WRM

VULCAN SOUTH

Water Management Plan

Prepared for Vitrinite Pty Ltd owner of Qld Coal Aust No. 1 Pty Ltd and Queensland Coking Coal Pty Ltd

9 January 2025

1571-35-B2

DETAILS

Report Title	Vulcan South, Water Management Plan
Client	Prepared for Vitrinite Pty Ltd owner of Qld Coal Aust No. 1 Pty Ltd and Queensland Coking Coal Pty Ltd

THIS REVISION

Report Number	1571-35-B2
Date	9 January 2025
Author	TN/RN
Reviewer	JO

Revision number	Report date	Report author	Reviewer
DRAFT	19 December 2024	TN/RN	JO
1	3 January 2025	TN/RN	JO
2	9 January 2025	TN/RN	JO

FORM OF CERTIFICATION

Name of Registered Professional Engineer providing certification:

Julian Orth RPEQ No 15706

Employed by WRM Water & Environment Pty Ltd

Address of Registered Professional Engineer providing certification:

WRM Water & Environment
Level 1, 369 Ann Street, Brisbane City
PO Box 10703
Adelaide St Brisbane QLD 4000

Statement of Relevant Experience:

I hereby state that I am a Registered Professional Engineer of Queensland and meet the requirements of the definition of 'suitably qualified and experienced person'.

Statement of Certification:

All relevant material relied upon by me, including subsidiary certifications of specialist components, where required by the environmental authority, is provided in the attached report 'Vulcan South - Water Management Plan', dated 9 January 2025.

I hereby certify that the Water Management Plan prepared for Vulcan South has been prepared in accordance with the engineering practice consistent with the standards required for this assessment, and in accordance with the Model Mine Conditions.

I, Julian Orth, declare that the information provided as part of this certification is true to the best of my knowledge. I acknowledge that it is an offence under Section 480 of the Environmental Protection Act 1994 to give the administering authority a document containing information that I know is false, misleading or incomplete in a material particular.

Signed: Julian Orth

Date: 9 January 2025

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1 INTRODUCTION

1.1 BACKGROUND

The Vulcan South (the Project), which is managed by Vitrinite Pty. Ltd., owner of Qld Coal Aust No.1 Pty. Ltd. and Queensland Coking Coal Pty. Ltd. (Vitrinite), is a proposed open pit and highwall mining operation located on Mine Lease (ML) 700073, southeast of Moranbah, in Queensland. Figure 1.1 shows the location of the Project in relation to surrounding mines and regional drainages features.

Figure 1.2 shows an overview of the Project area including the Highwall mining area in the northwest, the Vulcan North mining area in the north, the Vulcan Main mining area in the centre and the Vulcan South mining area in the south. The proposed mine stage layouts for the Project, including all major surface water infrastructure elements required during operations and post-mining, are shown in Figure 1.3 to Figure 1.15.

1.2 PURPOSE AND SCOPE

WRM Water & Environment Pty Ltd (WRM) was engaged by Mining and Energy Technical Services Pty Ltd (METServe), on behalf of Vitrinite, to prepare this Water Management Plan (WMP) to meet the requirements of Condition F24 to Condition F27 of the Project's Environmental Authority (EA) P-EA-100265081 issued by the Department of Environment, Science and Innovation (DESI) on 5 April 2024.

The WMP examines and addresses all issues relevant to the importation, generation, use, and management of water on a mining project in order to minimise the quantity of water that is contaminated and released by and from the Project. The actual and potential risks of environmental harm to natural water flows posed by mining activities have been identified and management actions that will effectively minimise these risks have been presented.

1.3 RELATED DOCUMENTS

This WMP should be read in conjunction with the following reports:

- *Vulcan South Surface water assessment* (WRM, 2023);
- *Vulcan South Erosion and Sediment Control Plan (*WRM, 2024a); and
- *Vulcan South Receiving Environment Monitoring Program* (REMP) (WRM, 2024b).

1.4 REPORT STRUCTURE

The report is structured as follows:

- Section 2 describes the environmental values of the regional and local drainage receiving waters;
- Section 3 presents the site operating activities including a study of the potential for generating contaminants on the site;
- Section 4 presents the surface water management system including the management objectives and principles;
- Section 5 provides a description of the site water balance;
- Section 6 describes measures to manage/prevent saline and acid rock drainage;
- Section 7 provides an overview of the surface water monitoring program;
- Section 8 provides a summary of the emergency and contingency planning information related to water management; and
- Section 9 gives a list of references.

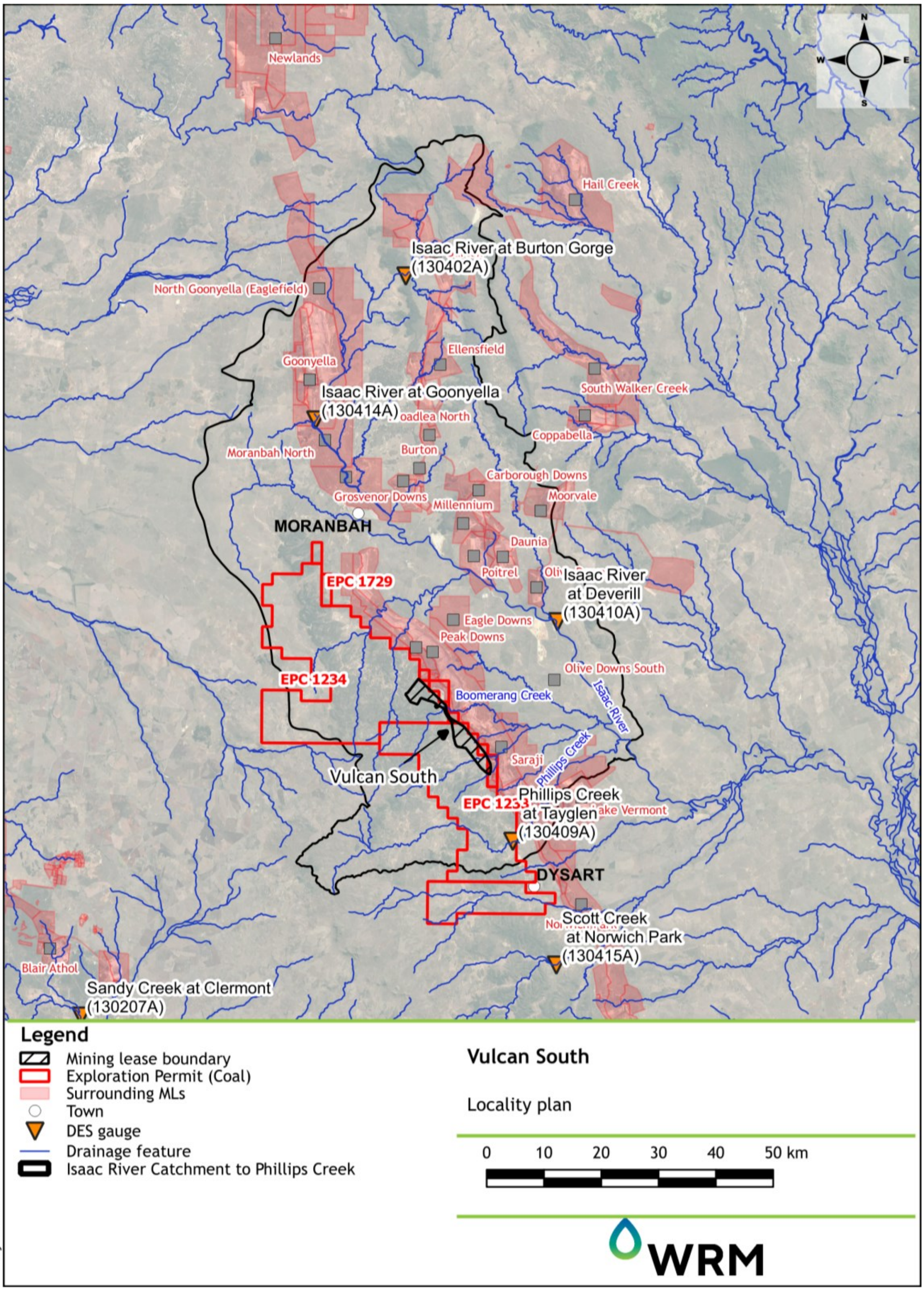

Figure 1.1 Locality and regional drainage characteristics

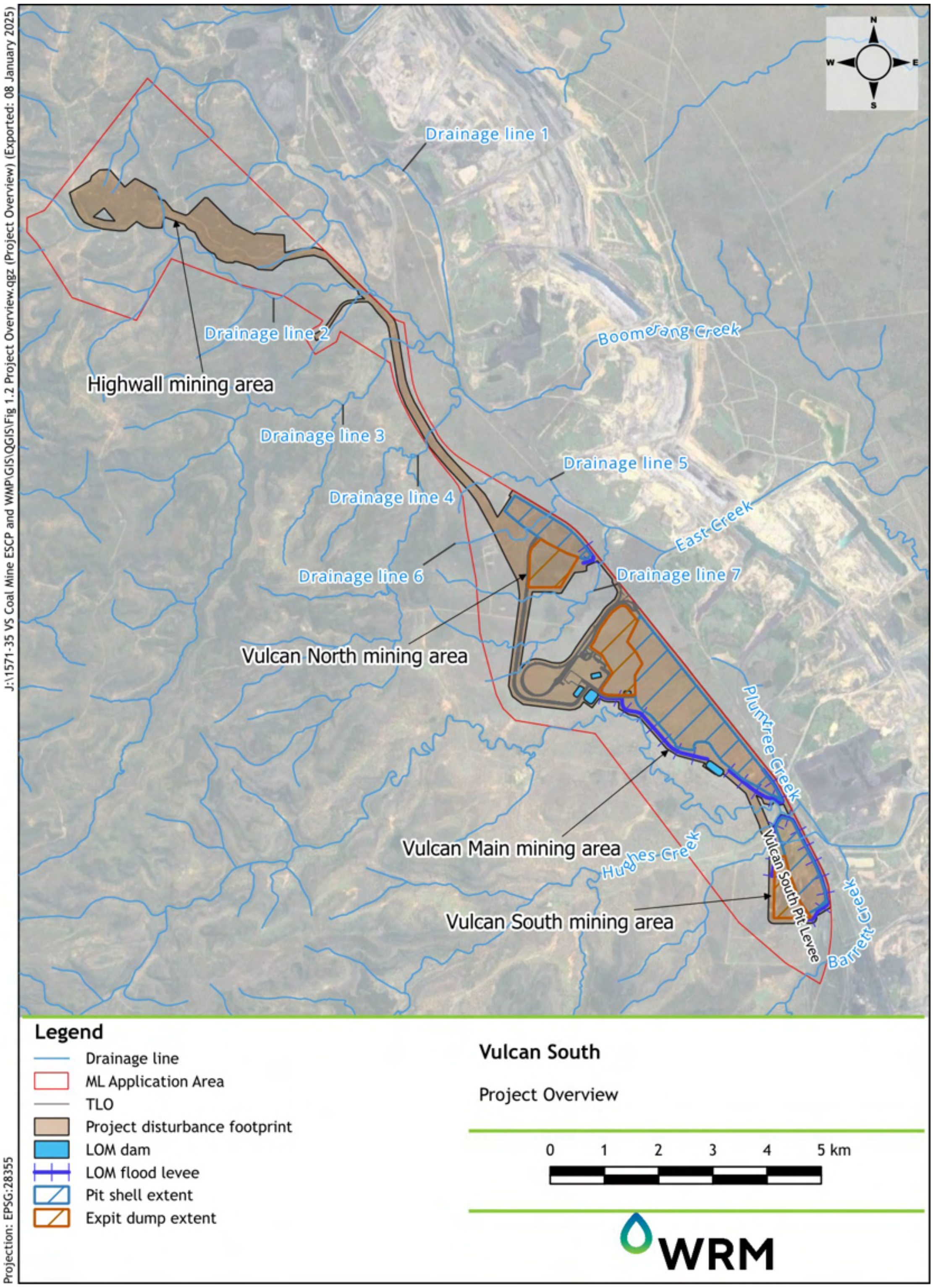

Figure 1.2 Project overview

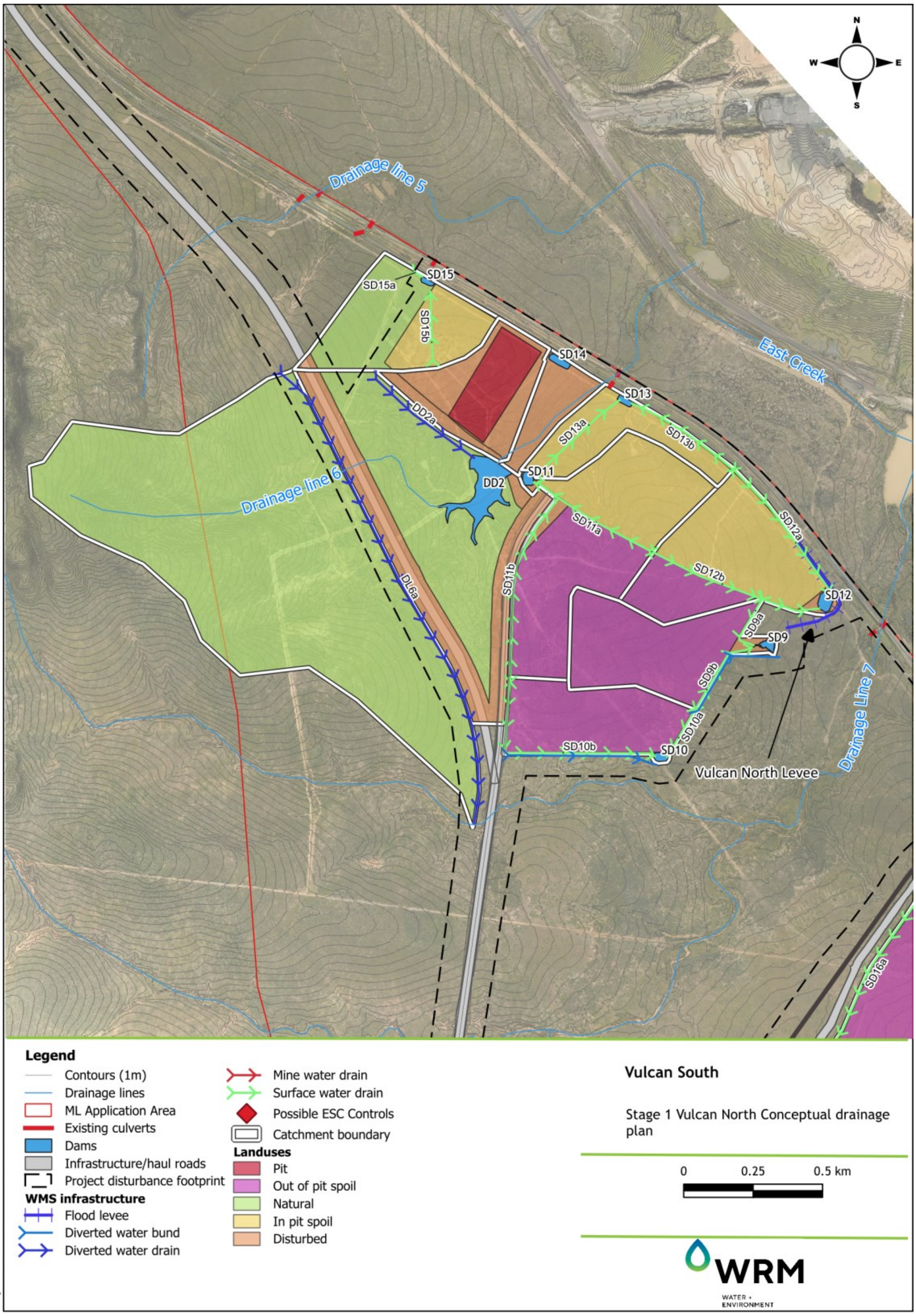

Figure 1.3 Stage 1 Vulcan North mining area conceptual drainage plan

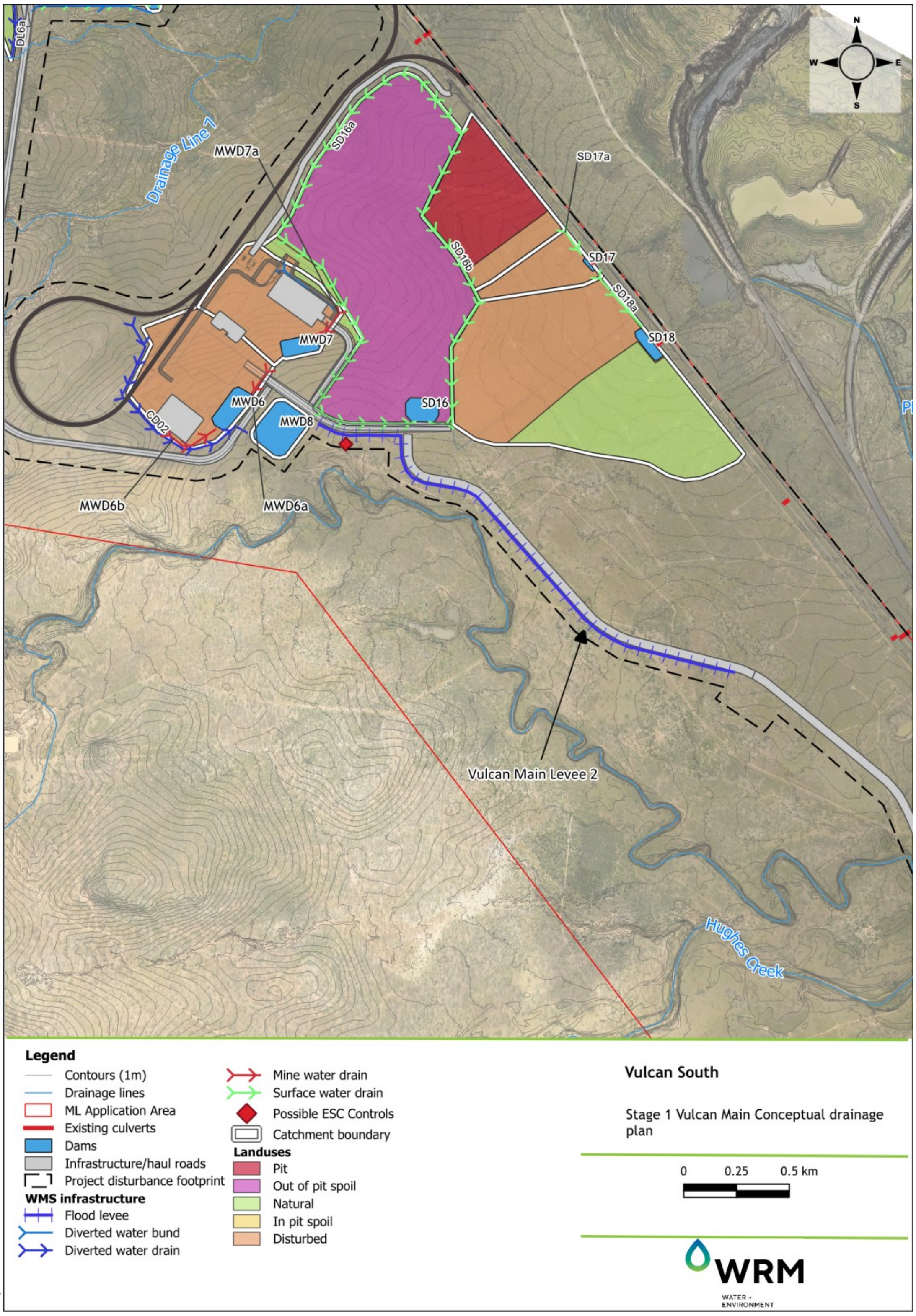

Figure 1.4 Stage 1 Vulcan Main mining area conceptual drainage plan

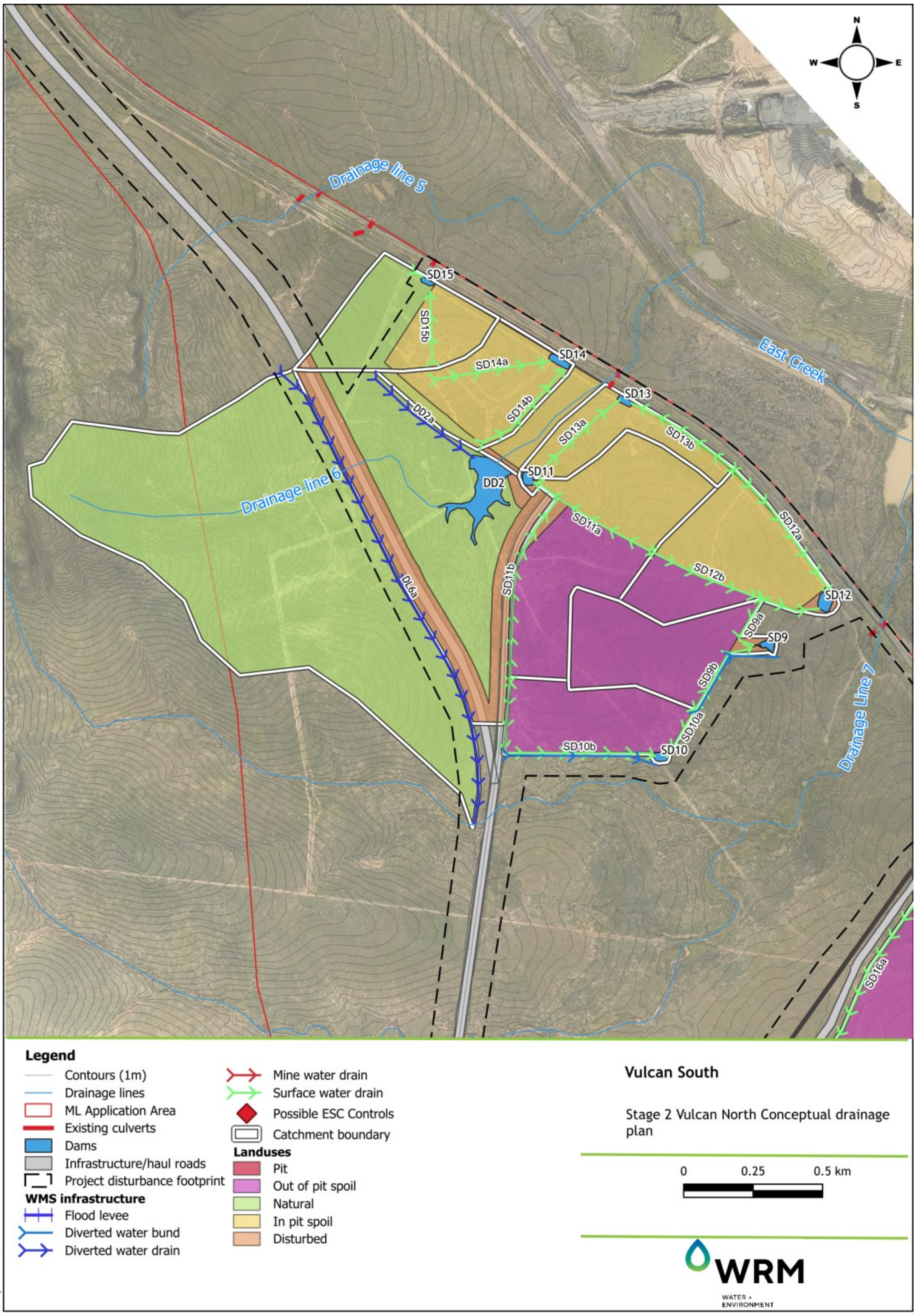

Figure 1.5 Stage 2 Vulcan North mining area conceptual drainage plan

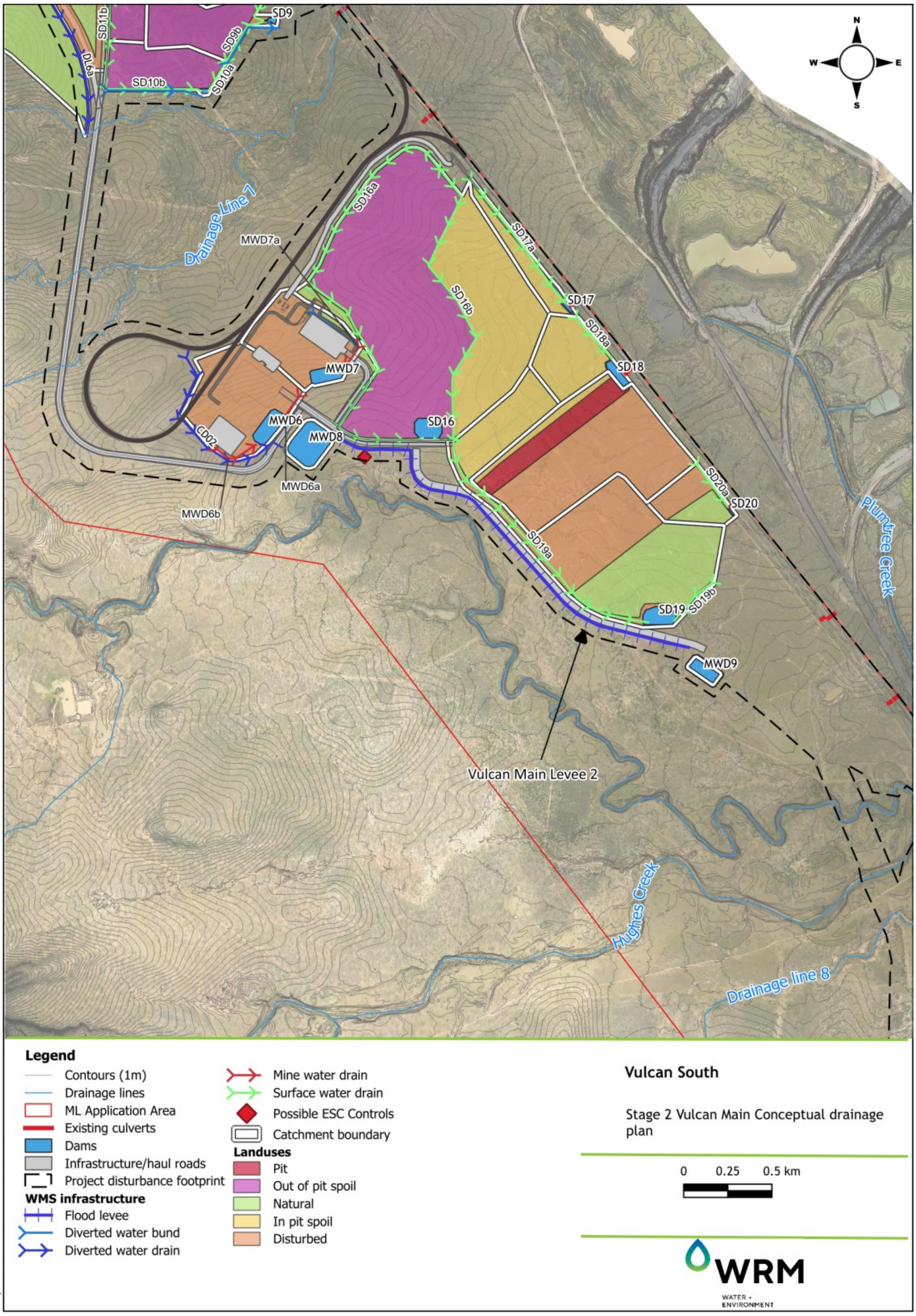

Figure 1.6 Stage 2 Vulcan Main mining area conceptual drainage plan

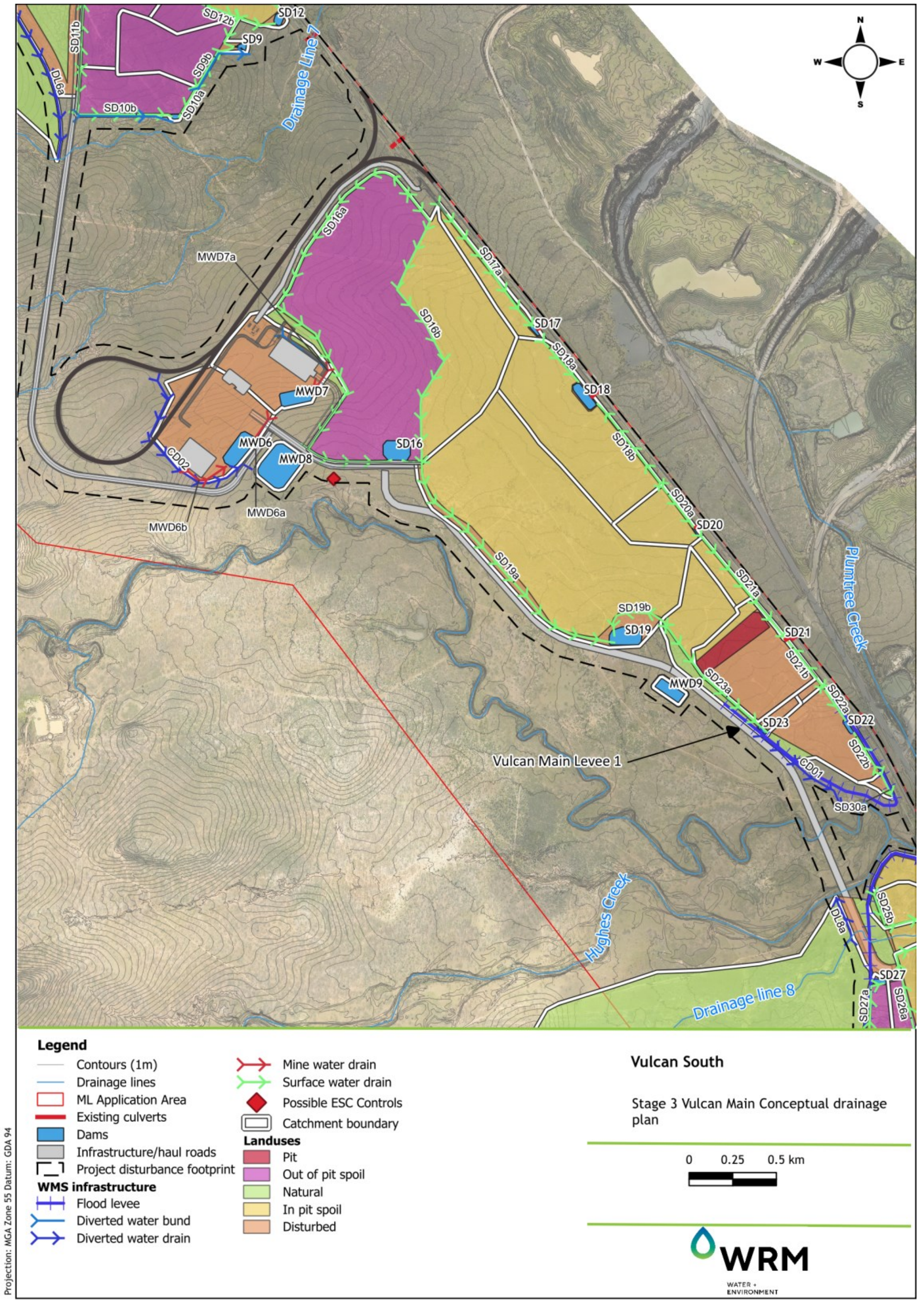

Figure 1.7 Stage 3 Vulcan Main mining area conceptual drainage plan

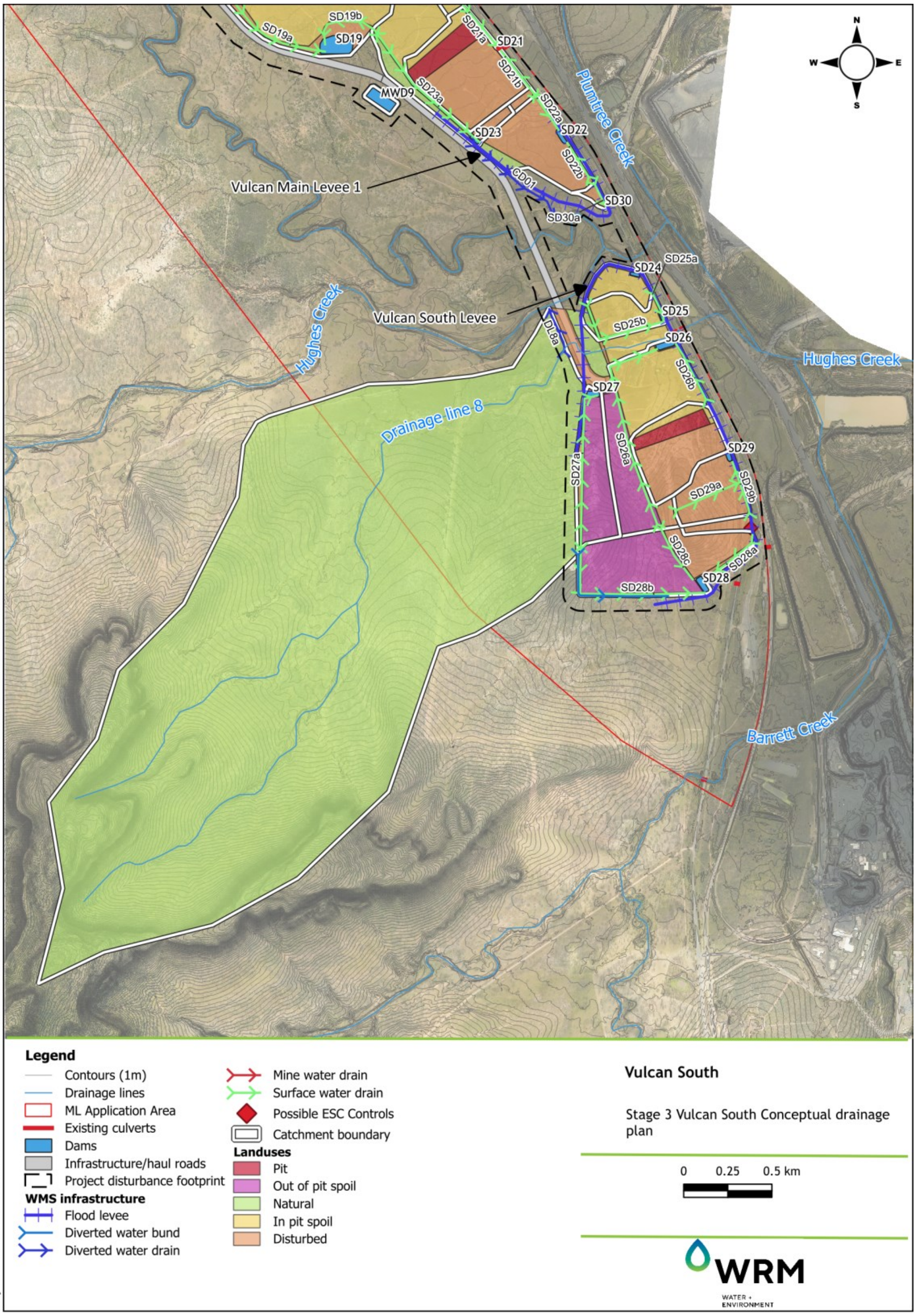

Figure 1.8 Stage 3 Vulcan South mining area conceptual drainage plan

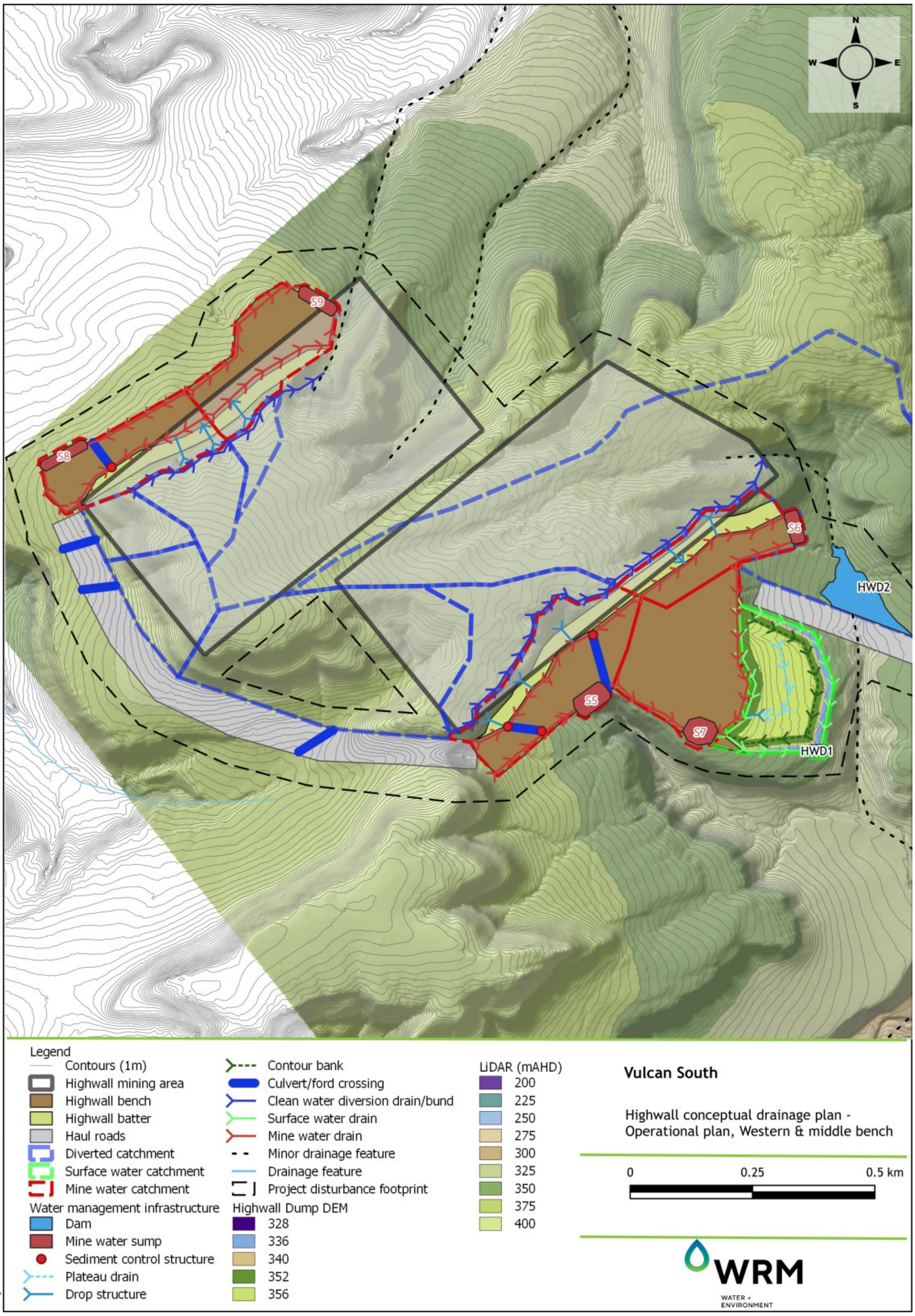

Figure 1.9 Highwall mining area west conceptual operational drainage plan

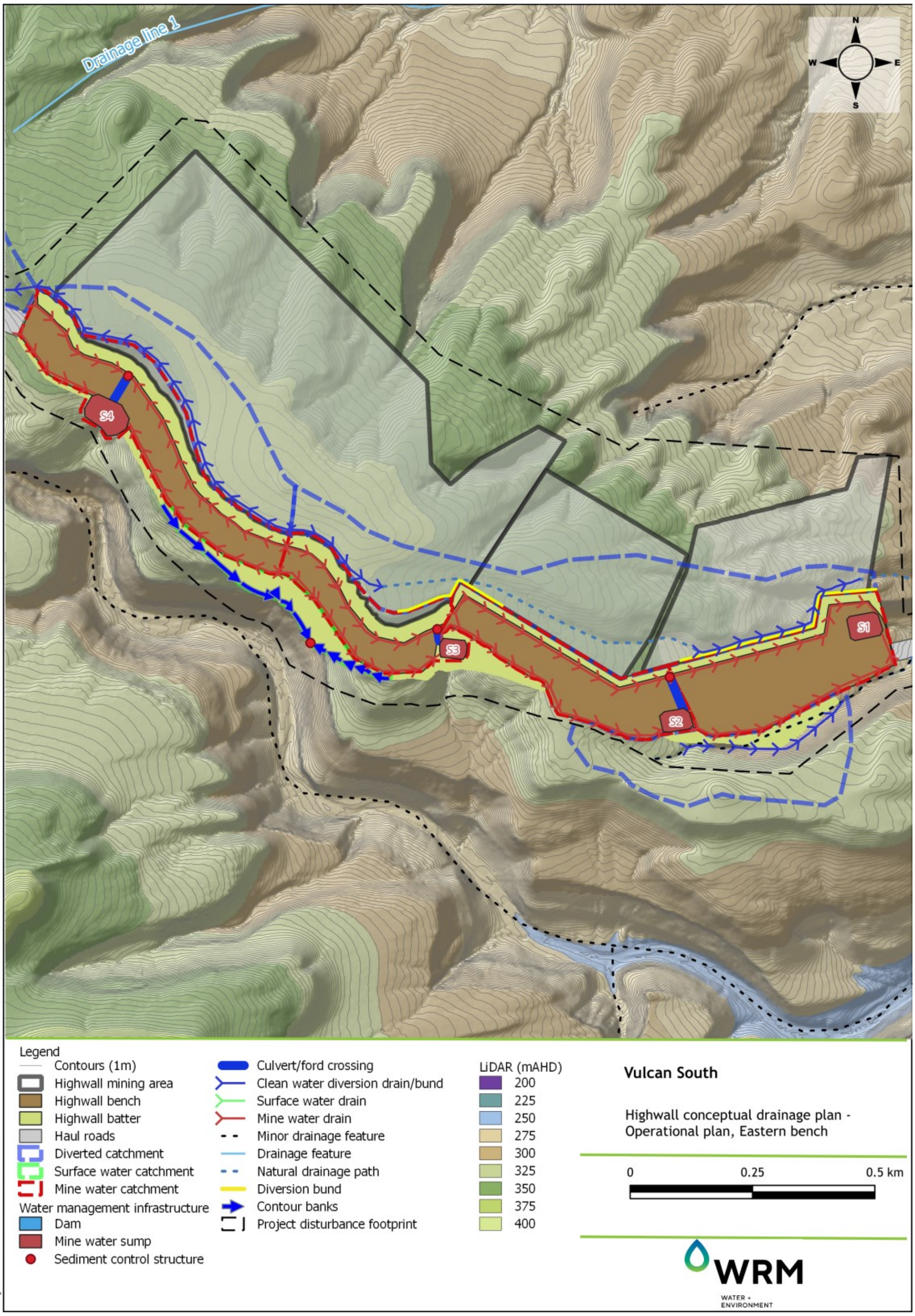

Figure 1.10 Highwall mining area east conceptual operational drainage plan

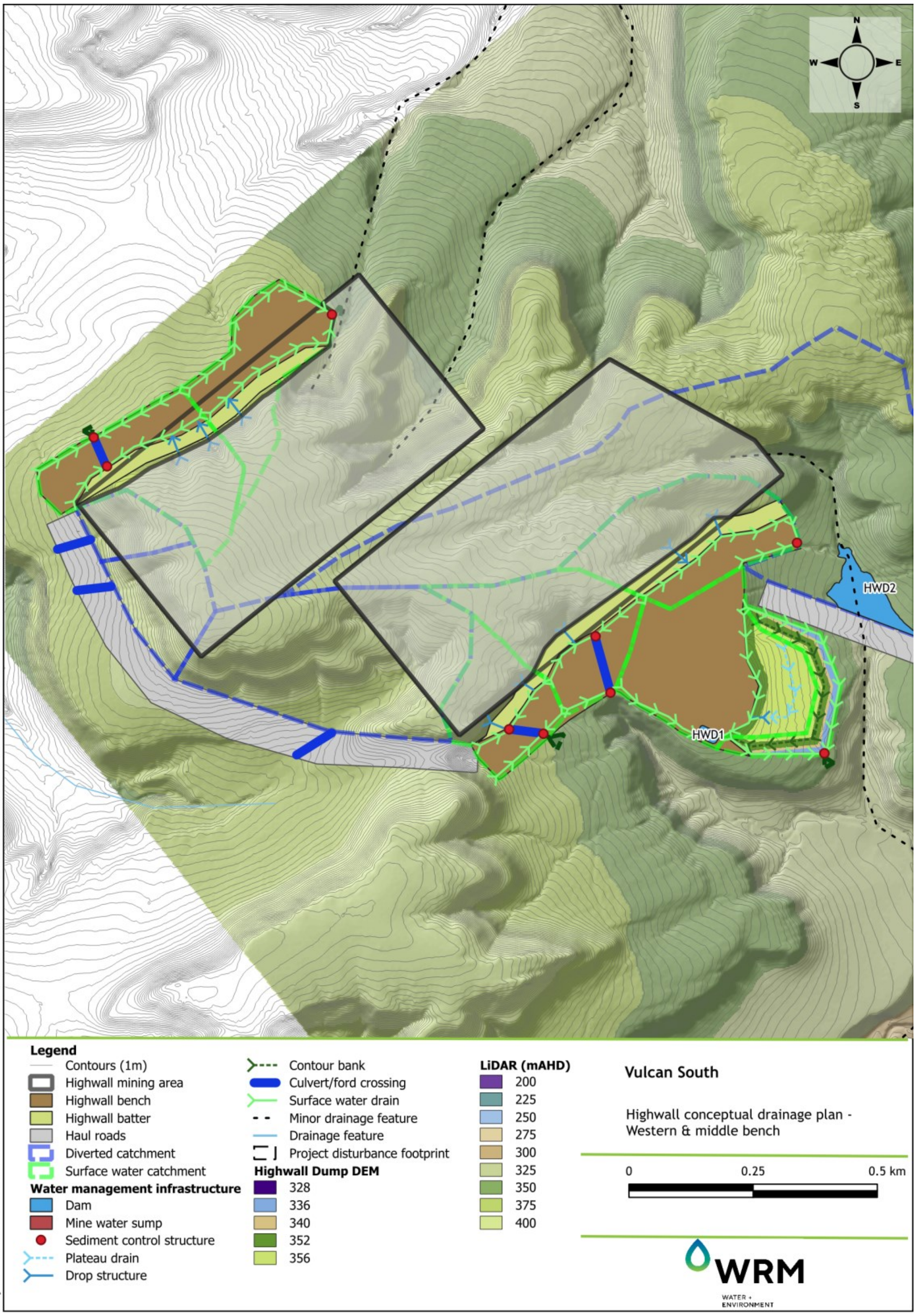

Figure 1.11 Highwall mining area west conceptual rehabilitation drainage plan (Year 2025)

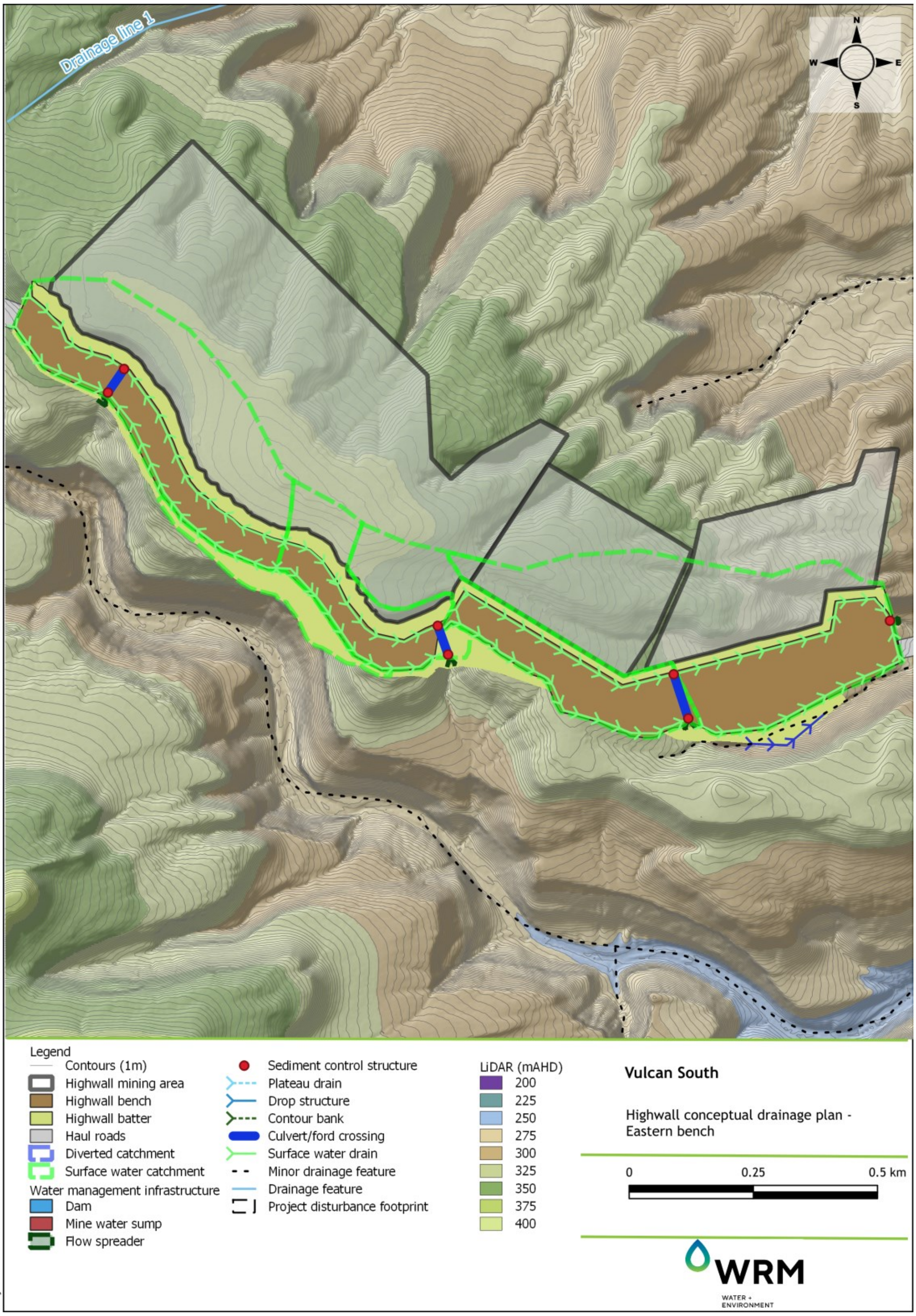

Figure 1.12 **Highwall mining area east conceptual rehabilitation drainage plan (Year 2025)**

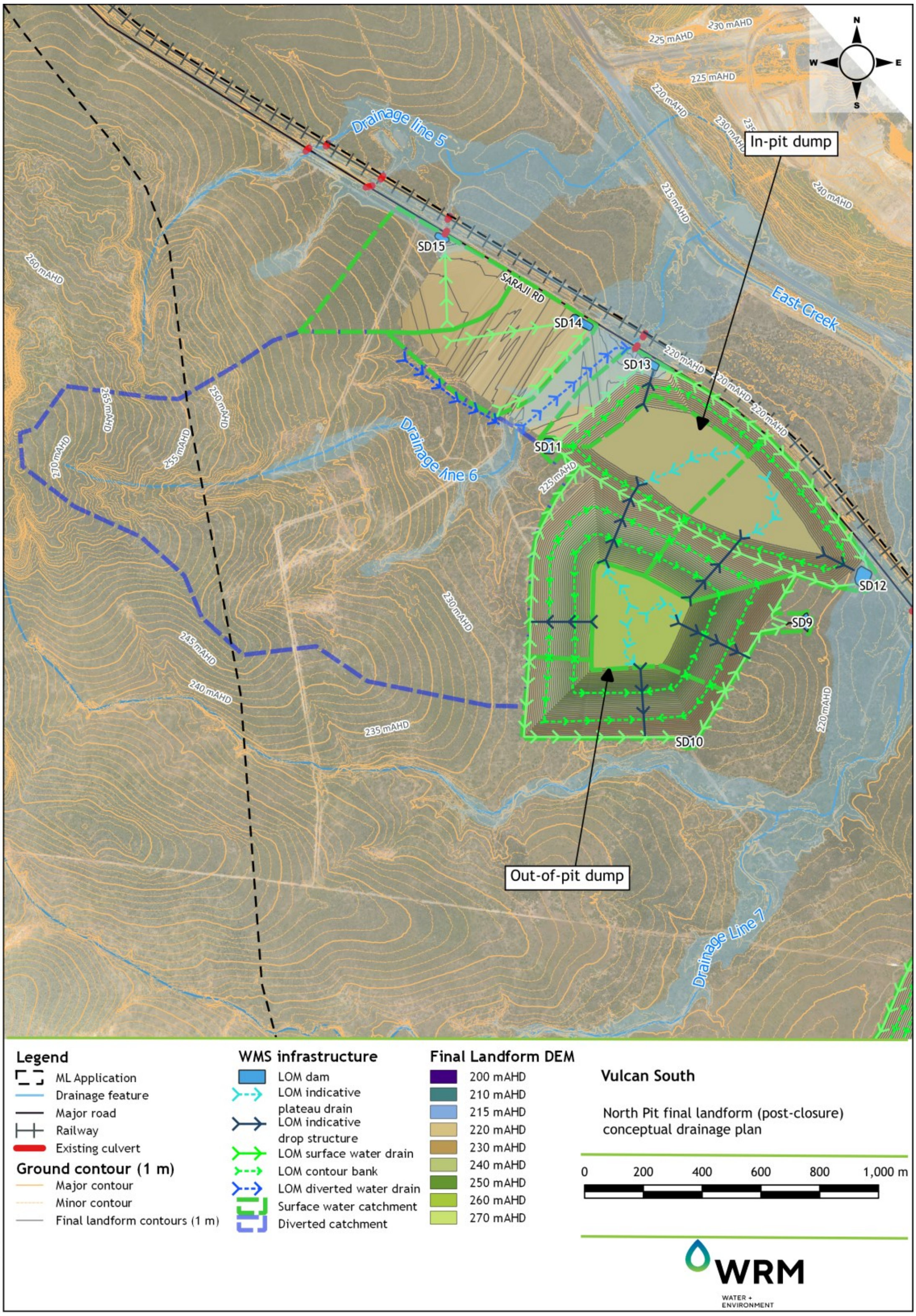

Figure 1.13 Vulcan North final landform (post-closure) conceptual drainage plan

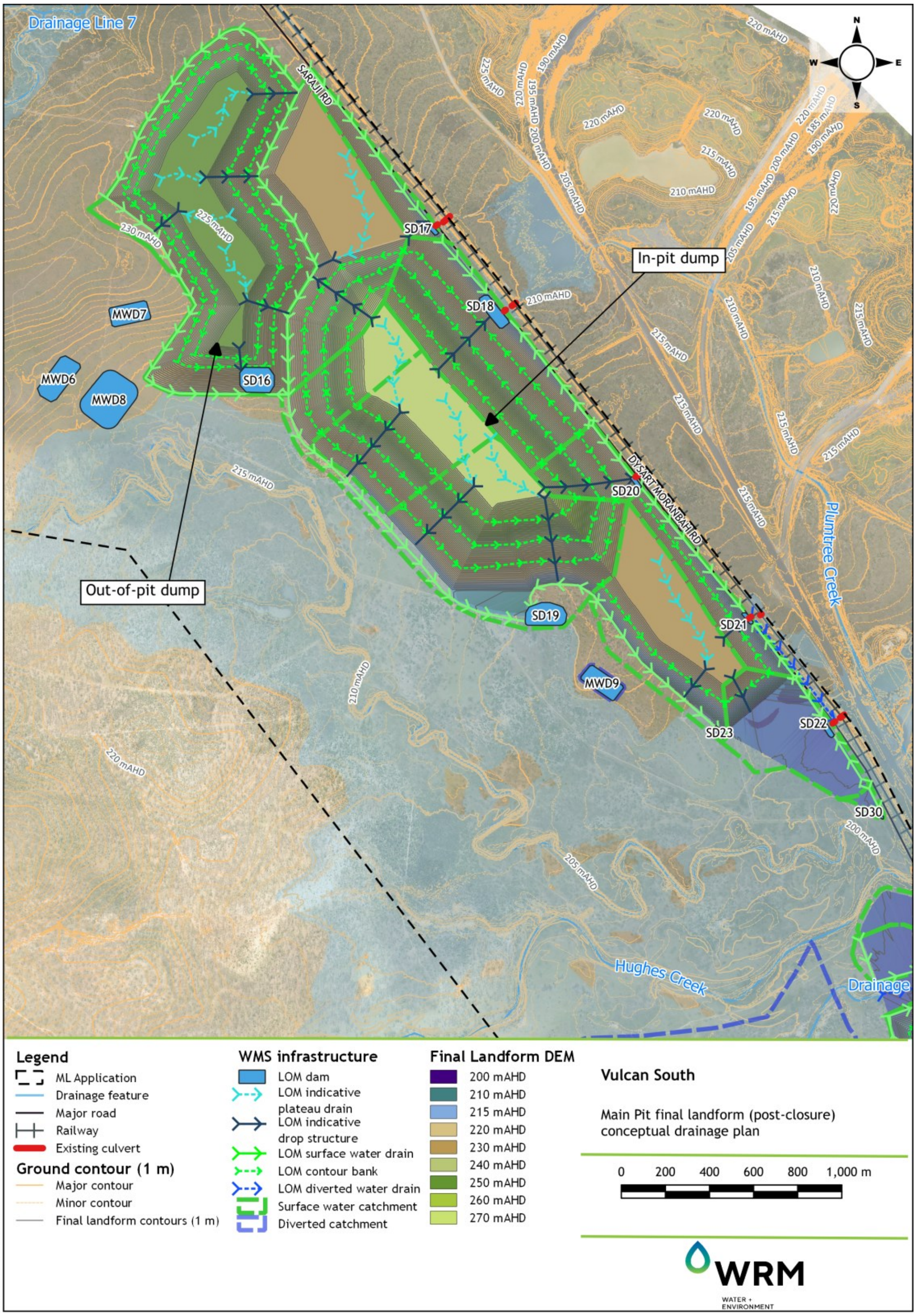

Figure 1.14 Vulcan Main final landform (post-closure) conceptual drainage plan

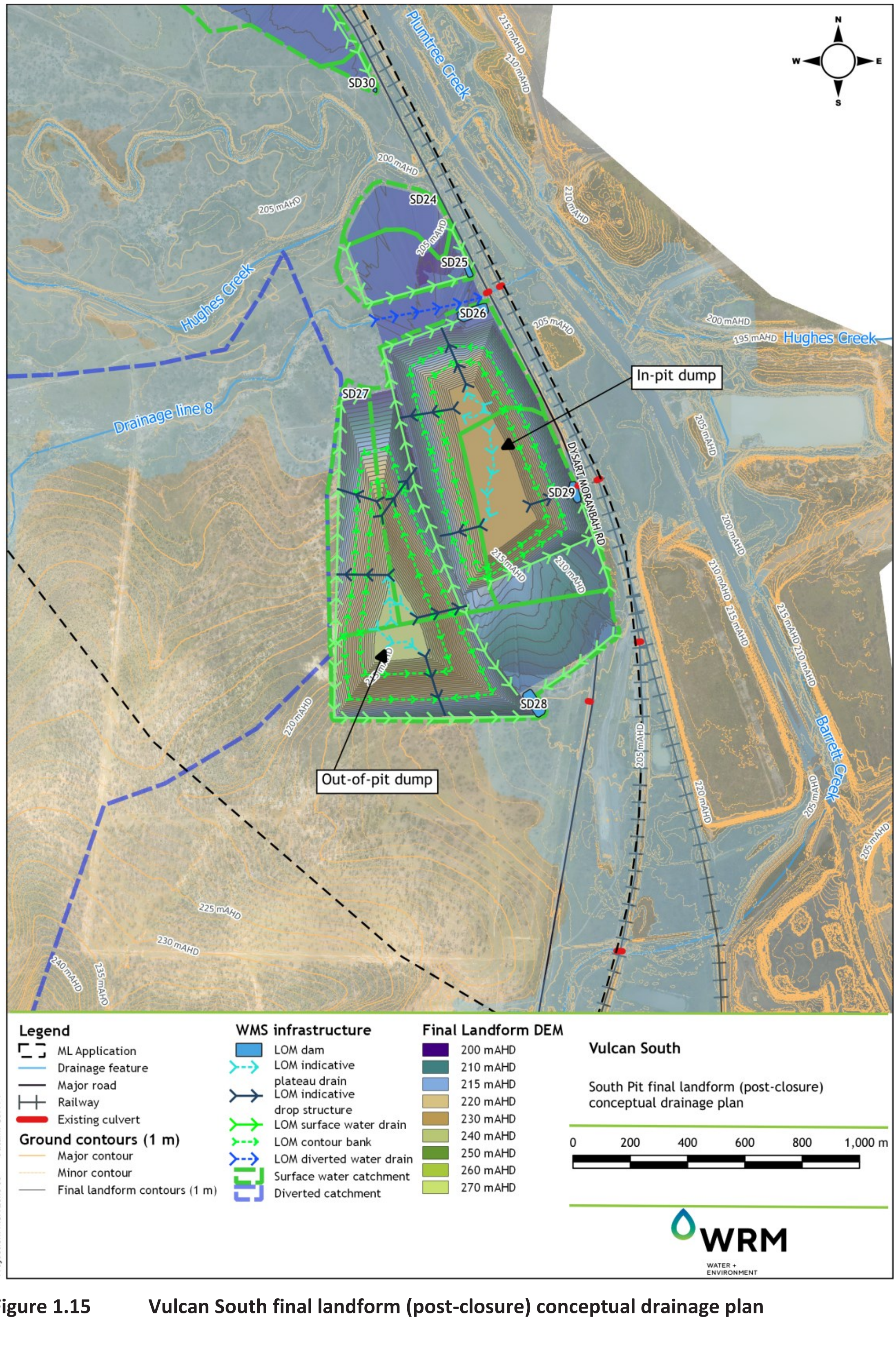

Figure 1.15 Vulcan South final landform (post-closure) conceptual drainage plan

2 CATCHMENT HYDROLOGY AND ENVIRONMENTAL VALUES

2.1 GENERAL

This section of the WMP describes the regional drainage characteristics in the vicinity of the Project. The environmental values (EVs) and water quality objectives (WQOs), as defined by the various environmental protection policies and guidelines and regulations relevant to these waterways, are also described.

2.2 REGIONAL DRAINAGE NETWORK

The Project is located within the Isaac River sub-basin of the greater Fitzroy Basin. Figure 2.1 shows the Upper Isaac River catchment to its confluence with Phillips Creek which has a catchment area of 5,708 square kilometres (km^2). The catchment area of Boomerang Creek is 788 km^2, of which 177 km^2 makes up the Hughes Creek catchment. The confluence of Boomerang and Hughes Creek occurs approximately 10 km to the east of the Project. Boomerang Creek drains into the Isaac River a further 10 km to the east of the Project.

The Isaac River commences approximately 100 km to the north of the Project site within the Denham Range. It drains in a south westerly direction through the Carborough and Kerlong Ranges before turning in a south easterly direction near the Goonyella Riverside Mine. It drains approximately 30 km to the east of the Project, and eventually flows to the Mackenzie River some 150 km to the southeast.

Three open water bodies are located in the Isaac upper catchment including Lake Elphinstone, Burton Gorge Dam and Teviot Creek Dam (Figure 2.1). Lake Elphinstone is a natural lake formed behind the Carborough Range whereas Burton Gorge Dam and Teviot Creek Dam are man-made structures that supply water to North Goonyella and Burton mines in the upper catchment.

Other than along the ranges, the majority of the Isaac River catchment has been cleared for agricultural use or for mining. There are several existing coal mines in the catchment, including Burton, North Goonyella, Goonyella Riverside, Broadmeadow, Broadlea North, Isaac Plains, Moranbah North, Millennium, Daunia, Poitrel, Grosvenor, Peak Downs, Saraji, Norwich Park and Lake Vermont mines.

Figure 2.2 shows the surrounding catchments of the Project area. The Project is located in the headwaters of the Boomerang, Hughes, Barret and Harrow creek catchments:

- Headwater drainage features of Boomerang Creek, which is a watercourse and tributary of the Isaac River, drains the northern portion of the Project area. Within the Project ML boundary, Boomerang Creek and its tributaries are identified as drainage lines. Boomerang Creek is identified as a watercourse approximately 1 km downstream (east) of the Project ML where Drainage lines 1, 2, 3 and 4 join. Boomerang Creek and its tributaries drain from Project ML boundary via a series of culverts under the Norwich Park Branch Railway.
- Hughes Creek is a watercourse and tributary of Boomerang Creek and drains the majority of the southern Project area. Hughes Creek is identified as a watercourse within the Project ML boundary. Hughes Creek drains from the Project ML boundary via a rail bridge under the Norwich Park Branch Railway.
- Barrett Creek, which is identified as a watercourse within the Project ML and is and tributary of Hughes Creek, drains a small portion of the southern Project area. Barrett Creek drains from the Project ML boundary via a culvert under the Norwich Park Branch Railway.
- Headwater drainage features of Harrow Creek, which is a tributary of Cherwell Creek and the Isaac River, drains a small portion of the northern Project ML area. Harrow Creek is identified as a watercourse approximately 2.2 km downstream (northwest) of the Project ML.

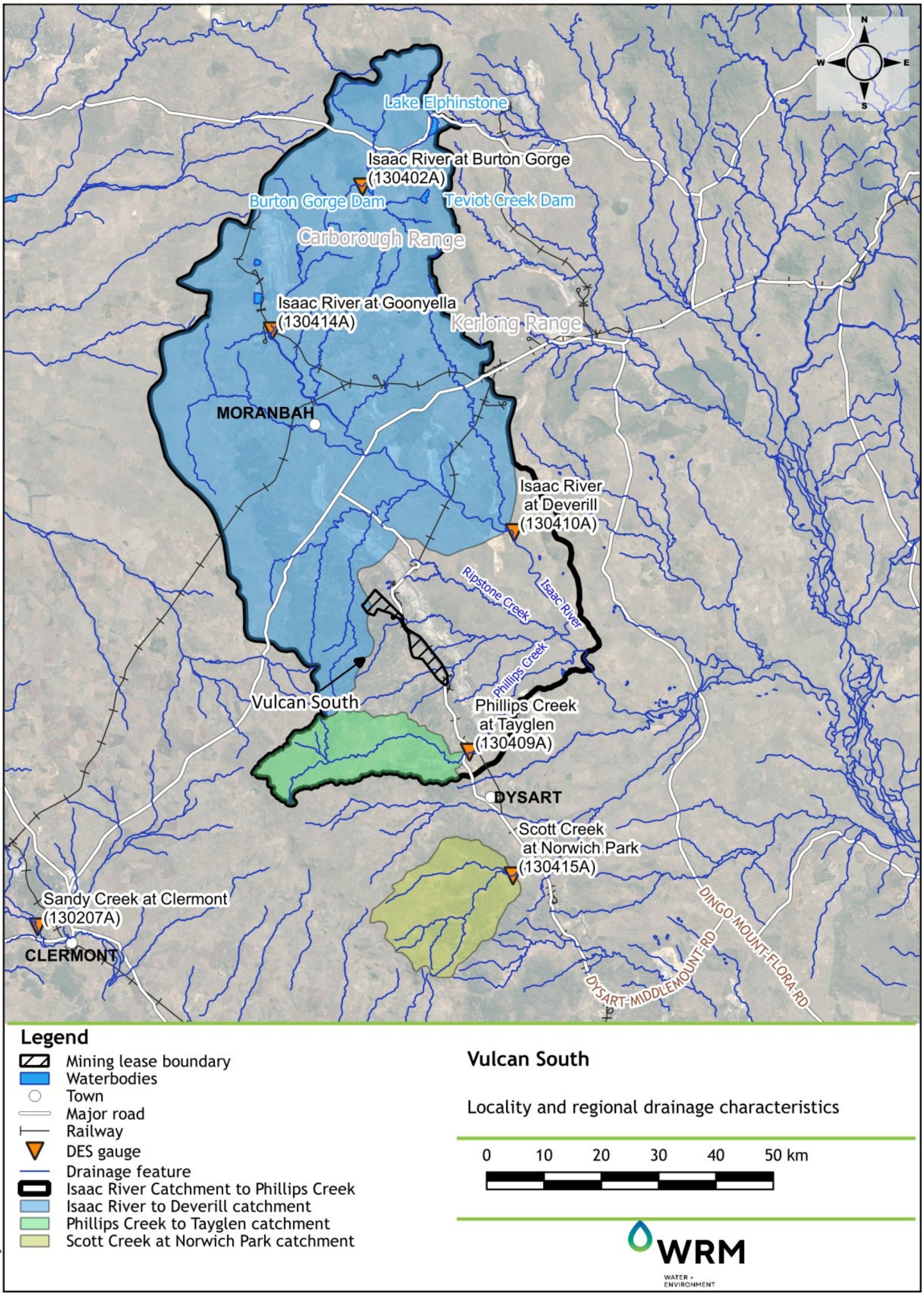

Figure 2.1 Upper Isaac River drainage characteristics

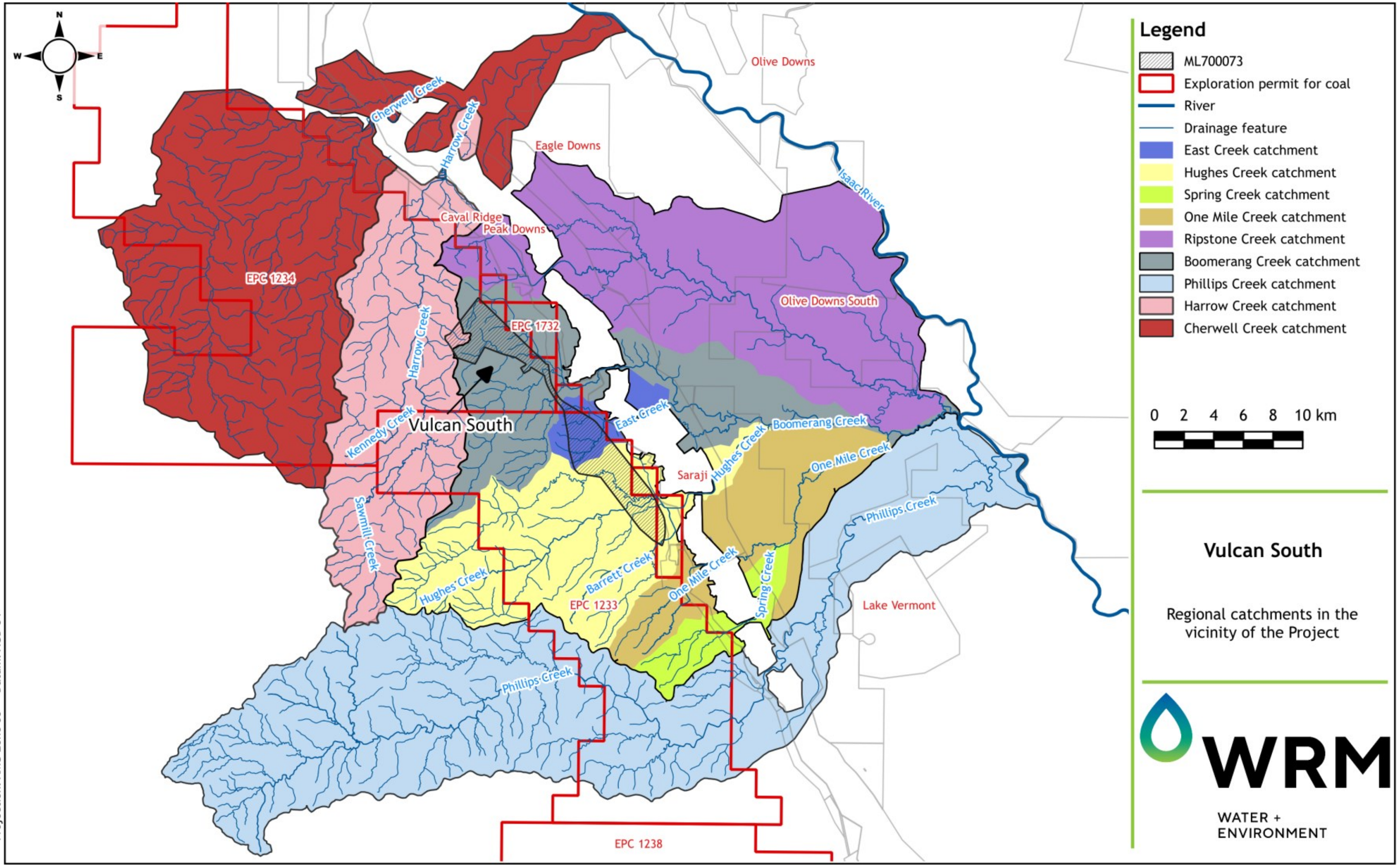

Figure 2.2 Regional catchments in the vicinity of the Project

2.3 LOCAL DRAINAGE NETWORK

Figure 2.3 to Figure 2.5 shows the local drainage features within the northern, central and southern Project areas respectively. Drainage features in the north of the Project area (in the vicinity of the highwall mining test area) primarily drain to Boomerang Creek. Drainage features in the centre of the Project area (near the Vulcan North pit) primarily drain to Boomerang Creek. Drainage features in the southern-central and southern areas of the Project area (near the Vulcan Main and Vulcan South pits) primarily drain to Hughes Creek and Barrett Creek. All drainage lines within the Project area eventually drain to the Isaac River. Figure 2.6 shows typical cross sections along the three local drainage features through the Project area with corresponding 1% AEP flood levels at the locations shown in Figure 2.3 to Figure 2.5.

The main drainage features which intersect the mining disturbance areas are (Figure 2.3 to Figure 2.5):

- Drainage line 1(a tributary of Boomerang Creek), which intersects the highwall mining (HWM) area;
- Drainage lines 2, 3, 4 and 5 (tributaries of Boomerang Creek), which intersects haul roads between the Vulcan North, HWM area and VCM;
- Drainage line 6 (a tributary of Boomerang Creek), which intersects Vulcan North mining area;
- Drainage line 7 (a tributary of Boomerang Creek), which intersects Vulcan Main mining area;
- Hughes Creek, which drains between Vulcan Main pit and Vulcan South mining area;
- Drainage line 8 (a tributary of Hughes Creek), which intersects Vulcan South mining area; and
- Barret Creek, which drains to the south of Vulcan South mining area.

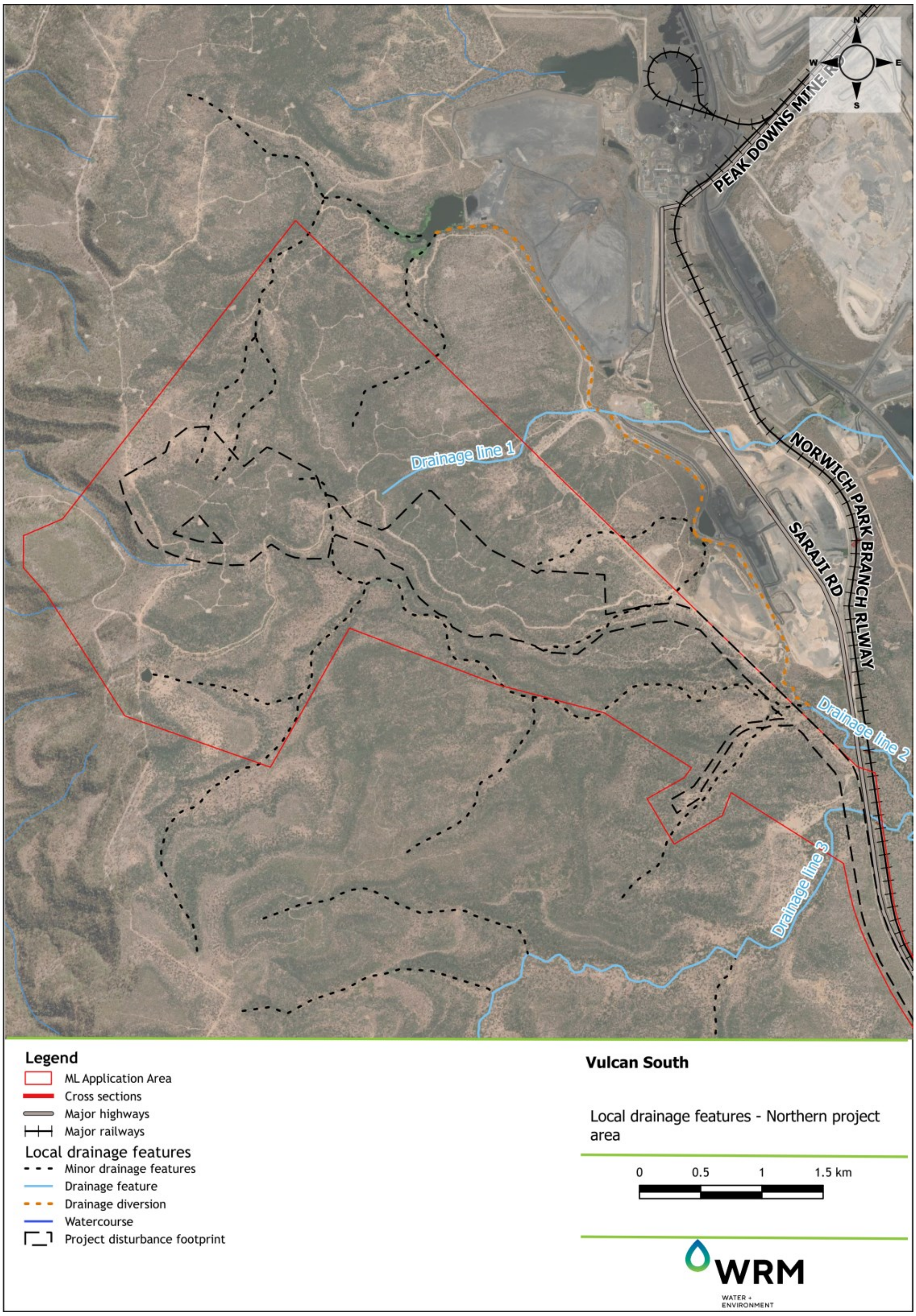

Figure 2.3 Local drainage features – northern Project area

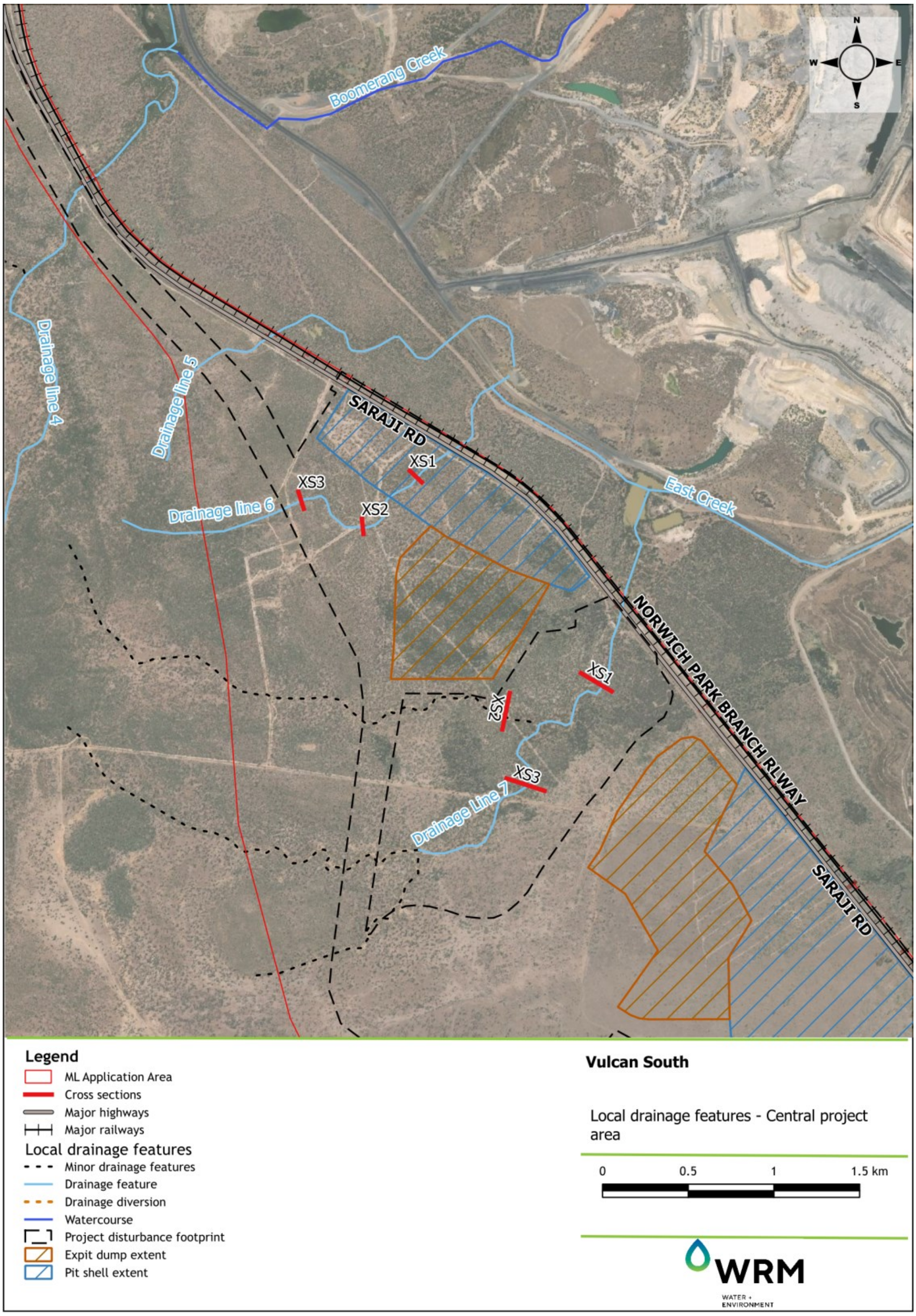

Figure 2.4 Local drainage features – central Project area

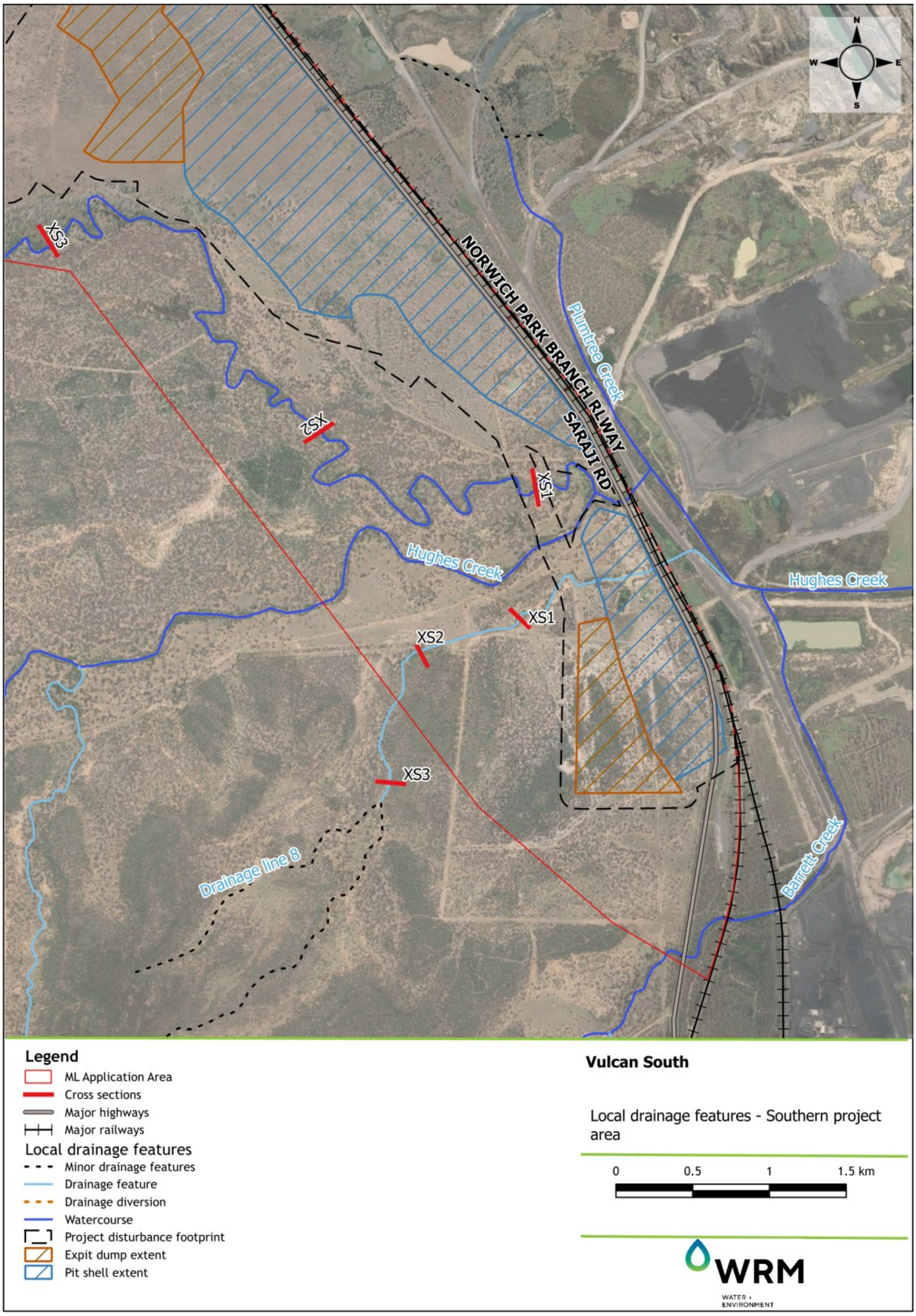

Figure 2.5 Local drainage features – southern Project area

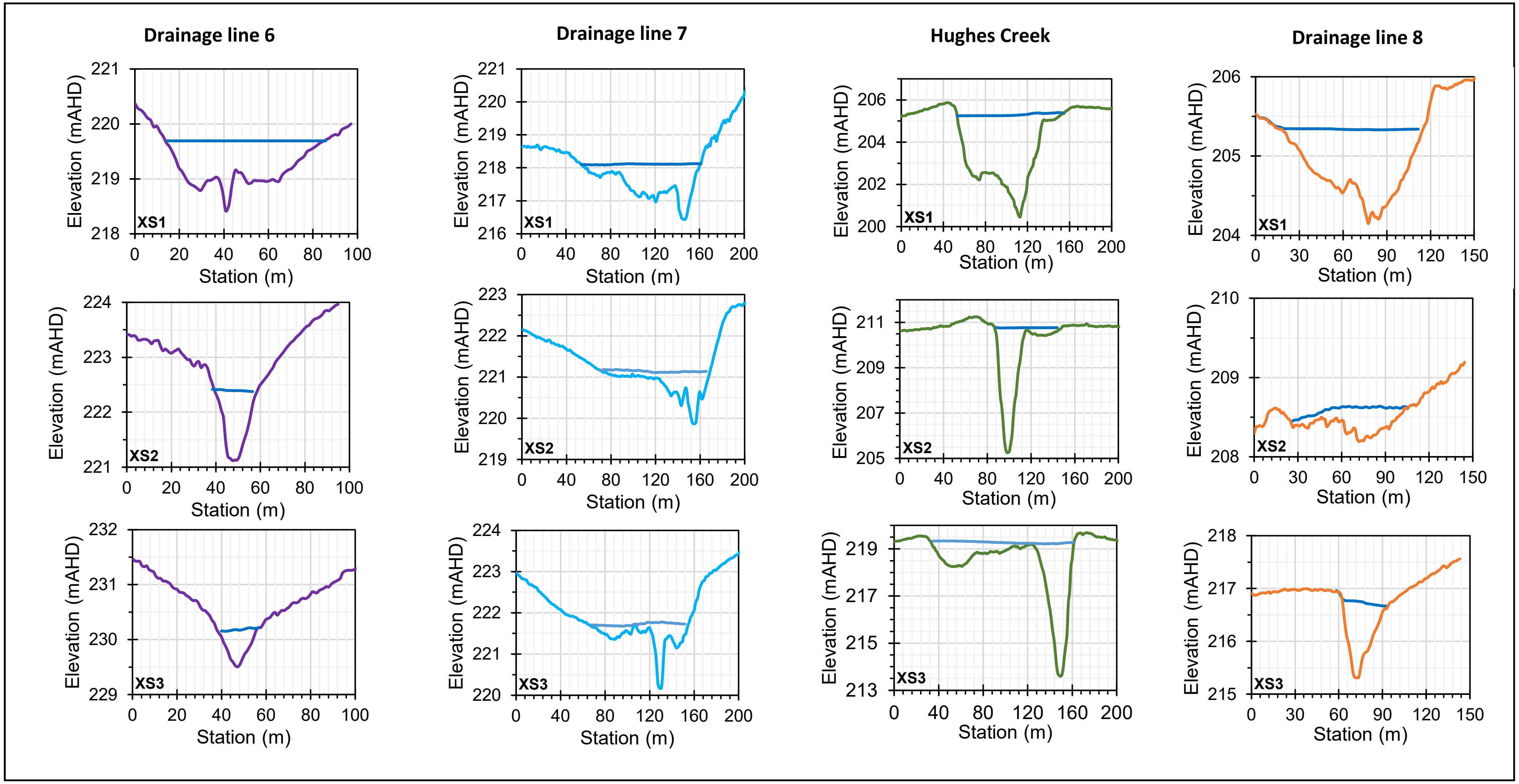

Figure 2.6 Drainage line cross sections with 1% AEP flood levels

2.3.1 Drainage line 1 and 2

Drainage lines 1 and 2 are tributaries of Boomerang Creek which drain the northern extent of the Project area (Figure 2.3). Drainage lines 1 and 2 also drain a significant portion of the Vulcan Coal Mine (VCM) and have previously been described in detail (WRM, 2021).

Drainage line 1 drains the northeastern extent of the Project area, in particular the northern extent of the Highwall mining area. Drainage Line 1 crosses the Saraji Road and the Norwich Park branch railway to the northeast of the Project area before discharging into the Peak Downs ML downstream of the railway. Drainage Line 1 flows into an existing on-line water storage within the Peak Downs operations before eventually discharging into Drainage Line 2 to the east of the Project boundary. Drainage Line 1 has been diverted and significantly modified within the Peak Downs ML.

The typical dimensions of the Drainage Line 1 channel are:

- channel bed widths of 2 m to 5 m;
- channel top widths of 10 m to 25 m;
- channel depths 0.5 to 1 m; and
- overbank floodplain widths of 20 m to 50 m.

Drainage line 1 is proposed to be diverted and subsequently reinstated as part of the VCM (WRM,2021). No further works are proposed for Drainage line 1 as part of this Project.

2.3.2 Drainage line 6

Drainage line 6 drains the majority of the Vulcan North mining area. The drainage line passes through a culvert under Saraji Road and the Norwich Park branch railway within the Project area (Figure 2.7). Drainage line 6 discharges into an existing drainage diversion within the Saraji Mine known as East Creek which in turn, passes through the Saraji Mine operation before draining into Boomerang Creek approximately 5 km to the east of the Project.

The typical dimensions of the Drainage Line 6 channel through the Project area are (Figure 2.4):

- channel bed widths of 1 m to 5 m;
- channel top widths of 5 m to 20 m;
- channel depths 0.5 to 1 m; and
- overbank floodplain widths of 15 m to 80 m.

Drainage line 6 will be diverted as part of the Project to avoid the Vulcan North mining area (Figure 1.3). The 1.8 km long drainage diversion will divert Drainage line 6 into Drainage line 7 during operations. Drainage Line 6 will be reinstated post-mining by constructing a drainage corridor through backfilled spoil. DD2 will collect runoff from the remaining Drainage line 6 catchment.

Figure 2.7 Photograph of Drainage line 6 passing under the Norwich Park Branch railway

2.3.3 Drainage line 7

Drainage line 7 (Figure 2.8) lies between the proposed Vulcan North and Vulcan Main mining areas, and north of the TLO and CHPP area. Drainage line 7 will receive releases from sediment dams around the Vulcan North out of pit emplacement area and the diverted water catchment from Drainage line 6 during operations (Section 2.3.2).

Drainage line 7 collects a natural catchment to the west of the Project area and discharges through existing box culverts under Saraji Road and the Norwich Park Branch railway (Figure 2.9). The Drainage line 7 flows into a dam 400 m east of the Project area, which forms part of the drainage diversion known herein as East Creek within the Saraji Mine.

The typical dimensions of the Drainage Line 7 channel through the Project area are (Figure 2.6):

- channel bed widths of 3 m to 5 m;
- channel top widths of 10 m to 15 m;
- channel depths 1.0 to 2.0 m; and
- overbank floodplain widths of 50 m to 100 m.

Figure 2.8 Photograph of Drainage line 7 south of the Vulcan North mining area

Figure 2.9 Photograph of Drainage line 7 passing through box culverts under Saraji Road

2.3.4 Hughes Creek

Hughes Creek is a watercourse that collects a significant natural catchment to the west of the Project area. The creek flows west-east between the Vulcan Main and Vulcan South mining areas, passing under two bridges crossings of Saraji Road and the Norwich Park branch railway (Figure 2.10). A number of drainage features discharge into Hughes Creek to the east of the Project Area, including Barrett Creek and Drainage line 8. Hughes Creek passes through the Saraji Mine operation before discharging to Boomerang Creek, approximately 10 km to the east of the Project area. Hughes Creek has been diverted and significantly modified within the Saraji ML.

A tributary of Hughes Creek flows on the southern edge of the Vulcan Main mining area and will receive releases from sediment dams around the southern side of the Vulcan Main in-pit and ex-pit emplacement areas and the northern side of the Vulcan South in pit emplacement areas. Hughes Creek will also receive the diverted water catchment from Drainage line 8 during operations (Section 2.3.5).

The typical dimensions of the Hughes Creek channel within the Project area are (Figure 2.6):

- channel bed widths of 3 m to 10 m;
- channel top widths of 30 m to 50 m;
- channel depths 2 to 5 m; and
- overbank floodplain widths of 50 m to 150 m.

Figure 2.10 Photograph of Hughes Creek passing under Saraji Road

2.3.5 Drainage line 8

Drainage line 8 is a tributary of Hughes Creek which flows through the proposed Vulcan South mining area. Drainage line 8 currently passes through box culverts under Saraji Road and the Norwich Park branch Railway before discharging into Hughes Creek to the east of the Project area (Figure 2.5). Drainage line 8 is proposed to be diverted during operations around the Vulcan South mining area into Hughes Creek (DL8a in Figure 1.8) to the north. Drainage Line 8 will be reinstated postmining by constructing a drainage corridor through backfilled spoil.

The typical dimensions of the Drainage Line 8 channel through/upstream of the Project area are (Figure 2.6):

- channel bed widths of 1 m to 3 m;
- channel top widths of 10 m to 20 m;
- channel depths 0.5 to 1.0 m; and
- overbank floodplain widths of 50 m to 150 m.

Drainage line 8 is not well defined in its lower reaches (i.e. closer to the proposed Vulcan South mining area) and an existing farm is located on the section of Drainage Line 8 that is to be diverted.

2.4 STREAM FLOW

There are two streamflow gauges that were operated by the Department of Regional Development, Manufacturing and Water (DRMW) in the vicinity of the Project including (see Figure 1.1):

- Isaac River at Deverill (approximately 25 km northeast of the Project); and
- Phillips Creek at Tayglen (approximately 30 km southeast of the Project).

The closest stream gauge is located on the Isaac River at Deverill (Station ID: 130410A). This gauge is located approximately 20 km upstream of where Boomerang Creek meets the Isaac River.

Historical flow and river height monitoring data (1968-2018) for the Isaac River at Deverill, provides an indication of the flow regime (refer Figure 2.11). Surveyed cross section data for this gauging station in September 2014 (DRMW, 2017) indicates that sediment covers the bottom one metre of the gauge range. The mean river height data shown in Figure 2.11 suggests that surface flow above the sand is more likely to occur only in the wetter months from November to April, reducing to shallow subsurface flows from about May to October in an average year.

The Phillips Creek at Tayglen Creek streamflow gauge (Station ID: 130409A) is located on Phillips Creek. Phillips Creek is an easterly draining tributary of the Isaac River. DRMW maintains data for the gauge between 1968 and 1988. The catchment area to the gauge location (see Figure 1.1) is 344 km^2.

A typical sequence of recorded flows from this station is shown in Figure 2.12. The creek is characterised by brief periods of flow interspersed by long periods of no flow. This ephemeral behaviour is typical for streams in this part of the Fitzroy Basin.

The median annual flow over the period of record was approximately 12,730 ML/a (52 mm of runoff), most of which occurred in the summer months (as shown in Figure 2.13). Figure 2.14 compares flow frequency curves for a number of gauged catchments in the Isaac River catchment which are located in the vicinity of the Project. Figure 2.14 shows that for Phillips Creek at Tayglen, flow only occurred approximately 22% of the time, which would be similar to other creeks in the vicinity of the Project.

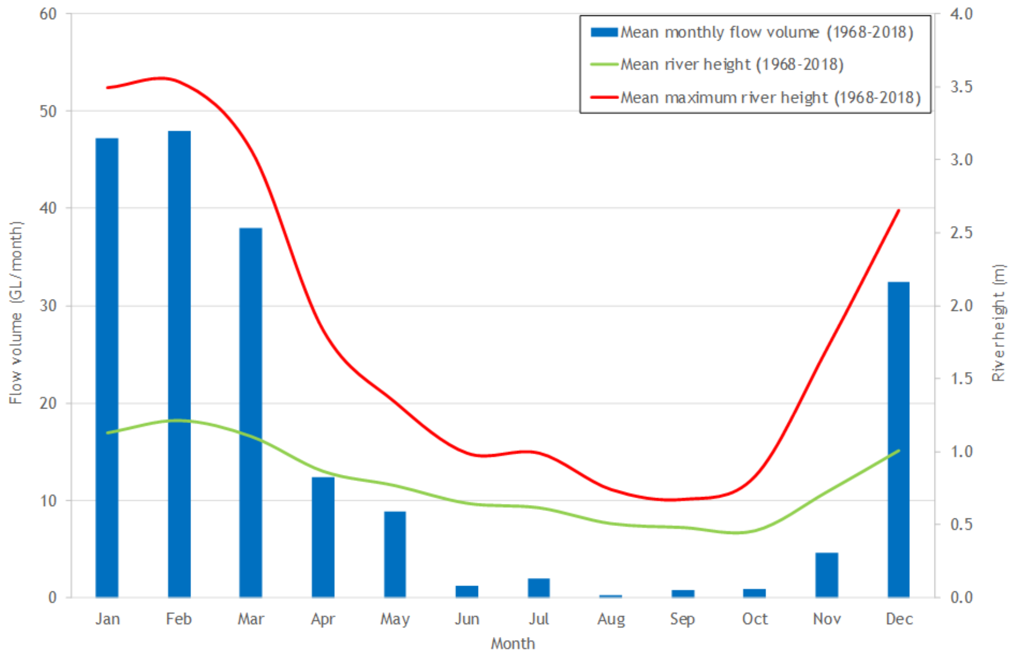

Figure 2.11 **Flow volume and river height in the Isaac River at Deverill**

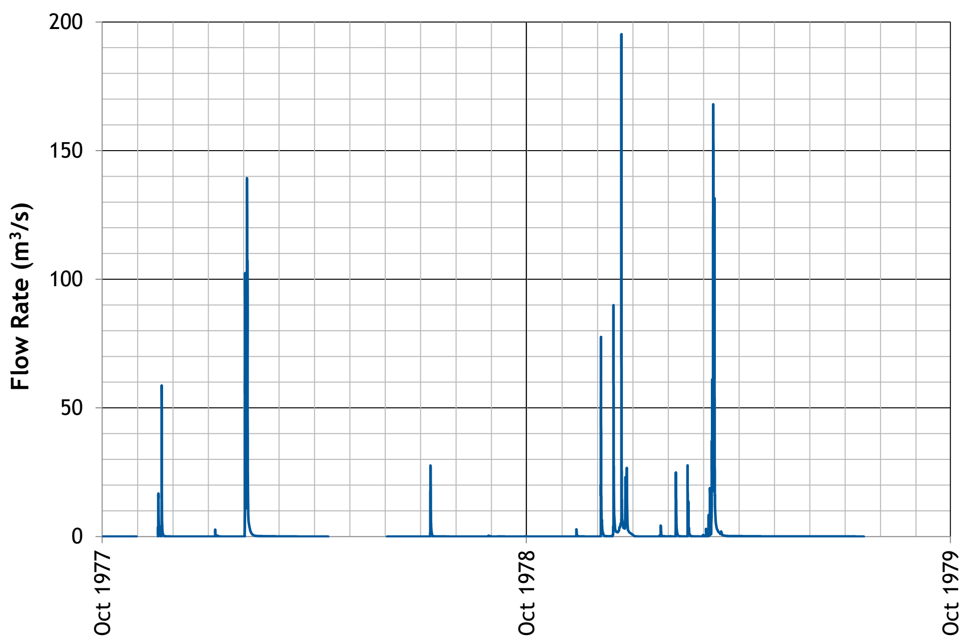

Figure 2.12 **Sample flow sequence – Phillips Creek at Tayglen 1977 - 1979**

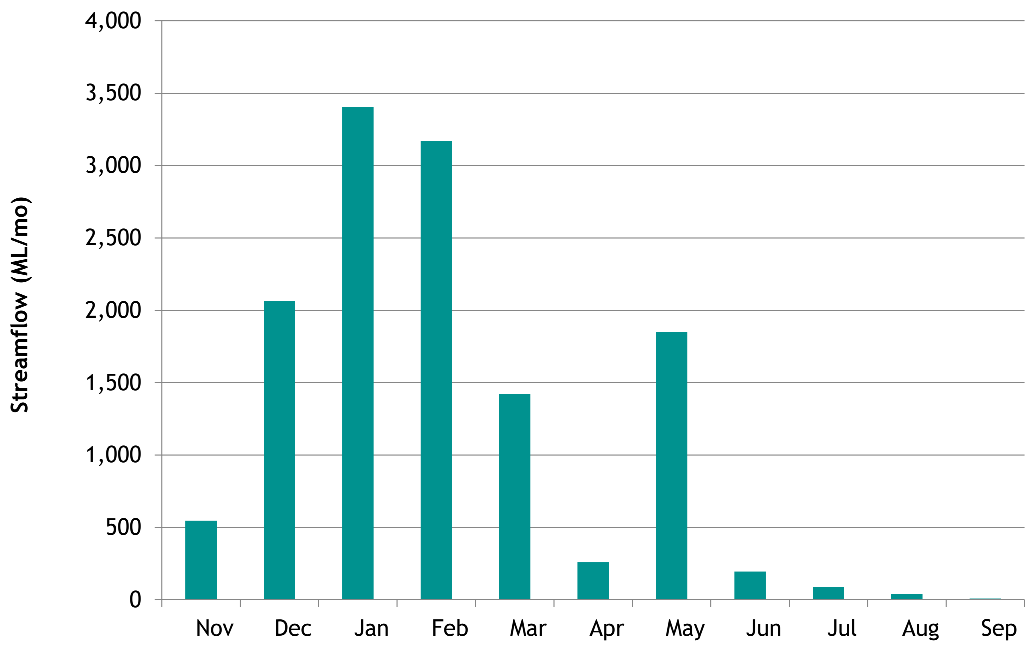

Figure 2.13 Measured mean monthly streamflow – Phillips Creek at Tayglen 1968-1988

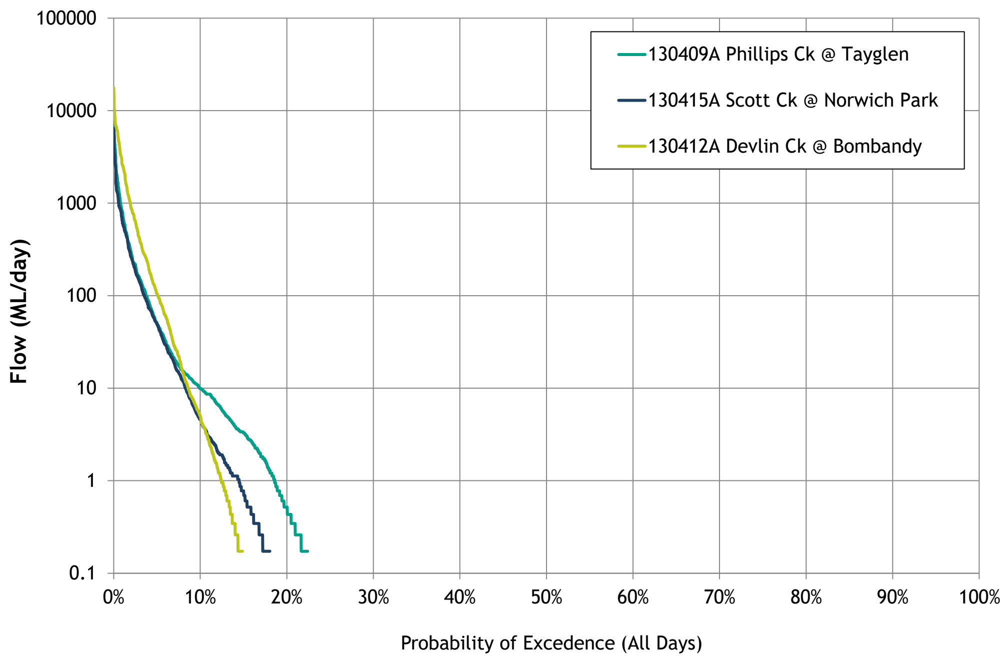

Figure 2.14 Recorded frequency curves at nearby DRMW gauges (no flow days included)

2.5 ENVIRONMENTAL VALUES

The Queensland Water Quality Guidelines and Environmental Protection (Water and Wetland Biodiversity) Policy (EPP Water) guidelines establish environmental values (EVs) and water quality objectives (WQOs) for natural waters in Queensland. The Project is located within the 'Isaac western upland tributaries' area of the Isaac River sub-basin (see Figure 2.15). Under the EPP Water, the following EVs have been nominated for this area:

- Aquatic ecosystems;
- Irrigation;
- Farm supply/use;
- Stock water;
- Aquaculture;
- Human consumption;
- Primary recreation;
- Secondary recreation;
- Visual recreation;
- Drinking water;
- Industrial use; and
- Cultural and spiritual values.

Site specific trigger values were derived in accordance with the methodology outlined in ANZG (2018). Where different EVs have different WQOs, the Project has adopted the lowest concentration value for mine water and receiving waters trigger levels (WRM, 2023).

2.6 EXISTING WATER USE ENTITLEMENTS

Figure 2.16 shows the water access licence holders in the vicinity of the Project which may be potentially affected. The active water access licences/licence to take water from waterways that drain through the Project area (Harrow Creek, East Creek, Boomerang Creek, Hughes Creek and Barrett Creek) include:

- Moranbah Coal Measures WAL 608364/615421 (Purpose: Dewatering - Underground);
- Boomerang Creek WAL 617686 (Purpose: Site Water Management), Isaac Connors Water Management Area;
- Ripstone Creek WAL 614270 (Purpose: Site Water Management), Isaac Connors Water Management Area;
- Isaac River WAL 619183/619184 (Purpose: Any), Isaac Connors Water Management Area;
- Harrow Creek WAL 43158L (Purpose: Industrial), Isaac Connors Water Management Area.

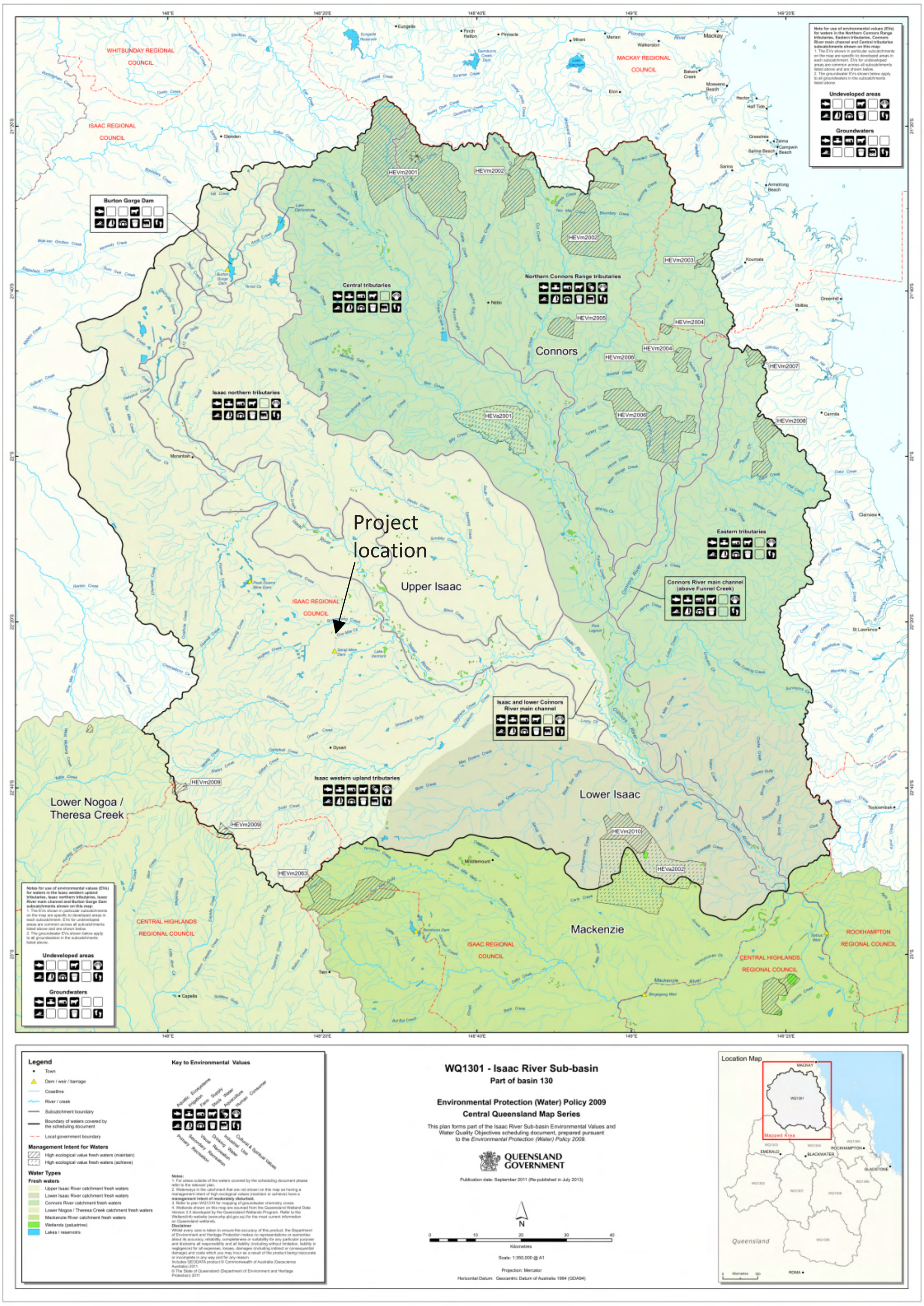

Figure 2.15 **Isaac River Sub-Basin EVs (source: DES, 2013)**

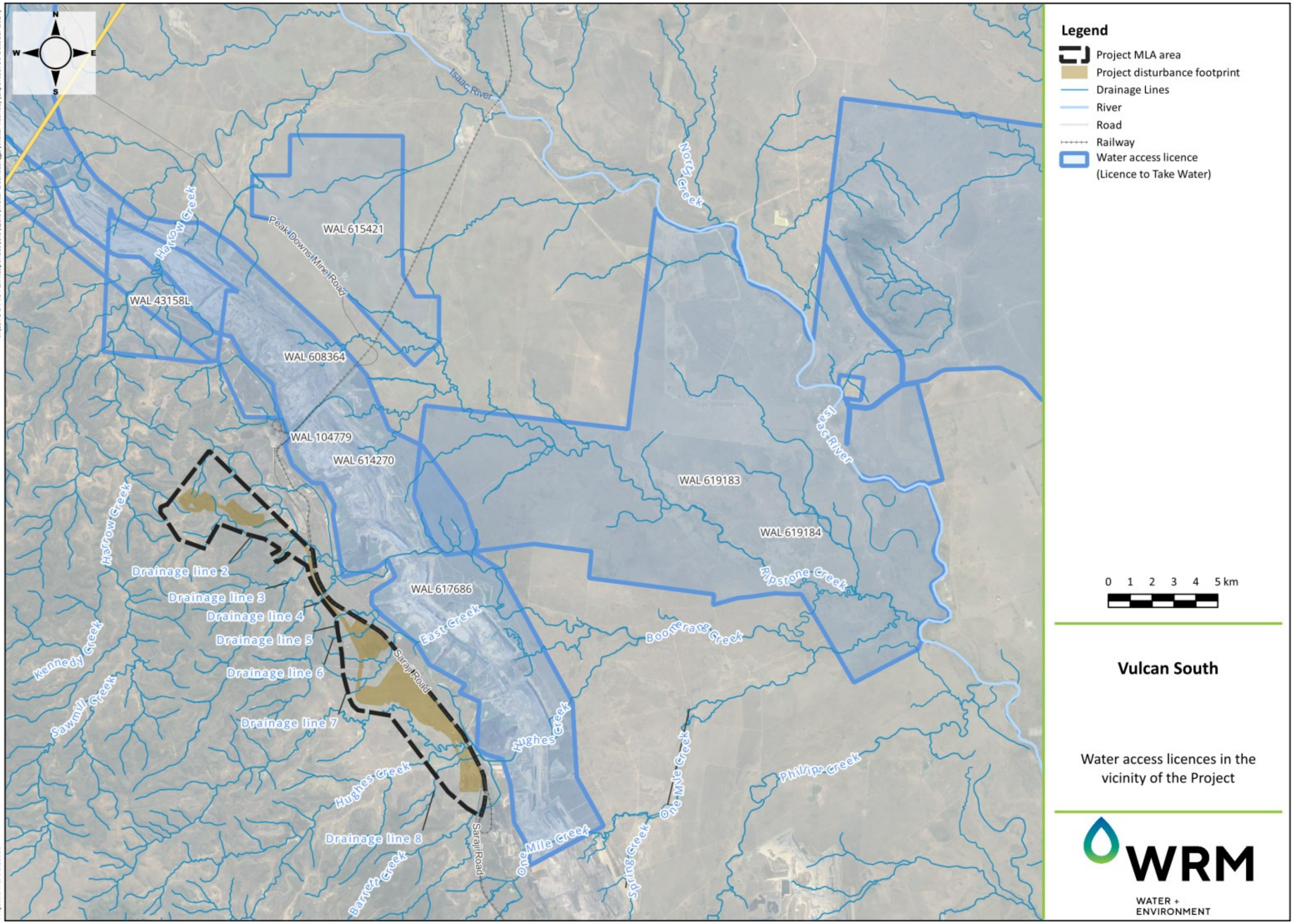

Figure 2.16 Active water access licences in the vicinity of the Project

2.7 GROUNDWATER

Groundwater inflow estimates to the open cut pits were provided by Hydrogeologist.com.au (2020) and have been provided as daily rates for six-monthly periods over the mine life. A summary of the predicted groundwater inflows (grouped by pit area) is provided in Table 2.1.

Table 2.1 Estimated groundwater inflows

Stage	Period (for the 6 months prior)	Groundwater inflow (m³/day)		
		Vulcan North	Vulcan Main	Vulcan South
1	1/07/2025	0.88	0	0
	1/01/2026	1.86	0.21	0
	1/07/2026	1.45	2.6	0
	1/01/2027	4.71	6.41	0
2	1/07/2027	3.09	35.93	0
	1/01/2028	1.15	37.14	0
	1/07/2028	0	33.72	0
	1/01/2029	0	35.09	0
	1/07/2029	0	42.42	0
	1/01/2030	0	32.2	0
3	1/07/2030	0	29	0
	1/01/2031	0	21.9	0.15
	1/07/2031	0	9.05	0.77
	1/01/2032	0	2.62	2.34
	1/07/2032	0	10.72	2.05
	1/01/2033	0	6.28	0.89

2.8 WATER QUALITY

2.8.1 Regional Isaac River water quality

DRMW has collected daily electrical conductivity (EC) data at the Isaac River at Deverill gauge. The Deverill gauge is located upstream of the point where Boomerang Creek drains into the Isaac River. The gauge would therefore be representative of water quality in the receiving waters of the Isaac River from the Project. Table 2.2 shows a summary of the analysed median results for the Isaac River at the Deverill Gauging Station. This site was selected as complete datasets (i.e. individual sample analysis results) are publicly available, as opposed to summary data only.

Figure 2.17 presents a time history of recorded instantaneous EC and stream flow for the Isaac River at Deverill gauging station. Figure 2.18 details the relationship between instantaneous flow and EC at the Isaac River at Deverill gauging station. The data collected by DRMW at the Deverill gauging station spans the period from 2011 to 2024 and indicates:

- The EC values for high flows greater than 200 m³/s are generally below the high flow WQO EC of 250 µS/cm;

- The EC of instantaneous flows below 100 m^3/s vary significantly from 50 µS/cm to 1,870 µS/cm with many recorded values exceeding the low flow WQO EC of 720 µS/cm but are below the Peak Downs EA receiving waters trigger value of 2000 µS/cm;
- The mean daily EC has exceeded the low flow WQO on a total of 23 days over this period and all of these days experienced some flow (not stagnant flow); and
- The stream flows are highly ephemeral with baseflows ceasing within a few days or weeks of a runoff event, or at least flowing below the top of the sandy bed.

Table 2.2 Water quality median data in the Isaac River at Deverill

Parameter	Unit	Isaac River at Deverill	WQO default guideline value (refer Table 3.1)
Aluminium - Total	mg/L	-	< 5 (stock)
Aluminium - Dissolved	mg/L	0.05	< 0.055 (aquatic)
Boron - Total	mg/L	0.06	< 5 (stock)
Calcium - Dissolved	mg/L	16	-
Chloride - Total	mg/L	30	-
Copper - Dissolved	mg/L	0.03	< 0.0014 (aquatic)
EC	µS/cm	251	< 720 (baseflow) < 250 (high flow)
Filterable Reactive Phosphorus	µg/L	0.35	< 20 (aquatic)
Fluoride - Total	mg/L	0.14	< 2 (irrigation)
Iron - Dissolved	mg/L	0.06	-
Manganese - Dissolved	mg/L	0.01	< 1.9 (aquatic)
Nitrate - Total	mg/L	1.1	-
Nitrogen – Total	µg/L	570	< 500 (aquatic)
pH	-	7.6	6.5–8.5 (aquatic)
Phosphorus - Total	µg/L	88.5	< 50 (aquatic)
Potassium - Total	mg/L	4.55	-
Sodium - Total	mg/L	22	< 30 (drinking water)
Sulfate - Total	mg/L	10	< 25 (aquatic)
Total Alkalinity	mg/L	78	-
Total Dissolved Solids	mg/L	155	< 2,000 (stock)
Total Suspended Solids	mg/L	108	< 55 (aquatic)
Turbidity	NTU	50	< 50 (aquatic)
Zinc - Dissolved	mg/L	0.01	< 0.008 (aquatic)

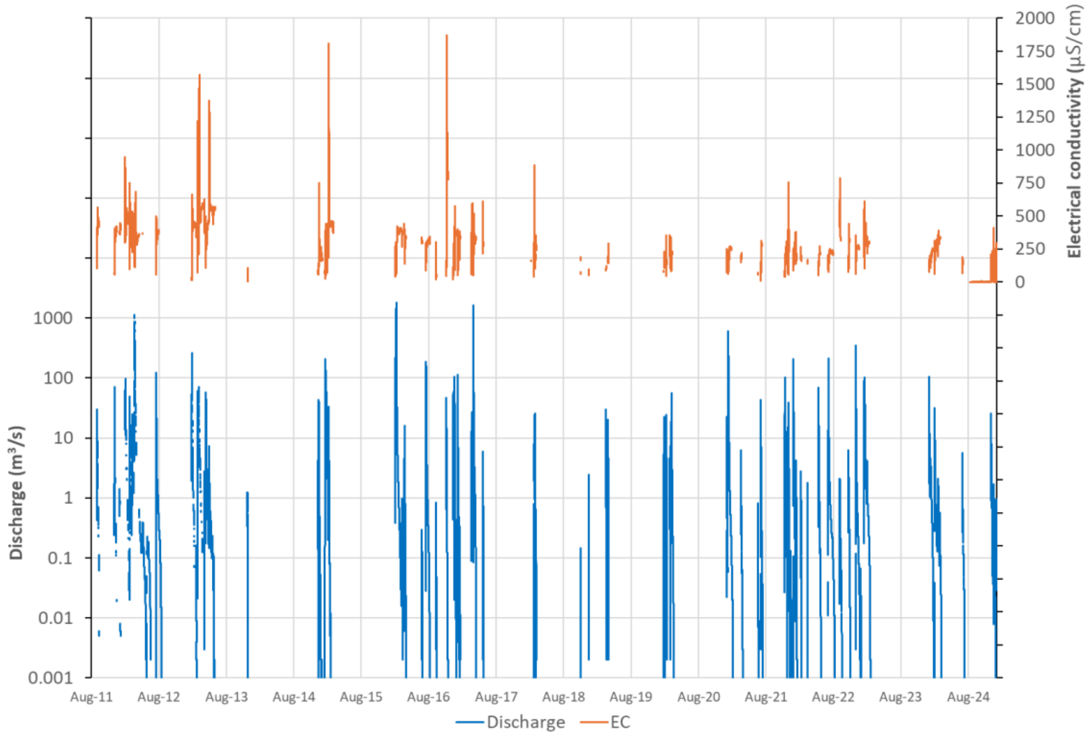

Figure 2.17 Electrical Conductivity and Flow (Isaac River at Deverill Gauge)

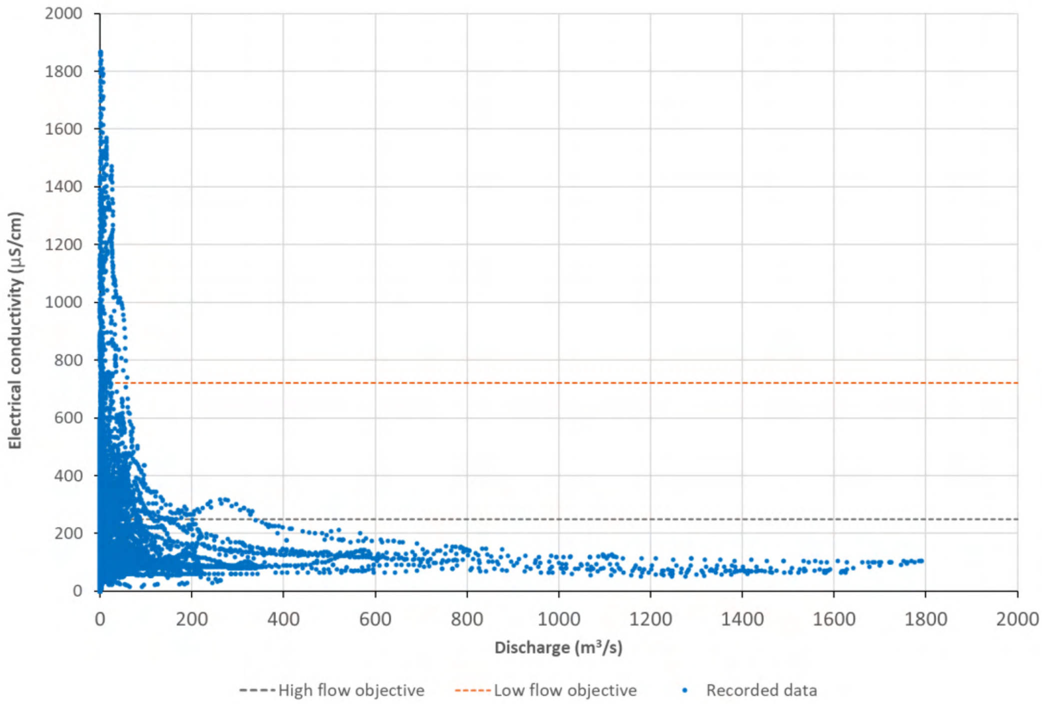

Figure 2.18 Flow vs Electrical Conductivity (Isaac River at Deverill Gauge)

2.9 WATER QUALITY OBJECTIVES

Release to receiving waters must comply with Condition F1 to Condition F4 of the Project EA (P-EA-100265081):

- Condition F1: Contaminants must not be released to any waters unless otherwise permitted by a condition of this environmental authority.
- Condition F2: Mine affected water must not be released directly or indirectly to the receiving environment.
- Condition F3: Surface water runoff is permitted to be released to waters for the purpose of ensuring stormwater does not become mine affected water from:
  a. Erosion and sediment control (ESC) structures identified in Table 7.1 (Table F1 of EA) that are installed and operated in accordance with the ESCP if monitoring required by Condition F4 confirms that water quality is compliant with the sediment dam trigger values specified in Table 2.3 (Table F3 of EA); and
  b. Water management infrastructure that is installed and operated, in accordance with a Water Management Plan that complies with Condition F24.
- Condition F4: The water from ESC structures must be monitored at the release locations detailed in Table 7.1 for each quality characteristic, and at the frequencies, specified in Table 2.3.

Table 2.3 Contaminant trigger investigation levels (Table F3 of the Project EA)

Parameter	Sediment Dam trigger value	Downstream monitoring point trigger value	Source	Frequency
pH (pH units)	6.5 - 8.5	6.5 - 8.5	EPP WQO (aquatic ecosystem)	Monthly And Daily during release (the first sample must be taken within 2 hours of commencement of release)
Electrical Conductivity (µS/cm)	864*	Baseflow: 720 Medium flow: 500 High flow: 250	EPP WQO	
Total suspended solids (mg/L)	102^	85	EPP WQO	
Turbidity (NTU)	60*	50	EPP WQO	
Sulphate as SO4 (mg/L)	37#	25	EPP WQO	
Ammonia (µg/L)	900	900	ANZG 2018	
Nitrate (µg/L)	1100	1100	For aquatic ecosystem protection, based on ambient Qld WQ Guidelines (2006) for Total Nitrate	
	Filtered metals and metalloids			
Filtered Lead (µg/L)	4.1*	3.4	ANZG 2018	Monthly And commencement of release and thereafter
Filtered Mercury (µg/L)	0.72*	0.6	EPP WQO	
Filtered Arsenic (µg/L)	16*	13	ANZG 2018	
Filtered Aluminium (µg/L)	192*	160	Locally derived	

Parameter	Sediment Dam trigger value	Downstream monitoring point trigger value	Source	Frequency
Filtered Molybdenum (µg/L)	40.8*	34	EPP WQO	weekly during release
Filtered Selenium (µg/L)	6*	5	ANZG 2018	

Note:
All metals and metalloids must be measured as 'dissolved' (from analysis of a field filtered sample) and total (unfiltered). Limits for metals and metalloids apply to dissolved results.
*20% increase on trigger value
95th percentile site specific
^locally derived trigger values (80th percentile values of natural surface water monitoring)

2.10 SOIL CHARACTERISTICS

AARC Environmental Solutions Pty Ltd (2022) completed a *Soil and Land Suitability Assessment* (SLSA) for the Project and surrounds. To characterise the soils at the site, AARC collected 42 detailed soil profiles and analysed 12 laboratory samples from the site vicinity.

The area surrounding the Project is dominated by clastic sedimentary rocks of marine and lacustrine origin, including sandstones, mudstones, siltstones and coal. Surface geology at the site includes Quaternary clay, silt, sand, gravel and soil with colluvial and residual deposits, as well as late Tertiary to Quaternary poorly consolidated sand, silt, clay, minor gravel and high-level alluvial deposits (AARC, 2022).

2.10.1 Soil management units

AARC mapped the Soil Management Units (SMUs) across the site using the methodologies specified in the *Guidelines for Surveying Soil and Land Resources* (McKenzie *et al*, 2008) based on soil morphology, parent material and land attributes.

A description of each SMU found within the Project area is outlined in Table 2.4. The majority of the site consists of the Limpopo SMU, the Orange SMU and the Zambezi SMU

Table 2.4 Soil Management Units surveyed on site (AARC, 2022)

Soil Management Unit	Description
Crocodile	A shallow rocky soil unit associated with hill slopes and plateaus. Soil textures grade from loam at the surface, to loamy sands with depth; often containing rock material with little to no pedologic development throughout the solum.
Limpopo	The Limpopo unit is a brown texture-contrast soil. Soil textures predominantly grade from sands to clay sands in the surface soils to light clays in deeper horizons.
Zambezi	A predominantly grey coloured texture contrast soil with surface soils consisting of sands, increasing in clay content in deeper horizons. Lower horizons display diffuse orange to yellow mottles.
Orange	A dark cracking clay associated with the flat grassy plains in the middle of the Project area. The predominant textures of soils within this unit range from light clays in surface soils to light medium clays in deeper horizons.

Soil Management Unit	Description
Sabie	A dark-coloured texture contrast soil with surface soils consisting of sands, increasing in clay content in deeper horizons. Lower horizons display red to orange mottles.
Komati	A dark brown coloured soil unit displaying vertic properties. Soil textures predominantly grade from light to medium clays with calcareous segregations occurring within the deeper horizons.
Fish	A predominantly sandy soil unit occurring on the flats of the southeastern end of the Project area. Soil textures grade from loamy sand at the surface, to clay and silty sands with depth.
Kei	A brown coloured soil unit occurring on the flats of the southeastern end of the Project area. Soil textures grade from clayey to loamy sands at the surface, to medium clay with depth and orange to yellow mottles present in the deeper horizons.

2.10.2 Sodic and dispersive soils

Sodic soils contain large concentrations of Sodium relative to other cations. These soils have a degree of dispersivity and can accelerate erosion.

AARC (2022) identified areas of high sodicity on site through the measurement of the Exchangeable sodium percentage and Emerson Class of surveyed soils. The Crocodile and Kei SMU were identified as having a low risk of dispersion and were not identified as being sodic.

For the remaining SMUs, AARC (2019) identified the depth horizons with sodic properties as follows:

- Fish SMU: Sodic below a depth of 0.2 m;
- Komati SMU: Sodic below a depth of 0.2 m;
- Limpopo SMU: Sodic below a depth of 0.5 m;
- Orange SMU: Sodic below a depth of 0.2 m;
- Sabie SMU: Sodic below a depth of 0.2 m; and
- Zambezi SMU: Sodic below a depth of 0.5 m.

To control erosion from sodic dispersive soils, soils will be selectively handled and managed where required, as per the ameliorative measures outlined by AARC (2019), and further detailed in the *Vulcan South Progressive Rehabilitation and Closure Plan* (METServe, 2022).

3 CONTAMINANT SOURCE STUDY

3.1 OVERVIEW

This section of the WMP describes the activities on the Project ML which, if not appropriately managed, could generate contaminants which impact on the EVs of the receiving waters.

3.2 SITE OPERATING ACTIVITIES

The major components of the Project include:

- three open cut pits (Vulcan North, Vulcan Main and Vulcan South) and a highwall mining area (Vulcan Highwall Mining). The open cut pits will be backfilled and overlain by in-pit spoil dumps;
- out-of-pit waste rock dumps adjacent to the Vulcan North, Vulcan Main and Vulcan South pits;
- a number of topsoil stockpiles which will be located adjacent to the in-pit and out-of-pit spoil dumps;
- access and haul roads;
- runoff drains and bunds;
- a mine infrastructure area (MIA) (including admin area, bathhouse and workshops);
- a Run-of-Mine (ROM) pad and crushing and screening plant;
- a rail loop and train load out facility;
- erosion and sediment control structures; and
- mine water management structures.

The Project involves three stages of mining – Stage 1, Stage 2 and Stage 3. The timeframes and staging of the Project are detailed in Section 5.2. The location of the open cut pits and highwall mining area is presented in Figure 1.2. The conceptual drainage plan for the mining areas for each stage is presented in Figure 1.3 to Figure 1.12. Figure 1.13 to Figure 1.15 shows the VS post closure drainage plan.

3.3 SURFACE WATER TYPES

Land disturbance associated with mining has the potential to adversely affect the quality of surface runoff in downstream receiving waters through increased sediment loads. In addition, runoff from active mining areas (including coal stockpiles, etc.) may have increased concentrations of salts and other pollutants when compared to natural runoff. The proposed strategy for the management of surface water at the Project is based on the separation of water from different sources based on anticipated water quality.

Definitions of the types of water generated within the Project are outlined in Table 3.1.

Table 3.1 Types of water managed within the Project

Water type	Definition
Mine affected water	In accordance with the Project EA, mine affected water means the following: i. pit water, tailings dam water, processing plant water; ii. water contaminated by a mining activity which would have been an environmentally relevant activity under Schedule 2 of the Environmental Protection Regulation 2019 if it had not formed part of the mining activity; iii. rainfall runoff which has been in contact with haul roads that have been constructed using coal and/or coal reject material; iv. rainfall runoff which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated, excluding rainfall runoff discharging through release points associated with erosion and sediment control structures that have been installed in accordance with the standards and requirements of an Erosion and Sediment Control Plan to manage such runoff, provided that this water has not been mixed with pit water, tailings dam water, processing plant water or workshop water; v. groundwater which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated; vi. groundwater from the mine dewatering activities; and vii. a mix of mine affected water (under any of paragraphs i to vi) and other water.
Surface water	In accordance with the Project EA, surface water means runoff from areas that are disturbed by mining operations (including out of pit waste rock emplacements and rehabilitated areas). This runoff may contain high sediment loads but would not contain contaminated material or high total dissolved solids (TDS).
Diverted water	Surface runoff from areas unaffected by mining operations. Diverted catchment water includes runoff from undisturbed areas.
Raw water	Untreated water that has not been contaminated by mining activities.
Potable water	Treated water suitable for human consumption.
External water	Water supplied from a source that is external to the Project area to make up water shortfalls for onsite water demands when site water sources cannot meet demand.

3.4 SURFACE WATER SOURCES

The sources of water types defined above are described in the following sub sections.

3.4.1 Mine-affected water

Mine-affected water is likely to be generated from the following activities/areas (Figure 1.3 to Figure 1.8):

- water which collects in the pits, comprising surface runoff and/or groundwater;
- water which has been dewatered from the pits;
- runoff from the MIA and ROM stockpiles;
- runoff from the truck laydown area from vehicles handling carbonaceous material;
- runoff from the CHPP area;
- runoff from the internal haul road between the mining pits and the MIA which will accommodate trucks hauling coal between the pits and the ROM pad; and

- runoff from the workshop area.

This water will have the potential to come into contact with coal and hydrocarbons and therefore is mine-affected under the Project EA. Management of mine-affected water is outlined in Section 4.4.1.

3.4.2 Surface water

Surface water is likely to be generated from the following activities/areas (Figure 1.3 to Figure 1.12):

- runoff from the out of pit and in pit spoil dumps which does not runoff into the pits. The runoff from these dumps is not expected to come into contact with coal or other carbonaceous materials. The runoff may contain high sediment loads but is not expected to contain elevated levels of other water quality parameters (e.g. EC, pH, metals, metalloids, non-metals). The runoff will be managed to ensure adequate sediment removal prior to release to receiving waters (i.e. drainage to sediment dams) and will not be mixed with pit water, tailings water or workshop water;
- runoff from the topsoil stockpiles, which is expected to have a high sediment load but will not come into contact with coal or other carbonaceous material;
- runoff from the Project's access and haul roads that have not been constructed out of coal and/or coal rejects material;
- runoff from the mine access road; and
- runoff from the site offices and carpark.

Runoff from these areas will be managed through erosion and sediment control structures as outlined in Section 4.4.3.

3.4.3 Diverted water

Diverted water is water which drains from undisturbed catchments that are proposed to be diverted around mining operations wherever practicable, including (Figure 1.3 to Figure 1.8 and Figure 4.3):

- flood protection levees along the southern side of the Vulcan North pit extent, along the western and southeastern sides of the Vulcan Main pit, and around the Vulcan South pit;
- Drainage line (DL) 6a diversion: water draining from the west of the Vulcan North pit and associated haul road;
- DL8a diversion: water draining around the Vulcan South pit; and
- Vulcan Main Levee Clean Water (CW) 01 diversion: water draining southerly around the Vulcan Main levee 1.

This water is managed through diverted water drains as outlined in Section 4.4.4.

4 SURFACE WATER MANAGEMENT

4.1 OVERVIEW

This section of the WMP describes the objectives and principles of the water management system (WMS), including a description of the infrastructure and systems that have been put in place to achieve the objectives and principles.

4.2 MANAGEMENT OBJECTIVES

The objective of the WMP is to manage all types of water onsite to meet operational, social and environmental objectives given in the Project EA.

The key WMS objectives are as follows:

- Have a strategy that ensures the Project does not release mine affected water into receiving waters under a controlled release (pumped release).
- Have a strategy that ensures releases to receiving waters does not cause erosion of the bed or banks of the receiving waters or causes a material build-up of sediment.
- The release of water is monitored and reported in line with the Project EA.
- Design and construct sediment dams and mine affected water dams in compliance with quality standards specified in the Project EA.
- Ensure the maintenance and cleaning of vehicles, plant and equipment is not carried out in areas from which contaminants can be released into receiving waters.
- Ensure spillage of wastes, contaminants or other materials is cleaned as quickly as practicable to minimise the release of contaminants to receiving waters.
- Manage and prevent saline and acid rock drainage from the site.

Specific objectives for each water type are as follows:

- External water: Ensure that external water allocation and associated infrastructure is sufficient to meet site demands under low rainfall conditions.
- Mine-affected water: Prevent uncontrolled discharges and ensure adequate water supplies are maintained for site demand during dry periods.
- Surface water: Maintain water quality leaving the Erosion and Sediment Control (ESC) structures to a quality as close to background levels as reasonably possible.
- Diverted water: Ensure that diverted water is separated from the mine-affected and surface water systems, and allowed to pass uninterrupted down the catchment.

4.3 SURFACE WATER MANAGEMENT PRINCIPLES

The general principles to manage surface water for the site are as follows:

- The fullest separation possible of diverted, surface and mine-affected water runoff.
- Minimise the area of surface disturbance, thereby minimising the volume of surface runoff.
- Collect and contain onsite all potential mine-affected water in dedicated mine water storages. The mine water storage will be used as the primary water source for dust suppression.

- Retain and reuse onsite any surface water runoff that has high sediment concentrations whenever possible. If not, release it in a controlled manner in compliance with an Erosion and Sediment Control Plan (ESCP).
- Minimise the potential for generation of mine-affected water by limiting the locations of chemical and fuel storage areas and manage the areas in accordance with relevant specifications of AS1940 *Storage and Handling of Flammable and Combustible Liquids* (AS1940). Implement spill response and management procedures in accordance with relevant trigger action response plans (TARPS) for any accidental spills.
- Maximise the use of onsite water and thereby minimise the need for importing external water.
- Prioritise the use of poor-quality water over superior quality water.

4.4 WATER MANAGEMENT SYSTEM

The site WMS is shown in Figure 1.3 to Figure 1.8. The WMS progresses over the mine life as the pits and dumps develop across the site:

- Figure 1.3 and Figure 1.4 shows the WMS during the mining stage 1 (2025) at Vulcan North and Vulcan Main, respectively;
- Figure 1.5 and Figure 1.6 shows the WMS during the mining stage 2 (2026) at Vulcan North and Vulcan Main, respectively;
- Figure 1.7 and Figure 1.8 show the WMS during the mining stage 3 (2029) at Vulcan Main and Vulcan South, respectively; and
- Figure 1.9 and Figure 1.10 show the WMS during the highwall mining trial stage at the Western and Eastern highwall benches, respectively.

The mine-affected water management, surface water management and diverted water aspects of the WMS are described in Section 4.4.1, 0 and 4.4.4 respectively.

4.4.1 Mine-affected water management

Table 4.1 shows the mine affected dam details for the Project, including the full supply volume (FSV) of each dam and the operating rules for each dam which are applied if the operating volume (OV) is exceeded.

The following areas of the site have been defined as mine water catchments, consistent with the definitions provided in the Guideline Model Mining Conditions (DES, 2024) (see Figure 1.3 to Figure 1.8):

- The Vulcan North, Vulcan Main, and Vulcan South pit;
- The MIA area adjacent to the Vulcan Main pit – this area contains a number of coal stockpiles and the sorter/crusher and therefore will come into contact with coal and the proposed ROM pad area (reporting to MWD6 and MWD7);
- The TLO pad (operational once CHPP area is constructed will contain the TLO dam and will be considered mine affected water; and
- The highwall mining trial area.

The above areas all drain to mine water dams and sumps (via overland flow and mine water drains) or to the pit itself. The adopted full storage volumes (FSVs), surface areas, operating volumes (OVs) and max operating volumes (MOVs) were refined using the water balance model (see Section 5) to and available space from site mapping. MWD8 and MWD9 have been designed to keep the pit dewatered for as long as practical. The CHPP mine water dams (MWD6 & MWD7) have been sized to limit the risk of spills to the receiving waters.

The TLO dam is intended to be a mine-affected water dam and will collect runoff from the train load out pad, direct rainfall and mine-affected water from the train loadout process. There is no external catchment runoff draining to the TLO dam. The TLO dam will only receive water as required for train loadout purposes.

Vitrinite are not currently planning any controlled mine affected water releases to the environment from the mine water dams. Therefore, under normal operating conditions any releases from mine affected water dams to the receiving waters would be uncontrolled releases. As outlined above, the water management system has been optimised to reduce the risk of this occurrence and this risk has been assessed in Section 5.3.7.

To limit the risk of uncontrolled discharges from the mine water storages, OVs have been set for these water storages (as shown in Table 4.1) as follows:

- MWD8 and MWD9 have a maximum operating volume (MOV) of 131.6 ML and 25.0 ML respectively. When the water inventory in these dams exceeds its MOV, all transfers to these dams (i.e. pit dewatering and mine water transfers) cease.
- MWD6 and MWD7 have OVs. When the water inventory in these dams exceeds their respective OVs, these storages commence dewatering to MWD9.

Table 4.1 Proposed mine affected water dams

Storage	FSV (ML)	OV (ML)	FSV surface area (ha)	FSV water depth (m)	Adopted dewatering rate (ML/d)	Operating rules
MWD6	83.9	64.3	1.97	5	4.32	• Above the OV, transfer water to MWD9 at 4.32 ML/d • Overflows to MWD8
MWD7	66.1	48.8	1.50	5	4.32	• Above the OV, transfer water to MWD9 at 4.32 ML/d • Overflows to MWD8
MWD8	179.8	131.6	2.92	7	-	• Pits dewater to this storage at 100 L/s (8.64 ML/d)
MWD9	50.0	25	1.33	3	8.64	• MWD9 stores water when MWD8 is above its MOV • Dewatering the pits at 100 L/s (8.64 ML/d) • Transferring the water to MWD8 when MWD8 is below its MOV • Receives transfers from the CHPP dams when they are above their OV

4.4.2 Highwall mining water management strategy

Figure 4.1 shows the proposed mine affected water management strategy for the Project. The active mining area (MAW catchment) is proposed to progressively shift as highwall mining panels are completed and rehabilitated to surface runoff water catchments. The key components of the mine water management strategy throughout the highwall mining stage of the Project include:

- clean water drains/contour banks and rock chutes/drop structures above the plunges will divert natural catchment runoff to the proposed surface water drains/sediment control structures and prevent contamination where active plunges are located;
- bunds along the bench will be built as required. These will contain MAW within the working portion of the bench to be managed by sumps, within the bench or the plunges. Bunds will also divert haul road runoff to the surface water drainage systems;
- direct mine water runoff (via gravity) either directly into a plunge or via a sump that dewaters to the plunge;
- as the highwall miner progresses, a mobile coal stockpile will keep pace within 100 m of the highwall miner before being trucked to the CHPP for processing. Disused coal stockpiles that are greater than 100 m from the highwall miner will be rehabilitated; and
- where plunges are no longer active, rehabilitation will commence to cover the voids at the surface. After covering the voids, surface runoff water would not be classified as MAW, and can be treated through the proposed sediment control structures.

The MAW catchment consists of an approximate area of 3.2 ha based on 318 m in length of highwall mining panels (4 active longwall mining panels + 2 panels with rehabilitation commenced) and a 100 m wide bench (including haul road and batter). This is based on:

- Each longwall mining panel is approximately 53.0 m in length and consists of 10 x 3.5 m wide x 1.5 m high plunges. Each panel will include 9 x 1.5 m wide pillars that will be left between each plunge with a 4.5 m wide pillar every 10 plunges; and
- MAW catchment extends from edge of highwall bench to the clean water contour bank on batter slope above highwall batter/plunges (nominally 100 m width).
- One (1) panel (10 plunges) would store approximately 9.9 ML. This is based on the void capacity of each completed plunge of approximately 990 m^3 assuming plunge dimensions of 1 m high, 3.5 m wide and 300 m deep at 3% gradient;
- Each panel will take approximately 1 to 2 weeks to complete;
- MAW catchment runoff for a 10% AEP 72 hour storm event containment (extreme storm storage [ESS]) = 6.1 ML (rainfall depth = 189 mm, catchment area of 3.2 ha, assumed all rainfall is converted to runoff). This is equivalent to two thirds of the storage capacity of a panel;
- Runoff from MAW catchments would be directed to the designated water storage panel using bunds, drains and pumps (where required). Where possible, there will be an interim panel separating the active panel and the water storage panel to limit the amount of seepage through the coal seam into the seam being actively mined. As mining progresses, the water storage panel plunge openings will be buried, with any water stored in the plunge to remain within the voids. The adjacent panel would then be designated the water storage panel;
- Runoff from areas external to the active mining area including haul roads and batters are considered surface runoff water and not MAW provided the two waters do not mix. Surface runoff water would be managed with erosion and sediment control (ESC) structures and can be released after passing through an ESC structure. Surface runoff water does not require water containment; and
- Mobile coal stockpiles will be located within the MAW catchment within 100 m of the highwall miner. The mobile coal stockpile will keep pace with the highwall miner. Coal will be loaded into trucks and hauled to the VS operations. Abandoned coal stockpile areas that are more than 100 m away from the highwall miner will be cleared of any residual coal material (including fines and

rejects). Once the area is cleared of residual coal material and the plunges, runoff will be classified as surface runoff water and can be directed to ESC controls.

Table 4.2 shows the indicative mine affected water volume requirements for the HWM trial area for the catchments shown in Figure 1.9 and Figure 1.10. The mine affected water storage requirements have been sized to contain a 10% AEP 72 hour storm event and are met through a combination of sumps, bench storage and plunge storage. This size and location of sumps will be confirmed once the HWM trial area has been designed. Where possible, mine affected sumps will be converted to ESC control structures during rehabilitation.

Table 4.2 HWM trial area indicative mine water storage requirements

Catchment	Mine affected water volume (combination of sump, bench storage and plunge) (ML)	Surface area (ha)
S1	14.2	0.32
S2	11.1	0.25
S3	9.0	0.20
S4	17.7	0.40
S5	14.1	0.32
S6	8.1	0.18
S7	12.7	0.28
S8	9.8	0.22
S9	10.2	0.23

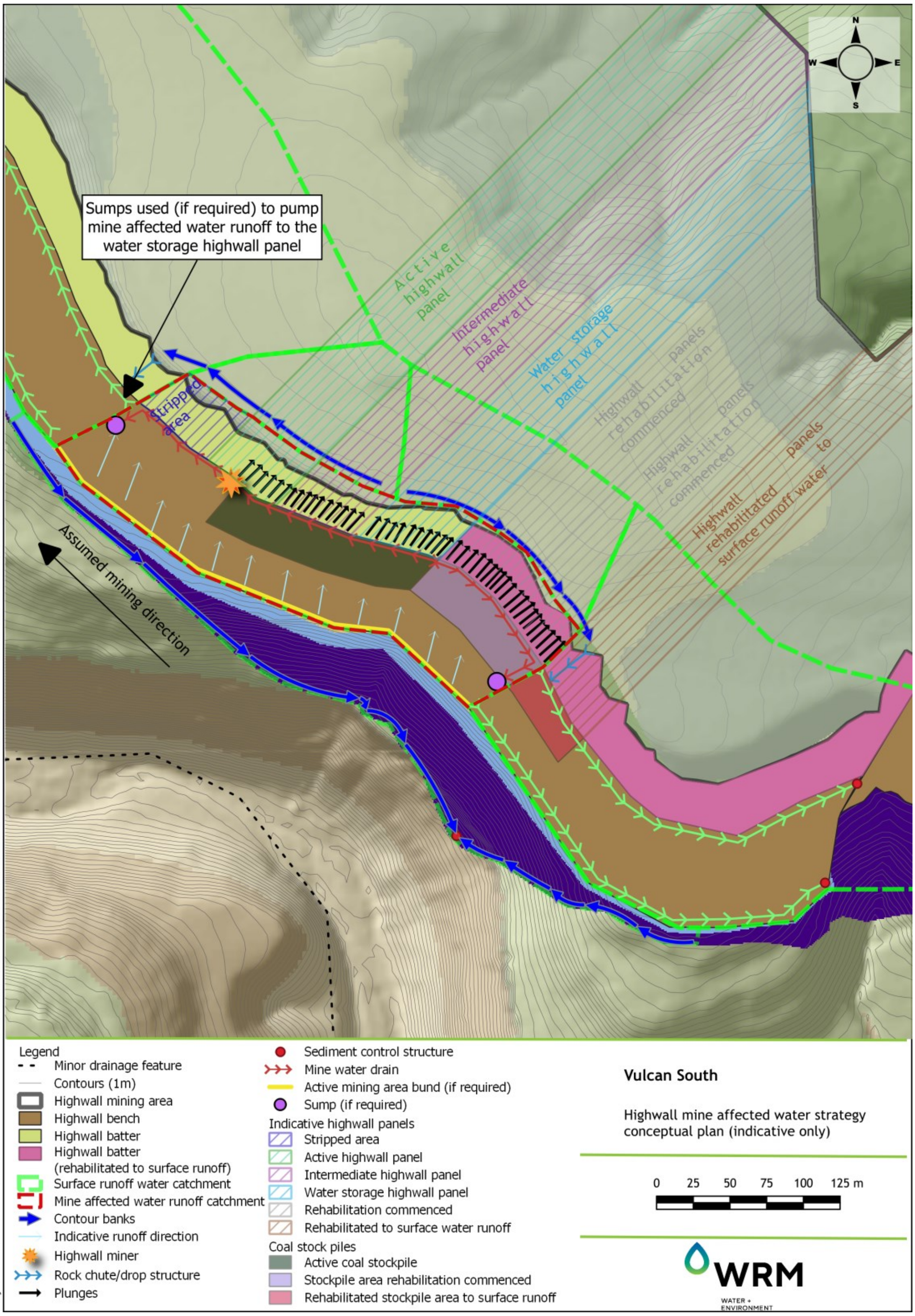

Figure 4.1 Highwall mine affected water strategy conceptual plan

4.4.3 Surface water management

Surface water generated from the Project is managed as follows:

- **the Vulcan North out-of-pit spoil dump:** generates runoff to surface water drains on its perimeter which drain to sediment dams SD9, SD10 and SD15.
- **the Vulcan North in-pit spoil dump:** generates runoff to surface water drains on its perimeter which drain to sediment dams SD11, SD12, SD13 and SD14.
- **the Vulcan Main out-of-pit spoil dump:** generates runoff to surface water drains on its perimeter which drain to sediment dam SD16.
- **the Vulcan Main in-pit spoil dump:** generates runoff to surface water drains on its perimeter which drain to sediment dams SD17, SD18, SD19, SD20, SD21, SD22, SD23 and SD30.
- **the Vulcan South out-of-pit spoil dump:** generates runoff to surface water drains on its perimeter which drain to sediment dams SD27 and SD28.
- **the Vulcan South in-pit spoil dump:** generates runoff to surface water drains on its perimeter which drain to sediment dams SD23, SD25, SD26 and SD29.
- **The Vulcan Highwall Mining trial area:** following operations, rehabilitation areas generates runoff to surface water drains, which drains to ESC controls.

The above areas all drain to sediment dams/traps (via overland flow and surface water drains). Table 4.3 provides details for the proposed sediment dams for the Project.

Sediment dams and traps will be installed and managed in accordance with the ESCP (WRM, 2024). Consistent with the IECA guidelines (2008), sediment dams are not designed to provide 100% containment of captured runoff. Hence overflows will occur from sediment dams when rainfall exceeds the design capacity. The sediment dams design storage volumes shown in Table 4.4 are based on containing an eighty-fifth (85th) percentile 5-day rainfall event plus 50% sediment storage. The adopted 85th percentile 5-day rainfall design storage volume is a higher standard than recommended in IECA (2008) which stipulates a minimum design storage volume based on the 80th percentile 5-day rainfall event.

Table 4.4 shows the sediment dams design storage volume requirements for the Project based on IECA (2008). The sediment dam design storage volumes are based on the following:

- A “Type D” sediment dam.
- Total sediment dam volume = settling zone volume + sediment storage volume as shown in Figure 4.2. The sediment storage volume is the portion of the sediment dam storage volume that progressively fills with sediment until the basin is de-silted. The settling zone is the minimum required free storage capacity that must be restored within 5 days after a runoff event.
- The settling volume is calculated based on the stormwater runoff from the catchment generated by an 85th percentile 5-day rainfall event.
- Sediment storage volume = 50% of settling zone volume.
- A depth of 3 m is adopted for the sediment dams.

Table 4.3 ESC structure monitoring locations (Table F1 of the EA)

Storage name	Latitude (GDA2020)	Longitude (GDA2020)	ESC structure water source location	Downstream monitoring point	Receiving waters description
SD9	-22.3432	148.2276	Vulcan North Out of Pit Dump	DL7_DS	Drainage Line 7
SD10	-22.3469	148.224	Vulcan North Out of Pit Dump	DL7_DS	Drainage Line 7
SD11	- 22.3379	148.2193	Vulcan North In Pit Dump	DL6_DS	Drainage Line 6
SD12	-22.3418	148.2297	Vulcan North In Pit Dump	DL7_DS	Drainage Line 7
SD13	-22.3353	148.2226	Vulcan North In Pit Dump	DL6_DS	Drainage Line 6
SD14	-22.3341	148.2203	Vulcan North In Pit Dump	DL6_DS	Drainage Line 6
SD15	-22.3315	148.2157	Vulcan North Out of Pit Dump	DL5_DS	Drainage Line 5
SD16	-22.3643	148.2365	Vulcan North Out of Pit Dump	HC_DS	Hughes Creek
SD17	-22.3578	148.2441	Vulcan Main In Pit Dump	HC_DS	Hughes Creek
SD18	-22.3612	148.2469	Vulcan Main In Pit Dump	HC_DS	Hughes Creek
SD19	-22.3737	148.2488	Vulcan Main In Pit Dump	HC_DS	Hughes Creek
SD20	-22.3682	148.2532	Vulcan Main In Pit Dump	HC_DS	Hughes Creek
SD21	-22.3738	148.2582	Vulcan Main In Pit Dump	HC_DS	Hughes Creek
SD22	-22.3782	148.2617	Vulcan Main In Pit Dump	HC_DS	Hughes Creek
SD23	-22.3784	148.257	Vulcan Main In Pit Dump	HC_DS	Hughes Creek
SD24	-22.3852	148.2658	Vulcan Main In Pit Dump	HC_DS	Hughes Creek
SD25	-22.3875	148.2673	Vulcan Main In Pit Dump	HC_DS	Hughes Creek
SD26	-22.3888	148.2676	Vulcan Main In Pit Dump	HC_DS	Hughes Creek
SD27	-22.3914	148.2636	Vulcan South Out of Pit Dump	HC_DS	Hughes Creek
SD28	-22.4011	148.2697	Vulcan South Out of Pit Dump	DL8_DS	Barrett Creek
SD29	-22.3944	148.271	Vulcan South In Pit Dump	HC_DS	Hughes Creek
SD30	-22.3818	148.2641	Vulcan South In Pit Dump	HC_DS	Hughes Creek
HWD1	-22.2866	148.1497	Highwall Trial Area Bench	DL2_DS	Drainage Line 2

Note: Locations may change depending on finalisation of in-pit and out-of-pit spoil dumps

Table 4.4 Proposed sediment dam storage capacity requirements

Storage name	Catchment area (ha)	Settling volume (ML)	Sediment storage volume (ML)	Total sediment dam volumes required (ML), based on the 85th percentile 5-day rainfall
SD9	19.0	2.8	1.4	4.2
SD10	15.8	2.3	1.2	3.5
SD11	32.6	4.8	2.4	7.1
SD12	23.3	3.4	1.7	5.1
SD13	10.6	1.5	0.8	2.3

Storage name	Catchment area (ha)	Settling volume (ML)	Sediment storage volume (ML)	Total sediment dam volumes required (ML), based on the 85th percentile 5-day rainfall
SD14	15.9	2.3	1.2	3.5
SD15	18.1	2.6	1.3	4.0
SD16	148.8	21.8	10.9	32.6
SD17	9.4	1.4	0.7	2.1
SD18	82.4	12.1	6.0	18.1
SD19	105.0	15.4	7.7	23.0
SD20	10.3	1.5	0.8	2.3
SD21	6.1	0.9	0.4	1.3
SD22	18.0	2.6	1.3	3.9
SD23	19.7	2.9	1.4	4.3
SD24	5.8	0.8	0.4	1.3
SD25	7.4	1.1	0.5	1.6
SD26	32.8	4.8	2.4	7.2
SD27	15.5	2.3	1.1	3.4
SD28	32.4	4.7	2.4	7.1
SD29	24.0	3.5	1.8	5.3
SD30	1.1	0.2	0.1	0.2
HWD1	10.0	7.4	3.7	11.1

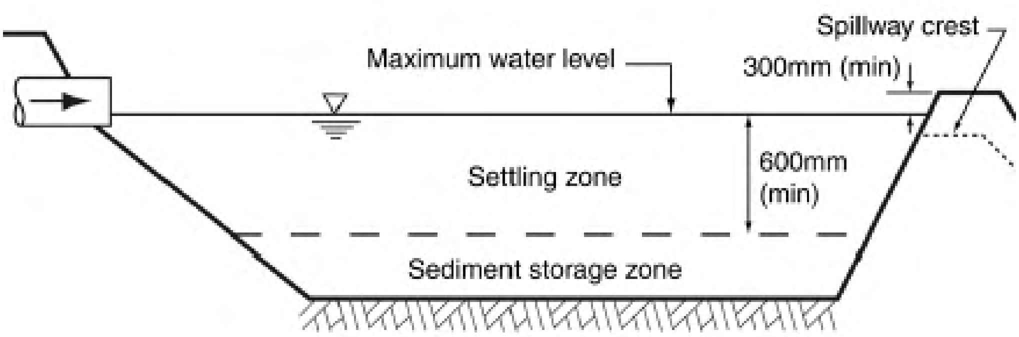

Figure 4.2 **Typical type D sediment basin cross-section (Source: IECA, 2008)**

The settling zone volume was calculated using the following equation (IECA, 2008):

- Vs = 10 * R(Y%, 5-day) * Cv * A
  - Vs = volume of the settling zone (m^3)
  - R(Y%, 5-day) = Y%, 5-day rainfall depth (mm) (85th percentile adopted in Table 4.3)
  - Cv = volumetric runoff coefficient
  - A = effective catchment surface area connected to the basin (ha)

The 5-day rainfall depths were calculated using the following equation (IECA, 2008):

- R(Y%, 5-day) = K1 * I(1yr, 120hr) + K2
    - K1 = Constant
    - K2 = Constant
    - I(1yr, 120hr) = Average rainfall intensity for a 1 in 1 year ARI, 120 hour storm (mm/hr)

4.4.4 Diverted water management

Figure 4.3 shows the diverted water management infrastructure proposed at the Project which are described in Section 4.4.4.1 and 4.4.4.2.

4.4.4.1 Flood levees

A number of flood levees are proposed for the Project, as shown on Figure 1.3 to Figure 1.8 including:

- Vulcan North levee on the southern edge of the Vulcan North pit to be constructed in Stage 1;
- Vulcan Main levee 2 on the western edge of the Vulcan Main pit to be constructed in Stage 2 and Vulcan Main levee 1 on the southern edge of the Vulcan Main pit to be constructed in Stage 3; and
- Vulcan South levee around the full extent of the Vulcan South pit to be constructed in Stage 3.

The flood levees will be regulated structures under the EP Act and will therefore be required to have a crest above the 0.1% AEP event. Section 8.5.4 of WRM (2023) provide the flood assessment of the levees against the requirements of the EP Act.

4.4.4.2 Diverted water drains and bunds

The water management system has been designed to divert undisturbed catchments around mining operations wherever practicable.

Three diverted water drains are proposed as part of the Project (Figure 1.3 to Figure 1.12):

- Drainage diversion DL6a will be constructed in Stage 1 and will divert a catchment of approximately 105 ha away from the Vulcan North pit and dam DD2. This drainage diversion will collect an undisturbed catchment to the west of the Vulcan North pit and associated haul road. This drainage diversion will divert a portion of Drainage line 6 and discharge under a haul road to Drainage line 7 (which is a tributary of East Creek).
- Drainage diversion DL8a will be constructed in Stage 3 and will divert a portion of Drainage line 8 around the Vulcan South pit. This drainage diversion will collect an undisturbed catchment of approximately 570 ha and discharge to Hughes Creek.
- A minor drainage diversion (CD01) diverts water southward around the Vulcan Main levee 1, to discharge into Hughes Creek.

A number of diverted water bunds are proposed in the vicinity of the three open cut pits, as shown on Figure 1.3 to Figure 1.12. These bunds will collect runoff from minor catchments (i.e. smaller than 15 ha) where a drain is not deemed necessary and divert these catchments around mining operations.

Dam DD2 will be constructed in Stage 1 to collect water from an undisturbed catchment (catchment area of approx. 46.5 ha) to the west of the Vulcan North pit, between the pit and the haul road. In addition, DD2 may potentially provide some level of flood protection for the Vulcan North pit. Dam HWD2 will be constructed during highwall operations north of the highwall central haul road

(Figure 1.11) to collect an undisturbed catchment north of the highwall central bench. The dam will collect an undisturbed catchment of approximately 34 ha.

Additional temporary drainage management measures including bunds, drains and re-contouring adjacent pit progression may be constructed as required to prevent runoff and flood waters from flowing into the open pits. These drainage management measures will be mined through as the pits progress. It is expected that temporary drainage measures will be designed to convey at least a 5% AEP (1 in 20-year ARI) flow event.

4.4.5 External water management

External water at the Project is managed as follows:

- Mine affected water can be reused for mine water demands.
- Vitrinite sources external mine water from neighbouring operations via a pipeline for the life of the Project to be stored in MWD8 when mine affected water inventories are low.
- Potable water is to be supplied by trucked water and delivered onsite.

4.5 CHEMICAL MANAGEMENT

Any spillages of hazardous materials will be cleaned up as quickly as practicable to minimise the release of wastes, contaminants or hazardous materials to the site WMS and into receiving waters.

4.5.1 Chemical storage

Chemical storage at the Project will be managed in accordance with best practice management (AS1940: The Storage and Handling of Flammable and Combustible Liquids), including the use of bunding and immediate clean-up of spills. Hazardous Substances Standard Operating procedures (SOPs) will be in place at these operations. A register will also be maintained onsite for all chemicals. Where appropriate, Safety Data Sheets (SDS) will be kept in storage areas or accessed online, as required.

4.5.2 Fuel storage

Fuel storage areas are a potential source of hydrocarbons. Primary fuel storage areas at the MIA and workshop area will be constructed and bunded in accordance with the relevant specifications of AS1940. Fuel storage areas will also be constructed at service and operational points across the mining lease.

Fuel storage areas associated with the Project operations will be inspected regularly, with repair and maintenance work completed on an as-needs basis. Bunded areas filled with stormwater are drained (i.e. diesel/oil storage bunding at warehouse drains to oil sump and onto oil separator system) or pumped out by a licensed contractor as soon as practicable to maintain the bunded volume.

4.5.3 Sewage

Sewage will be trucked offsite by registered waste transport contractors.

4.6 POST-MINING CONDITIONS WATER MANAGEMENT

Figure 1.13 to Figure 1.15 shows the conceptual final landform water management plan for the Project during the post-mining stage. The final landform plan has been developed with an aim to use water infrastructure constructed during the mining stage. The post-mining layout shown in Figure 1.13 to Figure 1.15 is conceptual only and may be updated should the mine plan and final landform plans change over the mine life.

The key features of the final landform include the following:

- no final voids are proposed. All open cut pits will be backfilled with overburden material;
- final landform batter slopes will be 1(V):6(H);
- the plateaus include proposed drains and drop structures to drain the top of the landform to natural ground level;
- mine water dams will be decommissioned following rehabilitation of infrastructure areas;
- Drainage line 6 and Drainage line 8 will be reinstated through the Vulcan North and Vulcan South final landforms respectively;
- the Hughes Creek floodplain will be reinstated through the Vulcan Main and Vulcan South landforms; and
- When a sediment dam catchment is completely rehabilitated, and water quality monitoring of the runoff has established that it is consistent with EA release conditions, the sediment dam and associated drainage infrastructure will be decommissioned. Surface runoff and seepage from the rehabilitated catchment will be allowed to shed directly to the receiving waters.
- When Drainage line 6 is rehabilitated, DD2 will be decommissioned. DD2 will remain until this time to allow in-stream vegetation to establish before receiving upstream catchment flows.

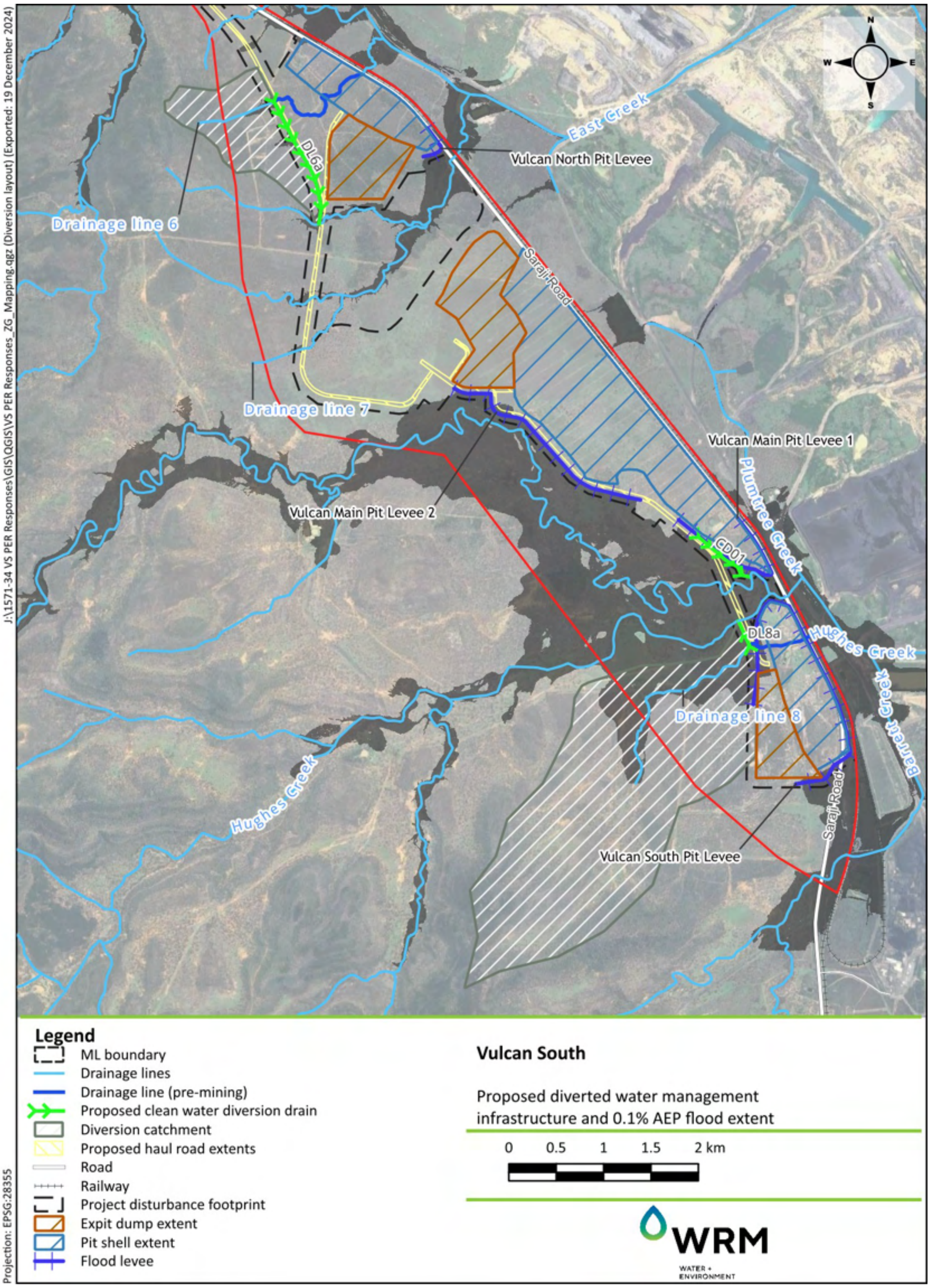

Figure 4.3 Diverted water management infrastructure and 0.1% AEP flood extent

5 MINE SITE WATER BALANCE

5.1 OVERVIEW

A water balance model was developed using the GoldSim water balance modelling software to assess the behaviour of the WMS at the Project for the expected infrastructure and pit extent for the three mining stages. The model was used to determine:

- the behaviour of the various onsite storages during the life of the Project;
- the ability and reliability of the various onsite storages to supply the mine site water requirements;
- the volume of potential 'surface' and/or 'mine-affected' water overflows from various onsite storages;
- the volume of 'external' water required to meet shortfalls in mine water demands; and
- the overall site water balance.

Details regarding the model setup (e.g. AWBM parameters, site water demands, groundwater inflows and catchment areas) are outlined in the report *Vulcan South Surface water assessment* (WRM, 2023). The key model inputs are outlined in Section 5.2 of WRM (2023) and the key results are outlined in Section 5.3 of WRM (2023).

5.2 MODELLING CONFIGURATION

The model has been configured to assess the operations of all major components of the WMS. Figure 5.1 shows the schematic of the water management system for the Project. The inflows and outflows included in the model are given in Table 5.1. The modelled mining stages are summarised in Table 5.2. Three representative years of the mine plan have been selected to reflect the average conditions over the mine stage.

Over the mine stages, the three mine pits progress their active status within the water balance model. The mining status for each pit during each mine stage is outlined in Table 5.3 and are defined as follows:

- Inactive: Mining in the pit has either not yet commenced in the mine plan or has been completed and backfilled. For modelling purposes, the pit does not receive rainfall runoff, is not dewatered and does not spill.
- Active: The pit is actively being mined. For modelling purposes, the pit has a storage curve which varies per Stage, receives runoff and is actively dewatered.

The modelled water management system configuration and operating rules are outlined in Table 5.4.

Table 5.1 Simulated inflows and outflows to the mine water management system

Inflows	Outflows
Direct rainfall on water surface of storages	Evaporation from water surface of storages
Catchment runoff	Haul road dust suppression demand
Moisture stored within the ROM coal	Potable water demand
Groundwater inflows to the open cut pit	Moisture stored within product coal and rejects
External water pipeline	TLO demand
Trucked potable water	Dam overflows

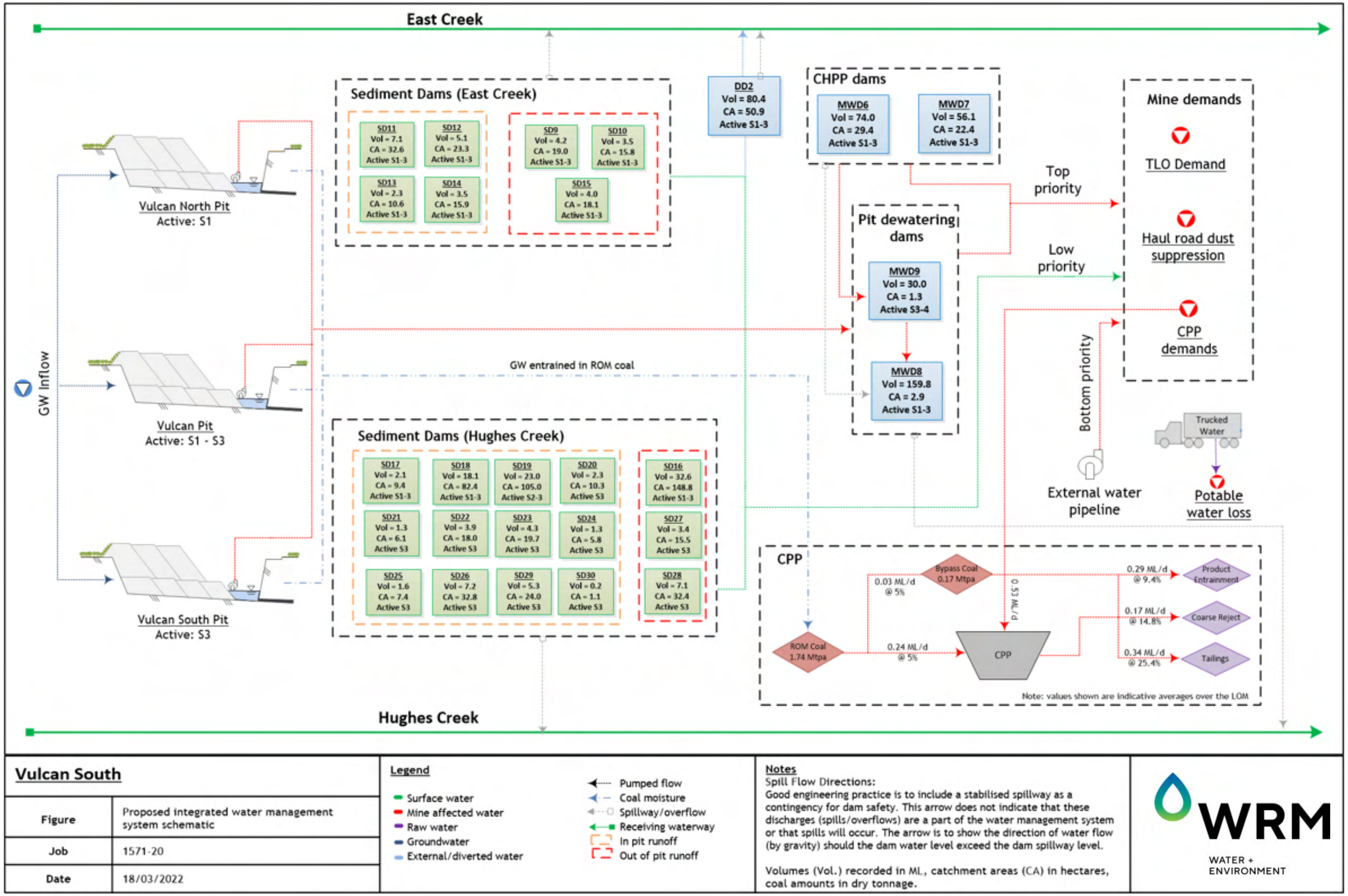

Figure 5.1 Water management system schematic

Table 5.2 Representative mine stages adopted for assessment and modelling purposes

Mine stage	Representative year	Applied range of mine life	Stage duration
Stage 1	2026	1/1/2025 – 1/1/2027	2 years
Stage 2	2029	1/1/2027 – 1/1/2030	3 years
Stage 3	2033	1/1/2030 – 1/1/2033	3 years

Table 5.3 Pit status progression over mine stages

Stage	Mine pit		
	Vulcan North	Vulcan Main	Vulcan South
1	Active	Active	Inactive
2	Inactive	Active	Inactive
3	Inactive	Active	Active

Table 5.4 Water balance model operational rules

Item	Node Name	Operating Rules
1	***External water supply***	
1.1	External water pipeline	• Mine affected water can be imported to supplement mine water demands • Supplies mine demands (3rd priority)
1.2	Trucked water	• Supplies the potable water demand
2	***Supply to demands***	
2.1	Haul road dust suppression/TLO Demand	• Supplied from the following sources: ○ 1st priority: Mine affected water dams; ○ 2nd priority: Sediment/diverted water dams; and ○ 3rd priority: External water pipeline. • 100% loss assumed • Haul road dust suppression values vary depending on haul road length, as outlined in Section 6.5.1 of WRM (2023). • TLO demand assumed as constant 0.2 ML/d as outlined in Section 6.5.3 of WRM (2023)
2.2	CHPP demands	• Supplied by the following sources: ○ 1st priority: Mine affected dams; ○ 2nd priority: Sediment/clean water dams; and ○ 3rd priority: External water pipeline. • Varies depending upon production schedule, as outlined in Section X of WRM (2023).
2.3	Potable water demand	• Sourced from trucked water delivered to site • 100% loss assumed

Item	Node Name	Operating Rules
		• Assumed constant rate of 50 ML/yr, as outlined in Section 6.5.4 of WRM (2023).
3	***Pit water***	
3.1	Vulcan North, Vulcan Main and Vulcan South pit	• Pit status progression outlined in Table 5.3. • Active pits dewater to the pit dewatering dams (MWD8 and MWD9) at 100 L/s (8.64 ML/d) • Receive groundwater inflows as outlined in Section 2.7
4	***Operation of mine affected dams***	
4.1	MWD6 & MWD7 (CHPP dams)	• Mine affected water storages that capture runoff from the CHPP/ROM pad • Supply water to the mine demands as outlined in Item 2 above • In Stages 2 and 3 when above their OV, transfer water to MWD9 at 4.32 ML/d • Overflows to MWD8
4.2	MWD8	• Turkeys nest dams, receiving no external catchment • Main pit dewatering dam, pits dewater to this storage at 100 L/s (8.64 ML/d) • Supplies water to the mine demands as outlined in Item 2 above
4.3	MWD9	• Turkeys nest dams, receiving no external catchment • Secondary pit dewatering dam, dewatering the pits at 100 L/s (8.64 ML/d) and transferring the water to MWD8 when MWD8 is below its MOV • When MWD8 is above its MOV, MWD9 stores water • Receives transfers from the CHPP dams when they are above their OV
5	***Operation of sediment dams***	
5.1	Sediment dams (SD9 – SD29)	• Up to 20 sediment dams active over the mine life • Assumed to be dewatered to 33% of capacity after 5 days following a rainfall event (not modelled) • Supplies water to the mine demands as outlined in Item 2 above • Overflows to the receiving waters (i.e. to East Creek or Hughes Creek)
6	***Clean water storages***	
6.1	DD2	• Diverted water dam that receives inflows from the rural catchment to the southwest of Vulcan North pit • Transfers water from empty to the diversion drain to the southwest of Vulcan North pit at 100 L/s (8.64 ML/d), which flows to East Creek, from empty

5.3 MINE SITE WATER BALANCE RESULTS

5.3.1 Overall mine site water balance

Average water balance results based on the 123 model realisations are presented in Table 5.5. The results presented in Table 5.5 are the average of all realisations and will include wet and dry periods distributed throughout the mine life. Rainfall yield and evaporation for each stage is affected by the variation in climatic conditions within the adopted climate sequence.

Table 5.5 provides an indication of the long-term average annual inflows and outflows. Key outcomes from the overall water balance are as follows:

- Average annual inflows from rainfall runoff for surface water dams increases from Stage 1 to Stage 3, as the pit progresses, and more catchment runoff is collected in these dams.
- Average inflow volumes to mine storages are greatest in Stage 2, when the Vulcan Main pit catchment area is greatest.
- The proposed water management system is in negative balance under 'average' climate conditions. This indicates that the Project will require significant volumes of external water to meet mine water demands every year.
- External water requirements are greatest in Stage 1 due to the significantly larger haul road length during this Stage to the Highwall mining area.

It should be recognised that the following items are subject to climatic variability:

- Rainfall runoff;
- Evaporation;
- External water requirement;
- Dust suppression demand; and
- Dam overflows.

Whilst it provides an indication of the long-term average annual inflows and outflows, application of the nominated values for other purposes should only be undertaken with due consideration of the suitability of the nominated value and any potential implications.

In particular, the "average" sediment dam overflows do not necessarily mean that discharges occur under median climatic conditions. It means that there was a discharge in at least one of the 123 model realisations. A more detailed analysis of the performance of the various components of the water management system is provided in the following sections.

Table 5.5 Average annual water balance – all realisations

Description	Stage 1	Stage 2	Stage 3
Inflows (ML/year)			
Rainfall Runoff			
Mine affected water	*215*	*255*	*235*
Surface water	*333*	*361*	*544*
Diverted water	*74*	*74*	*75*
Groundwater inflow	1	12	7
ROM Coal Moisture	45	86	83
External Pipeline	1079	322	505
Trucked potable water	50	50	50
Total Inflows	1796	1160	1498
Outflows (ML/year)			
Evaporation	29	64	67
Dam overflows			
Mine affected water	0	0	0

Description	Stage 1	Stage 2	Stage 3
Surface water	145	169	243
Diverted water	73	73	74
CHPP			
Product moisture	50	96	92
Coarse rejects moisture	32	61	59
Fine rejects moisture	64	122	118
Haul road dust suppression	1270	441	722
TLO demand	73	73	73
Potable water demand	50	50	50
Total Outflows	1786	1150	1498
Change in volume (ML/year)			
Change in stored volume	10	10	0

5.3.2 Mine affected water inventory

5.3.2.1 MWD8 inventory

Figure 5.2 shows the forecast inventory for MWD8 which is the key out-of-pit mine affected water storage, controlling the dewatering of the pit. Figure 5.3 shows the annual maximum forecast inventory for MWD8 over the mine life.

These results show the 1%ile (wettest climatic conditions), 5%ile, 10%ile, 25%ile and 50%ile traces.

As outlined in Section 4.4.1, to prevent uncontrolled discharges from MWD8 a MOV is required. If the MOV is exceeded, all transfers to the storage cease (i.e. pit dewatering and mine water dam dewatering). The MWD8 MOV, in addition to the FSV are shown in Figure 5.2 and Figure 5.3.

The model results show the following:

  - The MWD8 inventory is maintained below the FSV for all climatic conditions assessed and therefore is not predicted to spill under any modelled climate sequence.
  - The MWD8 inventory is maintained below its MOV for 5%ile and drier conditions in Stage 1 and 25%ile & drier conditions in Stages 2 & 3. This means pit and mine dam dewatering is restricted under 1%ile in Stage 1 and 10%ile and wetter conditions in Stages 2 and 3.
  - Under the 50%ile trace, the MWD8 inventory is maintained below 12 ML for the entire mine life.
- Under very wet (1%ile) conditions, MWD8 has an inventory of up to 165 ML during Stage 2.
- Under wet (10%ile conditions), MWD8 has a maximum inventory of approximately:
  - up to 50 ML during Stage 1; and
  - up to 115 ML during Stage 2 and 3.

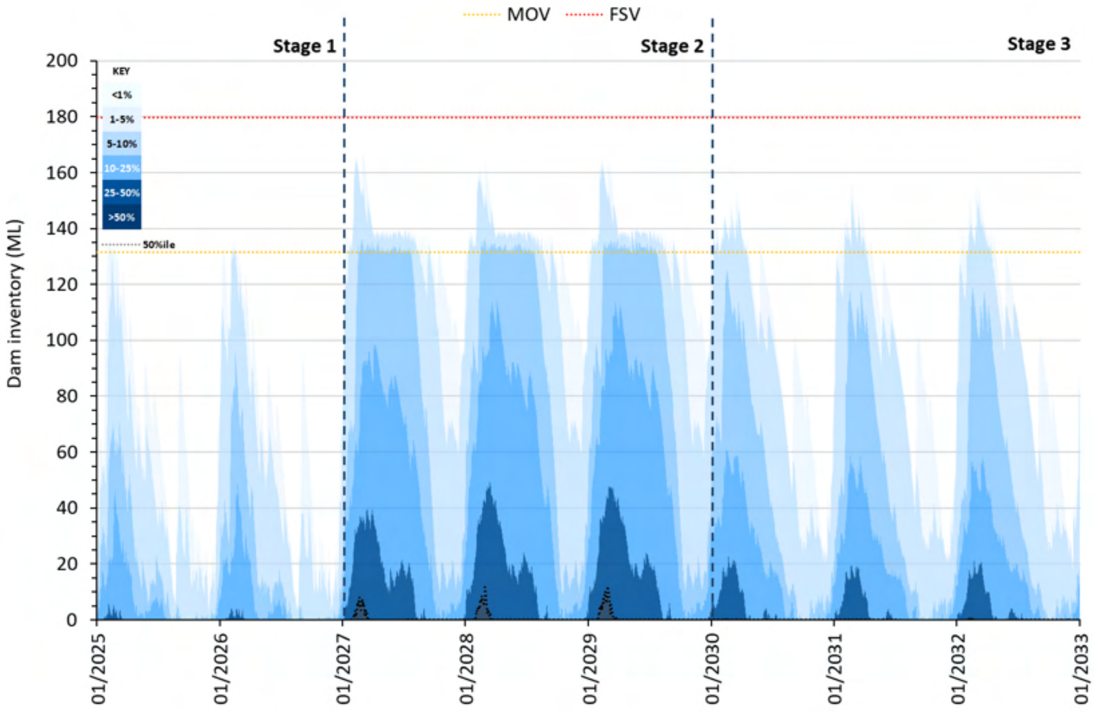

Figure 5.2 Forecast MWD8 inventory

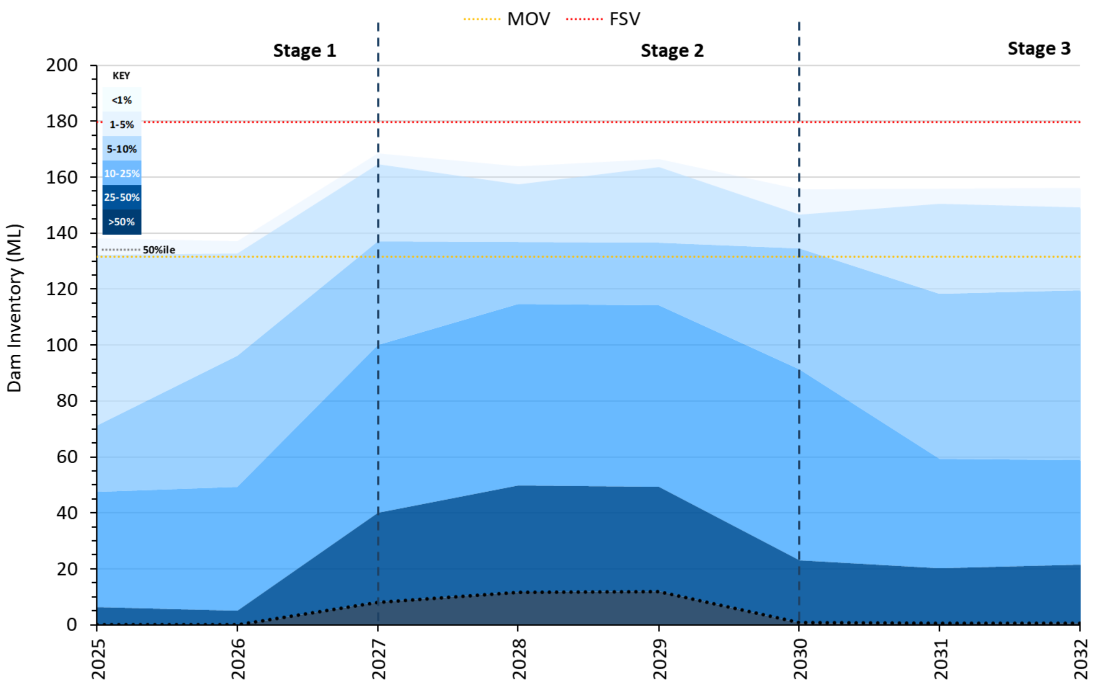

Figure 5.3 Forecast annual maximum MWD8 inventory

5.3.2.2 MWD9 inventory

Figure 5.4 shows the annual maximum forecast inventory for MWD9. MWD9 acts as a transfer dam for Vulcan Main pit and Vulcan South pit. MWD9 is not active in Stage 1. The results show the 1%ile (wettest climatic conditions), 5%ile, 10%ile, 25%ile and 50%ile traces.

The model results show the following:

- The MWD9 inventory is maintained below the FSV for all climatic conditions assessed and therefore is not predicted to spill under any modelled climate sequence.
- Under wet (10%ile conditions), MWD9 has a maximum inventory of approximately up to 24 ML during both Stage 1 & 2.

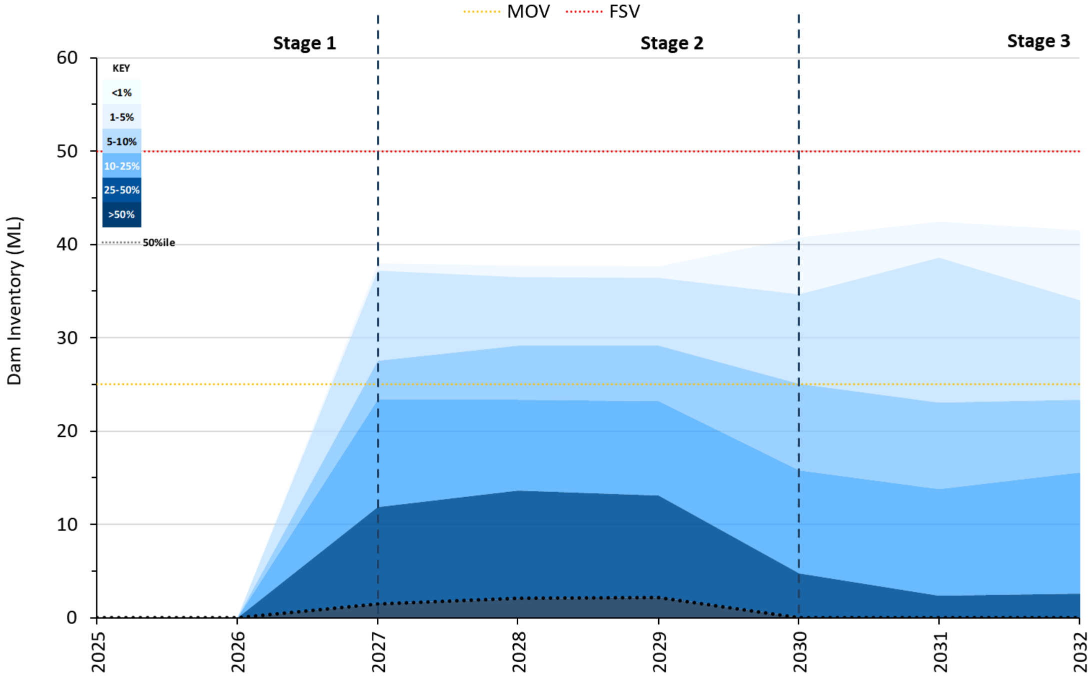

Figure 5.4 Forecast annual maximum MWD9 inventory

5.3.2.3 MWD6 and MWD7 inventories

Mine water dams MWD6 and MWD7 collect mine water draining from the CHPP area and the TLO area. They have been grouped together for the purpose of this assessment as they are operated in a similar way. Figure 5.5 shows the annual maximum forecast combined inventory for MWD6 and MWD7.

The model results show that:

- The combined water inventories in MWD6 and MWD7 remain below the combined FSV under the 1%ile and drier climate sequence. Model results indicate that the mine dams spill into MWD8 very infrequently (i.e. less than 1% of the time).
- Under the 50%ile trace, the maximum mine water inventory is maintained well below the MOV for all years.
- The maximum water inventory only rises above the MOV under conditions wetter than the 5%ile during all stages.

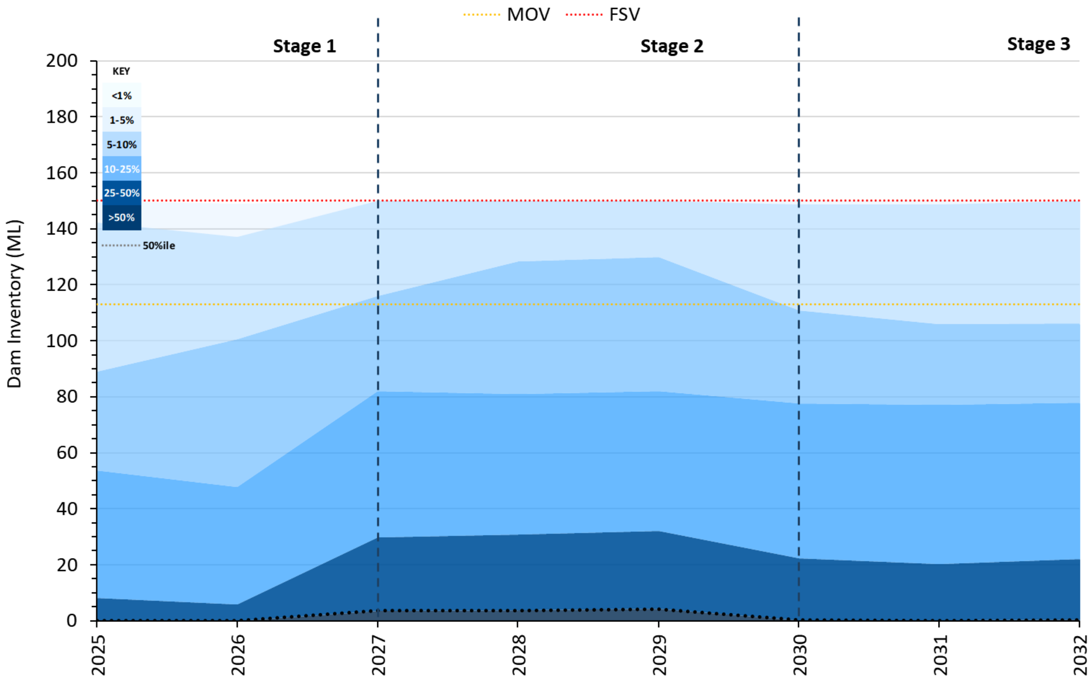

Figure 5.5 Forecast annual combined maximum water inventory in MWD6 and MWD7

5.3.3 Vulcan North pit water inventory

Figure 5.6 shows the forecast annual maximum Vulcan North pit inventory during Stage 1. The pit is inactive and therefore empty during Stages 2 and 3.

The 1%ile (wettest climatic conditions), 5%ile, 10%ile, 25%ile and 50%ile percentile traces are shown. As outlined in Section 4.4.1, the pit is continuously dewatered into MWD8 as long as MWD8 is maintained below its MOV.

The model results show the following:

- The pit is empty for the majority of the mine life.
- The Vulcan North pit will have a forecast inventory of approximately:
  - up to 8 ML under very wet (1%ile conditions); and
  - up to 1 ML under wet (10%ile conditions).

The results suggest that MWD8 has sufficient capacity to dewater the Vulcan North pit for the entirety of its active mine life.

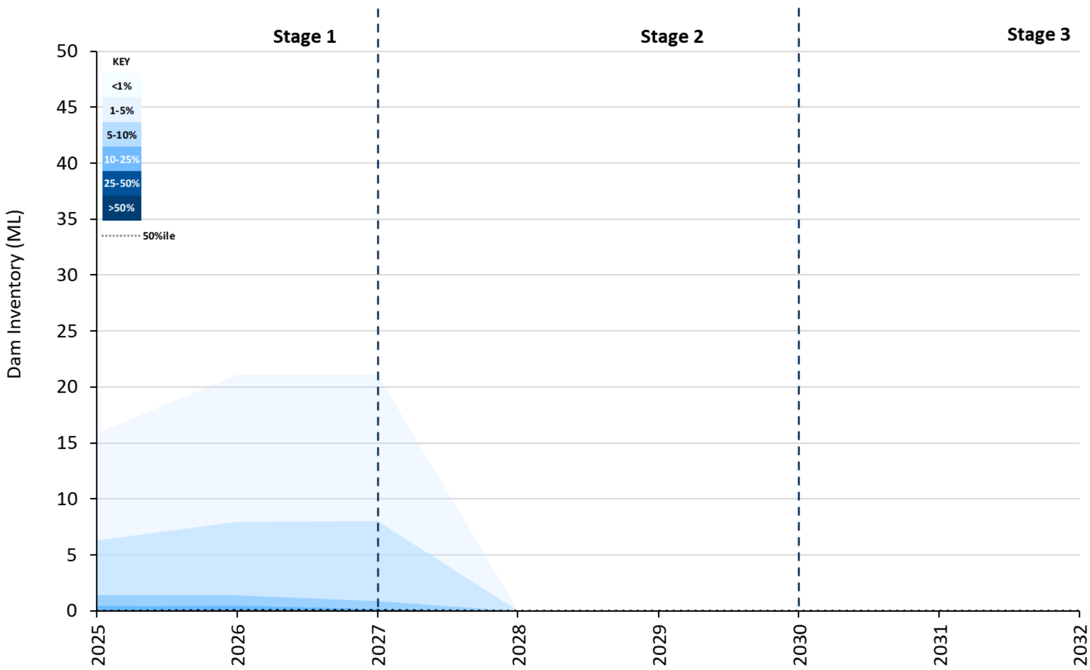

Figure 5.6 Vulcan North forecast annual maximum pit inventory

5.3.4 Vulcan Main pit water inventory

Figure 5.7 shows the forecast pit inventory for Vulcan Main pit. Figure 5.8 shows the forecast annual maximum inventory in Vulcan Main pit.

The 1%ile (wettest climatic conditions), 5%ile, 10%ile, 25%ile and 50%ile percentile traces are shown. As outlined in Section 4.4.1, the pit is continuously dewatered into MWD8 and MWD9.

The model results show the following:

- Under very wet (1%ile) conditions, the Vulcan Main pit will have a forecast inventory of approximately:
  - up to 29 ML during Stage 1;
  - up to 103 ML during Stage 2; and
  - up to 49 ML during Stage 3.
- Under wet (10%ile conditions), the Vulcan pit will have an inventory of approximately:
  - up to 1 ML during Stage 1;
  - up to 6 ML during Stage 2; and
  - up to 2 ML during Stage 3.
- Under 50%ile conditions, the maximum pit inventory is less than 1 ML for all stages.

The results suggest that the Vulcan Main pit may begin to accumulate water during Stage 2 during very wet climate conditions due to capacity being reached in MWD8 and MWD9. If there is a 5%ile or wetter climatic condition, then the on-site water storages would be filled to capacity and the Vulcan Main pit would be required to store excess water potentially disrupting mining activities.

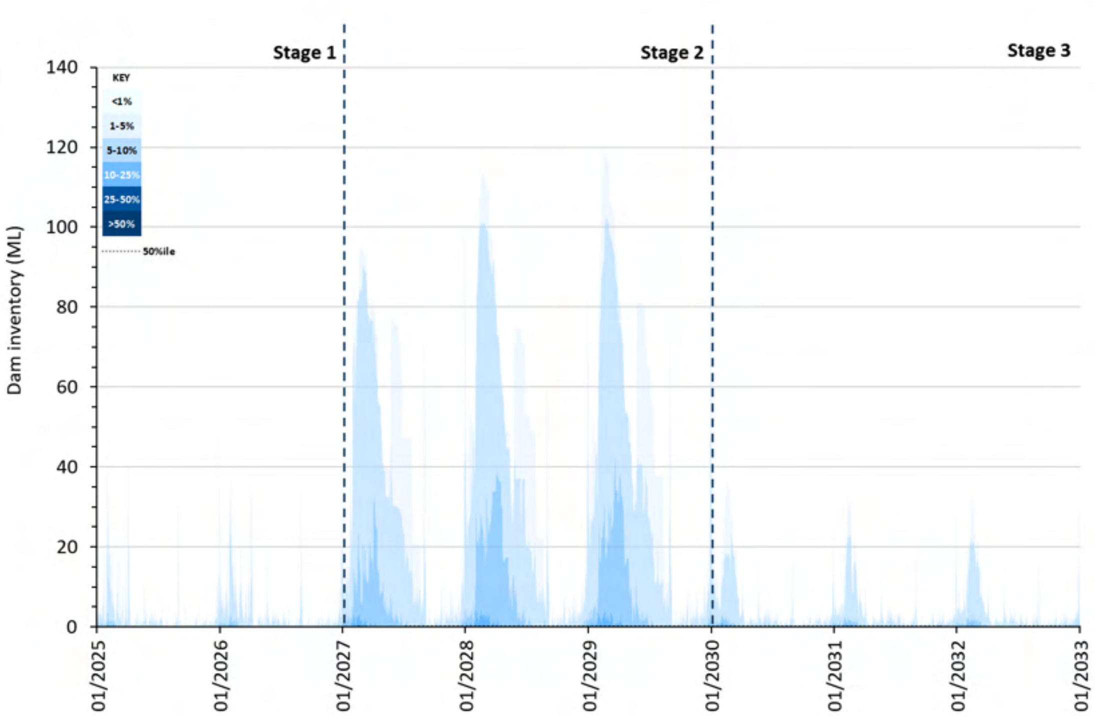

Figure 5.7 Vulcan Main pit forecast mine pit inventory

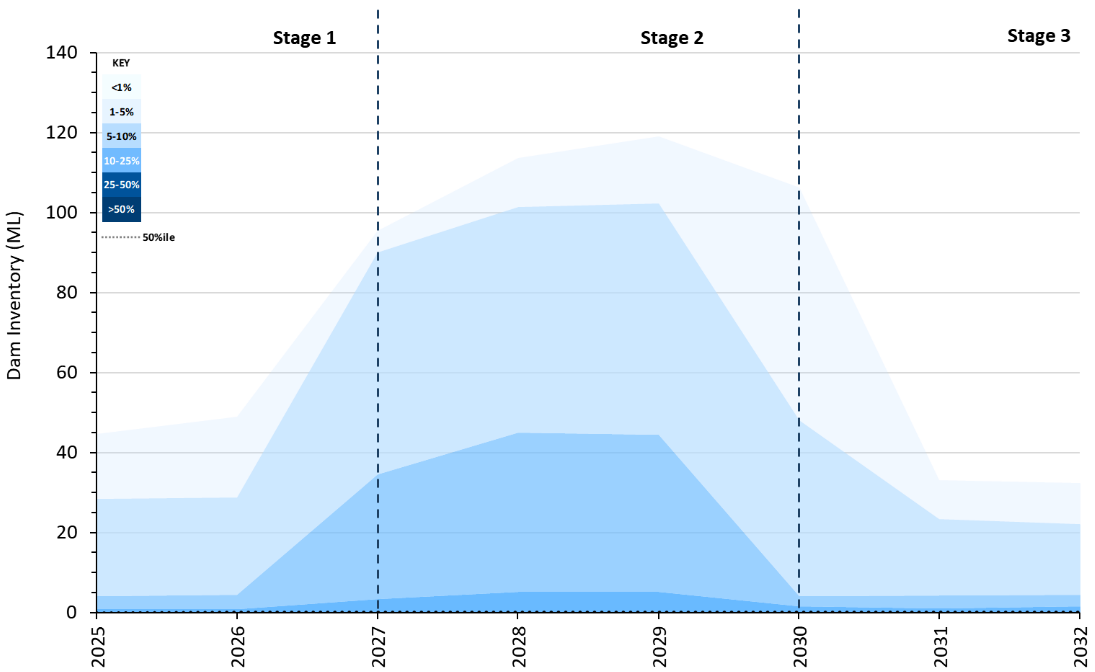

Figure 5.8 Vulcan Main pit forecast annual maximum pit inventory

5.3.5 Vulcan South pit water inventory

Figure 5.9 shows the forecast annual maximum inventory in Vulcan South pit. The Vulcan South pit is only active in Stage 3.

The 1%ile (wettest climatic conditions), 5%ile, 10%ile, 25%ile and 50%ile percentile traces are shown. As outlined in Section 4.4.1, the pit is continuously dewatered into MWD8 and MWD9.

The model results show the following:

- The Vulcan South pit will have a forecast inventory of approximately:
  - up to 16 ML during very wet (1%ile) climate conditions; and
  - up to 1 ML during wet (10%ile) climate conditions.
- Under 50%ile and drier conditions the pit is kept dewatered for the entirety of its mine life.

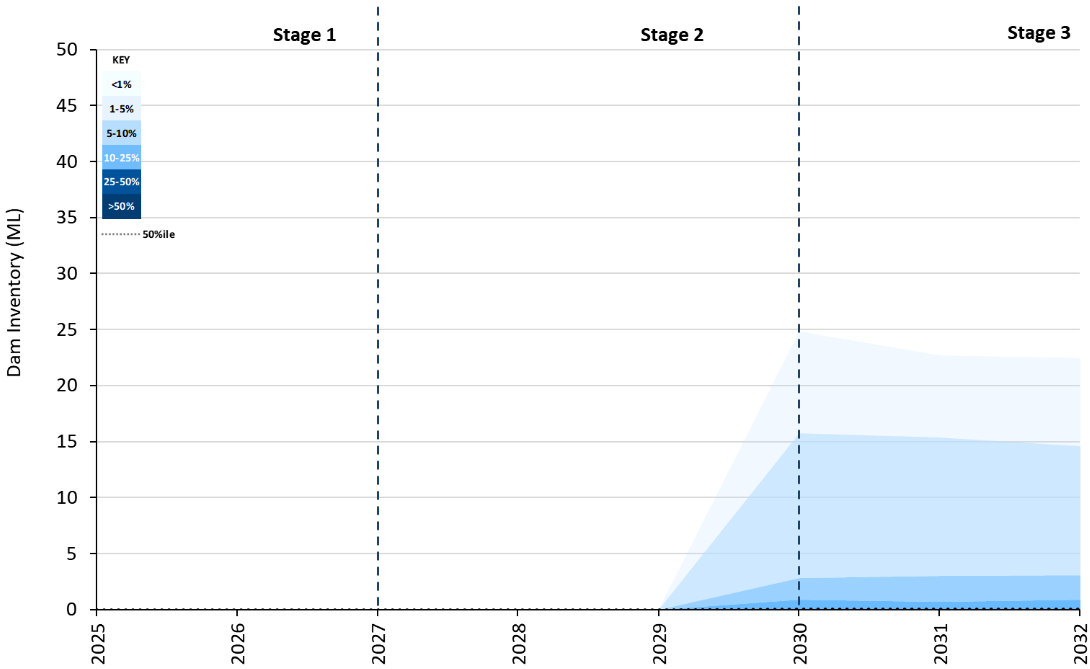

Figure 5.9 Vulcan South pit forecast annual maximum pit inventory

5.3.6 External makeup requirements

Figure 5.10 shows the total annual modelled external water required to meet predicted mine demands. The 1%ile (driest climatic conditions), 5%ile, 10%ile, 25%ile and 50%ile percentile traces are shown. As outlined in Section 4.4.5, the external pipeline is used to satisfy mine demands as lowest priority when all other sources are empty.

The modelling results show the following:

- Stage 1 requires significantly more external water than Stages 2 and 3 because Stage 1 has the largest haul road dust suppression requirements and therefore the highest mine water demands.
- During the driest (1%ile) climatic conditions, the external water requirement is:

- up to approximately 1,520 ML/annum during Stage 1;
  - up to 675 ML/annum during Stage 2; and
  - up to 965 ML/annum during Stage 3.
- During 50%ile conditions, the predicted external water requirements is:
  - up to approximately 1,210 ML/annum during Stage 1;
  - up to approximately 335 ML/annum during Stage 2; and
  - up to approximately 530 ML/annum during Stage 3.

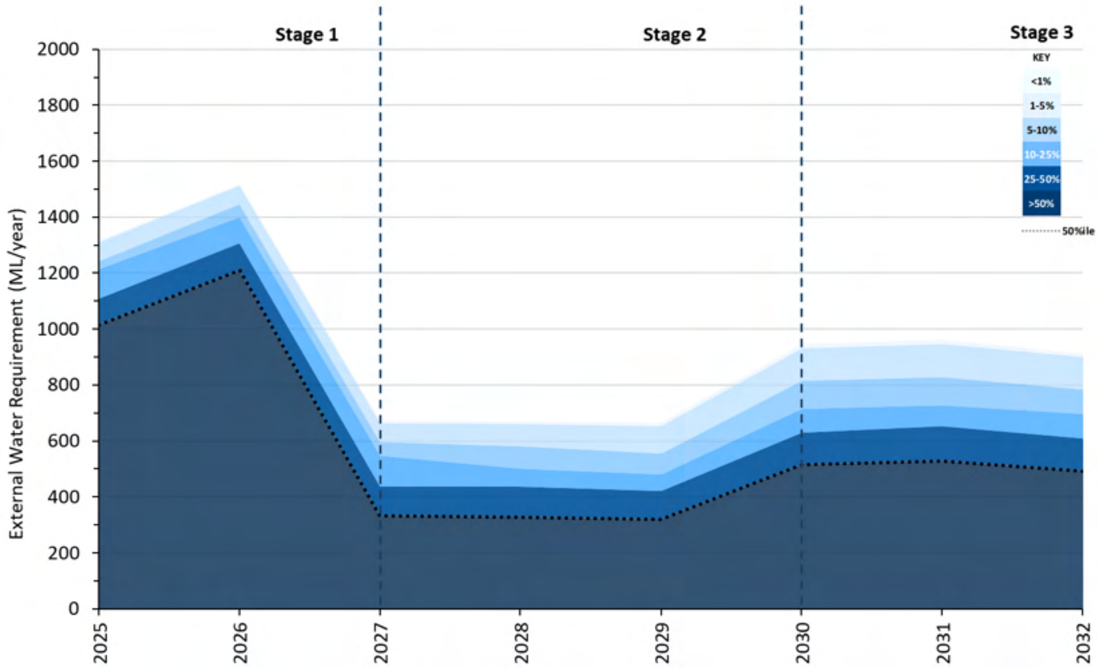

Figure 5.10 Forecast external water requirement for dust suppression

5.3.7 Releases/overflows to the receiving waters

5.3.7.1 Mine Affected Water Dams

As outlined in Section 5.3.2, no spills are predicted from any of the mine affected water dams (i.e. MWD6, MWD7, MWD8 and MWD9) to the external environment under any of the climate sequences modelled.

Under very rare circumstances (i.e. <1%ile) MWD6 and MWD7 are predicted to spill to MWD8. This does not cause MWD8 to spill to Hughes Creek.

5.3.7.2 Sediment Dams

Consistent with the IECA guidelines (2008), sediment dams do not provide 100% containment for captured runoff. Hence overflows will occur from sediment dams when rainfall exceeds the design standard.

The potential for releases from the proposed sediment dam has been modelled using a passive overflow rather than active release (to regain storage capacity within 5 days).

Figure 5.11 shows the forecast annual sediment dam releases to Hughes Creek. Figure 5.12 shows the forecast annual sediment dam releases to East Creek.

The model results indicate that:

- The predicted sediment dam releases to Hughes Creek progressively increases over the mine life. This is due to sediment dams which release to Hughes Creek progressively being constructed over the mine life as the dump areas associated with the Vulcan Main and Vulcan South pits increases.
- The predicted sediment dam releases to East Creek increase in Stage 2 compared to Stage 1 before decreasing again in Stage 3. This is due to no new sediment dams draining to this creek being constructed at the commencement of Stage 3. The surface water catchment areas do not change between Stages 2 and 3, however mine demands for the sediment dam water increase in Stage 3.
- Under wet (10%ile) conditions, the annual volume of sediment dam releases to Hughes Creek is approximately:
  - up to 356 ML/yr during Stage 1;
  - up to 422 ML/yr during Stage 2; and
  - up to 686 ML/yr during Stage 3.
- Under wet (10%ile) conditions, the annual volume of sediment dam releases to East Creek is approximately:
  - up to 143 ML/yr during Stage 1;
  - up to 162 ML/yr during Stage 2; and
  - up to 155 ML/yr during Stage 3.
- Under 50%ile conditions, the annual volume of sediment dam releases to Hughes Creek is approximately:
  - up to 54 ML/yr during Stage 1;
  - up to 38 ML/yr during Stage 2; and
  - up to 72 ML/yr during Stage 3.
- Under 50%ile conditions, the annual volume of sediment dam releases to East Creek is approximately:
  - up to 1 ML/yr during Stage 1; and
  - up to 9 ML/yr during Stage 2 and Stage 3.
- Overall, the results indicate that under average or drier conditions low spill volumes are expected to the receiving waters, while wet conditions result in more significant spill volumes.

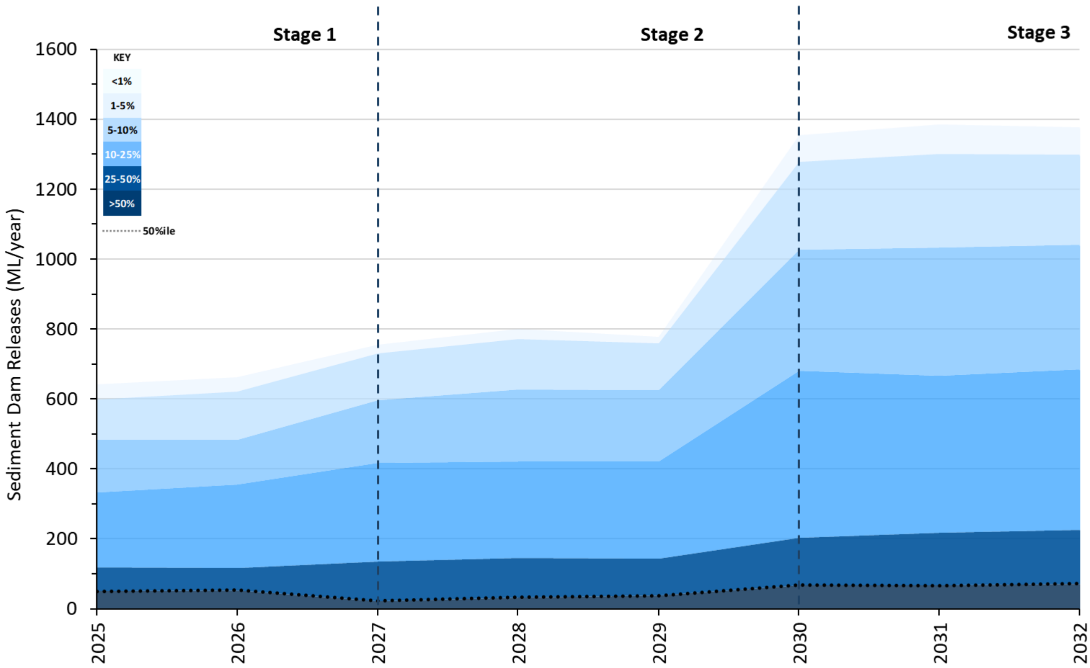

Figure 5.11 **Forecast annual sediment dam releases to Hughes Creek**

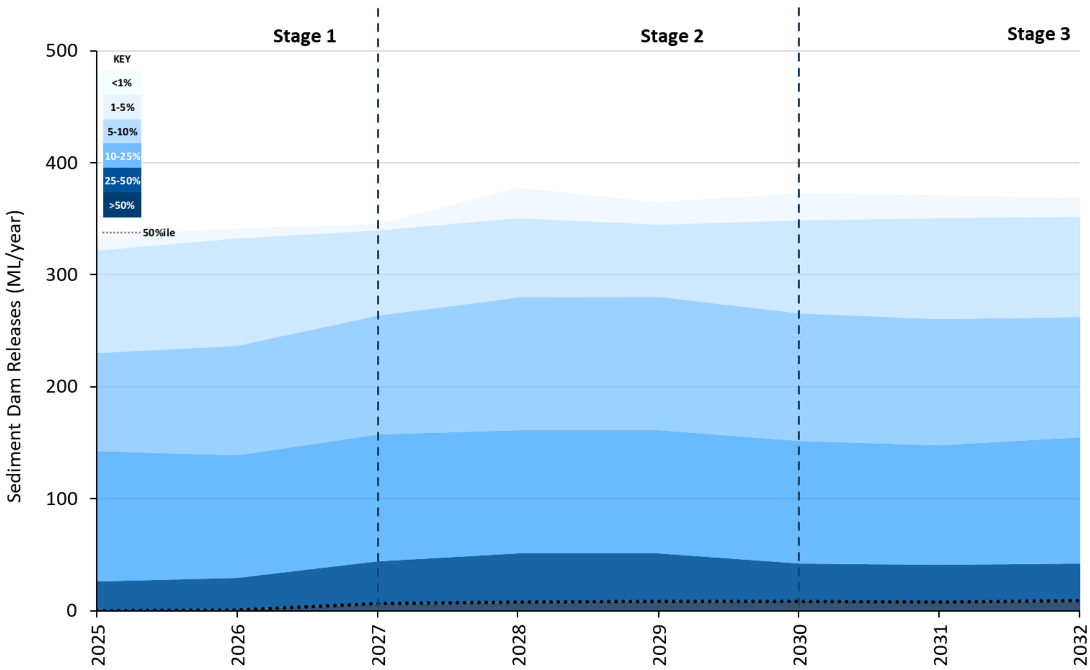

Figure 5.12 **Forecast annual sediment dam releases to East Creek**

5.3.7.3 DD2

DD2 collects water from a primarily undisturbed catchment to the southwest of the Vulcan North pit, with a small area of haul road. Water stored in DD2 is dewatered to the existing drainage diversion at 100 L/s. If the capacity of DD2 is exceeded, water would spill to the Vulcan North pit in Stage 1 and East Creek in Stages 2 and 3.

Figure 5.13 shows the combined annual total pumped flows from DD2 to the existing drainage diversion, as well as any overflows. The 1%ile (wettest climatic conditions), 5%ile, 10%ile, 25%ile and 50%ile percentile traces are shown.

The model results predict the following:

- Under wet (10%ile) conditions DD2 dewaters up to approximately 175 ML/year to the receiving waters in all stages.
- Under very wet (1%ile climatic conditions) DD2 is predicted to spill up to 4 ML and dewaters up to approximately 215 ML/year to the receiving waters in all stages.

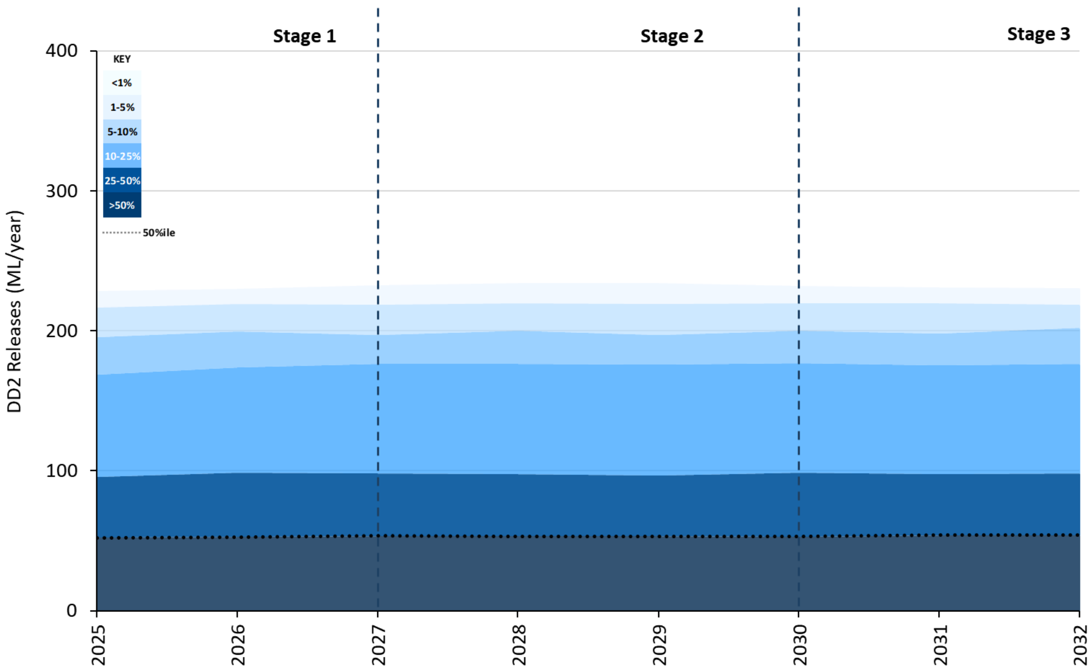

Figure 5.13 Forecast total annual releases from DD2 to the existing waters

6 SALINE AND ACID ROCK DRAINAGE

6.1 GEOCHEMICAL TESTING

RGS (2022) completed a geochemical assessment of the material in the vicinity of the Project.

RGS obtained and tested 138 representative samples of waste rock (overburden and interburden; including roof, floor and parting materials) from 21 drill holes within the Project site and surrounds. Of these drill holes, 7 were located in the Jupiter target area and 14 within the Vulcan target area. RGS completed static and kinetic geochemical tests on the samples to determine their potential for acid mine drainage (AMD) and salinity.

RGS (2022) determined the following:

- The overwhelming majority (137 of 138) of the waste rock samples contained negligible sulfide content, had excess acid neutralising capacity (ANC), and were classified as non-acid forming (NAF). One of the samples was classified as uncertain. Overall, the waste rock samples were classified as having a very low risk of acid generation and a high factor of safety with respect to acid drainage.
- Coal reject materials have relatively low sulfide content and excess ANC. As a bulk mixed material, it is expected that coal reject will be classified as NAF and have a relatively low risk of generating acidic drainage. Given that coal from the will be washed and processed offsite until the CHPP is constructed and operating, there is a low likelihood of runoff from coal rejects causing contamination in the Project's receiving waters.
- Initial and ongoing surface runoff and seepage from mine waste materials was expected to be pH neutral to slightly alkaline and have a low level of salinity.

In consideration of the RGS (2022) results, material within three pits are expected to be benign and the potential risk of saline and acid rock drainage is expected to be low.

6.2 MANAGEMENT MEASURES

Notwithstanding the low risk of acid rock or saline drainage outlined above, the following measures have been outlined to manage saline and acid rock drainage:

- The WMS has been designed to manage mine affected water separately from other water types at the Project, as outlined in Section 4.4.1. This includes designing specialised mine water storages inline with the Project EA and reusing mine affected water as a priority to avoid spills to receiving waters. Mine water drains ensure mine affected water is managed separately from other types of runoff in the Project area.
- Surface water will be managed in the surface water system (as outlined in Section 4.4), including drainage through surface water drains to sediment dams which will be managed in accordance with a site ESCP. In consideration of the RGS findings for the Vulcan pit, the runoff from the in pit and out of pit spoil dumps may contain high sediment loads but is not expected to contain elevated levels of electrical conductivity or pH. The runoff will be managed to ensure adequate sediment removal prior to release to receiving waters (i.e. drainage to sediment dams) and will not be mixed with pit water, tailings water or workshop water.
- Water is monitored in the Project at the sediment dam release points and in the receiving waters for a number of water quality parameters, including pH and EC as outlined in Section 7. These parameters are measured against trigger levels, which, if exceeded will trigger the requirement to undertaken an investigation and may require the development of immediate and long-term measures to avoid environmental harm.

7 WATER MONITORING PLAN

7.1 OVERVIEW

Monitoring of surface water quality both within and external to the mine site will form a key component of the surface water management system. Monitoring of upstream, onsite and downstream water quality will assist in demonstrating that the site water management system is effective in meeting its objective of minimal impact on receiving water quality and will allow for early detection of any impacts and appropriate corrective action.

Further details regarding the monitoring program, including the sampling methodology and analysis process of the monitoring program, is described in the REMP (WRM, 2024b).

Details of the receiving water quality monitoring, mine affected water quality monitoring and sediment dam water monitoring program are outlined in Section 7.2, Section 7.3 and Section 7.4 respectively. Locations of the proposed surface water monitoring locations and mine affected dam monitoring locations are shown in Figure 7.1 and Figure 7.2 and summarised in Table 7.1. Note that the mine water release points are the same as the mine water monitoring locations (i.e. at the spillway).

Table 7.1 Surface water monitoring locations (Table F2 of EA)

Station ID	Previous Station ID	Catchment Area	Latitude (GDA 2020)	Longitude (GDA2020)	Description
Upstream sites					
DL2_US	N/A	Boomerang Creek	22.290841264°S	148.154357187°E	Drainage line 2 upstream of the highwall trial mining area
DL3_ US	N/A	Boomerang Creek	22.305612596°S	148.192716185°E	Drainage line 3 upstream of the haul road
DL4_US	N/A	Boomerang Creek	22.323035473°S	148.200252458°E	Drainage line 4 at the upstream mining lease boundary
DL6_US	N/A	East Creek	22.339508200°S	148.207957289°E	Drainage line 6 at the upstream mining lease boundary
DL7_US	N/A	East Creek	22.347211456°S	148.209392813°E	Drainage line 7 at the upstream mining lease boundary
HCN_US	N/A	Hughes Creek	22.370485469°S	148.226638033°E	Hughes Creek north tributary approximately 5.5 km upstream of Saraji Road
HC_US	VSW5	Hughes Creek	22.395927439°S	148.224656137°E	Hughes Creek approximately 2.8 km upstream of Saraji Road
DL8_US	N/A	Hughes Creek	22.395784122°S	148.251629364°E	Drainage line 8 approximately 2.2 km upstream of Saraji Road
BC1_US	VSW6	Hughes Creek	22.411388907°S	148.269449617°E	Barrett Creek upstream of Saraji Road
Downstream sites					
DD1_US	VSW1	Boomerang Creek	22.276596290°S	148.174514955°E	Diversion bund

DD1_DS	VSW2	Boomerang Creek	22.301050508°S	148.195240117°E	Drainage line 2, downstream of the confluence of existing diversion drain
DL2_DS	VSW11	Boomerang Creek	22.298264498°S	148.189625245°E	Drainage line 2 upstream of confluence of existing diversion drain
DL3_DS	VSW3	Hughes Creek	22.306311857°S	148.194663612°E	Minor drainage line, upstream of confluence of Drainage Line 2
DL4_DS	VESW4	Hughes Creek	22.321553686°S	148.200307744°E	Drainage line 4 upstream of the confluence of Boomerang Creek
DL6_DS	VSW9	East Creek	22.334779125°S	148.221868903°E	Drainage line 6, at the downstream mining lease boundary
DL7_DS	VSW7	East Creek	22.343101091°S	148.231039608°E	Drainage line 7, at the downstream mining lease boundary
HC_DS	VSW4	Hughes Creek	22.384885209°S	148.266275740°E	Hughes Creek at the downstream mining lease boundary
DL8_DS	VSW10	Hughes Creek	22.388240114°S	148.268093290°E	Drainage line 8 at the downstream mining lease boundary
HWM_DS1	N/A	Harrow Creek	22.282°S	148.131°E	Harrow Creek headwaters downstream of the mining lease boundary
HWM_DS2	N/A	Boomerang Creek	22.261°S	148.153°E	Upstream of the existing BMA diversion drain

Table 7.2 Mine affected water storages (Table F4 of the EA)

Station ID	Latitude (GDA2020)	Longitude (GDA2020)	Description	Frequency
MWD6	22.364255447°S	148.227496324°E	MWD6 spillway	Quarterly
MWD7	22.361502986°S	148.230735154°E	MWD7 spillway	Quarterly
MWD8	22.364977354°S	148.229969352°E	MWD8 spillway	Quarterly
MWD9	22.376445088°S	148.251660294°E	MWD9 spillway	Quarterly

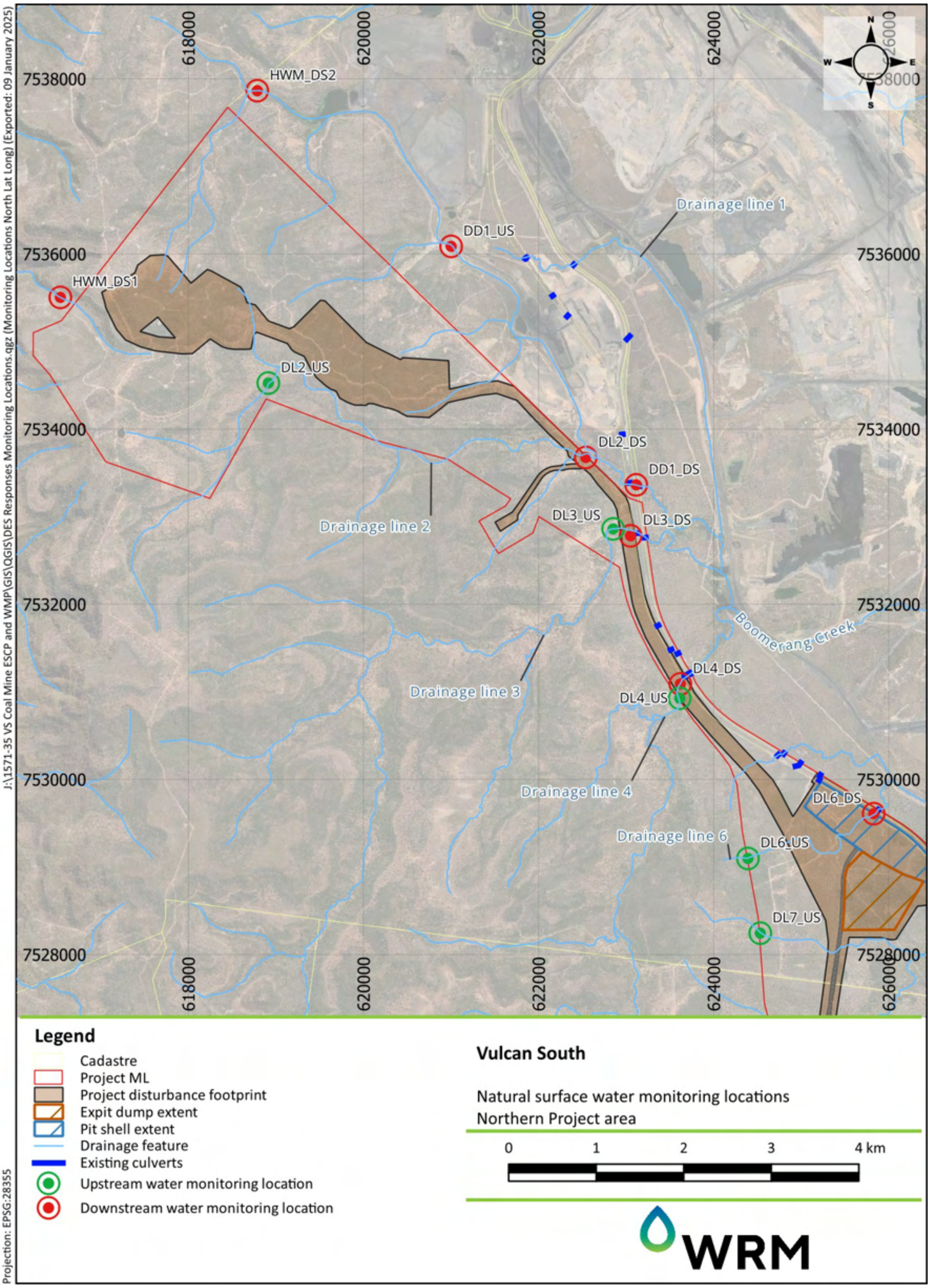

Figure 7.1 Proposed surface water monitoring locations – northern Project area

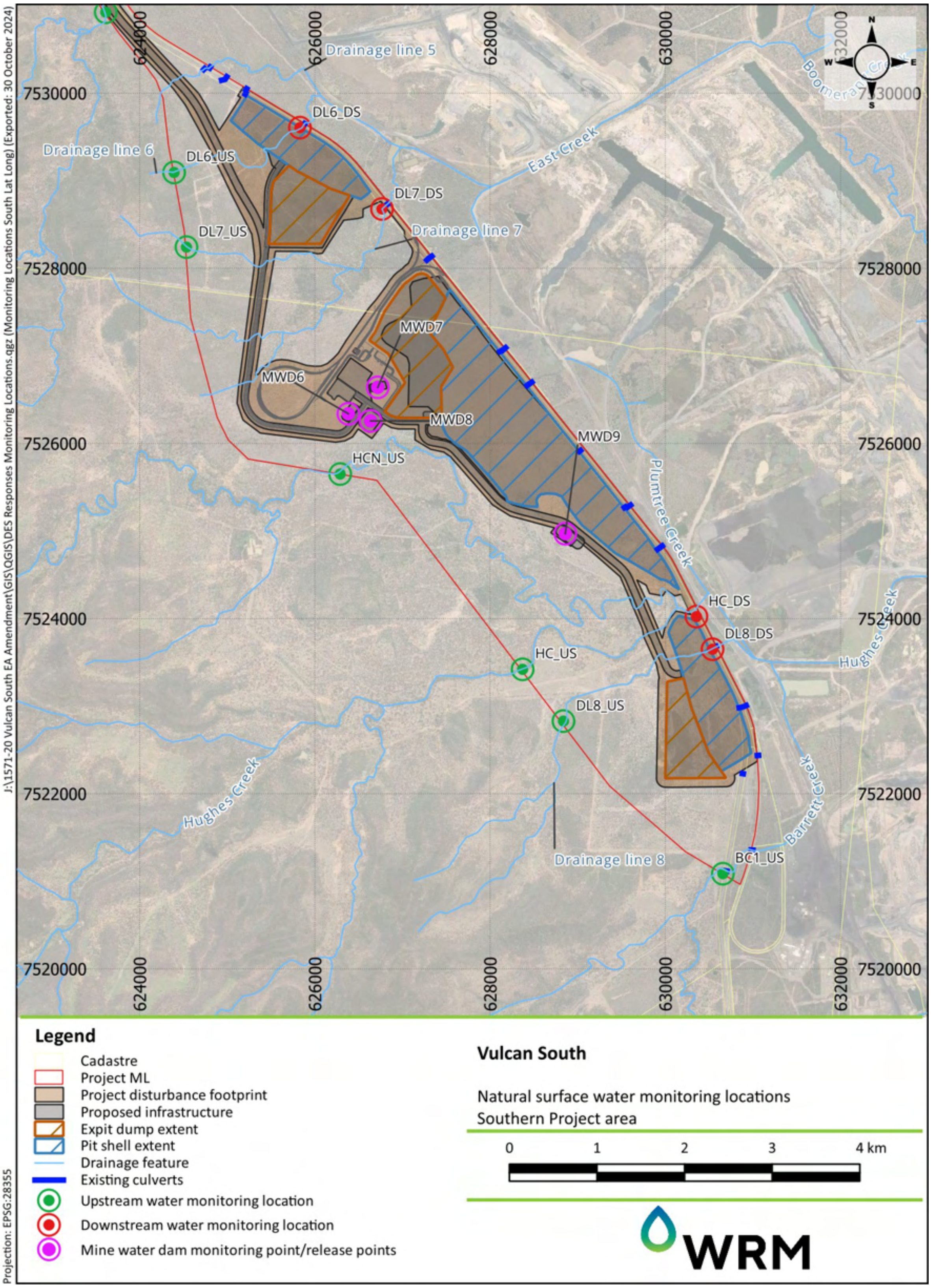

Figure 7.2 Proposed surface water monitoring locations – southern Project area

7.2 RECEIVING WATERS MONITORING

In accordance with Condition F12 of the Project EA, Vitrinite will monitor the receiving water locations shown in Figure 7.1 and Figure 7.2 and summarised in Table 7.1. Receiving waters monitoring locations are classified as upstream or downstream sites per the Project EA. The sites are classified as follows:

- upstream monitoring points: DL2_US, DL2_DS, DL3_US, DL4_US, DL6_US (Post-closure only), DL7_US, HCN_US, HC_US, DL8_US and BC1_US; and
- downstream monitoring points: DD1_US, DL1_DS, DD1_DS, DL6_DS, DL7_DS, HC_DS and DL8_DS.

Two additional downstream monitoring points, HWM_DS1 and HWM_DS2, are proposed for the highwall mining trial area to monitor any potential disturbance to the receiving environment.

7.3 MINE AFFECTED WATER QUALITY MONITORING

The Project does not propose to release mine affected water to the receiving waters, however, the water quality monitoring program will also include monitoring at all dams which contain mine affected water with the potential to discharge to the receiving waters to provide indication on mine affected water quality. This includes the following dams:

- MWD6;
- MWD7;
- MWD8; and
- MWD9.

Locations of the proposed mine water monitoring locations are shown in Figure 7.1 and Figure 7.2 and summarised in Table 7.2.

In accordance with Condition F22 of the Project EA, the quality of water in the above dams (summarised in Table 7.2) must be monitored:

a. at the location shown in Table 7.2;
b. at the monitoring frequency in Table 7.2;
c. for all quality characteristics specified in Table 2.3; and
d. include the volume of the water storage (in megalitres) at the time of monitoring.

Per Condition F23 of the Project EA, if the results of any water storage monitoring from Condition F22 exceed a trigger value for the water quality characteristics specified in Table 2.3, then all necessary actions must be taken to prevent access to the waters by wildlife and livestock.

7.4 SEDIMENT DAM WATER QUALITY MONITORING

In accordance with Condition F4 of the Project EA releases from sediment dams will be monitored at their release points for the water quality parameters specified in Table 2.3. The Project sediment dams are shown in Figure 1.3 to Figure 1.12 and details regarding the sediment dams (including the location of release points) is outlined in Table 7.1.

7.5 MAINTENANCE AND INSPECTIONS

Water management structures should be inspected as follows:

- at least daily when rain is occurring;
- within 24 hours prior to expected rainfall; and

- as soon as practicable following a rainfall event of sufficient intensity and duration to cause on-site runoff.

Daily site inspections taking place during periods of runoff inducing rainfall must check:

- all drainage, erosion and sediment control measures;
- occurrences of excessive sediment deposition (whether on-site or off-site); and
- all site discharge points.

Site inspections immediately prior to anticipated runoff inducing events must check:

- all drainage, erosion and sediment control measures
- all mine affected water management measures; and
- all temporary (i.e. overnight) flow diversion and drainage works.

Site inspections as soon as practicable following runoff producing rainfall must check:

- treatment and dewatering requirements of sediment basins;
- sediment deposition within sediment basins and requirements for its removal;
- the integrity of all drainage, erosion and sediment control measures;
- occurrences of excessive sediment deposition (whether on-site or off-site);
- occurrences of construction materials, litter or sediment placed, deposited, washed or blown from the site, including deposition by vehicular movements;
- occurrences of excessive erosion, sedimentation, or mud generation around the site office, car park and/or material storage area;
- integrity of all mine affected water drains and dam embankments; and
- mine water dam operating volumes.

In addition to the above, monthly site inspections must check:

- surface coverage of finished surfaces (both area and percentage cover);
- health of recently established vegetation;
- proposed staging of future land clearing, earthworks, pre-strip activities and site/soil stabilisation; and
- mine water dam volumes.

The inspection and monitoring regime should collect and record the following key information:

- the previous condition of the infrastructure and any recommendations or works actioned since the last inspection;
- the current condition of the ESC infrastructure or mine water structure;
- the ESC controls currently in place, and their condition; and
- recommendations on remedial measures to ESC controls or mine water drains or additional ESC or mine water controls if required.

Any failure of effectiveness of structure will be reported to the Mine Site General Manager. The implementation plan should include the recommendations for the incident report. An example inspection template is provided in Appendix C of the ESCP.

7.6 DAM MONITORING

The embankments of all dams will be monitored annually before the wet season, and during and after flow events to ensure they are operating satisfactorily and have not been damaged through erosion.

Should a dam become damaged, the stored water will be pumped to a suitable water storage facility to minimise the risk of an uncontrolled release to the downstream waterway. The Mine Site General Manager will be responsible for communicating with regulators. A suitably qualified person shall be used to inspect the dam. Repair work will occur as soon as practicable after damage has occurred.

7.7 TRIGGER INVESTIGATION

Water quality trigger investigations at the Project will be undertaken in accordance with Condition F5 to Condition F8 of the Project EA:

- Condition F5: If monitoring required by Condition F4, for any ESC structure, identifies an exceedance of any of the sediment dam trigger values identified in Table 2.3, all water in that structure must be transferred to a storage listed in Table 7.2.
- Condition F6: If water quality sampling as specified in Condition F4 identifies three (3) consecutive exceedances of sediment dam trigger values detailed in Table 2.3, the environmental authority holder must complete an investigation into the cause of the deterioration in water quality and the potential for environmental harm.
- Condition F7: Following completion of the investigation required under Condition F6, the environmental authority holder must submit a written report to the administering authority within twenty (20) business days outlining:
    a. details of the investigation carried out including any assumptions and limitations of the investigation; and
    b. findings of the investigation including an explanation of the cause identified; and
    c. recommendations of the investigation; and
    d. actions taken to comply with the conditions of the environmental authority and to prevent environmental harm.
- Condition F8: The holder of the environmental authority must notify the administering authority within twenty-four (24) hours of receiving the monitoring results of the three (3) consecutive exceedances via WaTERS and pollution hotline.

7.8 RECEIVING ENVIRONMENT MONITORING PROGRAM (REMP)

Further details regarding the monitoring program, including the sampling methodology and analysis process of the monitoring program, is described in the REMP (WRM, 2024b). The main objective of the REMP will be to report against WQOs for local waterways potentially affected by discharge from the Project and will assist in assessing general aquatic ecosystem health.

7.9 PRE WET SEASON CHECKLIST

A pre-wet season checklist should be undertaken for the Project at least annually, to prepare the site for potential rainfall events. A checklist provided by Vitrinite is in Appendix A.

8 EMERGENCY AND CONTINGENCY PLANNING

8.1 OVERVIEW

The WMS for the Project has been developed for both normal operation and during extreme wet weather events in order to:

- minimise the risk of uncontrolled releases from mine-affected water dams; and
- ensure compliance with the Project EA.

A summary of the emergency response, should a failure of the WMS occur, is given below.

8.2 EMERGENCY MANAGEMENT

In accordance with Condition A1, A2, and A3 of the Project EA:

- All reasonable and practicable measures must be taken to prevent or minimise environmental harm caused, or likely to be caused, by the authorised activities.
- This environmental authority authorises environmental harm referred to in the conditions. Where there is no condition or this environmental authority is silent on a matter, the lack of a condition or silence does not authorise environmental harm.
- Unless specifically authorised by a condition of this environmental authority, this environmental authority does not authorise a relevant act which is:
    a. an act that causes serious or material environmental harm or an environmental nuisance; or
    b. an act that contravenes a noise standard; or
    c. a deposit of a contaminant, or release of stormwater run-off, mentioned in section 440ZG of the *Environmental Protection Act 1994*.

In accordance with Condition A9 the Project EA, unless specifically authorised by a condition of this environmental authority, details of any contravention of a condition of this environmental authority must:

a. be reported to the administering authority within twenty-four (24) hours of becoming aware of the contravention; and
b. include the nature and circumstances of the contravention and any immediate actions taken.

In accordance with Condition A10 the Project EA, as soon as reasonably practicable but no later than **twenty (20) business days** of a report made under Condition **A9(a)** (or a longer period agreed to in writing by the administering authority), an investigation report must be submitted to the administering authority detailing:

a. the potential circumstances and actions that may have contributed to the contravention; and
b. reasonable and practicable measures that will be implemented to address the cause of the contravention to prevent future contraventions of this nature and to address any actual or potential environmental harm.

In accordance with Condition A11 and A12 of the Project EA:

- As soon as reasonably practicable but no later than **twenty (20) business days** after submitting the report required under Condition **A10** (or a longer period agreed to in writing by the administering authority), the measures identified under Condition **A10(b)** must be implemented; and
- The measures implemented under Condition A11 must be recorded.

8.3 WET WEATHER ACCESS

During wet weather, site access may be restricted due to impassable unsealed roads, flooding and safety issues. It is proposed that waterways which have short duration flows and are inaccessible in wet conditions have a rising stage sampler which can be used to take water samples, minimising exposure of personnel to extreme weather events.

8.4 POST-EVENT MONITORING

Dams and drains onsite will be inspected after any significant rainfall event where overflows from sediment dams occur.

Drains and dam spillways will be checked for erosion damage and repaired when required.

9 REFERENCES

AARC Environmental Solutions Pty Ltd, 2022	*Vulcan Project Soil and Land Suitability Assessment.* October 2019.
DESI,2023	*Environmental authority P-EA-100265081 Vulcan South Coal Mine*, Department of Environment, Science and Innovation, QLD, March, 2023
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McKenzie NJ, Grundy MJ, Webster R and Ringrose-Voase, 2008	*Guidelines for Surveying Soil and Land Resources*. Australian Soil and Land Survey Handbook Series. CSIRO Publishing, Melbourne.
RGS Environmental Pty Ltd, 2022	*Geochemical Assessment of Waste Rock, Coal Reject and Coal Vulcan South,* prepared for Vitrinite Pty Ltd, Rev01, February 2022.
WRM, 2023	*Vulcan South Surface Water Assessment,* WRM Water & Environment Pty Ltd, prepared for Vitrinite Pty Ltd., report number 1571-20-B6, November 2023.
WRM, 2024a	*Vulcan South Erosion and Sediment Control Plan*, prepared for Vitrinite Pty Ltd., report number 1571-35-C2, November 2024.
WRM, 2024b	*Vulcan South Receiving Environment Monitoring Program,* prepared for MET Serve, Report Number 1571-37-B2

APPENDIX A PRE-WET SEASON AND STORM CHECKLIST

PRE WET SEASON AND STORM CHECKLIST

INSPECTION OFFICER . . . . **DATE** . . . .

SIGNATURE . . . .

N/A – not applicable

✓ – acceptable controls adopted

× – measures are not acceptable, or a potential problem exists

Vulcan South

Item	Consideration	Assessment
1	Ensure adequate mine and sediment water storage capacity to cope with heavy rain and the wet season.	. . . .
2	All structures are in place are sound and operational.	. . . .
3	All monitoring equipment is installed and operational.	. . . .
4	All pumps are in place, serviced and operational, pipes are attached and operators passed out.	. . . .
5	All exposed areas report to a sediment dam prior to leaving site (not mine water catchments).	. . . .
6	Seed and fertilizer in air conditioned storage, ready to seed when required.	. . . .
7	Pipelines have been inspected.	. . . .
8	All mine water dams are below operating volume to cope with wet weather runoff.	. . . .
9	Markers are in place to allow observers to know water volumes in dams (Operating Volume vs Full Supply Volumes).	. . . .
10	All ESC structures - rock check dams / silt fences / sediment traps / sediment dams are installed to IESC standards. All to have ID numbers, be checked on regular basis throughout wet season and be repaired / desilted where necessary.	. . . .
11	All water quality testing equipment is calibrated, with spare sensors and monitoring equipment on hand.	. . . .

12	At least two sampling events worth of ALS testing kits for all monitoring sites is kept on hand.	....
13	All RSS sites are inspected, bottles cleaned and set at correct levels. Spare RSS bottles are ready to install if required.	....
14	All main drainage lines have been inspected, appropriate works are installed to ensure all areas are stable.	....
15	Ensure all topsoil stockpiles are bunded with either earthern bunds / silt fences to control runoff and sediment. Have an adequate vegetative cover where sites are longer term, will not overtop.	....

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