Stream Environment and Water

Memorandum

Date	12 March 2025	**Reference**	242138
To	John Morrell, Main Roads Western Australia		
CC			
From	Mike Braimbridge	**Email**	mike@streamew.com.au

Anketell Road characterisation and assessment of impacts on GDEs and groundwater users

1 Introduction

Main Roads Western Australia (Main Roads) is proposing to upgrade Anketell Road. The proposal includes approximately seven kilometres (km) of new road construction along Anketell Road, between Leath Road, Kwinana to Treeby Road, Wandi/Anketell in the City of Kwinana, Western Australia.

Stream Environment and Water (Stream) was commissioned by Main Roads to assess the risks to wetlands and surface water, considering direct and indirect impacts from the proposal. Stream submitted a draft Wetland Assessment to Main Roads in June 2024 (updated in 2025). Based on recent advice from the EPA, Main Roads have requested Stream assess the risks to groundwater dependent ecosystems (other than wetlands) and groundwater users from the proposal, summarised in this memo.

2 Scope of Work

The objective of this memo is to assess the risk of impact on Groundwater dependent ecosystems (GDEs) and groundwater users from potential groundwater drawdown associated with dewatering and groundwater abstraction for the proposal. The key components of the assessment scope were:

- Identify and characterise GDEs and groundwater users potentially impacted by groundwater drawdown associated with the proposal.
- Assess the risk and potential impacts on GDEs and groundwater users of modelled groundwater drawdown from abstraction and dewatering activities.

3 Methodology

3.1 Assessment of risk to GDEs

The assessment uses a methodology based on that developed by Froend and Loomes (2004) to assess the risks to GDEs from groundwater abstraction on the Swan Coastal Plain. The methodology has been adapted from the original Froend and Loomes (2004) approach incorporating outcomes of previous consultation with DWER for completion of ecological water requirements for the Peel Integrated Water Initiative, and described in Braimbridge *et al.* (2018).

The methodology uses a semi quantitative approach to rate the risk of impact to GDEs. The assessment considers the type and conservation value of the ecosystem, the current depth to groundwater and historical change to rate the susceptibility of ecosystems (Figure 1). A risk of impact from a predicted drawdown (obtained from a numerical groundwater model) is also assigned to each GDE. A score is assigned at each step and the overall risk of impact determined based on the total score. The method and steps to complete the assessment are outlined below.

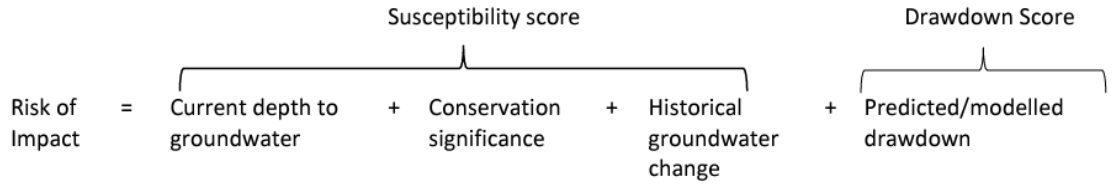
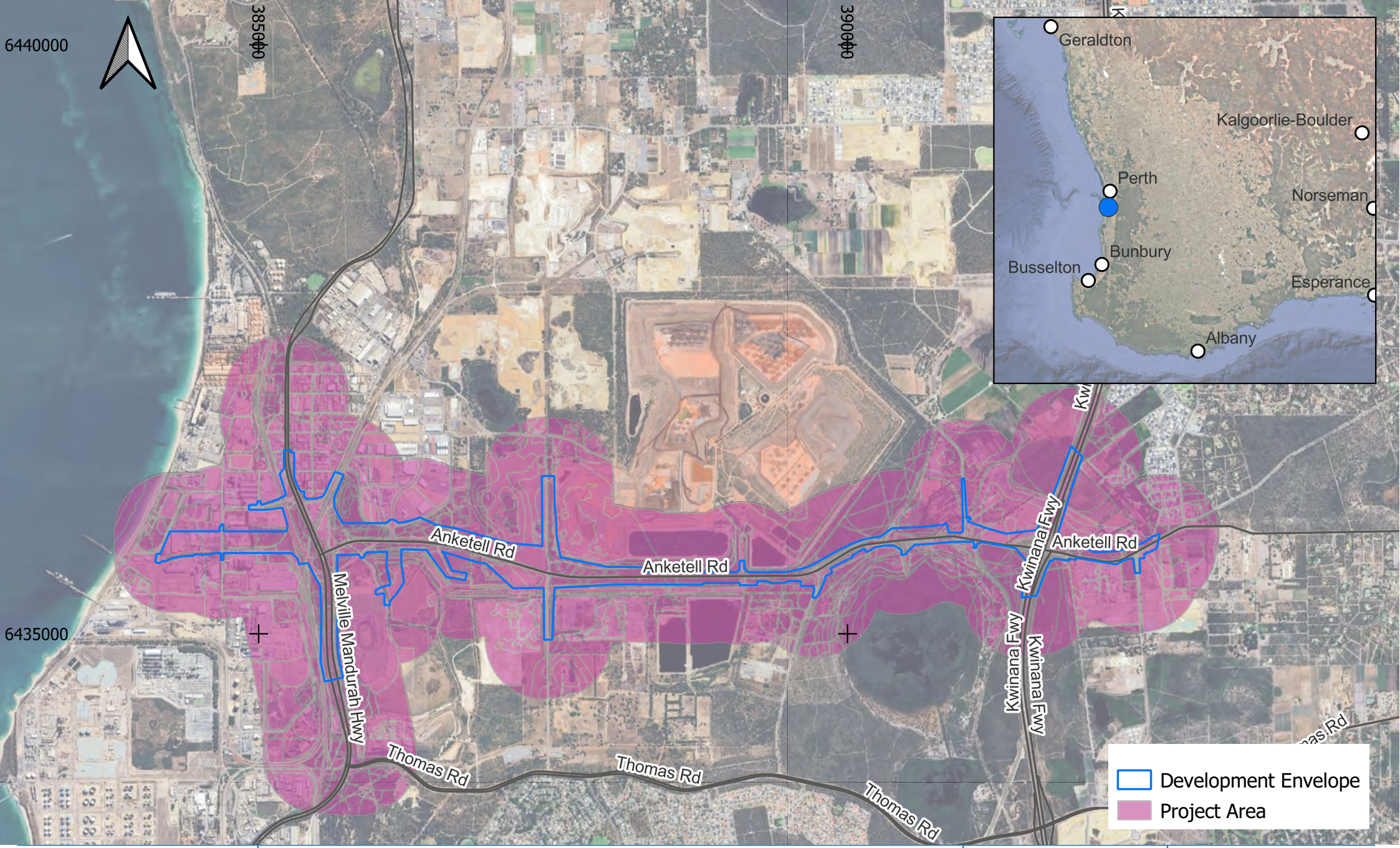


Figure 1: Calculation for risk of impact from modelled drawdown

Information sources

This risk assessment was completed using existing information focusing on ecosystems within the contextual boundary defined for vegetation mapping in Biota (2025). The mapping covers an area of approximately 1700 ha, the extent of which is the Project Area for this risk assessment (Figure 2). The assessment utilised information from the draft wetland assessment (Stream 2025) and groundwater information and predicted groundwater surfaces for dewatering and water abstraction scenarios modelled by FSG (2025) to support the proposal. Further information on datasets used to support each step of the risk assessment are detailed below.



0 0.5 1 km

Projection: GDA 20 zone 50

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Figure 2: Risk assessment location

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Step 1: Identify potential GDEs and current depth to groundwater

Potential GDEs were identified based on vegetation mapping completed by Biota (2025), Geomorphic Wetlands of the Swan Coastal Plain dataset (see wetland assessment, Stream 2025) and current depth to groundwater (based on groundwater surface developed by FSG 2025). GDEs were categorised by ecosystem type as either wetland, phreatophytic vegetation or non-GDE. Vegetation units that represent predominantly native vegetation were considered as potential GDEs.

Ecosystems were identified as potentially groundwater dependent where the current maximum depth to groundwater was less than 10 m. Previous studies on the Swan Coastal Plain have identified 10 m as an approximate maximum depth where groundwater dependence of vegetation is likely (e.g., Antao 2015, Froend *et al*. 2004). Groundwater may still provide a water source to deep rooted vegetation, however dependence on groundwater is considered low or opportunistic beyond 10 m.

Potential GDEs were scored based on the ecosystem type and current depth to groundwater (DTGW) categories (Table 1) using the maximum depth to groundwater value for each feature. Ecosystems with a shallower depth to groundwater score higher because they are considered to have a greater dependency on groundwater and therefore a higher susceptibility to impact from groundwater drawdown. Consistent with the application of the scoring method elsewhere, wetlands were scored higher, indicating a higher susceptibility or sensitivity to drawdown than groundwater dependent vegetation at the same depth to groundwater.

Table 1: Current depth to groundwater (DTGW) categories and scoring (adapted from Froend and Loomes 2004)

Score	DTGW Category	Current DTGW Description
0	>10 m	Watertable estimated to be >10.5 m
1	6 – 10 m	Watertable estimated to be 6 – 10.5 m DTGW
2	3 – 6 m	Watertable estimated to be 3 - 6 m DTGW
3	0 – 3 m (vegetation)	Watertable estimated to be 0 -3 m DTGW, vegetation site
4	<3 m (wetland)	Watertable estimated to be < 3 m DTGW, wetland site

Step 2: Assess ecological value/conservation significance of GDEs

The ecological value and conservation significance of GDEs within the project area was assessed using the following spatial datasets:

- Threatened/Priority flora, fauna and ecological communities (Biota 2025)
- Bush Forever (DEP 2000)
- Vegetation Complex mapping (Native Vegetation Extent DPIRD-005 (DPIRD 2020)
- Geomorphic Wetlands of the Swan Coastal Plain DBCA-019 (DBCA 2023)
- Directory of important wetlands in Australia (DBCA-045) (DBCA 2018)
- Ramsar sites (DBCA-010) (DBCA 2017)

The ecological value of potential GDE features were scored as low, moderate (locally significant) or high (regionally, nationally or internationally significant), based on the categories in Table 2.

This scoring system acknowledges that the consequence and risk of impact of groundwater drawdown is greater for high value ecological features, however, not that these features are necessarily more susceptible to impacts.

Table 2: Ecological value score

Score	Category	GDE values
1	Low	Assessed as having no recognised values and moderately to severely impacted from surrounding land uses, where values are: - Multiple use wetland - Remnant vegetation consisting of a vegetation complex with greater than 30% pre-clearing extent remaining intact and located on private land
2	Locally significant (moderate)	Assessed as having some recognised values and low to moderately impacted from surrounding land uses, where values are: - Resource enhancement wetland - Remnant vegetation consisting of a vegetation complex with less than 30% pre-clearing extent remaining intact
4	Regionally, Nationally or internationally significant (high)	Formally assessed international, national or regional environmental values with evidence of low to moderate impacts from surrounding land use, where values include: - Ramsar wetland - Directory of important wetlands in Australia - Conservation category wetlands - Native vegetation mapped as Bush Forever - Native vegetation supporting threatened and priority species or ecological communities

Step 3: Assess historical groundwater level change

Declines in groundwater over the previous 10 years may indicate an ecosystem is already under water stress and potentially more susceptible to risk of impact from additional declines in groundwater. To incorporate pre-existing hydrology the risk assessment included review of recent (last 15 years) groundwater levels in representative bores.

Historical change in groundwater was assessed based on a linear trend (line of best fit) calculated for seven superficial monitoring bores within the project area (see Section 4). This method uses all available data however reduces the potential influence of individual years (Braimbridge et al. 2018).

The calculated historical change in groundwater was scored based on Table 3.

Table 3: Historical change (10 years previous) in groundwater score

Rate of decline m/yr		DTGW Category and Score			
Lower Threshold (≥)	Upper threshold (<)	6-10 m	3-6 m	0-3 m Vegetation	0-3 m Wetland
	-1†	0	0	0	0
0	0.025	1	1	1	1
0.025	0.05	1	1	2	2
0.05	0.075	1	1	2	3
0.075	0.1	1	2	2	4
0.1	0.125	1	2	3	5
0.125	0.15	2	3	3	5
0.15	0.175	2	3	3	5
0.175	0.2	3	3	4	5
0.2	0.225	3	4	5	5
0.225	0.25	4	4	5	5
0.25	0.275	4	5	5	5
0.275	3	5	5	5	5

The selected monitoring bores are operated by DWER and provide long term superficial groundwater trends across the project area. GDEs were assigned a historical change calculated from the nearest bore.

Step 4: Rate GDE susceptibility to change in DGWL (Susceptibility score)

The susceptibility of identified GDEs was calculated by adding the scores from Step 1: depth to groundwater, Step 2: environmental value/conservation significance and Step 3: historical change in groundwater (Figure 1).

Step 5: Risk of modelled drawdown (Drawdown score)

The potential impact of construction activities on GDEs was assessed using drawdown predicted for proposed dewatering and abstraction scenarios. Details of the scenarios modelled by FSG (2025) are provided in the section 5.

Scoring for drawdown is based on the risk of impact resulting from change in depth to groundwater level described in Froend and Loomes (2004). The scoring applied in this assessment as outlined in Table 4, incorporates modifications arising from previous consultation with DWER, as described in Braimbridge *et al.* (2018).

The scoring outlined in Table 4 rates the risk of impact (from low 1to severe 5) associated with groundwater level drawdown for GDEs in each depth to groundwater category (determined in step 1).

Table 4: Risk of modelled groundwater drawdown score

Modelled drawdown		DTGW Category and Score			
Lower	Upper	6–10 m	3–6 m	0–3 m Vegetation	0–3 m Wetland
0	**0.09**	0	0	0	0
0.10	**0.24**	1	1	1	1
0.25	**0.49**	1	1	2	3
0.5	**0.74**	1	1	2	4
0.75	**0.99**	1	2	3	5
1	**1.24**	2	3	3	5
1.25	**1.49**	3	3	4	5
1.5	**1.74**	3	4	4	5
1.75	**1.99**	3	4	5	5
2	**2.24**	4	4	5	5
2.25	**2.5**	4	5	5	5
2.5	**2.74**	4	5	5	5
2.75	**3**	5	5	5	5

Step 6: Overall risk of impact

The susceptibility score is combined with the drawdown score to obtain an overall risk of impact. Based on the sum of susceptibility and drawdown, the risk to GDEs from a decline in groundwater level is then classed as either 'acceptable', 'manageable' or 'unacceptable' (Table 5).

Table 5: Sum of susceptibility and drawdown risk

Risk of Impact	Risk category	Score
Low	Acceptable	<10
Moderate	Manageable	10 - 13
High	Unacceptable	>13

3.2 Assessment of risk to existing groundwater users

A search of DWERs online Water Register was conducted for existing 5C groundwater licences in the Superficial aquifer within the project area. A 5C licence was captured where the property with a licence intersected the groundwater model boundary. Information obtained from the register and used for this assessment included:

- Total number of licences within the project area
- Groundwater area
- Allocated licenced volume
- Number of drawpoints associated with a licence

The potential risk of impact to existing groundwater users was assessed by overlaying projected drawdown for proposed dewatering and abstraction scenarios on drawpoint mapping in the Water Register. Details of the scenarios modelled by FSG (2025) are provided in the Section 5.

Existing groundwater users were considered potentially at risk of impact where they occurred within the predicted drawdown contours for the modelled scenarios. A nominal threshold of 1m drawdown was used to identify groundwater users with a potentially high level of risk (drawdown risk of 1m or greater was considered to have potential to draw groundwater levels below screened section of existing production bores).

4 Assessment Results - Susceptibility

The results of steps 1,2 and 3 of the assessment are presented for the overall project area. The results of the drawdown assessment and overall risk assessment are presented for each of the modelled scenarios assessed.

Step 1: Potential GDEs and depth to groundwater

The project area occurs in a highly modified landscape with a variety of land use including cleared semi-rural areas and industrial and residential developments.

Biota (2025) mapped vegetation over approximately 1773.49 ha and described 34 mapping units. Approximately 1033.02 ha (of the 1773.49 ha area) was described as modified or cleared under one of the following six units:

- Cleared (CL)
- Road and rail infrastructure (RR)
- Modified/planted Callistemon and Calothamnus on roadsides (R2)
- Beach (B)
- Ocean (O)
- Commercial/residential mixed land use (ML)[1].

These units (and area) do not represent native vegetation (not representative of potentially groundwater dependent ecosystems) and were excluded from further assessment.

A total of 324.84 ha of potential GDE was identified within the project area. This includes areas with some native vegetation intact (some of the mapping units included have cleared areas with native trees) and depth groundwater of <10m or shallower. Of the 324.84 ha, 67.99 ha is mapped as wetland and 256.86 ha as phreatophytic vegetation (Table 6) (Figure 3&4).

The project area also includes 338.85 ha of native vegetation with depth to groundwater >10m and identified as non-GDE.

[1] It is noted through this desktop assessment that some sections classified as ML contain isolated native trees.

In addition, a 76.77 ha section of vegetation mapping (including 32.54 ha was mapped as vegetated and the remainder as cleared/modified) was not assessed as it extended beyond the boundary of the groundwater model[2].

Table 6: Desktop assessment results for project area

	Depth to Groundwater and Category (Area, ha)					Total Area (ha)
GDE Type	**>10m (0)**	**6-10m (1)**	**3-6m (2)**	**0-3m veg (3)**	**0-3m wetland (4)**	
Vegetation						**256.86**
Non-TEC		49.51	49362	33.47		132.61
TEC/PEC		76.84	23.37	24.04		124.25
Wetland			**2.22**		**65.77**	**67.99**
CCW			1.23		55.12	55.12
RE					3.27	3.27
MU			0.99		8.61	9.60
Non-GDE – not assessed						
Vegetation DTGW >10 m (not GDE)	338.85					**338.85**
Other – not assessed						
Not mapped (outside of Biota 2025 survey extent)						**76.77**
Cleared/Modified	430.63	145.47	245.04	119.13	92.75	**1033.02**
Total						**1773.40**

Step 2: Environmental values

Phreatophytic Vegetation

Of the 256.86 ha identified as potential groundwater dependent vegetation:

- 124.25 ha was rated as high ecological value, 64.30 ha as moderate and 68.31 ha as low.
- High value areas included:
    - 53.31 ha identified as representative of either the Banksia Woodlands of the Swan Coastal Plain TEC or Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain (22.04 ha) by Biota (2025)
    - Occurrences of vegetation representative of the Northern Spearwood shrublands and woodlands Priority 3 PEC

[2] Note the groundwater model included the full extent of predicted drawdown associated with all of the potential scenarios and therefore this section of vegetation is beyond the potential zone of influence of groundwater abstraction and/or dewatering associated with the proposal.

    - Areas with flora species of conservation significance (Priority 3 and Priority 4), all of which occurred in GDE vegetation with DTGW of 6 – 10 m (majority of which also occurred in areas mapped as either the Northern Spearwood shrublands and woodlands Priority 3 PEC or the Banksia Woodlands of the Swan Coastal Plain TEC).
- 91.42 ha is classified as a vegetation complex with less than 30% remaining (some of which was rated as high value as it also coincided with TEC occurrences and/or priority flora occurrences) and 165.43 ha of a vegetation complex with greater than 30% remaining.

Wetland values

Of the 67.99 ha of wetland within the project area:

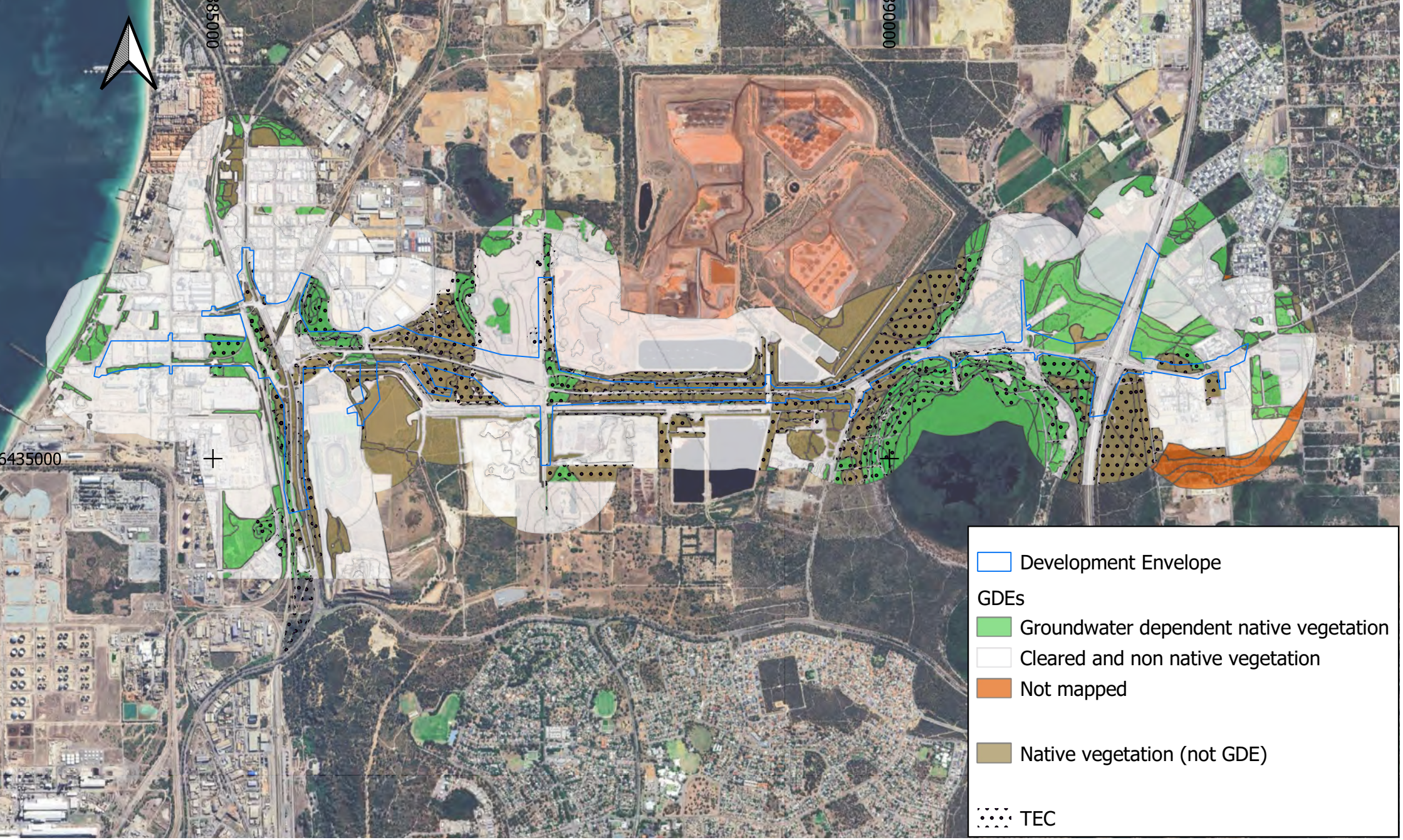
- 56.63 ha was rated as high ecological value, 7.27 ha as moderate and 4.08 ha as low (Based on scoring in Table 2). This included:
    - 55.12 ha was classified as Conservation Category wetland, 3.27 ha as Resource Enhancement wetland and 9.60 ha as Multiple Use wetland
    - 15.49 ha was identified within wetland boundaries as representative of either the Banksia Woodlands of the Swan Coastal Plain TEC (13.98 ha) or Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain (1.51 ha) by Biota (2025)
    - 16.04 ha of vegetation within wetlands was classified as a vegetation complex with less than 30% remaining, with 51.94 ha of a vegetation complex with greater than 30% remaining.
- No flora species of conservation significance occurred within wetland areas.

Tumulus Spring TEC

The Communities of Tumulus Springs (Organic Mounds SCP) is listed as a critically endangered ecological community under the BC Act 2016 and endangered under the EPBC Act. The TEC is mapped as occurring within geomorphic wetland UFI 6530 (DBCA database only, not confirmed or mapped by Biota 2025). The area of potential TEC occurs approximately 600m north of the DE (Figure 4).

The flora and fauna assemblages of the Organic Mounds SCP TEC are reliant on a permanent supply of freshwater and the maintenance of hydrological processes to the mounds (DBCA 2023). Typical and common native vascular plant species associated with the tumulus springs are the trees *Banksia littoralis* (swamp banksia), *Melaleuca preissiana* (moonah) and *Eucalyptus rudis* (flooded gum), and the shrubs *Taxandria linearifolia* (swamp peppermint), *Pteridium esculentum* (bracken fern), *Astartea scoparia* (common astartea) and *Cyclosorus interruptus* (swamp shield-fern) (DBCA 2023). The habitat of the mound springs is characterised by raised areas of peat that with a continuous discharge of groundwater supporting moist microhabitats and invertebrate fauna assemblages. This community is likely to provide a refuge for flora and fauna in a drying climate (DBCA 2023).

One of the key threats to this community is decline groundwater levels and quality (DBCA 2023). Changes in the level of the water table are very likely to influence the hydrology of these wetlands as they are likely to be almost entirely dependent on groundwater for water supply (Department of Conservation and Land Management 2006).



0 0.5 1 km

Projection: GDA 20 zone 50

Source: Base map © ESRI and its data suppliers, DPIRD (2019). Landgate (2019)

Figure 3: Groundwater dependent vegetation and other native vegetation

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0 0.5 1 km

Projection: GDA 20 zone 50

Source: Base map © ESRI and its data suppliers, DPIRD (2019). Landgate (2019)

Figure 4: Wetlands within the project area.

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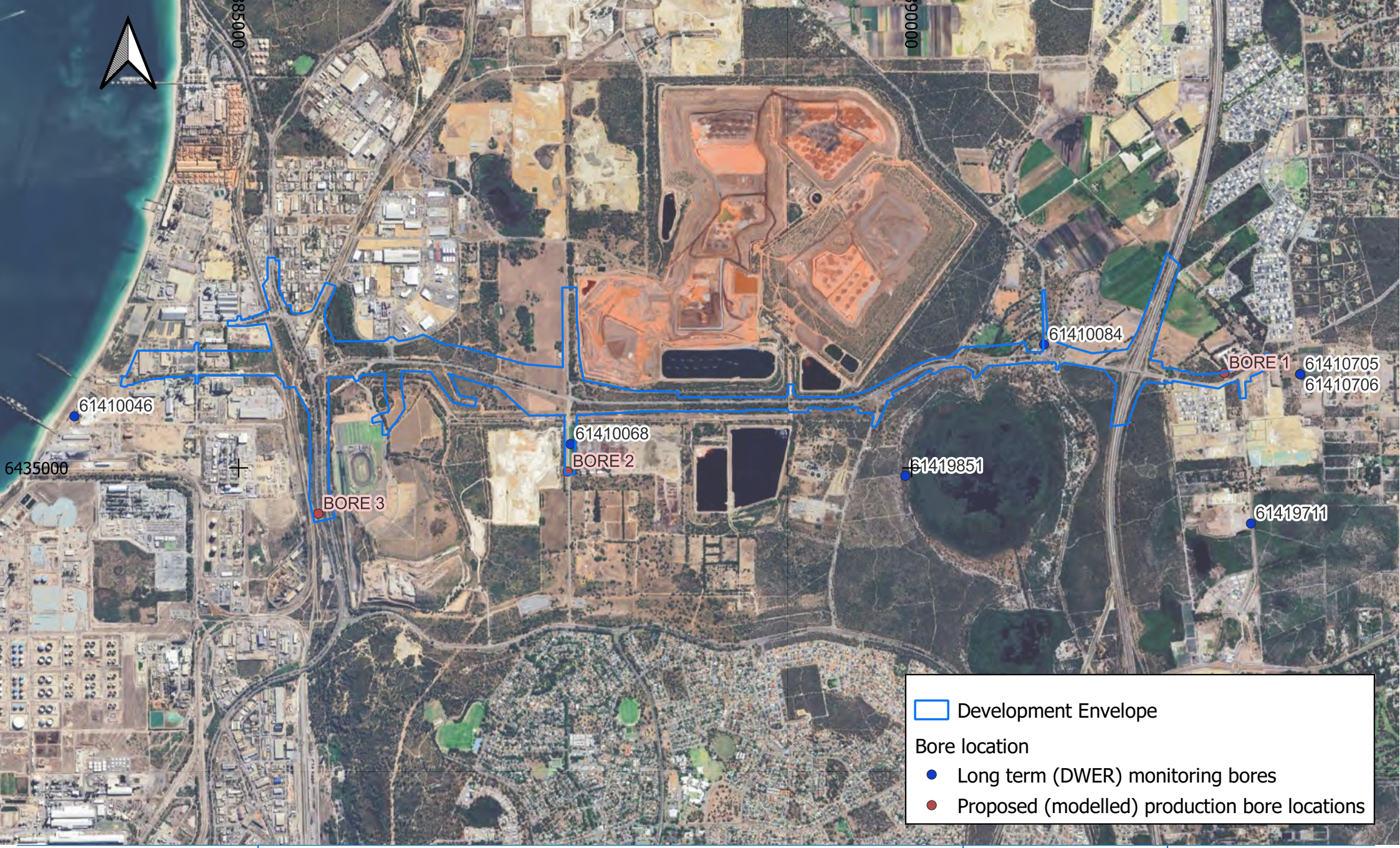
Step 3: Historical groundwater level trends

Historical groundwater level change was assessed using groundwater level data from seven long term monitoring bores operated by DWER (61410046, 61410068, 61410084, 61410705, 61410706, 61419711, 61419851) (Figure 5). Hydrographs for the 15 years 2009 to 2024 indicate there is a rising trend in groundwater level across the project area in six of the seven monitoring bores (Appendix A). Based on scoring in Table 3, groundwater levels over the majority of the project area were scored 0 for historical change.

One bore located on the west side of The Spectacles Wetland (61419851) shows a declining long-term trend of around 0.3 m from 2009 to 2024 (Appendix A). This decline over a 15 year period equates to a rate of 0.02 m per year and is therefore scored as 1 (based on scoring in Table 3). This bore is located 2.5 km west of the site for proposed dewatering and production bore 1 and 2.5 km east of proposed production bore 2 (Figure 5).



0 0.5 1 km

Projection: GDA 20 zone 50

Source: Base map © ESRI and its data suppliers, DPIRD (2019). Landgate (2019)

Figure 5: Monitoring bores and proposed production bores

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5 Assessment results – drawdown and overall risk

For steps five and six the assessment focused on groundwater dependent vegetation and wetlands within the potential area of drawdown for four modelled dewatering and abstraction scenarios (FSG 2025).

The assessment was completed for two dewatering scenarios:

- Dewatering dry season without recharge - Construction dewatering (volume 180,000kL) during the dry season without infiltration of the abstracted groundwater back into the aquifer.
- Dewatering dry season with recharge - Construction dewatering (volume 210,000kL) during the dry season with infiltration (infiltration rate 16 L/s) of some of the abstracted groundwater back into the aquifer. Infiltration was modelled based on a trench located between the dewatering location and the Tumulus Spring TEC (to minimise the potential impacts on groundwater levels at the TEC.

For water supply during construction, the assessment was completed for one modelled scenario (with outputs assessed at two stages) with water obtained from 3 proposed production bores (location of bores shown in Figure 5):

- Scenario 3: 50% of the earthworks construction water demand (215,000 kL) and 100% of the additional water demand for dust suppression (270,000 kL) was obtained from 3 production bores (Figure 5).

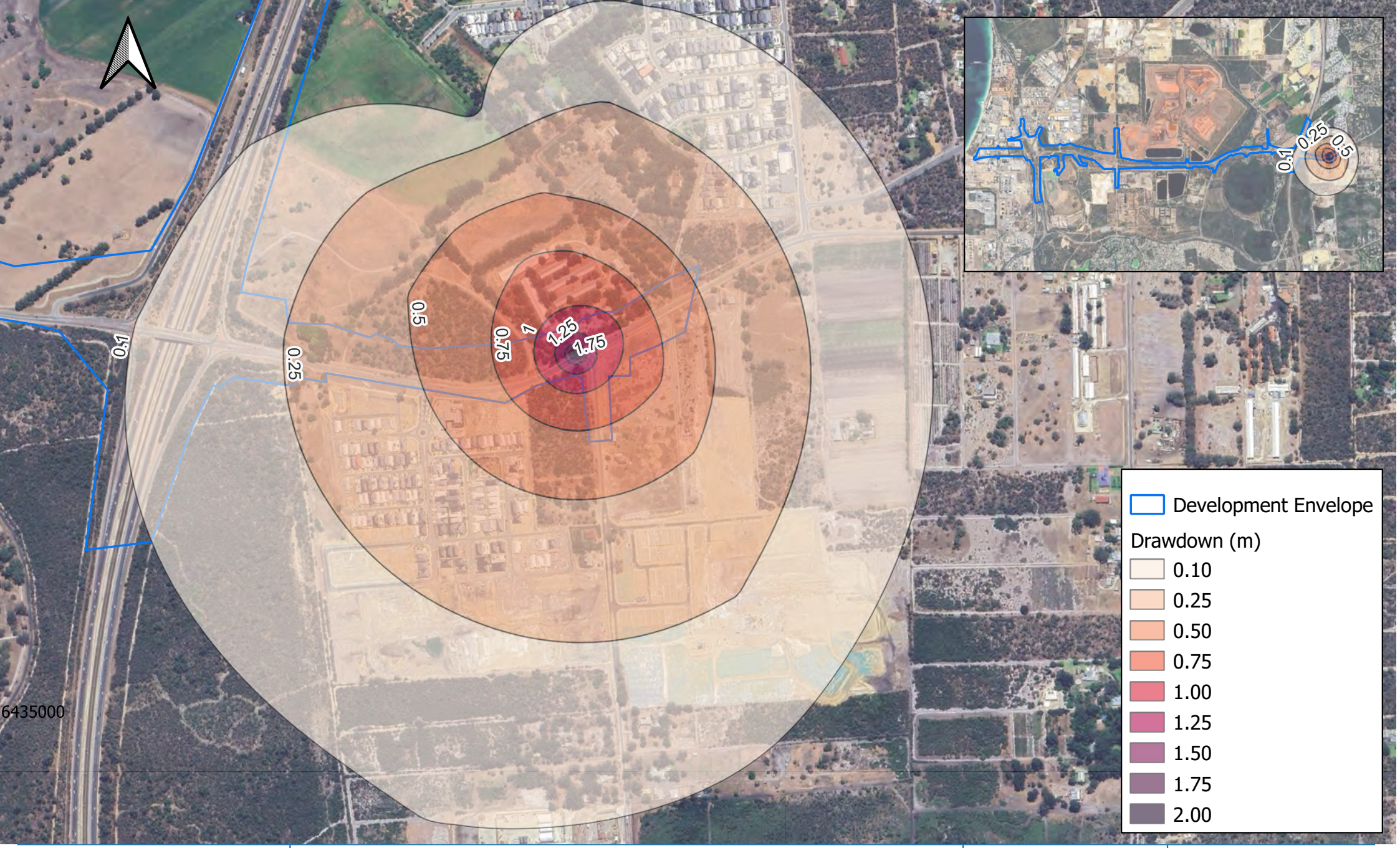
The assessment of impacts was completed at two points for scenario 3. Once after 413 days of abstraction for construction demand and dust suppression (Scenario 3a) and once after an additional 210 days of abstraction for dust suppression only (Scenario 3b).

Further details of the model construction, data used, scenarios assessed, rates of abstraction and additional scenarios modelled are provided in FSG (2025).

The potential risk of impact to GDEs (groundwater dependent vegetation and wetlands identified in the previous steps) was assessed within the predicted total area of drawdown as represented by the limit of the 0.1 m drawdown contour for each scenario (referred to as the total area of drawdown). The assessment results for each scenario are presented in the following sections.

5.1 Dewatering (no recharge) – dry season

The dewatering dry season scenario (with no recharge) results in drawdown (to a minimum modelled drawdown of 0.1 m) across approximately 183.4 ha (Figure 6). Drawdown at the dewatering point reaches a maximum depth of 1.9 m. This depth of drawdown is restricted to a 0.006 ha area (as represented by the 2 m drawdown contour) (Figure 6). The assessment of risk of impact considered the potential drawdown impacts on native vegetation and wetlands within the 183.4 ha total drawdown area (Table 7).



0 0.8 1.6 km

Projection: GDA 20 zone 50

Source: Base map © ESRI and its data suppliers, DPIRD (2019). Landgate (2019)

Figure 6: Drawdown contours - dewatering dry season no recharge scenario

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GDEs present

27.26 ha of potential GDEs were identified within the total drawdown area including:

- 22.26 ha of native vegetation (non-TEC)
- 2.27 ha of native vegetation identified as Banksia Woodlands of the Swan Coastal Plain TEC
- 2.73 ha of Wetlands (Multiple Use)
- 0.026 ha of the estimated extent of the Tumulus Spring TEC[3].

In addition, within the total drawdown area there is:

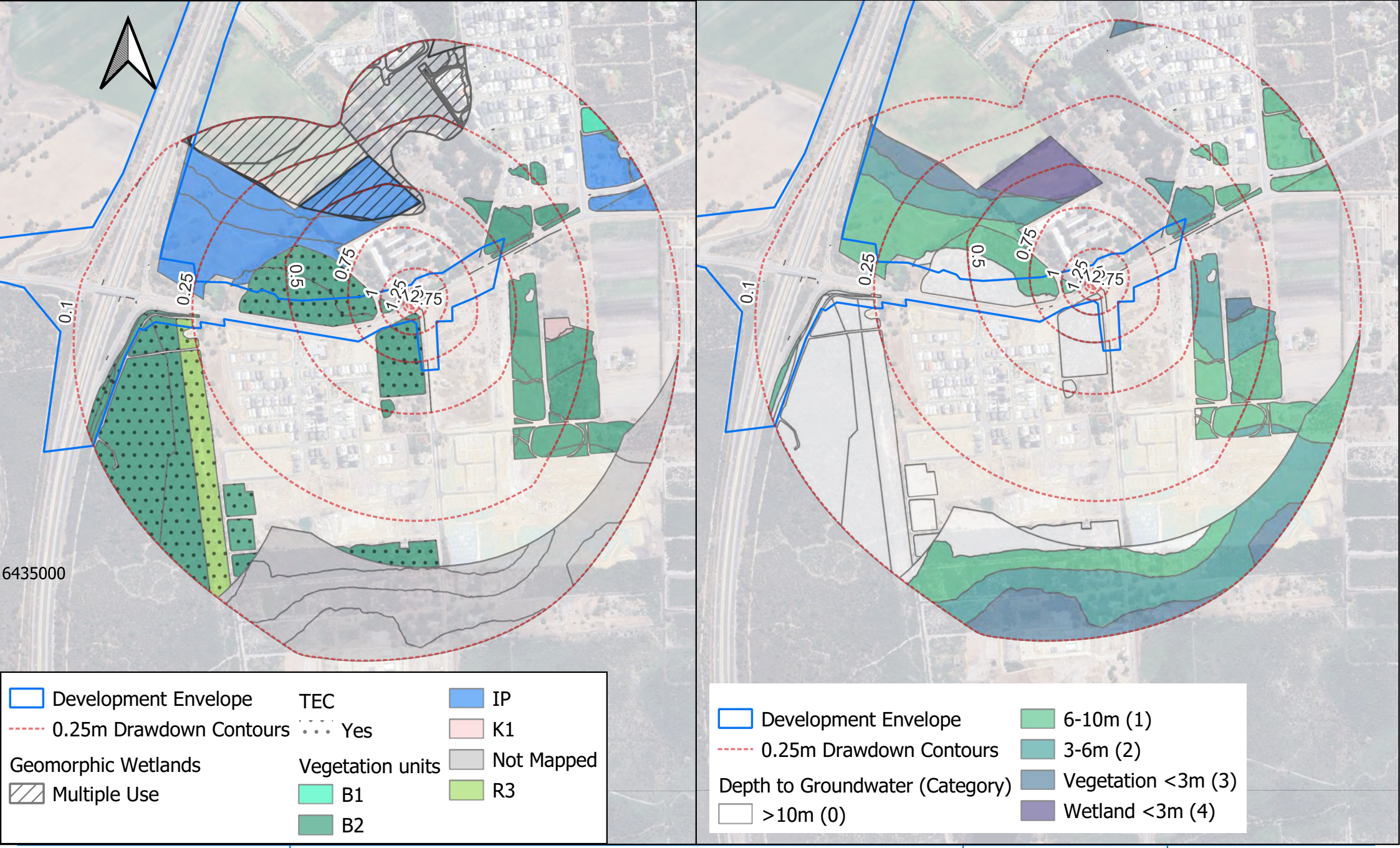
- 22.89 ha of native vegetation with a DTGW >10m (and not considered to be groundwater dependent)
- 24.62 ha outside of the extent of vegetation mapping by Biota (2025)
- 108.70 ha mapped as cleared, roads or mixed commercial/residential.

The majority of the total area of drawdown has relatively deep groundwater. Of the 24.53 ha of potentially groundwater dependent vegetation (TEC and non-TEC), 1.99 ha has DTGW <3 m, 7.45 ha 3-6 m and 15.12 ha 6-10 m DTGW. Almost all of the 2.73 ha of wetland has a DTGW <3 m (Figure 7).

Table 7: Summary of GDE and other areas within total dewatering drawdown area

	Depth to Groundwater and Category (Area, ha)					Total Area (ha)
GDE Type	**>10m (0)**	**6-10m (1)**	**3-6m (2)**	**0-3m veg (3)**	**0-3m wetland (4)**	
Vegetation		**15.12**	**7.42**	**1.99**		**24.53**
Non-TEC		12.86	7.42	1.99		22.26
TEC/PEC		2.27				2.27
Wetland			**0.04**		**2.69**	**2.73**
Non-GDE – not assessed						
Vegetation DTGW >10 m (not GDE)	22.89					**22.89**
Other – not assessed						
Not mapped (outside of Biota 2025 survey extent)	3.11	6.77	9.41	5.33		**24.62**
Cleared/Modified	45.35	24.73	20.31	5.19	13.12	**108.70**
Total						**183.47**

[3] This occurrence is located just outside of the limit of the Biota (2025) vegetation mapping.



0 0.8 1.6 km

Projection: GDA 20 zone 50

Source: Base map © ESRI and its data suppliers, DPIRD (2019). Landgate (2019)

Figure 7: Dewatering dry season drawdown contours with potential GDEs by (a) GDE Type and (b) Depth to groundwater category

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Risk of impact

The risk of impact to GDE's from dewatering under this scenario is generally low (Figure 8).

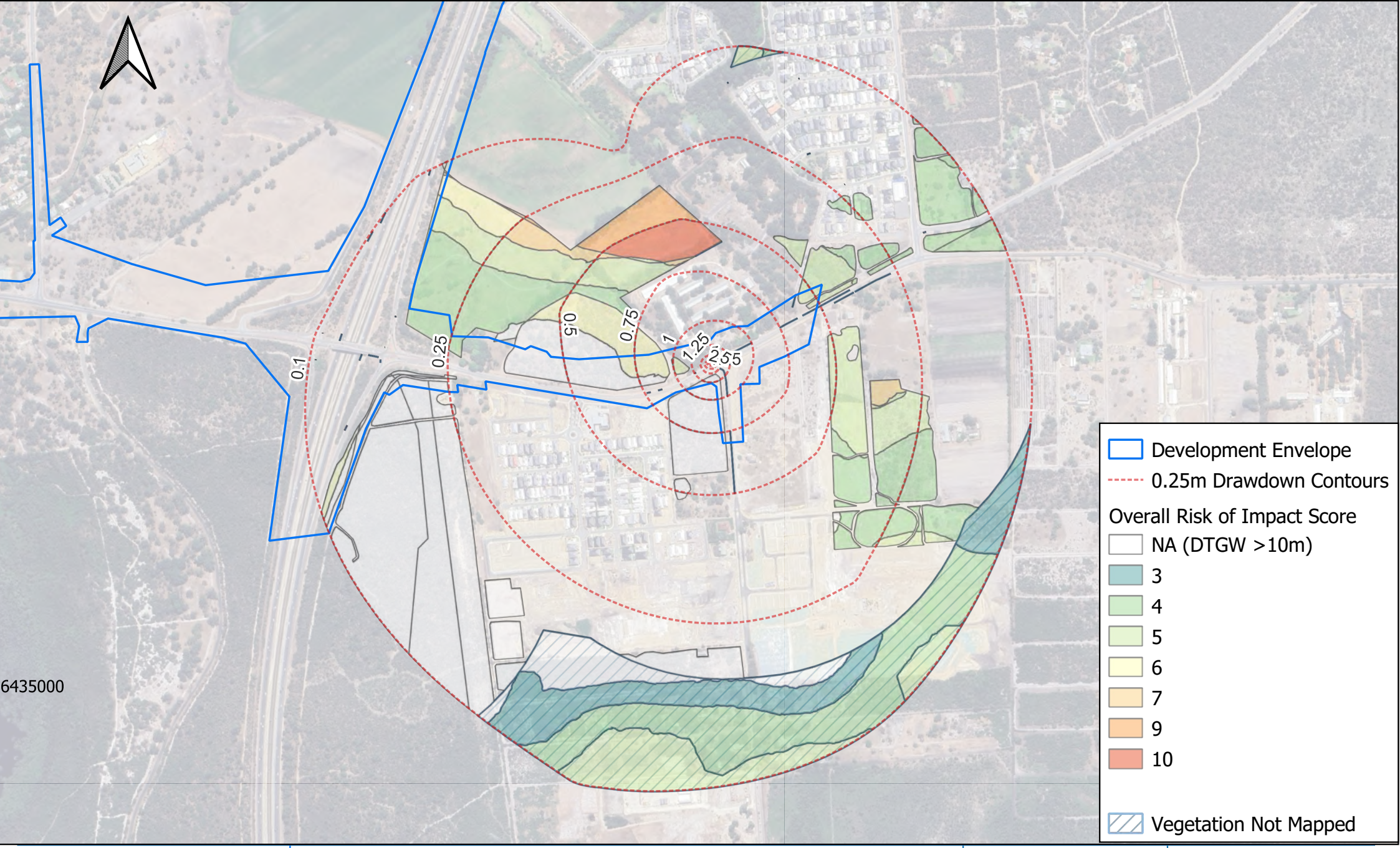
The highest risk of impact within the total area of drawdown is for a 1.37 ha section of MU wetland (part of Mandogalup Swamp). This wetland falls within the 0.5 m drawdown contour with groundwater at or near surface and scored a risk impact of 10. The overall risk of impact to this wetland was scored as moderate as:

- the wetland depth to groundwater is <3 m (DTGW score = 4)
- the wetland is classed as Multiple Use and does not support any significant ecological values (was mapped by Biota (2025) as isolated trees over paddock) (ecological value score = 2)
- historic change in groundwater is negligible (nearest bores had an increasing trend in groundwater) (Historical change value = 0)
- susceptibility score = 6
- the drawdown is classed as high risk (Drawdown score = 4)
- overall risk of impact (Susceptibility score (6) + Drawdown score (4) = 10 (moderate risk of impact 10-13).

The assessment of drawdown risk as high and the overall risk of impact as moderate is considered conservative for this wetland given the vegetation within the wetland is mapped as isolated trees over previously cleared or pasture (Biota 2025).

The Tumulus Spring TEC occurrence that intersects the 0.1m drawdown had an overall risk of 9, indicating a low risk of impact. Groundwater flow modelling indicates flow paths in the vicinity of the spring are very slightly altered under the dewatering scenario.

All of the remaining potential GDE areas within the total drawdown area were assessed as having an overall low risk of impact (<10 score). This is in part due to the relatively deep groundwater underlying the majority of native vegetation within the total drawdown area, reducing the potential risk of impacts from drawdown. In addition, the zone of high drawdown (where drawdown is equal to or greater than 1 m) is very small and includes only 0.34 ha of native vegetation (of which 0.27 ha has DTGW >10 m).



0 0.8 1.6 km

Projection: GDA 20 zone 50

Source: Base map © ESRI and its data suppliers, DPIRD (2019). Landgate (2019)

Figure 8: Dewatering dry season drawdown contours with overall risk of impact for GDEs

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5.2 Dewatering (with recharge) – dry season

The dewatering dry season scenario (with recharge) results in drawdown of up to 1.9 m (2 m contour) within a 0.004 ha area. Drawdown of to 0.1 m occurs across approximately 106.66 ha (Figure 9). The infiltration trench is located approximately 675 m north of the dewatering area and is modelled to result in increased groundwater levels over an approximately 2.38 ha area.

The assessment of potential risk of impact focused on the potential drawdown impacts on native vegetation and wetlands within the 106.66 ha total drawdown area (Table 8). That is, the area with increased groundwater levels from infiltration was not assessed.

GDEs present

19.75 ha of potential GDEs were identified within the total drawdown area including:

- 16.44 ha of native vegetation (non-TEC)
- 2.06 ha of native vegetation representative of the Banksia Woodlands of the Swan Coastal Plain TEC by Biota (2025)
- 1.26 ha of wetlands (Multiple Use).

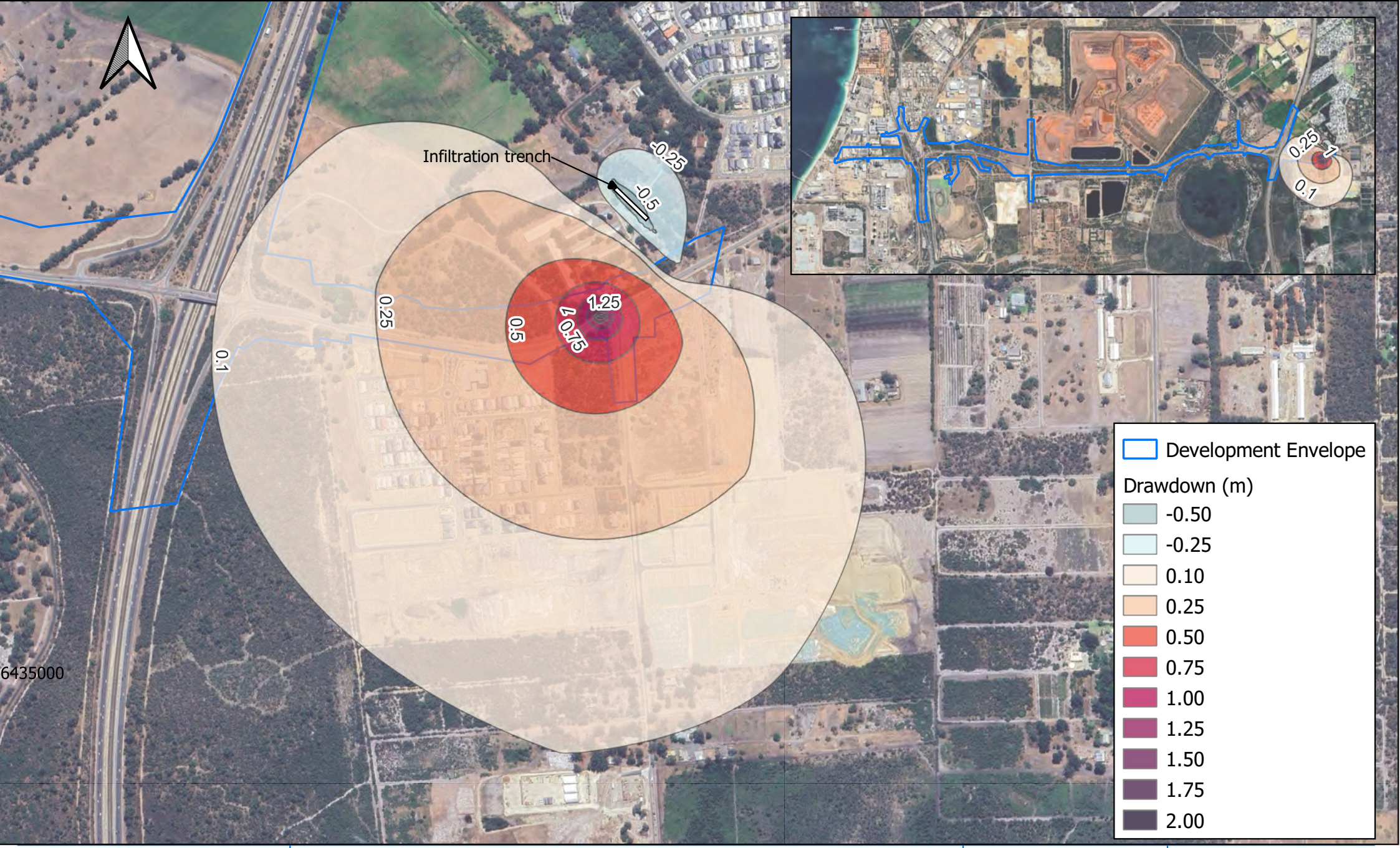
In addition, within the total drawdown area there is:

- 16.21 ha of native vegetation with a DTGW >10m (and not considered to be groundwater dependent)
- 58.84 ha mapped as cleared, roads or mixed commercial/residential
- 11.87 ha outside of the extent of vegetation mapping by Biota (2025).

The majority of the total area of drawdown has relatively deep groundwater. Of the 18.49 ha of potentially groundwater dependent vegetation (TEC and non-TEC), 1.62 ha has DTGW <3 m, 5.75 ha 3-6 m and 11.13 ha 6-10 m DTGW. Almost all (1.22 ha) of the 1.25 ha of wetland has a DTGW <3 m (Figure 10).

Table 8: Summary of GDE and other areas within total dewatering drawdown area

	Depth to Groundwater and Category (Area, ha)					Total Area (ha)
GDE Type	**>10m (0)**	**6-10m (1)**	**3-6m (2)**	**0-3m veg (3)**	**0-3m wetland (4)**	
Vegetation		**11.13**	**5.75**	**1.62**		**18.49**
Non-TEC		9.07	5.75	1.62		16.44
TEC/PEC		2.06				2.06
Wetland			**0.04**		**1.22**	**1.26**
Non-GDE – not assessed						
Vegetation DTGW >10 m (not GDE)	16.21					**16.21**
Other – not assessed						
Not mapped (outside Biota 2025 survey)	2.93	3.90	4.40	0.68		**11.87**
Cleared/Modified	42.43	7.90	6.49	0.22	1.79	**58.84**
Total						**106.67**



0 0.8 1.6 km

Projection: GDA 20 zone 50

Source: Base map © ESRI and its data suppliers, DPIRD (2019). Landgate (2019)

Figure 9: Drawdown contours - Dewatering dry season with recharge scenario

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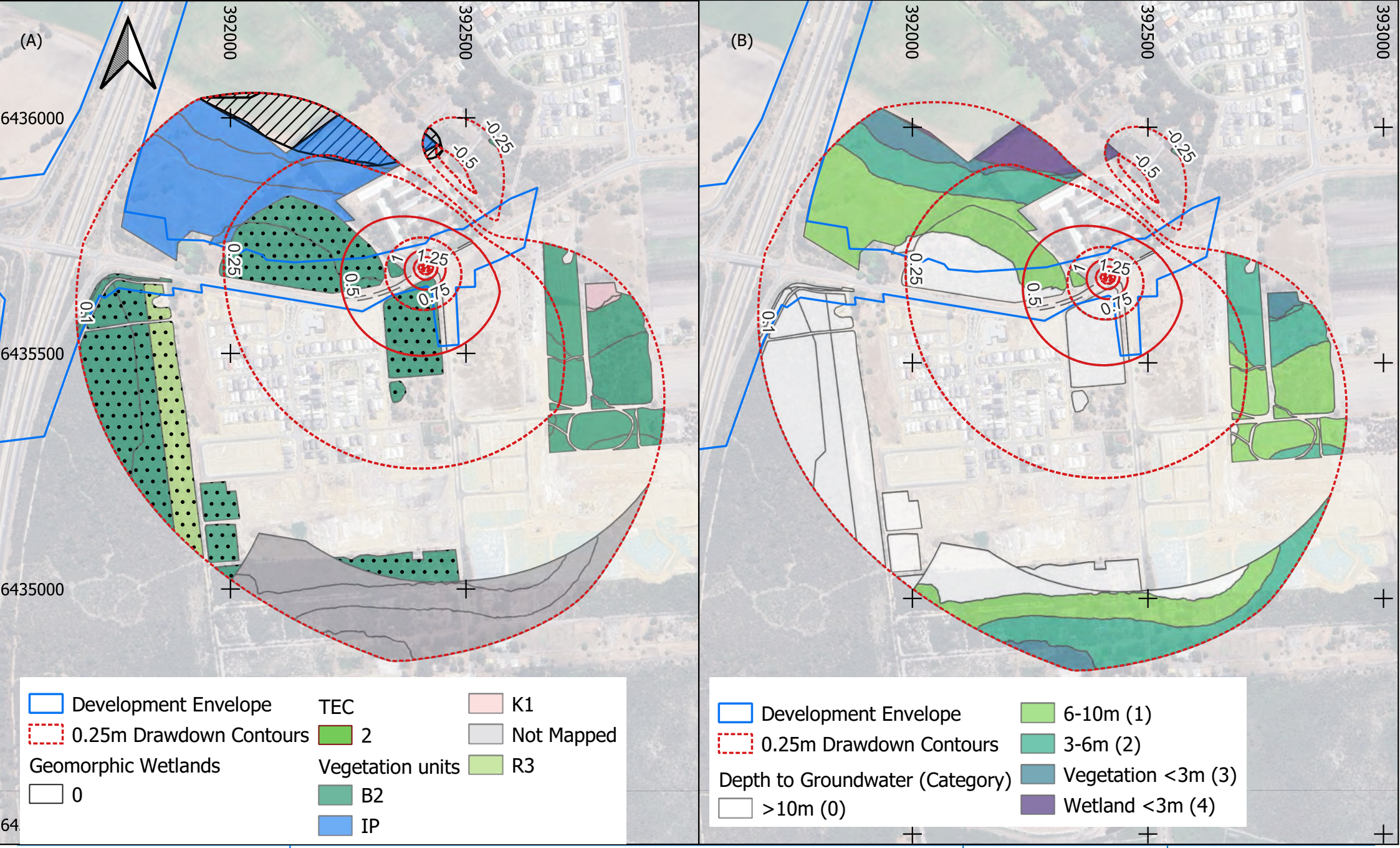

0 0.8 1.6 km

Projection: GDA 20 zone 50

Source: Base map © ESRI and its data suppliers, DPIRD (2019). Landgate (2019)

Figure 10: Dewatering dry season drawdown contours with potential GDEs by (a) GDE type and (b) Depth to groundwater category

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Risk of impact

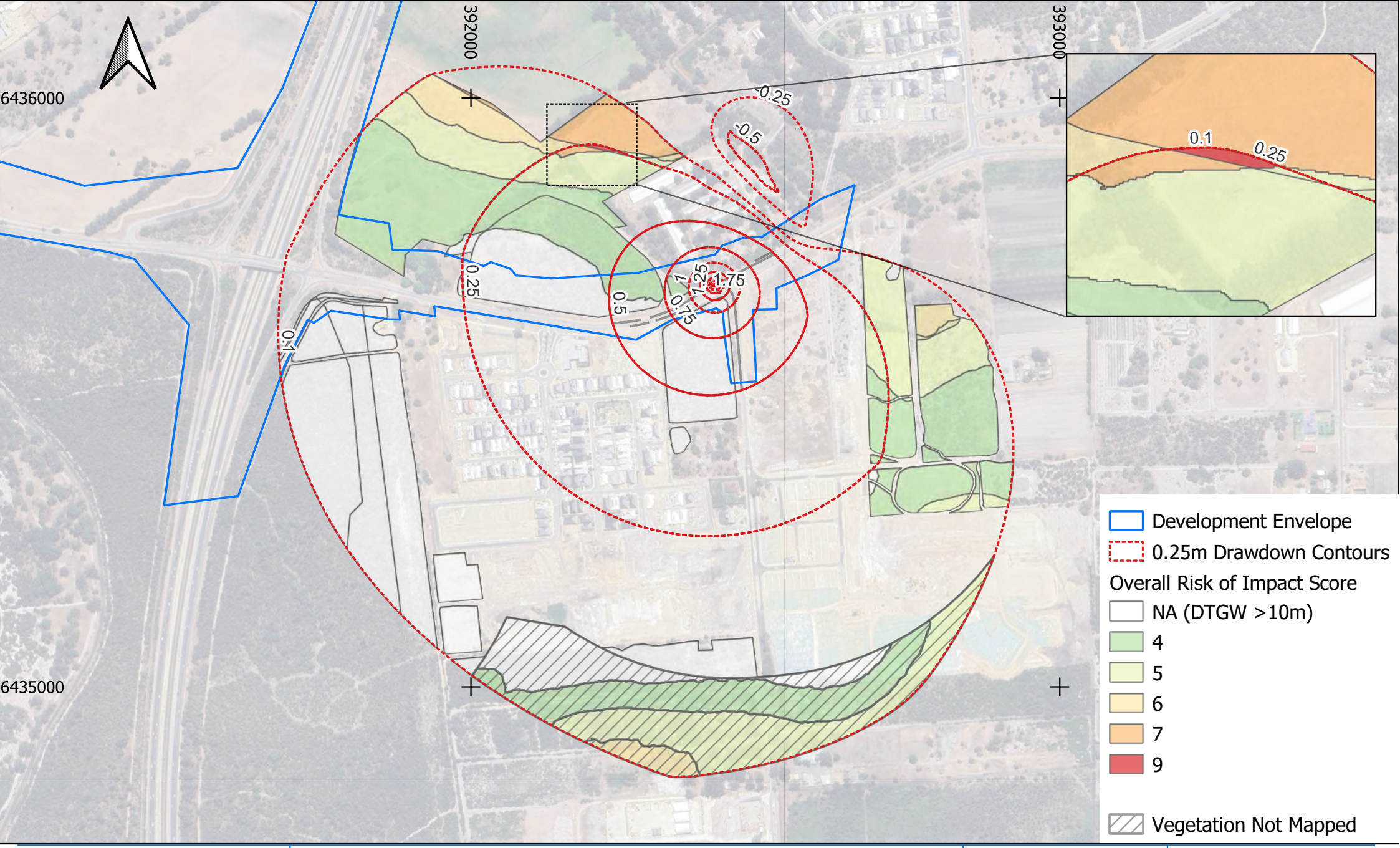
The risk of impact to GDEs from dewatering under this scenario is low. All of the potential GDE areas are identified as having a low risk of impact (<10 score) (Figure 11).

The total drawdown area includes four sections of Multiple Use wetland (part of Mandogalup Swamp) that retain isolated trees only (mapped as unit IP by Biota 2025). One of the four sections occurs within the 0.25 m drawdown area (and has depth to groundwater <3 m), which represents a moderate drawdown risk. The total risk of impact for this 0.03 ha section is scored as 9 which represents a low overall risk of impact. This is in part due to the low ecological values present within this wetland (i.e. Multiple Use, with vegetation that is not representative of TEC or providing habitat for significant flora or fauna) and no historical decline in groundwater. One other section of the wetland also occurs within the 0.25 m drawdown contour but has a depth to groundwater of 3-6 m and therefore has a reduced risk of impact (overall risk of impact of 5). The remaining two sections of wetland both occur within the predicted 0.1 m drawdown contour which presents a low risk of impact and score low overall risk of impact. NB Additional areas within the MU wetland were mapped as cleared (Biota 2025) and not assessed.

The drawdown contours under this scenario do not extend to the Tumulus Spring (TEC) occurrence to the north of the dewatering location and therefore no impact from dewatering is expected under this scenario. In addition, groundwater flow modelling indicates flow paths in the vicinity of the spring are not impacted under the dewatering scenario when recharge is incorporated.

The depth to groundwater underlying the majority (16.87 ha, 91%) of potentially groundwater dependent vegetation in the total drawdown area is relatively deep (3-10 m). Approximately 1.62 ha of the assessed area of vegetation has a depth to groundwater of 0-3 m, however this occurs within the 0.1 m and 0.25 m drawdown areas and the risk of impact resulting from this drawdown is considered low (Risk of impact score 6 for 0.1 m drawdown and 7 for 0.25 m drawdown). It is also noted that 1.3 ha of this vegetation (of the 1.6 ha with DTGW 0-3 m) is mapped as isolated trees in paddocks and is likely to retain limited ecological values (was not identified as supporting any threatened or priority flora, fauna or communities).

There are several areas of vegetation, including areas identified as Banksia Woodland TEC that occur within the total area of drawdown, however the majority of the TEC occurs where the depth to groundwater is >10 m and is therefore considered to have limited dependence on groundwater. The remaining areas have a DTGW of 6-10 m and are predicted to be subject to 0.1 to 0.25 m of drawdown which is considered low risk (the highest overall risk of impact for these areas was calculated to be 4).



0 1 2 km

Projection: GDA 20 zone 50

Source: Base map © ESRI and its data suppliers, DPIRD (2019). Landgate (2019)

Figure 11: Dewatering dry season drawdown contours with overall risk of impact for GDEs

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5.3 Construction water supply: Scenario 3a and 3b

Scenario 3 for supply of construction water modelled 50% (215 000 kL) and 100% of dust suppression (270 000 kL) from three production bores. Scenario 3 also modelled 210 days for dust suppression only (270 000 kL) from three proposed production bores. The two stages are referred to as Scenario 3a and Scenario 3b respectively.

The assessment of risk of impact focused on the potential drawdown impacts on native vegetation identified as groundwater dependent and wetlands within the total drawdown area of each bore and both abstraction scenarios (Table 9, Figure 12).

Table 9: Modelled groundwater drawdown and extent

Bore	Scenario	Maximum drawdown (m)	Extent (ha)	Extent of 0.1 m drawdown (ha)
1 (east)	3a	0.2	0.188	13.2
	3b	0.1	0.240	
2 (central)	3a	0.3	0.003	4.3
	3b	0.1	0.03	
3 (west)	3a	0.3	0.004	7.5
	3b	0.1	0.02	

5.3.1 Scenario 3a

Production Bore 1

Modelled abstraction at bore 1 results in drawdown up to 0.2 m within a 0.188 ha area. The maximum extent of modelled drawdown, out to the 0.1 m contour, occurs across 13.24 ha (total drawdown area) (Figure 12).

3.61 ha of potential GDEs were identified within the total drawdown area, including:

- 1.36 ha of native vegetation (non-TEC)
- 1.78 ha native vegetation identified as Banksia Woodlands of the Swan Coastal Plain TEC/PEC
- 0.47 ha of Wetlands (Multiple Use, non-TEC).

In addition, within the total drawdown area there is:

- 7.31 ha mapped as cleared, roads or mixed commercial/residential.
- 2.32 ha of native vegetation with DTGW >10 m (not considered GDE).

DTGW increases from north to south across the drawdown zone. Of the 3.14 ha of potentially groundwater dependent vegetation (TEC and non-TEC), 0.06 ha has DTGW <3 m, 0.85 ha has 3-6 m and 2.23 ha 6-10 m DTGW (Table 10). Almost all of the 0.47 ha of wetland has DTGW <3 m (Figure 13).

Production Bore 2

Modelled abstraction at bore 2 results in drawdown up to 0.3 m within a 0.003 ha area. The maximum extent of drawdown modelled, out to the 0.1 m contour, occurs across 4.31 ha (total drawdown area) (Figure 12).

A relatively small area of GDE native vegetation, 0.07 ha (DTGW 6 – 10 m), is the only GDE to intersects the total drawdown zone. It is part of a larger patch of native vegetation within the drawdown zone (0.69 ha DTGW >10 m) that is representative of Northern Spearwood shrublands and woodlands State Priority 3 PEC (Biota 2025) (Figure 13, Table 10).

Over half of the drawdown zone is mapped as cleared, roads or mixed commercial/residential (2.69 ha). The majority of the total area of drawdown had DTGW >10 m (3.86 ha), of which 1.54 ha is native vegetation.

Production Bore 3

Abstraction under Scenario 3a results in drawdown at bore 3 up to 0.3 m within a 0.004 ha area. The maximum extent of drawdown modelled, out to the 0.1 m contour, occurs across approximately 7.51 ha (total drawdown area) (Figure 12).

3.50 ha of potential GDEs were identified within the total drawdown area including:

- 1.92 ha native vegetation (non-TEC)
- 0.53 ha of native vegetation identified as Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain Federal TEC
- 1.06 ha native vegetation identified as Northern Spearwood shrublands and woodlands State Priority 3 PEC.

Additionally, within the total drawdown area there is:

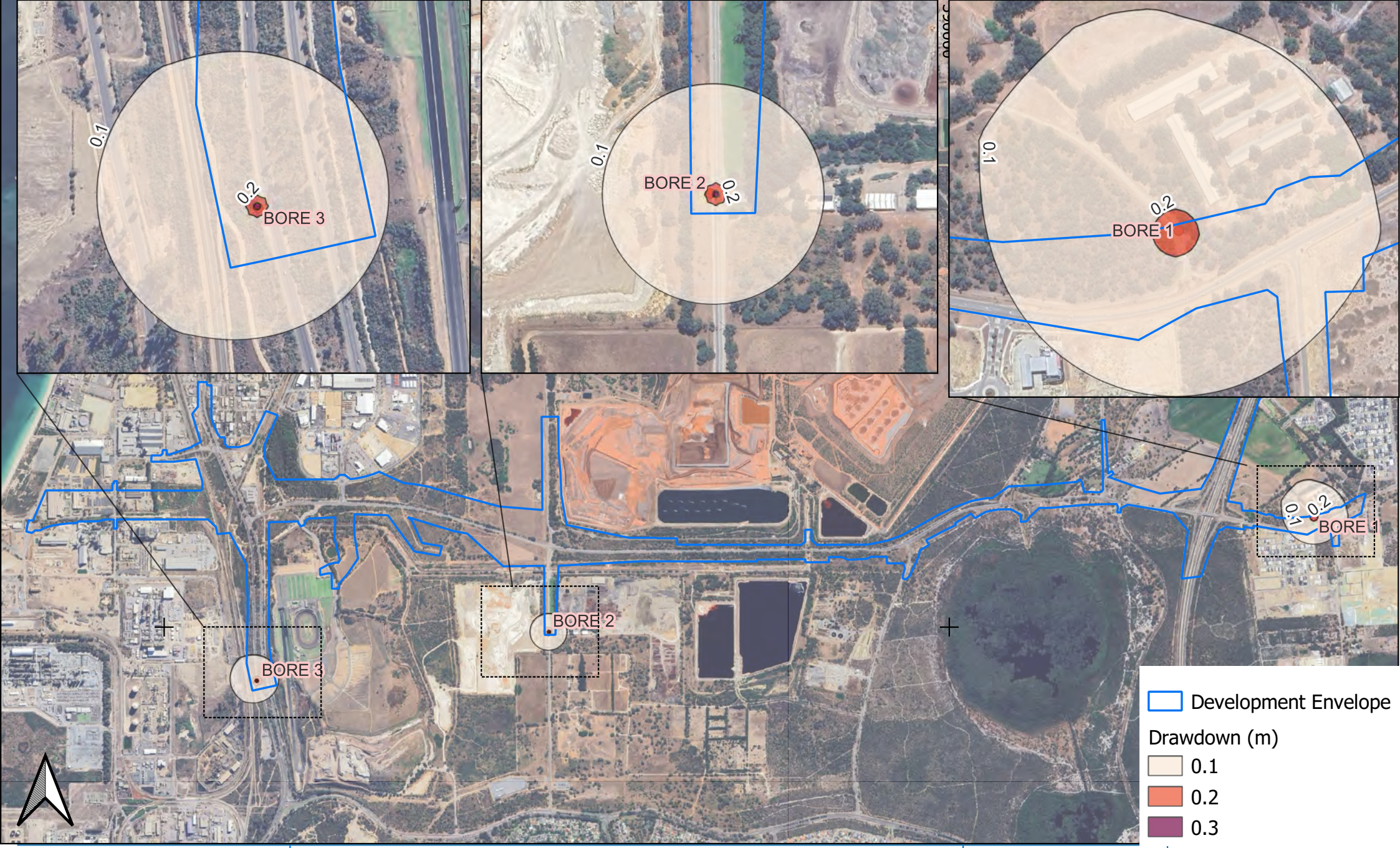
- 2.37 ha mapped as cleared, roads or mixed commercial/residential.
- 1.64 ha of native vegetation with DTGW >10 m (not considered to be groundwater dependent).

No wetlands were identified to occur within the total drawdown zone (<3 m DTGW).

DTGW becomes shallower from east to west across the drawdown zone. Of the 3.50 ha of potentially groundwater dependent vegetation (TEC and non-TEC), 0.13 ha has DTGW <3 m, 1.38 ha has 3-6 m and 2.0 ha has 6-10 m DTGW (Figure 13, Table 10).

Table 10: Summary of GDE and other areas within total drawdown area – Scenario 3a

GDE Type	Depth to Groundwater and Category (Area, ha)					Total Area (ha)
	>10m (0)	6-10m (1)	3-6m (2)	0-3m veg (3)	0-3m wetland (4)	
Production Bore1						
Vegetation		**2.23**	**0.85**	**0.06**		**3.14**
Non-TEC		0.45	0.85	0.06		1.36
TEC/PEC		1.78				1.78
Wetland (MU) (non-TEC)			**0.04**		**0.43**	**0.47**
Vegetation DTGW >10 m (not GDE)	2.32					**2.32**
Cleared/ Modified	7.31					**7.31**
Total						**13.24**
Production Bore 2						
Vegetation (TEC)		**0.07**				**0.07**
Not TEC						
TEC/PEC		0.07				0.07
Vegetation DTGW >10 m (not GDE)	1.54					**1.54**
Cleared/ Modified	2.69					**2.69**
Total						**4.3**
Production Bore 3						
Vegetation		**2.00**	**1.38**	**0.13**		**3.50**
Not TEC		0.93	0.87	0.11		1.92
TEC/PEC		1.06	0.51	0.02		1.59
Vegetation DTGW >10 m (not GDE)	1.64					**1.64**
Cleared/ Modified	0.49	0.92	0.59	0.37		**2.37**
Total						**7.51**



0 0.5 1 km

Projection: GDA 20 zone 50

Source: Base map © ESRI and its data suppliers, DPIRD (2019). Landgate (2019)

Figure 12: Drawdown contours - production scenario 3a

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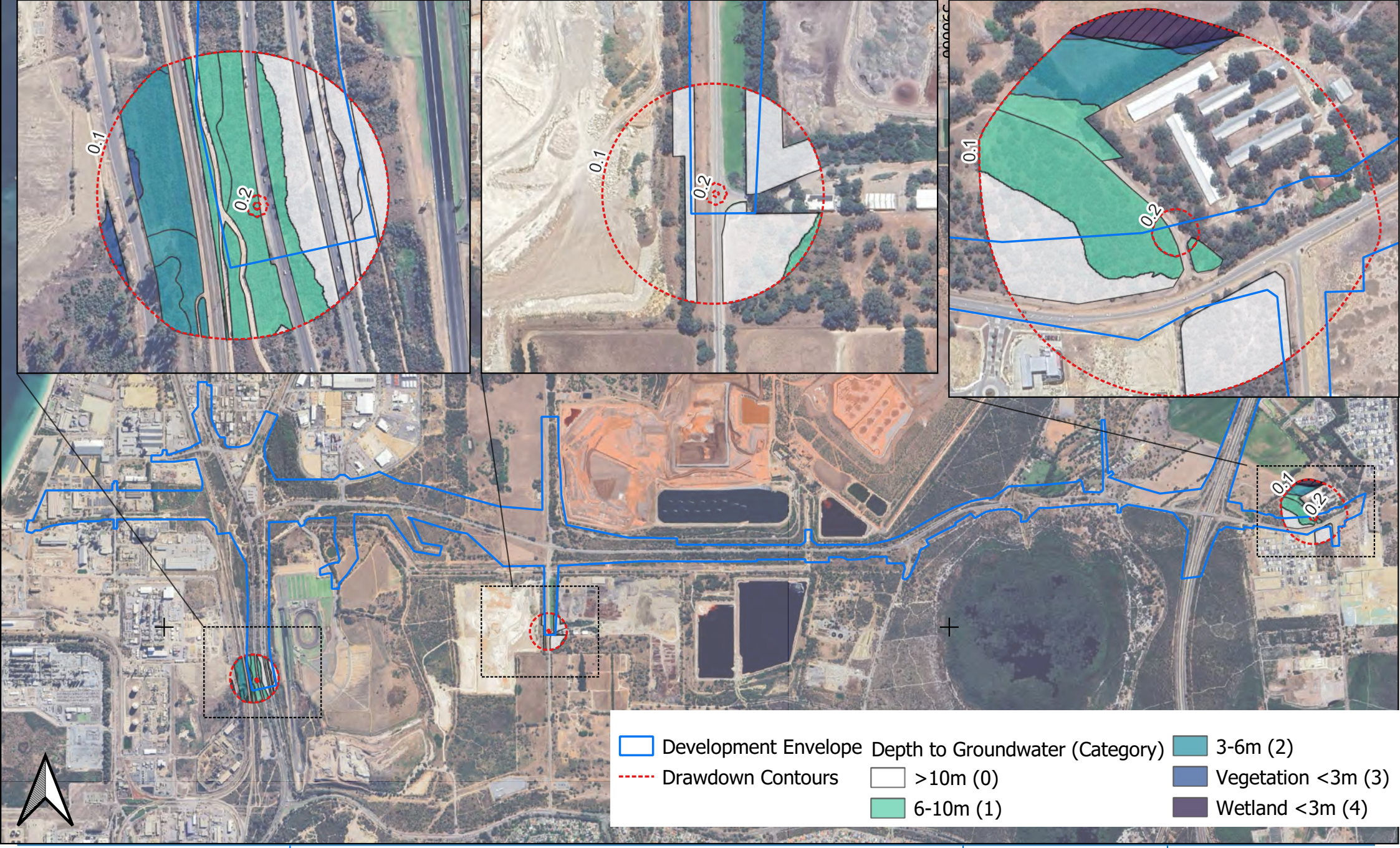

0 0.5 1 km

Projection: GDA 20 zone 50

Source: Base map © ESRI and its data suppliers, DPIRD (2019). Landgate (2019)

Figure 13: Drawdown contours - production scenario 3a with GDEs by depth to groundwater category

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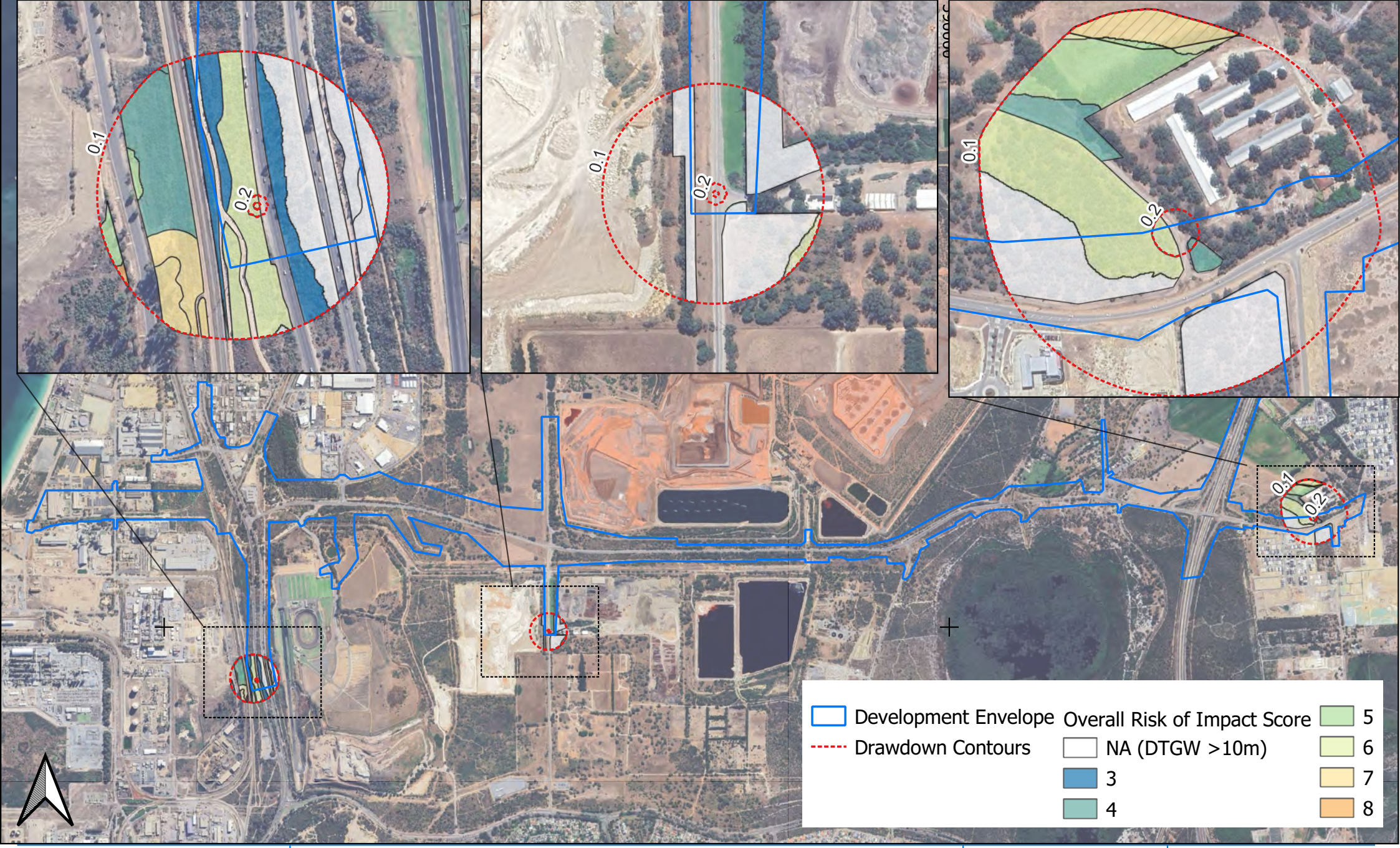
Risk of impact

The risk of impact to GDEs from this abstraction scenario is low (Figure 14). The total of 7.18 ha of potential GDE within the three drawdown zones are identified as having a low risk of impact (<10 score). The maximum drawdown of 0.2 m and 0.3 m is less than drawdown identified as likely to pose a high risk to GDEs i.e. drawdown >0.5 m for wetlands and >1.25 m for terrestrial vegetation (as identified by Froend and Loomes 2004).

The area of Tuart TEC (0.53 ha) within the 0.1 m drawdown contour of bore 3 had an overall risk impact of 7 to 8. The section is part of a larger Tuart TEC Patch (which extends outside of the total drawdown area of this bore) and occurs on shallow groundwater (0 – 3 m based on DTGW data). The overall risk of impact to this TEC is low considering drawdown of 0.1 m is classed as low risk for this type of GDE and historic change in groundwater level is negligible in this location.

Two sections of MU wetland 6530 occur in the 0.1m drawdown contour for production bore 1 and have risk of impact scores of 5 and 7 respectively. The risk of impact to this Multiple Use wetland is low, in due to:

- the wetland is classed as Multiple Use and supports limited ecological values (was mapped by Biota (2025) as isolated trees over paddock,
- historic change in groundwater is negligible (nearest bores had an increasing trend in groundwater),
- the 0.1m drawdown poses a low level of risk.



0 0.5 1 km

Projection: GDA 20 zone 50

Source: Base map © ESRI and its data suppliers, DPIRD (2019). Landgate (2019)

Figure 14: Production scenario 3a drawdown contours with overall risk of impact for GDEs

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5.3.2 Scenario 3b

The model results for Scenario 3b indicate a reduced extent of drawdown compared to Scenario 3a as groundwater levels partially recover when the pumping rate is reduced part way through the scenario.

At the end of the scenario the maximum modelled drawdown is reduced to 0.1 m at each of the three bores and the maximum extent (total drawdown area) is approximately 0.24 ha (bore 1), 0.03 ha (bore 2) and 0.02 ha (bore 3) (Figure 15).

GDEs present and environmental values identified within the 0.1 m drawdown extent for the three production bores, under Scenario 3b, is outlined below:

- Total drawdown area under Scenario 3b at Production bore 1 is 0.24 ha. Within that extent 0.11 ha of GDE native vegetation (6 – 10 m DTGW) was identified, of which 0.09 ha is Banksia Woodlands of the Swan Coastal Plain TEC and PEC. The remaining 0.13 ha is mapped as cleared/mixed land use.
- At Production bore 2 the total drawdown area under Scenario 3b is 0.03 ha. No GDEs were identified within this extent, the entire drawdown zone is mapped as cleared and roads and rail infrastructure.
- Maximum extent of drawdown at Production bore 3 is 0.02 ha. Within that extent 0.013 ha of GDE native vegetation (6 – 10 m DTGW) was identified which is Northern Spearwood shrublands and woodlands State Priority 3 PEC. The remaining area is mapped cleared.

The risk of impact at the end of Scenario 3b, to all GDEs at bores 1 and 3 (where GDEs were identified), is low to negligible (Figure 16). The maximum drawdown of 0.1 m is considered low risk to wetlands and vegetation (as identified by Froend and Loomes 2004).

0 0.5 1 km

Projection: GDA 20 zone 50

Source: Base map © ESRI and its data suppliers, DPIRD (2019). Landgate (2019)

Figure 15: Drawdown contours - production scenario 3b

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0 0.5 1 km

Projection: GDA 20 zone 50

Source: Base map © ESRI and its data suppliers, DPIRD (2019). Landgate (2019)

Figure 16: Production scenario 3b with overall risk of impact to GDEs

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5.4 Existing groundwater users

The online Water Register identified 36 current 5C groundwater licences issued within the Superficial aquifer across three groundwater areas intersecting the groundwater model boundary (Appendix B).

Based on the data provided on the Water Register i.e. the number and location of drawpoints displayed for a GW licence, and the risk threshold of 1 m or greater of groundwater drawdown, the risk to existing groundwater users was assessed as low for modelled scenarios of dewatering and abstraction (Figure 17).

No drawpoints (as displayed on the Water Register) intersect the maximum extent of drawdown (the 0.1 m drawdown contour) for modelled production scenarios Scenario 3a or Scenario 3b.

Assessment of the dewatering scenarios indicate a low level of risk to existing groundwater users considering all drawpoints occur outside of the 1 m drawdown risk threshold. No drawpoints occur from the maximum drawdown of 2 m to the 0.5 m contour in either scenario. Thirteen drawpoints occur between the 0.75 m and 0.1 m contour in the dewatering no recharge (dry season) scenario and ten drawpoints occur between the 0.5 m and 0.1 m contour in the dewatering with recharge (dry season) scenario.

0 100 200 m

Projection: GDA 20 zone 50

Source: Base map © ESRI and its data suppliers, DPIRD (2019). Landgate (2019)

Figure 17: Current SC groundwater licences with drawdown from {a) Scenario 3a {b) Scenario 3b

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6 Conclusion and Recommendations

Overall risk of impact to GDEs from dewatering and production scenarios is considered low.

Drawdown extent is small and bore placement means drawdown (as modelled) generally occurs where the depth the groundwater is relatively deep, reducing the risk of impact to GDEs, and/or environmental values associated with GDEs are limited. One section of multiple use wetland was scored with a moderate risk of impact under the dewatering scenario without recharge. With recharge the potential risk to this wetland was reduced to low.

Recharge of dewatering outputs via an infiltration trench, as modelled, appears to exclude any potential risk to the Tumulus Spring TEC occurring to the north of the dewatering location. Groundwater flow modelling indicates flow paths in the vicinity of the spring are not impacted under the dewatering scenario when recharge is incorporated. Modelled drawdown contours do not extend out to the Tumulus Spring TEC and therefore no impact to the TEC is expected.

Both production scenarios were considered to pose a low risk to GDEs. The modelled total drawdown area is very small and the degree of drawdown is low and poses a low risk of impact to GDEs.

In addition, given the relatively short timeframes for water abstraction under the dewatering and production scenarios assessed, the potential risk to GDEs is considered further reduced and groundwater models would be expected to recover following cessation of abstraction.

Similarly, the risk to existing groundwater users is low. The predicted drawdown from production bores under abstraction Scenario 3a and 3b do not intersect known bore locations of existing groundwater users.

7 References

Antao M (2015), Peel Coastal groundwater allocation plan: groundwater- dependent ecosystems, Department of Water, Perth, Western Australia.

Biota (2025). Westport Consolidated Biological Report. Prepared for Main Roads Western Australia. Biota Environmental Sciences, Perth, Western Australia.

DBCA (2023). Communities of Tumulus Springs (Organic Mound Springs, Swan Coastal Plain). Threatened Ecological Community Factsheet. Current as of September 2023.

DWER Water Register accessed 7 January 2025

FSG (2025). Anketell Road Upgrade Project, preliminary groundwater level assessment. Prepared for Main Roads Western Australia report no. 12106RAL02A. FSG Geotechnics and Foundations, Perth, Western Australia.

Froend R and Loomes R (2004), *Interim EWR Approach*. Joondalup: Centre for Ecosystem Management.

Froend R and Loomes R (2006), *Determination of ecological water requirements for groundwater dependent ecosystems – southern Blackwood and eastern Scott Coastal Plain*: Report for the Department of Water, Edith Cowan University, Perth.

Braimbridge M, Barron O and Hodgson G (2018) Assessment of ecological water requirements for the Peel Integrated Water Initiative. CSIRO, Australia.

Froend R, Loomes R, Horwitz P, Bertuch M, Storey A and Bamford M (2004), *Study of Ecological Water Requirements on the Gnangara and Jandakot Mounds under Section 46 of the Environmental Protection Act - Task 2: Determination of Ecological Water Requirements*. Prepared for: The Water and Rivers Commission by Centre for Ecosystem Management, ECU.

Department of Conservation and Land Management. (2006). Assemblages of organic mound (Tumulus) springs of the Swan Coastal Plain Interim Recovery Plan 2005–2010 (Interim Recovery Plan No. 198).

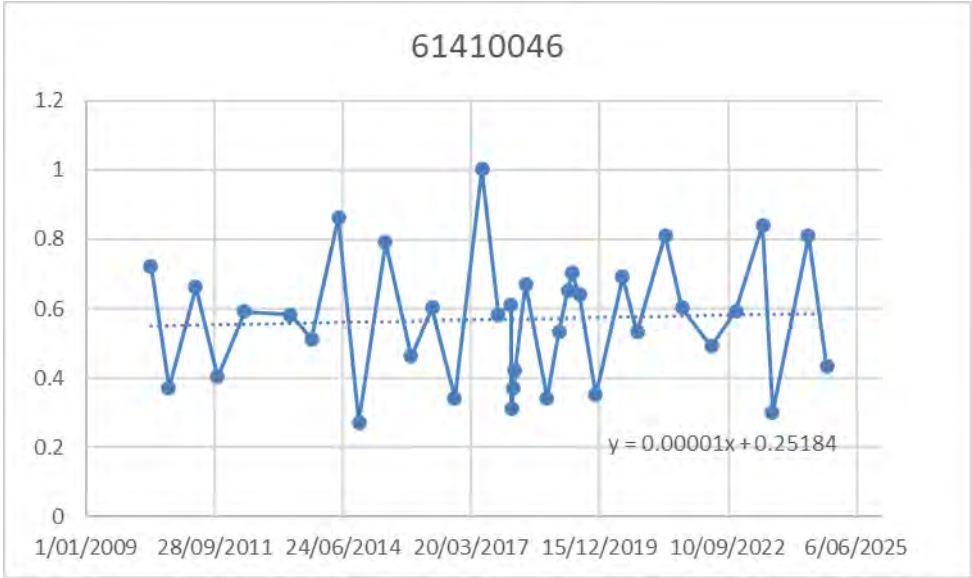
DEP (2000). *Bushforever: Keeping the bush in the city: Volume 2 – directory of bushforever sites*. Published by the Department of Environmental Protection, Perth, Western Australia.

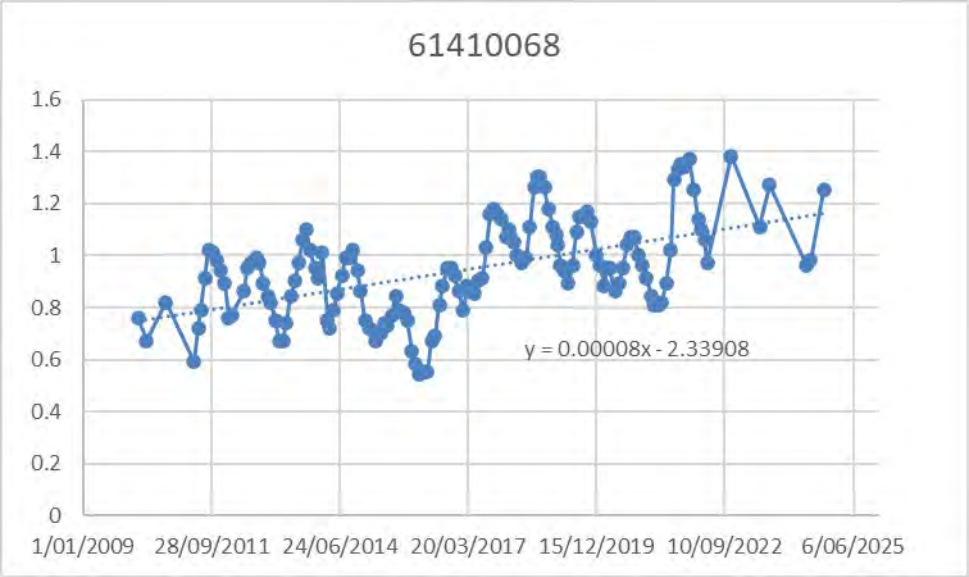
DBCA (2023). Spatial dataset – Geomorphic Wetlands Swan Coastal Plain dataset (DBCA-019). Department of Biodiversity, Conservation and Attractions, Western Australia.

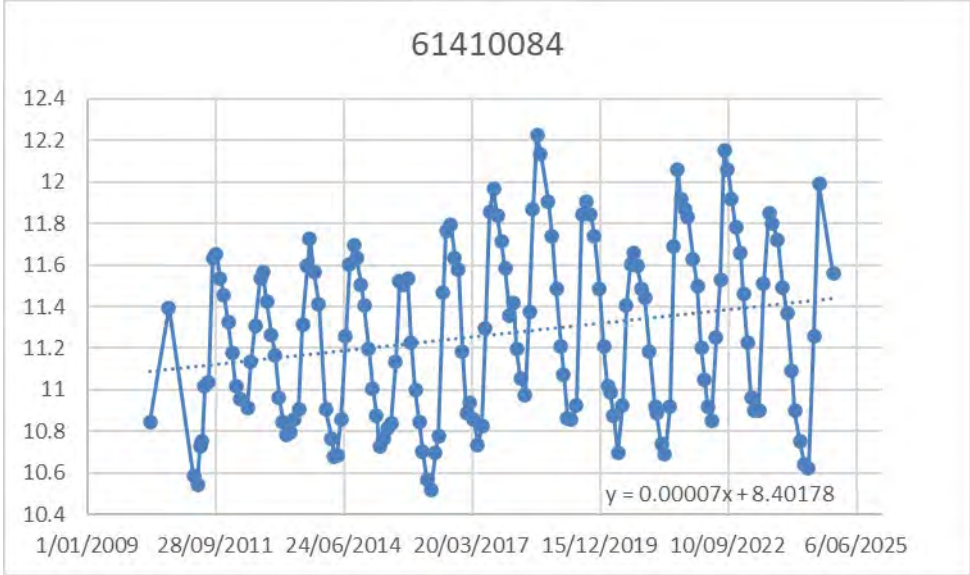
DBCA (2018). Spatial dataset - Directory of Important Wetlands in Australia - Western Australia (DBCA-045). Department of Biodiversity, Conservation and Attractions, Western Australia.

DBCA (2017). Spatial dataset - Ramsar sites (DBCA-010). Department of Biodiversity, Conservation and Attractions, Western Australia.

Appendix A: Long term groundwater monitoring



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15/12/2019
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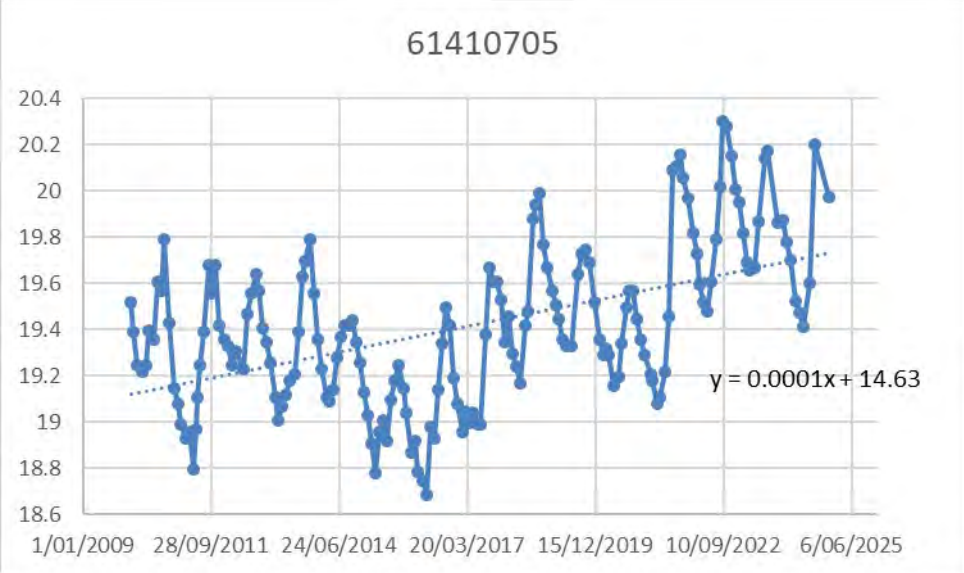
6/06/2025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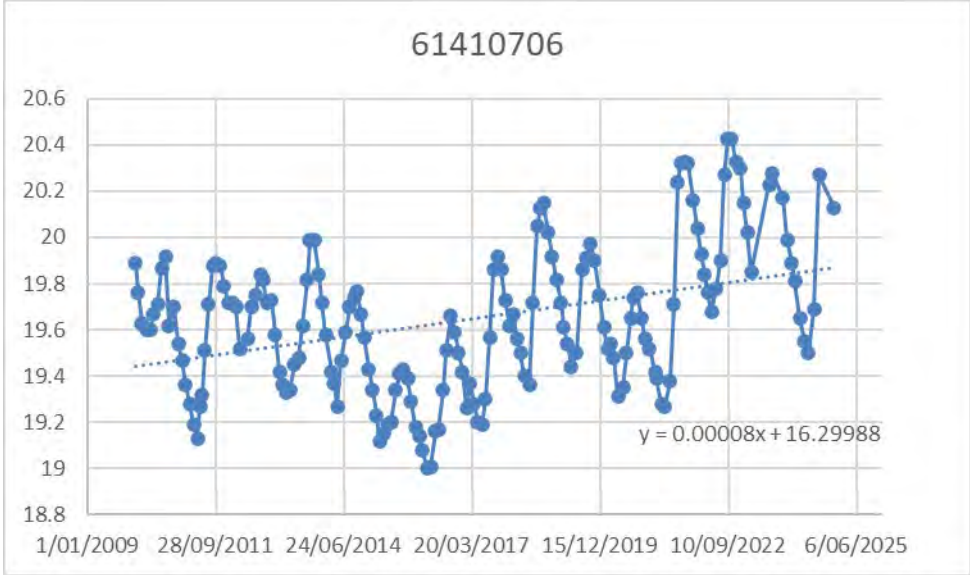
6/06/2025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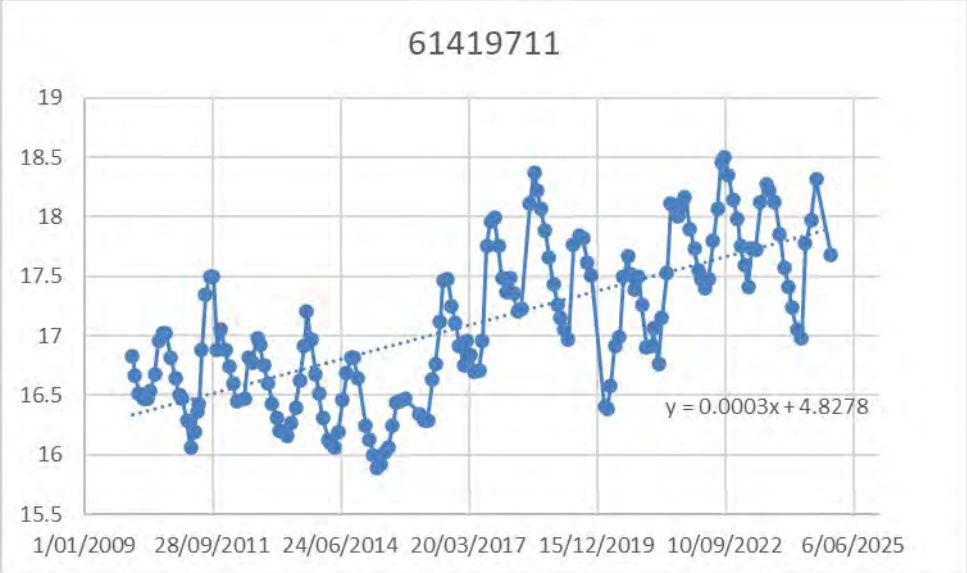
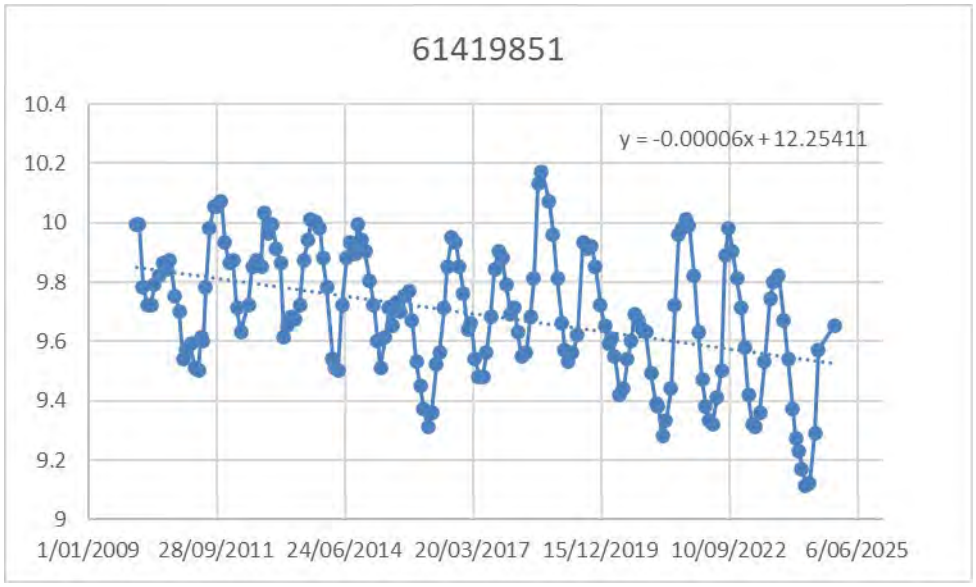
19
18.8
y = 0.00008x + 16.29988
1/01/2009
28/09/2011
24/06/2014
20/03/2017
15/12/2019
10/09/2022
6/06/2025


61419711
19
18.5
18
17.5
17
16.5
16
15.5
y = 0.0003x + 4.8278
1/01/2009
28/09/2011
24/06/2014
20/03/2017
15/12/2019
10/09/2022
6/06/2025


61419851
y = -0.00006x + 12.25411
10.4
10.2
10
9.8
9.6
9.4
9.2
9
1/01/2009
28/09/2011
24/06/2014
20/03/2017
15/12/2019
10/09/2022
6/06/2025

Appendix B: Existing groundwater users

Table 11: Current 5C groundwater licences within the model boundary

Licence Number	Licence Allocation	# of drawpoints
Serpentine Jandakot Mound 1 Perth - Superficial Swan		
48228	19950 KL	1
58529	9200 KL	2
101078	10350 KL	2
160839	8000 KL	1
179454	61150 KL	2
182060	14625 KL	1
202118	1875 KL	1
203006	15375 KL	1
208076	16800 KL	1
210876	20000 KL	1
106782	6750 KL	1
150481	17900 KL	2
156470	18650 KL	1
Jandakot, Mandogalup, Perth - Superficial Swan		
166922	724935 KL	3
169930	119650 KL	1
171301	9750 KL	1
177515	270800 KL	2
181321	300000 KL	2
200427	8400 KL	1
200440	15150 KL	1
202605	226285 KL	5
205255	18650 KL	1
Cockburn, Valley, Perth - Superficial Swan		
50465	97000 KL	2
54280	15000 KL	1
59069	26500 KL	3
73597	12000 KL	1
78096	300000 KL	1
109942	150000 KL	2

158359	3000 KL	1
159072	60850 KL	1
159085	5404000 KL	many
163607	40000 KL	1
175643	75000 KL	1
175930	129100 KL	1
181288	1500 KL	1
200502	35000 KL	1