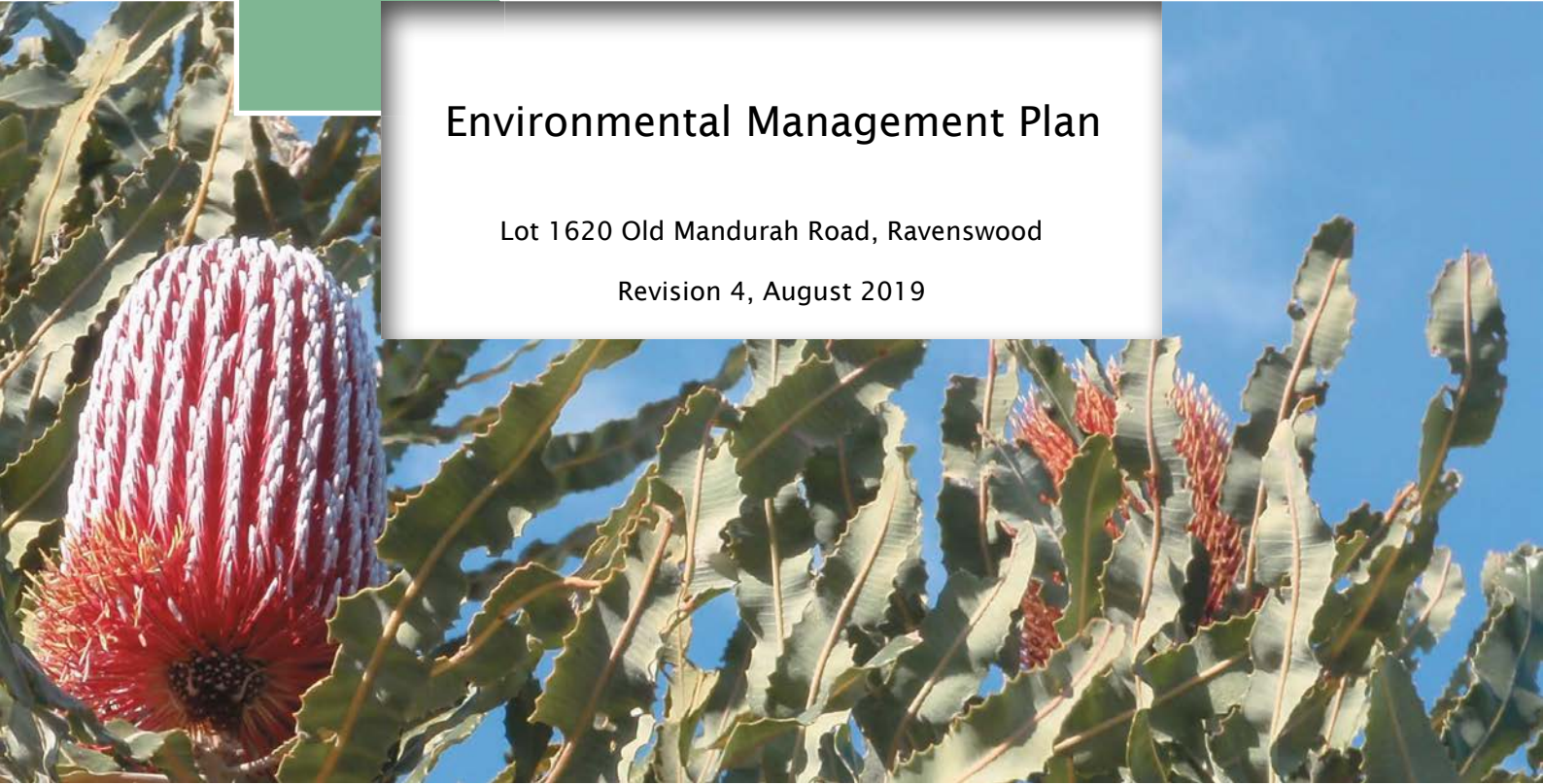


Annexure 11

Environmental Management Plan



COTERRA ENVIRONMENT



Environmental Management Plan

Lot 1620 Old Mandurah Road, Ravenswood

Revision 4, August 2019

CALIBRE | COMMITMENT | COLLABORATION

Environmental Management Plan

Lot 1620 Old Mandurah Road, Ravenswood

Revision 4, August 2019

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EXECUTIVE SUMMARY

Lot 1620 Old Mandurah Road, Ravenswood (the site) is located approximately 75km south of the Perth CBD within the Shire of Murray. The site is zoned 'Urban' and 'Regional Open Space' under the Peel Region Scheme and 'Special Development' and 'Regional Open Space' under the Shire of Murray Town Planning Scheme No. 4.

This Environmental Management Plan (EMP) has been prepared to address environmental requirements contained within the site's Outline Development Plan and the Town Planning Scheme. The three areas addressed within this EMP are proposed for different levels of management dependent upon their anticipated future usage. These are generally summarised below:

- River Reserve ROS – Recreational facilities and a higher level of management are proposed for this area as it is viewed as a key area for future conservation and recreation. This area has the best condition native vegetation of all three management areas. The target for revegetation works in proximity to the L-shaped wetland will be to create a self-perpetuating ecosystem, which requires limited further maintenance by the Shire of Murray.
- Western POS – Management of this area is to focus on bushfire prevention actions and avoidance of impacts to the adjacent conservation areas. Some drainage infiltration areas may also be incorporated in this location, subject to design and review as part of the Urban Water Management Plan process.
- Foreshore Reserve – This area is currently managed by the Shire of Murray. Additional support to the existing management is proposed through the planting of additional vegetation along the Murray River interface and bushfire prevention actions. The design of the foreshore works has focused on improving the ecological condition of the area, while minimising further maintenance requirements for the Shire of Murray.

The River Reserve ROS and the Western POS areas are owned by Kimba Pty Ltd and will be created when subdivision of the site occurs. The Murray River Foreshore Reserve has already been created and is under the management of the Shire of Murray.

Key environmental features of the site are summarised as follows:

- Lot 1620 was cleared prior to 1979 and utilised for farming activities. Up until 2003 the site was used for horse agistment and horse training. A number of dwellings and sheds are located within the southern portion of the site.
- Two Aboriginal heritage sites are mapped as potentially occurring in this location. The Waugal Cave is not present within the landholdings (confirmed by H. Thomason, DPLH), and the Murray River site is located adjacent to the foreshore reserve.
- Soils at the site comprise alluvial terraces with red earths and duplex soils near the river, and sand plains with low dunes and occasional swamps further inland.

- The alluvial terraces are have a High to Moderate Acid Sulfate Soil (ASS) risk, and the sand plain has a Moderate to Low ASS risk.
- The average annual maximum groundwater level (AAMGL) at the site is estimated to be approximately 4.5 to 5.5mAHD.
- The majority of the site is mapped as a Multiple Use category wetland (UFI 15802 and UFI 13829). An L-shaped Conservation Category Wetland (CCW) is present within the River Reserve ROS (UFI 4888). This wetland appears to have been influenced by historical drainage works, with excavation/amendment of the drainage channel appearing likely. A CCW is also present along the south western boundary of the Western POS area (UFI 13828).
- The Murray River is located immediately adjacent to the site. This is mapped as a CCW.
- A drainage channel originating to the east of the River Reserve ROS, enters the L-shaped wetland and discharges to the Murray River towards the southern end of the wetland. A number of additional shallow drainage lines are also present within the River Reserve ROS and the Foreshore Reserve.
- Native vegetation onsite is generally limited to trees along the Murray River foreshore and areas of isolated wetland vegetation. The onsite vegetation is generally described as follows:
 - The River Reserve ROS comprises a wetland, and some grasslands predominantly made up of Kikuyu Grass. The vegetated L-shaped wetland contains several overflow drainage depressions / channels, and the dry grassland appears regularly managed in parts and semi-managed in others. In the areas of remnant vegetation the vegetation could be described as Good to Very Good Condition according to the Keighery Scale. The tree density is high, the canopy is dense and intact, and there are a number of large old trees in the area. The mid-storey is also thick in places. The understorey is degraded and dominated by Kikuyu Grass, although scattered native rushes and sedges are present throughout.
 - The native vegetation along the sloping banks of the river is mainly comprised of *Eucalyptus rudis* and *Melaleuca raphiophylla* trees, with area of mid and lower storey vegetation also present. Moving away from the banks the terrain flattens out and transitions into *Corymbia calophylla* canopy over managed grassland. The riverbank vegetation is in Good condition, although there is an incursion of grasses from adjoining residential properties and managed grassland. The grasses are predominantly *Cenchrus clandestinus* (Kikuyu Grass) and *Cynodon dactylon* (Couch Grass). Although dominating the understorey in places these species do appear to be contributing to riverbank stability
 - The Western POS is completely degraded. Apart from a few *Kunzea glabrescens*, there are no native species in the area. The area is

dominated by grass weeds that are primarily Perennial Veldt Grass and African Lovegrass.

- Database search results and knowledge of the local area indicated that there may be a variety of native and introduced fauna species present in this location (as described in Section 2.6). The remaining riparian and wetland vegetation at the site provide the key areas for fauna habitat onsite. The foreshore and adjacent areas also form part of the Murray River wildlife corridor.
- All areas covered by this EMP are mapped as Bushfire Prone by the Department of Fire and Emergency Services. The features of the site which are associated with an increased fire risk include native vegetation, particularly where understorey vegetation is present and dry grasslands.

The overall management objectives for the River Reserve ROS are to prevent potential impacts to the existing wetland and to also rehabilitate the vegetation to promote a self-perpetuating ecosystem. In the Murray River Foreshore Reserve, the management actions proposed seek to improve current river bank stability. In the Western POS, the focus is on management of potential bushfire risk.

The management actions committed to within this EMP are summarised in the following table.

Table A: Summary of Management Actions

Action	Strategy	Timing	Areas of Site Applicable
General Obligations			
A1	Contractors will be informed of their responsibilities under the <i>Aboriginal Heritage Act 1972</i> in terms of reporting of potential Aboriginal sites or artefacts found during the construction program to The Registrar of Aboriginal Sites or the Police. Work must cease in this area until the matter is investigated.	Throughout life of the EMP	All areas
A2	Requirement for all plant and equipment used within the POS and Reserve areas to be 'clean on entry' to the site to be included in relevant contracts.	Throughout life of the EMP	River Reserve ROS, Murray River Foreshore Reserve and Western POS
A3	Undertake annual slashing (prior to 30 th November) of the grassland present in the areas managed under this management plan	Throughout life of the EMP	River Reserve ROS, Murray River Foreshore Reserve and Western POS
A4	Work undertaken within 50m of the Murray River is to avoid excavation of soils where possible. If this cannot be avoided consultation with DPLH will be undertaken to determine if a Section 18 application under the <i>Aboriginal Heritage Act 1972</i> is required.	Throughout life of the EMP	River Reserve ROS - areas within 50m of the Murray River

Action	Strategy	Timing	Areas of Site Applicable
A5	The need for an ASS investigation is to be assessed when detailed design information is available to determine if the ASS assessment criteria are triggered. If this is the case the investigation is to be undertaken prior to ground disturbing works.	Throughout life of the EMP	All developable land
A6	Stormwater drainage design to prevent stormwater drainage entering UFI 4888 and UFI 13826.	Throughout life of the EMP	All areas
A7	Only utilise areas of stormwater infiltration which are greater than 30m from the boundary of UFI 4888 and UFI 13826.	Throughout life of the EMP	All areas
A8	Alignment of the interface road to provide for a 30m buffer to the CCW within the River Reserve ROS.	Throughout life of the EMP	River Reserve ROS, Areas within 30m of the CCW
A9	Maintain the functionality of the drainage lines which traverse through the River Reserve POS. Details and specifications for the proposed drainage infrastructure will be submitted with the Development Application to the Shire for the proposed construction of the pathway.	Prior to Development Application for the pathway	River Reserve ROS
A10	Refuse bins are not proposed to be installed within the River Reserve ROS, to reduce presence of feral fauna attractants.	Throughout life of the EMP	River Reserve ROS
Murray River Foreshore Reserve			
B1	Undertake three pre-planting weed control events within the tree planting area shown on Figure 7.	Spring, Summer and Autumn following trigger outlined in Section 3.	Murray River Foreshore Reserve
B2	Rip planting lines and install tubestock at 10 m spacing in two rows along the edge of the Murray River at the location indicated on Figure 7. Species to comprise WA Flooded Gum, Swamp Paperbark, Marri and Jarrah.	Winter following B1	Murray River Foreshore Reserve
B3	Install tree guards around tubestock to protect against kangaroo and rabbit grazing.	Following B2	Murray River Foreshore Reserve
B4	Maintenance Year 1 : Undertake three post-planting weed control events within the tree planting area shown on Figure 7. Monitor the success of the plantings and undertake infill planting where necessary.	Weed control in Spring, Summer and Autumn following B2. Monitor and infill plant in Spring/Autumn	Murray River Foreshore Reserve
B5	Maintenance Year 2 : Undertake three weed control events within the tree planting area shown on Figure 7. Monitor the success of the plantings and undertake infill planting where necessary.	Weed control in Spring, Summer and Autumn following B4. Monitor in Spring/Autumn following B4. Infill planting in winter following B4.	Murray River Foreshore Reserve

Action	Strategy	Timing	Areas of Site Applicable
B6	Removal of tree guards once plants are established	Determined by plant growth	Murray River Foreshore Reserve
River Reserve ROS – Fencing			
C1	Install fencing in the River Reserve ROS as shown on Figure 7.	Refer to Section 3.	River Reserve ROS
C2	Repair or replace existing fencing along the eastern side of the River Reserve ROS.	Refer to Section 3.	River Reserve ROS
C3	Provide two gated access points to the River Reserve ROS access path from the adjacent subdivision as shown on Figure 7.	Refer to Section 3.	River Reserve ROS
River Reserve - Paths			
D1	Install a 2m wide crushed limestone access path around the wetland retention and revegetation area within the River Reserve ROS as shown on Figure 7.	Refer to Section 3.	River Reserve ROS
D2	Upgrade the culvert over the drainage line present within the River Reserve ROS as part of the path installation works.	Refer to Section 3.	River Reserve ROS
D3	Link the River Reserve ROS access paths to the internal subdivision POS access paths, via a pedestrian connection along the road bounding the Murray River foreshore reserve. Path to be constructed of crushed limestone.	Refer to Section 3.	River Reserve ROS
D4	Provide a crushed limestone path connection to the Murray River at the location shown on Figure 7.	Refer to Section 3.	River Reserve ROS
D5	Provide signage at the River ROS access points to advise that dogs must be kept on a leash and please do not litter within the ROS.	Refer to Section 3.	River Reserve ROS
D6	Any European Bee nests present within tree hollows in proximity to public access areas will be removed.	Refer to Section 3.	River Reserve ROS
River Reserve ROS – Rehabilitation			
E1	Undertake three pre-planting weed control events within the weed control zone shown on Figure 7. Remove woody weeds present in the area.	Weed control in Spring, Summer and Autumn following trigger described in Section 3.	River Reserve ROS
E2	Apply 75mm of mulch to the targeted infill planting zone as shown on Figure 7. Rip the area and plant tubestock at a density of 1/m ²	Following completion of E1 – Winter	River Reserve ROS
E3	Install tree guards around tubestock to protect against kangaroo and rabbit grazing.	Following E2	River Reserve ROS
E4	Maintenance Year 1 : Undertake three post-planting weed control events within the infill planting zone shown on Figure 7. Monitor the success of the plantings and undertake infill planting where necessary.	Weed control in Spring, Summer and Autumn following E2. Monitor in Spring/Autumn following E2. Infill planting in Winter following E2.	River Reserve ROS

Action	Strategy	Timing	Areas of Site Applicable
E5	Maintenance Year 2 : Undertake three weed control events within the infill planting zone shown on Figure 7. Monitor the success of the plantings and undertake infill planting where necessary.	Weed control in Spring, Summer and Autumn following E4. Monitor and infill plant in Spring/Autumn following E4	River Reserve ROS
E6	Remove plant guards when plants are established.	Determined by plant growth	River Reserve ROS
E7	Create and maintain a 3.5m wide firebreak along the eastern boundary of the River Reserve ROS	Refer to Section 3.	River Reserve ROS
Western POS			
F1	Provide fencing at the locations in the Western POS as shown on Figure 7.	Refer to Section 3.	Western POS
F2	Create and maintain a 3.5m wide firebreak along the cadastral boundaries of the Western POS area, unless a road interface is provided in these locations	Refer to Section 3.	Western POS

To ensure the above management actions achieve the desired objectives for the site the following success criteria, contingency measures and monitoring actions are proposed:

Success Criteria

- River Reserve ROS wetland targeted infill planting zone - achieve a final plant density of 1 plant / m² and a species richness of at least 75% of the initial planting list.
- Reserve ROS wetland and surrounding natural vegetation the target is to achieve 95% weed free status with no bulbous, rhizomatous, woody or declared weeds.
- Murray River Foreshore Reserve – achieve a planting density of 2 trees for every 10m of the 550m long foreshore reserve (equivalent of 110 trees).

Contingency Measures

- If weed cover does not meet the success criteria, undertake additional control events to ensure weeds are reduced to meet the criteria.
- Any failed seedlings within the River Reserve ROS will be replanted in the following winter, along with provisions for anticipated future failures. Similarly any seedlings lost in the Murray River Foreshore planting rows will also be replaced.
- If infill planting is required this will be undertaken during the following winter period to ensure seedlings are planted in optimal conditions. Additional seedlings may be planted in the first year after installation to anticipate future mortality rate.

Monitoring Program



- Formal monitoring will be undertaken each spring and autumn post-planting. Three 5 m x 5 m quadrats will be randomly established in the CCW buffer revegetation area. Plant densities, species representation, native and weed cover will all be measured in these areas at each event. These values will be compared with the completion criteria to determine whether remedial action is required.
- All trees in the Murray River Foreshore Reserve planting rows will be assessed for survival, and failed trees counted.
- Photographs will be taken at each quadrat and permanent photo monitoring points will be established around the site. Within weed control only areas at each photo monitoring point a photo will be taken in north, south, east, and west directions and the weed cover percentage within a 5 m radius of the photo point will be determined.
- A report will be issued following each event with recommendations for action based on the results of each assessment.

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1.0 INTRODUCTION

1.1 Background

Lot 1620 Old Mandurah Road, Ravenswood (the site) is located approximately 75km south of the Perth CBD within the Shire of Murray (Figure 1). The site is zoned 'Urban' and 'Regional Open Space' under the Peel Region Scheme (PRS), and 'Special Development' and 'Regional Open Space' under the Shire of Murray Town Planning Scheme No. 4 (Figure 2).

An Outline Development Plan (ODP) has been prepared for the site; the most recent version dated 8 August 2013 (Appendix A). This plan identifies the Regional Open Space portion of Lot 1620 as 'River Reserve ROS' which extends over 6.92ha. The ODP also identifies numerous POS areas within the site.

The ODP (2013) notations include the following requirement:

4. An Environmental Management Plan shall be prepared, endorsed and implemented for the Conservation Category Wetland and its buffer in the western portion of the ODP area, the adjacent Murray River foreshore and Regional Open Space as a condition of subdivision approval.

Schedule 7 of the Shire of Murray Local Planning Scheme contain the following special provisions which are relevant to the site:

4. Wetland Management Plan

Prior to subdivision of the land, a Wetland Management Plan shall be prepared and implemented to the satisfaction of Council and the Department of Environment – Catchment and Waterways Section.

7. Foreshore Management Plan

Prior to subdivision of the land, a detailed Foreshore Management Plan shall be prepared and implemented over the adjacent Murray River Foreshore and Regional Open Space to the satisfaction of Council and the Department of Environment – Catchment and Waterways Section.

This Environmental Management Plan (EMP) has been prepared to address the above requirements. The EMP is applicable to the River Reserve Public Open Space (POS), the Murray River Foreshore Reserve and the Western POS (Figure 3).

1.2 Ownership and Vesting

Lot 1620, which includes the River Reserve ROS and the Western POS areas, is owned by Kimba Pty Ltd. The certificate of title details are as follows:

Lot 1620 on Deposited Plan 410723

Volume: 2932

Folio: 437

The Murray River Foreshore Reserve (Reserve No. 30342) was part of the original landholdings but has been subdivided off the parent title with the responsible

authority identified as the Department for Planning and Infrastructure. This reserve is under the management of the Shire of Murray.

1.3 Objectives of the EMP

The key purpose of the EMP is to identify the management actions required to protect and/or enhance the conservation and recreation values of the subject area. The specific goals and objectives of this plan are as follows:

- Identify the key environmental features of the site;
- Identify the environmental management required for the conservation areas to protect their ecological values;
- Identify how integration of passive recreational opportunities can be achieved without detrimental environmental impacts within the proposed recreation spaces;
- Identify management measures required to protect retained vegetation; and
- Identify items which will be provided as detailed POS design progresses post-EMP approval.

1.4 General Overview of Management Areas

The three areas addressed within this EMP are proposed for different levels of management dependent upon their anticipated future usage. These are generally summarised below:

- River Reserve ROS – Recreational facilities and a higher level of management are proposed for this area as it is viewed as a key area for future conservation and recreation. This area has the best condition native vegetation of all three management areas. The target for revegetation works in proximity to the L-shaped wetland will be to create a self-perpetuating ecosystem, which requires limited further maintenance by the Shire of Murray.
- Western POS – Management of this area is to focus on bushfire prevention actions and avoidance of impacts to the adjacent conservation areas. Some drainage infiltration areas may also be incorporated in this location, subject to design and review as part of the Urban Water Management Plan process.
- Foreshore Reserve – This area is currently managed by the Shire of Murray. Additional support to the existing management is proposed through the planting of additional vegetation along the Murray River interface and bushfire prevention actions. The design of the foreshore works has focused on improving the ecological condition of the area, while minimising further maintenance requirements for the Shire of Murray.

1.5 Overall Development

As indicated by the zoning (Figure 2) and ODP (Appendix A) the development site will generally comprise medium density residential land. In relation to the 'Area subject to future planning' the ODP notations identify the following:

- The future planning of this area is to be undertaken with a full review of adjoining design interfaces including road and open space linkages with a view to creating a focal point for the area with increased development density. Planning is to ensure land in the vicinity of the adjacent River Reserve (including the exiting foreshore reserve) is developed with a high quality public interface; allows for public access to the reserve; is clearly separated from the reserve whilst providing physical and visual integration with the reserve; and maintains a high standard of visual amenity from the reserve.

2.0 STUDY AREA DESCRIPTION AND MANAGEMENT ACTIONS

2.1 Climate

The climate of the Ravenswood area is characterised by cool wet winters and warm dry summers. Mean temperatures recorded at the Mandurah Weather station (Site ID: 9977), which is located approximately 14km west of Ravenswood, range from a mean maximum of 29.8°C in February to a mean minimum of 10.6°C in July (BoM, 2018). The mean annual rainfall is 667mm, with the monthly rainfall statistics shown in Plate 1.

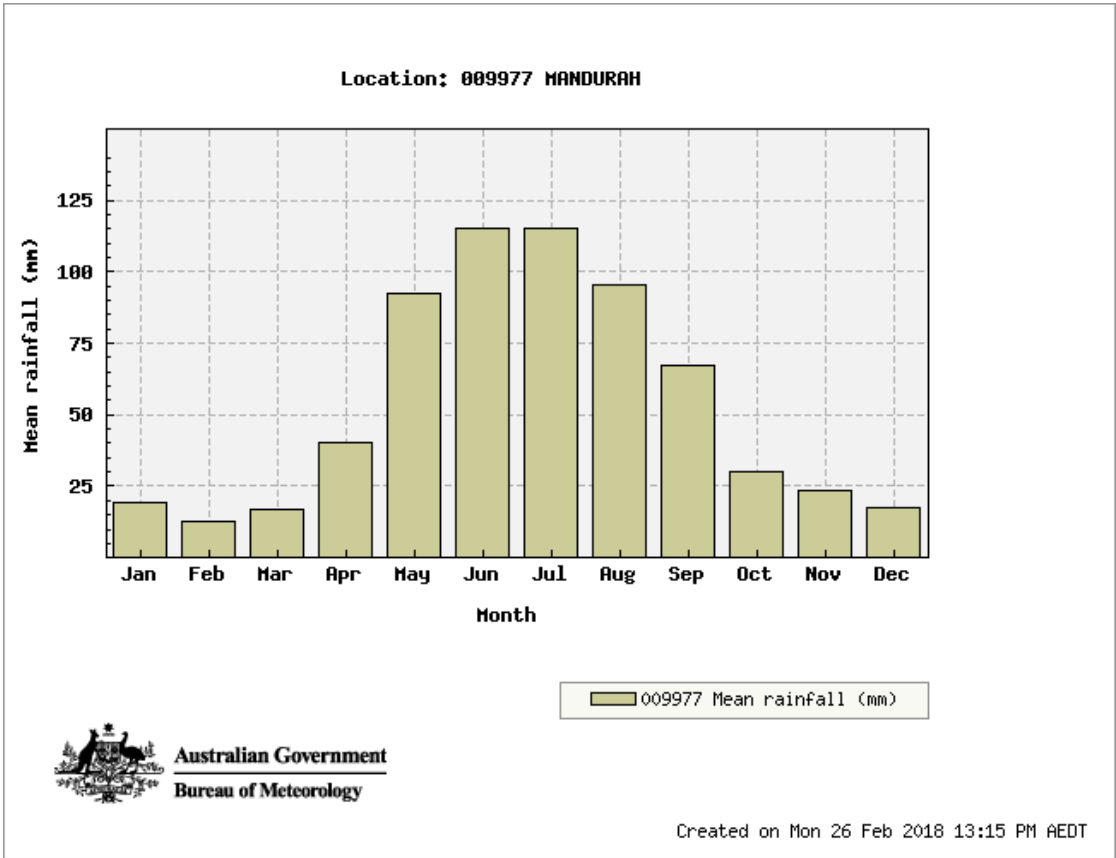


Plate 1: Mean Monthly Rainfall (BoM, 2018)

Strongest wind conditions recorded for Mandurah Weather Station are from the south-west in the summer afternoons. Average summer and winter wind speeds and directions are shown on Plate 2.

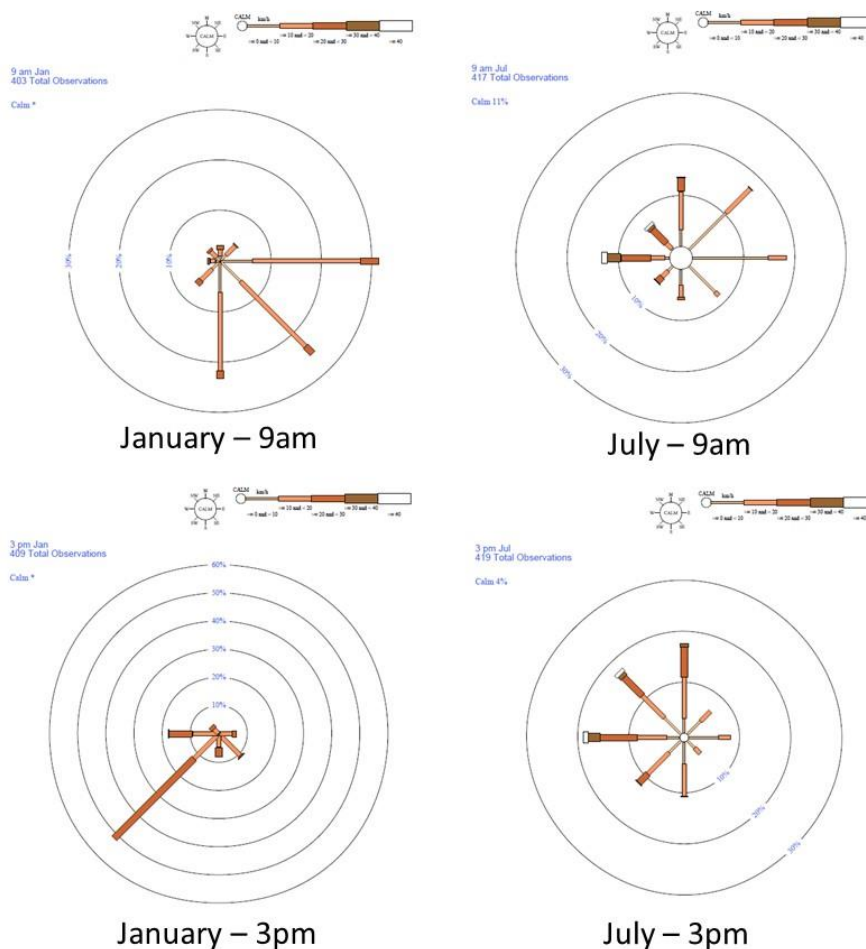


Plate 2: Average Wind Speed and Direction (BoM, 2018)

2.2 History

2.2.1 Land Use

Based on a review of historical aerial photography it appears that Lot 1620 was cleared prior to 1979 and utilised for farming activities. Up until 2003 the site was used for horse agistment and horse training. A number of dwellings and sheds are located within the southern portion of the site.

2.2.2 Aboriginal Heritage

A search of the Department of Planning, Lands and Heritage (DPLH) Aboriginal Heritage Enquiry System database identified that the following Aboriginal heritage sites polygons overlap the River Reserve ROS and the Murray River Foreshore Reserve areas:

- Site 3537 – Murray River (Mythological Site)
- Site 3677 – Waugal Cave (Mythological Site)

Information about each of these sites as issued by DPLH is provided in Appendix B.

Following additional liaison with DPLH it was identified that Site 3677 is not present within Lot 1620 or areas which form part of this EMP (H. Thomason, pers comm.26/3/18).

The *Aboriginal Heritage Act 1972* defines the following as an offence:

17. A person who —

(a) excavates, destroys, damages, conceals or in any way alters any Aboriginal site; or

(b) in any way alters, damages, removes, destroys, conceals, or who deals with in a manner not sanctioned by relevant custom, or assumes the possession, custody or control of, any object on or under an Aboriginal site,

commits an offence unless he is acting with the authorisation of the Registrar under section 16 or the consent of the Minister under section 18.

As such, any work proposed within 50m of the Murray River will not include excavation of soils (aside from works needed to instal plants) to avoid disturbance to Site 3537, otherwise consultation with DPLH will be undertaken to determine if a Section 18 referral under the *Aboriginal Heritage Act 1972* is required.

2.2.3 European Heritage

A search of the State government Heritage Council heritage places database (State Heritage Office, 2018), which shows both State heritage records and Shire of Murray Municipal Inventory listings, did not identify any site of European heritage significance within or immediately surround the areas which are the subject of this EMP.

2.2.4 Management Actions

The following management actions are proposed in relation to land use and heritage matters.

Table 1: Management Actions – Heritage

Action	Strategy	Timing	Areas of Site Applicable
General Obligations			
A1	Contractors will be informed of their responsibilities under the <i>Aboriginal Heritage Act 1972</i> in terms of reporting of potential Aboriginal sites or artefacts found during the construction program to The Registrar of Aboriginal Sites or the Police. Work must cease in this area until the matter is investigated.	Throughout the life of the EMP	All areas

Action	Strategy	Timing	Areas of Site Applicable
A4	Work undertaken within 50m of the Murray River is to avoid excavation of soils where possible. If this cannot be avoided consultation with DPLH will be undertaken to determine if a Section 18 application under the <i>Aboriginal Heritage Act 1972</i> is required.	Throughout the life of the EMP	River Reserve ROS - areas within 50m of the Murray River

2.3 Landform, Topography and Soils

2.3.1 Landforms and Topography

Regional scale mapping indicates that the site comprises landforms from both the Swan and the Bassendean Soil and Landform units, which are described as follows (Churchward and McArthur, 1980):

- Swan – alluvial terraces with red earths and duplex soils.
- Bassendean – sand plains with low dunes and occasional swamps.

The topographic elevations within the management areas range from 2 to 6.5mAHD (Figure 4). A steep slope is present along the northern boundary of the L-shaped wetland within the River Reserve ROS, with much of the other management areas having a gentle slope.

The banks of the Murray River have a low gradient at the northern end of the study area, but have a steep decline (from 4mAHD to the river level) at the eastern end of the study area.

2.3.2 Soils

Soils present onsite comprise of the following units (Geological Survey of WA, 1999):

- Bassendean Sand (Qpb/Qpa) (pale grey to white fine to coarse grained sand) as a thin veneer over Guildford Formation (silty and slightly sandy clay)
- Alluvium (Qha)

The location of these units is shown on Figure 4.

2.3.3 Acid Sulfate Soils

Soils at the site have been identified as having a High to Moderate Acid Sulfate Soil (ASS) risk generally associated with the Alluvium soil unit. The Bassendean Sand soils are mapped as having a Moderate to Low ASS risk (Figure 4). Activities which can potentially disturb ASS include:

- Earthworks involving soil disturbance in excess of 100m³
- Dewatering or soil drainage (either temporary or permanent)

The actions proposed for management of the POS and Foreshore Reserve areas onsite do not appear likely to trigger either of the above scenarios. This will be reviewed at the detailed design stage, particularly in relation to access path construction and drainage maintenance works. Should it appear likely that one of the above criteria will be triggered, an ASS investigation will be undertaken prior to commencement of the underground works.

2.3.4 Management Actions

The following management actions are proposed in relation to landform, topography and soils:

Table 2: Management Actions – Landform, Topography and Soils

Action	Strategy	Timing	Areas of Site Applicable
General Obligations			
A5	The need for an ASS investigation is to be assessed when detailed design information is available to determine if the ASS assessment criteria are triggered. If this is the case the investigation is to be undertaken prior to ground disturbing works.	Throughout the life of the EMP	All developable land

2.4 Hydrology

2.4.1 Groundwater

The average annual maximum groundwater level (AAMGL) at the site is estimated to be approximately 4.5 to 5.5m AHD (JDA, 2005). An extract of the mapping from the site's Drainage and Nutrient Management Plan (DNMP) is provided below.

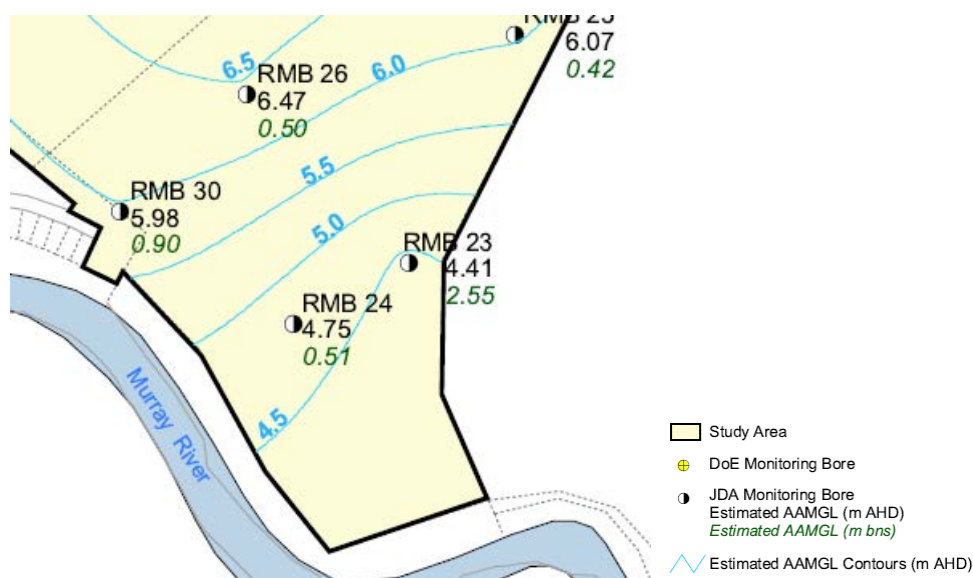


Plate 3: Estimated AAMGL (Source: JDA, 2005)

2.4.2 Wetlands

The majority of the site is mapped as a Multiple Use category wetland (UFI 15802 and UFI 13829). An L-shaped Conservation Category Wetland (CCW) is present within the River Reserve ROS (UFI 4888). This wetland appears to have been influenced by historical drainage works, with excavation/amendment of the drainage channel appearing likely. A CCW is also present along the south western boundary of the Western POS area (UFI 13828).

The Murray River is also mapped as a CCW (UFI 14622). The location of these wetland areas is shown on Figure 5.

The Department of Biodiversity, Conservation and Attractions (DBCA) and the Environmental Protection Authority (EPA) management objectives for these wetland categories are (WRC, 2001):

- *Multiple Use – Use, development and management should be considered in the context of ecologically sustainable development and best management practice catchment planning through landcare.*
- *Conservation - Highest priority wetlands. Objective is to preserve and protect the existing conservation values of the wetlands through various mechanisms including:*
 - *reservation in national parks, crown reserves and State owned land,*
 - *protection under Environmental Protection Policies, and*
 - *wetland covenanting by landowners.*

No development or clearing is considered appropriate. These are the most valuable wetlands and any activity that may lead to further loss or degradation is inappropriate.

The vegetation and condition of these wetland areas is discussed in Section 2.5.

2.4.3 Rivers and Drainage

The Murray River is located immediately adjacent to the site. It has a length of approximately 134km and discharges into the eastern side of the Peel Inlet. Flood studies associated with this river indicate that the floodway does not extend beyond the Murray River Foreshore Reserve and the River Reserve ROS (Figure 5).

A drainage channel originating to the east of the River Reserve ROS, enters the L-shaped wetland and discharges to the Murray River towards the southern end of the wetland. A number of additional shallow drainage lines are also present within the River Reserve ROS and the Foreshore Reserve. Photographs of these drainage lines are provided in Plates 4 and 5



Plate 4: Main Drainage Channel Between UFI 4888 and the Murray River



Plate 5: Example of Minor Drainage Channels in the POS and Foreshore

The DNMP (JDA, 2005) prepared for the site outlines the stormwater drainage approach for the development site:

- Existing drains define the AAMGL and will be permitted to remain to allow existing hydrological regimes to continue.
- Any new drainage routes will be located to minimise impacts on wetlands and their buffers.
- New drainage invert levels are to be set at the AAMGL.
- Flood management for the development is based on maintaining the peak flow at the downstream boundary of the DNMP study area with existing design peak flows, to protect downstream areas from flooding and erosion. In general, existing culverts or channels will be used to discharge flow.

- The Department of Environment has previously advised that the drainage line entering the L-shaped wetland is allowed to be used to discharge part of the proposed urban catchment,
- Water quality within the study area is proposed to be maintained or improved through the use of source control techniques and Water Sensitive Urban Design Best Management Practices.

The drainage system proposed for the site, which supports the above approach, was proposed to consist of compensating / infiltration basins and swales to attenuate peak surface water flows from the proposed development, prior to discharge from the Study Area (JDA, 2005).

In accordance with the proposed strategy, a portion of the Western POS may be utilised as a drainage overflow area. No physical drainage infrastructure would be located within this POS.

An Urban Water Management Plan will be prepared at subdivision stage which will provide specific detail regarding the drainage design for the development site, as such this information is not included in this EMP.

2.4.4 Management Actions

The following hydrological management actions are proposed for the site:

Table 3: Management Actions – Hydrology

Action	Strategy	Timing	Areas of Site Applicable
General Obligations			
A6	Stormwater drainage design to prevent stormwater drainage entering UFI 4888 and UFI 13826.	Throughout the life of the EMP	All areas
A7	Only utilise areas of stormwater infiltration which are greater than 30m from the boundary of UFI 4888 and UFI 13826.	Throughout the life of the EMP	All areas
A9	Maintain the functionality of the drainage lines which traverse through the River Reserve POS. Details and specifications for the proposed drainage infrastructure will be submitted with the Development Application to the Shire for the proposed construction of the pathway..	Prior to Development Application for the pathway	River Reserve ROS

2.5 Flora and Vegetation

2.5.1 Regional Description

The vegetation complexes present at the site include the Swan Complex and the Bassendean Complex – Central and South (Hedde et al., 1980). These are described as follows:

- Swan Complex – Fringing woodland of *Eucalyptus rudis* – *Melaleuca raphiophylla* and localised occurrence of low open forest of *Casuarina obesa* and *Melaleuca cuticularis*.
- Bassendean complex, Central and South – Vegetation ranges from woodland of *Eucalyptus rudis* – *Eucalyptus marginata* – *Casuarina fraseriana* – *Banksia* spp to low woodland of *Melaleuca* spp and sedgelands on the moister sites.

An assessment of natural areas in this region was undertaken as part of the Swan Bioplan Regionally Significant Natural Areas (EPA, 2010). The location of regionally significant natural areas within and adjacent to the site is shown on Figure 6.

The Shire of Murray also provide information about native vegetation areas within the Shire of Murray Local Biodiversity Strategy (Ironbark Environmental, 2013). The Site falls within Precinct 16 (Lot 22 Old Mandurah Road, Ravenswood). This precinct is identified to be subject to an approved ODP.

2.5.2 Site Vegetation, Flora and Weed Descriptions

A basic flora survey was undertaken by Damian Grose of Tranen Revegetation Systems on the 9th of March 2018. The goal was to identify the predominant native and weed species to develop appropriate management strategies. Due to the late summer timing it is expected that some species were not present or actively growing at the time of assessment, and that they may emerge at a later time when conditions are favourable.

2.5.2.1 River Reserve ROS

The River Reserve ROS comprises a L-shaped wetland with several overflow drainage depressions / channels, with the balance of the area being dry grassland that appears regularly managed in parts and semi-managed in others. The grassland is predominantly Kikuyu Grass.

The CCW is an open water body surrounded by a 2-3 m tall embankment up to 10 m wide. Vegetation around the embankments and drainage channels are of the Swan Complex comprising *Eucalyptus rudis* and *Melaleuca raphiophylla*, over *Callistachys lanceolata*, *Acacia pulchella*, *Gastrolobium bilobum*, *Astartea scoparia*, *Melaleuca lateritia*, and *Pteridium esculentum* over *Hardenbergia comptoniana*, *Juncus pallidus*, *Baumea juncea*.

On the northern and north-eastern sides of the wetland the land becomes more elevated and quickly transitions into the Bassendean complex. Within the River Reserve ROS this vegetation complex comprises *Eucalyptus marginata* over *Kunzea glabrescens*, *Acacia saligna*, *Adenanthos cygnorum*, *Jacksonia furcellata* and *Macrozamia fraseri*.

In the areas of remnant vegetation the vegetation could be described as Good to Very Good Condition according to the Keighery Scale. The tree density is high, canopy is dense and intact, and there are a number of large old trees in the area. The mid-storey is also thick in places. The understorey is degraded and dominated by Kikuyu Grass, although scattered native rushes and sedges are present throughout.

Kikuyu Grass dominates the wetland weeds in this area. Other species present in order of significance include *Gomphocarpus fruticosus* (Cottonbush), *Rumex crispus* (Dock), *Solanum nigrum* (Black Nightshade), *Echinochloa crus-galli* (Barnyard Grass), and *Mentha pulegium* (Pennyroyal). In the Bassendean complex to the north the Kikuyu Grass is no longer present and weed representation changes to a dominance of *Eragrostis curvula* (African Lovegrass), Perennial Veldt Grass, and *Lupinus cosentinii* (WA Blue Lupin).

Several specimens of the woody weed *Schinus terebinthifolius* (Brazilian Pepper) were observed in a cluster immediately adjacent to the L-shaped wetland. They are considered a small to medium size for this species at the time observed.

2.5.2.2 Murray River Foreshore Reserve

The native vegetation along the sloping banks of the river are described as *Eucalyptus rudis* and *Melaleuca raphiophylla*, over *Callistachys lanceolata*, *Acacia pulchella*, *Gastrolobium bilobum*, *Astartea scoparia*, and *Pteridium esculentum* over *Bolboschoenus caldwellii*, *Juncus subsecundus*, *Baumea juncea*, *Hardenbergia comptoniana*, *Juncus pallidus*, and *Dichopogon capillipes*. Moving away from the banks the terrain flattens out and transitions into *Corymbia calophylla* canopy over managed grassland.

The riverbank vegetation is in good condition, although there is an incursion of grasses from adjoining residential properties and managed grassland. The grasses are predominantly *Cenchrus clandestinus* (Kikuyu Grass) and *Cynodon dactylon* (Couch Grass). Although dominating the understorey in places these species do appear to be contributing to riverbank stability. At the interface between the top of the bank and the managed grass *Ehrharta calycina* (Perennial Veldt Grass) occurs in pockets, and herbaceous weeds such as *Hypochaeris glabra* (Smooth Catsear) and *Conyza sumatrensis* (Tall Fleabane) are scattered throughout.

Three woody weed species were observed in this zone: *Ficus carica* (Edible Fig) *Acacia longifolia* (Sydney Golden Wattle) and *Olea europea* (Olive). The Fig and Wattle are mature isolated specimens near the existing dwellings in the north, and the Olives are two small individuals at the eastern end of the zone that are estimated to be just two to three years old.

2.5.2.3 Western POS

The Western POS is completely degraded. Apart from a few *Kunzea glabrescens*, there are no native species in the area. The area is dominated by grass weeds that are primarily Perennial Veldt Grass and African Lovegrass.

2.5.3 **Management Actions**

The overall management objectives for the River Reserve ROS are to prevent potential impacts to the existing wetland and to also rehabilitate the vegetation to promote a self-perpetuating ecosystem. In the Murray River Foreshore Reserve, the management actions proposed seek to improve current river bank stability. In the Western POS, the focus is on management of potential bushfire risk.

The general management strategies for the site are to:

1. Undertake weed control only amongst the existing native vegetation to encourage natural regrowth. The exception being areas where the weeds are helping to stabilise the riverbanks, as erosion prevention is seen as a higher priority in those areas than weeds.
2. Create a revegetation area along the southern edge of the L-shaped wetland between the existing vegetation and the proposed path to create a buffer to the wetland.
3. Retain all remaining managed grassland for public amenity.
4. Plant two rows of trees along the extent of the Murray River Foreshore reserve to provide trees that may help arrest future potential streambank erosion.

2.5.3.1 Weed Control

Weed control and targeted planting is to be undertaken within the L-shaped wetland area within the River Reserve ROS, extending out to the path which will form a boundary between the native wetland vegetation and the surrounding grassland/parkland cleared foreshore zone (Figure 7). This area (excluding the waterbody) extends over approximately 2.9ha. Weed control will be undertaken to achieve the Shire of Murray objective of creating a self-perpetuating wetland system. As an indication of the work which will be undertaken to achieve this objective the following will be allowed for:

- Three weed control events in the 12 months prior to planting
- Six weed control events in the 24 months post planting

Weed control events will target the peak growth periods of spring and autumn which will allow the majority of weeds to be targeted in single events. Additional events are also allowed for the summer season to further assist the success of this program. The timing will be adjusted to suit the weather conditions at the time, with control to occur at optimum stages of growth rather than at a fixed time.

Recommended control methods for the key weeds present in this area are summarised as follows:

- Spot spraying of herbicide.
- Herbicide injection and manual removal of woody weeds.

Herbicides will be selected for the target species, taking into account the surrounding environment and the constraints this may present. Selective herbicides (i.e. grass or broadleaf-specific) will be favoured over general knockdown herbicides to keep off-target damage to a minimum. Within 20 m of water bodies only herbicides considered safe for use in these environments will be applied (e.g. Roundup Biactive).

Woody weed herbicide injection will be conducted by either the drill and fill, or basal barking techniques as most effective for each species. Drill and fill involves drilling the trunks of the woody plants and then injecting herbicide directly into the active parts of the plant. Basal barking is similar, but instead of mechanically drilling into

the plant, a bark penetrating chemical (typically diesel) is used to transfer the herbicide into the active tissues.

The weed control program proposed for the Murray River foreshore area will target the areas around each tree planting location. However, any weeds in these areas that are noted as assisting with the stabilisation of the river bank will not be removed.

2.5.3.2 Planting

Tubestock will be planted to create a buffer along the southern side of the CCW between the existing vegetation and the path. The area to be planted extends over approximately 0.4ha with a planting density proposed of 1 plant/m². This equates to 4,221 plants within this zone. The buffer will be mulched to a depth of 75 mm to aid in weed suppression, and assist with moisture retention for the establishing seedling.

Species which may be included in the planting program include:

- *Acacia pulchella* (Prickly Moses)
- *Acacia saligna* (Orange Wattle)
- *Astartea scoparia* (Common Astartea)
- *Baumea juncea* (Twig Rush)
- *Bolboschoenus caldwellii* (Marsh Club-rush)
- *Callistachys lanceolata* (Wonnich)
- *Corymbia calophylla* (Marri)
- *Eucalyptus marginata* (Jarrah)
- *Eucalyptus rudis* (WA Flooded Gum)
- *Gastrolobium bilobum* (Heart Leaf Poison)
- *Hardenbergia comptoniana* (Native Wisteria)
- *Jacksonia furcellata* (Grey Stinkwood)
- *Juncus kraussii* (Sea Rush)
- *Juncus pallidus* (Pale Rush)
- *Juncus subsecundus* (Finger Rush)
- *Kunzea glabrescens* (Spearwood)
- *Melaleuca lateritia* (Robin Red-breast)
- *Melaleuca raphiophylla* (Swamp Paperbark)

Planting of two rows of trees (tubestock size plants) within the foreshore along the edge of the Murray River will be undertaken to boost the number of trees present in this area. Tree spacing along each row will be at approximately 10 m intervals with planting to be staggered across the two rows. The total length of planting is approximately 550 m, requiring 110 trees in total. The row planted closest to the river will be Flooded Gum and Swamp Paperbark. The row furthest from the river will be Marri and Jarrah. The tree lines will be ripped to facilitate rapid plant growth, and weed control will also be undertaken around each tree to optimise establishment rates.

2.5.3.3 Hygiene Management

In order to ensure weed material or plant diseases are not brought into the site as a result of works undertaken within the POS or Reserve areas, all plant and equipment used for the conservation and infrastructure installation works will be required to be 'clean on entry' to the site (i.e. free from any adhered soil or plant materials). This

requirement will be inserted into the construction, landscape and revegetation contracts.

2.5.3.4 Fauna Control

Kangaroos and rabbits are active within the L-shaped wetland and adjoining nature reserves. Herbivory from these species is a threat to any revegetation project and therefore countermeasures will be put in place to protect against this. It will be difficult to control the movement of these species through the site and therefore the plants themselves will need protection. Corflute tree guards will be placed around all tubestock, and will be removed once the plants are established enough to survive any potential herbivory.

2.5.3.5 Summary of Management Actions

The management actions which are proposed in relation to vegetation and flora include:

Table 4: Management Actions – Vegetation and Flora

Action	Strategy	Timing	Areas of Site Applicable
General Obligations			
A2	Requirement for all plant and equipment used within the POS and Reserve areas to be 'clean on entry' to the site to be included in relevant contracts.	Throughout the life of the EMP	River Reserve ROS, Murray River Foreshore Reserve and Western POS
A3	Undertake annual slashing (prior to 30 th November) of the grassland present in the areas managed under this management plan	Throughout the life of the EMP	River Reserve ROS, Murray River Foreshore Reserve and Western POS
Murray River Foreshore Reserve			
B1	Undertake three pre-planting weed control events within the tree planting area shown on Figure 7.	Spring, Summer and Autumn following trigger outlined in Section 3.	Murray River Foreshore Reserve
B2	Rip planting lines and install tubestock at 10 m spacing in two rows along the edge of the Murray River at the location indicated on Figure 7. Species to comprise WA Flooded Gum, Swamp Paperbark, Marri and Jarrah.	Winter following B1	Murray River Foreshore Reserve
B3	Install tree guards around tubestock to protect against kangaroo and rabbit grazing.	Following B2	Murray River Foreshore Reserve
B4	Maintenance Year 1 : Undertake three post-planting weed control events within the tree planting area shown on Figure 7. Monitor the success of the plantings and undertake infill planting where necessary.	Weed control in Spring, Summer and Autumn following B2. Monitor and infill plant in Spring/Autumn	Murray River Foreshore Reserve

Action	Strategy	Timing	Areas of Site Applicable
B5	Maintenance Year 2 : Undertake three weed control events within the tree planting area shown on Figure 7. Monitor the success of the plantings and undertake infill planting where necessary.	Weed control in Spring, Summer and Autumn following B4. Monitor in Spring/Autumn following B4. Infill planting in winter following B4.	Murray River Foreshore Reserve
B6	Removal of tree guards once plants are established	Determined by plant growth	Murray River Foreshore Reserve
River Reserve ROS – Rehabilitation			
E1	Undertake three pre-planting weed control events within the weed control zone shown on Figure 7. Remove woody weeds present in the area.	Weed control in Spring, Summer and Autumn following trigger described in Section 3.	River Reserve ROS
E2	Apply 75mm of mulch to the targeted infill planting zone as shown on Figure 7. Rip the area and plant tubestock at a density of 1/m ²	Following completion of E1 – Winter	River Reserve ROS
E3	Install tree guards around tubestock to protect against kangaroo and rabbit grazing.	Following E2	River Reserve ROS
E4	Maintenance Year 1 : Undertake three post-planting weed control events within the infill planting zone shown on Figure 7. Monitor the success of the plantings and undertake infill planting where necessary.	Weed control in Spring, Summer and Autumn following E2. Monitor in Spring/Autumn following E2. Infill planting in Winter following E2.	River Reserve ROS
E5	Maintenance Year 2 : Undertake three weed control events within the infill planting zone shown on Figure 7. Monitor the success of the plantings and undertake infill planting where necessary.	Weed control in Spring, Summer and Autumn following E4. Monitor and infill plant in Spring/Autumn following E4	River Reserve ROS
E6	Remove plant guards when plants are established.	Determined by plant growth	River Reserve ROS

2.6 Fauna and Habitat

2.6.1 Conservation Significant Fauna and Habitats

Fauna species of conservation significance that have been identified through a search of the databases listed above and are considered to potentially occur within or near the site are provided in Table 5. Note that this list does not include marine or migratory species unless they fall into another conservation significance category, however it is likely that a number of marine and migratory bird species occur in the area.

Table 5: Conservation Significant Fauna Species that May Utilise the Site

Species	Common Name	WC Act Status	EPBC Act Status
Birds			
<i>Anous tenuirostris melanops</i>	Australian Lesser Noddy		Vulnerable
<i>Botaurus poiciloptilus</i>	Australasian Bittern		Endangered
<i>Calidris canutus</i>	Red Knot		Endangered
<i>Calidris ferruginea</i>	Curlew Sandpiper		Critically Endangered
<i>Calyptrorhynchus banksii naso</i>	Forest Red-tailed Black-Cockatoo	S3	Vulnerable
<i>Calyptrorhynchus baudinii</i>	Baudin's Cockatoo	S3	Endangered
<i>Calyptrorhynchus latirostris</i>	Carnaby's Cockatoo	S2	Endangered
<i>Limosa lapponica baueri</i>	Bar-tailed Godwit		Vulnerable
<i>Limosa lapponica menzbieri</i>	Northern Siberian Bar-tailed Godwit		Critically Endangered
<i>Numenius madagascariensis</i>	Eastern Curlew		Critically Endangered
<i>Oxyura australis</i>	Blue-billed Duck	P4	
<i>Pachyptila subantarctica turtur</i>	Fairy Prion		Vulnerable
<i>Rostratula australis</i>	Australian Painted Snipe		Endangered
Mammals			
<i>Dasyurus geoffroii</i>	Chuditch	S3	Vulnerable
<i>Hydromys chrysogaster</i>	Rakali, Water Rat	P4	
<i>Isoodon obesulus fusciventer</i>	Quenda	P4	
<i>Pseudocheirus occidentalis</i>	Western Ringtail Possum		Vulnerable
Fish			
<i>Geotria australis</i>	Pouched Lamprey	P1	
Invertebrates			
<i>Westralunio carteri</i>	Carter's Freshwater Mussell		Vulnerable

2.6.2 Introduced Fauna

Feral fauna species likely to occur in the area include:

- European rabbit
- Red fox
- Feral cat
- Brown rat
- Mosquitofish (Gambusia)
- European bees

2.6.3 Fauna Habitat

The vegetation remaining within the site consists largely of riparian and wetland vegetation.

The aquatic environments, consisting of the Murray River, the adjacent CCW and inflow channels are likely to support a number of aquatic fauna species, such as fish, amphibians, crustaceans and aquatic macroinvertebrates. Migratory waterbirds are also likely to utilise the aquatic environments and surrounding vegetation for foraging and shelter.

2.6.4 Management Actions

2.6.4.1 Habitat Retention, Protection and Enhancement

The retention of vegetated areas within the foreshore reserve is important for protection and enhancement of the value of this open space area for native fauna. The Murray River is a wildlife corridor along which various fauna species traverse and rely upon for shelter, foraging opportunities and connection to adjacent habitat areas, enabling species ranges to be fully utilised.

It is proposed that the wetland vegetation and fringing vegetation along the Murray River be enhanced through weed control efforts and targeted planting, and that by undertaking these works the linkage that currently exists is enhanced. This is further discussed in Section 2.5.2.2.

2.6.4.2 Access Control

It is proposed to install POS boundary fencing and crushed limestone pathways that guides pedestrians through the foreshore reserve and around the wetland without encouraging access into environmentally sensitive areas (water bodies and associated fringing vegetation). Given the potential for nesting waterbirds and other fauna to inhabit these areas, it is of particular importance that pedestrians do not trample through vegetated areas. This will also enhance the quality of the vegetation by minimising weed spread and encouraging new plant growth / recruitment. This is further discussed in Section 2.7.

2.6.4.3 Domestic Animals

To minimise the relative impact to native fauna and associated habitat within the River Reserve ROS and Murray River Foreshore Reserve, signage is proposed to be erected at appropriate entrance points from the development indicating that dogs must be kept on a leash at all times in this area. This is further discussed in Section 2.7.

2.6.4.4 Introduced Fauna

It is proposed to minimise the impacts of introduced fauna known to be widespread and common across the Swan Coastal Plain by minimising attractants within the foreshore reserve. Refuse bins are not proposed to be installed within the foreshore area, in particular to minimise the presence of rats and mice, as well as other opportunistic fauna such as crows.

Undertaking weed control and planting within fringing vegetation will reduce the accessibility of these areas to rabbits.

Where European bees are found to be utilising tree hollows in proximity to areas to be accessed by the public, it is proposed that these be safely removed, to provide additional habitat to hollow-dwelling fauna and remove the associated risk to human health.

2.6.4.5 Summary of Management Actions

The management actions proposed in relation to fauna are summarised below. Management actions which reflect other sections of this EMP (e.g. weed control, panting and access management) are not duplicated in the summary table below.

Table 6: Management Actions – Fauna

Action	Strategy	Timing	Areas of Site Applicable
General Obligations			
A10	Refuse bins are not proposed to be installed within the River Reserve ROS, to reduce presence of feral fauna attractants.	Throughout the life of the EMP	River Reserve ROS
Murray River Foreshore Reserve			
B3	Install tree guards around tubestock to protect against kangaroo and rabbit grazing.	Following B2	Murray River Foreshore Reserve
River Reserve - Paths			
D6	Provide signage at the River POS access points to advise that dogs must be kept on a leash and please do not litter within the POS.	Refer to Section 3.	River Reserve ROS
D7	Any European Bee nests present within tree hollows in proximity to public access areas will be removed.	Refer to Section 3.	River Reserve ROS
River Reserve ROS – Rehabilitation			
E3	Install tree guards around tubestock to protect against kangaroo and rabbit grazing.	Refer to Section 3.	River Reserve ROS

2.7 Access and Recreation

2.7.1 Fencing

Fencing is proposed at strategic locations along the POS boundaries to control unauthorised access. The proposed fencing locations are shown on Figure 7 and listed below:

- Along the NE and SE boundaries of the Western POS.
- Along the northern boundaries of the River Reserve ROS.

The fencing style in River Reserve ROS is proposed to be in accordance with the Department of Environment and Conservation Cable Barrier fencing style. Specifications for this fencing style are provided in Appendix C.

The existing fencing present along the eastern boundary of the River Reserve ROS will be repaired or replaced as required.

The fencing style proposed for the Western POS will reflect the fencing installed on the adjacent property (see Plate 6).



Plate 6: Existing Fencing in connection with the Western POS area

2.7.2 Access

It is recognised that public access to the River Reserve ROS and Foreshore Reserve will be desired, and if this is not provided for in the POS design then uncontrolled access is likely to occur. As such the following access plans are proposed:

- Installation of a 2m wide crushed limestone path which will form a loop around the vegetation retention/revegetation area within the River Reserve ROS. This will provide a walking circuit around this area.
- The subdivision road adjacent to the River Reserve ROS will provide for a 30m buffer to the CCW. To achieve this the road alignment has been adjusted (i.e. size of the POS has been increased) from that shown in the ODP.
- Two entry points for access will be provided along the adjacent subdivision road which will allow for pedestrian access. Authorised vehicle access for maintenance or emergency requirements will also be facilitated at these locations. Between these two points pedestrian access will be along the road footpath rather than within the POS.
- The existing culvert over the drainage line will be upgraded as part of the access path installation works. Note: Detailed landscape plans for the path and culvert will be submitted to Council for approval prior to site works commencing.

- Pedestrian access path to be provided along the subdivision road to the north-west of the River Reserve ROS (i.e. running along the boundary of the Murray River Foreshore Reserve). This path will link with the Dual Use Path network associated with the subdivision POS areas identified in the ODP (Figure 7). Note: construction of this path would coincide with construction of the subdivision road in this location.
- A crushed limestone path link to the Murray River will be provided at the northern end of the Murray River Foreshore Reserve area which is adjacent to the site (Figure 7). This location directly connects to the subdivision POS path network as well as the foreshore paths. Note: construction of this path would coincide with construction of the subdivision road adjacent to this location.

The location of the above access paths and features are shown on Figure 7.

2.7.3 Facilities

At the access points into the River Reserve ROS signage will be installed which will advise users that dogs are to be kept on a leash in this area and that rubbish bins are not provided within the POS area, so please use external bins. The external bins will be provided at the entry points to the POS.

2.7.4 Management Actions

The following management actions are proposed in relation to access and recreation:

Table 7: Management Actions – Access and Recreation

Action	Strategy	Timing	Areas of Site Applicable
General Obligations			
A8	Alignment of the interface road to provide for a 30m buffer to the CCW within the River Reserve ROS.	Throughout the life of the EMP	River Reserve ROS, Areas within 30m of the CCW
River Reserve ROS – Fencing			
C1	Install fencing in the River Reserve ROS as shown on Figure 7.	Refer to Section 3.	River Reserve ROS
C2	Repair or replace existing fencing along the eastern side of the River Reserve ROS.	Refer to Section 3.	River Reserve ROS
C3	Provide two gated access points to the River Reserve ROS access path from the adjacent subdivision as shown on Figure 7.	Refer to Section 3.	River Reserve ROS
River Reserve – Paths			
D1	Install a 2m wide crushed limestone access path around the wetland retention and revegetation area within the River Reserve ROS as shown on Figure 7.	Refer to Section 3.	River Reserve ROS
D2	Upgrade the culvert over the drainage line present within the River Reserve ROS as part of the path installation works.	Refer to Section 3.	River Reserve ROS
D3	Link the River Reserve ROS access paths to the internal subdivision POS access paths, via a pedestrian connection along the road bounding the Murray River foreshore reserve. Path to be constructed of crushed limestone.	Refer to Section 3.	River Reserve ROS
D4	Provide a crushed limestone path connection to the Murray River at the location shown on Figure 7.	Refer to Section 3.	River Reserve ROS
D5	Provide signage at the River POS access points to advise that dogs must be kept on a leash and please do not litter within the POS.	Refer to Section 3.	River Reserve ROS
Western POS			
F1	Provide fencing at the locations in the Western POS as shown on Figure 7.	Refer to Section 3.	Western POS

2.8 Bushfire Management and Maintenance Access

2.8.1 Bushfire Prone Areas

All areas covered by this EMP are mapped as Bushfire Prone by the Department of Fire and Emergency Services (DFES). The features of the site which are associated with an increased fire risk include native vegetation, particularly where understorey vegetation is present and dry grasslands.

General recommendations issued by DFES to assist to reduce bushfire risk include:

- Create and maintain 20m building protection zones abutting homes.
- Prune lower branches of trees to stop a ground fire spreading into the canopy of trees

- Clear vegetation along property boundaries to create a firebreak
- Cut long grass and dense scrub

In addition DFES recommend that there be two entry/exit points to development areas to assist with access and egress during a fire.

2.8.2 Management Actions

Bushfire management actions are generally proposed to include:

- Create and maintain a 3.5m wide firebreak along the following boundaries:
 - Cadastral boundaries of the Western POS area, unless a road interface is provided in these locations; and the
 - Eastern boundary of the River Reserve ROS;
- Undertake annual slashing (prior to 30th November) of the grassland present in the areas subject to this management plan.
- As discussed in Section 2.7, install a 2m wide access path around the L-shaped wetland vegetation within the River Reserve ROS for the dual purpose of access and fire spread prevention. The proposed path location is shown on Figure 7.
- As discussed in Section 2.7, provide two gated access points within the River Reserve ROS fencing as shown in Figure 7 to facilitate emergency and recreational access.
- Undertake weed control within the L-shaped wetland to assist to remove flammable weeds. No additional planting is proposed on the subdivision side of the wetland (i.e. northern edge) to not increase the bushfire risk posed by this area through increasing plant densities.

The actions which are proposed to reduce bushfire risk and assist to make the site safer in the case of an emergency are summarised below. Please note these do not include items already noted in Table 7.

Table 8: Management Actions – Bushfire

Action	Strategy	Timing	Areas of Site Applicable
General Obligations			
A3	Undertake annual slashing (prior to 30 th November) of the grassland present in the areas managed under this management plan	Throughout the life of the EMP	River Reserve ROS, Murray River Foreshore Reserve and Western POS
A8	Alignment of the interface road to provide for a 30m buffer to the CCW within the River Reserve ROS.	Throughout the life of the EMP	River Reserve ROS, Areas within 30m of the CCW
River Reserve - Paths			
C3	Provide two gated access points to the River Reserve ROS access path from the adjacent subdivision as shown on Figure 7.	Refer to Section 3.	River Reserve ROS



Action	Strategy	Timing	Areas of Site Applicable
River Reserve ROS – Rehabilitation			
E7	Create and maintain a 3.5m wide firebreak along the eastern boundary of the River Reserve ROS	Refer to Section 3.	River Reserve ROS
Western POS			
F2	Create and maintain a 3.5m wide firebreak along the cadastral boundaries of the Western POS area, unless a road interface is provided in these locations	Refer to Section 3.	Western POS

3.0 IMPLEMENTATION

3.1 Implementation Schedule Overview

The owners of Lot 1620, Kimba Pty Ltd (Kimba) acquired the land in 1990 as part of a larger purchase. Since the acquisition Kimba has not undertaken any subdivision development on any of the land purchased at the time and has no intention of undertaking any subdivisional development on Lot 1620.

Kimba intends to sell Lot 1620 in its present form or, following appropriate subdivision, in resultant super lot form. Kimba has no fixed time frame for the sale of the land.

Having regard to the above it may be several years from the date of approval of this EMP before any development by a purchaser of portion (or all) of Lot 1620 commences.

The following Implementation Conditions are included in the EMP to provide for:

1. A liability framework for the implementation of the EMP;
2. The EMP obligations to be implemented within a time frame consistent with the development of the land;
3. The developers of the land to contribute equitably to the cost of the EMP works.

3.2 Responsibility for Implementation

Any sale of a super lot resulting from a subdivision of Lot 1620 will create multiple ownership of the land the subject of the EMP. In this event, Kimba agrees that it is responsible for the implementation of the EMP save and except for:

1. Any obligation under the EMP which can only be effectively discharged by the then registered owner of the land;
2. The works referred to in the Staging Schedule as Item 6. Western POS where as a condition of any sale by Kimba of the land including the Western POS the buyer has agreed to accept responsibility for these works.

With respect to 1. above, Kimba acknowledges that it will be a condition of any subdivision approval for a super lot that it enters into legally binding arrangements with the buyer of any super lot to accept the transfer of any obligation under this EMP which can only be effectively discharged by the registered owner of the land.

In the event Kimba sells Lot 1620 without subdivision or, having subdivided Lot 1620, sells the final lot from that subdivision, to the extent that any of the EMP works have not been fully completed, Kimba is entitled to enter into legally binding arrangements requiring the buyer to accept transfer to it of responsibility for the completion of the EMP works and of any other remaining obligations under the EMP.

3.3 Timing of Implementation

For the purposes of agreeing the timing of the implementation of the EMP a Staging Schedule forms part of these Implementation Conditions (Section 3.5).

The Staging Schedule is set out under the headings:

1. General obligations
2. Murray River Foreshore Reserve
3. River Reserve ROS – Fencing Package
4. River Reserve ROS – Paths Package
5. River Reserve ROS – Rehabilitation Package
6. Western POS

The obligations listed under **1. General obligations** are required to be complied with throughout the life of the EMP or as the relevant obligation arises.

The works listed under **2. Murray River Foreshore Reserve** are required to be commenced within 30 days of the first of either:

- Settlement of the sale of any super lot created from Lot 1620;
- Clearance by the Shire of subdivided titles from the August 2013 ODP totalling 100 lots.

The works listed under **3. River Reserve ROS – Fencing Package** are required to be commenced within 30 days of the first of either:

- Clearance by the Shire of subdivided titles from the August 2013 ODP totalling 100 lots;
- Any event which triggers commencement of the works listed under 4. & 5. River Reserve ROS – Paths/Rehabilitation Packages.

The works listed under **4. & 5. River Reserve ROS – Paths/Rehabilitation Packages** and **6. Western POS** are required to be commenced within 30 days of the first of either:

- Clearance by the Shire of subdivided titles from the August 2013 ODP totalling 150 lots;
- In the event of any approval for residential development having been obtained for the land presently notated in the ODP as “Subject to further planning”, clearance by the Shire of subdivided titles equal to 50% of the total number of approved titles;
- In the event of any approval for development as a single title or with a form of tenure other than standard residential titles having been obtained for the land presently notated in the ODP as “Subject to further planning”, practical completion of civil works by area equal to 50% of the total area;
- Clearance by the Shire of subdivided titles from the August 2013 ODP totalling 75 lots and development of the “Subject to further planning” land with either clearances of 25% of approved titles or practical completion of 25% of civil works.

3.4 Bond Funding of the EMP

A present value costing for the stages 2. - 6. works forms part of these Implementation Conditions as outlined in Section 3.6.

The April 2019 value costing is \$281,500..

Kimba Pty Ltd acknowledges that it will be a condition of any subdivision approval for a super lot that Kimba Pty Ltd enters into legally binding arrangements with the Shire to pay to the Shire at settlement of a sale of the super lot an amount calculated in accordance with the formula:

$$(A \times 130\%) \times B/26.52$$

Where:

A = \$281,500 subject to indexation as follows:

- Effective date 30 September 2019;
- Frequency – annual being change in the latest September quarter over the preceding September quarter;
- All Groups CPI for Perth

B = Area of super lot sold

By way of explanation the 26.52 referred to in the above formula is the developable area of Lot 1620 (33.44ha less 6.92 River Reserve ROS).

The amount paid will constitute a bond to be held by the Shire pending the staged completion of the EMP works to the satisfaction of council.

In relation to the bond, the Shire will:

1. Hold the funds in their trust account;
2. Interest on these funds will be accrued annually (30th June) calculated on the principal multiplied by days held;
3. Release of funds will be paid within 28 business days of receipt by it of a claim from Kimba for reimbursement of funds expended on EMP works for amounts up to \$250,000 (or within 40 business days for amounts exceeding \$250,000). The portion of funds reimbursed will be in accordance with the formula:

$$\text{Funds Expended} \times C/26.52$$

Where:

C = Total area of super lot sale contribution to the bond

Funds Expended means expenditure exclusive of GST attributable to a triggered item of works PROVIDED THAT:

- The amount claimed is the full amount of a stage (or sub-stage) in the Staging Schedule (Section 3.5 below);
 - The amount claimed cannot exceed the April 2019 (as per the Tranen, Shire and Kimba implementation estimates) value costing amount for that item of works plus 30%.
4. Pay to Kimba, at its written request, each year by 31 August the interest earned on the bond funds in the previous financial year;
 5. Provide Kimba, at its written request, each year by 31 August with a statement of inflows and outflows for the previous financial year;
 6. Within 28 (or 40 if the balance of bond funds is greater than \$250,000) business days of completion of the EMP works to the satisfaction of council, pay to Kimba the balance of bond funds (if any) held by it.

Any reference above to Kimba Pty Ltd will include its successor in title if this becomes applicable.

3.5 Staging Schedule

The staging schedule as it applies to the various commitments outlined within this EMP is provided below. The codes on the left refers to the numbering system used throughout this report for each of the commitments, and also directly relates to the April 2019 Value Costing Schedule provided in Section 3.6.

1. GENERAL OBLIGATIONS

- | | |
|-----|--|
| A1 | Aboriginal Heritage Act obligations - all areas |
| A2 | Plant & equipment - clean on entry to River Reserve ROS and Western POS |
| A3 | Annual pre 30 November slashing of grassland |
| A4 | Works within 50m of river to avoid excavation of soils |
| A5 | ASS assessment developable land (Acid sulphate soils) |
| A6 | Stormwater drainage design requirement |
| A7 | Stormwater infiltration design requirement |
| A8 | Alignment of road to provide 30m buffer to CCW (Conservation category wetland) |
| A9 | Maintain functionality of drainage line traversing L shaped wetland river |
| A10 | No installation of refuse bins in River Reserve ROS |

Note: Items A1 - A8 have applicability outside the River Reserve ROS, either to the Western POS or the developable land or both and must be transferred to all appropriate subsequent successors in title of developable portions of Lot 1620

2. MURRAY RIVER FORESHORE RESERVE

- B1 Pre-planting weed control - Spring
Pre-planting weed control - Summer
Pre-planting weed control - Autumn
- B2 Planting of tubestock along Murray River
- B3 Installation of tree guards
- B4 Maintenance - Year 1:
Monitoring - Spring/Autumn
Weed control - Spring
Weed control - Summer
Weed control - Autumn
Infill planting
- B5 Maintenance - Year 2:
Monitoring - Spring/Autumn
Weed control - Spring
Weed control - Summer
Weed control - Autumn
Infill planting
- B6 Removal of tree guards

3. RIVER RESERVE ROS - FENCING PACKAGE

- C1 Fencing provision as shown on Fig. 7
- C2 Fencing repair and/or replacement eastern side River Reserve ROS
- C3 Provision two gated access points

4. RIVER RESERVE ROS - PATHS PACKAGE

- D1 Construct 2.0m wide access path around wetland
- D2 Upgrade culvert within the access path around wetland
- D3 Link access paths
- D4 Pathway to river
- D5 Signage re dogs & litter
- D6 Remove any European bee nests

5. RIVER RESERVE ROS - REHABILITATION PACKAGE

- E1 Pre-planting weed control - Spring
Removal of woody weeds
Pre-planting weed control - Summer
Pre-planting weed control - Autumn
- E2 Mulch buffer planting area & plant tubestock
- E3 Installation of tree guards
- E4 Maintenance - Year 1:
Monitoring - Spring/Autumn

- Weed control - Spring
- Weed control - Summer
- Weed control - Autumn
- Infill planting
- Maintenance - Year 2:
- E5 Monitoring - Spring/Autumn
- Weed control - Spring
- Weed control - Summer
- Weed control - Autumn
- Infill planting
- E6 Removal of tree guards
- E7 Create and maintain 3m firebreak eastern boundary of River Reserve ROS

6. WESTERN POS

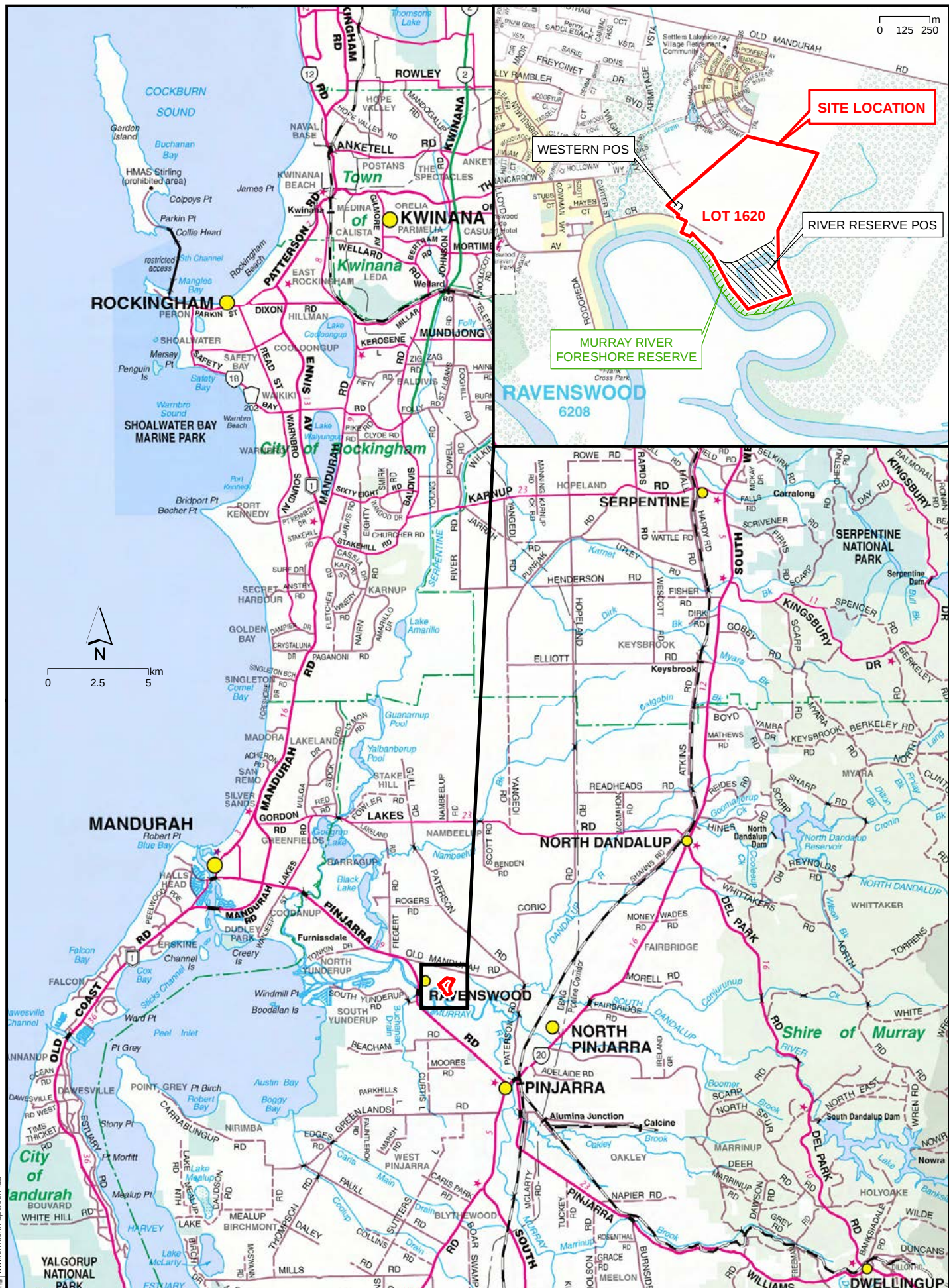
- F1 Fencing provision as shown on Fig. 7
- F2 Create and maintain 3m firebreak Western POS

3.6 April 2019 Value Costing Schedule

As outlined above, a present value costing for Stages 2 – 6 of works forms part of these Implementation Conditions. The April 2019 value costing has been calculated to be \$281,500, which is itemised and further detailed in the costing schedule shown in Appendix D, together with the original quotations from Tranen Revegetation Systems.

4.0 REFERENCES

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- State Heritage Office. 2018. *InHerit Database*.
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- Thomason, H. Department of Planning, Lands and Heritage *pers comm.*, 26/3/18.
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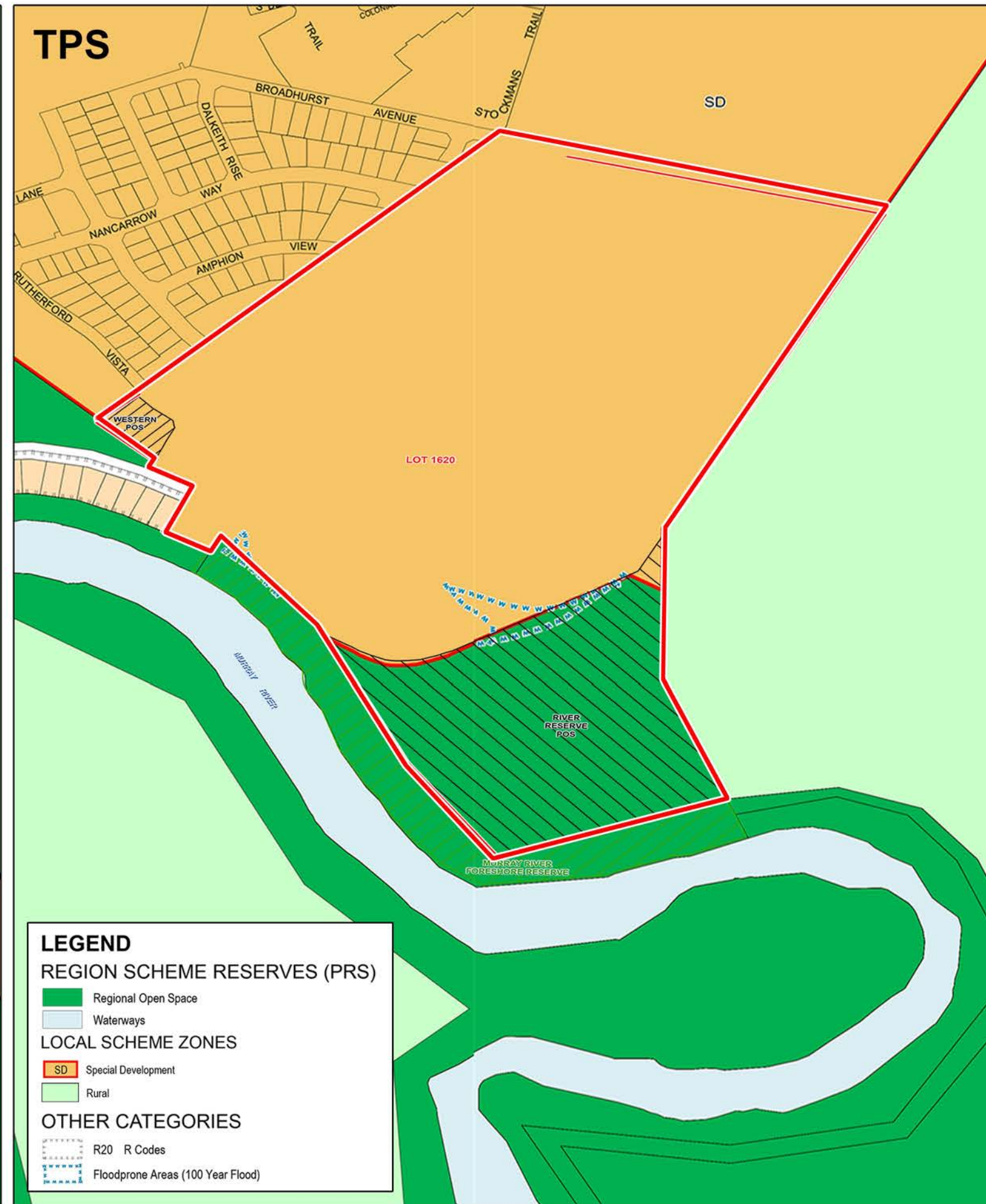
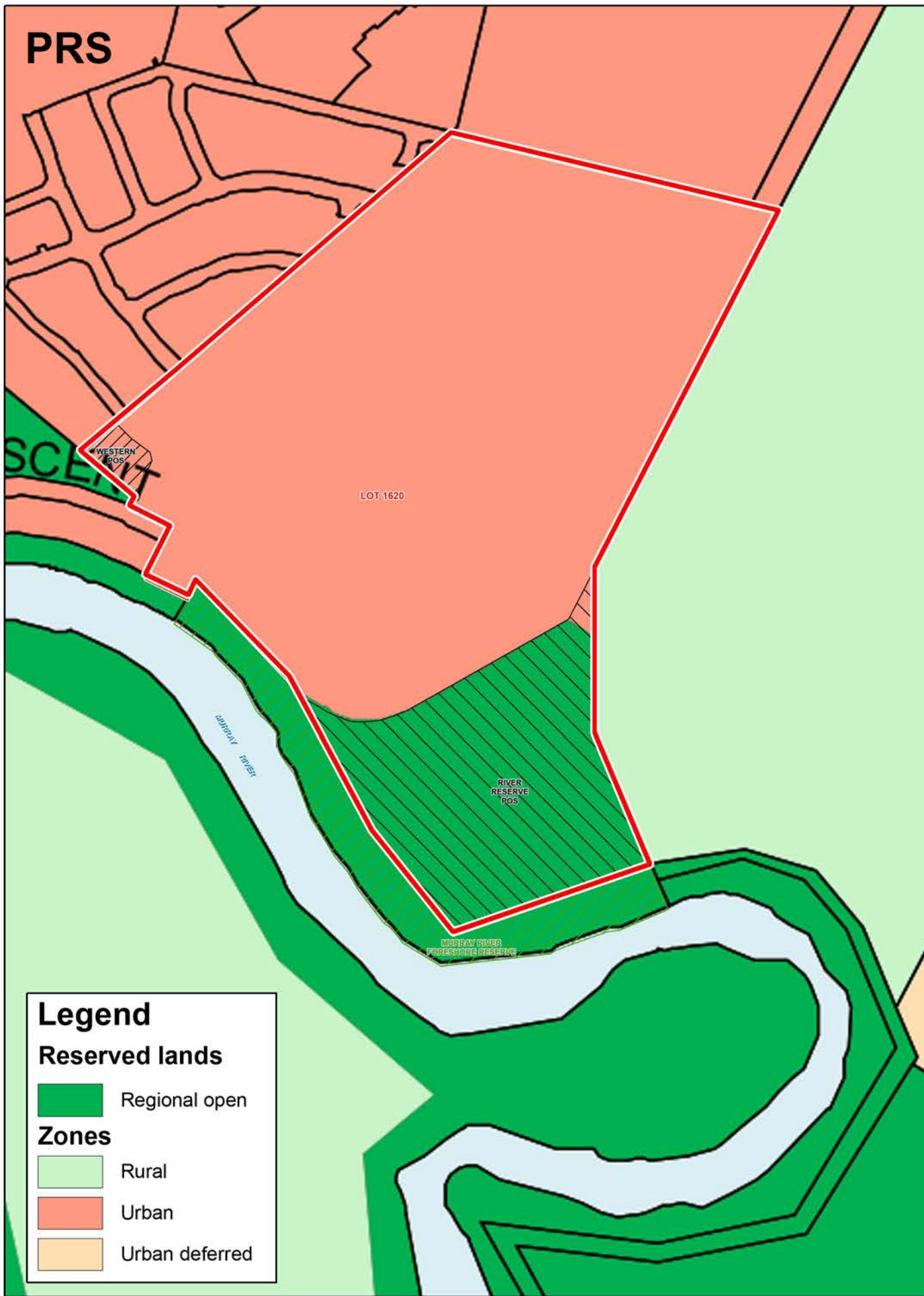
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Kimba Pty Ltd
ENVIRONMENTAL MANAGEMENT PLAN
LOT 1620 OLD MANDURAH ROAD, RAVENSWOOD

SITE LOCATION

Figure 1

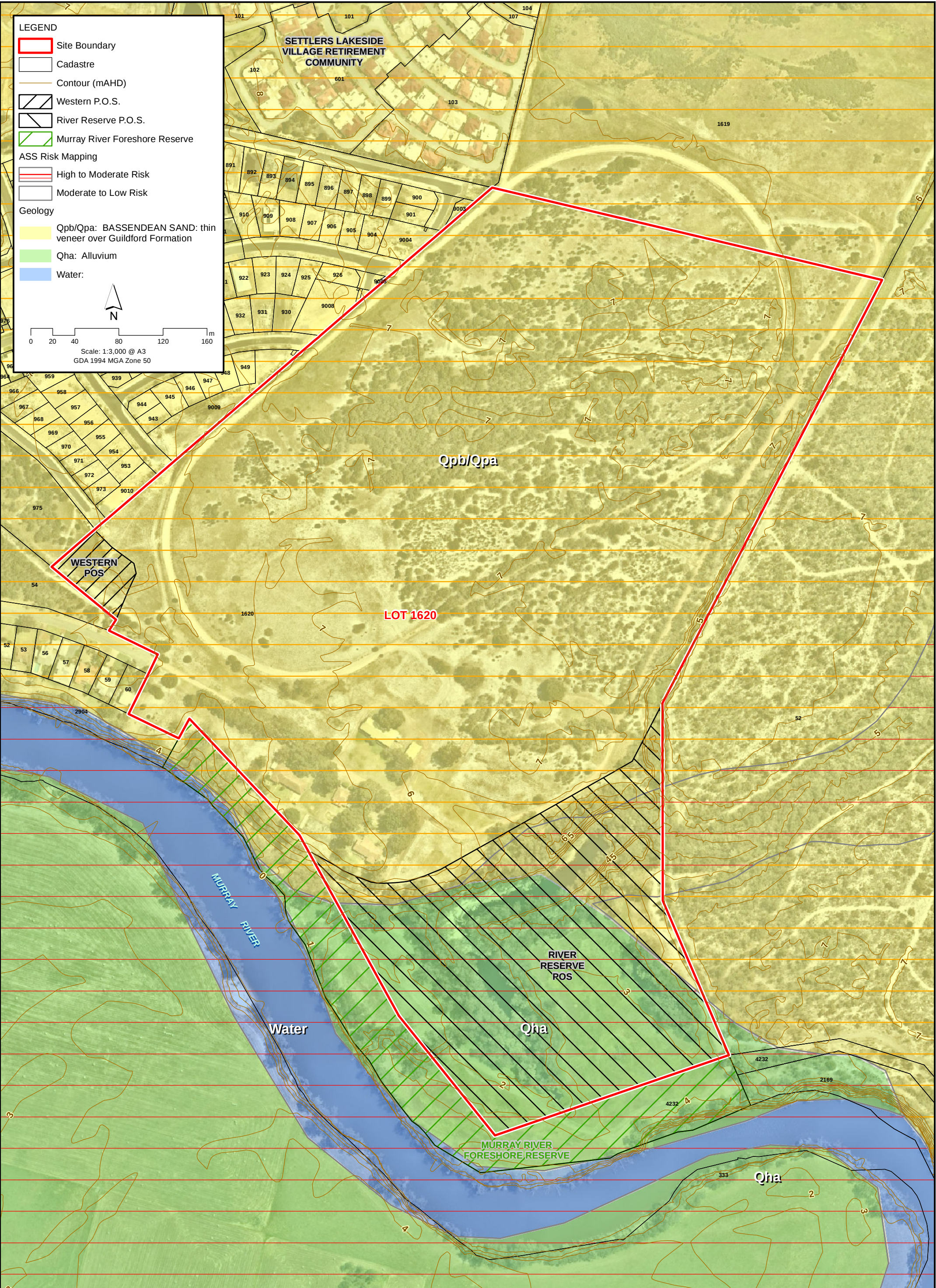




LEGEND

- Site Boundary
- Cadastre
- Western P.O.S.
- River Reserve P.O.S.
- Murray River Foreshore Reserve

0 12.5 25 50 75 100m
Scale: 1:3,000 @ A3
GDA 1994 MGA Zone 50



Source: Cadastre - Landgate, 2017
Orthophoto - NearMaps, 01.11.17
Contours - DoW, 2016
ASS Risk Mapping - DER, 22.09.14
Geology - DoIR: Geological Survey of W.A., 1999

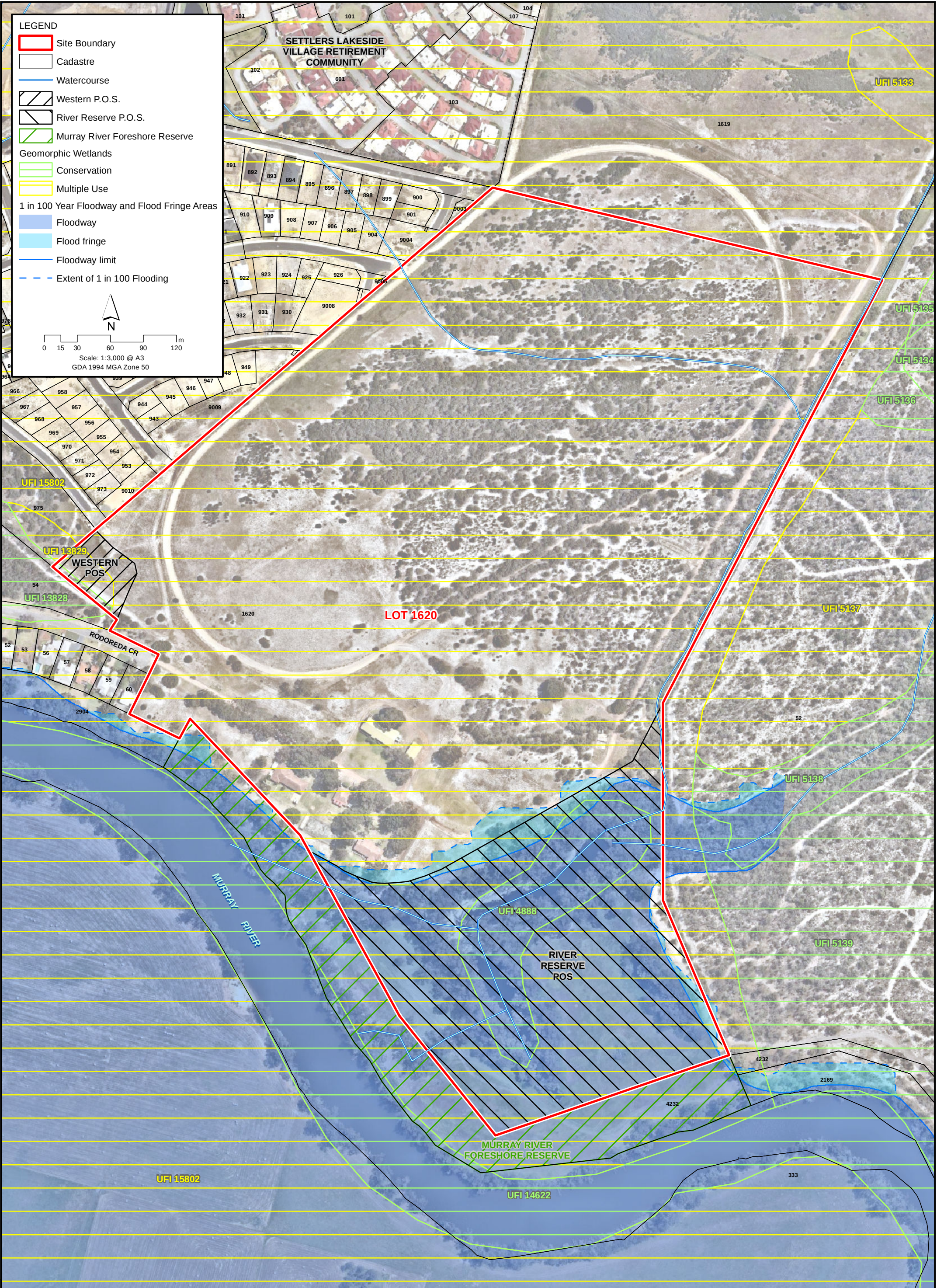
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Kimba Pty Ltd
ENVIRONMENTAL MANAGEMENT PLAN
LOT 1620 OLD MANDURAH ROAD, RAVENSWOOD

TOPOGRAPHY AND SOILS

Figure 4



Source: Cadastre - Landgate, 2017
Orthophoto - NearMaps, 01.11.17
Wetlands - DPaW, 2017
Flood Mapping - DoW, 2016

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Kimba Pty Ltd
ENVIRONMENTAL MANAGEMENT PLAN
LOT 1620 OLD MANDURAH ROAD, RAVENSWOOD

HYDROLOGY

Figure 5



Source: Hedde - DEC, 2002
Cadastral - Landgate, 2017
Orthophoto - NearMaps, 01.11.17
Regionally Significant Natural Areas - EPA, 2016

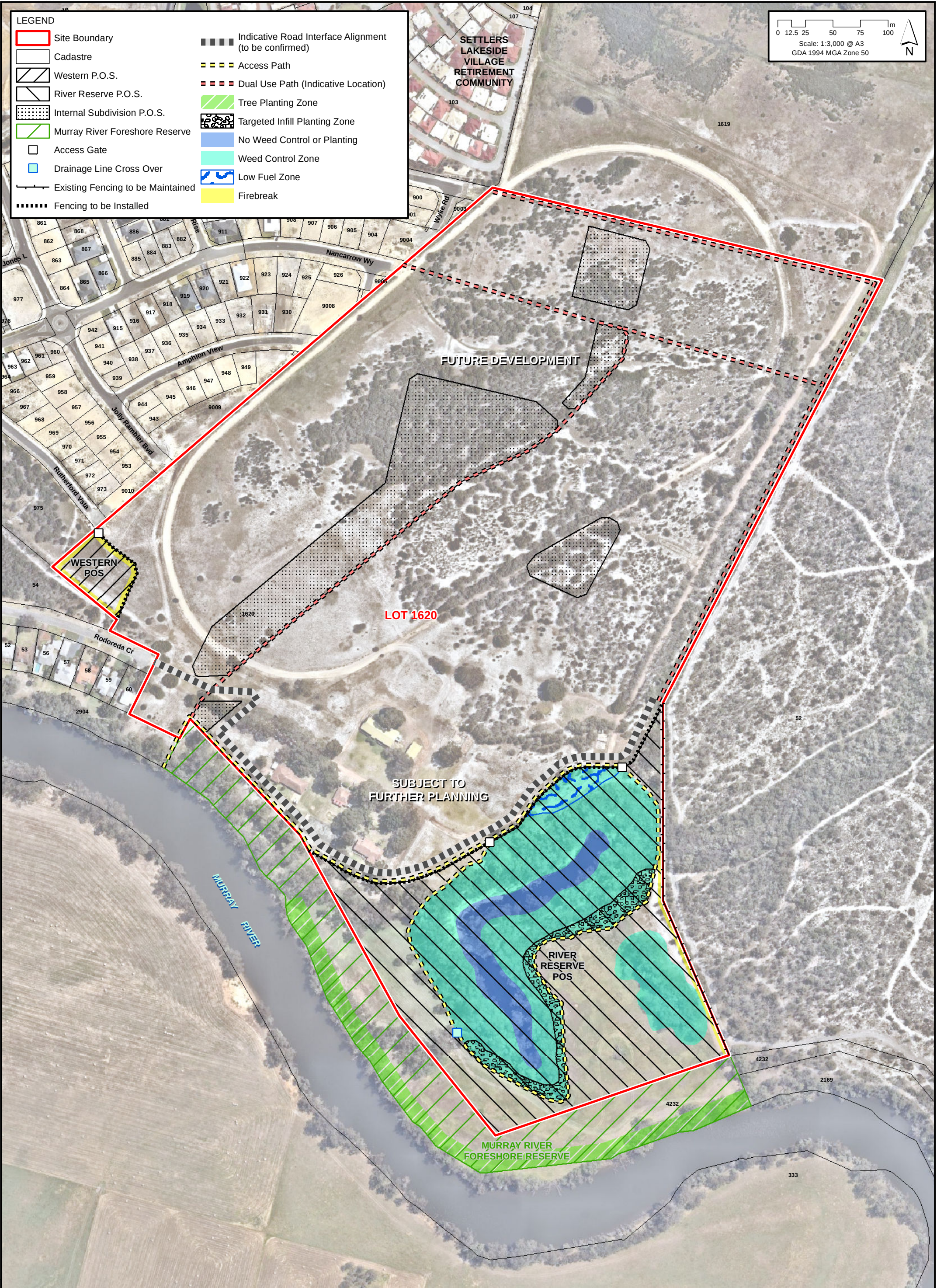
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ENVIRONMENTAL MANAGEMENT PLAN
LOT 1620 OLD MANDURAH ROAD, RAVENSWOOD

VEGETATION AND FLORA

Figure 6



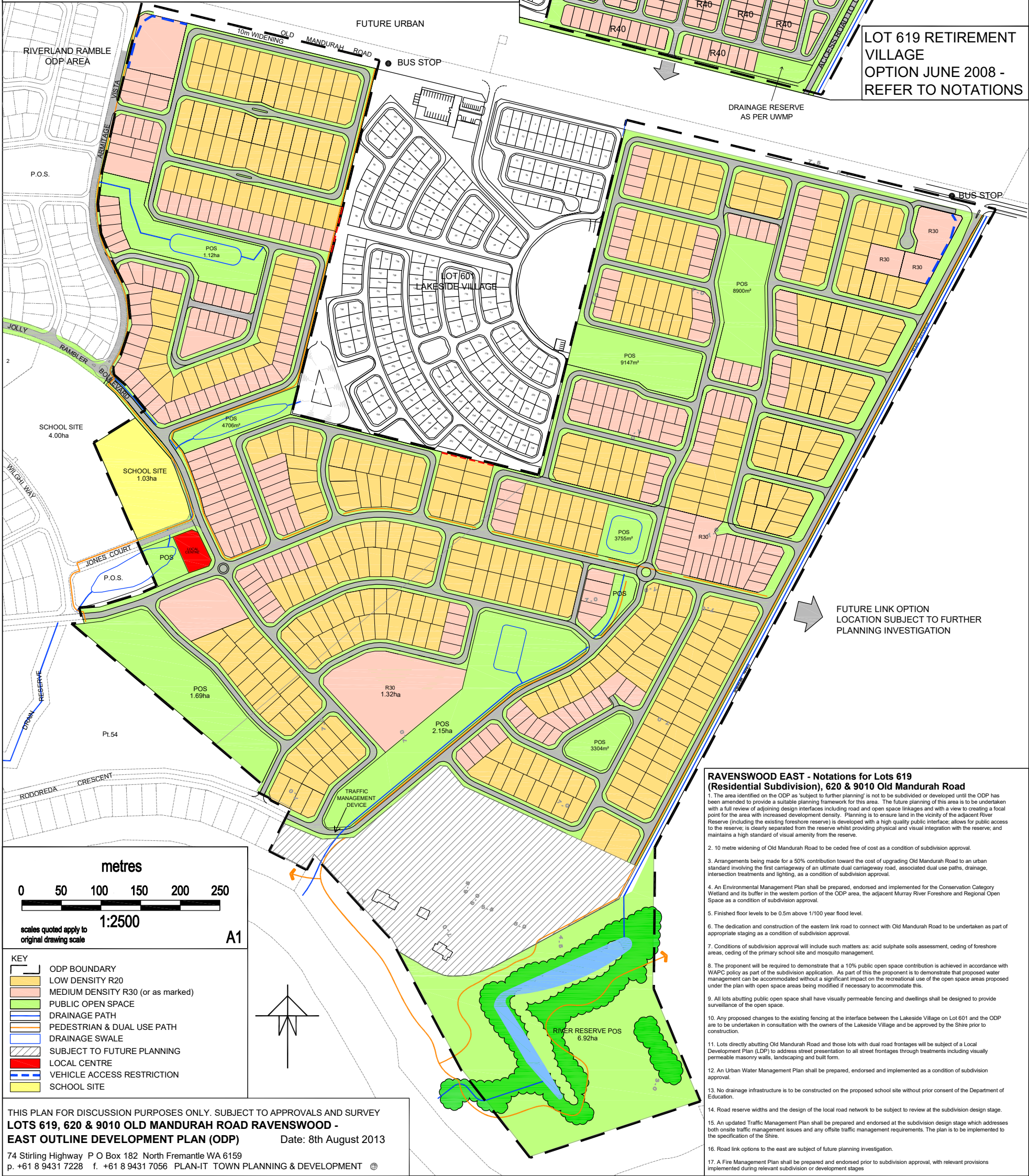
APPENDIX A – OUTLINE DEVELOPMENT PLAN

NOTATIONS FOR LOT 619 RETIREMENT VILLAGE OPTION

- The portion of the ODP relating to Lot 619 is subject of two options comprising a Retirement Village (previously endorsed by the WAPC on 17 June 2008) and a conventional residential subdivision. Either option may be implemented in whole by the landowner.
1. All drainage to be contained on site to council requirements and subject to a revised Drainage Management Plan.
 2. 5% cash-in-lieu of public open space contribution is to be provided (upon strata subdivision of the site), which is to be in addition to at least 5% unconstrained communal open space (excluding drainage).
 3. The revised ODP is based upon the current traffic report and subject to a revised internal study at the development application stage.
 4. Internal roads to be designed to carry rubbish disposal vehicles and designed to the satisfaction of the Shire.
 5. The north/south multi use corridor to be created to allow drainage services & private access.
 6. Link to Old Mandurah Rd is a dedicated public road.
 7. The internal design of the future retirement village must present home frontages and permeable fencing to all external site boundaries as indicated on the revised ODP.
 8. The indicative nursing home site is shown in accordance with the Shire of Murrays Positive Ageing initiative and is subject to approvals. The internal layout of the Village may be modified to accommodate a nursing home.
 9. The operator/proponent of the retirement village will provide a private bus service for residents of the village to access shopping facilities on at least a weekly basis.
 10. Contributions will be required for the upgrading of Old Mandurah Road as a condition of super lot subdivision approval.
 11. Visually permeable fencing, rather than solid, is to be constructed where fencing is required on the boundary of the site.
 12. Future planning for the balance of the site is to provide for possible long term additional vehicular access point for existing village adjacent to the south-eastern corner of the existing retirement village.



LOT 619 RETIREMENT VILLAGE OPTION JUNE 2008 - REFER TO NOTATIONS



- RAVENSWOOD EAST - Notations for Lots 619 (Residential Subdivision), 620 & 9010 Old Mandurah Road**
1. The area identified on the ODP as 'subject to further planning' is not to be subdivided or developed until the ODP has been amended to provide a suitable planning framework for this area. The future planning of this area is to be undertaken with a full review of adjoining design interfaces including road and open space linkages and with a view to creating a focal point for the area with increased development density. Planning is to ensure land in the vicinity of the adjacent River Reserve (including the existing foreshore reserve) is developed with a high quality public interface; allows for public access to the reserve; is clearly separated from the reserve whilst providing physical and visual integration with the reserve; and maintains a high standard of visual amenity from the reserve.
 2. 10 metre widening of Old Mandurah Road to be ceded free of cost as a condition of subdivision approval.
 3. Arrangements being made for a 50% contribution toward the cost of upgrading Old Mandurah Road to an urban standard involving the first carriageway of an ultimate dual carriageway road, associated dual use paths, drainage, intersection treatments and lighting, as a condition of subdivision approval.
 4. An Environmental Management Plan shall be prepared, endorsed and implemented for the Conservation Category Wetland and its buffer in the western portion of the ODP area, the adjacent Murray River Foreshore and Regional Open Space as a condition of subdivision approval.
 5. Finished floor levels to be 0.5m above 1/100 year flood level.
 6. The dedication and construction of the eastern link road to connect with Old Mandurah Road to be undertaken as part of appropriate staging as a condition of subdivision approval.
 7. Conditions of subdivision approval will include such matters as: acid sulphate soils assessment, ceding of foreshore areas, ceding of the primary school site and mosquito management.
 8. The proponent will be required to demonstrate that a 10% public open space contribution is achieved in accordance with WAPC policy as part of the subdivision application. As part of this the proponent is to demonstrate that proposed water management can be accommodated without a significant impact on the recreational use of the open space areas proposed under the plan with open space areas being modified if necessary to accommodate this.
 9. All lots abutting public open space shall have visually permeable fencing and dwellings shall be designed to provide surveillance of the open space.
 10. Any proposed changes to the existing fencing at the interface between the Lakeside Village on Lot 601 and the ODP are to be undertaken in consultation with the owners of the Lakeside Village and be approved by the Shire prior to construction.
 11. Lots directly abutting Old Mandurah Road and those lots with dual road frontages will be subject of a Local Development Plan (LDP) to address street presentation to all street frontages through treatments including visually permeable masonry walls, landscaping and built form.
 12. An Urban Water Management Plan shall be prepared, endorsed and implemented as a condition of subdivision approval.
 13. No drainage infrastructure is to be constructed on the proposed school site without prior consent of the Department of Education.
 14. Road reserve widths and the design of the local road network to be subject to review at the subdivision design stage.
 15. An updated Traffic Management Plan shall be prepared and endorsed at the subdivision design stage which addresses both on-site traffic management issues and any off-site traffic management requirements. The plan is to be implemented to the specification of the Shire.
 16. Road link options to the east are subject of future planning investigation.
 17. A Fire Management Plan shall be prepared and endorsed prior to subdivision approval, with relevant provisions implemented during relevant subdivision or development stages.

THIS PLAN FOR DISCUSSION PURPOSES ONLY. SUBJECT TO APPROVALS AND SURVEY
LOTS 619, 620 & 9010 OLD MANDURAH ROAD RAVENSWOOD - EAST OUTLINE DEVELOPMENT PLAN (ODP) Date: 8th August 2013
74 Stirling Highway P O Box 182 North Fremantle WA 6159
p. +61 8 9431 7228 f. +61 8 9431 7056 PLAN-IT TOWN PLANNING & DEVELOPMENT

APPENDIX B – ABORIGINAL HERITAGE SITE INFORMATION

Search Criteria

Registered Aboriginal Site ID 3537

Disclaimer

The *Aboriginal Heritage Act 1972* preserves all Aboriginal sites in Western Australia whether or not they are registered. Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist.

The information provided is made available in good faith and is predominately based on the information provided to the Department of Planning, Lands and Heritage by third parties. The information is provided solely on the basis that readers will be responsible for making their own assessment as to the accuracy of the information. If you find any errors or omissions in our records, including our maps, it would be appreciated if you email the details to the Department at heritageenquiries@dplh.wa.gov.au and we will make every effort to rectify it as soon as possible.

South West Settlement ILUA Disclaimer

Your heritage enquiry is on land within or adjacent to the following Indigenous Land Use Agreement(s): Gnaala Karla Booja People ILUA.

On 8 June 2015, six identical Indigenous Land Use Agreements (ILUAs) were executed across the South West by the Western Australian Government and, respectively, the Yued, Whadjuk People, Gnaala Karla Booja, Ballardong People, South West Boojarah #2 and Wagyl Kaip & Southern Noongar groups, and the South West Aboriginal Land and Sea Council (SWALSC).

The ILUAs bind the parties (including 'the State', which encompasses all State Government Departments and certain State Government agencies) to enter into a Noongar Standard Heritage Agreement (NSHA) when conducting Aboriginal Heritage Surveys in the ILUA areas, unless they have an existing heritage agreement. It is also intended that other State agencies and instrumentalities enter into the NSHA when conducting Aboriginal Heritage Surveys in the ILUA areas. It is recommended a NSHA is entered into, and an 'Activity Notice' issued under the NSHA, if there is a risk that an activity will 'impact' (i.e. by excavating, damaging, destroying or altering in any way) an Aboriginal heritage site. The Aboriginal Heritage Due Diligence Guidelines, which are referenced by the NSHA, provide guidance on how to assess the potential risk to Aboriginal heritage.

Likewise, from 8 June 2015 the Department of Mines, Industry Regulation and Safety (DMIRS) in granting Mineral, Petroleum and related Access Authority tenures within the South West Settlement ILUA areas, will place a condition on these tenures requiring a heritage agreement or a NSHA before any rights can be exercised.

If you are a State Government Department, Agency or Instrumentality, or have a heritage condition placed on your mineral or petroleum title by DMIRS, you should seek advice as to the requirement to use the NSHA for your proposed activity. The full ILUA documents, maps of the ILUA areas and the NSHA template can be found at <https://www.dpc.wa.gov.au/lantu/Claims/Pages/SouthWestSettlement.aspx>.

Further advice can also be sought from the Department of Planning, Lands and Heritage at heritageenquiries@dplh.wa.gov.au.

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Coordinate Accuracy

Coordinates (Easting/Northing metres) are based on the GDA 94 Datum. Accuracy is shown as a code in brackets following the coordinates.

Terminology (NB that some terminology has varied over the life of the legislation)

Place ID/Site ID: This a unique ID assigned by the Department of Planning, Lands and Heritage to the place.

Status:

- Registered Site : The place has been assessed as meeting Section 5 of the *Aboriginal Heritage Act 1972*.
- Other Heritage Place which includes:
 - Stored Data / Not a Site: The place has been assessed as not meeting Section 5 of the *Aboriginal Heritage Act 1972*.
 - Lodged: Information has been received in relation to the place, but an assessment has not been completed at this *stage* to determine if it meets Section 5 of the *Aboriginal Heritage Act 1972*.

Access and Restrictions:

- File Restricted = No: Availability of information that the Department of Planning, Lands and Heritage holds in relation to the place is not restricted in any way.
- File Restricted = Yes: Some of the information that the Department of Planning, Lands and Heritage holds in relation to the place is restricted if it is considered culturally sensitive. This information will only be made available if the Department of Planning, Lands and Heritage receives written approval from the informants who provided the information. To request access please contact heritageenquiries@dplh.wa.gov.au.
- Boundary Restricted = No: Place location is shown as accurately as the information lodged with the Registrar allows.
- Boundary Restricted = Yes: To preserve confidentiality the exact location and extent of the place is not displayed on the map. However, the shaded region (generally with an area of at least 4km²) provides a general indication of where the place is located. If you are a landowner and wish to find out more about the exact location of the place, please contact the Department of Planning, Lands and Heritage.
- Restrictions:
 - No Restrictions: *Anyone* can view the information.
 - Male Access Only: Only *males* can view restricted information.
 - Female Access Only: Only *females* can view restricted information.

Legacy ID: This is the former unique number that the former Department of Aboriginal Sites assigned to the place. This has been replaced by the Place ID / Site ID.

Basemap Copyright

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Aboriginal Heritage Inquiry System

List of Registered Aboriginal Sites

ID	Name	File Restricted	Boundary Restricted	Restrictions	Status	Type	Knowledge Holders	Coordinate	Legacy ID
3537	MURRAY RIVER	No	No	No Gender Restrictions	Registered Site	Mythological	*Registered Knowledge Holder names available from DAA	409996mE 6373194mN Zone 50 [Reliable]	S02549

Aboriginal Heritage Inquiry System

Map of Registered Aboriginal Sites

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Search Criteria

Registered Aboriginal Site ID 3677

Disclaimer

The Aboriginal Heritage Act 1972 preserves all Aboriginal sites in Western Australia whether or not they are registered. Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist.

The information provided is made available in good faith and is predominately based on the information provided to the Department of Planning, Lands and Heritage by third parties. The information is provided solely on the basis that readers will be responsible for making their own assessment as to the accuracy of the information. If you find any errors or omissions in our records, including our maps, it would be appreciated if you email the details to the Department at heritageenquiries@dplh.wa.gov.au and we will make every effort to rectify it as soon as possible.

South West Settlement ILUA Disclaimer

Your heritage enquiry is on land within or adjacent to the following Indigenous Land Use Agreement(s): Gnaala Karla Booja People ILUA.

On 8 June 2015, six identical Indigenous Land Use Agreements (ILUAs) were executed across the South West by the Western Australian Government and, respectively, the Yued, Whadjuk People, Gnaala Karla Booja, Ballardong People, South West Boojarah #2 and Wagyl Kaip & Southern Noongar groups, and the South West Aboriginal Land and Sea Council (SWALSC).

The ILUAs bind the parties (including 'the State', which encompasses all State Government Departments and certain State Government agencies) to enter into a Noongar Standard Heritage Agreement (NSHA) when conducting Aboriginal Heritage Surveys in the ILUA areas, unless they have an existing heritage agreement. It is also intended that other State agencies and instrumentalities enter into the NSHA when conducting Aboriginal Heritage Surveys in the ILUA areas. It is recommended a NSHA is entered into, and an 'Activity Notice' issued under the NSHA, if there is a risk that an activity will 'impact' (i.e. by excavating, damaging, destroying or altering in any way) an Aboriginal heritage site. The Aboriginal Heritage Due Diligence Guidelines, which are referenced by the NSHA, provide guidance on how to assess the potential risk to Aboriginal heritage.

Likewise, from 8 June 2015 the Department of Mines, Industry Regulation and Safety (DMIRS) in granting Mineral, Petroleum and related Access Authority tenures within the South West Settlement ILUA areas, will place a condition on these tenures requiring a heritage agreement or a NSHA before any rights can be exercised.

If you are a State Government Department, Agency or Instrumentality, or have a heritage condition placed on your mineral or petroleum title by DMIRS, you should seek advice as to the requirement to use the NSHA for your proposed activity. The full ILUA documents, maps of the ILUA areas and the NSHA template can be found at <https://www.dpc.wa.gov.au/lantu/Claims/Pages/SouthWestSettlement.aspx>.

Further advice can also be sought from the Department of Planning, Lands and Heritage at heritageenquiries@dplh.wa.gov.au.

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Coordinate Accuracy

Coordinates (Easting/Northing metres) are based on the GDA 94 Datum. Accuracy is shown as a code in brackets following the coordinates.

Terminology (NB that some terminology has varied over the life of the legislation)

Place ID/Site ID: This a unique ID assigned by the Department of Planning, Lands and Heritage to the place.

Status:

- Registered Site : The place has been assessed as meeting Section 5 of the Aboriginal Heritage Act 1972.
- Other Heritage Place which includes:
 - Stored Data / Not a Site: The place has been assessed as not meeting Section 5 of the Aboriginal Heritage Act 1972.
 - Lodged: Information has been received in relation to the place, but an assessment has not been completed at this stage to determine if it meets Section 5 of the Aboriginal Heritage Act 1972.

Access and Restrictions:

- File Restricted = No: Availability of information that the Department of Planning, Lands and Heritage holds in relation to the place is not restricted in any way.
- File Restricted = Yes: Some of the information that the Department of Planning, Lands and Heritage holds in relation to the place is restricted if it is considered culturally sensitive. This information will only be made available if the Department of Planning, Lands and Heritage receives written approval from the informants who provided the information. To request access please contact heritageenquiries@dplh.wa.gov.au.
- Boundary Restricted = No: Place location is shown as accurately as the information lodged with the Registrar allows.
- Boundary Restricted = Yes: To preserve confidentiality the exact location and extent of the place is not displayed on the map. However, the shaded region (generally with an area of at least 4km²) provides a general indication of where the place is located. If you are a landowner and wish to find out more about the exact location of the place, please contact the Department of Planning, Lands and Heritage.
- Restrictions:
 - No Restrictions: Anyone can view the information.
 - Male Access Only: Only males can view restricted information.
 - Female Access Only: Only females can view restricted information.

Legacy ID: This is the former unique number that the former Department of Aboriginal Sites assigned to the place. This has been replaced by the Place ID / Site ID.

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Aboriginal Heritage Inquiry System

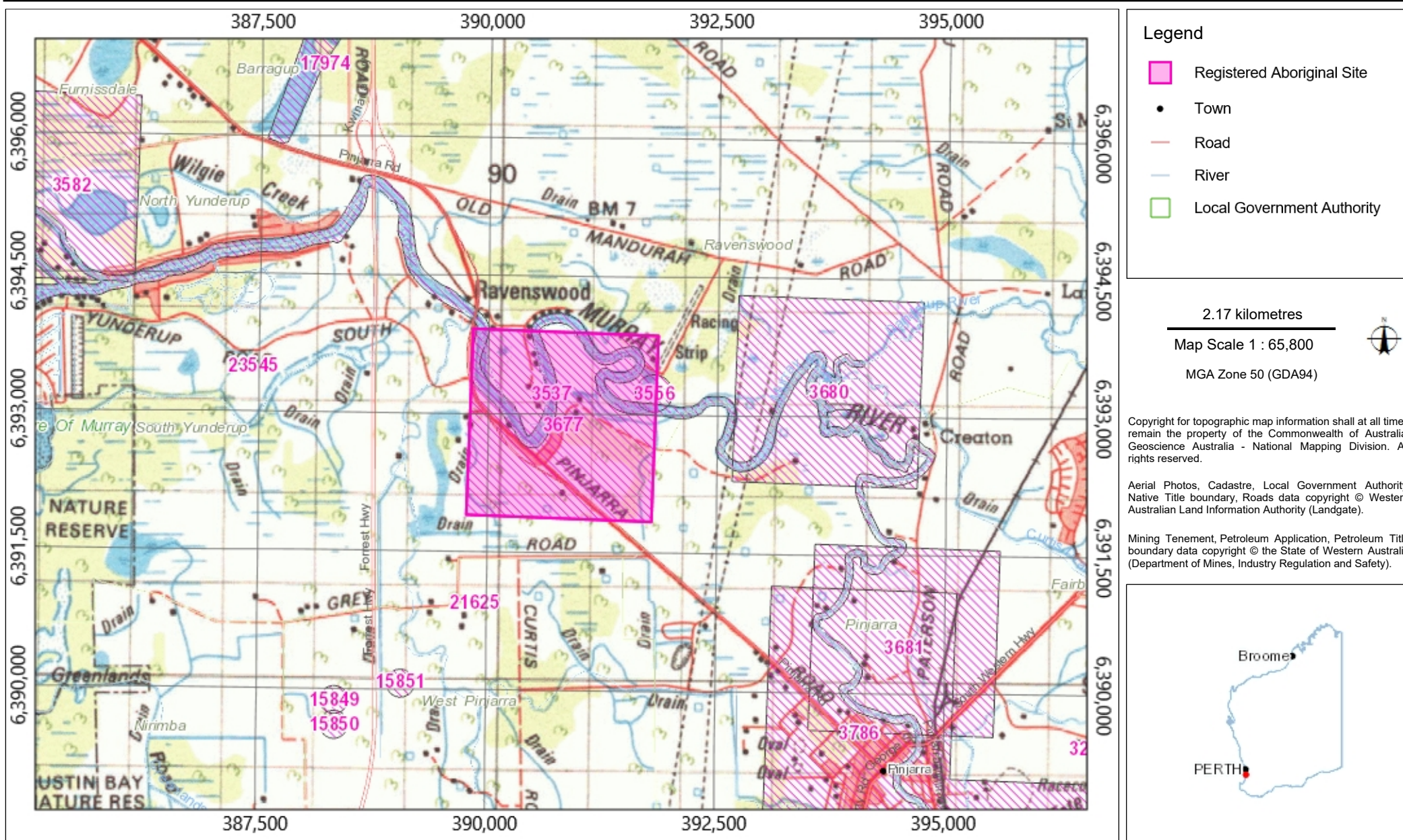
List of Registered Aboriginal Sites

ID	Name	File Restricted	Boundary Restricted	Restrictions	Status	Type	Knowledge Holders	Coordinate	Legacy ID
3677	WAUGAL CAVE	Yes	Yes	No Gender Restrictions	Registered Site	Mythological	*Registered Knowledge Holder names available from DAA	Not available when location is restricted	S02228

Aboriginal Heritage Inquiry System

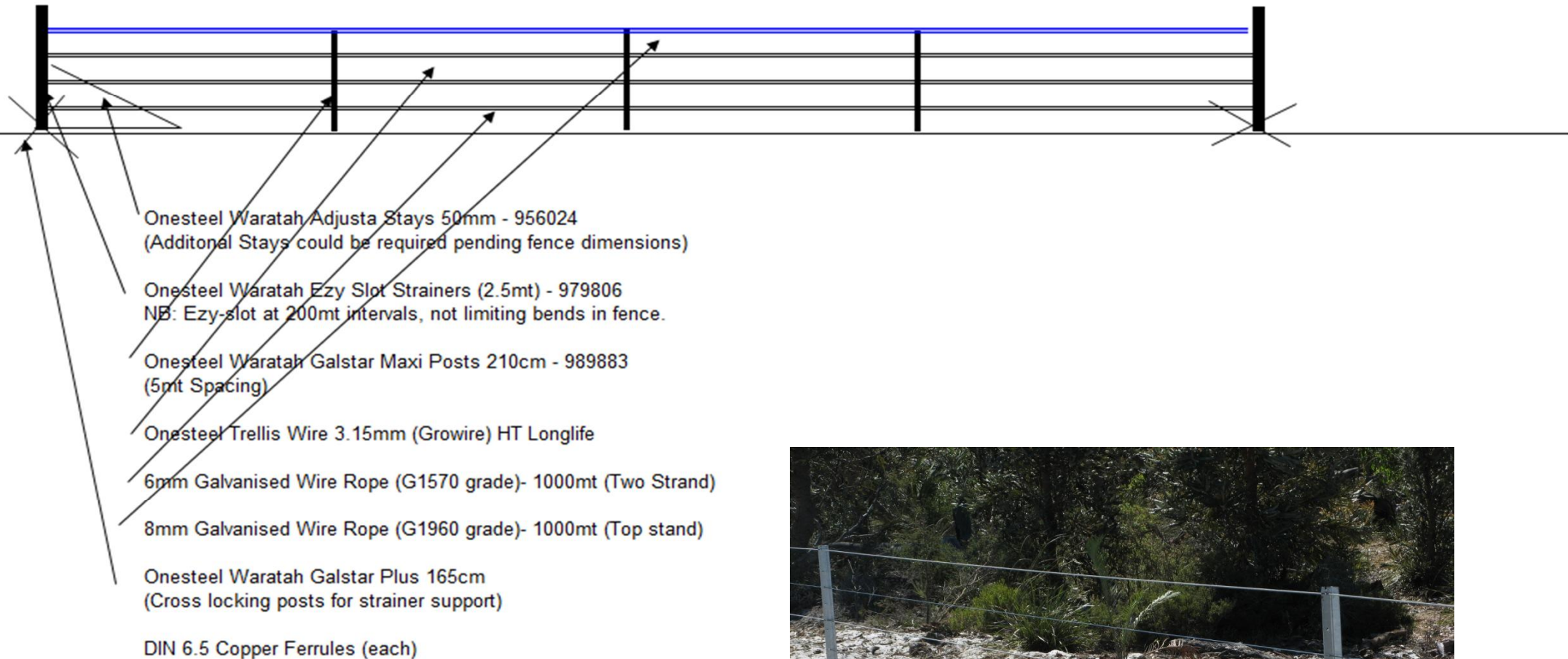
Map of Registered Aboriginal Sites

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APPENDIX C – DEC FENCING SPECIFICATIONS

Department of Environment and Conservation (DEC) Cable Barrier Fencing Specifications



APPENDIX D - APRIL 2019 VALUE COSTING SCHEDULE AND TRANEN REVEGETATION SYSTEMS COSTINGS

APPENDIX D
APRIL 2019 VALUE COSTING SCHEDULE

			COST*	SOURCE
1. GENERAL OBLIGATIONS				
Cost provision not applicable				
2. MURRAY RIVER FORESHORE RESERVE				
B1-B3	Initial weed control & planting	4,646.40		
B4	Maintenance - Year 1	4,336.68		
B5-B6	Maintenance - Year 2	<u>4,562.01</u>	13,545.09	Tranen
3. RIVER RESERVE ROS - FENCING PACKAGE				
C1	Fencing provision as shown on Fig. 7 - 500 metres		18,060.00	Tranen
C2	Fencing repair and/or replacement eastern side River Reserve ROS - 350 metres		16,170.00	Tranen
C3	Provision two gated access points		1,501.50	Tranen
4. RIVER RESERVE ROS - PATHS PACKAGE				
D1	Construct 2.0m wide access path around wetland - 740 metres		57,886.50	Tranen
D2	Upgrade culvert within the access path around wetland		5,000.00	Shire est
D3	Link access paths - 487 metres		38,095.57	Tranen
D4	Pathway to river - 51 metres		3,989.48	Tranen
D5	Signage re dogs & litter		2,000.00	Kimba est
D6	Remove any European bee nests		2,000.00	Kimba est
5. RIVER RESERVE ROS - REHABILITATION PACKAGE				
E1-E3	Initial weed control & planting	66,458.28		
E4	Maintenance - Year 1	22,573.70		
E5-E6	Maintenance - Year 2	<u>25,542.76</u>	114,574.74	Tranen
E7	Firebreak eastern boundary of River Reserve ROS (\$750 x 4 years)		3,000.00	Kimba est
6. WESTERN POS				
F1	Fencing provision as shown on Fig. 7 - 105 metres		3,792.60	Tranen
F2	Firebreak Western POS (\$400 x 4 years)		1,600.00	Kimba est
			281,215.48	

* Costs shown are excluding GST

Reconciliation to supporting documentation:

Tranen - Murray River Foreshore estimate	13,545.09
Tranen - Fencing & Paths estimate	139,495.65
Tranen - River Reserve Rehabilitation estimate	114,574.74
Shire culvert upgrade estimate	5,000.00
Kimba estimates various	<u>8,600.00</u>
	281,215.48

Quantity Calculations

Location Name	Area (m2)	Length (m)	Plant Spacing	Total Plants	Mulch @ 75 mm	Comments
Foreshore planting zone	8,494	550	0.2	110		Two rows of trees @ 10 m spacing
Total	8,494	550		110	0	

Itemised Cost Calculations

Item	Description	Quantity	Unit	Rate	Total	Comments
1.0	Murray River Foreshore Installation					
1.1	Weed control - spring	0.9	ha	\$1,040.00	\$936.00	
1.2	Weed control - summer	0.9	ha	\$1,040.00	\$936.00	
1.3	Weed control - autumn	0.9	ha	\$1,040.00	\$936.00	
1.4	Ripping	1	ea	\$800.00	\$800.00	
1.5	Tubestock supply	110	ea	\$1.90	\$209.00	
1.6	Tubestock installation	110	ea	\$0.90	\$99.00	
1.7	Fertiliser tablet supply and install	110	ea	\$0.40	\$44.00	1 x 10 g tablet per seedling
1.8	Tree guard supply	110	ea	\$1.60	\$176.00	
1.9	Tree guard installation	110	ea	\$0.80	\$88.00	
	Sub-Total				\$4,224.00	
2.0	Maintenance					
2.1	Monitoring - spring and autumn 2 years	4	ea	\$400.00	\$1,600.00	
2.2	Weed control - spring year 1	0.9	ha	\$1,092.00	\$982.80	
2.3	Weed control - summer year 1	0.9	ha	\$1,092.00	\$982.80	
2.4	Weed control - autumn year 1	0.9	ha	\$1,092.00	\$982.80	
2.5	Infill planting provision - year 1 30%	33	ea	\$5.88	\$194.04	Includes tree guards
2.6	Weed control - spring year 2	0.9	ha	\$1,146.60	\$1,031.94	
2.7	Weed control - summer year 2	0.9	ha	\$1,146.60	\$1,031.94	
2.8	Weed control - autumn year 2	0.9	ha	\$1,146.60	\$1,031.94	
2.9	Infill planting provision - year 2 20%	22	ea	\$6.18	\$135.96	Includes tree guards
2.10	Tree guard maintenance and removal	165	ea	\$0.70	\$115.50	
	Sub-Total				\$8,089.72	
3.0	Project Management and Administration	10	%		\$1,231.37	
	TOTAL (ex-GST)				\$13,545.09	
	GST				\$1,354.51	
	TOTAL (inc-GST)				\$14,899.60	

Quantity Calculations

Location Name	Area (m2)	Length (m)	Plant Spacing	Total Plants	Mulch @ 75 mm	Comments
CCW weed control only area	29,301					
Additional remnant to east	4,118					
Targeted infill zone	4,221		1	4,221	320	
Total	37,640	0		4,221	320	

Itemised Cost Calculations

Item	Description	Quantity	Unit	Rate	Total	Comments
1.0	River Reserve Rehabilitation					
1.1	Weed control - spring	3.8	ha	\$1,040.00	\$3,952.00	
1.2	Woody weed - manual control	1.0	ea	\$3,000.00	\$3,000.00	Estimate only - TBC
1.3	Weed control - summer	3.8	ha	\$1,040.00	\$3,952.00	
1.4	Weed control - autumn	3.8	ha	\$1,040.00	\$3,952.00	
1.5	Mulch supply	320	m3	\$55.00	\$17,600.00	
1.6	Mulch installation	320	m3	\$20.00	\$6,400.00	
1.7	Ripping	1	ea	\$800.00	\$800.00	
1.8	Tubestock supply	4,221	ea	\$1.90	\$8,019.90	
1.9	Tubestock installation	4,221	ea	\$0.90	\$3,798.90	
1.10	Fertiliser tablet supply and install	4,221	ea	\$0.40	\$1,688.40	1 x 10 g tablet per seedling
1.11	Tree guard supply	4,221	ea	\$1.60	\$6,753.60	
1.12	Tree guard installation	4,221	ea	\$0.80	\$3,376.80	
	Sub-Total				\$63,293.60	
2.0	Maintenance					
2.1	Monitoring - spring and autumn 2 years	4	ea	\$800.00	\$3,200.00	
2.2	Weed control - spring year 1	3.8	ha	\$1,092.00	\$4,149.60	
2.3	Weed control - summer year 1	3.8	ha	\$1,092.00	\$4,149.60	
2.4	Weed control - autumn year 1	3.8	ha	\$1,092.00	\$4,149.60	
2.5	Infill planting provision - year 1 30%	1,267	ea	\$5.88	\$7,449.96	Includes tree guards
2.6	Weed control - spring year 2	3.8	ha	\$1,146.60	\$4,357.08	
2.7	Weed control - summer year 2	3.8	ha	\$1,146.60	\$4,357.08	
2.8	Weed control - autumn year 2	3.8	ha	\$1,146.60	\$4,357.08	
2.9	Infill planting provision - year 2 20%	845	ea	\$6.18	\$5,222.10	Includes tree guards
2.10	Tree guard maintenance and removal	6,333	ea	\$0.70	\$4,433.10	
	Sub-Total				\$45,825.20	
3.0	Project Management and Administration	5	%		\$5,455.94	
	TOTAL (ex-GST)				\$114,574.74	
	GST				\$11,457.47	
	TOTAL (inc-GST)				\$126,032.21	

Itemised Cost Calculations

Item	Description	Quantity	Unit	Rate	Total	Comments
1.0	River Reserve POS					
C1	Fencing provision as shown on Fig 7	500	lin m	\$34.40	\$17,200.00	
C2	Fencing repair and/or replacement eastern side River Reserve POS	350	lin m	\$44.00	\$15,400.00	For replacement, old material to be removed
C3	Provision of two gated access points - 2 ea	2	ea	\$715.00	\$1,430.00	
	Sub-Total				\$34,030.00	
2.0	Maintenance					
D1	Construct 1.8m wide access path around wetland	740	lin m	\$74.50	\$55,130.00	Note council spec 2 m wide, 150 - 200 mm limestone on prepared subgrade
D2	Upgrade culvert within the access path around wetland	1	ea	\$0.00	By others?	
D3	Link access paths	487	lin m	\$74.50	\$36,281.50	As required
D4	Pathway to river	51	lin m	\$74.50	\$3,799.50	
	Sub-Total				\$95,211.00	
3.0	Western POS					
F1	Fencing provision as shown on Fig 7	105	lin m	\$34.40	\$3,612.00	
	Sub-Total				\$3,612.00	
4.0	Project Management and Administration	5	%		\$6,642.65	
	TOTAL (ex-GST)				\$139,495.65	
	GST				\$13,949.57	
	TOTAL (inc-GST)				\$153,445.22	

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