

PEMBROKE

Olive Downs Coking Coal Project

Additional Information to the
Environmental Impact Statement

Section 15

**Cumulative Impact Assessment
– Hydrology and Flooding**

15 CUMULATIVE IMPACT ASSESSMENT – HYDROLOGY AND FLOODING

- 1. Further assessment of the cumulative impacts of the project to groundwater and surface water hydrology is required in response to the breadth of issues raised by DES and the IESC. The scope of further cumulative impact assessment is well defined in DES and IESC submissions.**

A detailed response to each of the DES and IESC comments are provided within Appendix A. Responses to the general issues raised in the DES and IESC comments regarding cumulative impacts to groundwater and surface water is provided below.

The IESC state in its advice (underlining added for emphasis):

The proponent has provided an appropriate assessment of potential cumulative groundwater impacts for the project, through incorporation of information from neighbouring mines and the proposed coal seam gas project into the numerical model.

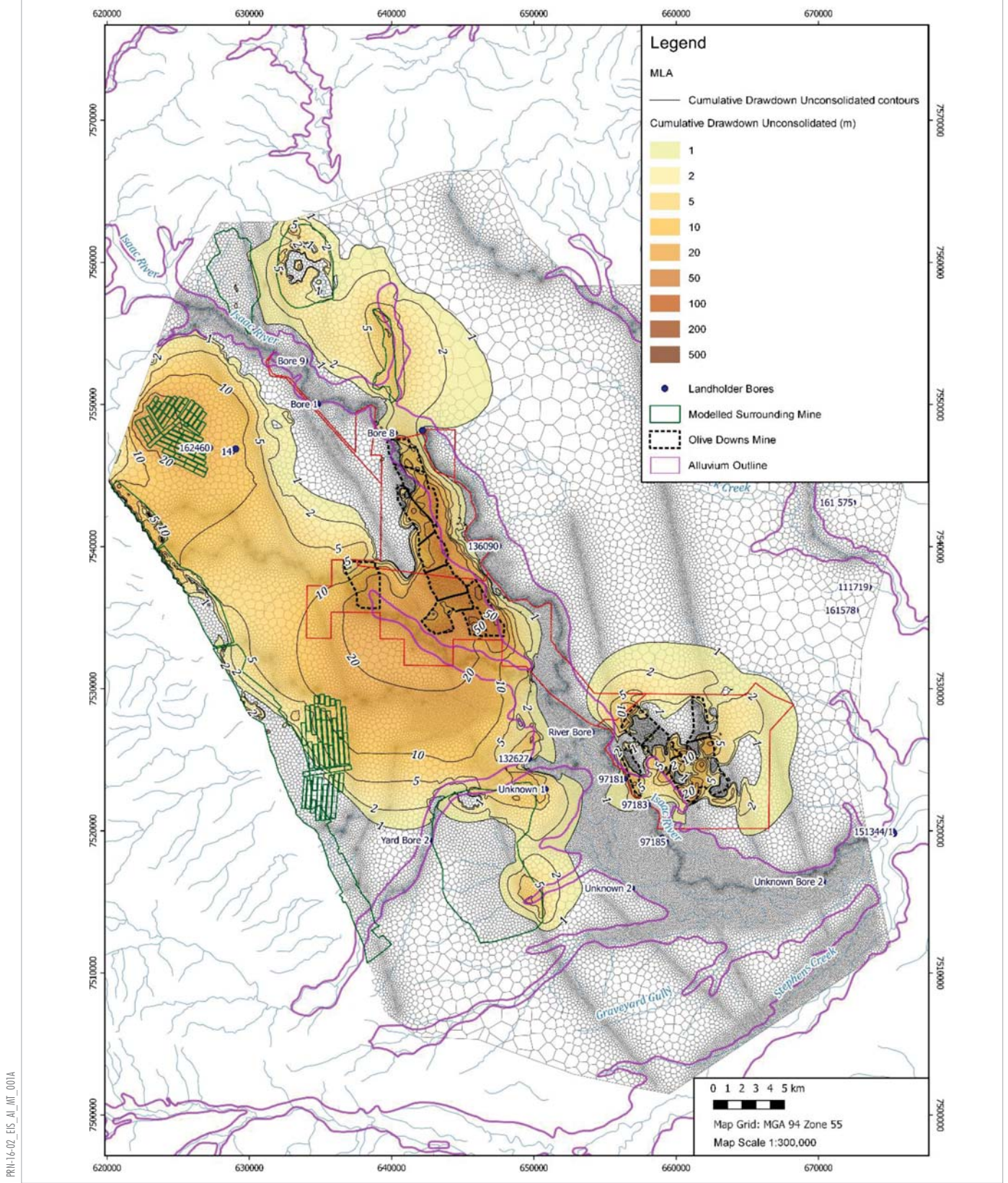
As described in Section 6.5 of the Groundwater Assessment (Appendix D of the draft EIS) cumulative impacts associated with approved and foreseeable open cut and underground coal mines surrounding the Project were modelled through the inclusion of Poitrel, Daunia, Peak Downs, Lake Vermont, Eagle Downs and Saraji mines within the groundwater model.

The maximum cumulative drawdown of approved and foreseeable mining, plus the Project is shown on Figures 6-6 to 6-8 of the Groundwater Assessment. The maximum drawdowns were obtained by calculating the maximum difference in heads between the Cumulative and Null Run scenarios at each cell at any time over the duration of the predictive model.

Figure 6-6 of the Groundwater Assessment (reproduced as Figure 15-1 below) demonstrates the maximum cumulative drawdown within alluvium and regolith (maximum drawdown within saturated extent of layer 1 and layer 2 combined) for the Project. The figure shows the zone of depressurisation from surrounding open cut and underground mines has reached the zone of impact from mining at the Olive Downs South domain. The magnitude of drawdowns is greatest in or closely around the mining area, and gradually reduces with distance from the mine. The zone of depressurisation from the Willunga domain is not affected by mining at surrounding mines.

Modelling of the potential drawdown impacts in the alluvial system along the Isaac River indicates that cumulative drawdown impacts are only predicted at the northern extent of the Olive Downs South domain (Figure 15-1). The cumulative impacts are associated with the Project and the Moorvale South Mine, and are predicted to result in a groundwater drawdown in the Isaac River alluvium of approximately 2 m (or less).

Although the potential cumulative drawdown of approximately 2 m is predicted to occur in the Isaac River riparian corridor (where vegetation may be intermittently dependent on subsurface expression of groundwater), as described in Appendix E of this Additional Information to the EIS, it is unlikely that this potential impact would result in a significant impact to terrestrial riparian vegetation. This is due to the fact that this vegetation is subject to continuous (natural) wetting and drying cycles and these communities are most likely facultative GDEs which rely more heavily on the replenishment of moisture in the soil following rainfall rather than access to the groundwater system. The Project would not result in a drawdown in the alluvial aquifers that would dewater the aquifer to the extent that it would not recover following rainfall (HydroSimulations, pers comm.).



PRN-16-02_EIS_AI_AM_001A

Source Hydro Simulations (2018)

Figure 15-1

Section 10.6 of the draft EIS Surface Water Assessment (Appendix E of the draft EIS) specifically assessed cumulative impacts. Table 10.3 in the Surface Water Assessment tabulates all the existing mines cumulatively assessed and identifies the relationship to the Project in regard to timing and location. Table 10.4 of the Surface Water Assessment identifies the new or developing projects that were also considered in the cumulative assessment. A summary of the cumulative impact assessment provided in Section 3.3.10.3 of the draft EIS is provided below.

Flooding

The Flood Assessment (Appendix F of the draft EIS) included a cumulative assessment of changes to flood characteristics associated with the development of the Project and the approved Moorvale South Project. The cumulative assessment concluded that the development of the Project would not result in any significant change to the existing flood risk for surrounding privately-owned properties or infrastructure.

The existing flood conditions for a 2% annual exceedance probability flood event (i.e. a 1 in 50-year flood) are shown on Figure 15-2 (extracted from the Flood Assessment [Appendix F of the draft EIS]). Figure 15-3 shows that, with the development of the Project, predicted changes to flood levels are largely expected to be constrained to the Project mining tenements and Pembroke-owned land. Land on the eastern side of the Isaac River is predicted to experience a small decrease in flood levels (due to upstream flood waters being held back by the Project landforms). In particular, Figure 15-3 shows that changes to flood levels during a 1 in 50-year flood at privately-owned dwellings are predicted to be less than 0.1 m. The predicted changes to flood characteristics for other flood events are shown in Appendix D of the Flood Assessment.

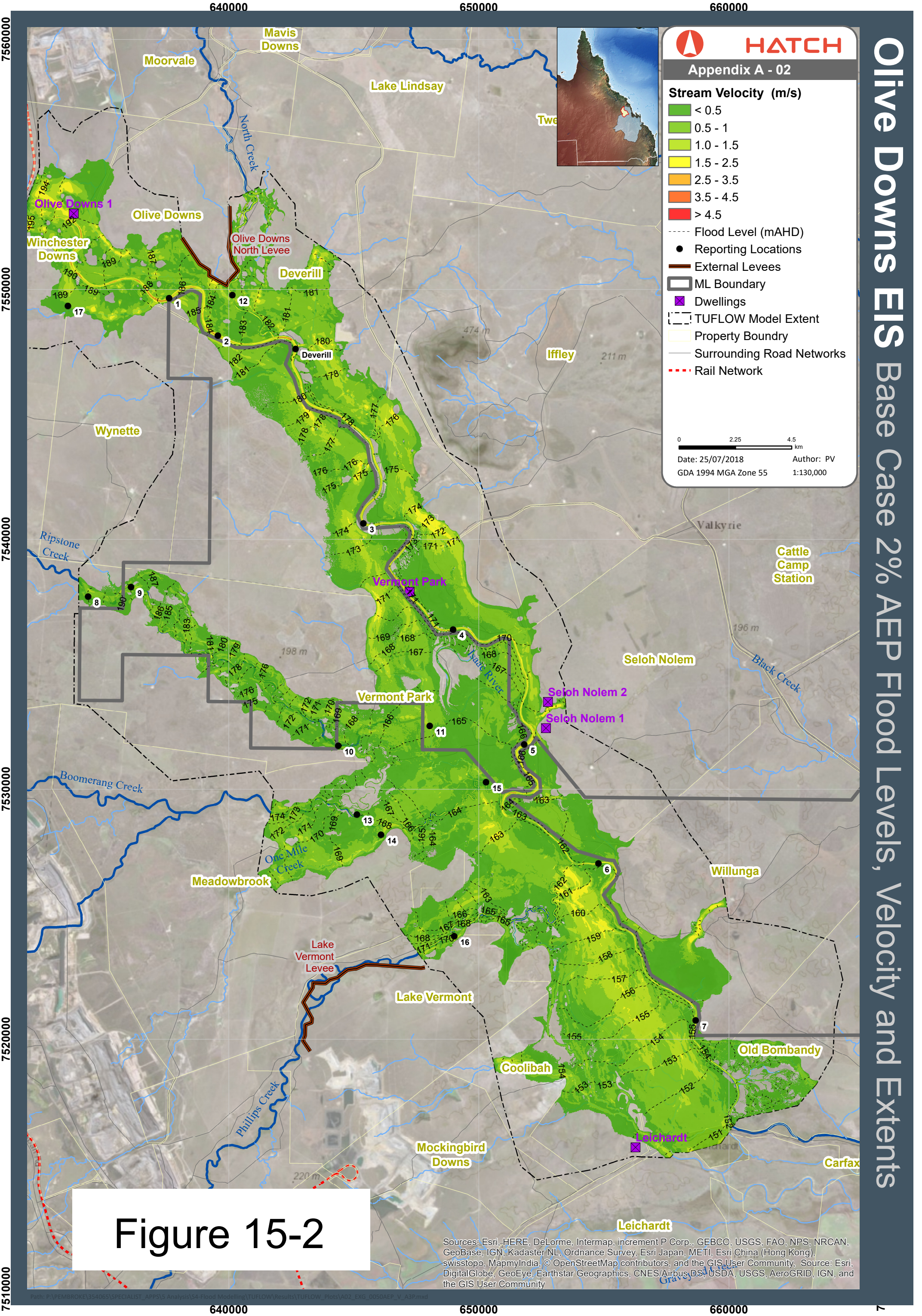
Pembroke has signed a Confidentiality Agreement with Peabody to allow for sharing of information and modelling. Peabody has supplied their levee alignment which Pembroke has used to conduct more detailed flood modelling. The modelling is being conducted by Peabody's flood consultant and using Peabody's 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.

Catchment Excision

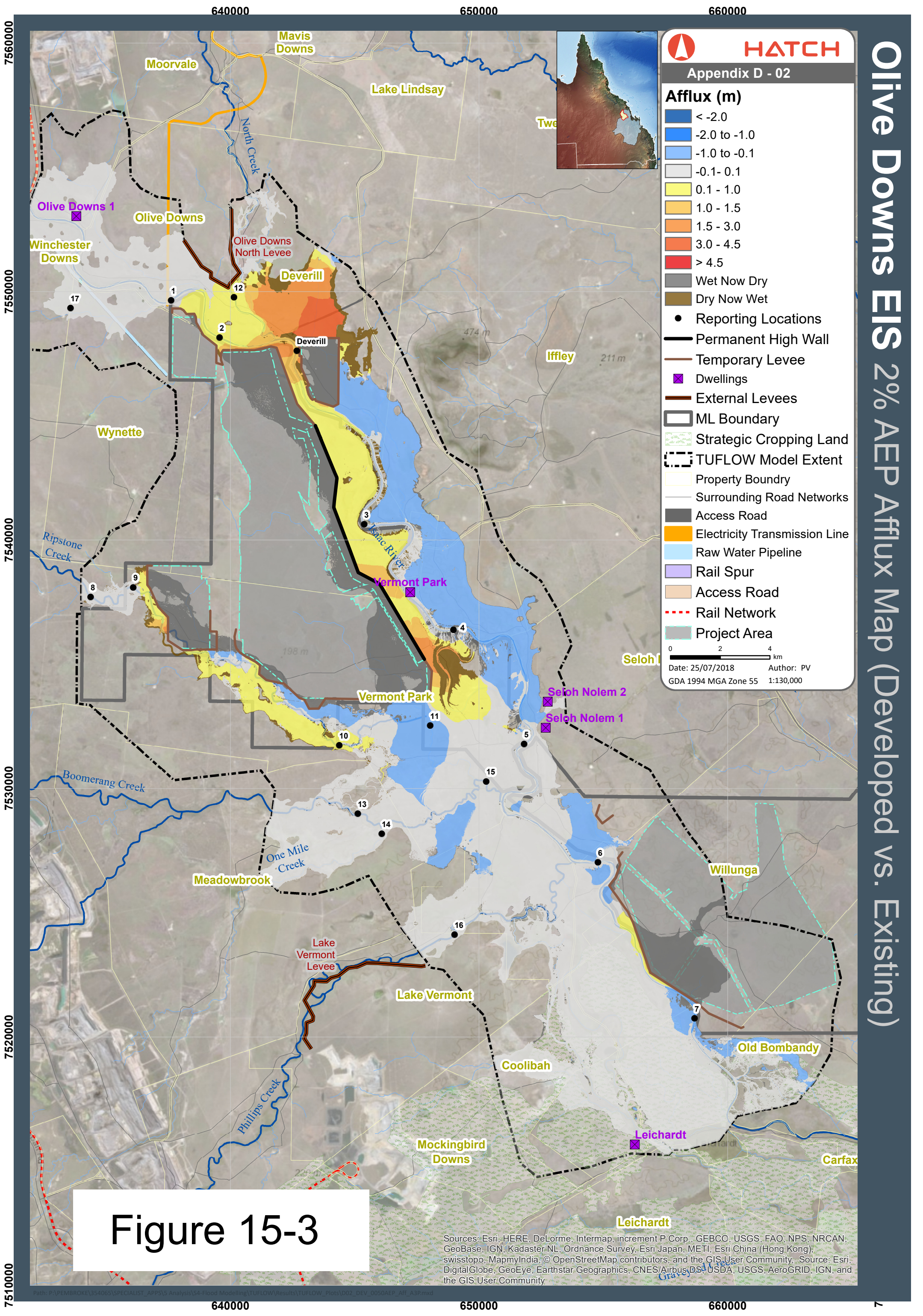
Instream flows in the Isaac River immediately adjacent the Project are not necessarily influenced, nor mostly affected by, the adjacent local catchments. As demonstrated by the catchment analysis in Section 10.4 of the Surface Water Assessment (Appendix E of the draft EIS), less than 1% of the Isaac 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 km² and the maximum Isaac River catchment area that is captured within the Project water management system at any one time being 51 km².

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]).



Olive Downs EIS Base Case 2% AEP Flood Levels, Velocity and Extents



Olive Downs EIS 2% AEP Afflux Map (Developed vs. Existing)

Figure 15-3

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

The Surface Water Assessment concluded that, when taking into account potential controlled release volumes from the operating mines in accordance with their current release rules (as well as the approved Bowen Gas Project), the overall loss of catchment area and associated stream flow reductions estimated would be further reduced by the controlled releases from the Project.

Water Releases

The site water management system has been designed such that the risk of off-site uncontrolled release of mine affected water during operations is very low and sediment inputs can be controlled through drainage, and erosion and sediment control measures. On this basis, the Surface Water Assessment provided in the draft EIS determined that the Project is not expected to make any significant contribution to cumulative sediment loads in the Fitzroy River Basin.

Section 3.3.10.3 of the draft EIS identifies that any CSG water that may be released into the Isaac River by the Bowen Gas Project would have an insignificant effect on the receiving environment.

The water balance simulation of the final voids post-mining provided in the Surface Water Assessment shows that the water surface is expected to reach an equilibrium water level well below the void overflow level and regional water table and would remain a groundwater sink.

The development of the proposed controlled release strategy to the Isaac River has been based on the existing release conditions for nearby operating coal mines.

The release conditions have been developed by the regulators within an overarching strategic framework for the management of the cumulative impacts of water releases from mining activities and are therefore expected to have negligible cumulative impact on surface water quality and associated environmental values.

2. Issues to be addressed include:

a) Information on recent regional impacts to EPBC listed species and communities

The cumulative impacts of the Project (as a whole, including the four Project components) on threatened species and ecological communities are described below.

The Project area is approximately 16,316 ha, comprising a disturbance footprint of approximately 16,114 ha for the Mine Site and Access Road, approximately 57 ha for the Water Pipeline, approximately 42 ha for the Project ETL and approximately 103.5 ha for the Rail Spur and Loop.

Cumulative impacts are considered to be the total impact on the environment that would result from the incremental impacts of the Project added to other existing impacts. They include direct and indirect impacts.

As described in Section 3.2 of the draft EIS, the Project is located within the Brigalow Belt North Bioregion (as defined by DEE [2019]). In a local context, the Project is located within the Bowen Basin mining area where, in parallel with agricultural activities, open cut and underground coal mining is a key land use. As a result, the majority of the Project area comprises agricultural grasslands with tracts of remnant vegetation (Appendix A of the draft EIS).

The Project is located immediately south of the approved (yet not constructed) Moorvale South Mine and within 6 km of existing mines to the east (Peak Downs and Saraji Mines) and there are many more mines within a 30 km radius of the site to the north and west, including Moorvale, Daunia, Poitrel, Millennium, Eagle Downs and Lake Vermont. There are 25 operating coal mines in the region (DSDMIP, 2018).

The cumulative effect of these mines and beef grazing is already evident in the landscape, with large tracts of cleared land in the Isaac River floodplain from Moranbah to Dysart and Rockhampton (DSITI, 2018).

Approximately 5,661.5 ha of remnant vegetation would be cleared within the overall Project area (approximately 16,316 ha), comprising approximately 5,573 ha for the Mine Site and Access Road, approximately 30.5 ha for the Water Pipeline, approximately 14 ha for the Project ETL and approximately 44 ha for the Rail Spur and Loop.

It is noted that the Lake Vermont Coal Mine Northern Extension Project (EPBC 2016/7701) (Lake Vermont Project) was approved on 29 June 2018. Although the Lake Vermont Project was not determined to be a Controlled Action for threatened species and communities, the Squatter Pigeon (southern) was recorded during the ecology surveys, and it was determined that suitable habitat for the Squatter Pigeon (southern) exists throughout the Lake Vermont Project site (AARC, 2016).

As outlined in Table 3-24 of the draft EIS, the Project would result in the removal of approximately 5,463.5 ha of potential habitat for the Squatter Pigeon, which would, in conjunction with the Lake Vermont Project, further reduce the area of potential habitat for this species in the locality.

The REs to be cleared during the life of the Project all occur more widely in surrounding landscapes and subregions (Accad et al., 2017), with clearance associated with the Mine Site and Access Road representing approximately 0.4% of the remaining remnant vegetation in the Northern Bowen Basin and Isaac-Comet Downs biodiversity sub-regions (Accad et.al., 2017).

In addition to the progressive rehabilitation of the Project, Pembroke would provide a biodiversity offset for the impacts associated with the Project in accordance with the EPBC Act Environmental Offsets Policy (SEWPaC, 2012a) (and supporting EPBC Act Offsets Assessment Guide [SEWPaC, 2012b]) and the Queensland Environmental Offsets Policy (Version 1.4) (DEHP, 2017).

As described in Section 10, Pembroke has prepared a stand-alone MNES Biodiversity Offset Strategy (BOS) in Appendix F. The BOS has been prepared to provide detailed information about Stage 1 of the Project's Offset Strategy. This detailed level of information is possible because Pembroke owns the offset property. There is consequently, 100% certainty around Pembroke's ability to commit to the Stage 1 Offset Area. The relevant sections of the BOS which address each of these requirements is outlined below.

Information is also provided for Stages 2 to 4 including habitat mapping. Biodiversity offsets for Stages 2 to 4 will be, at least partly, and likely wholly located on Pembroke's landholdings. Pembroke proposes to provide an offset for each stage of the Project prior to works commencing for that stage. Pembroke's ownership of the properties and the known ecological characteristics and values of the properties means future offsetting requirements are highly likely to be located on these properties.

b) An assessment of potential cumulative impacts to the Isaac River from mining activities

A summary of the cumulative impact assessment from flooding, catchment excision, water releases and groundwater depressurisation and drawdown are described in response to Item 1 above.

c) An assessment of potential cumulative impacts of mining activities on water resources downstream

As described above, the Project is predicted to result in a reduction of the Isaac River catchment of less than 1%. When taking into account potential controlled release volumes from the operating mines in accordance with their current release rules (as well as the approved Bowen Gas Project), the overall loss of catchment area and associated stream flow reductions estimated would be further reduced by the controlled releases from the Project. Accordingly, there is not predicted to be a significant cumulative impact on downstream water resources associated with catchment excision due to the Project.

The proposed controlled release strategy for the Project has been developed in consideration of the *Model Water Conditions for Coal Mines in the Fitzroy Basin*. These model conditions were developed by the Queensland Government within an overarching strategic framework for the management of the cumulative impacts of water releases from mining activities and are therefore expected to have negligible cumulative impact on downstream water resources.

As shown on Figure 15-3, changes to flood characteristics are predicted to be negligible within approximately 2 km downstream of the Project. Accordingly, impacts to downstream water resources associated with changes to flood characteristics are predicted to be negligible.

d) Cumulative impacts of surface and groundwater impacts to riparian vegetation, wetlands, stygofauna and GDE's.

Responses 1 and 2 (a) and (b) above outline how the draft EIS has considered cumulative impacts to surface water and groundwater resources. As outlined in Appendix E, although a potential cumulative drawdown of approximately 2 to 5 m is predicted to occur in areas where riparian vegetation may be intermittently dependent on subsurface expression of groundwater, it is unlikely that this potential impact would result in a significant impact to terrestrial riparian vegetation. This is due to the fact that this vegetation is subject to continuous (natural) wetting and drying cycles and these communities are most likely facultative GDEs which rely more heavily on the replenishment of moisture in the soil following rainfall rather than access to the groundwater system. The Project would not result in a drawdown in the alluvial aquifers that would dewater the aquifer to the extent that it would not recover following rainfall (HydroSimulations, pers comm.).

With respect to potential impacts on aquatic habitats, Appendix D of the draft EIS predicts that the Project would result in a potential 0.5% reduction in flow within the Isaac River during mining operations. It should be noted that this potential reduction only applies to the reach of the Isaac River adjacent to the Project area. Given the ephemeral nature of the Isaac River and the small local contribution of baseflow, which only occurs after periods of prolonged rainfall, this predicted reduction in baseflow is expected to have only a minimal impact on aquatic habitat within the Isaac River and associated tributaries. The aquatic species that inhabit these waterways have adapted to wetting and drying cycles and are expected to persist in the environment despite the potential reduction in baseflow.

Further to this, it is likely that the terrestrial vegetation associated with wetlands relies on the slow percolation of surface water after rainfall events to sustain their health rather than direct access to the groundwater system. As such, the Project would not result in an adverse impact to these communities through any potential cumulative impacts to the groundwater system.

It should be noted that modelling of the potential drawdown impacts in the alluvial system indicates that no cumulative drawdown impacts would occur (Appendix D of the draft EIS). Notwithstanding, Pembroke will prepare and implement a GDE and Wetland Monitoring Program to detect potential impacts on GDEs and wetlands associated with the Project (Appendix E).

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). This will include monitoring of:

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