The Island Area also looking south - February 2011 (a)

The Island Area also looking south - February 2012 (a)

The Island Area also looking south - July 2012 (a)

2.3.9. Location 9 – Western Central area of Habitat Corridor looking south.

Again note infestation of Torpedo Grass, management including controlled burn and then planting to supplement regrowth.

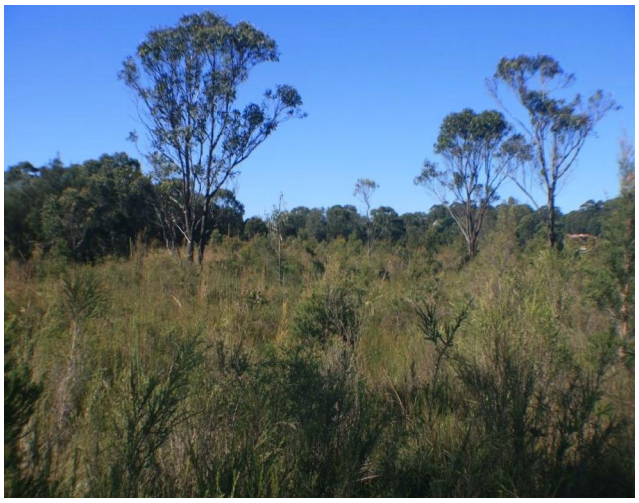
Western regen area looking southeast - February 2008

Western regen area looking southeast - July 2008

Western regen area looking South-East 2010 - February 2010

Western regen area looking South-East July

Western regen area looking South-East 2012 - February 2011



Western regen area looking South-East July

Western regen area looking South-East February 2012

2.3.10. Location 10 – North side of southwestern EEC area looking south.

Note gradual regrowth of healthy sedgeland with ideal ECM habitat being established. Weeding from time to time is essential in this area (mainly exotic grasses) at this stage to ensure successful regeneration.

Southwestern regeneration area looking south – Feb 2008

Southwestern regeneration area looking south – July 2008

Southwestern regeneration area looking south – Feb 2010

Southwestern regeneration area looking south - July 2010

Southwestern regeneration area looking south – Feb 2011

Southwestern regeneration area looking south – July 2011

Western regeneration area looking south – Feb 2012

Western regeneration area looking south – July 2012

2.3.11. Location 11 – South side of southeastern area looking southeast.

Note gradual regrowth of healthy wet heath, with ideal ECM habitat being established as verified in this assessment (see Part D). Also note range of different types of vegetation.

Southwestern regeneration area looking southeast – Feb 2008

Southwestern regeneration area looking southeast – July 2008

Southwestern regeneration area looking southeast – Feb 2010

Southwestern regeneration area looking southeast – July 2010

Southwestern regeneration area looking southeast looking – Feb 2008

Southwestern regeneration area looking southeast – July 2008

Southwestern regeneration area looking southeast looking – Feb 2010

Southwestern regeneration area looking southeast – July 2010

Southwestern regeneration area looking southeast – Feb 2011

Southwestern regeneration area looking southeast – July 2011

Southwestern regeneration area looking southeast – Feb 2012

Southwestern regeneration area looking southeast – July 2012

Part A: Eastern Creek Swamp Oak Floodplain Forest EEC Review

The objectives of this section are to:

- On the basis of new soils information and legal precedents, re-evaluate the presence and extent of the EEC – *Swamp Oak Floodplain Forest on Coastal Floodplains of the NSW North Coast Bioregion*, etc (NSWSC 2004) in the area referred to as 'Eastern Creek' on the property, as mapped by Biolink (2005).
- Following the above, evaluate the need for/extent of buffers as per Plan 1 in the Concept Approval (DPI 2012).

3.0 Biolink Vegetation Community and EEC Mapping

For the purposes of consistency with the *Urban Investigation Area* (UIA) *14 Urban Growth Strategy* (Dieke Richards 2004) and the associated *Comprehensive Koala Plan of Management* (Biolink 2012, 2005, 2003), the vegetation community and EEC mapping of the property prepared by Biolink (2012, 2005, 2003) was generally adopted by Darkheart (2008d) for the Environmental Assessment (AECOM 2010).

Biolink (2005) identified a total of 7 native vegetation communities on the property. The majority of the property was not classed as any vegetation type, and this generally incorporates what was designated in Darkheart (2008d) as "*pasture/pastoral woodland*". Biolink (2005, 2012) also omitted a small patch of regrowth on Lot 5 identified by the Darkheart (2008a) report as "*dune scrub*" as it did not fit into any other of Biolink's vegetation community classification. The delineation of the extent of forest communities along Duchess Gully and in the southeast was also found to be imprecise.

Biolink's vegetation map and EEC map is shown in Figure 2.

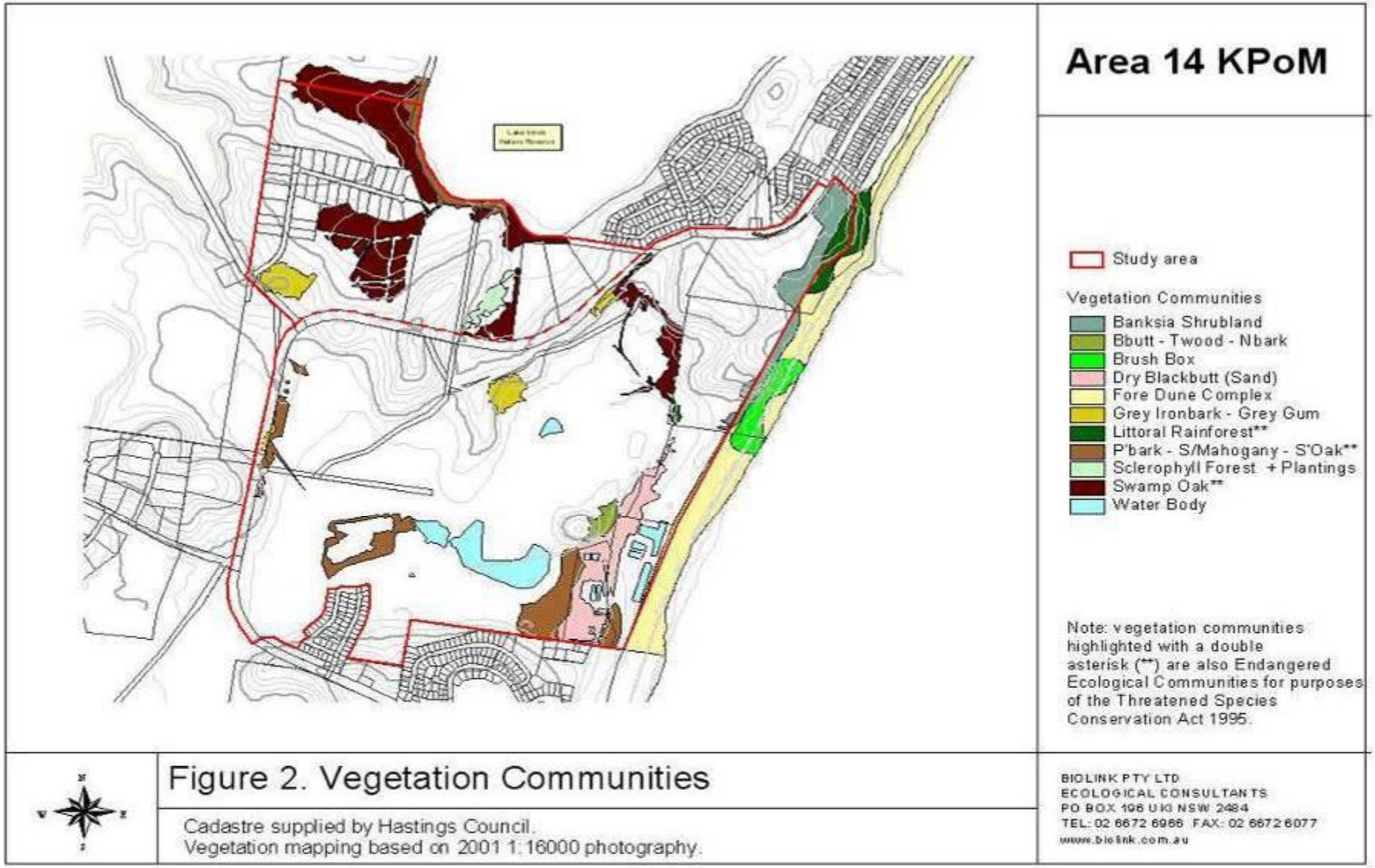
As shown in Figure 1, Biolink (2012, 2005) identified the occurrence of two Coastal Floodplain EECs on the property as part of vegetation mapping for the UIA 14 KPoM.

These EECs are:

- *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast Bioregion* (NSWSC 2004a): Consists of remnant patches of paperbark to Swamp Mahogany swamp forest in the mid-west, central-south and southeast.
- *Swamp Oak Floodplain Forest on Coastal Floodplains of the NSW North Coast Bioregion* (NSWSC 2004b): Confined to the drainage depression and artificial drains in the northwest, sourcing Duchess Gully with freshwater from catchment runoff.

The following section reviews the extent of the *Swamp Oak Floodplain Forest* (SOFF) *on Coastal Floodplains* EEC based on subsequent legal precedents and availability of more definitive soil landscape information.

Figure 2: Biolink (2012, 2005) vegetation communities and EEC mapping



4.0 Review of the Eastern Creek SOFF EEC Extent

4.1. Final Determination Criteria and Legal Precedents

In re-assessing the validity and extent of occurrence of the SOFF EEC mapped by Biolink (2012, 2005) on the site (Eastern Creek), some preliminary discussion of legal precedents and literature review is required.

The most relevant literature and legal precedents assisting the interpretation of the Coastal Floodplain EEC Final Determinations are:

- *Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209.*
- *Motorplex (Australia) Pty Limited v Port Stephens Council [2007] NSWLEC 74.*
- *CBD Prestige Holdings Pty Ltd v Lake Macquarie City Council [2005] NSWLEC 367.*
- DECC (2008a). Swamp Oak Floodplain Forest on Coastal Floodplain – Identification Guide. NSW DECC. Available at http://www.threatenedspecies.environment.nsw.gov.au/index.aspx.
- Keith (2004). Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT. NSW Department of Environment and Conservation, Sydney.
- Keith, D. and Scott, J. (2005). Native vegetation of coastal floodplains – a diagnosis of the major plant communities in New South Wales. *Pacific Conservation Biology*, 11: 81-104.
- NSWSC (2004b). Swamp Oak Floodplain Forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological listing.
- Preston, B.J. and Adam, P. (2004a). Describing and listing threatened ecological communities under the Threatened Species Conservation Act 1995 (NSW): Part 1 – the assemblage of species and the particular area. *Environmental and Planning Law Journal*, 21:250-263.
- Preston and Adams (2004b). Describing and listing threatened ecological communities under the Threatened Species Conservation Act 1995 (NSW): Part 2 – the role of supplementary descriptors and the listing process. *Environmental and Planning Law Journal*, 21:372-390.

4.2. Review of Final Determination Criteria

4.2.1. Preston and Adam (2004a, 2004b)

Preston and Adam (2004a, 2004b) provide a very comprehensive and thorough review of how duly to assess a vegetation community for qualification as an EEC from a legal standpoint. As this is crucial to the following process, their paper is summarised here.

Firstly, Section 4(1) of the TSCA 1995 defines an “ecological community” simply as an “assemblage of species occupying a particular area”. This definition identifies three requirements in order for there to be an ecological community under the TSCA 1995:

a) The constituents of the community need to be "species";

b) The species need to be brought together in such a way as to constitute an "assemblage" of species; and,

c) The assemblage of species needs to occupy a "particular area".

The concept of the key term "*species*" needs no further explanation here (though Preston and Adams 2004a explore the term in all its facets), however "*assemblage*" and "*particular area*" deserve discussion given their legal significance as expressed in various precedents (*Preston and Adams 2004a, 2004b, Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209, Motorplex (Australia) Pty Limited v Port Stephens Council [2007] NSWLEC 74, CBD Prestige Holdings Pty Ltd v Lake Macquarie City Council [2005] NSWLEC 367, VAW (Kurri Kurri) Pty Ltd v Scientific Committee (2003) 58 NSWLR 631*), and the relevance to the subject site in this instance.

Preston and Adam (2004a) state that an "*assemblage*" is essentially a collection of species in a location. The latter qualifier is significant in that if the species do not occur in a specific location, then by definition, they are not assembled but scattered. Preston and Adam (2004a) elaborate on the significance of the term "assemblage" in that by its ecological context as applied to an ecological community, it refers to "*a number of species, animal and plants interacting ecologically to sustain the community…This interaction is enabled by the species co-occurring in the one place*." If such interactions did not take place then no distinct assemblage could be defined.

Preston and Adam (2004a) follow on from this discussion to define the key significance of the term "particular area" as relevant to an EEC, in that it logically follows from the above that the location of the assemblage of the species is its natural habitat ie where suitable ecological conditions exist.

However, Preston and Adam (2004a) consider that "*satisfaction of each of these three requirements of the definition of 'ecological community' does not generate a description of an ecological community at any particular level of specificity or spatial scale of biological diversity*". As Preston and Adam (2004a) argue, "*the level of specificity and the spatial…will depend on the nature of the species, the assemblage of species and the particular area occupied…*", hence the requirement for (and significance of) a range of primary and supplementary descriptors within the Final Determinations for EECs to allow separation by a reasonably informed lay man of floristically similar assemblages at different "*locations*" (Preston and Adams 2004a, 2004b).

Primary descriptors are considered by Preston and Adams (2004a, 200b4) to be:

a) *Floristic diversity* – i.e. characteristic species (including dominants) that comprise the assemblage of species that defines the community.

b) *Location* – e.g. bioregion, Local Government Area (LGA). This may also include topography/landform elements.

These are the key descriptors as they directly embody constituents of the statutory definition of an ecological community (Preston and Adams 2004a, 2004b) ie an "assemblage of species occupying a particular area".

Supplementary descriptors include:

a) Structure and physiognomy – e.g. height, vegetation type, and response to disturbances.

b) Abiotic factors – e.g. climatic, physiographic and edaphic factors such as soil types and parent material, or elevation.

c) Biotic and ecological factors – e.g. typical fauna associated with the community, ecological relationships.

Following their thorough discussion and reference to legal precedents to validate their points of view, Preston and Adam (2004b) conclude in regard to supplementary factors that they "*cannot be used as a substitute for a description of the assemblage of species and the particular area in which the community is located. Rather, they should be seen as a valuable adjunct*".

4.2.2. Legal Precedents

The papers by Preston and Adams (2004a, 2004b) were regrettably published before the gazettal of the Coastal Floodplain EECs Final Determinations, hence do not specifically evaluate the key descriptors in these Final Determinations, of which there is still some debate and doubt (ECANSW 2008a).

However, subsequent development consent refusal challenges in the NSW Land and Environment Court have led to some major relevant precedents which have provided a reasonably high degree of clarity in interpreting the key descriptors. These key precedents are:

- *Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209,*
- *Motorplex (Australia) Pty Limited v Port Stephens Council [2007] NSWLEC 74,* and less so,
- *CBD Prestige Holdings Pty Ltd v Lake Macquarie City Council [2005] NSWLEC 367*.

As detailed in his judgement on *Motorplex vs Port Stephens Council and Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209*, Commissioner Preston uses these primary and supplementary descriptors in clarifying uncertainty at specific site situations where there is difficulty in delineating the presence and extent of an EEC. Commissioner Bly in *CBD Prestige Holdings Pty Ltd v Lake Macquarie City Council [2005] NSWLEC 367* also evaluates the potential occurrence of the subject EEC via evaluation of the descriptors, but arrives at a different conclusion in regard to the key phrase, "*associated with*", which had a significant bearing on the outcome of that case.

In general there is a high degree of similarity between these cases which deal with the Coastal Floodplain EECs. Each systematically evaluates the primary and supplementary descriptors eg landform, soils and vegetation. All three cases follow similar lines of argument from the applicant and respondent with vegetation meeting the floristic criteria for example (ie the "*assemblage*") and an assessment of whether the soils and geomorphology match the edaphic and landform requirements to satisfy the legal definition of a "*particular area*" under the TSCA 1995 as explained by Preston and Adam (2004a).

The site assessed in C*BD Prestige Holdings Pty Ltd v Lake Macquarie City Council [2005] NSWLEC 367* primarily fails the EEC identification test by the soil profile (and hence underlying geomorphology) being determined to be derived from colluvial not alluvial processes – the latter being the key indicator of a floodplain or landforms associated with a floodplain and the underlying ecological process defining

the *Coastal Floodplain EECs (Motorplex (Australia) Pty Limited v Port Stephens Council [2007] NSWLEC 74, Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209*, Keith and Scott 2005, 2004, DECC 2008a-c, Dr David Keith pers. comm.); hence an ecological pre-requirement for identifying the occurrence of a Coastal Floodplain EEC (ie the "*particular area*"). In this case, Commissioner Bly accepts the applicant's view that the subject landforms do not constitute an alluvial flat or drainage line as tendered by the applicant's consultants due to a lack of alluvial geomorphology. This is a key requirement (as detailed subsequently) as floristic and structural assemblages matching the Final Determination may occur in locations and landforms other than floodplains eg sandplains and hill slopes, as detailed in Keith and Scott's (2005) seminal paper which forms the basis for the Coastal Floodplain EECs.

Furthermore, as discussed by Preston and Adam (2004a, 2004b), the meeting of some broad criteria does not qualify a specific assemblage in a specific location as an EEC, i.e. "*satisfaction of each of these three requirements of the definition of 'ecological community' does not generate a description of an ecological community at any particular level of specificity or spatial scale of biological diversity*". As noted above, the legal definition of an ecological community under the TSCA 1995 is an "*assemblage of species occupying a particular area*". Hence the floristic assemblage and the required location must be matched to produce the EEC. The absence of alluvial processes (hence alluvial soils and landforms associated with a floodplain) thus failed the subject sites in *CBD Prestige Holdings Pty Ltd v Lake Macquarie City Council [2005] NSWLEC 367* from qualifying as an occurrence of the Swamp Sclerophyll Forest on Coastal Floodplains EEC.

The primary area of divergence between Commissioners Bly and Preston was on the issue of "*associated with coastal floodplains*". Commissioner Bly determined that the subject site was not "*associated with coastal floodplains*" as the vegetation was not continuous to the floodplain (as presented by the applicant's ecologist). Commissioner Preston, and subsequently the NSW Scientific Committee (in communication to Commissioner Preston), state that it is the continuity of the landform (i.e. the drainage line or alluvial flat), not the vegetation that is the required association. Hence Commissioner Preston's following recommendation at paragraph 87 is in regard to interpretation and application of the phrase, "*associated with*":

> "*Insofar as the decision of Commissioner Bly in CBD Prestige Holdings Pty Ltd v Lake Macquarie City Council [2005] NSWLEC 367 (12 July 2005) paras 45-47 held to the contrary of the construction of the Final Determination for the Swamp Sclerophyll Forest community that I have explained, I am of the opinion that it was wrongly decided and should not be followed*."

Overall however, the key outcome in all three of these relevant legal precedents is determining when a site meets the '*location'* criteria for the Coastal Floodplain EECs. All three have the common finding that the assemblage must occur on alluvial soils, as best explained in paragraph 64 of *Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209*, where Commissioner Preston states in referring to the Final Determination for *Freshwater Coastal Wetlands on Coastal Floodplains* (NSWSC 2004e), but the same principle applies to all the Coastal Floodplain EECs (as later stated by Commissioner Preston):

> "*This description has three components that are linked: an edaphic (soil) component ("silts, muds or humic loams"), a topographical component ("depressions, flats, drainage lines, backswamps, lagoons and lakes") and a locational component ("associated with coastal floodplains"). The soils are "in" the topographical features identified, which are in turn*

> *"associated" with the coastal floodplain, as defined by the Scientific Committee. This suggests that these topographical features are formed by the fluvial processes referred to in the definition of floodplains, namely, 'active erosion and aggradation by channelled and overbank stream flow with an average recurrence interval of 100 years or less'. So too the soils which are in such topographical features will be formed by such fluvial processes.*"

Hence in essence, for the specified assemblage of vegetation to match any of the Final Determinations and therefore qualify as an EEC, it must occur on a topographical landform formed by fluvial processes, and consist of soils derived from alluvial processes (*Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209*).

In addition to the above, Justice Preston also clarifies that above information must be considered with the following key definition of a floodplain (*Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209, Motorplex (Australia) Pty Limited v Port Stephens Council [2007] NSWLEC 74*):

> "*Floodplains are level landform patterns on which there may be active erosion and aggradation by channelled and overbank stream flow with an average recurrence interval of 100 years or less (adapted from Speight 1990).*"

This key criterion was extensively evaluated in *Motorplex (Australia) Pty Limited v Port Stephens Council [2007] NSWLEC 74*, as it differs from the Speight (1990) definition. The evaluation appears to indicate that the upper limit of a floodplain is defined by the 1:100 ARI. This is also listed in the DECC (2007) identification guidelines. Hence the combination of soil landscape, vegetation and 1:100 ARI define the Coastal Floodplain EECs.

With this in mind, the subject site's Swamp Oak community is reviewed for its qualification as the SOFF ECC.

4.3. Review of Biolink's SOFF EEC Occurrence/Extent

4.3.1. Extent and Condition of SOFF EEC at SVF Acquisition

St Vincent's Foundation purchased the property in 1997. Since that time, the property has been continually maintained (e.g. slashing to suppress regrowth) and utilized as a cattle property by a caretaker (Mr James Dunn, Tierney Property Services - pers. comm.).

Figure 3 shows the property in 1989 with the extent of Swamp Oak forest shown as a narrow band of trees along the footslope up the drainage depression that comprises the area colloquially referred to as the "Eastern Creek" to Ocean Drive, and the property overall significantly more disturbed than its current state. This band of remnant Swamp Oak is readily evident during a site inspection.

As shown in this photo, and compared with Figure 4, the extent of Swamp Oak forest has increased over SVF's ownership.

Figure 3: 1989 Aerial photograph of the Eastern Creek SOFF EEC area

4.3.2. Eastern Creek SOFF EEC Assessment

Biolink (2012, 2005) generically mapped the entire Swamp Oak swamp forest on the property as this EEC. As noted in Section 2, for consistency with planning instruments at the time, this was adopted for the EA.

Since the EA, the following information (including GIS data for mapping) has been released and obtained:

- Hashimoto, T.R. and Troedson, A.L. (2008). Port Macquarie 1:100 000 and 1:25 000, Coastal Quaternary Geology Map Series. Geological Survey of NSW, Maitland.
- Troedson, A.L. and Hashimoto (2008). Coastal Quaternary Geology – North and South Coast of NSW. Geological Survey of NSW, Bulletin 34.

Prior to this, soil landscape mapping was limited to the 1:100 000 scale and on-site geotechnical investigations (Luke and Company 2010, Natural Resource Atlas 2008). Neither allowed sufficient confidence to ascertain the precise extent of alluvial soils. The mapping of Hashimoto and Troedson (2008) however is at the 1:25 000 scale for the area, which is significantly more accurate than previous information.

Figure 4 shows this mapping overlaid on an aerial photo of the site with the 1:100 ARI. The flood level used is not the current level, but considers Climate Change (AECOM 2010). This is line with the Precautionary Principle.

This Figure shows that an intergraded fan of alluvial and colluvial soils occurs in the Eastern Creek area (with similar features in other small drainage lines on the site). The area mapped as 'undifferentiated' correlates with the geomorphological account in Holmes (1993) of a mosaic of alluvial, colluvial and eventually aeolian geomorphological processes.

Based on Preston and Adams (2004a, 2004b) and legal precedents (Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209, Motorplex (Australia) Pty Limited v Port Stephens Council [2007] NSWLEC 74), it follows that the SOFF EEC should be limited to areas of the soil landscape mapped as being of alluvial geomorphological origins, up to the 1:100 ARI.

Figure 4 shows that Biolink (2012, 2005) significantly over-estimated the extent of this EEC, by not duly considering these components of the Final Determination as clarified by the legal precedents.

In the northwest end of the Swamp Oak forest, Biolink's mapping includes occurrences on residual soils on the footslope to the hill crest and above the 1:100 ARI. In addition to not meeting the geomorphological origins criterion, the latter topographic formations are not part of a floodplain, i.e. do not meet the '*associated with'* criterion (*Motorplex (Australia) Pty Limited v Port Stephens Council [2007] NSWLEC 74, Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209*). Hence this portion of the Swamp Oak forest is not SOFF EEC.

More significant however, is that well over half of the Swamp Oak forest in the Eastern Creek area is above the 1:100 ARI. It is only the lower end of the Swamp Oak forest (and the regrowth along drains and fence lines in this area) which lies below this limit. Hence all Swamp Oak forest above this limit cannot be considered to qualify as this EEC on this key criterion alone, according to the cited legal precedents.

In addition to this, the remaining area of Swamp Oak forest falls on the area mapped as an '*alluvial and colluvial fan*', down to the '*differentiated*' soil landscape. The latter generally refers to an overlap zone of three geomorphological processes i.e. alluvial, colluvial and aeolian (Hashimoto and Troedson 2008).

This fact is relevant as in paragraph 73, *Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209*, Justice Preston states:

> "*The endangered ecological communities in question in this case cannot exist if there be only isolated and disparate lenses, at various depths, of soil that might meet the edaphic criteria in the Scientific Committee's description of the endangered ecological community. The soils over the land in question, said to support the endangered ecological community, must be looked at fairly and as a whole*."

Hence it could be argued that the Swamp Oak forest on the '*differential*' soil landscape and perhaps at least the upper portions of the Swamp Oak on the '*alluvial and colluvial fan'* do not meet the key geomorphological criteria, as the soil profile may not be dominated by alluvial soil/processes (and hence the ecological process underlying this EEC is not the primary influence), and therefore is not an EEC, as per *Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209*.

As a specific soil profile/geomorphological survey has not been undertaken in this area to verify the dominant geomorphological origin; on the basis of the Principle of Uncertainty, it will be assumed for this assessment that the localised area shown in Figures 4 and 5 on the '*differentiated*' and '*alluvial and colluvial fan'* soil landscapes up to the 1:100 ARI, qualifies as the only area within the Eastern Creek swamp forest that is the EEC – *Swamp Oak Floodplain Forest on Coastal Floodplains*.

In regards to the remaining Swamp Oak, the occurrence of Swamp Oak forest above the 1:100 ARI, or not even on a floodplain or alluvial soils is not unusual but demonstrates that Swamp Oak and several key indicator species (e.g. Bladey Grass) are poor defining criteria of this EEC when not considered in consideration with soil landscape information (*Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209*).

On-site, it is readily apparent that Swamp Oak (with its evidently wide range of preferred edaphic conditions) has invaded the slopes/toe of the adjacent slopes and displaced pasture and regeneration of the previously cleared dry/wet sclerophyll forest on higher areas (as evidenced by remnant species on the ecotone). Such situations are noted in the Final Determination (NSWSC 2004b) and this consultant has personally observed similar situations with the opportunistic species even occurring on coastal headlands in place of Littoral Rainforest or *Banksia* scrub (Berrigan 2002a, Darkheart 2006a-c).

Locally, it can also be seen dominating table drains in the median along the Pacific Highway from the Oxley Highway/Pacific Highway intersection to the Bago Road intersection where dry sclerophyll forest previously existed on a ridgeline (Darkheart 2012).