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BIOSCIENCE PTY LTD ACN 054 829 131
625 WARTON ROAD FORRESTDALE WESTERN AUSTRALIA 6112
PO BOX 5466 CANNINGVALE WESTERN AUSTRALIA 6155
TELEPHONE (08) 9397 2446 FACSIMILE (08) 9397 2447
EMAIL bioscience@biosciencewa.com.au
WEBSITE www.biosciencewa.com

REPORT ON FIELD INVESTIGATIONS:

GROUND TRUTHING THE PRESENCE AND MANAGEMENT CLASSIFICATION OF WETLANDS LOT 123 MORTIMER RD, CASUARINA CITY OF KWINANA

Prepared by:
Dr Peter Keating — **Managing Director**
Mr Peter Hood — **Senior Environmental Scientist**

Prepared For:
Mr Ivan Yujnovich (Landowner)
398 Oxford St
Mt Hawthorn
Western Australia

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Objective:

The purpose of this study is to examine and report on the environmental and hydrological characteristics of Lot 123 Mortimer Road, Casuarina with respect to the appropriateness of wetland classification and the subsequent potential effect such a classification may have on any proposed development.

The wetland classification system in Western Australia is currently under review. The analysis reported here is in the context of the existing classification guidelines and considers changes mooted in draft revisions in wetland classification.

1) Site Description

Lot 123 Mortimer Road, Casuarina (32.235° S, 115.853° E) is 45ha of largely *Banksia-Eucalyptus* woodland situated approximately 35km south of Perth, Western Australia (Figure 1). It lies within the City of Kwinana and is surrounded by a mix of rural and special rural properties on its western, northern and eastern boundaries with Mortimer Road defining the southern boundary.

The site is undulating, with the highest point near the southern boundary at 40 m AHD, and the lowest point near the northern boundary at 17.6 m AHD. Ridges and saddles through the middle of the property mask the overall slope of the land from the south east to the north west. (See contour map Figure 4).

The property has been privately owned by Mr I. Yujnovich since 1955 and apart from a small area near the middle of the southern boundary, has remained largely undisturbed since that time. In 2002 part of the northern section of the property was classified as a Conservation Category Wetland (CCW) under the Department of Environment's Wetland Classification guidelines. Four other areas respectively classified as Resource Enhancement and Multiple Use Wetlands also overlap the site (see Figure 2). The property is not listed under Bush Forever (2000) and investigation with the Department of Indigenous Affairs indicates it is not a Site under the Aboriginal Heritage Act (1972)

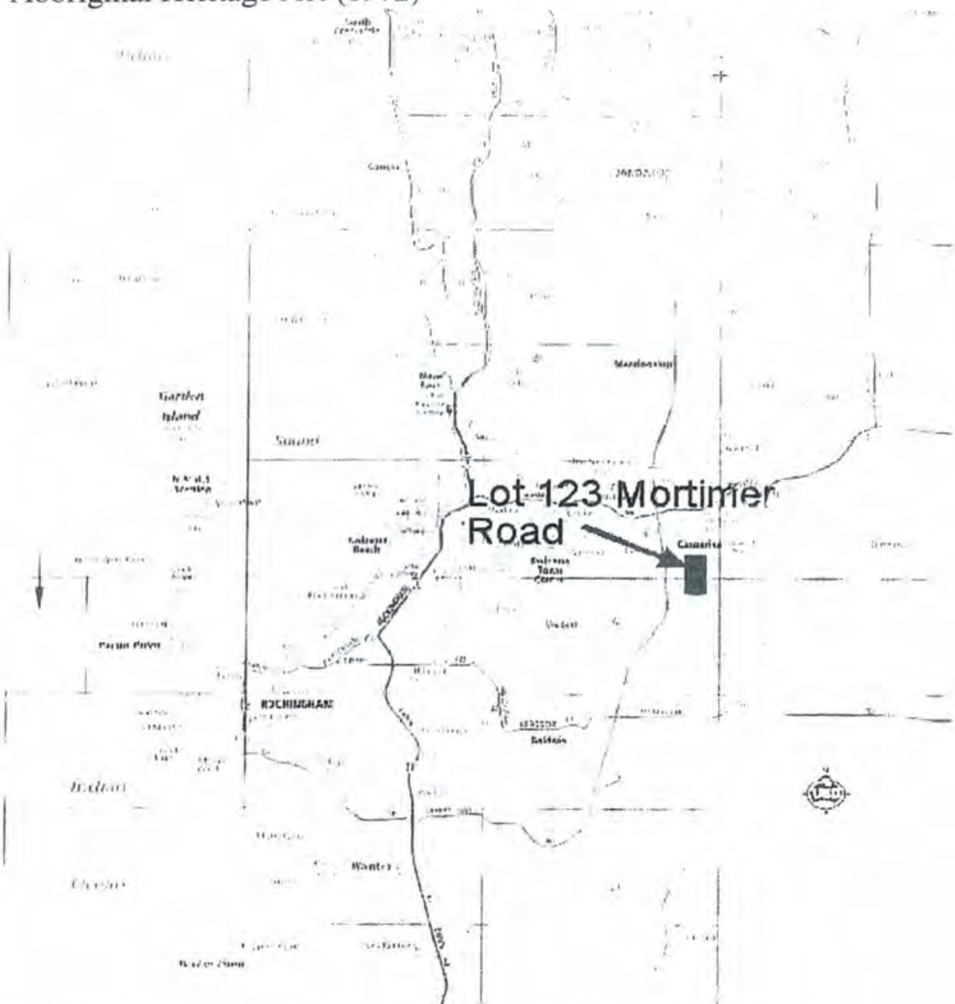

Figure 1: Site Location

2) Wetlands:

2.1 Definition.

The definition of wetlands of the Swan Coastal Plain as used in legislation and regulations is contained in:

> Hill A.L, Semeniuk C.A., Seminiuk V. and Del Marco A. (1996) *Wetlands of the Swan Coastal Plain. Volume 2a.* WRC and DEP of WA.

In particular, Chapters 2 and 3 address at length the basis of defining and of geomorphically classifying wetlands, considering both internationally accepted definitions and the specific regional setting of the Perth area.

At p32 the above volume states:

"Wetlands in Western Australia have been defined locally as: *areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh or saline, eg. waterlogged soils, ponds, billabongs, lakes, swamps tidal flats, estuaries, rivers and their tributaries".*

The key words are waterlogged and inundated, and the definition recognises that such conditions may be permanent or intermittent. Unfortunately waterlogged is not a precise technical term, thus subject to some interpretation. Intermittent is also a problematic word for it does not define an appropriate timescale. However; the book provides assistance with interpretation by way of further description and illustrations.

In particular, Figs 2.2, 2.3 and 2.5 show the authors relate inundation and waterlogging to groundwater levels. Figure 2.2 clearly shows that wetlands extend to the area where there is seasonal saturation of soil by capillary rise of groundwater to the surface. Figure 2.3 clearly shows the edge of this seasonally waterlogged zone constitutes the boundary of a wetland. Fig 2.5 shows that the upper extreme of the range of groundwater levels is pertinent to defining wetlands.

Further, the text on page 35 states:

"The term 'waterlogged' is equivalent to saturated and is used as distinct from inundated in the following way in this classification:

- Waterlogged: those soils that are saturated with water, but where the water does not inundate the soil surface;
- Inundated: those soils that are covered with free standing water, the soil below the surface in these situations is also saturated (waterlogged).

As the text refers to seasonality in terms of annual cycles, it is safe to assume the authors context of time was not geological time, but human time frames, arguable around 50 years.

From the detailed hydrological studies of the Swan Coastal Plain, it is well known that superficial and deeper artesian aquifer interactions influence local water tables, and that local soil conditions (particularly the occurrence of clay and silt particles in surface soil) can create "perched" water tables which lie above local superficial aquifers.

In summary the primary judgement of whether a wetland exists is determined by local groundwater levels, and secondarily by the nature of soils which are conducive to a) capillarity rise of underlying groundwater creating a saturated state, and b) conditions which create local perching. Accordingly, it is hydrological studies, augmented by soil physical structure which determined the presence or absence of wetlands.

2.2 Vegetation and soil type.

The cited publication notes the relatedness of vegetation and soil to wetlands. For example at p32:

> "Wetland terrains may be distinguished by the occurrence of water, or waterlogged soils, or vegetation typical of water conditions (eg., swamp trees, reed beds) or hydric soil (ie., formed in response to prevailing water inundation or waterlogging, and including peats, peaty sands, carbonate muds, etc.)"

Note the words "may be distinguished". Distinguish means (Collins Dictionary):1. to make, show or recognise a difference or differences (between or among): differentiate (between). 2. to be a distinctive feature of; characterise. 3. to make out, perceive. The word distinguish does not mean define, it means to show or differentiate.

At p 42 it is stated:

> "Semeniuk *et al.* (1990) proposed a classification of wetland vegetation which can be used to augment the basic geomorphic wetland types".

The term "augment" clearly shows the authors do not mean that vegetation defines a wetland, but rather that it assists the classification of wetlands once they are so defined.

This is further elaborated at Section 3.5 At page 59, the study details the importance of field verification of wetlands. Point 5 states:

> "Wetland vegetation, which is a good indicator of hydro-period needed to be assessed in the field. In many instances aerial photographic work can only reveal a closed forest or a heath, without any indication as to water levels or hydro-period, and compositional differences between forest and heath types (e.g., *Melaleuca pressiana* forest and *Melaleuca radiophylla* forest). These differences in vegetation signal major differences in hydro-period features and cannot be ascertained from aerial photographs."

Note the authors restate vegetation is an <u>indicator</u>, not a definition. The authors chose to distinguish between *M. pressiana* and *raphiophylla*, eruditely reflecting Marchant's observations that *raphiophylla* ("Swamp Paperbark") occurs <u>in</u> watercourses and permanent swamps, whereas *presianna* ("Moonah") <u>borders</u> watercourses and winter wet depressions.

The point is raised here only to illustrate that should hydrological and soil examination provide equivocal or ambiguous results, vegetation may assist by augmenting the data. In this specific case, *M. pressiana* would help define the boundary of a wetland as it occurs on boundaries.

2.3 Groundwater levels and soil type.

Because groundwater is fundamentally important to areas outside environmental science, (for example scheme water supply, urban drainage and civil engineering) methods for measuring and monitoring groundwater are well established and an extensive dataset exists for the Swan Coastal Plain.

The seminal reference is:
Davidson W.A. (1995) *Hydrogeology and groundwater resources of the Perth Region, Western Australia.* Western Australia Geological Survey Bulletin 142.

A finer spatial resolution series of groundwater maps, (albeit with less technical detail) is contained in *Perth Groundwater Atlas, Second Edition 2004.*Dept. of Environment, WA.

Davidson describes at length the nature and dynamics of the superficial aquifers. He notes (p54) the watertable fluctuates seasonally by about 1 m in the central sandy areas (the Bassendean Dunes System) with the maximum watertable elevation occurring during September – October.

He also notes in reference to wetlands (p11) "Many of the swamps are perched above the water table and downward leakage of water is inhibited by peaty swamp deposits and in some areas, particularly south of Perth, by a ferrunginous hardpan colloquially called 'coffee rock'."

The term "hydritic soil" refers to chemical changes which occur when soils are permanently or intermittently waterlogged. Because void spaces between soil particles become filled with water, and because gas diffusion is much slower in liquid than in air, such soils become depleted of oxygen. Because oxygen has a significant impact on redox potential, such soils become reducing, rather than oxidising. This means organic carbon accumulates and soil sulphur becomes immobilised as organic and free sulfides. Accordingly, hydritic soils progressively become darker due to accumulation of fine organic humus, and permeability becomes reduced.

Such soils on the Swan Coastal Plain also typically accumulate reduced sulphur and tend to become so-called "acid sulfate soil". Reduced sulfides also interact with free iron forming the ferricrete layer termed "coffee rock"

These characteristics of "swampiness" accurately reflect the extent and duration of inundation and waterlogging. The location of ferrunginous layers is also an indicator of the average annual maximum groundwater level (AAMGL).

2.4 The Classification of Wetlands

When a site has been defined as a wetland, in order to classify that area in terms of appropriate management, an assessment is undertaken using the protocols described in EPA Bulletin 686 "A Guide to Wetland Management in the Perth and Near Perth Swan Coastal Plain Area". By using a structured assessment protocol which considers both natural and human use attributes, a wetland is classified into one of three management categories, Conservation Category, Resource Enhancement or Multiple Use. Management decisions in relation to appropriate land use (from reservation to development) can then be made.

This system of classification is currently under revision. The draft re-assessment protocol (July 2005) provides very little by way of further guidance to the references previously used, however it requires a far greater amount of work to be undertaken, particularly in relation to definition of vegetation, where comprehensive vegetation surveys are required. The draft is paradoxical in that none of the cited references contained therein require such a detailed assessment of vegetation.

One important new reference is that to Tiner (1999) *Wetland Indicators, A Guide to Wetland Identification, Delineation, Classification and Mapping.* This book refers to wetlands in the

United States, but most importantly, whereas Hill *et al* refer in general terms to distance to watertables, Tiner is quite specific about how far the watertable must rise, and for what period of time before an area is classified as a wetland. Also of seminal importance is that Tiner modifies this definitional benchmark according to soil permeability such that the distance to groundwater is decreased for highly permeable soil, and increased for lower permeability soil.

A further enhancement Tiner brings to wetland classification in WA is a careful and detailed description of hyritic soils (which although mentioned, are not defined by Hill *et.al.*).

2.5 Geomorphic Data Set

The original wetland mapping for the Swan Coastal Plain is contained in Hill *et al* (1996) Volume 2b. This was progressively transformed into a digital data set which is now contained within the Western Australian Land Information Service available through the internet at www.walis.wa.gov.au

In 2002 part of the northern section of the property was classified as a Conservation Category Wetland (CCW) under the Department of Environment's Wetland Classification guidelines. Four other areas respectively classified as Resource Enhancement and Multiple Use Wetlands also overlap the site (see Figure 2).

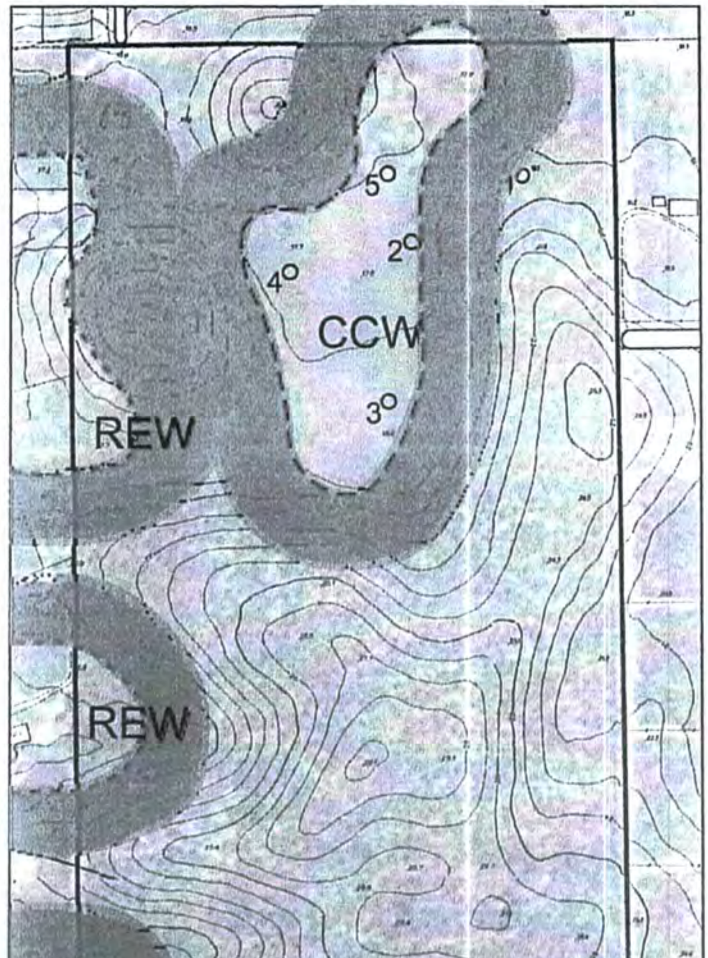

Figure 2-Wetland classifications on the Mortimer Road site under the Geomorphic Data Set (Hill *et al.*, 1996) with the minimum requirement (50m) for protection buffer zones (CCW – Conservation Category wetland; REH – Resource Enhancement Wetland; MUW – Multiple Use wetland).

2.6 Field Verification:

Hill *et al* state at 3.12 that field verification is important for classifying wetlands for several reasons:

1. Climatic variations influence wetlands, and field investigations are needed to determine such changes.
2. The maximum and minimum water levels in wetlands are required in order to apply wetland geomorphic classification.
3. Wetlands have to be classified according to the present water regime, as drainage modifies the wetness characteristics of the system.
4. Wetlands in unusual or particular settings require field studies to clarify their attributes.
5. As previously mentioned, vegetation can provide indicators of hydroperiod, and these can not be ascertained from aerial photograph.

3) Wetland Assessment Field Work

3.1 Hydrology and Soil Investigations:

In order to investigate the soil and hydrology of the area classified by DoE as Wetland, a drilling program was undertaken in August 2005. Using an auger-core drill rig, holes were dug to 4 m below the surface. Core samples were recovered, examined and logged, and sub-samples were taken for laboratory investigation.

After holes were drilled, piezometers made from 50 mm slotted PVC pipe were inserted to a depth of 3.5 m (bottom 3 m slotted and end capped) with 0.5 m above the surface. Piezometer tops were capped and locations were logged by GPS. Bore locations are marked on Figure 2.

3.2 Soil Profiles

Each drilled holed presented a very similar soil profile consisting of a shallow A horizon (100 – 150 mm) of grey sand overlying white medium/coarse grained white sand typically to a depth of about 1 m. Sand then became uniform grading coarse yellow to brown sand to 4 meters.

A weakly indurated layer 200 mm deep was found at only one site, hole 1. This area is outside the boundary and 50 m buffer zone of what is currently classified as CCW.

Complete data of exploration holes are attached as Appendix 2.

3.3 Hydrological Data

Piezometer water levels were taken at monthly intervals. The data is summarised in Figure 3. Ground water levels were closest to the surface during October and began to recede after this time. Ground water was closest to the surface at MB4 reaching a maximum of 1250mm. Depths correspond well with the sites topography as shown by the contours in Figure 4 indicate the groundwater level is at the same AHD across the site.

These data correlates with local groundwater data of surrounding monitoring bores (Dept. of Env., 2005) that suggest levels fluctuate annually about one metre reaching minimum depth around October. However despite above average rainfall in the area the ground water reaches no closer than 1250mm from the surface. This is inconsistent with the Hill *et al* (1996) wetland classification that suggests that in order to be classified as a dampland the soil should become waterlogged through the capillary rise of water or raising of the water table. It is unlikely that capillary action would have an effect of more than 30-50cm in the regional soil type (see below).

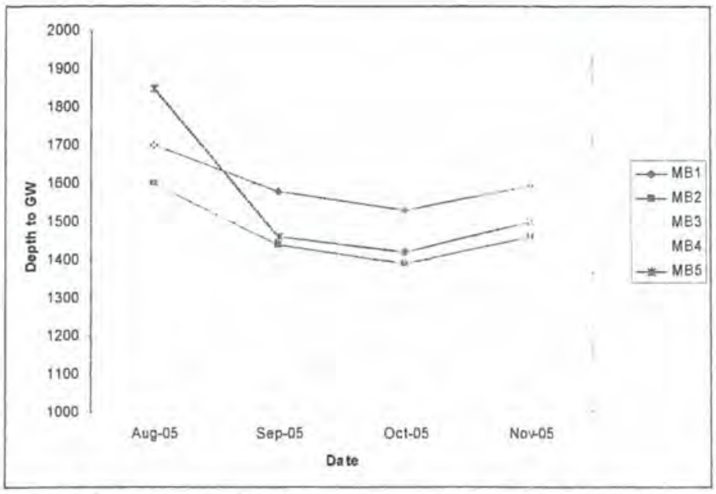

Figure 3. Mortimer Road ground water data for 5 monitoring bores (MB1-MB5).

The determine the influence of the particular season on data collected on site, it was considered against the four closest long term monitoring bores logged by the Department of Environment for at least 30 years.

Monitoring Bore T200 (Lake Thompson) is about 1 Km north east of the site. It records that there has been a modest fall in maximum height over the last 10 years by about 0.4 m, compared with the 30 year long term record.

Monitoring Bore T250 (Lake Thomson) is about 1 Km south west of the site (but the other side of the Mitchell Freeway) which shows a decline of about 0.5 m in maximum height over the last 30 years, but a peak about 0.5 m above average in the years around 1985.

Monitoring Bore 260 (Lake Thompson) is about 2.5 Km south east of the site and shows a decline of about 0.6 m over the last 30 years, and again a peak in 1985.

Monitoring Bore T190 (Lake Thompson) is about 2.5 Km north west of the site (again on the other side of the Mitchell Freeway) and show fairly constant levels over the last 30 years.

The long term data in summary shows some signs of reduced maximum groundwater levels over the last 10 years in particular, but this must be put in the context of generally lower than average rainfall over this time, whereas the year site recordings were made was one of record May and June rainfall, and overall average yearly rainfall.

We conclude the average minimum depth to groundwater is greater than 1.2 m, but in very wet years, the groundwater could potentially rise to 0.7 m below the surface.

3.4 Soil Data

Soil samples were selected from recovered drilling cores to test for the presence of Actual Acid Sulphate Soils and Potential Acid Sulphate soils. As the soils were invariably sand with very low organic matter, only those samples which occurred in dark brown horizons were tested expect for Hole 1, where the entire profile was tested.

Tests involved measuring field pH and pH after oxidation with peroxides, according to the "Field Test" guidance issued by DoE.

Sample	pH_{KCl}	pH_{H2O2}	H_2O_2 reaction
1.2	4.45	4.07	Nil
1.3	4.66	4.28	Nil
1,4	4.84	4.28	Nil
1.5	5.14	4.43	Nil
1.6	5.40	3.89	Nil
1.7	5.64	4.69	Nil
1.8	6.24	5.34	Nil
1.9	6.43	4.74	Nil
2.5	4.91	4.36	Nil
3.6	5.12	4.13	Nil
4.6	5.94	4.36	Nil
5.5	5.42	4.02	Nil

Table 1: Soil pH before and after oxidation with hydrogen peroxide.

Acid sulphate soil is judged by a lowering of pH by more than 2 units after reaction with hydrogen peroxide, and extent of reaction with peroxide. As shown in Table 1, none of the soils tested showed any evidence of acid sulphate conditions.

It is also noteworthy that Hole 1 soil shows a progressive rise of soil pH with depth (podzolisation) rather than a sudden rise at a particular point as would be expected from saturated soil, where waterlogging changes redox potential and under anaerobic (reducing) conditions, pH show a sharp rise.

3.5 Vegetation

General site vegetation

An informal assessment of the vegetation was completed to attain a general concept of vegetation complexes within the Mortimer Road site. Figure 1 shows the site can be graded broadly into six vegetation groups. The site is mostly open *Banksia-Eucalyptus* woodland with *B.attenuata, B. menziesii* and, to a lesser extent, *B. illicifolia* the defining species throughout. *Eucalyptus marginata, E. todtiana* and *Corymbia calophylla* are also common, becoming more densely populated at greater elevation to the south. The overstorey of area B is noticeably dominated by *Allocasuarina fraseriana.* With the exception of Area W, areas differ mainly in the understorey - commonly dominated for example by *Hibbertia hypericoides, Eremea pauciflora, Stirlingia latifolia* and/or *Conostylis aculeata*. Area C2 has considerable weed incursion (mainly *Ehrharta calycina*).

Low lying areas, marked W in Figure 4, are defined as heathland with a sparse *Corymbia calophylla* and *Melaleauca preissiana* overstorey with occasional, *X. preissii* and *Nuytsia floribunda*. The understorey is dominated largely by shrub and herbaceous species common to damplands (see below). Table 2 summarises the dominant vegetation in each area.

Table 2-Summary of Mortimer Road vegetation complexes

Area	General Description
A	Open *Banksia* woodland - *B.attenuata, B. menziesii* and *B. illicifolia.* Sparse *Eucalyptus marginata, Corymbia calophylla.* Occ. *Allocasuarina fraseriana*. Understorey *E. pauciflora, C. aculeata*, occ. population *Kunzea ericifolia.*
B	Woodland of *A. fraseriana* overstorey, leading into *E. marginata* and *C. callophylla. Banksia* less dominant. Understorey *S. latifolia, H. hypericoides*, occ. *Pimelia rosea.*
C	Open *Banksia* woodland interspersed with *E. marginate, E. todtiana* and *C. callophylla.* Understorey varies between *H. hypericoides* and *S. latifolia.*
C2	As for Area C, however, has had serious incursion of *E. calycina* and other disturbances
D	Open *Banksia* woodland but noticeably dominated by a mid-storey of *Allocasuarina humilis.*
W	Heathland with sparse *Corymbia calophylla* and *M. preissiana* overstorey with *X. preissii* and occ. *N. floribunda.* Understorey a mosaic of mostly dampland species – *Pericalymma ellipticum, Aotus procumbens, Hypocalymma angustifolium.*

Vegetation within the area marked as W

Several species were identified that were common and/or dominant only in the CCW (Area W) and REH. Of these species 13 are considered by Marchant *et al* (1987) to be commonly found near wetlands or winter-wet depressions (Table 3).

Table 3-Species listed within W.

Species	**Occurrence**	**Commonly occurs in;**
Trees		
Melaleuca pressiana	Occasional	Bordering watercourses and winter-wet depressions
Xanthorrhoea preissii	Occasional	Widespread
Nuytsia floribunda	Occasional	Sandy areas.
Allocasuarina fraseriana	Occasional	Sandy areas
Corymbia calophylla	Occasional	Widespread
Shrubs		
Aotus procumbens	Very common	Winter-wet depressions
Astartea fascicularis	Common	Usually along watercourses and winter-wet depressions
Bossiaea eriocarpa	Very common	Widespread
Leptomeria pauciflora	Common	Winter-wet depressions
Pericalymma ellipticum	Very common	Winter-wet depressions and along watercourses
Hypocalymma angustifolium	Very common	Winter-wet depressions and along watercourses
Dasypogon bromeliifolius	Common	Low-lying areas
Herbs		
Carex sp.	Very common	Usually winter-wet depressions
Lyginia barbata	Very common	Usu. Winter-wet depressions
Mesomelaena tetragona	Very common	Widespread
Phlebocarya ciliata	Very common	Seasonally wet areas
Schoenus curvifolius	Very common	Often in *Banksia* woodland or winter-wet depressions
Siloxerus filifolius	Common	Moist situations

Note: this list was compiled during a short visit to the site and is by no means comprehensive.

Vegetation Condition

In general the bushland is in quite good condition. Weed incursions have been largely restricted to the southern end of the property and along the edges of tracks and boundaries. There has also been some disturbance associated with the dumping of rubbish and/or vehicles. Fires do not appear to have been very regular.

Within the CCW *M. pressiana* are sparse and older trees appear to be in decline. Little or no regeneration of the species appears to have occurred in recent years. There is evidence of recruitment of *Allocasuarina fraseriana* and *C. calophylla* encroaching on the area and this suggests there has been a period of prolonged reduction in water table levels.

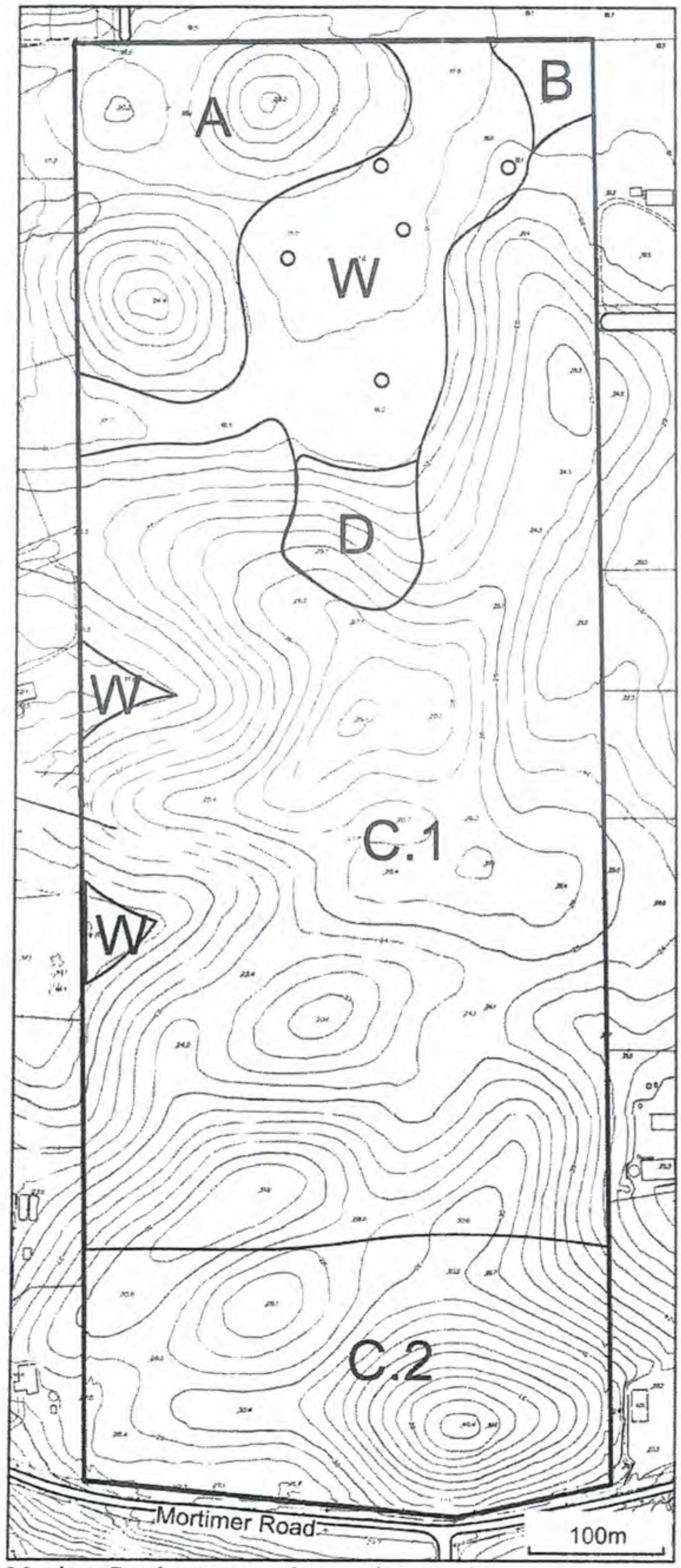

Figure 4: Mortimer Road contours and vegetation complexes.

4. Findings

4.1 Geomorphic Classification

Under current State legislation the three wetland management categories are:

1. Conservation (CCW) – Wetlands supporting a high level of ecological attributes and functions;
2. Resource enhancement (REW) – Wetlands which may have been partially modified but still support substantial ecological attributes and functions; and,
3. Multiple use (MUW) – Wetlands with few important ecological attributes and functions remaining.

The Mortimer Road site sits on the Bassendean Soil Complex according to the Soil Maps within WALIS. Under the Geomorphic Data Set (Hill *et al.*, 1996) the area is classified as a dampland. Under the current classification system, this would suggest the soil experiences intermittent waterlogging either due either to the existence of a "perched" water table or the lifting of the water table to the soil surface.

Soil analysis data from the site is consistent with that of the Bassendean complex. There is little evidence of a confining ferrunginous hardpan that would otherwise be expected in the event of a perched water table (Davidson, 1995) and there are no acid sulphate soils and there is no evidence of hydritic conditions. Furthermore This would suggest the CCW classification is based purely on the vegetation features rather than the soil becoming waterlogged due to water table rise.

The data collected from monitoring bores on site, and its relatedness to surrounding deep monitoring bores indicates this area is not a wetland, as the water table rose to a maximum which was at least 1.2 m below the surface. Historical data from the closest monitoring bores shows that in the wettest years of the 30 year records, the highest groundwater levels recorded are only 300 mm above the average maxima. It is thus concluded that even in a very heavy rainfall year the groundwater would not rise to greater than 800 mm below he surface.

It is noteworthy that Tiner (1999) states that for an area to be considered a wetland the water table must rise to a least a foot from the surface (30 cm) for at least 2 weeks, at least every second year.

Accordingly, by the definitions contained in Hill *et al* and in Tiner, the area to the north of Lot 123 is not a wetland, so classification is not necessary.
There are other areas within the site similarly classified as damplands although these have been deemed Resource Enhancement Wetlands on the western boundary presumably due to the current state of nearby development. These areas are more clearly wetlands, as a) water occurs near the surface, b) the soil contains a deeper peaty layer and c) the wetland vegetation, particularly *Melaleuca pressiana,* Pericalymma ellipticum and *Kunzea* sp. are healthy and vigorous. The Multiple Use Wetland, on the south east, outside the property has been excavated to accommodate a large shed. It is clearly not a wetland, and the water table is at least 4 m below the surface.

The overall health of the Resource Enhancement wetlands suggests there has been no significant regional drop in groundwater levels in recent years.

4.2 Purpose and Limitations of Bulletin 686

Bulletin 686 was designed specifically for the Swan Coastal Plain region. It was written "for a wide range of people including community groups, state and local governments and private landowners". It is "especially useful to developers to assist in their planning and to identify issues that they will have to address to obtain statutory approvals".

Bulletin 686 elucidates the reasons why preservation of wetlands is desirable because of their functions and values.

Wetland functions include

a) Ecological functions:

- food webs including plants, animals and micro-organisms.
- drought refuges for waterbirds
- provision of feeding areas for migrating waterbirds
- habitats for communities considered to be rare or of restricted occurrence
- limited capacity to assimilate nutrients and pollutants
- an index of environmental quality.

b) Hydrological functions:

- compensation basis with a flood control function
- nutrient, sediment and pollutant assimilation.

c) Social functions:

- historical/archaeological
- recreation
- nature study
- education
- access to wildlife
- aesthetic considerations.

Wetland values are discussed in Section 3 of Bulletin 686 where it is stated they are important to wildlife as "natural" ecosystems and they are important to people for various human use purposes.

The Bulletin is intended to systematically assess wetlands using specific questions and score the totality of answers to thereby distinguish management categories.

Conservation Categories have high priority to maintain and enhance wetland attributes. Generally it is very difficult if not impossible to develop such wetlands for any other purpose.

Resource Enhancement wetlands may have opportunities for commercial development. However, the management objective is to enhance the conservation values and preserve wetland functions.

Multiple Use wetlands are typically degraded, possess few natural attributes and have limited human interest. Management objectives should include consideration of water catchment (drainage, nutrient enrichment, surface and groundwater pollution) in terms of current value and potential value to the community of rehabilitated. Some wetlands which fall into this category may only have a hydrological function.

In order to protect wetlands, developments impacting on Resource Enhancement and Multiple Use wetlands could be recommended for approval provided:

a) the wetland function is retained within the development or
b) a wetland is constructed or rehabilitated to fulfil equivalent function.

In the context of Lot 123, it must be noted that of the ecological functions indicated above, the only relevant one related to food webs of plants, animals and microorganisms, however such functions exist for any habitat, not just wetlands. The land has no standing water, thus provides no drought refuge or feeding areas for migrating waterbird. There is no evidence it contains rare or endangered species.
Of the hydrological functions, because the soil has not developed sufficient organic matter to promote significant water retention, it can not fulfil a flood control or pollution assimilation function. The only social function it serves is to the landowners.

In summary, the only wetland functions the area has relate to ecological functions which are not exclusively wetland functions.

5. Development Potential

The Mortimer Road site is currently zoned for Special Rural Development under the Kwinana Town Planning Scheme No.2 (1992). Under this zoning there is a requirement to limit block sizes to 2-4 ha, with a building envelope of $2000m^2$.

Under the Jandakot Structure Plan the land earmarked as future Urban, anticipating housing development for the area surrounding the CCW. Based on present development standards that may mean housing at a rate of about 12 dwellings per hectare for residential land.

Preservation of the CCW would likely require an allowance of approximately 50m to buffer it from any development. The basis for such a distance is detailed in the recent draft publication from WAPC *Guidelines for the Determination of Wetland Buffer Distances* (2005). However, most importantly this Guideline unequivocally states the importance of agreeing that wetlands exist as a first step in determining buffer distances.

"Acknowledgment of the existence of a wetland is the first step in the determination of a wetland buffer. This step does not require any specific definition of the wetland area. The outcome is agreement that a wetland of some form exists at a particular location." (*ibid* p7)

The presence of Conservation Category Wetlands would have a major impact on development plans. For example housing envelopes or access driveways cannot be placed within the wetlands or buffer zones.

It is noteworthy that the landowner has preserve the bushland on Lot 123 intact for over 50 years with the intention of eventually developing it in a way which maximises the preservation of native vegetation.

Conclusions

The current wetland classification system is inadequate and subject to interpretation and is currently under review by the Department of Environment. Under this system it is our belief that the so-called CCW on the Mortimer Road site should be declassified since the primary criterion for defining a 'dampland' (ie the soil undergoes intermittent waterlogging) is not satisfied, withstanding the area does support a number of key plant species common to low-lying areas and/or wetlands.

Despite vegetation not being a defining feature under the Hill *et al.*, (1996) classification, it is our experience that this becomes the defining characteristic that determines the preservation (or otherwise) of land considered wetland, in the absence of clear hydrological and soil data. We have collected and presented such data here. According to the definitions provided by Hill and by Tiner, the data clearly and unequivocally means the area is not a wetland. Because it is not a wetland, Bulletin 686 is not an appropriate mechanism for classifying the areas conservation value.

We believe the planning constraints on the development of Lot 123 Mortimer Rd should not be related to wetlands on the northern part of the property as wetlands do not exist there. Revision of wetland geomorphic classification of the site is necessary in order to rationally develop the site to the owners wishes by preserving bushland according to its conservation value rather than its wetland status.

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