Annual monitoring of Matted Flax-lily: Aurora, Epping (year 10: 2018–19)

FINAL REPORT

Prepared for Development Victoria

2 October 2020

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- Development Victoria: Jessamy Smooker and Sonya Rezo

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- Samantha Barron, Tim Dredge and John Muchan (assistance in the field)
- Sally Mitchell (mapping)

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1 Background

Biosis Pty Ltd was commissioned by Development Victoria to undertake the year 10 (2018–19) annual monitoring of the Matted Flax-lily *Dianella amoena* population within reserves 11 and 14 at the Aurora residential development, Epping, Victoria (Figure 1).

1.1 Approval under the EPBC Act

Aurora is a residential development area in Epping North, Victoria (Figure 1). It is approximately 20 kilometres north of the Melbourne CBD, and 1.5 kilometres north of existing urban development in the township of Epping. It is bounded by Craigieburn Road East to the north, O'Herns Road to the south and the Craigieburn Bypass to the west. The east boundary follows existing property titles. Development Victoria (formerly known as VicUrban and then Places Victoria) were the major landholder of Aurora. In 2014 Lendlease Communities (Australia) Limited (Lendlease) acquired the balance of development land at Aurora although three of the Conservation Reserves remain as Development Victoria land (Reserve 10, 11 &14).

The action was referred to the Australian Government Department of the Environment and Energy (DoEE, now Department of Agriculture, Water and Environment; DAWE) on 3 July 2007 seeking approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (EPBC 2007/3524) (DEWHA 2008). On 3 August 2007, DoEE declared that the proposed action is deemed a 'controlled action' and that it will be assessed by preliminary documentation. The project was approved with conditions on the 16 March 2008. Variations to the approval were given on the 15 April 2011, 3 October 2016, and the 29 November 2017.

Conditions relating to Matted Flax-lily include 1, 2c and 2e, as outlined below.

1. The person taking the action must undertake all works in accordance with the Aurora Conservation Management Plan – January 2008 (Biosis 2008).
2. To protect the threatened species listed EPBC Act, in particular the Matted Flax-lily and Golden Sun Moth *Synemon plana*, the person taking the action must monitor and manage the reserves identified in Figures 1a and 1b in accordance with the Aurora Conservation Management Plan – January 2008. In particular the following actions must be taken:
    c. Monitoring of the Matted Flax-lily is to be undertaken between 1 October and 1 March every 12 months commencing 2008 and continuing for a period of 10 years after establishment of reserves.
    e. If monitoring indicates a decrease of the Matted Flax-lily, the cause of the decline must be investigated. Corrective actions must be developed and implemented. In this event, the Department must be provided, within two months of the monitoring results being known, with a report stating the corrective action(s) implemented.

1.2 Annual monitoring

Biosis has monitored the Matted Flax-lily population at Aurora annually since 2008. Annual reports submitted to the relevant Departments are listed in Table 1.

Table 1 Annual monitoring reports

Year	Report
Year 0: 2008–2009	Letters to DEWHA, 5 May and 26 June 2009
Year 1: 2009–2010	Report to DEWHA, 19 July 2010
Year 2: 2010–2011	Report to DSEWPaC, 4 May 2011
Year 3: 2011–2012	Report to DSEWPaC, 8 June 2012
Year 4: 2012–2013	Report to DSEWPaC, 4 April 2013
Year 5: 2013–2014	Report to DoE, 11 April 2014
Year 6: 2014–2015	Report to DoE, 1 March 2015
Year 7: 2015–2016	Report to DoE, 25 August 2016
Year 8: 2016–2017	Report to DoE, 25 August 2017
Year 9: 2017–2018	Report to DoEE, 11 November 2018
Year 10: 2018-2019	Current report – to be submitted to DAWE upon finalisation

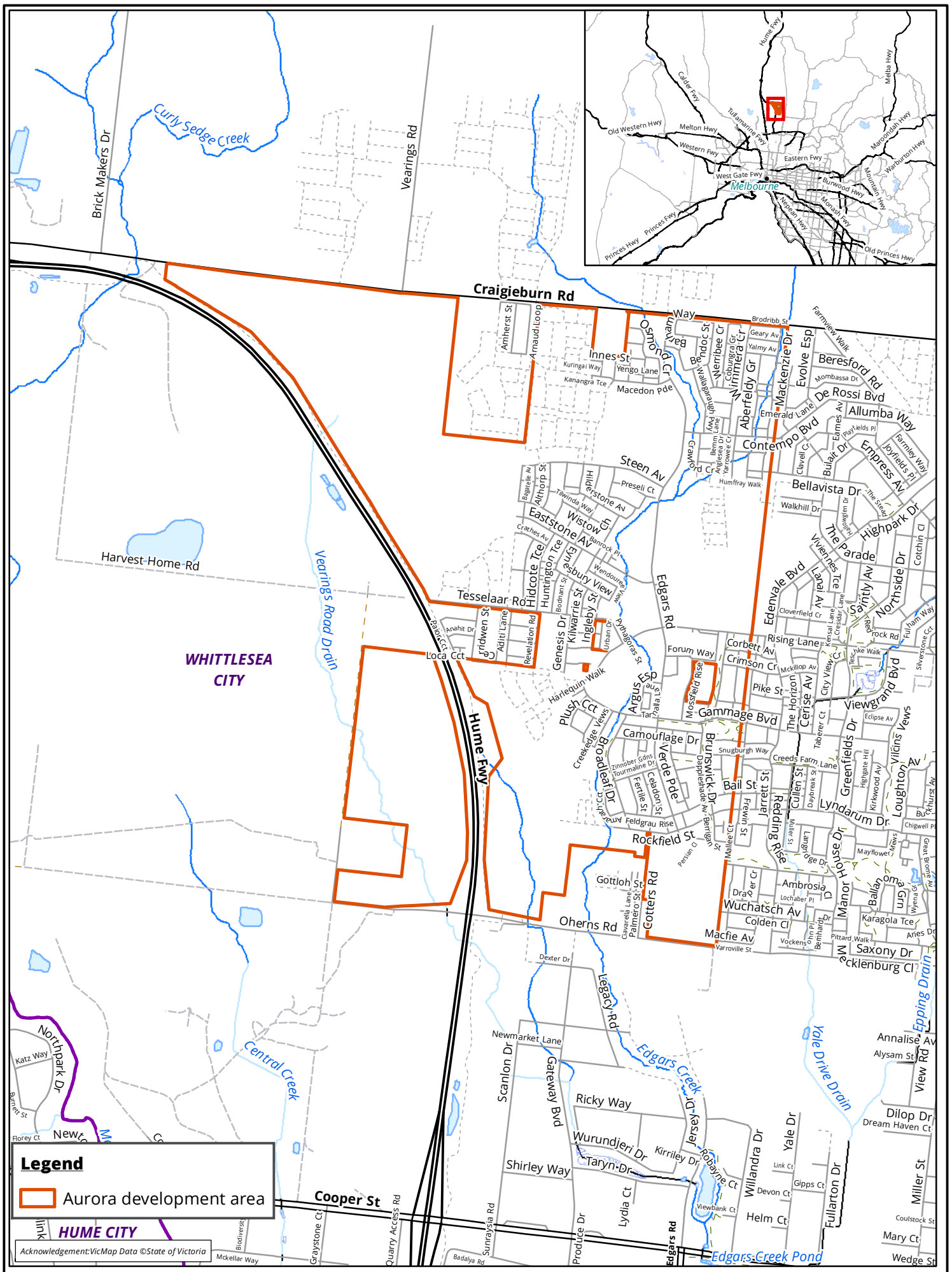

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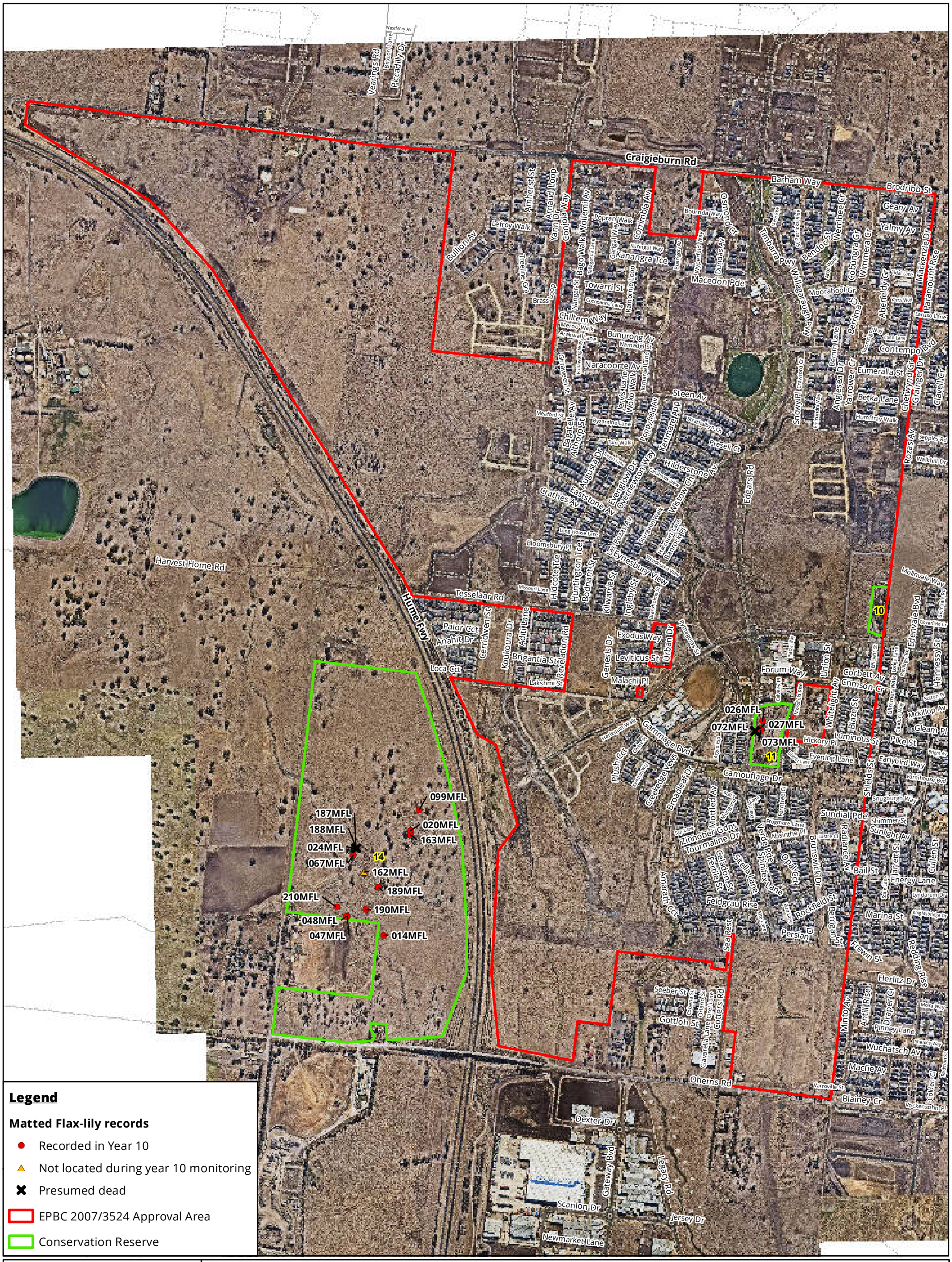
Figure 1 Location of the Aurora development, Epping North, Victoria

Matter: 25681,
Date: 20 July 2018,
Checked by: CP, Drawn by: SKM, Last edited by: smitchell
Location:P:\25600s\25681\Mapping\25681_F1_MFL_Locality.mxd

0 240 480 720 960
Metres
N
Scale 1:25,000 @ A4, GDA 1994 MGA Zone 55



Legend

Matted Flax-lily records

- Recorded in Year 10
- Not located during year 10 monitoring
- Presumed dead
- EPBC 2007/3524 Approval Area
- Conservation Reserve

Figure 2 The distribution of Matted Flax-lily (MFL) within conservation reserves managed by Development Victoria

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Acknowledgements: Vicmap ©State of Victoria, NearMap Imagery Oct 2016

Matter: 25681,
Date: 10 October 2019,
Checked by: SMB, Drawn by: SKM, Last edited by: smitchell
Location:P:\25600s\25681\Mapping\25681_F2_MFL_Annual_Monitoring

0 100 200 300 400 500

Metres

Scale 1:12,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

1.3 Timing of surveys

A total of 30 Matted Flax-lily were included in the EPBC Act referral and these plants were recorded over a number of years prior to March 2008. Since then, Biosis has completed ten years of annual Matted Flax-lily population monitoring. Surveys undertaken are set out in Table 2.

Table 2 Annual monitoring surveys

Year	Surveys
Pre 2008	Original records – plants included in the EPBC approval in March 2008, from surveys between 2001–2008 (i.e. the 30 original records)
2008–09 Year 0	Monitoring in December 2008 and June 2009
2009–10 Year 1	Monitoring in November 2009 and January 2010 (when plants were staked) and May–June 2010
2010–12 Year 2	Monitoring in December 2010 and January 2011 (when new plants were located with a DGPS and staked)
2011–12 Year 3	Monitoring in January–February 2012
2012–13 Year 4	Monitoring in December 2012 and January 2013
2013–14 Year 5	Monitoring in December 2013
2014–15 Year 6	Monitoring in December 2014 and January–February 2015
2015–16 Year 7	Monitoring in December 2015
2016–17 Year 8	Monitoring in December 2016 and January 2017
2017-18 Year 9	Monitoring in January 2018
2018-19 Year 10	Monitoring in December 2018

In years 1 and 2 monitoring was undertaken in late spring–summer (as per the EPBC approval conditions), when the plants were due to flower and therefore generally easier to locate. However, due to poor conditions (drought and grazing) during 2008–2010 it was found that most of the plants had not flowered and were generally difficult to locate during the late spring–summer period. As a result, for both years 1 and 2, Biosis undertook follow-up surveys in autumn–winter, following substantial rains and subsequent growth of the plants. In both years, the plants were easier to locate at this time.

Surveys in years 3–10 have been undertaken in late spring–summer only. Plants were observed to be flowering and fruiting in each of these years and were mostly easily located. In addition, all of the plants have now been individually marked in the field with star pickets and labels, making them easier to locate.

2 Methods

2.1 Marking of Matted Flax-lily

At commencement of the 10-year monitoring program, the locations of Matted Flax-lily were recorded using a hand-held GPS unit (+/– 7 m accuracy). This aided in relocation of plants, but still led to difficulties where plants were stressed and–or surrounding biomass was high.

Biosis have since recorded plants with a DGPS, which has greater accuracy than a standard GPS (+/– 4 m) enabling improved accuracy of mapped Matted Flax-lily locations.

All monitored Matted Flax-lily have also been marked with a star picket positioned adjacent to each plant with a numbered tag attached to each star picket. This has made relocation of plants much easier and ensures contractors undertaking vegetation management works within conservation reserves are aware of the location of all Matted Flax-lily plants.

2.2 Monitoring data

During year 10 (2018–19) monitored plants were located using current mapping (Figure 2) and with the aid of star pickets next to each plant.

The following information was recorded for each plant:

- Plant health (good, moderate, poor)
- Number of inflorescences (<5, ≥5 <10, ≥10)
- Approximate number of leaf tufts (<5, ≥5 <10, ≥10)
- Approximate spread of the plant (width at the widest point in cm)
- Management - other notes (e.g. presence of fruit, if weeding is required, evidence of herbivory etc.).

2.3 Year 10 monitoring dates

Monitoring in Year 10 was undertaken on 11, 12 and 21 December 2018.

3 Results

A comparison of data collected from years 3 to 10 is provided in Table 3. The health calculations shown in Table 4 include all Matted Flax-lily populations within the Aurora development area. However, following year 6 (2014), Lendlease Communities (Australia) Limited (Lendlease) acquired land from Development Victoria, and monitoring and management of the plants in Development Victoria Conservation Reserves became separate. Therefore, health data collected from year 7 onwards includes only Matted Flax-lily plants from reserves managed by Development Victoria.

The location of each monitored Matted Flax-lily within each reserve is displayed in Figure 2.

3.1 Annual numbers of Matted Flax-lily

Since the beginning of monitoring in year 0 (2008–2009), additional Matted Flax-lily plants have been discovered and added to the annual monitoring program. Table 3 provides the location and monitored numbers of Matted Flax-lily by survey year. In year 0, data was collected for 5 Matted Flax-lily plants within Conservation Reserves 11 and 14. In year 5, the number of monitored Matted Flax-lily plants had increased to 18. Originally, observations of additional plants within the reserves was suspected to be due to recruitment within the population, however, the increase more likely reflected survey effort and increased management. In year 7, the number of plants recorded decreased from 18 to 13 and continued to fluctuate for the remaining monitoring years.

In year 10, three Matted Flax-lily plants (072, 162 and 188) were searched for but not found. An active search for remaining plant material was undertaken around star pickets and rocks; however, the plants were not located. Matted Flax-lily plants vary seasonally and detectability may be due to natural fluctuations. Although the above mentioned plants were not located, the overall health of the Matted Flax-lily population has continued to increase throughout the 10-year monitoring period. At year 10, 15 plants were recorded.

Table 3 Annual Matted Flax-lily plants recorded (Year 0-10)

Reserve–location	Baseline pre-2008	Year 0 2008/09	Year 1 2009/10	Year 2 2010/11	Year 3 2011/12	Year 4 2012/13	Year 5 2013/14	Year 6 2014/15	Year 7 2015/16	Year 8 2016/17	Year 9 2017/18	Year 10 2018/19
11	2	2	4	4	4	4	4	4	3	3	2	3
14	-	3	6	13	13	12	14	14	10	11	9	12
Total in reserves	**2**	**5**	**10**	**17**	**17**	**16**	**18**	**18**	**13**	**14**	**11**	**15**

3.2 Plant health

Comprehensive data collection on Matted Flax-lily health, including numbers of inflorescences and leaf tufts, commenced in year 3 (2011–12). A comparison of data collected in years 3 to 10 for remnant Matted Flax-lily is provided in Table 4.

Two wildfires have occurred within the Aurora development area since management of the reserves began in 2009. On 18 February 2013, a deliberately lit wildfire spread throughout the Epping/Wollert/Donnybrook area, north of Melbourne, and burnt approximately 2040 hectares of land. Much of the Aurora development was burnt, including 10 of the 14 Conservation Reserves. The second fire, also a deliberately lit wildfire, occurred on 19 December 2015, and spread throughout Conservation Reserve 14 on the west side of the Hume Freeway.

During the 2013 (year 4) and 2015 (year 7) fire events, all Matted Flax-lily plants within Conservation Reserve 14 were burnt. Following the 2013 wildfire, there was an overall increase in Matted Flax-lily health for year 5 monitoring, with the number of leaf tufts and flowers exceeding all other monitoring years (Plate 1 and Plate 2). Fire plays an important role in regeneration for many Australian plants and typically promotes growth and reproduction; the reduction of competition from surrounding plants and increase in nutrient availability may have contributed to these increased results. Following the increase in Matted Flax-lily health in year 5, overall plant health, and the number of flowers decreased slightly, but typically remained stable.

In Year 9 and 10, an increase in the overall health of Matted Flax-lily plants was observed, with 91 and 80 percent of plants recorded in good health, compared to 64 percent in year 8. Despite this increase, the number of inflorescences produced decreased slightly in years 10 and 9, respectively. While the health and production of flowers for Matted Flax-lily plants has varied throughout the 10 years of monitoring, the number of leaf tufts has stayed relatively stable with more than 50 percent of plants having 10 or more leaves. Seasonal conditions play an important role in determining foliage growth, and the number and timing of flowering of plants.

Table 4 Matted Flax-lily population health (year 3 –10) – percentages of plants in each category

	Year 3: 2011/12	Year 4: 2012/13	Year 5: 2013/14	Year 6: 2014/15	Year 7: 2015/16	Year 8: 2016/17	Year 9: 2017/18	Year 10: 2018/19
Health %								
Poor	10	9	0	1	8	0	0	0
Moderate	76	20	1	8	38	36	9	20
Good	14	71	99	91	54	64	91	80
Number of inflorescences								
0	-	-	-	-	-	-	-	53
<5	51	66	40	83	53	43	73	20
5 - 10	21	14	13	8	23	14	0	7
≥10	28	20	47	9	23	43	27	20
Number of leaf tufts								
<5	5	13	5	11	15	14	18	27
≥5 <10	21	13	8	17	0	7	27	0

≥10	74	74	87	72	85	79	55	73

Note: in years 3-9, plants with 0 inflorescences were recorded as <5 inflorescences.

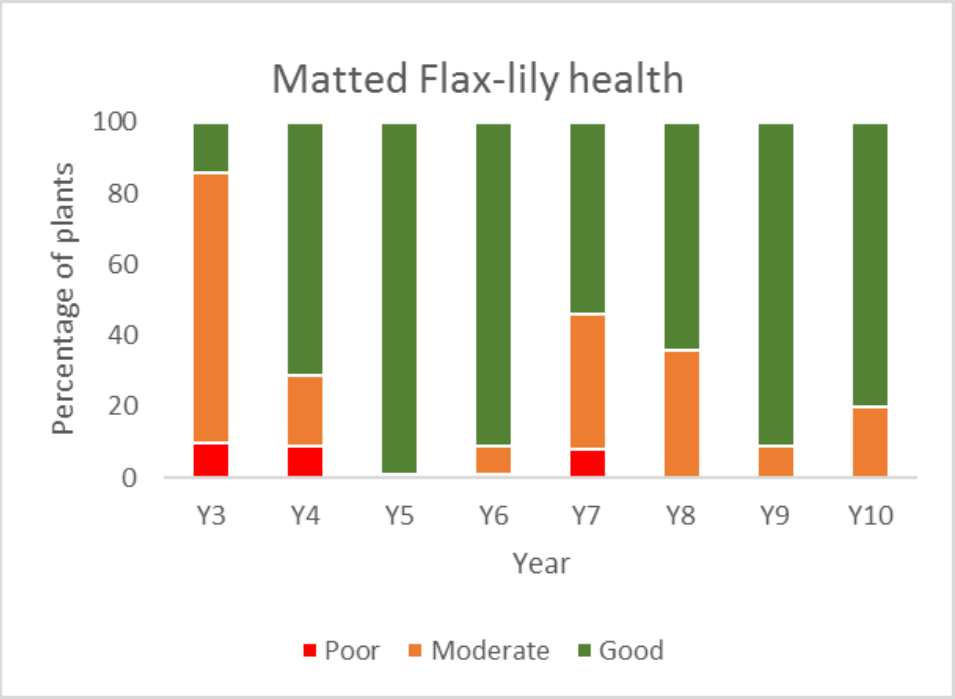


Plate 1 **Percentage Matted Flax-lily plants in each health category across monitoring years (year 3 – 10)**

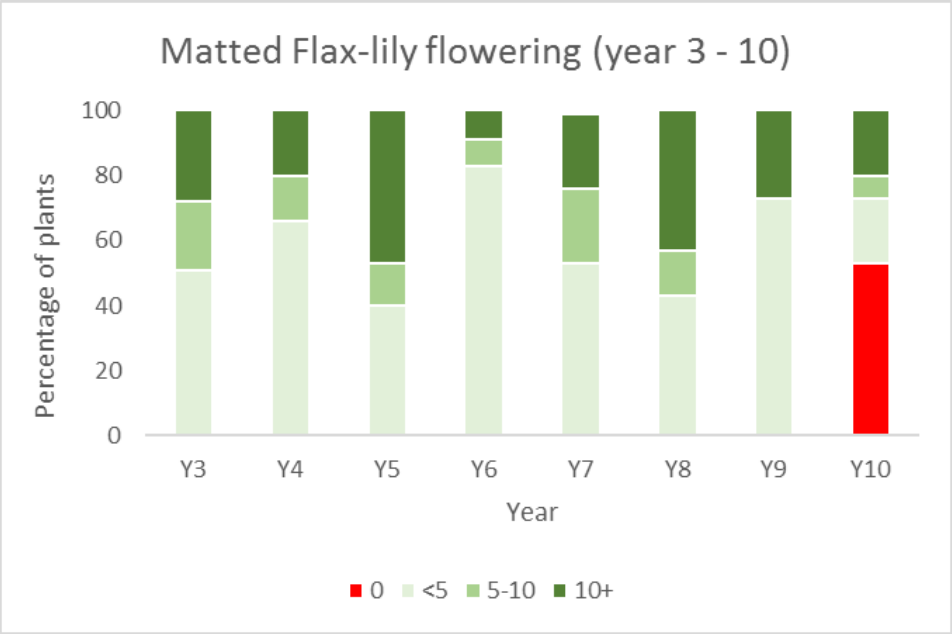


Plate 2 **Percentage of Matted Flax-lily plants in each inflorescence category across monitoring years (year 3 – 10)**

Note: in years 3-9, plants with 0 inflorescences were recorded as <5 inflorescences.

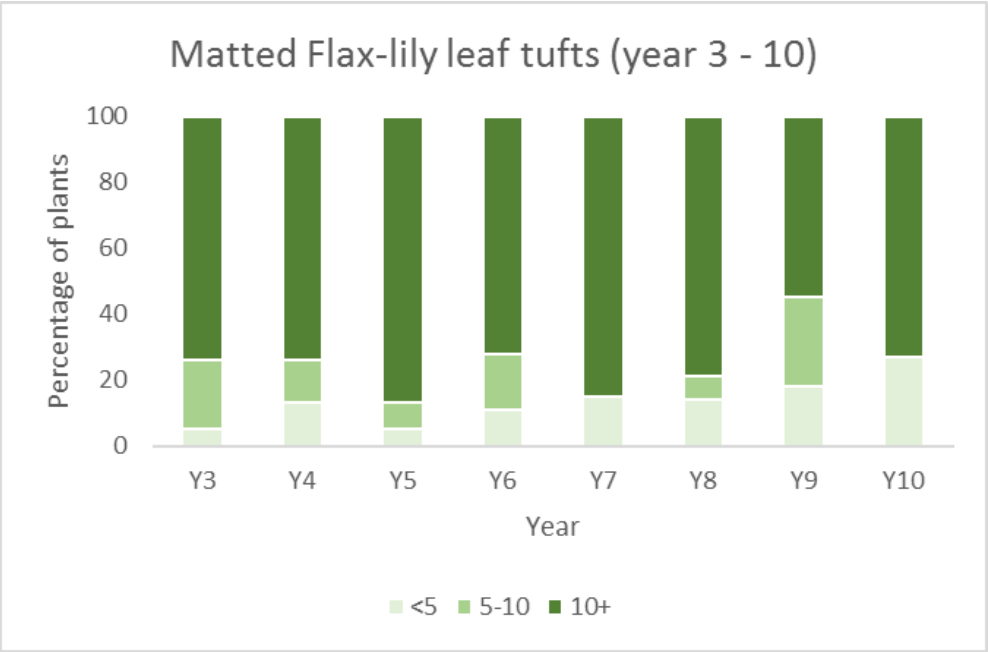
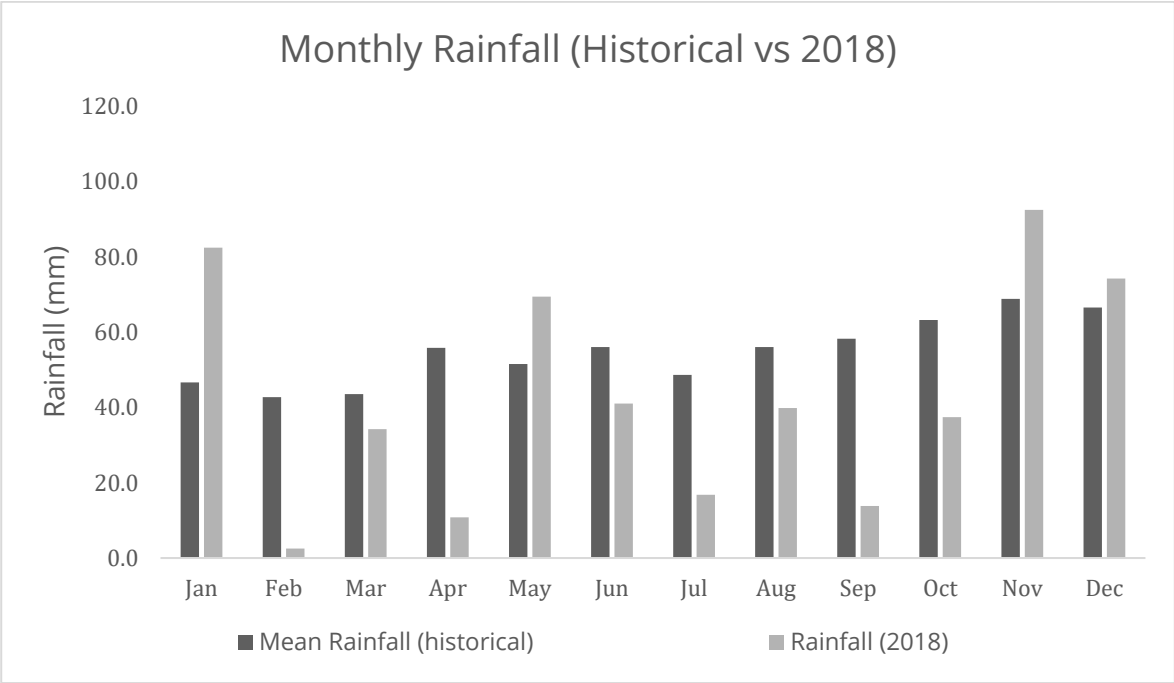


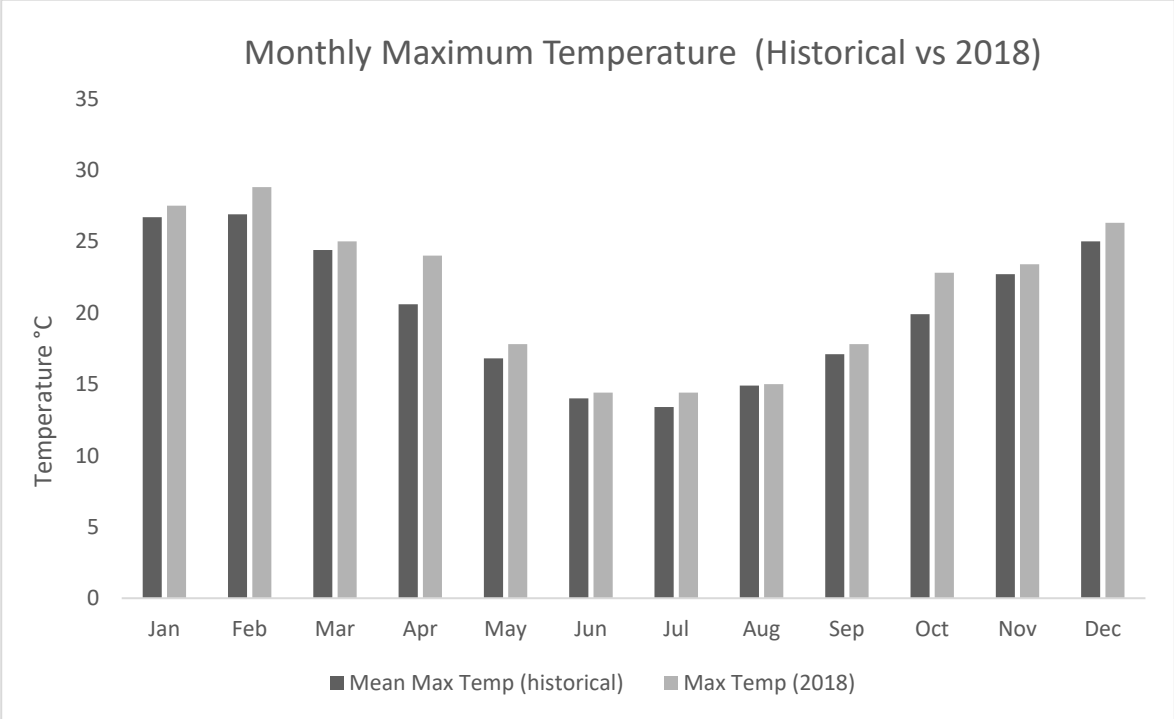
Plate 3 Percentage of Matted Flax-lily plants in eacg leaf tuft category across monitoring years (year 3 – 10)

3.3 Seasonal conditions of 2018

Weather data from Bundoora (the closest weather station to Aurora) presented in Graph 1 shows that overall the mean monthly rainfall in 2018 was lower than the historical mean monthly rainfall. January, May, November and December were exceptions, having rainfall levels that exceeded the historical mean monthly rainfall (BOM 2020). The monthly maximum temperature was generally higher throughout 2018 compared with the historical mean (Graph 2). Spring and summer rainfall in particular is known to influence the reproductive output of Matted Flax-lily. Lower than average rainfall throughout spring in 2018 might, in part, explain the poor rate of flowering among plants, and the fewer inflorescences recorded on plants this season compared with the last.



Graph 1 2018 monthly rainfall, Bundoora, Victoria



Graph 2 2018 mean daily maximum temperature, Bundoora, Victoria

4 EPBC Act compliance

Conditions relating to Matted Flax-lily include 1, 2c and 2e, as outlined below.

1. The person taking the action must undertake all works in accordance with the Aurora Conservation Management Plan – January 2008 (Biosis 2008).
2. To protect the threatened species listed EPBC Act, in particular the Matted Flax-lily and Golden Sun Moth *Synemon plana*, the person taking the action must monitor and manage the reserves identified in Figures 1a and 1b in accordance with the Aurora Conservation Management Plan – January 2008. In particular the following actions must be taken:
    c. Monitoring of the Matted Flax-lily is to be undertaken between 1 October and 1 March every 12 months commencing 2008 and continuing for a period of 10 years after establishment of reserves.
    f. If monitoring indicates a decrease of the Matted Flax-lily, the cause of the decline must be investigated. Corrective actions must be developed and implemented. In this event, the Department must be provided, within two months of the monitoring results being known, with a report stating the corrective action(s) implemented.

At the end of year 10, the health of the natural populations of Matted Flax-lily appears to be remaining stable and generally good, with 100 percent of living plants in moderate or good condition. There are 15 living Matted Flax-lily plants across the two reserves, equating to threefold the initial 5 plants recorded within the reserves. Fluctuations in health over the ten year period are within the ranges of natural variability and do not represent an overall decline in condition. If significant further declines in health or survivorship are observed in this population further actions may need to be taken.

5 Conclusion

At year 10, there are 15 living Matted Flax-lily plants across the two reserves, equating to threefold the initial 5 plants recorded within the reserves. Fluctuations in health over the ten year period are within the ranges of natural variability and do not represent an overall decline in condition. If significant further declines in health or survivorship are observed in this population further actions may need to be taken.

Grazing pressure from Eastern Grey Kangaroos and cattle in conservation reserve 14 may be a contributing factor to the decline in Matted Flax-lily numbers in this reserve. It is recommended that plants that are not currently fenced off from cattle grazing be fenced off to prevent cattle from grazing on new growth of the plants. Plants not detected in the year 10 monitoring season should also be fenced off as this may increase the chance of these plants persisting into the future.

The overall health observed in year 10 was higher than in year 9 and the overall trend for Matted Flax-lily health appears to be reaming stable within the reserves. Although it was observed that there was a decrease in the number of inflorescences, there was an increase in plant growth traits (i.e. leaf tufts and condition), and this may indicate a redirection of plant resources leading to overall better health and resilience leading into the following season.

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