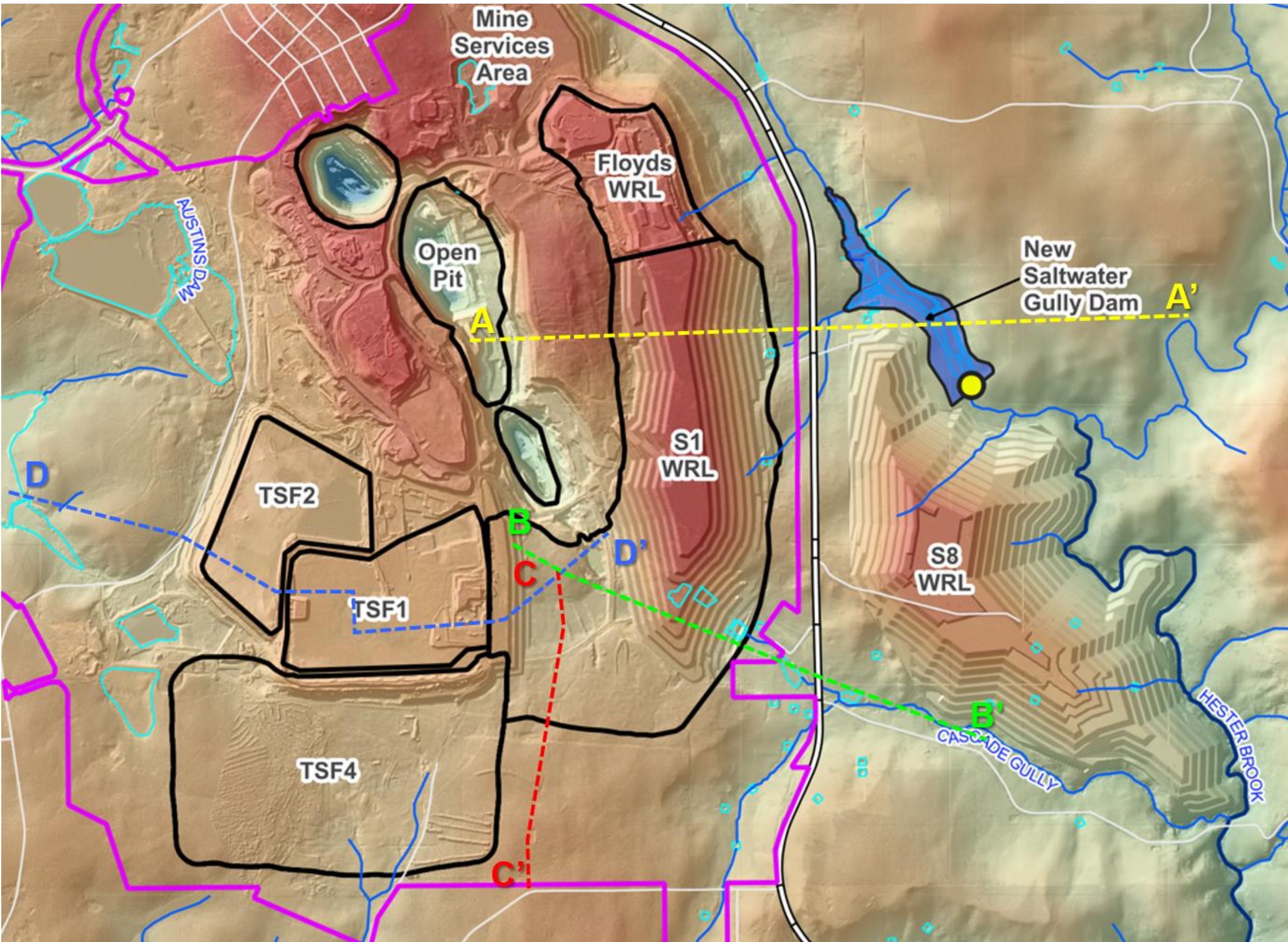
Eastern Catchments Hydrology Study

Conceptual Site Model

Talison Lithium Pty Ltd

11 October 2023

→ The Power of Commitment



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→ **The Power of Commitment**

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Table of Definitions

Term	Definition
Hydrogeological Unit	One or more geological units which have similar hydrogeological characteristics and behaviour.
Model Domain	Extent of a numerical model that is representation of a physical groundwater or surface water system, normally constrained by boundary conditions.
Boundary Condition	Condition that describes the exchange of flow and/or solute mass between a numerical model and the external system.
Archean Basement	Thick foundation of ancient metamorphic and igneous rock that makes up the crust of continents formed during the second period in geological history (Archean) that was characterised by extraction from the mantle and the subsequent formation of continental crusts.
Fractured Bedrock	Rock mass containing fractures of hydrogeological significance that have formed because of tectonic and/or geomorphic fracturing.
Saprock	Lightly weathered rock at the bedrock surface that retains the original rock fabric and is not extensively chemically altered.
Saprolite	Soil layer in the lower soil profile formed by chemically weathering of the bedrock surface, the nature of which is influenced by the type of rock from which it develops.
Clay	Fine grained soil that is characterised by the presence of clay minerals in varying amounts of organic and detrital materials. It is usually plastic when wet and hard and brittle when dry.
Laterite	Soil layer that is rich in iron oxide and derived from a wide variety of rocks weathering under strongly oxidizing and leaching conditions.
Caprock	A more resistant rock type that overlies a less resistant rock type.
Vuggy	Vugs are cavities, or voids, in a rock that are commonly lined with mineral precipitates.

1 Introduction

1.1 Background

GHD Pty Ltd (GHD) was engaged by Talison Lithium Pty Ltd (Talison) to undertake the Eastern Catchments Hydrology Study (the Study) which entails hydrological and hydrogeological assessments of proposed new activities on the mine site and subsequent assessment of the environmental and human health risks arising from these activities. These activities are:

- Construction and operation of a new water dam within the mine water supply network, namely Saltwater Gully (SWG) Dam.
- Establishment of the new S8 Waste Rock Landform (WRL)[1].
- Reuse of all or part of Tailings Storage Facility #1 (TSF1) following removal of existing material for reprocessing, either for tailings or water rock deposition.

A plan of the proposed facilities is provided in **Figure 1.1**.

The purpose of the Study is to demonstrate that the proposed facilities will not adversely impact the beneficial use of the surface water and groundwater receiving environments, during operations and closure, and provide definitive details to guide the development of a future management plan for possible adverse impacts. In doing so, this Study will support the environmental approvals application.

The Study deliverables are:

- Data Review and Gap Analysis (GHD, 2023a).
- Conceptual Site Model (this report).
- Water Resources Monitoring Plan (GHD, 2023b).
- Groundwater Modelling (GHD, 2023c).
- Surface Water and Mass Balance Modelling (GHD, 2023d).
- Risk Assessment (GHD, 2023e).

This report details the conceptual hydrological and hydrogeological models that have been developed from site data and information.

1.2 Mine Site Location

The mine site is located on the top part of the southern section of the Darling Scarp, approximately 250 km south of Perth and 80 km southeast of Bunbury, adjacent to the town of Greenbushes. The ore body occurs in the extreme south-west portion of the Yilgarn Block in the Balingup Metamorphic Belt. The mine site is located at the top of a catchment that feeds into the Blackwood River via Norilup Brook, Woljenup Creek, and Hester Brook.

Bushland, mostly disturbed because of historic mining activities, predominately surrounds the active mining area, except for the north that borders the Greenbushes townsite. The Southwestern Highway is located just to the east of the mine site, with pastoral land also located to the east. Smaller pastoral areas are located within and south of the bushland to the south of the site.

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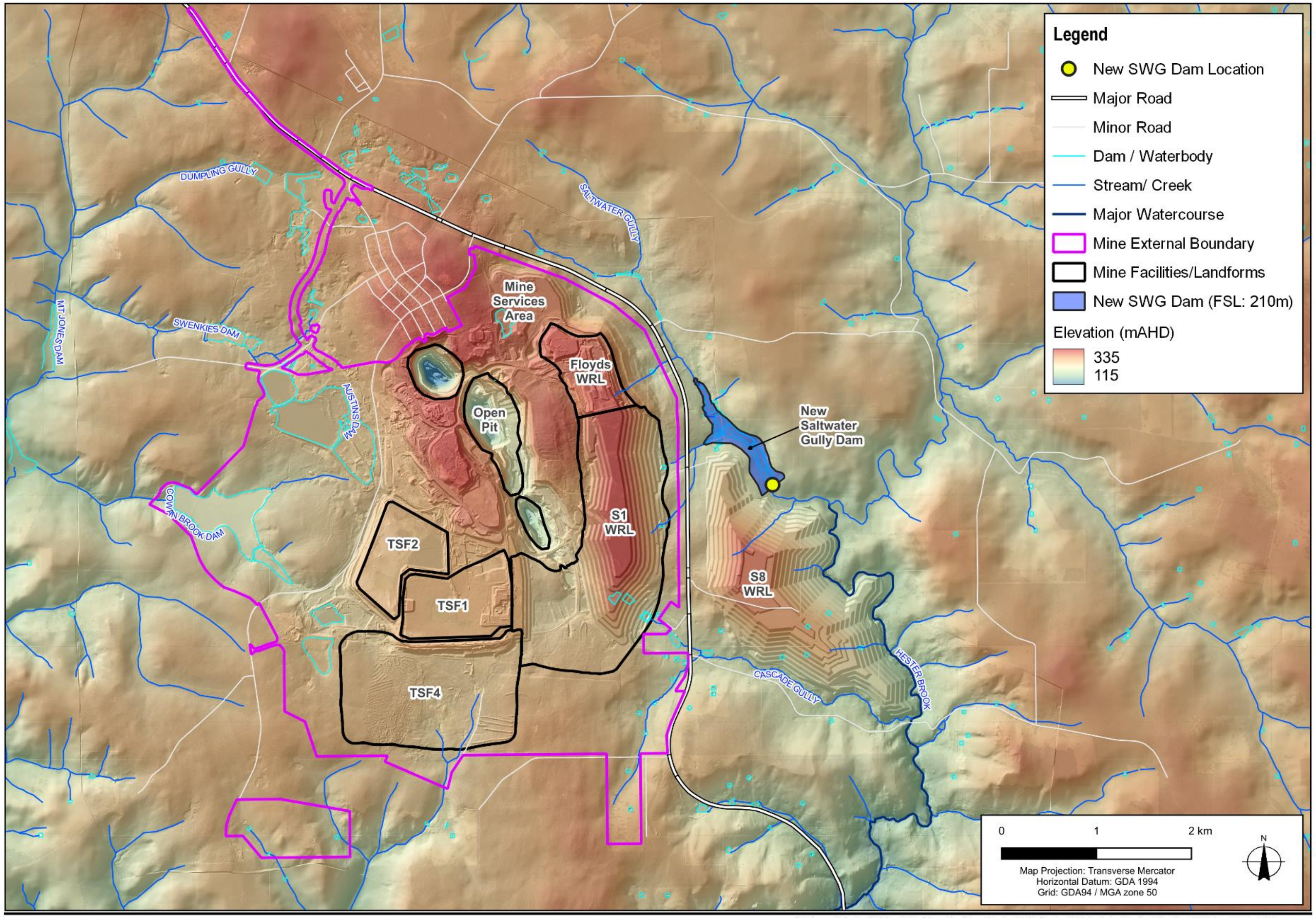
[1] The S1 expansion of Floyds WRL has already been approved and this will form part of the baseline for the risk assessment.



Data Source: GHD - New SWG Dam (2023). Talison - Mine External Boundary (2023), Elevation (2023). Landgate - Major Road/ Minor Road (2020), Dam / Waterbody, Major Watercourse, Minor Watercourse, Stream / Creek (2020), Elevation (2020).

Figure 1.1: Plan of the Proposed Facilities

1.3 Study Area

The Study Area is defined by the domains of the surface water and groundwater models.

The proposed surface water model domain encompasses the construction footprints of the S8 WRL, the new SWG Dam and TSF1, the upstream contributing catchment areas and the downstream receiving environment. This includes Hester Brook and its tributaries up to the confluence with Blackwood River. A plan of the surface water model domain is provided in **Figure 1.2**.

A site wide groundwater model has already been configured and calibrated for the Talison mine site (GHD, 2023f). The model domain will be extended to accommodate the potential groundwater impact areas downgradient of the proposed activities (i.e., to the southeast). The groundwater model domain will also match the surface water model domain in this area. A plan of the surface water model domain is provided in **Figure 1.3**.

1.4 Purpose of this Report

The purpose of this report is to document the further development of the Conceptual Site Model (CSM) in the Study Area to better understand the potential seepage pathways for migration of the Contaminants of Potential Concern (CoPC) to the downgradient receptors and endpoints. Rigorous conceptual modelling of the existing datasets creates a more robust understanding of ground and surface water characteristics and seepage potential to inform the development of the numeric simulation models.

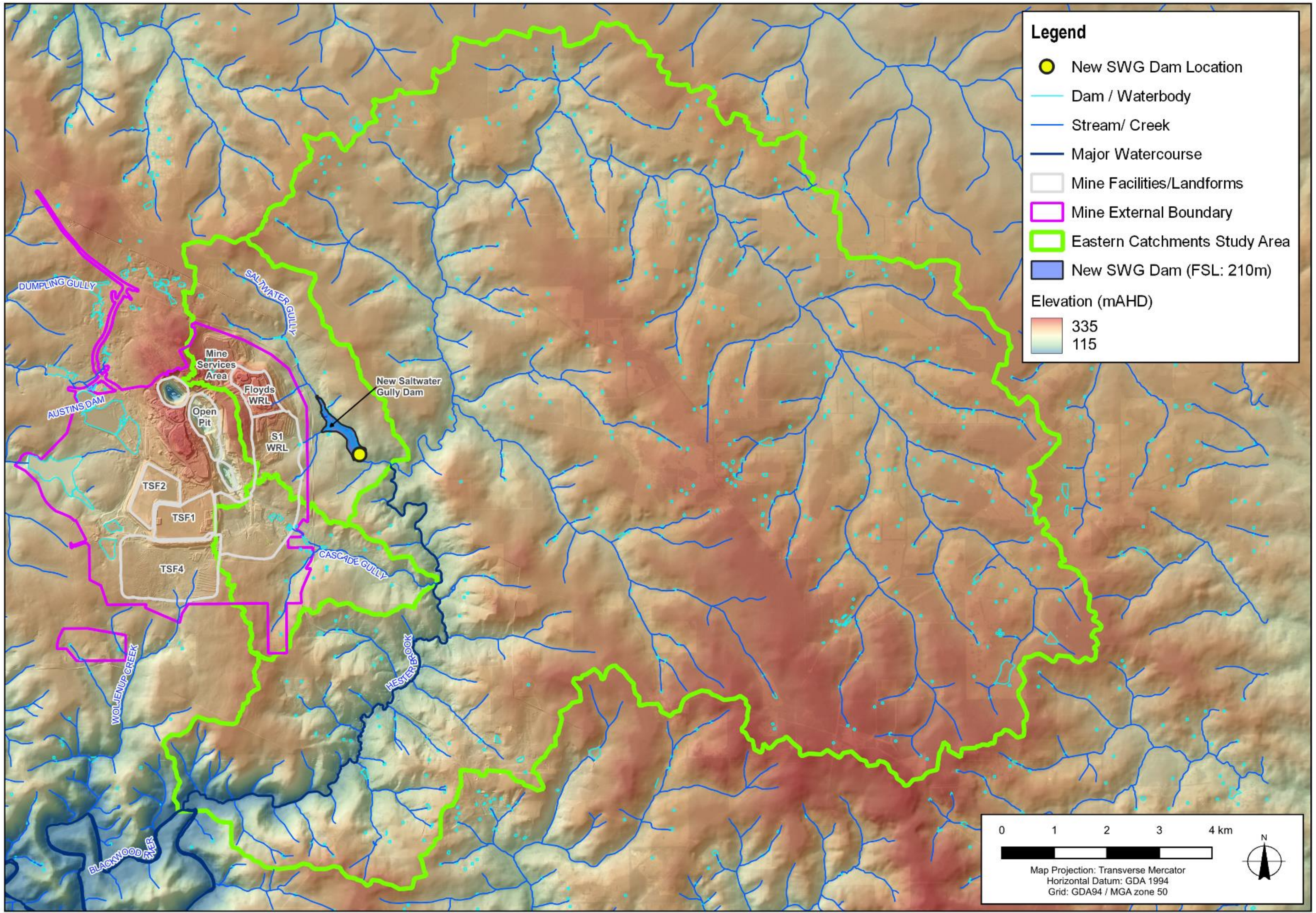
The development (and constraints) of the CSM was based on a review of the following data and information:

– Local and regional hydrogeology.
– Potential surface and groundwater interactions.
– Groundwater flow behaviour through identified hydrogeological units.
– Defined groundwater flow paths and solute transport within groundwater systems and discharges to surface water.
– Beneficial uses of surface and groundwater.

The objectives for preparing the CSM are to:

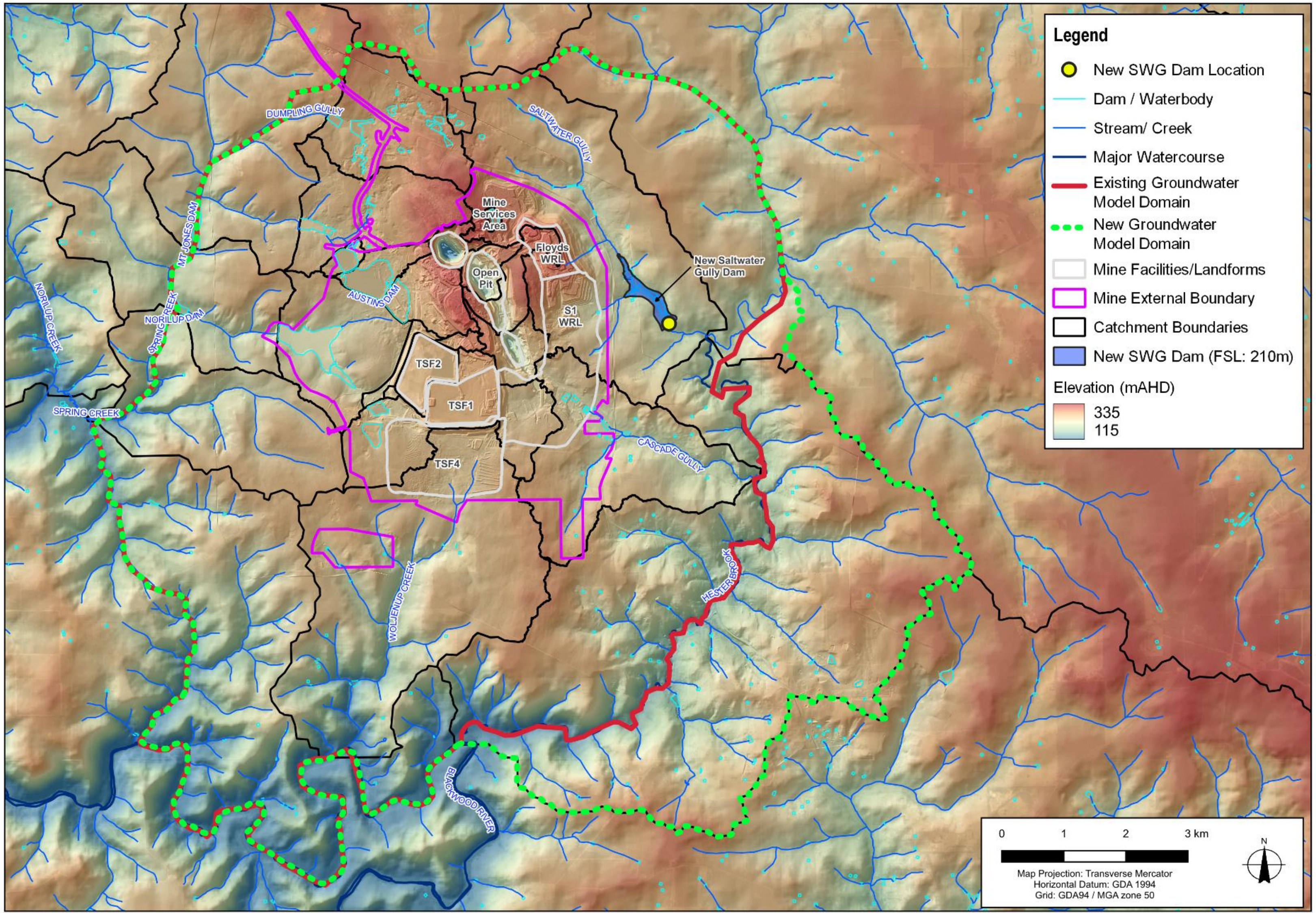
– Provide a basis from which to define and characterise the hydrogeological units across the Study Area.
– Present an understanding of groundwater flow paths as related to hydraulic properties, lateral continuity, and connectivity of identified hydrogeological units.
– Identify and characterise recharge, potential seepage source points, migration paths and discharge/receptor locations within model domains.
– Provide a basis on which to confirm there will be no significant reduction in the quantity of water recharge to the various stock water dams downgradient of the mine site and no detrimental impacts to the beneficial uses of groundwater.

This report contextualises, displays, and discusses datasets that characterise the conceptual understanding presented by the CSM, and outlines fundamental assumptions involved in CSM development. In addition, it is the purpose of this report to detail data gaps identified by the development of the conceptual model and to make recommendations to address limitations to the conceptual understanding.



Data Source: GHD - New SWG Dam, Eastern Catchments Study Area (2023), Mine Facilities/ Landform (2022). Talison - Mine External Boundary (2023), Elevation (2022). Landgate - Dam / Waterbody, Major Watercourse, Minor Watercourse, Stream / Creek (2020), Elevation (2020).

Figure 1.2: Surface Water Model Domain



Data Source: GHD - New SWG Dam (2023), Mine Facilities/ Landform (2022), Catchment Boundaries (2023), Existing/ New Groundwater Model Domain (2023). Talison - Mine External Boundary (2023), Elevation (2023). Landgate - Dam / Waterbody, Major Watercourse, Minor Watercourse, Stream / Creek (2020), Elevation (2020).

Figure 1.3: Groundwater Model Domain

1.5 Limitations and Assumptions

1.5.1 Limitations

This report has been prepared by GHD for Talison and may only be used and relied on by Talison for the purpose agreed between GHD and Talison as set out in **Section 1.4** of this report.

GHD otherwise disclaims responsibility to any person other than Talison arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described throughout this report. GHD disclaims liability arising from any of the assumptions being incorrect.

Depth of analysis is determined by the extent of available datasets; analysis may be restricted in locations that are data poor at the time of reporting. Where this is the case, extrapolation of data trends across a broader scale is applied to support assumptions used in conceptually modelling datasets across all areas of interest.

1.5.2 Assumptions

GHD assumes data provided by Talison, including groundwater and surface water levels, stream and mine inflows and other data are correct. While some data errors may have been noted and attempts made to correct the data, a detailed validation of the data has not been caried out.

2 Climate

Rainfall and evaporation are the key drivers for all hydrological and hydrogeological processes. The site has a distinct wet and dry season, with the highest rainfall occurring between May and September. Some high rainfall events do, however, occur as summer storms. Monthly evaporation exceeds rainfall outside of the wet winter season.

Climate and rainfall data are available from the Bureau of Meteorology (BoM) monitoring station located at Greenbushes (station number 9552), which is located immediately north of the mine site. The timeseries of annual rainfall for the period 1900 to 2022 is depicted in **Figure 2.1**, for which the average annual rainfall is 930 mm. During this period, the annual rainfall generally varied between a low of 480 mm and as high as 1,730 mm.

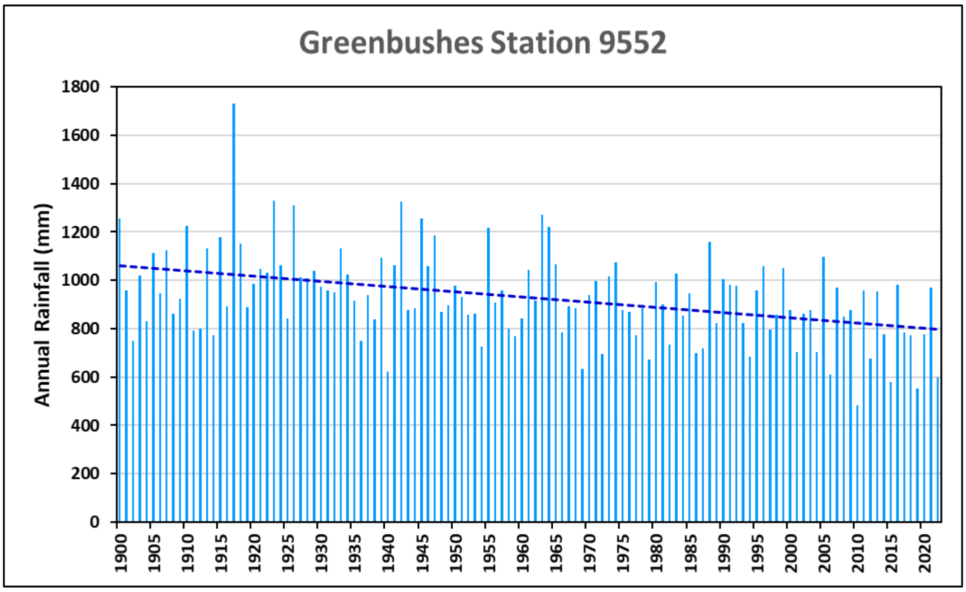


Figure 2.1: Annual Rainfall Totals (1900 to 2022)

The drying climate at the site is noted by the declining slope of the linear trend depicted in **Figure 2.1**. The last 40 years have seen an increasingly drying climate, with the annual averages of rainfall reducing from 919 mm for the decade between 1983 to 1992 to 775 mm for the decade between 2013 to 2022. The progression of this drying pattern over the last four decades is noted in **Table 2.1**.

Table 2.1: Average Annual Rainfall over the Decades

Decade	Average Annual Rainfall (mm)
1983-1992	919
1993-2002	867
2003-2012	810
2013-2022	775

A patched[2] daily climate dataset was obtained for Greenbushes from the SILO[3] web site (Queensland Department of Environment and Science and Bureau of Meteorology, 2022). The monthly averages of daily rainfall and Moreton Wet Evapotranspiration (ET) between 1980 and 2022 are presented in **Figure 2.2** along with the trends in these data sets.

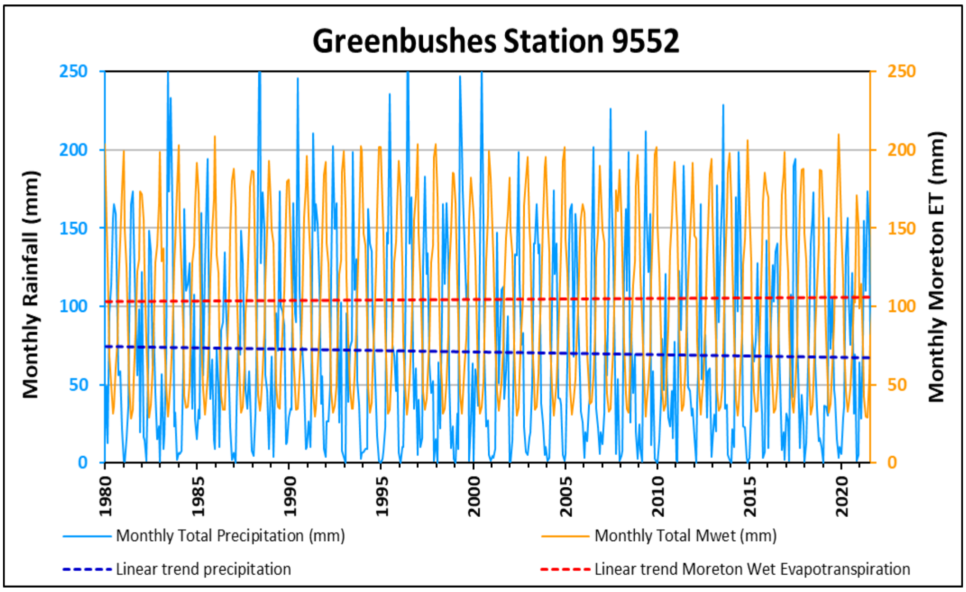


Figure 2.2: Monthly Rainfall and Moreton Wet Evapotranspiration (1980-2022)

The reduction in rainfall between 1980 and 2022 is again noted in **Figure 2.2** by the declining slope of the linear trend, whereas the Moreton Wet ET rate increased slightly over this period. This has led to decreasing recharge and runoff, which is likely to decrease further in future. Monthly evaporation exceeds rainfall outside of this winter wet season.

Figure 2.3 depicts the times series of monthly average of daily rainfall minus daily Moreton Potential ET, or net rainfall, which will be used to derive recharge rates for numerical modelling.

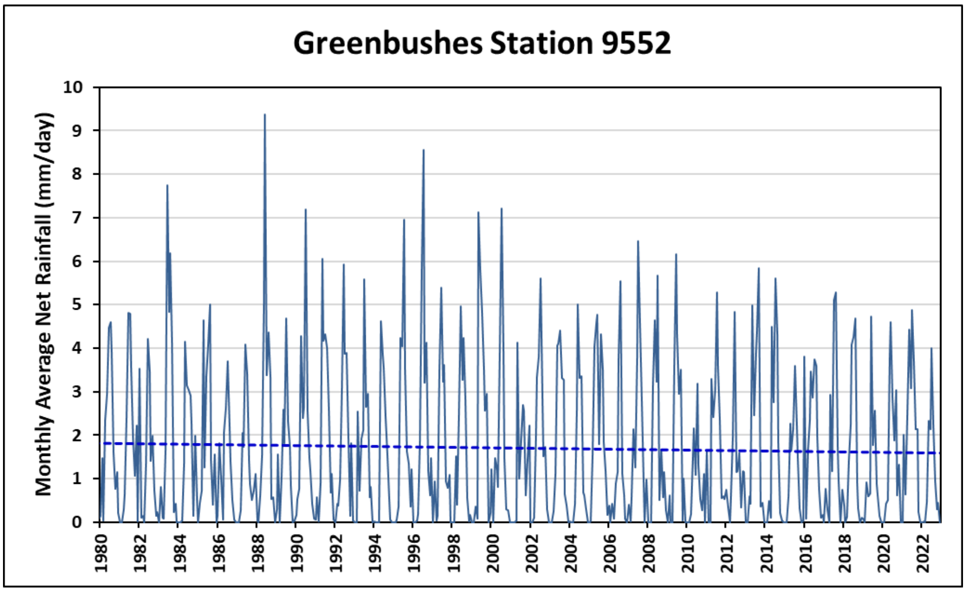


Figure 2.3: Monthly Net Rainfall Rate (1980-2022)

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[2] Patched data uses interpolated data from surrounding sites to fill gaps in the data.

[3] SILO is a database of Australian climate data from 1889 to the present, hosted by the Queensland Department of Environment and Science (DES) constructed from observational data obtained from BoM and other suppliers.

Rainfall data were used to develop time series of rainfall residual by plotting the cumulative difference between average and measured monthly rainfall. These are useful in groundwater studies as average groundwater levels, in areas not immediately adjacent to fixed recharge/discharge areas such as rivers or lakes/dams, tend to follow the residual rainfall curve. A rising residual line indicates a period of above average rainfall, whereas a falling residual indicates below average rainfall.

Figure 2.4 shows the cumulative rainfall residuals from 1900 to 2022 compared to the average over the period 1900 to 2022. **Figure 2.5** shows the residuals from 1900 to 2022 using the pre-1950 average. These plots indicate a marked decrease in rainfall after ~1950, decreasing further from ~2000, which is consistent with the changes in average rainfall noted above.

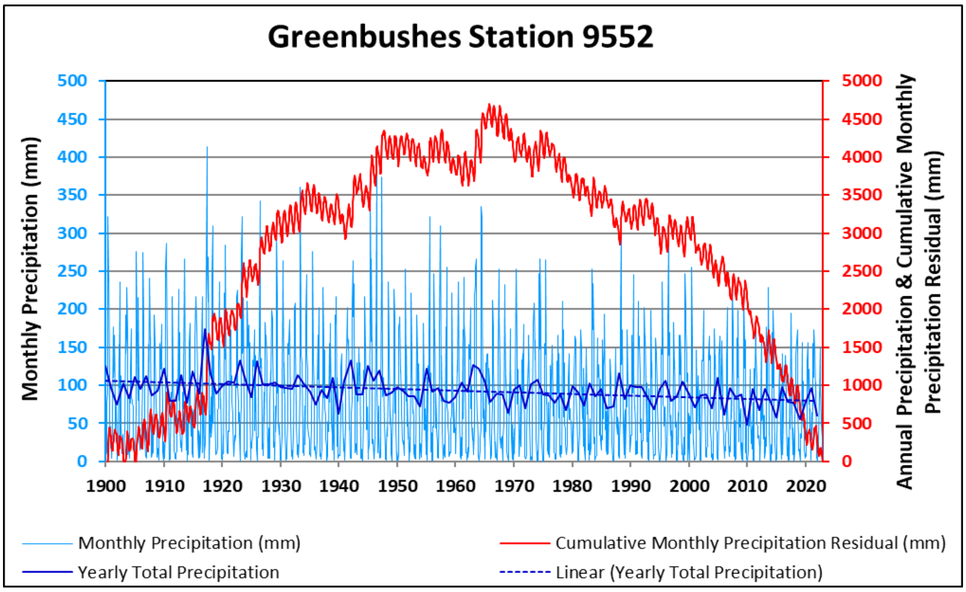

Figure 2.4: Monthly Cumulative Rainfall Residual Plot (1900 to 2022)

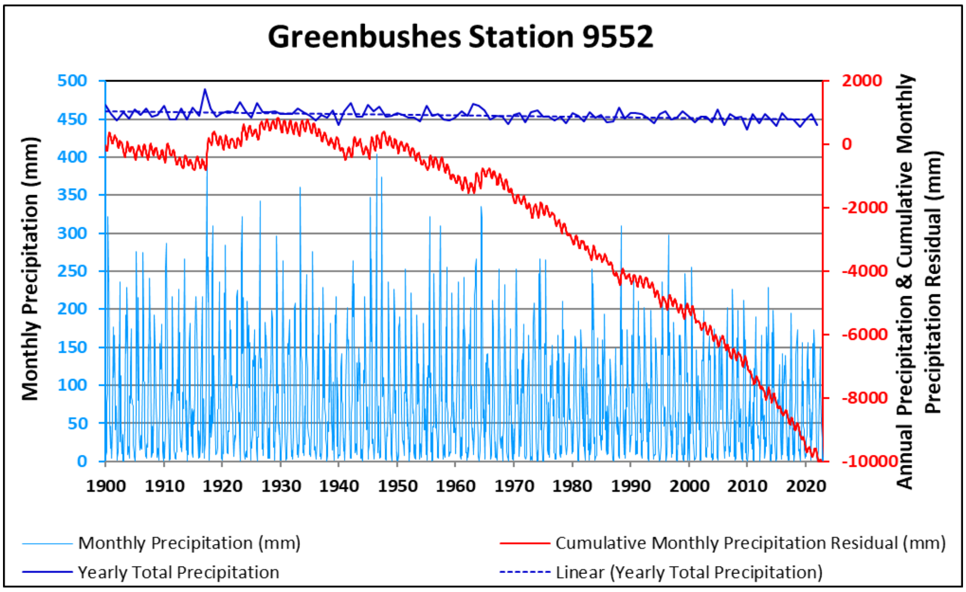

Figure 2.5: Monthly Cumulative Rainfall Residual Plot using pre 1950 Average (1900 to 2022)

3 Hydrological Setting

3.1 Catchment overview

The extent of the surface water model domain depicted in **Figure 1.2** comprises the entire catchment of Hester Brook down to its confluence with the Blackwood River. Hester Brook rises northeast of Greenbushes and has two main tributaries that drain parts of the mine site, namely Saltwater Gully and Cascades Gully. The catchments of these gullies are shown in **Figure 3.1** and are summarised in **Table 3.1**.

Table 3.1: Hester Brook and Tributaries Catchment Areas

Catchment Name	Catchment Area[4]	
	(Ha)	% of Total
Hester Brook total	18,517	100%
Hester Brook upstream of Saltwater Gully confluence	13,173	71%
Hester Brook downstream of Cascades Gully confluence	3,076	17%
Saltwater Gully	1,252	7%
Cascades Gully	643	3%

The combined catchment areas of Saltwater Gully and Cascades Gully makes up 10% of the total Hester Brook Catchment and are considered minor contributors to the overall flow in Hester Brook. Historical dredge mining was undertaken in the upper reaches of Saltwater and Cascades Gullies and that Floyds WRL is also located in these areas and so the quality of the runoff from these areas may be impacted by these activities.

3.2 Streamflow

Continuous streamflow gauging is undertaken by Talison at the four licenced discharge points along the eastern boundary of the mine site, and one on Saltwater Gully. There is also a Department of Water and Environment Regulation (DWER) streamflow gauge located on Hester Brook downstream of the mine site, data from which was downloaded from DWER’s Water Information Reporting (WIR) database. The locations of the various streamflow gauging points are depicted in **Figure 3.1**

Data from the gauging stations have been collated and analysed to describe the hydrological conditions, with the annual average flows over the periods of record being provided in **Table 3.2**. **Figure 3.2** to **Figure 3.7** depict the daily streamflow at each gauge along with the daily rainfall measured at Greenbushes Station 9552.

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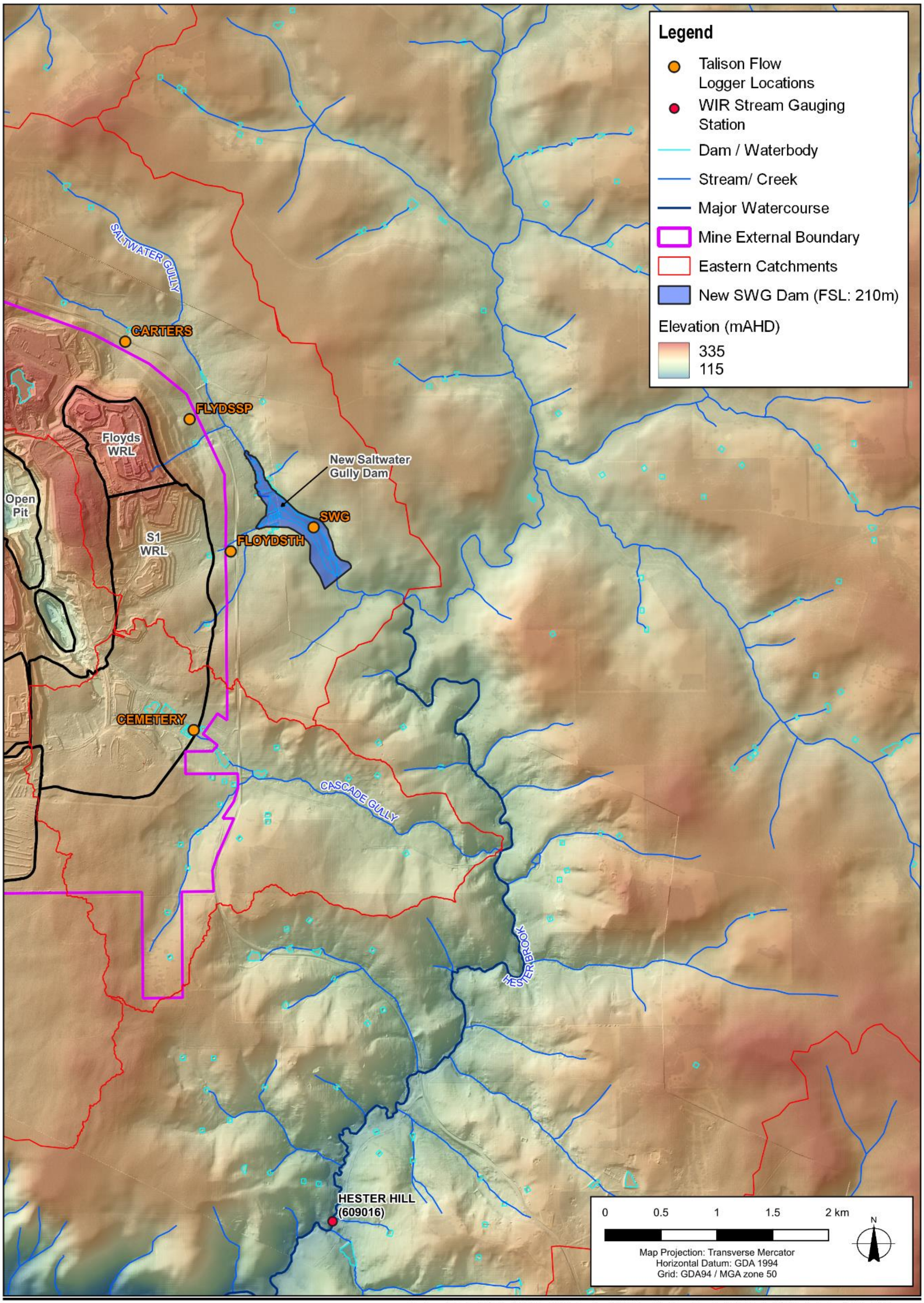
[4] Catchment areas based on exiting extents of waste rock landforms.



Data Source: GHD - New SWG Dam (2023). Mine Facilities/ Landform (2022). Talison - Mine External Boundary (2023), Elevation (2022). Landgate - Dam / Waterbody, Major Watercourse, Minor Watercourse, Stream / Creek (2020), Elevation (2020). WA Landgate SLIP - Background Aerial Imagery.

Figure 3.1: Streamflow Gauging Locations

Table 3.2: Details of Streamflow Gauges and Data

Name	**Station ID**	**Data Source**	**Location**	**Data range**	**Catchment Area (Ha)[5]**	**Average Annual Flow (GL)**
Hester Hill	609016	WIR	Hester Brook, ~4 km southeast of mine site.	28/03/1983 – 01/08/2015	17,402	19.6
Carters Farm	Carters Farm	Talison	Site boundary – discharge from northern end of the WRL into Saltwater Gully	20/04/2018– 01/04/2023	60	0.05
Floyds North	FLOYDSSP	Talison	Site boundary – discharge from Floyds North into Saltwater Gully	01/01/2014 – 01/04/2023	67	0.22
Floyds South	FLOYDSTH	Talison	Site boundary – discharge from Floyds South into Saltwater Gully	30/06/2015 – 01/04/2023	161	0.04
Cemetery Dam	CEMETERY	Talison	Site boundary – discharge from Cemetery catchment into Hester Brook	01/04/2017 - – 01/04/2023	139	0.08
Saltwater Gully	SWG	Talison	Saltwater Gully, downstream of confluence with Floyds South.	01/01/2022 - – 01/04/2023	1,046	0.9

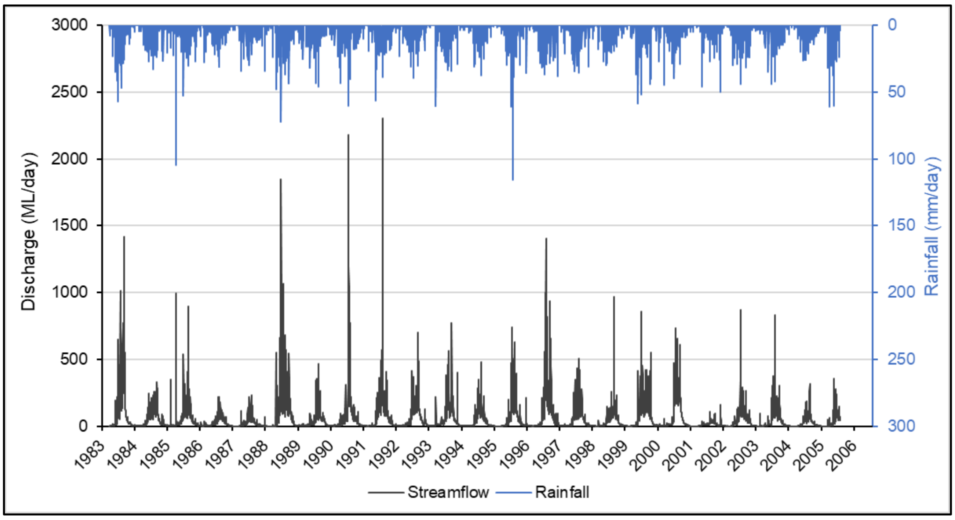


Figure 3.2: Hester Brook (609016) Streamflow

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[5] Catchment areas based on exiting extents of waste rock landforms.

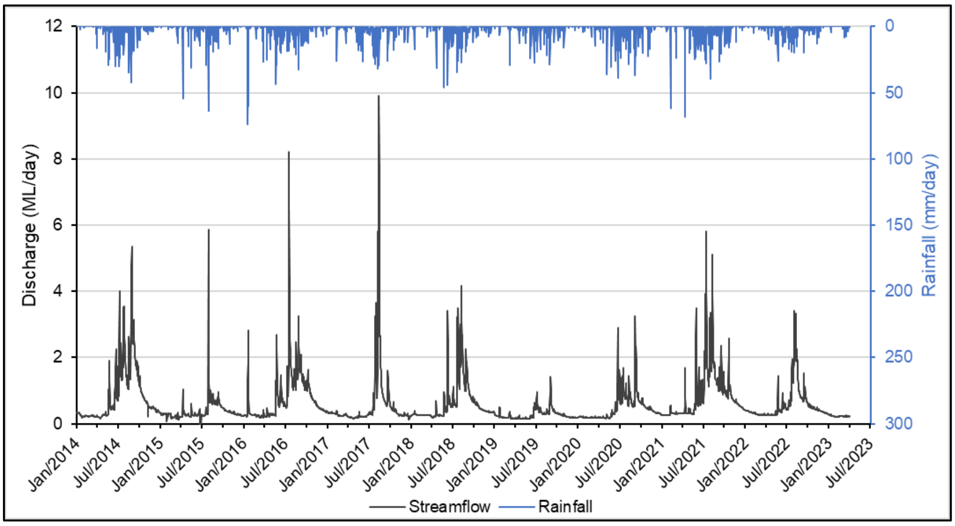


Figure 3.3: Floyds North Streamflow

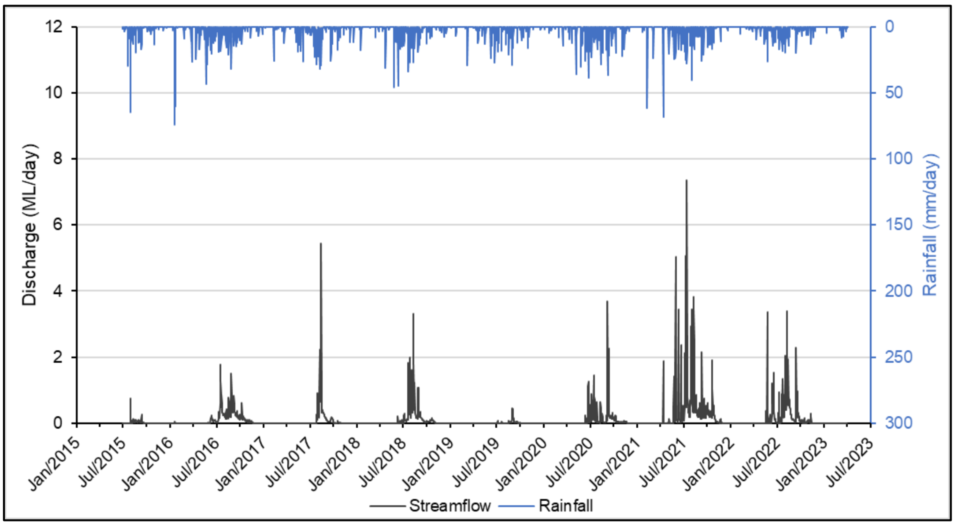


Figure 3.4: Floyds South Streamflow

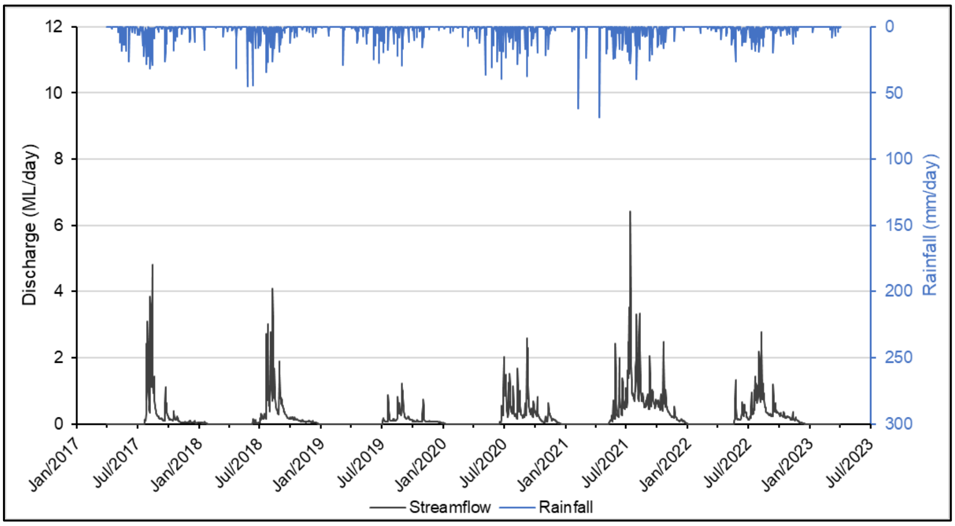


Figure 3.5: Cemetery Dam Streamflow

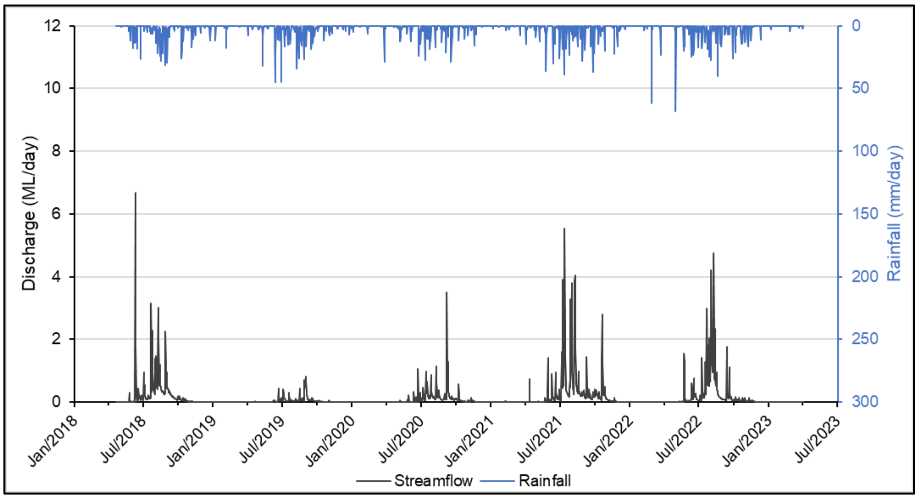


Figure 3.6: Carters Streamflow

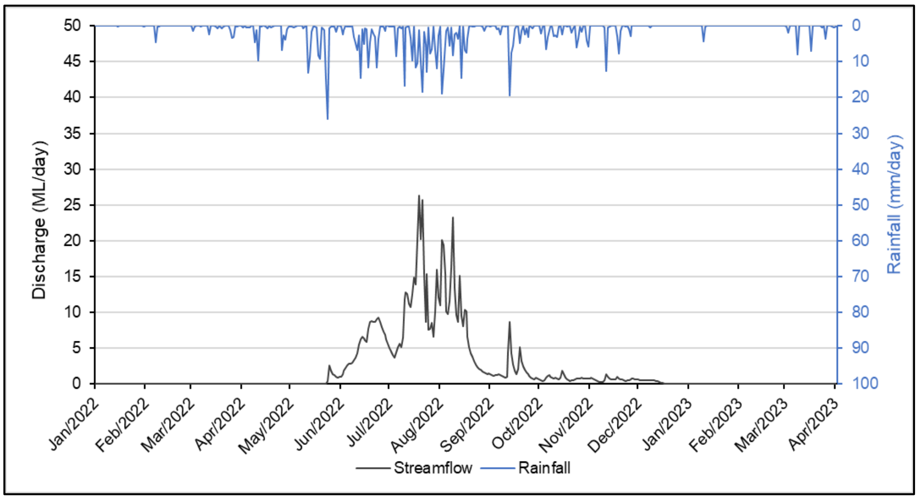


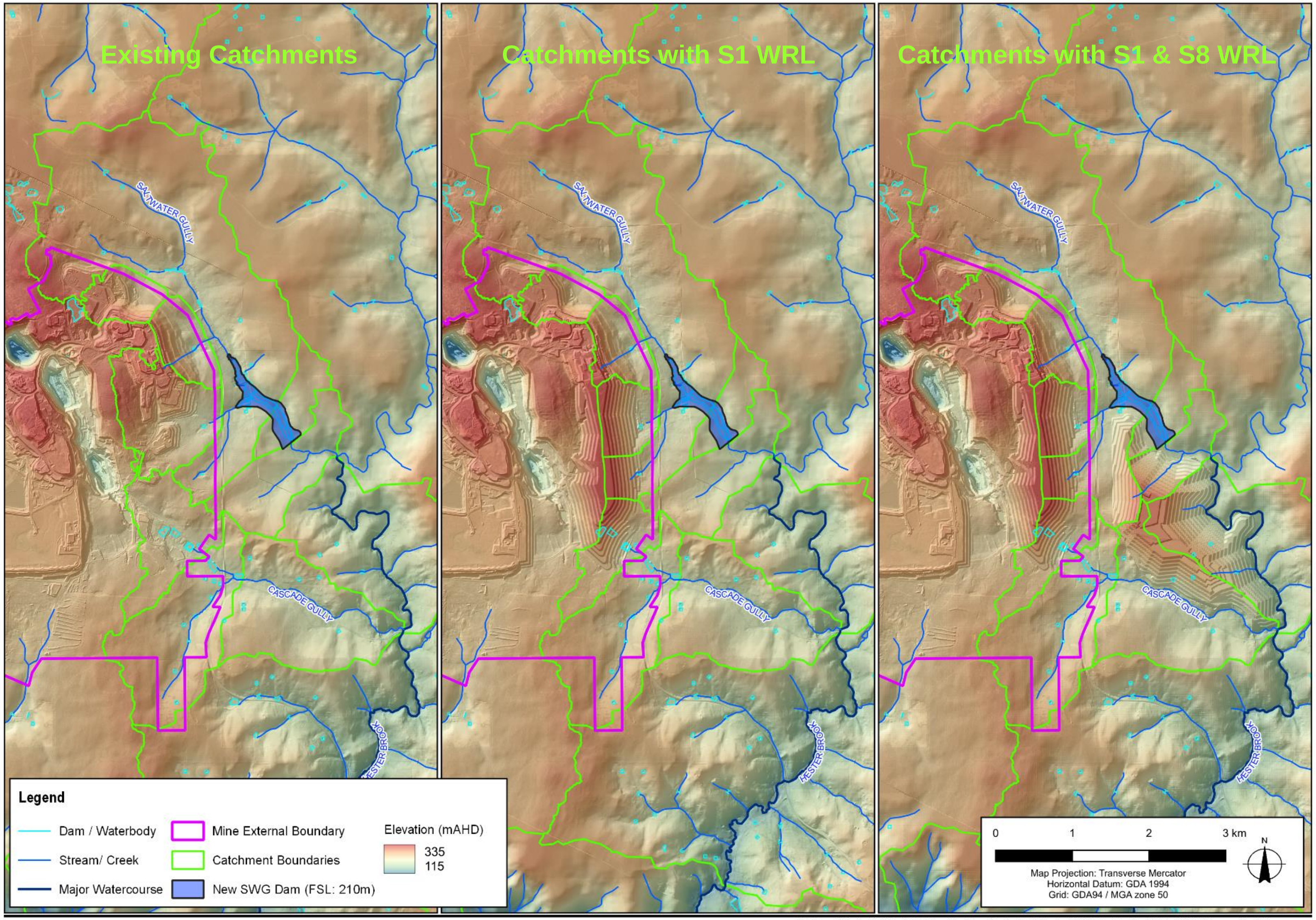
Figure 3.7: SWG Streamflow

The following conditions are noted from these plots:

- Hester Brook flows perennially, but with a marked seasonal variation.
- Floyds North also exhibits perennial flows, which is likely attributable to the storage and slow release of water from Floyds WRL (which makes up a significant portion of the catchment) as base flow throughout the year. This is likely to change once the WRL is capped with surface water being retained by the capped landform.
- Cemetery Dam, Floyds South and Carters Dam only flow seasonally, which is likely due to the smaller proportions of these catchments being made up of the WRL.
- Floyds North catchment contributes significantly greater flows than that of Floyds South catchment, despite similar catchment areas. The reason is likely the increased storage of water and slow release of water from the WRL in Floyds North.

3.3 Changes to Catchment Areas

The establishment of the new WRLs (S1 and S8) will alter the catchments and consequently flows discharging off the site. The changes in catchment areas are detailed in **Table 3.3** and shown in **Figure 3.8**. It should be noted that these catchment areas may change as the design of the landforms and associated drainage infrastructure are finalised.



Data Source: GHD - New SWG Dam (2023). Talison - Mine External Boundary (2022), Elevation (2022-23). Landgate - Dam / Waterbody, Major Watercourse, Minor Watercourse, Stream / Creek (2020), Elevation (2020). WA Landgate SLIP - Background Aerial Imagery.

Figure 3.8: Change in Catchment Areas due to WRL Expansion

Table 3.3: Changes in Catchment Areas (Ha)

Landform	Land use	Saltwater Gully	Cascade Gully	Hester Brook (Total)
Existing	Mine affected[6]	180	41	220
	Other[7]	1,072	603	18,296
	Total	1,252	643	18,517
Existing + S1	Mine affected	190	40	230
	Other	986	555	18,164
	Total	1,176	595	18,394
Existing + S1 + S8	Mine affected	279	123	402
	Other	876	497	17,992
	Total	1,155	620	18,394

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[6] Mine affected catchment areas refers to the footprints of mine facilities.

[7] Other refers to natural vegetation, forested and cleared for agriculture.

4 Conceptual Site Model

4.1 Data Sources and Information

The CSM is based on previous studies, historical groundwater monitoring data, and the recent site-wide hydrogeological investigation. The extent of the numerical groundwater model domain is depicted in **Figure 1.3** and the focus of this CSM is on the eastern extent of the domain.

Information on the local hydrogeology has been collated from drilling data throughout the mine site, the existing Floyds WRL, and the TSFs (see **Appendix A** for bore logs) and from the monitoring of the water levels and groundwater quality (see **Appendix B** for water levels). The locations of the various monitoring wells and investigation bores assessed in this Study are depicted in **Figure 4.1.**

It has been necessary to extrapolate data trends and interpretations to inform the conceptual understanding in data-poor areas to the east and southeast of the existing Floyds WRL and the surrounds of the proposed SWG Dam location. Data from the drilling of several monitoring bore networks adjacent to the TSF1 and TSF4 footprints, sterilisation drilling at the southern end of the Floyds WRL area, and monitoring bore series MB WRD were used to develop the conceptual understanding of the hydrogeology in the study area.

Data for the broader Eastern Catchments is not yet sufficient to model catchment-scale systems and processes without extrapolating data trends from existing datasets, and what is already understood about regional conditions. Assumptions of lateral hydrogeological homogeneity in the saprolitic profile and Archean basement beneath surficial units and the shallow groundwater system have been made in developing the conceptual understanding of hydrogeology.

4.2 Hydrogeological Setting

Drilling results indicate that weathering of the Archean basement rocks occurs from surface to a depth of greater than 20 m below ground level, with the profile comprising clays (saprolite) which are generally of low permeability and having low groundwater yields (GHD, 2018). The drilling information also indicates increased groundwater flows occur in some areas at the transition zone between the clays and extremely weathered basement saprock (GHD, 2023g).

The rise of the groundwater levels in the saprock/bedrock layers during drilling/intersection of groundwater support a working understanding that the upper clays function as a confining layer in large areas of the site (GHD, 2023g). Local groundwater systems are differentiated as shallow, referring to groundwater existing above the confining clay layers in surficial units, and intermediate, describing the groundwater system identified transition from the saprock layer and fractured bedrock, beneath the confining saprolite clays.

Sedimentary sequences have been deposited in paleo-drainage channels in areas surrounding the mine site, which are incised into the saprolite/saprock profile and upper fractured bedrock. These paleo-drainage channels have been extensively mined for tin since its discovery at the end of the Nineteenth Century. The thicknesses of the paleo-drainage channels are not well defined but appear to be typically ~5 m to ~10 m and are noted at a maximum of ~30 m thick in the western part of the mine site adjacent to TSF2. The channels have been backfilled with dredge/sluice spoil, predominately comprising mixed sands and clays, during and following mining.

The palaeo-drainage channels coexist with more recent alluvial sand deposits, both of which occupy the topographic lows and form a shallow alluvial aquifer. The shallow alluvial aquifer is generally coincident with the surface water drainage system and, given that the water levels in the alluvia are close to the surface, this supports an assumption of a high degree of connectivity between surface water and shallow groundwater.

Data Source: GHD - New SWG Dam Location, New SWG Dam (FSL:210m) (2023), Mine Facilities/ Landform (2022). Talison - Mine External Boundary (2022). Landgate - Dam / Waterbody, Major Watercourse, Minor Watercourse, Stream / Creek, Major Road/ Minor Road (2020). WA Landgate SLIP - Background Aerial Imagery.

Figure 4.1: Monitoring Bores used to Develop the Coneptual Site Model

The alluvial profile consists of fine to medium sands and fine to medium gravels composed of feldspathic/quartz and lateritic/ferrierite and transported gravelly clays. Drilling indicates laterally discontinuous zones of a thin (~1 m to ~2 m) Laterite caprock. This has been observed most notably in drill cuttings from bores drilled in the Floyds WRL area forming a vuggy, porous lens of increased hydraulic conductivity above the impervious clay layers of the upper saprolitic profile. Infiltration through the deposited waste material is thought to migrate laterally down gradient along the lateritic caprock.

The common occurrence of water bodies within the alluvium is deemed to reflect the shallow groundwater levels. Within the shallow alluvial system, groundwater flow will generally follow local topography along current drainage lines and paleochannels. Given the low permeability of the underlying clays, this possibly non-contiguous shallow groundwater system demonstrates a restricted hydraulic connection in upland areas within the Archean basement. This is further supported by notable differences in the chemical profiles of the shallow and deep groundwater systems.

4.3 Hydrogeological Units

Geological logging from the drilling of the bores indicates the following geological profile:

1. Surficial/shallow unit:
    - Transported/alluvial materials: Medium sands, lateritic gravels, and gravelly clay, dredge material (historic mine deposition).
    - Fine to medium grained quartz/feldspathic sands averaging ~1 m to ~3 m thick.
    - Surficial laterite averaging ~1 m to ~2 m thick.
2. Intermediate unit:
    - The upper basement rocks typically develop lateritic weathering profiles ~20 m to ~50 m thick, with a saprolitic profile comprising upper and lower clay layers, which yield little groundwater flow and have low or negligible permeability.
    - Upper saprolitic clay: Pallid, leached saprolitic clays and highly oxidised bedrock.
    - Lower saprolitic clay: Non-pallid, darker saprolitic clays.
    - Transition zone of saprock/moderately oxidised bedrock defines the base of the saprolitic profile.
3. Basement Unit:
    - Fresh bedrock (not oxidised) which exhibits a low permeability (fractured bedrock).

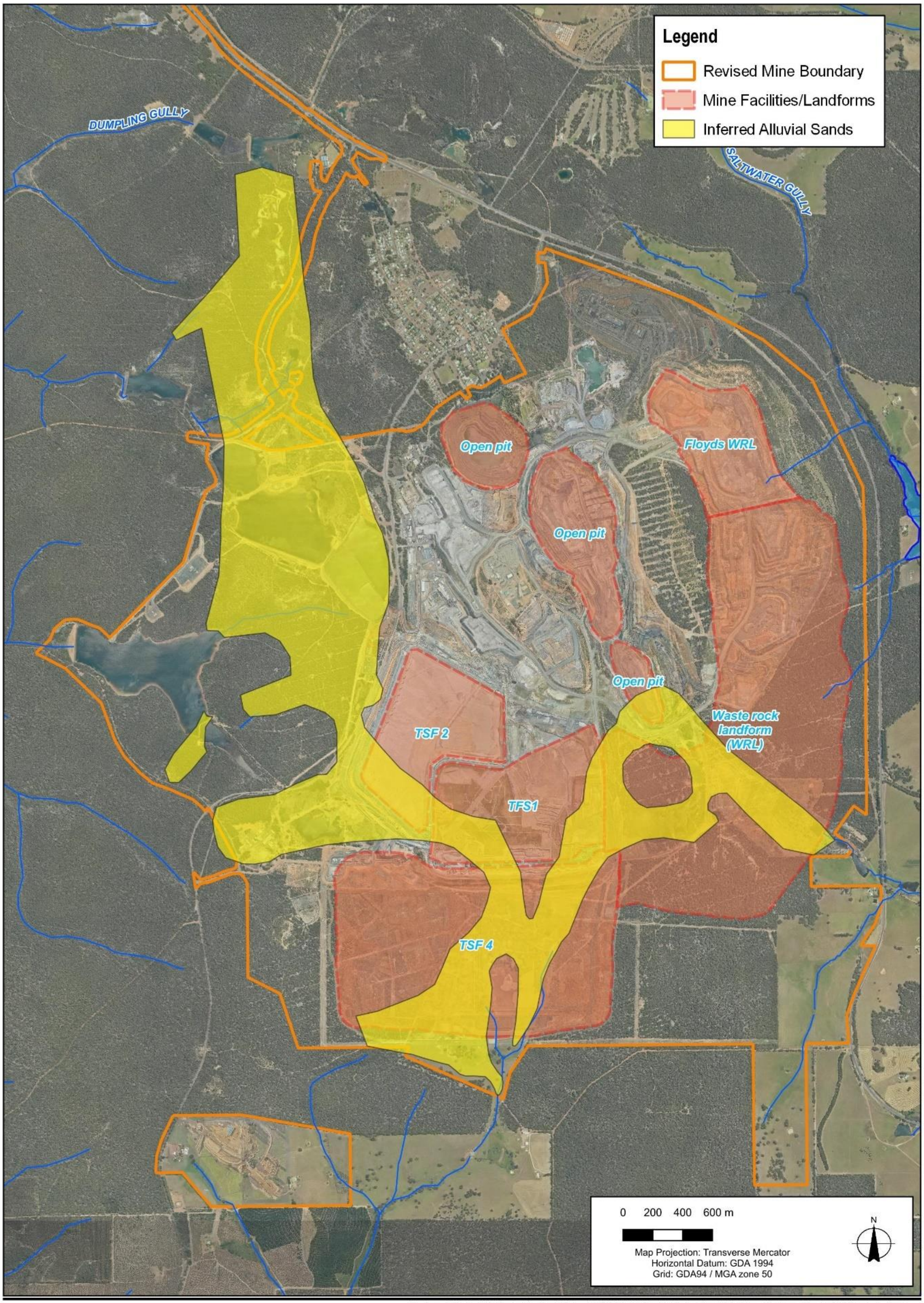
4.4 Aquifer Characteristics

4.4.1 Surficial Sands

The upper unit of surficial sands is made up of fine to medium grained quartz sands, with gravels and clayey gravels, ranging from ~2 m to ~3 m in thickness up to ~30m. The conceptual distribution of the unit is depicted in **Figure 4.2**.

Evidence from surface mapping and test pitting (GHD, 2017) indicates that the surficial sands are saturated in winter (deemed perched rainfall as it has around 50 mg/L chloride), with groundwater levels close to 1 m below the ground surface. Drilling shows this unit is laterally discontinuous but exhibiting sufficient connectivity to act as flow paths for infiltrating recharge and seepage migration, forming higher-permeability flow channels, along topographic lows in the upper boundary of the saprolitic profile in which it commonly occurs.

Historically, deposited mine waste materials, consisting of dumped clays and sands often in a matrix of poorly sorted, transported gravels and other alluvial material, is present across areas of the site, and can be considered as part of the surficial sands unit for the purposes of this report.



Data Source: GHD - New SWG Dam Location, New SWG Dam (FSL:210m) (2023), Mine Facilities/ Landform (2022). Talison - Mine External Boundary (2022). Landgate - Dam / Waterbody, Major Watercourse, Minor Watercourse, Stream / Creek, Major Road/ Minor Road (2020). WA Landgate SLIP - Background Aerial Imagery.

Figure 4.2 Distribution of Inferred Sands[8]

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[8] Mapping of the inferred sands is not complete and focussed on the western and southern extents of the mine site.

A layer of vuggy, weathered lateritic caprock and lateritic gravel, is shown by available drilling data to cover most of the existing and proposed WRL footprint, extending east to SWG Dam, and south to the MB WRD_SE bores, before pinching out at the surface. The connectivity of the zones of intact caprock is not known with great certainty, but groundwater monitoring and migration analysis indicates it is prominent enough to significantly influence groundwater flow patterns of infiltration through WRD and WRL profiles. Forming a lens of relatively high hydraulic conductivity in relation to the impervious clays, it is continuous enough in this region to facilitate the movement of groundwater from the WRLs down gradient to discharge points along Saltwater Gully (see **Section 4.7.2**).

4.4.2 Intermediate Clays

The saprolitic profile thickness derived from sterilisation drilling and monitoring bore data shows depth to bedrock is greater than ~15 m across the site, and consistently observed to be ~25 m to ~30 m below ground level. Minor points of basement rock highs outcrop the surface at the regional scale. The permeability of the saprolitic clays is low (see **Section 4.6)** and therefore is not considered to comprise exploitable groundwater resources. Intermediate and deep drilling across the wider mine site consistently shows the saprolitic profile differentiates into an upper, pallid layer and lower, non-pallid layer of saprolitic clays, with effectively equal thickness.

During installation of the monitoring bores, water strikes typically occurred co-incident within the weathered bedrock (saprock), within the bottom few metres of the saprolite profile overlying the unoxidised bedrock. The unit is deemed as laterally continuous, given the common occurrence of water strikes during drilling. With a moderate/low hydraulic conductivity (See **Section 4.6**) and, given that the unit is relatively thin (~2 m to ~4 m thick), the unit is unlikely to comprise an exploitable groundwater resource.

4.4.3 Basement

The bedrock has not been extensively tested via monitoring well drilling within the bounds of the Eastern Catchments, but where monitoring wells have been installed, the bedrock appears to be competent with a sharp contact between the weathered bedrock and unoxidised bedrock. Where intersected, the bedrock generally exhibits few secondary joints/foliations/open fractures, which indicates that that the permeability is low. In addition, the open-pit groundwater inflows are minor and indicate that the bedrock permeability is low/very low, supported by calibration of the computer model using measured pit inflows (GHD, 2019).

4.5 Cross Section Analysis

4.5.1 Overview

The primary means of displaying the CSM is through cross section analyses along the potential discharge pathways from the mine site. The transects used for cross sectional analysis are depicted in **Figure 4.3** and are indicative of the following:

- **Section A-A':** West–East section from the mine pit through the future S1 WRL down the Saltwater Gully valley to SWG Dam and up and over the watershed to Hester Brook, which is representative of typical groundwater pathways from Floyds and S1 WRLs (see **Figure 4.4**).
- **Section B-B':** Northwest–Southeast section from the area immediately east of TSF1 through Cemetery Dam and along Cascades Gully, which is representative of potential groundwater pathway from TSF1 and the future S2 and S8 WRLs (see **Figure 4.5**).
- **Section C-C':** North–South section from the area immediately east of TSF1 through the future S2 WRL and/or pit extension, which is representative of a potential groundwater pathway for seepage from east of TSF1 (see **Figure 4.6**).

- **Section D-D':** West–East section from the area west of TSF2 through to the area east of TSF1, which is also representative of a potential groundwater pathway for seepage from TSF1 (see **Figure 4.7**).

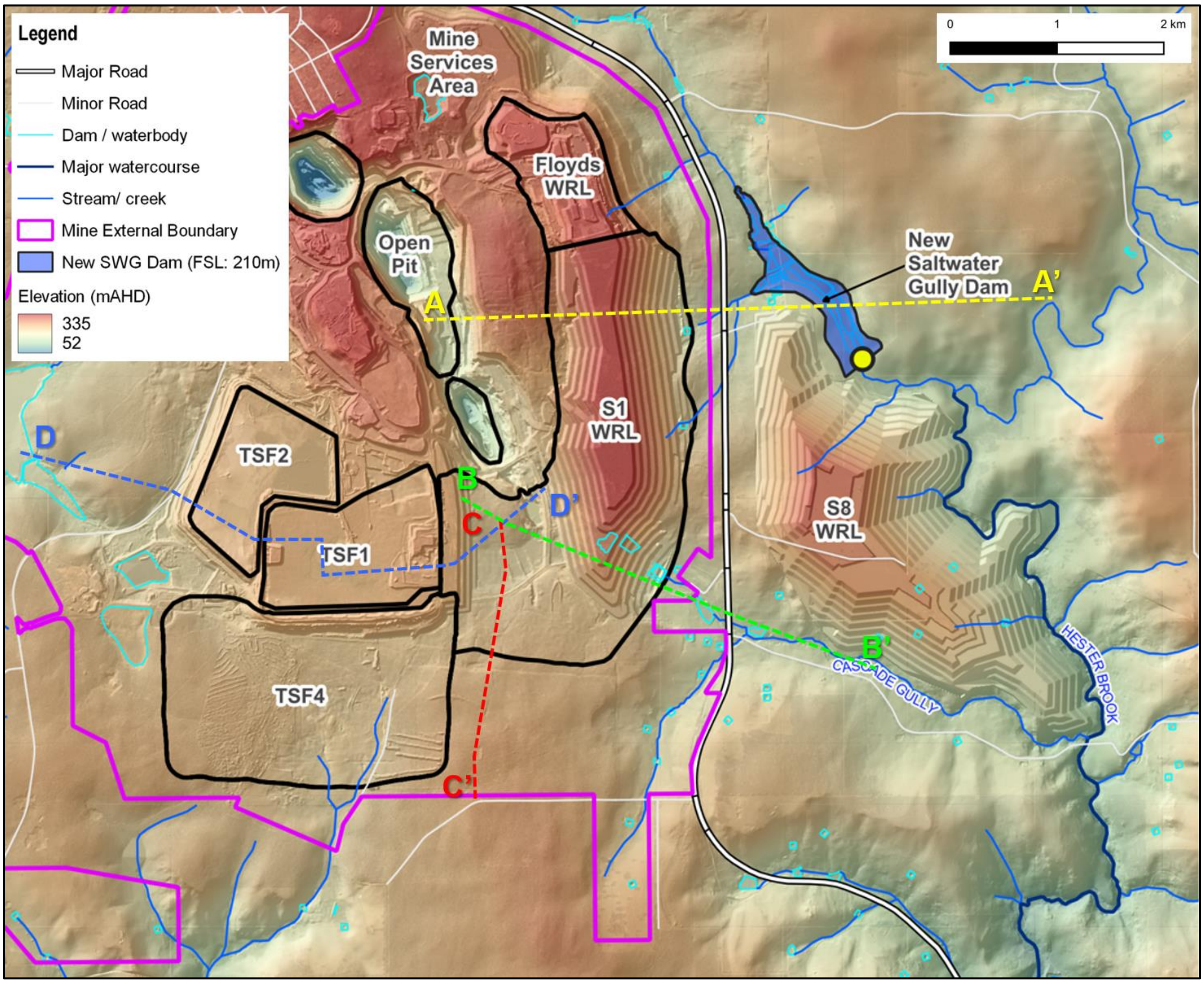


Figure 4.3: Cross Section Transects

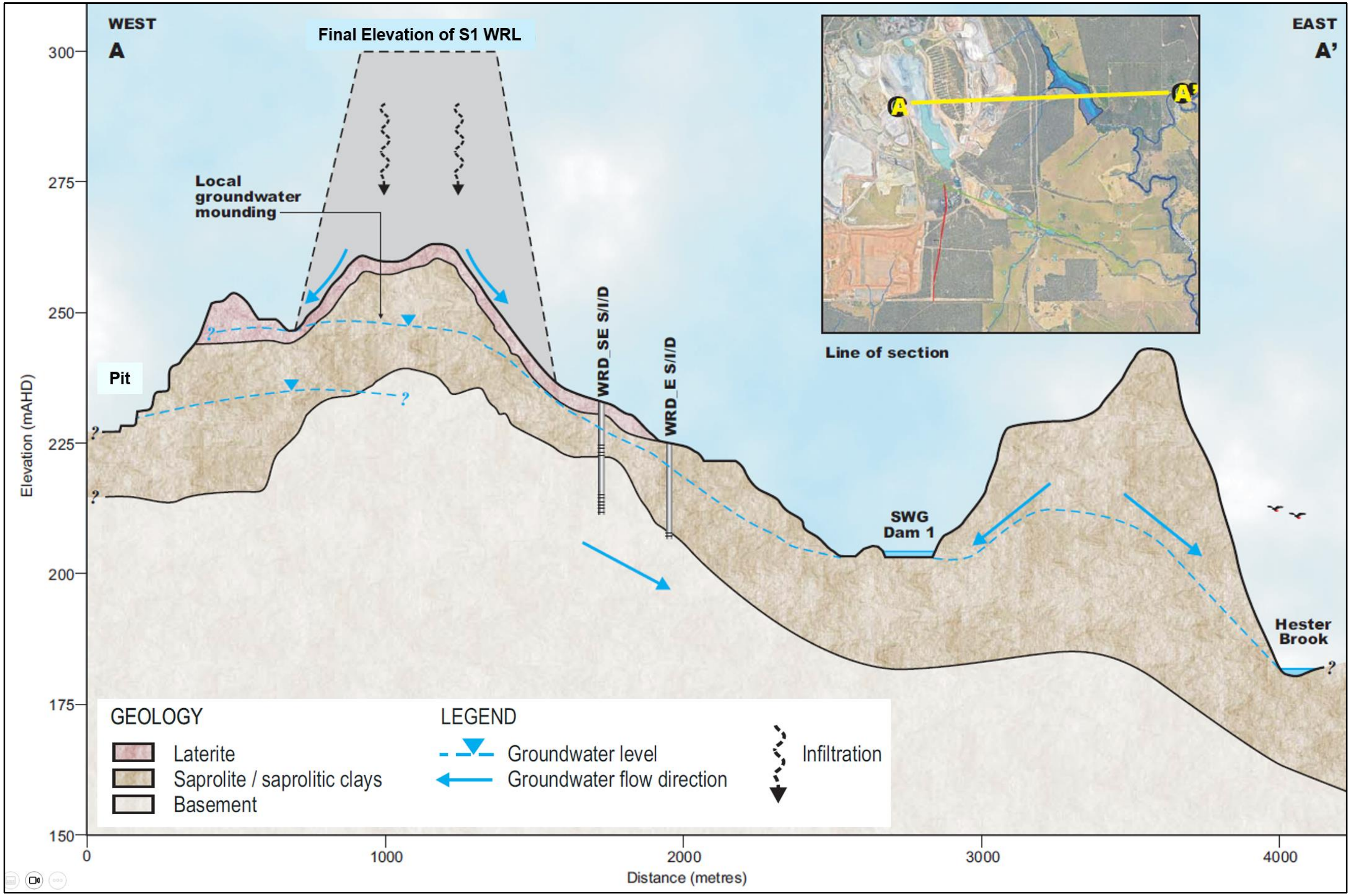


Figure 4.4: Conceptual Model Section A-A'

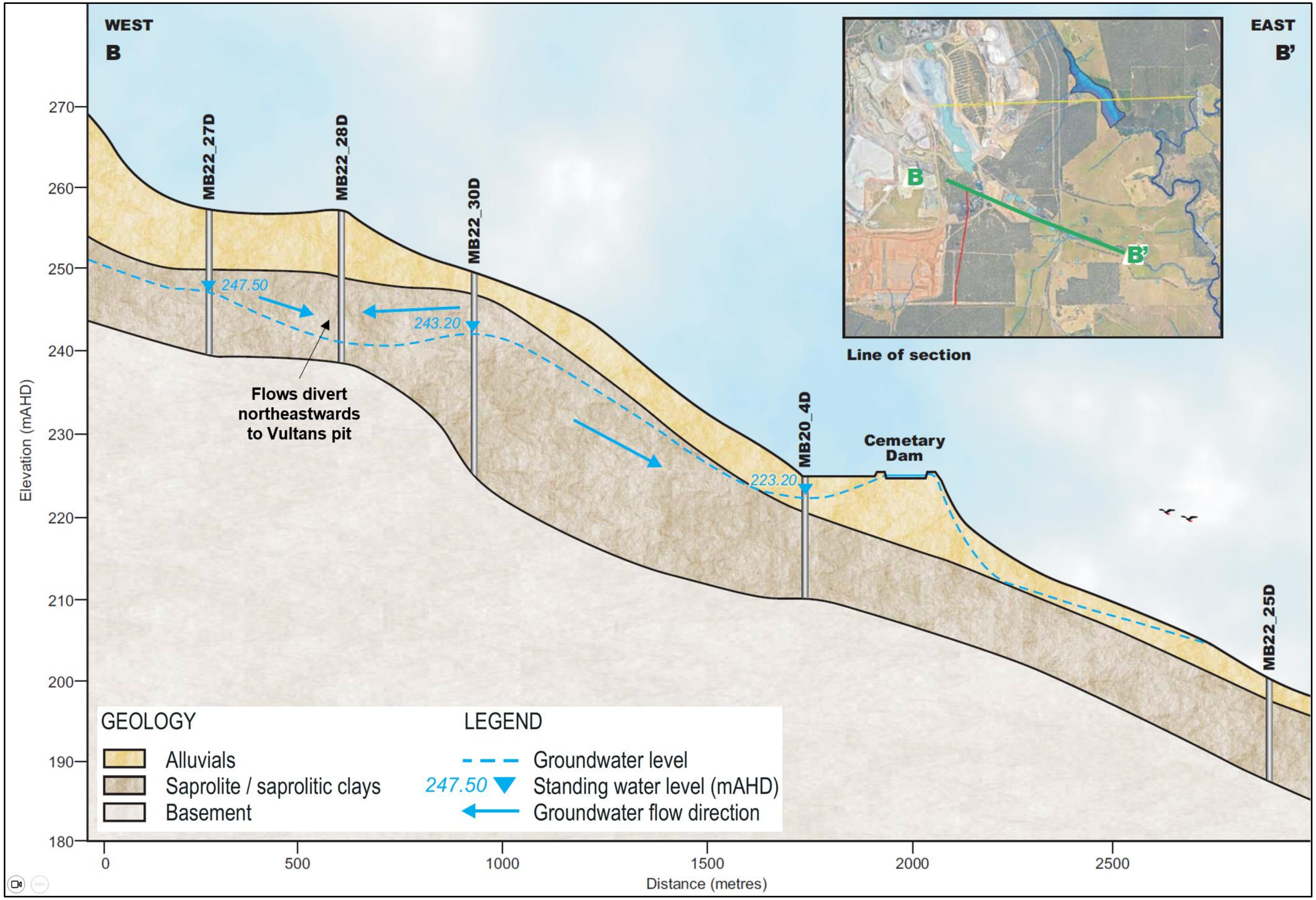


Figure 4.5: Conceptual Model Section B-B'

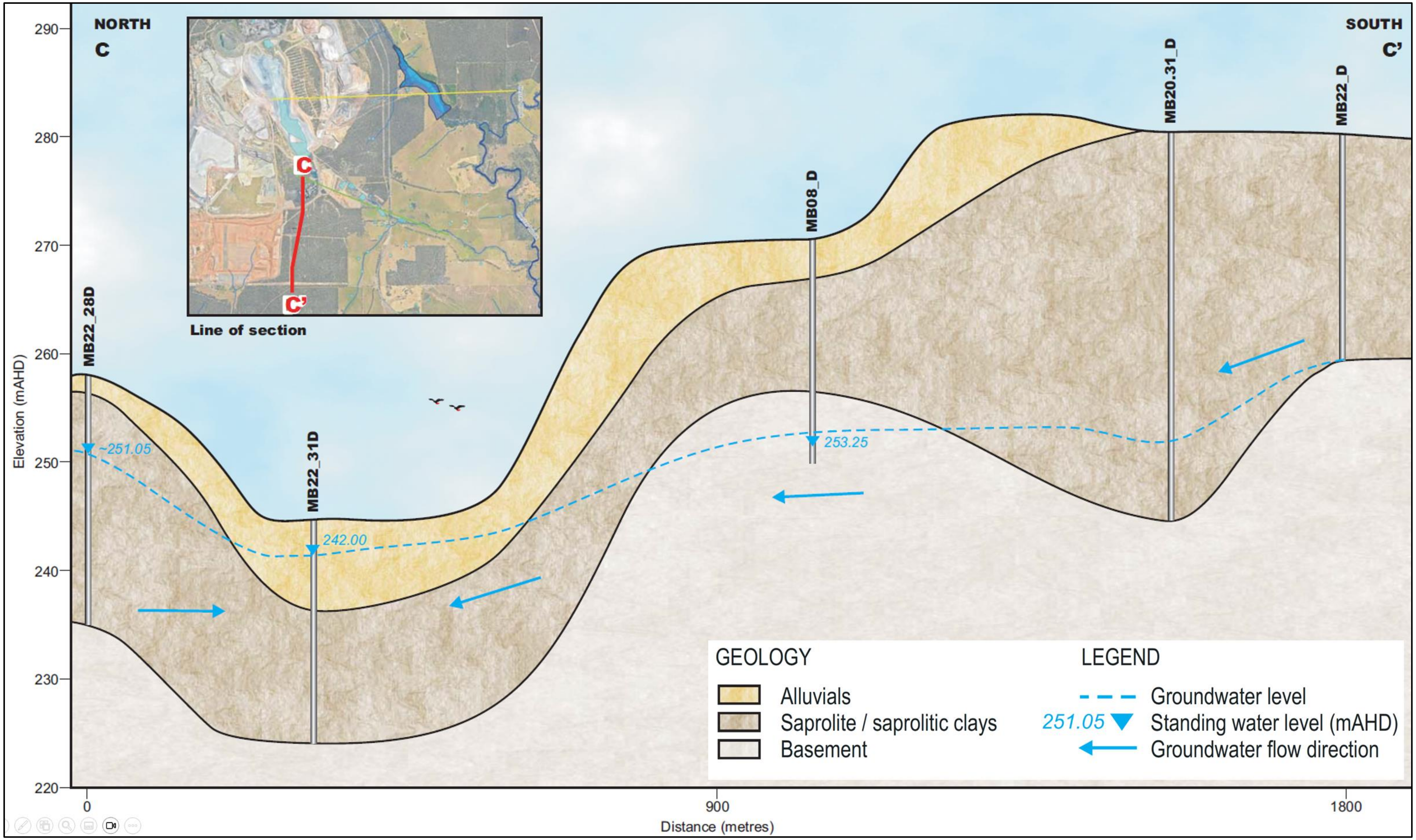


Figure 4.6: Conceptual Model Section C-C'

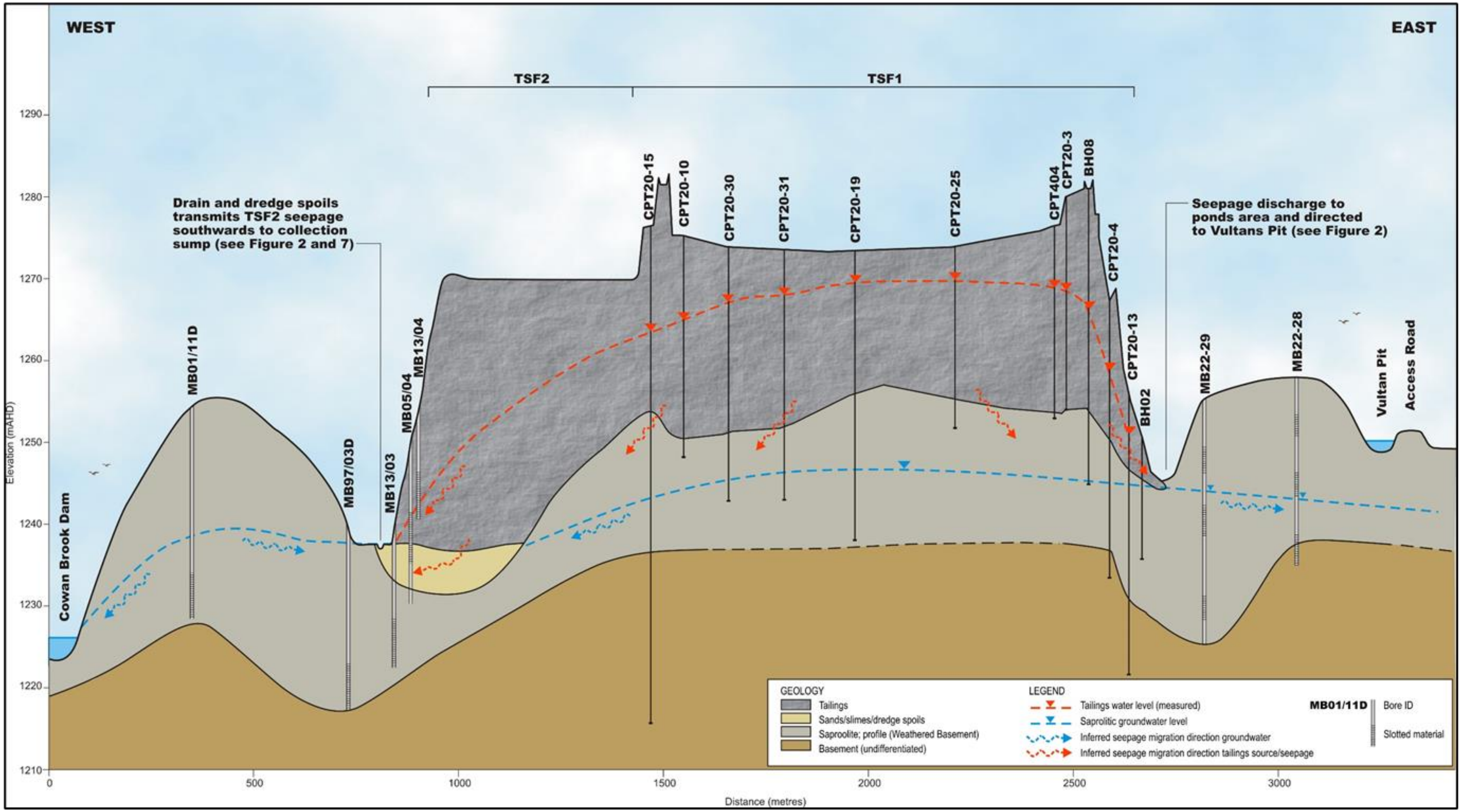


Figure 4.7: Conceptual Model Section D-D' (GHD, 2023h)

4.5.2 Section A-A’

Surficial lateritic sands and lenses of intact laterite caprock appear laterally continuous across the mine site, pinching out at the surface between MB_WRD E and Saltwater Gully. The saprolitic profile maintains a consistent thickness of ~20 m to ~30 m beneath the surficial unit, following the topographic surface and gradient from a depth of ~1 m to ~2 m below ground level until outcropping at the surface and thinning slightly at the surficial unit boundary to Hester Brook.

Differentiation between the upper and lower saprolitic clay layers was not specified in all geology logs, these being more generally classified as a single saprolitic clay layer. The assumption is that the depths of the upper and lower layers remain consistent. Bores targeting the saprock transition zone suggest it has a thickness of ~2 m to ~4 m following the surface of the Archean basement unit. Geology follows a downslope gradient from the base of the Floyds/S1 WRL (~265 mAHD) to the topographic lows of Saltwater Gully and Hester Brook (~200 mAHD) where the water table expresses itself at the surface.

Groundwater mounding beneath the WRL is inferred from the Site-Wide Hydrogeological Investigation (GHD, 2018). Localised and episodic surface water expressions within the alluvial sands/laterite observed below the toe of Floyds WRL indicate water levels of the local shallow groundwater system within the mine boundary. The water table then intersects the top of the saprolitic profile, groundwater moving east along the transect before expressing at locations where the clays outcrop at the surface. Conceptually, leachate from the Floyds/S1 WRL is likely to follow a similar flow path.

4.5.3 Section B-B’

The continuation of surficial laterite is observed at monitoring bore MB WRD SE, indicating lateral continuity to the south as far as this data point. The absence of surficial laterite at monitoring bore MB25_D supports the assumption that the unit pinches out in a consistent manner to the east of mine operations, discharging groundwater into the surface features along Cascade Gully. Monitoring bores MB22_27, MB22_28 and MB30 indicate lenses of deposited gravel and clay within the mine boundary, confirming the heterogenous nature of the shallow groundwater system due to historical deposition of different mine waste materials. The thickness of the saprolitic profile remains consistent across the monitoring bores in this cross section, following the topographic gradient downwards from the boundary of TSF1 (~275 mAHD) to MB25 (~202 mAHD)

Groundwater hydraulic gradients indicate minor localised mounding within the mine boundary. Extrapolation of the gradient trend suggests Cemetery Dam gains groundwater along its western edge and loses groundwater to the east before the gradient likely intersects ground level to the east of MB25. The converging hydraulic gradients in the vicinity of MB22 are the result in a change in groundwater flow direction to the north-east towards Vultans Pit.

4.5.4 Section C-C’

The cross section indicates alluvial sands, particularly the feldspathic/quartz and lateritic sands and gravels, are assumed relatively continuous east of TSF1 and extends some of the way to discharge points at Woljenup Creek to the south. Monitoring bores MB22_D and PB001D indicate lateritic gravels extend south to these data points to a depth of ~3 m, suggesting this surficial unit is present in a relatively continuous manner south of the mine boundary, facilitating the movement of groundwater in the southern region of the mine area toward and along a flow path south toward the Woljinup creek system.

The alluvial layer above the upper saprolitic clay layer is thicker than observed elsewhere in the southern region, with the top of the clay layer being observed clearly at an average depth of ~10 m. Bore logs display a thin layer of what is recorded as “gravelly saprolitic clay” at depths shallower than this but the presence of alluvial material beneath these lenses suggests this may be transported or alluvial. Similarly, monitoring bores and geotechnical drilling along the southern border of TSF4 indicate the gravelly clays detailed above extend south from the facility, reaching a depth of up to

~8 m below ground level (BGL). The saprolitic profile in this area presents with reduced thickness, (~10 m to ~15 m) and the top of the weathered bedrock appears consistent across the few southern bores at a depth of ~20 m to ~25 m, suggesting a thinning out of the saprolitic profile in the southern region of the study area.

The topography of the southern region is punctuated by high points to the south-east and south-west, incised by a valley running north-south along the eastern boundary of TSF4 (~270 mAHD) down to the Woljenup Creek system south of TSF4 (~170 m AHD). As such, groundwater flows back towards the mine operations from the higher elevation of the hill to the south until joining the preferential flow path flowing south to Woljenup creek at the southern end, the path following Cascade Gully to the east, and back toward pit operations at the northern end.

4.5.5 Section D-D’

A detailed CSM and risk assessment of TSF1 has been completed separately (GHD, 2023h) and a summary of the lithology and groundwater flow directions is provided here.

A combination of undifferentiated historic dredge spoils/sands/old tailings occupy the lower lying areas surrounding TSF1, the spatial distribution of which is presented in **Figure 4.2**. The thickness and permeability of this material has not been tested well, but is inferred to be ~1 m to ~3 m thick immediately south and east of TSF1 (the material to the south has been removed from the footprint of TSF4, which is under construction).

The thickness of the saprolitic profile beneath the TSF1 is estimated to be between ~15 m and ~20 m thick although, beneath the dredge spoils/sand, the thickness of the saprolite is inferred as between ~5 m to 10 m thick. Permeability testing data of the saprolitic profile beneath the TSF1 derived from CPT testing methods is low at an average of 4×10^{-4} m/day (GHD, 2021), which is consistent with the permeability of clays.

The permeability of the bedrock has not been extensively tested, however, the drilling information indicates that bedrock permeability is considered low/very low, supported by groundwater modelling (GHD, 2023f).

The groundwater level data and inferred groundwater flow directions indicates that the TSF1 seepage which migrates into the saprolitic profile (beneath the TSF1) will migrate radially outwards from the facility. For the purposes of this Study, it is noted that groundwater is inferred to migrate in an easterly direction and discharges in the open pit (waters retained on-site) and towards the Cemetery Creek catchment (potential for off-site discharge).

4.6 Hydraulic Conductivity

Hydraulic conductivity tests were conducted by GHD (2022) on the geological profile (e.g., shallow/intermediate/deep) within the saprolitic clay and weathered bedrock profile in areas where groundwater monitoring infrastructure allowed. To reflect the bulk hydraulic properties of unit material, the hydraulic conductivity values were calculated using methods based on a central tendency of the data (the mean/average can skew the values based on data outliers). The relative consistency in hydraulic values between testing locations further supports the assumption that hydraulic parameters within units can be considered homogenous and values extrapolated to data poor areas of the Eastern Catchments can be assumed representative.

The hydraulic testing methods by GHD (2022) included rising/falling head tests at each interval (logger data processed using AQTESOLV) with selected cored intervals submitted to the laboratory for permeability tests.

The drilling, methods and hydraulic testing results are presented by GHD (2022), and the hydraulic testing results for the rising/falling head-tests have also been summarised and presented in **Table 4.1**. These results indicate the alluvium/dredge material ranges from sandy to clayey. The re-deposition of the historic workings into the channels is likely to result in chaotic bedding and commensurate chaotic permeability ranging from high to low.

Table 4.1: Hydraulic Conductivity and Velocity Values

Groundwater Unit	Hydraulic Conductivity (m/d)	Effective Porosity (estimated)	Hydraulic Gradient (m/m)	Groundwater Flow Velocity (m/year)
Surficial alluvial sands/gravels and dredged sands (GHD, 2017)	2×10^{-2} to 3.6×10^{1}	0.3	0.02	1.7 to 31
Upper saprolitic clay	7.0×10^{-3}	0.1	0.02	0.6
Lower saprolitic clays	6.0×10^{-3}	0.1	0.02	0.5
Weathered bedrock (Saprock)	3×10^{-2}	0.2	0.02	2.7
Fresh bedrock	6×10^{-3} to 3×10^{-4}	0.1	0.02	0.02 to 0.4

The upper and lower saprolitic clay horizons have similar hydraulic conductivity (10^{-3} m/day). The values are consistent within published text values for clays (10^{-2} to10^{--8} m/day), but indicate a “permeable” clay, considered due to the presence of residual primary feature (rock and grain textures) and secondary features (mineral dissolution and roots/organics). The results indicate that the saprock unit (typically ~2 m to ~3 m of weathered bedrock) exhibits higher hydraulic conductivity, close to 10^{-2} m/day, likely due to lower clay composition and residual rock features

4.7 Groundwater Recharge and Discharge

4.7.1 Recharge

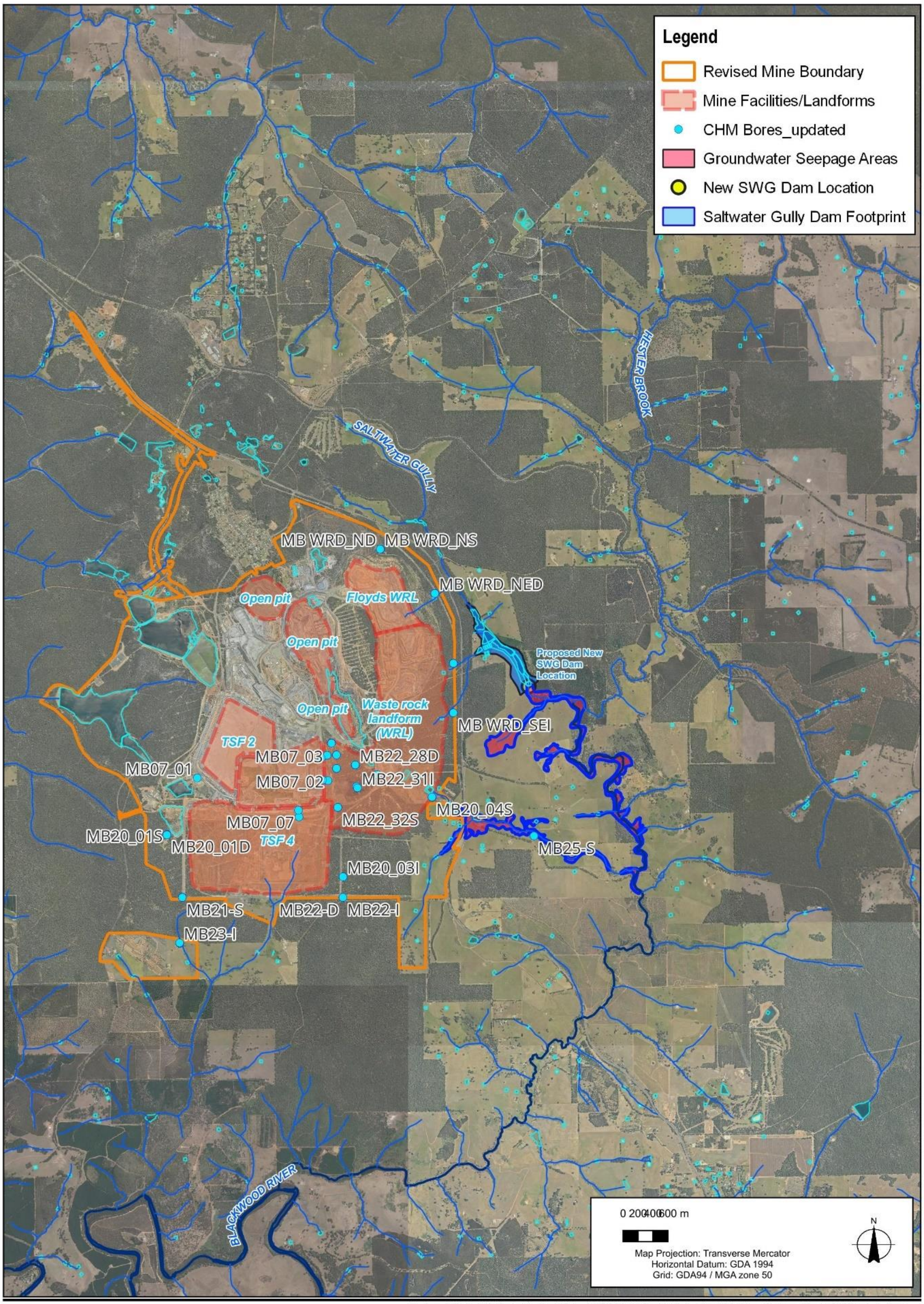
Groundwater recharge mechanisms within the mine boundary relate to TSF seepage, infiltration through material deposited within WRL boundaries, and infiltration from rainfall falling directly upon areas where alluvial sands and gravels are expressed at the surface.

Groundwater levels in the shallow groundwater system indicate seasonal and/or episodic surface water features that can be categorised as expressions of the water table and represent recharge points in topographic lows within the mine boundary. These would also be discharge points at times when groundwater is expressed.

4.7.2 Discharge

Groundwater discharge points are reflected closely by the network of local and dams, creeks and streams depicted in **Figure 4.8**. The overall radial flow pattern exhibited outside the central mining open pit operations area suggests groundwater discharges into Cowan Brook Dam, Clear Water Dam and Austins Dam in the West, Woljenup creek to the South, and Cascade Gully, Saltwater Gully and potentially as far as Hester Brook in the East.

The localised flow pattern observed with the bounds of the open pit mining area suggests the majority of the groundwater moving through the pattern described, discharges into the open pits. The most notable groundwater discharges within the Study Area are the primary receptors of Cascade Gully and Saltwater Gully, both tributaries to Hester Brook.



Data Source: GHD - New SWG Dam Location, New SWG Dam (FSL:210m) (2023), Mine Facilities/ Landform (2022). Talison - Mine External Boundary (2022). Landgate - Dam / Waterbody, Major Watercourse, Minor Watercourse, Stream / Creek, Major Road/ Minor Road (2020). WA Landgate SLIP - Background Aerial Imagery.

Figure 4.8: Groundwater Discharge Points and Features[9]

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[9] Discharge zones in vicinity of S8 WRL only mapped.

4.8 Groundwater Levels and Flow Paths

4.8.1 Groundwater Levels

Monitoring bore networks MB20, MB22 and MB WRD provide groundwater level monitoring datasets in specific areas of the Eastern Catchments within the mine boundary. The networks are concentrated in the southwestern corner of the Eastern Catchments, except for the MB WRD bores, which are situated along the eastern edge of Floyds WRL and the future S1 WRL. Groundwater contours across the extent of the current model boundary created from groundwater level monitoring across the entirety of the mine site are depicted in **Figure 4.9**.

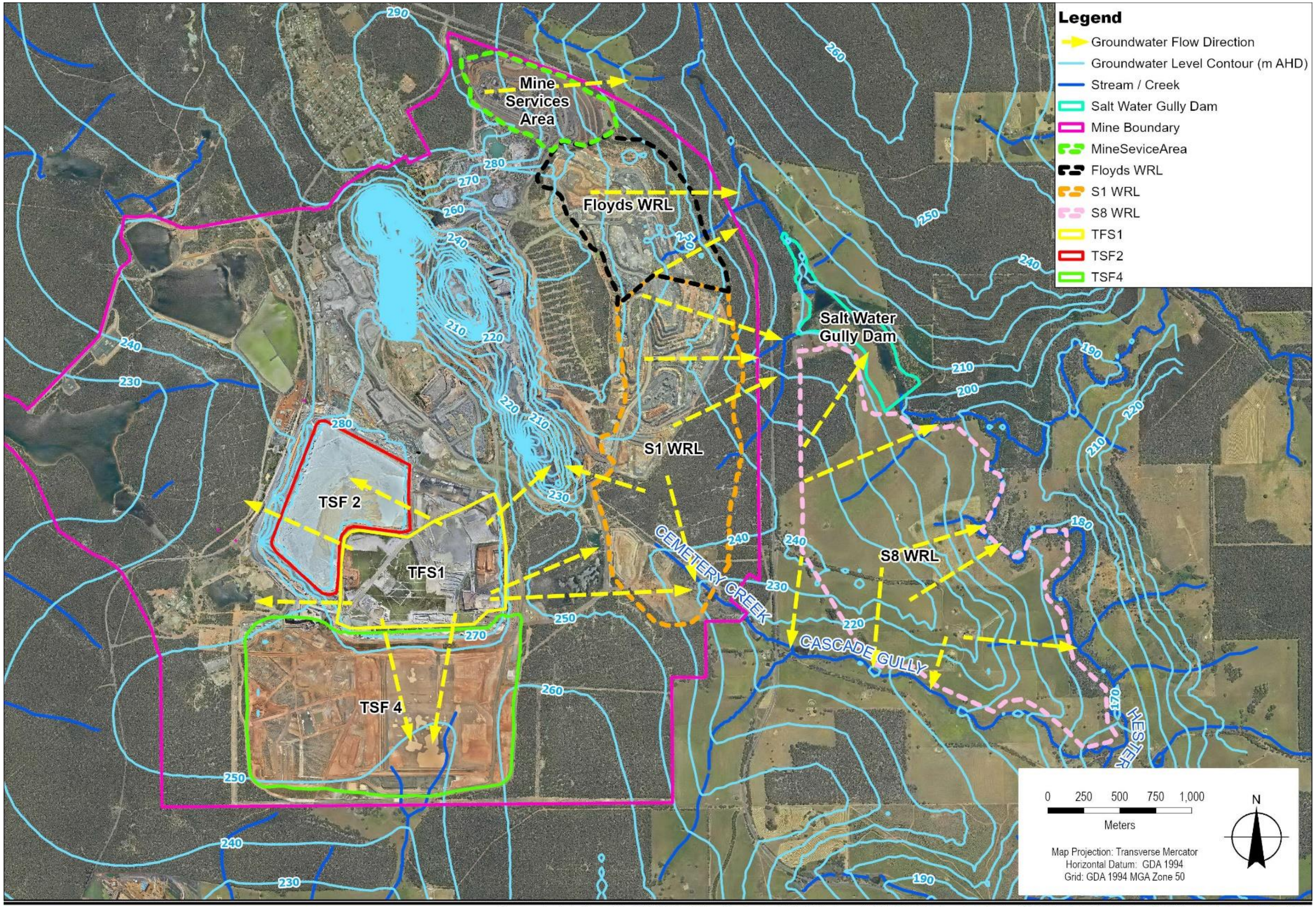
The contours indicate a radial flow pattern to the east, south and west of the mine operations, with an overall southerly flow trend. To the north, groundwater levels of ~270 mAHD to ~290 mAHD are observed, with the groundwater gradient sloping south through the mine site (~240 mAHD to ~270 mAHD). The gradient tends to drop quite steeply to the west of the mine boundary, with contour arcs depicting levels declining to ~110 mAHD in the south-western corner and along the southern boundary of the existing model domain.

4.8.2 Groundwater flow paths

The common occurrence of groundwater within the alluvium is associated with the expression of groundwater at the surface. Within the shallow alluvial system, upon infiltrating the soil profile within recharge zones (see **Section 4.7.1**) groundwater flow will generally follow local topography, along current drainage lines and paleochannels. The paleochannels also, generally, reflect surface water drainage lines along topographical lows and discharging to local water bodies or to the open pits of the mining operation itself.

Zones of lateritic caprock within the surficial profile create a preferential pathway for infiltration in the WRL area. Rainfall infiltrates through the WRD material, then primarily moves laterally down-gradient through the thin laterite caprock along the top of the saprolitic profile, discharging into Saltwater Gully to the east, and joining the paleo-drainage channels flowing north into the open pits to the west.

Groundwater levels across monitoring bores MB22_27, MB22_28 and MB30 indicate groundwater flows through lenses of re-deposited gravel and clay within the mine boundary, confirming the heterogenous nature of the shallow groundwater system, assumedly because of the historical deposition of different mine waste materials. Within the immediate vicinity of TSF1 and the southern end of the open pit operations, groundwater flow is northwards, towards the open pits, while at the southern end of the WRL, groundwater flows in a south-easterly direction, beneath Cascade Gully.



\\ghdnet\ghd\AU\Perth\Projects\61\12604929\GIS\Maps\Working\12604929_HZhang\12604929_HZhang.aprx - TSF1 GW Flow Direction Map-LANDSCAPE
Print date: 06 Oct 2023 - 11:59

Data source: Landgate - Stream / Creek (2020); Talison Lithium - Mine Boundary (2022), Site Background Aerial (2023); GHD - Groundwater Contours (2023), Groundwater Flow Directions (2023), Mine Facilities, New SWG Dam (2023).
Created by: hzhang4

Figure 4.9: Groundwater Level Contours and Flow Directions

5 Conclusions

The following can be concluded about the CSM:

- Groundwater contours tend to follow local and regional topography, including that of the natural (pre-mining) topography, elevations and topographic features created via historical mining operations at the site, and recent and ongoing changes to the topography within the mine site.
- At a regional catchment scale, it is a valid assumption that groundwater flow direction, specific flow paths, gradients and discharge points remain similar to those existing prior to mining operations commencing. Data indicates groundwater of the deeper formation following either paleo-drainage channels incised into fresh, low permeability Archean bedrock units beneath a weathered bedrock (saprock) horizon of moderate permeability, or following faults, shear zones and potential minor fracture zones within the deeper unoxidized bedrock. While valid for the purposes of a conceptual site model, this assumption would require a drilling program targeting the fresh bedrock to better define and properly quantify aquifer characteristics and at this stage is not regarded as a viable groundwater resource.
- Groundwater volumes flowing through fresh bedrock are insignificant relative to weathered bedrock, alluvial units and paleochannels.
- At the local scale, within the existing mine site, groundwater flow direction, flow paths and recharge/discharge points are notably more influenced by current and historical mine operations. Groundwater infiltration and migration through the significantly altered shallow groundwater system is influenced by;
  - Open pit mining at the ore body and associated dewatering;
  - Seepage from TSFs;
  - Areas of transported alluvial material (dumped mine waste – clays, sands and waste rock) creating “channels” of relatively high permeability;
  - Areas of altered topography and infiltration created by WRLs; and
  - Intersection into, and exposure of, comparably low permeability clays that constitute the upper boundary of the saprolitic profile, acting as a confining impervious layer in certain places.
- Groundwater flow paths and migration rates immediately adjacent to open pit operations are heavily governed by:
  - A network of higher permeability drainage channels of dumped sands in topographic low points to the area immediately south of the existing pits, which potentially capture and divert shallow groundwater (and TSF seepage) back in a northerly direction to the lower elevations of the open pits, and
  - Groundwater flow divides as a result of natural topographic high points around the eastern, northern and western boundaries of the open pits (most accurately displayed by digital elevation modelling). Groundwater contour gradients indicate inverse radial flow, sloping inwards toward the pit floors with the aspect of the gradient within the pits tending northwest toward Cornwall Pit where the hydraulic gradient increases notably.
- There is little, if any, differentiation between shallow and deep groundwater systems within this central zone of mine operations and water level contour data supports the assumption that the groundwater within this area exists as a singular system, most likely due to the high level of disturbance of the pre-mining stratigraphy and lithology caused by open pit mining operations.
- GW level data outside the central zone, detailed above, suggest a relatively consistent radial flow pattern outwards from the interior of the mine, toward the topographic lowlands of the surrounding terrain, identifying multiple potential discharge points, including dams, streams, and minor and major rivers.

- SWG Dam will likely be a predominantly groundwater gaining feature, receiving groundwater discharge from the WRL areas as seepage from the landform moves through the shallow groundwater system down gradient. The area immediately upstream from the embankment is likely to lose water to the underlying aquifer.
- Seepage from TSF1 will contribute to the local shallow groundwater system upon resumption of tailings deposition into the facility, seepage volumes and groundwater levels within the immediate will need to be assessed to quantify the extent to which this is occurring. Groundwater from the eastern side of TSF1 will be captured by drainage to the former dredge ponds, draining into the operational pits.
- Groundwater arising from the footprint of the S8 WRL generally flows Southwards, Eastwards and Northwards towards Cascades Gully, Hester Brook, Saltwater Gully receptively, into which much of the flow is inferred to discharge.

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Appendices

Appendix A

Borelogs

GHD

BOREHOLE LOG

HYDROGEOLOGICAL-GROUNDWATER

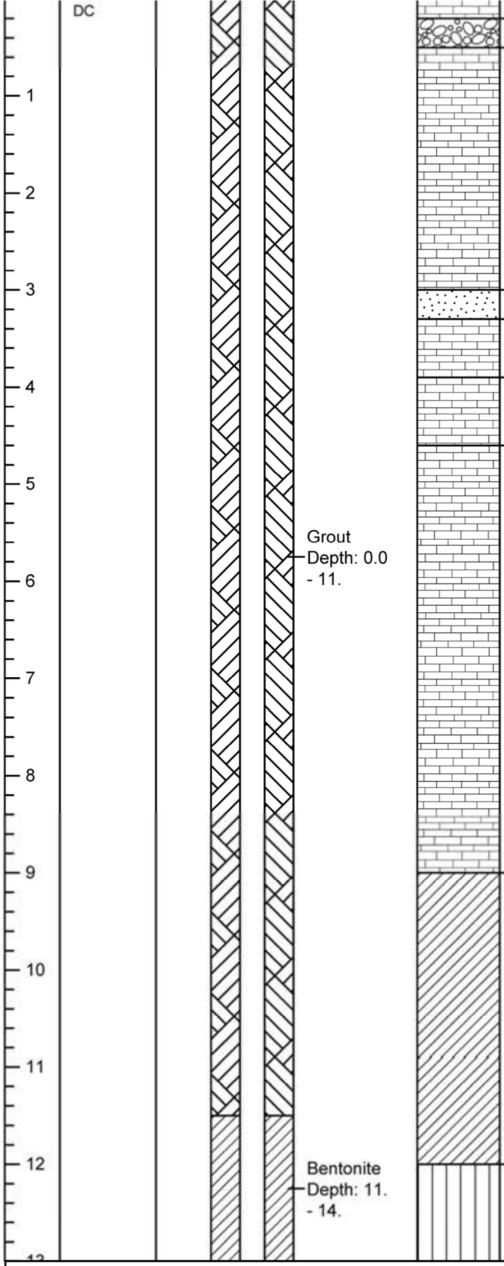
MONITORING WELL MB08-D

Page 1 of 2

Client Talison Lithium	**Drill Co.** Hagstrom	**Easting, Northing** 414225.14, 6250273.6
Project Talison TSF4 Drilling	**Rig Type** Hydrapower	**Grid Ref** GDA2020_MGA_zone_50
Project No. 12567622	**Drill Method** Diamond Core	**Elevation** 270.65
Site Greenbushes	**Total Depth (m)** 21.00	**TOC Elevation (m)** 271.276
LocationTSF4	**Casing Diameter (mm)** 50	**Logged By** Anna Edgar
Date Drilled 25/02/2022 - 25/02/2022	**Stickup (m)** 0.62	**Checked By** Adam Osbaldeston

Casing 50 mm PVC (Class 18)	**Screen** 0.5mm Slotted PVC (Class 18)	**Surface Completion** Monument

Depth (m) | **Drilling Method** | **Water** | **Well Details** | **Graphic Log**



LITHOLOGICAL DESCRIPTION
Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.

Silty FERRICRETE brown, laterite/ferricrete, angular gravels, sily clay matrix

GRAVEL dark brown- black, pisolite, loose, ≤10mm, well rounded, well sorted, magnetic.

FERRICRETE pale brown, hard, clay and silt matrix, vuggy texture, minor dark brown metallic colouration.

SAND very coarse, well graded, subrounded to rounded, dark brown, well sorted with minor silt, loose

FERRICRETE brown, hard, consolidated with a silty clay matrix and gravels, minor mottled colouration. Trace dark brown metallic colouration.

FERRICRETE mottled red and dark brown, dark metallic brown now domnant colour, vuggy texture.

FERRICRETE mottled red and pale brown, clay mottling includes bright reds which are harder then light brown, minor vuggy texture. Trace dark brown metallic colouration reduced to none from 5.6m. Increase in grey mottle colour from 7.5m

Silty CLAY yellow- brown, minor mottled grey, moderate plasticity. some minor patchy consolidated saprock.

Clayey SILT yellow- brown, with minor mottled grey, moderate plasticity and increased silt content. Trace mica.

Elevation (m)

270
269
268
267
266
265
264
263
262
261
260
259
258

Notes

This log is not intended for geotechnical purposes.

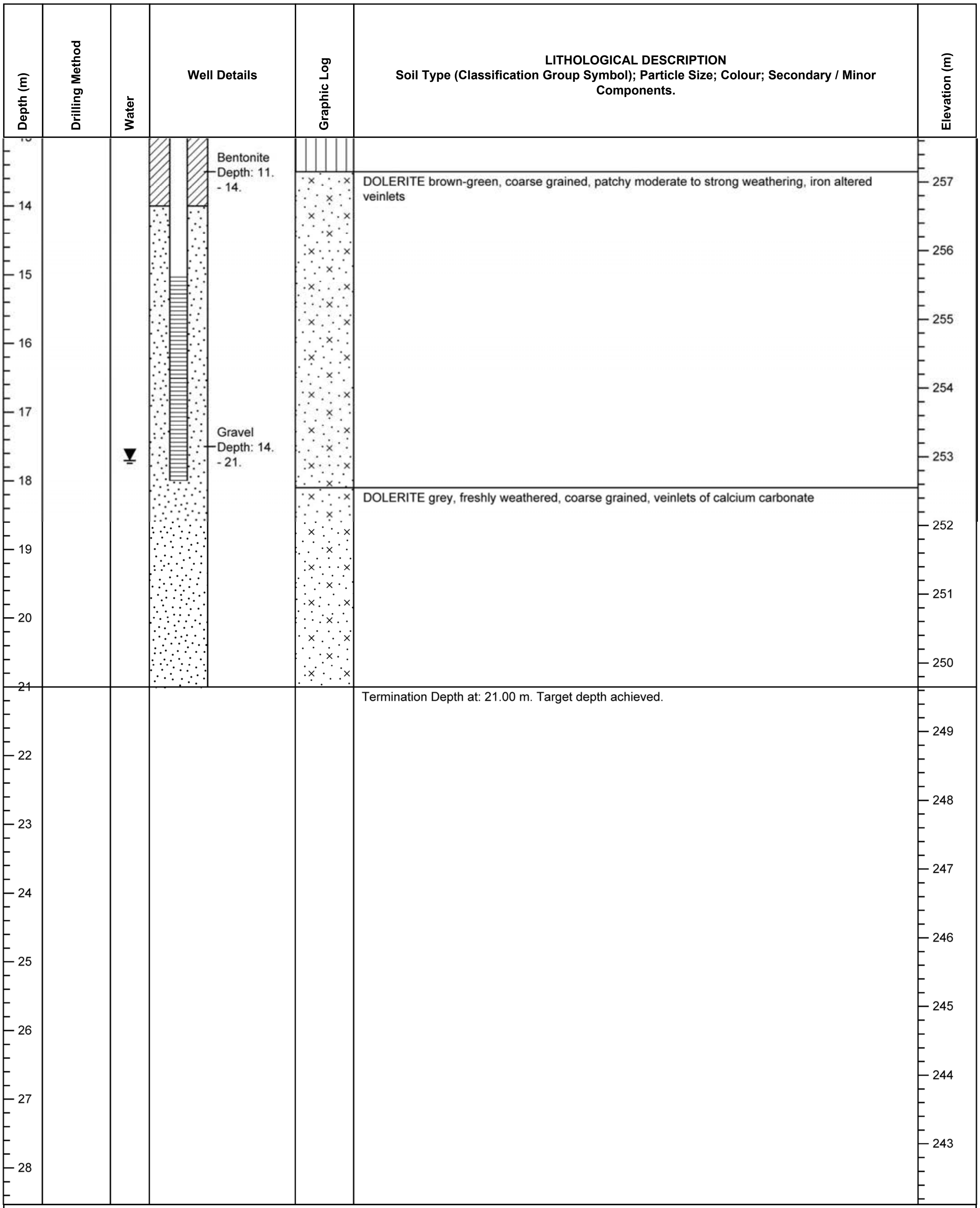
Drilling Abbreviations	**Moisture Abbreviations**	**Consistency Abbreviations**	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

MONITORING WELL MB08-D

HYDROGEOLOGICAL-GROUNDWATER

Page 2 of 2



LITHOLOGICAL DESCRIPTION
Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.

DOLERITE brown-green, coarse grained, patchy moderate to strong weathering, iron altered veinlets

DOLERITE grey, freshly weathered, coarse grained, veinlets of calcium carbonate

Termination Depth at: 21.00 m. Target depth achieved.

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	**Moisture Abbreviations**	**Consistency Abbreviations**	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MB WRD_NED

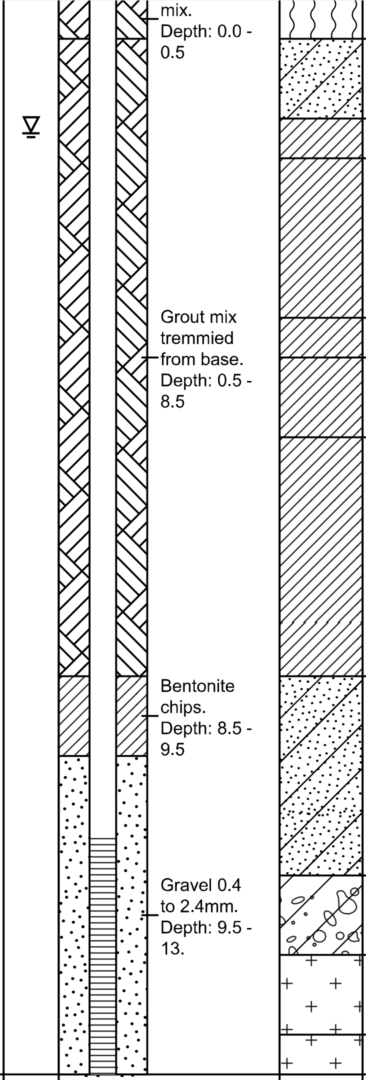
Page 1 of 1

Client Talison Lithium	**Drill Co.** Proline	**Easting, Northing** 415370.646, 6253582.29
Project TSF4 and Floyds Drilling Program 2018	**Driller** Stuart Birnie	**Grid Ref** GDA94_MGA_zone_50
Project No. 6135735	**Rig Type** Comacchio Geo 305	**Elevation** 223.721
Site Greenbushes Operations	**Drill Method** Dual tube aircore	**Collar RL** -
Location Expansion areas	**Total Depth (m)** 13.50	**Logged By** Adam Osbaldeston
Date Drilled 28/06/2018 - 29/06/2018	**Diameter (mm)** 135	**Checked By** Adam Osbaldeston

Casing 57 mm Class 18 threaded uPVC **Screen** 0.4mm slots: 10.5-13.5m **Surface Completion** Monument cover

Depth (m) | **Drilling Method** | **Water** | **Well Details** | **Graphic Log**

Drilling Method: Dual tube



LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials,separate phase liquids, imported fill, ash.
TOPSOIL - Topsoils, silty sand and clay, dark brown, minor organic matter. Moist	
SANDY CLAY - Clay, firm, light brown, with fine grained sand. Moist.	
CLAY - Clay, stiff, brown to grey, occasional root matter. Slightly moist.	
SILTY CLAY - Clay, firm to soft, light brown to cream, with iron stained occasionally white mottle. Moist. [residual soil]	
SILTY CLAY - As above, colour change to cream. Saturated. [extremely weathered basement]	
SILTY CLAY - Clay and silt, soft to loose, mica rich, blue grey, with occasional pegmatite rock to 60mm and very hard to brittle. Moist. [extremely weathered basement]	
SILTY CLAY - As above, colour change to red/brown. Moist to flow. [extremely weathered basement]	At 8.5m: Flow up to 0.2 L/s, TDS 2800 mg/L, EC 5260 uS/cm, pH 8.1
CLAYEY SAND/GRAVEL - Medium to course sand with gravel, angular, feldspar and quartz 1-6mm, brittle, within clay matrix to <40%, partly to weakly cemented. Minor lithic fabric, foliation. [extremely weathered basement]	Flow as above, increasing with depth
GRAVELLY CLAY - Brown clay, with medium to course sand / gravel, angular. Inclusion of pegmatite/elongated white crystalline rock 10%. Moist. [extremely weathered basement]	Reduction in flow.
AMPHIBOLITE - Fine grained dark blue/grey rock with foliation and significant iron staining, significant to 40% quartz veining. [weathered basement]	Flow increasing.
AMPHIBOLITE - As above, becoming increasingly fresh and increase in flow [slightly weathered basement]	Flow at 13.5m: up to 0.5 L/s, TDS 2970 mg/L, EC 5600uS/cm, pH 7.1.

Termination Depth at: 13.50 m. Target depth.

Depth (m)	Elevation (m)
1	223
2	222
3	221
4	220
5	219
6	218
7	217
8	216
9	215
10	214
11	213
12	212
13	211
14	210
	209

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

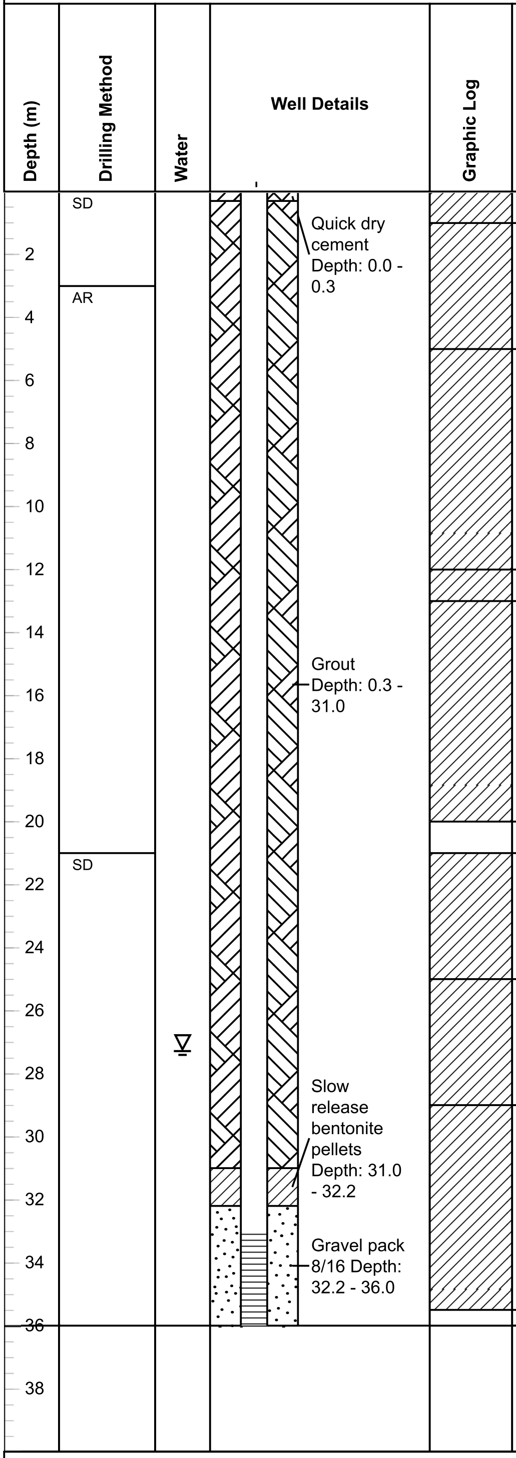
ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MB20_03D

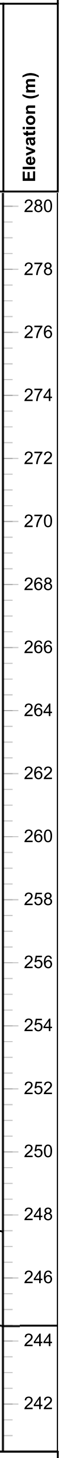
Page 1 of 1

Client Talison Lithium Australia Pty Ltd	**Drill Co.** Hagstrom	**Easting, Northing** 414138.62, 6249775.138
Project TSF4 and Floyds Drilling Program 2018	**Driller** Ed	**Grid Ref** GDA94_MGA_zone_50
Project No. 6135735	**Rig Type** LS 250 Minisonic	**Elevation** 280.473
Site Greenbushes Operations	**Drill Method** Air	**Collar RL** 281.214
Location Expansion areas	**Total Depth (m)** 36.00	**Logged By** Steff Bright
Date Drilled 28/11/2020 - 30/11/2020	**Diameter (mm)** 120	**Checked By** DB

Casing 50 mm CL18 PVC **Screen** 0.5mm slots, CL18 PVC **Surface Completion**



LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials,separate phase liquids, imported fill, ash.
Silty clay, cemented nodules <3mm, poorly sorted, laminated, redbrown	
Mottled silty clays with trace gravel, non-planar laminations, organic matter, quartz 1-4mm, fining downwards, firm, grey/brown	
Pallid saprolite clays, very fine, grey/white	
as above, purple	
Silty saprolite clays with trace gravel, iron nodules 1-7mm, dense, brown, (weathered bedrock)	
No sample return, issues with clays	
Streaked clays, mica flecks, fine grained, firm, grey/brown/purple, moist	
Saprolite clays with trace gravel, iron nodules 1-6mm, iron veinlets/cement, (weathered bedrock), moist	
as above, increased iron nodules 5-30 mm, clay lens 33-34, moist	Yield: 0.02 L/s, pH: 8.08, TDS: 752 mg/L, EC: 1176 µS/cm
Clay rich weathered bedrock, mafic origin, medium grained, grey/green, moist	
Termination Depth at: 36.00 m	



Notes

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Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MB20_04D

Page 1 of 1

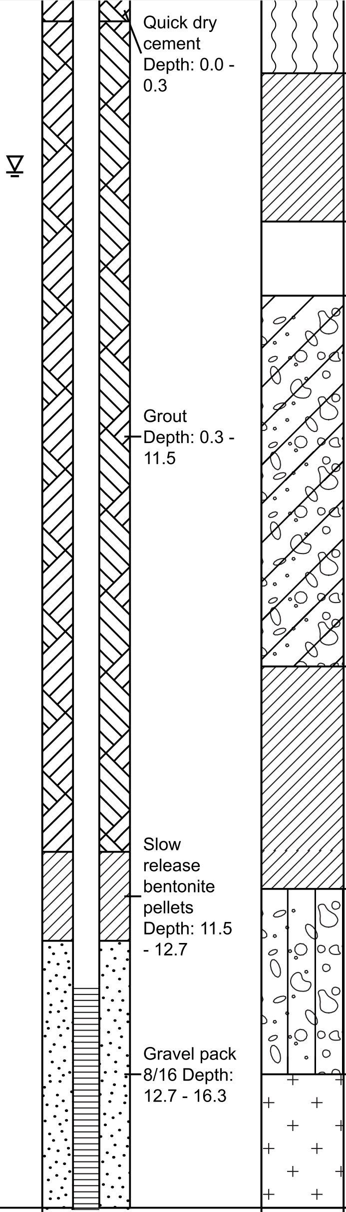
Client Talison Lithium Australia Pty Ltd	**Drill Co.** Hagstrom	**Easting, Northing** 415333.62, 6250842.904
Project TSF4 and Floyds Drilling Program 2018	**Driller** Ed	**Grid Ref** GDA94_MGA_zone_50
Project No. 6135735	**Rig Type** LS 250 Minisonic	**Elevation** 225.656
Site Greenbushes Operations	**Drill Method** Air	**Collar RL** 226.387
Location Expansion areas	**Total Depth (m)** 16.30	**Logged By** Steff Bright
Date Drilled 25/11/2020 - 26/11/2020	**Diameter (mm)** 120	**Checked By** DB

Casing 50 mm CL18 PVC **Screen** 0.5mm slots, CL18 PVC **Surface Completion**

Depth (m): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16

Drilling Method: SD; AR; AH

Elevation (m): 225, 224, 223, 222, 221, 220, 219, 218, 217, 216, 215, 214, 213, 212, 211, 210, 209



LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials,separate phase liquids, imported fill, ash.
Clayey soil, organic matter, iron nodules <3mm, firm, brown, moist	
Mottled clays with trace gravel, quartz/iron nodules <5mm, coarser with depth, firm, clay lens 2-2.5m, brown/cream, moist	
Lateritic gravel, silty matrix, sub-angular, <15mm, poorly sorted, redbrown, wet	
Saprolite clays with minor gravel, angular quartz/granite clasts. 1-10mm, tan, (weathered bedrock), slightly moist	
Silty saprolite clays, iron nodules <5mm, firm, light grey, moist	
Sandy gravel fining to silty sand, sub-rounded quartz, 1-10mm, loose, tan, (weathered bedrock), moist	Yield: 0.3 L/s, pH:7.47, TDS: 2084 mg/L, EC: 3323 µS/cm
Slightly weathered granitic bedrock, coarse grained ,15mm, hard, crystalline, light grey, moist	
Termination Depth at: 16.30 m	

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	**Moisture Abbreviations**	**Consistency Abbreviations**	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

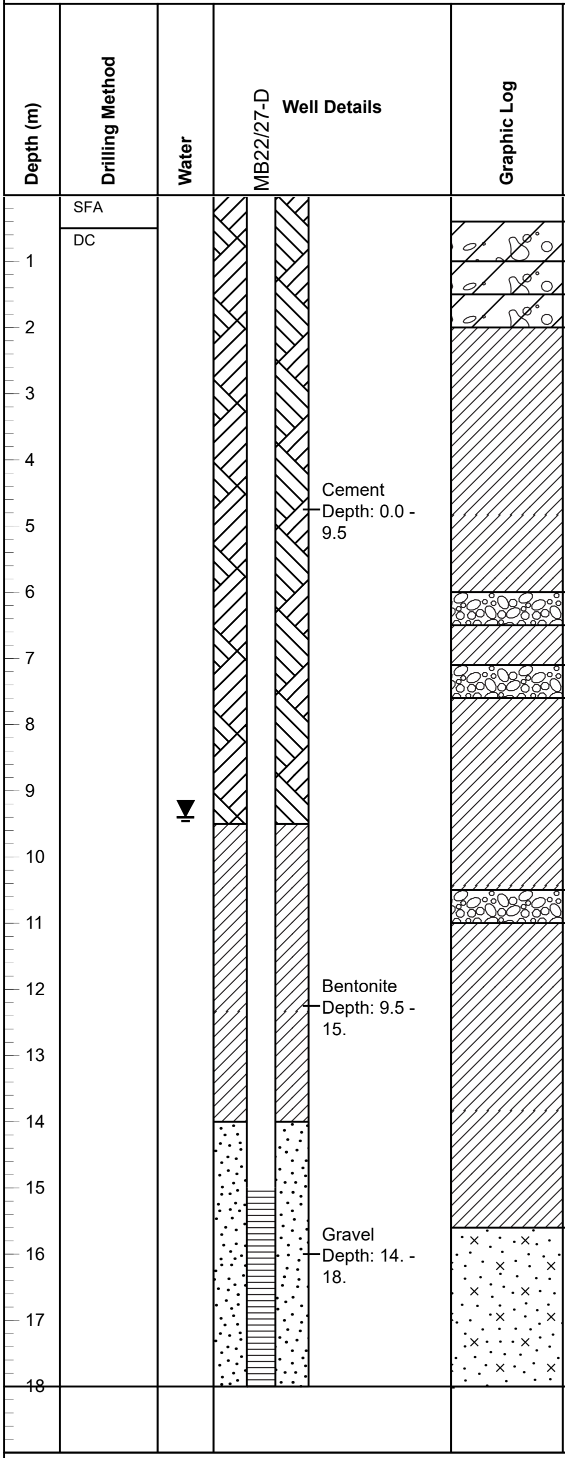
HYDROGEOLOGICAL-GROUNDWATER

MONITORING WELL MB22/27-D

Page 1 of 1

Client Talison Lithium	**Drill Co.** Hagstrom	**Easting, Northing** 414047.46, 6251413.07
Project Talison TSF1 Hydrogeological Drilling 2022	**Rig Type** Hydrapower	**Grid Ref** GDA2020_MGA_Zone_50
Project No. 12583743	**Drill Method** Diamond Core	**Elevation** 256.77
Site TSF1	**Total Depth (m)** 18.00	**TOC Elevation (m)** 257.29
Location MB22/27	**Casing Diameter (mm)** 50	**Logged By** AE
Date Drilled 30/05/2022 - 31/05/2022	**Stickup (m)** 0.522	**Checked By** PH

Casing 50 mm 50 mm PVC (Class 18)	**Screen** 0.5 mm Slotted PVC (Class 18)	**Surface Completion** Monument



LITHOLOGICAL DESCRIPTION
Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.

CORE LOSS auger drilled, no core recovered

CLAY AND GRAVEL (FILL) red-brown, very soft and sticky clay with moderate plasticity. Moderate well rounded gravels (5-30mm).

CLAY AND GRAVEL (FILL) red-brown mottled with grey, friable, very stiff clay with very low plasticity. Moderate, reducing downhole to minor well rounded gravels.

CLAY AND GRAVEL (FILL) red-brown, very soft and sticky clay with moderate plasticity, minor smaller well rounded gravels (1-10mm), within clay.

CLAY grey and orange mottled, very stiff, friable clay with very low plasticity. Roots present at 2.9m. Minor to trace well rounded, red-brown gravels (~5mm)., From 5 -6m slight increase in plasticity to low plasticity clay with increase in dominance of orange colour sediments. Significant core loss.

GRAVEL light brown well rounded gravel (5-30mm). Significant core loss, possibly larger section of gravel.

CLAY grey and Orange mottled, very stiff, friable clay with very low plasticity. Minor to trace red-brown gravel inclusions, well rounded.

GRAVEL red-brown subrounded to subangular gravel. Possibly rock texture caused by chemical cementation (similar to laterite).

CLAY grey, moderate plasticity, very stiff clay. Significant core loss in interval. Colour change to orange dominant at 8.8 - 9m and 9.8 - 10.5m.

GRAVEL very fine, orange brown, rounded to subangular gravel. When washed gravel grains are black, of mafic (dolerite) origin.

Saprolite CLAY orange brown silty clay with low plasticity. Clay has gritty texture caused by original rock being medium grained. Original rock textures present. Minor fracturing and core loss.

DOLERITE dark grey mafic medium grained massive rock texture with minor fractures containing iron alteration.

Termination Depth at: 18.00 m

Elevation (m)
256
255
254
253
252
251
250
249
248
247
246
245
244
243
242
241
240
239
238

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	**Moisture Abbreviations**	**Consistency Abbreviations**	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

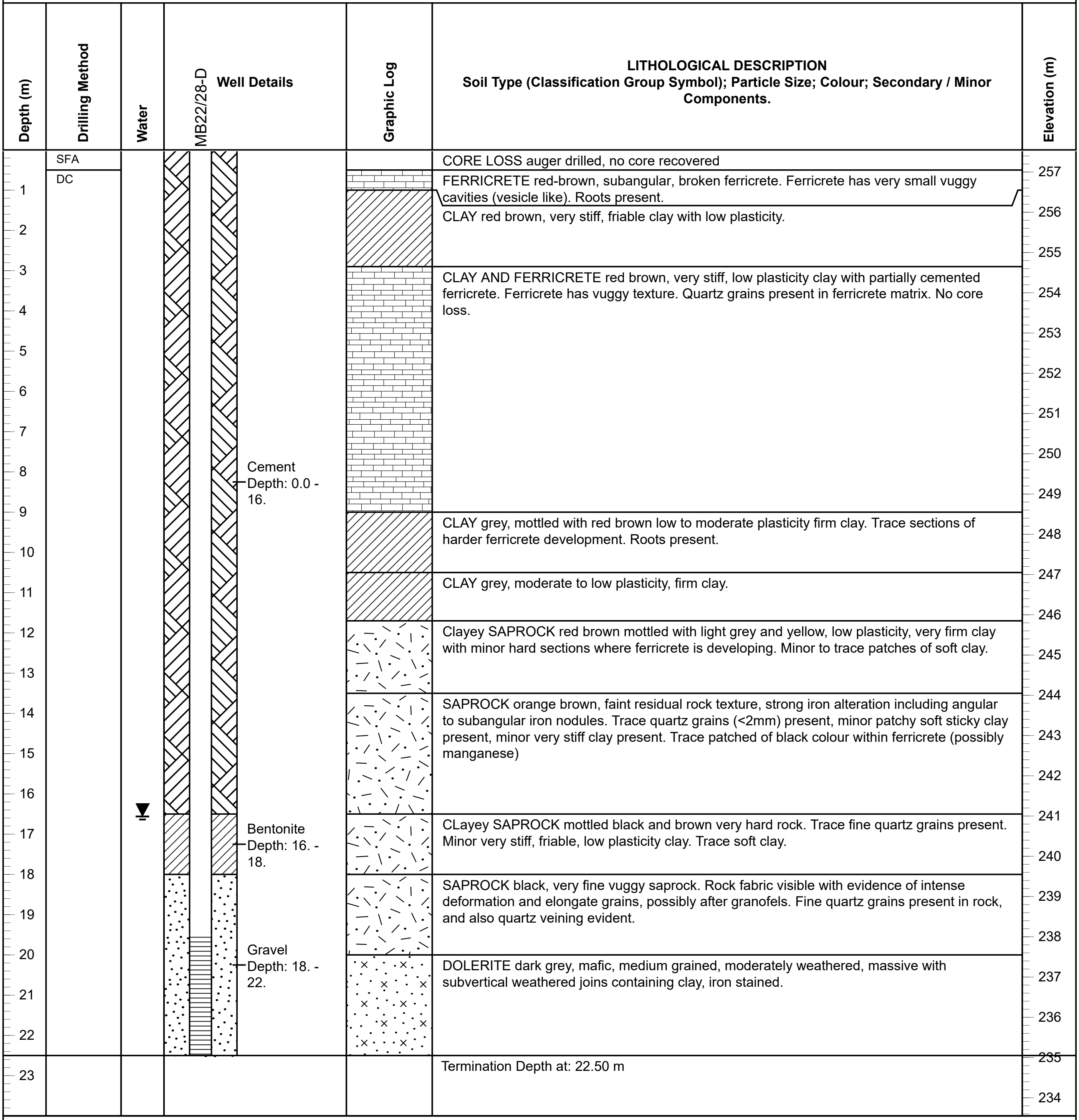
BOREHOLE LOG

HYDROGEOLOGICAL-GROUNDWATER

MONITORING WELL MB22/28-D

Client Talison Lithium	**Drill Co.** Hagstrom	**Easting, Northing** 414302.65, 6251275.24
Project Talison TSF1 Hydrogeological Drilling 2022	**Rig Type** Hydrapower	**Grid Ref** GDA2020_MGA_Zone_50
Project No. 12583743	**Drill Method** Diamond Core	**Elevation** 257.55
Site TSF1	**Total Depth (m)** 22.50	**TOC Elevation (m)** 258.2
Location MB22/28	**Casing Diameter (mm)** 50	**Logged By** JF
Date Drilled 02/06/2022 - 07/06/2022	**Stickup (m)** 0.649	**Checked By** PH

Casing 50 mm 50 mm PVC (Class 18) **Screen** 0.5 mm Slotted PVC (Class 18) **Surface Completion** Monument



LITHOLOGICAL DESCRIPTION
Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.

CORE LOSS auger drilled, no core recovered

FERRICRETE red-brown, subangular, broken ferricrete. Ferricrete has very small vuggy cavities (vesicle like). Roots present.

CLAY red brown, very stiff, friable clay with low plasticity.

CLAY AND FERRICRETE red brown, very stiff, low plasticity clay with partially cemented ferricrete. Ferricrete has vuggy texture. Quartz grains present in ferricrete matrix. No core loss.

CLAY grey, mottled with red brown low to moderate plasticity firm clay. Trace sections of harder ferricrete development. Roots present.

CLAY grey, moderate to low plasticity, firm clay.

Clayey SAPROCK red brown mottled with light grey and yellow, low plasticity, very firm clay with minor hard sections where ferricrete is developing. Minor to trace patches of soft clay.

SAPROCK orange brown, faint residual rock texture, strong iron alteration including angular to subangular iron nodules. Trace quartz grains (<2mm) present, minor patchy soft sticky clay present, minor very stiff clay present. Trace patched of black colour within ferricrete (possibly manganese)

CLayey SAPROCK mottled black and brown very hard rock. Trace fine quartz grains present. Minor very stiff, friable, low plasticity clay. Trace soft clay.

SAPROCK black, very fine vuggy saprock. Rock fabric visible with evidence of intense deformation and elongate grains, possibly after granofels. Fine quartz grains present in rock, and also quartz veining evident.

DOLERITE dark grey, mafic, medium grained, moderately weathered, massive with subvertical weathered joins containing clay, iron stained.

Termination Depth at: 22.50 m

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	**Moisture Abbreviations**	**Consistency Abbreviations**	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

HYDROGEOLOGICAL-GROUNDWATER

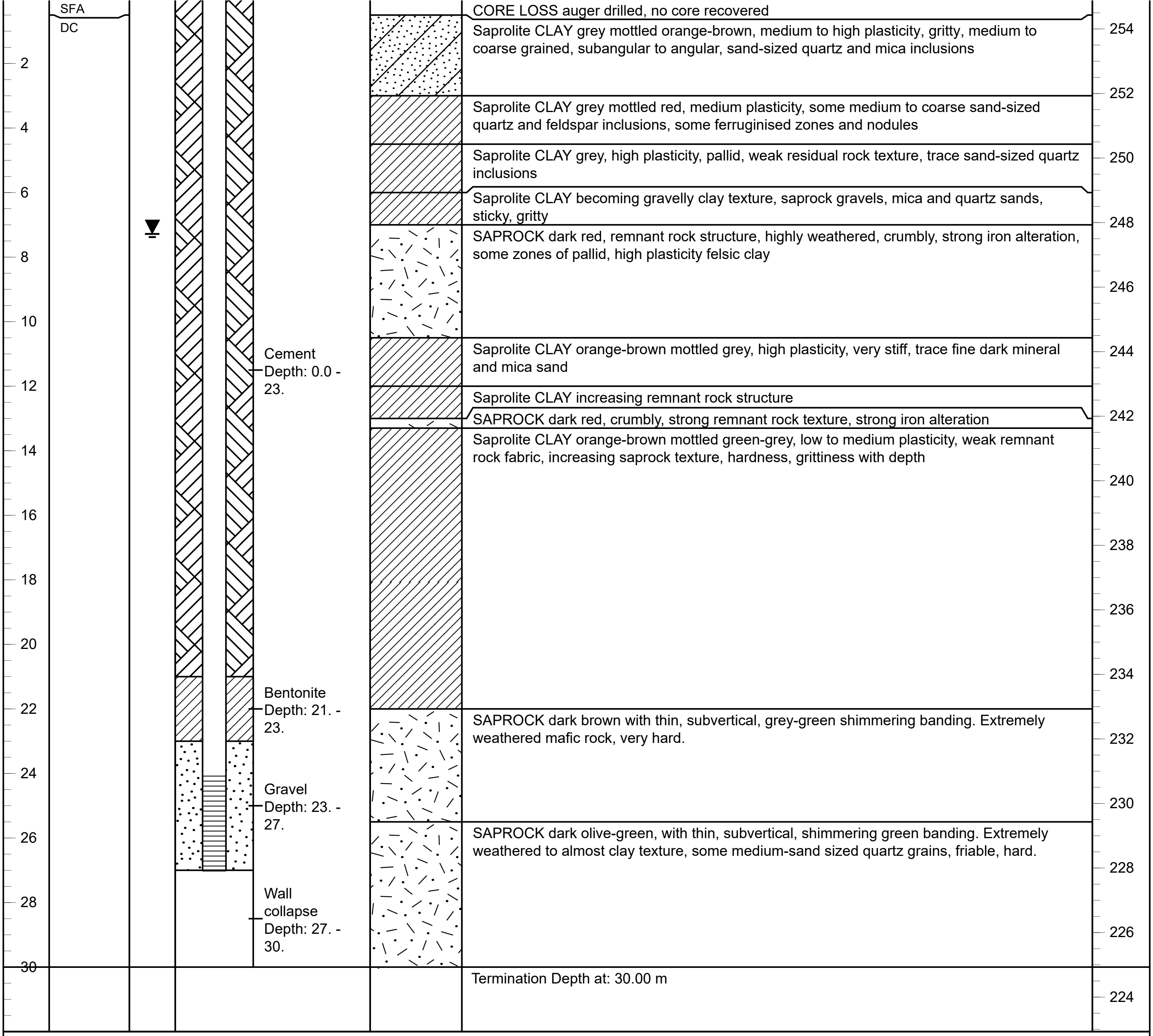
MONITORING WELL MB22/29-D

Page 1 of 1

Client Talison Lithium	**Drill Co.** Hagstrom	**Easting, Northing** 414048.94, 6251228.83
Project Talison TSF1 Hydrogeological Drilling 2022	**Rig Type** Hydrapower	**Grid Ref** GDA2020_MGA_Zone_50
Project No. 12583743	**Drill Method** Diamond Core	**Elevation** 254.93
Site TSF1	**Total Depth (m)** 30.00	**TOC Elevation (m)** 255.73
Location MB22/29	**Casing Diameter (mm)** 50	**Logged By** JF
Date Drilled 15/06/2022 - 15/06/2022	**Stickup (m)** 0.797	**Checked By** PH

Casing 50 mm 50 mm PVC (Class 18) **Screen** 0.5 mm Slotted PVC (Class 18) **Surface Completion** Monument

Depth (m) | Drilling Method | Water | MB22/29-D Well Details | Graphic Log | **LITHOLOGICAL DESCRIPTION** Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components. | Elevation (m)



CORE LOSS auger drilled, no core recovered

Saprolite CLAY grey mottled orange-brown, medium to high plasticity, gritty, medium to coarse grained, subangular to angular, sand-sized quartz and mica inclusions

Saprolite CLAY grey mottled red, medium plasticity, some medium to coarse sand-sized quartz and feldspar inclusions, some ferruginised zones and nodules

Saprolite CLAY grey, high plasticity, pallid, weak residual rock texture, trace sand-sized quartz inclusions

Saprolite CLAY becoming gravelly clay texture, saprock gravels, mica and quartz sands, sticky, gritty

SAPROCK dark red, remnant rock structure, highly weathered, crumbly, strong iron alteration, some zones of pallid, high plasticity felsic clay

Saprolite CLAY orange-brown mottled grey, high plasticity, very stiff, trace fine dark mineral and mica sand

Saprolite CLAY increasing remnant rock structure

SAPROCK dark red, crumbly, strong remnant rock texture, strong iron alteration

Saprolite CLAY orange-brown mottled green-grey, low to medium plasticity, weak remnant rock fabric, increasing saprock texture, hardness, grittiness with depth

SAPROCK dark brown with thin, subvertical, grey-green shimmering banding. Extremely weathered mafic rock, very hard.

SAPROCK dark olive-green, with thin, subvertical, shimmering green banding. Extremely weathered to almost clay texture, some medium-sand sized quartz grains, friable, hard.

Termination Depth at: 30.00 m

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	**Moisture Abbreviations**	**Consistency Abbreviations**	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

HYDROGEOLOGICAL-GROUNDWATER

MONITORING WELL MB22/30-D

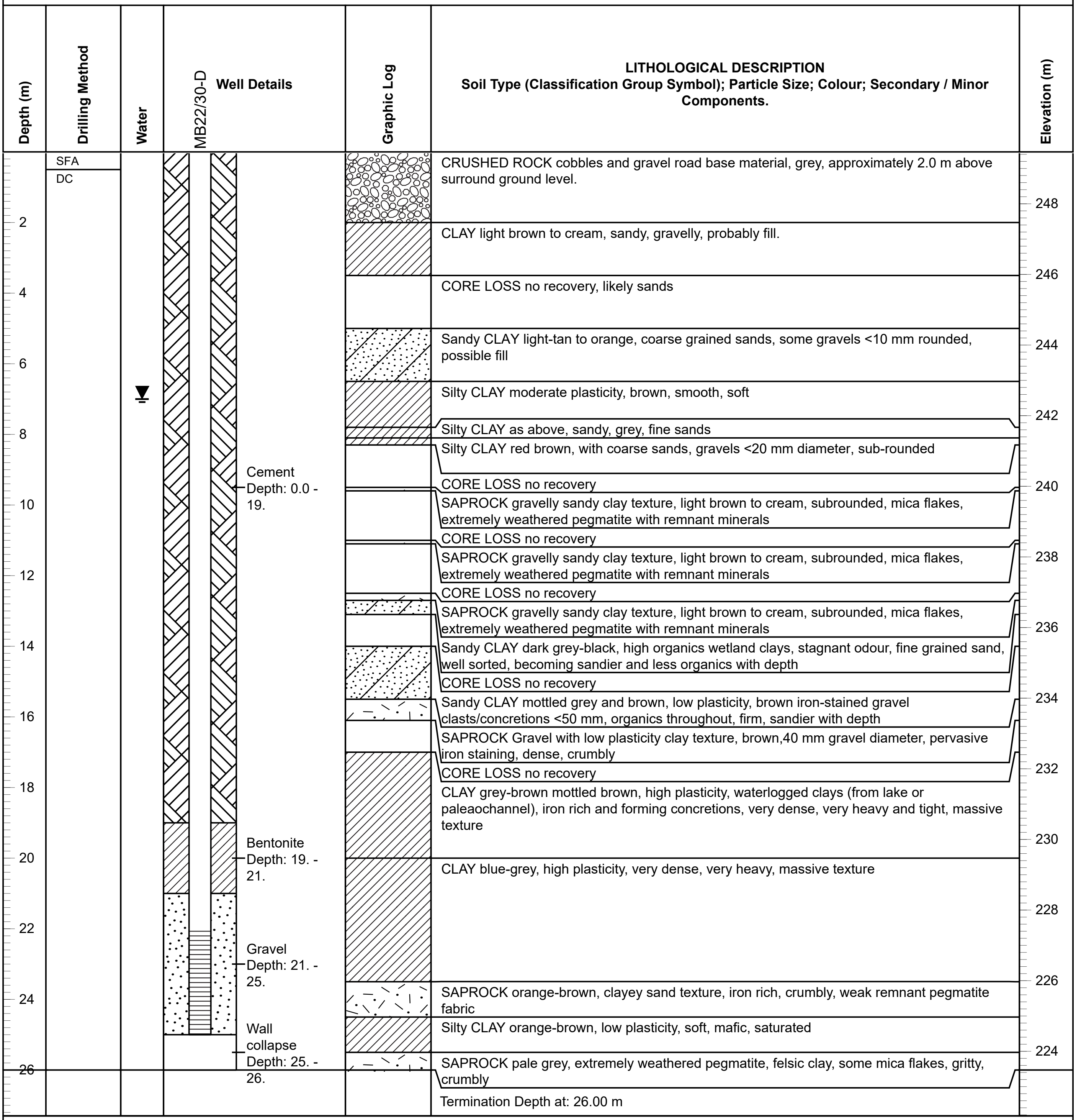
Page 1 of 1

Client Talison Lithium
Project Talison TSF1 Hydrogeological Drilling 2022
Project No. 12583743
Site TSF1
Location MB22/30
Date Drilled 28/06/2022 - 29/06/2022

Drill Co. Hagstrom
Rig Type Hydrapower
Drill Method Diamond Core
Total Depth (m) 26.00
Casing Diameter (mm) 50
Stickup (m) 0.647

Easting, Northing 414597.7, 6251145.03
Grid Ref GDA2020_MGA_Zone_50
Elevation 249.47
TOC Elevation (m) 250.12
Logged By SB
Checked By PH

Casing 50 mm 50 mm PVC (Class 18)
Screen 0.5 mm Slotted PVC (Class 18)
Surface Completion Monument



LITHOLOGICAL DESCRIPTION
Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.

CRUSHED ROCK cobbles and gravel road base material, grey, approximately 2.0 m above surround ground level.

CLAY light brown to cream, sandy, gravelly, probably fill.

CORE LOSS no recovery, likely sands

Sandy CLAY light-tan to orange, coarse grained sands, some gravels <10 mm rounded, possible fill

Silty CLAY moderate plasticity, brown, smooth, soft

Silty CLAY as above, sandy, grey, fine sands

Silty CLAY red brown, with coarse sands, gravels <20 mm diameter, sub-rounded

CORE LOSS no recovery

SAPROCK gravelly sandy clay texture, light brown to cream, subrounded, mica flakes, extremely weathered pegmatite with remnant minerals

CORE LOSS no recovery

SAPROCK gravelly sandy clay texture, light brown to cream, subrounded, mica flakes, extremely weathered pegmatite with remnant minerals

CORE LOSS no recovery

SAPROCK gravelly sandy clay texture, light brown to cream, subrounded, mica flakes, extremely weathered pegmatite with remnant minerals

Sandy CLAY dark grey-black, high organics wetland clays, stagnant odour, fine grained sand, well sorted, becoming sandier and less organics with depth

CORE LOSS no recovery

Sandy CLAY mottled grey and brown, low plasticity, brown iron-stained gravel clasts/concretions <50 mm, organics throughout, firm, sandier with depth

SAPROCK Gravel with low plasticity clay texture, brown,40 mm gravel diameter, pervasive iron staining, dense, crumbly

CORE LOSS no recovery

CLAY grey-brown mottled brown, high plasticity, waterlogged clays (from lake or paleaochannel), iron rich and forming concretions, very dense, very heavy and tight, massive texture

CLAY blue-grey, high plasticity, very dense, very heavy, massive texture

SAPROCK orange-brown, clayey sand texture, iron rich, crumbly, weak remnant pegmatite fabric

Silty CLAY orange-brown, low plasticity, soft, mafic, saturated

SAPROCK pale grey, extremely weathered pegmatite, felsic clay, some mica flakes, gritty, crumbly

Termination Depth at: 26.00 m

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	**Moisture Abbreviations**	**Consistency Abbreviations**	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

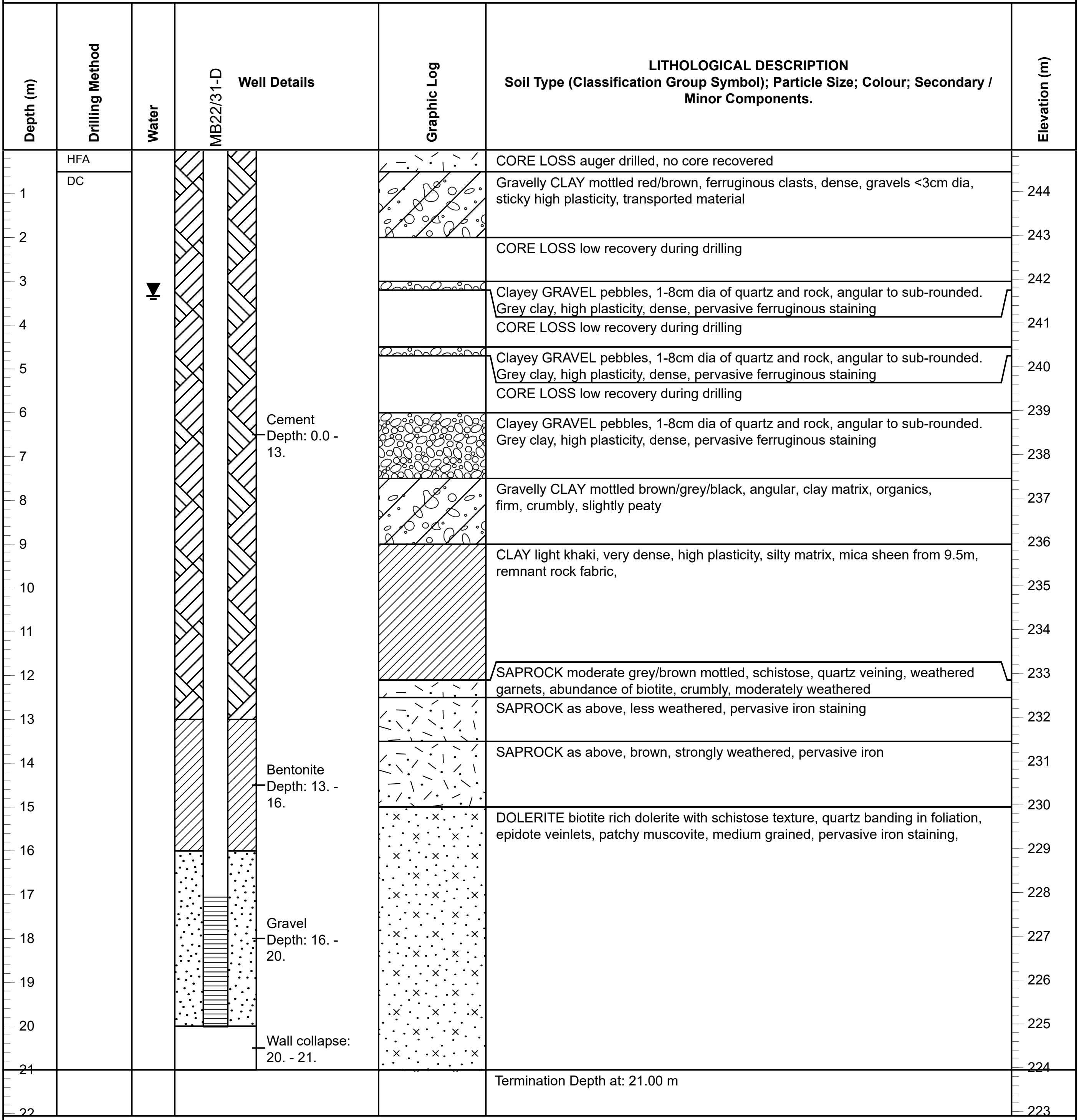
BOREHOLE LOG

HYDROGEOLOGICAL-GROUNDWATER

MONITORING WELL MB22/31-D

Client Talison Lithium	**Drill Co.** Hagstrom	**Easting, Northing** 414319.89, 6250987.94
Project Talison TSF1 Hydrogeological Drilling 2022	**Rig Type** Hydrapower	**Grid Ref** GDA2020_MGA_Zone_50
Project No. 12583743	**Drill Method** Diamond Core	**Elevation** 244.95
Site TSF1	**Total Depth (m)** 21.00	**TOC Elevation (m)** 245.52
LocationMB22/31	**Casing Diameter (mm)** 50	**Logged By** SB
Date Drilled 21/06/2022 - 22/06/2022	**Stickup (m)** 0.571	**Checked By** PH

Casing 50 mm 50 mm PVC (Class 18) **Screen** 0.5 mm Slotted PVC (Class 18) **Surface Completion** Monument



LITHOLOGICAL DESCRIPTION
Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.

CORE LOSS auger drilled, no core recovered

Gravelly CLAY mottled red/brown, ferruginous clasts, dense, gravels <3cm dia, sticky high plasticity, transported material

CORE LOSS low recovery during drilling

Clayey GRAVEL pebbles, 1-8cm dia of quartz and rock, angular to sub-rounded. Grey clay, high plasticity, dense, pervasive ferruginous staining

CORE LOSS low recovery during drilling

Clayey GRAVEL pebbles, 1-8cm dia of quartz and rock, angular to sub-rounded. Grey clay, high plasticity, dense, pervasive ferruginous staining

CORE LOSS low recovery during drilling

Clayey GRAVEL pebbles, 1-8cm dia of quartz and rock, angular to sub-rounded. Grey clay, high plasticity, dense, pervasive ferruginous staining

Gravelly CLAY mottled brown/grey/black, angular, clay matrix, organics, firm, crumbly, slightly peaty

CLAY light khaki, very dense, high plasticity, silty matrix, mica sheen from 9.5m, remnant rock fabric,

SAPROCK moderate grey/brown mottled, schistose, quartz veining, weathered garnets, abundance of biotite, crumbly, moderately weathered

SAPROCK as above, less weathered, pervasive iron staining

SAPROCK as above, brown, strongly weathered, pervasive iron

DOLERITE biotite rich dolerite with schistose texture, quartz banding in foliation, epidote veinlets, patchy muscovite, medium grained, pervasive iron staining,

Termination Depth at: 21.00 m

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	**Moisture Abbreviations**	**Consistency Abbreviations**	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

HYDROGEOLOGICAL-GROUNDWATER

MONITORING WELL MB22-D

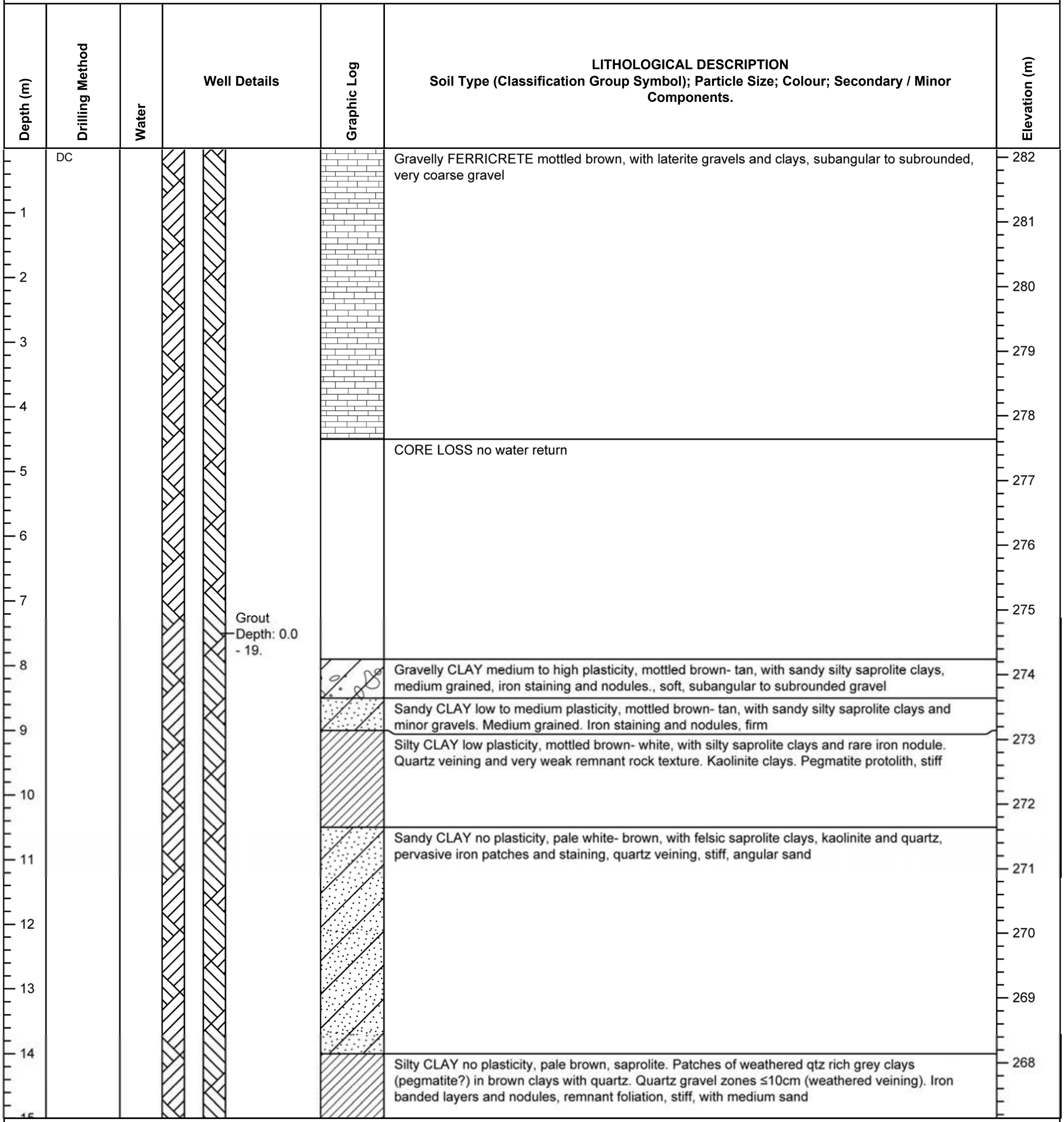
Page 1 of 2

Client Talison Lithium
Project Talison TSF4 Drilling
Project No. 12567622
Site Greenbushes
LocationTSF4
Date Drilled 21/03/2022 - 23/03/2022

Drill Co. Hagstrom
Rig Type Hydrapower
Drill Method Diamond Core
Total Depth (m) 28.50
Casing Diameter (mm) 50
Stickup (m) 0.59

Easting, Northing 414133.86, 6249497.41
Grid Ref GDA2020_MGA_zone_50
Elevation 282.14
TOC Elevation (m) 282.697
Logged By Steff Bright
Checked By Adam Osbaldeston

Casing 50 mm PVC (Class 18)
Screen 0.5mm Slotted PVC (Class 18)
Surface Completion Monument



LITHOLOGICAL DESCRIPTION
Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.

Gravelly FERRICRETE mottled brown, with laterite gravels and clays, subangular to subrounded, very coarse gravel

CORE LOSS no water return

Gravelly CLAY medium to high plasticity, mottled brown- tan, with sandy silty saprolite clays, medium grained, iron staining and nodules., soft, subangular to subrounded gravel

Sandy CLAY low to medium plasticity, mottled brown- tan, with sandy silty saprolite clays and minor gravels. Medium grained. Iron staining and nodules, firm

Silty CLAY low plasticity, mottled brown- white, with silty saprolite clays and rare iron nodule. Quartz veining and very weak remnant rock texture. Kaolinite clays. Pegmatite protolith, stiff

Sandy CLAY no plasticity, pale white- brown, with felsic saprolite clays, kaolinite and quartz, pervasive iron patches and staining, quartz veining, stiff, angular sand

Silty CLAY no plasticity, pale brown, saprolite. Patches of weathered qtz rich grey clays (pegmatite?) in brown clays with quartz. Quartz gravel zones ≤10cm (weathered veining). Iron banded layers and nodules, remnant foliation, stiff, with medium sand

Notes

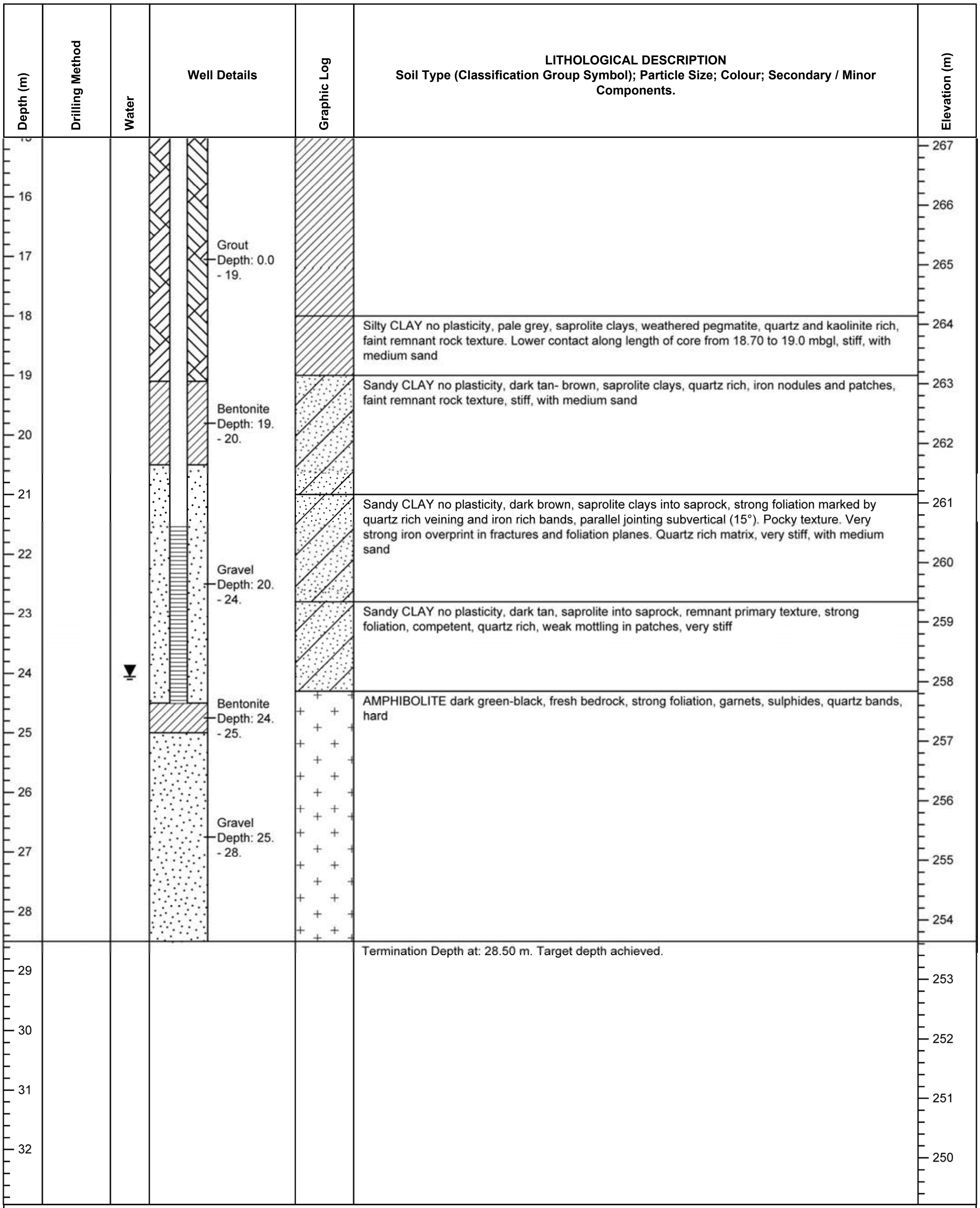
This log is not intended for geotechnical purposes.

Drilling Abbreviations	**Moisture Abbreviations**	**Consistency Abbreviations**	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

HYDROGEOLOGICAL-GROUNDWATER

MONITORING WELL MB22-D



LITHOLOGICAL DESCRIPTION
Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.

Silty CLAY no plasticity, pale grey, saprolite clays, weathered pegmatite, quartz and kaolinite rich, faint remnant rock texture. Lower contact along length of core from 18.70 to 19.0 mbgl, stiff, with medium sand

Sandy CLAY no plasticity, dark tan- brown, saprolite clays, quartz rich, iron nodules and patches, faint remnant rock texture, stiff, with medium sand

Sandy CLAY no plasticity, dark brown, saprolite clays into saprock, strong foliation marked by quartz rich veining and iron rich bands, parallel jointing subvertical (15°). Pocky texture. Very strong iron overprint in fractures and foliation planes. Quartz rich matrix, very stiff, with medium sand

Sandy CLAY no plasticity, dark tan, saprolite into saprock, remnant primary texture, strong foliation, competent, quartz rich, weak mottling in patches, very stiff

AMPHIBOLITE dark green-black, fresh bedrock, strong foliation, garnets, sulphides, quartz bands, hard

Termination Depth at: 28.50 m. Target depth achieved.

Notes

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Drilling Abbreviations	**Moisture Abbreviations**	**Consistency Abbreviations**	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

HYDROGEOLOGICAL-GROUNDWATER

MONITORING WELL MB25-D

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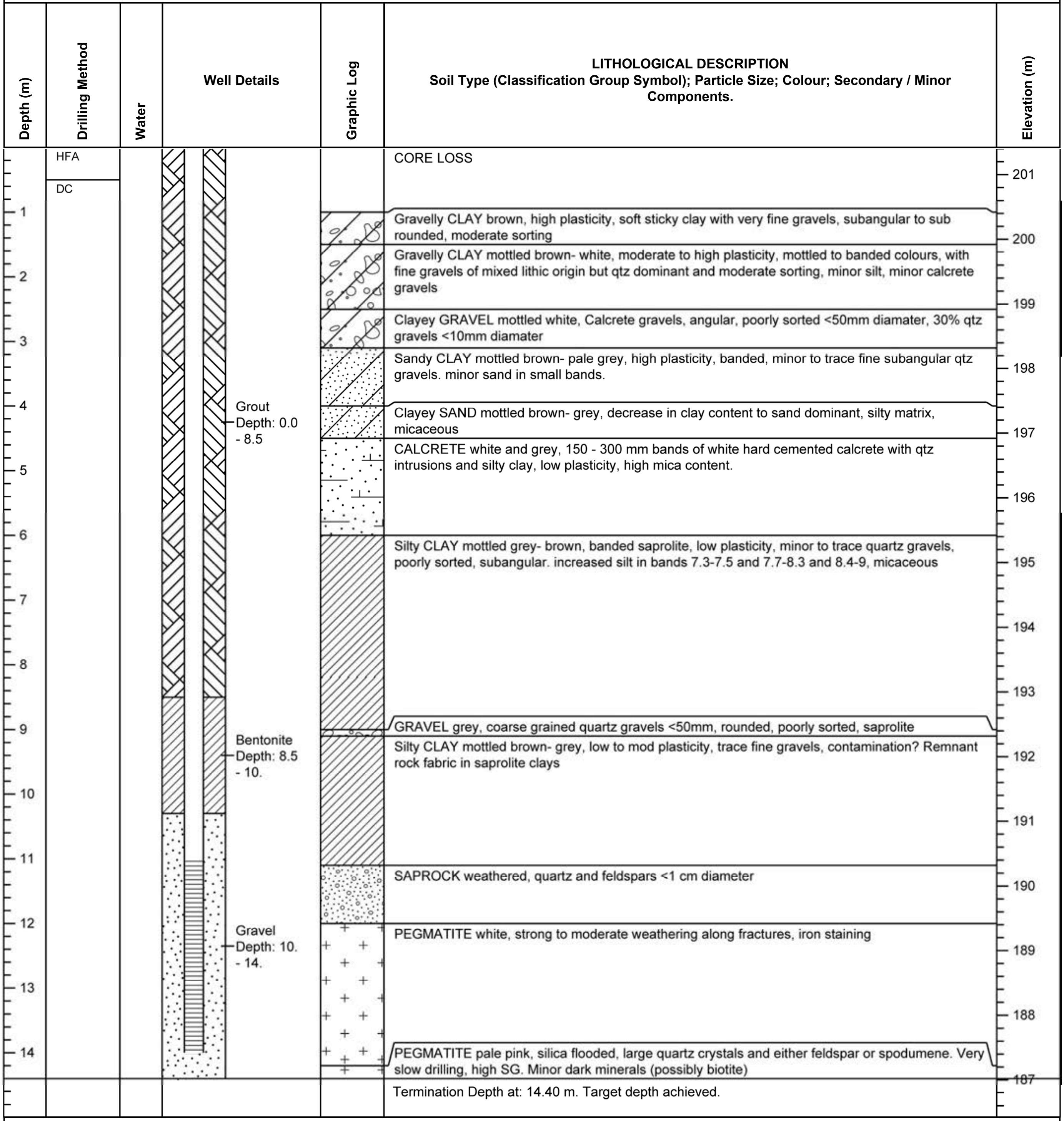
Client Talison Lithium	**Drill Co.** Hagstrom	**Easting, Northing** 416701.74, 6250325.4
Project Talison TSF4 Drilling	**Rig Type** Hydrapower	**Grid Ref** GDA2020_MGA_zone_50
Project No. 12567622	**Drill Method** Diamond Core	**Elevation** 201.42
Site Greenbushes	**Total Depth (m)** 14.40	**TOC Elevation (m)** 201.99
LocationTSF4	**Casing Diameter (mm)** 50	**Logged By** Anna Edgar
Date Drilled 09/04/2022 - 09/04/2022	**Stickup (m)** 0.57	**Checked By** Adam Osbaldeston
Casing 50 mm PVC (Class 18)	**Screen** 0.5mm Slotted PVC (Class 18)	**Surface Completion** Monument



LITHOLOGICAL DESCRIPTION
Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.

CORE LOSS

Gravelly CLAY brown, high plasticity, soft sticky clay with very fine gravels, subangular to sub rounded, moderate sorting

Gravelly CLAY mottled brown- white, moderate to high plasticity, mottled to banded colours, with fine gravels of mixed lithic origin but qtz dominant and moderate sorting, minor silt, minor calcrete gravels

Clayey GRAVEL mottled white, Calcrete gravels, angular, poorly sorted <50mm diamater, 30% qtz gravels <10mm diamater

Sandy CLAY mottled brown- pale grey, high plasticity, banded, minor to trace fine subangular qtz gravels. minor sand in small bands.

Clayey SAND mottled brown- grey, decrease in clay content to sand dominant, silty matrix, micaceous

CALCRETE white and grey, 150 - 300 mm bands of white hard cemented calcrete with qtz intrusions and silty clay, low plasticity, high mica content.

Silty CLAY mottled grey- brown, banded saprolite, low plasticity, minor to trace quartz gravels, poorly sorted, subangular. increased silt in bands 7.3-7.5 and 7.7-8.3 and 8.4-9, micaceous

GRAVEL grey, coarse grained quartz gravels <50mm, rounded, poorly sorted, saprolite

Silty CLAY mottled brown- grey, low to mod plasticity, trace fine gravels, contamination? Remnant rock fabric in saprolite clays

SAPROCK weathered, quartz and feldspars <1 cm diameter

PEGMATITE white, strong to moderate weathering along fractures, iron staining

PEGMATITE pale pink, silica flooded, large quartz crystals and either feldspar or spodumene. Very slow drilling, high SG. Minor dark minerals (possibly biotite)

Termination Depth at: 14.40 m. Target depth achieved.

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	**Moisture Abbreviations**	**Consistency Abbreviations**	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

HYDROGEOLOGICAL-GROUNDWATER

MONITORING WELL PB001D

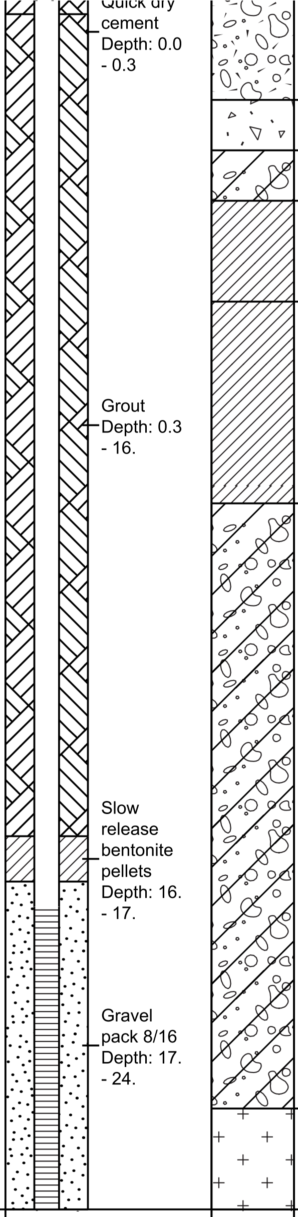
Page 1 of 1

Client Talison Lithium Australia Pty Ltd
Project TSF4 and Floyds Drilling Program 2018
Project No. 6135735
Site Greenbushes Operations
Location Expansion areas
Date Drilled 02/12/2020 - 03/12/2020

Drill Co. Hagstrom
Rig Type LS 250 Minisonic
Drill Method Air
Total Depth (m) 24.00
Casing Diameter (mm) 50
Stickup (m)

Easting, Northing 413181.121, 6249162.435
Grid Ref GDA94_MGA_zone_50
Elevation 237.948
TOC Elevation (m) 238.526
Logged By Steff Bright
Checked By DB

Casing 50 mm CL18 PVC
Screen 0.5mm slots, CL18 PVC
Surface Completion



Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	DRILLING OBSERVATIONS	Elevation (m)
	SD		Quick dry cement Depth: 0.0 - 0.3		Lateritic gravel, angular, clast supported <10 mm, cemented nodules, loose, red-brown		
1							237
2					Silcrete, well cemented, polymictic, hard, 1-13 mm clasts, light grey		236
3	AR				Saprolite clays minor gravel, iron nodules 2-20 mm, soft, grey/brown, saturated		235
4		▽			Silty saprolite clays, mica shimmer, soft, khaki grey, very moist		234
5							233
6					as above, organic matter, iron/quartz nodules 1-10 mm, angular, brown/grey, very moist		232
7							231
8			Grout Depth: 0.3 - 16.				230
9							229
10					Saprolite clays with minor gravel, quartz/saprock nodules 5-30 mm, iron staining, angular, (weathered bedrock) tan/grey, saturated		228
11							227
12							226
13							225
14							224
15							223
16			Slow release bentonite pellets Depth: 16. - 17.				222
17							221
18						Yield: 0.3 L/s, pH:8.2, TDS: 760 mg/L5, EC: 1171 µS/cm	220
19							219
20			Gravel pack 8/16 Depth: 17. - 24.				218
21							217
22					Weathered bedrock, heavy iron staining, 30% quartz, saprock, brown, saturated		216
23							215
24					Termination Depth at: 24.00 m		214
							213

Notes

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Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

HYDROGEOLOGICAL-GROUNDWATER

MONITORING WELL PB001I

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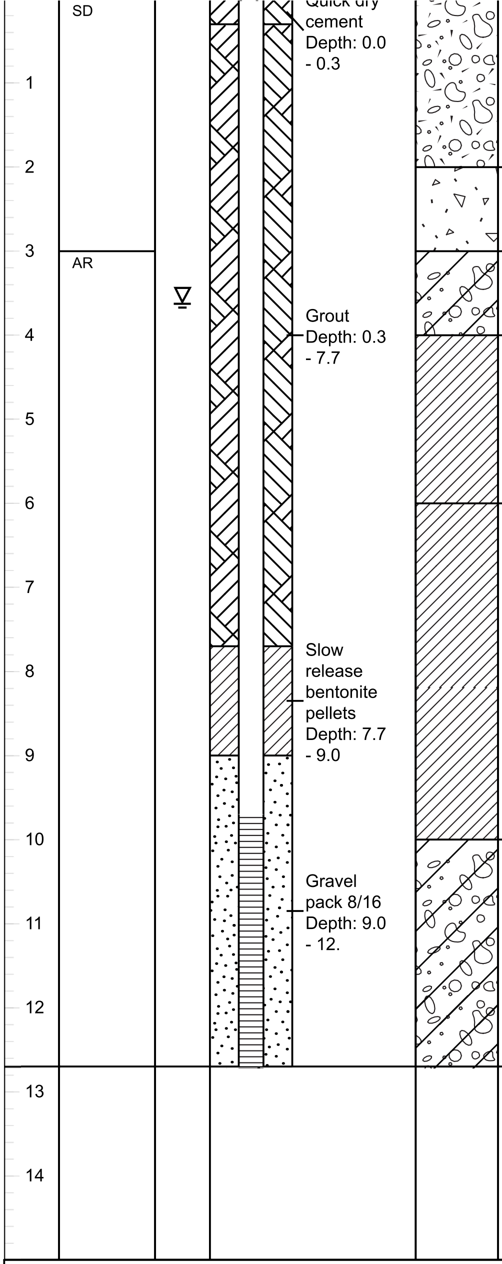
Client Talison Lithium Australia Pty Ltd
Project TSF4 and Floyds Drilling Program 2018
Project No. 6135735
Site Greenbushes Operations
Location Expansion areas
Date Drilled 03/12/2020 - 04/12/2020

Drill Co. Hagstrom
Rig Type LS 250 Minisonic
Drill Method Air
Total Depth (m) 12.70
Casing Diameter (mm) 50
Stickup (m)

Easting, Northing 413180.189, 6249159.598
Grid Ref GDA94_MGA_zone_50
Elevation 237.85
TOC Elevation (m) 238.396
Logged By Steff Bright
Checked By DB

Casing 50 mm CL18 PVC
Screen 0.5mm slots, CL18 PVC
Surface Completion



LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	DRILLING OBSERVATIONS
Lateritic gravel, angular, clast supported <10 mm, cemented nodules, loose, red-brown	
Silcrete, well cemented, polymictic, hard, 1-13 mm clasts, light grey	
Saprolite clays minor gravel, iron nodules 2-20 mm, soft, grey/brown, saturated	
Silty saprolite clays, mica shimmer, soft, khaki grey, very moist	
as above, organic matter, iron/quartz nodules 1-10 mm, angular, brown/grey, very moist	Yield: 0.2 L/s, pH:8.09, TDS:780 mg/L, EC:1196 μS/cm
Saprolite clays with minor gravel, quartz/saprock nodules 5-30 mm, iron staining, angular, (weathered bedrock) tan/grey, saturated	
Termination Depth at: 12.70 m	

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	**Moisture Abbreviations**	**Consistency Abbreviations**	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

HYDROGEOLOGICAL-GROUNDWATER

MONITORING WELL PB001S

Page 1 of 1

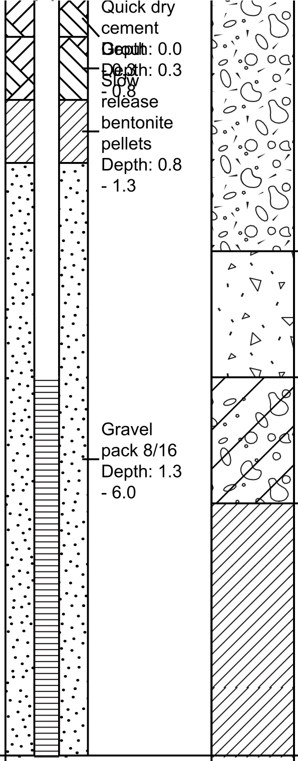
Client Talison Lithium Australia Pty Ltd
Project TSF4 and Floyds Drilling Program 2018
Project No. 6135735
Site Greenbushes Operations
Location Expansion areas
Date Drilled 04/12/2020 - 04/12/2020

Drill Co. Hagstrom
Rig Type LS 250 Minisonic
Drill Method Air
Total Depth (m) 6.00
Casing Diameter (mm) 50
Stickup (m)

Easting, Northing 413179.373, 6249156.626
Grid Ref GDA94_MGA_zone_50
Elevation 237.755
TOC Elevation (m) 238.351
Logged By Steff Bright
Checked By DB

Casing 50 mm CL18 PVC
Screen 0.5mm slots, CL18 PVC
Surface Completion

Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	DRILLING OBSERVATIONS	Elevation (m)
0.0 – 2.0	SD		Quick dry cement Depth: 0.0 - 0.3 Grout Depth: 0.3 - 0.8 Slow release bentonite pellets Depth: 0.8 - 1.3 Gravel pack 8/16 Depth: 1.3 - 6.0		Lateritic gravel, angular, clast supported <10 mm, cemented nodules, loose, red-brown		
2.0 – 3.0					Silcrete, well cemented, polymictic, hard, 1-13 mm clasts, light grey		
3.0 – 4.0		⊻			Saprolite clays minor gravel, iron nodules 2-20 mm, soft, grey/brown, saturated	Yield: 0.01 L/s, pH:8.01, TDS;1014 mg/L, EC:1644 µS/cm	
4.0 – 6.0					Silty saprolite clays, mica shimmer, soft, khaki grey, very moist		
6					Termination Depth at: 6.00 m		



Depth (m): 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5

Elevation (m): 237., 237, 236., 236, 235., 235, 234., 234, 233., 233, 232., 232, 231., 231, 230., 230, 229., 229, 228., 228

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

Appendix B

Groundwater Level Monitoring Data

Bore ID	**RL (mAHD)**	**Screen Depth (mBGL)**	**SWL (mAHD)**	**SWL (mBGL)**
MB22_26D	254.9	16.5	247.6	7.3
MB22_26I	254.9	12	247.8	7.1
MB22_26S	254.8	6	248.0	6.8
MB22_27D	257.3	15	247.1	10.2
MB22_27I	257.4	9	247.4	10.0
MB22_27S	257.4	6	Dry	Dry
MB22_28D	258.2	19.5	241.0	17.2
MB22_28I	258.2	11	244.5	13.8
MB22_28S	258.3	4	250.8	7.5
MB22_29D	255.7	24	247.7	8.0
MB22_29I	255.9	13.5	247.8	8.1
MB22_29S	255.8	6	247.6	8.2
MB22_30D	250.1	22	242.4	7.7
MB22_30I	250.3	13	243.9	6.4
MB22_30S	250.3	6	244.4	5.9
MB22_31D	245.5	17	241.6	3.9
MB22_31I	245.6	9	244.7	0.9
MB22_31S	245.6	4.5	245.1	0.5
MB22_32D	256.9	24	247.5	9.4
MB22_32I	256.9	8	247.7	9.3
MB22_32S	256.9	4	251.0	5.9
MB20_01D	259.9	24.7	248.6	11.25
MB20_01I	259.9	11.85	249.5	10.39
MB20_01S	259.9	0.5	258.4	1.54
MB20_03D	280.5	33	253.2	27.27
MB20_03I	280.5	21.8	255.7	24.86
MB20_04D	225.7	13.3	223.3	2.33
MB20_04I	225.7	8.3	223.0	2.68
MB20_04S	225.6	2	222.9	2.77
MB22_26D	254.9	16.5	247.6	7.3
MB22_26I	254.9	12	247.8	7.1

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