



# Lake George Mine Remediation

Addendum REF

Department of Regional NSW

16 December 2022

→ The Power of Commitment



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**GHD Pty Ltd | ABN 39 008 488 373**

133 Castlereagh Street, Level 15

Sydney, New South Wales 2000, Australia

**T** +61 2 9239 7100 | **F** +61 2 9239 7199 | **E** [sydmail@ghd.com](mailto:sydmail@ghd.com) | **ghd.com**

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# Executive Summary

## Introduction

The Legacy Mines Program (LMP) within the Department of Regional New South Wales (NSW) propose to undertake remediation works at the legacy Lake George Mine, located immediately west of the township of Captains Flat, NSW. Mining operations in the area commenced in the early 1880s and continued until 1962, when the Lake George Mine officially closed. The site is heavily contaminated with metals and metalloids including lead, arsenic, copper, zinc, and sulfur, and has undergone a succession of remediation works since 1972.

The proposed remediation works include site preparatory early works, fencing historic mining structures, strategic structural works, remediation earthworks, augmentation of surface water drainage, and revegetation across several key domains, predominantly in the northern portion of Lake George Mine (the approved project).

In April 2022, the Department of Regional NSW approved the Review of Environmental Factors (REF) document (GHD, 2022a) prepared to assess the proposed remedial works through a self-assessment under Part 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

Following the REF approval, the LMP identified some modifications to the approved project that require assessment and approval under the EP&A Act. This addendum (Addendum REF) to the original REF has been prepared to describe the proposed modifications to the approved remediation works by assessing the potential environmental impacts. This Addendum REF describes and assesses only those aspects of the approved project that have changed since determination of the original REF. To obtain an understanding of the wider impacts of the approved project, this Addendum REF should be read in conjunction with the original REF.

## Proposed modifications

Following the REF approval, the LMP identified the following modifications to the approved project that require assessment and approval under the EP&A Act:

- an additional location option for the temporary site infrastructure including site office, lunchroom, ablutions block, induction / training room and first aid room
- mobile, packaged worker decontamination facilities
- remedial work in and around Copper Creek, Forsters Creek and the Molonglo River (i.e., a controlled activity (remedial works) on waterfront land as defined under the NSW *Water Management Act 2000*)
- the addition of culvert works, a clean water diversion drain, and sediment basins for construction water management in the Mill Area and Creeks and Rail Loading Area
- the optional reuse of an existing spoil stockpile as backfill after the removal of a sulfidic waste stockpile in the North Mine Ridge (Elliot's) domain
- a change in remediation methodology, with respect to retention of heritage items, within the Captains Flat Railway Precinct
- a change in remediation methodology within the Old Mill Area
- green waste generation and disposal during site early works and the clearing and grubbing component of the remedial works
- de-silting of sediment basins and management of the generated waste
- construction water management during remedial works
- minor road maintenance work.

As a result of the above, minor changes to the previously approved boundary for the maximum extent of site remedial works are required.

## Key findings

This Addendum REF identifies potential environmental benefits and impacts of the revised proposal and outlines mitigation measures to reduce the identified impacts.

The revised proposal would provide the following benefits:

- long-term positive impact on air quality and water quality
- support new areas of vegetation in remediated and revegetated areas
- increase both the accessibility and safety of the site to visitors.

The following remediation impacts have been identified should the revised proposal proceed:

- short-term additional negative impact on to air quality and water quality
- the potential for removal of up to 0.99 ha of additional native vegetation noting that The *Captains Flat Rail Corridor Remediation Action Plan* (Ramboll, 2022) proposes to fence off and retain the PCT 283 within the TfNSW part of the site to limit access and exposure to contractors undertaking remedial activities
- removal of some heritage fabric in the Captains Flat Railway Precinct
- one additional truck movement per hour during remediation.

Further information regarding these impacts is provided in section 4 of the Addendum REF.

## Conclusions

The revised proposal is subject to assessment under Section 5.5 of the EP&A Act. This addendum to the original REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the revised proposal.

The Addendum REF found that the revised proposal would be unlikely to cause a significant impact on the environment. Indeed, the aim of the remedial works is to improve the condition of the environment at, and downstream of, the Lake George Mine.

In addition, the REF proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*.

On balance, the revised proposal is considered justified as the environmental impacts would be outweighed by the improvement to the environment at Lake George Mine and increased public health and safety.

# Abbreviations

Abbreviation	Term
ABN	Australian Business Number
ACT	Australian Capital Territory
ADWG	Australian Drinking Water Guidelines
AEP	Annual exceedance probability
AH	Aboriginal heritage
AHIMS	Aboriginal Heritage Information Management System
AMD	Acid and metalliferous drainage
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASLP	Australian Standard Leaching Procedure
BC Act	<i>Biodiversity Conservation Act 2016 (NSW)</i>
CE	Critically Endangered
CEEC	Critically Endangered Ecological Community
CEMP	Construction environmental management plan
CLM Act	<i>Contaminated Land Management Act 1997 (NSW)</i>
CNVMP	Construction noise and vibration management plan
COVID	Coronavirus (COVID-19) pandemic
CTMP	Construction Traffic Management Plan
DCCEEW	Australian Department of Climate Change, Energy, the Environment and Water
DECC	NSW Department of Environment and Climate Change
DFAT	Australian Department of Foreign Affairs and Trade
DI	Deionised water
DP	Deposited Plan
DPE	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
DPIE	NSW Department of Planning, Industry and Environment (now renamed as NSW Department of Planning and Environment)
pH	Potential of hydrogen
EC	Electrical conductivity
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
EPA	NSW Environment Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i>
EPL	Environmental Protection Licence
FAE	Freshwater aquatic ecosystem
FM Act	<i>Fisheries Management Act 1994 (NSW)</i>
GAI	Geochemical Abundance Index

Abbreviation	Term
ha	Hectares
ICNG	Interim Construction Noise Guideline
LEP	Local Environmental Plan
LMP	Legacy Mines Program
ML	Megalitre
MNES	Matters of national environmental significance under the <i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i> .
NAG	Net acid generation
NAH	Historic heritage
NAPP	Net acid production potential
NHMRC	National Health and Medical Research Council
NRMMC	Natural Resource Management Ministerial Council
NSW	New South Wales
PCT	Plant community type
POEO Act	<i>Protection of the Environment Operations Act 1997 (NSW)</i>
PWC	Principal works contractor
REF	Review of environmental factors
RFS	Rural Fire Service
SEPP	State environmental planning policy
SES	NSW State Emergency Service
SWMP	Surface Water Management Plan
TARP	Trigger Action Response Plan
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened ecological communities
TISEPP	State Environmental Planning Policy (Transport and Infrastructure) 2021
TMP	Traffic Management Plan
TfNSW	Transport for NSW
TSP	Total Suspended Particulates

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# 1. Introduction

## 1.1 Background

The Legacy Mines Program (LMP) within the Department of Regional NSW propose to undertake remediation works at the legacy Lake George Mine, located immediately west of the township of Captains Flat, New South Wales (NSW). Mining operations in the area commenced in the early 1880s and continued until 1962, when the Lake George Mine officially closed. The site is heavily contaminated with metals and metalloids including lead, arsenic, copper, zinc, and sulfur, and has undergone a succession of remediation works since 1972.

The proposed remediation works include site preparatory early works, fencing historic mining structures, strategic structural works, remediation earthworks, augmentation of surface water drainage, and revegetation across several key domains, predominantly in the northern portion of Lake George Mine (the approved project).

In April 2022, the Department of Regional NSW approved the Review of Environmental Factors (REF) document (GHD, 2022a) prepared to assess the proposed remedial works through a self-assessment under Part 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

Following the REF approval, the LMP identified some modifications to the approved project that require assessment and approval under the EP&A Act. These modifications are:

- an additional location option for the temporary site infrastructure including site office, lunchroom, ablutions block, induction / training room and first aid room
- mobile, packaged worker decontamination facilities
- remedial work in and around Copper Creek, Forsters Creek and the Molonglo River (i.e., a controlled activity (remedial works) on waterfront land as defined under the NSW *Water Management Act 2000*)
- the addition of culvert works, a clean water diversion drain, and sediment basins for construction water management in the Mill Area and Creeks and Rail Loading Area
- the optional reuse of an existing spoil stockpile as backfill after the removal of a sulfidic waste stockpile in the North Mine Ridge (Elliot's) domain
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This addendum (Addendum REF) to the original REF has been prepared to describe the proposed modifications to the approved remediation works by assessing the potential environmental impacts. This Addendum REF describes and assesses only those aspects of the approved project that have changed since determination of the original REF. To obtain an understanding of the wider impacts of the approved project, this Addendum REF should be read in conjunction with the original REF.

## 1.2 Purpose of this Addendum REF

The purpose of this Addendum REF is to describe the proposed modifications to the original REF, assess the environmental and social impacts of the proposed modifications (refer to section 4) and detail additional safeguards or management measures, where required.

This Addendum REF has been undertaken to address Clause 171(2) of the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation). In doing so, the Addendum REF helps fulfil the requirements of Section 5.5 of the *EP&A Act* which requires that LMP examine and take into account, to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

## 1.3 Stakeholder and community consultation

Section 4.3 of the original REF outlined previous stakeholder and community consultation undertaken for the approved project.

The original REF required the implementation of a Communication Management Plan for the project to manage impacts to community stakeholders. This Plan outlines the regular community updates that will be provided via newsletters and online postings, and the face to face community sessions that will occur to allow community input into remediation strategies.

Formal consultation was undertaken with Queanbeyan Palerang Regional Council on 6th April 2022 regarding impacts on local heritage and excavation of a road or adjacent footpath managed by Council.

A consultation letter was issued to Queanbeyan Palerang Regional Council on 6th April 2022. The Department of Regional NSW has also had ongoing consultation with Queanbeyan-Palerang Regional Council regarding the proposed modifications. Council responded in June 2022 via a signed Consent to Enter document to undertake work on the Surge Bin, situated on Queanbeyan Palerang Regional Council land. The response outlined how the proposal had been taken to the Council meeting on 25th May 2022 and resolved in favour of the works progressing (Resolution 214/22).

As the revised proposed involves additional impacts on a local heritage item (Captains Flat Railway: goods shed, weighbridge, gantry and turntable Item No. 1266) in the Transport for NSW (TfNSW) part of the site, TfNSW will update and consult Queanbeyan Palerang Regional Council prior to works beginning.

## 2. Project description

### 2.1 Proposed modifications

The following summarises the proposed modifications to the approved project as described in the original REF:

- an additional location option for the temporary site infrastructure including site office, lunchroom, ablutions block, induction / training room and first aid room (collectively, temporary site infrastructure)
- mobile, packaged worker decontamination facilities
- remedial work in and around Copper Creek, Forsters Creek and the Molonglo River (i.e., a controlled activity (remedial works) on waterfront land as defined under the NSW *Water Management Act 2000*)
- the addition of culvert works, a clean water diversion drain, and sediment basins for construction water management in the Mill Area and Creeks and Rail Loading Area
- the optional reuse of an existing spoil stockpile as backfill after the removal of a sulfidic waste stockpile in the North Mine Ridge (Elliot's) domain
- a change in remediation methodology, with respect to retention of heritage items, within the Captains Flat Railway Precinct
- a change in remediation methodology within the Old Mill Area
- green waste generation and disposal during site early works and the clearing and grubbing component of the remedial works
- de-silting of sediment basins and management of the generated waste
- construction water management during remedial works
- minor road maintenance work.

As a result of the above, minor changes to the previously approved boundary for the maximum extent of site remedial works are required.

Further information regarding these changes is provided in the following sections. Design relevant to the above are provided in Attachment 1 of Appendix A.

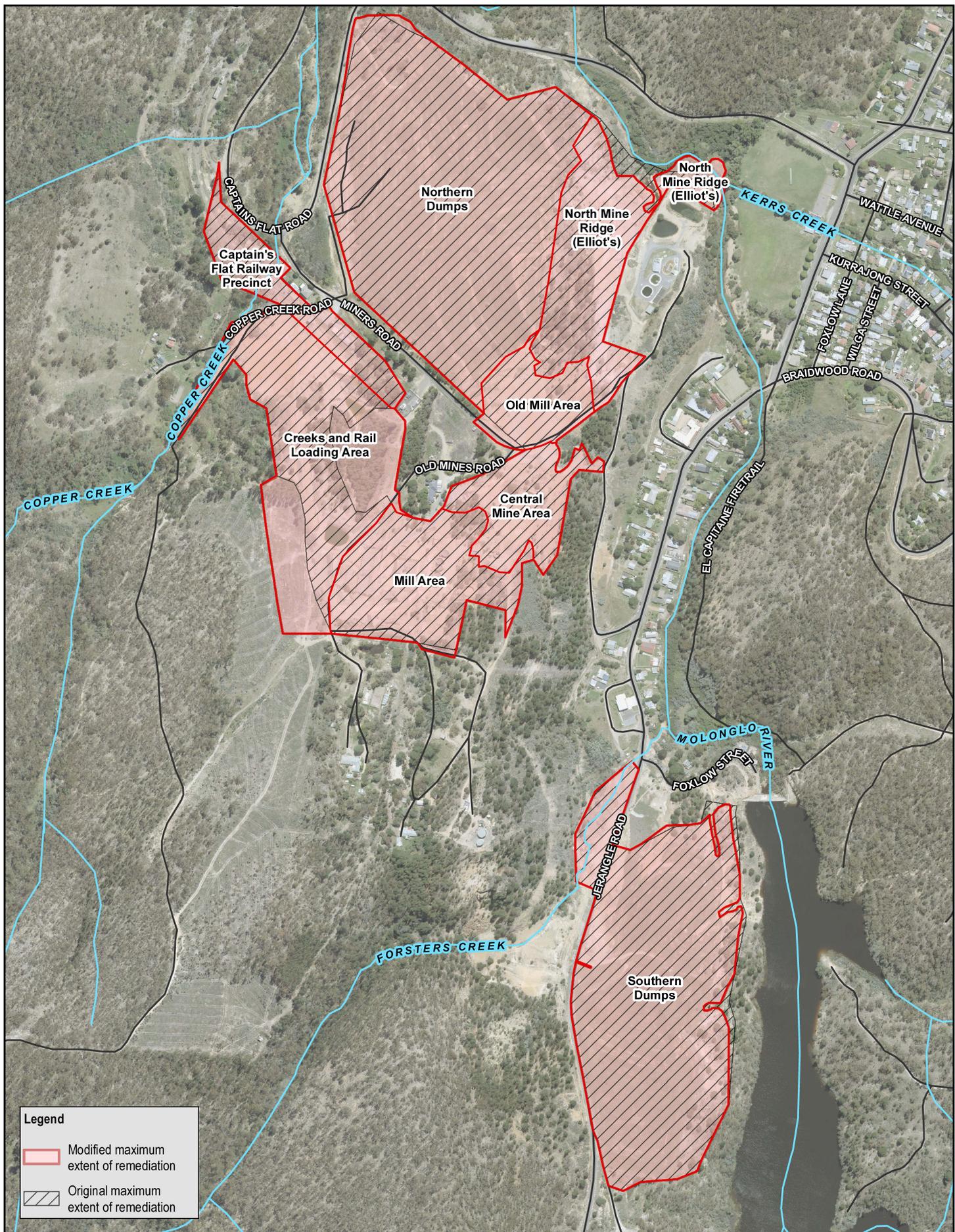
### 2.2 Location

Figure 2.1 shows the revised maximum extent of remediation, noting that the boundary for the Captains Flat Railway Precinct remains as assessed in the original REF.

The modified site boundary accommodates:

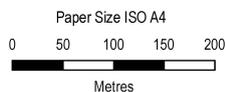
- the clean water diversion drain and sediment basins in the Creeks and Rail Loading Area and Mill Area
- the additional location option for the temporary site infrastructure
- the remedial work in and around Copper and Forsters Creeks and the Molonglo River (i.e., a controlled activity (remedial works) on waterfront land as defined under the NSW *Water Management Act 2000*)
- minor road maintenance works
- other minor refinements as required.

The key features of the proposed modifications are shown in Figure 2.2.



**Legend**

- Modified maximum extent of remediation
- Original maximum extent of remediation



Map Projection: Transverse Mercator  
 Horizontal Datum: GDA 1994  
 Grid: GDA 1994 MGA Zone 55

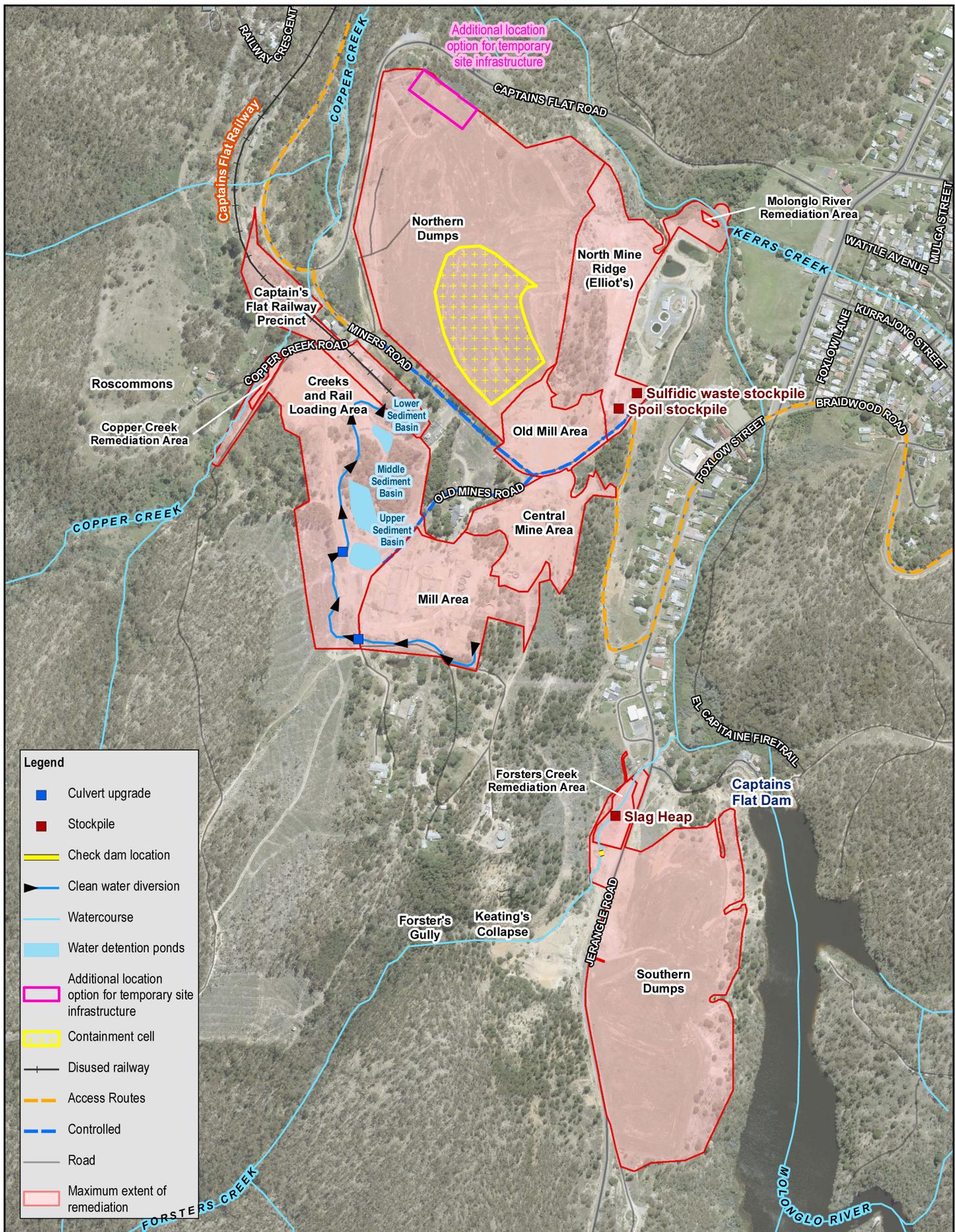


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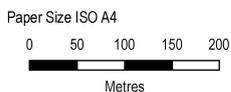
**Modified maximum extent of remediation**

**FIGURE 2.1**



**Legend**

- Culvert upgrade
- Stockpile
- Check dam location
- ▶ Clean water diversion
- Watercourse
- Water detention ponds
- Additional location option for temporary site infrastructure
- Containment cell
- Disused railway
- Access Routes
- Controlled
- Road
- Maximum extent of remediation



Map Projection: Transverse Mercator  
 Horizontal Datum: GDA 1994  
 Grid: GDA 1994 MGA Zone 55

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**Key features of the revised proposal**

**FIGURE 2.2**

## 2.3 Description of modifications

### 2.3.1 Additional location option for temporary site infrastructure

The original REF included two options for the temporary site infrastructure that included a site office, ablutions block and other facilities as described below - being the NSW State Emergency Services building (the preferred option) and / or at the mine lookout parking area.

The amendment includes a third option for the location of the temporary site infrastructure, being at the northern extremity of the Northern Dumps, as shown in Figure 2.2. The temporary site infrastructure remains unchanged from the approved REF and includes a portable (demountable):

- site office (6m x 3m)
- lunchroom (12m x 3m)
- ablution block (6m x 3m)
- induction/training room (6m x 3m)
- first aid room (3.6m x 3m).

The temporary site infrastructure requires connection to grid electricity and temporary solutions for water and sewerage. Light vehicle parking would occur in this area.

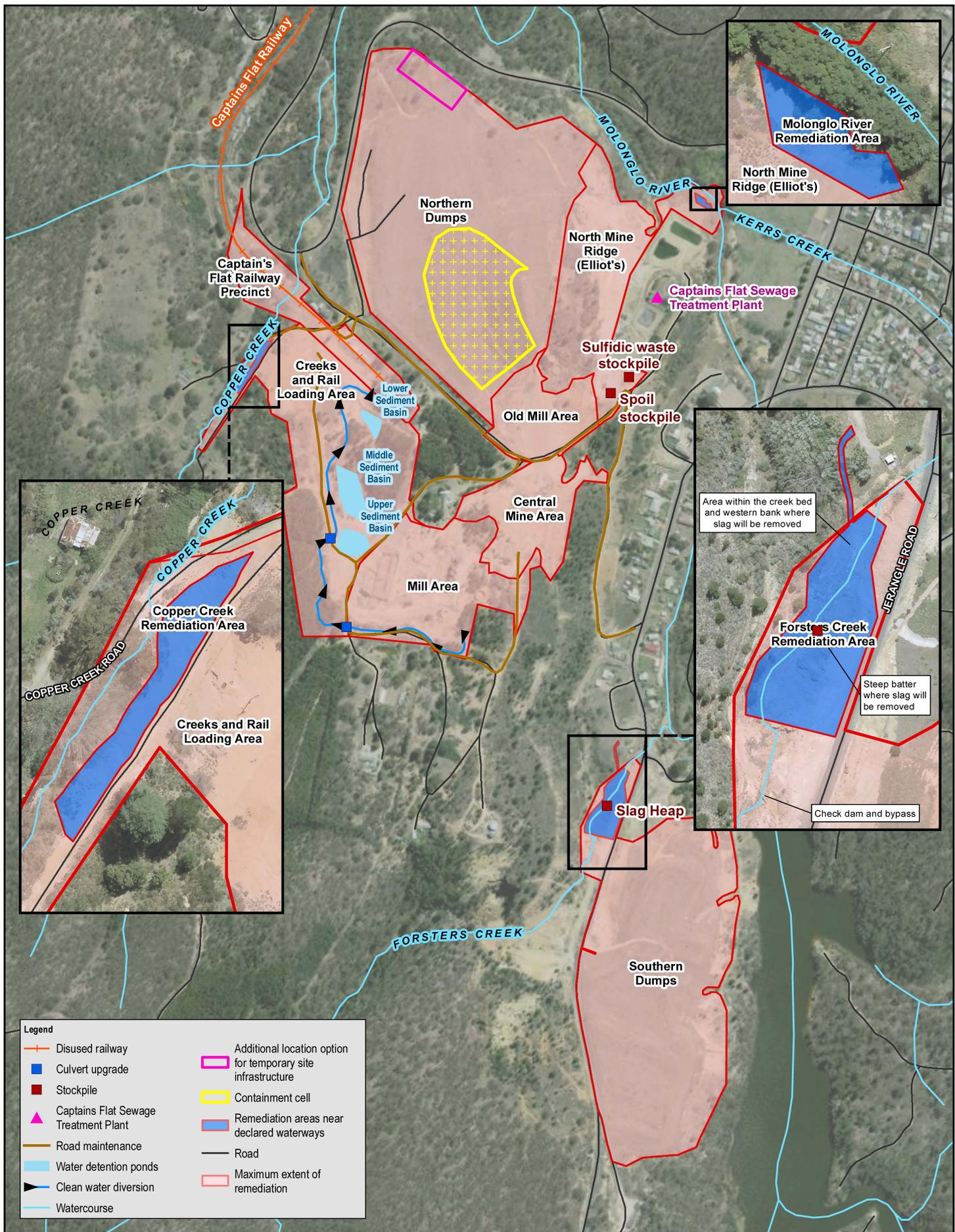
Note that the worker decontamination / washroom facilities, including showers would be a packaged mobile facility that would be moved around the site to be proximal to live remediation areas.

### 2.3.2 Remedial work in waterfront land

The approved project included remedial work to the bank of Forsters Creek, however, did not include works on waterfront land at Copper and Forsters Creeks, nor the Molonglo River.

The remedial works are deemed to be a controlled activity on waterfront land as defined under the NSW *Water Management Act 2000*.

The proposed remedial works, as shown in Figure 2.3, are described below.



Legend	
	Disused railway
	Culvert upgrade
	Stockpile
	Captains Flat Sewage Treatment Plant
	Road maintenance
	Water detention ponds
	Clean water diversion
	Watercourse
	Additional location option for temporary site infrastructure
	Containment cell
	Remediation areas near declared waterways
	Road
	Maximum extent of remediation

Paper Size ISO A4  
 0 50 100 150 200  
 Metres  
 Map Projection: Transverse Mercator  
 Horizontal Datum: GDA 1994  
 Grid: GDA 1994 MGA Zone 55



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Remedial works on waterfront land

FIGURE 2.3

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### 2.3.2.1 Copper Creek

The approved project included remedial works adjacent to Copper Creek within the Creeks and Rail Loading Area, however, remedial works to the south-eastern bank of Copper Creek were excluded. Further field inspections revealed that remediating the full extent of the slag and other contaminated material on the south-eastern bank of Copper Creek is required, therefore remedial works on waterfront land are now proposed.

Designs for the proposed Copper Creek remedial work is provided in Attachment 1 of Appendix A.

The remedial work in Copper Creek would involve excavation of contaminated material on the south-eastern bank as shown indicatively in Figure 2.3. Material would be removed from the unvegetated bank area between the track situated on the top of bank (i.e., the Crown road reserve) to approximately 800 mm above the baseflow channel, tying into stiff clay or rock. Placement of rip rap into the base flow channel would only be required where stiff clay or rock is not present in the base flow area. This would allow tie-in of the remediation work. Work would be undertaken nominally using a 20 tonne excavator or similar, stationed on, or adjacent to, the south-eastern bank of the creek, with the excavated material hauled to the contaminated cell using moxys or truck following amendment using lime or a lime alternative.

The Copper Creek remediation area would then be backfilled to the original profile using Capping Option 3 (*in situ* liming overlain with geotextile under appropriately sized rock mulch for bank scour protection – refer Appendix A). That is, the rock mulch depth would not be greater than the depth of the contaminated material removed from the bank, meaning that the rock mulch would not reduce the capacity of Copper Creek, and thus, flood risk would not be increased.

The only scenario where works within the baseflow channel are anticipated is where riprap for the bank stabilisation can't be tied into *in situ* rock or still clay.

Scour bank protections were designed in accordance with *Catchments & Creeks Rock Sizing for Bank Stabilisation*, section 5 (Catchments & Creeks Pty Ltd, 2014).

Flood modelling informed the choice of rock sizing for the scour bank protections. The flood modelling used a K-value of 0.86 for supercritical flow and angular riprap with a minimum specific gravity of 2.6. The works area was reviewed against the 1 in 20 AEP HEC-RAS modelling results to identify flood velocities along the bank.

### 2.3.2.2 Forsters Creek

The approved project included remediation of the slag heap within the Forsters Creek channel (refer Figure 2.4), and the removal of existing mineral waste material that may have spilled into the natural waterway (refer Figure 2.5). However, the original REF specified that the mobile civil plant used for remedial works would only operate from the top of bank and would not enter the watercourse *per se*. Further, no backfilling of excavated material for scour protection was assessed.

Further field inspections revealed that remediating the full extent of the slag within Forsters Creek would require access to the channel bed. As such, remedial works on waterfront land have been included in this modification, as shown indicatively in Figure 2.3.

A check dam would be installed upstream of the works, with a gravity feed pipe system to divert water around the work site on the western batter. The pipe discharge would be located downstream of the works area prior to the culvert under Foxlow Street.

Access to the slag would first occur from above the deposit, from the top of eastern bank adjacent to Jerangle Road. Access would then be from a formed track into the channel from the eastern bank as well as within the creek bed to the north from Foxlow Street. Excavation would then continue back up the eastern slope with benching utilised to access the full face.

Slag would be mechanically removed, nominally using 24 tonne excavators or similar. Excavations would continue to a depth where slag was no longer evident, likely natural *in situ* bedrock. Excavated material would be placed in trucks working from Jerangle Road and transported to the containment cell.

At the completion of excavation, where natural bedrock was not exposed, the batters and creek line would be re-shaped with existing site material to form consistent batters. Finally, the check dam would be released and returned to the natural creek flow.

The capacity of Forsters Creek would not be reduced by the works, thus flood risk would not be increased.

If required during construction, the construction contractor would engage a suitably qualified geotechnical engineer or engineering geologist to develop and implement suitable controls to manage construction phase stability risks. If excavation identifies that the slag on the road batter exceeds a depth where excavations may undermine and destabilise Jerangle Road, then excavation works would be halted. Contingency actions would then be developed and implemented in consultation with a suitably qualified geotechnical engineer or engineering geologist, which would likely involving capping this slag with appropriate erosion and scouring controls installed.



**Figure 2.4** View downstream (north) in Forsters Creek showing slag to be removed from eastern bank



Figure 2.5 View across (west) Forsters Creek showing slag to be removed from the channel bed

### 2.3.2.3 Molonglo River

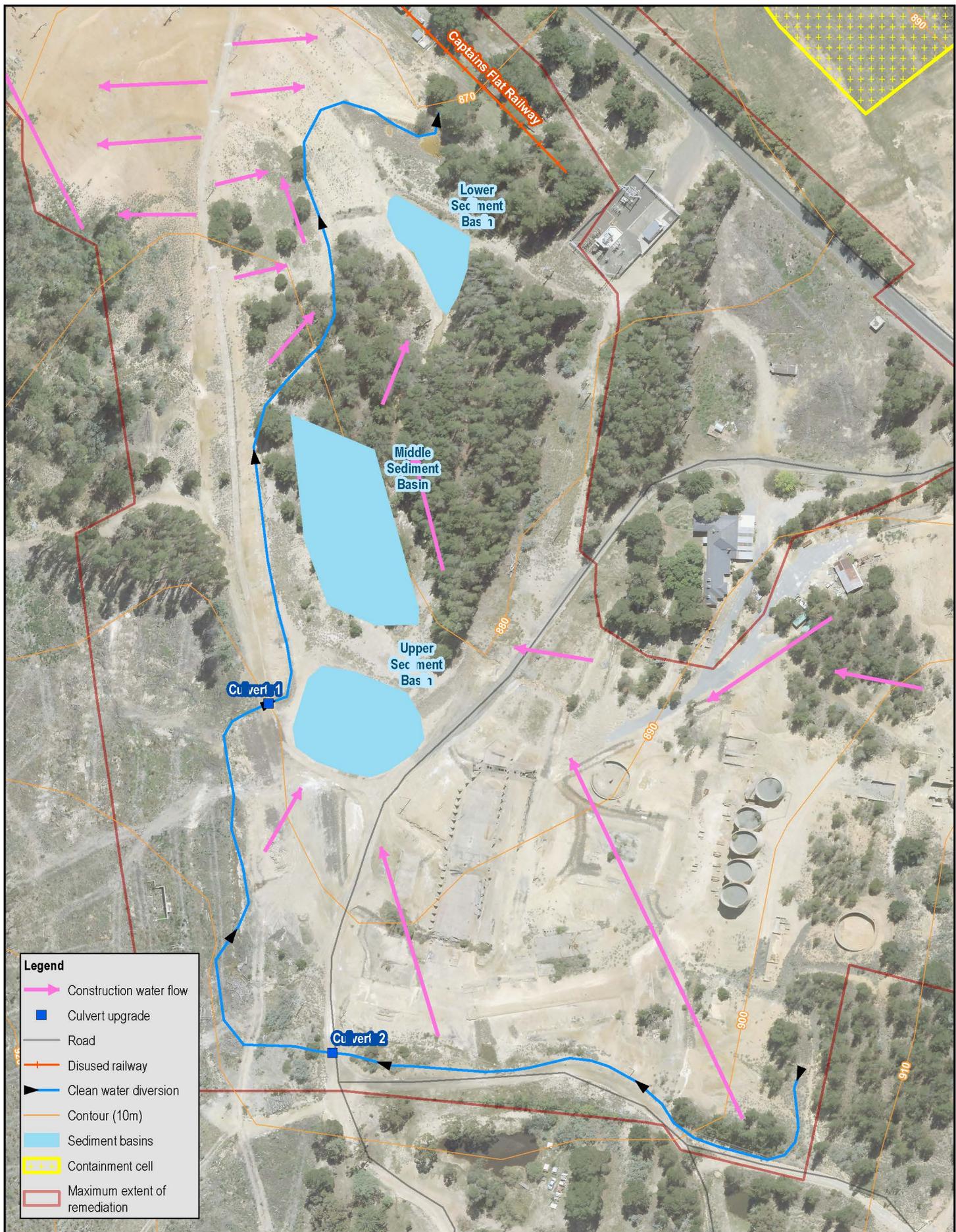
The southern bank of the Molonglo River immediately to the north of Council's water treatment plant contains contaminated mineral waste and slag. The previously approved project does not include remediation of this bank. Works at Molonglo River would involve removal of the contaminated bank material in the area shown indicatively in Figure 2.3, with site remediation being undertaken using Capping Option 3 (*in situ* liming overlain geotextile and rock mulch). Once remediated this area would be revegetated as far as reasonably practicable considering the treatment. The use of rock mulch on the depositional point bar side of this reach of the Molonglo River reduces the risk of scouring should a flood event occur prior to vegetation becoming fully established.

The capacity of Molonglo River would not be reduced by the works, thus, flood risk would not be increased.

### 2.3.3 Preliminary SWMP modifications

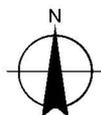
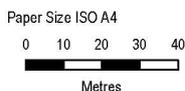
The approved project included a preliminary conceptual surface water management plan (SWMP) that detailed the approach to managing erosion and sediment controls, and site water management, provided as Appendix F of the original REF. The preliminary SWMP was developed to reduce impacts to water quality from the remedial works. Modifications to the preliminary SWMP, as shown in Figure 2.6, are described in sections 2.3.3.1, 2.3.3.2 and 2.3.3.3, and would include additional sediment basins, re-use of construction water onsite, and increased water holding capacity on site

At minimum, the modifications to the preliminary SWMP would be designed by the Principal Works Contractor in accordance with *Managing Urban Stormwater – Volume 1* (Landcom, 2004), *Managing Urban Stormwater – Volume 2* (DECC, 2008a) and *Managing Urban Stormwater – Volume 2E, Mines and quarries* (DECC, 2008b), informally known as the 'Blue Book'.



**Legend**

- Construction water flow
- Culvert upgrade
- Road
- Disused railway
- Clean water diversion
- Contour (10m)
- Sediment basins
- Containment cell
- Maximum extent of remediation



Map Projection: Transverse Mercator  
 Horizontal Datum: GDA 1994  
 Grid: GDA 1994 MGA Zone 55

Department of Regional NSW  
 Lake George Mine Remediation –  
 Addendum REF

Project No. 12551771  
 Revision No. 0  
 Date 14/12/2022

**Surface Water Management  
 Plan amendments**

**FIGURE 2.6**

\\ghdnet\ghd\AU\Sydney\Projects\2112551771\GIS\Maps\Deliverables\REF\_Addendum\12551771\_REF\003\_WaterManagementPlanModifications\_A\_2022\1018.mxd  
 Print date: 14 Dec 2022 - 14:00  
 Whilst every care has been taken to prepare this map, GHD (and Nearmap) make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

Data source: General topography - LPI 2017; Aerial - MetroMap - Imagery (date extracted: 14/12/2022)  
 Created by: thompson2

Further, the SWMP will document enhanced controls to minimise the risk of erosion where possible, including consideration of best management practice and guidelines likely including:

- staging construction activities to minimise land disturbance at any one time
- using timber windrows during clearing to assist erosion control
- retaining vegetation within flow lines for as long as possible
- retaining groundcover on soils to minimise the potential loss of sediment
- treating topsoils with a high level of care to enable reuse in the rehabilitation phases
- using surface covers and binders to limit soil loss
- installing clean water diversions early
- ensuring prompt stabilisation and rehabilitation of the site
- reuse of construction water on site
- increased water holding storage on site.

The SWMP will also address vegetation clearing, initial site establishment, construction and operation of unsealed access roads, laydown areas, stockpile areas and permanent infrastructure (such as the containment cell) at minimum.

### **2.3.3.1 Culvert upgrade**

At two locations, upgrades to existing, or installation of new culverts, are proposed to allow clean water to pass under existing site roads and tracks unimpeded. The culvert works will include upgrades at culvert location 1 and installation at culvert location 2 (refer Figure 2.6) to have both locations accommodate 3 x 600 mm diameter concrete pipes as follows:

- Cutting through the concrete road and excavating adjacent to the single culvert at Culvert 1 in the lower Mill Area west of the existing Upper Sediment Basin and preparing the sub-grade for installation of an additional two new 600 mm diameter circular culverts. This work will be completed prior to construction of the clean water diversion (refer below) to minimise water quality risk. If the existing pipe is found to be fatigued and/or too damaged to remain *in situ*, it will be removed and three new pipes will be installed.
- Installing three new 600 mm diameter circular culverts at Culvert 2 in the upper Mill Area.
- Backfilling and compacting the ground around the new culverts to reduce the risk of pipe failure and surface slumping.
- Installation of appropriately sized inlet and outlet scour protection.
- Backfilling and compacting excavated material to road sub-grade and reinstating the road pavement.

### **2.3.3.2 Sediment basins**

There is currently an Upper and Lower Sediment Basin on site to manage contaminated surface water runoff in the Mill Area and Rail Loading / Creeks Area. It is proposed to increase the water holding capacity of the current basins and to construct a new Middle Sediment Basin between the Mill Area and Rail Loading / Creeks Area to assist with construction water management (refer Figure 2.6). Construction of the new basin would require some vegetation clearance.

Collectively, the three sediment basins would be operated together to:

- Improve water storage capacity on site thereby allowing water to be transferred from other small sediment basins in active remedial areas located around the site to the sediment basins. Where possible, the smaller sediment basins would be connected to the three larger sediment basins by pipes, otherwise, water would be transported to the three larger sediment basins by truck.
- Allow for construction water treatment as required. This would comprise a staged treatment method using flocculent/coagulant to remove suspended sediment and some metals followed by pH adjustment (alkalinity) to precipitate metals as metal hydroxides, followed by further pH adjustment (acidity) in the on site 200,000 L water storage tank to bring pH values back to a range suitable for on site beneficial reuse of the water as/via dust suppressant, revegetation watering and/or irrigation.
- Provide greater evaporation potential, thereby reducing the risk of discharge.

- Provide treated water for on-site use via irrigation.

Details of the three Sediment Basins are provided in Table 2.1.

To maximise the capacity of the existing Upper and Lower Sediment Basins, they require de-silting following de-watering to the site, or to the newly constructed Middle Sediment Basin. It is proposed that excavated silt be temporarily stored on site in the Mill Area using appropriate erosion and sediment controls until such time that the on-site containment cell is constructed. The thermally dried, de-silted sludge would then be analysed for contaminants before being stoichiometrically lime amended and placed in the containment cell for long term storage along with the remainder of the sulfidic mineral waste to be excavated and removed from the Mill Area. The height of the Lower Sediment Dam spillway may also be adjusted to increase its capacity.

**Table 2.1** Sediment basin details

Basin	Existing / new	Approx. Size (ML)	Purpose
Middle Sediment Basin	New	2	<ul style="list-style-type: none"> <li>– increase the water storage capacity on site by about 60%, thereby reducing the likelihood of licenced discharge under the site’s Environment Protection Licence, while also increasing the potential for evaporation as a management strategy</li> <li>– onsite water treatment as required and used for:               <ul style="list-style-type: none"> <li>• construction water (to meet standard compaction)</li> <li>• dust suppression</li> <li>• vegetation establishment</li> <li>• site irrigation</li> </ul> </li> </ul>
Upper Sediment Basin	Existing	2	<ul style="list-style-type: none"> <li>– water storage</li> <li>– increase the water storage capacity on site</li> <li>– on-site water treatment as required</li> </ul>
Lower Sediment Basin	Existing	2	<ul style="list-style-type: none"> <li>– water storage</li> <li>– increase the water storage capacity on site</li> <li>– on-site water treatment as required</li> </ul>

### 2.3.3.3 Clean water diversion channel

A clean water diversion channel is proposed to divert run-on from upslope of the Mill Area around the western edge of the Mill Area, through the Rail Loading / Creeks Area and off site (refer Figure 2.6). The purpose of the clean water diversion channel is to reduce run-on by around 73% from the 22 ha catchment area upslope. This would significantly reduce run-on into the contaminated Mill Area, which in turn will reduce the volume of construction water to manage through remedial works. The three sediment basins described above would then be used to manage the construction water running off from the Mill Area.

The upslope component of the proposed clean water diversion channel would be positioned between the unimpacted area upslope of the Mill Area and the Mill Area works zone to divert clean water runoff around the remedial works. It is proposed that the clean water diversion channel and three sediment basins (above) would remain on site following remedial works to assist with site water management, both in terms of water quantity and quality.

The western side of the Mill Area proposed to host the clean water diversion channel was cleared of a pine plantation in 2021 (refer Figure 2.7). Given that this area was hosting vegetation, it is not expected to be contaminated, and therefore, would not require remediation as per the Mill Area. In that regard, the site boundary has been expanded to the west of the approved boundary simply to accommodate the clean water diversion channel.



**Figure 2.7** Cleared vegetation on the western boundary of the Mill Area (circled in green). Provided by LMP, taken in October 2021.

### 2.3.4 Use of spoil stockpile

The approved project includes removal of a sulfidic waste stockpile in the North Mine Ridge/Elliot's domain (shown in Figure 2.2) and placement in the containment cell located on the Northern Dumps.

The amendment to the approved remedial strategy for the sulfidic waste stockpile is that the cleared stockpile footprint would optionally be backfilled to grade with material from an existing spoil stockpile located adjacent to the sulfidic waste stockpile (also shown in Figure 2.2).

The spoil stockpile was undergoing geochemical analysis at the time of writing the Addendum REF. If the geochemical analysis finds the spoil stockpile to be inert, then it would be used as backfill. Alternatively, if the spoil stockpile is found not to be inert then:

- The sulfidic waste stockpile would be removed and placed in the containment cell.
- The area would be remediated with capping Option 2 and or 3, depending on the land grade, in accordance with the original REF remediation method the spoil stockpile may also be removed and placed in the containment cell, with the area remediated with capping Option 2 and or 3, depending on the land grade, in accordance with the original REF remediation method.

A decision regarding the beneficial reuse of the stockpile as backfill would be made prior to remediation being implemented.

### 2.3.5 Captains Flat Railway Precinct

The original REF assesses remediation works at the Transport for NSW owned land that hosts the Captains Flat Railway Precinct. The assessed remediation methodology included the following:

- Prior to excavation of the contaminated surface soils, existing railway infrastructure including the railway line, signalling, gantry, signs, posts and fencing would be removed and temporarily stored on, or nearby the site.
- Approximately the top 500 millimetres of contaminated topsoil would be removed for encapsulation in the containment cell on the Northern Dumps, before importing railway ballast, sub- and topsoil to site for backfilling.

- Once excavation and backfilling had been completed, the railway infrastructure would be replaced into its original location as far as reasonably practicable. It is understood that the railway turntable located on a short spur line northwest of the Station Master's Cottage, can remain *in situ* during remedial works.

It is now proposed that:

- The gantry would remain *in situ* during, and following, remedial works. The replica weigh bridge that is present on site may be de-constructed before the remedial works and re-constructed after the remedial works.
- The railway line and sleepers would not be replaced after the remedial works, rather, would be disposed of.
- The Captains Flat Railway Precinct would be backfilled with sub- and topsoil only, rather than railway ballast.

### 2.3.6 Remediation method in Old Mill Area

The original REF assessed remediation of the Old Mill Area using *in situ* liming followed by placement of a 300 mm thick (subsoil (200 mm) / growing media or topsoil (100 mm)) layer (remedial option 2). Some of the steeper areas were to be remediated by *in situ* liming then placement of a 300 mm thick rock mulch layer comprising a hard rock drainage aggregate (option 3).

It is now proposed that the Old Mill Area be excavated, with the contaminated material placed into the Northern Dumps containment cell. The Old Mill Area would then be backfilled using sub- and topsoil and revegetated (option 5). Please refer to section 4.2.3 for additional technical justification.

### 2.3.7 Green waste management

The original REF assessed the generation and disposal of waste including excavated spoil, structural waste, and general waste. Green waste would also be produced from clearing and grubbing works, however green waste was not assessed in the original REF, rather, was implicit in the assessment due to its discussion in the appended Technical Specifications.

Green waste generated through clearing and grubbing would be managed as outlined in section 2.9 of Appendix B of the original REF. Green waste would be reused on site where possible (e.g., chipped wood), or disposed of at a licenced facility. Some supervised and managed burning of cleared pine may also be required in consultation with an agreed method as developed by the LMP, principal works contractor (PWC), relevant landholders and Rural Fire Service (RFS).

### 2.3.8 Road maintenance

The original REF excluded road maintenance activities on site to support heavy vehicle traffic.

It is now proposed that the following road maintenance activities would occur to further reduce the potential for impacts to air and water quality, and improve road safety through improved road stability:

- repair minor potholes, subsidence, and pavement instability
- repair drains next to road pavement. Drain and gutter maintenance may include cleaning sediment from drains, installing rock rip rap scour protection, and repairing existing culverts to be retained
- maintain road surface including paved and non-paved (gravel) surface roads. Works may include re-sheeting (gravel) and bitumen sealing.

### 2.3.9 Remedial works method

The remedial method and workforce, would be consistent with section 4.2 of the original REF.

The work hours, including truck deliveries, have been amended to be in accordance with the *Interim Construction Noise Guideline* (DECC 2009) during the following hours:

- Monday to Friday 7:00 am to 6:00 pm
- Saturday 8:00 am to 1:00 pm
- No work on Sundays or Public Holidays.

The only activities that could occur outside of the above hours would be:

- delivery of oversized plant or structures
- environmental mitigation activities in accordance with the approved Construction Environmental Management Plan (CEMP)
- emergency work to avoid the loss of life or damage to property, or to prevent environmental harm in accordance with the approved CEMP.

The duration of the works would be amended so that final site demobilisation would not occur until late 2024.

The remediation works would be progressed under a phased delivery with the TfNSW-owned and managed Captains Flat Railway Precinct part of the site following on from the rest of the Lake George Mine site. It may be that remedial works on the TfNSW are managed by TfNSW under a separate works contract rather than managed by the LMP.

A separate environment protection licence (EPL) application may be sought for the Captains Flat Railway Precinct works. The EPL application and Captains Flat Railway Precinct remediation works would occur after archiving of the railway area had occurred in accordance the *Heritage Act 1977* (refer section 4.2.6).

## 2.4 Traffic management and access

The modifications proposed herein require additional remedial materials, and therefore, truck movements, relative to the approved project, largely due to the amended remedial method in the Old Mill Area and changed remedial backfill in the Captains Flay Railway Precinct. However, this may be offset by a reduction in backfill requirements in the Mill Area given a reduction in the estimated quantities of contaminated material to be removed.

The revised approximate volumes of imported material have been summarised in 4.2.8 to inform the quantum of truck movements over the indicative remediation works schedule. The volumes shown in 4.2.8 are in addition to the volumes presented in section 4.2.1.5 of the original REF for the approved project.

The numbers assume the following densities: topsoil (1.3 tonnes per m<sup>3</sup>), subsoil (1.4), clay (2.0) and rock mulch (1.6). No bulking factors have been used. It is assumed that imported material is being supplied using truck and trailers (i.e. truck and dog configuration) with a payload of circa 33 tonnes. Both the number of trucks (for material delivery) and truck movements (return trip for traffic impact considerations) have been provided.

Table 2.2 Estimated additional truck movements for imported material

Material	Original REF					Revised quantities resulting from the addendum					Difference (total additional volumes)				
	m <sup>2</sup>	m <sup>3</sup>	tonnes	trucks	truck mvmts (in/out)	m <sup>2</sup>	m <sup>3</sup>	tonnes	trucks	truck mvmts (in/out)	m <sup>2</sup>	m <sup>3</sup>	tonnes	trucks	truck mvmts (in/out)
Lime			1,628	49	<b>98</b>			1,177	36	<b>72</b>			-451	-13	<b>-26</b>
Lime alternate			9,071	275	<b>550</b>			8,600	261	<b>522</b>			-471	-14	<b>-28</b>
Subsoil		27,688	38,763	1,175	<b>2,350</b>		27,350	38,290	1,160	<b>2,320</b>		-338	-473	-15	<b>-30</b>
Topsoil		12,844	16,697	506	<b>1,012</b>		12,675	16,478	499	<b>998</b>		-169	-220	-7	<b>-14</b>
Clay		3,450	6,900	209	<b>418</b>		12,675	25,350	768	<b>1,536</b>		9,225	18,450	559	<b>1,118</b>
Rock mulch		14,388	23,020	698	<b>1,396</b>		14,565	23,304	706	<b>1,412</b>		177	284	8	<b>16</b>
Cellular confinement system <sup>1</sup>	1,300			10	<b>20</b>	0			0	<b>0</b>	-1,300			-10	<b>-20</b>
Hydromulch				30	<b>60</b>				30	<b>60</b>				0	<b>0</b>
Geotextile <sup>2</sup>	47,960			50	<b>100</b>	49,050			9	<b>18</b>	1,090			-41	<b>-82</b>
Rip rap		0	0	0	<b>0</b>		1,100	1,760	53	<b>106</b>		1,100	1,760	53	<b>106</b>
Clay rich fill		0	0	0	<b>0</b>		3,450	6,900	209	<b>418</b>		3,450	6,900	209	<b>418</b>
			<b>Total</b>	<b>3,002</b>	<b>6,004</b>		<b>Total</b>	<b>3,731</b>	<b>7,462</b>			<b>Total</b>	<b>729</b>	<b>1,458</b>	

1. Presto Geoweb at 150 mm depth.

2. Assumes Bidim A24; 19 units of 600 m<sup>2</sup> each at circa 130 kg each.

Notes:

- Negative values signify a reduction in material volume requirements, resulting to a decrease in the number of trucks trips for material importation.
- The above totals 729 additional trucks, or 1,458 additional truck movements over the materials delivery window of 18 months. Based on standard construction work hours, this is the equivalent of around 20 additional truck movements per week, being approximately 0.4 truck movements every hour. Most material would be delivered from the north, with approximately 10% of topsoil being delivered from the east. No changes in light vehicle movements are expected.

### 3. Statutory and planning framework

Chapter 5 of the original REF provided the statutory and planning framework for the approved project and considered provisions of the relevant State Environmental Planning Policies (SEPPs), Local Environmental Plans (LEPs) and other legislation.

#### 3.1 Relevant legislation

A review of the relevant State and Commonwealth legislation assessed in the original REF has been undertaken in consideration of the project modifications assessed. No changes to the existing approval pathway presented in the original REF are required as a result of the proposed modifications.

The modified project results in three additional requirements under relevant legislation and SEPPs (refer Table 3.1).

Table 3.1 Additional legislation and SEPPs requirements

Legislation	Description / applicability	Action required
<i>Contaminated Land Management Act 1997</i> (CLM Act)	<p>The EPA have been notified of the contamination in the Captains Flat Railway Precinct by Transport for NSW in accordance with the CLM Act. Transport for NSW has entered into a Voluntary Management Plan with the EPA under the CLM Act.</p> <p>The Captains Flat Railway Precinct remediation works remain a Schedule 1 activity under the <i>Protection of the Environment Operations Act 1997</i> (POEO Act) and as such an EPL will be required.</p> <p>A separated EPL application may be submitted for the Captains Flat Railway Precinct remediation works.</p>	No
<i>Fisheries Management Act 1994</i> (FM Act)	<p>Under section 199 of the Act, public authorities must give notification to the Minister before a public authority carries out or authorises dredging or reclamation work.</p> <p>Dredging is proposed as a part of the creeks' remediation work.</p>	Yes – notification
<i>Roads Act 1993</i>	<p>Provides for the construction and maintenance of public roads. Requires consent to dig up, erect a structure or carry out work in, on or over a road.</p> <p>The revised proposal involves maintenance works to local roads managed by Queanbeyan-Palerang Council. As such, under section 125 an approval would be required from Queanbeyan-Palerang Council.</p>	Yes – licence
<i>State Environmental Planning Policy (Transport and Infrastructure) 2021</i> (TISEPP)	<p>The approved project involves consequential impacts on a locally listed heritage item and a road or adjacent footpath managed by Council.</p> <p>The revised proposal would result in additional consequential impacts to a locally listed heritage item and council managed roads.</p> <p>As such, formal consultation with the Queanbeyan-Palerang Regional Council would usually be required under TISEPP.</p> <p>However, the approved project, and its proposed modifications, do not rely on a TISEPP Chapter 2 provision to be carried out without consent (refer section 2.10(1) of TISEPP) and as such, consultation is not required.</p> <p>As discussed in the original REF, the proposal is permissible without consent under the SEPP (Resources and Energy) 2021.</p> <p>Regardless, consultation with Queanbeyan-Palerang Regional Council has been ongoing, and Council will be consulted by TfNSW regarding the additional heritage impacts involved in the revised proposal.</p>	No

## 3.2 Confirmation of statutory position

All relevant statutory planning instruments have been examined considering the modified project, with the following approvals or activities required:

- an EPL for scheduled activities or scheduled development work outlined in Schedule 1 of the POEO Act
  - Note that a separate EPL application may be sought for the Captains Flat Railway Precinct works
- notification to NSW DPI Fisheries for dredging work under section 199 of the *Fisheries Management Act 1994*
- approval from Queanbeyan-Palerang Council for road maintenance works under section 125 of the *Roads Act 1993*.

# 4. Environmental assessment

## 4.1 Issue identification

The existing environment as described in the original REF is considered applicable for assessing the modified project. Therefore, it has not been reproduced herein.

Table 4.1 shows the output of impact screening for the proposed project modifications with environmental disciplines requiring additional impact assessment flagged. The additional assessment is provided in section 4.2.

Table 4.1 Identification of environmental issues

Environmental aspect	Further assessment required due to the revised proposal	Reasoning and scope of works
Air impacts	Yes	Air quality impacts from the approved project were discussed in section 6.1.1 in the original REF. However, the assessment did not consider the modified remediation method for the Old Mill Area, nor the remedial works on waterfront land at Copper and Forsters Creeks and the Molonglo River. Potential impacts to air quality from the modified project are discussed in section 4.2.1 of this Addendum REF.
Water impacts	Yes	Water impacts from the approved project were discussed in section 6.1.2 in the original REF. However, the assessment did not consider the proposed works at Copper and Forsters Creeks, the Molonglo River nor the clean water diversion drain and new sediment ponds. Potential impacts to water from the modified project are discussed in section 4.2.2 of this Addendum REF.
Soil and stability impacts	Yes	Soil and stability impacts of the approved project were discussed in section 6.1.3 in the original REF. However, the assessment did not account for the remediation on waterfront land, the modified remediation method for the Old Mill Area, the additional excavation needed for the clean water diversion drain and sediment ponds, nor use of the existing spoil stockpile as backfill material. Potential impacts to soil and stability from the modified project are discussed in section 4.2.3 of this Addendum REF.
Noise and vibration impacts	No	Remedial works for the modified project would remain consistent with the approved REF. The noise and vibration assessment reported in section 6.1.4 of the original REF considered the worst-case scenario for noise generation. As the revised proposal would not negatively alter the worst-case scenario, additional impacts are not anticipated. Therefore, no additional assessment or mitigation is required.
Other physical and pollution impacts	Yes	Other physical and pollution impacts of the approved project were discussed in section 6.1.5 of the original REF. The modified remedial works also includes the generation, use and transportation of green waste. Potential other physical and pollution impacts from the modified project are discussed in section 4.2.4 of this Addendum REF.
Flora and fauna impacts	Yes	Flora and fauna impacts of the approved project were discussed in section 6.2.1 of the original REF. However, the assessment did not consider potential impacts to flora and fauna within the modified maximum extent of remediation. As such, potential impacts to flora and fauna from the modified project are discussed in section 4.2.5 of this Addendum REF.

Environmental aspect	Further assessment required due to the revised proposal	Reasoning and scope of works
Ecological and biosecurity impacts	No	The modified remedial works would not result in additional ecological and biosecurity impacts to those assessed in section 6.2.2 of the original REF. Therefore, no additional assessment or mitigation is required.
Community resources	No	The modified remedial works would not result in additional community resource impacts to those assessed in section 6.3.1 of the original REF. Therefore, no additional assessment or mitigation is required.
Natural resources	No	The modified remedial works would result in marginally higher use of natural resources than assessed in section 6.3.2 of the original REF. However, the incremental change is considered negligible, with no additional impacts to natural resources are anticipated. Therefore, no additional assessment or mitigation is required.
Social impacts	No	The modified remedial works may result in slightly higher impacts to air quality and traffic. However, the impacts would result in a negligible change to the previously reported social impacts as assessed in section 6.4.1 of the original REF, with no additional social impacts anticipated. Therefore, no additional assessment or mitigation is required.
Economic impacts	No	The modified remedial works would not result in additional economic impacts to those assessed and reported in section 6.4.2 of the original REF. Therefore, no additional assessment or mitigation is required.
Non-Aboriginal heritage impacts	Yes	Non-Aboriginal heritage impacts from the approved project were discussed in section 6.4.3 of the original REF. However, the changed remediation method in the Captains Flat Railway Precinct and Old Mill Area have the potential to result in additional impacts to non-Aboriginal heritage. Potential impacts to non-Aboriginal heritage resulting from the modified remedial works are discussed in section 4.2.6 of this Addendum REF.
Aboriginal heritage impacts	No	A search of the Aboriginal Heritage Information Management System (AHIMS) on 14 September 2022 did not identify any Aboriginal cultural heritage sites in the footprint of the modified works area. The modified remedial works would not result in additional Aboriginal heritage impacts to those assessed and reported in section 6.4.4 of the original REF. Therefore, no additional assessment or mitigation is required.
Aesthetic impacts	Yes	Aesthetic impacts of the approved project were discussed in section 6.2.5 in the original REF. However, the location of certain aspects of the modified remedial works are closer to both Jerangle and Captains Flat Roads than the approved REF. This could result in additional aesthetic impacts to road users. In addition, removal of rail infrastructure under the modified remedial method in the Captains Flat Railway Precinct could result in negative impacts to the aesthetic character of the heritage listed features. Potential impacts to aesthetics from the modified project are discussed in section 4.2.7 of this Addendum REF.
Land use impacts	No	The modified remedial works would not result in additional land use impacts to those assessed and reported in section 6.4.6 of the original REF. Therefore, no additional assessment or mitigation is required.
Transportation impact	Yes	Transportation impacts under the approved project were discussed in section 6.4.7 in the original REF. The modified project would result in additional truck movements due to an increase in imported materials. Potential impacts to transportation under the modified remedial works are discussed in section 4.2.8 of this Addendum REF.

Environmental aspect	Further assessment required due to the revised proposal	Reasoning and scope of works
National impacts	No	There were no identified matters of national environmental significance (MNES) likely to occur under the modified project. Therefore, there would be no impacts from the proposed remediation works on MNES. No additional assessment or mitigation is required.
Cumulative impacts	No	Searches of the NSW Department of Planning Major Projects Portal and the Queanbeyan-Palerang Council 'Works and Projects' list were conducted on 14 September 2022 to identify any major projects that may interact with the modified project. The searches did not identify additional major projects that additional to those previously assessed in section 6.6 of the original REF. Therefore, the modified project would not result in additional cumulative impacts from those previously assessed in section 6.6 of the original REF. No additional assessment or mitigation is required.

## 4.2 Additional assessment

### 4.2.1 Air

#### 4.2.1.1 Introduction

Air quality impacts of the approved project were discussed in section 6.1.1 in the original REF. However, the assessment did not account for the modified remediation method for the Old Mill Area and remedial works on waterfront land at Copper and Forsters Creeks and the Molonglo River.

#### 4.2.1.2 Potential impacts

The methodology adopted to assess potential worst-case air quality impacts from use of a modified remediation methodology for the Old Mill Area and remedial works on waterfront land at Copper and Forsters Creeks and the Molonglo River was consistent with that used in the original REF. All emissions estimation and dispersion modelling assumptions are the same as those adopted in the original REF.

Contaminant emissions to air were estimated based on estimated particulate matter emissions and contaminant sampling data. A review of soil contamination data was undertaken to determine appropriate contaminant emission rates from the additional or modified remediation areas. The adopted contaminant data was generally the same as that used in the original REF (i.e., use of two datasets; one for 'Rail Loading and Railway Precinct Areas' and one for 'Average for rest of site'), except for the Old Mill Area where specific sampling of some contaminants within the area was used (URS, 2004). The contaminant data adopted for each area is summarised as follows:

- Old Mill Area – data for Arsenic, Cadmium, Copper, Iron, Lead and Zinc was sourced from average value presented in *Environmental Site Assessment and Remediation Action Plan for the Ore Processing and Loading Area at the Lake George Mine, Captain's Flat* (URS 27 May 2004) as this data was sampled within the Old Mill Area. Data for remaining contaminants was consistent with that adopted for the 'Average for rest of site'.
- Copper creek – contaminant data consistent with that adopted for the 'Rail Loading and Railway Precinct Areas'.
- Forsters Creek – contaminant data consistent with that adopted for the 'Average for rest of site'.
- Molonglo River – contaminant data consistent with that adopted for the 'Average for rest of site'.

The metal and other contaminant emission inventory (provided as a percentage of total suspended particles (TSP) emissions) is provided in Table 4.2.

Table 4.2 Contaminant emission inventory

Contaminant	Old Mill Area		Copper creek (equivalent to Rail Loading and Railway Precinct Areas)		Forsters Creek and Molonglo River (equivalent to Average for rest of site)	
	Average measured concentration (mg/kg)	Corresponding percentage of TSP emissions	Average measured concentration (mg/kg)	Corresponding percentage of TSP emissions	Average measured concentration (mg/kg)	Corresponding percentage of TSP emissions
Aluminium	9638	0.96%	9920	0.99%	9638	0.96%
Antimony	42.8	0.0043%	64.1	0.0064%	42.8	0.0043%
Arsenic	88	0.009%	37	0.004%	73	0.0073%
Barium	927	0.09%	641	0.06%	927	0.093%
Cadmium	7.25	0.0007%	7.3	0.0007%	9.90	0.0010%
Chromium (III+VI)	37.5	0.00375%	4.46	0.00045%	37.5	0.0038%
Cobalt	25.8	0.0026%	44.6	0.0045%	25.8	0.0026%
Copper	474	0.047%	292	0.029%	240	0.024%
Iron	60400	6.0%	46289	4.6%	36670	3.7%
Lead	8513	0.9%	14985	1.5%	2704	0.27%
Magnesium	530	0.053%	6.67	0.00067%	530	0.053%
Manganese	282	0.028%	150	0.015%	282	0.028%
Molybdenum	1.53	0.00015%	3.57	0.00036%	1.53	0.00015%
Nickel	53.8	0.0054%	49.1	0.0049%	53.8	0.0054%
Selenium	2.21	0.0002%	0.0	0.0000%	2.21	0.00022%
Silver	88.6	0.009%	112	0.011%	88.6	0.0089%
Sulphur (total oxidised as SO <sub>4</sub> )	2704	0.27%	4829	0.48%	2704	0.27%
Uranium	1.23	0%	0	0%	1.23	0.00012%
Vanadium	51.9	0.0052%	60.1	0.0060%	51.9	0.0052%
Zinc	2656	0.27%	405	0.04%	1828	0.18%

It is noted that excavated material near the waterfront land (at Copper and Forsters Creeks and the Molonglo River) is expected to contain a relatively high moisture content due to close proximity with the water way. Consequently, dust emissions from excavation and handling of contaminated material may be reduced.

Dispersion modelling was undertaken for four scenarios, which assessed active remediation works occurring in the following locations:

- Old Mill Area
- Copper Creek
- Forsters Creek
- Molonglo River.

All scenarios assumed material would be transported to the Northern Dumps Containment cell for remediation.

Modelling results are presented for the maximum predicted concentration across all four modelled scenarios in Table 4.3. The following results are noted:

- No exceedances at sensitive receptor locations were predicted for any scenario.
- Exceedances ‘at and beyond site boundary’ were predicted at:
  - Copper Creek for Arsenic and Silver
  - Molonglo River for Arsenic, Cadmium, Chromium, Iron, Nickel and Silver
- No exceedances were predicted for the Old Mill Area and Forsters Creek modelling scenarios.
- Worst case predictions ‘at and beyond site boundary’ were used for modelling at Molonglo River. This is attributed to the close proximity of remediation works to site boundary and the geometry of the site boundary near the Molonglo River remediation area which allows emissions to be dispersed beyond the site boundary in all directions.
- Worst case predictions ‘at receptor locations’ were used for modelling at Copper Creek. This is attributed to the close proximity of remediation works to the sensitive receptor at 8 Copper Creek Road.

**Table 4.3** Predicted contaminant concentrations from Old Mill Area, Copper Creek, Forsters Creek and Molonglo River

Contaminant	Criteria (ug/m <sup>3</sup> )	Maximum predicted at and beyond site boundary		Maximum predicted at receptor	
		Concentration (ug/m <sup>3</sup> )	Percentage of assessment criteria	Concentration (ug/m <sup>3</sup> )	Percentage of assessment criteria
Aluminium	9.2	6.4	69%	1.4	15%
Antimony	9	0.15	2%	0.046	1%
Arsenic	0.09	0.26	289%	0.079	87%
Barium	9	3.3	37%	1.00	11%
Cadmium	0.018	0.035	196%	0.0107	59%
Chromium (III+VI)	0.09	0.13	149%	0.041	45%
Cobalt	0.092	0.017	18%	0.0036	4%
Copper	18	0.86	5%	0.26	1%
Iron	90	131	145%	40	44%
Lead	0.5	0.40	80%	0.028	6%
Magnesium	180	1.9	1%	0.57	0%
Manganese	18	1.01	6%	0.30	2%
Molybdenum	11	0.00101	0%	0	0%
Nickel	0.18	0.19	107%	0.058	32%
Selenium	0.92	0.0092	1%	0.0031	0%
Silver	0.18	0.37	205%	0.12	69%
Sulphur (total oxidised as SO <sub>4</sub> )	18	9.6	54%	2.9	16%
Uranium	0.037	0	0%	0	0%
Vanadium	0.92	0.22	24%	0.073	8%
Zinc	90	6.5	7%	2.0	2%

### **4.2.1.3 Mitigation measures**

Table 5.1 provides the mitigation measures listed as a part of the approved project. These mitigation measures aim to eliminate or otherwise reduce potential impacts on air quality during the remediation works.

The previously approved mitigation measures should be applied to the modified remediation method and new remedial works locations, including:

- remediation activities undertaken at the Molonglo River and at Copper Creek (due to their close proximity to the site boundary)
- remediation activities undertaken on the site boundary or near sensitive receptors.

No amendments to previously approved mitigation measures are proposed.

## **4.2.2 Water**

### **4.2.2.1 Introduction**

The approved project's potential impact on water was discussed in section 6.1.2 in the original REF.

Potential additional water impacts from the proposed modifications have been assessed in the Water Impact Assessment provided in Appendix A. This section summarises the Water Impact Assessment.

### **4.2.2.2 Methodology**

The Water Impact Assessment applied the following methodology:

- The nature of the modifications were reviewed with relation to their potential impact on the water management system proposed in the original REF and any additional risks posed.
- The calculations and justifications developed for the original REF were reviewed, where required, based on the modified works. Aspects of the modifications still appropriately managed through the original REF water management system were noted and it was nominated that the original REF mitigation measures for these aspects are to remain.
- Where the modifications are such that the original REF calculations and justifications no longer demonstrate their appropriate management, re-assessment is required to be undertaken and revised mitigation developed. It should be noted that the modifications under this category do not necessarily suggest a higher risk than under the current approval, rather they only suggest that proposed changes are significant enough to require reassessment.

### **4.2.2.3 Impact assessment**

Potential water impacts found to be appropriately managed through the original REF water management system are summarised in Table 4.4.

Table 4.4 Potential water impacts still appropriately managed through the original REF

Water aspect		Potential impact
Water sourcing		No change, no further assessment was undertaken.
Water storage		A new 2 ML basin is proposed to better manage construction water, however, it is not anticipated to interact with other water storages that collect runoff from the site's catchments.. No significant impacts on catchment water storages are anticipated for this modification, and therefore, no further assessment was undertaken.
Hydrology	Protect natural water levels in pools of creeks and rivers and wetlands during periods of no flows	No change to river flow objectives are anticipated, as changes to runoff patterns are not anticipated to affect regional hydrology. Remedial works are proposed within Forsters Creek where civil plant and equipment are required to be located within the creek. Clean water will bypass the works via a temporary upstream check dam, however no storage of water is proposed and flow objectives are not anticipated to be influenced by the revised proposal. Remediation works within Copper Creek would involve excavation and removal of contaminated material from the south-eastern creek bank. Works would involve removal of contaminated material, followed by lime treatment and placement of engineered rip-rap. No changes to flow objectives are anticipated. Works at Molonglo River would involve removal of contaminated southern bank material with remediation via <i>in situ</i> liming overlain geotextile and rock. River flow would not be constrained by the works as the proposed works area is to be situated on an elevated point. Generally, works are on a minor scale compared to the downstream system, such that measurable change to river flow objectives is not anticipated. Furthermore, works restore conditions closer to those of a natural state which is consistent with the overall revised proposal objectives. Thus, no significant impacts are anticipated with relation to these objectives, and no further assessment was undertaken.
	Protect natural low flows	
	Protect or restore a proportion of moderate flows ('freshes') and high flows	
	Maintain or restore the natural inundation patterns and distribution of floodwaters supporting natural wetland and floodplain ecosystems	
	Mimic the natural frequency, duration, and seasonal nature of drying periods in naturally temporary waterways	
	Maintain or mimic natural flow variability in all streams	
	Minimise the impact of instream structures	
Groundwater		No change, no further assessment was undertaken.
Hydraulic fracturing		N/A.
Flooding		Along Copper Creek and Molonglo River, proposed works involve placement of rip rap along the riverbank to minimise the risk of scour (refer Attachment 2 of Appendix A). For both of the works, no net filling is anticipated, works are minor in scale (i.e., at most approximately 950 m <sup>2</sup> for Copper Creek and 300 m <sup>2</sup> for Molonglo River) and expected duration, and the capacity of the waterways would not be reduced or constrained. On this basis, no significant impacts to flood conditions are predicted. The works located within the Forsters Creek waterway alignment involve a net balance of cut over fill, and thus do not have potential to worsen flooding conditions by 'filling' in the floodplain.

It was found that the revised proposal could pose an additional risk to water quality that was not assessed in the original REF. However, the new risks to water quality are of a similar nature to those assessed in the original REF.

The remedial works located on the waterfront land of Copper Creek, Forsters Creek, and Molonglo River, have the potential to increase risk of erosion and sedimentation above existing levels. However, these works have built in mitigation measures including:

- Copper Creek: would not occur within base flow; would be managed by previously proposed 'enhanced controls'.
- Forsters Creek: water would be temporarily diverted for the duration of the works via a check dam and a new sedimentation basin would manage areas downstream of the check dam.
- Molonglo River: works would be taking place for a maximum of two weeks, therefore, the works would be managed by previously proposed 'enhanced controls'.

The handling of materials posing a high risk to downstream waterways (excluding those associated with typical erosion and sedimentation hazard) is required to permit construction of the revised proposal. Potential activities where handling of high-risk materials could occur, may include:

- the neutralisation of acidic mineral waste and soils while using liming products at Copper Creek and the Molonglo River – over application of liming products has the risk to result in alkaline runoff
- construction water on-site treatment using flocculation and pH adjustment
- green waste management.

The resulting water quality risks during remediation are considered moderate and adequately managed by the mitigation measures listed in Table 5.1.

The proposed modifications are ultimately anticipated to provide a long-term improvement to downstream water quality by neutralising and minimising the risk of contaminated runoff and potential sedimentation into downstream waterways. This would result in a long-term environmental benefit, relative to existing conditions, that would counteract any potential minor short-term water quality impacts.

#### **4.2.2.4 Mitigation measures**

Table 5.1 provides the mitigation measures listed as a part of the approved project. The existing mitigation measures include implementation of a Surface Water Management Plan, sediment and erosion controls and water monitoring. Appendix A provides greater detail on these mitigation measures including updates to the Surface Water Management Plan and two new locations for Trigger Action Response Plan (TARP) water quality monitoring on Forsters Creek.

One new mitigation measure, regarding handling of high-risk materials with water quality risks have been provided. This would mitigate potential impacts to surface water from materials such as liming materials, flocculants, pH adjusters, and materials associated with green waste management.

### **4.2.3 Soil and stability**

#### **4.2.3.1 Introduction**

Soil and stability impacts from the approved project were discussed in section 6.1.3 in the original REF. However, the following proposed modifications could have an additional impact on soil and stability:

- remedial work on waterfront land
- modified remediation method for the Old Mill Area
- the additional excavation needed for the clean water diversion drain and sediment ponds
- the optional use of the existing spoil stockpile as backfill material.

These modifications are assessed below.

## 4.2.3.2 Potential impacts

### 4.2.3.2.1 Remediation work on waterfront land

As discussed in section 2.3.2, scour protections would be installed at the remedial works locations on waterfront land at Copper Creek and the Molonglo River.

Forsters Creek is unlikely to require scour protection as it is likely the slag overlays *in situ* bedrock. If excavation identifies that the slag on the road batter exceeds a depth where excavations may undermine and destabilise Jerangle Road, then excavation works would be halted. Contingency actions would then be implemented, including capping this slag with appropriate erosion and scouring controls installed.

As such, stability issues would be adequately managed by the design of revised proposal on waterfront land. After the works are complete installation of erosion and scouring controls are likely to have a positive impact on the stability of the waterfront land.

### 4.2.3.2.2 Modified remediation method for the Old Mill Area

The original REF assessed remediation of the Old Mill Area using *in situ* liming followed by placement of a 300 mm thick (subsoil (200 mm) / growing media or topsoil (100 mm)) layer (remedial option 2). Some of the steeper areas were to be remediated by *in situ* liming then placement of a 300 mm thick rock mulch layer comprising a hard rock drainage aggregate (option 3).

From a geochemical perspective, analysis of the historic data from URS (2004) and GHD (2018) showed that the acid generating potential of the Old Mill Area (with an average net acid production potential (NAPP) of 24.6 kg H<sub>2</sub>SO<sub>4</sub>/t) was second only to the Mill Area (average NAPP of 42.1 kg H<sub>2</sub>SO<sub>4</sub>/t) on site.

Based on geochemical results from six test pits in 2003, URS (2004) listed the Old Mill Area (then known as the Unvegetated Area North Dump) as a significant risk acid and metalliferous drainage (AMD) area that required *in situ* clay capping or excavation and containment, while Dobos and Associates (2002) did not undertake sampling on the area nor have a remedial recommendation.

Re-assessment of the URS (2004) data in conjunction with additional data reported in GHD (2018) resulted in a larger data set (n = 24 as compared to 7 for URS 2004 only). Re-interpretation of the combined data with one statistical outlier removed that was an ore sample returned a median NAPP (using total sulfur values only and assuming zero acid neutralising capacity) value of 11.5 kg H<sub>2</sub>SO<sub>4</sub>/t; similar to the average value for the Rail Loading Area of 15.7 kg H<sub>2</sub>SO<sub>4</sub>/t. Therefore, whilst a borderline decision, originally the same remedial treatment was recommended for the Old Mill Area as for the Rail Loading Area being *in situ* liming.

However, upon inspecting the Old Mill Area during a site visit in June 2022, it became apparent that the area was predominantly sulfidic mineral waste. Visible weathered ore and low-grade ore samples were also observed. Therefore, it is now proposed that the Old Mill Area be excavated, with the contaminated material placed into the Northern Dumps containment cell. The Old Mill Area would then be backfilled using sub- and topsoil and revegetated (i.e., remedial Option 5). This proposed modification would mean that a consistent approach to applying the geochemical data is applied across the site, with average values by domain being used to inform the remediation method (24.6 kg H<sub>2</sub>SO<sub>4</sub>/t for the Old Mill Area).

It is anticipated that as this strategy would now align with URS (2004) recommendations, therefore would be an improved remedial outcome in the Old Mill Area. The remediation works would significantly reduce the likelihood of contaminants entering the surrounding off-site environment. As such, this modification would have a positive impact on soils and stability.

### 4.2.3.2.3 Use of the existing spoil stockpile

The approved project includes removal of a sulfidic waste stockpile in the North Mine Ridge/Elliot's domain (shown in Figure 2.2) and placement in the containment cell located on the Northern Dumps.

The amendment to the approved remedial strategy for the sulfidic waste stockpile is that the cleared stockpile footprint would optionally be backfilled to grade with material from an existing spoil stockpile located adjacent to the sulfidic waste stockpile (also shown in Figure 2.2).

Testing was carried out on a sample collected from the spoil stockpile during a site visit on 16 and 17 June 2022. The single sample collected for analysis was a composite of up to 12 individual samples from the stockpile.

The switchback stockpile sample returned a total metals Geochemical Abundance Index (GAI) of greater than 3 for lead (GAI of 6), with the remaining metals and metalloids reporting below 3. A GAI of 3 corresponds to a 12-fold enrichment above the average-crustal-abundance; and so forth, up to a GAI of 6 which corresponds to a 96-fold, or greater, enrichment above average crustal abundances. A GAI of 3 or greater is considered significantly elevated enough to warrant investigative action (DFAT 2016).

Australian Standard Leaching Procedure (ASLP) was performed on the sample to assess the potential for the mineral waste to produce acid, metalliferous, and/or saline drainage. The test was performed on the sample using deionised water (DI) at circumneutral pH values.

The results were compared against:

- ANZG (2018) metals and metalloids - guidelines for protection of 80% and 95% of freshwater aquatic ecosystem species (FAE80% and FAE95%)
- ANZECC & ARMICANZ (2000) pH and Electrical conductivity (EC) values for south-eastern Australia (upland rivers)
- ANZECC & ARMICANZ (2000) livestock watering and irrigation guidelines
- NHMRC & NRMICANZ (2011) – Australian drinking water guidelines (ADWG - aesthetic and health).

The laboratory leachate results for the Switchback Stockpile showed the following exceedances:

- pH value (stock watering, ANZECC&ARMICANZ 2000)
- Lead (stock watering, ADWG health)
- Manganese (ADWG aesthetic)
- Copper (FAE 80%, FAE 95%)
- Lead (FAE 80%, FAE 95%)
- Zinc (FAE 80%, FAE 95%).

The practice of directly comparing leachate results against water quality guidelines is inherently conservative and should be used only as an indicative guide to flag elements that may be higher risk, and therefore may contribute to closure risk based on the agreed final land use. This because a direct comparison does not consider natural catchment processes such as dilution, adsorption, reduction and precipitation amongst others. As a result, it is common practice for a dilution factor to be applied to the leachate results when considering their environmental significance.

When assessing the acid base accounting data provided to the LMP (GHD, 2022b), the switchback stockpile sample reported a  $\text{pH}_{1:5}$  of 5.6 and a near neutral net acid generation (NAG)  $\text{NAG}_{\text{pH}}$  of 6.8  $\text{kgH}_2\text{SO}_4/\text{tonne}$ . Net acidity is low at 0.01%S. Due to the positive net acid production potential (NAPP) value of 0.6 and neutral  $\text{NAG}_{\text{pH}}$  the sample classifies as uncertain.

However, given the low sulfur content, and a GAI for lead of 6, plus leachable lead, copper, zinc and manganese, it is likely the sample may generate metalliferous, rather than sulfidic acidity. The  $\text{NAG}_{\text{pH}7.0}$  value was 0.4  $\text{kgH}_2\text{SO}_4/\text{tonne}$  in that regard.

The Switchback Stockpile located on Miners Rd has significantly elevated lead concentrations, with leachable lead, manganese, copper, lead and zinc negatively impacting pH values. Lead leaches at 0.57 mg/L and zinc at 0.25 mg/L. The acid base accounting data suggests a low sulfide acidity risk, however, the material retains leachable metals generating metalliferous acidity.

A decision regarding the beneficial reuse of the stockpile as backfill would be made prior to remediation being implemented.

Regardless on if the spoil stockpile is beneficially reused or not, the proposed modification would remove the spoil stockpile, and stabilise the area using remedial Option 5 (excavate and apply sub- and topsoil before revegetating). As such, this modification would have a positive impact of soils and stability.

#### **4.2.3.2.4 Clean water diversion drain and sediment ponds**

Construction of the clean water diversion drain and new sediment basin would require earthworks. Management of this spoil would occur in accordance with the original REF.

Desilting of the existing sediment based would require excavated silt to be temporarily stored on site in the Mill Area until such time that the on-site containment cell is constructed. Longer-term stockpiling of excavated silt could cause an erosion and sediment risk which could cause the spread of contaminated material. As such, appropriate erosion and sediment controls would need to be applied.

The de-silted sludge would be thermally dried before being analysed for contaminants before being stoichiometrically lime amended and placed in the containment cell for long term storage along with the remainder of the sulfidic mineral waste to be excavated and removed from the Mill Area. The process of thermally drying the de-silted sludge could be extended if there are prolonged periods of rain. The weather would be checked before commencing excavation to reduce the potential for mobilisation of material during excavation and drying.

#### **4.2.3.3 Mitigation measures**

Table 5.1 provides the mitigation measures listed as a part of the approved project. These mitigation measures would be sufficient to manage the additional impacts discussed in section 4.2.3.2.

### **4.2.4 Other physical or pollution aspects**

#### **4.2.4.1 Introduction**

Other physical and pollution impacts of the approved project were discussed in section 6.1.5 of the original REF. The original REF assessed the generation and disposal of waste including excavated spoil, structural waste, and general waste.

#### **4.2.4.2 Potential impacts**

The modified remedial works also includes the generation, use and transportation of green waste. Green waste would also be produced from clearing and grubbing works. Green waste would be reused on site where possible (e.g., chipped wood), or disposed of at a licenced facility in accordance with the Waste Classification Guidelines (EPA 2014) and the *Protection of the Environment Operations Act 1997* (NSW).

Some supervised and managed burning of cleared pine may also be undertaken by the local RFS and landowner. This could have some minor impacts on air and water quality. These impacts are assessed separately in sections 4.2.1 and 4.2.2, respectively.

Addition spoil would also be generated from the:

- construction of the clean water diversion and Middle Sediment Pond
- desilting of the existing sediment ponds.

De-silted sludge excavated from the existing sediments ponds would be thermally dried, then be analysed for contaminants before being stoichiometrically lime amended and placed in the containment cell for long term storage. Similarly, excavated soil from the Middle Sediment Pond earthworks would be transported and stored on site in the containment cell. As such, this additional spoil would be managed on site.

Containment or reuse of the spoil stockpile for backfilling the remediated sulfidic stockpile would reduce the amount of soil needed on site.

#### **4.2.4.3 Mitigation measures**

Other physical and pollution impacts from the proposed modifications would be adequately managed by the existing mitigation measures provided in Table 5.1.

### **4.2.5 Biodiversity**

#### **4.2.5.1 Introduction**

Biodiversity impacts of the approved project were discussed in section 6.2 of the original REF. The proposed modifications would involve additional vegetation clearance and earthworks, and a larger disturbance footprint. The biodiversity impacts of the proposed modifications have been assessed below.

#### 4.2.5.2 Methodology

This addendum largely relied upon the methodology used in the original assessment prepared earlier in 2020 (GHD, 2022a). This section outlines the additional tasks that were completed to inform this addendum.

The database and literature review completed by GHD (2022a) was revised to capture any newly listed or recently recorded threatened or migratory biota of relevance to the additional works. The following biodiversity databases were reviewed in November 2022:

- NSW BioNet Atlas for records of threatened biota previously recorded in a 10 kilometre radius around the project site (DPE, 2022a) and Threatened Biodiversity Data Collection (TBDC) profiles of threatened species listed under the BC Act (DPE 2022b)
- Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search Tool for records of matters of national environmental significance known or predicted to occur within a 10 kilometre radius of the proposed works (refer Figure 2.2) (DCCEEW, 2022a)
- DPI Fisheries NSW Spatial Data Portal (DPI, 2022)
- NSW State Vegetation Map (DPE 2022c).

The biodiversity assessment completed for the original REF (GHD, 2022a) provides a likelihood of occurrence assessment for threatened and migratory biota to occur within the area of proposed works. This addendum considers the outcomes of the original likelihood of occurrence assessment, as well as the results of the revised desktop review (as described above) to identify any existing or additional threatened biota of relevance to the additional works.

The methodology of the approved biodiversity assessment is described in the original REF (GHD, 2022a).

#### 4.2.5.3 Conservation significance

The database searches identified the following threatened species that were not considered in the original assessment, that are either known or predicted to occur within the area of additional works:

- Key's Matchstick Grasshopper (*Keyacris scurra*) (listed as an endangered species under the BC Act)
- South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathamii*) (listed as a vulnerable species under the BC Act)
- Spiny Pepper-cress (*Lepidium aschersonii*) (listed as a vulnerable species under the BC Act and EPBC Act)
- Pilotbird (*Pycnoptilus floccosus*) (listed as a vulnerable species under the EPBC Act).

None of these additional species are likely to occur within the maximum extent of remediation given the lack of suitable habitat present within the area of additional works. Five of the threatened biota considered in the original assessment (GHD, 2022a) are also likely to occur within the area of additional works on occasion. These are described in section 4.2.5.4.3.

## 4.2.5.4 Potential impacts

### 4.2.5.4.1 Proposed modifications

Additional impacts associated with the proposed modifications are outlined in Table 4.5.

Table 4.5 Potential impacts of the proposed modifications

Proposed modification		Existing environment at the location of the proposed modification	Potential impacts
Additional location option for temporary site infrastructure		The Northern Dumps is covered in exotic grassland.	<p>The site infrastructure has the potential to temporarily disturb and/or remove a small area of exotic grassland. Impacts would occur on the edge of a larger patch of exotic grassland which forms the Northern Dumps.</p> <p>Impacts may include the temporary removal of low-value habitat, particularly for a small number of common and widespread mammals, birds and amphibians likely to use this habitat, including the Eastern Grey Kangaroo (<i>Macropus giganteus</i>), Welcome Swallow (<i>Hirundo neoxema</i>) and Common Eastern Froglet (<i>Crinia signifera</i>).</p>
Remedial work in waterfront land	Copper Creek	<p>Copper Creek is a slow-flowing perennial creek which flows into the Molonglo River. It is a highly modified and disturbed waterway subject to substantial levels of contamination from historic mine workings and activities.</p> <p>No instream emergent aquatic vegetation was recorded within Copper Creek, but there are terrestrial grasses and shrubs directly above the creek bank. Overhanging canopy vegetation shades large parts of the creek throughout much of the day.</p> <p>Copper Creek comprises Class 3 minimal key fish habitat as it is a named third order stream with likely intermittent flow and sporadic refuge, breeding, and feeding area for aquatic fauna (DPI 2013). It also has a fish habitat sensitivity ranking of Type 3 – Minimally sensitive key fish habitat (DPI 2013).</p> <p>No threatened species, populations or aquatic ecological communities listed under the FM Act are likely to occur within the Copper Creek.</p> <p>The vegetation community along the south bank of Copper Creek is Apple Box - Blakely's Red Gum moist valley open forest (PCT 283) (listed as a Critically Endangered Ecological Community (CEEC) under the BC Act and EPBC Act).</p>	<p>The remediation works along Copper Creek have been designed to maintain or increase its flow capacity.</p> <p>The modification would involve earthworks along the waterfront land of Copper Creek which could cause a decline in aquatic habitat value through:</p> <ul style="list-style-type: none"> <li>– alterations to catchment hydrology</li> <li>– temporary reduction in water quality through heavy metal contamination and/or through increased sediment inputs.</li> </ul> <p>As discussed in the original REF, this creek has been subject to impacts from erosion and sedimentation and leaching of contaminated material associated with historic operation of Lake George Mine.</p> <p>While the remediation works could temporarily impact the water quality of Copper Creek, ultimately the remediation and rehabilitation works would improve water quality in the creek in the long term.</p> <p>Additional mitigation measures for protecting water quality are provided in section 4.2.2.</p>

Proposed modification		Existing environment at the location of the proposed modification	Potential impacts
			<p>The original REF approved the removal of up to 0.36 ha of Apple Box – Blakely’s Red Gum moist valley open forest (PCT 283) adjacent to Copper Creek in the Captains Flat Railway Precinct. This vegetation type comprises an occurrence of the White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland which is listed as a CEEC under the BC and EPBC Act.</p> <p>Remediation of the waterfront land along the south bank of Copper Creek may require the clearing of a further 0.1 ha of this TEC.</p> <p>However, as noted in the original REF the actual extent of removal would likely be much smaller based on the levels of contamination previously recorded (Ramboll, 2022). The <i>Captains Flat Rail Corridor Remediation Action Plan</i> (Ramboll, 2022) proposes to fence off and retain the PCT 283 within the TfNSW part of the site to limit access and exposure to contractors undertaking remedial activities.</p> <p>Vegetation removal would be limited where possible and managed with mitigation measure FF02 (refer Table 5.1).</p> <p>Removal of an additional 0.1 ha of Apple Box – Blakely’s Red Gum moist valley open forest (PCT 283) is unlikely to constitute a significant impact pursuant to Section 7.3 of the BC Act or the EPBC Act significant impact guidelines 1.1 (DoE 2013) given:</p> <ul style="list-style-type: none"> <li>– Only up to 0.46 ha of Box Gum Woodland would be impacted by the proposal, mainly comprising degraded edge vegetation adjacent to a heavily contaminated decommissioned mine and railway line.</li> <li>– The proposal will not isolate any stands of this community in the locality.</li> <li>– The proposal will not threaten the persistence of the local occurrence of the community.</li> <li>– In the medium to long term, rehabilitation works at Captains Flat Mine are likely to improve the condition of adjoining vegetation.</li> </ul>

Proposed modification		Existing environment at the location of the proposed modification	Potential impacts
	Forsters Creek	<p>Forsters Creek is a minor, ephemeral creek. Material from slag heap on the right bank of Forster Creek has historically spilled into the natural waterway over the site's history.</p> <p>Degraded Broad-leaved Peppermint – Mountain Gum dry open forest (PCT 730) (refer Figure 2.4 and Figure 2.5) occurs on the left bank of Forsters Creek. The creek is often dry.</p>	<p>The Forsters Creek remediation works have been designed to maintain or increase Forsters Creek's flow capacity.</p> <p>The modification would involve earthworks within Forsters Creek which could cause a decline in aquatic habitat value through:</p> <ul style="list-style-type: none"> <li>– alterations to catchment hydrology</li> <li>– reduced water quality through heavy metal contamination and/or through increased sediment inputs if the watercourse was flowing at the time of the work.</li> </ul> <p>Potential impacts to water quality are discussed further in section 4.2.2.</p> <p>While the proposed modification could further impact the water quality of Forsters Creek during the remediation works, this waterway is already subject to ongoing contamination from the adjacent slag heap and the proposed works are unlikely to substantially increase the degree of contamination. Ultimately the remediation and rehabilitation works would improve water quality in the creek in the long term.</p> <p>Additional mitigation measures for protecting water quality are provided in section 4.2.2.</p> <p>The modified remediation works would require the removal of a small area (0.30 ha) of degraded Broad-leaved Peppermint – Mountain Gum dry open forest (PCT 730) (refer Figure 2.4 and Figure 2.5) which is dominated by the exotic Radiata Pine (<i>Pinus radiata</i>) and which has a sparse and disturbed understorey, lacking many of the characteristic native species. Given the scarcity of flowering shrubs and dense understorey, and an absence of eucalypts in the proposal site, it is likely to comprise only low to moderate habitat value for local fauna.</p> <p>Some of the vegetation to be removed would provide foraging resources for a small range of common birds, mammals, snakes and lizards.</p> <p>However, this additional impact to biodiversity is anticipated to be negligible given:</p> <ul style="list-style-type: none"> <li>– the proposed modifications would only remove a small area of vegetation dominated by exotic species, with no impact to intact, good condition native vegetation</li> <li>– the surrounding areas would provide sufficient alternative foraging resources for these species.</li> </ul>

Proposed modification		Existing environment at the location of the proposed modification	Potential impacts
	Molonglo River	<p>Within the proposal site, the Molonglo River is a highly modified and disturbed waterway subject to substantial levels of contamination from historic mine workings and activities.</p> <p>No fish were observed in any of the creeks or dams within the proposal site, or within the Molonglo River itself during field surveys. The presence of fish in the Molonglo River is highly dependent on the level of contamination from Lake George Mine. The collapse of mine tailings dams in Captains Flat between 1930-1960 has historically resulted in the loss of fish from the Molonglo River (Lintermans, 2002).</p> <p>Downstream of the dam, the Molonglo River comprises Type 2 fish habitat as defined by DPI (2013) and moderately sensitive key fish habitat including freshwater habitats and brackish wetlands, lakes and lagoons and including freshwater aquatic vegetation.</p> <p>Molonglo River downstream of the dam is also classified as Class 2 for fish passage (DPI 2013) which comprises moderate key fish habitat, non-permanently flowing stream, creek or waterway with clearly defined bed and banks.</p> <p>The Molonglo River downstream of the Captains Flat dam becomes narrower (up to 25 m wide) and contains large patches of emergent aquatic vegetation, which slows the flow of water further downstream.</p> <p>No threatened species, endangered populations, endangered ecological communities listed under the FM Act are likely to occur within this section of the Molonglo River where remedial works are proposed.</p> <p>A chorus of Common Eastern Froglet, Eastern Banjo Frog (<i>Limnodynastes dumerilii</i>), Spotted Grass Frog (<i>Limnodynastes tasmaniensis</i>), Verreaux's Frog (<i>Litoria verreauxii</i>) and Brown-striped Frog (<i>Limnodynastes peronii</i>) was recorded calling within the Molonglo River at Colin Winchester Oval near to the Molonglo River Remediation Area.</p>	<p>The modification would involve earthworks along waterfront land of the Molonglo River which could cause a decline in aquatic habitat value through:</p> <ul style="list-style-type: none"> <li>– alterations to catchment hydrology</li> <li>– reduced water quality through heavy metal contamination and/or through increased sediment inputs.</li> </ul> <p>The Molonglo River is a highly modified and disturbed waterway and as such sediment inputs are unlikely to change the hydrology of catchment.</p> <p>As discussed in the original REF, this river has been subject to impacts from contaminated material associated with historic operation of Lake George Mine.</p> <p>While the remediation works could temporarily impact the water quality of Molonglo River, the remediation and rehabilitation works would improve water quality in the creek in the long term.</p> <p>The modified remediation works would require the temporary removal of a small area of cleared land likely characterised by exotic grasses and scattered regenerating <i>Acacia</i> spp. This is unlikely to comprise important habitat for threatened flora and fauna in the locality.</p> <p>The modification may also contribute to the mortality of less-mobile common fauna species such as amphibians that are unable to readily relocate from areas impacted by changes in water quality or reduction in vegetation cover. Any such impacts are unlikely to influence a substantial proportion of any local fauna populations, nor would they influence the ongoing persistence of any local populations of native fauna species within the locality.</p> <p>Additional mitigation measures for protecting water quality are provided in section 4.2.2.</p>

Proposed modification		Existing environment at the location of the proposed modification	Potential impacts
SWMP modifications	Culvert upgrades	<p>The proposed modification would involve the likely remediation of an existing culvert (at Culvert location 1) and installation of new culverts at both Culvert location 1 and 2. Both locations would accommodate the remediation and/or installation of 3 x 600 mm diameter concrete pipes.</p> <p>The culverts would be installed in areas mapped as 'cleared' on Figure 4.4 and shown on Figure 2.2 and Figure 2.3 within the Old Mill Area in the south west of the proposal site. These areas support minimal vegetation, with patchy areas of exotic grasses, dirt and concrete roads.</p> <p>The existing culvert (Culvert location 1) adjacent to the Upper Sediment Basin in the lower Mill Area is shown in Figure 4.1.</p>  <p><i>Figure 4.1 Existing culvert in lower Mill Area (culvert 1)</i></p>	<p>The existing culvert at location 1 has the potential to provide only low quality or marginal roosting and/or breeding habitat for microbats as it:</p> <ul style="list-style-type: none"> <li>– becomes regularly inundated and fills with water during rainfall events</li> <li>– has few crevices or gaps for roosting</li> <li>– is exposed to light impacts.</li> </ul> <p>As such, it is unlikely that the culvert works would injure or lead to the mortality of any roosting microbats. No additional mitigations measures are required to manage the potential impact of this modification on threatened species or their habitats.</p> <p>Earthworks form culvert remediation and installation works could result in erosion and sedimentation, potentially increasing:</p> <ul style="list-style-type: none"> <li>– sediment runoff to waterways impacting the water quality and any potential aquatic life</li> <li>– weed spread</li> <li>– contamination of surrounding areas.</li> </ul> <p>However, the risk of any of these potential impacts is low, as the site currently comprises mostly bare, contaminated ground with an already high potential for erosion. The proposed additional works are unlikely to result in any substantial increase to these impacts.</p> <p>Erosion and sedimentation impacts would be adequately managed with the mitigation measures included as a part of the approved project.</p>

Proposed modification	Existing environment at the location of the proposed modification	Potential impacts
<p>Sediment basins</p>	<p>The Upper and Lower Sediment Basins, shown in Figure 4.2 and Figure 4.3, are devoid of any emergent aquatic vegetation. The Upper Sediment Basin is surrounded by bare ground with scattered tussock grasses.</p>  <p><i>Figure 4.2 Upper Sediment Basin</i></p>  <p><i>Figure 4.3 Lower Sediment Basin. Sourced from GHD, 2018.</i></p> <p>Dams in the site would not provide habitat for the threatened species predicted to occur by the desktop review (including the Green and Golden Bell Frog).</p> <p>The existing sediment basins may provide habitat for common frogs capable of persisting in heavily modified and degraded environments, such as the Common Eastern Froglet (<i>Crinia signifera</i>).</p>	<p>It is unlikely that any aquatic flora would be impacted during the desilting of the Upper and Lower Sediment Basins as they are largely devoid of aquatic vegetation.</p> <p>During de-silting, the existing sediments basins could not provide:</p> <ul style="list-style-type: none"> <li>– potential habitat for aquatic fauna, such as common frogs</li> <li>– potential foraging resources for bats.</li> </ul> <p>These impacts are expected to be minor given:</p> <ul style="list-style-type: none"> <li>– the habitat would be restored after desilting.</li> <li>– suitable alternative foraging habitat for bats is present within the Molonglo River and other creeks within the locality.</li> </ul> <p>Following completion of the proposed additional works, the construction of the Middle Sediment Basins would provide additional habitat for common wetland birds, such as the Pacific Black Duck (<i>Anas superciliosa</i>) the Australian Wood Duck (<i>Chenonetta jubata</i>), and common frog species. The excavation of the Middle Sediment Basin may also provide a small increase in the amount of available foraging habitat for the threatened Southern Myotis, should it occur.</p> <p>Post-remediation, water quality in the sediment basins would likely improve over time. As such, the remediation works would likely lead to long-term improvements in the habitat quality in these basins.</p> <p>Construction of the Middle Sediment Basin would remove some additional degraded Broad-leaved Peppermint – Mountain Gum dry open forest (PCT 730). Vegetation to be impacted comprises <i>Pinus</i> species over scattered exotic grasses, with no intact native vegetation to be impacted.</p> <p><i>Pinus</i> species within mapped areas of PCT 730 would have little value as foraging habitat for native fauna given the scarcity of flowering shrubs, a dense understorey, and eucalypts within pine forest. <i>Pinus</i> also comprise low habitat value for local fauna.</p> <p>Regardless, vegetation clearance would remove some foraging habitat for:</p> <ul style="list-style-type: none"> <li>– common birds, such as the Sulphur-crested Cockatoo (<i>Cacatua galerita</i>) which were recorded foraging on cones in the canopy of pine forest east of the Central Mine Area</li> </ul>

Proposed modification		Existing environment at the location of the proposed modification	Potential impacts
		<p>The Southern Myotis (<i>Myotis 38acropus</i>) may forage over the existing sediment basins, as part of a larger home range, however is unlikely to rely on any habitats present for its continued persistence in the locality.</p> <p>The vegetation between the Upper and Lower Sediment Basins comprises degraded Broad-leaved Peppermint – Mountain Gum dry open forest (PCT 730).</p>	<ul style="list-style-type: none"> <li>– threatened woodland birds, such as the Flame Robin (<i>Petroica phoenicea</i>) which were recorded in the Old Mill area and off Old Mines Road near to the proposed location for the Middle Sediment Basin.</li> </ul> <p>The proposal is unlikely to have a significant impact on small woodland birds as:</p> <ul style="list-style-type: none"> <li>– no Flame Robin nests were identified despite targeted surveys around locations where both male and female Flame Robins were recorded</li> <li>– a negligible area of foraging habitat for woodland birds would be removed and the extent of foraging and shelter habitat would increase following proposed revegetation works.</li> </ul>
	Clean water diversion channel	The clean water diversion channel would be constructed in the cleared area along the western boundary of the Mill Area, shown in Figure 4.4.	<p>As the area is already cleared, no additional vegetation removal would be needed for construction of the clean water diversion channel. As above, the additional earthworks could result in additional impacts related to erosion and sedimentation.</p> <p>However, any impacts associated with erosion and sedimentation are expected to be minimal and would be adequately managed with the mitigation measures included as a part of the approved project.</p> <p>Overall, operation of the culvert upgrades, sediment basins, and clean water diversion channel would reduce the risk of clean water becoming contaminated and thus would have a positive impact for aquatic habitats in the locality in the long term.</p>
	Use of spoil stockpile	The spoil stockpile is located in a cleared area and consists of rock debris.	This spoil stockpile is devoid of vegetation and would not provide habitat or foraging resources to any native fauna species. No biodiversity impacts are anticipated from this modification.
	Captains Flat Railway Precinct	The Captains Flat Railway Precinct is made up of cleared areas and Box Gum woodland.	The proposed modification of would not involve removal of any additional vegetation beyond what was assessed as part of the approved project. No additional impacts to native species as a result of the proposed modification are anticipated.
	Remediation method in Old Mill Area	The Old Mill Area is either cleared with infrastructures or is vegetated with exotic grassland.	The proposed modification would not involve removal of any additional vegetation beyond what was assessed as part of the approved project. No additional impacts to native species are anticipated as a result of the proposed modification.

Proposed modification	Existing environment at the location of the proposed modification	Potential impacts
Green waste management	-	Green waste management would be unlikely to have impacts on flora and fauna at the site. Burning of some previously cleared pine could potentially have impacts on water quality. However, this would be adequately managed by the mitigation measures provided in section 4.2.2.
Road maintenance	Road maintenance would be taking place on previously cleared roads.	This proposed modification would not involve removal of any additional vegetation beyond what was assessed as part of the approved project. No additional impacts to native species as a result of the proposed modification are anticipated.

#### 4.2.5.4.2 Vegetation communities

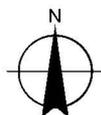
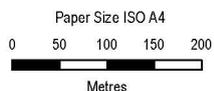
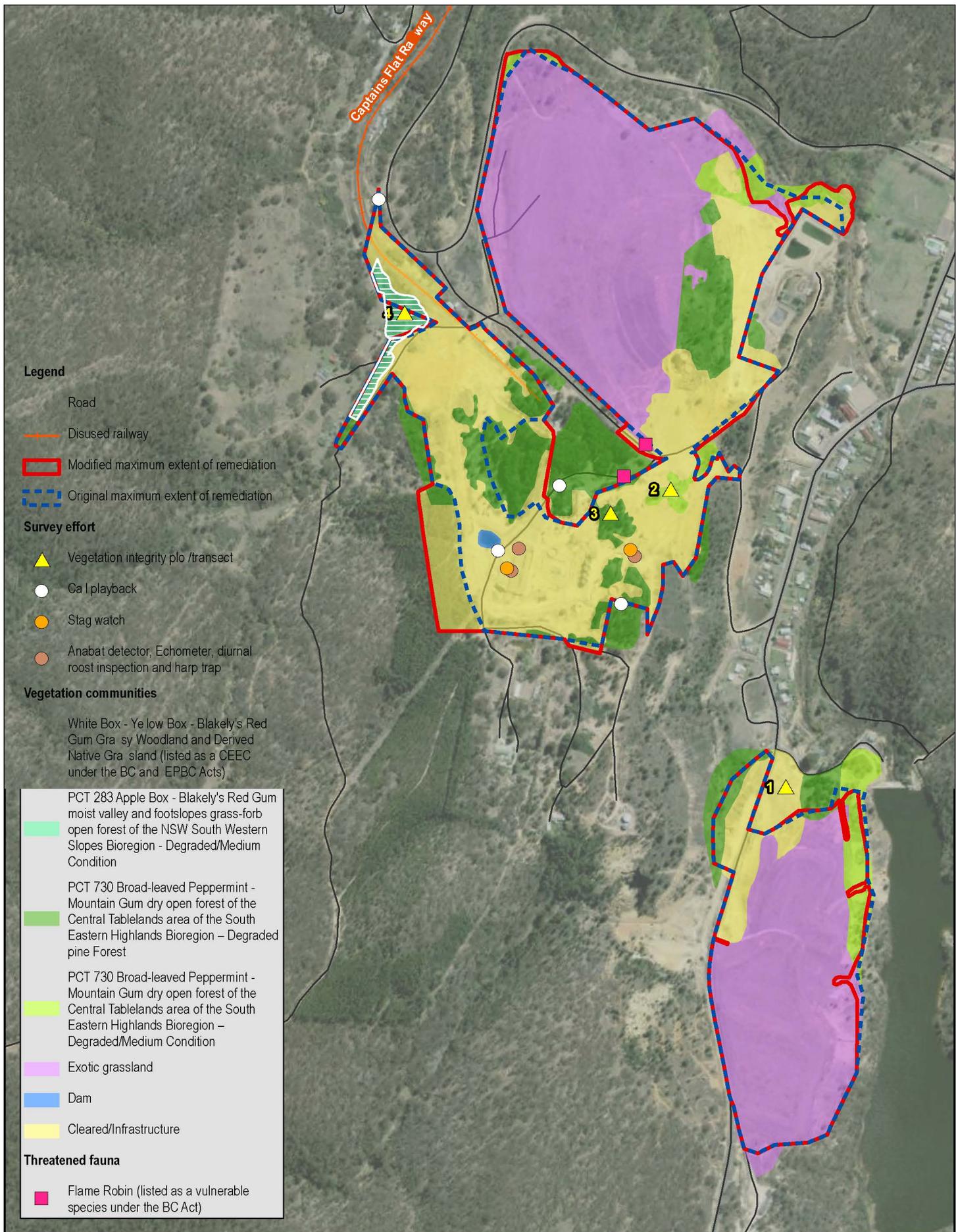
The vegetation communities present on site are shown in Figure 4.4.

Table 4.6 compares the area of native and non-native vegetation communities that would be impacted by the modified proposal compared to the determined project footprint.

The change in area of impacted vegetation is a result of both the modifications proposed in this Addendum REF (including the construction of the Middle Sediment Basin) and the maximum extent of remediation boundary refinements.

**Table 4.6** Comparison of vegetation types to be impacted by the approved project and the proposed modifications

Name of community	Condition	BC Act status	EPBC Act status	Area (ha) in approved project footprint	Area (ha) in proposed modification footprint	Change (ha)
<b>Native vegetation types</b>						
Apple Box – Blakely’s Red Gum moist valley and footslopes grass-forb open forest (PCT 283)	Medium	CEEC	CEEC	0.36	0.46	+0.1
Broad-leaved Peppermint – Mountain Gum dry open forest (PCT 730)	Degraded Pine Forest	-	-	3.57	4.96	+1.21
Broad-leaved Peppermint – Mountain Gum dry open forest (PCT 730)	Degraded / medium condition	-	-	1.72	1.65	-0.07
<b>Non-native</b>						
Exotic grassland	-	-	-	24.50	24.25	-0.25
<b>Totals</b>						
<b>Native vegetation</b>	-	-	-	5.65	<b>7.07</b>	<b>+1.24</b>
<b>All vegetation</b>	-	-	-	30.15	<b>31.32</b>	<b>+0.99</b>



Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 55

Department of Regional NSW  
Lake George Mine Remediation

Project No. 12551771  
Revision No. 0  
Date 13/12/2022

Survey effort, vegetation  
and threatened biota

FIGURE 4.4

#### 4.2.5.4.3 Threatened biodiversity

Potential impacts on threatened fauna species, threatened populations and their habitat are discussed in Table 4.7. The original impacts on these species with consideration to formal Assessments of Significance are discussed in Appendix C and D of the approved Biodiversity Assessment (GHD, 2022a).

Table 4.7 Impacts on threatened fauna and their habitats

Scientific name	Common name	Status		Habitat impacted within approved project footprint	Additional impacts within proposed modification footprint
		BC Act	EPBC Act		
<i>Petroica boodang</i>	Scarlet Robin	V		5.65 ha of broadly suitable habitat in Box-Gum woodland in the Captains Flat Railway Precinct and degraded Broad-leaved Peppermint- Mountain Gum forest in Central Mine Area, and edges of Northern Dumps and Southern Dumps. No breeding habitat present.	Additional removal of up to 1.24 ha of native woodland for construction of the Middle Sediment Basin and remediation around the creeks comprising potential foraging habitat. Minor increase in potential impact.
<i>Petroica phoenicea</i>	Flame Robin	V		5.65 ha of broadly suitable habitat in Box-Gum woodland in the Captains Flat Railway Precinct and degraded Broad-leaved Peppermint- Mountain Gum forest in Central Mine Area, and edges of Northern Dumps and Southern Dumps. No known breeding habitat recorded. Recorded within and also adjacent to remediation areas.	The Flame Robin has been recorded at the site. Additional removal of up to 1.24 ha of native woodland for construction of the Middle Sediment Basin and remediation around the creeks comprising known foraging habitat. Minor increase in potential impact.
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Fairy Martin mud nests and derelict loading tunnels representing potential roosting habitat. 24.50 ha of exotic grassland and 5.66 ha of edge woodland vegetation representing potential foraging habitat within Captains Flat Railway Precinct and Central Mine Area.	Existing culvert proposed for upgrades is unlikely to provide roosting habitat for microbats. Additional removal of up to 1.24 ha of native vegetation comprising foraging habitat for the species. Changes to the maximum extent of remediation have decreased the amount of potential foraging habitat to be removed in exotic vegetation by 0.25 ha. No impact to breeding habitat anticipated.
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V		Fairy Martin mud nests and derelict loading tunnels representing potential roosting habitat. 24.50 ha of exotic grassland and 5.66 ha of edge woodland vegetation representing potential foraging habitat within Captains Flat Railway Precinct and Central Mine Area.	Existing culvert proposed for upgrades is unlikely to provide roosting habitat for microbats. Additional removal of up to 1.24 ha of native vegetation comprising foraging habitat for the species. Changes to the maximum extent of remediation have decreased the amount of potential foraging habitat to be removed in exotic vegetation by 0.25 ha. No impact to breeding habitat anticipated.

Scientific name	Common name	Status		Habitat impacted within approved project footprint	Additional impacts within proposed modification footprint
		BC Act	EPBC Act		
<i>Myotis macropus</i>	Southern Myotis	V		Fairy Martin mud nests and derelict loading tunnels representing potential roosting habitat. Foraging habitat within Molonglo River and existing sediment basins	Existing culvert proposed for upgrades is unlikely to provide roosting habitat for microbats. Temporary removal of potential foraging habitat within upper and lower sediment basin within Old Mill Area during de-silting. Long-term increase in foraging habitat following construction of the Middle Sediment Basin.

Notes: CE = critically endangered, E= endangered, V= vulnerable.

#### 4.2.5.5 Mitigation measures

The additional potential impacts to biodiversity from the proposed modifications would be minor. Impacts would be adequately managed by the existing mitigation measures provided in Table 5.1.

### 4.2.6 Non-Aboriginal heritage

#### 4.2.6.1 Introduction

Non-Aboriginal heritage impacts were discussed in section 6.4.3 of the original REF.

Potential additional impacts on non-Aboriginal heritage from the proposed modifications have been assessed in the Heritage Impact Assessment provided in Appendix B. This section summarises the Heritage Impact Assessment.

#### 4.2.6.2 Methodology

##### 4.2.6.2.1 Initial assessment

The proposed modifications discussed in section 2.3, were initially assessed to determine which modifications could potentially have an additional heritage impact beyond what was assessed in the original REF.

The proposed modifications outlined in section 2 were analysed to determine if they could potentially impact non-Aboriginal heritage beyond what was assessed and approved as part of the original REF. These were:

- the culverts works (refer section 2.3.3.1)
- the change in remediation method of the Captains Flat Railway Precinct (refer section 2.3.5).

As such, a more detailed assessment in accordance with the *Statement of Heritage Impact Guidelines* (Heritage NSW) was carried out for these proposed modifications.

##### 4.2.6.2.2 Detailed assessment

As part of the detailed assessment of the culvert and Captains Flat Railway Precinct works the following occurred:

- a search of the NSW State Heritage Inventory, the Palerang Local Environment Plan 2014 (Palering LEP) and the Australian Heritage Database to determine if there is any additional information on places of heritage significance in or near to the proposed modification location
- a description of heritage items (and their significance) within the proposed modification location
- an assessment of the potential for the proposed works to impact upon identified heritage places and values within the proposed activity area, including:
  - consideration of the questions posed in the NSW Heritage Office's Statement of Heritage Impact Guidelines as they relate to identified heritage places within the proposed activity area and heritage listed places adjacent to the proposed activity area

- consideration of the relevant questions posed in the requirements of the Palerang LEP.
- description of any proposed impacts and Identification of any potential impacts and the methods proposed to avoid, ameliorate or mitigate those impacts.

The detailed assessment was supported by a site visit undertaken on 8 November 2022.

The assessment of heritage significance was carried out with reference to the NSW Heritage Register Criteria.

### 4.2.6.3 Existing environment

#### 4.2.6.3.1 Listed heritage items

The heritage database searches undertaken on 2 November 2022 were consistent with those undertaken as part of the original REF.

The heritage listings within the Captains Flat Railway Precinct are provided in Table 4.8. Table 4.9 provides the heritage listings adjacent to the Captains Flat Railway Precinct.

**Table 4.8** Palerang LEP Schedule 5 – Listings within proposed activity area

Listing	Significance	Item No.	Property Description
Captains Flat railway goods shed, weighbridge, gantry and turntable	Local	I266	Railway land adjacent to Lots 155, 194, and 319 DP754870; Lot 1 DP189797 and Lot 1 DP36902
Stationmasters Residence (Former)	Local	I251	Lot 1, DP 572636

**Table 4.9** Palerang LEP Schedule 5 – Listings adjacent to the proposed activity area

Listing	Significance	Item No.	Property Description
Railway Station (Former)	Local	I249	Lot 1, DP 189797 and adjacent land
Lake George Mine, including smelter site, mine processing sites, railway precinct, Fosters Gully and Keatings Collapse	Local	I267	Lot 2, DP229690; Lot 1, DP222274; Lot C, DP172630; Lot 319, DP 754870; Lot 2, DP 1033184 and adjacent Crown land
Roscommon	Local	I252	Lot 2, DP 369062; Lot 192, DP 754870

#### 4.2.6.3.2 Heritage values

Table 4.10 summarises the heritage value and significance of the structures potentially impacted by the proposed modifications.

Table 4.10 Heritage value of potentially impacts structures

Name	Listing number (if listed)	Description	NSW Heritage Criteria met	Heritage Significance
Weighbridge	I266	<ul style="list-style-type: none"> <li>– good condition</li> <li>– reconstructed from original and new materials following unauthorised demolition</li> </ul>	A; D; E; F; G	<ul style="list-style-type: none"> <li>– prominent and iconic part of the mining fabric dating to the 1936-1962 mining period</li> <li>– value of this element lies in its ability to tell the story of mining at Captains Flat rather than any specific values attributable to the age or condition of its fabric</li> <li>– remains a visually significant element of the Captains Flat Railway Precinct</li> </ul>
Railway lines, gantry and railway platform	I266	<ul style="list-style-type: none"> <li>– very good condition</li> <li>– constructed of metal and built on concrete blocks</li> </ul>	A; D; E; G	<ul style="list-style-type: none"> <li>– three items are important elements of the Captains Flat Railway Precinct from the 1936-1962 mining period</li> <li>– not as significant as weighbridge and turntable</li> </ul>
Turntable	I266	<ul style="list-style-type: none"> <li>– very good condition</li> <li>– constructed of timber and metal and built on concrete pylons</li> </ul>	A; D; E; F; G	<ul style="list-style-type: none"> <li>– dating from the 1930s</li> <li>– is overgrown with brambles, making definitive assessment difficult</li> <li>– important part of the Captains Flat Railway Precinct</li> </ul>
Culvert 1	-	<ul style="list-style-type: none"> <li>– single pipe culvert of concrete construction carrying water beneath the concrete paved road</li> <li>– board construction mould formwork of the eastern end of the culvert is of a style contemporary to other concrete features throughout the mine site</li> <li>– facing of the western end of the culvert appears to be constructed of vernacular hand-packed stonework</li> <li>– appears to be functioning well</li> </ul>	None	<ul style="list-style-type: none"> <li>– constructed in a manner that is contemporary with the other existing built elements of the Lake George Mine</li> <li>– chronologically contemporary with the later years of the mine's operation</li> <li>– not considered to possess heritage values in their own right</li> </ul>
Culvert 2	-	<ul style="list-style-type: none"> <li>– no existing heritage structures</li> </ul>	None	<ul style="list-style-type: none"> <li>– none</li> </ul>

#### **4.2.6.4 Potential impacts**

The proposed modifications can be implemented without impacting on the heritage significance of the Lake George Mine site, fabric, settings, and views.

No archaeological sites, or areas of archaeological potential, have been identified within the impact footprint of the proposed modifications within the curtilage of the Captains Flat railway goods shed, weighbridge, gantry and turntable site or the former Stationmasters Residence.

The below sections summarise the potential impact of the proposed modifications on the specific structures of heritage value discussed in Table 4.10.

##### **4.2.6.4.1 Captains Flat Railway (goods shed, weighbridge, gantry and turntable)**

The proposed modification to the remediation method at the Captains Flat Railway Precinct would involve the permanent removal of some heritage fabric at the Captains Flat Railway including the:

- rail spikes, fishplates, ties and timber sleepers
- contaminated ballast and sub-grade.

Removal of this heritage fabric would impact upon the heritage of the Captains Flat Railway Precinct. However, this impact would not be sufficient to reduce the significance of the place as:

- other heritage fabric would be reinstated after the remediation works were completed
- the remediation works would enhance the amenity of the precinct as the removal and / or containment of contaminated soil would make the sites safer for neighbouring residents and visitors.

Additional interpretive heritage signage would be considered as part of the ongoing management of the site. Consideration of interpretive signage would be captured in a site Environmental Management Plan post-remediation works. Signage and interpretive material would help visitors gain an understanding and appreciation of the mining history and heritage of Captains Flat.

The proposed modification is considered to be the most appropriate solution to addressing the significant health risks associated with mine site contamination. An additional mitigation measure, provided in Table 5.1, has been proposed to manage the heritage impact of the works.

##### **4.2.6.4.2 Stationmasters Residence (Former)**

The proposed modifications would be unlikely to have a detrimental impact on the Stationmaster Residence. The remediation works would enhance the amenity of the former Stationmasters Residence site as the removal and / or containment of contaminated soil would make the site safer for public visitation. Revegetation work would contribute to stabilising the site.

##### **4.2.6.4.3 Culverts**

The proposed culvert works would not have a negative impact on the heritage value or significance of the Lake George Mine.

Removal of any original heritage fabric, including the existing culvert, would have an incremental impact on the way that the rest of the Lake George Mine site is able to tell the story of its past. As such, the existing culvert should be retained unless the safety, condition, or functionality of the culvert is compromised. An additional mitigation measure, provided in Table 5.1, has been proposed to reflect this.

#### **4.2.6.5 Mitigation measures**

Table 5.1 provides the mitigation measures approved as a part of the approved project. In addition, two additional mitigation measures have been included in Table 5.1 to mitigate potential impacts to the heritage of Lake George Mine:

- A detailed archival photographic record of the railway will be carried out before the remediation works in the Captains Flat Railway Precinct commence.
- The existing culvert to be upgraded will be retained, unless the safety, condition, or functionality of the culvert is compromised.

## 4.2.7 Aesthetic

### 4.2.7.1 Introduction

The aesthetic impacts of the approved project are discussed in section 6.4.5 of the approved project.

### 4.2.7.2 Potential impacts

#### 4.2.7.2.1 During remediation works

The original REF identified that there would be aesthetic impacts during the remediation works from the presence of construction vehicles, equipment, construction works, materials stockpiling, and fencing.

Key impacted viewpoints would be from:

- nearby residential receivers, including:
  - 5 Old Mines Road
  - 44 Old Mines Road
  - 8 Copper Creek Road
- local roads including:
  - Miners Road
  - Old Mines Road
  - Foxlow Street.

Under the modified proposal there would potentially be site infrastructure set up on the northern extremity of the Northern Dumps, close to Captains Flat Road. However, aesthetic impacts from users of Captains Road would be limited as there is a hill screening the Northern Dumps from viewers.

The modified proposal would involve more extensive remediation works in the Forsters Creek Remediation Area. This work would be viewable from Jerangle Road. The views of the Forsters Creek Remediation Area would be brief and intermittent by road user.

Overall, the potential aesthetic impact of the proposed modifications would be low.

#### 4.2.7.2.2 Post remediation works

The proposed removal of the railway and rock ballast would have an impact on the aesthetic of Lake George Mine. Removing the railway and rock ballast would mean that the Captains Flat Railway Precinct would be marginally less recognisable as a historic rail site dating to the 1936-1962 mining period.

This change would impact the residential property at the Station Masters Cottage at 2 Copper Creek Road. Other viewpoints of this change are limited due to the restricted access to the railway line. However, the remaining heritage infrastructure including the Weigh Station, Gantry, Platform and Turntable would be sufficient for the precinct to retain its aesthetic value as a disused railway.

To mitigate the impact of removal of the railway line it is proposed that a detailed archival photographic record of the railway be prepared prior the proposed works commencing. Other historic mining structures would remain *in situ* after the proposed works and therefore, the proposal site would maintain its overall mining heritage character.

As part of construction of the Middle Sediment Basin some vegetation would be removed and replaced with a pond. This would be unlikely to impact the aesthetic of the site given the pond would be visually similar to the existing Upper and Lower Sediment Basins and the vegetation in Lake George Mine would increase overall post-remediation.

Post remediation, the proposal site would have a more natural appearance and blend into the existing landscape while also retaining the rail heritage character of the site. Overall, the potential aesthetic impact of the post remediation works would be positive.

### 4.2.7.3 Mitigation measures

Table 5.1 provides the mitigation measures approved as a part of the original REF. One additional mitigation measure, a detailed archival photographic record of the railway, has been included to maintain historical records of the railway's aesthetic.

## 4.2.8 Transportation

Transportation impacts of the approved project were discussed in Section 6.4.7 in the original REF.

Potential impacts to the existing transport network were assessed based on the amount of traffic likely to be generated by the remediation works, which were estimated based upon the volume of imported materials (to inform truck movements) and the number of site personnel (to inform light vehicle movements).

As described in section 2.4, the proposed modifications would result in 729 additional trucks, or 1,458 additional truck movements over the materials delivery window of 18 months. Based on standard construction work hours, this is the equivalent of around 20 additional truck movements per week, being approximately 0.4 truck movements every hour. For the purposes of a conservation assessment, this value has been rounded up to the nearest whole number, equivalent to 1 additional truck movement per hour. No changes in light vehicle volumes and movements are expected from the proposed modifications.

In total, the proposed modification is anticipated to generate one (1) additional truck movement per hour along Captains Flat Road (north), increasing the average peak hour traffic volume to 108 vehicles per hour. This increase would not impact the road's level of service (LoS), and Captains Flat Road would be expected to continue operating with a high level of comfort and convenience (i.e. generally free flow movement within the traffic stream).

Access to the remediation site would remain to be via Miners Road and Foxlow Street. Both roads are accessible without having to go through the town of Captains Flat and would not be expected to impact road safety and amenity in the town.

Additional activity resulting from the proposed modifications are expected to be contained within the maximum extent of site remedial works. Internal vehicle movement, parking of project vehicles, and pedestrian management within the site shall be managed through the construction traffic management plan (CTMP) to be prepared by the contractor prior to the commencement of remediation works.

Given the above assessment, no additional management measures to those provided in Table 6.36 of the approved REF are required to manage traffic impacts associated with the proposed modifications.

# 5. Environmental management

## 5.1 Environmental management plans

As described in the original REF a construction environmental management plan (CEMP) would be prepared for the revised proposal including environmental safeguards and management measures outlined in this Addendum REF.

## 5.2 Summary of safeguards and management measures

The environmental safeguards and management measures outlined in this Addendum REF would be incorporated into the detailed design phase of the revised proposal and implemented during construction and operation.

All safeguards and management related to the revised proposal, as well as those identified in the original REF have been incorporated into Table 5.1.

In addition to the changes to safeguards and management measures described in section 4.2, changes have been made to address the change in construction methodology and locations of work. Names of key regulators have also been updated and some changes have been made for clarity.

New safeguards and management measures or additions to existing safeguards and management measures are shown in **bold** text, with deletions shown with a ~~strike through~~.

Table 5.1 Modification mitigation measures

Item	Commitment
Air quality	<p>AQ1: Prepare a dust management plan, with specific management measures for all remediation areas.</p> <hr/> <p>AQ2: Prepare a dust monitoring plan, which is to include at least two real time particulate samplers to assist proactive management of dust.</p> <p>Real -time samplers should be placed at the two nearest receptors to the current remediation area.</p> <p>The plan should include triggers and alerts to reduce or stop works based on measured dust concentrations.</p> <p>Install a network of dust deposition gauges including the following:</p> <ul style="list-style-type: none"> <li>– one at receptor adjacent to Rail Loading Area</li> <li>– one at nearest receptor south of the Mill Area</li> <li>– one to the east of central mine area in Captains Flat</li> <li>– one to the east of the North Mine Ridge, potentially the sports field or swimming pool.</li> </ul> <p>SES is located directly adjacent to remediation works. This SES site should not be used by non-construction workers when remediation works are directly adjacent unless in the case of an emergency.</p> <p>Undertake watering (2 L/m<sup>2</sup>/h) of haul truck access routes, the remediation zones and stockpiles, as required. Additional watering should be applied if any visible dust plumes are observed leaving the work area or site boundary</p> <hr/> <p>AQ3: Additional watering should be applied to the Rail Loading Area and any remediation activities undertaken on the site boundary within 70 metres of sensitive receptors due to a higher risk of exceedances of the criteria. Watering can reduce emissions by up to 70 per cent.</p> <p>Aim to minimise the size of excavated stockpiles where possible.</p> <p>Limit clearing areas of land and clear only when necessary to reduce fugitive wind-blown dust emissions.</p> <p>Control on-site traffic by designating specific routes for haulage and access and limiting vehicle speeds to below 25 kilometres per hour.</p> <p>All trucks hauling material should be covered on the way to and from the proposal site and should maintain a reasonable amount of vertical space between the top of the load and top of the trailer to prevent the escape of dust or other material while in transit.</p> <p>During stockpile loading and unloading the drop height of the excavator should be minimised to prevent unnecessary dust emissions.</p>

Item	Commitment
	<p>If dust generation is evident, measures such as increased water application, minimising vehicle movements and reducing vehicle speed limits will be carried out to minimise dust impacts.</p> <p>On high wind days, or when real-time dust sampling trigger alerts, increase watering, reduce activity or stop works.</p> <p>All construction plant and machinery will be fitted with emission control devices complying with the Australian Design Standards.</p> <p>All vehicles, plant and machinery will be maintained and serviced in accordance with manufacturer's specifications.</p> <p>Machinery will be turned off when not in use and not left to idle for prolonged periods.</p>
Water	<p>W1: A Construction Environmental Management Plan (CEMP) will be prepared by the Contractor, including a Surface Water Management Plan (SWMP) based upon the detailed design to provide specific further guidance on the Contractor's proposed water management strategy. The Surface Water Management Plan should be developed in accordance with Managing Urban Stormwater – Volume 1 (Landcom, 2004), Managing Urban Stormwater – Volume 2 (DECC, 2008a) and Managing Urban Stormwater – Volume 2E, Mines and quarries (DECC, 2008b), informally known as the 'Blue Book', this document, as well as any condition of consent and relevant agency requirements.</p> <p>W2: To manage the erosion and sedimentation risk during the works, a system of engineered erosion and sedimentation controls. These controls should be implemented in accordance with the CEMP and the Surface Water Management Plan.</p> <p>W3: Use a lower-risk liming product, such as a calcium carbonate based agricultural lime on areas not subject to clay capping.</p> <p><b>W4: To manage handling of high-risk material with water quality impacts (such as liming materials, flocculants, pH adjusters, and materials associated with green waste management) the following will occur:</b></p> <ul style="list-style-type: none"> <li>– <b>scheduling works to avoid forecasted rainfall during handling of high-risk materials</b></li> <li>– <b>bunding of potentially high-risk areas to capture any spills</b></li> <li>– <b>safe storage all high-risk liquids and materials on ground level away from existing stormwater drainage systems and waterways</b></li> <li>– <b>preparation and implementation of a Pollution Incident Response Management Plan</b></li> <li>– <b>regular visual inspections of the works area and waterways to identify any potential water quality issues, as per the implementation of the CEMP and SWMP</b></li> <li>– <b>installation and maintaining control measures such as silt fencing.</b></li> </ul> <p>W45: Implement a water quality monitoring program to identify potential deficits in the site's environmental management during construction at previous monitoring locations, including key upstream and downstream locations, using similar analytes to allow for comparison to historical observations.</p> <p>W56: Implement a Trigger Action Response Plan (TARP) to identify trigger values and criteria and provide appropriate response actions if impacts during the remediation works are identified through the monitoring program.</p> <p>W67: Post remediation, monitor water quality to identify any acute changes to water quality (anticipated benefits) arising from implementation of the remediation works, as well as any long-term trends following remediation. Post-remediation water monitoring will be included as part of the long-term Environmental Management Plan.</p> <p>W78: Monthly inspections of vegetation establishment, including monitoring and rectification of any deficiencies (or as required in accordance with the Technical Specification of the works) for a minimum of 12 months.</p> <p>W89: Quarterly visual stability inspections of Forsters Creek in proximity to the remediated slag heap.</p>
Erosion and sediment controls	<p>SS1: Erosion and sediment controls would be implemented in accordance with Volume 1, 2C and 2E of <i>Managing Urban Stormwater: soils and construction</i> (Landcom 2004; DECC NSW, 2008a; DECC NSW 2008b). These should not extend across waterways as this may interrupt fish passage (as applicable).</p> <p>SS2: Erosion and sediment control measures would be regularly inspected, particularly following rainfall events, to ensure their ongoing functionality.</p> <p>SS3: Stabilised surfaces would be rehabilitated as quickly as practicable after construction.</p>

Item	Commitment
	<p>SS4: Stockpiled material would be stabilised / covered where feasible / bunded and contained as required, during extended periods of time, such as when heavy rainfall is forecast.</p> <p>SS5: Measures to minimise the potential for hydrocarbon spills or release of contaminated material and associated impacts on natural environments adjacent to, and downstream, of the proposal site.</p> <p>SS6: The CEMP would include controls to limit the transfer of contaminated soil onto public roads such as a truck wash for example.</p> <p>SS7: Develop and implement an Unexpected Finds Protocol for asbestos within the CEMP.</p>
Noise and vibration	<p>NV1: Ensure employees, contractors and subcontractors receive an environmental induction. The induction must include:</p> <ul style="list-style-type: none"> <li>– all proposal-specific and relevant standard noise and vibration mitigation measures</li> <li>– relevant licence and approval conditions</li> <li>– permissible hours of work</li> <li>– any limitations on high noise generating activities</li> <li>– location of nearest sensitive receivers</li> <li>– construction employee parking areas</li> <li>– designated loading/unloading areas and procedures</li> <li>– site opening/closing times (including deliveries)</li> <li>– environmental incident procedures.</li> </ul> <p>NV2: Confine activities on site between the hours: daytime hours of 7:00 am to 6:00 pm from Monday to Friday and 8:00 am to 1:00 pm on Saturday, with the exception of the following activities:</p> <ul style="list-style-type: none"> <li>– the delivery of oversized plant or structures</li> <li>– <b>environmental mitigation activities in accordance with the approved CEMP</b></li> <li>– emergency work to avoid the loss of life or damage to property, or to prevent environmental harm <b>in accordance with the approved CEMP</b>.</li> </ul> <p>The need for additional works required to be undertaken outside of standard construction hours (ICNG) should be justified in the CEMP for the proposed remediation works and assessed against the noise requirements of the ICNG. Consult with affected neighbours about scheduling activities to minimise noise impacts.</p> <p>Schedule work generating high noise and/or vibration levels during less sensitive time periods.</p> <p>NV3:</p> <p>Avoid the use of radios or stereos outdoors where neighbours can be affected.</p> <p>Avoid shouting and minimise talking loudly and slamming vehicle doors.</p> <p>Reduce throttle setting and turn off equipment when not being used.</p> <p>Avoid use of reversing alarms by designing site layout to avoid reversing, such as by including drive-through for parking and deliveries.</p> <p>Install where feasible and reasonable less-annoying alternatives to the typical 'beeper' alarms, taking into account the requirements of any relevant Occupational Health and Safety legislation (in particular, the Interim Construction Noise Guideline); examples are multifrequency alarms that emit noise over a wide range of frequencies.</p> <p>NV4: Prepare a CNVMP. Include a review of the construction noise predictions assessed during the environmental impact assessment phase based on the methodology and revise accordingly to include a detailed examination of feasible and reasonable work practices and noise mitigation measures to manage sensitive receivers that are predicted to be 'noise affected'. The CNVMP should also include:</p> <ul style="list-style-type: none"> <li>– details of the construction methodology</li> <li>– feasible and reasonable mitigation measures to be implemented</li> <li>– updated noise predictions at sensitive receivers</li> <li>– a noise monitoring procedure for the duration of works</li> <li>– a community consultation plan to liaise with the noise affected receivers.</li> </ul> <p>NV5: Fit and use non-tonal reversing beepers (or an equivalent mechanism) on all construction vehicles and mobile plant regularly used on site and for any out of hours work. Consider the use of ambient sensitive alarms that adjust output relative to the ambient noise level.</p>

Item	Commitment
	NV6: Use quieter and less vibration emitting construction methods, where feasible and reasonable.
	NV7: Select, where feasible and reasonable, the most effective mufflers. Always seek the manufacturer's advice before making modifications to plant to reduce noise.
	Silencers/mufflers are required on the following mobile plant:
	<ul style="list-style-type: none"> <li>– dozers</li> <li>– graders</li> <li>– backhoe</li> <li>– loaders</li> <li>– concrete trucks – as applicable</li> <li>– rollers</li> <li>– asphalt pavers – as applicable</li> <li>– excavators</li> <li>– trucks</li> <li>– water carts</li> <li>– bobcats</li> <li>– scrapers.</li> </ul>
	NV8: Orient equipment with directional noise characteristics away from noise sensitive receivers.
	NV9: Use only the necessary size and power.
	<p>NV10:</p> <p>Ensure loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers.</p> <p>Select site access points and roads as far as possible away from sensitive receivers.</p> <p>Shield dedicated loading/unloading areas if close to sensitive receivers.</p> <p>Fit delivery vehicles with straps rather than chains for unloading, wherever possible.</p> <p>Avoid or minimise out of hours movements, where possible.</p>
	<p>NV11:</p> <p>Limit the use of engine compression brakes in proximity to residences</p> <p>Ensure vehicles are fitted with a maintained Original Equipment Manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's 'In-service test procedure' and standard.</p>
	<p>NV12:</p> <p>Use temporary site buildings and materials stockpiles as noise barriers</p> <p>Use natural landform as noise barrier – place fixed equipment in cuttings, or behind earth berms.</p>
	NV13: Ensure a noise monitoring procedure is developed and carried out for the duration of works in accordance with the CNVMP and any approval or licence conditions. Monitoring reports should be prepared in accordance with the requirements of the noise monitoring procedures.
	NV14: Compliance monitoring should be undertaken to investigate complaints.
	NV15: Where vibratory rollers may be required, use plant types of type VR3 or lower (i.e. 6 tonnes or less) if works are within the buffer distances (100 metres from sensitive receivers).
	NV16: Notify residents in potentially affected catchment zones prior to use of any vibratory within the human response zones outlined in Section 6.1.4.3.2.
	NV17: Wherever possible, avoid the use of any vibrating roller within 15 metres of the residential building at 5 Old Mines Road.
	<p><del>NV18: Ensure delivery truck movements not exceed the following hourly volumes:</del></p> <ul style="list-style-type: none"> <li><del>— Day period 7am* to 6 pm – 6 in and 6 out</del></li> <li><del>— Evening period 6 pm to 9 pm – 2 in and 2 out</del></li> <li><del>— Night period – 6 am to 7* am - 2 in and 2 out.</del></li> <li><del>— *8 am on Sundays and public holidays.</del></li> <li><del>– No truck deliveries should occur between 9 pm and 6 am.</del></li> </ul>

Item	Commitment
	<p>NV19: Ensure all trucks are in good working order and comply with the relevant noise emissions standards by checks and regular inspection.</p> <p>Operations should be designed to minimise reversing on site.</p> <p>Keep to speed limits on public roads and onsite.</p> <p>Where possible, driving of trucks should minimise:</p> <ul style="list-style-type: none"> <li>– heavy acceleration and braking</li> <li>– engine/compression braking (especially during the evening and night)</li> <li>– reversing using tonal alarms, where feasible.</li> </ul>
Use of chemical, fuels and lubricants	<p>OPP1: Use a lower-risk liming product, such as a calcium carbonate based agricultural lime except in the containment cell which would remain an enclosed and controlled environment.</p> <p>OPP2: Measures to minimise the potential for hydrocarbon spills or release of contaminated material and associated impacts on natural environments adjacent to, and downstream, of the proposal site.</p> <p>OPP3: Ensure that any contaminated soil that is spilled during transportation on site is collected and appropriately landfilled and remediated at the Northern Dumps.</p> <p>OPP4: All trucks would be covered when transporting contaminated material between the Southern Dumps and the Northern Dumps containment cell.</p>
Waste	<p>OPP5: Ensure waste that is to be disposed of off-site is classified in accordance with the Waste Classification Guidelines (EPA, 2014) and that it is removed and disposed of at a facility that can lawfully accept the waste in accordance with the POEO Act and POEO Waste Regulation.</p> <p>OPP6: Document and implement waste mitigation and management strategies in accordance with the CEMP. This shall include:</p> <p>Waste management facilities on-site including their set-up, use, management removal and waste tracking documentation</p> <p>Waste hierarchy application including information demonstrating the reduction of the amount of waste produced and the maximised reuse and recycling opportunities utilised</p> <p>Appropriate waste management across all possible waste items produced.</p> <p>OPP7: Remove waste on a weekly basis, or as soon as reasonably practicable. At the completion of works, a check shall be made to ensure that all waste has been removed from site.</p> <p>OPP8: Ensure waste is removed by an appropriately licenced contractor.</p>
Flora and fauna	<p>FF1: A Construction Environmental Management Plan (CEMP) will be prepared, including the specific mitigation measures and sub plans listed below along with work methods, contingencies, roles and responsibilities.</p> <p>The mitigation measures included in the CEMP and sub-plans would be implemented during remediation and rehabilitation works.</p> <p>All workers must be provided with an environmental induction prior to starting remediation and rehabilitation works on site. This would include information on the ecological values of the site and protection measures to be implemented to protect biodiversity during remediation and rehabilitation. This would focus particularly on measures to avoid or minimise disturbance of roosting microbats and minimising impacts on the adjacent Box Gum Woodland CEEC.</p> <p>FF2: To reduce the potential for adverse impacts on ecologically sensitive areas the following measures would be implemented:</p> <ul style="list-style-type: none"> <li>– Confirmation of the final spatial extent of vegetation clearance required for remediation of the underlying soil.</li> <li>– A site inspection prior to the commencement of any vegetation clearing to clearly demarcate vegetation protection areas and clearing limits with a particular focus on minimising clearing of Box-Gum Woodland with reference to Figure 4-1 of this report.</li> <li>– Hygiene protocols would be followed to prevent the introduction and spread of pathogens. All machinery and plant should be cleaned prior to work on site.</li> <li>– Weed control mitigation and management strategies shall be documented and implemented in accordance with the CEMP and <i>Biosecurity Act 2015</i>. This shall include procedures to reduce the spread of weeds via vehicles and machinery with particular focus on weeds of concern such as Serrated Tussock, which is particularly abundant in grassland areas throughout Lake George Mine.</li> </ul>

Item	Commitment
	<ul style="list-style-type: none"> <li>– Post remediation rehabilitation of disturbed or exposed surfaces should include planting of a cover crop to quickly reduce the erosion risk in line with the <i>Lake George Mine Capping and revegetation works technical specification</i> (GHD 2020). This will include: <ul style="list-style-type: none"> <li>• Grass seed sown in accordance with the supplier’s requirements and/or achieve a minimum 70% cover per square metre</li> <li>• Lightly raking the topsoil surface after sowing and watering the area as possible</li> <li>• Regular watering through the establishment period in accordance with the suppliers requirements</li> <li>• Protection of revegetated areas from pedestrians and animals until the grass has established, and from vehicles or heavy plant at all times</li> <li>• Maintenance of revegetation areas for a period of 12 months.</li> </ul> </li> </ul> <p>It is noted that the initial ground cover will be a sterile exotic cover crop.</p> <p>FF3: To reduce the potential for adverse impacts on fauna and fauna habitat the following measures will be implemented:</p> <ul style="list-style-type: none"> <li>– fencing of retained derelict structures to avoid disturbance to potential microbat roosting habitat within Lake George Mine</li> <li>– retention and relocation of woody debris within the mine site which provide important habitat components for small woodland birds</li> <li>– a local vet or wildlife carer should be identified as a contact during clearing operations contacted if wildlife is injured</li> <li>– demolition of derelict mine structures should not occur during the breeding seasons for cave-roosting microbats. Breeding season occurs from approximately October to February.</li> </ul> <p>FF4: The following measures should be incorporated into the CEMP to manage impacts on aquatic habitats and water quality:</p> <ul style="list-style-type: none"> <li>– measures to minimise the potential for chemical spills or release of contaminated material and associated impacts on natural environments adjacent to and downstream of the site</li> <li>– erosion and sediment controls would be implemented in accordance with Volume 1, 2 and 2E of <i>Managing Urban Stormwater: soils and construction</i> (Landcom 2004; DECC 2008a, 2008b)</li> <li>– erosion and sediment control measures would be regularly inspected, particularly following rainfall events, to ensure their ongoing functionality</li> <li>– stabilised surfaces would be rehabilitated as quickly as practicable after construction</li> <li>– all stockpiled material would be stored in bunded areas and kept away from waterways to avoid sediment entering the waterway</li> <li>– dust suppression techniques such as water spraying and covering stockpiles would be implemented, where necessary</li> <li>– vehicles would follow appropriate speeds to limit dust generation</li> <li>– specific measures will be incorporated to minimise the potential for chemical spills and associated impacts on natural environments adjacent to and downstream of the site.</li> </ul>
Ecological and biosecurity	<p>BS1: A Construction Environmental Management Plan (CEMP) will be prepared, including the specific mitigation measures and sub plans listed below along with work methods, contingencies, roles and responsibilities.</p> <p>The mitigation measures included in the CEMP and sub-plans would be implemented during remediation and rehabilitation works.</p> <p>Ensure all workers are provided with an environmental induction prior to starting remediation and rehabilitation works on site. This would include information on the ecological values of the site and protection measures to be implemented to prevent biosecurity issues during remediation and rehabilitation.</p> <p>The CEMP will include a bushfire risk assessment and management protocol as a sub-plan.</p> <p>BS2: To reduce the potential for adverse impacts to biosecurity the following measures would be implemented:</p> <p>Hygiene protocols would be followed to prevent the introduction and spread of pathogens. All machinery and plant should be cleaned prior to work on site.</p> <p>Weed control mitigation and management strategies shall be documented and implemented in accordance with the CEMP and Biosecurity Act 2015. This shall include procedures to reduce the spread of weeds via vehicles and machinery with particular focus on weeds of concern such as Serrated Tussock, which is particularly abundant in grassland areas throughout Lake George Mine.</p>

Item	Commitment
	<p>BS3: Measures to mitigate and manage bushfire risk will be developed and included as part of site-specific hazard and risk management measures for the proposal. Measures will include the maintenance of ancillary facilities in a tidy and orderly manner and the storage and management of dangerous goods and hazardous materials in a safe location.</p> <p>BS4: An incident response management plan will be developed and implemented. This plan will include bushfire risks. The response to incidents will be managed in accordance with the requirements of NSW Rural Fire Service, NSW Fire Brigade and other emergency services.</p>
Community resources	CR1: Potential for local and regional businesses to participate in procurement opportunities during construction. Local businesses may also benefit from construction workers spending money in town.
Social	<p>S1: Implement a communication management plan to manage impacts to community stakeholders. This would include:</p> <ul style="list-style-type: none"> <li>– protocols to keep the community updated on the progress of the proposal</li> <li>– protocols to inform the community of potential impacts (traffic/access, noise, air quality impacts)</li> <li>– inform the community about companies involved in truck movements so the community is aware of the contracting vehicles associated with the proposal</li> <li>– protocols to respond to complaints received.</li> </ul> <p>S2: The communication management plan which would include procedures to ensure adjacent residents are notified about remediation activities, as well as a complaints procedure.</p>
Non-Aboriginal Heritage	<p>NAH1: The proposed activity must be confined to the proposed works footprint. This would ensure that neighbouring and adjacent heritage sites (Captains Flat Railway Station, Stationmasters Residence (Former) and Roscommon) are not impacted upon.</p> <p>NAH2: To mitigate any unintended harm the following measures must be taken:</p> <ul style="list-style-type: none"> <li>– A detailed geospatial survey of the site must be prepared that identifies all elements subject to removal and temporary relocation.</li> <li>– A detailed photographic record must be prepared of each element subject to removal and temporary relocation.</li> <li>– Elements subject to removal and temporary relocation will be securely stored at an appropriate location at, or near, the site.</li> <li>– Reinstatement of elements subject to removal and temporary relocation must occur as soon as practicable following completion of the remediation works.</li> <li>– <del>Fabric elements associated with the rails including rail spikes, fishplates and ties must be salvaged and, where that is not possible, they must be replaced with like components</del></li> <li>– <del>Replacement timbers (including rail sleepers) should be like items, where possible</del></li> <li>– <del>The rail ballast and sub-grade is to be replaced with new material.</del></li> <li>– <del>As the Captains Flat railway is no longer operating, the reinstatement of railway tracks may not require engineering and construction to meet operational railway standards. Advice should be obtained from Transport for NSW on this matter.</del></li> </ul> <p>NAH3: Potential archaeological deposits are likely to be associated with the mine entrance, workshop and change rooms and at the Processing Site (Kohinoor &amp; Elliots). These sites must be protected from disturbance with physical barriers whilst works are underway. The positioning of barrier fencing should be determined in consultation with an archaeologist with experience of the Lake George Mine site.</p> <p>The application of lime to surface deposits at the Processing Site (Kohinoor &amp; Elliots) will be undertaken by hand and without disturbance to surface deposits to avoid any impact to potential archaeological deposits.</p> <p>NAH4: If the Concentrate Loading Tunnels are to be removed, the following measures would be taken before the proposed activity commences in order to mitigate the impact:</p> <ul style="list-style-type: none"> <li>– a detailed archival recording of the Concentrate Loading Tunnels will be prepared including site plans and <del>measured drawings</del> <b>historic photographs</b>; and</li> <li>– a detailed archival photographic record of the Concentrate Loading Tunnels will be prepared.</li> </ul> <p>NAH5: To mitigate any unintended harm to the Concentrate Bins, the following measures would be taken before the proposed activity commences:</p> <ul style="list-style-type: none"> <li>– a detailed archival recording of the Concentrate Bins will be prepared including site plans and <del>measured drawings</del> <b>historic photographs</b>; and</li> </ul>

Item	Commitment
	<ul style="list-style-type: none"> <li>– a detailed archival photographic record of the Concentrate Bins will be prepared</li> <li>– if removal of the inert gravel and the sulfidic waste causes the structural integrity of one or more of the Concentrate Bins to be compromised, additional heritage assessment will be required to determine the most appropriate future management of the structure(s).</li> </ul> <p>NAH6: To mitigate any unintended harm to the Surge Bin, the following measures would be taken before the proposed activity commences:</p> <ul style="list-style-type: none"> <li>– A detailed archival recording of the Surge Bin will be prepared including site plans and <del>measured drawings</del> <b>historic photographs</b>; and</li> <li>– A detailed archival photographic record of the Surge Bin will be prepared.</li> <li>– If removal of the sulfidic waste causes the structural integrity of the Surge Bin to be compromised, additional heritage assessment will be required to determine the most appropriate future management of the structure.</li> </ul> <p>NAH7: Prior to the commencement of the proposed remediation works, the Processing Site (Kohinoor &amp; Elliots) should be secured with temporary fencing to restrict access, minimise on site safety risk, and to protect the historic structures from inadvertent damage during the works.</p> <p>NAH8: At the completion of construction works, the following heritage elements should be secured with appropriate permanent safety fencing to restrict access. Final barrier design would be determined based on site specific conditions and the relevant Australian Design Standards.</p> <ul style="list-style-type: none"> <li>– Flotation Mill</li> <li>– Storage Bins, Sulphur Plant &amp; Ball Mills</li> <li>– Surge Bin concrete footers.</li> </ul> <p><b>NAH9: To mitigate any unintended harm to the Captains Flat Railway, the following measures will be taken before the proposed activity commences:</b></p> <ul style="list-style-type: none"> <li>– <b>a detailed archival recording of the Captains Flat Railway will be prepared including site plans and historic photographs; and</b></li> <li>– <b>a detailed archival photographic record of the Captains Flat Railway will be prepared.</b></li> </ul> <p><b>NAH10: The existing culvert structures will be retained unless the safety, condition or functionality of the culvert is compromised.</b></p>
Aboriginal Heritage	<p>AH1: Implement unanticipated finds protocol. If unforeseen Aboriginal objects/sites are uncovered during the proposed remediation works, work would cease in the vicinity of the find and next step would be co-ordinated by LMP. This would likely involve consultation with an archaeologist, the Department of Planning, Industry and Environment (DPIE) and the Local Aboriginal Land Council.</p> <p>AH2: Implement unanticipated skeletal remains protocol. If human remains are found during the proposed remediation works, work would cease, the site would be secured, and the NSW Police and DPIE would be notified.</p> <p>AH3: If a native title land claim is declared this will be investigated and a notice of the works will be forwarded to the native title claimants' representative body.</p>
Aesthetic	<p>A1: Ensure construction plant, equipment, waste and excess materials are contained within the designated boundaries of the site and are removed following the completion of the proposed remediation works</p> <p>A2: Keep work areas tidy at all times</p> <p>A3: Keep vegetation clearance to a minimum</p> <p>A4: Ensure the proposal site is revegetated as per a Revegetation Plan</p> <p>A5: Monitor revegetation to ensure successful re-establishment</p> <p>A6: A detailed archival photographic record of the Surge Bin will be prepared prior to the works commencing.</p> <p><b>A7: A detailed archival photographic record of the Captains Flat Railway Precinct will be prepared prior to the works commencing.</b></p>
Land use	<p>LU1: Rock mulch instead of topsoil will be used as the top layer for remediation works occurring in the central part of the Central Mine Area, around one third of the Mill Area and in other select areas of the site to promote mining infrastructure aesthetics.</p>

Item	Commitment
Transport	T1: A Traffic Management Plan (TMP) shall be prepared by the contractor prior to commencement of remediation works. The TMP shall form part of the CEMP and shall include specific traffic, transportation, and access mitigation and management strategies to facilitate the safety of all workers and road users within, including access to, the proposal site.
	T2: Protection shall be provided to workers and road users through advance warning of roadworks, speed changes, safety barriers with adequate offsets and deflection allowance, where necessary.
	T3: Opportunity for carpooling and/or the provision of coach/shuttle services for site personnel shall be explored, subject to government guidelines around COVID-19, to minimise light vehicle movements.
	T4: All deliveries shall be scheduled and coordinated to facilitate the organised arrival of trucks. Ample space and time shall be allotted for the safe loading and unloading of materials. All parking and queueing (if any) shall be contained within the proposal site.
Cumulative	C1: Consult with Council to coordinate the timing and duration of any road closures and project activities that will impact road capacity. As necessary, alternative route options and (truck) delivery schedules will be planned with council to minimise impact (e.g. delays) to other road users.
	C2: Consult with Council to coordinate the timing and duration of any project activities that will impact noise levels and air quality in the vicinity of Lake George Mine.
	C3: Notify residents of planned construction works in the Captains Flat area as well as when they are expected to start and finish. Notifications will provide community with a complaints mechanism.
	C4: Consult with the Captains Flat Taskforce to coordinate any concurrent remediation works that may result from the Lead Management Plan.
Rehabilitation commitments and timeframes	Not applicable as the proposal works are remediation works
Other regulatory approvals required	<i>Protection of the Environment Operations Act 1997 (POEO Act)</i> licence. <i>State Environmental Planning Policy (Transport and Infrastructure) 2021</i> requires consultation with Council as the project involves consequential excavation of a road for which the council is the roads authority <b>and substantial impacts to local heritage impacts.</b> <b><i>Fisheries Management Act 1994</i> required notification for proposed dredging works.</b> <b><i>Roads Act 1993</i> requires a licence for road works.</b>
Community consultation	To be engaged using a range of tools and techniques including meetings, phone calls, and information sessions. To be supported by community feedback mechanisms, including a project-specific phone number and email address.
Compliant management	A Complaints Management Procedure will be established, and information provided to all landholders of properties where activities will take place. Landholders will be provided with relevant contact details to be able to contact a staff member.
Incident management	An Incident Management Procedure will be established and utilised in the event of an environmental or safety incident. The Department will be notified of all incidents
Monitoring	Monitoring of the long-term impacts of the remediation works will be undertaken in accordance with the water quality monitoring program and potentially, the forward site Environmental Management Plan.
Continuous improvement	No additional measures identified
Reporting	Reporting to the Department will occur as required
Other (as applicable)	No additional measures identified

## 6. Conclusions

### 6.1 Justification

The approved project as described in the original REF and this Addendum REF are required to significantly reduce the risk of off-site contaminant migration through windborne dust, sediment, and surface water migration to the surrounding environment, in addition to reducing on site human health and safety risks.

The revised proposal is needed to:

- minimise locational risks and reduce traffic impacts with regards to the location of the temporary site infrastructure
- remediate contaminated mineral waste and slag in Fosters Creek, the Molonglo River and Copper Creek
- better mitigate erosion and sediment control risks by implementing enhanced controls with respect to surface water management; both clean and construction water
- provide an option to beneficially reuse stockpiled waste on site as a resource
- implement a slightly amended remedial strategy to maximise the removal of contaminated fill from the TfNSW-owned Railway Precinct
- reduce forward contamination risk from the Old Mill Area by encapsulating the mineral waste in the containment cell
- better manage the green waste generated on site through clearing and grubbing
- maintain the site roads to a condition suitable for the remedial works to be undertaken safely.

All amendments support the overall remedial purpose at the Lake George Mine as summarised above.

### 6.2 Objectives of the EP&A Act

It is considered that the revised proposal is generally consistent with the objects of the EP&A Act, including the principles of ecologically sustainable development (refer Table 6.1).

Table 6.1 Objectives of the EP&A Act

Object	Comment
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources	The revised proposal would increase the social and economic welfare of the local community by decreasing the risk off-site contamination and associated health risks. The revised proposal would promote vegetation growth as well as water and air quality thus leading to a better environment.
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental, and social considerations in decision-making about environmental planning and assessment.	The revised proposal is consistent with the principles of ecologically sustainable development as it would support the health of local communities and the environment.
1.3(c) To promote the orderly and economic use and development of land	The revised proposal would support the conversion of unused, contaminated land into: <ul style="list-style-type: none"> <li>– a safe, accessible place to visit for community members</li> <li>– higher value habitat for fauna.</li> </ul> This is an economic use of land.
1.3(d) To promote the delivery and maintenance of affordable housing	Not relevant.

Object	Comment
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	The revised proposal would promote vegetation growth as well as water and air quality thus leading to a better environment.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	The proposed modifications would involve the removal of heritage fabric in the Captains Flat Railway Precinct. This would be appropriately managed by the mitigation measures discussed in section 4.2.6.  Overall, the revised proposal would not impact on the heritage significance of the Lake George Mine site and would make the site a safe, accessible place to visit for community members viewing the remaining heritage structures.
1.3(g) To promote good design and amenity of the built environment.	The remediation strategy of the revised proposal has been developed with reference to decades of research regarding the contamination of the site. The remediation strategy is thus supported by good design.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Not relevant.
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	Not relevant.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	Community participation undertaken for the revised proposal is described in section 4.3 of the original REF.

## 6.3 Conclusion

The revised proposal is subject to assessment under Section 5.5 of the EP&A Act. This addendum to the original REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the revised proposal.

This Addendum REF has identified the following additional negative impacts as a result of the revised proposal:

- short-term additional negative impact on air quality and water quality
- removal of up to 0.99 ha of additional native vegetation noting that the *Captains Flat Rail Corridor Remediation Action Plan* (Ramboll, 2022) proposes to fence off and retain the PCT 283 within the TfNSW part of the site to limit access and exposure to contractors undertaking remedial activities
- removal of some heritage fabric in the Captains Flat Railway Precinct
- one additional truck movement per hour during remediation.

Overall, the modifications would assist in significantly reducing the risk of off-site contaminant migration through windborne dust, sediment, and surface water migration to the surrounding environment, in addition to reducing on-site human health and safety risks. The modifications would:

- have a long-term positive impact on air quality and water quality
- support new areas of vegetation in remediated and revegetated areas
- increase both the accessibility and safety of the site to visitors.

Impacts associated with the revised proposal would be managed by implementation of the additional and revised safeguard and management measures provided in this Addendum REF.

## 7. Scope and limitations

*This report has been prepared by GHD for Department of Regional NSW and may only be used and relied on by Department of Regional NSW for the purpose agreed between GHD and Department of Regional NSW as set out in section 1.2 of this report.*

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

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

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

*If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.*

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