Section 2

Flora assessment and rehabilitation planning: Whites Creek Valley Park

1.0 Introduction

The site, Whites Creek Valley Park, is located between Leichhardt and Annandale, east of White Street. It is bound to the north by Piper Street, and to the south by Moore Street. It is found on either side of Whites Creek, which runs into Rozelle Bay (Figure 2).

The vegetation of the site was surveyed by Tony Rodd in January-February 1998 and inspected by Dr AnneMarie Clements and Tony Rodd on 16 April 1998. Dr AnneMarie Clements, Tony Rodd and Adele Crane have prepared this section of the report on Whites Creek Valley Park.

Part of the vision of Leichhardt Council's Strategy and Plan of Management of Whites Creek Valley Park, was to restore the health and diversity of the former creek, and the flora and fauna within an urban context.

To achieve the object of restoring the health and diversity of fauna involves creation of native fauna habitat, that is re-establishment of native vegetation (Clements in press). Birds, bats and frogs are likely to be target species for this area.

2.0 Environmental setting

2.1 Past land uses

Inspection of the site has revealed no remnant native vegetation, with the possible exception of one *Glochidion ferdinandi* (Cheese Tree) (#116) near Arguimbau Street. The Leichhardt LGA was cleared early in the nineteenth century for agricultural estates. By 1900, these estates were subdivided into suburban allotments and the construction of rows of Victorian terraces and villas occurred (Benson and Howell 1990).

The low lying, flood prone land along Whites Creek tended not to be sub-divided. The residential properties (#19-39 White Street) purchased or being purchased by the Department of Urban Affairs and Planning, have approximately 100 m long back gardens running down to the creek.

The site is crossed by an east-west 1880s sewerage aqueduct, one of the first reinforced concrete structures in Australia (Hall 1997).

A north flowing concrete lined drain was installed probably in the 1920-30s replacing the natural creek line.

From the exposed soil profile, there are at least three distinct artificial soil horizons, namely:

- In the SW corner, there are foundations of an old factory. Bruce Lay from Leichhardt Council said it was a cardboard factory prior to demolition. From the slags on the soil surface near the former factory, there has been some sort of boiler operation, probably on site.

- Along the eastern boundary near Smith Street, there is an exposed coke layer. Coke is the solid product resulting from the distillation of coal in an oven or closed

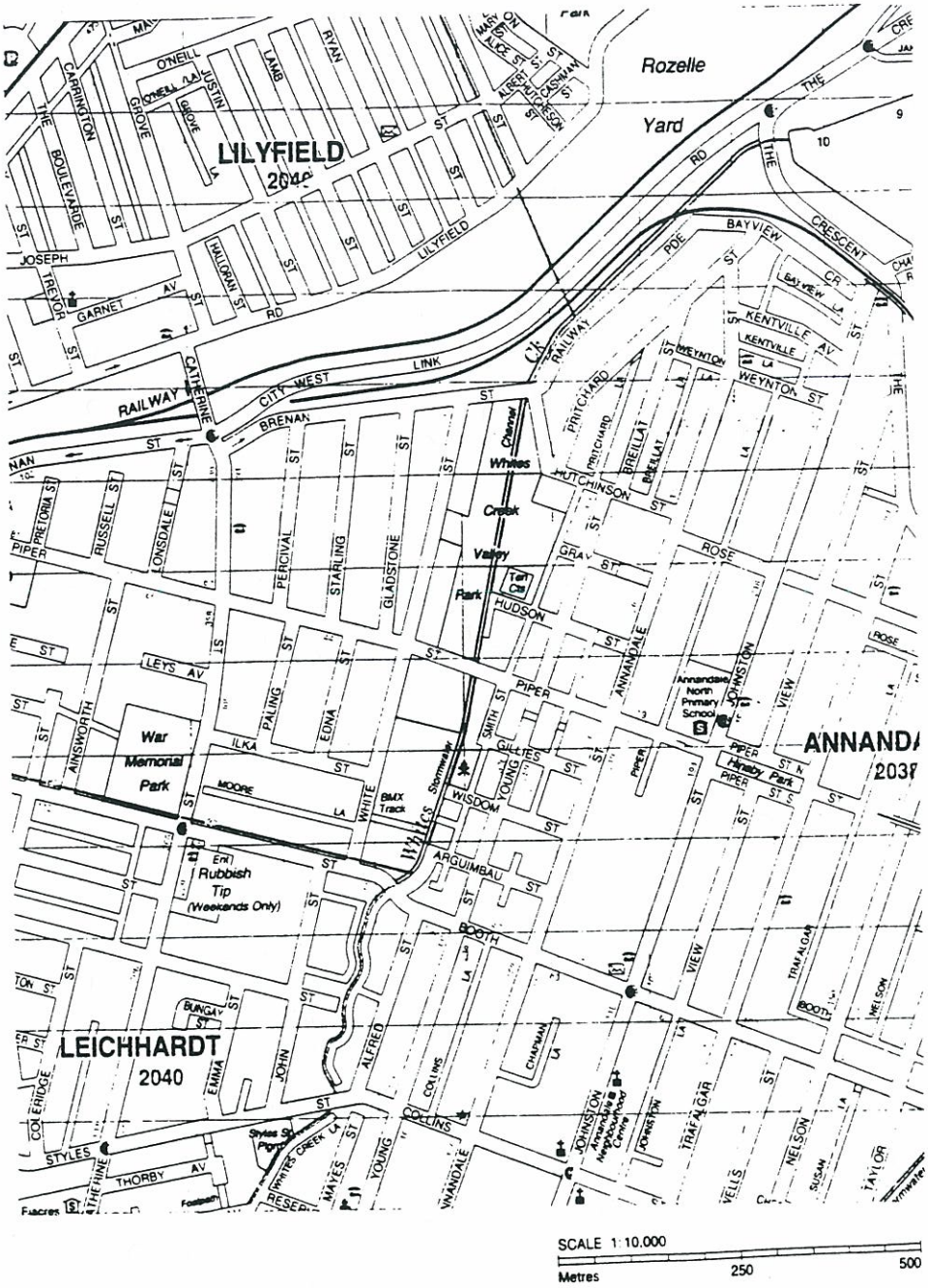

Figure 2
Location of Whites Creek Valley Park

chamber, or by imperfect combustion used as a fuel, in metallurgy etc (Delbridge *et al.* 1981). Coke layers are not uncommon in parkland in inner Sydney.

- In the rear garden of 29-31 White Street, there was at least one truck load of non-putrescible waste, mainly clay from an excavation, building rubble (bricks and a post 1970s light switch). The extent of the building rubble was not investigated fully.

2.2 Soils

The soil landscape of this site has been mapped as disturbed terrain (xx), a soil grouping of soils extensively disturbed by human activity (Chapman et al. 1989).

The nature of the fill in the centre of the valley is not known. The area was filled more than one hundred years ago and it is suspected that it was dredge fill, which was common for the time. A similar project that was done around the same time using dredge fill was Bicentennial Park, Glebe Point (Vince Cusumano, Parks Manager, Leichhardt Council, pers comm, April 1998).

If the fill of the site is dredge material, as suspected by Leichhardt Council, this puts the soil in the category of xx4 – dark dredged muds and sands (Chapman and Murphy 1989). This type of soil material can pose limitations in that some typical characteristics of it are for the soil to be; saline, sodic, have a low available water capacity, have low fertility, erodibility (localised), and be moderately alkaline with acid sulphate potential (Chapman and Murphy 1989).

The surrounding area is mapped as Gymea soil landscape (gy). The landscape is described as undulating to rolling rises and low hills on Hawkesbury Sandstone, with its soils defined as shallow to moderately deep (Chapman et al. 1989). On the northern side of Ilka Street near White Street there are sandstone benches associated Gymea soil landscape still visible.

3.0 Vegetation

The area from west of Centennial Park in Waverley Local Government Area (LGA) to Rockwood Cemetery in Auburn LGA, and from north of the Cooks River to Sydney Harbour is mapped at a 1:100 000 scale as cleared (Benson and Howell 1994).

The extent of clearing in the Whites Creek catchment is clearly shown on the front cover of Floyd (1996) (Appendix 1).

3.1 Vegetation on site

The mown areas in the northern area are exotic turf, mainly *Pennisetum clandestinum* (Kikuyu). No native grass species were likely to occur due to the extent of clearing and the extent of fill. None were recorded.

High maintenance rose garden beds have been established in the SW corner in the past five years by a local resident, Arthur Ryan, with some assistance from Leichhardt Council. Planting of annuals, weeding and pruning is the full time occupation of Arthur Ryan. This garden is a relatively formal area.

The rear of the long back gardens were dominated by *Cestrum parqui* (Green Cestrum), a category W2 declared noxious weed in Leichhardt LGA. Gray *et al.* (1993) describes the W2 category as:

A weed which poses a threat to agriculture, the environment, or the community and has the potential to spread to other areas.

with the prescribed action:

Private landholders must fully and continuously suppress and destroy all W2 weeds.

In terms of safety and children, *Cestrum parqui* (Green Cestrum) is a perennial shrub in the Solanaceae family with green poison berries (Whittet 1968). It was commonly planted in gardens and has become a garden and escape plant (Auld and Medd 1987).

The berries of *Cestrum parqui* are toxic to animals including cattle, sheep, horses, pigs and poultry. Two alkaloids, *parquine* and *solasonine* have been isolated and thought to account for the toxic properties (Parson and Cuthbertson 1992).

The control methods suggested range from mechanical removal of plants, such as bulldozing (Parson and Cuthbertson 1992) or hoeing out plants Whittet (1968) to herbicide use – amitrole T and picloram sprayed as an overall spray thoroughly wetting the plant in the active growth phase before flowering. The dense growth of seedlings that springs up over the next year must also be sprayed (Parsons and Cuthbertson 1992).

3.1.1 Existing trees

All existing trees on the site are shown on the survey plan prepared by Barrie Green and Associates dated 26/2/98, with their approximate canopy size indicated in the form of a circle. We have identified all trees to species and numbered them on Figure 3. Table 2 shows the tree identifications and their trunk diameters at breast height to the nearest 5 cm.

In the areas presently used as public parkland, at the northern end and continuing south along the east bank of the canal, there are belts of planted trees which appear to be in the vicinity of 15–20 years old. Close to the canal the majority of trees are *Casuarina cunninghamiana* (River She-oak). This species has thrived in this situation and the trees have grown large and are in a vigorous state of health. River She-oak is not a local native species in this area, being restricted in the Sydney district to major freshwater streams of the Hawkesbury River catchment. Its aesthetic qualities are not to everyone's taste, but it has the advantage of shedding large quantities of 'needles' that form a dense mat on the ground which inhibit weed and grass growth. One of its major drawbacks as a street and park tree is that cones are shed in quantity by female trees and lie on paths, behaving like ball-bearings beneath the feet of pedestrians. Female trees cannot be distinguished at time of planting. The closely related *Casuarina glauca* (Swamp Oak) is a local native, found on harbour foreshores and along lower parts of creeks flowing to the harbour, though none survive in this area. It has the same advantages and disadvantages as River She-oak.

Other trees planted in numbers in the parkland are *Melaleuca quinquenervia* (Broad-leaved Paperbark), *Eucalyptus robusta* (Swamp Mahogany) and *Eucalyptus botryoides* (Bangalay). Only the latter two are likely to have been local natives. *Melaleuca quinquenervia* occurs as far south as Sydney but is confined to a few sites close to the ocean. Swamp mahogany grows along swampy freshwater streams not far above the tidal limit, and has been seen in equivalent situations around the Harbour. It is one of the eucalypts most tolerant of high soil nutrient levels and its high nectar yield when in flower (April to July) makes it an important food tree for

TREE TYPES

...ntified

- Tree 0.3m Radius trunk, 4m Radius Spread, 12m High.

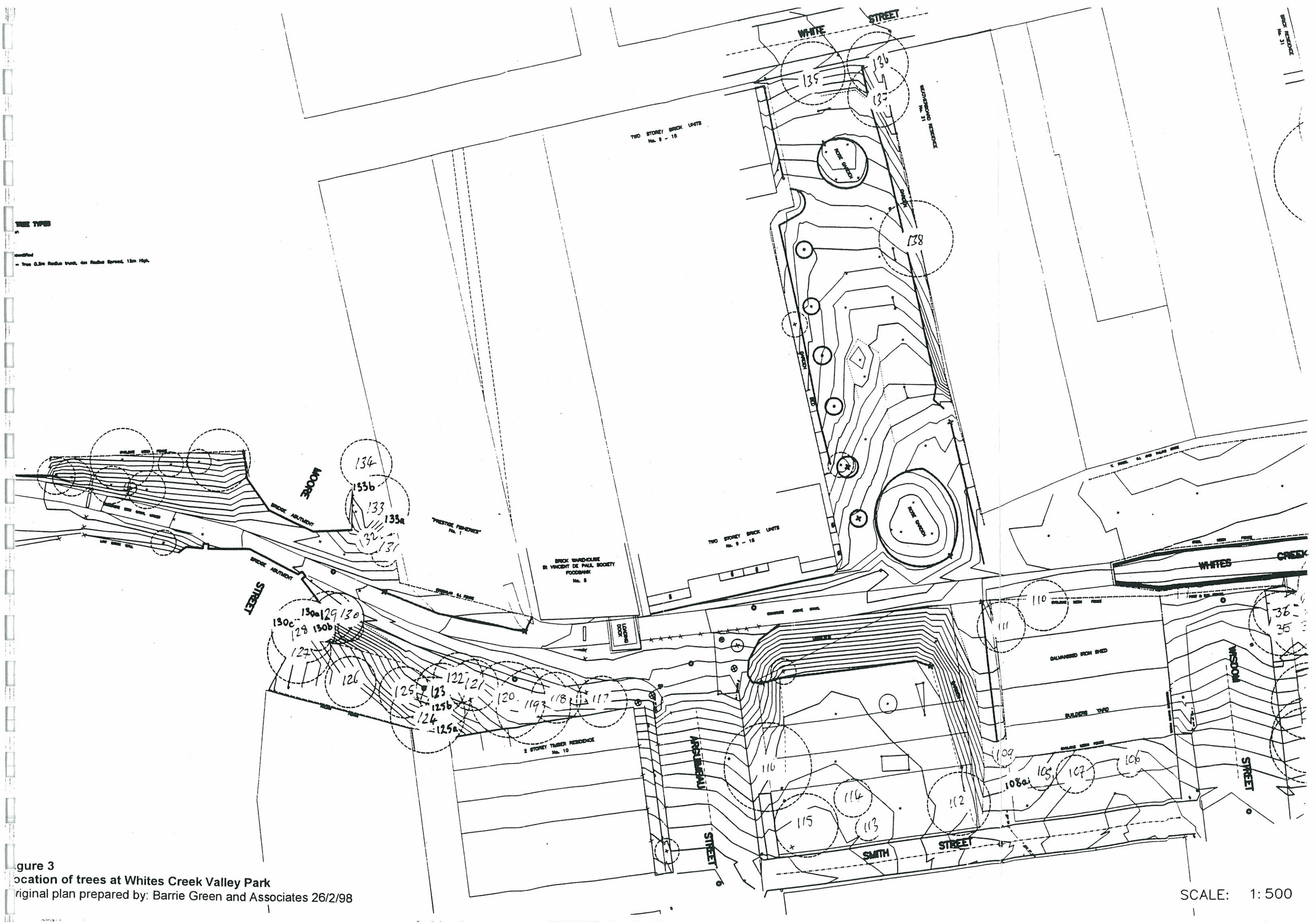

Figure 3
Location of trees at Whites Creek Valley Park
Original plan prepared by: Barrie Green and Associates 26/2/98

SCALE: 1:500

Location of trees at Whites Creek Valley Park
Original plan prepared by: Barrie Green and Associates 26/2/98

WHITE STREET
ADDITIONAL SURVEY 27th MARCH
WILLIAM STUART PLAYGROUND
PIPER STREET
WHITES CREEK CANAL
SMITH STREET
GILLIES

SCALE: 1:500

Table 2
Tree species and their diameter at breast height

#	Species	Breast height diameter (cm)
1	Schinus areira	60
2	Melaleuca quinquenervia	15
3	Melaleuca quinquenervia	15
4	Melaleuca quinquenervia	20
4a	Casuarina cunninghamiana	40
5	Melaleuca quinquenervia	40
6	Melaleuca quinquenervia	40
7	Casuarina cunninghamiana	50
8	Phoenix canariensis	50
9	Casuarina cunninghamiana	60
10	Melaleuca quinquenervia	30
11	Casuarina cunninghamiana	40
12	Schinus areira	30
13	Schinus areira	40
14	Schinus areira	30
15	Schinus areira	30
16	Casuarina cunninghamiana	40
17	Casuarina cunninghamiana	70
18	Casuarina cunninghamiana	40
19	Casuarina cunninghamiana	30
20	Casuarina cunninghamiana	60
21	Casuarina cunninghamiana	50
22	Casuarina cunninghamiana	40
23	Melaleuca quinquenervia	20
24	Casuarina cunninghamiana	40
25	Casuarina cunninghamiana	50
26	Eucalyptus robusta	25
27	Schinus areira	2 x 50
28	Casuarina cunninghamiana	50
29	Eucalyptus botryoides	25
30	Melaleuca quinquenervia	30
31	Citrus	over fence
32	Citrus	over fence
33	Citrus	over fence
34	Mango	over fence
35	Casuarina cunninghamiana	40
36	Casuarina cunninghamiana	40
37	Casuarina cunninghamiana	40
38	Casuarina cunninghamiana	30
39	Casuarina cunninghamiana	25
40	Casuarina cunninghamiana	50
41	Casuarina cunninghamiana	40
42	Casuarina cunninghamiana	40
43	Casuarina cunninghamiana	30
44	Casuarina cunninghamiana	40
45	Casuarina cunninghamiana	25
46	Eucalyptus botryoides	25
47	Jacaranda mimosifolia	20

48	Schinus areira	15
49	Casuarina cunninghamiana	50
50	Melaleuca quinquenervia	20
51	Casuarina cunninghamiana	40
52	Casuarina cunninghamiana	30
53	Eucalyptus botryoides	30
54	Phoenix canariensis	60
55	Quercus robur	60
56	Cinnamomum camphora	80
57	Casuarina cunninghamiana	40
58	Eucalyptus robusta	20
59	Casuarina cunninghamiana	40
59a	Casuarina cunninghamiana	40
60	Casuarina cunninghamiana	40
61	Casuarina cunninghamiana	40
62	Casuarina cunninghamiana	50
63	Casuarina glauca	20
64	Eucalyptus scoparia	50
65	Eucalyptus microcorys	30
66	Eucalyptus microcorys	30
67	Melaleuca quinquenervia	20
68	Eucalyptus robusta	25
69	Casuarina cunninghamiana	50
70	Schinus areira	30
71	Schinus areira	40
72	Schinus areira	40
73	Casuarina cunninghamiana	40
74	Casuarina cunninghamiana	40
75	Eucalyptus botryoides	30
76	Eucalyptus botryoides	15
77	Eucalyptus botryoides	30
78	missing	
79	Eucalyptus botryoides	25
80	Eucalyptus botryoides	25
81	Eucalyptus botryoides	25
82	Casuarina cunninghamiana	40
83	Eucalyptus botryoides	25
84	Casuarina cunninghamiana	25
85	Casuarina cunninghamiana	40
86	Casuarina cunninghamiana	30
87	Casuarina cunninghamiana	30
88	Eucalyptus botryoides - dead	10
89	Casuarina cunninghamiana	30
90	Casuarina cunninghamiana	40
91	Eucalyptus botryoides	20
92	Eucalyptus botryoides	20
93	Eucalyptus scoparia	50
94	Corymbia torelliana - planted	20
95	Eucalyptus botryoides	15
96	Casuarina cunninghamiana	30
97	Eucalyptus botryoides	10
98	Casuarina cunninghamiana	25
99	Eucalyptus botryoides	40

100	Casuarina cunninghamiana	30
100a	Casuarina cunninghamiana	30
101	Eucalyptus botryoides	15
102	Casuarina cunninghamiana	30
103	Leptospermum laevigatum	20
104	Leptospermum laevigatum	20
105	Leptospermum laevigatum	20
106	Eucalyptus scoparia - dead	10
107	Eucalyptus scoparia	15
108	Eucalyptus sideroxylon	20
108a	Melaleuca quinquenervia	10
109	Jacaranda mimosifolia	5
110	Lophostemon confertus	50
111	Lophostemon confertus	50
112	Eucalyptus scoparia	40
113	Casuarina cunninghamiana	20
114	Eucalyptus microcorys	15
115	Eucalyptus nicholii	30
116	Glochidion ferdinandi	40
117	Corymbia maculata	40
118	Melaleuca quinquenervia	40
119	Eucalyptus bicostata	60
120	Melaleuca quinquenervia	50
121	Melaleuca quinquenervia	50
122	Corymbia maculata	40
123	Corymbia maculata	30
124	Eucalyptus botryoides	40
125	Melaleuca quinquenervia	40
125a	Eucalyptus botryoides	20
125b	Melaleuca quinquenervia	15
126	Melaleuca quinquenervia	40
127	Grevillea robusta	30
128	Grevillea robusta	40
129	Eucalyptus botryoides	25
130	Eucalyptus botryoides	20
130a	Pittosporum undulatum	25
130b	Melaleuca quinquenervia	10
130c	Ficus rubiginosa	10
131	Melaleuca styphelioides	20
132	Melaleuca styphelioides	10
133	Eucalyptus saligna	20
133a	Allocasuarina verticillata	20
133b	Corymbia eximia	15
134	Eucalyptus saligna	25
135	Ceratonia siliqua	60
136	Cinnamomum camphora / Jacaranda mimosifolia	40 / 25
137	Citharexylum spinosum	40
138	Populus X canadensis	90

nectarivorous fauna. A tree of this species near the northeast corner of the park was seen in profuse flower in April, with a dozen or more rainbow lorikeets feeding on the blossom.

There is a male *Ceratonia siliqua* (carob tree) (# 135) about 100 years old on White Street. To produce fruit we need to plant a female tree near by.

4.0 Previous Studies

Friends of the Earth have been investigating ways to reduce Sydney's stormwater problems in urban areas. This site at Annandale is being used by them as a test case. A report examining the area and giving a proposed wetlands design is provided in their report (Floyd 1997, Appendix 1).

5.0 Rehabilitation priorities

There is an aim to rehabilitate the weedy neglected residential gardens to a people park safe for children to play in. The site has a cultural heritage with the viaduct, the concrete channel, the footbridge as well as the social mix of residents.

In all rehabilitation projects, soils, landform and plant selections are part of good design.

5.1 Soil and landform

The White Creek Valley Park has a long history of fill/dumps. Associated with the soil dumping and developments, are weeds and soil nutrient enrichment. With time dumpings oxidise and the soil biologically breaks down the contaminants even in many of the worst cases. Digging into old fill is not recommended as it generally is in a stable state. It is strongly recommended that a cover of fresh, clean, low nutrient topsoil be spread and that solid well designed retaining walls are built to minimise the risk of soil erosion and exposure of the underlying soil profile of old fill dumpings.

It is recommended that the post 1950s building rubble be removed as it is likely to contain paint, plastics and poisons. The post 1950s fill is not likely to be extensive. The extent of recent fill needs to be assessed with some precision to effectively cost the rehabilitation. Probably the most cost effective way of assessing the extent of fill is to hire a large skip and remove the most recent building rubble down to the original soil profile using a small bulldozer or bobcat.

At worst, it is expected that removal of a strip about 20 m wide by 100 m long, and about 1-2 m deep, that is 2000-5000 m^3 will occur. The expected cost would be @ \$7-10 per m^3, that is \$14 000 to \$50 000 in total. The cost to move on site is about \$4-7 per m^3 plus the cost of solid stone or masonry retention walls and clean soil to cover. The decision to remove or retain is cost constrained. A test run on the most recently dumped material is recommended.

It is recommended to initially clear a surface area of about 30 m x 30 m, create the final landform and re-plant the area. If the intent is forest then deep rip to about 300 mm followed by planting tubestock at 1 m x 1m and the addition of about 5-10 cm of deep weed-free mulch.

It has been found that deep ripping on compacted soils results in healthy and taller trees with better soil/root exploration. Ripping the soils also increases in situ water retention. Depending on the landscape design, gentle sloped land contouring to

create "natural" detention systems would further decrease water runoff and topsoil loss from the park.

Once the most recent fill has been removed, it is time to scrap off the weedy soil surfaces, deep rip and plant the next area. It is important not to open more areas than there are plants to plant and for a weeder to carefully weed around.

5.2 Plant selection

Collecting from the nearest seed source is strongly recommended, if the outcome is to be an example of the original local native vegetation. There are profession seed collectors in the Sydney region. Tony Rodd has inspected the closest native remnants and provided details in Section 1 of this document. Collecting the correct plant material is essential if the aims are to be achieved.

5.3 Reducing soil nutrients enrichment

If the aim is to reintroduce a low maintenance example of the original flora, then reduction of soil nutrient enrichment is required. Physical removal of the weeds removed is recommended due to the nutrient held in their biomass (the vegetative material). Exotic plants generally have a higher level of nutrient in the leaf tissue than native sandstone plant species. Their removal is an effective way of removal of nutrient. Burning is also a good method, but this would have to be either a bonfire or a burn permission, with advice and supervision by the local fire brigade.

5.4 Nutrient management and wetland/nutrient retention systems

As clearly stated in Floyd (1996), for water, "Management begins in the upper reaches of the catchment", it is also equally true for nutrients and topsoil. This is consistent with treatment (utilisation) at source or as close as possible of potential pollutants rather than the end point treatment systems. Ecologically sustainable development is essential if there is to be a world for our children.

Nutrient treatment in the lowest points in the catchment does not optimise the use of nutrients in situ. Creating detention basins in the upper slope areas, which depending on the depth, permeability of soils and edging, support a range of vegetation types from wetlands to forest. Detention systems would not only minimise water runoff but reduce topsoil loss, retain sediment fines and seeds on the slopes. In an urban context, the raised stone wall garden beds in the Royal Botanic Gardens, Sydney, act as mini detention systems. The placement and slopes of the paths also form part of the soil, water and nutrient management system.

5.5 Planting

In terms of growing and planting, this is a community park. There are a large number of children with Annandale, Annandale North, Leichhardt and Orange Grove Primary Schools, St Fiacres and St Brendans Catholic Schools and Leichhardt High School within about a 1 km radius of the park.

Paying a donation to the schools to grow and plant about a third to a half of the plants is suggested, and the remaining plants to be grown by nurseries and planted by adults with or without their children. A donation of about $1-1.50 per tree planted is suggested. The survival rate of school planted trees is generally lower than professional tree planters so we often do a second planting by a professional tree

planter in the school planting areas. The cost of professional planters is about $3/tubestock including seed collection and propagation.

It is important that the local children have a sense of ownership as well as having pride in their local park, which all adds to their self-esteem.

5.6 Weeds, staging and designing rehabilitation

In inner western Sydney, especially along drainage line, there is high risk of invasion by *Parietaria judaica* (Asthma Weed). It is important to create stable cover in these areas to minimise maintenance in the flood prone areas. A suggestion of one or a combination of the following needs to be carried out:

- dense native plantings with a high percentage of native legumes, up to about one third of the tubestock, and 10 cm of mulch with careful weeding.
- well maintained lawns
- hard landscaping (paths and walls).

6.0 In conclusion

It should be noted that good design and planning are required to maximise the success and minimise the costs.

Removal of the post 1950s fill dumping and the containment and covering of earlier fill with clean low nutrient topsoil, followed by dense plantings is recommended.

In terms of nutrient control measures; maximising the retention of water, topsoil and nutrients on the slopes involve good planning of the soil preparation (deep ripping and contouring), garden bed edging, path locations and use of a wide variety of plant forms and plant species.

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APPENDIX 7.2 PATTERSON BRITTON AND PARTNERS PTY LTD