PEMBROKE

Olive Downs Coking Coal Project

Additional Information to the Environmental Impact Statement

Section 14

Surface Water – Water Quality and Hydrology

14 SURFACE WATER – WATER QUALITY AND HYDROLOGY

1. Provide further information in relation to the potential local, catchment and regional scale surface water quality impacts resulting from the project.

The Project water management system has been designed to protect the environmental values of local and regional water resources. Key features of the water management system to protect environmental values include (as described in Section 4.3.4 if the draft EIS):

- design erosion and sediment control structures, including sediment dams, in accordance with the Best Practice Sediment and Erosion Control Guideline (International Erosion Control Association Australasia [IECA] 2008);
- incorporation of up-catchment diversions to divert overland flow around the Project and allow it to continue to flow into the receiving environment downstream of the Project;
- a controlled release strategy which achieves compliance with the relevant water quality objectives; and
- a surface water monitoring program to demonstrate the effectiveness of the site water management system.

Instream flows in the Isaac River immediately adjacent the Project are not necessarily influenced, nor mostly affected by, the adjacent local catchments. As demonstrated by the catchment analysis in Section 10.4 of the Surface Water Assessment (Appendix E of the draft EIS), less than 1% of the Isaac River catchment, downstream of the Project, will be captured within the Project mining area at any one time during the Project life. This is based on the Isaac River catchment at the ISDS gauging station being 7,782 km^2 and the maximum Isaac River catchment area that is captured within the Project water management system at any one time being 51 km^2.

It is also noted that DES acknowledge the numerous existing mines within the catchments in the vicinity of the Project which have the authority to release water to the Isaac River upstream of the Project. Accordingly, the vast majority of the catchment runoff, which is already influenced by the existing mining operations in the region, will remain unchanged due to the Project.

On a local scale, the instream flows in lower reaches of Ripstone Creek immediately adjacent the Project are not necessarily influenced, nor mostly affected by, the adjacent local catchments. As demonstrated by the catchment analysis, 87%-93% of the catchment runoff following rainfall events that reports to Ripstone Creek will remain unchanged (as described in Section 10.4.1 of the Surface Water Assessment [Appendix E to the draft EIS]).

Section 2.7.5 of the draft EIS also describes that surface runoff from the waste rock emplacements would be directed to dedicated sediment dams. In rainfall events below the design standard, runoff from disturbed areas would be intercepted and treated by sediment dams. Some overflow of water from sediment dams (designed in accordance with the Best Practice Erosion and Sediment Control guideline [International Erosion Control Association Australasia 2008]) may occur during wet periods (that is, in larger events that exceed the design standards, these sediment dams would overflow following a period of settlement treatment); however, it is unlikely that this would have a measurable impact on receiving water quality. Section 8.3.6.2 of the Surface Water Assessment (Appendix E to the draft EIS) describes that there is predicted to be between 1,730 ML/year and 12,960 ML/year of overflows from the sediment dams during wet climatic conditions (i.e. 10%ile), and between 0 ML/year and 1,340 ML/year during dry climatic conditions (i.e. 90%ile). As described in Section 10.5.2.2 of the Surface Water Assessment, environmental risks from disturbed area runoff are expected to be low, given:

- runoff draining to the sediment dams is predicted to have a low salinity; and

- the receiving environment would be subject to high flows and high sediment loads from surrounding catchments during times of any overflows.

Pembroke has specifically committed to sediment dam monitoring to validate the anticipated quality of water runoff reporting to sediment dams and haul road runoff dams, as described in Section 4.2.4 of the draft EIS. Initially, the sediment dam monitoring would occur on a regular (e.g. monthly) basis to demonstrate the water quality of stored waters is consistent with the relevant operating parameters to allow releases from sediment dams to occur when required. Subject to demonstrating the water quality objectives can be met, the frequency of monitoring and suite of parameters for the sediment dam monitoring would be reviewed and updated accordingly (e.g. to occur only when releases occur).

Sediment dams would be retained until the revegetated surface of the waste rock emplacements are stable and runoff water quality reflects runoff water quality from similar un-mined areas, at which time these controls would be removed and the areas would become free-draining.

The Project water management system has been designed to contain mine affected water such that it is separated from other water streams (e.g. up-catchment water is diverted and, therefore, separated from sediment laden water) and can be managed to prevent uncontrolled discharge (Section 8.3.2 of the Surface Water Assessment [Appendix E to the EIS]).

Given the above, the Surface Water Assessment (Appendix E to the draft EIS) has found that no adverse water flow related impacts are likely to occur on habitats surrounding the Project, because no measurable impacts on surface water flows are likely to occur. That is, the timing, duration and magnitude of flows in the reach of the Isaac River are determined by rainfall/releases in the greater catchment, as opposed to smaller reach/local scale catchments. This is also demonstrated by the additional analysis provided in Section 8.3.5 of the Surface Water Assessment, analysing the maximum release rates (i.e. up to 5 m3/s versus up to 900 m3/s) for a period of 10 days following a flow event which shows, the controlled release from the Project would be compliant with the mine affected water release limits identified in Table 7-13 of the Surface Water Assessment.

Modelling of controlled releases from the mine water management system to the Isaac River indicates that a small increase in the electrical conductivity (EC) of the Isaac River is expected in the vicinity of the Project (in the order of up to 50 µS/cm), however the EC of the Isaac River is still predicted to remain well below the regional Water Quality Objective and therefore there is not predicted to be an impact on its environmental values (as described in Section 10.5.3 of the Surface Water Assessment).

Further to this, detailed responses to each of the DES, DEE and IESC comments are provided within the response spreadsheet in Appendix A.

2. If a full EA is sought, specific water quality objectives, release limits and trigger levels must be nominated and supported by sufficient sampling and analysis. Provide additional information around the potential impacts of catchment reduction/interception of water flows, noting DEE and DES advice in relation to this issue.

The proposed draft EA conditions have been revised to include the specific water quality objectives (WQOs), release limits and trigger levels sought for the Project. The revised, proposed EA conditions are provided in Appendix B.

As described in Section 4.2.2 of the draft EIS, draft WQOs have been developed for the Project for each physical and chemical parameter, based on a review and consideration of:

- the WQO for each relevant environmental value; and
- the available baseline water quality datasets.

Pembroke has either adopted the lowest WQO or derived an alternative WQO (where baseline datasets demonstrate clearly that the lowest WQO could not be achieved). This process is outlined in Tables 5-7 and 5-8 of the Surface Water Assessment (Appendix E of the draft EIS).

In addition to the design refinements to minimise direct impacts to wetlands, Pembroke has included additional commitments to conduct ongoing monitoring of the ecological characteristics of these wetlands over the life of the Project (i.e. additional monitoring to what was committed to in the draft EIS). The ongoing monitoring will be used to validate the predicted impacts presented in the EIS, and identify whether any measures (such as habitat repair works, revegetation) need to be implemented to minimise any observed impacts. A detailed description of this monitoring program is provided in the *Assessment of Potential Impacts to GDEs and Wetlands* that is provided in Appendix E of this document.

The GDE and Wetland Monitoring Program to be implemented by Pembroke within/adjacent riparian vegetation and HES wetlands not proposed to be cleared by the Project (e.g. HES2, HES3, HES5, HES7 and HES8 as shown in Appendix E). This will include monitoring of:

- groundwater depth and quality;
- health of the terrestrial vegetation; and
- surface water quantity and quality.

Selection of GDE monitoring sites will be undertaken in consideration of the GDE mapping tools recommended in Richardson *et al.* (2011) and Emelyanova *et al.* (2017). The GDE and Wetland Monitoring Program will include details of:

- the nature and ecological values of each GDE and wetland being monitored;
- a field validation survey and baseline description of the condition of the GDEs and wetlands prior to any direct or indirect impacts from the project;
- a map and coordinates of the location of the GDEs and wetlands subject to the monitoring program, including justification for the selected locations;
- sampling and analysis methodologies for detecting impacts associated with the project;
- environmental quality indicators, impact thresholds and triggers;
- corrective actions and timing to address impacts associated with the project, should they be detected; and
- sampling and analysis reporting.

The GDE and Wetland Monitoring Program will be prepared prior to commencement of mining.

It is important to note that the instream flows in lower reaches of Ripstone Creek immediately adjacent the Project are not necessarily influenced, nor mostly affected by, the adjacent local catchments. As demonstrated by the catchment analysis, 87%-93% of the catchment runoff following rainfall events that reports to Ripstone Creek will remain unchanged (as described in Section 10.4.1 of the Surface Water Assessment [Appendix E of the draft EIS]). Further, as recognised by the DES, Peak Downs Mine has the authority to release water to Ripstone Creek upstream of the Project. It is also noted that an 'up-catchment water drain' from the CWD to Ripstone Creek is shown on Figure 2-3 of the draft EIS. The drain would provide for the continued conveying of up-catchment local rainfall runoff west of the Project to Ripstone Creek and the Isaac River downstream.

Section 2.7.5 of the draft EIS also describes that surface runoff from the waste rock emplacements would be directed to dedicated sediment dams. In rainfall events below the design standard, runoff from disturbed areas would be intercepted and treated by sediment dams.

Controlled releases from sediment dams are not considered to be 'untreated' discharges. Some overflow of water from sediment dams (designed in accordance with the *Best Practice Erosion and Sediment Control Guideline* [International Erosion Control Association Australasia, 2008]) may occur during wet periods (that is, in larger events that exceed the design standards, these sediment dams would overflow following a period of settlement treatment); however, it is unlikely that this would have a measurable impact on receiving water quality.

Pembroke has also specifically committed to sediment dam monitoring to validate the anticipated quality of water runoff reporting to sediment dams and haul road runoff dams. Initially, the sediment dam monitoring would occur on a regular (e.g. monthly) basis to demonstrate the water quality of stored waters is consistent with the relevant operating parameters to allow releases from sediment dams to occur when required. Subject to demonstrating the water quality objectives can be met, the frequency of monitoring and suite of parameters for the sediment dam monitoring would be reviewed and updated accordingly (e.g. to occur only when releases occur).

Sediment dams would be retained until the revegetated surface of the waste rock emplacements are stable and runoff water quality reflects runoff water quality from similar un-mined areas, at which time these controls would be removed and the areas would become free-draining.

Given the above, the Surface Water Assessment (Appendix E of the draft EIS) has found that no adverse water flow related impacts are likely to occur on habitats surrounding the Project, because no measurable impacts on surface water flows are likely to occur.

Further to this, detailed responses to each of the DES, DEE and IESC comments are provided within the response spreadsheet in Appendix A.

3. Provide additional information on flooding impacts and management, noting concerns raised in submissions from neighbouring properties, and advice from DEE (IESC), DES.

The draft EIS has taken into account pre-existing approvals and adequately assessed the level of impact. The draft EIS has been prepared based on the information publicly available within the Moorvale South EMP and the Environmental Authority. The Moorvale South (previously Olive Downs North) Levee has been conservatively modelled and is clearly described and annotated in the Flooding Assessment (Appendix F of the draft EIS):

> *'Based on the review of past flood studies for surrounding mines/projects, three existing or approved levees were identified in the region (i.e. Olive Downs North, Lake Vermont and Poitrel) however only the approved Olive Downs North levees were located at/within the hydraulic model extent in the Flood Assessment (Figure 9-1). While is recognised that the Olive Downs North levees are yet to be constructed, the cumulative flood modelling undertaken as part of this assessment has demonstrated that with the exception of localised stream level, velocity and power increases predicted in areas adjacent the approved levee alignment, the potential impact of the Olive Downs North levees alone is considered to be negligible, and any downstream effects at the Deverill gauging station located more than 3 km downstream would be immeasurable.'*

Importantly the approved Moorvale South Levees are yet to be constructed, which is why the draft EIS concludes:

> *'For the purposes of flood modelling, a conservative levee was assumed to be located at the most downstream section of the Olive Downs North Project area [now Moorvale South]. …*

That is, the final design and construction of the Moorvale South levee (when installed) should be undertaken cognisant of the potential flood level increases/afflux, noting however that the predicted flood level increases may be subject to the installed levee location.

As recognised in Peabody's submission re: Moorvale South:

> *'It would mean that the CMJV Participants would carry costs associated with levee redesign and improved levee construction as a result of the cumulative impacts of the two projects. …'*

Pembroke has signed a Confidentiality Agreement with Peabody to allow for sharing of information and modelling. Peabody has supplied their levee alignment which Pembroke has used to conduct more detailed flood modelling. The modelling is being conducted by Peabody's flood consultant and using Peabody's flood model. The modelling has identified where adjustments to the design of the Moorvale South levee are required. Pembroke and Peabody have maintained regular communication regarding the modelling and both parties are working towards resolution of the concerns raised in Peabody's submission.

In addition, it should be noted that while the afflux change may be up to 2.0 metres during a 1% AEP flood event on the Vermont Park property, it is within existing flood prone areas on the property (note the footnote in Table 4-18). Each impact assessment difference map presented in Appendix D of the Flood Assessment also relevantly shows the few areas that the model predicts are currently dry that would consequently become flooded (depending on the event) with the Project.

For clarification purposes, the predicted afflux changes at neighbouring/private properties presented in Table 4-18 are the predicted maximum values (i.e. during the life of the mine and after mine closure) for those within/adjacent the Project area. As shown in Table 4-18, some homesteads/properties in closer proximity (Winchester Downs, Leichardt and Old Bombandy) than other downstream homestead/properties further afield are predicted to have negligible impacts (i.e. less than 0.1m). That is, other homesteads/privately-owned properties downstream of the waste rock emplacement that are not listed in Table 4-18 would be expected to have negligible to no impacts (i.e. lesser downstream with distance).

In terms of scale, it is also noted that the cumulative flood modelling showed that the downstream effects of the approved Olive Downs North levees alone would be immeasurable at the Deverill gauging station (located 3 km downstream).

Furthermore, as stated on Page 4-91 of the draft EIS, the changes in flow velocity up to and including the 0.1% AEP event are predicted to be relatively small in most areas adjacent the Project, with absolute flow velocities similar to areas downstream in the natural section of the stream (Figures 4-22a and 4-22b of the draft EIS).

The final landform 0.1% AEP flood velocity and extents figure presented in Appendix C of the Flood Assessment of the draft EIS has been prepared to allow comparison to the developed case 0.1% AEP flood velocity and extents figure presented in Appendix B of the Flood Assessment of the draft EIS. In general, the predicted maximum values occur during the life of the mine (i.e. when the extent of temporary levees and permanent highwall emplacements are the largest). Relevantly, an afflux map (existing versus developed) is also presented in Appendix D of the Flood Assessment of the draft EIS to allow direct comparison of the extent of the predicted changes.

Finally, as concluded in the Flood Assessment (Appendix F of the draft EIS):

> *'Cumulative impacts on flooding are not expected to lead to any significant adverse impacts on human populations, property or other environmental or social values.'*

Notwithstanding the above, updated flood modelling to reflect the final (detailed) design of the temporary levees and waste rock emplacements would be undertaken during the life of the mine and results reported in the Water Management Plan.

Further to this, detailed responses to each of the DES, DEE and IESC comments are provided within the response spreadsheet in Appendix A.