South Walker Creek Mulgrave Resource Access Project

Stage 2C

Water Resource – assessment of impacts (EPBC Act)

ADAPTIVE STRATEGIES

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INTRODUCTION

The South Walker Creek Mine (SWC Mine) is an open cut coal mining operation owned and managed by BHP Billiton Mitsui Coal (BMC). The mine is located in the northern Bowen Basin, approximately 26 km southeast of the township of Nebo in Queensland.

The mine includes a number of mining pits including the Mulgrave Pit. The Mulgrave Resource Access (MRA) project is a multi stage progression of open cut mining of the Mulgrave Pit. Previous stages have been assessed and approved separately (ref: EPBC 2014/7272), The current project relates to MRA Stage 2C (MRA2C) that involves a progression of the Mulgrave Pit in a south –westerly direction to access coal resources within the current mining lease (ML4750). The pit progression will intersect an ephemeral creek system (Walker Creek) requiring the diversion of the watercourse. The project will also require the replacement of a mine water dam, this will be achieved through the establishment of two new dams one to the north and one to the south of the pit.

Under the EPBC Act, an action that involves a large coal mining development requires approval from the Australian Government Environment Minister if the action has, will have, or is likely to have a significant impact on a water resource. This report provides a summary of studies undertaken to determine the levels of impacts on water resources.

PURPOSE

Adaptive Strategies Pty Ltd has been engaged by BMC to review and advise on whether the MRA2C project will have a significant impact on water resources under the requirements and definitions of the *Environment Protection and Biodiversity Conservation Act 1999*.

The advice considers the Australian Government's *Significant impact guidelines 1.3: Coal seam gas and large coal mining developments— impacts on water resources*; and in particular whether the proposed progression of mining is likely to have a significant impact on a water resource as a matter of national environmental significance.

INFORMATION SOURCES

The assessment and information in this report has been derived from a number of key source documents. Each of these documents contains both a technical assessment of water and ecology issues and complies information from earlier studies, surveys and impact assessments. The reports are:

- Alluvium (2016). MRA2C Surface Water Impact assessment. Report by Alluvium Consulting Australia for BHPB Coal.
- CDM Smith (2016) Mulgrave Access Resource Project - MRA2C Groundwater Impact Assessment. Report by CDM Smith for BHPB Coal.
- Eco Logical Australia (2016) Mulgrave Stage 2C Ecological Impact Study. Prepared for BHP Billiton.
- DEHP August (2015). Environmental Authority (EA) – *South Walker Creek Mine Permit No. EPML00712313*

RELEVANT LEGISLATION, POLICIES AND PLANS

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, wetlands, water resources and heritage places — defined in the EPBC Act as matters of national environmental significance.

These matters of national environmental significance (MNES) are:

- World heritage properties
- National heritage places
- Wetlands of international importance
- Nationally threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- A water resource in relation to coal seam gas (CSG) and large coal mining (the water trigger).

The amendment to the EPBC Act to include a water resource in relation to CSG and large coal mining as a MNES came into effect on 22 June 2013. This means that, under the EPBC Act, an action that involves a CSG development or a large coal mining development now requires approval from the Australian Government Environment Minister (the Minister) if the action has, will have, or is likely to have a significant impact on a water resource.

The 'Water Trigger'

The intent of the introduction of water resources as a matter of National Environmental Significance (NES) was to address community concern about potential impacts to critical water resources. This intent was quite clearly stated in the Minister's second reading speech, as reproduced below:

"The challenge we have had up until now is that people quite reasonably expect the minister for the environment and water to take into account, by law, the impacts of coal seam gas and large coal mining on water resources. They want to know that I am considering: if there is an irreversible depletion and contamination of our surface and groundwater resources; the impacts on the way critical water systems operate; and the related effects on our ecosystems."

The Minister went on to say that:

"The amendment does not seek to invoke the Commonwealth in all water decisions. The trigger will not capture small projects such as farm dams. The amendments will create a new matter of national environmental significance for coal seam gas and large coal mining developments which are likely to have a significant impact on a water resource. It will provide the strong legal basis for protection that the community wants. This is not a broad trigger."

(The Hon Tony Burke, Minister for Sustainability, Environment, Water, Population and Communities, 13 March 2013)

The second reading speech made clear that water resources as a matter of NES is restricted to CSG and coal developments and this is reflected in the Significant impact guidelines 1.3.

Significant Impact Guidelines 1.1: Matters of National Environmental Significance.

The Australian Government published the *Significant Impact Guidelines 1.1: Matters of National Environmental Significance* to assist proponents understand when significant impacts may result.

The guidelines describe a 'significant impact' as an impact that is:

important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. You should consider all of these factors when determining whether an action is likely to have a significant impact on matters of national environmental significance.

The guidelines provide questions to consider in determining whether an action is likely to have a significant impact on a matter of national environmental significance and for project proponents to use in undertaking a 'self-assessment' to decide whether or not a proposed action is likely to have a significant impact on any matters of national environmental significance. Significant impact criteria are provided for each matter of NES.

Significant impact guidelines 1.3: Coal seam gas and large coal mining developments— impacts on water resources

The Australian Government has also issued guidelines specifically relating to consideration of a water resource in relation to CSG and large coal mining as a MNES. The *Significant impact guidelines 1.3: Coal seam gas and large coal mining developments— impacts on water resources* (December 2013) seek to assist in the decision about whether an action involving a CSG development or a large coal mining development has, or is likely to have, a significant impact on a water resource. The guidelines should be read in conjunction with the EPBC Act and Significant impact guidelines 1.1.

The guidelines provide a 'self-assessment' process for the proposers of projects, including detailed criteria, to assist in deciding whether or not referral may be required. This advice has regard to those detailed criteria and forms the 'self-assessment' for the MRA2C project.

RELEVANT CRITERIA

For large coal mining operations the criteria relevant to impacts on water resources are focussed on changes in hydrological characteristics, water quality, cumulative impacts. The criteria refer specifically to the utility of the water resource, therefore, it is imperative that any assessment of impacts is undertaken with a focus on third party uses of the water resource, including human and natural environmental users.

Specifically the criteria are:

5.2 General criteria

An action is likely to have a significant impact on a water resource if there is a real or not remote chance or possibility that it will directly or indirectly result in a change to:

- the hydrology of a water resource,
- the water quality of a water resource,

that is of sufficient scale or intensity as to reduce the current or future utility of the water resource for third party users, including environmental and other public benefit outcomes, or to create a material risk of such reduction in utility occurring. For further information on the utility of a water resource for third party uses.

5.2.1. Value of a water resource

It is important to consider the value of the water resource in determining whether the impacts of a proposed action on a water resource are likely to be significant. The key factor that will be relevant in determining the value of a water resource will be its utility for all third party uses, including environmental and other public benefit outcomes (see Example 8). Such outcomes include:

- provisioning services (e.g. use by other industries and use as drinking water)
- regulating services (such as the climate regulation or the stabilisation of coastal systems)
- cultural services (including recreation and tourism, science and education)
- supporting services (e.g. maintenance of ecosystem function).

The ecosystem function of a water resource includes the ecosystem components, processes and benefits or services that characterise the water resource, including support for the biological diversity or species composition of the water resource.

If there is evidence, based on data, modelling and engagement with potentially affected stakeholders, that the action would not materially affect (either by increasing or decreasing) the availability and quality of water for all third party users, including environmental and other public benefit outcomes and including at a future time or in another place, then that would reduce the likelihood of the action having a significant impact.

Criteria 5.3. Guidance on changes to hydrological characteristics

A significant impact on the hydrological characteristics of a water resource may occur where there are, as a result of the action:

a) changes in the water quantity, including the timing of variations in water quantity
b) changes in the integrity of hydrological or hydrogeological connections, including substantial structural damage (e.g. large scale subsidence)
c) changes in the area or extent of a water resource

Where these changes are of sufficient scale or intensity as to significantly reduce the current or future utility of the water resource for third party users, including environmental and other public benefit outcomes.

Criteria 5.4. Guidance on changes to water quality

A significant impact on a water resource may occur where, as a result of the action:

a) there is a risk that the ability to achieve relevant local or regional water quality objectives would be materially compromised, and as a result the action:
    I. creates risks to human or animal health or to the condition of the natural environment as a result of the change in water quality
    II. substantially reduces the amount of water available for human consumptive uses or for other uses, including environmental uses, which are dependent on water of the appropriate quality
    III. causes persistent organic chemicals, heavy metals, salt or other potentially harmful substances to accumulate in the environment seriously affects the habitat or lifecycle of a native species dependent on a water resource, or
    IV. causes the establishment of an invasive species (or the spread of an existing invasive species) that is harmful to the ecosystem function of the water resource, or
    V. there is a significant worsening of local water quality (where current local water quality is superior to local or regional water quality objectives), or
    VI. high quality water is released into an ecosystem which is adapted to a lower quality of water.

Criteria 5.5.1. Cumulative impacts

With regards cumulative impacts the guidelines provide the following advice:

The definitions of CSG development and large coal mining development refer to the action having a significant impact 'when considered with other developments, whether past, present or reasonably foreseeable developments'. This means that a significant impact on water resources may be caused by one CSG development or large coal mining development, or the cumulative impact of other developments in the area.

At the referral stage, cumulative impacts should be assessed qualitatively on the basis of potential risks, and only existing and reasonably foreseeable future uses should be considered.

ASSESSMENT AGAINST CRITERIA

SURFACE WATER

The MRA2C project will occur within the surface water catchment of Walker Creek, just downstream of the confluence with the smaller tributary, Carborough Creek.

Walker Creek is an ephemeral watercourse with a catchment of approximately 17,500ha that originates roughly 25 kilometres north of the current mining activity and drains in a general southerly direction. The vast majority of the Walker Creek catchment is used for grazing and no other mines are located within it.

Walker Creek enters the mine lease north of the project and is currently not impacted by mining activities until it reaches SWC Mine where its original course has been diverted to avoid sections of the Mulgrave pit, specifically MRA2A which was an earlier stage of the mine plan (EPBC 2014/7272).

Downstream from the recently constructed MRA2A diversion, Walker Creek flows in a south-easterly direction adjacent the Mulgrave Pit highwall through the mining lease area identified for the MRA2C stage of mining. Walker Creek then joins Bee Creek approximately 5.5km downstream of the eastern mining lease boundary. Bee Creek continues for approximately 60km before joining the Connors River that, together with the Isaac River, form a major drainage basin for the Fitzroy River Basin (refer Figure1).

Water quality in Walker Creek upstream of mining activity is considered to be good with the exception of the high suspended solid concentrations often in excess of 1000mg/L. It is this high suspended load that is believed responsible for the uniformly flat sandy bed, which offers little to no habitat value.

The *South Walker Creek and Poitrel Mines – Salt Assimilation Studies: Environmental Values and Water Quality Objectives* report (BMT WBM, 2011) determined that based on the degree of modification to its catchment, lack of aquatic habitat and/or permanent/semi-permanent water holes, and overall stream condition, Walker Creek is considered to be in slightly-to-moderately disturbed condition.

No listed fish species or other aquatic fauna have been identified within the creek system and field surveys indicate that there are no aquatic macro-invertebrate, fish or reptile (turtles) MNES species likely to be present. While Walker Creek provides temporary aquatic fauna movement habitat during flow events, it does not provide sufficient habitat diversity or type suited to MNES fauna species, predominately due to the lack of permanent waterholes which area result of seasonal rains and from the increased sediment loads carried by the system.

Surface water flows into Walker Creek from the project area occur during moderate and high rainfall events. Low rainfall events are generally absorbed by surface soils (Alluvium 2016). Drainage into Walker Creek occurs from the western and southern side of the creek, flows from the northern side are already interrupted by the existing mine operations.

An assessment of impacts to surface water has been undertaken and reported in *MRA2C Surface Water Impact Assessment* (Alluvium 2016). A summary of findings against the Significant Impact Guidelines 1.3 is provided below.

Change in integrity of hydrological connections

The main change in hydrological surface water connections will be from the diversion of Walker Creek from it original course to avoid pit progression as shown in Figure 2.

The Walker Creek diversion has been hydraulically designed using both existing design guidelines adopted by the Queensland Government and the outcomes of research undertaken by the Australian Coal Association Research Program (ACARP) in a report titled *Criteria for functioning river landscape units in mining and post mining landscapes* (ACARP, 2014). These guidelines are the recommended standard to minimise potential adverse impacts and allow diversions to function as part of the natural landscape in the longer term.

The diversion design includes consideration of the existing hydrologic, hydraulic and sediment transport data so that channel stability is created and rates of erosion mimic the natural conditions. The entire diversion is located on existing mining lease area and the diversion will re-join the natural creek line prior to the creek crossing the mine lease boundary. Hydraulic and hydrodynamic modelling shows that stream power, sheer stress and velocity are below threshold levels throughout the length of the diversion channel and no change to water quantity downstream of the diversion will occur. Changes to stream location, function and flow beyond the mine lease will not result.

The diversion has been designed to provide continuity in physical stream system processes such that the reach of Walker Creek upstream and downstream of the proposed diversion should be minimally impacted.

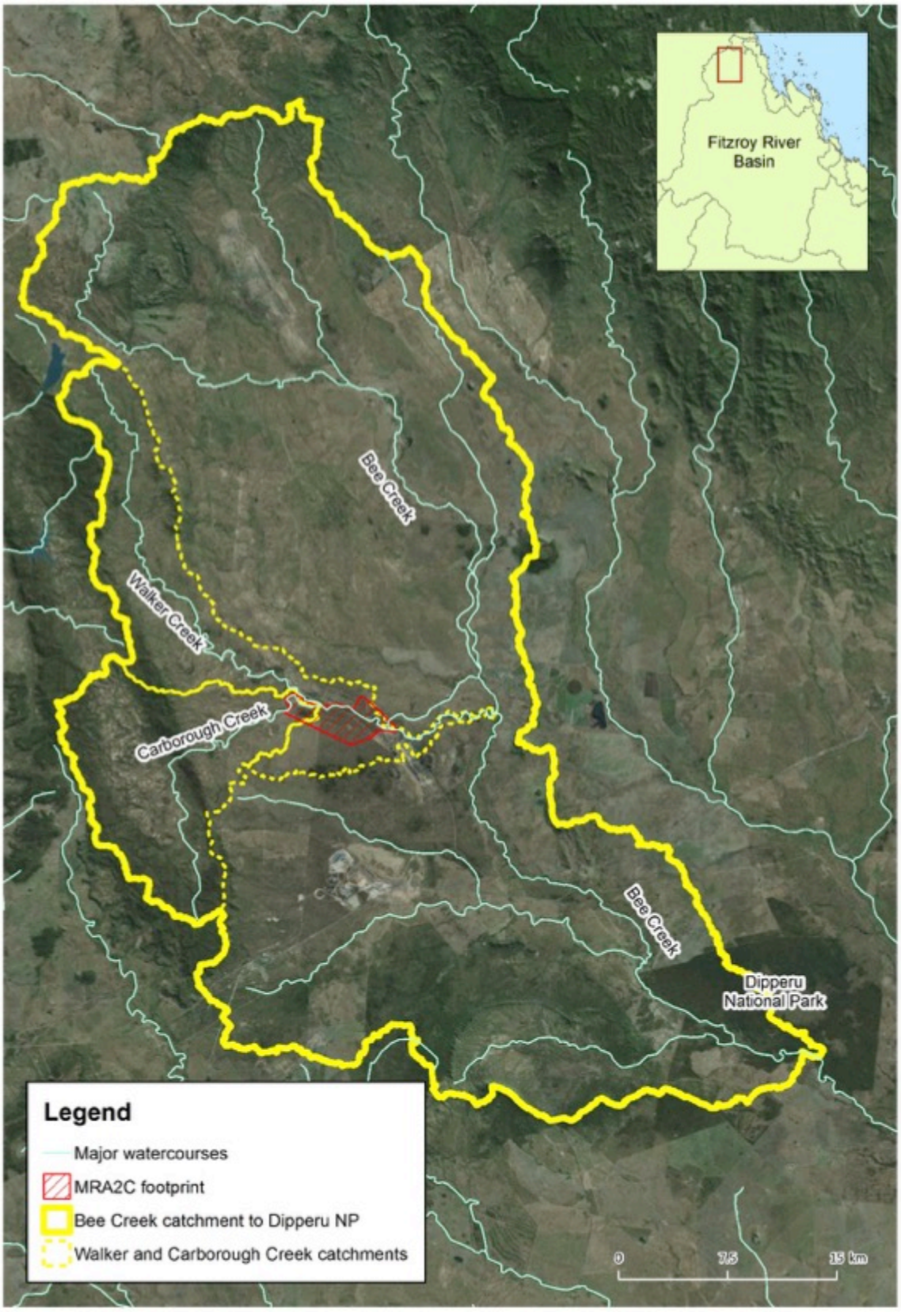


Figure 1: Waterways in the vicinity of the project

Changes in catchment flows and water quantity

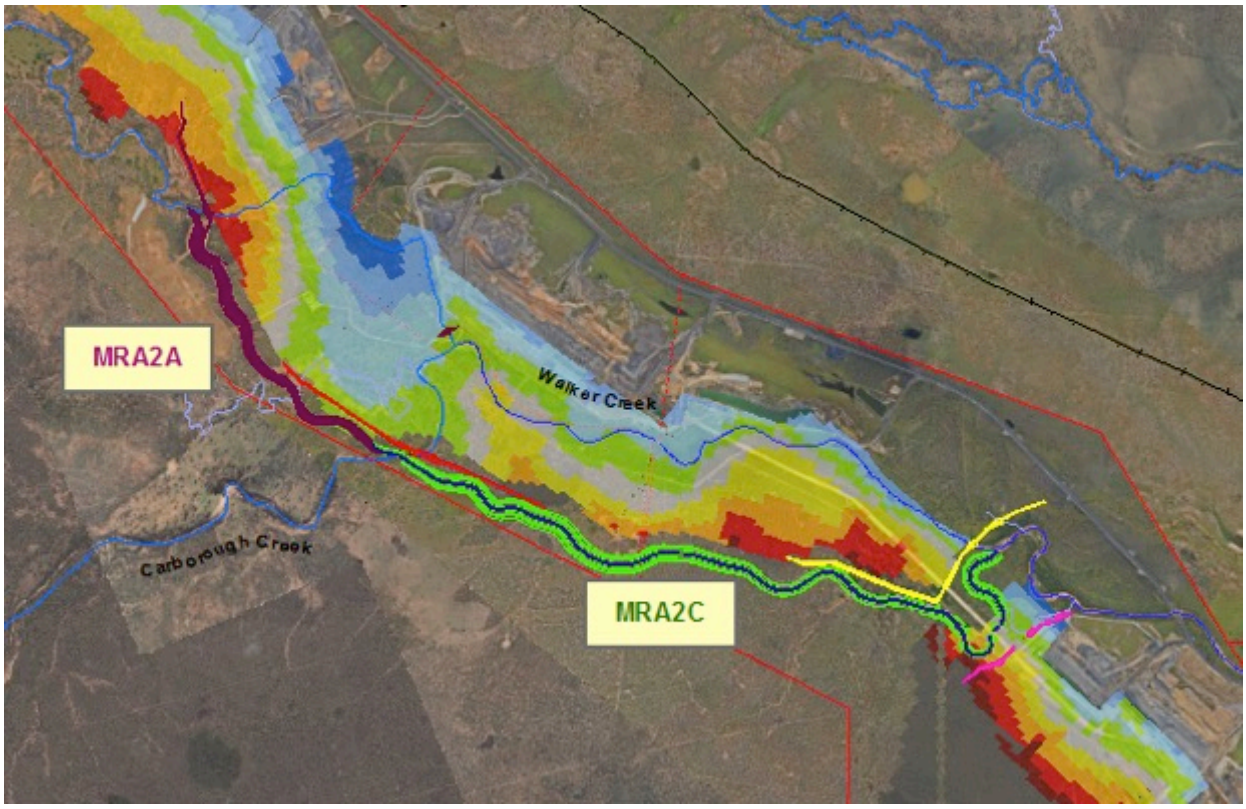
Flows through the diversion become confined between high ground and constructed levees before returning to the original channel and floodplain. All impacts will be limited to the SWC Mine lease. There are no expected impacts to users upstream or downstream.

The increase in mine pit catchments has the potential to result in a decrease in creek flows. The maximum impact on flows in Walker Creek as a direct result of the increasing catchment areas is a decrease of 0.08% of the Bee Creek catchment at Dipperu National Park. This is considered to be a conservative (upper limit) estimate, as it does not include any flows returned to the natural system from storages under licence conditions.

This percentage reduction in water quantity, catchment area and flows is well within any margin of error in calculations and is not considered to represent any significant impact on the hydrology of Walker Creek and is therefore considered to have no significant impacts to users.

The highwall drain catchments will generate runoff that will initially drain to the remnant Walker Creek channel from where it must be pumped out due to impoundment by the downstream diversion plug. This is considered 'clean' water and can be pumped directly to Walker Creek under existing EA conditions. As the mine develops post 2019 the highwall drain catchments reduce as the pit progresses. The remnant Walker Creek channel will be cut and a number of subcatchments will be created, which can be joined by drainage or managed separately. By the time the development is completed the highwall drain catchments will be minimal and the remaining catchments topography can be graded and/or built up to prevent ponding behind levees.

Figure 2: Walker Creek diversions for MRA2A and MRA2C



Changes in flood flows and extents

Some change to flood flows and extents is expected, these changes are minor and will be localised to the diversion and the immediate reaches of Walker Creek upstream and downstream from the diversion on the SWC Mine lease. There are no identified significant impacts to other users.

Changes in water quality

The primary focus for water quality is related to the need for SWC to periodically return water (both "stormwater" and "mine water" collected from the catchments of the mining pits) back into the natural system.

The controlled release of mine water from site is only permissible in accordance with strict conditions outlined in the Environmental Authority (EA) – *South Walker Creek Mine Permit No. EPML00712313* (DEHP 2015). These release conditions have been carefully and scientifically determined, and are in accordance with Qld Government requirements,

so as to protect downstream environmental values. The release conditions are based upon natural flow rates in Bee Creek.

The pit progression will result in the decommissioning of an existing mine water dam. Two new water storage dams will be constructed to replace the existing dam. One dam is located to the north of the coal pit and one to the south. These dams will hold mine affected water that will be pumped directly from the mine into these dams. Water storage and release conditions will be as per the SWC Mine EA, the dams will be managed as per standard procedures for other mine water damns.

The two damns are relatively shallow with raised bund walls. There will be no interaction between the dams and groundwater resources.

Under the EA conditions, monitoring is required of the quality of receiving waters at specific locations and different frequencies. All monitoring is undertaken under the umbrella of the site Receiving Environment Monitoring Program (REMP), which under EA condition W20 "*must include monitoring the effects of the mine on the receiving environment periodically (under natural flow conditions) and while mine affected water is being released. For the purposes of the REMP, the receiving environment is the waters of Bee Creek and connected or surrounding waterways with 15km downstream of the release*."

In the latest annual report for REMP (2015) there was no evidence of an impact on macro invertebrate or fish communities, it is considered unlikely that any changes in water quality associated with the discharge of mine-affected water resulted in environmental harm. Based on these results, the current discharge limits appear suitable to protect downstream environmental values. Additionally, the maximum change in catchment area to Walker Creek as a result of the MRA2C development is 1.65km^2, which is 0.08% of the Bee Creek catchment. Potential changes to water quality over current conditions are considered to be very limited due to the limited increase in the scale of the project. As the MRA2C project develops the land previously mined will be progressively rehabilitated resulting in a limited overall increase in disturbed ground or pit extent. Consequently, the potential for significant changes to water quality over the current mining configuration is considered to be very low.

Stormwater is managed via the EA, and includes all runoff from lease areas other than mine water. Stormwater may potentially contain elevated levels of suspended solids and dissolved elements compared to background conditions. To mange this, surface water is collected on site from areas disturbed by mining that generate stormwater runoff and associated sediment generation and transport. These areas are treated in accordance with current EA conditions and the Erosion and Sediment Control Plan (ESCP). It is not expected that the EA conditions will need to be revised as they already adequately cover the treatment and discharge of stormwater runoff. The ESCP will require updating over the project lifespan to reflect the changing site configuration.

Impact on human use

There are no known human uses of Walker Creek within the stretch of waterway to be directly impacted by mining and the creek diversion. The entirety of direct impact will occur on mining lease as will the reconstructed diversion. The land is owned by BHPB and all existing stock activity will be removed.

Indirect impacts to human uses downstream of the project are not expected. There will be no discernable change in the quantity and quality of water leaving the mining lease than occurs currently. Additionally, there are no known permanent water extraction points for surface water in Walker Creek due to its ephemeral nature.

Impact on environmental use

Direct impacts to waterway related values are limited to the progression of the mining pits. This will result in a direct loss of vegetation and habitats unrelated to any change in surface water. Direct ecological impacts have been addressed separately to this report.

Indirect impacts on riparian vegetation and other downstream values, such as Dipperu National Park are not expected due to the minimal changes in water quantity and quality that will ultimately be released or discharge from the mining area. This includes the diverted flows along Walker Creek.

GROUND WATER

To support mine planning, impact assessments and both Commonwealth and Queensland regulatory approvals a detailed groundwater study (CDM Smith 2016) has been undertaken. This Study involved two key pieces of work:

1. Groundwater effect assessment to identify groundwater-affecting mining activities and associated effects on groundwater, i.e. alteration of groundwater conditions; and
2. Numerical groundwater modelling to quantify the magnitude and spatial extent of potential effects, focusing on the alteration of groundwater conditions at the location of receptors.

From this study and other related groundwater work undertaken at SWC Mine the following assessment is provided against the Significant Impact Guidelines 1.3.

Change in integrity of hydrological connections, water quantity, area or extent

Open cut mining involves the removal of the overburden material and extraction of coal seams, creating a void that is progressively backfilled by waste rock during the course of mining. This causes permanent changes to the physical properties of groundwater aquifers at the location of the mine pit, with the void forming a new low point in the landscape.

The depth of the coal seams in the MRA2C mining area indicates that the floor of the pits will extend several metres beneath the water table. As the overburden rock mass and coal seams are removed, groundwater is likely to seep into the pits from the surrounding formation. Removal of seepage water from the pits to enable dry mining conditions will result in the depressurisation of the surrounding groundwater, forming a cone of depression that radiates away from the pits.

Analytical modelling predicts that the impacts to groundwater levels are likely to be concentrated around the Mulgrave Pit. Due to the low permeability rockmass, the area of influence on groundwater (i.e. cone of depression) is limited to a small confined area and extends out to a radius of 2.5 to 3km (refer Figure 3). The drawdown created is predicted to be minimal, for instance the estimated drawdown at two nearby bores will lead to a 0.9% to 2% reduction in the height of standing water.

Within the Mulgrave Pit the groundwater inflow rates range from 0.4 to 6.5 ML/day, these rates correspond to rates already experienced in the Mulgrave Pit and surrounding mining pits of SWC Mine. The predicted median groundwater inflow rate into the mine is 1.36 mega litres per day.

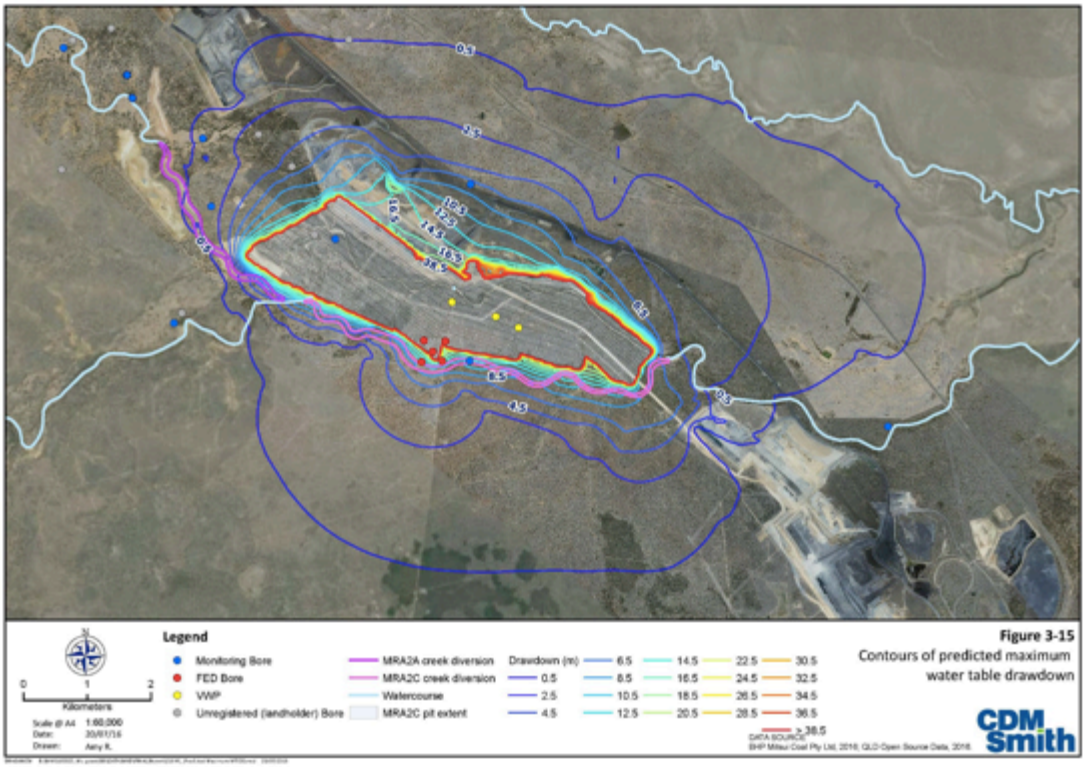


Figure 3: Maximum extent of groundwater drawdown (Source: CDM Smith 2016)

Surface Water – Groundwater interaction

Walker Creek is ephemeral, with moderate to high surface water flows during the wet season. The depth to groundwater measured in monitoring bores located within the vicinity of the creek range from 2.8 to 14 m below ground level, with the shallowest level recorded after periods of above average rainfall (from 2011 to 2013) and reflect the influence of ephemeral surface flows. The depth to water measurements indicate that the Creek is disconnected from groundwater and (when flowing) it acts as a losing stream, locally supplying recharge to the water table during the wet season. Accordingly, any change in groundwater will not affect the flows within Walker Creek.

Changes in water quality

Potential changes in groundwater quality resulting from the alterations of the flow regime are considered unlikely, as groundwater flowing from the broader area is expected to have a similar quality. Local groundwater flow directions will be maintained towards the mine during and after mining, such that changes to groundwater quality, if any, are unlikely. Groundwater will not be exposed to new materials or surface locations; the mining it will act like a sink and water accumulating will be pumped out and treated as onsite mine water. Contamination of the aquifer will be avoided.

The flow of groundwater towards the MRA2C pit from the adjacent area greatly reduces the risk of the mining activity contaminating the groundwater source. Existing controls on potential sources of contamination, such as fuel spills, will be maintained in all operational areas of the mine.

Impact on human use

Drawdown is predicted at four bores, of which two of the bores are located within the footprint of proposed mining area and will be decommissioned. Information on these two remaining bores indicate that drawdown will lead to 2% and 0.9% reduction in the height of standing water respectively, these two bores are on land owned by BHPB and arrangements to replace any water usage has already been made.

No impacts on human users are expected.

Impact on environmental use

Groundwater-dependent ecosystems are defined as ecosystems that require access to groundwater to meet all or some of their water requirements so as to maintain the communities of plants and animals, ecological processes they support, and ecosystem services they provide.

Three broad types of groundwater dependent ecosystems occur:

1. Aquifer and cave ecosystems - are underground ecosystems supported by groundwater that provide habitat stygofauna and other living organisms.
2. Ecosystems dependent on the surface expression of groundwater - include wetlands, lakes, seeps, springs, and river baseflow systems. In these cases, groundwater discharge provides water to support aquatic biodiversity.
3. Ecosystems dependent on subsurface presence of groundwater - include terrestrial vegetation that depends on groundwater on a seasonal, episodic or permanent basis. These types of ecosystems can exist wherever the water table capillary fringe is within the root zone of the plants, either permanently or episodically.

The first two types do not occur in the vicinity of the project.

Potentially the third type may occur within the vicinity of the project although this is considered unlikely. Vegetation in the study area occurs in five major habitat types identified by Eco Logical Australia (2016) as follows:

- Fringing riparian forest occurs on the stream banks of Walker and Carborough Creek, providing habitat for *Eucalyptus raveretiana*
- Floodplain Eucalypt forest occurs on the active floodplains adjacent to Walker and Carborough Creek
- Dry Eucalypt Forest occurs in the majority of the study area and occurs outside of the extent of the currently active floodplain (e.g. on older alluvial terraces);
- Brigalow Woodland occurs in discrete patches (e.g. towards the southern extent of the proposed expansion area) associated with clay plans; and
- Wetlands occur in discrete patches and include a palustrine wetland fringed by *Eucalyptus camaldulensis* that occurs to the immediate south west of the proposed expansion area.

Of these vegetation habitats, the most likely areas of groundwater interaction are those that occur along riparian corridors and adjacent floodplains. This is consistent with groundwater level data that shows the water table being marginally shallower in these zones; however, it is well below the streambed. While some intermittent use of groundwater by terrestrial vegetation could potentially occur at these locations the species are not groundwater

dependent, their presence in the riparian zone is a clear indication that their occurrence is due to the availability of surface water (not groundwater).

Mapping of average depth to water and groundwater contours indicates that the regional groundwater source occurs approximately 10 m below the surface (CDM Smith, 2016). The depth is consistent across the entire study area, including the Walker Creek riparian zone. For instance, the fact that Black Ironbox is limited to the riparian zone suggests it is not highly dependent on the regional groundwater but rather reliant on the riparian saturation zone that is replenished by seasonal flooding (Eco Logical Australia 2016).

In summary, the presence of GDEs in the study area is unlikely, but some intermittent groundwater use by terrestrial vegetation in riparian zones is possible.

CUMULATIVE IMPACT

The wider land uses and activities that could affect the quantity and quality of water within the Bee Creek catchment above Dipperu National Park are:

- Grazing - the predominant landuse, which contributes to land disturbance and the generation of sediment via reduced vegetation cover, particularly in riparian zones.
- Mining at Hail Creek - located in the upper catchment of Bee Creek.
- Mining at Coppabella mine – located on Harrybrandt Creek, which discharges to Bee Creek immediately upstream from Dipperu National Park.
- Mining at South Walker Creek Mine.

The location of the mines is shown in Figure 5.

Given the existing catchment wide disturbance from grazing and the existing mines of Hail Creek, Copabella and South Walker Creek, the MRA2C project will have a very minor additional potential cumulative impact.

As has been stated previously, the limited additional increase in disturbed surface catchment and the ongoing management of water discharges under existing EA conditions will result in no significant impacts to users.

Ground water disturbances are localized and primarily occur within the mining lease, limited to around a 3km radius from the pit. There is some potential for the drawdown effects to overlap in the north of the MRA2C project area with the previously approved MRA2A project (refer Figure 4) but these are minor. The predicted drawdown due to the MRA2A project is greater than that of the MRA2C project and accordingly the MRA2A dewatering will dominate over the MRA2C dewatering effects, with limited cumulative effects.

In areas away from the projects, towards the edge of the predicted area of influence where drawdown due to the two projects is comparable, the cumulative effect may lead to a small net increase in drawdown, however, the overlapping drawdown contours are localised, generally contained within the mine lease; therefore, the cumulative effect of the two mining pits are not expected to lead to additional impacts to the environment of other uses.

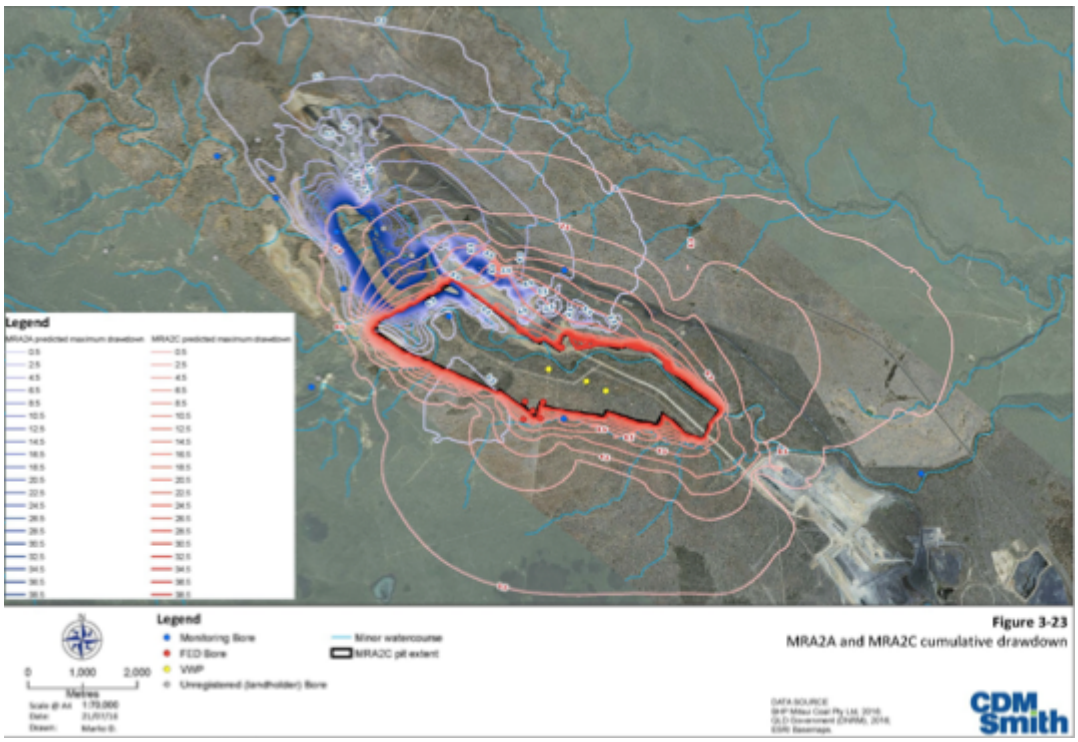
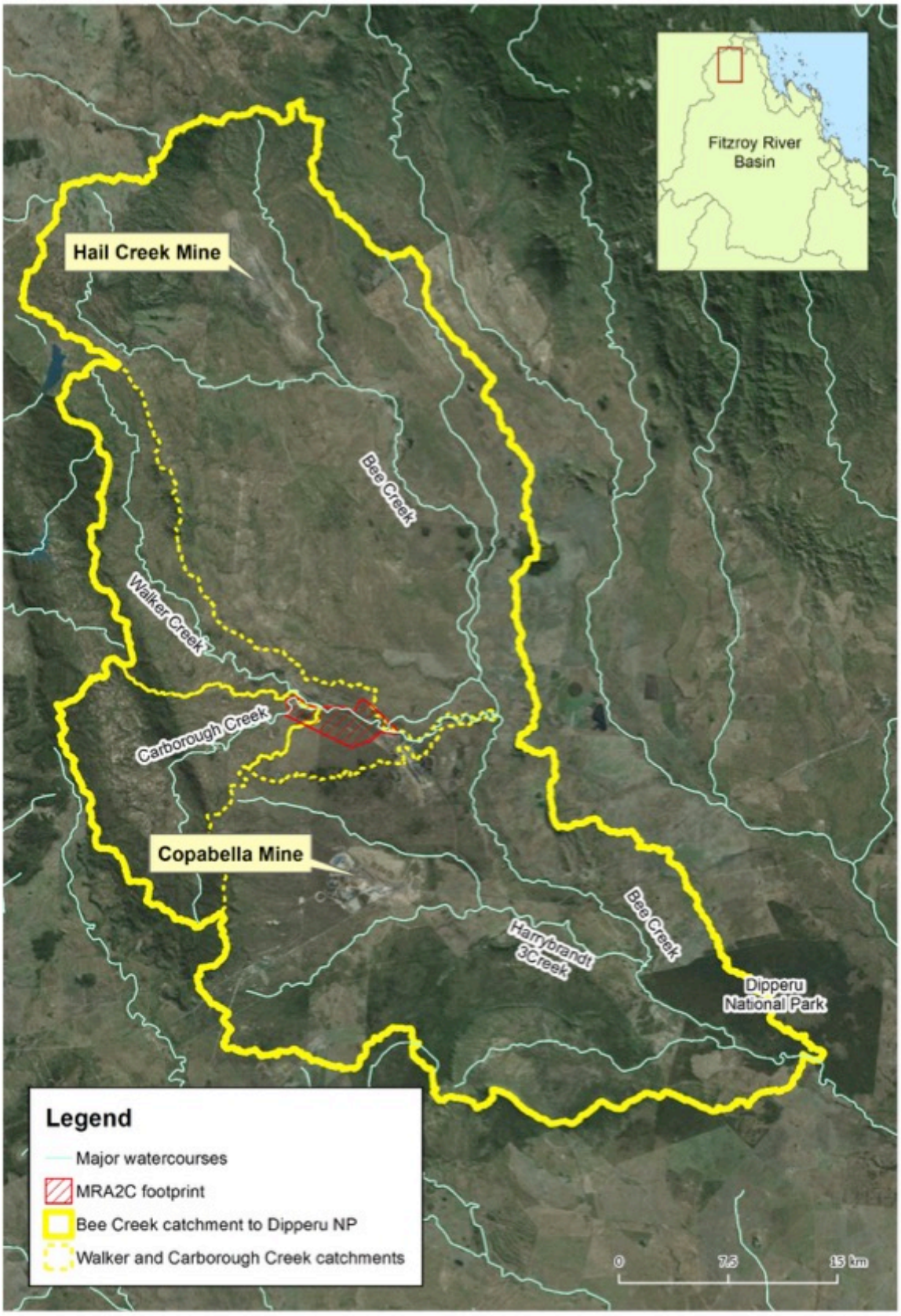


Figure 4: MRA2A and MRA2C cumulative drawdown effects (Source: CDM Smith 2016)



Figur
e 5: Regional land uses and activities (Source: Alluvium 2016)

CONCLUSION

The proposed activity will not cause a significant depletion or quality change of any surface or groundwater resources, nor will it have an impact on the way a critical water system operates.

One ephemeral local watercourse, Walker Creek, will be impacted by the project directly through the construction of a diversion around proposed mining activities. This change will be carefully managed and regulated to ensure water leaving the site is in similar quantities and quality to that occurring currently.

SWC Mine's water management system including release of mine affected water operates effectively under current EA conditions – given that the catchment areas of the pits changes little over the proposed mining period (2019 to 2034) it can be expected that the mine can continue to operate effectively without the need for changed EA conditions or alterations to water flows and quality.

There is also a high level of confidence that the project activity will not substantially change the quality or quantity of groundwater in the vicinity of the project. Drawdown effects are localised and the risk of water quality changes or contamination are low and correspond to those in place currently for the SWC Mine. There are no current known uses of groundwater within the area affected, alternative water source arrangements have been made for stock on affected land owned by BHPB.

Under the definitions detailed in "*Significant impact guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources*", the development of MRA2C will not result in any significant impacts to water resources or users.

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