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2 April 2020

Stephen O'Donoghue
Department of Planning, Industry and Environment
12 Darcy Street
Parramatta NSW

Re: McPhillamys Gold Project SSD 9505 - Request for clarification regarding Section 2 of DPIE Water & NRAR's submission

Dear Steve,

The following letter requests clarification and guidance regarding the Department of Planning, Industry and Environment – Water (DPIE Water) and the Natural Resources Access Regulator (NRAR) recommendations contained in Section 2 of the DPIE Water and NRAR submission on the McPhillamys Gold Project Environmental Impact Statement (EIS).

DPIE Water and NRAR request in Section 2 of their submission, more information to improve the understanding of the likely reductions in storage volumes and reliability of Carcoar Dam and proposed mitigation options, believing that the analysis in the EIS does not reflect the realities of inflows into Carcoar dam and how regulated flows are managed.

We acknowledged that the Carcoar Dam catchment Australian Water Balance Model (AWBM) presented in the EIS is simulating catchment inflow to Lake Carcoar for the purposes of assessing the impact to those inflows. We question the improvement that would be gained from modelling the full catchment network, particularly in regard to assessing Project impact. It is unclear what effect the management of regulated flows (indicated in the DPIE submission as a concern) would have on modelled inflows to Lake Carcoar. We maintain that the use of the AWBM (which is a nationally recognised and accepted catchment-scale water balance model) provides results that are fit for purpose for assessing the potential impacts of the Project. We would be happy to provide any output from the AWBM to DPIE Water so that the model may be compared to the Belubula Source model outputs. If specific data requests are provided, we will respond in a timely manner.

We would like to clarify the pathway identified by DPIE Water to progress this part of the study and request that expectations be provided as soon as possible, to mitigate potential delays this may pose in lodgement of the Project's Submissions Report and Amended Project Report. As previously communicated, Regis is currently reviewing and refining the mine development's surface water management system including operational water management and clean water diversions. These refinements will result in some changes to the disturbance footprint shown in the EIS. Finalisation of these design refinements is required prior to remodelling the impacts on flow downstream of the mine development to Carcoar Dam.

The calibrated input parameters used in the AWBM of the Lake Carcoar catchment presented in the Surface Water Assessment for the Project were identified summarised in Section 4.1.1 of this assessment (HEC 2019)[1] and are presented in Table 1. The accompanying text also provides metrics of the model calibration which indicate a good fit to Lake Carcoar inflow volumes. Also as indicated in the assessment report, a limiting factor for model calibration of Lake Carcoar volumes was the extent and accuracy of publically available Lake Carcoar stored water volume and release data. If more accurate and extensive data could be provided by

[1] Hydro Engineering & Consulting Pty Ltd (HEC) 2019, The McPhillamys Project; Surface water assessment.

DPIE Water, an even better calibration may be possible. It is intended that the AWBM will be re-run using these parameters once design refinements are finalised.

Table.1 AWBM input parameters

AWBM Parameter	Adopted value
C1 (mm)	7
C2 (mm)	130
C3 (mm)	180
Initial C1 proportion full	0.25
Initial C2 proportion full	0.25
Initial C3 proportion full	0.25
A1	0.05
A2	0.45
A3	0.5
BFI	0.25
k_b (day^{-1})	0.935
k_s (day^{-1})	0.48
T_r (transmission loss multiplier on evaporation)	0.0011
T_r Min Flow (mm/d) (minimum flow below which loss is not applied)	0.0016

It should be noted that the last two parameters refer to transmission losses which are an add-on to the original AWBM. A similar transmission loss is detailed in a paper by Walter Boughton who is the creator of the AWBM (Boughton 2015)[2], and refers to transmission loss in the original 2004 AWBM paper (Boughton 2004)[3], stating:

> "Transmission loss is more widespread in Australian streams than might be expected from the lack of attention given to it in hydrological publications. The magnitude of the loss is relatively small in humid zone catchments and becomes relatively more significant in sub-humid, semi-arid and arid zone catchments. Its main effect on low flow analysis is to increase cease to flow periods. A version of the AWBM incorporating a transmission loss function was developed by the writer on contract for a specific application, and this worked well. It has not been incorporated into the main versions of the model for sake of simplicity; but the increasing interest in very low flows might dictate that another version of the AWBM specifically for low flow analysis, and incorporating a transmission loss function, be produced."

DPIE Water and NRAR request in Section 2.2 of their submission that remodelling include sensitivity analyses of input variables to the AWBM. Remodelling of the revised surface water management system and mine development disturbance footprint will include sensitivity analyses of the AWBM input variables (i.e. a +/- 20% change to the storage parameters outlined in Table 1 - i.e. C1, C2 and C3 and the k_s, BFI, k_b, T_r and T_r Min Flow parameters) to generate one conservatively low estimate of runoff and one conservatively high estimate of runoff, in order to assess the effect on the forecast impacts. We ask that DPIE Water and NRAR confirm the suggested sensitivity analyses will meet their expectations.

We would welcome a meeting with DPIE Water and NRAR to discuss DPIE Water and NRAR's recommendations contained in Section 2.2 of their submission, particularly the pathway identified by DPIE Water to progress this part of the study and sensitivity analyses prior to remodelling of the revised Project

[2] Boughton W. 2015, "Master recession analysis of transmission loss in some Australian streams", Australian Journal of Water Resources, Vol. 19, No. 1, pp. 43-51

[3] Boughton W. 2004, "The Australian water balance model", Environmental Modelling & Software, Vol. 19, pp. 943-956

design. We respectfully request that expectations be clarified as soon as possible to mitigate delays associated with remodelling the revised Project design and therefore delays in the lodgement of the Project's Submission and Amended Project reports.

Yours sincerely

Janet Krick
Senior Environmental Planner
jkrick@emmconsulting.com.au

OUT20/2172

Janet Krick
Senior Environmental Planner
EMM Consulting
jkrick@emmconsulting.com.au

Dear Ms Krick

McPhillamys Gold Project (SSD 9505) –
Request for clarification of DPIE – Water's EIS submission

I refer to your letter of 2 April 2020 to the Department of Planning, Industry and Environment (DPIE) – Planning and Assessment Group requesting clarification and guidance about the additional information that DPIE Water seeks in order to improve understanding of possible impacts to inflows and storage volumes in Carcoar Dam.

Following a meeting involving EMM Consulting, Hydro Engineering & Consulting (HEC), Regis Resources, DPIE Planning & Assessment and DPIE Water on 14 April 2020, HEC provided additional background information on model inputs.

DPIE Water has now reviewed the model including the suitability of model inputs and proposed sensitivity analyses. We advise that the Australian Water Balance Model (AWBM) model is generally fit for purpose for assessing flow interception and reduction of river flow inputs to Carcoar Dam. However the model has limitations based on inherent uncertainties in transmission losses and the reduced (30 year) period of gauging record used. DPIE Water recommends that:

1. **AWBM – additional data**

   The AWBM model be improved and its outputs have greater reliability by using a longer period of record and testing for low storage volume periods (drought).

   As agreed at the meeting on April 14 and to assist with this analysis, DPIE - Water can provide additional storage volume records before the current AWBM model commencement at 1989, and any daily release data prior to 1985. Dushmanta Dutta will be in contact to arrange the transfer of this information (Dushmanta.dutta@dpie.nsw.gov.au).

2. **AWBM - Sensitivity analyses**

   Further sensitivity analyses be undertaken to improve understanding of the likely range of outputs from the AWBM model. These should include runoff generation parameters in conjunction with, as well as separate to a range of transmission losses in order to test flow sensitivity to the ranges of transmission losses along the Belubula River and its tributaries.

3. **Mitigation of flow loss**

   Once greater confidence is established in the AWMB outputs and the range of flow reductions that may occur, DPIE Water can provide further advice on the proposed mitigation options.

More detail on the model assessment and these recommendations is included in **Attachment A**.

DPIE Water (and the Natural Resources Access Regulator) welcomes any further opportunity for consultation on any of these (or other) matters regarding this proposal, and as such any correspondence can be sent by email to landuse.enquiries@dpi.nsw.gov.au.

Yours sincerely

Mitchell Isaacs
Director, Office of the Deputy and Strategic Relations
Department of Planning, Industry and Environment: Water
23 April 2020

cc:
Stephen.ODonoghue@planning.nsw.gov.au
Mandana.Mazaheri@planning.nsw.gov.au

ATTACHMENT A

Advice to EMM and DPIE - Planning & Assessment regarding the McPhillamys Gold Project (SSD 9505) – Request for clarification of DPIE – Water's EIS submission

DPIE – Water provides the following advice and recommendations.

1. Model Review and Improvement

The AWBM model is generally fit for purpose for assessing flow interception and reduction of river flow inputs to Carcoar Dam. However, the model has limitations based on inherent uncertainties in transmission losses and the reduced (30 year) period of gauging record used.

1.2 Recommendation

To improve the AWBM model, it should include a larger period of record (depending on data availability). This will give its outputs greater reliability with a longer period of record and testing for low storage volume periods (drought).*

* - DPIE - Water will provide additional storage volume records before the current AWBM model commencement at 1989, and any daily release data prior to 1985. Please note that DPIE - Water is unable to assess the general quality of the daily release data.

1.3 Explanation

The AWBM model is generally regarded as fit for purpose. The simulation of catchment runoff and river flows entering Carcoar Dam are within a range of error expected from a catchment that has rivers generally in poor geomorphic condition, connected to extensive alluvial floodplain strips. In general, the simulated storage volume follows the observed pattern reasonably well in for storage volumes above 20 GL. The overall performance of the model seems to be reasonable with a linear correlation coefficient of greater than 0.9.

The simulated storage volume is positively biased by about 7% (which is due to higher simulated inflows during the period of the millennium drought). There is no explanation provided for this provided in the EIS. Further review of the data suggests that this might be due to use of the observed data from downstream gauge 412077 to infill the storage release data during this period. Rainfall-runoff modelling undertaken by DPIE – Water using Sacramento Rainfall-runoff modelling using the same dataset produces similar results.

The period of record used to develop the AWBM model appears to be part of the reason for over estimate of river inflows to Carcoar Dam. Overall, the model performance based on the results presented under the data constraints of the environment seems to be reasonable for the period of the model calibration and can be considered as fit for purpose for storage inflow simulation to Carcoar Storage. The modelling used data from 1989 until 2017, however, data exists prior to data (since 1974) which might enable further improvement of the model.

Revision of the AWBM model will increase confidence in its predictions of river flows above Carcoar Dam. This requires extension to the period of record used to test and calibrate the model, including previous dry periods. DPIE – Water is able to provide the additional data to enable EMM and HEC to further improve the model.

<u>Reference</u>

- Boughton, W (2004). The Australian Water Balance Model. Environmental and Modelling Software (Vol 19, pp 943-956).

2. Sensitivity Analyses

2.1 Recommendation

Further sensitivity analyses are required to improve understanding of the likely range of outputs from the AWBM model. These should include runoff generation parameters with and separately to altering transmission losses to test flow sensitivity due to ranges of transmission losses along the Belubula River and its tributaries.

2.2 Explanation

In EMM's request letter (dated 2 April, 2020) it states the McPhillamys mine plan is being reviewed, and runoff/flow outputs from the AWMB model will re-run and review model outputs. Further, sensitivity analyses requested by DPIE - Water are proposed for this review. EMM proposes to adjust model input parameters by 20% above and below the coefficients used in the current model. This proposal has merit, with the following recommended sensitivity inputs:

- Model current and prior gauge history records (ie the record used for the EIS 1989-2017 and gauged flow records before 1989), and
- Adjust runoff characteristics alone, and then conduct runs with and without adjusting transmission losses.

The estimation of inflow reduction to Carcoar Dam can then be compared to runoff capture on-site as well as detention of flow and runoff from above the proposed mine. This should be used to analyse the volumes and rates of detained flow and means to transmit this to below the mine site into the Belubula River.

3. Mitigation of Flow Loss

3.1 Recommendation

The assessment of any mitigation measures for flow loss should be provided once greater confidence is established in the AWMB outputs and the range of flow reductions that may occur.

3.2 Explanation

Providing information regarding proposed options regarding mitigation mechanisms (and associated justification) will assist in understanding and assessing the level of net impact the proposal will have on flow losses.

END ATTACHMENT A

Planning, Industry & Environment

Mr Rod Smith
General Manager NSW
Regis Resources
P.O. Box 862
SUBIACO Western Australia 6008

15/02/2021

Dear Mr Smith

McPhillamys Gold Project (SSD 9505)
Request for Additional Information

I refer to the Submissions Report and Amendment Report for the proposed McPhillamys Gold Project, dated September 2020.

Following further consultation with the Department's Water Group and the Natural Resources Access Regulator (NRAR), including provision of additional information from Regis on 11 November, DPIE Water/ NRAR has provided additional advice on the project.

One of the recommendations includes advice to the Department, however you may wish to provide additional comments in relation to the significance of impact on Carcoar Dam and downstream flows to inform the Department's assessment.

You are requested to provide the information, or notification that the information will not be provided, to the Department by **Fri 5 March 2021**. The Department is happy to facilitate a meeting with DPIE Water/ NRAR representatives to further clarify issues raised. If you are unable to provide the requested information within this timeframe, please provide, and commit to, a timeframe detailing the provision of this information.

If you have any questions, please contact Mandana Mazaheri on 02 9995 5093.

Yours sincerely,

Stephen O'Donoghue
Director
Resource Assessments

Enclosed: DPIE Water/ NRAR advice

OUT20/10904

Mandana Mazaheri, PhD
Energy, Resources & Compliance Division
Planning and Assessment Group
Department of Planning, Industry and Environment

Mandana.Mazaheri@planning.nsw.gov.au

Dear Dr Mazaheri

McPhillamys Gold Project (SSD 9505) -
Response to Submissions (RTS), Amendment Report & Additional Information

I refer to your letter of 8 September 2020 and Regis Resource's letter of 11 November 2020 to the Department of Planning, Industry and Environment (DPIE) – Water and the Natural Resources Access Regulator (NRAR) about the above matter.

DPIE – Water and NRAR have reviewed the RTS and Amendment Report & additional information provided. We continue to have significant concerns regarding limited availability of surface water entitlement in the unregulated water source. This is a major risk for the project. The Department does not agree with the proponent's interpretation of the stream order (which informs the water entitlement requirements) applicable to the dams and structures proposed for the project.

Regis Resources has recently been in contact seeking advice on options to address this issue. We are considering their request separate to this advice.

I note as well that downstream impacts have been quantified for your consideration of the significance of these impacts, and consideration of any mitigation that may be required.

Please note our more detailed advice is in **Attachment A**.

DPIE – Water and NRAR welcome any further opportunity for consultation regarding this proposal, and as such any correspondence can be sent by email to: landuse.enquiries@dpie.nsw.gov.au.

Yours sincerely

Mitchell Isaacs
Chief Knowledge Officer,
Water - Knowledge
10 February 2021

ATTACHMENT A

Advice to DPIE - Planning & Assessment regarding the McPhillamys Gold Project (SSD 9505) – RTS, Amendment Report & Additional Information

1. Water Take and Entitlement

1.1 Explanation

Water Entitlement Requirements

The proponent would need to ensure sufficient entitlement is held prior to all water take. Based on the Department's assessment of stream order for the project site the dams/structures located on third order and higher order watercourses where entitlement needs to be held for water take include CWF1a, CWF1b, MWMF, RWMF, WMF6 and the TSF. Based on Annexure C and Annexure D of the additional information provided by Regis Resources on 11 November 2020, the figures provided for runoff captured for the 80th%tile for relevant structures are MWMF (178ML), RWMF (50.3ML), WMF6 (93.3ML), TSF (1103ML) and CWF1 (658ML) which total 2082.6ML. It is recognised the 80th %tile assessment was for a wet year at maximum disturbance, however there is the potential for wetter events to occur.

There is not sufficient water entitlement available in the Belubula River upstream Carcoar Dam Unregulated River Water Source to account for the water take requirements of this project. The project is therefore at this stage unable to meet the regulatory requirements of the *Water Management Act 2000*, noting that we continue to explore additional information provided by the proponent.

Excluded Works, Stream Orders and Diversion

We do not support the interpretation of excluded works by the proponent. The Department's view of how to identify a minor stream to enable the interpretation of the excluded work provisions under Schedule 1 of the *Water Management (General) Regulation (2018)* does not align with the information presented by the proponent. There is no ability to vary a stream order based on an on-ground assessment or future modifications that may occur to a watercourse. Determining stream order to enable interpretation of a "minor stream" for the purpose of the excluded work provisions is based on the definition in the *Water Management (General) Regulation (2018)* which relies on the hydro line spatial data published on the Department's website (https://www.industry.nsw.gov.au/water/licensing-trade/hydroline-spatial-data).

The ability for a diversion to replace an existing watercourse with the aim of avoiding the need for an entitlement for the structure is a possibility for projects where adequate diversion of the original watercourse and its associated flow can occur. This is not considered possible for this project based on the size and location of the proposed structures which are not able to adequately divert the original watercourse's flow.

Other Water Take / Entitlement Considerations

The amended project predicted leakage from the Belubula River and Tributary A to increase to a maximum of 24ML/year during mining and up to 28ML/year post mining. This water take would also need to be accounted for in the surface water source.

The commitment to return water captured in clean water dams on third order and higher order watercourses to the downstream environment is supported. The regulatory requirement however remains to hold entitlement for water take from these dams. This is due to no active return flow provisions under water legislation at this time.

On the understanding CWF2 and CWF3 are to capture clean runoff and are on a minor stream for the purpose of harvestable rights, these dams need to be considered within the Maximum Harvestable Right Dam Capacity (MHRDC) for the property and/or the need to hold entitlement if the MHRDC is exceeded. The excluded work provisions do not apply.

Groundwater Take

The peak groundwater inflow to the pit for the base case has reduced from 890ML/yr in the EIS to 580ML/yr. A worst case scenario associated with a high inflow case (which was quoted in the EIS as a peak of 2670ML/yr) could not be identified in the RTS or Amendment Report. The proponent appears to be relying on a base case modelling scenario to inform the groundwater take. This is likely to inadequately inform water take requirements for wetter years. As entitlement needs to be held for all water take, irrespective of climatic conditions, it is the proponent's responsibility to ensure sufficient entitlement is held. This may represent a risk to the project.

The proposal by the proponent to use an existing 400 unit WAL and a 200 unit WAL which is to be acquired via the Controlled Allocation process is sufficient to meet the water take requirements for the base case scenario. Additional entitlement will be required if this is to be exceeded. Comprehensive monitoring, metering and modelling is required to inform future requirements and to verify actual water take.

Additionally, the calculation of peak groundwater inflow to the pit is described as "net" of evaporation of groundwater from the sides of the open cut. The Department is uncertain of the total groundwater take from the open cut that needs to be accounted. This evaporated groundwater volume must be included in the calculations of entitlement requirements as it is a component of the water take. It is recommended the current modelled take figure of 580ML/yr be reviewed to ensure this water take component is included. Where additional entitlement is required the proponent will need to demonstrate this can be obtained.

Baseflow reduction to the Belubula River upstream of the Trib A confluence is to peak at 10.22ML/year at end of mining in the amended report compared to 10.59ML/year in the EIS. Baseflow reduction to Trib A is predicted to be a max of 4.75ML/year for the amended project compared to 5.11ML/yr in the EIS. Baseflow reductions are to be accounted for by entitlements in the groundwater source.

Water transfer from Centennial Coal

We note that further assessments under the *Environmental Planning and Assessment Act 1979* are required by Centennial Coal to enable the transfer of water between the two coal mines and the project site. As the transfer of this water is critical to the project, the additional approvals represent significant uncertainty and a risk to the project.

1.2 Pre-approval Recommendations

- The proponent is required to confirm that it is able to obtain the necessary surface water entitlement to account for runoff capture structures and water take.
- The proponent should review the volume of groundwater take from the open cut pit to ensure it includes the volume evaporated from the pit walls and that it considers a range of climatic conditions. Where additional entitlement is required the ability to acquire this needs to be demonstrated.
- Baseflow reductions should be accounted for by entitlements in the groundwater source.

1.3 Post Approval Recommendations

- The proponent will need to ensure adequate entitlement is held in a Water Access Licence for the relevant water sources prior to all water take, and complies with the rules of the relevant Water Sharing Plans and the NSW Non-Urban Water Metering Policy.
- The proponent should ensure the necessary approvals to transfer water from the Centennial Coal mines are in place prior to the commencement of any activities for the project.
- The proponent must ensure that relevant nomination of work dealing applications for Water Access Licences proposed to account for water take by the project have been completed prior to the water take occurring.

2. Surface Water – Modelling and Impacts

2.1 Explanation

Comments on Water Balance Modelling for Upstream of Carcoar Dam

The revised calibration of Rainfall-runoff model has improved with the use of additional data provided by DPIE Water and showed better performance in simulating Carcoar dam storage volume for historical periods particularly in dry periods. The Water Balance model has been setup with sufficient details of storages for surface water assessment for the project.

The peak groundwater inflow to the pit for the base case has reduced from 890ML/yr to 580ML/yr. This reduction of groundwater inflow needs to be incorporated in the water balance modelling and resultant impact on daily flows to Carcoar in the post-mining scenario needs to be explained.

Potential changes in runoff characteristics of catchment excision area before and post mining are not considered.

Currently no entitlement is defined in the water balance model to capture runoff. Considering some of the storages are located on higher than 2nd order streams, such consideration is required in modelling.

The daily time series of inflows (for current and post-mining) provided by Regis Resources shows 4% constant reduction of daily inflow into the Carcoar storage post mining compared to current, which is calculated based on the reduction in median annual inflow for the maximum project extend. That linear scaling ignores the attenuation of daily flows due to capture of runoff in various storages and doesn't reflect the effect on initial conditions of the storages on daily inflows. The impact of that on daily inflows to Carcoar dam and the resultant impact on the downstream of Carcoar dam under the existing regulations need to be assessed under those conditions of attenuations of daily during low flow periods.

Analysis of Impact on the Regulated Belubula System due to change of Inflow to Carcoar Dam

Regis Resources provided two daily time series of simulated inflows to Carcoar dam for the period of 1889-2020 for the current and post-mining scenarios. DPIE Water's Belubula Source model (current condition scenario) was used to assess the impacts of reduced inflow to Carcoar storage using the two sets of daily inflow time series provided by Regis Resources. The results are summarised below.

Table 1: Impact on Carcoar Storage volume

Period (1895-2017)	% of time		
Period (1895-2017)	Current situation	Regis: mining	Difference
Flow below dead storage (<300 ML)	9.1%	10.3%	1.2%
Flow below 21,000 ML (threshold for uncontrolled flow access)	70.0%	72.0%	2.0%

Table 2: Impact on average annual extractions

Total extraction (1895-2007)	Current situation	Regis: mining	Difference (ML/yr)	Difference in %
General Security (irrigation) (ML/yr)	986	967	-18	-1.8%
General Security (mining) (ML/yr)	432	413	-20	-4.6%
High Security (irrigation) (ML/yr)	901	895	-6	-0.7%
Stock and Domestic (ML/yr)	143	141	-1	-1.0%
Supplementary (mining) (ML/yr)	1,079	1,094	16	1.5%

Impact on Streamflow

Table 3: at Carcoar (downstream of Carcoar dam)

Period (1895-2017)	% of time		
Period (1895-2017)	Current situation	Regis: mining	Difference
Flow below 2 ML/d (% of time) (Basic Landholder Rights)	17.2%	17.5%	0.4%

Table 4: at Helensholme (End of the System (EoS))

	% of time		
Period (1895-2017)	Current situation	Regis: mining	Difference
Cease to flow (% of time)	14.2%	14.5%	0.3%
% of time flow below 10 ML/d	25.9%	26.2%	0.3%

The daily time series of inflow provided by Regis Resources shows 4% constant reduction of daily inflow into the Carcoar storage post mining compared to current. The reduction of inflow has caused varied impacts on the regulated system. Some of the key impacts based on the DPIE Water Source Modelling are summarised below.

- The Carcoar dam will sit below the dead storage for a 1.2% longer period.
- The Carcoar dam volume will sit below 21,000 ML (threshold for accessing uncontrolled flow) for a 2.0% longer period.
- Long-term annual extraction for General Security diversion for irrigation will be reduced by 1.8%.
- Long-term annual extraction for General Security diversion for mining will be reduced by 4.6%.
- Flow at Carcoar will be below 2 ML/d (related to Basic Landholder Rights) for 0.4% time longer.
- Flow at the Helensholme (EoS) will be below 10 ML/d (EoS minimum flow requirement) for 0.3% time longer.
- Flow at Helensholme (EoS) will cease for 0.3% time longer.

The above analysis is based on constant reduction of daily inflow to Carcoar whilst the mine is operational. The initial conditions of storages, operational rules and entitlement arrangement will affect daily inflows to different degrees in different flow ranges and hence, the likely effect of that on EoS flow during low flows will be higher than due to the constant reduction of inflows to storage.

2.1 Pre Approval Recommendations

- That DPIE P&A consider the significance of the project's impact on Carcoar Dam and downstream flows and consider any mitigation that may be warranted.

2.2 Post Approval Recommendations

- That the surface water model be improved to: include entitlement which captures runoff, to account for attenuation of daily flows due to runoff capture, and include changes to groundwater peak inflow into the pit.

3. Groundwater Model

3.1 Explanation

Although a model upgrade plan has been provided, the proponent has not explicitly committed to improve the model in order to meet Australian Modelling Guidelines 'Class 2' classification within three years of approval. Dr Bell (DPIE P&A consultant engaged to conduct a technical review of the groundwater model) similarly argues for the model classification upgrade as recommended in DPIE Water submissions. The proponent maintains that model improvements already made to include predictive uncertainty analysis and additional scenarios render the model demonstrably fit-for-purpose. DPIE - Water accepts that conclusion, recognising that reaching a "Class 2" status is not a requirement in itself to be fit-for-purpose. Validation of the model remains to be achieved.

3.2 Post Approval Recommendation

- The groundwater model verification/review and a model upgrade plan be included as conditions of consent for project approval.

4. Bore Impact Assessment

4.1 Explanation

Water levels at test production bore TB05 had recovered by 50 percent after 12 hours and 85 percent after 15 days (360 hours) following the cessation of pumping. EMM suggested that the long duration of recovery was attributed to the limited extend of the aquifer (limestone) and that since most water at this location is sourced from localised karstic storage, only partial dewatering of the primary porosity of the rock matrix likely occurred over the five day test. Therefore, a potential risk is inherent (for extended pumping periods, [e.g. nine months]) that localized karstic storage may be dewatered after which yield from construction water supply bore TB05 may be significantly reduced. Secondly, impacts at bores situated adjacent to TB05 may be greater than predicted as aquifer stress starts to radiate from local limestone into adjacent rock matrix.

4.2 Post Approval Recommendation

- The proponent should investigate the potential risk posed by the 'dewatering of local karstic storage' at test production bore TB05.

5. Borefield Assessment

5.1 Explanation

The Construction Water Supply Groundwater Investigation and Impact Assessment (Appendix D of Appendix H of the Amendment Report [Section 9.3]) concludes that there will be a water supply shortfall of 5 L/s during peak periods of demand during mine construction. Construction water supply demand totals 470 ML (during the first 9 months of construction before the planned pipeline comes online). The shortfall is proposed to be met by drilling and installing additional water supply bores within the mine development and Regis owned land.

DPIE - Water guidelines or trade criteria must be met. The borefield approval is separate from the SSD approval. The groundwater impact of this proposed additional supply has not been

assessed and the supply is yet to be proven. Any production bore would be required to follow the groundwater trade process and be assessed against the groundwater trade criteria (https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/175931/Assessing-groundwater-applications-fact-sheet.pdf). The borefield approval is separate from the SSD approval and until this process is complete the borefield is not considered a secure water supply.

5.2 Pre-approval Recommendation

- The proponent should clarify with DPIE - Water the arrangement for the proposed borefield. All water supply bores are required to be registered with WaterNSW and hold an access licence and relevant water supply works approval to extract a nominated volume of water. The approval will require an impact assessment carried out by DPIE - Water as per the groundwater trade process.

6. Other Post Approval Recommendations

- Develop the ability to accurately meter and monitor water take from surface and groundwater sources and to monitor potential impacts to water sources. This will be a key component to confirm impact predictions, the adequacy of mitigating measures and compliance for water take, and will need to incorporate ongoing review of actual versus modelled predictions.
- Report on water take at the site each year (direct and indirect) in the Annual Review. This is to include water take where a water licence is required and where an exemption applies. Where a water licence is required the water take needs to be reviewed against existing water licences.
- As raised in our EIS advice (OUT19/12287) prior to commencement of construction and operation of the project address the following issues relating to impacts to watercourses from the project and pipeline:
    - Address bed and bank stability
    - Develop a strategy for reconstruction of excavated or buried watercourses alongside a remediation and rehabilitation strategy for all watercourses lying within the mine project area. This must aim to recover pre-disturbance geomorphic processes and river forms where available.
    - Devise a remediation and reconstruction strategy for watercourses of 3rd order and greater located within the disturbance envelope. The strategy should be consistent with Rutherford, Jerie and Marsh A Rehabilitation Manual for Australian Streams Cooperative Research Centre for Catchment Hydrology, LWRRDC, Canberra 2000.
    - Develop a monitoring and response strategy that includes watercourse re-establishment, monitoring and remediation for at least ten years post-mining, to maintain responsibility for watercourse structure and integrity until riparian vegetation is established.
    - Develop a hierarchy of procedures for any excavation of watercourses to the proposed pipeline between Angus Place coal mine and the McPhillamys mine site based on the published NSW River Styles database. This must prioritise protective mechanisms to those watercourses assigned high fragility classification and recovery potential classes.
    - In addition, it is recommended that the proponent use the hierarchy of vulnerable rivers to identify the priority for protective works in any pipeline crossings that occur. The hierarchy of fragility classes is set out in the NSW River Styles database; www.trade.maps.argis/apps/webappviewer/index.html?id=425c7364e71a90c4ba353b8949f

- Use the protection requirements set out in Guidelines for laying cables in watercourses in waterfront land (NSW Office of Water 2012) as the basis to any approval to the pipeline corridor and watercourse crossings. The geomorphic assessment in Appendix X recommends industry standard guidelines such as Witheridge (2017) Erosion and Sediment Control Field Guide for Pipeline Projects, Parts 1, 2. Geomorphologic criteria should be required to prioritise those rivers and sections/reaches that are vulnerable to degradation on disturbance.

END ATTACHMENT A

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6 October 2022

Steve O'Donoghue
Director Resource Assessments
Department of Planning, Industry and Environment
12 Darcy Street
Parramatta NSW 2124

Re: Response to DPE Water and NRAR advice on the McPhillamys Gold Mine Project's Submissions Report, Amendment Report and additional information

Dear Steve,

1 Introduction

1.1 Scope

This letter provides a response to the matters raised in various advice from the NSW Government in 2021 and 2022 on the Amendment Report (EMM 2020a) and Submissions Report (EMM 2020b) for the McPhillamys Gold Project (the project), specifically:

- the (then) NSW Department of Planning, Industry and Environment – Water (DPIE Water) and the Natural Resources Access Regulator (NRAR) on 10 February 2021; and
- DPIE Water and NRAR on 22 June 2021 and 19 August 2021.

It also addresses matters raised in advice from the Department of Planning and Environment – Water (DPE Water) on the second Amendment Report (Regis 2022) and during consultation with DPE Water and NRAR since the lodgement of the Submissions Report and Amendment Report on 4 September 2020.

Broadly, the NSW Government advice and consultation has focused on the surface water licensing pathway for the project. This letter addresses the matters raised in the various correspondence and focuses on the surface water licensing pathway.

Section 2 of this letter outlines the surface water licensing pathways proposed by Regis. Section 3 provides responses to specific issues raised by DPE Water and NRAR

1.2 Recent consultation and regulatory/policy changes

Discussions have been ongoing with DPE Water since late 2017, and since the lodgement of the Amendment Report (EMM 2020a) and Submissions Report (EMM 2020b) in 2020, Regis Resources Ltd (Regis) has been working with DPE Water to clarify and obtain alignment on the surface water licensing pathway. Several policy and regulatory changes have occurred over this period that support or affect the surface water licensing pathway for the project.

On 22 June 2021, DPIE Water and NRAR advised the (then) NSW Department of Planning, Industry and Environment (DPIE) that the following policy developments were underway and relevant to the project:

- **making surrendered water access licences (WALs) available** – via a controlled allocation order (CAO) process for various water sources, including for 192 unit shares of entitlement in the unregulated Belubula River above Carcoar Dam Water Source, regulated by the Water Sharing Plan for the Lachlan Unregulated River Water Sources 2012 (LUR WSP). This process was finalised in March 2022 and Regis was successful in obtaining the entitlement[1];

- **water trading** – DPE Water is working on updated rules to guide the trade of water entitlements and allocations, including allowing trade from a regulated river to upstream unregulated river water sources and between unregulated river water sources. The trade rules relevant to this project area have not yet been updated; and

- **hydroline dataset update** – DPE Water indicated its intent to implement a regular update process for the Water Management (General) Regulation 2018 (WM Regulation) hydroline spatial dataset. This has not occurred to date, but *Regis has verified the actual site hydrolines and intends to rely on the DPE Water commitment to update the hydroline spatial dataset to implement its preferred surface water licensing pathway*.

In April 2022, the Government amended clause 10 of the WM Regulation to include a new subcategory of specific purpose access licence (SPAL) for applications under Section 61(1)(a) of the NSW *Water Management Act 2000* (WM Act), specifically:

> an unregulated river access licence of subcategory "McPhillamys Belubula River gold mine", for the purpose of enabling water to be taken for McPhillamys Gold Mine from the Belubula River above Carcoar Dam water source.

In July 2022, DPE Water released a draft factsheet for targeted consultation clarifying the interpretation/application of the excluded works provisions in Schedule 1 to the WM Regulation and, by extension, the requirement for access licences for water captured by these. The factsheet – "How to interpret excluded work exemptions" – notes that an exemption under item 3 of the Schedule can apply to dams that capture water that is not already contaminated (ie clean water), if it would otherwise have flowed over land and result in it contaminating a water source.

In May 2022, the Minister for Land and Water made a new Harvestable Rights Order for central inland draining catchments within which with project is located. This order establishes the hydroline data set as that used to define the stream order with respect to 'harvestable rights'. Stream order for determining these rights is no longer defined by reference to topographic maps specified in the previous harvestable rights order.

The surface water licensing pathways described in Section 2 have been discussed with DPE Water and are supported by the above policy developments and the new SPAL category in the WM Regulation. In addition, recent correspondence from DPE Water to DPE Planning and Assessment (dated 15 August 2022) confirms **DPE Water has not identified any critical barriers to a successful application for a SPAL**, providing that:

- it is for the purpose of enabling water to be taken for the McPhillamys Gold Mine from the Belubula River above Carcoar Dam Water Source;

- the volume sought is the minimum required to meet the purpose for which the SPAL would be granted; and

- the granting of the SPAL will result in no more than minimal harm to the water source.

[1] This represents more than 99% of the total available entitlement in the water source. The effort and success of Regis in securing and purchasing entitlement in this catchment to offset the project impacts demonstrates to genuine commitment to use the water market as intended by the regulations and planning instruments in NSW.

2 Summary – surface water licensing pathway

2.1 Context

As noted, issues identified by DPE Water and NRAR have related to the availability of surface water entitlement in the unregulated water source for the project. While this matter is addressed in more detail in the responses to each matter in Section 3 and Appendix A, an initial summary is provided here. For context, Figure 1 shows the project's water management facilities in the context of both the current regulation hydroline stream orders and the 'refreshed' stream orders. These refreshed stream orders accurately reflect the existing conditions within the project area as verified by EMM (2020c) and were accepted by the Spatial Services Division of the NSW Department of Finance, Services and Innovation (Spatial Services) in correspondence with Regis in November 2020. As outlined above, DPE Water indicated its intent to implement a regular update process for the WM Regulation hydroline spatial dataset in correspondence with Regis of 22 June 2021. Table 2.1 details the peak water take associated with each water management facility and other take activities. Blue highlights indicate the facilities for which a licence is required under the current and refreshed hydroline data sets.

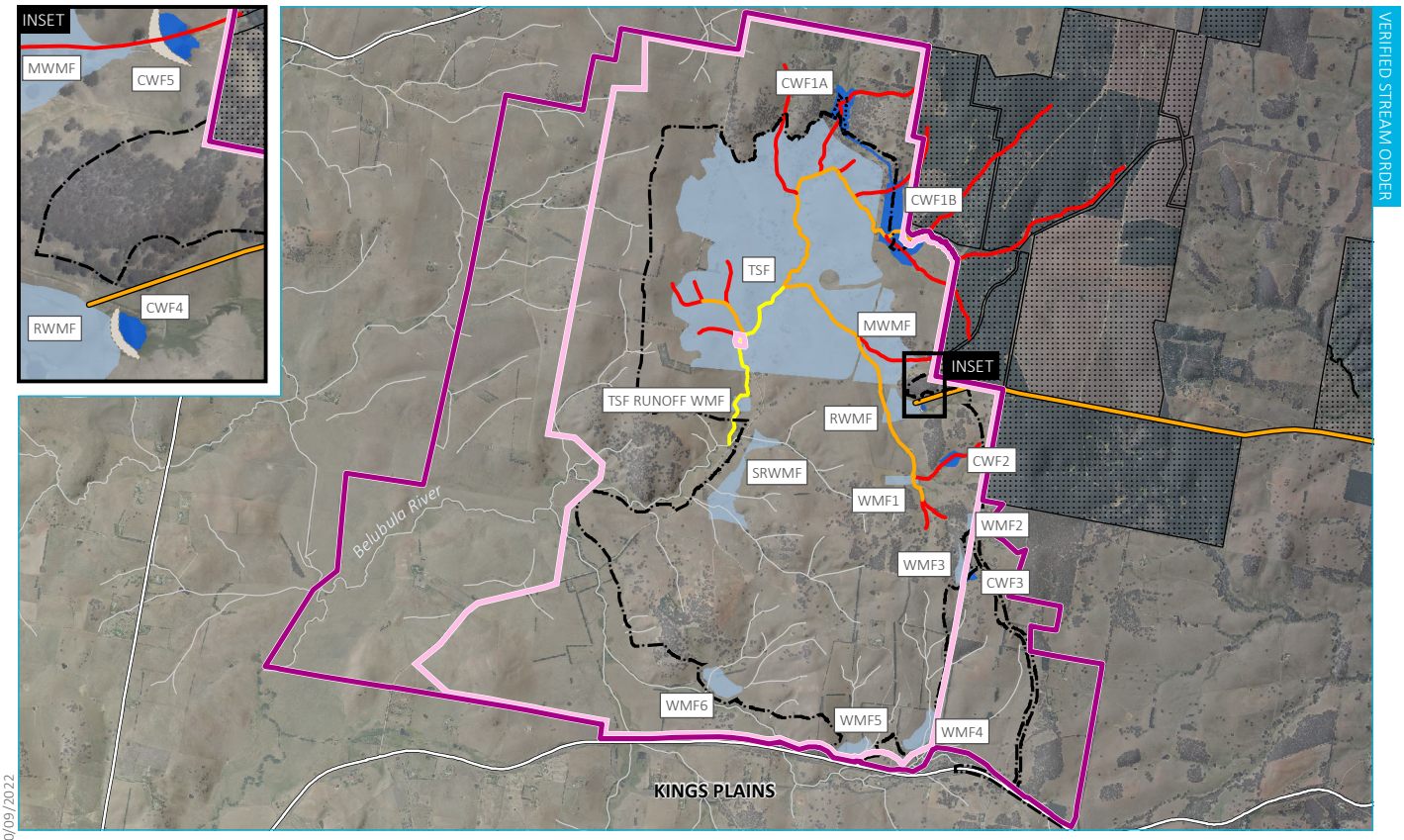
It is important to note that volumetric estimates of water take have been provided in this document based on predictions made by HEC using water balance models developed for the project. These initial estimates provide indicative volumes and will be further reviewed and verified as further streamflow monitoring (at Regis' dedicated stream gauge on the Belubula River), design revisions and modelling is undertaken.

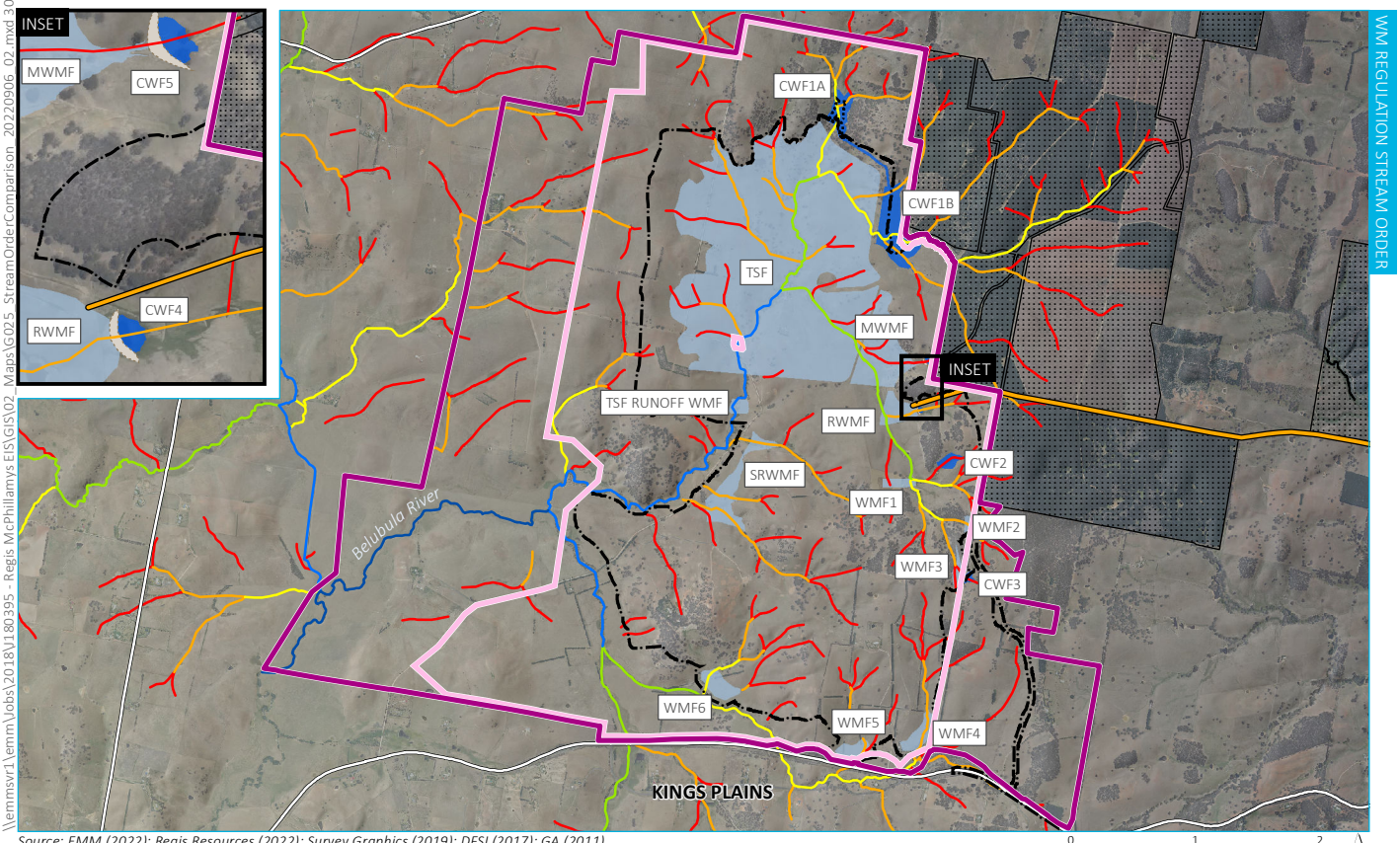
Table 2.1 Project water management facility and water take details

Storage	Maximum capacity (ML)	Peak water take (ML/year)[1]	Peak water take year	Current stream order[2]	Refreshed stream order[3]
CWF1	506	202[4]	1-11	3	2
CWF1 losses	NA	4	1-11	3	2
CWF2	21.6	N/A		1	1
CWF3	3	N/A		1	
CWF4	1.6	N/A		2	
CWF5	3.3	N/A		1	1
MWMF	2,009	0[5]	7	4	2
RWMF	217	0[5]	3	4	2
SRWMF	600	600	4	2	
TSF	Variable	1,117[6]	11	5	3
TSF Runoff WMF	25.8	29	4	5	3
WMF1	70	192[7]	1	4	2
WMF2	60	36	2	2	1
WMF3	21.3	39	11	1	
WMF4	123	117	4	2	
WMF5	136	130	2	2	
WMF6	158	128	2	3	
River leakage	NA	24	11		
Open cut pit	Variable	360	5	1	
Final void (post mining)		112	Ongoing	1	

1. Peak water 'take' is the rainfall runoff captured by the water management facilities. For all facilities, take is based on water balance modelling predictions for a wet (80th percentile) rainfall year.
2. Based on the current WM Regulation hydroline spatial data (DPE Water 2022).

3. Based on verified watercourses and stream orders presented in EMM (2020c). As the stream order assessment (EMM 2020c) was focused primarily on the location of the TSF, the stream orders of several storages (ie CWF3, CWF4, SRWMF, WMF3, WMF4, WMF5, WMF6 and the open cut pit) were not revised, as indicated by blank cells.
4. Note this volume is significantly less than previously reported (see DPE Water advice of August 2021 wherein volume was reported as 655 ML/year at the 80th percentile). This change has come about as a result of CWF model re-calibration to a new streamflow gauging station directly downstream of the Project site. Note also that the CWF1 take during an extremely high rainfall year (98th percentile) may be up to 1,751 ML. If a SPAL is required, this larger volume may need to be considered to comply with the water account management rules in the LUR WSP if there is a series of very wet years.
5. Note that these volumes are significantly less than previously reported (see DPE Water advice of August 2021 wherein volumes reported were 178 ML/year and 50.3 ML/year for the MWMF and RWMF storages respectively at the 80th percentile). This is a result of the redesign of these facilities, as recommended by DPE Water to reduced capture of runoff to a practical minimum. These facilities are now 'turkey's nest' structures that do not capture rainfall runoff.
6. Note the TSF take under extremely wet conditions (98th percentile rainfall year) may be up to 1,753 ML/year. A SPAL of this larger volume may need to be considered to comply with the water account management rules in the LUR WSP if there is a series of very wet years.
7. Note that WMF1 take under extremely wet conditions (99th percentile rainfall year) may be up to 325 ML/year. If a SPAL is required to meet all or part of the take, this larger volume may need to be considered to comply with the water account management rules in the LUR WSP if there is a series of very wet years.





\\emmsvr1\emm\Jobs\2018\J180395 - Regis McPhillamys EIS\GIS\02_Maps\G025_StreamOrderComparison_20220906_02.mxd 30/09/2022

Source: EMM (2022); Regis Resources (2022); Survey Graphics (2019); DFSI (2017); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 55

N

KEY

Project application area
- Mine development project area
- Mining lease application area (Note: boundary offset for clarity)
- Disturbance footprint
- Additional (post-closure) disturbance footprint
- Pipeline
- CWF4/CWF5 embankment (conceptual design)
- Operational water storage
- Clean water collection and diversion maximum area

Existing environment
- Major road
- Vittoria State Forest

Stream order
- Not assessed
- 1st order
- 2nd order
- 3rd order
- 4th order
- 5th order
- 6th order

Project area with water management facilities with stream orders

McPhillamys Gold Project

Figure 2.1

REGIS RESOURCES LTD

EMM creating opportunities

It is important to re-iterate that the **project has been specifically designed *not* to capture "clean" overland flow from the local catchment to meet the site water demand**. That is, water from undisturbed catchments upstream that, if not diverted, would have flowed through the mine site. Instead, operational water will be supplied to the mine development via a 90 kilometre (km) long pipeline from Centennial Coal's Angus Place Colliery and Springvale Coal Services Site, and Energy Australia's Mount Piper Power Station near Lithgow. The aim of this is to minimise the impact of the project on the existing water resources and dependent ecosystems of the Belubula River and greater Lachlan catchment. However, Regis is required to satisfy the licensing requirements for water intercepted by the infrastructure footprint, which includes water management facilities (WMFs) located on non-minor streams as shown in Table 2.1.

2.2 Surface water licensing pathways

The project's impact on flows in the Belubula River downstream of the site and on inflows to Carcoar Dam are described in Section 3 and Appendix A. During mining, the maximum catchment area of the operational water management system constitutes 4% of the total Carcoar Dam catchment. In the long-term, following rehabilitation, the area will significantly reduce, and the final void catchment area represents only 0.46% of the total Carcoar Dam catchment. The predicted reduction in median flows (ie 50th percentile) at Carcoar Dam as a result of the maximum catchment reduction during mining is now 185 megalitres per year (ML/year). The relatively small loss of catchment area reporting to Carcoar Dam and project related flow reductions are considered to pose minimal risk to the Belubula river downstream of the project site and water users dependent on flows in this unregulated section of the river, and on inflows to Carcoar Dam and the regulated river water users that access water from the storage.

Notwithstanding this, the WM Act requires all water take from non-minor streams (refer Table 2.1) to be licensed. Following the success of the CAO, Regis now holds 262 of the total 264 shares of water entitlement in the Belubula River above Carcoar Dam Water Source. Despite this, within the terms of the current LUR WSP, this remains insufficient to account for the project's licensable take. The pathways to account for this take under the WM Act are shown in Figure 2 below.

Regis assumes that the WM Regulation hydroline data set will be updated/refreshed, as indicted by DPE Water. As part of the update and refresh process, the hydroline spatial data should reflect Spatial Services' acceptance of the verified stream orders by EMM (2020c), reflecting existing conditions within the project area. Spatial Services confirmed acceptance of the verified stream orders in communications with Regis in November 2020. Regis also assumes that the recent exemption interpretation developed by DPE Water for clean water diversions will be implemented.

On this basis, all take (except for that associated with the TSF) can be accounted for as take by an 'excluded work', take pursuant to the harvestable right entitlement, or take licensed under Regis's 262 unit shares of licensed entitlement in the water source. An application would be made for a SPAL for the TSF take of between 1,117 ML/year and 1,753 ML/year. This volume represents the take in wet periods (80th to 98th percentile rainfall years). In a median rainfall year, the actual take would be in the order of 765 ML. The impacts of this take on streamflow into Carcoar Dam will likely be 'offset' by the acquisition of regulated river entitlements in the Belubula Regulated River Water Source.

If, contrary to DPE Water's indication, the hydroline is not refreshed, or if the refresh is delayed, SPALs would be sought for the clean water facility 1 (CWF1) and associated losses, and for a portion of the take associated with Water Management Facility 1 (WMF1). As the water captured by CWF1 is returned to the Belubula River downstream of the site, no Carcoar offset would be required for this take. However, the impacts of any SPAL authorising take from WMF1 on streamflow into Carcoar Dam would be likely be 'offset' by purchasing further regulated river water access licences.

If the recent exemption interpretation developed by DPE Water is not implemented, Regis will account for the take associated with CWF2, CWF3, CWF4 and CWF5 for clean water diversions under the property's harvestable right.

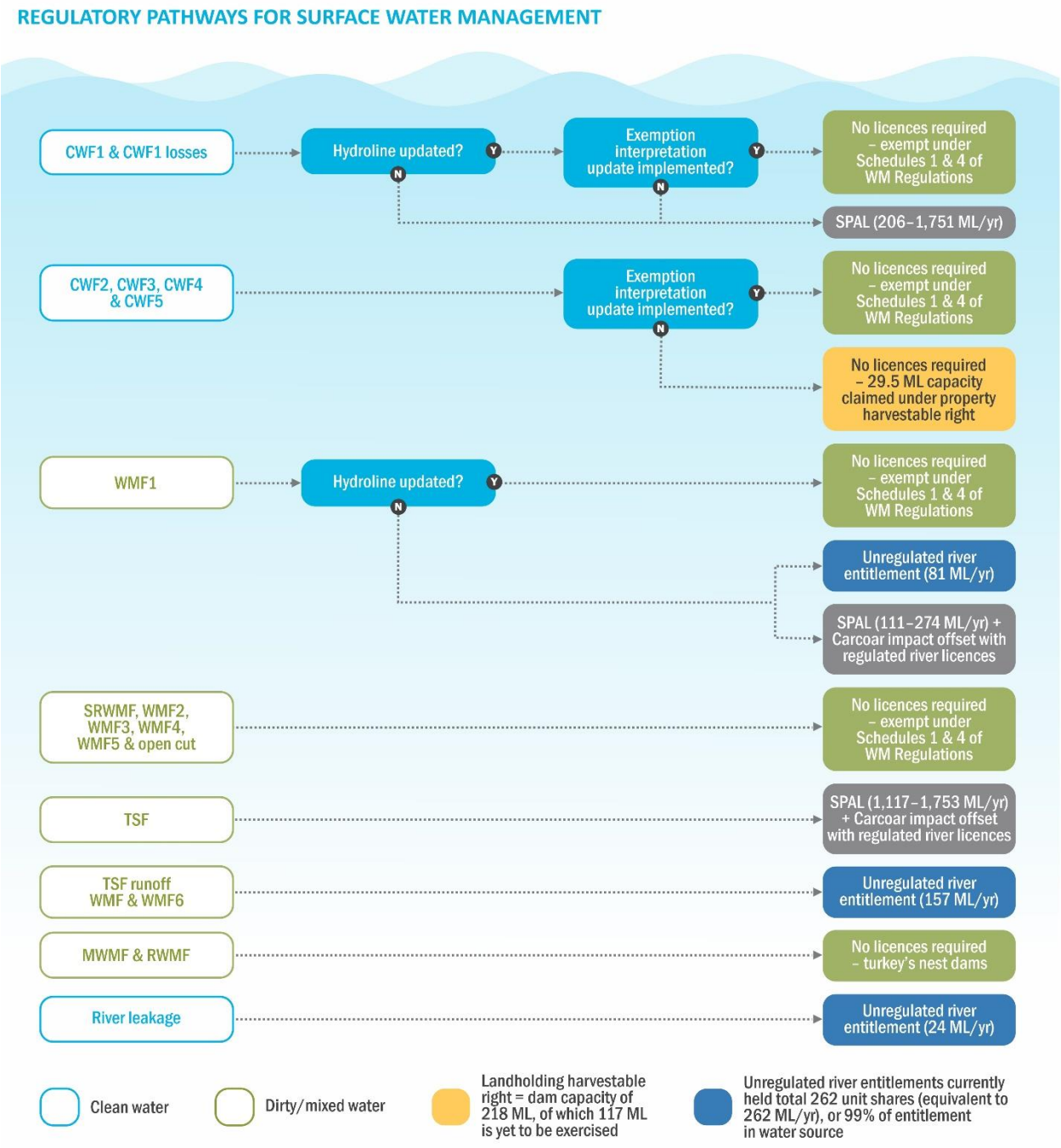


Figure 2 **Regulatory pathways for surface water management**

The proposed surface water licensing pathway demonstrates that the project can operate within the NSW water regulatory framework through the application of harvestable rights, excluded works exemptions and sufficient entitlement for all licensable surface water take. The preferred pathway relies on:

- updating/refreshing of the WM Regulation hydroline dataset as indicated in DPE's advice of June 2021;
- implementation of the government positions contained in DPE's draft Factsheet of July 2022 "How to interpret excluded work exemptions";
- a successful application for a SPAL post project approval; and
- successful purchase of entitlement in the Belubula Regulated River Water Source to offset the reduction in streamflow at Carcoar Dam.

3 Specific responses to DPIE Water, NRAR and DPE Water advice

A summary of matters raised in the DPIE Water, NRAR and DPE Water advice to date and responses to these are presented in this section. Where relevant, the responses incorporate the outcomes of recent consultation with DPE Water and DPE's Planning and Assessment Group.

A detailed discussion on the proposed water management system for the project, including details of individual storages, and the proposed surface water licensing strategy is provided in Appendix A. In summary, for the water management system:

- Clean water runoff will be diverted where practical around all facilities to be constructed in the project area, so as to divert runoff to the Belubula River catchment and not 'harvest' it for supply to the project. Therefore, no overland flow is proposed to be captured or harvested, with all runoff outside of the direct disturbance footprint diverted as far as practical.

- A key feature of the project and the water management system is the water supply pipeline from Angus Place Colliery, Springvale Coal Services Site and Mount Piper Power Station near Lithgow. The supply of water from these locations avoids the need to take clean water from the local catchment and enables a beneficial use of otherwise surplus water from mining in the Sydney Basin. This will result in a significantly better environmental outcome for the Sydney drinking water catchment and the Belubula River catchment, while providing a reliable water source for the mine development.

- Water runoff from mining areas such as haul roads, waste rock emplacement, hardstand areas and the open cut is part of the operational water management system for the mine development. Runoff from these areas is also called mine water, or dirty water runoff. The operational water management system includes a number of WMFs, the open cut and the TSF, together with a system of pumped transfers and drains in order to capture and contain runoff from disturbed areas to prevent its release to the surrounding environment.

The clean water diversion system and operational water management system for the project have been revised following consultation with the NSW Government. Water balance modelling for the project has been updated to reflect these changes, which is provided in Appendix C. A summary of the proposed surface water licensing pathway is provided in the following sections.

3.1 Water take and entitlement

3.1.1 Surface water take and entitlement

DPIE/DPE Water and NRAR advice relating to surface water take and entitlement has evolved over the project development period. The salient points in the advice are detailed in the box below. As indicated, Regis has undertaken extensive consultation with the water agencies over a number of years to ensure that an appropriate pathway to account for all project take is identified.

Advice dated 10 February 2021

Water entitlement requirements

The proponent would need to ensure sufficient entitlement is held prior to all water take. Based on the Department's assessment of stream order for the project site the dams/structures located on third order and higher order watercourses where entitlement needs to be held for water take include CWF1a, CWF1b, MWMF, RWMF and the TSF.

There is not sufficient water entitlement available in the Belubula River upstream Carcoar Dam Unregulated River Water Source to account for the water take requirements of this project. The project is therefore at this stage unable to meet the regulatory requirements of the Water Management Act 2000, noting that we (DPIE Water/NRAR) continue to explore additional information provided by the proponent.

Excluded works, stream orders and diversion

We do not support the interpretation of excluded works by the proponent. The Department's view of how to identify a minor stream to enable the interpretation of the excluded work provisions under Schedule 1 of the Water Management (General) Regulation (2018) does not align with the information presented by the proponent. There is no ability to vary a stream order based on an on-ground assessment or future modifications that may occur to a watercourse. Determining stream order to enable interpretation of a "minor stream" for the purpose of the excluded work provisions is based on the definition in the Water Management (General) Regulation (2018) which relies on the hydro line spatial data published on the Department's website (https://www.industry.nsw.gov.au/water/licensing-trade/hydroline-spatial-data).

The ability for a diversion to replace an existing watercourse with the aim of avoiding the need for an entitlement for the structure is a possibility for projects where adequate diversion of the original watercourse and its associated flow can occur. This is not considered possible for this project based on the size and location of the proposed structures which are not able to adequately divert the original watercourse's flow.

Other water take/entitlement considerations

The amended project predicted leakage from the Belubula River and Tributary A to increase to a maximum of 24ML/year during mining and up to 28ML/year post mining. This water take would also need to be accounted for in the surface water source.

The commitment to return water captured in clean water dams on third order and higher order watercourses to the downstream environment is supported. The regulatory requirement however remains to hold entitlement for water take from these dams. This is due to no active return flow provisions under water legislation at this time.

On the understanding CWF2 and CWF3 are to capture clean runoff and are on a minor stream for the purpose of harvestable rights, these dams need to be considered within the Maximum Harvestable Right Dam Capacity (MHRDC) for the property and/or the need to hold entitlement if the MHRDC is exceeded. The excluded work provisions do not apply.

Pre approval recommendations

- *The proponent is required to confirm that it is able to obtain the necessary surface water entitlement to account for runoff capture structures and water take.*

Post approval recommendations

- *The proponent will need to ensure adequate entitlement is held in a Water Access Licence for the relevant water sources prior to all water take, and complies with the rules of the relevant Water Sharing Plans and the NSW Non-Urban Water Metering Policy.*
- *The proponent must ensure that relevant nomination of work dealing applications for Water Access Licences proposed to account for water take by the project have been completed prior to the water take occurring.*

Advice dated 22 June 2021

The "hydroline" dataset adopted by the Government to calculate stream order for water access licence exemption purposes ('excluded works' in Schedule 1 to the Water Management (General) Regulation 2018*) is a static version of this data from 2018. The department has no intention to use a live dataset as this would create significant regulatory and enforcement challenges across the state. Instead, the department intends to implement a regular data update and refresh process, where this data would be updated into a new static version, likely on an annual basis, commencing from July 2022, once approaches and processes are in place to manage the regulatory implications of regular updating of the data set for excluded works.*

The Natural Resources Access Regulator (NRAR) has advised that it is unlikely the [hydroline] *changes will address the water requirements for the project. This is because:*

- *The updated hydroline layer resulted in the dam walls of two storages (TSF and WMF6) being located on third or higher order watercourses and the remaining storages located on minor streams.*
- *Dams CWF1a, CWF1b, CWF2, CWF3, RWMF, MWMF would be located on minor streams, however do not appear to satisfy any of the exclusions for licence requirements under Schedule 1 of the Water Management Regulation 2018. This is due to the dams either capturing runoff from undisturbed areas or being constructed because of the project and hence not solely for the exclusion purposes (Sch. 1(3) and (4)) as required by the regulation.*

In order to consider these structures as exempt the NRAR recommends that the proponent consider:

- *Redesigning RWMF and MWMF to be turkeys nest dams with no catchment from undisturbed areas. Divert clean water around the site via diversions or in combination with appropriately sized clean water dams.*
- *Redesigning CWF1a and CWF1b to the minimum size necessary to enable the capture and diversion of clean runoff.*
- *Reviewing the design of WMF6 to ensure it is sized appropriately for the draining catchment and/or consider its relocation to minor streams.*

Advice dated 19 August 2021

The storages which account for the majority of the water take (1758ML) are located on third or higher order streams based on the 2018 hydroline dataset. This includes the tailings storage facility (TSF) and two clean water dams CWF1(a and b). We acknowledge that CWF1(a and b) and also MWMF and RWMF would be on minor streams once the hydroline is updated but these dams do not meet the provisions in Schedule 1 (3 or 4) of the Water Management (General) Regulation 2018 that would exempt the need for water licensing. The key aspects of the storages that require most of the entitlement are that:

- *the proposed clean water diversion around the TSF does not effectively divert the fifth order watercourse it is located on, noting that there is still a significant volume of water captured, and the diversion removes a significant section of the river and replaces it with dams, pumps and pipelines, and*
- *the CWF1(a and b) dams capture clean water, and the primary purpose is considered to be to enable mining activity rather than for an environmental management purpose. Although this water is to be returned to the watercourse there is no ability at this time for these return flows to reduce entitlement requirements.*

July 2022 – Draft DPE Water Factsheet "How to interpret excluded work exemptions"

Contaminated water dams [on minor streams] – *Clause 3 of Schedule 1 of the Water Management (General) Regulation 2018:*

- *The exemption does not explicitly apply only to the capture of contaminated or 'dirty' water. The words "to prevent the contamination of a water source" allows for a broader interpretation where the captured drainage or effluent water does not have to have been contaminated before the capture occurred. Therefore, this exemption can apply to the capture of water that is not already contaminated, if it would have otherwise flowed over land which would result in it contaminating a water source. For the exemption to apply in these circumstances there needs to be clear evidence that without the capture of that water it would have resulted in a water source being contaminated.*
- *The requirement for dams to be 'solely for the capture, containment and recirculation of drainage* [and/or effluent]*' does not mean that captured water cannot be used. This is because the word 'solely' relates only to the dam and not the water captured by it. Additionally, the word 'recirculation' applies to the use of the dam rather than the use of the water captured by it.*

Advice dated 14 July 2022

<u>Water take</u>

The proponent should quantify the maximum water take from the 4th order watercourse and its catchment downstream of the clean water diversion system.

Key amendments to the water licensing considerations proposed by the second amendment report include the following:

- *The redesign of the Main Water Management Facility (MWMF) and Raw Water Management Facility (RWMF) on a 4th order watercourse as turkeys nest dams has removed a licence requirement for water take by these structures.*
- *The proposed clean water diversion system around the MWMF and RWMF has included 2 clean water dams totalling 4.6ML on minor streams. This capacity is within the proponents Maximum Harvestable Right.*
- *It is unclear if other infrastructure will capture water from the 4th order watercourse. The isolation of the MWMF and RWMF from catchment runoff has resulted in the need to confirm the water take from the remainder of the 4th order watercourse and its catchment that flows in a north west direction and is upstream of the TSF/MWMF/RWMF and downstream of the clean water diversion around the Waste Rock Emplacement. Therefore, there is still a large catchment area with infrastructure that may be taking water. This has not been included in the second amendment report.*

Advice dated 15 August 2022

DPE Water has reviewed the information package [in support of a future application for a Specific Purpose Access Licence (SPAL) under the Water Management Act 2000] *and requests Regis Resources address several matters and amend the information accordingly prior to submitting a formal licence application. The matters relate to the following:*

- *That all external documentation used to support the application is provided and that statements or conclusions are justified with relevant information in the application.*
- *Further detail be provided of the methodology used to determine the SPAL volume, and to confirm whether climate change has been factored in to determining the volume and associated impacts.*
- *Further detail be provided of the impact assessment to understand whether more than minimal harm will occur to the water source. This is to address the surface water and groundwater source and the associated users and dependent ecosystems.*

Notwithstanding these points, DPE Water has not identified any critical barriers to a successful application for a SPAL, providing that:

- *it is for the purpose of enabling water to be taken for McPhillamys Gold Mine from the Belubula River above Carcoar Dam water source,*
- *the volume sought is the minimum required to meet the purpose for which the SPAL would be granted, and*
- *the granting of the SPAL will result in no more than minimal harm to the water source.*

Regis acknowledges that sufficient entitlement is required to be held prior to all licensable water take. As described above in Section 2, Regis has undertaken extensive consultation with DPE Water over a number of years to ensure that appropriate pathways to account for all take are confirmed for the project.

The licensing pathway proposed by Regis and summarised in Section 2 relies on four key elements:

- updating/refreshing of the WM Regulation hydroline dataset as indicated in DPE's advice of June 2021 (above);
- implementation of the government positions contained in DPE's draft Factsheet of July 2022 "How to interpret excluded work exemptions";
- a successful application for a SPAL post project approval; and
- successful purchase of entitlement in the Belubula Regulated River Water Source to offset the reduction in streamflow at Carcoar Dam

i Hydroline refresh

The Hydro line spatial data (hydroline) is a data set of mapped watercourses and waterbodies in NSW which is used to determine the Strahler stream order of a watercourse (set out in Schedule 2 of the WM Regulation). This in turn enables the interpretation of a "minor stream" for the purpose of the excluded work provisions in the WM Regulation. The Regulation hydroline dataset is a 'static' version published on the Department's website (https://www.industry.nsw.gov.au/water/licensing-trade/hydroline-spatial-data).

A more contemporary and dynamic hydroline dataset is managed by Spatial Services and is updated from time to time to accurately reflect existing conditions in accordance with the NSW Foundation Spatial Data Framework (DFSI 2018a) and the NSW Custodianship Guidelines for Spatial Data (DFSI 2018b).

Determining the WMFs for which entitlement needs to be held relies on the hydroline spatial data accurately depicting the watercourse configuration on the land relevant to the project. However, within and surrounding the project area, the current WM Regulation hydroline spatial data for the relevant land is based on historical topographic mapping and has not been updated to accurately reflect the current watercourse configuration of this significantly modified landscape.

Ground-truthing of the hydroline was undertaken by EMM (2020c) within and in the vicinity of the project area.

A number of watercourses that are currently mapped by the WM Regulation hydroline spatial data as non-minor streams (ie third order streams or above) were verified by EMM (2020c) to either not exist or be mapped as minor streams (ie first or second order streams). Many of the watercourses in the project area depicted by the WM Regulation hydroline spatial data were found to be topographical depressions rather than watercourses. They lacked incised channels, flow confinement, vegetation assemblages and other attributes common to streams and rivers. The verified stream order presented by EMM (2020c) accurately represents the watercourse configuration of the landscape.

The EMM (2020c) report outlining the verified stream orders was submitted to DPE, and Regis received communication from Spatial Services on 17 November 2020 that confirmed this report has been accepted. It is understood that this new baseline data has been uploaded to the NSW Government database; however, this new baseline dataset has not yet become the baseline hydroline layer for the purposes of the WM Regulation. In correspondence to Regis on 22 June 2021, DPIE Water indicated that the hydroline dataset used to calculate stream order for WAL exemption purposes (ie excluded works under Schedule 1 of the WM Regulation) will be updated regularly, likely on an annual basis, commencing from July 2022 (Regis notes this is still to occur).

The verified/refreshed stream order confirmed that only three WMFs within the proposed water management system for the project will be on non-minor streams:

- TSF;
- TSF Runoff WMF; and
- WMF6.

A SPAL will be sought for water take associated with the TSF (see sub-section iv below). Take associated with the TSF Runoff WMF and WMF6 will be accounted for by relying on the 262 unit shares of entitlement held by Regis.

As shown in Table 2.1, CWF1a, CWF1b, MWMF and RWMF, which were listed by DPIE Water in their initial advice as being on non-minor streams, have been verified as being on minor streams.

ii Excluded works

Dams that are on minor streams and are for certain purposes are excluded works as specified in Schedule 1 of the WM Regulation. These dams do not require a water supply work or water use approval, and do not require a WAL for the purposes, and in the circumstances, specified in Schedule 1. DPE Water in July 2022 release a draft factsheet “How to interpret excluded work exemptions”, which clarifies the Government’s current position on the types of works and purposes specified in the Regulation. This advice provides a different interpretation to that provided by DPE Water and NRAR in its advice to Regis of June and August 2021. Regis intends to rely on this more contemporary interpretation. Further discussion on the excluded works exemption is provided in Section A.4.3i in Appendix A.

a Operational water management facilities

Dams on minor streams that are solely for the capture, containment or recirculation of drainage to prevent the contamination of a water source are excluded works under Schedule 1, item 3 of the WM Regulation.

The project can rely on the excluded works exemption under Schedule 1, item 3 of the WM Regulation for the majority of the proposed WMFs, because:

- they have been designed to prevent discharges to the environment, and represent best management practice to capture, contain and recirculate drainage to prevent the contamination of the downstream receiving environment;
- MWMF and RWMF have been re-designed as a ‘turkey’s nest’ dams following advice from DPIE Water and NRAR to eliminate the undisturbed catchment contributing to the storages using upslope diversions and two additional CWFs (CWF4 and CWF5); and

- SRWMF, WMF1, WMF2, WMF3, WMF4 and WMF5 are located on minor streams (based on the verified stream orders (EMM 2020c), and as per Table 2.1).

If the hydroline is not updated, a SPAL would be required for a portion of the water take associated with the WMF1.

The TSF, TSF Runoff WMF and WMF6 are not on minor streams. Take associated with the TSF Runoff WMF and WMF6 can be accounted for by relying on the 262 unit share entitlements held by Regis. A SPAL will be sought for take associated with the TSF (see subsection iv below).

b Clean water facilities

Regis will maximise the diversion of clean water around the mine development to maintain catchment runoff to the Belubula River and not 'harvest' it for supply to the project. This will be achieved via a series of diversion drains, CWFs, pumps and pipelines, as shown in Figure A.2 in Appendix A. Runoff from undisturbed areas will be directed to a system of upslope runoff diversion drains and either directed to existing gully lines or to one of five clean water facilities. These CWFs will be dewatered as quickly as possible by pumping to the Belubula River downstream of the mine development during and following rainfall events. All CWFs are on minor streams (based on the updated hydroline spatial data).

The recent DPE Water factsheet clarifies that dams on minor streams relying on an exemption under Schedule 1, item 3 of the WM Regulation can apply to the capture of water that is not already contaminated (ie clean water), if it would otherwise have flowed over land which would result in it contaminating a water source. The CWFs serve no purpose other than diverting clean runoff from undisturbed catchments to the Belubula River downstream of the mine disturbance area. Without the capture and/or diversion of this clean runoff in the CWFs, the water would come into contact with mining areas such as haul roads, waste rock emplacement and hardstand areas. Runoff from these areas has the potential to contain elevated levels of environmentally significant contaminants such as metals, nutrients, suspended solids and hydrocarbons.

Under this contemporary clarification of the exempt works regulation and following the update to the WM Regulation hydroline dataset, all CWFs would be excluded works under Schedule 1, item 3 of the WM Regulation.

If the hydroline dataset is not updated in a timely manner, and/or the exempt works clarification is not implemented, a SPAL of between 206 ML/year and 1,751 ML/year would be sought for take by CWF1 and its associated losses. This represents high rainfall year take (80th to 98th percentile). Regis will seek further clarification from DPE Water regarding the quantum of the SPAL required to meet all obligations under the WM Act and the WSP.

If the exempt works clarification is not implemented, take by CWF2, CWF3, CWF4 and CWF5 would be accounted for under the harvestable right for the property, as indicated in the DPE advice of February 2021.

The total landholding area of Regis' property associated with the mine development project area is 2,951 hectares (ha). Using the online MHRDC calculator (WaterNSW 2022b), the total harvestable right for the project is 221.3 ML. A baseline assessment of existing farm dams on Regis landholdings found that these storages have an estimated combined capacity of 104.1 ML. Based on the calculations above, the total remaining harvestable right volume available for the project is 117.2 ML (ie total harvestable right of 221.3 ML minus existing farm dam capacity of 104.1 ML).

CWF2, CWF3, CWF4 and CWF5 are located on existing minor streams (first or second order), upslope (east) of the waste rock emplacement and processing plant area. These facilities have an estimated combined total capacity of 29.5 ML, which is well within the remaining harvestable right volume available for the project of 117.2 ML.

iii River leakage and final void

An indirect take of surface water is expected to occur via an increase in leakage (as a result of groundwater drawdown) from the Belubula River and Tributary A to groundwater. This has been estimated as part of the groundwater modelling conducted for the mine development (Appendix H of EMM 2020a) and is required to be accounted for through entitlements within the Belubula River above Carcoar Dam Water Source. This take of 24 ML/year during mining operation and 28 ML/year post mine rehabilitation will be accounted for by relying on the 262 unit shares of entitlement held by Regis. The water balance model predicts take of catchment runoff by the final void (post mining) of 112 ML/year under wet (80th percentile) rainfall conditions. Again, this take will be accounted for by relying on the 262 unit shares of entitlement held by Regis.

iv Specific purpose access licence/s

As indicated, a SPAL will be sought for the TSF. Full details of this SPAL and associated analysis are in Appendix B. In summary:

- The volume sought will be up to 1,753 ML/year, which represents the take in very high rainfall years (occurring in only 2% of years over the historical record). Actual take will be much lower in almost all years. Under 50th percentile (median) rainfall conditions the TSF take is modelled at 765 ML/year. Under relatively wet rainfall years (20% of years) take is modelled at 1,117 ML/year. Regis will seek further clarification from DPE Water regarding the quantum of the SPAL required to meet all obligations under the WM Act and the WSP.

- The impact of the TSF on flows into Carcoar Dam will be offset by acquisition (and suspension) of licences from the Belubula Regulated River Water Source. The impact on Carcoar Dam inflows has been modelled as 413 ML/year at the 20th percentile flows (wet conditions) and 83 ML/year at the 50th percentile, with an average of 255 ML/year. Offsetting flow impacts ensures that the impact on Carcoar Dam storage volume, and hence security of supply to the regulated Belubula River system and downstream dependent ecosystems will be negligible, as the available allocation for these licences will not be used for the duration of the impact.

- The difference between the take volume and offset volume for the TSF SPAL is primarily a function of the difference between the runoff from developed (hard surfaced) sub-catchment for the TSF and the current pre-development sub-catchment.

- Based on DPE Water analysis:

    - to offset the average impact of the TSF on inflows, up to 315 unit shares of regulated river high security entitlement (or 1,109 unit shares of regulated river general security entitlement) may need to be acquired; and

    - to offset the 80th percentile impact of the TSF on inflows, up to 510 unit shares of regulated river high security entitlement (or 1,796 unit shares of regulated river general security entitlement) may need to be acquired.

    The high security entitlement water market is limited, with only six licences with a total of just under 1,100 unit shares. In contrast, there are 78 general security licences with 22,454 unit shares (WaterNSW 2022a). The general security shares required to offset the development of the TSF represents around 8% of the total shares currently available, which provides a good prospect for permanent trade, a long term ‘lease’ or, if required, temporary trade.

- There are a small number of water users (domestic and stock basic landholder rights) on the Belubula River downstream of the mine development and above Carcoar Dam. The impact of the TSF on daily streamflow downstream of the project will be minimal in the low flow range, noting that flow currently ceases from time to time. The greatest magnitude of the flow reduction occurs in the higher flow ranges, when there would be more than sufficient flow to meet the needs of authorised downstream users. Notwithstanding this, Regis expects to 'make good' any loss of access caused by the mining operation. Regis will monitor and report on downstream flows and will provide water to supply basic landholder rights if and when, but for the mining operation, they would have been able to pump directly from the river.

- The following information will be relied upon in the proposed TSF SPAL application to demonstrate that the take associated with the SPAL will have no more than minimal harm on the relevant water sources and dependent ecosystems:

    - The aquatic ecology assessment undertaken for the project (EMM 2019b; EMM 2020b) considered the impact of the entire mine development on environmental conditions and receptors such as water and sediment quality, key fish habitat, aquatic biodiversity and native plants which inhabit the riparian zone. It was concluded that the proposed mine development is unlikely to pose a significant ecological risk, due to the lack of species of conservation significance supporting habitat.

    - Annual flows to Carcoar Dam are predicted to decrease by 4% as a result of the entire project during operation (for example by 185 ML/year of median flows). While there are conservation significant fish species within Carcoar Dam, this negligible flow impact is unlikely to pose a significant ecological risk to these species. In any event, the proposed SPAL conditions will offset the impact of the TSF take on Carcoar inflows.

    - In terms of habitat between the mine development and Carcoar Dam, there is currently a lack of connectivity during low flow conditions, and a distinct absence of species of conservation significance within the Belubula River and associated tributaries upstream of Carcoar Dam. These factors, and the physical barrier (Carcoar Dam) between the mine development and known areas of conservation significance, means that the potential impact of the project on aquatic ecology will be minimal.

    - The aquatic ecology assessment outlined above does not distinguish between the impacts of the entire project and those of the TSF only. The TSF represents about half of the flow impacts of the entire development. Therefore, the aquatic ecology impacts of the TSF only will be significantly less than assessed and will cause no more than minimal harm to the water source and its dependent ecosystems.

    - Notwithstanding this, Regis has committed in its environmental impact statement (EIS) to several biodiversity offset and habitat enhancement initiatives including the development of an aquatic ecology offset package in consultation with the NSW Department of Primary Industries – Fisheries.

v Other – access licences and administrative compliance

As discussed, Regis is committed to ensuring that, where required, adequate entitlement is held for take (direct or indirect) from both surface water and groundwater sources prior to the take occurring.

Regis acknowledges that the project must meet the requirements of the WM Act and WM Regulation for its water take and comply with the rules of the relevant water sharing plans and all associated policies, as well as the conditions of consent if the project is approved, which often include requirements for measuring, recording and reporting water take.

Where take can be directly measured, this will occur consistent with the NSW Non-Urban Water Metering Policy. Where take cannot be directly measured, Regis will work with the responsible agency to agree on other techniques and robust modelling regimes to regularly report on this incidental or diffuse take.

The predicted take associated with the proposed development and the assessment of the potential impact on water resources is provided in the Amendment Report (EMM 2020a), Submissions Report (EMM 2020b) and second Amendment Report (Regis 2022). Further clarification on the predicted take and how this has been calculated is provided in Appendix A.

3.1.2 Groundwater take and entitlement

Advice dated 10 February 2021

Groundwater take

The peak groundwater inflow to the pit for the base case has reduced from 890ML/year in the EIS to 580ML/year. A worst case scenario associated with a high inflow case (which was quoted in the EIS as a peak of 2670ML/year) could not be identified in the RTS or Amendment Report. The proponent appears to be relying on a base case modelling scenario to inform the groundwater take. This is likely to inadequately inform water take requirements for wetter years. As entitlement needs to be held for all water take, irrespective of climatic conditions, it is the proponent's responsibility to ensure sufficient entitlement is held. This may represent a risk to the project.

The proposal by the proponent to use an existing 400 unit WAL and a 200 unit WAL which is to be acquired via the Controlled Allocation process is sufficient to meet the water take requirements for the base case scenario. Additional entitlement will be required if this is to be exceeded. Comprehensive monitoring, metering and modelling is required to inform future requirements and to verify actual water take.

The calculation of peak groundwater inflow to the pit is described as "net" of evaporation of groundwater from the sides of the open cut. The Department is uncertain of the total groundwater take from the open cut that needs to be accounted. This evaporated groundwater volume must be included in the calculations of entitlement requirements as it is a component of the water take. It is recommended the current modelled take figure of 580 ML/year be reviewed to ensure this water take component is included. Where additional entitlement is required the proponent will need to demonstrate this can be obtained.

Baseflow reduction to the Belubula River upstream of the Trib A confluence is to peak at 10.22 ML/year at end of mining in the amended report compared to 10.59 ML/year in the EIS. Baseflow reduction to Trib A is predicted to be a max of 4.75 ML/year for the amended project compared to 5.11 ML/year in the EIS. Baseflow reductions are to be accounted for by entitlements in the groundwater source.

Pre approval recommendations

- *The proponent should review the volume of groundwater take from the open cut pit to ensure it includes the volume evaporated from the pit walls and that it considers a range of climatic conditions. Where additional entitlement is required the ability to acquire this needs to be demonstrated.*
- *Baseflow reductions should be accounted for by entitlements in the groundwater source.*

i Groundwater take in wetter than average years

As reported in Section 5.3.3(i) of Appendix H to the Amendment Report (EMM 2020a), the results of the predictive uncertainty analysis conducted for the EIS remain valid. Additional uncertainty analysis was conducted following submission of the EIS and is reported in Section 5.3.5 of Appendix H to the Amendment Report (EMM 2020a). The predictive uncertainty analysis results of the numerical groundwater modelling represent a potential range in results (eg drawdown, inflows) based on varying aquifer properties and boundary conditions. As there is little difference in the regional groundwater system between wet and dry years, the results do not represent a range of results based on changes in wetter versus drier years. Climatic variance is typically presented in discussion of surface water modelling results.

Unlike surface water, groundwater inflows to the open cut will not vary considerably on a seasonal basis (eg wetter years or drier years). This is due to the nature of the hydrogeology in the project area (very little alluvium, with highly weathered clay-like saprock overlying metasediments and volcaniclastics).

The groundwater modelling conducted for the amended project predicts a peak inflow to the open cut in mining year 2 at 580 ML/year (base case results). The base case represents the most likely case for the mine development project, as the hydraulic properties applied in the base case model represent the current understanding and are considered most appropriate for the hydrogeological environment. As discussed in the Section 4.1.3(i)(b) of the Submissions Report (EMM 2020b), the results of the uncertainty analysis reported a peak groundwater inflow to the open cut pit of 2,670 ML/year. This high inflow case was modelled to test the margins of hydraulic parameters in the model, and the result is unrealistic when we consider actual site data of hydraulic parameters. Therefore, is considered extremely unlikely to occur as it simulated the saprock layer with a specific yield value of 20%, compared to the more realistic (but still conservative) value of 5% applied in the base case scenario. Specific yield decreases with decreasing grain size: a specific yield of 20% is typical of coarse sand and gravel; clay material (like that observed in the saprock in the mine project area) is typically <1-5% (Johnson 1967). This simulation was conducted to assess the potential 'what-if' scenario of a very high specific yield in the weathered rock and is extremely unlikely to occur. As such, the hydraulic properties applied in the base case model represent our current understanding of the hydrogeological environment and are considered appropriate to provide an indication of most likely groundwater inflows to be observed during mining of the open cut pit.

The predicted groundwater inflows reported in Appendix H of the Amendment Report (EMM 2020a), including the peak groundwater inflow of 580 ML in year 2, includes evaporation of groundwater from the open cut.

As outlined in Section 4.1.3(iii) of the Submissions Report (EMM 2020b), Regis commits to continual improvement of the numerical groundwater flow model as and when new data become available, particularly where there is a divergence of observed groundwater system response from the predicted. Information relating to volumes of water pumped from the open cut pit, groundwater level and quality monitoring (and other observations) will be collected, collated and reviewed by Regis and their specialist consultants prior to and during mine construction and development. The data will be used to review, verify and refine the groundwater model as needed. Should the groundwater inflows to the open cut pit be greater than predicted, additional groundwater licences will be acquired for the project. As shown below (Section 3.1.2iii), there is more than adequate water entitlement available in the water source.

ii Baseflow reductions

Predicted direct and indirect interception of water associated with the open cut pit are reported in Section 8.2 of Appendix H to the Amendment Report (EMM 2020a) and Section 4.1.3(i)(b) of the Submissions Report (EMM 2020b). The changes to surface flow as a result of groundwater is licensed as a combination of reduced baseflow (ie sourced and licensed from groundwater) and induced reduction of streamflow (sourced and licensed from surface water). As such, baseflow reductions have been included in the estimated total take from the Lachlan Fold Belt Murray Darling Basin Groundwater Source within the Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011.

It should be noted that the estimated peak groundwater interception is driven by the predicted groundwater inflows to the pit, which is anticipated to occur in mining Year 2 (580 ML/year). The predicted baseflow reduction in Year 2 is approximately 0.4 ML/year. The peak baseflow reduction of 14.2 ML/year is predicted to occur at the end of mining (year 11), which is after the peak inflow, due to the delay in propagation of the resulting drawdown to the watercourse. It is noted that by the time this peak baseflow reduction occurs, the groundwater inflows to the pit are predicted to be much lower than the peak in Year 2.

iii Groundwater entitlement held by Regis

Regis has secured 947 unit shares in the Lachlan Fold Belt Murray Darling Basin Groundwater Source from a combined five water access licences (WAL 28577, 41835, 43924, 43516 and another WAL that is being finalised from the 2021 CAO). Therefore, Regis holds sufficient entitlement for the predicted peak groundwater take.

3.1.3 Water transfer from Centennial Coal

Advice dated 10 February 2021

Water transfer from Centennial Coal

We note that further assessments under the Environmental Planning and Assessment Act 1979 are required by Centennial Coal to enable the transfer of water between the two coal mines and the project site. As the transfer of this water is critical to the project, the additional approvals represent significant uncertainty and a risk to the project.

Post approval recommendations

- *The proponent should ensure the necessary approvals to transfer water from the Centennial Coal mines are in place prior to the commencement of any activities for the project.*

Centennial Coal has applied to modify the existing State significant development (SSD) consent SSD-5579 for Western Coal Services. This modification, referred to as MOD 4 – water transfer and management system, includes the redesign of Western Coal Services existing site water management system and construction of a water transfer system to enable the transfer of water to the pipeline development component of the project (ie to pumping station facility No. 2). The status of this application may be found on DPE's Major Projects website: https://pp.planningportal.nsw.gov.au/major-projects/projects/mod-4-water-transfer-and-management-system.

Centennial Coal will progress a separate application to modify the existing Angus Place Colliery's development consent MP 06_0021 to allow for the construction and operation of a water transfer pipeline and associated infrastructure between Angus Place and pumping station facility No. 1.

As noted in Section 2.14.4 of the EIS (EMM 2019), the proposed Regis Resources Water Offtake Agreement (the agreement) with Centennial Coal will ensure a reliable water supply to the mine development. Rights to the pipeline supply water sources will be authorised through this agreement. The agreement will include provisions to ensure that there are no restrictions on the relevant WALs, or the planning approval held by the water supplier that may impact this supply.

3.2 Surface water – Modelling and impacts

Advice dated 10 February 2021

Comments on water balance modelling for upstream of Carcoar Dam

The revised calibration of Rainfall-runoff model has improved with the use of additional data provided by DPIE Water and showed better performance in simulating Carcoar Dam storage volume for historical periods particularly in dry periods. The Water Balance model has been setup with sufficient details of storages for surface water assessment for the project.

The peak groundwater inflow to the pit for the base case has reduced from 890ML/year to 580ML/year. This reduction of groundwater inflow needs to be incorporated in the water balance modelling and resultant impact on daily flows to Carcoar in the post-mining scenario needs to be explained.

Potential changes in runoff characteristics of catchment excision area before and post mining are not considered.

Currently no entitlement is defined in the water balance model to capture runoff. Considering some of the storages are located on higher than 2nd order streams, such consideration is required in modelling.

The daily time series of inflows (for current and post-mining) provided by Regis Resources shows 4% constant reduction of daily inflow into the Carcoar storage post mining compared to current, which is calculated based on the reduction in median annual inflow for the maximum project extend. That linear scaling ignores the attenuation of daily flows due to capture of runoff in various storages and doesn't reflect the effect on initial conditions of the storages on daily inflows. The impact of that on daily inflows to Carcoar Dam and the resultant impact on the downstream of Carcoar Dam under the existing regulations need to be assessed under those conditions of attenuations of daily during low flow periods.

Analysis of impact on the regulated Belubula System due to change of inflow to Carcoar Dam

Regis Resources provided two daily time series of simulated inflows to Carcoar Dam for the period of 1889-2020 for the current and post-mining scenarios. DPIE Water's Belubula Source model (current condition scenario) was used to assess the impacts of reduced inflow to Carcoar storage using the two sets of daily inflow time series provided by Regis Resources.

Some of the key impacts based on the DPIE Water Source Modelling are summarised below.

- *The Carcoar Dam will sit below the dead storage for a 1.2% longer period.*
- *The Carcoar Dam volume will sit below 21,000 ML (threshold for accessing uncontrolled flow) for a 2.0% longer period.*
- *Long-term annual extraction for General Security diversion for irrigation will be reduced by 1.8%.*
- *Long-term annual extraction for General Security diversion for mining will be reduced by 4.6%.*
- *Flow at Carcoar will be below 2 ML/d (related to Basic Landholder Rights) for 0.4% time longer.*
- *Flow at the Helensholme (EoS) will be below 10 ML/d (EoS minimum flow requirement) for 0.3% time longer.*
- *Flow at Helensholme (EoS) will cease for 0.3% time longer.*

The above analysis is based on constant reduction of daily inflow to Carcoar whilst the mine is operational. The initial conditions of storages, operational rules and entitlement arrangement will affect daily inflows to different degrees in different flow ranges and hence, the likely effect of that on EoS flow during low flows will be higher than due to the constant reduction of inflows to storage.

Pre approval recommendation

- *That DPIE P&A consider the significance of the project's impact on Carcoar Dam and downstream flows and consider any mitigation that may be warranted.*

Post approval recommendation

- *That the surface water model be improved to include entitlement which captures runoff, to account for attenuation of daily flows due to runoff capture, and include changes to groundwater peak inflow into the pit.*

3.2.1 Impact on Carcoar Dam

DPIE Water's assertion in the February 2021 advice to DPIE that the surface water modelling predicts a constant 4% reduction in daily inflow to Carcoar Dam post-mining based on median annual inflow for the maximum project extent is not correct. The reduction is not constant and is not based on median inflows. The 4% reduction represents a reduction in catchment area when the project will be at maximum extent, and is irrespective of median, wet or dry climate conditions. Post mining, and following rehabilitation, the reduction in catchment area reporting to Carcoar Dam reduces to 0.46%, in comparison to the current catchment.

The significance of the impact on Carcoar Dam has been assessed and the predicted reduction (ie 50th percentile) in median flows at Carcoar Dam is 185 ML/year during operations. The predicted level of change to flows to Carcoar Dam is considered to be within the natural variability in catchment conditions. Users downstream of the project who rely on and access water within the Belubula River will therefore not experience reduced access to water and are not affected by the project. The small loss of catchment area reporting to Carcoar Dam and project related flow reductions are considered to represent a negligible risk to increased storage vulnerability and lower storage reliability, or downstream regulated river users.

As discussed in Appendix A and above, Regis has identified a surface water licensing pathway in consultation with the NSW Government, which includes a combination of water entitlements held by Regis in the Belubula River above Carcoar Dam Water Source, excluded works exemptions under the WM Regulation, harvestable rights and issuing of a SPAL for the take associated with the TSF.

The volume of water captured by the storages within the operational water system does not reflect the volume of water that would flow downstream to Carcoar Dam under existing conditions. This is due to the difference in runoff characteristics in natural catchments compared to cleared and altered ground conditions that reflect mining operations. The dirty water captured by the storages during operations will not be discharged to the environment, consistent with best practice to prevent potential contamination of the downstream receiving environment.

3.2.2 Improvements to water balance model

DPIE Water and NRAR's advice to DPIE (February 2021) discusses "the impact of … initial conditions and daily attenuations … on daily inflows to Carcoar Dam" and states "the resultant impact on the downstream of Carcoar Dam under the existing regulations need to be assessed … during low flow periods". As the project will be operated as a nil discharge site, the effects of attenuation and initial conditions of the storages will not affect flows to Carcoar Dam. The impact to Carcoar Dam will be 4% catchment reduction during mining and less than 0.5% post mining and rehabilitation. If DPIE Water is referring to the clean water facilities, the location and size of these facilities will have a minor effect on flows and Regis has designed the system such that the facilities are sized to a minimum with the use of large pumps to empty the facilities quickly, resulting in negligible impact on downstream flows.

The surface water balance model will be updated annually using monitoring data, including groundwater inflows to the open cut pit. As mining progresses, the need for further model calibration and verification will be assessed every two years. Regis will apply the adaptive management approach to all environmental related aspects of the project, including assessing surface water-related impacts.

3.3 Groundwater model

Advice dated 10 February 2021

Groundwater model

Although a model upgrade plan has been provided, the proponent has not explicitly committed to improve the model in order to meet Australian Modelling Guidelines 'Class 2' classification within three years of approval. Dr Bell (DPIE P&A consultant engaged to conduct a technical review of the groundwater model) similarly argues for the model classification upgrade as recommended in DPIE Water submissions.

DPIE - Water accepts that conclusion, recognising that reaching a "Class 2" status is not a requirement in itself to be fit-for-purpose. Validation of the model remains to be achieved.

Post approval recommendation

- *The groundwater model verification/review and a model upgrade plan be included as conditions of consent for project approval.*

Section 4.1.3(iii) of the Submissions Report (EMM 2020b) discussed the model upgrade plan and commitment to review and verify groundwater modelling predictions. The groundwater model will be reviewed over time and updated using additional baseline data and data from active mining. As mining progresses, a need for further model updates will be assessed every two years based on evaluation of groundwater monitoring data and findings of impact verification. Regis will apply the adaptive management approach to all environmental related aspects of the project, including assessing groundwater-related impacts.

3.4 Bore impact assessment

Advice dated 10 February 2021

Bore impact assessment

Water levels at test production bore TB05 had recovered by 50 percent after 12 hours and 85 percent after 15 days (360 hours) following the cessation of pumping. EMM suggested that the long duration of recovery was attributed to the limited extend of the aquifer (limestone) and that since most water at this location is sourced from localised karstic storage, only partial dewatering of the primary porosity of the rock matrix likely occurred over the five day test. Therefore, a potential risk is inherent (for extended pumping periods, [e.g. nine months]) that localised karstic storage may be dewatered after which yield from construction water supply bore TB05 may be significantly reduced. Secondly, impacts at bores situated adjacent to TB05 may be greater than predicted as aquifer stress starts to radiate from local limestone into adjacent rock matrix.

Post approval recommendation

- *The proponent should investigate the potential risk posed by the 'dewatering of local karstic storage' at test production bore TB05.*

Regis is continuing groundwater investigations to establish contingency production bores and to meet peak construction water demands at drilling targets identified within the mine development project area and on Regis-owned land. Preliminary targets (identified as indicative construction bores) were presented in Section 2.9.1i and on Figure 2.1 of the Amendment Report (EMM 2020a). As reported in Appendix H of the Amendment Report (EMM 2020a), analytical modelling has been conducted to estimate the potential impacts of a proposed groundwater abstraction rate of 20 L/s for the initial nine months of the construction period to:

- estimate the potential drawdown at the pumping bores from the proposed groundwater abstraction for the initial nine months of the construction period;
- estimate the area of influence (extent of drawdown as defined by the 1 m change in groundwater level) caused by pumping of the bores; and
- assess the potential impacts of operating the bores on local receptors.

Available information regarding existing water supply works indicates these bores are not constructed within the limestone.

Results of the analytical modelling completed for the Amendment Report predict:

- localised groundwater level drawdown around the production bores extending no more than 500 metres (m);
- there are no third-party bores or springs within the extent of modelled drawdown;
- the extent of drawdown will be significantly less than the predicted drawdown from the open cut pit; and
- a temporary reduction in baseflow contribution of 0.7 ML (2.5 kilolitres per day (kL/day)) to the Belubula River in the vicinity of TPB4 during the nine-month period of predicted use. Users downstream of the project who rely on and access water from the Belubula River will not experience a reduced access to water. This reduction in baseflow contribution will be covered by the entitlements held by Regis for the Lachlan Fold Belt MDB Groundwater Source.

3.5 Borefield assessment

Advice dated 10 February 2021

Borefield assessment

The Construction Water Supply Groundwater Investigation and Impact Assessment…concludes that there will be a water supply shortfall of 5 L/s during peak periods of demand during mine construction. Construction water supply demand totals 470 ML (during the first 9 months of construction before the planned pipeline comes online). The shortfall is proposed to be met by drilling and installing additional water supply bores within the mine development and Regis owned land.

DPIE – Water guidelines or trade criteria must be met. The borefield approval is separate from the SSD approval. The groundwater impact of this proposed additional supply has not been assessed and the supply is yet to be proven. Any production bore would be required to follow the groundwater trade process and be assessed against the groundwater trade criteria… The borefield approval is separate from the SSD approval and until this process is complete the borefield is not considered a secure water supply.

Pre-approval recommendations

- *The proponent should clarify with DPIE – Water the arrangement for the proposed borefield. All water supply bores are required to be registered with WaterNSW and hold an access licence and relevant water supply works approval to extract a nominated volume of water. The approval will require an impact assessment carried out by DPIE - Water as per the groundwater trade process.*

Advice dated 14 July 2022

Water supply works

The proponent should apply to DPE Water:

- *For a water supply works approval for any new/additional groundwater supply works required to augment water supply not already referenced in the EIS or Amendment reports.*
- *For a water supply works approval for any ongoing use of the borefield for water supply or other purpose(s) after the water supply pipeline is operational.*

Following the above advice, DPE Water provided advice to DPE on the second Amendment Report (dated 14 July 2022) which states:

> DPE Water has an interim policy regarding borefields associated with SSD applications. The interim policy states the following two positions:
>
> 1. Where the impacts of a borefield, bore or work used to supply water for consumptive purposes to an aquifer interference activity can be clearly separated from the impacts of the aquifer interference activity, the water supply works should be assessed under the same process as a water supply dealing. This principle applies even where both a water supply work/borefield and an aquifer interference activity, for example a mine, are contained in the same application.
>
> 2. Where the impacts of a borefield, bore or work used to supply water for consumptive purposes to an aquifer interference activity cannot be clearly separated from the impacts of the aquifer interference activity, these activities should be assessed together under NSW Aquifer Interference Policy.
>
> As DPE Water's prior advice requested the impacts of the borefield be modelled and this was fulfilled, position 2 of the interim policy on SSD borefields applies. A further impact assessment via the groundwater trade process is not required. However, should any additional groundwater works not already referenced in the EIS or Amendment Reports be required to augment water supply, those works must obtain an approval from DPE Water and will be subject to an impact assessment carried out by DPE Water as per the groundwater trade process.

As discussed in Section 3.4, Regis is continuing groundwater investigations to establish contingency production bores and to meet peak construction water demands at drilling targets identified within the mine development project area and on Regis-owned land.

Under Section 4.41(1)(g) of the *Environmental Planning and Assessment Act 1979* (EP&A Act), Regis will be exempt from seeking a work approval under section 89 and 90 of the WM Act should the project be approved under the EP&A Act. This includes approval for production bores assessed as part of the EIS or Amendment Report. Should the project be approved, Regis will apply to amend the existing WAL to link it to a Miscellaneous Work for all works associated with the project (as reported in the Amendment Report). Regis understands that the 'dealing' will be referred to DPE Water for assessment under DPE Water's 'dealing impact assessment' process.

Should additional production bore targets be identified and constructed (that differ to those presented in the Amendment Report), Regis understands those works would require an approval from DPE Water and would be subject to an impact assessment carried out by DPE Water as per the groundwater trade process.

Regis will consult with DPE Planning and DPE Water as the groundwater investigations progress and the final supplementary production bore/s are established.

3.6 Other post approval recommendations

3.6.1 Metering, monitoring and reporting of water take

Advice dated 10 February 2021

Other post approval recommendations

Develop the ability to accurately meter and monitor water take from surface and groundwater sources and to monitor potential impacts to water sources. This will be a key component to confirm impact predictions, the adequacy of mitigating measures and compliance for water take, and will need to incorporate ongoing review of actual versus modelled predictions.

Report on water take at the site each year (direct and indirect) in the Annual Review. This is to include water take where a water licence is required and where an exemption applies. Where a water licence is required the water take needs to be reviewed against existing water licences

As stated above, Regis is committed to comply with the rules of the applicable water sharing plans, the WM Act, WM Regulation and all associated policies, including the NSW Non-Urban Water Metering Policy. Regis will develop a water management plan (WMP), in consultation with the DPE and DPE Water, that will document water management objectives, commitments, the water management system, management measures, monitoring program, trigger levels and associated action response plan, and reporting commitments. Methods for measuring and metering water take will be included in the WMP.

This will include, for example, a commitment to meter pumped transfer between storages and pumped volumes from the open cut pit. Where interception of water cannot be practically metered, Regis will use monitoring data and modelling to predict and report take. Examples of water interception that cannot be practically metered include:

- runoff volumes;
- rainfall on a dam surface;
- leakage from the Belubula River and Tributary A to groundwater; and
- evaporation from surfaces of WMFs.

Regis will conduct the following to assist with calculating and reporting water intercepted by the project:

- continue to monitor rainfall at the site;
- measure and record pumping between storages and from CWFs to Belubula River downstream of the site;
- monitoring of levels in the storages;
- measure and record pumped volumes from the open cut pit;
- groundwater level monitoring at monitoring locations that will be agreed with DPE Water;
- surface water flow monitoring in the Belubula River;
- use of monitoring data to calibrate the water balance model; and
- use of monitoring data to review and verify groundwater model predictions, including estimates of river leakage to groundwater (an indirect take).

Following commencement of the project, Regis will prepare annual reports that will include, but not be limited to, the following:

- WALs held by Regis, listed by water source;
- direct and indirect water take for the reporting period, calculated using methods described in Section 3.6.1 above, with a comparison to entitlements held (per water source);
- a comparison of actual/measured take and that predicted by the water balance model and groundwater model;
- monitoring results (groundwater and surface water quality and quantity), including trend analysis; and
- review of the water management system and other management measures.

3.6.2 Impacts to watercourses

Advice dated 10 February 2021

Other post approval recommendations

Prior to commencement of construction and operation of the project address the following issues relating to impacts to watercourses from the project and pipeline:

- *Address bed and bank stability*
- *Develop a strategy for reconstruction of excavated or buried watercourses alongside a remediation and rehabilitation strategy for all watercourses lying within the mine project area. This must aim to recover pre-disturbance geomorphic processes and river forms where available.*
- *Devise a remediation and reconstruction strategy for watercourses of 3rd order and greater located within the disturbance envelope. The strategy should be consistent with Rutherford, Jerie and Marsh A Rehabilitation Manual for Australian Streams Cooperative Research Centre for Catchment Hydrology, LWRRDC, Canberra 2000.*
- *Develop a monitoring and response strategy that includes watercourse re-establishment, monitoring and remediation for at least ten years post-mining, to maintain responsibility for watercourse structure and integrity until riparian vegetation is established.*
- *Develop a hierarchy of procedures for any excavation of watercourses to the proposed pipeline between Angus Place coal mine and the McPhillamys mine site based on the published NSW River Styles database. This must prioritise protective mechanisms to those watercourses assigned high fragility classification and recovery potential classes.*
- *In addition, it is recommended that the proponent use the hierarchy of vulnerable rivers to identify the priority for protective works in any pipeline crossings that occur. The hierarchy of fragility classes is set out in the NSW River Styles database; www.trade.maps.argis/apps/webappviewer/index.html?id=425c7364e71a90c4ba353b8949f*
- *Use the protection requirements set out in Guidelines for laying cables in watercourses in waterfront land (NSW Office of Water 2012) as the basis to any approval to the pipeline corridor and watercourse crossings. The geomorphic assessment in Appendix X recommends industry standard guidelines such as Witheridge (2017) Erosion and Sediment Control Field Guide for Pipeline Projects, Parts 1, 2. Geomorphologic criteria should be required to prioritise those rivers and sections/reaches that are vulnerable to degradation on disturbance.*

Advice dated 14 July 2022

Surface water impacts

The watercourse monitoring and response strategy should include more detail for the design and monitoring of the final water diversion across the mine site. It should specify how the diversion will be designed to prevent erosion and instability in the channelised section and to provide for geomorphic processes to maintain channel integrity in the post mine life landscape.

Controlled activities on waterfront land

The proponent should ensure:

- *The design and construction of the northern pipeline option is in accordance with the Guidelines for Controlled Activities on Waterfront Land (NRAR 2018).*
- *Works within waterfront land are in accordance with the Guidelines for Controlled Activities on Waterfront Land (NRAR 2018).*

As outlined in Section 4.1.2(iv)(a) of the Submissions Report (EMM 2020b), during the post closure phase of the mine development, it will not be possible to reinstate watercourses on the surface of the TSF (to maintain the integrity of the TSF capping). A final diversion structure will be constructed that mimics natural geomorphological features consistent with appropriate reference reaches within the catchment and guided by A Rehabilitation Manual for Australian Streams (Rutherford, Jerie and Marsh 2000) or current best practice natural channel design guidance. This method will ensure that, where possible, constructed waterways will have similar characteristics in terms of stream type, alignment, riparian zone width and longitudinal grade to the existing watercourses.

A watercourse remediation and reconstruction strategy will be included in the Rehabilitation Management Plan for the mine development. This strategy will specify how the final clean water diversion will be designed to prevent erosion and instability in the channelised section and to provide for geomorphic processes to maintain channel integrity in the post mine life landscape.

The stability and rehabilitation of the final clean water diversion will be monitored in accordance with the methods described in Section 6 of the EIS Rehabilitation and Landscape Strategy (Appendix U of the EIS) using analogue sites, appropriate completion criteria and annual formal rehabilitation monitoring. These methods will be documented in the watercourse remediation and reconstruction strategy. The final clean water diversion will not be considered stable and rehabilitated until it meets the agreed rehabilitation criteria. Should the criteria not be met within the post closure monitoring period, then consultation with relevant agencies will be undertaken to ensure the remediation strategies are effective.

Monitoring of bed and bank stability of watercourses outside of the direct disturbance footprint within the mine development project area will be carried out under the WMP. This will include bi-annual monitoring (spring and autumn) via established photo and assessment points on the Belubula River downstream of the proposed TSF Runoff WMF (to be established immediately prior to construction) at approximately 50 m intervals downstream to the confluence with Tributary A. The bi-annual timing is designed to assess the potential effects of high intensity summer storms and prolonged winter rainfall periods.

As outlined in Section 4.1.4(iii)(c) of the Submissions Report, Regis commits to the following as part of the construction environmental management plan (CEMP) for the pipeline development:

- Use of the protection requirements set out in the Controlled Activities on Waterfront Land: Guidelines for laying cables in watercourses in waterfront land (NSW Office of Water 2012) and industry standard guidelines such as Witheridge (2017) Erosion and Sediment Control Field Guide for Pipeline Projects, Parts 1, 2.

- Best Practice Erosion & Sediment Control will be incorporated into the CEMP for the pipeline development construction (International Erosion Control Association (IECA) Australasia (2008)).

- In consultation with DPE Water, Regis will develop a hierarchy of procedures for any excavation of watercourses based on the published NSW River Styles database and other watercourses identified as at risk of geomorphic change.

- Geomorphologic criteria will be established to prioritise those rivers and sections/reaches that are vulnerable to degradation on disturbance, particularly targeting bed and bank stability.

- Devise a remediation and reconstruction strategy in consultation with DPE Water for watercourses crossings of third order and greater. The strategy will be consistent with A Rehabilitation Manual for Australian (Rutherford, Jerie and Marsh 2000). Regis commits to restoration associated with the pipeline that at a minimum maintains the condition of the geomorphology at the crossing, ie no net degradation.

- Monitoring of geomorphic aspects of the pipeline watercourse crossings will focus on significant storm runoff events. An inspection will be undertaken of a random sample of crossings of first and second order streams, and all third and higher order streams, as soon as possible following a 20% annual exceedance probability regional storm event.

- Inspection of watercourse crossings will be incorporated in the routine pipeline inspection and maintenance procedures developed for the operational phase.

All works within waterfront land will be undertake in accordance with the Guidelines for Controlled Activities on Waterfront Land (NRAR 2018).

4 Closing

We trust the responses contained in this letter address the matters raised in DPIE Water and NRAR's submission on the project's Submissions Report and Amendment Report as well as DPE Water's submission on the second Amendment Report.

5 References

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– 2022b, *Maximum Harvestable Right Calculator*, viewed 24 August 2022, https://www.waternsw.com.au/customer-service/water-licensing/blr/harvestable-rights-dams/maximum-harvestable-right-calculator

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Appendix A

Surface water management system and licensing strategy

A.1 Introduction

LFB Resources NL (a 100% owned subsidiary of Regis Resources Limited (Regis)) is proposing to develop and operate the McPhillamys Gold Project (the project) in Central West NSW. The project comprises an open cut gold mine and associated infrastructure. This document has been prepared to provide further information regarding estimated surface water take associated with the project and confirm pathways to meet the regulatory requirements of the *Water Management Act 2000* (WM Act).

The volumetric estimates of water take have been provided in this document based on predictions made by HEC using water balance models developed for the project. These initial estimates provide indicative volumes and will be further reviewed and verified as further streamflow monitoring (at Regis' dedicated stream gauge on the Belubula River), design revisions and modelling is undertaken.

A.2 Regulatory setting

A.2.1 Overview

The objective of the WM Act is to enable sustainable and integrated management of the state's water for the benefit of both present and future generations. The licensing provisions of the WM Act apply to areas where a water sharing plan (WSP) has commenced, with WSPs implemented across the state. WSPs are statutory documents developed under the WM Act that establish the rules for sharing water between the environment and water users, and between competing water users.

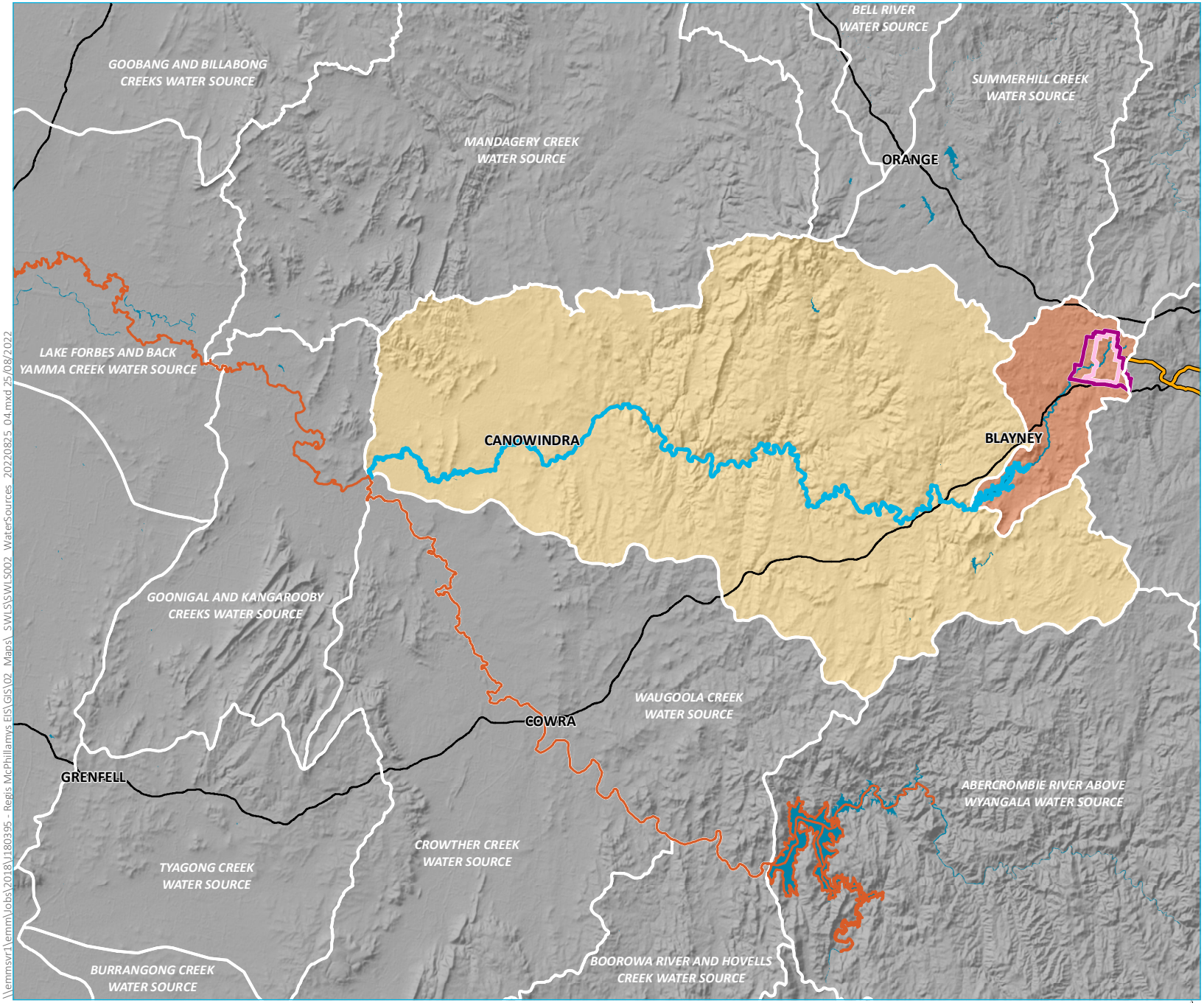
The key regulation made under the WM Act is the Water Management (General) Regulation 2018 (WM Regulation). The regulation specifies important procedural and technical matters related to the administration of the WM Act and also specifies exemptions from licence and approval requirements under the WM Act.

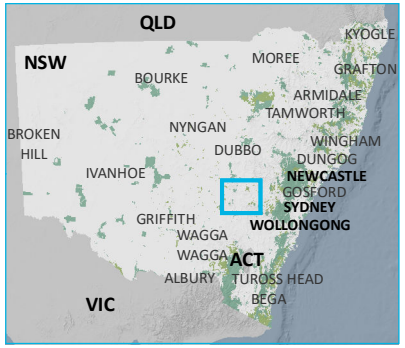
The project is located within the Belubula River above Carcoar Dam (BRACD) Water Source, which is regulated by the Water Sharing Plan for the Lachlan Unregulated River Water Sources 2012 (LUR WSP). There are four water access licences (WALs) within the BRACD water source with a total of 264 share components (WaterNSW 2022a). Regis currently holds two of these WALs with a combined 70 share units and was recently successful in its registration of interest for the 2022 controlled allocation order for an additional 192 share units. Purchase of the additional 192 shares has increased the shares in the BRACD Water Source held by Regis from 70 shares to 262 shares out of a total of 264 shares available (ie more than 99% of the total available entitlement in the water source).

The water sources in the vicinity of the project are presented in Figure A.1.

A.2.2 Harvestable rights

Owners or occupiers of a landholding are entitled to collect a proportion of the runoff from their property in one or more dams located on a minor stream or unmapped stream and use the water without the need for a licence or approval under the WM Act.





KEY

- Primary road
- Belubula River
- Named waterbody

Project application area

- Mine development project area
- Mining lease application area
- Pipeline

Water source

- Belubula River above Carcoar Dam Water Source
- Belubula Tributaries below Carcoar Dam Water Source
- Other water source
- Belubula Regulated River
- Lachlan Regulated River

INSET KEY

- NPWS reserve
- State forest

Source: EMM (2022); DPIE (2021); DFSI (2017); GA (2011); ASGC (2006)

\\emmsvr1\emm\Jobs\2018\J180395 - Regis McPhillamys EIS\GIS\02 Maps\ SWLS\SWLS002 WaterSources 20220825 04.mxd 25/08/2022

Water sources

McPhillamys Gold Project

Figure A.1

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In the Central and Eastern Divisions of NSW (where the project is located), landholders may capture, store and use up to 10% of the average regional runoff for their property. The total capacity of all dams on minor streams on a property allowed under the harvestable right is called the maximum harvestable right dam capacity (MHRDC). An MHRDC calculator is available on the WaterNSW website, which considers location, rainfall and variations in rainfall patterns.

If the total capacity of dams on minor streams on a property exceeds the maximum harvestable rights volume, unless otherwise exempt, a licence is required to authorise the take of water in excess of the maximum harvestable right volume. In addition, unless exempt under the WM Act or EP&A Act (as is the case for Regis, being a State significant development (SSD)), water supply work and use approvals are required for dams that exceed the maximum harvestable right volume.

The total current and proposed area of Regis' landholdings associated with the project is 2,951 ha. Using the online MHRDC calculator (WaterNSW 2022b), the total harvestable right for the project is 221.3 ML. A baseline assessment of existing farm dams on Regis landholdings has found that these storages had an estimated combined capacity of 104.1 ML. An additional six existing farm dams on non-minor watercourses were also identified, with an estimated total capacity of 10.7 ML. An analysis of historical aerial imagery suggests these dams were constructed prior to January 2001 and are used solely for stock and/or domestic purposes. These dams are therefore classified as excluded works under Schedule 1, item 7 of the WM Regulation and have been excluded from the harvestable rights calculations.

Based on the calculations above, the total remaining harvestable right volume available for the project is 117.2 ML (ie total harvestable right of 221.3 ML minus existing farm dam capacity of 104.1 ML).

A.2.3 Exemptions

i Excluded works

Water taken from or by means of an excluded work specified in Schedule 1 of the WM Regulation does not require a WAL or water supply work or water use approvals.

Dams that are solely for the capture, containment or recirculation of drainage, consistent with best management practice or required by a public authority (other than Landcom or the Superannuation Administration Corporation or any of their subsidiaries) to prevent the contamination of a water source, that are located on a minor stream, are considered to be excluded works under Schedule 1, item 3 of the WM Regulation.

ii Hydrolines

The term "minor stream" is defined under clause 3(1) of the WM Regulation as follows:

> minor stream means:
>
> a) any stream or part of a stream:
>
> i) the location of which is specified in the hydroline spatial data, and
>
> ii) that is identified as a first or second order stream, or part of such a stream, as determined in accordance with the system set out in Schedule 2, and
>
> iii) that does not maintain a permanent flow of water, being a visible flow that occurs on a continuous basis, or would so occur if there were no artificial abstractions of water or obstruction of flows upstream, and
>
> iv) that does not at any time carry flows emanating from a third or higher order stream as determined in accordance with the system set out in Schedule 2, or
>
> b) any stream or part of a stream the location of which is not specified in the hydroline spatial data.

> For the purposes of paragraphs (a) (i) and (b), a stream is specified in the hydroline spatial data if it is identified as a watercourse (however described) in accordance with the legend or terms of that data.

Additionally, the term "hydroline spatial data" is defined as follows:

> hydroline spatial data means the *Water Management (General) Regulation 2018* hydroline spatial data published by the Department on the Department's website.

The Hydro line spatial data (hydroline) is a data set of mapped watercourses and waterbodies in NSW which is used to determine the Strahler stream order of a watercourse (set out in Schedule 2 of the WM Regulation). This in turn enables the interpretation of a "minor stream" for the purpose of the excluded work provisions is based on the definition in the WM Regulation. The Regulation hydroline dataset is a 'static' version published on the Department's website (https://www.industry.nsw.gov.au/water/licensing-trade/hydroline-spatial-data).

A more contemporary and dynamic hydroline dataset is managed by the Spatial Services Division of the NSW Department of Finance, Services and Innovation (Spatial Services) and is updated from time to time to reflect existing conditions in accordance with the NSW Foundation Spatial Data Framework (DFSI 2018a) and the NSW Custodianship Guidelines for Spatial Data (DFSI 2018b).

A.2.4 WM Act approvals

Approved SSD projects do not require water supply work, water use or controlled activity approvals. As the project is SSD, no approvals under the WM Act will be required for activities and take described in the approval documentation.

A.3 Proposed water management system

A summary of the details of the proposed water management storages for the project is presented in Table A.1. The location of the proposed water management system has been carefully considered and optimised to balance environmental and social impact with maintaining a pragmatic and economically viable mine plan. The key principle of the water management system is the diversion of clean water around the mine disturbance footprint to avoid the take of water from the catchment as much as possible. Instead, operational water will be supplied to the project via an external pipeline from Angus Place Colliery, Springvale Coal Services Site and Mount Piper Power Station, near Lithgow.

Table A.1 Details of proposed water management facilities

Storage	Maximum capacity (ML)	Purpose
CWF1	506	Capture of clean water runoff from upstream undisturbed catchments and divert runoff into Belubula River downstream of mine development during operation
CWF2	21.6	
CWF3	3	
CWF4	1.6	
CWF5	3.3	
MWMF	2,009	Capture and storage of mine water/dirty water runoff
RWMF	217	Initial site water supply storage to provide water for construction activities Store external water transferred to the site
SRWMF	600	Capture and storage of dirty/sediment laden water runoff
Tailings Storage Facility (TSF)	Variable	Storage and management of tailings and internal TSF runoff

Table A.1 Details of proposed water management facilities

Storage	Maximum capacity (ML)	Purpose
TSF Runoff Water Management Facility (WMF)	25.8	Capture and storage of dirty water runoff from TSF crest and main embankment
WMF1	70	Capture and storage of dirty water runoff, including flows from the waste rock emplacement
WMF2	60	
WMF3	21.3	
WMF4	123	
WMF5	136	
WMF6	158	

A.3.1 Key changes

The clean water diversion system and operational water management system for the project have been revised following consultation with DPE Water. Figure A.2 presents the amended water management system layout, as presented in the 2022 Amendment Report (Regis 2022). Key changes from the water management system that was presented in the revised Surface Water Assessment (HEC 2020) and Amendment Report (EMM 2020b) are summarised as follows (discussed further in the following sections):

- removal of the Construction Water Management Facility (CWMF);
- optimisation of Clean Water Facility (CWF) 1 pump rate; and
- addition of CWF4, CWF5 and upslope diversions for the Raw Water Management Facility (RWMF) and the Mine Water Management Facility (MWMF) to eliminate water reporting to these from the undisturbed catchment.

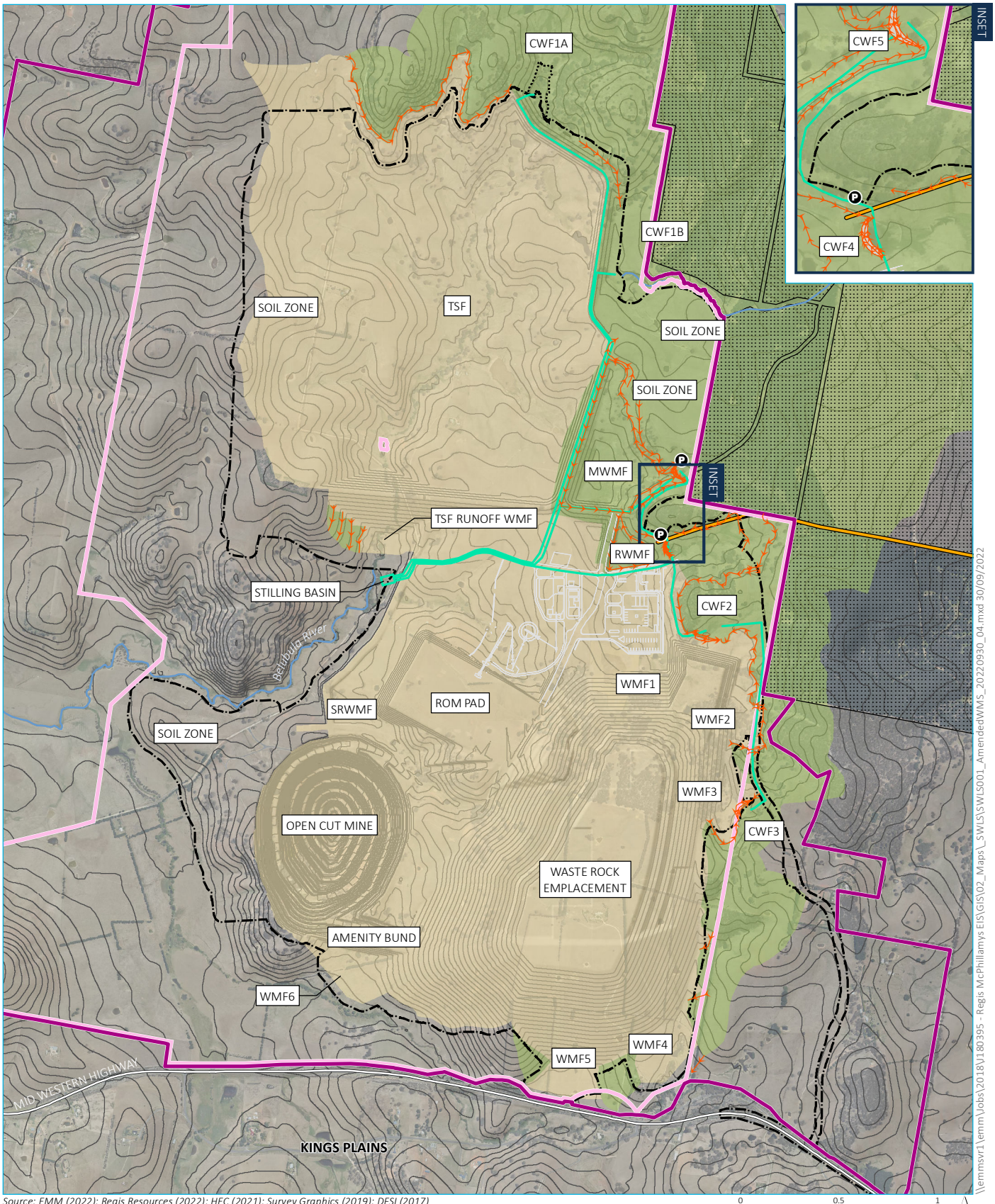
A.3.2 Clean water facilities

Where practical, Regis proposes to divert clean water around all facilities to be constructed at the site, so as to divert catchment runoff back to the Belubula River catchment and not 'harvest' it for supply to the project. Therefore, harvesting of overland flow will be minimised, with diverted runoff maximised.

During mining, clean water will be diverted around the mine development via a series of diversion drains, CWFs, pumps and pipelines, as shown in Figure A.2. Runoff from undisturbed areas will be directed to a system of upslope runoff diversion drains and either directed to existing gully lines or to one of five CWFs. The CWFs will be dewatered by pumping to the Belubula River downstream of the mine development during and following rainfall events.

i CWF1

The largest CWF is CWF1, which will be located upslope of the TSF with a catchment area of approximately 6.8 km2. The embankment which forms CWF1 also forms the northern embankment of the TSF and is planned to be built progressively in two stages. Stage one of the embankment will be used to establish CWF1A and stage two of the embankment will be used to establish CWF1B. CWF1A and CWF1B are collectively referred to as CWF1. At higher water levels (during periods of higher rainfall and associated runoff), the two storages will form a single pond.



Source: EMM (2022); Regis Resources (2022); HEC (2021); Survey Graphics (2019); DFSI (2017)

0 0.5 1 km

GDA 1994 MGA Zone 55

N

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KEY

Project application area
- Mine development project area
- Mining lease application area (Note: boundary offset for clarity)
- Disturbance footprint
- Additional (post-closure) disturbance footprint
- Pipeline
- Mine plan contour (5 m)

- Diversion pump
- Diversion drain
- Plant layout
- Pipeline

- Diverted catchment
- Non-diverted catchment

Existing environment
- Major road
- Belubula River
- Vittoria State Forest

Amended water management system layout

McPhillamys Gold Project

Figure A.2

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Accumulated water will be diverted around the TSF to downstream of the mine development, so that both the catchment area reporting to the operational water management system and the impacts on downstream flow are reduced. The only purpose of this facility is to divert clean runoff from undisturbed catchments to the Belubula River downstream of the mine disturbance area. No clean water from this facility will be used to meet the site water demand.

Water balance modelling of CWF1 was undertaken by HEC[2] (2020; 2021; 2022) to estimate the storage capacity and pump rates for CWF1A and CWF1B.

Water balance modelling of the CWFs for the 11 year project life was undertaken by HEC (2020) to conceptually estimate the storage capacity and pump rates for CWF1A and CWF1B. The storage capacities and pump rates were conceptually sized to prevent spills into the TSF and avoid ponded water levels above 954 m Australian Height Datum (AHD) to prevent substantial flooding of the Vittoria State Forest to the north of the site. CWF1 will pond water for short periods of time during and following rainfall events while diversion pumping occurs.

The CWF water balance model has been updated by HEC (2022) to include additional recent climate data and catchment rainfall-runoff model parameters (calibrated using data recorded at the gauging station on the Belubula River located immediately downstream of the proposed mining area installed by Regis in March 2020). The model was then used to investigate a range of CWF1 storage capacity and pump rate combinations. For a given maximum water level, pump rates were iteratively derived to prevent spill from CWF1 in any of the 133 climatic scenarios simulated (based on the full historical climatic data set).

ii CWF2 and CWF3

CWF2 and CWF3 will be established as small embankments across first order streams upslope of the mine disturbance area, with any ponded water to be diverted downstream by pumping. The nominal capacities of CWF2 and CWF3 are 21.6 ML and 3 ML respectively.

iii CWF4 and CWF5

The design of the RWMF and MWMF has been reconsidered to eliminate undisturbed catchment runoff contributions to storages in the operational water management system by using upslope diversions and two additional CWFs (CWF4 and CWF5). A conceptual design for the additional diversions and CWFs has been undertaken by HEC (2021) and is presented in Figure A.2.

A contour drain upslope of the RWMF will be established to direct runoff to CWF4. CWF4 will be formed by enhancing an existing farm dam to a conceptual capacity of 1.6 ML. A contour drain upslope of the MWMF will also be formed, with the northern-most drain diverting catchment north to CWF1B and the remaining drains diverting runoff to CWF5. CWF5 will be established as an embankment across the drainage line reporting to the MWMF, with a conceptual capacity of 3 ML. Both CWF4 and CWF5 will be equipped with a pump and pipeline to divert ponded water to the Belubula River downstream of the mine disturbance area.

The additional upslope diversions and CWFs will divert a further 32 hectares (ha) of undisturbed catchment and reduces the catchment area reporting to the RWMF and MWMF to a practical minimum. The total catchment area intercepted by the operational water management system at maximum development of the project will be reduced from an estimated 964 ha to 932 ha.

A.3.3 Operational water management system

i Overview

Runoff from mining areas such as haul roads, waste rock emplacements, hardstand areas and the open cut is part of the operational water management system for the mine development.

[2] HEC (Hydro Engineering and Consulting) has recently become a division of ATC Williams Pty Ltd.

Runoff from these areas has the potential to contain elevated levels of environmentally significant contaminants such as metals, nutrients, suspended solids and hydrocarbons. The operational water management system will be comprised of a number of WMFs, the open cut and the TSF, together with a system of pumped transfers and drains in order to capture and contain site runoff to prevent its release to the surrounding environment, as shown in Figure A.2.

A CWMF was proposed for initial site water supply storage, providing water for construction activities. As part of the 2022 Amendment Report (Regis 2022), the staging of water storage construction was reviewed, and it was determined that the RWMF can be constructed earlier so that it can be used as the raw water supply storage during the construction phase of the project instead of the CWMF. The CWMF is therefore not required for the amended water management system.

The MWMF and SRWMF will be the main water storages on site, with operational water captured in other storages pumped to the MWMF or, prior to the MWMF commissioning, the SRWMF. The SRWMF, WMF1, WMF2, WMF3, WMF4, WMF5 and WMF6 will capture runoff from the waste rock emplacement and other infrastructure areas with accumulated water pumped to the MWMF.

The TSF Runoff WMF will be located downstream of the TSF to serve as a sediment dam during the construction of the TSF main embankment and capture runoff from the crest and outer main embankment during the operational phase of the mine.

The open cut will receive groundwater inflow and rainfall runoff with accumulated water to be pumped to the MWMF.

ii Revised water balance modelling

As discussed in Section A.3.2iv, the design of the RWMF and the MWMF has been reconsidered to minimise the undisturbed catchment contributing to the storages using upslope diversions and two additional CWFs. HEC (2021) has updated water balance modelling of the operational water management system considering these changes.

The capacities of the RWMF and MWMF remain unchanged from those given by the revised Surface Water Assessment (HEC 2020). The MWMF is the main operational water storage on site. During periods of extended rainfall, significant volumes of water will need to be stored within the MWMF to reduce the volume of water stored in the TSF, other WMFs and the open cut. The RWMF stores water from the imported pipeline supply. During low rainfall periods, this storage would be maintained with a significant operating volume to maintain site supply of water.

The updated operational water balance model results, including stored water volumes, water supply reliability and spill risk, were found to be similar to the results given by the revised Surface Water Assessment (HEC 2020), although the rainfall runoff yield to the storages has been significantly reduced.

iii Potential reduction of inflows to Carcoar Dam

Water balance modelling of streamflow to Carcoar Dam was undertaken by HEC (2020) using an Australian Water Balance Model (AWBM), which was parameterised to represent the local catchment to Carcoar Dam. The model was reviewed by the (then) NSW Department of Planning, Industry and Environment Water Group (DPIE Water), who confirmed that the model is generally fit for purpose to assess flow interceptions and reduction of inflows to Carcoar Dam (DPIE Water 2021).

The model was updated by HEC (2021) to consider the reduction in the total catchment area intercepted by the operational water management system at maximum development of the project due to the additional upslope diversions and CWFs as described above. The model was also updated to include additional recent climate data and run using the full period of available historical climatic data to obtain a series of annual total inflows to Carcoar Dam. The same model was then run with the revised maximum catchment area captured by the mine development (932 ha, as discussed in Section A.3.2iii).

A summary of the modelled "existing" and "with project" total annual inflows to Carcoar Dam is provided in Table A.2. For comparison, results from the modelling reported in the revised Surface Water Assessment (HEC 2020) are also presented in Table A.2.

The updated model results indicate a slight improvement in the predicted project peak modelled reduction in annual inflows to Carcoar Dam. As with the results for the revised Surface Water Assessment (HEC 2020), there is a less than 4.1% reduction in the total Carcoar Dam catchment at the maximum development disturbance. This is equivalent to a reduction in median inflows to Carcoar Dam of 185 ML/year. This level of change to inflows to Carcoar Dam will be imperceptible and within the natural variability in catchment conditions.

Table A.2 Modelled change in inflow to Carcoar Dam during operations (HEC 2020; 2021)

Percentage of time flow is greater than the modelled inflow	Existing inflow (ML/year)		With project inflow (ML/year)		Decreased inflow due to maximum project extent (ML/year)	
	HEC (2020) model[1]	Updated model[2]	HEC (2020) model[1]	Updated model[2]	HEC (2020) model[1]	Updated model[2]
95%	1,574	1,576	1,509	1,512	65	64
90%	2,014	2,020	1,930	1,938	83	83
80%	2,554	2,554	2,448	2,449	106	104
70%	3,058	3,070	2,932	2,945	127	125
60%	3,628	3,640	3,478	3,492	150	149
50%	4,485	4,526	4,299	4,341	186	185
40%	6,236	6,250	5,978	5,994	258	255
30%	12,317	12,493	11,807	11,983	510	510
20%	22,646	22,571	21,709	21,649	937	922
10%	36,156	35,974	34,660	34,505	1,496	1,469
5%	56,104	56,019	53,782	53,731	2,322	2,288

1. As presented in the revised Surface Water Assessment (HEC 2020).
2. Updated model that considered additional upslope diversions, CWF4 and CWF5 to minimise catchment reporting to the RWMF and MWMF (HEC 2021).

A.3.4 Final landform

Post mining, all mining areas, except for the final void, will be regraded to a stable landform and revegetated. All disturbed areas, except for the final void catchment, will be rehabilitated. Permanent clean water diversion channels will be constructed to allow a free-draining landform. A clean water diversion channel will be constructed adjacent to the northern boundary of the open cut area to divert upslope runoff to the Belubula River.

A.4 Licensing pathway

Regis is required to hold WALs and entitlement (or shares) in accordance with the requirements of the WM Act and WM Regulation, and prior to water take occurring within any water year (1 July to 30 June). Proponents are required to hold WALs and sufficient share entitlements to account for both direct and indirect water take prior to the take occurring. Site water balance and groundwater modelling have been used to predict and quantify the volume of water intercepted during and post mining and the ultimate sources of that water. Methods for measuring and metering water intercepted is discussed in the covering letter to this appendix (refer Section 3.6.1).

The pathways to account for the project's water take under the WM Act is summarised in Figure A.3 below and discussed further in this section.

The proposed surface water licensing pathway demonstrates that the project can operate within the NSW water regulatory framework through the application of excluded works exemptions, harvestable rights and sufficient entitlement for all licensable surface water take. The preferred pathway relies on:

- updating/refreshing of the WM Regulation hydroline dataset as indicated in DPE's advice of June 2021;
- implementation of the government positions contained in DPE's draft Factsheet of July 2022 "How to interpret excluded work exemptions";
- a successful application for a SPAL or SPALs post project approval; and
- successful purchase of entitlement in the Belubula Regulated River Water Source to offset the reduction in streamflow at Carcoar Dam.

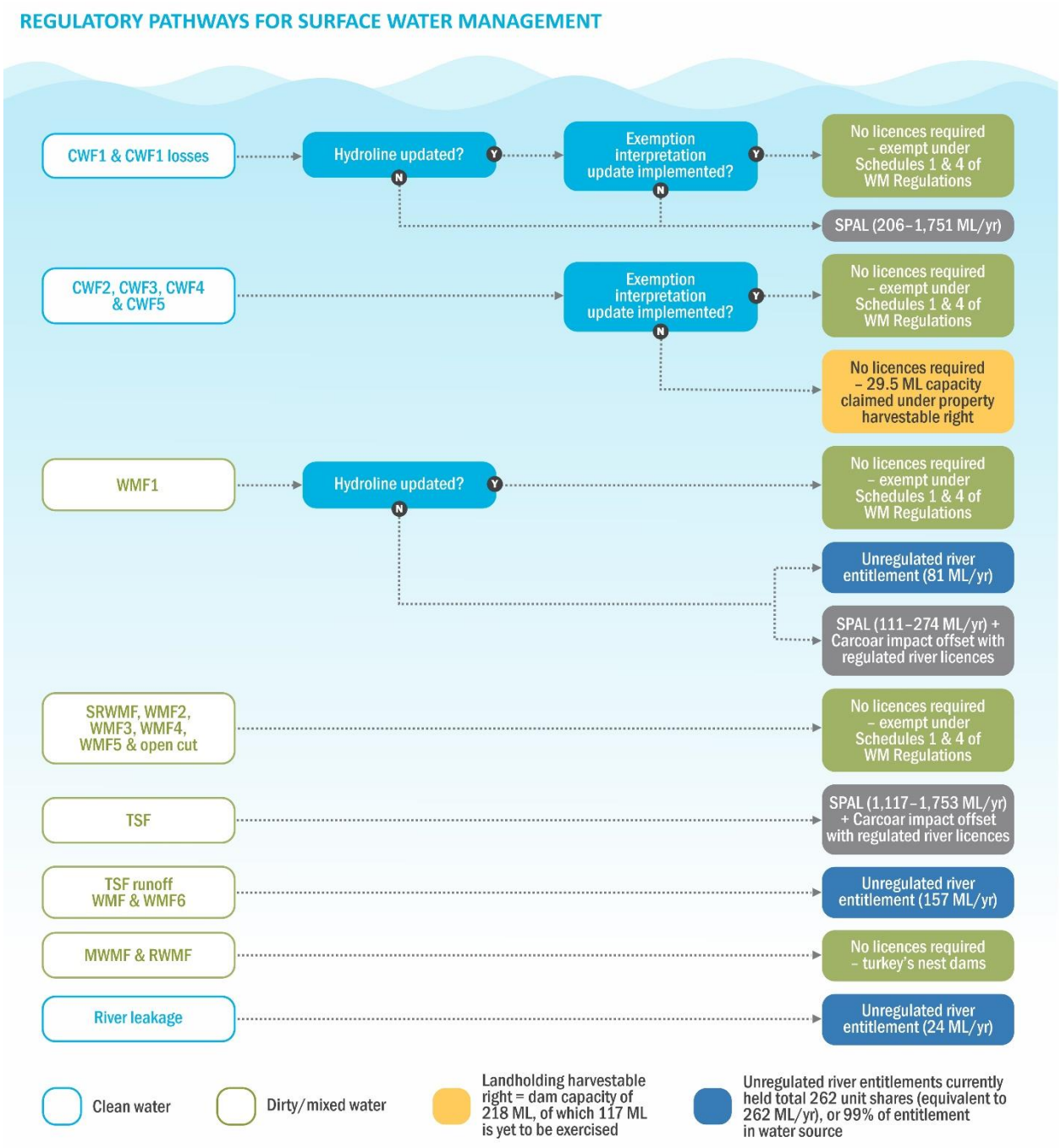

Figure A.3 Regulatory pathways for surface water management

A.4.1 Stream order verification

The preferred surface water licensing strategy for the project relies on the WM Regulation hydroline spatial data accurately depicting the watercourse configuration on the land relevant to the project. However, the hydroline spatial data for the relevant land is currently based on historical topographic mapping and has not been updated to accurately reflect the current watercourse configuration of this significantly modified landscape. EMM (2020c) undertook an assessment to validate and verify the watercourses and stream order of those watercourses in the vicinity of the project (based on the Strahler (1952) system), focusing on the location of the TSF. The assessment was based on geomorphic principles and collated aerial footage to document the catchment and considered relevant definitions in the WM Act and WM Regulation.

The verified stream order presented by EMM (2020c) is considered to accurately represent the watercourse configuration of the landscape. A number of watercourses that are currently mapped by the WM Regulation hydroline spatial data as non-minor streams (ie third order streams or above) have been verified by EMM (2020c) to either not exist or be minor streams (ie first or second order streams). Many of the watercourses in the project area depicted by the hydroline spatial data in the catchment headwaters were found to be topographical depressions rather than watercourses. They lacked incised channels, flow confinement, vegetation assemblages and other attributes common to streams and rivers. The verified stream order presented by EMM (2020c) accurately represents the watercourse configuration of the landscape.

The stream order assessment report (EMM 2020c) outlining the verified stream orders was submitted to DPE, and Spatial Services confirmed on 17 November 2020 that this report has been accepted. It is understood that this new dataset has been uploaded to the NSW Government database; however, this new baseline dataset has not become the official baseline hydroline layer for the purposes of the WM Regulation.

In correspondence of 22 June 2021 to the (then) NSW Department of Planning, Industry and Environment (DPIE), DPE Water indicated that it intends to implement a regular update process for the hydroline dataset used to calculate stream order for WAL exemption purposes (ie excluded works under Schedule 1 of the WM Regulation).

A comparison of the stream order of hydrolines is presented in Table A.3, showing the current WM Regulation hydroline spatial data (DPE Water 2022), and the verified stream orders presented by EMM (2020c). Non-minor streams (ie third order or higher) are indicated in blue in Table A.3. As the stream order assessment (EMM 2020c) was focused primarily on the location of the TSF, the stream orders of several storages (ie CWF3, CWF4, SRWMF, WMF3, WMF4, WMF5 and WMF6) were not revised, as indicated by blank cells in the table.

Table A.3 Project water management facility and water take details

Storage	Maximum capacity (ML)	Peak water take (ML/year)[1]	Peak water take year	Current stream order[2]	Refreshed stream order[3]
CWF1	506	202[4]	1-11	3	2
CWF1 losses	NA	4	1-11	3	2
CWF2	21.6	N/A		1	1
CWF3	3	N/A		1	
CWF4	1.6	N/A		2	
CWF5	3.3	N/A		1	1
MWMF	2,009	0[5]	7	4	2
RWMF	217	0[5]	3	4	2
SRWMF	600	600	4	2	
TSF	Variable	1,117[6]	11	5	3
TSF Runoff WMF	25.8	29	4	5	3

Table A.3 Project water management facility and water take details

Storage	Maximum capacity (ML)	Peak water take (ML/year)[1]	Peak water take year	Current stream order[2]	Refreshed stream order[3]
WMF1	70	192[7]	1	4	2
WMF2	60	36	2	2	1
WMF3	21.3	39	11	1	
WMF4	123	117	4	2	
WMF5	136	130	2	2	
WMF6	158	128	2	3	
River leakage	NA	24	11		
Open cut pit	Variable	360	5	1	
Final void (post mining)		112	Ongoing	1	

1. Peak water 'take' is the rainfall runoff captured by the water management facilities. For all facilities, take is based on water balance modelling predictions for a wet (80th percentile) rainfall year.
2. Based on the current WM Regulation hydroline spatial data (DPE Water 2022).
3. Based on verified watercourses and stream orders presented in EMM (2020c). As the stream order assessment (EMM 2020c) was focused primarily on the location of the TSF, the stream orders of several storages (ie CWF3, CWF4, SRWMF, WMF3, WMF4, WMF5, WMF6 and the open cut pit) were not revised, as indicated by blank cells.
4. Note this volume is significantly less than previously reported (see DPE Water advice of August 2021 wherein volume was reported as 655 ML/year at the 80th percentile). This change has come about as a result of CWF model re-calibration to a new streamflow gauging station directly downstream of the Project site. Note also that the CWF1 take during an extremely high rainfall year (98th percentile) may be up to 1,751 ML. If a SPAL is required, this larger volume may need to be considered to comply with the water account management rules in the LUR WSP if there is a series of very wet years.
5. Note that these volumes are significantly less than previously reported (see DPE Water advice of August 2021 wherein volumes reported were 178 ML/year and 50.3 ML/year for the MWMF and RWMF storages respectively at the 80th percentile). This is a result of the redesign of these facilities, as recommended by DPE Water to reduced capture of runoff to a practical minimum. These facilities are now 'turkey's nest' structures that do not capture rainfall runoff.
6. Note the TSF take under extremely wet conditions (98th percentile rainfall year) may be up to 1,753 ML/year. A SPAL of this larger volume may need to be considered to comply with the water account management rules in the LUR WSP if there is a series of very wet years.
7. Note that WMF1 take under extremely wet conditions (99th percentile rainfall year) may be up to 325 ML/year. If a SPAL is required to meet all or part of the take, this larger volume may need to be considered to comply with the water account management rules in the LUR WSP if there is a series of very wet years.

As shown in Table A.3, CWF1, MWMF, RWMF and WMF1 are all located on watercourses that are classified as non-minor (ie third order or higher) by the current WM Regulation hydroline spatial data (DPE Water 2022). However, these have been verified to be minor (ie first or second order) by EMM (2020c) and agreed by Spatial Services.

The TSF and TSF Runoff WMF were confirmed to be on a non-minor stream by EMM (2020c). The proposed location of WMF6 was not considered as part of the stream order assessment (EMM 2020c) and is mapped as on a non-minor (third order) stream by the current WM Regulation hydroline spatial data (DPE Water 2022).

Acceptance of the EMM (2020c) stream assessment report so that the hydroline accurately depicts the stream order based on on-site verification will allow CWF1 and its losses and WMF1 to be considered under the excluded works provisions of the WM Regulation.

As outlined, irrespective of stream order, the re-design of MWMF and RWMF as 'turkey's nest' dams 'has removed a licence requirement for water take by these structures' (as per DPE Water advice of July 2022).

A.4.2 Harvestable rights

As described in Section A.2.2, the harvestable right volume available for the project (accounting for existing farm dams) is 117.2 ML. CWF2, CWF3, CWF4 and CWF5 are located on existing minor streams (first or second order), upslope (east) of the waste rock emplacement and processing plant area. These facilities will have an estimated combined total capacity of 29.5 ML. Regis's preference is to treat these facilities as exempt works. Alternatively, take from these storages can be accounted for under the harvestable right for the landholding.

A.4.3 Excluded works

Dams and other works that are on minor streams and are for certain purposes are excluded works as specified in Schedule 1 of the WM Regulation. These dams and works do not require a water supply work or water use approval, and do not require a WAL for the purposes and in the circumstances specified in Schedule 1. In July 2022, DPE Water released a draft factsheet for targeted consultation – "How to interpret excluded work exemptions" – clarifying the interpretation/application of the excluded works provisions in Schedule 1 to the WM Regulation and, by extension, the requirement for access licences for water captured by these.

i Operational water management facilities

Dams on minor streams that are solely for the capture, containment or recirculation of drainage to prevent the contamination of a water source are excluded works under Schedule 1, item 3 of the WM Regulation.

As discussed in Section A.3.3, the operational water management system will be comprised of a number of WMFs, the open cut and TSF, together with a system of pumped transfers and drains in order to capture site runoff and prevent its release to the surrounding environment. Consistent with best management practice, the storage and pumping system capacities have been sized such that no spills have been predicted by water balance modelling for the operational life of the project. In addition, the water management system has been optimised to reduce the undisturbed catchment area that contributes to the WMFs to a practical minimum.

The project seeks to rely on the excluded works exemption under Schedule 1, item 3 of the WM Regulation for the majority of the proposed WMFs, because:

- they have been designed to prevent discharges to the environment, and represent best management practice to capture, contain and recirculate drainage to prevent the contamination of the downstream receiving environment;
- MWMF and RWMF have been re-designed as a 'turkey's nest' dams following advice from DPIE Water and NRAR to eliminate the undisturbed catchment contributing to the storages using upslope diversions and two additional CWFs (CWF4 and CWF5); and
- SRWMF, WMF1, WMF2, WMF3, WMF4 and WMF5 are located on minor streams (based on the verified stream orders (EMM 2020c), and as per Table 2.1).

If the hydroline is not updated, a SPAL would be required for a portion of the water take associated with the WMF1.

The TSF, TSF Runoff WMF and WMF6 are not on minor streams. Take associated with the TSF Runoff WMF and WMF6 can be accounted for by relying on the 262 unit share entitlements held by Regis. A SPAL will be sought for take associated with the TSF (see subsection 3.1.1iv below).

ii CWFs

DPE Water's July 2022 draft factsheet notes that an exemption under Schedule 1, item 3 of the WM Regulation can apply to dams that capture water that is not already contaminated (ie clean water), if it would otherwise have flowed over land and result in it contaminating a water source.

All CWFs will divert clean water around the TSF downstream of the mine development to reduce the catchment area reporting to the operational water management system and reduce the downstream flow impact. The CWFs serve no purpose other than to divert clean runoff from undisturbed catchments to the Belubula River downstream of the mine disturbance area. Without the capture of this clean runoff in CWF1, this water would come into contact with mining areas such as haul roads, waste rock emplacement and hardstand areas. As discussed in Section A.3.3i, runoff from these areas has the potential to contain elevated levels of environmentally significant contaminants such as metals, nutrients, suspended solids and hydrocarbons. No clean water from these facilities will be used to meet the site water demand.

Under DPE Water's most recent clarification of the exempt works regulation and following the update to the WM Regulation hydroline dataset, all CWFs would be excluded works under Schedule 1, item 3 of the WM Regulation. If the hydroline dataset is not updated, and/or the exempt works clarification is not implemented, a SPAL would be sought for take by CWF1 (see Section A.4.5 below). This was enabled by the 1 April 2022 amendment to the WM Regulation, which recognised the limited opportunities to obtain licences in the BRADC water source under previous arrangements. If the exempt works clarification is not implemented, take by CWF2, CWF3, CWF4 and CWF5 would be accounted for under the harvestable right for the landholding, as indicated in the DPE advice of February 2021.

A.4.4 Water take accounted for with current entitlement

As discussed in Section A.2.1, Regis currently holds two WALs within the BRACD Water Source with a combined 70 share units in the unregulated river category and was recently successful in its registration of interest for the 2022 controlled allocation order for an additional 192 share units. Purchase of the additional 192 shares has increased the shares in the BRACD Water Source held by Regis from 70 shares to 262 shares. This entitlement will be used to account for water take associated with the RWMF, TSF Runoff WMF, WMF6, river leakage; and runoff captured by the final void (post mining and rehabilitation only).

i TSF Runoff WMF and WMF6

The TSF Runoff WMF and WMF6 are storages located on non-minor streams (based on the revised hydroline spatial data). Water take associated with these facilities will be accounted for with the 262 shares of entitlement held by Regis within the BRACD Water Source.

ii River leakage

An indirect take of surface water is expected to occur via an increase in leakage (as a result of groundwater drawdown) from the Belubula River and Tributary A to groundwater. This has been estimated as part of the groundwater modelling conducted for the mine development (EMM 2020b, Appendix H) to be24 ML/year at the end of mining (Year 11) and up to 28 ML/year post mining and rehabilitation. This take will be accounted for with the 262 shares of entitlement held by Regis within the BRACD Water Source

iii Final void

The final void is predicted to have a catchment area of 107.1 ha comprising 40.0 ha of rehabilitated sub-catchment and 67.1 ha of remnant open cut pit sub-catchment. The final void water balance model (HEC 2020) predicted an annual volume of runoff captured ranging from 21.5 ML/year (20th percentile) to 112 ML/year (80th percentile), with a median (50th percentile) volume of 51.1 ML/year.

Catchment runoff into the final void will be accounted for against the landholding's harvestable right. Alternatively, sufficient licence entitlement will be held to account for runoff to the final void.

Figure A.3 presents surface water take associated with losses from river leakage and surface water runoff captured by the TSF Runoff WMF and WMF6. The combined peak take under the 80th percentile (wet) rainfall conditions from the TSF Runoff WMF, WMF6 and river leakage during the mining operation totals 155 ML/year in Year 2 of the project.

Post mining and rehabilitation, the predicted increased river leakage of 28 ML/year is proposed to be licensed. If catchment runoff into the final void cannot be accounted for under harvestable rights, a total of 140 ML/year will be licensed, including 28 ML/year of increased river leakage and 112 ML/year of catchment runoff under wet (80th percentile) rainfall conditions predicted by the water balance model. This will be accounted for with the 262 shares of unregulated river entitlement held by Regis within the BRACD Water Source.

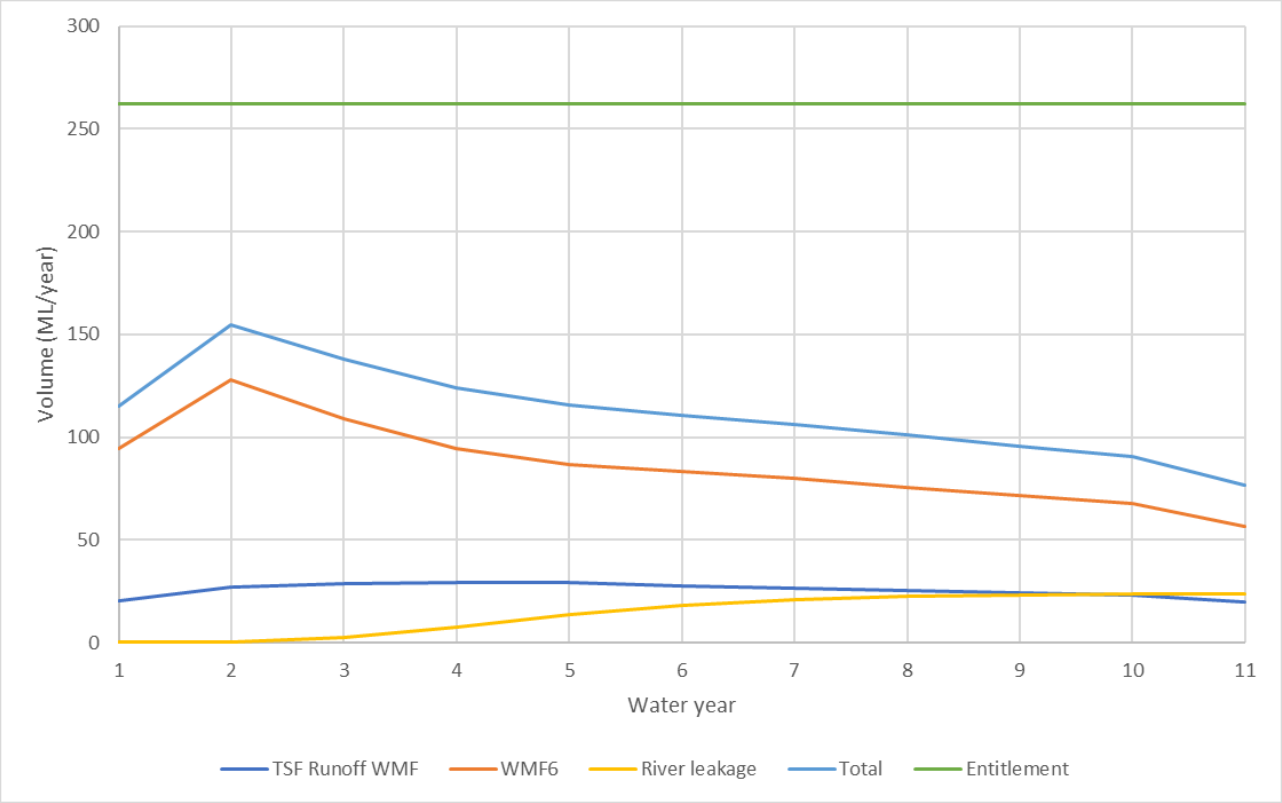

Figure A.3 Surface water take (80th percentile) associated with CWF losses, river leakage, TSF Runoff WMF and WMF6

A.4.5 Specific purpose access licence/s

Section 10 of the WM Regulation was amended in April 2022 to allow applications for SPALs to be made for 'an unregulated river access licence of subcategory "McPhillamys Belubula River gold mine", for the purpose of enabling water to be taken for McPhillamys Gold Mine from the Belubula River above Carcoar Dam water source'. SPALs for the project would be issued as the subcategory of unregulated river access. A SPAL, if granted, would extinguish when the specific purpose for which it was issued no longer exists.

Regis intends to apply for a SPAL to account for the water take associated with the TSF. In addition, if the exempt works provisions of the WM Regulation cannot be relied upon for WMF1 take and for the CWF1 take and associated losses, additional SPALs may need to be sought for these, or a portion thereof (see Figure A.3).

Following project approval, Regis will apply to DPE Water for the SPAL/s. Supporting information will be provided with each SPAL application, including details of how the volume of water requested has been calculated and the potential impacts of take under the SPAL on the water source, its dependent ecosystems and other water users. A preliminary information package to support a future SPAL application was provided to DPE Planning and DPE Water in August 2022. DPE Water reviewed the information and in a letter to DPE on 15 August 2022 stated that DPE Water **has not identified any critical barriers to a successful application for a SPAL**, providing that:

- it is for the purpose of enabling water to be taken for the McPhillamys Gold Mine from the Belubula River above Carcoar Dam Water Source;
- the volume sought is the minimum required to meet the purpose for which the SPAL would be granted; and
- the granting of the SPAL will result in no more than minimal harm to the water source.

i Method for calculating volume sought

As discussed, water balance modelling undertaken for the project (HEC 2020; HEC 2021; HEC 2022) has been used to predict the runoff captured by the TSF as well as the runoff captured by the CWF1, and the streamflow to Carcoar Dam over the life of the project under a wide range of rainfall conditions.

Modelling of streamflow to Carcoar Dam was undertaken using an AWBM, which was parameterised to represent the local catchment to Carcoar Dam. Modelling of streamflow at the gauging station on the Belubula River located immediately downstream of the proposed mining area was undertaken using an AWBM parameterised to represent the local catchment. The gauging station was commissioned by Regis in March 2020 and the available data recorded over the past two years was used to calibrate the model.

Water balance modelling was used to determine the minimum volume required for the SPALs over the life of the mine, taking into consideration the following water accounting rules specified by the LUR WSP for unregulated river access licences:

- carryover – a maximum of 1 ML per unit share of unused allocation to be carried over from one water year to the next; and
- three-year average – water taken must not exceed a maximum of 3 ML per unit share of allocation over a period of any three consecutive water years.

The maximum volume of would that will be applied for under the SPAL/s represents the modelled volume of water captured under very wet (ie 98th percentile) rainfall conditions. Acquiring this conservative higher volume (as opposed to the average or even 80th percentile rainfall 'take') means that over the period of record there would have been no incidence of non-compliant water 'take' consistent with the carryover and the three-year rolling average accounting rules in the LUR WSP. Regis will seek further clarification from DPE Water regarding the volume of the SPAL/s required to meet all obligations under the WM Act and the WSP.

Results in this section are presented per water year (ie 1 July to 30 June) and as the water balance model simulations begin in October, results for the first year represent a nine month period (ie 1 October to 30 June). If construction commences in a different month, the water balance model would be revised accordingly and documented in the project's water management plan (prepared in consultation with DPE Water). However, the licensing strategy would remain the same.

ii TSF

Regis intends to apply for a SPAL to account for the surface water take associated with the TSF. The SPAL may be conditioned to require the predicted streamflow impacts at Carcoar Dam to be 'offset'. Full details of this SPAL – the volume sought, the predicted flow impacts, the proposed offset mechanisms and the impacts on downstream users and the environment are outlined in Appendix B.

iii CWF1 and WMF1

As discussed in Section A.4.3i and A.4.3ii, Regis assumes that the hydroline dataset will be refreshed and the recent DPE clarification of the excluded works provisions will be confirmed. As such, CWF1 and WMF1 would be considered as excluded works under Schedule 4, item 3 of the WM Regulation and SPALs will not be required for the take associated with these facilities. This is the preferred and expected pathway. However, SPALs will be sought for all or part of this take if these changes are not progressed.

It should be noted that no 'offset' condition would be required for the CWF1 take as this water will be returned to the Belubula River immediately downstream of the project site. A SPAL condition would require this and may also relate to timing and rates of return, as well as specifying take and return measurement arrangements. As such, and as the flows will be returned as soon as possible to the river, impacts on the environment and any downstream water users will be negligible.

Figure A.4 presents the modelled annual volume of water intercepted by CWF1 under a range of rainfall conditions. The catchment size of CWF1 will not change over the life of the project.

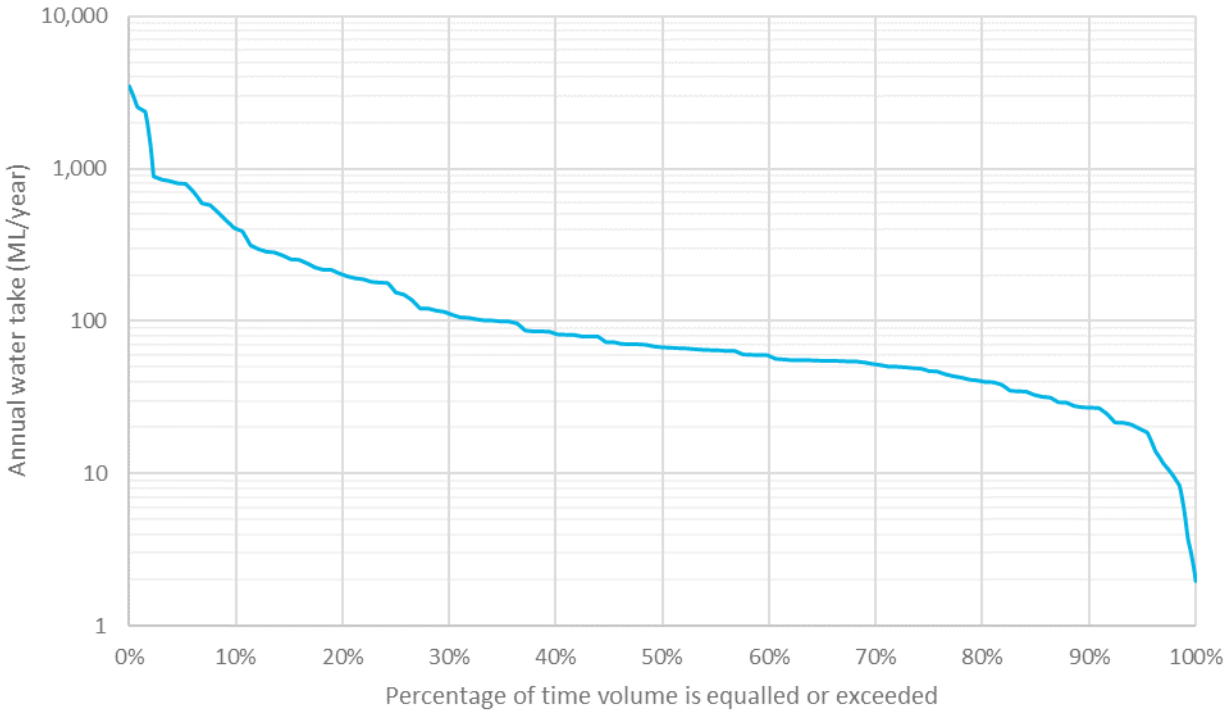

Figure A.4 Predicted annual CWF1 water intercepted

The SPAL volume for CWF1 would be for up to 1,751 ML/year, representing the surface water take associated with CWF1 predicted under very wet (ie 98th percentile) rainfall conditions (based on the historical rainfall record), which includes just 4 ML/year of losses from the transmission of water from CWF1 to the Belubula River downstream of the mine disturbance area (ie associated with dead storage and evaporative losses).

A.4.6 Summary

This Appendix demonstrates that there are pathways for this project to operate within, and comply with, the NSW water regulatory framework. The preferred surface water licensing pathway is shown in Figure A.3 for the project, and has been developed based on:

- **Update of the hydroline spatial data to reflect real world conditions.** DPE Water to update the hydroline spatial data, as outlined in DPIE Water's correspondence to DPIE on 22 June 2021, based on the outcomes of the EMM (2020c) stream assessment report;

- **Excluded works exemptions**. Implementation of the excluded works exemptions under Schedule 1, item 3 of WM Regulation for all CWFs and associated losses and the remaining WMFs that are located on minor streams, as recently clarified by DPE Water's July 2022 clarification factsheet;

- **Holding a SPAL** for surface water take associated with the TSF, subject to conditions to 'offset' the predicted streamflow impacts at Carcoar Dam (from the current baseline);

- Holding sufficient unregulated river entitlement in the BRACD Water Source for:

    - river leakage from Belubula River and Tributary A to groundwater;

    - incidental capture of runoff by the TSF Runoff WMF and WMF6; and

    - incidental capture of runoff by the final void (if harvestable rights cannot be relied upon to account for this water take); and

- **Holding sufficient unregulated river entitlement in the Belubula Regulated River water source** to offset the streamflow impacts on Carcoar Dam associated with the TSF.

If the hydroline is not refreshed and the excluded works provisions in the WM Regulation cannot be relied upon, and alternative pathway remains available that includes:

- **Holding SPALs** for:

    - surface water take associated with CWF1 subject to conditions to 'return' the water to the Belubula River downstream of the mine disturbance area; and

    - a proportion of the take associated with WMF1.

- **Harvestable rights**. Application of the harvestable rights regime to account for water temporarily captured in CWF2, CWF3, CWF4 and CWF5.

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Appendix B

Information to support a future application for a specific purpose access licence

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Memorandum

Subject: McPhillamys Gold Project - Information to support a future application for a specific purpose access licence

Figure B.1 provides an overview of the overall approach discussed in this document to support a future application for a Specific Purpose Access Licence (SPAL) for the Regis Gold Project tailings storage facility (TSF).

i Circumstances in which access licence or licences are proposed to be used

The TSF will be a highly regulated, confined facility constructed and operated for the purpose of securely storing and managing tailings, as well as internal TSF runoff. The intent and proposed design of the TSF is as a closed structure, with minimal natural or catchment inflows and no discharges from the structure. The TSF will therefore be effectively isolated from the catchment. It is not designed for the purpose of capturing water from the catchment and would only capture direct rainfall runoff within the facility.

Water balance modelling undertaken for the project (HEC 2020; HEC 2021) has been used to predict the rainfall runoff captured by the TSF. Figure B.2 presents the modelled runoff captured by the TSF over the life of the project under dry, median and wet rainfall conditions. Figure B.3 presents the modelled runoff captured by the TSF in Year 11 of the project (representing the year of peak annual water take for the TSF) under a range of rainfall conditions.

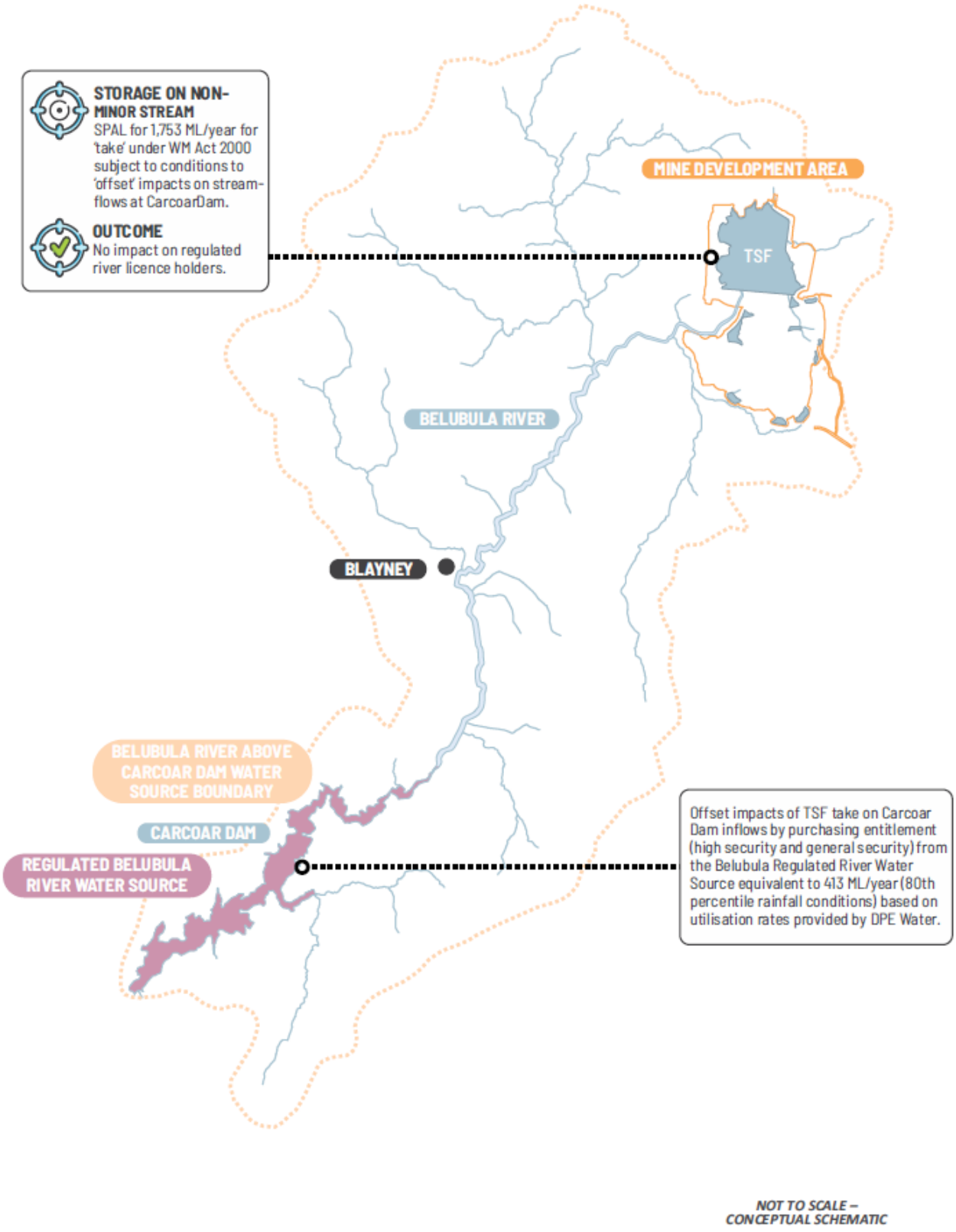


Figure B.1 **Overview of SPAL approach**

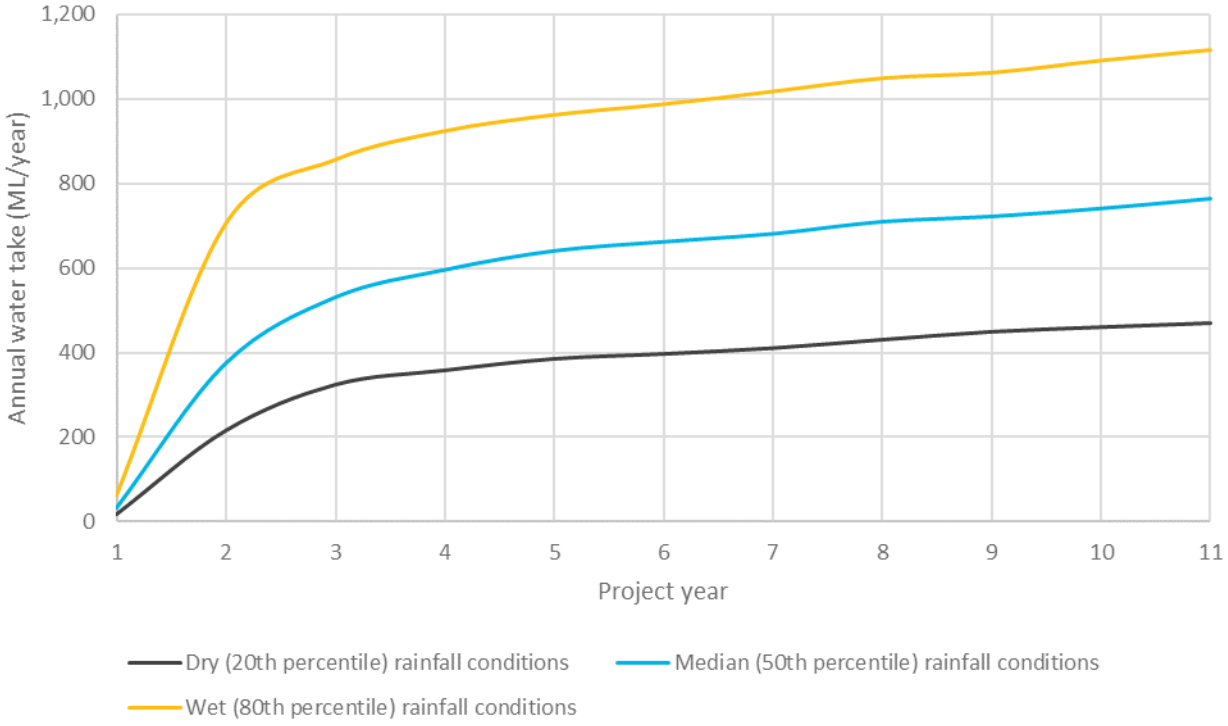


Figure B.2 **Runoff predicted to be captured by the TSF over the life of the project**

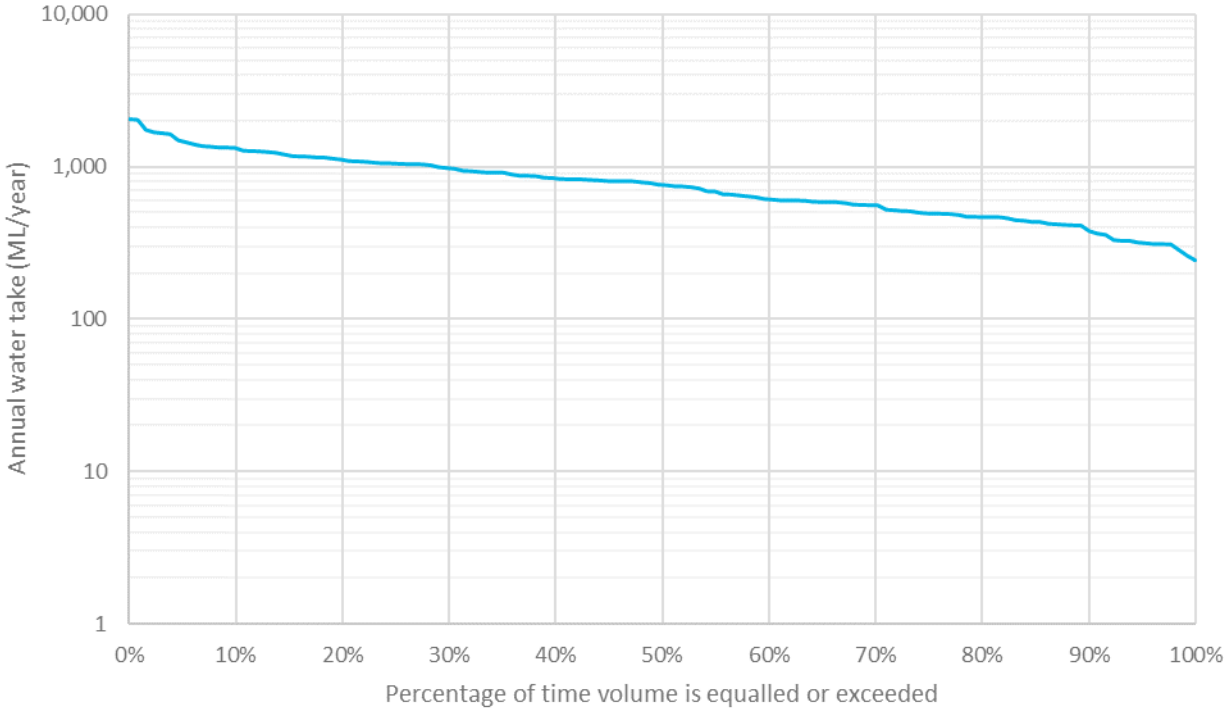


Figure B.3 **Runoff predicted to be captured by the TSF in Year 11**

ii Volume of water applied for

Regis intends to apply for a specific purpose access licence (SPAL) to account for the surface water take associated with the TSF. The SPAL would be conditioned to require the predicted streamflow impacts at Carcoar Dam to be 'offset'. The volume of the SPAL for the TSF would be for up to 1,753 ML/year, representing the predicted peak surface water take associated with the TSF under wet (ie 98th percentile) rainfall conditions (based on the historical rainfall record), which is estimated to occur in Year 11 of the project when the mine will be fully developed.

As explained below, it is important to emphasise that this requested volume is highly conservative and that it is unlikely that the TSF would actually capture 1,753 ML in any given year.

iii Method for calculating volume sought

Water balance modelling undertaken for the project (HEC 2020; HEC 2021b; HEC 2022) has been used to predict the runoff captured by the TSF and the streamflow to Carcoar Dam over the 11 year life of the project under a wide range of rainfall conditions, based on 132 years of historical climate records.

The operational water balance modelling undertaken as part of the environmental impact statement (EIS) for the project (HEC 2019) underwent independent technical review (contained as Attachment D to Appendix J of the EIS [EMM 2019a]). This review found the approach and methodology of the assessment (which has subsequently been applied to the revised assessments) was appropriate and consistent with industry standards.

Modelling of streamflow to Carcoar Dam was undertaken using an Australian Water Balance Model (AWBM), which was parameterised to represent the local catchment to Carcoar Dam. The model was reviewed by the (then) Department of Planning, Industry and Environment Water Group (DPIE Water), who confirmed that the model is generally fit for purpose to assess flow interceptions and reduction of inflows to Carcoar Dam (DPIE Water 2021).

Modelling of streamflow at the gauging station on the Belubula River located immediately downstream of the proposed mining area was undertaken using an AWBM parameterised to represent the local catchment. The gauging station was commissioned by Regis Resources Ltd (Regis) in March 2020 and the available data recorded over the past two years was used to calibrate the model.

Water balance modelling was used to determine the minimum volume required for the SPAL over the life of the mine, taking into consideration the following water accounting rules specified by the water sharing plan for unregulated river access licences:

- carryover – a maximum of 1 ML per unit share of unused allocation to be carried over from one water year to the next; and

- three-year average – water taken must not exceed a maximum of 3 ML per unit share of allocation over a period of any three consecutive water years.

The maximum volume of water that will be applied for under the SPAL represents the modelled volume of water captured by the TSF under wet rainfall (ie 98th percentile) conditions. Acquiring this conservative higher volume (as opposed to the average or even 80th percentile rainfall 'take') means that over the period of record there would have been no incidence of non-compliant water 'take' consistent with the carryover and the three-year rolling average accounting rules in the water sharing plan.

iv Climate change effects

The effects of climate change on water balance modelling for the project have been discussed by HEC (2019; 2020). Assessment of the future climate was undertaken based on the information provided by the online Climate Futures Tool (CSIRO 2022), which includes projections from the full set of global climate models developed by various groups around the world. Climate effects were found to be likely to result in a slight reduction in annual rainfall and an increase in annual evapotranspiration by 2030 compared to the reference period of 1986 to 2005.

Recently, modelling of likely future rainfall and evapotranspiration changes within the Lachlan region has been undertaken during the development of the *Draft Regional Water Strategy: Lachlan* (DPIE 2020), based on climate variability data (including both historical recorded data and paleoclimate data) and the most conservative result from the NSW Government's NARCliM (climate change) projections (ie the scenario that represents the greatest reduction in average monthly rainfall). Modelling results presented by DPIE (2020) suggests that in the Lachlan region, where the project is located, there will likely be:

- a reduction in the average annual rainfall by up to 15% compared to the period 1990 to 2009;
- a shift in seasonal rainfall patterns, resulting in a decrease in winter and spring rainfall and an increase in summer and autumn rainfall; and
- increased potential evapotranspiration of up to 3% over the near future (2020 to 2039) compared to the period 1990 to 2009.

Climate change is likely to lead to reductions in rainfall and runoff in the mine development area and the Lachlan regional generally. The implications of climate change predictions on water management for the project are unlikely to be significant over the life of the mine development as they are fairly small compared to natural climatic variability and the relatively short duration of the mine development (HEC 2019; 2020).

v Water approvals

As the project is a State significant development (SSD, SSD-9505), section 4.41(1)(g) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) exempts the project from requiring:

- a water use approval under section 89 of the *Water Management Act 2000* (WM Act), which authorises the holder to use the water taken for a specified purpose at a specified location;
- a water management work approval under section 90 of the WM Act, which authorises the holder to construct and use a work to take water from a river, lake or aquifer at a specified location; and
- an activity approval (other than an aquifer interference approval) under section 91 of the WM Act, which authorises the holder to carry out a specified controlled activity at a specified location in, on or under waterfront land (defined as the bed of any river, lake or estuary and the land within 40 m of the river banks, lake shore or estuary mean high water mark).

This provision exempts the applicant from needing to seek duplicate approvals unless the take and/or activity has not been assessed as part of the EIS or SSD approval. It is noted that the SPAL will need to nominate the relevant facility approved under the EP&A Act.

Once granted, the SPAL would need to nominate a work via a 71W dealing under the WM Act to nominate a specified water supply work. It is noted that Clause 20(3) of the Access Licence Dealing Principles Order 2004 prohibits 71W dealings for SPALs. There are a limited number of exceptions to this, including when "all works or extraction points nominated by the licence would only supply the same property or contiguous properties that are owned or occupied by the same landholder". The TSF is the only water supply work that would be required to be nominated by the SPAL. The entire mine development area, including the TSF, is located on land owned by Regis. As such, this exception is considered to be satisfied for the purposes of a 71W dealing.

vi Impact of proposed take

Detailed assessment of the environmental impacts resulting from the proposed take of surface water by the entire Project has been undertaken to support the EIS and subsequent reports. Assessments evaluated potential changes to surface water quantity and quality, geomorphology, aquatic ecology and fish habitat. This memorandum that provides information to support a future SPAL application should be considered in conjunction with the following documents:

- environmental impact statement (EMM 2019a) and technical appendices:
  - surface water assessment (HEC 2019);
  - groundwater assessment (EMM 2019b);
  - aquatic ecology assessment (EMM 2019c);
- amendment report (EMM 2020a) and technical appendices:
  - revised surface water assessment (HEC 2020);
  - groundwater assessment addendum (EMM 2020b);
  - aquatic ecology assessment addendum (EMM 2020c);
- surface water-groundwater interaction assessment (EMM 2020d);
- additional surface water assessment and reporting in response to advice from DPIE Water and the Natural Resources Access Regulator (NRAR) (letter 22 June 2021) (EMM 2020e, HEC 2021a; HEC 2021b; HEC 2022); and
- modelling of the Belubula River System by DPE Water (2022).

a Extent and magnitude of streamflow effects

Changes to streamflow would be greatest immediately downstream of the TSF, where flow which would have occurred previously would instead be captured within the TSF. Downstream from the development, unaffected tributaries would contribute runoff, and the effects of the TSF as a proportion of total flow would decrease with distance, as shown in Figure B.4.

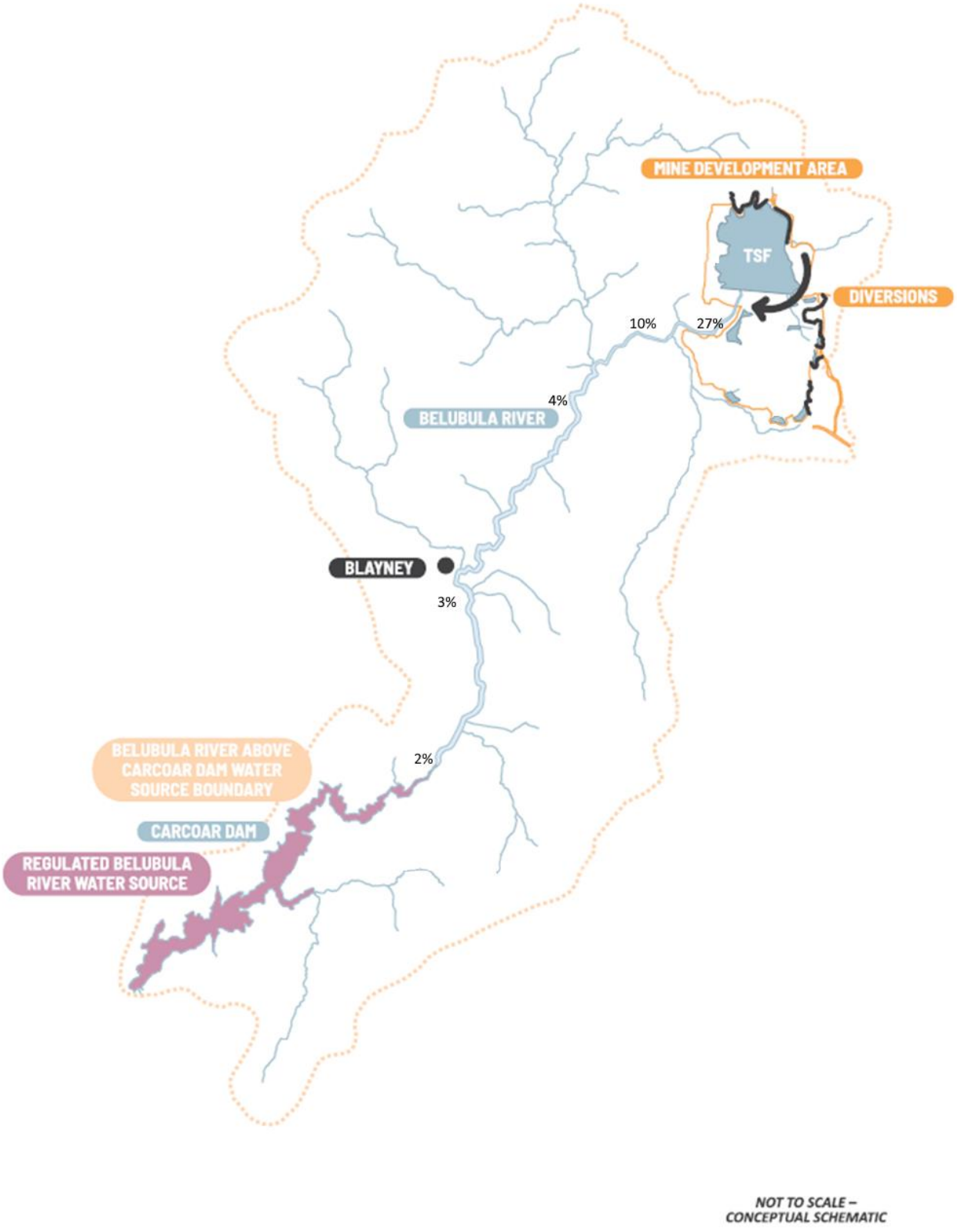


Figure B.4 **Catchment area (and flow) reduction due to TSF development**

Modelling of streamflow at the gauging station on the Belubula River located immediately downstream of the proposed mining area was undertaken to estimate changes to the flow regime at this location as a result of the development of the proposed TSF. The model was calibrated using data collected at the gauging station between March 2020 and June 2022. The model was run using the full period of available historical climatic data to obtain a series of daily flow results under existing conditions. The same model was then run with a reduction in catchment area of 4.27 km^2, which represents the maximum area of the TSF during the project life (occurring in Year 11 of the project).

Flow duration curves were developed from the flow results, as shown in Figure B.5, for the current conditions as well as the proposed conditions considering a reduction in the catchment area associated with the TSF. Changes to flows were assessed using the daily model flow results, calculated as the difference between flow results for the two scenarios, and are presented in Figure B.6. Table B.1 presents the predicted annual flows at different percentile levels.

The results presented indicate that there would be a slight reduction in streamflow downstream of the mine development as a result of the reduction in catchment area associated with the TSF. For the majority of days, minimal change in flow is predicted. Reduction in flow of more than 1 ML/day was predicted to occur on less than 6% of days. During the occasional high flow days (when the flow past the gauge is greater than 500 ML/day), the modelling predicts greater reductions in the magnitude of flows.

Table B.1 Modelled change in annual flow at streamflow gauge downstream of project

Flow exceedance percentile (Percentage of time flow is greater than the modelled inflow)	Existing flow (ML/year)	'With TSF' flow (ML/year)	Decreased flow due to TSF	
			ML/year	% of existing flow
95%	119	108	11	9%
90%	164	148	16	10%
80%	246	222	24	10%
70%	322	291	31	10%
60%	369	333	36	10%
50%	420	379	41	10%
40%	521	469	52	10%
30%	728	656	72	10%
20%	1,288	1,161	127	10%
10%	2,600	2,345	255	10%
5%	5,126	4,622	504	10%

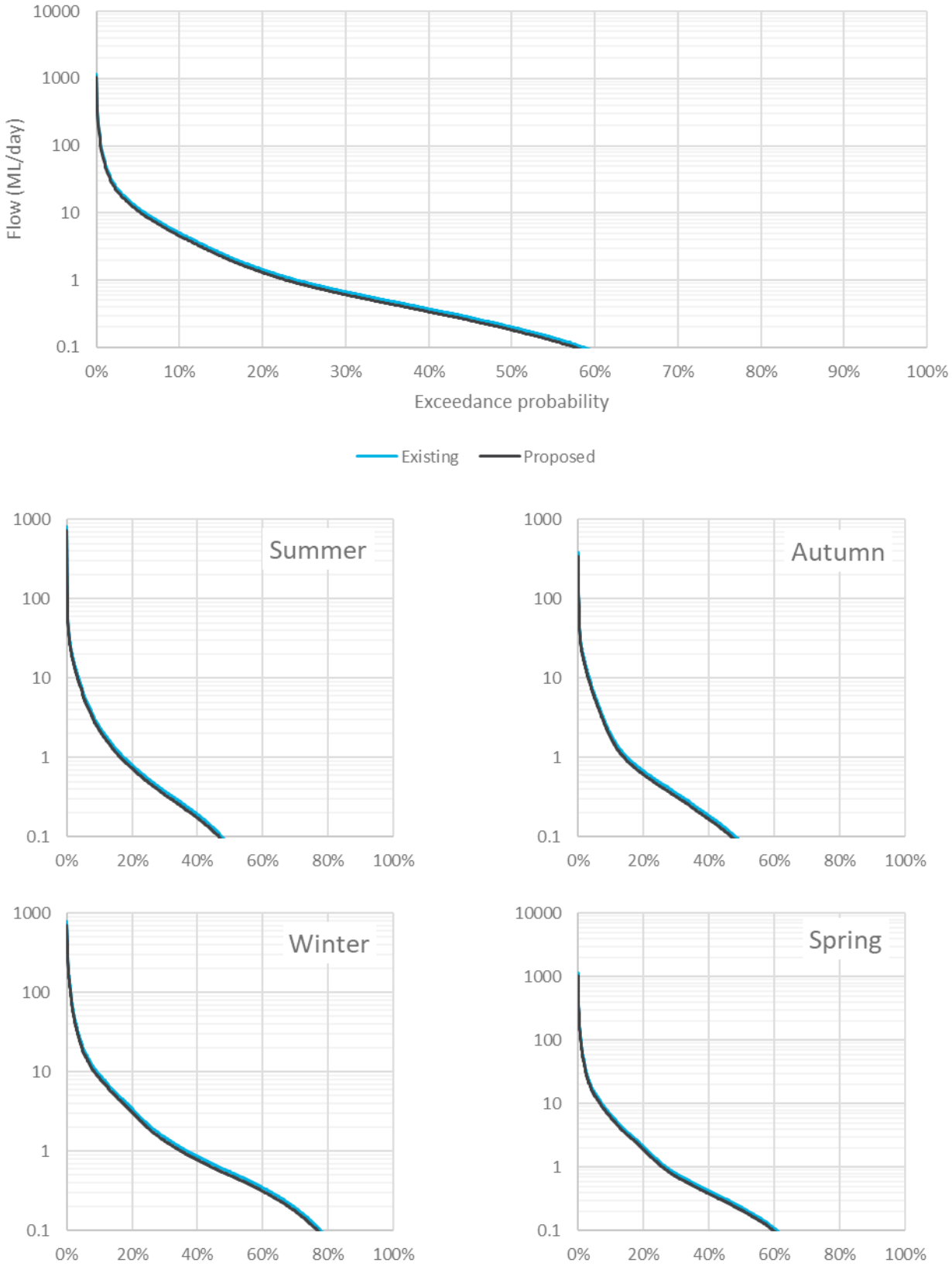


Figure B.5 **Daily flow duration curves at streamflow gauge downstream of project**

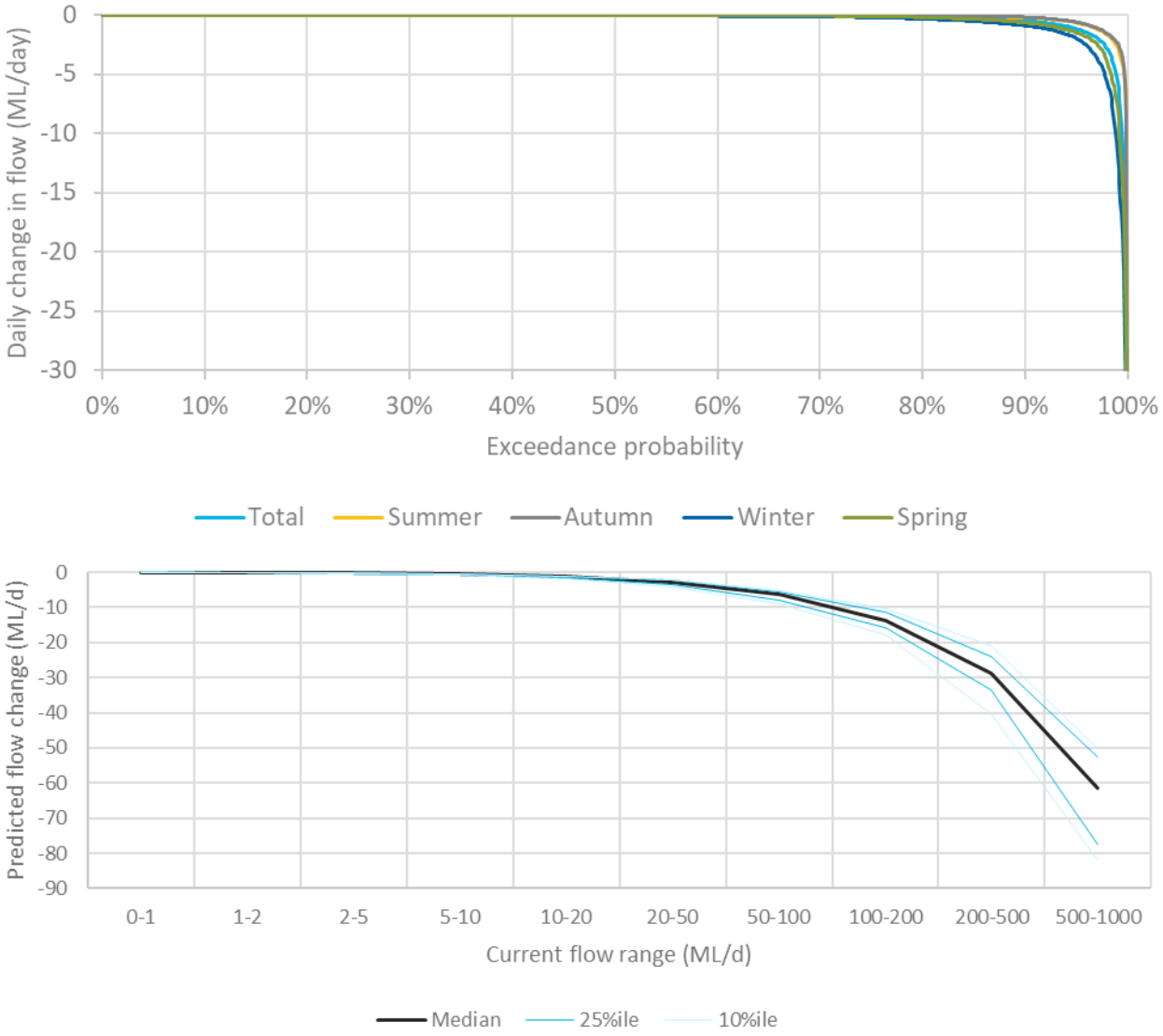


Figure B.6 Change in daily flows at streamflow gauge downstream of project

The streamflow model is not perfectly calibrated at low flows and predicts extremely low flows when in reality no flow conditions are likely. If the modelled flows of less than flow 0.1 ML/day are taken to be 'no flow' days, then at this location:

- currently no flow conditions may occur on average 41.2% of the time (average 151 days/year); and
- following the development of the TSF, no flow conditions may occur on average 42.4% of the time (average 155 days/year).

From these results, the model predicts a 2.6% increase in the frequency no flow days.

Currently, daily flows at the streamflow gauge downstream of the project are predicted to be at least 11.9 ML/day for 95% of the time. This flow exceedance percentile can be used to represent very low streamflow during low rainfall years. Following development of the TSF, the streamflow is predicted to reduce by 1.2 ML/day compared to existing conditions, with streamflow predicted to be at least 10.7 ML/day for 95% of the time. Streamflow is predicted to be at least 11.9 ML/day for 95.4% of the time following TSF development.

c Potential impacts on Carcoar Dam inflows

A water balance model of Carcoar Dam has been developed by HEC (2020) to estimate the impact of the project on streamflow in the downstream Belubula River and on inflows to Carcoar Dam. This model was reviewed by DPIE Water, who confirmed that the model is generally fit for purpose to assess flow interceptions and reduction of inflows to Carcoar Dam. This analysis was undertaken to inform any 'offset' conditions that might apply to the TSF SPAL.

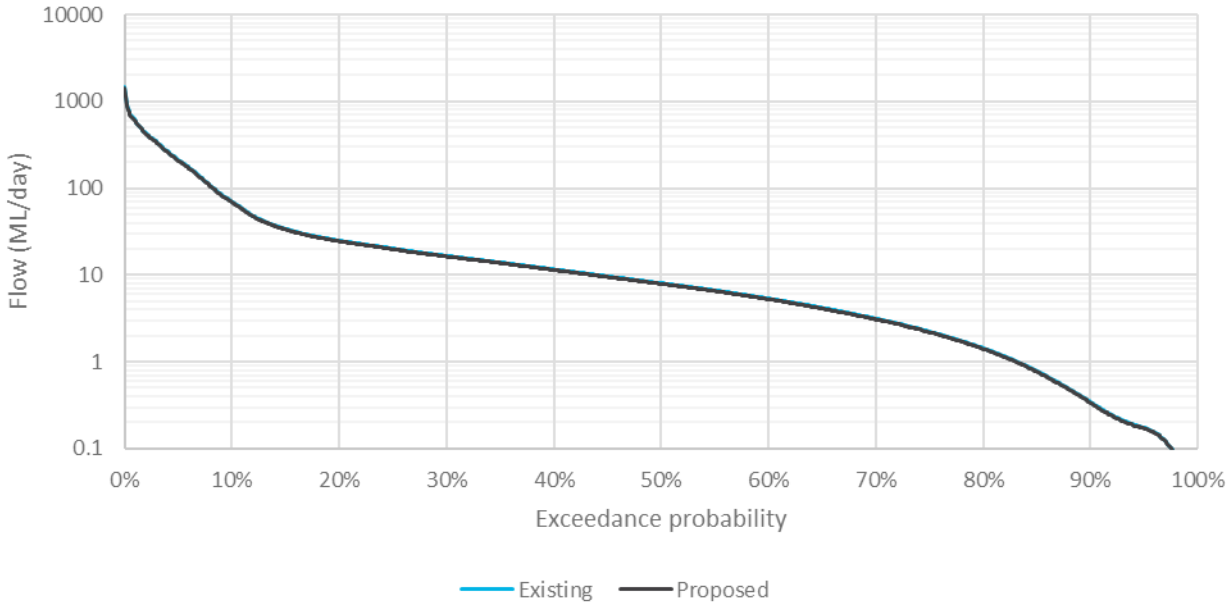
The model was updated by HEC (2021b) to include catchment rainfall-runoff model parameters (consistent with the revised Carcoar Dam model parameters as discussed in Section 4.1.2 of the McPhillamys Gold Project Submissions Report (EMM 2020e)). The model was run using the full period of available historical climatic data (132 years) to obtain a series of annual total inflows to Carcoar Dam (ie existing conditions). The same model was then run with a reduction in catchment area of 4.27 km^2, which represents the maximum area of the TSF during the project life (occurring in Year 11 of the project).

Flow duration curves were developed from the flow results, as shown in Figure B.7, for the existing conditions as well as the proposed conditions considering a reduction in the catchment area associated with the TSF. Changes to flows were assessed using the daily model flow results, calculated as the difference between flow results for the two scenarios (with and without the TSF), and are presented in Figure B.8. Table B.2 presents the predicted annual flows at different flow percentile levels.

The model results indicate a slight reduction in the predicted inflows to Carcoar Dam as a result of the reduction in catchment area associated with the development of the TSF. Minimal change in the inflows to Carcoar Dam was predicted for the majority of days. Reductions in inflow of more than 1 ML/day were predicted to occur for less than 11% of days, with reductions greater than 10 ML/day predicted to occur on less than 1% of days. There were occasionally predicted significant reductions in the magnitude of flows, however this occurs on higher flow days when the flow past the gauge is greater than 500 ML/day.

Table B.2 Modelled change in annual inflow to Carcoar Dam during operations

Flow exceedance percentile (Percentage of time flow is greater than the modelled inflow)	Existing inflow (ML/year)	'With TSF' inflow (ML/year)	Decreased inflow due to TSF	
			ML/year	% of existing flow
95%	1,582	1,553	29	2%
90%	2,053	2,016	38	2%
80%	2,557	2,510	47	2%
70%	3,084	3,028	57	2%
60%	3,634	3,567	67	2%
50%	4,502	4,420	83	2%
40%	6,268	6,153	115	2%
30%	12,385	12,158	227	2%
20%	22,522	22,109	413	2%
10%	35,809	35,152	657	2%
5%	55,938	54,912	1,026	2%



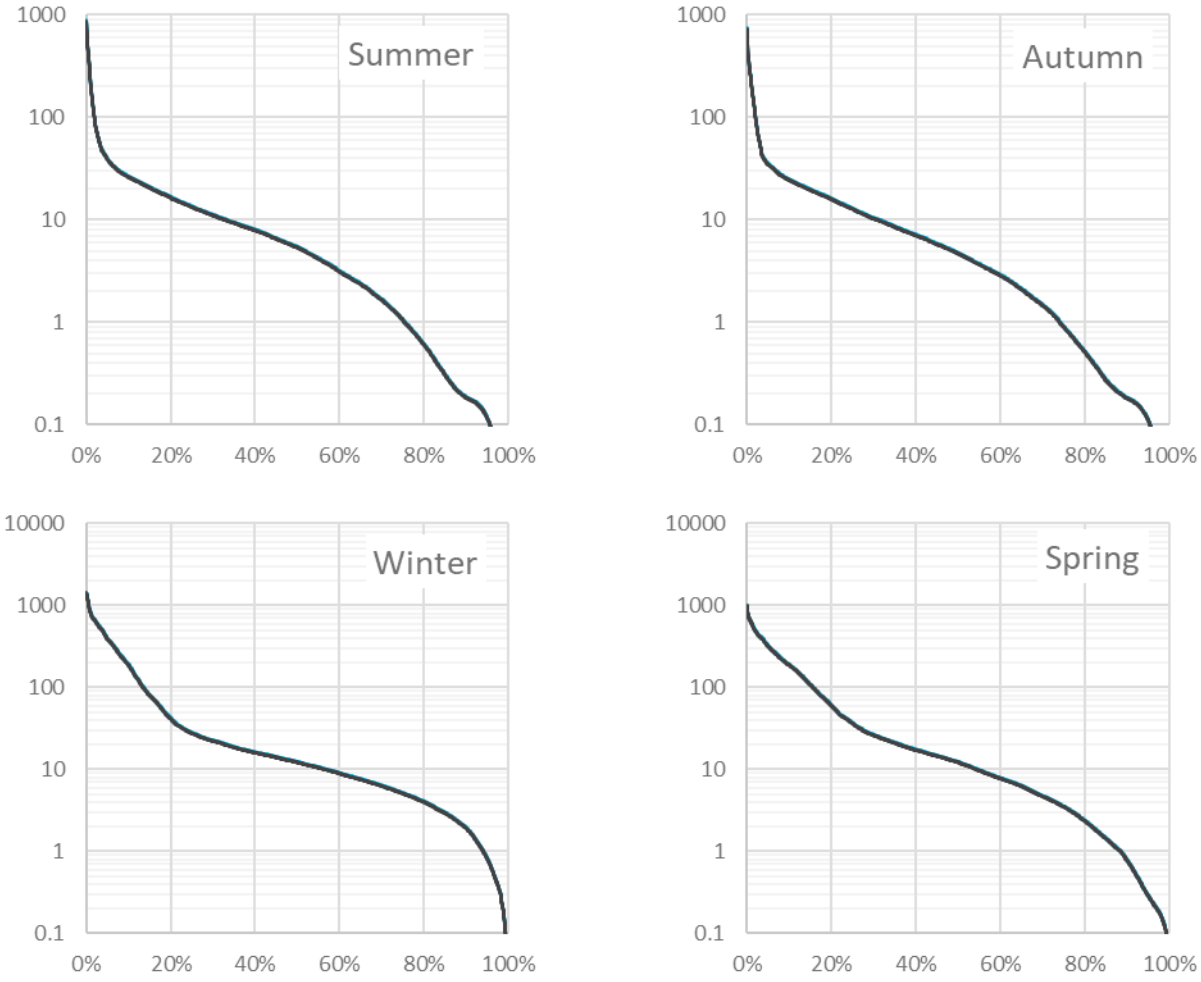


Figure B.7 **Daily flow duration curves for inflow to Carcoar Dam**

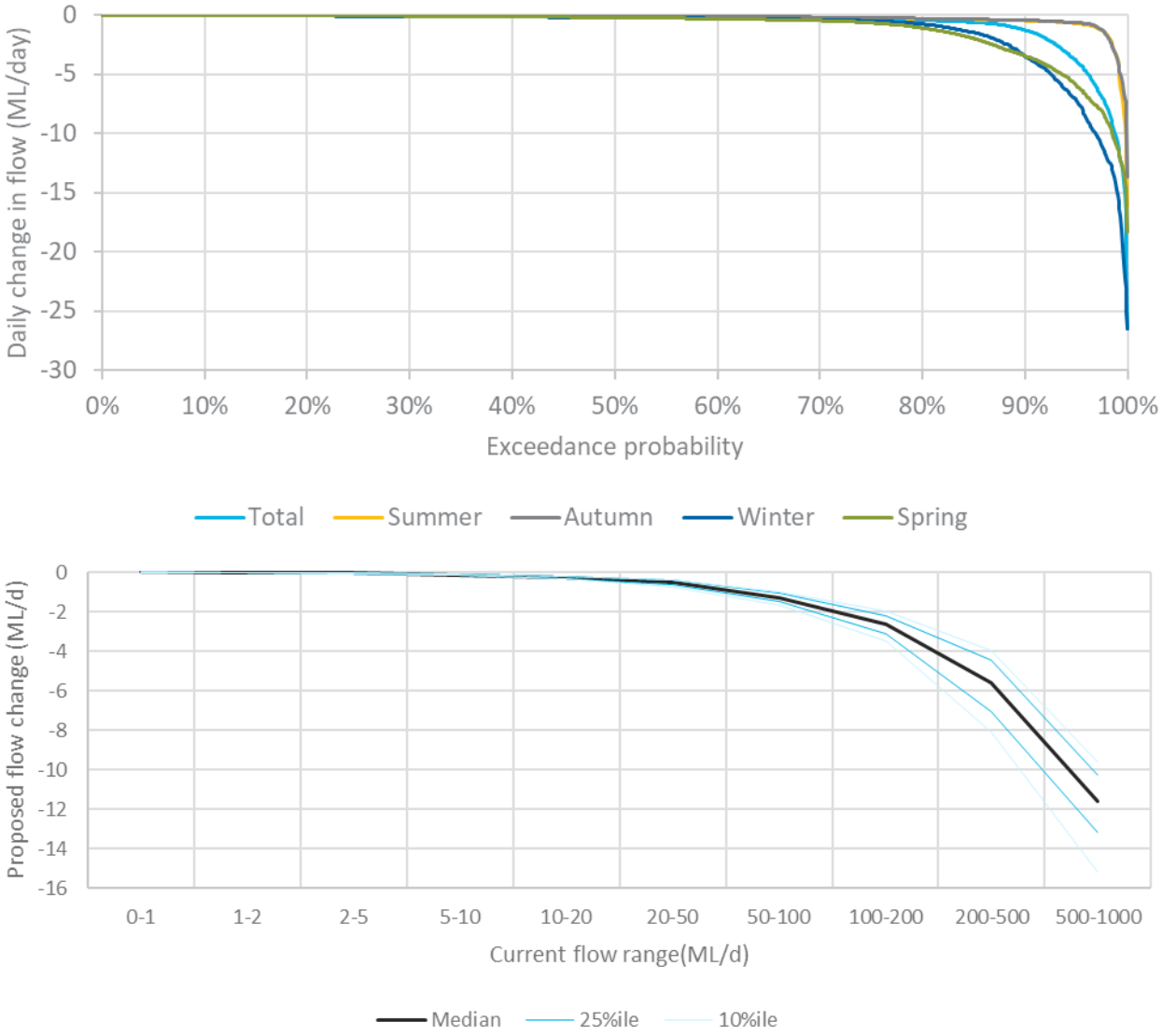


Figure B.8 Change in daily inflows to Carcoar Dam

No change in the number of no flow days was predicted by the streamflow model within the Belubula River at the upstream end of Carcoar Dam.

Currently, very low flows at this location (ie 95th percentile exceedance probability) are predicted to be at least 211 ML/day for 95% of the time. Following development of the TSF, the streamflow is predicted to reduce by 3.9 ML/day compared to existing conditions, with streamflow predicted to be at least 207 ML/day for 95% of the time. Streamflow is predicted to be at least 211 ML/day for 95.1% of the time following TSF development.

d Potential impacts on Belubula River water users upstream of Carcoar Dam

Based on a search of the NSW Water Register (WaterNSW 2022), there are no water access licences linked to approvals located on the Belubula River downstream of the mine development and above Carcoar Dam. There are a number of properties with frontage to the Belubula River that may take and use water for domestic consumption and stock watering without an access licence or approval under basic landholder rights. The *Water Sharing Plan for the Lachlan Unregulated River Water Sources 2012* estimated the water requirements for domestic and stock rights in the entire Belubula River above Carcoar Dam Water Source, including tributaries to Belubula River upstream of the project, to be 68 ML/day.

As discussed in Section v(b), Table B.2, Figure B.7 and Figure B.8 demonstrate that the impact of the TSF on daily streamflow downstream of the project will be negligible in the low flow range. The greatest magnitude of the flow reduction occurs in the higher flow ranges, when there would be more than sufficient flow to meet the needs of authorised downstream users.

e Potential impacts on Carcoar Dam water users

DPE Water (2022) used the results of HEC's water balance model of Carcoar Dam as inputs to DPE Water's Belubula River System model to assess the impact of catchment reduction associated with the development of the TSF on the Belubula Regulated River Water Source.

Table B.3 presents the long-term average annual extraction for the different use categories within the Belubula Regulated River Water Source, provided by DPE Water (2022). The reduced inflows into Carcoar Dam predicted as a result of the catchment reduction associated with the TSF was found by DPE Water (2022) to result in a relatively minor reduction in the average availability of water allocated to water users.

Table B.3 Average annual extraction for different use categories (DPE Water 2022)

Use category	Existing conditions (ML/year)	'With TSF' (ML/year)	Decreased extraction due to TSF (ML/year)
Domestic and stock	163	162	1 (<1%)
High security	972	965	7 (<1%)
General security	1,707	1,693	14 (<1%)

f Potential impacts on groundwater source

The groundwater assessment (EMM 2019b; EMM 2020b) and surface water-groundwater interaction assessment (EMM 2020d) prepared for the project considered the groundwater-related impacts of the mine development.

At the top of the Belubula River catchment, there is limited interaction between surface water and groundwater. During average climate condition, the tributaries to the Belubula River (at the top of the catchment) are ephemeral. Downstream of Tributary A, groundwater discharge to the Belubula River increases, and the watercourse is a gaining system. There is no predicted impact to baseflow downstream of the confluence with Tributary A.

The findings of the assessments were that the proposed development is predicted to have a minor impact on groundwater users and water dependent assets. This includes third-party bores, surface water interacting with groundwater, identified springs and vegetation that is potentially groundwater dependent. It is difficult to separate the potential groundwater impacts as a result of the development of the TSF compared to the mine development as a whole, however as the TSF forms a portion of the greater mine development, the potential impacts related to surface water take associated with the TSF alone are expected to also be minor.

g Potential impacts on aquatic ecology

The aquatic ecology assessment undertaken for the project (EMM 2019c; EMM 2020c) considered the impact of the mine development on such environmental conditions and receptors as water and sediment quality, key fish habitat, aquatic biodiversity and native plants which inhabit the riparian zone.

Overall, the existing aquatic and riparian environment within the mine development area was assessed to be generally in poor condition, with invasive exotic species dominant and habitat modification prevalent (eg constructed dams, land clearing and surface flow barriers). The Belubula River within the mine development area generally exhibits no flow and no permanent pools during dry conditions, with the exception of some downstream sections.

It was concluded that the proposed mine development is unlikely to pose a significant ecological risk, due to the lack of species of conservation significance supporting habitat. The aquatic ecology assessment does not distinguish between the impacts of the entire project and those of the TSF only.

Annual median flows to Carcoar Dam are predicted to decrease by 4% as a result of the entire project during operation. While there are conservation significant fish species within Carcoar Dam, this negligible flow impact is not assessed to be significant for these species. In terms of habitat between the mine development and Carcoar Dam, there is currently a lack of connectivity during low flow conditions, and a distinct absence of species of conservation significance within the Belubula River and associated tributaries upstream of Carcoar Dam. These factors, and the physical barrier (Carcoar Dam) between the mine development and known areas of conservation significance, means that the potential impact of the project on aquatic ecology will be negligible.

Notwithstanding this, Regis has committed in its EIS to a number of biodiversity offset and habitat enhancement initiatives including the development of an aquatic ecology offset package in consultation with DPI Fisheries. It is expected that these initiatives will be a component of the development consent.

vii Proposed SPAL impact mitigation measures

a Offsetting TSF impacts at Carcoar Dam

The proposed strategy for managing the impact of take associated with the TSF is to offset the reduction in inflows to Carcoar Dam by purchasing regulated river access licences in the Belubula Regulated River Water Source. The objective is to park, or even suspend, the licence for the duration of the project, such that the water allocation made available to the licence cannot be used for the duration of the impact, and is, in effect, made available to other users in the system. In this way, the reliability of supply to regulated river water users will be unaffected by the TSF take. The exact condition and administrative mechanism to achieve this will be confirmed by DPE Water.

The volume of water captured by the storages within the operational water system does not reflect the volume of water that would flow downstream to Carcoar Dam under existing conditions. This is due to the difference in runoff characteristics in natural catchments compared to cleared and altered ground conditions that reflect mining operations. The volume captured by the storages during operations will not be discharged to the environment, consistent with best practice to prevent potential contamination of the downstream receiving environment.

As advised by DPE Water (via email on 27 June 2022), the required offset would represent the reduction in streamflow to Carcoar Dam under wet (ie 80th percentile) conditions as a result of the removal of the pre-development sub-catchments from the overall catchment draining to Carcoar Dam. That is, the current (pre-development) runoff contribution to Carcoar Dam inflows from the sub-catchment for the TSF, which would no longer contribute to the dam during operation of the project. The required offset volume representing the reduction in streamflow to Carcoar Dam is predicted to be 413 ML/year (80th percentile).

The difference between the take volume and offset volume for the SPAL is primarily a function of the difference between the runoff from developed (hard surfaced) sub-catchment for the TSF and the current pre-development sub-catchment. It also represents the difference between the volume needed for the wettest 2% of years (98th percentile) required to comply with the WSP account management rules and the 80th percentile impacts on inflows (the standard generally required by DPE Water).

DPE Water has advised ‘utilisation’ rates to determine the entitlement shares that would be required to adequately offset the volumetric impact on Carcoar Dam inflows associated with the TSF. Table B.4 presents these under average and wet (ie 80th percentile) rainfall conditions, for both high security entitlements and general security entitlements. Note that the values presented in Table B.4 are for the total offset volume, ie either 510 high security unit shares or 1,796 general security unit shares would be required under wet rainfall conditions. A combination of high security and general security shares may also be possible.

Table B.4 Offset entitlements required

	Average rainfall year	Wet year – 80th percentile rainfall
Change in Carcoar Dam inflows because of TSF	255 ML/year	413 ML/year
High security equivalent (utilisation rate of 0.81)	315 unit shares	510 unit shares
General security equivalent (utilisation rate of 0.23)	1,109 unit shares	1,796 unit shares

The offset volume condition of the SPAL associated with the TSF would be met through the purchase of high security and/or general security entitlement within the Belubula Regulated River Water Source (through dealings).

Figure B.9 and Figure B.10 presents the historical availability and usage of entitlement in the Belubula Regulated River Water Source for high security and general security licences respectively, obtained from a search of the NSW Water Register (WaterNSW 2022a). Figure B.10 also shows the 'effective available water' for general security entitlements. This is the total water in accounts of general security licence holders, including carryover water, and capped at 100% of entitlement for each account. It is the water that is physically available for ordering each year. These figures indicate that much of the high security and general security entitlement is held in individual accounts and is not used.

Securing existing high security entitlement in the Belubula Regulated River Water Source to offset the development of the TSF may be challenging as the offset required represents close to half of the shares currently available, and historical trade has been limited. The general security shares required to offset the development of the TSF represents around 8% of the total shares currently available, which provides a reasonable prospect for permanent trade, a long term 'lease' or, if required, temporary trade.

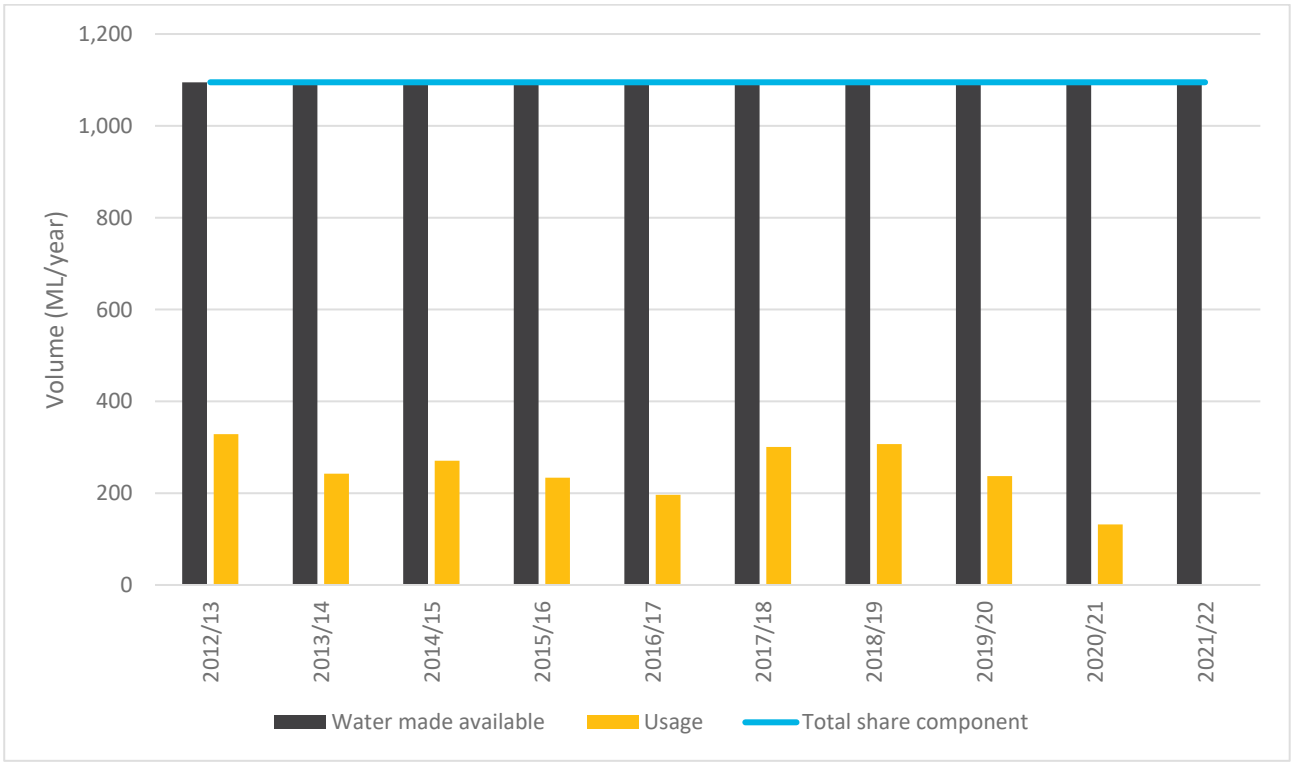


Figure B.9 Historical availability and usage of high security entitlement in the Belubula Regulated River Water Source

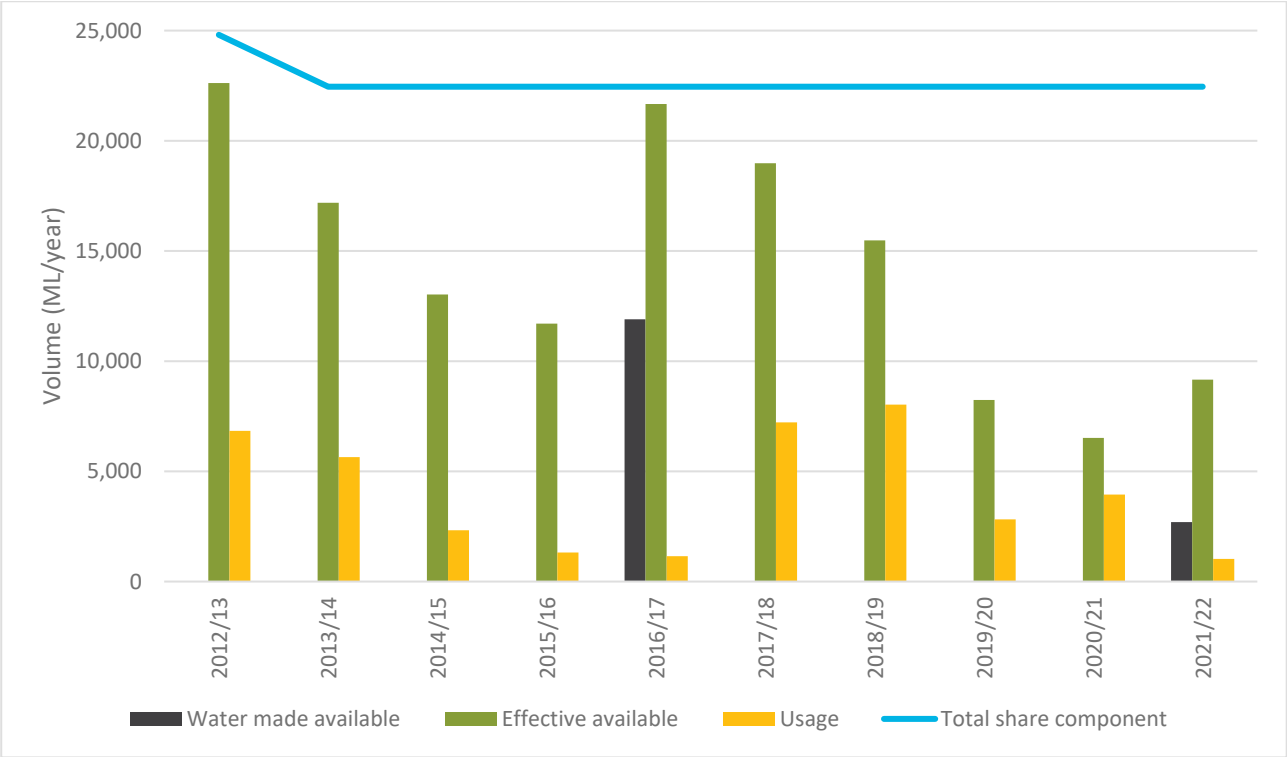


Figure B.10 Historical availability and usage of general security entitlement in the Belubula Regulated River Water Source

b Additional impact mitigation measures

Additional impact mitigation measures have been discussed in the EIS (EMM 2019a) and Amendment Report (EMM 2020a). Measures that Regis has committed to undertaking include:

- Scour protection and suitable energy dissipation measures (eg engineered stilling basin) will be constructed at the outlet of the clean water management system into the Belubula River to reduce erosion potential associated with concentrated flows.
- Stream remediation measures and possible additional controls (eg rock armouring) to reduce the extent and effect of erosion.
- An aquatic ecology offset package developed in consultation with DPI Fisheries, which will include a number of rehabilitation and remediation programs focusing on the downstream sections of the Belubula River, Tributary A and Tributary B within the mine development project area. These rehabilitation and remediation programs may include any of the following items:
  - undertaking aquatic habitat rehabilitation within degraded areas outside of the disturbance footprint, including remediation of eroded waterways and planting of indigenous aquatic macrophyte species;
  - undertaking riparian habitat rehabilitation within degraded areas outside of the disturbance footprint, including remediation of eroded banks and planting of indigenous riparian plant species;
  - removal of introduced terrestrial and aquatic species and weed species from the riparian zone and from within watercourses;
  - fencing of rehabilitated areas and watercourses within the mine development project area to ensure grazing by stock and native herbivores is mitigated (excluding areas where the final land use will comprise grazing);

- re-snagging of areas of watercourses where semi-permanent or permanent surface water pools exist, and/or in areas where high-flow would occur during flood events; and

- removal of existing barriers to fish passage in the mine development project area (that are not critical to transport, mine development or closure stock watering requirements), including constructed soil dams, livestock dams, sediment alluviation, access tracks and blocked culverts.

viii Accounting for water take

Regis will develop a water management plan, in consultation with DPE and DPE Water, that will document methods for measuring and metering water take. Where the interception of water cannot be practically metered, Regis will use monitoring data and modelling to predict and report water take. Examples of interception of water that cannot be practically metered include:

- rainfall on a dam surface;
- evaporation from a dam surface;
- runoff captured by a dam; and
- baseflow losses.

Regis will conduct the following to assist with calculating and reporting water intercepted by the project:

- continue to monitor rainfall at the site;
- measure and record pumping between storages;
- measure and record pumping from clean water facilities (including CWF1) to the Belubula River downstream of the site;
- monitoring of levels in the storages; and
- surface water flow monitoring in the Belubula River.

The recorded monitoring data will be to calibrate the water balance model and predict the volume of water captured by CWF1 and TSF.

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Appendix C

Additional information from HEC

HYDRO ENGINEERING & CONSULTING PTY LTD

8 July 2022

Regis Resources Limited
57 Adelaide St
Blayney NSW 2799
via email
Attention: Andrew Wannan

Andrew,

Re: McPhillamys Gold Project Hydrological Modelling for Surface Water Licensing

1. INTRODUCTION

Further to recent correspondence with yourself and EMM, we have undertaken the following work to support surface water licensing for the McPhillamys Gold Project (the Project):

1. Calibration of a rainfall-runoff model for the Belubula River at the Regis Resources Limited (Regis) streamflow gauging station located approximately 1.3 km downstream of the confluence with Trib A (refer Figure 1).
2. Use of the calibrated rainfall-runoff model to assess reductions in streamflow at this location as a result of the following project components:
   - the excision of the proposed Tailings Storage Facility (TSF) catchment only; and
   - the excision of the full (maximum) Project catchment area plus loss of maximum predicted stream leakage and baseflow reduction from groundwater modelling undertaken by EMM.
3. Use of the calibrated rainfall-runoff model to assess the likely catchment yield and volumes of pumped diverted flow from the proposed Clean Water Facility (CWF) 1 (to be located upslope of the proposed TSF).
4. Conducting a validation of the previously calibrated model of the Lake Carcoar water balance.

The following sections deal with each of these in turn.

2. BELUBULA RIVER GAUGING STATION RAINFALL RUNOFF MODEL CALIBRATION

Regis commissioned a streamflow gauging station on the Belubula River at the location indicated on Figure 1 in March 2020 (refer Photo 1) and more than two years' recorded data are now available. The catchment area at the gauging station is estimated as 43.5 km^2. The gauging station was equipped with a concrete weir with a v-notch section in order to provide a theoretical rating relationship[1] for flows contained within the weir cross-section. For higher flows, the rating relationship has been extrapolated. Recorded depth data were provided and used to calculate daily flow volumes using the rating relationship.

[1] A gauging station rating relationship relates monitored upstream flow depth to flow rate.

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Regis also maintain a network of automatic rainfall recording stations, at the locations indicated on Figure 1.

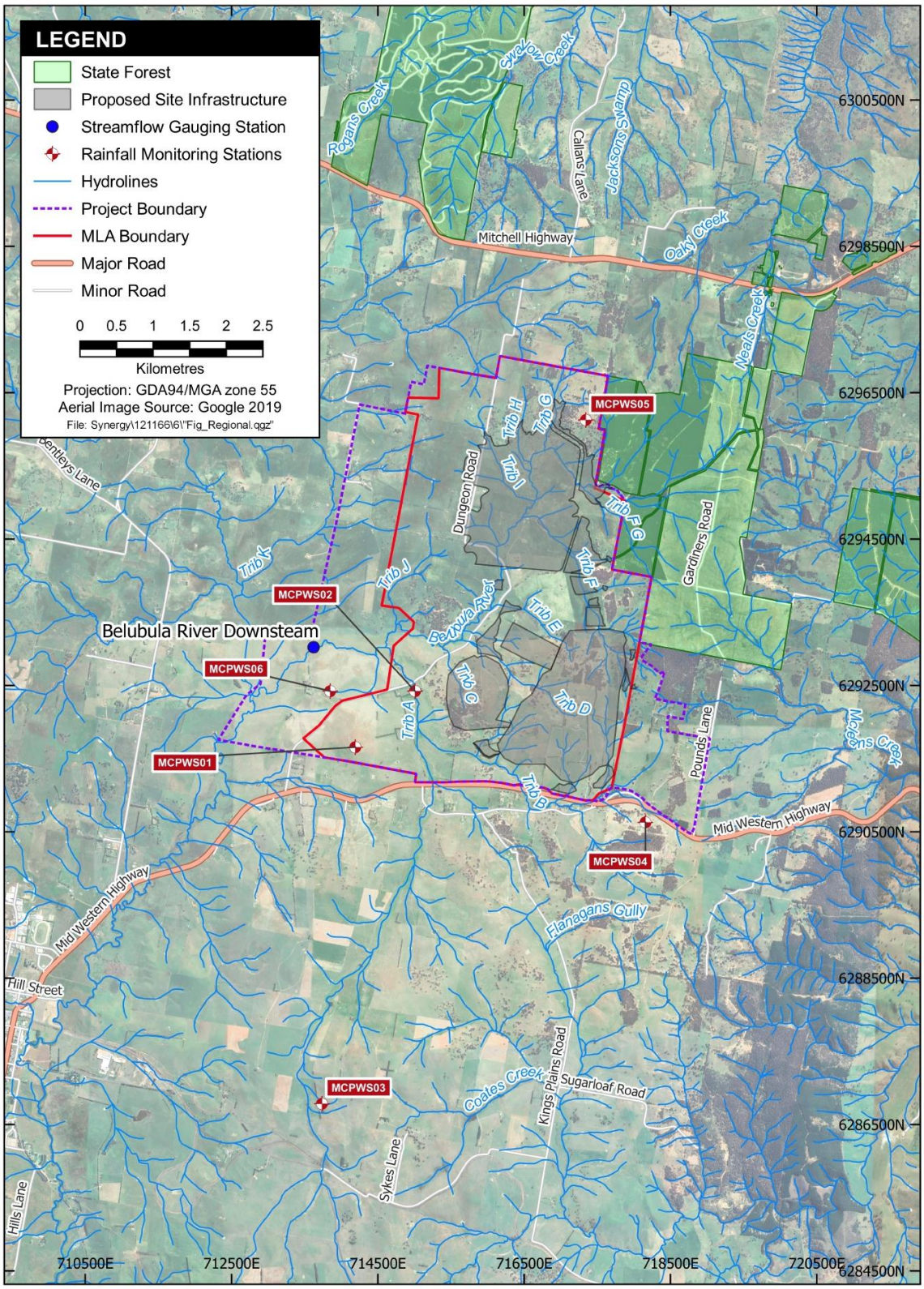

Figure 1 Location Plan

Photo 1 Belubula River Downstream Gauging Station

Recorded streamflow and rainfall data for two of the rainfall stations are plotted in Figure 2. Recorded data from the gauging station was lost for a short period in February/March 2022, otherwise the data record is continuous. The period of data record coincides with an above average rainfall period, with recorded rainfall averaging 1,010 mm/year, compared with 737 mm/year average from long term data for the catchment.

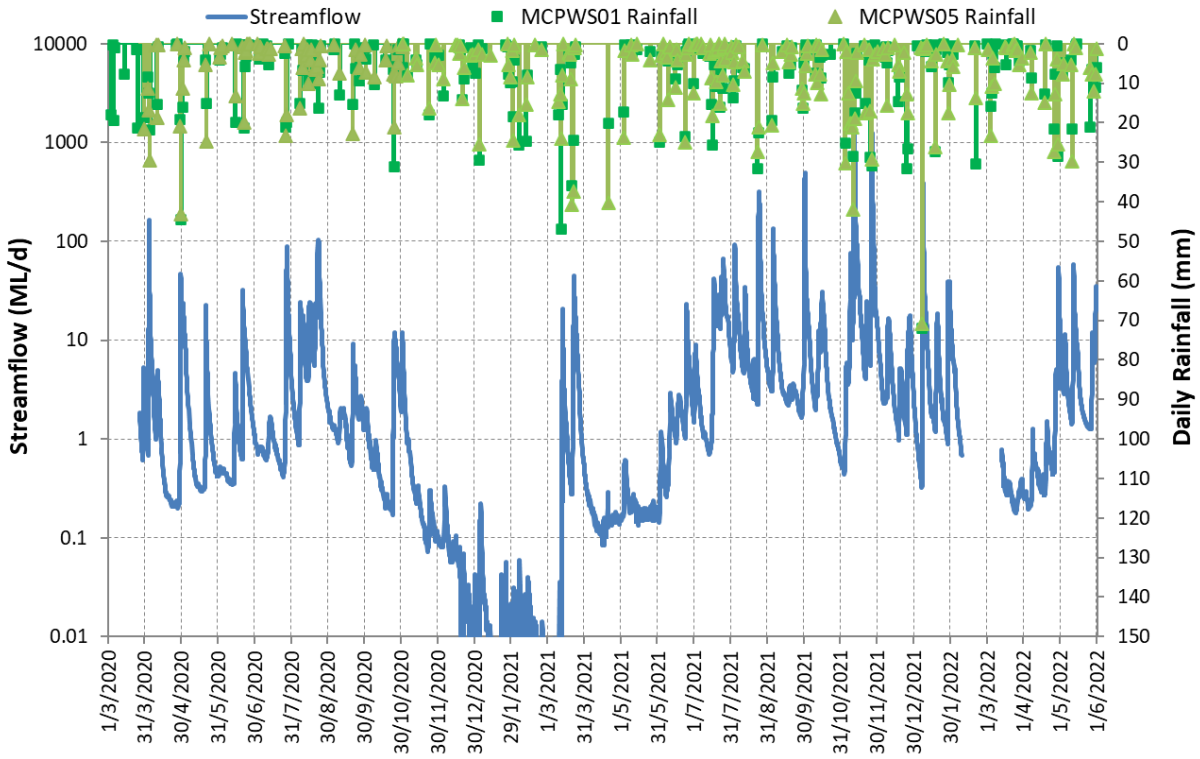

Figure 2 Belubula River Recorded Streamflow and Catchment Rainfall Data

A rainfall runoff model was developed to simulate streamflow rate at the gauging station. Rainfall runoff was simulated using the AWBM[2], which is a nationally-recognised catchment-scale water balance model that estimates catchment yield (flow) from rainfall and evaporation. The structure of the AWBM is illustrated in Figure 3.

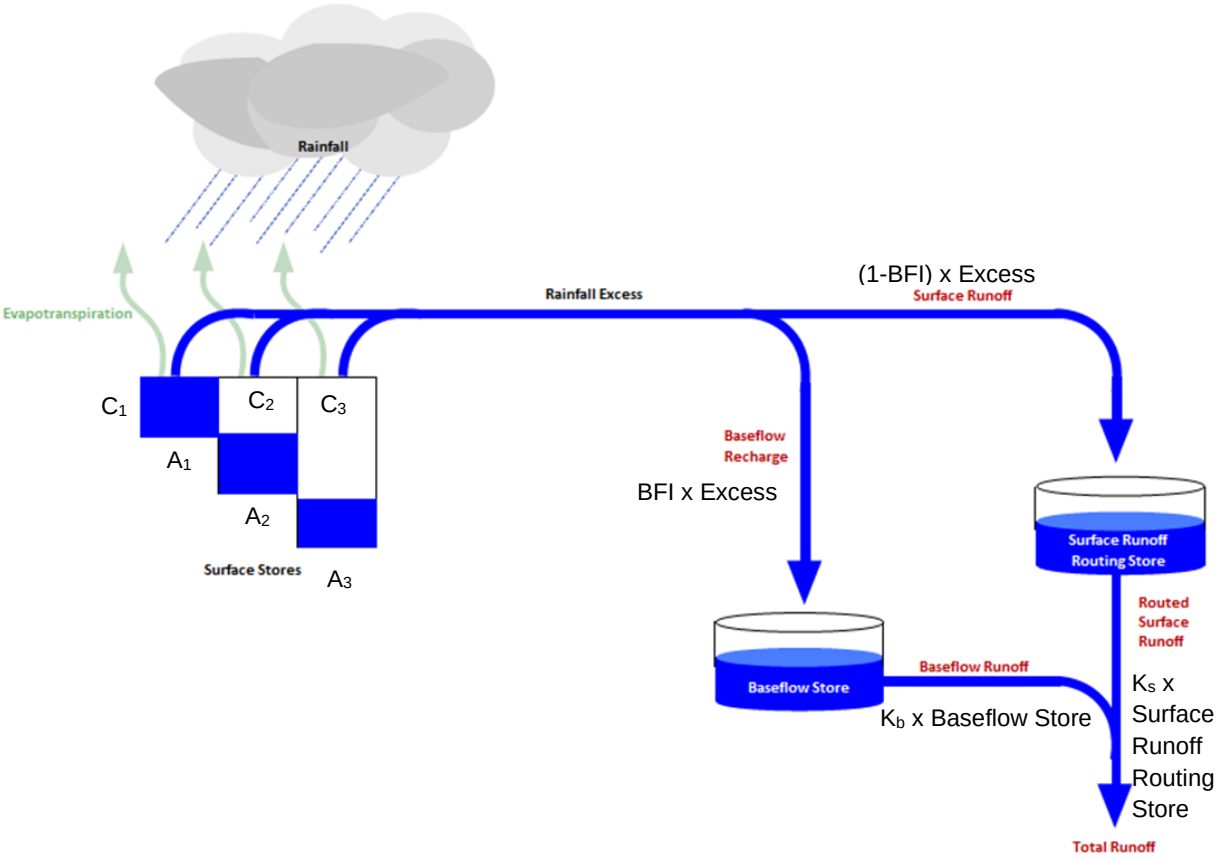

Figure 3 AWBM Structure

Model calibration was undertaken for the period of available streamflow data plotted in Figure 2. Daily rainfall data for the calibration period was derived by taking the average of data recorded at the Regis rainfall monitoring stations. Where there were inconsistencies in recorded rainfall data for a particular station on a given day, that data was not used in the calculation of average rainfall for that day. Daily pan evaporation data for the catchment was sourced from SILO point data[3]. AWBM parameters were adjusted to obtain a calibration.

A plot of the recorded and calibrated model hydrographs are given in Figure 4, while Figure 5 shows flow duration curves for recorded and modelled daily flows. These plots indicate a good replication of recorded streamflow using the AWBM. Relevant model goodness-of-fit parameters are as follows:

- Nash-Sutcliffe coefficient of efficiency on monthly flows: 0.949
- Coefficient of determination (r^2) on monthly flows: 0.966
- Recorded total flow: 5,763 ML
- Modelled total flow: 5,754 ML
- Modelled total flow difference to recorded: -0.2%

[2] Boughton, W.C. (2004). The Australian Water Balance Model. In "Environmental Modelling and Software", vol.19, pp. 943-956.

[3] SILO point data is a system which provides synthetic data sets for a specified point by interpolation between surrounding point records held by the Bureau of Meteorology. Refer https://www.longpaddock.qld.gov.au/silo/

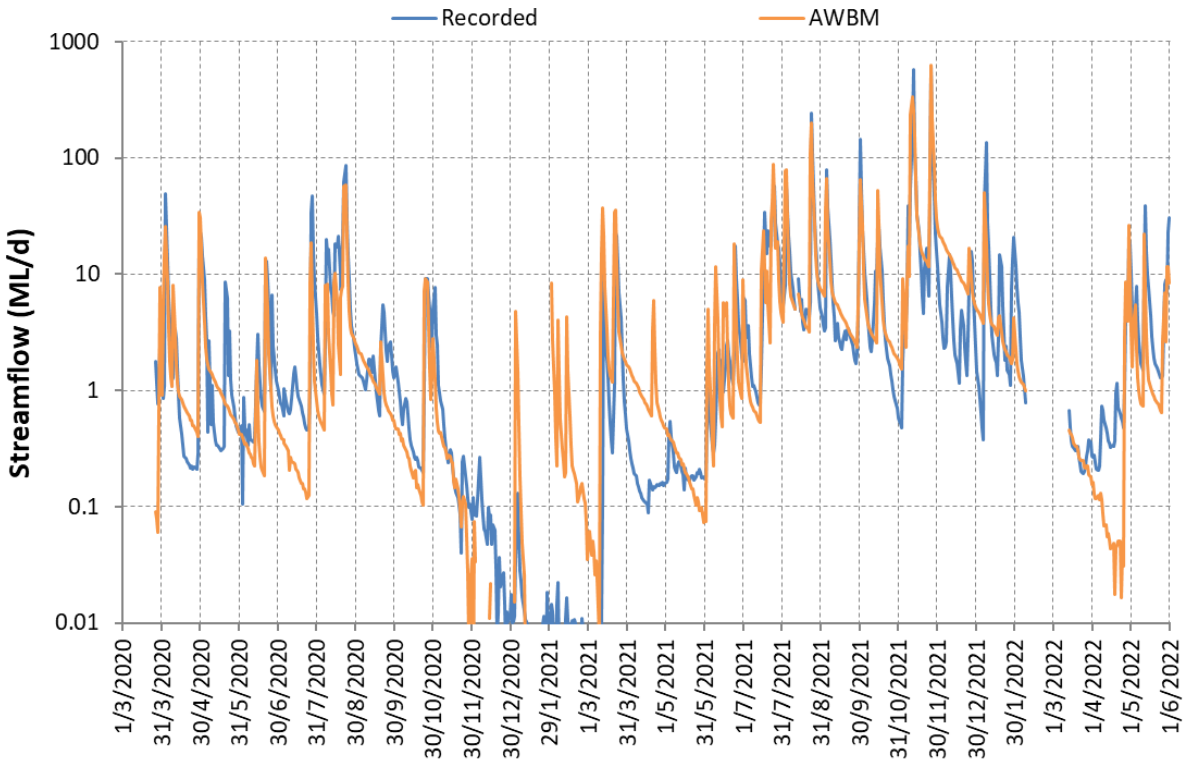

Figure 4 Belubula River Recorded and Modelled Streamflow Hydrographs

There is a noticeable difference between the flow duration curves for very low flows: less than approximately 0.08 ML/day. Recorded low flows of this magnitude were recorded only in late 2020/early 2021. During this period, the gauging station pond experienced extensive growth of aquatic weed[4], which may have affected recorded water levels and hence flow rates. On-going recording of data during receding and low flow periods will further improve model calibration for such low flows. Note that the lowest flow plotted in Figure 4 and Figure 5 of 0.01 ML/day equates to only 0.12 Litres/second.

[4] Confirmed via email: D.Wallace 27 June 2022.

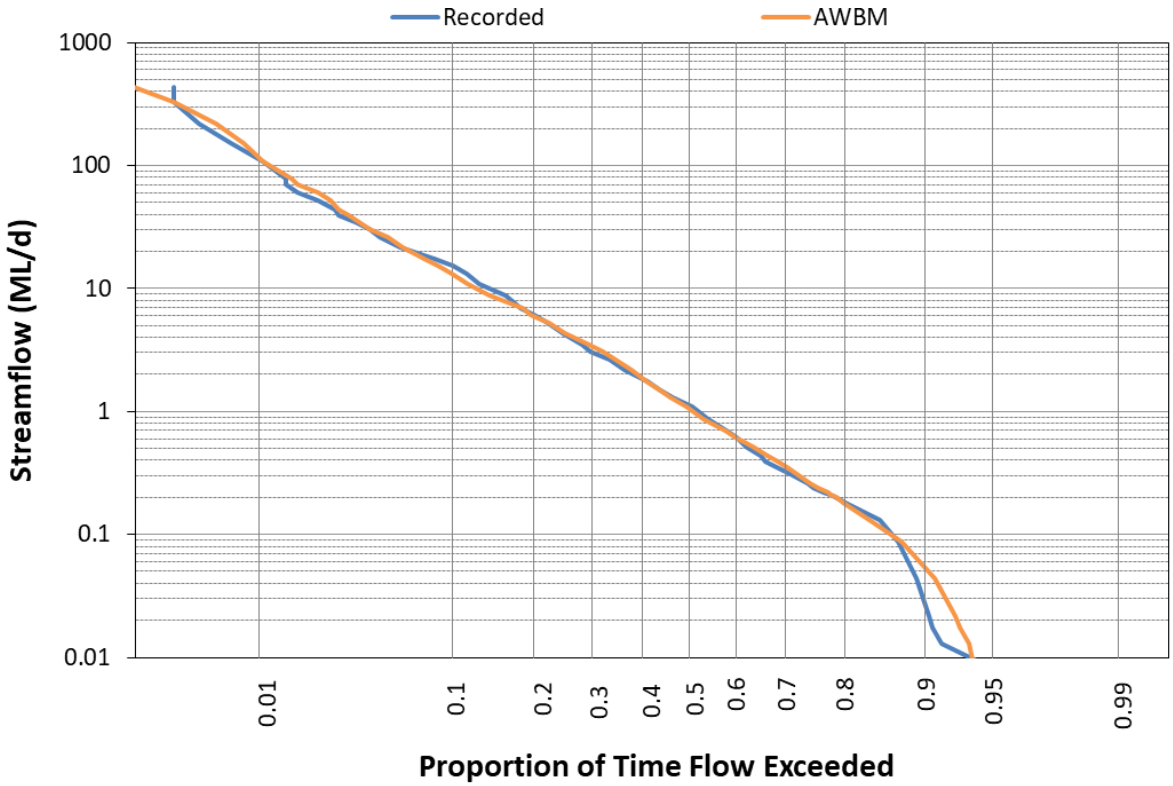

Figure 5 Belubula River Recorded and Modelled Flow Duration Curves

Calibrated AWBM parameters are given in Table 1.

Table 1 Belubula River Calibrated AWBM Parameters

Parameter:	C_1 (mm)	C_2 (mm)	C_3 (mm)	A_1	A_2	A_3	K_s (d^{-1})	BFI	K_b (d^{-1})	Tr*	EvF
Value:	21	235	455	0.042	0.30	0.658	0.3	0.3	0.95	0.0004	0.85

* Transmission loss as a multiplier on pan evaporation. These losses include stream evapotranspiration, infiltration into and through the stream bed alluvium and underlying fractured rock and water which ponds in stream pools.

3. FORECAST PROJECT FLOW IMPACTS AT BELUBULA RIVER GAUGING STATION

The calibrated AWBM was used to forecast changes to the flow regime at the gauging station that could result from the following scenarios:

- the excision of the proposed Tailings Storage Facility (TSF) catchment only; and
- the excision of the full (maximum) Project catchment area plus loss of maximum predicted stream leakage and baseflow reduction from groundwater modelling undertaken by EMM[5].

For the former scenario, a reduction in catchment area of 4.27 km^2 was adopted, while for the latter the modelled catchment area reduction was 9.21 km^2. These represent maximum areas during Project development. The predicted stream leakage and baseflow reduction is summarised in Table 2. This is based on the forecast Project year with the highest rate of stream leakage and baseflow reduction.

[5] As reported in "McPhillamys Gold Project Amendment Report – Groundwater Assessment Addendum", report prepared for LFB resources NL by EMM, v5, 25 August 2020.

Table 2 Belubula River Predicted Flow Loss from Groundwater Modelling[5]

Belubula Upstream of Trib A (kL/day)		Trib A (kL/day)	
Leakage	*Baseflow Reduction*	*Leakage*	*Baseflow Reduction*
31	28	35	11

A total of 0.105 ML/day was subtracted from the AWBM simulated baseflow at the gauging station.

Forecast modelling was undertaken for the full 133½ year period of rainfall and evaporation data available from the SILO point data, sourced for a location near the centroid of the gauging station catchment. Model results are presented in Figure 6 as flow duration curves (daily flow) for the 133½ year period for the above two scenarios and the existing unaffected catchment.

Total annual streamflows for the above two scenarios and the existing unaffected catchment were calculated and used to estimate annual flows at different percentile levels. Results are given in Table 3.

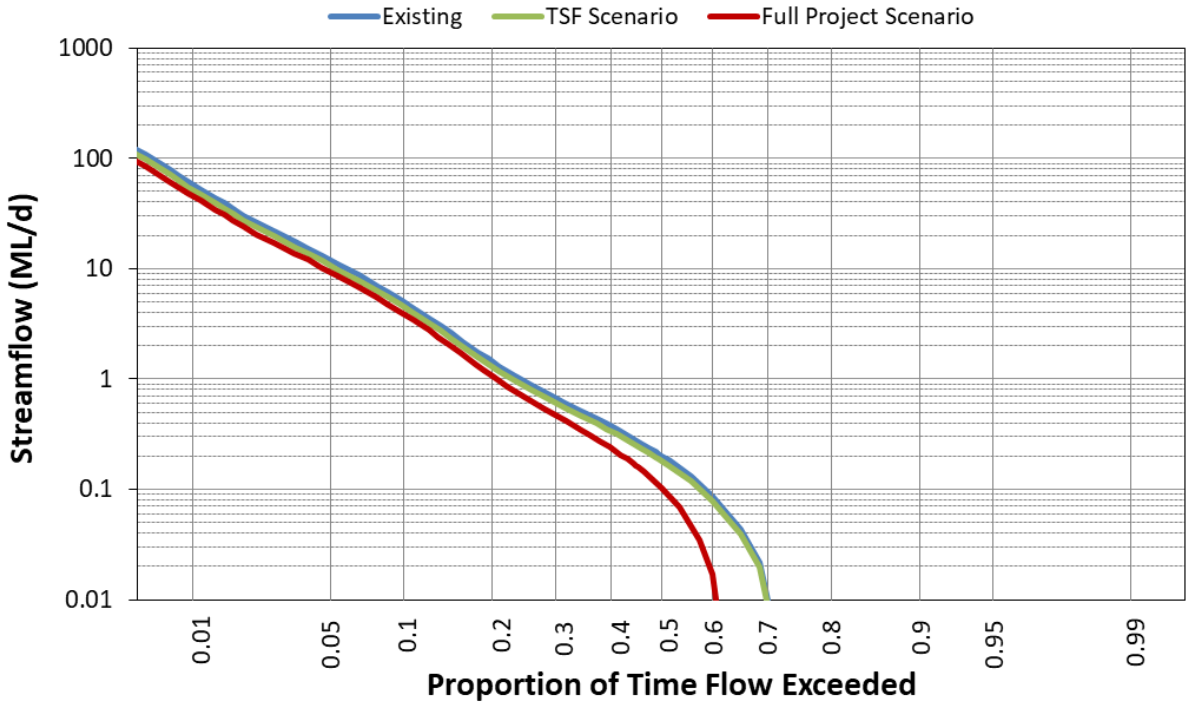

Figure 6 Belubula River Modelled Flow Duration Curves

Table 3 Modelled Long Term Annual Flow at Belubula River Gauging Station

Percentage of Time Flow is Greater Than the Modelled Flow	Existing Catchment	With TSF Excision	With Maximum Project Excision, Stream Leakage and Baseflow Reduction
	ML/year		
95%	119	108	84
90%	164	148	112
80%	246	222	176
70%	322	291	234
60%	369	333	268
50%	420	379	308
40%	521	469	383
30%	728	656	549
20%	1,288	1,161	985
10%	2,600	2,345	2,023
5%	5,126	4,622	4,010

Figure 6 shows quite a small difference between the flow duration curve for the unaffected catchment and that with excision of the TSF catchment. The change is related only to the less than 10% catchment area reduction and is uniformly distributed across the flow range, as evident in Table 3. This contrasts with the flow duration curve for the full Project catchment plus loss of maximum predicted stream leakage and baseflow reduction, which shows a greater departure at lower flows because of the prevalence of baseflow at these lower flows. There is a predicted reduction of approximately 10% in the frequency of flow of up to 0.01 ML/day.

4. WATER BALANCE MODELLING OF CWF1

The calibrated AWBM was used to forecast the water balance of CWF1 in response to catchment inflows and pumped outflows. Forecast modelling was undertaken for the full 133 year period of rainfall and evaporation data available from the SILO point data, sourced for a location near the centroid of the CWF1 catchment. The simulated catchment area of CWF1 was 6.81 km^2 and the pumped outflow (diversion) rate was 275 L/s.

Storage volumes simulated by the water balance model were used to calculate a varying storage surface area (i.e. water area) based on a storage level-volume-area relationship developed from a design embankment alignment for CWF1 and storage area topographic contours. Daily SILO pan evaporation was multiplied by the calculated water area and by a pan factor in the calculation of storage evaporation losses from CWF1. Monthly pan factors were taken from McMahon et al. (2013) data for Canberra Airport (located 200 km south of the Project area) and are listed in Table 4.

Table 4 Adopted Monthly Pan Evaporation Factors

Month	Pan Factor
Jan	0.785
Feb	0.791
Mar	0.77
Apr	0.801
May	0.82
Jun	0.849
Jul	0.881
Aug	0.879
Sep	0.873
Oct	0.883
Nov	0.852
Dec	0.811

The ponded water surface area of CWF1 was modelled as producing 100% rainfall runoff yield, while the runoff from upslope catchment areas was simulated using the calibrated AWBM.

Total annual modelled CWF1 inflows and outflows are summarised in Table 5 at different percentile levels.

Table 5 Modelled Long Term Annual Flow at Belubula River Gauging Station

Percentage of Time Flow is Greater Than the Modelled Flow	Rainfall Runoff	Evaporation	Pumped Flow (Diversion)
	ML/year		
95%	19.3	1.5	17.3
90%	27.1	1.61	25.3
80%	40.3	1.71	38.8
70%	52.1	1.78	50.1
60%	59.2	1.83	57.3
50%	67.4	1.88	64.8
40%	82.7	1.92	81.5
30%	112.2	1.98	110.7
20%	202.5	2.09	210.7
10%	405.4	2.21	403.6
5%	800.3	2.39	746.8

5. LAKE CARCOAR WATER BALANCE MODEL VALIDATION

A calibrated water balance model of Lake Carcoar (catchment area approximately 230 km^2) has previously been developed as described in HEC (2020)[6]. This included model revision in response to review by the then DPIE – Water (now DPE – Water) and provision of data records of historical storage levels and release volumes. The model was previously calibrated for the period from the start of 1985 to mid-2020. Rainfall runoff was modelled using AWBM simulation of catchment runoff using SILO point data for a location near the centroid of the catchment. The calibrated model was used to forecast Project impacts on inflows to Lake Carcoar.

Updated climate and Lake Carcoar release data[7] are now available. This data was used as input to the model to validate the calibration (i.e. to extend the 'calibration' period to mid-2022). In addition, Project site rainfall data (available from early 2014) was used instead of SILO Point rainfall data, with the exception of 2019 for which site data was unavailable for periods of time.

Results showing the comparison between the recorded and modelled stored water volumes in Lake Carcoar during the period from 1985 to mid-2022 are shown in Figure 7. The linear correlation coefficient for the recorded to revised modelled daily stored water volume is 0.93 and hence is considered a good fit. No changes were made to model parameters, with the only changes comprising the data update as described above. The calibrated and validated Lake Carcoar AWBM parameters differ from those for the Belubula River gauging station given in Section 2 above.

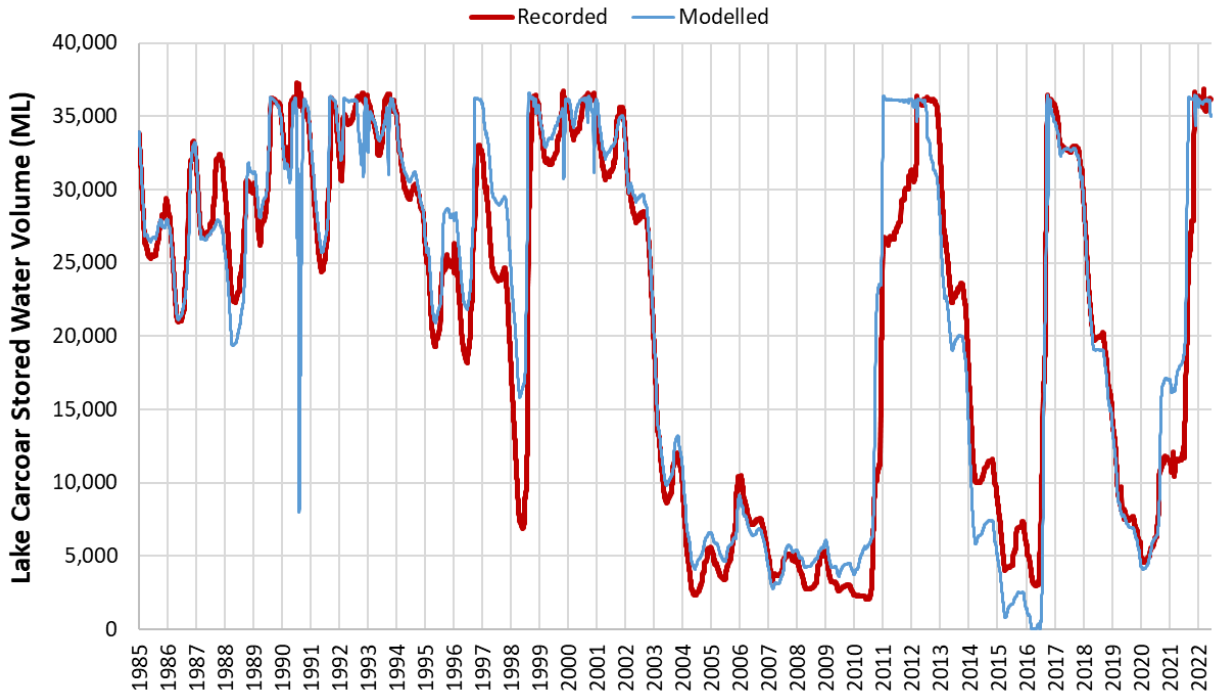

Figure 7 Comparison of Recorded and Modelled Stored Water Volume in Lake Carcoar

[6] "McPhillamys Gold Project Mine Development Revised Surface Water Assessment." Hydro Engineering & Consulting Pty Ltd report J1613-05.r1c, prepared for EMM Consulting, August, 2020.

[7] Daily release data for the period from mid-2020 were sourced from https://realtimedata.waternsw.com.au/

The good calibration between recorded and modelled stored water volumes in Lake Carcoar confirms that the model provides a reasonable fit for longer term simulation. The model is considered fit for purpose for assessing the potential effects of the Project on inflows to Lake Carcoar. The predicted effects documented in HEC (2020) therefore remain valid.

6. CLOSURE

Please do not hesitate to contact the undersigned if you have any queries or require further information.

Yours faithfully,

Tony Marszalek
Senior Principal Engineer