Attachment 4

Surface Water and Flooding Responses

WINCHESTER SOUTH PROJECT

Environmental Impact Statement

Response to Submissions

WHITEHAVEN COAL

Resource Strategies

Winchester South Project

Surface Water and Flooding Responses

Whitehaven Coal Limited

0869-10-A1, 22 March 2023

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1 Department of Transport and Main Road Comments

1.1 ISSUE NO. 212.6 & 212.7

1.1.1 Submitter recommendation / suggested mitigation

The Department of Transport and Main Roads (DTMR) raised the following:

> *The proponent has submitted additional surface flooding and groundwater information, but it does not specifically address TMR's comments.*
>
> *TMR would like to discuss the options for conditioning a requirement for the development to not worsen stormwater or flooding or cause actionable nuisance to the railway corridor with CG and DES, as per TMR's previous comments.*

1.1.2 Response

Figure 1.1 and Figure 1.2 show the modelled change in water level for the 0.1 per cent (%) Annual Exceedance Probability design event for the operational and final landform scenarios, respectively and interactions with the surrounding infrastructure. The "no impact" tolerance has been adjusted to +/- 0.01 metres (m) (+/- 10 millimetres [mm]) as per Department of Transport and Main Roads (DTMRs) requirements. Figure 1.1 and Figure 1.2 show that:

- Under both model scenarios, the project results in less than 0.01 m water level impact around the Norwich Park Branch Railway line (as shown by the cyan zones).
- For the operational scenario, there is a peak water level impact of 0.08 m along the Olive Downs spur line.
- For the final landform scenario, the is a peak water level impact around the Olive Downs spur line is less than 0.01 m during a 0.1% AEP flood event.

The model results demonstrate that the Winchester South Project (the Project) (both under operational conditions and the final landform) has an impact of less than 0.01 m on water levels around Norwich Park Branch Railway, and less than 0.1 m impact on water levels around the Olive Downs spur line during a 0.1% AEP flood event.

Notwithstanding, the following commitments have been made by Whitehaven WS regarding flooding management and the Norwich Park Branch Railway corridor in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments):

> ***Stormwater and Flooding Management***
>
> *(a) Stormwater and flooding management of the development must not cause worsening or actionable nuisance to the Norwich Park Branch Railway.*
>
> *(b) Any works associated with the development must not:*
>
> *(i) create any new discharge points for stormwater runoff onto the railway corridor;*
>
> *(ii) interfere with and/or cause damage to the existing stormwater drainage on the railway corridor;*
>
> *(iii) surcharge any existing culvert or drain on the railway corridor,*
>
> *(v) worsen the flood immunity of the Norwich Park Branch Railway associated with development activities, or*
>
> *(vi) impede or interfere with overland flows paths and/or hydraulic conveyance on the site.*

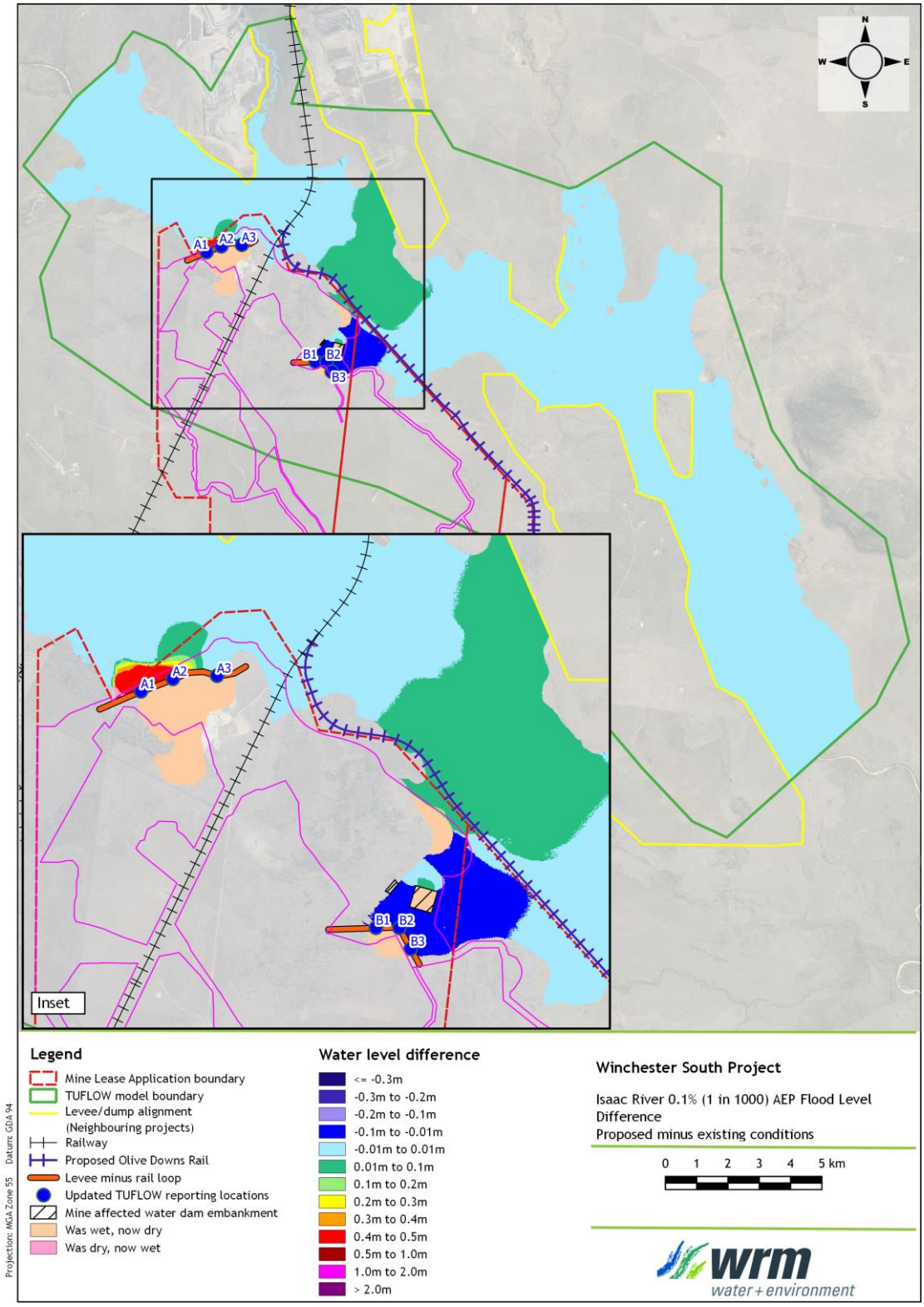

Figure 1.1 – 0.1% AEP change in peak water level, proposed minus existing conditions

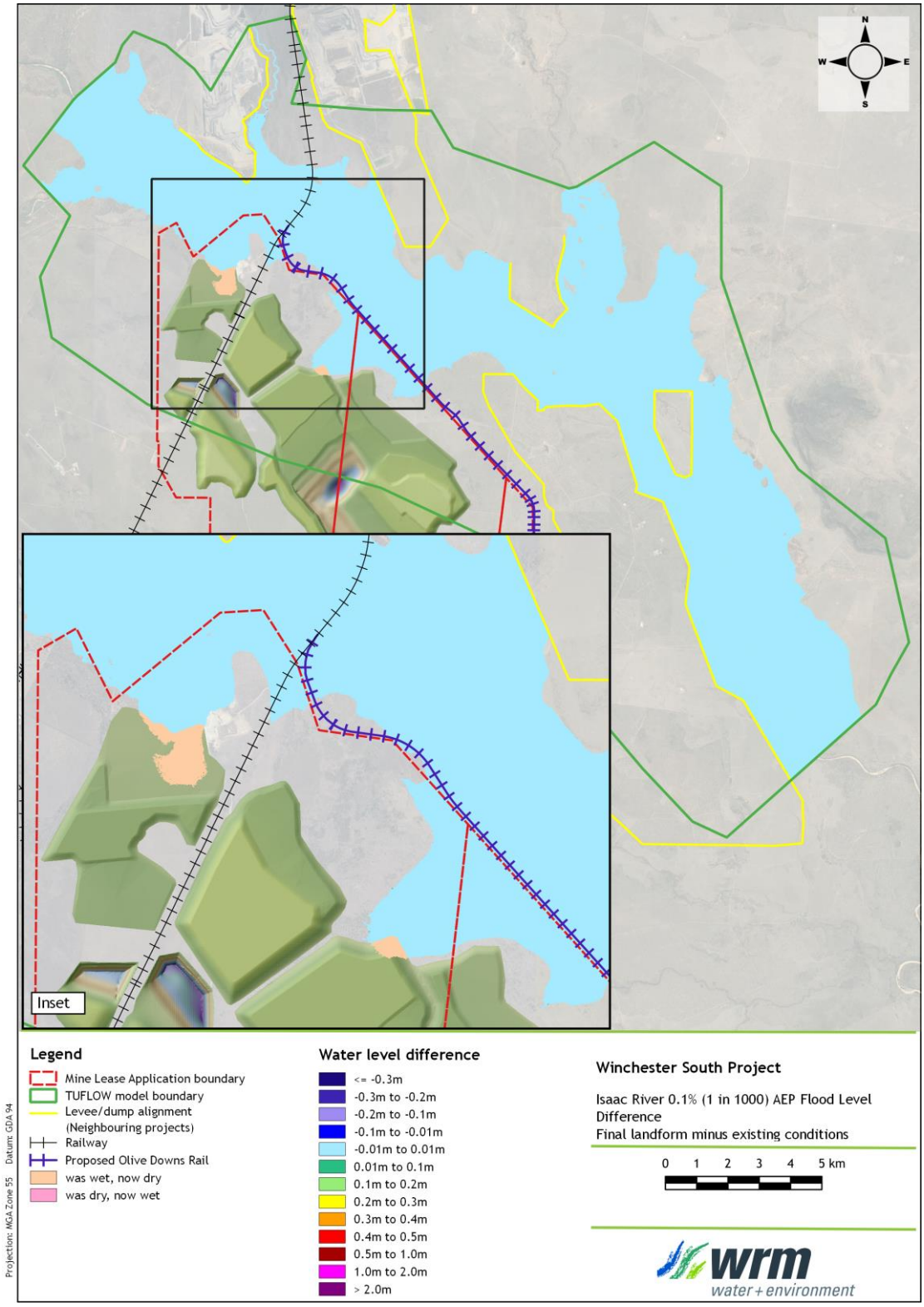

Figure 1.2 – 0.1% AEP change in peak water level, post-mining minus existing conditions

2 Department of Environment and Science Comments

2.1 ISSUE NO. 584.09

2.1.1 Submitter recommendation / suggested mitigation

The Department of Environment and Science (DES) raised the following:

> *The revised draft EIS should include a level of detail that is nominated to be contained in the future proposed Water Management Plan to allow for a robust and adequate assessment of all potential impacts to water. This information is required to allow the proponent to develop suitable draft EA conditions, which have not been provided.*
>
> *The draft EIS is to provide draft EA conditions, including water quality monitoring locations, monitoring timing and frequencies, limits and trigger values.*

2.1.2 Response

The full list of proposed Environmental Authority (EA) conditions is provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments) with justification for the proposed EA conditions relevant to surface water provided in *Proposed Environmental Authority Conditions for Surface Water and Justification* (WRM, 2023) (Appendix A).

2.2 ISSUE NO. 584.10

2.2.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *No assessment on the potential impacts to the Greater Barrier Reef (GBR) catchment could be found in Attachment 6 or Additional Information document.*
>
> *Although Section 41AA of the Environmental Protection Regulation 2019 does not directly inform the EIS process, Environmental Protection Act 1994 s40(e) states that the purpose of an EIS and the EIS process is to help the administering authority decide an environmental authority application for which the EIS is required. Hence the information on how section 41AA of the EP Reg will be considered should be within the draft EIS – i.e., how the DIN and fine sediment will be managed to achieve no net decline in the GBR catchment.*
>
> *The draft EIS should assess direct and indirect impacts to the Great Barrier Reef as required under TOR item 11.57(b)(vi).*
>
> *The draft EIS is to consider section 41AA of the EP Reg and discuss how no net increase in DIN and fine sediment will be achieved.*

2.2.2 Response

Section 1.2 of *Reef discharge standards for industrial activities* (DES, 2022) states that:

> *The '2017 Scientific Consensus Statement: Land use impacts on Great Barrier Reef water quality and ecosystems' confirms that poor water quality continues to be a significant issue for overall GBR health, with the main source of pollution being the cumulative nutrient and sediment run off from agricultural land use, with local scale contributions from urban and industrial land uses.*

The pre-mining land use for the majority of the Project area is agricultural land use which, as noted in DES (2022), it a key source of pollution to the Great Barrier Reef through cumulative nutrient and sediment runoff. The proposed changes to the Project area land use would significantly reduce the areas of agricultural activity.

During operations, significant areas of the Project area will be captured within the water management system, where it is either re-used within the mine water management system, or treated with the sediment water management system. The maximum catchment areas excised by the Project during operations represent:

- Up to 53 square kilometres (km^2) of the Isaac River catchment (to the Isaac River and Ripstone Creek confluence) compared to pre-mining conditions.
- Up to 13 km^2 of the Ripstone Creek catchment compared to pre-mining conditions.

The predicted volumes of water required to be released to the receiving environment through controlled releases are relatively small, and only occur during very wet climatic conditions. The nutrient and sediment runoff during the operational phase is expected to be significantly less than under pre-mining conditions.

The post-mining final landform features significant areas of rehabilitated land (outside of the residual void waterbody areas), which are expected to generate similar water quality run-off as the pre-mining conditions. The change in the pre-mining topography by the proposed final landform would (e.g. catchment excision in perpetuity):

- reduce the catchment draining to the Isaac River (to the Isaac River and Ripstone Creek confluence) would reduce by around 13.7 km^2 compared to pre-mining conditions.
- reduce the catchment draining to Ripstone Creek would reduce by around 4.3 km^2 compared to pre-mining conditions.

As such, the post-mining final landform are expected to generate similar or lesser amounts of nutrient and sediment runoff than under pre-mining conditions. Therefore, during both the operational and post-mining phases, the net impact on nutrient and sediment releases to the Isaac River (and subsequently the Great Barrier Reef) is expected to be lesser than under existing conditions.

2.3 ISSUE NO. 584.11

2.3.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Attachment 6 does discuss Door records for the 'Isaac River water levels at the Goonyella (upstream) and Deverill (downstream) gauges. The details of these gauges are provided in Table 4.1. Figure 4.2 shows the Isaac River catchment to the Deverill gauging station adjacent to the Project.'*
>
> *Section C1.1 of Appendix C of Attachment 6 states: 'The Isaac River XPRafts model was calibrated to hydrographs recorded at the Deverill and Goonyella gauging stations for three historical flood events (2008, 2010 and 2017).'*
>
> *Unclear why proponent/OCG response discusses EC, as the original comment was about the Goonyella gauging station. Clarify what data is recorded at each gauging station, how the data will be used and how any discrepancies or deficiencies will be ratified.*

2.3.2 Response

The data recorded at each gauging station is provided in Sections 4.3 and 4.4 of the Surface Water and Flood Assessment (WRM, 2022) (SWFA), and a summary is provided below. The data has been used to characterise the existing surface water environment in proximity to the Project and the gauging stations would continue to be used during the Project if available.

The Department of Resources (DoR) currently records Isaac River water levels at the Deverill (downstream) gauge. The DoR previously recorded water levels at the Burton Gorge (upstream) gauge between 1963 and 1985 and at the Goonyella (upstream) gauge between 1983 and 2013.

Historical flow and river height monitoring data at the Goonyella and Deverill gauges provide an indication of the local flow regime (Section 4.3 of the SWFA [WRM, 2022]). DoR also collects daily electrical conductivity (EC) data at the Isaac River at the downstream Deverill and Yatton gauging stations (Section 4.4 of the SWFA) [WRM, 2022].

Publicly available regional water quality data for the Isaac River at the Burton Gorge, Goonyella and Deverill gauging stations is available for the following parameters:

- Burton Gorge collects **Conductivity @ 25C**, **Turbidity**, Colour True, **pH**, Total Alkalinity as $CaCO_3$, Hydroxide as OH, Carbonate as CO_3, Bicarbonate as HCO_3, Hardness as $CaCO_3$, Hydrogen as H, **Total Dissolved Solids**, Total Dissolved Ions, **Total Suspended Solids**, Calcium as Ca soluble, Chloride as Cl, **Magnesium as Mg soluble**, **Nitrate as NO_3**, Potassium as K, **Sodium as Na**, **Sulphate as SO_4**, **Boron as B**, **Fluoride as F**, **Iron as Fe soluble**, Silica as SiO_2 soluble.
- Goonyella gauging station collects **Conductivity @ 25C**, **Turbidity**, Colour True, **pH**, Total Alkalinity as $CaCO_3$, Hydroxide as OH, Carbonate as CO_3, Bicarbonate as HCO_3, Hardness as $CaCO_3$, Hydrogen as H, **Total Dissolved Solids**, Total Dissolved Ions, **Total Suspended Solids**, Calcium as Ca soluble, Chloride as Cl, **Magnesium as Mg soluble**, **Nitrate as NO_3**, Total Nitrogen, Organic Nitrogen, Nitrate + nitrite as N soluble, Ammonia as N – soluble, Oxygen (Dissolved), **Total Phosphorus as P**, Total React P, Potassium as K, **Sodium as Na**, **Sulphate as SO_4**, **Aluminium as Al soluble**, **Boron as B, Copper as Cu soluble**, Chromium as Cr, Copper as Cu, Cyanide as CN, **Fluoride as F**, **Iron as Fe soluble**, Lead as Pb, **Manganese as Mn soluble**, Mercury as Hg, Nickel as Ni, Selenium as Se, Silica as SiO_2 soluble, **Zinc as Zn soluble**.
- Deverill gauging station collects data on the following analytes; **Conductivity @ 25C**, **Turbidity**, Colour True, **pH**, Total Alkalinity as $CaCO_3$, Hydroxide as OH, Carbonate as CO_3, Bicarbonate as HCO_3, Hardness as $CaCO_3$, Hydrogen as H, **Total Dissolved Solids**, Total Dissolved Ions, **Total Suspended Solids**, Calcium as Ca soluble, Chloride as Cl, **Magnesium as Mg soluble**, **Nitrate as NO_3**, Kjeldahl Nitrogen, Total Nitrogen, Organic Nitrogen, Nitrate + nitrite as N soluble, Ammonia as N – soluble, Oxygen (Dissolved), **Total Phosphorus as P**, Total React P, Potassium as K, **Sodium as Na**, **Sulphate as SO_4**, **Aluminium as Al soluble, Boron as B, Copper as Cu soluble, Fluoride as F**, **Iron as Fe soluble, Manganese as Mn soluble**, Silica as SiO_2 soluble, **Zinc as Zn soluble**.

Table 4.3 of the SWFA (WRM, 2022) focusses on the parameters that are most relevant to the Project as an open cut mine. These parameters are bolded above.

2.4 ISSUE NO. 584.12

2.4.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Without undertaking a detailed cumulative impact assessment with other mines, how would can it be concluded that the releases from the proposed Winchester South project will not cause a tipping point to be achieved and cumulatively cause an impact.*
>
> *Diverting water away from the sediment dam to MAW dam so that there is no release water with salinity level greater than 2,000 µs/cm when the flow is less than 50 ML/d is noted. This however, does not imply that the cumulative impact assessment is not required. The purpose of cumulative impact assessment is to better understand the impact as a whole, including those releases that are considered to be minor as a single point release. In addition, without specific draft EA conditions it is unclear how ongoing reporting, notification and compliance activities are proposed to occur. DES requires the provision of modelling and detailed calculations of the proposed minimum dilution ratios for controlled releases to local waterways and the modelling should include cumulative impacts by including details on releases from mines in the Upper Isaac catchment (e.g. details such as flow volume, daily /weekly release or release pattern, contaminants present and level).*
>
> *Sediment dams continue to be nominated to receive contaminants other than simply suspended sediments from minimal-disturbance catchments, therefore site-specific draft EA conditions related to these dams was agreed to be provided by the proponent.*

2.4.2 Response

The Project water management system has been configured to greatly minimise the likelihood that controlled releases of potentially mine-affected water (MAW) would be required during operations. As described in Section 7.3.5 of the SWFA (WRM, 2022), controlled releases would only be required during extremely wet (1 percentile) climatic conditions. In these circumstances, flow in the Isaac River would provide significant dilution to any release of MAW to the receiving environment, which is demonstrated by the water balance model.

Details of the predicted dilution ratios during controlled releases is provided in Section 7.3.5 of the SWFA (WRM, 2022). The modelled dilution ratios during a controlled release from the Project range between 407:1 (minimum) and greater than 800,000:1, with 50% of release days having a dilution ratio of at least 5,550:1.

The predicted volumes of water discharged during controlled releases (under these extremely wet conditions) are relatively small, with the peak annual volume at less than 230 mega litres (ML) (see Figure 7.6 of the SWFA [WRM, 2022]).

The model results clearly demonstrate that controlled releases from the Project would have a negligible and unmeasurable impact on both flows and water quality within the Isaac River. The predicted water quality within the Isaac River during a controlled release from the Project would be below the high flow water quality objective for EC on 95% of all controlled release days.

Based on the above, the Project would have a negligible influence on the cumulative impacts from controlled releases within the upper Isaac River.

Notwithstanding, an "expected worst-case" cumulative impact assessment is provided in (Appendix A), including modelling of mine-affected water releases of the Project and surrounding operations based on the approved tiered release strategies for mine-affected water. For this cumulative assessment, the Winchester South Project, Olive Downs Mine and Isaac Downs Mine were assumed to be releasing at the maximum flow rate and contaminant concentration for the relevant release tier based on the mine-affected water release limits. The outcomes of the "expected worst-case" cumulative impact assessment, with the Project and surrounding operations discharging simultaneously at their maximum release rates, electrical conductivity (EC) concentrations and sulphate (SO_4^{2-})within each tier:

- the predicted downstream EC in the Isaac River is less than 800 microSiemens per centimetre (µS/cm) and there is significant capacity remaining within the Isaac River to accommodate simultaneous releases from other mines that may discharge upstream of the Project.
- the water quality in the Isaac River is predicted to be less than proposed downstream receiving trigger level of 250 milligrams per litre (mg/L) and there is significant capacity within the Isaac River to accommodate coincident releases from other mines that may discharge upstream of (or adjacent to) the Project.

The cumulative impact assessment is highly conservative, as:

- it is unlikely that all three operations would be discharging at the same time, at the maximum of the flow rates, and EC and SO_4^{2-} limits;
- the site water balance model for the Project predicts that there is only a 1% Annual Exceedance Probability (AEP) probability controlled releases would be required.
- the predicted EC within the mine-affected water storages at the Project is typically modelled to be between 3,000 and 5,000 µS/cm.

2.5 ISSUE NO. 584.14

2.5.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Section 6.11 of Attachment 6 page 93 states: 'Site operating procedures and Trigger Action Response Plans (TARPs) for controlled releases will be developed prior to operations commencing and would be detailed in the site Water Management Plan. This will include the development of a real-time release "calculator" to allow operators to determine appropriate release windows, volume and quality.' No discussion was found on continuous monitoring of releases/surface water.*
>
> *The draft EIS should clarify how the real-time release "calculator" and continuous monitoring of surface water will allow operators to determine appropriate release windows, volume and quality of release water to ensure that suitably protective receiving water contaminant trigger levels are achieved.*
>
> *The practicality of this approach requires further detailed consideration. Designing MAW releases using the multiple rungs approach outlined in the Fitzroy Model Conditions is considered more reliable for the operators and in terms of compliance reporting. Real time calculations will likely require significant amount of calculations being submitted for compliance.*
>
> *Using in-stream triggers and limits is problematic in terms of ascribing any non-compliance to a specific-site and EA. For example a trigger or limit connected to instream water quality in the Isaac River, if exceeded, is not reliably able to be connected with one particular mine site. As per the guidance documents, ensure that near-, mid-, and far- field water quality objectives are considered in the design of the proposed conditions.*

2.5.2 Response

As outlined in Section 6.11 of the SWFA (WRM, 2022), the proposed controlled release limits are based on the "multiple-rung approach" outlined in the Model Mining Conditions [DES, 2017]. The real-time calculator referred to was simply a proposed tool which allows for simple and reliable interpretation of the monitoring data based on the "multiple-rung approach". The full list of proposed EA conditions and controlled release rules is provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments).

The proposed site water storage sampling regime at the release points (under normal operations and prior to release) will ensure that the quality of water being released is well understood and will be in compliance with the proposed release conditions. This monitoring data will provide suitable data for attribution of any potential downstream exceedances to the Project (or similarly demonstrate the opposite case).

With regards to mid- and far-field water quality objectives, if the Project is achieving the relevant water quality triggers at the downstream (near-field) monitoring point, it logically follows that it is not contributing to any exceedances further downstream.

It should be noted there is no predicted uncontrolled releases of mine-affected water from the mine water management system for the Project under the varying climatic scenarios assessed, and therefore the approach outlined above only applies to the controlled releases.

2.6 ISSUE NO. 584.15 & 548.16

2.6.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *See comments in Issue number 480.86 on the variable limits and Issue numbers 480.85 and 480.83_2 on applicability of using triggers/limits from adjacent mines.*

2.6.2 Response

For clarity, the proposed receiving environment trigger levels are fixed limits (i.e. not variable limits) as provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments) and Appendix A.

The full list of proposed EA conditions is provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments). Justification for the proposed release contaminant trigger investigations level, mine affected water release limits and receiving environment trigger levels is provided in Section 2, Section 3 and Section 5 of Appendix A.

2.7 ISSUE NO. 584.17

2.7.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Revise the proposed receiving water contaminant trigger level for EC based on historical monitoring data and considering the flow regime for the proposed releases. DES recommends the revised receiving water contaminant trigger level not be above 1000 µS/cm for EC.*

2.7.2 Response

Based on additional investigation of the receiving environment trigger levels, a revised downstream receiving trigger level for EC of 1,000 µS/cm is proposed in Schedule F of Section 1.1. of Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments) and Appendix A.

The full list of proposed EA conditions is provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments). Justification for the proposed receiving environment trigger levels is provided in Section 5 of Appendix A.

2.8 ISSUE NO. 584.18

2.8.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Original comment was in regards to planned use of saline MAW in dust suppression and other activities and possible risk of impacts to groundwater and via run-off. This element requires further detailed discussion and impact assessment in the draft EIS.*

2.8.2 Response

The proposed haul road dust suppression application rates are based on "topping up" the soil moisture deficit due to evaporation. The proposed application depths are therefore relatively small, and would not be sufficient to generate runoff from the surface of the road (i.e. enough water to soak in). During wet periods, dust suppression would not be applied to the haul roads. If accumulation of salts is observed along the haul roads, it is recommended that Whitehaven WS investigate the source and undertake remediation actions to avoid impacts to the receiving environment.

2.9 ISSUE NO. 584.19

2.9.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Section 10.7.4 and Table 10.12 of Attachment 6 discusses the monitoring of sediment dams.*
>
> *Also see comments in Issue number 480.83_4 on monitoring sediment dams discussed in section 10.7.3 and Table 10.12 of Attachment 6.*
>
> *1. DES considers the sediment dams actually contain mine-affected water (MAW) and should be included in that process. They have MAW as they receive water from disturbed areas of the mine. Provide a scientific, reason based explanation as to why sediment dams are not part of the MAW system.*
>
> *2. For those sediments dams that contain MAW (i.e. receive water from disturbed areas) they are releasing MAW and not just discharging water, so should be covered by those aspects such as release points.*
>
> *3. If sediment dams have no water from disturbed areas then they can be considered a sediment dam and separate to the MAW process. DES considers a cumulative impact assessment is required. For example, if a cumulative assessments not undertaken how can the proponent be confident the prediction that increasing the salinity levels in Isaac River by discharging from sediment dams with water that has less than 7% increase in salinity, or might contain other contaminants into Isaac River will have negligible impacts if the proponent is unaware of the volume being discharged and levels of EC and other contaminant and what might occur due to mixing of contaminants in the water being released by other mines.*
>
> *4. Require monitoring to ensure the assumptions on estimate of the volume and contaminant levels of discharges from sediment dams is correct and need long-term monitoring of this water type (e.g., why only proposing 2 years of monitoring?)*
>
> *5. Currently the proponent expects to monitor the sediment dams and the RDEIS states parameters in Table 10.8 will be monitored, but the discussion in section 10.7.4 only indicates that mitigation measures would be triggered when values exceed the trigger values in Table 10.9. DES would not allow discharge of water if it exceeds values in Table 10.8.It is also unclear how flocculation would reduce the parameters in Table 10.8 or Table 10.9, since it is really about reducing suspended solids.*
>
> *6. Following an assessment of the site's requirements determine if monitoring of TDS, TSS and/or Turbidity is required (i.e., discussed in section 10.7.4 of Attachment 6).*
>
> *7. Ensure potential impacts due to seepage are adequately addressed.*

2.9.2 Response

Extensive consultation has been undertaken with DES and the Office of the Co-ordinator General (OCG) regarding mine-affected water. The key outcomes from these discussions include:

- All sediment dams will be monitoring on a quarterly basis, with proposed water quality trigger levels and management actions.
- Co-disposed coal reject emplacement areas would be designed to be internally draining to the mine-affected water management system.

The full list of proposed EA conditions is provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments). Justification for the proposed water storage monitoring strategy is provided Section 4 of Appendix A.

2.10 ISSUE NO. 584.20

2.10.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Noted. Extra QA/QC descriptions have now been added. It appears that insufficient data has been collected, to date, to suitably justify the derivation of locally derived trigger values (LDTV) according to the criteria set-out in the Queensland Water Quality Guidelines, 2013.*
>
> *Unless all minimum criteria of relevant guidelines are met, the use of LDTVs are not supported and currently EPP Water Fitzroy Basin water quality objectives will apply.*

2.10.2 Response

A summary of the baseline water quality sampling regime has been provided in spreadsheet format in Appendix B. The spreadsheet shows that between 12 to 19 sampling attempts were made across all surface water monitoring locations, over a period of almost 4 years. The lack of samples at some sites was due to dry sample locations during the sampling attempts.

Based on the amount of data collected over the past 3 to 4 years, we do not agree that there is insufficient data to justify locally derived trigger values (and therefore the Fitzroy Basin water quality objectives should apply to all contaminants).

The current guidance documents (Qld Water Quality Guidelines [2009] and ANZG [2018,2020]) are noted to be deficient when it comes to ephemeral watercourses. As such, we consider the project-specific approach taken for the Project is best practice (i.e. periodic sampling of multiple sites over many years to establish conditions during wet and dry conditions).

Supporting evidence for our position is provided below:

- Qld Water Quality Guideline (2009):
  - Section 5.2.2: *The application of guidelines to ephemeral waters is undoubtedly problematical. The ANZECC 2000 Guidelines mention the lack of good data on these stream types but in general offer little advice on how to approach the issue.*
  - Section 4.3.3.1 shown below on *Figure 4.4.1: Relationship between sample size and the error in estimation of percentile values for the indicator conductivity* and *Table 4.4.2: Reference data requirements for estimating 20th, 50th and 80th percentiles*:
- ANZG (2018):
  - *Data collected over 2 years of monthly sampling are regarded as sufficient to indicate ecosystem variability and therefore suitable for guideline value derivation.* (https://www.waterquality.gov.au/anz-guidelines/guideline-values/derive/reference-data)

- ANZG (2020) Assessing and managing water quality in temporary waters Technical Report:
  - Section 1.3: *The centrepiece of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) is the water quality management framework (WQMF). The WQMF provides a nationally consistent, 10 step approach for managing, assessing and monitoring water and/or sediment quality. In theory, the WQMF can be applied to any water quality issue in any type of waterbody, and it is supported by extensive guidance on how to assess and monitor water and/or sediment quality. However, and notwithstanding the prevalence of temporary waters in Australia, much of the guidance and guideline values provided by ANZG (2018) is more applicable to permanent waters than temporary waters. In fact, little guidance has previously been published on how to appropriately manage, assess and monitor water and/or sediment quality in temporary waters.*

Figure 4.4.1: Relationship between sample size and the error in estimation of percentile values for the indicator conductivity

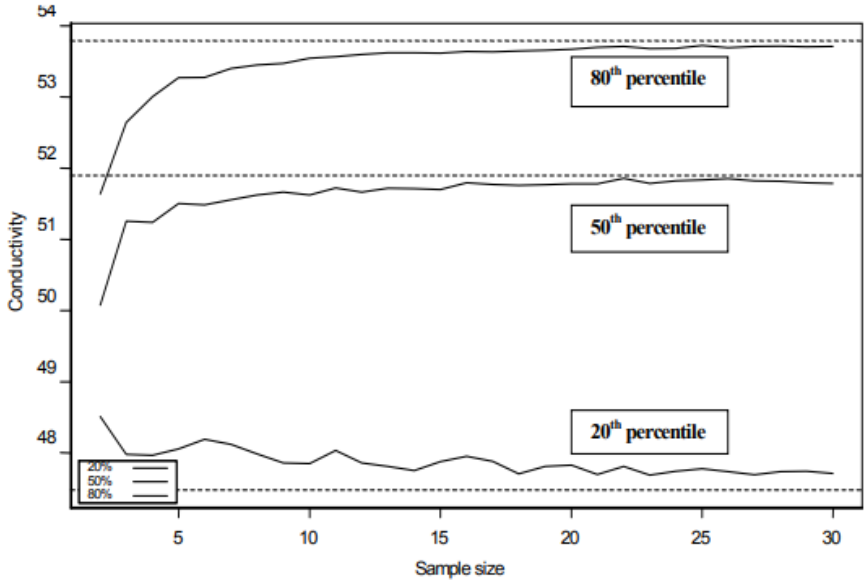

Table 4.4.2: Reference data requirements for estimating 20th, 50th and 80th percentiles

Reference site criteria	Number required	Minimum time period
Recommended minimum number of reference sites	2 or more depending on local variability[1]	
Recommended minimum data set per site:		
1–2 reference sites	18/site	12 months (preferably 24 months)
3 or more reference sites	12/site	12 months (preferably 24 months)
Minimum interim data set (subject to further data collection)	8/site	12 months

Note: 1. It is recommended that there should be at least 2 and ideally three or more reference sites for each water type.

2.11 ISSUE NO. 584.23

2.11.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Table 7-1 Additional Information states all residual voids will act as sinks. This conclusion does not appear to fully consider the complexity. The draft EIS should discuss and qualify this assessment.*
>
> *Main Void - the predicted average water level in the void is 141m AHD and the long-term groundwater level in the Permian is 150m adjacent to the void and then 160m nearby. What is the result if cattle don't drink the water (since water in the voids is considered marginal as stock drinking water), the number of cattle is not feasible, or drought conditions mean that insufficient fodder is available to support cattle stocking rates? The draft EIS is required to investigate the sink or source status of each proposed void using no cattle drinking the water scenario and various levels of cattle stocking rates.*
>
> *The North-west void is actually a source and not a sink, but does drain into West Void. Discuss whether this situation is altered by a no cattle drinking water scenario and various cattle stocking rates.*
>
> *The draft EIS should proved a detailed assessment discussion on the timeframe for each void being a sink or source and what happens over time. Attachment 5 implies the voids will change behaviour over time.*

2.11.2 Response

The current guidance on stock water quality tolerance shows that the predicted salinity of water within Main Void is not marginal, and would still be more than capable of supplying stock water over the 500 years of simulation. Supporting evidence for our position is provided below:

- Stock water quality tolerance:
  - The ANZG (2018) guidelines have not been updated for livestock, so the ANZECC (2000) guidance prevails (https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/primary-industries/stock-water-guidance).
  - Based on Table 9.3.3 from ANZECC (2000) (https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol3.pdf), beef cattle can consume water of up to 4,000 mg/L (around 6,000 µS/cm) with no adverse effects expected.
- Stock water requirements:
  - Based on Table 9.3.1 from ANZECC (2000) (https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol3.pdf), beef cattle consume on average **45 litres/day** (or **16,425 litres/year**). This is more than the modelled consumption rate of 15,000 litres/year per head of cattle.
  - The modelled consumption rate of 15,000 L/year is also supported by the table at the following link: https://futurebeef.com.au/resources/water-requirements/.

WRM does not agree with the notion that modelling for a post-mining land use (PMLU) should not account for the abstraction of water required to support that use. Notwithstanding, modelling has been undertaken without the removal of water for beneficial use (Section 2.33.3). The results show that even without a beneficial use demand applied, Main Void would still be more than capable of supplying stock water over the 500 years of simulation. Although North-west Void and West Void have elevated salinity, this could be managed by diluting with Main Void water, noting that:

- the North-west Void and West Void are comparatively small relative to Main Void and contain a very small proportion of the total water stored within the three voids; and
- periods of elevated salinity coincide with dry periods (i.e. when smaller volumes of water are stored in the North-wet Void and West Void).

The full list of proposed EA conditions is provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments), including conditions that require the residual voids to act as surface water and groundwater sinks and the proposed completion criteria for the PMLU rehabilitation areas.

Furthermore, direct responses to Issue No. 584.23 regarding the residual voids behaving as sinks without the proposed beneficial use is provided in the Spreadsheets 1 and 2 of the Response to Submissions.

2.12 ISSUE NO. 584.29

2.12.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *It is unclear from the draft EIS provided to date if any waterways/creeks are proposed to be diverted. Attachment 6 appears to only discuss clean water diversions. It is also unclear how these clean water diversions relate to the reinstated waterway and indicative surface water drain shown on Figure 7-1d of the Additional information document. Also see comments in Issue number 480.89 on changes to water flow paths/patterns (e.g., temporary/permanent diversions or interception of overland flow and interference/disturbance of watercourses and floodplain).*
>
> *Clarify what order are the waterways/creeks that exist within the surface area; if any waterways/creeks are proposed to be diverted or if diversions are not occurring, what is happening with existing waterways/creeks within the surface area.*
>
> *Clarify the relationship of clean water diversions with the reinstated waterway and indicative surface water drain shown on Figure 7-1d of the Additional information document and discuss changes to water flow paths/patterns (e.g., temporary/permanent diversions or interception of overland flow and interference/disturbance of watercourses and floodplain areas). Also see comments in Issue number 480.89 on changes to water flow paths/patterns.*

2.12.2 Response

Watercourse classification of all drainage lines that intersect the Project is provided in Section 4.2.4 of the SWFA (WRM, 2022) (reproduced in Figure 2.1 below) and are consistent with the *Watercourse Identification Map* (WIM) classifications under the Water Act 2000 published by the Department of Regional Development, Manufacturing and Water (2023).

There are only three waterways that intersect the Project surface disturbance areas, which have undergone a watercourse determination by the Department of Environment and Resource Management (DERM) (now the Department of Environment and Science) (2012) by the previous tenement owner. DERM concluded that:

- There were two main features (or waterways) identified (identified as Drainage Feature 1 and Drainage Feature 2).
- Only the downstream sections of both Drainage Feature 1 and Drainage Feature 2 were considered to possess the characteristics of a watercourse (under the *Water Act 2000*).
- The waterways are considered "drainage features" (and not watercourses) upstream of the identified locations.

The maximum Project disturbance has been overlaid onto the waterways in Figure 2.1, and shows the following:

- The downstream sections of Drainage Feature 1 and Drainage Feature 2 that were classified as watercourses are not affected by Project disturbance.
- The upper section of Drainage Feature 1 is partially captured or removed by the Project.
- Up until Phase 4, Drainage Feature 2 is diverted through the Project, with only minor removal of catchment where is passes through. Ultimately, the western part of the Drainage Feature 2 upper catchment is removed through mining, whilst the eastern section continues to be diverted through the Project.

The proposed drainage configuration for the final landform is provided in Section 8 of the SWFA (WRM, 2022) (reproduced in Figure 2.1 below). Figure 2.2 shows that:

- The majority of the Drainage Feature 1 catchment will be reinstated to drain back to the Isaac River.
- The Drainage Feature 2 catchment will be reinstated to drain back to the Isaac River.

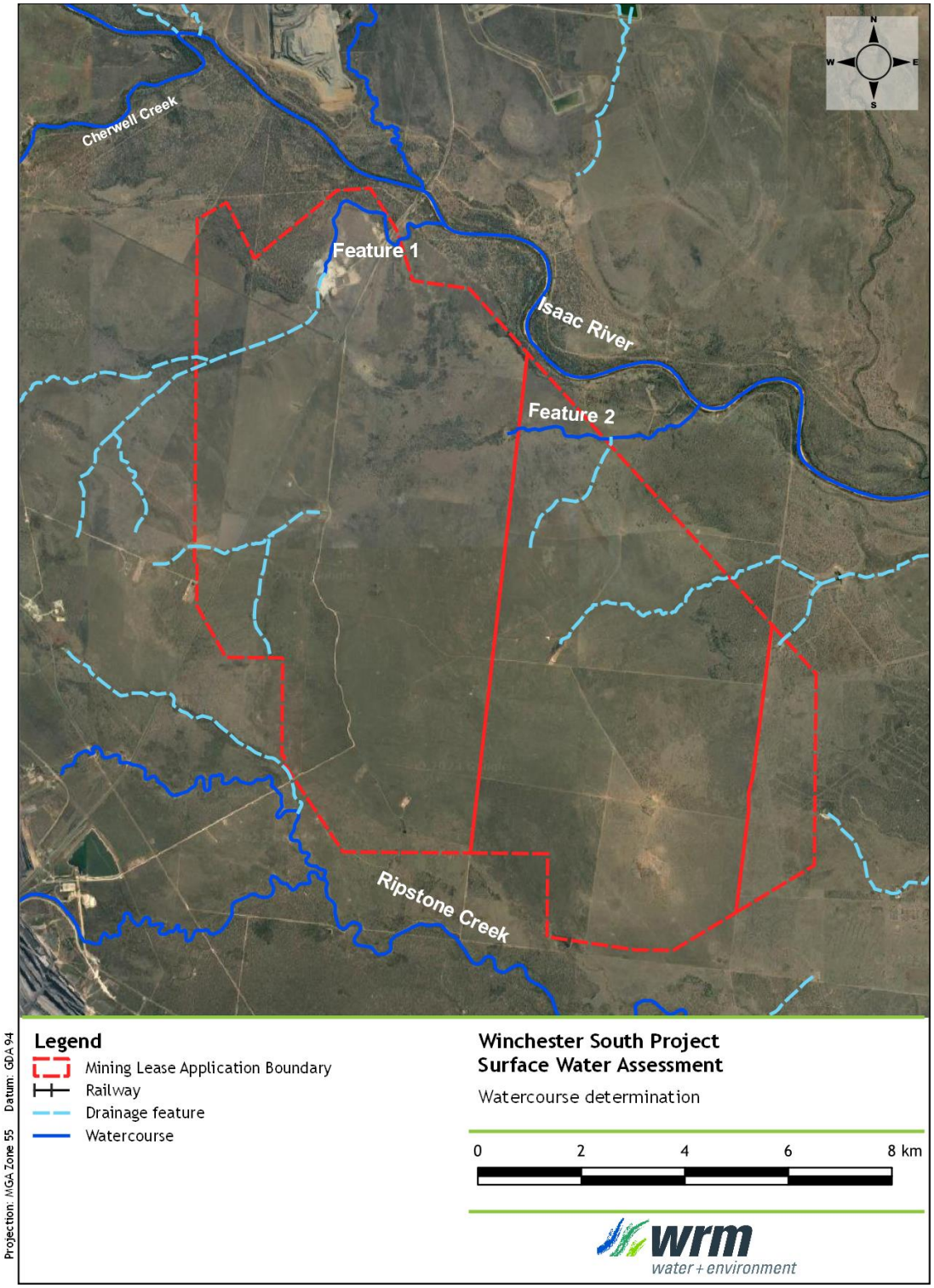

Figure 2.1 – Waterway mapping and watercourse classification

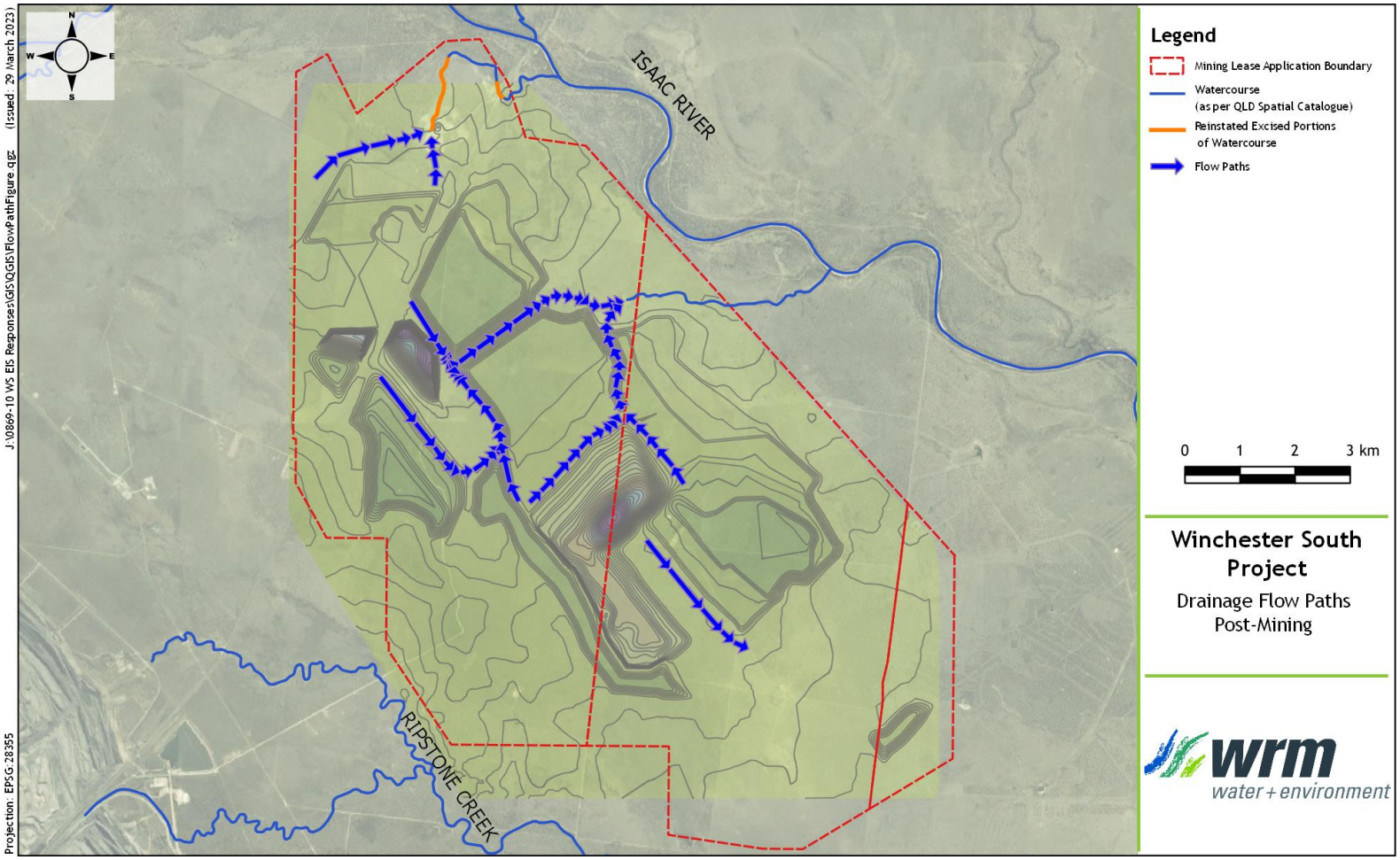

Figure 2.2 – Residual void catchment plan

2.13 ISSUE NO. 584.30

2.13.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *A Consequence Category Assessment (CCA) for all the dams and levees proposed for this project was required by the stie-specific Terms of Reference document.*
>
> *The proponent have so far only completed the preliminary Consequence Category Assessment (CCA) for the three dams which they predict will be regulated dams; the MWD, the MIA Dam, and the CC Dam. The result of their preliminary assessments is that the three dams are classed as "Low" CCA.*
>
> *Levees:*
>
> *Under the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures, levees which will be constructed to protect working pits from the ingress of flood water during a 0.1% AEP flood, or more frequent floods, will always be certified during a CCA assessment as regulated structures. The proponents have already acknowledged that the two levees proposed to protect the pits from Isaac River floods will be regulated structures. This is acknowledged in Section 5.6.2 and in Section 9.1.5 of Attachment 6 (Surface Water and Flooding); but there is no mention anywhere of any CCA assessment of the levee structures.*
>
> *The draft EIS (2021) included a commitment to include standard regulated dam conditions in Schedule I of their proposed Environmental Authority (see Section 7 – General Environmental Protection Commitments and Model Conditions, on page 7-39, draft EIS 2021 Surface Water Chapter). This commitment has been made in the RDEIS too (Section 2.2.1.1, Section 2.2.1.5, and Table 2.2 of Attachment 6 of the recent Additional Information document). However, standard regulated dam conditions require RPEQ assessment and certification of proposed dams and levees under the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures. This Consequence Category Assessment is required so that regulated structures can be identified, assessed and nominated as either the Significant or High Consequence Category . Regulated structures must be designed and constructed by RPEQ engineers as required by the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures. Therefore, it is recommended that RPEQ assessment and standard regulated dam conditions are explicitly included in draft EA conditions for the proposal.*
>
> *It is suggested that the OCG ensure that the standard regulated dams conditions are included in the draft EA, so that the RPEQ certified CCA are undertaken for all the proposed dams and levees proposed for this site, including the MWD, the MIA Dam and the CC Dam.*
>
> *The standard regulated dam conditions also need to be included in the EA to formally confirm and record through a CCA assessment, that the flood protection levees are regulated structures, as acknowledged by the proponents in the RDEIS. This will ensure that the levees are designed and constructed as regulated structures.*

2.13.2 Response

Whitehaven WS has included this recommendation in the proposed conditions for regulated structures in Schedule I of Section 1.1 of Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments).

2.14 ISSUE NO. 584.31

2.14.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *The draft EIS should provide the possible avoidance measures to address the risks of erosion and scouring during release events from proposed release points. Section 10.5.2.3 and 11.5 present a number of high-level mitigation options, however, there is no detail on what mitigation measures management strategies were consider to avoid this potential impact.*
>
> *Describe how mine affected water would be released to the receiving environment, including addressing the risks of erosion and scouring of the receiving environment and effective strategies to avoid or minimise potential impacts.*

2.14.2 Response

Controlled release of MAW to the Isaac River from the controlled release points at the relevant water storages would occur through either pumped releases or gated valves.

As described in Section 10.5.2.3 of the SWFA (WRM, 2022):

- The potential impacts of the proposed controlled releases on the downstream tributaries were assessed in the Geomorphology Technical Study (Fluvial Systems, 2020) for the Draft Environmental Impact Statement (EIS). The Geomorphology Technical Study was prepared by Dr Christopher Gippel and included a comprehensive review of the geomorphology of the tributaries downstream of the proposed controlled discharge points.
- The Geomorphology Technical Study for the Draft EIS described the proposed monitoring and management strategy for the tributaries, which would be undertaken using objective, scientifically sound methods, following a BACI (Before/After/Control/Intervention) design. Visual inspections would be undertaken following each controlled release event. A topographic survey (using LiDAR) would be undertaken if either of the following are observed:
  - a channel exceeding 0.2 m deep for a length of 10 m or more; or
  - initiation of a knickpoint higher than 0.3 m.

Appropriate mitigation measures would be applied in response to any observed geomorphic impacts. The appropriate mitigation would be assessed at the time and would range from doing nothing (self-sealing), to assisted recovery (e.g. plant vegetation and soft engineering such as coir matting and stakes), to hard engineering (e.g. rock rip-rap) (Fluvial Systems, 2020).

2.15 ISSUE NO. 584.32

2.15.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Additional information has been provided that partially addresses the issues raised, however there is no quantitative assessment found regarding the MAW storage capacities at various project stages against the predicted base case or worse case volumes of MAW anticipated (under various weather scenarios).*
>
> *The management technique is proposed that "sufficient capacity within Railway Pit and Main Pit to temporarily store any excess MAW without affecting mining operation". What is planned to occur if Railway Pit and Main Pit are at capacity? A commitment and/or condition is suggested to avoid "uncontrolled releases" from MAW storages during periods which do not meet minimum instream flow and quality criteria etc when onsite water management actions are prompting the release. It is not considered "uncontrolled" to actively pump water to a storage that is nearing overtopping.*

It is recommended that a quantitative assessment is presented of temporal MAW storage capacities at various project stages against the predicted base case or worse case volumes of MAW anticipated (under various weather and groundwater influx scenarios).

2.15.2 Response

The following storages are available to stored MAW over the whole life of the Project, providing 1,490 ML of storage capacity:

- MWD.
- Mine Infrastructure Area (MIA) Dam.
- Run-of-mine (ROM) Dam.
- CC Dam.

Railway Pit will be available to provide additional MAW storage from 2029 once it is mined out. This provides at least 25 giga litres (GL) of additional capacity for storage of MAW for the rest of the Project life. From 2048, Main Pit becomes available for storage, providing an additional 330 GL of capacity.

The predicted volume of MAW required to be stored over the life of the Project is shown in Figure 7.1 of the SWFA (WRM, 2022) (reproduced in Figure 2.3 below). It shows that:

- Prior to 2029, the Project water management system can adequately contain the predicted MAW under all climatic conditions.
- From 2029 onwards, the additional capacity provided by Railway Pit is more than sufficient to accommodate the additional potential water generated by the increasing disturbance area over time.

The water balance model takes into account the variability of future weather, based on 133 years of historical climate data. It also includes the predicted groundwater inflows over the Project.

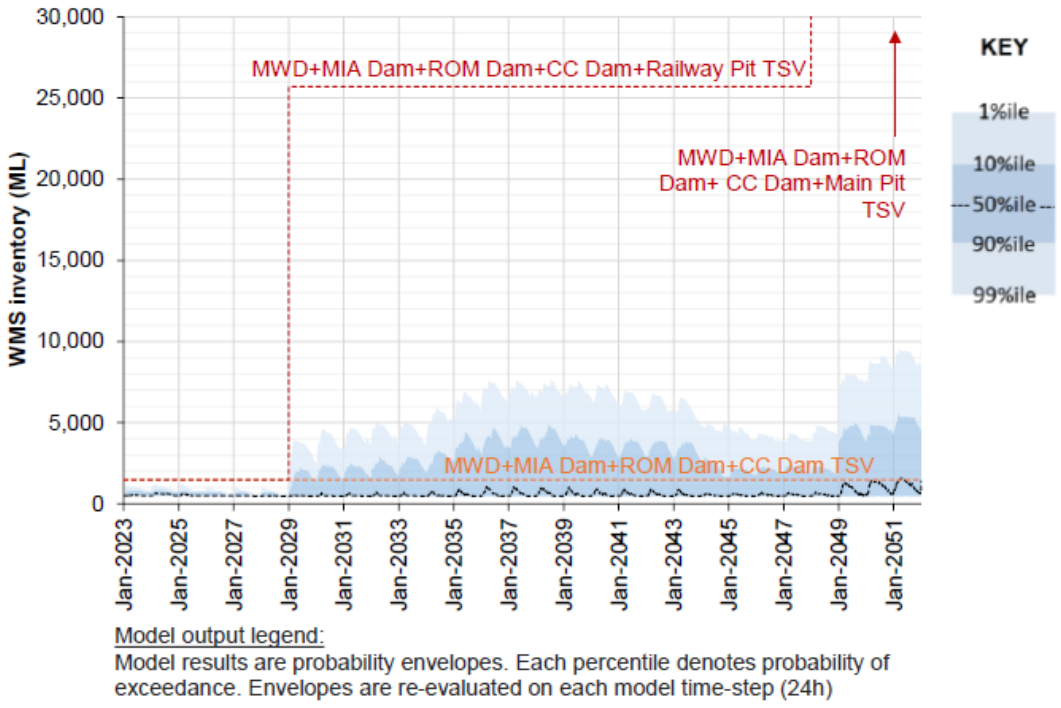

Figure 2.3 – Forecast water management system inventory

2.16 ISSUE NO. 584.33

2.16.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *See issue number 480.21*

2.16.2 Response

The full list of proposed EA conditions is provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments). Justification for and details of the proposed water storage monitoring strategy (including sediment dams) is provided Section 4 of Appendix A.

Discussion relating to the management of runoff from overburden dumps and associated sediment dams is provided in the response to Issue No. 584.37.

2.17 ISSUE NO. 584.34

2.17.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *The purported 'low impact' for predicted increases in the salinity levels in the Isaac River of up to a 7% increase from this mine alone, lacks adequate consideration of equitable allocation and relevant environmental values requiring protection under the EPP Water. This Basin requires effective management and suitable mitigation measures which incorporate an understanding of cumulative impacts from all upstream existing industry, human impacts, and the remaining assimilative capacity for this freshwater system.*
>
> *The draft EIS is to present a adequate discussion demonstrating that concepts of the Fitzroy Basin Model Mining Conditions and other relevant literature relating to salinity and important aspects being managed in the Basin. This should include adequate consideration of the sharing of assimilative capacity, relevant EVs water quality objectives and current cumulative industrial and anthropogenic impacts. The assimilative capacity within the Basin is considered by DES for each separate application and a demonstrated understanding of how salinity is managed within the Basin on a long-term basis is needed. A proponent making application to discharge to this Basin should describe how their impact assessments are aligned with the principles of equitable sharing of assimilative capacity. In particular, present the full mathematical calculations of requested discharge rates, quality limits, minimum receiving waters flows, location of gauging stations etc. The Fitzroy Basin Model Conditions list the mathematical equations and mine location considerations to be used to guide the process of derivation of site-specific limits. This information is required within the draft EIS.*

2.17.2 Response

The full list of proposed EA conditions is provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments).

A more detailed assessment of the cumulative impact of releases on downstream EC and sulphate is provided in *Proposed Environmental Authority Conditions for Surface Water and Justification* (WRM, 2023) (Appendix A).

2.18 ISSUE NO. 584.35

2.18.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Figure 10.3 Attachment 6 maps proposed SW monitoring locations but omit to map the local waterways, or sediment dams with release points. It is unclear whether the proposed receiving monitoring program would adequately monitoring for near- or mid-field potential impacts.*
>
> *No changes to monitoring locations in Table 10.12 (now Table 10.13). Figure referred to by proponent is not what was being requested. Still no release-related monitoring of Ripstone Creek proposed, despite being the receiving waters for spills from SD10 etc.*
>
> *Monitoring design is to include release-related and REMP-related monitoring points within appropriate upstream and downstream locations of Ripstone Creek, in addition to monitoring within the Isaac River. Provide the requested mapping, including all relevant spatial features.*

2.18.2 Response

The proposed surface water monitoring regime for waterways and dams is provided in Section 10 of the SWFA (WRM, 2022). Specifically:

- Waterway monitoring: Table 10.7, Table 10.8, Table 10.9 and Table 10.13.
- Sediment dam monitoring: Table 10.12, Table 10.8 and Table 10.9.
- Receiving Environment Monitoring Program monitoring is discussed in Section 10.7.5.

Whitehaven WS has included upstream (SW7) and downstream (SW9) monitoring locations on Ripstone Creek (as per Figure 10.3 of the SWFA [WRM, 2022]). The downstream monitoring point is located in a position that would include any overflows from SD10.

Any overflows from SD15 will be monitored at SW11.

2.19 ISSUE NO. 584.37

2.19.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *While some limited information has been provided on what is broadly intended with management of sediment dams (e.g., section 5.4.3 of Additional Information document). DES considers further information is required. Also see Issue number 480.21 DES's view is that if sediment dams receive water from disturbed areas such as waste rock emplacements, then they contain mine affected water (MAW) and must be managed through that process. It is not clear what is the expected water quality of sediments dams with and without MAW and potential contaminated sediments. What investigations are proposed to identify contaminant issues and what effective management measures are proposed.*
>
> *The draft EIS should detail sediment dam characteristics, including retention or removal and management requirements, identification and management of contaminated sediments to assess potential impacts. Also see Issue number 480.21 - DES's view is that if sediment dams have water from disturbed areas such as waste rock emplacements, then they would likely contain mine affected water (MAW) and must be dealt with in that water management process - unless evidence is provided to demonstrate otherwise.*

2.19.2 Response

Details regarding the sizing and location of the proposed sediment dams (which have been developed in accordance with the International Erosion Control Association [IECA] guidelines) is provided in Section 5.7.2 of the SWFA (WRM, 2022).

Prior to operations commencing, an Erosion and Sediment Control Plan will be developed to provide further details on the management and operations of the overall Erosion and Sediment Control system (including the sediment dams).

The Model Mining Conditions (DES, 2017) clearly states that 'rainfall runoff from areas disturbed by mining activities that is managed through appropriately designed erosion and sediment control structures is not deemed to be mine-affected water'. The proposed approach to the management of surface water from the overburden dumps at the Project is entirely consistent with the intent and definitions of the Model Mining Conditions (DES, 2017), as well as neighbouring mining operations.

The outcomes from the geochemical assessment of the Project overburden material (Terrenus, 2020) indicates that there is no geochemical or scientific basis to require a different approach to the management of overburden runoff at the Project compared to other nearby recently approved projects. The waste rock samples from the Project are consistent with those from (approved) neighbouring operations/development projects such as Poitrel, Daunia and Olive Downs, which Terrenus notes are all within the same geological setting (Rangal Coal Measures). It is also significant that the same or similar conclusions on overburden runoff quality were made in the geochemistry reports for the other approved projects.

2.20 ISSUE NO. 584.39

2.20.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Location of temporary levees are illustrated in Attachment 6, figures 9.3-9.5. Temporary levees have been assessed against the design flood events. No plans detailing the design of levees have been located.*
>
> *It is suggested that the Final EIS contains plans detailing the design of levees and/or EA conditions requiring detailed design plans of levees be presented. See Issue and Recommendation 480.33.*

2.20.2 Response

The full list of proposed EA conditions is provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments).

The EIS documentation (including the SWFA [WRM, 2022]) provides conceptual details for the proposed temporary levees. Detailed design of these structures in not undertaken at EIS stage, and will be developed during the detailed design phase of the Project.

2.21 ISSUE NO. 584.41

2.21.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *'Figure D.23 to Figure D.26 in Appendix D of Attachment 6 provide the depth of flooding and peak velocities in Isaac River, as well as impact mapping, under post-mining Conditions for the PMF flood event'. It is unclear if the flooding information is with or without levees and how flooding changes due to proposed changes to flow paths and diversions. It is also unclear whether there is any local flooding within the site? See Issue numbers 480.32 and 480.89 on proposed changes to flow paths and diversions.*
>
> *Clarify how the flooding information changes when proposed changes to flow paths and diversions occur; and if levees exist and without levees.*
>
> *Explain what is meant by the following statement: 'Post-mining the final landform would only interact with the Isaac River for rarer flood events (1% AEP and rarer design events). The impacts identified on the Isaac River floodplain for these rare events are generally localised and relatively small in magnitude.' For example, clarify if the reference to final landform is meaning voids or other areas. See Issue numbers 480.32 and 480.89 on proposed changes to flow paths and diversions.*

2.21.2 Response

The proposed Project levees will be decommissioned and removed as part of the final landform works. That is, the flood mapping presented in Figure D.23 to Figure D.26 of Appendix D the SWFA (WRM, 2022) does not include the presence of any levees proposed as part of the Project.

The statement referenced above is referring to minor interaction between Isaac River floodwaters and the out-of-pit waste rock emplacements in the final landform during the rarer flood event, not the residual voids. There is no risk of floodwater entering the residual voids, including under Probable Maximum Flood (PMF) event conditions.

2.22 ISSUE NO. 584.42

2.22.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Details on final landform for voids and assessment of various scenarios for the voids were contained in Enclosure 1 (Assessment of Final Landform Alternatives) and section 5.5 of Additional Information document pages 26 – 28. No landform design details are provided for other parts of the site.*
>
> *Table 1 of Enclosure 1 does not clarify the link between void treatment being proposed for those residual voids used as Water Storage final land use to provide drinking water for stock. For example, are the voids partially backfilled or only stabilised to become Water Storage final land use? The RDEIS does indicate that South Pit mine void will be backfilled.*
>
> *Provide a revised list of proposed EA conditions on landform design, including details on landform design for all final land uses and parts of the site. See comments in issue number 480.91 on NUMAs becoming Water Storage final land use, including water treatment and void treatment that will ensure the water quality in the water storages within voids are suitable for livestock drinking water in both short- and long-term. See comments in issue number 480.58 on EA containing conditions on rehabilitation.*

2.22.2 Response

The full list of proposed EA conditions is provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments), including conditions that require the residual voids to act as surface water and groundwater sinks and the proposed completion criteria for the PMLU rehabilitation areas. It also includes monitoring requirements to demonstrate that residual voids will act as sinks (such as monitoring of the hydraulic gradient towards the voids and water quality monitoring. WRM does not agree with the notion that modelling for a PMLU should not account for the abstraction of water required to support that use. Notwithstanding, modelling has been undertaken without the removal of water for beneficial use (Section 2.33.3). The results show that even without a beneficial use demand applied, Main Void would still be more than capable of supplying stock water over the 500 years of simulation. Although North-west Void and West Void have elevated salinity, this could be managed by diluting with Main Void water, noting that:

- the North-west Void and West Void are comparatively small relative to Main Void and contain a very small proportion of the total water stored within the three voids; and
- periods of elevated salinity coincide with dry periods (i.e. when smaller volumes of water are stored in the North-wet Void and West Void).

Furthermore, direct responses to Issue No. 584.23 regarding the residual voids behaving as sinks without the proposed beneficial use is provided in the Spreadsheets 1 and 2 of the Response to Submissions.

2.23 ISSUE NO. 584.46

2.23.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *As discussed in Issue number 480.91, it must be demonstrated that the intended use of what were NUMAs as water storages for providing drinking water for stock is achievable in the short- and long-term, to ensure they do not become unusable Water Storage final land use and therefore a de facto NUMA.*
>
> *See Issue number 480.91 on NUMAs and water storage final land use to provide drinking water for stock.*

2.23.2 Response

The full list of proposed EA conditions is provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments), including conditions that require the residual voids to act as surface water and groundwater sinks and the proposed completion criteria for the PMLU rehabilitation areas. Assessment of the long-term salinity within Main Void (over a 2,500 year forecast period) is provided in the response to Issue No. 584.94 (Section 2.42).

2.24 ISSUE NO. 584.62

2.24.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Eastings and Northings and/or GDA 94 MGA Zone 55 are being used in, for example, Table 4.2 pages 43-44 and Table 10.7 page 155 in Attachment 6 and Tables 5-1 to 5-4 pages 55-56 in Attachment 5. GDA2020 is the accepted static datum required to be used in the draft EIS.*
>
> *All references to coordinates including groundwater monitoring sites, water storages or release points described as Easting/Northing and GDA94 must be converted to Lat/Long in GDA2020 with 6 decimal places.*

2.24.2 Response

The co-ordinates for all waterway monitoring sites and dam locations are provided in Table 2.1.

Table 2.1 – Monitoring location coordinates in Latitude and Longitude GDA2020

Location	Latitude (GDA2020)	Longitude (GDA2020)
Waterway monitoring		
SW2	-22.158708	148.318067
SW3	-22.125102	148.270803
SW4	-22.114402	148.269078
SW5	-22.153447	148.328597
SW6	-22.246762	148.284223
SW7	-22.216853	148.222996
SW8	-22.183646	148.332025
SW9	-22.245291	148.302170
Water Storages		
MWD	-22.154581	148.290244
MIA Dam	-22.139702	148.280798
CC Dam	-22.152906	148.285622
Railway Pit	-22.135072	148.255544
RWD	-22.135946	148.273093
SD01	-22.149218	148.291069
SD02	-22.155898	148.286610
SD03	-22.156432	148.280629
SD04	-22.148188	148.249901
SD05	-22.140346	148.264702
SD06	-22.137318	148.241813
SD07	-22.185521	148.325958
SD08	-22.168349	148.261141
SD09	-22.185856	148.268010
SD10	-22.223946	148.294046
SD11	-22.170820	148.306359
SD12	-22.162640	148.292068
SD13	-22.198556	148.260956
SD14	-22.159876	148.282060
SD15	-22.230925	148.343778
SD16	-22.168039	148.235944

2.25 ISSUE NO. 584.72

2.25.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *The three release points (i.e., MWD (RP1), CC Dam (RP2) and Railway Pit (RP3)) are listed in Table 6.11 page 94 of Attachment 6 Surface Water and Flooding. However, information detail should include such as receiving waters description for each point and the coordinates (GDA2020 with 6 decimal points).*
>
> *The draft EIS should include details on each release point such as receiving waters description and the coordinates (lat/long using GHD2020 with 6 decimal points as per TOR requirement 7.14). The draft EIS should provide a reasoned, science-based discussion, including relevant evidence justifying why these three proposed release points would be sufficient for managing mine affected water at the site.*

2.25.2 Response

The full list of proposed EA conditions is provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments, including conditions that require the residual voids to act as surface water and groundwater sinks and the proposed completion criteria for the PMLU rehabilitation areas. It also includes monitoring requirements to demonstrate that residual voids will act as sinks (such as monitoring of the hydraulic gradient towards the voids and water quality monitoring. WRM does not agree with the notion that modelling for a PMLU should not account for the abstraction of water required to support that use. Notwithstanding, modelling has been undertaken without the removal of water for beneficial use (Section 2.33.3). The results show that even without a beneficial use demand applied, Main Void would still be more than capable of supplying stock water over the 500 years of simulation. Although North-west Void and West Void have elevated salinity, this could be managed by diluting with Main Void water, noting that:

- the North-west Void and West Void are comparatively small relative to Main Void and contain a very small proportion of the total water stored within the three voids; and
- periods of elevated salinity coincide with dry periods (i.e. when smaller volumes of water are stored in the North-wet Void and West Void).

Furthermore, direct responses to Issue No. 584.23 regarding the residual voids behaving as sinks without the proposed beneficial use is provided in the Spreadsheets 1 and 2 of the Response to Submissions.

2.26 ISSUE NO. 584.73

2.26.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *See comments above for Issue number 480.85 on applicability of using triggers/limits from adjacent mines.*

2.26.2 Response

The full list of proposed EA conditions is provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments). Justification for the proposed release contaminant trigger investigations level, mine affected water release limits and receiving environment trigger levels is provided in Section 2, Section 3 and Section 5 of Appendix A.

2.27 ISSUE NO. 584.74

2.27.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *The draft EIS should detail all aspects of the proposed program to monitor water releases and surface water, including how the proposal protects Environmental Values and Water Quality Objectives and satisfies relevant guidelines such as Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018). The following in issue numbers 480.83_1 to 480.83_5 discusses each relevant proposed provisions on monitoring release of mine affected water covering Tables 10.7 to 10.13 in Attachment 6.*
>
> *See comments in Issue numbers 480.83_1 to 480.83_5 on aspects of monitoring water releases and surface water. The draft EIS provided a reasoned science based discussion justifying why the proposed program to monitor water releases and surface water will protect Environmental Values and Water Quality Objectives and satisfies the relevant guidelines.*

2.27.2 Response

The full list of proposed EA conditions is provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments). Justification for the proposed release contaminant trigger investigations level, mine affected water release limits and receiving environment trigger levels is provided in Section 2, Section 3 and Section 5 of Appendix A.

2.28 ISSUE NO. 584.75

2.28.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Compared to gauging station details in Table F4 (Mine-affected Water Release During Flow Events) on page 7-26 in draft EIS Section 7 - General Environmental Protection Commitments and Model Conditions.*
>
> *The RDEIS does not included any discussion of alternative gauging stations (downstream and upstream stations) or discussion of how stream flow records will be obtained if the Department of Resources stations are offline.*

It was positive the upstream gauging station was included as stated in section 4.3 by: 'Isaac River water levels at the Goonyella (upstream) and Deverill (downstream) gauges. The details of these gauges are provided in Table 4.1.' on page 39 of Attachment 6. The draft EIS should discuss and provide alternative gauging stations (downstream and upstream stations) if the Department of Resources stations are offline or include in the proposed, the following draft EA condition:

'In the event that the data from the 130410A Isaac River at Deverill gauging station becomes unavailable, the environmental authority holder must ensure that a new stream flow gauging station(s) is installed, operated and maintained to determine and record stream flows prior to and during releases.'

2.28.2 Response

Whitehaven WS has included this recommendation in the proposed conditions as an option in Schedule F of Section 1.1 of Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments).

The full list of proposed EA conditions is provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments).

2.29 ISSUE NO. 584.76

2.29.1 Submitter recommendation / suggested mitigation

DES raised the following:

Compared to EC and sulfate details in Table F4 (Mine-affected Water Release During Flow Events) on page 7-26 in draft EIS Section 7 - General Environmental Protection Commitments and Model Conditions.

The basis for the triggers (e.g., EC and sulfur) was provided in section 6.11 on page 93 that stated: 'The proposed release conditions have been based on those recently approved for the neighbouring Isaac Downs and Olive Downs projects. The variable receiving flow triggers (with appropriate dilution ratios) is consistent with majority of approved EAs for mining operations within the upper Isaac River catchment (refer to Table 10.5 for details), including the recently approved Isaac Downs and Olive Downs projects.'

No scientific, evidence-based information is provided in the RDEIS on why these levels from adjoining mines are applicable to the proposed Winchester South project

DES does not accept using release conditions from neighbouring mines, unless science-based evidence is provided that justifies why they are applicable to the circumstances at the proposed Winchester South project site with regard to geochemical characteristics, water quality of runoff and surface water, environmental values/water quality objectives and risks/impacts and water quality of the associated receiving environments.

The draft EIS must provide justification as to why no other water quality parameters are applicable for the proposed Winchester South project. Either provide a justification for using release conditions from neighbouring mines or provide a justification for the EC and sulfate levels in the previous Table F4 of draft EIS Section 7 and discuss the assumed EC and sulfate relationship for mine affected water on the site and provide evidence that demonstrates how it has been derived from results of the geochemical assessment and characterisation of materials and any other relevant evidence.

2.29.2 Response

The full list of proposed EA conditions is provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments). Justification for the proposed release contaminant trigger investigations level, mine affected water release limits and receiving environment trigger levels is provided in Section 2, Section 3 and Section 5 of Appendix A.

2.30 ISSUE NO. 584.77

2.30.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Table 10.10 of Attachment 6 does have variable limits for 'Receiving water flow criteria for discharge' applying to EC and sulphate.*
>
> *The draft EIS should provide a reasoned, scientific, evidence-based discussion as to why variable receiving environment triggers are deemed appropriate for the proposed Winchester South project or provide fixed triggers for EC and sulfate.*
>
> *See comments on issue number 480.83_2 and 480.85 on why use of adjacent limits/triggers from adjacent mines are considered appropriate without suitable evidence of applicability. Please clarify why the 'receiving water flow criteria for discharge' only apply to Isaac River and not other waterways/creeks. If Table 10.10 is to remain then justify each aspect e.g., parameters used and levels and flows levels identified.*

2.30.2 Response

Whitehaven WS has provided the proposed EA conditions in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments) which includes set receiving environment triggers for the Project (i.e. does not include variable receiving environment triggers).

The proposed variable mine-affected water controlled release conditions proposed are consistent with the Model Mining Conditions and industry standards and the release conditions for almost all of the other operations with in the upper reach of the Isaac River. We also note that our approach is consistent with an earlier DES comment which appears to be endorsing the variable release rules (DES Issue No. 584.14 recommends the use of the "*multiple rungs approach outlined in the Fitzroy Model Conditions*"

Given the similar geochemistry, expected water quality of runoff and the same receiving environment as the neighbouring operations (which have variable release rules), there is no scientific basis to indicate that the proposed release conditions are not appropriate.

Variable release rules are important as they allow for the significant dilution capacity within the Isaac River during varying flow events, whilst still achieving the proposed set receiving water containment trigger levels.

The proposed receiving environment trigger levels only apply to the Isaac River for the Release Point into Drainage Feature 1 is less than 4 kilometres (km) upstream of the Isaac River confluence. As such, there is only a very limited reach of Drainage Feature 1 that would be impacted by controlled releases.

The full list of proposed EA conditions for mine-affected release limits and receiving environment triggers is provided in Schedule F of Section 1.1. of Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments) with justification for the proposed EA conditions relevant to surface water provided in Appendix A.

2.31 ISSUE NO. 584.78

2.31.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Compared to proposed condition F20 on Receiving Environment Monitoring Program on page 7-27 in draft EIS Section 7 - General Environmental Protection Commitments and Model Conditions. Also see comments in issue number 480.89 on changes to water flow paths/patterns (e.g. temporary/permanent diversions or interception of overland flow and interference/disturbance of watercourses and floodplain areas).*

DES assumes the statement in section 6.1 on page 93 of Attachment 6 has provided part of the answer on the distance along the Isaac River, as it states: 'The maximum distance between the controlled release point and the Isaac River is around 2 km, where it will mix directly with flow in the Isaac River.' No details are provided on what connected or surrounding waterways of Isaac River will be captured within the receiving environmental zone downstream of the release point.

Provide a revised list of proposed EA conditions that clarifies for the purposes of the REMP for the receiving environment, including 2km downstream from the release point on Isaac River. Provide details on what connected or surrounding waterways of Isaac River will be captured within the receiving environment zone downstream of the release point, including specifying the distance along each connected/surrounding waterways.

2.31.2 Response

As described in Section 10.5.2.3 of the SWFA (WRM, 2022):

- The potential impacts of the proposed controlled releases on the downstream tributaries were assessed in the Geomorphology Technical Study (Fluvial Systems, 2020) for the Draft Environmental Impact Statement (EIS). The Geomorphology Technical Study was prepared by Dr Christopher Gippel and included a comprehensive review of the geomorphology of the tributaries downstream of the proposed controlled discharge points.
- The Geomorphology Technical Study for the Draft EIS described the proposed monitoring and management strategy for the tributaries, which would be undertaken using objective, scientifically sound methods, following a BACI (Before/After/Control/Intervention) design. Visual inspections would be undertaken following each controlled release event. A topographic survey (using LiDAR) would be undertaken if either of the following are observed:
  - a channel exceeding 0.2 m deep for a length of 10 m or more; or
  - initiation of a knickpoint higher than 0.3 m.

Appropriate mitigation measures would be applied in response to any observed geomorphic impacts. The appropriate mitigation would be assessed at the time and would range from doing nothing (self-sealing), to assisted recovery (e.g. plant vegetation and soft engineering such as coir matting and stakes), to hard engineering (e.g. rock rip-rap) (Fluvial Systems, 2020).

2.32 ISSUE NO. 584.80

2.32.1 Submitter recommendation / suggested mitigation

DES raised the following:

Compared to proposed condition F26 on Temporary Interference with Waterways on page 7-29 in draft EIS Section 7 - General Environmental Protection Commitments and Model Conditions.

No details were provided in the RDEIS on changes to water flow paths/patterns such as temporary/permanent diversions or interception of overland flow, interference/disturbance of watercourses and floodplain areas, including maps of suitable scale showing the locations. See comments on Issue number 480.32 on diverting waterways/creeks, clean water clean water diversions, reinstated waterway and indicative surface water drain. Provide a revised list of proposed EA conditions with details on permanent and temporary disturbance of water flow paths/patterns, including diversion, interception of overland flow and interference/disturbance of watercourses and floodplain areas and include maps at suitable scale of all locations. Also link disturbance of water flow paths/patterns with clean water clean water diversions, reinstated waterway and indicative surface water drain.

2.32.2 Response

The defined flow paths and watercourses during for the pre-mining, operational (maximum disturbance) and post-mining phases are presented in Figure 2.4, Figure 2.5 and Figure 2.6.

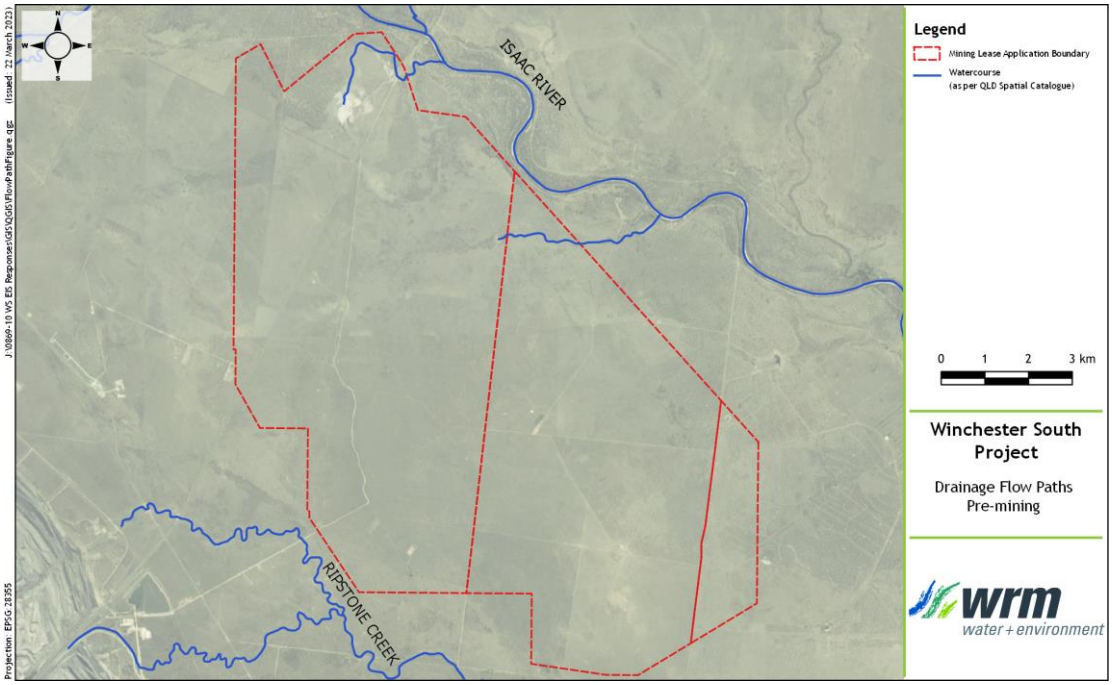

Figure 2.4 – Watercourses and drainage flow paths – Pre-mining

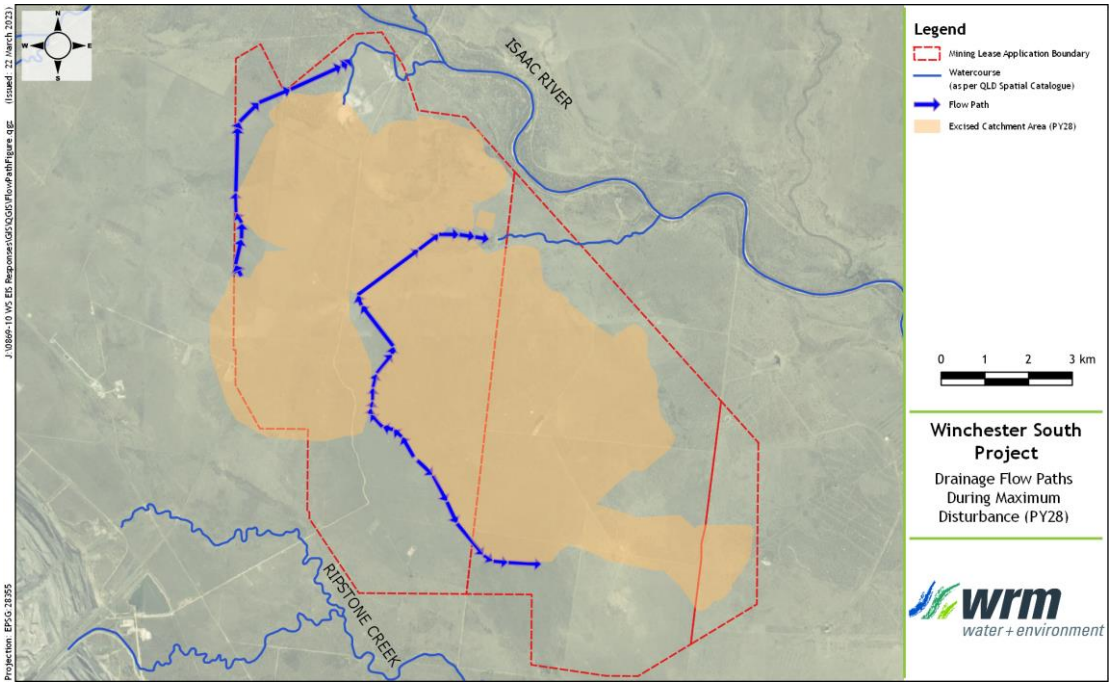

Figure 2.5 – Watercourses and drainage flow paths – Maximum disturbance – Project Year 28

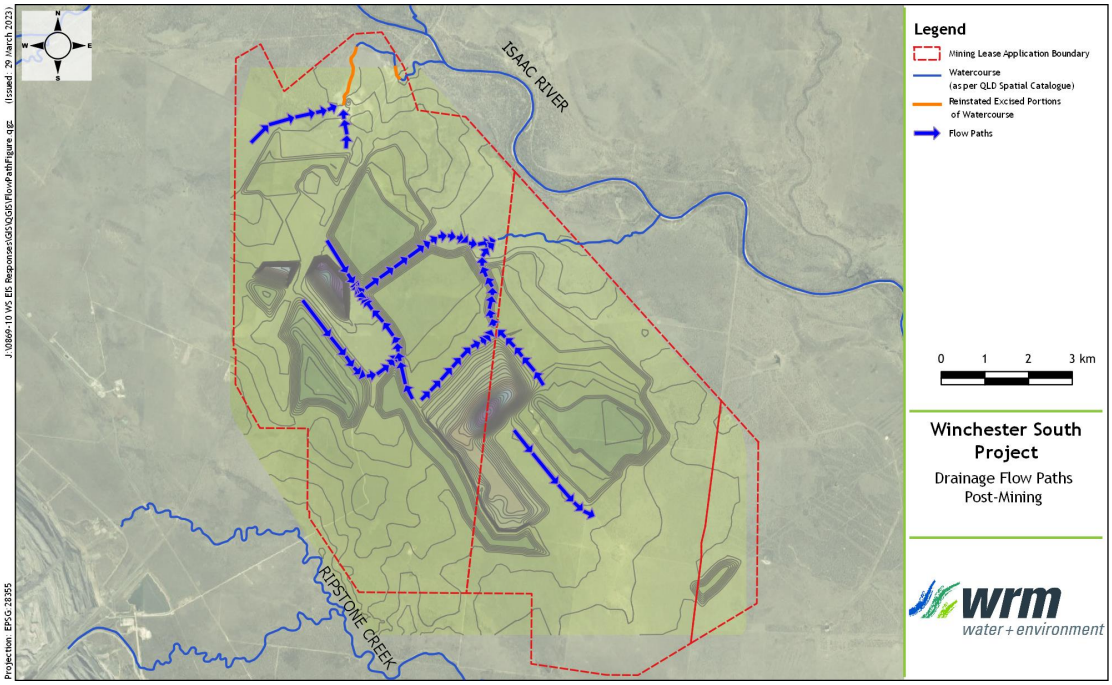

Figure 2.6 – Watercourses and drainage flow paths – Post-mining

2.33 ISSUE NO. 584.82

2.33.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Compared to proposed condition H1 and Table H2 (Rehabilitation Requirements - Land Outcomes (NUMA)) on NUMAs on page 7-31 and pages 7-36 to 7-37 in draft EIS Section 7 - General Environmental Protection Commitments and Model Conditions.*
>
> *No NUMA are now proposed as discussed in section 5.6.8 (Soils and Land Suitability) of Additional Information document on page 55 states: 'Whitehaven WS has proposed a PMLU for all areas of the Project (including residual void water bodies) and repurposing their final landform from a NUMA to potential water storage for agricultural production (e.g. supply water to cattle) as part of the optimised Project.'*
>
> *Table 7-1 of Additional Information document states for water storages in voids: 'For residual void water bodies, the water quality monitoring results indicate water quality is suitable for the PMLU for a period of at least two years post-rehabilitation.' This is interpreted as saying they are only suitable for stock drinking water for the first two years.*
>
> *The proponent to provide evidence that each residual void is suitable to be repurposed as water storage for agricultural production to supply drinking water to cattle over both the short- and long-term. Clarify the statement in Table 7-1 on the suitability of the water in voids as stock drinking water.*

Attachment 6 provides an assessment of void water levels and long-term salinity modelling. Periods of unsuitable water quality for livestock occur at the proposed North-west and West voids when inventories are lower. It is unlikely to be supported as a PMLU if the use cannot be maintained over the long-term and has an assumption that 70ML/year would be used for beneficial agricultural use (cattle grazing) thereby removing salt loads and water gradually. However, there is no void model provided for the scenario where that extraction does not take place. Evidence should include results of water quality in the water storages compared to trigger values for livestock drinking water defined in applicable guidelines, details on each location compared to grazing PMLU and any other details that show they are a safe, stable, non-polluting and sustainable PMLU. This would include any water treatment and void treatment that will ensure the water quality in the water storages is suitable for livestock drinking water.

2.33.2 Response

WRM does not support the methodology or approach that a water body that provides a PMLU should not model the associated water take from the void to sustain that PMLU; however, WRM has conservatively undertaken modelling without the removal of water for beneficial use (see Section 2.33.3).

Section 7.1.2.5 of the revised draft EIS (Whitehaven WS, 2022) states the residual voids have been designed to avoid spills and present negligible risk of water within the residual voids interacting with the surrounding environment (including the surrounding groundwater systems) and therefore, would be safe, stable and not cause environmental harm.

Geochemistry analysis of the Project waste rock indicates that runoff from rehabilitated final landforms is not expected to be particularly saline (i.e. after revegetation, runoff is expected to be comparable to the natural environment). Groundwater inflows are expected to primarily comprise flows from recharged waste rock emplacement that have a high freshwater component (SLR, 2022).

The final void modelling conservatively applies a constant salinity rate to the final void inflows (surface water and groundwater). In practice, the salinity of inflows would decline as there is a finite volume of salt within the void catchment. Given water does not leave the voids except via evaporation, there is no mechanism for salt to leave the voids (except via water pumped for a use). Therefore, it follows that the final void modelling will indicate that the voids will increase in salinity. If this same modelling approach is applied to a freshwater lake that does not overflow or lose water to groundwater, this same trend of increasing salinity would be observed.

Take from residual voids does not affect the risk of spill as demonstrated by the storm surge analysis and climate change sensitivity outlined in Section 8 of the SWFA (WRM, 2022). Furthermore, direct responses to Issue No. 584.82 regarding the residual voids behaving as sinks without the proposed beneficial use is provided in the Spreadsheets 1 and 2 of the Response to Submissions.

At equilibrium, the majority of the water stored within the residual voids is located within Main Void (around 89%), with around 10% stored within West Void and around 1% stored within North-west Void. If there are periods of low volume and elevated salinity post-mining in the North-west and West Voids, the salinity of water within these residual voids could be managed via dilution by pumping the water to the Main Void, due to the significantly larger volume of lower salinity water within the Main Void (WRM, 2022).

Under these circumstances, Main Void would still be able to supply suitable water quality, as the relatively small salt loads transferred from North-west Void and West Void would only have a minor impact on Main Void salinity. Pumping all the higher salinity water from North-west Void and West Void into Main Void would only increase Main Void salinity by approximately 100 µS/cm (on average) (WRM, 2022).

Furthermore, supporting evidence for the beneficial use for agriculture (e.g. cattle consumption) position is provided below:

- Stock water quality tolerance:
  - The ANZG (2018) guidelines have not been updated for livestock, so the ANZECC (2000) guidance prevails (https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/primary-industries/stock-water-guidance).
  - Based on Table 9.3.3 from ANZECC (2000) (https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol3.pdf), beef cattle can consume water of up to 4,000 mg/L (around 6,000 µS/cm) with no adverse effects expected.
- Stock water requirements:
  - Based on Table 9.3.1 from ANZECC (2000) (https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol3.pdf), beef cattle consume on average **45 litres/day** (or **16,425 litres/year**). This is more than the modelled consumption rate of 15,000 litres/year per head of cattle.
  - The modelled consumption rate of 15,000 L/year is also supported by the table at the following link: https://futurebeef.com.au/resources/water-requirements/.

2.33.3 Residual void modelling – no beneficial use scenario

Residual void modelling without a beneficial use demand has been undertaken as per the comments from DES. The model results are presented in Figure 2.7 to Figure 2.12.

Removing the beneficial use demand from the voids results in the following:

- North-west Void
  - Peak water level around 80 m below the void overflow level, therefore no risk of spilling to the environment.
  - Elevated salinity concentrations, with typical non-drought EC of around 50,000 µS/cm after 500 years (compared with around 5,000 µS/cm when beneficial use demand applied).
- West Void
  - Peak water level around 85 m below the void overflow level, therefore no risk of spilling to the environment.
  - Elevated salinity concentrations, with typical non-drought EC of around 10,000 µS/cm after 500 years (compared with around 3,000 µS/cm when beneficial use demand applied).
- Main Void
  - Peak water level around 60 m below the void overflow level, therefore no risk of spilling to the environment.
  - Slightly elevated salinity concentrations, with typical non-drought EC of around 5,000 µS/cm after 500 years (compared with around 4,000 µS/cm when beneficial use demand applied).

The results show that even without a beneficial use demand applied, Main Void would still be more than capable of supplying stock water over the 500 years of simulation. At equilibrium, the majority of the water stored within the residual voids is located within Main Void (around 87%), with around 12% stored within West Void and around 1% stored within North-west Void. Although North-west Void and West Void have elevated salinity, this could be managed by diluting with Main Void water, noting that:

- the North-west Void and West Void are comparatively small relative to Main Void and contain a very small proportion of the total water stored within the three voids; and
- periods of elevated salinity coincide with dry periods (i.e. when smaller volumes of water are stored in the North-west Void and West Void).

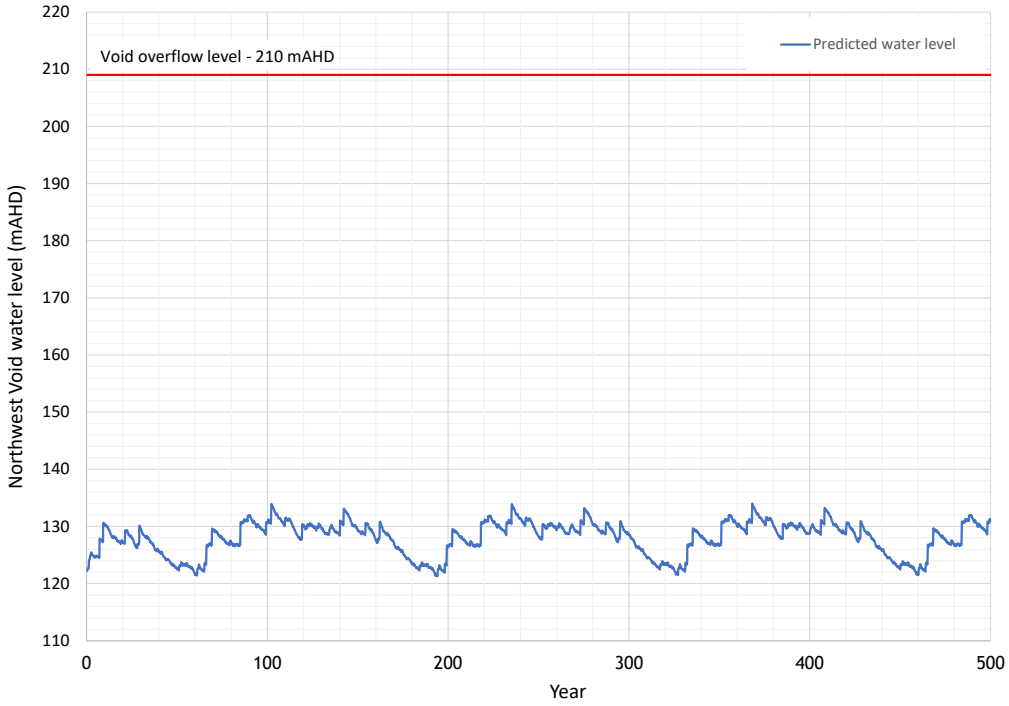

Figure 2.7 – Residual void water level– North-west Void

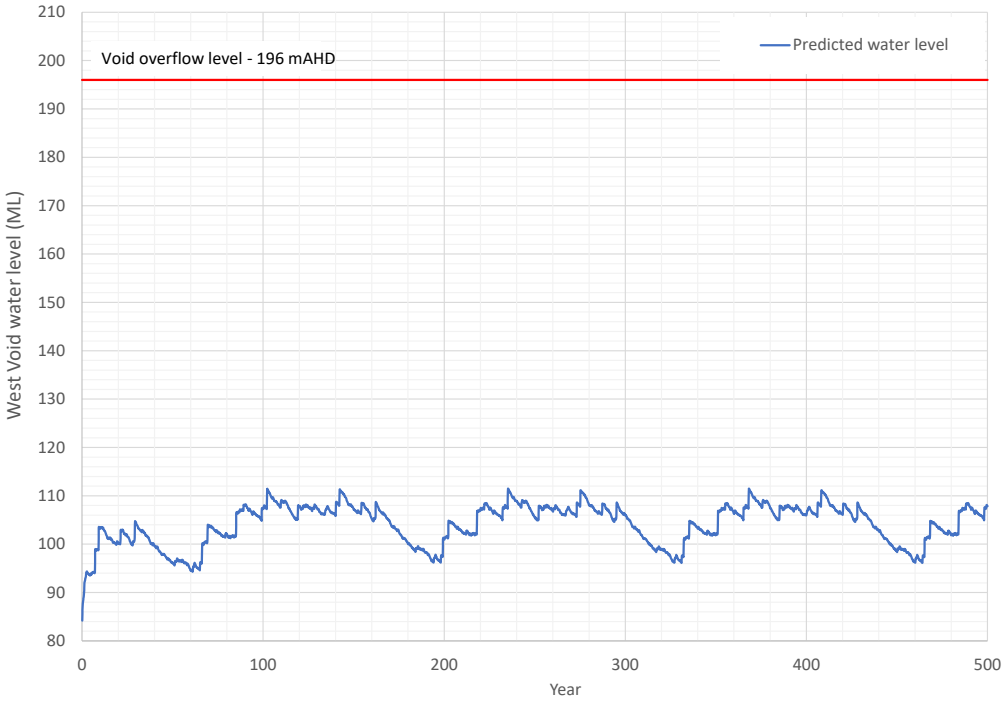

Figure 2.8 – Residual void water level- West Void

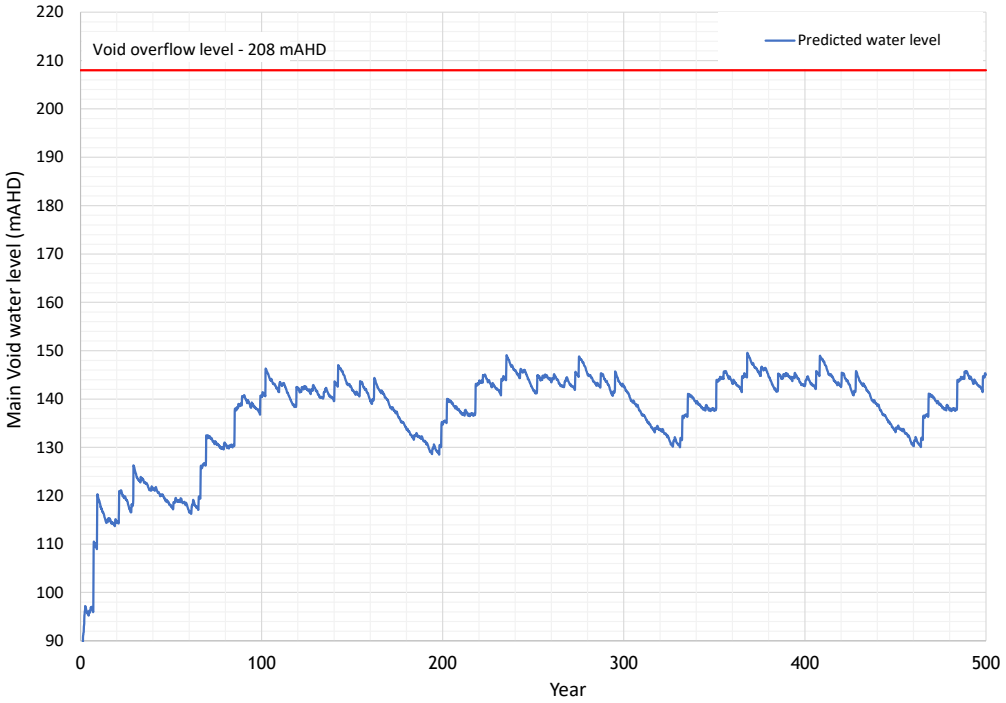

Figure 2.9 – Residual void water level- Main Void

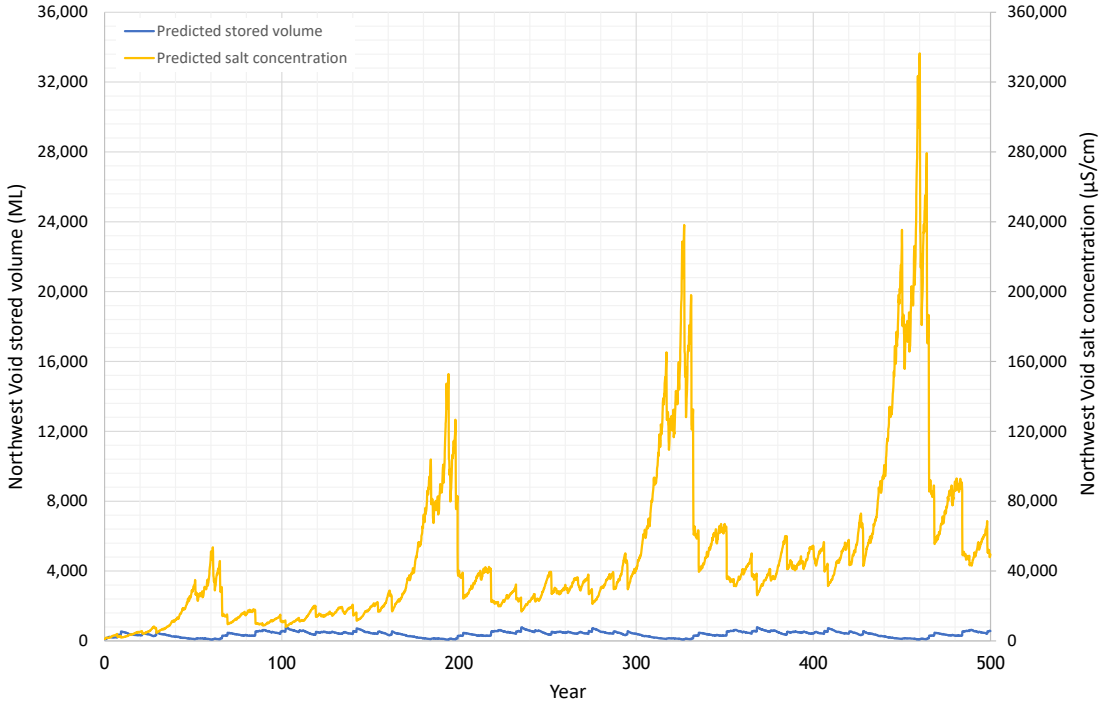

Figure 2.10 – Residual void stored volume and salt concentration – North-west Void

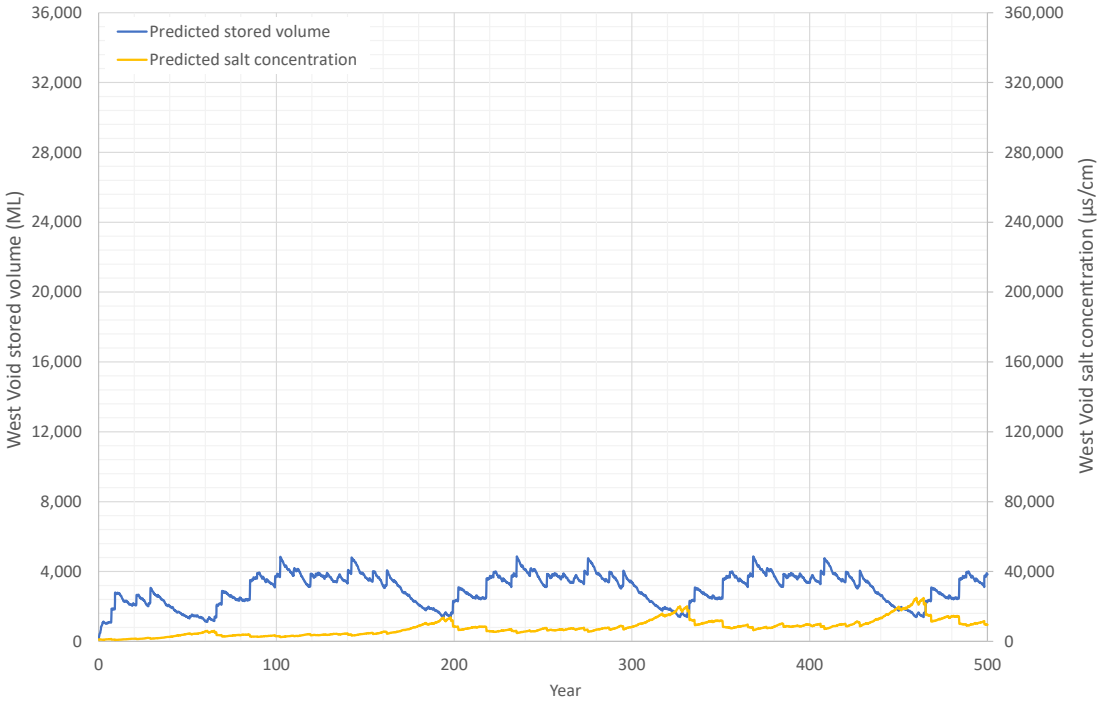

Figure 2.11 – Residual void stored volume and salt concentration – West Void

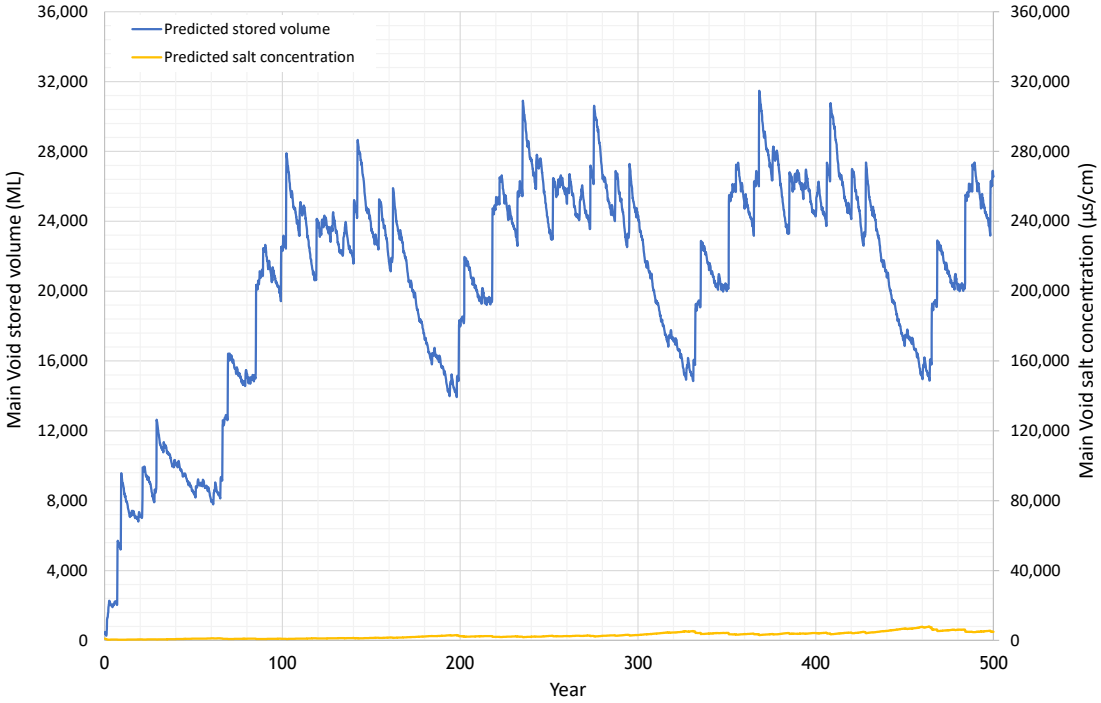

Figure 2.12 – Residual void stored volume and salt concentration – Main Void

2.34 ISSUE NO. 584.83

2.34.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Compared to proposed conditions in section 7.4.9 Schedule I (Regulated Structures) on pages 7-39 to 7-42 in draft EIS Section 7 - General Environmental Protection Commitments and Model Conditions.*
>
> *Limited information on levees being regulated structures is provided in section 5.4.6 Flooding and Regulated Structure page 25 of Additional Information document and in Attachment 6 Surface Water and Flooding (i.e. section 5.6.2 (Flood protection levees) page 76, section 9.1.5 (Flood protection levee assessment) page 128 and section 5.1 Operational Phase of Winchester South Project EIS Technical Study Report Geomorphology page 71).*
>
> *Provide details on levees, regulated structures and other aspects such as diversions and water management infrastructure, including required management. Provide list of proposed EA conditions covering levees, regulated structures and water management infrastructure and the required management approach.*

2.34.2 Response

Whitehaven WS has included this recommendation in the proposed conditions for regulated structures in Schedule I of Section 1.1 of Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments).The EIS documentation (including the SWFA [WRM, 2022]) provides conceptual details for the proposed regulated structures. Detailed design of these structures in not undertaken at EIS stage, and will be developed during the detailed design phase of the Project.

2.35 ISSUE NO. 584.84

2.35.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *The coordinates for surface water monitoring locations in Table 10.7 should not be easting/northing using GDA94 but lat/long using GDA2020 with 6 decimal places.*
>
> *Provide a scientific, reasoned discussion as to why the list of proposed surface water monitoring locations is considered adequate in the context of the proposed release points, sources of contaminants and management requirements.*
>
> *Ensure coordinates are lat/long using GDA2020 with 6 decimal places as per TOR requirement 7.14.*

2.35.2 Response

Co-ordinates have been provided in response to Issue No. 584.62 in latitude and longitude (GDA2020) (Table 2.1).

The locations have been selected to provide upstream (reference) and downstream (impact) sites to allow for compliance monitoring and assessment of potential impacts resulting from off-site releases (whether controlled or uncontrolled).

2.36 ISSUE NO. 584.85

2.36.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Table 10.8, Table 10.9 and Table 10.10 define the proposed frequency and parameters to be sampled at the proposed release points during the discharge of mine-affected water.*
>
> *Section 10.7.3 of Attachment 6 page 157 states: 'The proposed EC and sulphate (as SO4) mine-affected water release limits [refer Table 10.10] are consistent with the approved limits applied at the majority of mining operations in the vicinity of the Project, including the recently approved Isaac Downs and Olive Downs projects. Refer to Table 10.3 for a summary of the approved release limits for operating coal mines in the vicinity of the Project.'*
>
> *DES notes that the release contaminant trigger investigation limits in the draft EIS Section 7 in Table F3 included quality characteristic of sodium, suspended solids and sulphate. No explanation was provided for why these are not included as triggers in Table 10.9 of Attachment 6.*
>
> *As discussed in Issue number 480.85 DES does not accept using release conditions from neighbouring mines unless robust evidence is provided that justifies why they would applicable to the site-specific circumstances and conditions found at the proposed Winchester South mine with regard to geochemical characteristics, water quality of runoff and surface water, environmental values/water quality objectives, risks/impacts at the Winchester and water quality of the associated receiving environments. Provide scientific, reason evidence that discusses all aspects of the proposed mining program, including how it will protect Environmental Values, Water Quality Objectives and complies with relevant guidelines.*
>
> *Issues with each Table include:*
>
> - *Table 10.8 - explain the parameters and limits used (i.e., EC, pH and Sulphate) including, why is a upper limit of 9 for pH applicable?; explain if these are end-of-pipe limits or limits of the water quality within a water storage before release is permitted - also see comments on Table 10.10.*

- *Table 10.9 - explain the contaminant parameters used; trigger levels including what guideline(s) were used to develop them; suitability of monitoring frequency for each contaminant. Explain why trigger investigation limits for sodium, suspended solids and sulphate have not been included.*
- *Table 10.10 - explain variable levels/proposed flow levels?; what is intended reason for proposed maximum release rate; why only parameters EC and Sulphate; coordinates for gauging station should be update to Lat/Long with GDA2020; only gauging station at Deverill was listed; do not indicate if the EC/Sulfate are monitored as end-of-pipe of the RP or water is monitored in dam before it is released.*
- *Following an assessment of the site's requirements determine if monitoring of TDS, TSS and/or Turbidity is required (i.e., discussed in section 10.7.4 of Attachment 6).*

2.36.2 Response

See responses to Issue No. 584.17 and Issue No. 584.77 regarding:

- Table 10.8:
  - pH consistent (or lower than) almost all other mines that release into the upper reach of the Isaac River.
  - These are end-of-pipe limits.
- Table 10:
  - This is covered in *Proposed Environmental Authority Conditions for Surface Water and Justification* (WRM, 2023) (Appendix A).
- Table 10.10:
  - A tiered controlled release strategy is proposed to take advantage of the significant dilution capacity available within the Isaac River as the flow rates increase. This approach is in accordance with the Model Mining Conditions (DES, 2017) and is consistent with most contemporary EAs for other nearby mining operations.
  - The proposed EA conditions include variable release limits for EC, SO_4 and Total Suspended Solids, as well as fixed limits for pH.
  - The Deverill gauge is located immediately downstream of the Project, and is the most appropriate flow gauge to use as the reference gauging station.
  - The monitoring locations are end-of-pipe, although field sampling will be undertaken within the dam itself prior to release to confirm water quality characteristics.

2.37 ISSUE NO. 584.86

2.37.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Table 10.11 provides the water storage monitoring to be undertaken and indicates the monitoring will occur in specified dams (i.e., MWD, CC Dam, Railway Pit), parameters to be monitored are those identified in Table 10.8 and Table 10.9 and monitoring frequency is quarterly.*
>
> *While DES agrees with undertaking monitoring of required water storages, provide a scientific, reasoned based explanation for the parameters to be monitored and their frequency.*
>
> *DES recommends an EA condition that the dams listed (i.e. MWD, CC Dam, Railway Pit) can only be used to discharge mine-affected water to the receiving environment. Clarification is required regarding which monitoring points and release points relate to which dam.*

2.37.2 Response

The parameters and monitoring frequency proposed are over and above the water quality monitoring recommendations in the Model Mining Condition (DES, 2017). They will provide Whitehaven WS with an enhanced understanding of the contaminant concentrations within the mine-affected water management system. This will allow for a more informed decision-making process when considering controlled releases from the mine-affected water system.

The linkage between dam, release point and monitoring location is included in Schedule F of Section 1.1 of Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments).

2.38 ISSUE NO. 584.87

2.38.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Table 10.12 indicates that all parameters identified in Table 10.8 and Table 10.9 will be monitored in the sediment dams and identifies frequency as quarterly.*
>
> *A footnote on Table 10.12 states: 'Monitoring would be undertaken quarterly for the first two years of the Project to inform to validate the anticipated quality of water runoff reporting to sediment dams. The frequency of monitoring and suite of parameters for the sediment dam monitoring would be reviewed and updated accordingly as part of the ESCP.'*
>
> *Section 10.7.4 states: 'If water quality sampling of sediment dam water shows contaminant concentrations materially higher than those predicted by the geochemical characterisation study and exceed the release contaminant trigger investigation levels (Table 10.9), the following mitigation measures would be implemented: Pump back all sediment dam water to the water management system; or Treat the sediment water through flocculation prior to release.'*
>
> *Provide a scientific, reasoned based explanation for the parameters to be monitored and their frequency. Explain why monitoring of sediment dams would not be ongoing and only intended to be done for 2 years.*
>
> *Justify:*
>
> - *Why Table 10.8 is not used as a trigger for the application of the mitigation measures; and*
> - *Why limited mitigation measures are being proposed, including treatment.*
>
> *Explain how the proposed flocculation treatment would deal with unacceptable levels of contaminates.*

2.38.2 Response

The parameters and monitoring frequency proposed are over and above the water quality monitoring recommendations in the Model Mining Condition (DES, 2017). They will provide Whitehaven WS with an enhanced understanding of the contaminant concentrations within the sediment water management system during the first 2 years of the Project. This will allow for a more informed decision-making process when managing potential risks associated with overflows from the sediment dams to the receiving environment.

The SWFP does not state that monitoring would be discontinued after two years. Table 10.12 describes that the frequency of monitoring and suite of parameters for the sediment dam monitoring would be reviewed and updated accordingly as part of the ESCP. Monitoring of the sediment water quality over a 2-year period is expected to be sufficient to validate the anticipated quality of water runoff reporting to the sediment dams. If the quality of water runoff reporting to the sediment dams is consistent with expectations, then further monitoring would not be necessary.

However, if the data collected during the first two years indicates that ongoing monitoring is required (e.g. if water quality is elevated or fluctuates such that a trend cannot be confidently established), then this would form part of the updated ESCP prepared at that time (which must be prepared to the satisfaction of DES). It is important to note that the initial two year period applies to each individual sediment dam (i.e. sediment dams developed later in the mine life would still be monitored for at least two years).

The release limits in Table 10.8 of the SWFA (WRM, 2022) would also trigger the application of mitigation measures (in addition to the triggers in Table 10.9).

The proposed mitigation measures are practical and appropriate to manage the risk of elevated contaminant levels in sediment dam water. The application of coagulation and flocculation would be targeted towards sediment dams with elevated levels of suspended solids. For sediment dams with elevated levels of dissolved metals or other contaminants, the water would be pumped back to the MAW management system for containment. Whitehaven WS would also investigate the source of any elevated contaminants undertake remediation actions at the source to avoid impacts to the receiving environment (e.g. by dumping any material with geochemical complications in-pit or otherwise within the mine water management system).

2.39 ISSUE NO. 584.88

2.39.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *A set of proposed receiving water contaminant triggers levels (i.e., pH, EC, sulphate) have been developed, based on the conditions recently approved in the EA at the neighbouring Olive Downs Project. These trigger levels are presented in Table 10.13 and are proposed to be measured at the upstream and downstream Isaac River monitoring stations (SW4 and SW5, respectively).*
>
> *As discussed in Issue number 480.8 DES does not accept using release conditions from neighbouring mines unless robust evidence is provided that justifies why they would be applicable to the site-specific circumstances and conditions found at the proposed Winchester South mine with regard to geochemical characteristics, water quality of runoff and surface water, environmental values and risks/impacts and water quality of the associated receiving environments.*
>
> *Provide a scientific, reasoned discussion explaining the relevance of all aspects of the proposed receiving water contaminant triggers, including:*
>
> - *parameters used (i.e., pH, EC, sulphate)*
> - *trigger levels*
> - *monitoring location*
> - *monitoring frequency*
> - *explain why alternative aspects are not applicable (i.e. parameters).*

2.39.2 Response

The full list of proposed EA conditions is provided in Attachment 1 of the Response to Submissions (Proposed Conditions and Commitments). Justification for the proposed release contaminant trigger investigations level, mine affected water release limits and receiving environment trigger levels is provided in Section 2, Section 3 and Section 5 of Appendix A.

2.40 ISSUE NO. 584.89

2.40.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Section 7.4 and Figure 7.11 of Attachment 6 discusses salt inputs and outputs for the proposed project. This is very confusing as it is very general information and is not linked to actual specific areas or activities at the proposed mine site. By being general it is hard to determine if salt and associated EC levels would increase, decrease or stabilise over time.*
>
> *The information on the salt balance could be useful if it were specific and sufficiently detailed. DES considers Figure 7.11 of Attachment 6 too general and should have specific inputs and outputs, including water storages with variable forecasted salt levels, sources of salt (e.g., areas with sodic soils) and other landscape components. Provide a conclusion on salt and EC levels for the proposed mine site as part of assessing and managing potential impacts.*

2.40.2 Response

Figure 7.11 of the SWFA (WRM, 2022) is a conceptual diagram of the modelled inputs and outputs of salt to the proposed Project water management system. Each of the input and output components are discretely modelled in the water balance model, and have been used to predict the salinity within each of the storages on a daily timestep throughout the Project life.

The salinity concentrations applied to the various inputs to the model are provided in Table 6.10 of the SWFA (WRM, 2022).

The outputs from the daily salt balance model have been used to inform the impact assessment (including the calculation of salinity of discharge water) and are presented in key graphs within the SWFA (WRM, 2022) such as Figure 8.2 to Figure 8.4 (residual void assessment) and Figure 7.8 (impact on Isaac River salinity during discharges).

2.41 ISSUE NO. 584.93

2.41.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *The groundwater and surface water assessment has relied on 70ML/y assumption for the water consumption by cattle.*
>
> *The 70ML assumption for the water consumption by cattle is not considered reasonable and must be supported by suitable evidence, scientifically justified. The level of consumption by cattle has relevance for water levels in the voids, potential for overtopping, impacts on groundwater (and as discussed above) if they are sinks, including timeframes and the salinity levels in the voids.*
>
> *Various scenarios should be provided ranging from no cattle to 4,700 cattle using 70ML/year and discuss the assumptions on cattle drinking the water in each void since it is in the high salinity range for cattle. Each of the scenarios should discuss how the reduced level of consumption alters each of the matters that reply on it (e.g., water levels in the voids, overtopping, potential impacts on groundwater, is it a sink including over what timeframe and the salinity levels in the voids).*
>
> *Also see next comment on the remaining uncertainty on the salinity levels for Main Void.*

2.41.2 Response

Section 8 of the SWFA describes the basis for the 70 ML/year consumption rate as follows:

> *An annual extraction rate of 70 ML/year has been applied across the residual voids. This is based on an average cattle water consumption rate of 15,000 L per year per head, at an adopted cattle carrying capacity of 2.4 hectare per Animal Equivalent (AE) and a resulting 4,700 AE cattle.*

Furthermore, supporting evidence for the beneficial use for agriculture (e.g. cattle consumption) position is provided below:

- Stock water quality tolerance:
  - The ANZG (2018) guidelines have not been updated for livestock, so the ANZECC (2000) guidance prevails (https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/primary-industries/stock-water-guidance).
  - Based on Table 9.3.3 from ANZECC (2000) (https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol3.pdf), beef cattle can consume water of up to 4,000 mg/L (around 6,000 µS/cm) with no adverse effects expected.
- Stock water requirements:
  - Based on Table 9.3.1 from ANZECC (2000) (https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol3.pdf), beef cattle consume on average **45 litres/day** (or **16,425 litres/year**). This is more than the modelled consumption rate of 15,000 litres/year per head of cattle.
  - The modelled consumption rate of 15,000 L/year is also supported by the table at the following link: https://futurebeef.com.au/resources/water-requirements/.

Direct responses to Issue No. 584.93 regarding the residual voids behaving as sinks without the proposed beneficial use is provided in the Spreadsheets 1 and 2 of the Response to Submissions.

2.42 ISSUE NO. 584.94

2.42.1 Submitter recommendation / suggested mitigation

DES raised the following:

> *Section 8.7.2 of Attachment 6 discusses long-term salinity for each void. It states for Main Void: 'The salinity of the pit lake does not reach equilibrium with 500 years of simulation'. It is important to reach equilibrium so confidence is provided on the predicted salinity levels.*
>
> *DES recommends further work is undertaken to reach equilibrium. This is important for Main Void since it is 89% of the stored water and is most likely the main source of stock drinking water, since the salinity levels in North-West Void and West Void appear marginal.*

2.42.2 Response

For the 70 ML/year beneficial use scenario, it takes approximately 2,500 years for the salt concentration to reach equilibrium within Main Void, with EC ranging between 6,000 µS/cm and 13,600 µS/cm .

For the no beneficial use scenario, the salinity of the water will continue to increase over time until it reaches its saturation limit. This is due to it being a closed system, with no mechanism for salt to be removed from the system.

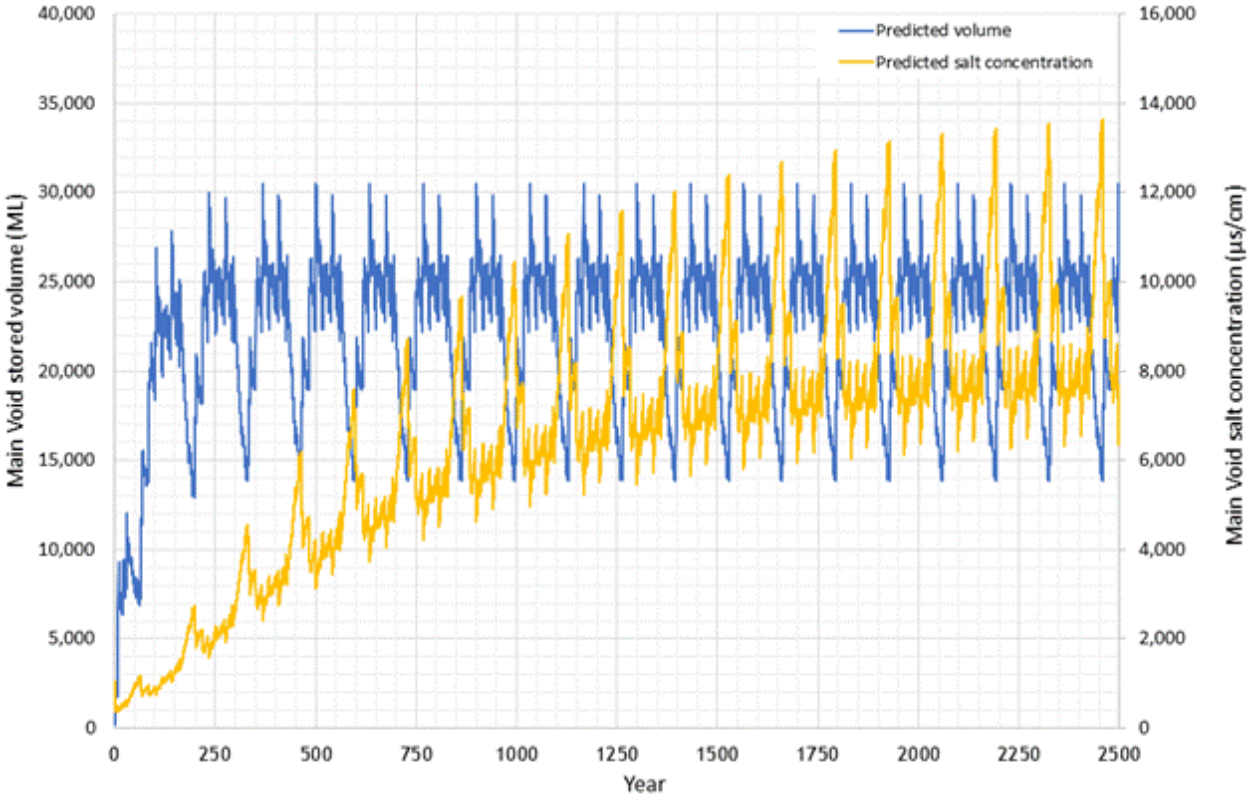

Figure 2.13 – Residual void stored volume and salt concentration – Main Void over 2,500 years

3 References

ANZG, 2018	Australian and New Zealand Governments (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality.
DES, 2017	Department of Environment and Science (DES) (2017). Model mining conditions.
DES, 2022	Department of Environment and Science (DES) (2022). Reef discharge standards for industrial activities.
DRDMW, 2023	Department of Regional Development, Manufacturing and Water (2023) Watercourse Identification Map (WIM).
Fluvial Systems, 2020	Fluvial Systems (2020). Winchester South Project Environmental Impact Statement – Technical Study Report – Geomorphology Assessment
Terrenus, 2020	Terrenus (2020) Winchester South Project – Geochemical Assessment of Potential Waste Rock and Coal Reject Materials.
Whitehaven, 2022	Whitehaven WS (2022) Winchester South Project – Additional Information.
WRM, 2022	WRM (2022) Winchester South Project: Surface Water and Flooding Assessment.
WRM, 2023	WRM (2023) Proposed Environmental Authority Conditions for Surface Water and Justification.

Appendix A - Proposed Environmental Authority Conditions for Surface Water and Justification

Winchester South Project

Proposed Environmental Authority Conditions for Surface Water and Justification

Whitehaven Coal Limited
0869-10-C2, 22 March 2023

1 Table F2 – Mine-affected Water Release Limits & Table F4 – Mine-affected Water Release During Flow Events

1.1 ELECTRICAL CONDUCTIVITY, SULPHATE AND TOTAL SUSPENDED SOLIDS LIMITS

The proposed release limits for electrical conductivity (EC), sulphate (SO_4^{2-}) and total suspended solids (TSS) (as shown in Table F4) are structured as a tiered release strategy, and are dependent on the flow rate in the receiving waters.

The adopted medium/high/very high flow thresholds, maximum release rates and EC/SO_4^{2-}/TSS are based on achieving a dilution ratio of between 8:1 (minimum under medium flow conditions) and 60:1 (minimum under very high flow conditions). Other factors taken into consideration when developing the release strategy include:

- probability that controlled releases of mine-affected water would be required under a comprehensive range of climatic conditions over the Project life; and
- the expected mix level/concentration of EC/sulphate in the receiving waters during a controlled release event.

Section 7.3.5 of the Surface Water and Flooding Assessment (WRM, 2022) shows the modelled impact of controlled releases on the receiving environment during the Project life. The key outcomes are as follows:

- The minimum modelled dilution ratio that occurred from all release categories throughout all realisations is 407:1. However, 50% of modelled release days exceed a dilution ratio of 5,500:1. This demonstrates that controlled releases are only required during very high flow conditions in the Isaac River (i.e. following very wet conditions), with significant dilution capacity available.
- Controlled releases would have a negligible impact on the mixed water quality within the Isaac River immediately downstream of the Project. During 95% of controlled release days, the increase in Isaac River EC is less than 10 microSiemens per centimetre (µS/cm). Under worst case conditions, the Isaac River EC is predicted to increase by only 30 µS/cm.

The predicted cumulative impact of releases from multiple operations on the receiving environment for EC and sulphate is discussed further in Section 6.

1.2 PH LIMITS

The mine-affected water pH limit range of 6.5 to 9.0 is based on the minimum and maximum recorded pH in the local Isaac River dataset (see Appendix B) and is consistent with (or has a smaller range than) the vast majority of other operating coal mines in the upper Isaac River catchment.

Table F2 - Mine-affected Water Release Limits

Quality Characteristic	Release Limits	Release Limits
Electrical Conductivity (µS/cm)	Release limits specified in **Table F4 - Mine-affected Water Release During Flow Events** for variable flow criteria.	Daily during release (the first sample must be taken within two hours of commencement of release).
pH (pH Unit)	6.5 (minimum) 9.0 (maximum)	
Sulphate (SO_4^{2-}) (mg/L)	Release limits specified in **Table F4 - Mine-affected Water Release During Flow Events** for variable flow criteria.	
Total Suspended Solids (TSS)	Release limits specified in **Table F4 - Mine-affected Water Release During Flow Events** for variable flow criteria.	

2 Table F3 – Release Contaminant Trigger Investigation Levels, Potential Contaminants

The majority of the proposed release containment trigger investigation levels are based on either:

- the *Guidelines for Fresh and Marine Water Quality* published by Australian and New Zealand Governments (ANZG) (2018) trigger values for slightly to moderately disturbed systems (at 95% level of protection);
- the low reliability guideline published by ANZG (2018);
- the toxicant default guideline values for aquatic ecosystem protection: Boron in fresh water (at 95% level of protection) published by ANZG (2018);
- the QLD water quality guidelines (2006) for Total Nitrogen;
- the short-term trigger value in irrigation water for fluoride ANZECC and ARMCANZ (2000);
- the protection of livestock and short-term irrigation guideline; or
- the limit of Reporting values for various analytical methods.

Proposed releases contaminant trigger investigation levels that are based on site specific data or regional Isaac River gauge data are as follows:

- *Aluminium (dissolved)*: A trigger level of 116 micrograms per litre (µg/L) is based on the 80th percentile statistical value from the local composite dataset collected by Whitehaven WS and other surrounding developments with data sharing agreements.
- *Iron (dissolved)*: A trigger level of 380 µg/L is based on the 80th percentile statistical value from the local composite dataset collected by Whitehaven WS and other surrounding developments with data sharing agreements.
- *Sodium*: A trigger level of 188,000 µg/L (or 188 milligrams per litre [mg/L]) is based on the 80th percentile statistical value from the Isaac River at Goonyella gauge dataset.

Table F3 - Release Contaminant Trigger Investigation Levels, Potential Contaminants

Quality Characteristic[1]	Trigger Levels (µg/L)	Comment on Trigger Level	Monitoring Frequency
Aluminium	116	80th percentile value for local dataset	Commencement of release (first sample taken within two hours) and weekly during releases thereafter.
Arsenic (total)	13	For aquatic ecosystem protection, based on slightly to moderately disturbed ecosystems (ANZG, 2018)[2]	
Cadmium (total)	0.2	For aquatic ecosystem protection, based on based on slightly to moderately disturbed ecosystems (ANZG, 2018)[2]	
Chromium	1	For aquatic ecosystem protection, based on based on slightly to moderately disturbed ecosystems (ANZG, 2018)[2]	
Copper	1.4	For aquatic ecosystem protection, based on based on slightly to moderately disturbed ecosystems (ANZG, 2018)[2]	
Iron	380	80th percentile value for local dataset	
Lead	3.4	For aquatic ecosystem protection, based on based on slightly to moderately disturbed ecosystems (ANZG, 2018)[2]	
Mercury	0.2	For aquatic ecosystem protection, based on LOR for ICP-MS[3]	
Nickel	11	For aquatic ecosystem protection, based on based on slightly to moderately disturbed ecosystems (ANZG, 2018)[2]	
Zinc	8	For aquatic ecosystem protection, based on based on slightly to moderately disturbed ecosystems (ANZG, 2018)[2]	
Boron	940	For aquatic ecosystem protection, based on based on slightly to moderately disturbed ecosystems (ANZG, 2020)[5]	
Cobalt	90	For aquatic ecosystem protection, based on low reliability guideline (ANZG, 2018)[4]	
Manganese	1,900	For aquatic ecosystem protection, based on based on slightly to moderately disturbed ecosystems (ANZG, 2018)[2]	
Molybdenum	34	For aquatic ecosystem protection, based on low reliability guideline (ANZG, 2018)[4]	
Selenium	5	For aquatic ecosystem protection, based on based on slightly to moderately disturbed ecosystems (ANZG, 2018)[2]	
Silver	0.5	For aquatic ecosystem protection, based on LOR for ICP-MS[3]	
Uranium	1	For aquatic ecosystem protection, based on LOR for ICP-MS[3]	
Vanadium	10	For aquatic ecosystem protection, based on LOR for ICP-MS[3]	
Ammonia	900	For aquatic ecosystem protection, based on based on slightly to moderately disturbed ecosystems (ANZG, 2018)[2]	
Nitrate (TN)	1,100	For aquatic ecosystem protection, based on ambient *Queensland Water Quality Guidelines* (EPA, 2006) for TN[6]	

Quality Characteristic[1]	Trigger Levels (µg/L)	Comment on Trigger Level	Monitoring Frequency
Petroleum Hydrocarbons (C_6 – C_9)	20	For aquatic ecosystem protection, based on LOR for GC-MS[3]	Commencement of release (first sample taken within two hours) and weekly during releases thereafter.
Petroleum Hydrocarbons (C_{10} – C_{36})	100	For aquatic ecosystem protection, based on LOR for GC-MS[3]	
Fluoride (total)	2,000	Protection of livestock and short-term irrigation guideline (ANZECC and ARMCANZ, 2000)[7]	
Sodium	188,000	80th percentile value for Isaac River at Goonyella gauge	

LOR = limit of reporting; ICP-MS = Inductively Coupled Plasma mass spectrometry; GC-MS = gas-chromatography mass spectrometry; ANZG = Australian and New Zealand Guidelines; EPA = Queensland Environmental Protect Agency.

1 All metals and metalloids must be measured as total (unfiltered) and dissolved (<0.45 µm filtered). Contaminant limits for metals and metalloids are only considered to be exceeded if the results for dissolved metal or metalloid exceed the trigger level.

2 Table 3.4.1 of ANZG (2018): trigger values for slightly to moderately disturbed systems, (95% level of protection). For Selenium, 99% level of protection.

3 LOR – typical reporting for method stated. ICPMS/CV FIMS/GCMS – analytical method required to achieve LOR.

4 Low reliability guideline – refers to Section 8.3.7 of ANZG (2018): low reliability guideline.

5 Based on 95% level of protection in Toxicant default guideline values for aquatic ecosystem protection: Boron in fresh water (ANZG, 2020).

6 Based on ambient WQGs (2006) for total nitrogen –standard trigger value for contemporary environmental authorities in Bowen Basin.

7 Based on short-term trigger value in irrigation water for fluoride (ANZECC and ARMCANZ, 2000).

3 Table F4 – Mine-affected Water Release During Flow Events

The proposed mine-affected water release strategy (Table F4) is a tiered release strategy, that is dependent on the following parameters:

- Flow rate in the Isaac River
- Controlled release discharge rate;
- Water quality (EC, SO_4^{2-} and TSS) of the discharged water.

The tiered release approach is based on achieving an acceptable dilution ratio and downstream receiving water quality concentrations under varying flow conditions in the Isaac River, and is consistent with the approved release strategies for many of the operating coal mines in the Upper Isaac River catchment.

Table F4 - Mine-affected Water Release During Flow Events

Receiving Waters	Release Point (RP)	Gauging Station	Gauging Station Latitude (GDA2020)	Gauging Station Longitude (GDA2020)	Receiving Water Flow Recording Frequency	Receiving Water Flow Criteria for Discharge (m^3/s)	Maximum Release Rate	Release Limits[1]
Isaac River	MWD (RP1) CC Dam (RP2) Railway Pit (RP3)	130410A Isaac River at Deverill[2]	-22.170765	148.384174	Continuous (minimum daily)	**Medium Flow**		
						4 m^3/s	0.5 m^3/s	1,000 µS/cm 300 mg/L SO_4^{2-} 55 mg/L TSS
						10 m^3/s	1.0 m^3/s	1,200 µS/cm 300 mg/L SO_4^{2-} 200 mg/L TSS
						High Flow		
						50 m^3/s	2.0 m^3/s	4,000 µS/cm 400 mg/L SO_4^{2-} 200 mg/L TSS
						100 m^3/s	3.0 m^3/s	6,000 µS/cm 400 mg/L SO_4^{2-} 300 mg/L TSS
						Very High Flow		
						300 m^3/s	5.0 m^3/s	10,000 µS/cm 400 mg/L SO_4^{2-} 400 mg/L TSS

1 If upstream levels of SO_4^{2-} and TSS are above the release limits, mine-affected water release limits may be increased to the levels of SO_4^{2-} and TSS upstream with monitoring on a minimum frequency of daily to provide sufficient evidence for compliance and no exceedances of the receiving water contaminant trigger levels in **Table F7 – Receiving Waters Contaminant Trigger Levels**.

2 If gauging station 130410A Isaac River at Deverill is not available, a gauging station downstream of the release points in a similar location may be used for monitoring purposes.

4 Table F5 – Water Storage Monitoring

Quarterly water monitoring (full suite) of all mine-affected water dams and sediment dams is proposed to be undertaken during the Project (following construction of each dam/water storage). This will enable Whitehaven WS to accurately characterise the water quality within both the mine-affected water and sediment dams at regular intervals, allowing for early detection of unexpected contaminant concentrations. This will provide time for the implementation of any required mitigation measures to prevent uncontrolled releases of any potential contaminants to the receiving waters outside of those authorised under the Environmental Authority for the Project.

Table F5 - Water Storage Monitoring

Water Storage Description	Latitude (GDA2020)	Longitude (GDA2020)	Monitoring Location	Frequency of Monitoring
MWD	-22.154581	148.290224	Dam wall	Quarterly
CC Dam	-22.152906	148.285622	Dam wall	Quarterly
MIA Dam	-22.139702	148.280798	Dam wall	Quarterly
Railway Pit Storage	-22.135072	148.255544	-	Quarterly
RWD	-22.135946	148.273093	Dam wall	Quarterly
SD01	-22.149218	148.291069	Dam wall	Quarterly
SD02	-22.155898	148.286610	Dam wall	Quarterly
SD03	-22.156432	148.280629	Dam wall	Quarterly
SD04	-22.148188	148.249901	Dam wall	Quarterly
SD05	-22.140346	148.264702	Dam wall	Quarterly
SD06	-22.137318	148.241813	Dam wall	Quarterly
SD07	-22.185521	148.325958	Dam wall	Quarterly
SD08	-22.168349	148.261141	Dam wall	Quarterly
SD09	-22.185856	148.268010	Dam wall	Quarterly
SD10	-22.223946	148.294046	Dam wall	Quarterly
SD11	-22.170820	148.306359	Dam wall	Quarterly
SD12	-22.162640	148.292068	Dam wall	Quarterly
SD13	-22.198556	148.260956	Dam wall	Quarterly
SD14	-22.159876	148.282060	Dam wall	Quarterly
SD15	-22.230925	148.343778	Dam wall	Quarterly
SD16	-22.168039	148.235944	Dam wall	Quarterly

5 Table F7 – Receiving Waters Containment Trigger Levels

5.1 PH LIMITS

The proposed receiving water contamination trigger level range of 6.5 to 8.5 for pH is based on the Environmental Protection (Water) Policy 2009 Isaac River Sub-basin Environmental Values and Water Quality Objectives Basin No. 130 (part), including all waters of the Isaac River Sub-basin (including Connors River) (2011). This range is consistent with, or allows for greater protection of the receiving waters than, the receiving water pH trigger range for other operating coal mines in the vicinity of the Project.

5.2 ELECTRICAL CONDUCTIVITY LIMITS

The proposed receiving water contamination trigger level of 1,000 µS/cm for EC is consistent with, or allows for greater protection of the receiving waters than, the authorised EC receiving water trigger values for most of the neighbouring coal mining operations that discharge into the Isaac River (or tributaries of) in close proximity to the Project (both upstream and downstream of the Project).

5.3 TOTAL SUSPENDED SOLIDS

The proposed receiving water contamination trigger level of 1,901 mg/L TSS is based on the 80th percentile sample value for the Goonyella and Deverill gauge locations.

5.4 SULPHATE

The proposed receiving water contamination trigger level of 250 mg/L for sulphate is consistent with the recommended trigger level in Table F5 of the Model Mining Conditions. This value is based on the trigger level for the *Protection of Drinking Water* Environmental Value.

It is also consistent with, or allows for greater protection of the receiving waters than, the authorised sulphate receiving water trigger values for many of the neighbouring coal mining operations that discharge into the Isaac River (or tributaries of) in close proximity to the Project (both upstream and downstream of the Project).

Table F7 - Receiving Waters Contaminant Trigger Levels

Quality Characteristic	Trigger Level	Monitoring Frequency
pH (pH units) (range)[1]	6.5 – 8.5	Daily during the releases from RP1, RP2 and RP3
Electrical Conductivity (µS/cm)	1,000	
Sulphate (SO_4^{2-}) (mg/L) [2]	250	
Total Suspended Solids (mg/L)[3]	1,901	

1 Based on the Isaac River Sub-basin Water Quality Objectives.

2 Based on the protection of the Drinking Water EV

3 Based on the 80th percentile value from the Goonyella and Deverill gauging stations.

6 Assessment of cumulative impacts of mine-affected water releases

To demonstrate the robustness of the proposed mine-affected water release conditions and receiving water triggers, we have developed a "expected worst case" scenario which includes coincident releases from a number of neighbouring operations that have similar release conditions.

The neighbouring operations included in this assessment are:

- Olive Downs mine (approved mine located immediately downstream of the Project); and
- Isaac Downs mine (recently constructed mine located upstream of the Project).

For this assessment, it has assumed that all three operations are releasing at their maximum flow rate and maximum contaminant concentration for the relevant release tier (Medium 1, High 1 etc).

We have not included other nearby mining operations in this assessment, as most of the other EAs do not include a volumetric limit on releases. This makes it difficult to predict the volume of mine water (and hence contaminant load) that may be released in accordance with the respective approved EA conditions.

6.1 CUMULATIVE IMPACTS OF RELEASES ON EC

For this cumulative assessment, we assumed that all three operations (Winchester South [WS], Olive Downs [OD] mine and Isaac Downs [ID] mine) will be discharging at the same time, within the same release tiers.

The outcomes from the assessment are provided in Table 6.1 and summarised below:

- Even with all three operations discharging simultaneously at their maximum release rates and EC concentrations (with each tier):
  - the predicted downstream EC in the Isaac River is less than 800 µS/cm, which is well below the proposed downstream receiving trigger level of 1,000 µS/cm.
  - there is still significant capacity within the Isaac River to accommodate coincident releases from other mines that may discharge upstream of (or adjacent to) the Project.

The assessment is highly conservative, for the following reasons:

- It is unlikely that all three operations would be discharging at the same time, at the maximum of their flow rate and EC limits.
- The Project site water balance model predicts that there is only a 1% AEP probability that the WMS will require controlled releases. These would only occur during high or very high flows in the Isaac River.
- The predicted EC within the mine-affected water storages at the Project is typically between 3,000 and 5,000 µS/cm, significantly less than the maximum allowable limit for the High 2 and Very High flow release tiers.

Table 6.1 – Mine-affected water releases - cumulative impact assessment - EC

Controlled Release Tier	U/S Isaac River Flow (m^3/s)	U/S Isaac River EC (µS/cm)[a]	WS Release Rate (m^3/s)	WS Release EC (µS/cm)	OD Release Rate (m^3/s)	OD Release EC (µS/cm)	ID Release Rate (m^3/s)	ID Release EC (µS/cm)	**D/S Isaac River mixed EC (µs/cm)**
Medium 1	4	288	0.5	1,000	0.5	1,000	0.1	3,000	**784**
Medium 2	10	244	1.0	1,200	1.0	1,200	0.3	4,000	**729**
High 1	50	181	2.0	4,000	2.0	4,000	1.1	5,000	**762**
High 2	100	160	3.0	6,000	3.0	6,000	2.0	5,000	**761**
Very High	300	131	5.0	10,000	5.0	10,000	3.1	8,000	**681**

Note: a/ Isaac River EC based on flow vs EC relationship derived from Deverill gauging station data

6.2 CUMULATIVE IMPACTS OF RELEASES ON SULPHATE

A similar assessment has been undertaken for sulphate (SO_4^{2-}). The outcomes from the assessment are provided in Table 6.2 and summarised below:

- Even with all three operations discharging simultaneously at their maximum release rates and SO_4^{2-} concentrations (with each tier):
  - the predicted downstream SO_4^{2-} in the Isaac River is less than 150 mg/L, which is well below the proposed downstream receiving trigger level of 250 mg/L.
  - there is still significant capacity within the Isaac River to accommodate coincident releases from other mines that may discharge upstream of (or adjacent to) the Project.

The assessment is highly conservative, for the following reasons:

- It is unlikely that all three operations would be discharging at the same time, at the maximum of their flow rate and SO_4^{2-} limits.
- The Project site water balance model predicts that there is only a 1% AEP probability that the WMS will require controlled releases. These would only occur during high or very high flows in the Isaac River.

Table 6.2 – Mine-affected water releases - cumulative impact assessment – sulphate

Controlled Release Tier	U/S Isaac River Flow (m^3/s)	U/S Isaac River SO_4^{2-} (mg/L)	WS Release Rate (m^3/s)	WS Release SO_4^{2-} (mg/L)	OD Release Rate (m^3/s)	OD Release SO_4^{2-} (mg/L)	ID Release Rate (m^3/s)	ID Release SO_4^{2-} (mg/L)	**D/S Isaac River mixed SO_4^{2-} (mg/L)**
Medium 1	4	20	0.5	300	0.5	300	0.1	300	**150**
Medium 2	10	20	1.0	300	1.0	300	0.3	300	**129**
High 1	50	20	2.0	400	2.0	400	1.1	400	**77**
High 2	100	20	3.0	400	3.0	400	2.0	400	**65**
Very High	300	20	5.0	400	5.0	400	3.1	400	**45**

Note: a/ Isaac River SO_4^{2-} based on 80th percentile value from Deverill gauging station

Appendix B - Surface Water Quality Monitoring Data Spreadsheet