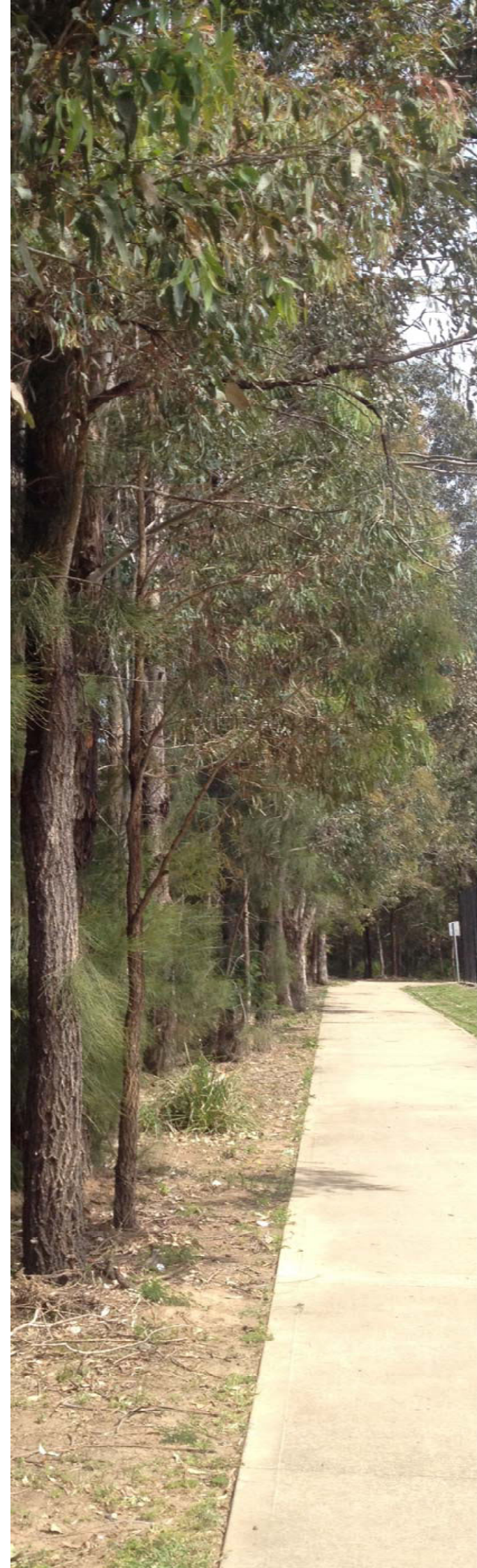




CAMDEN COUNCIL PUBLIC EXHIBITION DOCUMENT 2022

INVESTIGATION & DESIGN HARRINGTON PARK MITIGATION WORKS, NARELLAN – NEPEAN STAGE I & STAGE II REPORT: VEGETATION MANAGEMENT PLAN



vegetation management plan - narellan creek proposed spillway channel, harrington park

Lesryk

ENVIRONMENTAL

Lesryk
Environmental Pty Ltd
PO Box 3001
Bundamba NSW 2230
Ph: (02) 95232016
Mobile: 0408258129
Email: admin@lesryk.com.au

3rd January 2017

prepared by mark couston

This vegetation management plan has been prepared at the request of NSW Public Works and covers a section of Narellan Creek in the Harrington Park area at Camden. Field work and surveys associated with the vegetation mapping were carried out between 5th January and 5th February 2016 with more detailed assessments of the proposed channel area conducted in October 2016.

There is evidence to suggest that due to the presence of instream and bank vegetation, portions of Harrington Park are currently being affected by flood waters during major rainfall events. A number of studies and modelling have been undertaken that identify management works that could alleviate the flooding. One of these options considered is the construction of a spillway channel roughly running parallel to Narellan Creek.

This vegetation management plan outlines the extent and nature of the revegetation works required to stabilise the spillway channel. Revegetation of the spillway channel primarily utilises native grasses so as to minimise restrictions to flows in the spillway channel whilst providing some contribution to the local ecology.

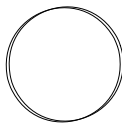
This vegetation management plan is based upon:
- Option 2, Channel General Arrangement Plan, Drawing C005, Rev 0, Dated 24/10/16, (NSW Water Solutions, NSW Department of Finance, Services & Innovation).

Consideration has also been given to the
- Vegetation Mapping Report (Lesryk, March, 2016), and
- Flora & Fauna Assessment report (Lesryk, December 2016).

Contents

sheet	1	- this cover page
sheet	2	- local context & the proposed spillway channel
sheet	3	- stages 1 & 2, preliminary & initial works
sheet	4	- stage 3, earthworks & construction
sheet	5	- stages 4, 5 & 6 revegetation, establishment & maintenance
sheets	6	- specifications

draft

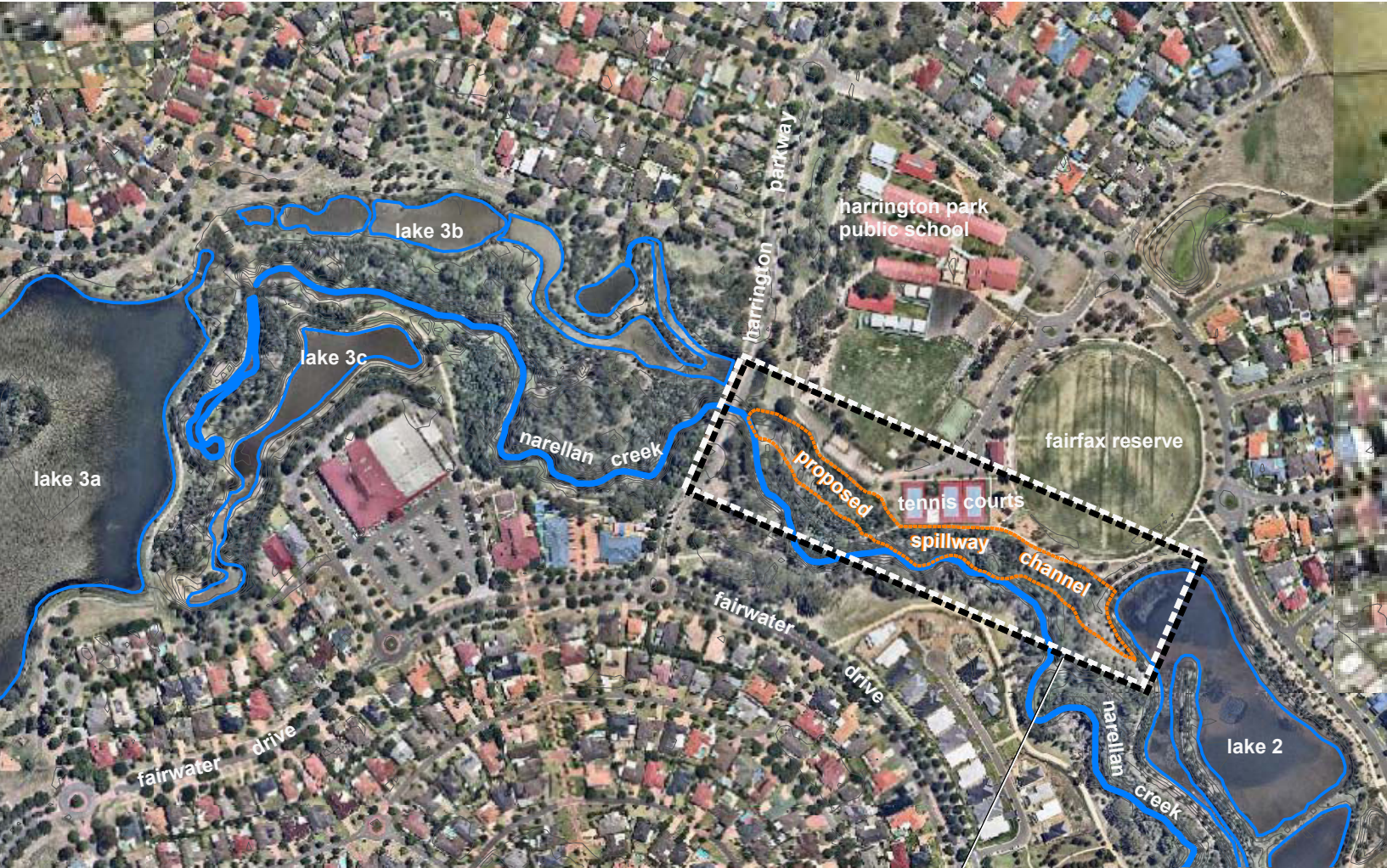


scale at A3
nts

dwg no.	rev.	sheet of
vmpcc1.01	0.1	1 6

drawing title
cover sheet

figure 2.1 - proposed spillway channel, harrington park local context



refer detail plans following sheets



figure 2.2 - the eastern end of the proposed channel in the area of the proposed spillway



figure 2.3 - the vegetation along the tennis courts on the northern side of the proposed channel.



figure 2.3 - the vegetation at the western end where the proposed channel discharges into narellan creek upstream of the harrington parkway bridge



plan implementation
stage 1 - preliminaries

Task No.	Task
1.1	The project manager is to be made aware of the tasks, procedures and specifications in this plan and is to co-ordinate these tasks with other construction activities in a timely and efficient manner.
1.2	A qualified and experienced project ecologist (refer specifications s.13) shall be engaged to undertake preclearing surveys and supervise the removal of vegetation associated with this plan to ensure that native fauna are not harmed.
1.3	An experienced hydroseeding contractor is to be engaged to carry out the revegetation of the channel associated with Stage 4 of this plan.
1.4	Availability of native grass seed species and quantities (refer specifications s. 6) to be used for revegetation shall be secured / pre-purchased by the hydroseeding contractor to be used in Stage 4 of this plan.
1.5	A qualified and experienced bush regeneration contractor (refer specifications s.2) is to be engaged to undertake weed control associated with this plan.
1.6	The extent of earthworks is to be identified on the ground using star pickets or similar semi-permanent features in conjunction with hazard tape between star pickets. This may be substituted where construction site fencing is required and the construction site fencing identifies the extent of earthworks.
1.7	Efforts should be made to program the vegetation clearing works during the Autumn-Winter period when species such as the Latham's Snipe would be breeding in the northern hemisphere.
1.8	Environmental awareness and identification of the native vegetation adjacent the earthworks area is to be incorporated as part of the site induction program for contractors along with WH&S practices.
1.9	A site log book shall be established and maintained to record site photographs and completion dates of each task in each Stage of this Plan.
1.10	Satisfactory completion of the above Stage 1 Tasks must be undertaken before commencing Stage 2 of this plan

plan implementation
stage 2 - site investigations & initial works prior to & during removal of vegetation)

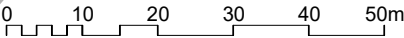
Task No.	Task
2.1	Star pickets of similar semi-permanent features are to remain in a functional state to clearly identified the extent of earthworks on the ground.
2.2	The project ecologist (refer specification s.13) is to undertake targeted surveys within and adjacent the earthworks area for the Cumberland Plain Land Snail, Latham's Snipe, Cattle Egret, Great Egret and Australasian Bittern.
2.3	The project ecologist (refer specification s.13) is to clearly mark the trunks of hollow bearing trees or trees with any nests within and immediately adjacent the earthworks area.
2.4	The project ecologist (refer specification s.13) is to check identified hollows and nests or the presence / absence of fauna.
2.5	The project ecologist (refer specification s.13) is to supervise the clearing of vegetation, in particular trees after felling with any collected fauna being relocated locally.
2.6	In the event that native fauna are injured, the project ecologist shall take the injured animal to a local veterinarian or wildlife carer.
2.7	Where possible, any indigenous trees that are felled should not be mulched and should be relocated within adjacent bushland areas area to provide habitat for native species and their prey under the direction of the project ecologist and consulting drainage engineer.
2.8	To offset the loss of those hollow-bearing trees, nesting boxes are to be erected within the adjacent woodland areas. These boxes should be designed to meet the life cycle needs of both hollow dependent microchiropteran bats and native birds (refer specifications s.7). Nesting boxes should be erected at a ratio of two nesting boxes per hollow-bearing tree cleared
2.9	All vegetation and debris shall be removed from site.
2.10	Initial weed control is to be carried out to 2m beyond the extent of the earthworks area removing all weeds, non-indigenous and exotic vegetation by the Bush Regeneration Contractor (refer specifications s2) using standard bush regeneration weed control techniques (refer specifications s.1, s.4, s.15 & s.16)
2.11	Environmental awareness and identification of the native vegetation adjacent the earthworks area is to be incorporated as part of the site induction program for contractors along with WH&S practices.
2.12	Specific records including site photographs and completion dates of each task must be maintained in the site log.
2.13	Satisfactory completion of the above Stage 2 Tasks and achievement of the performance measures must be met before commencing Stage 3 of this plan.

legend



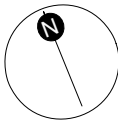
stage 2 - performance measures

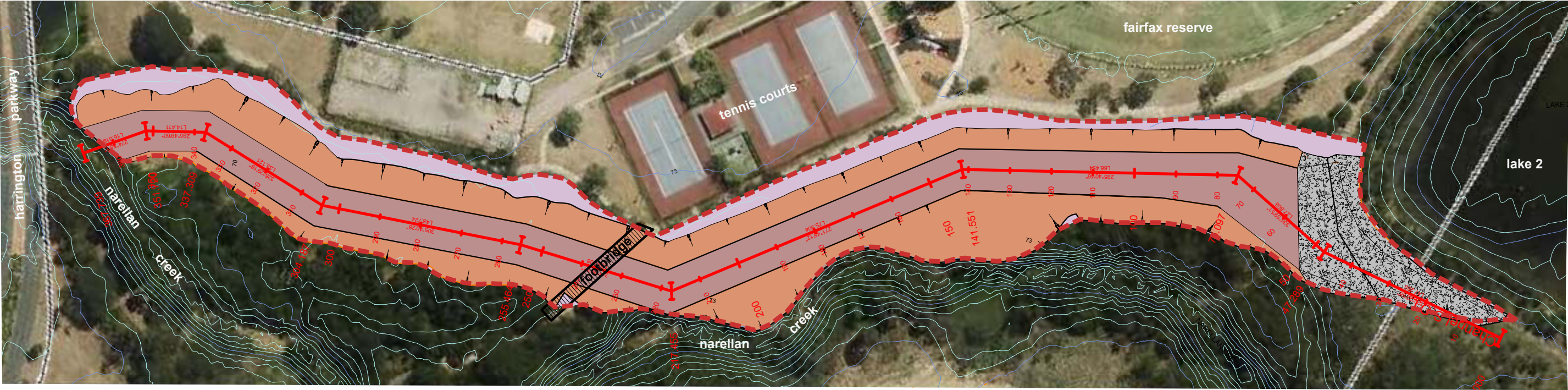
- extent of earthworks identified on the ground;
- all vegetation removed from within the earthworks areas;
- no damage to habitats and native vegetation outside works areas;
- no harm to native fauna.



This plan is based upon:

Option 2 - Channel General Arrangement Plan, Drawing C005, Rev 0, Dated 24/10/16, (NSW Water Solutions, NSW Department of Finance, Services & Innovation)





plan implementation
stage 3 – earthworks & construction

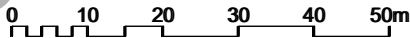
Task No.	Task
3.1	After the satisfactory completion of Stage 2 Tasks, Star pickets of similar semi-permanent features are to remain in a functional state to clearly identified the extent of earthworks on the ground..
3.2	At the satisfactorily completion of Stage 2 Tasks, follow up weed control (refer specifications s.1, s.4, s.15 & s.16) is to be carried out in the areas 2m beyond the extent of the earthworks area removing all environmental & noxious weeds at minimum of: <ul style="list-style-type: none">- 2 weekly intervals during the period 0 - 3 months, and- 4 weekly intervals after 3 months, until completion of earthwork and construction of the footbridge.
3.3	Erosion & sediment control measures are to be installed (refer specifications s.3) in conjunction with the program of channel excavation and construction.
3.4	Excavation of the channel and construction of the footbridge across the channel shall be undertaken ensuring no damage occurs to vegetation outside the defined earthworks area.
3.5	All soil, debris and vegetation shall be removed from within the earthworks area.
3.6	The performance measures (refer this plan) at each scheduled weed control period (refer Task 1.10) must be satisfactorily achieved.
3.7	Specific records including site photographs and completion dates of each task must be maintained in the site log.
3.8	Satisfactory completion of the above Stage 3 Tasks and achievement of the performance measures must be met before commencing Stage 4 of this plan.

stage 3 - performance measures

- extent of earthworks identified on the ground;
- no signs of sediment deposition outside the earthworks areas;
- no damage to habitats and native vegetation outside works areas.

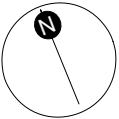
legend

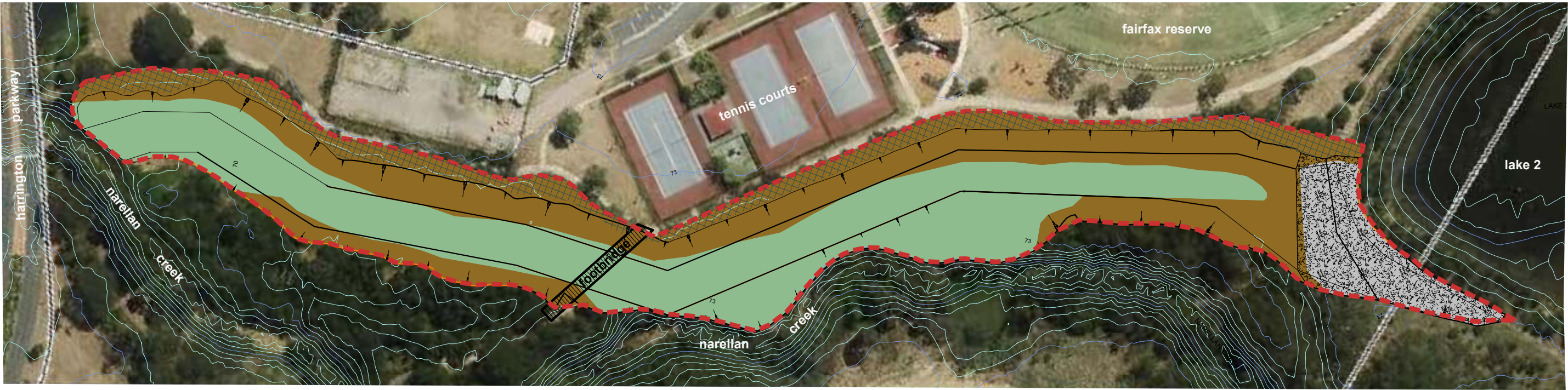
9,325 m2	extent of earthworks
1,555 m2	disturbed areas
3,705 m2	channel bank
3,220 m2	channel bed
845 m2	channel spillway



This plan is based upon:

Option 2 - Channel General Arrangement Plan, Drawing C005, Rev 0, Dated 24/10/16, (NSW Water Solutions, NSW Department of Finance, Services & Innovation)





plan implementation
stage 4 - revegetation
(post earthworks & construction)

Task No.	Task
4.1	After the satisfactory completion of Stage 3 Tasks, Star pickets of similar semi-permanent features are to remain in a functional state to clearly identified the extent of earthworks on the ground..
4.2	At the satisfactorily completion of Stage 3 Tasks, follow up weed control (refer specifications s.1, s.4, s.15 & s.16) is to be carried out in the areas 2m beyond the extent of the earthworks area removing all environmental & noxious weeds at minimum of: - 4 weekly intervals until completion of Stage 4 revegetation works.
4.3	Erosion & sediment control measures are to be maintained (refer specifications s.3) until completion of Stage 4 works.
4.4	No topsoil is to be returned or used within the excavated channel.
4.5	The exposed soil in the channel is to be prepared for hydroseeding of native grasses (refer specifications s.14)
4.6	The areas of hydroseeding, Seed Mix A and Seed Mix B (refer specifications s.6) as shown on this plan are to be clearly marked on the ground prior to hydroseeding.
4.7	Hydroseeding of native grass, seed mix A & B (refer specifications s.6) and Hydromulching (refer specifications s.5) is to be undertaken in one application across the earthworks areas.
4.8	Planting (refer specifications s.11, & s.12) is to be carried out across the areas identified as Supplementary Boundary Planting as shown on this plan.
4.9	Specific records including site photographs and completion dates of each Task must be maintained in a site log.
4.10	Satisfactory completion of the above Stage 4 Tasks and achievement of the performance measures must be met before commencing Stage 5 of this plan.

plan implementation
stage 5 - revegetation establishment period

Task No.	Task
5.1	After the satisfactory completion of Stage 4; maintenance weed control within the Native Grassland Area and areas 2m beyond the extent of the Native Grassland Area is to be carried using standard bush regeneration techniques (refer specifications s.1, s.4, s.15 & s.16) and at minimum of: - 4 weekly intervals for a 6-month period achieving the performance measures on this plan at each interval.
5.2	Supplementary Boundary Plantings shall be maintained in good health and vigour (refer specifications s.8) and shall be maintained at a minimum of: - 4 weekly intervals for a 6-month period achieving the performance measures on this plan at each interval.
5.3	The Native Grassland Area shall be maintained to ensure growing conditions are conducive to the development and establishment of native grasses. The Native Grassland Area shall be maintained at a minimum of: - 4 weekly intervals for a 6-month period achieving the performance measures on this plan at each interval.
5.4	In the event that flooding or scouring of the channel or wash-outs of the sown native grass and mulch occurs, the affected area shall be retreated with hydroseeding and hydromulching treatments or, depending upon the severity of the event, alternative methods shall be investigated and carried out to prevent future occurrences.
5.5	Specific records including site photographs and completion dates of each task must be maintained in a site log.
5.6	The performance measures for Stage 5 Establishment Period (refer this plan) must be satisfactorily achieved before commencing Stage 6 Maintenance Period works

plan implementation
stage 6 - revegetation maintenance

Task No.	Task
6.1	After the satisfactory completion of Stage 5; maintenance weed control within the Native Grassland Area and areas 2m beyond the extent of the Native Grassland Area is to be carried using standard bush regeneration techniques (refer specifications s.1, s.4, s.15 & s.16) and at minimum of: - 8 weekly intervals for an 18-month period achieving the performance measures on this plan at each interval.
6.2	Supplementary Boundary Plantings shall be maintained in good health and vigour (refer specifications s.8) and shall be maintained at a minimum of: - 8 weekly intervals for an 18-month period achieving the performance measures on this plan at each interval.
6.3	The Native Grassland Area shall be maintained to ensure growing conditions are conducive to the development and establishment of native grasses. The Native Grassland Area shall be maintained at a minimum of: - 8 weekly intervals for an 18-month period achieving the performance measures on this plan at each interval.
6.4	In the event that flooding or scouring of the channel or wash-outs of the sown native grass and mulch occurs, the affected area shall be retreated with hydroseeding and hydromulching treatments or, depending upon the severity of the event, alternative methods shall be investigated and carried out to prevent future occurrences.
6.5	Specific records including site photographs and completion dates of each task must be maintained in a site log.
6.6	The performance measures for Stage 5 Establishment Period (refer this plan) must be satisfactorily achieved at the ends of the maintenance period.

legend

9,325 m2	extent of earthworks
1,085 m2	revegetation - supplementary boundary planting
5,265 m2	hydroseeding - native grasses seed mix A
4,060 m2	hydroseeding - native grasses seed mix B

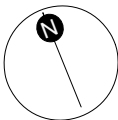
stage 3, 4 & 5 - performance measures

- no signs of exposed soil and surface stabilised with no signs of erosion;
- less than 5% weed biomass maintained at all times within the revegetation areas;
- revegetation completed with signs of native grass recruitment;
- plantings & native grasses maintained to display good health & vigour;
- no signs of sediment deposition outside the earthworks areas;
- no damage to habitats and native vegetation outside works areas.



This plan is based upon:

Option 2 - Channel General Arrangement Plan, Drawing C005, Rev 0, Dated 24/10/16, (NSW Water Solutions, NSW Department of Finance, Services & Innovation)



s.1 bush regeneration

Bushland Regeneration is the activities carried out to provide conditions that facilitate the natural recruitment or germination of endemic flora species. It primarily involves the progressive control of weed species in a systematic manner of primary weed control, follow-up weed control (often several follow –up sessions) and maintenance over an identified works area. Typically work areas progress from areas of little weeds and expand to adjacent works areas. It is recommended that these activities are undertaken by specialised and experienced bush regeneration contractors.

s.2 bush regeneration contractors

Bush regeneration contractors are companies or individuals who have experience and qualifications in bush regeneration activities. Contractors must provide an experienced site supervisor with minimum qualifications of a TAFE Certificate II in Bush Regeneration or Conservation & Land Management and must be eligible for membership to Australian Association of Bush Regenerators.

s.3 erosion & sediment controls

All erosion and sediment controls such as berms, sediment fences, rumble zones sediment basins and site drainage flow paths must be designed and constructed in accordance with Managing Urban Stormwater: Soils and Construction. 4th Edition (Landcom, 2004), New South Wales Government.

s.4 herbicide usage

Glyphosate based herbicides can be used in conjunction with weed control techniques and is to be used in accordance with the product label and registration. Herbicide usage must be undertaken in a manner or method that does not cause harm to new plantings and there is no contamination of surface or ground waters.

s.5 hydromulching

Hydromulching is to be carried out by a mechanical spray machine using a bonded-fibre matrix. Fibre mulch is to be used at a rate of 2 tonnes/ ha. Paper based fibre is not to be used.

No fertiliser is to be used in the hydromulching process

In conjunction with the fibre mulch a binder is to be used such as Envirotack at a rate of 50kg/ha, or a polymer binder maximum 250 litres per hectare.

s.6 hydroseeding – native grasses species mix, sowing rates & purity

Native grasses shall be sown by a mechanical spraying machine at the following rates:

- Native Grass Seed Mix A
- Kangaroo Grass (*Themeda triandra*) Pelletised4kg / ha
 - Weeping Grass (*Microlaena stipoides*)10kg / ha

- Native Grass Seed Mix B
- Kangaroo Grass (*Themeda triandra*) Pelletised3kg / ha
 - Weeping Grass (*Microlaena stipoides*)10kg / ha
 - Wallaby Grass (*Rytidosperma* spp.) Pelletised1kg / ha

- Seed is to be supplies from a reputable supplier along with a NATA certification of Pure Live Seed (PLS);
- Kangaroo Grass (*Themeda triandra*)90% PLS
 - Weeping Grass (*Microlaena stipoides*)90% PLS
 - Wallaby Grass (*Rytidosperma* spp.)90% PLS

Seed crops vary between season and supplier and in the event that suppliers cannot meet the PLS % the sowing rated shall be adjusted accordingly.

s.7 nest boxes

Nest boxes are to be designed specifically for the target species. Specific nest boxes have been designed and are commercially available for micro-bats, parrots, possums and gliders. Commercially available nest boxes are available from Melbourne Wildlife Sanctuary La Trobe University, Victoria. Nest Boxes should be installed at a minimum of 3m above ground level, away from night lights with openings facing away from the prevailing weather. Shredded bark or leaf litter should typically be placed in the Nest Box before installation to provide some insulation and nesting material.

s.8 plant maintenance & replacement

All plantings shall be maintained, (watered, weeded) so as to display good health and vigour. Apart from typical seasonal variations, plantings showing poor vigour, stress or disease will be replaced.

s.9 plant stock

All plant material will be tubestock or in maxi-cells Plants used must be grown from seed or cuttings taken from provenance stock. Greening Australia or local commercial nurseries specialising in native species can be contacted as they have a range of seed from the local provenance. Provided that orders are placed in advance, consignment propagation can be carried out from local stock.

S.10 planting

Planting is to be carried out using standard horticultural practices. Because of the nature of the site and environmentally sensitive lands downstream, no fertiliser is to be used in conjunction with planting, however if considered necessary, water retaining crystals can be used. All tree & understorey shrub plantings are to be planted with staked translucent or cardboard grow tubes.

s./11 planting densities

- Supplementary boundary planting densities shall be in addition to native grass hydroseeding and shall be shall be carried out at the average rate of:
- 1 canopy tree / 36m²;
 - 1 ground cover / 1 m² in addition to native grass hydroseeding.

Note the above are not numbers of plants to be used.

s.12 planting species & numbers

The following landscape planting shall occur as supplementary boundary planting in addition to native grass hydroseeding to form a physical separation between the adjacent recreational areas and the top of the bank of the channel.

canopy tree species		
Genus species	Common Name	No of Plants
<i>Eucalyptus moluccana</i>	Grey Box	13
<i>Eucalyptus amplifolia</i>	Cabbage Gums	13
<i>Angophora subvelutina</i>	Broad-leaved Apple	17

ground covers		
Genus species	Common Name	No of Plants
<i>Lomandra longifolia</i>	Mat-rush	780
<i>Poa labillardieri</i>	Tussock Grass	780

s. 13 project ecologist

A project ecologist is an individual who has experience with handling and capturing native fauna, has experience in vegetation clearing requirements, habitat restoration and has an understanding of rehabilitation of native vegetation. The project ecologist must have a Scientific Licence (OEH) and an Animal Research Authority (DPI) and is a member of the Ecological Consultants Association of NSW.

s.14 soil preparation hydroseeding – native grasses

Prior to hydroseeding the soil surface must be roughened to create micro-niches for seed germination with furrows running along the contours. Furrows should typically be between 10-50mm high and spacing between furrows approximately 300mm. Unless soils are compacted by heavy machinery working on sodden ground, deep cultivation is not necessary. Where soils are compacted they shall be deep ripped to 200mm.

s.15 weed control

Weed control is to be undertaken using standard bush regeneration techniques such as hand weeding or with the use of Glyphosate based herbicides when necessary (eg. cut & paint, stem scrape, spot spraying).

s. 16 weed material disposal and temporary storage on site.

Weed material containing seed or weed material capable of spreading vegetatively shall be removed from site and disposed of at an appropriate location where it will not cause further environmental damage.

Temporary storage of weed material prior to disposal can occur on site where it is stored, outside drainage lines, on an impervious surface and it is covered with a material that adequately contains the weed debris.

