NSW SCIENTIFIC COMMITTEE

Preliminary Determination

The Scientific Committee, established by the *Threatened Species Conservation Act 1995* (the Act), has made a Preliminary Determination under Section 22 of the Act to support a proposal to list Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion as a CRITICALLY ENDANGERED ECOLOGICAL COMMUNITY in Part 2 of Schedule 1A of the Act, and as a consequence, to omit reference to Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion from Part 3 of Schedule 1 (Endangered Ecological Community) of the Act.

This determination contains the following information:

Parts 1 & 2: Section 4 of the Act defines an ecological community as "an assemblage of species occupying a particular area". These features of Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion are described in Parts 1 and 2 of this Determination, respectively.

Part 3: Part 3 of this Determination describes the eligibility for listing of this ecological community in Part 2 of Schedule 1A of the Act according to criteria as prescribed by the *Threatened Species Conservation Regulation 2010.*

Part 4: Part 4 of this Determination provides additional information intended to aid recognition of this community in the field.

Part 1. Assemblage of species

1.1 Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion (hereafter referred to as the Eastern Suburbs Banksia Scrub) is characterised by the assemblage of species listed below.

Acacia longifolia	*Acacia myrtifolia*
Acacia suaveolens	*Actinotus helianthi*
Actinotus minor	*Allocasuarina distyla*
Angophora costata	*Banksia aemula*
Banksia ericifolia subsp. *ericifolia*	*Banksia marginata*
Billardiera scandens	*Boronia ledifolia*
Bossiaea heterophylla	*Bossiaea scolopendria*
Brachyloma daphnoides	*Cassytha pubescens*
Caustis flexuosa	*Caustis pentandra*
Chordifex dimorphus	*Chordifex fastigiatus*
Corymbia gummifera	*Cyathochaeta diandra*
Dampieria stricta	*Darwinia fascicularis*
Dillwynia floribunda	*Dillwynia retorta*
Elaeocarpus reticulatus	*Entolasia marginata*
Eriostemon australasius	*Eucalyptus camfieldii*
Grevillea buxifolia	*Grevillea speciosa*
Haemodorum planifolium	*Hakea gibbosa*
Hibbertia acicularis	*Hibbertia empetrifolia* subsp. *empetrifolia*
Hibbertia fasciculata	*Hibbertia linearis*
Hypolaena fastigiata	*Isopogon anethifolius*
Kunzea ambigua	*Lambertia formosa*

Contact Address: C/o PO Box 1967 Hurstville BC NSW 1481 Telephone: (02) 9585 6940 Facsimile: (02) 9585 6606

Lasiopetalum ferrugineum
Lepidosperma viscidum
Leptospermum laevigatum
Leucopogon ericoides
Lomandra glauca
Melaleuca nodosa
Monotoca elliptica
Patersonia glabrata
Persoonia lanceolata
Philotheca buxifolia
Phyllanthus hirtellus
Pittosporum undulatum
Smilax glyciphylla
Woollsia pungens
Xanthosia pilosa
Lepidosperma laterale
Leptocarpus tenax
Lepyrodia scariosa
Lomandra filiformis
Melaleuca armillaris subsp. *armillaris*
Micrantheum ericoides
Opercularia aspera
Patersonia sericea
Petrophile pulchella
Philotheca salsolifolia
Pimelea linifolia
Ricinocarpos pinifolius
Styphelia triflora
Xanthorrhoea resinosa

1.2 The total species list of the community across all occurrences is likely to be considerably larger than that given above. Due to variation across the range of the community, not all of the above species are present at every site and many sites may also contain species not listed above.

Characteristic species may be abundant or rare and comprise only a subset of the complete list of species recorded in known examples of the community. Some characteristic species show a high fidelity (are relatively restricted) to the community, but may also occur in other communities, while others are more typically found in a range of communities.

The number and identity of species recorded at a site is a function of sampling scale and effort. In general, the number of species recorded is likely to increase with the size of the site and there is a greater possibility of recording species that are rare in the landscape.

Species presence and relative abundance (dominance) will vary from site to site as a function of environmental factors such as soil properties (chemical composition, texture, depth, drainage), topography, climate and through time as a function of disturbance (*e.g.* fire, logging, grazing) and weather (*e.g.* flooding, drought, extreme heat or cold).

At any one time, above ground individuals of some species may be absent but the species may be represented below ground in the soil seed bank or as dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers.

The species listed above are vascular plants, however the community also includes micro-organisms, fungi and cryptogamic plants as well as vertebrate and invertebrate fauna. These components of the community are less well documented.

Part 2. Particular area occupied by the ecological community

2.1 The assemblage of species listed in Part 1.1 above which characterises the Eastern Suburbs Banksia Scrub occurs within the Sydney Basin Bioregion. This Bioregion is defined by SEWPaC (2012) Interim Biogeographic Regionalisation for Australia, Version 7. Department of Sustainability, Environment, Water, Population and Communities.
http://www.environment.gov.au/parks/nrs/science/bioregion-framework/ibra/maps.html

Contact Address: C/o PO Box 1967 Hurstville BC NSW 1481 Telephone: (02) 9585 6940 Facsimile: (02) 9585 6606

2.2 It is the intent of the Scientific Committee that all occurrences of the ecological community (both recorded and as yet unrecorded, and independent of their condition) that occur within this bioregion be covered by this Determination.

Part 3. Eligibility for listing

3.1 Reasons for determining eligibility for listing

3.1.1 Eastern Suburbs Banksia Scrub was listed as an Endangered Ecological Community under the Act in 2002 (NSW Scientific Committee 2011). At the time of listing the Critically Endangered category did not exist. Since this original listing, new data have become available and the Scientific Committee has undertaken a review of the conservation status of the ecological community to inform the current listing status under the Act.

3.1.2 Eastern Suburbs Banksia Scrub has undergone a very large reduction in distribution. Both Tozer *et al*. (2010) and OEH (2013b) estimated that the pre-European distribution of Eastern Suburbs Banksia Scrub covered at least 2,500 ha and that <10% of the original distribution of Eastern Suburbs Banksia Scrub remains.

3.1.3 The distribution of Eastern Suburbs Banksia Scrub is very highly restricted. The extent of occurrence of Eastern Suburbs Banksia Scrub is 69 km^2 based on a minimum convex polygon enclosing all occurrences of the community mapped by Tozer *et al*. (2010) and OEH (2013), the method of assessment recommended by IUCN (2014). The estimated area of occupancy (AOO) of Eastern Suburbs Banksia Scrub is 52 km^2 based on 2 x 2 km grid cells, the scale recommended for assessing AOO by IUCN (2014).

3.1.4 OEH (2013b) estimate that the total extant area of Eastern Suburbs Banksia Scrub is 127 ha, with between 42 and 54 ha (33–43%) of this area occurring within conservation reserves (Botany Bay National Park and Sydney Harbour National Park). Its original distribution has been reduced to small fragments (Tozer *et al.* 2010) ranging in size from 0.02 to 69 ha (DECC 2009).

3.1.5 Major threats to Eastern Suburbs Banksia Scrub throughout its range include clearing and fragmentation, weed invasion, inappropriate fire regimes (both high and low fire frequency), grazing by rabbits and soil erosion (DEC 2004; DECC 2009; NSW Scientific Committee 2011; Lambert *et al.* 2015). Individual remnants may also be threatened by mowing, slashing, altered drainage/runoff, inappropriate plantings, damage caused by pedestrians, bicycles, motorcycles and horses and the dumping of construction materials and green waste (DEC 2004; NSW Scientific Committee 2011). Other potential threats, or threats of unknown extent, include infection by *Phytophthora cinnamomi*, unauthorised seed and wildflower collection, stormwater pollution and inappropriate use of herbicides (DECC 2009). Invasive weeds impacting on this community include *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush), *Lantana camara* (Lantana) and *Eragrostis curvula* (African Love grass) (DECC 2009). 'Clearing of native vegetation', 'Competition and grazing by the feral European rabbit *Oryctolagus cuniculus* (L.)', 'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition', 'Infection of native plants by *Phytophthora cinnamomi*', 'Invasion, establishment and spread of Lantana (*Lantana camara* L. *sens. lat*)', 'Invasion of native communities by *Chrysanthemoides monilifera*' and 'Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants' are listed as Key Threatening Processes under the Act.

3.2 Criteria for listing

Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion is eligible to be listed as a Critically Endangered Ecological Community in accordance with Section 12 of the Act as, in the opinion of the Scientific Committee, it is facing an extremely high risk of extinction in New South Wales in the immediate future, as determined in accordance with the following criteria as prescribed by the *Threatened Species Conservation Regulation 2010*:

Clause 17 Reduction in geographic distribution of the ecological community

The ecological community has undergone, is observed, estimated, inferred or reasonably suspected to have undergone or is likely to undergo within a time span appropriate to the life cycle and habitat characteristics of its component species:

(a) a very large reduction in geographic distribution.

Clause 18 Restricted geographic distribution of the ecological community

The ecological community's geographic distribution is estimated or inferred to be:

(a) very highly restricted,

and the nature of its distribution makes it likely that the action of a threatening process could cause it to decline or degrade in extent or ecological function over a time span appropriate to the life cycle and habitat characteristics of the ecological community's component species.

Dr Mark Eldridge
Chairperson
NSW Scientific Committee

Exhibition period: 22/04/16 – 17/06/16 Proposed Gazettal date: 22/04/16

Part 4. Additional information about the ecological community

The following information is additional to that required to meet the definition of an ecological community under the Act, but is provided to assist in the recognition of Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion (hereafter referred to as the Eastern Suburbs Banksia Scrub) in the field. Given natural variability, along with disturbance history, Eastern Suburbs Banksia Scrub may sometimes occur outside the typical range of variation in the features described below.

4.1 Eastern Suburbs Banksia Scrub is an open to closed heath or, occasionally, a low woodland with a sparse canopy of low, multi-stemmed eucalypts. It is known to occur on Pleistocene sand dunes perched on some of Sydney's major sandstone headlands (Adam *et al.* 1990; OEH 2013b).

4.2 Eastern Suburbs Banksia Scrub is included within the 'Wallum Sand Heaths' vegetation class of Keith (2004). Eastern Suburbs Banksia Scrub includes vegetation described under Coastal Sand Mantle Heath (Map Unit HL03) by OEH (2013b). It has been previously defined as Map Unit HL p563 in Tozer *et al.* (2010) and as Map Unit 21b (i) in Benson and Howell (1994).

4.3 Eastern Suburbs Banksia Scrub is found on sand mantles of Pleistocene age where the sand deposits are deep enough to support a podsolised soil (OEH 2013b). These highly podsolised soils are extremely nutrient poor because they have been exposed to long periods of weathering and leaching (Keith 2004; OEH 2013b). Variation in floristic composition may arise from variation in the depth of the sand mantle/dune and with drainage conditions (OEH 2013b). Eastern Suburbs Banksia Scrub occasionally contains localised patches of low-growing multi-

Contact Address: C/o PO Box 1967 Hurstville BC NSW 1481 Telephone: (02) 9585 6940 Facsimile: (02) 9585 6606

stemmed eucalypts such as *Angophora costata* (Smooth-barked Apple) and *Corymbia gummifera* (Red Bloodwood) (OEH 2013b). A dense cover of ferns may be found on drier sites that have a more open heath structure, whilst poorly drained sites have a greater abundance and cover of sedge species (OEH 2013b). In the first few years after fire, Eastern Suburbs Banksia Scrub is an open and diverse ecological community (Lambert *et al.* 2015). Floristic diversity decreases as the canopy closes over time and the community may become dominated by a few large shrubs such as *Leptospermum laevigatum, Banksia ericifolia* and *Monotoca elliptica* (Benson and Howell 1994; Lambert *et al.* 2015). The floristic composition may appear simplified after a prolonged period without fire (DECC 2009), however many species not present as aboveground vegetation cover may still exist as seedbank propagules in the soil (Lambert *et al.* 2015).

4.4 Eastern Suburbs Banksia Scrub is one of a complex of related communities which differ in composition in response to a range of edaphic and drainage-related factors. Eastern Suburbs Banksia Scrub grades into Coastal Headland Banksia Heath (Map Unit HL06) or Coastal Headland Cliffline Scrub (Map Unit HL07) as the perched dunes become shallower and sandstone benches and outcropping become more common (OEH 2013b). Both communities share many species with Eastern Suburbs Banksia Scrub but differ in species composition in a variety of ways including the absence of the key dominant (*Banksia aemula*)**,** the relative rarity of key species in the Fabaceae (*Bossiaea heterophylla, B. scolopendria, Dillwynia retorta*) and in the representation of restioid species. Coastal Headland Cliffline Scrub is restricted to locations where the soil is skeletal and exposure to maritime influences is high (OEH 2013b). Species richness is lower in Coastal Headland Cliffline Scrub relative to Eastern Suburbs Banksia Scrub and it is dominated by different shrub species including *Melaleuca armillaris, Baeckea imbricata* and *Westringia fruticosa* (Adam *et al*. 1990, OEH 2013b).

4.5 Eastern Suburbs Banksia Scrub grades into Coastal Sandplain Heath (Map Unit HL04) or Coastal Sand-Apple Bloodwood Forest (Map Unit DSF03) with decreasing age of the underlying sand deposits. Dunefields in the eastern suburbs of Sydney comprise complex mosaics of dunes originating in the Holocene and Pleistocene epochs (Chapman and Murphy 1989). Dunes of Holocene age predominate nearer the coast and support the structurally and compositionally distinct Coastal Sand-Apple Bloodwood Forest (Map Unit DSF03). Dunes further inland may date from either the Pleistocene or Holocene, or comprise complex reworkings of a mixture of deposits (Chapman and Murphy 1989). Eastern Suburbs Banksia Scrub is primarily restricted to the older dunes of Pleistocene age while the more extensively distributed Coastal Sandplain Heath (Map Unit HL04) occurs on perched dunes originating from the early Holocene or, more rarely, sandy soils derived from sandstone (Adam *et al*. 1990, Benson and Howell 1994). Coastal Sandplain Heath shares a similar structure to Eastern Suburbs Banksia Scrub and has a wide distribution (*e.g.* Port Stephens, the Central Coast, Sydney and the Illawarra) along the New South Wales coast (Adam *et al*. 1990, Tozer *et al*. 2010, OEH 2013b). It generally occurs on gently to moderately sloping dunes but, in contrast to Eastern Suburbs Banksia Scrub, rarely on steeply sloping dunes (Adam *et al*. 1990). Coastal Sandplain Heath shares many species with Eastern Suburbs Banksia Scrub, however a number of compositional differences are evident (OEH 2013b), including the dominant species (*Banksia serrata* versus *B. aemula*). Although the presence of *B. aemula* has been identified as a defining feature of highly podsolised soils of Pleistocene age (Adam *et al*. 1990, Benson and Howell 1994, Keith 2004), the species is not present in all examples of Eastern Suburbs Banksia Scrub.

4.6 Eastern Suburbs Banksia Scrub is currently known to occur in the local government areas of Botany, Manly, Randwick, Waverley and Woollahra (within the Sydney Basin Bioregion) but unrecorded stands of the ecological community may occur elsewhere in the bioregion.

Contact Address: C/o PO Box 1967 Hurstville BC NSW 1481 Telephone: (02) 9585 6940 Facsimile: (02) 9585 6606

4.7 The Eastern Suburbs Banksia Scrub is included within the Endangered Ecological Community listed under the *Environment Protection and Biodiversity Conservation Act 1999* as "Eastern Suburbs Banksia Scrub of the Sydney Region". However the Commonwealth listing advice excludes some patches, here regarded as Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion, on the basis of condition or structure thresholds (including patch size, ground cover and tree density).

4.8 Eastern Suburbs Banksia Scrub is likely to contain a number of threatened species, listed in the table below.

Species	Common name	TSC Act*	EPBC Act+
Plants			
Acacia terminalis subsp. *terminalis*	Sunshine Wattle	Endangered	Endangered
Mammals			
Cercartetus nanus	Eastern Pygmy-possum	Vulnerable	
Miniopterus schreibersii oceanensis	Eastern Bentwing Bat	Vulnerable	
Perameles nasuta	Long-nosed Bandicoot (North Head population)	Endangered	
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Vulnerable
Amphibians			
Heleioporus australiacus	Giant Burrowing Frog	Vulnerable	Vulnerable
Litoria littlejohni	Littlejohn's Tree Frog	Vulnerable	Vulnerable
Pseudophryne australis	Red-crowned Toadlet	Vulnerable	Vulnerable

* Threatened Species Conservation Act 1995
+ Environment Protection and Biodiversity Conservation Act 1999

References

Adam P, Stricker P, Wiecek BM, Anderson DJ (1990) The vegetation of seacliffs and headlands in New South Wales, Australia. *Australian Journal of Ecology* **15**, 515–547.

Benson D, Howell J (1994) The natural vegetation of the Sydney 1:100 000 map sheet. *Cunninghamia* **3,** 677–1004.

Chapman GA, Murphy CL (1989) 'Soil landscapes of the Sydney 1:100 000 sheet.' (Soil Conservation Service of New South Wales: Sydney)

DEC (Department of the Environment and Conservation) (2004) Eastern Suburbs Banksia Scrub Endangered Ecological Community Recovery Plan. NSW Department of Environment and Conservation, Hurstville.

DECC (Department of the Environment and Climate Change) (2009) Best Practice Guidelines: Eastern Suburbs Banksia Scrub. NSW Department of Environment and Climate Change, Sydney

Contact Address: C/o PO Box 1967 Hurstville BC NSW 1481 Telephone: (02) 9585 6940 Facsimile: (02) 9585 6606

IUCN Standards and Petitions Subcommittee (2014) Guidelines for Using the IUCN Red List Categories and Criteria. Version 11. Prepared by the Standards and Petitions Subcommittee. http://www.iucnredlist.org/documents/RedListGuidelines.pdf.

Keith D (2004) 'Ocean shores to desert dunes: the native vegetation of NSW and the ACT'. (Department of Environment and Climate: Hurstville)

Lambert J, Lambert G, Pellow B (2015) An evaluation of two management options to restore species diversity of Eastern Suburbs Banksia Scrub at North Head, Sydney. *Cunninghamia* **15,** 69–78.

NSW Scientific Committee (2011) Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion. Determination to make a minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act 1995. NSW Scientific Committee, Sydney. http://www.environment.nsw.gov.au/determinations/easternsuburbsbanksia36a.htm (accessed 14 August 2015)

OEH (Office of Environment and Heritage) (2013a) The Native Vegetation of the Sydney Metropolitan Area. Volume 1: Technical Report. Version 2.0. NSW Office of Environment and Heritage, Sydney.

OEH (Office of Environment and Heritage) (2013b) The Native Vegetation of the Sydney Metropolitan Area. Volume 2: Vegetation Community Profiles. Version 2.0. NSW Office of Environment and Heritage, Sydney.

SEWPaC (2012) Interim Biogeographic Regionalisation for Australia, Version 7. Department of Sustainability, Environment, Water, Population and Communities. http://www.environment.gov.au/parks/nrs/science/bioregion-framework/ibra/maps.html

Tozer MG, Turner K, Simpson C, Keith DA, Beukers P, MacKenzie B, Tindall D, Pennay C (2010) Native Vegetation of Southeast NSW: a revised classification and map for the coast and eastern tablelands. *Cunninghamia* **11**, 359–406.

Contact Address: C/o PO Box 1967 Hurstville BC NSW 1481 Telephone: (02) 9585 6940 Facsimile: (02) 9585 6606