

Vegetation Management Plan

Hobart Rivulet, Guy Fawkes Rivulet and Ross Rivulet FINAL

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Vegetation Management Plan – Hobart Rivulet and Guy Fawkes Rivulet

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1 Introduction

This Vegetation Management Plan for the Hobart Rivulet and its major tributaries has been developed to provide a framework for removal of willows and other weeds and the subsequent revegetation with native species to restore natural values. The plan identifies the natural values of these watercourses and outlines the threats to the native biodiversity. Weed density and distribution has been mapped and documented and a plan for strategically addressing their control and restoring native vegetation is presented. Restoring native vegetation will have benefits for water quality, stormwater management, biodiversity and public amenity.

In the *Review of the Three Rivulet Plans* in 2016, the development of an overall vegetation management plan for Hobart Rivulet was identified as a high priority.

2 Background

2.1 Site description

The Hobart Rivulet is a perennial watercourse, travelling 9.5 km from its origin near The Springs on kunanyi/Mount Wellington until its confluence with the Derwent Estuary near the Domain (Bonar, 2011; Cascades Landcare Group, 2000). The rivulet flows naturally throughout most of its length, only changing when it reaches the edge of Hobart's urban centre, where it is engineered into channels with a base of stone or concrete, often running underground (Bonar, 2011). In its middle reaches, the rivulet provides a popular recreational corridor located in the Hobart Rivulet Park where walkers and cyclists can traverse a recreational shared-use path.

This plan considers the vegetation 20 metres either side of the following sections of rivulet (Figure 2):

- Hobart Rivulet between the Wellington Park boundary and Molle Street,
- Guy Fawkes Rivulet from the Wellington Park boundary to its confluence with Hobart Rivulet
- Ross Rivulet from its origin to its intersection with Hobart Rivulet.

2.1.1 Geology

The Hobart Rivulet lies on undulating terrain, with variable geology along its length. In the upper section of the catchment, from the boundary of Wellington Park to Cascade Brewery, the geology is constituted of Permian sandstone and mudstone (LISTmap, 2021). Triassic sandstone

dominates the middle section of the study area, downstream from Cascade Brewery. The lower flatter reaches of the Rivulet are in Tertiary deposits of sand and gravel.

2.1.2 Land Tenure and Use

Land tenure along the Hobart Rivulet is varied. The upper catchment of the study area consists of largely intact native vegetation extending across the foothills of kunanyi/Mount Wellington. This land is owned by the City of Hobart and within Wellington Park. Downstream of Wellington Park, there are riparian sections owned by the Council and sections owned by Cascade Brewery. There are also many private residential lots containing gardens along the rivulets. There are landscaped parklands around Cascade Brewery at Cascade Gardens, managed by the City of Hobart. Downstream of Cascade Gardens, land tenure along the rivulet becomes a complexity of land owned or managed by Council and private freehold parcels in residential lots.

Land use along the rivulet in the study area mainly consists of public land used for nature conservation and recreation, and private residential lots. In some sections of the rivulet there is private land along one or both sides of the watercourse. Cascade Brewery is the only industrial use of the Rivulet, in South Hobart (Bonar, 2011).

The Hobart Rivulet Park sections of the Rivulet are used by walkers and cyclists for both recreation and commuting, as the park provides a connection between the residential areas of South Hobart and the city.



Figure 1 - Hobart Rivulet Park, note cotoneaster (environmental weed) on left

The Hobart Rivulet is also a major stormwater asset for the City of Hobart, draining an area of approximately 2,217 hectares (Bonar, 2011). The majority of the catchment area (approximately 80%) is dominated by native vegetation, mostly within the upper to mid sections. The remaining 20% flows through the urban centre of Hobart and is dominated by impervious surfaces. This lower section of the rivulet is mostly channelised and lined with stone and concrete (Bonar, 2011).



Hobart Rivulet Vegetation Management Plan – November 2021

Figure 2 – Location of Hobart Rivulet survey area and management zones

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2.2 Planning and Strategic Context

A range of management plans have been developed in the past that relate to the Hobart Rivulet and its tributaries. A summary of relevant plans is provided below with actions relating to the current Vegetation Management Plan outlined.

Hobart Rivulet Catchment Management Plan 2011-2016

Hobart City Council

The Hobart Rivulet Catchment Management plan was developed to highlight appropriate stormwater management practices and implement actions to improve the overall long-term stormwater quality within the catchment and its sub-catchments. The plan aimed to improve existing stormwater quality within the Hobart Rivulet and in the lower catchment area and implement management practices to reduce stormwater pollution.

The plan identified that weeds found throughout the catchment are having significant negative impacts on catchment values and waterways. Although considerable work has been undertaken to remove weeds and revegetate with native species, the weed burden remains high, requiring significant planning and resources to reduce longer-term impacts.

Relevant actions identified in this plan include:

- Develop a vegetation (including weed survey) strategy for the catchment in collaboration with Council's relevant units.
- Investigate funding options to target priority weeds through the catchment, including new and emerging species.

Upper Hobart Rivulet Natural Area Action Plan 2000

Cascades Landcare Group

This plan was developed to provide an overview of the state of the upper Hobart Rivulet, identify key management issues in the area and provide practical action plans to address the issues through actions undertaken by the Cascades Landcare Group. The plan also aimed to identify a way to facilitate cooperative action between the Landcare Group and other stakeholders to deal with relevant management issues.

Vegetation management was a <u>key issue</u> identified in the plan, particularly degradation of bushland through inappropriate fire regimes, weed invasion and soil degradation and erosion resulting from a loss of natural vegetation cover.

Cascade Track Environs Vegetation Management Plan 2012

North Barker Ecosystem Services

The Cascade Track Environs Vegetation Management Plan was developed for the Cascade Walking Track following its opening in 2011. The plan identifies the biodiversity and habitat values of the land either side of the track, key management issues impacting on the values, and provides recommended management actions. The plan identifies weed invasion of native vegetation in the area as being of greater concern than the other management issues. Alongside weed invasion, inappropriate fire regimes, track maintenance, garden plantings and boundary encroachment, pest animals and rubbish dumping are identified as key issues.

Relevant actions:

• Weed management and boundary encroachment including garden plantings by adjacent landowners.

Hobart Rivulet Strategic Master Plan 2011

Inspiring Place

The purpose of the Hobart Rivulet Strategic Master Plan is to guide the future development and management of the parkland and open space along the rivulet. The plan focuses primarily on the section of the rivulet park between Molle Street and the Wellington Park boundary, but also addresses the other open space links to the city centre, Knocklofty and West Hobart.

The plan recognises that weeds are a ubiquitous occurrence in many sections of the Hobart Rivulet parklands, having significant negative visual and environmental impacts. The plan also recognises that sentimental value has been attached to some weeds, particularly crack willow and hawthorn, by some local residents due to the appeal of their colour, form and role in bank stabilisation along the rivulet. However, except for the willows, there is relatively consistent support for the removal of weed species along the Rivulet and replacement with either native vegetation or appropriate exotic, non-invasive species.

As part of the plan's strategic goal 'to strive for sustainable management', a key relevant action

 Develop progressive rehabilitation plans for the Hobart Rivulet banks that identify the progressive removal of declared weed species and recognised environmental weeds such as crack willow and sycamore and preparing planting/landscaping plans for revegetation.

City of Hobart Biodiversity Action Plan

City of Hobart

The Biodiversity Action Plan aims to allow Bushland staff within the City of Hobart to plan management actions for bushland reserves holistically, ensuring that the management carried out is in-line with biodiversity principles. In doing so, the plan ensures that reserves are prioritised for management according to biodiversity values, threats that may impact upon them and resources available to achieve the best long-term outcomes.

The plan outlines:

- Council's role in biodiversity management as part of a broader natural resource management network,
- Identifies the biodiversity values and threats in the City's bushland reserves
- Prioritises biodiversity conservation actions for the City's bushland reserves
- Identifies knowledge gaps in the city's understanding of biodiversity to inform the prioritisation of future work and improve biodiversity management in the long-term
- Defines management priorities through an adaptive management approach

Weed invasion in bushland reserves is identified as a major threat to their floristic values, and reserves are recognised as particularly vulnerable to invasion due to pervasive edge effects at the interface between the reserves and the urban environment, roads, tracks and trails.

Due to the large number of introduced plant species and limited resources available to control weeds, the plan recognises a need for prioritisation of weed management. To prioritise, the Weeds at Early Stage of Invasion (WESI) environmental weed risk database was used (Blood *et al.*, 2019). The WESI ranks invasive plants to indicate priority for control, based on the following characteristics:

- Invasion potential
- Impact on natural systems
- Area of potential distribution
- Range of susceptible habitat types
- Rate of dispersal

The WESI framework is then used to identify high threat weeds within high value biodiversity assets and prioritise them for removal.

Other relevant management objectives include:

- Prioritise high threat weeds within high biodiversity value environments
- Manage weeds cooperatively involving all agencies, private landholders, other stakeholders.

- Ongoing mapping and monitoring of progress of weed control is integral to the evaluation of the success of the control program.
- Maintain a GIS dataset of weed infestations as a threat to biodiversity assets. Ensure the City of Hobart weed dataset is shared with the Natural Values Atlas.
- Ensure weed data is within the monitoring methodology for vegetation and habitat quality for recording the arrival of new species.

2.3 Management issues

2.3.1 Threats to Biodiversity

Willows

Willows, particularly crack willow (*Salix fragilis*) are abundant in the study area, with a large infestation below Tara Street (Bonar, 2011). A Weed of National Significance (WoNS), willows can dominate entire stretches of riverbanks, choking watercourses, consuming large amounts of water, outcompeting native vegetation and changing stream dynamics. Willows produce heavy leaf fall in autumn and winter, negatively affecting native vegetation growth and fauna habitat (The Derwent Catchment Project, 2021).

Despite these impacts, there is still a level of sentiment regarding the willows among several local residents, largely due to their colour and form (Inspiring Place, 2015). Further, willows are challenging to remove, requiring specialist contractors and careful control methodology to avoid bank destabilization and minimise impacts on waterway health and ongoing follow-up control of regrowth.

Other Weeds

Weed invasion of native vegetation has been highlighted as a major management issue in several management plans for the Rivulet (Bonar, 2011; Cascades Landcare Group, 2000; City of Hobart, 2019; North Barker Ecosystem Services, 2012). The weed burden throughout the study area varies from patches of intact native vegetation with sporadic weed occurrence to large sections entirely dominated by exotic plant species. Unlike willows, there is a general consensus among the community that other weeds should be removed and the area revegetated with native species or appropriate, non-invasive plants (Inspiring Place, 2015).

However, the high diversity and cover of weeds and finite resources requires prioritisation of weed management (City of Hobart, 2019). Some weeds are also providing ecosystem services (e.g. soil stabilisation) and habitat for native wildlife, particularly in the more degraded urban sections of the rivulet, which is important to consider for management.

2.3.2 Social challenges

There are also numerous social challenges in applying land management works along the rivulet. The Hobart Rivulet Park is a high use area for walkers and cyclists for recreation and commuting, and large sections of the study area adjoin residential properties, resulting in a high level of visibility and scrutiny of any work undertaken on the rivulet.

Several residential properties adjoin the rivulet, making access to some sections for management purposes difficult, particularly with machinery for willow removal. Private land ownership of these sections also significantly limits the influence of council for management, necessitating approval and cooperation of private landowners to undertake some management works.

2.3.3 Waterway health and management

The Hobart Rivulet is a main drainage point for a catchment area of approximately 2,217 hectares, and a key stormwater asset for the City of Hobart (Bonar, 2011). Stormwater is a significant issue for the health and management of the Hobart Rivulet. Urban development in the catchment surrounding the Rivulet has considerably altered local hydrology, particularly the velocity, pattern, volume and quality of flow in the rivulet (Cascades Landcare Group, 2000; Walsh et al., 2012). This is largely due to the increase in impervious surface cover in the catchment, reduced surface roughness and reduced natural storage in the rivulet due to channelisation and engineering (Blacklow, 1995; Cascades Landcare Group, 2000).

There is a need to improve the Rivulet's waterway health while maintaining its function as a stormwater asset. Erosion is a significant issue along the Rivulet, particularly along banks where the riparian area has been disturbed and stabilising vegetation lost. Bank destabilisation and erosion results in sediment movement along the waterway, increasing turbidity and degrading water quality in the stream, affecting the growth of aquatic vegetation.

3 Methods

The development of the vegetation management plan included a site assessment which involved an initial desktop analysis followed by a field survey.

3.1 Desktop analysis

The desktop analysis involved extracting data from a variety of sources, including:

- Natural Values Atlas (DPIPWE, 2021)
- LIST map
- City of Hobart's Tree Database
- City of Hobart's Botanical Communities mapping
- City of Hobart's Significant Tree Register

Several reports, management plans and strategy documents were consulted during the literature review phase to examine the context and background for this Vegetation Management Plan.

3.2 Field survey

The field survey was primarily undertaken in May 2021. The survey area defined by CoH is the length of Hobart Rivulet from Strickland Avenue in South Hobart to Molle Street in central Hobart, plus two tributaries: Guy Fawkes Rivulet downstream of the Wellington Park boundary and Ross Rivulet. The survey area is 40 m wide centred on each watercourse or to property boundaries when private land adjoins the Rivulet.

The vegetation communities in the survey area were classified (as per the TASVEG 4.0 classification system) and mapped. Vascular plant species were recorded and identified where possible, except for plants in cultivation (in parkland or domestic gardens) that are not considered environmental weeds. Old-growth trees with visible or potential hollows were mapped as important fauna habitat.

Environmental weeds were mapped either as points (for single individuals or small patches) or polygons (where weeds extend over a large patch with moderate or high density coverage).

Willow trees were mapped individually, with additional details including size and access. Willow size was based on trunk diameter (of the largest trunk) and classed as small (< 10 cm), medium (10–30 cm) or large (> 30 cm). Willows that were resprouting from previously cut trunks were classified on the size of the living regrowth trunk. Where individual willow trees were identified as trees mapped in Council's tree database, the ID number was recorded to allow cross-referencing between the mapping for this project and the existing database.

Locations of threatened flora, fauna habitat and significant weeds were mapped with a handheld GPS and population data was captured e.g. numbers of individuals, area occupied etc. Geographic datum used was GDA94 Zone 55.

Private land other than Cascade land was not surveyed systematically due to access constraints. Occasional opportunistic observations of weeds on private land were recorded where these were visible from adjacent land, e.g. where weed patches extended onto private land or where weeds occurred close to a cadastral boundary the land tenure was uncertain for that observation. Given the limitations of GPS accuracy, some points mapped on a particular land tenure may represent a weed growing within a few metres of that point, which may mean the point is on another land tenure.

Taxonomic nomenclature for flora follows the latest Census of Vascular Plants of Tasmania (Baker & de Salas 2021). Classification of vegetation communities is in accordance with Kitchener and Harris (2013) and TASVEG 4.0.

3.3 Limitations of the survey

Whilst every effort was made to compile a complete list of native vascular plants and weeds for the survey area, a single survey is unlikely to detect all species present due to seasonal/temporal variations. Some plants could not be identified to a species level and some species may have been overlooked due to a lack of fertile material. It is also possible that additional species are present but were dormant at the time of survey e.g. annuals, ephemerals.

4 Natural Values

This section outlines the findings of the desktop analysis and field survey, including a description of the vegetation communities, threatened flora, fauna habitat values and weeds.

4.1 Native Vegetation

The natural vegetation of the survey area is eucalypt-dominated forest. The generally west-east alignment of Guy Fawkes and Hobart rivulets results in a distinct difference in annual solar radiation between the north-facing slopes on the south side of the watercourse and the south-facing slopes on the opposite side of the gully. This is particularly pronounced in the middle reaches of Guy Fawkes Rivulet where the gully is deeply incised. The vegetation reflects this topography, with wet forest occurring on the south-facing slopes and the riparian zone and dry forest communities on the north-facing slopes. Wet forest communities feature a tall eucalypt canopy and a dense subcanopy of tall broad-leafed shrubs and often ferns and sedges in the

understorey. Dry forest communities have a more uneven aged canopy and open understorey featuring heathy shrubs.

The upper sections of Guy Fawkes Rivulet are largely intact native vegetation. The original vegetation of Hobart Rivulet has been fragmented by urban development, which increases downstream toward the city centre. Much of the remaining native vegetation is on steep south-facing slopes unsuitable for development and such remnants occur even in the lower reaches of the Rivulet.

Five native vegetation communities and three modified communities were mapped in the study area, as per the TASVEG 4.0 classification system:

- Eucalyptus amygdalina forest on sandstone (DAS)
- Eucalyptus globulus dry forest (DGL)
- *Eucalyptus obliqua* dry forest (DOB)
- Eucalyptus globulus wet forest (WGL)
- Eucalyptus obliqua wet forest with broadleaf understorey (WOB)
- Agricultural land (FAG)
- Urban (FUR)
- Weed infestation (FWU)

Vegetation communities are mapped in the collection of figures for each rivulet section and the native vegetation is described briefly below.

Eucalyptus amygdalina forest on sandstone (DAS)

A very small remnant of this community occurs in the upper reaches of Ross Rivulet. Black peppermint (*E. amygdalina*) is the dominant tree species, and the understorey is relatively open, with sparse shrubs. This community typically occurs on drier and sunnier sites and in this situation it has some wet forest understorey species, indicating that the vegetation is transitioning to a wet forest community.

Eucalyptus globulus dry forest (DGL)

This vegetation community occurs on the upper section of Ross Rivulet on the west side of the watercourse. The canopy is dominated by blue gum (*Eucalyptus globulus*), with several other eucalypt species in smaller numbers, including white gum (*Eucalyptus viminalis*), stringybark (*Eucalyptus obliqua*) and black peppermint (*Eucalyptus amygdalina*). The tall shrub layer is sparse and includes sheoak (*Allocasuarina verticillata*), native cherry (*Exocarpos cupressiformis*), silver wattle (*Acacia dealbata*) and prickly box (*Bursaria spinosa*). The mid shrub

layer includes viscid daisybush (*Olearia viscosa*), currant bush (*Coprosma quadrifida*) and dollybush (*Cassinia aculeata*). The ground layer is dominated by silver tussockgrass (*Poa labillardierei*), sagg (*Lomandra longifolia*) and bracken (*Pteridium esculentum*).

The vegetation intergrades into *Eucalyptus globulus* wet forest (WGL) in the headwaters of the rivulet near Forest Road, due to the appearance of wet forest species such as dogwood (*Pomaderris apetala*), stinkwood (*Zieria arborescens*), tree fern (*Dicksonia antarctica*) and shield fern (*Polystichum proliferum*).

Eucalyptus obliqua dry forest (DOB)

This forest type is widespread on north-facing slopes in the Hobart Rivulet catchment. In the survey area it is limited to steep rocky mudstone slopes in the middle reaches of Guy Fawkes Rivulet.

Stringybark (*E. obliqua*) is the dominant tree species and older trees show signs of previous fires. The understory is open and includes a diverse suite of shrubs such as native cherry, prickly box and sunshine wattle (*Acacia terminalis*).



Figure 3 - Eucalyptus obliqua dry forest upstream from Cascade Brewery on Hobart Rivulet.

Eucalyptus globulus wet forest (WGL)

This vegetation community occurs widely in the survey area on south-facing slopes. The canopy is dominated by blue gum, with white gum and stringybark often present. There is a dense stratum of tall broad-leafed shrubs including blanket leaf (*Bedfordia salicina*), blackwood (*Acacia melanoxylon*), musk daisy bush (*Olearia argophylla*) and dogwood (*Pomaderris apetala*). The understorey includes small shrubs such as native currant (*Coprosma quadrifida*) and a typically dense ground cover of ferns and sedges. In drier or more disturbed sites, such as the lower reaches of Hobart Rivulet and near Cascade Brewery, the understorey is more open with a groundcover of grasses and bracken.



Figure 4 - Eucalyptus globulus forest on hillside adjacent to Rivulet Park.

Eucalyptus obliqua wet forest (WOB)

This vegetation community occurs widely in the survey area on south-facing slopes, particularly on the lower reaches of Guy Fawkes Rivulet. The structure and species composition on Guy Fawkes Rivulet is very similar to the WGL forest, differing in the canopy composition which is dominated by stringybark. On Hobart Rivulet upstream of Cascade Brewery, this community is transitional between wet and dry forest and consequently has a more open understorey of smaller shrubs such as cheeseberry (*Cyathodes glauca*) and native daphne (*Pultenaea daphnoides*).

4.1.1 Conservation status of the vegetation communities

Two vegetation communities listed as threatened under Schedule 3A of the Tasmanian *Nature Conservation Act 2002* are present in the area:

- Eucalyptus amygdalina forest on sandstone (DAS),
- Eucalyptus globulus dry forest (DGL).

These threatened vegetation communities are confined to the upper reaches of Ross Rivulet.

Both these communities and the *E. globulus* wet forest (WGL) are listed as 'High Priority Biodiversity Value' under the *Biodiversity Code* (E10.0) of the *Hobart Interim Planning Scheme* 2015.

No communities listed as threatened under Commonwealth legislation (*Environment Protection and Biodiversity Conservation Act* 1999) are present in the survey area.

4.2 Original vegetation of the Hobart Rivulet

The vegetation of Hobart Rivulet below the confluence with Guy Fawkes Rivulet is highly modified, resulting from clearing of native vegetation in the colonial era, around 200 years ago. Remnant native vegetation in the area, combined with observation of similar landscapes with less disturbed vegetation, provides some confidence in predicting the pre-colonial vegetation of the lower reaches of Hobart Rivulet.

Modelling of pre-European (c. 1750) vegetation in Tasmania suggests that *Eucalyptus amygdalina* forest on sandstone was the most extensive community along the lower stretches of Hobart Rivulet. However, remnant vegetation on sandstone near the Rivulet supports *E. globulus* and *E. obliqua*, probably because the microclimate is too moist for *E. amygdalina*. Furthermore, fine-scale geological mapping indicates the riparian zone comprises alluvial deposits, which is likely to support different vegetation from the surrounding geology. The modelling also suggests some occurrence of *E. obliqua* dry forest, which is consistent with extant vegetation on lower slopes on mudstone.

The area would certainly have supported eucalypt forest with a mixture of tree species including *E. globulus, E. obliqua* and *E. viminalis.* The intact forest in parts of Hobart Rivulet and Guy Fawkes Rivulet above the Cascade Brewery has historically been subject to logging and has been influenced by changing fire regimes over time. Nevertheless, the forest communities and

species composition are likely to be largely unchanged. These forest communities, and the riparian zone in particular, provide a good indication of the plant species which would have naturally occurred further downstream along the Hobart Rivulet in presently suburban and urban areas.

However, the non-riparian vegetation is more difficult to predict since the remnant vegetation is biased toward steep south-facing slopes which may not represent the alluvial flats where indigenous land management likely contributed to a more open grassy forest community. Even if the surrounding forest was drier and more open than in the foothills of the mountain, the riparian zone would likely have supported wet forest understorey plants, which would have readily migrated from upstream.

Riparian areas in south-eastern Tasmania typically have a dense shrubby understorey. The riparian vegetation of Hobart Rivulet is consistent with Community 7 (*Eucalyptus viminalis – E. globulus – E. obliqua – E. amygdalina* woodland over *Beyeria viscosa – Exocarpos cupressiformis* sedgy–grassy, ferny or heathy closed- scrub) identified by Daley and Kirkpatrick (2004) in a systematic classification of Tasmanian riparian vegetation.

Several shrub and groundcover species observed in the forested parts of the survey area and commonly found in riparian vegetation elsewhere (Daley & Kirkpatrick, 2004) would have been prominent in the riparian zone of the now modified parts of Hobart Rivulet, including *Pomaderris apetala, Leptospermum lanigerum, Acacia dealbata, A. melanoxylon, A. verticillata, Coprosma quadrifida, Prostanthera lasianthos, Bursaria spinosa, Exocarpos cupressiformis, Poa labillardierei, Lomandra longifolia, Gahnia grandis, Carex appressa, Dianella tasmanica, Acaena novae-zelandiae, Blechnum nudum, B. minus.*

4.3 Native Flora

A total of 81 Tasmanian native vascular plant species were recorded during the survey. Three species appeared to be planted and not naturally occurring in the area and several others (e.g. *Poa labillardieri*) occur in both wild and planted situations.

4.3.1 Threatened flora

No threatened flora species listed under the *Threatened Species Protection Act* 1995 or the *Environment Protection and Biodiversity Conservation Act* 1999 were recorded during the survey.

The threatened flora species previously observed within 500 m of the survey area are all species of dry forests or grasslands, with very limited suitable habitat in the survey area (

Table 1). The Hobart Rivulet catchment is a critically important location for *Corunastylis nudiscapa* in Tasmania and supports some of the largest known populations of *C. nuda* in the state. Observations of *Austrostipa bigeniculata* and *Vittadinia muelleri* in the catchment area represent isolated small populations of these species outside of their core habitat.

| Species | Status TSPA | Status EPBCA | Habitat preferences ¹ |
|--|-------------|--------------|--|
| Austrostipa bigeniculata doublejointed speargrass | rare | - | Native grasslands and open woodlands. |
| <i>Corunastylis nuda</i> tiny midge-orchid | rare | - | Known from a wide range of habitat types in Tasmania. In the Hobart area it occurs in forest on dry north-facing slopes, similar to the habitat of <i>C.</i> <i>nudiscapa</i> . |
| Corunastylis nudiscapa bare midge-orchid | endangered | - | Dry open forests with a sedgy or heathy understorey on sedimentary geology, typically on north-facing slopes. |
| <i>Vittadinia muelleri</i> narrowleaf new-holland-daisy | rare | - | Native grasslands and open woodlands on relatively fertile dry soils. |

| Fable 1 – Threatened flora species recorded within 500 m of the survey area. |
|--|
|--|

4.4 Significant Trees

Five trees listed on Council's Significant Tree Register are located within the survey area (Table 2).

| Table 2 – Trees listed on | the HCC Significant | Tree Register within | n the survey area. |
|---------------------------|---------------------|----------------------|--------------------|
|---------------------------|---------------------|----------------------|--------------------|

| Ref no. | Location | Species | Common Name | Number of trees | Land tenure |
|------------|--|------------------------|-----------------------|-----------------|----------------|
| G3 | Glen Street (end of road, adjacent to no. 6) | Eucalyptus globulus | Tasmanian blue gum | 1 | HCC |
| L31 | Linear park (next to rivulet bridge at end of Anglesea Street, on boundary of South Hobart Primary School) | Cedrus deodara | Deodar | 3 | HCC |
| 01 | 14 Old Farm Road | Notelaea ligustrina | native olive | 1 | Private |

¹ FPA (2016) and Natural Values Atlas data



Figure 5 - E. globulus tree on Glen Street, listed on Significant Tree Register.

4.5 Native Fauna

4.5.1 Threatened fauna

Two threatened fauna species have been observed in the survey area based on Natural Values Atlas records:

- eastern barred bandicoot (Perameles gunnii),
- grey goshawk (Accipiter novaehollandiae).

There are records of the eastern quoll (*Dasyurus viverrinus*) from nearby and this species would almost certainly occur within the survey area. Other threatened fauna that are likely to visit the area include masked owl (*Tyto novaehollandiae castanops*), swift parrot (*Lathamus discolor*) and Tasmanian devil (*Sarcophilus harrisii*). The survey area is likely to have been inhabited by the now extinct Cascade funnel-web spider (*Hadronyche pulvinator*).

4.5.2 Threatened fauna habitat

Native forest and urban areas provide suitable foraging habitat for several threatened fauna species, particularly wide-ranging predators such as the masked owl, Tasmanian devil and eastern quoll. There is very limited potential nesting habitat for hollow-nesting species such as the masked owl and swift parrot due to the scarcity of old-growth trees. Potential denning habitat for devils and quolls is present, particularly in dense riparian vegetation and rocky areas along Guy Fawkes Rivulet. Eastern barred bandicoots inhabit the survey area and are known to occur in the Hobart Rivulet Park close to the city.

4.5.3 Other native fauna

The aquatic environment and riparian zone provide suitable habitat for a variety of native wildlife. Platypus (*Ornithorhynchus anatinus*) are known to inhabit waterways in the Hobart Rivulet catchment, including urban sections of the Rivulet around the Cascade boulder trap, and have been sighted near the sediment basin at Barrack St, and down as far as the Royal Hobart Hospital on Collins St. The native freshwater crayfish *Astacopsis franklinii* inhabits the waterways, at least in the upper catchment areas with intact vegetation.

Other native wildlife observed within and along the rivulets include the Australian wood duck (*Chenonetta jubata*), the Tasmanian native hen (*Tribonyx mortierii*), the Tasmanian pademelon (*Thylogale billardierii*) and the red-necked wallaby (*Macropus rufogriseus*). Native hens and pademelons are common throughout the area, including in the lower section of the Rivulet Park between Gore Street and Molle Street, where exotic vegetation such as blackberry patches provides shelter.

A range of native woodland bird species utilise the riparian vegetation for foraging and nesting. Including species such as the pink robin, fairy wren (*Malurus cyaneus*), pardalotes (*Pardalotus* sp.), thornbills (*Acanthiza* sp.) and honeyeaters. Snake and skink species are also likely to utilise parts of the riparian habitat.



Figure 6 - Platypus in Guy Fawkes Rivulet near Wellington Park boundary

5 Environmental Weeds

Exotic plant species observed during the survey were considered weeds if they are known to be invasive in Tasmania. In most cases, these species are listed in the Biodiversity Action Plan (City of Hobart 2019, Appendix 1 – Priority Weed List). The weed risk score (WESI) and category from the Priority Weed List is used here to rank the weeds recorded during the survey (Table 3).

The survey identified 23 weed species classed as 'very high risk' under the WESI scheme and 33 species listed as lower, medium, or high risk. Five species listed as Weed of National Significance (WoNS) and 10 declared weeds (as per the *Weed Management Act 1999*) were recorded. A further 15 species either did not receive a risk rating or were not assessed under the WESI scheme.

| Species | Common Name | Declared/ WoNS | WESI Score | WESI Category |
|------------------------------|--------------|---------------------|---------------|------------------|
| Hedera helix | English Ivy | No | 1 | Very high risk |
| Cytisus scoparius | Scotch Broom | WoNS, Declared weed | 3 | Very high risk |
| Crocosmia Xcrocosmiiflora | Montbretia | No | 3 | Very high risk |
| Rubus fruticosus | Blackberry | WoNS, Declared weed | 4 | Very high risk |

Table 3 – Environmental weeds observed in project area.

| Species | Common Name | Declared/ WoNS | WESI Score | WESI Category |
|---|----------------------------|---------------------|---------------|------------------|
| Pinus radiata | Monterey Pine | No | 6 | Very high risk |
| llex aquifolium | Holly | Declared weed | 10 | Very high risk |
| Pittosporum undulatum subsp. undulatum | Sweet Pittosporum | No | 10 | Very high risk |
| Cotoneaster glaucophyllus | Grey-leaved Cotoneaster | No | 10 | Very high risk |
| Cotoneaster simonsii | Khasia Berry | No | 10 | Very high risk |
| Coprosma robusta | Karamu | Declared weed | 10 | Very high risk |
| Leycesteria formosa | Himalayan honeysuckle | No | 10 | Very high risk |
| Genista monspessulana | Montpellier broom | WoNS, Declared weed | 11 | Very high risk |
| Clematis vitalba | Old Man's Beard | No | 11 | Very high risk |
| Acer pseudoplanatus | Sycamore Maple | No | 11 | Very high risk |
| Erica lusitanica | Spanish heath | Declared weed | 11 | Very high risk |
| Passiflora tarminiana | Banana passionfruit | No | 11 | Very high risk |
| Crataegus monogyna | Hawthorn | No | 13 | Very high risk |
| Vinca major | Blue Periwinkle | No | 15 | Very high risk |
| Ulex europaeus | Gorse | WoNS, Declared weed | 15 | Very high risk |
| Fuchsia magellanica | Fuchsia | No | 19 | Very high risk |
| Myosotis sylvatica | Forget-Me-Not | No | 20 | Very high risk |
| Zantedeschia aethiopica | Arum Lily | No | 21 | Very high risk |
| Salix fragilis | Crack willow | WoNS, Declared weed | 23 | Very high risk |

| Species | Common Name | Declared/ WoNS | WESI Score | WESI Category |
|--------------------------|-----------------------|----------------|---------------|------------------|
| Anthoxanthum odoratum | Sweet Vernal Grass | No | 31 | High risk |
| Oxalis sp. | | No | 39 | High risk |
| Holcus lanatus | Fog-grass | No | 52 | High risk |
| Cyperus eragrostis | Drain flat-sedge | No | 53 | High risk |
| Coprosma repens | Mirror bush | No | 73 | Medium risk |
| Arum sp. | Cuckoo-pint | No | 75 | Medium risk |
| Delairea odorata | Cape Ivy | No | 77 | Medium risk |
| Dactylis glomerata | Cocks Foot | No | 97 | Medium risk |
| Rosa rubiginosa | Briar Rose | No | 98 | Medium risk |
| Sambucus nigra | Elberberry Tree | No | 100 | Medium risk |
| Prunus laurocerasu | English Laurel | No | 101 | Medium risk |
| Buddleja davidii | Butterfly bush | No | 102 | Medium risk |
| Conium maculatum | Hemlock | No | 104 | Medium risk |
| Cirsium vulgare | Spear Thistle | No | 115 | Medium risk |
| Hypericum androsaemum | Tutsan | No | 118 | Medium risk |
| Kniphofia uvaria | Red-hot Poker | No | 121 | Lower risk |
| Solanum nigrum | Deadly Nightshade | No | 124 | Lower risk |
| Nasturtium officinale | Watercress | No | 131 | Lower risk |
| Agapanthus praecox | Agapanthus | No | 147 | Lower risk |
| Populus alba | Poplar | No | 156 | Lower risk |

| Species | Common Name | Declared/ WoNS | WESI Score | WESI Category |
|------------------------------------|-----------------------|----------------|---------------|------------------|
| Verbascum thapsus | Mullein | No | 176 | Lower risk |
| Verbascum virgatum | Twiggy Mullein | No | 176 | Lower risk |
| Digitalis purpurea | Foxglove | No | 186 | Lower risk |
| Kunzea ericoides | Burgan | No | 189 | Lower risk |
| Foeniculum vulgare | Fennel | Declared weed | 212 | Lower risk |
| Fumaria sp. | Fumitory | No | 212 | Lower risk |
| Galium aparine | Sticky Weed | No | 212 | Lower risk |
| Chamaecytisus palmensis | Tree Lucerne | No | 213 | Lower risk |
| Cirsium arvense | Californian Thistle | Declared weed | 214 | Lower risk |
| Helminthotheca echioides | Bristly Oxtongue | No | 214 | Lower risk |
| Narcissus sp. | Daffodil/Jonquil | No | 228 | Lower risk |
| Centranthus ruber | Red Valerian | No | 236 | Lower risk |
| Euphorbia lathyris | Caper Spurge | No | 240 | Lower risk |
| Ribes sanguineum | Currant | No | 243 | Not assessed |
| Pittosporum bicolor X undulatum | | No | 243 | Not invasive |
| Pittosporum tenuifolium | Kohuhu | No | 423 | Not invasive |
| Grevillea rosmariniifolia | Rosemary Grevillea | No | 243 | Not assessed |
| Laurus nobilis | Bay Laurel | No | 243 | Not assessed |
| Phormium tenax | New Zealand Flax | No | 243 | Not invasive |

| Species | Common Name | Declared/ WoNS | WESI Score | WESI Category |
|---------------------|--------------------------|----------------|---------------|------------------|
| Bellis perennis | English daisy | No | NA | NA |
| Conyza bonariensis | Flaxleaf Fleabane | No | NA | NA |
| Betula pendula | Silver Birch | No | NA | NA |
| Arbutus unedo | Strawberry Tree | No | NA | NA |
| Gunnera maculata | Giant Rhubarb | No | NA | NA |
| Mentha Xpiperita | Peppermint | No | NA | NA |
| Cotoneaster dammeri | Bearberry Cotoneaster | No | NA | NA |
| Brugmansia sp. | Angels Trumpet | No | NA | NA |
| Physalis peruviana | Cape Gooseberry | No | NA | NA |

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Some of the exotic species observed in low numbers appeared to be naturalized as local garden escapes but are not known to be invasive in natural vegetation i.e. *Betula pendula, Arbutus unedo, Gunnera maculata, Physalis peruviana, Cotoneaster dammeri, Brugmansia* sp. These species have been listed here because they appear to have spread and naturalized but are likely to be very low risk. Other garden plants that have not naturalized have not been recorded here.

Poplar (*Populus alba*), like willows, have been planted as ornamental trees in parts of the survey area but do not appear to be highly invasive in the area and pose little threat to native vegetation or riparian values. New Zealand flax (*Phormium tenax*) is classed as not invasive in the WESI list. However, it is known to be invasive in riparian situations elsewhere in Tasmania such as the Egg Islands in the Huon River.

6 Weed Management Zones

The management zones identified here identify sections of the survey area with similar vegetation characteristics and management issues. A brief description of each zone is provided. Weed control and revegetation actions identified in this Vegetation Management Plan are based on these zones. The 17 zones identified include 10 zones along the length of Hobart Rivulet, plus five zones on Guy Fawkes Rivulet and two on Ross Rivulet.

The location of the zones is shown in Figure 2. Detailed maps of each zone are presented in Appendix 1.

GF1

This zone is in the middle reaches of Guy Fawkes Rivulet, extending from the Wellington Park boundary 500 m downstream to the bridge over the Rivulet on the Cascade Walking Track. The rivulet has a moderately steep gradient and occupies a well-defined gully with steep slopes. This zone is Cascade land.

The riparian zone and surrounding land is entirely native forest, with *E. globulus* dominant in most situations and *E. obliqua* becoming dominant on the drier north-facing slopes. The native vegetation is in good condition and subject to minimal disturbance.

Weeds are sparse in this zone. The most widespread weed is fuchsia, which occurs as small patches or individual plants in the watercourse or on the streambank. Gorse is limited to the transmission line easement. Several mature radiata pine trees occur at one location at the southern edge of the zone.



Figure 7 - Native riparian vegetation including tree fern in GF1

GF2

This zone is in the middle reaches of Guy Fawkes Rivulet, extending from the bridge over the Rivulet on the Cascade Walking Track downstream to the confluence with Myrtle Gully Creek flowing from the northern side of Old Farm Road. The landscape featuring steep slopes is comparable to GF1. This zone is mostly Cascade land and includes a private residential block.

The native forest is similar to that in GF1 but is in poorer condition due to more abundant and widespread weeds. The major weeds in this zone are sweet pittosporum and cotoneaster, occurring throughout most of the native forest, particularly on the wetter south-facing slopes. These woody weeds appear to be garden escapes originating from the neighbouring residential properties on Old Farm Road and are now well established in the understorey of the native forest with many mature plants producing bird-dispersed fruit. The declared weeds karamu and holly occur infrequently as immature shrubs. Fuchsia is present in several small riparian patches and blackberry occurs infrequently.

The tributary of Guy Fawkes Rivulet was not surveyed for this project but is known to contain weeds including karamu, cotoneaster, gorse, blackberry and hydrangea.



Figure 8 - Fuchsia and blackberry on streambank in GF2.

GF3

This zone is in the lower reaches of Guy Fawkes Rivulet, where the watercourse gradient becomes less steep. It extends from GF2 to the junction of an unnamed tributary flowing from Jubilee Road in the south. The northern half of this zone is private land which has been cleared.

The Cascade land in the southern half of this zone comprises steep rock slopes with dry forest. This forest is in good condition and weeds are mostly absent from the Cascade land in this zone. A few blackberry and fuchsia plants occur along the Rivulet, which is either on the property boundary or on the residential land.



Figure 9 - Native riparian vegetation in GF3

GF4

This large zone is mostly Cascade land, along with Council reserved road and a single residential parcel. Apart from the residential block and Old Farm Road, this zone is entirely native forest dominated by *E. obliqua* and is generally in poor condition due to the dominance of weeds in the understorey. Wet sclerophyll forest predominated on the south-facing slopes and creek flats. Dry forest occurs on the south side of Old Farm Road. While some areas are almost free of weeds, large parts of this zone feature dense infestations of blackberry and hawthorn, particularly on the rivulet banks and alluvial flats. Two small crack willows are present near the road bridge. Other weeds such as briar rose, cotoneaster, montbretia, fuchsia, gorse and Spanish heath occur infrequently.

Another tributary enters from Golden Valley Road to the north and this intermittent watercourse contains blackberry, hawthorn and sweet pittosporum.



Figure 10 - Dense infestation of blackberry and hawthorn at boundary of GF4 and GF5

GF5

This zone is directly upstream from Cascade Brewery and is Cascade Land. *Eucalyptus obliqua* wet forest occurs on the north side of the Rivulet. The flat land south of the Rivulet is cleared and maintained as exotic grassland, with some herbaceous weeds such as hemlock. Large willow trees dominate the riparian vegetation in this zone. Other riparian weeds include a single holly, several hawthorn and scattered St John's wort. The native vegetation on south-facing slopes above the rivulet (on the north side) is in good condition with few weeds.

H1

This zone extends from the Strickland Avenue bridge on the Hobart Rivulet downstream to the trash racks and residential properties. The zone is mostly Council land supporting native forest dominated by *E. globulus*. The south-facing slopes on the northern side of the Rivulet feature intact forest in good condition with few weeds. Forest on the south side of the Rivulet occupies alluvial flats and is in poor condition, with an understorey of scattered shrubs and exotic grasses reflecting a history of disturbance. There is some natural regeneration of native shrubs and some have been planted. Herbaceous weeds such as forget-me-not, mignonette and caper spurge occur throughout this area. Blackberry and montbretia are common in low densities along the rivulet banks.

H2

This zone is largely private residential land. Council land includes a landscaped area of public open space and some narrow riparian strips which are dominated by weeds. A small area of native forest on Council land at the western end of the zone is in poor condition and features a variety of established weeds including sycamore maple and English ivy. Blackberry, montbretia and St John's wort are common on the creek banks throughout this zone. Weeds that are likely garden escapes from nearby properties include arum lily, Himalayan honeysuckle and cotoneaster. Several medium and large crack willows occur in the eastern half of this zone.

An unnamed tributary flowing from upper Strickland Avenue enters the Hobart Rivulet upstream of Woodlyn Court. This tributary was not surveyed but casual observation from Strickland Avenue indicates that the watercourse on private land has extensive infestation of weeds including sycamore maple, blackberry and old man's beard.



Figure 11 - Mix of native and exotic trees in H2.

H3

This large zone extends from near Avon Road to Cascade Gardens, including the confluence with Guy Fawkes Rivulet and the final section of that watercourse. The Cascade Brewery occupies a significant part of this zone and the section of Hobart Rivulet through this industrial complex is mostly channelized or underground.

Native forest is confined to south-facing slopes and is generally dominated by *E. obliqua*, with *E. globulus* prominent at the eastern end. Native forest is on Cascade land and Council land and is in poor to moderate condition due to the presence of woody weeds such as cotoneaster, sweet pittosporum and blackberry. Gorse and blackberry occur infrequently on the creek banks. A wide variety of weeds are present in low numbers or local patches, including foxglove, montbretia, St

Johns wort, elderberry and banana passionfruit. Weeds are locally dominant in much of the riparian habitat. Medium and large crack willows are present, generally in small patches of a few plants.



Figure 12 - Willow tree in H3.

H4

This zone from Cascade Gardens to Tara Street is largely residential land. The Council-owned Cascade Gardens at the western end of this zone features parkland with the Rivulet between the boulder trap and McRobies Road not landscaped and largely unmanaged. Sycamore maples are invasive in this area and other weeds are abundant including blackberry, montbretia, cotoneaster, periwinkle, cape ivy and St John's wort. Many of these weeds are likely to have escaped from nearby private gardens. Medium and large crack willow trees are common in this section.

Between McRobies Road and Tara Street the rivulet occupies a narrow strip of public land and is dominated by weeds. Several medium and large willow trees are present and a few sycamore maples. Dense patches of blackberry are present. Some weed control and revegetation planting has occurred in parts, likely by local residents.

The streambed is mostly in a natural state, while retaining walls have replaced the riverbanks in parts. There is no infrastructure to facilitate public access to the rivulet in this Zone.


Figure 13 - Native and exotic plants in H4.

H5

This zone from Tara Street and the confluence of the Ross Rivulet to Macfarlane Street features residential properties on the south side of the Rivulet and Council-owned land on the north side. The Council land includes flat parkland backed by steep sandstone slopes and cliffs which support remnant native forest dominated by *E. globulus*.

The Rivulet in this zone has natural geomorphology but is lacking in riparian vegetation. Exotic grasses and herbaceous weeds (e.g. spear thistle, forget-me-not) are prominent along the banks, with some plantings of native species such as blackwood. Apart from small patches of weeds, environmental weeds such as blackberry, gorse, English broom, periwinkle and arum lily are infrequent and in low numbers. Large willows near Macfarlane Street have been removed and consequently this zone is free of willows and largely lacking in woody vegetation.

The native forest on steep south-facing slopes is in fair condition, with a largely native understorey and few weeds.



Figure 14 - Parkland with planted blackwood trees on top of left bank and weeds on right bank in H5 **H6**

This zone from Macfarlane Street to Anglesea Street is similar to H5 with residential land to the south and flat parkland on the north side of the Rivulet. Council land at the western end is very steep and forested as in H5. Unlike H5, the Rivulet banks are mostly densely vegetated with weeds including some large willows on the southern side.

H7

This zone from Anglesea Street to Wynyard Street is mostly Council-managed parkland, with the Rivulet Park on both sides of the Rivulet along most of this zone. The riparian vegetation is comprised of exotic trees and shrubs, with a dense canopy of willows and sycamore maple. Some hawthorn and blackberry are present. The understorey is mostly open due to the dominance of the willows suppressing undergrowth.

H8

This zone from Wynyard Street to Mackellar Street includes the Rivulet Park on the north side of the Rivulet and additional Council land on the south side which has no public access and is partly vegetated with large elm trees and partly a dense patch of annual and herbaceous weeds following removal of blackberries. The riparian habitat features a variety of weeds in low abundance, such as gorse, broom and tree lucerne. One large patch of blackberry is present, with smaller patches of Californian thistle and periwinkle. Mature willows have been removed from this section and only two small willows are present. Revegetation following weed control near Wynyard Street has successfully established tussocks of *Poa labillardieri*.



Figure 15 - Revegetation site with Poa tussocks near Wynyard St

H9

This zone, from Mackellar Street to near Ispahan Avenue includes the Rivulet Park on the north side of the Rivulet and residential land on the south side. Willows are common in this zone and there are patches of periwinkle. Other weeds are infrequent, often present as a single plant.

H10

This section from Ispahan Avenue to Molle St is the final stretch of waterway before the Rivulet is channelized through the Hobart CBD. The Rivulet Park occupies most of the northern side of the Rivulet, with private land on the south side. Numerous weeds are present along the Rivulet banks in this zone. Patches of blackberry and periwinkle occur in parts, particularly on steep banks. Retaining walls replace the natural riverbanks in places. Several small and medium size willows are present but no large willows.



Figure 16 - Weedy vegetation along Hobart Rivulet in H10

R1

The upper reaches of Ross Rivulet below Forest Road include a mix of Council land and private land. This zone is mostly native forest, with three different forest communities present. The Ross Rivulet is an ephemeral watercourse with a steep gradient. The uppermost section near Forest Road is in good condition and almost free of weeds. However, weeds are common in the lower half of this zone. Here, the *E. globulus* forest has an open understorey with woody weeds including gorse and hawthorn, much of which has been controlled in recent years. Three mature willows and a few other weeds occur on the drainage line. A patch of thistles and other herbaceous weeds in a canopy gap next to the Rivulet on Council land has recently been treated. A large dense patch of gorse occurs in a power line easement on private land on the eastern side of the Rivulet and is a seed source for gorse spreading onto Council land.

R2

The lower reaches of Ross Rivulet are steep and subject to streambank erosion that has been treated by recent instream stabilization and rock armouring works. This zone is lacking native vegetation, except for *E. globulus* forest on the lower section which extends into H5. This forest occurs on steep rocky slopes and is not riparian, the Ross Rivulet being diverted into a culvert under Tara Street for the final 100 m before it joins the Hobart Rivulet. The streambanks are mostly exotic pasture. Willows are infrequent and occur on both Council and private land. Gorse and broom occur as scattered individuals in the paddock, with small dense patches present near some remnant *E. viminalis* trees. The watercourse and surrounding area are in poor condition due to soil erosion, lack of native vegetation and presence of woody weeds.



Figure 17 - Broom and gorse with remnant patch of white gums in lower Ross Rivulet

7 Weed Control

The survey area contains a wide variety of environmental weeds including significant infestations of high threat weeds. Most weed species are disturbance colonisers that benefit from disturbance to native vegetation or soils. Riparian areas are naturally subject to flood disturbance, which promotes establishment of weeds. The urban and peri-urban environment favours weeds due to vegetation fragmentation and disturbance and an abundance of exotic plants species, many of which are invasive.

7.1 Weed control methods

Choice of weed control methods will be influenced by a wide range of factors including target weed species, extent of weeds, presence of native vegetation, site accessibility, erosion risk, proximity to watercourse, private land and other infrastructure such as bridges and tracks, and so on.

Most of the environmental weeds present in the survey area are difficult to control or eradicate because they can regenerate from roots, stem fragments or soil seed bank. Some weeds have seeds dispersed by birds, which allows them to spread from urban gardens into bushland (e.g. sweet pittosporum, karamu and cotoneaster). Water is an effective dispersal mechanism for seeds and other propagules, which are readily distributed downstream. Willows, for example, can grow from twigs or branches transported in floods.

Herbicide treatment is the most effective and efficient method for controlling most weeds, particularly in large scale infestations. Choice of herbicide will depend on the target species and application method. Many of the weeds in the survey area are growing in a watercourse on the streambanks and therefore only herbicides and surfactants approved for aquatic use are suitable. Effectiveness of herbicide control and minimization of impacts on non-target (native) species are influenced by application method and seasonal timing. Generally, direct application of herbicide (e.g. cut and paste or drill and fill) is preferable to spraying because less herbicide is required and impacts on non-target species and the environment (e.g. waterways) are minimised.

Manual control by slashing/brushcutting, hand pulling or digging out weeds is often effective for initial control prior to herbicide treatment. Where weeds occur in large dense patches, such as blackberry and periwinkle, a useful strategy is to cut the weeds to ground level with a brushcutter and spray the subsequent new growth with herbicide to control regrowth prior to revegetation work. Staging of this work over several years may be useful to reduce soil erosion and streambank instability. It may be preferable to treat individual patches of a few metres of

streambank at one time rather than entire stretches of the watercourse. Revegetation can proceed in treated patches amongst more extensive weeds.

7.2 Community engagement

While it is anticipated that Council staff or professional contractors will undertake or at least coordinate much of the weed control and revegetation works, there are significant opportunities for engagement with community volunteers, such as Bushcare groups. Sites suitable for volunteer weed control and/or revegetation will be relatively accessible and without high-risk hazards such as steep slopes. Weed control works involving manual removal, such as hand pulling of small plants or cut and paste application of herbicide, may be suited to volunteers, while works involving machinery or herbicide spraying are not. Revegetation works such as planting tubestock and installing tree guards are generally suited to volunteer work, while site preparation and follow-up maintenance will be the responsibility of Council or private property owners. Refer to Table 4 - Summary of weed control priorities and approach by zones. Table 4 for an indication of zones where volunteer weeding and/or revegetation projects may be appropriate, noting that the suitability of each individual worksite will needed to be assessed prior to commencing a volunteer project.

7.3 Weed control prioritisation

The aim of weed control varies across the 17 management zones described in Section 6. Zones with few weeds and mostly intact native vegetation are a high priority for weed control and will require relatively little effort to remove weeds and allow natural revegetation to take place. Zones with well-established weeds in native vegetation will require more effort for weed control and active revegetation to restore native bushland. In the more urban zones (e.g. the Rivulet Park), the aim will be to remove weeds and revegetate sites for both fauna habitat, public amenity and stormwater/flood management. These zones are described as 'parkland' based on the character of the Rivulet Park, noting that the streambanks in these areas will generally be revegetated with native flora for habitat and erosion control rather than landscaped for public amenity.

Early intervention is a high priority because it is much easier to control an emerging weed problem before it becomes established, particularly for weeds that form dense patches (e.g. blackberry, periwinkle, gorse) and tree species that can grow to a large size (e.g. crack willow, sycamore maple). Council needs to review the maintenance currently undertaken on Hobart Rivulet in parkland, and look for opportunities to intervene, for example the existing brush-cutting could be expanded to include cutting out small sycamore maples.



Figure 18 - Dense infestation of blackberry, with willows and other weeds, on Hobart Rivulet adjacent to Cascade Brewery

Table 4 provides a summary of the weed control issues and aims for the 17 zones and a prioritization for works. A summary of willow control is presented in Table 5. Section 8 provides detail for individual weeds within each zone.

| Zone | Weeds extent | Aim | Priority | Future character | Revegetation required | Suitability for volunteers |
|------|--------------------------|-----|----------|-------------------------|-----------------------|----------------------------|
| GF1 | few | Е | н | Bushland | None | Ν |
| GF2 | widespread | Е | Н | Bushland | None | Possibly |
| GF3 | few | Е | н | Bushland | None | Ν |
| GF4 | extensive | С | М | Bushland | Minor | Υ |
| GF5 | extensive | С | М | Bushland | Minor | Ν |
| H01 | widespread | Е | М | Bushland | Minor | Υ |
| H02 | widespread | С | М | Bushland/ parkland | Minor | Y |
| H03 | widespread/ extensive | С | М | Bushland/ industrial | Minor | In parts |
| H04 | extensive | С | L | Parkland | Extensive | Ν |
| H05 | few | Е | L | Bushland | Extensive | Υ |
| H06 | extensive | С | L | Bushland/ parkland | Extensive | In parts |
| H07 | extensive | Е | L | Parkland | Extensive | Υ |

Table 4 - Summary of weed control priorities and approach by zones.

| Zone | Weeds extent | Aim | Priority | Future character | Revegetation required | Suitability for volunteers |
|------|-----------------|-----|----------|---------------------|-----------------------|----------------------------|
| H08 | widespread | С | L | Parkland | Extensive | In parts |
| H09 | widespread | С | L | Parkland | Extensive | Υ |
| H10 | extensive | С | L | Parkland | Extensive | In parts |
| R1 | few | E | Н | Bushland | Minor | Υ |
| R2 | few | Е | L | Bushland | Extensive | Υ |

7.4 Prevention of further weed establishment

Preventing the introduction and spread of weeds, or early detection and control, is more effective than dealing with an established weed infestation. Vehicle and machinery biosecurity is important when undertaking weed control and revegetation works to reduce the risk of introducing weeds to the site and spreading weeds from the site (see Section 7.5).

Domestic gardens and roadsides are major sources of the weeds invading the Rivulet and surrounding bushland. This will be an ongoing threat which will necessitate regular surveillance and weed control in the survey area to detect and control newly established weeds early, particularly in areas where weed control has been successfully undertaken.

While private land ownership presents a barrier to more strategic and comprehensive weed management along the Rivulet, there may be opportunities for outreach to specific landowners to promote education and collaboration where private land presents a high risk of spreading weeds onto public land. For example, a campaign to encourage landowners neighbouring bushland to remove specific high-risk weeds (e.g. karamu, Spanish heath, sweet pittosporum and cotoneaster) could reduce the threat to native vegetation.

In the riparian environment, weeds will mostly disperse downstream and therefore strategic weed control will generally target upstream weeds first. For example, control of fuchsia and karamu on Guy Fawkes Rivulet in Wellington Park should be undertaken if these weeds are to be controlled downstream of the park boundary.

7.5 Biosecurity and disposal of weed material

All staff, contractors and volunteers undertaking works should follow Council's policies and procedures to prevent spread of weeds, including seeds, from and to works sites. This includes vehicle and machinery hygiene measures to minimise the risk of spreading weeds away from the site. In addition to vehicle and machinery hygiene measures, the movement of soil around the

site and the import and export of soil or gravel should aim to minimise the risk of weed dispersal. Failure to adhere to hygiene guidelines could result in the spread of declared weeds from the site to other areas and is in breach of the *Weed Management Act* 1999.

Weed control methods which involve physical removal of weeds, such as hand pulling or cut and paste, may require disposal of weed debris. Weed material containing seeds should be bagged and removed from the site for disposal in landfill. It may be practical to cut off and dispose of seed heads separate from the remaining weed material, particularly if it is bulky. Weed material that may regrow, such as montbretia corms and any parts of crack willow, should be disposed of carefully, such as removal and composting.

Other weed material may be piled and left to decay on site, chipped for use as mulch on site or removed from the site and composted.

7.6 Willow control strategy

Willow removal has been undertaken at several locations in the survey area. Seven stretches of large mature willows remain. A strategic approach to willow removal will aim to remove willows from entire reaches of the waterway, proceeding downstream. Engagement of private property owners adjacent to council land will be critical for the successful control of willows in the rivulet.

The highest priority for control is zone GF4 where two immature willows in native forest can be controlled with minimal effort. The other zones with willows will require more substantial works, typically requiring machinery to remove willows. Willow trees present on private land that are not removed as part of Council works will present an ongoing risk of spreading willows downstream.

The negative impacts of invasive willows are well documented, but willows may also have some positive influence on waterway health and biodiversity in degraded systems, particularly in regulating water temperature by providing shade (McInerney *et al.*, 2021). Staging willow removal works by targeting individual reaches of the waterway at different times allows work to be carried out with limited resources and provides some resilience to impacts of floods or heatwaves that may be exacerbated if all willows were removed at once.

Planning for willow removal should consider the desired endpoint for restoration of the waterway, which may not be trying to replicate the historical native riparian vegetation due to other factors such as waterway engineering, altered catchment hydrology and climate change (McInerney *et al.*, 2021). In the lower reaches of Hobart Rivulet, the lack of knowledge of the pre-colonial native vegetation and the mosaic of other land uses (e.g. residential, parkland) precludes restoration of an extensive natural ecosystem. However, it is practical to use local native plant species in this section to perform hydrological and ecological roles in this modified environment.

7.7 Willow control methods

Willow control methods to be used:

1. <u>Drill and fill</u> (with a registered, water-safe herbicide, e.g. Weedmaster DUO) in areas with good native vegetation cover or where machinery access is not possible. The method kills the willows in -situ and does not include felling and removal of the tree. This approach is not recommended in sites accessible from the Rivulet Park, to remove the risk of falling limbs if the public were to climb the dead tree.

2. <u>Machine removal of living willows may be feasible where there is no native vegetation and</u> there is already considerable disturbance of the waterway. Machine removal of living willow will involve removal of the trunk and branches, cut and paste (with a registered, water-safe herbicide) the stem and retention of stumps. Ongoing monitoring and control of willow fragment regrowth is vital with this method.

- 3. Hand pulling of small plants and fragments and removal of debris.
- 4. Cut and paste of small saplings and the removal of debris.

Herbicide application must be during the growing season, ideally in late spring or summer.

Cut trunks and branches will be removed from the site and disposed of.

7.8 Willow control by zones

Crack willow is a major ecosystem-transforming weed in the catchment. Willow removal requires significant works, typically involving heavy machinery. Willow removal can have short-term negative impacts on streambank stability, instream habitat and site aesthetics. Careful planning and implementation of works and subsequent site restoration are needed to remedy these impacts and ensure willows are replaced with vegetation that provides habitat (instream and riparian), streambank stabilization and visual amenity.

The highest priority zones for willow removal are GF4 and R1 (Table 5).

Willows have a limited extent on Guy Fawkes Rivulet, the furthest upstream crack willows are near the bridge on Old Farm Road in GF4. Two immature plants are present and can easily be removed, preventing the risk of downstream dispersal into the remainder of the zone, which is presently lacking in willows. The lower reaches of Guy Fawkes Rivulet (GF5) feature extensive willows with easy access for machinery.

On Hobart Rivulet, the furthest upstream willows are located around the trash rack which has machinery access from Strickland Avenue, although the trash rack may be a limitation for machinery access to some of the willow trees. The other willows in H2 are more difficult to access

due to private land. It may be possible to arrange machinery access via a private driveway at 81 Strickland Avenue onto 36 Avon Road to reach some of the large willow trees in this section. Most of the willows in H3 cannot be reached with machinery and would need to be poisoned and left in situ. This includes a significant number of willows within the Cascade Brewery site and along the northern side of the Brewery. Similarly, in Cascade Gardens and downstream to Tara Street (H4) the Hobart Rivulet is largely inaccessible to machinery.

Willow control has been completed in H5 (Figure 19). Most of H6 is accessible for machinery, which may be useful for removing medium-sized willows in this area. Small willows can be removed by hand. The large willows on the south bank of the Rivulet are probably on private land (Collegiate School) and may be out of reach of machinery, but pose no risk to the adjacent school for drill and fill treatment. The extensive large willows in H7, near South Hobart Primary School, can be accessed for mechanical removal on either side of the Rivulet. Willows have been removed in the next section (H8) and manual removal of the two small regrowth willows is an easy option.



Figure 19 - Cut stumps and lack of tree cover following removal of large willow trees near MacFarlane St

Machinery access is possible on the north side of the Rivulet in H9 and H10 and therefore most of the willows in these lower reaches of the Rivulet can be mechanically removed. Some of the small and medium sized willows will require manual removal or can be poisoned and left in situ. Few willows are present in Ross Rivulet, so eradication will be relatively easy in this area. Machinery access is difficult in the upper reaches (R1), and it is preferable to drill and fill willows and leave them in situ. In R2 there is potential machinery access though the paddock, which allows the mechanical removal of willows there. A resprouting cut stump at Tara Street requires herbicide treatment.

| Zone | Distribution | Aim Eradication, Control | Priority High, Medium, Low | Control method |
|------|--------------|--------------------------------|-------------------------------------|---|
| GF4 | isolated | E | Н | Cut and paste, manual removal of material |
| GF5 | extensive | Е | М | Mechanical removal |
| H02 | widespread | E | М | Mechanical removal where possible, drill and fill where no machinery access |
| H03 | widespread | E | Μ | Mechanical removal where possible, drill and fill where no machinery access |
| H04 | extensive | E | Μ | Mechanical removal where possible, drill and fill where no machinery access |
| H06 | extensive | E | М | Mechanical removal where possible, drill and fill where no machinery access |
| H07 | extensive | E | М | Mechanical removal |
| H08 | isolated | E | М | Manual removal |
| H09 | extensive | E | М | Mechanical removal where possible, drill and fill where no machinery access |
| H10 | widespread | С | L | Mechanical removal where possible, drill and fill where no machinery access |
| R1 | few | E | Н | Drill and fill |
| R2 | few | E | М | Mechanical removal |

Table 5– Willow control approach by management zone.

8 Weed Control Action Plan

Within each management zone, the distribution of all major weed species has been classified as follows:

- Isolated (i) single individual or up to 3 plants,
- Few (f) small number of plants occurring as scattered individuals or in a small patch,
- Widespread (w) present at numerous locations as individual plants or multiple small patches,
- Extensive (e) large patches of the species covering a significant area.

For each weed in each zone the management aim has been determined as eradicate or control (except for some minor weeds which do not require active management). Eradication (E) is appropriate where a weed is present in low numbers or poses a significant threat to natural values. Control (C) is a practical option where the weed species is well established and eradication is not feasible, or where the threat is of little concern. Control is a broad term that may involve containment, or strategic removal and revegetation depending on the context.

Three categories of priority for action are provided. High priority actions are typically cases where high threat weeds occur in native vegetation and can readily be eradicated. These actions offer good value outcomes. Medium priority actions reflect either lower risk threats or high risk threats that are less practical to address, such as long-term labour-intensive works. Low priority actions are low threat weeds or established weeds in degraded areas where the effort required is large and biodiversity benefits are lower.

The weed control prioritization for individual weed species is presented in

Table 6. Willow control presents some unique challenges and is addressed in more detail in Section 0 and Table 5.

| Zone | Species name | Common name | WESI Score | WESI Category | Distribution Isolated (i) Few (f) Widespread (w) Extensive (e) | Aim Eradication, Control | Priority High, Medium, Low |
|------|--|-------------------|---------------|-------------------|--|--------------------------------|--|
| GF1 | Pinus radiata | Monterey Pine | 6 | Very high risk | f | E | Н |
| GF1 | Ulex europaeus | Gorse | 15 | Very high risk | i | E | Н |
| GF1 | Fuchsia magellanica | Fuchsia | 19 | Very high risk | w | С | М |
| GF2 | Rubus fruticosus | Blackberry | 4 | Very high risk | w | С | М |
| GF2 | Cotoneaster spp. | Cotoneaster | 10 | Very high risk | e | С | М |
| GF2 | Pittosporum undulatum subsp. undulatum | Sweet Pittosporum | 10 | Very high risk | е | С | М |
| GF2 | llex aquifolium | Holly | 10 | Very high risk | f | E | Н |
| GF2 | Coprosma robusta | Karamu | 10 | Very high risk | i | E | Н |
| GF2 | Ulex europaeus | Gorse | 15 | Very high risk | i | E | Н |
| GF2 | Fuchsia magellanica | Fuchsia | 19 | Very high risk | w | С | М |
| GF2 | Zantedeschia aethiopica | Arum lily | 21 | Very high risk | f | E | Н |
| GF2 | Sorbus aucuparia | Rowan | NA | NA | i | E | М |
| GF3 | Rubus fruticosus | Blackberry | 4 | Very high risk | w | С | L |
| GF3 | Fuchsia magellanica | Fuchsia | 19 | Very high risk | w | С | L |
| GF4 | Cytisus scoparius | Scotch Broom | 3 | Very high risk | f | E | М |

Table 6 – Weed control prioritisation by management zone.

| GF4 | Crocosmia Xcrocosmiiflora | Montbretia | 3 | Very high risk | w | С | L |
|-----|------------------------------------|---------------|-----|-------------------|---|---|---|
| GF4 | Rubus fruticosus | Blackberry | 4 | Very high risk | е | С | М |
| GF4 | Pinus radiata | Monterey Pine | 6 | Very high risk | i | E | М |
| GF4 | Cotoneaster spp. | Cotoneaster | 10 | Very high risk | f | E | М |
| GF4 | Erica lusitanica | Spanish heath | 11 | Very high risk | f | E | н |
| GF4 | Crataegus monogyna | Hawthorn | 13 | Very high risk | е | С | L |
| GF4 | Ulex europaeus | Gorse | 15 | Very high risk | f | С | М |
| GF4 | Fuchsia magellanica | Fuchsia | 19 | Very high risk | w | С | L |
| GF4 | Myosotis sp. | Forget-Me-Not | 20 | Very high risk | f | | |
| GF4 | Salix fragilis | Crack Willow | 23 | Very high risk | i | Е | н |
| GF4 | Rosa rubiginosa | Briar Rose | 98 | Medium risk | f | E | М |
| GF4 | Kunzea ericoides | Burgan | 189 | Lower risk | f | Е | М |
| GF4 | Pittosporum bicolor X undulatum | | 243 | Not invasive | i | | |
| GF5 | llex aquifolium | Holly | 10 | Very high risk | i | Е | н |
| GF5 | Crataegus monogyna | Hawthorn | 13 | Very high risk | f | С | L |
| GF5 | Myosotis sp. | Forget-Me-Not | 20 | Very high risk | f | | |
| GF5 | Salix fragilis | Crack Willow | 23 | Very high risk | е | E | М |
| H01 | Crocosmia Xcrocosmiiflora | Montbretia | 3 | Very high risk | w | С | М |
| H01 | Rubus fruticosus | Blackberry | 4 | Very high risk | W | С | М |

| H01 | Pinus radiata | Monterey Pine | 6 | Very high risk | i | E | М |
|-----|------------------------------|--------------------------|-----|-------------------|---|---|---|
| H01 | llex aquifolium | Holly | 10 | Very high risk | i | E | н |
| H01 | Myosotis sp. | Forget-Me-Not | 20 | Very high risk | е | | |
| H01 | Anthoxanthum odoratum | Sweet Vernal Grass | 31 | High risk | е | | |
| H01 | Dactylis glomerata | Cocks Foot | 97 | Medium risk | е | | |
| H01 | Hypericum androsaemum | Tutsan | 118 | Medium risk | w | С | L |
| H01 | Kniphofia uvaria | Red-hot Poker | 121 | Lower risk | i | E | L |
| H01 | Verbascum virgatum | Twiggy Mullein | 176 | Lower risk | f | С | L |
| H01 | Euphorbia lathyris | Caper Spurge | 240 | Lower risk | f | С | L |
| H02 | Crocosmia Xcrocosmiiflora | Montbretia | 3 | Very high risk | w | С | L |
| H02 | Rubus fruticosus | Blackberry | 4 | Very high risk | w | С | М |
| H02 | Pinus radiata | Monterey Pine | 6 | Very high risk | i | E | М |
| H02 | Cotoneaster spp. | Cotoneaster | 10 | Very high risk | f | С | М |
| H02 | Leycesteria formosa | Himalayan Honeysuckle | 10 | Very high risk | i | E | н |
| H02 | Acer pseudoplanatus | Sycamore Maple | 11 | Very high risk | f | E | М |
| H02 | Crataegus monogyna | Hawthorn | 13 | Very high risk | f | С | М |
| H02 | Ulex europaeus | Gorse | 15 | Very high risk | f | E | н |
| H02 | Vinca major | Blue Periwinkle | 15 | Very high risk | f | С | М |
| H02 | Myosotis sp. | Forget-Me-Not | 20 | Very high risk | w | | |

| H02 | Zantedeschia aethiopica | Arum Lily | 21 | Very high risk | i | E | н |
|-----|--|-------------------|-----|-------------------|---|---|---|
| H02 | Salix fragilis | Crack Willow | 23 | Very high risk | w | Е | М |
| H02 | Holcus lanatus | Fog-grass | 52 | High risk | f | | |
| H02 | Delairea odorata | Cape Ivy | 77 | Moderate risk | i | С | М |
| H02 | Dactylis glomerata | Cocks Foot | 97 | Medium risk | w | | |
| H02 | Sambucus nigra | Elderberry Tree | 100 | Medium risk | f | С | L |
| H02 | Hypericum androsaemum | Tutsan | 118 | Medium risk | w | С | L |
| H03 | Hedera helix | English Ivy | 1 | Very high risk | f | С | М |
| H03 | Cytisus scoparius | Scotch Broom | 3 | Very high risk | f | E | м |
| H03 | Crocosmia Xcrocosmiiflora | Montbretia | 3 | Very high risk | w | С | L |
| H03 | Rubus fruticosus | Blackberry | 4 | Very high risk | е | С | М |
| H03 | Pinus radiata | Monterey Pine | 6 | Very high risk | f | Е | М |
| H03 | Cotoneaster spp. | Cotoneaster | 10 | Very high risk | е | С | М |
| H03 | llex aquifolium | Holly | 10 | Very high risk | f | Е | н |
| H03 | Coprosma robusta | Karamu | 10 | Very high risk | f | E | н |
| H03 | Pittosporum undulatum subsp. undulatum | Sweet Pittosporum | 10 | Very high risk | w | С | М |
| H03 | Acer pseudoplanatus | Sycamore Maple | 11 | Very high risk | f | E | М |
| H03 | Erica lusitanica | Spanish heath | 11 | Very high risk | i | E | н |

| H03 | Passiflora tarminiana | Banana passionfruit | 11 | Very high risk | i | E | Н |
|-----|--------------------------|---------------------|-----|-------------------|---|---|---|
| H03 | Crataegus monogyna | Hawthorn | 13 | Very high risk | е | С | м |
| H03 | Vinca major | Blue Periwinkle | 15 | Very high risk | f | С | М |
| H03 | Ulex europaeus | Gorse | 15 | Very high risk | w | С | М |
| H03 | Myosotis sp. | Forget-Me-Not | 20 | Very high risk | w | | |
| H03 | Salix fragilis | Crack Willow | 23 | Very high risk | w | E | М |
| H03 | Holcus lanatus | Fog-grass | 52 | High risk | f | | |
| H03 | Delairea odorata | Cape Ivy | 77 | Moderate risk | i | С | L |
| H03 | Dactylis glomerata | Cocks Foot | 97 | Medium risk | w | | |
| H03 | Rosa rubiginosa | Briar Rose | 98 | Medium risk | i | С | L |
| H03 | Sambucus nigra | Elberberry Tree | 100 | Medium risk | w | С | L |
| H03 | Prunus laurocerasus | English Laurel | 101 | Medium risk | w | С | L |
| H03 | Conium maculatum | Hemlock | 104 | Medium risk | w | С | L |
| H03 | Hypericum androsaemum | Tutsan | 118 | Medium risk | w | С | L |
| H03 | Agapanthus praecox | Agapanthus | 147 | Lower risk | f | E | М |
| H03 | Populus alba | Poplar | 156 | Lower risk | f | Ν | |
| H03 | Digitalis purpurea | Foxglove | 186 | Lower risk | f | С | L |
| H03 | Foeniculum vulgare | Fennel | 212 | Lower risk | f | С | L |
| H03 | Galium aparine | Sticky Weed | 212 | Lower risk | f | С | L |
| H03 | Chamaecytisus palmensis | Tree Lucerne | 213 | Lower risk | f | E | L |

| Cirsium arvense | Californian Thistle | 214 | Lower risk | i | С | L |
|------------------------------|--|--|---|---|---|--|
| Grevillea spp. | grevillea | 243 | Not assessed | i | E | L |
| Gunnera maculata | Giant Rhubarb | NA | NA | i | E | L |
| Hedera helix | English Ivy | 1 | Very high risk | f | С | М |
| Crocosmia Xcrocosmiiflora | Montbretia | 3 | Very high risk | f | С | L |
| Cytisus scoparius | Scotch Broom | 3 | Very high risk | i | E | Н |
| Rubus fruticosus | Blackberry | 4 | Very high risk | е | С | М |
| Pinus radiata | Monterey Pine | 6 | Very high risk | i | E | М |
| Cotoneaster spp. | Cotoneaster | 10 | Very high risk | e | С | М |
| Leycesteria formosa | Himalayan Honeysuckle | 10 | Very high risk | i | Е | Н |
| Clematis vitalba | Old Man's Beard | 11 | Very high risk | е | С | М |
| Acer pseudoplanatus | Sycamore Maple | 11 | Very high risk | w | Е | М |
| Crataegus monogyna | Hawthorn | 13 | Very high risk | f | Е | М |
| Vinca major | Blue Periwinkle | 15 | Very high risk | w | Е | М |
| Myosotis sp. | Forget-Me-Not | 20 | Very high risk | w | | |
| Salix fragilis | Crack Willow | 23 | Very high risk | е | E | М |
| Holcus lanatus | Fog-grass | 52 | High risk | f | | |
| Delairea odorata | Cape Ivy | 77 | Moderate risk | f | С | М |
| Dactylis glomerata | Cocks Foot | 97 | Medium risk | w | | |
| | Cirsium arvenseGrevillea spp.Gunnera maculataHedera helixCrocosmia ScrocosmiifloraCytisus scopariusRubus fruticosusPinus radiataCotoneaster spp.Leycesteria formosaClematis vitalbaCrataegus monogynaVinca majorMyosotis sp.Salix fragilisHolcus lanatusDelairea odorataDactylis glomerata | Cirsium arvenseCalifornian ThistleGrevillea spp.grevilleaGunnera maculataGiant RhubarbHedera helixEnglish IvyCrocosmia XcrocosmiifloraMontbretiaCytisus scopariusScotch BroomRubus fruticosusBlackberryPinus radiataMonterey PineCotoneaster spp.CotoneasterLeycesteria formosaHimalayan HoneysuckleCrataegus monogynaSycamore MapleVinca majorBlue PeriwinkleMyosotis sp.Forget-Me-NotSalix fragilisCape IvyDelairea odorataCocks Foot | Cirsium arvenseCalifornian Thistle214Grevillea spp.grevillea243Gunnera maculataGiant RhubarbNAHedera helixEnglish Ivy1Crocosmia XcrocosmiifloraMontbretia3Cytisus scopariusScotch Broom3Rubus fruticosusBlackberry4Pinus radiataMonterey Pine6Cotoneaster spp.Cotoneaster10Leycesteria formosaNdan's Beard11Acer pseudoplanatusSycamore Maple13Vinca majorBlue Periwinkle15Myosotis sp.Forget-Me-Not23Salix fragilisCrack Willow52Delairea odorataCocks Foot97 | Cirsium arvenseCalifornian Thistle214Lower riskGrevillea spp.grevillea243Not assessedGunnera maculataGiant RhubarbNANAHedera helixEnglish Ivy1Very high riskCrocosmia XcrocosmifloraMontbretia3Very high riskCytisus scopariusScotch Broom3Very high riskRubus fruticosusBlackberry4Very high riskPinus radiataMonterey Pine6Very high riskCotoneaster spp.Cotoneaster10Very high riskLeycesteria formosaHimalayan Honeysuckle11Very high riskAcer pseudoplanatusSycamore Maple11Very high riskMyosotis sp.Forget-Me-Not20Very high riskMyosotis sp.Forget-Me-Not20Very high riskHolcus lanatusFog-grass52High riskDelairea odorataCocks Foot97Medium risk | Cirsium arvenseCalifornian Thistle214Lower riskiGrevillea spp.grevillea243Not assessediGunnera maculataGiant RhubarbNANAiHedera helixEnglish Ivy1Very high riskfCrocosmia XorocosmiifloraMontbretia3Very high riskfCytisus scopariusScotch Broom3Very high riskiRubus fruticosusBlackberry4Very high riskiPinus radiataMonterey Pine6Very high riskiCotoneaster spp.Cotoneaster10Very high riskiClematis vitalbaOld Man's Beard11Very high riskiAcer pseudoplanatusSycamore Maple11Very high riskfVinca majorBlue Periwinkle15Very high riskwMyosotis sp.Forget-Me-Not20Very high riskwSalix fragilisCrack Willow23Very high riskfHolcus lanatusFog-grass52High riskfDelairea odorataCape Ivy77Moderate riskfDactylis glomerataCocks Foot97Medium riskw | Cirsium arvenseCalifornian Thistle214Lower riskiCGrevillea spp.grevillea243Not assessediEGunnera maculataGiant RhubarbNANAiEHedera helixEnglish Ivy1Very high riskfCCCrocosmia XcrocosmiifloraMontbretia3Very high riskfCCCytisus scopariusScotch Broom3Very high riskieCCRubus fruticosusBlackberry4Very high riskeCCPinus radiataMonterey Pine6Very high riskieCCotoneaster spp.Cotoneaster10Very high riskieCClematis vitalbaOld Man's Beard11Very high riskieEVinca majorBlue Periwinkle15Very high riskfeEMysostis sp.Forget-Me-Not20Very high riskwillfEMustor frugilisCrack Willow23Very high riskfeEMysotis sp.Forget-Me-Not20Very high riskfEEMustor frugilisCrack Willow23Very high riskfEEDelairea odorataFog-grass52High riskfEEMustor frugilisFog-grass52High riskfEEMustor frugili |

| H04 | Sambucus nigra | Elberberry Tree | 100 | Medium risk | f | С | L |
|-----|-----------------------------|------------------|-----|-------------------|---|---|---|
| H04 | Prunus laurocerasus | English Laurel | 101 | Medium risk | f | С | L |
| H04 | Conium maculatum | Hemlock | 104 | Medium risk | w | С | L |
| H04 | Hypericum androsaemum | Tutsan | 118 | Medium risk | w | С | L |
| H04 | Nasturtium officinale | Watercress | 131 | Lower risk | f | | |
| H04 | Agapanthus praecox | Agapanthus | 147 | Lower risk | f | E | М |
| H04 | Populus alba | Poplar | 156 | Lower risk | f | | |
| H04 | Verbascum thapsus | Mullein | 176 | Lower risk | i | С | L |
| H04 | Digitalis purpurea | Foxglove | 186 | Lower risk | f | С | L |
| H04 | Foeniculum vulgare | Fennel | 212 | Lower risk | f | С | L |
| H04 | Galium aparine | Sticky Weed | 212 | Lower risk | f | С | L |
| H04 | Fumaria sp. | Fumitory | 212 | Lower risk | i | С | L |
| H04 | Chamaecytisus palmensis | Tree Lucerne | 213 | Lower risk | w | С | L |
| H04 | Helminthotheca echioides | Bristly Oxtongue | 214 | Lower risk | i | С | L |
| H04 | Ribes sanguineum | Currant | 243 | Not assessed | i | | |
| H04 | Gunnera maculata | Giant Rhubarb | NA | NA | i | E | L |
| H04 | Brugmansia sp. | Angels Trumpet | NA | NA | i | | |
| H05 | Cytisus scoparius | Scotch Broom | 3 | Very high risk | f | E | М |
| H05 | Rubus fruticosus | Blackberry | 4 | Very high risk | e | С | М |
| H05 | Pinus radiata | Monterey Pine | 6 | Very high risk | i | E | М |

| H05 | Clematis vitalba | Old Man's Beard | 11 | Very high risk | е | С | М |
|-----|------------------------------|------------------|-----|-------------------|---|---|---|
| H05 | Ulex europaeus | Gorse | 15 | Very high risk | f | E | М |
| H05 | Myosotis sp. | Forget-Me-Not | 20 | Very high risk | f | | |
| H05 | Zantedeschia aethiopica | Arum Lily | 21 | Very high risk | i | E | н |
| H05 | Holcus lanatus | Fog-grass | 52 | High risk | f | | |
| H05 | Coprosma repens | Mirror Bush | 73 | Medium risk | i | E | М |
| H05 | Dactylis glomerata | Cocks Foot | 97 | Medium risk | w | | |
| H05 | Cirsium vulgare | Spear Thistle | 115 | Medium risk | f | С | L |
| H05 | Kniphofia uvaria | Red-hot Poker | 121 | Lower risk | i | С | L |
| H05 | Chamaecytisus palmensis | Tree Lucerne | 213 | Lower risk | i | С | L |
| H05 | Narcissus sp. | Daffodil/Jonquil | 228 | Lower risk | i | | |
| H05 | Laurus nobilis | Bay Laurel | 243 | Not assessed | i | | |
| H06 | Cytisus scoparius | Scotch Broom | 3 | Very high risk | f | Е | Μ |
| H06 | Crocosmia Xcrocosmiiflora | Montbretia | 3 | Very high risk | f | С | М |
| H06 | Rubus fruticosus | Blackberry | 4 | Very high risk | е | С | М |
| H06 | Acer pseudoplanatus | Sycamore Maple | 11 | Very high risk | е | С | М |
| H06 | Ulex europaeus | Gorse | 15 | Very high risk | е | С | М |
| H06 | Vinca major | Blue Periwinkle | 15 | Very high risk | е | С | М |
| H06 | Zantedeschia aethiopica | Arum Lily | 21 | Very high risk | i | E | М |

| H06 | Salix fragilis | Crack Willow | 23 | Very high risk | е | E | М |
|-----|------------------------------|--------------------------|-----|-------------------|---|---|---|
| H06 | Holcus lanatus | Fog-grass | 52 | High risk | f | | |
| H06 | Buddleja davidii | Butterfly bush | 102 | Medium risk | i | | |
| H06 | Conium maculatum | Hemlock | 104 | Medium risk | f | | |
| H06 | Digitalis purpurea | Foxglove | 186 | Lower risk | f | С | L |
| H06 | Foeniculum vulgare | Fennel | 212 | Lower risk | i | С | L |
| H06 | Euphorbia lathyris | Caper Spurge | 240 | Lower risk | f | С | L |
| H06 | Phormium tenax | New Zealand Flax | 243 | Not invasive | i | С | L |
| H06 | Arbutus unedo | Strawberry Tree | NA | NA | i | | |
| H06 | Cotoneaster dammeri | Bearberry Cotoneaster | NA | NA | i | | |
| H07 | Rubus fruticosus | Blackberry | 4 | Very high risk | е | С | М |
| H07 | Acer pseudoplanatus | Sycamore Maple | 11 | Very high risk | е | С | М |
| H07 | Crataegus monogyna | Hawthorn | 13 | Very high risk | е | С | М |
| H07 | Ulex europaeus | Gorse | 15 | Very high risk | е | С | М |
| H07 | Salix fragilis | Crack Willow | 23 | Very high risk | е | E | М |
| H07 | Holcus lanatus | Fog-grass | 52 | High risk | f | | |
| H07 | Vinca major | Periwinkle | 15 | Very high risk | f | E | М |
| H08 | Crocosmia Xcrocosmiiflora | Montbretia | 3 | Very high risk | f | С | М |
| H08 | Cytisus scoparius | Scotch Broom | 3 | Very high risk | i | E | Н |
| H08 | Rubus fruticosus | Blackberry | 4 | Very high risk | е | С | М |

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| H08 | Genista monspessulana | Canary Broom | 11 | Very high risk | f | E | н |
|-----|----------------------------|---------------------|-----|-------------------|---|---|---|
| H08 | Vinca major | Blue Periwinkle | 15 | Very high risk | е | С | М |
| H08 | Ulex europaeus | Gorse | 15 | Very high risk | f | E | н |
| H08 | Salix fragilis | Crack Willow | 23 | Very high risk | i | E | М |
| H08 | Holcus lanatus | Fog-grass | 52 | High risk | f | | |
| H08 | Delairea odorata | Cape Ivy | 77 | Moderate risk | f | С | М |
| H08 | Dactylis glomerata | Cocks Foot | 97 | Medium risk | w | | |
| H08 | Solanum nigrum | Deadly Nightshade | 124 | Lower risk | е | | |
| H08 | Digitalis purpurea | Foxglove | 186 | Lower risk | f | С | L |
| H08 | Galium aparine | Sticky Weed | 212 | Lower risk | f | | |
| H08 | Chamaecytisus palmensis | Tree Lucerne | 213 | Lower risk | f | С | L |
| H08 | Cirsium arvense | Californian Thistle | 214 | Lower risk | f | E | н |
| H09 | Hedera helix | English Ivy | 1 | Very high risk | е | С | М |
| H09 | Rubus fruticosus | Blackberry | 4 | Very high risk | f | С | М |
| H09 | Clematis vitalba | Old Man's Beard | 11 | Very high risk | е | С | М |
| H09 | Salix fragilis | Crack Willow | 23 | Very high risk | е | Е | М |
| H09 | Holcus lanatus | Fog-grass | 52 | High risk | f | | |
| H09 | Coprosma repens | Mirror Bush | 73 | Medium risk | i | E | М |
| H09 | Dactylis glomerata | Cocks Foot | 97 | Medium risk | w | | |
| H09 | Populus alba | Poplar | 156 | Lower risk | f | | |

| H09 | Kunzea ericoides | Burgan | 189 | Lower risk | i | E | L |
|-----|----------------------------|------------------|-----|-------------------|---|---|---|
| H09 | Phormium tenax | New Zealand Flax | 243 | Not invasive | i | E | L |
| H10 | Hedera helix | English Ivy | 1 | Very high risk | f | С | L |
| H10 | Cytisus scoparius | Scotch Broom | 3 | Very high risk | f | Е | L |
| H10 | Rubus fruticosus | Blackberry | 4 | Very high risk | е | С | L |
| H10 | Cotoneaster spp. | Cotoneaster | 10 | Very high risk | w | С | L |
| H10 | Clematis vitalba | Old Man's Beard | 11 | Very high risk | е | С | L |
| H10 | Genista monspessulana | Canary Broom | 11 | Very high risk | f | С | L |
| H10 | Acer pseudoplanatus | Sycamore Maple | 11 | Very high risk | i | Е | L |
| H10 | Vinca major | Blue Periwinkle | 15 | Very high risk | е | С | L |
| H10 | Ulex europaeus | Gorse | 15 | Very high risk | i | Е | М |
| H10 | Salix fragilis | Crack Willow | 23 | Very high risk | w | С | L |
| H10 | Holcus lanatus | Fog-grass | 52 | High risk | f | С | L |
| H10 | Coprosma repens | Mirror Bush | 73 | Medium risk | f | С | L |
| H10 | Delairea odorata | Cape Ivy | 77 | Moderate risk | f | С | L |
| H10 | Rosa rubiginosa | Briar Rose | 98 | Medium risk | i | С | L |
| H10 | Kunzea ericoides | Burgan | 189 | Lower risk | i | E | L |
| H10 | Foeniculum vulgare | Fennel | 212 | Lower risk | w | С | L |
| H10 | Chamaecytisus palmensis | Tree Lucerne | 213 | Lower risk | i | С | L |

| H10 | Helminthotheca echioides | Bristly Oxtongue | 214 | Lower risk | i | | |
|-----|-----------------------------|--------------------|-----|-------------------|---|---|---|
| H10 | Centranthus ruber | Red Valerian | 236 | Lower risk | w | | |
| H10 | Conyza bonariensis | Flaxleaf Fleabane | NA | NA | f | | |
| H10 | Physalis peruviana | Cape Gooseberry | NA | NA | i | | |
| H2 | Hedera helix | English Ivy | 1 | Very high risk | w | С | М |
| H2 | Cytisus scoparius | Scotch Broom | 3 | Very high risk | f | E | Н |
| R1 | Ulex europaeus | Gorse | 15 | Very high risk | е | С | М |
| R1 | Myosotis sp. | Forget-Me-Not | 20 | Very high risk | f | | |
| R1 | Salix fragilis | Crack Willow | 23 | Very high risk | f | Е | Н |
| R1 | Conium maculatum | Hemlock | 104 | Medium risk | f | С | L |
| R2 | Cytisus scoparius | Scotch Broom | 3 | Very high risk | е | С | М |
| R2 | Cotoneaster spp. | Cotoneaster | 10 | Very high risk | i | Е | н |
| R2 | Crataegus monogyna | Hawthorn | 13 | Very high risk | i | Е | н |
| R2 | Ulex europaeus | Gorse | 15 | Very high risk | е | Е | М |
| R2 | Vinca major | Blue Periwinkle | 15 | Very high risk | i | Е | М |
| R2 | Salix fragilis | Crack Willow | 23 | Very high risk | f | Е | М |
| R2 | Anthoxanthum odoratum | Sweet Vernal Grass | 31 | High risk | w | | |
| R2 | Dactylis glomerata | Cocks Foot | 97 | Medium risk | w | | |

9 Revegetation Guidelines

Revegetation will be necessary following weed control in most situations. Revegetation involves establishing native plants on sites lacking vegetation or dominated by weeds. There are several possible aims of revegetation works and the revegetation methods and species choice will be determined by the specific aims:

- reduce the regrowth of weeds by providing competition,
- stabilize soils and reduce erosion and streambank instability,
- restore degraded or lost native vegetation,
- assist in the treatment of stormwater,
- provide habitat for native fauna,
- provide public amenity, such as landscaping.

Choice of species for revegetation plantings will reflect the desired vegetation structure. For restoration of native bushland it is necessary to plant a mix of canopy trees, understorey shrubs and groundcover plants. If there is already a tree canopy present and the understorey is dominated by weeds it will only be necessary to plant understorey species following weed control.

For parkland plantings the vegetation structure may vary from natural bushland. It may be desirable to plant only groundcover species to improve visibility and sunlight, for example where taller vegetation would reduce sightlines for walkers and cyclists on the Rivulet Track. Similarly, planting trees and groundcovers with no understorey layer can provide a parkland effect, with some shade and habitat value while improving public safety.

Establishing groundcover species is important in most situations because they will help to stabilize soil (especially on streambanks), provide habitat for many native fauna species (e.g. bandicoots, native hens) and help suppress weeds. For bushland restoration, native vegetation in similar situations should be used as a guide – it may be that the natural vegetation has a sparse groundcover layer and a dense shrub layer. However, we need to be mindful of bushfire risk. A sparse shrub layer disconnected from the canopy and the groundcover layer is best. Also, Bandicoots need dense plantings in clumps not sparse plantings.



Figure 20 - Erosion control works and revegetation with grasses and sedges on Ross Rivulet

9.1 Revegetation Methodology

This section outlines major considerations for revegetation projects including local knowledge and experience of Council staff, professional contractors and experienced volunteers.

9.1.1 Site preparation and planting

Revegetation in this project is primarily for sites following weed control. This should involve both primary removal and at least one follow-up treatment of weed regrowth. In addition to weeds, pasture grasses will need to be suppressed in many revegetation sites.

Woody weed debris (excluding willow, weeds with seed material and weeds that grow from fragments) could be mulched to prepare the site for revegetation in some instances. Additional mulch may be required to be imported to the site. Mulching is useful for suppressing weeds and grasses in areas not prone to flooding. Weed matting may be used instead of mulch on steep slopes where erosion is a risk.

9.1.2 Planting

Timing of planting will depend on site conditions. On dry sites, such as north-facing slopes, planting in late autumn or winter (May through August) is ideal. Most of the sites requiring revegetation are in the riparian zone where soil moisture is adequate for planting for much of the year. Planting in winter or early spring is appropriate for sites with good drainage where waterlogging is not a risk. For lower streambanks where there is a risk of flooding or waterlogging

it is better to plant in spring and time planting to avoid heavy rainfalls. For riparian sites with no tree canopy cover spring planting may be preferable to reduce risk of frost damage to seedlings, although the suggested native species should be frost tolerant if the seedlings have been hardened prior to planting. Planting in summer should generally be avoided. Timing is important if bare ground is exposed and at risk of erosion or weed invasion.

Spacing of plants will vary depending on the purpose of the planting and the mature size of the species planted. Tree species (e.g. eucalypts) should be planted 10 m apart. Shrubs should be planted 4–5 m apart for bushland restoration or where a dense understorey is desired. A lower density of shrubs may be appropriate in parkland areas where a more open vegetation is desired. Groundcover plants (grasses, sedges, rushes) should be planted in clusters of 3–5 plants, with density of planting determined by how much bare ground is present.

Dense plantings of groundcover species, such as sedges and rushes, may be useful on lower streambanks around stormwater outflows, to reduce erosion and flow rates.

9.1.3 Plant protection

Most plants will be at risk of severe damage from browsing by native mammals. All newly planted trees and shrubs will need to be protected from browsing by native animals using tree guards, except within the zone inundated by regular flooding. The condition of the guards should be monitored and any damaged or missing guards replaced until plants are well established, at which time they should be removed. Temporary fencing may be more practical than tree guards around clusters of groundcover plantings (sedges and tussocks) or shrubs where planting density is high. Grasses and sedges are naturally more resilient to browsing and can be planted without guards, particularly those planted within the waterway and lower streambanks.



Figure 21 - Revegetation site on Hobart Rivulet near Tara St

9.1.4 Watering

Depending on the seasonal weather conditions following plantings, some supplementary watering of plants may be required during dry periods until plants become well established. Given the predominantly sheltered aspect and the riparian location, plantings are unlikely to require watering unless weather conditions are exceptionally dry.

9.1.5 <u>Maintenance</u>

Plantings are to be monitored and maintained on a regular basis. Dead plants are to be replaced and guards and stakes replaced if they deteriorate prior to successful plant establishment. Tree guards should be removed when plants are established (typically after 2–3 years). The control of weeds and pasture around plantings and within guards should be undertaken to ensure plants are not out-competed for nutrients, water and light. Careful spot spraying with herbicide may be useful for control of grasses or weed regrowth around revegetation plantings where mulch or weed matting is not used.

Maintenance may be required for up to five years after initial planting until the revegetation is well established. Tussock grass (*Poa labillardieri*) grows fast but becomes dominated by dead foliage which requires periodic slashing or burning to promote new green foliage in ornamental plantings.

9.1.6 <u>Species selection</u>

Local native plant species representative of the remnant and historical flora of the Hobart Rivulet have been considered for their revegetation potential. Table 7 provides a list of suggested local native species suitable for revegetation by planting of seedlings. This list comprises species currently inhabiting the catchment area and likely to have been present in lower sections of the Hobart Rivulet prior to the development of the city. The list is not exhaustive and there are other Tasmanian native species suitable for planting in the area that may be used. Choice of species will depend on site characteristics; revegetation aims and plant availability.

Site suitability:

- R riparian (suitable for streambanks),
- W wet forest, damp or shady situations,
- D dry forest.

Utility of plants for specific purposes:

- N native forest restoration following weed control,
- P parkland planting for public amenity.

The aim of revegetation works for each zone is indicated in Table 4, with broad categories of 'bushland' and 'parkland'. Bushland includes areas of existing native vegetation requiring rehabilitation following weed control as well as degraded areas that can be restored to native vegetation. For example, establishing bushland in zone R2 will provide habitat connectivity between Knocklofty and the Hobart Rivulet corridor.

All the plants suggested here are local native species. The parkland classification here indicates those native plants that are suitable for more formal or landscaped planting. This assumes that future revegetation plantings will use entirely native flora even if the structure of the vegetation does not seek to recreate a natural vegetation community. It is assumed that landscaped sections of the Rivulet Park containing exotic plants (including mainland Australian species) will continue to be maintained as such. In some situations in the lower reaches of Hobart Rivulet, it may be desirable to plant non-invasive exotic species following weed removal in the riparian zone, in keeping with the landscaping of the Rivulet Park. This would be determined by the City of Hobart.

| Table Species name | Table 7 - Some suggested native plant species suitable for revegetation | | | | | |
|--------------------------------|---|--------------|---|---|--|--|
| Species name | Common Name | Lifeform | R – riparian W – wet forest D – dry forest. | N – native restoration P – parkland | Notes | |
| Eucalyptus globulus | blue gum | tree (large) | R W D | NP | Swift parrot habitat | |
| Eucalyptus obliqua | stringybark | tree (large) | W D | N | | |
| Eucalyptus ovata | black gum | tree (large) | RW | Р | Swift parrot habitat | |
| Eucalyptus viminalis | white gum | tree (large) | WD | NP | | |
| Acacia melanoxylon | blackwood | tree | R W D | NP | | |
| Acacia leprosa | varnished wattle | tall shrub | W | N P | | |
| Allocasuarina verticillata | sheoak | tall shrub | D | NP | | |
| Asterotrichion discolor | currajong | tall shrub | RW | NP | | |
| Banksia marginata | silver banksia | tall shrub | W D | NP | Bird habitat | |
| Bedfordia salicina | blanketleaf | tall shrub | RW | N | | |
| Dodonaea viscosa | hop-bush | tall shrub | WD | N | Fast growing dense shrub | |
| Pittosporum bicolor | cheesewood | tall shrub | W | N | | |
| Pomaderris apetala | dogwood | tall shrub | RW | Ν | | |
| Prostanthera lasianthos | christmas mintbush | tall shrub | RW | NP | | |
| Acacia terminalis | sunshine wattle | shrub | D | NP | | |
| Acacia verticillata | prickly moses | shrub | RW | Ν | | |
| Bursaria spinosa | hopbush | shrub | D | NP | Bird and invertebrate habitat | |
| Correa reflexa var. reflexa | common correa | shrub | D | Р | | |
| Goodenia ovata | hop native- primrose | shrub | R W D | N | | |
| Indigofera australis | native indigo | shrub | W D | N P | | |
| Leptospermum lanigerum | teatree | shrub | RW | N | Suited to streambank or instream stabilisation | |
| Leptospermum scoparium | manuka | shrub | R D | Ν | | |
| , Melaleuca pallida | lemon bottlebrush | shrub | WD | NP | | |
| Olearia stellulata | daisy bush | shrub | W | Р | | |
| Pomaderris elliptica | yellow dogwood | shrub | D | NP | | |
| Pultenaea daphnoides | native daphne | shrub | D | Ν | | |
| Pultenaea juniperina | prickly beauty | shrub | D | Ν | | |
| Stylidium graminifolium | trigger plant | herb | WD | NP | | |

| Table 7 - Some suggested | native plant | species suita | ble for revea | retation |
|--------------------------|--------------|---------------|---------------|----------|
| | | | | |

| Carex appressa | tall sedge | graminoid (sedge) | RW | NP | |
|---------------------------|----------------------|----------------------|-----|----|--|
| Dianella tasmanica | tasman flax-lily | graminoid (sedge) | RW | NP | |
| Diplarrena moraea | flag iris | graminoid (sedge) | R D | NP | |
| Gahnia grandis | cutting grass | graminoid (sedge) | RW | N | Large sedge suited to soil stabilisation |
| Lepidosperma ensiforme | sword sedge | graminoid (sedge) | RW | N | |
| Lomandra Iongifolia | sagg | graminoid (sedge) | RW | NP | |
| Juncus pallidus | pale rush | graminoid (rush) | RW | N | |
| Juncus pauciflorus | loose-flower rush | graminoid (rush) | RW | NP | |
| Poa labillardierei | tussockgrass | graminoid (grass) | RWD | NP | Not typically subject to browsing. Requires trimming in parkland. |
| Polystichum proliferum | mother shield fern | fern | RW | NP | |

10 Conclusion and Recommendations

The Hobart Rivulet is an important natural feature of the city, linking the CBD with the slopes of kunanyi/Mt Wellington. The Rivulet has significance to many residents, who live close to the waterway or use the Rivulet Park for recreation and travel.

This Vegetation Management Plan outlines a strategic approach to controlling weeds and revegetating the Hobart Rivulet and its tributaries, Ross Rivulet and Guy Fawkes Rivulet.

The Plan identifies opportunities to improve the condition of existing bushland in the upper reaches of the watercourses and to restore native flora in degraded sections where weeds are presently widespread. Restoration of riparian areas aims to improve terrestrial and aquatic habitat for native fauna, erosion control, water quality, and the appearance and enjoyment for residents and visitors.

Weed control and revegetation are long-term projects and it will typically take many years to transform a weed infestation into fully restored native bushland or an established planting of trees and other local species. The scale and approach of weed control works varies from removal of emerging weeds in bushland, to treatment of large patches of weeds with follow up control over several years, to using heavy machinery to remove large willow trees.

In many cases there are opportunities for volunteer involvement in weed control and revegetation works (e.g. Bushcare volunteers).

Recommendations

- Routine park management works on streambanks should include removing new and emerging weeds.
- Conduct weed surveys annually in sites where weed control and/or revegetation has been undertaken to detect and control new or regenerating weeds.
- Encourage weed control in Wellington Park, where this will benefit the lower reaches of Guy Fawkes Rivulet.
- Approach private landowners (as well as Cascade) with willow trees on their property. Negotiate willow removal, with the aim of eradicating willows from the catchment.

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Appendix 1 – Vascular plant species list

This list documents species recorded during surveys conducted for this project in 2021. All native vascular plant species were recorded, where possible. Introduced plant species were recorded where they appeared to be invasive, e.g. growing in native vegetation or wild populations. Many exotic plant species occur within the survey area in cultivation (e.g. planted in private gardens or public park land). These exotic species have not been recorded unless they are considered to be invasive species.

i = introduced species

p = Tasmanian native species planted in the survey area

D = declared weed

W = Weed of National Significance

MAGNOLIIDS

LAURACEAE

| | Cassytha pubescens | Hairy Dodder-laurel | | |
|---------------|----------------------------|------------------------|---|---|
| | Laurus nobilis | Bay Laurel | i | |
| EUDICOTS | | Buy Euclor | • | |
| | | | | |
| APIACEAE | | | | |
| | Conium maculatum | Hemlock | i | |
| | Foeniculum vulgare | Fennel | i | D |
| | Hydrocotyle sibthorpioides | Entire-leaf Pennywort | | |
| APOCYNACEAE | | | | |
| | Parsonsia brownii | Twining Silkpod | | |
| | Vinca major | Blue Periwinkle | i | |
| AQUIFOLIACEAE | | | | |
| | llex aquifolium | Holly | i | D |
| ARALIACEAE | | | | |
| | Hedera helix | English Ivy | i | |
| ASTERACEAE | | | | |
| | Bedfordia salicina | Tasmanian Blanket Leaf | | |
| | Bellis perennis | English daisy | i | |
| | Cirsium arvense | Californian Thistle | i | D |
| | Cirsium vulgare | Spear Thistle | i | |
| | Conyza bonariensis | Flaxleaf Fleabane | i | |
| | Delairea odorata | Cape Ivy | i | |
| | Helminthotheca echioides | Bristly Oxtongue | i | |
| | Olearia argophylla | Musk | | |
| | Olearia stellulata | Daisy Bush | | |
| | Olearia viscosa | Viscid Daisy Bush | | |
| | Ozothamnus ferrugineus | Tree Everlasting | | |
| | Senecio linearifolius var. | Fireweed | | |
| | linearifolius | | | |
| | Senecio minimus | Shrubby Fireweed | | |
| BETULACEAE | | | | |
|-----------------|---------------------------|-----------------------|---|------|
| | Betula pendula | Silver Birch | i | |
| BORAGINACEAE | | | | |
| | Myosotis sylvatica | Forget-Me-Not | i | |
| BRASSICACEAE | | | | |
| | Nasturtium officinale | Watercress | i | |
| | | | | |
| CAPRIFOLIACEAE | | | | |
| | Leycesteria formosa | Himalayan Honeysuckle | i | D |
| | Sambucus nigra | Elberberry Tree | i | |
| CASUARINACEAE | | | | |
| | Allocasuarina monilifera | Necklace Sheoak | | |
| CLUSIACEAE | | | | |
| | Hypericum androsaemum | Tutsan | i | |
| ELATINACEAE | | | | |
| | Elatine gratioloides | Waterwort | | |
| ERICACEAE | | | | |
| | Arbutus unedo | Strawberry Tree | i | |
| | Cyathodes glauca | Cheeseberry | | |
| | Epacris impressa | Common Heath | | |
| | Erica lusitanica | Spanish heath | i | D |
| | Styphelia humifusa | Native Cranberry | | |
| EUPHORBIACEAE | | | | |
| | Beyeria viscosa | Pinkwood | | |
| | Euphorbia lathyris | Caper Spurge | i | |
| FABACEAE | | | | |
| | Chamaecytisus palmensis | Tree Lucerne | i | |
| | Cytisus scoparius | Scotch Broom | i | W, D |
| | Genista monspessulana | Canary Broom | i | W, D |
| | Pultenaea daphnoides var. | Native Daphne | | |
| | obcordata | | | |
| | Pultenaea juniperina | Prickly Beauty | | |
| | Ulex europaeus | Gorse | i | W, D |
| FAGACEAE | | | | |
| | Nothofagus cunninghamii | Myrtle Beech | р | |
| FUMARIACEAE | | | | |
| | Fumaria sp. | Fumitory | i | |
| GERANIACEAE | | | | |
| | Geranium potentilloides | | | |
| | Geranium sp. | | | |
| GOODENIACEAE | | | | |
| | Goodenia ovata | Parrot's Food | | |
| GROSSULARIACEAE | | | | |
| | Ribes sanguineum | Currant | i | |
| GUNNERACEAE | | | | |
| | Gunnera maculata | Giant Raspberry | i | |
| HALORAGACEAE | | | | |

| | Gonocarpus sp. | Raspwort | |
|----------------|--|---------------------|---|
| | Gonocarpus teucrioides | Raspwort | |
| LAMIACEAE | | | |
| | Mentha Xpiperita | Peppermint | i |
| | Prostanthera lasianthos var. Iasianthos | Christmas Mintbush | |
| MALVACEAE | | | |
| | Asterotrichion discolor | Currajong | |
| MIMOSACEAE | | | |
| | Acacia leprosa | Varnished wattle | |
| | Acacia longifolia subsp. Sophorae | Coast Wattle | |
| | Acacia mearnsii | Black Wattle | |
| | Acacia melanoxylon | Blackwood | |
| | Acacia terminalis | Sunshine Wattle | |
| | | | |
| | Acacia verticillata subsp. verticillata | Prickly Mimosa | |
| MYRTACEAE | | | |
| | Eucalvptus globulus subsp. | Tasmanian Blue Gum | |
| | globulus | | |
| | Eucalyptus obliqua | Stringybark | |
| | Eucalyptus tenuiramis | Silver Peppermint | |
| | Eucalyptus viminalis subsp. viminalis | Manna Gum | |
| | Kunzea ericoides | Burgan | i |
| | Leptospermum lanigerum | Woolly Tea-tree | |
| OLEACEAE | | | |
| | Notelaea ligustrina | Native Olive | |
| ONAGRACEAE | | | |
| | Epilobium sp. | Willowherb | |
| | Fuchsia magellanica | Fuchsia | i |
| | | | |
| OXALIDACEAE | | | |
| | Oxalis sp. | | i |
| PASSIFLORACEAE | | | |
| | Passiflora tarminiana | Banana passionfruit | i |
| PITTOSPORACEAE | | | |
| | Bursaria spinosa subsp. spinosa | Prickly Box | |
| | Pittosporum bicolor | Cheesewood | |
| | Pittosporum undulatum subsp. undulatum | Sweet Pittosporum | i |
| | Pittosporum bicolor X undulatum | | i |
| POLYGONACEAE | | | |
| | Muehlenbeckia gunnii | Macquarie Vine | |
| PROTEACEAE | - | | |
| | Banksia marginata | Silver Banksia | |
| | | | |

| | Grevillea rosmariniifolia | | i | |
|------------------|-----------------------------|-------------------------|---|-------|
| | Hakea lissosperma | Needle Bush | | |
| RANUNCULACEAE | | | | |
| | Clematis vitalba | Old Man's Beard | i | |
| RHAMNACEAE | | | | |
| | Pomaderris apetala subsp. | Dogwood | | |
| | apetala | | | |
| | Pomaderris elliptica var | Yellow Pomaderris | | |
| | diemenica | | | |
| POSACEAE | domonou | | | |
| NUSAULAL | Accora novao zolandico | But zzy | | |
| | Acaeria novae-zelandiae | Basebarry Cotopostor | ; | |
| | | Gravilagued Catarageter | : | |
| | Cotoneaster glaucopriyilus | Grey-leaved Cotoneaster | | |
| | Cotoneaster simonsii | Khasia Berry | 1 | |
| | Crataegus monogyna | Hawthorn | i | |
| | Prunus laurocerasus | English Laurel | i | |
| | Rosa rubiginosa | Briar Rose | i | |
| | Rubus fruticosus | Blackberry | i | W, Ds |
| | Sorbus aucuparia | Rowan | i | |
| RUBIACEAE | | | | |
| | Coprosma quadrifida | Native Currant | | |
| | Coprosma repens | Mirror Bush | i | |
| | Coprosma robusta | Karamu | i | D |
| | Galium aparine | Sticky Weed | i | |
| RUTACEAE | | | | |
| | Correa reflexa var. reflexa | Common Correa | | |
| SALICACEAE | | | | |
| | Populus alba | Poplar | i | |
| | Salix fragilis | Crack Willow | i | W. Ds |
| | Salix X reichardtii | | i | , |
| SANTALACEAE | | | | |
| 0, (((), ())) | Exocarpos cupressiformis | Native Cherry | | |
| | Exocarpos strictus | Dwarf Cherry | | |
| | | Dwair Cherry | | |
| SAI INDAGEAE | Acor psoudoplanatus | Sycamore Maple | ; | |
| | | | 1 | |
| | | Hop Bush | | |
| | spatulata | | | |
| SCRUPHULARIACEAE | | | | |
| | Buddieja davidii | Butterfly bush | | |
| | Digitalis purpurea | Foxglove | 1 | |
| | Verbascum thapsus | Mullein | Ì | |
| | Verbascum virgatum | Twiggy Mullein | i | |
| | | | | |
| SOLANACEAE | | | | |
| | Brugmansia sp. | Angels Trumpet | i | |
| | Physalis peruviana | Cape Gooseberry | i | |
| | Solanum laciniatum | Kangaroo Apple | | |

| | Solanum nigrum | Deadly Nightshade | i |
|-------------------|---|---------------------------------------|---|
| STACKHOUSIACEAE | | | |
| | Stackhousia monogyna | Candles | |
| STYLIDIACEAE | | | |
| | Stylidium graminifolium | Trigger Plant | |
| THYMELAEACEAE | Dimalaa drivnaaaa | Charmy Diag flower | |
| | Pinielea diupacea | Cherry Rice-nower | |
| URTICACEAE | l Irtica incisa | Stinging Nettle | |
| VALERIANACEAE | | | |
| VALENIANAOLAL | Centranthus ruber | Red Valerian | i |
| | | | |
| | | | |
| CUFRESSACEAE | Callitris rhomboidea | Oveter Bay Pine | n |
| PINACEAE | | Oyster Day I me | P |
| | Pinus radiata | Monterev Pine | i |
| MONOCOTE | , mao radiata | Montorey Fine | • |
| | | | |
| AGAFANTIACEAE | Agapanthus pracox | Agapanthus | i |
| | Agapaninus praecox | Agapaninus | I |
| | Narcissus sp | Daffodil/ Ionguil | i |
| ARACEAE | | Dariodii/Joriqui | 1 |
| | Arum sp. | Cuckoo-pint | i |
| | Zantedeschia aethiopica | Arum Lilv | i |
| ASPARAGACEAE | | , , , , , , , , , , , , , , , , , , , | |
| | Lomandra longifolia | Sagg | |
| ASPHODELACEAE | , i i i i i i i i i i i i i i i i i i i | | |
| | Kniphofia uvaria | Red-hot Poker | i |
| CYPERACEAE | | | |
| | Carex appressa | Common Sedge | |
| | Cyperus eragrostis | Drain Flat-sedge | i |
| | Gahnia grandis | Cutting Grass | |
| | Lepidosperma ensiforme | Sword Sedge | |
| HEMEROCALLIDACEAE | | | |
| | Dianella tasmanica | Flax lily | |
| | Phormium tenax | New Zealand Flax | i |
| IRIDACEAE | | | |
| | Crocosmia Xcrocosmiiflora | Montbretia | İ |
| JUNCACEAE | | Dela Duch | |
| | | Pale Rush | |
| | Juncus paucinorus | LUUSE-HUWEI KUSH | |
| ΡΟΔΟΕΔΕ | sunces sp. | | |
| | Anthoxanthum odoratum | Sweet Vernal Grass | i |
| | Dactylis glomerata | Cocks Foot | i |
| | Deveuxia sp. | Bent Grass | • |
| | Holcus lanatus | Fog-grass | i |
| | | i og gradd | 1 |

| | Poa labillardierei var. labillardierei | Tussock Grass |
|------------------|--|----------------------|
| | Rytidosperma sp. | Wallaby-grass |
| | | |
| PTERIDOPHYTES | | |
| ASPLENIACEAE | | |
| | Asplenium flabellifolium | Necklace Fern |
| BLECHNACEAE | | |
| | Blechnum fluviatile | Ray Water-fern |
| | Blechnum minus | Soft Water-fern |
| | Blechnum nudum | Fishbone Water-fern |
| DENNSTAEDTIACEAE | | |
| | Histiopteris incisa | Bat's Wing |
| | Hypolepis rugosula | Ruddy Ground-fern |
| | Pteridium esculentum | Bracken |
| DICKSONIACEAE | | |
| | Dicksonia antarctica | Tree-fern |
| DRYOPTERIDACEAE | | |
| | Polystichum proliferum | Mother Shield Fern |
| | Rumohra adiantiformis | Leathery shield-fern |
| HYMENOPHYLLACEAE | | |
| | Hymenophyllum rarum | Narrow Filmy-fern |
| POLYPODIACEAE | | |
| | Microsorum pustulatum subsp. pustulatum | Kangaroo Fern |

Appendix 1 – Management zones figures



Sweet pittosporum



















| | Survey area | Wee | eds | \diamond | English ivy | \bigcirc | Periwinkle | Vege | tation communities |
|------------|-------------------|-------------|---------------------|-------------|--------------------|------------|-------------------|--------|--------------------------------------|
| | Roads | | Agapanthus | \land | Fennel | ٠ | Radiata pine | \vee | (DOB) Eucalyptus obliqua dry forest |
| | Road | | Banana passionfruit | | Foxglove | \bigcirc | Sweet pittosporum | | (FUR) Urban areas |
| | Track | | Blackberry | | Fuchsia | ightarrow | Sycamore maple | \vee | (FWU) Weed infestation |
| nics | — Watercourse | 0 | Briar rose | \triangle | Gorse | | Tree lucerne | | (WOB) Eucalyptus obliqua forest with |
| ging world | Cadastral parcels | | Broom | \bigcirc | Hawthorn | Wee | ed patches | | broad-leat shrubs |
| | Council land | \triangle | Californian thistle | | Holly | ••• | Blackberry | | |
| | Cascade land | ightarrow | Cape Ivy | | Hybrid pittosporum | | Multiple weeds | | |
| | 🖈 Habitat tree | • | Cherry laurel | | Karamu | | | | |
| | × Willows | | Cotoneaster | | Montbretia | | | | |













♦ Mirrorbush







broad-leaf shrubs









Survey Zone: R1 - Ross Rivulet North, R2 - Ross Rivulet South

Gorse

Periwinkle



Weed patches Vegetation communities

- (DAS) Eucalyptus amygdalina forest and woodland on sandstone (DGL) Eucalyptus globulus dry forest and woodland
 - (FAG) Agricultural land
 - (FUR) Urban areas
- (FWU) Weed infestation
- (WGL) Eucalyptus globulus wet forest
 - (WOB) Eucalyptus obliqua forest with broad-leaf shrubs





Appendix 2 – Action plans for high priority zones

Suggested action plans for high priority weeding and revegetation works are presented below. The action plans provide weed control methods and timing for specific weeds. Specific herbicides have not been recommended. Herbicide use should be in accordance with relevant regulations and permits. The action plan indicates which activities are potentially suitable for Bushcare volunteers. Activities in Zones GF1 and GF2 may be suitable for experienced volunteers who are capable of working in bushland on steep slopes. Zones GF4 and H07 are more accessible. Activities involving heavy machinery or herbicide spraying are suitable only for Council staff or professional contractors with relevant experience and qualifications.

An action plan for weed control and revegetation on the middle and upper sections of Ross Rivulet has been prepared previously (Enviro-dynamics, 2019) and works are currently in progress.

| Weed | Action | Treatment/Methodology | Outcome | Timing | Priority | Land tenure | Council/ contractor | Bushcare volunteers |
|--------------|--|--|--|-----------------------------------|----------|----------------|------------------------|---------------------|
| Radiata pine | Remove radiata pine | Cut down pine trees and leave felled trees on site | Pine trees eradicated from Rivulet | Year 1 | High | Cascade | Х | |
| Fuchsia | Initial control | Cut and paste fuchsia. Remove all plant material from site for disposal. | Fuchsia biomass reduced | Year 1 - Spring / Summer | Medium | Cascade | Х | Х |
| Fuchsia | Follow up control | Cut and paste any regrowth. Remove all plant material from site for disposal. | Fuchsia eradicated from zone | Annual for at least 4 years | Medium | Cascade | Х | Х |
| Gorse | Initial control | Cut and paste all plants. Plant material left on site if no seeds. | Mature gorse controlled | Year 1 - Spring / Summer | High | Cascade | Х | Х |
| Gorse | Follow up control | Hand pull or foliage spray regrowth or seedlings | Gorse eradicated | Year 2 - Spring / Summer | High | Cascade | Х | Х |
| All | Ongoing monitoring and follow-up control of weeds | Monitor and treat regrowth or seedlings as required | Zone remains free of weeds | Annual for at least 4 years | Medium | Cascade | Х | |

Table A1 – Action plan for Zone GF1 (upper Guy Fawkes Rivulet)

Table A2 – Action plan for Zone GF2 (upper Guy Fawkes Rivulet)

| Weed | Action | Treatment/Methodology | Outcome | Timing | Priority | Land tenure | Council/ contractor | Bushcare volunteers |
|------------|----------------------|---|---------------------------------------|--------------------------------|----------|----------------|------------------------|---------------------|
| Blackberry | Initial control | Cut and paste mature plants. Hand pull seedlings. | Blackberry biomass reduced | Year 1 - Spring / Summer | Medium | Cascade | Х | Х |
| Blackberry | Follow up control | Hand pull or foliage spray regrowth or seedlings | Blackberry eradicated from zone | Year 2 - Spring / Summer | Medium | Cascade | Х | Х |

| Fuchsia | Initial control | Cut and paste. Remove all plant material from site for disposal. | Fuchsia biomass reduced | Year 1 - Spring / Summer | Medium | Cascade | Х | Х |
|--|----------------------|---|--|--------------------------------|--------|---------|---|---|
| Fuchsia | Follow up control | Cut and paste any regrowth. Remove all plant material from site for disposal. | Fuchsia controlled - not blocking water flows or excluding native plants | Year 2 - Spring / Summer | Medium | Cascade | Х | Х |
| Karamu, Himalayan honeysuckle, holly | Initial control | Cut and paste all plants. Remove Himalayan honeysuckle material to prevent vegetative regeneration. | Karamu, holly and Himalayan honeysuckle controlled, preventing further spread | Year 1 - Spring | High | Cascade | X | Х |
| Karamu, Himalayan honeysuckle, holly | Follow up control | Hand pull or foliage spray regrowth or seedlings | Karamu, holly and Himalayan honeysuckle eradicated | Year 2 - Spring | High | Cascade | Х | Х |
| Other woody weeds (gorse, cotoneaster, hawthorn, sweet pittosporum, rowan) | Initial control | Cut and paste all plants. Plant material left on site if no seeds. | Mature plants removed | Year 1 - Spring / Summer | Medium | Cascade | X | Х |
| Other woody weeds (gorse, cotoneaster, hawthorn, sweet pittosporum, rowan) | Follow up control | Hand pull or foliage spray regrowth or seedlings. Cut and paste any mature plants missed previously. | Woody weeds eradicated | Year 2 - Spring / Summer | Medium | Cascade | X | Х |
| Arum lily | Initial control | Apply herbicide directly to leaves or apply undiluted herbicide by injection into stem base | Arum lily foliage killed and tubers reduced | Year 1 - Spring | High | Cascade | Х | |
| Arum lily | Follow up control | Apply herbicide directly to leaves or apply undiluted herbicide by injection into stem base | Arum lily tubers killed | Year 2 - Spring | High | Cascade | X | |

| All | Ongoing monitoring and follow-up control of weeds | Monitor and treat regrowth or seedlings as required | Zone remains free of weeds | Annual for at least 4 years | High | Cascade | X |
|-----|--|--|-------------------------------|--------------------------------|------|---------|---|
|-----|--|--|-------------------------------|--------------------------------|------|---------|---|

Table A3 – Action plan for Zone GF3 (upper Guy Fawkes Rivulet)

| Weed | Action | Treatment/Methodology | Outcome | Timing | Priority | Land tenure | Council/ contractor | Bushcare volunteers |
|------------------------|--------|--|--|--------|----------|---------------------|------------------------|------------------------|
| Blackberry, Fuchsia | None | Weeds are very difficult to access and partly on private land. Requires participation of landowners to be effective. | Weeds remain on creek banks and in watercourse | N/A | Low | Cascade/ private | Х | |

Table A4 – Action plan for Zone GF4 (lower Guy Fawkes Rivulet)

| Weed | Action | Treatment/Methodology | Outcome | Timing | Priority | Land tenure | Council/ contractor | Bushcare volunteers |
|--------------|---|---|--|---|----------|-----------------------------|------------------------|---------------------|
| | Implement hygiene measures prior to work | As per Guidelines for Herbicide Use and Machinery Hygiene section and CoH policies | Spread of weed seed or debris around the site or away from the site is minimised | Prior to primary weed control works | High | All | X | X |
| Crack Willow | Initial control | Cut and paste. Remove all plant material from site for disposal. | Willows removed | Year 1 - Spring / Summer | High | Cascade/ Council road | Х | |
| Crack Willow | Follow up control | Cut and paste any regrowth. Remove all plant material from site for disposal. | Willows eradicated | Year 2 - Spring / Summer | High | Cascade/ Council road | Х | |

| Scotch broom, Spanish heath | Initial control | Cut and paste all plants. Plant material left on site if no seeds. | Mature Spanish heath removed | Year 1 - Spring | High | Cascade/ Council road | Х | Х |
|--------------------------------|----------------------|---|--|--------------------------------|--------|-----------------------------|---|---|
| Scotch broom, Spanish heath | Follow up control | Hand pull or foliage spray regrowth or seedlings | Spanish heath eradicated | Year 2 - Spring | High | Cascade/ Council road | Х | Х |
| Burgan, briar rose | Initial control | Cut and paste all plants. Plant material left on site if no seeds. | Mature plants controlled | Year 1 - Spring / Summer | Medium | Cascade/ Council road | Х | Х |
| Burgan, briar rose | Follow up control | Hand pull or foliage spray regrowth or seedlings | Burgan and briar rose eradicated | Year 2 - Spring / Summer | Medium | Cascade/ Council road | Х | Х |
| Radiata pine | Initial control | Cut down pine tree. | Pine eradicated | Any | Medium | Cascade/ Council road | Х | |
| Cotoneaster | Initial control | Cut and paste all plants. Plant material left on site if no seeds. | Mature plants removed | Year 1 - Spring / Summer | Medium | Cascade/ Council road | Х | Х |
| Cotoneaster | Follow up control | Hand pull or foliage spray regrowth or seedlings. Cut and paste any mature plants missed previously. | Cotoneaster eradicated | Year 2 - Spring / Summer | Medium | Cascade/ Council road | Х | Х |
| Blackberry, gorse | Initial control | Cut and paste mature plants. Hand pull seedlings. Target outlying plants. | Blackberry and gorse biomass reduced, weeds contained to large patches | Year 1 - Spring / Summer | Medium | Cascade/ Council road | X | X |
| Blackberry, gorse | Follow up control | Hand pull or foliage spray regrowth or seedlings | No further expansion of blackberry and gorse | Year 2 - Spring / Summer | Medium | Cascade/ Council road | Х | Х |
| Montbretia | Initial control | Apply herbicide directly to leaves or dig out plant including all underground corms | - | Year 1 - Spring | Low | Cascade/ Council road | Х | Х |
| Montbretia | Follow up control | Apply herbicide directly to leaves or dig out plant including all underground corms | | Year 2 - Spring / Summer | Low | Cascade/ Council road | Х | Х |

| Fuchsia, Hawthorn | Initial control | Cut and paste mature plants. Hand pull seedlings. Target outlying plants. | Hawthorn and fuchsia biomass reduced, weeds contained to large patches | Year 1 - Spring / Summer | Low | Cascade/ Council road | X | X |
|----------------------|--|--|--|--------------------------------|--------|-----------------------------|---|---|
| Fuchsia, Hawthorn | Follow up control | Hand pull or foliage spray regrowth or seedlings | No further expansion of hawthorn and fuchsia | Year 2 - Spring / Summer | Low | Cascade/ Council road | Х | Х |
| Forget-Me-Not | Opportunistic control | Hand pull plants opportunistically during other weed control works | Reduced extent or spread | Any | Low | Cascade/ Council road | Х | Х |
| All | Ongoing monitoring and follow-up control of weeds | Monitor and treat regrowth or new infestations | Zone remains free of eradicated weed species and other weeds do not expand | Annual for at least 4 years | Medium | Cascade/ Council road | X | |

Table A5 – Action plan for Zone GF5 (lower Guy Fawkes Rivulet)

| Weed | Action | Treatment/Methodology | Outcome | Timing | Priority | Land tenure | Council/ contractor | Bushcare volunteers |
|--------------|---|--|--|---|----------|----------------|------------------------|---------------------|
| | Implement hygiene measures prior to work | As per <i>Guidelines for</i> <i>Herbicide Use and</i> <i>Machinery Hygiene</i> section and CoH policies | Spread of weed seed or debris around the site or away from the site is minimised | Prior to primary weed control works | High | All | X | X |
| Holly | Control | Cut and paste | Holly eradicated | Year 1 - Spring | High | Cascade | Х | |
| Crack Willow | Initial control | Cut and paste mature willows. Remove trunks and branches using heavy machinery. | Mature willow removed | Year 2 - Spring / Summer | Medium | Cascade | Х | |
| Crack Willow | Follow up control | Cut and paste or drill and fill regrowth | Willow eradicated | Year 2 - Spring / Summer | Medium | Cascade | Х | |

| Hawthorn | Initial control | Cut and paste mature plants, targeting outlying plants. Plant material left on site if no seeds. | Mature hawthorn controlled | Year 1 - Spring / Summer | Low | Cascade | X | Х |
|--------------|---|---|--|---|--------|---------|---|---|
| Hawthorn | Follow up control | Hand pull or foliage spray regrowth or seedlings | Hawthorn contained to large patches | Year 2 - Spring / Summer | Low | Cascade | Х | Х |
| All | Ongoing monitoring and follow-up control of weeds | Monitor and treat regrowth or new infestations | Zone remains free of eradicated weed species and other weeds do not expand | Annual for at least 4 years | Medium | Cascade | X | |
| REVEGETATION | Prepare revegetation sites | Control pasture grass, if necessary | Competition from weeds/grasses removed | Prior to planting | | Cascade | Х | |
| REVEGETATION | Revegetation | Plant tubestock or plugs, install guards for plantings above flood level | Plants in ground and protected | Winter or Spring following weed removal | | Cascade | X | Х |
| REVEGETATION | Monitor revegetation | Inspect site, replace dead plants and missing guards. Remove guards once plants established. | Revegetation successfully established | Annually until plants are established | | Cascade | X | |



Figure A1 – Revegetation site plan for Zone GF5 (lower Old Farm Rd).

Table A6 – Action plan for Zone H07 (lower Hobart Rivulet)

| Weed | Action | Treatment/Methodology | Outcome | Timing | Priority | Land tenure | Council/ contractor | Bushcare volunteers |
|---------------------------------|---|---|--|---|----------|----------------|------------------------|------------------------|
| | Implement hygiene measures prior to work | As per <i>Guidelines for</i> <i>Herbicide Use and</i> <i>Machinery Hygiene</i> section and CoH policies | Spread of weed seed or debris around the site or away from the site is minimised | Prior to primary weed control works | High | All | Х | X |
| Crack willow, sycamore maple | Initial control | Cut and paste mature willows and sycamore. Remove trunks and branches using heavy machinery. | Mature willow and sycamore removed | Year 1 - Spring / Summer | Medium | Council | Х | |
| Crack willow, sycamore maple | Follow up control | Cut and paste or drill and fill regrowth | Willow and sycamore eradicated | Year 2 - Spring / Summer | Medium | Council | Х | |
| Blackberry, gorse | Initial control | Cut and paste mature plants. Slashing with a brushcutter may be useful for initial knock down. Hand pull seedlings. | Mature blackberry, gorse and hawthorn removed | Year 1 - Spring / Summer | Medium | Council | Х | |
| Blackberry, gorse | Follow up control | Hand pull or foliage spray regrowth or seedlings | Blackberry, gorse and hawthorn contained | Year 2 (and ongoing) - Spring / Summer | Medium | Council | Х | |
| Periwinkle | Initial control | Foliage spray or wipe with herbicide | Above ground growth killed | Year 1 - Spring / Summer | Medium | Council | Х | |
| Periwinkle | Follow up control | Foliage spray or wipe regrowth with herbicide | Periwinkle eradicated | Year 2 (and ongoing) - Spring / Summer | Medium | Council | Х | |
| Hawthorn | Initial control | Cut and paste mature plants in riparian zone (south side of walking track). | Hawthorn controlled in riparian zone | Year 1 - Spring / Summer | Medium | Council | Х | |

| Hawthorn | Follow up control | Hand pull or foliage spray regrowth or seedlings | Hawthorn eradicated from riparian zone (hawthorn remains on slope north of track) | Year 2 - Spring / Summer | Medium | Council | X | |
|--------------|---|---|--|---|--------|---------|---|---|
| All | Ongoing monitoring and follow-up control of weeds | Monitor and treat regrowth or new infestations | Zone remains free of eradicated weed species and other weeds do not expand | Annual for at least 4 years | Medium | Council | X | |
| REVEGETATION | Prepare revegetation sites | Control pasture grass and weeds, if necessary | Competition from weeds/grasses removed | Prior to planting | Medium | Council | Х | |
| REVEGETATION | Revegetation | Plant tubestock or plugs, install guards for plantings above flood level | Plants in ground and protected | Winter or Spring following weed removal | Medium | Council | X | Х |
| REVEGETATION | Monitor revegetation | Inspect site, replace dead plants and missing guards. Remove guards once plants established. | Revegetation successfully established | Annually until plants are established | | Council | Х | |



Figure A2 – Revegetation site plan for Zone H08 (Anglesea St to Wynyard St).