URS

DRAFT **APPENDIX B**

March 12 2002
Project No. 46154-005

LesryK Environmental Consultants
20 Woodfield Avenue
Bundeena NSW 2230

Attention: Deryk Engel

Dear Deryk,

Subject: Vegetation Assessment - Precinct A, North Seaforth – DRAFT FOR DISCUSSION

Introduction and Background

URS Australia Pty Ltd (URS) was commissioned by LesryK Environmental Consultants on behalf of Egis Consulting to undertake a Section 5A Assessment on two small stands of woodland which occur on the eastern side of the Wakehurst Parkway at North Seaforth. These stands have been potentially identified as Duffys Forest, listed as an Endangered Ecological Community under Part 3 Schedule 1 of the NSW *Threatened Species Conservation Act* 1995 (TSC Act). The bushland remnants, referred to as Precincts A1 and A2, have been subject to a previous flora survey conducted by Lesryk (2001) as part of proposed site re-development.

Recent methodology prepared by Smith and Smith (2000) attempt to distinguish between Duffys Forest (DF), Sydney Sandstone Ridgetop Woodland (SSRW) and Sydney Sandstone Gully Forest (SSGF) plant communities which may often be difficult to determine based on the overlap of species and habitats occurring in these communities. As an example, all of the plant species noted in the NSW Scientific Committee Final Determination for Duffys Forest are also frequently recorded in SSRW and SSGF remnants with the exception of *Grevillea caleyi*.

Based on this recently-prepared methodology, detailed below, coupled with the presence of other habitat features associated with Duffys Forest recorded within the subject remnants, the two bushland remnants should be considered as Duffys Forest, and thus a Section 5A Assessment (8 part test) has been prepared for them. The Final Determination for Duffys Forest is provided as Attachment A.

Soils and Geology

The subject remnants are mapped as being part of the Somersby Soil Landscape Unit, being underlain by Hawkesbury Sandstone with overlying laterite gravels and clays (Chapman and Murphy 1989). Inspection of soils during site surveys verified this mapping to be accurate.

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Site Description

Precinct A1

The subject remnant is comprised of a 3000 square metre (150 m by 20 m) linear bushland strip situated across from Garigal National Park to the north of Judith Street. The remnant is bordered to the north by Wakehurst Golf Course, to the south and east by residential properties and to the west by Garigal National Park (across the Wakehurst Parkway).

The site supports a Silvertop Ash (*Eucalyptus sieberi*) – Scribbly Gum (*E. haemastoma*) – Common Sandstone Stringybark (*E. oblonga*) Open Woodland. This remnant supports a partially cleared native overstorey and understorey within or just beyond the road reserve. The majority of Precinct A1 beyond the woodland strip (to the east) is cleared of native vegetation and is comprised of mown exotic grassland, although some patches of native shrubs survive past mowing activities.

Precinct A2

The subject remnant is comprised of a 7500 square metre (150 m by 50 m) rectangular strip situated across from Seaforth Oval on the eastern side of the Wakehurst Parkway. The site is bordered by residential property to the south, north and east and by Garigal National Park (and Seaforth Oval) to the west across the Wakehurst Parkway.

The site supports a Silvertop Ash (*Eucalyptus sieberi*) – Red Bloodwood (*Corymbia gummifera*) Woodland/Open Forest. The remnant is considered to be in poor condition due to both a prolonged absence of fire and the impacts of urban runoff. The eastern half of this remnant is highly depauperate with garden escapees and other bushland pests whilst the western half fronting the Wakehurst Parkway is in better condition, supporting an intact native understorey and overstorey.

Methodology Used to Assist in Determining Duffys Forest Remnants

Smith and Smith (2000) have used a Duffys Forest Index (DFI) which compares positive and negative diagnostic species, derived from statistical analysis, to assist in distinguishing between Sydney Sandstone Ridgetop Woodland (SSRW), Sydney Sandstone Gully Forest (SSGF) and Duffys Forest (DF) plant communities.

$$DFI = \frac{100(x + (20 - y))}{40}$$ where

x = number of positive diagnostic Duffys Forest species recorded; and

y = number of negative diagnostic Duffys Forest species recorded.

Positive diagnostic species generally reflect those most closely associated with (that is, more frequently recorded in) typical Duffys Forest remnants. Negative diagnostic species are conversely those species that are more closely associated with SSRW and SSGF remnants. The value of the index ranges from 100 when all positive diagnostic species are present to 0 when the reverse is true. Consequently, a high index number (say 50 or greater) indicates a relatively high

confidence of the presence of Duffys Forest for a particular remnant. Positive and negative diagnostic species recorded in the two bushland remnants are shown in Attachment B.

The species list compiled for the site as part of the previous flora survey in September 2001 was used to determine a DFI for the two bushland remnants at Precincts A1 and A2 (Attachment B). The DFI for Precincts A1 and A2 was 57 and 67, respectively. Given the relatively high DFIs coupled with the presence of laterite and an absence of sandstone rock outcrops (both features closely associated with Duffys Forest), the subject remnants should be considered as Duffys Forest vegetation.

Follow up site investigations at both remnants was undertaken by URS to note any additional plant taxa that may have germinated or grown since the 2001 survey. As part of this follow up investigation, the following Rare (ROTAP) or Threatened plants were recorded:

- A total of 3 plants of the Threatened shrub, *Pimelea curviflora* var. *curviflora* were recorded in the northern remnant on top of the roadside cutting and in the vicinity of a dirt access track which bissects the remnant (in an area subject to past mowing). *Pimelea curviflora* var. *curviflora* is listed as Endangered under both the TSC Act and the Commonwealth *Environment Protection Biodiversity Conservation Act* 1999 (EPBC Act);

- A total of 3 plants of *Prostanthera sp.* (Mintbush) situated along the southern portion of the southern remnant, about 3 metres back from the road reserve. This species is the same plant which occurs in a patch of Duffys Forest adjacent to the Wakehurst Golf Course to the north of the subject site. The plants show distinct similarities to *Prostanthera densa*, listed as a Threatened shrub under both the TSC and EPBC Acts. It is understood that the NSW National Herbarium has identified these plants as *Prostanthera junonis*, also listed as Threatened under the EPBC Act. *Prostanthera junonis* is listed as *Prostanthera sp.* Somersby under the TSC Act. URS has some concerns with the Herbarium identification. Further work may be warranted to confirm the taxanomic status of these plants, particularly should the development option (and SIS preparation) be pursued; and

- One rare plant, *Darwinia diminuta* (ROTAP Code 2RCi), was recorded in the northern remnant on top of the roadside cutting just back from the road reserve.

Discussions with NSW NPWS revealed that the Threatened plant, *Microtis angusii*, was recorded in a patch of Duffys Forest to the north of the site in the Wakehurst Golf Course. This species is listed as Endangered under both the TSC and EPBC Acts. Whilst this species was not recorded in bushland remnants at Precinct A, it is possible for it to have recruited onto the site and may be present within the soil seedbank. Consequently, if the development option is pursued, this species should be addressed within the SIS.

Conclusions

Precinct A1

The Section 5A Assessments carried out concluded that the impacts on both Duffys Forest and *Pimelea curviflora* var. *curviflora* as a result of the proposal would be expected to be significant and that the preparation of a Species Impact Statement (SIS) would be required should a development option be pursued in this remnant. It is understood that mowing of Precinct A1 has ceased. This would be expected to assist natural regeneration of the area from existing seed sources.

Referral to the Federal Minister of the Environment for approval for the proposed works in relation to *Pimelea curviflora* var. *curviflora* would be expected to be required. .

Precinct A2

The Section 5A Assessments carried out concluded that the impact on Duffys Forest as a result of clearing would be expected to be significant and that a Species Impact Statement (SIS) would thus need to be prepared.

URS emphasise that this remnant is in poor condition, heavily impacted upon from a prolonged absence of fire and from the effects of urban runoff. **Without extensive rehabilitation (chiefly through the use of fire), the subject site would NOT be considered to be a viable remnant in the medium to long term.** That is, the native overstorey and understorey will likely become depauperate in the medium to long term should present forces (ie impacts from prolonged absence of fire, urban runoff effects) continue. The eastern half of this remnant is already close to this condition and is encroaching on the remainder of the site.

Whether the use of fire on the site can be managed appropriately given the adjacent residential properties surrounding the remnant must be considered. Even if small pile burns were initiated, it is uncertain as to whether such burns would generate sufficient heat with which to break seed dormancy mechanisms for a variety of "Duffys" taxa recorded on the site.

Precincts C and D

Bushland remnants recorded in Precincts C and D have been subject to previous surveys and assessments undertaken by LesryK in 2001. These remnants comprised either coastal Heath, Sydney Sandstone Ridgetop Woodland (SSRW) or Sydney Sandstone Gully Forest (SSGF). No Duffys Forest vegetation or associated habitats (e.g. laterite) were recorded in these remnants.

Notwithstanding the above, Sydney Sandstone remnants supporting an intact overstorey and understorey situated outside conservation reserves are considered to have local conservation value and should be retained, where possible.

References

Benson, D. and Howell, J. (1994) The natural vegetation of the Sydney 1:100 000 map sheet. *Cunninghamia* 3:677-787.

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NSW Scientific Committee (1998a). Final Determination – Duffys Forest. NSW Scientific Committee, Hurstville.

NSW Scientific Committee (1998b). Final Determination – Clearing of native vegetation NSW Scientific Committee, Hurstville.

NSW Scientific Committee (1998c) Final Determination- Pimelea curviflora var. curviflora. NSW Scientific Committee, Hurstville.

Smith and Smith (2000). Survey of the Duffys Forest Vegetation Community. Report prepared for NSW NPWS and Warringah Council. November 2000.

Yours faithfully,
URS AUSTRALIA PTY LTD

Isaac Mamott
Senior Ecologist

John Simpson
Senior Ecologist

Attachment A	NSW Scientific Committee Final Determinations (Duffys Forest, *Pimelea curviflora* var. *curviflora*)
Attachment B	Floristic List (Precinct A1, A2)
Attachment C	Section 5A Assessments (Duffys Forest, *Pimelea curviflora* var. *curviflora*)
Attachment D	Limitations

Attachment A –

Final Determination of the NSW Scientific Committee
Duffys Forest Vegetation Community
Pimelea curviflora var. curviflora

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Threatened Species Conservation Act 1995
NSW Scientific Committee

Final Determination

The Scientific Committee established by the Threatened Species Conservation Act, has made a Final Determination to list *Pimelea curviflora* R. Br var. *curviflora* (Thymelaeaceae) a small shrub as a VULNERABLE SPECIES on Schedule 2 of the Act. Listing of vulnerable species is provided for by Schedule 2 of the Act.

The Scientific Committee has found that:

1. *Pimelea curviflora* was first described in 1810 by Robert Brown. A number of varieties have since been described with *Pimelea curviflora* var. *curviflora* described in 1982 by S. Threlfall (*Brunonia* 5, p.113-201).

2. *Pimelea curviflora* var. *curviflora* is a much-branched subshrub or shrub 20-120cm high, with leaves 5-10mm long and 2-4mm wide, the lower surface sparsely hairy. The red to yellow flowers are in clusters of 4-12 and 6-8mm long and hairy (Harden 1990). It is restricted to the northern area of Sydney on sandstone soils and laterite soils.

3. The taxon is currently known from about 20 locations from the coastal area of northern Sydney to Maroota in the north-west. It is found between South Maroota, Cowan, Narrabeen, Allambie Heights, Northmead and Kellyville. Its former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly.

4. It is usually recorded as rare with only 2 sites with estimates of 300 plants, and most sites with only a few plants or estimates of <100 plants. The taxon has an inconspicuous cryptic habit as it is fine and scraggly and often grows amongst dense grasses and sedges. It may not always be visible at a site as it appears to survive for some time without any foliage after fire or grazing, relying on energy reserves in its tuberous roots.

5. There are only 2 localities presently reserved in a National Park or Nature Reserve. It has been recorded only once in Garigal National Park in 1992 and in Muogamarra Nature Reserve in 1971 despite other surveys in both areas. The number of plants reserved is unknown.

6. The major threat is habitat loss by clearing for urban development. Five locations (including the two largest sites) are currently under threat from construction proposals. Populations tend to be in close proximity to various forms of disturbance such as existing trails,

and are threatened by trail construction and associated recreational activities. Close proximity to developed or developing areas also presents threats such as weed invasion, an inappropriate fire regime and grazing by pest fauna. The numbers of plants at the locations is generally low.

7. In view of 3, 4, 5 & 6 above, the Scientific Committee is of the opinion that the species is likely to become endangered unless the circumstances and factors threatening its survival or evolutionary development cease to operate and hence *Pimelea curviflora* var. *curviflora* is eligible to be listed as vulnerable on Schedule 2 of the Act.

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Threatened Species Conservation Act 1995
NSW Scientific Committee

Final Determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a final determination to list the Duffys Forest vegetation community as an ENDANGERED ECOLOGICAL COMMUNITY on Part 3 of Schedule 1 of the Act. The listing of Endangered Ecological Communities is provided for by Part 2 of the Act.

The Ecological Community proposed for listing is:

1. The Duffys Forest vegetation community is the accepted name for the plant community that occurs on lateritic (ironstone) and deeply weathered shale derived soils on the ridgetops in the Duffys Forest / Terrey Hills / Ingleside / Belrose area within Warringah, Pittwater and Ku-ring-gai Council areas.

2. It has the structural form predominantly of open-forest to low open-forest or rarely open woodland.

3. The Duffys Forest vegetation community is characterised by the following assemblage of vascular plant species:

Acacia myrtifolia	*Dodonaea triquetra*	*Lindsaea microphylla*
Acacia suaveolens	*Entolasia stricta*	*Lomandra glauca*
Actinotus minor	*Epacris pulchella*	*Lomandra obliqua*
Allocasuarina littoralis	*Eucalyptus capitellata*	*Lomatia silaifolia*
Angophora costata	*Eucalyptus gummifera*	*Micrantheum ericoides*
Anisopogon avenaceus	*Eucalyptus haemastoma*	*Patersonia spp.*
Banksia ericifolia	*Eucalyptus oblonga*	*Persoonia levis*
Banksia serrata	*Eucalyptus sieberi*	*Persoonia pinifolia*
Banksia spinulosa	*Gompholobium grandiflorum*	*Petrophile pulchella*
Billardiera scandens	*Grevillea buxifolia*	*Phyllanthus hirtellus*
Boronia ledifolia	*Grevillea caleyi*	*Phyllota phylicoides*
Boronia pinnata	*Hakea dactyloides*	*Pimelea linifolia*
Bossiaea heterophylla	*Hakea sericea*	*Pittosporum undulatum*

Bossiaea obcordata	*Hakea teretifolia*	*Platysace linearifolia*
Ceratopetalum gummiferum	*Hovea linearis*	*Pteridium esculentum*
Conospermum longifolium	*Kunzea ambigua*	*Pultenaea elliptica*
Cyathochaeta diandra	*Lambertia formosa*	*Telopea speciosissima*
Dampiera stricta	*Lasiopetalum ferrugineum*	*Xanthorrhoea media*
Dianella caerulea	*Leptospermum trinervium*	*Xylomelum pyriforme*
Dillwynia retorta	*Lindsaea linearis*	

4. The total species list of the community is considerably larger then that given in 3 (above), with many species present in only one or two sites or in very small quantity. In any particular site not all of the assemblage listed in 3 may be present. At any one time, seeds of some species may only be present in the soil seedbank with no above ground individuals present. The species composition of the site will be influenced by the size of the site and by its recent disturbance history. The number of species and the above ground composition of species will change with time since fire, and may also change in response to changes in fire frequency.

5. The Duffys Forest vegetation community occurs on lateritic soils on the ridgetops including part of the Somersby and Blacktown Soil Landscapes in the Duffys Forest / Terrey Hills / Ingleside / Belrose areas. The soil can be distinguished from the surrounding sandstone soils by colour and the usual presence of ironstone nodules.

6. The endangered shrub *Grevillea caleyi* is restricted to the Duffys Forest vegetation community though it is not necessarily present at all locations of the community.

7. The Scientific Committee noted that general information on the Duffys Forest vegetation community is contained in:

Benson, D. & Howell, J. (1994) The natural vegetation of the Sydney 1:100000 map sheet. *Cunninghamia* 3(4) pg.677-787.

Thomas, J. & Benson, D.H. (1985) Vegetation survey of Ku-ring-gai Chase National Park. National Herbarium of New South Wales, Royal Botanic Gardens, Sydney.

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Scott, J., Marshall, A. & Auld, T.D.(1995) Conservation research statement and recovery plan for *Grevillea caleyi*. ANCA Endangered Species Project No. 456.

These surveys and accompanying maps are by no means inclusive in their representation of the Duffys Forest vegetation community. The scale of the Sydney map is too coarse to map the smaller remnants of this

community. The community is highly fragmented by urban developments and not all the small fragments appear on the maps. The Duffys Forest community is represented on the southern edge of the Ku-ring-gai Chase National Park vegetation map (Thomas & Benson 1985) and the northerly edge of the Garigal National Park vegetation map (Sheringham & Sanders 1993). These two maps do not directly abut as there is a gap in the middle comprising cleared land within which small remnant patches of the Duffys Forest community exist.

The Scientific Committee has found that:

8. The Community, as defined by the proposal, satisfies the definition of an ecological community under the Act; i.e., an assemblage of species occupying a particular area.

9. It is estimated that only 15% of the original area of the community currently exists in the form of a number of remnants.

10. Threats to the survival of the community include land clearing, habitat degradation by rubbish dumping and access by people, trail bikes, and other vehicles; weed invasion facilitated by urban runoff, an inappropriate fire regime, and unauthorised horse riding activities in the area.

11. Only a small number of fragments of the community occur within Ku-ring-gai Chase and Garigal National Parks, and all of these are on the boundary of the Parks and bounded by roads. In view of the substantial reduction in the area occupied by the community, its fragmentation and the numerous threats to the community, the Scientific Committee is of the opinion that the Duffys Forest vegetation community is likely to become extinct in nature in New South Wales unless the factors threatening its survival cease to operate.

12. In view of 9, 10 and 11, the Scientific Committee is of the opinion that the community is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate. Accordingly, the Committee has made a Final Determination to list the Duffys Forest vegetation community on Part 3 of Schedule 1 of the Act.

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Threatened Species Conservation Act 1995
NSW Scientific Committee

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The Scientific Committee has found that:

8. The Community, as defined by the proposal, satisfies the definition of an ecological community under the Act; i.e., an assemblage of species occupying a particular area.

9. It is estimated that only 15% of the original area of the community currently exists in the form of a number of remnants.

10. Threats to the survival of the community include land clearing, habitat degradation by rubbish dumping and access by people, trail bikes, and other vehicles; weed invasion facilitated by urban runoff, an inappropriate fire regime, and unauthorised horse riding activities in the area.

11. Only a small number of fragments of the community occur within Ku-ring-gai Chase and Garigal National Parks, and all of these are on the boundary of the Parks and bounded by roads. In view of the substantial reduction in the area occupied by the community, its fragmentation and the numerous threats to the community, the Scientific Committee is of the opinion that the Duffys Forest vegetation community is likely to become extinct in nature in New South Wales unless the factors threatening its survival cease to operate.

12. In view of 9, 10 and 11, the Scientific Committee is of the opinion that the community is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate. Accordingly, the Committee has made a Final Determination to list the Duffys Forest vegetation community on Part 3 of Schedule 1 of the Act.

Proposed Gazettal Date: 24/7/98
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Attachment B –

Floristic List

Floristic List

Key:

A1= those taxa recorded in Precinct A1during present study
A2=those taxa recorded in Precinct A2 during present study
+ = Positive diagnostic species for Duffys Forest (per Smith and Smith 2000)
- = Negative diagnostic species for Duffys Forest (per Smith and Smith 2000)
*=introduced and non-endemic taxa (garden escapees, pests)
bold TAXA = listed as Threatened under TSC Act

The flora list represents species recorded on the site during the botanical survey and should not be interpreted as a comprehensive list of all species present, given the ephemeral nature of many plant species (that is, surveys over many years would be required to obtain a comprehensive list of all species occurring in an area).

Grouping and Family	Botanical Name	Common Name	A1	A2	Diagnostic species (DF)
Ferns and Fern Allies					
Dennstaedtiaceae	*Pteridium esculentum*	Bracken		*	
Lindsaeaceae	*Lindsaea linearis*	Screw Fern		*	
Angiosperms					
(Monocotyledons)					
Asparagraceae	*Protasparagus aethiopicus**	Asparagus Fern	*	*	
Commelinaceae	*Tradescantia albiflora**	Wandering Jew		*	
	Commelina cyanea	Creeping Christian, Scurvy Weed		*	
Cyperaceae	*Lepidosperma laterale*	Sword-Sedge		*	
	Caustis flexuosa	Old Man's Beard	*		
Iridaceae	*Patersonia glabrata*	Leaf Purple Flag	*	*	
	Dianella revoluta		*	*	+
Juncaceae	*Juncus cognatus**	-		*	
Liliaceae	*Thysanotus tuberosus*	Fringe Lily		*	
	Caesia parviflora var. *vittata*	Blue Grass Lily		*	
	Burchardia umbellata	Milkmaids		*	
Lomandraceae	*Lomandra glauca* ssp. *glauca*		*	*	

Grouping and Family	Botanical Name	Common Name	A1	A2	Diagnostic species (DF)
	Lomandra brevis	-	*		
Poaceae	*Aristida vagans*	Three-awn Speargrass		*	+
	Aristida ramosa	Three-awn Speargrass		*	
	*Cynodon dactylon**	Common Couch		*	
	Entolasia stricta	Wiry Panic	*	*	
	*Imperata cylindrica**	Blady Grass	*	*	
	Austrostipa pubescens	Tall Speargrass	*	*	
	Themeda australis	Kangaroo Grass	*	*	+
Restionaceae	*Lepyrodia scariosa*	-	*	*	
Stackhousiaceae	*Stackhousia viminea*			*	
Stylidiaceae	*Stylidium graminifolium*	Trigger Plant		*	
Violaceae	*Hybanthus monopetalus*		*	*	
Xanthorrhoeaceae	*Xanthorrhoea media*	Grass Tree		*	
(Dicotyledons)					
Apiaceae	*Actinotus minor*		*		
	Platysace linearifolia	Carrot Tops	*	*	
	Xanthosia tridentata	Rock Xanthosia		*	
Cassythaceae	*Cassytha pubescens*	Common Devil's Twine		*	
Casuarinaceae	*Allocasuarina littoralis*	Black She-oak	*	*	
Cunoniaceae	*Bauera microphylla*			*	
	Ceratopetalum gummiferum	New South Wales Christmas Bush	*	*	
Dilleniaceae	*Hibbertia empetrifolia*	Trailing Guinea Flower		*	
Elaeocarpaceae	*Eleaocarpus reticulatus*	Blueberry Ash		*	
	Micrantheum ericoides		*	*	
Epacridaceae	*Epacris microphylla*	Coral Heath	*		-
	Epacris pulchella		*		
	Monotoca scoparia			*	
Euphorbiaceae	*Phyllanthus hirtellus*	Thyme Spurge	*	*	
Fabaceae/Faboideae	*Bossiaea heterophylla*	Variable Bossiaea		*	
	Dillwynia retorta	Heathy Parrot Pea	*		

Grouping and Family	Botanical Name	Common Name	A1	A2	Diagnostic species (DF)
	Dillwynia sp (infertile - possibly *ramosissima*)			*	
	Glycine clandestina complex	Love Creeper		*	
	Gompholobium minus	Dward Wedge-Pea	*	*	
	Pultenaea stipularis		*		
	Pultenaea elliptica		*		
	Pultenaea linophylla			*	
Fabaceae/ Mimosoideae	*Acacia parramattensis*	Parramatta Green Wattle		*	
	Acacia linifolia	Flax-leaved Wattle	*		
	Acacia suaveolens	Sweet-scented Wattle		*	
	Acacia terminalis	Sunshine Wattle	*		
	*Acacia saligna**	Golden Wreath Wattle	*	*	
	Acacia myrtifolia	Myrtle Wattle		*	
Goodeniaceea	*Goodenia heterophylla*	Variable-leaved Goodenia		*	+
	Goodenia bellidifolia	Daisy-leaved Goodenia	*	*	
Malaceae	*Cotoneaster glaucophyllus**	-		*	
	*Cotoneaster pannosus**	-		*	
Myrtaceae	*Angophora costata*	Smooth-barked Apple		*	
	Corymbia gummifera	Red Bloodwood	*	*	
	*Callistemon citrinus**	Crimson Bottlebrush	*		
	Eucalyptus sieberi	Silvertop Ash	*	*	
	Eucalyptus haemastoma	Scribbly Gum	*	*	
	Eucalyptus oblonga	Common Sandstone Stringybark	*		
	Kunzea ambigua	Tick Bush	*	*	
	Leptospermum trinervium	Paperbark tea-Tree	*	*	
Oleaceae	*Ligustrum sinense**	Small leaved Privet		*	
	*Ligustrum lucidum**	Large leaved Privet		*	
	Notelaea longifolia	Mock Olive		*	

Attachment B –

Floristic List

Grouping and Family	Botanical Name	Common Name	A1	A2	Diagnostic species (DF)
	*Olea europaea subsp. africana**	African Olive		*	
Orchidaceae	*Cryptostylis erecta*	Hooded Orchid		*	
Pittosporaceae	*Pittosporum undulatum**	Sweet Pittosporum		*	
	Billardiera scandens	Apple Berry	*	*	
Proteaceae	*Banksia serrata*	Old Man Banksia		*	
	Banksia spinulosa ssp. spinulosa	Hair-pin Banksia	*	*	
	Grevillea speciosa	Red Spider Flower			
	Grevillea sp. (either sericea or sericea/speciosa hybrid)			*	
	Grevillea buxifolia	Grey Spider Flower	*		
	Hakea sericea	Bushy Needlebush		*	+
	Isopogon anemonifolius			*	
	Lambertia formosa	Mountain Devil		*	
	Lomatia silaifolia	Crinkle Bush	*	*	
	Persoonia levis	Smooth Geebung		*	
	Xylomelum pyriforme	Woody Pear	*	*	
Rubiaceae	*Opercularia varia*	Stink Weed	*	*	+
Rutaceae	*Boronia ledifolia*			*	
Sapindaceae	*Dodonea triquetra*	Hop Bush	*	*	
Sterculiaceae	*Lasiopetalum ferrugineum* var. *ferrugineum*	Rusty Petals	*	*	
Thymelaeaceae	***Pimelea curviflora* var. *curviflora***		*	*	+
Verbenaceae	*Lantana camara**	Lantana		*	

Attachment C–

Section 5A Assessments Duffys Forest
Pimelea curviflora var. curviflora

Section 5A Assessments

Pimelea curviflora var. *curviflora*

A Section 5A Assessment under the *Environmental Planning and Assessment Act* 1979 is carried out below to determine whether or not the impacts from the proposal will have a significant impact on the Threatened shrub species, *Pimelea curviflora var curviflora*, and consequently whether or not the preparation of a Species Impact Statement is required.

Pimelea curviflora var. curviflora

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

The life cycle components of the multi-stemmed low shrub *Pimelea curviflora* var. *curviflora*, essentially comprising recruitment, reproduction and the formation of seed banks, along with other physiological and ecological data such as habitat, response (sensitivity) to fire and an increased nutrient load, is poorly understood. A Draft Recovery Plan for the species detailing ecological, biological and conservation data known to date has reportedly not been prepared by NPWS. The NSW Scientific Committee Final Determination for the species indicates that the plant is rare within its restricted distribution on sandstone and lateritic soils in northern Sydney and that it can survive fire via its underground tuberous roots (NSW Scientific Committee 1998).

Three plants were recorded in Precinct A1 on top of the road cutting just beyond the road reserve and near a dirt access track that bissects the site. Two individuals of the species were previously recorded by URS in the northern section of Precinct A2 within the road reserve although these individuals were not recorded in follow up investigations but may be present in the soil seed bank. All three individuals recorded were in flower. Smith and Smith (2000) note that this species was recorded on the western side Wakehurst Parkway in Garigal National Park across from the Precinct A2 remnant, and thus the 3 individuals recorded are expected to be part of a subset of a local population of this species. No details on the estimated size of the local population of the species were ascertained at the time of report preparation. The NSW Scientific Committee Final Determination for the species notes that most sites where the species has been recorded support only a few plants or estimates of less than 100 plants (NSW Scientific Committee 1998).

Removal of one or more of the 3 plants recorded may not result in a significant reduction in the genetic diversity and viability of the local plant population, although no definitive statement to this effect can be made without accurate information on the local plant population size.

Should the development option be pursued in Precinct A, measures to mitigate the impacts of loss of these plants as part of the local populations should bee undertaken via a process of direct translocation and cloning (with relocation to a patch of Duffys Forest habitat in Garigal National Park across the Wakehurst Parkway). Assuming this is successful, this would ensure the retention of the existing local plant genome and provide greater security to the population. Directly transplanting the three individual plants and surrounding soil into

suitable Duffys habitat in GNP is also a recommended option to maintain the existing plant genome. Work done to date on some *Pimelea* taxa by Bloombery and Maloney (1994) and Sydney Native Nurseries (Matt Bannerman pers. comm.) indicate moderate to good success in reproducing clones from cuttings and from direct transplanting assuming appropriate techniques are used.

Further assessment within the Duffys Forest remnant in GNP would be useful in determining the population size of the plant taxon.

(b) *in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.*

Not applicable

(c) *in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.*

Pimelea curviflora var. *curviflora* is generally restricted to northern Sydney and is closely associated with the Duffys Forest vegetation community. Clearing of bushland remnants at Precincts A1 and A2 would result in the removal of approximately 1.05 hectares of potential habitat for the species. A portion of the Precinct A2 remnant no longer supports a vegetative structure conducive to recruitment of this species (due to severe understorey shading from exotics and native bushland pests). Consequently, the removal of "preferred" or "optimal" habitat for the species is realistically somewhat less than 1.05 hectares.

Habitat for the species in the immediate locality consists of approx. 5.4 hectares of Duffys Forest at Manly Dam Reserve and 0.4 hectares of Duffys Forest across from the existing A2 remnant in Garigal National Park. These areas afford quality habitat and long term security for the species. A significant area of known habitat for the species in the locality will therefore be removed should both remnants be cleared.

(d) *whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community*

The proposal will not result in any further isolation of the species to other areas of potential habitat.

(e) *whether critical habitat will be affected.*

The study area is not listed as critical habitat under Part 3 Division 1 of the Threatened Species Conservation Act 1995.

(f) *whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region.*

The taxon is known from Lane Cove and Garigal National Parks as well as from a number of Warringah Council reserves, including Manly Dam and Frank Beckman (Terrey Hills). No definitive statement can currently be made in relation to adequate representation in

conservation reserves for the species given the insufficient information regarding populations sizes and population health in these reserves.

Based on the above discussion, it is difficult to predict whether the species is adequately conserved in conservation reserves within its restricted geographical range.

(g) *whether the development or activity proposed is of a class of development or activity that is recognised as a threatening processes.*

"Clearing of native vegetation" is a prescribed key threatening process under both Schedule 3 of the *Threatened Species Conservation Act* 1995, as amended, and the Commonwealth's Environment Protection and Biodiversity Act 1999. Clearing of any area of native vegetation, including areas less than 2 hectares in extent, is recognised as a major factor contributing to the loss of biological diversity. Clearing has been identified as a threat to *Pimelea curviflora* var. *curviflora* as it is listed as Vulnerable Species under Schedule 2 of the TSC Act.

(h) *whether any threatened species, populations or ecological community is at the limit of its known distribution.*

Pimelea curviflora var. *curviflora* is closely associated with Duffys Forest vegetation and thus is probably at or near its present southern distributional limit at North Seaforth.

Section 5A Assessment Conclusion

Further assessment in GNP would assist in determining the plant population size of *Pimelea curviflora* var. *curviflora*. Based on the precautionary approach, the impact from removal of these plants on the local population may be significant and thus the preparation of a Species Impact Statement (should the development option be pursued) is recommended. .

Duffys Forest

A Section 5A Assessment under the *Environmental Planning and Assessment Act* 1979 is carried out below to determine whether or not the impacts from the proposal will have a significant impact on the Endangered Ecological Community, Duffys Forest, recorded within the study area and consequently whether or not the preparation of a Species Impact Statement is required.

Duffys Forest

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

Not Applicable

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

The life cycle components of the characteristic assemblage of species that comprise Duffys Forest, essentially comprising recruitment, reproduction and the formation of seed banks, along with other physiological and ecological data such as habitat, response (sensitivity) to fire and an increased nutrient load, is partially understood. A Draft Recovery Plan for Duffys Forest is currently being prepared (pers.comm., NPWS).

Precinct A1

Precinct A1 essentially consists of a strip of Duffys Forest vegetation amongst a generally cleared area of mown exotic grassland. Some patches of native shrubs have survived, however, in the mown areas, particularly *Micranthium ericoides*. It is understood that mowing activities on the site have ceased. Existing seed sources (on and offsite) may be sufficient to allow the site to naturally regenerate to Duffys Forest and thus, adopting the precautionary approach, clearing within this area may constitute a significant impact on Duffys Forest.

Precinct A2

Removal of a 0.75 hectare strip of Duffys Forest which is essentially contiguous with a similar size remnant in Garigal National Park and which comprises the southern-most distribution of the community within its geographic range (and forms part of the only Duffys remnant in Manly LGA) would be expected to result in a significant reduction in the genetic diversity and viability of the community in the locality. Given the restricted range of this plant community and the extent of its clearance (85% cleared), any remaining remnants, no matter how small, particularly those at its limit of distribution, must be considered of high conservation value.

Notwithstanding the above, there are two factors which pose a threat to the long term viability of the remnant, these being:

1. An inappropriate fire regime where the prolonged absence of a fire in the remnant has resulted in a homogeneous understorey dominated by dense stands of *Pittosporum undulatum* and *Allocasuarina littoralis* which act to inhibit the regeneration of a host of native species; and

2. Weed invasion. Urban runoff (increased moisture levels, nutrient enrichment of soils and a source of weed propagules), fragmentation (high edge to area ratio) and physical disturbance (tracks and dumped building supplies) have all played a part in causing significant weed invasion in the understorey of the remnant. Dominant weeds include Small-leaved Privet, Lantana and *Cotoneaster* spp.

Without site rehabilitation (ie. implementing an appropriate fire), the remnant overstorey and understorey will become depauperate in the medium to long term. Whether the use of fire on the site can ever be managed appropriately given the adjacent residential properties surrounding the remnant must be considered. Even if small pile burns were initiated, it is uncertain as to whether such burns would generate sufficient heat with which to break seed dormancy mechanisms for a variety of "Duffys"taxa recorded on the site.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.

Precinct A1

Whilst a large area of Duffys has been cleared, a cessation of mowing activities may allow the site to naturally regenerate, given the availability of local seed provenance. Adopting the precautionary approach, a significant area of known potential habitat for Duffys may be removed should the development option be pursued in this Precinct.

Precinct A2

Given the restricted range of this plant community and the extent of its clearance (85% cleared), any remaining remnants, no matter how small, particularly those at its limit of distribution, must be considered a significant area of known habitat.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community

Precinct A1 and A2

The proposal will not result in any further isolation of the community to other areas of potential habitat.

(e) whether critical habitat will be affected.

The study area is not listed as critical habitat under Part 3 Division 1 of the Threatened Species Conservation Act 1995.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region.

Smith and Smith (2000) note that mapping of Duffys Forest confirmed that the plant community has a restricted and highly fragmented distribution. The total area of the plant community is 239.9 hectares (ha), of which 116.8 ha (49%) is in NPWS reserves, 35.9 ha (15%) is in reserves managed by local Councils or trusts and 87.2 ha (36%) is unreserved (Smith and Smith 2000). The estimated original extent of the community was about 1500 ha which correlates to 16% of this area presently remaining.

Based on this data, Duffys Forest can be considered adequately conserved throughout its restricted geographical range.

(g) whether the development or activity proposed is of a class of development or activity that is recognised as a threatening processes.

"Clearing of native vegetation" is a prescribed key threatening process under both Schedule 3 of the *Threatened Species Conservation Act* 1995, as amended, and the Commonwealth's Environment Protection and Biodiversity Act 1999. Clearing of any area of native vegetation, including areas less than 2 hectares in extent, is recognised as a major factor contributing to the loss of biological diversity. Clearing has been identified as a threat to Duffys Forest as it is listed as an Endangered Ecological Community under Schedule 1 Part 3 of the TSC Act.

(h) whether any threatened species, populations or ecological community is at the limit of its known distribution.

Precinct A1 and A2

The Precinct A remnants form the southern distributional limit of the plant community in northern Sydney.

Section 5A Assessment Conclusion

Precinct A1

Whilst a large area of Duffys has been cleared, a cessation of mowing activities may allow the site to naturally regenerate, given the availability of local seed provenance. Adopting the precautionary approach, a significant area of known potential habitat for Duffys may be removed should the development option be pursued in this Precinct and thus an SIS is recommended in this instance.

Precinct A2

Clearing of the bushland remnant in Precinct A2 would be expected to result in a significant impact upon the life cycle requirements of the characteristic assemblage of species that comprise Duffys Forest and thus the preparation of a Species Impact Statement would thus be required.

KEY

DUFFYS FOREST

PROSTANTHERA SP

DARWINIA DIMINUTA

PIMELEA CURVIFORA VAR. CURVIFLORA

CLIENT: EGIS CONSULTING

PROJECT: VEGETATION ASSESSMENT, NORTH SEAFORTH

TITLE: DISTRIBUTION OF RARE AND THREATENED FLORA PRECINCT A, NORTH SEAFORTH

DESIGNED: IM
DRAWN: DF
DATE: 12/03/02

APPROVED: IM
DATE: 12/3/02
STATUS: DRAFT

PROJECT: 46154.005
CAD FILE: 0p1.CDR
REVISION: A

URS

FIGURE: 1

Attachment D –

Limitations

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