GOVERNMENT OF
WESTERN AUSTRALIA

CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 9139/2
Permit Holder:	City of Wanneroo
Duration of Permit:	From 20 August 2021 to 20 August 2026

The permit holder is authorised to clear *native vegetation* subject to the following conditions of this permit.

PART I – CLEARING AUTHORISED

1. Clearing authorised (purpose)

Typha orientalis and *Typha domingensis* control

2. Land on which clearing is to be done

Crown Reserve (PIN 408326) Wanneroo
Lot 300 on Deposited Plan 106721 Wanneroo
Lot 740 on Deposited Plan 245969 Wanneroo
Crown Reserve (PIN 408324) Wanneroo
Crown Reserve (PIN 11377834) Wanneroo
Crown Reserve (PIN 1126271) Wanneroo
Crown Reserve (PIN 408314) Wanneroo
Crown Reserve (PIN 408313) Wanneroo
Crown Reserve (PIN 1088896) Wanneroo
Crown Reserve (PIN 408320) Wanneroo
Crown Reserve (PIN 408319) Wanneroo
Crown Reserve (PIN 408317) Wanneroo
Crown Reserve (PIN 408316) Wanneroo
Crown Reserve (PIN 1068) Wanneroo
Lot 2451 on Deposited Plan 133174 (Crown Allotment PIN 408319) Wanneroo
Lot 2385 on Deposited Plan 133173 (Crown Allotment PIN 408317) Wanneroo
Lot 2384 on Deposited Plan 133172 (Crown Allotment PIN 408320) Wanneroo
Lot 774 on Deposited Plan 246224 (Crown Allotment PIN 408313) Wanneroo
Lot 672 on Deposited Plan 245973 (Crown Allotment PIN 408316) Wanneroo
Crown Reserve (PIN 9407) Wanneroo
Crown Reserve (PIN 9360) Wanneroo
Crown Reserve (PIN 9359) Wanneroo
Lot 143 on Plan 10445 (Crown Allotment PIN 9360) Wanneroo
Lot 139 on Plan 9815 (Crown Allotment PIN 9407) Wanneroo
Lot 137 on Plan 10027 (Crown Allotment PIN 9359) Wanneroo
Lot 73 on Diagram 56768 Wanneroo

Lot 36 on Diagram 48067 Wanneroo
Lot 1 on Diagram 62246 Wanneroo
Lot 11524 on Diagram 56917 Wanneroo
Crown Reserve (PIN 4826) Mariginiup
Lot 300 on Deposited Plan 301991 Wanneroo
Easement on Deposited Plan 76721 (PIN 12033733) Wanneroo
Easement on Deposited Plan 68139 (PIN 11914148) Woodvale
Crown Reserve (PIN 11043623) Wanneroo
Lot 41 on Plan 32924 (Crown Allotment PIN 11043626) Wanneroo
Lot 40 on Plan 32924 (Crown Allotment PIN 11043625) Wanneroo
Lot 39 on Plan 32924 (Crown Allotment PIN 11043624) Wanneroo
Crown Reserve (PIN 11023502) Wanneroo
Crown Reserve (PIN 1359140) Wanneroo
Crown Reserve (PIN 1359137) Wanneroo
Lot 8 on Deposited Plan 231377 (Crown Allotment PIN 1069) Wanneroo
Crown Reserve (PIN 11043625) Wanneroo
Crown Reserve (PIN 11043624) Wanneroo
Crown Reserve (PIN 11043626) Wanneroo
Crown Reserve (PIN 1060196) Marangaroo
Lot 13968 on Plan 23449 (Crown Allotment PIN 1284672) Landsdale
Crown Reserve (PIN 12324956) Woodvale
Crown Reserve (PIN 11926159) Woodvale
Lot 300 on Deposited Plan 413701 Woodvale
Crown Reserve (PIN 12255914) Landsdale
Crown Reserve (PIN 1284672) Landsdale
Lot 801 on Deposited Plan 409474 Landsdale
Crown Reserve (PIN 12033732) Wanneroo
Lot 801 on Deposited Plan 76721 Wanneroo
Lot 800 on Deposited Plan 76721 Wanneroo
Crown Reserve (PIN 11914120) Wanneroo
Lot 3000 on Deposited Plan 69603 Marangaroo
Crown Reserve (PIN 11921958) Wanneroo
Lot 8001 on Deposited Plan 68139 Woodvale
Crown Reserve (PIN 11841633) Madeley
Lot 555 on Deposited Plan 64232 Madeley
Lot 808 on Deposited Plan 50215 Woodvale
Crown Reserve (PIN 11480003) Tapping
Lot 705 on Deposited Plan 46781 Tapping
Lot 12421 on Plan 20358 (Crown Allotment PIN 1126271) Wanneroo
Lot 11921 on Plan 18933 (Crown Allotment PIN 1088896) Wanneroo
Lot 11139 on Plan 217410 (Crown Allotment PIN 1060196) Wanneroo

3. Clearing authorised

The permit holder must not clear more than 27.5 hectares of *native vegetation* within the area cross-hatched yellow in Figures 1-9 of Schedule 1.

PART II – MANAGEMENT CONDITIONS

4. Avoid, minimise, and reduce impacts and extent of clearing

In determining the *native vegetation* authorised to be cleared under this permit, the permit holder must apply the following principles, set out in descending order of preference:

(a) avoid the clearing of *native vegetation*;

(b) minimise the amount of *native vegetation* to be cleared; and

(c) reduce the impact of clearing on any environmental value.

5. Weed and dieback management

When undertaking any clearing authorised under this permit, the permit holder must take the following measures to minimise the risk of introduction and spread of *weeds* and *dieback*:

(a) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;

(b) ensure that no known *dieback* or *weed*-affected soil, *mulch, fill*, or other material is brought into the area to be cleared; and

(c) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

6. Directional clearing

The permit holder must conduct clearing activities in a slow, progressive manner from one direction only to allow fauna to move into adjacent *native vegetation* ahead of the clearing activity.

7. Fauna Management

(a) The permit holder must inspect the area authorised to be cleared under this permit prior to works commencing and for the duration of clearing for any native fauna that may be present.

(b) Where fauna have been identified under condition 7(a), works must cease until the fauna have escaped into adjacent habitat ahead of the clearing activity or translocated into adjacent native vegetation.

8. Weed Management – Chemical

The permit holder must only undertake spot spraying of Roundup Biactive solution during the driest period of the year, between October to March.

PART III - RECORD KEEPING AND REPORTING

9. Records that must be kept

The permit holder must maintain records relating to the listed relevant matters in accordance with the specifications detailed in Table 1.

Table 1: Records that must be kept

No.	Relevant matter	Specifications
1.	In relation to the authorised clearing activities generally	(a) the species composition, structure, and density of the cleared area; (b) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings; (c) the date that the area was cleared; (d) the direction that the clearing occurred; (e) the size of the area cleared (in hectares); (f) actions taken to avoid, minimise, and reduce the impacts and extent of clearing in accordance with condition 4; (g) actions taken to minimise the risk of the introduction and spread of *weeds* and *dieback* in accordance with condition 5; (h) fauna management actions taken in accordance with condition 7; and (i) the date that chemical weed control occurred in accordance with condition 8.

10. Reporting

The permit holder must provide to the *CEO* the records required under condition 9 of this permit when requested by the *CEO*.

DEFINITIONS

In this permit, the terms in Table have the meanings defined.

Table 2: Definitions

Term	Definition
CEO	Chief Executive Officer of the department responsible for the administration of the clearing provisions under the *Environmental Protection Act 1986*.
clearing	has the meaning given under section 3(1) of the EP Act.
condition	a condition to which this clearing permit is subject under section 51H of the EP Act.
dieback	means the effect of *Phytophthora* species on native vegetation.
department	means the department established under section 35 of the *Public Sector Management Act 1994* (WA) and designated as responsible for the administration of the EP Act, which includes Part V Division 3.
EP Act	*Environmental Protection Act 1986* (WA)
fill	Means material used to increase the ground level, or to fill a depression.
mulch	Means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation.
native vegetation	has the meaning given under section 3(1) and section 51A of the EP Act.
weeds	means any plant – (a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*; or (b) published in a Department of Biodiversity, Conservation and Attractions species-led ecological impact and invasiveness ranking summary, regardless of ranking; or (c) not indigenous to the area concerned.

END OF CONDITIONS

Mathew Gannaway
MANAGER
NATIVE VEGETATION REGULATION

Officer delegated under Section 20
of the Environmental Protection Act 1986

26 August 2021

Schedule 1

The boundary of the area authorised to be cleared is shown in the maps below (Figures 1-9 below).

CPS 9139/2 – Plan A

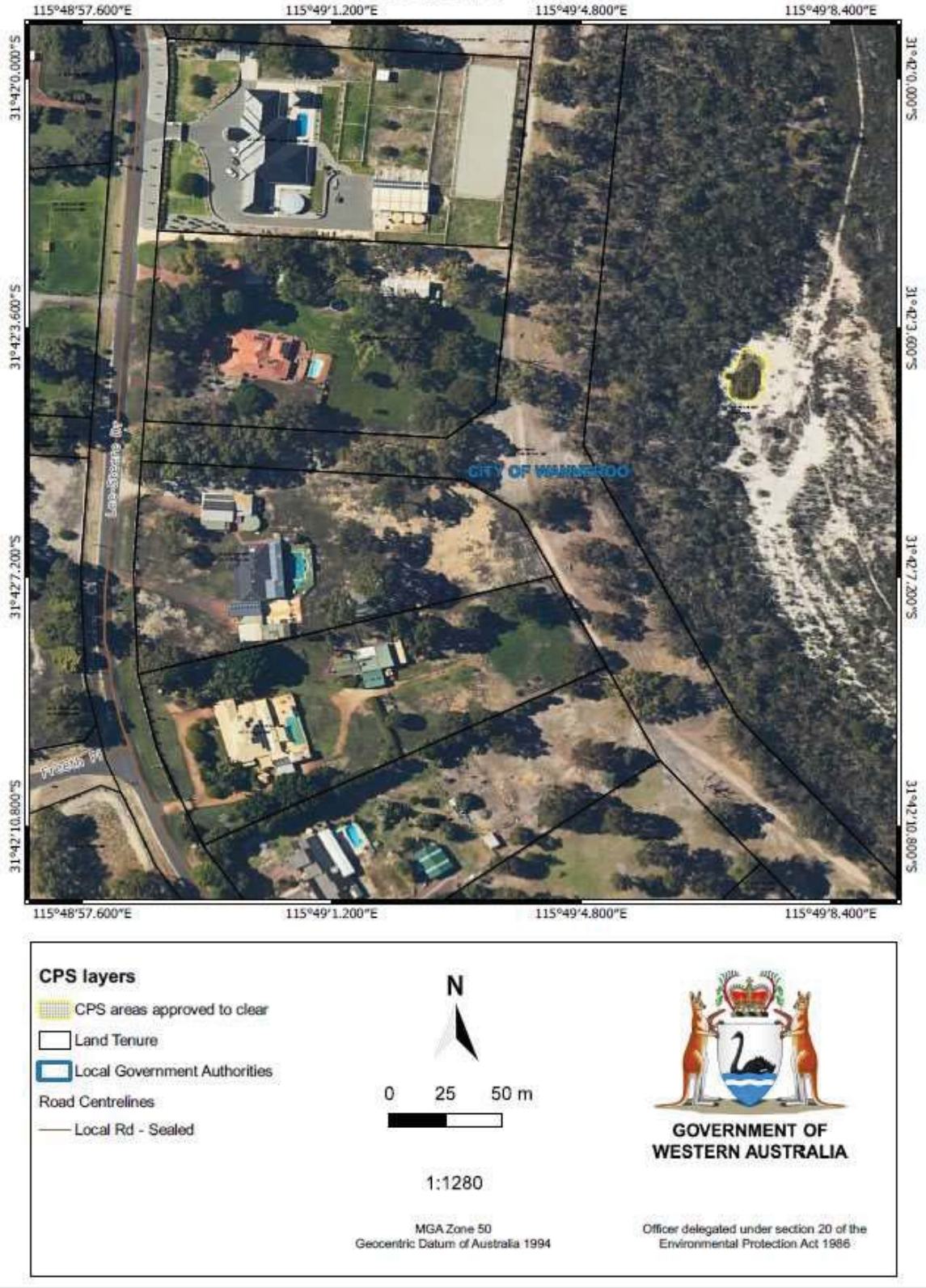

Figure 1: Map of the boundary of the area within which clearing may occur

Figure 2: Map of the boundary of the area within which clearing may occur

CPS 9139/2 – Plan C

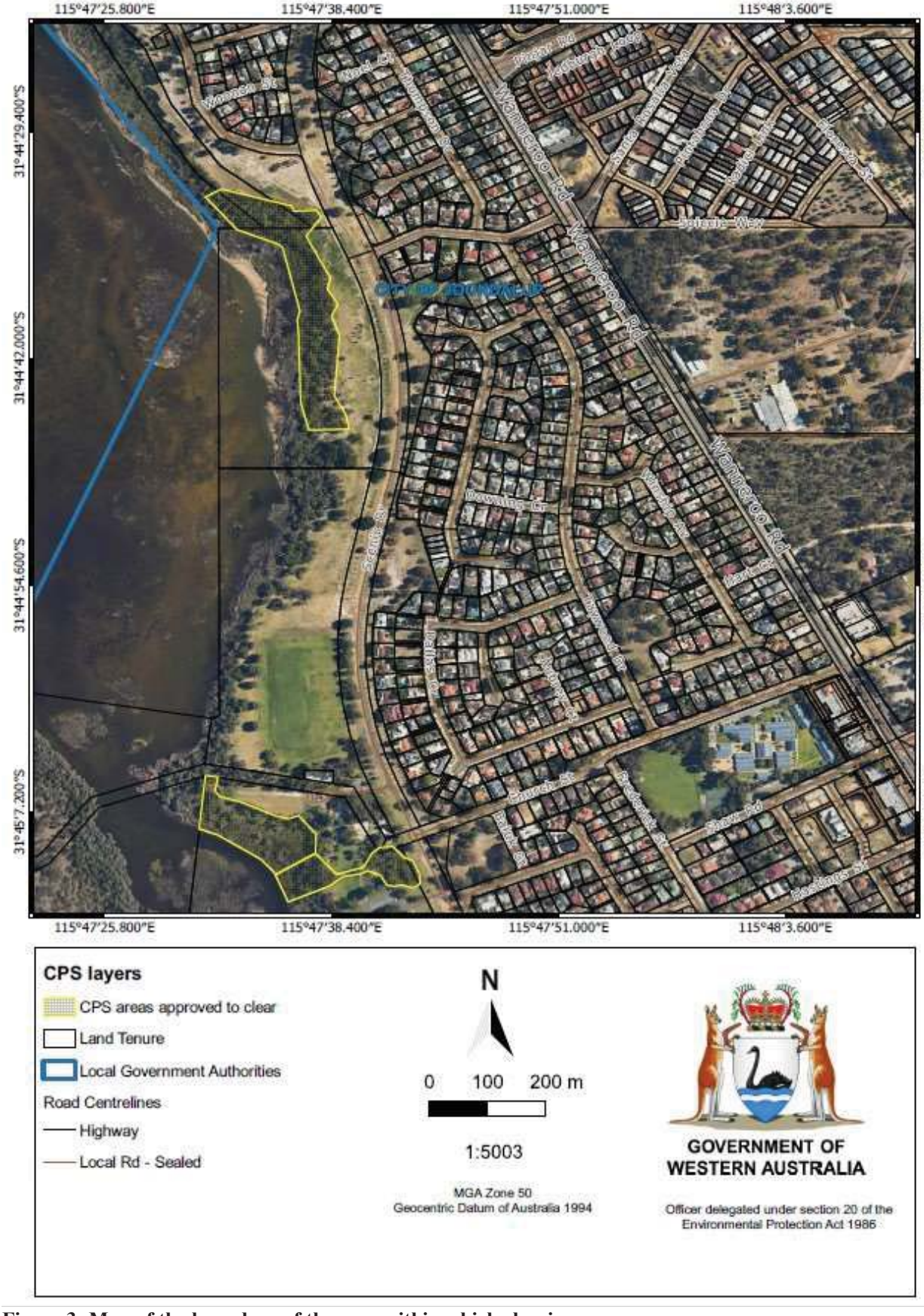

Figure 3: Map of the boundary of the area within which clearing may occur

CPS 9139/2 – Plan D

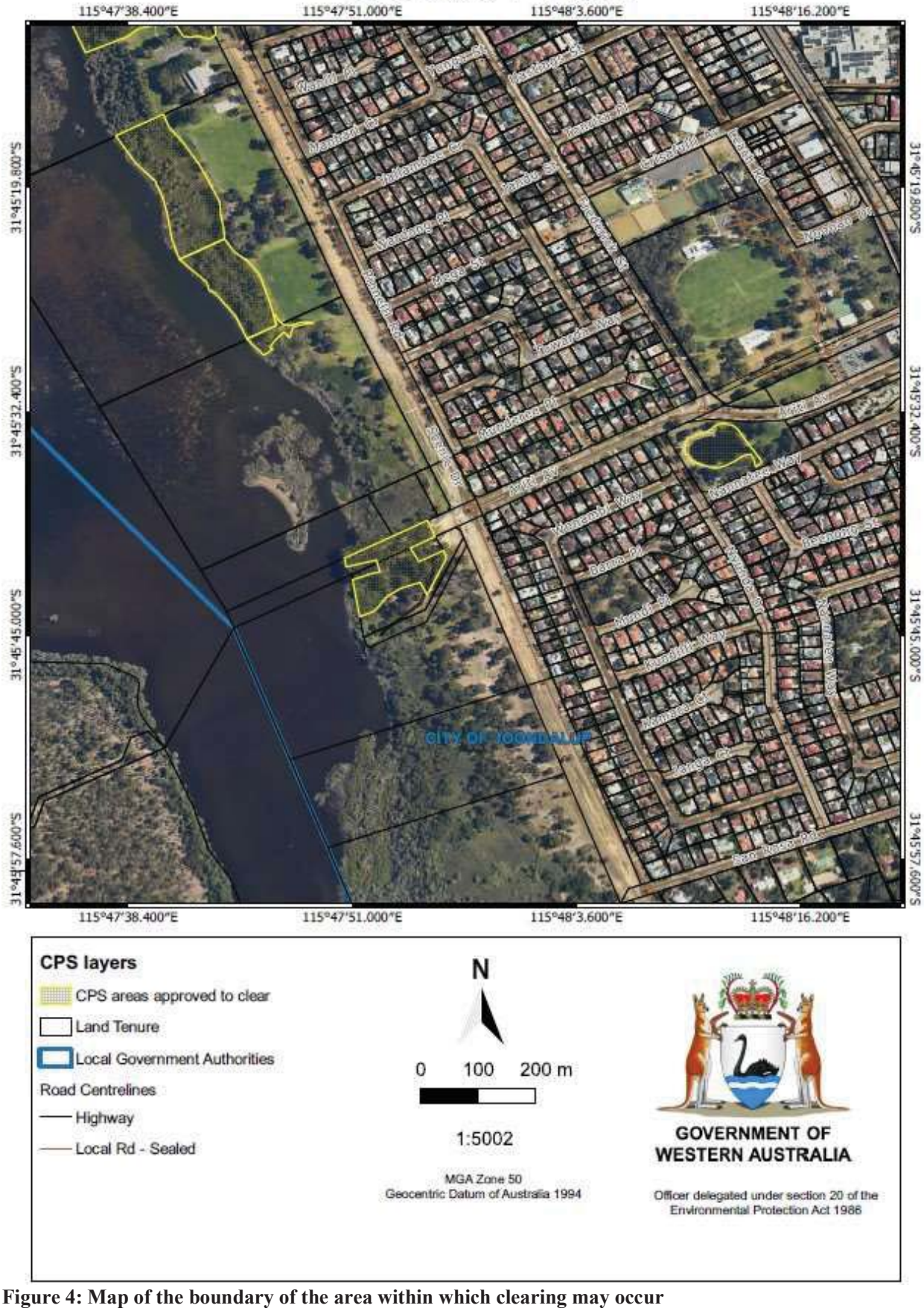

Figure 4: Map of the boundary of the area within which clearing may occur

CPS 9139/2 – Plan E

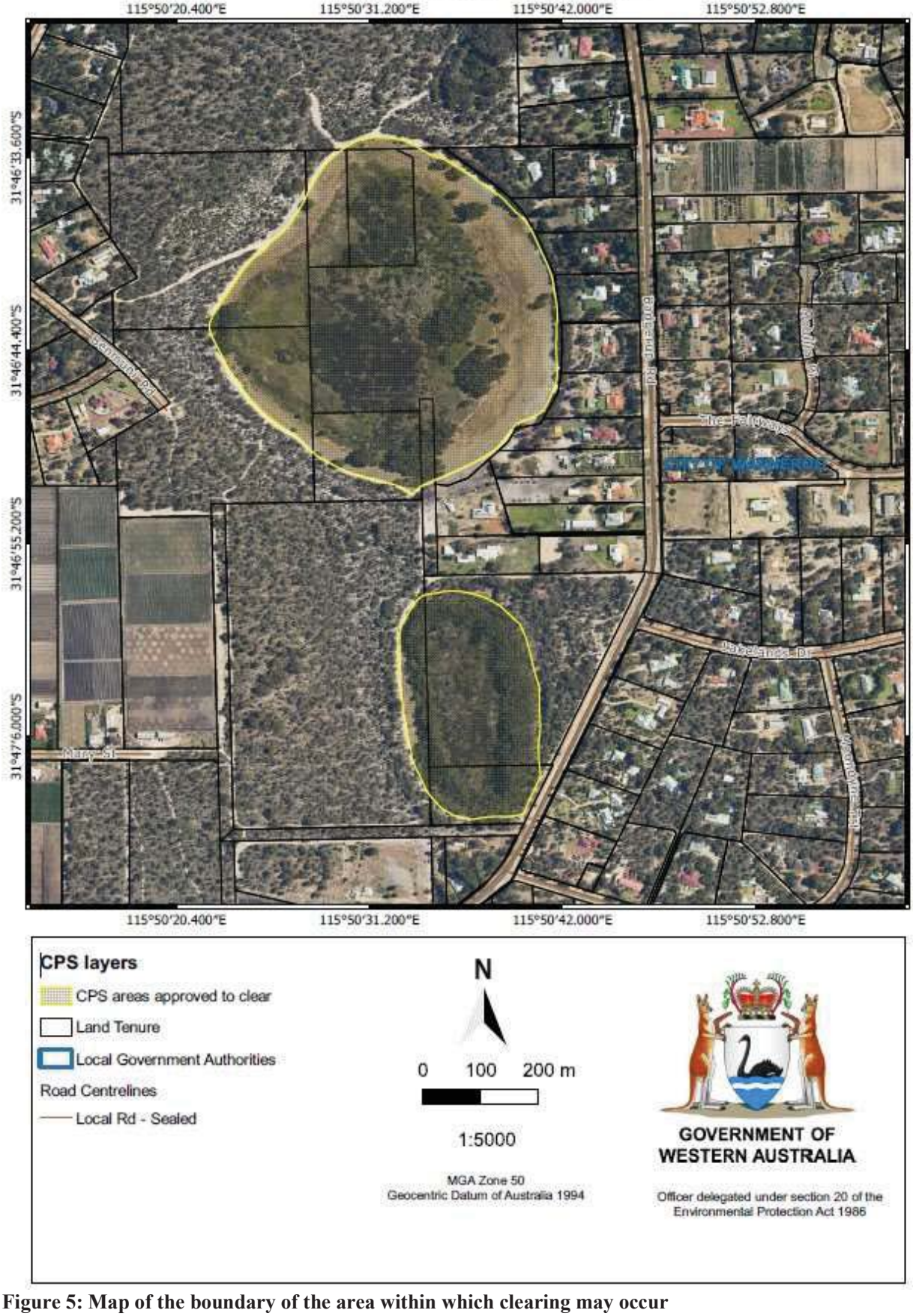

Figure 5: Map of the boundary of the area within which clearing may occur

CPS 9139/2 – Plan F

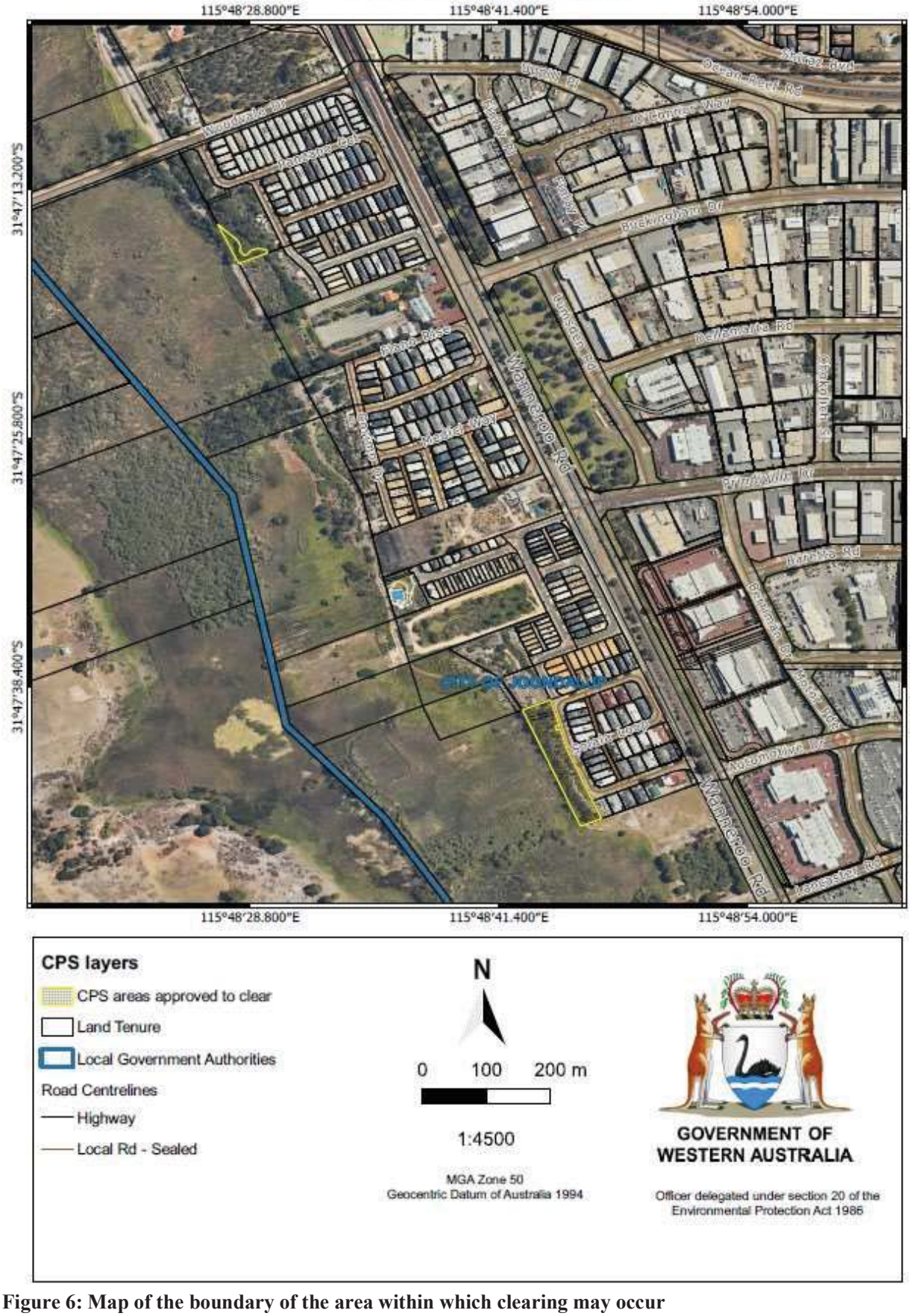

Figure 6: Map of the boundary of the area within which clearing may occur

CPS 9139/2 – Plan G

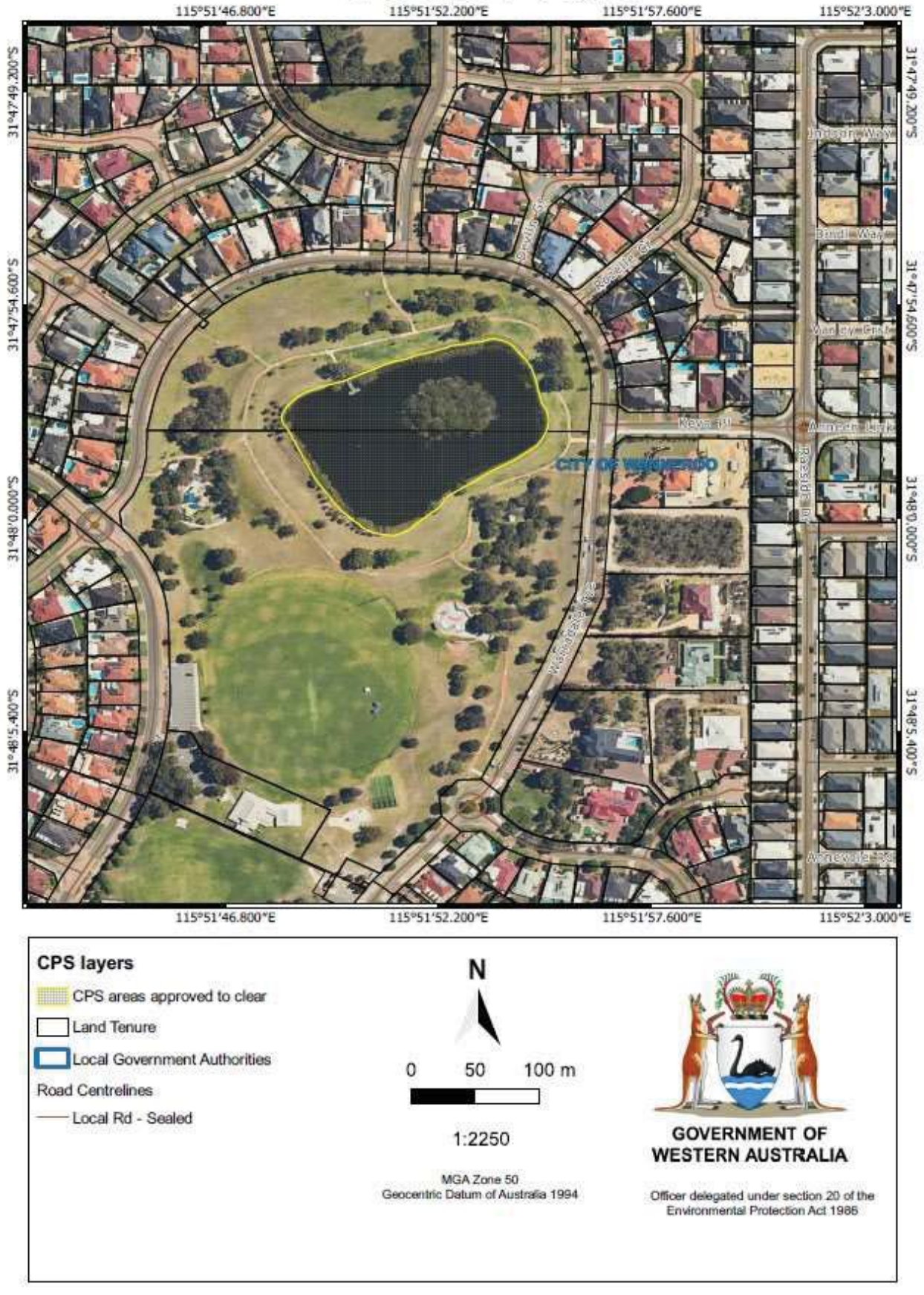

Figure 7: Map of the boundary of the area within which clearing may occur

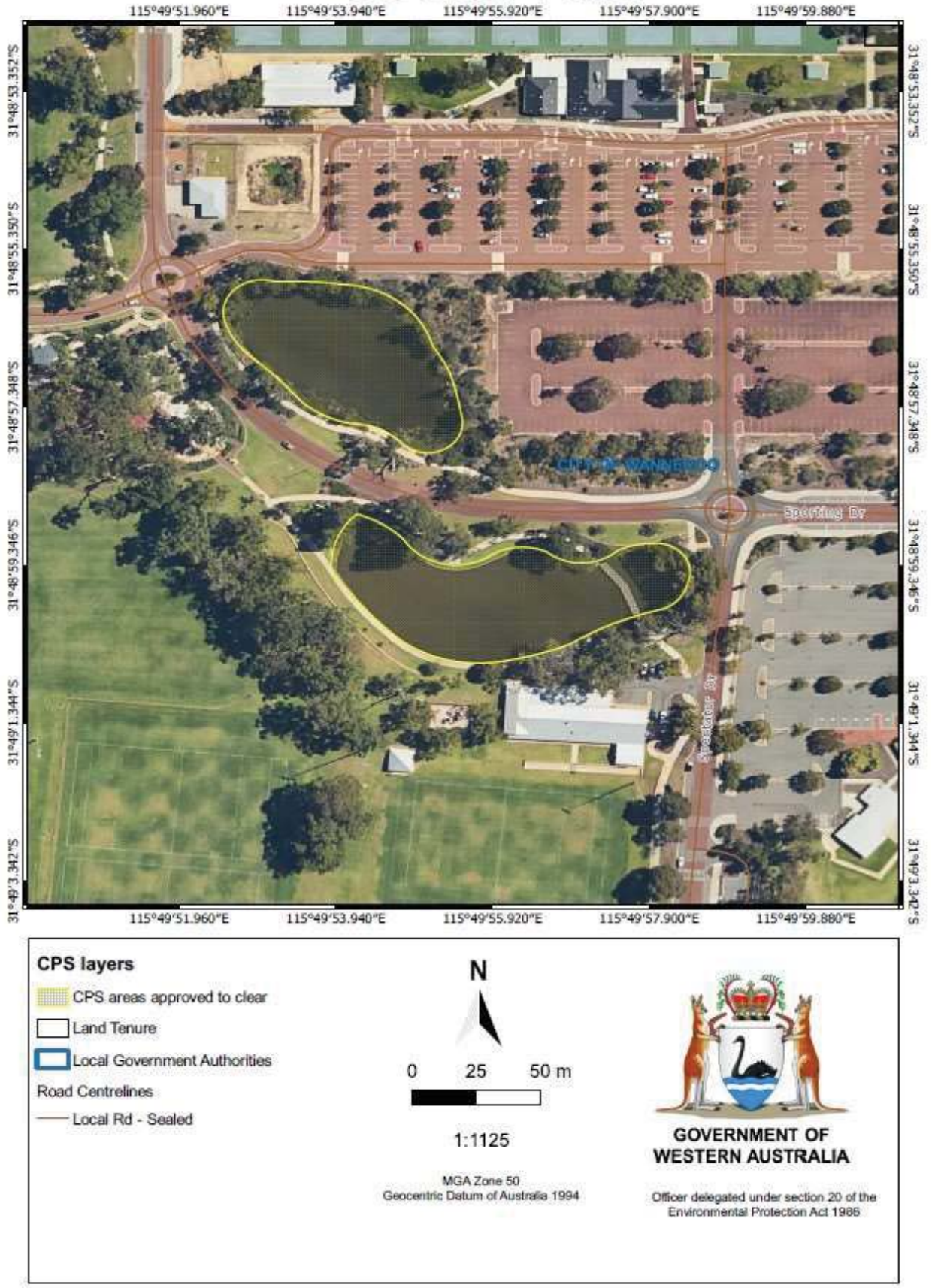

Figure 8: Map of the boundary of the area within which clearing may occur

CPS 9139/2 – Plan I

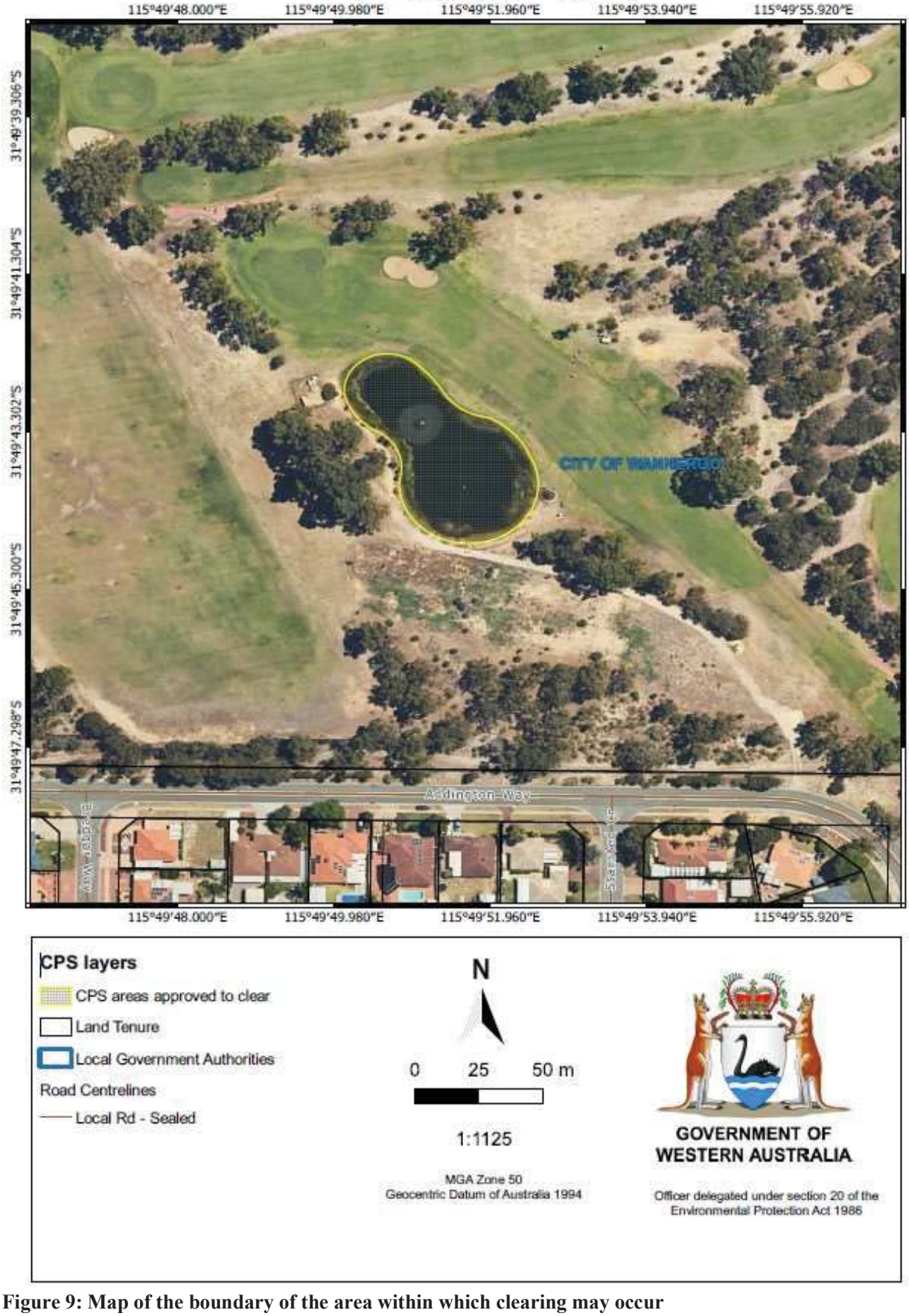

Figure 9: Map of the boundary of the area within which clearing may occur

Government of Western Australia
Department of Water and Environmental Regulation

Clearing Permit Decision Report

1 Application details and outcome

1.1. Permit application details

Permit number:	CPS 9139/2
Permit type:	Purpose permit
Applicant name:	City of Wanneroo
Application received:	08 December 2020
Application area:	27.5 hectares of native vegetation within a 41.63-hectare footprint (as revised)
Purpose of clearing:	*Typha orientalis* and *Typha domingensis* control
Method of clearing:	Mechanical/chemical
Property:	See Appendix A
Location (LGA area/s):	City of Wanneroo
Localities (suburb/s):	Within multiple properties in Landsdale, Madeley, Marangaroo, Mariginiup, Wanneroo, Woodvale and Tapping

1.2. Description of clearing activities

This application is for targeting the removal of two species of robust herbaceous plants, *Typha domingensis* and *T. orientalis* (collectively referred to as Typha). Typha is distributed across nine targeted areas comprised of one or more, natural or manmade waterbodies and wetland areas (see Figure 1, Section 1.5), within various properties managed by the applicant. The species composition of each stand proposed to be cleared has not been verified. Therefore, for the purpose of this report, all stands of either or both species will be referred to as Typha.

The applicant has further delineated portions of the application area at Joondalup Lake into six separate sites (see appendix G, Figure 11-48). The remainder of the application area is comprised of the following waterbodies:

- Nyunda Park (see Appendix G, Figure 49-53)
- Lake Adams (see section Appendix G, Figure 54-57)
- Da Vinci Park (see section Appendix G, Figure 58-59)
- Badgerup lake (see section Appendix G, Figure 66-70)
- Little Badgerup lake (see section Appendix G, Figure 71-72)
- Warradale Park Site/Snake Swamp (see section Appendix G, Figure 73-77)
- Kingsway Lake North (see section Appendix G, Figure 78-84)
- Kingsway Lake North (see section Appendix G, Figure 78-84)
- Marangaroo Golf course (see section Appendix G, Figure 85-87)

The application area also includes two sites at Wallubuenup Swamp (see section Appendix G, Figure 60-59), adjacent to a public walkway and cycle path.

The applicant has proposed to implement a range of methods for Typha control, including wiping with a Roundup Biactive solution, mechanical removal with a brush cutter, chemical spray and draining, and mechanical removal and flooding (see Section 3.1 for further details).

1.3. Decision on application

Decision:	Granted
Decision date:	27 July 2021
Decision area:	Up to 27.5 hectares of native vegetation within a 41.63-hectare footprint.

1.4. Reasons for decision

On 27 July 2021, Clearing Permit CPS 9139/1 was granted to clear up to 27.5 hectares of native vegetation within a 41.63 hectare footprint within various land parcels around Lake Joondalup, Lake Adams, Da Vinci Park, Solana Park, Panzano Park, Badgerup Reserve, Little Badgerup Reserve, Warradale Park, Kingsway Regional Sporting Complex, Marangaroo Golf Course, and Nyunda Park in the City of Wanneroo for the purpose of *Typha orientalis* and *Typha domingensis* control.

Following the grant, it was identified that a clerical error had occurred on the permit. This clearing permit amendment removes repetition of condition 9 and includes a reporting condition (condition 10).

Given the above, the Delegated Officer decided to grant this amendment to correct the clerical error. The assessment has not changed from the determination of Clearing Permit CPS 9139/1.

1.5. Site maps

CPS 9139/2 – Context Map

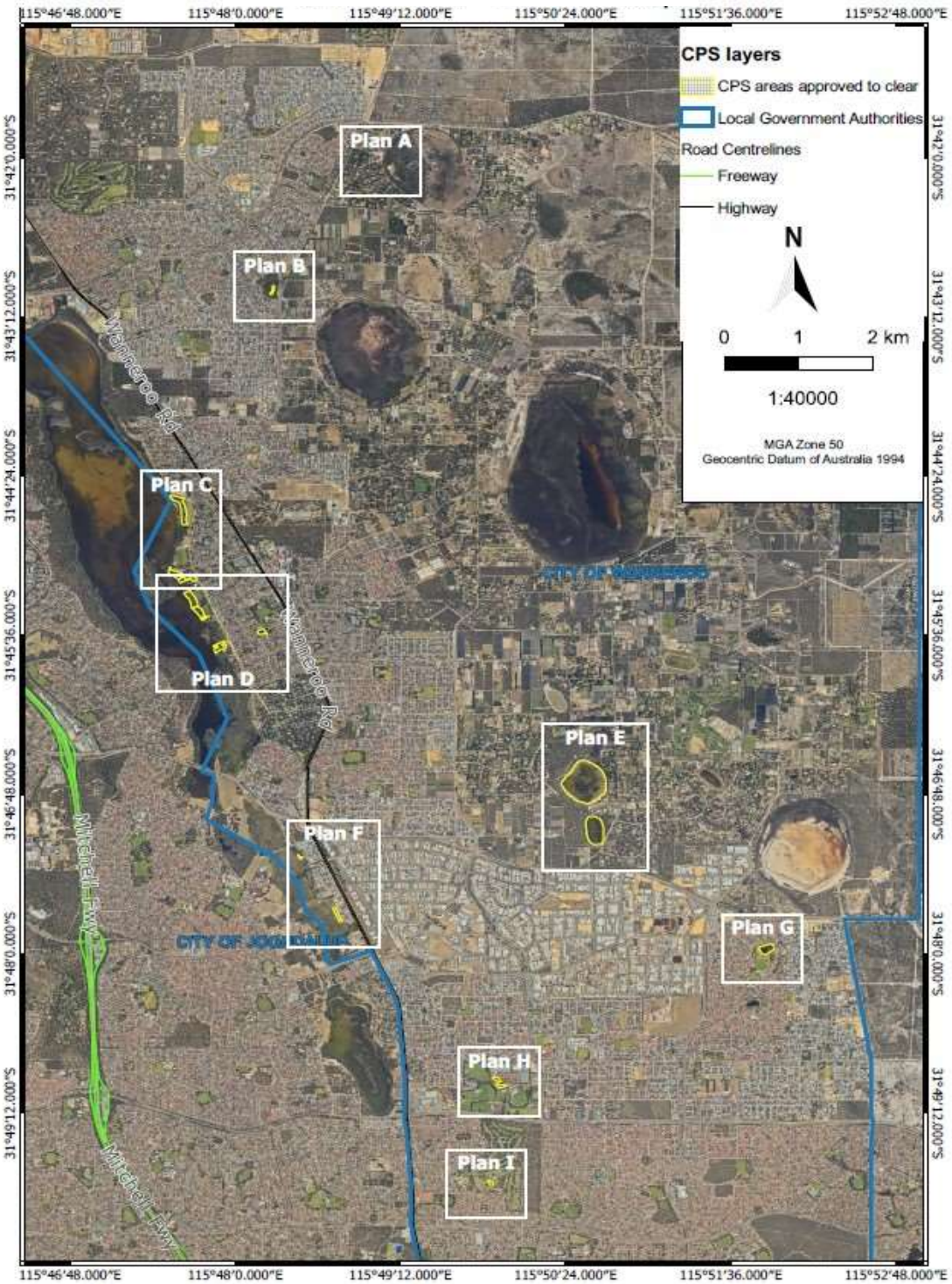

Figure 1 Context map of the application area. Areas crosshatched yellow indicate the areas authorised to be cleared under the granted clearing permit.

CPS 9139/2 – Plan A

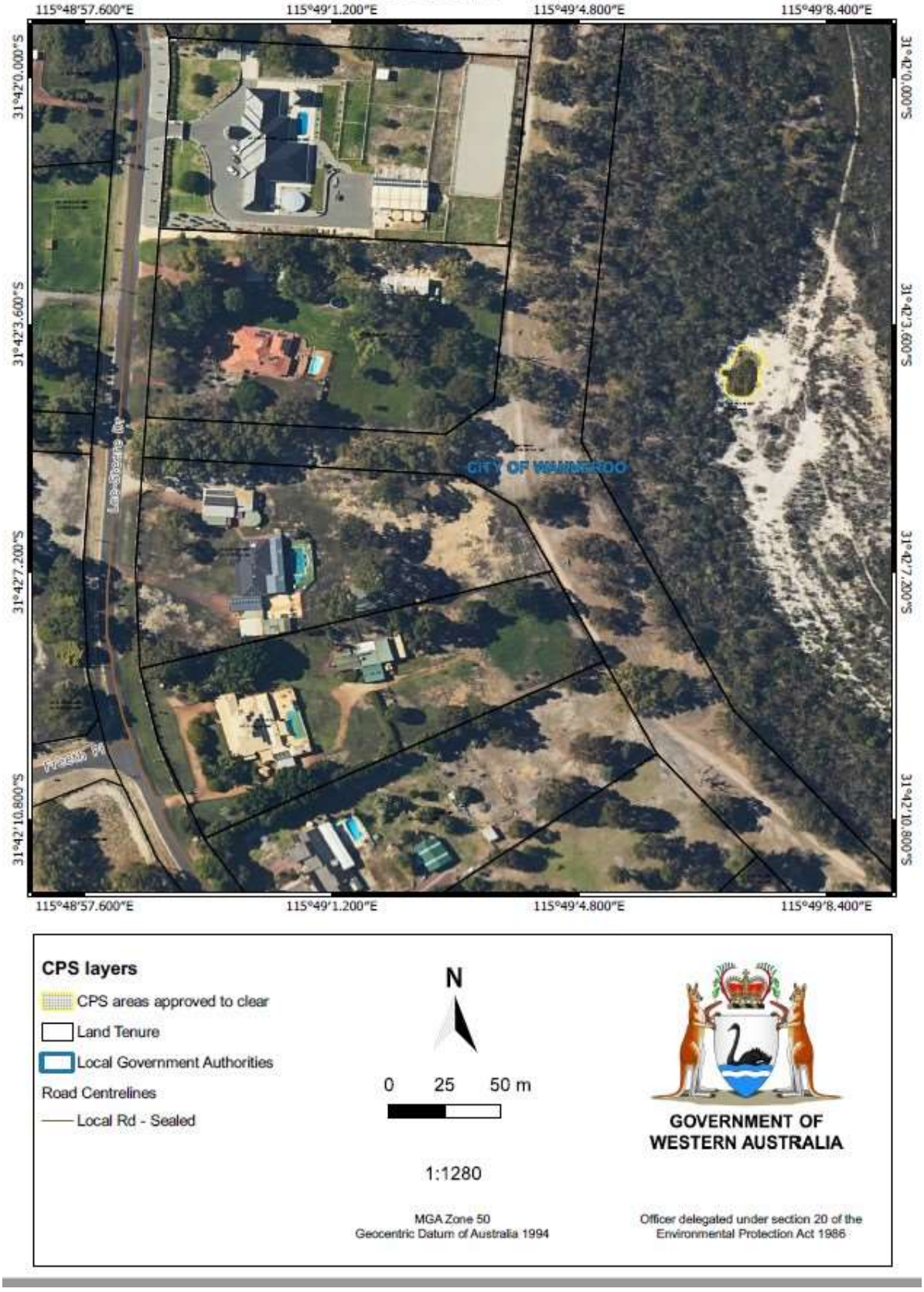

Figure 2 Lake Adams.

CPS 9139/2 – Plan B

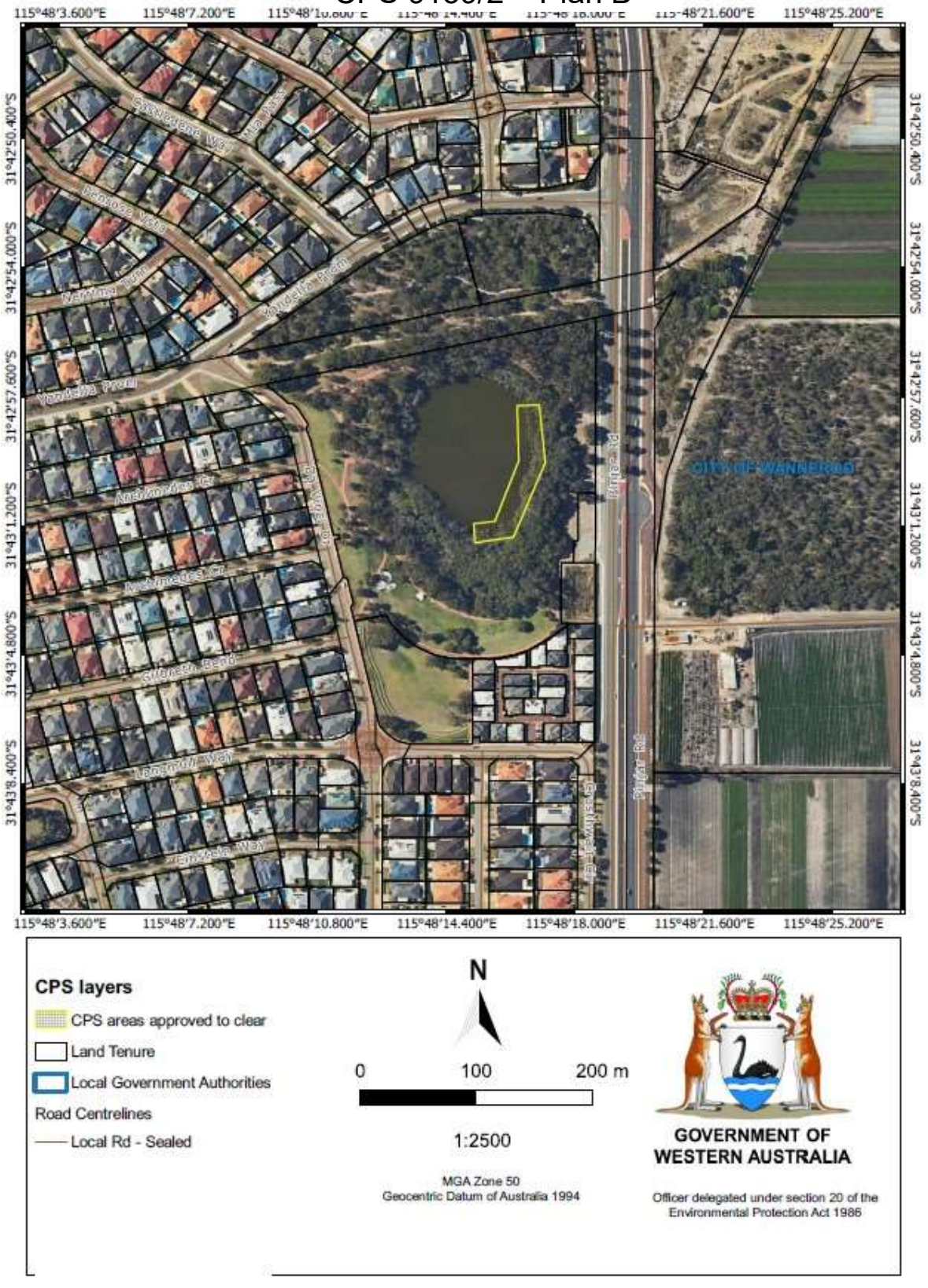

Figure 3 Da Vinci Park.

CPS 9139/2 – Plan C

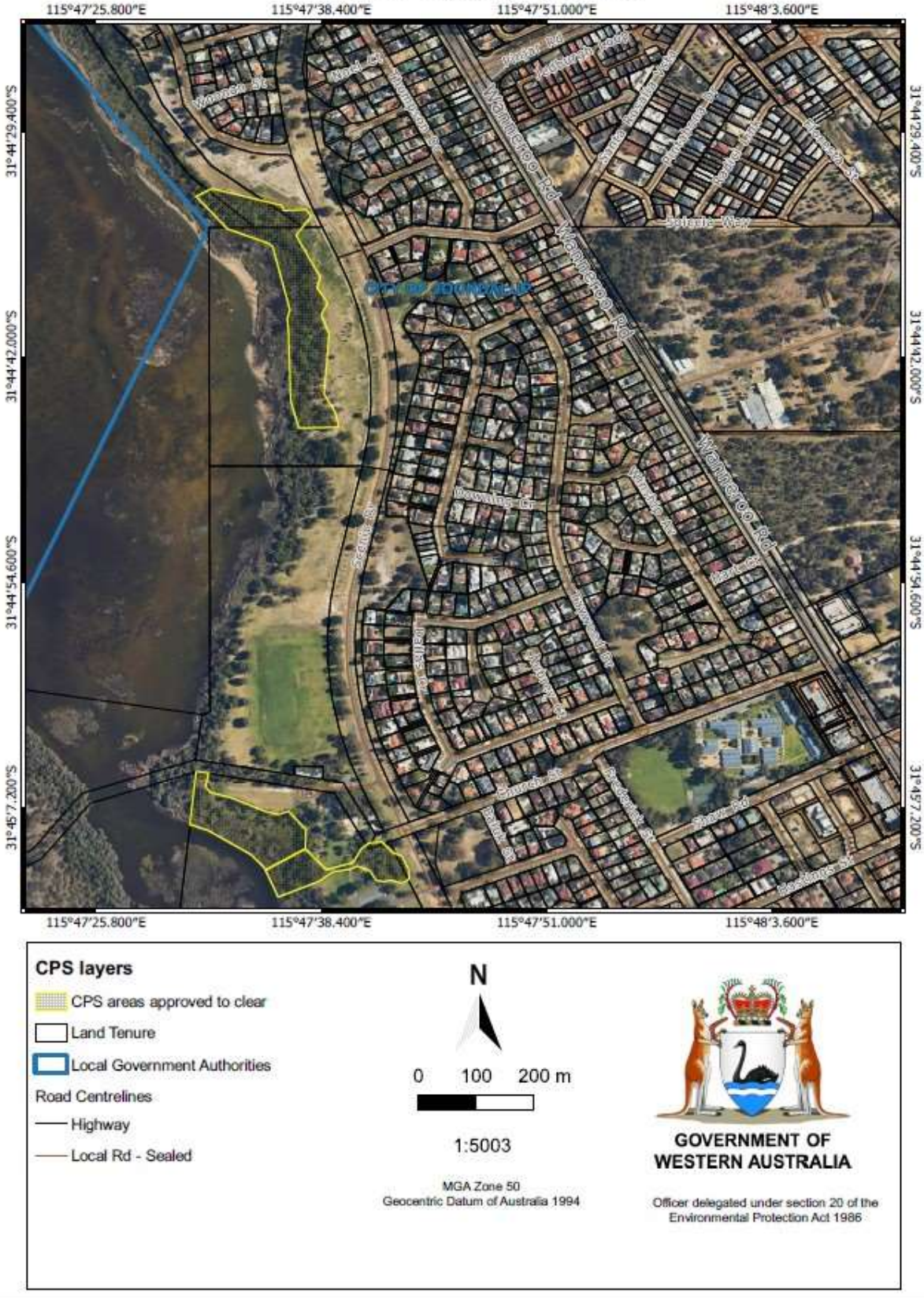

Figure 4 Joondalup Lake – Including Ottawa, Rotary Park rand Church Street Drain rehabilitation sites.

CPS 9139/2 – Plan D

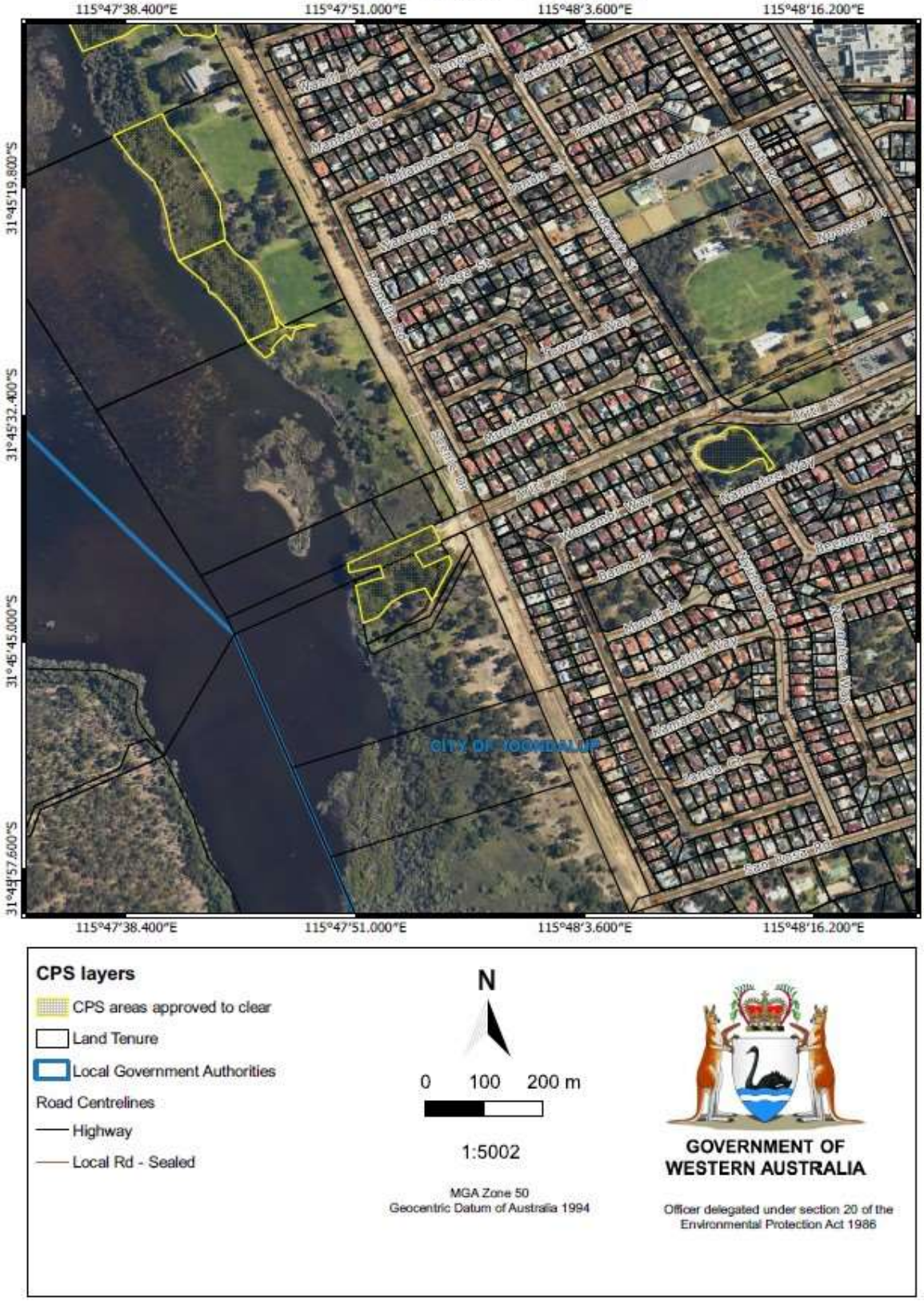

Figure 5 Wanneroo Recreation Centre rehabilitation site, Frogs Hollow site, Turtle Nesting Site, Ariti rehabilitation site and Nyunda Park.

CPS 9139/2 – Plan E

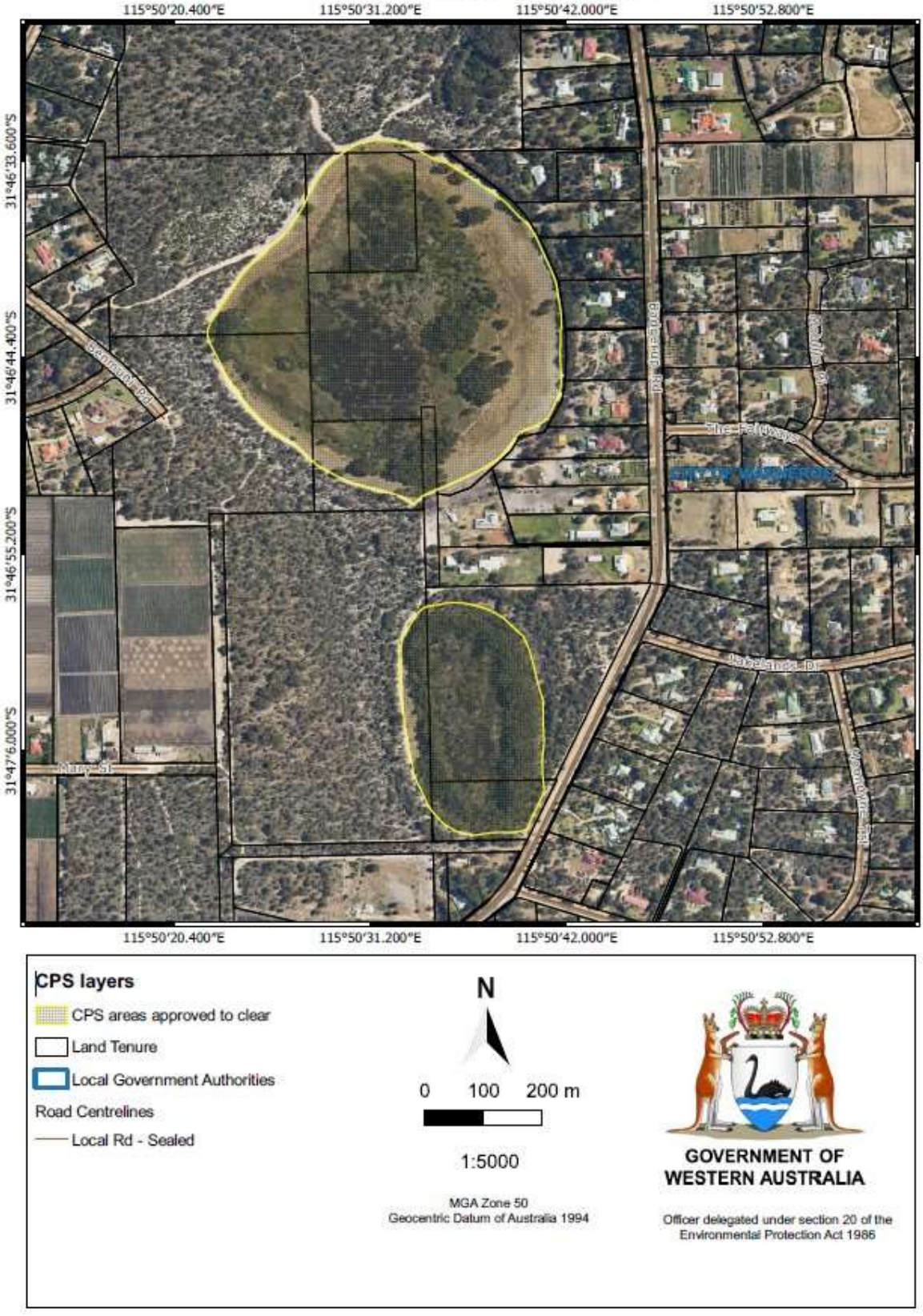

Figure 6 Badgerup lake and Little Badgerup Lake.

CPS 9139/2 – Plan F

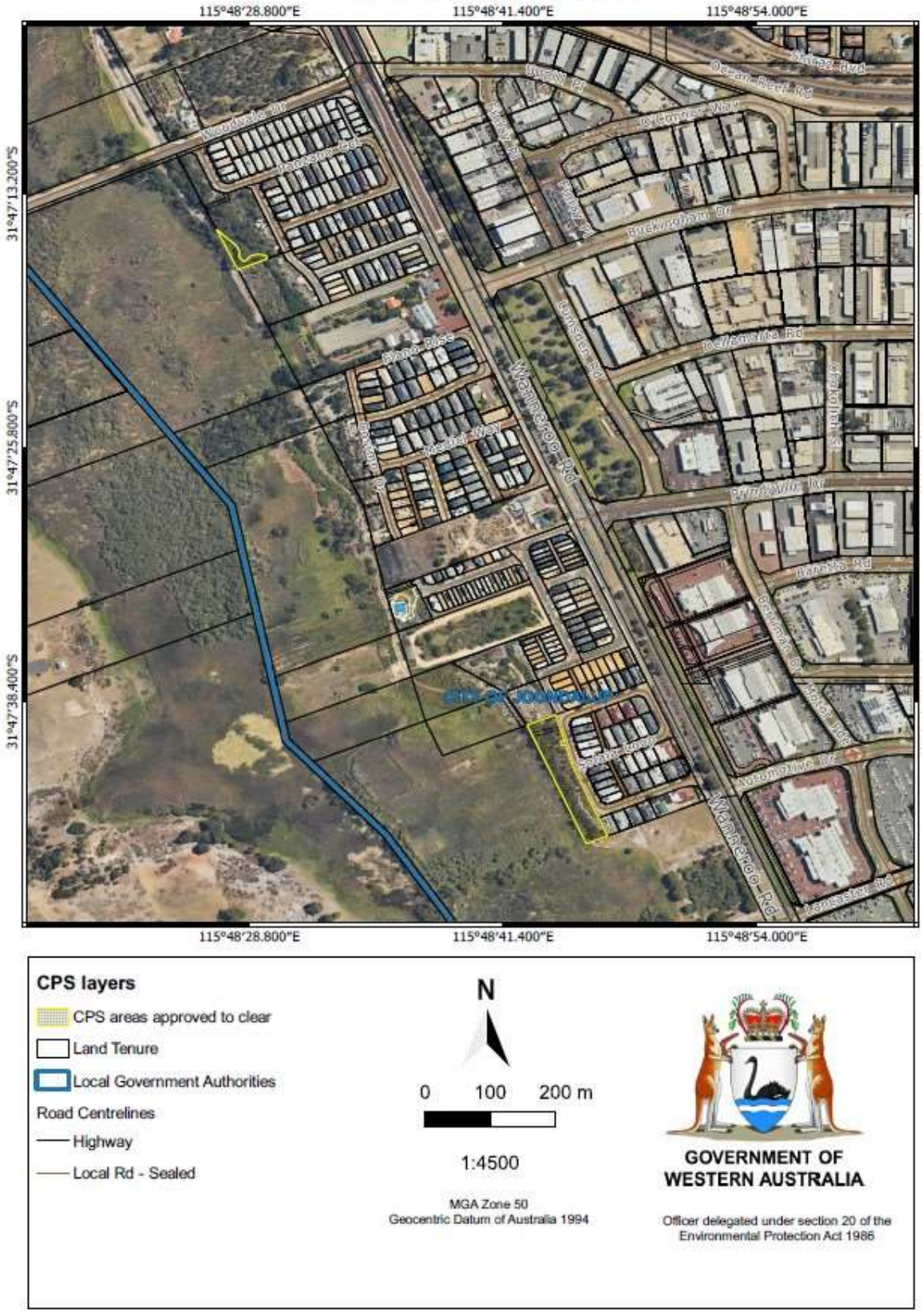

Figure 7 Wallubuenup swamp Including, Salanao Park site in the south and Panzano Park site to the north.

CPS 9139/2 – Plan G

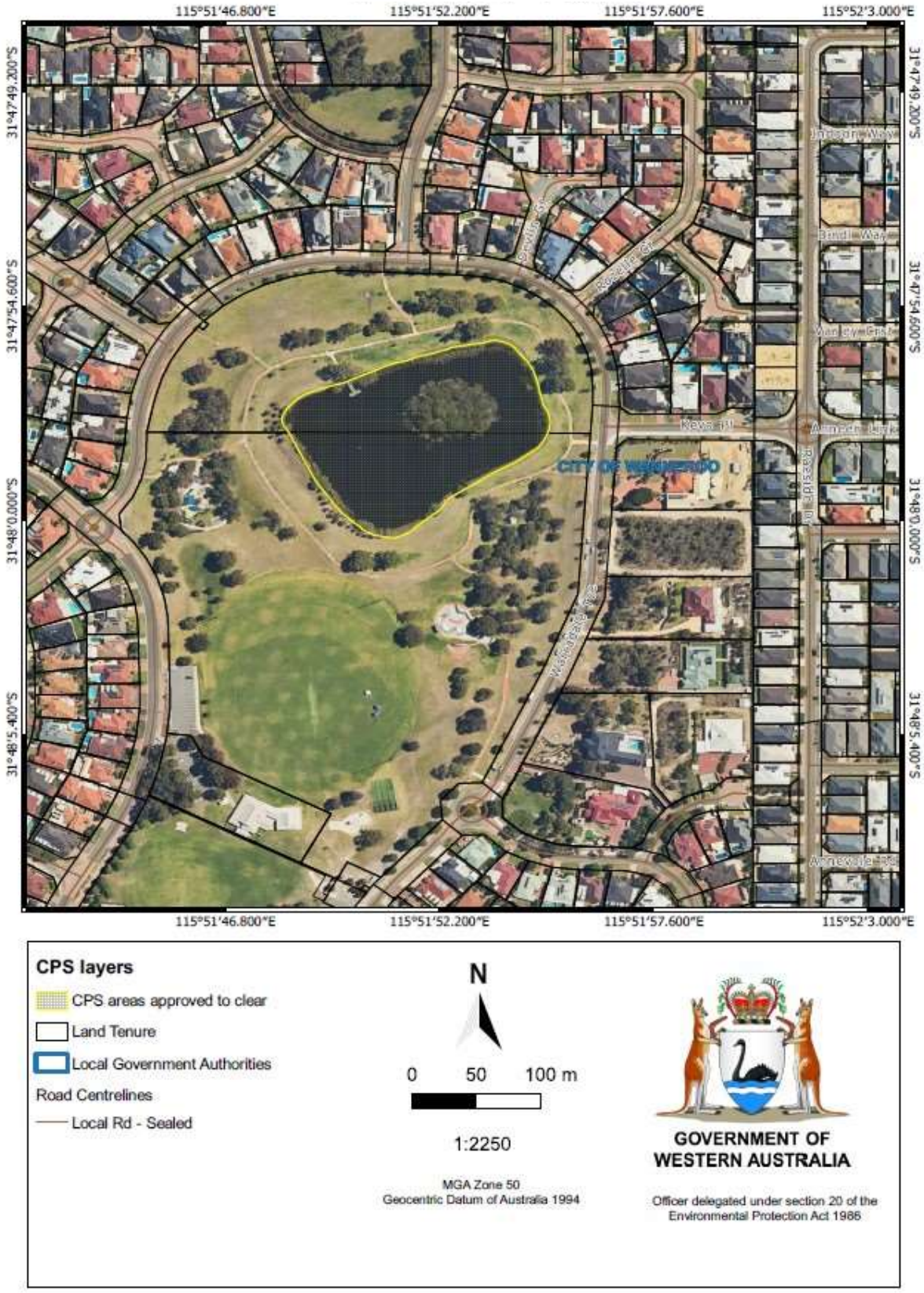

Figure 8 Warradale Park

CPS 9139/2 – Plan H

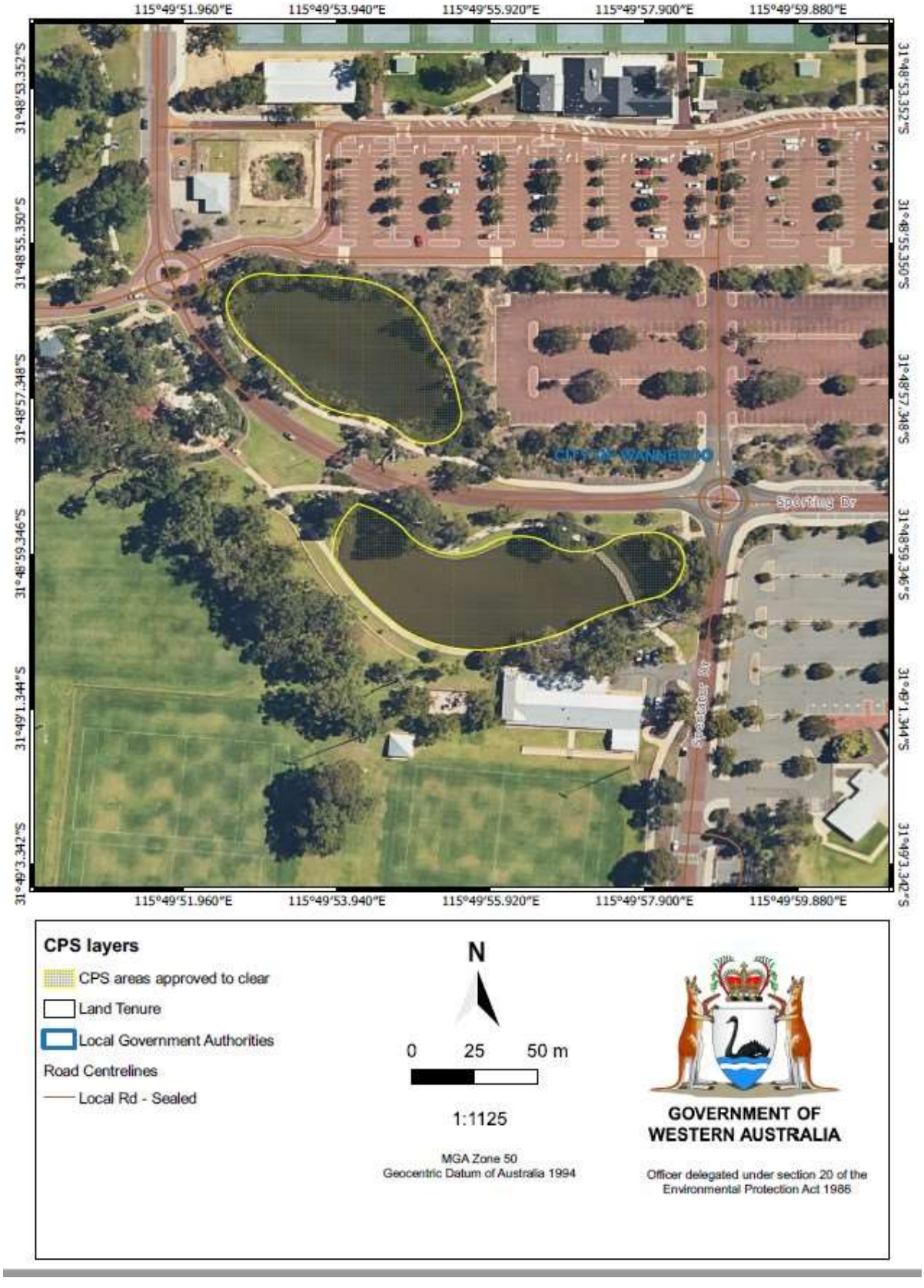

Figure 9 Kingsway Lake North and Kingsway Lake south

CPS 9139/2 – Plan I

Figure 10 Marangaroo Golf Course

2 Legislative context

The clearing of native vegetation in Western Australia is regulated under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (Clearing Regulations).

In addition to the matters considered in accordance with section 51O of the EP Act (see Section 1.4), the Delegated Officer has also had regard to the objects and principles under section 4A of the EP Act, particularly:

- the precautionary principle
- the principle of intergenerational equity
- the principle of the conservation of biological diversity and ecological integrity.

Other legislation of relevance for this assessment include:

- *Biodiversity Conservation Act 2016* (WA) (BC Act)
- *Conservation and Land Management Act 1984* (WA) (CALM Act)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- *Soil and Land Conservation Act 1945* (WA)

The key guidance documents which inform this assessment are:

- *A guide to the assessment of applications to clear native vegetation* (DER, December 2013)
- *Procedure: Native vegetation clearing permits* (DWER, October 2019)

3 Detailed assessment of application

3.1. Avoidance and mitigation measures

The applicant has proposed several methods of Typha removal to reduce the risk of soil erosion, deterioration in the quality of surface or underground water and impact to adjacent fauna and flora (Applicant 2021a, 2021b). Methods include:

- Typha growing amongst native species will be controlled by wiping a 33 per cent Roundup Biactive solution directly onto Typha leaves.
- High density Typha stands, will be cleared by removal of approximately 50% of the Typha biomass with brush cutters, then spraying the slashed stumps with a 2 per cent Roundup Biactive solution. Regrowth will be sprayed with a one percent solution of Roundup Biactive.
- Clearing activity will be carried out in the low water season between October and March. If required and where possible, water bodies will be partially drained (Kingsway Lakes and Marangaroo Golf Course Lake, (See section 1.5 Figures 9 and 10), to expose the base of Typha stands. Stands will be cut with brush cutters below the water line. Waterbodies will be re-filled once works have been completed.
- Prior to clearing, Typha stands will be inspected for the presents of water bird nests.
- Typha will be cleared in a staged mosaic pattern, clearing, and removing only small areas at a time.
- Clearing will be carried out in one direction to another to allow fauna access to adjacent vegetation or open water.
- Cleared areas will be rehabilitated with endemic reed species, during winter.

3.2. Assessment of impacts on environmental values

In assessing the application, the Delegated Officer has had regard for the site characteristics (see Appendix D) and the extent to which the impacts of the proposed clearing present a risk to biological, conservation, or land and water resource values. The assessment against the clearing principles (see Appendix E) identified that the impacts of the proposed clearing may present a risk to fauna, flora, conservation areas, and land and water resources. The consideration of these impacts, and the extent to which they can be managed through conditions applied in line with sections 51H and 51I of the EP Act, is set out below

3.2.1. Biological values (flora) - Clearing Principles (a and d)

Assessment

According to available databases, no wetland and aquatic conservation significant flora found within the local area (see Appendix D.3) are recorded within the application area. None of the species have been recorded as occurring within stands of Typha (Western Australian Herbarium, 1998-). As the proposed clearing will only target Typha, it is unlikely any conservation significant flora will be negatively impacted during removal, due to the targeted nature of the clearing. The Applicant has proposed to control Typha stands occurring amongst native vegetation using a wiping/contact chemical control method. This will involve the application of a 33 per cent Roundup Biactive solution, directly onto Typha leaves (City of Wanneroo 2021a).

The proposed clearing is to reduce the area of wetland habitat dominated by Typha and reduce the rate of spread. The applicant has also proposed to plant native sedges in areas where Typha has been removed, this will increase the biodiversity of the proposed clearing areas. Sites relatively free of Typha will be monitored and controlled to ensure numbers remain low. For more dense stands of Typha, the applicant proposes cutting the stalks and spraying stumps with 2 per cent solution of Roundup Biactive. Glyphosate is a general herbicide and has the potential to impact adjacent fauna and flora, and the short-term and long-term impact on aquatic wildlife from Glyphosate use is not entirely clear (DBCA, 2019). The applicant has advised that every effort will be made to keep the herbicide out of the water, as much as possible, and spraying will occur between October and March when the water level is at its lowest (City of Wanneroo, 2021a).

The following proposed clearing sites within Joondalup Lake Nature Reserve and Yellagonga Regional Park intersect areas mapped as Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region (Threatened Ecological Community (TEC) under the EPBC Act; Priority 3 Priority Ecological Community (PEC) listed by DBCA):

- Ottawa rehabilitation site
- Rotary Park rehabilitation site
- Church Street Drain rehabilitation site
- Wanneroo Recreation Centre rehabilitation site
- Frogs Hollow site
- Turtle Nesting site
- Ariti rehabilitation site

Although elements of banksia woodland have been recoded adjacent to the application area at Joondalup Lake, photographs provided by the applicant (City of Wanneroo 2020b) indicate plant communities adjacent to targeted Typha stands do not resemble any state listed TEC or PEC (see Appendix D for vegetation descriptions and Appendix G, Figures 11 to 48).

Clearing activity, may have the potential to introduce and spread weeds or dieback, that may impact biodiversity. The applicant has proposed a number of measures to mitigate the spread of weeds and weeds, including the Clean Machinery Form procedure and process (See Appendix B). An assessment of the impacts to fauna will be discussed in 3.2.2 below.

Conclusion

Based on the above assessment, the proposed clearing is unlikely to result in a significant loss in biodiversity or impact significant populations of threatened and priority flora. Suitable habitat for conservation significant flora species is unlikely to be significantly impacted by the proposed clearing.

Conditions

To address the above impacts, the following management measures will be required as conditions on the clearing permit:

- Undertake spraying of Glyphosate during the driest period of the year when the water level is at its lowest.
- Take hygiene steps to minimise the risk of the introduction and spread of weeds and dieback.

3.2.2. Biological values (fauna) - Clearing Principle (b)

Assessment

According to available databases, none of the conservation significant fauna species associated with inland water bodies and wetlands have been recorded within the application area. *Calyptorhynchus latirostris* (Carnaby's cockatoo) have been recorded within the application area at Ottawa rehabilitation site. Black cockatoo's do not utilise Typha or other sedges as foraging, nesting, or roosting habitat. Given that the proposed clearing will only involve the clearing of Typha, it is unlikely to impact on the habitat of black cockatoos. Due to the density of Typha and presence of water, a range of other native fauna species may be present at the time of the clearing activity.

The ground dwelling marsupial, *Isoodon fusciventer* (quenda) has been recorded within the application area at Badgerup Lake, Little Badgerup Lake and Warradale Park Site. However, impacts on this species are likely to be minimal, as Typha stands are not the primary habitat for this species (DBCA 2017). Undertaking clearing in a slow progressive manner towards adjacent vegetation will mitigate any potential impacts to fauna. Scheduling works when the wetland is at its driest will also decrease the likelihood of fauna being present at the time of clearing.

A number of wetland bird species have been recorded within Joondalup Lake, including the *Tringa glareola* (Wood sandpiper), *Tringa nebularia* (Green shank), *Calidris ruficollis* (Red-necked stint), and the Priority 4 *Oxyura australis* (Blue-billed duck). Of the above species, Blue billed duck is most likely to occur in association with Typha stands.

The Priority 4 Blue-billed duck has 228 records within the local area. Approximately 46 of these records occur in direct proximity to Typha stands fringing Joondalup Lake. This species can breed from August to March, mostly

between October to January (DBCA 2021). Breeding habitat is typically secluded densely vegetated situations, with the nest constructed in Typha beds or other vegetation, in permanent water. Nests are usually constructed from dead Typha leaves and sometimes thinly lined with down (Birdlife Australia, 2020a). According to aerial imagery and photographs provided by the applicant (City of Wanneroo 2020b), the above nesting habitat is likely to occur within close proximity to the application area, at rehabilitation sites including Ottawa, Rotary Park, Church Street Drain, Wanneroo Recreation Centre, plus Frogs Hollow and Turtle Nesting sites (see appendix G). Considering the number of records associated with Joondalup Lake and the availability of habitat, Blue billed duck may use these areas for breeding. Additional waterbodies within the application area suitable for Blue billed buck breeding include DaVinci Park.

According to available databases, the Endangered wetland bird, *Leioproctus contrarius* (Australasian bittern) has seven records within the local area occurring at Jandabup Lake, 2.9 kilometres north east of the application area. This species favours permanent freshwater wetlands with tall, dense vegetation, particularly *Eleocharis* spp. (Spike rushes) and Typhus (DBCA 2018). The species is known to breed in Spring-Summer, with egg laying known to occur in September to December (DBCA 2021). The application area is outside the current range of Australasian bittern; however, it may potentially visit areas outside of its current range. It is not considered to be resident or breeding at those sites (DBCA 2018).

The Priority 4 *Ixobrychus dubius* (Little bittern) has been recorded within 1.3 kilometres of the application area and has similar habitat requirements to the Australasian bittern, mainly where tall rushes, reeds, Typha, shrub thickets or other dense cover is inundated by at least 30 centimetres of water. It can be found in extensive swamps, but often inhabits small patches of dense wetland vegetation such as Typha along drains or in small urban lakes (Birdlife Australia 2020b). Little bittern can occur as a migrant in south-west Australia from late August to early April, breeding in the north of the state in winter (Birdlife Australia, 2020b). Little bittern may visit wetlands on the Swan Coastal Plain, and there is a possibility of the species occurring within the application area, but the probability is low (DBCA 2021).

The Priority 3 *Ixobrychus flavicollis australis* (Black bittern) is also recorded in the local area. In spring, this species builds a nest on branches overhanging water. Habitat includes terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangrove (Birdlife Australia, 2020c). Given that Black bittern are not dependent on Typha habitat for breeding, it is unlikely this species will be impacted by the proposed clearing.

Hydromys chrysogaster (Rakali) have not been recorded in the application area, however this species has been recorded within Joondalup Lake and Lake Goollelal, approximately 5 kilometres to the south. Rakali may range through the application area, as ranging territory can be up to four kilometres of riverbank (DWER 2021). It is unlikely the proposed clearing will impact this species as Typha does not form a critical component of its habitat.

Westralunio carteri (Carter's freshwater mussel) has been recorded within the local area. Records are confined to Bennet brook, approximately seven kilometres to the south east. Bennet Brook is not connected to any of the water bodies comprising the application area. Carter's freshwater mussel is predominantly found in perineal rivers and minor drainage lines (DWER 2021a). The application area is comprised of standing water bodies it is unlikely this species occurs within the application area. This species has not previously been recorded in environments associated with the proposed clearing.

The City of Wanneroo has plans to carry out pre-clearing site inspections, as mitigation to avoid disturbance on environmental values, including to nesting birds (see appendix B). Where possible, the City of Wanneroo has plans to clear Typha in a mosaic pattern, in an effort to enhance habitat value for wetland fauna species. The adjacent vegetation is susceptible to weed invasion and dieback in which the clearing process may exacerbate, thereby reducing habitat quality.

Conclusion

Based on the above assessment, stands of Typha located at Joondalup Lake within rehabilitation sites including Ottawa, Rotary Park, Church Street Drain, Wanneroo Recreation Centre, plus, Frogs Hollow and Turtle Nesting site may provide breeding habitat and a source of nest building material for Blue billed duck. There is a low probability that Australasian bittern, Little bittern and Black bittern may temporarily utilise the above wetlands as foraging habitat. Joondalup Lake may also provide foraging habitat for a number of migratory shore birds. The proposed clearing within the reserve will not occur within the portion of the lake utilised by the above species. Rakali or Water rat may also range through the application area. Typha removal does not form a critical component of the habitat utilised by this species. For the reasons set out above, it is considered that the impacts of the proposed clearing can be managed by conducting pre-clearing site inspections and slow directional clearing.

Conditions

To address the above impacts, the following management measures will be required as conditions on the clearing permit, in areas comprising permanent water and dense stands of Typha:

- Pre-clearing site inspections prior to works commencing and ongoing during works for any fauna that may be present. If found and are not able to escape into adjacent habitat, the City of Wanneroo is to cease works until the identified fauna has been translocated.
- Undertake slow, progressive one directional clearing to allow terrestrial and avian fauna to move into adjacent habitat ahead of the clearing activity.

3.2.3. Environmental values (conservation areas) - Clearing Principle (h)

Assessment

The application area includes a portion of Joondalup Lake Nature Reserve and Yellagonga Regional Park. Badgerup Lake and Little Badgerup Lake is included as a portion of a Bush Forever Reginal scheme.

As discussed in section 1.2, the proposed clearing will target Typha only. Although Typha is a native species it is impacting on native ecosystems across the swan coastal plain and has invaded and modified significant areas of fringing vegetation (see Appendix G, Figures13 – 49) within Joondalup Lake Nature reserve and Yellagonga Regional Park (City of Wanneroo 2003). The proposed clearing is part of a management plan subscribed to improve the conservation value of the above reserve and regional park. The applicant has proposed specific methods of Typha control to mitigate impacts within these areas, including:

- Clearing activity to occur in the low water season, October to March.
- Typha will be cleared in a staged mosaic pattern, clearing and removing only small areas at a time.
- Using a wiping/contact chemical control method for Typha stands growing amongst native vegetation.
- Cleared areas will be rehabilitated with endemic reed species during winter.

The above methods are also proposed for Badgerup Lake and Little Badgerup Lake, Lake Adams, Da Vinci Park and Wallubuenup Swamp (City of Wanneroo 2021a).

The adjacent vegetation is susceptible to weed invasion and dieback in which the clearing process may exacerbate, thereby reducing quality of native vegetation present in the abovementioned reserves.

Conclusion

Given the nature of the clearing, Typha removal will be beneficial to the maintenance of species composition and structure of the fauna and flora habitats of conservation areas adjacent to the proposed clearing. Weed dieback management practices will mitigate against any potential impacts to the adjacent native vegetation.

Conditions

To address the above impacts, the implementation of weed and dieback management strategies as a condition on the permit will mitigate the impacts to adjacent vegetation and fauna habitat.

3.2.4. Environmental value: (land and water resources) - Clearing Principles (f, g and i)

Assessment

The proposed clearing is for the purpose of controlling the occurrence of Typha due to its invasive nature and adverse impacts on wetlands in the absence of management. Given the proposed clearing will target Typha or areas were Typha infestation is anticipated, the proposed clearing is not likely to result in any long-term impact to the ecological values of wetland vegetation within the application area.

Given the nature of the proposed clearing activities, the most likely land degradation impacts anticipated to result from the proposed clearing would be wind erosion of the exposed ground. However, the applicant is only proposing to clear small areas at a time in a mosaic pattern (City of Wanneroo 2021a). For large areas such as Joondalup Lake with dense infestations of Typha, the applicant has proposed removing 50 per cent of the biomass by mechanical cutting in the low water season (October to March) and spraying cut stems with Roundup Biactive.

The removal of Typha has the potential to increase sedimentation and turbidity in wetlands within the application area, thereby possibly impacting surface water quality. By implementing the methods proposed above, it is not likely to cause long-term deterioration in the quality of surface water. The applicant also proposes to replant cleared areas with additional species of native sedges and rushes, this will further reduce erosion.

Conclusion

The proposed clearing will not significantly impact riparian vegetation and is expected to enhance riparian and wetland habitats within the application area. Typha removal methods provided by the applicant are considered

sufficient to prevent appreciable land degradation. The staged method of clearing is unlikely to result in the deterioration in the quality of surface or underground water.

Conditions
No land or water resources management conditions are required.

3.3. Relevant planning instruments and other matters

Information contained within the Department of Water and Environmental Regulation's records (DWER 2021b) indicate that several parcels of land (i.e., Lot 143 on Plan10445 Banyandah Boulevard Wanneroo; Lots 39 on Plan 32924, 40 on Plan 322924 and 41 Plan 322924 Scenic Drive Wanneroo), within the application area have been historically used as an uncontrolled landfill. As such, there is potential of asbestos-containing material to be buried beneath these areas. The methods of clearing proposed by the applicant (See Appendix B), focus on the removal and treatment of Typha stands with minimal ground disturbance. However, in the event that soil-disturbing works are required within the above-mentioned parcels of land, the DWER recommends that a site management plan is developed to mitigate any potential risk to the health of any workers undertaking ground-disturbing works and should include management measures for any asbestos encountered. The site management plan should be prepared in accordance with the 'Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia' (Department of Health 2009).

The City of Wanneroo is the responsible agent in managing the properties contained within the application area. The management of Typha is consistent with their obligations as land managers.

The DBCA (2019) advised that the use of Glyphosate can be contentious near human populations and that the short-term and long-term impact on aquatic wildlife from Glyphosate use is not entirely clear. Within Australia, the regulation of pesticides is undertaken by the Australian Pesticides and Veterinary Medicine Authority. There are legal penalties in place for using pesticides outside of label directions. The applicant is advised to ensure their use of Glyphosate and any other pesticides during this clearing activities complies with all legal requirements concerning the use of these pesticides. Furthermore, applying the Glyphosate when the wind is calm and directing the spray carefully to each individual stalk will mitigate potential risk to adjacent vegetation and fauna.

Several Aboriginal sites of significance have been mapped within the application area. It is the permit holder's responsibility to comply with the *Aboriginal Heritage Act 1972* (WA) and ensure that no Aboriginal Sites of Significance are damaged through the clearing process.

End

Appendix A. List of properties where clearing is to occur

Property	Locality
Crown Reserve (PIN 408326)	Wanneroo
Lot 300 on Deposited Plan 106721	Wanneroo
Lot 740 on Deposited Plan 245969	Wanneroo
Crown Reserve (PIN 408324)	Wanneroo
Crown Reserve (PIN 11377834)	Wanneroo
Crown Reserve (PIN 1126271)	Wanneroo
Crown Reserve (PIN 408314)	Wanneroo
Crown Reserve (PIN 408313)	Wanneroo
Crown Reserve (PIN 1088896)	Wanneroo
Crown Reserve (PIN 408320)	Wanneroo
Crown Reserve (PIN 408319)	Wanneroo
Crown Reserve (PIN 408317)	Wanneroo
Crown Reserve (PIN 408316)	Wanneroo
Crown Reserve (PIN 1068)	Wanneroo
Lot 2451 on Deposited Plan 133174 (Crown Allotment PIN 408319)	Wanneroo
Lot 2385 on Deposited Plan 133173 (Crown Allotment PIN 408317)	Wanneroo
Lot 2384 on Deposited Plan 133172 (Crown Allotment PIN 408320)	Wanneroo
Lot 774 on Deposited Plan 246224 (Crown Allotment PIN 408313)	Wanneroo
Lot 672 on Deposited Plan 245973 (Crown Allotment PIN 408316)	Wanneroo
Crown Reserve (PIN 9407)	Wanneroo
Crown Reserve (PIN 9360)	Wanneroo
Crown Reserve (PIN 9359)	Wanneroo
Lot 143 on Plan 10445 (Crown Allotment PIN 9360)	Wanneroo
Lot 139 on Plan 9815 (Crown Allotment PIN 9407)	Wanneroo
Lot 137 on Plan 10027 (Crown Allotment PIN 9359)	Wanneroo
Lot 73 on Diagram 56768	Wanneroo
Lot 36 on Diagram 48067	Wanneroo
Lot 1 on Diagram 62246	Wanneroo
Lot 11524 on Diagram 56917	Wanneroo
Crown Reserve (PIN 4826)	Mariginiup
Lot 300 on Deposited Plan 301991	Wanneroo
Easement on Deposited Plan 76721 (PIN 12033733)	Wanneroo
Easement on Deposited Plan 68139 (PIN 11914148)	Woodvale
Crown Reserve (PIN 11043623)	Wanneroo
Lot 41 on Plan 32924 (Crown Allotment PIN 11043626)	Wanneroo
Lot 40 on Plan 32924 (Crown Allotment PIN 11043625)	Wanneroo
Lot 39 on Plan 32924 (Crown Allotment PIN 11043624)	Wanneroo
Crown Reserve (PIN 11023502)	Wanneroo
Crown Reserve (PIN 1359140)	Wanneroo
Crown Reserve (PIN 1359137)	Wanneroo
Lot 8 on Deposited Plan 231377 (Crown Allotment PIN 1069)	Wanneroo
Crown Reserve (PIN 11043625)	Wanneroo
Crown Reserve (PIN 11043624)	Wanneroo
Crown Reserve (PIN 11043626)	Wanneroo
Crown Reserve (PIN 1060196)	Marangaroo
Lot 13968 on Plan 23449 (Crown Allotment PIN 1284672)	Landsdale
Crown Reserve (PIN 12324956)	Woodvale
Crown Reserve (PIN 11926159)	Woodvale
Lot 300 on Deposited Plan 413701	Woodvale
Crown Reserve (PIN 12255914)	Landsdale
Crown Reserve (PIN 1284672)	Landsdale
Lot 801 on Deposited Plan 409474	Landsdale
Crown Reserve (PIN 12033732)	Wanneroo
Lot 801 on Deposited Plan 76721	Wanneroo
Lot 800 on Deposited Plan 76721	Wanneroo
Crown Reserve (PIN 11914120)	Wanneroo
Lot 3000 on Deposited Plan 69603	Marangaroo

Property	Locality
Crown Reserve (PIN 11921958)	Wanneroo
Lot 8001 on Deposited Plan 68139	Woodvale
Crown Reserve (PIN 11841633)	Madeley
Lot 555 on Deposited Plan 64232	Madeley
Lot 808 on Deposited Plan 50215	Woodvale
Crown Reserve (PIN 11480003)	Tapping
Lot 705 on Deposited Plan 46781	Tapping
Lot 12421 on Plan 20358 (Crown Allotment PIN 1126271)	Wanneroo
Lot 11921 on Plan 18933 (Crown Allotment PIN 1088896)	Wanneroo
Lot 11139 on Plan 217410 (Crown Allotment PIN 1060196)	Wanneroo

Appendix B. Additional information provided by applicant

Summary of comments

The applicant submitted additional details of Typha control methods (City of Wanneroo 2021a; 2021b; 2021c):

The City of Wanneroo plans to use the three different methods of Chemical application to control the spread of Typha in their managed reserves:

1. Approximately 50 percent of the Typha biomass will be removed with brush cutters, then the slashed stumps will be sprayed with a two percent solution of Roundup Biactive.
2. Regrowth will be sprayed with a one percent solution of Roundup Biactive.
3. Were Typha is growing amongst native vegetation Typha leaves will wiped with a 33 percent solution of Roundup Biactive.
4. If required, Kingsway Lakes and Marangaroo Golf Course Lake will be partially drained to expose the base of Typha stands. Stands will be cut with brush cutters below the water line. Waterbodies will be re-filled once works have been completed.

The method used by the applicant will be determined by site characteristics and environmental values off the site. The methods that may be used for each of the wetland areas are listed in the table below.

Table 1: Typha control methods utilised at each wetland site

Location	Method (Numbered as above)
All Sites, Joondalup Lake	1,2 and 3
Lake Adams	1,2 and 3
Da Vinci Park	1,2 and 3
Solana Park (Wallubuenup Swamp)	1,2 and 3
Panzano Park (Wallubuenup Swamp)	1,2 and 3
Badgerup Lake and Little Badgerup Lake	1,2 and 3
Nyunda Park	1,2 and 3
Kingsway Regional Sporting Complex (north and south)	4
Warradale	1,2 and 3
Marangaroo Golf Course	4

Timing and pattern of clearing:

- Clearing activity will be carried out in the low water season between October and March.
- Inspecting all clearing areas for water bird nests, prior to undertaking clearing.
- Typha will be cleared in a staged mosaic pattern, clearing, and removing only small areas at a time.
- Clearing will be carried out from one direction to another.
- Cleared areas to be rehabilitated with endemic reed species, during winter.

Weed control measures:

All City of Wanneroo staff and contractors will follow procedures and complete a Clean Machinery Form to prevent the introduction and spread of weeds and dieback. Inspections of vehicles are undertaken every morning to ensure vehicles are in working condition and if weed seeds or soil is noticed during these inspections, they are removed or washed off within the depot prior to leaving.

Care is also taken when navigating through reserves, keeping to limestone tracks wherever possible. If limestone tracks are not present, vehicles will be inspected and cleaned to ensure no soil and weed seeds are present. In areas of known or suspected dieback, the procedure is to not enter the areas unless required, and then equipment, shoes and vehicles will require washing down.

Consideration of comment

Impact of methodology assessed:

Conditions controlling Chemical herbicide added to the permit.

Appendix C. Details of public submissions

Summary of comments	Consideration of comment
The Management Plan submitted by the City of Wanneroo does not contain any details about the methods to be used for Typha removal.	Further detail of Typha removal methods provided by the applicant during the assessment of the clearing permit (Appendix B).
What chemicals are proposed to be used.	Further detail of chemical control methods provided by the applicant during the assessment of the clearing permit (Appendix B).
What is the potential for affecting non-target species.	The applicant has identified and submitted methodology to reduce any impact to native species (Appendix B).
What is the potential for weed spread.	Measures to prevent weed spread will be conditioned on the permit. All City of Wanneroo staff and contractors will follow procedures and complete a Clean Machinery Form to prevent the introduction and spread of weeds and dieback (Appendix B).
The Management Plan also does not note that the proposed removal measures will likely not achieve long term removal, without also addressing the causes of the over-dominance – nutrient inflows and conditions favouring Typha, more generally.	The long-term mitigation measures for the spread of Typha have been considered by the applicant (Appendix B).

Appendix D. Site characteristics

The information provided below describes the key characteristics of the area proposed to be cleared and is based on the best information available to DWER at the time of this assessment. This information was used to inform the assessment of the clearing against the Clearing Principles, contained in Appendix E.

D.1 Site characteristics

<table>
<tr><th>Characteristic</th><th>Details</th></tr>
<tr><td>Local context</td><td>The nine targeted areas, containing the application area, are distributed across various properties managed by the City of Wanneroo municipality. The proposed clearing will be restricted to the removal of Typha from wetland vegetation including a portion of the Joondalup Lake foreshore, and associated wetlands (see section 1.5, Figure 9), plus a number of natural or manmade lakes within natural remanent vegetation or parkland (See Appendix G for images of the application area).</td></tr>
<tr><td>Ecological linkage</td><td>The following portions of the application area fall within the Gnangara Mound Ecological Linkages:
Joondalup Lake.
Two portions of the application area in Wallubuenup Swamp (Solana Park and Panzano Park), adjacent to Solaria Loop and Cosimo Drive.
Badgerup Lakes</td></tr>
<tr><td>Conservation areas</td><td>The table below lists portions of the clearing area that fall within Joondalup Lake Nature Reserve and Yellagonga Reginal Park, both of which are also Bush Forever sites. Proposed clearing at Lake Badgerup and Badgerup Reserve fall within Bush Forever sites.
<table>
<tr><th>Conservation Area</th><th>Application Area Land Tenure</th><th>Application Area Local Name</th></tr>
<tr><td>*Joondalup Lake Nature Reserve, *Yellagonga Regional Park,</td><td>Lot 137 on Plan 10027 (Crown Allotment PIN 9359)</td><td>Ottawa rehabilitation site</td></tr>
<tr><td>*Yellagonga Regional Park</td><td>Lot 39 on Plan 32924 (Crown Allotment PIN 11043624)</td><td>Rotary Park rehabilitation site</td></tr>
<tr><td>*Yellagonga Regional Park</td><td>Crown Reserve (PIN 11043625)</td><td>Church Street Drain rehabilitation site.</td></tr>
<tr><td>*Yellagonga Regional Park</td><td>Crown Reserve (PIN 11043625)</td><td>Wanneroo Recreation Centre rehabilitation site</td></tr>
<tr><td>*Yellagonga Regional Park</td><td>Crown Reserve (PIN 11043625)</td><td>Frogs Hollow</td></tr>
<tr><td>*Yellagonga Regional Park</td><td>Crown Reserve (PIN 11043626)</td><td>Turtle Nesting Site</td></tr>
<tr><td>*Yellagonga Regional Park</td><td>Crown Reserve (PIN 12033732)</td><td>Ariti rehabilitation site</td></tr>
<tr><td>Bush Forever Regional Scheme</td><td>Lot 12421 on Plan 20358 (Crown Allotment PIN 1126271)</td><td>Badgerup Lake</td></tr>
</table>
* Joondalup Lake Nature Reserve, Yellagonga Regional Park are also part of the Bush Forever Regional Scheme.</td></tr>
<tr><td>Vegetation description</td><td>Photographs supplied by the applicant (City of Wanneroo 2021b), indicate the vegetation within a number of the proposed clearing areas is consistent with the mapped vegetation complexes listed below. Representative photos and maps are available in Appendix G.

Swan Coastal Plain vegetation complexes as described and mapped by Heddle et al. (1980) as updated by Webb et al. (2016) within the application area include:</td></tr>
</table>

Characteristic	Details
	• Karrakatta Complex-Central and South 49: Predominantly open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri) and woodland of *Eucalyptus marginata* (Jarrah) - Banksia species. *Agonis flexuosa* (Peppermint) is co-dominant south of the Capel River. • Herdsman Complex 53: Sedgelands and fringing woodland of *Eucalyptus rudis* (Flooded Gum) - *Melaleuca* species. • Pinjar Complex 54: Vegetation ranges from woodland of *Eucalyptus marginata* (Jarrah) - Banksia species to a fringing woodland of *Eucalyptus rudis* (Flooded Gum) - *Melaleuca preissiana* (Moonah) and sedgelands.

Vegetation condition	Photographs supplied by the applicant (City of Wanneroo 2021b) indicate the vegetation within the proposed clearing areas is in a range of conditions (Keighery, 1994) as listed below:
	• Joondalup Lake.
	  ○ Ottawa rehabilitation site: Good to Degraded
	  ○ Rotary Park rehabilitation site: Good to Degraded
	  ○ Church Street Drain: Good to Degraded
	  ○ Wanneroo Recreation Centre: Good
	  ○ Frogs Hollow: Good
	  ○ Turtle Nesting Site: Good
	  ○ Ariti rehabilitation site: Good to Degraded
	• Nyunda Park: Degraded
	• Da Vinci Park: Good
	• Wallubuenup Swamp: Degraded
	• Badgerup Lake: Degraded
	  ○ Little Lake Badgerup: Good to Excellent
	• Warradale Park: Good to Degraded
	• Kingsway Lakes
	  ○ Kingsway Lake north: Good
	  ○ Kingsway Lake south: Degraded
	• Marangaroo Golf course: Good to Degraded
	The full Keighery (1994) condition rating scale is provided in Appendix F. Representative photos are available in Appendix G.

Climate	The climate is classified as Mediterranean, with dry, hot summers and cool, wet winters. • *average rainfall is 789.1 mm per annum, with the majority falling between May and* August. • average maximum temperature ranges from 21.4 degrees centigrade in winter (June) to 33.1 degrees centigrade in summer (December). • average minimum temperatures range from 17.6 degrees centigrade in winter to 28.8 degrees centigrade in summer.
Soil and landform description	Mapped soil types (Schoknecht et al, 2013) include: • Spearwood wet, lake Phase,: No Data • Karrakatta Sand Yellow Phase: Low hilly to gently undulating terrain. Yellow sand over limestone at 1-2 m. • Spearwood seasonal swamps Phase: Depressions with free water in winter. Humus podzols and peat. • Spearwood Sand Phase: Irregular banks of karst depressions. Some limestones outcrop. Shallow brown sands. • Bassendean, Jandakot Phase: Jandakot low dunes. Slopes <10% and generally more than 5m relief. Grey sand over pale yellow sands generally underlain by humic and iron podsols.

<table>
<tr><th>Characteristic</th><th>Details</th></tr>
<tr><td></td><td>Spearwood wet, Swamp Phase: No Data</td></tr>
<tr><td>Land degradation risk</td><td>There is a high amount of variability in the land degradation risk, between the six soils mapped as occurring across the application area. All soils types except the Spearwood Wet Lakes have a moderate to high risk of Subsurface acidification. Also, all soils except Spearwood Sand Phase have a high risk of Phosphorus export. See section D.5 for a full analysis of soil risks.</td></tr>
<tr><td>Waterbodies</td><td>All sites that comprise the application area intersect inland waterbodies and wetlands, these include:
Joondalup Lake, a large perennial lake, is intersected by, several portions of the application area, including Ottawa, Rotary Park, Church Street Drain, Ariti rehabilitation sites, Frogs Hollow, and Turtle Nesting Site.
Unnamed perianal lake at Nyunda Park.
Lake Adams, forms part of a Perennial swamp.
Da Vinci Park, a Manmade lake
Wallubuenup Swamp, a perennial swamp is intersected by Salanao Park and Panzano Park sites.
Badgerup Lake and Little Badgerup Lake, a perennial swamp and wetland.
Warradale Park Site (Snake Swamp), a terminal man made lake.
Kingsway Lake North / Kingsway lake South, perineal manmade lakes.
Manmade, perennial lake at Marangaroo Golf course</td></tr>
<tr><td>Hydrogeography</td><td>The application area falls within the Perth and Wanneroo, RIWI ground water areas. Ottawa, Rotary Park, Church Street Drain, Ariti rehabilitation sites, Frogs Hollow, Turtle Nesting Site, Salanao Park and Panzano Park sites, fall within, Perth Coastal and Gwelup Underground Water Pollution Control Area.</td></tr>
<tr><td>Flora</td><td>The nearest conservation significant flora record in the local area is Acacia benthamii. This species is recorded 0.14 kilometres from the application area west of Kingsway Lake north. It is unlikely Acacia benthamii still occurs in this area as this location is now a road. Two Priority 3 conservation significant Fungi occur within the local area: Amanita fibrillopes and Amanita preissii.

A total of 37 species of conservation significant flora occur within the local area. There are nine species of conservation significant flora that are known to be associated with wetland habitats and could possibly occur adjacent to Typha stands. Refer to the Flora Analysis table section Appendix D.3 for further flora analysis of the nine wetland species.</td></tr>
<tr><td>Ecological communities</td><td>According to available data sets (see Appendix H.1), portions of the application area at Joondalup Lake, including, Ottawa Rotary Park, Church Street, Wanneroo Recreation Centre and Ariti Drain rehabilitation sites occur adjacent to Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region State listed as priority 3 and federally listed as Endangered. Additional Threatened and Priority Ecological communities mapped within the local area are listed in the table below.
<table>
<tr><th>Community Name</th><th>State Listing</th><th>Federal Listing</th></tr>
<tr><td>Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain</td><td>Endangered</td><td>-</td></tr>
<tr><td>Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))</td><td>Endangered</td><td>-</td></tr>
<tr><td>Banksia attenuata woodlands over species</td><td>Endangered</td><td>Endangered</td></tr>
</table>
</td></tr>
</table>

Characteristic	Details		
	rich dense shrublands (floristic community type 20a as originally described in Gibson et al. (1994))		
	Callitris preissii (or *Melaleuca lanceolata*) forests and woodlands, Swan Coastal Plain (floristic community type 30a as originally described in Gibson et al. (1994))	Vulnerable	
	Northern Spearwood shrublands and woodlands	Priority 3	-
	Acacia shrublands on taller dunes	Priority 3	-
Fauna	According to available datasets (see Appendix H.1) there are 52 fauna species of conservation significance within the local area. Of the 52 species, *Isoodon fusciventer* (quenda), and *Calyptorhynchus latirostris* (Carnaby's cockatoo) is recoded within the application area. Also, in the local area there are 11 records for *Calyptorhynchus baudinii* (Baudin's cockatoo) and 39 records for *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo). A total of 17 species were identified associated with freshwater wetland habitats. The aforementioned 17 species are considered further in Section D.4.		

D.2 Vegetation extent

	Pre-European extent (ha)	Current extent (ha)	Extent remaining (%)	Current extent in all DBCA managed land (ha)	Current proportion (%) of pre-European extent in all DBCA managed land
IBRA bioregion*					
Swan Coastal Plain	1,501,221.93	579,813.47	38.62	222,916.97	14.85
Vegetation complex					
Karrakatta Complex-Central and South 49	24,017.08	10,426.47	23.49	4,282,73	8.07
Herdsman Complex 53	9,665.15	3,103.70	32.11	1,058.25	10.95
Pinjar Complex 54	4,892.64	1.735.34	35.47	239.77	4.90
Local area					
10km radius	621602700.30	18249.87	29.35	-	-

*Government of Western Australia (2019)

D.3 Flora analysis table

With consideration for the site characteristics set out above, relevant datasets (see Appendix H.1), impacts to the following conservation significant flora required further consideration.

Species name	Conservation status	Suitable habitat features ? [Y/N]	Suitable vegetation type? [Y/N]	Suitable soil type? [Y/N]	Distance of closest record to application area (km)	Number of known records (total)	Are surveys adequate to identify? [Y, N, N/A]
Dampiera triloba	P3	Yes	Yes	No	1.7	3	N/A
Cyathochaeta teretifolia	P3	Yes	Yes	Yes	1.6	7	N/A
Drosera patens	P1	Yes	Yes	Yes	1.5	5	N/A
Caladenia huegelii	T	Yes	No	no	1.7	5	N/A
Jacksonia sericea	P4	Yes	Yes	Yes	0.62	18	N/A
Hydrocotyle striata	P1	Yes	Yes	no	5.8	2	N/A
Styphelia filifolia	P3	No	No	No	2.4	4	N/A
Tripterococcus sp. Brachylobus (A.S. George 14234)	P2	Yes	No	No	6.7	1	N/A
Drosera x sidjamesii	P1	Yes	Yes	Yes	1.9	7	N/A

T: threatened, CR: critically endangered, EN: endangered, VU: vulnerable, P: priority

D.4 Fauna analysis table

Species name	Conservation status	Suitable habitat features? [Y/N]	Suitable vegetation type? [Y/N]	Distance of closest record to application area (km)	Number of known records (total)	Are surveys adequate to identify? [Y, N, N/A]
Oxyura australis (Blue-billed duck)	P4	Yes	Yes	0.48	228	N/A
Neelaps calonotos (Black-striped snake, black-striped burrowing snake)	P3	Yes	Yes	0.5	48	N/A
Hydromys chrysogaster (Water-rat, rakali)	P4	Yes	Yes	0.5	18	N/A
Plegadis falcinellus (Glossy ibis)	MI	Yes	Yes	0.8	89	N/A
Tringa nebularia (greenshank)	MI	Yes	Yes	0.8	56	N/A
Calidris ruficollis (Red-necked stint)	MI	Yes	Yes	1.2	10	N/A
Charadrius leschenaultii (Greater sand plover)	VU	Yes	Yes	1.2	1	N/A
Ixobrychus flavicollis australis (southwest subpop.) (Black bittern)	P2	Yes	Yes	1.2	2	N/A
Calidris ferruginea (curlew sandpiper)	CR	Yes	Yes	1.3	4	N/A
Ixobrychus dubius (Australian little bittern)	P4	Yes	Yes	1.3	5	N/A

Species name	Conservation status	Suitable habitat features? [Y/N]	Suitable vegetation type? [Y/N]	Distance of closest record to application area (km)	Number of known records (total)	Are surveys adequate to identify? [Y, N, N/A]
Limosa (Black-tailed godwit)	MI	Yes	Yes	1.5	2	N/A
Leioproctus contrarius (Australasian bittern)	EN	Yes	Yes	2.9	7	N/A
Tringa stagnatilis (Marsh sandpiper)	MI	Yes	Yes	3	4	N/A
Tringa glareola (Wood sandpiper)	MI	Yes	Yes	3	12	N/A
Calidris acuminata (Sharp-tailed sandpiper)	Mi	Yes	Yes	5.2	2	N/A
Actitis hypoleucos (Common Sandpiper)	MI	Yes	Yes	6.1	2	N/A
Carter's freshwater mussel (*Westralunio carteri)*	VU	no	no	7.4	6	N//A

T: threatened, CR: critically endangered, EN: endangered, VU: vulnerable, P: priority MI Migratory Species

D.5 Land degradation risk table

Risk categories	Spearwood wet, lake Phase	Karrakatta Sand Yellow Phase	Spearwood seasonal swamps Phase	Spearwood Sand Phase	Bassendean, Jandakot Phase	Spearwood wet swamps Phase
Percentage of mapped soil unit						
Wind erosion	<3	>70	<3	>70	50-70	<3
Water erosion	<3	<3	<3	3-10	<3	<3
Salinity	<3	<3	<3	<3	<3	<3
Subsurface Acidification	<3	>70	>70	50-70	>70	>70
Flood risk	>70	<3	<3	<3	<3	<3
Water logging	>70	<3	>70	<3	<3	>70
Phosphorus export risk	>70	10-30	>70	3-10	>70	>70

Appendix E. Assessment against the clearing principles

Assessment against the clearing principles	Variance level	Is further consideration required?
Environmental value: biological values		
Principle (a): *"Native vegetation should not be cleared if it comprises a high level of biodiversity."* Assessment: The proposed clearing will target stands of Typha. This species is capable of aggressive invasions that can transform ecosystems unless it is actively managed (Western Australian Herbarium, 2019). Without management, Typha can develop quickly into a monoculture (Figure 18 and 25) and cover an entire water body. Given the application area comprises predominantly of Typha and its tendency to colonise ecosystems, it is not anticipated that the proposed clearing will significantly impact fauna habitat or conservation significant assemblages of plants. The application area may contain suitable habitat and soils for a number of conservation significant fauna and flora species, however impacts are expected to be minimal.	Not likely to be at variance	Yes Refer to Section 3.2.1, above.
Principle (b): *"Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna."* Assessment: The area proposed to be cleared may contain foraging and breeding habitat for conservation significant fauna.	May be at variance	Yes Refer to Section 3.2.2, above.
Principle (c): *"Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora."* Assessment: *Caladenia huegelii* is listed as Threatened and is known to occur 1.7 kilometres east of the application area (Warradale Park), within fringing vegetation associated with Jandabup Lake. However, this species is associated with open heath vegetation, on well drained soils, a habitat that does not occur within the application are. The vegetation within the application area is comprised of stands of Typha, or vegetation with a closed, or fringing vegetation dominated by sedges and semi aquatic species on poorly drained soils. Therefore, it is unlikely that *Caladenia huegelii* occurs within the application area.	Not likely to be at variance	No
Principle (d): *"Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community."* Assessment: Four Threatened Ecological Community (TEC) listed by the Minister for Environment are recorded within the local area. According to available databases and photos provided by the applicant (See Appendix G), the area proposed to be cleared does not contain species assemblages that are considered to be representative of a TEC.	Not likely to be at variance	Yes Refer to Section 3.2.3, above
Environmental value: significant remnant vegetation and conservation areas		
Principle (e): *"Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared."* Assessment: The national objectives and targets for biodiversity conservation in Australia has a target to prevent clearance of ecological communities with an extent below 30 per cent of that present pre-European settlement, below which species loss appears to accelerate exponentially at an ecosystem level (Commonwealth of Australia, 2001). The extent of the mapped remanent native vegetation in the local area represents 29.35 percent of its original extent. Considering the targeted nature of Typha removal and that the native vegetation proposed to be cleared does not comprise high biodiversity, significant habitat for fauna, threatened or priority flora	Not at variance	No

Assessment against the clearing principles	Variance level	Is further consideration required?
or ecological communities, the application area is not considered to be significant as a remnant of native vegetation within an extensively cleared area.		
Principle (h): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area."* Assessment: Several sites included in the application area fall within Joondalup Lake Nature Reserve and Yellagonga Regional Park. Badgerup Lake, and Little Badgerup Lake form part of the Bush Forever Regional Scheme. Given the purpose of the proposed clearing is to create and improve wetland habitats, it is not likely to have an impact on the environmental values of the reserves and conservation schemes within the local area.	Not likely to be at variance	Yes Refer to Section 3.2.3, above
Environmental value: land and water resources		
Principle (f): "*Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland."* Assessment: Noting the definition of the principle, the proposed clearing is at variance with this principle. Typha forms a natural component of native wetland and watercourse vegetation. However, Typha can dominate wetland ecosystems. Given the nature of the proposed clearing, it is unlikely to significantly impact wetlands or watercourses.	At variance	Yes Refer to Section 3.2.4 above.
Principle (g): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation."* Assessment: There is a high degree of variation between soils within the application area. A number of soils are susceptible to one or more of variability of degradation risk, including wind, water erosion phosphorus export and Subsurface Acidification. Typha control methods proposed are not likely to have an appreciable impact on land degradation.	May be at variance	Yes Refer to Section 3.2.4, above.
Principle (i): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water."* Assessment: The removal of Typha may increase water turbidity. However impacts are likely to be minimal and short term.	May be at variance	Yes Refer to Section 3.2.4, above.
Principle (j): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding."* Assessment: In addition to improving wetland habitats, the purpose of the proposed clearing is to improve water flow, by monitoring and removing dense stands of Typha. Therefore, the proposed clearing is unlikely to contribute to waterlogging or increase incidence of flooding.	Not at variance	No

Appendix F. Vegetation condition rating scale

Vegetation condition is a rating given to a defined area of vegetation to categorise and rank disturbance related to human activities. The rating refers to the degree of change in the vegetation structure, density and species present in relation to undisturbed vegetation of the same type. The degree of disturbance impacts upon the vegetation's ability to regenerate. Disturbance at a site can be a cumulative effect from a number of interacting disturbance types.

Considering its location, the scale below was used to measure the condition of the vegetation proposed to be cleared. This scale has been extracted from Keighery, B.J. (1994).

Measuring vegetation condition for the South West and Interzone Botanical Province (Keighery, 1994)

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, with disturbance affecting individual species; weeds are non-aggressive species.
Very good	Vegetation structure altered, with obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and/or grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and/or grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and/or grazing.
Completely degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Appendix G. Photographs of the vegetation and maps supplied by the applicant

G.1 Joondalup Lake Forshaw sites

Figure 11. Joondalup Lake - Ottawa rehabilitation site (outlined in black, City of Wanneroo 2021a).

Figure12. Example of vegetation within the Ottawa restoration area (City of Wanneroo 2021a).

Figure 13. Example of vegetation within the Ottawa restoration area (City of Wanneroo 2021a).

Figure 14. Example of vegetation within the Ottawa restoration area (City of Wanneroo 2021a) .

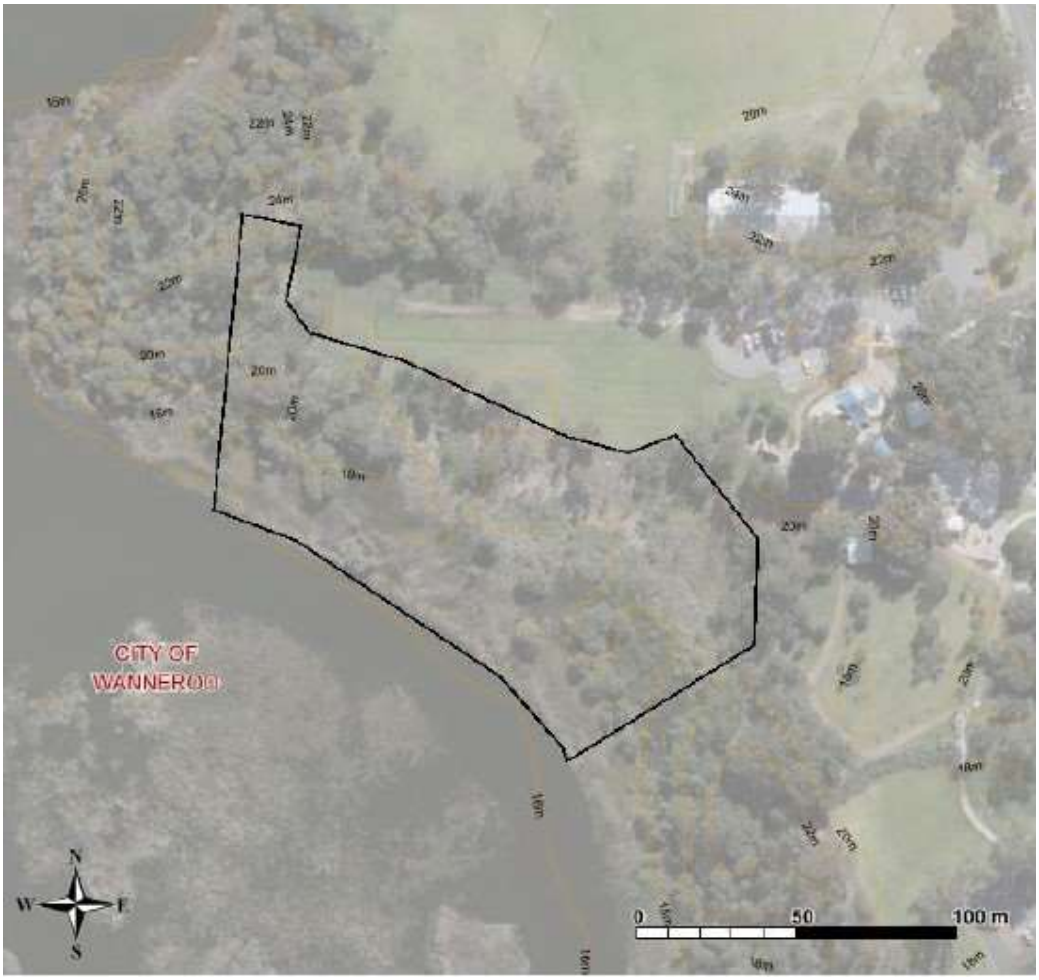

Figure 15. Joondalup Lake - Rotary Park rehabilitation site (outlined in black). (City of Wanneroo 2021a).

Figure 16. Example of vegetation within the Rotary Park rehabilitation site (City of Wanneroo 2021a).

Figure 17. Example of vegetation within the Rotary Park rehabilitation site, showing a dense infestation of Typha in the background, (City of Wanneroo 2021a).

Figure 18. Example of vegetation within the Rotary Park rehabilitation site (City of Wanneroo 2021a).

Figure 19. Example of vegetation within the Rotary Park rehabilitation site (City of Wanneroo 2021a).

Figure 20. Example of vegetation within the Rotary Park rehabilitation site (City of Wanneroo 2021a).

Figure 21. Joondalup Lake – Church Street Drain rehabilitation site (outlined in black).

Figure 22. Example of vegetation within the Church Street Drain rehabilitation site (City of Wanneroo 2021a).

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Figure 23. Example of vegetation within the Church Street Drain rehabilitation site (City of Wanneroo 2021a).

Figure 24. Example of vegetation within the Church Street Drain rehabilitation site (City of Wanneroo 2021a).

Figure 25. Example of vegetation within the Church Street Drain rehabilitation site (City of Wanneroo 2021a).

Figure 26. Joondalup Lake - Wanneroo Recreation Centre rehabilitation site (outlined in black).

Figure 27. Example of vegetation within Wanneroo Recreation Centre rehabilitation site (City of Wanneroo 2021a).

Figure 28. Example of vegetation within Wanneroo Recreation Centre rehabilitation site (City of Wanneroo 2021a).

Figure 29. Example of vegetation within Wanneroo Recreation Centre rehabilitation site (City of Wanneroo 2021a).

Figure 30. Example of fringing vegetation, within Wanneroo Recreation Centre rehabilitation site (City of Wanneroo 2021a).

Figure 31. Joondalup Lake – Frogs Hollow site (outlined in black).

Figure 32. Example of vegetation within the Frogs Hollow site (City of Wanneroo 2021a).

Figure 33. Example of vegetation within the Frogs Hollow site (City of Wanneroo 2021a).

Figure 34. Example of vegetation within the Frogs Hollow site (City of Wanneroo 2021a).

Figure 35. Example of vegetation within the Frogs Hollow site (City of Wanneroo 2021a).

Figure 36. Example of fringing vegetation, within the Frogs Hollow site (City of Wanneroo 2021a).

Figure 37. Example of Example of vegetation within the Frogs Hollow site (City of Wanneroo 2021a).

Figure 38. Joondalup Lake – Turtle Nesting Site (outlined in black).

Figure 39. Example of Example of vegetation within the Turtle Nesting Site (City of Wanneroo 2021a).

Figure 40. Example of vegetation within Turtle Nesting Site (City of Wanneroo 2021a).

Figure 41. Joondalup Lake – Ariti rehabilitation site (outlined in black).

Figure 42. Example of Example of vegetation within Ariti rehabilitation site (City of Wanneroo 2021a).

Figure 43. Example of Example of vegetation within Ariti rehabilitation site (City of Wanneroo 2021a).

Figure 44. Example of Example of vegetation within Ariti rehabilitation site (City of Wanneroo 2021a).

Figure 45. Example of Example of vegetation within Ariti rehabilitation site (City of Wanneroo 2021a).

Figure 46. Example of fringing vegetation, within Ariti rehabilitation site (City of Wanneroo 2021a).

Figure 47. Example of vegetation within Ariti rehabilitation site (City of Wanneroo 2021a).

Figure 48. Example of vegetation within Ariti rehabilitation site (City of Wanneroo 2021a).

G.2 Nyunda Park

Figure 49. Nyunda Park Lake (outlined in black).

Figure 50. Example of fringing vegetation, Nyunda Park Lake (City of Wanneroo 2021a).

Figure 51. Example of fringing vegetation, Nyunda Park Lake (City of Wanneroo 2021a).

Figure 52. Example of fringing vegetation, Nyunda Park Lake (City of Wanneroo 2021a).

Figure 53. Example of fringing vegetation, Nyunda Park Lake (City of Wanneroo 2021a).

G. 3 Lake Adams

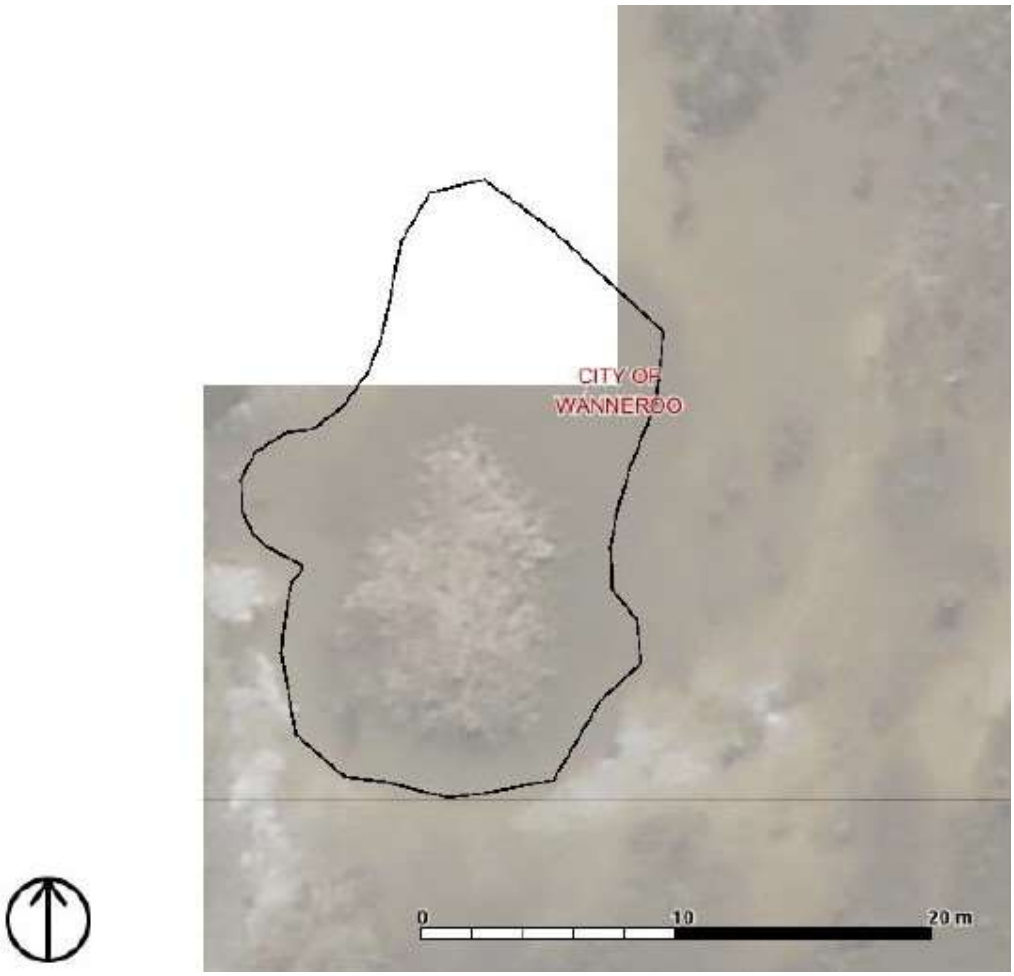

Figure 54. Lake Adams (outlined in black, City of Wanneroo 2021a).

Figure 55. Example of fringing vegetation, Lake Adams (City of Wanneroo 2021a).

Figure 56. Example of fringing vegetation, Lake Adams (City of Wanneroo 2021a).

Figure 57. Example of fringing vegetation, Lake Adams portion of the application area.

G.4 Da Vinci Park

Figure 58. Da Vinci Park site (outlined in black).

Figure 59. Example of vegetation within Da Vinci Park (City of Wanneroo 2021a).

G.5 Wallubuenup Swamp

Figure 60. Salana Park site (outlined in black).

Figure 61. Example of vegetation within Solana Park site, photo facing north west (City of Wanneroo 2021a).

Figure62. Example of vegetation within Solana Park site. Facing south west across Wallubuenup Swamp (City of Wanneroo 2021a).

Figure 63. Panzano Park site (outlined in black, City of Wanneroo 2021a).

Figure 64. Example of vegetation within Panzano Park site (City of Wanneroo 2021a).

Figure 65. Example of vegetation within Panzano Park site (City of Wanneroo 2021a).

G.6 Badgerup Lakes

Figure 66. Badgerup Lake site (outlined in black).

Figure 67. Example of vegetation within Lake Badgerup (City of Wanneroo 2021a).

Figure 68. Example of vegetation within Lake Badgerup (City of Wanneroo 2021a).

Figure 69. Example of vegetation within Lake Badgerup (City of Wanneroo 2021a).

Figure 70. Example of vegetation within Lake Badgerup (City of Wanneroo 2021a).

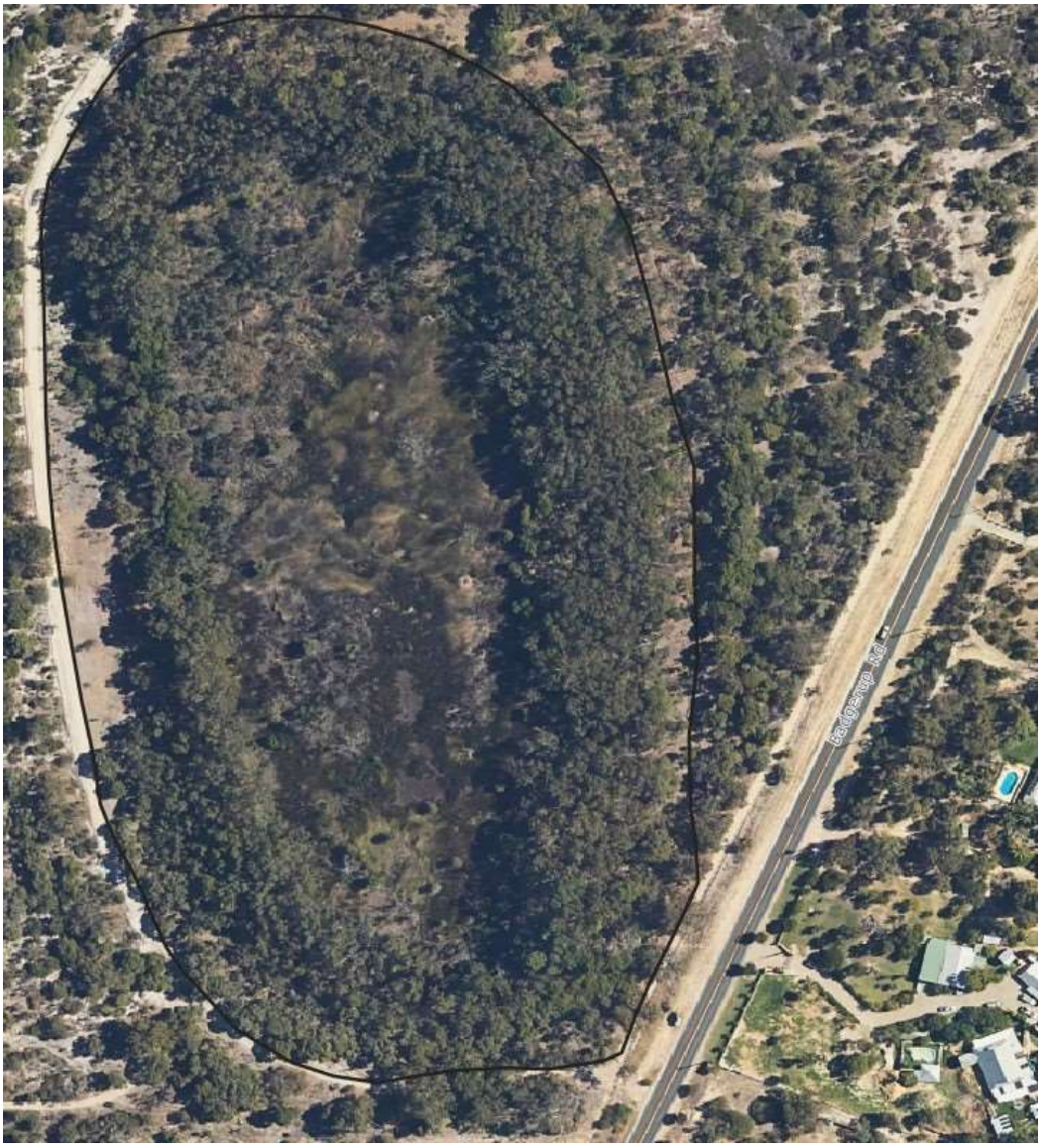

Figure 71. Little Lake Badgerup site (outlined in black).

Figure 72. Example of vegetation within Little Lake Badgerup (City of Wanneroo 2021a).

G.7 Warradale Park Site (Snake Swamp)

Figure 73. Warradale Park site (outlined in black).

Figure 74. Example of vegetation within Warradale Park site (City of Wanneroo 2021a).

Figure 75. Example of vegetation within Warradale Park site (City of Wanneroo 2021a).

Figure 76. Example of vegetation within Warradale Park site (City of Wanneroo 2021a).

Figure 77. Example of vegetation within Warradale Park site (City of Wanneroo 2021a).

G.8 Kingsway Lake North / Kingsway lake South

Figure 78. Kingsway Lakes (outlined in black).

Figure79. Example of vegetation within Kingsway Lake north site (City of Wanneroo 2021a).

Figure 80. Example of vegetation within Kingsway Lake north site (City of Wanneroo 2021a).

Figure 81. Example of vegetation within Kingsway Lake north site (City of Wanneroo 2021a).

Figure 82. Example of vegetation within Kingsway Lake south site (City of Wanneroo 2021a).

Figure 83. Example of vegetation within Kingsway Lake south site (City of Wanneroo 2021a).

Figure 84. Example of vegetation within Kingsway Lake south site (City of Wanneroo 2021a).

G.9 Marangaroo Golf course

Figure 85. Marangaroo Golf Course (outlined in black).

Figure 86. Example of fringing vegetation within Kingsway Marangaroo Golf Course lake (City of Wanneroo 2021a).

Figure 87. Example of fringing vegetation within Kingsway Marangaroo Golf Course lake (City of Wanneroo 2021a).

Appendix H. Sources of information

H.1. GIS databases

Publicly available GIS Databases used (sourced from www.data.wa.gov.au):

- 10 Metre Contours (DPIRD-073)
- Aboriginal Heritage Places (DPLH-001)
- Aboriginal Heritage Places (DPLH-001)
- Cadastre (LGATE-218)
- Cadastre Address (LGATE-002)
- Contours (DPIRD-073)
- DBCA – Lands of Interest (DBCA-012)
- DBCA Legislated Lands and Waters (DBCA-011)
- Directory of Important Wetlands in Australia – Western Australia (DBCA-045)
- Environmentally Sensitive Areas (DWER-046)
- Flood Risk (DPIRD-007)
- Groundwater Salinity Statewide (DWER-026)
- Hydrography – Inland Waters – Waterlines
- Hydrological Zones of Western Australia (DPIRD-069)
- IBRA Vegetation Statistics
- Imagery
- Local Planning Scheme – Zones and Reserves (DPLH-071)
- Native Title (ILUA) (LGATE-067)
- Pre-European Vegetation Statistics
- Public Drinking Water Source Areas (DWER-033)
- Ramsar Sites (DBCA-010)
- Regional Parks (DBCA-026)
- Remnant Vegetation, All Areas
- RIWI Act, Groundwater Areas (DWER-034)
- RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037)
- Soil Landscape Land Quality – Flood Risk (DPIRD-007)
- Soil Landscape Land Quality – Phosphorus Export Risk (DPIRD-010)
- Soil Landscape Land Quality – Subsurface Acidification Risk (DPIRD-011)
- Soil Landscape Land Quality – Water Erosion Risk (DPIRD-013)
- Soil Landscape Land Quality – Water Repellence Risk (DPIRD-014)
- Soil Landscape Land Quality – Waterlogging Risk (DPIRD-015)
- Soil Landscape Land Quality – Wind Erosion Risk (DPIRD-016)
- Soil Landscape Mapping – Best Available
- Soil Landscape Mapping – Systems
- Wheatbelt Wetlands Stage 1 (DBCA-021)

Restricted GIS Databases used:

- ICMS (Incident Complaints Management System) – Points and Polygons
- Threatened Flora (TPFL)
- Threatened Flora (WAHerb)
- Threatened Fauna
- Threatened Ecological Communities and Priority Ecological Communities
- Threatened Ecological Communities and Priority Ecological Communities (Buffers)

H.2. References

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