the Intermediate WRD and Main WRD and extending beneath the East Finnis R Diversion Channel (EFDC). The total length of this alignment is approximately 2000 m and has a similar orientation as the minor faults beneath the Intermediate WRD that were represented by an HFB in a previous version of the model. These minor faults are too short to be instructive for this letter report so the longer Alignment B was selected for Scenario 2.
C	Giant's Reef Fault and Secondary Faults	This alignment represents the Giant's Reef Fault as it is mapped in the original files provided to RGC. RGC modified the alignment of the Giant's Reef Fault in a previous version of the model because its location was inconsistent with borehole logs for several monitoring bores near the Main WRD. This alignment has a total length of approximately 4800 m, with three secondary faults intersecting alignments towards Dyson's Area also being represented. Alignment C extends across the Main WRD, the EBFR, Dyson's WRD and Dyson's (backfilled) Pit.

Table 2

Simulated Scenarios

Scenario #	Run ID	Fault Alighnment	Simulated Scenario	Transport Parameter
1	88	A	HFB	SO_4
1	89	A	HFB	Cu
2	91	A	High-K	SO_4
2	92	A	High-K	Cu
3	90	B	HFB	SO_4
3	90c	B	HFB	Cu
4	93	B	High-K	SO_4
4	94	B	High-K	Cu
5	95	C	HFB	SO_4
5	96	C	HFB	Cu
6	97	C	High-K	SO_4
6	98	C	High-K	Cu

Table 3

Summary of Additional Groundwater Simulations

Scenario	Comments	Conclusions
Scenario 1: Alignment A. HFB See Figure 15 Run R88 for SO_4 - Run R89 for Cu.	• No significant change in the overall flow field and calibration statistics as the fault alignment is parallel to the direction of the groundwater flow field. • Considerable decrease (by 1000 to 1500 mg/L) in SO_4 concentrations on the west side of CEPA. • No significant changes in the extent of simulated Cu plume or the magnitude of simulated Cu concentrations. • No significant changes in loads are expected based on the visual inspection of plumes and flow field and therefore are not discussed.	• Scenario provides a less favorable solution compared to the calibrated model. • Scenario does not provide a credible representation of the SO_4 plume in the CEPA. Calibrated SO_4 plume in this area provided a more plausible solution and a closer agreement with the observed elevated SO_4 concentrations (4500 to 6000 mg/l).
Scenario 2: Alignment A. High-K See Figure 16 Run R91 for SO_4 - Run R92 for Cu	• No significant change in the overall flow field and calibration statistics as the fault alignment is parallel to the direction of the groundwater flow field. • Full clean-up of the SO_4 plume along and north of the fault alignment is predicted. • Substantial decrease in Cu concentrations along the fault alignment (in the order of 100 to 150 mg/l), compared to the calibrated model. • No significant changes are predicted for SO_4 total loads (Table 3). e.g., for the 2017/2018 water year, loads to the EBFR (1273 t/year) and to the pits (158.5 t/year), i.e., 1% and 7% lower compared to the calibrated model (1288 t/year and 170 t/year, respectively). • No significant changes are predicted in the simulated Cu (total) load. • No off-site migration of plume is predicted along the fault alignment.	• Scenario is considered non-plausible. • Scenario does not allow the measured elevated SO_4 and Cu concentrations that persist in groundwater in the CEPA to be simulated, resulting in a full clean-up of the elevated concentrations along the fault.
Scenario 3: Alignment B. HFB See Figure 17 Run R90 for SO_4 - Run R90c for Cu	• No significant change in the overall flow field and calibration statistics • No key changes were predicted for the SO_4 and Cu plumes. • No significant changes in loads are expected based on the visual inspection of plumes and flow field and therefore are not discussed.	• Scenario is considered plausible. • Scenario shows no considerable changes, compared to calibrated model, within the bounds and at location of calibration targets. • Additional complexity assumed in this scenario is not justified.
Scenario 4: Alignment B. High-K See Figure 18 Run R93 for SO_4 - Run R94 for Cu	• Significant local changes in the flow field in proximity of the hypothetical fault near Intermediate and Main WRDs. But no significant changes in overall flow field and calibration statistics. • Predicts SO_4 plume to migrate along the fault alignment from the Main and Intermediate WRDs towards the north-east and report to the Main Pit. • SO_4 loads reporting to the EBFR reach north of the Main WRD, are predicted to drop by ~25% (from 500 t/year to 376 t/year for 2017/2018) and partially by-pass the EBFR to get intercepted in Main Pit. • SO_4 loads to the Main Pit are predicted to increase by about four-fold (from 71 t/year to 296 t/year, for 2017/2018) and loads to the Intermediate pit are predicted to drop by 40%. • The total SO_4 load reporting to the EBFR (1518 t/year) is predicted to increase only by ~4% compared to the calibrated model (1458 t/year). • No significant changes were predicted neither to the Cu plume nor to the loads. • No off-site migration of plume is predicted along the fault alignment.	• Scenario is considered plausible. • Scenario provides a less favorable solution compared to the calibrated model. • Additional complexity assumed in this scenario is not justified.

Table 3 (continued)

Summary of Additional Groundwater Simulations

Scenario	Comments	Conclusions
Scenario 5: **Alignment C. HFB** See Figure 19 Run R95 for SO_4 - Run R96 for Cu	• No significant change in the overall flow field and calibration statistics • No key changes were predicted for the SO_4 and Cu plumes. • No significant changes in loads are expected based on the visual inspection of plumes and flow field and therefore are not discussed.	• Scenario is considered plausible. • Scenario shows no significant changes, compared to calibrated model, within the bounds and at location of calibration targets. • Additional complexity assumed in this scenario is not justified.
Scenario 6: **Alignment C. High-K** See Figures 14 and 20 Run R97 for SO4 - Run R98 for Cu	• Scenario yielded a non-plausible head solution. • SO_4 and Cu plumes are predicted to migrate along the fault alignment from the Dyson's area towards the south-west and from the Main WRD area towards the north-east. • No off-site migration of plume is predicted along the fault alignment.	• Scenario is considered non-plausible.

Scenario 1, simulating alignment A (Main Shear Zone) as a hydraulic barrier (HFB), resulted in a considerable reduction in SO_4 plume concentrations in the west side of the CEPA area (**Figure 15**). In contrast, the SO_4 plume for the calibrated model in this area provided a closer agreement with the observed elevated SO_4 concentrations. There were no changes in the simulated SO_4 and Cu plumes for Scenarios 3 and 5, which represent fault alignments as a hydraulic barrier (see **Figure 17** and **Figure 19**).

The assumption of a high-K fault in the CEPA, Scenario 2, results in flushing of the residual sulphate and copper plume (with very dilute water from the flooded Main pit) along the fault alignment (**Figure 16**). This is not consistent with water quality observations, which suggest elevated SO_4 and Cu concentrations in groundwater have persisted since the loss of heap leach liquor during the heap leach operation in the 1970s. The calibrated model, on the other hand, simulates these elevated concentrations in groundwater and the overall distribution of SO_4 and Cu in the CEPA. A High-K scenario for the Main Shear Zone is therefore implausible and does not warrant further consideration or field investigations.

While both Scenarios 2 and 4 predicted a significant change in the simulated plume extents compared to the calibrated model, predicted changes in the total sulphate and copper loads to the EBFR are minor (up to 4% increase). These two scenarios illustrate that the loads are predicted to be redistributed in response to the influence of the high-K fault. For instance, in Scenario 4, the reduction in SO_4 loading to the EBFR and to the Intermediate Pit is compensated for by an increase in loading to the Main Pit with no significant change in the total loads reporting to the EBFR. In fact, both scenarios predicted an overall reduction in loads reporting to the EBFR reaches (A to I). A redistribution of contaminant loads within the Site is plausible and cannot be discounted. However, none of the scenarios tested here result in a net change in loads to the receiving environment, i.e., to the EBFR.

Scenario 6, simulating the Giant's Reef Fault as a high-K preferential pathway, is considered non-plausible as it resulted in a significant mismatch in heads and non-acceptable deterioration in head calibration statistics. However, this scenario provides an important illustration for a fault which extends across the whole model domain from east to west and intersects key contaminant source terms on site (Main, Intermediate and Dyson's WRDs, and Dyson's backfilled pit) and the EBFR. It predicts no off-site migration of the plumes, rather the plume is predicted to migrate towards the central area of the Rum Jungle Site, due to the dominant hydraulic control of the three pits on the local groundwater flow field.

Table 4

Summary of Simulated Sulphate Loads from Calibrated Model and High-K Scenarios for Fault Areas

Group	2011 Water Year		2012 Water Year		2013 Water Year		2014 Water Year		2015 Water Year		2016 Water Year		2017 Water Year		2018 Water Year		Annual Average	
	t/year	%	t/year	%	t/year	%	t/year	%	t/year	%	t/year	%	t/year	%	t/year	%	t/year	%
Calibrated Model, t/year																		
To EBFR Reaches	1537.1	91%	1125.9	90%	1089.5	87%	1307.7	89%	969.6	90%	951.3	89%	1166.2	90%	1288.2	88%	1179.4	89%
To Main Pit	78.3	5%	53.5	4%	61.3	5%	67.1	5%	46.3	4%	47.9	4%	58.8	5%	71.2	5%	60.5	5%
To Intermediate Pit	48.0	3%	65.8	5%	87.7	7%	68.3	5%	53.4	5%	59.3	6%	62.8	5%	70.7	5%	64.5	5%
To Browns Pit	8.1	0%	2.3	0%	17.9	1%	12.8	1%	8.6	1%	7.7	1%	8.7	1%	9.4	1%	9.5	1%
To Model Flooding Drains	22.2	1%	2.6	0%	1.4	0%	11.9	1%	0.3	0%	0.5	0%	5.5	0%	18.8	1%	7.9	1%
Total To EBFR	1693.7	100%	1250.0	100%	1257.8	100%	1467.8	100%	1078.3	100%	1066.6	100%	1302.1	100%	1458.3	100%	1321.8	100%
Scenario 2 (Central Shear Zone; Alignment A), t/year																		
To EBFR Reaches	1529.7	91%	1119.2	90%	1082.1	88%	1297.7	90%	962.4	91%	944.8	90%	1158.0	90%	1273.2	89%	1170.9	0%
To Main Pit	77.5	5%	51.8	4%	59.9	5%	65.3	5%	45.1	4%	47.2	4%	58.4	5%	70.6	5%	59.5	2%
To Intermediate Pit	48.7	3%	62.7	5%	82.1	7%	64.3	4%	50.9	5%	54.9	5%	61.7	5%	65.7	5%	61.4	21%
To Browns Pit	2.1	0%	1.7	0%	7.1	1%	3.9	0%	3.0	0%	3.2	0%	3.6	0%	3.4	0%	3.5	0%
To Model Flooding Drains	22.2	1%	2.6	0%	1.4	0%	11.9	1%	0.3	0%	0.5	0%	5.5	0%	18.8	1%	7.9	0%
Total To EBFR	1680.1	100%	1238.0	100%	1232.7	100%	1443.1	100%	1061.7	100%	1050.5	100%	1287.2	100%	1431.7	100%	1303.1	23%
Δ (Calibrated Model):	-13.6		-12.0		-25.1		-24.7		-16.6		-16.1		-14.9		-26.6		-18.7	
Scenario 4 (Giant's Reef Fault; Alignment B), t/year																		
To EBFR Reaches	1414.3	79%	1014.6	77%	959.8	75%	1159.6	77%	871.4	76%	828.3	76%	1034.9	77%	1159.7	76%	1055.3	85%
To Main Pit	329.5	18%	261.6	20%	258.1	20%	295.7	20%	237.4	21%	224.9	21%	271.1	20%	296.0	19%	271.8	1%
To Intermediate Pit	31.3	2%	43.1	3%	56.9	4%	44.3	3%	32.0	3%	36.8	3%	39.3	3%	43.4	3%	40.9	14%
To Browns Pit	0.4	0%	0.2	0%	1.1	0%	0.6	0%	0.4	0%	0.5	0%	0.5	0%	0.6	0%	0.5	0%
To Model Flooding Drains	22.2	1%	2.6	0%	1.4	0%	11.9	1%	0.3	0%	0.5	0%	5.5	0%	18.8	1%	7.9	0%
Total To EBFR	1797.8	100%	1322.1	100%	1277.3	100%	1512.1	100%	1141.7	100%	1090.9	100%	1351.3	100%	1518.5	100%	1376.5	100%
Δ (Calibrated Model):	104.1		72.1		19.5		44.3		63.4		24.3		49.3		60.2		54.6	
Scenario 6 (Giant's Reef Fault; Alignment C), t/year																		
To EBFR Reaches	1817.1	93%	1315.5	93%	1275.3	91%	1542.0	92%	1169.4	93%	1149.4	93%	1399.8	93%	1537.7	91%	1400.8	89%
To Main Pit	66.3	3%	44.3	3%	49.5	4%	56.4	3%	37.1	3%	39.0	3%	49.9	3%	61.5	4%	50.5	1%
To Intermediate Pit	42.2	2%	58.7	4%	78.1	6%	62.0	4%	47.0	4%	52.6	4%	56.8	4%	62.5	4%	57.5	10%
To Browns Pit	0.3	0%	0.2	0%	0.8	0%	0.5	0%	0.4	0%	0.4	0%	0.5	0%	0.5	0%	0.5	0%
To Model Flooding Drains	22.2	1%	2.6	0%	1.4	0%	11.9	1%	0.3	0%	0.5	0%	5.5	0%	18.8	1%	7.9	0%
Total To EBFR	1948.2	100%	1421.2	100%	1405.1	100%	1672.7	100%	1254.3	100%	1241.8	100%	1512.5	100%	1680.9	100%	1517.1	100%
Δ (Calibrated Model):	254.5		171.2		147.3		205.0		175.9		175.2		210.5		222.6		195.3	

Table 5

Summary of Simulated Copper Loads from Calibrated Model and High-K Scenarios for Fault Areas

Group	2011 Water Year		2012 Water Year		2013 Water Year		2014 Water Year		2015 Water Year		2016 Water Year		2017 Water Year		2018 Water Year		Annual Average	
	t/year	%	t/year	%	t/year	%	t/year	%	t/year	%	t/year	%	t/year	%	t/year	%	t/year	%
Calibrated Model, t/year																		
To EBFR Reaches	3.1	87%	2.1	83%	2.2	81%	2.6	84%	1.9	84%	1.9	83%	2.3	84%	2.6	84%	2.3	84%
To Main Pit	0.1	2%	0.1	2%	0.1	2%	0.1	2%	0.1	2%	0.1	2%	0.1	2%	0.1	2%	0.1	2%
To Intermediate Pit	0.4	11%	0.4	14%	0.4	16%	0.4	14%	0.3	13%	0.3	15%	0.4	14%	0.4	14%	0.4	14%
To Browns Pit	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%
To Model Flooding Drains	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%
Total To EBFR	3.5	100%	2.6	100%	2.7	100%	3.1	100%	2.2	100%	2.3	100%	2.8	100%	3.1	100%	2.8	100%
Scenario 2 (Central Shear Zone; Alignment A), t/year																		
To EBFR Reaches	3.1	75%	2.1	69%	2.2	70%	2.6	73%	1.9	70%	1.9	71%	2.3	74%	2.6	77%	2.3	0%
To Main Pit	0.1	3%	0.1	3%	0.1	3%	0.1	3%	0.1	3%	0.1	3%	0.1	3%	0.1	2%	0.1	2%
To Intermediate Pit	0.9	22%	0.9	29%	0.9	27%	0.8	24%	0.7	27%	0.7	26%	0.7	23%	0.7	21%	0.8	21%
To Browns Pit	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%
To Model Flooding Drains	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%
Total To EBFR	4.1	100%	3.1	100%	3.1	100%	3.5	100%	2.6	100%	2.7	100%	3.1	100%	3.4	100%	3.2	23%
Δ (Calibrated Model):	0.6		0.6		0.4		0.4		0.4		0.4		0.4		0.3		0.4	
Scenario 4 (Giant's Reef Fault; Alignment B), t/year																		
To EBFR Reaches	3.1	88%	2.2	84%	2.2	82%	2.6	85%	1.9	86%	2.0	84%	2.4	85%	2.6	85%	2.4	85%
To Main Pit	0.0	1%	0.0	1%	0.0	1%	0.0	1%	0.0	1%	0.0	1%	0.0	1%	0.0	1%	0.0	1%
To Intermediate Pit	0.4	11%	0.4	15%	0.5	17%	0.5	15%	0.3	14%	0.4	15%	0.4	15%	0.4	14%	0.4	14%
To Browns Pit	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%
To Model Flooding Drains	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%
Total To EBFR	3.5	100%	2.6	100%	2.7	100%	3.1	100%	2.3	100%	2.4	100%	2.8	100%	3.1	100%	2.8	100%
Δ (Calibrated Model):	0.0		0.0		0.0		0.0		0.1		0.1		0.0		0.0		0.0	
Scenario 6 (Giant's Reef Fault; Alignment C), t/year																		
To EBFR Reaches	4.3	91%	3.3	89%	3.3	87%	3.8	89%	2.9	90%	2.9	89%	3.4	89%	3.7	89%	3.5	89%
To Main Pit	0.1	1%	0.1	2%	0.1	2%	0.1	2%	0.0	1%	0.1	2%	0.1	2%	0.1	1%	0.1	1%
To Intermediate Pit	0.4	8%	0.4	10%	0.4	11%	0.4	10%	0.3	9%	0.3	10%	0.4	10%	0.4	10%	0.4	10%
To Browns Pit	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%
To Model Flooding Drains	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%
Total To EBFR	4.8	100%	3.7	100%	3.8	100%	4.3	100%	3.3	100%	3.3	100%	3.9	100%	4.2	100%	3.9	100%
Δ (Calibrated Model):	1.3		1.2		1.1		1.2		1.1		1.0		1.1		1.1		1.1	

8.2 Implications for Rehabilitation Planning

Post-rehabilitation, there will be contaminant loads to the EBFR from the following key sources:

- Residual, AMD-impacted groundwater.
- Backfilled Main Pit.
- New WSFs.

Post-rehabilitation loads from residual AMD-impacted groundwater are predicted to be substantially lower than loads for current conditions, mainly due to the operation of a Seepage Interception System (SIS) during the 10-year construction period. Post-rehabilitation, the backfilled Main Pit and the two WSFs will be the largest SO_4 sources at the Site. However, SO_4 loads to groundwater from the WSFs are predicted to be less than 10% of the current loads from the historic WRDs. Moreover, the WSFs are predicted to be very minor sources of Cu and other metals, as waste rock re-located to the WSFs will be amended with aglime, compacted during placement, and covered with a closure cover to limit rainfall infiltration (see RGC, 2019).

The additional modeling provided in this letter report suggests none of the scenarios that simulate faults as hydraulic barriers (Scenarios 1, 3, and 5) will significantly change the model predictions for post-rehabilitation, and hence do not warrant further consideration. Modeling results also suggest that high-K scenarios for Alignment A (Scenario 2) and Alignment C (Scenario 6) are implausible (see **Table 3**). The high-K scenario for Alignment B (Scenario 4) cannot be ruled out and there are potential implications for post-rehabilitation conditions at the Site.

Specifically, a high-K fault for Alignment B could allow a SO_4 plume migrating from the Central WSF to potentially reach the EBFR near the Main Pit faster than predicted with the calibrated groundwater model. This is because a portion of Alignment B extends beneath the Central WSF to the east of the Main Pit (see **Figure 21**). However, the predicted post-rehabilitation SO_4 load to the EBFR from the Central WSF will not change due to the higher permeability of the fault. Also, predicted post-rehabilitation SO_4 (and Cu) loads to the EBFR from RGC (2019) will allow water quality objectives for the EBFR to be achieved (see RGC, 2019).

A high-K Alignment B could also potentially influence the transport of residual AMD-impacted groundwater from near the remediated footprint of the Main WRD. However, groundwater quality near the footprint is predicted to be substantially improved during the construction period of rehabilitation due to the relocation of the waste rock material in the Main and Intermediate WRDs as well as the operation of the SIS near the remediated WRD footprints (see above), so much smaller loads from the Site are expected post-rehabilitation (see RGC, 2019).

9 Conclusions

Faults do not appear to impart a noticeable control on the groundwater level fluctuations at the Site, nor can the presence of faults be inferred from the hydraulic testing results or other observations during the 2018 geotechnical investigation that targeted the Central Shear Zone. Instead, seasonal fluctuations in heads are inferred to respond mainly to seasonal changes in recharge by rainfall, and any small differences in head responses are attributed to the local heterogeneity of bedrock, as opposed to linear alignments with different hydraulic characteristics than surrounding bedrock.

Representing faults at the Site as flow barriers has no significant influence on the simulated groundwater flow regime in fault areas and is not predicted to produce significant changes in the extent of the simulated SO_4 and Cu plumes for current conditions. The representation of faults as high-K zones has a more noticeable influence on groundwater levels and contaminant plumes near the fault alignments. None of the modeled scenarios (assuming very high or low K values) offers a more favorable match to observations than the latest calibrated model from RGC (2019).

Only one of the hypothetical fault scenarios tested in the additional sensitivity runs presented in this letter report (i.e., Scenario 4) has some potential to influence post-rehabilitation contaminant transport in groundwater. However, these potential influences on post-rehabilitation contaminant transport are relatively minor and would not significantly influence the overall success of site rehabilitation.

10 Closure

We trust that this letter report meets your requirements.

ROBERTSON GEOCONSULTANTS INC.

EGBC Permit Number: 1001164

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11 References

RGC (2016), Groundwater Flow and Transport Modelling (Current Conditions), RGC Report No. 183006/6, June 2016.

RGC (2019), Groundwater and Surface Water Modelling Report, Rum Jungle Stage 2A, RGC Report 183008/1, November 2019.

SRK (2020), Rum Jungle Pit Rim Investigations Factual Report. SRK Consulting (Canada) Inc. 1AR001.015

FIGURES

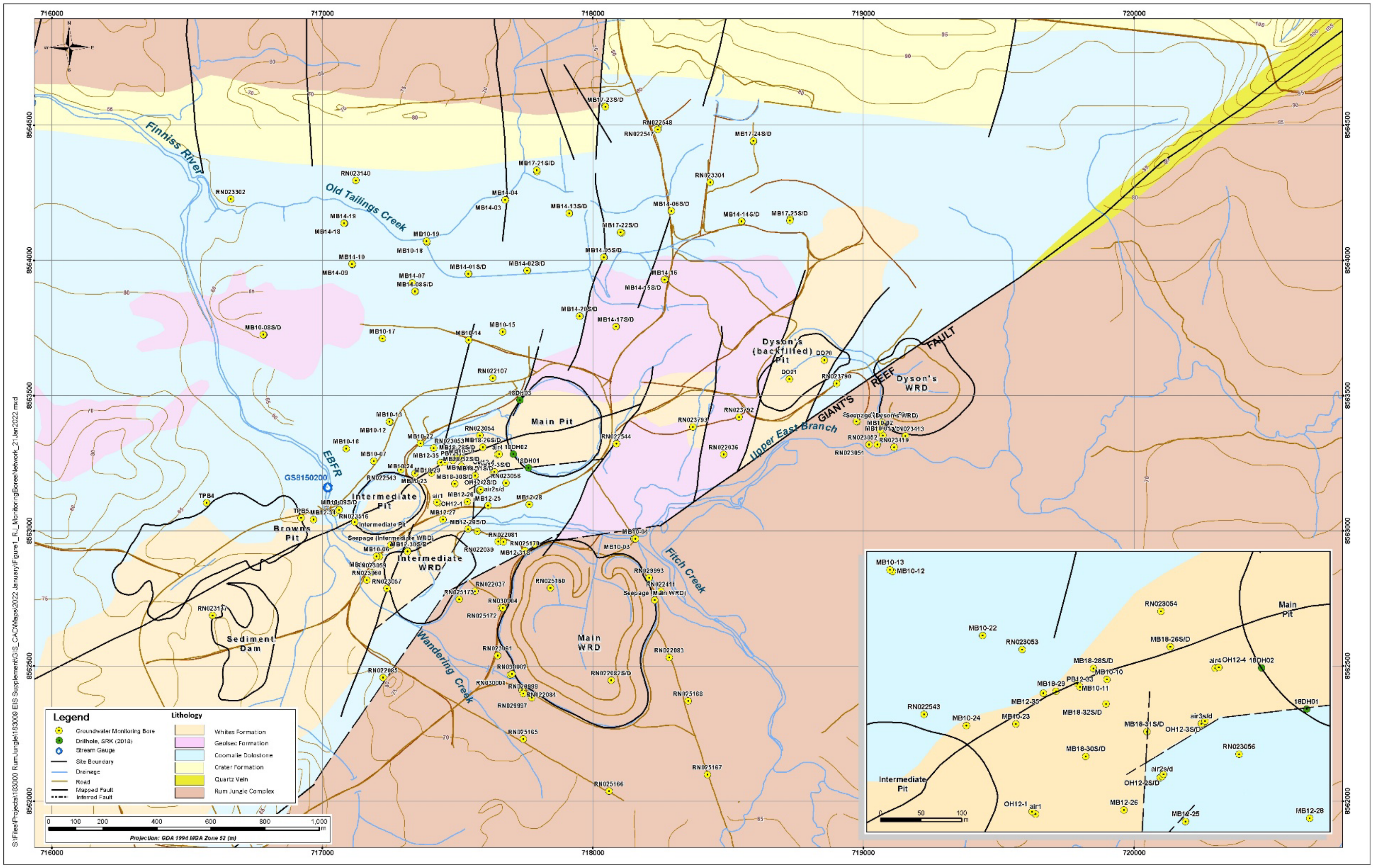


Figure 1: Monitoring Bores and Lithology

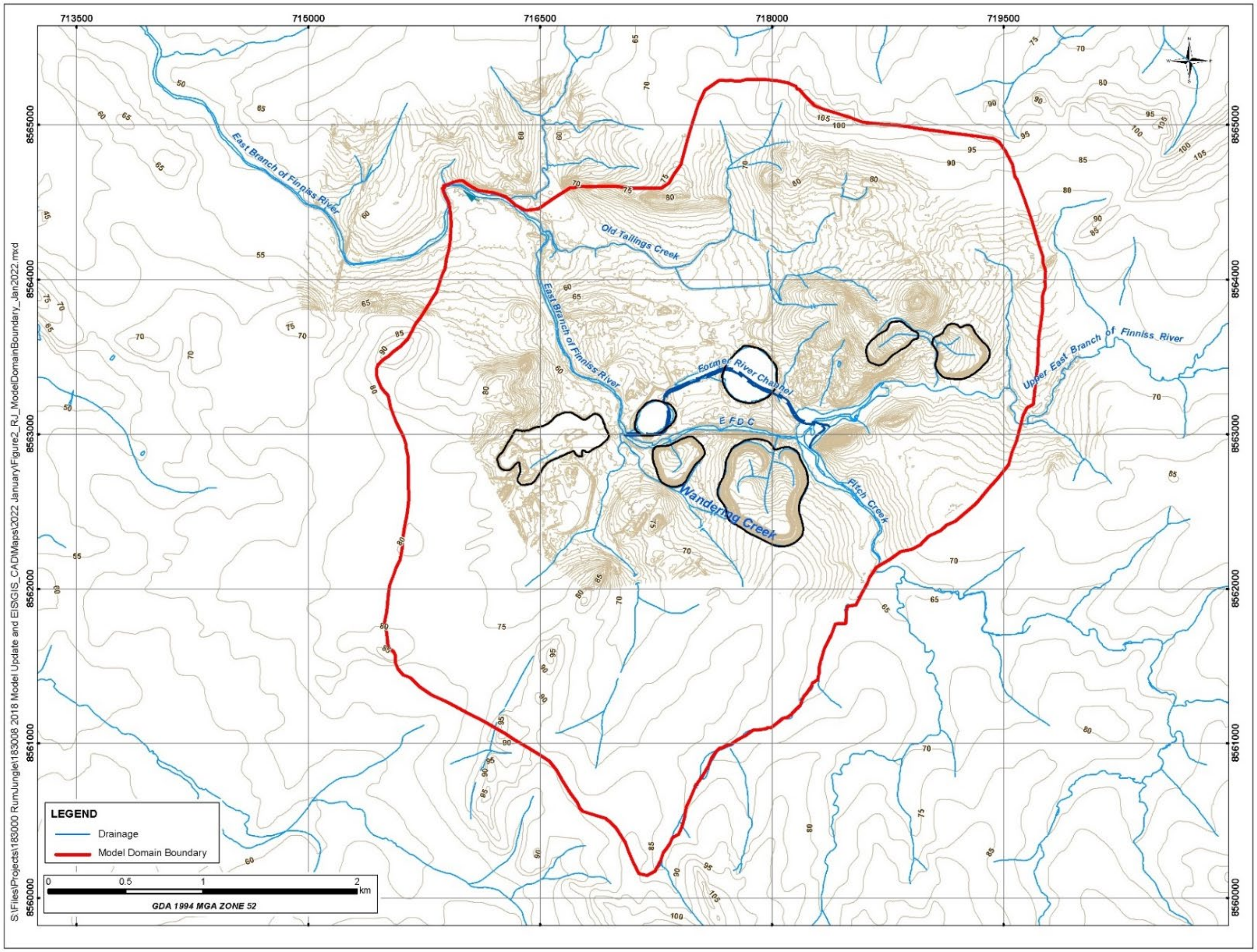


Figure 2: Conceptual Model Domain

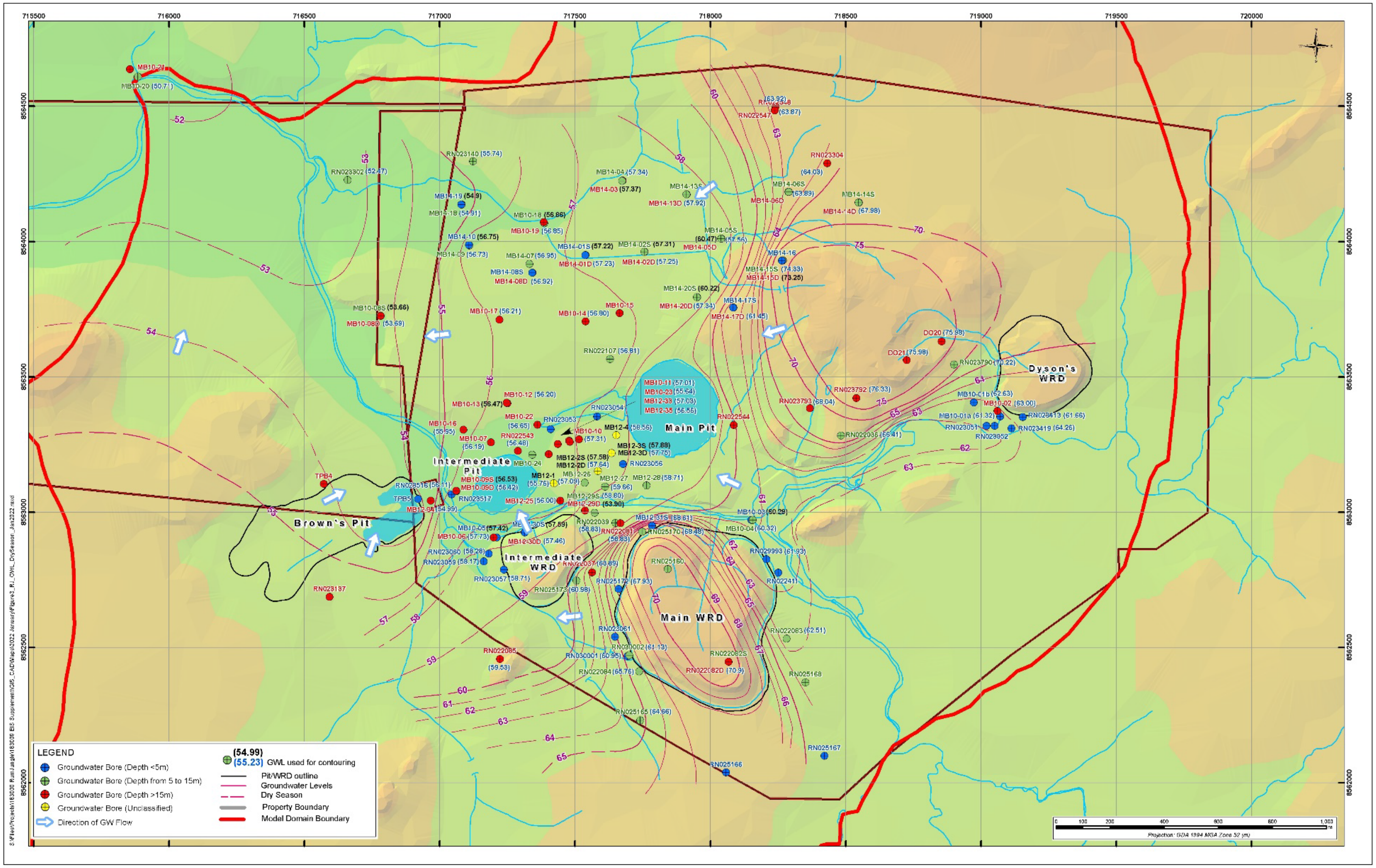


Figure 3: Groundwater Levels and Inferred Flow Field for Dry Season (November 2014)

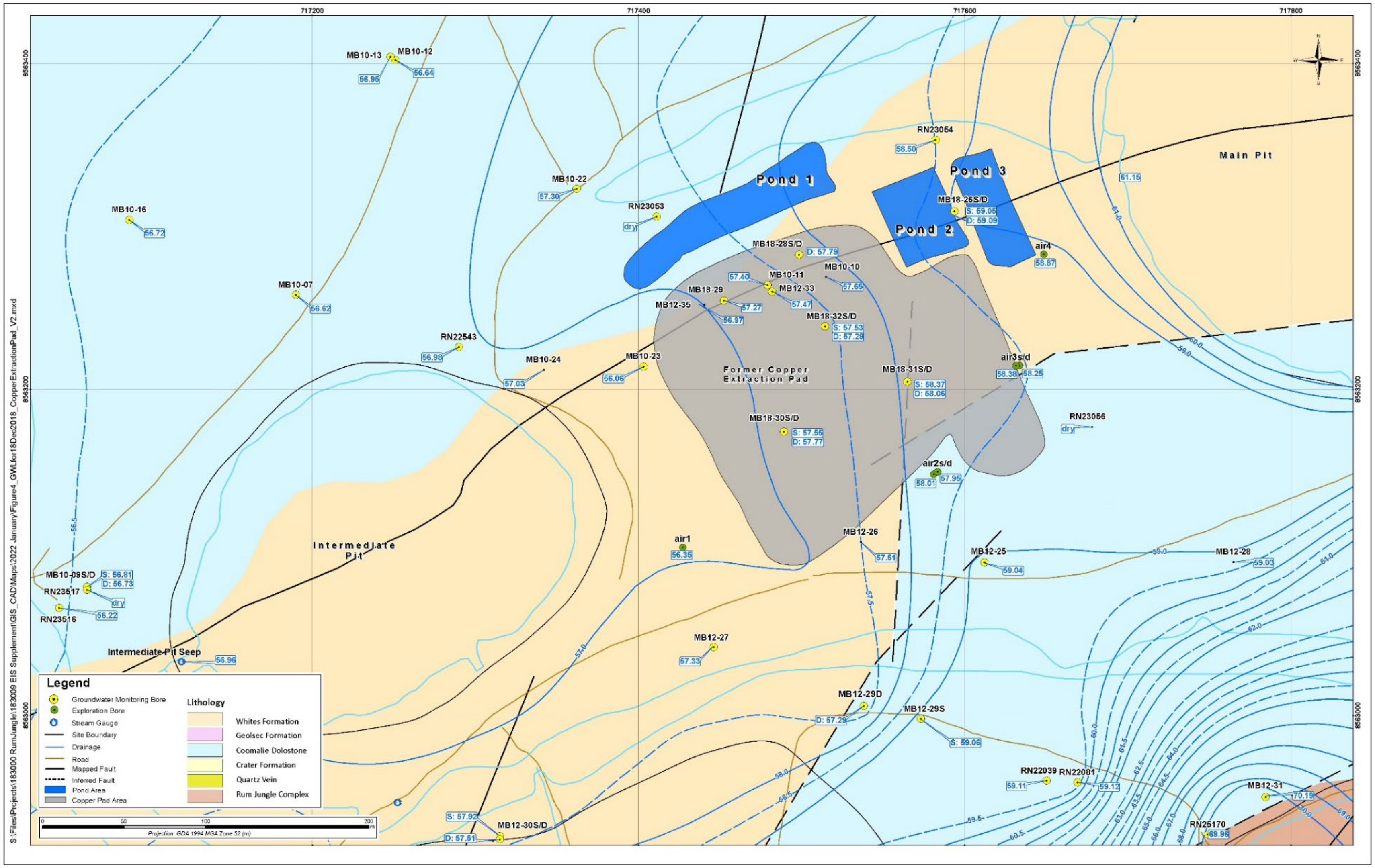


Figure 4: Groundwater Levels and Inferred Flow Field (December 2018) – Copper Extraction Pad area

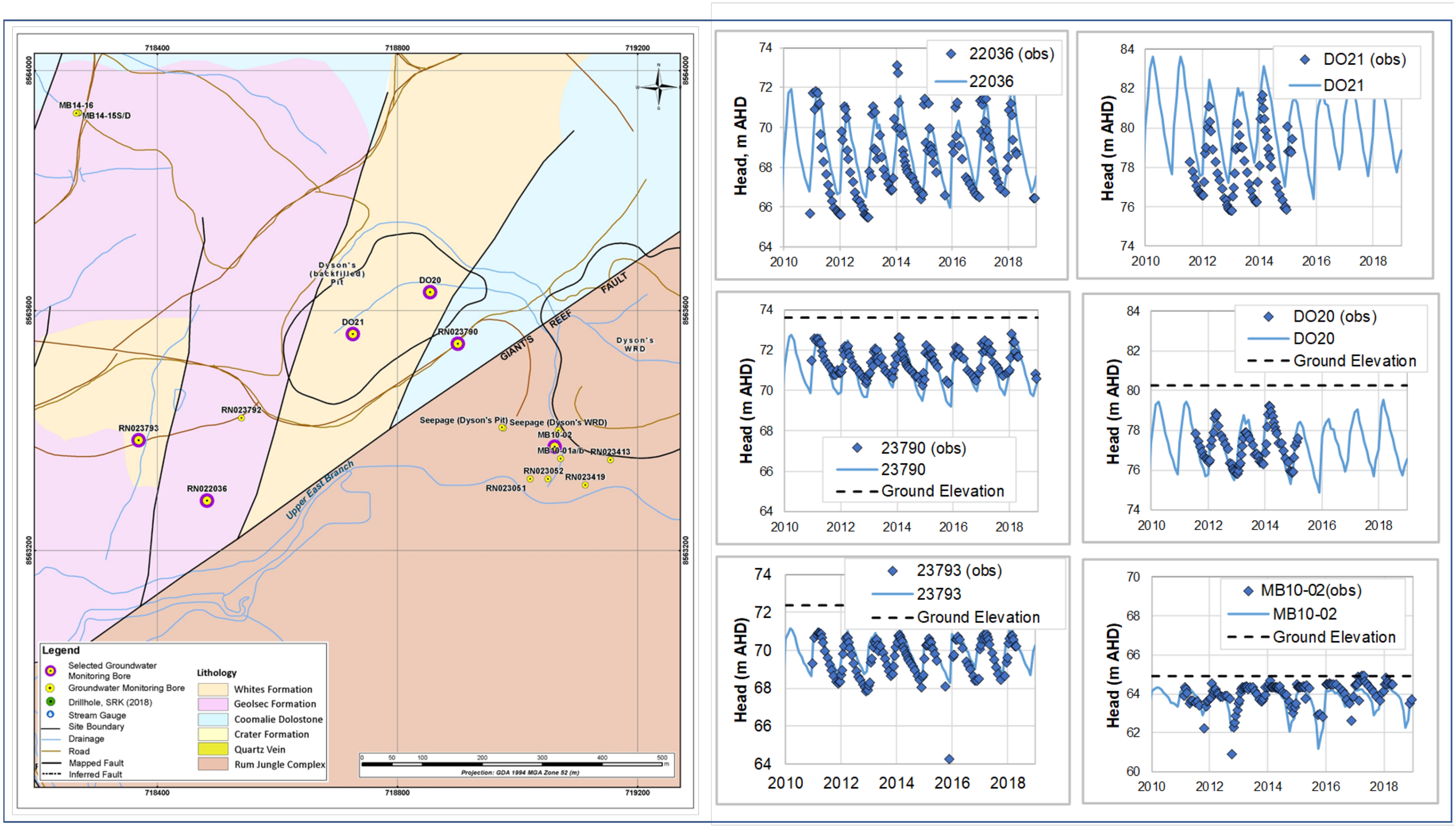


Figure 5: Observed vs Simulated Groundwater levels - from Selected Wells – Dyson's Area

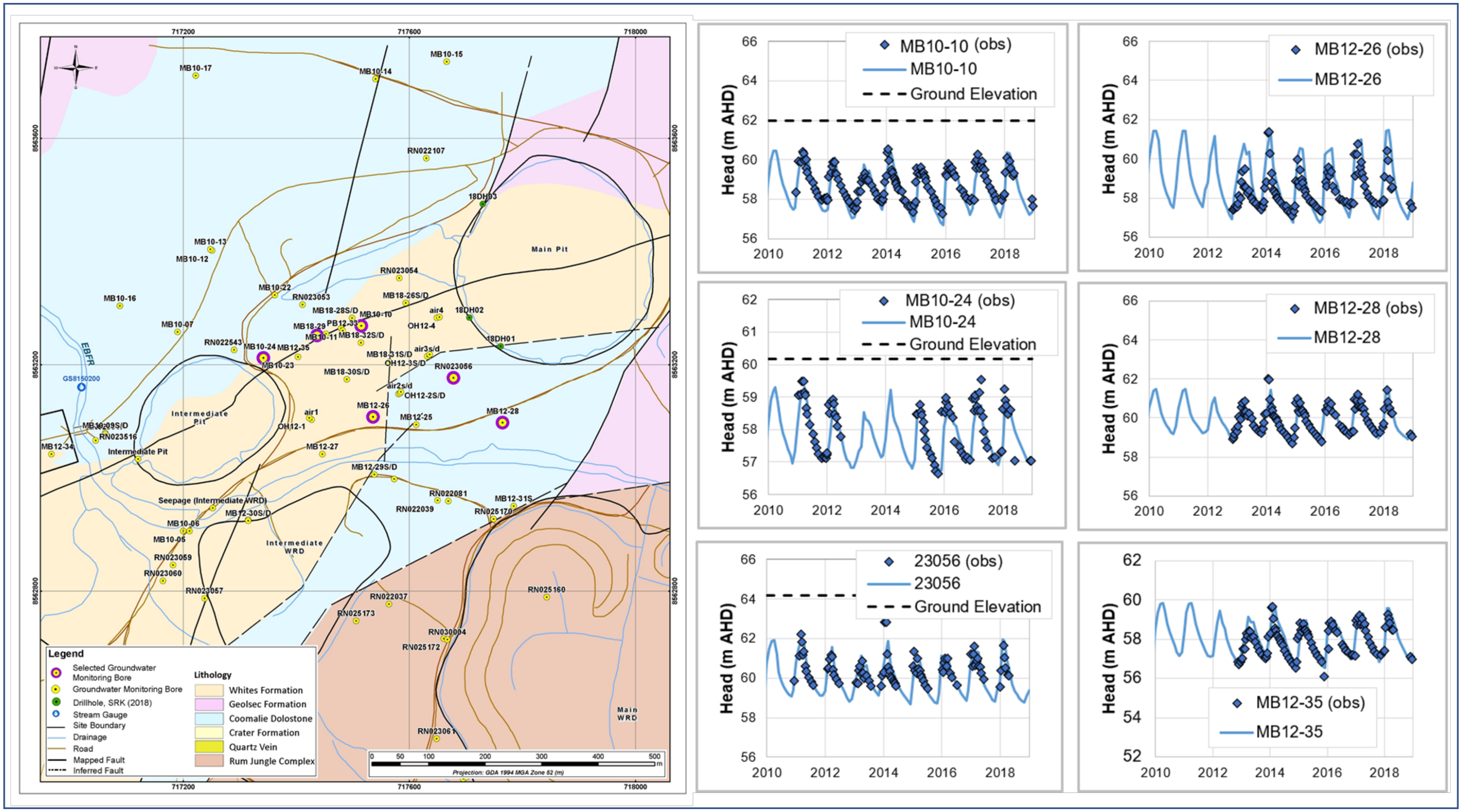


Figure 6: Observed vs Simulated Groundwater levels - from Selected Wells – Central Mining Area

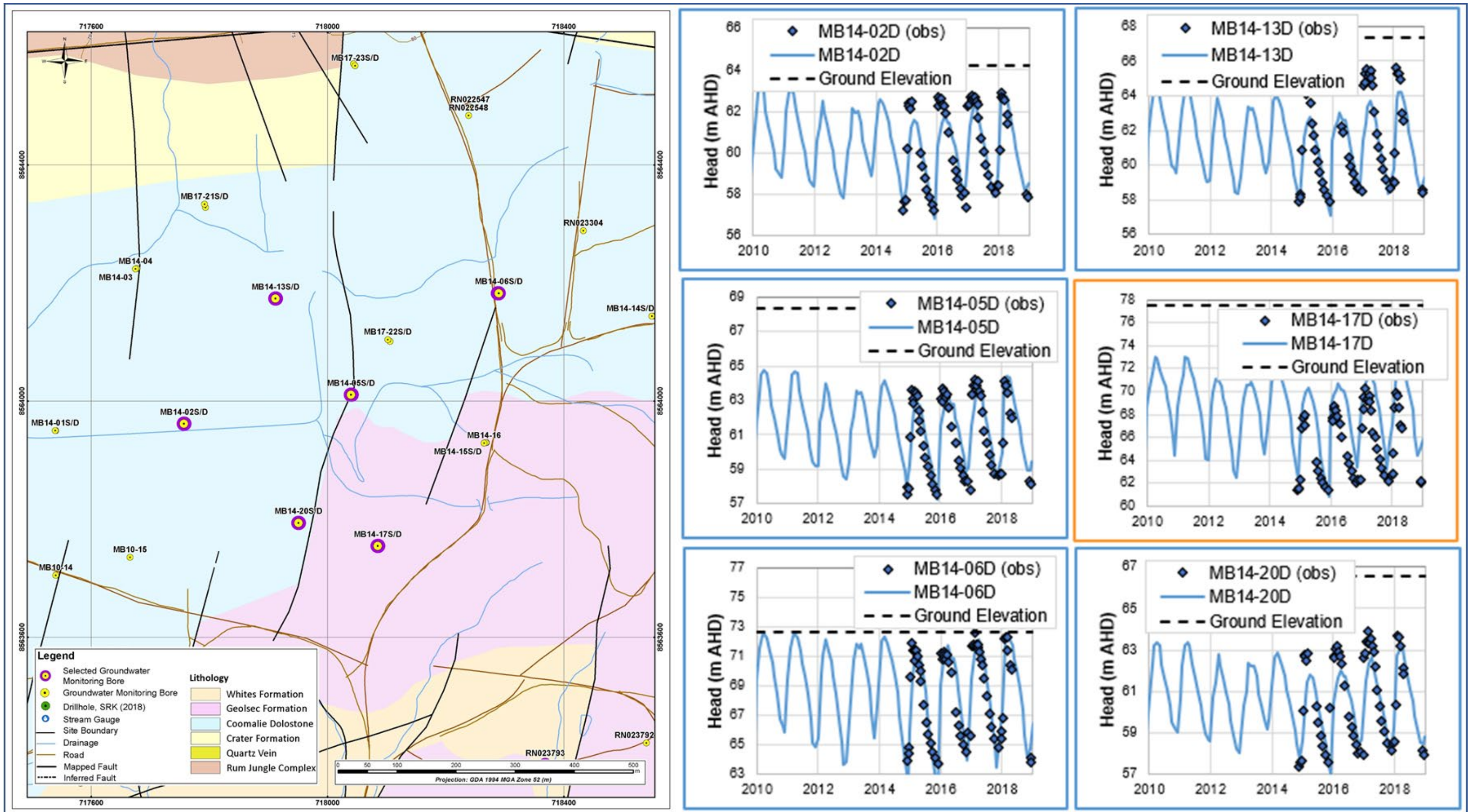
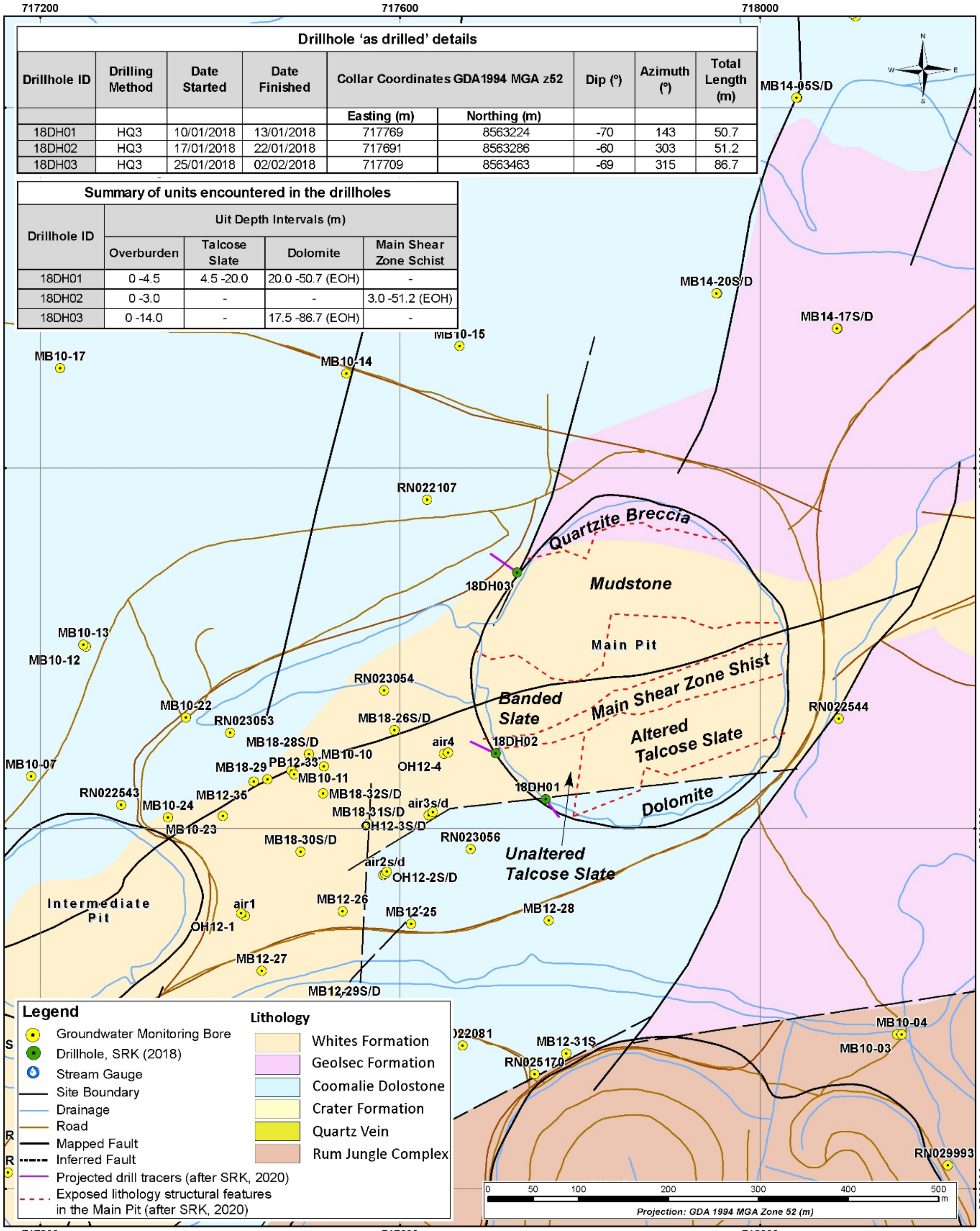


Figure 7: Observed vs Simulated Groundwater levels - from Selected Wells – Old Tailings Dam Area



Drillhole 'as drilled' details								
Drillhole ID	Drilling Method	Date Started	Date Finished	Collar Coordinates GDA1994 MGA z52		Dip (°)	Azimuth (°)	Total Length (m)
				Easting (m)	Northing (m)			
18DH01	HQ3	10/01/2018	13/01/2018	717769	8563224	-70	143	50.7
18DH02	HQ3	17/01/2018	22/01/2018	717691	8563286	-60	303	51.2
18DH03	HQ3	25/01/2018	02/02/2018	717709	8563463	-69	315	86.7

Summary of units encountered in the drillholes				
Drillhole ID	Uit Depth Intervals (m)			
	Overburden	Talcose Slate	Dolomite	Main Shear Zone Schist
18DH01	0 -4.5	4.5 -20.0	20.0 -50.7 (EOH)	-
18DH02	0 -3.0	-	-	3.0 -51.2 (EOH)
18DH03	0 -14.0	-	17.5 -86.7 (EOH)	-

Figure 8: Approximate lithology and structural features exposed in the Main Pit (after SRK 2020)

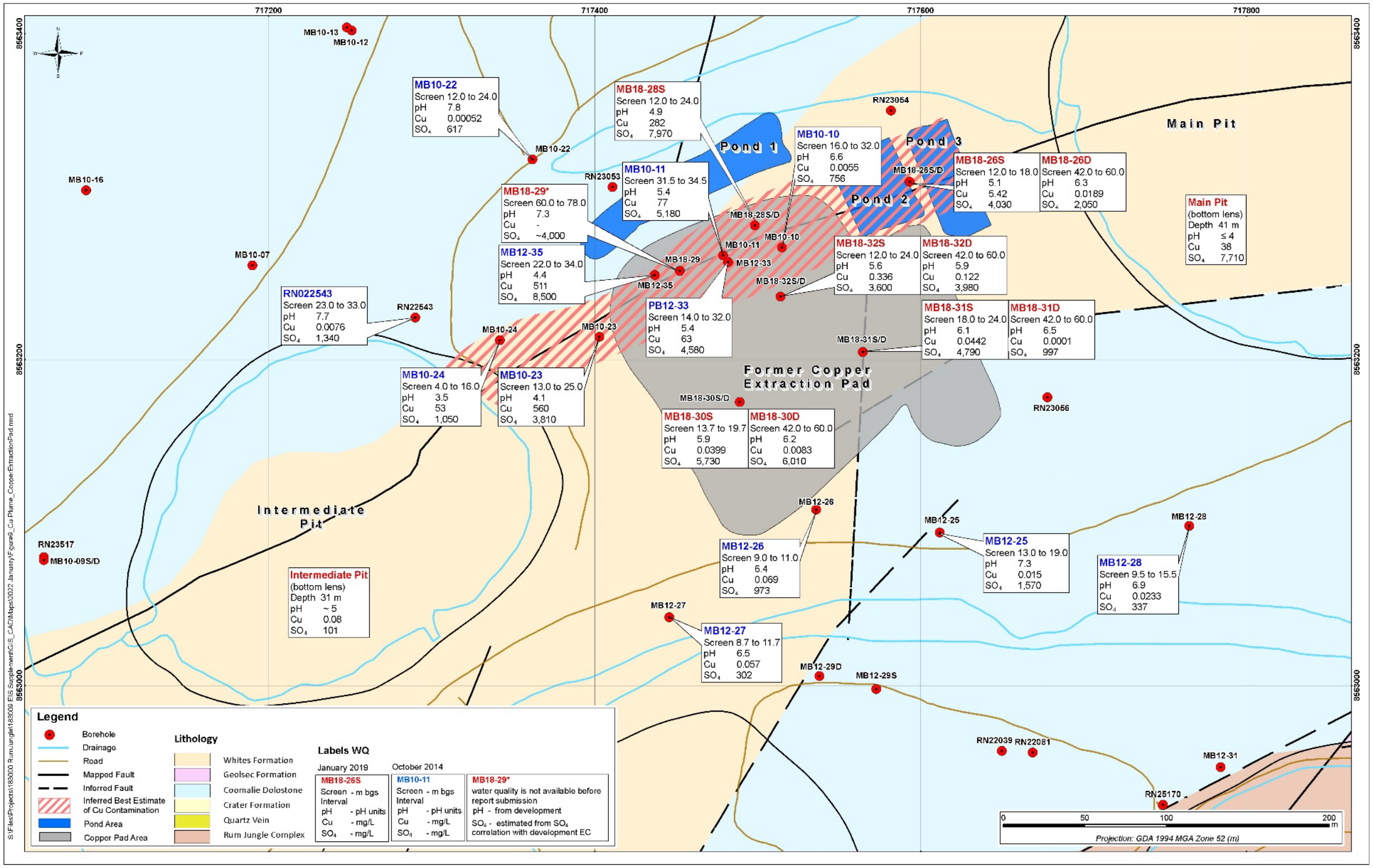


Figure 9: Observed Groundwater Quality in the Central Mining Area

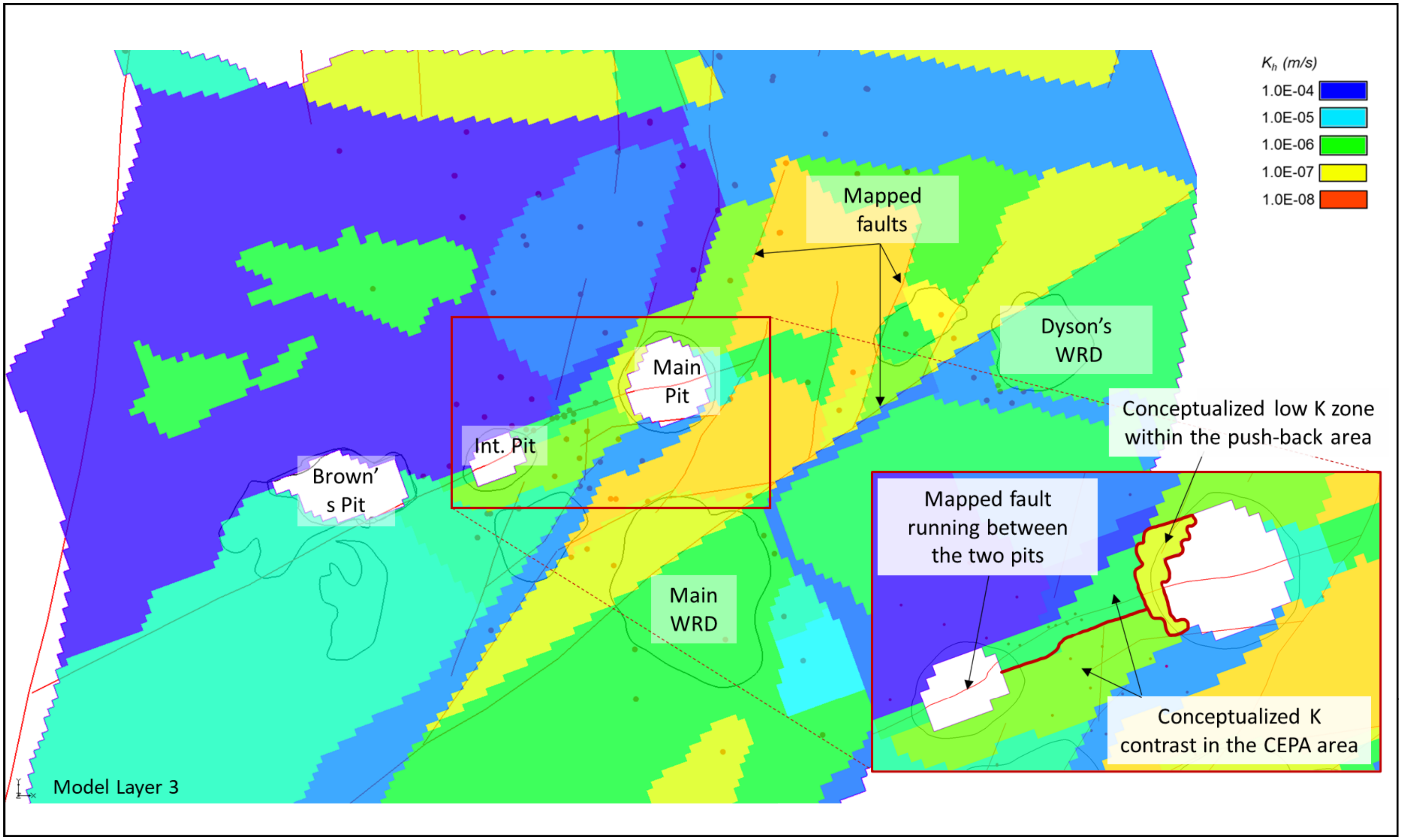


Figure 10: Calibrated Model Zonation for Hydraulic Properties

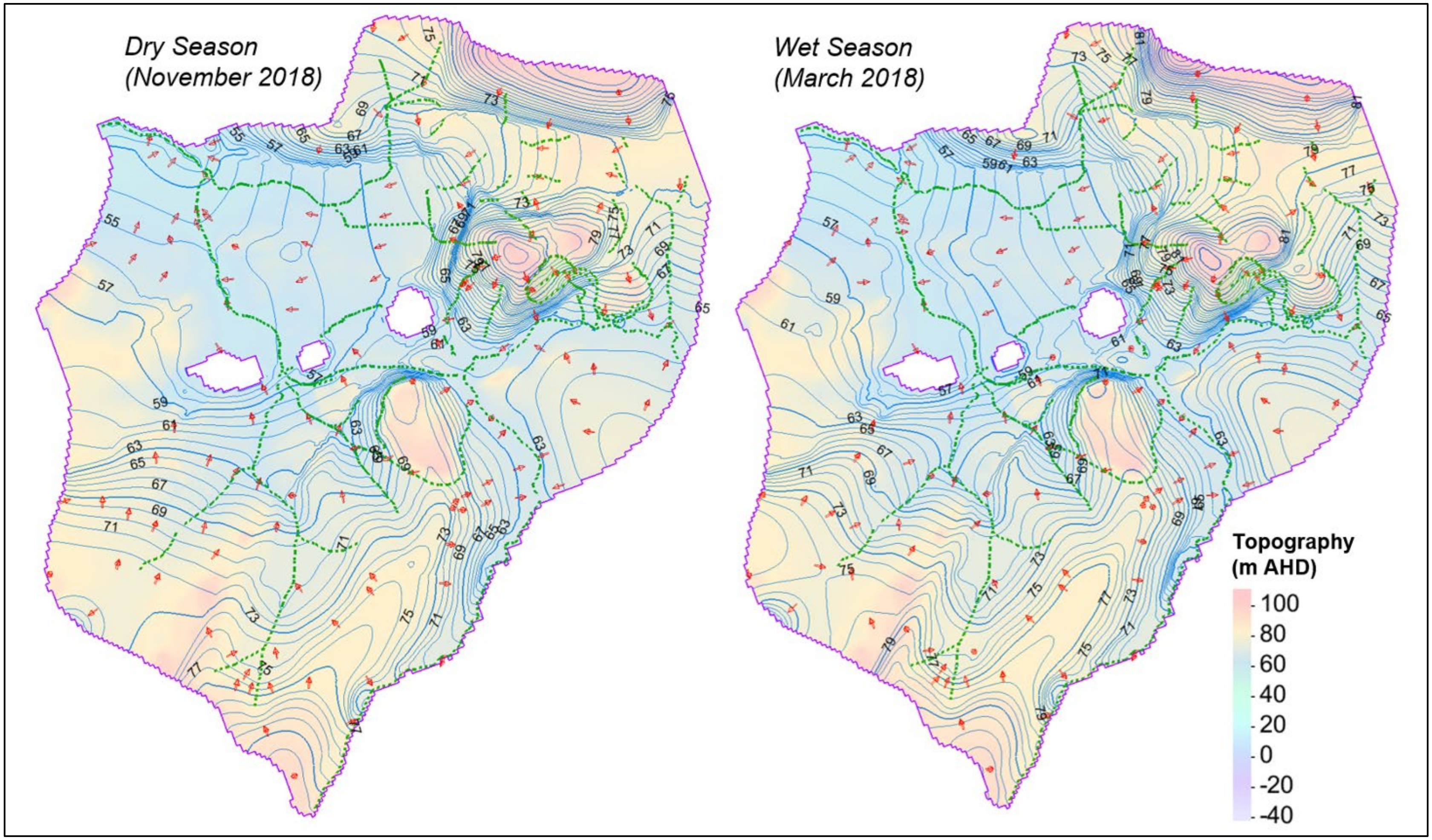


Figure 11: Simulated Groundwater Flow Field, Wet and Dry Seasons 2018

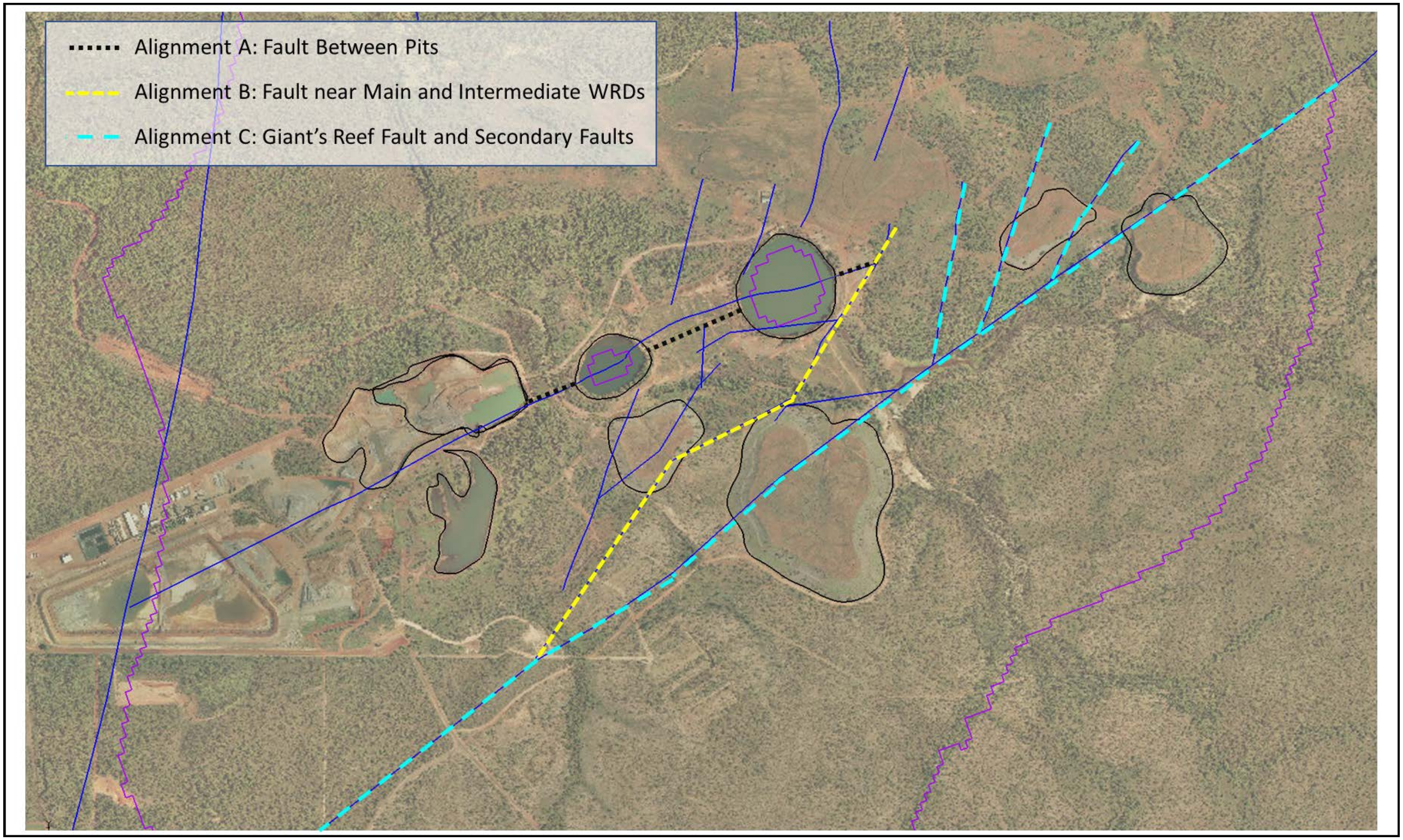
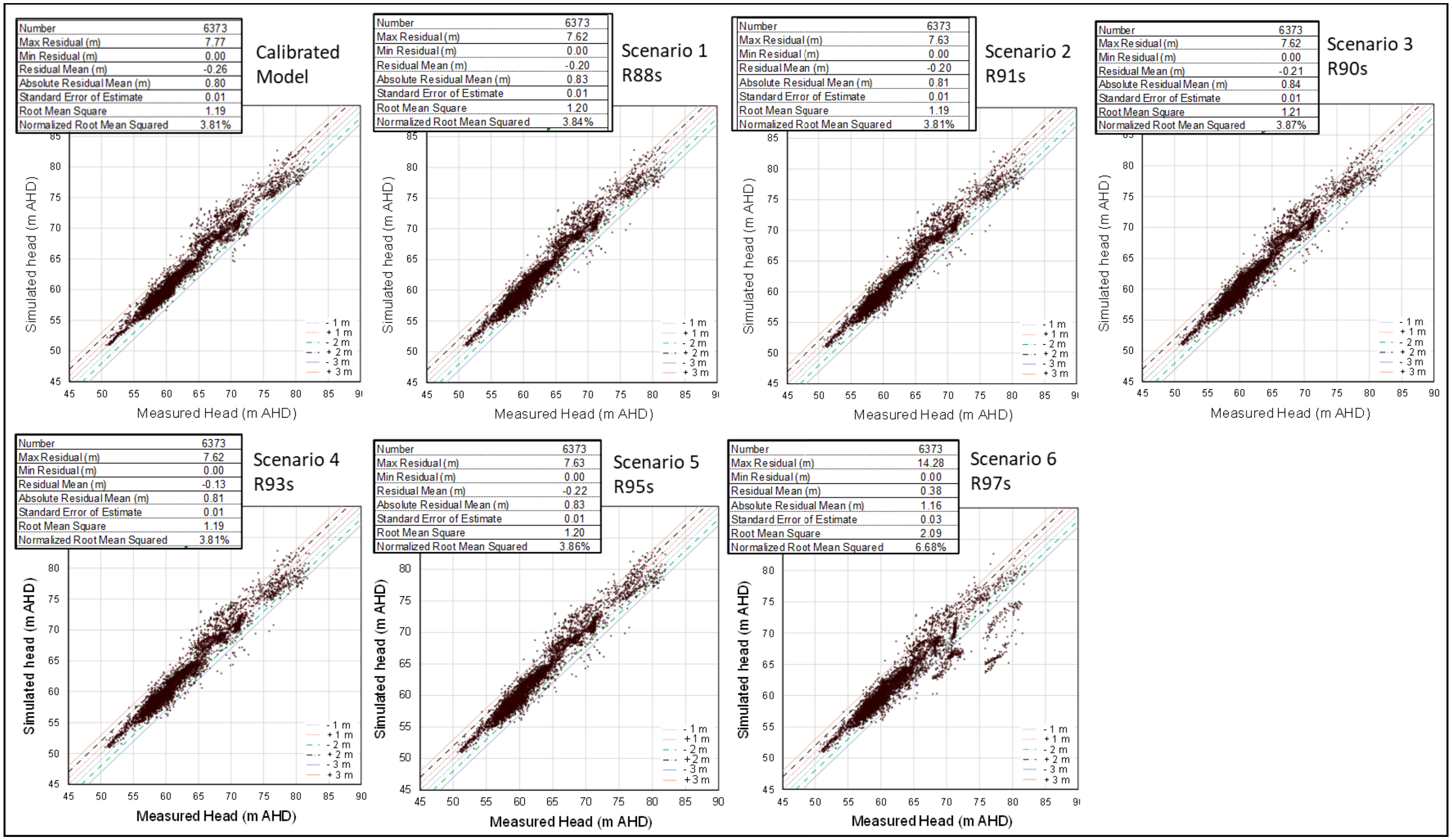


Figure 12: Simulated Fault Alignments for Scenarios 1 to 6



	Calibrated Model	Scenario 1 R88s	Scenario 2 R91s	Scenario 3 R90s	Scenario 4 R93s	Scenario 5 R95s	Scenario 6 R97s
Number	6373	6373	6373	6373	6373	6373	6373
Max Residual (m)	7.77	7.62	7.63	7.62	7.62	7.63	14.28
Min Residual (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residual Mean (m)	-0.26	-0.20	-0.20	-0.21	-0.13	-0.22	0.38
Absolute Residual Mean (m)	0.80	0.83	0.81	0.84	0.81	0.83	1.16
Standard Error of Estimate	0.01	0.01	0.01	0.01	0.01	0.01	0.03
Root Mean Square	1.19	1.20	1.19	1.21	1.19	1.20	2.09
Normalized Root Mean Squared	3.81%	3.84%	3.81%	3.87%	3.81%	3.86%	6.68%

Figure 13: Flow Calibration Statistics for Scenarios 1 to 6 versus the Calibrated Model

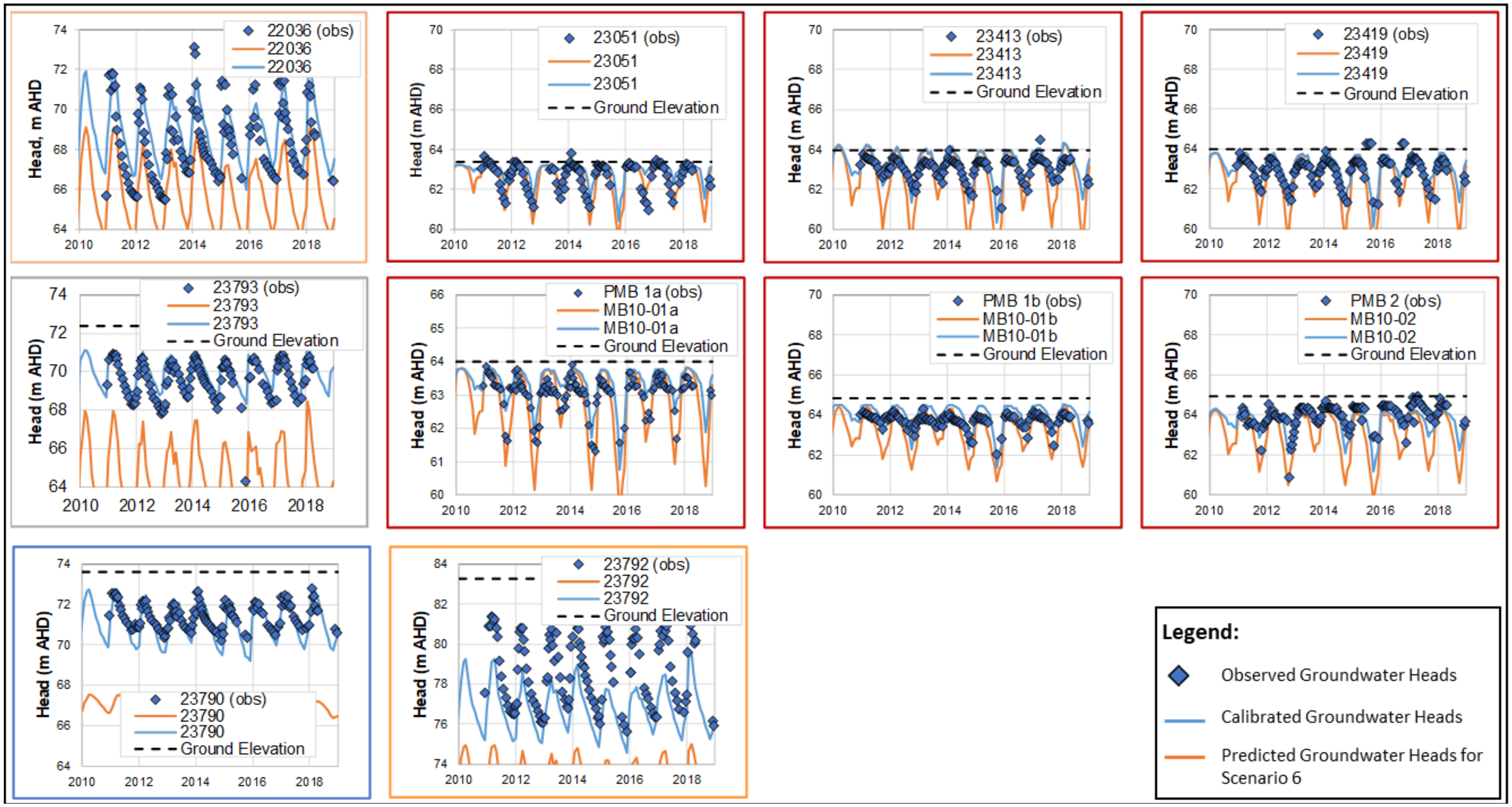


Figure 14: Simulated vs Observed Heads in the Dyson's Area for Scenario 6.

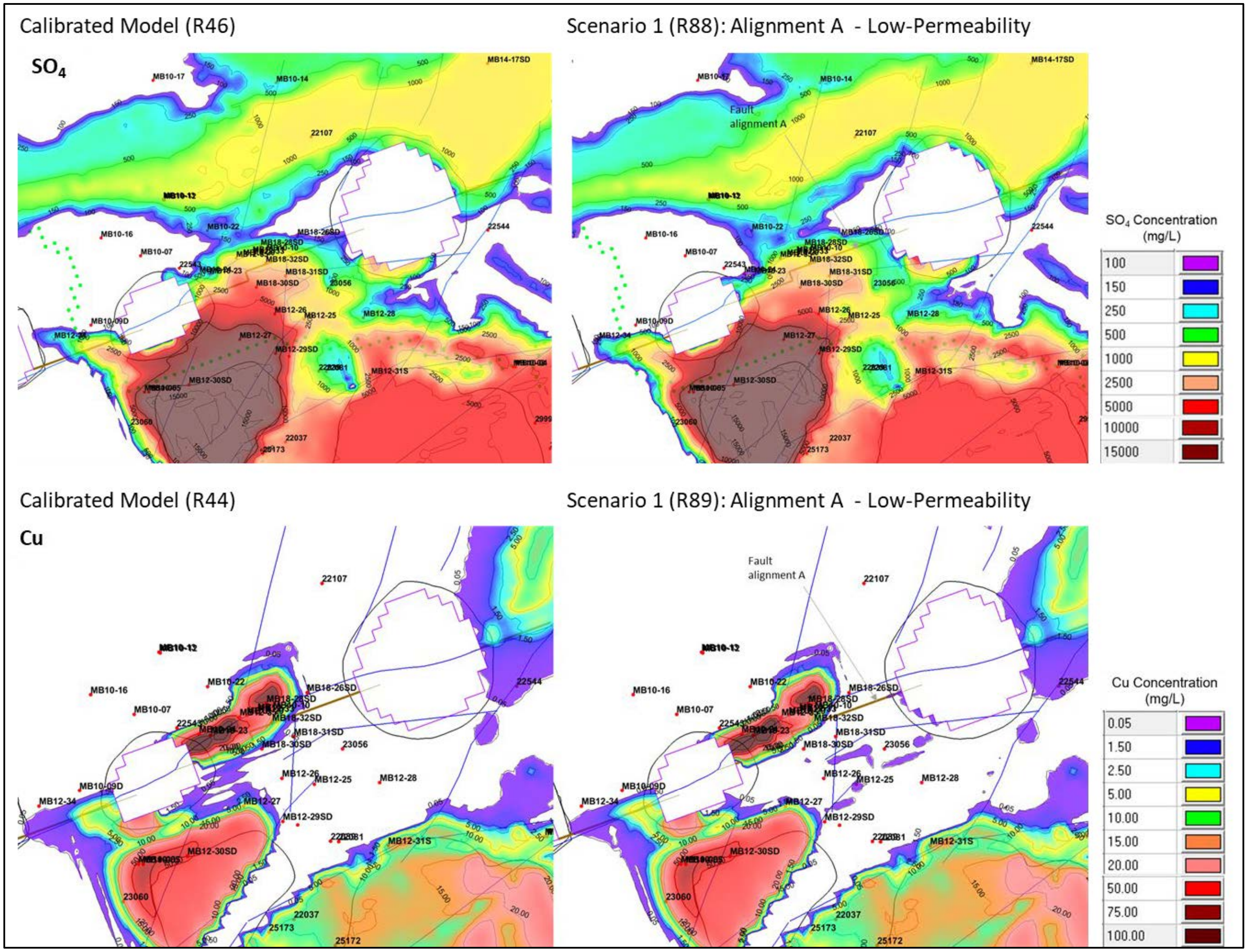


Figure 15: Predicted vs Calibrated Sulphate and Copper Plumes – Scenario 1

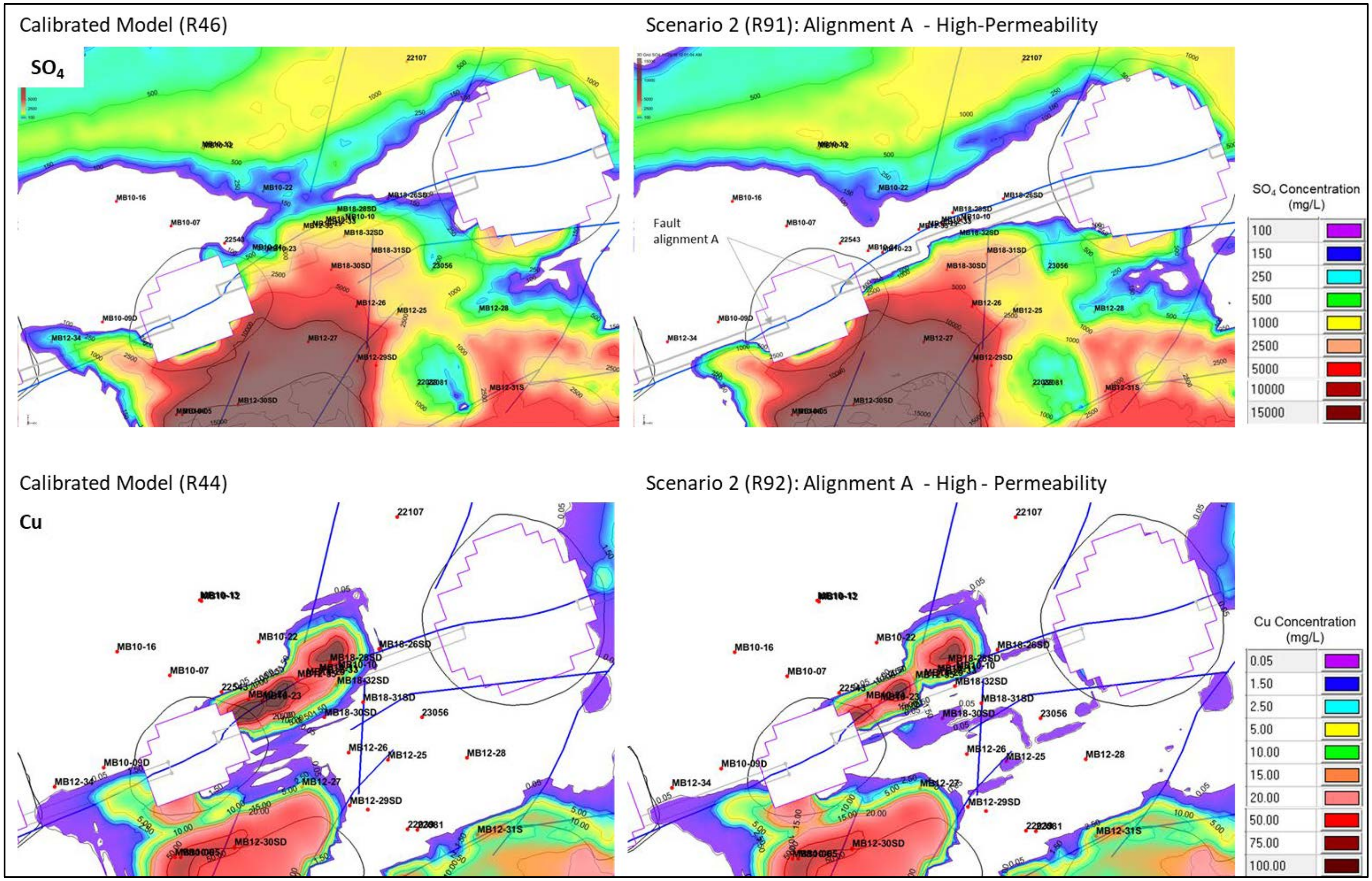


Figure 16: Predicted vs Calibrated Sulphate and Copper Plumes – Scenario 2

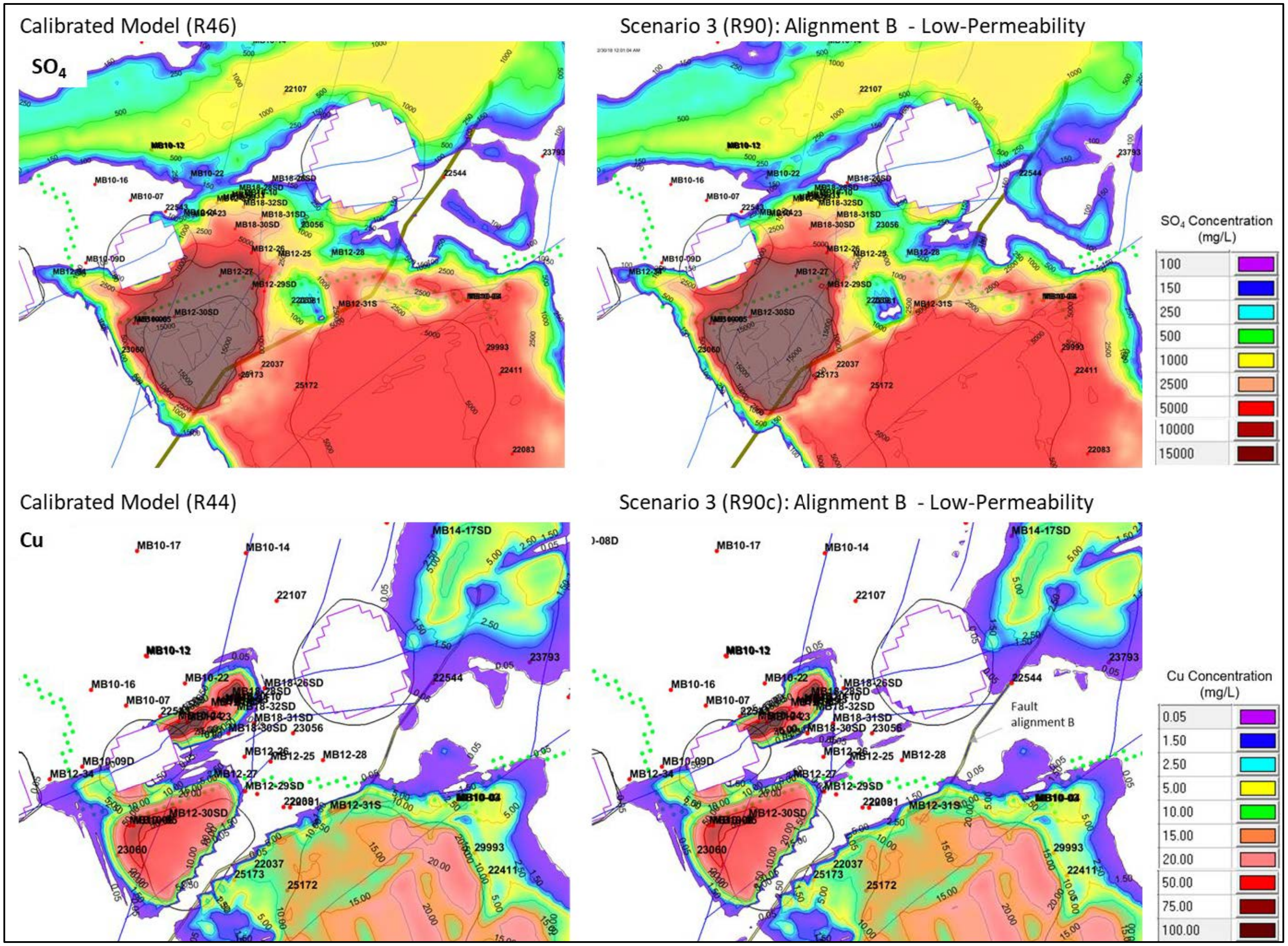


Figure 17: Predicted vs Calibrated Sulphate and Copper Plumes – Scenario 3

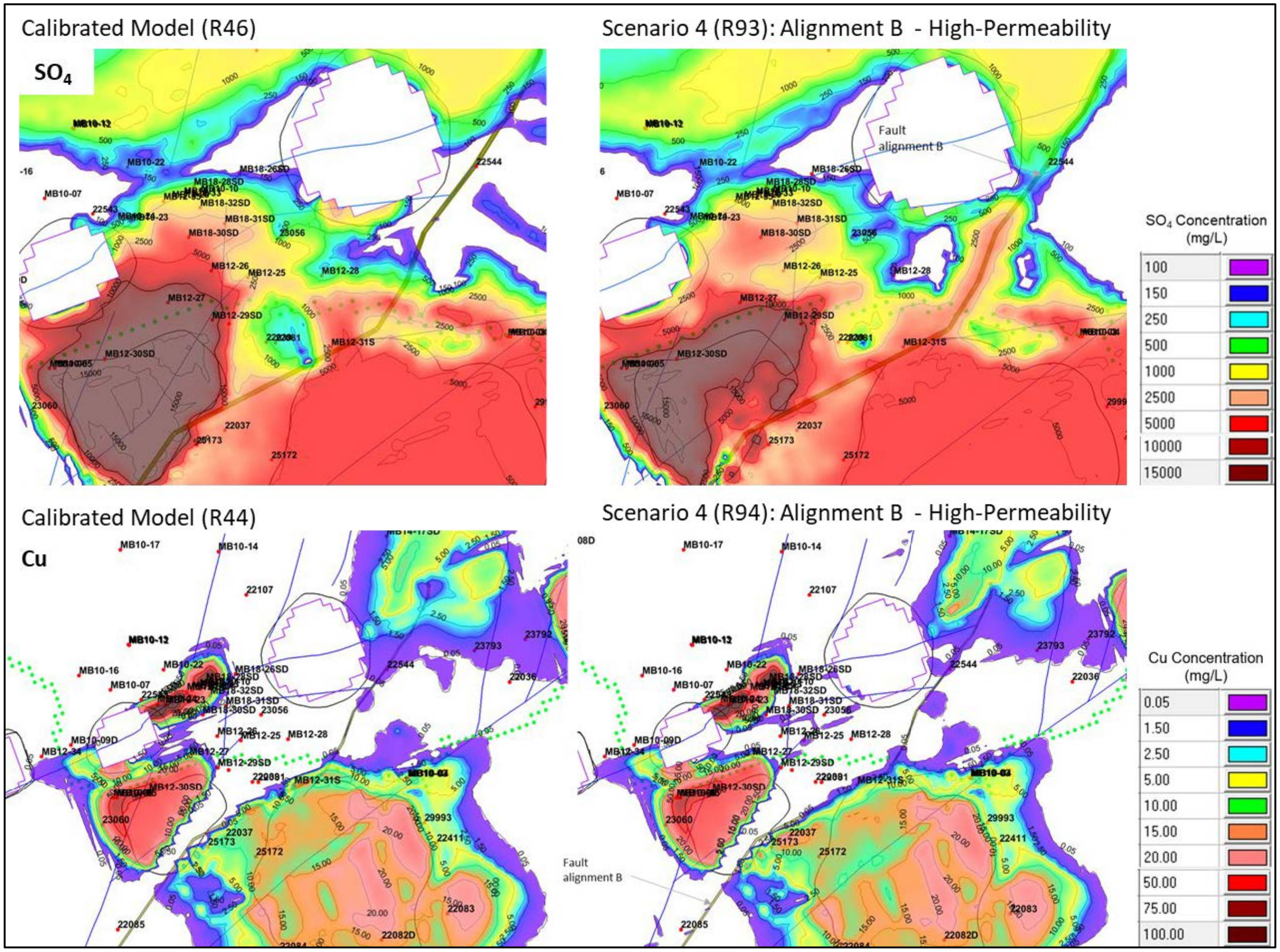


Figure 18: Predicted vs Calibrated Sulphate and Copper Plumes – Scenario 4

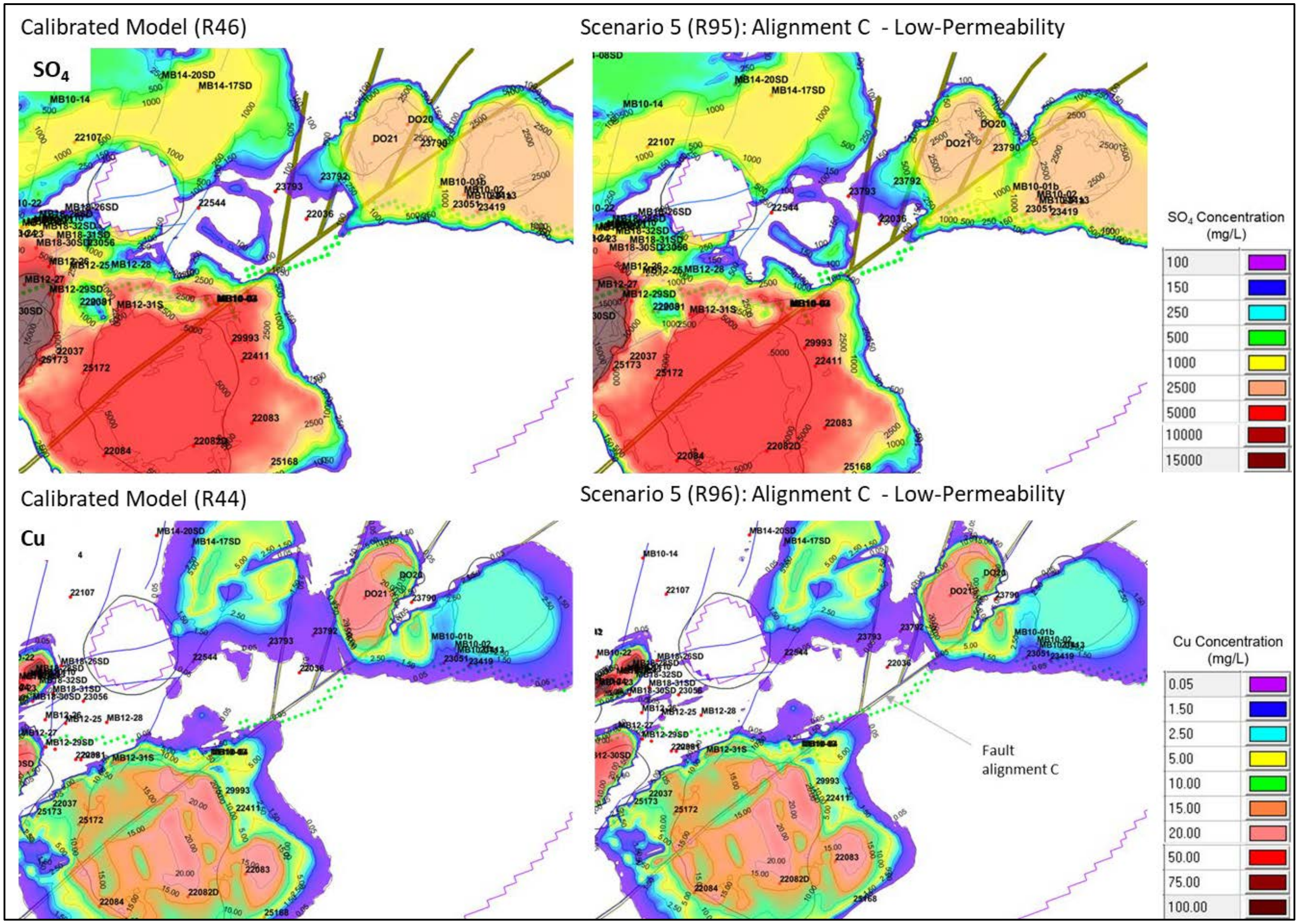


Figure 19: Predicted vs Calibrated Sulphate and Copper Plumes – Scenario 5

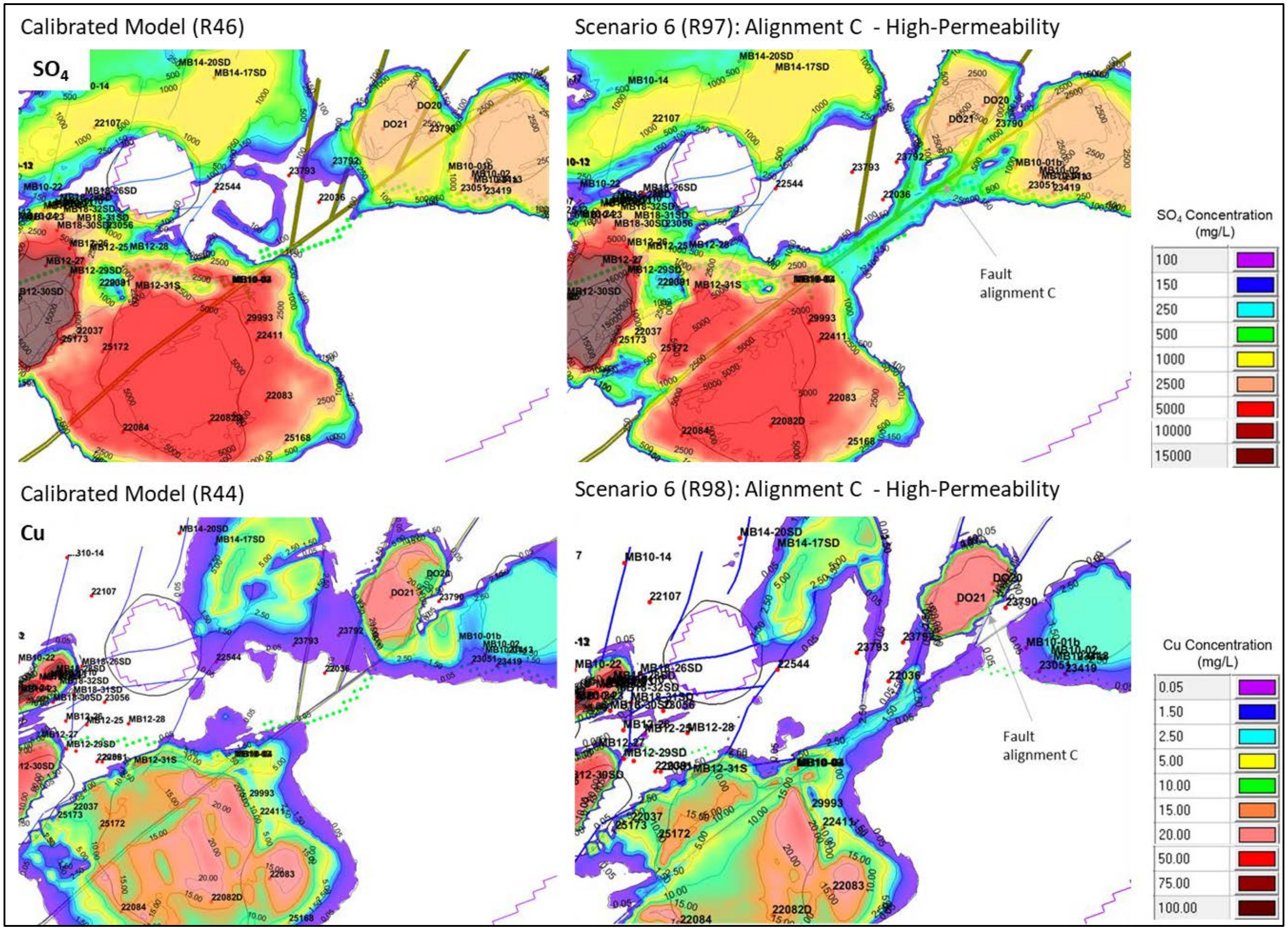


Figure 20: Predicted vs Calibrated Sulphate and Copper Plumes – Scenario 6

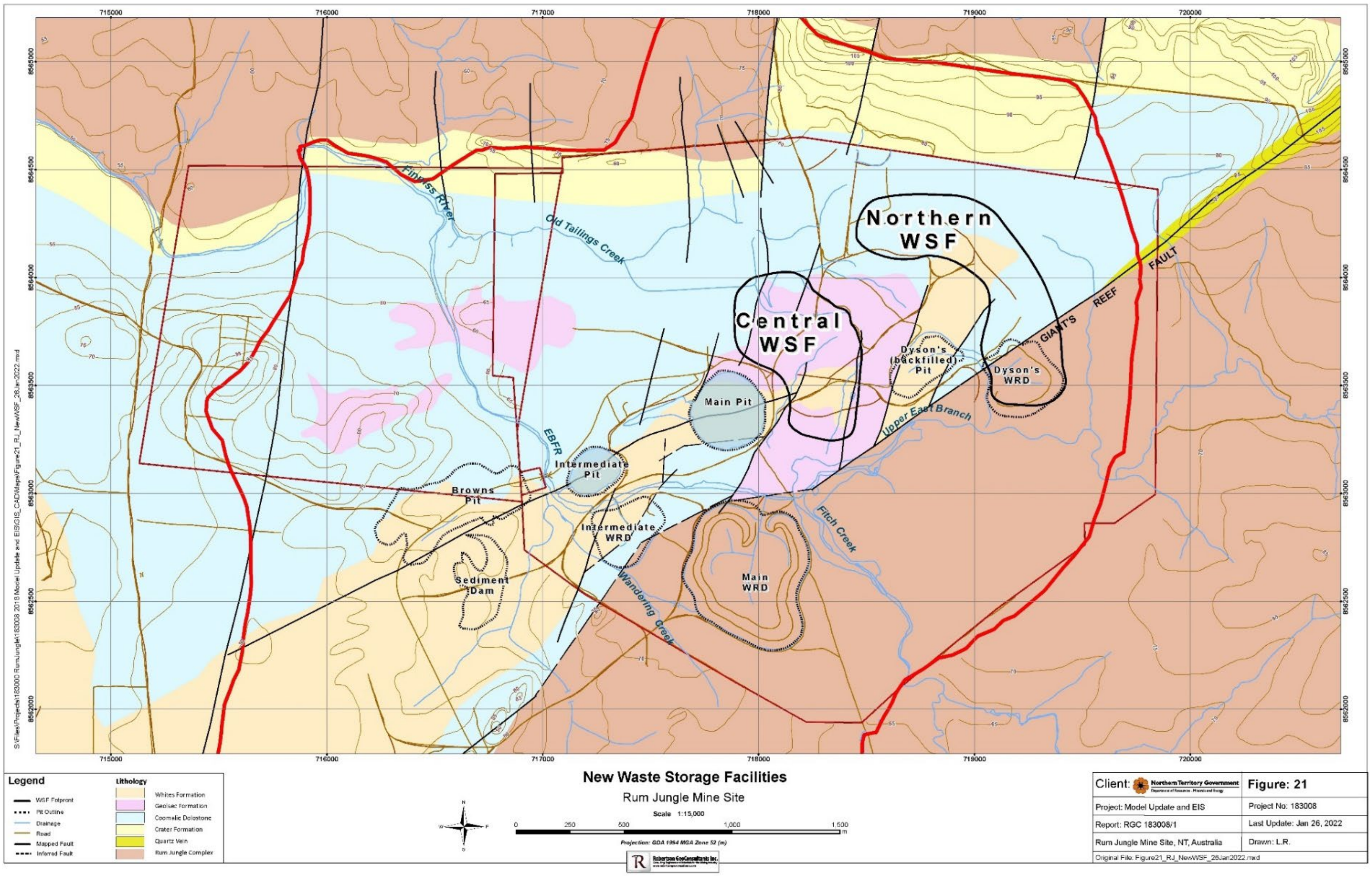


Figure 21: Location of the WSFs and Mapped Faults.

Appendix A

Construction Details for Monitoring Bores

Appendix Table A1

RN Bores in Dyson's Area and Near Main and Intermediate WRDs

Bore ID	Installation Date	Location/description	Borehole Depth	Screened Interval	Stickup[2]	TOC[3]	Screened lithology	Yield
			m bgs[1]	m bgs[1]	m	m AHD		L/s
RN Bores in Dyson's Area								
RN00259	Jul-44	Army bore	0.0	-	-	75.58	-	-
RN022035	May-83	Towards Main Pit	140.6	backfilled	-	68.01	Whites Formation (pyritic)	0.1
RN022036	May-83	Southwest of Dyson's (backfilled) Pit	14.2	7 to 12	0.32	76.06	Geolsec Formation	0.0
RN022544	Jan-84	Near eastern edge of Main Pit	44.5	35.2 to 44.5	0.87	65.78	Whites Formation (pyritic)	9.0
RN023051	Dec-85	Southwest of Dyson's WRD near upper EBFR	3.1	1.7 to 2.4	0.60	64.06	Alluvium	-
RN023052	Dec-85	Southwest of Dyson's WRD near upper EBFR	3.3	1.7 to 2.4	0.67	64.35	Alluviium	-
RN023413	Nov-84	Southwest of Dyson's WRD near upper EBFR	3.2	1.3 to 1.8	1.24	64.72	Laterite	-
RN023414	Nov-84	Southwest of Dyson's WRD near upper EBFR	2.4	1.0 to 1.5	0.86	64.02	Clay	-
RN023415	Nov-84	Southwest of Dyson's WRD near upper EBFR	2.8	1.2 to 1.8	1.33	64.78	Clay	-
RN023416	Nov-84	Southwest of Dyson's WRD near upper EBFR	2.8	1.2 to 1.8	1.11	64.30	Clay	-
RN023417	Nov-84	Southwest of Dyson's WRD near upper EBFR	2.1	0.3 to 0.8	0.69	64.73	Laterite	-
RN023418	Nov-84	Southwest of Dyson's WRD near upper EBFR	2.5	1.0 to 1.3	1.02	64.13	Clay	-
RN023419	Nov-84	Southwest of Dyson's WRD near upper EBFR	3.1	1.2 to 1.7	1.10	64.26	Alluvium	-
RN023420	Nov-84	Southwest of Dyson's WRD near upper EBFR	1.9	1.3 to 1.9	0.00	64.54	Clay	-
RN023790	May-85	Near southwest toe of Dyson's (backfilled) Pit	16.0	10 to 16	0.36	73.95	Geolsec Formation	10.0
RN023791	May-85	Near southern toe of Dyson's (backfilled) Pit	2.8	13 to 19	0.78	80.04	Whites Formation	0.2
RN023792	May-85	West of Dyson's (backfilled) Pit	26.2	20 to 26	0.52	83.80	Geolsec Formation	0.2
RN023793	May-85	West of Dyson's (backfilled) Pit	19.3	13.2 to 19.2	0.49	71.20	Whites Formation	0.2
RN Bores near Main and Intermediate WRDs								
RN022037	May-83	Southeast of the Intermediate WRD	22.8	16 to 22	0.51	67.18	Rum Jungle Complex (wtr)	0.1
RN022039	May-83	Between Main and Intermediate WRDs (near EFDC)	18.0	12 to 18	0.32	67.73	Quartz gravels	5
RN022081	May-83	Between Main and Intermediate WRDs (near EFDC)	43.9	40.7 to 43.9	0.86	68.75	Coomalie Dolostone	7.5
RN022082S	June-83	On top of Main WRD	17.0	11 to 17	0.49	94.24	Rum Jungle Complex (wtr)	0.1
RN022082D	June-83	On top of Main WRD	52.0	37 to 52	0.33	94.38	Rum Jungle Complex	0.1
RN022083	June-83	East of Main WRD near Fitch Creek	17.9	10 to 16	0.35	68.59	Rum Jungle Complex	0.6
RN022084	June-83	Near southwest toe of Main WRD	16.0	10 to 16	0.07	69.15	Rum Jungle Complex (wtr)	<0.1
RN022085	Jun-83	Upgradient of WRDs	32.0	24 to 32	0.92	73.99	Coomalie Dolomite	5
RN022410	Oct-83	East of Main WRD (near drainage channel)	1.9	0.3 to 1.1	0.50	64.45	Rum Jungle Complex (wtr)	0.5
RN022411	Oct-83	East of Main WRD (near drainage channel)	2.3	0.3 to 1.5	0.79	63.90	Alluvium	-
RN022412	Oct-83	East of Main WRD (near drainage channel)	2.7	0.4 to 2.1	0.46	70.43	Rum Jungle Complex (wtr)	0.1
RN022413	Oct-83	East of Main WRD (near drainage channel)	2.8	0.4 to 2.4	0.64	70.14	Sandy clay	0.5
RN022414	Oct-83	East of Main WRD (near drainage channel)	2.9	0.4 to 2.5	0.63	68.90	Rum Jungle Complex (wtr)	0.1
RN022417	Nov-83	Southwest of Main WRD	3.1	0.4 to 2.5	0.89	66.60	Rum Jungle Complex (wtr)	0.1
RN022418	Nov-83	Near southwest toe of Main WRD	2.2	0.4 to 2.0	0.53	64.02	Rum Jungle Complex (wtr)	0.1
RN023057	Oct-83	West of Intermediate WRD	3.4	1.8 to 2.6	0.72	61.77	Whites Formation (wtr)	-
RN023058	Oct-83	West of Intermediate WRD	4.3	2.6 to 3.7	0.65	62.29	Whites Formation (wtr)	-
RN023059	Dec-85	West of Intermediate WRD	5.7	4.2 to 5.2	0.76	60.87	Whites Formation (wtr)	-
RN023060	Dec-85	West of Intermediate WRD	5.1	4.2 to 5.1		60.87	Whites Formation (wtr)	-
RN023061	Dec-85	Near western toe of Main WRD	3.2	1.8 to 2.5	0.74	68.69	Rum Jungle Complex (wtr)	0.1
RN023062	Dec-85	Southwest of Main WRD (near Wandering Creek)	2.8	1.5 to 2.2	0.71	66.28	Rum Jungle Complex (wtr)	0.1
RN023063	Dec-85	Southwest of Main WRD (near Wandering Creek)	2.1	0.9 to 1.3	0.79	65.18	Rum Jungle Complex (wtr)	0.1
RN023064	Dec-85	Southwest of Main WRD (near Wandering Creek)	2.6	1.2 to 1.8	0.82	64.22	Alluvium	-
RN023510	Nov-84	East of Main WRD (near drainage channel)	3.1	1.5 to 2.1	1.05	64.27	Laterite	-
RN023511	Nov-84	East of Main WRD (near drainage channel)	2.6	1.1 to 1.6	1.12	64.20	Laterite	-
RN023512	Nov-84	East of Main WRD (near drainage channel)	2.5	1.1 to 1.5	1.01	64.81	Laterite	-
RN023513	Nov-84	East of Main WRD (near drainage channel)	3.2	1.5 to 2.2	0.97	65.63	Laterite	-
RN023514	Nov-84	Southwest of Main WRD	2.8	1.4 to 1.9	0.98	70.07	Laterite	-
RN025160	Jun-87	On top of Main WRD	16.9	13.9 to 16.9	0.09	87.02	Waste rock	0
RN025161	Jun-87	On top of Main WRD	18.7	15.7 to 18.7	0.03	88.95	Waste rock	-
RN025162	Jun-87	On top of Main WRD	20.8	17.8 to 20.8	0.12	84.63	Waste rock	0
RN025163	Jun-87	Southeast of Main WRD	6.0	backfilled	0.31	73.91	Rum Jungle Complex (wtr)	-
RN025165	Jun-87	Southwest of Main WRD	8.2	5.2 to 8.2	0.56	69.92	Rum Jungle Complex (wtr)	-
RN025166	Jun-87	Southwest of Main WRD	6.2	3.2 to 6.2	0.41	77.19	Rum Jungle Complex (wtr)	-
RN025167	Jun-87	Southeast of Main WRD	6.2	3.2 to 6.2	0.36	70.43	Rum Jungle Complex (wtr)	0.1
RN025168	Jun-87	Southeast of Main WRD	9.5	6.5 to 9.5	0.37	69.89	Rum Jungle Complex (wtr)	0.1
RN025169	Jun-87	North of Main WRD (near EFDC)	5.8	2.8 to 5.8	0.46	74.57	Laterite	-
RN025170	Jun-87	Northwest of Main WRD (near EFDC)	8.9	5.9 to 8.9	0.43	73.31	Rum Jungle Complex (wtr)	0.1
RN025171	Jun-87	Northwest of Main WRD (near EFDC)	6.2	2.8 to 5.8	0.52	65.97	Laterite	-
RN025172	Jun-87	Near western toe of White's Overburden Heap	4.7	1.7 to 4.7	0.35	70.28	Rum Jungle Complex (wtr)	-
RN025173	Jun-87	Near southeastern toe of the Intermediate WRD	7.8	5.1 to 8.1	0.37	64.72	Rum Jungle Complex (wtr)	-
RN029990	May-95	Northeast of Main WRD (near drainage channel)	5.8	1.5 to 5.2	0.30	63.57	Rum Jungle Complex	0.1
RN029991	May-95	Northeast of Main WRD (near drainage channel)	2.8	1.0 to 2.6	0.32	63.81	Rum Jungle Complex	0.1
RN029992	May-95	Northeast of Main WRD (near drainage channel)	5.6	1.5 to 5.2	0.31	63.32	Rum Jungle Complex (wtr)	0.4
RN029993	May-95	Northeast of Main WRD (near drainage channel)	7.5	1.0 to 7.2	0.72	63.88	Clay	-
RN029994	May-95	Northeast of Main WRD (near drainage channel)	2.2	1.0 to 2.5	0.50	64.21	Rum Jungle Complex (wtr)	-
RN029995	May-95	Northeast of Main WRD (near drainage channel)	3.5	1.0 to 3.0	0.56	64.39	Rum Jungle Complex	-
RN029997	May-95	Southwest of Main WRD	3.3	1.0 to 3.3	0.36	70.27	Quartz gravels	-
RN029998	May-95	Southwest of Main WRD	5.6	1.0 to 5.6	0.50	70.41	Quartz gravels	-
RN029999	May-95	Southwest of Main WRD	8.5	1.0 to 7.8	0.63	69.87	Quartz gravels	-
RN030000	May-95	Southwest of Main WRD	0.3	1.0 to 7.4	0.62	69.91	Quartz gravels	-
RN030001	May-95	Southwest of Main WRD	6.8	1.0 to 6.6	0.37	68.53	Quartz gravels	-
RN030002	May-95	Southwest of Main WRD	8.9	1.0 to 8.4	0.57	68.91	Quartz gravels	-
RN030003	May-95	Southwest of Main WRD	4.4	0.9 to 3.7	0.59	68.43	Sandstone	-
RN030004	May-95	Near western toe of Main WRD	3.4	1.5 to 2.9	0.52	70.80	Sandstone	-

1. bgs = below ground surface

3. TOC = Top of casing

Note: wtr = weathered

Appendix Table A2

RN Bores Near Pits and MB10 Bores

Bore ID	Installation Date	Location/description	Borehole Depth	Screened Interval	Stickup[2]	TOC[3]	Screened lithology	Yield
			m bgs[1]	m bgs[1]	m	m AHD		L/s
RN Bores near the Main Pit and Intermediate Pit								
RN022108	May-83	'Open hole' bore near road bridge (now PMB9S/D)	30.0	'open hole'	0.50	59.84	Coomalie Dolostone	30
RN022543	Jan-84	Near Intermediate Open Cut	33.0	23 to 33	1.08	61.25	Coomalie Dolostone	6.00
RN022546	Jan-84	Near White's Open Cut	5.4	backfilled	0.00	64.81	-	-
RN023053	Dec-85	In former copper heap leach area	3.9	2.1 to 3	0.90	61.95	Whites Formation (wtr)	-
RN023054	Dec-85	In former copper heap leach area	3.2	1.2 to 2.6	0.58	61.62	Whites Formation (wtr)	-
RN023055	Dec-85	In former copper heap leach area	4.3	2.5 to 3.6	0.70	62.78	Whites Formation (wtr)	-
RN023056	Dec-85	In former copper heap leach area	5.4	3.9 to 4.7	0.70	64.86	Whites Formation (wtr)	-
RN023516	Nov-84	Near EFDC (west of Intermediate Open Cut)	4.9	3.1 tp 3.9	0.92	60.40	Alluvium	-
RN023517	Nov-84	Near EFDC (west of Intermediate Open Cut)	3.1	1.7 to 2.4	0.80	60.25	Alluvium	-
RN023518	Nov-84	Near EFDC (west of Intermediate Open Cut)	3.0	1.3 to 1.9	0.99	59.34	Alluvium	-
RN023519	Nov-84	Near EFDC (west of Intermediate Open Cut)	4.7	3.0 to 3.8	0.95	59.35	Alluvium	-
RN022085	Jun-83	Upgradient of mine site	32.0	24 to 32	0.92	73.99	Coomalie Dolostone	5
RN Bores in Old Tailings Dam Area								
RN023304	Oct-84	Near northern boundary of mine site	26.4	20.9 to 26.4	0.58	75.97	Coomalie Dolostone	4.0
RN022547	Jan-84	Near northern boundary of mine site	23.0	17 to 23	0.68	75.32	Whites Formation (pyritic)	1.5
RN022548	Jan-84	Near northern boundary of mine site	30.5	27.9 to 30.5	0.06	74.82	Coomalie Dolostone	13.5
RN022107	Jun-83	NW of White's Open Cut	14.8	12.8 to 14.8	0.57	62.88	Coomalie Dolostone	25.0
RN023140	Oct-84	North of Old Tailings Creek	18.0	11 to 16	0.60	62.32	Coomalie Dolostone	4.2
RN023139	Sep-84	West of East Finniss River (d/s of mine site)	30.0		0.68	57.37	Geolsec Formation	0.1
RN023302	Oct-84	North of Old Tailings Creek	12.5	9.5 to 12.5	0.35	57.27	Coomalie Dolostone	1.3
MB10 Bores								
MB10-01a	Nov-10	In drainage channel from Dyson's (backfilled) Open Cu	3.4	1.4 to 3.4	0.74	69.88	Saprolite	n.d.
MB10-01b	Nov-10	Adjacent to braided channel south of Dyson's (backfil	3.7	2.2 to 3.7	1.22	70.73	Alluvium	n.d.
MB10-02	Nov-10	Bedrock beneath Dyson's area	18.7	12.7 to 18.7	0.68	70.73	Rum Jungle Complex	0.1
MB10-03	Nov-10	Saprolite (and some alluvium) near the head of EFDC	3.5	1.97 to 3.47	0.66	68.56	Saprolite/alluvium	n.d.
MB10-04	Nov-10	Bedrock beneath the EFDC (near White's Overburden	15.3	9.34 to 15.34	0.73	68.76	Rum Jungle Complex	0.1
MB10-05	Nov-10	Near Intermediate Overburden Heap	5.0	2.0 to 5.0	0.77	65.44	Overburden	n.d.
MB10-06	Nov-10	Bedrock near Intermediate Overburden Heap (next to	25.5	13.5 to 25.5	0.73	66.29	Whites Formation	2
MB10-07	Dec-10	Downgradient of Intermediate Open Cut near East Fin	18.0	9 to 18	0.55	65.70	Coomalie Dolostone	1.5
MB10-08S	Nov-10	West of the East Finniss River	14.6	5.56 to 14.56	0.62	65.78	Laterite	n.d.
MB10-08D	Nov-10	West of the East Finniss River	23.0	20 to 23	0.71	65.95	Geolsec Formation	0.1
MB10-09S	Dec-10	Near East Finniss River (formerly RN022108)	29.2	23.4 to 29.4	1.00	65.44	Coomalie Dolostone	n.d.
MB10-09D	Dec-10	Near East Finniss River (formerly RN022108)	61.3	46.26 to 62.26	0.92	65.51	Coomalie Dolostone	n.d.
MB10-10	Dec-10	In former copper heap leach area	32.0	16 to 32	0.55	67.66	Whites Formation	n.d.
MB10-11	Dec-10	In former copper heap leach area	34.5	31.5 to 34.5	0.55	67.61	Alluvium	8
MB10-12	Dec-10	North of former heap leach area	24.6	12.62 to 24.62	0.44	66.73	Coomalie Dolostone	2
MB10-13	Dec-10	North of former heap leach area	60.8	48.77 to 60.77	0.58	66.85	Coomalie Dolostone	2
MB10-14	Dec-10	North of White's Open Cut	16.2	14.23 to 16.23	0.70	69.96	Coomalie Dolostone	50
MB10-15	Dec-10	North of White's Open Cut	24.4	12.41 to 24.41	0.43	68.48	Coomalie Dolostone	1
MB10-16	Dec-10	North of former heap leach area	22.6	13.5 to 22.5	0.26	66.22	Coomalie Dolostone	1
MB10-17	Dec-10	North of former heap leach area	26.0	20 to 26	0.60	68.59	Coomalie Dolostone	10
MB10-18	Nov-10	Near Old Tailings Creek	8.0	1.97 to 7.97	0.48	66.40	Saprolite/alluvium	n.d.
MB10-19	Nov-10	Near Old Tailings Creek	24.5	12.53 to 24.53	0.57	66.35	Coomalie Dolomite	1
MB10-20	Nov-10	Downstream of site	6.9	2.87 to 6.87	1.27	60.48	Alluvium	n.d.
MB10-21	Nov-10	Downstream of site	32.1	12.14 to 32.14	0.67	60.47	Rum Jungle Complex	0.1
MB10-22	Dec-10	Near former heap leach area	24.6	12.58 to 24.58	0.70	67.01	Coomalie Dolostone	n.d.
MB10-23	Dec-10	Near former heap leach area	25.0	13 to 25	0.50	67.25	Coomalie Dolostone	n.d.
MB10-24	Dec-10	Near former heap leach area	16.0	4 to 16	0.61	65.98	Coomalie Dolostone	n.d.

1. bgs = below ground surface

3. TOC = Top of casing

Note: wtr = weathered

Appendix Table A3

MB12 and MB14 Bores

Bore ID	Installation Date	Location/description	Borehole Depth	Screened Interval	Stickup[2]	TOC[3]	Screened lithology	Yield
			m bgs[1]	m bgs[1]	m	m AHD		L/s
MB12 Bores								
MB12-25	Oct-12	Near EFDC	18.9	12.88		63.80	Whites Formation	0.4
MB12-26	Oct-12	Near EFDC	11.0	9.01		65.42	Whites Formation	0.2
MB12-27	Oct-12	Near EFDC	11.7	8.71		66.55	Coomalie Dolostone	n.d.
MB12-28	Oct-12	Near EFDC	15.4	9.38		64.42	Coomalie Dolostone	1.5
MB12-29D	Oct-12	Near EFDC	18.1	14.85	0.23	65.62	Geolsec Formation	n.d.
MB12-29S	Oct-12	Near EFDC	10.0	6.75	0.25	65.71	Red Laterite	n.d.
MB12-30D	Oct-12	Intermediate WRD	18.6	12.32	0.30	64.61	Whites Formation	0.5
MB12-30S	Oct-12	Intermediate WRD	7.9	1.47	0.42	64.40	Waste Rock	n.d.
MB12-31S	Oct-12	Main WRD	8.0	1.70	0.30	73.81	Red Laterite	n.d.
MB12-31D	Oct-12	Main WRD	22.5				Rum Jungle Complex	n.d.
MB12-32	Oct-12	Central Mining Area					Rum Jungle Complex	2.5
PB12-33	Oct-12	Central Mining Area	33.1	14.10		62.56	Whites Formation	3.5
MB12-34	Oct-12	Between Brown's Oxide Pit and Intermediate Pit	60.7	48.70		59.19	Coomalie Dolostone	0.5
MB12-35	Oct-12	Central Mining Area	34.1	22.10		62.32	Coomalie Dolostone	n.d.
MB14 Bores								
MB14-01S	Oct-14	Old Tailings Dam Area	6.5	2.0	0.74	63.02	Saprolite	n.d.
MB14-01D	Oct-14	Old Tailings Dam Area	31.8	25.8	0.72	63.00	Coomalie Dolostone	4
MB14-02S	Oct-14	Old Tailings Dam Area	8.0	2.0	0.74	64.96	Rum Jungle Complex	n.d.
MB14-02D	Oct-14	Old Tailings Dam Area	29.1	23.1	0.72	64.95	Coomalie Dolostone	2
MB14-03	Oct-14	Old Tailings Dam Area	22.8	17.8	0.72	64.03	Saprolite	1.5
MB14-04	Oct-14	Old Tailings Dam Area	8.3	2.3	0.75	64.11	Saprolite	n.d.
MB14-05S	Oct-14	Old Tailings Dam Area	8.0	2.0	0.85	69.25	Saprolite	n.d.
MB14-05D	Oct-14	Old Tailings Dam Area	27.6	21.6	0.83	69.22	Coomalie Dolostone	1
MB14-06S	Oct-14	Upgradient of Old Tailings Dam area	8.0	2.0	0.60	73.31	Siltstone	n.d.
MB14-06D	Oct-14	Upgradient of Old Tailings Dam area	24.0	18.0	0.58	73.25	Coomalie Dolostone	0.8
MB14-07	Oct-14	Old Tailings Dam Area	11.0	8.0	0.65	63.11	Coomalie Dolostone	3
MB14-08S	Oct-14	Old Tailings Dam Area	5.0	2.0	0.85	63.73	Lat/Sap/Coomalie Dolostone	n.d.
MB14-08D	Oct-14	Old Tailings Dam Area	23.5	17.5	0.83	63.68	Coomalie Dolostone	0.2
MB14-09	Oct-14	Old Tailings Dam Area	16.0	10.0	0.82	62.52	Coomalie Dolostone	1.5
MB14-10	Oct-14	Old Tailings Dam Area	5.2	2.2	0.75	62.49	Saprolite	n.d.
MB14-13S	Oct-14	Old Tailings Dam Area	8.0	2.0	0.84	68.20	Lat/Sap/Coomalie Dolostone	n.d.
MB14-13D	Oct-14	Old Tailings Dam Area	18.0	13.0	0.81	68.19	Coomalie Dolostone	2
MB14-14S	Oct-14	Upgradient of Old Tailings Dam area	8.0	2.0	0.88	78.31	Lat/Sap/Whites Formation	n.d.
MB14-14D	Oct-14	Upgradient of Old Tailings Dam area	29.5	23.5	0.84	78.23	Whites Formation	0.5
MB14-15S	Oct-14	Upgradient of Old Tailings Dam area	14.0	11.0	0.77	84.78	Geolsec Formation	n.d.
MB14-15D	Oct-14	Upgradient of Old Tailings Dam area	42.0	21.0	0.74	84.74	Geolsec Formation	0.5
MB14-16	Oct-14	Upgradient of Old Tailings Dam area	7.0	2.0	0.75	84.74	Laterite Fill	n.d.
MB14-17S	Oct-14	In former ore stockpile area	7.1	2.1	0.82	78.30	Fill/Lat/Geolsec Formation	n.d.
MB14-17D	Oct-14	In former ore stockpile area	29.0	21.0	0.77	78.25	Geolsec Formation	n.d.
MB14-18	Oct-14	Near Old Tailings Creek	17.0	11.0	0.58	59.98	Coomalie Dolostone	1.2
MB14-19	Oct-14	Near Old Tailings Creek	6.2	2.0	0.73	60.17	Saprolite	n.d.
MB14-20S	Oct-14	In former ore stockpile area	8.0	2.0	0.90	67.50	Saprolite	n.d.
MB14-20D	Oct-14	In former ore stockpile area	27.0	21.0	0.87	67.46	Coomalie Dolostone	0.2

1. bgs = below ground surface

3. TOC = Top of casing

Note: wtr = weathered

Appendix Table A4

RN Bores in the Old Tailings Dam Area and MB14 Bores

Bore ID	Installation Date	Location/description	Borehole Depth	Screened Interval	Stickup[2]	TOC[3]	Screened lithology	Yield
			m bgs[1]	m bgs[1]	m	m AHD		L/s
MB17 Bores								
MB17-21S	Dec-17	Near northern site boundary	8.0	2.0 to 8.0	0.78	66.06	Coomalie Dolostone (wtr)	n.d.
MB17-21D	Dec-17	Near northern site boundary	24.0	18.0 to 24.0	0.83	65.98	Coomalie Dolostone	n.d.
MB17-22S	Dec-17	Upgradient of Old Tailings Dam area	8.0	2.0 to 8.0	0.86	70.25	Laterite	n.d.
MB17-22D	Dec-17	Upgradient of Old Tailings Dam area	24.0	18.0 to 24.0	0.94	70.32	Geolsec Formation	n.d.
MB17-23S	Dec-17	Near northern site boundary	8.0	2.0 to 8.0	0.87	77.30	Coomalie Dolostone (wtr)	n.d.
MB17-23D	Dec-17	Near northern site boundary	24.0	17.8 to 23.8	0.99	77.42	Coomalie Dolostone	n.d.
MB17-24S	Dec-17	Near northern site boundary	8.0	2.0 to 8.0	0.93	78.59	Laterite	n.d.
MB17-24D	Dec-17	Near northern site boundary	42.0	18.0 to 24.0	0.88	78.50	Coomalie Dolostone (wtr)	n.d.
MB17-25S	Dec-17	Upgradient of Old Tailings Dam area	8.0	2.0 to 8.0	0.85	80.54	Laterite	n.d.
MB17-25D	Dec-17	Upgradient of Old Tailings Dam area	42.0	18.0 to 24.0	0.91	80.62	Whites Formation (wtr)	n.d.
MB18 Bores								
MB18-26S	Dec-18	Beneath former storage ponds	60.0	12.0 to 18.0	0.71	62.29	Whites Formation (wtr)	n.d.
MB18-26D	Dec-18	Beneath former storage ponds	60.0	42.0 to 60.0	0.69	62.27	Whites Formation	n.d.
MB18-28S	Dec-18	Near fault zone (beneath former collection ditch)	60.0	12.0 to 24.0	0.93	62.61	Whites Formation (wtr)	n.d.
MB18-28D	Dec-18	Near fault zone (beneath former collection ditch)	60.0	42.0 to 60.0	0.15	61.83	Whites Formation (fractured)	n.d.
MB18-29	Dec-18	Near fault zone (beneath former collection ditch)	78.0	60.0 to 78.0	0.76	62.65	Whites Formation (fractured)	n.d.
MB18-30S	Dec-18	South of fault zone (towards EFDC)	60.0	13.7 to 19.7	0.86	64.27	Whites Formation	n.d.
MB18-30D	Dec-18	South of fault zone (towards EFDC)	60.0	42.0 to 60.0	0.84	64.25	Whites Formation	n.d.
MB18-31S	Dec-18	South of fault zone (towards EFDC)	60.0	18.0 to 24.0	0.84	63.94	Whites Formation	n.d.
MB18-31D	Dec-18	South of fault zone (towards EFDC)	60.0	42.0 to 60.0	0.85	63.95	Whites Formation	n.d.
MB18-32S	Dec-18	South of fault zone (towards EFDC)	60.0	12.0 to 24.0	0.60	63.04	Whites Formation (wtr)	n.d.
MB18-32D	Dec-18	South of fault zone (towards EFDC)	60.0	42.0 to 60.0	0.60	63.04	Whites Formation	n.d.

1. bgs = below ground surface
3. TOC = Top of casing
Note: wtr = weathered

Appendix B

Hydraulic Testing Summary

Appendix Table B1

Hydraulic Testing Summary

Monitoring Bore ID	Screen Interval (m BGS)	Test Method	Hydraulic Conductivity (m/s)
Laterite		***Geometric Mean =***	***2E-05***
MB10-08S	5 - 14	Slug Test	2E-06
MB14-16	2 - 7	Slug Test	2E-06
MB14-17S	2 - 7	Slug Test	5E-06
MB14-20S	2 - 8	Slug Test	1E-05
2014-TPA-01	4.3	Infiltration Test	2E-04
2014-TPA-02	4.4	Infiltration Test	1E-04
2014-TPA-10	5.5	Infiltration Test	8E-05
Saprolite		***Geometric Mean =***	***2E-06***
MB10-01a	1.4 - 3.4	Slug Test	9E-07
MB10-20	3 - 7	Slug Test	3E-06
MB14-02S	2 - 8	Slug Test	4E-06
MB14-04	2 - 8	Slug Test	7E-07
Whites Formation		***Geometric Mean =***	***3E-06***
MB10-06	13 - 26	Slug Test	4E-05
MB14-14D	24 - 29	Slug Test	8E-07
MB12-35	22 - 34	Pumping Test (DD)	1E-05
		Pumping Test (TR)	3E-06
MB10-10	16 - 32	Slug Test	4E-07
		Pumping Test (DD)	8E-06
		Pumping Test (TR)	6E-06
MB10-11	31 - 34	Pumping Test (DD)	3E-06
		Pumping Test (TR)	2E-06
MB12-33	14 - 32	Pumping Test (TR)	2E-06
Geolsec Formation		***Geometric Mean =***	***2E-07***
MB10-08D	20 - 23	Slug Test	1E-05
MB14-15S	11 - 14	Slug Test	4E-07
MB14-15D	21 - 42	Slug Test	2E-08
MB14-17D	21 - 29	Slug Test	8E-09
Rum Jungle Complex		***Geometric Mean =***	***3E-06***
RN022083	11 - 17	Slug Test	9E-06
RN022084	10 - 16	Slug Test	3E-06
RN023792	20 - 26	Slug Test	1E-05
RN025165	5.2 - 8.2	Slug Test	2E-07
RN025170	5.9 - 8.9	Slug Test	2E-06
RN025173	5.2 - 8.2	Slug Test	4E-06
Coomalie Dolostone		***Geometric Mean =***	***2E-05***
MB10-07	9 - 18	Slug Test	1E-05
MB10-09D	46 - 62	Slug Test	2E-04
MB10-12	13 - 25	Slug Test	3E-06
MB10-13	49 - 61	Slug Test	1E-05
MB10-14	16 - 18	Slug Test	7E-05
MB10-17	20 - 26	Slug Test	5E-04
MB10-22	12 - 24	Slug Test	2E-07
MB14-01D	26 - 32	Slug Test	7E-05
MB14-02D	23 - 29	Slug Test	6E-04
MB14-03	18 - 23	Slug Test	2E-05
MB14-05D	22 - 28	Slug Test	1E-05
MB14-06D	18 - 24	Slug Test	2E-06
MB14-08D	18 - 24	Slug Test	8E-06
MB14-09	10 - 16	Slug Test	2E-03
MB14-13D	13 - 18	Slug Test	5E-05
MB14-18	11 - 17	Slug Test	5E-05
MB14-20D	21 - 27	Slug Test	8E-07

DD = Distance Drawdown

TR = Theis Recovery

Appendix Table B1 (continued)

Hydraulic Testing Summary

Bore ID	Screen top	Screen bottom	Screened Geology	Hydraulic Conductivity, K (m/s)					Analytical Method	Test Behaviour
				Slug Test				Best Engineering Judgment		
	m bgs	m bgs		FH	RH	RH 2	Average			
Waste Storage Facility										
MB17-21S	2.00	8.00	Highly weathered Coomalie Dolostone	3.5E-06	5.0E-06	4.8E-06	4.4E-06	4.4E-06	Hvorslev	Ideal
MB17-21D	18.00	24.00	Slightly weathered Coomalie Dolostone	1.8E-05	2.0E-05	-	1.9E-05	1.9E-05	Hvorslev	FH non-ideal, RH ideal
MB17-24D	18.00	24.00	Moderately weathered Coomalie Dolostone	5.4E-07	8.8E-07	-	7.1E-07	7.1E-07	Hvorslev	Non-ideal
Copper Extraction Pad										
MB18-26S	12.00	18.00	Moderately weathered Whites Formaiton	3.3E-06	4.8E-06	-	4.1E-06	4.1E-06	Hvorslev	Ideal
MB18-26D	42.00	60.00	Slightly weathered Whites Formation	2.5E-06	-	-	-	2.5E-06	Hvorslev	Non-ideal
MB18-30S	13.70	19.70	Slightly weathered Whites Formation	1.2E-06	3.1E-06	-	2.1E-06	2.1E-06	Hvorselv	Ideal
MB18-30D	42.00	60.00	Slightly weathered Whites Formation	5.8E-07	4.5E-07	-	5.2E-07	5.2E-07	Hvorselv	Ideal
MB18-31S	18.00	24.00	Slightly weathered Whites Formation	2.5E-07	7.6E-07	-	5.0E-07	5.0E-07	Hvorselv	Ideal
MB18-32S	12.00	24.00	Moderately weathered Whites Formaiton	4.9E-06	4.8E-06	-	4.9E-06	4.9E-06	Hvorslev	Ideal

Appendix C

Simulated Loads for Additional Scenarios

Appendix Table C1. Simulated Sulphate Loads for Scenario 2 (Central Shear Zone)

Group	July 2010 to June 2011		July 2011 to June 2012		July 2012 to June 2013		July 2013 to June 2014		July 2014 to June 2015		July 2015 to June 2016		July 2016 to June 2017		July 2017 to June 2018	
	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%
Annual SO4 Loads (Run # 91)																
A	292.3	17.4%	204.0	16.5%	223.0	18.1%	252.4	17.5%	177.7	16.7%	166.8	15.9%	221.8	17.2%	242.3	16.9%
B	267.4	15.9%	194.0	15.7%	189.1	15.3%	222.4	15.4%	157.7	14.8%	151.8	14.4%	186.9	14.5%	216.6	15.1%
C	226.8	13.5%	145.7	11.8%	133.2	10.8%	167.5	11.6%	112.2	10.6%	106.2	10.1%	145.6	11.3%	184.3	12.9%
D	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
E	604.5	36.0%	469.6	37.9%	446.7	36.2%	527.8	36.6%	415.9	39.2%	418.3	39.8%	479.1	37.2%	502.9	35.1%
F	39.2	2.3%	16.2	1.3%	17.1	1.4%	30.6	2.1%	11.2	1.1%	13.6	1.3%	26.5	2.1%	38.2	2.7%
G	68.0	4.0%	62.5	5.0%	42.7	3.5%	63.2	4.4%	52.3	4.9%	53.0	5.0%	61.6	4.8%	55.2	3.9%
H	21.2	1.3%	17.6	1.4%	17.0	1.4%	19.9	1.4%	22.3	2.1%	20.7	2.0%	23.4	1.8%	20.6	1.4%
I	10.2	0.6%	9.6	0.8%	13.3	1.1%	14.0	1.0%	13.2	1.2%	14.5	1.4%	13.0	1.0%	13.0	0.9%
To Main Pit	77.5	4.6%	51.8	4.2%	59.9	4.9%	65.3	4.5%	45.1	4.2%	47.2	4.5%	58.4	4.5%	70.6	4.9%
To Int. Pit	48.7	2.9%	62.7	5.1%	82.1	6.7%	64.3	4.5%	50.9	4.8%	54.9	5.2%	61.7	4.8%	65.7	4.6%
To Browns Pit	2.1	0.1%	1.7	0.1%	7.1	0.6%	3.9	0.3%	3.0	0.3%	3.2	0.3%	3.6	0.3%	3.4	0.2%
To Model Flooding Drains	22.2	1.3%	2.6	0.2%	1.4	0.1%	11.9	0.8%	0.3	0.0%	0.5	0.0%	5.5	0.4%	18.8	1.3%
SIS wells	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total To EBFR	1680.1	100.0%	1238.0	100.0%	1232.7	100.0%	1443.1	100.0%	1061.7	100.0%	1050.5	100.0%	1287.2	100.0%	1431.7	100.0%
Annual SO4 Loads (Calibrated model - R46)																
A	294.5	17.4%	208.5	16.7%	223.8	17.8%	251.9	17.2%	178.3	16.5%	169.1	15.9%	223.1	17.1%	245.1	16.8%
B	272.4	16.1%	196.8	15.7%	191.7	15.2%	225.6	15.4%	161.3	15.0%	152.0	14.2%	190.5	14.6%	218.9	15.0%
C	224.5	13.3%	142.4	11.4%	135.7	10.8%	170.1	11.6%	113.9	10.6%	107.6	10.1%	145.8	11.2%	193.4	13.3%
D	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
E	605.3	35.7%	469.3	37.5%	446.8	35.5%	531.1	36.2%	416.5	38.6%	417.8	39.2%	480.5	36.9%	500.8	34.3%
F	39.4	2.3%	16.2	1.3%	17.3	1.4%	30.8	2.1%	11.1	1.0%	13.7	1.3%	26.9	2.1%	38.2	2.6%
G	69.7	4.1%	64.3	5.1%	42.9	3.4%	63.7	4.3%	51.9	4.8%	54.3	5.1%	62.9	4.8%	57.4	3.9%
H	21.0	1.2%	18.1	1.4%	17.3	1.4%	19.8	1.3%	22.8	2.1%	21.8	2.0%	23.1	1.8%	20.9	1.4%
I	10.3	0.6%	10.4	0.8%	14.0	1.1%	14.8	1.0%	13.8	1.3%	15.0	1.4%	13.4	1.0%	13.5	0.9%
To Main Pit	78.3	4.6%	53.5	4.3%	61.3	4.9%	67.1	4.6%	46.3	4.3%	47.9	4.5%	58.8	4.5%	71.2	4.9%
To Int. Pit	48.0	2.8%	65.8	5.3%	87.7	7.0%	68.3	4.7%	53.4	5.0%	59.3	5.6%	62.8	4.8%	70.7	4.8%
To Browns Pit	8.1	0.5%	2.3	0.2%	17.9	1.4%	12.8	0.9%	8.6	0.8%	7.7	0.7%	8.7	0.7%	9.4	0.6%
To Model Flooding Drains	22.2	1.3%	2.6	0.2%	1.4	0.1%	11.9	0.8%	0.3	0.0%	0.5	0.0%	5.5	0.4%	18.8	1.3%
SIS wells	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total To EBFR	1693.7	100.0%	1250.0	100.0%	1257.8	100.0%	1467.8	100.0%	1078.3	100.0%	1066.6	100.0%	1302.1	100.0%	1458.3	100.0%
Annual differences in SO4 Loads (R91 - R46)																
A	-2.2		-4.5		-0.8		0.5		-0.6		-2.3		-1.3		-2.8	
B	-4.9		-2.8		-2.5		-3.2		-3.7		-0.2		-3.6		-2.3	
C	2.3		3.3		-2.5		-2.6		-1.7		-1.4		-0.2		-9.1	
D	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
E	-0.8		0.3		-0.1		-3.3		-0.6		0.5		-1.4		2.2	
F	-0.1		0.0		-0.2		-0.2		0.1		-0.1		-0.4		0.0	
G	-1.7		-1.8		-0.2		-0.5		0.4		-1.3		-1.3		-2.2	
H	0.1		-0.5		-0.3		0.1		-0.5		-1.1		0.3		-0.3	
I	-0.1		-0.8		-0.7		-0.8		-0.6		-0.5		-0.3		-0.5	
To Main Pit	-0.8		-1.7		-1.3		-1.8		-1.3		-0.7		-0.4		-0.5	
To Int. Pit	0.7		-3.1		-5.6		-4.0		-2.5		-4.4		-1.1		-5.0	
To Browns Pit	-6.0		-0.5		-10.8		-8.9		-5.7		-4.5		-5.1		-6.0	
To Model Flooding Drains	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
SIS wells																
Total To EBFR	-13.6		-12.0		-25.1		-24.7		-16.6		-16.1		-14.9		-26.6	

Appendix Table C2. Simulated Sulphate Loads for Scenario 4 (Giant's Reef Fault)

Group	July 2010 to June 2011		July 2011 to June 2012		July 2012 to June 2013		July 2013 to June 2014		July 2014 to June 2015		July 2015 to June 2016		July 2016 to June 2017		July 2017 to June 2018	
	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%
Annual SO4 Loads (Run # 93)																
A	290.7	16.2%	202.6	15.3%	221.0	17.3%	248.3	16.4%	175.1	15.3%	166.2	15.2%	219.7	16.3%	241.7	15.9%
B	260.8	14.5%	186.0	14.1%	185.2	14.5%	214.9	14.2%	152.9	13.4%	145.5	13.3%	181.1	13.4%	210.3	13.8%
C	242.2	13.5%	147.7	11.2%	131.3	10.3%	175.5	11.6%	116.7	10.2%	109.7	10.1%	155.2	11.5%	201.5	13.3%
D	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
E	480.8	26.7%	371.9	28.1%	332.0	26.0%	392.4	25.9%	328.2	28.8%	303.0	27.8%	351.8	26.0%	376.3	24.8%
F	39.2	2.2%	16.2	1.2%	17.1	1.3%	30.5	2.0%	10.9	1.0%	13.6	1.2%	26.9	2.0%	38.0	2.5%
G	69.9	3.9%	62.7	4.7%	42.6	3.3%	63.5	4.2%	51.7	4.5%	54.4	5.0%	63.6	4.7%	57.4	3.8%
H	20.8	1.2%	17.3	1.3%	16.8	1.3%	20.0	1.3%	22.4	2.0%	21.2	1.9%	23.2	1.7%	20.8	1.4%
I	9.9	0.6%	10.2	0.8%	13.7	1.1%	14.6	1.0%	13.5	1.2%	14.7	1.3%	13.4	1.0%	13.6	0.9%
To Main Pit	329.5	18.3%	261.6	19.8%	258.1	20.2%	295.7	19.6%	237.4	20.8%	224.9	20.6%	271.1	20.1%	296.0	19.5%
To Int. Pit	31.3	1.7%	43.1	3.3%	56.9	4.5%	44.3	2.9%	32.0	2.8%	36.8	3.4%	39.3	2.9%	43.4	2.9%
To Browns Pit	0.4	0.0%	0.2	0.0%	1.1	0.1%	0.6	0.0%	0.4	0.0%	0.5	0.0%	0.5	0.0%	0.6	0.0%
To Model Flooding Drains	22.2	1.2%	2.6	0.2%	1.4	0.1%	11.9	0.8%	0.3	0.0%	0.5	0.0%	5.5	0.4%	18.8	1.2%
SIS wells	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total To EBFR	1797.8	100.0%	1322.1	100.0%	1277.3	100.0%	1512.1	100.0%	1141.7	100.0%	1090.9	100.0%	1351.3	100.0%	1518.5	100.0%
Annual SO4 Loads (Run # 46)																
A	294.5	17.4%	208.5	16.7%	223.8	17.8%	251.9	17.2%	178.3	16.5%	169.1	15.9%	223.1	17.1%	245.1	16.8%
B	272.4	16.1%	196.8	15.7%	191.7	15.2%	225.6	15.4%	161.3	15.0%	152.0	14.2%	190.5	14.6%	218.9	15.0%
C	224.5	13.3%	142.4	11.4%	135.7	10.8%	170.1	11.6%	113.9	10.6%	107.6	10.1%	145.8	11.2%	193.4	13.3%
D	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
E	605.3	35.7%	469.3	37.5%	446.8	35.5%	531.1	36.2%	416.5	38.6%	417.8	39.2%	480.5	36.9%	500.8	34.3%
F	39.4	2.3%	16.2	1.3%	17.3	1.4%	30.8	2.1%	11.1	1.0%	13.7	1.3%	26.9	2.1%	38.2	2.6%
G	69.7	4.1%	64.3	5.1%	42.9	3.4%	63.7	4.3%	51.9	4.8%	54.3	5.1%	62.9	4.8%	57.4	3.9%
H	21.0	1.2%	18.1	1.4%	17.3	1.4%	19.8	1.3%	22.8	2.1%	21.8	2.0%	23.1	1.8%	20.9	1.4%
I	10.3	0.6%	10.4	0.8%	14.0	1.1%	14.8	1.0%	13.8	1.3%	15.0	1.4%	13.4	1.0%	13.5	0.9%
To Main Pit	78.3	4.6%	53.5	4.3%	61.3	4.9%	67.1	4.6%	46.3	4.3%	47.9	4.5%	58.8	4.5%	71.2	4.9%
To Int. Pit	48.0	2.8%	65.8	5.3%	87.7	7.0%	68.3	4.7%	53.4	5.0%	59.3	5.6%	62.8	4.8%	70.7	4.8%
To Browns Pit	8.1	0.5%	2.3	0.2%	17.9	1.4%	12.8	0.9%	8.6	0.8%	7.7	0.7%	8.7	0.7%	9.4	0.6%
To Model Flooding Drains	22.2	1.3%	2.6	0.2%	1.4	0.1%	11.9	0.8%	0.3	0.0%	0.5	0.0%	5.5	0.4%	18.8	1.3%
SIS wells	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total To EBFR	1693.7	100.0%	1250.0	100.0%	1257.8	100.0%	1467.8	100.0%	1078.3	100.0%	1066.6	100.0%	1302.1	100.0%	1458.3	100.0%
Annual differences in SO4 Loads (R93 - R46)																
A	-3.8		-5.8		-2.8		-3.6		-3.2		-3.0		-3.4		-3.5	
B	-11.5		-10.7		-6.4		-10.7		-8.4		-6.5		-9.4		-8.6	
C	17.7		5.3		-4.4		5.4		2.8		2.1		9.4		8.0	
D	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
E	-124.5		-97.4		-114.8		-138.7		-88.3		-114.8		-128.7		-124.4	
F	-0.2		0.0		-0.2		-0.3		-0.2		-0.1		0.0		-0.1	
G	0.1		-1.6		-0.4		-0.2		-0.1		0.1		0.7		0.1	
H	-0.2		-0.8		-0.5		0.2		-0.4		-0.5		0.1		-0.1	
I	-0.4		-0.2		-0.3		-0.2		-0.3		-0.3		0.0		0.1	
To Main Pit	251.2		208.1		196.9		228.6		191.1		177.0		212.3		224.9	
To Int. Pit	-16.7		-22.7		-30.8		-24.0		-21.4		-22.5		-23.5		-27.2	
To Browns Pit	-7.7		-2.0		-16.8		-12.3		-8.2		-7.2		-8.2		-8.9	
To Model Flooding Drains	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
SIS wells																
Total To EBFR	104.1		72.1		19.5		44.3		63.4		24.3		49.3		60.2	

Appendix Table C3. Simulated Sulphate Loads for Scenario 6

	2010		2011		2012		2013		2014		2015		2016		2017	
Annual SO4 Loads (Run # 97)																
Group	**July 2010 to June 2011**		**July 2011 to June 2012**		**July 2012 to June 2013**		**July 2013 to June 2014**		**July 2014 to June 2015**		**July 2015 to June 2016**		**July 2016 to June 2017**		**July 2017 to June 2018**	
	t/yr	**%**	**t/yr**	**%**	**t/yr**	**%**	**t/yr**	**%**	**t/yr**	**%**	**t/yr**	**%**	**t/yr**	**%**	**t/yr**	**%**
A	866.7	44.5%	635.0	44.7%	616.8	43.9%	732.1	43.8%	571.4	45.6%	542.4	43.7%	673.6	44.5%	734.5	43.7%
B	173.6	8.9%	124.0	8.7%	130.0	9.3%	145.5	8.7%	104.6	8.3%	109.3	8.8%	127.1	8.4%	144.1	8.6%
C	81.9	4.2%	24.7	1.7%	29.9	2.1%	50.5	3.0%	15.2	1.2%	16.4	1.3%	38.4	2.5%	72.0	4.3%
D	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
E	556.0	28.5%	424.3	29.9%	407.7	29.0%	483.9	28.9%	377.6	30.1%	378.4	30.5%	434.0	28.7%	456.5	27.2%
F	38.1	2.0%	15.5	1.1%	16.1	1.1%	29.8	1.8%	10.3	0.8%	12.7	1.0%	25.6	1.7%	36.8	2.2%
G	69.3	3.6%	63.9	4.5%	43.3	3.1%	64.9	3.9%	53.1	4.2%	53.1	4.3%	63.4	4.2%	58.3	3.5%
H	21.1	1.1%	17.7	1.2%	17.5	1.2%	20.3	1.2%	23.3	1.9%	21.8	1.8%	23.7	1.6%	21.2	1.3%
I	10.3	0.5%	10.4	0.7%	13.9	1.0%	14.9	0.9%	13.9	1.1%	15.3	1.2%	14.0	0.9%	14.3	0.9%
To Main Pit	66.3	3.4%	44.3	3.1%	49.5	3.5%	56.4	3.4%	37.1	3.0%	39.0	3.1%	49.9	3.3%	61.5	3.7%
To Int. Pit	42.2	2.2%	58.7	4.1%	78.1	5.6%	62.0	3.7%	47.0	3.7%	52.6	4.2%	56.8	3.8%	62.5	3.7%
To Browns Pit	0.3	0.0%	0.2	0.0%	0.8	0.1%	0.5	0.0%	0.4	0.0%	0.4	0.0%	0.5	0.0%	0.5	0.0%
To Model Flooding Drains	22.2	1.1%	2.6	0.2%	1.4	0.1%	11.9	0.7%	0.3	0.0%	0.5	0.0%	5.5	0.4%	18.8	1.1%
SIS wells	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total To EBFR	1948.2	100.0%	1421.2	100.0%	1405.1	100.0%	1672.7	100.0%	1254.3	100.0%	1241.8	100.0%	1512.5	100.0%	1680.9	100.0%
Annual SO4 Loads (Calibrated model - R46)																
A	294.5	17.4%	208.5	16.7%	223.8	17.8%	251.9	17.2%	178.3	16.5%	169.1	15.9%	223.1	17.1%	245.1	16.8%
B	272.4	16.1%	196.8	15.7%	191.7	15.2%	225.6	15.4%	161.3	15.0%	152.0	14.2%	190.5	14.6%	218.9	15.0%
C	224.5	13.3%	142.4	11.4%	135.7	10.8%	170.1	11.6%	113.9	10.6%	107.6	10.1%	145.8	11.2%	193.4	13.3%
D	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
E	605.3	35.7%	469.3	37.5%	446.8	35.5%	531.1	36.2%	416.5	38.6%	417.8	39.2%	480.5	36.9%	500.8	34.3%
F	39.4	2.3%	16.2	1.3%	17.3	1.4%	30.8	2.1%	11.1	1.0%	13.7	1.3%	26.9	2.1%	38.2	2.6%
G	69.7	4.1%	64.3	5.1%	42.9	3.4%	63.7	4.3%	51.9	4.8%	54.3	5.1%	62.9	4.8%	57.4	3.9%
H	21.0	1.2%	18.1	1.4%	17.3	1.4%	19.8	1.3%	22.8	2.1%	21.8	2.0%	23.1	1.8%	20.9	1.4%
I	10.3	0.6%	10.4	0.8%	14.0	1.1%	14.8	1.0%	13.8	1.3%	15.0	1.4%	13.4	1.0%	13.5	0.9%
To Main Pit	78.3	4.6%	53.5	4.3%	61.3	4.9%	67.1	4.6%	46.3	4.3%	47.9	4.5%	58.8	4.5%	71.2	4.9%
To Int. Pit	48.0	2.8%	65.8	5.3%	87.7	7.0%	68.3	4.7%	53.4	5.0%	59.3	5.6%	62.8	4.8%	70.7	4.8%
To Browns Pit	8.1	0.5%	2.3	0.2%	17.9	1.4%	12.8	0.9%	8.6	0.8%	7.7	0.7%	8.7	0.7%	9.4	0.6%
To Model Flooding Drains	22.2	1.3%	2.6	0.2%	1.4	0.1%	11.9	0.8%	0.3	0.0%	0.5	0.0%	5.5	0.4%	18.8	1.3%
SIS wells	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total To EBFR	1693.7	100.0%	1250.0	100.0%	1257.8	100.0%	1467.8	100.0%	1078.3	100.0%	1066.6	100.0%	1302.1	100.0%	1458.3	100.0%
Annual differences in SO4 Loads (R97 - R46)																
A	572.3		426.5		393.0		480.2		393.1		373.3		450.5		489.4	
B	-98.8		-72.8		-61.6		-80.0		-56.8		-42.7		-63.4		-74.8	
C	-142.6		-117.7		-105.8		-119.6		-98.7		-91.2		-107.4		-121.5	
D	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
E	-49.3		-45.0		-39.2		-47.1		-38.9		-39.4		-46.4		-44.3	
F	-1.3		-0.7		-1.2		-1.0		-0.7		-0.9		-1.3		-1.3	
G	-0.4		-0.4		0.4		1.2		1.2		-1.2		0.5		0.9	
H	0.1		-0.4		0.2		0.5		0.5		0.0		0.5		0.2	
I	0.0		0.0		-0.1		0.2		0.1		0.3		0.6		0.8	
To Main Pit	-12.0		-9.2		-11.8		-10.7		-9.2		-9.0		-8.9		-9.7	
To Int. Pit	-5.8		-7.1		-9.6		-6.2		-6.4		-6.7		-6.0		-8.2	
To Browns Pit	-7.8		-2.1		-17.1		-12.3		-8.2		-7.3		-8.2		-9.0	
To Model Flooding Drains	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
SIS wells																
Total To EBFR	254.5		171.2		147.3		205.0		175.9		175.2		210.5		222.6	

Appendix Table C4. Simulated Copper Loads for Scenario 2

Annual Cu Loads (Run # 92)

Group	July 2010 to June 2011		July 2011 to June 2012		July 2012 to June 2013		July 2013 to June 2014		July 2014 to June 2015		July 2015 to June 2016		July 2016 to June 2017		July 2017 to June 2018	
	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%
A	0.5	12.6%	0.3	10.1%	0.4	12.2%	0.4	12.6%	0.3	10.8%	0.3	11.0%	0.4	13.1%	0.5	14.5%
B	0.5	12.0%	0.3	10.7%	0.3	10.8%	0.4	11.6%	0.3	10.2%	0.3	10.3%	0.4	11.2%	0.4	12.2%
C	0.5	11.3%	0.3	8.4%	0.3	8.4%	0.3	9.6%	0.2	7.7%	0.2	7.7%	0.3	9.0%	0.4	11.2%
D	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
E	1.6	39.1%	1.2	39.2%	1.2	38.1%	1.4	39.6%	1.1	41.6%	1.1	41.8%	1.3	40.7%	1.3	38.5%
F	0.0	0.2%	0.0	0.1%	0.0	0.1%	0.0	0.1%	0.0	0.1%	0.0	0.1%	0.0	0.1%	0.0	0.1%
G	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
H	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
I	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
To Main Pit	0.1	2.6%	0.1	2.6%	0.1	2.8%	0.1	2.6%	0.1	2.6%	0.1	2.6%	0.1	2.6%	0.1	2.4%
To Int. Pit	0.9	21.9%	0.9	28.7%	0.9	27.4%	0.8	23.7%	0.7	26.7%	0.7	26.1%	0.7	22.9%	0.7	20.7%
To Browns Pit	0.0	0.1%	0.0	0.1%	0.0	0.2%	0.0	0.2%	0.0	0.2%	0.0	0.3%	0.0	0.3%	0.0	0.2%
To Model Flooding Drains	0.0	0.1%	0.0	0.1%	0.0	0.0%	0.0	0.1%	0.0	0.0%	0.0	0.0%	0.0	0.1%	0.0	0.1%
SIS wells	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total To EBFR	4.1	100.0%	3.1	100.0%	3.1	100.0%	3.5	100.0%	2.6	100.0%	2.7	100.0%	3.1	100.0%	3.4	100.0%

Calibrated Cu Loads (Run # 44)

Group	July 2010 to June 2011		July 2011 to June 2012		July 2012 to June 2013		July 2013 to June 2014		July 2014 to June 2015		July 2015 to June 2016		July 2016 to June 2017		July 2017 to June 2018	
	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%
A	0.5	15.0%	0.3	12.6%	0.4	14.5%	0.5	14.7%	0.3	13.2%	0.3	13.1%	0.4	15.1%	0.5	16.3%
B	0.5	13.8%	0.3	13.0%	0.3	12.6%	0.4	13.1%	0.3	12.3%	0.3	12.1%	0.3	12.6%	0.4	13.4%
C	0.5	13.2%	0.3	10.4%	0.3	9.9%	0.3	11.0%	0.2	9.4%	0.2	9.2%	0.3	10.2%	0.4	12.5%
D	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
E	1.6	44.2%	1.2	46.9%	1.2	43.9%	1.4	44.4%	1.1	49.3%	1.1	48.3%	1.3	45.3%	1.3	41.9%
F	0.0	0.3%	0.0	0.2%	0.0	0.2%	0.0	0.2%	0.0	0.1%	0.0	0.1%	0.0	0.2%	0.0	0.2%
G	0.0	0.1%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.1%	0.0	0.1%	0.0	0.1%	0.0	0.0%
H	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
I	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
To Main Pit	0.1	2.2%	0.1	2.4%	0.1	2.4%	0.1	2.3%	0.1	2.4%	0.1	2.4%	0.1	2.3%	0.1	2.1%
To Int. Pit	0.4	11.1%	0.4	14.4%	0.4	16.4%	0.4	14.1%	0.3	13.2%	0.3	14.7%	0.4	14.1%	0.4	13.5%
To Browns Pit	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
To Model Flooding Drains	0.0	0.1%	0.0	0.1%	0.0	0.0%	0.0	0.1%	0.0	0.0%	0.0	0.0%	0.0	0.1%	0.0	0.1%
SIS wells	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total To EBFR	3.5	100.0%	2.6	100.0%	2.7	100.0%	3.1	100.0%	2.2	100.0%	2.3	100.0%	2.8	100.0%	3.1	100.0%

Annual Differences in Cu Loads (Run 92 - Run 44)

Group																
A	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
B	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
C	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
D	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
E	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
F	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
G	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
H	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
I	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
To Main Pit	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
To Int. Pit	0.5		0.5		0.4		0.4		0.4		0.4		0.3		0.3	
To Browns Pit	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
To Model Flooding Drains	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
SIS wells																
Total To EBFR	0.6		0.6		0.4		0.4		0.4		0.4		0.4		0.3	

Appendix Table C5. Simulated Copper Loads for Scenario 4

Annual Cu Loads (Run # 94)

Group	July 2010 to June 2011		July 2011 to June 2012		July 2012 to June 2013		July 2013 to June 2014		July 2014 to June 2015		July 2015 to June 2016		July 2016 to June 2017		July 2017 to June 2018	
	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%
A	0.5	14.5%	0.3	12.0%	0.4	14.0%	0.4	14.2%	0.3	12.6%	0.3	12.5%	0.4	14.5%	0.5	15.8%
B	0.5	13.6%	0.3	12.5%	0.3	12.3%	0.4	12.8%	0.3	11.7%	0.3	11.6%	0.3	12.2%	0.4	13.1%
C	0.5	13.9%	0.3	10.6%	0.3	9.8%	0.4	11.3%	0.2	9.6%	0.2	9.4%	0.3	10.7%	0.4	12.7%
D	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
E	1.6	45.5%	1.3	48.9%	1.2	45.9%	1.4	46.1%	1.2	51.5%	1.2	50.4%	1.3	47.0%	1.3	43.2%
F	0.0	0.2%	0.0	0.1%	0.0	0.1%	0.0	0.1%	0.0	0.1%	0.0	0.1%	0.0	0.1%	0.0	0.1%
G	0.0	0.1%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.1%	0.0	0.1%	0.0	0.1%	0.0	0.0%
H	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
I	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
To Main Pit	0.0	0.8%	0.0	0.8%	0.0	0.7%	0.0	0.8%	0.0	0.7%	0.0	0.7%	0.0	0.8%	0.0	0.8%
To Int. Pit	0.4	11.4%	0.4	14.9%	0.5	17.1%	0.5	14.6%	0.3	13.6%	0.4	15.2%	0.4	14.6%	0.4	14.2%
To Browns Pit	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
To Model Flooding Drains	0.0	0.1%	0.0	0.1%	0.0	0.0%	0.0	0.1%	0.0	0.0%	0.0	0.0%	0.0	0.1%	0.0	0.1%
SIS wells	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total To EBFR	3.5	100.0%	2.6	100.0%	2.7	100.0%	3.1	100.0%	2.3	100.0%	2.4	100.0%	2.8	100.0%	3.1	100.0%

Annual Cu Loads (Run # 44)

Group	July 2010 to June 2011		July 2011 to June 2012		July 2012 to June 2013		July 2013 to June 2014		July 2014 to June 2015		July 2015 to June 2016		July 2016 to June 2017		July 2017 to June 2018	
	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%	t/yr	%
A	0.5	15.0%	0.3	12.6%	0.4	14.5%	0.5	14.7%	0.3	13.2%	0.3	13.1%	0.4	15.1%	0.5	16.3%
B	0.5	13.8%	0.3	13.0%	0.3	12.6%	0.4	13.1%	0.3	12.3%	0.3	12.1%	0.3	12.6%	0.4	13.4%
C	0.5	13.2%	0.3	10.4%	0.3	9.9%	0.3	11.0%	0.2	9.4%	0.2	9.2%	0.3	10.2%	0.4	12.5%
D	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
E	1.6	44.2%	1.2	46.9%	1.2	43.9%	1.4	44.4%	1.1	49.3%	1.1	48.3%	1.3	45.3%	1.3	41.9%
F	0.0	0.3%	0.0	0.2%	0.0	0.2%	0.0	0.2%	0.0	0.1%	0.0	0.1%	0.0	0.2%	0.0	0.2%
G	0.0	0.1%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.1%	0.0	0.1%	0.0	0.1%	0.0	0.0%
H	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
I	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
To Main Pit	0.1	2.2%	0.1	2.4%	0.1	2.4%	0.1	2.3%	0.1	2.4%	0.1	2.4%	0.1	2.3%	0.1	2.1%
To Int. Pit	0.4	11.1%	0.4	14.4%	0.4	16.4%	0.4	14.1%	0.3	13.2%	0.3	14.7%	0.4	14.1%	0.4	13.5%
To Browns Pit	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
To Model Flooding Drains	0.0	0.1%	0.0	0.1%	0.0	0.0%	0.0	0.1%	0.0	0.0%	0.0	0.0%	0.0	0.1%	0.0	0.1%
SIS wells	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total To EBFR	3.5	100.0%	2.6	100.0%	2.7	100.0%	3.1	100.0%	2.2	100.0%	2.3	100.0%	2.8	100.0%	3.1	100.0%

Annual Differences in Cu Loads (Run 94 - Run 44)

Group	July 2010 to June 2011	July 2011 to June 2012	July 2012 to June 2013	July 2013 to June 2014	July 2014 to June 2015	July 2015 to June 2016	July 2016 to June 2017	July 2017 to June 2018
A	-0.018	-0.012	-0.011	-0.013	-0.005	-0.007	-0.010	-0.014
B	-0.007	-0.007	-0.005	-0.007	-0.006	-0.005	-0.006	-0.006
C	0.026	0.011	0.000	0.011	0.010	0.010	0.017	0.009
D	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
E	0.047	0.067	0.061	0.060	0.081	0.078	0.067	0.049
F	-0.004	-0.001	-0.001	-0.003	-0.001	-0.001	-0.002	-0.003
G	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
I	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
To Main Pit	-0.050	-0.042	-0.044	-0.047	-0.037	-0.037	-0.041	-0.041
To Int. Pit	0.014	0.018	0.023	0.020	0.017	0.019	0.020	0.022
To Browns Pit	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
To Model Flooding Drains	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SIS wells								
Total To EBFR	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0

Appendix Table C6. Simulated Copper Loads for Scenario 6

	2010		2011		2012		2013		2014		2015		2016		2017	
Annual Cu Loads (Run #98)																
Group	**July 2010 to June 2011**		**July 2011 to June 2012**		**July 2012 to June 2013**		**July 2013 to June 2014**		**July 2014 to June 2015**		**July 2015 to June 2016**		**July 2016 to June 2017**		**July 2017 to June 2018**	
	t/yr	**%**	**t/yr**	**%**	**t/yr**	**%**	**t/yr**	**%**	**t/yr**	**%**	**t/yr**	**%**	**t/yr**	**%**	**t/yr**	**%**
A	2.2	45.8%	1.8	48.6%	1.8	47.9%	2.0	46.1%	1.6	49.7%	1.6	47.1%	1.8	46.7%	1.9	45.4%
B	0.4	7.6%	0.2	6.3%	0.2	6.4%	0.3	7.0%	0.2	5.8%	0.2	6.1%	0.3	6.6%	0.3	7.4%
C	0.3	5.2%	0.1	2.7%	0.1	2.6%	0.2	3.8%	0.1	2.0%	0.1	2.2%	0.1	3.1%	0.2	5.1%
D	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
E	1.5	31.7%	1.2	31.2%	1.2	30.2%	1.4	31.6%	1.1	32.4%	1.1	33.1%	1.2	32.1%	1.3	30.8%
F	0.0	0.1%	0.0	0.1%	0.0	0.1%	0.0	0.1%	0.0	0.0%	0.0	0.1%	0.0	0.1%	0.0	0.1%
G	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
H	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
I	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
To Main Pit	0.1	1.4%	0.1	1.5%	0.1	1.6%	0.1	1.5%	0.0	1.5%	0.1	1.5%	0.1	1.5%	0.1	1.5%
To Int. Pit	0.4	7.9%	0.4	9.6%	0.4	11.2%	0.4	9.9%	0.3	8.5%	0.3	9.9%	0.4	9.8%	0.4	9.8%
To Browns Pit	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
To Model Flooding Drains	0.0	0.1%	0.0	0.0%	0.0	0.0%	0.0	0.1%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.1%
SIS wells	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total To EBFR	4.8	100.0%	3.7	100.0%	3.8	100.0%	4.3	100.0%	3.3	100.0%	3.3	100.0%	3.9	100.0%	4.2	100.0%

Annual Cu Loads Calibrated Model (Run # 44)																
Group	**July 2010 to June 2011**		**July 2011 to June 2012**		**July 2012 to June 2013**		**July 2013 to June 2014**		**July 2014 to June 2015**		**July 2015 to June 2016**		**July 2016 to June 2017**		**July 2017 to June 2018**	
	t/yr	**%**	**t/yr**	**%**	**t/yr**	**%**	**t/yr**	**%**	**t/yr**	**%**	**t/yr**	**%**	**t/yr**	**%**	**t/yr**	**%**
A	0.5	15.0%	0.3	12.6%	0.4	14.5%	0.5	14.7%	0.3	13.2%	0.3	13.1%	0.4	15.1%	0.5	16.3%
B	0.5	13.8%	0.3	13.0%	0.3	12.6%	0.4	13.1%	0.3	12.3%	0.3	12.1%	0.3	12.6%	0.4	13.4%
C	0.5	13.2%	0.3	10.4%	0.3	9.9%	0.3	11.0%	0.2	9.4%	0.2	9.2%	0.3	10.2%	0.4	12.5%
D	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
E	1.6	44.2%	1.2	46.9%	1.2	43.9%	1.4	44.4%	1.1	49.3%	1.1	48.3%	1.3	45.3%	1.3	41.9%
F	0.0	0.3%	0.0	0.2%	0.0	0.2%	0.0	0.2%	0.0	0.1%	0.0	0.1%	0.0	0.2%	0.0	0.2%
G	0.0	0.1%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.1%	0.0	0.1%	0.0	0.1%	0.0	0.0%
H	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
I	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
To Main Pit	0.1	2.2%	0.1	2.4%	0.1	2.4%	0.1	2.3%	0.1	2.4%	0.1	2.4%	0.1	2.3%	0.1	2.1%
To Int. Pit	0.4	11.1%	0.4	14.4%	0.4	16.4%	0.4	14.1%	0.3	13.2%	0.3	14.7%	0.4	14.1%	0.4	13.5%
To Browns Pit	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
To Model Flooding Drains	0.0	0.1%	0.0	0.1%	0.0	0.0%	0.0	0.1%	0.0	0.0%	0.0	0.0%	0.0	0.1%	0.0	0.1%
SIS wells	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total To EBFR	3.5	100.0%	2.6	100.0%	2.7	100.0%	3.1	100.0%	2.2	100.0%	2.3	100.0%	2.8	100.0%	3.1	100.0%

Annual differences in Cu Loads (R98 - R44)								
A	1.7	1.5	1.4	1.5	1.3	1.3	1.4	1.4
B	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
C	-0.2	-0.2	-0.2	-0.2	-0.1	-0.1	-0.2	-0.2
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To Main Pit	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To Int. Pit	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To Browns Pit	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To Model Flooding Drains	0.0	0.0	0.0	0.0	0.0	0.0		
SIS wells								
Total To EBFR	1.3	1.2	1.1	1.2	1.1	1.0	1.1	1.1