Googong Township

Landscape Management Plan – Stage A - Network

19 October 2012. Prepared for Googong Township Pty Limited

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Googong Township

Landscape Management Plan – Stage A - Network

Prepared for

Googong Township Pty Limited

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1 Introduction

The Project Approval for the Stage A - Network requires the preparation of a Landscape Management Plan (LMP) for the management of visual amenity issues arising from the works.

This LMP is to be read in conjunction with the Weed and Pest Management Strategy also prepared for this project (Biosis Research, 2012), attached to the Network Stage A (west) CEMP sub-plan: Flora and Fauna Management Plan.

1.1 Proposed Development

Googong Township Pty Limited (GTPL) proposes to develop the new township of Googong in the Canberra region, within the Queanbeyan local government area, 16 kilometres south-east of Parliament House in Canberra. The study area encompasses the entirety of the proposed Googong Township and includes an additional corridor to the north-east.

The township will be built on 780 hectares of former grazing land. It will take about 25 years to create and include 5,550 homes of varying types and sizes to house about 16,000 people. The Googong Township has been designed to be one of the first purpose-built, large-scale water-efficient communities in Australia. The township is designed around an integrated water cycle, with a dedicated water recycling plant, which would reduce potable water consumption by at least 60 per cent and recycle 62 per cent of the township's wastewater for non-potable use.

This would allow the township's population of 16,000 to use the same amount of drinking water that traditionally would only sustain 6,000 people.

The Googong Water Cycle Project comprises the infrastructure for the potable water, recycled water and sewage system required to service the township. This LMP relates to the Stage A - Network, that is, the network related water cycle infrastructure (excluding the Water Recycling Plant) required for the first subdivision areas of the township, which would comprise about 1200 lots.

The Googong Township would be established in stages over a 25-year period. Therefore, completion of the final stages of the Project would not occur for about 25 years (completion would depend on the growth rate of the township, estimated at 300 dwellings per year). Detailed design and approvals for these subsequent stages would be sought at a later date, prior to development of further subdivisions.

1.2 Purpose of the Landscape Management Plan

The purpose of the LMP is, in summary to:

Action	Location
Identify project elements which may impact on the visual amenity of the area, and potential sensitive observer locations	s.3 / s.5
Provide measures to minimise and/or avoid visual amenity impacts to sensitive observer locations including: landscape / rehabilitation design; built elements and lighting design	s.6 / s.7
Provide timing and progressive implementation approaches for visual mitigation works	s.6 / s.7
Provide procedures and methods to monitor and maintain landscaped and rehabilitated areas.	s.8

The LMP is required to be prepared in consultation with both QCC and Palerang Council. As part of the Stage A - Network works are to be owned and operated by ACTEW (e.g. within the Googong Foreshore Boundary), both QCC and ACTEW will have the long-term responsibility for implementing the LMP.

1.3 Implementation of the Plan

The Landscape Management Plan will be implemented by a suitably experienced and qualified landscape management contractor. GTPL will be responsible for complying with the LMP requirements during the construction and associated defects maintenance / plant establishment period. Following the completion of this period, the work will be handed over to the relevant local authorities who will be responsible for funding and implementation of the plan.

2 Site Context

2.1 Climate

Googong is located to the southwest of Canberra approximately 8 km south east of Queanbeyan. The climatic conditions of Googong are considerably influenced by the surrounding terrain. The Snowy Mountains and Kybean Range encourage precipitation both to the east and west of Googong, leaving Googong drier than the surrounding areas, in a rain shadow. This rain shadow is typified (in this region) by the occurrence of lands up to 1000 m that receive less than 600 mm of annual rainfall - indicating semi-arid conditions with alpine elevations. The average annual rainfall for Queanbeyan is ~570 mm/ yr, which is relatively consistent across the year as 5 to 6 rain days per month. Whilst numerous predictions for future climate (within the next ~50 years) are available, data from the NSW Greenhouse Plan (2005) has been utilised due to its relevance to the site. Predictions described within this Plan suggest that the local climate will become hotter and drier as average temperatures for the Queanbeyan area will rise by several degrees by 2070, with consequent increases in evaporation.

2.2 Landscape

The topography of the site primarily consists of a gentle undulating plateau of ~750 m AHD, which is dissected by minor creek lines, and bordered to the east by the entrenched Queanbeyan River (~650m AHD).

The soil landscapes of the area are generally thin with low chemical fertility and a high proportion of small rock. Soils are generally magnesic (high in magnesium), low in calcium with moderate sodicity in subsoil clays. This has resulted from soils developing from hard metamorphic rocks of various sedimentary and volcanic origins that have undergone considerable deformation, intrusion and erosional sequences.

Prior to European settlement and the development of the land for grazing, the area would have been vegetated primarily by White Box - Yellow Box - Blakely's Red Gum Woodland and native grassland (Natural Temperate Grassland of the Southern Tablelands of New South Wales and the Australian Capital Territory), both listed as Endangered Ecological Communities under the *Threatened Species Conservation Act 1995*.

3 Project Description

The key components of the Stage A – Network comprise:

- a bulk water pumping station
- a sewer pumping station
- reservoirs for recycled and potable water, and
- rising and distribution mains for potable water, recycled water and sewerage.

These elements are shown in **Figure 1** and described in greater detail below.

A further key element of the overall Stage A - Network is a water recycling plant (WRP), which is not addressed as part of this LMP.

3.1 Bulk Water Main Pump Station and Access Road

3.1.1 Bulk water main pump station

The bulk water main pump station (BWPS) is to be located on a pad perched some 10m above the existing ground level, approximately 70m long by 25m wide (refer **Appendix A** – Dwg. C1/140 - 113+). With regard to visual amenity issues, key elements of the BWPS comprise (refer **Appendix B**):

- A buried off-take chamber, associated small above-ground electrical kiosk / control cabinet and two no. 5-6m light towers (each with two lights), all located within an existing cleared water main easement
- Three pre-cast concrete buildings, as follows:
  - 7.5m x 7.0m x 3-3.5m nominal height
  - 4.0m x 7.0m x 3-3.5m nominal height, and
  - 5.5m x 7.0m x 3-3.5m nominal height
- Lighting to the external face of the pump station over the personnel access door
- A transformer mounted on a 5-6m high pole, and small electrical control cabinet and pad mounted electrical distribution board.

All lighting associated with the BWPS will only be switched on when operators need to attend at night, which should only be in an emergency.

3.1.2 Access road

The BWPS is to be linked to Googong Dam Road via an access road as shown in **Appendix A**. The access road will pass through remnant bushland, and require batters of up to 7m in height. The larger batters will be located at the western end of the road. The batters to the eastern end of the road will average between 1-3m in height.

Two pipes will travel from the BWPS along the access road (refer **Appendix C** – Cross-section A), comprising a 225mm dia. water rising main travelling along the upslope side of the road as part of the Stage A works, and a 375mm dia. water main to run along the downslope side of the road to a future stage, as described below.

3.2 Googong Dam Road / Old Cooma Road

A 7.5m wide services corridor will run along Googong Dam Road, adjoining the southern road reserve boundary, and along Old Cooma Road adjoining the eastern road reserve boundary. Pipelines will be located within a 4.7m wide section of this easement (refer **Appendix C**).

3.3 Sewer Pumping Station 1

Sewer Pumping Station 1 (SPS 1) will be installed to the location shown in **Figure 1**. The majority of this infrastructure will be buried, as shown in **Appendix D**. The visible elements will comprise a:

- gravel hardstand area - 8 x 15m, within which is located two concrete covers, comprising a:
  - wet well – approximately 3.6m dia.
  - valve chamber - approximately 2.2m dia.
- service drive - 4m x 18m
- control cubicle – approximately 0.6m deep x 2.0m wide x 1.8m high
- vent pipe - approximately 0.1m dia. x 2.0m high,
- six gas 0.9 x 0.9 m access covers to each end of the three buried emergency storage tanks.

3.4 Interim Reservoir

An interim reservoir site will be constructed to the location shown in **Figure 2**. Key elements of the reservoir site will comprise (refer **Appendix E**):

- 1.10ML potable reservoir approximately 12.0m dia. and 8.5m high
- 2.16ML recycled water reservoir approximately 17.0m dia. and 8.5m high
- sealed access and loop road
- lighting to the loop road, comprising 6 pole mounted lights approximately 5m in height, which will be switched on when operators need to attend at night, which would only be in the case of an emergency
- fenced enclosure
- energy dissipator / scour protection overflow outlet.

Smaller elevated tanks may also be incorporated within the fenced enclosure.

The interim reservoir is proposed to be replaced by a permanent reservoir to a location south of the site in approximately 10 years (2022).

3.5 Staging of the Works

Pipework for the Stage A - Network will take place in four stages. The two stages that are relevant to this LMP are:

- Stage A pipework – will be installed between September 2012 and July 2013, which incorporates all of the proposed pipework with the exception of:
- Stage C pipework – built approximately between 2017 and 2018. The pipework of relevance to this LMP will comprise an additional 375mm dia. water main from the Bulk Water Pump Station to the Water Recycling Plant.

4 Site Description

4.1 Area of the Works

The landscape within which the works will take place comprises bushland, road verge and a small amount of land within the Googong Township site.

4.1.1 Bulk water main pump station and access road

The area to be developed with the BWPS and associated access road comprises a combination of:

- healthy bushland with little or no weed cover (approximately 50%), and
- disturbed bushland with moderate to high levels of weed cover, generally to drainage lines, and areas associated with an existing access track which runs close to the perimeter of the ACTEW water treatment plant.

The southern extent of the access road alignment runs across plateau / gently sloping land, while the northern extent runs across a substantially sloping, rocky hillside. Bushland canopy species are dominated by Inland Scribbly Gum (*Eucalyptus rossii*), with tree heights in the order of 8-12m and canopy spread of 6-10m.

4.1.2 Googong Dam Road

The services corridor within Googong Dam Road comprises predominantly of a cover that is described within the Weed and Pest Management Strategy (Biosis Research, 2012) as:

- 'moderately / scattered weed infestation' – with 'either predominantly native groundstorey, or a groundstorey dominated by naturalised exotic pasture species of low-moderate concern', and
- 'low or no weed infestation', located close to the intersection with Old Cooma Road, and described as Scribbly Gum / Red Box / Bundy Dry Forest, and also at the western end of works area.

4.1.2.1 Initial works

Pipe work for the Stage A works will be installed within the Googong Dam Road services corridor as described above, between September 2012 and July 2013. The road reserve of Googong Dam Road is then programmed to be subject to a landscape overlay as part of the Googong Township works (refer **Figure 2**), as described below in s.4.1.2.2.

The flora and fauna report prepared as part of the Environmental Assessment for this project (Ecowise, 2009), noted that:

> *The trenching is likely to adversely impact on some dense populations of Kangaroo Grass (Themeda australis). Populations of this species are of conservation significance in the area, largely because other native grasses and their seed banks are likely to be depleted in the modified environments of the area.*
>
> *Where practicable, trenches should be re-routed and aligned in a way that minimises impacts on Kangaroo Grass populations, which are found on both the eastern side of the Old Cooma Road and on both sides of the Googong Dam Road corridor.*

4.1.2.2 Landscape overlay

Googong Dam Road comprises an important element of the entry experience to Googong Township, and as such will be subject to detailed landscape amenity planting works as part of the Neighbourhood Stage 1A (NH1A) works, as shown in **Appendix F**. The treatment broadly comprises of:

- An exotic avenue planting of Oriental Plane Trees with,
- an adjacent discontinuous woodland planting of native tree species to the northern side of the road corridor
- a 2m wide discontinuous strip of predominantly native grasses to both edges of the carriageway, and
- a native dryland grass mix to much of the southern edge of the road corridor (over the services corridor).

The native dryland grass mix comprises provenance seed, applied using a hydroseeding and wood fibre mulching process.

The landscape overlay is not applied to all areas of the road corridor, with the current mix of native and exotic pasture being retained to the remaining areas.

The landscape overlay will be undertaken in two stages (refer **Figure 2**) as follows:

- NH1A - Sections 1 and 2 and (part of) 3 – Shortly after completion of the Stage A – Network pipework within Googong Dam Drive – September 2013 – February 2014
- NH1A - Section 3 (remaining part) – March 2014.

The landscape overlay occurs solely within the QCC local government area, ending approximately 300m west of the boundary with Palerang Council.

4.1.2.3 Bushfire management

Googong Dam Road is prescribed to be an Asset Protection Zone (APZ) for it's full 60m width (Australian Bushfire Protection Planners, April 2010 and March 2012), between the intersection with Old Cooma Road and the QCC / Palerang LGA boundary (refer **Figure 2)**. This APZ is to be managed in perpetuity by the relevant entity (initially GTPL, and then QCC). The March 2012 report specifies that the corridor is managed in accordance within the provisions for an Outer Protection Area (OPA), as follows:

> *OPA's will need to be managed such that they have a grass height of no greater than 150mm during the fire danger period (1 October to 31 March). This typically requires the ground layer to be slashed in mid to late Spring, and again in December. Depending upon the season, a 3rd slashing may be required in late February / early March.*
>
> *With regard to the provision of trees within the OPA, where these are required, the bushfire management objective is for these to be spaced such that they mimic the spacing of trees as typically found within Woodland, i.e. generally with individual trees well spaced within the landscape. However, it is also acceptable for trees to be grouped in small well spaced copses.*

The landscape overlay plan for Googong Dam Road has been prepared to be in accordance with the above prescriptions. The number of times that the corridor will need to be slashed will vary with seasonal conditions, e.g. in hot / dry years, native grass cover may be light and slow to grow.

The above requirement for slashing of the road corridor during the bushfire danger period needs to be considered within the context of recommendations in the Weed and Pest Management Strategy (*ibid.*), which states:

> *Following re-seeding of native grasses, and in areas adjacent to the clearance zone, the frequency and height of mowing should be carefully managed. A reduction in the slashing of the Googong Dam Road reserve will allow native grasses to seed and assist them to re-establish dominance over exotic species.*

4.1.3 Old Cooma Road

The services corridor adjoining Old Cooma Road comprises predominantly of a cover that is described within the Weed and Pest Management Strategy (*ibid.*) as:

- Predominantly 'moderately / scattered weed infestation' – with 'either predominatly native groundstorey, or a groundstorey dominated by naturalised exotic pasture species of low-moderate concern', and
- A relatively small area of 'high weed infestation' near the corner with Googong Dam Road, described as 'groundstorey dominated by exotic weed species, and a proportion of the biomass is usually comprised of at least one of the Weeds of National Significance.'

4.1.4 Googong Township site

Both the interim reservoir and SPS1 occupy small areas within the Googong Township site. Groundcover within the interim reservoir site is described within the Weed and Pest Management Strategy (*ibid.*) as comprising 'moderately / scattered weed infestation' as described above. The SPS1 site is not assessed by the Weed and Pest Management Strategy, but the area is located within Beltana Park, which will be subject to detail landscaping as part of the NH1A works.

4.2 Surrounding Areas

The area within which the works are to be located comprises a patchwork of cleared plateau areas, some of which contain regenerating woodland, and forest to steeper slopes and valleys. Biosis (2010 – Appendix P: Googong Township Water Cycle Project Environmental Assessment) notes that the broader study area is mapped as Secondary Grassland (higher probability of occurrence), Dry Forest and Box-Gum Woodland.

Substantial areas of the landscape have regenerating bushland, including plateau areas containing endangered ecological communities; the Googong Dam catchment area, and steep slopes / valleys.

The area includes significant numbers of rural residential developments, within which some dwellings have views towards the area of the works, as discussed below.

5 Sensitive Receptors

Sensitive receptors are for the purposes of this report defined as people who will have views to the proposed works, and include: those currently living on nearby rural residential developments; those who will live within Neighbourhood 1A of Googong New Town; and those driving along Old Cooma Road and Googong Dam Road. Refer to **Figure 3** for the location of the below listed sensitive receptors.

5.1 Rural Residential Development

5.1.1 Wickerslack Lane

Up to six rural residential developments at the eastern end of the Wickerslack Lane may have views back towards the BWPS. The viewing distance is between 2.0 and 2.2km.

Over this viewing distance, it will be possible to see large elements within the landscape, of which the key elements that may be visible would be the large, elevated pad on which the pump station and associated buildings would be located. Given the 10m height of the infrastructure pad and additional 3.0-3.5m height of buildings, it is likely that where views are available from the dwellings and grounds, the top of the pad and buildings may be visible above the tree canopy at the toe of the pad batter, if no landscape screening measures were put in place to the batter.

The other potential visual impact would be night lighting of the BWPS, but given that this will only be used in emergency, this is not a significant consideration.

5.1.2 Old Cooma Road

A rural residential development is located on Old Cooma Road opposite the Googong New Town site. The two northern-most dwellings have substantial tree cover around them, and or tree planting along the road frontage. However, residents within these two dwellings may have views to the interim reservoir, and as such, this should be a consideration of this LMP.

The other potential visual impact would be night lighting of the interim reservoir, but given that this will only be used in emergency, this is not a significant consideration.

The other rural residential properties to the south of these two dwellings are highly unlikely to have views to the Stage A works infrastructure due to screening from tree cover and landform.

5.2 Googong Township – Neighbourhoods 1A and 2

New residential development can be expected to be coming on line within Neighbourhood 1A (NH1A) from June 2013 to completion of the stage in April 2016. Some of this development will have views to both the interim reservoir and SPS 1, and as such, this should be a consideration of this LMP.

The next stage of residential development after NH1A will then be Neighbourhood 1B (NH1B), located to the east of NH1A, and to be built between October 2014 and January 2018. Given the location of NH1B to the east of NH1A, residents within this neighbourhood would not be able to see either SPS 1 or the interim reservoir, and as such this should not be a consideration of this LMP.

The next stage of residential development will be Neighbourhood 2 (NH2) which is located to the west of NH1A, and encompasses the area within which the interim reservoir will be located. The interim reservoir is proposed to be replaced by a permanent reservoir to a location south of NH2 in approximately 10 years (2022). Assuming residential development does commence in NH2 shortly after completion of NH1B (say March 2018), some of this development may be brought on line prior to replacement of the interim reservoir in 2022, and would have views towards the reservoir. As such, this should be a consideration of this LMP.

The remaining three stages of Googong Township will not be commenced until after replacement of the interim reservoir, and as such these should not be a consideration of this LMP.

5.3 Old Cooma Road

Old Cooma Road can be expected to be carry at least a moderate amount of traffic, from which motorists will have views to the interim reservoir. Many of these motorists can be expected to be either people on business (e.g. truck haulage), or local residents commuting to and from Queanbeyan and beyond for work or employment. As such, the sensitivity of these receptors to changes to the view is likely to be less than for instance people travelling along the road as part of scenic drive. However, given that the interim reservoir may constitute an adverse impact on the visual amenity of these receptors, this should be a consideration of this LMP.

5.4 Googong Dam Road

Travellers along Googong Dam Road will comprise local residents both living within the two rural residential developments to the north of Googong Dam Road, and future residents within Googong Township. Particularly with regard to the residents of Googong Township, travel could also be by bicycle, a slower form of transport that allows more time to take in the view.

Further sensitive receptors using the road will be recreational users travelling to the Googong Dam Foreshores recreational area, including visitors to the Googong Foreshores ranger station. These users are considered to potentially be more sensitive to changes in the landscape than say residents or workers who regularly commute along the road.

The key element that would be seen by both of the above sensitive receptors would be the interim reservoir. Given the fact that most of SPS 1 will be underground, and that the infrastructure that is above ground will be relatively minor in scale, it is unlikely that this would constitute a significant visual amenity impact for road users.

With regard to impacts on visual amenity, both of the above sensitive receptor groups should be a consideration of this LMP.

Further groups of visual receptors travelling along Googong Dam Road will be workers at both the ACTEW water treatment plant, and the Googong Foreshores ranger station. Both of these receptors are considered to be of relatively low sensitivity given their travel is regular and associated with work.

6 Landscape Management Issues & Strategies

6.1 Bushfire Management

6.1.1 Issue

The Googong Dam Road corridor is to be:

- managed as an APZ (refer s.4.1.2.3), and
- subject to a landscape overlay (refer s.4.1.2.2), which will need to be managed in accordance with the APZ requirements.

Additionally, is has been recommended in the Weed and Pest Management Strategy that the road corridor be managed to facilitate the natural regeneration of native grassland within the corridor (refer s.4.1.2.3). This recommendation conflicts in practice with the APZ prescriptions, which require periodic slashing of native grasses to a maximum height of 150mm throughout the bushfire danger period (1 October to 31 March). This period corresponds with the period that native grasses will set and drop seed. For most species, the native grasses will set their seed at a level well above 150mm in height. The currently proposed management regime is therefore likely to eliminate the great majority of opportunities for native grass seed set and drop between the periods of slashing. This may lead to a long-term decline in native grass numbers throughout the corridor. The regular slashing regime will potentially favour low and/or fast growing weed species which will be able to mature and set seed unhindered by the management regime.

A further issue of concern with regard to facilitating the development of a native grassland within the Googong Dam Road corridor is the method of slashing. Cut grass from conventional slashers tends to be laid down in often quite deep windrows. These slowly compost over a period of months, causing the native grasses below to die. Once the windrows have decomposed and open ground is again exposed, this is quickly colonised by weed species. Windrows when dry can also act as ignition / bushfire fuel points in bushfire settings. Additionally, conventional slashers when used low to the ground can scalp the ground, and/or damage native grasses, particularly damaging the crowns (the growing points) of tuft forming species. Many of the local native grasses are tuft forming.

Both of these processes (scalping and crown damage) are not conducive to achieving a robust native grassland outcome. A far preferable alternative is to use a different type of slashing machinery that mulches or ‘flails’ the grass rather than cutting it. The ‘mulcher’ slasher uses hammer blades attached to a central spindle (similar configuration to a rotary hoe) that ‘mulches’ the grass into small pieces. These small grass pieces are distributed evenly across the ground rather than in windrows, and decompose quickly, thereby not smothering native grasses. Mulcher slashers are also far less likely to scalp the ground.

A further consideration arising from the above is that, in order to avoid crown damage to native tuft forming grasses, they should preferably be mown to a minimum height of 100mm. This provides a very small differential between the minimum height (100mm) to facilitate a strong native grass response, and the maximum height (150mm) to facilitate a low bushfire fuel load during the bushfire danger period. In a good growing season this may equate to one months growth, and therefore require more regular slashing than would normally be expected.

Additionally to the above, the area of the landscape overlay will be managed by GTPL (initially), followed by joint GTPL/QCC management, as a step before long-term management by QCC alone. Both GTPL and QCC will therefore need to be core participants in the development of any management strategy.

From the viewpoint of:

- visual amenity for sensitive receptors;
- the intent of the corridor landscape plan to create a long-term self-sustaining native grassland corridor; and
- the need to provide a landscape approach that can rapidly and cost effectively revegetate the Stage A – Network services corridor, and later additional work for a new pipe;

a modified APZ management method is required.

6.1.2 Approach

Methods other than regular conventional slashing to a prescribed height are available for the management of fuel loads within an APZ. These could include:

- assessment of ground fuel loads, e.g. on the basis of tonnes per hectare rather than grass height, where the ground layer is only slashed when it is about to reach a critical fuel load. This would allow for potentially longer periods between slashing in for instance dry years where there is limited growth;
- nuancing of slashing times, e.g.:

  - if the slashing was put back three to four weeks from 1 October, winter active grasses would have the opportunity to drop seed, or
  - if the spring / summer season was looking to be wet (and therefore not conducive to a high bushfire risk), then the early slashing could be held back long enough to allow the summer active grasses to set and drop seed (say by December) before slashing, or
  - if the proposed possible third slashing in late February / early March (refer s. 4.1.2.3) was determined to be unnecessary, then the grass coming up after the December slashing would be able to set and drop seed;
- nuancing of slashing heights, e.g. determining appropriate times where grass could be left to grow higher within the bushfire danger period (say 200mm) which would reduce the frequency with which slashing would need to take place;
- slashing in a strip pattern (e.g. leave a 20cm strip of unslashed grasses between each pass of the slasher), that allows most of the corridor to be fuel reduced within the currently prescribed regime, while leaving thin rows of grasses to set seed and drop – this could also look quite attractive from a landscape amenity perspective, e.g. providing a husbanded agricultural / cropping feel.

Other important issues are (as discussed above) to ensure that:

- the slashing is undertaken with a 'mulcher' type slasher rather than a conventional slasher;
- the area is not scalped; and
- the grass is cut no lower than 100mm in height to avoid damage to the crowns of tuft forming native grass species.

6.1.3 Strategy

That a report be commissioned that incorporates the expertise of a bushfire management consultant, a native grassland restoration specialist, and a landscape restoration specialist, to determine a practical APZ management regime for the corridor that meets required bushfire fuel load reduction requirements, and provides a strong basis for the regeneration of a robust native grassland community and associated landscape amenity throughout the road corridor. The report shall be developed in consultation with QCC's Parks and Recreation department and GTPL.

6.2 Weed Management / Construction Measures

6.2.1 Issues

1. The Stage A – Network works have the potential to facilitate the spread of weeds, particularly within the pipeline corridor. Weeds are often unsightly; and have the potential to compromise the integrity of the proposed landscape overlay for Googong Dam Road, and the reinstatement of bushland adjoining the BWPS / access road.

2. The Weed and Pest Management Strategy (*ibid.*) (hereafter WPMS) identifies measures to be undertaken during the construction period to prevent the introduction and spread of weeds during the construction works. As previously discussed, the WPMS classifies most of the Googong Dam Road / Old Cooma Road corridor as containing 'Moderate/scattered weed infestation', noting that

   > *'these areas either have either a predominantly native groundstorey or a groundstorey dominated by naturalised exotic pasture species of low-moderate concern (such as Phalaris),* and *'…there may be scattered plants or small clumps of one Weeds of National Significance which will require targeted control.*

3. The flora and fauna report prepared for the works (Ecowise Environment, 2009) refers to the need for 'local, indigenous tree, shrub, herb, creeper and groundcover species and local provenances' for landscape rehabilitation, and that the works should include 'direct seeding of local native grasses'. The Principal Consultant for the flora and fauna report (Dr Nimal Chandrasena) confirmed that the intent of the impact amelioration measures for the work is that they should incorporate seed and plant materials of local provenance wherever possible (pers. comm., 8 August, 2012).

6.2.2 Approach

The Stage A – Network works can be divided into two broad types as follows:

4. The bulk water pump station and access road:

   a. sections of the access road that which are broadly aligned with the existing access track, or run through bushland that has high weed cover, e.g. drainage lines

   b. sections of the access road that run through native bushland / native grassland pasture that contains very low / nil weed cover, including the BWPS site

5. Googong Dam Road and Old Cooma Road verges which comprise a combination of:
    a. mixed exotic ground layer species and native pasture (say 90% of the corridor length), and
    b. substantially native pasture or bushland remnants which contain low weed cover.

6.2.2.1 Bulk water pump station and access road

The bulk water pump station access road runs through or lies adjacent to healthy native bushland, all of which adjoins a large bushland conservation area. The restoration approach will be to reinstate a dense, weed resistant cover of predominantly ground layer species from the adjoining bushland community. Plant material will be sourced from the reinstated bushland soil seed bank, and supplementary seeding and planting with a suite of native grass species using local provenance seed.

6.2.2.2 Googong Dam Road and Old Cooma Road verges

The Googong Dam Road verge is proposed to comprise an exotic avenue planting within an otherwise native open woodland / grassland setting. The Googong Township setback to Old Cooma Road is proposed to comprise a native open woodland / grassland setting (AECOM, 2010). The landscape restoration approach to the services corridor within both the Googong Dam Road and Old Cooma Road verges will be to reinstate a dense, weed resistant cover of endemic native grass species. Plant material will be sourced from the native seed bank within reinstated native pasture soil where appropriate, and seeding with a suite of native grass species using provenance seed.

6.2.3 Strategy

6.2.3.1 Soil Testing

Soil testing is to be undertaken along the length of the corridor to characterise the chemical and physical properties of the topsoil and subsoil; define depths of topsoil; and provide mitigation measures for chemically hostile sub-soils (to be undertaken prior to the backfilling of trenches and application of reinstated site topsoil).

6.2.3.2 Bushland Regenerator

A bushland regenerator is to walk the line of the proposed works construction corridor (including a pegged out centre-line) to assess the extent of the ground layer subject to weed invasion, and provide a report with mapping that identifies:

- areas where the resilience of the ground layer (or bushland in the case of the BWPS and associated access road) is sufficient to facilitate the stripping, separate stockpiling and reinstatement of the topsoil to facilitate natural regeneration of the ground layer from the existing soil seed bank
- areas where the weed cover is too dense to facilitate the above process.

6.2.3.3 Soil Management

The soil stripping and reinstatement process for all areas is to be as follows:

1. The bulk water pump station and access road:
    - stripping, separate stockpiling and reinstatement of bushland topsoil to the areas identified by the bushland regenerator as having good native cover, low weed cover, and likely to have a substantial native soil seed bank suitable for natural regeneration. Topsoil is to be reinstated to the same general area from which is it was stripped, e.g. the topsoil stripped from the area of the BWPS end of the access road is to be reinstated back to the same area
    - stripping (scalping) and separate stockpiling of the top 50-100mm depth of bushland topsoil to the areas identified by the bushland regenerator as unsuitable for reinstatement, and burial as part of the construction works, and
    - stripping, separate stockpiling and reinstatement of scalped topsoil (i.e. with the weed infested top layer removed) for landscape reinstatement using native grass seed and some planting. This material will be used only where there is insufficient stripped native seed laden topsoil available.
2. Googong Dam Road and Old Cooma Road verges
    - stripping, separate stockpiling and reinstatement of bushland topsoil to the areas identified by the bushland regenerator as having good native cover, and likely to have a substantial native soil seed bank suitable for natural regeneration. Topsoil is to be reinstated to the same general area from which is it was stripped

- stripping (scalping) and separate stockpiling of the top 50-100mm depth of topsoil to the areas identified by the bushland regenerator as unsuitable for reinstatement, and burial as part of the construction works, and
- stripping, separate stockpiling and reinstatement of scalped topsoil (i.e. with the weed infested top layer removed) for landscape reinstatement using native grass seed. This material will be used only where there is insufficient stripped native seed laden topsoil available.

3. Interim reservoir and Sewer Pump Station 1
    - Soil management for these areas is to be in accordance with that specified for the above road verges.

6.2.3.4 Landscape Restoration

Those areas of the works disturbed by the construction process are to be reinstated using a native grass mix (refer **Appendix G** for species and seeding rates), with the exception of the BWPS and associated access road, from which select species will be chosen from the seeding list by the bushland regenerator, as considered most representative of the species found within the adjoining bushland.

The seeding works are to be undertaken by a contractor with specialist expertise in the seeding and establishment of native grassland, in conjunction with a bushland regenerator. Seeding works are to be undertaken within one (1) week of the completion of discrete sections of the Stage A – Network works.

All batters associated with the BWPS pad, and batters with a slope length greater than 5m are to be planted with a cell sized planting (nominally 0.093L–Hiko cell) of Inland Scribbly Gum (*Eucalyptus rossii*) at intervals of between three and seven metres, to ensure a long-term screen to the earthworks. This will be of particular importance to the BWPS batters, to facilitate screening of the works from the Wickerslack Lane rural residential development. Additionally, the BWPS pad batters will be planted to acacias (Green Wattle [*Acacia mearnsii*] and Silver Wattle [*Acacia dealbata*]) at intervals of between five and seven metres, to provide a quick, tall cover.

All seeded and planted areas are to be managed by the bushland regenerator for a plant establishment period of 24 months, sufficient to facilitate a strong native grass and tree cover, and low weed cover. Additionally, the bushland regenerator is to manage those areas subject to native seed laden topsoil reinstatement, for native species germinating from the soil seed bank, e.g. other ground layer species, shrubs and trees.

For a description of how these works coordinate with the landscape overlay, refer to s.6.5.

6.3 Built Elements

6.3.1 Bulk water main pump station

6.3.1.1 Issue

The BWPS will be located on a large pad and incorporate three small concrete slab buildings, all as described in s.3.1.1. The facility has the potential to be seen from part of the Wickerslack Lane rural residential development as described in s.5.1.1. The BWPS will otherwise be away from the public eye, with the possible exception of local residents who may occasionally walk or cycle along the access road as a means of entering bushland nearby to Googong Township.

The key visual amenity issue relates to the potential for the BWPS and potentially parts of the associated pad to be seen from the Wickerslack Lane rural residential development.

6.3.1.2 Strategy

The batters associated with the BWPS pad are to be topsoiled with native seed laden topsoil stripped from the site, and then seeded with a native grass mix and planted to a tree species prevalent on the site, all as described in s.6.2.3. Planted tree species will include quick growing acacias and slower, long-lived eucalypts. The combination of seeding, tree planting and natural regeneration occurring both from the reinstated site topsoil and recruitment from adjoining bushland will ensure that:

- within the short term (2-5 years), the BWPS buildings and pad should be screened from view of the Wickerslack Lane rural residential development, and
- in the medium term (5-10 years), the hillside should appear to have a visually homogeneous cover of eucalypts as is currently the case.

6.3.2 Interim Reservoir

6.3.2.1 Issue

The two interim reservoirs (refer s.3.4), which are 12.0m dia. and 8.5m high, and 17.0m dia. and 8.5m high, will comprise the key built elements that may impact upon visual amenity. As described in s.5, the reservoirs will be

visible from a range of sensitive receptors including nearby rural residential development, future housing within Googong Township and vehicles travelling along Old Cooma Road and Googong Dam Road.

6.3.2.2 Strategy

The following strategy is proposed to mitigate potential visual amenity issues:

- The tanks will come painted in a dull green colour that is visually recessive within the landscape, and
- The area within a 20m off-set from the reservoir enclosure will be planted to stands of 5-11 quick growing acacias (Green Wattle [*Acacia mearnsii*] and Silver Wattle [*Acacia dealbata*]) at intervals of between three and five metres, to provide a quick, tall cover. The stands of trees will be located such that they provide a significant level of screening from each sensitive receptor, while still also partially revealing the reservoirs.

6.3.3 Sewer Pumping Station 1

6.3.3.1 Issue

The majority of Sewer Pumping Station 1 is buried as shown in **Appendix D**, and described in s.3.3. All of those parts of the facility that can be seen are located at ground level, with the exception of a small control cubicle and vent pipe.

6.3.3.2 Strategy

A detailed landscape integration approach has been prepared for the facility, to incorporate it as a visually integrated component of Beltana Park. The facility is subject to landscape planting measures incorporating dryland grass planting and a series of meadow mixes. Refer **Appendix H**.

6.4 Staging of Pipework

6.4.1 Issue

As described in s.3.5, a second stage of pipework will be installed between 2017 and 2018. A 375mm dia. water main will run between the BWPS and the WRP. From where the pipe leaves the BWPS to where the access road joins Googong Dam Road, the pipe will travel along the downslope shoulder of the road, and then travel within the designated services corridor along Googong Dam Road. This will disturb previously undertaken landscape restoration work.

6.4.2 Strategy

This work is to be undertaken broadly in accordance with s.6.2.3 as follows:

- Soil testing and amelioration as per s.6.2.3.1
- Bushland regenerator to be used as per s.6.2.3.2
- Topsoil to be managed in accordance with s.6.2.3.3 (Item 2 – 'Googong Dam Road and Old Cooma Road verges'), and
- Landscape restoration in accordance with s.6.2.3.4.

Post-Plant Establishment Management is to be undertaken in accordance with s.7.

6.5 Stage A – Network / Landscape Overlay Coordination

6.5.1 Issue

The Stage A – Network pipework will take place between September 2012 and July 2013. The landscape overlay works are then programmed to take place to Googong Dam Road quickly upon completion of these works as described in s.4.1.2.2, and as below:

- NH1A - Sections 1 and 2 and (part of) 3 – Shortly after completion of the Stage A – Network pipework within Googong Dam Drive – September 2013 – February 2014
- NH1A - Section 3 (remaining part) – March 2014.

The contractor undertaking the Stage A – Network pipework is responsible for plant establishment of the landscape restoration works for a period of 24 months after construction, i.e. for all of the Stage A – Network works undertaken between the BWPS and the interim reservoirs. However, as can be seen from the above dates, for that section of Googong Dam Road that will be subject to the landscape overlay, the overlay work will be undertaken shortly after completion of construction of the Stage A – Network pipework, and will include the pipework corridor. Therefore, there will be an overlap of responsibility within the area of the landscape overlay, between:

- the Stage A – Network contractor responsible for the plant establishment (24 months) of the pipeline corridor landscape restoration works, and
- the landscape overlay contractor.

6.5.2 Strategy

For that part of the Stage A – Network works that fall within the area of the landscape overlay, the Stage A – Network contractor will be responsible for the pipeline corridor landscape restoration works until commencement of the landscape overlay works, at which time this work (within the area of the landscape overlay) will be handed over to the Landscape Overlay Contractor.

6.6 Conservation of High Value Native Grassland

6.6.1 Issue

As discussed in s. 4.1.2.1, trenching for the pipeline is likely to adversely impact on some dense populations of Kangaroo Grass (*Themeda australis*), and the recommendation was made in the Environmental Assessment for this project (Ecowise, 2009), that where practicable, trenches should be re-routed and aligned in a way that minimises impacts on Kangaroo Grass populations, which are found on both the eastern side of the Old Cooma Road and on both sides of the Googong Dam Road corridor.

In this regard, the WPMS has identified a 200m long strip of 'Low of No Weed Infestation' on the pipeline route, on Googong Dam Road near the corner of Old Cooma Road (refer **Appendix I**). This area also contains a substantial stand of endemic trees. In effect, the desired long-term landscape for Googong Dam Road is already in place for this location.

6.6.2 Strategy

Where practicable, re-route trenches around the above noted bushland / grassland remnant, and any other substantial remnants (including dense populations of Kangaroo Grass or mature trees), as identified by the bushland regenerator. This work to be undertaken by the bushland regenerator when walking the line of the works (refer s.6.2.3.2), and incorporated in the same reporting.

7 On-going Management / Maintenance

7.1 Plant Establishment Period

7.1.1 Issue

The Stage A – Network construction phase works described above (s.6.2) will include a 24 month plant establishment period (PEP). The Stage A – Network contractor (hereafter the 'Network Contractor') will be responsible for this work. During this time, the grass seeded areas will need to be managed to ensure achievement of the required outcome for a dense, weed resistant cover of endemic native grass species, with a low incidence of weeds.

7.1.2 Approach

Weed management during the PEP by the Network Contractor will comprise of two types as follows:

1. Works between:
    - the BWPS and Googong Dam Road at a point approximately 300m west of the QCC / Palerang LGA boundary, and
    - Old Cooma Road at the intersection with Googong Dam Road and the interim reservoir,

    which comprise of the soil management and landscape restoration works described in s.6.2 above, and is hereafter referred to as the Bushland Restoration Area (BRA), and will be subject to a 24 month PEP, and
2. Works on Googong Dam Road from the intersection with Old Cooma Road, to a point ending approximately 300m west of the boundary with Palerang Council, which will upon completion of the Stage – Network works be subject to the staged provision of the landscape overlay, and is hereafter referred to as the Landscape Overlay Area (LOA). This area is also specified to be subject to a 24 month PEP, but as described in s.6.5, the duration of the PEP will be reduced, as this portion of the Stage A – Network works will be handed over to the Landscape Overlay Contractor upon commencement of the overlay works.

7.1.3 Strategy

7.1.3.1 Bushland restoration area

The Network Contractor will be responsible for management of the BRA works to facilitate native grass establishment within the seeded areas, to achieve a native plant cover of greater than 70%, with minimal weed cover of less than 20% for seasonal / temporary weeds. For perennial weeds that present a long-term threat to the integrity of the native grass population, e.g. African Lovegrass, Rhodes Grass and Phalaris, the Network Contractor will carefully monitor the progression of these weeds, and keep them to very minor numbers, with the objective of achieving eradication. This work is to be undertaken by a native grassland restoration specialist, in conjunction with a bushland regenerator (refer s.6.2.3.4).

7.1.3.2 Landscape overlay area

The Network Contractor will be responsible for management of the BRA works as per the s.7.1.3.1, until handover to the Landscape Overlay Contractor.

7.1.3.3 Sewer Pumping Station 1

SPS 1 will be seeded and stabilised with a sterile cover crop until handover to GTPL for incorporation into the Googong NH1A Beltana Park works, after which it will be separately managed in conjunction with the rest of the park. The surface elements of the pumping station will be integrated with landscape planting as part of an overall park setting.

7.2 Post-Plant Establishment Period

7.2.1 Issue

7.2.1.1 Bushland Restoration Area

Weed management of the BRA will cease upon completion of the PEP, other than that typically undertaken by QCC in the normal course of road corridor management, and that undertaken by ACTEW in the normal course facility management.

7.2.1.2 Googong Dam Road

Given the role of Googong Dam Road as an APZ (part of which will also be subject to a landscape overlay), this area will require specific ongoing / long-term management upon completion of the PEP.

7.2.1.3 Sewer Pumping Station 1

SPS1 will have been integrated with landscape planting into Beltana Park, and will be managed by GTPL.

7.2.2 Strategy

As described above, the LOA will be installed in stages (refer s.4.1.2.2). Upon completion of a 24 month PEP, the LOA will have attained a strong native grass and tree cover, with a very low incidence of weeds. The LOA will then be managed initially by GTPL for a period of two years, followed by joint GTPL/QCC management (for a period to be agreed by the parties), and then long-term management by QCC. The contractor responsible for undertaking this work is hereafter referred to as the Landscape Maintenance Contractor.

The Landscape Maintenance Contractor will be responsible for maintaining the integrity of the LOA. The LOA will maintain the area in accordance with the integrated method described with s.6.1. Work will include management of all landscape elements including:

- Slashing of the native grassland
- Management of the formal 2m wide strips of native grasses to both sides of the road four (4) times per annum for weeds, and to promote the natural regeneration of self-seeding native grasses. Where substantial gaps (>2m) open up in the strip planting within five years of completion of the PEP, these areas will be re-planted with cell-size grasses at a rate of 10 per sq.m.
- The informal grassland cover areas will be managed as per the integrated method to be agreed (refer s.6.1), which will facilitate both bushfire fuel load reduction and the capacity for the native ground layer to naturally regenerate and successfully compete with the existing exotic species.

7.3 Bushfire Management

7.3.1.1 Issue

Ongoing management of the Googong Dam Road needs to meet APZ requirements as described above in s.6.1. The Landscape Maintenance Contractor (and / or any other entities specified as part of the integrated management process) will be required to ensure that the landscape meets the APZ requirements during the bushfire danger period.

7.3.1.2 Strategy

It is recommended that the entity responsible for the maintenance / management of QCC section of Googong Dam Road periodically facilitate an inspection by a Bushfire Management Specialist, in conjunction with the Landscape Maintenance Contractor ensure that the area continues to meet the requirements of a ‘managed’ landscape. This would be undertaken shortly prior to the beginning of the bushfire season, providing the Landscape Maintenance Contractor with sufficient time to undertake any remediation works before the onset of the bushfire season. Inspections would be undertaken on an annual basis, or as mutually agreed with the BMS. This issue would be addressed as part of the integrated management design process.

7.4 Adaptive Landscape

7.4.1 Issue

The landscape restoration and landscape overlay works have been designed to facilitate natural regeneration of native grass species, such that these areas are self-replenishing, and evolve over time with regard to plant composition and percentage cover of species mixes in response to changing site conditions. This has been facilitated by:

- Planting a high diversity of grass species within the LOA, thereby maximising the potential for these areas to be fully vegetated, with different species being able to occupy different niches as they become available
- Designing a predominantly informal planting layout, thereby facilitating changes in species percentage cover and mix, such that when environmental conditions change, species can take advantage of the changed conditions and increase in coverage, while others may reduce in coverage or migrate to a more favourable niche.

7.4.2 Strategy

The landscape is to be managed in concert with the above mechanisms. This approach will require the Landscape Overlay Contractor to observe where native plants are seeding and facilitate the infill of small bare areas as they become available with native germinants or rhizomatous colonisation from nearby suitable species. Where these small bare areas do not show signs of natural regeneration of suitable native species within three (3) months of a seeding event, the Landscape Overlay Contractor is to assess the location and determine whether another species from the specified planting mix will better occupy that niche, and replant with the most appropriate species.

This approach aims to maintain species diversity, and maintain and enhance the visual integrity of the designed landscape over time.

7.5 Litter Management

7.5.1.1 Issue

Litter has the potential to severely impact the visual amenity of the landscape overlay works in particular.

7.5.1.2 Strategy

Regular inspections for litter, with:

- Plant Establishment Period - All litter to be removed from the LOA at each site inspection, during the engagement of the Landscape Overlay Contractor
- Post-Plant Establishment Period – All litter to be removed from the LOA at each site inspection by the Landscape Maintenance Contractor during the period of GTPL responsibility.

7.6 Management Responsibilities / LMP Implementation

7.6.1 Issue

The construction works covered by this LMP are to be undertaken by two separate contractors, in areas under the control of GTPL, GTPL/QCC jointly for an interim period after completion of the PEP, QCC, and ACTEW. Management responsibility for different areas of the works, and different periods of management, need to be clearly defined.

7.6.2 Approach

Responsibility for the works, and implementation of this LMP will be as per the below table.

7.6.2.1 Construction Phase

Area	Contractor	Implementation Responsibility
Stage A – Network (s.3)	Network Contractor	GTPL

7.6.2.2 Plant Establishment Period

Area	Contractor	Implementation Responsibility
Bushland Restoration Area (s.7.1.2)	Network Contractor	GTPL
Landscape Overlay Area (s.7.1.2)	Network Contractor (until handover to Landscape Overlay Contractor)	GTPL
	Landscape Overlay Contractor	GTPL
Sewer Pumping Station 1 (s.7.1.3.3)	Network Contractor (until handover to GTPL Landscape Contractor)	GTPL

7.6.2.3 Post-Plant Establishment Management

Area	Type / Contractor	Implementation Responsibility
Old Cooma Road Corridor	Management of road verge in accordance with standard QCC procedures	QCC
Landscape Overlay Area (s.7.1.2) and remaining section of Googong Dam	Development of a long-term integrated management strategy (s.6.1.3)[1].	GTPL

[1] Note: The LMP envisages that external contractors may be involved in the long-term management of the Googong Dam Road corridor, e.g. a bushfire management consultant to provide periodic assessments with regard to fuel loads, and a bush regenerator to provide maintenance management of the native grassland community. However, the need for, or extent of any requirement for the use of external contractors as part of the long-term management of the corridor will be determined as part of the development of the long-term integrated management strategy for Googong Dam Road.

Road within QCC LGA		
	2 years post-PEP - Landscape Maintenance Contractor in accordance with long-term integrated management strategy	GTPL
	Joint interim management - Landscape Maintenance Contractor in accordance with long-term integrated management strategy	GTPL / QCC
	Long-term management in accordance with long-term integrated management strategy	QCC
Bulk Water Main Pump Station / Access Road and Googong Dam Road to QCC LGA boundary	Management in accordance with standard ACTEW facility procedures	ACTEW

8 Monitoring and Reporting

8.1 Monitoring – Plant Establishment Period

8.1.1.1 Network Contractor

The Bush Regenerator will prepare six (6) monthly reporting (on behalf of the Network Contractor) during the Plant Establishment Period for GTPL. The reporting will:

- address weed management issues, including with regard to:
  - management of native grass germinants to ensure these are not choked out by weeds in the early stages of the process, and
  - ensuring establishing native grasses are not outcompeted by perennial non-native grasses, and that these are managed as described in s.7.1.3.1
  - identification of percentage cover of native grasses to weeds
- provide a summary of problems identified during the last reporting period, remedial actions and outcomes
- identify current problems that may impact upon the success of the restoration process, and recommendations for mitigation
- provide an assessment of the trajectory of the native grass restoration process based upon current management regime, and likelihood of achieving the required outcome
- provide a photographic record of the progress of the restoration process from fixed viewpoints as described below in s.8.3, as well as photographs as required to illustrate other issues as per above
- provide a list of activities that will be required within the next 6 months (if a specific activity is not part of routine maintenance).

8.1.1.2 Landscape Overlay Contractor

The Landscape Overlay Contractor will prepare four (4) monthly reporting during the Plant Establishment Period (12 months) for GTPL. The reporting will address all of the issues listed in s.8.1.1.1.

8.2 Monitoring – Post-Plant Establishment Period

Post-PEP monitoring will fall into two categories as follows:

8.2.1.1 Landscape Overlay Area

Monitoring of the LOA will be undertaken in spring and summer for the first two years post PEP.

Monitoring will be undertaken by a Bush Regenerator and comprise:

- an assessment of the resilience of the reinstated plant associations, and any observed trends re. increase or decrease in native plant cover
- listing and broad mapping of locations and abundance of perennial weeds that present a long-term threat to the integrity of the native grass population (refer s.7.1.3.1)
- listing of any other issues that are impacting upon the resilience of the native plant associations,
- an assessment of the Googong Dam Road corridor grassland APZ fuel load reduction regime, any trends with regard to increase / decrease in native plant cover, and recommendations for changes in the fuel management method (if required)
- provide a photographic record of the progress of the restoration process from fixed viewpoints as described below in s.8.3, as well as photographs as required to illustrate other issues as per above, and
- providing recommendations for additional weed control, planting, seeding or other remedial measures as required.

The Bush Regenerator will prepare reporting after each inspection, and be engaged by / report to GTPL.

8.2.1.2 Landscape Maintenance Monitoring

Landscape maintenance monitoring within the LOA will be undertaken by the Landscape Maintenance Contractor on a six monthly basis for the first two years post-PEP. The Landscape Maintenance Contractor will review the reporting by the Bush Regenerator, and incorporate report management findings into their ongoing landscape management program. Landscape monitoring will address landscape amenity issues, particularly with regard to the presentation of the landscape overlay works, including issues such as the need for:

- Weed management
- Remedial seeding or planting to areas of failed plant material
- Slashing regime for grassland areas

- Maintenance works on the exotic avenue planting, such as under-pruning or removal of broken limbs, and
- provide a photographic record of the progress of the restoration process from fixed viewpoints as described below in s.8.3, as well as photographs as required to illustrate other issues as per above.

The Landscape Maintenance Contractor will prepare six (6) monthly reporting, and be engaged by / report to GTPL.

8.3 Photographic Monitoring

Long-term photographic monitoring points are to be defined prior to commencement of the landscape management works. Colour photographs will be taken at each monitoring point to provide a long term record of change.

9 Action Plan

No.	Issue	Action	Location	Timing	Performance Criteria	Responsibility[2]
1	Bushfire Management	Preparation of long-term integrated management strategy	s.6.1	By completion of the Stage A – Network construction process	Report is completed on time	GTPL (*Bushfire Management Consultant / Native Grassland Restoration Specialist / Landscape Restoration Specialist*)
2a	Weed Management / Construction Measures	Soil testing	s.6.2.3.1	Soil testing is undertaken along the length of the line	Soil testing results are available to the Network Contractor prior to the backfilling of trenches and placement of topsoil	Network Contractor (*Soil Scientist*)
2b		Bushland regenerator to walk the line of the works / report	s.6.2.3.2 s.6.6	As early as practicable prior to commencement of construction	Bushland regenerator's reporting is completed and findings actioned prior to construction	Network Contractor (*Bushland Regenerator*)
2c		Soil management	s.6.2.3.3	After completion / actioning of findings from the bushland regenerator's report	Soil stripping does not commence until bushland regenerator's reporting is completed and findings actioned	Network Contractor
2d		Landscape restoration	s.6.2.3.4 s.6.3.1.2 s.6.3.2.2	As works become ready for landscape restoration	Works are undertaken by the specialist Seeding works are undertaken by the required native grassland restoration specialist, in conjunction with a bushland regenerator	Network Contractor (*Native Grassland Restoration Specialist / Bushland Regenerator*)
3	Plant Establishment Period	Implement PEP strategy	s.7.1.3	During the PEP	All requirements are implemented	Network Contractor
4	Post-Plant Establishment Period	Implement Post-PEP strategy	s.7.2.2	For 2 years post-PEP	All requirements are implemented	GTPL (*Landscape Maintenance Contractor*)
5	Adaptive Landscape	Manage the landscape for natural regeneration in accordance with s.7.2	s.7.4.2	When natural regeneration / colonisation mechanisms are occurring – Spring / Summer / Autumn	Full suite of specified plant species present / No large gaps where plant cover is specified / No gaps in plant cover that are expected to take longer than 3 months for natural regeneration by neighbouring plants	GTPL (*Landscape Overlay Maintenance Contractor / Landscape Maintenance Contractor*)

[2] Roles in brackets and italics list contractors / consultants who undertake the works.

No.	Issue	Action	Location	Timing	Performance Criteria	Responsibility[2]
6	Litter Management	All litter to be removed	s.7.5.1.2	At each site inspection	No litter to be present after each inspection	GTPL (*Landscape Overlay Contractor / Landscape Maintenance Contractor*)
7a	Monitoring – Plant Establishment Period (Network Stage - A)	Prepare 6 monthly reporting	s.8.1.1.1	During the Plant Establishment Period (24 months)	All reporting undertaken and actions completed	Network Contractor (*Bushland Regenerator*)
7b	Monitoring – Plant Establishment Period (Landscape Overlay)	Prepare 4 monthly reporting	s.8.1.1.2	During the Plant Establishment Period (12 months)	All reporting undertaken and actions completed	Landscape Overlay Contractor
7c(i)	Monitoring – Post-Plant Establishment Period (Landscape Overlay Area)	Prepare reports in spring and summer	s.8.2.1.1	First 2 years post-PEP	All reporting undertaken and actions completed	GTPL (*Bushland Regenerator*)
7c(ii)		Prepare 6 monthly reporting	s.8.2.1.2	First 2 years post-PEP	All reporting undertaken and actions completed	GTPL (*Landscape Maintenance Contractor*)

10 References

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Figures

Figures

1. Figure 1: Project Layout
2. Figure 2: Landscape Overlay to Googong Dam Road
3. Figure 3: Sensitive Receptors