



Goonyella Complex

Progressive Rehabilitation and Closure Plan Rehabilitation Flood Assessment

BHP Mitsubishi Alliance

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Brisbane City
QLD 4000

Prepared by:

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SLR Project No.: 620.040713.0000

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Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with BHP Mitsubishi Alliance (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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Appendix A Flood Risk Profile Assessment



Appendix B Fluvial Model Results

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Acronyms and Abbreviations

ACARP	Australian Coal Association Research Program
AEP	Annual Exceedance Probability
ARF	Areal Reduction Factor
ARR	Australian Rainfall and Runoff
ASC	Australian Soil Classification
BoM	Bureau of Meteorology
CSM	Conceptual Site Model
DEM	Digital Elevation Model
DESI	Department of Environment, Science and Innovation
DNRM	Department of Natural Resources and Mines
EP	Environmental Protection
FFA	Flood Frequency Analysis
Fi	Fraction Impervious
FRP	Flooding Risk Profile
GRM	Goonyella Riverside Mine
GSDM	Generalised Short Duration Method
GTSMR	Revised Generalised Tropical Storm Method
IFD	Intensity Frequency Duration
LiDAR	Light Detection and Ranging
MFL	Maximum Foreseeable Loss
ML	Mining Lease
NUMA	Non-Use Management Area
PMF	Probable Maximum Flood
PMLU	Post-mining land use
PMP	Probable Maximum Precipitation
PRCP	Progressive Rehabilitation and Closure Plan
RFFE	Regional Flood Frequency Estimation
RMC	Risk Management Center
RMG	Risk Management Guidelines
RRR	Residual Risk Rating
SGS	Sub-grid sampling
SRTM	Shuttle Radar Topography Mission
TEC	Threatened Ecological Communities
TP	Temporal pattern
TUFLOW	Two-Dimensional Unsteady Flow



USACE	US Army Corps of Engineers
USDA	United States Department of Agriculture
WBNM	Watershed Bounded Network Model



1.0 Introduction

1.1 Scope of Work

SLR was contracted by BHP Mitsubishi Alliance (BMA) to support the preparation of the Goonyella, Riverside and Broadmeadow mines (collectively known as Goonyella Complex) Progressive Rehabilitation and Closure Plan (PRCP). Specifically, the scope of work involved undertaking flood modelling of the Goonyella Complex in accordance with Section 3.6.1 and Section 3.6.4 of 'Guideline – Progressive Rehabilitation and Closure Plans', Department of Environment, Science and Innovation (DESI) (The Guideline) (Department of Environment, Science and Innovation 2024). Section 3.6.1 and Section 3.6.4 of The Guideline provides the following direction on general rehabilitation practices in relation to flooding:

Section 3.6.1 General Rehabilitation Practices (Flooding):

- Consider the location of domains in relation to potential flood levels;
- Consider alteration of flow upstream and downstream;
- Model flood levels (including probable maximum flood levels) for a range of design storm events; and
- Develop a flooding risk profile.

Section 3.6.4 Underground Mining:

- Changes to hydrological regime;
- Changes in surface topography and local drainage characteristics - this may result in some areas becoming more free-draining while runoff may be reduced in other areas, resulting in the ponding of water in areas where previously no ponding occurred; and
- Changes in surface drainage, leading to changes in the composition of vegetation communities and distribution of flora and fauna species.

This report details the assessments undertaken including hydrologic and hydraulic modelling of relevant watercourses and conceptual site modelling at the Goonyella Complex to address the above points.

1.2 Site Details

The Goonyella Complex is located in Central Queensland, approximately 170 kilometres west of Rockhampton and 20 kilometres north of Moranbah. **Figure 1-1** illustrates the location of Goonyella Complex and key surrounding features including the Isaac River which drains through the Mine. The Goonyella Complex includes the Mining Leases shown in **Table 1-1**.



Table 1-1 Goonyella Complex Mining Leases

Goonyella Mine Complex Mining Leases	
• ML1763 – Goonyella • ML1764 – Riverside • MLML1802 – Riverside Extended • ML1900 – Riverside West • ML700003 – Mabbinn • ML70121 – Riverside Tailings Extension • ML70193 – Riverside West Extension North • ML70194 – Riverside West Extension South • ML70287 – Goonyella Tailings	• ML70288 – Goonyella Industrial • ML70289 – West Airstrip Pit • ML70421 – Red Hill • ML70468 – Riverside West Extension 1 • ML70469 – Riverside West Extension 2 • ML70478 – Goonyella West 1 • ML70478 – Goonyella West 2 • ML70493 – Riverside North West • ML70494 – Riverside North

1.3 Relevant Documentation

This assessment was undertaken in accordance with the following guidelines and documentation:

- *Environmental Protection Act 1994*;
- *Environmental Protection Regulation 2019*.
- ‘*Guideline – Progressive Rehabilitation and Closure Plans*’, Version 3.01, Department of Environment and Science, September 2024 (PRCP Guideline);
- ‘*Information Sheet – Environmental Protection Act 1994 – Voids in Flood Plains*’, Department of Environment and Science, February 2024 (Voids in Flood Plains Information Sheet);
- ‘*Australian Rainfall and Runoff: A guide to Flood estimation*’, Geoscience Australia, v4.2 (Ball, et al. 2019); and
- ‘*Bowen Basin River Diversions – Design and Rehabilitation Criteria*’, Australian Coal Association Research Program, July 2002 (ACARP 2002).



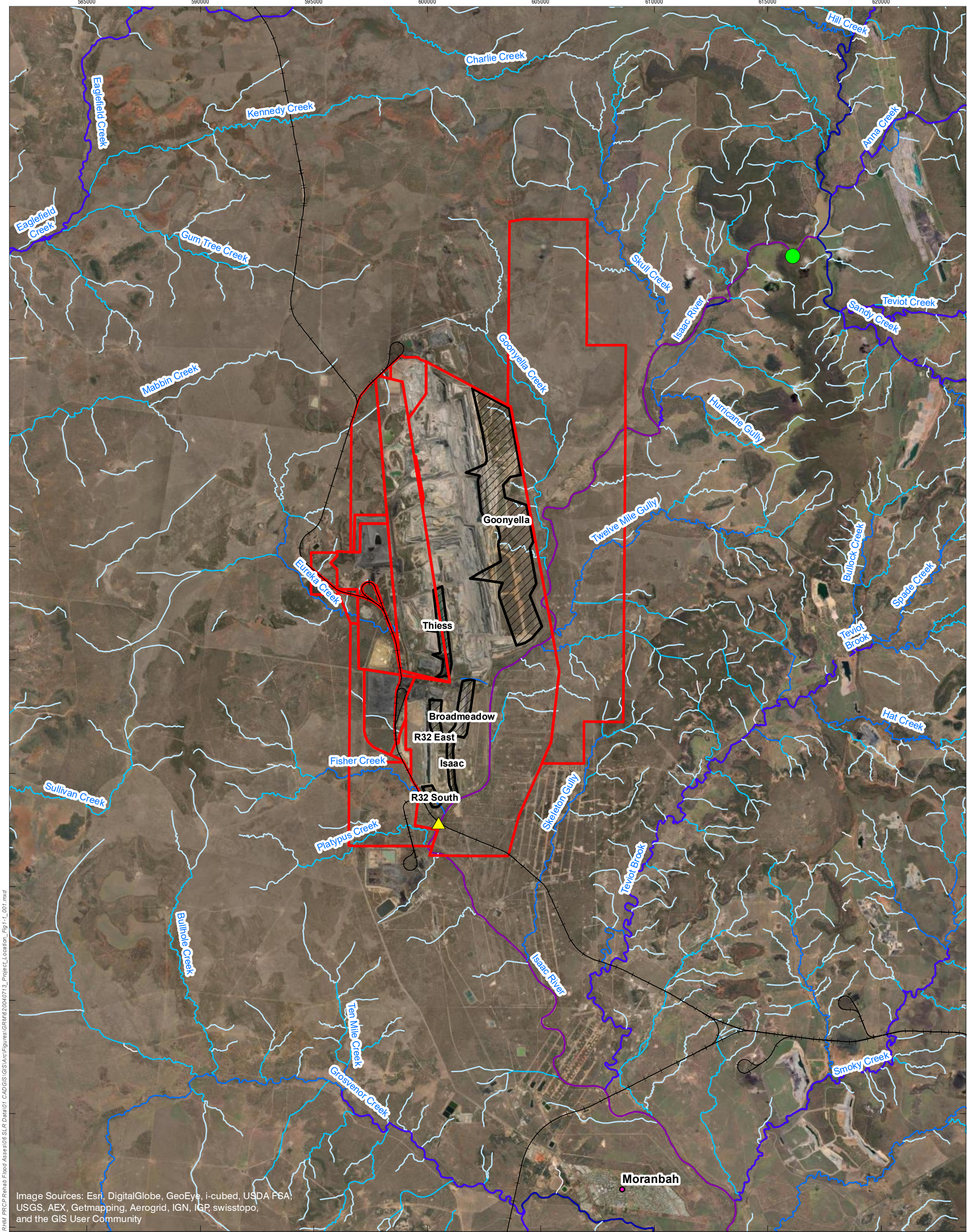


Image Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



0124

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:150,000 at A3

Project Number: 620.040713

Date: 26-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Residual Voids

 Rail Network

 Isaac River at Burton Gorge Gauge

 Isaac River at Goonyella Gauge

Watercourses

Stream Order

 0

 1

 2

 3

 4

 5

 6

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Site Location

Figure 1-1

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1.4 Assumptions and Limitations

This assessment was undertaken specifically for the purposes for undertaking floodplain modelling of relevant watercourses in accordance with the requirements of the EP Act and EP Regulation. The following assumptions and limitations apply to this assessment.

- The accuracy of the assessment is reliant on the accuracy of the utilised data, as detailed in **Section 3.0**. SLR has assumed all source data to be fit for purpose and sufficiently accurate for the purpose of this assessment. Except where noted, no verification of accuracy of the information has been carried out. In the event that some of the information which was relied upon for this assessment is found to be inaccurate, then some or all of the findings may change.
- Generation of the model landform for the assessment was undertaken in accordance with the PRCP Guidelines. Hydraulic modelling was undertaken only for the post-mining landform conditions.
- Although the analyses undertaken as detailed in this report were done so with the appropriate care and professionalism, this report shall only be used for the purposes intended. The analyses detailed in this report were undertaken solely for the purpose of addressing the requirements for general rehabilitation practices for Goonyella Complex in accordance with the relevant documentation as detailed in **Section 2.0**.
- This report should be read in full, and no excerpts are to be taken as representative of the findings. This report has been prepared on behalf of BMA and SLR accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.
- The Flood Risk Profile outlined in this report was undertaken specifically in accordance with the BHP Risk Framework (refer **Appendix A**), and therefore may not be applicable with other risk assessment methodologies.
- The TUFLOW model results for velocity bed shear stress and stream power are calculated using a depth-averaged approach for each model grid cell. Results of the TUFLOW hydraulic model were therefore utilised for general indication (only) of watercourse stability. TUFLOW does not account for geomorphological processes including watercourse re-alignment, therefore the assessment was based on the assumption of static topographic conditions.
- Groundwater levels in the area will have no significant effect on the outcomes of the flood modelling.

1.5 Document Structure

The structure of this report is set out as follows:

- **Section 1** – Introduction;
- **Section 2** - Relevant legislation and guidelines;
- **Section 3** - Data Review and Gap Analysis, including details of the model landform;
- **Section 4** - Hydrologic Modelling;
- **Section 5** - Hydraulic Modelling;
- **Section 6** – Flood Risk profile;



- **Section 7** – Outcomes;
- **Section 8** – Conclusions; and
- **Section 9** – References.

Details of each component of the assessment are provided in the following sections.



2.0 Legislation and Guidelines

2.1 Relevant Legislation and Guidelines

The relevant documentation for this assessment is detailed in **Section 1.3**. Key details in the context of the assessment are provided below.

The Environmental Protection Act 1994 states:

'In accordance with Section 126D(3) of the EP Act, if land the subject of the proposed PRCP schedule will contain a void situated wholly or partly in a flood plain, the schedule must provide for the rehabilitation of the land to a stable condition.'

The Environmental Protection Regulation 2019 Section 41C(3) also states:

'The administering authority must treat the land as a flood plain to the extent the results of the flood plain modelling show that, when all relevant activities carried out on the land have ended, the land is the same height as, or lower than, the level modelled as the peak water level 0.1% AEP for a relevant watercourse under the ARR'

Further guidance is provided in the PRCP Guideline and the Voids in Flood Plains Information Sheet.

Sections 3.4 and 3.6.1 of the PRCP Guideline both require a floodplain assessment to be carried out. Specifically, Section 3.4 requires a Void in Floodplain assessment for all unapproved Non-Use Management Area (NUMA) voids (i.e. floodplain assessment of the pre-mining landform), whilst Section 3.6.1 requires a post-mining landform assessment irrespective whether a post-mining land use (PMLU) or NUMA is proposed. A Voids in Floodplain assessment was undertaken by SLR as detailed in 'Goonyella Riverside Mine - Progressive Rehabilitation and Closure Plan – Voids in Floodplain Report' (ref 620.31051.00000-R03-v2.0). This current assessment was undertaken only to address the requirements of Section 3.6.1.

The hydrologic and hydraulic analyses were undertaken in accordance with ARR.

2.2 Applicability to the Project

Based on the review of the EP Act, EP Regulation, PRCP Guideline and the Voids in Floodplains information sheets, it is considered that the legislative requirements set out in **Table 2-1** are applicable to the project.

Table 2-1 Applicable Legislative Requirements

Requirement	Application to the Project	Source
For transitional sites, a floodplain assessment is required where: - A void has been identified as a NUMA in a land outcome document, but the location has not been specified; or - Where there are no land outcomes in the land outcome document.	The PRCP for Goonyella Complex includes six final voids which are proposed to be developed as NUMAs. Therefore, floodplain assessment is required. A Voids in Floodplain assessment was undertaken by SLR as detailed in 'Goonyella Riverside Mine - Progressive Rehabilitation and Closure Plan – Voids in Floodplain Report' (ref 620.31051.00000-R03-v2.0).	PRCP Guideline Section 3.4



Requirement	Application to the Project	Source
The requirement for a flood assessment under section 3.6.1 of the Guideline applies to the post mining landform across the whole site irrespective of whether a PMLU or a NUMA are proposed. Furthermore, section 3.6.1 is not only required to indicate flood risk but also to demonstrate the final landform (including waste rock dumps and diversions) will remain in a stable condition in a range of flood flow conditions.	The PRCP for Goonyella Complex includes six final voids which are considered to be pre-approved NUMAs and therefore will be retained in the post-mining landform where it can be shown the voids are in a stable condition. Therefore, a flood assessment is required to show that the proposed voids will remain in a stable condition following the closure of Goonyella Complex. The voids are: • R32 East • Broadmeadow • Goonyella • Isaac • R32 South • Thiess The void locations are shown in Figure 1-1.	PRCP Guideline Section 3.6.1.
Section 3.6.4 Underground Mining	The PRCP for Goonyella Complex includes rehabilitation of underground mining domains including subsidence. Therefore assessment of the relevant flooding aspects in relation to the planned subsidence is required.	PRCP Guideline Section 3.6.4.

2.3 Definitions and Terminology

Table 2-2 provides the definitions and terminology that are utilised in this assessment, in accordance with the PRCP Guideline and the Voids in Flood Plains Information Sheet.

Table 2-2 Definitions and Terminology

Term	Definition	Source
Voids	An area of land to be excavated in carrying out a mining activity. Therefore, all voids (PMLU or NUMA) are subject to the requirements of the EP Act.	Section 126D of the EP Act.
Flood plain	A void is considered to be located in a flood plain if the flood plain modelling shows that, when all relevant activities carried out on the land have ended, the land is the same height as, or lower than, the level modelled as the peak water level in a 0.1% AEP for a relevant watercourse under the guideline Australian Rainfall and Runoff (2019) (ARR).	Section 41C of the EP Regulation; and PRCP Guideline Section 3.4.
Stable condition	• The land is safe and structurally stable; • There is no environmental harm being caused by anything on or in the land; and • The land can sustain a PMLU.	Section 126D(3) of the EP Act; and PRCP Guideline Section 3.6.3.



Term	Definition	Source
Relevant watercourse	• A watercourse classified as stream order 4 or higher under the Strahler stream order classification system; or • If a watercourse mentioned in paragraph (a) is permanently diverted under – ○ A condition, or proposed condition, of an environmental authority mentioned in the Water Act 2000, section 98; or ○ A water license or proposed water license under the Water Act 2000; • the watercourse as permanently diverted.	PRCP Guideline Section 8; and Voids in Flood Plains information Sheet Section 5.
Flood plain modelling	For land the subject of a PRCP schedule, means modelling of the landform of the land – a) Carried out under the ARR; (and) b) Excluding any artificial features for the land	PRCP Guideline Section 8; and Voids in Flood Plains information Sheet Section 4.
Artificial feature	For land the subject of a PRCP schedule, means – a) A structure or feature that is temporary and, under the PRCP schedule or otherwise, is to be removed from the land; or b) A structure or feature that, under the PRCP schedule, will require a level of maintenance after the land is surrendered that is greater than the level of maintenance that would be required for the land if the relevant activities the subject of the PRCP schedule had not been carried out; or c) A feature forming part of the landform of the land, other than the natural landform, if the feature interferes with or affects – • A relevant watercourse; or • The natural flow of water on the land.	PRCP Guideline Section 8; and Voids in Flood Plains information Sheet Section 6.



3.0 Data Review and Gap Analysis

3.1 Available Data

The following data was provided to SLR by BMA for use in the assessment:

- Goonyella Riverside Mine Complex – Characterisation Study (Landloch 2024);
- PRCP Final Landform DEM;
- Additional LiDAR topographic data (dated 2024) within Goonyella Mine extents as a DEM with 1m grid cell spacing;
- Aerial imagery dated 2024;
- Goonyella and Broadmeadow Hydraulic Assessment (WRM 2019); and
- GRM Operational TUFLOW hydraulic model.

Additional data was obtained from publicly available sources including:

- Watercourse Lines – Queensland GIS dataset (Department of Resources, 2023);
- 1 second SRTM 30 metre DEM terrain data (Geoscience Australia);
- Rainfall intensity-frequency-duration (IFD) data for the area (Bureau of Meteorology (BoM));
- Catchment specific hydrologic data (ARR Data Hub);
- Historic gauged stream flow data for the Isaac River at Goonyella (130414A) and Isaac River at Burton Gorge (130402A) Stream Gauges (DNRM); and
- Burton Gorge Dam Emergency Action Plan (Peabody 2023).

The provided data was analysed for suitability for the purposes of this assessment. The outcomes of the review are detailed below.

3.2 Watercourses

A review of the existing watercourses in the vicinity of Goonyella Complex was undertaken using hydrologic streamline data sourced from Department of Resources. The following watercourses were included in the assessment:

- Isaac River: Isaac River runs north to south with a span of over 450 km and along the eastern side of Goonyella Mine, which is located in the upper part of the river. Much of the river is permanently diverted to the eastern side of the voids. It has a catchment area of approximately 1100km².
- 12 Mile Gully: 12 Mile Gully spans east to west for over 15 km. It is located east of Goonyella Mine, where it drains into the Isaac River at the southern end of Goonyella Void. It has a catchment area of approximately 67km².
- Goonyella Creek: Goonyella Creek spans approximately 20 km from north of Goonyella Mine and along the eastern side of Goonyella Void. It flows south before draining into the Isaac River. It has a catchment area of approximately 87km².
- Eureka Creek: Located within Riverside Mine, Eureka Creek runs for 10 km west to southeast and becomes a permanent diversion channel which then joins the Isaac River permanent diversion. It has a catchment area of approximately 118km².



- Fisher Creek: Fisher creek runs 11.5 km west to east along the south west of the Goonyella Complex and drains into the Isaac River. It has a catchment area of approximately 39km².
- Platypus Creek: Platypus Creek runs south of Fisher Creek for 10 km west to east before draining into the Isaac River. It has a catchment area of approximately 35km².

3.3 Landform

3.3.1 Landform Data

For the purposes of the hydrologic modelling, a landform DEM was developed which utilised the following topographic datasets, layered in order from bottom to top:

- SRTM DEM (outside Goonyella Complex extents only);
- Existing topography (1m resolution) for Goonyella Complex (2024); and
- Goonyella Complex PRCP Landform DEM (1m resolution).

The landform DEM is illustrated in **Figure 3-1**.

3.3.2 Conceptual Site Model

As part of this assessment, a Conceptual Site Model (CSM) was developed for the extent of the landform that included subsidence. Preliminary results of the pluvial hydraulic modelling (refer **Section 5.4**) were utilised to inform the development of the CSM. Where significant subsidence ponding was identified, conceptual modifications to the landform were incorporated to limit the depth of ponding to less than 1m depth in the 2% AEP event, and provide free drainage to the Isaac River, including:

- Backfilling within subsidence depressions; and
- Drainage paths (generally 10m-30m width) between subsidence depressions.

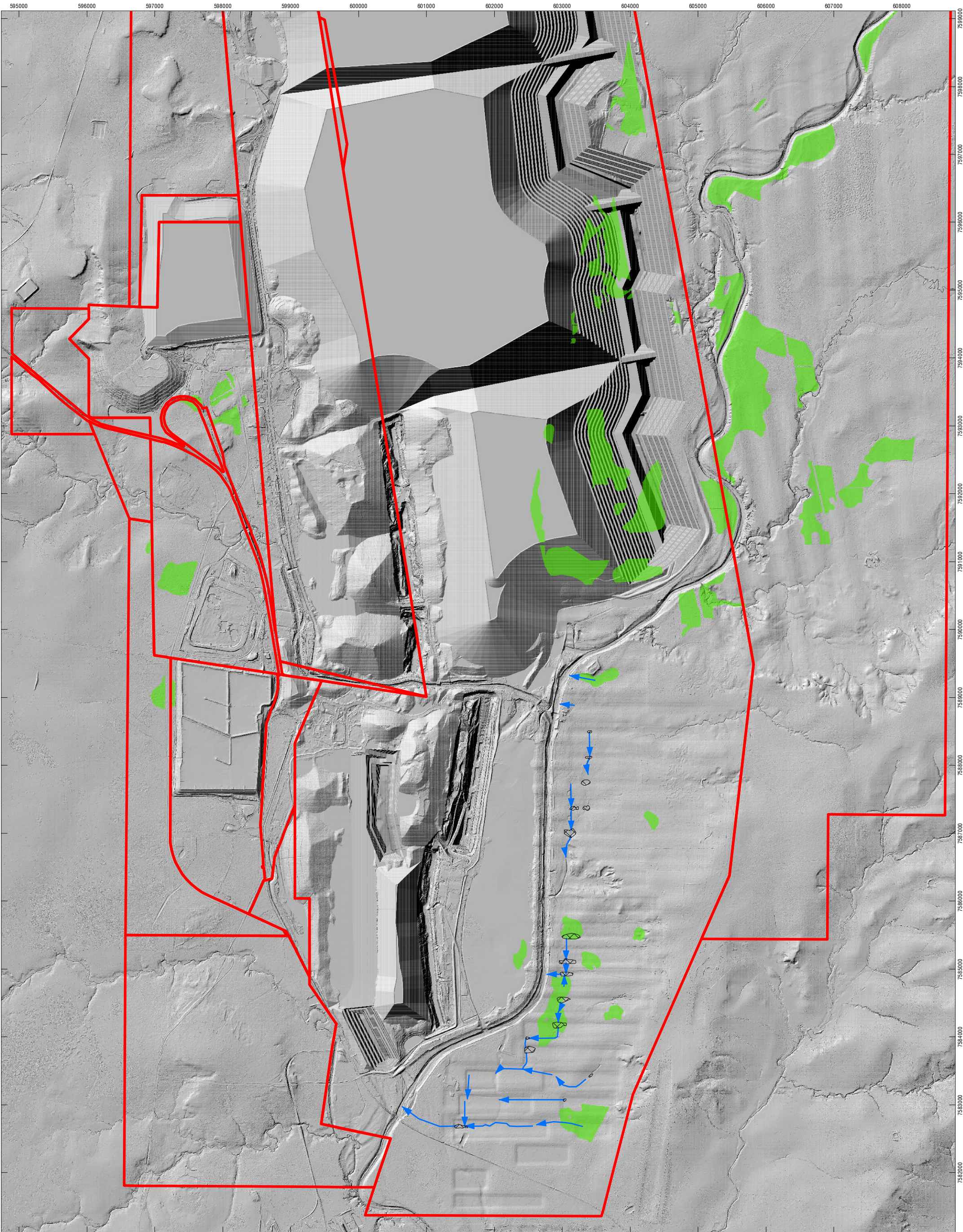
The depth of ponding limit was chosen by the teams managing the rehabilitation and ecosystems on site, based on the proposed vegetation.

Mapped threatened ecological communities (TECs) were obtained from BMA, and these areas were avoided where possible. There are some locations where drains were proposed where there were already existing flow paths. It is likely that the existing drains have not been well captured in the LiDAR in these locations, so disruption to the TECs may be minimal in these drains.

The CSM is illustrated in **Figure 3-1**.



H:\Projects\SLR\620-BNE\620.040713\00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CAD\GIS\GIS\Xmc\Figures\GRM620040713_Final_Landform_Fig3-1_001.mxd



0 0.4 0.8 1.6 km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:50,000 at A3

Project Number: 620.040713

Date: 27-Sep-2024

Drawn by: GN

LEGEND

- ▭ Mining Leases
- X Proposed Backfill Areas
- TECs
- ➔ Proposed Drains



**Goonyella Complex PRCP
Rehabilitation Flood Assessment**

Final Landform and CSM

Figure 3-1

4.0 Hydrologic Modelling

4.1 Software

A hydrologic model was developed for the Goonyella Complex catchments using Watershed Bounded Network Model (WBNM) Version 2017. The WBNM software is an industry standard rainfall-runoff routing program. Storm Injector Version 1.3.9.0 was utilised to assist in setup and analysis of ARR design storm ensembles and to review model results.

4.2 Model Setup

4.2.1 Catchment

The hydrologic model covers a total area of 1,240 km². Sub-catchments for the WBNM model were delineated based on the landform DEM detailed in **Section 3.3**. The WBNM model layout is illustrated in **Figure 4-1**.

The total catchment for each watercourse is detailed in **Table 4-1**.

Table 4-1 Catchment areas

Catchment	Total Area (km ²)
Isaac River	1,096
Eureka Creek	118
Platypus Creek	35
Fisher Creek	39

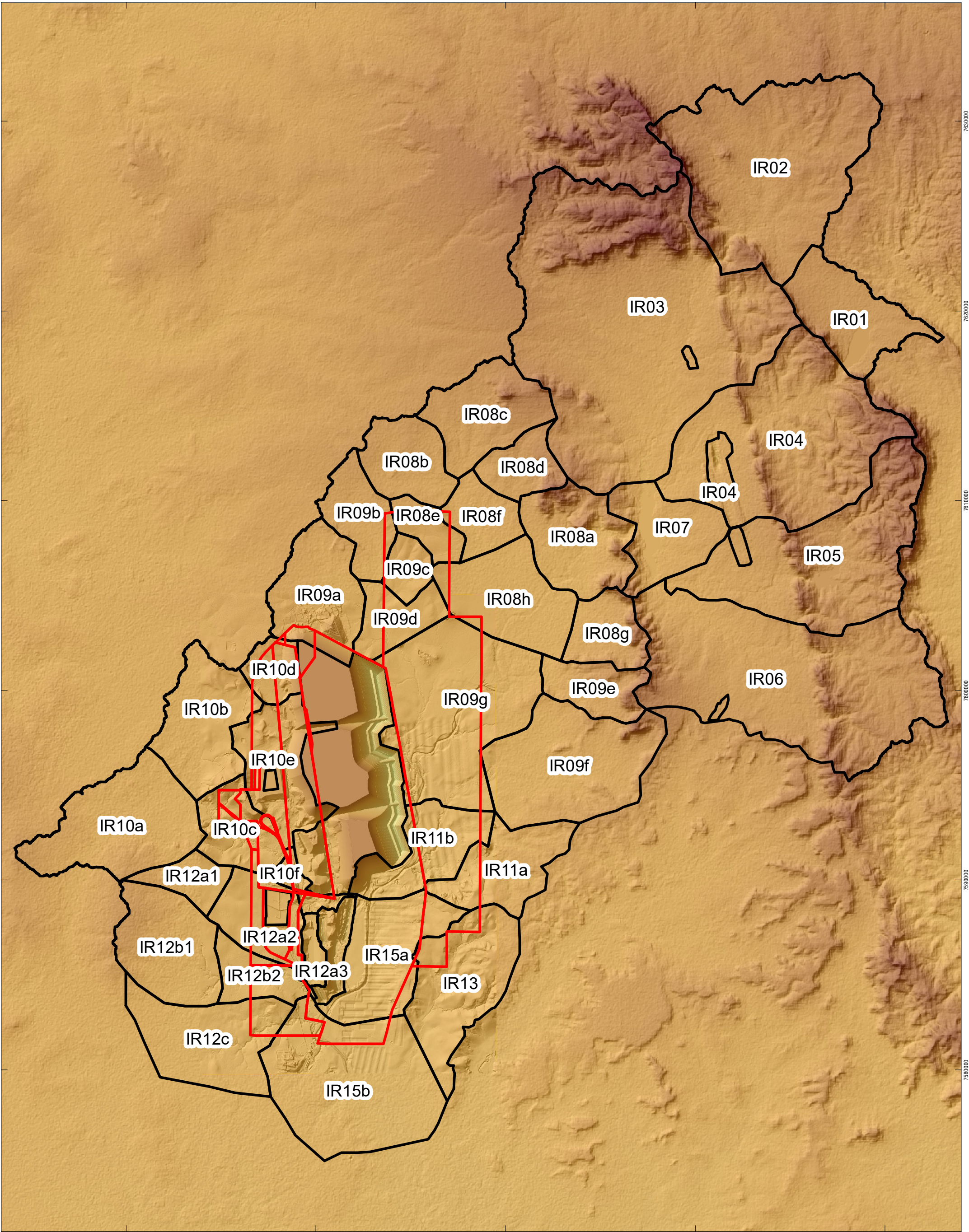
Catchment land use was adopted based on the final landform and aerial imagery. The predominant land use within the catchment is rural. Therefore, the majority of the catchment was modelled as fully pervious, with areas of imperviousness incorporated where appropriate, including water surfaces. The fraction impervious (Fi) values adopted for the various land use categories are shown in **Table 4-2**.

Table 4-2 Land Use Fraction Pervious

Category	Fraction Impervious
Water Bodies	1
Natural / Undisturbed	0
Rehabilitated	0



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0

1.25

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km

Coordinate System: GDA2020 MGA Zone 55	
Scale:	1:180,000 at A3
Project Number:	620.040713
Date:	27-Sep-2024
Drawn by:	TS

LEGEND

 Mining Leases

 WBNM Catchment Boundaries

Goonyella Complex PRCP
Rehabilitation Flood Assessment

WBNM Layout



Figure 4-1

4.3 Design Storm Analysis

4.3.1 Design Storm Events

The WBNM model was simulated for the 39%, 2%, 1%, 0.1% AEP and PMP events with a range of storm durations between 1 hour to 48 hours and ten temporal patterns for each duration accordance with ARR.

For each AEP-duration combination, the design storm temporal pattern which produced a peak flow nearest to the mean peak flow of the suite of 10 temporal patterns was adopted as the design storm. Preference was given to flows greater than the mean, with a bias factor of 2 applied. The adopted temporal pattern event for each creek was selected based on the focal point in the creek as given in **Table 4-3**.

Table 4-3 WBNM model adopted focal points for temporal pattern selection

River / Creek	Sub-catchment
Isaac River	IR15a
Eureka Creek	IR10f
Platypus Creek and Fisher Creek	IR12b2

For the 0.1% AEP event, in accordance with the procedures outlined in ARR, the Generalised Short Duration Method (GSDM) temporal pattern was applied. The GSDM temporal pattern, which is applicable for short durations (up to and including 6 hours only), was extended to the 12 hour event with time steps adjusted accordingly. This approach ensures that the critical duration was accurately captured. For storms from 12 hours to 48 hours, the GTSMR temporal pattern was applied. For the 0.1% AEP event, the model was simulated for durations ranging from 60 minutes to 48 hours.

For the PMP event, the GSDM temporal pattern was applied for events between 60 minutes and 6 hours, and the Revised Generalised Tropical Storm Method (GTSMR) 1000km² temporal pattern was applied for events between 24 hours and 48 hours.

A critical duration assessment was undertaken using the hydraulic model. The results of the assessment are provided in **Section 5.3**.

4.3.2 Intensity-Frequency-Duration Data

Rainfall Intensity-Frequency-Duration (IFD) data for the catchment was sourced from the Bureau of Meteorology (BoM) online IFD data portal. The IFD data adopted in the model is provided in **Table 4-4**.

Table 4-4 Rainfall Intensity-Frequency Duration Data

Storm Duration (min)	Design AEP Event Rainfall Intensity (mm/h)			
	39%	2%	1%	0.1%
60	41.8	75.5	82.2	132
90	46.8	86.3	94.1	151
120	50.2	94.2	103	165



Storm Duration (min)	Design AEP Event Rainfall Intensity (mm/h)			
	39%	2%	1%	0.1%
180	54.9	106	117	188
270	59.9	120	134	216
360	63.8	132	148	239
540	70.2	151	171	277
720	75.7	167	191	309
1080	85.2	195	224	362
1440	93.2	217	251	404
1800	100	237	275	438
2160	107	253	295	466
2880	117	281	328	512

4.3.3 Losses

Rainfall initial and continuing losses for the catchment were sourced from the ARR Online DataHub. The initial loss for each design storm event was calculated by subtracting the median pre-burst rainfall depth from the global catchment initial loss, in accordance with the methodology outlined in ARR. The adopted global loss values are shown in **Table 4-5**.

Table 4-5 Design Rainfall Losses – ARR Data Hub

Global Storm Loss	Loss Value
Initial Loss	36 mm
Continuing loss	2.7mm/h

For the 0.1% AEP and PMP events, an initial loss of 0 mm was adopted, given an event of such magnitude would typically occur following a period of significant antecedent rainfall.

4.3.4 Lag Parameter

A catchment lag parameter of 1.6 was applied for the design storm events, which is within the range recommended in the WBNM documentation (typically 1.3 to 1.8).

4.3.5 Areal Reduction Factor

Areal reduction factors (ARFs) are required under ARR, as design rainfall IFDs are based on specific points in a catchment rather than the whole catchment, and these point rainfall intensities are not representative of the areal average rainfall intensity across the catchment. The ARFs represent the ratio between the areal average rainfall and point rainfall for the same AEP and storm duration. ARFs are calculated based on the catchment area, AEP, and storm duration.

For the Isaac River catchment, the Areal Reduction Factor (ARF) was based on the catchment area of 1,100km².



For Fisher and Platypus creeks, ARFs were based on an area of 35km² and for Eureka Creek, ARFs were based on an area of 118km².

An ARF of 1.0 was used for the PMP event.

4.3.6 Probable Maximum Precipitation Event

A Probable Maximum Precipitation (PMP) analysis was undertaken in accordance with ARR. PMP rainfall depths were calculated using the Generalised Tropical Storm Method Revised (GTSMR) for the Isaac River catchment for durations between 24 and 120 hours. Generalised Short Duration Method (GSDM) was used for durations between 15 minutes and 6 hours.

PMP rainfall depths were calculated using GSDM for Eureka Creek, Fisher Creek and Platypus Creek for durations ranging from 15 minutes to 6 hours. These catchments were limited to GSDM due to their catchment size being less than 1000km², as per the GSTMR guidebook (Bureau of Meteorology 2005).

4.4 Validation

4.4.1 Stream Gauge

Flood frequency analysis was undertaken for Isaac River. Stream gauge data upstream of the site was obtained from the Qld Government Water Monitoring Information Portal.

There are two stream gauges upstream of the site; Isaac River at Goonyella (13414A) and Isaac River at Burton Gorge (130402A). Although there is 38 years (1983-2021) of data available, due to the construction of the Burton Gorge Dam, the Isaac River at Goonyella gauge is considered to be lacking in homogeneity, and hence it is not suitable for flood frequency analysis.

Flood frequency analysis was therefore undertaken for the gauge at Isaac River at Burton Gorge (130402A). Data for this gauge is available between 1964 and 1988 (24 years). Burton Gorge Dam was constructed in 1992, so the dataset is not influenced by the dam.

4.4.2 Flood Frequency Analysis

RMC-BestFit v1.0, a Bayesian estimation and fitting software developed by the US Army Corps of Engineers (USACE) Risk Management Center (RMC), was used for flood frequency analysis.

A Log-Pearson Type III distribution was fitted to the data. The peak flow prediction beyond 1% AEP goes outside the 90% credible intervals, and therefore should not be used for comparison with hydrological model results. Note that the peak flow of 0m³/s from 1969 was treated as low outlier data and not included in the analysis.

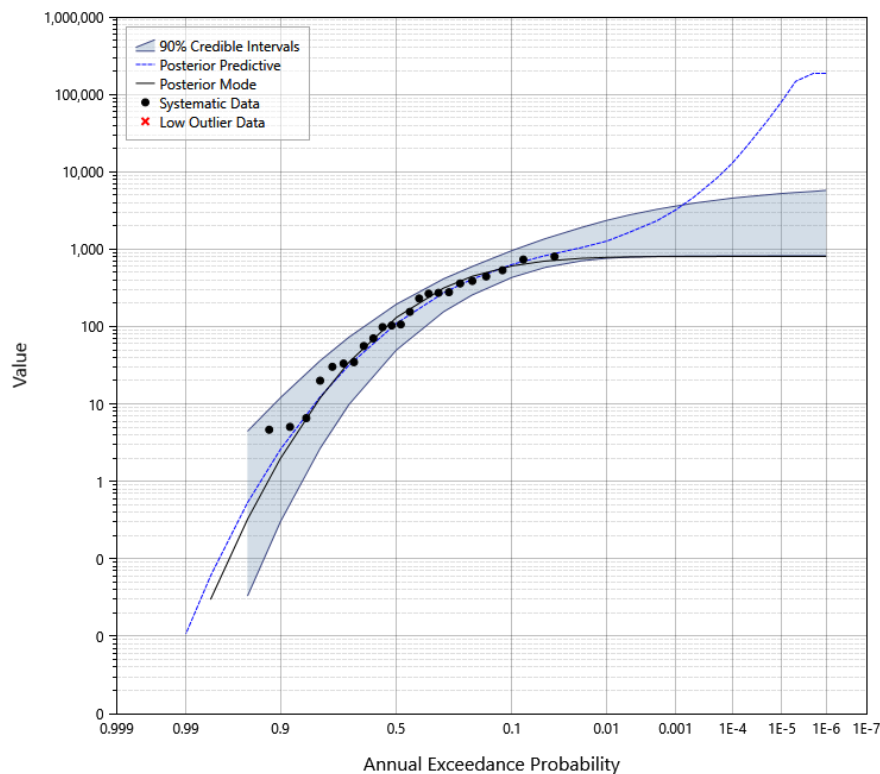
The results of the FFA are shown in **Table 4-6** and **Figure 4-2** below.



Table 4-6 FFA Results for Issac River at Burton Gorge gauge

AEP	Peak Flow (m ³ /s)	Lower 90% confidence limit (m ³ /s)	Upper 90% confidence limit (m ³ /s)
39%	165	83	273
20%	412	257	597
10%	635	433	961
5%	824	581	1,362
2%	1,052	710	1,914
1%	1,269	763	2,354

Figure 4-2 FFA Results for Issac River at Burton Gorge gauge



4.4.3 Comparison to 2019 FFA

A flood frequency analysis was undertaken for the Goonyella and Broadmeadow mines in the Goonyella and Broadmeadow Hydraulic Assessment (WRM 2019).

Analysis was undertaken for the Isaac River at Goonyella gauge. An “all-data” scenario using all 35 years of data and a “post-dam” scenario which uses only the data after Burton Gorge Dam construction (27 years) were undertaken. Although the Isaac River at Goonyella gauge was deemed not suitable for an FFA (refer to **Section 4.4.1**), the peak flows from the WRM FFA using the “post-dam” scenario and subsequent XP-RAFTS model results are of



similar magnitude to the WBNM model output. Comparison to these results are shown in **Table 4-8**.

4.5 Results

4.5.1 Isaac River

The peak flows from the WBNM model at Burton Gorge gauge were compared to the peak flow from the FFA in **Table 4-7**.

The WBNM peak flows were generally consistent with the 2% and 1% AEP FFA results. The WBNM model peak flow was lower than the FFA results in the 39% AEP. However, the 39% AEP results were utilised to assess the peak flood bed shear stress, stream power and velocity and subsequently the associated scour and erosion risk, and these parameters are not significantly affected by relatively small changes in peak flow.

Table 4-7 Peak flow at Burton Gorge gauge

AEP (%)	WBNM Peak Flow (m ³ /s)	FFA Peak Flow (m ³ /s)	% difference from FFA	RFFE Discharge (m ³ /s)	RFFE Lower confidence Limit 5% (m ³ /s)	RFFE Upper confidence Limit 95% (m ³ /s)
39	112	165.6	-32%	-	-	-
10	463	635	-27%	707	334	1,560
5	682	825	-17%	874	397	2,010
2	1,025	1,052	-2%	1,110	476	2,700
1	1,307	1,270	3%	1,300	532	3,310
0.1	2,502	-	-	-	-	-

The peak flows from the WBNM model at Isaac River at Goonyella gauge were compared to the peak flow from the XP-RAFTS model results from WRM as shown in **Table 4-8**.

Table 4-8 Peak flow at Isaac River at Goonyella

AEP (%)	WBNM Peak Flow (m ³ /s)	WRM (2019) "Post-Dam" FFA Peak Flow (m ³ /s)	WRM (2019) XP-RAFTS Peak Flow (m ³ /s)	% difference from WRM XP-RAFTS Peak Flow
10	718	896	830	-13%
5	1,080	1,308	1,167	-7%
2	1,689	1,786	1,707	-1%
1	2,187	2,078	2,079	5%
0.1	4,365	-	3,808	15%



The flows produced by the WBNM model are comparable to the peak flows from the FFA and the RFFE at Burton Gorge. The results are also comparable to the flows from the WRM (2019) FFA at Goonyella. Although the outcome suggests that the 0.1% AEP results may be conservative on the high side, there is insufficient gauge information to confirm this.

Therefore the WBNM model was deemed suitable for use for this assessment.

4.6 Climate Change Assessment

The effects of climate change were considered as part of the hydrologic analysis. Sensitivity analyses were carried out with respect to the modelled design rainfall Intensity-Frequency-Duration data. The three scenarios were modelled in accordance with the *CTD-WTR-GLD-001 Guideline for Climate Change Adaptation in Mine Water Planning and Hydrologic Assessments*:

- 6% increase in rainfall intensity;
- 11% increase in rainfall intensity; and
- 20% increase in rainfall intensity.

Hydrographs for each scenario for the 0.1% AEP events were extracted and utilised as inflows in the hydraulic model.

4.7 Consideration of Alteration of Flows

In accordance with Section 3.6.1 of the PRCP Guidelines, alteration of flows upstream and downstream should be considered. Catchment areas were compared between pre-mining and post-mining scenarios. The pre-mining scenario incorporated the pit areas excluded in the PRCP model landform scenario.

The catchment areas of the pre-mining scenario were compared to those of the PRCP model landform scenario to quantify potential alteration of flows downstream of the site. The results are summarised in **Table 4-9**. The WBNM model peak flows of the pre-mining scenario were compared to the results of the PRCP model landform scenario in **Table 4-10**.

Upstream of the site, the pre-mining scenario and rehabilitation scenario are identical. Hence there will be no alteration to upstream flows.

Table 4-9 Catchment area comparison – Pre-mining scenario vs PRCP model landform scenario

Location	Rehabilitation Scenario Area (km ²)	Pre-mining Scenario Area (km ²)	Change (km ²) Rehab – Pre-mining	Change in catchment area (%)
Isaac River	1,096	1,161	-65	-6.0



Table 4-10 WBNM Model Results – Pre-mining scenario vs PRCP model landform scenario

AEP	Rehabilitation Scenario Flow (m ³ /s)	Pre-mining Scenario Flow (m ³ /s)	Change (m ³ /s) Rehab – Pre-mining	Change in Peak Flow (%)
1%	2187.2	2353.6	-166.5	-7%
2%	1688.8	1825.0	-136.2	-7%
5%	1080.2	1169.7	-89.5	-8%
10%	718.39	783.59	-65.2	-8%
20%	429.69	469.67	-40.0	-9%
39%	198.2	213.3	-15.1	-7%

The comparison of catchment areas show that there is an approximately 6% decrease in catchment area in the rehabilitation scenario. The difference can be attributed to the reduction in catchment area due to the pit final voids. The change in peak flows correlate with the change in catchment area and show a reduction in peak flow of approximately 7% to 9% for downstream flows.



5.0 Hydraulic Modelling

5.1 Modelling Approach

2-dimensional hydraulic modelling was undertaken as part of the assessment. The following modelling approaches and the respective purposes were applied:

- The **Fluvial Model** was developed to quantify flooding conditions within the Isaac River, Eureka Creek, Platypus Creek and Fisher Creek for a range of design storm events. A traditional source inflow approach was applied for the model whereby discharge hydrographs generated by the WBNM model were applied as inflow conditions at appropriate discrete locations. The results of the model were utilised to assess the risk of inundation of the residual voids and stability of the final landform.
- The **Pluvial Model** was developed to simulate local catchment rainfall runoff behaviour over the areas of the final landform where subsidence will occur. A direct rainfall (Rain-on-Grid) approach was applied. The model results were utilised to investigate potential ponding in subsidence areas.

5.2 Software

The hydrodynamic modelling software TUFLOW (Build 2023-03-AE) was used for the hydraulic modelling. The sub-grid sampling (SGS) feature of TUFLOW provides increased definition of model terrain, which improves estimate of flow conveyance. This enables model resolution to be improved without significant increases in model run times.

5.3 Fluvial Model Setup

5.3.1 Topography

The final landform DEM received from BMA was adopted as the topography for the model. A model grid cell size of 10m was adopted.

A sub-grid sampling distance of 1m was applied, which was considered to provide adequate model resolution for the purposes of this assessment, which has creeks with channel widths of approximately 8 to 10m. The model DEM is shown in **Figure 5-1**.

Break lines were used to represent key discrete topographic features including creek beds and bunds around pits in order to capture the low and high points of the terrain in the model topography. The topography was increased by approximately 500mm at the northern side of R32 South Void to prevent pit ingress.

5.3.2 Hydraulic Roughness

The hydraulic roughness for the model was determined based on aerial imagery and the model landform. The model hydraulic roughness is shown in **Figure 5-2**. The Manning's n values adopted in the model are listed in **Table 5-1**.



Table 5-1 TUFLOW Model Manning's n Values

Land use	Manning's n
Sparse Trees	0.06
Dense Trees	0.08
Water Surfaces	0.02

5.3.3 Inflows

Flow hydrographs for the TUFLOW model were extracted from the WBNM model. The hydrographs were applied as inflow boundaries via source area polygons or polylines as total or local inflows at appropriate locations, as shown in **Figure 5-1**.

5.3.4 Downstream boundaries

Downstream model boundaries were applied as stage-discharge relationships based on the water surface gradient in the vicinity of the boundaries. The stage-discharge relationships are automatically calculated using the TUFLOW in-built functionality. The downstream boundaries are shown in **Figure 5-1**.

5.3.5 Hydraulic structures

Existing culverts were included in the model at two crossings. The structural data adopted for the modelled culverts was extracted from the hydraulic model used in the GRM operations model, received from BMA. There are two culverts in the model crossing Goonyella Road and the Coppabella to North Goonyella section of the Goonyella System, which are shown in **Figure 5-1**.

5.3.6 Critical Duration Assessment

A range of design storm events was simulated in the fluvial models for a range of AEPs which include 39%, 2%, 1%, 0.1% AEP and PMF (Probable Maximum Flood). Three climate change events were run for the 0.1% AEP. As there are multiple areas of interest, a range of durations were used to create a maximum grid for each AEP.

Critical durations are listed in **Table 5-2**.

Table 5-2 Critical Durations for Fluvial Model

AEP / Location	Isaac River	Eureka Creek	Fisher Creek / Platypus Creek
39%	720, 1080, 1440 min	1080 min	1440 min
2%	720, 1080 min	1440 min	360, 720 min
1%	1080, 1440 min	1440 min	360, 720 min
0.1%	720, 1440 min	540 min	270, 360 min



AEP / Location	Isaac River	Eureka Creek	Fisher Creek / Platypus Creek
0.1% + 6% rainfall intensity CC	720, 1440 min	540 min	270, 360 min
0.1% + 11% rainfall intensity CC	720, 1440 min	540 min	270, 360 min
0.1% + 20% rainfall intensity CC	720, 1440 min	540 min	270, 360 min
PMF	1440 min	360 min	180, 240, 300 min

5.4 Pluvial Model Setup

5.4.1 Topography

The final landform DEM received from BMA was adopted as the topography for the model. A model grid of 10m was adopted. A sub-grid sampling distance of 1m was applied.

The model DEM is shown in **Figure 5-3**.

5.4.2 Evaporation

Evaporation data was obtained from the SILO database on the state government Long Paddock website. The closest point (Latitude -21.8, Longitude 148) was chosen for evaporation data. The average evaporation rate applied in the model was 5.52 mm/day, or 0.23 mm/h.

5.4.3 Soil Type

The soil type within the pluvial model area was determined from the Australian Soil Classification (ASC) map from the *Goonyella Riverside Mine Complex- Material Characterisation Study* (Landloch 2024). The Australian soil types were matched to corresponding USDA soil types, which is used in the TUFLOW soils file to calculate infiltration rates. The choice of USDA soil types were confirmed with BMA's soils specialist on site. The ASC map as well as the USDA types corresponding to the ASC types are included in **Figure 5-4** and **Table 5-3** respectively.

Table 5-3 ASC Soil Types and corresponding USDA soil types

ASC Soil Type	USDA Soil Type
Anthroposol	Sandy Clay Loam*
Chromosol	Sandy Loam
Dermosol	Clay loam
Kandosol	Loam
Kurosol	Loam
Rudosol	Clay Loam



ASC Soil Type	USDA Soil Type
Sodosol	Loam
Vertosol	Clay
Rudosol-Tenosol	Sandy Clay Loam
Tenosol	Sand

* Note that Anthrosol does not have a corresponding USDA soil type but was nominally assumed to be sandy clay loam. There are no subsidence areas within the anthrosol classed areas.

5.4.4 Hydraulic Roughness

The hydraulic roughness for the fluvial model was also used in the pluvial model, shown in **Figure 5-2**.

5.4.5 Inflows

Inflows were applied using the direct rainfall method in TUFLOW, where rainfall is directly applied to 2D cells over the entire model area, as shown in **Figure 5-3**.

All ten temporal patterns were simulated for each design storm duration, and the median temporal pattern based on peak flood levels was adopted for each duration across the model domain using the TUFLOW post-processing utility. A maximum grid for all the envelope of durations for each AEP was then calculated.

Rainfall depths were determined using the ARR to TUFLOW tool for the 2% AEP Event. ARF was applied to all events. Initial loss and continuing loss were not applied for the pluvial model as infiltration was accounted for in the TUFLOW soils file.

5.4.6 Downstream boundaries

Downstream model boundaries were applied as stage-discharge relationships based on the water surface gradient in the vicinity of the boundaries. The stage-discharge relationships are automatically calculated using the TUFLOW in-built functionality. The downstream boundaries are shown in **Figure 5-3**.

5.4.7 Pond Backfill and Drainage Channels

The components of the CSM as described in **Section 3.3.2** were incorporated into the model terrain using the z-shape functionality within TUFLOW.

5.4.8 Critical Duration Assessment

A range of durations were simulated in the pluvial hydraulic model for the 2% AEP for all temporal patterns from the 45 min to the 1440 min storm event. The 2% AEP event was run to determine the worst ponding possible out of all the events specified in the proposal. More frequent events will result in lower ponding depths.



The median temporal pattern was chosen for each duration and a maximum of these grids was analysed to determine the critical durations. The median temporal pattern was chosen to have a representative temporal pattern for each storm duration, as per ARR. The critical durations for the pluvial model are listed in **Table 5-4**. Note that the 1440min is only critical for one pond, which is being maintained as a pond (refer to **Section 5.5.3** for further discussion).

Table 5-4 Pluvial model critical durations for 2% AEP event

Duration	Temporal Pattern
90min	TP09
120min	TP05
360min	TP09
540min	TP10
1440min	TP01



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Image Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



00.512 km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:75,000 at A3

Project Number: 620.040713

Date: 23-Sep-2024

Drawn by: GN



LEGEND

 Mining Leases

 TUFLOW Model Extent

 SA Inflows

 Downstream Boundary

 Upstream Inflow

 Gully Breaklines

 Culverts

Topography (mAHD)



High : 400

Low : -70

Goonyella Complex PRCP
Rehabilitation Flood Assessment

TUFLOW Fluvial Model Layout

Figure 5-1

H:\Projects\SLR\620-BNE\620.040713.00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CAD\GIS\GIS\Mc\Figures\GRM\620040713_HydraulicRoughness_Fig5-2_001.mxd

Image Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



00.512 km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:75,000 at A3

Project Number: 620.040713

Date: 23-Sep-2024

Drawn by: GN



LEGEND

 Mining Leases

 TUFLOW Model Extent

Manning's n Value

 0.06

 0.08

 0.02

Goonyella Complex PRCP
Rehabilitation Flood Assessment

TUFLOW Model Hydraulic Roughness

Figure 5-2

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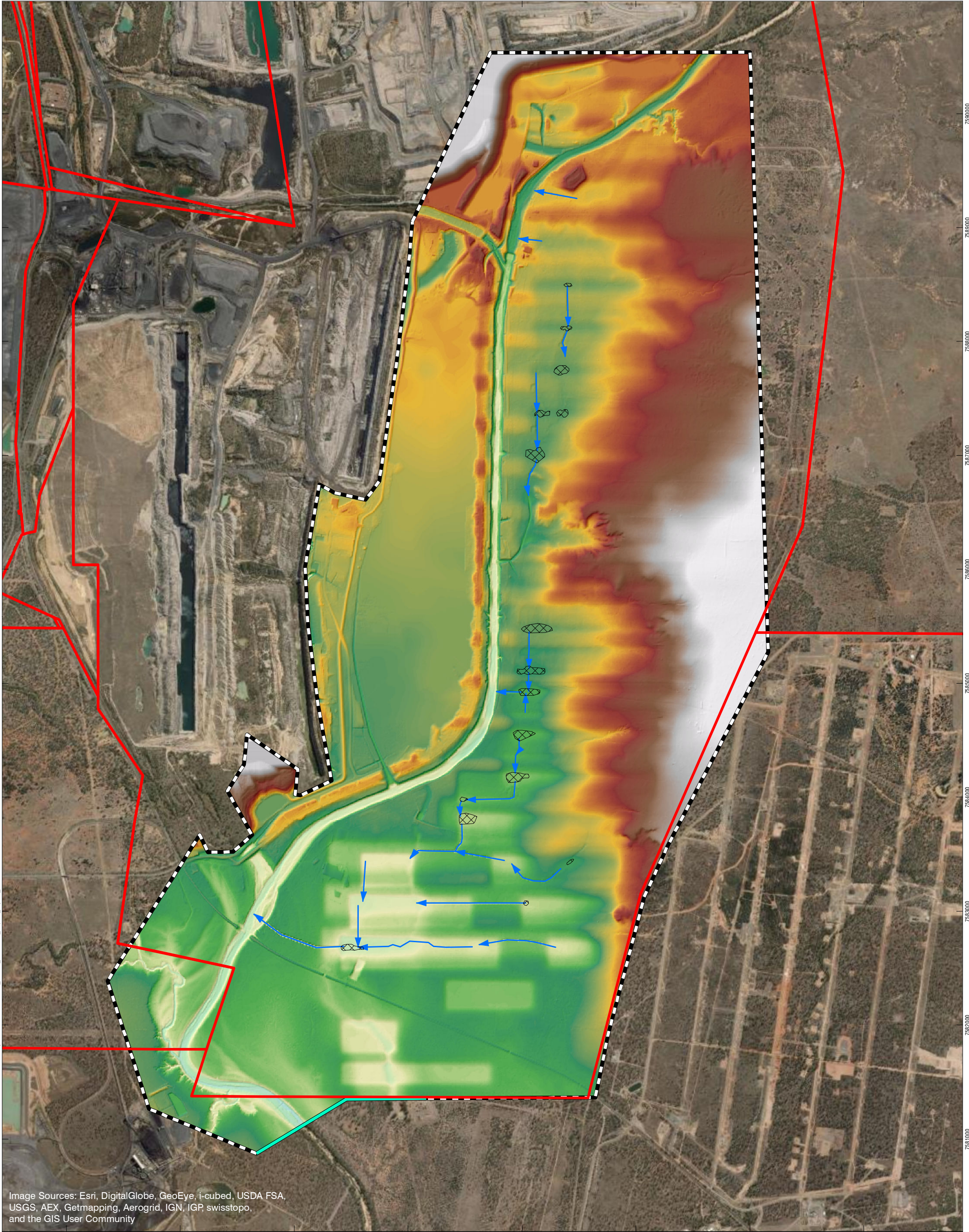


Image Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:30,000 at A3
Project Number:	620.040713
Date:	20-Sep-2024
Drawn by:	GN

LEGEND

Mining Leases

TUFLOW Model Extent

Proposed Backfill Areas

Downstream Boundary

Proposed Drains

Topography (mAHD)

High : 340.803

Low : 227.034

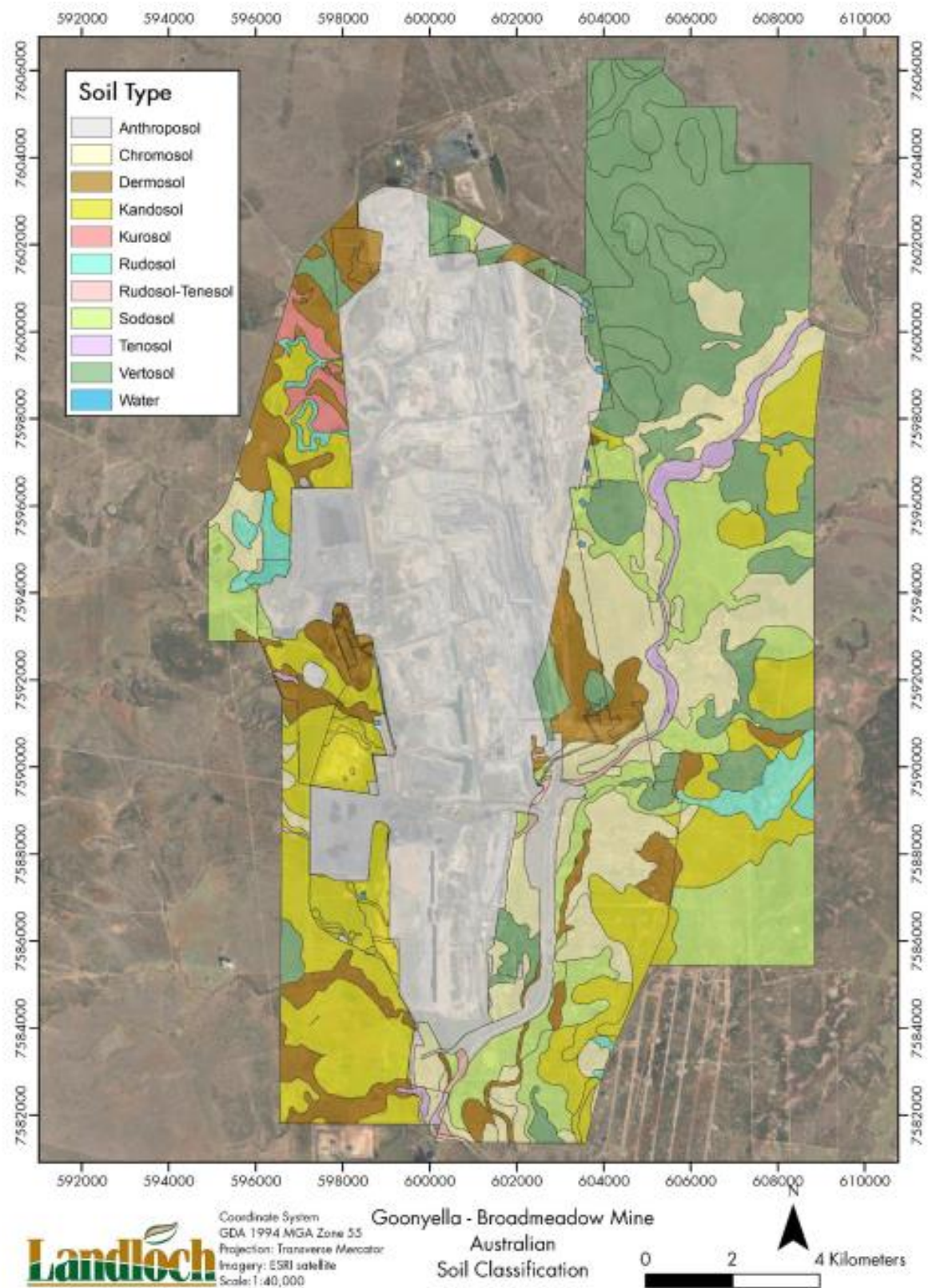
Goonyella Complex PRCP
Rehabilitation Flood Assessment

TUFLOW Pluvial Model Layout



Figure 5-3

Figure 5-4 Goonyella – Broadmeadow Mine Australian Soil Classification (Landloch 2024)



5.5 Results

5.5.1 Flood Ingress to Voids

The TUFLOW model results (refer **Figure 5-5**) show that all final voids are free from inundation from Isaac River, Eureka Creek, Platypus Creek and Fisher Creek in all modelled events up to and including the 0.1% AEP climate change event with 20% increase in rainfall intensity.

The results show that Goonyella Void and Isaac Void are subject to inundation from Isaac River in the PMF event, as shown in **Figure 5-6**.

Thiess Void is subject to inundation from Eureka Creek and Broadmeadow Void is subject to inundation from Eureka Creek and Isaac River in the PMF event (refer to **Appendix B2-1-4**).

R32 South residual void is subject to inundation from the R32/Airstrip tailing storage facility rehabilitated surface to the north and Isaac River from the south in the PMF event (refer to **Appendix B3-1-4**).

5.5.2 Scour and Erosion Potential

Table 1 from DNR's 'Guideline: Works that interfere with water in a watercourse for a resource activity – watercourse diversions authorised under the Water Act 2000' (State of Queensland 2019) provides indicative parameter thresholds for scour potential vegetated diversions in the Bowen Basin from ACARP. The criteria (refer to **Table 5-5**) is directed towards diversion design, which is not the purpose of this assessment. However it also provides general indication of scour and erosion potential in all waterways in the Bowen Basin and was therefore utilised in the analysis of the hydraulic model results.

Table 5-5 DNR Design Criteria for Vegetated Bowen Basin Diversions

Scenario	Parameter	ACARP Criteria
39% AEP event	Stream Power (W/m ²)	<60
	Velocity (m/s)	<1.5
	Shear Stress (N/m ²)	<40
2% AEP event	Stream Power (W/m ²)	<150
	Velocity (m/s)	<2.5
	Shear Stress (N/m ²)	<80*

*Table 1 of the DNR Guideline contains a known error for the 2% AEP Shear Stress value, which is listed as 50 N/m², but should be 80 N/m² in accordance with the ACARP documentation from which it is derived.

Depth-averaged bed shear stress, stream power and velocities were extracted from the fluvial model results for the 2% and 39% AEP events. It is noted that the model results for velocity, bed shear stress and stream power are calculated using a depth-averaged approach and were therefore used as indicative information only and likely provide a conservative estimate of erosion / scour potential.

The model results for the 39% AEP event showed that there are localised areas where the velocity, bed shear stress, and stream power exceeds the ACARP guideline values in Isaac River, Eureka Creek, Fisher Creek and Platypus Creek (refer **Appendices B1-3-1, B1-4-1, B1-5-1** for Isaac Creek, **Appendices B2-3-1, B2-4-1, B2-5-1** for Eureka Creek, and



Appendices **B3-3-1**, **B3-4-1**, **B3-5-1** for Fisher and Platypus Creek). Generally, these localised areas are within the waterways and unlikely to destabilise any landforms.

A similar pattern is seen for the 2% AEP event (refer Appendices **B1-3-2**, **B1-4-2**, **B1-5-2** for Isaac River, Appendices **B2-3-2**, **B2-4-2**, **B2-5-2** for Eureka Creek, and Appendices **B3-3-2**, **B3-4-2**, **B3-5-2** for Fisher and Platypus Creek).

Within the Eureka Creek diversion, the model results show the ACARP guideline values are exceeded for extended reaches, including in locations adjacent to landform features including the Thiess void and Goonyella void waste rock dumps and Broadmeadow void (refer to **Figure 5-7**). It is understood that diversion design is being undertaken by others which will include detailed analysis and mitigation of scour in the Eureka Creek diversion.

From the Isaac River results, some areas within the subsidence ponds show high bed shear stress and stream power values exceeding the ACARP guideline values, in addition to high values in the Isaac River. Localised scour in these locations are also unlikely to destabilise any landforms.

Additionally, the values of shear stress, stream power and velocity are consistent with the undisturbed reaches upstream and downstream of the site boundaries. Therefore, the characteristics are reflective of the natural conditions of the waterway and are not a product of the final landform configuration.

5.5.3 Subsidence ponding

Consultation with the Queensland Herbarium and the BMA ecology team was undertaken to determine what would constitute an acceptable ponding in the Broadmeadow final landform. The following was used as a guideline for criteria of acceptable subsidence ponding:

- Maximum 1m depth of ponding (2% AEP event);
- No specific duration of ponding;
- Mitigation approaches to include drains and backfilling of deeper points in the landform;
- For relatively minor ponded areas that would require extensive cutting of drains or off-site work, recommend keeping as ponds in support of PMLU.
- No limit of water take within the subsidence ponding.

Pond backfill and drainage channels as described in **Section 5.4.7** were included in the CSM and applied to the pluvial model. The pluvial model results are shown in **Appendix C**. The model results show the peak water levels, depths and velocity for a 2% AEP event. The model results show that the peak ponding depths in subsidence areas are less than 1m in the 2% AEP event, except for areas where there are existing channels in the topography (e.g. refer to points 28, 29 in **Figure 5-8**). The pond at point 30 in **Figure 5-8** cannot be drained to the Isaac River without works outside of the EA/BMA mining lease boundaries or significant disturbance to existing vegetation within the tenement. It is therefore recommended to be maintained as a pond. In areas excluding existing watercourses, drainage lines, existing ponds, dams, and the pond at point 30, the subsidence areas will be predominantly free-draining.

Additional analysis of long-term ponding was undertaken for ponds at point 28, 29, and 30. The pluvial model was run with the following conditions:

- 3 month model run time;



- Initial water level of ponds as full (236.6 mAHD for ponds 28 and 29 and 237.2mAHD for pond 30);
- No additional rainfall; and
- Infiltration and evaporation applied.

The modelling results showed that:

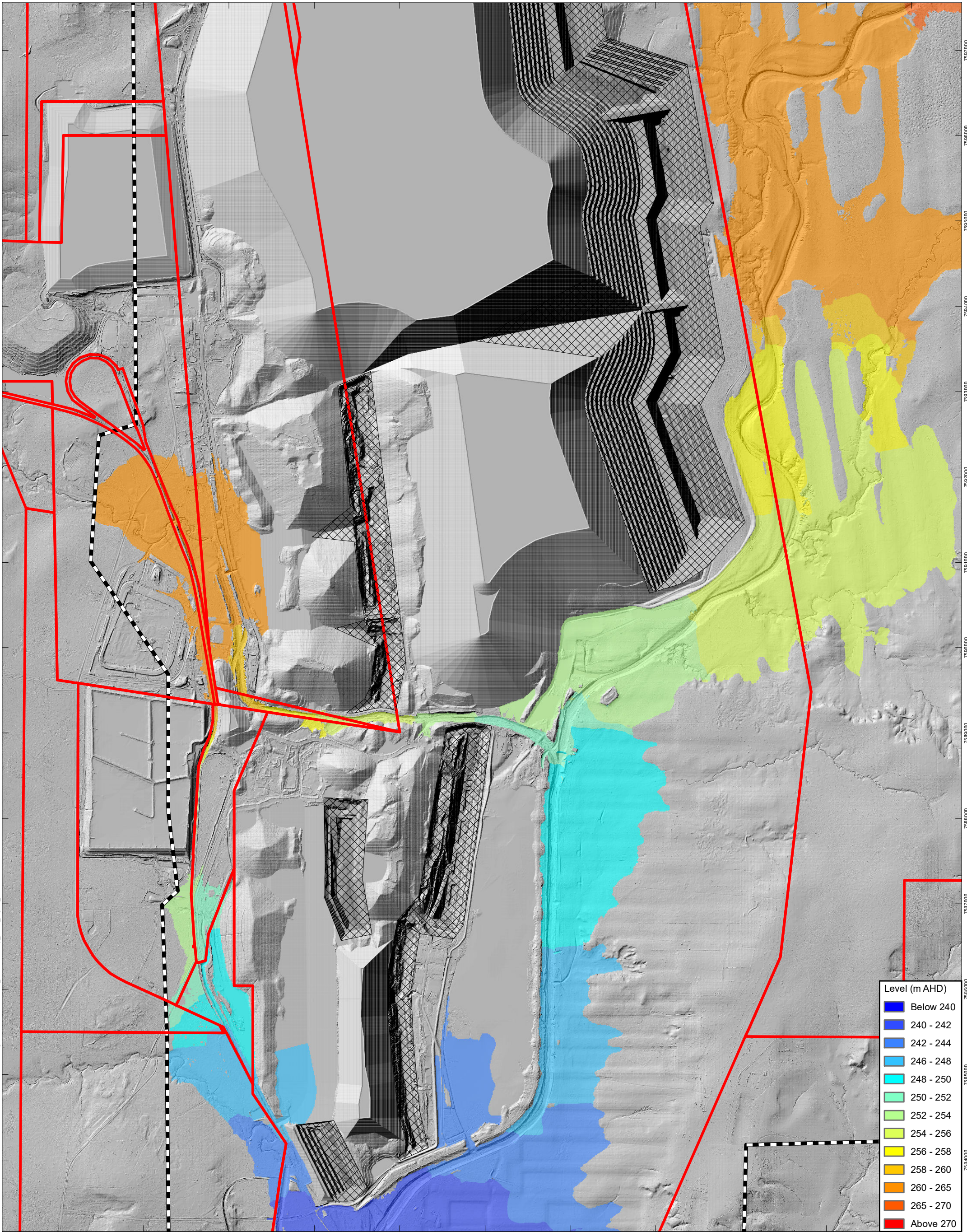
- Pond 28 was emptied within 1700 hours (70 days);
- Pond 29 was emptied within 1030 hours (43 days); and
- Pond 30 was emptied within 880 hours (37 days).

Therefore, the model results indicate there will be no residual ponding that would last more than 3 months at these points.

Drain sizes have been specified as proof of concept only and were not optimised as part of this assessment. Further refinement of the CSM components including drain sizing should be considered in future design phases.



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km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

Level (m AHD)	
	Below 240
	240 - 242
	242 - 244
	244 - 246
	246 - 248
	248 - 250
	250 - 252
	252 - 254
	254 - 256
	256 - 258
	258 - 260
	260 - 265
	265 - 270
	Above 270

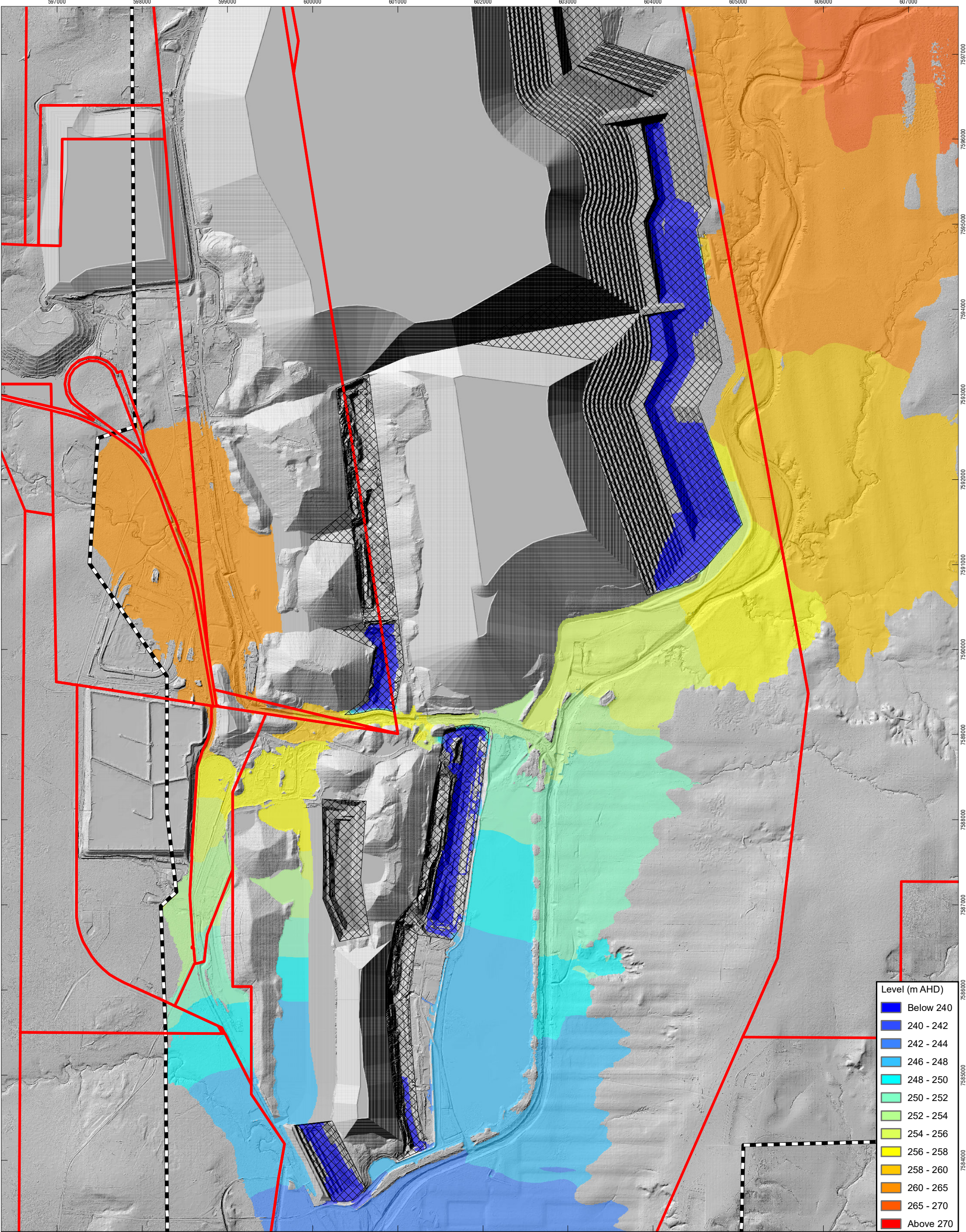
Goonyella Complex PRCP
Rehabilitation Flood Assessment

Isaac River PRCP Conditions
Peak Levels - 0.1% AEP + 20% rainfall intensity



Figure 5-5

H:\Projects\SLR\620-BNE\620.040713\00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CAD\GIS\GIS\Mc\Figures\GRM\620.040713_PMP_hmax_Fig 5-6-001.mxd





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km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 27-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

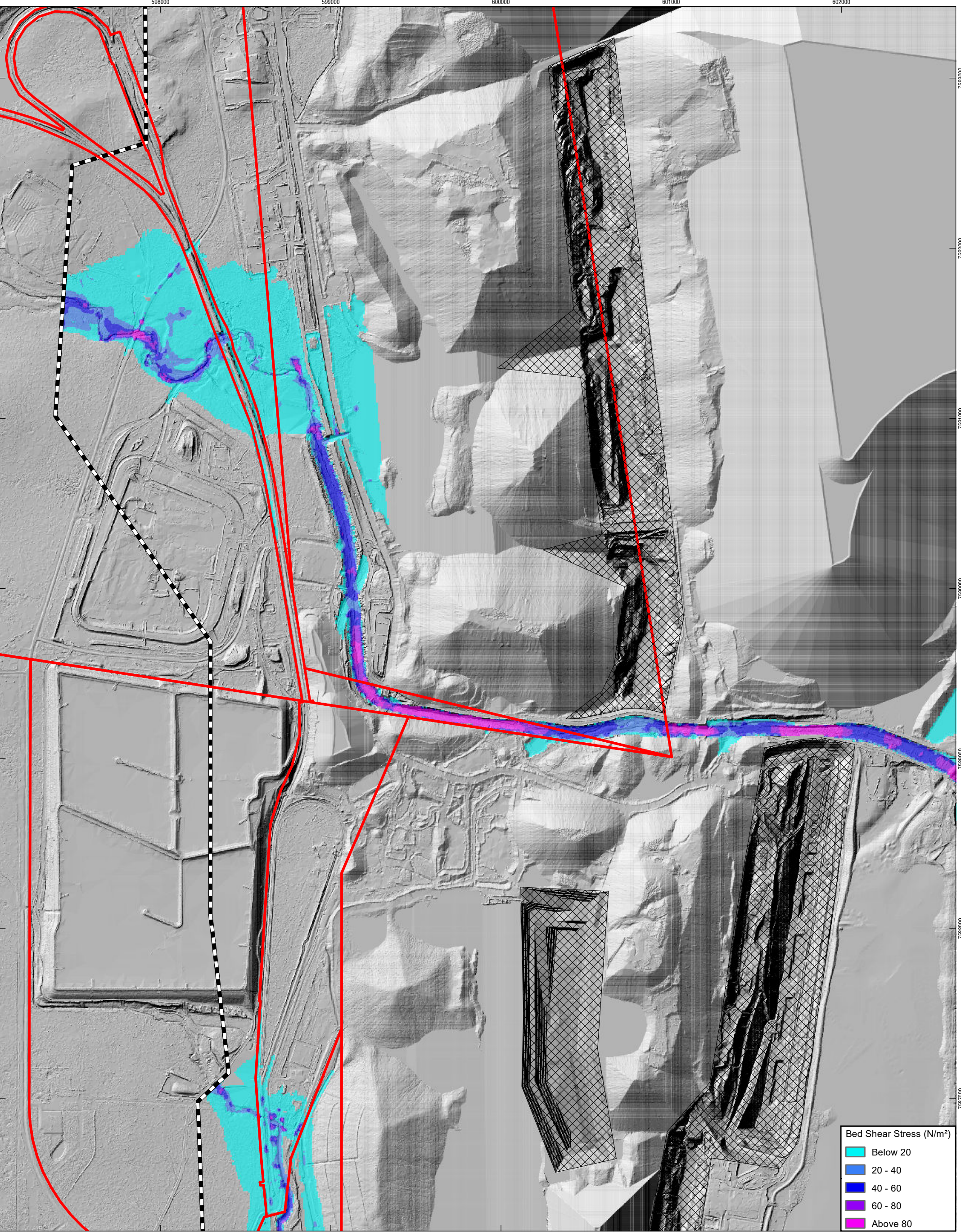
Goonyella Complex PRCP
Rehabilitation Flood Assessment

Isaac River PRCP Conditions
Peak Levels - PMF



Figure 5-6

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Asses\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\OutputMXDs\620-040713-APPENDIX B2-4-2_F08_02p_bss.mxd





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km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

 Voids

 TUFLOW Model Extent

Bed Shear Stress (N/m²)	
	Below 20
	20 - 40
	40 - 60
	60 - 80
	Above 80

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Bed Shear Stress - 2% AEP



Figure 5-7

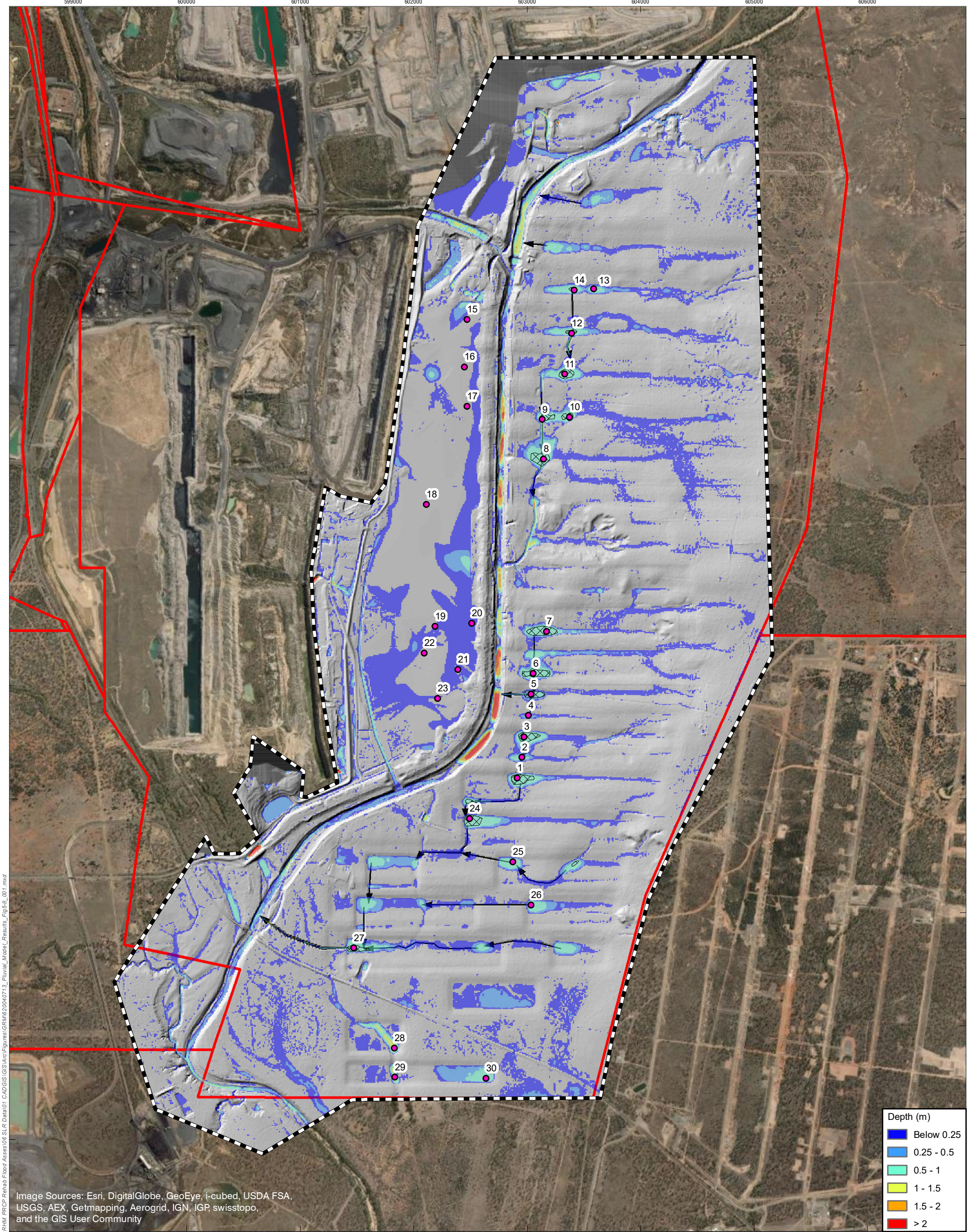


Image Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

 0 0.225 0.45 0.9 km
Coordinate System: GDA2020 MGA Zone 55
Scale: 1:30,000 at A3
Project Number: 620.040713
Date: 26-Sep-2024
Drawn by: TS

- LEGEND**
-  Mining Leases
 -  TUFLOW Model Extent
 -  Proposed Backfill Areas
 -  Proposed Drains
 -  Reporting Points

**Goonyella Complex PRCP
Rehabilitation Flood Assessment**

TUFLOW Pluvial Model Results

Figure 5-8

H:\Projects\SLR\620-BNE\620-BNE\620.040713\000001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CAD\GIS\GIS\Ac\Figures\GRM620040713_Pluvial_Model_Results_Fig5-8_001.mxd

6.0 Flooding Risk Profile

A Flooding Risk Profile (FRP) was developed for the Goonyella Complex post-closure conditions. The FRP was based on the results of the hydraulic model (as detailed in **Section 5.3**), as applied to the BHP Risk Framework. The BHP Risk Management Guidelines (RMG) and results of the FRP assessment are provided in **Appendix A**.

The risk assessment was undertaken using the methodology outlined in the RMG as follows:

1. Identify Risk
2. Assess Risk (including determining Maximum Foreseeable Loss (MFL) level and identifying material risks).
3. Identify possible risk prevention/mitigation measures.
4. Calculate Residual Risk Rating (RRR) for material risks.
5. Determine appetite for Risk based on RRR factored by likelihood and severity, where $RRR < 90$ is within appetite, otherwise exceeding appetite.

A summary of the identified flood risks, MFL, possible mitigation measures and residual risk ratings (RRR) are detailed in **Table 6-1**.

Table 6-1 Flood Risk Profile Summary

Identified Risk	MFL	Mitigation / Prevention Measures	RRR	Residual Risk Appetite Category
Goonyella Pit Final Void floodwater ingress (Isaac River) (PMF event only)	Serious impact to the environment, where recovery of ecosystem function takes between 3 and up to 10 years	Stable landform design features to prevent ingress. E.g. backfill void, stable bunding structure.	0.3	Within appetite (RRR<90)
Isaac Pit Final Void floodwater ingress (Isaac River) (PMF event only)	Serious impact to the environment, where recovery of ecosystem function takes between 3 and up to 10 years	Stable landform design features to prevent ingress. E.g. backfill void, stable bunding structure.	0.3	Within appetite (RRR<90)
Broadmeadow Pit Final Void floodwater ingress (Isaac River and Eureka Creek) (PMF event only)	Serious impact to the environment, where recovery of ecosystem function takes between 3 and up to 10 years	Stable landform design features to prevent ingress. E.g. backfill void, stable bunding structure.	0.3	Within appetite (RRR<90)
Thiess Pit Final Void floodwater ingress (Eureka Creek) (PMF event only)	Serious impact to the environment, where recovery of ecosystem function takes between 3 and up to 10 years	Stable landform design features to prevent ingress. E.g. backfill void, stable bunding structure.	0.3	Within appetite (RRR<90)



Identified Risk	MFL	Mitigation / Prevention Measures	RRR	Residual Risk Appetite Category
R32 South Pit Final Void floodwater ingress (Isaac River and R32/Airstrip tailings storage facility rehabilitated surface) (PMF event only)	Serious impact to the environment, where recovery of ecosystem function takes between 3 and up to 10 years	Stable landform design features to prevent ingress. E.g. backfill void, stable bunding structure.	0.3	Within appetite (RRR<90)
Alteration of flows downstream of site	Measurable but limited impact to the environment, where recovery of ecosystem function takes less than 1 year	Not required due to MFL < 4	0 / NA	Within appetite (RRR<90)

As shown in Table 6-1, the RRR for each identified flood risk is <90 and therefore within the appetite in accordance with the RMG.



7.0 Outcomes

The results of the assessment detailed in this report provided the following outcomes in relation to the scope of work outlined **Section 1.1**.

Section 3.6.1 General Rehabilitation Practices (Flooding)

- *Consider the location of domains in relation to potential flood levels.*

The results of the fluvial hydraulic model illustrate that the residual voids are immune to inundation from riverine and creek floodwaters for all modelled design storm events up to and including the 0.1% AEP + 20% rainfall intensity increase climate change event.

- *Consider alteration of flow upstream and downstream.*

Analysis of the final landform showed that a reduction in peak flow at the site discharge location of approximately 7-9% will occur due to the residual voids, in comparison to pre-mining conditions at the site downstream discharge location. No alteration of flows upstream of the site will occur.

- *Model flood levels (including probable maximum flood levels) for a range of design storm events.*

A range of design flood events were simulated using the fluvial hydraulic model including the 39%, 2%, 1%, 0.1% AEP and PMF. The effects of climate change were also assessed and the model was simulated for a range of future climate scenarios, as outlined in **Section 4.6**.

- *Develop a flooding risk profile.*

A risk profile was developed based on the results of the assessment using the BHP Risk Management Guidelines. Refer to **Section 6.0**.

Section 3.6.4 Underground Mining

- *Changes to hydrological regime.*

In areas where subsidence will occur, the final landform and CSM were developed based on the criteria for ponding as outlined in **Section 3.3.2** and **Section 5.5.3**.

- *Changes in surface topography and local drainage characteristics - this may result in some areas becoming more free-draining while runoff may be reduced in other areas, resulting in the ponding of water in areas where previously no ponding occurred.*

The final landform and CSM were developed such that ponding in subsidence areas will generally free-drain to discharge to the Isaac River in keeping with the pre-mining hydrologic regime.

- *Changes in surface drainage, leading to changes in the composition of vegetation communities and distribution of flora and fauna species.*

The criteria for allowable ponding within subsidence areas was informed by Queensland Herbarium and BMA ecology specialists as outlined in **Section 3.3.2** and **Section 5.5.3**. The results of the pluvial modelling illustrated that the criteria were generally achieved throughout the subsidence areas of the final landform.



8.0 Conclusions

SLR was contracted by BMA to support the preparation of the Goonyella Complex Progressive Rehabilitation and Closure Plan (PRCP). The assessment detailed in this report was undertaken specifically to address Section 3.6.1 and 3.6.4 of the PRCP Guideline, which relates to the analysis of flooding as part of the PRCP.

A model landform was developed for the project, which was based on the post-mining surface provided by BMA and included the proposed final voids for Goonyella, Thiess, R32 East, Isaac, R32 South and Broadmeadow Pits as well as rehabilitated dump areas.

Using the model landform, hydrologic models were developed for the Isaac River, Eureka Creek and Fisher and Platypus Creek catchments. The model was calibrated using recorded stream flow data for Isaac River. The results of the models were also verified against results of empirical flow estimation methods and previous studies. The hydrologic models were simulated for a suite of design storm events including a range of temporal patterns, storm durations and AEP events including the 0.1% AEP and PMF.

Hydraulic models covering Isaac River, Eureka Creek and Fisher and Platypus Creek catchments were developed. The model topography was based on the model landform for the purpose of assessing the post-mining flooding conditions in accordance with Section 3.6.1 and 3.6.4 of the PRCP Guideline. Flow hydrographs produced by the hydrologic models were utilised as inflows for the hydraulic model.

The results of the hydraulic model showed the proposed final voids are not subject to inundation for the modelled flood events up to and including the 0.1% AEP event with 20% increase in intensity increase scenario.

The results showed that the Goonyella, Issac, Broadmeadow, Thiess and R32 South Pit final voids are subject to inundation for the PMF event.

A pluvial hydraulic model was developed which was utilised to investigate potential ponding during local catchment rainfall events within the areas of the final landform where subsidence will occur. A Conceptual Site Model was developed including conceptual drainage connections and backfilling within subsidence depressions, which was driven by the defined criteria for ponding in subsidence areas.

The results of the model illustrated that the criteria for ponding can be achieved by the final landform including the CSM components.

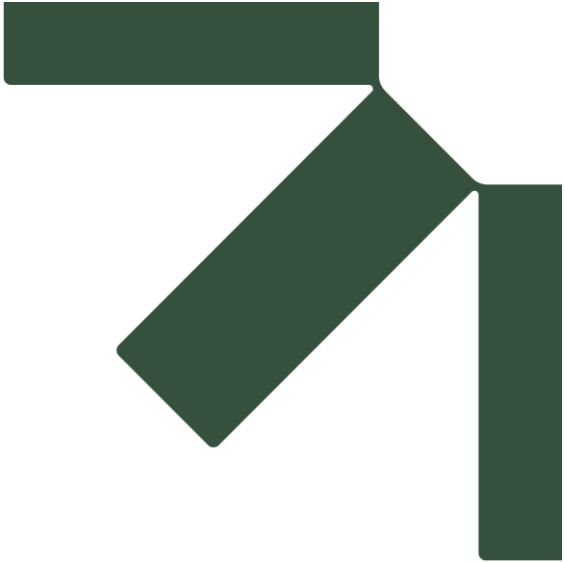
A Flood Risk Profile was developed based on the hydrologic and hydraulic model results. The FRP was developed using the framework provided in BHP's Risk Management Guideline. The outcome of the FRP was that the residual risk ratings of the identified flood risks are acceptable.



9.0 References

- ACARP. 2002. "Bowen Basin River Diversions - Design and Rehabilitation Criteria ."
- Ball, J, M Babister, R Nathan, E Weinmann, M Retallick, and I Testoni. 2019. *Australian Rainfall and Runoff - A Guide to Flood Estimation* . v4.2. Commonwealth of Australia (Geoscience Australia).
- Department of Environment and Science. 2024. "Guideline - Progressive Rehabilitation and Closure Plan (PRC Plans)."
- Landloch. 2024. "Goonyella Riverside Mine Complex - Material Characterisation Study ."
- Peabody. 2023. "Burton Gorge Dam Emergency Action Plan."
- State of Queensland. 2019. "Guideline: Works that interfere with water in a watercourse for a resource activity - watercourse diversions authorised under the Water Act 2000."
- WRM . 2019. "Goonyella and Broadmeadow Hydraulic Assessment."





Appendix A Flood Risk Profile Assessment

Goonyella Complex

Progressive Rehabilitation and Closure Plan Rehabilitation Flood Assessment

BHP Mitsubishi Alliance

SLR Project No.: 620.040713.0000

18 November 2024

Risk Management

Our Requirements

Why is this important?

Through the delivery of best in class risk management, we protect what BHP has today and grow value for tomorrow.

The identification and management of risks is central to achieving our strategic objectives. It protects us against downside risk; enables us to take risk for strategic reward; and improves our resilience against emerging risks.

An essential element of effective risk management is to have an enterprise view so that the full risk exposure can be prioritised, and the aggregate impact from cumulative risks can be understood. As such, BHP operates to one [Risk Framework](#) for all risks.

In addition to [Our Requirements for Risk Management](#), other [Our Requirements](#) set minimum controls for managing specific areas of risk (e.g. Safety, Aviation, Environment and Climate Change, Water and Tailings Storage Facilities, Capital Projects, Closure and Finance).

Who does this apply to?

- Anyone involved in identifying, assessing, controlling, monitoring or reporting risks or using this information to make decisions.



See [Our Code of Conduct](#) for the standard of behaviour expected of you at BHP.



See [Our Requirements for Organisation Design](#) for [functional](#) accountabilities.

What approvals are required?



[Alternative risk governance model](#)



[Operate while remediation plan is implemented to bring performance within defined key risk indicator limits](#)



[Operate outside of defined key risk indicator limits](#)



[Risk register completeness and continued management of risks within appetite](#)



[Operate while remediation plan is implemented to bring risk within appetite](#)



[Operate while risk is within tolerance](#)

Risk Strategy

Risk Framework

- Apply BHP's [Risk Framework](#) for the identification and management of all risks.
- Strengthen our risk culture.



Strengthen our risk culture by demonstrating the following behaviours that support great risk management:

- everyone can speak up without fear;
- leaders own and prioritise threats and opportunities;
- we learn from mistakes and successes;
- everyone takes responsibility for risk;
- we encourage the right behaviour.



A strong risk culture enables us to make decisions that balance risk and reward and actively seek to take risk within appetite.



BHP operates to a global risk framework aligned to ISO31000. The level of effort applied should be prioritised commensurate with the level of risk. Notify the Global Risk team of any opportunities to improve BHP's [Risk Framework](#).

Strategic business decisions

- When making a [strategic business decision](#) for BHP:
 - use BHP's [Risk Appetite Statement](#) and [Group Risk Architecture](#) to make sure the decision is within BHP's appetite for risk;
 - use [recommended techniques](#) from the [Risk Framework](#) when additional analysis is required to be certain that a decision is within appetite; and
 - apply the [risk process](#) to the selected decision.



BHP's [Risk Appetite Statement](#) and [Group Risk Architecture](#) are central to understanding the type and extent of risk BHP chooses to accept in pursuit of achieving strategic and [operational](#) objectives.

Risk Governance

- Implement the [Three Lines](#) model for all [Group Risks](#) or [get approval](#) for an alternative risk governance model.
- When any of the defined [key risk indicator](#) limits (elevated or avoidant) specified in the [Group Risk Architecture](#) are exceeded:
 - review the appropriateness of the [Risk Appetite Statement](#) and defined [key risk indicator](#) limits and determine if an update is required; and
 - develop a remediation plan to bring performance within defined [key risk indicator](#) limits, and [get approval](#) to continue to operate while implementing the remediation plan; or
 - [get approval](#) to continue to operate outside of defined [key risk indicator](#) limits where there are no reasonable remediation actions to bring the [Group Risk](#) within appetite and have the [approval](#) reviewed annually.



Refer to the [Risk Framework](#) for a description of the [roles and responsibilities](#) for risk management under the [Three Lines](#) model.

Risk Process

Identify risk

- Identify threats and opportunities by considering:
 - what can go wrong and what must go right;
 - five year plans, Life of [Asset](#) planning and other deliverables from [Our Requirements for Corporate Alignment Planning](#);
 - purpose statements from [Our Requirements for Organisation Design](#);
 - the [Group Risk Architecture](#);
 - internal and external sources of risk;
 - intended and unintended consequences when introducing change;
 - [current risks](#) and [emerging risks](#).
- Prioritise for assessment and treatment any risks that can impact the achievement of strategic and [operational](#) business objectives.

Assess risk

- For each identified risk:
 - classify the risk as a [current risk](#) or an [emerging risk](#);
 - use one or more [recommended techniques](#) in the [Risk Framework](#) to perform a risk assessment;
 - use [Appendix 1](#) to determine the [maximum foreseeable loss \(MFL\)](#) and for each risk or [risk scenario](#) with an [MFL](#) ≥ level 4 impact determine the [residual risk rating \(RRR\)](#);
 - determine [maximum foreseeable gain \(MFG\)](#) for an opportunity;
 - tell the [Group Risk Representative](#) immediately of any newly identified risk with [MFL](#) level 5 impact;
 - review, and when applicable, update your risk assessment following any [risk relevant change](#); and
 - make sure people with relevant expertise and experience are involved in all risk assessments.
- For each [current risk](#), classify it as a current [material risk](#) if it has an [MFL](#) ≥ level 4 impact.
- For each current [material risk](#), identify [critical controls](#), and for each [critical control](#) determine:
 - the critical aspects of the design and operating performance criteria required to achieve the [control's](#) primary objective;
 - the verification activities required to check that the [critical control](#) is operating effectively according to its design; and
 - a manual test plan to test that the [critical control](#) is achieving its primary objective and effectively managing the risk.



[Critical controls](#) are not mandated for opportunities, [emerging risks](#), non-material risks or [one-off short-term material risks](#).



Some [risk events](#) may have multiple scenarios, in which case risk owners should consider whether these scenarios have a higher [RRR](#) than the [MFL scenario](#) and whether they have additional causes or impacts and require additional [controls](#).

Treat Risk

- For each [current risk](#) (either [material risk](#) or non-[material risk](#)) and each [one-off short-term material risk](#):
 - implement preventative [controls](#) to prevent the causes of a threat, and mitigating [controls](#) to reduce its impacts;
 - implement [controls](#) to enable and/or enhance an opportunity; and
 - if the [RRR](#) ≥ 90 , stop the activity or get [approval](#) to continue the activity by completing a risk evaluation under [Appendix 2](#).
- For each [emerging risk](#), make sure [contingency controls](#) are in place when the [RRR](#) ≥ 90 .

Monitor and Review

- For each current [material risk](#) follow [Appendix 2](#) to perform a [critical control](#) effectiveness test (CET) and risk evaluation at least annually.
- For each [emerging risk](#), review the risk at least annually to confirm:
 - the risk remains an [emerging risk](#) and has not become a [current risk](#);
 - the [RRR](#) remains accurate; and
 - any required [contingency controls](#) remain in place.
- Review the [risk register](#) for completeness and continued management of risks within appetite and [get approval](#) annually.

Communicate

- For each risk with an [MFL](#) $\geq$ level 4 impact, [record](#) the risk in [1SAP Governance Risk and Compliance](#) (GRC).



This requirement will be expanded to include each risk with an [MFL](#) level 3 impact once [material risks](#) are adequately represented and managed.



Remember to consult with the Global Risk team when providing risk information to the Board or Executive, [functional](#) or [asset](#) leadership teams.

Appendix 1 Severity and likelihood tables

Severity table¹: Use this table to select the [MFL](#) severity level and the [RRR](#) severity factor. The [RRR](#) severity factor measures the worst case expected outcome for the [risk event](#), assuming the mitigating [controls](#) that are in place are operating in accordance with their design.

Severity Level	Descriptor	Severity Factor
5	6 or more fatalities or 6 or more chronic life threatening illnesses; or Severe impact to the environment and where recovery of ecosystem function takes 10 years or more; or Severe impact on community lasting more than 12 months or a substantiated human rights violation impacting 6 or more people; or Severe impact on company reputation, investment attractiveness, legal rights or compliance, social value proposition or ability to access opportunities at a global level; or US\$2 billion or more ² .	1000
4	1-5 fatalities or 1-5 chronic life threatening illnesses; or Serious impact to the environment, where recovery of ecosystem function takes between 3 and up to 10 years; or Serious impact on community lasting 6-12 months or a substantiated human rights violation impacting 1-5 persons; or Serious impact on company reputation, investment attractiveness, legal rights or compliance, social value proposition or ability to access opportunities at a national level; or Between US\$250 million and up to US\$2 billion ² .	300
3	Life altering or long term/permanent disabling injury or illness to one or more persons; or Substantial impact to the environment, where recovery of ecosystem function takes between 1 and up to 3 years; or Substantial impact on community lasting 2-6 months; or Substantial impact on company reputation, legal rights or compliance, social value proposition, or ability to access opportunities at a sub national level (state, territory, province); or Between US\$50 million and up to US\$250 million ² .	100
2	Non-life altering or short-term disabling injury or illness to one or more persons; or Measureable but limited impact to the environment, where recovery of ecosystem function takes less than 1 year; or Measureable but limited community impact lasting less than one month; or Measureable but limited impact on company reputation, legal rights or compliance, or social value proposition at a local level (region , city, town); or Between US\$2 million and up to US\$50 million ² .	30
1	Low level impact resulting in first aid only; or Minor, temporary impact to the environment, where the ecosystem recovers with little intervention; or Minor, temporary community impact that recovers with little intervention; or Minor, temporary impact on company reputation, legal rights or compliance, or social value proposition; or Less than US\$2 million ² .	10

(1) Guidance on using the severity table is available [here](#).

(2) Assess the cash impact on revenue, operating cost and capital cost or cash equivalent impact (net [present value](#)). The impact should be assessed for the full life cycle of a single immediate occurrence of the event and calculated in US\$ (BHP share). If the sum of the initial impact assessed is greater than US\$250 million (BHP share) a valuation aligned to [Our Requirements for Decision Evaluation](#) should support the analysis.

Current risk likelihood table³: Use this table when calculating [RRR](#) to select the [current risk](#) likelihood factor. The likelihood factor measures the likelihood of the [risk event](#) occurring, assuming the preventative [controls](#) that are in place are operating in accordance with their design.

Calculate the [RRR](#) using the formula: $RRR = \text{severity factor} \times \text{current risk likelihood factor}$.

Uncertainty	Frequency	Likelihood factor
Highly Likely	Likely to occur within a 1 year period.	3
Likely	Likely to occur within a 1 - 5 year period.	1
Possible	Likely to occur within a 5 - 20 year period.	0.3
Unlikely	Likely to occur within a 20 - 50 year period.	0.1
Highly Unlikely	Not likely to occur within a 50 year period.	0.03

Emerging risk likelihood table: Use this table to measure the timeframe and velocity in the calculation of the [RRR](#).

Calculate the [RRR](#) using the formula: $RRR = \text{severity factor} \times \text{emerging risk likelihood factor}$.

Timeframe & Velocity	Description	Likelihood factor
Near Term & Fast	Risk event is possible within the next 2 years. Impact would occur within six months of the initial onset of the risk event .	3
Near Term & Slow	Risk event is possible within the next 2 years. Impact would occur slowly over a period of greater than six months from the initial onset of the risk event .	1
Medium Term & Fast	Risk event is possible within 2 - 5 years. Impact would occur immediately or within six months of the initial onset of the risk event .	0.3
Medium Term & Slow	Risk event is possible within 2 - 5 years. Impact would occur slowly over a period of greater than six months from the initial onset of the risk event .	0.1
Long Term (no velocity required)	Risk event is possible within 5 - 10 years, but not sooner.	0.03

(3) Guidance on using the likelihood table is available [here](#).

RRR heat map: Use this table to help determine whether a risk is exceeding appetite based on **RRR**.

Likelihood	Severity Level				
	1	2	3	4	5
Highly Likely	30	90	300	900	3000
Likely	10	30	100	300	1000
Possible	3	9	30	90	300
Unlikely	1	3	10	30	100
Highly Unlikely	0.3	0.9	3	9	30



The levels in the severity table are aligned to the Risk Appetite Statement to allow for screening that **RRR** is within appetite. When the **RRR** is ≥ 90 the risk is exceeding appetite.

Appendix 2 Critical control and risk evaluation

Critical control effectiveness test

A [critical control](#) effectiveness test (1SAP GRC control effectiveness manual test) must evaluate whether the [control](#) remains effective at managing the [risk event](#). At a minimum, it must consider results from: verification activities and any trends, actual or similar [control](#) failures, internal and external audits and management reviews.

Critical control effectiveness test	Explanation
Adequate	The design, operation and verification of the critical control are appropriate, effective and achieve the control objective.
Deficient	The design, operation or verification of the critical control is not appropriate, not effective or does not achieve the control objective.

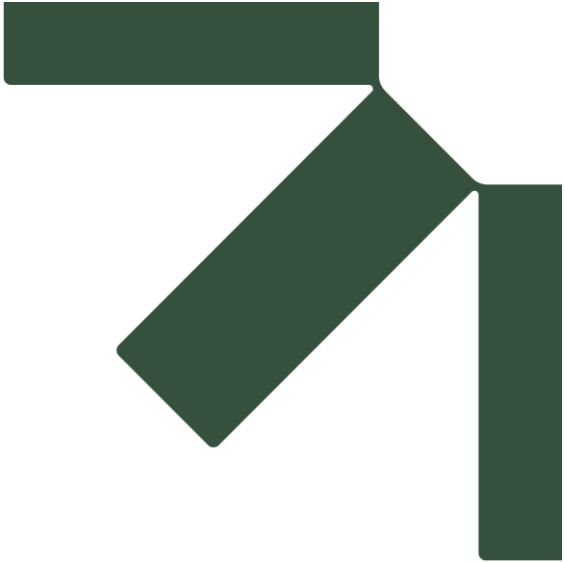
Issues identified from a [critical control](#) effectiveness test must be rated using the categories below and remediated.

Issue rating	Explanation
Low	The deficiency is unlikely to compromise the achievement of the control objective.
High	The deficiency is likely to compromise the achievement of the control objective.

Risk evaluation

Each current [material risk](#) and each non-[material risk](#) with an [RRR](#) ≥ 90 and [one-off short-term material risk](#) with an [RRR](#) ≥ 90 must be evaluated by the [Risk Owner](#) using the categories below. The risk evaluation must consider the overall effectiveness of the [control](#) environment, [critical control](#) effectiveness test(s), internal or external [control](#) failures related to the risk, audit findings, management reviews, and internal or external [risk relevant changes](#).

Rating	Explanation
Within appetite	- The RRR < 90; and - There are no deficient CETs with a high issue rating where the deficiency is specifically related to the risk being assessed.
Exceeding appetite with remediation	- The RRR ≥ 90; and/or - One or more CET(s) are rated as deficient with a high issue rating and the deficiency is specifically related to the risk being assessed; and Approval has been granted to continue to operate while a remediation plan is implemented to bring the risk back within appetite.
Within tolerance	- The RRR ≥ 90; and/or - One or more CETs are rated as deficient with a high issue rating and the deficiency is specifically related to the risk being assessed; and - There are no reasonable remediation actions to bring the risk within appetite; and - The activity has been stopped or approval has been granted to operate while the risk is within tolerance.



Appendix B Fluvial Model Results

Goonyella Complex

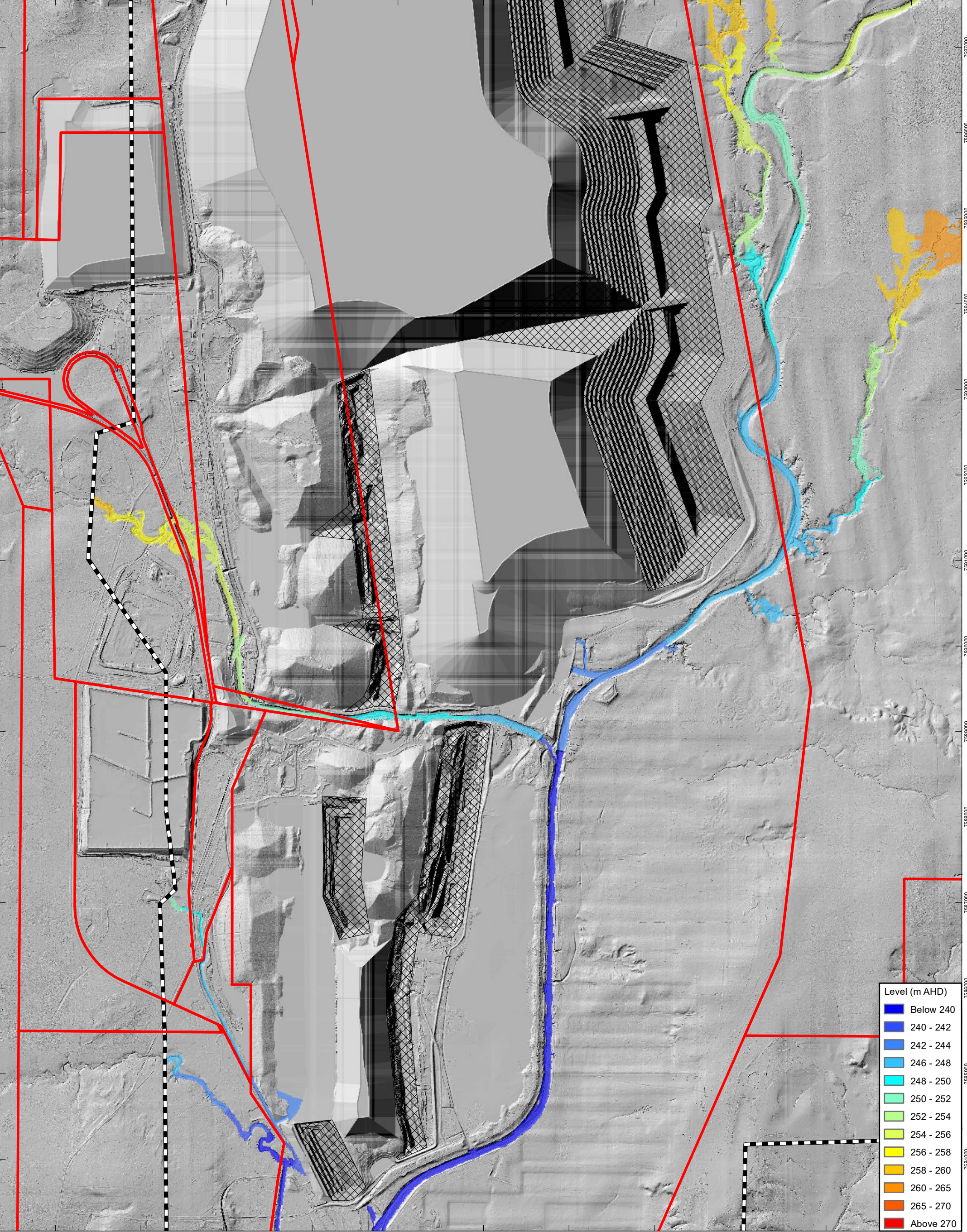
Progressive Rehabilitation and Closure Plan Rehabilitation Flood Assessment

BHP Mitsubishi Alliance

SLR Project No.: 620.040713.0000

18 November 2024

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Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

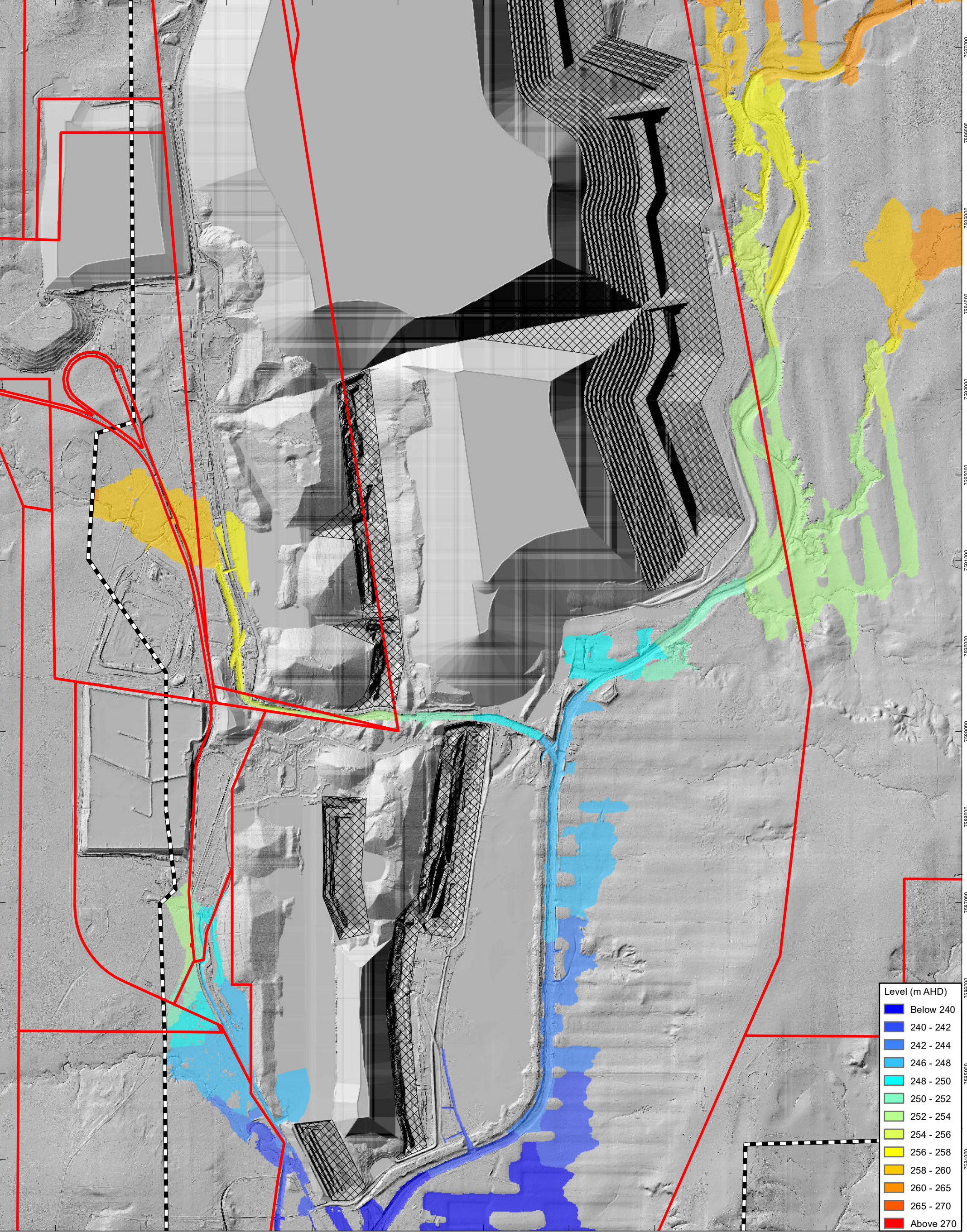
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Isaac River PRCP Conditions
Peak Levels - 39% AEP



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km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

Level (m AHD)

 Below 240

 240 - 242

 242 - 244

 246 - 248

 248 - 250

 250 - 252

 252 - 254

 254 - 256

 256 - 258

 258 - 260

 260 - 265

 265 - 270

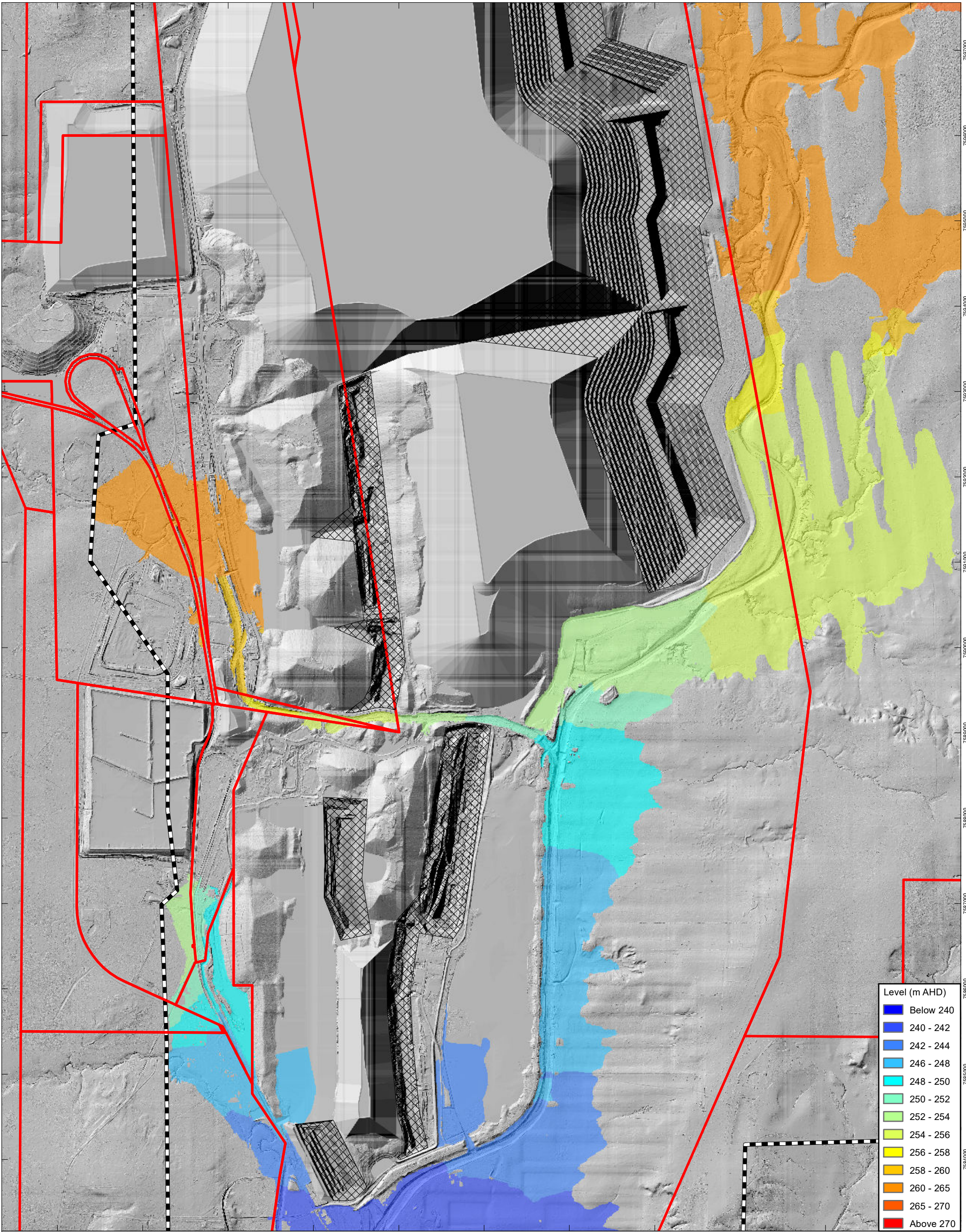
 Above 270

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Isaac River PRCP Conditions
Peak Levels - 2% AEP



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713_00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CADGIS\GIS\ArcAuto\Maping\010\Output\MXDs\620_040713_APPENDIX B1-1-3_F08_1in1000_h.mxd





00.3250.651.3 km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

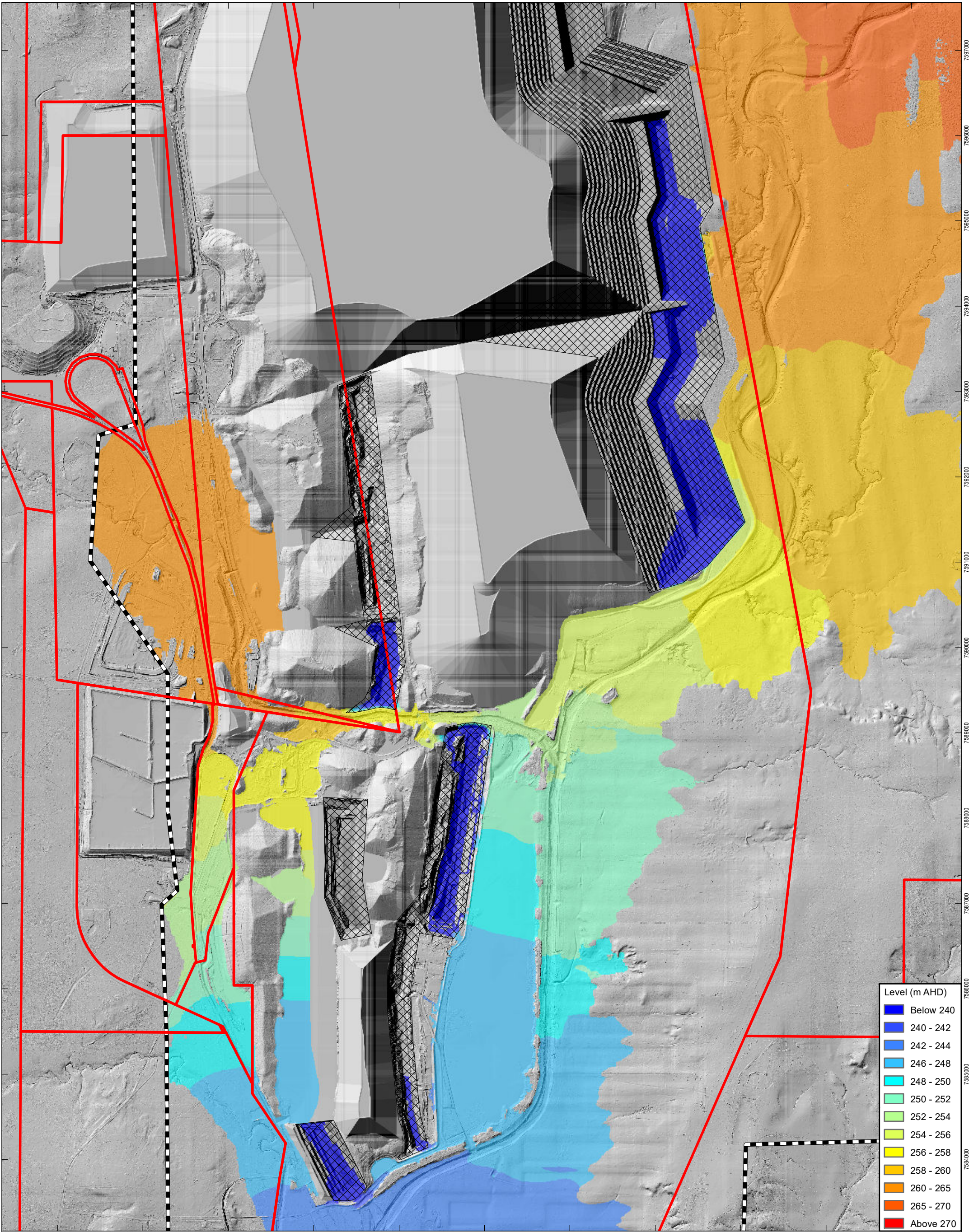
 TUFLOW Model Extent

**Goonyella Complex PRCP
Rehabilitation Flood Assessment**

**Isaac River PRCP Conditions
Peak Levels - 0.1% AEP**



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620-040713_00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CADGIS\GIS\ArcAuto\Maping\010\Output\MXDs\620_040713_APPENDIX B1-1-4_F08_PMP_h.mxd





00.3250.651.3

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

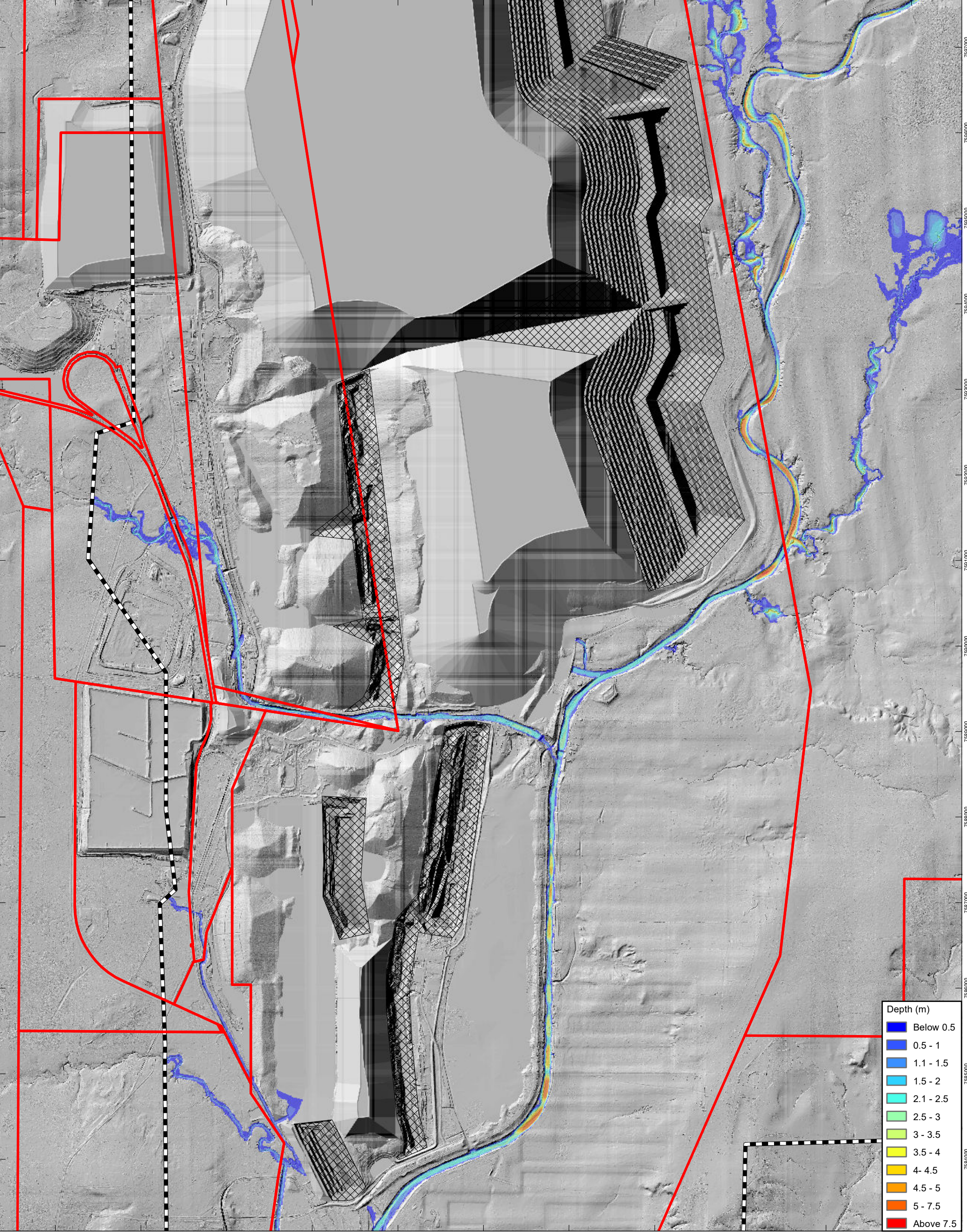
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Isaac River PRCP Conditions
Peak Levels - PMF



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CADGIS\GIS\ArcAutoMapping\010\Output\MXDs\620_040713_APPENDIX B1-2-1_F08_39p_d.mxd





00.3250.651.3 km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

 Voids

 TUFLOW Model Extent

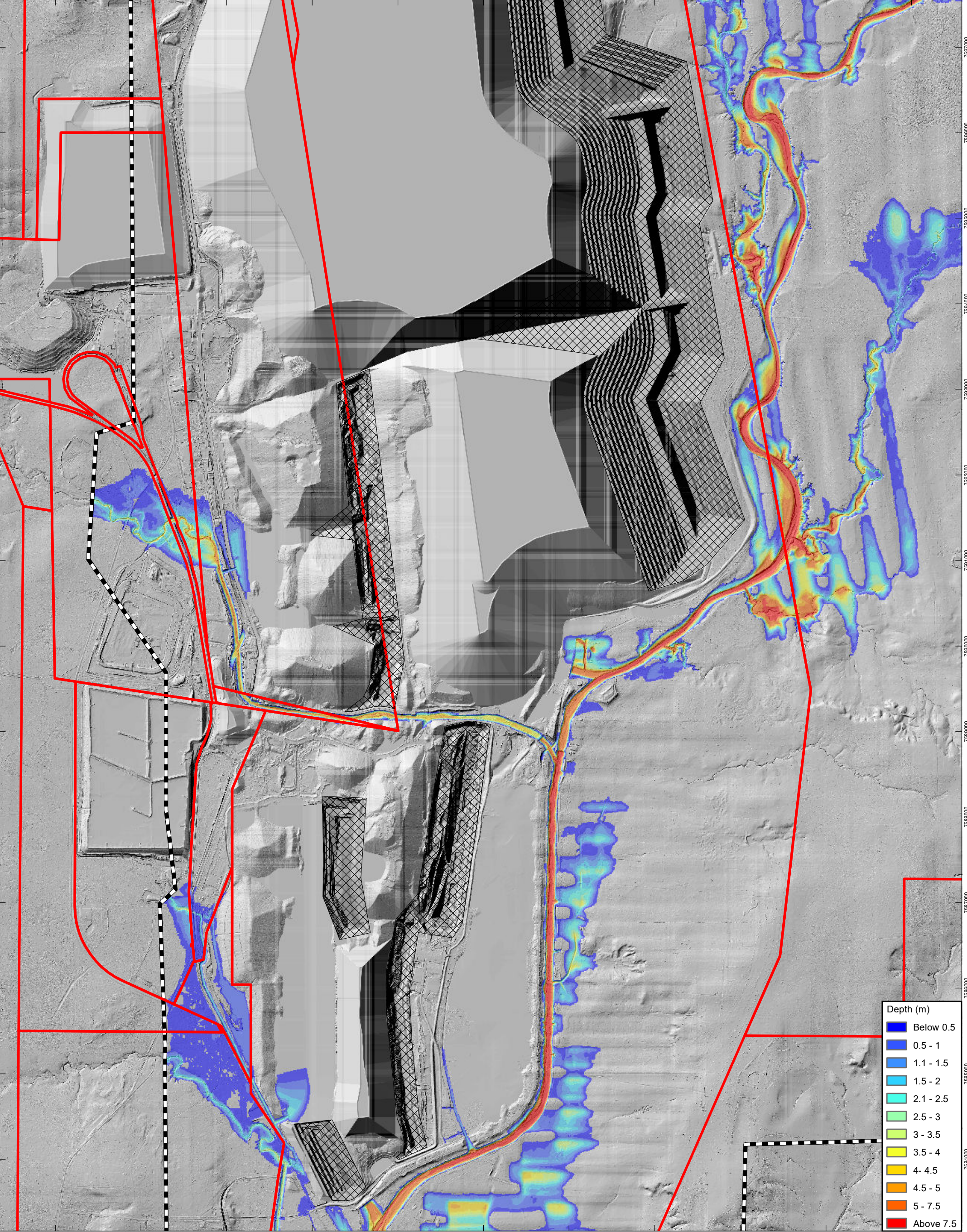
Depth (m)	
	Below 0.5
	0.5 - 1
	1.1 - 1.5
	1.5 - 2
	2.1 - 2.5
	2.5 - 3
	3 - 3.5
	3.5 - 4
	4 - 4.5
	4.5 - 5
	5 - 7.5
	Above 7.5

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Isaac River PRCP Conditions
Peak Depths - 39% AEP



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CADGIS\GIS\ArcAuto\Mapping\010\Output\MXDs\620_040713_APPENDIX B1-2-2_F08_02p_d.mxd





00.3250.651.3 km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

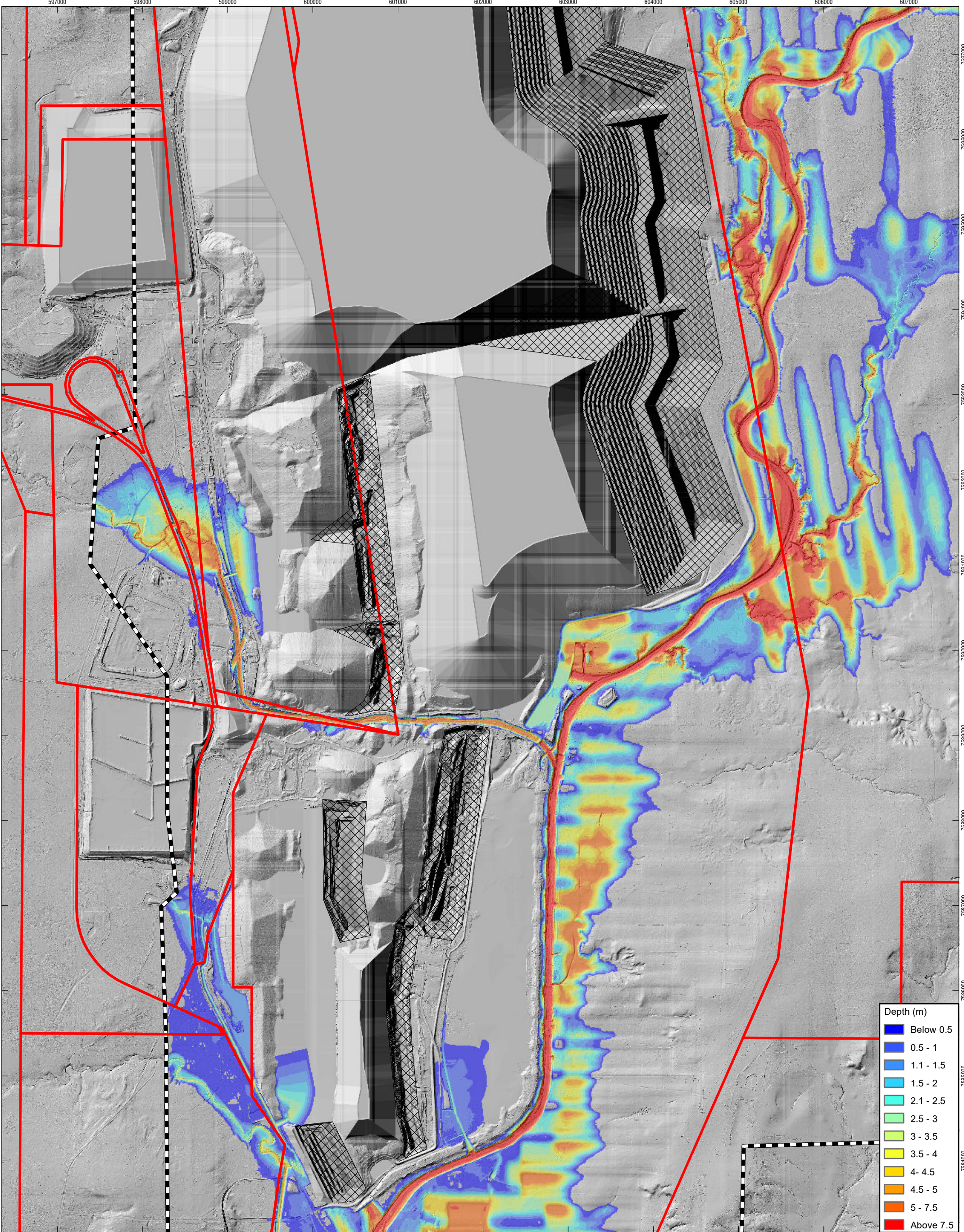
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Isaac River PRCP Conditions
Peak Depths - 2% AEP



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CADGIS\GIS\ArcAutoMapping\010\OutputMXDs\620_040713_APPENDIX B1-2-3_F08_1in1000_d.mxd





00.3250.651.3

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

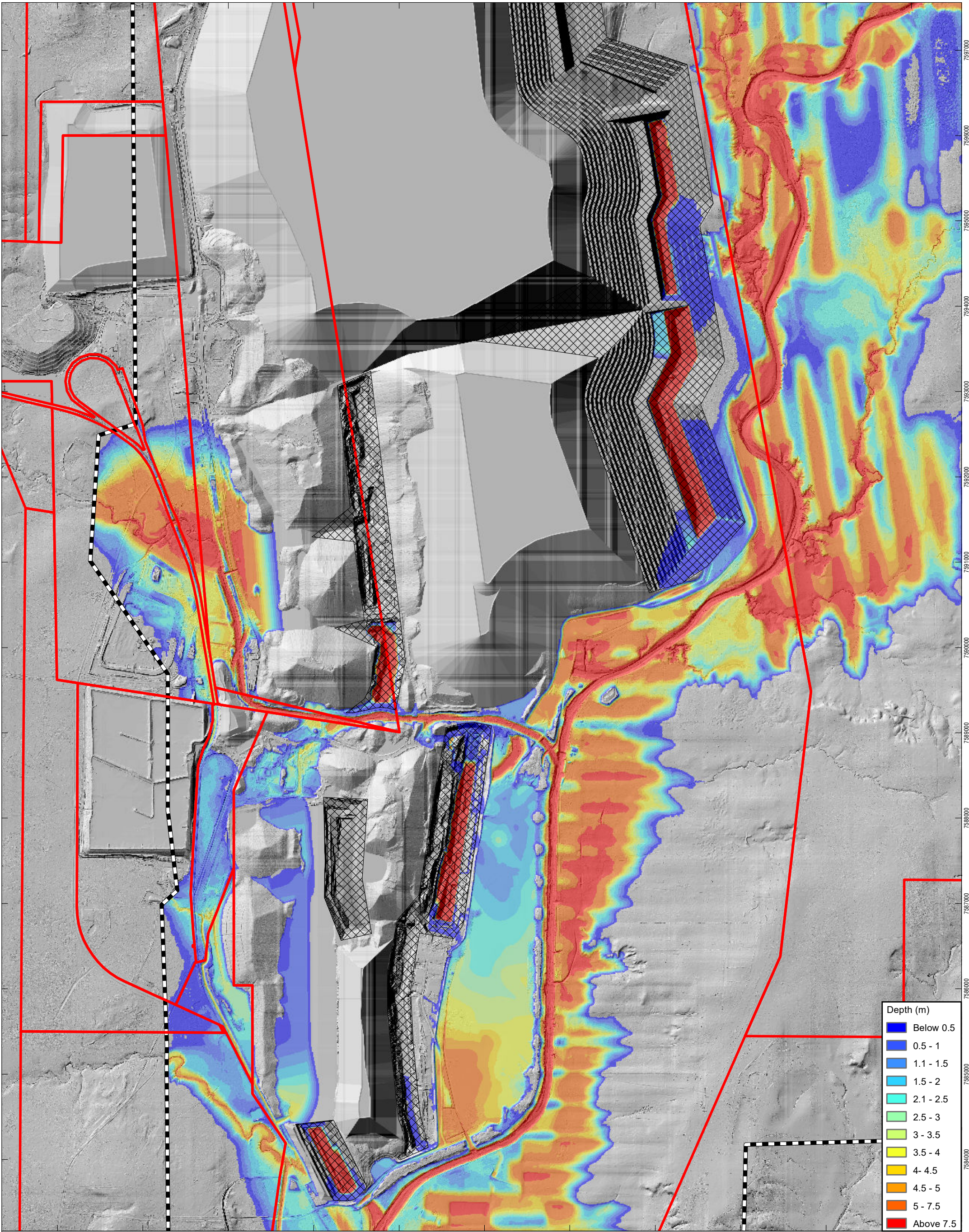
 TUFLOW Model Extent

**Goonyella Complex PRCP
Rehabilitation Flood Assessment**

**Isaac River PRCP Conditions
Peak Depths - 0.1% AEP**



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CADGIS\GIS\ArcAuto\Maping\010\Output\MXDs\620_040713_APPENDIX B1-2-4_F08_PMP_d.mxd





00.3250.651.3 km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

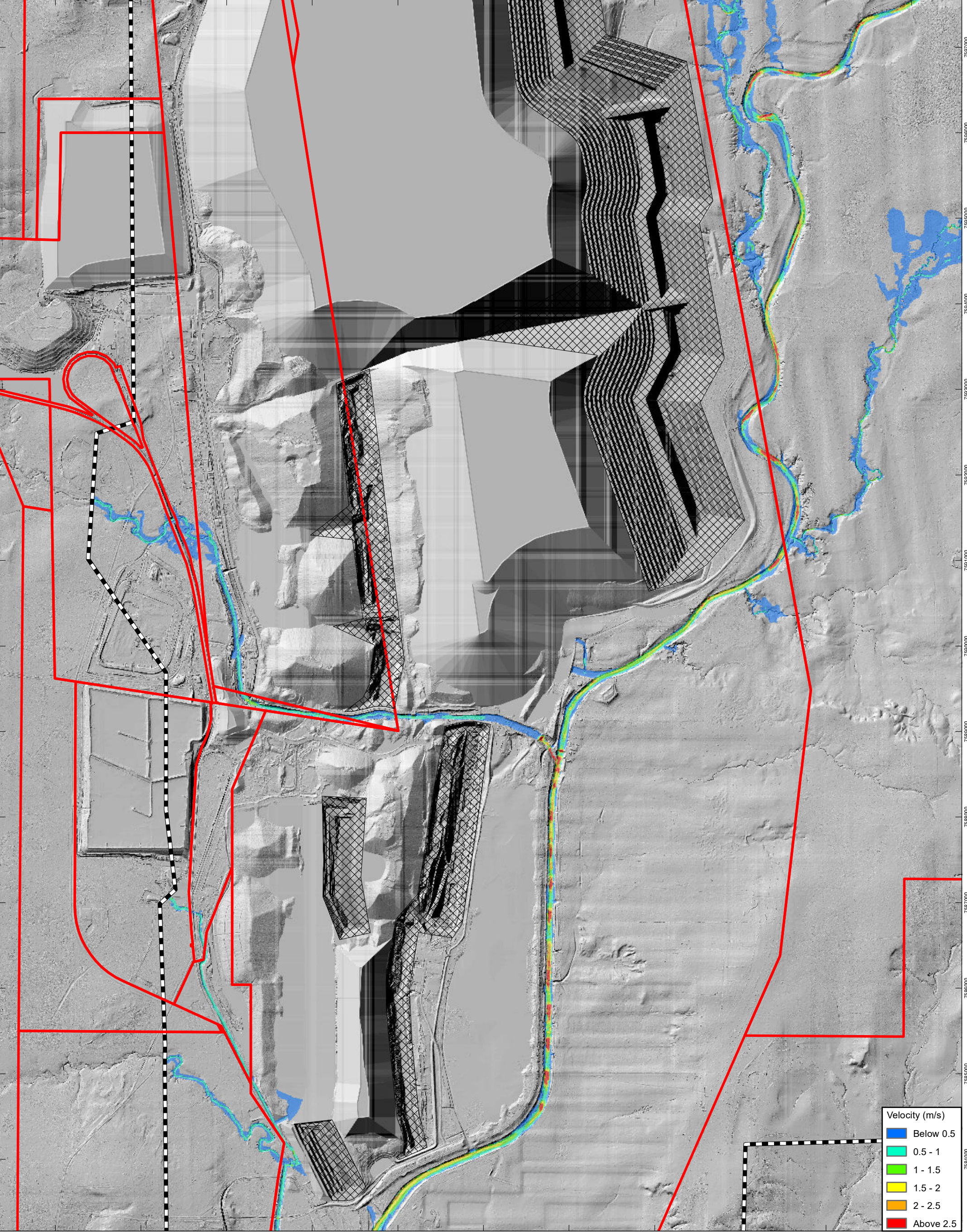
 TUFLOW Model Extent

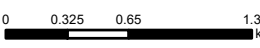
Goonyella Complex PRCP
Rehabilitation Flood Assessment

Isaac River PRCP Conditions
Peak Depths - PMF



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CADGIS\GIS\ArcAutoMapping\010\Output\MXDs\620-040713-APPENDIX B1-3-1_F08_39p_v.mxd





Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

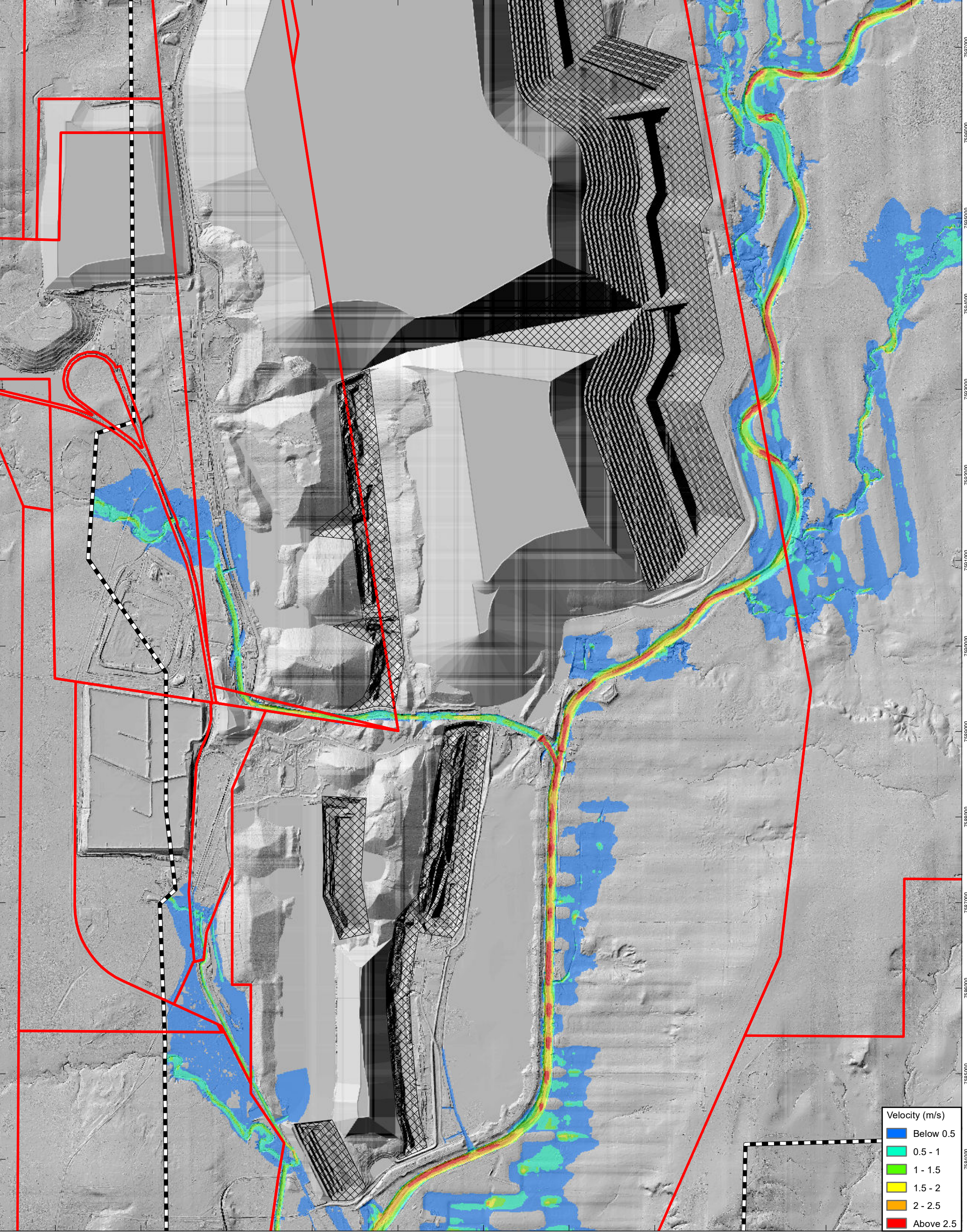
- LEGEND
-  Mining Leases
 -  Voids
 -  TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Isaac River PRCP Conditions
Peak Velocities - 39% AEP



\\lau.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CADGIS\GIS\ArcAutoMapping\010\Output\MXDs\620_040713_APPENDIX B1-3-2_F08_02p_v.mxd





0

0.325

0.65

1.3

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

 Voids

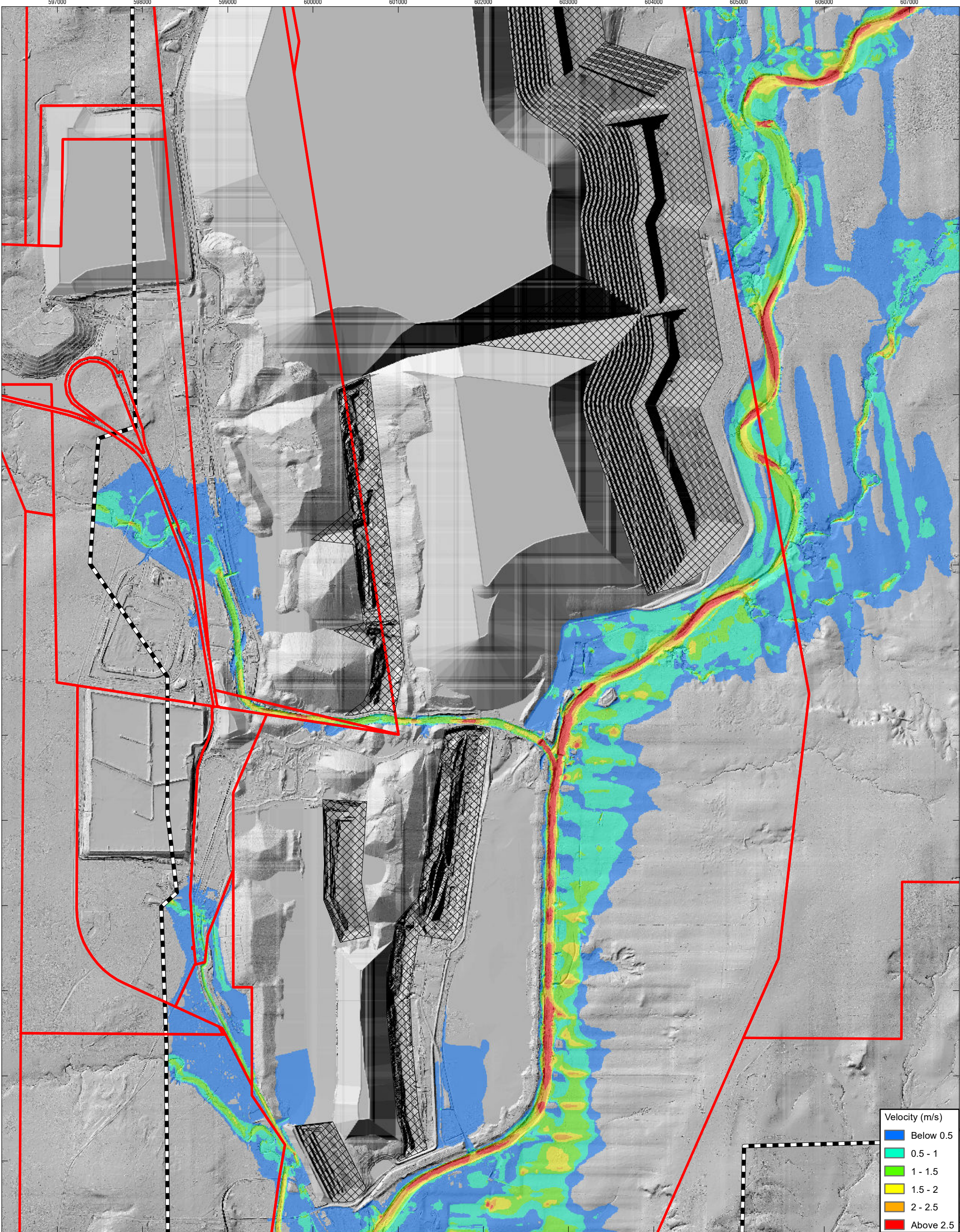
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Isaac River PRCP Conditions
Peak Velocities - 2% AEP



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CADGIS\GIS\ArcAutoMapping\010\Output\MXDs\620_040713_APPENDIX B1-3-3_F08_1in1000_v.mxd



0 0.325 0.65 1.3 km

Coordinate System: GDA2020 MGA Zone 55
Scale: 1:40,000 at A3
Project Number: 620.040713
Date: 25-Sep-2024
Drawn by: TS

LEGEND

- Mining Leases
- Voids
- TUFLOW Model Extent

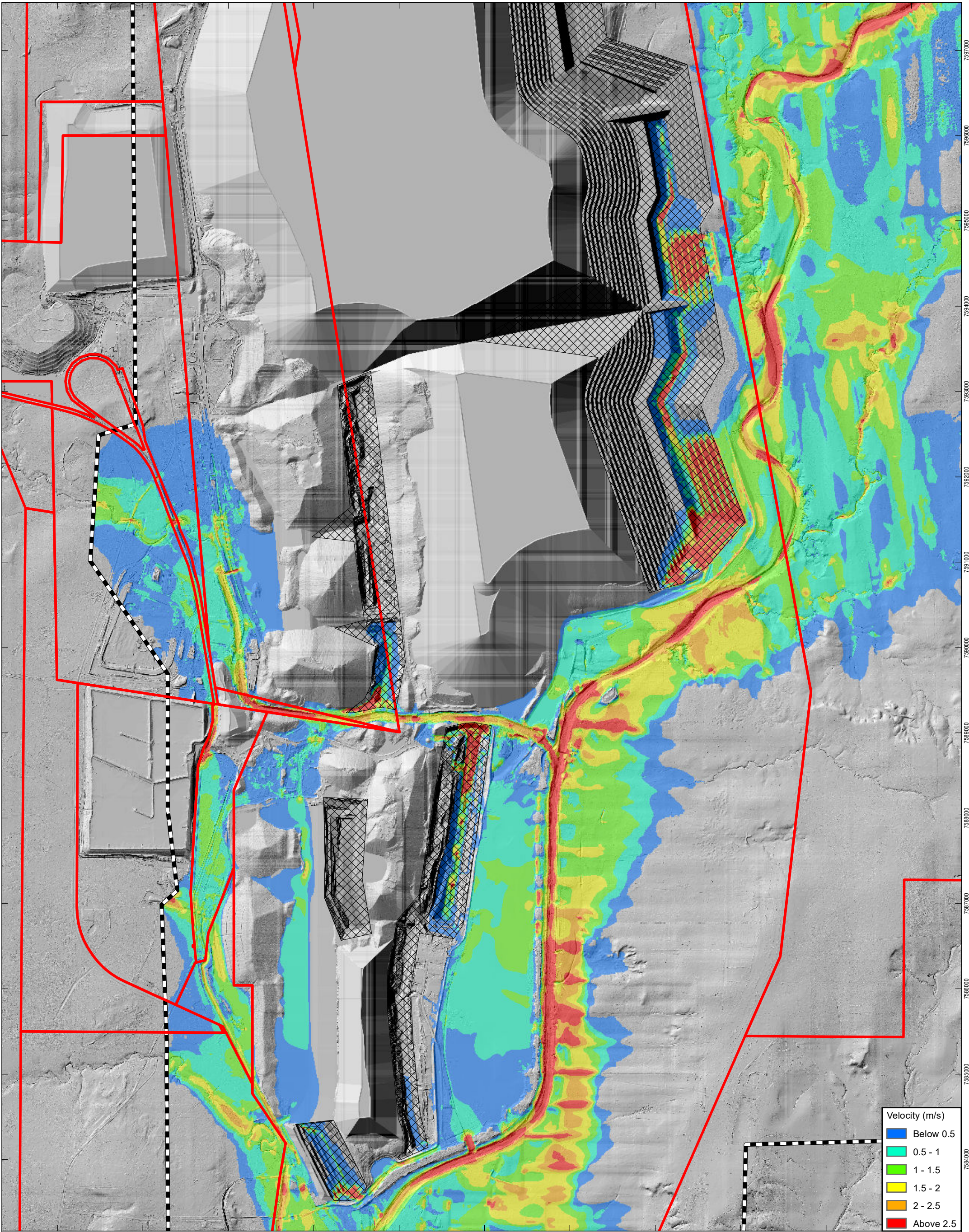
Velocity (m/s)	
	Below 0.5
	0.5 - 1
	1 - 1.5
	1.5 - 2
	2 - 2.5
	Above 2.5

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Isaac River PRCP Conditions
Peak Velocities - 0.1% AEP



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CADGIS\GIS\ArcAuto\Maping\010\Output\MXDs\620_040713_APPENDIX B1-3-4_F08_PMP_v.mxd



0 0.325 0.65 1.3 km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

Mining Leases

Voids

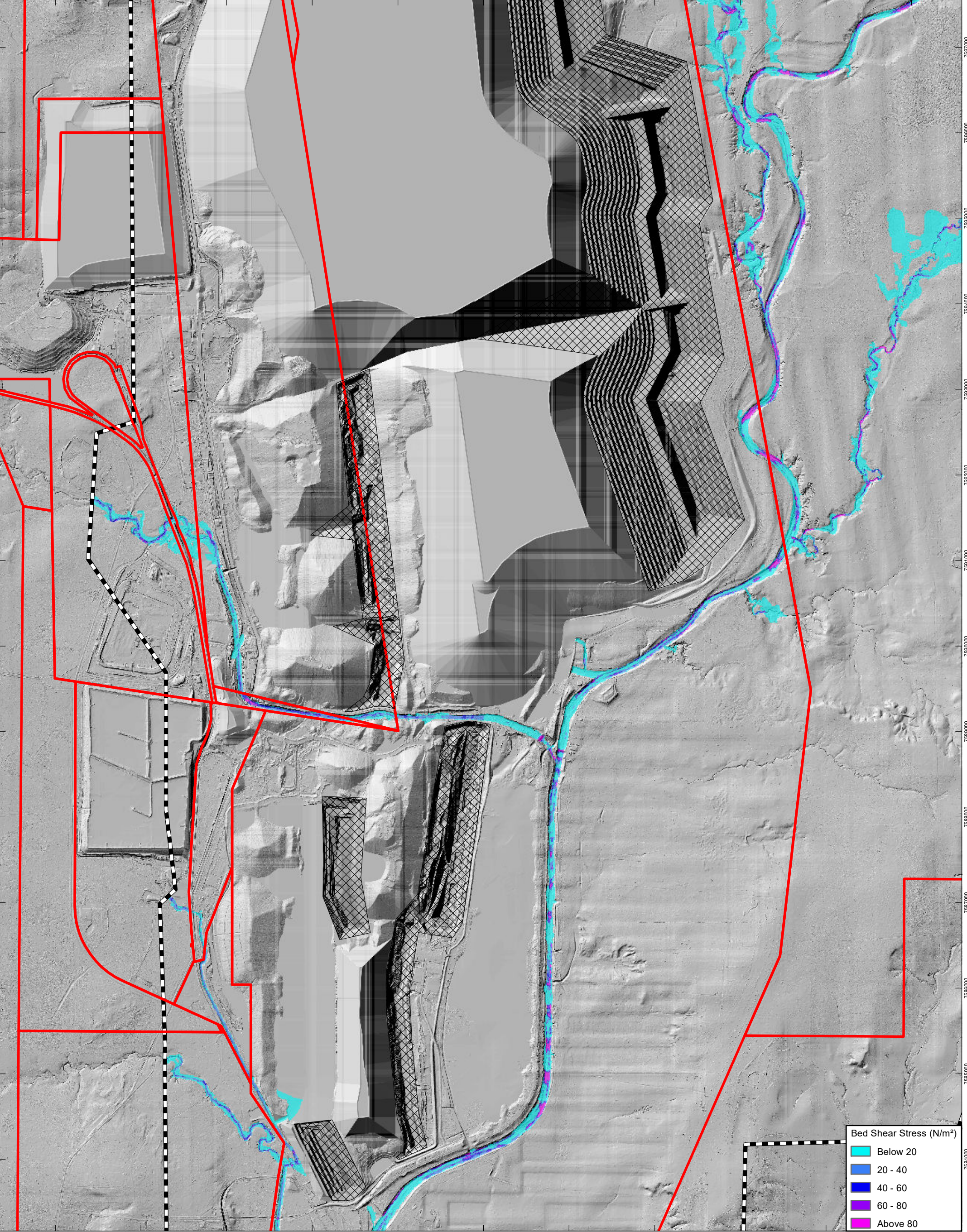
TUFLOW Model Extent



**Goonyella Complex PRCP
Rehabilitation Flood Assessment**

**Isaac River PRCP Conditions
Peak Velocities - PMF**

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713_00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CADGIS\GIS\ArcAutoMapping\010\Output\MXDs\620_040713_APPENDIX B1-4-1_F08_39p_bss.mxd





00.3250.651.3
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

 Voids

 TUFLOW Model Extent

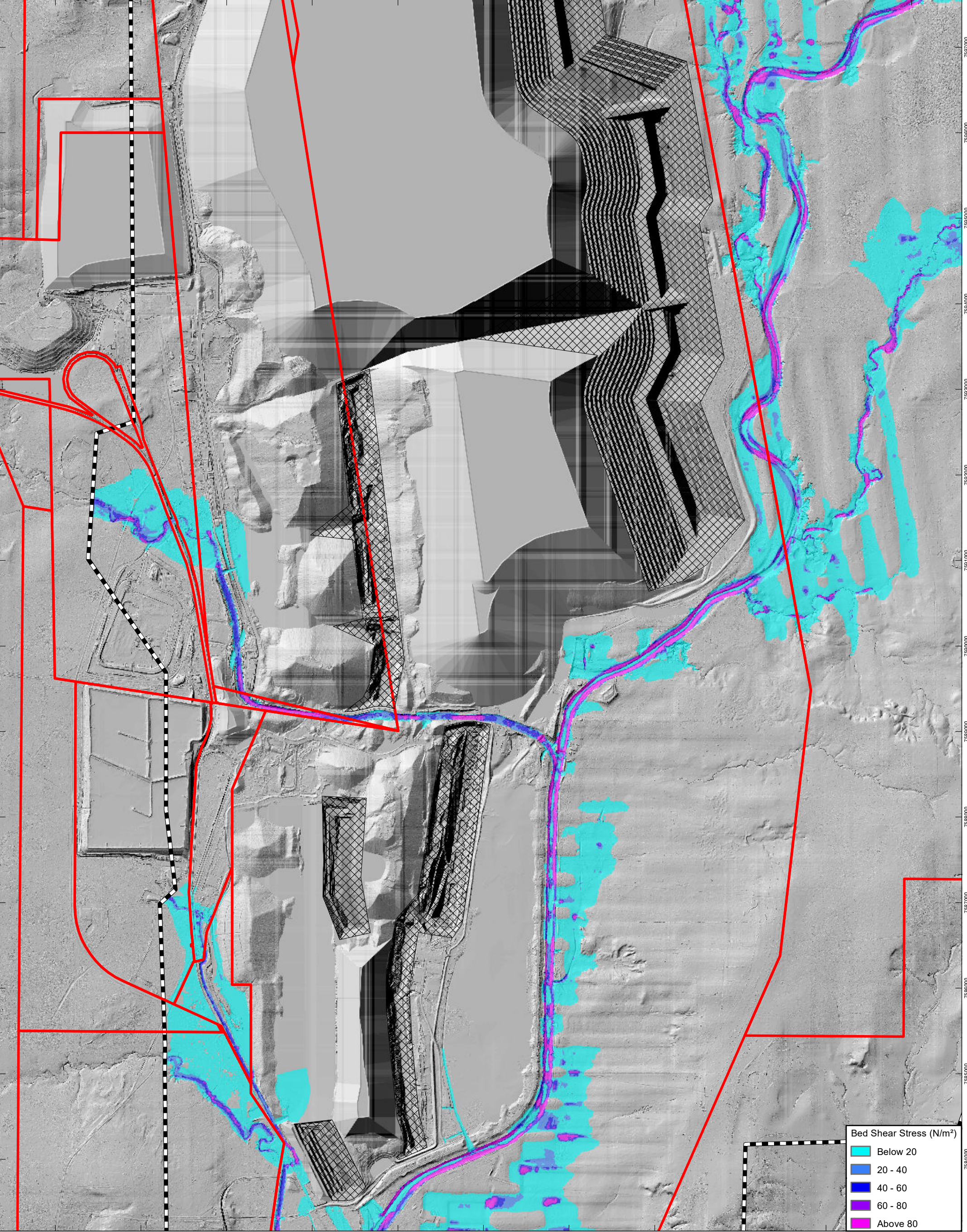
Bed Shear Stress (N/m²)	
	Below 20
	20 - 40
	40 - 60
	60 - 80
	Above 80

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Isaac River PRCP Conditions
Peak Bed Shear Stress - 39% AEP



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713_00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CADGIS\GIS\ArcAuto\Maping\010\Output\MXDs\620_040713_APPENDIX B1-4-2_F08_02p_bss.mxd





00.3250.651.3 km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

 Voids

 TUFLOW Model Extent

Bed Shear Stress (N/m²)	
	Below 20
	20 - 40
	40 - 60
	60 - 80
	Above 80

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Isaac River PRCP Conditions
Peak Bed Shear Stress - 2% AEP



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620-040713_00001 GRM RHM PRCP Rehab Flood Assea\06 SLR Data\01 CADGIS\GIS\ArcAutoMapping\010\Output\MXDs\620_040713_APPENDIX B1-5-1_F08_39p_sp.mxd





00.3250.651.3
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

 Voids

 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Isaac River PRCP Conditions
Peak Stream Power - 39% AEP



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CADGIS\GIS\ArcAuto\Maping\010\Output\MXDs\620_040713_APPENDIX B1-5-2_F08_02p_sp.mxd





00.3250.651.3
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

 Voids

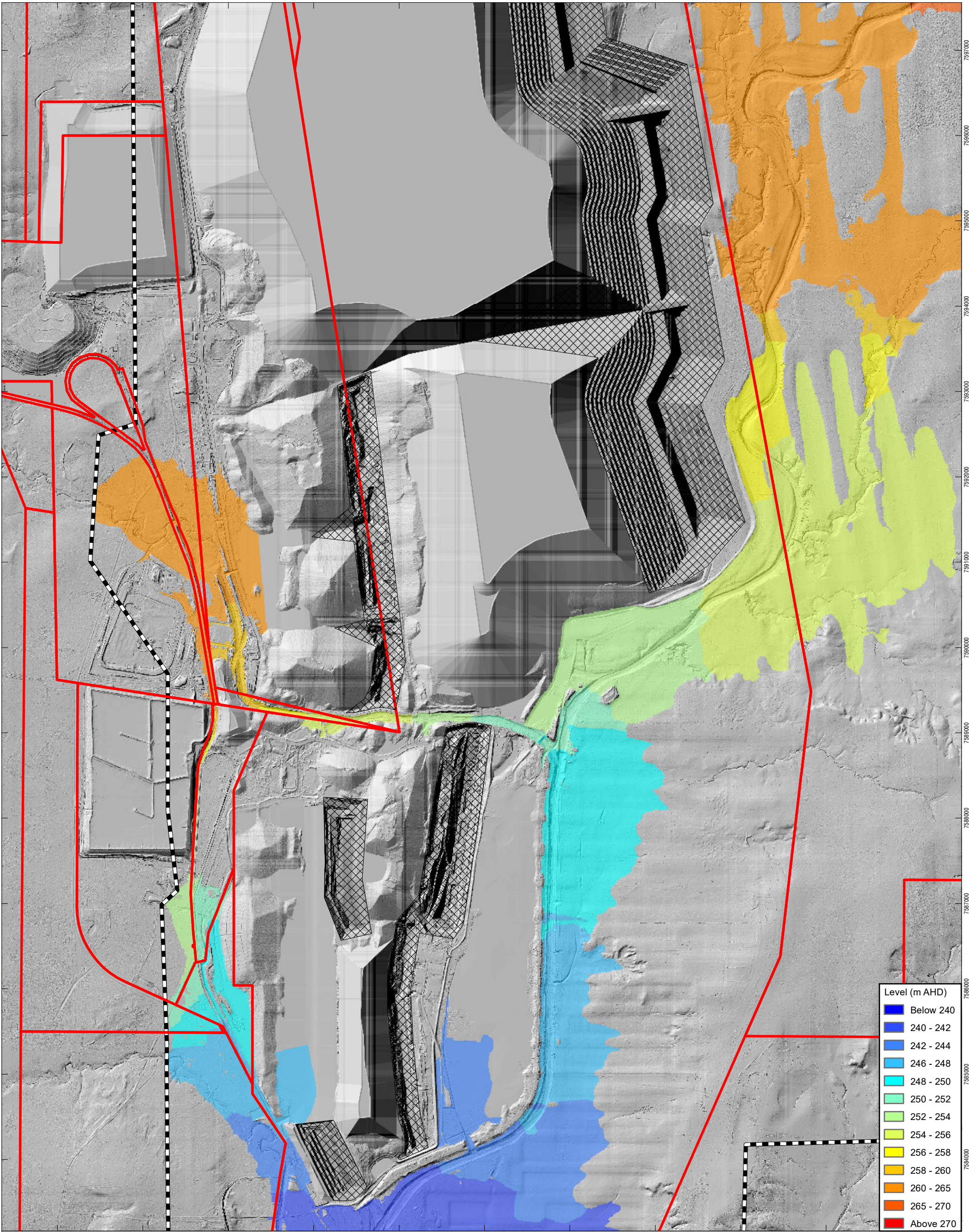
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Isaac River PRCP Conditions
Peak Stream Power - 2% AEP



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620-040713_00001 GRM RHM PRCP Rehab Flood Assessment\01\Output\MXDs\620_040713_APPENDIX B1-6-2_F08_1in1000C1rp_h.mxd





00.3250.651.3

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

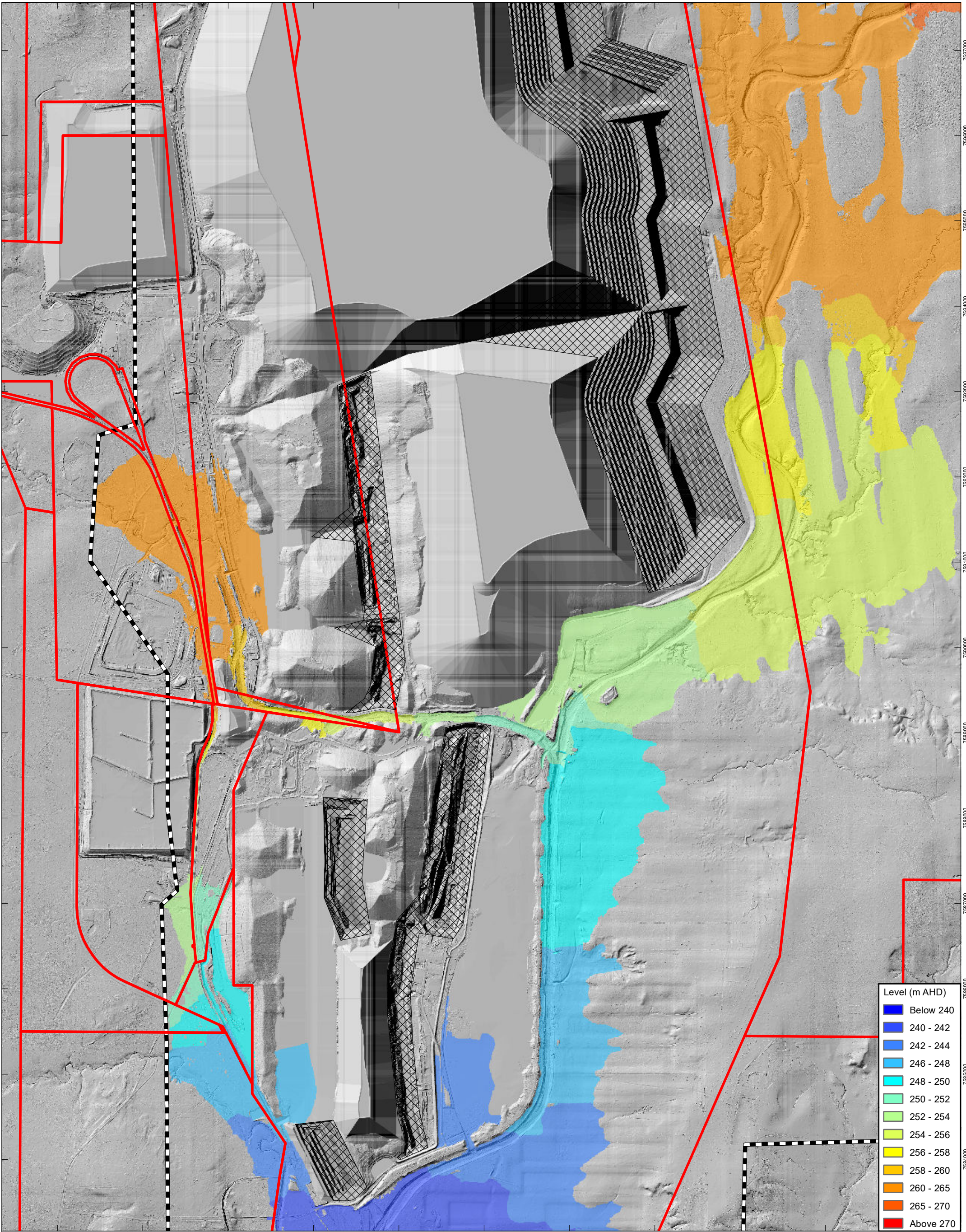
 TUFLOW Model Extent

**Goonyella Complex PRCP
Rehabilitation Flood Assessment**

**Isaac River PRCP Conditions
Peak Levels - 0.1% AEP + 11% rainfall intensity**



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assea\06 SLR Data\01 CADGIS\GIS\ArcAuto\Maping\010\Output\MXDs\620_040713_APPENDIX B1-6-3_F08_1in1000CC20p_h.mxd





00.3250.651.3 km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

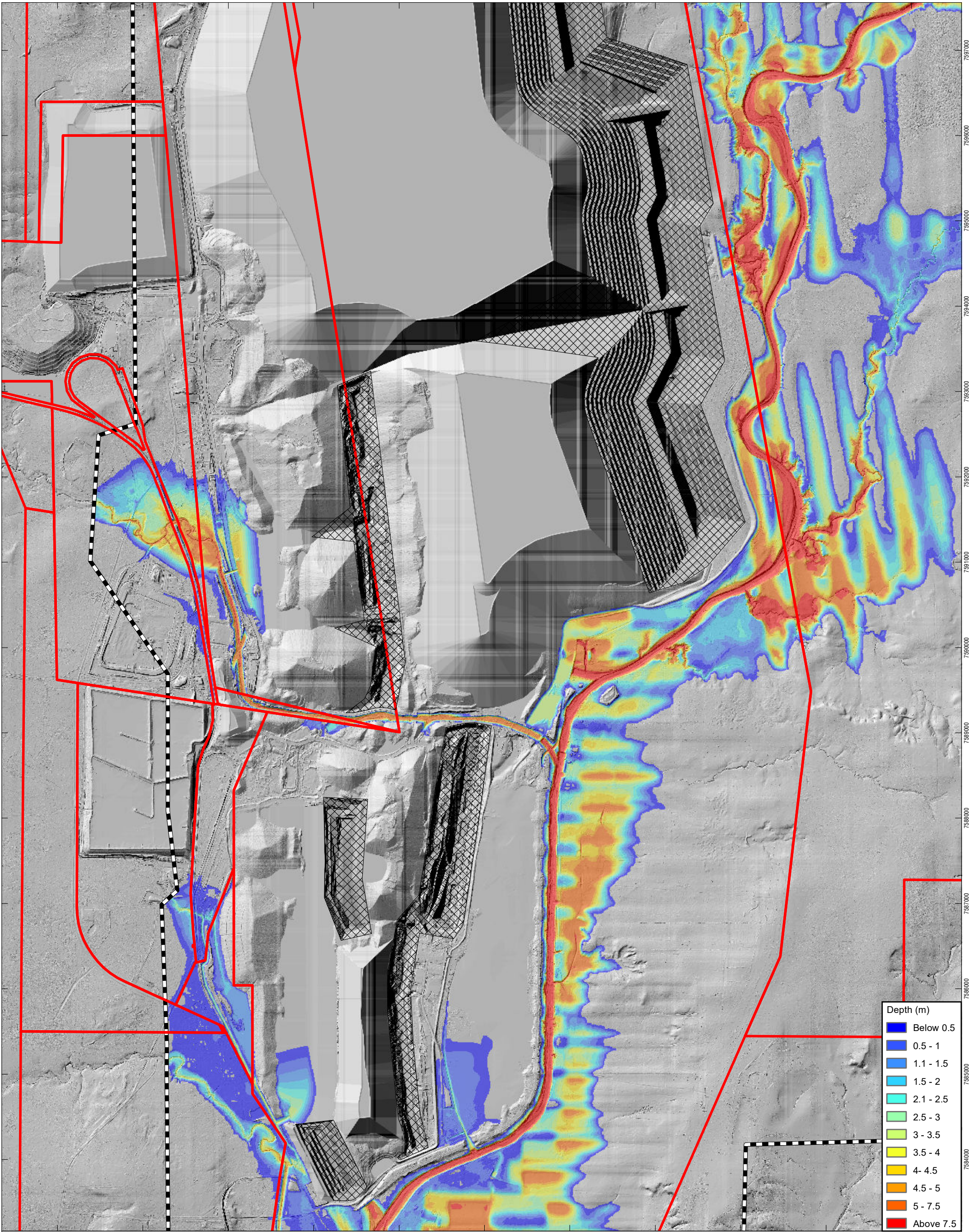
Level (m AHD)	
	Below 240
	240 - 242
	242 - 244
	246 - 248
	248 - 250
	250 - 252
	252 - 254
	254 - 256
	256 - 258
	258 - 260
	260 - 265
	265 - 270
	Above 270

**Goonyella Complex PRCP
Rehabilitation Flood Assessment**

**Isaac River PRCP Conditions
Peak Levels - 0.1% AEP + 20% rainfall intensity**



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assessment\010\Output\MXDs\620_040713_APPENDIX B1-7-1_F08_1in1000CC06p_d.mxd



 0 0.325 0.65 1.3 km
Coordinate System: GDA2020 MGA Zone 55
Scale: 1:40,000 at A3
Project Number: 620.040713
Date: 25-Sep-2024
Drawn by: TS

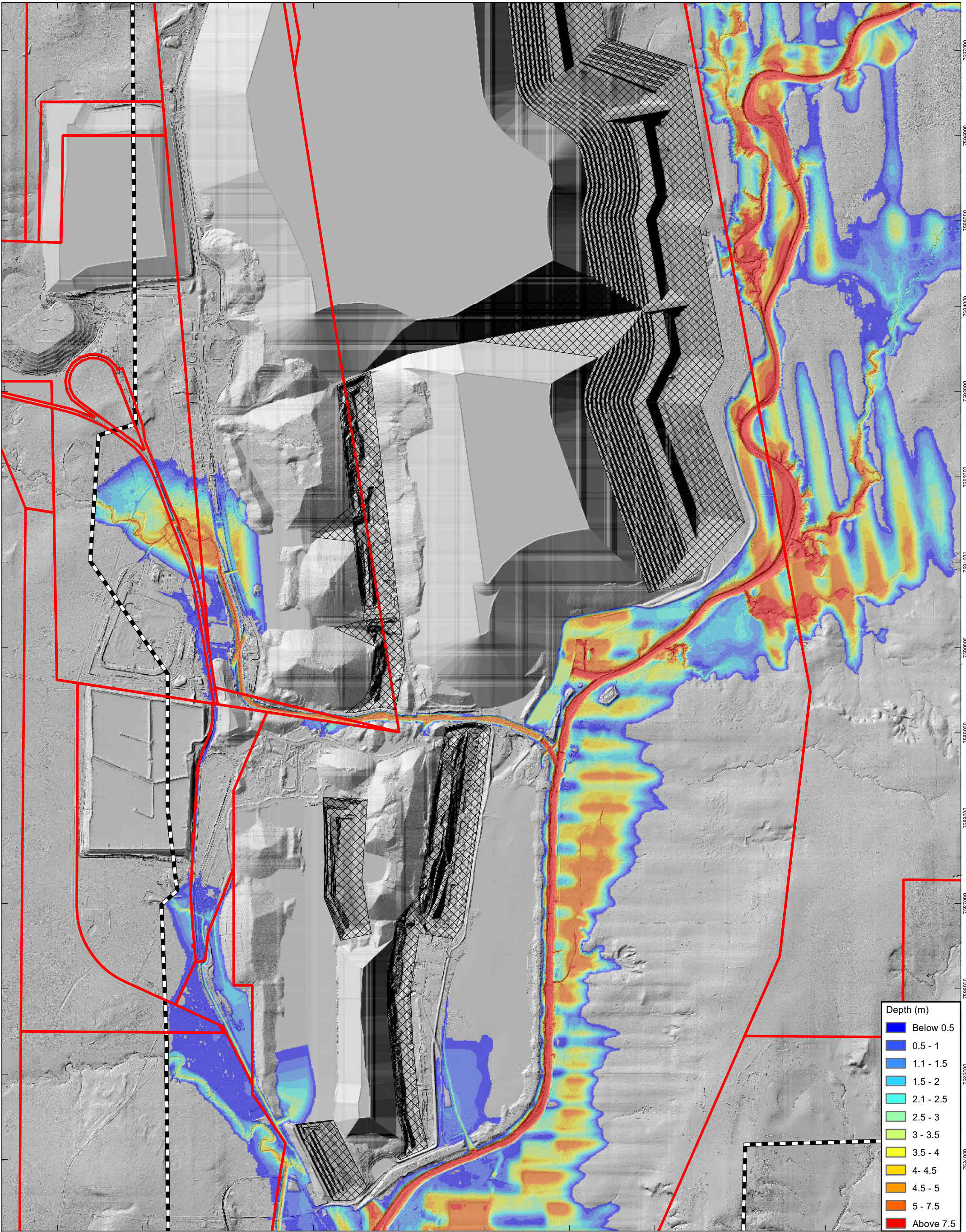
LEGEND
 Mining Leases
 Voids
 TUFLOW Model Extent

**Goonyella Complex PRCP
Rehabilitation Flood Assessment**

**Isaac River PRCP Conditions
Peak Depths - 0.1% AEP + 6% rainfall intensity**



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CADGIS\GIS\ArcAutoMapping\010\Output\MXDs\620_040713_APPENDIX B1-7-2_F08_1in1000C11p_d.mxd



 0 0.325 0.65 1.3 km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

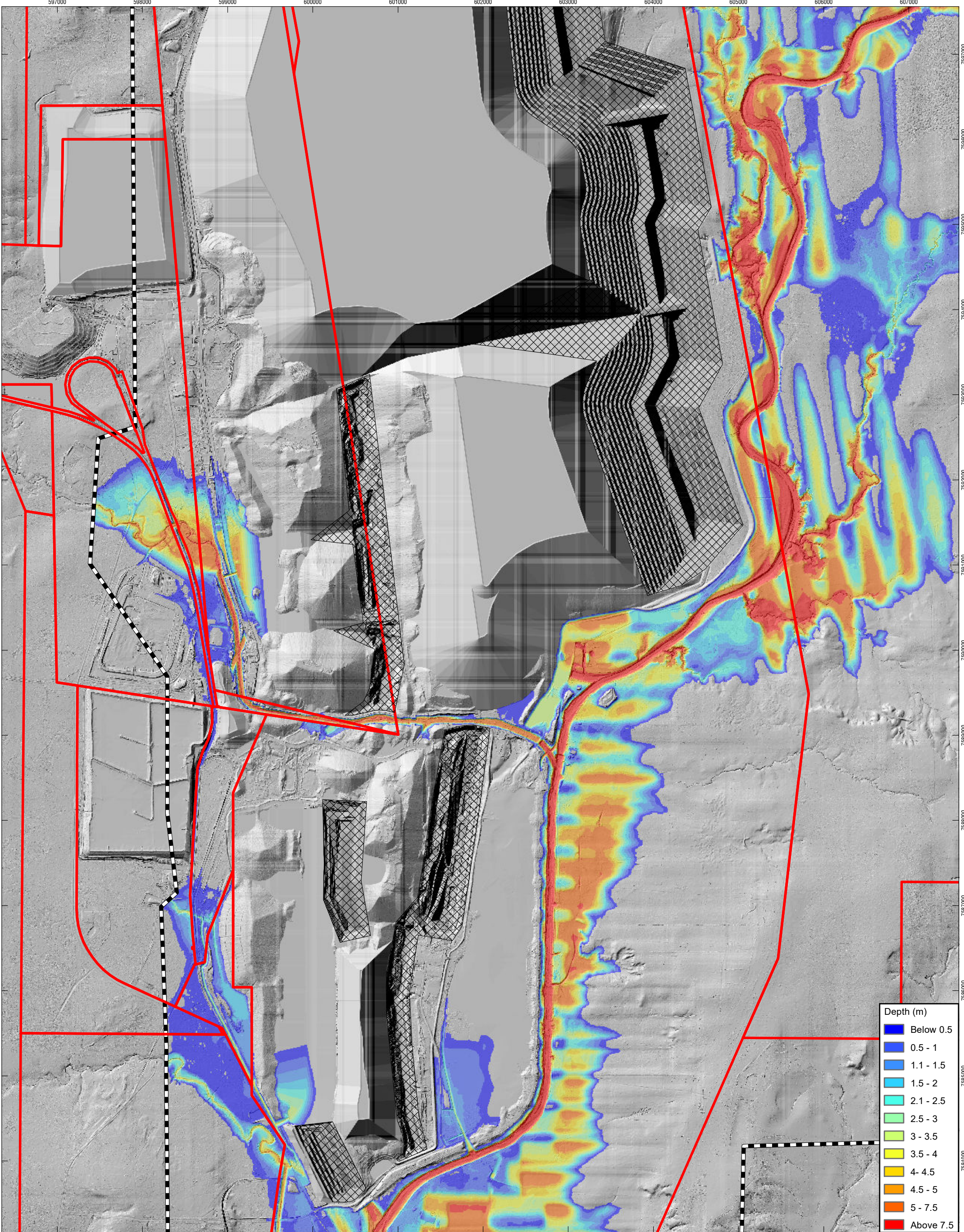
 TUFLOW Model Extent

**Goonyella Complex PRCP
Rehabilitation Flood Assessment**

**Isaac River PRCP Conditions
Peak Depths - 0.1% AEP + 11% rainfall intensity**



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CADGIS\GIS\ArcAutoMapping\010\Output\MXDs\620_040713_APPENDIX B1-7-3_F08_1in1000CC20p_d.mxd





00.3250.651.3
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

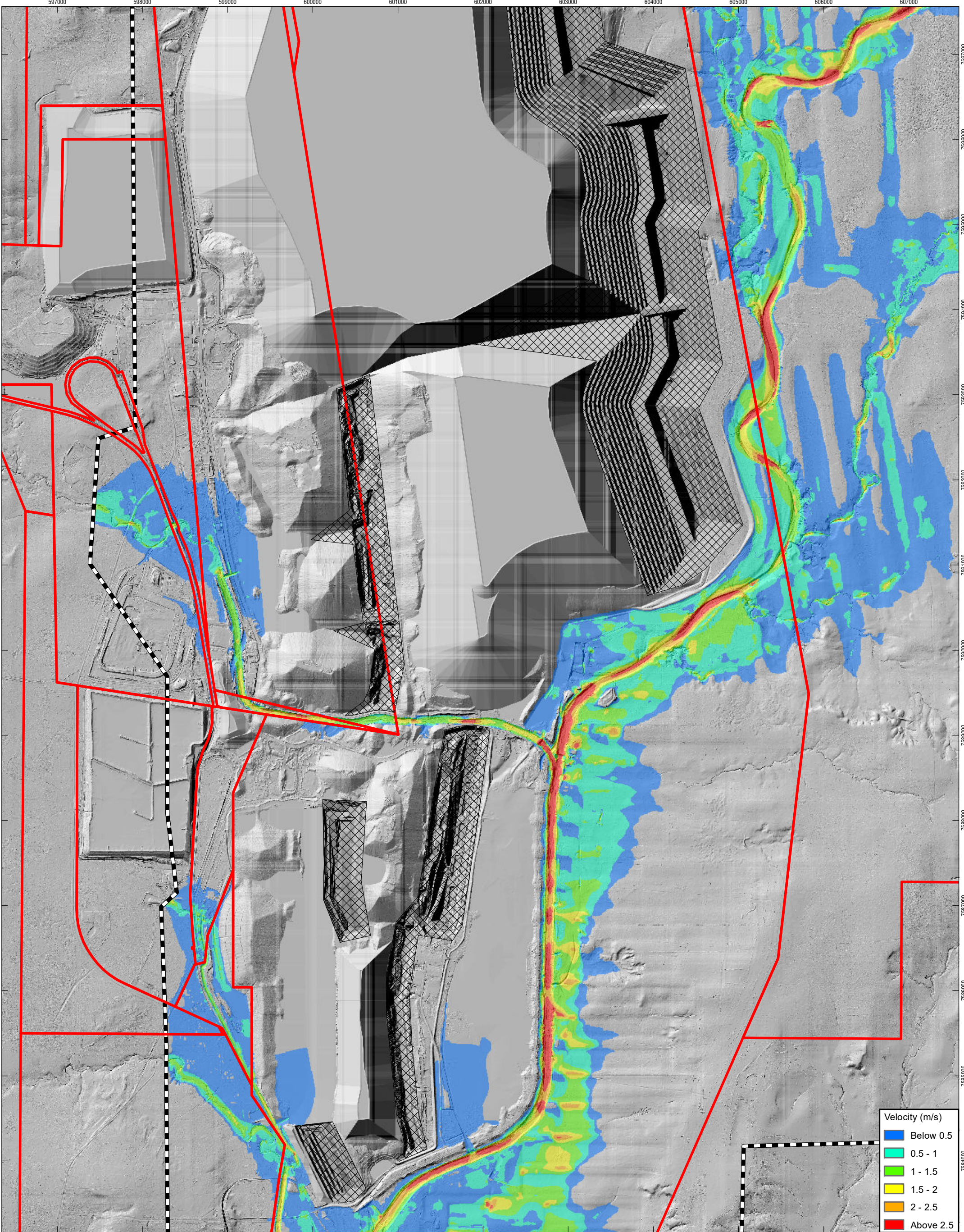
 TUFLOW Model Extent

**Goonyella Complex PRCP
Rehabilitation Flood Assessment**

**Isaac River PRCP Conditions
Peak Depths - 0.1% AEP + 20% rainfall intensity**



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CADGIS\GIS\ArcAutoMapping\010\Output\MXDs\620_040713_APPENDIX B1-8-1_F08_1in1000CC06p_v.mxd





00.3250.651.3
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

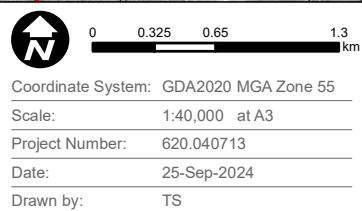
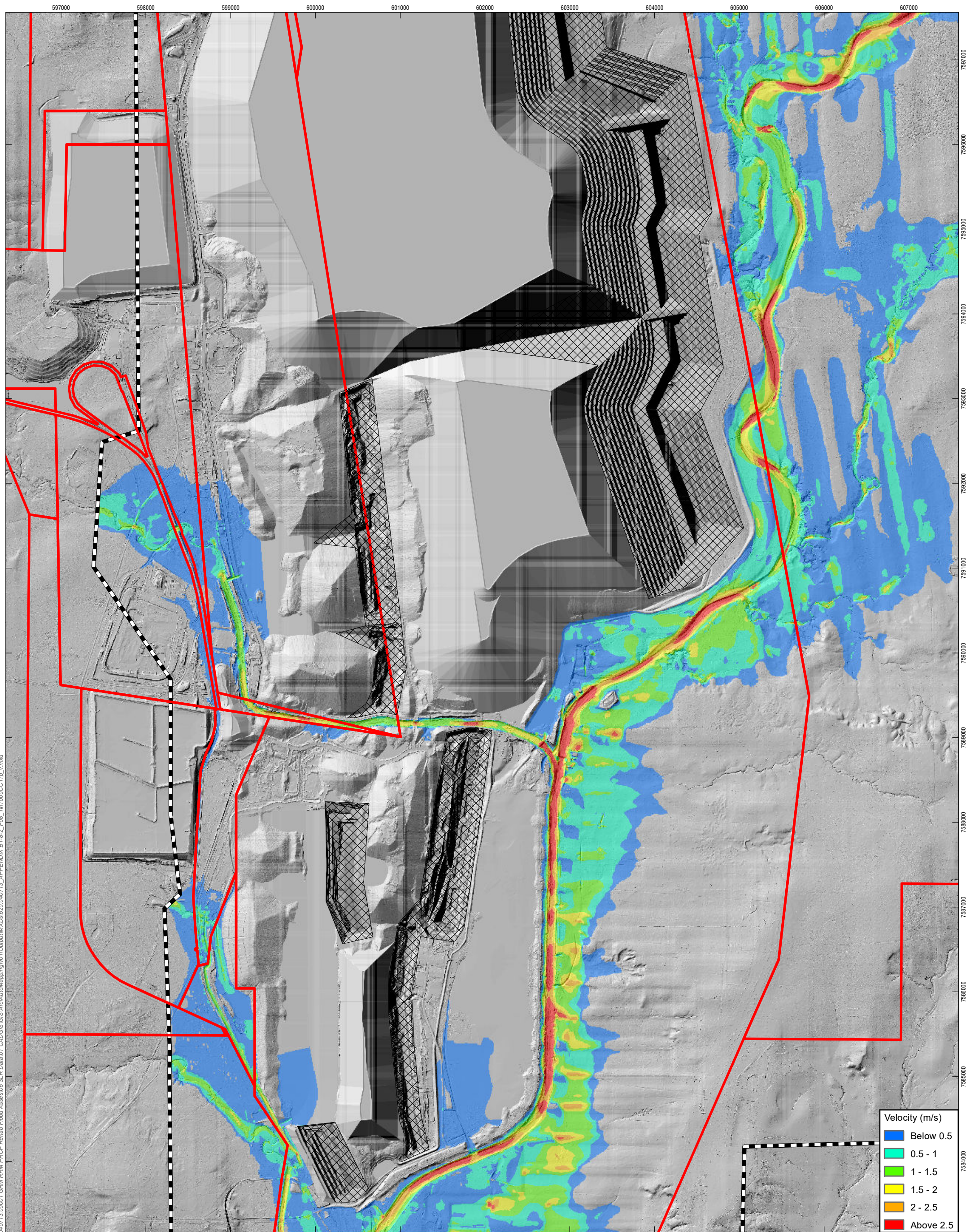
 Voids

 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Isaac River PRCP Conditions
Peak Velocities - 0.1% AEP + 6% rainfall intensity





LEGEND

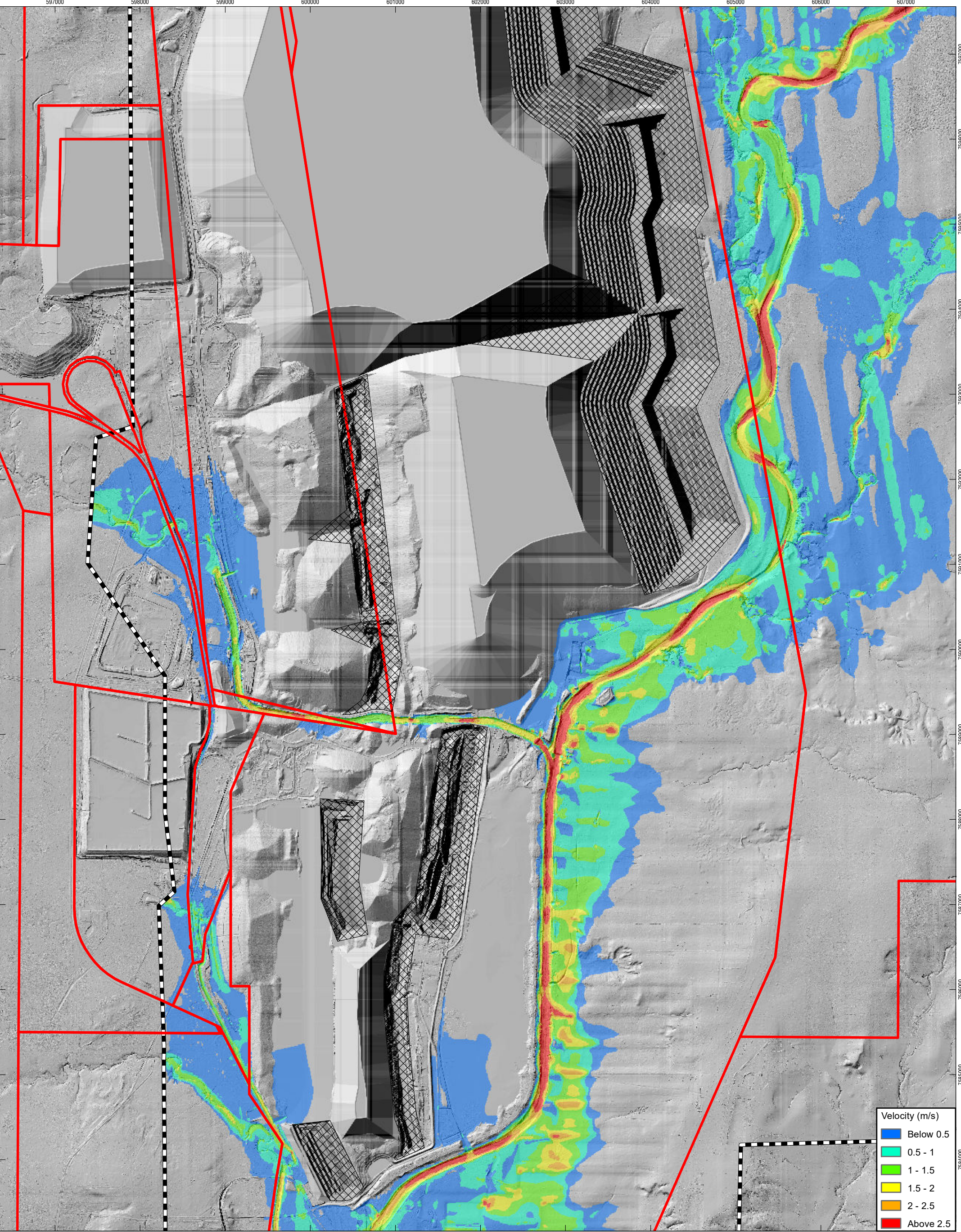
-  Mining Leases
-  Voids
-  TUFLOW Model Extent

**Goonyella Complex PRCP
Rehabilitation Flood Assessment**

Isaac River PRCP Conditions
Peak Velocities - 0.1% AEP + 11% rainfall intensity



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620-040713_00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CADGIS\GIS\ArcAutoMapping\010\Output\MXDs\620_040713_APPENDIX B1-8-3_F08_1in1000CC20p_v.mxd





00.3250.651.3 km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:40,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

 Voids

 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Isaac River PRCP Conditions
Peak Velocities - 0.1% AEP + 20% rainfall intensity



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\Output\MXD\620.040713_APPENDIX B2-1-1_F08_39p_h.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Levels - 39% AEP



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\Output\MXD\620-040713-APPENDIX B2-1-2_F08_02p_h.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Levels - 2% AEP



\\au.slr.local\Corporate\Projects\SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\Output\MXD\620-040713-APPENDIX B2-1-3_F08_1in1000_h.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

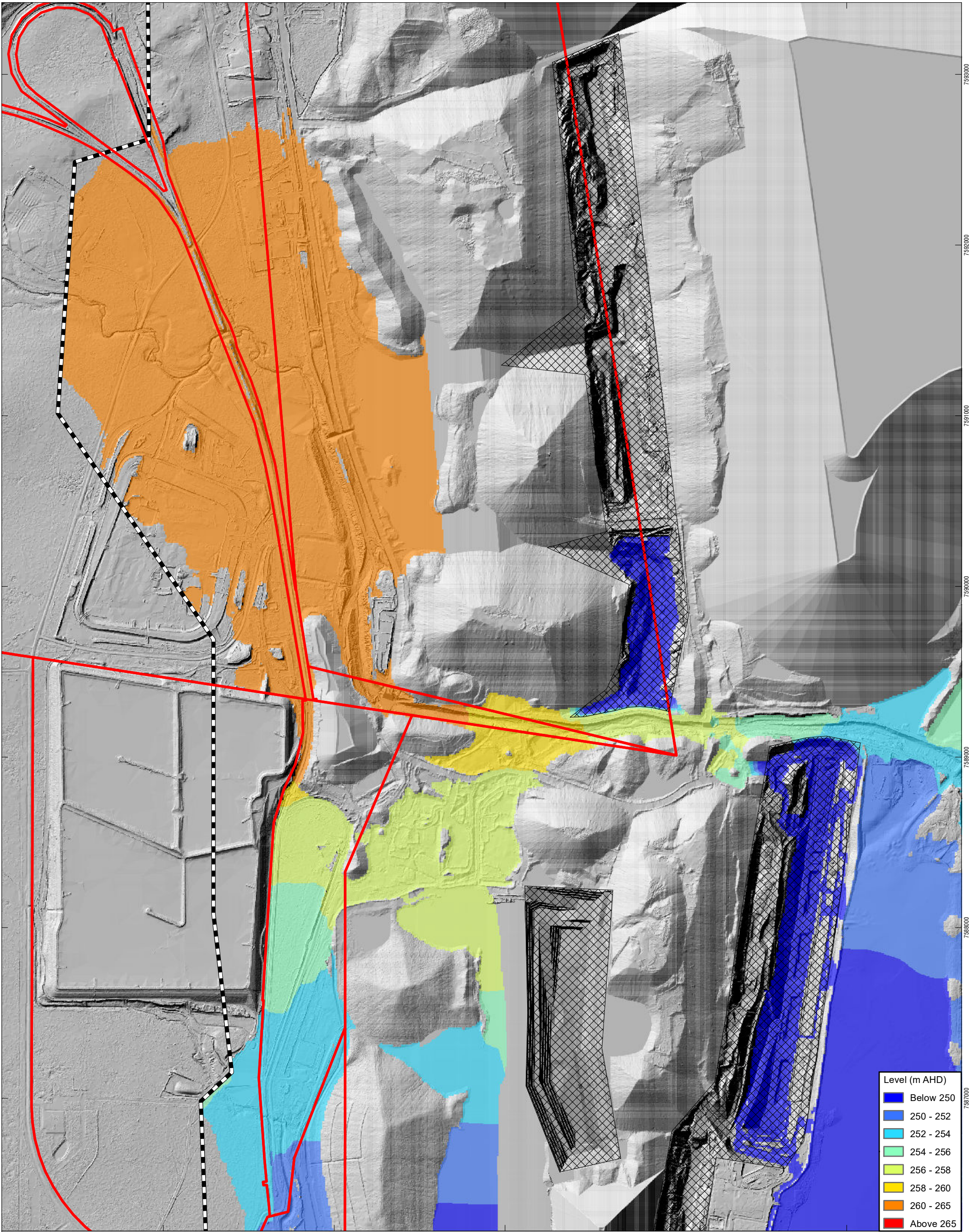
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Levels - 0.1% AEP



\\slr\local\Corporate\Projects\SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Asses\06 SLR Data\01 CADGIS\GIS\ArcAutoMapping\010\Output\MXD\620-040713-APPENDIX B2-1-4_F08_PMP_h.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

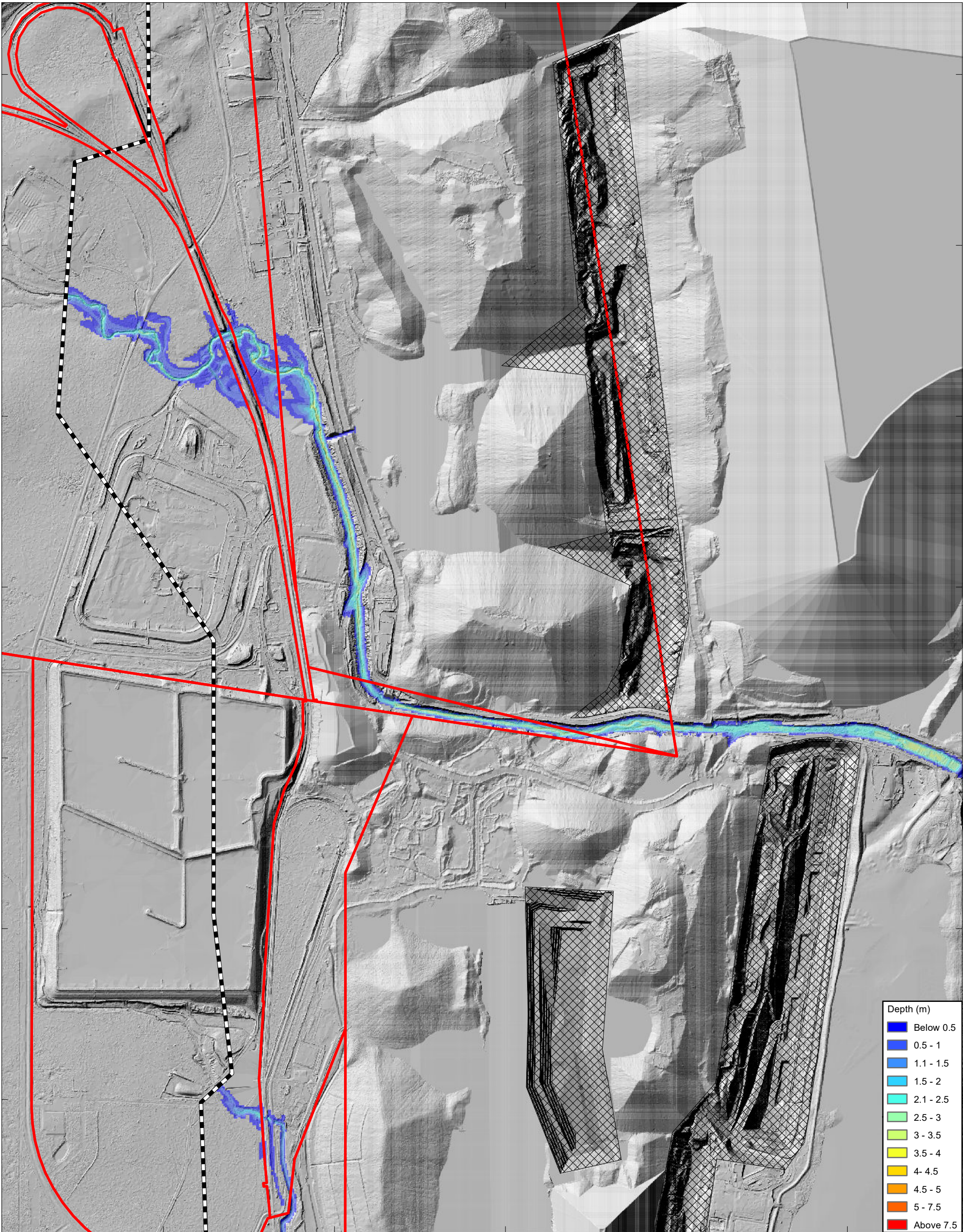
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Levels - PMF



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\Output\MXD\620-040713-APPENDIX B2-2-1_F08_39p_d.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

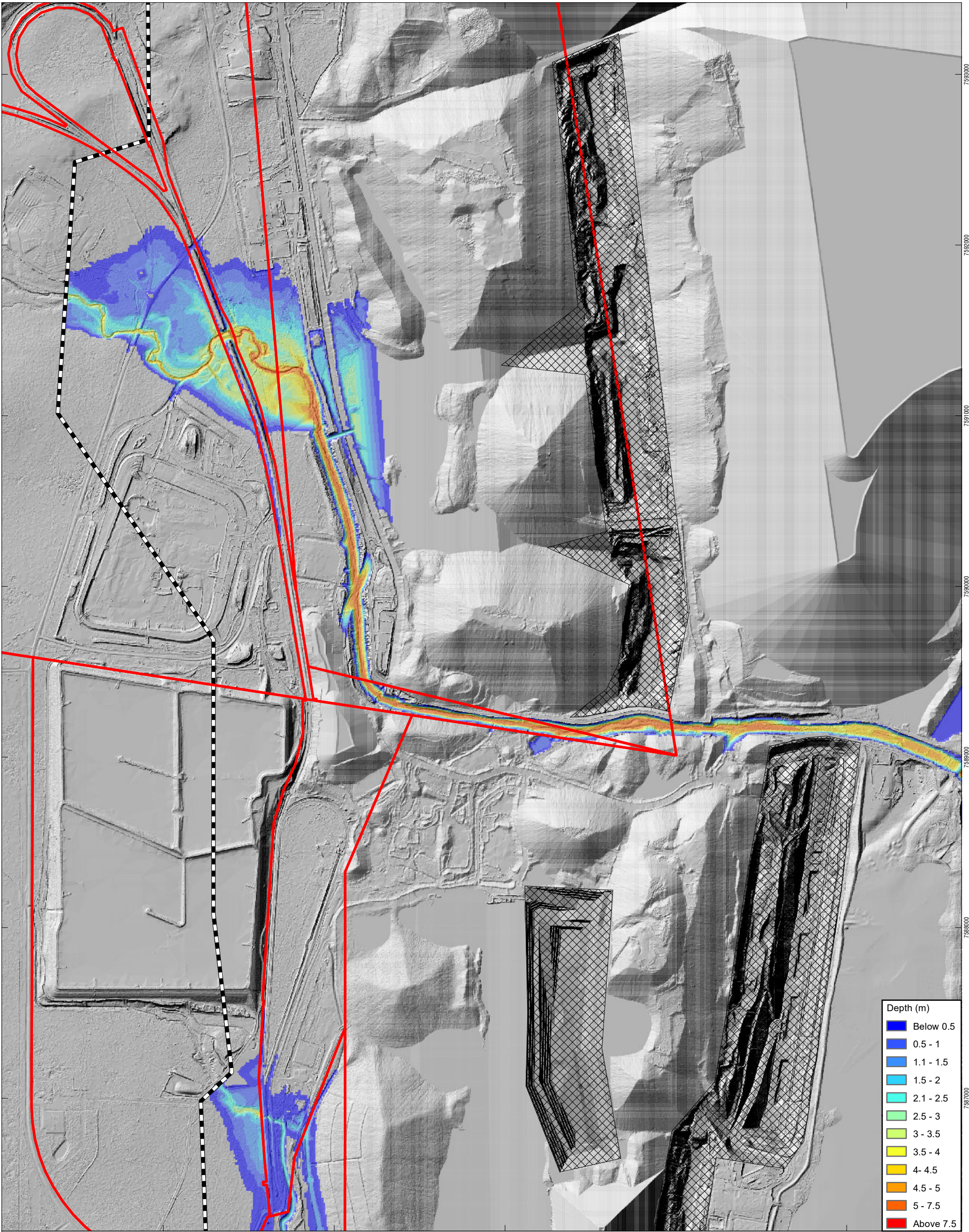
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Depths - 39% AEP



\\slr\local\Corporate\Projects\SLR\620-BNE\620-040713_00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\Output\MXD\620-040713_APPENDIX B2-2-2_F08_02p_d.mxd





00.150.30.6

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

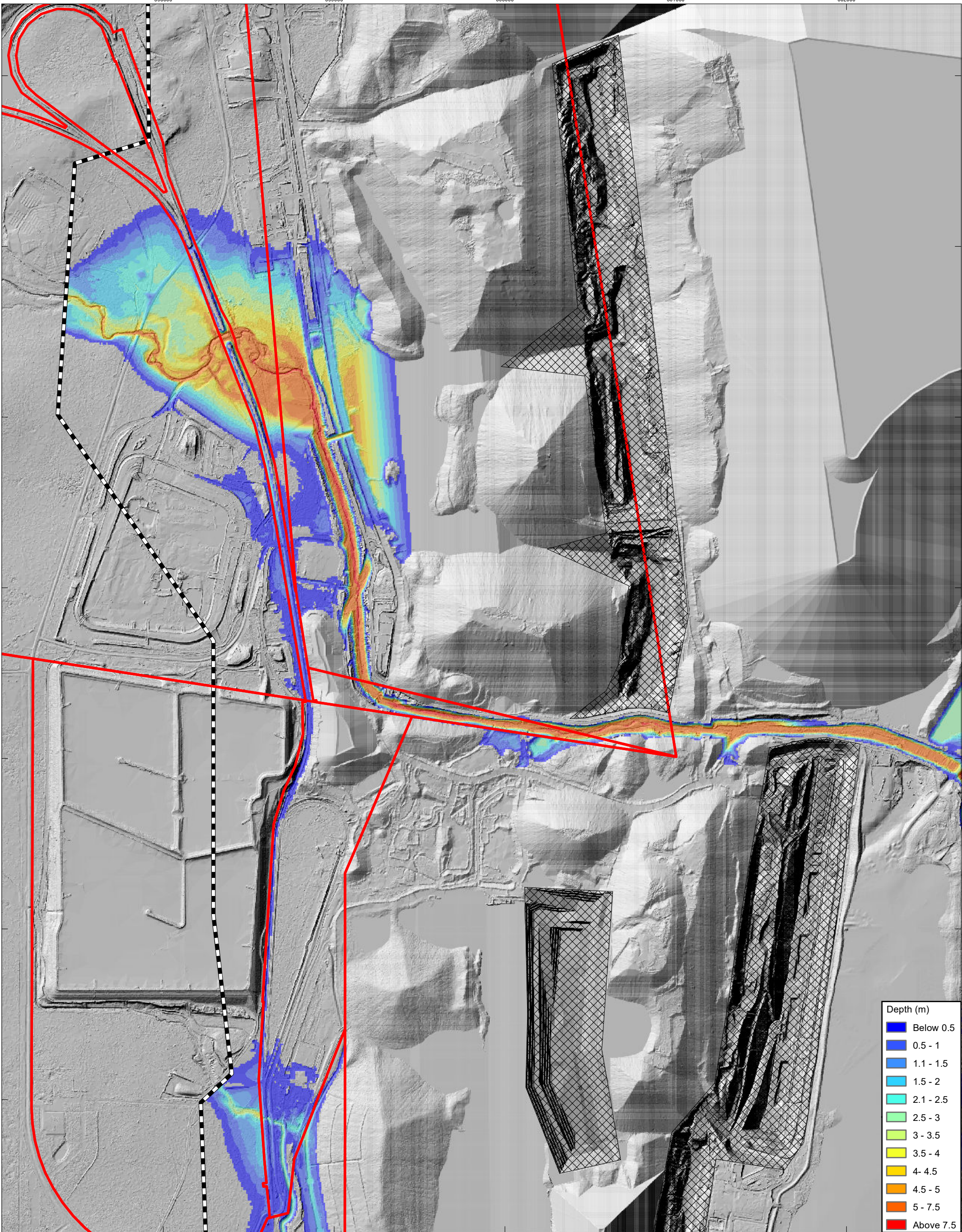
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Depths - 2% AEP



\\slr\local\Corporate\Projects\SLR\620-BNE\620-040713_00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\Output\MXD\620-040713_APPENDIX B2-2-3_F08_1in1000_d.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

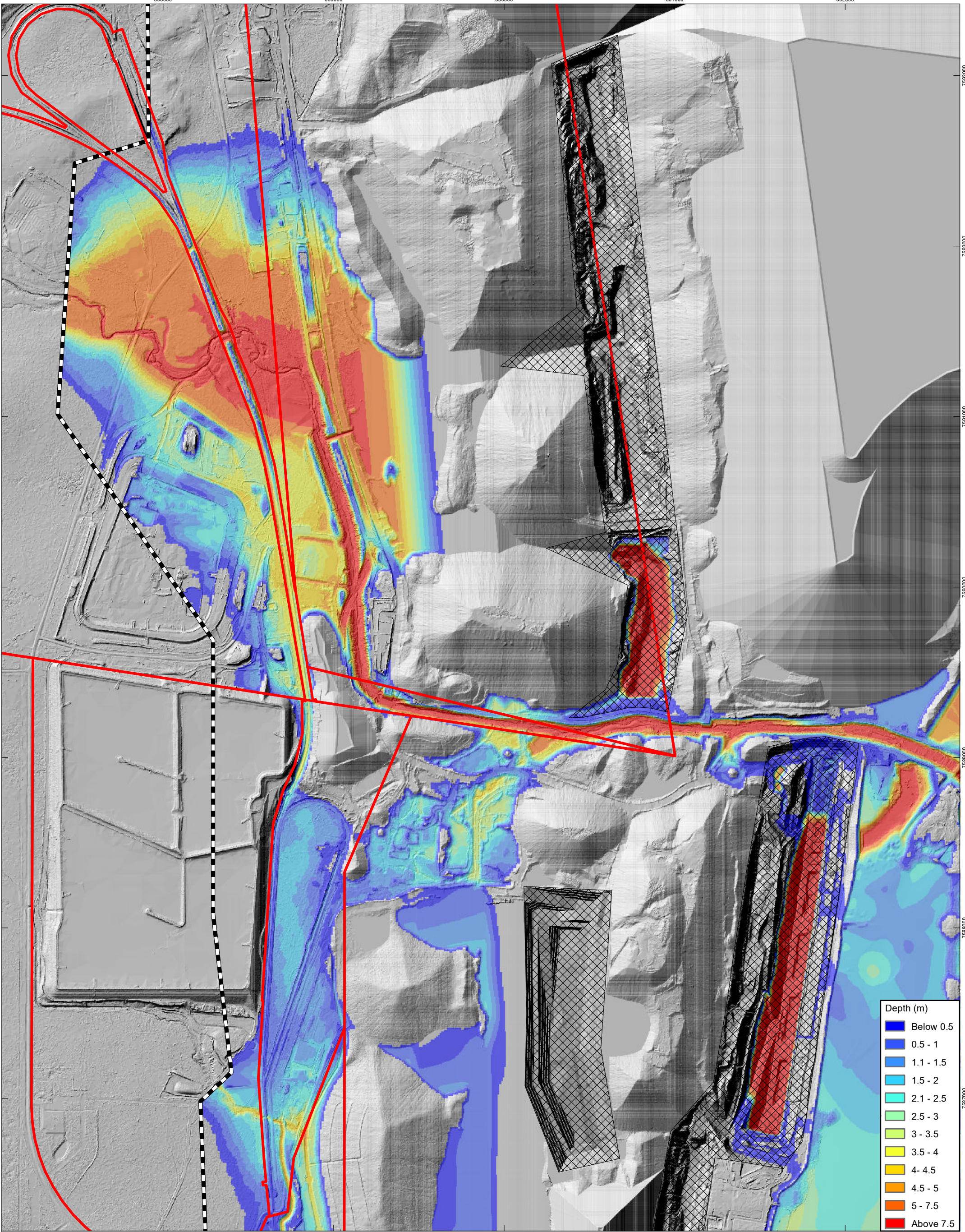
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Depths - 0.1% AEP



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Asses\06 SLR Data\01 CADGIS\GIS\ArcAuto\Maping\010\Output\MXD\620-040713-APPENDIX B2-2-4_F08_PMP_d.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Depths - PMF



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\Output\MXD\620-040713-APPENDIX B2-3-1_F08_39p_v.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

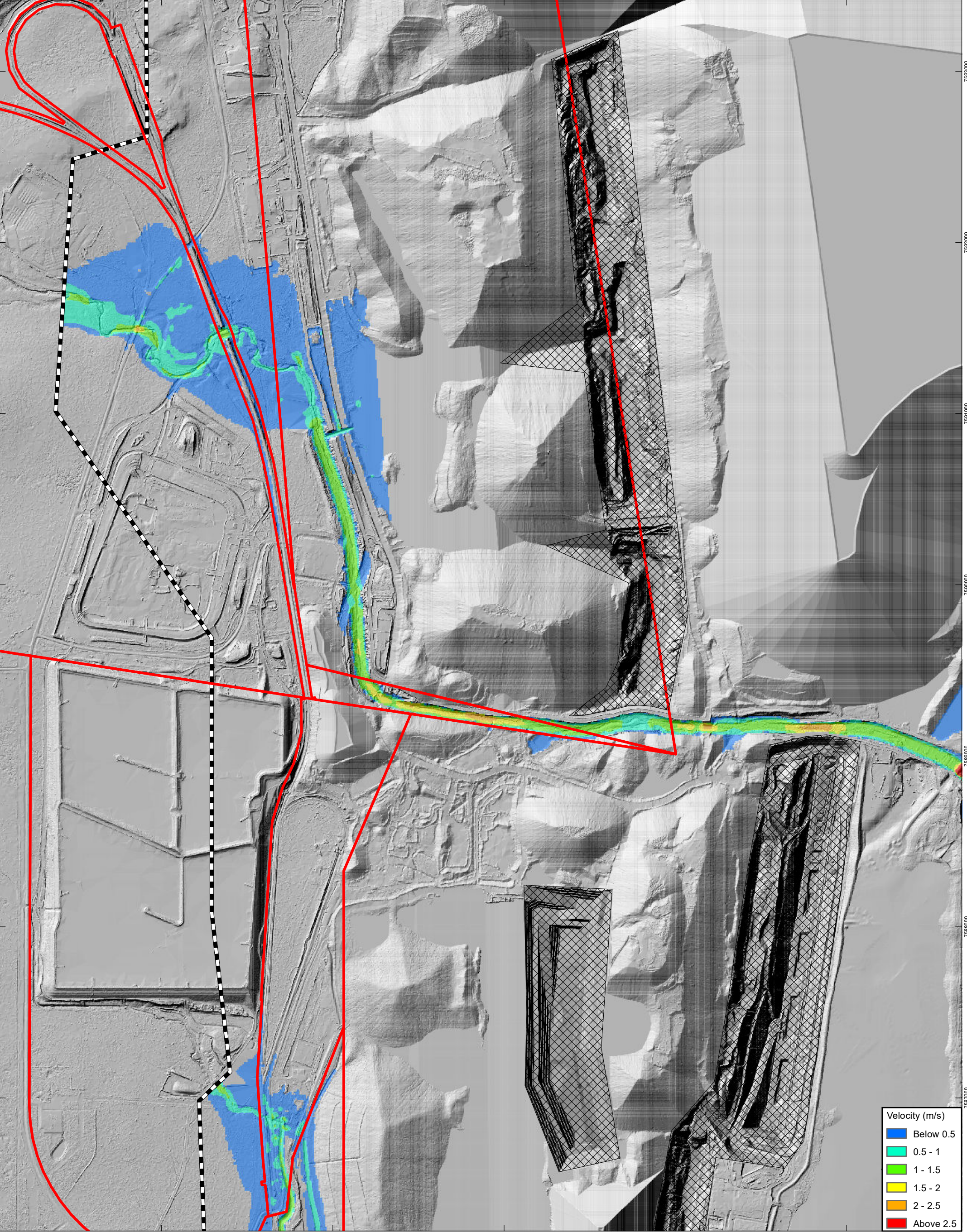
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Velocities - 39% AEP



\\slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\OutputMXDs\620-040713-APPENDIX B2-3-2_F08_02p_v.mxd





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km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

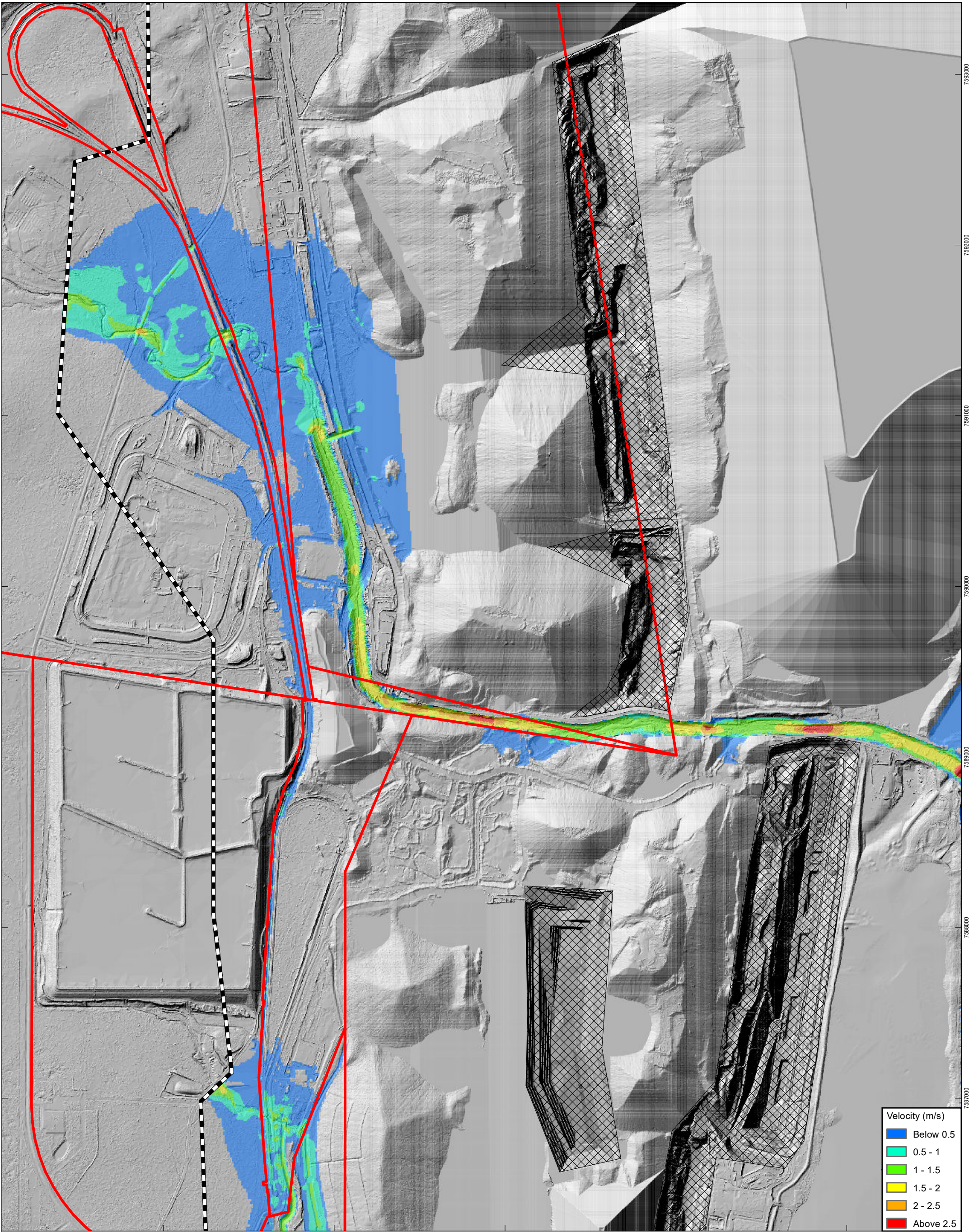
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Velocities - 2% AEP



\\slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assest\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\OutputMXDs\620-040713-APPENDIX B2-3-3_F08_1in1000_v.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

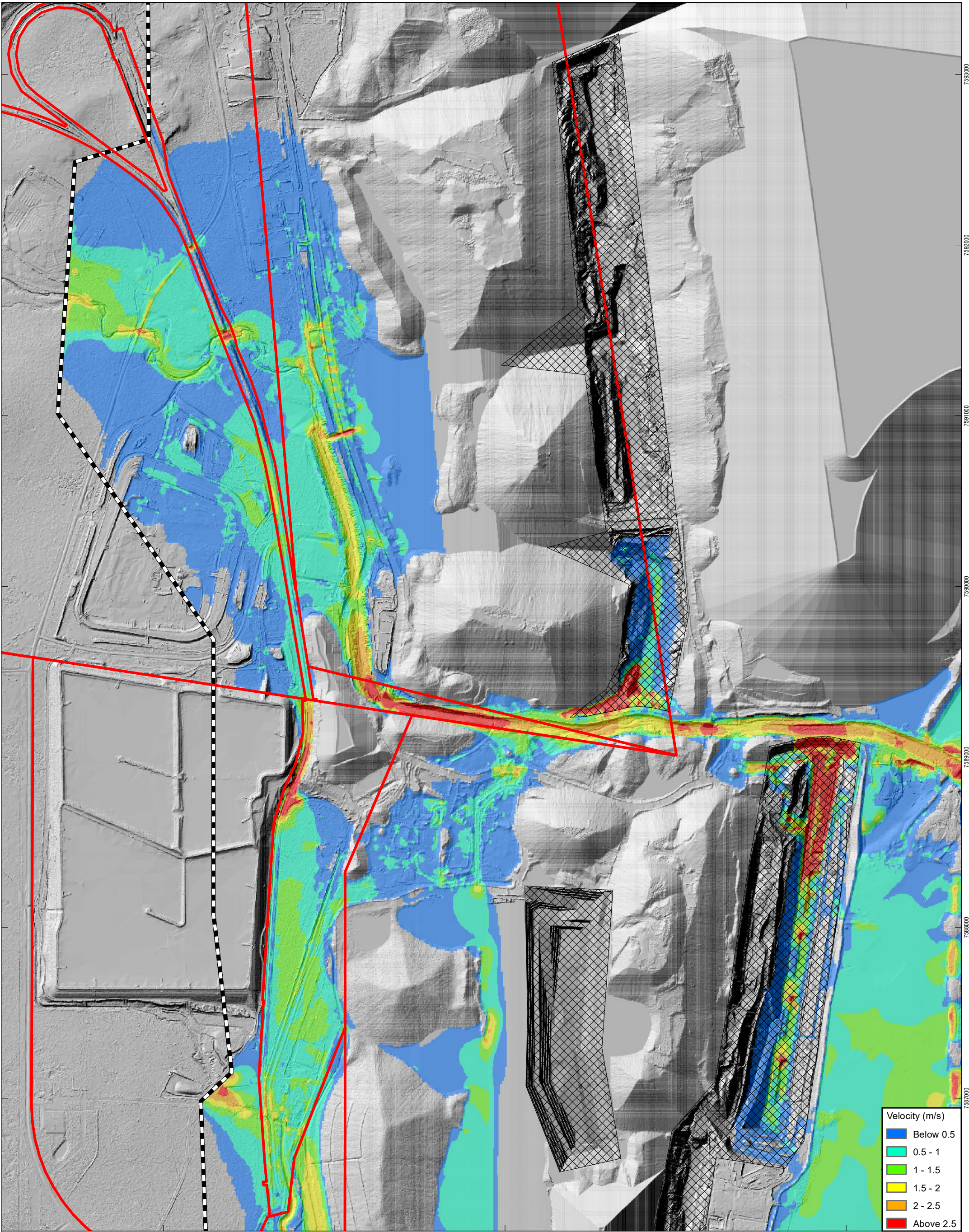
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Velocities - 0.1% AEP



\\slr\local\Corporate\Projects\SLR\620-BNE\620-040713_00001 GRM RHM PRCP Rehab Flood Asses\06 SLR Data\01 CADGIS\GIS\ArcAutoMapping\010\Output\MXDs\620-040713_APPENDIX B2-3-4_F08_PMP_v.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Velocities - PMF



\\slr\local\Corporate\Projects\SLR\620-BNE\620-040713_00001 GRM RHM PRCP Rehab Flood Assest\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\Output\MXD\620_040713_APPENDIX B2-4-1_F08_39p_bss.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

 Voids

 TUFLOW Model Extent

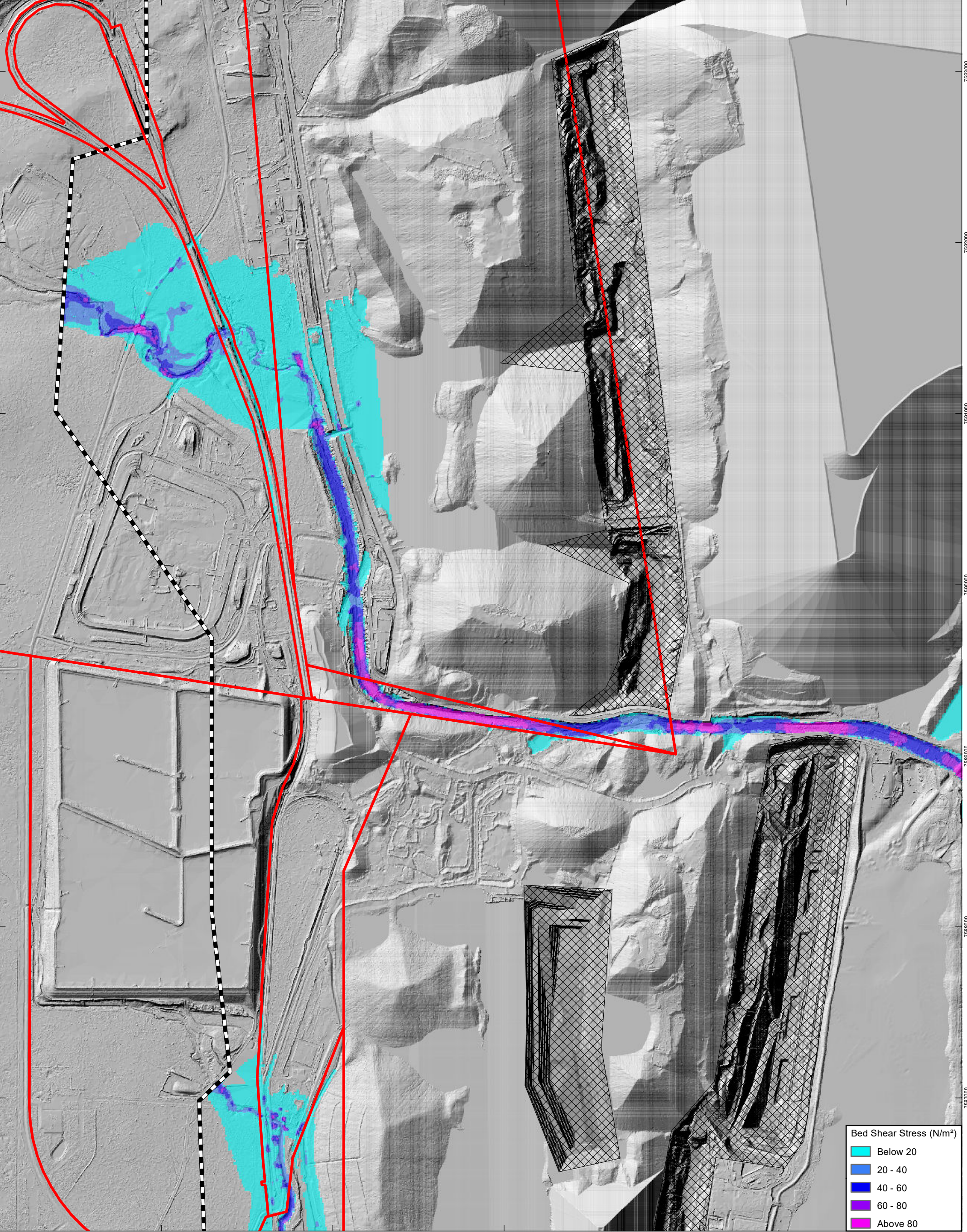
Bed Shear Stress (N/m²)	
	Below 20
	20 - 40
	40 - 60
	60 - 80
	Above 80

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Bed Shear Stress - 39% AEP



\\slr\local\Corporate\Projects\SLR\620-BNE\620-040713\00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\Output\MXDs\620_040713_APPENDIX B2-4-2_F08_02p_bss.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

 Voids

 TUFLOW Model Extent

Bed Shear Stress (N/m²)	
	Below 20
	20 - 40
	40 - 60
	60 - 80
	Above 80

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Bed Shear Stress - 2% AEP



\\slr.local\Corporate\Projects-SLR\620-BNE\620-040713_00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CAD\GIS\GIS\ArcAutoMapping\010\Output\MXD\620_040713_APPENDIX B2-5-1_F08_39p_sp.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

 Voids

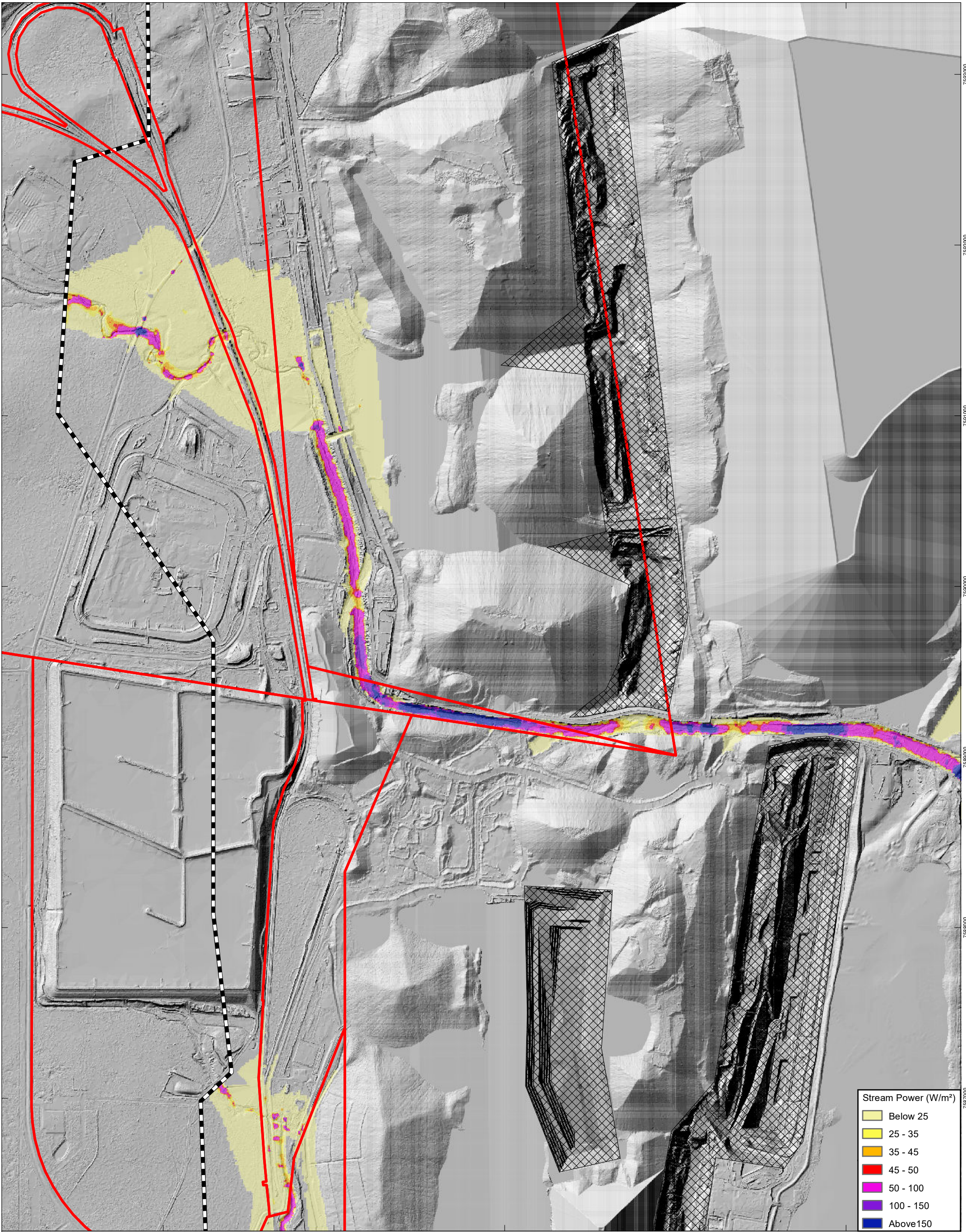
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Stream Power - 39% AEP



\\slr.local\Corporate\Projects-SLR\620-BNE\620-040713_00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\OutputMXDs\620-040713_APPENDIX B2-5-2_F08_02p_sp.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Stream Power - 2% AEP



\\au.slr.local\Corporate\Projects\SLR\620-BNE\620-040713_00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\Output\MXD\620_040713_APPENDIX B2-6-1_F08_1in1000CC06p_h.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

**Goonyella Complex PRCP
Rehabilitation Flood Assessment**

**Eureka Creek PRCP Conditions
Peak Levels - 0.1% AEP + 6% rainfall intensity**



\\slr\local\Corporate\Projects\SLR\620-BNE\620-040713_00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\Output\MXD\620_040713_APPENDIX B2-6-2_F08_1in1000CC1p_h.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

 Voids

 TUFLOW Model Extent

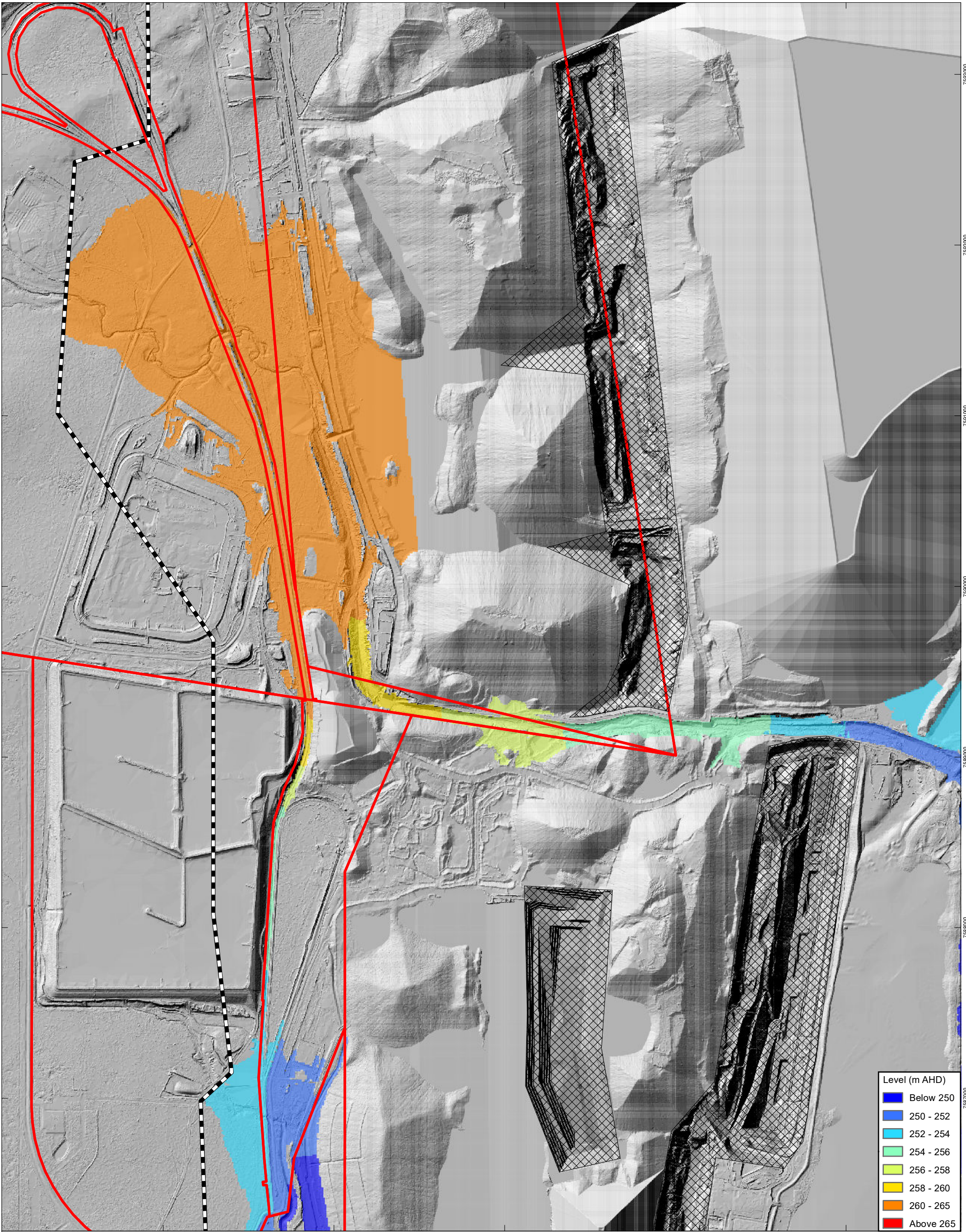
Level (m AHD)	
	Below 250
	250 - 252
	252 - 254
	254 - 256
	256 - 258
	258 - 260
	260 - 265
	Above 265

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Levels - 0.1% AEP + 11% rainfall intensity



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\Output\MXD\620-040713-APPENDIX B2-6-3_F08_1in1000CC20p_h.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

 Voids

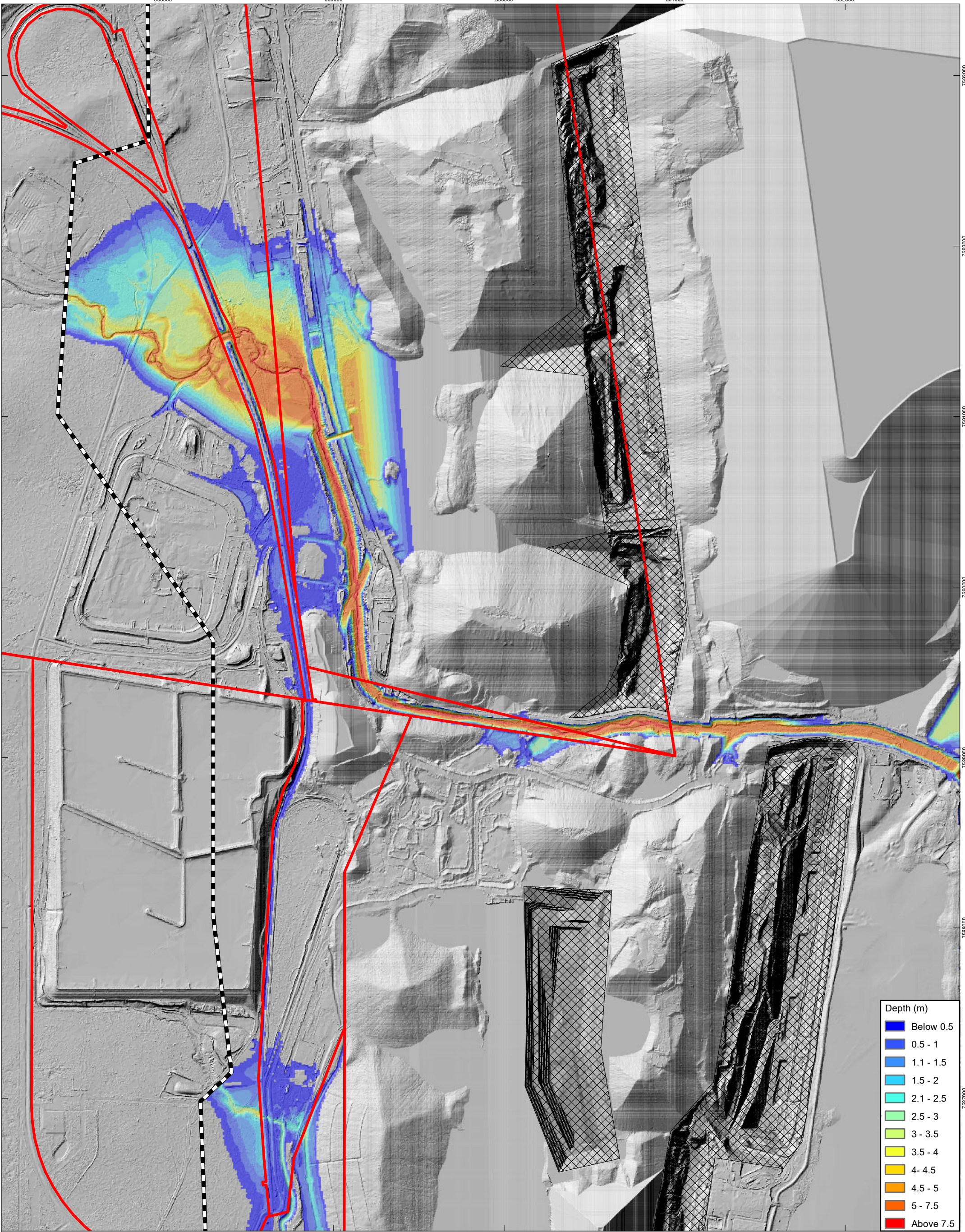
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Levels - 0.1% AEP + 20% rainfall intensity



\\slr.local\Corporate\Projects-SLR\620-BNE\620-040713_00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CADGIS\GIS\ArcAutoMapping\010\OutputMXDs\620-040713_APPENDIX B2-7-1_F08_1in1000CC06p_d.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

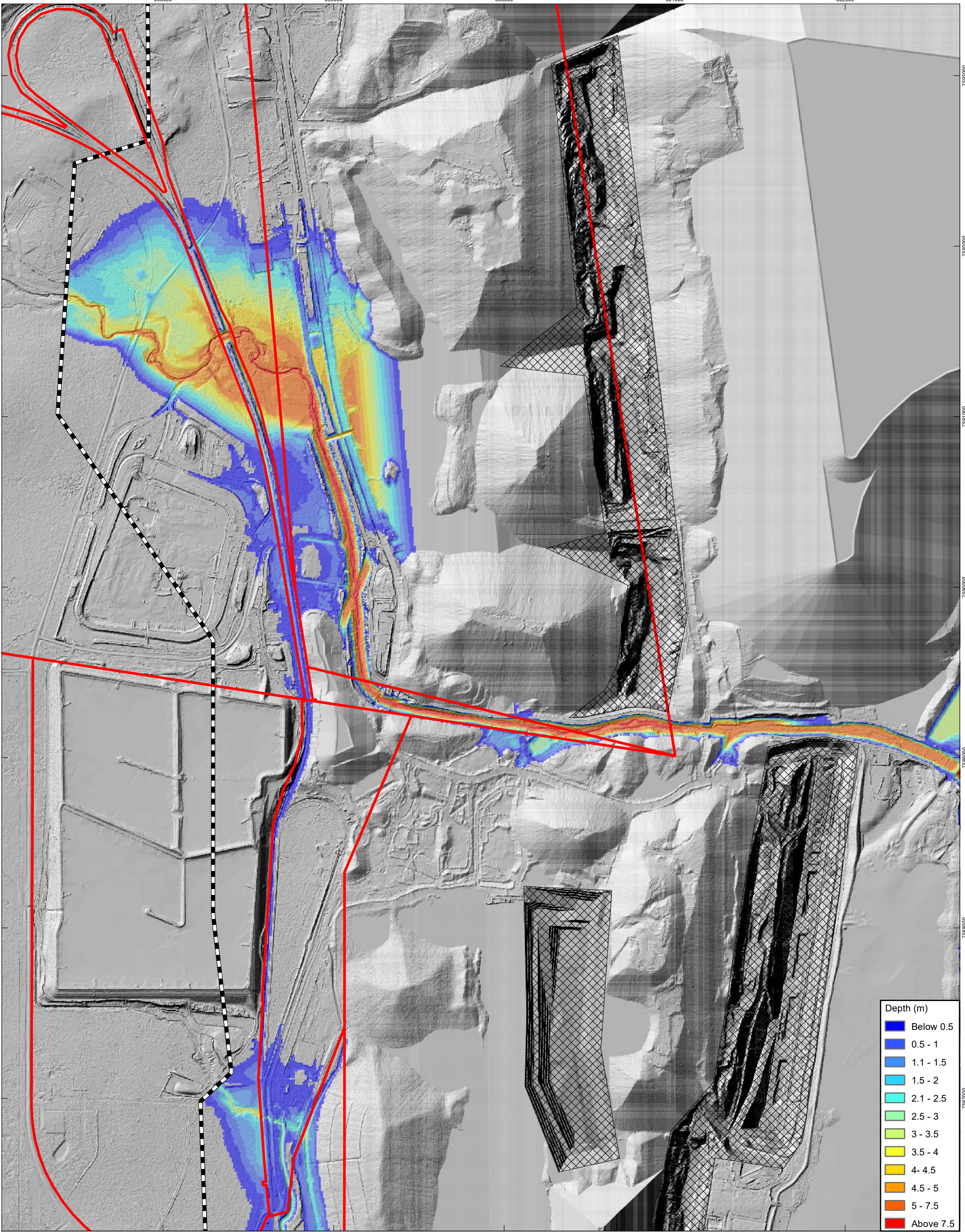
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Depths - 0.1% AEP + 6% rainfall intensity



\\slr\local\Corporate\Projects\SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assessment\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\Output\MXD\620-040713-APPENDIX B2-7-2_F08_1in1000CC1p_d.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

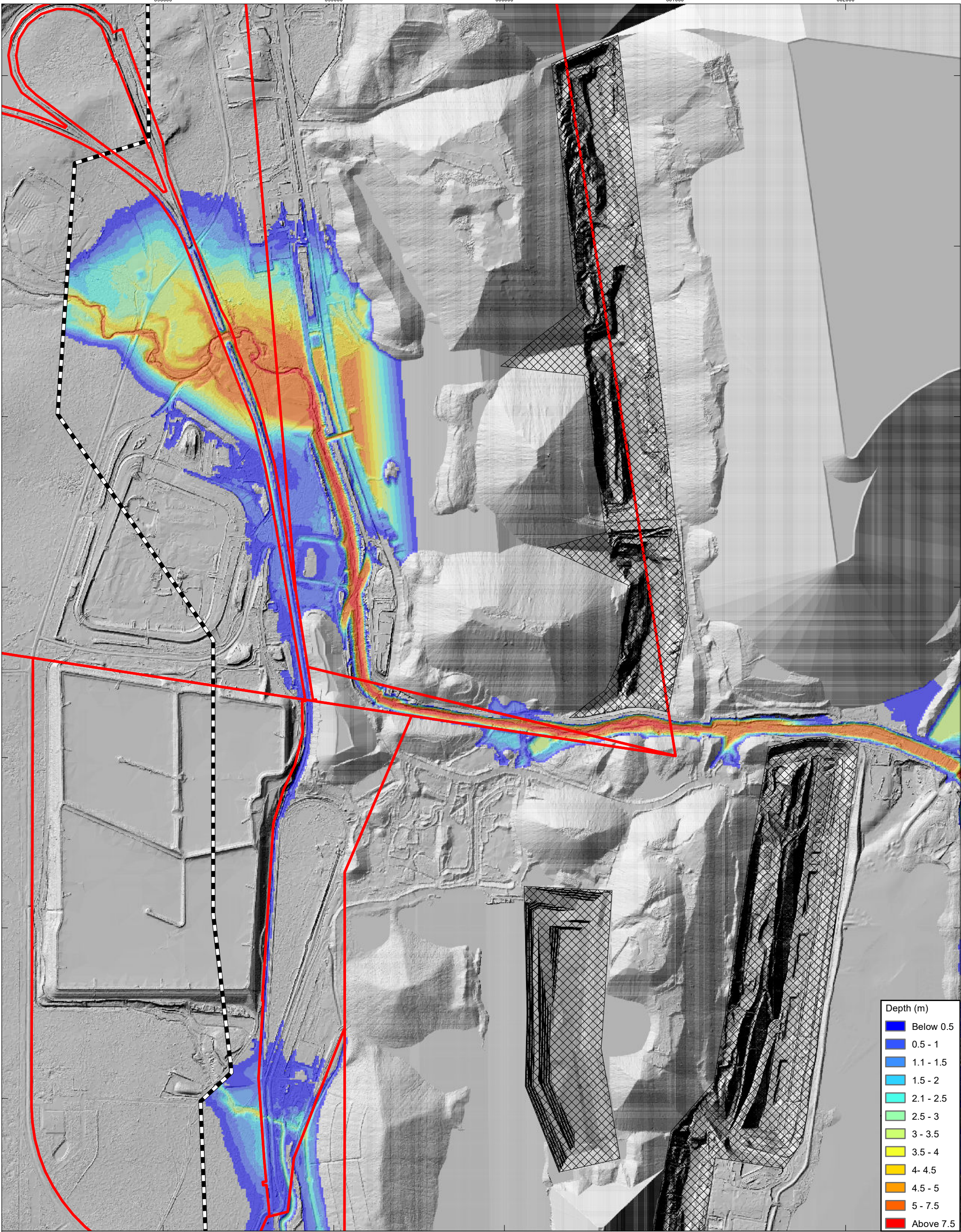
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Depths - 0.1% AEP + 11% rainfall intensity



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assest\06 SLR Data\01 CADGIS\GIS\ArcAutoMapping\010\Output\MXD\620-040713-APPENDIX B2-7-3_F08_1in1000CC20p_d.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

 Voids

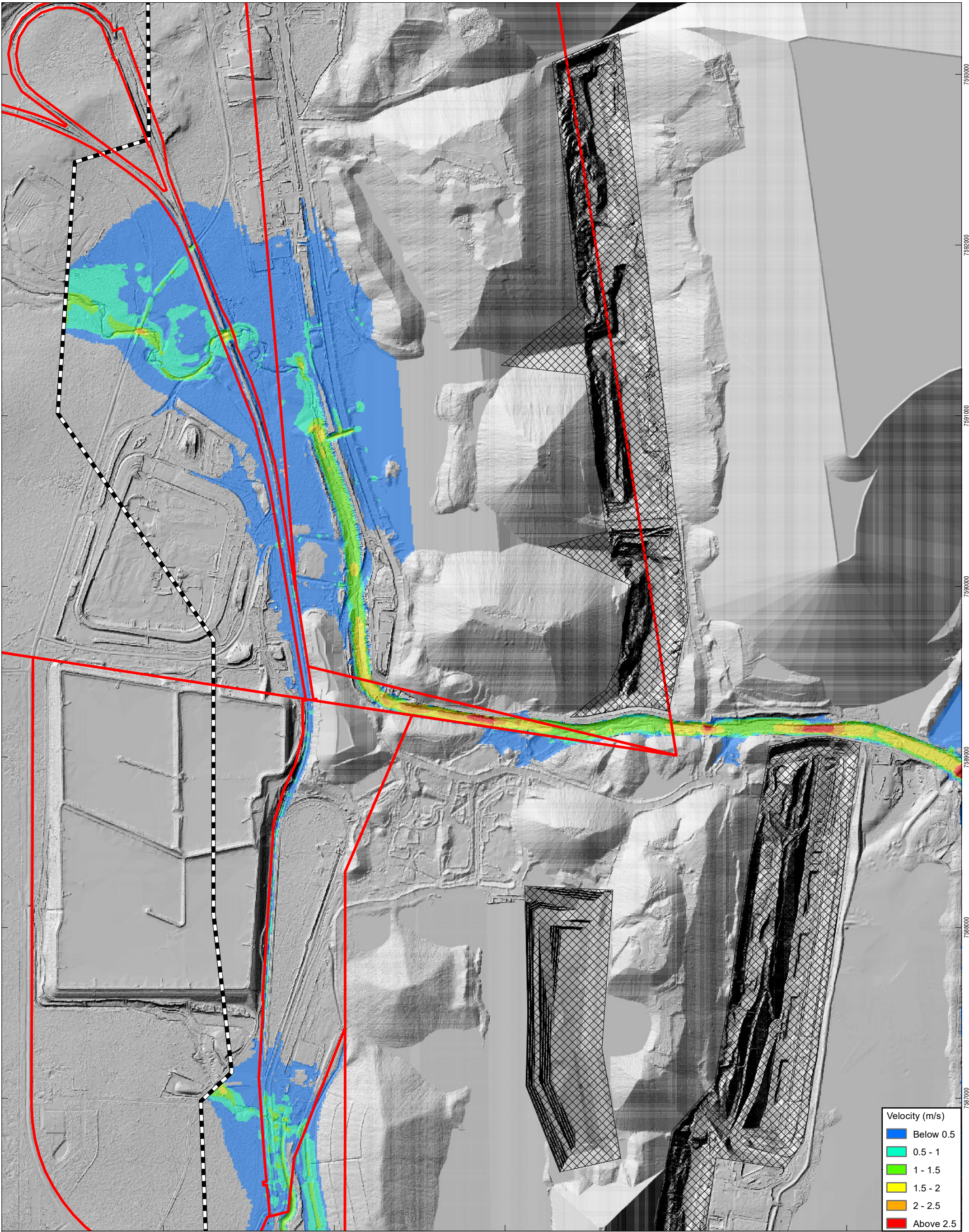
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Depths - 0.1% AEP + 20% rainfall intensity



\\slr.local\Corporate\Projects\SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assest\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\Output\MXD\620-040713-APPENDIX B2-8-1_F08_1in1000CC06p_v.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

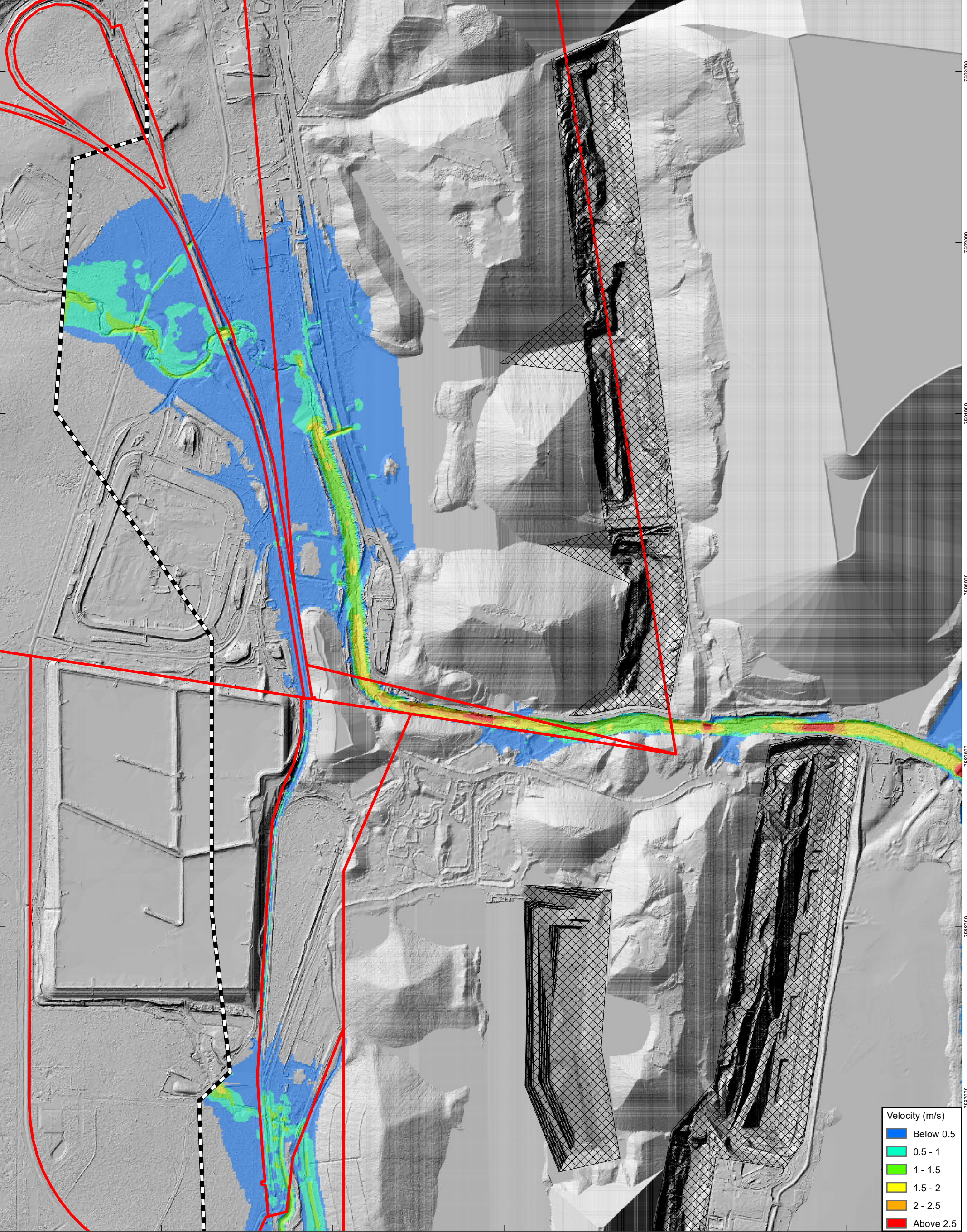
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Velocities - 0.1% AEP + 6% rainfall intensity



\\slr\local\Corporate\Projects\SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Asse\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\Output\MXD\620-040713-APPENDIX B2-8-2_F08_1in1000CC1p_v.mxd



 0 0.15 0.3 0.6 km
Coordinate System: GDA2020 MGA Zone 55
Scale: 1:20,000 at A3
Project Number: 620.040713
Date: 25-Sep-2024
Drawn by: TS

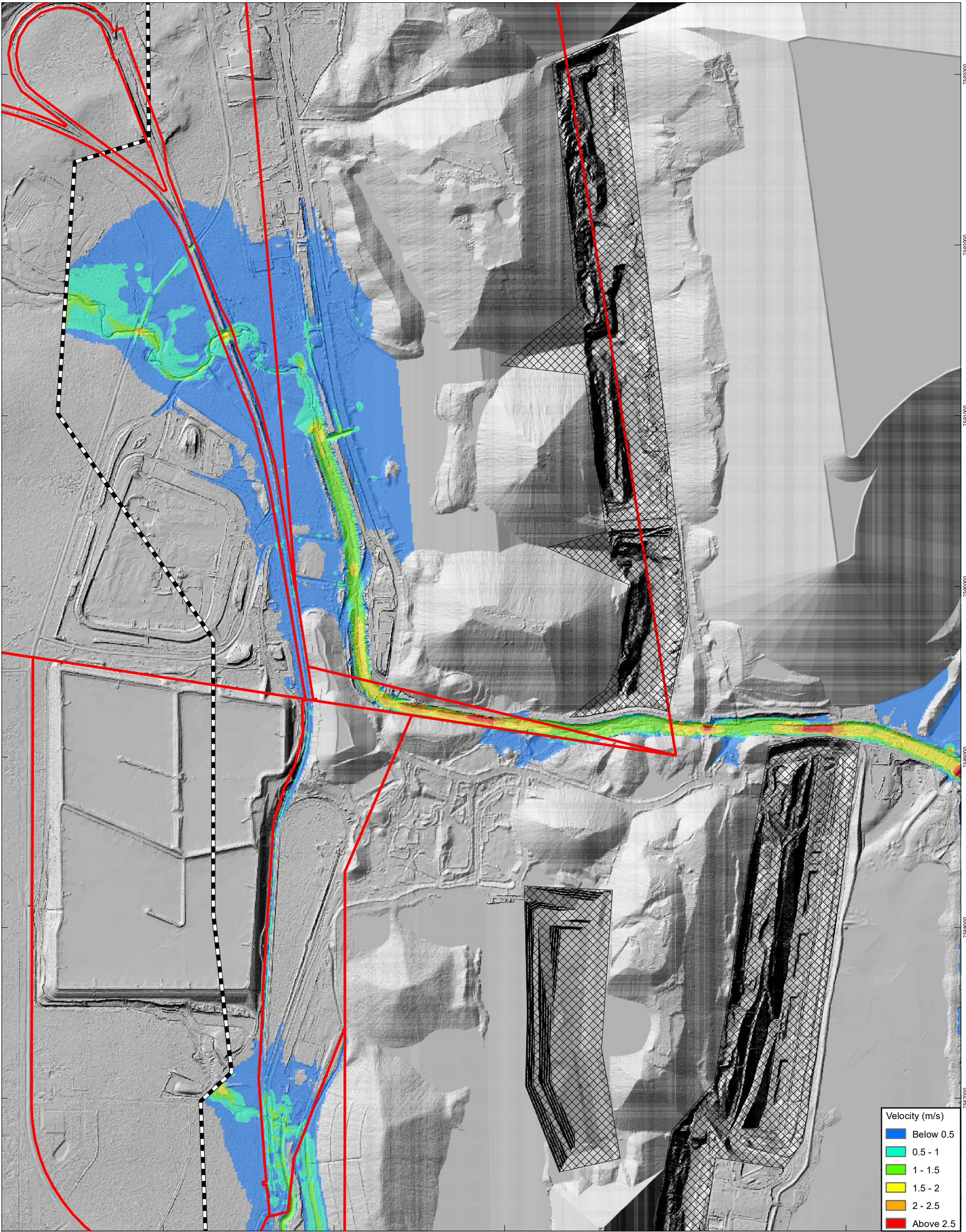
LEGEND
 Mining Leases
 Voids
 TUFLOW Model Extent

**Goonyella Complex PRCP
Rehabilitation Flood Assessment**

**Eureka Creek PRCP Conditions
Peak Velocities - 0.1% AEP + 11% rainfall intensity**



\\slr\local\Corporate\Projects\SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Asse\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\Output\MXD\620-040713-APPENDIX B2-8-3_F08_1in1000CC20p_v.mxd





00.150.30.6

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Eureka Creek PRCP Conditions
Peak Velocities - 0.1% AEP + 20% rainfall intensity



\\slr\local\Corporate\Projects\SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CAD\GIS\GIS\ArcAutoMapping\010\Output\MXD\620-040713-APPENDIX B3-1-1_F08_39p_h.mxd





00.150.30.6

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

Level (m AHD)

 Below 240

 240 - 242

 242 - 244

 244 - 246

 246 - 248

 248 - 250

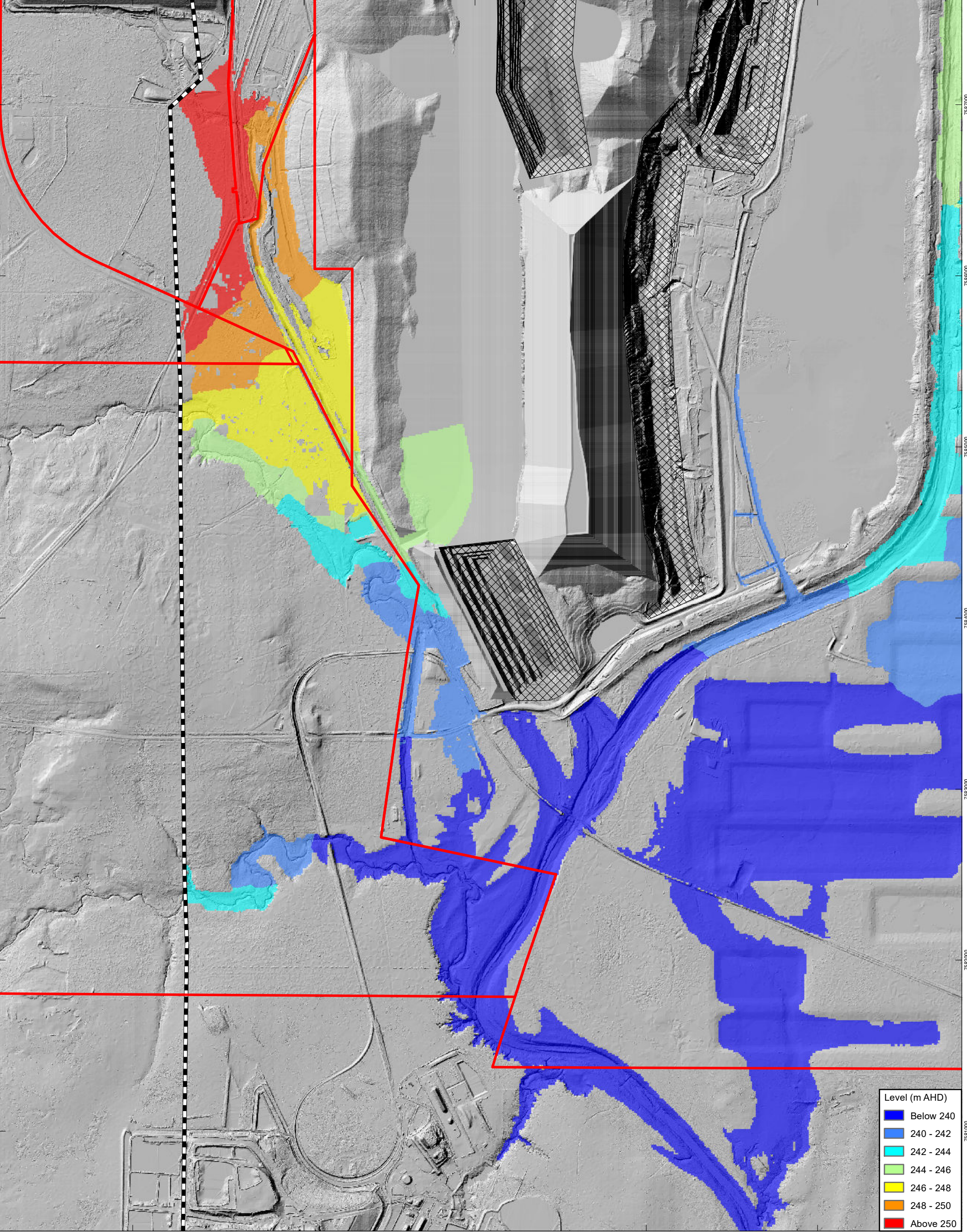
 Above 250

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Levels - 39% AEP



\\slr\local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Asses\06 SLR_Data\01 CAD\GIS\GIS\ArcAuto\MapInfo\010\Output\MXDs\620-040713-APPENDIX B3-1-2_F08_02p_h.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

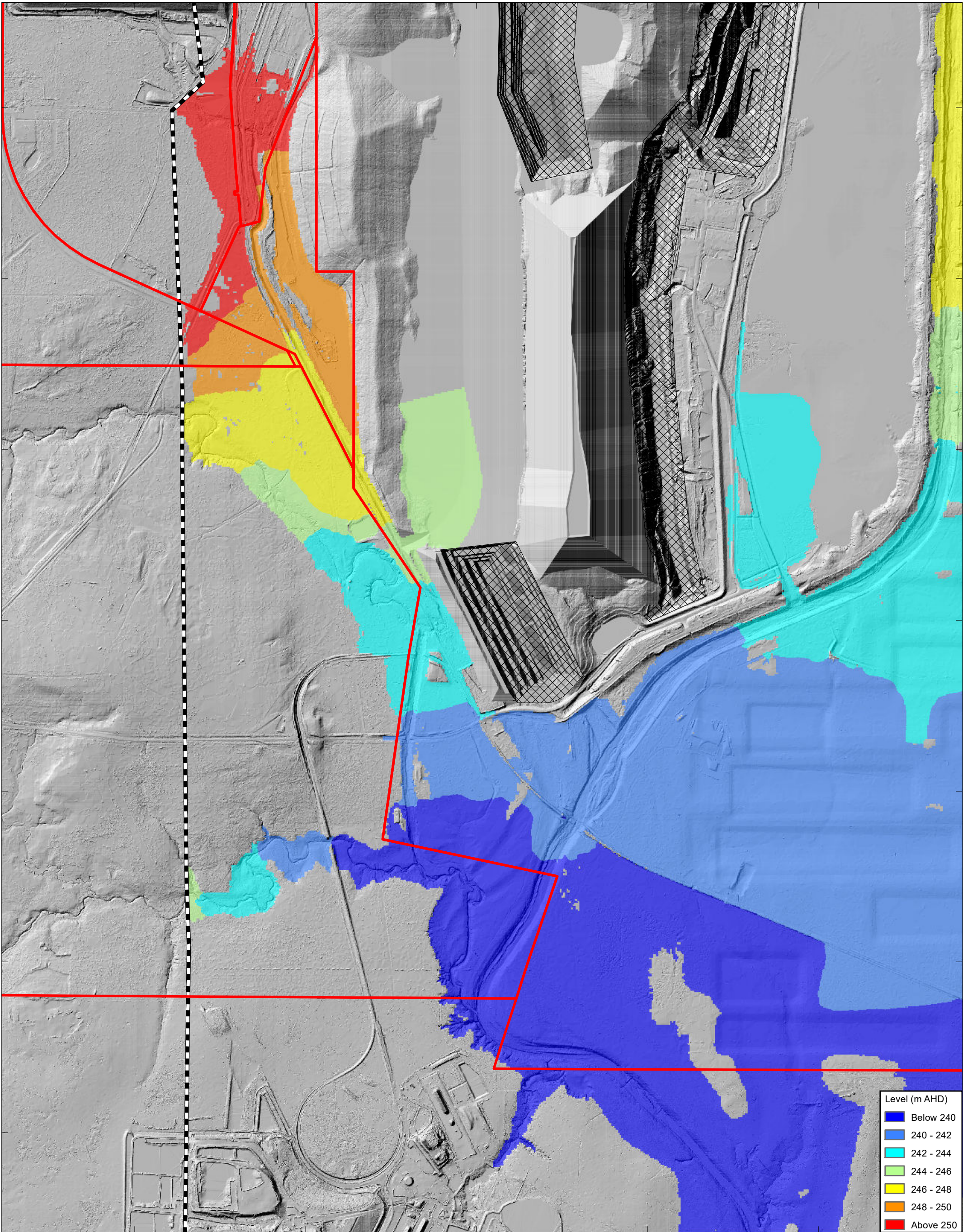
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Levels - 2% AEP



\\slr.local\Corporate\Projects\SLR\620-BNE\620-040713-00001\GPM\RMH\PRCP\Rehab\PRCP Flood Assest\06 SLR_Data\01 CAD\GIS\GIS\ArcAuto\MapInfo\010\Output\MXDs\620-040713-APPENDIX B3-1-3_F08_1in1000_h.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Levels - 0.1% AEP



\\slr\local\Corporate\Projects\SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Asses\06 SLR Data\01 CADGIS\GIS\ArcAuto\MapInfo\010\Output\MXDs\620-040713-APPENDIX B3-1-4_F08_PMP_h.mxd





00.150.30.6

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Levels - PMF



\\slr\local\Corporate\Projects\SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CAD\GIS\GIS\ArcAuto\MapInfo\010\Output\MXDs\620-040713-APPENDIX B3-2-1_F08_39p_d.mxd





0

0.15

0.3

0.6

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

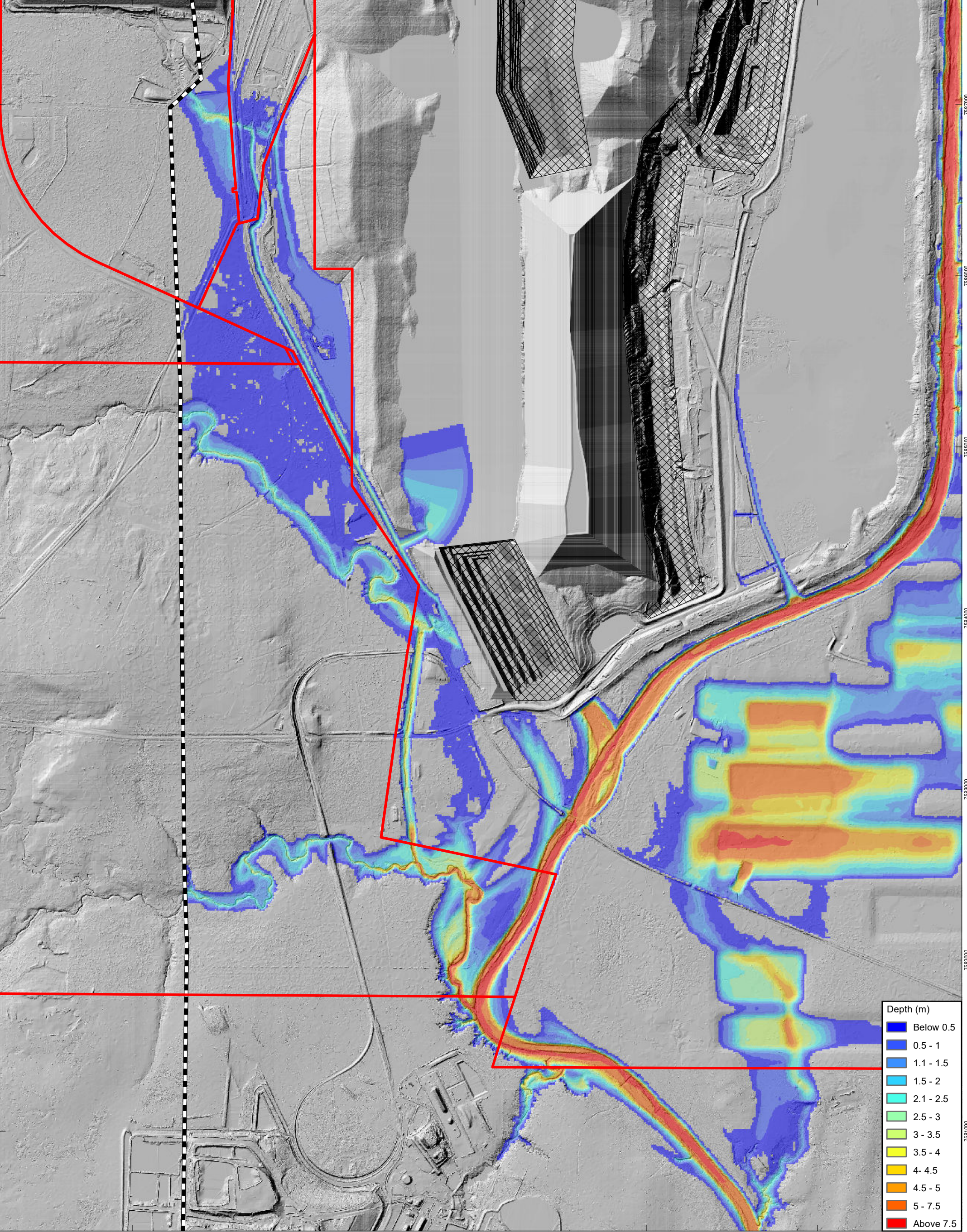
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Depths - 39% AEP



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Asses\06 SLR Data\01 CADGIS\GIS\ArcAuto\MapInfo\010\Output\MXDs\620-040713-APPENDIX B3-2-2_F08_02p_d.mxd





00.150.30.6

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

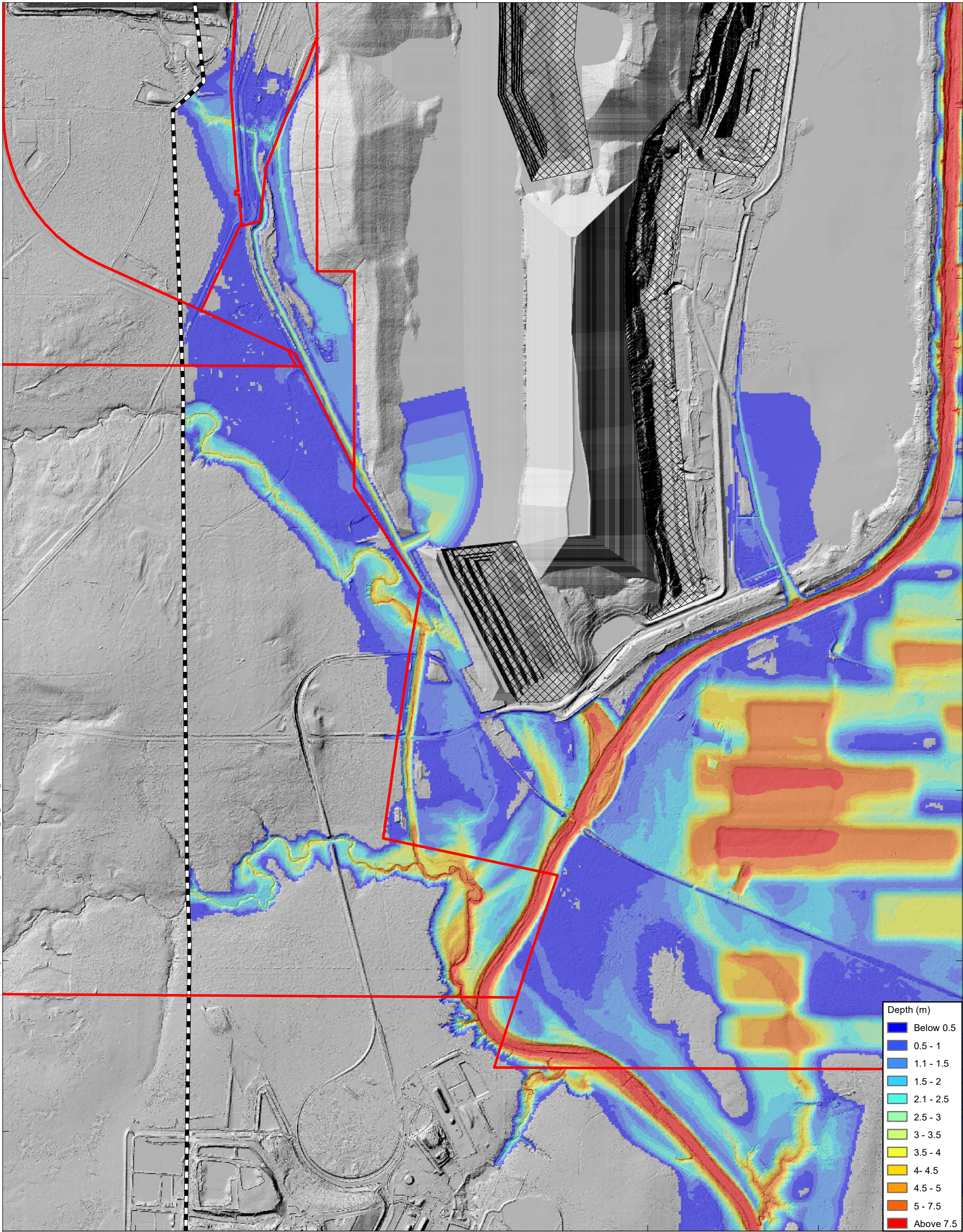
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Depths - 2% AEP



\\slr.local\Corporate\Projects\SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CAD\GIS\GIS\ArcAuto\MapInfo\010\Output\MXDs\620-040713-APPENDIX B3-2-3_F08_1in1000.d.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

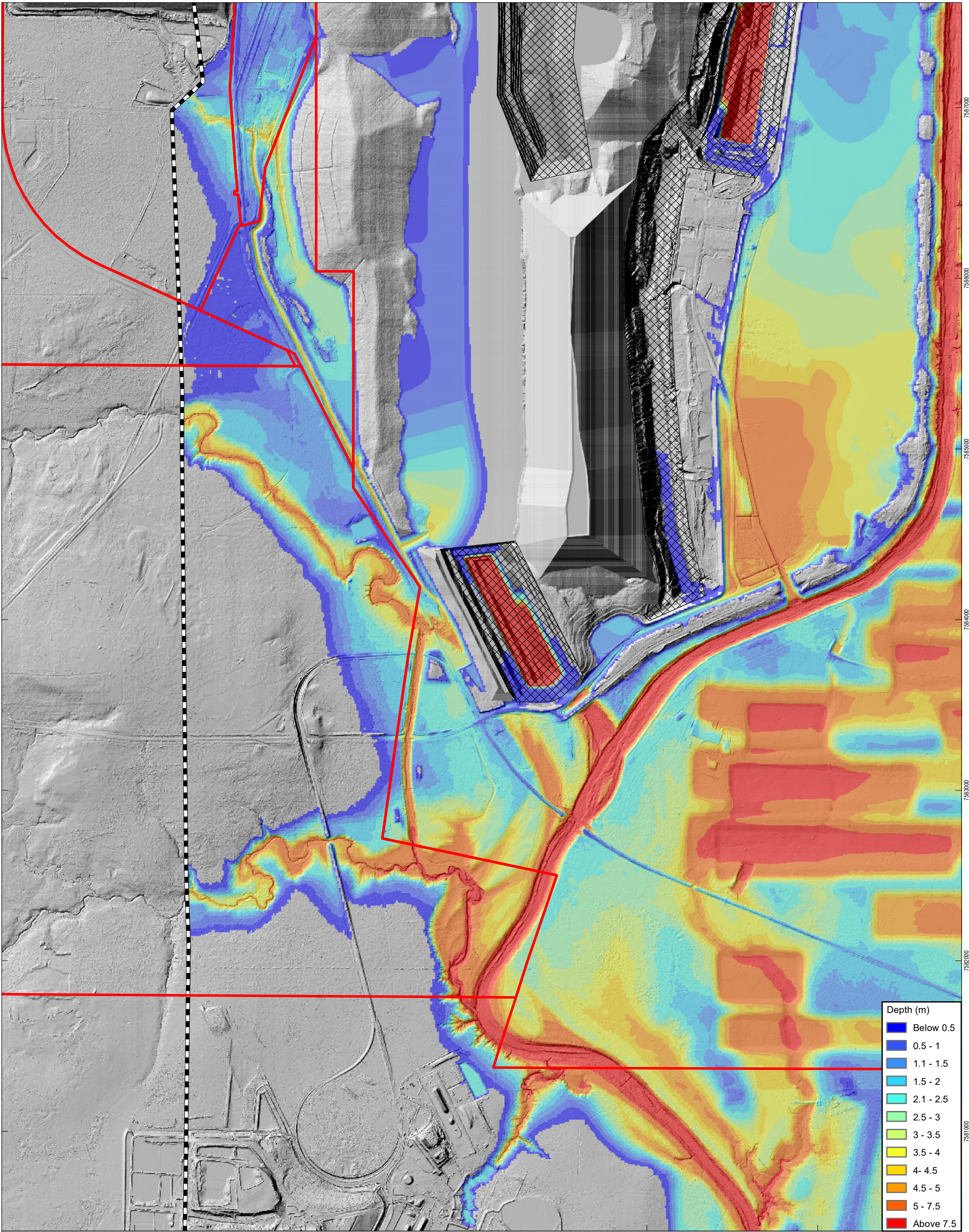
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Depths - 0.1% AEP



\\slr\local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Asses\06 SLR Data\01 CADGIS\GIS\ArcAutoMapping\010\Output\MXDs\620-040713-APPENDIX B3-2-4_F08_PMP_d.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Depths - PMF



\\slr\local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Asses\06 SLR_Data\01 CADGIS\GIS\ArcAutoMapping\010\Output\MXDs\620-040713-APPENDIX B3-3-1_F08_39p_v.mxd





0

0.15

0.3

0.6

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

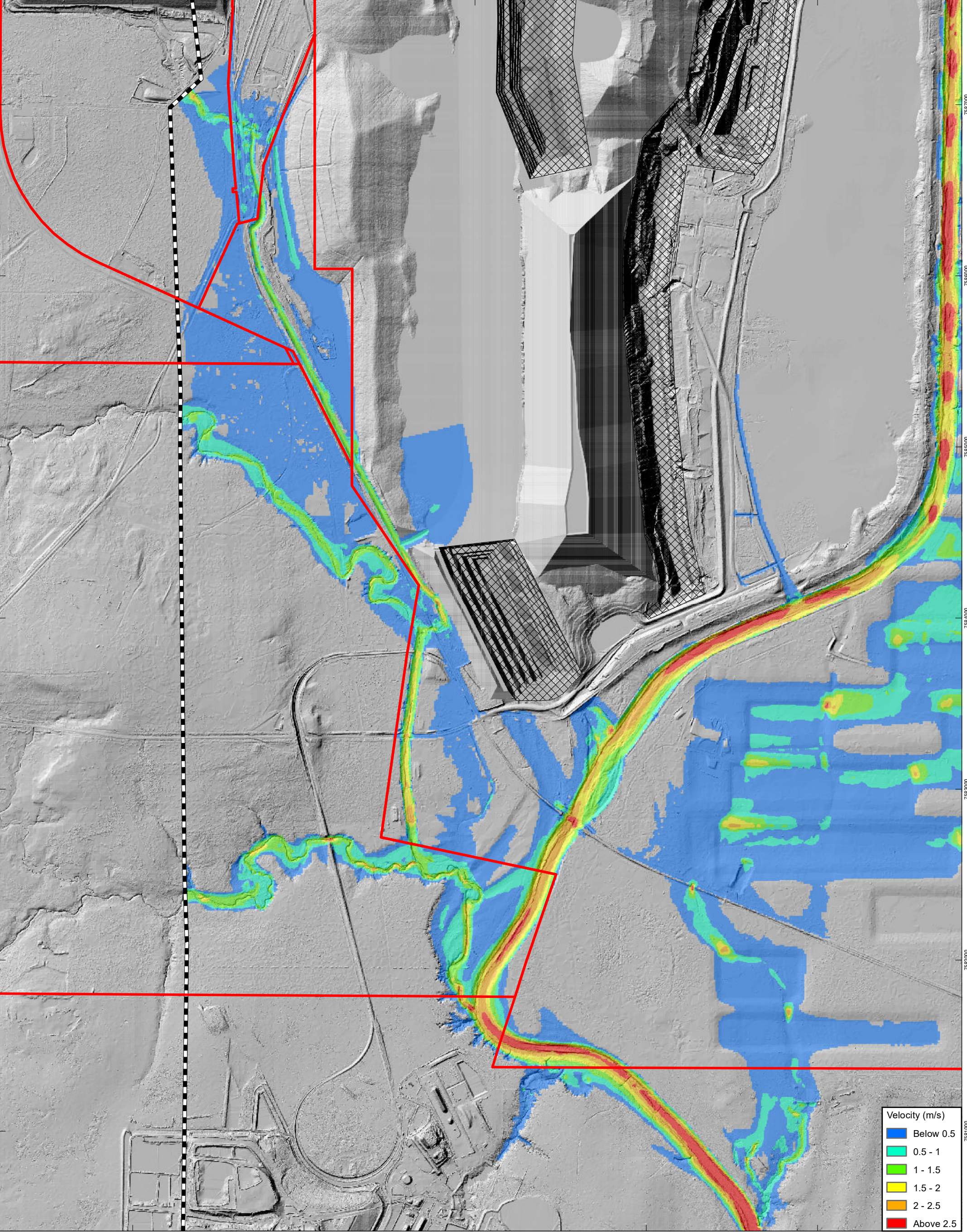
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Velocities - 39% AEP



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CAD\GIS\GIS\ArcAutoMapping\010\Output\MXD\620-040713-APPENDIX B3-3-2_F08_02p_v.mxd





00.150.30.6

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

Velocity (m/s)

 Below 0.5

 0.5 - 1

 1 - 1.5

 1.5 - 2

 2 - 2.5

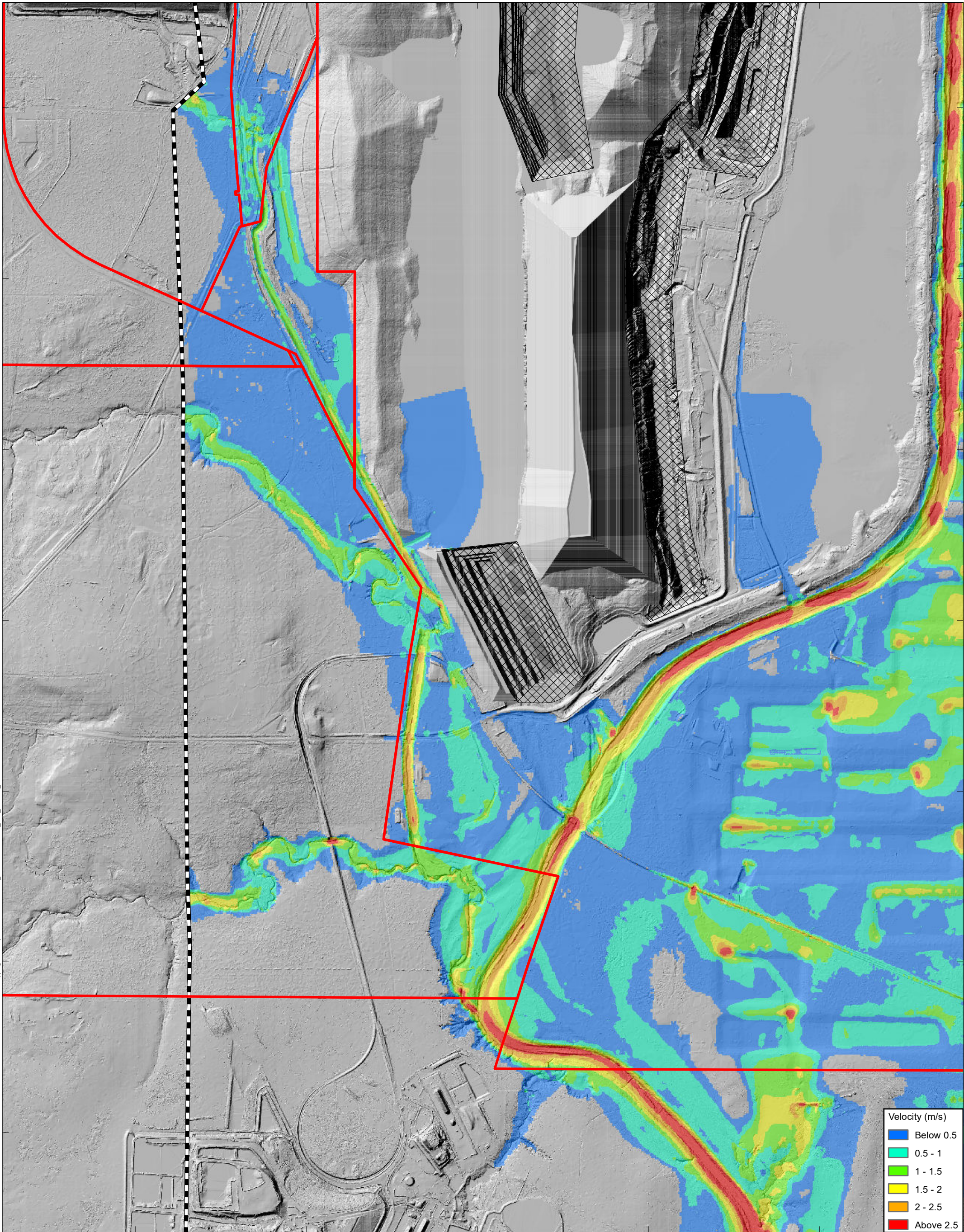
 Above 2.5

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Velocities - 2% AEP



\\slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CADGIS\GIS\ArcAutoMapping\010\Output\MXDs\620-040713-APPENDIX B3-3-3_F08_1in1000_v.mxd





00.150.30.6

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

Velocity (m/s)

 Below 0.5

 0.5 - 1

 1 - 1.5

 1.5 - 2

 2 - 2.5

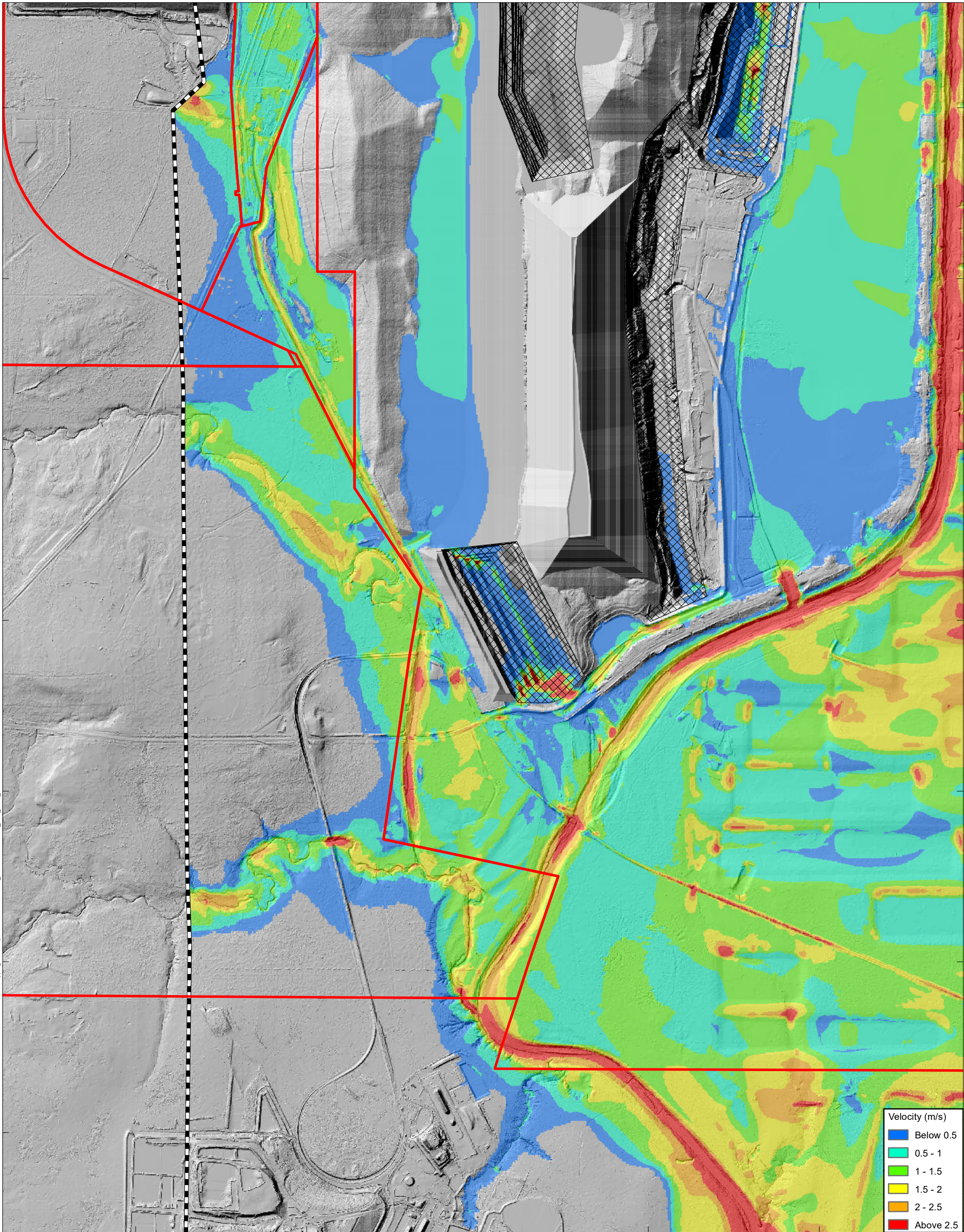
 Above 2.5

**Goonyella Complex PRCP
Rehabilitation Flood Assessment**

**Platypus and Fisher Creek PRCP Conditions
Peak Velocities - 0.1% AEP**



\\slr\local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Asses\06 SLR Data\01 CAD\GIS\GISArcAutoMapping\010\Output\MXD\620-040713-APPENDIX B3-3-4_F08_PMP_v.mxd



0 0.15 0.3 0.6 km

Coordinate System: GDA2020 MGA Zone 55
Scale: 1:20,000 at A3
Project Number: 620.040713
Date: 25-Sep-2024
Drawn by: TS

LEGEND

- Mining Leases
- Voids
- TUFLOW Model Extent

Velocity (m/s)	
	Below 0.5
	0.5 - 1
	1 - 1.5
	1.5 - 2
	2 - 2.5
	Above 2.5

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Velocities - PMF



\\slr\local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CAD\GIS\GIS\ArcAuto\MapInfo\010\Output\MXDs\620-040713-APPENDIX B3-4-1_F08_39p_bss.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

Bed Shear Stress (N/m²)

 Below 20

 20 - 40

 40 - 60

 60 - 80

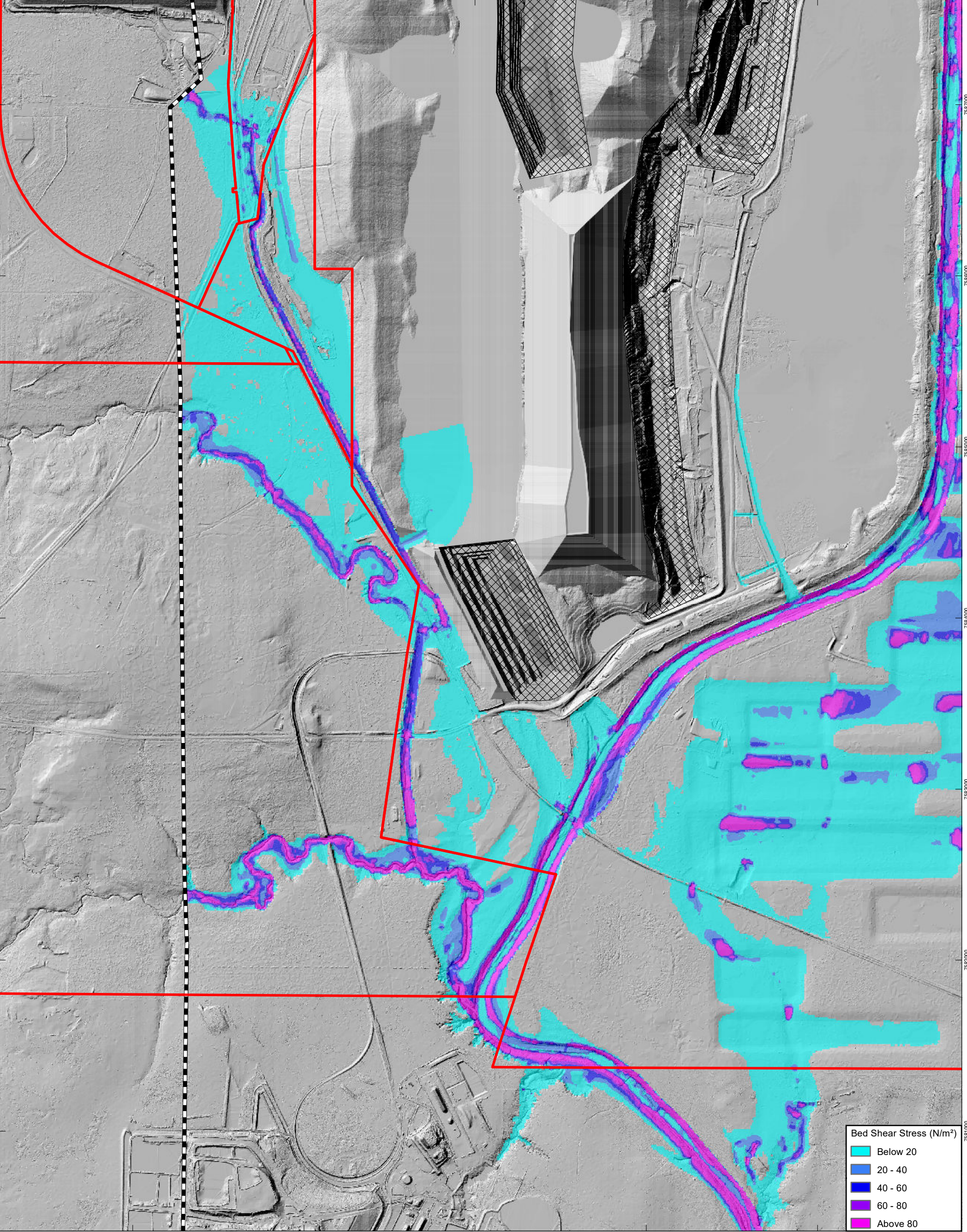
 Above 80

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Bed Shear Stress - 39% AEP



\\slr\local\Corporate\Projects\SLR\620-BNE\620-040713-00001\GPM\PRCP\Rehab\PRCP\Rehab Flood Assessment\06 SLR Data\01 CAD\GIS\GIS\ArcAuto\MapInfo\010\Output\MapInfo\620-040713-APPENDIX B3-4-2_F08_02p_bss.mxd





00.150.30.6

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

 TUFLOW Model Extent

Bed Shear Stress (N/m²)

 Below 20

 20 - 40

 40 - 60

 60 - 80

 Above 80

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Bed Shear Stress - 2% AEP



\\slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CAD\GIS\GIS\ArcAutoMapping\010\Output\MXDs\620-040713-APPENDIX B3-5-1_F08_39p_sp.mxd





00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 Voids

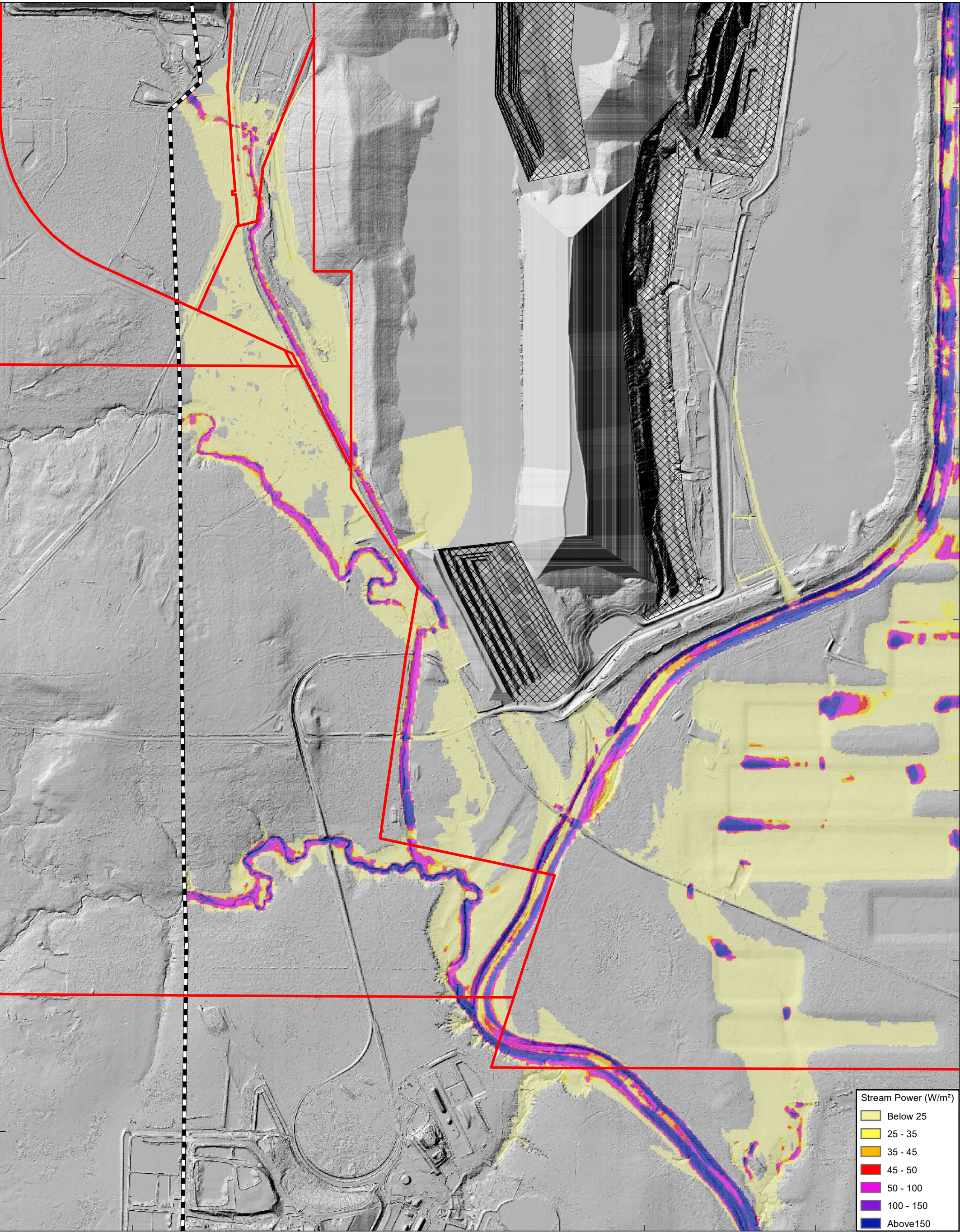
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Stream Power - 39% AEP



\\slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CAD\GIS\GIS\ArcAutoMapping\010\Output\MXDs\620-040713-APPENDIX B3-5-2_F08_02p_sp.mxd





00.150.30.6

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

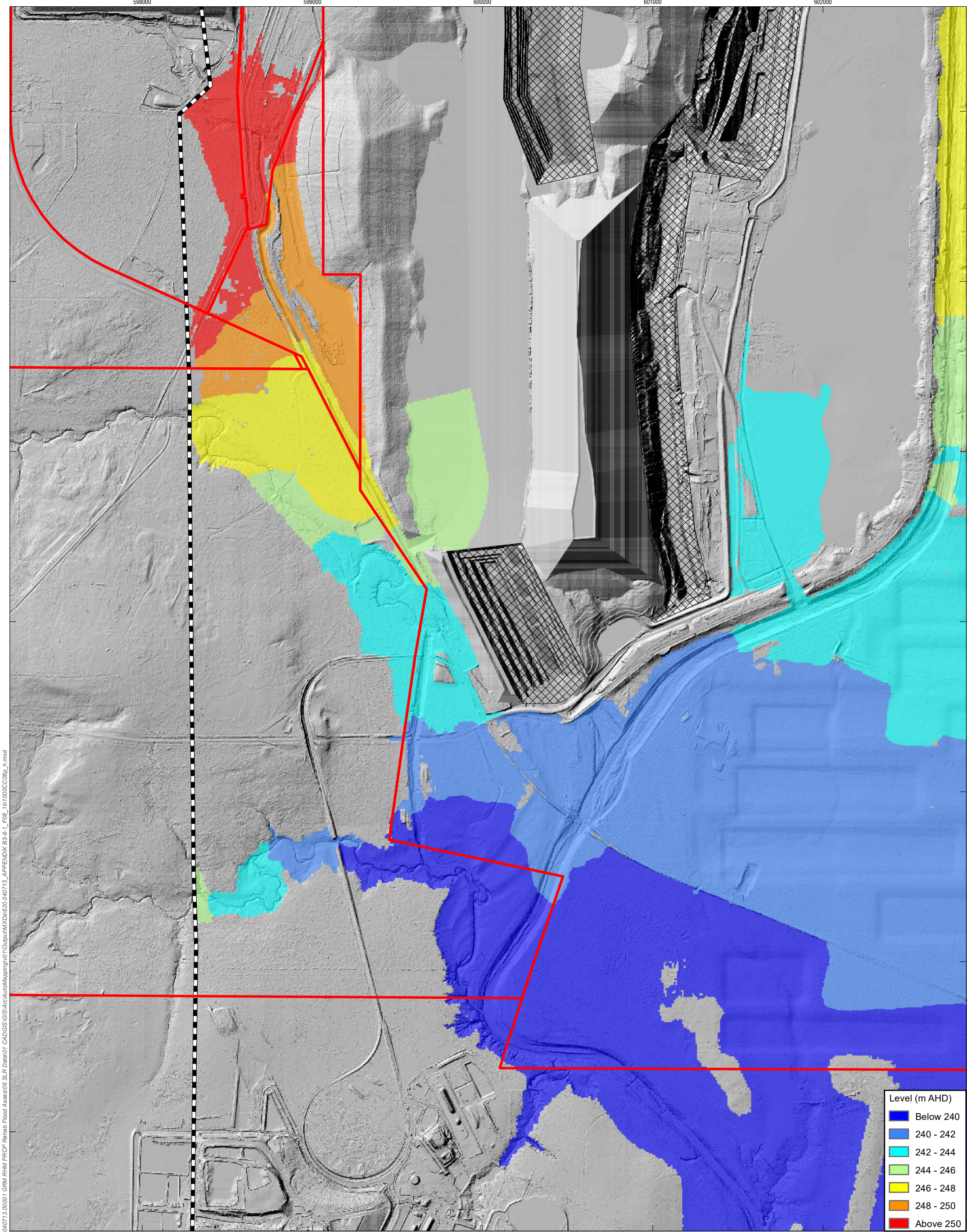
 Voids

 TUFLOW Model Extent

**Goonyella Complex PRCP
Rehabilitation Flood Assessment**

**Platypus and Fisher Creek PRCP Conditions
Peak Stream Power - 2% AEP**





\\slr\local\Corporate\Projects\SLR\620-BNE\620-040713-00001\GPM\RMH\PRCP\Rehab\Flood\Assets\06_SLR_Data\01_CAD\GIS\GIS\ArcAuto\MapInfo\010\Output\MXDs\620_040713_APPENDIX B3-6-1_F08_1in1000CC06p_h.mxd



0

0.15

0.3

0.6

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

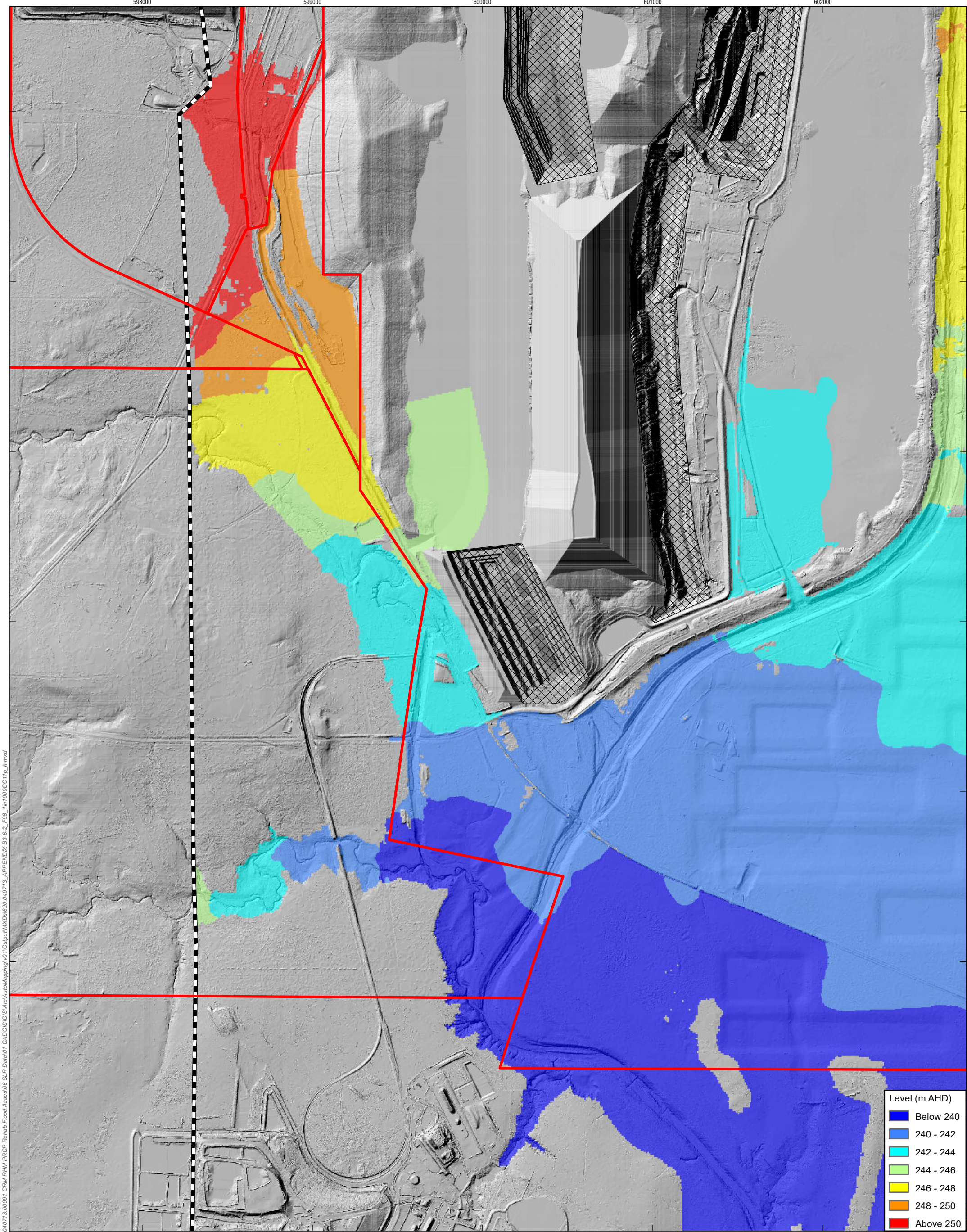
 Voids

 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Levels - 0.1% AEP + 6% rainfall intensity





\\slr\local\Corporate\Projects\SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assess\06 SLR Data\01 CADGIS\GIS\ArcAuto\MapInfo\010\Output\MXDs\620-040713-APPENDIX B3-6-2_F08_1in1000CC1p_h.mxd



0

0.15

0.3

0.6

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

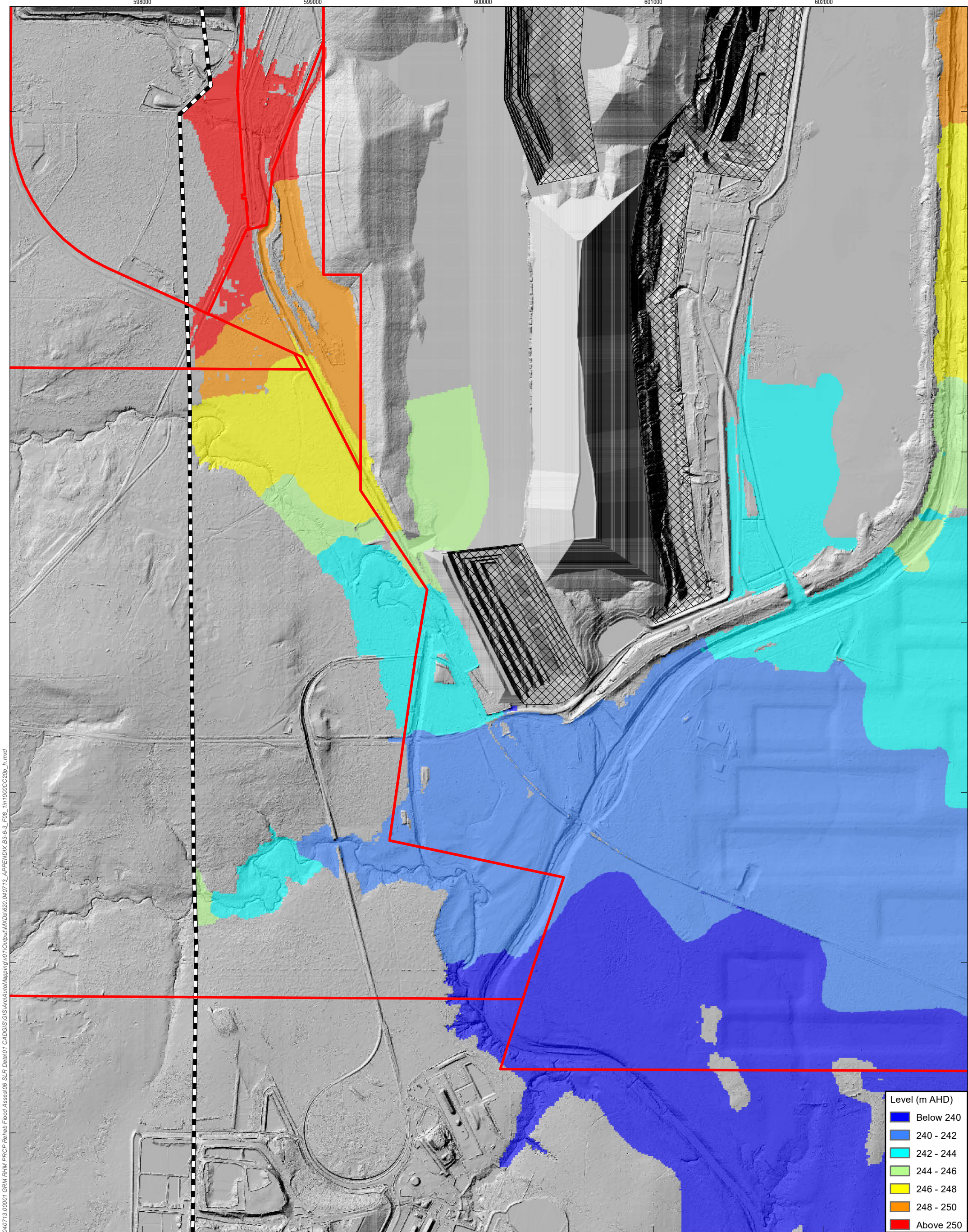
 Voids

 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Levels - 0.1% AEP + 11% rainfall intensity





\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assea\06 SLR Data\01 CAD\GIS\GIS\AutoMapping\01\Output\MXD\620-040713_APPENDIX B3-6-3_F08_1in1000CC20p_h.mxd



00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

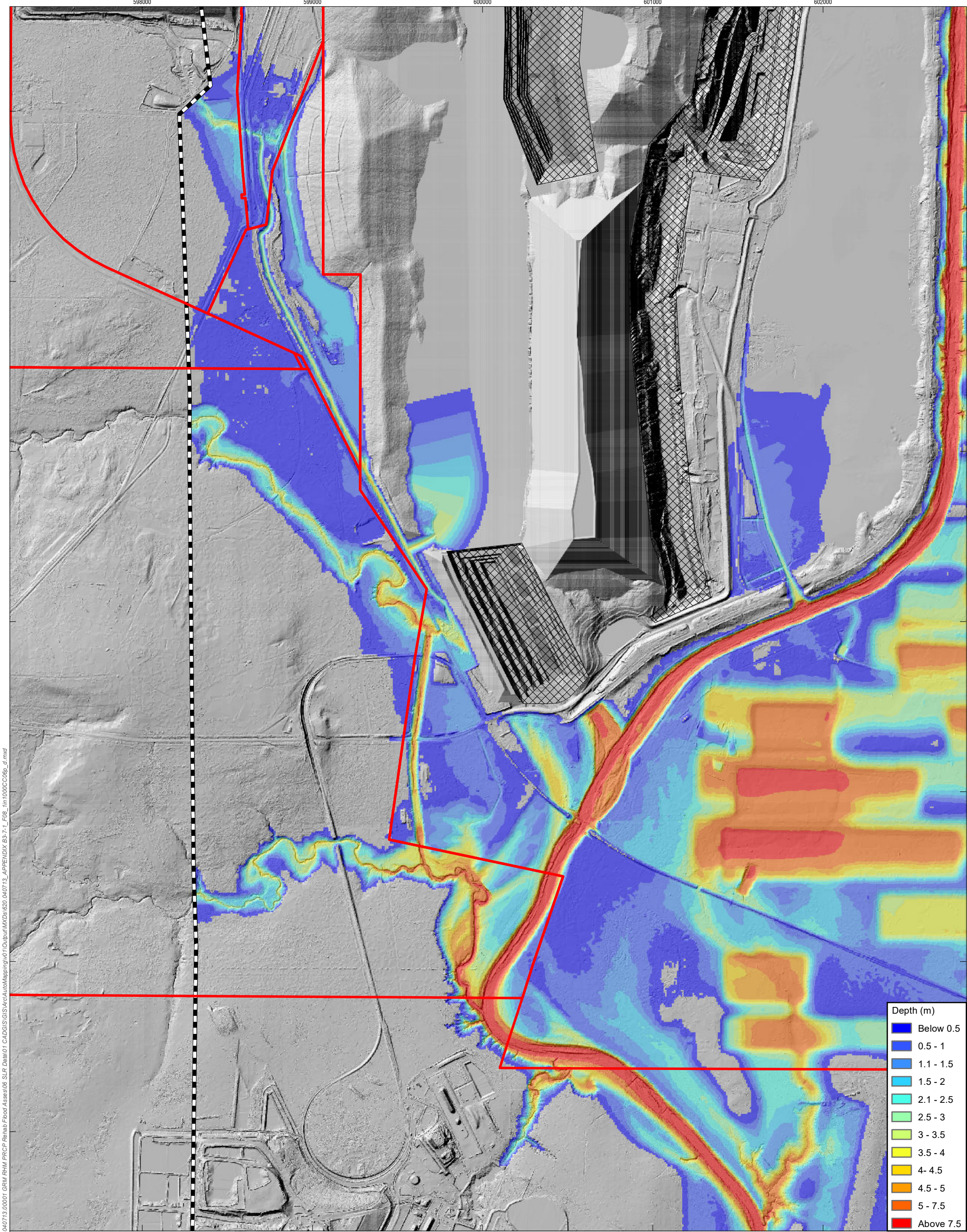
 Voids

 TUFLOW Model Extent

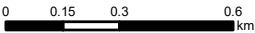
Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Levels - 0.1% AEP + 20% rainfall intensity





\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assea\06 SLR Data\01 CAD\GIS\GISAutoMapping\01\Output\MXD\620-040713_APPENDIX B3-7-1_F08_1in1000CC06p_d.mxd



Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

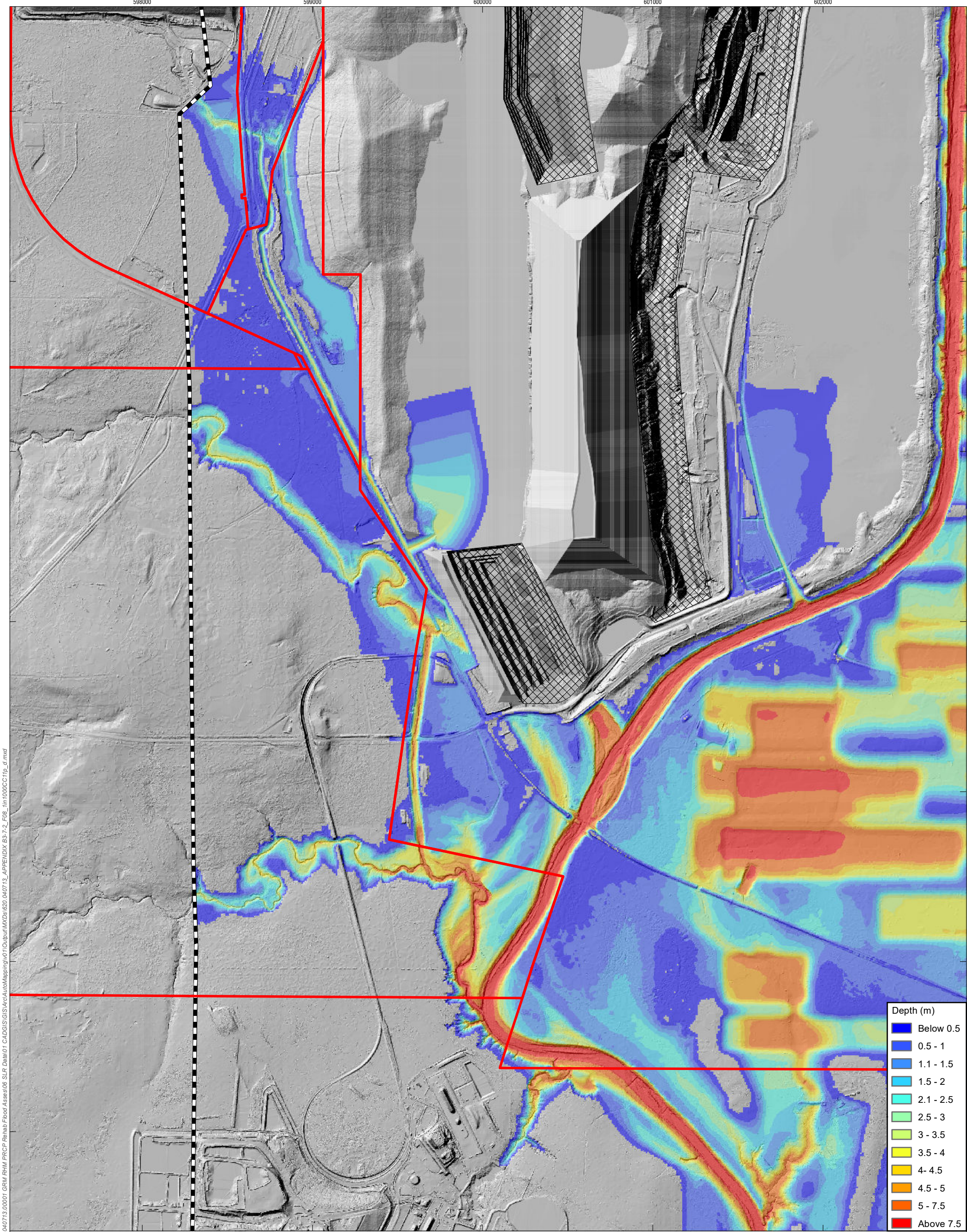
 Voids

 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Depths - 0.1% AEP + 6% rainfall intensity





\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assea\06 SLR Data\01 CAD\GIS\GISAutoMapping\01\Output\MXD\620-040713_APPENDIX B3-7-2_F08_1in1000CC1ip_d.mxd



00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

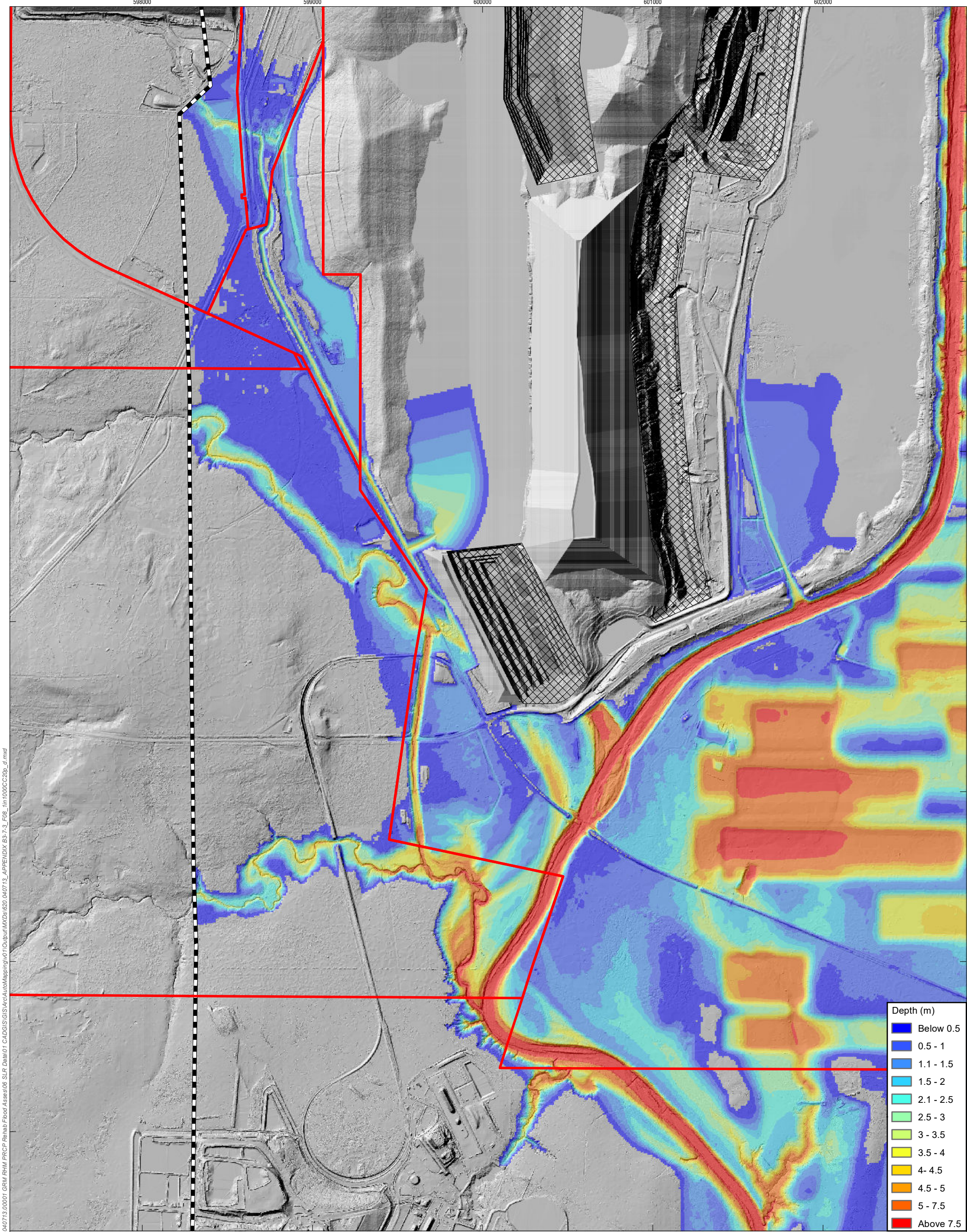
 Voids

 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Depths - 0.1% AEP + 11% rainfall intensity





\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assea\06 SLR Data\01 CAD\GIS\GIS\AutoMapping\01\Output\MXD\620-040713_APPENDIX B3-7-3_F08_1in1000CC20p_d.mxd



00.150.30.6
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

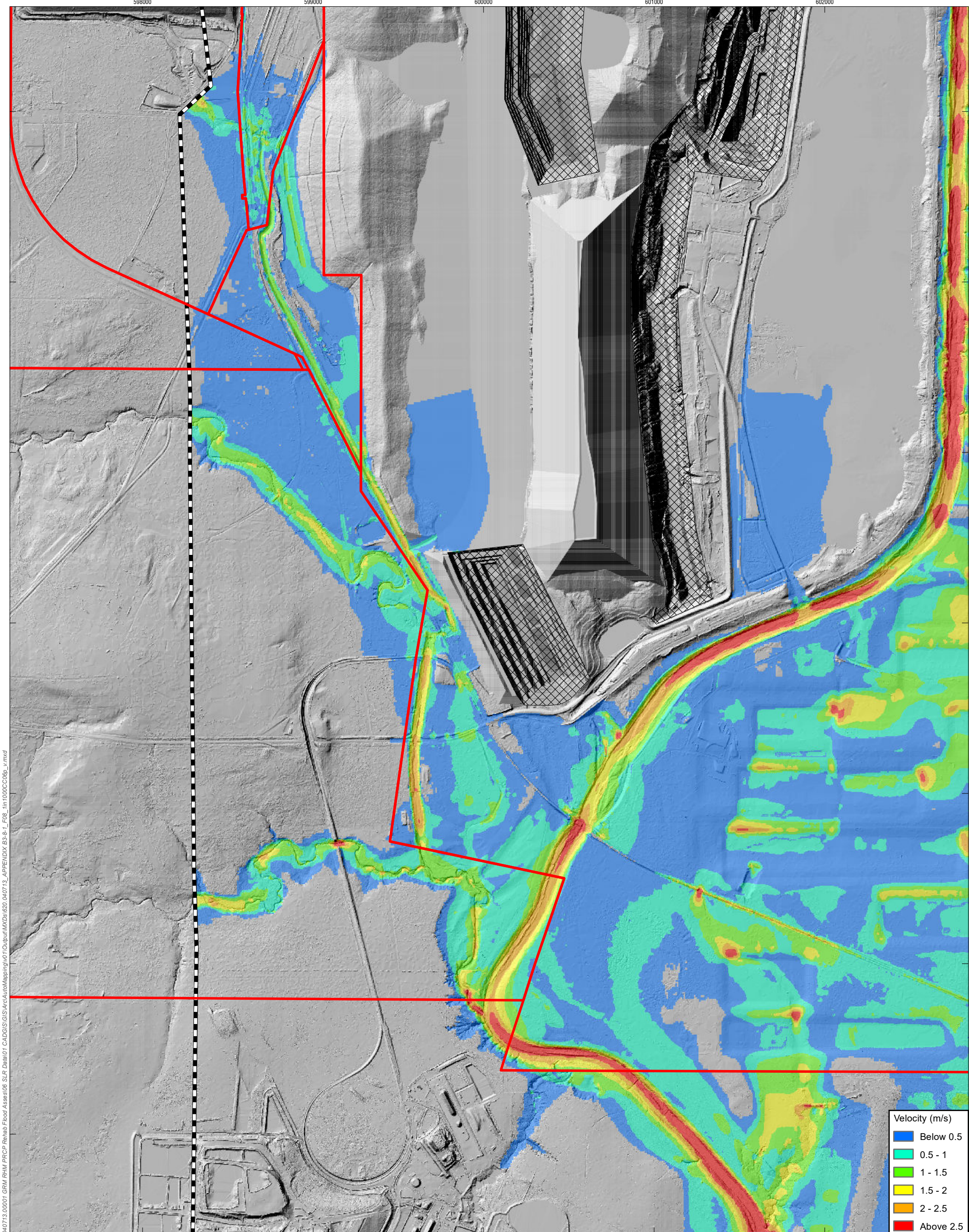
 Voids

 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Depths - 0.1% AEP + 20% rainfall intensity





 0 0.15 0.3 0.6 km

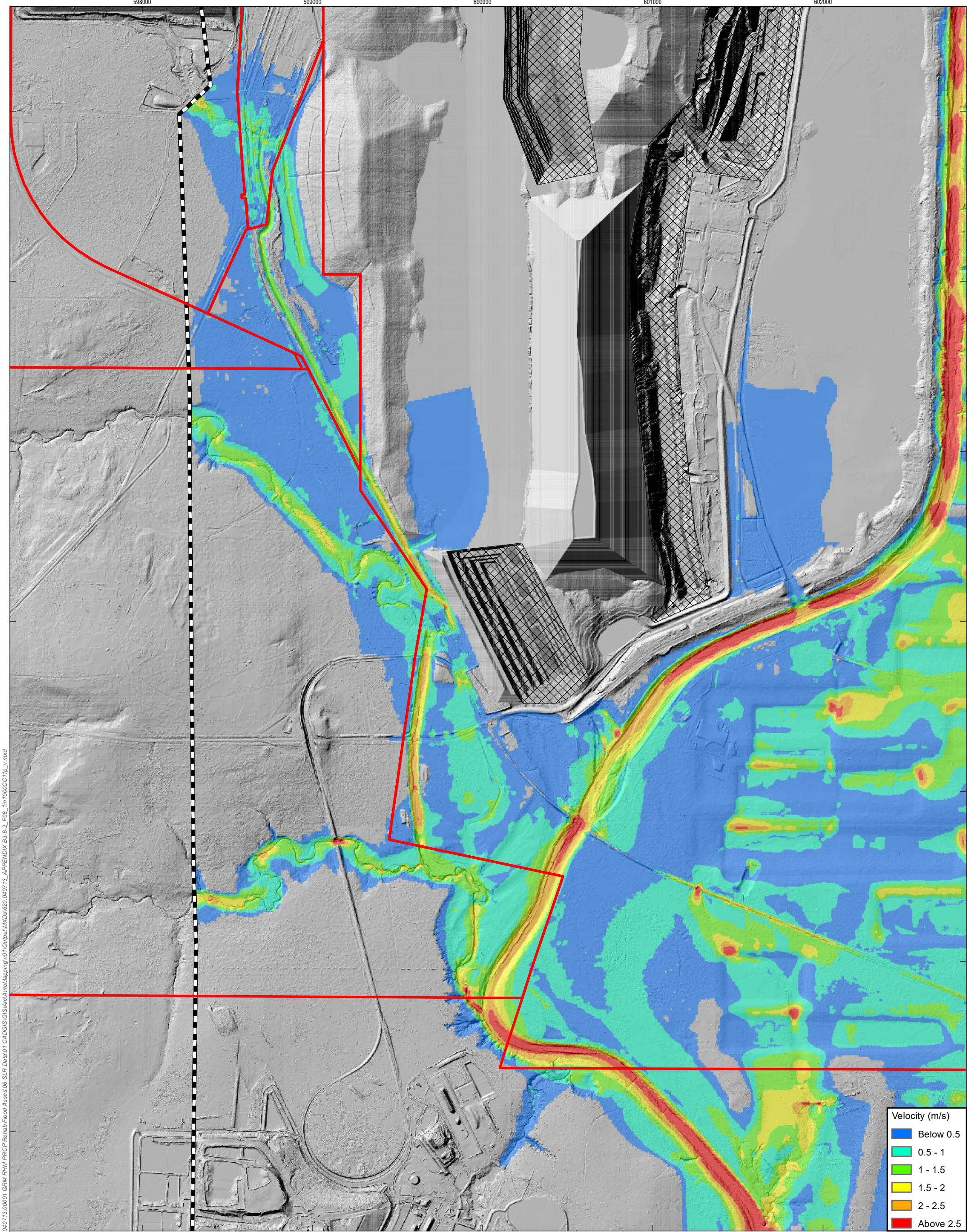
Coordinate System: GDA2020 MGA Zone 55
Scale: 1:20,000 at A3
Project Number: 620.040713
Date: 25-Sep-2024
Drawn by: TS

- LEGEND
-  Mining Leases
 -  Voids
 -  TUFLOW Model Extent

**Goonyella Complex PRCP
Rehabilitation Flood Assessment**

**Platypus and Fisher Creek PRCP Conditions
Peak Velocities - 0.1% AEP + 6% rainfall intensity**





\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assea\06 SLR Data\01 CAD\GIS\GIS\AutoMapping\01\Output\MXD\620-040713_APPENDIX B3-8-2_F08_1in1000CC1ip_v.mxd



0

0.15

0.3

0.6

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

- LEGEND
-  Mining Leases

 Voids

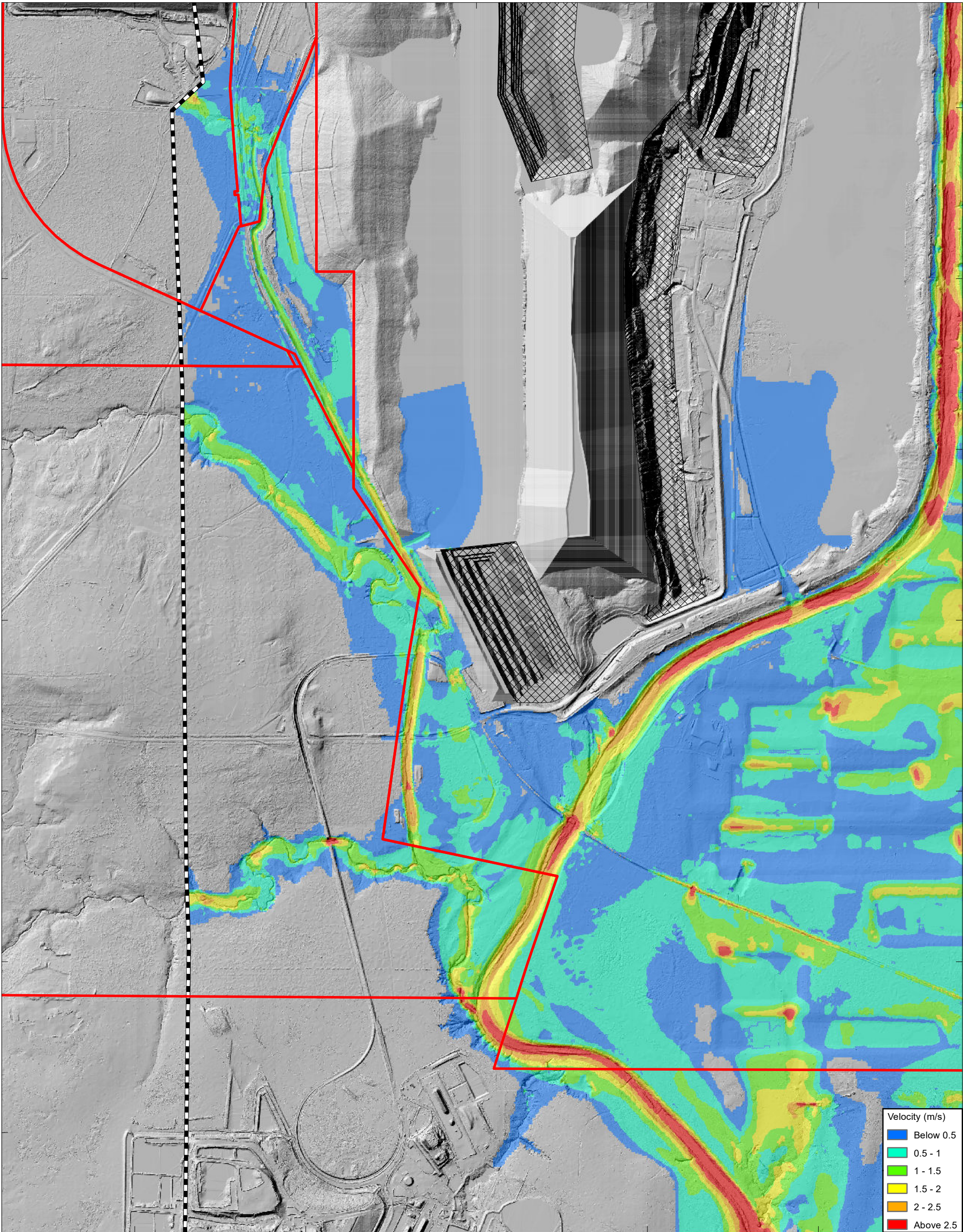
 TUFLOW Model Extent

Goonyella Complex PRCP
Rehabilitation Flood Assessment

Platypus and Fisher Creek PRCP Conditions
Peak Velocities - 0.1% AEP + 11% rainfall intensity



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001 GRM RHM PRCP Rehab Flood Assea\06 SLR Data\01 CAD\GIS\GIS\AutoMapping\01\Output\MXD\620 040713_APPENDIX B3-8-3_F08_1in1000CC20p_v.mxd





0

0.15

0.3

0.6

km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:20,000 at A3

Project Number: 620.040713

Date: 25-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

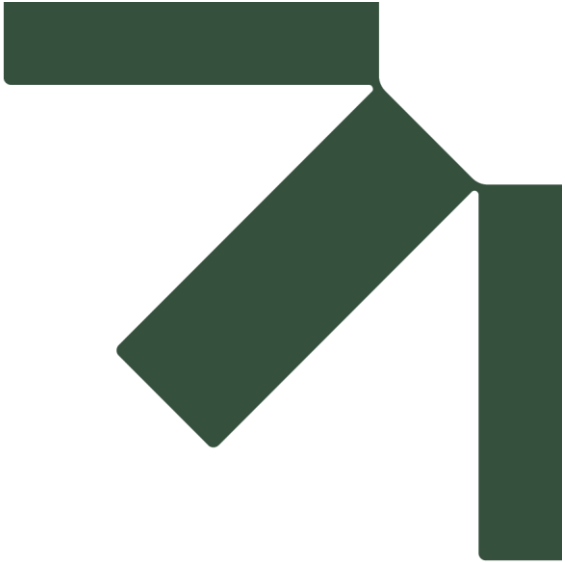
 Voids

 TUFLOW Model Extent

**Goonyella Complex PRCP
Rehabilitation Flood Assessment**

**Platypus and Fisher Creek PRCP Conditions
Peak Velocities - 0.1% AEP + 20% rainfall intensity**





Appendix C Pluvial Model Results

Goonyella Complex

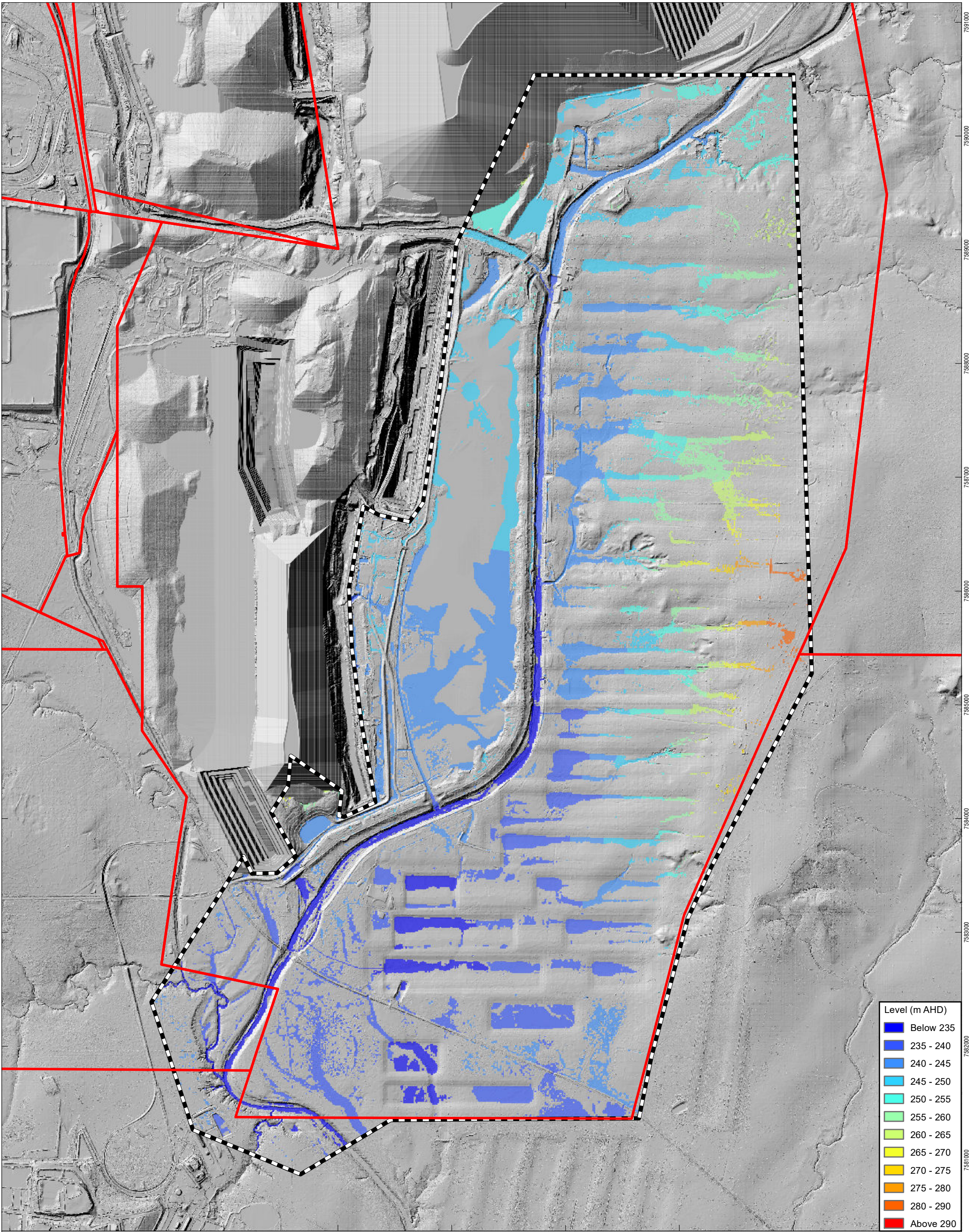
Progressive Rehabilitation and Closure Plan Rehabilitation Flood Assessment

BHP Mitsubishi Alliance

SLR Project No.: 620.040713.0000

18 November 2024

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620.040713.00001.GPM.RHM.PRCF.Rehab.Flood.Asses\06.SLR.Data\01.CAD\GIS\GIS\ArcAuto\Maping\010\Output\MXDs\620.040713_APPENDIX C1-1-1_P08_02p_h.mxd





00.2250.450.9
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:30,000 at A3

Project Number: 620.040713

Date: 26-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 TUFLOW Model Extent

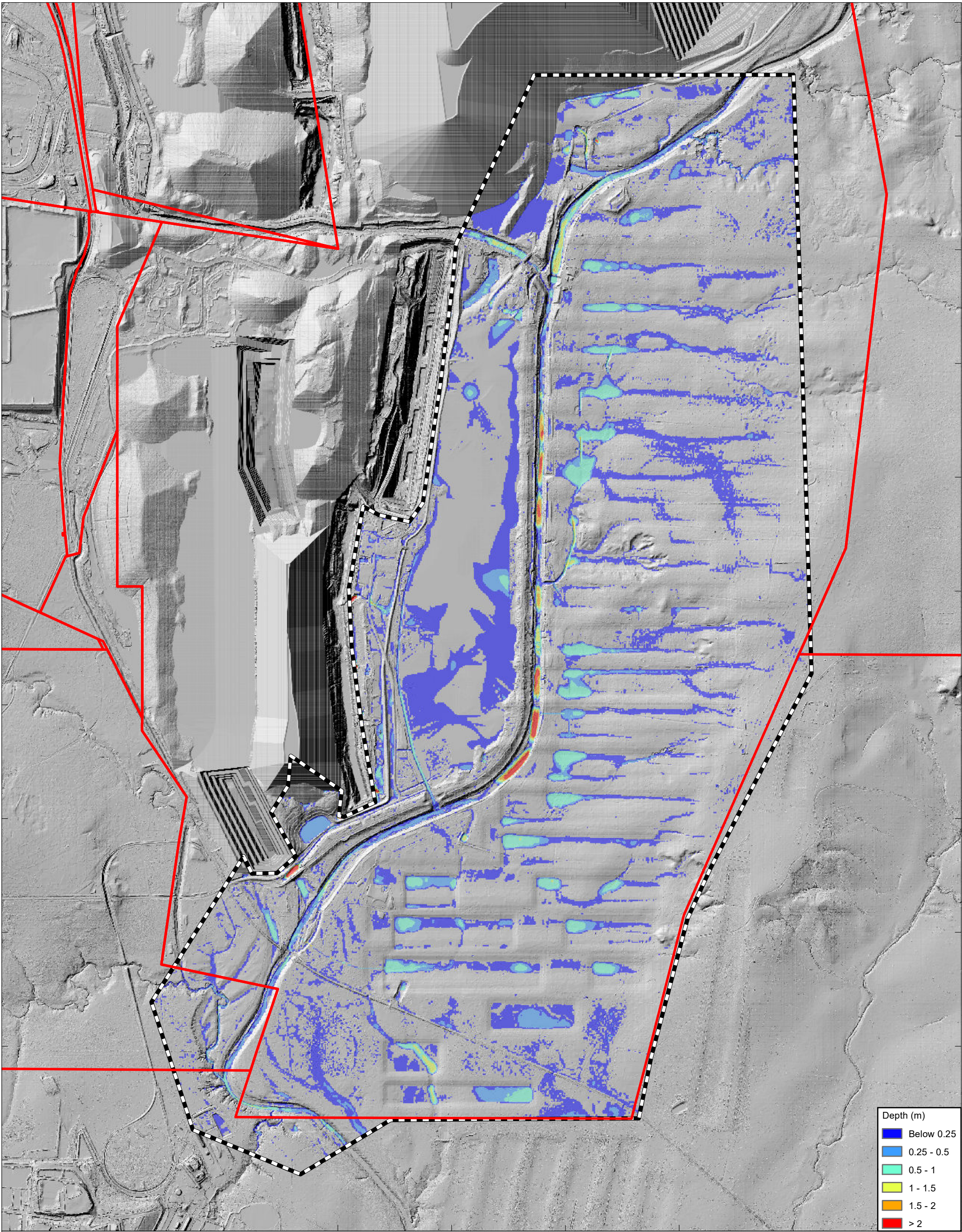
Level (m AHD)	
	Below 235
	235 - 240
	240 - 245
	245 - 250
	250 - 255
	255 - 260
	260 - 265
	265 - 270
	270 - 275
	275 - 280
	280 - 290
	Above 290

**Goonyella Complex PRCF
Rehabilitation Flood Assessment**

**PRCP Conditions Pluvial Modelling
Peak Levels - 2% AEP**



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-040713-00001-GRM-RHM-PRCP-Rehab-Flood-Asses\06-SLR-Data\01-CAD\GIS\GIS\ArcAuto\Maping\010\Output\MXDs\620-040713-APPENDIX C1-1-2-PO8-02p_d.mxd





00.2250.450.9
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:30,000 at A3

Project Number: 620.040713

Date: 26-Sep-2024

Drawn by: TS

LEGEND

 Mining Leases

 TUFLOW Model Extent

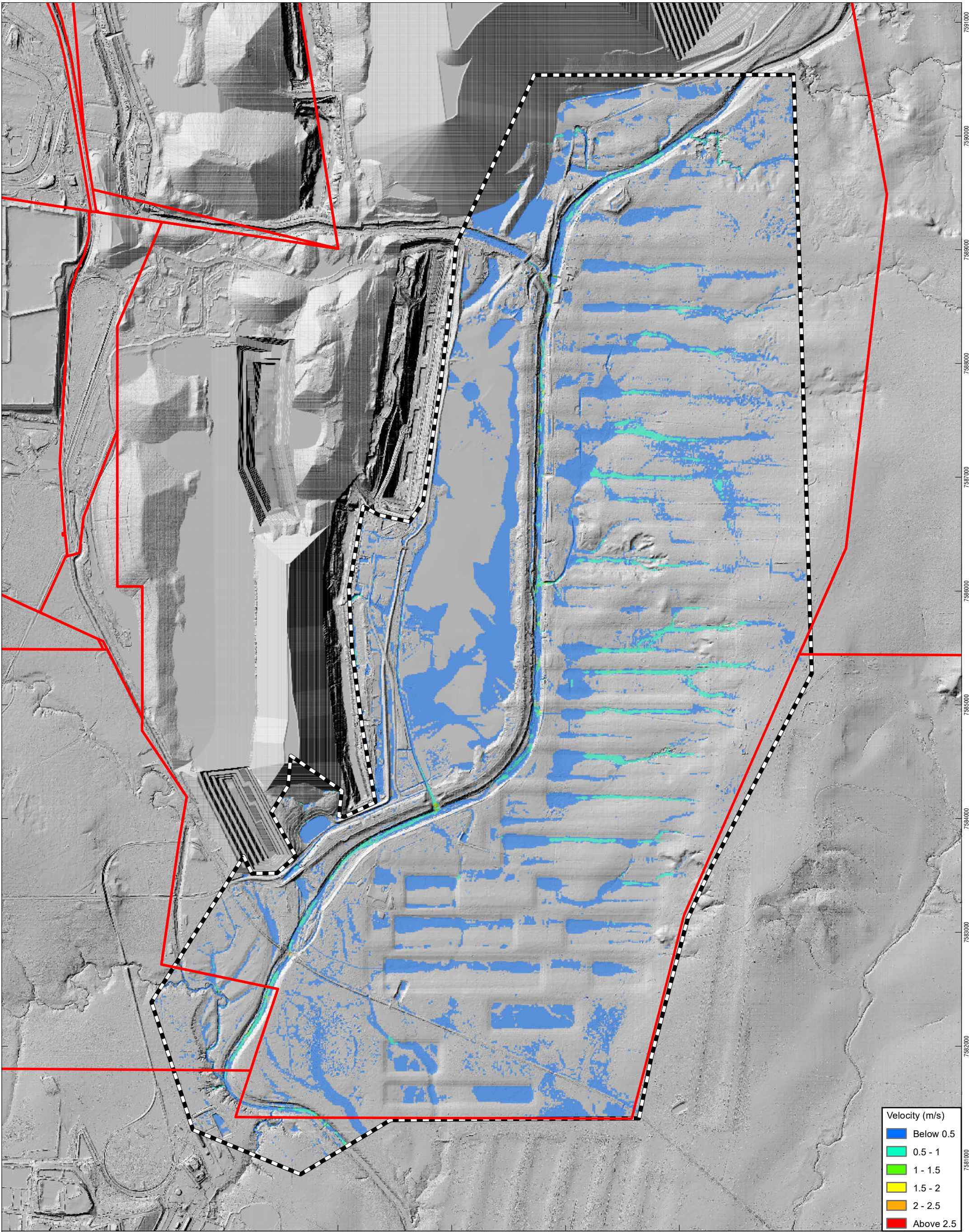
Depth (m)	
	Below 0.25
	0.25 - 0.5
	0.5 - 1
	1 - 1.5
	1.5 - 2
	> 2

Goonyella Complex PRCP
Rehabilitation Flood Assessment

PRCP Conditions Pluvial Modelling
Peak Depths - 2% AEP



\\au.slr.local\Corporate\Projects-SLR\620-BNE\620.040713.00001\GPM_RHM_PRCF_Rehab_Flood_Asses\06_SLR_Data\01_CAD\GIS\GIS\ArcAuto\Maping\010\Output\MXDs\620.040713_APPENDIX C1-1-3_P08_02p_V.mxd



Velocity (m/s)	
■	Below 0.5
■	0.5 - 1
■	1 - 1.5
■	1.5 - 2
■	2 - 2.5
■	Above 2.5



00.2250.450.9
km

Coordinate System: GDA2020 MGA Zone 55

Scale: 1:30,000 at A3

Project Number: 620.040713

Date: 26-Sep-2024

Drawn by: TS

LEGEND

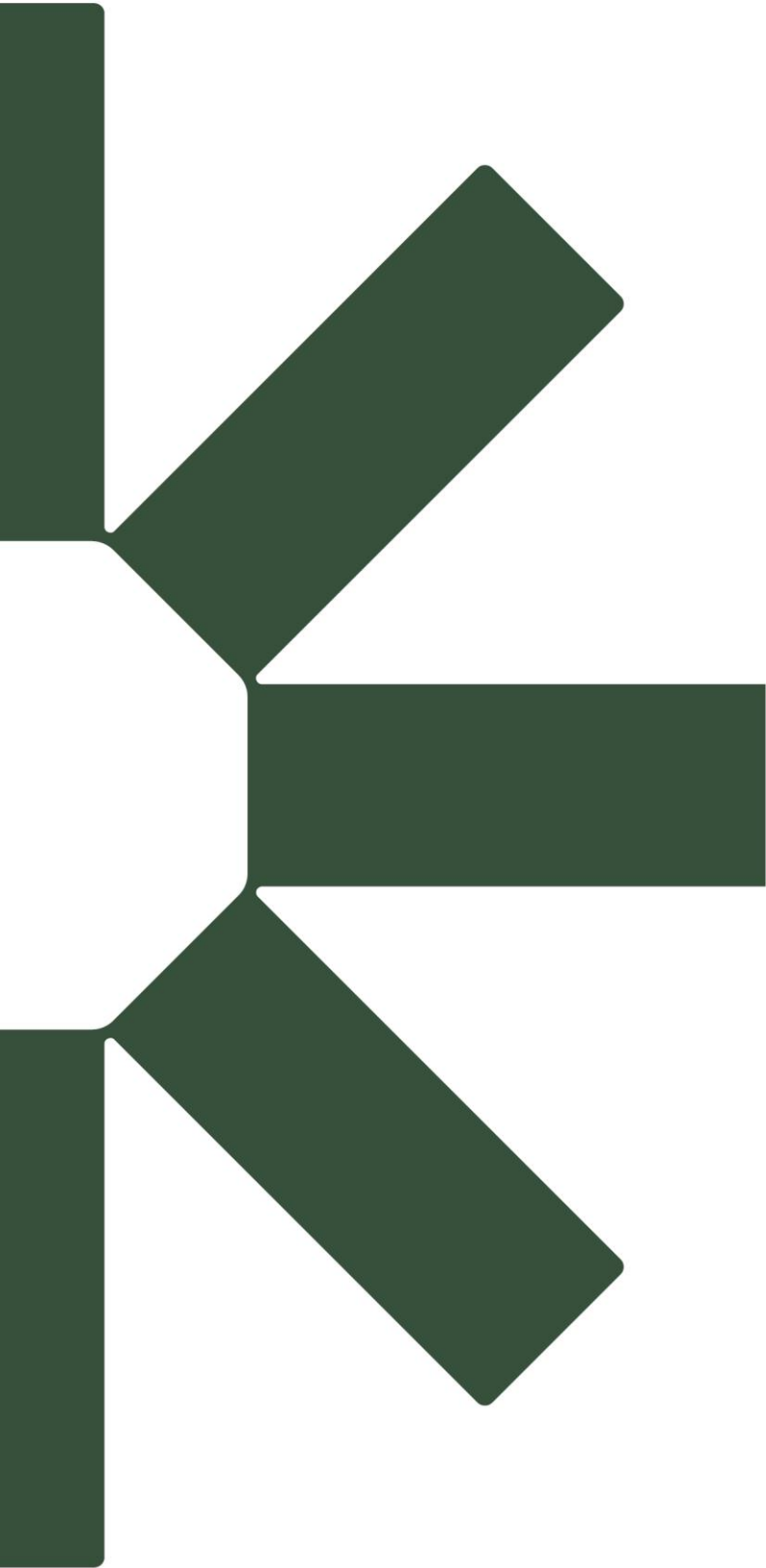
 Mining Leases

 TUFLOW Model Extent

Goonyella Complex PRCF
Rehabilitation Flood Assessment

PRCP Conditions Pluvial Modelling
Peak Velocities - 2% AEP





Making Sustainability Happen