

# Reserve Activity Plan 2013 – 2017

## For Thoona Bushland Reserve, Geilston Bay



November 2013



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*Cover Photo: Bennett's wallaby in Thoona Bushland Reserve (A. Welling)*

## **1. BACKGROUND**

The following Reserve Activity Plan (RAP) has been developed to manage environmental and recreational values of the Thoona Bushland Reserve and Lindhill Bushland Reserve in Geilston Bay. The plan has been developed in response to community and council concerns regarding the current condition and ongoing management of the reserve.

The main issues affecting the reserves are natural values management, weed management, fire management, recreation opportunities and limited public access.

### **1.1. REVIEW OF RESERVE ACTIVITY PLAN**

This plan has been prepared for a period of 5 years from 2013 - 2017. An informal review of actions and priorities should be undertaken annually and a complete review of the plan undertaken at the end of the 5 year period.

## **2. SITE DESCRIPTION**

The Thoona Bushland Reserve Activity Plan (RAP) relates to two parcels of council land to the west of Pilchers Hill in Geilston Bay.

- The Thoona Bushland Reserve is a 3.6ha linear reserve that contains a small ephemeral tributary of Faggs Gully Creek and an associated steep south-west facing slope (Figure 1). The reserve extends for a length of approximately 580m along the tributary from the end of Lindhill Avenue in a north-west direction towards Fairfield Street. The reserve contains intact woodland vegetation across the slope and disturbed/exotic grassland vegetation with a native tree overstorey along the riparian strip. The site contains skeletal soils over a pebbly mudstone substrate. There is currently limited recreational use of the reserve due to access and connectivity issues however some local residents utilise the reserve for walking.
- The Lindhill Bushland Reserve is approximately 1.4ha in size and is located behind residential lots to the south of Lindhill Avenue (Figure 1). The reserve occupies a north facing slope which extends up to a small ridgeline which overlooks Hobart to the south. Intact woodland vegetation covers the entire site varying between woodland on mudstone soils at the eastern side of the reserve to woodland on sandstone substrate across the centre and western side of the reserve. Due to restricted access, lack of connectivity to other public land and absence of any tracks the reserve currently has limited recreational value for local residents.

Both reserves are isolated from other bushland remnants by residential lots (Figure 1), although there is some connectivity between the reserves and the large Pilchers Hill Reserve via intact vegetation on private land (Figure 4).

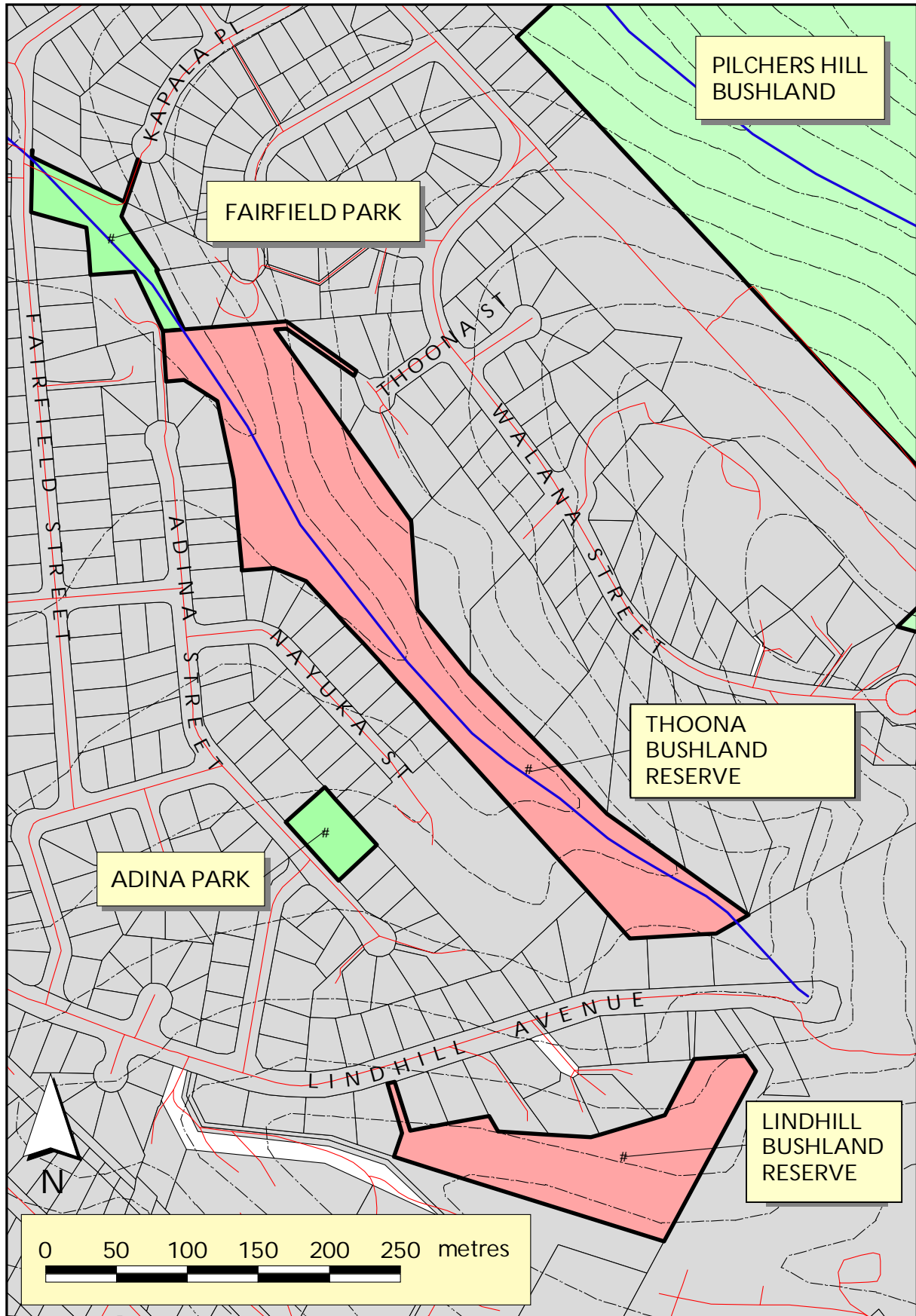


Figure 1 – Location Plan for Thoona Bushland Reserve and Lindhill Bushland Reserve

### 3. NATURAL VALUES OF SITE

#### 3.1. NATIVE VEGETATION COMMUNITIES

There are two (2) native vegetation communities and one disturbed community occurring within the two reserves. The Thoona Street Reserve contains black peppermint woodland across the slope and cleared/disturbed land along the creekline and western side of the creekline (Figure 3). The Lindhill Bushland Reserve contains black peppermint woodland and white gum woodland (Figure 3). Descriptions of these communities and species lists for each reserve are provided in Appendices 1 & 2.

The native vegetation communities in both reserves are in relatively good condition with only scattered weed infestations present. The cleared land along the creekline in the Thoona Bushland Reserve is in a more degraded state as it contains a wide range of exotic species.

#### 3.2. NATIVE FLORA VALUES

There were 89 native plant species and 69 exotic or introduced species recorded in the Thoona Bushland Reserve; and 60 native plant species and 22 exotic or introduced species recorded in the Lindhill Bushland Reserve. A significant number of species are common to both reserves (refer to species lists in Appendix 2).

Two (2) threatened flora species were recorded in the Thoona Bushland Reserve.

Rockplate buttercup (*Ranunculus sessiliflorus* var. *sessiliflorus*) – Listed as rare under *Threatened Species Protection Act (1995)*.

*Rockplate buttercup is a small, rare annual herb. It grows in dry grasslands and dry grassy woodlands. The plant has small trifoliate leaves with prominent hairs and produces very small, yellow-green flowers.*

*A number of specimens were recorded across the upper slope of the Thoona Bushland Reserve. It was not recorded within the Lindhill Bushland Reserve.*



Figure 2 – Photos of rockplate buttercup and tall wallabygrass

Tall wallabygrass (*Rytidosperma indutum*) – Listed as rare under *Threatened Species Protection Act (1995)*.

*Tall wallabygrass is an erect, tufted perennial grass that grows up to 120 cm tall that grows on mudstone and dolerite in open, dry woodlands. The tightly in-rolled leaf blades are up to 25 cm long, with the flowering stem between 7-15 cm long. The spikelets are 4-5 flowered, straw coloured or tinged purple.*

*This species was scattered across the upper slope of the Thoona Bushland Reserve. It was not recorded within the Lindhill Bushland Reserve.*

A further five (5) threatened flora species have been recorded within 500m of the site (as per Natural Values Atlas Database (DPIPWE)); however none of these species were present in the reserves (refer to Appendix 3 for list of these species).

### **3.3. NATIVE FAUNA VALUES**

The small reserves provide habitat for a range of native fauna species including mammals such as wallabies and echidnas, woodland bird species, reptile species and invertebrates including butterflies.

Both reserves are partially bordered by residential lots which limits the connectivity of the reserves to each other and to other larger intact areas of native vegetation such as the Pilchers Hill Bushland Reserve (Figures 1 & 4). Larger lots to the south east of the reserves do however contain some intact native vegetation which allows for limited movement of fauna species in and out of the reserves and as such the retention of this bushland is important for the future viability of the reserves.

#### **Mammals**

Resident populations of bennett's wallabies occur in the both reserves, whilst local residents have also reported seeing long nosed potoroos, pademelons and echidnas in the reserves. Brush-tailed possums are likely to be present and bettongs and quolls may also utilise the reserves although they are unlikely to reside there due to lack of suitable shelter habitat (tussock grasses and hollow fallen logs).

The threatened eastern barred bandicoot has been recorded within 2km of the reserves and this species is known to persist in urban areas fringed by vegetation. The reserves provides some habitat for bandicoots species which may be enhanced with suitable management actions that provide additional shelter habitat along the creekline in the Thoona Bushland Reserve in particular.

#### **Reptiles**

The reserves provide habitat for a number of native reptile species including the metallic skink, blue tongue lizard and the mountain dragon. Rocky outcrops and leaf litter are important habitat elements for reptile species and these elements need to be maintained and enhanced.

The mountain dragon (Tasmania's only dragon lizard) was once common in bushland around Hobart and suburbs however vegetation clearance and predation by cats and kookaburras have reduced their numbers significantly. Local residents did not report seeing snakes in the reserves or originating from the reserves.

#### **Birds**

The bird fauna in the Thoona Bushland Reserve was assessed during a bird survey carried out by Alan Fletcher from Birdlife Tasmania. He reported that the bird fauna was limited due the '*lack of major understorey and low levels of leaf litter are likely causes of the limited list of birds recorded*'. He also reported that '*there appears to be little movement of birds into the area from the Meehan Range to the east*'. A list of species recorded in the reserve is contained in Appendix 4. The bird



survey, whilst not representing a comprehensive list of birds occurring in the reserves, provides a basis for management actions which aim to enhance bird habitat and increase diversity.

Isolated blue gums and black gums occur along the creekline and in the top corner of the Thoona Bushland Reserve. These trees provide some foraging habitat for the endangered swift parrot (*Lathamus discolor*) which migrates to Tasmania each year to breed. The habitat provided to this species in the reserves can be increased through revegetation using blue gums and black gums.

A list of threatened species that have been recorded within 5km of the reserve and a comment on the likelihood of them occurring in the reserve is provided in Appendix 3.



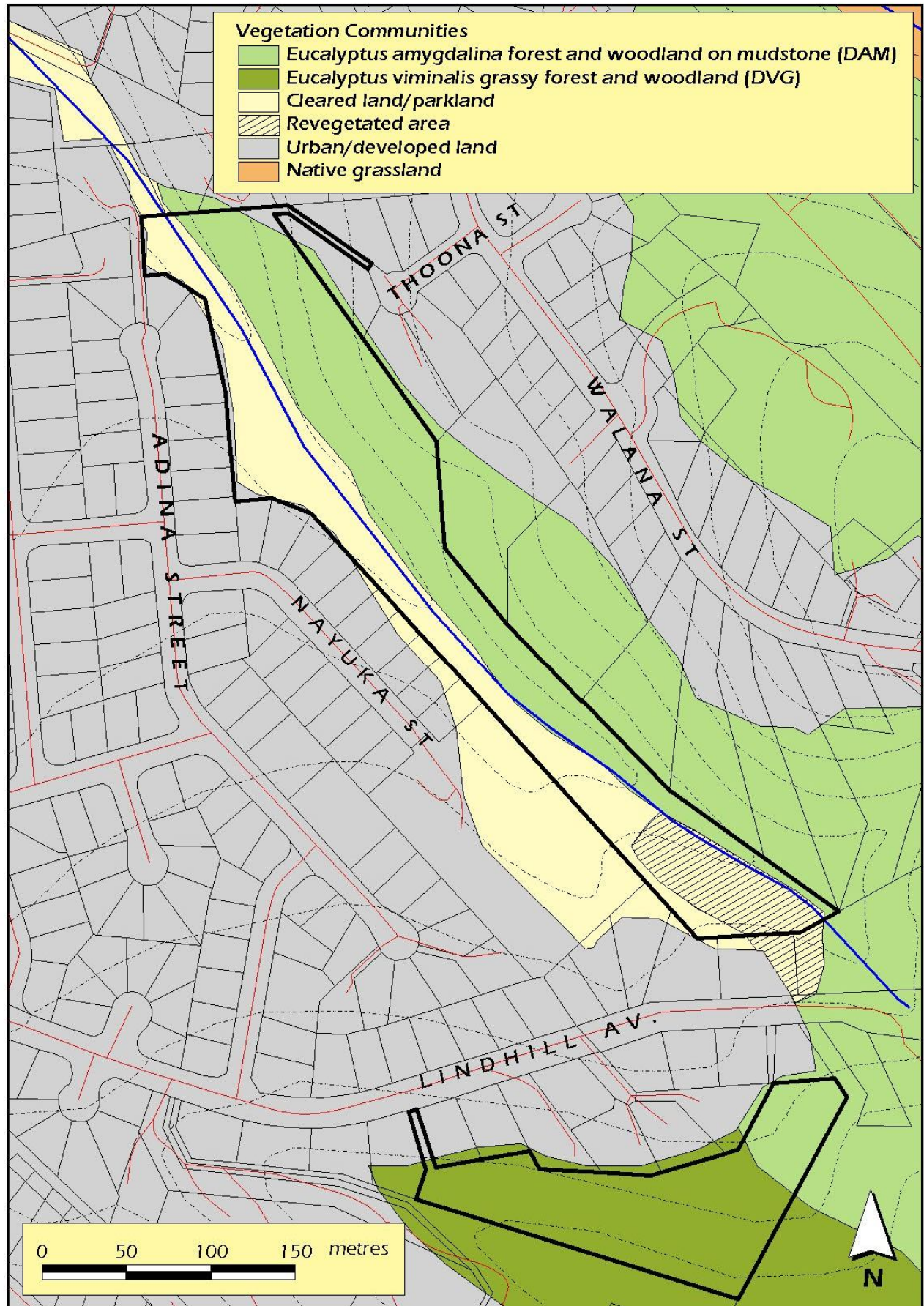


Figure 3 – Vegetation communities occurring in the reserves.

### **3.4. GEOCONSERVATION VALUES**

There are two (2) listed geoconservation sites within 1km of the reserves. Cenozoic plant macrofossils and marsupial fossils have been recorded at sites in Geilston Bay. There are no known geoconservation sites within the reserves.

### **3.5. CULTURAL HERITAGE VALUES**

The original owners and occupiers of the land where the reserves are located are the Mumiriminer people of the Oyster Bay Nation. There are no known artifact sites within the reserves however no specific aboriginal heritage assessment has been undertaken.

## **4. COMMUNITY CONSULTATION**

As part of the development of the Reserve Activity Plan for the Thoona Bushland Reserve a community 'walk and talk' event was held in the reserve in November 2012 facilitated by Clarence City Council. Public feedback forms were also posted out to approximately 600 residents in the local area prior to the development of the first draft.

The 'Draft Thoona Bushland Reserve Activity Plan' was also released for community comment.

The initial feedback received was considered during the development of the draft RAP and feedback received during the community comment phase will be considered in the finalisation of the plan.

A summary of issues raised during the community consultation phase are provided in Appendix 5.

## **5. MANAGEMENT ISSUES AND THREATS**

As a result of the on site surveys and public consultation process the following management issues have been identified for the reserves. The management issues are divided into those relating to natural values and those relating to public amenity. All management actions are also summarised in Table 1, Section 6.

### **Natural Values Management Issues**

- rehabilitation of degraded areas;
- fire management;
- weed management;
- management of fauna habitat; and
- erosion control and stormwater management.

### **Public Amenity Management Issues**

- access to reserve;
- walking tracks;
- fire management;
- reserve signage; and
- formation of a Bushcare Group



### 5.1. REHABILITATION OF DEGRADED AREAS

There are number of degraded areas within the reserves that have been previously cleared of native vegetation, contain dense weed infestations or have soil disturbance/rubbish and debris associated with adjoining land uses. The strategic rehabilitation of these areas to restore the native vegetation and provide additional fauna habitat can be achieved by encouraging natural regeneration or by actively revegetating areas. Some earth works and debris removal will also be required.

As a general rule encouraging natural regeneration is a more successful and cost effective method of regenerating an area than revegetation as the regenerating plants are more suitable to the local environmental than nursery grown species. Plantings are also more difficult to establish and tend to be targeted by browsing mammals more than naturally regenerating plants.

Three (3) rehabilitation zones have been identified within the Thoona Bushland Reserve (refer Figure 5);

- Zone1 – Cleared land on the western side of the creekline
  - *R1 - strategic revegetation to create additional habitat – some parkland areas to be maintained and cleared strip along the back of residences in Adina Street and Nayuka Street to be retained for fire protection.*
  - *R2 - bag and stake native seedlings to protect from browsing mammals and ensure they are not slashed.*
- Zone 2 – Boundary of reserve adjoining residences at end of Takone Street (Figure 4 & 5).
  - *R3 - determine accurate location of boundary prior to rehabilitation works.*
  - *R4 - remove weeds and debris.*
  - *R5 - consolidate fallen timber – some logs to be retained to provide habitat for native fauna and some to be removed to reduce fire risk.*
  - *R6 - undertake active revegetation of degraded area following debris removal.*



Figure 4 – Photos of degraded area of reserve off the end of Takone Street.



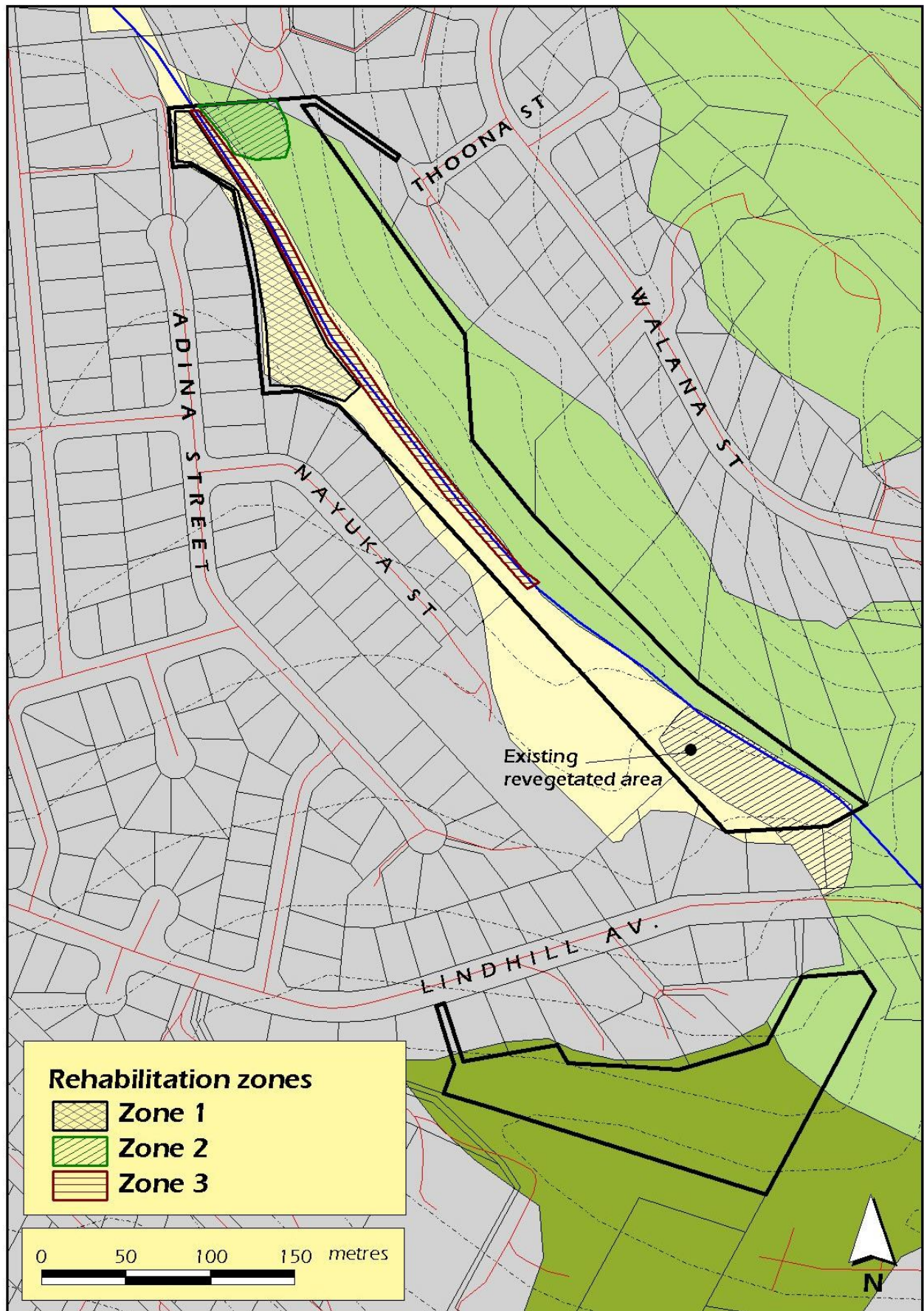


Figure 5 – Location of rehabilitation zones within Thoona Bushland Reserve.

- Zone 3 – Along the creekline in Thoona Bushland Reserve
  - *R7 - revegetation after removal of weed species.*
  - *R7 - Revegetation along creek banks following erosion control (refer to Section 5.5) to stabilise banks and reduce flow rates.*
  - *R2 - Bag and stake native seedlings to protect from browsing mammals and ensure they are not slashed.*
- Plantings to replace mainland wattles and willows
  - *R8 - Mainland wattle species and willows removed from reserve adjacent to residences off Nayuka Street may be replaced with local native species.*
- Lindhill Reserve where dense boneseed infestation removed.
  - *R9 - Undertake active revegetation if no natural regeneration occurs within 2 years of weed clearance. Maintain cleared strip along the rear of residences in Lindhill Avenue for bushfire protection.*

Notes regarding revegetation techniques including site preparation, species selection and plant protection and a suggested species list are provided in Appendix 6.

## 5.2. FIRE MANAGEMENT

As the reserves are largely surrounded by residential properties, uncontrolled fire within the vegetation poses a threat to the natural values and processes within the reserve and the assets surrounding the reserve. Fire management was identified as a significant issues for a number of residents around the reserves (refer to Appendix 5).

The development of a fire management plan is therefore recommended. The plan should be developed as a priority to allow preparations for the 2013/14 summer.

- *FIRE1 – Develop Fire Management Plan*

Key considerations for the fire management plan include the following

- management of the ecological values of the reserves such as maintaining some leaf litter and fallen logs to maintain habitat for reptiles and invertebrates and undertaking mosaic burns to stimulate new growth.
- minimising fuel loads to reduce risks to adjoining residences.
- fire management plan should be developed in conjunction with neighbouring properties that contain native vegetation (such as properties on lower side of Walana Street and at the end of Lindhill Avenue).
- maintaining fire breaks along the rear of residences.

### 5.3. WEED MANAGEMENT

The Thoona Avenue Bushland Reserve contains a high number of exotic species with approximately 40% of all plants recorded introduced. A significant number of the exotic species occur along the creekline which is degraded and has been extensively disturbed; whilst the woodland slope is relatively weed free. The Lindhill Bushland Reserve contains weed species adjacent to the rear of the residential properties however the majority of the reserve is relatively weed free.

A number of the exotic species found in the reserve are considered to be environmental weeds as they spread readily, have the potential to out-compete native flora species and reduce diversity, alter and degrade fauna habitat and increase fire risk. As such the management of certain weed species is important to protect and promote the natural values of the reserves.

Weed control is part of an overall long-term strategy to promote natural regeneration and assist with the revegetation of degraded areas. Priority weeds for management within the reserves include weeds species that are declared as Weeds of National Significance (WONS); declared weeds as listed under the *Weed Management Act 1999* and those species classified as environmental weeds.

Six (6) declared weed species occur in the Thoona Street Reserve with two (2) species recorded in the Lindhill Bushland Reserve. Up to 12 environmental or potential environmental weeds were recorded in the Thoona Street Reserve with two (2) species present in the Lindhill Bushland Reserve. The distribution of the weeds across the reserves is indicated in Figure 6.

#### Current Weed Management

Currently the management of exotic species in the reserve is undertaken by the Clarence City Council. This management is restricted to the annual slashing of exotic species along the creekline in the Thoona Bushland Reserve to reduce fire risk. In addition some opportunistic weed control (removal of boneseed) is carried out by local residents.

The continued management of these species will occur in conjunction with revegetation efforts.

Descriptions of weed species that are to be controlled, their extent and control methodology is provided in Appendix 7.

- Control of WONS and declared weeds – Weed management actions within the reserves should prioritise the control of the six declared weed species recorded in the reserves. If limited funds are available for weed control actions then the control of declared weeds which have limited distribution (patersons curse, gorse and pampas grass) should be undertaken in preference to the control of more widespread weeds such as boneseed and blackberry.
  - *WC1, WC2 & WC4 - Control all declared weeds and WONS species in the reserves. Prioritise the control of isolated patersons curse, gorse and pampas grass plants if funds are limited.*
- Control of Declared weeds outside reserves – Small populations of three (3) declared weed species were recorded outside the Thoona Bushland Reserve off the end of Lindhill Avenue (Figure 6). The location of these species in the catchment above the reserve means that they are likely to spread into the reserve if not controlled and as such these species should be eradicated. The slender thistle infestation appears to occur on the road verge on council land however the african boxthorn and boneseed may occur on private land. If the weeds are on private land the landowners should be approached to gain permission to control the weeds.

- *WC3 - Control slender thistle, african boxthorn and boneseed on road verge off Lindhill Avenue.*
- Control of Environmental weeds- The environmental weeds that occur in the reserves are generally restricted to isolated populations. Ideally the control of the environmental weed species in the reserves should be undertaken in conjunction with the control of the declared weeds species. If there are limited funds available, environmental weeds should be controlled following control of the declared weeds. Priority should then be given to the control of species that have isolated distribution followed by more widespread species such as thistles and wild teasel.
  - *WC5 & WC6 - Control environmental weeds species in the reserves in conjunction with the control of declared weeds. If insufficient funds are available control isolated environmental weed species following control of declared weeds as funds become available.*
- Control of Mainland wattles – some mainland wattle species occur adjacent to properties off Nayuka Street. These species have some potential to spread into the reserve however their removal is not considered to be a priority. As some of the wattles are likely to have been deliberately planted by residents who border the reserve consultation with residents is recommended prior to any removal. Native shrub species may be planted to replace mainland wattles if they are removed.
  - *WC6 - Consult with adjoining residents prior to the removal of mainland wattle species along creekline.*
- Control of non-priority weeds – Exotic grasses and broadleaf weeds are widespread along the creekline and scattered within the remnants. The control of these weeds is only a priority in areas that are to be revegetated and to reduce fuel loads for fire protection. As such slashing of the cleared land along the rear of properties along Adina Street and Nayuka Street and brushcutting and foliage spraying of grasses and other broadleaf weeds around revegetated areas should occur on an annual basis.
  - *WC7 - Control grasses and broadleaf weeds in revegetated areas and along the cleared land on an annual basis.*
- Community Education – A number of the weed infestations and weed species present in the reserves have been introduced as a result of inappropriate disposal of garden waste into the reserve. In addition to degrading the natural value of the reserve this disposal also degrades the amenity of the reserve and increases the fire risk in areas directly bordering residences. Educational material that highlights the impacts of weed dumping in bushland reserves and provides suggestions for more appropriate plantings should be circulated to residents that border the reserves.
  - *WC8 - Mail out NRM South brochure 'Creeping Back Yards' brochure to all residents in the local area.*
- Monitoring and Maintenance – The successful eradication of declared and environmental weeds from the reserves will require ongoing monitoring and follow-up weed control for a number of years to come. There is likely to be seedling regrowth from seed stored in the soil, re-sprouting of treated plants and reintroduction of weeds from seed



sources outside the reserves (through bird droppings and mammal movements) which will require treatment.

- *WC9 - Conduct an annual survey of the reserve and remove seedlings and retreat any re-sprouted declared and environmental weeds.*

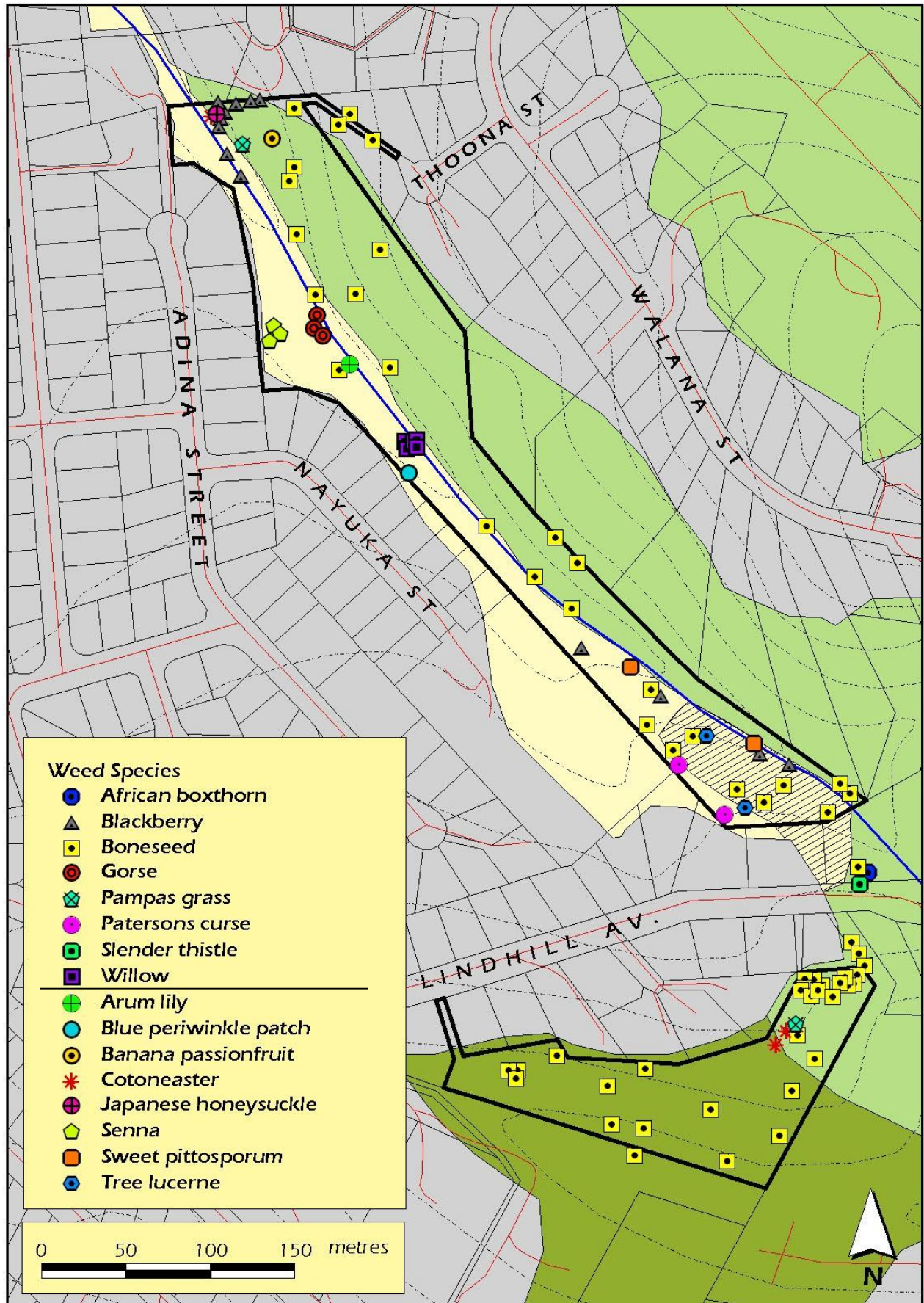


Figure 6 – Weed distribution in reserves

#### 5.4. MANAGEMENT OF FAUNA HABITAT

The reserves contain habitat for a range of native fauna species from wallabies and echidnas to woodland bird species, lizards and butterflies. The close proximity of the reserves to residential areas provides for close interactions between residents and wildlife and is one of the most valued aspects of the reserve (community consultation).

The ongoing management of the habitat provided in the reserve is important to maintain and increase the fauna diversity. Fauna habitat management issues include;

- Connectivity to other reserves – The Thoona and Lindhill Reserves are currently separated from the Pilchers Hill Reserve by residential properties. There is however remnant native vegetation persisting on the private land between the reserve areas which provide a physical connection and allow for movement of fauna species between reserves. This limited connectivity to the larger bushland areas is important for the long term viability of the reserves and the persistence of wildlife within the reserves.
  - *It is recommended that any future development of the adjoining lots that impacts on vegetation that provides a connection to Pilchers Hill take into consideration the importance of the link. Any future subdivision of adjoining land should consider the provision of public open space that provides a physical greenway link between the reserves and the Pilchers Hill Reserve.*
  - *A1 - consider as the preferred option negotiation with private property owners to provide a greenway linkage between Thoona Bushland Reserve and Lindhill Bushland Reserve and Pilchers Hill Bushland (Figure 10).*
- Management of leaf litter and fallen timber – the leaf litter and fallen timber on the floor of the reserves provides important habitat for invertebrate species and reptiles as well as sub soil species and fungi. These species in turn provide a food source to native birds and mammals and as such provide a vital link in the diversity of the bushland.
  - *The retention of the leaf layer and fallen timber in bushland that is located within an urban setting is often counter to perceptions regarding fire fuel minimisation. It is however important that habitat requirements are considered in the development of a fire management plan for the reserves (refer to Section 5.2).*
- Encouraging recruitment of flora species – to maintain diversity in a woodland reserve it is important to have plants of a range of age classes from seedlings and saplings to mature to over mature plants. Currently the reserve has a relatively uniform tall shrub layer of black sheoak, broadleaf hopsbush, silver wattle and prickly box and is heavily grazed by native mammals such as Bennett's wallabies. This has reduced the diversity of small shrubs and groundlayer plants which in turn reduces the woodland bird diversity in the reserves.
  - *FM1 - Measures to increase recruitment in the reserve include undertaking low intensity mosaic burns through the reserves, revegetation of cleared areas and restricting wallaby access to small areas for set periods of time to allow natural regeneration.*
- Control of feral cats and domestic cats and dogs – feral cats are known to have significant impacts on native fauna through the predation of small mammals, birds and lizards and the spread of disease such as toxoplasmosis. Domestic cats that are allowed to roam bushland can have similar impacts to feral cats, whilst uncontrolled dogs can predate or disturb/harass native mammals.
  - *The Clarence City Council supports the recently ratified Cat Management Act 2012 which recommends de-sexing, micro chipping and keeping cats under control and in*



*inside at night. Dogs are currently allowed in the reserve and plans to install a walking track in the Thoona Bushland Reserve (refer to Section 5.7) are likely to increase dog numbers. As such it is recommended that within the reserve dogs must be under effective control at all times.*

- Weed management – weed species out compete native flora species and can reduce the diversity in a bushland reserve. In some instances weed infestations do provide good habitat on the absence of other native habitat – i.e. blackberry can provide good shelter for bandicoots and mainland grevillea and wattles provide a food source for nectar gathering birds and mammals.
  - WC1 – WC9 – *The weed infestations in the reserves are not considered to provide significant habitat for native fauna species and will be controlled as per Section 5.1.*

## **5.5. STORMWATER MANAGEMENT AND EROSION CONTROL**

The condition of the creekline that bisects the Thoona Bushland Reserve *'has deteriorated over time as the composition of its catchment has changed. Several decades of residential development in the catchment has resulted in native vegetation being replaced with impervious, hard surfaces such as roads and buildings. The increased imperviousness of the catchment alters the natural hydrologic regime. Runoff volume increases, while travel time decreases which inturn increases runoff flows. Higher flows in the creek have resulted in erosion in some segments of the creek (Figure 7). Some residential properties have also experienced minor inundation during major events.*

*Water quality in the creek has decreased as the composition of the catchment has changed. Runoff water quality from residential areas differ from pristine native vegetated environments due to soil dispersion during subdivision and building construction activities, hydrocarbons and metals from car use on the roads and increased nutrient loading from typical suburban gardening practice.*



*Figure 7 – Photo of erosion of creek bank in lower half of reserve.*

A 'Stormwater Management and Erosion Control' document has been developed by the Clarence City Council (Appendix 9) which made a broad assessed the stormwater and erosion issues in the Thoona Bushland Reserve and surrounding catchment and made the following recommendations.

- Erosion Control Measures
  - EC1 - Rip-rap stabilisation of creek banks (example - Figure 8), and
  - EC2 - Installation of drop structures to alter the slope of the creek bed and mitigate future erosion.
- Stormwater Management
  - SW1 - The following improvements should be investigated further to determine their impact on Thoona bushland Reserve.
    - Construction of bio-retention basins on the Lindhill, Lynch and Thoona sub catchments with suitable extended detention depth to attenuate flows discharging into the creek.
    - Alteration of the creek profile behind Nayuka Street.

A detailed topographic survey shall be obtained prior to any works being carried out on site. The survey is required to facilitate a comprehensive analysis of the creek to identify/confirm potential flooding and erosion hotspots and determine the feasibility of sites for bio-retention basins.

Any earth works along the drainage line would need to involve measures to protect mature trees from root and/or canopy damage.



*Figure 8 – photo of rock battered creek bed and revegetation at top end of Thoona Bushland Reserve.*

## 5.6. ACCESS TO RESERVES

Access to both reserves is currently restricted. Access to Thoona Bushland Reserve is through the Fairfield Park along an informal track adjacent to the creekline and down steps from the end of Thoona Street. The Thoona Street entrance is poorly defined and it appears as an access to an adjoining residence. Once down the steps past the residence the informal track finishes and there is no link through to Fairfield Park (Figure 9).

Formal access to the Lindhill Bushland Reserve is via a narrow strip of land between residential lots off Lindhill Avenue (Figure 1). This access is not well defined and there is some encroachment by a neighbouring property.

### Future linkages

Future linkages from the reserves to adjoining streets and greenway links to other bushland areas such as Pilchers Hill Reserve is recommended to provide additional recreational opportunities and increase connectivity (refer to Section 5.4).

The formation of the following linkages should be investigated through negotiation with private property owners (Figure 9);

Link 1 - from end of Thoona Bushland Reserve onto Lindhill Avenue;

Link 2 - from Adina Park (CCC park) off Adina Street to Thoona Bushland Reserve;

Link 3 - from upper or southern end of Thoona Bushland Reserve to Pilchers Hill Reserve;

Link 4 - from eastern end of Lindhill Bushland Reserve to Pilchers Hill Reserve off Robin Court; and

Link 5 - from Fairfield Park to Fagg Gully Creek.

- *A1 - Investigate development of additional linkages between reserves adjoining streets and nearby bushland areas.*
- *WT1 & WT2 - Develop a walking track plan for the Thoona Bushland Reserve (refer to Section 5.7 and Appendix 8) with links to Thoona Street.*

### Entrance Upgrades

The entrances to Thoona Bushland Reserve from Fairfield Park and off Thoona Street should be upgraded to provide a landscaped entrance to encourage usage of the reserve (refer to Appendix 10). Enhancements may include the placement of rocks around the entrances (sourced locally), planting of native shrubs, grasses and sedges. Species that provide vibrant displays of flowers may be selected for the entrances. Reserve signage and seating may also be included in the entrance areas.

- *A2 - Upgrade the entrance to the Reserve from Fairfield Park and Thoona Street. Entrance enhancements to follow basic landscape plans as provided in Appendix 10.*

Some minor enhancement of the entrance to the Lindhill Reserve should be considered to highlight the presence of the reserve. Future entrance enhancement can be undertaken if the reserve is linked to Pilchers Hill Reserve.

- *A3 - The access to the Lindhill Bushland Reserve should be formalised to allow for public access to the reserve although no formal walking tracks are proposed for the Lindhill Bushland Reserve. Entrance enhancement may be considered once linkages to the Pilchers Hill Reserve are developed.*

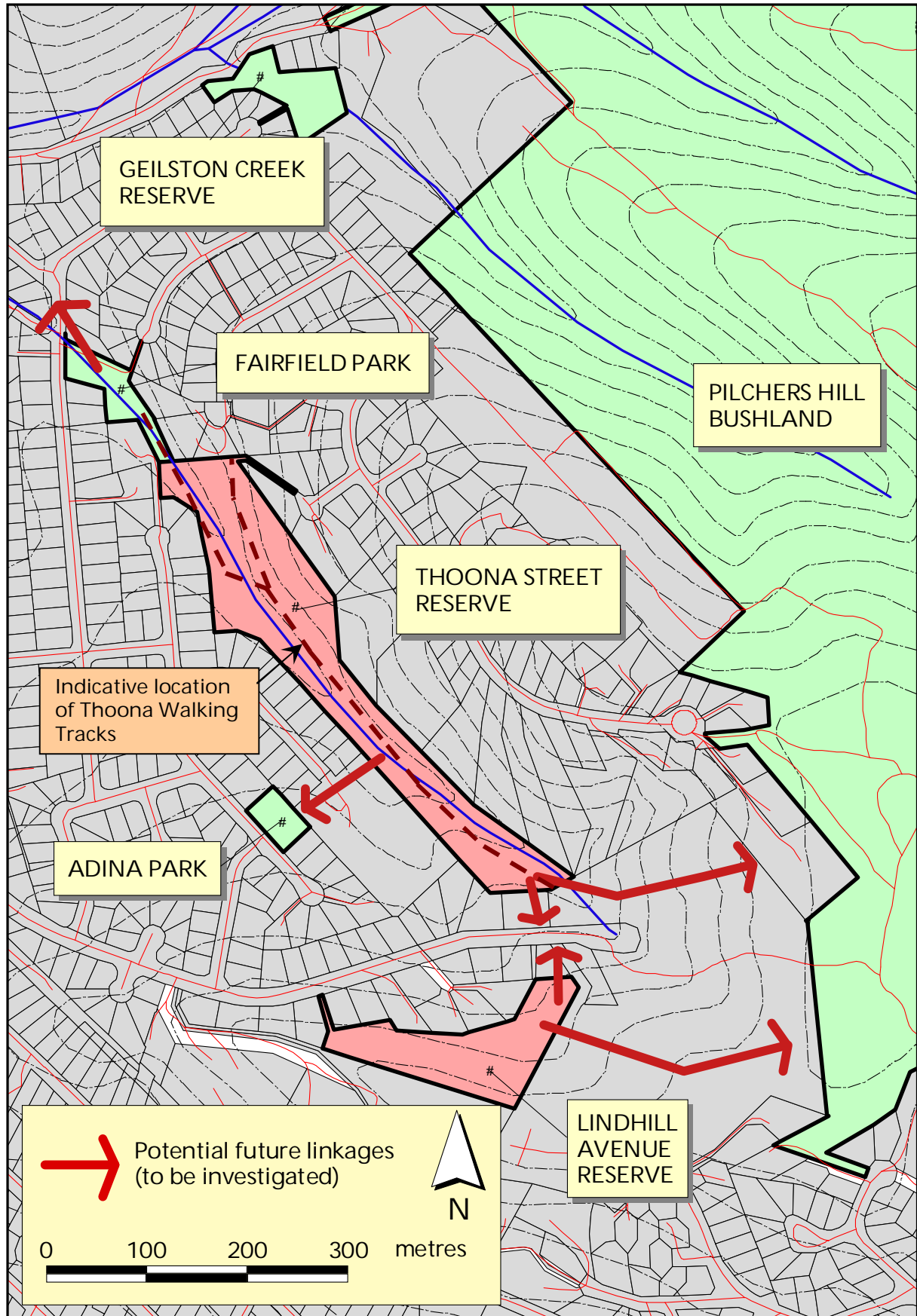


Figure 9 – Potential linkages between the Thoona Bushland Reserve and Lindhill Bushland Reserve and other bushland and recreational areas.



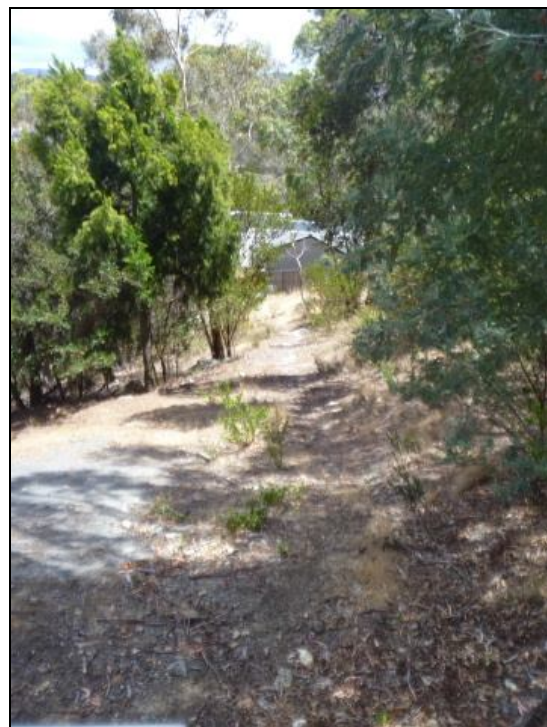
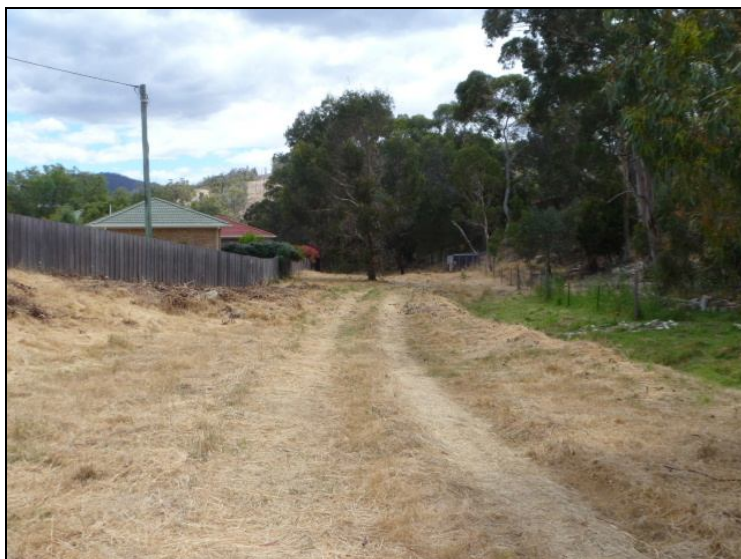


Figure 10– Existing access to Thoona Bushland Reserve from Fairfield Park (L) and off Thoona Street (R).

### 5.7. WALKING TRACKS

There are currently no formal walking tracks in either reserve. An informal track runs from the end of Fairfield Park up towards the middle of the Thoona Bushland Reserve along the creekline (Figure 10), however no other tracks are present.

The community consultation process identified the need for a link between Thoona Street and Fairfield Street to access local bus routes especially on weekends and a desire to have a track linking with Lindhill Avenue to create a through track. There is currently an access point from the end of Thoona Street however there is no track.

In response to the community consultation process a draft walking track plan for the Thoona Bushland Reserve was developed (refer to Appendix 8). The plan proposed a track that traverses the length of the Thoona Bushland Reserve to link Fairfield Park with Lindhill Avenue with a side track that links Thoona Street. The thoroughfare track is dependant on the negotiation of a formal access with private landholders at the end of Lindhill Avenue. The proposed side track will follow an old 4WD track which traverses the slope from the northern end of the reserve near the Thoona Street access down to the creekline approximately in the middle of the reserve.

Due to concern expressed by some residents of Adina Street and Nayuka Street in regard to potential impacts on security, the council will consult further with local residents on the exact route of the walking track within the Thoona Bushland Reserve.

- ***WT1*** – Council to consult with local residents on the route of the walking track within the Thoona Bushland Reserve.
- ***WT2 & WT3*** – Implement Walking Track Plan for Thoona Bushland Reserve.

## 5.8. RESERVE SIGNAGE

A signage plan (Appendix 11) has been developed for the reserve in conjunction with the development of walking tracks in Thoona Bushland Reserve. The location of the tracks is based on gaining access to the reserve from Lindhill Avenue and signage at this entry point is subject to successful negotiation of this access point.

Information to be included on signage may include the following;

- *Catchment values and threats to the values.*
- *Vegetation communities* – highlight the significance of the remnants on a local and statewide basis.
- *Flora values* – threatened species, species diversity, endemic species.
- *Fauna values* – fauna species likely to occur in reserve, habitat values
- *Landscape value* – highlight importance of remnant for riparian connectivity and providing landscape link between other bushland remnants.

Directional information will also be included on future signs.

- *S1 – Develop and implement a Signage Plan for Thoona Bushland Reserve.*

## 5.9. LANDCARE GROUP FORMATION

The ongoing management of the Thoona Bushland Reserve following primary weed control and rehabilitation actions will require significant effort. The idea of the formation of a Thoona Bushland Reserve Landcare Group was suggested to participants of the community' walk and talk' and was received well and several written feedback forms also indicated interest in joining a Landcare Group (refer to Appendix 5).

A local Landcare Group can make significant contributions to the ongoing maintenance of the reserves by removing weed seedlings, reporting new weed infestations, monitoring and maintaining tree plantings, maintaining tracks, helping to prevent rubbish dumping and making observations of the flora and fauna within the reserve at all times of the year which helps to build up a complete picture of the values of the reserve and the progress of management actions.

Assistance with the formation of a Landcare group can be provided by the following people and organisations;

Justin Burgess – Natural Assets Officer, Clarence City Council – email [jburgess@ccc.tas.gov.au](mailto:jburgess@ccc.tas.gov.au); Ph (03)6245 8785

Phil Watson – NRM Planner, Clarence City Council – email [pwatson@ccc.tas.gov.au](mailto:pwatson@ccc.tas.gov.au); Ph (03)62458619  
email [pwatson@ccc.tas.gov.au](mailto:pwatson@ccc.tas.gov.au)

Tasmanian Landcare Association – [admin@landcaretas.org.au](mailto:admin@landcaretas.org.au)

- *O1 – Facilitate formation of Landcare Group.*

## 5.10. OTHER MANAGEMENT ISSUES

The reserve contains scattered rubbish across the reserve which has originated from a variety of sources including neighboring properties, reserve users, in stormwater runoff or as a result of children building shelters and cubby houses etc in the reserve.

An initial clean up of all existing rubbish within the reserve should be undertaken and then regular 'clean-up' days held where the local community can assist to maintain the reserve rubbish free.

- O2 – *Clean up rubbish and debris in reserves. Conduct regular 'Clean-up' days.*

There is also some private play equipment situated within the reserve at the rear of residences along Nayuka Street. This play equipment presents a safety risk to the public and a liability risk for the council and as will need to be removed.

- O3 – *Remove play equipment from reserve.*

### 5.11. MONITORING AND EVALUATION

An informal review of the actions and outcomes of the Thoona Bushland Reserve Activity Plan should be undertaken annually and a complete review of the plan undertaken at the end of the 5 year period.

Ongoing monitoring and maintenance of areas where weed control actions and revegetation actions have occurred should be undertaken on an annual basis. In addition the remaining areas of the site (such as the intact remnants) that do not currently contain weeds should be monitored on an annual basis to ensure new weed infestations do not become established.

In addition to monitoring the reserves for new weed infestations or regrowth of treated infestations the condition of the vegetation should also be monitored. This can be achieved through vegetation condition assessments and establishing photopoint monitoring.

#### **Vegetation Condition Assessment**

To undertake a vegetation condition assessment of the reserve assessment zones or transects that contain/traverse different vegetation types or vegetation communities of varying condition should be established.

The vegetation condition assessments should be undertaken as per standard guidelines contained in the DPIPW document '*A Manual for Assessing Vegetation Condition in Tasmania (Ver. 1 2006)*'.

#### **Photopoints**

It is recommended that the photo points are set-up to record current condition of the site and future achievements in weed control and revegetation. These photopoints should be photographed annually and the photos stored for future reference. The procedure for setting up photopoints is outlined in Appendix 12.

## **6. IMPLEMENTATION PLAN**

The following section provides a plan for the implementation of all actions identified through out the plan for a 5 year period from 2013 to 2017.

The plan outlines the action to be undertaken, location, treatment methods, desired outcomes, timing, estimated costing and priorities for each action.

Actions are prioritised into three categorises – 1= High priority, 2 = Medium priority and 3= Low priority and are based around their strategic importance, achievability, timing and the availability of funds.

Many of the actions are dependant on the availability of funding and as such priorities may change over the course of the plan period. A review of action priorities should be undertaken on an annual basis and changes made as required.

This Reserve Activity Plan should be used to support funding applications for Federal, State and Local Governments grants.

Table 1 – Management Actions for Reserve

Action #	Action	Outcome	Timing	Responsibility	Cost	Priority
<b>REHABILITATION OF DEGRADED AREAS</b>						
R1	Revegetate cleared land along western side of Thoona Bushland Reserve (Zone 1).	Cleared areas revegetated. Additional habitat formed.	Autumn – winter	CCC, Contractor, Future Landcare Group	\$2100 per year	2 & 3
R2	Bag native seedlings along creekline and cleared areas	Native seedlings protected.	Ongoing	CCC	Nil	1
R3	Determine location of northern boundary at end of Takone Street.	Boundary established.	All year round	CCC	Nil	2
R4	Remove weeds and debris from northern end of reserve (Zone 2)	Degraded area prepared for nature regeneration or revegetation.	All year round	CCC, Contractor	\$1500 - \$2000	2
R5	Consolidate fallen timber in degraded area (Zone 2); retain larger logs for fauna habitat.	Some timber removed to allow for rehabilitation of area and larger logs retained as fauna habitat.	All year round	CCC, Contractor	\$1000	2
R6	Revegetate cleared area following removal of weeds and debris	Degraded area is free of weeds and debris and native vegetation re-established.	Autumn – winter	CCC, Contractor, Future Landcare Group	\$3000-\$4000	2
R7	Revegetate along creekline in Thoona Bushland Reserve following erosion/ stormwater control measures	Creekline is revegetated and stabilised to reduce erosion and slow stormwater flows.	Autumn – winter	CCC, Contractor, Future Landcare Group	\$3000-\$4000	2
R8	Replace mainland wattles and willows with native species	Exotic species replaced with native species.	Autumn – winter	CCC, Landcare Group	Nil	3
R9	Rehabilitate areas of Lindhill Bushland Reserve where large scale weed removal undertaken if no natural regeneration occurs.	Significant weed infestations removed. Degraded area rehabilitated.	Autumn – winter	CCC, Contractor, Future Landcare Group	\$2000 - \$3000	3

<u>FIRE MANAGEMENT</u>						
FIRE1	Develop Fire Management Plan	Fire Management Plan developed and implemented	All year round	Consultant	\$5000	1
<u>WEED CONTROL</u>						
WC1	Eradicate patersons curse, pampas grass and gorse (as per Appendix 6).	Patersons curse, pampas grass and gorse eradicated from reserves	Spring-summer for foliage spraying. All year round for others methods.	Contractor	\$700	1
WC2	Control boneseed and blackberry (as per Appendix 6).	Boneseed and blackberry eradicated from reserves	Spring-summer for foliage spraying. All year round for others methods.	Contractor	\$2100	1
WC3	Eradicate declared weeds outside reserves	Declared weeds outside reserve are controlled	Spring - summer for foliage spraying. All year round for others methods.	CCC, Contractor	\$700	1
WC4	Eradicate willows	Willows eradicated from Thoona Bushland Reserve	Spring- summer. Physical removal autumn/winter.	CCC, Contractor	\$1500	3
WC5	Undertake primary control of arum lily, blue periwinkle, banana passionfruit, japanese honeysuckle, sweet pittosporum, tree lucerne and foxglove (as per Appendix 6).	Targeted weeds are eradicated from reserves	Spring- summer	Contractor	\$2100	2
WC6	Undertake primary control of seena, wild teasel, thistles and mainland wattle species (as per Appendix 6).	Targeted weeds are eradicated from reserves	Spring- summer	Contractor	\$1400	3
WC7	Slash exotic grasses on annual basis to minimise fuel risk	Fire risk is reduced; aesthetics of reserve enhanced.	Annually during early summer.	CCC	Nil	1
WC8	Distribute weed information	Garden dumping reduced and inappropriate planting of weed species reduced.	All year round	CCC, Landcare Group.	Nil	1
WC9	Weed control follow-up. Undertake annual survey of reserves and conduct follow up control when as required	Weeds species do not re-establish or new infestation establish	Annually for duration of plan.	Contractor, Landcare Group	\$1500 per year	2

<b><u>FAUNA MANAGEMENT</u></b>						
<b>FM1</b>	Implement measures to increase recruitment in the reserve	Natural recruitment of groundcovers, shrubs and trees apparent in reserves.	All year round	CCC	Nil	2
<b><u>EROSION CONTROL</u></b>						
<b>EC1</b>	Assess stormwater erosion and flooding issues in Thoona Bushland Reserve.	Stormwater flows assessed to allow development of WSUD strategy.	All year round	CCC	Nil	1
<b>EC2</b>	Develop WSUD strategy for Thoona Bushland Reserve	Stormwater flows controlled, creekline erosion rehabilitated and additional habitat formed.	All year round	CCC	Nil	1
<b>EC3</b>	Implement stormwater control measures	Stormwater flood events and erosion of creekline reduced.	Summer – Autumn	Contractor	\$15000	2
<b>EC4</b>	Undertake review of effectiveness of stormwater control measures	Success of measures assessed. Need for further works determined.	During review of plan after 5 years	CCC, Consultant	\$5000	2
<b><u>ACCESS TO RESERVE</u></b>						
<b>A1</b>	Investigate development of additional greenway links between reserves adjoining streets and nearby bushland areas.	Additional greenway links between reserves and bushland areas created.	All year round	Consultant	\$5000	2
<b>A2</b>	Enhance entrances to Thoona Bushland Reserve.	Entrance to reserve from Fairfield Park and Thoona Street is upgraded to encourage use of the reserve.	All year round	CCC, Contractor	\$3000 - \$5000	2
<b>A3</b>	Upgrade entrance to Lindhill Bushland Reserve	Access to Lindhill Bushland Reserve highlighted.	All year round	CCC	\$1000	3
<b><u>WALKING TRACKS</u></b>						
<b>WT1</b>	Council to consult with local residents on the route of the walking track within the Thoona Bushland Reserve	Determine the preferred route of new walking tracks.	2014	CCC	Nil	1
<b>WT2</b>	Develop new track from Thoona Street to Fairfield Park.	Walking link between Fairfield Street and Thoona Street is developed.	All year round	Contractor	\$15000	1
<b>WT3</b>	Develop walking track from Lindhill Avenue to Fairfield Park if/when formal access from Lindhill Avenue is created.	Walking link between Lindhill Avenue and Fairfield Street is developed.	All year round	Contractor	\$27,000	2



<b><u>SIGNAGE</u></b>						
<b>S1</b>	Implement Signage Plan for Thoona Bushland Reserve.	Interpretative signage erected	All year round	CCC	Nil	2
<b><u>OTHER</u></b>						
<b>O1</b>	Form Landcare Group (Council Natural Assets Officer and NRM Planner; Tas Landcare to facilitate group formation).	Landcare Group established	2013	CCC, Tas Landcare	Nil	1
<b>O2</b>	Clean up rubbish in reserves (initial clean up followed by regular 'Clean Up' days.	Rubbish is removed from both reserves	2013 - ongoing	CCC, Landcare group	Nil	2
<b>O3</b>	Remove private play equipment for Thoona Bushland Reserve.	Safety risk and liability associated with unauthorised play equipment in the reserve is removed.	2013	CCC.	Nil	2

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## **APPENDIX 1 – VEGETATION COMMUNITY DESCRIPTIONS**

### Vegetation Descriptions

There are two (2) native vegetation communities and one disturbed community occurring within the two reserves as classified under the TASVEG (2.0) vegetation classification system (Figure 2). *Eucalyptus amygdalina* forest and woodland on mudstone (DAM) occurs in both reserves whilst *Eucalyptus viminalis* grassy forest and woodland (DVG) occurs across the western side of the Lindhill Bushland Reserve (Figure 2).

TASVEG Unit - *Eucalyptus amygdalina* forest and woodland on mudstone  
TASVEG Code - DAM

This community occurs across the south western facing slope of the Thoona Street Reserve and at the eastern end of the Lindhill Drive Reserve (Figure 2).

Black peppermint (*Eucalyptus amygdalina*) is the dominant tree species with isolated black gum (*E. ovata*), white gum (*E. viminalis* subsp. *viminalis*) and blue gum (*E. globulus*) trees also present along the creekline and at the south eastern end of the reserve.

The tall shrub layer is dominated black sheoak (*Allocasuarina littoralis*), broadleaf hopsbush (*Dodonaea viscosa* subsp. *spatulata*), silver wattle (*Acacia dealbata*), prickly box (*Bursaria spinosa* subsp. *spinosa*) and native cherry (*Exocarpos cupressiformis*); common small shrubs recorded include yellow everlasting (*Ozothamnus obcordatus*), twiggy daisybush (*Olearia ramulosa*), orange spiky-bushpea (*Daviesia ulicifolia* subsp. *ulicifolia*), native cranberry (*Astroloma humifusum*) and matted bushpea (*Pultenaea pedunculata*). The groundlayer contains bracken (*Pteridium esculentum*) and sagg (*Lomandra longifolia*) and native grasses including speargrass species (*Austrostipa* sp.), wallabygrass (*Rytidosperma* sp.), weeping grass (*Microlaena stipoides* var. *stipoides*) and velvet tussockgrass (*Poa rodwayi*) and herbs including common raspwort (*Gonocarpus tetragynus*), tiny pennywort (*Hydrocotyle callicarpa*), bluebell (*Wahlenbergia* sp.), kidneyweed (*Dichondra repens*), small poranthera (*Poranthera microphylla*) and scaly buttons (*Leptorhynchos squamatus*). Nine (9) orchid species were also recorded within this community including greenhood orchids (*Pterostylis* sp.), sun orchid (*Thelymitra* sp.) and small mosquito orchid (*Acianthus pusillus*).

The dry slope above the drainage line in the Thoona Bushland reserve is in good condition overall, with only scattered boneseed (*Chrysanthemoides monilifera* subsp. *monilifera*) plants present and some exotic herbs and grasses (17 exotic species recorded). The remnant at the eastern end of the Lindhill Bushland Reserve contains significant infestations of boneseed and isolated cotoneaster (*Cotoneaster* sp.) and pampas grass plants (*Cortaderia selloana*).

The vegetation either side of the drainage line is in poor condition with erosion of the creekline, abundance of weeds species and a low diversity of native plants (50 exotic species recorded). The southern or upper end of the drainage line has been physically altered and the bank revegetated in the recent past. Significant weeds recorded along the creekline include patersons curse (*Echium plantagineum*), boneseed, gorse (*Ulex europaeus*), blackberry (*Rubus fruticosus*) and willow (*Willow* sp.).

TASVEG Unit - *Eucalyptus viminalis* grassy forest and woodland  
TASVEG Code - DVG

This community occurs on the north facing hillside of the Lindhill Bushland Reserve (Figure 2). White gum is the dominant tree species with blue gum (*E. globulus*) and black peppermint (*E. amygdalina*). The tall shrub layer is dominated by black sheoak and black wattle (*Acacia mearnsii*).

with broadleaf hopsbush and silver wattle (*A. dealbata*) also common. The understorey is dominated by sedge species including sagg and swordsedg species (*Lepidosperma* sp.) with few low shrubs present. Native grasses such as speargrass (*Austrostipa* sp.), tussockgrass (*Poa* sp.) and loose plumegrass (*Dichelachne inaequiglumis*) are abundant whilst tiger orchid (*Diuris sulphurea*), bulbine lily (*Bulbine glauca*), dwarf riceflower (*Pimelea humilis*) and bluebell (*Wahlenbergia* sp.) are also common.

The remnant is in good condition overall. There are scattered boneseed plants across the remnant with a higher density of weeds along the northern or lower boundary at the rear of the existing residences.

## APPENDIX 2 – FLORA SPECIES LISTS

### Flora species list recorded at Thoona Bushland Reserve, Geilston Bay.

Recorder: A. Welling, D. Albrecht

Date: Sept, Nov. 2012

e = endemic

i = introduced

d = declared weed

#### *Dicotyledonae*

Species Name	Common Name	TSPA	End.	Family
<i>Carpobrotus rossii</i>	native pigface			AIZOACEAE
<i>Hydrocotyle callicarpa</i>	tiny pennywort			APIACEAE
<i>Vinca major</i>	blue periwinkle		i	APOCYNACEAE
<i>Arctotheca calendula</i>	capeweed		i	ASTERACEAE
<i>Bellis perennis</i>	english daisy		i	ASTERACEAE
<i>Cassinia aculeata</i> subsp. <i>aculeata</i>	dollybush			ASTERACEAE
<i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>	boneseed		i, d	ASTERACEAE
<i>Cirsium vulgare</i>	spear thistle		i	ASTERACEAE
<i>Crepis ?capillaris</i> (vegetative material only)	smooth hawksbeard		i	ASTERACEAE
<i>Euchiton collinus</i>	common cottonleaf			ASTERACEAE
<i>Hypochaeris radicata</i>	rough catsear		i	ASTERACEAE
<i>Leptorhynchus squamatus</i>	scaly buttons			ASTERACEAE
<i>Olearia ramulosa</i>	twiggy daisybush			ASTERACEAE
<i>Ozothamnus ferrugineus</i>	tree everlastingbush			ASTERACEAE
<i>Ozothamnus obcordatus</i>	yellow everlastingbush			ASTERACEAE
<i>Senecio glomeratus</i>	purple fireweed			ASTERACEAE
<i>Senecio linearifolius</i>	fireweed groundsel			ASTERACEAE
<i>Senecio minimus</i>	shrubby fireweed			ASTERACEAE
<i>Senecio quadridentatus</i>	cotton fireweed			ASTERACEAE
<i>Silybum marianum</i>	variegated thistle		i	ASTERACEAE
<i>Sonchus asper</i>	prickly sowthistle		i	ASTERACEAE
<i>Sonchus oleraceus</i>	common sowthistle		i	ASTERACEAE
<i>Echium candicans</i>	pride of Madeira		i	BORAGINACEAE
<i>Echium plantagineum</i>	patersons curse		i	BORAGINACEAE
<i>Myosotis sylvatica</i>	garden forgetmenot		i	BORAGINACEAE
<i>Cardamine hirsuta</i>	hairy bittercress		i	BRASSICACEAE
<i>Hirschfeldia incana</i>	hoary mustard		i	BRASSICACEAE
<i>Callitriche stagnalis</i>	mud waterstarwort		i	CALLITRICHACEAE
<i>Wahlenbergia</i> sp.	bluebell			CAMPANULACEAE
<i>Lonicera japonica</i>	japanese honeysuckle		i	CAPRIFOLIACEAE
<i>Cerastium glomeratum</i>	sticky mouse-ear		i	CARYOPHYLLACEAE
<i>Sagina procumbens</i>	spreading pearlwort		i	CARYOPHYLLACEAE
<i>Stellaria media</i>	garden chickweed		i	CARYOPHYLLACEAE
<i>Allocasuarina littoralis</i>	black sheoak			CASUARINACEAE
<i>Allocasuarina verticillata</i>	drooping sheoak			CASUARINACEAE
<i>Einadia nutans</i> subsp. <i>nutans</i>	climbing saltbush			CHENOPODIACEAE
<i>Dichondra repens</i>	kidneyweed			CONVOLVULACEAE
<i>Dipsacus fullonum</i> subsp. <i>fullonum</i>	wild teasel		i	DIPSACACEAE
<i>Astroloma humifusum</i>	native cranberry			EPACRIDACEAE
<i>Lissanthe strigosa</i> subsp. <i>subulata</i>	peachberry heath			EPACRIDACEAE

<i>Euphorbia lathyris</i>	caper spurge	i	EUPHORBIACEAE
<i>Euphorbia peplus</i>	petty spurge	i	EUPHORBIACEAE
<i>Poranthera microphylla</i>	small poranthera		EUPHORBIACEAE
<i>Chamaecytisus palmensis</i>	tree lucerne	i	FABACEAE
<i>Daviesia ulicifolia</i> subsp. <i>ruscifolia</i>	orange spiky bitterpea		FABACEAE
<i>Dillwynia cinerascens</i>	grey parrotpea		FABACEAE
<i>Pultenaea daphnoides</i> var. <i>obcordata</i>	heartleaf bushpea		FABACEAE
<i>Pultenaea pedunculata</i>	matted bushpea		FABACEAE
<i>Trifolium repens</i>	white clover	i	FABACEAE
<i>Ulex europaeus</i>	gorse	i	FABACEAE
<i>Vicia sativa</i>	vetch	i	FABACEAE
<i>Vicia</i> sp.	vetch	i	FABACEAE
<i>Fumaria muralis</i> subsp. <i>muralis</i>	wall fumitory	i	FUMARIACEAE
<i>Geranium</i> sp.	cranesbill		GERANIACEAE
<i>Gonocarpus tetragynus</i>	common raspwort		HALORAGACEAE
<i>Prunella vulgaris</i>	selfheal	i	LAMIACEAE
<i>Acacia dealbata</i> subsp. <i>dealbata</i>	silver wattle		MIMOSACEAE
<i>Acacia genistifolia</i>	spreading wattle		MIMOSACEAE
<i>Acacia howittii</i>	sticky wattle	i	MIMOSACEAE
<i>Acacia longifolia</i>	coast wattle	?i	MIMOSACEAE
<i>Acacia mearnsii</i>	black wattle		MIMOSACEAE
<i>Acacia pravissima</i>	ovens wattle	i	MIMOSACEAE
<i>Callistemon</i> sp.	prickly bottlebrush	i	MYRTACEAE
<i>Eucalyptus amygdalina</i>	black peppermint	e	MYRTACEAE
<i>Eucalyptus globulus</i> subsp. <i>globulus</i>	tasmanian blue gum		MYRTACEAE
<i>Eucalyptus ovata</i> var. <i>ovata</i>	black gum		MYRTACEAE
<i>Eucalyptus viminalis</i> subsp. <i>viminalis</i>	white gum		MYRTACEAE
<i>Kunzea ericoides</i>	burgan	i	MYRTACEAE
<i>Oxalis incarnata</i>	pale woodsorrel	i	OXALIDACEAE
<i>Oxalis</i> sp. x 2	woodsorrel		OXALIDACEAE
<i>Passiflora caerulea</i>	blue passionflower	i	PASSIFLORACEAE
<i>Bursaria spinosa</i> subsp. <i>spinosa</i>	prickly box		PITTOSPORACEAE
<i>Pittosporum undulatum</i>	pittosporum	i	PITTOSPORACEAE
<i>Rhytidosporum procumbens</i>	starry appleberry		PITTOSPORACEAE
<i>Plantago coronopus</i>	buckshorn plantain	i	PLANTAGINACEAE
<i>Comesperma volubile</i>	blue lovecreeper		POLYGALACEAE
<i>Acetosella vulgaris</i>	sheep sorrel	i	POLYGONACEAE
<i>Rumex obtusifolius</i>	broadleaf dock	i	POLYGONACEAE
<i>Lysimachia arvensis</i>	scarlet pimpernel	i	PRIMULACEAE
<i>Aquilegia vulgaris</i>	columbine	i	RANUNCULACEAE
<i>Ranunculus sessiliflorus</i> var. <i>sessiliflorus</i>	rockplate buttercup	r	RANUNCULACEAE
<i>Ranunculus</i> sp.	buttercup		RANUNCULACEAE
<i>Reseda luteola</i>	weld	i	RESEDACEAE
<i>Pomaderris elliptica</i> var. <i>elliptica</i>	yellow dogwood		RHAMNACEAE
<i>Acaena novae-zelandiae</i>	common buzzy		ROSACEAE
<i>Cotoneaster glaucophyllus</i> var. <i>serotinus</i>	largeleaf cotoneaster	i	ROSACEAE
<i>Cotoneaster</i> sp. (vegetative material only)	cotoneaster	i	ROSACEAE
<i>Prunus</i> sp. (inadequate material)		i	ROSACEAE
<i>Rubus fruticosus</i> spp. agg.	blackberry	i	ROSACEAE
<i>Galium gaudichaudii</i> subsp. <i>parviflorum</i>	smallflower rough bedstraw		RUBIACEAE
<i>Galium aparine</i>	cleavers	i	RUBIACEAE

<i>Salix ?alba</i> var. <i>vitellina</i> (inadequate material)	golden willow	i	SALICACEAE
<i>Exocarpos cupressiformis</i>	common native-cherry		SANTALACEAE
<i>Dodonaea viscosa</i> subsp. <i>spatulata</i>	broadleaf hopbush		SAPINDACEAE
<i>Digitalis purpurea</i>	foxglove	i	SCROPHULARIACEAE
<i>Veronica persica</i>	persian speedwell	i	SCROPHULARIACEAE
<i>Solanum laciniatum</i>	kangaroo apple		SOLANACEAE
<i>Stylidium graminifolium</i>	narrowleaf triggerplant		STYLIDIACEAE
<i>Viola</i> sp. (vegetative material only)	native violet		VIOLACEAE

## Monocotyledonae

Species Name	Common Name	TSPA	End.	Family
<i>Zantedeschia aethiopica</i>	arum lily		i	ARACEAE
<i>Cyperus eragrostis</i>	drain flatsedge		i	CYPERACEAE
<i>Isolepis inundata</i>	swamp clubsedge			CYPERACEAE
<i>Lepidosperma laterale</i>	variable swordedge			CYPERACEAE
<i>Juncus australis</i>	southern rush			JUNCACEAE
<i>Juncus pallidus</i>	pale rush			JUNCACEAE
<i>Juncus planifolius</i>	broadleaf rush			JUNCACEAE
<i>Juncus sarophorus</i>	broom rush			JUNCACEAE
<i>Juncus subsecundus</i>	finger rush			JUNCACEAE
<i>Luzula flaccida</i>	pale woodrush			JUNCACEAE
<i>Luzula meridionalis</i>	southern woodrush			JUNCACEAE
<i>Agapanthus praecox</i> subsp. <i>orientalis</i>	agapanthus		i	LILIACEAE
<i>Arthropodium milleflorum</i>	pale vanilla-lily			LILIACEAE
<i>Dianella</i> sp. (vegetative material only)	flaxlily			LILIACEAE
<i>Narcissus pseudonarcissus</i>	wild daffodil		i	LILIACEAE
<i>Narcissus tazetta</i>	jonquil		i	LILIACEAE
<i>Acianthus pusillus</i>	small mosquito-orchid			ORCHIDACEAE
<i>Caladenia mentiens</i>	lesser fingers			ORCHIDACEAE
<i>Corybas</i> sp. (vegetative material only)	helmet-orchid			ORCHIDACEAE
<i>Cyrtostylis reniformis</i>	small gnat-orchid			ORCHIDACEAE
<i>Diuris pardina</i>	leopard orchid			ORCHIDACEAE
<i>Pterostylis nutans</i>	nodding greenhood			ORCHIDACEAE
<i>Pterostylis pedunculata</i>	maroonhood			ORCHIDACEAE
<i>Pterostylis williamsonii</i>	brownlip greenhood		e	ORCHIDACEAE
<i>Thelymitra</i> sp. (vegetative material only)	sun-orchid			ORCHIDACEAE
<i>Agrostis capillaris</i>	browntop bent		i	POACEAE
<i>Aira</i> sp. (inadequate material)	hairgrass		i	POACEAE
<i>Arrhenatherum elatius</i> var. <i>bulbosum</i>	bulbous oatgrass		i	POACEAE
<i>Rytidosperma indutum</i>	tall wallabygrass	r		POACEAE
<i>Rytidosperma pilosa</i>	velvet wallabygrass			POACEAE
<i>Rytidosperma racemosa</i> var. <i>racemosa</i>	stiped wallabygrass			POACEAE
<i>Austrostipa mollis</i>	soft speargrass			POACEAE
<i>Austrostipa rudis</i> subsp. <i>australis</i>	southern speargrass			POACEAE
<i>Austrostipa stupos</i>	corkscrew speargrass			POACEAE
<i>Briza maxima</i>	greater quaking-grass		i	POACEAE
<i>Cynosurus echinatus</i>	rough dogstail		i	POACEAE
<i>Dactylis glomerata</i>	cocksfoot		i	POACEAE
<i>Deyeuxia quadriseta</i>	reed bentgrass			POACEAE
<i>Dichelachne</i> sp.	plumegrass			POACEAE
<i>Ehrharta erecta</i> var. <i>erecta</i>	panic veldtgrass		i	POACEAE
<i>Holcus lanatus</i>	yorkshire fog		i	POACEAE



<i>Lachnagrostis filiformis</i>	common blowgrass		POACEAE
<i>Microlaena stipoides</i> var. <i>stipoides</i>	weeping grass		POACEAE
<i>Phalaris aquatica</i>	toowoomba canarygrass	i	POACEAE
<i>Poa annua</i>	winter grass	i	POACEAE
<i>Poa labillardierei</i>	tussockgrass		POACEAE
<i>Poa rodwayi</i>	velvet tussockgrass		POACEAE
<i>Lomandra longifolia</i>	sagg		XANTHORRHOACEAE

## Pteridophyta

Species Name	Common Name	TSPA	End.	Family
<i>Asplenium flabellifolium</i>	necklace fern			ASPLENIACEAE
<i>Blechnum nudum</i>	fishbone waterfern			BLECHNACEAE
<i>Hypolepis rugosula</i>	ruddy groundfern			DENNSTAEDTIACEAE
<i>Pteridium esculentum</i>	bracken			DENNSTAEDTIACEAE

## Flora species list recorded at Lindhill Bushland Reserve, Geilston Bay.

**Recorder:** A. Welling, D. Albrecht

**Date:** Sept, Nov. 2012

e = endemic

i = introduced

d = declared weed

## Dicotyledonae

Species Name	Common Name	TSPA	End.	Family
<i>Carpobrotus rossii</i>	native pigface			AIZOACEAE
<i>Arctotheca calendula</i>	capeweed		i	ASTERACEAE
<i>Cassinia aculeata</i> subsp. <i>aculeata</i>	dollybush			ASTERACEAE
<i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>	boneseed		i, d	ASTERACEAE
<i>Chrysocephalum apiculatum</i>	common everlasting			ASTERACEAE
<i>Cotula australis</i>	southern buttons			ASTERACEAE
<i>Euchiton sphaericus</i>	globe cottonleaf			ASTERACEAE
<i>Hypochaeris glabra</i>	smooth catsear		i	ASTERACEAE
<i>Hypochaeris radicata</i>	rough catsear		i	ASTERACEAE
<i>Osteospermum fruticosum</i>	trailing daisy		i	ASTERACEAE
<i>Ozothamnus obcordatus</i>	yellow everlastingbush			ASTERACEAE
<i>Solenogyne gunnii</i>	hairy flat-herb			ASTERACEAE
<i>Cardamine hirsuta</i>	hairy bittercress		i	BRASSICACEAE
<i>Lepidium africanum</i>	common peppergrass		i	BRASSICACEAE
<i>Wahlenbergia gracilis</i>	sprawling bluebell			CAMPANULACEAE
<i>Wahlenbergia multicaulis</i>	bushy bluebell			CAMPANULACEAE
<i>Wahlenbergia stricta</i> subsp. <i>stricta</i>	tall bluebell			CAMPANULACEAE
<i>Cerastium glomeratum</i>	sticky mouse-ear		i	CARYOPHYLLACEAE
<i>Silene gallica</i>	catchfly		i	CARYOPHYLLACEAE
<i>Allocasuarina littoralis</i>	black sheoak			CASUARINACEAE
<i>Allocasuarina verticillata</i>	drooping sheoak			CASUARINACEAE
<i>Einadia nutans</i> subsp. <i>nutans</i>	climbing saltbush			CHENOPODIACEAE
<i>Dichondra repens</i>	kidneyweed			CONVOLVULACEAE
<i>Crassula sieberiana</i>	rock stonecrop			CRASSULACEAE
<i>Astroloma humifusum</i>	native cranberry			EPACRIDACEAE
<i>Lissanthe strigosa</i> subsp. <i>subulata</i>	peachberry heath			EPACRIDACEAE

<i>Poranthera microphylla</i>	small poranthera		EUPHORBIACEAE
<i>Kennedia rubicunda</i>	dusky coralpea	i	FABACEAE
<i>Pultenaea pedunculata</i>	matted bushpea		FABACEAE
<i>Goodenia lanata</i>	trailing native-primrose		GOODENIACEAE
<i>Gonocarpus tetragynus</i>	common raspwort		HALORAGACEAE
<i>Acacia dealbata</i> subsp. <i>dealbata</i>	silver wattle		MIMOSACEAE
<i>Acacia floribunda</i>	gossamer wattle	i	MIMOSACEAE
<i>Acacia longifolia</i>	coast wattle		MIMOSACEAE
<i>Acacia mearnsii</i>	black wattle		MIMOSACEAE
<i>Eucalyptus amygdalina</i>	black peppermint	e	MYRTACEAE
<i>Eucalyptus globulus</i> subsp. <i>globulus</i>	tasmanian blue gum		MYRTACEAE
<i>Eucalyptus viminalis</i> subsp. <i>viminalis</i>	white gum		MYRTACEAE
<i>Oxalis perennans</i>	grassland woodsorrel		OXALIDACEAE
<i>Bursaria spinosa</i> subsp. <i>spinosa</i>	prickly box		PITTOSPORACEAE
<i>Plantago lanceolata</i>	ribwort plantain	i	PLANTAGINACEAE
<i>Lysimachia arvensis</i>	scarlet pimpernel	i	PRIMULACEAE
<i>Cotoneaster</i> sp. (seedlings only)	cotoneaster	i	ROSACEAE
<i>Galium gaudichaudii</i> subsp. <i>parviflorum</i>	smallflower rough bedstraw		RUBIACEAE
<i>Exocarpos cupressiformis</i>	common native-cherry		SANTALACEAE
<i>Dodonaea viscosa</i> subsp. <i>spatulata</i>	broadleaf hopbush		SAPINDACEAE
<i>Solanum laciniatum</i>	kangaroo apple		SOLANACEAE
<i>Stylidium graminifolium</i>	narrowleaf triggerplant		STYLIDIACEAE
<i>Pimelea humilis</i>	dwarf riceflower		THYMELAEACEAE

## Monocotyledonae

Species Name	Common Name	TSPA	End.	Family
<i>Carex breviculmis</i>	shortstem sedge			CYPERACEAE
<i>Gahnia radula</i>	thatch sawsedge			CYPERACEAE
<i>Lepidosperma concavum</i>	sand swordgrass			CYPERACEAE
<i>Lepidosperma curtisiae</i>	little swordgrass			CYPERACEAE
<i>Lepidosperma laterale</i>	variable swordgrass			CYPERACEAE
<i>Juncus pallidus</i>	pale rush			JUNCACEAE
<i>Juncus subsecundus</i>	finger rush			JUNCACEAE
<i>Bulbine glauca</i>	bluish bulbine-lily			LILIACEAE
<i>Dianella revoluta</i> var. <i>revoluta</i>	spreading flaxlily			LILIACEAE
<i>Thysanotus patersonii</i>	twining fringelily			LILIACEAE
<i>Diuris sulphurea</i>	tiger orchid			ORCHIDACEAE
<i>Aira caryophylla</i> subsp. <i>caryophylla</i>	silvery hairgrass	i		POACEAE
<i>Aira elegantissima</i>	delicate hairgrass	i		POACEAE
<i>Austrostipa mollis</i>	soft speargrass			POACEAE
<i>Austrostipa rudis</i> subsp. <i>australis</i>	southern speargrass			POACEAE
<i>Briza maxima</i>	greater quaking-grass	i		POACEAE
<i>Briza minor</i>	lesser quaking-grass	i		POACEAE
<i>Cortaderia selloana</i>	silver pampasgrass	i, d		POACEAE
<i>Deyeuxia quadriseta</i>	reed bentgrass			POACEAE
<i>Dichelachne inaequiglumis</i>	loose plumegrass			POACEAE
<i>Ehrharta erecta</i> var. <i>erecta</i>	panic veldtgrass	i		POACEAE
<i>Microlaena stipoides</i> var. <i>stipoides</i>	weeping grass			POACEAE
<i>Poa labillardierei</i> var. <i>labillardierei</i>	silver tussockgrass			POACEAE
<i>Poa rodwayi</i>	velvet tussockgrass			POACEAE
<i>Poa sieberiana</i> var. <i>sieberiana</i>	grey tussockgrass			POACEAE
<i>Rytidosperma geniculatum</i>	knead wallabygrass			POACEAE
<i>Rytidosperma racemosum</i>	stiped wallabygrass			POACEAE

<i>Rytidosperma setaceum</i>	bristly wallabygrass		POACEAE
<i>Tetrarrhena distichophylla</i>	hairy ricegrass		POACEAE
<i>Vulpia bromoides</i>	squirreltail fescue	i	POACEAE
<i>Vulpia myuros</i>	fescue	i	POACEAE
<i>Lomandra longifolia</i>	sagg		XANTHORRHOEACEAE

### *Pteridophyta*

Species Name	Common Name	TSPA	End.	Family
<i>Cheilanthes sieberi</i> <i>subsp. sieberi</i>	narrow rockfern			ADIANTACEAE

## APPENDIX 3 – THREATENED FLORA AND FAUNA RECORDS

### THREATENED FLORA RECORDED WITHIN A 500M RADIUS OF RESERVE

<i>Species</i>	<b>Status TSPA</b>	<b>Status EPBCA</b>	<b>Comments</b>
<i>Rytidosperma indutum</i> Tall wallaby grass	r		Usually found in dry sclerophyll woodlands on dolerite or mudstone. Species recorded in Thoona Bushland Reserve.
<i>Cynoglossum australe</i> Australian hound's tongue	r		Frequent on the landward margins of stable or hollow coastal sand dunes or dry wooded grasslands. Not recorded in reserves.
<i>Juncus amabilis</i> Gentle rush	r		Found amongst exotic pasture, grassy and heathy eucalypt woodland, roadside ditches and flood plains. Not recorded.
<i>Eucalyptus risdonii</i> Risdon peppermint	r		Occurs amongst scrub and low open forest on Permian mudstone soils. Not present in reserves.
<i>Lepidium pseudotasmanicum</i> Shade peppergrass	r		Usually occurs on bare ground in grassland and grassy woodland. Not recorded in reserves.

Notes on preferred habitats for threatened plants sourced from the Threatened Species Unit (DPIPWE)

### THREATENED FAUNA RECORDED WITHIN A 5KM RADIUS OF SITE.

<b>Species</b>	<b>Status TSPA</b>	<b>Status EPBCA</b>	<b>Comments</b>
<i>Antipodia chaostola</i> Chaostola skipper	e		Has an intrinsic link with Gahnia species especially <i>G. radula</i> . <i>G. radula</i> not present.
<i>Botaurus poiciloptilus</i> Australasian bittern		EN	Occur in saltmarsh and wetlands. Not suitable habitat in reserves.
<i>Haliaeetus leucogaster</i> White-bellied sea eagle	v		Coastal foraging/nesting species. No significant habitat on site.
<i>Litoria raniformis</i> green and gold frog			Found in permanent water with fringing vegetation. No suitable habitat in reserves.
<i>Lathamus discolor</i> Swift parrot	e	EN	Species has strong association with blue gum and black gum close to the coast. Site contains scattered blue and black gums.
<i>Marginaster littoralis</i> seastar	E	CR	Marine species.
<i>Perameles gunnii gunnii</i> Eastern barred bandicoot		r	Bandicoots prefer grassy woodland areas with dense cover and pasture areas nearby. No sign recorded during surveys however likely to utilise reserves.
<i>Pseudemoia pagenstecheri</i> Tussock skink			Found in tussock grassland. No suitable habitat in reserves.
<i>Sarcophilus harrisii</i> tasmanian devil	e	EN	No denning habitat in reserves and due to urban nature of reserves species unlikely to utilise reserves.
<i>Tyto novaehollandiae castanops</i> Masked owl (Tasmanian)	e		Found in dry forest and woodland nearby to open country. No large hollows in reserve.

Notes on preferred habitats sourced from Bryant and Jackson 1999

## **APPENDIX 4 – BIRD SURVEY**

A bird survey was under taken by Alan Fletcher from Birdlife Tasmania in October 2012. Additional bird species to those recorded may utilise the reserve however where not apparent at the time of the one off survey.

### **Thoona Bushland Reserve....a Birder's Perspective**

A relatively brief bird survey of this reserve was undertaken at the end of October 2012. Access was via Fairfield Park.

The reserve is something of an “orphan”. Although apparently connected to other woodland areas, there appears to be little movement of birds into the area from the Meehan Range to the east. The reserve itself is a steep-sided, dry, open eucalypt woodland. The lack of major understorey and low levels of leaf litter are likely causes of the limited list of birds recorded.

Birds seen:

**Common Greenfinch**--movement into reserve from surrounding gardens and Fairfield Park.

**Forest Raven**--common scavenger ranging widely, probably breeds in this reserve.

**Little Wattlebird**--incursions into reserve from surrounding gardens at northern end.

**Spotted Pardalote**--common breeding bird in reserve, utilising holes in old gums to breed.

**Striated Pardalote**--breeding as Spotted Pardalote, probably the most common bird in the reserve.

**Brown Thornbill**--seen adjacent to Fairfield Park and like the 2 preceding species, largely a leaf ‘gleaner’ and not reliant on leaf litter. May breed here.

**Silvereve**--large numbers on the periphery and in surrounding gardens, feeding on sap sucking insects.

**Common Blackbird**--Few probably breed in surrounding gardens.

**House Sparrow**--Large numbers feeding in areas of weeds along streamside, probably from adjoining gardens.

**Common Starling**--An omnivorous feeder common in more open grass area streamside.

**Fan-tailed Cuckoo**--Single bird seen near top of reserve.

**Black-faced Cuckoo-Shrike**--Pair observed towards southern end of reserve.

**Grey Fantail**—A few pairs seen along main stream, may breed here—mainly feeds on flying insects.

**Grey Currawong**—A family of this species was seen at the southern end of the reserve. Probably breeds here.

Apart from the bird species, a small mob of Bennett's Wallaby occupy the reserve, probably benefiting from the large areas of grass growing along the main stream. The mob included a female with joey and one of the largest Bennett's males I have ever seen.

Alan Fletcher.

## **APPENDIX 5 - SUMMARY OF COMMUNITY CONSULTATION**

### Initial Consultation

As part of the development of the Reserve Activity Plan for the Thoona Bushland Reserve a community 'walk and talk' session was held in the reserve on the 18<sup>th</sup> November 2012 facilitated by the Clarence City Council and the Andrew Welling. The session was attended by 10 local residents.

In addition to the on-site community consultation session a feedback form seeking input on the reserve management was posted out to 600 local residents. There were 13 written feedback forms received.

The responses received during the 'walk and talk' session and through the feedback forms is summarised in the following table.

Management Issue/comments	Number of responses
Interested in joining Landcare group	4
Dogs should be on lead to protect native wildlife	3
Concerned about fire management; Want understorey cleared	3
Establish walking track in reserve	3
Re-establish access off Thoona Drive	3
Better access to reserve	3
Control weeds in reserve	2
Concern about flooding/management of rivulet	2
Concern about security if walking track established in reserve	2
Concern about dogs and cats in reserve	2
Connection to Fairfield Street for residents to catch bus on weekends	1
Want a link to other bushland reserve in areas	1
Already actively removing boneseed and blackberry	1
Maintain/improve 'greenbelt' behind houses on Nayuka Street	1
Stable frog population currently in reserve	1
Good to attract more people to area	1
Concern about loss of privacy if walking track established in reserve	1
Wants to walk dog on lead in reserve	1
Stair access to reserve needs to be improved (off Kapala)	1
New playground, BBQ facility and shade area in Fairfield Reserve	1
Require alternative vehicle exist from Walana Street	1
Maintain bushland in current form	1
Discourage the development of informal unstable tracks	1
Provide access for children to engage with nature	1
Against development of recreational facilities in reserve	1
Install parking lot for visitors	1

### Community Consultation Period for Draft Reserve Activity Plan

The draft Thoona Bushland Reserve Activity Plan was released for public comment in April 2013 with the comment period closing on the 17th May 2013.

Two written comments were received (via email) during this feedback period with these comments summarised below;

- Resident raised concern with road kill on Walana Street and Eurobin Road and suggested that residents be surveyed on need to install speed humps on these roads.
- Submission received from resident who carried out a targeted survey of other residents whose properties border the reserve along Adina Street and Nayuka Street in regard to statements made in the report card and aspects of the RAP. Eight residents responded to this survey form. Majority of respondents expressed concern regarding the establishment of a walking track within the reserve.



## **APPENDIX 6 –REVEGETATION NOTES AND SPECIES LIST**

Site preparation – Areas to be planted should be foliage sprayed prior to planting to kill exotic grasses and reduce competition for the seedlings. In addition the ground should be scalped at the time of planting to remove the root mass and break up the ground.

Species selection – Species selected for the revegetation projects should occur locally and plants grown for the site should ideally be grown from seed of local provenance and be well-established and hardened off prior to planting. Refer to table below for a suggested revegetation species list.

Plant protection – All trees and shrubs should be protected from browsing by native animals by tree guards. The condition of these guards should be monitored and any damaged or missing guards replaced until the plants are well established. Plantings along the creekline should not be bagged as they can be washed downstream during flood or storm events.

**Watering** – dependant on the weather conditions following revegetation projects some plants may require supplementary watering during warm, dry periods until they become established.

### *Suggested Revegetation Species list*

Species name	Common Name	Form	Location to be planted - revegetation site#
<i>Eucalyptus globulus</i>	blue gum	tree	Isolated planting in Zone 1 and Zone 2.
<i>Eucalyptus viminalis subsp. viminalis</i>	white gum	tree	Isolated planting in Zone 1 and Zone 2.
<i>Acacia dealbata subsp. dealbata</i>	silver wattle	tree	Zone 1 & 2; replacement for mainland wattles.
<i>Allocasuarina littoralis</i>	black sheoak	tall shrub	Scattered plantings in Zone 1 & 2.
<i>Allocasuarina verticillata</i>	drooping sheoak	tall shrub	Scattered plantings in Zone 1 & 2.
<i>Bursaria spinosa subsp. spinosa</i>	prickly box	tall shrub	Scattered plantings in Zone 1 & 2.
<i>Dodonaea viscosa subsp. spatulata</i>	broadleaf hopsbush	shrub	Scattered plantings in Zone 1 & 2.
<i>Pultenaea daphnoides</i>	heartleaf bushpea	shrub	Zone 1 & 2.
<i>Acacia genistifolia</i>	spreading wattle	small shrub	Zone 1 & 2
<i>Olearia ramulosa</i>	twiggy daisybush	small shrub	Zone 1,2 & 3
<i>Ozothamnus obcordata</i>	yellow everlasting	small shrub	Zone 1 & 2
<i>Pultenaea pedunculata</i>	matted bushpea	groundcover/shrub	Zone 1 & 2
<i>Dianella sp.</i>	flaxlily	lily	Zone 1,2 & 3
<i>Lomandra longifolia</i>	sagg	sedge	Zone 1 & 2
<i>Lepidosperma laterale</i>	variable swordedge	sedge	Zone 1 & 2
<i>Juncus australis</i>	southern rush		Zone 3 – along creekline
<i>Juncus pallidus</i>	pale rush	sedge	Zone 3 – along creekline
<i>Juncus sarophorus</i>	broom rush	sedge	Zone 3 – along creekline
<i>Poa rodwayi</i>	velvet tussockgrass	grass	Zone 1,2 & 3
<i>Blechnum nudum</i>	fishbone waterfern	fern	Zone 3 – along creekline

Zone 1 = Cleared land on the western side of the creekline

Zone 2 = Boundary of the reserve adjoining residences at end of Takone Street

Zone 3 = Along the creekline in Thoona Bushland Reserve

## **APPENDIX 7 – WEED SPECIES WITHIN RESERVE**

### **Declared Weeds**

Six (6) declared weed species occur in the Thoona Street Reserve with only two (2) species recorded in the Lindhill Bushland Reserve.

**Blackberry (*Rubus fruticosus*).**



Photo - [www.weeds.asn.au](http://www.weeds.asn.au)

**Extent of infestation** - Large infestation occurs at northern end of the reserve on the bank above the creekline. Additional small plants occur along the creekline at the northern and southern ends of the Thoona Bushland Reserve (Figure 4). Blackberry is absent from Lindhill Bushland Reserve.

**Control Technique** – Foliage spray larger infestations; cut

**Boneseed (*Chrysanthemoides monilifera* subsp. *monilifera*).**



Photo – [www.stca.tas.gov.au](http://www.stca.tas.gov.au)

**Extent of infestation** - Boneseed is scattered throughout both the Thoona Bushland Reserve and Lindhill Bushland Reserve, with higher density of plants in the north east corner of Lindhill Reserve (Figure 4).

**Control Technique** – Hand pull small plants; cut and paste larger plants.  
Remove all debris from site.

**Gorse (*Ulex europaeus*).**



Photo – [www.stca.tas.gov.au](http://www.stca.tas.gov.au)

**Extent of infestation** - Scattered small plants were recorded along the creekline in the Thoona Bushland Reserve (Figure 4).

**Control Technique** – Hand pull small plants when soil is moist or spot spray. Remove all debris from site.

**Pampasgrass (*Cortaderia selloana*).**



Photo – Adam Burrowes ([www.pittwater.nsw.gov.au](http://www.pittwater.nsw.gov.au))

**Extent of infestation** - A single pampas grass plant occurs in the northern or lower end of the Thoona Bushland Reserve. A single plant was also recorded in the Lindhill Reserve close to the northern boundary (Figure 4).

**Control Technique** – Foliage spray plants. Cut off and collect any seed heads that develop prior to treatment. Bag and remove all seed heads from site.

**Patersons Curse (*Echium plantagineum*).**



Photo – www.bird.net.au

Extent of infestation - Isolated plants occur at the southern end of the Thoona Bushland Reserve along the creekline where there has been recent earthworks and revegetation. Some plants were also recorded outside the reserve on the lower side of Lindhill Avenue (Figure 4).

Control Technique – Hand pull or spot spray all plants. Bag and remove all debris from site.

**Willow (*Salix alba*).**

Extent of infestation - Four willows occur in the creekline in the centre of the Thoona Bushland Reserve (Figure 4).

Control Technique – Drill and fill trees. Remove debris once trees are dead.

Gorse, blackberry, boneseed and willow are also listed as Weeds of National Significance (WONS).

**Environmental Weeds**

Environmental weeds have the ability to out-compete native species and reduce diversity in the reserve. They can also increase fire risk and degrade important threatened fauna habitat.

Up to 12 environmental or potential environmental weeds were recorded in the Thoona Street Reserve with only two (2) species present in the Lindhill Bushland Reserve.

The creekline in the Thoona Bushland Reserve is dominated by introduced species including, exotic grasses and herbs, climbers and shrubs. There is currently no maintenance of the introduced species or grasses along the creekline.

There are minimal infestations of environmental weeds amongst the intact native vegetation in the reserves.

The following section outlines the weed species that occur in the reserves that require active management. The distribution of these weeds is indicated in Figure 4.

**Arum lily (*Zantedeschia aethiopica*)**



Photo – www.weeds.org.au

Extent of infestation - An isolated infestation occurs in the creekline in Thoona Bushland Reserve (Figure 4).

Control Technique – Dig out plants or spot spray infestation. Repeated treatment is likely to be required. Remove all debris from site.

### Blue periwinkle (*Vinca major*)



Photo – [www.southgipslan weeds.com.au](http://www.southgipslan weeds.com.au)

Extent of infestation – A large patch of blue periwinkle occurs on the Nayuka Street fenceline (Figure 4).

Control Technique – Heavy mulching may suppress some growth and weaken plants to allow digging out. ALL plant fragments must be removed. Repeated spraying with herbicide after slashing back can also be effective.

### Blue passionfruit and Banana passionfruit (*Passiflora caerulea* & *P. tarminiana*).



Photo – [www.esc.nsw.gov.au](http://www.esc.nsw.gov.au)

Extent of infestation – A single blue passionfruit plant was recorded in the centre of Thoona Bushland Reserve. Isolated banana passionfruit plants occur in the north east corner of the Thoona Bushland Reserve (Figure 4).

Control Technique – Cut and paste stems. Debris can remain in-situ or be removed along with other weeds debris.

### Largeleaf cotoneaster (*Cotoneaster glaucophyllus* var. *serotinus*)



Photo - [www.weeds.asn.au](http://www.weeds.asn.au)

Extent of infestation – Isolated large plants occur in the northern end of the Thoona Bushland Reserve amongst the Japanese honeysuckle and blackberry. Isolated cotoneaster seedlings were also recorded in the north eastern corner of the Lindhill Reserve (Figure 4).

Control Technique – Cut and paste larger plants. Hand-pull seedlings. Remove debris from site



Foxglove (*Digitalis purpurea*).



Photo – [www.flowerpictures1.com](http://www.flowerpictures1.com)

Extent of infestation – A single plant was recorded amongst the slashed blackberry at the northern end of the site.

Control Technique – Hand pull all plants.  
Remove debris from site.

Japanese honeysuckle (*Lonicera japonica*).



Photo - [www.sbs.utexas.edu](http://www.sbs.utexas.edu)

Extent of infestation – A large plant is growing amongst native shrubs in the weedy area at the northern end of Thoona Bushland Reserve (Figure 4).

Control Technique – Cut and paste plant. Debris can remain in-situ or be removed along with other weeds debris.

Mainland wattles (*Acacia howittii*, *A. longifolia*, *A. pravissima*).

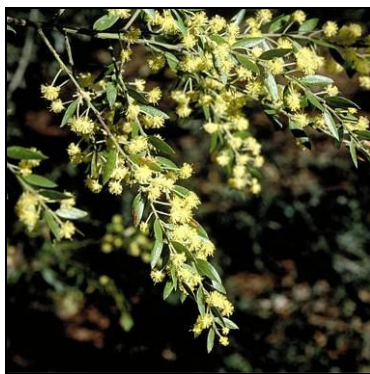


Photo *Acacia howittii*– [www.anbg.gov.au](http://www.anbg.gov.au)

Extent of infestation – Scattered mainland wattle species are present along the creekline behind the residences off Nayuka Street. A number of these trees may have been planted by local residents behind their properties.

Control Technique – Cut and paste trees. Replace with native wattle or similar.

Senna (*Senna* sp.).



Photo – [www.flmnh.ufl.edu](http://www.flmnh.ufl.edu)

Extent of infestation – A small infestation of senna occurs in the cleared area to the west of the creekline in Thoona Bushland Reserve (Figure 4).

Control Technique – Hand pulls small plants; cut and paste larger plants.  
Remove debris from site.

Sweet pittosporum (*Pittosporum undulatum*).



Photo – Colin Bower - [www.floraphoto.com.au](http://www.floraphoto.com.au)

Extent of infestation – Two isolated plants and a number of seedlings occur at the upper or southern end of Thoona Bushland Reserve (Figure 4).

Control Technique – Hand pulls seedlings; cut and paste larger plants.  
Remove debris from site.

Thistle species (*Cirsium vulgare*, *Silybum marianum*, *Sonchus* sp.).



Photo - [www.iewf.org](http://www.iewf.org)

Extent of infestation – Thistle species are scattered along the creekline and amongst the cleared land to the east of the creekline.

Control Technique – Spot spray thistles with approved herbicides approved for use near waterways.

Tree lucerne (*Chamaecytisus palmensis*).



Photo – [www.dpipwe.tas.gov.au](http://www.dpipwe.tas.gov.au)

Extent of infestation – Isolated plants occur on the slope in the Thoona Bushland Reserve (Figure 4).

Control Technique – Cut and paste plants.  
Remove debris from site.

Wild teasel (*Dipsacus fullonum* subsp. *fullonum*).



Photo – [wikimedia.org](http://wikimedia.org)

Extent of infestation – Teasel is widespread and common along the creekline and in the cleared land to the west of the creekline in the lower half of the Thoona Bushland Reserve.

Control Technique – Foliage spray plants or physically remove during erosion control works.

Disposal of Debris.

All weed debris removed from the reserve should be bagged (where appropriate) and disposed at an approved waste management facility.

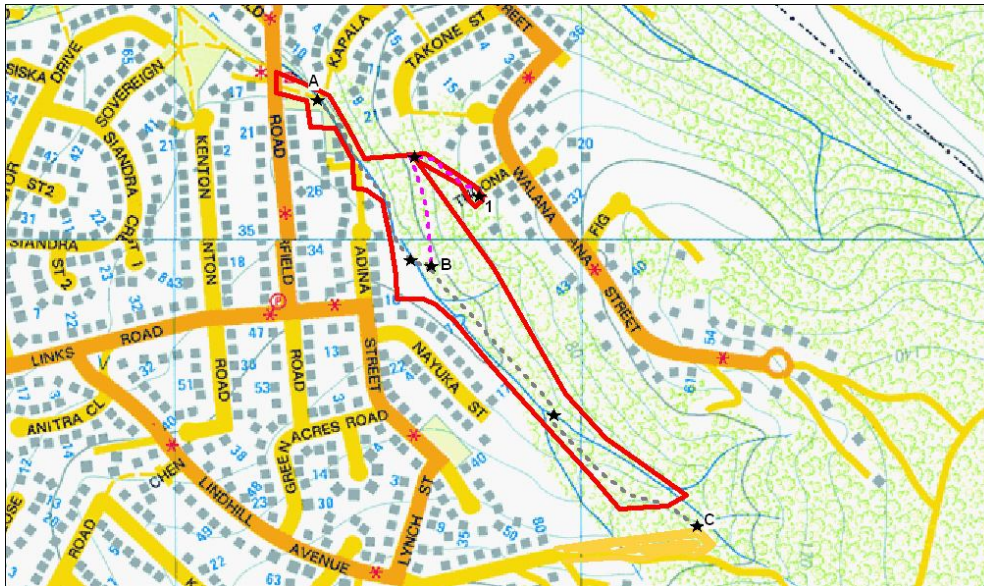


## **APPENDIX 8 – TRACK MANAGEMENT PLAN**

### **THOONA BUSH LAND RESERVE**

### Track Management Plan

Prepared for Clarence City Council



*John Hughes*

Walking Track Design and Construction

[snapperjohn1@live.com](mailto:snapperjohn1@live.com)

Ph: 0429391065

## Introduction

### Thoona Bushland Reserve

The track planning report includes details on track constructions, upgrades, entrances and signage recommendations.

Details are included of a proposed entrance to the reserve and a track linking to Lindhill Avenue. The entrance is possibly through the vacant residential property, which the Clarence City Council proposes to purchase from Lindhill Estate.

### Proposed Track

The proposed track is **710 metres**. There are two creek crossings. Creek crossings could be achieved with the construction of 2 small arched bridges. The track is to Australian Standard Three, the track width is 1.2 metres wide. There was a possible higher route but this was not feasible due to private land locations. The track mainly follows the Creek with a slight incline to Lindhill Avenue. There is a connecting link to Thoona Street. This link follows an old track which is 200 m. This track would need minimum work to attain Australian Standard Three.

### Clarence City – land required for Thoona Reserve Track

The proposed track alignment would require the purchase of land from Lindhill Estate. Properties Number 92 or Number 94 Lindhill Avenue have land which would need to be purchased to enable the proposed track alignment. There is a choice of land acquisition; Number 94 is the preferred choice. However it is not clear without further research which actual property would be required.

### Total Track Cost to construct Thoona Reserve Track\*

	Construction Labour costs	Gravel purchase and laying	Bridges Materials & construction	Total
Main track Sections A-B and sect B-C	\$4,600	\$17,750	\$10,000 for two bridges	\$32,350
Link track to Thoona Street Section B - 1	\$1,000	\$3,000	No bridges this section	\$4,000
<b>Total Cost Thoona Tracks</b>				<b>\$36,350</b>

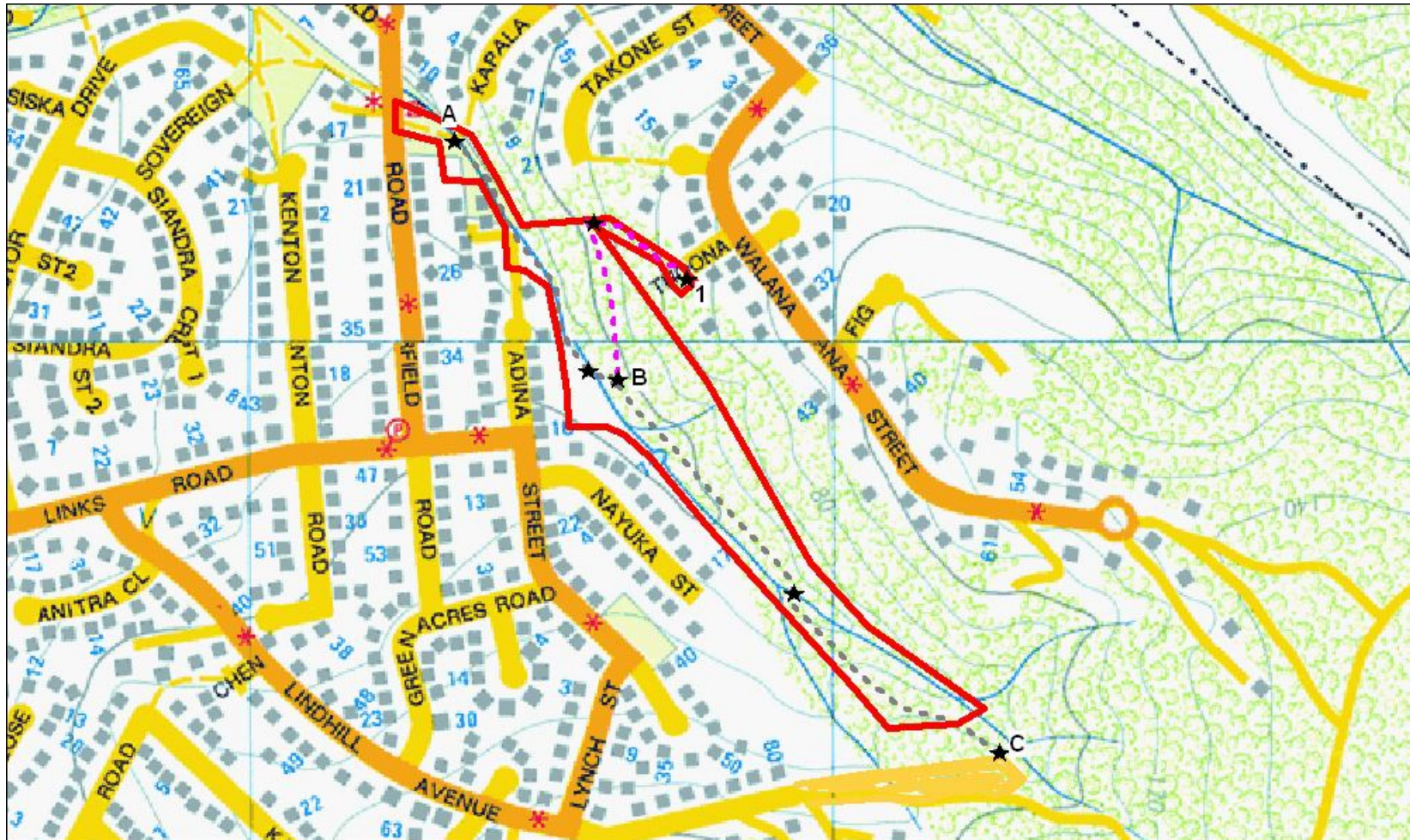
\*This cost estimate does not include the cost of signage

### **Thoona Bushland Reserve Section Detail**

	<b>Section A to B</b>	<b>Section B to C</b>	<b>Section B to 1 Side track to Thoona St</b>
<b>Cost and metres</b>	250 m @ \$25 per metre Total this section \$6,250	460 m @ \$48 per metre Total this section \$22,350	200 m @ \$20 per metre Total this section \$4000
<b>Bridge</b>	\$5000 for one stone arched bridge	\$5000 for one stone arched bridge	None
<b>Track Techniques</b>	Graveling with dingo and power carriers Some areas of top drains Small amount of clearing	Benching Gravelling with dingo and power carriers Some areas of top drains Clearing Vegetation	Gravelling Clearing Light benching Signage
<b>Comments</b>	Following the creek Follows an old track No construction needed Creek crossing	Following the creek Follows an old track Creek crossing Steeper section at top	An old track is used Property boundaries to be determined
<b>Materials</b>	40 mm Road Base Gravel Mudstone Gravel Stone for bridge construction	40 mm Road base gravel Mudstone Gravel Stone for bridge construction	40 mm Road base Gravel Mudstone Gravel
<b>Signage</b>	3 signs located at track junctions – entrance of Fairfield rd., turn off to Kapala st, track to Thoona St.	1 sign needed located at Lindhill at the start of the track	1 sign needed located at Thoona St at the start of the track
<b>Track Entry points</b>	Fairfield Road	Lindhill Avenue	Thoona Street



## Map of Thoona Bushland Reserve



Work recommendations given are the most suitable techniques to build the track to an AS 2156.1- 2001 Class Three standard. Class Three walking tracks are generally modified with a hardened surface. Width may be variable but generally less than 1200mm. Gradient may exceed 1:10 (approximately 6°) for short sections, and steps may be common.

**Appendix One has a summary of Australian Standard Walking Track Class 3**

### **Construction Method/Techniques**

It is recommended that all work on the walking tracks be built by hand. Volunteers may be involved in bridge construction, working with the supervision of experienced track workers.

### **Benching**

Where the route traverses hill slope the track will need to be benched. For this grade of walk the track surface should be fully benched into the slope. The down slope fill batter should have cut vegetation pulled over it to the short term of the slope and will assist in vegetation re-establishing. The upslope cut batter should be shaped at an approximately uniform angle leaning back slightly into the slope. All exposed root material should be trimmed flush.



**Figure Two. Benched track**



### **Arched Bridge**

A small arched bridge is constructed of rock. Paving on top allows for flooding



**Figure Three. Arched Bridge**

### **Benching with rock retaining wall**

This benching will be 1200 mm wide. Where there is a steep side slope, the use of rock edging is required. To retain the lower edge of the bench construction, 3 to 4 tiers of rock are placed.



**Figure Four. Rock Retaining wall**

### **Grade dips /Top drains**

Grade dips are a change in gradient of the track to slightly up hill with a slight out slope to divert water off from the track.

Top drains are needed in areas where excess moisture collects (eg. cutting grass areas). The drain runs parallel to the track on the top sides. The fill collected from digging the drain is placed on the track. A culvert pipe may be used so that water can exit through a 300 mm plastic culvert hidden under the track



## Appendix One. AS 2156 Class Three Walking Track

### CLASSIFICATION SYSTEM-CLASS 3

Item	Description
Overview	<p>Opportunity for visitors to walk in slightly modified natural environments requiring a moderate level of fitness and where the provision of interpretation and facilities is not common.</p> <p>Users can expect opportunities to observe and appreciate the Natural environment with limited provision of interpretative signage.</p> <p>Users can expect occasional encounters with others.</p>
<b>Elements for classification*</b>	
Track conditions	Generally a modified surface, sections may be hardened. Width: variable and generally less than 1200 mm. Kept mostly clear of intrusions and obstacles.
Gradient	May exceed 1:10 for short sections but generally no steeper than 1:10. Steps may be common.
Signage	Signs and track markers may be used for direction. Limited signage for management and interpretation purposes.
Infrastructure	Facilities generally not provided except for specific safety and environmental considerations.
Terrain	<p>Users need no bushwalking experience and a minimum level of specialized skills. Users may encounter natural hazards such as steep slopes, unstable surfaces and minor water crossings. They are responsible for their own safety.</p> <p>Storms may affect navigation and safety.</p>
Weather	
<b>Guidance for managers</b>	
Facilities	Track head facilities may include toilets, picnic facilities, car parking, drinking water, camp sites and information shelters.
Management intervention	Moderate
Risk management	Built elements will be inspected and maintained regularly. Any built facilities will be managed for public risk. Inspection interval: 6 months or less
Track information	Track details will generally be shown on local maps and brochures. Route-guide authors should consult with the managing authority.
Usage and group size	The managing authority may impose limits on group sizes and total numbers. Access and use to be in accordance with permit conditions.
Publicity	<p>Will normally appear on maps and brochures produced by the managing authority</p> <p>Not required.</p>
Activity registration	Route guide authors encouraged to consult with the managing authority before publication.
Route guides	Visibly impacted sites for up to 12 tent sites, preferably dispersed in groups of no more than four tents. Toilets to be provided where required for environmental protection
Campsites	

†

## **APPENDIX 9 – STORMWATER MANAGEMENT AND EROSION CONTROL**

### **Stormwater Management and Erosion Control Thoona Bushland Reserve, Geilston Bay (written by G. Popowski, Engineer, Clarence City Council)**

#### **1. Objective**

The following report makes recommendations for stormwater management and erosion control at Thoona Bushland Reserve at 10 Thoona Street, Geilston Bay. No detail survey has been undertaken thus the recommendations are of a preliminary concept only.

#### **2. Introduction**

Thoona Bushland Reserve is located within a gully to the west of Pilchers Hill and is abutted by residential development on all sides. The Reserve features a small creek, ephemeral in nature, which is a tributary of Faggs Gully Creek. The creek has a catchment area of approximately 48 hectares.

The condition of the creek has deteriorated over time as the composition of its catchment has changed. Several decades of residential development in the catchment has resulted in native vegetation being replaced with impervious, hard surfaces such as roads and buildings. The increased imperviousness of the catchment alters the natural hydrologic regime. Runoff volume increases, while travel time decreases which in turn increases runoff flows. Higher flows in the creek have resulted in erosion in some segments of the creek. Some residential properties have also experienced minor inundation during major events.

Water quality in the creek has decreased as the composition of the catchment has changed. Runoff water quality from residential areas differ from pristine native vegetated environments due to soil dispersion during subdivision and building construction activities, hydrocarbons and metals from car use on the roads and increased nutrient loading from typical suburban gardening practice.

Rainfall patterns in recent years have seen frequent heavy events, including an event that exceeded 1 in 50 Average Recurrence Interval on 19 December 2011, and total annual rainfall close to the mean. Various climate models have indicated the potential for heavier rainfall events to occur more frequently. A revision of Australian Rainfall and Runoff is due for release in 2013 and will provide more guidance on this matter.

#### **3. Catchment**

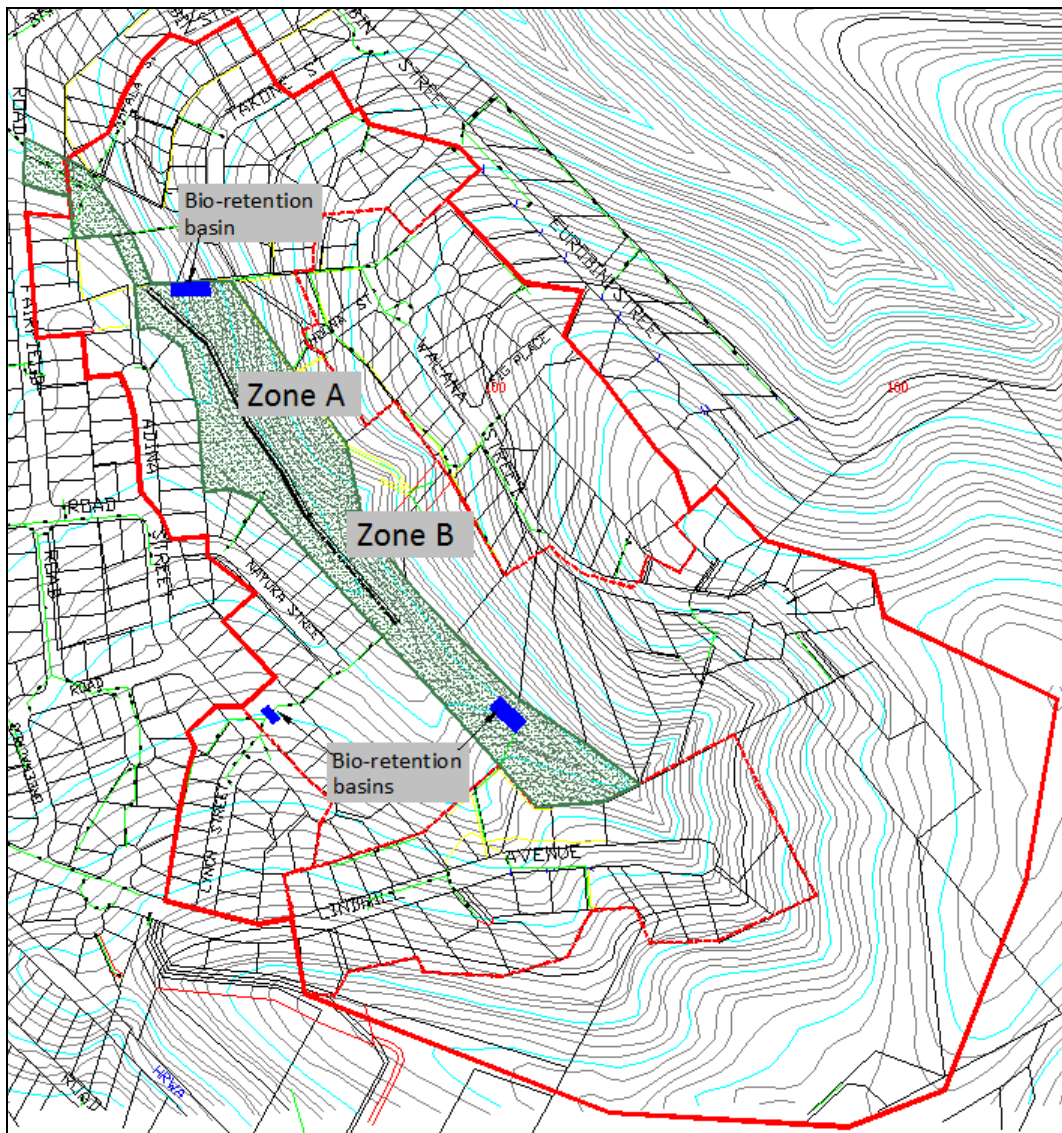
The catchment contributing to the Reserve is approximately 48 hectares (Figure 1). Approximately 25 hectares enters the Reserve at the southern end where the creek formation begins. The remainder of the catchment discharges to the Reserve along its length.

Three sub catchments that have concentrated discharge locations in the Reserve have been identified (Table 1).

**Table 1. Sub catchment summary**

<b>Sub Catchment</b>	<b>Size (ha)</b>	<b>Pipe Diameter (mm)</b>	<b>Peak Discharge (l/s)</b>
Lindhill	5.0	375	550
Lynch	1.6	300	175
Thoona	5.4	300	525

Lindhill and Lynch sub catchments discharge to the creek near the upstream southern end of the reserve. Thoona discharges near the downstream northern end.



**Figure 1. Thoona Bushland Reserve catchment**

#### **4. Stormwater Management**

The two main aspects of stormwater management are *quantity* and *quality*. The stormwater management objectives for the Reserve are:

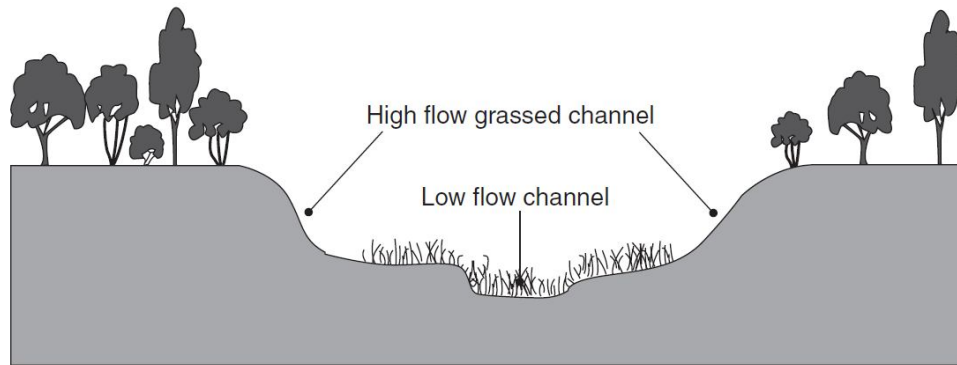
- quantity* to either increase the capacity of the creek or reduce flow rates, and
- quality* to improve runoff water quality.

##### **4.1 Quantity control**

The increased flow rates in the creek are impacting on the creek in two ways: erosion of the creek bed (Zone A) and inundation of private property (Zone B). Refer to Figure 1 for locations of zones A and B. Erosion control measures can be implemented, these are discussed in more detail below. The creek profile can be modified to increase its capacity, however the works would require significant stabilisation works to mitigate unintended erosion into the future. The preferable method for increasing the capacity of a natural creek is to maintain the natural profile of the creek as a low flow channel and incorporate it into a high flow

grassed channel. An example of a natural low flow channel within a grassed high flow channel is shown in Figure 2.

However there is limited scope for increasing the capacity of the creek in Zone B due to the presence of high voltage electricity cables laid under the creek. Council has recently undertaken some minor works that help to drain the flat land adjacent to creek after a rainfall event. Further improvements could include changing the shape of the creek to a broad triangular cross section such that the ground falls steadily from the boundary of private properties to the invert of the creek.



**Figure 2. Low flow channel with grassed floodway**

An alternative quantity control measure to increasing the capacity of the creek is to reduce the flow rates of point stormwater discharges. Discharges from the Lindhill, Lynch and Thoona sub catchments discussed earlier can be attenuated by constructing detention basins at their outlets. Adequately sized basins could reduce the peak flows from these sub catchments by as much as 50%. Installation of detention basins can also be integrated with stormwater quality improvement measures.

#### 4.2 Quality control

Runoff water quality from parts of the catchment that have been developed for residential activities is considerably worse than that from more natural parts of the catchment. Targeted implementation of stormwater quality improvement measures, typically referred to as at-source pollution control, is more efficient than attempting to improve the water quality in the combined flow. Improved water quality in the creek could be achieved by targeting the Lindhill, Lynch and Thoona sub catchments.

The most appropriate solution would be the construction of bio-retention basins. Bio-retention basins typically consist of a sandy filter/growing media, native vegetation and provision for water storage, or extended detention. The sand filter, while providing a media for plants to grow, filters out particulate matter and sediments, the vegetation will remove some of the nutrients from the flow and the extended detention maximises the volume of runoff that can be treated. An example of a bio-retention basin is shown in Figure 3.



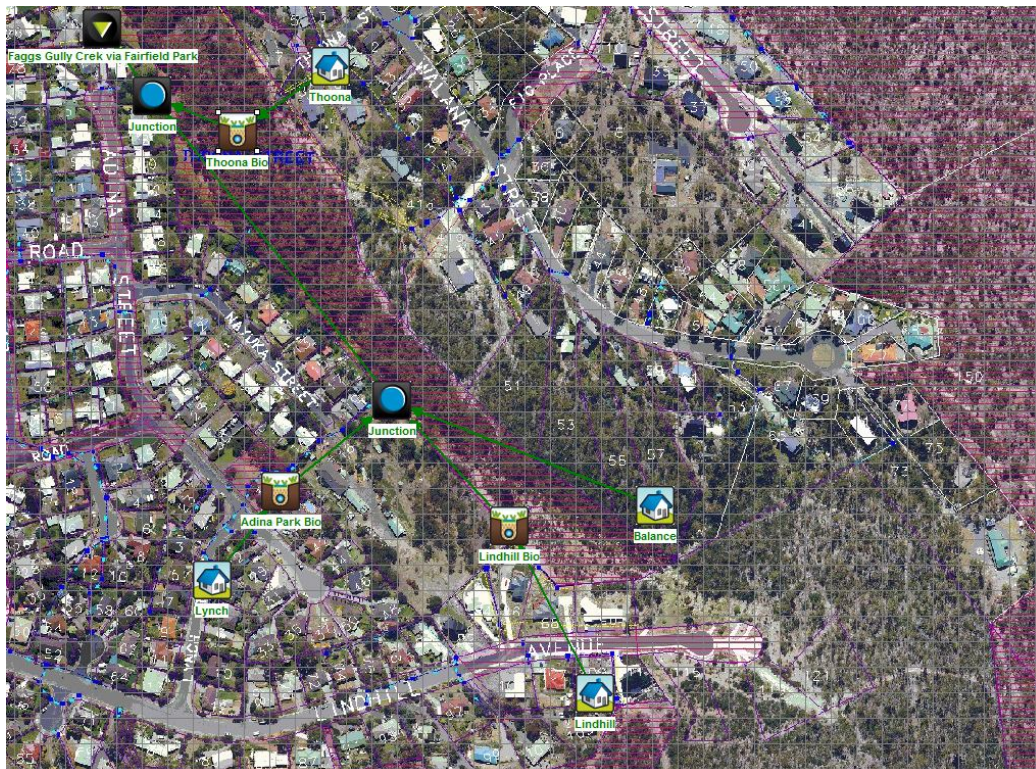


**Figure 3. – Example of a bio-retention basin**

The bio-retention basins for the Lindhill and Thoona sub catchments would be constructed at their outlets near the creek. The basin for the Lynch sub catchment could be installed in Adina Park where it could provide an interesting landscaping feature. The vegetation for these basins would be selected for its nutrient uptake properties and with consideration of native vegetation endemic to the area.

Bio-retention basins are prone to blocking up if subject to high sediment loads. It is imperative that construction sites within their catchments adhere to best practice site soil and water management.

Preliminary sizing of the bio-retention basins has been performed using MUSIC. The conceptual MUSIC model is shown in Figure 4 while the preliminary bio-retention basin sizes are shown in Table 2.



**Figure 4. MUSIC model**

**Table 2. Preliminary bio-retention basin sizing**



Sub catchment	Basin Area (m <sup>2</sup> )	Extended Detention Depth (mm)
Lindhill	225	700
Lynch	100	600
Thoona	225	700

## 5. Erosion Control

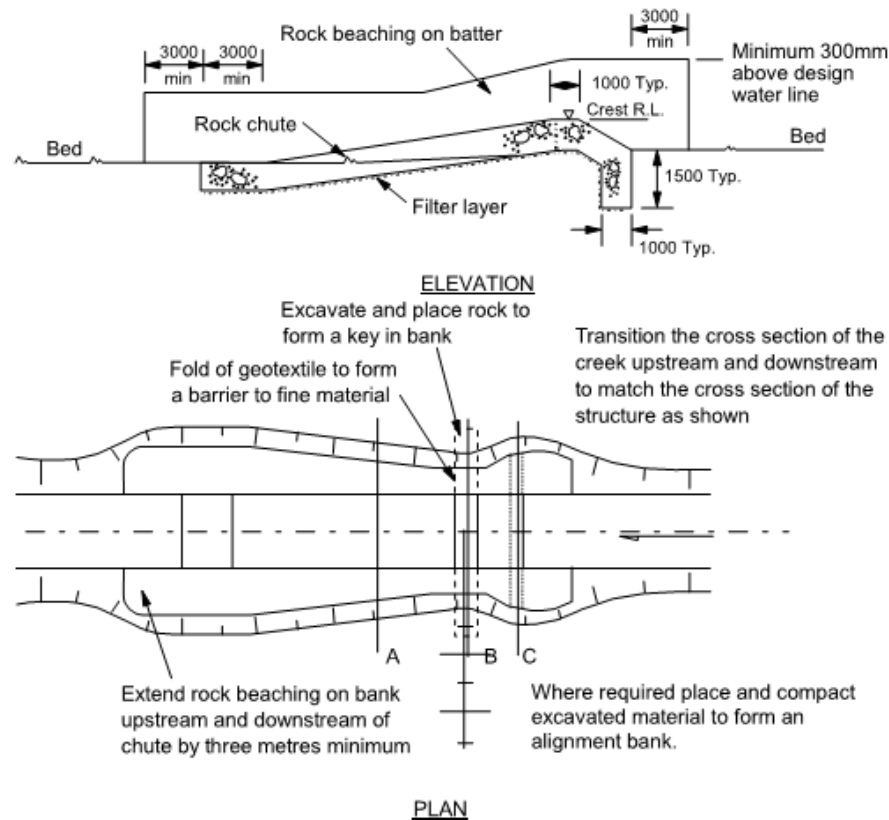
The geomorphology of the creek is currently evolving to accommodate the new flow regime of the catchment. That is, the capacity of the creek is increasing through erosive means in response to increased flows. However, left unchecked, erosion can have serious effects on adjacent land and structures through a negative feedback loop. In a stable state a creek will flood under high flow conditions, water will spread over its banks and the erosive forces are minimised. As the composition of the catchment changes and higher flow rates occur more commonly erosion starts to occur, generally on steep sections of the creek. Initial erosion of the creek increases its depth and/or width, the creek can then carry more water before its banks are overtopped which in turn leads to erosion of the new profile. Thus the creek continues to increase until it reaches equilibrium. **The erosion currently observed in the creek has the potential to undermine large trees and infrastructure such as underground services and fences.**

The existing erosion can be controlled by installing rip-rap along the creek banks and creek bed. Rip-rap is typically hard rock, such as dolerite, sourced from a quarry. The size of rock required is dependent on the slope of the creek and the anticipated flow rates. An example of rip-rap stabilisation of a creek bank is shown in Figure 5.



**Figure 5. Rip-rap stabilisation of a creek bank**

**The potential for further erosion of the creek can be reduced by altering the slope of the creek bed. Drop structures** consisting of adequately sized quarry rock can be installed at specified locations along the creek. The drop structure will allow water, and eventually sediment, to build up on the upstream side of the drop structure, effectively flattening out the alignment, which has the effect of reducing flow velocities in the creek. The drop structure could also be complimented and improved by **the planting of appropriate native vegetation.** An example of a rock drop structure is shown in Figure 6.



**Figure 6. Example of a rock drop structure (Guidelines for the Design of Rock Chutes using CHUTE – CRC for Catchment Hydrology).**

## 6. Cost Estimates

Preliminary cost estimates for the stormwater management and erosion control measures are summarised in Table 3 below.

**Table 3. Preliminary cost estimates**

Control measure	Cost Estimate	Year
Stormwater Management		
Lindhill Bio-retention basin	\$45,000	2015-16
Lynch Bio-retention basin	\$25,000	2014-15
Thoona Bio-retention basin	\$45,000	2016-17
Nayuka St creek alteration	\$26,000	2017-18
Erosion Control		
Rip-rap stabilisation	\$10,000	2013-14
Drop structures	\$5,000 (each)	2013-14

## 7. Recommendations

The following erosion control measures should be implemented within Thoona Bushland Reserve.

- Rip-rap stabilisation of creek banks, and



- Installation of drop structures to alter the slope of the creek bed and mitigate future erosion.

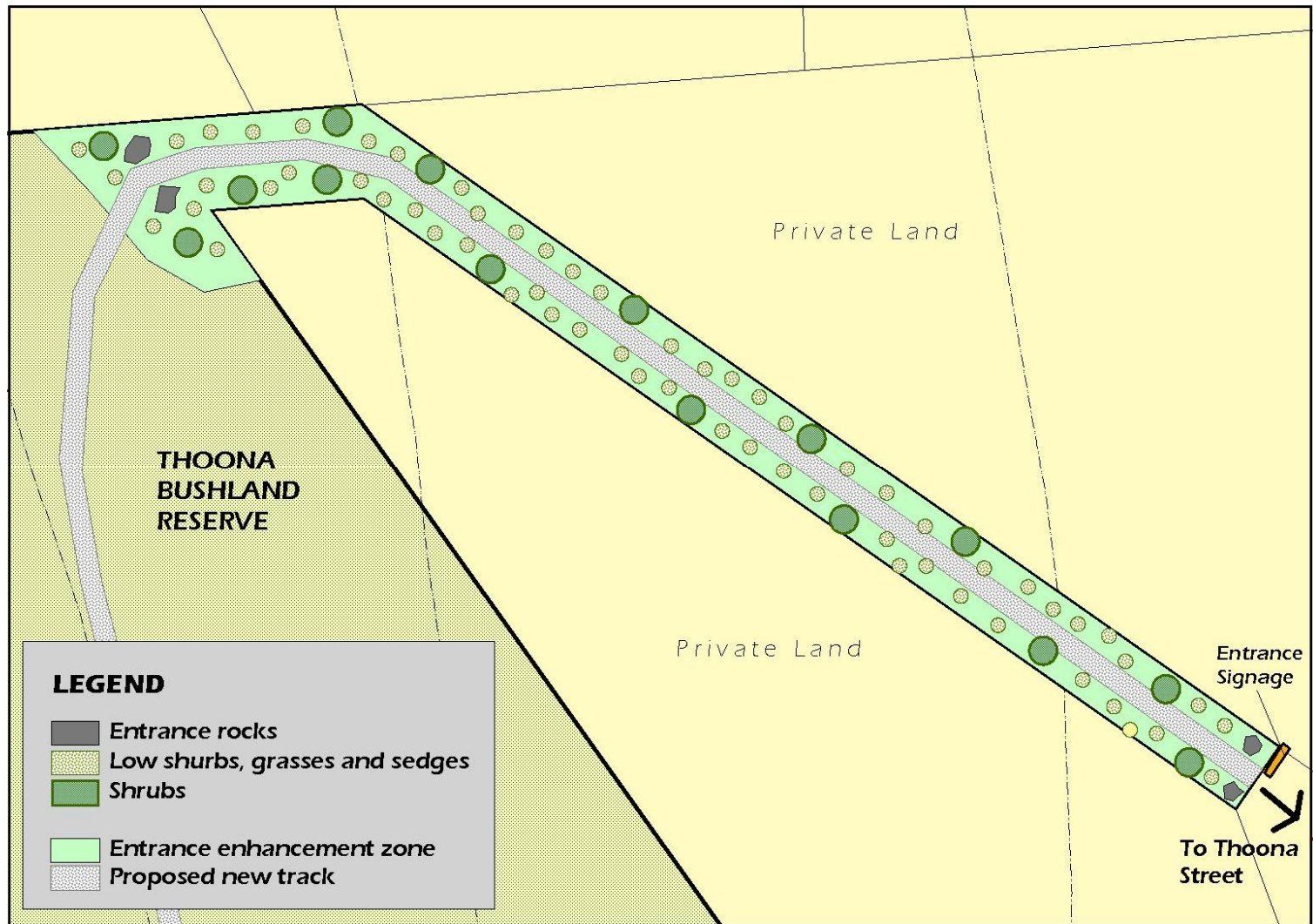
The following stormwater management improvements should be investigated further to determine their impact on Thoona bushland Reserve.

- Construction of bio-retention basins on the Lindhill, Lynch and Thoona sub catchments with suitable extended detention depth to attenuate flows discharging into the creek.
- Alteration of the creek profile behind Nayuka Street.

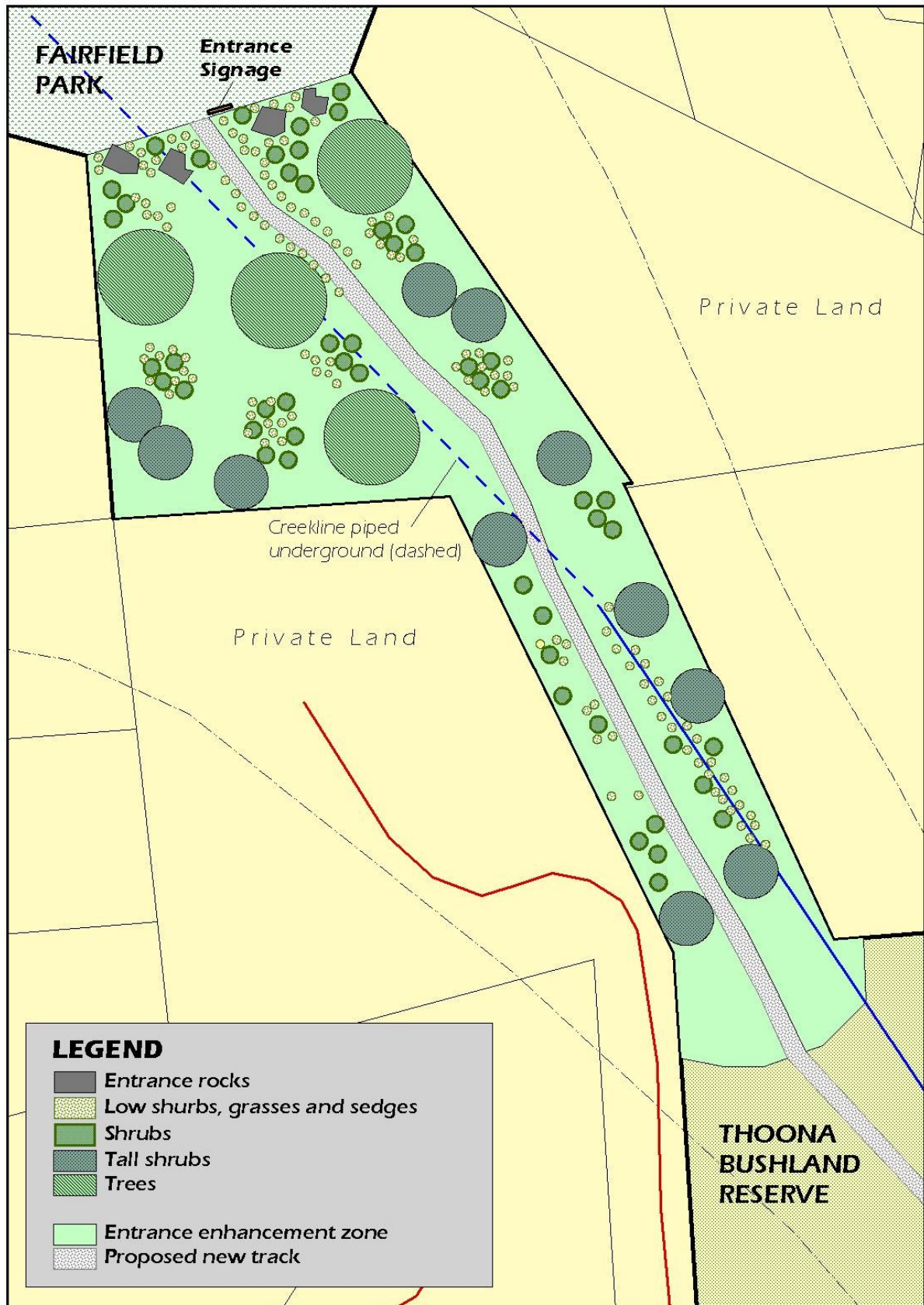
A detailed topographic survey shall be obtained prior to any works being carried out on site. The survey is required to facilitate a comprehensive analysis of the creek to identify/confirm potential flooding and erosion hotspots and determine the feasibility of sites for bio-retention basins.

## APPENDIX-10 – ENTRANCE LANDSCAPE PLANS

*The following entrance landscape plans provide indicative planting layouts only and actual layouts are to be determined on site.*



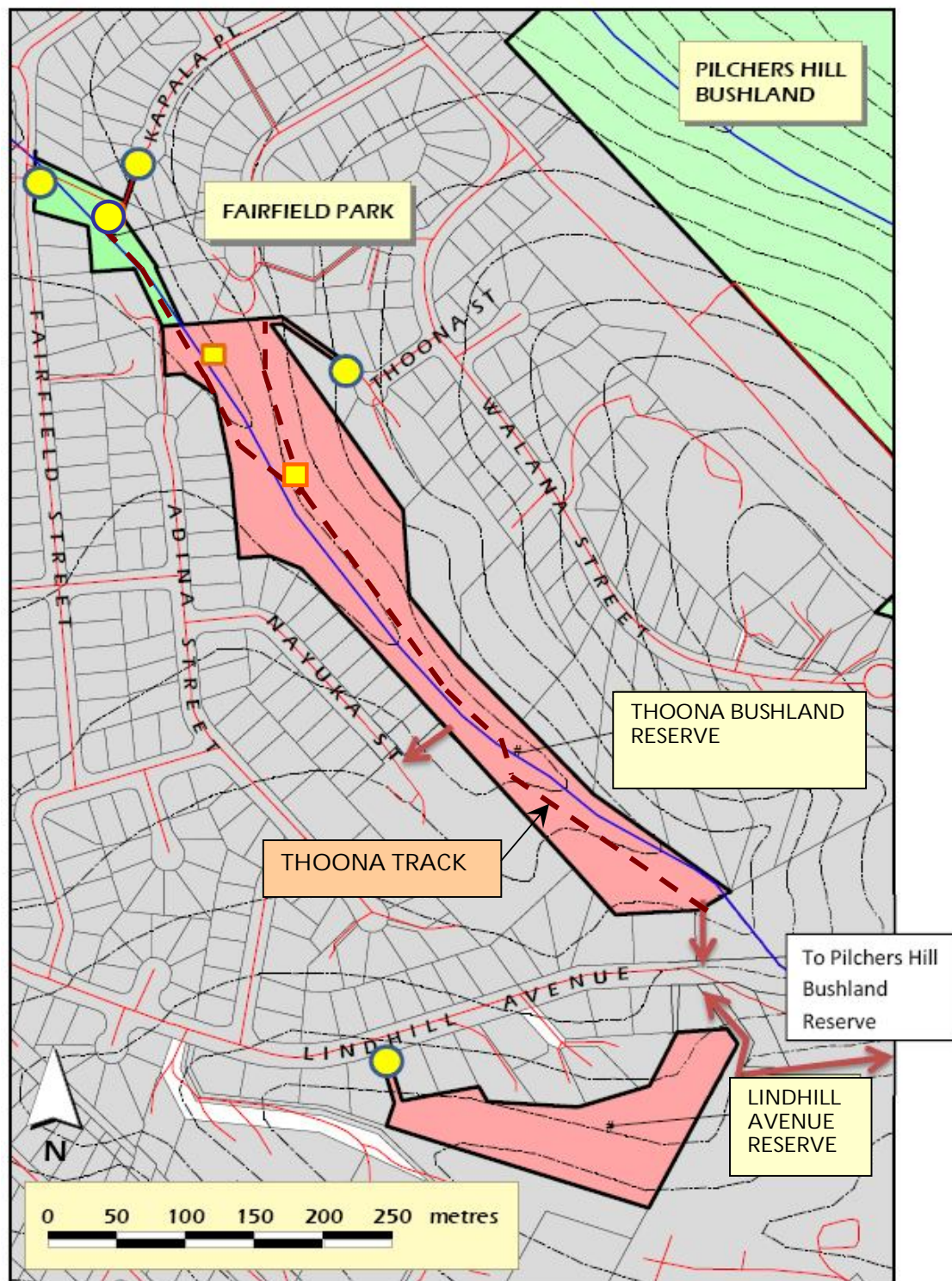
*Entrancement Landscape Plan for Thoona Street Entrance*






*Enhancement Landscape Plan for Fairfield Park Entrance.*



## APPENDIX 11 – SIGNAGE PLAN



-  Entrance signage
-  Directional signage
-  Future connection as part of subdivisions

Interpretive signage not shown (appropriate locations to be determined)



## APPENDIX 12 – REPORT CARD

### THE DRAFT THOONA BUSHLAND RESERVE ACTIVITY PLAN RECOMMENDS:

- >> Improve access - establish access from Thoona Drive and options for access off Lindhill Avenue
- >> Establish a walking track through to connect access points
- >> Manage weeds - key weeds to control are boneseed, patersons curse and blackberry
- >> Develop a fire management plan
- >> Establish local Landcare group
- >> Restore native vegetation, manage erosion and flooding along creekline
- >> Create links with Pilchers Hill, Fagg's Rivulet and local bushland areas
- >> Install entrance and information signs

### STAY WITH US...

Council invites your comments on the Draft Thoona Bushland Reserve Activity Plan. The Plan will guide the community and Council as we work together to improve the management of the Reserve. You can find the draft plan at [www.ccc.tas.gov.au/environment](http://www.ccc.tas.gov.au/environment)

### USE THE ONLINE FORM OR CONTACT

BY 17 MAY 2013

Andrew Welling 0400 151 205

[awelling@bigpond.net.au](mailto:awelling@bigpond.net.au)

Phil Watson 6245 8619

[pwatson@ccc.tas.gov.au](mailto:pwatson@ccc.tas.gov.au)



Mountain Dragon

*'I am all in favour of  
making bush reserves  
such as this one into areas  
which can be enjoyed  
by all people'*

Local resident



Rockplate Buttercup



Wall Wallaby Grass

## THOONA BUSHLAND RESERVE

## REPORT CARD



Bennett's Wallaby

Your Community and  
Council working together  
to care for our Reserve

*In the Spring of 2012 Clarence City Council asked the community about Thoona Bushland Reserve..  
..these are the results.*



	EVALUATION				DESCRIPTION	COMMUNITY COMMENTS
	OUTSTANDING	VERY GOOD	PASS	CAN DO BETTER	THOONA BUSHLAND RESERVE	
LOCATION					Small linear woodland in Geilston Bay. Northern boundary at Fairfield Street and southern boundary at Lindhill Road.	
VEGETATION					Grassy woodland vegetation that contains rare plant species.	
ANIMALS AND BIRDS					Home to wildlife including wallabies, echidna, mountain dragons and abundant birdlife.	<i>Amazing amount of wildlife and birdlife in the area including a stable frog population</i>
LANDSCAPE					Bushland has a 'wild' element.	<i>Proximity and connection to natural bushland valued by local residents</i>
ACCESS					Limited access - important to provide connection to other bushland areas.	<i>Local residents would like to see a sustainable multi-use track to link surrounding streets</i>
USAGE					Quiet, peaceful place in midst of an urban area mainly for local recreation.	<i>Has recreational potential and provides a chance for people/children to connect with nature in urban setting</i>
THREATS					Weed species, fires, stormwater flooding and creekline erosion.	

Stay with us on the journey of caring for Thoona Bushland Reserve. Your comments and ideas are welcome!  
**Go to [www.ccc.tas.gov.au/environment](http://www.ccc.tas.gov.au/environment) and find out how.**





## APPENDIX 13 – SETTING UP PHOTOPPOINTS




Photopoint Monitoring
FACT SHEET

### WHAT IS PHOTOPPOINT MONITORING ?

Photopoint monitoring is a simple, fast and inexpensive technique to record and monitor visual changes in the natural environment over time. It involves taking a series of images of a fixed area or subject at regular time intervals, which can then be compared to show physical change at a given location.

Consistency is critical to the success of photopoint monitoring. Photos must be taken at the same location, with the same camera direction angle, focus points and preferably camera settings at each time point, for an effective permanent visual record of environmental change.

Photopoint monitoring is most effective only when its strengths as a method match the objectives of the study, in terms of the nature and magnitude of the change that is expected to occur. When considering using photopoint, you need to be clear about the **appropriateness**, **capabilities** and **limitations** of the method.

### Appropriateness

Photopoint monitoring is a useful technique for recording the effectiveness of on-ground management actions at the site scale (10m-100m) and is most appropriate when used to capture environmental changes which are visible to the eye. Photopoint monitoring may be best used to support other monitoring efforts aimed to quantify environmental change.

**The photo series can detect change in condition due to:**

- Weed growth/management
- Grazing pressure/management
- Feral animal impacts/management
- Erosion impacts/management
- Recreational or human impacts/management
- Revegetation
- Reintroduction of native animals
- Regeneration
- Dieback

### Capabilities

- Low measurement error and variation
- Requires minimal training
- Readily obtainable equipment
- Low impact on monitoring site
- Provides a standardised and precisely replicable result that can be achieved by different people at different points in time
- Generally, it can be conducted by one person; however two people may be preferable due to safety considerations and transporting of equipment
- Complements quantitative monitoring techniques/data i.e. vegetation condition monitoring and species survival counts
- Potential to store data electronically and link to site records and/or GIS maps/data point
- Photos provide a permanent visual record of site conditions that transcends periodic changes in staff and expertise
- Photos may be a more effective communication/extension tool when dealing with the public and decision makers than highly quantitative charts, tables and graphs

### Limitations

- Will only detect changes large enough to be seen by the eye from the camera position
- Is a qualitative rather than quantitative monitoring technique. These imitations can be overcome if additional quantitative techniques are applied, such as counts (*see Appendix 1*).
- May not provide any evidence of cause of change in the variable of interest
- External effects, such as light may make detection of changes more difficult. Extreme wind and rain also present challenges
- Cannot be used in dense woody vegetation as branches and foliage obscure camera field of view.
- Overtime representation of objects may be restricted by the size and number of fields of view or photopoint markers can become obscured by vegetation, or lost due to soil erosion or vandalism
- Results will almost always be relative to the site where they are taken and comparison between sites may be limited
- Interpretation requires collection of 'metadata', e.g. date, time, plant species names
- Changes in operators or technology/equipment may affect results. This can be avoided by following a set method.

# One picture is worth a thousand words

Page 1



## Photopoint Monitoring

NRM SOUTH

### THE METHOD

There are five stages to photopoint monitoring:

1. **Project planning**
2. **Equipment acquisition**
3. **Photopoint monitoring**
4. **Photo archiving**
5. **Repeat monitoring**

It is essential that all stages are implemented to ensure that the photopoint standard is maintained and that the project goals and objectives are achieved.

#### Project Planning

There is no guarantee that photopoint monitoring will produce useful data for every kind of restoration or management project. In the planning phase consideration should be given to:

- the aims of the project,
- the management actions to be conducted,
- relevant indicators and other supporting monitoring techniques, *(see Appendix 1)*,
- the nature, magnitude, and time frames of the expected change, *(see Appendix 1)*,
- the monitoring frequency, *(see Appendix 1)*,
- the level of confidence in monitoring results required to inform further management, and
- the archiving systems and requirements.

#### Tips for selecting monitoring sites:

- The location of a photopoint monitoring site should be carefully chosen. Choose an easily recognizable location with minimal access issues. Proximity to a road or track will aid efficiency for future monitoring. Remember to obtain permission to restricted areas or private land.
- Avoid steep slopes, where possible, as this can make photo consistency more difficult and complicate interpretation.
- The photo view needs to illustrate a distinct feature that you want to monitor, e.g. a boundary between grazed and un-grazed vegetation, an area subject to weed control, or the growth of revegetation or plants regenerating. Choose a location which will clearly capture the feature you want to monitor. The more specific the photo, the easier it will be to interpret the sequence of photos.
- The view through the camera to the central focus point needs to be uncluttered. Anticipate things like plant growth which may obscure views in future monitoring.
- The photos need to be representative of the site and maximize subject matter in the field of view.

#### How to select monitoring frequency:

Photos can be taken at different time intervals depending on the changes expected at the site. Baseline photos should be taken to capture the site before management actions are implemented or environmental changes are expected e.g. revegetation or weed control, before an area is opened up for recreation

Following the baseline photos, timeframes for further comparison may be:

- **Short:** before and after. This will help capture short events such as implementation of management actions.
- **Medium:** very 6 – 12 months, when a site is changing quite rapidly or a lot of visible work is being carried out.
- **Long:** every year to few years, when more subtle changes are occurring.

The frequency of monitoring may change over time as management actions or condition improvement/decline on the site. For example, photos may be taken frequently as management works are implemented, and then drop to a medium and then long timeframe as management actions slow or cease and the environment responds over time.

Additionally, photos can be taken at any point in time, of anything of interest occurring on the site, e.g. a new species occurs at the site.



Above: Photopoint monitoring series of regeneration after a fire.

## Equipment

For each monitoring point you will need:

- 2 steel or aluminum posts/star dropper (with protectors), approx 1.8m long, per photopoint site.
- Hammer or post driver for driving in star droppers
- Tape measure (up to 50m)
- Coloured flagging tape (optional)
- Camera
- GPS
- Map or aerial photo of the site/location
- Aluminium tags and soft tie-wire or cable ties (or other means of identifying the photopoint position)
- Field Data Sheet
- Data Board
- Marker pen
- Clipboard

## Conducting photopoint monitoring

At your chosen site, fix a 'camera post' and 'sighter post' firmly into the ground so they are difficult to remove. If vandalism is likely to be a problem, marker pegs can be placed at the base of each post to mark their location in a less conspicuous manner.

- The 'camera post' is where the photos will be taken from and should have approximately the eye height of the average person (1.5m) remaining above the ground. An identification tag should be permanently tied to the 'camera post'. An identical tag can also be attached to a marker peg on the ground if vandalism is a problem.
- The 'sighter post' is approximately 10m away from the 'camera post' in the direction that you want to take the photo (Fig. 1a). Place the Data Board in the field of view, with the site identification and relevant monitoring information visible, e.g. date, time etc. The writing on the Data Board needs to be large enough to be visible.
- Hold the camera on the 'camera post', facing the 'sighter post', and focus the centre of view on the top of the 'sighter post' (Fig. 1b).

Fill in the Photopoint Field Data Sheet, making sure it corresponds with the information on the Data Board. When taking the compass bearing of the 'sighter post', be careful to keep the compass away from the metal star dropper as this can influence the reading. Take two steps back and line up both droppers before taking the reading.

Ideally use the same type of camera with the same settings each time. A good choice is a SLR camera with 50mm lens. The 'auto' setting allows for ease of use and consistency, but if you use manual settings remember to record them. Zoom should not be used as it changes the width of the field of view. Turn on date stamping features on the camera if available and unlikely to obscure important elements of the picture (see *Hints and Tips* for more).

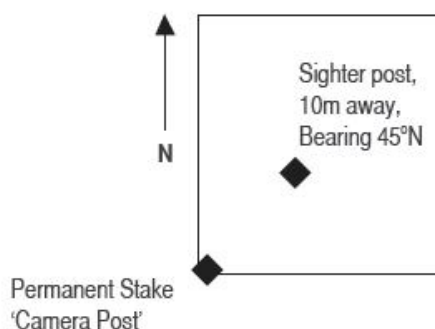


Figure 1: Example of Photopoint set up - aerial view

Source: Pedler et al., 2007

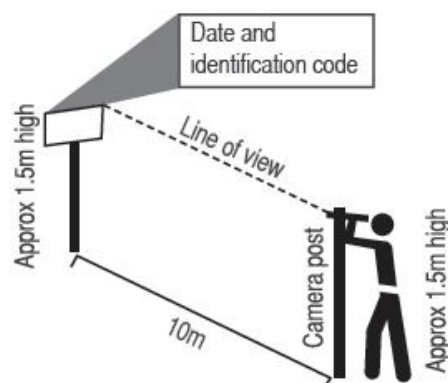


Figure 2: Example of Photopoint set up - side view

Source: Friends of Stuart Gorge, 2010

## Photo Archiving

At the time of taking the photo it is important to collect supporting data to support the interpretation of the image and enhance the value of the monitoring effort. The more complete the supporting information the more you will be able to assess the environmental change and, if relevant, the impacts of management actions. See the 'Photopoint Field Data Sheet' template for essential information fields.

When downloading photos, clearly label each photograph with the site ID, site no. and date. Filing photos and corresponding field data sheet either electronically or in hard copy a folder system will help accessibility and efficiency in the future.

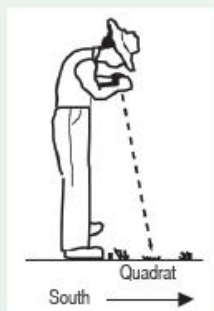
There is no substitute for reliable monitoring to help determine the success or failure of management action



## Photopoint Monitoring

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### ADDITIONAL PHOTO MONITORING TECHNIQUES



#### Spot photograph

A spot photograph is an image taken looking vertically down on a marked spot or a quadrat from head height (Fig. 3). This is used for recording ground cover, species and organic litter for a standard sized area.

Figure 3: Spot photograph monitoring  
Source: Grodecki & van Willing 2010

#### Photo Quadrat Monitoring

The purpose of photo quadrat monitoring is to derive more detailed quantitative data, which can be compared between the baseline and subsequent data sets taken at the same location over time. This additional data can also be spatially related to the contents of the photopoint photos over time. Like photopoint monitoring, you must be clear about your objectives when considering photo quadrat monitoring. If the additional data is not needed then time will be wasted. Additionally, the 'site observations' section of the Photopoint Field Data Sheet can be used to collect as much or as little supporting data as the user requires and can fill information gaps to support photopoint photos. Appendix 1 in this booklet suggests when alternative measurements could be taken to support photopoint monitoring. Photo quadrat monitoring could be used as a method to 'count' where this is indicated.

To undertake photo quadrat monitoring, divide the most distant 5m section of the photopoint into 10 (1m x 1m) quadrats (see Figure 4). Within each quadrat, record the information required, for example mark a point for species present, species height and so on. If revegetation or regeneration survival rates is one of the variables you want to monitor, pegs can be used to mark the seedlings planted or new germinants. If seedlings/germinants are no longer present when your return you could conclude that the plants have died, unless the plants experience prolonged dormancy or the site has been tampered with.

This technique should not be used to assess the condition of vegetation community. The Vegetation Condition Assessment method has been developed for this purpose (<http://www.dpiw.tas.gov.au/inter.nsf/WebPages/PWOD-7PM7CH?open>).

There are several variations on photopoint monitoring using quadrats, please research the best one for your site. All methods require knowledge about plant species.

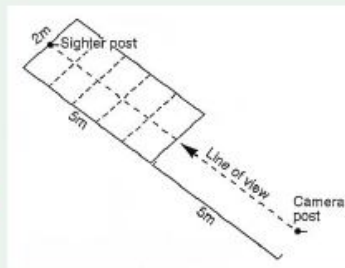


Figure 4: An example of photo quadrat monitoring for further vegetation monitoring data, aerial view.

Source: Friends of Sturt Gorge, 2010

### HINTS AND TIPS:

- In addition to the fixed photopoint shots, consider taking multiple photos to create a panorama, to help with interpretation of context and subject in the future.
- Do not use a wide angle or telephoto lens as this alters the perspective of the photo and makes it difficult to repeat.
- Minimize sun glare in the photo and try to take photos at the same time of day. Although not always possible, locate photopoint posts north – south, and take the photo facing south with the sun behind you and the sunlight shining on the landscape facing you. This helps prevent glare and avoid direct sun light in the shot.
- Taking photos on a cloudy but bright day can help avoid strong shadows.
- Photos taken between 9am and 3pm will help reduce shadowing and different colour cast which may conceal some features. Auto settings used appropriately for different light levels can help reduce the problems of over exposure. Set the light exposure levels for the monitoring site by excluding the sky. To do this lower the camera and obtain exposure whilst the top of the camera is no higher than the horizon and lock the exposure at that level.
- Photos repeated annually should be taken at the same point in the season.
- Take a copy of the previous or original photo to the site with you and use it to compare with the field of view to ensure consistency.

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### FOR MORE INFORMATION

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**Photopoint Sighter Board:**

Date:	
Time:	
Property / Site ID:	
Photopoint Site No:	
GPS Coordinates:	
Purpose of Photo:	

