

Final Report

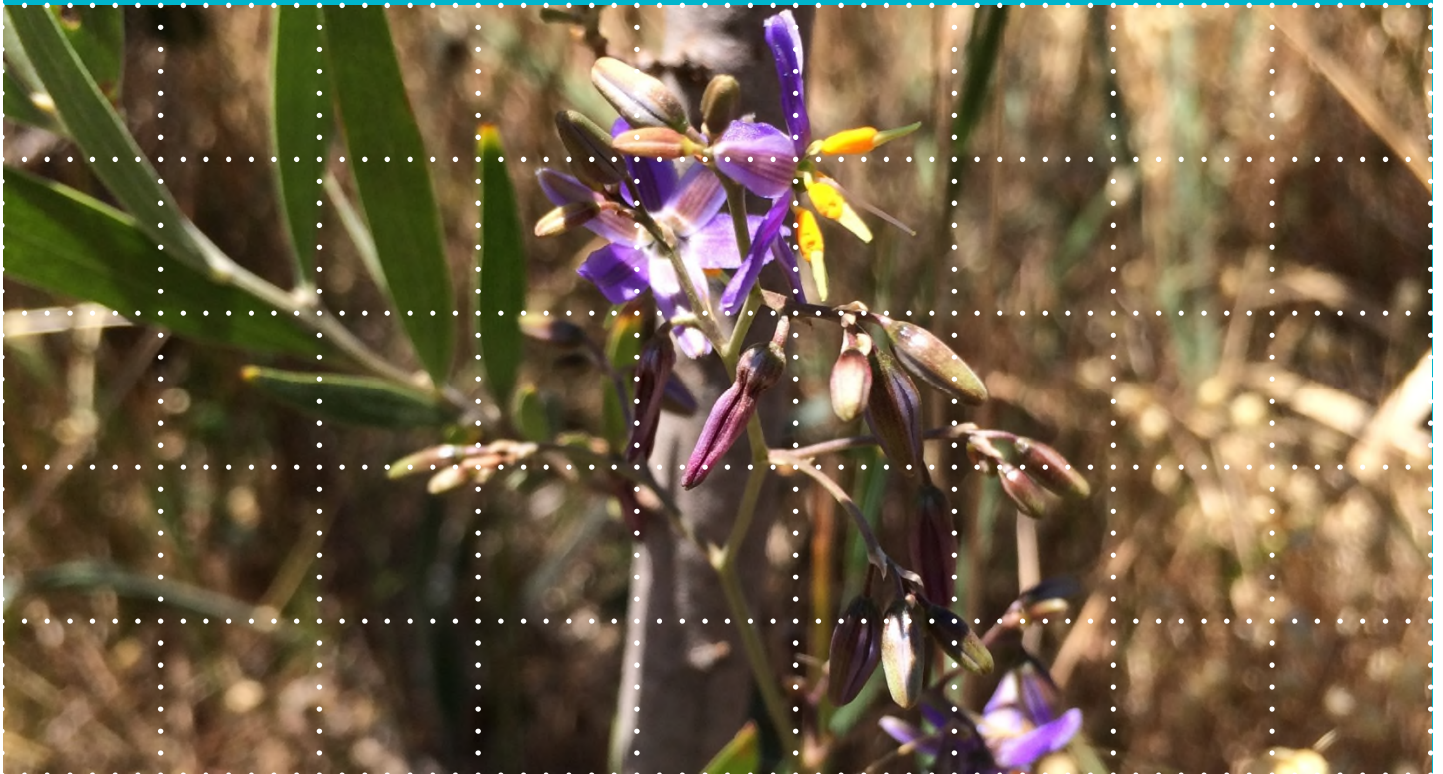
Matted Flax-lily *Dianella amoena* Translocation Plan: 135-161 Barry Road, Thomastown

EPBC 2014/7364

Prepared for

Barry Road Project Pty Ltd

November 2018



Ecology and Heritage Partners Pty Ltd

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SUMMARY

Ecology and Heritage Partners Pty Ltd was engaged by Urban Terrain Pty Ltd on behalf of Barry Road Project Pty Ltd to prepare a Matted Flax-lily *Dianella amoena* Translocation Plan for the salvage of 36 Matted Flax-lily specimens (CEMP) recorded within the construction footprint of the residential development located at 135-161 Barry Road, Thomastown, Victoria.

This Plan has been prepared to ensure compliance with Condition 3 of EPBC Approval 2014/7364.

Barry Road Project Pty Ltd or their nominated Development Manager is responsible for ensuring all actions detailed in this translocation plan are undertaken to ensure the translocation and management of the Matted Flax-lily over the five-year period are conducted in a manner which ensures that performance targets are met.

The salvage of all Matted Flax-lily material within the development footprint will be undertaken prior to the start of construction and once the necessary approvals have been provided.

The translocation program will commence as soon as this plan is approved. Preparation of the proposed recipient site within the recipient site will also begin as soon as this plan is approved, with selection of planting sites and initial weed control.

After the necessary approvals are obtained, all of the Matted Flax-lily within the development site will be removed. This material will be divided at the time of salvage, to allow for ease of management and to allow for a variety of end use of the plants.

Three uses will be undertaken for all salvaged material:

- One third of material salvaged be immediately transferred to the recipient site (direct translocation);
- One third of material taken to a nursery and 'grown on' in pots, once the plants have taken to the potting medium and site conditions allow replanting, the plants will be planted into the recipient site (delayed translocation); and,
- One third of the material kept in a nursery for a period of one year to provide a contingency if plants within the recipient site fail to establish. If not required for contingency purposes, these plants will be transferred to the Whittlesea City Council or other relevant organisations to be utilised in projects for revegetation or landscaping in the local area.

The translocation plan and associated post-translocation management actions are considered to be successful when a minimum of 70% of the clones (26 of the 36 salvaged plants) are established after the five-year period.

EPBC Act Approval Conditions

Table S1. Conditions of EPBC 2014/7364 approval reference table

Cond.	Condition requirement	Plan reference
3a, b	Prepare a Matted Flax-lily Translocation Plan that addresses the below:	
3bi)	Appropriate nursery and recipient site for the translocation meets species habitat requirements	Section 1.3 Section 2.3.2
3bii	Map and description of chosen recipient site and surrounding land use	Section 1.3 Figure 2a Figure 2b.
3biii	Pre-clearance surveys for the salvage site	Section 2.1
3biv	Protocols and timeframes for the salvage, translocation and propagation of the impacted Matted Flax-lily	Section 2.2 Section 2.3
3bv	Post-translocation management actions for the nursery and recipient site including protection measures for the translocated Matted Flax-lily	Section 2.3.2 Section 2.3.3 Section 3
3bvi	Roles and responsibilities	Section 1.4
3bvii	Translocation failure risk assessment	Appendix 1
3bviii	A monitoring and adaptive management program for at least five years after translocation of the Matted Flax-lily	Section 3.2 – 3.8
3bviii a	Clear and concise performance indicators capable of accurate and reliable measurement	Section 3.9
3bviii b	Outcomes (as measured by performance indicators)	Section 3.9.1
3bviii c	Monitoring requirements (timing and frequency) to detect changes in the performance indicators.	Section 3.2
3bviii d	Trigger values for corrective actions	Section 3.10
3bviii e	Corrective actions	Section 3.10

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1 INTRODUCTION

1.1 Background

Ecology and Heritage Partners Pty Ltd was engaged by Urban Terrain Pty Ltd on behalf of Barry Road Project Pty Ltd to prepare a Matted Flax-lily *Dianella amoena* Translocation Plan associated with the residential development located at 135-161 Barry Road, Thomastown, Victoria (Figure 1).

A total of 74 Matted Flax-lily were recorded within the study area during the 2015/2016 targeted surveys conducted by Ecology and Heritage Partners Pty Ltd (2016), and of these, a total of 36 specimens are located within the construction footprint (Figure 2).

This Matted Flax-lily Translocation Plan (the Plan) has been prepared to address Condition 3 of EPBC approval 2014/7364. The proponent (Barry Road Project Pty Ltd) must not commence the action until the Plan has been finalised and published.

Details regarding the proposed impacts and measures to mitigate and manage the translocated plants at the recipient site and nursery site are provided in this report to ensure all stakeholders are fully informed and all statutory obligations are met.

It should be noted that this Plan is based on the Matted Flax-lily Translocation Plan included in Section 4 of the Environmental Management Plan (EMP) prepared by Ecology and Heritage Partners (2016) to inform the application for the development plan as required by Clause 3.0 of the Development Plan Overlay – Schedule 35 (DPO35) in the Whittlesea planning scheme. Further, it is noted that the EMP and Matted Flax-lily Translocation Plan contained therein was endorsed by both the City of Whittlesea (20/09/2017) and the Victorian Department of Environment, Land, Water and Planning (DELWP) (email dated 19/06/2016).

1.2 Matted Flax-lily

1.2.1 Conservation Status

Matted Flax-lily was described by Carr and Horsfall (1995). It is listed as endangered under the Commonwealth EPBC Act, endangered under the Victorian Advisory List of Rare or Threatened Plants in Victoria (DEPI 2014) and listed as Threatened under FFG Act.

1.2.2 Species Description

Matted Flax-lily is a perennial, tufted, mat-forming lily which can form patches of up to five metres wide. The plant can grow vegetatively, through sending underground rhizomatous roots, which rise above the ground with a tiller of several leaves, spread over a distance from the parent plant. This in turn can prove problematic in determining the number individual plants within a close proximity (< one metre). Therefore, any tillers not separated by at least one metre are in most circumstances considered to be a single individual plant.

The leaves of the Matted Flax-lily are generally glaucous, blue in colour and usually but not always having small hooks (teeth) along the margins and midrib. The leaves taper to approximately 45 centimetres long depending on site and climatic conditions and are born on tillers with the leaves arranged alternatively, with several leaves

per tiller (DSE 2006). Matted Flax-lily generally flowers between November and January but may continue flowering with summer and autumn rains. It has pale blue to violet flowers with bright yellow stamens and berries, which are generally purple in colour (Plates 1-2). The flowers and berries are born on culms extending to typically 30 centimetres in height, but this may alter depending on plant location and season (Carter 2010).



Plate 1. Matted Flax-lily within the study area (Ecology and Heritage Partners 2016)



Plate 2. Matted Flax-lily within the study area (Ecology and Heritage Partners 2016)

1.2.3 Ecology

Plants typically occur in grasslands, grassy woodlands and grassy wetlands in Victoria (Carter 2010). Grasses typically dominate the understorey layer (Carr and Horsfall 1995), including native species such as Kangaroo Grass *Themeda triandra*, Weeping Grass *Microlaena stipoides* var. *stipoides*, Common Tussock-Grass *Poa labillardierei*, and Clustered Wallaby-grass *Rytidosperma racemosa* var. *racemosa*. In grassy woodlands, a variety of eucalypt species dominate, with Blackwood a common understorey component at many sites (Carter 2010). Rocks are often present on sites in the Victorian Volcanic Plain bioregion, and usually offer protection from grazing by stock, pest animals and native fauna.

1.3 Recipient Site

1.3.1 Attributes for an acceptable recipient site

Several elements are required for an acceptable recipient site. An acceptable recipient site should have the following attributes:

- The site must suit the biology and ecology of the translocated species;
- The recipient site should be of similar quality to the salvage site (i.e. the same EVC);
- The site must be large enough to support a self-sustaining population;
- The site should be free from grazing and erosion;
- The recipient site should be in close proximity to the salvage site; and,

- The site should be secure and protected through covenants or agreements against future development.

The recipient site will be included as a component within the conservation reserve (Figure 2a; Figure 2b). As the recipient site is immediately adjacent to the construction footprint, suitable habitat for Matted Flax-lily has been assessed as present. The close proximity and similar ecological conditions should increase the likelihood of success for the translocated specimens.

Management access to the recipient site will be provided for from a gate on the eastern side of the recipient site, from an internal road from within the residential development. This will be established prior to translocation, and construction activities.

Translocation will not be undertaken in areas which support significant amount of embedded basalt rock as it will be difficult to successfully dig recipient holes for translocated specimens. Rocks will not be removed to create a recipient site as this is likely to cause unnecessary damage to the grassland, while removing important habitat for small fauna. A site inspection by a botanist familiar with the ecology of Matted Flax-lily will be undertaken prior to translocation to identify suitable locations within the recipient site for the transplanted individuals.

1.3.2 Current Conditions at the Recipient Site

The recipient site comprises an area within the Conservation Reserve and is currently vacant Crown Land subject to regular disturbance through mowing for the purposes of maintaining a firebreak. Specifically, the recipient site is dominated by exotic grasses, although scattered occurrences of Wallaby-grass *Rytidosperma* spp., and Kangaroo Grass *Themeda triandra* are present. Importantly, the recipient site is free of the woody weed Sweet Briar *Rosa rubiginosa* which is present throughout much of the rest of the broader property. Further, while the recipient site is adjacent to a large existing population of Matted Flax-lily and contains suitable habitat, the translocation of Matted Flax-lily into the recipient site will not result in degradation of existing *Natural Temperate Grassland of the Victorian Volcanic Plains* ecological community and will not require woody weed control prior to translocation.

The management actions detailed in the Construction Environmental Management Plan (CEMP) (Ecology and Heritage Partners 2018) will be undertaken within the broader Conservation Reserve to ensure that the recipient site and surrounds are enhanced, and that suitable habitat for the Matted Flax-lily is maintained in perpetuity. Specific management actions relating to the translocation and ongoing management within the recipient site are detailed below.

1.4 Roles and Responsibility

Barry Road Project Pty Ltd or their nominated Development Manager is responsible for ensuring all actions detailed in this translocation plan are undertaken to ensure the translocation and management of the Matted Flax-lily over the five-year period are conducted in a manner which ensures that performance targets are met.

Barry Road Project will employ a specialist contractor to undertake the salvage and translocation of the Matted Flax-lily and manage the nursery plants for a five-year period. A botanist familiar with the species and ecology of Matted Flax-lily must be employed to ensure the salvage is undertaken in accordance with the Plan and provide ongoing monitoring and reporting obligations to the relevant authorities.

The weed and biomass management of the recipient site should be undertaken by a specialist contractor, familiar with Matted Flax-lily to ensure weed control does not impact on replanted salvage material.

Management of the Conservation Reserve (including the recipient site) will be transferred to the City of Whittlesea, with a Committee of Management established by the City of Whittlesea to ensure the management objectives are met in perpetuity. Funding

1.5 Timing

The translocation program will commence as soon as this plan is approved (anticipated to be November 2018) and will follow the summary timetable outlined in Table 1. Preparation of the proposed recipient site within the recipient site will also begin as soon as this plan is approved, with selection of planting sites and initial weed control.

The ideal time for any salvaged material to be translocated is late autumn/early winter (May – July), however plants can be relocated anytime provided adequate watering and detailed monitoring is undertaken to ensure the continued health and vigour of plants. Regardless of timing, supplementary watering of replanted salvaged material is recommended with the frequency of this being dependent on rainfall and climatic conditions.

Table 1. Summary of timing and actions associated with the Matted Flax-lily translocation.

Timing	Action
Late 2018 (once MFL Plan approved)	Pre-clearance survey for MFL
Late 2018 (once MFL Plan approved)	Preparation of recipient site
	Salvage of MFL plants from Development Area
	Planting of salvaged MFL (1 clone) into recipient site
Late 2018 - April 2019	Monitoring, management and watering as per schedule
May 2019	Planting of salvaged MFL (1 clone) into recipient site
May 2019 - April 2020	Monitoring, management and watering as per Section 3. Replace any clones that perish. Prepare and submit Annual report at least 1 month prior to anniversary of MFL Translocation Plan approval. If survival of translocation clones is below 70%, contingency actions are triggered.
May 2020 - April 2021	Monitoring, management and watering as per Section 3. Replace any clones that perish. Prepare and submit Annual report at least 1 month prior to anniversary of MFL Translocation Plan approval. If survival of translocation clones is below 70%, contingency actions are triggered.
May 2021 - April 2022	Monitoring, management and watering as per Section 3. Replace any clones that perish. Prepare and submit Annual report at least 1 month prior to anniversary of MFL Translocation Plan approval. If survival of translocation clones is below 70%, contingency actions are triggered.

Timing	Action
May 2022 - April 2023	Monitoring, management and watering as per Section 3. Replace any clones that perish. Prepare and submit Annual report at least 1 month prior to anniversary of MFL Translocation Plan approval. If survival of translocation clones is below 70%, contingency actions are triggered.
May 2023 - December 2023	Monitoring, management and watering as per Section 3. Replace any clones that perish. Prepare and submit Final Annual report at least 1 month prior to anniversary of MFL Translocation Plan approval. If survival of translocation clones exceeds 70%, the MFL translocation is considered a success.

2 TRANSLOCATION PLAN

2.1 Pre-clearance Survey

The detectability of Matted Flax-lily populations is known to vary significantly within and between seasons and the observed numbers of plants in a defined area can fluctuate markedly. Pre-clearance surveys will be conducted at the construction site prior to the translocation of Matted Flax-lily to the recipient site. The survey will identify any additional Matted Flax-lily that were not recorded during the previous surveys undertaken in 2015/2016. The aim of this survey is to confirm the total number of plants to be translocated and to identify any new individuals. The pre-clearance survey will include the following:

- All specimens identified in the previous surveys will be located by GPS, and any deviations from previously recorded locations and/or additional patches identified during the salvage will be recorded using the GPS unit;
- Five metre transects will be walked throughout the Construction Footprint to identify and record any new specimens;
- Each plant will be marked with a flag by a qualified botanist. The flag nominates that the individual is considered suitable for salvage;
- A tally of plants will be recorded and mapped; and,
- The final removal number will be updated and provided to DoEE and DELWP.

2.2 Removal Technique

The removal will be supervised by a qualified botanist, and all patches and their full extent assessed by measuring the size of the colony, number and height of tillers, general health, and whether it is flowering or not. During removal plants will be labelled according to the patch number and segment, to ensure once they arrive at the recipient site and/or nursery they are easily identifiable as to which colony they have been removed from and the total number of divided segments.

All vegetative material to be disturbed should be removed from the impact site. The procedure for removal will be:

1. All plants to be removed will be identified with marker paint, and plants will be recorded against the monitoring sheet;
2. Plants will be watered the day before the proposed removal to loosen the soil and to ensure the plants are not drought stressed during salvage and movement;
3. Material will be dug from the ground by hand using spades clean of dirt; and,
4. During excavation, soil will be maintained around the root system, however plants can survive if exposed to air for short periods.

The plants will be divided into a size which fits into a polystyrene box or similar to allow for ease of handling and transport. Where possible, plants will be divided into three near equal segments. However, this may

change depending on the conditions on the day, including how well the soil binds together and the size of the patches. Once plants are lifted from the ground and placed into polystyrene boxes, two thirds of the salvaged material will be immediately taken to a nursery experienced in the propagation of Matted Flax-lily (Section 2.3.2 below), the final third will be taken to the recipient site to be immediately placed into pre-excavated and systematically arranged holes (Section 2.3.1).

2.3 End Use of Salvaged Material

After the necessary approvals are obtained, all of the Matted Flax-lily within the construction footprint will be salvaged. This material will be divided at the time of salvage, to allow for ease of management and to allow for a variety of end use of the plants.

Three uses will be undertaken for any salvaged material:

- One third of material salvaged be immediately transferred to the recipient site (direct translocation);
- One third of material taken to a suitable nursery and 'grown on' in pots, once the plants have taken to the potting medium and site conditions allow replanting, the plants will be planted into the recipient site (delayed translocation); and,
- One third of the material kept in a nursery for a period of one year to provide a contingency if plants within the recipient site fail to establish. If not required, seed will be salvaged from these specimens and these plants will be transferred to the Whittlesea City Council or other relevant organisations to be utilised in projects for revegetation or landscaping in the local area.

Although in some cases, it is recommended that salvaged clones be kept for a period of up to five years in a nursery, advice from Western Plains Flora is that this is not feasible due to the high rate of senescence that occurs in scenarios where Matted Flax-lily are kept in pots for multiple years.

2.3.1 Direct Translocation

The direct translocation from the impact site to a recipient site needs to take place on the same day as the material is removed to minimise stress on the plants.

Material will be removed as discussed in Section 2.2 and transported directly to the recipient site. The following steps will be taken to ensure successful establishment at the recipient site:

- Soil from around the salvaged material will be kept in place as a sod, to help the plants establish within the recipient site. This also helps with moisture retention around the root zone;
- Holes at the recipient site will be prepared prior to the salvage of plants at the impact site, to minimise the time out of the ground for the salvaged material;
- Holes will be dug deeper than the clod of soil from the impact site, soil will also be broken up at the base of the hole to allow quick penetration of the soil by the roots of the salvaged material;
- Holes should be filled with water before the translocation to soften and loosen the surrounding soil, also helping to remove air pockets in the soil;

- A weed free medium will be placed in the hole to allow an easy fit and manoeuvrability for the clod of soil;
- The sod containing the material will be placed into the medium in the hole, ensuring the medium is tightly packed around the sod, removing air pockets and binding the medium together to prevent erosion;
- The minimum spacing between clones and between plants and any reserve boundary will be three metres, to allow for vegetative expansion;
- The area around the plant will be mulched with certified weed free mulch, consisting of either wood chips or pea straw; and,
- After planting the sod will be watered by hand until it is wet enough for water to no longer penetrate the soil.

The placement of the salvaged material will be recorded with a GPS and labelled, according to the patch from which it was removed, with a metal 'dog tag' held in the ground with a peg. Where possible, the holes will be systematically lined up to allow for ease of monitoring.

2.3.2 Nursery Management

Material which is taken to a nursery will have the soil removed and be thoroughly washed to allow for division of the rootstock/tillers. Two clones are required per salvaged plant. Of these, one clone will be planted back into the recipient site. Rootstock/tillers will be divided into segments that will fit into an eight-inch pot (or similar) and filled with a suitable medium (native potting mix). Each divided segment will be labelled according to their patch number, box number and then also its end use, to ensure they are tracked through the translocation process.

After the plants are divided into segments and placed within pots, they must be managed correctly to ensure survival within the nursery environment. This can be dependent on conditions and the length of time they will stay in the nursery. Watering and fertilisation will need to be undertaken correctly throughout the period and generally *Dianella* spp., within a nursery environment will do well and will spread within their container. If plants become pot bound, division and correct labelling must be undertaken. Before being planted into the recipient site, plants need to be hardened off to ensure they are not stressed by a sudden change in conditions including frost, wind and reduced water.

Disease and pest control is important to ensure no diseases or pests are introduced to the recipient site, and plants suspected of being diseased will be treated according to nursery guidelines and/or destroyed appropriately. At no time will plants suspected of carrying a disease or having pests be introduced to a recipient site. Weeding of pots will also be undertaken periodically and correct hygiene procedures practiced at all times within the nursery.

Nursery populations will be monitored by a qualified person every three months in the first year, with seed collected when appropriate (mid-late summer).

It is anticipated that management of nursery clones will be undertaken at Western Plains Flora.

2.3.3 Delayed Translocation

The delayed translocation will occur once plants have become established within the nursery environment and site conditions at the recipient site are favourable e.g. soil moisture, climatic conditions, weed control has been undertaken and fencing erected, if required.

The ideal time to plant the salvaged material into the recipient site is outside the hottest and driest months (December to March) and preferably in early winter (June or July) when rainfall is highest, and conditions are cool. Adequate rainfall will reduce the potential requirement for supplementary watering of replanted material. Planting the material at the earliest stage before summer will also maximise the growth of the material, allow for a higher rate of establishment, and maximise the potential for long-term survival within the recipient site.

The delayed planting is similar to that of the direct translocation:

- Holes need to be pre-dug systematically and filled with water the day before material from the pots is removed;
- Holes need to be dug approximately 100 millimetres wider and 50 millimetres deeper than the pot in which the material is grown in, this allows the soil to be loosened and increases the soils permeability and allows moisture to penetrate the soil to a deeper level;
- Pots containing material will be well watered before planting into the hole;
- Plants from the nursery will be 'hardened' before they are planted;
- Care will be taken when removing the material from the pot to keep the medium intact around the root system before placing into the hole;
- Extra medium may need to be placed into the hole to ensure the material is tightly packed into the hole;
- The material and medium will then be covered in certified weed free mulch, consisting of either wood chips or pea straw.
- Watering by hand will then be undertaken; care will be undertaken not to wash medium away.

Each plant will be labelled according to the nursery number and a waypoint taken from a GPS.

3 MATTED FLAX-LILY WITHIN THE RECIPIENT SITE

3.1 Salvaged Material Placement at the Recipient Site

Planting of the material at the recipient site will be done in systematic order to help the monitoring of the plants. Material will be placed away from perimeter fencing, areas of pest animal or pest plants and in areas which limit impacts on native vegetation when digging holes. Plants should be approximately placed no closer than three metres from one another to ensure over time, plants can be counted as individuals. Once placed into the recipient site, plants should be marked with a stake to enable identification and also a GPS waypoint taken to record the location on a GIS layer.

3.2 Monitoring

Monitoring is critical to the success of any salvage and translocation of flora species (Vallee *et al.* 2004). Monitoring by a qualified botanist familiar with the ecology and growth habits of Matted Flax-lily should be undertaken to ensure the on-going survival of the plants and reporting to the relevant approval authorities. Monitoring will look at drought stress, pest plant and animal impacts, biomass and other site disturbances, along with measuring the replanted salvaged materials growth. Monitoring should be undertaken weekly for the first month, fortnightly for the remaining first two months, monthly for the next four months, bi-monthly until the end of Year 2, and then every 6 months for the remainder of the five-year monitoring and management period.

This should occur for each planting event, i.e. direct translocation, any planting of nursery stock, etc. Water will be provided as required during monitoring and management visits.

Should extreme weather events (e.g. periods of prolonged heat) occur during the first year of translocation, additional monitoring and management visits may be required.

To enable accurate monitoring and ongoing assessment of the health of the translocated plants, the following measurements will be recorded:

- dimensions of the plants;
- number of "leaflets" or "tillers" associated with each plant;
- approximate tiller height; and,
- whether or not the plant is flowering and the number of flowering spikes or culms from that season present.

3.2.1 Reporting

A report will be prepared for the proponent and relevant referral authorities six months after replanting the salvaged material, then ongoing at every 12 months. The report will detail the growth level of the plants and include information on disturbances, deaths, further plantings and conditions at both the recipient site and nursery. The report will also highlight any threats to the future success of the translocating program and provide recommendations for the ongoing management of the translocated Matted Flax-lily plants.

3.3 Watering

Watering of both direct and delayed translocated material will be undertaken to ensure plants establish quickly. The requirement for watering is dependent on a number of factors including timing of the planting, soil type and topography, rainfall and mulch. The plants will be monitored for drought and heat stress and supplementary watering undertaken when required to ensure the health of any translocation plants.

The period between October and March is crucial for the establishment of translocation plants, with those that survive this period over the first year more likely to establish successfully (G. French. pers. comm. [Parks Victoria]). Once plants survive the initial summer, ongoing watering is unlikely to be required unless extreme, drought conditions are experienced. Table 2 below is a suggested period for watering after replanting, however the periods between watering may vary depending on climatic conditions and monitoring of the plants will be important to ensure successful establishment.

Table 2. Watering requirements for replanted salvaged MFL plants

Months after planting	Period between significant rainfall events (<5mm) that will trigger watering	Watering Required
0 - 3	2 weeks	Weekly thereafter until significant rainfall
3 - 9	3 - 4 weeks	Fortnightly thereafter until significant rainfall
9 - 21	1 – 2 Months	Monthly thereafter until significant rainfall
21 - 36	1 – 2 Months	Only if plants display signs of stress

3.4 Grazing

Grazing pressure by introduced and native animals can have a considerable effect on the successful outcome of the proposed salvage and translocation. A rabbit-proof fence will be established around the perimeter of the Conservation Reserve in part to reduce grazing pressure upon replanted salvaged material, as kangaroos and rabbits are currently known to occur at the site. Caging or using tree guards may be an option to protect individual plants if fencing of the entire recipient site is not effective in protecting the salvaged material. Pest animal control will be undertaken as part of the overall management of the conservation reserve. Fencing along with signage will also protect the site from accidental and potentially intentional human disturbance.

3.5 Pest Plant Management

Pest plant control will be required within the recipient site and should be undertaken before and after the planting of the salvaged material. The focus of control efforts should be on pest plants which compete with the salvaged material for available space, light, water and nutrients. Initially the focus of any management actions should be on high threat/high impact species at first and as numbers reduce over time the focus should shift to other species which are not considered high threat but may still compete with the replanted salvage material. Hand weeding around the salvaged plants must occur on a regular basis, especially on plants directly translocated which may carry weeds not already established within the recipient site. Given that Matted Flax-

lily is susceptible to some herbicides it is important that skilled contractors familiar with Matted Flax-lily be used to ensure off-target damage is avoided.

3.6 Biomass Reduction

As Matted Flax-lily is generally found in grassy habitats, it can be self-maintaining in areas of high ground storey biomass e.g. dense grassy swords. However, the closure of inter tussock space from a lack of fire or grazing may reduce the areas of available occupancy within a recipient site. Grass length should be monitored around replanted salvaged material to ensure both native and exotic grass species are not limiting the growth of the salvaged material. If required, measures such as slashing, mosaic burning or weed control should be employed to lower the levels of the recipient site biomass. All measures to lower biomass measures must be done in consultation with a botanist familiar with the growth of Matted Flax-lily and also the management of native vegetation to limit potential impacts on replanted salvaged material. Slashing, burning or grazing may also be employed as forms of weed control.

At a minimum, biomass of both native and exotic vegetation will be controlled within a minimum 0.5 metre radius around each plant.

3.7 Labelling

The correct labelling of all salvaged material should be undertaken to ensure plants can be tracked through the entire process. Plants should be labelled with small metal dog tags prior to their removal from the impact site, labelling should follow an alphabetic system for whole distinct plants in the ground e.g. A, B, C, D etc. Once plants are broken up at the impact site they should then form a numeric system e.g. A1 would describe the first plant part to be removed, this plant would be directly taken to the recipient site, A2 would be taken to the nursery to be grown on in tubes to be planted in year two or three, A3 would be taken to a nursery as backup for the loss of plants. If further plants are removed from the same patch then they follow on A4 direct translocation, A5 delayed translocation, A6 back up material. The main priority is to be able to extract three plants from every patch for all end uses; however, the size of patches may only enable two or one plant to be removed, in these cases reducing the size of salvaged material may enable the desired number of patches to be salvaged.

Plant growth in a nursery often exceeds the pots capacity within a year or two. If repotting is required then labelling of divided material should be followed with numeric numerals, for example A2i, A3i and so forth. Within the nursery, the side of pots should be labelled with a permanent marker along with a tag. At the recipient site plants need to be labelled with a small metallic dog tag, embedded in the ground with a peg to prevent removal by animals or humans.

3.8 Access and Signage

The recipient site will be adequately fenced to demarcate it from the developed area. A lockable vehicle access gate will be installed in at least one section of the fence to provide access to the recipient site (Figure 2). At the entrance, signs will be erected that show activities that are allowed or prohibited in the area (e.g. no pets, no dumping of rubbish).

Signs will be erected highlighting the area's role in protection of the Matted Flax-lily. Signage will remain in place for the duration of the management plan.

3.9 Performance Targets

The ultimate aim of translocation is to ensure the conservation of the genetic diversity of a species. The conservation of genetics is especially critical for endangered species and the loss of genetics from even a single plant can be seen as a failure of the translocation process.

The translocation of any species can be inherently difficult and may put excessive stress on material which is disturbed. However, Matted Flax-lily has been successfully translocated for several projects within the Melbourne region where disturbance was unavoidable. The success of these translocations is due in part to its strong tuberous root system which is dividable and generally tolerates disturbance. However, previous success should not be relied upon and each salvage and translocation must be carefully planned and managed to ensure success.

The aim of translocating flora is to ensure no genes are lost, regardless of whether they are contained in a single individual or entire population. Conserving genetic diversity drives the success of translocation, with any loss from the death of material seen as a failure to conserve the genetics of an individual.

Vallee *et al.* (2004) has detailed stringent criteria for determining the success of translocated plant species, criteria is broken into segments for short and long-term success, and also the success of management of material in an *ex-situ* situation.

In the short term biological success can be determined through:

- Greater than 70% of transplants surviving, with representatives from the range of genetic individuals planted;
- The new or enhanced populations have similar characteristics to the natural population(s), such as the survival and growth of translocated individuals;
- Survival of transplants to reproductive stage (producing flowers and fruit);
- The reproduction of translocated individuals, including the production of flowers and fruit at levels consistent with naturally occurring plants; and,
- Seed viability is consistent with that in naturally occurring plants.

Long Term Criteria includes:

- New seedlings are established;
- The number of individuals within the population being maintained or increased by natural recruitment; and,
- Adequate levels of biodiversity, particularly genetic variation, are maintained through generations.

Criteria for determining successful establishment and maintenance of the *ex situ* collection:

- The required number of transplants were available for the translocation proposal;
- Correct labelling and documentation maintained through cultivation;
- Techniques for successful propagation of the taxon are understood; and,

- A genetically representative collection was maintained.

3.9.1 Translocation Outcome

After the five-year monitoring and management program, the following minimum performance target is to be achieved:

- Successful establishment of at least 70% of all translocated individuals, resulting in a minimum 51 Matted Flax-lily within the recipient site (i.e. 70% establishment of two clones from each of 36 plants salvaged).

Due to recruitment of Matted Flax-lily in a natural system being currently poorly known, the measurement of success through recruitment is not possible. The conservation of all genetic material should therefore be kept as a higher goal in determining success of the translocation.

In the unlikely event the criteria for success have not been met after five years of monitoring and management, from the date of approval of this plan, Barry Road Project Pty Ltd will provide DoEE with an assessment of the translocation program that examines the reasons why the program was unable to meet its performance targets. This assessment will be provided within five years and six months from the date of approval of this plan.

3.10 Contingency Measures

One third of the salvaged material will be kept in a nursery (Western Plains Flora) for a period of one year to provide a contingency if plants within the recipient site fail to establish. If not translocated back into the recipient site, seed will be salvaged from these specimens and these plants will be transferred to the Whittlesea City Council or other relevant organisations to be utilised in projects for revegetation or landscaping in the local area after one year.

Advice from Western Plains Flora is that keeping Matted Flax-lily in pots is not feasible due to the high rate of senescence that occurs in scenarios where Matted Flax-lily are kept in pots for multiple years. Instead, seed will be salvaged from clones while in the nursery, as well as clones translocated into the recipient site seasonally over a period of five years.

3.10.1 Corrective Actions

Any dead Matted-Flax-lily plants will be replaced with nursery clone from the same parent plant between April and August to increase the opportunity for the clone to establish during the wetter months.

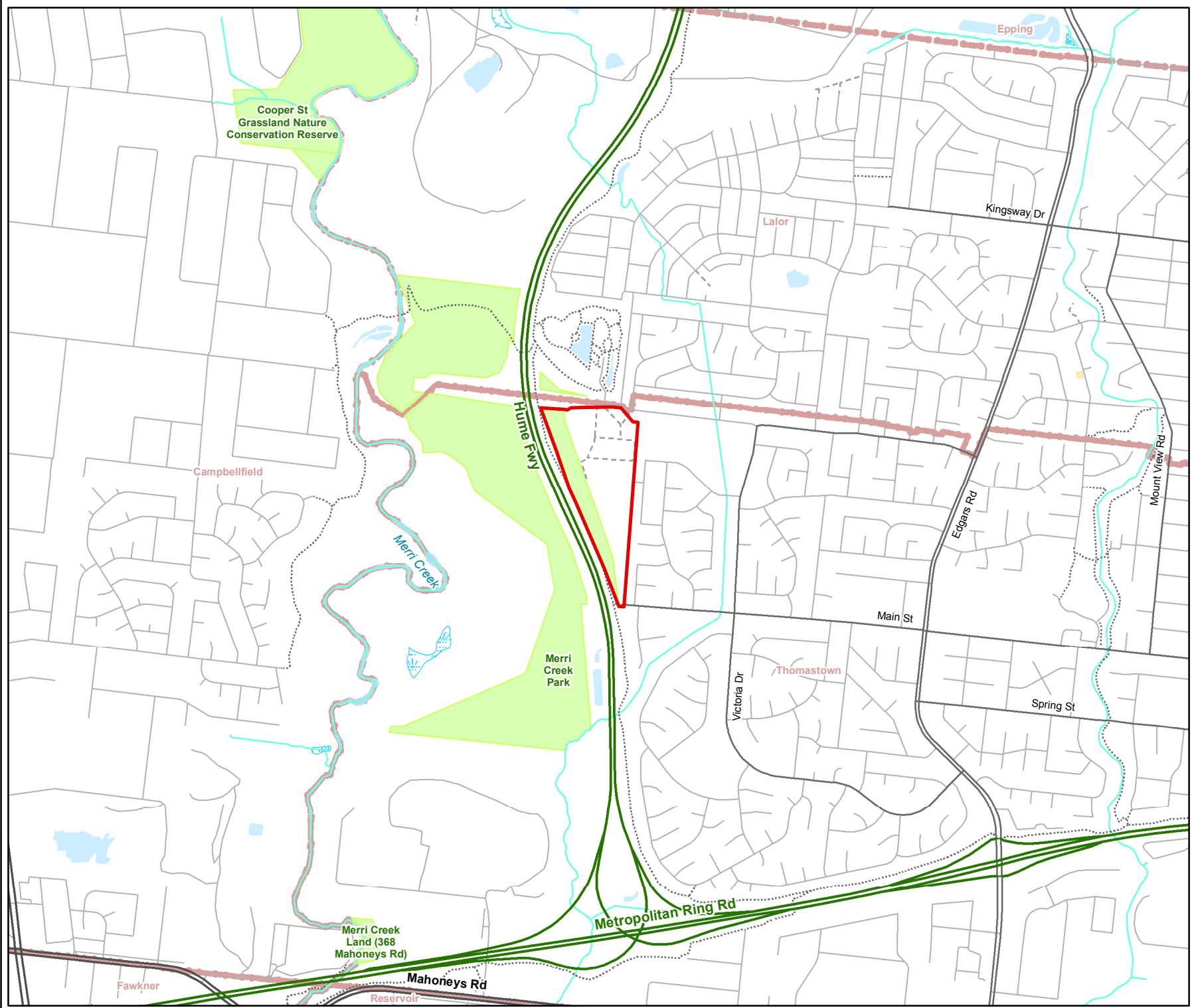
If establishment of less than 70% of Matted-flax-lily is recorded at the end of the annual monitoring period, Western Plains Flora will use the collected seed to germinate new Matted Flax-lily seedlings for translocation into the recipient site. This has the potential to result in many hundreds of specimens able to be germinated if required.

Germinated seedlings will be translocated into the recipient site as soon as conditions allow between April and August. Monitoring and management of any translocated seedlings will be undertaken as per the details contained within Sections 3.2 – 3.7 above.

After five years, any excess seed will be transferred to the Whittlesea City Council or other relevant organisations to be utilised in projects for revegetation or landscaping in the local area.

REFERENCES

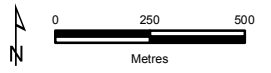
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- Legend**
- Study Area
 - Freeway
 - Major Road
 - Collector Road
 - Minor Road
 - Proposed Road
 - Walking Track
 - Minor Watercourse
 - Permanent Waterbody
 - Wetland/Swamp
 - Parks and Reserves
 - Crown Land
 - Localities



Figure 1
Location of the study area
Matted Flax-lily Translocation Plan: EPBC 2014/7364



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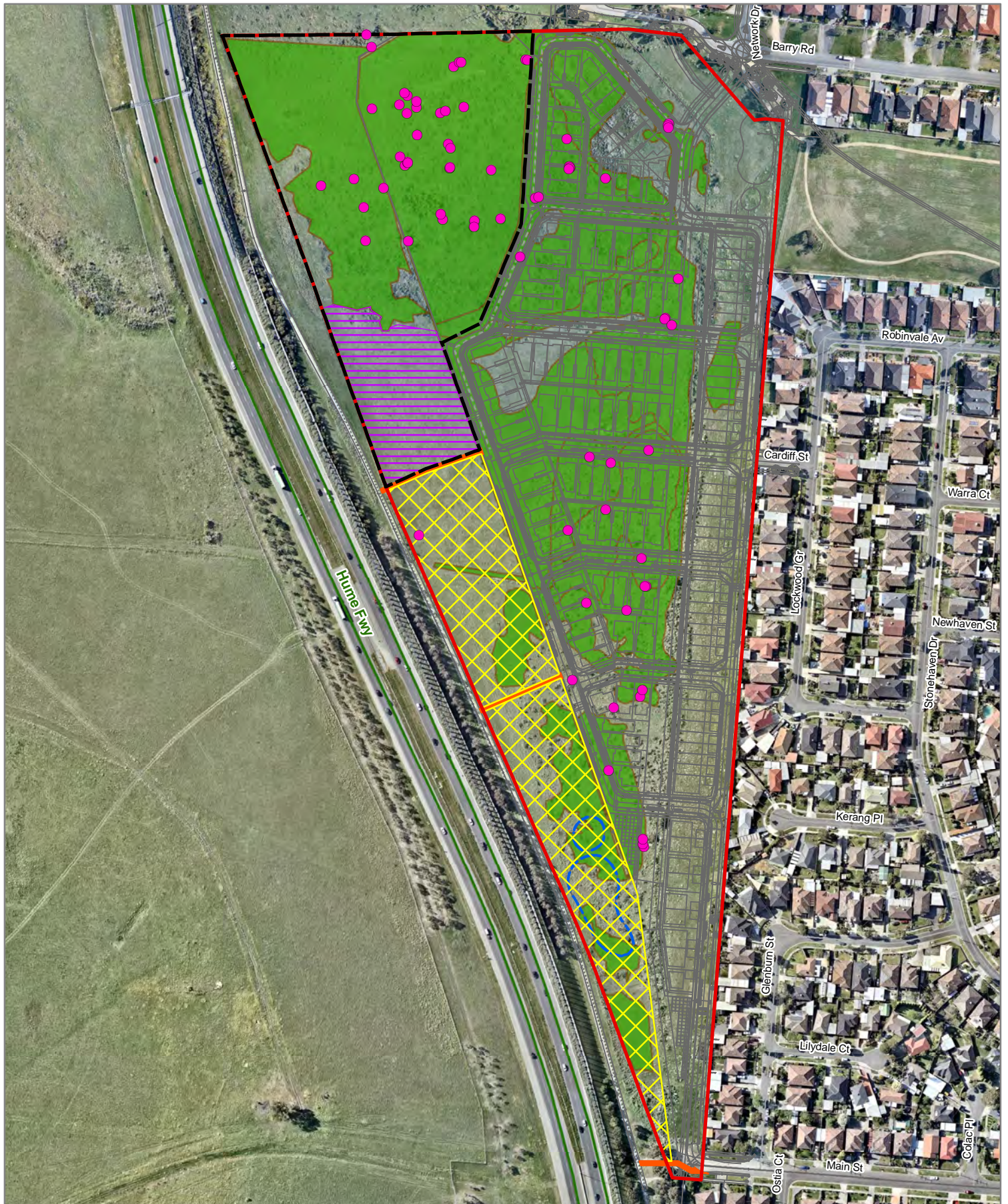


Figure 2a
Location of Matted Flax-lily specimens
Matted Flax-lily Translocation Plan:
 EPBC 2014/7364

Legend

- Study Area
- Conservation Area
- Development plan
- Bike access / access
- Public reserve
- Potential wetland
- Matted Flax-lily recipient site
- Matted Flax-lily records
- Natural Temperate Grassland



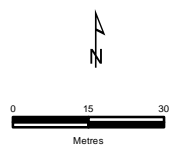
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Figure 2b
Location of Matted Flax-lily specimens
Matted Flax-lily Translocation Plan:
 EPBC 2014/7364

Legend

- Study Area
- Conservation Area
- Development plan
- Bike access / access
- Public reserve
- Matted Flax-lily recipient site
- Matted Flax-lily records
- Natural Temperate Grassland



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APPENDICES

Appendix 1. Risk

Appendix 1.1. Risk Assessment

An assessment of potential risks associated with the objectives of this plan are outlined within Table A1.1. All risks are considered manageable.

Table A1.1. Risk assessment and management table for Matted Flax-lily Translocation.

Management objective/desired outcome	Event or circumstance	Relevant management actions/measures	Residual risk			Trigger detection and monitoring activity/ies	Feasible/effective corrective actions	Notes
			L	C	RR			
To achieve performance targets and completion criteria for all MNES	MFL Translocation Plan fail to adequately address management commitments in the offset plan	Engage an expert to manage this process. Ensure all impacts are suitably managed.	Unlikely	High	Medium	Quality assurance and monitoring	Revise actions within the MFL Translocation Plan.	The recipient site will be monitored and managed in accordance with the actions in this Plan and the CEMP.
	Adjacent land management practices fail to support attainment of outcomes.	Ensure understanding of Plan objectives. All contractors inducted onto site made aware of values within Conservation Reserve and recipient site	Unlikely	High	Medium	Adjacent land practices begin to negatively impact offset site.	Take steps to halt negative impacts. Follow up with stakeholder discussions	Based on the current land management practices in the region and it is unlikely that any foreseeable land management practices within the vicinity will impact the Conservation Reserve and/or recipient site
	Insufficient funds provided by approval holder to implement the plan.	Ensure reputable land holder to implement plan.	Unlikely	High	Medium	Monitoring and/or annual reporting	Review plan for cost efficiencies.	The approval holder will subcontract MFL Translocation, monitoring and management works to experienced ecologists, familiar with undertaking similar, previous projects.

Management objective/desired outcome	Event or circumstance	Relevant management actions/measures	Residual risk			Trigger detection and monitoring activity/ies	Feasible/effective corrective actions	Notes
			L	C	RR			
To achieve performance targets and completion criteria for all MNES								The conservation reserve will be gifted to the City of Whittlesea, who employ staff with extensive experience in management of Matted Flax-lily and Conservation Reserves. The proponent and Whittlesea sea have agreed on a funding package to ensure that the required management actions detailed in this Plan and the CEMP will continue to be undertaken once the land is gifted.
	Stochastic events (wildfire/drought/flood) prejudice attainment of interim performance targets and/or completion criteria for MNES.	Ensure appropriate biomass management. Plan for scheduling delays.	Possible	High	Medium	Monitoring and/or annual reporting	Apply adaptive management to ensure the objectives of the Translocation Plan are not compromised.	-
	Approved development prejudicing plan outcomes	Ensure proper stakeholder engagement to prevent poor outcomes.	Unlikely	High	Medium	Advertisement of planning scheme amendments/planning permit applications	Objection to proposed development/laisse with proponent to ensure the proposed development does not	-

Management objective/desired outcome	Event or circumstance	Relevant management actions/measures	Residual risk			Trigger detection and monitoring activity/ies	Feasible/effective corrective actions	Notes
			L	C	RR			
							compromise the objectives of the MFL Translocation Plan.	
MFL population maintained and improved	Drought	Apply adaptive management to ensure the site is not over-burnt/grazed	Likely	Moderate	Medium	Drought Event	Apply adaptive management to ensure the site is not over-burnt/grazed, and is not grazed when soil is waterlogged.	The MFL population is located within a mosaic dominated by native grassland, historically subject to frequent drought and occasional wildfire. As such, the MFL populations is likely to survive such an event.
	Wildfire		Likely	Moderate	Medium	Wildfire Event		

Appendix 1.2. Risk Assessment and Management Definitions

Risk framework

		• Consequence				
		• Minor	Moderate	• High	• Major	• Critical
• Likelihood	Highly Likely	Medium	• High	• High	Severe	Severe
	Likely	• Low	Medium	• High	• High	• Severe
	Possible	• Low	Medium	Medium	• High	• Severe
	Unlikely	• Low	• Low	Medium	• High	• High
	Rare	• Low	• Low	• Low	Medium	• High

Likelihood and consequence

Qualitative measure of likelihood (how likely is it that this event/circumstances will occur after management actions have been put in place/are being implemented)	
Highly likely	Is expected to occur in most circumstances
Likely	Will probably occur during the life of the project
Possible	Might occur during the life of the project
Unlikely	Could occur but considered unlikely or doubtful
Rare	May occur in exceptional circumstances
Qualitative measure of consequences (what will be the consequence/result if the issue does occur)	
Minor	Minor risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing low cost, well characterised corrective actions.
Moderate	Moderate risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing well characterised, high cost/effort corrective actions.
High	High risk of failure to achieve the plan's objectives. Results in medium-long term delays to achieving plan objectives, implementing uncertain, high cost/effort corrective actions.
Major	The plan's objectives are unlikely to be achieved, with significant legislative, technical, ecological and/or administrative barriers to attainment that have no evidenced mitigation strategies.
Critical	The plan's objectives are unable to be achieved, with no evidenced mitigation strategies.