

# Report

# Wonnerup South Mineral Sands Deposit



## Wetland Buffer Investigation

Prepared by

**ECOSYSTEM SOLUTIONS PTY LTD**

**A.B.N. 19115287593**

For

**Ekologica Pty Ltd & Ennovate Consulting**

**on behalf of**

**Cristal Mining Australia**

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PO Box 685  
DUNSBOROUGH WA 6281  
Ph: +61 8 9759 1960  
Fax: +61 8 9759 1920  
Mobile: 042 759 1960  
Email: [info@ecosystemsolutions.com.au](mailto:info@ecosystemsolutions.com.au)  
[www.ecosystemsolutions.com.au](http://www.ecosystemsolutions.com.au)

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## 1. Introduction

Cristal Mining Australia is conducting investigations for the development of the Wonnerup South Mineral Sands Deposit. As part of this process, Ecosystem Solutions were contracted by Ekologica Pty Ltd to investigate and report on the wetland within an area within Lot 3819, Wonnerup and determine the wetland buffer requirements for these wetlands as outlined in *Guidelines for the Determination of Wetland Buffer Requirements – Draft* (WAPC, 2005). We were also asked to investigate a spring near the Sabina River and provide comment on its significance as well as identify areas for revegetation and protection on the property that would support offset plantings.

This report outlines the methodology and results of the field survey and utilises the processes outlined in WAPC (2005) to determine the requirements for appropriate buffer limits on the wetlands within the location. The report also provides brief comments on the inspection on the spring and identifies areas for revegetation on the property where any offset planting would enhance and increase ecological function and protection.

## 2. Site Location, Soils and Landscape.

The Study Area was provided by Ekologica Pty Ltd and consists of approximately 235 ha within Lot 3819 in Wonnerup, 6 km south east of Busselton in Western Australia. Lot 3819 is located on the Swan Coastal Plain, bounded by Bussell Highway to the North and Sues Road to the East. The Sabina River bound the north east section of the Study Area (Map 1). The property has historically and is currently being used for agricultural production.

The topography of the Study Area is flat and rises gently from approximately 10 m Australian Height Datum (AHD) in the north to 15-20 m AHD to the south, with very slight depressions and rises through the site (Map 1 & Figure 1).

Soils and landscapes within the Study Area have been mapped by Tille and Lantzke (1990). These data are incorporated into the Department of Agriculture WA's Soil-landscape mapping dataset which show that the Study Area contains 5 Soil-Landscape units (Map 2). Four of these are categorised within the Abba Plain land system, with a small narrow band of sandy soil belonging to the Bassendean soil-landscape system (which overlays the Abba system). These units are described as:

- Bassendean System Golf Course Deep Sandy Rises (212 Bs GCd 2) – Pale Deep Sands of remnant dunes;
- Abba System Cokelup Wet Clayey Flats (213 Ab CKw) – Low lying flats and depressions; Wet and Semi Wet soils, Saline Wet Soils; Alkaline grey shallow sandy and loamy duplexes and hard cracking clays;
- Abba System Wet Flats (213 Ab ABw)- Poorly drained flats and depressions; Wet and Semi-wet soils with pale sandy earths and pale deep sands;

- Abba System Abba Flats (213 Ab AB1) - Plain consisting of very low rises; Pale sandy earths; Semi-wet soils and pale deep sands with some grey deep sandy duplexes; and
- Abba System Abba wet vales (213 Ab ABvw) – Shallow drainage depressions with swampy floors; Wet and Semi-wet soils.

These soil types are consistent with wetland dominated areas as the deeper depressions become inundated in winter.

### **3. Wetland Buffer Determination**

#### **3.1. Approach**

WAPC (2005) outlines a seven step process for the determination of buffer requirements.

1. Acknowledge existence of the wetland
2. Identify wetland attributes, management category and establish management objective
3. Define wetland functional area
4. Identify threatening processes
5. Identify role of separation
6. Establish separation requirements
7. Apply separation requirements to proposal and assess its ability to achieve management objective.

This report follows these steps for wetlands within the Study Area.

#### **3.1.1. Existence of Wetlands**

The Department of Environment and Conservation's Geomorphic Wetlands of the Swan Coastal Plain dataset indicate that the Study Area contains the following wetland areas (Map 3 & Table 1).

- UFI 1521 – Multiple Use Wetland in the northern and eastern sections of the Study Area:
- UFI 190 – Multiple Use Wetland running in a thin band NE-SW through the Study Area between UFI 1521 and the 15m contour line: and
- UFI 378 – Multiple Use Wetland running in a narrow band, North-South in the south west corner of the property.

These wetlands are seasonally and/or intermittently inundated areas or seasonally waterlogged areas within the Study Area. They do not retain a water body above ground for the whole year.

The existence of these wetlands was correlated with an aerial image acquired of the Study Area and overlain with the Soil Landscape datasets using ArcView GIS. This was to confirm via a desktop analysis, that the wetland boundaries were consistent with the landform and soil types. UFI 1521 & 190 follow the boundary of the Cokelup Wet Clayey Flats soil landscape (Figure 2). The other areas are consistent with hydric or waterlogged soils and the landforms. Note that much of the native vegetation on the Study Area is cleared and cannot be used to provide an indication of the extent of wetland based on wetland vegetation types.

The boundaries of these were transferred into a Trimble GIS/GPS and the site was visited on Monday 12<sup>th</sup> November 2012. The boundaries of each of the identified wetlands were traversed on foot and vehicle. The definition by Semeniuk and Semeniuk (1995) for wetland delineation was adopted to confirm the boundaries. This stated “the boundary of (a) wetland is drawn at the outside of the area that has the characteristic of dampness, or hydric soils, or vegetation indicative of wetland conditions”.

Numerous points along the boundary were sampled by digging to confirm the presence of hydrous or waterlogged soils. The actual boundaries were visually determinable with areas of green against the dryer terrestrial areas adjoining them (Figure 3)

The boundaries within the DEC’s Geomorphic Wetlands of the Swan Coastal Plain dataset are consistent with the field observations.

In the south-west corner of the Study Area, a small depression with water, consistent with a sumpland (after Semeniuk, 1987) with areas of *Juncus pallidus* was found and mapped using Arcpad GIS (Figure 4). This area had standing water remaining in November and the boundary was determined from the hydric soils sampled and the area of *Juncus*. This area of approximately 2.2 ha was not on the Geomorphic Wetlands dataset. The area did not contain any other native vegetation other than small, isolated areas of *Juncus pallidus* and would not be considered to have any conservation or resource value. It would be considered to be a seasonally inundated basin Dampland. The wetland area has been highly modified and is significantly degraded, possessing very few natural attributes and limited human use interest (Hill *et al*, 1996). This wetland would fall within the Multiple Use wetland category, however its formal status has not been investigated. The location is shown in Map 4. Two additional areas with wetland vegetation were identified by Ekologica (2012). These are more comparable to the Dampland wetlands such as UFI 378 and would also fall under the Multiple Use category based on the same criteria. These are also shown in Map 4.

### 3.1.2. Wetland Attributes, Management Category and Objectives

The three formally identified wetlands (UFI 1521, 190 & 378) have been assigned a category of Multiple Use. This category is described as wetlands with few attributes, and rank poorly on both natural and human use attributes. These wetlands still provide wetland functions within the management context focused on the use, development and management of water, town and environmental planning through Landcare (Hill *et al* 1996).

**Table 1: Wetlands within Study Area**

Wetland UFI	Management Category	Geomorphic Classification	Area within site	Total area of wetland
15213	Multiple Use	Plausplain	136.5ha	42,308ha
190	Multiple Use	Sumpland	15.3ha	87ha
378	Multiple Use	Dampland	11.4ha	238ha

The vegetation of the Study Area was reviewed by Ekologica (Dec 2012) which found the site to be dominated by introduced flora species (30 out of 40 identified). They reported that due to the small size of vegetation remnants (<2ha) and ongoing grazing, the remnants that remain lack a native understorey component and there was no regeneration of native overstorey species and were considered to be "Completely Degraded" using the definition of Keighery (1994). The report concluded that the study area remnants were considered to have little or no conservation values.

Although the small unidentified area of wetland had standing water, the remaining areas had none. There were no obvious use by any native fauna observed during the survey and the habitat present within the Study Area would be unlikely to support any native fauna as it was predominantly cleared and used for agriculture (grazing). The wetlands would not be considered to support any significant flora, fauna or ecological values.

Evaluation of the wetlands during the field survey concluded that there is very little, if any, ecological values within these wetlands or any other significant values or attributes that would alter the category of Multiple Use.

The wetlands would, however, provide values for human use, primarily for agricultural production. The additional retention of water within the soil within the Study Area and within the landscape would allow for the pastures within them to be productive longer into the summer month. This was visually confirmed during the field visit by the presence of greener feed in the paddocks during a warm November.

Therefore the major attribute of these Multiple Use wetlands is in their value for human uses, primarily their importance for productive areas for agricultural purposes. This in turn can contribute to an effect on the land values as the ability to retain moisture in the paddocks longer than other areas makes the property more attractive for farming purposes.

### **3.1.3. Wetland Functional Area**

The wetland functional area is the area required to be protected to ensure the values, attributes, processes and functions of the wetland can be maintained.

For the wetlands within the Study Area, given the lack of native vegetation surrounding the wetlands and overall lack of ecological functionality, the functional area would be considered to be that area with seasonal inundation and seasonally wet soils. The wetland functional area for those wetlands within the Study Area, are therefore defined by the area with hydric soils, which is consistent with the boundaries already described in the Geomorphic Wetlands of the SCP dataset. This was confirmed from both the desktop analysis and field survey and investigations.

### **3.1.4. Threatening Processes & Separation Requirements**

The processes that could potentially threaten the attributes of these wetlands were identified based on consideration of the environmental risks of the surrounding landscape and proximity to the nearby Sabina River.

The relevant threatening processes identified are:

- Alterations to the water regime within the surrounding landscape, in particular groundwater variances as data obtained from bore monitoring suggest that there is a link between these wetlands and the groundwater system (Ennovate Consulting – N. Dixon, *pers comm*).

Table 2 shows the requirements to support the attributes of the wetlands within the Study Area.

**Table 2: Attributes, Requirements and Threats for Wetland in Study Area**

<b>Attribute</b>	<b>Requirements to support attribute for defining functional area</b>	<b>Definable Boundary</b>	<b>Key Threatening Processes</b>	<b>Role of separation.</b>
<b>Important productive areas for commercial endeavours – Agriculture</b>	Maintain seasonal water levels	Areas seasonally inundated and areas of wetter soils	Alteration to the water regime	<ul style="list-style-type: none"> <li>• Protection from direct disturbance or their change/impact to the wetland functional area</li> <li>• Can provide indirect support for wetland functional areas through hydrological and terrestrial process</li> </ul>
<b>Effect on Land Values</b>	Maintain seasonal water levels	Areas seasonally inundated and areas of wetter soils	Alteration to the water regime	<ul style="list-style-type: none"> <li>• Protection from direct disturbance or their change/impact to the wetland functional area</li> </ul>



### **3.2. Conclusion.**

No separation is required to manage the potential for alterations to the water regime; consequently no separation area beyond the wetland functional area is required.

The recommended management to maintain functional area of the wetlands within the Study Area is the regulation of groundwater abstraction as a catchment management measure.

Proposals for appropriate development outside the wetland functional area of the wetland and within the Study Area should meet the management objectives for a multiple use wetland. Water quality and ground water alterations within the landscape still need to be managed to ensure there are no adverse impacts on the values, functions and attributes of the wetlands in the site.

## 4. Spring Investigation

Ecosystem Solutions were asked to inspect a spring that had been located from a previous survey team.

The spring location was provided as 115° 25' 5.533"E: 33° 39' 49.538"S, which is outside the Study Area of the main proposal (Map 4).

The area was examined and although no specific spring could be located, the area was very damp and lower in the landscape. It was covered in Kikuyu grass that was still green and Arum Lilies that were still flowering (Figure 5). The vegetation was typical riverine with common tree species present (*Eucalyptus rudis*, *Agonis flexuosa*) in the damper areas, and dominated by annual grass weeds and Arum Lilies in the understory (Figure 6). It appears as though the area was once a meander in the Sabina River and had become cut off from the main channel through siltation or other process (similar to a very small oxbow lake), which had, over time, itself become silted with deposited sands. Other than the obvious moisture below the surface, no other ecological or environmental values of significance could be determined from the inspection of the site.

## 5. Opportunities for revegetation

Environmental offsets are defined by the EPA as “environmentally beneficial activities” undertaken to counterbalance any adverse environmental impact to achieve a net environmental benefit outcome (EPA 2008).

Both the EPA and the Federal Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) recognise the role of environmental offsets and have issued guidance on their usage in various applications. Under the State process, the assets within the Study Area would be considered a Low to Medium Value Assets (under criteria defined in EPA, 2006), which are those assets that are in less than good to excellent condition. Offsets are normally applied to high value and critical assets. The Federal policy relates to those assets protected by the EPBC Act, which would not include any attributes of the wetlands or vegetation within the Study Area.

Given the low value nature of the assets within the Study Area, offsets may not be required by the EPA or the Commonwealth, however impacts to low quality assets are usually dealt with by the relevant government agency approvals process (EPA, 2008), in this case, the Department of Environment and Conservation, as part of the vegetation clearing process.

Two areas were identified for potential opportunities for revegetation to support offset planting should this be required as part of the package.

- An area of *Melaleuca* dominated pasture in the North West corner outside the Study Area (Map 4). This area has existing mature tree, though grazing pressure has resulted in very little signs of regeneration. This site is within palusplain wetland (UFI 1521) and the Cokelup soil types, hence would have

sufficient moisture to enable successful revegetation while complimenting the existing mature tree with varying ecological strata if suitable tree, shrub and groundcover species are selected. It also appears that it would be relatively easy to fence off this area to exclude stock and promote natural regeneration (Figure 7).

- The areas within Lot 3819 that adjoin the Sabina River (Map 4). It would appear that some revegetation within this area has occurred and fencing to exclude stock already exists. The area is within the wetland boundaries and would have sufficient moisture for success. The addition of multiple local native species, of differing strata layers, would complement and enhance the ecological functionality of the exiting native vegetation along the riparian system. This would also enhance the connectivity through the landscape to the Tuart Forest National Park and Vasse-Wonnerup Wetland system to the north of the location.

## 6. Figures



Figure 1: Flat nature of the topography of the Study Area.



Figure 2: Southern Boundary of Cokelup Soil Type and Wetland Boundary



Figure 3: Wetland Boundary Definition - note green of vegetation.



Figure 4: Undocumented Wetland



Figure 5: Spring Area - Weedy understory

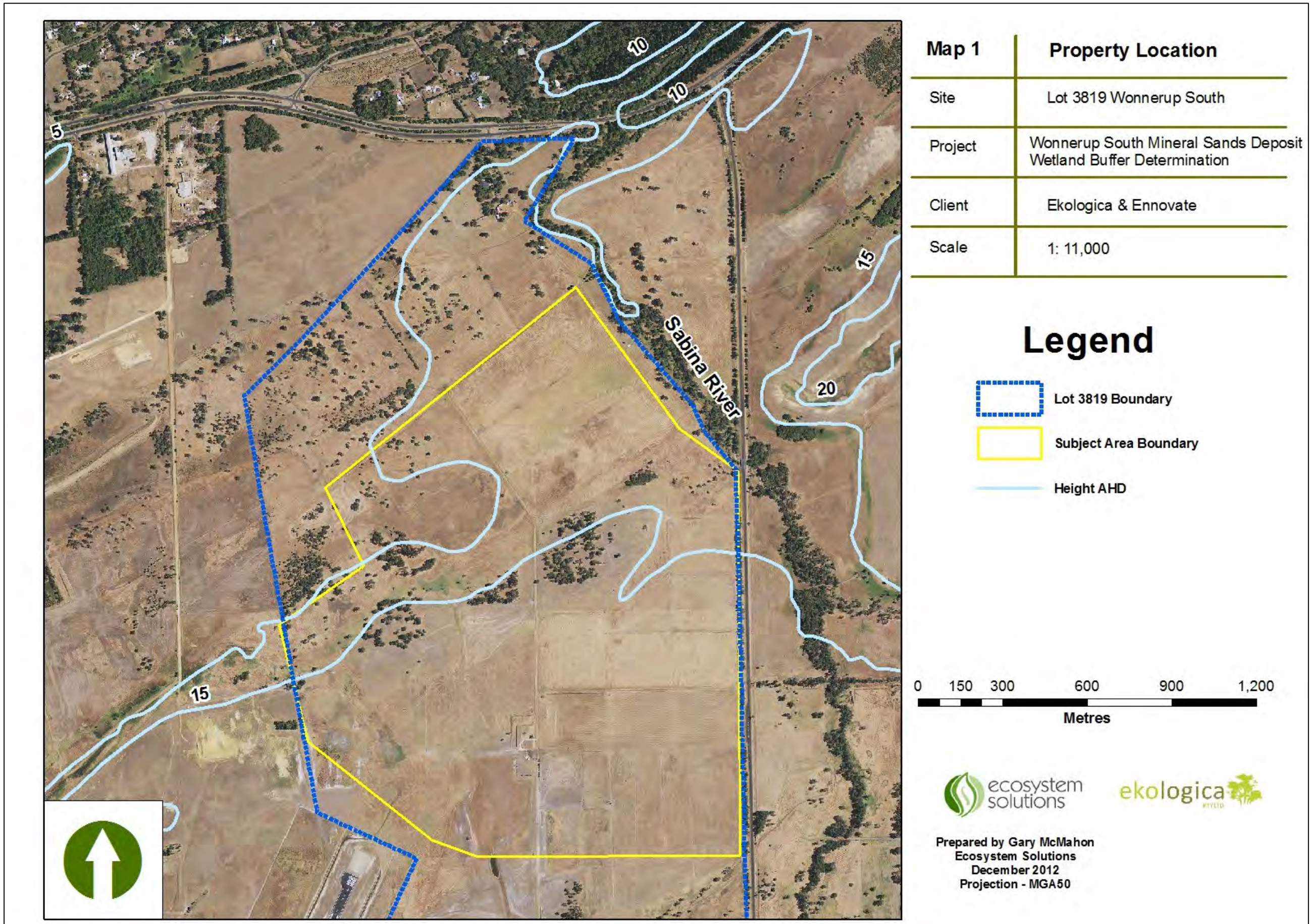


Figure 6: Spring Location as provided.






Figure 7: Potential Revegetation Area in N-W

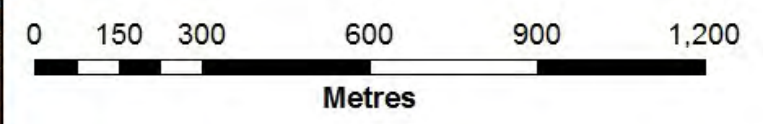
7. Maps



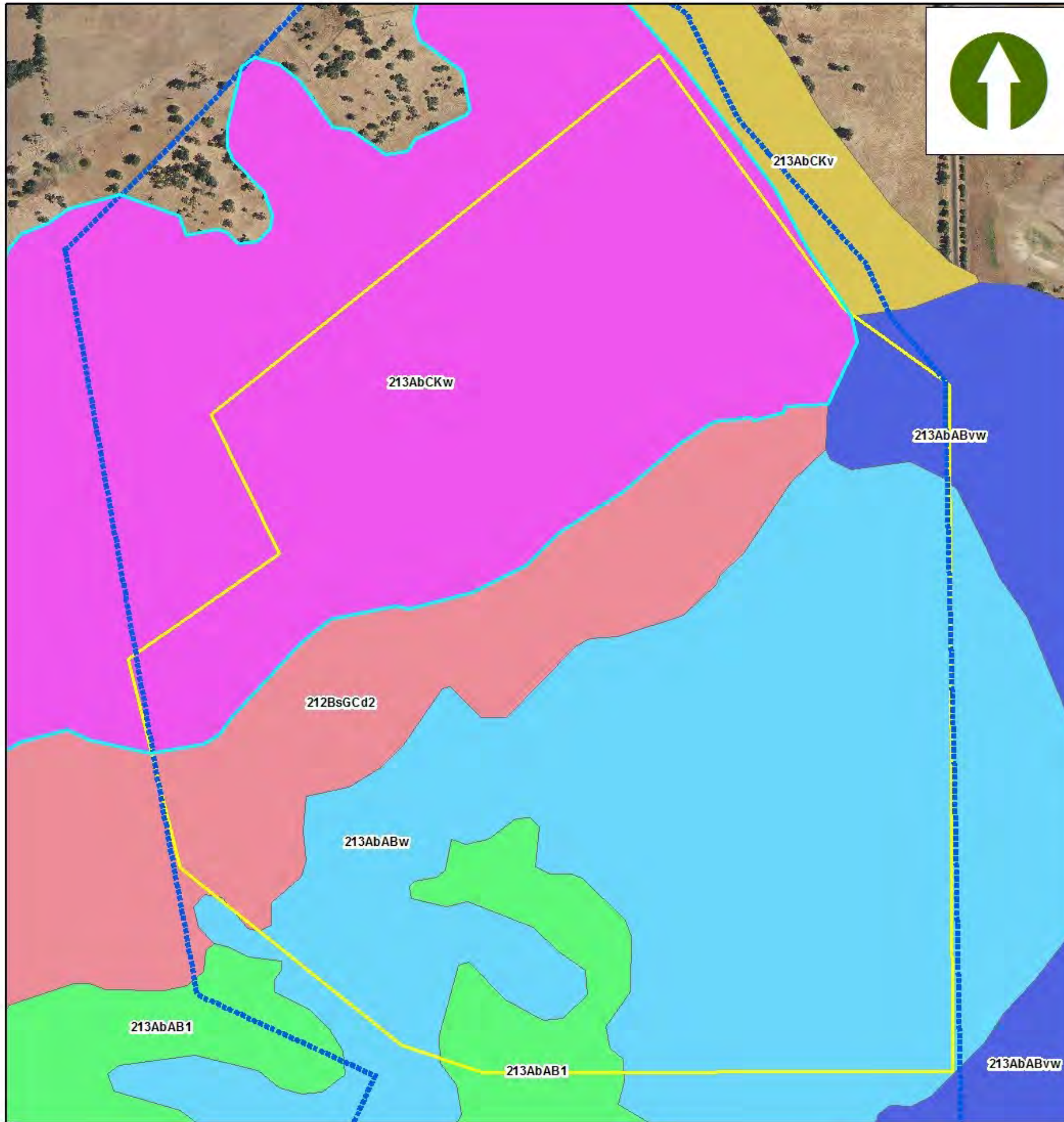
Map 1	Property Location
Site	Lot 3819 Wonnerup South
Project	Wonnerup South Mineral Sands Deposit Wetland Buffer Determination
Client	Ekologica & Ennovate
Scale	1: 11,000

**Legend**

-  Lot 3819 Boundary
-  Subject Area Boundary
-  Height AHD









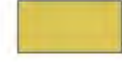

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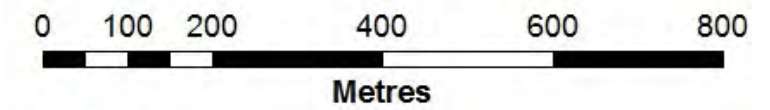


**Map 2** | **Soils Within Subject Area**

Site	Lot 3819 Wonnerup South
Project	Wonnerup South Mineral Sands Deposit Wetland Buffer Determination
Client	Ekologica & Ennovate
Scale	1: 7,000

**Legend**

-  Lot 3819 Boundary
-  Subject Area Boundary
- Soil Landscape Descriptors**
-  212BsGCd2
-  213AbAB1
-  213AbABvw
-  213AbABw
-  213AbCKv
-  213AbCKw








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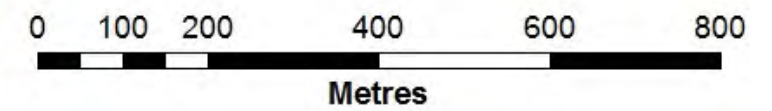




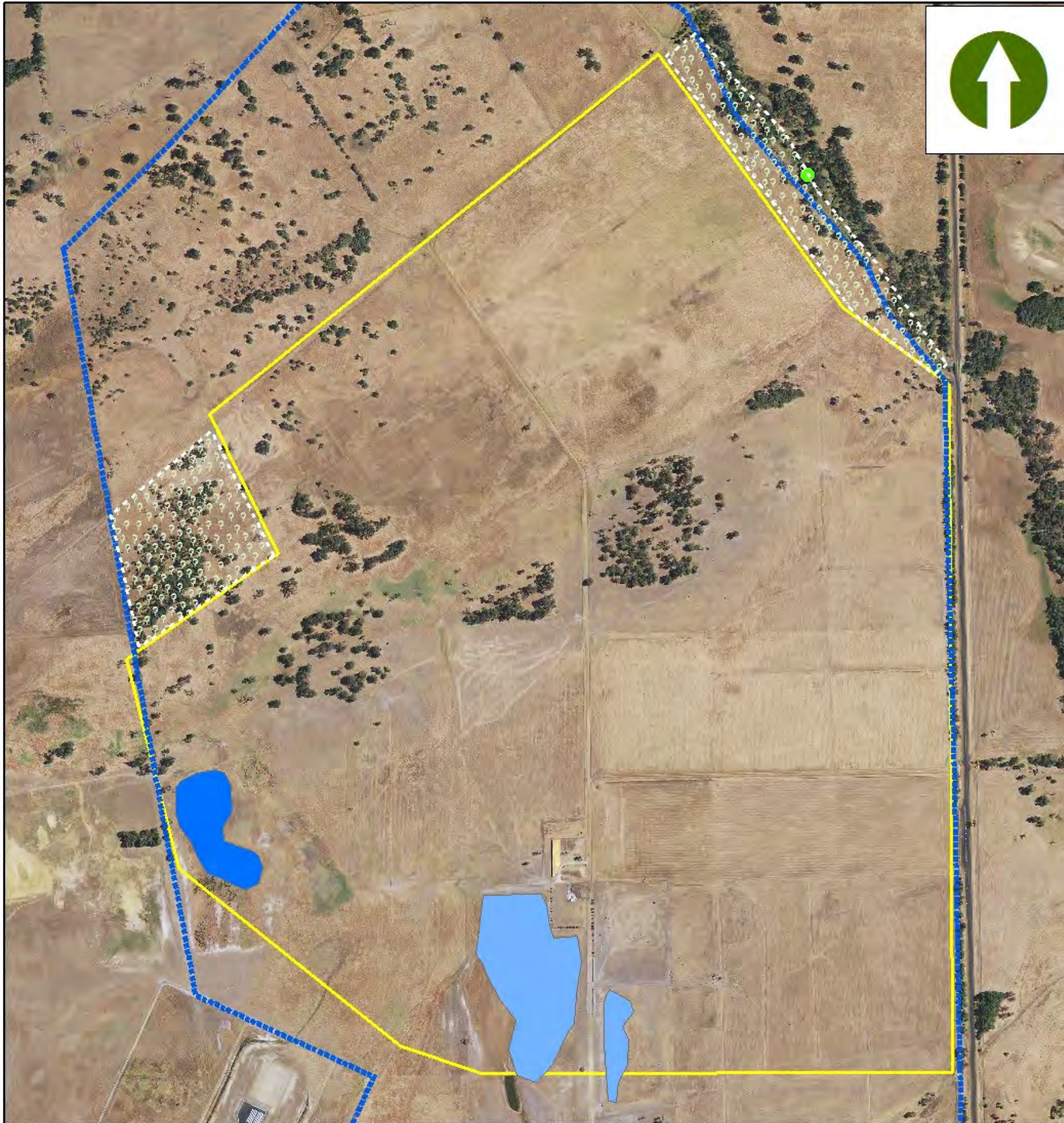
Map 3		Wetlands Within Subject Area	
Site	Lot 3819 Wonnerup South		
Project	Wonnerup South Mineral Sands Deposit Wetland Buffer Determination		
Client	Ekologica & Ennovate		
Scale	1: 7,000		

### Legend

-  Lot 3819 Boundary
-  Subject Area Boundary
- Geomorphic Wetlands UFI**
-  15213
-  190
-  378









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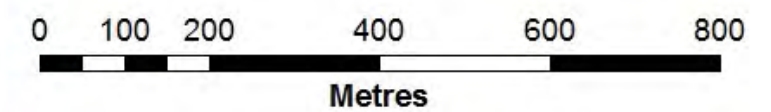


**Map 4 Spring, Wetland & Reveg Areas**

Site	Lot 3819 Wonnerup South
Project	Wonnerup South Mineral Sands Deposit Wetland Buffer Determination
Client	Ekologica & Ennovate
Scale	1: 7,000

**Legend**

-  Lot 3819 Boundary
-  Subject Area Boundary
-  Undescribed Wetland
-  Wetlands (Ekologica 2012)
-  Spring Location
-  Potential Revegetation Areas



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