APPENDIX 12
ATTACHMENT 1

COMMUNITY CONSULTATION OUTCOMES REPORT

Draft Weed Management Plan 2022–2032

CONTENTS

OVERVIEW

The community were invited to provide feedback from 24 November 2022 to 14 December 2022 on the draft Weed Management Plan 2022–2032. A total of 280 responses were received during the 21-day consultation period.

Respondents were asked to indicate their level of support for the 3 weed management methods used by the City:

- Physical weed control
- Chemical weed control
- Steam and hot water weed control

There was a strong level of support for physical weed control and steam and hot water weed control. The majority of respondents opposed the use of chemical weed control.

Respondents were asked if they had any comments on the draft Weed Management Plan 2022–2032 and 186 respondents provided feedback. Approximately half of the comments related to the use of glyphosate specifically, or chemical weed control more generally. Other common themes raised by respondents included:

- Prefer the City use more physical / non-chemical weed control
- Prefer the City display signage for longer / improve notifications
- Concerned that weed spraying is undertaken completed incorrectly / ineffectively by the City.

Some positive feedback was also provided as follows:

- General praise for the draft Plan / suggestions for weed types to be added to the Plan
- General praise for friends groups / request for more funding.

The City received 3 submissions from friends groups and 3 submissions from resident / ratepayer groups. Full verbatim responses are provided in Appendix 9–14.

STAKEHOLDERS

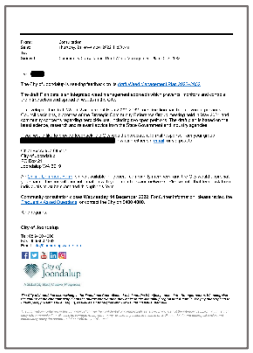
A total of 36 stakeholders were directly engaged by the City of Joondalup. Stakeholders identified included:

- Friends groups (21)
  - Friends of Cadogan Park
  - Friends of Carnaby Reserve
  - Friends of Central Park Bushland
  - Friends of Craigie Bushland
  - Friends of Duncraig Library Bushland
  - Friends of Harman Park
  - Friends of Hepburn and Pinnaroo Bushland
  - Friends of Hillarys and Kallaroo Foreshore
  - Joondalup Community Coast Care Forum
  - Friends of Maritana Bushland
  - Mullaloo Beach Community Group
  - Friends of North Ocean Reef — Iluka Foreshore
  - Friends of Periwinkle Bushland
  - Friends of Porteous Park
  - Friends of Robin Park Bush Reserve
  - Friends of Shepherd Bush Park
  - Friends of Sorrento Beach and Marmion Foreshore
  - Friends of Trigonometric Park
  - Friends of Warwick Bushland
  - Friends of Yellagonga Regional Park
  - Woodvale Waters Friends of Beenyup Channel
- Resident / ratepayer groups (15)
  - Beldon Residents Association Inc
  - Burns Beach Residents Association Inc
  - Connolly Residents Association
  - Edgewater Community Residents' Association
  - Harbour Rise Home Owners Association Inc
  - Heathridge Residents' Association
  - Iluka Homeowners Association
  - Kallaroo Residents' Association
  - Kingsley & Greenwood Residents Association
  - Marmion, Sorrento, Duncraig Progress and Ratepayers Association
  - North Shore Country Club and Residents Association
  - Padbury Residents' Association Inc
  - Warwick Residents' Group
  - Whitford Community, Ratepayers & Recreation Association Inc
  - Woodvale Waters Landowners Association

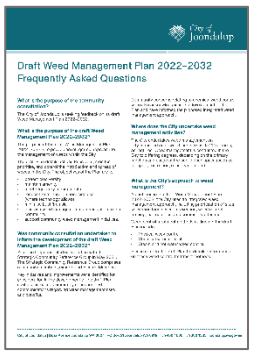
CONSULTATION MATERIALS

Friends groups and resident / ratepayer groups sent emails on 24 November 2022 which advised them of the consultation and directed them to provide written feedback via post or email. These stakeholders were encouraged to promote the consultation and the Online Comment Form (for individuals) to their members and networks. The email also directed the groups to review the Frequently Asked Questions document for further information on the draft Weed Management Plan 2022–2032.

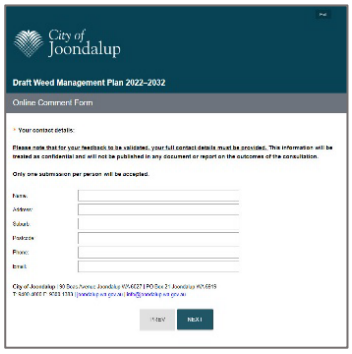
Email to friends groups and resident / ratepayer groups (see Appendix 1–2 for full):



Frequently Asked Questions (see Appendix 3 for full):


Draft Weed Management Plan 2022–2032
Frequently Asked Questions

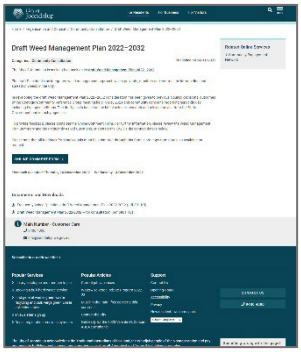
Online Comment Form (see Appendix 4 for full):


Draft Weed Management Plan 2022–2032
Online Comment Form

In addition to directly contacting identified stakeholders via email, the City advertised the consultation to other community members via the following means:

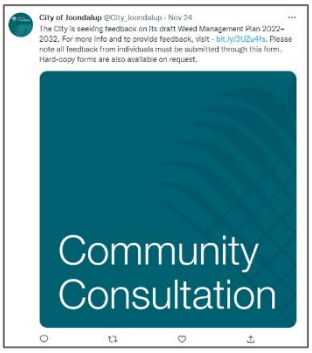
- Webpage published on the 24 November 2022 to 14 December 2022.
- Item published in the Community Engagement Network eNewsletter emailed to subscribers on 24 November 2022.
- Facebook post published through the City's Facebook account on 24 November 2022.
- Twitter post published through the City's Twitter account on 24 November 2022.

Community Consultation webpage of the City's website (see Appendix 5 for full):



Community Engagement Network eNewsletter (see Appendix 6 for full):

Social media posts (see Appendix 7–8 for full):



RESPONSE RATE

The City collected a total of 280 responses during the 21-day consultation period. Responses that were considered valid include all those which contained contact details enabling identification and were submitted within the advertised timeframe. This indicates a response rate of 16.7% for stakeholders who were directly engaged. This data is shown in the table below.

The total number is inclusive of 3 submissions from friends groups and 3 submissions from resident / ratepayer groups. Note that an analysis of the responses from the friends groups and resident / ratepayer groups has not been included in this report. Full verbatim responses are provided in Appendix 9–14.

Note that 1 Elected Member responded to the consultation; however, this response has not been included in the data analysis.

	Feedback sought	Feedback received	Response rate
Responses received by stakeholder type:	**N**	**N**	**%**
Friends groups	**21**	**3**	**14.3%**
Friends of Cadogan Park	1	0	0.0%
Friends of Carnaby Reserve	1	0	0.0%
Friends of Central Park Bushland	1	0	0.0%
Friends of Craigie Bushland	1	0	0.0%
Friends of Duncraig Library Bushland	1	0	0.0%
Friends of Harman Park	1	0	0.0%
Friends of Hepburn and Pinnaroo Bushland	1	0	0.0%
Friends of Hillarys and Kallaroo Foreshore	1	0	0.0%
Joondalup Community Coast Care Forum	1	1	100.0%
Friends of Maritana Bushland	1	0	0.0%
Mullaloo Beach Community Group	1	1	100.0%
Friends of North Ocean Reef — Iluka Foreshore	1	1	100.0%
Friends of Periwinkle Bushland	1	0	0.0%
Friends of Porteous Park	1	0	0.0%
Friends of Robin Park Bush Reserve	1	0	0.0%
Friends of Shepherd Bush Park	1	0	0.0%
Friends of Sorrento Beach and Marmion Foreshore	1	0	0.0%
Friends of Trigonometric Park	1	0	0.0%
Friends of Warwick Bushland	1	0	0.0%
Friends of Yellagonga Regional Park	1	0	0.0%
Woodvale Waters Friends of Beenyup Channel	1	0	0.0%

Responses received by stakeholder type:	Feedback sought N	Feedback received N	Response rate %
Resident / ratepayer groups	**15**	**3**	**20.0%**
Beldon Residents Association Inc	1	0	0.0%
Burns Beach Residents Association Inc	1	1	100.0%
Connolly Residents Association	1	0	0.0%
Edgewater Community Residents' Association	1	0	0.0%
Harbour Rise Home Owners Association Inc	1	0	0.0%
Heathridge Residents' Association	1	0	0.0%
Iluka Homeowners Association	1	0	0.0%
Kallaroo Residents' Association	1	0	0.0%
Kingsley & Greenwood Residents Association	1	1	100.0%
Marmion, Sorrento, Duncraig Progress and Ratepayers Association	1	1	100.0%
North Shore Country Club and Residents Association	1	0	0.0%
Padbury Residents' Association Inc	1	0	0.0%
Warwick Residents' Group	1	0	0.0%
Whitford Community, Ratepayers & Recreation Association Inc	1	0	0.0%
Woodvale Waters Landowners Association	1	0	0.0%
Other community members (engaged indirectly)	**—**	**274**	**—**
Total response rate (engaged directly)	**36**	**6**	**16.7%**
Total responses	**—**	**280**	**—**

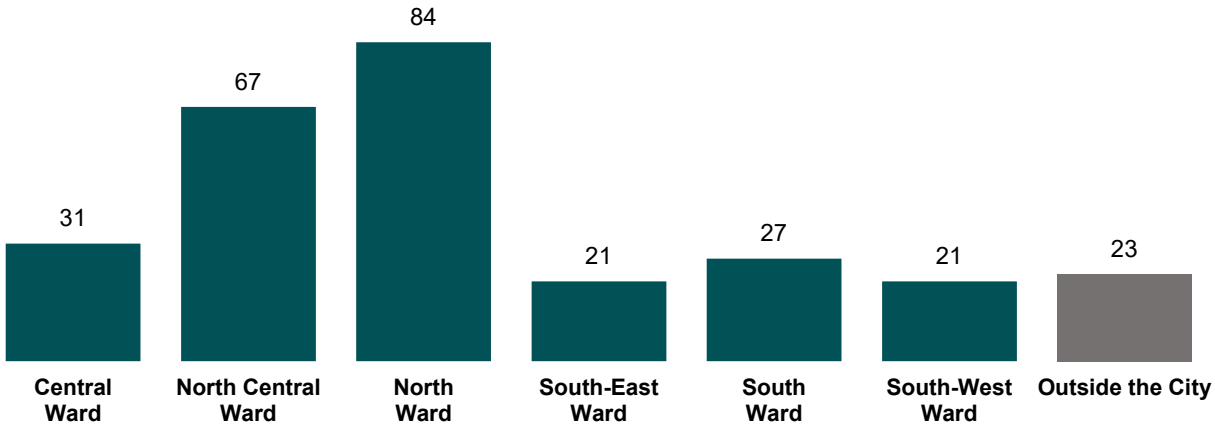
DEMOGRAPHICS

Respondent address

Respondents were asked to provide their contact address and just under one-third of respondents were from the North Ward (84). This data is shown in the table and chart below.

Responses received by ward and suburb:	N	%
City of Joondalup	**251**	**91.6%**
Central Ward	**31**	**11.3%**
Beldon	7	2.6%
Craigie	12	4.4%
Kallaroo	6	2.2%
Woodvale	6	2.2%
North Central Ward	**67**	**24.5%**
Connolly	10	3.6%
Edgewater	13	4.7%
Heathridge	7	2.6%
Mullaloo	10	3.6%
Ocean Reef	27	9.9%
North Ward	**84**	**30.7%**
Burns Beach	8	2.9%
Currambine	11	4.0%
Iluka	50	18.2%
Joondalup	6	2.2%
Kinross	9	3.3%
South-East Ward	**21**	**7.7%**
Greenwood	11	4.0%
Kingsley	10	3.6%
South Ward	**27**	**9.9%**
Duncraig	20	7.3%
Marmion	7	2.6%
Warwick	0	0.0%
South-West Ward	**21**	**7.7%**
Hillarys	10	3.6%
Padbury	8	2.9%
Sorrento	3	1.1%
Outside of the City of Joondalup	**23**	**8.4%**
Total responses	**274**	**100.0%**

Responses received by ward:



OUTCOMES

QUESTION: “To what extent do you support the City’s use of physical weed control?”

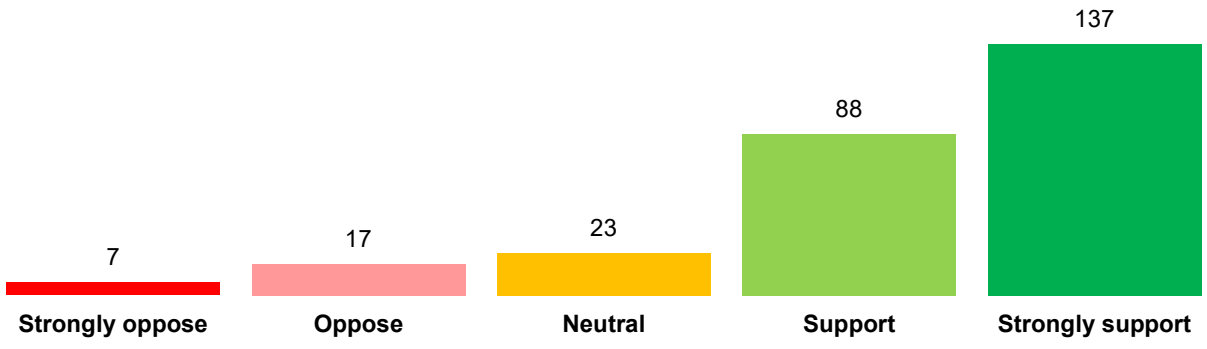
Respondents were asked the following question:

> *The draft Plan outlines the use of **physical weed control** for small infestations or as a follow-up to other weed control methods. Physical weed control mostly includes hand weeding and is used predominantly in natural areas. Widespread hand weeding is not generally employed, as it is labour intensive and, if conducted inappropriately, can result in negative impacts to native vegetation by disturbance of the soil surface, and can also lead to erosion.*
>
> *To what extent do you support the City’s use of physical weed control as described above?*

Half of respondents *strongly supported* the use of physical weed control and 88 *supported* this method of weed control. In total, 24 respondents *opposed* the use of physical weed control. This data is shown in the table and chart below.

To what extent do you support the City’s use of physical weed control?	N	%
Strongly oppose	7	2.6%
Oppose	17	6.2%
Neutral	23	8.4%
Support	88	32.1%
Strongly support	137	50.0%
No response	*2*	*0.7%*
Total participants	**274**	**100.0%**

To what extent do you support the City’s use of physical weed control?



QUESTION: “To what extent do you support the City’s use of chemical weed control?”

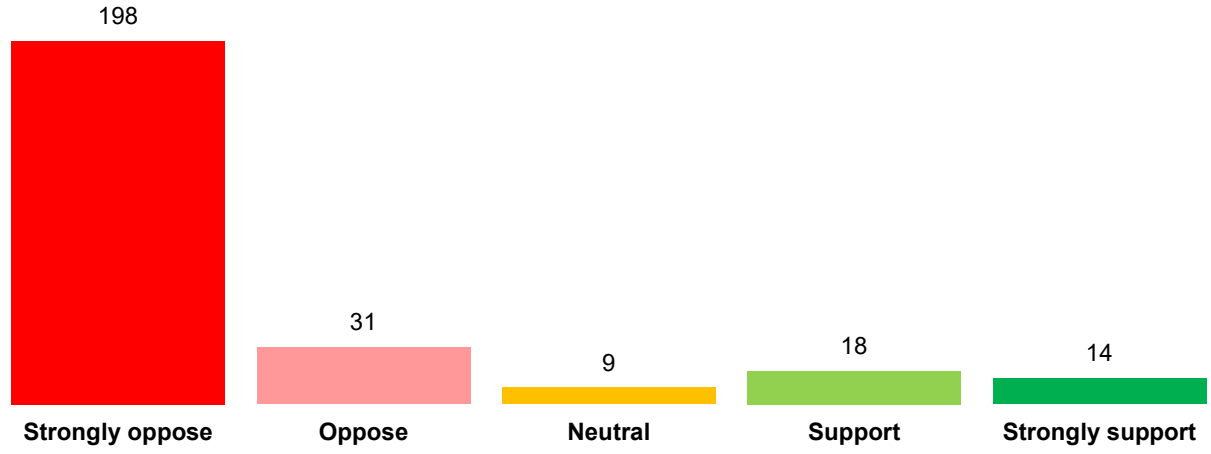
Respondents were asked the following question:

> *The draft Plan outlines the use of **chemical weed control** through the use of herbicides. Chemical weed control is safe and is the most effective and economical means of weed control, as it requires less labour, fuel and equipment. The City schedules the application of herbicides according to rainfall and temperature in order to increase effectiveness and minimise any adverse impacts. Chemical weed control is conducted in strict accordance with regulatory requirements, and with consideration to community wellbeing and public health.*
>
> *To what extent do you support the City’s use of chemical weed control as described above?*

In total, 32 respondents *supported* the use of chemical weed control. Approximately three-quarters *strongly opposed* the use of chemical weed control (198) and 31 indicated they *opposed* the use of this method. This data is shown in the table and chart below.

To what extent do you support the City’s use of chemical weed control?	N	%
Strongly oppose	198	72.3%
Oppose	31	11.3%
Neutral	9	3.3%
Support	18	6.6%
Strongly support	14	5.1%
No response	*4*	*1.5%*
Total participants	**274**	**100.0%**

To what extent do you support the City’s use of chemical weed control?



QUESTION: “To what extent do you support the City’s use of steam and hot water weed control?”

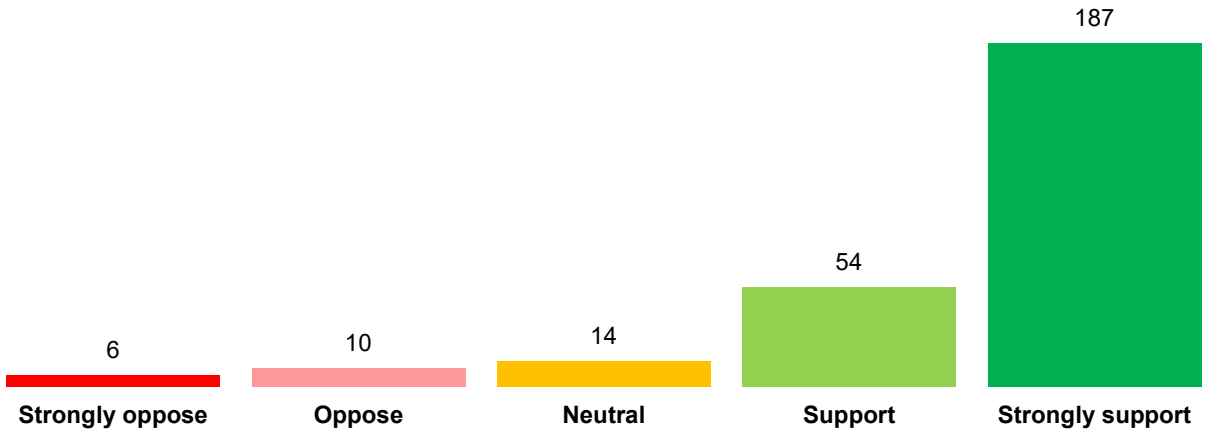
Respondents were asked the following question:

> *The draft Plan outlines the use of **steam and hot water weed control** which is a relatively new method that is mainly used on paved and mulched areas. The City commenced the use of steam and hot water in 2022 as part of its commitment to reduce reliance on chemical weed control. At this stage, the technology is less effective than chemical weed control and is not a viable method of weed control for large infestations or for wide application as it is very labour intensive and costly. It is also not appropriate for natural areas, as it is non-selective (kills everything) and can therefore impact non-target native species. Additionally, the equipment is generally too large and cumbersome to use safely in natural areas.*
>
> *To what extent do you support the City’s use of steam and hot water weed control as described above?*

Approximately two-thirds of respondents *strongly supported* the use of use of steam and hot water weed control and 54 *supported* this method of weed control. In total, 16 respondents *opposed* the use of steam and hot water weed control. This data is shown in the table and chart below.

To what extent do you support the City’s use of steam and hot water weed control?	N	%
Strongly oppose	6	2.2%
Oppose	10	3.6%
Neutral	14	5.1%
Support	54	19.7%
Strongly support	187	68.2%
No response	*3*	*1.1%*
Total participants	**274**	**100.0%**

To what extent do you support the City’s use of steam and hot water weed control?



QUESTION: “Do you have any comments on the draft Weed Management Plan 2022–2032?”

Respondents were asked if they had any comments on the draft Weed Management Plan 2022–2032 and 186 respondents provided feedback. These comments have been grouped into the themes shown in the table below. Approximately half of the comments related to the use of glyphosate specifically, or chemical weed control more generally. Other common themes raised by respondents included:

- Prefer the City use more physical / non-chemical weed control
- Prefer the City display signage for longer / improve notifications
- Concerned that weed spraying is undertaken completed incorrectly / ineffectively by the City.

All comments are provided verbatim at Appendix 15.

Do you have any comments on the draft Weed Management Plan 2022–2032?	N	%
Prefer the City do not use glyphosate / chemical weed control (health / environmental / toxicity concerns)	130	47.4%
Prefer the City use more physical / non-chemical weed control	37	13.5%
Prefer the City display signage for longer / improve notifications	19	6.9%
Would like dog parks to be ‘chemical free’	5	1.8%
Concerned that weed spraying is undertaken incorrectly / ineffectively by the City	18	6.6%
Noted a specific location / infrastructure where weeding is needed	8	2.9%
General praise for friends groups / request for more funding	7	2.6%
General praise for the draft Plan / suggestions for weed types to be added to Plan	9	3.3%
General praise for the use of glyphosate / steam control ineffective	4	1.5%
Other / miscellaneous comment	10	3.6%
Total comments	186	67.9%
Total responses	**274**	**—**

APPENDIX 1 — Email to friends groups

From: Consultation
Sent: Thursday, 24 November 2022 11:00 AM
To:
Subject: Community Consultation: Draft Weed Management Plan 2022–2032

Dear [redacted]

The City of Joondalup is seeking feedback on its draft Weed Management Plan 2022–2032.

The draft Plan details an integrated weed management approach which prevents, monitors and controls the introduction and spread of weeds in the City.

In developing the draft Weed Management Plan 2022–2032 consideration has been given to previous Council decisions, outcomes of the Strategic Community Reference Group meeting held in May 2021 and community concerns regarding herbicide use, including two open petitions. The draft plan is based on the latest science, research and relevant advice from the State Government and industry agencies.

If you would like to provide feedback, the City would appreciate a formal response from your group [redacted] in writing either via email, or via post to:

Chief Executive Officer
City of Joondalup
PO Box 21
Joondalup WA 6919

An Online Comment Form is also available for general community members, and the City would appreciate you sharing the consultation information with your members and networks. Please note that feedback from individuals must be submitted through this form.

Community consultation closes **Wednesday 14 December 2022**. For further information, please review the Frequently Asked Questions, or contact the City on **9400 4000**.

Kind regards,

City of Joondalup

Tel: 08 9400 4000
Fax: 08 9300 1383
Email: info@joondalup.wa.gov.au

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The City of Joondalup acknowledges the Traditional Custodians of this land, the Whadjuk people of the Noongar nation. We recognise the culture of the Noongar people and the unique contribution they make to the Joondalup region and Australia. We pay our respects to Elders past, present, and emerging, as well as all Aboriginal and Torres Strait Islander peoples.

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APPENDIX 2 — Email to residents / ratepayer groups

From: Consultation
Sent:
Subject: Community Consultation: Draft Weed Management Plan 2022–2032

Dear Resident and Ratepayer Groups

The City of Joondalup is seeking feedback on its draft Weed Management Plan 2022–2032.

The draft Plan details an integrated weed management approach which prevents, monitors and controls the introduction and spread of weeds in the City.

In developing the draft Weed Management Plan 2022–2032 consideration has been given to previous Council decisions, outcomes of the Strategic Community Reference Group meeting held in May 2021 and community concerns regarding herbicide use, including two open petitions. The draft plan is based on the latest science, research and relevant advice from the State Government and industry agencies.

If you would like to provide feedback, the City would appreciate a formal response from your group in writing either via email, or via post to:

Chief Executive Officer
City of Joondalup
PO Box 21
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An Online Comment Form is also available for general community members, and the City would appreciate you sharing the consultation information with your members and networks. Please note that feedback from individuals must be submitted through this form.

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APPENDIX 3 — Frequently Asked Questions (page 1)

City of Joondalup

Draft Weed Management Plan 2022–2032 Frequently Asked Questions

What is the purpose of the community consultation?

The City of Joondalup is seeking feedback on its draft Weed Management Plan 2022–2032.

What is the purpose of the draft Weed Management Plan 2022–2032?

The purpose of the draft Weed Management Plan 2022–2032 is to provide an integrated approach to the management of weeds within the City.

The draft Plan details actions to prevent, monitor, prioritise, and control the introduction and spread of weeds in the City. The objectives of the Plan are to:

- protect biodiversity
- maintain amenity
- meet regulatory requirements
- reduce the reliance on herbicide use (where technology allows)
- minimise bushfire risk
- increase weed management communication to the community
- support community weed management initiatives.

Was community consultation undertaken to inform the development of the draft Weed Management Plan 2022–2032?

Yes. The City conducted consultation with the Strategic Community Reference Group in May 2021. The Strategic Community Reference Group comprises community members, experts and Elected Members.

Key initiatives and improvements were identified for consideration in the development of the draft Plan, such as increased community education and communications regarding weed management risks and benefits.

Community concerns relating to chemical weed control were also acknowledged in the development of the Plan and have informed the proposed integrated weed management approach.

Where does the City undertake weed management activities?

The City undertakes weed management on City-managed and owned land across its 22 suburbs, as required. Weed management is conducted in the City to differing degrees, depending on the primary function and usage of the public open space (such as for sport, recreation, conservation, etc).

What is the City's approach to weed management?

As outlined in the draft Weed Management Plan 2022–2032, the City uses an integrated weed management approach, including prioritisation of sites, weed monitoring, weed prevention, weed control, training, partnerships, and community education.

Weed control treatment methods outlined in the draft Plan include:

- Physical week control
- Chemical weed control
- Steam and hot water weed control.

Please refer to the draft Plan for detailed information on these weed control treatment methods.

City of Joondalup | Boas Avenue Joondalup WA 6027 | PO Box 21 Joondalup WA 6919 | T: 9400 4000 F: 9300 1383 | joondalup.wa.gov.au

How does the City determine the appropriate weed control method(s) for each site?

The City takes the following into consideration when determining the most appropriate weed control method(s):

- the target weed
- the season
- timing i.e. before weeds set seed
- resistance of the weed to specific herbicides
- potential residual effects and damage to off-target species
- rotation of the type of herbicide used to reduce herbicide resistance
- selection of the least toxic herbicide for the target species
- site location and any special considerations i.e. near wetlands
- weather conditions i.e. rain and wind
- effectiveness of outcomes, labour intensity required and cost involved.

When is physical weed control used?

Physical weed control, such as hand weeding, is used for small infestations, or as a follow-up to other weed control methods, usually in natural areas. Hand weeding is also used in sensitive areas where herbicide use is not recommended.

Other physical weed control methods, such as smothering and the use of mulch, are used in sports parks, recreation parks and urban landscaping areas, but are generally not suitable for natural areas because they can prevent the growth of native seedlings.

Widespread hand weeding is generally not employed, as it is very labour intensive and, if conducted inappropriately, can result in negative impacts to native vegetation by disturbance of the soil surface, and can also lead to erosion.

When is chemical weed control used?

Chemical weed control, through the use of herbicides, can be an effective and practical method of weed control applicable in a variety of situations and locations.

Herbicides are used globally and are an effective component of integrated weed management. Chemical weed control is recognised as being the most effective weed control method and is the most economical as it requires less labour, fuel and equipment than other methods of weed control.

The draft Weed Management Plan 2022 – 2032 proposes the continued use of herbicides such as glyphosate as part of an integrated approach to weed management.

The City complies with regulations and implements a number of initiatives to maximise safety and minimise risk to staff and the community including the following:

- Adhering to *Health (Pesticides) Regulations 2011 – Signage Requirements*.
- City of Joondalup Pesticide Use Notification and Pesticide Exclusion Register.
- Use of non-chemical weed control for hardstand areas within a 50 metre radius of schools, within playspaces and within kerbs, footpaths, hardstand median islands, mulched median islands and general paved areas within the Central Business Precinct.
- Utilising technology such as WeedSeeker to improve efficiency of herbicide application.
- Herbicide use adjacent to sensitive facilities is subject to the City's assessment of authorised chemicals process.

When is steam and hot water weed control used?

Steam and hot water weed control is a relatively new method of weed control that is used mainly on paved and mulched areas. The City commenced the use of steam and hot water in 2022 as part of its commitment to reduce reliance on chemical weed control.

At this stage, the technology is less effective than chemical weed control and is not a viable method of weed control for large infestations or for wide application as it is very labour intensive and costly.

Steam and hot water weed control is also not a viable option for the treatment of weeds in natural areas, as it is non-selective and can therefore impact non-target native species. Additionally, the equipment is generally too large and cumbersome to use safely in natural areas.

Why doesn't the City use only non-chemical weed control?

The City conducts weed management on City managed or owned land across its 22 suburbs. Within the City, there are 285 identified weeds including 15 declared pest plants and five Weeds of National Significance. These weed species are often widespread and without control can alter public open spaces reducing viability and biodiversity.

Integrated weed management involves using a variety of different techniques to monitor, prevent, prioritise and control weeds and keep weed densities at a manageable level. Non-chemical weed control methods (including physical weed control and steam and hot water weed control) are generally far more time consuming, labour-intensive and much less effective than herbicide use; however, they still form an important part of an integrated weed management approach.

Can I register to be notified before the City conducts chemical weed spraying near my home?

Yes. Community members can apply to be added to the City's Pesticide Use Notification Register. Registered community members are advised in advance of chemical spraying activities undertaken by the City that are scheduled to occur within 100 metres of their residence.

As part of the registration, community members can also select up to five park/reserve locations in the City to receive advance notification of chemical spraying activities. Further information on the Pesticide Use Notification Register can be found on the City's website at **joondalup.wa.gov.au**

Can I exclude my own verge from chemical weed spraying by the City?

Yes. Community members wishing to exclude the verge immediately adjoining their property/residence from chemical weed control undertaken by the City can apply to be added to the City's Pesticide Exclusion Register. Further information on the Pesticide Exclusion Register can be found on the City's website at **joondalup.wa.gov.au**

Does the City use the herbicide glyphosate as part of its chemical weed control program?

The draft Weed Management Plan 2022 – 2032 proposes the continued use of herbicides such as glyphosate as part of an integrated approach to weed management.

The City is guided by industry regulators such as the Australian Pesticides and Veterinary Medicines Authority (APVMA) and the WA Department of Health which advise that glyphosate is safe when used in accordance with the label instructions. The City complies with regulations and implements a number of initiatives to maximise safety and minimise risk to staff and the community when using herbicides.

Who is being contacted to provide feedback on the draft Weed Management Plan 2022–2032?

Consultation is open to all members of the community. The City is directly consulting with the following community stakeholders:

- Environmental/Friends' groups
- Local resident/ratepayer groups

In addition, all information is available on the City's website. Anyone interested in the proposal can submit feedback via an Online Comment Form. Responses are limited to one per person.

How do I provide feedback on the draft Weed Management Plan 2022–2032?

If you are interested in providing feedback on the draft Plan, please complete the Online Comment Form available via the Community Consultation section of the City's website at **joondalup.wa.gov.au**

Alternatively hard-copy Comment Forms are available on request.

All feedback must be submitted through one of these forms.

When is the community consultation period open?

The community consultation period is open from **Thursday 24 November 2022 – Wednesday 14 December 2022**.

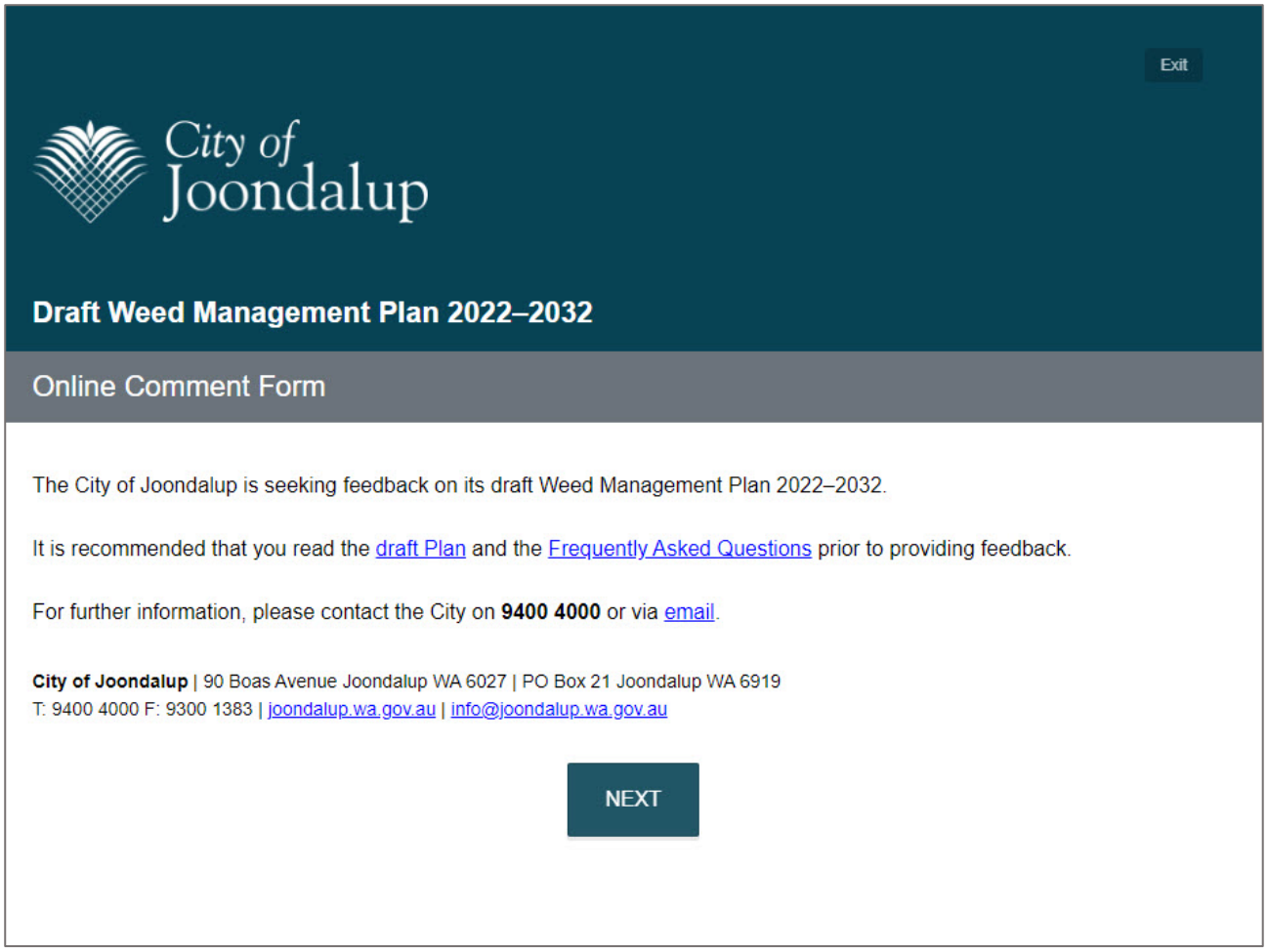
What happens next?

After the close of the consultation period, the City will consider all feedback received and prepare a report for the Council on the outcomes. The outcomes will also be made available via the Community Consultation section of the City's website at **joondalup.wa.gov.au**

Who do I contact for further information?

For further information, please contact the City on **9400 4000** or email **info@joondalup.wa.gov.au**

APPENDIX 4 — Online Comment Form (page 1)



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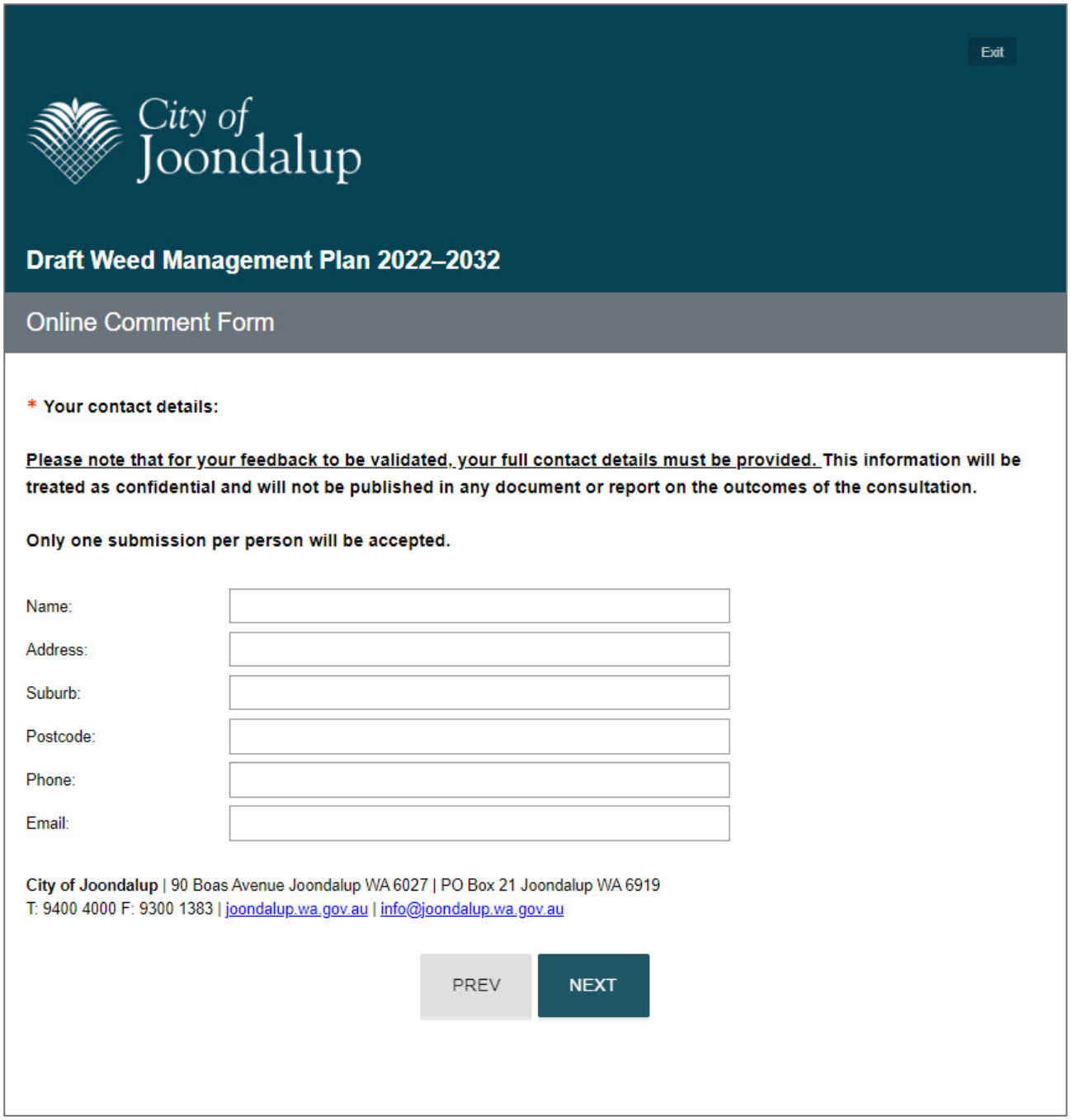


Exit

City of Joondalup

Draft Weed Management Plan 2022–2032

Online Comment Form

* **Your contact details:**

Please note that for your feedback to be validated, your full contact details must be provided. This information will be treated as confidential and will not be published in any document or report on the outcomes of the consultation.

Only one submission per person will be accepted.

Name:

Address:

Suburb:

Postcode:

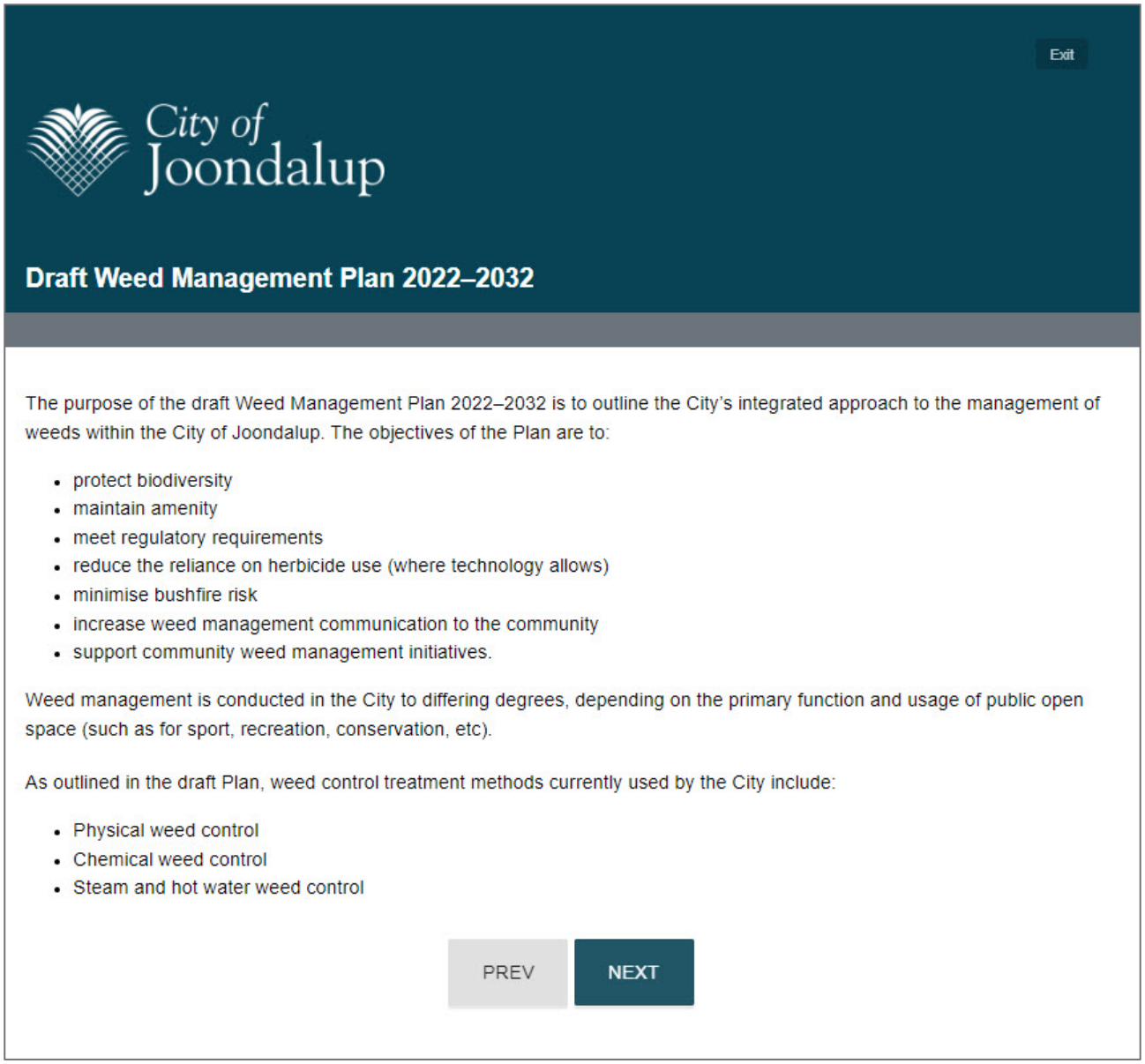
Phone:

Email:

City of Joondalup | 90 Boas Avenue Joondalup WA 6027 | PO Box 21 Joondalup WA 6919
T: 9400 4000 F: 9300 1383 | joondalup.wa.gov.au | info@joondalup.wa.gov.au

PREV NEXT

(page 3)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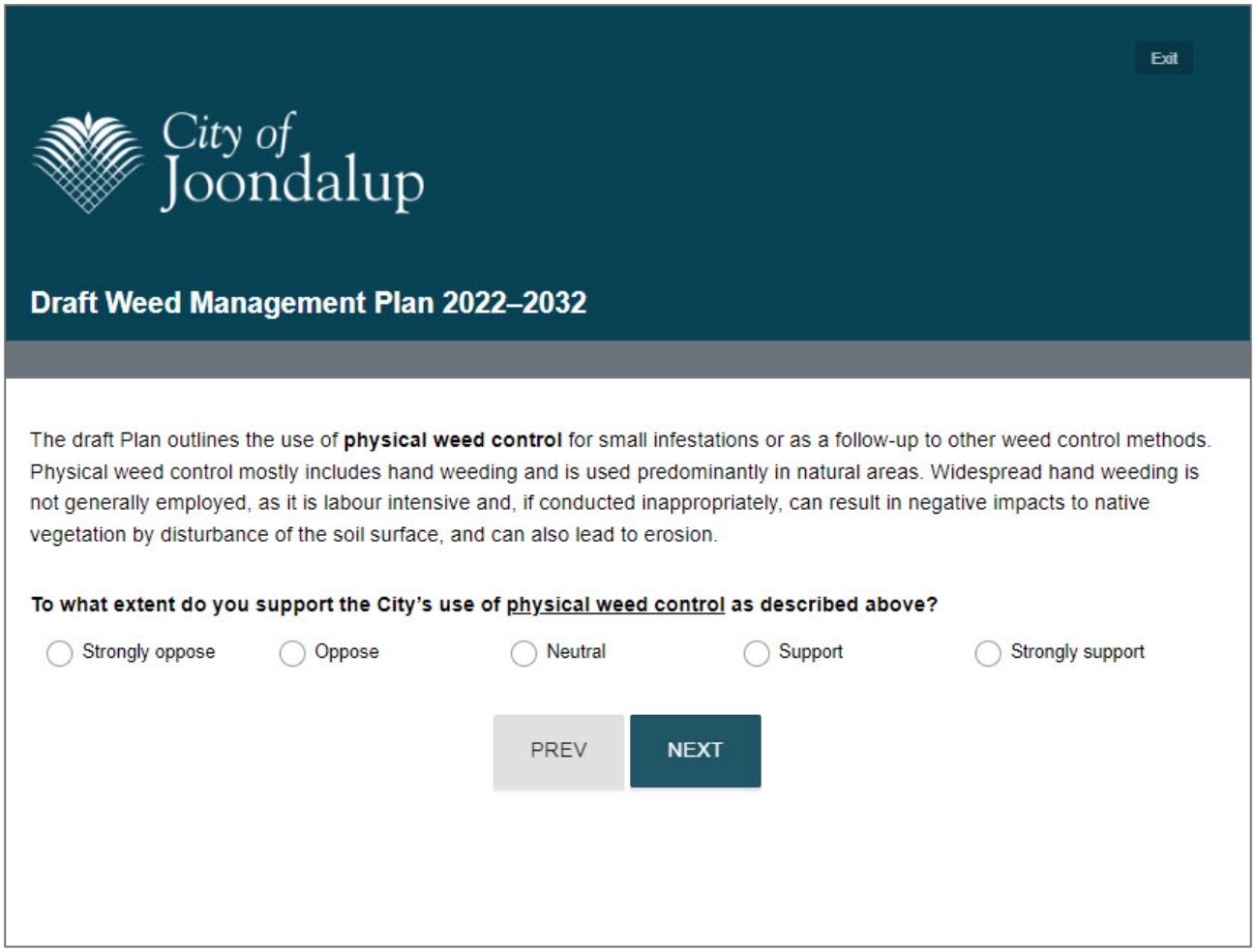
City of Joondalup
Draft Weed Management Plan 2022–2032
The purpose of the draft Weed Management Plan 2022–2032 is to outline the City's integrated approach to the management of weeds within the City of Joondalup. The objectives of the Plan are to:
protect biodiversity
maintain amenity
meet regulatory requirements
reduce the reliance on herbicide use (where technology allows)
minimise bushfire risk
increase weed management communication to the community
support community weed management initiatives.
Weed management is conducted in the City to differing degrees, depending on the primary function and usage of public open space (such as for sport, recreation, conservation, etc).
As outlined in the draft Plan, weed control treatment methods currently used by the City include:
Physical weed control
Chemical weed control
Steam and hot water weed control
PREV
NEXT

(page 4)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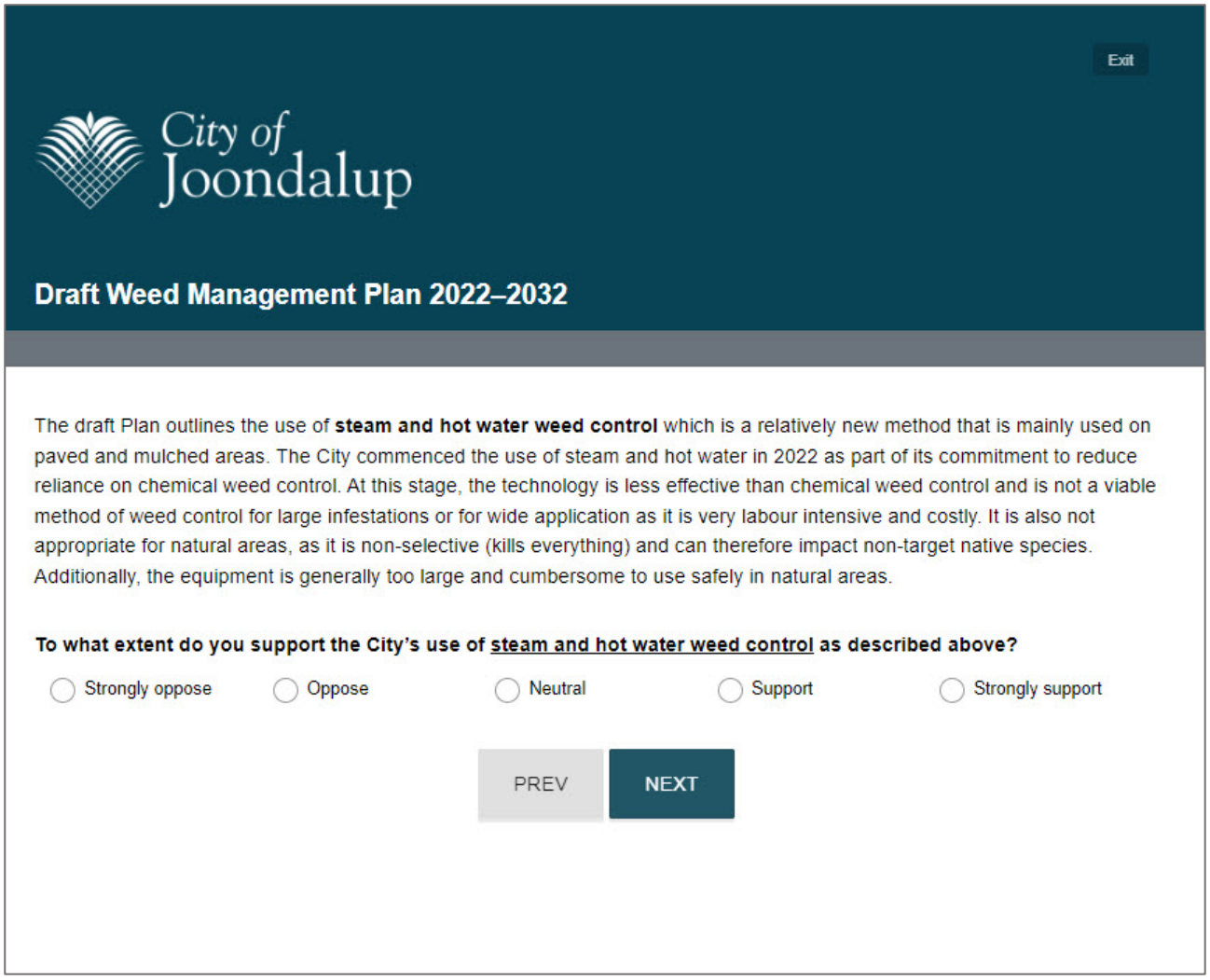
City of Joondalup
Draft Weed Management Plan 2022–2032
The draft Plan outlines the use of physical weed control for small infestations or as a follow-up to other weed control methods. Physical weed control mostly includes hand weeding and is used predominantly in natural areas. Widespread hand weeding is not generally employed, as it is labour intensive and, if conducted inappropriately, can result in negative impacts to native vegetation by disturbance of the soil surface, and can also lead to erosion.
To what extent do you support the City's use of physical weed control as described above?
Strongly oppose
Oppose
Neutral
Support
Strongly support
PREV
NEXT

(page 5)


Exit
City of Joondalup
Draft Weed Management Plan 2022–2032
The draft Plan outlines the use of chemical weed control through the use of herbicides. Chemical weed control is safe and is the most effective and economical means of weed control, as it requires less labour, fuel and equipment. The City schedules the application of herbicides according to rainfall and temperature in order to increase effectiveness and minimise any adverse impacts. Chemical weed control is conducted in strict accordance with regulatory requirements, and with consideration to community wellbeing and public health.
To what extent do you support the City's use of chemical weed control as described above?
Strongly oppose
Oppose
Neutral
Support
Strongly support
PREV
NEXT

(page 6)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City of Joondalup
Draft Weed Management Plan 2022–2032
The draft Plan outlines the use of steam and hot water weed control which is a relatively new method that is mainly used on paved and mulched areas. The City commenced the use of steam and hot water in 2022 as part of its commitment to reduce reliance on chemical weed control. At this stage, the technology is less effective than chemical weed control and is not a viable method of weed control for large infestations or for wide application as it is very labour intensive and costly. It is also not appropriate for natural areas, as it is non-selective (kills everything) and can therefore impact non-target native species. Additionally, the equipment is generally too large and cumbersome to use safely in natural areas.
To what extent do you support the City's use of steam and hot water weed control as described above?
Strongly oppose
Oppose
Neutral
Support
Strongly support
PREV
NEXT

(page 7)

Exit

City of Joondalup

Draft Weed Management Plan 2022–2032

Online Comment Form

Do you have any comments on the draft Weed Management Plan 2022–2032?

Request to be informed:

Community consultation assists Council in deliberating and then making decisions on certain matters. The analysis from this consultation will be provided to Council to assist them in their decision-making role first at a Briefing Session and then at a Council meeting. Deputations can be made at Briefing Sessions by appointment and questions and public statements can be presented at Council meetings.

☐ I would like to be informed via email when this consultation will be presented at a Briefing Session and Council meeting
Please ensure your email address is provided below

☐ Email address

City of Joondalup Community Engagement Network eNewsletter:
The Community Engagement Network eNewsletter is an online newsletter for community members who want to keep up to date on community consultation activities in the City of Joondalup. If you are interested in subscribing, visit the City's website at joondalup.wa.gov.au

Thank you for taking the time to complete this Online Comment Form. Please click on the SUBMIT FORM button below to finalise.

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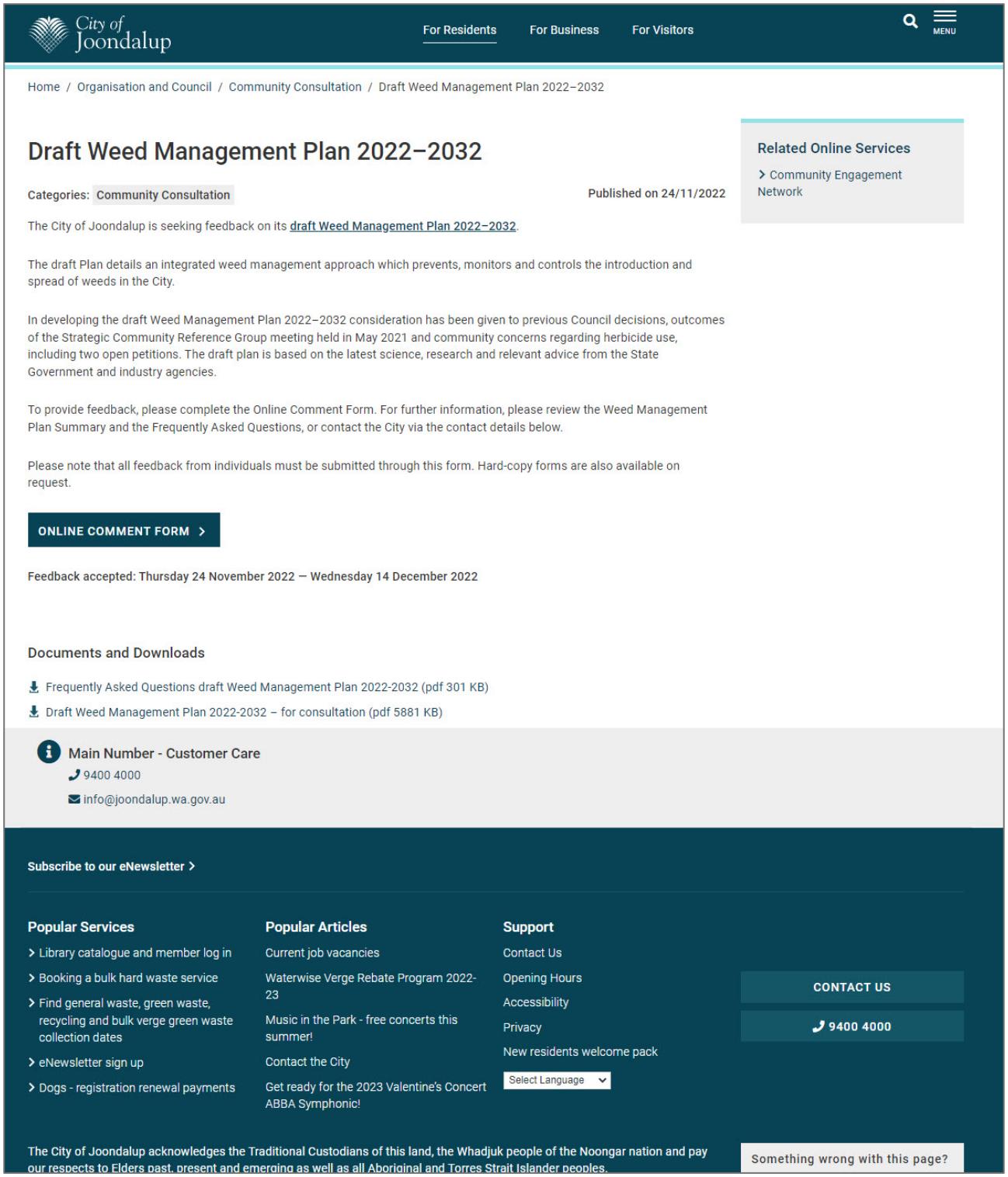
T: 9400 4000 F: 9300 1383 | joondalup.wa.gov.au | info@joondalup.wa.gov.au

PREV SUBMIT FORM

APPENDIX 5 — Community Consultation webpage



City of Joondalup

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Home / Organisation and Council / Community Consultation / Draft Weed Management Plan 2022–2032

Draft Weed Management Plan 2022–2032

Categories: Community Consultation

Published on 24/11/2022

The City of Joondalup is seeking feedback on its draft Weed Management Plan 2022–2032.

The draft Plan details an integrated weed management approach which prevents, monitors and controls the introduction and spread of weeds in the City.

In developing the draft Weed Management Plan 2022–2032 consideration has been given to previous Council decisions, outcomes of the Strategic Community Reference Group meeting held in May 2021 and community concerns regarding herbicide use, including two open petitions. The draft plan is based on the latest science, research and relevant advice from the State Government and industry agencies.

To provide feedback, please complete the Online Comment Form. For further information, please review the Weed Management Plan Summary and the Frequently Asked Questions, or contact the City via the contact details below.

Please note that all feedback from individuals must be submitted through this form. Hard-copy forms are also available on request.

ONLINE COMMENT FORM >

Feedback accepted: Thursday 24 November 2022 — Wednesday 14 December 2022

Documents and Downloads

- Frequently Asked Questions draft Weed Management Plan 2022-2032 (pdf 301 KB)
- Draft Weed Management Plan 2022-2032 – for consultation (pdf 5881 KB)

Related Online Services

> Community Engagement Network

Main Number - Customer Care

9400 4000

info@joondalup.wa.gov.au

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- Booking a bulk hard waste service
- Find general waste, green waste, recycling and bulk verge green waste collection dates
- eNewsletter sign up
- Dogs - registration renewal payments

Popular Articles

- Current job vacancies
- Waterwise Verge Rebate Program 2022-23
- Music in the Park - free concerts this summer!
- Contact the City
- Get ready for the 2023 Valentine's Concert ABBA Symphonic!

Support

- Contact Us
- Opening Hours
- Accessibility
- Privacy
- New residents welcome pack

Select Language

CONTACT US

9400 4000

The City of Joondalup acknowledges the Traditional Custodians of this land, the Whadjuk people of the Noongar nation and pay our respects to Elders past, present and emerging as well as all Aboriginal and Torres Strait Islander peoples.

Something wrong with this page?

APPENDIX 6 — Community Engagement Network eNewsletter (24 November 2022)

No images? Click here

Community Engagement Network

City of Joondalup

Thursday 24 November 2022

Dear Test

View the latest community engagement opportunities:

Use of Bramston Park, Burns Beach

The City of Joondalup is seeking community feedback on two matters relating to the use of Bramston Park, Burns Beach:

A trial of expanded use of the park which has allowed for female senior sport since April 2022. (The use of the park was previously restricted to junior sport only.)

A proposal from Burns Beach Primary School to establish a shared use agreement that would allow them to use Bramston Park on school days between 8.00am and 4.00pm.

To view more information and to provide feedback click the 'Have your say' button.

Feedback accepted: Thursday 24 November 2022 — Wednesday 14 December 2022

Have your say

(continues…)

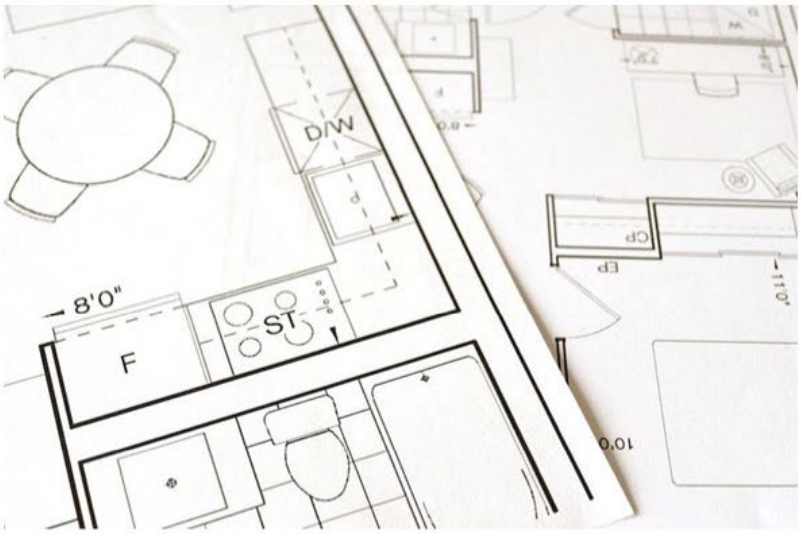
Draft Weed Management Plan 2022–2032

The City of Joondalup is seeking feedback on its draft Weed Management Plan 2022–2032. The draft Plan details an integrated weed management approach which prevents, monitors and controls the introduction and spread of weeds in the City.

To view the draft Plan and provide feedback click the 'Have your say' button.

Feedback accepted: Thursday 24 November 2022 — Wednesday 14 December 2022

Have your say



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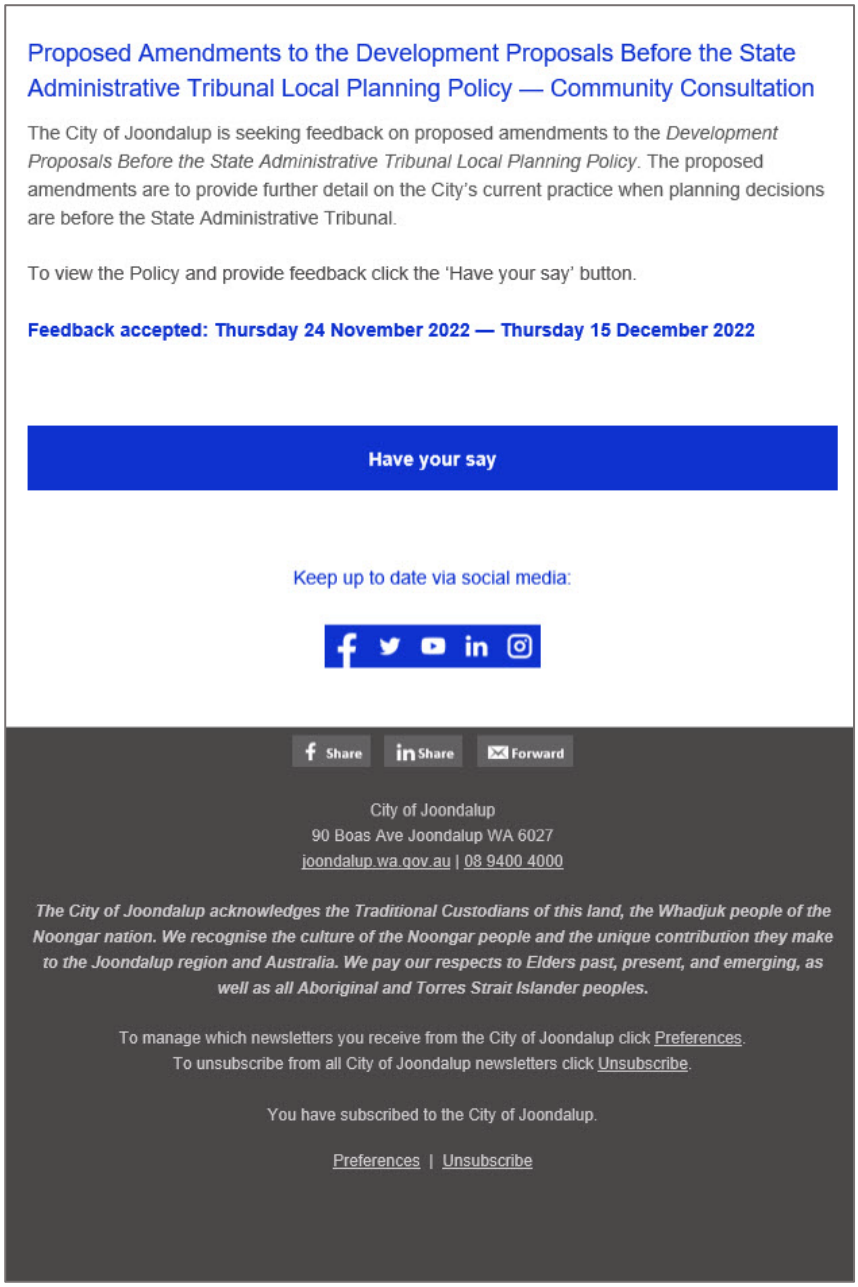

Proposed Amendments to the Development Proposals Before the State Administrative Tribunal Local Planning Policy — Community Consultation

The City of Joondalup is seeking feedback on proposed amendments to the *Development Proposals Before the State Administrative Tribunal Local Planning Policy*. The proposed amendments are to provide further detail on the City's current practice when planning decisions are before the State Administrative Tribunal.

To view the Policy and provide feedback click the 'Have your say' button.

Feedback accepted: Thursday 24 November 2022 — Thursday 15 December 2022

Have your say

Keep up to date via social media:

Share Share Forward

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90 Boas Ave Joondalup WA 6027
joondalup.wa.gov.au | 08 9400 4000

The City of Joondalup acknowledges the Traditional Custodians of this land, the Whadjuk people of the Noongar nation. We recognise the culture of the Noongar people and the unique contribution they make to the Joondalup region and Australia. We pay our respects to Elders past, present, and emerging, as well as all Aboriginal and Torres Strait Islander peoples.

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To unsubscribe from all City of Joondalup newsletters click Unsubscribe.

You have subscribed to the City of Joondalup.

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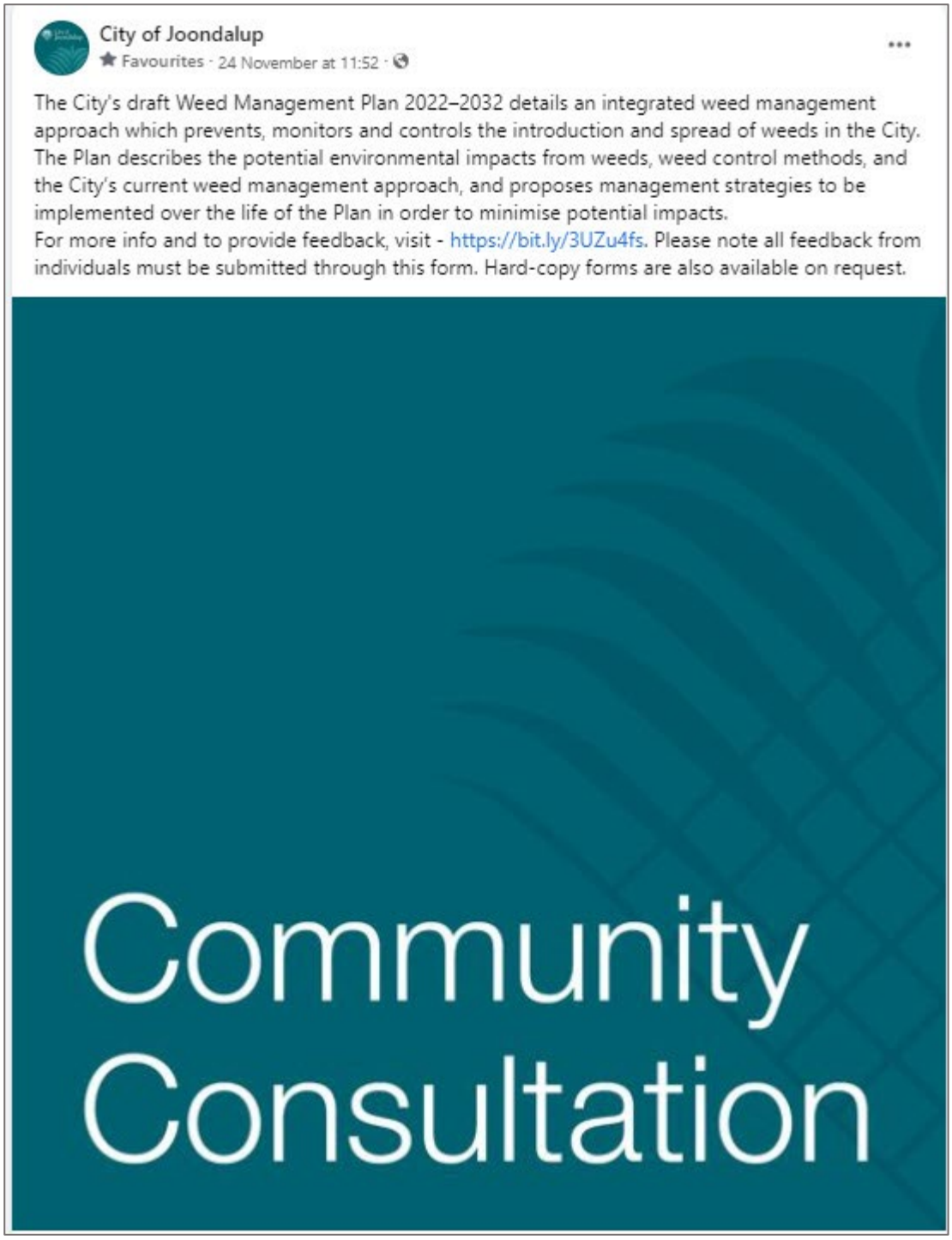
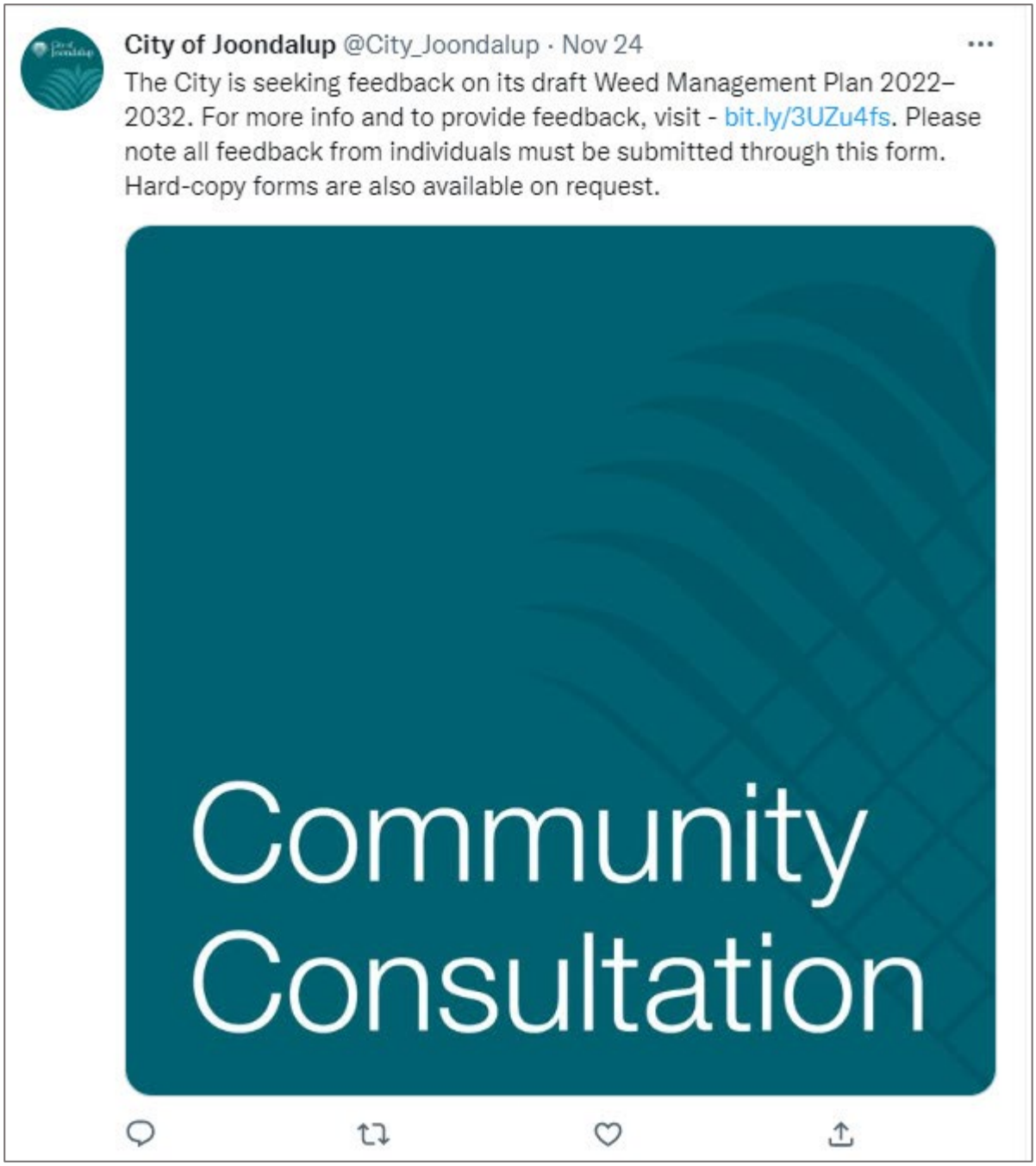
APPENDIX 7 — Facebook post (24 November 2022)



APPENDIX 8 — Twitter post (24 November 2022)



APPENDIX 9 — Response from Mullaloo Beach Community Group (page 1)

MULLALOO BEACH COMMUNITY GROUP INC.
PO Box 908
Hillary 6923
mbgcinc.org.au

Community Consultation on Draft Weed Management Plan (2022 – 2032)[1]

Members and friends of this Association has been actively involved in community conservation from 2006 and the following comments refer to the City of Joondalup Draft Weed Management Plan (2022 – 2032)[1]

Initially it is our view that the proposed Management Plan consultation period was very limited in time and did not allow this complex Plan to be fully digested, critically assessed and reviewed.

The following essential detail is missing from the draft document:

1. Any planned structure, costings and timeline actions, by suburb and public open space.
2. Any mention of the life cycle of weeds and their critical importance to monitor, map, define and to control the resource emphasis taken to manage individual weed species by their inventory, development and seeding signatures.
3. How the City will effectively protect native vegetation and ecosystems in natural areas, as well as the amenity, functionality and aesthetics of public open space the proliferation of weeds throughout the City in general.
4. Any mention of La Nina or El Nino and their effect on the life cycle of weeds (by species).
5. Any method to do something in the event of a) forecast and b) eventuated La Nina or El Nino preceding a typical West Australian Summer.
6. Any reference to or definition of “climate stability.”
7. Any method of adaptation in the event of the onset of rapid climate instability.
8. The effect of pesticide(s), including herbicide(s), and combinations and frequencies thereof, on base editing of our biodiversity, soil ecology, and ecological communities and ecological linkages.
9. The effects and costs of failing to protect biodiversity and ecological linkages on human health, well-being and survival.
10. The details of the staffing levels, operating field practices, and operating budgets of a) the Urban Areas Team and b) the Natural Areas Team.
11. Any permanent requirement on City Staff and contractors not to use of an open hose when applying pesticide(s), including herbicide(s).
12. Any permanent requirement on City Staff and contractors to always use spray hoods on spray heads when spraying pesticide(s), including herbicide(s) including on hand-held spray lances or machine-held spray booms to minimise the overall consumption of chemical and to prevent any overspray or wind drift.
13. Any details on how the City Staff or contractors are required to dispose of unused pesticide(s), including herbicide(s).
14. All details on the complete SOP(s) used by City Staff and contractors to undertake pesticide(s), including herbicide(s) spraying activities in the City.
15. All details on how the City ensures total compliance to the complete SOP(s) used by City Staff and contractors when undertaking pesticide(s), including herbicide(s) spraying in the City.

(page 2)

16. Any timed City activities requesting the vigilant reporting of weeds at seedling size by the residents of our 22 suburbs.
17. Any means to effectively address the fire hazards and weed seed bank inventories continually produced on vacant City land and vacant blocks and in PAWs. To render these areas inert, as a minimum, quarterly line-strimming and/or mowing with green waste removal is required to be a scheduled activity so that the City naturally minimises fire hazards and any subsequent demand on limited resources courtesy of a logarithmic weed seed production and seed dispersal across the City.
18. The terms and conditions of the supply contracts for pesticides, including herbicides, including details of any long-term (greater than 1 year) advance purchasing commitments.
19. The City's quantity (volume and concentration), by time and brand and type, of pesticides, including herbicides, a) currently in storage, b) to be purchased by the City and c) consumed monthly by suburb location.
20. Any SDS or MSDS including those current for the admixtures that are the utilised pesticide(s), including herbicide(s).
21. Any reports and references detailing the effects of the cumulative and combined use of pesticide(s), including herbicide(s).
22. Any expiry details for the pesticide(s), including herbicide(s).
23. Any listing of the AgVet chemical products permitted under PER 13534.
24. Any details of any SOP detailing how the City classifies, handles, transports, stores and disposes of a) weed bags and b) seed bags. These bags of biological content are commonly collected from the activities of volunteers such as Friends Groups and Community Groups.
25. Any details of how the City identifies any build-up of pesticide, including herbicide resistant weeds (by species), including to combinations of pesticide(s) and herbicide(s) thereof.
26. Any details of how the City costs any occurrence of pesticide, including herbicide resistance.
27. Any details of how the City intends to adapt in the event that the use of pesticides, including herbicides, either inducing weed intolerance or harming public health.
28. Any details of how City staff are trained in the application and use of pesticides, including herbicides.
29. Any details of the licensing of the contractors directly involved in the use of pesticide (s), including herbicides(s).
30. Any details of City staff Green Card training.
31. Any inclusion for design and impact assessment based on post 2016 peer-reviewed referencing including a) the latest global climate status, in parallel with b) the impending scenarios detailed by The IPCC's AR6 as agreed by 194 countries.
32. Any reminder by the City that a lack of full scientific certainty should not be used as a reason for postponing measures to prevent further environmental degradation.
33. Any meaningful *Design Performance Criteria* based on a an unfettered survey of all the contributors to this City requested community consultation asking whether or not their individual contributions have been considered in full and included where necessary.

34. Details of how the City staff use herbicides in accordance with the City's Spraying Chemicals Work Instruction, an internal procedure in the ISO 9001 Quality Management System (QMS).
35. Any reference to available drone sensing and mapping technology
36. Any meaningful a) *Implementation Criteria* and b) *Operating Performance Criteria* in light of the 35 points above.

For your consideration

Yours sincerely

[redacted] 14122022
Chairperson

APPENDIX 10 — Response from Joondalup Community Coast Care Forum

From: [redacted]
Sent: Wednesday, 14 December 2022 5:02 PM
To: info@joondalup.wa.gov.au
Subject: JCCCF feedback on the draft Weed Management Plan 2022 - 2032

Chief Executive Officer
City of Joondalup.
Dear Sir,
The "Joondalup Community Coast Care Forum, Inc" (JCCCF) is the incorporated umbrella group for three of the four coast care groups undertaking coastal reserve restoration work within the City of Joondalup, being:

- "Friends of North Ocean Reef - Iluka Foreshore"
- "Friends of Sorrento Beach & Marmion Foreshore"
- "Friends of Hillarys & Kallaroo Foreshore"

The first two of the friends groups have been involved in extensive weed control for the last 20 years, have demonstrated considerable expertise in performing that work and achieved very successful outcomes. The third friends group listed above has been recently formed and has started their weed control program, leveraging off the experience of others and working with the City's natural areas team.
At the JCCCF Committee meeting on the 12th of December, it was noted the draft is subject to public consultation and the content of the draft Plan was discussed. It was resolved that I respond on behalf of JCCCF, with our feedback as follows:
CLAUSE 1.1, Background
There is a lot of reference to biodiversity in this clause and other parts of the document. There is no statement that most weed control (we think maybe over 90%) is simply for "cosmetic" purposes, that is, to make our City look neat and tidy. That is referred to in Clause 2.2: "meet community expectations for the amenity and aesthetics of local areas" and should be referred to in this clause as the primary reason for the City's weed control program.
CLAUSE 1.3, Public Health and Safety
There is a statement that some weeds can impact on human health. But there is far more concern in the community that herbicide use can affect human health, with a focus on glyphosate (given most in the community are not aware of the other herbicides the City uses). APVMA rely on industry to test the safety of the products that are approved by them. Most herbicide production now occurs in China so unfortunately there is the potential for highly poisonous (cancer causing) contaminants, and APVMA do not conduct spot checks on what is actually being imported and used in Australia (I confirmed that at a WALGA weed management conference some years ago, where an APVMA representative was present on a video link). So we see that there will be growing opposition to the use of all herbicides generally (and the City, in response, should certainly just not replace glyphosate with even more poisonous or persistent herbicides), and the City needs to do a lot more to develop a strategy to reduce herbicide use, which has only started in a small way to date. JCCCF agree with those concerns, but do not agree that herbicide use should be entirely eliminated (some herbicide use is essential in natural areas at least). Instead strategies must be put into place to substantially reduce herbicide use, which has only started in a small way at present.
Also, there is a need to make herbicide application more visible so residents using stronger concentration of marker dye, so they can avoid physical contact with it. We have seen examples of a higher concentration of dye used in the City of Wanneroo and the Town of Cambridge (blue dye very visible and no spray operations or signage in sight).

1

CLAUSE 3, Background of Weed Control

The most important aspect of weed control is not acknowledged, that is, to reduce the weed seed bank in the soil by controlling weeds prior to seed set, or physically remove them once they have set seed. This blocks the reproduction cycle. If this is not adopted, there will be an endless cycle on weed control (which if herbicides are widely used, this is of concern), and certainly the vegetation condition/ biodiversity of natural areas will never improve.

CLAUSE 3.1, Physical Weed Control

We disagree that physical weed control is suitable for small infestations – some friends groups in our City have shown many hectares can be weeded out manually, with a strategy applied as referred to in our comment about Clause 3.

For natural areas, we have found it is the only way to improve bushland condition, especially if using the "Bradley Method" as the City says it does (the City only sprays two of the dozens of weed species with selective herbicide in good condition bushland, as nearly all other species cannot be sprayed without collateral damage).

Unlike herbicide application, physical weed control is not weather dependent (that should be listed as an advantage in Table 1). Also an advantage not listed in Table 1 (but listed for herbicides in Table 2); "Can prevent weeds seeding and spreading" and add "before or after seed set".

Figure 4 is a very poor example of physical weed control as it illustrates bad practice and should be removed from the document. Most weeds leave no hole in the ground behind when removed (eg Geraldton Carnation Weed), or they can be levered out or cut off at the base very quickly with a serrated knife (eg perennial veld grass, many flat weed species etc).

CLAUSE 3.2, Chemical Weed Control

There are many disadvantages that are not listed in Table 2:

- Herbicide application is causing ongoing concern in the community.
- It is weather dependent, meaning the spraying program can slip, allowing weeds to set seed.
- Ineffective in controlling weed spread after seed set.
- Cannot control the majority of weed species in natural areas (without causing collateral damage)
- Pre-emergent herbicides pollute ground water in sandy soils.
- Can kill soil microbes (note – listed as a disadvantage for steam/ hot water treatment, but not for herbicides)

The winter weather significantly delayed the City's spraying program in 2022, and we heard from another friends group that the firebreaks were being sprayed after seed set. I have personally seen weeds being sprayed after seed set in earlier years too.

We understand the City is trialling a pre-emergent herbicide Sierraron 4G. We have seen "trials" at the City can be widespread, as was the case for the herbicide Esplanade which Council did not support. It contains dichlobenil which is very persistent in groundwater. We don't believe we should be polluting our environment to achieve cosmetic weed control, because that is what it is being used for!

To support the objective of reducing reliance on herbicide use (as per Clause 1.2.2), we believe contracts for herbicide application should include weed slashing. So as soon as weeds set seed (for most weed species, late August or early September), all herbicide application should stop and slashing used instead to mow down the weeds for a cosmetic affect. This is because herbicide application does not generally kill the seeds. This approach should apply to all firebreaks too. There are very effective slashing tools available now, such as the "Indestructible Trimmer" which can be fitted to existing wipper-snippers. Processes or tree guards may need to be implemented to prevent trees from being ring barked! This approach would be consistent with a herbicide use reduction strategy.

We request that authorised friends group volunteers (and the contractors they directly supervise) be able to "wipe" certain weed species with tongs, as there is no impact to their safety (if using nitrile gloves, long sleeves and safety glasses, all of which we have) or the public (no spray drift and applied inside natural areas only, and with marker dye). It takes all day when wiping just to use a few litres of herbicide mix, as it

is precisely applied (so does not contaminate the soil). Many local governments and DBCA allow friends groups not only to wipe weeds but spray as well, so we believe the City of Joondalup is imposing unreasonable restrictions on friends groups, while not have the resources to do this labour intensive work themselves.

CLAUSE 3.3, Steam and Hot Water Weed Control

JCCCF supports steam treatment, but it is energy intensive (creating greenhouse gases) and water intensive, so it should only be used on weeds which cannot be removed manually, such as weeds in brick paving. The areas treated with steam should be expanded, such as the coastal shared path.
The contract for steam weeding should also include manual weeding, as often it is much quicker and less energy intensive to hand pull a weed than sizzle it for 20 seconds! So both methods should be performed simultaneously, one operator steaming, the other manually weeding. It would not take them long to learn which method is most efficient in a particular situation.

CLAUSE 3.3, Biological Weed Control

A rust is being developed for the widespread weed "Fleabane" and trials starting shortly. So biological weed control should be part of the City's integrated weed management.

CLAUSE 4.1, Natural Areas

Given the City has stated previously they use the "Bradley Method" of weeding in natural areas, manual weeding is therefore essential, as most weed species cannot be sprayed with herbicides in good condition bushland, or better.
JCCCF challenges the statement that it is managing natural areas for biodiversity, as the Natural Areas Team has insufficient staff numbers to do much manual weeding, nor is much spent on contractors to do that. The City appears to be mainly managing natural areas for fire control, including fire breaks. Agree that is important, but the City should recognise it does not budget to improve biodiversity in most natural areas. There is no recommendation to increase spending on manual weed control and more frequent selective herbicide application to conserve/ improve natural area biodiversity.
The City applies selective herbicides on just two weed species (annual and perennial veld grass, to our knowledge) so what about the remaining 283 weed species, as the City currently spends very little on manual weed control. JCCCF supports control of veld grass, as it is a big fire hazard when it dries off. But selective herbicide is only applied once per year, while veld grass can germinate over a long period during winter and spring, so more than one application of herbicide, or follow-up manual weeding, is needed to reduce its occurrence.
Friends groups affiliated with JCCCF perform manual weed control as per the Friends Group Manual, and improving bushland condition as a result, but there are only a small number of such groups in the City compared to the number and area of our natural areas. The friends groups use the Special Purpose grants mainly for contractors to perform manual weeding, but even that has been very restricted – only 1.75% increase in 7 years when wages have increased 20% in the same period. We believe the City should consider more support for friends groups to arrange and supervise manual weeding by contractors to compliment the work of volunteers, especially during what we call "peak weed season" during late winter/ early spring when many weed species are developing seed at the same time.

CLAUSE 4.1.5, Weed Monitoring

JCCCF consider there is not much point monitoring or mapping weeds if the City does not have the budget to actually control them, given most weed species in natural areas need to be dealt with manually. Refer to our comments re natural areas above.

CLAUSE 4.1.6, Weed Prevention

We have seen that there is not enough checking that contractors and staff are adhering to the City's Pathogen Hygiene Procedures. For example, the highly invasive Golden Crownbeard has recently come in with soil carted by contractors, and the City was alerted to this by the Chairman of JCCCF.

CLAUSE 4.2.8, Weed Control

See our feedback at clause 1.3 about marker dye. It may be visible to operators when being applied but it is not often visible soon after the job is completed. If stronger concentration of marker dye is not applied, signage is needed at all locations where herbicides are applied, with or without marker dye.

(continues)

The weed "Golden Crownbeard" is starting to spread in the City. This needs to be controlled both on public and private land (especially vacant blocks) if it is not to become a major new weed problem in our City. The only way to achieve that is to add it to the schedule of pest plants in the Pest Plant Local Law.

CLAUSE 5.1, Partnerships

JCCCF certainly values the assistance received from the City, but as noted at Clause 4.1, those groups improving the biodiversity of large areas should be able to apply for a more substantial Special Purpose grant, or alternatively, more assistance budgeted by the City to employ contractors to help, noting the City's Natural Areas Team do not have sufficient resources to assist with this on-ground work.

See the comment at Clause 3.2 about wiping. A partnership should not impose unreasonable restrictions on their partner!

CLAUSE 5.2, Community Education

To date, there is no evidence that community education is working other than on a very limited way. We have spoken at schools, for example, where neither the adults or students have any knowledge of biodiversity and the threat weeds impose on it.

Almost every vacant block, and many residential verges, are weed seed generators in our City!

CLAUSE 5.3, Training

Most friends groups are now highly experienced with weed control in their patch and do not need any training. Any new groups may need some training, but they often leverage off the knowledge gained by existing friends groups. The problem is the need for more volunteers and assistance with manual weeding from the City.

Appendix 6.

Wiping (with tongs) is different to "Wick Wiping" and is not listed in the table. This method is very effective in controlling many bulbous weed species, and works in rocky ground or amongst the roots of other plants where manual weeding is not possible. It does not drip and it does not need multiple applications.

See our feedback re "germination inhibitors" at Clause 3.2. The disadvantage of polluting groundwater is not listed.

Regards,

[redacted]

Treasurer - "Joondalup Community Coast Care Forum")

[redacted]

APPENDIX 11 — Response from Friends of North Ocean Reef-Iluka Foreshore

Note: Friends groups and resident / ratepayer groups were asked to provide written feedback via post or email. This stakeholder instead provided feedback via the Online Comment Form which has been extracted below.

To what extent do you support the City's use of physical weed control as described above?	*Strongly support*

To what extent do you support the City's use of chemical weed control as described above?	*Support*

To what extent do you support the City's use of steam and hot water weed control as described above?	*Support*

Do you have any comments on the draft Weed Management Plan 2022–2032?
Recommendation 6: should be reported as area (ha) and $ spent directly by City's Natural Areas Team and area (ha) and $ spent on contractors undertaking weeding. The community needs to know if contractors are an efficient way of controlling weeds. *Section 5: Now control of Marmion Avenue has been taken over by Main Roads Department, it should be added to list of agencies. The spread of Golden Crownbeard along Marmion Avenue is its responsibility but without monitoring and eradication we are seeking this weed spread into adjacent bushland which one day will be controlled by the City eg Bush Forever 322 on west side of Marmion Avenue north of Burns Beach Road.* *Appendix 5. Why is Acacia xanthina list as a weed species?* *Appendix 5. A number of the species listed as weeds are actually planted by the City in parks or on verges e.g. Casuarina equisetifolia, Eucalyptus platypus, Melaleuca lanceolata. These species should be identified as such, in the list by a suffix.* *Appendix 5: Verbesina encelioides (Golden Crownbeard) should be added to Local Pest Plant (LPP) list immediately. This weed has only begun to proliferate within the City in the last two years, often where the City has undertaken infrastructure activities involving the import of sand. If declared as a LPP immediately there is a chance it can at least, controlled if not eradication. the species displaces native vegetation and is toxic to stock and humans. being a member of the Asteraceae family, it spreads rapidly by numerous seeds in each flower. To Quote DBCA: to avoid damage to agriculture and the environment, the further spread of the species needs to be prevented. Urgent action is required.*

APPENDIX 12 — Response from Kingsley & Greenwood Residents Association

Kingsley and Greenwood Residents Association (KAGRA) Inc Submission
Draft Weed Management Plan 2023-2032

We support the plan in general. We would like to see effective supervision to ensure that the plan is complied with.

Detailed comments are below:

Page 5 1.2.1 Purpose
The interaction between friends groups and COJ needs to be two-way. The groups liaise with the City and seek approval re their annual work plans and the City should advise the groups when the City plans to work in their area. Plans of both should be integrated and available to Groups. The City should support groups with resources as requested.

Page 6 1.2.2 Objectives ii
Cost should be a consideration as well. The average yearly cost of weed management over 2016 to 2022 was about $1M. This plan has an average yearly cost over the next 10 yrs of $1.5M., a 50% increase. Ratepayers need to be advised of this extra cost to vary the weed management process to include new methods not used in the past.

Page 9 1.4 Weed Management Plan 2016 – 2021
There are areas in most parks where there is part natural bush with grass trees , where the City continues to Mow resulting in impacts on grass trees killing them and also ring barking of remnant trees. Some of these areas could be returned to native vegetation with mowing excluded. This would improve the park landscape. Mowing as a method of weed control is destructive in these areas.

Page 34 4.1.5 Weed Monitoring ; Observational Weed Monitoring
There also needs to be an assessment of the effectiveness of weed control in those areas weeded. The weeds may grow back as the seed bank is significant, or new weeds may invade the weeded area.

Page 37 4.1.6 Weed Prevention ; Fire Management and Response
Grass Trees skirts are known habitat refuges for fauna such as quenda and skinks. Burning every grass tree skirt effectively eliminates these fauna.

Page 79 Appendix 1 Natural Areas
Legana Park in Kingsley has a large area, effectively functioning as a shallow drainage sump for the area, which has mixed marri, tuart and jarrah forest that should be recognised as a natural area and managed accordingly. As it is it seems to be mowed using tractors which damages the undergrowth and the trees.

[redacted]

Secretary
Kingsley and Greenwood Residents Association (KAGRA) Inc

14/12/22

APPENDIX 13 — Response from Marmion, Sorrento, Duncraig Progress and Ratepayers Association (page 1)

Marmion
Sorrento
Duncraig

PROGRESS & RATEPAYERS ASSOCIATION INC

SERVING THE COMMUNITY SINCE 1958

Chief Executive Officer
City of Joondalup

DRAFT - WEED MANAGEMENT PLAN - 2022-32

The **Marmion, Sorrento, Duncraig Progress and Ratepayers Association** (Association) supports the general aims and objectives of City of Joondalup's (City) proposed DRAFT Weed Management Plan for 2022-32 (DRAFT).

However, conditional to that support, the Association proposes a number of strategies be considered by the City to increase the safety, effectiveness and efficiency of the strategies and deliverables outlined in the proposed DRAFT.

The next decade will provide great challenges on many fronts in determining and maintaining the future sustainable, viable and amenity of our , the Western Australian , the Australian and the world's communities, under the threat from many issue, but most obviously Climate Change.

The south west of Western Australia, including the City of Joondalup is, as pointed out in the DRAFT, a biodiversity " hot spot" with a range of unique indigenous / naturally occurring flora and fauna under ongoing threat. Climate Change and growing incursion of human - urbanisation in the City, pose unprecedented challenges that need to be addressed now, and set in place through smart, safe, effective and efficient range of strategies, for future weed mitigation.

While we have no doubt the City is investing its limited resources (ratepayer's money) into this challenge, it is not enough to just increase funding to resolve the problem but being able to do deliver more effective or best available outcomes, at a value for money price and within its skill base and resource capabilities, needs to be a priority.

The Association proposes the following strategies be given strong consideration for inclusion as part of the City's strategies and tactics for incorporation as part of its Weed Management Plan - 2022-32. Some of these may need to be further work-shopped with the community, government and private business organisations, with the view of opening up both practical and scientific resources, in tackling this issue in a smarter, safe and more practical range of Strategies. The following is a list of suggested strategies :

(page 2)

1. A Weed Census, to determine the top 5 of the most invasive and impactful weed species and from this focus on their mitigation, within the capacity and capability of the resources available to the City;

2. Partnering with the CSRIO (drawing on their wealth of research data and scientific background) or similar bodies e.g. WA Department Primary Industry and Regional Development - the Premier announcing (1/12/22) a $320m investment in a new research and development biodiversity facility at Murdoch University Campus, the Nursery & Garden Industry WA and businesses like Bunnings. The latter two entities to be encouraged not to introduce into the WA domestic market potentially invasive plant species. This could include working with and lobbying the Nursery & Garden Industry WA peak body, to cease importation and trade in identified invasive plant species like Lantana, Patterson's Curse, Gloxyinias, Prickley Pear, exotic grasses, etc

3. Exploring safer chemical, natural based herbicides, as an alternative to Glyphosate based products, in weed control mitigation. The City needs to consider and take note of Australian and International Standards on herbicides used, in its choice of weed control application, within its jurisdiction. Risk assessments need to be considered where Australian Standards are at odds with International Standards e.g. "Round Up " is banned in EU but not in Australia due to pressure from lobby groups.

4. Reinstating the of public notifications as to where the application of herbicides have been applied, beyond the current 24 hours, to that of a period of at least three days, post application. This being a priority in public open spaces / parks where children and family pets frequent;

5.Seeking clarity around the safety issue in the application, use and long term impact of all chosen chemical weed control applications on the environment including - human, animal and in particular indigenous flora and fauna. All staff and contractors to demonstrate licensing, training and safety protocols are in place and are current, when undertaking weed mitigation activities for and or on behalf of the City;

6. Increased mulching by the City on all road reserves median strips, parks and sporting grounds, within its boundaries. Incentivise local tree lopping contractors to recycle compostable material, created from their pruning and clearing work, back into the client / neighbours gardens rather than transporting it for dumping at City landfill sites. Alternatively, consider ben given to the feasibility from a biodiversity perspective, the safety and financial viability status, of allowing free dumping of compost generated material by contactors, for use as mulching at City owned sites.

7. That COJ give consideration to introducing a policy of banning the planting of potentially invasive introduced / non-indigenous plant species in all COJ owned / leased properties and COJ sponsored commercial estates.

The Association recommends the strongly consider the above seven points for incorporation into its proposed Weed Management Plan - 2022-32.

(page 3)

The suggested actions offer the smart option of adding partnering, to the raft of other strategies that have already been utilised. Through partnering, with other professional bodies that have research and development expertise as part of their activities, will add a scientific base in the delivering of informed and hopefully, enhanced outcomes to weed mitigation measures, over what is likely to be a very challenging decade and beyond.

[redacted]

SECRETARY, MARMION, SORRENTO, DUNCRAIG PROGRESS & RATEPAYERS ASSOCIATION

7 December, 2022

APPENDIX 14 — Response from Burns Beach Residents Association

Note: Friends groups and resident / ratepayer groups were asked to provide written feedback via post or email. This stakeholder instead provided feedback via the Online Comment Form which has been extracted below.

To what extent do you support the City's use of physical weed control as described above?	*Support*

To what extent do you support the City's use of chemical weed control as described above?	*Support*

To what extent do you support the City's use of steam and hot water weed control as described above?	*Support*

Do you have any comments on the draft Weed Management Plan 2022–2032?
In relation to specific programs or uses we have the following to say: *Leafy City Program* *This needs to be addressed in the new development areas of Burns Beach so tree planting can increase the leafy canopy cover in the high-density residential streets creating a cooler, inviting green urban space. The City should ensure every new home has a tree planted outside it according to the street Tree Planting Plan they have compiled for the Northern Precinct and that homeowners are made aware of the City's rules regarding verge trees and verge treatments. Existing residents continue to remove their verge trees and to illegally pave their entire verges for low maintenance and to create extra parking. This needs to be more stringently monitored by the City to avoid the increasing heat-island effect generated by hardstand surfaces and the lack of trees.* *Impact and Control of Weeds on Verges and Vacant Lots* *No mention is made in the Plan of the huge impact unkempt private residential verges and vacant lots have on weed dispersal. Stricter by laws and implementation of these bylaws would go a long way to help easing the dispersal of weeds in a suburb and reduce the cost of removing them.* *Glyphosate* *Research to date has only found that glyphosate products are only "probably carcinogenic to humans". It is clearly stated that products containing glyphosate are safe if used according to the label instructions. Glyphosate is currently approved by the State and is the cheapest method of weed control. Alternative methods of weed control also come with disadvantages eg steam and hot water weed control is less effective than chemical weed control, is more expensive, uses large amounts of energy to apply, is a safety risk to operators, and kills non targeted species and native species. As an Association we are happy to have a combination of glyphosate and alternative methods of weed control as long as the methods used are effective in eradicating the weeds and costs are kept under control. SAR areas will be hugely affected if weed removal costs are increased. Reducing the reliance on herbicides by increasing non chemical weed control methods, where appropriate should only be done if finances allow.* *Page 42: Parks Managed by CoJ Toowoon Park is missing from the diagram* *Friends groups* *These are volunteers who play a huge role in restoring bushland by removing invasive species in the bushland areas. At the moment, the volunteers stop at the [- - -] Cafe. Forming a group to continue northwards would be beneficial as this is adjacent to the Marine Park. Trying to get a group established for the Burns Beach foreshore area will be a very difficult process with lots of paperwork involved. CoJ should consider having an appointed officer to assist a community in forming such a group.*

APPENDIX 15 — Verbatim comments

Question: “Do you have any comments on the draft Weed Management Plan 2022–2032?”

Note: Words that may identify respondents or contain offensive language have been removed and replaced with square brackets, i.e. [- - -]. Minor alterations have been made to spelling/grammar to enhance readability.

Do you have any comments on the draft Weed Management Plan 2022–2032? (N = 186)
I have yet to see it done in my street. When it is done, I think that they are watering it down to save money and not doing it correctly.
I am very impressed with the plan and think the City is doing a fantastic job. I am glad to see the following: aspiring to reduce use of chemicals, increasing canopy, hydro and eco-zoning, use of mulch, community education, guidance of Traditional Owners and working with Reconciliation Plan, Pathogen Procedures, use of performance indicators, investigating research participation to improve methods. *Some notes I'd like to make:* *One of the aims of the plan should be to protect the safety of the public and their pets (ie dogs) because pets are our family members. Dogs regularly get Wild Oats in their feet and ears which can be harmful and costly to remove. Sometimes tracking inside and up the body or far down the ear canal.* *"City takes the following into consideration: timing i.e. before weeds set seed". This is not done in my area. Mows and sprays are done after seeds have formed in the spring. In which case a spray is totally pointless.* *"Pathogen and weed free mulch is applied to suppress weed growth in garden beds or non-turf areas": It would be great to see the use of mulch in park spaces where mowers cannot access to reduce weeds. At present I only see it done on road median strips.* *There is no mention in the plan of measures to notify the public of herbicide sprays in their areas. Also there is no mention of signage 24-hour after a spray being put up. Please do not take these away.* *Why hasn't there been trials of using salt spray instead of glyphosate? I understand glyphosate is cheap and within the guidelines for Australia pesticide use. However, the research based off these guidelines was done in 2016 and surely there has been much development since then in the science world. I am told that glyphosate has been taken off the shelves in America for sale. As this is a contentious issue, and there is varying scientific opinions on how long it really lives in the soil, it would be great to see the City continue to look into alternatives. In these times of tight budgets and increased cost of living, no one wants to see their rates go up, so I understand the dilemma. Please keep searching. My family only uses salt sprays for weed control on our property and it works fine for us.* *At Gascoyne Park the areas with a native tree canopy have minimal weeds due to the naturally occurring toxins in the leaves (although increases in native trees also pose a fire hazard). The palms planted there may have seemed like an exotic idea at the time; however, the result is prolific weeds where there are palms. There are areas of wide-open space where grass is infested with prickles in the summer making the park unusable. This space also needs more watering and it is without shade in the summer. Given that the large, grassed area is hardly used recreationally, it would be great to see some native trees planted in this open space instead. Palms near the sump could also be taken out and replaced with some native trees. This provides more shade, decreases watering, and reduces weeds and makes the park of better use. I am sure this is just one example of strategies that could be implemented smartly in other parks around the City, where there is open space that is not a sports field.*
It's time to stop using chemicals wherever possible. Glyphosate is not the answer, no matter what the literature states, which as a [- - -] I don't particularly trust, nor believe.
Concerned with the use of glyphosates around our wetlands. Steam treatment and manual weeding, plus mulching should be adopted to manage weeds.

Stop using glyphosate. My pets and I have been negatively affected. Stop poisoning the people who pay your wages.
A combination of chemical and heat seems to be a viable option when used appropriately. It would be preferable, as much as possible, to do away with herbicides.
Please stop using glyphosate. Thank you.
The residents do not want glyphosate used in our suburbs at all because it greatly impacts the health of ourselves and our animals. Subiaco has stopped using glyphosate, so why is our Council still using it? Why are we not following their lead? There is much literature on the dangers and toxic nature of glyphosate, regardless of what the manufacturers say.
Needs more alignment and appreciation of world research on dangers of chemicals (eg links to breast cancers, skin cancers and recent references to increased impact on birth prematurity). The literature is there on the internet and there may well be serious medicolegal issues in the future if facts are ignored. It would seem obvious to avoid chemicals and go with steam; however, I have found hand weeding is best, although not practical for the City.
There is too much reliance on chemicals, especially when this method has been proven to be detrimental to people's health. These products have been banned in many countries. We need to be moving forward in a more sustainable way. Maybe a combination of steam and hand weeding should be prioritised over the use of chemicals.
Disappointed that those drafting these measures have failed to see the long-term and constant use of toxins to manage unwanted plants. Those drafting these measures need to understand that the damage these toxins are doing to all living systems is far greater than any benefits they perceive there are. A major paradigm shift needs to occur ASAP.
Stop spraying poison.
The only positive weed control is to pull weeds by hand, nothing else is good enough.
Thanks for giving us the opportunity to have a say.
Please leave signs up for minimum 48-hours in the area where glyphosate has been used. We need more glyphosate free parks to walk our dogs. Stop using glyphosate. Use other methods that are less toxic.
Stop the use of glyphosate in our suburbs and parks.
Maybe find a balance of both chemical and steam weed control, eg near public places like parks, sport ovals which are most visited by humans and family pets — maybe more steam management in these places and chemical in other areas. Mirror Park is a prime case for chemical weed management and quite a few dogs have had bad reactions from these chemicals, hence annoyed owners which then rolls on to vet bills and even some humans reactions, which means doctor's fees. Surely chemical management is part of the problem of climate change. Think wisely Council members, you may not think it messes with the public as there probably hasn't been many reports, but there are disgruntled ratepayers out there. I would prefer to pay rates towards a safer and healthier way of eradicating weeds than toward poisons.
No chemicals to be used despite increased costs of labour for physical and steam weeding.
Would like to know that animals and young children experience no harm when going to these prone areas.
We are all affected by chemicals, we need to seek alternative solution. This is for our next generation and the environment we live in to be safe. We are encouraged to be wise in what we put in our gardens. Why aren't Councils doing the same?
I would like the City of Joondalup to phase out all toxic chemical spraying in line with City of Subiaco and City of Stirling. I did not even know my verge was being sprayed with these toxins until recently. I hand weed my own property as I have chemical sensitivities and have now opted out. Thank you.
Steam weed control is being used successfully in many areas. My dog has had her feet burnt and irritated from walking on chemical glyphosate that was sprayed on grass in parks. There are many negative impacts from chemical spraying.
I feel strongly that toxic chemicals should not be sprayed by the Council. Glyphosate has been banned in most countries in the world because it has been proven to be carcinogenic in many scientific studies. Stop putting lives at risk by polluting our environment with toxic chemicals.
I think it is time you thought about people's health and get the steam process going ASAP. Why is the COJ behind the times?

Please use non-chemical, friendly methods.
An idealised version of the application and effectiveness of chemical control is presented in the plan, which I regularly see not observed by contractors. I would like to see at least some acknowledgement of the impact that manual removal of weeds by Friends of (natural bushland area name) already make. Financial support for these activities needs to be continued and increased. In other places interstate, I have seen successful maintenance of road side verges by volunteer groups (scouts / rotary etc) who adopt that stretch of road. It is regularly cleared of litter and weeds by the group who are acknowledged as custodians for that space. In return, their group receive some funding from the shire whose maintenance budget no longer needs to buy the chemicals or drive the machinery, which was used previously to maintain the area. The shire provides reusable bags (different colours for litter and for weeds). The filled bags are collected by the shire.
The City of Joondalup needs to follow the example of Subiaco (switched from chemical to steam) and Stirling (in the process of switching). It is not acceptable for the City of Joondalup to continue ignoring worldwide evidence on the health risks of using products like Roundup.
I am concerned about the widespread almost exclusive use of chemical weed control in CoJ. It is likely to be a cause of cancer and other health issues effects in humans. The CoJ practice of paying contractors to regularly saturate large areas of the shire with these poisonous substances are negligent and has to be strongly discouraged. Some issues which the Councillors need to be made aware of: *Chemicals can stay in the soils, run off onto the water table and have been seen to kill street trees.* *Contractors have been witnessed to use poor practises, spraying in wrong season to control seed production of weeds, spraying in times of impending rain, saturating footpaths where there are minimal or dead weeds within spaces between slabs. They appear not to care what they are doing as long as they get paid by the Council to saturate everything. More attention should be based on scientific botanical knowledge of only targeting some harmful weeds in certain situations.* *I cycle to work in Joondalup 3 days each week and recently noticed a limited outbreak of Arum Lilies growing on the west side of Lake Joondalup, north of Ocean Reef Road which I took on myself to control by spot spraying with a chemical used by volunteers in the south west region. Obviously, it wasn't even noticed by the contractors who I have seen regularly saturating glyphosate along the sides of the walking / bike track in that area. Generally, much more needs to be done using volunteers for weed pulling and also pay people to do this type of work. I am sure the ratepayers would be more than happy for their money to be used in this way. I also strongly support other non-chemical methods of weed control.*
Glyphosate needs to be phased out as quickly as possible. It is too toxic.
Chemical weed control is harmful to native wildlife species which are already under pressure in our urban areas due to ongoing development, domestic pets and feral animals that prey on them and the use of toxic vermin control substances. Chemicals of any sort impose further suffering and death to these species and will ensure the eventual extinction of these helpless animals.
It's a very difficult topic because no one wants weeds and we all know the chemicals are carcinogenic. My idea for suburban areas is some sort of annual community project where over the course of 1–2 weeks, residents are encouraged to weed and prepare their gardens at the same time. It would be a hard sell to begin with, but having before and after photos would likely encourage others and it would need to be an ongoing large-scale project. The idea being that if most people (think herd immunity) weeded around the same time, that this would prevent extra weeds and would start to break the cycle so to speak. Sometimes weeding is not worth it because if the folks up the street haven't weeded, their seeds just come to us. Getting local schools involved, the whole shebang. Perhaps some kind of incentive program for a deal on reticulation would also contribute to a change in attitude in the areas where weeds and crappy gardens are the norm. A reduction on rates for having a mostly weed free garden or a program, similar to the skip program, offering people a few hours a year of gardening help. Give the work to small businesses from inside the City, rather than multinational companies. Getting other groups involved for parks would also be beneficial and save the City some costs overall. It would certainly be a game changer for resident interaction if this idea could be pulled off.

I feel there is a place for multiple weed control methods. Most importantly, the weeds need to be knocked down before going to seed, which is not always possible using herbicide, as rain and wind can make it difficult to time this correctly. I also feel herbicide use does not meet a number of other objectives (eg protect biodiversity, minimise bush fire risk) and regulatory requirements may become harder to meet in future. Lastly, I would suggest herbicide use could be greatly reduced simply by more careful application. Perhaps better training in its use. I have watched the application of glyphosate on a verge recently, where the whole area was sprayed blue. Glyphosate being a systemic herbicide has no effect to the ground or seeds and need only be applied to a part of each weed to be effective, so 90% of the product was wasted.
The plan strikes a good balance between the various options available to control weeds. An integrated approach makes a lot of sense. Whilst I have heard calls for more hand weeding, I acknowledge the need to increase staff numbers and time (and rates) to enable this method to be more widely employed. As someone who helps look after a small natural area close to my home, I know some methods of weed control (eg weeding or whipper snipping) are not practical or viable. Hot water / steam can work to a degree, in some places, but it doesn't always kill all weeds. I'm pleased to see the City is looking to reduce chemical control methods, but acknowledge this will likely come at a cost, one way or another.
We want more physical weeding and hydrothermal weeding, not chemical weeding.
I would like weed control without glyphosate. Definitely signs left up longer.
I do not want the Council to use chemical weeding. These sorts of chemicals should not be going into our waterways and groundwater reserves. This is an outdated method and needs to be changed immediately.
Please stop spraying glyphosate in dog parks around trees as dogs sniff and eat in the area.
The language in the online comment form is heavily biased towards residents selecting the use of chemical control over other means of weed control. A balanced approached to garnering public opinion is appropriate if the Council is truly trying to gauge the public's thoughts on the topic. The particular chemical identified for use in the Joondalup area according to the draft plan is glyphosate. According to a number of scientific publications this herbicide is recognised to have a wide range of negative environmental and health impacts. As such, this herbicide should not be used for weed control in the Joondalup Council, or elsewhere. Particularly in light of the mounting legal cases globally against the herbicide manufacturers. The Joondalup Council's use of this herbicide may have serious legal ramifications in the future. This class of herbicide is banned in the following countries: Argentina; Austria; Belgium; Bermuda; Bahrain; Barbados; Brazil; Canada (8 out of 10 provinces); Colombia; Costa Rica; Czech Republic; Denmark; El Salvador; Fiji; France; Germany; India; Italy; Luxembourg; Malta; Netherlands; Oman; Qatar; St. Vincent and the Grenadines; Saudi Arabia; Portugal; Scotland; Slovenia; Spain; Sri Lanka; Thailand; Vietnam. Below is an expert from one of the publications mentioned above detailing the negative impacts of glyphosate: (Reference [- - -]) "Increasing evidence shows that glyphosate and glyphosate-based herbicides exhibit cytotoxic and genotoxic effects, increase oxidative stress, disrupt the estrogen pathway, impair some cerebral functions, and allegedly correlate with some cancers. Glyphosate effects on the immune system appear to alter the complement cascade, phagocytic function, and lymphocyte responses, and increase the production of pro-inflammatory cytokines in fish. In mammals, including humans, glyphosate mainly has cytotoxic and genotoxic effects, causes inflammation, and affects lymphocyte functions and the interactions between microorganisms and the immune system."
The steam use for weed removal, at last some hope that this Council genuinely cares for the wellbeing of the community and has some ethical backbone. Please stop spraying toxic glyphosate / chemical weed control when it is banned / illegal to use in other countries for being carcinogenic and harmful to human health. City of Joondalup must stop putting cost cutting and weed removal efficiency above the safety and health of its people and the environment.
Chemical spraying is killing other vegetation in the Greenwood area, as noticed on the roundabouts in Allenswood Road. If residents are not notified for at least 4 days of spraying of chemicals, dogs have been becoming ill. This chemical spraying needs to cease immediately with steam spraying being the alternative.
Please stop the use of glyphosate, so many people are against it for their pets, their kids or themselves. It is dangerous for people and for the environment.

I believe, in general, that hand weeding is not a practical solution and, when coupled with the cost of labour and machinery, it not a satisfactory use of ratepayer money.
Chemical weeding needs to be phased out completely. Signage is a joke, communication about chemical weeding needs to be extremely improved.
No more glyphosate or chemicals. Hand picking and steam. What about salt and white vinegar? It works and we don't want ourselves and our family to get health issues, such as cancer.
We must reduce the use of chemicals in society, it is not good for humans or animals.
Council's own practices are condemned on page 21 of this very Plan. Why would Council put at risk the health of even a very small component of its community by using a product that the WHO classifies as 'probably carcinogenic to humans'? The same reporting body of the World Health Organisation, the IARC, found sufficient evidence to declare in 2015 that glyphosate is reclassified from Group 2B, possibly carcinogenic to humans to Group 2A, probably carcinogenic to humans. Why is evidence from around the world not sufficient for Joondalup to follow more progressive councils around Australia and ban the use of glyphosate? "Other components of the toxicity of glyphosate are not taken into account". This is totally inadequate. The "justification" provided in the next paragraph from the APVMA is not reassuring. It assumes that the 'label instructions' are correct, effective, comprehensive, are based on wide and long-term studies and are followed. This is inadequate since none of these aspects are achieved. A typical example of a product label declaring it to be "Complete Directions for Use" states that the product is "Harmful if inhaled". APVMA advice addresses only risk to humans. The risk to children, animals and pets, does not appear to have been considered. These users of our public spaces are closer to, more involved with, and less protected than adult humans. Damage to a pet can be every bit as distressing and much more expensive than sickness in an adult. I was present at the last community presentation to an AGM when members of the public related injuries and damage to their pets following glyphosate spraying and the upset to whole families was plain to hear. These concerns are simply not addressed by this plan. Secondly, the APVMA advice is based on a 1997 review which is massively out of date since there are many subsequent studies casting doubt on the product safety. The 2016 advice found "sufficient evidence" that glyphosate is genotoxic and capable of inducing oxidative stress in animals. Thirdly, this advice has already been negated by law courts. In the USA, there have been substantial damages, judgements and fines imposed on Monsanto due to proof that glyphosate has caused Non-Hodgkin's Lymphoma (NHL) in the claimants. Australian cases are underway: I refer you to the case filed in the [- - -] Supreme Court by [- - -] who was diagnosed with NHL following extended exposure to glyphosate. Council's report is dishonest on this matter and conceals a continued plan to use glyphosate in its references to the Annual Maintenance Schedule and Fire Weed Management Guidelines. The chemicals permitted by each of these documents should be cited in the Plan to ensure that the planned extent and duration of their use is clear. It is not just cancer that is implicated in glyphosate use and all possible damage to human and animal health should be considered before it is used.
I would prefer no harsh chemicals to protect young children and animals.
I don't like the poison that is sprayed as I believe it caused the bladder cancer in my small dog.
The City of Joondalup has created the weed problem through their own poor management practices, which see spraying being done at the wrong time, allowing the seeds to survive and then doing the same the next year. It's almost as if the contractors are ensuring their jobs into the future with the support from the COJ. If they removed the source by weeding effectively before the seeds form then slowly but surely, they would win the battle. We can see non chemical methods work. You just have to look to the volunteers who hand weed the coastal dunes and have eradicated many weeds through their efforts. Hand weeding has come on in leaps and bounds in the last two years, there are many new tools used to remove weeds effectively and efficiently from all sorts of places like road edges. The City of Subiaco has banned glyphosate in January 2020 and is using hydrothermal. City of Stirling is transitioning to hydrothermal (replacing glyphosate with steam) for all hard surfaces by December 2025. Where is the COJ's plan?
I am worried about the safety will the use of chemicals for my dog and the children at my park.
We should use all three methods, with chemical spray only on large areas.
I think we should be moving with the times to eliminate harsh chemicals in our suburbs.

Concerned for the environment and safety of our children and animals. There is an increase in cancers in our society which we need to stop the use of herbicides banned in Europe and USA.
I don't want these chemicals near me or my family ever. You need to listen to the people. My grandkids deserve to live chemical free.
I used to farm 14,000 acres in the wheatbelt and used to buy 10 x 200 litre drums of Roundup each year. I have personally sprayed tens of thousands of acres in my time on the farm. I used a 40-foot boom sprayer and a tractor with an air-conditioned cab, if the wind was behind, I would turn off the air and wait till I turned the corner before turning it on again. Living now in [- - -] I look after [- - -] blocks of commercial units mainly around [- - -] Road. Most of my work involves spraying Roundup on weeds in garden beds. I use a hand-held sprayer with an extension wand so that I spray directly on the weed and don't get any drift. I've never worn a mask but I do wear gloves. I'm [- - -] years old and as fit as someone half my age. So why people are apprehensive of glyphosate is beyond me, plus weeds need to be sprayed long before they start to seed to stop them multiplying as so many times, I have seen people spraying mature weeds that have already set their seeds.
Could you not spray around the tree trunks, as that is where most dogs eat the grass, which helps their digestion.
I have already noticed the weed problem becoming a lot worse since the steam weed control has been used compared to chemical weeding.
We want safe and effective weed management. No chemicals.
More weeding needs to be done on Bonnie Doon Park during September / October. The Bindi infestation there is always terrible that time of year so much so the park is almost unusable.
The chemical weed control doesn't appear to have any effect reducing the weeds in the area. We see more weeds, not less. Also, the chemicals have negative effect on native plants, every year we see fewer wildflowers, such as orchids blooming in the spring. Most importantly, as we well know, these poisons have a dreadful effect on the health of our community and animals. Could we please stop using these unhealthy and, at the same time, useless chemicals / poisons?
Remove all chemical weed control, particularly around homes, schools and parks. It has been proven to be toxic, dangerous and unsafe. It should be ceased immediately for the safety of humans, pets and native wildlife. Many local councils have already removed chemical weeding as have many countries overseas. COJ needs to now follow this lead and protect everyone from these significant risks involved with use of chemical weeding.
Unfortunately, the chemicals used as weed control are toxic to humans, natural fauna and flora. We have lost many grass trees in our local park due to irresponsible spraying by contractors. Whereas a large clump of asparagus fern is left to thrive.
At this stage I am shocked our Council still persists in using glyphosate and other chemicals for weed management. It is known that this has many harmful effects on both humans and our wildlife that are constantly bombarded with it. I have seen it sprayed during rains when it shouldn't be, contaminating our waterways. I support steam weeding. I would also like to see the 24-hour signage. I think it is sad that people who are employed to represent the people make choices based on their own personal bias.
Chemical weed control is outdated and harmful, not only to the ecosystem, but also to the person who sprays it and anyone who comes into contact with it. Chemicals don't just disappear and it certainly is not only harmful to weeds. Putting out signs to say it is being applied does nothing to prevent potential harm. Asbestos was also a wonderful, cheap solution until the harmful effects became clear.
The use of glyphosate should be stopped immediately.
Please be a leader in weed control and reconsider the use of glyphosate. Many Councils within Australia have banned its use for very good reason, it is toxic. I walk daily in James McCusker Park and children and dogs should be able to play freely without any fear of coming into contact with chemicals. The 2-hour signage is a joke as, if you enter the park through a different route to where the sign is, you don't see it. This happens often and is not acceptable. You use steam control around the enclosed dog area in Winton Road. There are many more dogs and children that frequent the JMP in Iluka so please prioritise. Thank you

There is no reason to be using carcinogenic glyphosate when other councils are successfully using steam.
There are numerous studies showing that glyphosate is deadly to both humans and animals. My dog is suffering from an allergic reaction by constantly licking her paws after walking in either the Iluka parks or the Kinross parks. It must stop sooner rather than later. I believe the Council will be subject to litigation from its workers when / if they develop cancers from this spraying.
I have conducted trials of chemical and physical weed control in a variety of hand and soft landscape areas over two decades of home ownership and 9 years in residential subdivision construction, project management and maintenance and can confirm the results of physical weed control to prevail for much longer periods, including the use of brush cutters and snippers at the appropriate times. Studies show that chemical pollutants, such as glyphosate, accumulate on the land, persist in human bodies, are linked to serious disease and reduce the microflora in the soil. There is less risk associated with physical weed control and a cleaner and healthier image.
It will take time and education but reducing and removing all chemical use will be more effective and benefit the health of our local community. The City could possibly allocate some funding into ground level studies about the effectiveness from the use of herbicide and the alternatives. Also, as it has identified that there is a "a varied perception in the community regarding weed control" and that "the use of herbicides needs to be based on science". It would be great to source these papers and maybe look at both sides.
My dog has cancer which I blame the use of chemicals by the Council for.
The unsafe use of herbicides at primary schools in windy conditions, with no signage, on shared ovals, no masks worn, while kids playing on weekends, is unacceptable. It needs to be better controlled. Schools should be herbicide free.
I appreciate the enormous efforts of the City's natural areas crews in maintaining the City's natural areas. I would like to see less reliance on chemical weed control and a reduction of sources of weeds for example: • *Filtering of drains for nutrients and weed seeds.* • *Soil analysis for natural areas to determine nutrient and biota imbalances that favour weeds of native vegetation.* • *Less disturbance of native vegetation for asset maintenance.* • *Greater efforts to stop pedestrian and cyclists using informal paths through natural areas.* • *More community education on how people can reduce their impacts on biodiversity and help to protect native fauna and flora.* *I would like to see more support and education for existing friends groups and facilitation of the creation of new groups. I am concerned about impacts of chemical pesticides on soil biota and chemistry, groundwater, marine, wetland and terrestrial ecosystem and germination of native plants. The facility to upload a file containing photos and detailed comments would enable more meaningful public comment. I request that my name and address be kept confidential*
This should be implemented ASAP as we don't need poisonous chemicals that can harm innocent people and animals.
A very well researched and long overdue draft plan. The City must be made aware that the weed management program will require program costings to be increased each year for this program to be maintained at the current level nominated in the draft report. The City must be prepared to increase the manpower, materials, equipment and chemicals costing for the program in each budget year to ensure that, at the very least, the same amount and impetus of the program is maintained. This is a necessary and important program that cannot be permitted to be impacted or reduced due to inadequate funding.
I don't consider chemical weed control as safe. It kills everything it touches. Please put a plan in place to phase out glyphosate. If City of Stirling can do it, so can you. Remember that you, as the Council, make the decision about the spraying. As a dog owner, I am very worried about my dog being exposed to glyphosate. My last two dogs both had cancer. Please reintroduce glyphosate caution signage. Then there are people who forage for edible plants, one more reason to stop spraying poison in public areas.

I do not support the proposed and existing use of chemical weed control. Glyphosate (and similar) application is still proposed to occur around the boundary of play spaces (such as mulched areas, which are common around play spaces and can sometimes include 'nature play areas', such as balancing logs). These areas are frequently used by children who pick up mulch and walk barefoot. These areas should be considered part of the play space and therefore treated with physical or steam method of weed removal. Alternatively, adopting a no spray area within 50 metres of play spaces, as previously suggested by Council Members.
Use steam, stop all the chemicals.
To Whom it may concern, *As a member of the [- - -], I am concerned that although this topic was discussed with the [- - -], this hasn't been raised with [- - -]. The [- - -] group are involved in [- - -] and clearly this issue relates to the Environment and Public safety. Unfortunately, although I understand the reasons why multiple choice, specific questions are posed, they provide no latitude for community members to express their concerns and associated ideas, which I believe leads to apathy from the community knowing that it's hardly worth the effort to respond given the inability to properly expand on concerns. Firstly, I would like to state that I am not against the use of appropriate weed management chemicals used in the right place, for the right reasons at the right time. I realise that in some situations, certain weed control chemicals may be the only option. Clearly, there are members of the community who are expressing concerns relating to the use of weed control chemicals in particular in and around their own properties, around play areas and parks. Regardless of the City's management views, in my opinion, if ratepayers and community members hold a belief that certain chemicals are potentially harmful their concerns should be respected, and appropriate measures taken to address them. Although a comprehensive draft weed management plan has been produced for Council acceptance and adoption, I would like to add some thoughts to the decision-making process as in my opinion the way in which community feedback has been requested doesn't provide a collaborative platform to consider all the issues. I would like to address the key issues and of course would be happy to discuss in further detail if required.*
Avoid poisons, encourage the community to grow food and share within the suburb.
Please avoid the use of chemicals, such as glyphosate, in weed management.
Chemical weed control should be phased out ASAP.
Use of dye to show where areas have been sprayed. Use of chemicals on adjoining property where weeds are prevalent. Use of pre-emergent to prevent weeds. Proactive identification of repetitive areas. Proactive removal of weed trees such as Pepper trees growing in the Connolly and Heathridge area.
Chemical sprays are toxic to animals and humans. They don't kill the seed. Too often, notification is after where spraying is taking place.
Avoid poisons, encourage community to grow food and share within the suburb
Please avoid the use of chemicals such as glyphosate in weed management.
I appreciate the points outlaid, but there needs to be a more natural weed control. My main concern is glyphosate and poisoning my dog. I am not sure about the broad leaf sprays that target Bindi etc, which are rife.
Knowledge is key for your workers who do the weed control. I know the plan says that staff will be educated, but this doesn't always happen regularly. From what I have read, it all looks good and now it needs to be implemented by the staff who do the physical work.
Use of chemicals is very harmful to children playing and adults doing outdoor fitness in parks.
Glyphosate is very toxic and damaging to humans and our furry friends. Less toxic options must be found. I won't even take my dog to the park anymore!
No more poisoning our soil and waterways, please
I think these questions are poorly designed and will not really gather any meaningful data. I support the use of herbicide in some areas, other areas I feel the use of a hoe and hand weeding is more appropriate and for other areas steam. I know you say you use herbicide taking rain into account, but I have seen it been used during a rain event, before a rain event, and soon after a rain event with more rain on the way.
Hand weed and plant natives to cover the ground and prevent weeds regrowing. They can also be food for bees and butterflies in ally ways.

Stop the use of glyphosate. Email/leaflet drop to households in immediate areas prior to spraying. My rabbits have died due to Council use of herbicides.
Please stop using chemicals, it's hurting our children!
I do not agree with the use of glyphosate as it has been banned throughout many countries in the world due to its cancer-causing properties and the killing off of our bees and other beneficial bugs.
Please stop using glyphosate, it is not safe for your employees, our pets, children and it seeps into our water supply.
Glyphosate type chemicals are already banned in other countries. Why is this a 10-year plan? Products change. If you must spray glyphosate, please give residents a fair chance to avoid these areas by ensuring placement of signage for a minimum of 24-hours instead of just 2. The Glyphosate chemicals far out live even this timeframe. Please use marker dye to indicate the chemically sprayed areas. We did see this occur for a very short time. Last but not least, check out other Councils, eg City of Stirling, why are they are showing to be more advanced than the CoJ and are able to successfully transform their weed management to non-chemical methods by 2025? C'mon CoJ, you can and should do better than this! From a very concerned resident, who has resided in the CoJ for [- - -] years.
More physical and hydrothermal weeding methods required, and no chemical weeding. Please have a plan in place to phase out spraying toxic chemicals, reinstate 24-hour glyphosate caution signage, have more chemical free dog parks, have marker dye that last at least 48-hours.
Chemical weed control is being abolished in many countries due to health risks. Joondalup needs to heed warnings and evidence of the harmful effects.
I don't understand why we are still using strong dangerous chemicals when other regions have found alternatives. From experience, the signage at parks when such spraying is being undertaken is inadequate
Add 24-hour glyphosate caution signage. More chemical free dog parks. Expand steam contract to other sensitive locations. More funding for hand weeding. Ban all toxic chemicals in public spaces
Maybe organise local residents to have a weeding day. If they are passionate about not using chemicals then they should put their backs and effort into helping.
I understand that pulling out weeds manually is labour intensive, but for a long-term plan, this is the best option. The more this method of weed control can be implemented the better. Perhaps increasing community weeding days in native bush land could help this process? Please put in a plan to phase out glyphosate weed control. The City of Stirling is planning to use the hydrothermal method on all road reservations by Dec 2025. Surely, Joondalup can come up with a similar plan. In the meantime, please widely publicise the non-spray list website for people's verges, particularly in the lead up to the cut off time to register. I only found out about the list this year when someone incidentally mentioned it. I have heard Joondalup City already uses a contractor who uses non-chemical weeding methods in playgrounds, outside schools and in the Joondalup City Centre. This is great. Please look at expanding these areas, including outside aged-care residences, hospitals, shopping precincts and coastal dual path. When glyphosate is still being used, please ensure the 24-hour glyphosate caution signs remain to help keep dogs and other pets safe. Our two rabbits died after they escaped through our garage while my parents were minding them in Duncraig. They only got to the bushy embankment on the other side of the road, and were brought home safely and quite quickly, but they got sick and died very soon afterwards. The nearby reserve had a sign up for glyphosate poisoning, but not the roadside bush directly along our street. Having the sign up everywhere that is being poisoned could save more pets lives. I have heard that Elcar Park in Joondalup has hydrothermal weed control. This is great but would be great to expand further. Gibson Park in Padbury backs on to Pinnaroo Reserve. It's used by dog walkers, children and wildlife. It also has a Community Hall and playground. This would be an excellent park to switch to hydrothermal weed control. Thank you for the opportunity to give input.
As you are probably already aware, glyphosate is extremely toxic. In 2015, the WHO deemed it to be the known cause of many cancers. It's lethal to those who administer it (your workers) as well as the public, wildlife and other animals (dogs) who come into contact with it. Thank you for your consideration.
Please stop using glyphosate.

I am strongly opposed to the use of glyphosate. It is also non-selective. If you have to erect a sign warning of its use then there is a concern of its safety. We recently had the truck spraying the laneway in our court, I had just put the washing out, we shut all doors and windows as I was very concerned. Also, children traverse that laneway to and from school.
Glyphosate is being banned because of its potential link to cancer in humans, as well as potentially causing the death of important insects, such as bees. Biologists have sounded the alarm over the serious decline in insect populations that affect species diversity.
Chemical use for weed management — the signage needs to stay in parks for 3 days, not just for the duration the council worker is there applying the chemical. Most residents are at work during this time and signage has gone by the time they arrive home. Annato Park as reference is a great community park used for walking dogs. Chemicals used is harmful for dogs if they eat the grass that's been sprayed, so why wouldn't you leave signage out to make residents aware? You need to rethink your actions on weed control in animal access areas.
We shouldn't need signs and avoidance notices for public parks and footpaths every few months after spraying glyphosate. We know it's bad, so let's stop it now, there are so many better alternatives.
This is a most impressive document with strong foundations in research and practical experience. The writing is precise and clear, and effectively communicates the background information and rationales for recommendations. I have been alarmed at the explosion of Fleabane (Conyza spp.) over the past 20 years in the northern suburbs and agree that this particular weed must be prioritised for control. However, I am surprised that it is not included in Appendix 4 (Examples of priority weeds) and Appendix 5 (Weeds identified in the CoJ). I have observed the wonderful and effective work of Friends Groups in our dune systems and would hope CoJ will continue to encourage and support these groups. Thank you for the opportunity to provide feedback and for the fabulous work of the CoJ in creating such great amenity in this local government area.
It is an impressive plan which appears to take a thorough investigation of the City's needs.
Though I think the plan is well written. However, it doesn't include the key issues that are concerns of the public. These include: *a) That weeds are sprayed too late, allowing for the seeds to germinate the next year (the seed bank is not being reduced due to late spraying. Glyphosate does not kill seeds). To whipper snipper weeds after spraying makes little or no impact or the next germination, except reducing the height of the weeds.* *b) Mulching works well but, if not regularly topped up and kept thick, the blown-in weeds will find a foothold, just look at the median strips on major roads such as Ocean Reef Road. Regular top-ups are needed.* *c) Hand weeding works well, particularly in natural areas, but can also work in play spaces, we just need to make a dedicated effort for a few years to get the weeds out before they reach seed stage. Such an effort would be rewarded with much lower rates of weeds into the future.* *d) Finally, I strongly support steam being widely used in the City, all streetscapes could easily be reached, not just selected areas. If the City invested in the equipment, it could extend steam to all play spaces. It has the advantage of not being dependent on weather. We frequently see your contractors spraying glyphosate during the winter rains. Subiaco uses steam extensively, cut the trials and ask them how it works. Basically getting in early, before the seeds have set should be a priority, though I am strongly against pre-emergent herbicides as they can travel within the soil and impact trees. Community members, like myself, are concerned about the spraying of parks with glyphosate as our animals and children are not protected. I would like to see the reinstatement of 24-hour signage so that we can make an informed decision about entering a newly sprayed park. The current 2-hour window for signs does not consider that the half-life of glyphosate is weeks, not hours. As a member of the Friends of [- - -] I undertake weeding in the areas we are working on to regenerate native species. We weed by hand and it is very effective. I see other friends of groups and they too are making a huge positive impact on the natural areas. I also undertake weeding in the local park, on street verges near my home which all helps to keep my yard weed free. Perhaps encouraging the community to participate in keeping the weeds down beyond a flyer in the junk mail might help.*
The questionnaire text was biased in favour of chemical weed control.
No to glyphosate.

City needs a plan to phase out toxic chemicals for weed control. Need 24-hour caution signals.
In respect of hand weeding I indicated that am neutral only because I respect that incorrect methods can be responsible for some erosion. However, I consider hand weeding is far less harmful to the environment, plants and all living creatures than chemicals.
Well done City of Joondalup to bring this topic to the public vote. I strongly oppose the use of herbicides and strongly support hand and steam weeding.
Chemical control of weeds needs to be stopped immediately. It has serious impacts on bee populations and makes my dog sick even weeks after it has been sprayed in an area. These are deadly toxins. I studied weed management with a view to working with chemicals and once I did and paid for the course, I vowed I would never use these methods.
Stop spaying toxic chemicals in our environment. They have been shown to be carcinogenic in numerous scientific studies. Most countries have banned glyphosate. Stop putting lives at risk.
I would like to see the use of glyphosate stopped. This is toxic to humans and animals and I feel like I am constantly seeing the warning signs of its use around are suburbs. It is quite disturbing that this known carcinogen is being sprayed.
Section 4.2.2 — Limitations — "excludes weed management of natural areas managed by the City". This is confusing wording, needs clarification. Would like to see a couple of extra weeds added to a JCC specific list, eg olive trees, which are being spread mainly by ravens (and thoughtless humans), displacing native vegetation. Some other trees, such as Murrayas should also be banned, as I bought one once for use of its leaves as a garnish and flavour enhancer in meat and curry dishes, until I spotted a beautiful male mistletoe bird taking the fruit, possibly into nearby bush where it could spread. The root system sends out runners and is hard to kill to rid of. Comprehensive Weed Management Plan. Good.
The evidence is overwhelmingly global of the dangers to human, animal and insect life in using dangerous toxic chemicals, such as glyphosate. Why doesn't COJ have a plan in place to phase out completely the use of chemicals and use steam and heat and manual removal of weeds as the management plan? As other councils have.
Glyphosate is not safe for humans or animals, hence the need for warning signs when it is being applied. The incidence of respiratory problems among my fellow residents rises whenever spraying is being carried out and the cancer rates in dogs in Western Australia have risen significantly. Although the cause for this has yet to be determined, the use of pesticides must be considered.
Glyphosate is proven to cause cancer, the Council can no longer overlook this fact. Other councils have demonstrated to be effective
In Europe they are letting the weeds grow to support biodiversity and it looks so well.
My foremost concern is that glyphosate is still being used despite it being banned or restricted in many other countries around the world. Also, on a few occasions I have noticed that the person conducting the spraying was not wearing a mask to prevent inhaling glyphosate residue. Surely this alone should necessitate the banning of its use for the sake of the health of those closest to the spraying.
I am interested to see how the electrical treatment does in weed control. I feel the survey is vague, it is difficult to give feedback on which parts of a policy one agrees to when it is written like this.
Ban glyphosate and other toxic chemicals. Use more non-chemical weeding methods.
Could find no mention of Lovegrass a most invasive species in the weeds list. Greatly disappointed that the City fails to control and enforce control by ensuring glyphosate application is mandated before mid-August so that fire hazards are eliminated. Sprayed that early will give time for grasses to rot down rather than just hay off as fire fuel. Also greatly disappointed that the City fails to use controlled droplet spray technology. Such offer great labour savings plus much reduced chemical need. At a normal walking speed one person can, with a hand-held device, spray a one metre swathe at total fluid of 10 litres / hectare to achieve total weed control in that swathe. Suggest you refer [- - -] senior research officer with [- - -] on all of these issues. There is also a good argument for pursuing revised registration of Paraquat to allow it to be used as a double knock after glyphosate to inhibit the development of resistance.
Keep spraying.

The use of weed control is largely unnecessary. Regular mulching and the use of barrier methods is viable on road nature strips alongside utilising ground cover shrubs. Spraying glyphosate and other toxic chemicals has been banned in other countries and has its place alongside DDT and other chemicals that have been abolished years ago. Killing bees and wildlife for the sake of a few weeds is ludicrous.
Glyphosate has been defined as a likely carcinogen by WHO. I measure it in people in my work because it depletes gut bacteria. It is a persistent and very toxic chemical and should not be used, nor should any other toxic chemicals.
I understand chemical weed removal has its place, but I have an alley next to my house and the children play right next to it. I don't like chemicals being used there.
Shepherds Bush Reserve is very overgrown with weeds and currently is a severe fire hazard. The weed seed bank continues to increase. Chemical weed control should have begun as soon as the weeds started to germinate. There appears to be a lack of weed control. The fire tracks created during the fire in late 2021 — very weedy. I walk through Shepherds Bush Reserve just about every day and am disappointed with its degraded state.
I believe it is the City of Joondalup's responsibility to do everything in its power to ensure the health of their residents first and foremost; therefore, there should be no question that natural and environmentally friendly practices of weed control should be the only option considered to protect the health and well-being of their ratepayers, their families, their pets and the biodiversity of the City areas that they live in.
You need to work towards phasing out glyphosate.
I hope CoJ listens to and acts on comments received and informs residents about all decisions.
Please stop using glyphosate-based products in all public area and, most importantly, near children's play area and pathways leading to and from schools. So often we observe contractors/council workers spraying with the spray being swooshed around with the wind catching it and it becomes airborne. Not spot spraying, which is the least they could do with this insidious herbicide. Please don't use in sensitive areas close to native bushland to the detriment of the soil and trees have far reaching roots. Thank you.
Whilst the Australian regulators permit the use of glyphosate when package directions are followed, other countries and states have already banned its use. There is not yet enough insurgent research to conclusively demonstrate the health impacts (in addition to it being a carcinogen) on humans, animals and the environment. Is the risk worth it? Can other methods used in other jurisdictions be trialled, such as highly acidic vinegar? What effective solutions do other states/countries have in place?
I urge the Council to completely phase out the use of chemical weed control as the spray has the potential to negatively impact young children and pets.
I support herbicide control methods along roadways only. Glyphosate should never be used anywhere in parks and along footpaths where children and animals play. Iluka, in particular, has a SAR and this could be used to pay for the more acceptable steam management.
Glyphosate causes cancer period.
Physical Weed Control: Over 20 years of manual weeding in Porteous Park have shown positive results in that some weed species have almost been eradicated and other present common species do not dominate any areas of native plants. So physical weed control should not be restricted to small infestations. Where, as in Porteous Park, there are grass areas, it would be very helpful if the physical weed control included regular mowing at 3-week intervals from July to mid-November of the grass area to cut off weeds growing in the grass before they seed and the seed migrates to the bush area. *Chemical Weed Control: The only way this can be effective, from our experience in Porteous Park, is for spraying to be supervised or checked by friends groups who are fully aware of what needs to be sprayed. Our observation of spraying indicates that contractors have no idea what they are doing or do not care, hence most times the cost is wasted. It would help if some persons in friends groups could be authorised to do some low risk poisoning of some weeds like Cape Tulip or Gladioli.* *Steam and Hot Water Weed Control: I cannot see this being suitable or efficient in the bush setting but may be an option dealing with some of the larger weeds around the outside of park fence lines.*

I think signage for areas that have been sprayed with glyphosate or other chemicals should remain for much longer than just when the chemical is being applied. I'd like to know and make the choice if I want to walk on these areas that have been recently sprayed. Especially if it was only in the few hours prior.
It's time to remove chemical-based weed management, it's destroying foraging abilities, making people and animals sick, many times unknowingly, and may only show in years to come with fatal results.
Plan needs to include a timeline for transitioning to non-chemical weeding methods. Spraying signage needs to be in place for at least 24 hours. Cost of signage pick-up is irrelevant as City crew will be paid for the following days' work. Good management would prevent a Saturday pick-up charge for contractors. In the meantime, marker dye must be visible for longer, especially in damp conditions. Herbicides that actually work against a particular weed or grass not the cheaper option of glyphosate. Rye grass has spread throughout Joondalup during the last few years. Hand weeding and now steam weeding have proven to be more effective and so much better for the environment and wildlife. Extra budget for friends groups who are on-site and able to judge the optimum time for weeding before seeds drop. Extra budget for contractors employed by friends groups for prompt action when needed. Friends groups would benefit from an individual staff member who has better knowledge of area and able to act promptly when required.
We've seen the worldwide studies and health outcomes from the use of these chemicals. The brief of the chemical weed management option is very biased and leaves out crucial information to suit the agenda and sound all positive. In contrast to the other options, which include details from both sides of the argument about the options. It is disappointing when the uninformed are choosing options to support.
I strongly oppose the use of glyphosate for weed control.
1. The City should allocate additional time to hand weeding in natural areas immediately adjacent to play spaces where the use of chemicals is not permitted or is not advisable, eg Iluka Foreshore Park where children's playground is located within 10 metres of natural area, that requires constant management of weeds and encroaching lawn grass. *2. The toxic weed Golden Crownbeard should be added to the list of Local Pest Plants. This weed, which was not even listed in the current WMP prepared in 2016, now occurs across the entire City from Kinross to Marmion. Information from Florabase:* [hyperlink removed] *Notes: Disturbed sandy substrates are particularly vulnerable to invasion. Characteristics that make it a serious environmental weed include ability to invade native vegetation and displace native flora, high seed production, seed dormancy, the ability to tolerate dry conditions and allelopathic effects. Can grow to 1.5 metres and forms dense stands. Suggested method of management and control. Hand-remove isolated plants, including tap root, before seeds set. Carefully dispose of plants as they are known to resprout roots. In degraded areas, try 1% glyphosate + Pulse® 2 mL/L or in more intact bushland, Lontrel® 20 ml/10 L + wetting agent. Apply herbicide before seeds set. Follow-up control will be required on germinating seedlings for at least three years. The draft Weed Management Plan states: "Prevention of a new weed species being introduced into natural areas is the most effective method of weed control. Eradication of weeds usually requires more resources for weed management than those required for weed prevention, and weed eradication is easiest and most cost effective with the early identification and management of new weed populations." This statement should apply to all areas in the City, inclusive of the LGA and privately controlled/owned land, not just to natural areas. As the weed appears to be associated with infrastructure projects on both public and private land, the most effective method of eradication, is by including it on the Local Pest List and making its control a condition on any building approval, so property owners are required to act. Unlike caltrop, this is an erect plant growing to 1 metre with very prominent large yellow flowers (a mini sunflower) so is easily recognised.*
Put in a plan to phase out glyphosate. More chemical-free dog parks.
City of Stirling, along with other LGAs, use steam as a weed control as the preferred method. Please limit the use of glyphosate and other chemicals for the health of the community and pets.
Stop using glyphosate. It is proven to cause cancer.
I would like to see the use of non-chemical weed control methods extended around schools and adjacent ovals and continued signposting when chemical spaying is being undertaken.

Generally, I'd prefer to see a reduction in chemical weeding products from a perspective of improving human and animal health, but also avoiding the environmental impact of run-off and contamination of natural environments. Though, I respect the fact that in some cases it would be more appropriate to use chemical methods over steam, for example, to be more selective with which plants are killed. Only when absolutely needed would be a good way to summarise my view on the use of glyphosate and other chemical weeding products. Otherwise wherever possible, and at whatever cost, please use steam, physical, or other environmentally and health friendly methods.

Do your best. I oppose chemicals but appreciate the work you do.

[respondent copied a section of the City's draft plan as follows]

The purpose of the draft Weed Management Plan 2022–2032 is to outline the City's integrated approach to the management of weeds within the City of Joondalup. The objectives of the Plan are to:

- *protect biodiversity*
- *maintain amenity*
- *meet regulatory requirements*
- *reduce the reliance on herbicide use (where technology allows)*
- *minimise bushfire risk*
- *increase weed management communication to the community*
- *support community weed management initiatives.*

[respondent provided their comments as follows]

A. Protect biodiversity: Pesticide use has a negative impact on biodiversity causing harm to soil organisms, insects, birds, mammals and aquatic life. It should be the last resort and, if no other weeding method is found suitable, should be applied by dabbing onto to the plant directly.
B. Maintain amenity: There are many methods to control weed to maintain amenity. The cheapest, quickest way is to use chemical. The question is, is it really the cheapest way? It only has a short-term effect as it requires a regular effort. It seems not to be cheap nor effective when you do the sums. Evidently, SAR locations such as Burns Beach and Iluka have to be sprayed with chemicals on a weekly basis compared to other non-SAR suburbs that are only treated on a monthly basis. The real cost of the chronic health impact on people, animals and the environment has not been factored into it and it is a burden on the ratepayers.
C. Meet regulatory requirements: On PPE: Regulatory requirements on PPE appears to be the bare minimum that can we get away with rather than how can we protect the workers better. For example, pesticides exposure on operators can be through direct contact (mists landing on skin or mucous membrane in eyes), inhalation and ingestion (rare). Wearing gloves is the only requirement when applying pesticides, the rest are optional. This has been one of the main reason for complaints from concerned residents. When questioned every time, the experts from the Health Department WA refer me to the direction labels supplied by the manufacturer. Similar to the safety data sheet, the safety studies supplied are provided by the manufacturer's own scientists. The sole aim for any company is to make profits, do you think they will declare that the product they produced is carcinogenic, hormone disruptor, causes auto-immune diseases, mutagenic, clastogenic, crosses blood brain barrier, causes neurological diseases, causes fertility and pregnancy problems, damages organs such as kidney and liver? My suggestion for Council to set out some rules for minimum protection for operators (City staff or contractor) to protect the 3 routes of exposure:
1. Wear long sleeves shorts and pants (direct skin contact)
2. Eye protection (absorption via mucous membrane)
3. Respirator (exposure through inhalation).
On signage: According to Health (Pesticides) Regulations 2011 page 57 (stamped page) Item 89B: - (3) In addition, warning signs with the words "CAUTION: [NAME OF CHEMICAL] BEING APPLIED. AVOID CONTACT WITH AREA WHEN SIGN IS DISPLAYED." in capital letters not less than 50 mm in height must be displayed — (a) so that the signs —
(i) are clearly visible to persons approaching the spraying operation; and
(ii) are at a distance from the spraying operation that provides adequate warning of the application of the pesticide; and
(b) for the following periods —
(i) while the pesticide is being applied;

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(ii) after the pesticide has been applied until any surface to which it was applied has dried. Bearing in mind the average half-life of glyphosate is 47-days and this only protects human, it is inadequate to leave signage out for the short period of time. Please note it has never been mentioned that it is safe when the surface is dried. Safe is a word used by the City and not found in the Act. There is a strong case for using 24-hour advisory signage.
D. Reduce the reliance on herbicide use (where technology allows). Note: City of Subiaco and City of East Fremantle have both banned glyphosate 2-years ago. City of Stirling has a plan and budget allocated to ban glyphosate on road reservation by 2025. City of Joondalup should implement a plan to do so. Reducing Glyphosate use can be done by:
1. Expanding non-chemical weeding in sensitive facilities from schools, play spaces and CBD to aged care, hospitals, community centres, dual path along the coast, around cafes with outdoor seating.
2. Use only WeedSeeker on footpaths, kerb lines and roundabouts to reduce glyphosate use by 80–90%
3. Contracts for chemical weeding should be amended to include mechanical and hand weeding. One problem is the present contractors are contracted to spray which limits the possibility to use other means in appropriate situations. For example, when you waste time and chemical spraying weeds that are seeded, it would be better to whipper snip and bag them to eliminate the seed bank.
E. Minimise Bushfire risk: glyphosate is licensed as a desiccant to dry cereal crops for a uniform harvest. Spraying glyphosate on wild cereal grass will increase fire risk by killing and drying them increasing the fuel load in the suburbia. These should be whipper snipped and bagged.
F. Increase weed management communication to the community: The residents are not aware of the services provided by the City, such as a notification register, pesticide exclusion verge register. The other issue is the City needs to send reminder for people to reregister in July, given that we have a good IT department, this should not be hard to put in place. Having visited the Hepburn Heights / Craigie Friends Group stall at the Six Season concert held at Penistone Reserve, most people failed to identify native flora from weeds when asked to play the ID game at the stall. There's a considerable lack of knowledge or awareness of weeds in natural areas. [- - -] *from* [- - -] *runs weekly informative tour to 5 of the bushlands in City of Stirling. COJ should run a program to engage someone with that level of knowledge to do regular guided tour in our natural areas.*
G. Support community weed management initiatives: More funding is required for volunteer groups to carry out education. Given that conserving a biodiversity hotspot is of high priority, the proportion of budget allocated to natural areas for weed management does not reflect its importance or express the intention to conserve. One should increase the funding for natural areas by engaging more hand weeding contractors. The Weed ID brochure has been useful for residents. They can be provided to schools. The City can partner with State Government to support more school outings to natural areas for education purposes such as learning native flora fauna and ID pest animals and weeds. The City should provide grants for residents to set up task force to weed their PAWs and local reserves. Provide initiatives for fleabane removal and collection in exchange for points that can be redeemed for other incentives.
City of Stirling has a plan to phase out glyphosate on road reservations by Dec 2025, City of Joondalup needs to implement a plan. Item 14.1 page 496 [hyperlink removed] *Physical weeding removing the whole plant including potential seed bank is much more effective than glyphosate. It does not require a licence, PPE other than gloves, no harmful effect from short- or long-term chemical exposure to the operator, the public, to animals and the environment. It is the long-term sustainable solution. Physical (hand) weeding might be time consuming and expensive for the first year, once the seed bank is reduced, it will require less time and effort and cost will be reduced dramatically. A resident weeded a mulched area in her local park, the other part was sprayed with glyphosate. Months later, the hand weeded area has relatively few weeds regrowing, whereas the area sprayed was full of weeds. We have been misled by thinking that a chemical is the most cost-effective means, but this has demonstrated that it is only a short-term solution. Hand weeding is much more effective in eliminating seed bank, hence a long-term solution. One way to achieve this is by increasing funding to friends' groups, encourage more friends groups to look after reserves. Volunteers are passionate about*

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conservation, it's a win-win situation. Friends group along the coast have shown the effectiveness of hand weeding, the environment is pristine compared to median strips along our arterial roads, the trees are not a healthy look. The use of pre-emergent has such a long-term devastating effect for the water table and the environment and it could end up in bore water, it should never be allowed. The amount of chemicals entering into the environment is out of our control. Glyphosate breaks down into AMPA which is a known toxin for the aquatic environment and as toxic as glyphosate itself. [hyperlink removed] *These environmental toxins affect the health of the environment and studies have shown that animals exposed to half the toxic dose would not exhibit any signs of illness, but their offspring and the third generations are born with ill health.* [hyperlink removed] *US lawsuits also exposed the Monsanto Papers.* [hyperlink removed] *The Monsanto Papers tell an alarming story of ghost-writing, scientific manipulation, collusion with the Environmental Protection Agency (EPA), and previously undisclosed information about how the human body absorbs glyphosate. These documents, which Monsanto does not want you to see, provide a deeper understanding of the serious public health consequences surrounding Monsanto's conduct in marketing Roundup. When our regulator APVMA has 95% ($41 million) of their annual income in 2021/2022 coming from the industry that it is supposed to regulate, this is unacceptable and one cannot in all honesty, rely on their safety data which is supplied by the manufacturers themselves* [hyperlink removed] *The draft WMP also quotes WA Health Department, when questioned on the level of PPE required for workers, they referred me back to the same information (directions / SDS) supplied by the manufacturers which says only gloves are mandated during application, others PPE are optional. These experts are only referring to manufacturers' guidelines. Operators are exposed to glyphosate regularly. In 2019, a collaborative study published in Mutation Research reported that individuals with particularly high exposures to glyphosate (i.e. those who spray it) could have a 41% increased relative risk of developing non-Hodgkin lymphoma.* [hyperlink removed] *Most people are concerned about Bindi and other weeds with burrs. It is an issue in sporting oval when chemicals like Bow and Arrow is applied broadacre style. The Town of East Fremantle managed to improve turf health and eliminate these weeds in their sporting ovals. They still use chemical, but use spot treatment, if necessary, rather than broadacre style.*
By using correct management methods, chemical use can be reduced or eliminated in sporting ovals. [hyperlink removed] *The report includes cost factors for fertilisation, aeration, over-seeding and irrigation for both programs. The conventional program includes additional costs for purchasing and applying typical herbicides and insecticides, while the natural program includes costs for compost topdressing and natural soil amendments. Costs for the natural program are slightly higher in the first two years of the comparative report, then drop significantly in years three and beyond. The City needs to carry out trials or share resources from other shires that have shown success in the area. The City has implemented a number of measures to improve public awareness of chemical use such as:*

- *add marker dye*
- *24-hour glyphosate signage*
- *pesticide exclusion register*
- *pesticide use location maps and schedule*
- *pesticide use notification register*
- *PAW planting and maintenance initiative*
- *contractor that uses WeedSeeker technology*
- *non-chemical weeding contract including hydrothermal at nominated locations.*

Marker dye needs to last at least 48-hours as average half-life of glyphosate is 47 days.
24-hour glyphosate caution signage needs to be reintroduced to raise awareness, especially for dog owners who walk their dogs after work and no signs nor marker dye is visible. [hyperlink removed]
Signage can have wordings indicating it is for 24-hours and tampering with property of City of Joondalup is an offence. For example, add the word today to indicate an expectation that the signage is for the day. "Caution glyphosate is being applied today".
The nominated locations for non-chemical weeding can be expanded to include high foot traffic locations, such as coastal dual path and areas in proximity to cafes with outdoor dining areas, outside aged care facilities and hospitals. We also need more chemical free parks for dogs.

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Presently only Elcar Park in Joondalup. One should aim for one dog park per ward to start with. The City also needs to trial flame weeding over winter months and trial other types of weeding methods such as electricity and laser.
[hyperlink removed]
[hyperlink removed]
[hyperlink removed]
There are a number of interest groups that forage for wild food. The use of pesticide in public open space has posed unnecessary health risks to the public. The City should consider weeds as a resource. They are green waste and that can be made into compost provided it's done correctly. Poisoning them has excluded the possibility of a circular economy. According to Public Health Act 2016 page 3
1. Sustainability principle
(1) Sound public health practices and procedures should be adopted as a basis for sustainability for the benefit of all people and the community today, while consideration is given to the public health, social, economic and environmental needs of future generations.
(2) Public health, social, economic and environmental factors should be considered in decision-making, with the objective of improving community wellbeing and the benefit to future generations.
(3) Public health practices and procedures should be cost effective and in proportion to the significance of the public health risks and consequences being addressed.
2. Precautionary principle
(1) If there is a public health risk, lack of scientific certainty should not be used as a reason for postponing measures to prevent, control or abate that risk.
(2) In the application of the precautionary principle, decision-making should be guided by (a) a careful evaluation to avoid, where practicable, harm to public health; and
(b) an assessment of the risk-weighted consequences of the options.
3. Principle of proportionality
(1) Decisions made and actions taken in the administration of this Act to prevent, control or abate a public health risk should be proportionate to the public health risk sought to be prevented, controlled or abated.
(2) In the application of the principle of proportionality, decision-making and action should be guided by the aim that, where measures that adversely impact on an individual's or business's activities or a community's functioning are necessary, measures that have the least adverse impact are taken before measures with a greater adverse impact.
4. Principle of intergenerational equity. The present generation should ensure that public health is maintained or enhanced for the benefit of future generations.
5.Principle relating to local government. The functions of local governments in relation to public health should be acknowledged and respected. Persons involved in the administration of this Act must perform their functions with due regard to the objects and principles of this Act. [hyperlink removed] *The harmful effect of chemicals and the costs to the community has never been factored into consideration. The irony is that residents are paying for poisons they rather not exposed to as well as paying for medicine to cure their ill health as a result of chemical exposure.* [hyperlink removed]
[multiple submissions received]
City of Stirling has a plan to phase out Glyphosate on road reservations by Dec 2025, City of Joondalup needs to implement a plan. [hyperlink removed] *Physical weeding removing the whole plant including potential seed bank is much more effective than glyphosate. It does not require a license, PPE other than gloves, no harmful effect from short- or long-term chemical exposure to the operator, the public, to animals and the environment. It is the long-term sustainable solution. Physical (hand) weeding might be time consuming and expensive for the first year, once the seed bank is reduced, it will require less time and effort and cost will be reduced dramatically. One way to achieve this is by increasing funding to friends' group, encourage more friends group to look after reserves. Volunteers are passionate about conservation, it's a win-win situation.*
A resident weeded a mulched area in her local park, the other part was sprayed with glyphosate. Months later, the hand weeded area has relatively little weeds regrowing whereas the area

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sprayed are full of weeds. We have been misled by thinking that chemical is the most cost-effective means, but this has demonstrated that it's only a short-term solution, hand weeding is much more effective in eliminating seed bank, hence a long-term solution. The use of pre-emergent has such a long-term devastating effect for the water table and the environment and it could end up in bore water, it should never be allowed. Friends group along the coast has shown the effectiveness of hand weeding, the environment is pristine compared to median strips along our arterial roads, the trees are either sick, lack of vibrancy or dead. The amount of chemical entering into the environment is out of our control, glyphosate breaks down into AMPA which is a known toxin for the aquatic environment and as toxic as glyphosate itself. [hyperlink removed] *These environmental toxins affect the health of the environment and studies has shown that animals exposed to half the toxic dose would not exhibit any signs of illness, but their offspring and the third generations are born very ill health. US lawsuits also exposed the Monsanto Papers.* [hyperlink removed] *The Monsanto Papers tell an alarming story of ghost-writing, scientific manipulation, collusion with the Environmental Protection Agency (EPA), and previously undisclosed information about how the human body absorbs glyphosate. These documents, which Monsanto does not want you to see, provide a deeper understanding of the serious public health consequences surrounding Monsanto's conduct in marketing Roundup. When our regulator APVMA has 95% ($41 million) of their annual income in 2021-2022 coming from the industry that it's supposed to regulate, this is unacceptable and one cannot in all honesty, relying on their safety data which is supplied by the manufacturers themselves! The draft WMP also quotes WA Health Department, when questioned on the level of PPE required for workers, they referred me back to the same information (labels directions/SDS) supplied by the manufacturers which says only gloves are mandated during application, others PPE are optional. These so-called experts are only referring to manufacturers' guidelines. Operators are exposed to glyphosate regularly. In 2019, a collaborative study published in Mutation Research reported that individuals with particularly high exposures to glyphosate (i.e. those who spray it) could have a 41% increased relative risk of developing non-Hodgkin lymphoma.* [hyperlink removed]

The City needs a plan in place to follow City of Stirling's example to replace chemical weeding by non-chemical weeding methods.

In regard to protecting biodiversity, of our native coastal heath / dune's heath, could the City please note and define the cyclops Wattle as a weed. This species is aggressively and opportunistically taking over the dunes as a cyclops wattle monoculture, with the many and varied and unique local native plants such as scaevola and pig face and prickly wattle being completely displaced. The dunes vegetation biodiversity is something important to be preserved and is a great shame for the coastal heath to not be protected from the cyclops wattle weed. Please see the northern Mullaloo dunes stretch for evidence of the displacement that has already occurred and the encroachment of the cyclops wattle southwards now past Korella Street. This monoculture displacement of the indigenous plant varieties is particularly evident closest to the road were possibly the road water runoff provides an advantage to the cyclops wattle weed. These plants appear to spread by multiple underground suckers and could be managed by a coast care manual weeding program, as well as spraying of the existing larger bushes by professional licensed contractors. Thank you for the opportunity to comment. Best regards [weblink removed]

I think the Council is all about saving money than the health of citizens and pets that use or walk by these areas. To say glyphosate is safe is a lie. There is legal action over deaths in the USA and the manufacturer does not have a great track record on safety. Although slower, hand weeding and / or water blasting is preferred. This method has proven, in the long term, be more effective as the seeds are pulled with weeding. Chemical spraying does not prevent the seeds from creating weeds. Councils' method of weed control is outdated and is simply a health hazard. Also, the areas of spray need to have signage warning passers-by much longer than current. And the areas already chosen for weed control must be expanded. Will Council listen?

The use of glyphosate needs to be reduced. There are countless studies showing the long-term impact of this chemical. Easiest is not always best.

Some parks are infested with the clover weeds and the prickles they leave and if we walk our dogs these prickles end up in the dog's feet and can take over 30 minutes to an hour to remove or they risk injury. The park on Whitmore Terrace is directly across from us but we can't walk the dogs there. Is there any response to this? Thanks.
It is time Joondalup stepped up and stopped with the poison use, we all know it's not safe. Stop damaging our health, soils and killing off our wildlife.
I have seen chemical weed spray being poorly applied (as evident with the dye). Not specifically on weeds and near or on native plants which run along the area sprayed. More care is needed when applying chemical controls. (Caledonia bushland area)
I think the use of steam is fantastic. Glyphosate has been proven to be unsafe and is banned in many places for a reason, it's extremely harmful to humans. It needs to be phased out immediately. I fear for the health of the population every time I see a sign saying it's being used, and for the health and safety of the people spraying it.
Reintroduce 24-hours glyphosate caution signage. More chemical free dog parks. More funding for volunteer hand weeding groups.
Stop using toxic glyphosate. It's no secret the damaging, harmful and negative effects this chemical has on humans and pets alike. It has already been banned in other councils in WA and also banned in other countries. Council of Joondalup do better.
The statement on the use of chemical control whilst referring to best practice is not applied in use. I regularly see operators spraying without any protection or signs. I also question the Council's removal of trees and shrubs on the corner of Caridean Street and Hodges Drive, then leaving the area bare. Obviously, it will become weed covered and it has. This indicates a lack of planning and consideration of environmental impact. It is also costly to the ratepayers. End of year assessment, you can do better Joondalup.
Hand and steam weeding should only be used until a safe alternative to harmful chemical weeding is found.
I support the use of herbicides for managing weeds. Health considerations need to be balanced with effectiveness and efficiency. Physical weeding is uneconomical. Steam and hot water weed control appears to have limited effectiveness. Some weed attention is needed at the corner of Forest Hill Drive and Trinity Way in Kingsley.
I would like to see a plan in place to phase out the use of glyphosate completely from the COJ. And while this toxin is still in use, the 24-hour signage should be returned. I would like to see more non-chemical weed control in our parks and on the paths that lead to our parks and sensitive areas, such as along our coastal walking paths. If other councils can do it, so can COJ. Full steam ahead. Glyphosate cannot be used proficiently in the wet winter months, it has no action in killing seeds in spring and summer. Steam can be used all year round.
Please inform all residents in the area if glyphosate is sprayed. Also, signs need to be in place for at least 48-hours following spraying of chemicals
Keep our suburb chemical-free wherever possible please.
The Weed Management plan does not address significant community concerns re the use of chemicals, such as glyphosate. In my own situation, my block has a fence which faces the [- - -] walkway. Behind this fence I grow organic fruit and vegetables. I am unable to prevent the Council from spraying chemicals on the plants on the other side of my fence as it is neither a verge nor a PAW. I have seen contractors in the CoJ who spray chemicals without safety equipment of even the most basic kind. I have seen them spray without the basic attempt to actually target the spray at a weed, but rather to wave the spray in a non-discriminatory manner. I do not think the signs that advertise the use of chemicals for just one hour after use is at all satisfactory. They should be left out for 24-hours at least. This plan is just more of the same and a defence of the current practice. Not good enough.
Will the walkways be cleared of weeds? Some places you can't walk because of weeds and tree branches. Will verges with waist high weeds be cleared?

The walkway next to our house was sprayed in completely wrong time of the year and, when I complained about it, I was told that that is how the schedule was set and nothing can be done about it. Could you please correct this and have more workers to do the spraying so it is done in correct timing? The Pesticide Use Notification — Locations Map and Schedule is a great improvement but could be made more usable by updating it daily. We could then avoid the park for a few days. There is also a practice to plan spraying in lots of parks all at once and then notify about this spraying for following weeks, sometimes 4–5 times. It makes it difficult to access all parks in the area for weeks on certain times of the year. I understand that it is difficult because of the weather and available resources, but it is also difficult for the residents trying to exercise and relax after work. I am not criticising, just informing about the difficulties that we are experiencing. The signage during and after the spraying is a big issue for me. To have signs up for a few days after the spraying would be great improvement and I would not need to try to remember every schedule planned and changed all the time. I know you don't have to because there is no regulation and the sign need to be up only during the spraying, but it would be such help and as much as we understand that there is no way around using chemicals in the parks the same way, could we be made more comfortable with the situation by providing this signage for extended periods after spraying?
I am disgusted with use of chemicals at kids' playgrounds. We went to one where the lawn was all bubbly, with 2 little toddlers and my daughter pregnant at the time. After we had played on the equipment, we saw warning signs on the opposite side of the park we were exposed without warning and I am furious with the Council for risking my grandchildren's future health.
Please stop using glyphosate. Natural products on sunny days work just as well.
The fact that you have to warn people you are spraying chemicals says it all doesn't it? You are warning them of a poison. How can you protect parks with substances that are unnatural? I believe staff have to wear protective items to spray it. Doesn't that tell you it's not good for you? [hyperlink removed] *here is an interesting link: Monsanto having to pay $11 billion settlement over glyphosate 9th largest personal injury case. Doesn't that tell you anything? Stop listening to a group of people saying it is safe when the evidence suggests otherwise. I wish you would use critical thinking of your own rather than following antiquated approvals.*
Chemical weed control is a serious health risk to the public and alternative methods need to be sought including using natural weed killers.
While the use of chemicals for weed control is more efficient, I would support a more environmentally and animal friendly solution more. Is it viable to phase out the use of glyphosate for a natural weed killer? As a dog owner, I worry about the effect on them as well. Using warning signs is always appreciated.
I think it is completely disgusting and reckless that chemicals such as glyphosate continue to be used to control weeds in our parks, playgrounds and other suburban areas. The chemical has been linked to non-Hodgkin lymphoma and is banned overseas, yet we continue to regard it as the only effective treatment of weed control which is the biggest load of [- - -] *I have ever heard. Steam has been successfully used in many different shires and has been found to be much more effective in the long-term control of many varieties of weeds. If glyphosate was genuinely effective, there would be no need or purpose to spray the same areas on an almost fortnightly basis! It is ludicrous to see those signs up every other week. Speaking of the signs, I find it completely disgusting and reckless that they are only on display for a period of approximately 2 hours. People who might visit parks and recreational spaces in the morning are aware of when it has been sprayed, but those then walking their dogs or taking their kids to the play areas in the afternoon would have no idea. These Council members need to* [- - -] *and do some research on how harmful these chemicals are to not only the environment, flora, fauna, pets, children and adults as well. The science is out there for those that wish to stand up and take note. I can't believe that the Council does not wish to hire more workers in this current job climate, who would be only too happy to get out and do some hand weeding. I know a lot of people looking for work so to say hand weeding is onerous or the equipment is too cumbersome for steam weed control is an absolute joke and a cop-out. Who comes up with these ludicrous excuses? Beyond pathetic.*

[- - -] *Feedback on the City of Joondalup's Draft Weed Management Plan 2022–2032: I am extremely concerned about the City of Joondalup's plan to use glyphosate for the next 10 years when there is mounting evidence around the world of how harmful this chemical and the chemicals used to bind with it are. Scientists have raised concerns about the other ingredients (arsenic, chromium, cobalt, nickel and lead) in glyphosate-based herbicides. While glyphosate is the active ingredient, companies don't have to publicly disclose other proprietary chemicals in these herbicide formulations. Consequently, regulators and researchers can't fully study these inert chemicals to determine their health effects alone and in combination with each other. Glyphosate also contains the surfactant polyoxymethylene tallow amine (POEA). A toxicologist has stated that glyphosate and POEA when combined, cause a synergistic effect, making the product 50 times more toxic to humans. Other City Councils are moving away from the use of glyphosate so why isn't the City of Joondalup?*
We need to phase out the use of chemicals as they have shown to cause serious health issues amongst residents. We need to ensure signs are left out for 24 hours, at least, so people can avoid these areas. We need to stop spraying in areas where there are more vulnerable people, like schools, day cares, aged care facilities and animals. If other shires can do it successfully there is no reason at all why the City of Joondalup can't.
I understand that the natural management is more labour intensive but will create a healthier ecosystem for everything to live in, rather than fighting against the chemicals. Longer term benefits.
I worry about the use of chemical weed control on health, also with dog walkers and the health of the dogs as they tend to forage through the undergrowth.
No chemicals in Kallaroo. Steam is just as good. Protect our children and pets. Chemicals kill.
Chemical pesticides and herbicides should be avoided. Physical removal is the best option environmentally.

City of Joondalup

City of Joondalup
Weed Management Plan
2023 - 2033

City of Joondalup pest plant and priority listed weed, Caltrop (*Tribulus terrestris*)

Acknowledgements

Please formally acknowledge the City of Joondalup if you choose to use any of the content contained within the Weed Management Plan.

Suggested citation:

City of Joondalup, 2023, *Weed Management Plan 2023 - 2033*, Joondalup, WA.

Acknowledgement of Country

The City of Joondalup acknowledges the Traditional Custodians of this land, the Whadjuk people of the Noongar nation. The City recognises the culture of the Noongar people and the unique contribution they make to the Joondalup region and Australia.

The City pays its respects to Elders past, present, and emerging, as well as all Aboriginal and Torres Strait Islander peoples.

This plan may include words from the Noongar language and the City recognises that Aboriginal languages are oral in nature and the same word can be spelt in multiple ways.

Aboriginal and Torres Strait Islander people are advised that this plan may contain images or names of people who are deceased.

Contents

Acronyms

Acronym / Abbreviation	Definition
APVMA	Australian Pesticides and Veterinary Medicines Authority
BAM Act	*Biosecurity and Agriculture Management Act 2007* (State)*
BC Act	*Biodiversity Conservation Act 2016* (State)
CALM	Department of Conservation and Land Management
CBP	Commercial Business Precinct
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFWA	Department of Agriculture and Food Western Australia
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DEC	Department of Environment and Conservation
DFES	Department of Fire and Emergency Services
DPaW	Department of Parks and Wildlife
DPIRD	Department of Primary Industries and Regional Development
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
DWER	Department of Water and Environmental Regulation
FCT	Floristic Community Type
ha	Hectare
IARC	International Agency for Research on Cancer
km	kilometre
KPI	Key Performance Indicator
m	meter
n.d.	No date
NEWP	National Established Weed Priorities
NIASA	Nursery Industry Accreditation Scheme Australia
NRM	Natural Resource Management
PAW	Pedestrian Access Way
POSF	Public Open Space Framework
QMS	Quality Management System
SAR	Specified Area Rates
SDS	Safety Data Sheet
TEC	Threatened Ecological Community
WA	Western Australia
WALGA	Western Australian Local Government Association
WAH	Western Australian Herbarium
WAM	Western Australian Museum
WAOL	Western Australian Organism List
WHO	World Health Organization
WoNS	Weeds of National Significance

* A review of the BAM Act is being undertaken in 2022.

1.0 Introduction

1.1 Background

The City is located within the Southwest Australian biodiversity hotspot, one of 36 biodiversity hotspots in the world, with over 2,900 endemic plant species occurring in this region.[1] There are a number of regionally, nationally and internationally significant natural areas located within or adjacent to the City including Yellagonga Regional Park, Marmion Marine Park and Neerabup National Park. There are a total of eight Bush Forever sites within the City that contain vegetation communities and species of high conservation value.

The City is situated along the Swan Coastal Plain, with its southern boundary located approximately 16 kilometres from the Central Business District of Perth. The City covers an area of 96.5 square kilometres which encompasses a diverse range of natural areas including 17 kilometres of coastal foreshore, a chain of wetlands and a variety of natural areas. The City also includes 550ha of parks, 533ha of natural areas, 1,060km of roads and 927km of pathways.

The City is bounded by the City of Wanneroo to the east and north, the City of Stirling to the south, and the Indian Ocean to the west. A map of the City is displayed in Figure 1.

1.2 Weed Management Plan 2023 – 2033

1.2.1 Purpose

The purpose of the *Weed Management Plan 2023 – 2033* is to provide an integrated approach to the management of weeds within the City.

The *Weed Management Plan 2023 - 2033* details actions to prevent, monitor, prioritise and control the introduction and spread of weeds in the City. The Plan describes the potential impacts from weeds, weed control methods, the City's current weed management approach and proposes management strategies to be implemented over the life of the Plan to minimise potential impacts.

Weed management is conducted within the City by staff, contractors and the valuable contributions from community members in Friends Groups. There are currently 19 Friend Groups within the City, whose members voluntarily work to protect, preserve and enhance significant bushland areas in the community. The *Weed Management Plan* is aligned with the voluntary work of Friends Group volunteers.

The *Weed Management Plan 2023 – 2033* builds upon the outcomes of the previous *Weed Management Plan 2016 – 2021.*

1.2.2 Objectives

Over the past decade the City has been implementing an integrated weed management approach and increasing non-chemical weed control methods to address community concerns.

The objectives of the *Weed Management Plan 2023 – 2033* are to:

i. Implement the integrated weed management program to protect biodiversity and maintain amenity in accordance with regulatory requirements.

[1] Conservation International (2014)

ii. Reduce the reliance on herbicide use by increasing non-chemical weed control methods, where appropriate.
iii. Minimise bushfire risk by undertaking weed control to mitigate fire fuel loads.
iv. Increase communication to the community regarding the City's weed management practices.
v. Support the community's role in weed management through increased community awareness initiatives.

1.2.3 Scope

The City conducts weed management on City managed or owned land across its 22 suburbs, as required. Weed management is conducted in the City to differing degrees, depending on the primary function and usage type of public open space. In alignment with the City's *Public Open Space Framework* all public open spaces owned or managed by the City fall into one of the classifications below:

- Natural Areas
- Urban Areas, consisting of:
    - Sports Park
    - Recreation Park
    - Urban Landscaping.

Weed management of the City's natural areas differs substantially to weed management in parks and urban landscaping areas, due to the difference in weed density and biodiversity values. Section 4.1 of the Plan outlines weed management in natural areas, whilst Section 4.2 of the Plan details weed management in parks and urban landscaping areas.

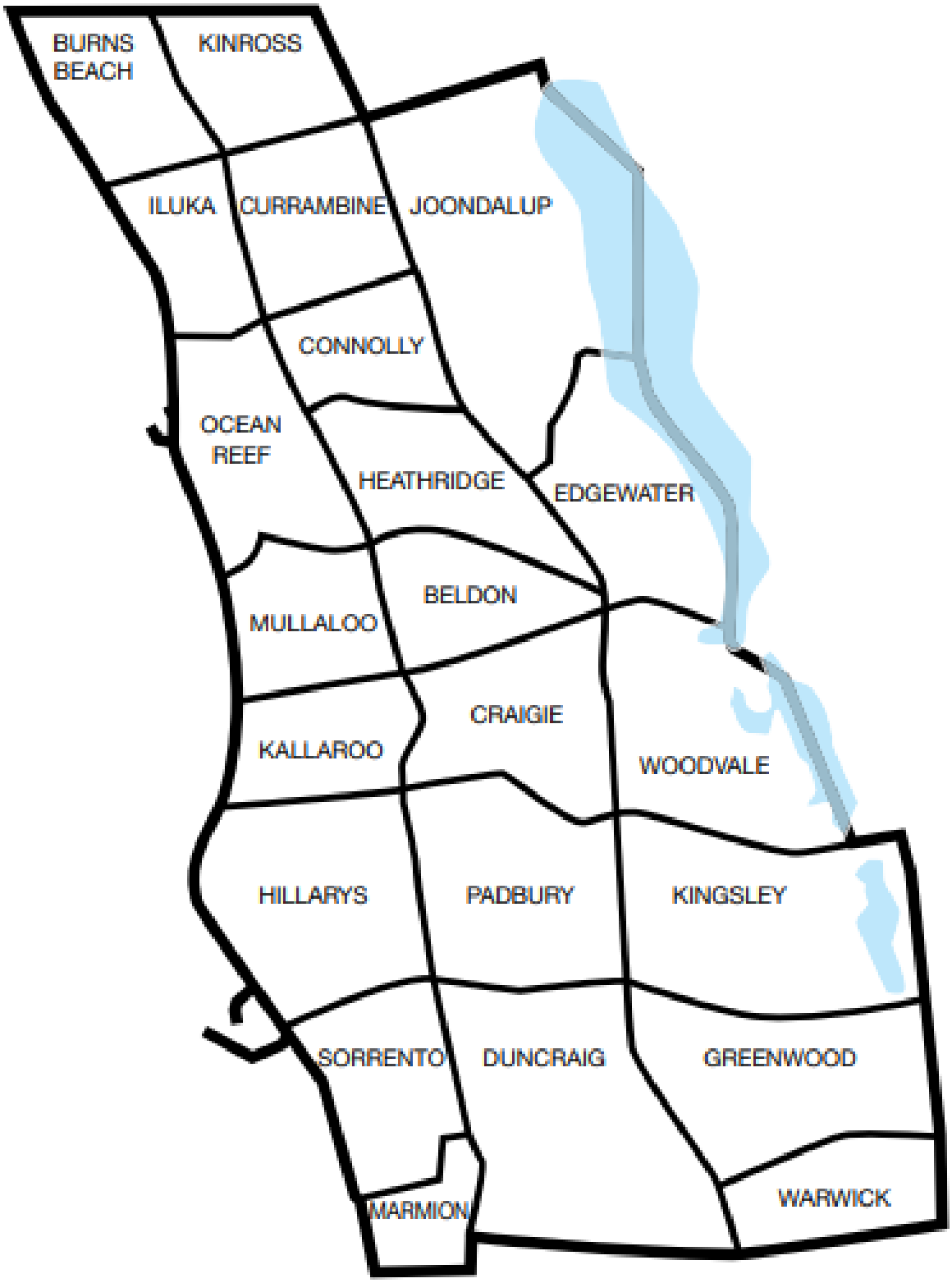


Figure 1: Location of the City of Joondalup

1.2.4 Community Consultation

The City conducted community consultation to consider the City's strategic integrated weed management approach and identify opportunities to inform the review of the Weed Management Plan with the Strategic Community Reference Group in May 2021. The Strategic Community Reference Group consisted of community members, experts and Elected Members. Key initiatives and improvements were identified for consideration in the development of the City's new Weed Management Plan, such as increased community education and communications regarding weed management risks and benefits.

The City conducted community consultation on the draft Weed Management Plan from 24 November to 14 December 2022. A total of 280 responses were received during the 21-day consultation period. In addition to community consultation, the City undertook a peer review process with relevant agencies on the draft Weed Management Plan. Feedback was received from the Department of Health and Edith Cowan University experts which indicates that the City's current approach is in accordance with regulatory requirements and poses minimal risks to staff, the community, animals and the environment.

The City's integrated approach to weed management considers the latest science, research and relevant advice from state government and industry agencies. In addition, the Plan provides a balance between the use of chemical and non-chemical weed management to ensure biodiversity and amenity within the City is maintained and fire risk is reduced. The Plan considers the financial and resource implications related to the delivery of weed management services and provides for a sustainable approach into the future.

Community feedback was incorporated into the final Weed Management Plan, where relevant, which will be presented to Council for endorsement.

1.3 Public and Occupational Health and Safety

The City's integrated weed management approach is conducted in accordance with regulatory requirements and with consideration to community wellbeing and public health.

The City's use of any chemical pesticides to control weeds is in accordance with established health and safety standards. The *Health (Pesticides) Regulations 2011* provide for the safe use and application of pesticides, including herbicides, through appropriate registration and licensing of businesses and persons involved in weed control. All City employees and contractors that use herbicides for weed control are required to adhere to these regulations.

The City uses products that are approved by the Australian Pesticides and Veterinary Medicines Authority (APVMA), according to label instructions, and abides by safety requirements listed on Safety Data Sheets (SDS). The City conducts risk assessments to identify and assess pesticide risks, and where necessary put in place management options to eliminate or control risks.

The *Work Health and Safety Act 2020* requires the City to maintain a current register of hazardous chemicals used in the workplace, provide workers with information and training on the risks associated with their use (storage, handling and disposal) and take precautions to eliminate or minimise the risk of injury.

It is also recognised that some weeds affect human and animal health, causing injury, allergies, dermatitis, poisoning, asthma and other respiratory problems. Weeds have

additionally been linked to indirectly affect wellbeing through the reduction of functionality and amenity of natural areas and public open spaces.[2]

1.4 Weed Management Plan 2016 – 2021

The *Weed Management Plan 2016 – 2021* was endorsed by Council in 2016. Substantial progress has been made in implementing the recommended actions from the Plan with all recommendations that were scheduled for implementation during the life of the Plan having been either completed or commenced. Key achievements from the *Weed Management Plan 2016 - 2021* include:

- Ongoing weed control in natural areas and public open spaces in accordance with the Annual Maintenance Schedules.
- Flora surveys and vegetation condition assessments conducted in numerous major conservation areas, including weed mapping to enable targeted weed control.
- Regular weed monitoring and mapping of natural areas to inform weed control measures.
- Annual monitoring of percentage cover of weeds in natural areas to assess the City's weed management performance.
- Undertaking soil and leaf tissue analysis and turf renovation works to improve the quality of turf and reduce the likelihood of weeds.
- Implementation of the City's bushfire mitigation program including maintenance of firebreaks and other bushfire mitigation works.
- Conducting alternative weed control and technology trials.
- Implementation of steam and hot water and steam only treatment trials within sections of the:
    - Coastal Dual Use Path
    - Commercial Business Precinct (CBP) - kerbs, footpaths, hardstand (paved) median islands, mulched median islands and general paved areas.
- Best practice landscape design and management including hydrozoning and ecozoning principles undertaken in numerous parks.
- Use of pathogen and weed free mulch to suppress weed growth in garden beds or non-turfed areas.
- Community weed education through the Environmental Education Program and Adopt a Bushland/Coastline Program.
- Participation in the WALGA Local Government Herbicide Use and Integrated Weed Management Working Group.

It is estimated that in 2020-21, the City's weed control trials included 2.2ha of non-chemical techniques as part of its chemical reduction approach which focused on research and trials of both chemical and non-chemical products and technologies.[3] Aspirations for future management include measures to continue increasing coverage of non-chemical weed control through the City's chemical reduction approach, as shown in Figure 2.

The City will also aim to continue increasing canopy cover in the City, through the Leafy City Program and the Parks Development Program. The Leafy City Program provides increased leaf canopy cover in residentials streets through tree planting to mitigate the heat-island effect and impacts of climate change. The Parks Development Program focuses on the gradual hydrozoning and ecozoning of parks which supports the replacement of invasive weeds with suitable native species, reducing both financial and environmental impacts over time.

[2] Commonwealth of Australia (2017)
[3] City of Joondalup, 2021

Figure 2: Steam and hot water weed control commenced within the City's CBP in July 2022

1.5 Weeds in Mooro Noongar Boodjar

The City of Joondalup acknowledge the Traditional Custodians past, present and future of the land and waters we are situated, the Whadjuk people of the Noongar Nation, and recognise Aboriginal peoples have practiced sustainable natural resource management and cared for the flora, fauna and biodiversity of Australia for thousands of years.

The Joondalup area, also known as *Mooro Boodjar* (Country), has always been abundant with natural resources, supporting many Noongar generations who continue to remain connected to *Mooro Boodjar*. In return, Noongar people have cared for, protected and sustainably managed their *Boodjar*, and the local plants and animals, traditional kaartdijin (knowledge), stories and ceremonies.

European settlement saw the establishment of market gardens, farms and vineyards, with the subsequent building of roads, settlements and industry; changing the landscape and how it was managed. Traditional Owners recognise that the changes to the landscape brought about by colonisation have significantly changed the connectivity of natural areas, and the local flora, fauna and biodiversity. The clearing of native vegetation, planting of imported species, impacts on wetland and coastal systems, lack of continued cultural burning practices and infestation of pest plants and animals have impacted on *Boodjar.*

The *Weed Management Plan 2023 - 2033* aims to address the adverse impacts brought about in a relatively short span of time by European colonisation and, with the guidance of Traditional Owners, contribute towards bringing back the health of *Boodjar*. This plan also seeks to work in conjunction with the City's strategic environmental framework and draft Reconciliation Action Plan to sustainably manage *Boodjar* in the City. The City's *Environment Plan 2014 - 2019*, *Yellagonga Integrated Catchment Management Plan 2021 - 2026* and Natural Area Management Plans also support the removal of invasive weeds while protecting and promoting natural areas.

1.6 Strategic Context

The purpose of the *Weed Management Plan* aligns with the City of Joondalup Strategic Environmental Framework outlined in Figure 3. Details of the relevant local, State and Federal legislation policies, plans and strategies are outlined in Appendix 3.

Figure 3: City of Joondalup Strategic Environmental Framework

2.0 Impact of Weeds

The City manages large areas of bushland, approximately 533 hectares (ha) of natural areas in over 100 reserves, many of which are recognised as having local, regional or national significance. Weeds are a key management issue for the City's natural areas and threaten the biodiversity values they contain.

The City also contains large areas of assets and infrastructure, parks and urban landscaping areas. Assets maintained by the City include 550ha of parks, 17ha of urban streetscapes, 1,060km of roads, 120ha of grassed medians, 15 artificial wetlands, 927km of pathways and cycleways, numerous play spaces, public garden beds, sporting fields and more. The invasion of weeds in these areas affects the amenity, functionality and aesthetics and impacts upon community use of the sites.

2.1 What are Weeds?

Weeds are plants that grow in areas where they are not naturally occurring and proceed to modify natural processes, usually adversely, resulting in the decline of the communities they invade.[4] A weed usually requires some form of action to reduce its effects on the economy, the environment, human health and amenity.[5] Weeds can establish themselves in terrestrial, aquatic or marine ecosystems.[2]

There are two types of invasive weeds, exotic plants that have been introduced and native species that have moved into new areas in response to changed land and water use and management practices.[5, 6]

Weeds account for approximately 15% of all flora in Australia, with this figure increasing by approximately 20 species per year.[7,8] The number of weeds in Australia has increased linearly over recent years, compared with the majority of other regions of the world where introductions are still increasing exponentially.[9] Over 27,000 known weed species have been introduced to Australia and 10% of those are now considered to be established (have existed for a long time). Escaped garden and landscaping plants are the main source of Australia's weeds, accounting for 66% of recognised weed species.[10]

Most of the environmental impacts on threatened species and communities in Australia are caused by a small number of target weed species.[11] For example, there are 187 invasive weed species introduced to Australia and 16 invasive native plant species introduced to regions outside their native range and have become problematic and are resulting in the greatest impact to Australia's threatened species and communities.[12]

Weeds typically produce large numbers of seeds and spread rapidly, invading natural areas, parks and urban landscaping areas. Weeds can be spread by:

- dispersal of seeds by water, wind, birds, animals, human or vehicle movement
- site activities
- underground root systems

[4] DPaW (1999)
[5] NRM Ministerial Council (2007)
[6] Australian Government (2022)
[7] Australian Government (2012b)
[8] Australian Government (2022)
[9] Australian Government (2022)
[10] Groves, Boden and Lonsdale (2005)
[11] Australian Government (2022)
[12] Australian Government (2022)

- mulch, soil and plant stock
- garden rubbish dumping
- fire.[7]

Yearly growth patterns of weeds vary with some species growing in summer and seeding in autumn and others growing in winter and seeding in spring. The life cycle of weeds also varies, with weeds being classified as either:

- **Annual:** Weeds which germinate, grow, set seed and die in one season or year, such as Wild Oat, Veldt Grass, Paterson's Curse and Cape Weed.
- **Biennial:** Weeds which live for up to two years, usually growing and flowering in the first year and setting seed in the second, such as Bridal Creeper.
- **Perennial:** Weeds which live for three years or more, such as Geraldton Carnation Weed or Gazania.[13]

2.2 Why Weed Management is Important

The City is required to undertake weed control and management to:

- meet the regulatory requirements under the *Biosecurity and Agriculture Management Act 2007*
- protect biodiversity
- reduce bushfire risk
- reduce damage to infrastructure
- meet community expectations for the amenity and aesthetics of local areas.

Within the City, there are 285 identified weeds including 15 declared pest plants and five WoNS. These weed species are often widespread and without control can alter public open spaces reducing viability and biodiversity. The City recognises the importance of weed management and outlines the key impacts in the sections below.

Environment

Weeds are one of the major threats to Australia's natural environment and biodiversity and can change the natural diversity and balance of ecological communities. The City is committed to the ongoing management and conservation of the City's natural environment and biodiversity. Integrated weed management, inclusive of utilising a suite of weed control techniques and timely interventions, is essential to the ongoing protection and enhancement of the City's natural environment.

The City manages a diverse range of natural areas including iconic locations such as sections of Yellagonga Regional Park, Craigie Bushland, Warwick Bushland, Hepburn Heights Conservation Area, Shepherds Bush Reserve and a range of coastal foreshore reserves. Key environmental aspects of the natural areas managed by the City include:

- Two Federally listed Threatened Ecological Communities (TEC)
- Eight Bush Forever sites
- 30 conservation significant fauna
- One endangered and six priority flora species.

Weeds can impact the natural environment by:

[13] CRC for Australian Weed Management (2005a)

- Reducing the viability of native plant species by competing more vigorously for space, water and nutrients.[14] This can result in a decrease in the abundance and health of native species, even to the point of extinction in that area.
- Reducing natural diversity by smothering native plants or preventing them from regenerating after clearing, fire or other disturbance.
- Altering nutrient recycling and soil quality by fixing nitrogen in the soil which can inhibit the germination of native species or releasing nutrients into the soil which may impact negatively on native seedling germination and growth.
- Introducing pests and disease from different areas which native species may not have previously had contact with and may be particularly susceptible to. Weeds can also be more resilient than native plants to certain pests and diseases.
- Creating high fuel loads for fires and increasing the risk of fire in bushland areas.[15]
- Negatively impacting on native fauna by replacing or reducing the native plants and altering plant communities that animals use for shelter, food and nesting.
- Altering hydrological cycles by clogging water courses, resulting in erosion and alteration to flow and or aquatic habitat, as well as reducing light and oxygen to aquatic flora and fauna.
- Impact on cultural heritage sites and reducing availability of bush tucker and medicine.
- Altering genetics of native flora species over time from hybridisation through cross-pollination.

Infrastructure and amenity

Weeds can have social impacts on communities by degrading parks, verges, median strips, public access ways and natural areas. Weeds impact these areas by lowering the amenity, functionality and aesthetics of sites and make these areas less usable by the community.

Weed control is undertaken along City managed roadsides to help improve road safety, particularly when weeds on roadsides reduce driver visibility or impact the integrity of the road surface and road shoulder. Weeds can also impact upon stormwater drainage and result in unsafe road surfaces such as potholes forming.

Weeds can form barriers that impact cultural activities, including food collection and recreational use. Weeds can quickly overtake waterways, preventing water recreation activities and remove habitat for locally native species.

It is widely recognised that weed management is costly, including the direct costs of weed control, and the indirect costs in reduction to the amenity of an area. There is also the unquantified impacts of weeds on nature conservation, tourism and landscape amenity.[16] The use of alternative weed control methods in public open spaces usually has an increased cost and subsequent financial impacts.

2.3 The Effect of Climate Change on Weeds

The City is already experiencing the effects of climate change such as increased coastal erosion, higher summer temperatures, more severe heatwaves, less rainfall, more extreme weather events and a longer bushfire season.[17,18] As a result, climate change has significant social, environmental, economic and legal implications. Climate change has the potential to cause damage to, or loss of, biodiversity and natural habitat.

[14] Australian Government (2012a)
[15] FESA (2011)
[16] Invasive Plants and Animals Committee (2016)
[17] Scott, J.K., et al (2014)
[18] City of Joondalup (2016)

Predicting the exact scale and nature of climate change at a local level is challenging, and the effect on ecosystems is likely to be complex. Climate change is creating favourable environments for weeds as they are generally able to respond rapidly to disturbances enabling weed species to move into new areas or out-compete native species in their existing range.[19]

Climate change has the potential to increase the presence of weeds by:

- creating opportunities for weeds to establish through increased extreme events and resulting disturbance to natural areas, noting the rate of response of weeds to establish is expected to be faster than native plants.
- providing weeds, likely a new set of weed species, that are more readily able to adapt to future climates with a competitive advantage over native species.
- altering distribution patterns of weed and native species.
- increasing activity from sleeper weeds which may appear benign for many years, but have the potential to suddenly spread rapidly following certain natural events such as flood, fire, drought, climate change, or change in land or water management.[20]

In terms of weed management, reliance on one type of weed control under all scenarios is no longer feasible or efficient. Therefore, weed management within the City must evolve further using integrated management techniques available and introduce alternate viable techniques.

[19] Australian Government (2012)
[20] Australian Government (2013)

3.0 Background on Weed Control

The City undertakes an integrated weed management approach to its weed control in public open spaces including use of a variety of mechanical, suppression, chemical-free and chemical (herbicide) application methods, as well as hand weeding. In determining the appropriate weed control method(s) for a given situation the City takes the following into consideration:

- the target weed
- the season
- timing i.e. before weeds set seed
- resistance of the weed to specific herbicides
- potential residual effects and damage to off-target species
- rotation of the type of herbicide used to reduce herbicide resistance
- selection of the least toxic herbicide for the target species
- site location and any special considerations i.e. near wetlands
- weather conditions i.e. rain and wind
- effectiveness of outcomes, labour intensity required and cost involved.

The City's integrated approach also incorporates risk mitigation measures, surveillance, diagnostics and the most appropriate management response. The purpose of integrated management is to reduce the total impact of invasive non-native plant species in different systems.

Integrated weed control involves using a number of methods to reduce weed infestations to manageable levels or if possible to eradicate infestations. Potential weed control treatment methods available to the City may include:

- Physical weed control – the removal of weeds by physical or mechanical means or the suppression of weed growth, such as mowing, grazing, mulching, geo-fabrics, tilling, burning or by hand.
- Chemical weed control – the use of selective and non-selective herbicides to affect the growth of the weed and cause it to die.
- Steam and hot water weed control – the application of hot water and/or steam (also known as hydrothermal weed control) to a weed plant causing it to die.
- Biological weed control – the introduction of a weeds natural enemy (could be an insect or pest, fungi or disease) to reduce its spread and growth. This approach is not currently undertaken by the City.
- Electric weed control – the use of a high-voltage electrode that allows an electric current to pass through the plant which raises its temperature and causes it to die. This approach is not currently undertaken by the City.

There are many aspects that need to be taken into consideration when determining appropriate methods of weed control in public open spaces. The City utilises a range of weed control treatment methods as part of its integrated weed management approach. This approach has included 16 years of researching and trialling alternative weed control options.

The City allows residents to stay informed and receive notification of chemical application treatment locations or alternatively to have their residence excluded from any chemical application treatment. The City's integrated weed management program provides transparency to the community, flexibility to deliver the most safe and effective weed control treatments for the City's diverse range of public open spaces, allows for innovation through trialling emerging weed control methods and where effective will see their incorporation into the program. The City recognises that weed management is constantly evolving and will

review and consider incorporating other emerging weed control methods into its program throughout the life of this plan.

The types of weed control available to the City and their advantages and disadvantages are described in sections 3.1 to 3.5 and detailed in Appendix 6. Further discussion on the use of weed control in particular locations and circumstances is provided in section 4.2.8.

3.1 Physical Weed Control

There are several types of physical weed control methods, including:

- Mechanical or manual – for example hand removal, hand tools, harrows, tractor hoes, brushcutters and mowers
- Smothering – using materials such as wood chips or geofabric to suppress weeds
- Mulching – using NIASA accredited nursery organic matter to suppress weeds (e.g. pathogen-free mulches such as pine wood chips and others)
- Other suppression materials and methods – geofabric materials, organic barriers, revegetation with locally native plantings.

Smothering and the use of mulch are generally not suitable for natural areas as they would also prevent the growth of native seedlings, but can be used in limited situations (e.g. along edges or larger areas void of native vegetation for smothering only). Mechanical methods using large pieces of equipment or machinery would also create too much disturbance to the native vegetation and soil surface and are therefore not suitable.

The physical removal of weeds through hand weeding can be appropriate in some circumstances. Advantages and disadvantages of hand weeding are provided in Table 1.

Table 1: Advantages and Disadvantages of Hand Weeding[21]

Advantages:	**Disadvantages:**
• Young plants can be easy to pull out if soil is moist. • Can prevent weeds seeding and spreading. • Allows for selective removal of weeds. • Can be effective for small infestations. • Avoids the use of herbicides. • This method is not dependant on weather conditions.	• Can be difficult to remove plants if soil is dry or plants are large. • Is time consuming and labour intensive for large infestations. • Digging can cause soil disturbance and disturb the root systems of native vegetation. • Can result in trampling and destruction of understorey and shrubs (particularly if there are a large number of people conducting hand weeding). • Can make the area more vulnerable to erosion.

Whilst hand weeding has been found to be more time consuming, labour-intensive and less effective than herbicide use, it can form an important part of an integrated weed management approach. Hand weeding using hand tools can be used and may be suitable for many annual species and for relatively small infestations. Hand weeding is particularly useful for the control of herbicide resistant weeds or when herbicides are unable to be used. However, it is mainly used for small infestations or as a follow-up to other methods. The City undertakes a small amount of hand weeding. A substantial amount of hand weeding is conducted by Friends Groups volunteers who contribute significantly to weed control in natural areas within the City.

[21] CRC for Weed Management (2004)

Hand weeding also provides opportunities to the personnel conducting the hand weeding to connect with and make broader observations of the natural area they are working in, which can result in management benefits.

An example of the physical weed control method of hand pulling is shown in Figure 4.

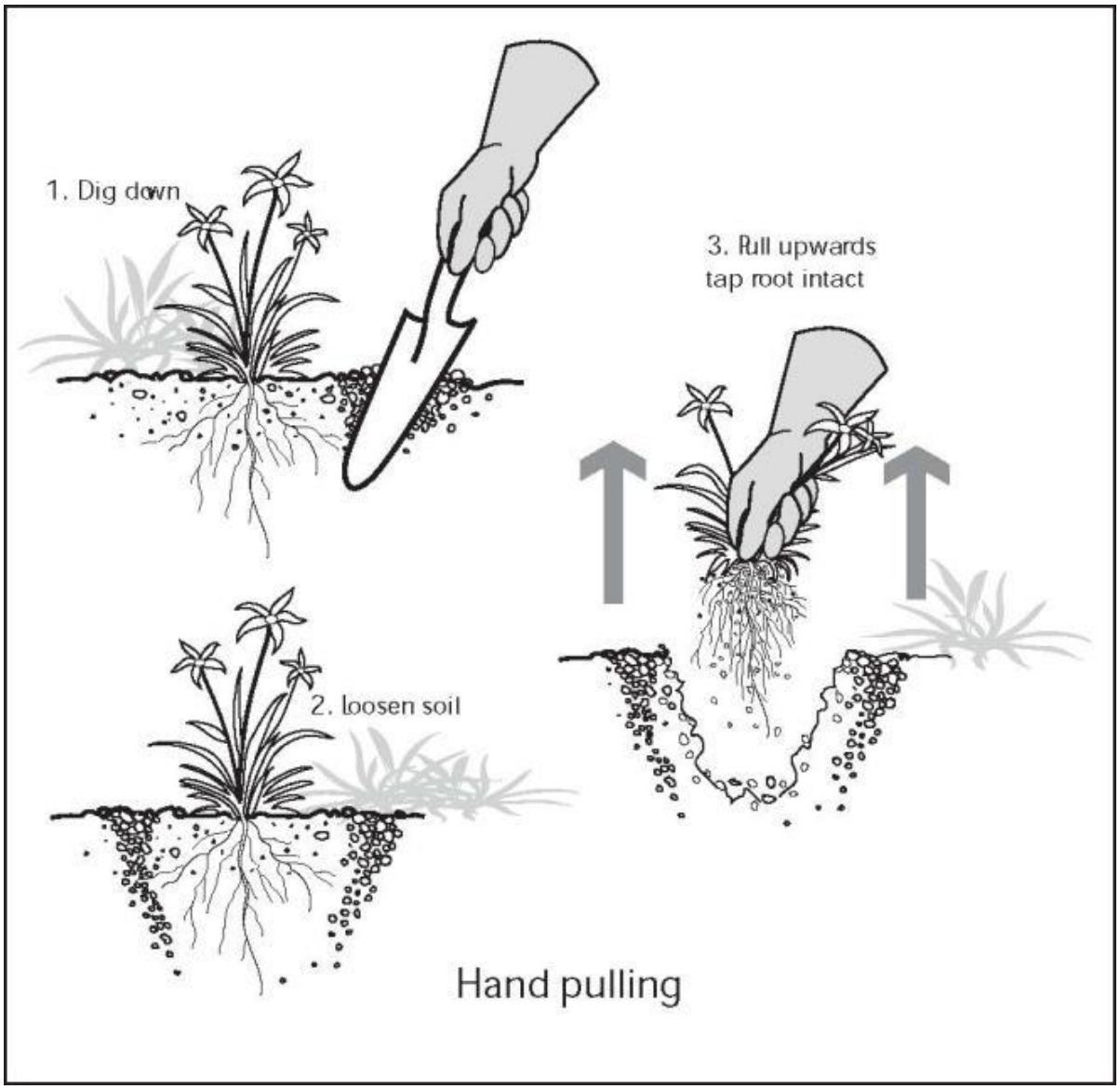


Figure 4: Hand Pulling Method [22]

3.2 Chemical Weed Control

Pesticides are defined as a chemical formulated as a solid, liquid or gas used for managing pests.[23] Pesticides can be used for directly or indirectly destroying, stupefying, repelling, inhibiting, or preventing infestation by or attacks of, any pest in relation to a plant, a place or thing; or modifying the physiology of a plant or pest so as to alter its natural development productivity, quality or productive capacity.[24] Pesticides includes herbicides, insecticides, fungicides and algaecides.[25]

[22] Department of Planning (n.d.)
[23] Department of Health WA (2020)
[24] Department of Health WA (2020)
[25] Department of Health WA (2020)

Chemical treatments include pre-emergent and post-emergent herbicides.[26] Chemical weed control through the use of herbicides can be an effective and practical method of weed control applicable in a variety of situations.[27] Herbicides are defined as 'a chemical substance used to destroy or inhibit the growth of plants, especially weeds'.[28] Herbicides can be selective i.e. work on a specific range of plants or can be broad spectrum / non-selective and work on a wide variety of plants. Herbicides can also be synthetic or organic. There are also a number of ways in which herbicides can be applied depending on the situation to ensure specific weeds are targeted.[30]

Herbicides are used globally and are an effective component of integrated weed management. Herbicides are generally recognised as being the most effective weed control method having higher success rates than other forms of weed control. They are also generally the most economical means of weed control, requiring less labour, fuel and equipment than other methods.[27] In some locations such as natural areas, herbicides offer the most practical, cost-effective and selective method of managing certain weeds.[29]

Herbicides are chemicals and if applied in accordance with the manufacturer label instructions and relevant legislation are beneficial for weed management and pose minimal risks to staff, community and the environment. The effect of applying herbicides on the environment varies depending on the target weed, chemical properties, rate, distribution and the soil environment. Herbicides vary in the length of time that they persist in the environment. The greater the solubility in water of a herbicide, the larger the distance that it can move through the soil. As well as impacting targeted plants, herbicides can impact on other aspects of the environment such as insects, bacteria, fungi, algae, non-targeted plants, soil and water. Figure 5 outlines some common processes that may occur following herbicide application.[30]

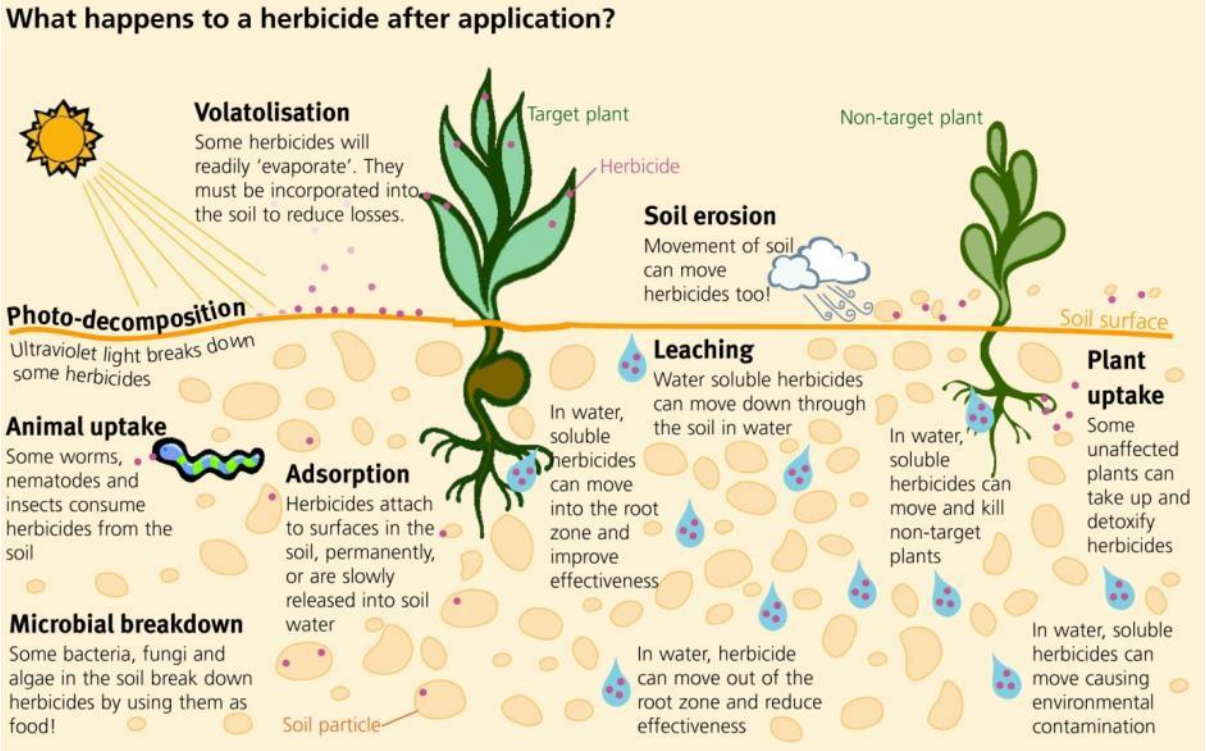


Figure 5: Processes that may occur following Herbicide Application[30]

[26] WALGA (n.d.)
[27] Department of Primary Industries (2011)
[28] Houghton Mifflin Company (2009)
[29] Australian Government (2012b)
[30] CRC for Australian Weed Management (2005a)

When herbicides are used correctly they can be very effective and have limited negative impact on the environment and public health.[30,31] The correct application of herbicides involves knowing the target weed, understanding the site conditions, choosing the correct herbicide, choosing the correct application method, ensuring operators are trained and ensuring all regulations and label instructions are followed.

Certain weeds can become resistant to herbicides with repeated application, meaning that herbicides are no longer effective to control those species. Most cases of herbicide resistance relate to agricultural areas, usually with grain crops. There are currently 25 weed species in Australia with populations that are resistant to at least one herbicide group.[32] The following five weeds are present in Western Australia and within the City, however the City has not experienced these weeds having any chemical resistance:

- Mediterranean Turnip (*Brassica tournefortii*)
- Patersons Curse (*Echium plantagineum*)
- Wimmera Ryegrass (*Lolium rigidum*)
- Wild Oat (*Avena fatua*)
- Wild Radish (*Raphanus raphanistrum*).[33]

An integrated weed management approach will reduce the likelihood of weeds becoming resistant to a particular herbicide and will ensure a more effective response to those weeds that are resistant.

The advantages and disadvantages of chemical weed control are provided in Table 2.

[31] WALGA (n.d.)
[32] DPIRD (2022)
[33] WeedScience.org (2013)

Table 2: Advantages and Disadvantages of Chemical Weed Control

Advantages:	Disadvantages:
• Is usually the most effective form of weed control. • Is cost effective for large infestations. • Can be selective (depending on choice of herbicide, timing, plant life cycles, operator skills). • Can prevent weeds seeding and spreading. • Is appropriate on small and large weed infestations. • Minimises direct soil disturbance.	• Weeds can become resistant to particular herbicides. • Some herbicides may be soluble in water and therefore may not be appropriate in wetlands or other sensitive areas. • Spraying of herbicides is weather dependent and needs to avoid rainfall. • Some herbicides are non-selective and can impact on other plants and animals. • Has potential for negative impacts on the broader environment, such as causing environmental contamination. • Herbicide residue can build up in the soil and affect the growth of native species. • Technical proficiency is required otherwise there may be operator / public hazards.

Glyphosate

Glyphosate is a broad-spectrum and non-selective herbicide effective on annual and perennial plants. Glyphosate currently has the highest global production volume of all herbicides. Glyphosate has been registered by the APVMA (and its predecessors) and been in use for over 45 years. There are over 590 products containing glyphosate registered for use in Australia.

In 2015 reports investigating the health effects of using glyphosate were released by the International Agency for Research on Cancer (IARC), an agency affiliated with the World Health Organization (WHO), the reports classified glyphosate as 'probably carcinogenic to humans', following a hazard-based assessment of publicly available scientific information. The IARC assessment looked at the intrinsic 'hazard' of the chemical glyphosate as a cancer-causing agent only. Other components of the toxicity of glyphosate are not taken into account.

Following the release of this report the APVMA undertook several investigations to determine the risks for people using the formulated chemical product. As Australia's agricultural and veterinary chemical regulator, it is the role of the APVMA to consider all relevant scientific material when determining the likely impacts on human health and worker safety including long and short term exposure to users and residues in food before registering a product. The APVMA considered the full range of risks which include studies of cancer risks and how human exposure can be minimised through instructions for use and safety directions.

The APVMA, in collaboration with the Office of Chemical Safety in the Department of Health, examined the basis for the IARC classification including review of the full monograph related to glyphosate. The APVMA released the findings of its investigations in May 2016 which concluded that products containing glyphosate are safe to use as per the manufacturers label instructions.

3.3 Steam and Hot Water Weed Control

This method was initially a steam only application and with time has evolved to a combination of steam and hot water. This method of treatment can also be referred to as hydrothermal weed control.

Steam and hot water weed control involves applying hot water under pressure through a heated chamber to the weed. The combination of heat and water pressure breaks down the cellular structure, causing discolouration and plant death within hours or over a few days.[34] Steam and hot water weed control has been suggested as a safer alternative to herbicide use.[35] However research and trials into steam and hot water weed control have generally found it to be less effective than chemical weed control, more expensive, uses large amounts of energy, is non-selective and is not practical in natural areas.[36]

Steam and hot water weed control generally kills the upper most portion of the weed and is therefore most suitable for annuals or young perennials. Perennial weeds with deeper roots will generally resprout as the steam and hot water treatment does not affect the deeper root systems.[34,37,38] As a result more repeat treatments are required when using thermal weed control. Steam and hot water weed control has been found to be more expensive as the cost of the application is more expensive and it takes longer so the labour costs are higher and more treatments are required.[38]

Whilst steam and hot water weed control is a non-chemical form of weed control, it also uses large amounts of energy to create the steam and therefore has environmental impacts in relation to greenhouse emissions. It can pose a safety risk to the operator through burns or scalds from the use of the hot steam.

Steam and hot water weed control is not a viable option for the treatment of weeds in natural areas[39] because:

- it is non-selective and will therefore also kill non-target species including adjacent native species.
- the very high temperatures kill beneficial soil microbes including fungi and bacteria and the soil can become inoculated allowing bad pathogens to replace good microbes.
- once treated, an area is left with rotting organic matter and moisture, which can promote seed germination in the soil increasing the number of weeds immediately following treatment.
- the equipment also tends to be large and bulky and is generally unsuitable for accessing natural areas.

Steam and hot water weed control has generally been investigated for use in urban environments, such as on footpaths or kerbs, where concerns about herbicide use are greater and off target impacts are less likely. However steam and hot water weed control in urban environments is still less effective,[40] more expensive and generally does not work as a stand-alone approach in the longer term. The City and a number of other local governments have trialled the use of steam and hot water weed control in urban areas with the aim of reducing herbicide use, with the result that many have limited or ceased the use of steam and hot water weed control due to the cost and effectiveness in the long term.[41] However, some local

[34] Department of Primary Industries (2011)
[35] Collins (1999)
[36] Hudek et al (2021)
[37] Banks and Sandral (2007)
[38] Banks and Associates (2009)
[39] Natural Areas Consulting (2013)
[40] Hudek et al (2021)
[41] City of Nedlands (2013)

governments, including the City, in the Perth metropolitan area are utilising steam and hot water weed control as part of their integrated weed management approach, particularly for sensitive facilities and suitable hardstand treatment areas.[42]

The advantages and disadvantages of steam and/or hot water weed control are provided in Table 3.

Table 3: Advantages and Disadvantages of Steam and Hot Water Weed Control

Advantages:	**Disadvantages:**
• Does not involve the use of chemicals and may be appropriate in areas of chemical sensitivity. • Can be effective on annuals and some young perennials.	• Is not suitable in natural areas. • Is more expensive, less effective and requires more repeat treatments. • Is non-selective and can harm adjacent plants. • The high temperatures can kill soil microbes and good bacteria. • May have some results in the short term but not in the long term. • Is carbon and energy intensive. • Equipment is large and bulky and is not suitable for accessing natural areas.

[42] WALGA (2022)

3.4 Biological Weed Control

Biological control involves using a weed's naturally occurring enemies (usually insects or disease), to help reduce the impact of the weed and achieve sustainable weed control. These natural enemies of weeds are often referred to as biological control agents[43].

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) states that *'A biological control agent is generally only used when the cost of conventional control methods such as herbicides, mechanical control or fire is so great, both in dollar terms and impact on the environment, that there is little option than to pursue the biological control avenue'.*[44]

To develop a new biological control agent requires a substantial investment, adherence to a strict approval process, extensive host specificity testing to ensure it does not pose a threat to non-target species and a risk analysis. It should be noted that not all weeds have biological control agents that would be considered safe for introduction in Australia. Biological control agents have the potential to become pests themselves.[44]

Biological control is unlikely to eradicate a weed species, but it can reduce a weed population and slow down its invasive potential. Successful programs may take more than 10 years to be effective, and results may vary from area to area. Biological control may be practical and effective for inaccessible areas such as timbered, rocky and steep locations, areas of low-priority for control, or where chemical control may be too expensive or not effective.[45]

Biological weed control is not a part of the City's weed management approach because it is better undertaken at a regional level rather than a local level, takes too long to have an impact, is often not effective and can be expensive.

3.5 Electric Weed Control

The use of electrical energy to kill weeds was designed to destroy persistent weeds following conventional chemical treatment. When a high-voltage electrode touches a weed, an electric current passes through the plant and is returned to the transformer via the soil by a ground contact device. Due to the electrical resistance of the plant, the electrical energy is converted to heat. Plant death is caused primarily by the increase in temperature and vaporisation of the water and other volatile liquids it contains, leading to a build up of pressure within the plant cells, and subsequent rupture of the cell membranes.[46] In plants with an extensive root system, the electric current travels deep into the root system before being dissipated into the soil.[47] Root damage is known to be more severe in dry conditions in comparison to wet conditions. [48] As a result, plants dry down and remain fixed to the ground without the need to move soil or open soil surfaces. [49]

Electric weed control technology is currently not certified for use in Australia, with no Australian research undertaken into this weed control method prior to 2022. Recently studies in other regions of the world have tested the ability of electricity to prevent growth and are effective in killing weed species, inclusive of woody weed species. For example, experiments with different plant species showed root destruction down to a depth of 10-15cm, which was sufficient to destroy the vegetation points or rhizomes sufficiently to lead to no or very slow regrowth of plants.[50] Depending on the amount of available electric power, treatment speed,

[43] Australian Government (2012c)
[44] CSIRO (2013)
[45] Department of Primary Industries (2011)
[46] Vincent (2001)
[47] Vigneault C., Benoît D.L. (2001)
[48] Vincent (2001)
[49] Vincent (2001)
[50] CEDR (2016)

stem density and woodiness of plants, many weeds up to 1m of height can be controlled. The studies results indicate that electricity is a viable alternative to manual, mechanical or chemical methods in some settings. Further research is required in a local context to determine if this methodology would be appropriate for the City.

The DPIRD is partnering with local governments in WA to undertake Australia's first electric weed trials in 2022 and 2023. There is interest in this methodology as it may provide a new method to control herbicide-resistant weeds, as well as address the publics growing concerns for human and environmental health related to pesticides.[51] The advantages and disadvantages of electric weed control are outlined in Table 4.

Table 4: Advantages and Disadvantages of Electric Weed Control

Advantages:	**Disadvantages:**
• Does not involve the use of chemicals and may be appropriate in areas of chemical sensitivity. • No soil disturbance or erosion. • The dosage can be adjusted to target specific species. • Does not involve the use of water and is more energy efficient than steam and hot water treatment. • No waste. • Cost effective option in some urban settings (i.e. hardstand areas). • Can be effective on a range of weed species, including woody weed species.	• This method is not certified for use in Australia, however trials are underway. • Equipment is large and bulky and is not suitable for accessing natural areas. • Is non-selective and can harm adjacent plants. • Unknown if the method can kill soil microbes and good bacteria. • May not be an effective method for all weeds. • Research needs to be undertaken regarding whether there is any fire risk. • Some carbon and energy impacts.

[51] Lehnhoff et al (2022)

4.0 Weed Management at the City

The City implements its integrated weed management program in alignment with the *Public Open Space Framework* to ensure the community has access to quality public open space that reflects their needs now and into the future. The Framework enables long-term infrastructure management and aims to achieve a more cost-effective and sustainable approach to planning and maintenance. The Framework also enables the City to classify public open space according to primary function and manner of use; to identify appropriate infrastructure for each type of public open space; and to inform levels of service and maintenance schedules for each type of public open space. The Framework is essential for informing how the City prioritises weed management in public open spaces.

All public open spaces owned or managed by the City fall into one of the four classifications:

- Natural Area
- Sports Park
- Recreation Park
- Urban Landscaping.

This plan also includes weed control within wetlands, that may fall within one of the above public open spaces.

City staff and contractors are required to abide by relevant legislation and the following herbicide use procedures:

- Use herbicide products registered by the APVMA.
- Follow all regulations and label instructions applicable to the specific herbicide.
- Comply with the Department of Primary Industries and Regional Development (DPIRD) Permit to Allow Minor Use of an Agvet Chemical Product for the Control of Environmental Weeds in Various Situations.
- Comply with the relevant Department of Health documents such as:
    - A guide to the use of pesticides in Western Australia
    - A guide to the management of pesticides in local government pest control programs in Western Australia
    - Quick contacts for the use of pesticides in WA
    - *Health (Pesticides) Regulations 2011*
    - Guidelines for the safe use of pesticides in non-agricultural workplaces.
- Comply with WorkSafe WA processes regarding working with pesticides.
- Act in accordance with its internal procedures which outline instructions for training, transport, handling, storage, resident notification, application, records, spills and use of new herbicides.
- Consult resources, such as the DBCA's Florabase website or *Southern Weeds and their Control* (DAFWA Bulletin 4744), in regard to best practice timing and methods of weed control for individual weed species.
- Undertake assessment of authorised chemicals to determine whether or not more suitable alternatives are available, which meet safety requirements and reduce potential environmental impacts. The City minimises the use of herbicides, where possible.

City staff use herbicides in accordance with the City's Spraying Chemicals Work Instruction, an internal procedure in the ISO 9001 Quality Management System (QMS). The Spraying Chemicals Work Instruction is reviewed internally in accordance with the QMS.

To prevent herbicide resistance the City incorporates herbicide rotation into its Annual Maintenance Schedule. If herbicide resistant weeds are identified, the City either utilises alternative herbicides or undertakes hand weeding.

Weed control may be undertaken in areas that contain Aboriginal Heritage places. It is recommended that City staff and contractors comply with the *Aboriginal Cultural Heritage Act 2021* in Aboriginal Heritage places and determine whether the activities may harm Aboriginal places and/or objects and acquire Aboriginal Cultural Heritage Permits when required.

Management Recommendations

1. *Comply with the requirements of the Aboriginal Cultural Heritage Act 2021 when conducting weed control, as required.*

2. *Continue to review and undertake weed control activities in accordance with the ISO 9001 Quality Management System and other relevant legislation.*

4.1 Natural Areas

The City is committed to conserving and enhancing its natural assets to ensure the long term protection of the environment for future generations.

There are a variety of regionally, nationally and internationally significant natural areas located within the City including eight Bush Forever sites which contain species of high conservation value such as Yellagonga Regional Park. Natural areas of significance adjacent to the City include the Marmion Marine Park and Neerabup National Park. The City also manages 28 natural areas listed in the Local Planning Scheme No. 3 as areas with biodiversity and conservation value.

The City manages over 500 hectares of natural areas in 96 reserves containing significant flora and fauna species and ecological communities.

Environmental threats have the potential to degrade natural areas and reduce biodiversity values. Weeds are one of the key environmental threats to biodiversity in natural areas in the City. The City contains 285 identified weed species, including 15 declared pest plants and five WoNS. Effective weed management is required to ensure that measures are taken to prevent, monitor and control the spread of weeds within the City.

Natural areas are public open spaces that can include bushland, coastal and wetland areas. Natural areas are managed to enable some recreational access while protecting local ecological and biodiversity values.

In order to protect native vegetation and ecosystems within the City, Section 4.1 of the Weed Management Plan addresses natural areas weed management. Section 4.1 complements the voluntary work of Friends Group volunteers who contribute substantially to weed management in the City's natural areas.

4.1.1 Purpose

The purpose of Section 4.1 of the Plan is to provide an integrated weed management approach to prevent, monitor and control the spread of weeds in the City's natural areas and conserve local ecological and biodiversity values.

Section 4.1 of the Weed Management Plan includes the following:

- Description of the City's current weed management approach.
- Identification of weed control measures.
- Recommended integrated weed management strategies to prevent, monitor, prioritise and control the spread of weeds.
- Development of education initiatives to engage the organisation, stakeholders and the community in order to raise the awareness of weeds and weed management.
- Development of reporting mechanisms to identify weed risks.
- Recommended partnerships with and support for Friends Groups to facilitate weed management and bushland restoration.

4.1.2 Limitations

Section 4.1 excludes weed management of the following areas managed by the City:

- Parks
- Verges (apart from natural area verges)
- Medians
- Streetscapes.

Section 4.1 also excludes land not managed by the City, including but not limited to:

- Private property
- Natural areas managed by other government agencies or landholders, including Woodvale Nature Reserve, Pinnaroo Valley Memorial Park and Ern Halliday Recreation Camp
- Yellagonga Regional Park (jointly managed by the City of Joondalup, Department of Biodiversity, Conservation and Attractions (DBCA) and City of Wanneroo). The approach for weed control for DBCA managed areas of Yellagonga Regional Park within the City of Joondalup is outlined in the DBCA *Weed Control and Revegetation Plan* (2002)
- The marine environment.

4.1.3 Study Area

The study area for Section 4.1 includes natural areas managed by the City as illustrated in Figure 6. A list of the sites included within Section 4.1 of the Weed Management Plan is provided in Appendix 1 and Appendix 2.

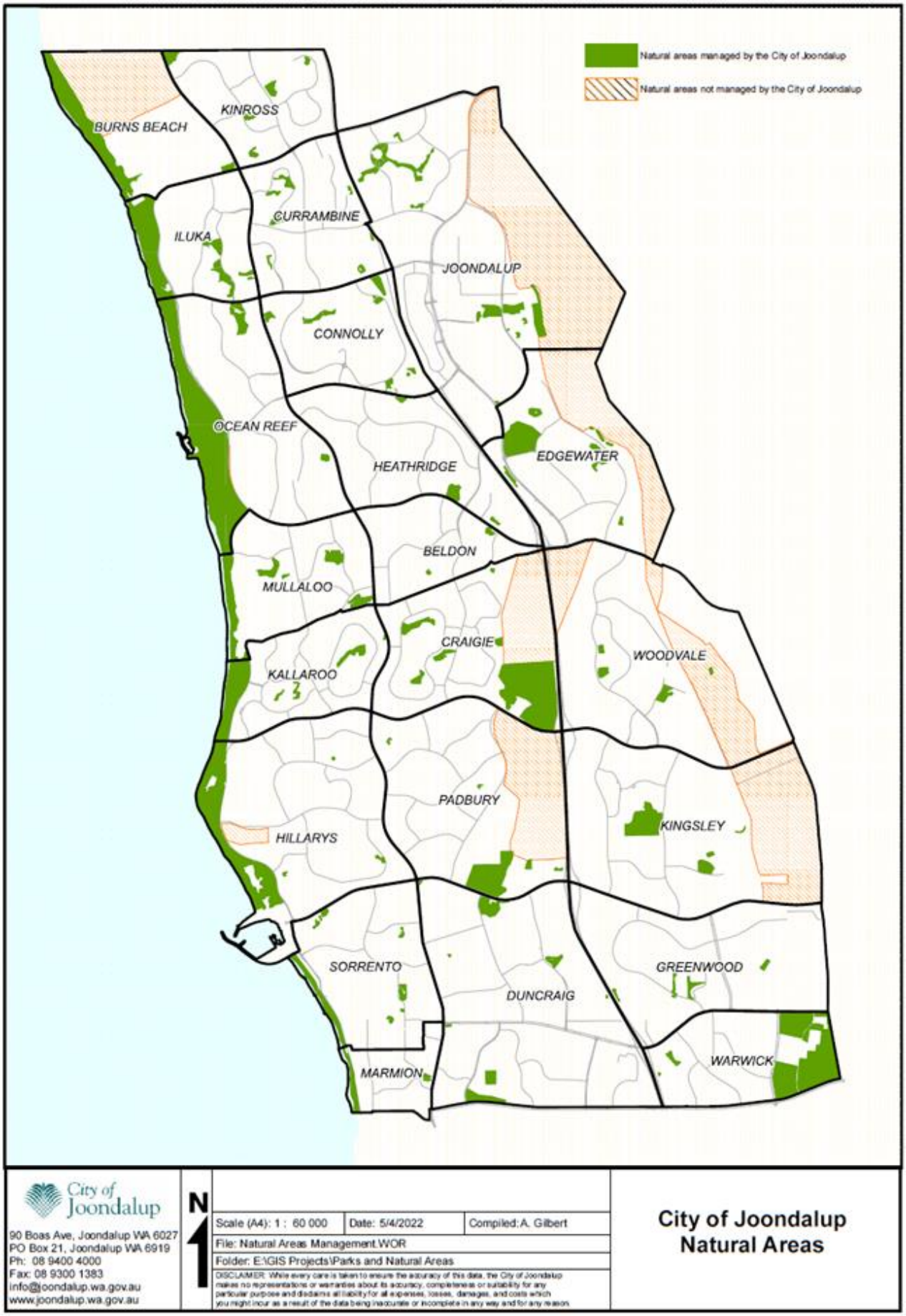


Figure 6: City of Joondalup Natural Areas

4.1.4 Weed Management Site Prioritisation

The City's current approach to weed management prioritisation of natural area sites and within sites is detailed in the following sections.

Prioritisation of sites

The City has 285 identified weed species in natural areas, including 16 priority weeds consisting of 15 declared pest species and 5 WoNS. The City currently conducts weed management in natural areas on a priority basis using four criteria (in descending order), as shown in Figure 7.

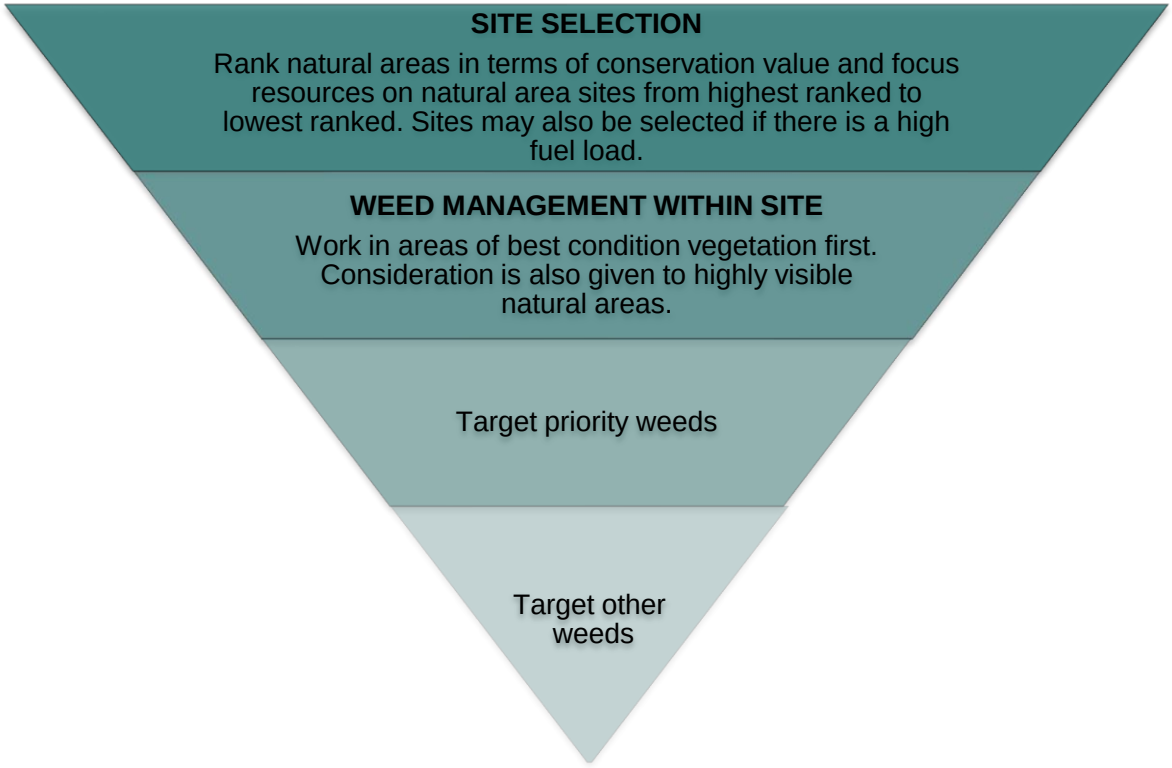


Figure 7: Criteria currently used to prioritise weed management actions for natural areas

Site Selection

Natural Areas are public open spaces predominantly used to protect local ecological and biodiversity values.

The City ranks management of natural areas according to the Local Biodiversity Program Natural Areas Initial Assessment ranking.[52] As part of the Local Biodiversity Program, the City assessed all natural areas from 2004 onwards using the ecological criteria of the Natural Area Initial Assessment, resulting in a priority ranking of natural areas. Natural Area Initial Assessments include a desktop assessment and field survey, documenting information such as:

- vegetation complexes
- threatened or significant flora or ecological communities
- structural plant communities
- weed species

[52] WALGA (2014)

- vegetation condition assessment
- ecological criteria rankings
- a viability estimate
- fauna species observed.

Priority rankings of sites based on Natural Area Initial Assessments utilise criteria such as:

- Biodiversity conservation value within a regional level (including designated conservation areas, containing significant flora, fauna or ecological communities or forming part of a regional ecological linkage)
- Biodiversity conservation value within a local level
- Representation of ecological communities and amount remaining locally
- Vegetation condition
- Area size of site
- Protection of wetland and coastal vegetation.[53]

The City reassesses its natural areas that do not have a Council endorsed Natural Area Management Plan every 5-7 years using the Natural Areas Initial Assessment tool.

Listed below are the different types of natural areas and details regarding their purpose, use and functional requirements:

- **Major Conservation Natural Areas** are of very high conservation significance and include medium to large areas of vegetation in very good or excellent condition. These areas are likely to contain TEC's or priority ecological communities. These areas are also likely to contain priority flora species or conservation-significant flora species. Conservation-significant fauna species are likely to use the site as habitat, and ecological linkages are likely to exist to other significant conservation areas. These areas are managed by individual Natural Area Management Plans.
- **High Priority Natural Areas** are of high conservation significance and generally include medium to large areas of vegetation in good or very good condition. These areas can contain threatened ecological communities or priority ecological communities. These areas can also contain priority flora species or conservation-significant flora species. Conservation-significant fauna species may use the site as habitat, and ecological linkages may exist to other significant conservation areas.
- **Medium Priority Natural Areas** are of medium conservation significance and generally include small and medium areas of vegetation in good condition, usually fragmented. These areas can contain various vegetation communities, and can also contain priority flora species or conservation-significant flora species. Conservation-significant fauna species may use the site as habitat, but ecological linkages are unlikely to exist to other significant conservation areas.
- **Low Priority Natural Areas** are of low conservation significance and include areas of vegetation in good or degraded condition, usually fragmented. These areas can contain various vegetation communities, and can also contain priority flora species or conservation-significant flora species. Conservation-significant fauna species may use the site as habitat, but ecological linkages are unlikely to exist to other significant conservation areas.

Natural areas are listed by ratings in Appendix 2.

The resources allocated to weed management in natural areas are guided by the ratings of individual sites. Generally the higher the rating of the site, the more resources are allocated to weed management.

[53] WALGA (2004)

Sites may also be prioritised for weed control if they have a high fuel load and are deemed to be a fire risk.

Weed Management within Sites

The City conducts weed management within individual natural areas according to the Bradley Method by focussing on areas of vegetation in best condition first, followed by areas of decreasing vegetation condition. The Bradley Method also encourages minimal disturbance to the environment and allows for bushland regeneration through clearing of weeds.[54,55] This is implemented primarily to prioritise conservation of the highest biodiversity values. Vegetation condition in major conservation areas is assessed through flora surveys to inform Natural Area Management Plans approximately every five years. Vegetation condition in other sites is assessed visually by City staff during site inspections. Consideration is also given to highly visible natural areas.

Priority Weeds

The City prioritises weeds based on their invasiveness, ecological impacts, potential and current distribution and feasibility of control. Prioritisation of weeds enables more effective and targeted weed control.

The City classifies environmental weeds as priority weeds if they meet one or more of the following criteria:

- Weed species listed as a WoNS under the National Weeds Strategy (2017).
- The weed species is listed as a Declared Pest Plant according to the Department of Agriculture and Food (2011).
- The weed species is listed as a pest plant under the City's *Pest Plant Local Law 2012*.

A summary of priority weeds identified in the City according to criteria are listed in Table 5. There are currently a total of 16 priority weeds identified in the City. A detailed list of priority weeds can be found in Appendix 4.

Table 5: Priority Weeds Identified in the City of Joondalup According to Criteria (2014).

Priority Weed Criteria	Number of Priority Weeds Identified within City of Joondalup
National Weeds Strategy 2017 -2027	• Five Weeds of National Significance (WoNS)
Biosecurity and Agriculture Management Act 2007	• 15 declared pest plants, includes all five WoNS
City's Pest Plant Local Law 2012	• One pest plant

Integrated Weed Management Approach

Integrated weed management involves using a variety of different techniques to monitor, prevent, prioritise and control weeds and keep weed densities at a manageable level. Using a variety of control methods, rather than just one, also ensures weeds are less able to adapt to the control methods used and less likely to become herbicide resistant.[56] An integrated approach is required for effective weed management, and therefore the management of weeds within the City includes:

[54] Leschenault Catchment Council (n.d.)
[55] AABR (2013)
[56] CSIRO (2011)

- weed monitoring
- weed prevention
- weed control
- education and training
- partnerships with external stakeholders.

4.1.5 Weed Monitoring

Ongoing monitoring of the City's natural areas is critical to ensuring the long term management of biodiversity within the City. Weed management can be modified according to weed monitoring results. Weed monitoring is important to:

- identify areas with weed populations
- weed spread
- discover new weeds on a site
- protect significant native flora species
- measure the effectiveness of weed control measures.

There are numerous different approaches to weed monitoring including weed mapping, taking of photographs and identification of weed species and their distribution (observational weed monitoring).

Weed Mapping

Weed mapping involves recording weed populations and distribution and is a form of weed monitoring. Weed mapping is useful to:

- identify and locate weed species to inform management plans and actions
- record progress in weed management
- provide a historical record to guide management actions
- inform weed management at a local government level.[57]

Weed mapping is conducted on a regular basis through City inspections of natural areas to establish the extent of weeds and to identify priority weed species. The outcomes from weed mapping inform the on ground weed management program. Inspections of the City's natural areas are conducted according to the Annual Maintenance Schedule which prioritises sites and the frequency of inspections, i.e. major conservation areas are scheduled for monthly inspections. During inspections, key priority weeds and maintenance issues are identified and marked on site maps as prioritised actions. These actions are then undertaken during the following maintenance visit to the site, if possible.

The City engages consultants to undertake flora, fauna and fungi surveys of major conservation areas approximately every 5-10 years to inform the development of Natural Area Management Plans. The surveys document components of biodiversity and make recommendations to minimise ecological impacts. Weed mapping is conducted as part of this survey with occurrences of priority weed species being recorded and mapped for individual natural areas. The flora and fauna surveys also identify vegetation condition and threatened and priority flora and fauna species on site. Information from flora and fauna surveys is utilised during City inspections of natural areas (through inspection maps) and used to inform maintenance visits.

Identification of weed species and their distribution is undertaken approximately every 5-7 years when the City undertakes its assessment of high priority and medium priority natural

[57] Australian Weeds Committee (n.d.)

areas using the Natural Areas Initial Assessment tool and in accordance with the Natural Areas Assessment Schedule.

Management Recommendations

3. *Continue mapping of key priority weeds through regular inspections of natural areas in accordance with the Annual Maintenance Schedule to inform on ground weed management actions.*

4. *Continue to assess high priority and medium priority natural areas every 5-7 years using the Natural Areas Initial Assessment Tool, including identification of weed species and their distribution in accordance with the Natural Areas Assessment Schedule.*

Weed Monitoring

The City has implemented two approaches to weed monitoring in the past, photo monitoring and observational weed monitoring. Monitoring weeds through one of these methods or an alternate method is useful to inform and prioritise weed management activities and measure the effectiveness of weed control activities. Quantitative monitoring methods are preferred to qualitative monitoring methods.

Photo Monitoring

Photo monitoring is a photographic record to assess changes occurring in vegetation over time at individual sites taken consistently from the same location. Photo monitoring can be used to assess the effectiveness of weed control on site and could focus on the management of a particular target weed or the recovery of native vegetation. Photo monitoring also requires recording information such as the date, time, location and GPS data.

Photo monitoring is currently conducted within key conservation areas to provide an indication of the effectiveness of weed control methods. Photo monitoring has occurred annually since commencement in 2021.

Observational Weed Monitoring

Observational weed monitoring can be conducted using permanent quadrats or transects to visually assess the percentage cover of weeds, as an indicator of vegetation health. Observational weed monitoring can guide weed control efforts and assess effectiveness of weed management actions. Weed monitoring can also occur by recording weed coverage, weed density and target weed species for weed control programs.

The City has measured the density of environmental weeds in key conservation areas annually at the same time of year up until October 2021. Data is collected in the City's key conservation areas through three transects on each site. The City's density of environmental weeds has generally been decreasing over the past 12 years due to increased weed management, as shown in Figure 8. There have been challenges with accessing the transects in some natural areas and utilising the data to inform weed management. It is proposed that the City monitors and reports on the coverage or area (hectares) where weed control has been undertaken in natural areas rather than the density of environmental weeds using a limited number of transects.

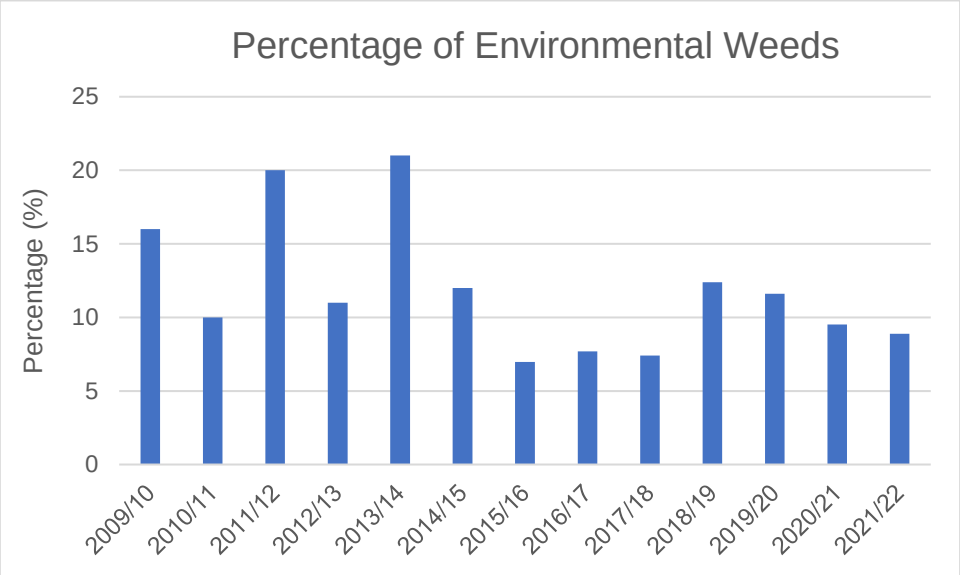


Figure 8: Indicator – Density of Environmental Weeds

Management Recommendations

5. *Continue to undertake photo monitoring in major conservation areas when measuring the natural areas key performance indicator annually to assess the effectiveness of ongoing weed control.*

6. *Record and monitor the coverage (hectares) of weed control in major conservation natural areas.*

4.1.6 Weed Prevention

Control of weed species can be both costly and labour intensive. Preventing weed establishment within natural areas is one of the most effective approaches to weed management.[58]

Examples of ways that weeds can establish that can be managed by the City include:

- weeds seeds being attached to footwear, clothing or vehicles
- introduction through landscaping materials
- movement via stormwater
- garden rubbish dumping
- post fire opportunities
- fire prevention activities such as creating firebreaks and access ways.

The City can directly prevent the introduction of weeds through minimising access and disturbance, undertaking weed hygiene measures and minimising the impacts from fire prevention activities when operating in natural areas.

The City can also indirectly prevent weed introduction and spread by educating the community on how they can prevent weeds by not dumping rubbish in natural areas, minimising disturbance of vegetation, undertaking weed hygiene measures and not planting species in gardens that have the potential to become bushland weeds.[59] Actions that community members can take to prevent weeds are described in more detail in section 5.2.

[58] State Weed Plan Steering Group (2001)
[59] DSEWPC (2012)a

Monitoring for new weed populations

Prevention of new weed species being introduced into natural areas is the most effective method of weed control. Eradication of weeds usually requires more resources for weed management than those required for weed prevention, and weed eradication is easiest and most cost effective with the early identification and management of new weed populations.

The City monitors for new weed populations being introduced into its Natural Areas through routine inspections. In addition to monitoring for new weed population being introduced into natural areas or spreading into new sections of natural areas, the City also minimises access and disturbance and undertakes weed hygiene measures.

Management Recommendation

7. *Continue to monitor for new weed populations, including new aggressive weed species, identified in the City to prioritise for weed control and prevent spread.*

Site Access and Hygiene Management

Accessing natural areas for maintenance or management activities can cause disturbance, creating opportunities for weeds to invade or establish. Limiting or controlled access to natural areas via paths, tracks and conservation fencing can prevent trampling or disturbance to vegetation and soil.

City staff and contractors regularly access natural areas to undertake management activities such as weed control, removing rubbish, undertaking revegetation activities and regular inspections and monitoring. During these activities sites may be accessed by vehicles and/or foot and a variety of machinery and equipment may be used. Where possible, vehicle access on-site is avoided. When vehicles are on site they are kept on tracks and avoid disturbing vegetation where possible. Pedestrians also remain on tracks where possible. Care is taken when operating machinery or equipment to minimise the impact on vegetation and soil surfaces. Natural areas often have conservation fencing, locked gates to access tracks and designated pathways to prevent disturbance to the vegetation and soil.

Weed hygiene is an important weed prevention measure to protect native vegetation from the introduction or spread of weed species through the movement of people, equipment, vehicles or landscaping materials. Weed material or weed seeds can become attached or lodged in footwear, vehicles and equipment and then transported into natural areas where they weren't found previously. Weed material or weed seeds can also be found in landscaping supplies such as plant stock, compost, mulch or sand/soil. Weed hygiene involves practices to ensure only clean and weed free vehicles, equipment, footwear, landscaping supplies and materials are entering natural areas. This is essential for preventing the introduction of weeds or further spreading weeds throughout natural areas.

The City's Pathogen Hygiene Procedure for staff and contractors ensures weed hygiene practices are implemented, including conducting vehicle and equipment inspections, and cleaning and brushing down soil and weed seeds from vehicles, machinery, equipment, tools, footwear, and clothing before they enter and leave natural areas. The City's vehicle washdown bay is located at the Works Operation Centre for washing down vehicles and equipment to enable the removal of material in a contained manner. The regular washing down of vehicles and equipment is a key control measure to prevent weed spread and introduction to the City's public open spaces. Staff and contractors conducting hand weeding in natural areas ensure that weeds are bagged and disposed of appropriately off-site to prevent weed spread.

The supply of plant stock, mulch, soil and compost that contain weeds is a common way for weeds to establish within an area. The City undertakes revegetation in bushland areas, as required. The majority of plant stock used for revegetation is grown at the City nursery and consists of plants, soil, Perlite and Vermiculite. The City's Purchasing Guidelines for the Supply of Landscaping Materials is implemented and ensures that the majority of the remaining plant stock that needs to be supplied is purchased from Nursery Industry Accreditation Scheme Australia (NIASA) accredited nurseries and the City currently purchases Australian Standard certified mulch and potting mix.

Management Recommendation

8. *Continue to implement the Pathogen Hygiene Procedure, and Purchasing Guidelines for the Supply of Landscaping Materials to provide direction to staff and contractors and prevent the introduction and spread of weeds within the City.*

Fire Management and Response

Whilst fire is an important natural feature of the Australian landscape, human activity such as accidents and arson have resulted in increased incidences of fire within natural areas, which can have a negative effect on biodiversity and encourage growth of highly flammable and invasive weeds.[60,61]

Natural areas may be disturbed and provide opportunities for weeds to invade or establish through the following fire related activities:

- Fire occurrences
- Hazard Reduction Grass Tree Burning Program
- Manual fuel load reduction
- Construction or maintenance of firebreaks
- Emergency services responding to fire events including use of emergency vehicles and fire suppression activities.

A coordinated and planned approach is required to address fire management within the City in order to reduce the risk of fire occurrences that could result in damage to life, property and the environment. The City implements a Hazard Reduction Grass Tree Burning program within applicable natural areas to reduce bushfire risk including Craigie Open Space Bushland; Hepburn Heights Conservation Area; Warwick Open Space Bushland, Shepherds Bush Reserve and Yellagonga Regional Park.

The City minimises weeds through the Hazard Reduction Grass Tree Burning program by:

- Implementing the City's Pathogen Hygiene Procedure.
- Monitoring the site for signs of weed emergence or erosion, particularly following the first rainfall events post fire when native and weed species will start to germinate.
- Preventing access to the burnt natural area to protect the ash bed and allow vegetation to regenerate.
- Implementing bespoke post fire weed control programs tailored to the site in response to the monitoring outcomes.

The manual fuel load reduction and construction and maintenance of firebreaks are important and necessary fire prevention tools, however it also requires the clearing of native vegetation and allows opportunities for weeds to spread. The City complies with the *Bush Fires Act 1954* which requires firebreaks immediately inside and around all external boundaries of the land.[62]

[60] City of Joondalup (2014)
[61] City of Joondalup (2012)
[62] DFES (2013)

The City developed a *Fire Weed Management Guideline* which informs staff and contractors about weed management whilst undertaking manual fuel load reduction and installing and maintaining firebreaks and access ways.

Management Recommendations

9. Continue to implement the Fire Weed Management Guideline to inform staff and contractors about weed hygiene when undertaking manual fuel load reduction works and when constructing and maintaining firebreaks and access ways.

4.1.7 Weed Control

While weed prevention is important for reducing new infestation of weeds from occurring or spreading in natural areas, weed control is necessary for reducing or eradicating weed infestations already occurring in natural areas. While weed control can be an expensive and time consuming exercise, failure to control weeds can have significant environmental impacts including displacing native plant species, harbouring pests and diseases and creating fuel loads for fire. Weeds also alter the structure and distribution of plant communities which has a negative impact on native flora and fauna. Weed control is necessary to protect and restore diverse natural ecosystems.[63] The City currently uses hand weeding and herbicide weed control methods in natural areas.

Hand Weeding

Hand weeding is used in natural areas as part of an integrated approach. This includes use of hand weeding for smaller infestations, for herbicide resistant weeds or as follow up to herbicide application. Hand weeding is also used in sensitive areas where herbicide use is not recommended. Widespread hand weeding is not used as it is labour intensive and, if applied inappropriately, can result in negative impacts to native vegetation by disturbance of the soil surface and may lead to erosion.

The City supports a total of 19 Friends Groups that conduct a large amount of hand weeding in natural areas. The City acknowledges the large contribution that Friends Groups make to weed control and conservation within natural areas.

Herbicide Use

Herbicides are used in the City as they are effective on large weed populations and can be economical compared to other weed control techniques. Methods of herbicide application used include blanket spray, spot spray, cut and paint, basal bark treatment and wick wiping. Appendix 6 provides further details on these different methods of herbicide application. The City implements herbicide use in natural areas in accordance with the Annual Maintenance Schedule. Natural areas are prioritised for weed control based on their priority status, the type of weeds present, the weed infestation levels and the bush fire management system risk rating.

The City conducts flora surveys including vegetation condition assessments in key natural areas approximately every 5 years. Information obtained from the flora surveys is utilised by the City to create vegetation condition maps which are used to guide weed control activities and prioritise works in best condition vegetation areas on sites.

The City schedules its herbicide application according to rainfall and temperature in order to increase its effectiveness and minimise any adverse impacts. Hand weeding or maintenance is conducted when it rains, rather than using herbicides. Where possible, herbicide application is scheduled prior to seed production.

[63] Brown and Brooks (2002)

Research and Trials

Weed control methods are improving over time as technologies and research become available. Weed control research and trials can assess the effectiveness of different weed control methods and inform the best weed management approach. Improved understanding of the biology and ecology of individual weeds and the environmental and human-induced factors that influence abundance and distribution are important factors that assist in determining effective weed control approaches.

The City has undertaken a number of weed control trials commencing in 2006-07. The purpose of the trials has been to support the research and development of improved weed control or management. The City's weed control trials are considered in relation to the biology and ecology of individual weeds within a specific natural area.

The City has conducted steam and hot water weed control trials in urban areas rather than natural areas. The unsuitability of using steam and hot water weed control methods in natural areas is well documented and therefore has not been trialled by the City.[64]

The City has a chemical reduction approach to weed management and is trialling alternative treatments to test effectiveness and safety. Natural areas often have challenges associated with accessibility and minimising impacts to biodiversity that limit the effective implementation of alternative weed control treatments. If alternative weed control methods are successful, they are considered for integration into the City's weed management program.

Weed Control in Specific Circumstances

Specialised weed management activities are required for weed control in specific circumstances including identification of new populations of weeds, weed control on verges and post fire weed management.

Weed Control on Verges

Weeds can spread into natural areas from adjacent verges. Effective weed control of verges adjacent to nearby areas minimises the risk of weed spread. The City conducts weed control on verges of key natural areas consisting of increased mowing of verges to reduce seed spread, spraying of weeds and spreading of certified mulch, where required.

Weed Control Post Fire

The City has unplanned fire occurrences in natural areas on a frequent basis. For example, there were substantial unplanned fire occurrences in Shepherd's Bush Reserve and Warwick Open Space Bushland in 2022. DFES is responsible for fire eradication, whilst the City is responsible for post fire weed management.

Fire is important for native species regeneration and fuel load reduction in urban bushland areas.[65] The local environment and bushland has evolved with cultural burning practices being implemented as part of traditional Aboriginal land management practices.[66] Many vegetation communities respond well to fire, and some native species are reliant on fire for regeneration or germination.

However, the disturbance of fire can create an opportunity for rapid growth of competitive weed species, particularly grasses, with minimal competition from native plants. Weed species may have established a long-term soil seed bank that is triggered to germination by fire. Weed

[64] Natural Areas Consulting (2013)
[65] Miller and Miller (2020)
[66] DFES (2020)

species can often be quick to exploit the favourable conditions immediately after fires, germinating prolifically and spreading vigorously in the first few seasons.

DBCA undertook fire management experiments in Kings Park and Bold Park in 2015 and 2016 respectively. Since the experiments DBCA have been undertaking long-term monitoring, with the results showing the following:

- fire enhances the spread and cover of introduced grasses
- weed management treatments are effective in reducing weed cover
- native perennial species richness increased after fire
- burning leads to a decrease in litter fuels.[67]

It is further recognised that where effective weed control is implemented post fire native species biodiversity is likely to increase and native species will be prevalent.[68]

The City implements a Fire Weed Management Guideline to minimise weed occurrence in natural areas post fire. After a fire occurrence the DFES maps the fire scar information and the City make this available on IntraMaps to monitor fire frequency on individual sites. The City also obtains information from DFES regarding fire occurrence history for sites as required.

The City allows for at least three months of natural vegetation regeneration through restricting access after fire before commencing weed control activities. The purpose of restricting any disturbance to the burnt area is to protect the ash bed and allow for natural regeneration. The three month period prevents disturbance and allows native seedlings to resprout.

Post fire the City monitors the fire scar area, particularly following rainfall events, for weed emergence and erosion. Regrowth of weeds are then managed prior to seeding through an integrated weed management approach using a variety of methods. Herbicide treatments, are selected based on the weed species present.

Revegetation is rarely undertaken post fire within natural areas, with the preference to allow natural regeneration. In some fire impacted natural areas post fire revegetation may be undertaken, usually within selected small areas, such as within previously degraded sections of the natural area.

Management Recommendations

10. *Continue to implement weed control in natural areas in accordance with the Annual Maintenance Schedule.*

11. *Continue to conduct weed control on verges adjacent to key natural areas including increasing mowing of verges to reduce weed seed spread, spraying of weeds and spreading of certified mulch, where required.*

12. *Continue to implement the Fire Weed Management Guidelines to limit the infestation of weeds in the City's natural areas.*

[67] Miller and Miller (2020)
[68] Miller and Miller (2020)

4.2 Parks and Urban Landscaping Areas

The City manages over 370 parks and reserves and a substantial number of urban landscaping areas such as streetscapes, pedestrian access ways, sumps and swales.

4.2.1 Purpose

The purpose of Section 4.2 of the Plan is to provide an integrated weed management approach to prevent, monitor and control the spread of weeds and conserve the amenity, aesthetics and functionality of the City's parks and urban landscaping areas.

Section 4.2 of the Weed Management Plan includes the following:

- description of the City's current weed management approach
- identification of weed control measures
- recommended integrated weed management strategies to prevent, monitor and control the spread of weeds.

4.2.2 Limitations

Section 4.2 of the Weed Management Plan excludes weed management of natural areas managed by the City and land not managed by the City such as private property.

4.2.3 Study Area

The study area for Section 4.2 includes parks and urban landscaping areas managed by the City. Urban landscaping areas managed by the City include the following:

- streetscapes
- pedestrian access ways (PAWs)
- sumps and swales.

The parks managed by the City are shown in Figure 9 and streetscapes are shown in Figure 10. Urban landscaping areas are not shown or detailed due to the large number of such areas within the City.

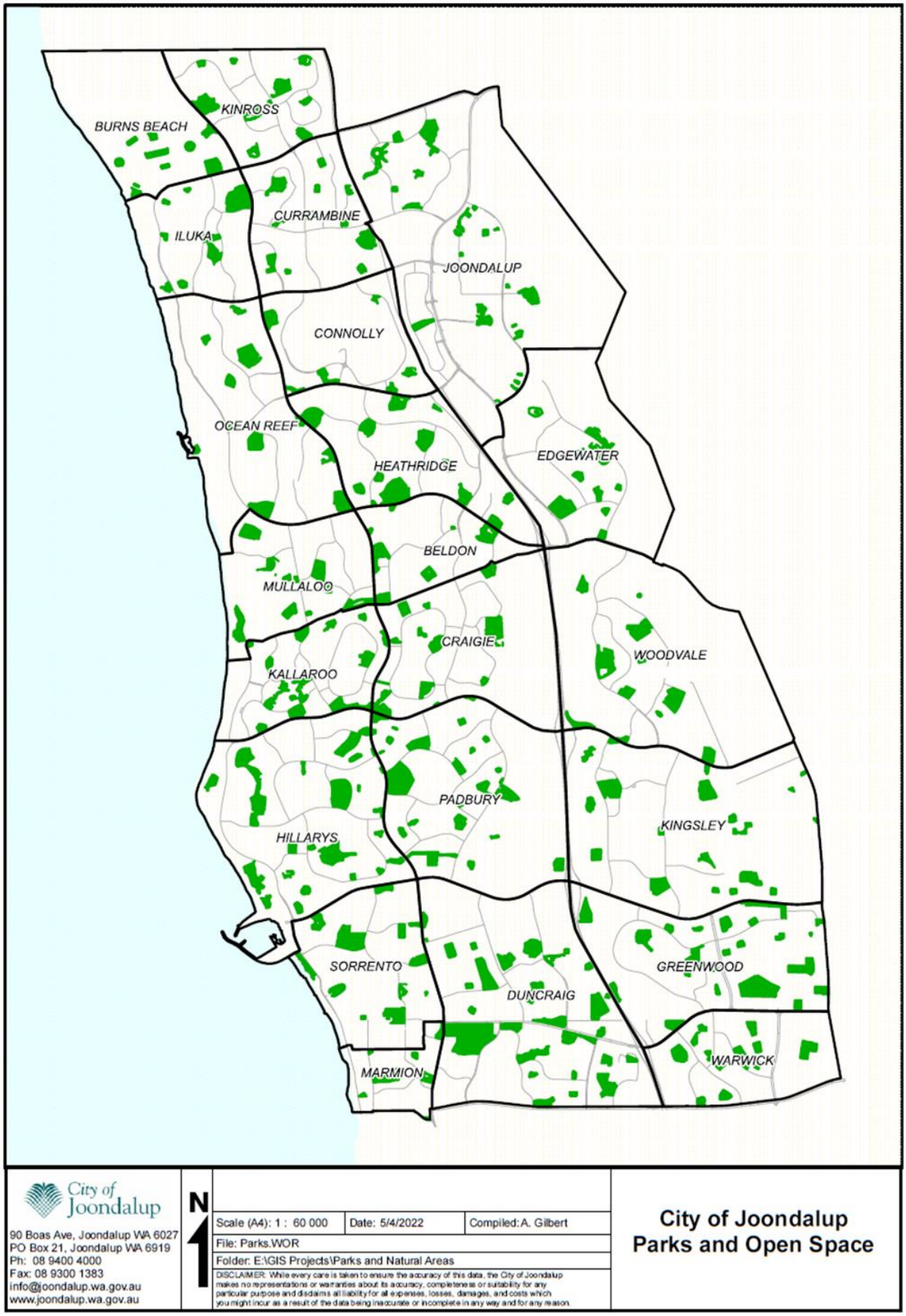


Figure 9: Parks Managed by the City of Joondalup

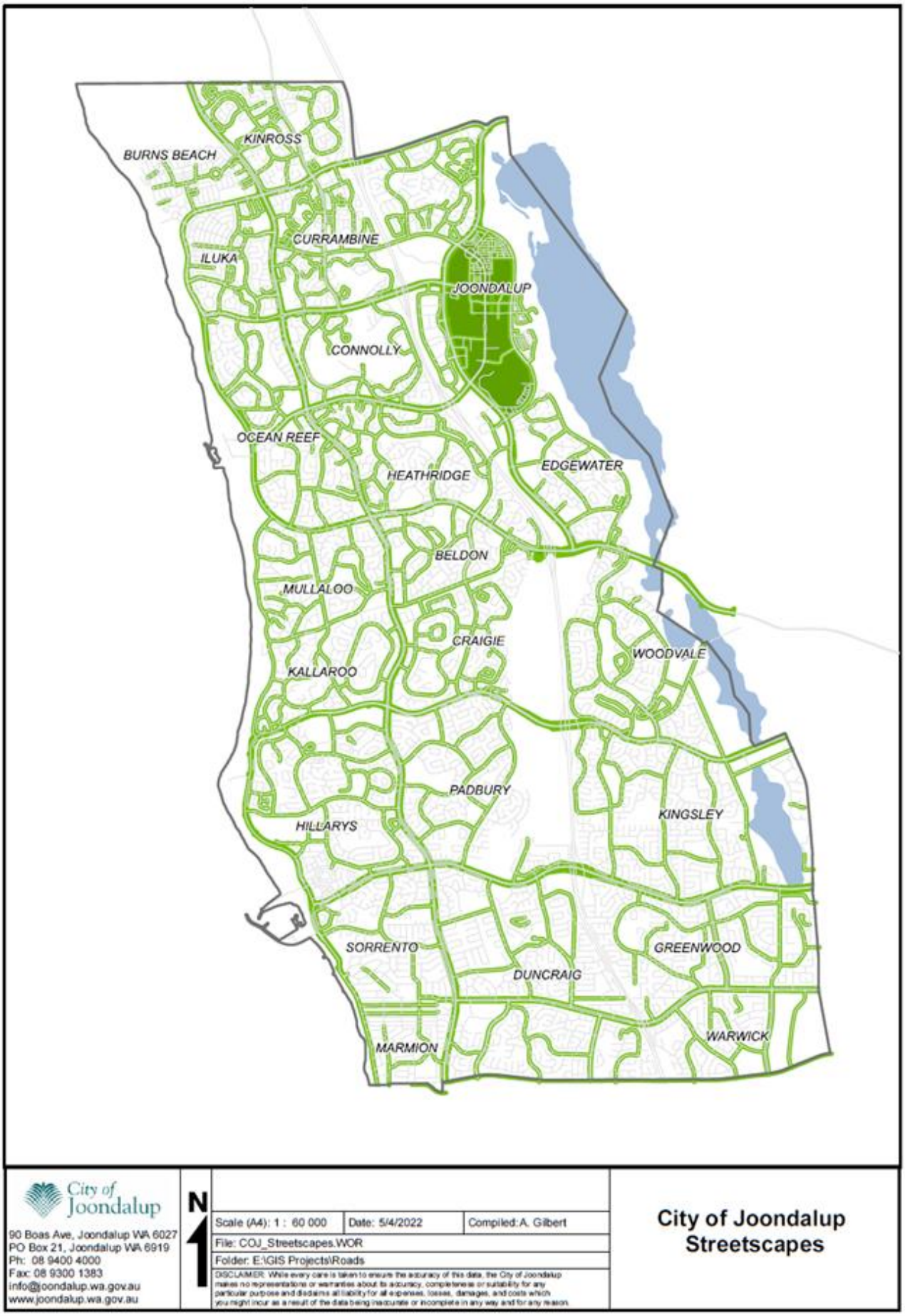


Figure 10: City of Joondalup Streetscape Areas

4.2.4 Service Agreements

The City manages several locations with service agreements, such as Specified Area Rates (SAR) service agreements for the provision of enhanced landscaping services.

Specified Area Rates (SAR) Service Agreement

A SAR is an additional rate charge that is applied separately to designated areas within the City by agreement with the residents association. These rates cover additional maintenance costs for landscaping services (including weed management) over and above services ordinarily provided by the City.

The City currently has four SAR areas:

- Iluka
- Woodvale Waters Estate, Woodvale
- Harbour Rise Estate, Hillarys
- New Burns Beach.

4.2.5 Weed Management Site Prioritisation

The City's current approach to weed management prioritisation of parks and urban landscaping area sites and within sites is detailed in the following sections.

Prioritisation of Sites

The City currently conducts seasonal weed management in parks and urban landscaping areas on a priority basis using four criteria (in descending order), as shown in Figure 11.

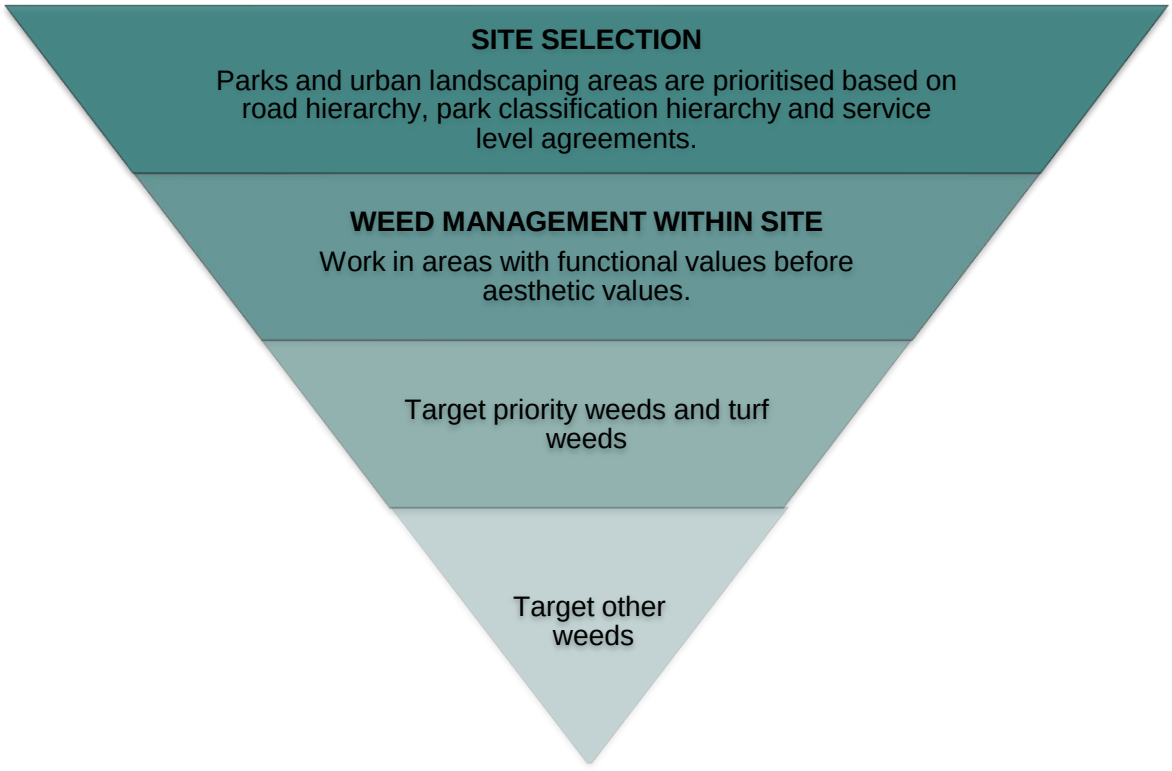


Figure 11: Criteria currently used to prioritise weed management actions for parks and urban landscaping areas

Site Selection

Parks and urban landscaping areas are categorised and prioritised based on the type, profile, amenity or functional requirements of a specific location. A consistent approach is applied to all areas that fall within the same category.

Listed below are the different types of parks and urban landscaping areas and details regarding their purpose, use and functional requirements.

Parks are areas of public open space that contain facilities for recreation and leisure. The *Public Open Space Framework* outlines the planning, maintenance and resourcing service levels for the City's public open spaces which also assists in prioritising weed management. Parks are classified using factors such as the site purpose, size and surrounding catchment.

Parks are given priority ratings from 1 to 4, as outlined below. Parks with priority ratings of 1 receive the highest level of weed management, whilst parks with priority ratings of 4 receive the lowest level of weed management. For example, Regional Sports Parks or Regional Recreation Parks (Priority 1) are treated for weeds in accordance with the annual maintenance schedule and inspected at a higher frequency than Local Recreation Parks (Priority 4).

Sports Parks

Sports Parks are public open spaces predominantly used for formal, structured sports activities, such as team competitions, physical skill development and training. They are generally designed to accommodate the playing surface and infrastructure requirements of specific sports. People attend these public open spaces with the primary purpose of engaging in organised sports activity, training, competition or viewing as a spectator.

Sports parks are split into four sub-categories and are prioritised in the following order:

- **Regional Sports Park**: Regional Sports Parks are suitable for larger-scale, significant or regional sports events where multiple sports matches can be undertaken simultaneously. These parks accommodate at least three oval sports fields or six rectangular sports fields, and also accommodate playing courts and/or bowling greens. Regional Sports Parks attract users from the whole of the City and surrounding local governments. An example of a Regional Sports Park is Percy Doyle Reserve in Duncraig.
- **District Sports Park**: District Sports Parks are suitable for significant sports events where more than more one sports match can be undertaken simultaneously. These parks accommodate at least two oval sports fields or four rectangular sports fields, or accommodate one sports field and either playing courts and/or bowling greens. District Sports Parks attract users form the whole of the City, especially surrounding suburbs. An example of a District Sports Park is Iluka District Open Space in Iluka.
- **Neighbourhood Sports Park**: Neighbourhood Sports Parks are suitable for smaller-scale sports events where between one and two sports matches can be undertaken simultaneously. These parks accommodate at least one oval sports field, two rectangular sports fields. Neighbourhood Sports Parks attract users from within the suburb and surrounding suburbs. An example of a Neighbourhood Sports Park is Barriadale Park in Kingsley.
- **Local Sports Park**: Local Sports Parks are suitable for local sports training and social day time matches. These parks accommodate one sports field or playing courts. Local Sports Parks attract users from within the suburb and surrounding suburbs. An example of a Local Sports Park is Parkside Park in Woodvale.

Recreation Parks

Recreation Parks are public open spaces predominantly used for informal recreation activities, such as walking, jogging, picnicking and play. They are generally designed to accommodate low wear activities (in turfed areas) and contain recreation-based infrastructure. People attend these public open spaces with the primary purpose of engaging in social and leisure activities.

Recreation Parks are split into four sub-categories and ranked in the following order:

- **Regional Recreation Park**: Regional Recreation Parks are located near a natural place of interest, such as a lake or beach, or located near commercial activities, such as shopping or a café/restaurant. These parks accommodate multiple distinct zones where different types of recreation can be undertaken simultaneously. Regional Recreation Parks encourage long-stay usage for recreational activities and attract users from the whole of the City and surrounding local governments. An example of a Regional Recreation Park is Tom Simpson Park in Mullaloo.
- **District Recreation Park**: District Recreation Parks may be located near a natural place of interest, such as a lake or beach, or located near commercial activities, such as shopping or a café/restaurant. These parks accommodate at least two distinct zones where different types of recreation can be undertaken simultaneously. District Recreation Parks encourage medium to long-stay usage for recreational activities and attract users from the whole of the City, especially surrounding suburbs. An example of a District Recreation Park is Delamere Park in Currambine.
- **Neighbourhood Recreation Park**: Neighbourhood Recreation Parks are usually located within suburban areas. These parks accommodate one medium recreation zone. Neighbourhood Recreation Parks encourage short to medium-stay usage for recreational activities and attract users from the surrounding suburb. An example of a Local Recreation Park is Menteith Park in Kinross.
- **Local Recreation Park**: Local Recreation Parks are usually located within suburban areas. These parks accommodate one small recreation zone. Local Recreation Parks encourage short-stay usage for recreational activities and attract users from the surrounding streets. An example of a Local Recreation Park is Carr Park in Warwick.

Urban Landscaping Areas

Urban landscaping areas are public open spaces predominantly used to contribute to visual amenity and suburban aesthetics. They can act as entry points to the City and include verges, medians and thoroughfares, as well as residual land. Urban landscaping areas are broken down into the following categories and weed management is dependent on the priority rating:

- **Major Urban Landscaping**: Major Urban Landscaping includes large verges and medians located on major traffic routes into and out of the City and within the Joondalup City Centre. These areas act as visual indicators for major entry points and a welcome to residents and visitors. Major Urban Landscaping delivers a high level of visual amenity and an opportunity for public art. An example is the along Joondalup Drive in Joondalup.
- **High Priority Urban Landscaping**: High Priority Urban Landscaping includes verges and medians located on high-level traffic routes, mostly centred around intersection nibs and arterial roads. These areas act as visual indicators for significant locations and help to foster a sense of place. High Priority Urban Landscaping delivers a high level of visual amenity and may provide an opportunity for public art. An example is along Ocean Reef Road in Edgewater.
- **Medium Priority Urban Landscaping**: Medium Priority Urban Landscaping includes verges, roundabouts and thoroughfares located on medium-level traffic routes in suburban areas. These landscaping areas provide vegetation and tree cover and help to mitigate the urban heat island effect. Medium Priority Urban Landscaping delivers a

medium level of visual amenity and enhances local aesthetics. An example is along Mullaloo Drive and Dampier Avenue, in Mullaloo and Kallaroo.

- **Low Priority Urban Landscaping**: Low Priority Urban Landscaping includes verges, remnant land and minor thoroughfares located on low-level traffic routes in suburban areas, as well as extended verges adjacent to arterial or distributor roads. These areas provide some vegetation and may contain tree cover. An example is Craigie Drive and Marmion Avenue in Craigie.

Weed Management within Sites

The City conduct weeds management within parks and urban landscaping areas by focussing on areas with functional values followed by areas with aesthetic values.

Priority Weeds

The City focuses on weed management of broadleaf weeds (most commonly found weeds), skeleton weed (declared pest plant), Noogoora burr (declared pest plant) and Caltrop (local pest plant) for parks and urban landscaping areas.

Broadleaf Weeds

The most common broadleaf weeds that are managed in parks and urban landscaping areas include:

- Fleabane (*Conyza* spp.)
- Dandelion (*Taraxacum officinale*)
- Medic Burr (*Medicago polymorpha*)
- Bindii (*Soliva sessilis*)
- Cudweed (*Gamochaeta calviceps*)
- White Clover (*Trifolium repens*)
- Flat Weed (*Hypochaeris radicata*)
- Common Cotula (*Cotula australis*)
- Blue Lupin (*Lupinus cosentinii*).

Skeleton Weed

Skeleton weed (*Chondrilla juncea*) is a declared pest plant in Western Australia under the *Biosecurity and Agriculture Management Act 2007*. The City is obligated to search for, and eradicate, all skeleton weed found on City managed land. All skeleton weed must be reported to DPIRD and treated to prevent seed set within 48 hours. Occurrences of skeleton weed are added to a City skeleton weed register and locations are inspected annually.

Noogoora burr

Noogoora burr (*Xanthium strumarium*) is a declared pest plant in Western Australia under the *Biosecurity and Agriculture Management Act 2007*. The City is obligated to search for, and eradicate, all Noogoora burr found on City managed land. All occurrences must be reported to DPIRD and treatment includes special disposal measure conditions. Recorded locations of Noogoora burr occurrences are inspected annually.

Caltrop

Under the *Biosecurity and Agriculture Management Act 2007* and the *Local Government Act 1995*, the Council of the City of Joondalup made the *Pest Plant Local Law 2012* to require the owner or occupier of private land within the City district to destroy, eradicate or otherwise

control pest plants within a specified time. Caltrop (*Tribulus terrestis*) is designated as a pest plant.

The City maintains a Caltrop register to document confirmed locations of Caltrop on land managed by the City and public property. All Caltrop locations are inspected annually. Figure 12 shows current and dormant Caltrop locations on the Caltrop register as per April 2022.

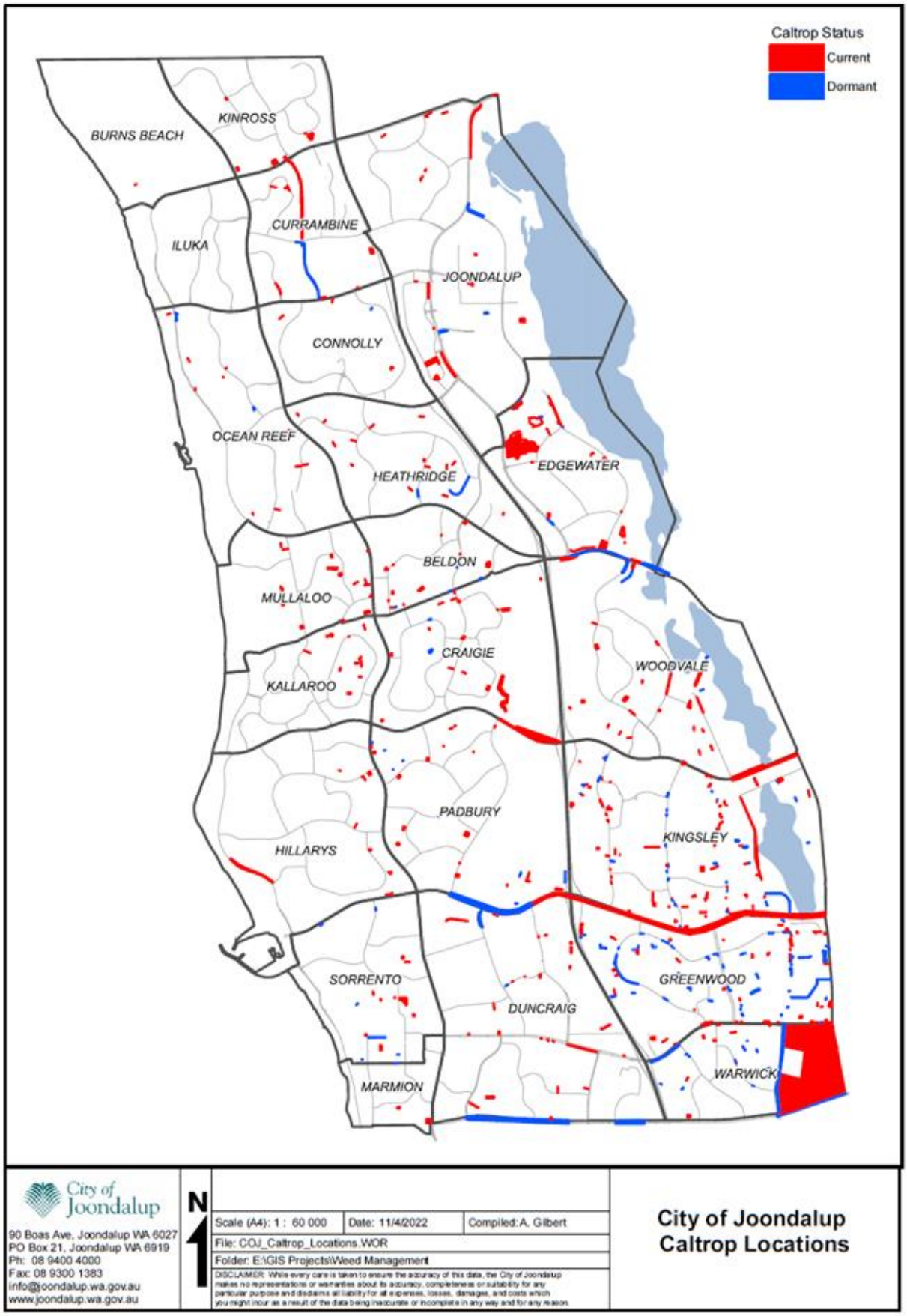


Figure 12: Map of locations on the Caltrop register in April 2022

Integrated Weed Management Approach

Integrated weed management involves using a variety of different techniques to monitor, prevent and control weeds. Using a variety of weed control methods, rather than just one, also ensures weeds are less able to adapt to the control methods used and less likely to become herbicide resistant. An integrated approach is required for effective weed management, and therefore the management of weeds within the City parks and urban landscaping areas includes:

- weed monitoring
- weed prevention
- weed control
- notification and community awareness
- innovation, continual improvement and training.

4.2.6 Weed Monitoring

Ongoing monitoring of the City's priority and high profile areas is beneficial to assist with the long-term management of parks and urban landscaping areas within the City. Weed monitoring is important for identifying and effectively managing weed populations.

Observational weed monitoring is conducted for parks and urban landscaping areas. Observational weed monitoring can guide weed control efforts and assess the effectiveness of weed management actions. Informal weed inspections in parks and urban landscaping areas are regularly undertaken by staff during scheduled maintenance activities and site inspections. The frequency of inspections is determined by the site prioritisation.

When weed issues are identified during inspections, an evaluation is undertaken to determine the most effective and efficient method of control. This can be the immediate treatment of weeds or scheduling of specific weed management actions to effectively manage larger infestations.

4.2.7 Weed Prevention

Prevention of weeds in parks and urban landscaping areas is the most effective method of weed control. Eradication of weeds usually requires more resources for weed management than those required for weed prevention.

The main weed prevention methods that are implemented by the City include mulching, turf management, renovation works, suppression of weed seed banks, best practice landscape design and management, minimising access and disturbance and undertaking weed hygiene measures.

Mulching

Pathogen and weed free mulch is applied to suppress weed growth in garden beds or non-turf areas, as per the City's *Pathogen Management Plan*.

Turf Management Practices

Fertiliser is applied, based on soil and leaf tissue analysis, to improve the quality of the turf and to promote healthy turf. Healthy turf reduces the likelihood of seasonal weeds.

Renovation Works

Renovation works are undertaken to encourage improved density and coverage of turf, reducing the opportunity for weed growth. Weeds are more prevalent in sand and denuded areas.

Weed Seed Bank Suppression

Weed seed banks are suppressed through the use of chemical pre-emergents. These types of chemicals are applied to non-planted garden beds and hardstand areas.

Landscape Design

Landscape design and management can assist with reducing weed growth and ensuring effective weed management can be delivered through, for example, the use of stencilled concrete, hydro-zoning, eco-zoning and irrigation design.

Stencilled concrete has been installed rather than brick paving in some appropriate hardstand areas to assist with weed control and management. Stencilled concrete does not allow weeds to surface as easily as brick paving.

Hydro-zoning and eco-zoning have been applied in numerous City parks to conserve water whilst keeping the area's amenity and function. Hydro-zoning is the installation of irrigation to allow for different zones of a park or reserve to receive different amounts of water based on the type of use of the zones and turf requirements. Eco-zoning is the division of a park or reserve into zones of turf and natural areas to promote biodiversity and conserve water. Hydro-zoning and eco-zoning principles also assist with weed management through suppressing weeds and only watering targeted areas. Figure 13 shows an example of hydro-zoning and eco-zoning undertaken in 2020-21 in Macaulay Park, Duncraig.

Figure 13: Example of hydro-zoning and eco-zoning at Macaulay Park, Duncraig

Hygiene Measures

Hygiene is important to ensure weeds, pathogens and pests are not introduced or spread from or into parks and urban landscaping areas. The City has developed and implements a *Pathogen Management Plan* to protect biodiversity values within the City of Joondalup by minimising the risk of introducing and spreading pathogens (and weeds) within landscaped and natural areas of the City.

City staff and contractors implement a *Pathogen Hygiene Procedure* and undertake hygiene measures on vehicles used for turf renovation activities between each site and at the end of each day. City contractors occasionally undertake turf renovation activities and are required by tenders and contracts to implement hygiene measures between sites and at the end of each day on vehicles used.

The majority of plant stock is supplied from NIASA accredited nurseries and the City currently purchases Australian Standard certified mulch and potting mix. The City has developed

Purchasing Guidelines for the Supply of Landscaping Materials that will be used to eliminate the likelihood of introducing weeds seeds from purchased materials.

4.2.8 Weed Control

While weed prevention is important for reducing new infestation of weeds from occurring or spreading in parks and urban landscaping areas, weed control is necessary for reducing, containing or eradicating weed infestations. While weed control can be expensive and resource intensive, failure to control weeds can have significant impacts including affecting the quality of playing surfaces or the aesthetics and amenity of parks and urban landscaping areas.

The City undertakes an integrated weed management approach to its weed control in parks and urban landscaping including the use of a variety of approved herbicides. Weed control involves using a number of methods to reduce weed infestations to manageable levels or, if possible, to eradicate infestations. Weed control methods used in parks and urban landscaping areas include:

- Chemical weed control – the use of herbicides to control or suppress weeds.
- Steam and/or hot water (also known as hydrothermal) weed control – the application of hot water and/or steam to a weed plant causing it to die.
- Physical weed control – the removal of weeds by physical or mechanical means, such as mowing, mulching or by hand.

Chemical Weed Control

The majority of weed control in parks and urban landscaping areas is managed by the use of approved herbicides as they are effective on large weed populations and are economical compared to other weed control techniques.

The two main methods of chemical application in parks and urban landscaping areas are blanket and target spraying. Appendix 6 provides further details on the different methods of herbicide application.

Blanket spraying

Blanket spraying is generally undertaken by machinery with boom sprays and is the most effective and efficient method to apply chemicals to large open spaces such as sports ovals.

Broadleaf selective turf weeds are subject to seasonal control generally between July and September. This activity is only conducted on the City's irrigated sporting parks and recreation parks.

Target Spraying

Target spraying can be undertaken using the following methods:

- backpack spray units or vehicle mounted tanks and hoses with applicable control attachments where required.
- wick or sponge wiping via a handheld applicator directly on to targeted plant/s.
- a cut and paint/basal bark treatment which involves painting pesticide directly on to a woody cut plant.

Target spraying is generally used in small areas or where obstacles or site constraints restrict access of larger machinery. Target spraying weeds with herbicide is conducted on an as

required basis with frequency dependent on the service levels in place at the time for the following locations:

- landscaped medians and verges
- kerblines, footpaths and brick paved areas
- Joondalup CBP
- parks infrastructure and tree surrounds.

Weed management within the City's parks and open spaces, verges, median strips and gardens is both seasonally and resource driven.

WeedSeeker Technology

WeedSeeker technology allows accurate and automated spatial tracking and monitoring of application areas by detecting living green organic material using fluorescence technology to assist in reducing the amount of chemical use. This technology was trialled in 2020-21 alongside the steam and hot water control and found to be effective at controlling weeds and reducing chemical use through selectively targeting and spot spraying specific weeds using minimal amounts of non-selective herbicides. The City commenced the use of WeedSeeker technology on footpaths and kerblines on arterial and distributor roads in 2022-23, as shown in Figure 14.

Figure 14: WeedSeeker Technology in use on a footpath

Steam and Hot Water Weed Control

The City has been trialling steam and hot water treatments to test their effectiveness since 2006-07. Steam and hot water weed control has improved in effectiveness over the past couple of years through the development of suitable machinery and equipment.

Given the positive results of the steam and hot water weed control trials in some locations, as well as the growing community interest, the Council determined, in 2021, that the City would implement non-chemical weed control (inclusive of steam and hot water weed control and physical weed removal) for hardstand areas within a 50m radius of schools, within the footprint of playspaces, as well as the kerbs, footpaths, hardstand (paved) median islands, mulched median islands and general paved areas within the CBP, as shown in Figure 15. The non-chemical weed control includes any weeds exceeding a height or width of 50mm, being mechanically removed and disposed of in an appropriate manner.

The City's non-chemical weed control treatment commenced in July 2022 and will be applied to the same locations until the term of the contract, for up to a period of 3 years. Continuation of the non-chemical weed control treatment will be dependent upon review of the contract.

Figure 16 shows the locations that will be managed by the City through non-chemical weed control. Additional locations that are suitable for this weed control method will be reviewed and incorporated into the City's integrated weed management program.

Figure 15: Photograph of the City's chemical-free weed control in July 2022

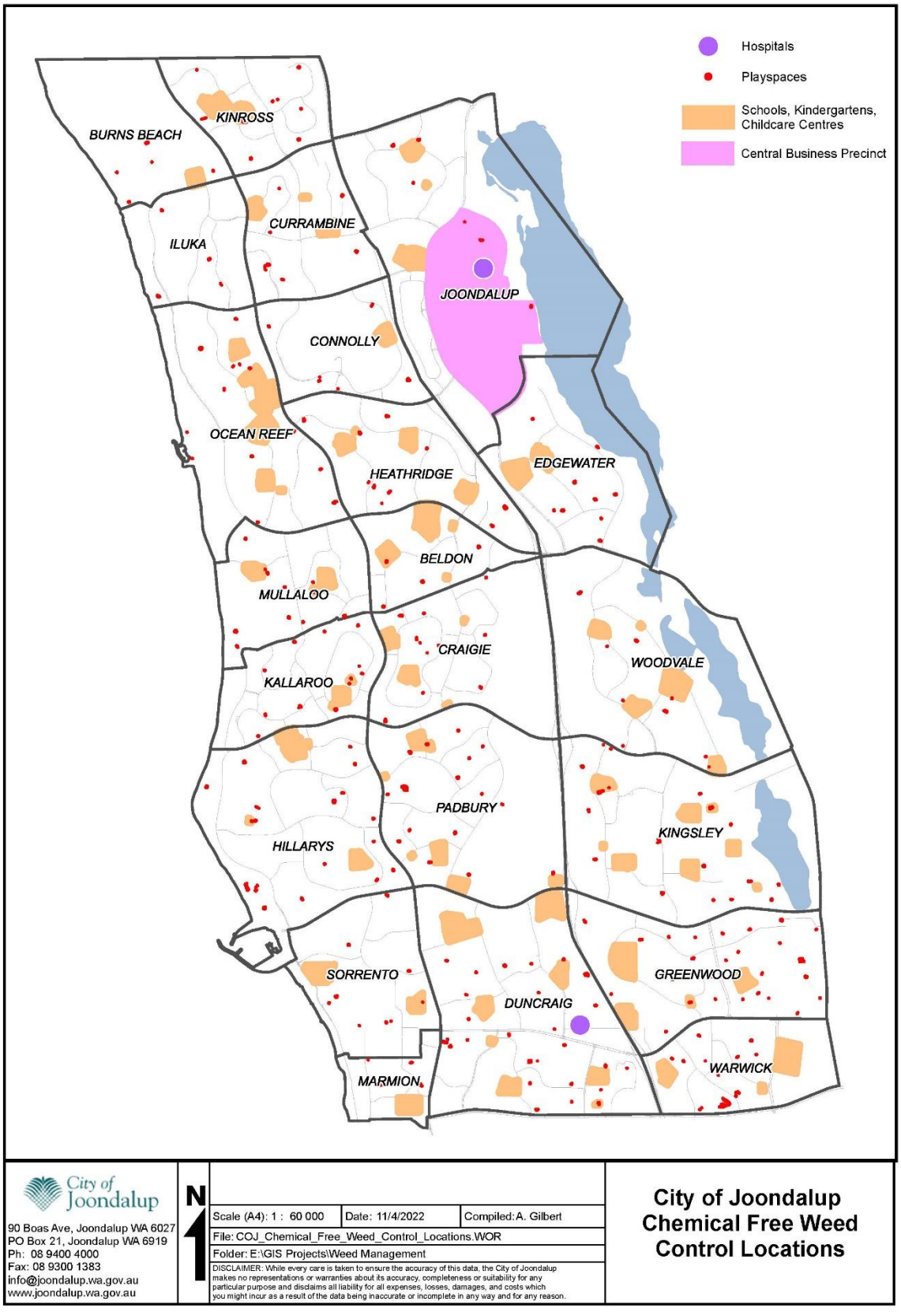


Figure 16: Map of the City's chemical free weed control locations in 2022[69]

[69] The CBP chemical free treatment areas include the kerbs, footpaths, hardstand (paved) median islands, mulched median islands and general paved areas only.

Sensitive Facilities

Herbicide use adjacent to sensitive facilities is subject to the City's assessment of authorised chemicals process. Additional consideration is given to the timing of herbicide application in the vicinity of sensitive facilities to minimise potential impacts.

The City considers the following as sensitive facilities:

- School or pre-school
- Kindergarten
- Childcare Centre
- Hospital
- Community Health Centre
- Nursing Home
- Play spaces.

Physical Weed Control

Physical weed control is mainly undertaken in urban landscaping areas when required. This method is utilised when the weed species are significantly impacting on the presentation of the landscape and chemical application is not determined to be the most effective method of removal, as compared to herbicide use. This weed control method is also used within and surrounding the City's sensitive facilities, particularly in areas unable to be accessed by the steam and hot water weed control machinery.

Site Specific Weed Control

Weed control is conducted according to specific site attributes such as parks, streetscapes, SARs, CBP, PAW's and sumps and swales.

Parks

Weed control is conducted in all irrigated sport and recreation parks through the following methods:

- **Turf**: broadleaf selective, target spraying i.e. around infrastructure.
- **Landscaped garden beds**: hand weeding, target spraying, mulch application.
- **Hardstands and footpaths**: target spraying, use of pre-emergent herbicides (where appropriate).

Weed control in landscaped garden beds, hardstands and footpaths in district and local recreation parks is assessed as per scheduled site inspections.

Urban Landscapes

Weed control is conducted from July to October and April to May according to the Annual Maintenance Schedule and is subject to ongoing site inspections and reactive maintenance from October to March. Weed control in streetscapes is conducted through the following methods:

- **Landscaped garden beds**: hand weeding, target spraying, mulch application
- **Turf**: broadleaf selective, target spraying i.e. around infrastructure
- **Kerblines**: target spraying
- **Medians**: blanket spraying, use of pre-emergent herbicides (where appropriate)
- **Hardstands and footpaths**: target spraying, use of pre-emergent herbicides (where appropriate)

- **Entry statements**: hand weeding, target spraying, mulch application.

Commercial Business Precinct

The CBP or Joondalup City Centre receives a higher frequency of weed control activities to maintain the area to a higher standard of appearance. The visual appearance of this area is particularly important given its role in supporting the City's economic activities and positive visitor experiences.

Weed control in the CBP is conducted through the following methods:

- **Parks**: broadleaf selective, target spraying i.e. around infrastructure.
- **Landscaped garden beds**: hand weeding, target spraying, broadleaf selective, mulch application.
- **Streetscapes**: hand-weeding, steam, hot water and steam, target spraying, broadleaf selective, mulch application.
- **Turf**: broadleaf selective, target spraying i.e. around infrastructure.
- **Kerblines**: steam, hot water and steam, mechanical removal.
- **Footpaths**: steam, hot water and steam, mechanical removal.
- **Medians (mulched)**: target spraying, mechanical removal and steam/hot water where appropriate.
- **Medians (hardstand)**: steam, hot water and steam, mechanical removal.
- **Median (other)**: broadleaf spraying, use of pre-emergent herbicides.
- **Hardstands and footpaths**: steam, hot water and steam, mechanical removal.

The CBP will be partly controlled using non-chemical weed control. The CBP chemical free treatment areas include the kerbs, footpaths, hardstand (paved) median islands, some mulched median islands and general paved areas only and is shown in Figure 17.

Figure 17: City of Joondalup Commercial Business Precinct[70]

[70] The CBP chemical free treatment areas include the kerbs, footpaths, hardstand (paved) median islands, mulched median islands and general paved areas only.

Pedestrian Access Ways

Weed control on pedestrian access ways (PAWs) is conducted from June to October in accordance with the annual scheduled maintenance and is subject to ongoing site inspections and reactive maintenance from November to May.

Weed control is conducted in PAWs through the following methods:

- Fence lines - target spraying
- Hardstands and footpaths - target spraying, use of pre-emergent herbicides.

City residents who own a property adjoining a PAW and wish to plant and maintain the PAW adjoining their residence can apply to be added to the City's Pedestrian Accessway Planting and Maintenance Register.

If approved by the City, chemical weed control will not be undertaken within the PAW by either the City or the registrants.

Sumps and Swales

The City has approximately 200 sumps with weed control being undertaken annually and more often if necessary. An example of a sump is shown in Figure 18. Weed control in sumps consists of mowing weeds and use of herbicide applications. It is conducted prior to summer to reduce fuel load and lower the fire hazard risk. Swales are mowed in accordance with the Annual Maintenance Schedule.

Figure 18: Sump at Shepherds Bush Reserve, Kingsley

Pesticide Use Notification

The City has implemented chemical application notification and exclusion registration processes to keep residents and stakeholders informed of the City's weed control application locations and scheduling or alternatively to allow them to register for their residence to be excluded from receiving any chemical weed control treatment.

City residents wishing to be advised in advance of scheduled spraying activities, occurring within 100m of their residence, can apply to be added to the City's Pesticide Use Notification Register. Residents listed on the Pesticide Use Notification Register will receive an automated notification at least 24 hours prior to spraying commencing. Further information on the Pesticide Use Notification Register can be found on the City's website.

Pesticide Use Notification – Locations Map and Schedule

The City also updates the Pesticide Use Notification – Locations Map and Schedule platform on the City's website weekly to provide a visual search tool, inclusive of an interactive map and searchable database, that displays areas where the City undertakes herbicide application activities and the activities status. The implementation of herbicide application as per the schedule is dependent on weather and the availability of operational resources.

Pesticide Exclusion Register

City residents and/or property owners wishing to exclude the verge immediately abutting their property/residence from chemical weed control can apply to be added to the City's Pesticide Exclusion Register.

Registration to the Pesticide Exclusion Register requires the resident to commit to:

- Maintaining their verge in a good and tidy condition, including weed removal
- Re-register at 30 June each year to remain on the Pesticide Exclusion Register
- Adhere to the City's Street Verge Guidelines.
- Understanding that the Pesticide Exclusion Register does not apply to parks, reserves or natural areas
- For tenanted properties, written confirmation from the property owner approving inclusion on the Register must be provided.
- That Main Roads WA roads are exempt from registration.

Innovation, continual improvement and training

The City is committed to delivering an innovative, holistic and integrated weed management program and will continue to undertake research and complete trials into alternate and emerging weed control and monitoring methods.

The City will provide its staff with professional development opportunities to learn and train in emerging weed control methods, best-practice weed management approaches and associated weed management training such as Green Card training. Further information is detailed in Section 5.3.

Management Recommendations

13. *Undertake weed control in parks and urban landscaping areas in accordance with the Annual Maintenance Schedule.*

14. *Implement steam and hot water weed control in accordance with specified scope. Undertake review of non-chemical weed control at expiration of contract.*

15. Continue to implement the Pesticide Use Notification Register, Pesticide Use Notification - Location Map and Schedule and Pesticide Exclusion Register.

4.3 Wetlands

Wetlands can contain weeds on the perimeter or aquatic weeds within the water body. The City manages 17 wetlands contained within parks, including being responsible for weed control (see Figure 19). Yellagonga Regional Park wetlands are managed separately through the *Yellagonga Integrated Catchment Management Plan 2021-2026*.

Alternative methods of weed control for weeds on the perimeter of wetlands, such as hand weeding, slashing and matting, to minimise the risk of chemicals entering the water bodies and risk to native fauna and flora, are preferable to using herbicides. Herbicides can enter water bodies through spray drift, dripping from treated plant foliage or landing on a hard surface (e.g. rock or gravel) and washing into the water.[71] However, some weed species are best controlled with the use of herbicides and can form part of an integrated weed management approach.

Aquatic weeds can be emergent (stems and leaves above waterline), free floating (not attached to the soil), floating leaf (rooted into soil with leaves on water surface) or submerged weeds (rooted into soil with the whole plant submerged under water). Aquatic weeds can be introduced through dumping of invasive garden pond plants or spread through mediums such as birds or boats. Weed control of aquatic weeds poses a risk to wildlife, fish and native plants in the wetland. Early control of aquatic weeds prevents weed spread. Some aquatic weeds can be controlled with the use of herbicides such as glyphosate and diquat.[72]

The City conducts wetland water quality monitoring three times a year in accordance with the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (2000) to monitor chemical and physical water conditions.

Weeds growing in or around wetlands are controlled either by physical removal or treatment with a herbicide formulated for use in or around wetlands.

The City undertakes regular inspections of wetlands accessing the overall health of the wetlands to assist with prioritising management actions. These inspections include assessment of weeds, litter, fauna, odour and water quality.

The City has developed and implements *Wetland Guidelines* for staff and contractors to minimise weed establishment and spread into and around wetlands.

Bulrush

Bulrush (*Typha orientalis*), previously considered an introduced species, was reclassified as being native to Western Australia by Keighery and McCabe in 2015.[73] Bulrush is capable of aggressive invasion and can transform wetland ecosystems largely as a result of landscape modifications.[74] Altered hydrology to permanently wet and increased nutrient flow benefit Bulrush over other native sedges which prefer lower nutrient levels and seasonal drying. [75]

[71] CRC for Australian Weed Management (2005b)
[72] Department of Agriculture and Food (2009)
[73] Keighery, G (2016)
[74] Keighery, G (2016)
[75] Keighery, G (2016)

Bulrush can rapidly change nutrient levels and water levels and flow, requiring active management to prevent it from becoming a weed. [76]

A clearing permit or exemption is required to undertake Bulrush control within its natural range, however exemptions under Schedule 6 Clause 3 of the *Environmental Protection Act 1986* allow the DBCA (including volunteers, and contractors) to undertake control works on DBCA managed land, such as within Yellagonga Regional Park without requiring a permit.[77,78] The City would require a clearing permit to undertake Bulrush control within any City owned or managed public open spaces, this includes wetlands but also urban landscaping areas such as sumps and drainage infrastructure. The City has not undertaken any Bulrush removal from its wetlands or other public open spaces.

Management Recommendations

16. *Continue to implement the Wetland Guidelines to provide direction to staff and contractors conducting weed control activities in and around wetland areas and minimise environmental impacts, where possible.*

[76] Keighery, G (2016)
[77] Keighery, G. (2016)
[78] DBCA (2019)

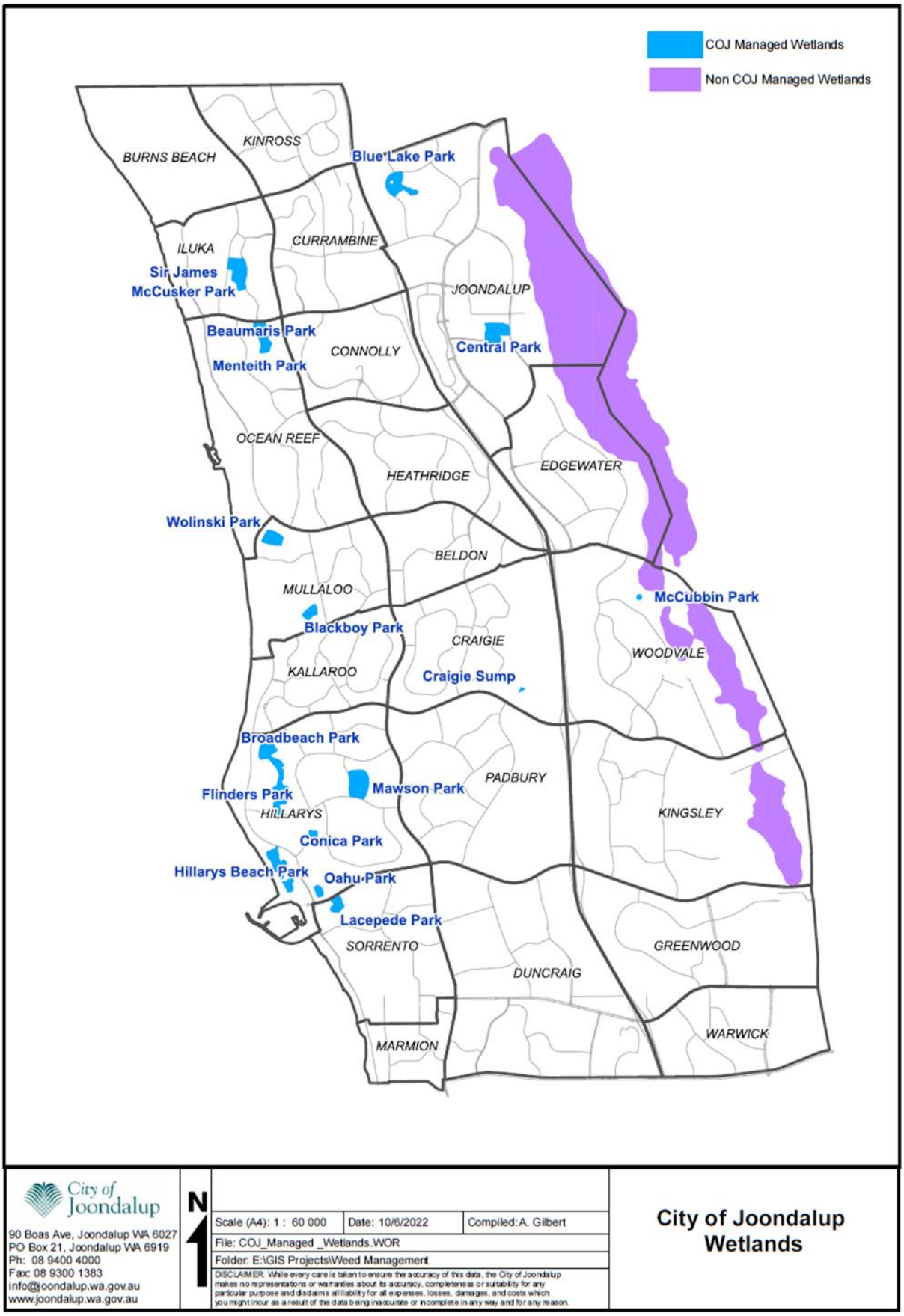


Figure 19: Wetlands managed by the City of Joondalup

Note: The City manages some natural areas adjacent to Yellagonga Regional Park but is not responsible for managing the water bodies.

5.0 Partnerships, Education and Training

An important component of this Plan is to ensure that the local community, visitors and those that manage the City's natural areas and parks have the necessary information to assist in protecting the City's natural areas and parks from the threat of weeds.

5.1 Partnerships

There are many organisations other than the City that have roles and responsibilities in weed management including State government, local governments, WALGA, natural resource management agencies, research organisations and Friends Groups.

The City liaises with a variety of external stakeholders regarding weed management, such as DBCA, DPIRD, Water Corporation, Main Roads WA, other local governments (e.g. City of Wanneroo and City of Stirling), WALGA, universities, schools and Friends Groups.

The City participates in WALGA's Local Government Herbicide Use and Integrated Weed Management Working Group. The purpose of the Working Group is to build the capacity of local government by sharing information and addressing knowledge gaps to deliver effective weed management programs. The City also advocates for natural areas specific alternate weed control treatment methods to be developed and trialled in WA through the Working Group.

Friends Groups are an important partner of the City in managing natural areas and reducing weeds and contribute substantially to bushland conservation. For example, the City's 19 Friends Groups voluntarily contributed 7,415 hours in 2020/21 towards bushland restoration in 23 natural areas. Friends Groups are involved in a variety of activities, including weed control, for their chosen reserve with the aim of restoring the reserve's conservation values and the community's appreciation for the natural environment.

The City works with Friends Groups to protect, maintain and enhance natural areas and assist Friends Groups through the provision of special purpose grants that can be used for weed control activities and assisting with on-ground works, including weed control. The City has also developed the *City of Joondalup Natural Areas Friends Group Manual* to provide an appropriate framework and process for City support of Friends Groups and volunteers including recognising roles and responsibilities and ensuring environmental best-practice issues such as weed management are understood and implemented.[79]

Management Recommendations

17. *Continue to participate in WALGA's Local Government Herbicide Use and Integrated Weed Management Working Group.*

18. *Continue to investigate opportunities to participate in research projects and take up opportunities for sharing information relating to best practice approaches to weed management.*

19. *Continue to partner with and support local Friends Groups to facilitate bushland restoration and weed management activities.*

[79] City of Joondalup (n.d.)d

5.2 Community Education

The City implements an Environmental Education Program to raise community awareness regarding weed prevention and control, particularly regarding the City's weed management approach, the impact of weeds and the importance of weed control.[58]

In order to educate the community about how they can prevent weed introduction and spread the City has developed a number of key brochures titled *'Being WEEDwise: Garden Escapees in the City of Joondalup'*[80], *'Being WEEDwise: Environmental Weeds in the City of Joondalup'*[81] and *'Protecting our Natural Areas and Parks'.*[82]

The community can support local biodiversity and prevent weed introduction and spread by:

- Conducting weed control in their gardens to prevent weed spread.
- Minimising their access and disturbance to natural areas by staying on tracks, not taking vehicles into natural areas, and not allowing dogs to run off-leash in natural areas.
- Undertaking appropriate hygiene practices such as cleaning footwear when entering and leaving natural areas, removing any weed seeds attached to clothing and removing and disposing appropriately of dog excrement (may contain weed seed).
- Reporting sightings of any priority or declared weeds observed within City owned or managed public open spaces.
- Planting local, native species in their gardens where possible.
- Opting for native species rather than invasive species in private gardens to reduce the spread of invasive species to natural areas.
- Not dumping garden rubbish in natural areas or parks.
- Joining a Friends Group to participate in bushland restoration and maintenance activities.

Schools are also an important avenue for raising awareness and interest in environmental and sustainability issues and creating future community members that are aware of and actively participate in local environmental management. Many schools are located adjacent to bushland areas which creates unique and educational learning opportunities for students.

As part of the Environmental Education Program, the City coordinates an Adopt a Coastline/Bushland program for students from years 4 to 7 to provide an interactive coastline/bushland management program. The coastline component of this program commenced in 2006/07 and the bushland component of this program commenced in 2014/15. The Program has had a positive impact on the natural environment as well as being an important education mechanism.

The City recognises that State Government also plays a big role in education and management of weeds, for example the DPIRD works with a range of land owners and managers, community groups and biosecurity groups, provides weed identification services and contributes to social science through weedwatcher. The DPIRD website provides a range of information, tools and programs that support community education. This includes the Western Australian Organism List, PestFacts WA newsletter, MyPestGuide™ Report to report weeds and the MyWeedWatcher project.

[80] City of Joondalup n.d(a)
[81] City of Joondalup n.d(b)
[82] City of Joondalup n.d.(c)

Management Recommendations

20. *Continue to implement an Adopt a Bushland/Coastline program for students to provide an interactive bushland and/or coastline management program.*

21. *Continue to distribute the 'Being WEEDwise' and 'Protecting our Natural Areas and Parks' brochures through the community.*

22. *Continue to implement the Environmental Education Program to raise awareness and encourage weed management practices.*

5.3 Training

The City continues to ensure its staff have the necessary knowledge and experience to undertake integrated weed management activities to ensure the program is safe, effective and innovative; resources are used productively; potential negative impacts are minimised as well as ensuring the safety of staff. Training is important for the continued development of staff knowledge and expertise. Training is particularly important for staff to learn about emerging weed management methods, such as the stem and hot water weed control method.

City staff are trained in the correct application and safe use of herbicides. Contractors directly involved in the use of herbicides are licenced and registered with the Department of Health under the *Health (Pesticides) Regulations 2011*.

City staff also complete Green Card training, and although focused on plant diseases and pathogens, the hygiene management practices are relevant to weed management.

City staff in the Natural Areas team are qualified with a Certificate in Conservation and Land Management or relevant experience. The City currently conducts regular plant identification training, including weed identification and management. City staff also undertake relevant training to increase knowledge of weed identification, safety and effective methods of weed control.

The City's Friends Groups help to protect, preserve and enhance significant bushland areas within the City and will continue to benefit from training related to weed management.
Through ongoing meetings with Friends Groups, the Friends Groups Coordinator shares information about weed hygiene practices to protect the biodiversity of natural areas.

Management Recommendations

23. *Ensure City staff working within natural areas and parks continue to undertake relevant training to increase knowledge of weed identification, safety and research on effective methods of weed control.*

24. *Continue to conduct ongoing weed hygiene practices information sharing with City Friends Groups.*

6.0 Implementation

Effective and coordinated implementation of the *Weed Management Plan* is critical to achieving the objectives of the Plan. Implementation of the Plan will be coordinated by annual reporting and review of the Plan.

6.1 Monitoring

The City will annually report on, evaluate and review the plan as part of an ongoing process.

6.1.1 Performance Measures

The following indicators will be monitored annually to determine the effectiveness of the City's weed management actions.

Indicator	Source	Measure	Reportable Period
Community satisfaction with conservation and natural area management	Customer Satisfaction Monitor	% of respondents satisfied with service	Biennial
Vegetation condition of City Major Conservation Natural Areas	Vegetation assessments (five yearly)	% of area per vegetation condition classification (as per the Keighery scale)	Once every five years per Major Conservation Natural Area
Fuel load of City Major Conservation Natural Areas	Fuel load assessments	Fuel load (tonnes/hectare)	Once every five years per Major Conservation Natural Area
Weed control in City Major Conservation Natural Areas.	Contractor monthly reports	Coverage (hectares) of weed control.	Annual
Community satisfaction with parks	Customer Satisfaction Monitor	% of respondents satisfied with service	Biennial
Weed control in playspaces	Non-chemical weed control contractor monthly reports	% of playspaces using non-chemical weed control methods	Annual
Weed control in sensitive areas	Non-chemical weed control contractor monthly reports	% kerblines and footpaths within 50 m of sensitive activities using non-chemical weed control	Annual
Community awareness of weed management	Corporate Business Plan	Number of events/initiatives.	Annual
Volunteer Hours	Friends Group Annual Work Plans	Total number of volunteer hours by City of Joondalup Friends Groups	Annual
Expenditure for weed management	Annual Budget	Total annual budget allocated to weed management per year	Annual

Note: the City's non-chemical weed control treatment commenced in July 2022 and will be applied to the same locations until the term of the contract and then be dependent upon review of the contract.

6.1.2 Reporting

The progress of recommended management actions and performance measures within the Plan will be reported against on an annual basis via the City's State of the Environment Report.

6.1.3 Review

The Weed Management Plan is to be reviewed and updated every 10 years with a major review undertaken every 5 years. This aligns with the timeframes for capital works programming and natural area management plans and will ensure the City is managing weeds in accordance with best practice approaches.

6.2 Recommendations

A total of 24 management actions have been recommended to coordinate and improve the City's weed management activities. A list of the recommended management actions is provided in the following table.

Recommended Management Actions

No.	Recommended Management Action	Relevant to Natural Areas	Relevant to Parks and Urban Landscaping Areas
1	Comply with the requirements of the *Aboriginal Cultural Heritage Act 2021* when conducting weed control, as required.	●	●
2	Continue to review and undertake weed control activities in accordance with the ISO 9001 Quality Management System and other relevant legislation.	●	●
3	Continue mapping of key priority weeds through regular inspections of natural areas in accordance with the Annual Maintenance Schedule to inform on ground weed management actions.	●	
4	Continue to assess high priority and medium priority natural areas every 5-7 years using the Natural Areas Initial Assessment Tool, including identification of weed species and their distribution in accordance with the Natural Areas Assessment Schedule.	●	
5	Continue to undertake photo monitoring in major conservation areas when measuring the natural areas key performance indicator annually to assess the effectiveness of ongoing weed control.	●	
6	Record and monitor the coverage (hectares) of weed control in major conservation natural areas.	●	
7	Continue to monitor for new weed populations, including new aggressive weed species, identified in the City to prioritise for weed control and prevent spread.	●	●
8	Continue to implement the Pathogen Hygiene Procedure, and Purchasing Guidelines for the Supply of Landscaping Materials to provide direction to staff and contractors and prevent the introduction and spread of weeds within the City.	●	●
9	Continue to implement the Fire Weed Management Guideline to inform staff and contractors about weed hygiene when undertaking manual fuel load reduction works and when constructing and maintaining firebreaks and access ways.	●	
10	Continue to implement weed control in natural areas in accordance with the Annual Maintenance Schedule.	●	
11	Continue to conduct weed control on verges adjacent to key natural areas including increasing mowing of verges to reduce weed seed spread, spraying of weeds and spreading of certified mulch, where required.	●	●

No.	Recommended Management Action	Relevant to Natural Areas	Relevant to Parks and Urban Landscaping Areas
12	Continue to implement the Fire Weed Management Guidelines to limit the infestation of weeds in the City's natural areas.	●	
13	Undertake weed control in parks and urban landscaping areas in accordance with the Annual Maintenance Schedule.		●
14	Implement steam and hot water weed control in accordance with specified scope. Undertake review of non-chemical weed control at expiration of contract.		●
15	Continue to implement the Pesticide Use Notification Register, Pesticide Use Notification - Location Map and Schedule and Pesticide Exclusion Register.	●	●
16	Continue to implement the Wetland Guidelines to provide direction to staff and contractors conducting weed control activities in and around wetland areas and minimise environmental impacts, where possible.	●	●
17	Continue to participate in WALGA's Local Government Herbicide Use and Integrated Weed Management Working Group.	●	●
18	Continue to investigate opportunities to participate in research projects and take up opportunities for sharing information relating to best practice approaches to weed management.	●	●
19	Continue to partner with and support local Friends Groups to facilitate bushland restoration and weed management activities.	●	
20	Continue to implement an Adopt a Bushland/Coastline program for students to provide an interactive bushland and/or coastline management program.	●	
21	Continue to distribute the 'Being WEEDwise' and 'Protecting our Natural Areas and Parks' brochures through the community.	●	●
22	Continue to implement the Environmental Education Program to raise awareness and encourage weed management practices.	●	●
23	Ensure City staff working within natural areas and parks continue to undertake relevant training to increase knowledge of weed identification, safety and research on effective methods of weed control.	●	●
24	Continue to conduct ongoing weed hygiene practices information sharing with City Friends Groups.	●	

7.0 References

ArborCarbon (2014) Using airborne MSI to manage weeds in urban bushland: City of Joondalup Natural Areas, Perth, Western Australia.

Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Artarmon, New South Wales.

Australian Association of Bush Regenerators (AABR), 2013, *The Bradley Method*, viewed 1 August 2022, http://www.aabr.org.au/learn/what-i-bush-regeneration/general-principles/the-bradley-method/.

Australian Glyphosate Sustainability Working Group, n.d., *Sustainable Glyphosate Use on Roadsides, Railways, Public Utilities and Parks*.

Australian Government, 2012a, *Impact of Weeds,* viewed 1 August 2022, http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/why/impact.html

Australian Government, 2012b, *Weeds in Australia*, viewed 1 August 2022, http://www.environment.gov.au/biodiversity/invasive/weeds/index.html.

Australian Government, 2012c, *Biological Control*, viewed 1 August 2022, http://www.environment.gov.au/biodiversity/invasive/weeds/management/biological-control.html

Australian Government, n.d., *Climate Change: Extreme climate events*, viewed 11 December 2013, http://www.climatechange.gov.au/climate-change/grants/australian-climate-change-science-program/extreme-climate-events.

Australian Government, 2022, Australia State of the Environment 2021, viewed 1 August 2022, https://soe.dcceew.gov.au/.

Australian Weeds Committee, n.d., *Weed Mapping*, viewed 1 August 2022, https://weeds.org.au/monitor/.

Banks,J. And Sandral, G., 2007, *Report on Weed Control using hot water/ steam and herbicides in the City of Joondalup*. Prepared for the City of Joondalup, Perth, Western Australia.

Banks and associates 2009, *Weed Control Trials comparing hydrothermal and herbicides in the City of Joondalup*. Prepared for the City of Joondalup, Perth, Western Australia.

Bettink, K. and Keighery, G., 2008, *Environmental Weed Census and Prioritisation, Swan NRM Region*, Swan Catchment Council and Department of Environment and Conservation, Perth, Western Australia.

Brown and Brooks, 2002, *Bushland Weeds: A practical guide to their management*, Perth, Western Australia.

City of Joondalup, n.d.(a), *Being WEEDwise – Environmental Weeds in the City of Joondalup*, Perth, Western Australia.

City of Joondalup, n.d.(b), *Being WEEDwise – Garden Escapees in the City of Joondalup*, Perth, Western Australia.

City of Joondalup, n.d.(c), *Protecting our Natural Areas and Parks*, Perth, Western Australia.

City of Joondalup, n.d.(d), *Natural Areas – Friends Group Manual*, Perth, Western Australia.

City of Joondalup, 2012, *Lilburne Park Management Plan*, Perth, Western Australia.

City of Joondalup, 2013, *Pathogen Management Plan 2013-2016*, Perth, Western Australia.

City of Joondalup, 2014, *City of Joondalup Environment Plan 2014-2019*, Perth, Western Australia.

City of Joondalup, 2021, *City of Joondalup Weed Management Trial Presentation*, Perth, Western Australia.

City of Joondalup, 2022, *City of Joondalup – Minutes of Meeting of Council – 19-Jul-2022,* viewed 1 August 2022, https://api.joondalup.wa.gov.au/files/councilmeetings/2022/220719_CNCL_MIN.pdf

City of Nedlands, 2013, *Weed control decision saves more than $83,000,* Media Release November 2013, Perth, Western Australia.

Collins, M, 1999, *Thermal Weed Control, A Technology with a Future? Twelfth Australian Weeds Conference*, Hobart, Tasmania.

Conservation International, 2014, *Hotspots*, viewed 1 August 2022, https://www.conservation.org/priorities/biodiversity-hotspots.

Cooperative Research Centre (CRC) for Australian Weed Management, 2004, *Introductory Weed Management Manual*, Department of Environment and Heritage, Australia.

Cooperative Research Centre (CRC) for Australian Weed Management, 2005a, *Herbicide Guidelines: Knowing when and how to use them*, Glen Osmond, South Australia.

Cooperative Research Centre (CRC) for Australian Weed Management, 2005b, *Herbicide Guidelines: For use in and around water*, Glen Osmond, South Australia.

Commonwealth, Science and Industry Research Organisation (CSIRO), 2011, *Biological Control of Weeds,* viewed 1 August 2022, https://www.csiro.au/en/research/plants/Pathogens-Pests-Weeds/Biological-control-of-weeds.

Commonwealth, Science and Industry Research Organisation (CSIRO), 2013, *Weed Biological Control,* viewed 1 August 2022, https://research.csiro.au/weed-biocontrol/.

Department of Agriculture and Food, 2011, *Declared Plants in Western Australia*, Perth, Western Australia.

Department of Biodiversity, Conservation and Attractions (DBCA), 2019, *Reclassification of Typha orientalis as native to Western Australia and the implications under Environmental Protection Act 1986 and the Swan and Canning Rivers Management Regulations 2007*, viewed 31 March 2022, https://www.udiawa.com.au/wp-

content/uploads/2019/05/Reclassification-of-Typha-orientalis-as-native-to-WA_implications-under-EP-Act_SCRM-Regs-external.pdf.

Department of Parks and Wildlife (DPaW), 1999, *Environmental Weed Strategy for WA*, Perth, Western Australia.

Department of Parks and Wildlife (DPaW), 2002, *Weed Control and Revegetation Plan*, Perth, Western Australia.

Department of Parks and Wildlife (DPaW), 2013, *Weed Prioritisation Process for DPaW*, Perth, Western Australia.

Department of Fire and Emergency Services (DFES), 2013, *Bush Fires Act 1957*, Perth, Western Australia.

Department of Planning, n.d., *Weeds and Weed Management*, website viewed 27 August 2013.

Department of Primary Industries (DPI), 2011, *Noxious and environmental weed control handbook – a guide to weed control in non-crop, aquatic and bushland situations, 5th Edition.* New South Wales.

Department of Primary Industries and Regional Development, 2022, *Environmental weed risk assessments*, viewed 1 August 2022, https://www.agric.wa.gov.au/rangelands/environmental-weed-risk-assessments.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC), 2012a, *Weed Prevention*, viewed 1 August 2013, http://www.environment.gov.au/biodiversity/invasive/weeds/management/prevention.html.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC), 2012b, *Why are weeds a problem?* viewed 13 February 2013, http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/why/index.html

Dunne, C., 2005, *Managing Phytophthora Dieback in Bushland*, Dieback Working Group and the Threatened Species Network, Perth, Western Australia.

Eurobodalla Shire Council, n.d., *Weed Control Methods*, website viewed 8 August 2013.

Fire and Emergency Services Authority (FESA) of Western Australia, 2011, *Biodiversity Conservation and Fire in Road and Rail Reserves: Management Guidelines*, Perth, Western Australia.

Government of South Australia, 2019, *Weed Management Techniques Fact Sheet*, Natural Resources Adelaide and Mt Lofty Ranges.

Groves, R.H., Boden, R. and Lonsdale, W.M., 2005, *Jumping the Garden Fence: Invasive Garden Plants in Australia and their Environmental and Agricultural Impacts*, CSIRO report prepared for WWF-Australia, WWF-Australia, Sydney, New South Wales.

Hudek, L., Enez, A., and Brau, L., 2021, Comparative Analyses of Glyphosate Alternative Weed Management Strategies on Plant Coverage, Soil and Soil Biota, *Sustainability 13*(20), viewed on 9 May 2022, https://doi.org/10.3390/su132011454.

Houghton Mifflin Company, 2009, *The American Heritage Dictionary of the English Language*, viewed 30 November 2012, http://www.thefreedictionary.com/herbicide.

Johansson, E., n.d., *Alternative Weed Control Methods*, website viewed on 27 August 2013.

John Banks and Associates, 2007, *Report on Weed Control Using Hot Water/ Steam in the City of Joondalup*, Prepared for the City of Joondalup.

John Banks and Associates, 2009, *Weed Control Trials Comparing Hydrothermal and Herbicides in the City of Joondalup*, Prepared for the City of Joondalup.

Keightery, G., 2016, Typha Orientalis in Western Australia' in Bushland News, Issue 97.

Leschenault Catchment Council, n.d., *Bringing Back the Bush*, website viewed 16 February 2015.

Natural Area Consulting, 2013, *Draft City of Joondalup Weed Treatment Trial – Interim Report December 2013*, unpublished report.

Natural Resource Management (NRM) Ministerial Council, 2007, *The Australian Weeds Strategy: A national strategy for weed management in Australia*, Canberra, Australian Capital Territory.

New South Wales (NSW) Government, n.d., *Weeds*, viewed on 26 November 2012, https://www.dpi.nsw.gov.au/biosecurity/weeds.

Nursery and Garden Industry, no date, *Way to Grow!,* viewed on 9 December 2013, http://ngiq.asn.au/wp-content/uploads/FINAL-NIASA-Production-A4-Brochure-05.pdf.

Penn State, 2014, *Adjuvants for Enhancing Herbicide Performance*, viewed on 2 April 2014, http://extension.psu.edu/pests/weeds/control/adjuvants-for-enhancing-herbicide-performance.

Scott, J.K., Webber, B.L., Murphy, H., Ota, N., Kriticos, D.J. & Loechel, B., 2014*, AdaptNRM Weeds and climate change: supporting weed management adaptation*. Available at: https://adaptnrm.csiro.au/wp-content/uploads/2014/08/Adapt-NRM_M2_WeedsTechGuide_5.1_LR.pdf.

State Weed Plan Steering Group, 2001, *A Weed Plan for Western Australia*, Perth, Western Australia.

The University of Queensland, 2011, *Weeds of Australia*, website viewed on 26 November 2012.

Water and Rivers Commission, 2001, *Water notes: Herbicide Use in Wetlands*, Perth, Western Australia.

WeedScience.org, 2013, *International Survey of Herbicide Resistant Weeds: Herbicide Resistant Weeds in Australia*, viewed 27 August 2013, http://weedscience.org/summary/Country.aspx.

Western Australian Herbarium, n.d., *Florabase*, viewed on 26 November 2012, https://florabase.dpaw.wa.gov.au/.

Western Australian Local Government Association (WALGA), 2014, *Biodiversity Program,* website viewed 25 April 2014.

Western Australian Local Government Association (WALGA), 2004, *Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region*, viewed 13 August 2014, https://walga.asn.au/getattachment/Policy-Advice-and-Advocacy/Environment/Biodiversity/swbp_lg_bio_planning_guide_adden.pdf?lang=en-AU.

Vigneault C. & Benoît D.L., 2001, *Electrical Weed Control: Theory and Applications*, viewed 28 February 2022, https://doi.org/10.1007/978-3-662-04584-8_12

8.0 Appendices

Appendix 1 – Natural Area Sites within Study Area (Alphabetically)

Appendix 2 - Prioritisation of City of Joondalup Natural Areas

Appendix 3 – Relevant Local, State and Federal Legislation, Policies, Plans and Strategies

Appendix 4 – Examples of City of Joondalup Priority Weeds

Appendix 5 – Weeds Identified in City of Joondalup and Weed Status

Appendix 6 – Weed Control Methods

Appendix 7 – Wetlands within City of Joondalup

Appendix 1 – Natural Area Sites within Study Area (Alphabetically)

Natural Area	Suburb
Adelaide Park	Craigie
Alfreton Park	Duncraig
Beaumaris Park	Ocean Reef
Bethany Park	Iluka
Blue Lake Park	Joondalup
Bonnie Doon Park	Connolly
Brisbane Park	Padbury
Burns Beach Foreshore Reserve	Burns Beach
Cadogan Park	Kingsley
Caledonia Park	Currambine
Callander Park	Kinross
Candlewood Park	Joondalup
Carnaby Reserve	Connolly
Castlecrag Park	Kallaroo
Cawarra Park	Craigie
Central Park	Joondalup
Chadlington Park	Padbury
Chichester Park	Woodvale
Christchurch Park	Currambine
Clermont Park	Currambine
Conidae Park	Heathridge
Craigie Open Space	Craigie
Cranston Park	Kinross
Culwalla Park	Kallaroo
Delamere Park	Currambine
Duncraig Library Bushland	Duncraig
Earlsferry Park	Kinross
Fairway Park	Connolly
Fernwood Park	Padbury
Finney Park	Marmion
Garrong Park	Edgewater
Glenbar Park	Duncraig
Greenshank Park	Joondalup
Gunida Park	Mullaloo
Haddington Park	Beldon
Harman Park	Sorrento
Hawker Park	Warwick
Hepburn Heights Conservation Area	Padbury
Hillarys Foreshore Reserve	Hillarys
Hilton Park	Duncraig
Huntingdale Park	Connolly
Huxley Park	Burns Beach
Iluka Foreshore Reserve	Iluka
Kallaroo Foreshore Reserve	Kallaroo
Kallaroo Park	Mullaloo
Kiernan Park	Kallaroo
Kilrenny Park	Greenwood
Korella Park	Mullaloo
Kuta Park	Iluka

Natural Area	Suburb
Lacepede Park	Sorrento
Lady Evelyn Park	Joondalup
Lakeside Park	Joondalup
Lakevalley Park	Edgewater
Ledge Park	Sorrento
Lilburne Park	Duncraig
Littorina Park	Heathridge
Lookout Park	Edgewater
Lysander Park	Heathridge
MacNaughton Park	Kinross
Madana Park	Craigie
Magpie Reserve	Marmion
Manapouri Park	Joondalup
Mandalay Park	Craigie
Marbella Park	Hillarys
Maritana Park	Kallaroo
Marmion Foreshore Reserve	Marmion
Menteith Park	Kinross
Mullaloo Foreshore Reserve	Mullaloo
Nanika Park	Joondalup
Naturaliste Park	Iluka
Negresco Park	Currambine
Neil Hawkins Park	Joondalup
Ocean Reef Foreshore Reserve	Ocean Reef
Okely Park	Edgewater
Pentland Park	Duncraig
Periwinkle Park	Mullaloo
Picnic Cove Park	Edgewater
Pine Valley Park	Connolly
Porteous Park	Sorrento
Quarry Park	Edgewater
Quarry Ramble Park	Edgewater
Riversdale Park	Currambine
Robin Park	Sorrento
Sandalford Park	Beldon
Shepherds Bush Reserve	Kingsley
Sir James McCusker Park	Iluka
Sorrento Foreshore Reserve	Sorrento
St Clair Park	Edgewater
St Michael's Park	Connolly
Stilt Park	Joondalup
Sweeney Park	Padbury
Timberlane Park	Woodvale
Trig Point Park	Ocean Reef
Trigonometric Park	Duncraig
Walsh Park	Joondalup
Warrandyte Park	Craigie
Warwick Open Space Bushland	Warwick
Water Tower Park	Joondalup

Appendix 2 – Prioritisation of City of Joondalup Natural Areas

Site	Suburb	Priority	Bush Forever Site	Local Planning Scheme No. 3, Environmental Conservation Zoning	Friends Group
Warwick Open Space Bushland	Warwick	Major Conservation Natural Area	●		●
Craigie Open Space Bushland	Craigie	Major Conservation Natural Area	●		●
Hepburn Conservation Area*	Padbury	Major Conservation Natural Area	●		●
Shepherd's Bush Park*	Kingsley	Major Conservation Natural Area	●		●
Lilburne Park	Duncraig	Major Conservation Natural Area		●	
Marmion Foreshore Reserve	Marmion	Major Conservation Natural Area			●
Sorrento Foreshore Reserve	Sorrento	Major Conservation Natural Area			●
Hillarys Foreshore Reserve	Hillarys	Major Conservation Natural Area	●		●
Kallaroo Foreshore Reserve	Kallaroo	Major Conservation Natural Area	●		●
Mullaloo Foreshore Reserve	Mullaloo	Major Conservation Natural Area	●		●
Ocean Reef Foreshore Reserve	Ocean Reef	Major Conservation Natural Area	●		●
Iluka Beach Foreshore Reserve^	Iluka	Major Conservation Natural Area	●		●
Burns Beach Foreshore Reserve	Burns Beach	Major Conservation Natural Area	●		
Cranston Park	Kinross	High Priority Natural Area			
Fairway Park	Connolly	High Priority Natural Area		●	
Lakeside Park	Joondalup	High Priority Natural Area			
Lakevalley Park	Edgewater	High Priority Natural Area		●	
Saint Clair / Quarry Park	Edgewater	High Priority Natural Area			
St Michaels Park	Connolly	High Priority Natural Area		●	
Lady Evelyn Park^	Joondalup	High Priority Natural Area			

Site	Suburb	Priority	Bush Forever Site	Local Planning Scheme No. 3, Environmental Conservation Zoning	Friends Group
Timberlane Park	Woodvale	High Priority Natural Area		●	
Beaumaris Park	Ocean Reef	High Priority Natural Area		●	
Bonnie Doon Park	Connolly	High Priority Natural Area		●	
Cadogan Park	Kingsley	High Priority Natural Area		●	●
Central Park	Joondalup	High Priority Natural Area			●
Clermont Park	Currambine	High Priority Natural Area		●	
Naturaliste Park	Iluka	High Priority Natural Area		●	
Chadlington Park	Padbury	High Priority Natural Area			
Neil Hawkins Park^*	Joondalup	High Priority Natural Area	●		●
Cawarra Park	Craigie	High Priority Natural Area		●	
Glenbar Park	Duncraig	High Priority Natural Area		●	●
Littorina Park^	Heathridge	High Priority Natural Area		●	
Maritana Park	Kallaroo	High Priority Natural Area		●	●
Periwinkle Park	Mullaloo	High Priority Natural Area		●	●
Porteous Park	Sorrento	High Priority Natural Area		●	●
Trigonometric Park	Duncraig	High Priority Natural Area			●
Blue Lake Park^	Joondalup	High Priority Natural Area		●	
Water Tower Park^	Joondalup	High Priority Natural Area		●	
Carnaby Reserve	Connolly	High Priority Natural Area		●	●
Kallaroo Park	Mullaloo	High Priority Natural Area			
MacNaughton Park	Kinross	High Priority Natural Area			
Nanika Park^	Joondalup	High Priority Natural Area		●	
Sandalford Park	Beldon	High Priority Natural Area		●	
Sir James McCusker Park	Iluka	High Priority Natural Area			
Huxley Park	Burns Beach	Medium Priority Natural Area			
Chichester Park	Woodvale	Medium Priority Natural Area			
Garrong Park	Edgewater	Medium Priority Natural Area			

Site	Suburb	Priority	Bush Forever Site	Local Planning Scheme No. 3, Environmental Conservation Zoning	Friends Group
Korella Park	Mullaloo	Medium Priority Natural Area			
Madana Park	Craigie	Medium Priority Natural Area			
Mandalay Park	Craigie	Medium Priority Natural Area			
Warrandyte Park	Craigie	Medium Priority Natural Area			
Alfreton Park	Duncraig	Medium Priority Natural Area		●	
Duncraig Library Bushland	Duncraig	Medium Priority Natural Area			●
Harman Park	Sorrento	Medium Priority Natural Area			●
Lacepede Park	Sorrento	Medium Priority Natural Area			
Picnic Cove Park	Edgewater	Medium Priority Natural Area	●		●
Negresco Park^	Currambine	Medium Priority Natural Area			
Robin Park	Sorrento	Medium Priority Natural Area			●
Finney Park	Marmion	Medium Priority Natural Area			
Bethany Park	Iluka	Medium Priority Natural Area			
Caledonia Park	Currambine	Medium Priority Natural Area		●	
Huntingdale Park	Connolly	Medium Priority Natural Area			
Kuta Park	Iluka	Medium Priority Natural Area			
Manapouri Park^	Joondalup	Medium Priority Natural Area			
Greenshank Park	Joondalup	Medium Priority Natural Area			
Pine Valley Park	Connolly	Medium Priority Natural Area		●	
Adelaide Park	Craigie	Medium Priority Natural Area			
Callander Park	Kinross	Medium Priority Natural Area			
Castlecrag Park	Kallaroo	Medium Priority Natural Area			
Conidae Park	Heathridge	Medium Priority Natural Area			
Earlsferry Park	Kinross	Medium Priority Natural Area			
Lysander Park	Heathridge	Medium Priority Natural Area			
Menteith Park	Kinross	Medium Priority Natural Area			
Okely Park	Edgewater	Medium Priority Natural Area			

Site	Suburb	Priority	Bush Forever Site	Local Planning Scheme No. 3, Environmental Conservation Zoning	Friends Group
Brisbane Park	Padbury	Medium Priority Natural Area			
Candlewood Park^	Joondalup	Medium Priority Natural Area		●	
Gunida Park	Mullaloo	Medium Priority Natural Area			
Ledge Park	Sorrento	Medium Priority Natural Area			
Quarry Ramble Park	Edgewater	Medium Priority Natural Area		●	
Trig Point Park	Ocean Reef	Medium Priority Natural Area			

Note: Sites in Appendix 1 that are not listed in the above table are classified as low priority and no weed management activities are undertaken.

* = State Heritage Site
^ = Aboriginal Heritage Site

Appendix 3 – Relevant Local, State and Federal Legislation, Policies, Plans and Strategies

Local Government

The purpose of the *Weed Management Plan* aligns with the environmental aims and objectives of a number of City of Joondalup Plans including:

Strategic Community Plan

The *City of Joondalup Strategic Community Plan 2022 – 2032* highlights the focus on conservation, rehabilitation and accessibility of the City's natural assets and the importance of engaging with the community, key stakeholders and relevant agencies.

Environment Plan

The *City of Joondalup Environment Plan 2014 – 2019* provides strategic direction in the delivery of environmental initiatives within the City.

Biodiversity Action Plan

The *City of Joondalup Biodiversity Action Plan 2009 – 2019* provides direction for the City's biodiversity management activities and details the development of individual Natural Areas Management Plans as an action.

City of Joondalup Pest Plant Local Law 2012

Under the *Agriculture and Related Resources Protection Act 1976* and the *Local Government Act 1995*, the Council of the City of Joondalup made the *Pest Plant Local Law 2012* to require the owner or occupier of private land within the City district to destroy, eradicate or otherwise control pest plants within a specified time. Caltrop (*Tribulus terrestis*) is designated as a pest plant. Caltrop has been identified within the City.

Local Biodiversity Program (formerly Perth Biodiversity Project)

The City of Joondalup is one of 32 local governments participating in the Western Australian Local Government Association's (WALGA's) Local Biodiversity Program. The aim of the Local Biodiversity Program is to support local governments to effectively integrate biodiversity conservation into land use planning to protect and manage local natural areas.

As part of the Local Biodiversity Program, the City assessed all natural areas from 2004 onwards using the ecological criteria of the Natural Area Initial Assessment process, resulting in a priority ranking of natural areas. The City assess major conservation, high priority and medium priority natural areas approximately every 5-7 years using this assessment tool.

Natural Area Initial Assessments include a desktop assessment and field survey and document information such as:

- vegetation complexes;
- threatened or significant flora or ecological communities;
- structural plant communities;
- weed species;
- vegetation condition assessment;
- ecological criteria rankings;

- a viability estimate; and
- fauna species observed.

Herbicide Use and Integrated Weed Management for Local Government Communications Strategy and Action Plan, 2021

WALGA established the *Local Government Herbicide and Integrated Weed Management Working Group*, to build the capacity of Local Government to develop and implement effective weed control programs that are most suitable for their local context.

The City has representatives on the Working Group.

State Government

Relevant Legislation, Policies and Documents

Biodiversity Conservation (BC) Act 2016

The BC Act provides for the conservation and protection of biodiversity, particularly threatened species and threatened ecological communities. Although the Act does not directly refer to invasive weed species; invasive weed species can that threaten or may threaten biodiversity.

Biosecurity and Agriculture Management Act 2007

The Act gives provision to prevent new animals and plant pests (vermin and weeds) and diseases from entering WA and manages the impact and spread of those pests already present in the State. The Act also gives provision to safely manage the use of agricultural chemicals. There are 67 species on the list of declared pest plants in WA.

The City contains 8 known declared pest plants.

Environmental Protection (EP) Act 1986

The EP Act provides for the protection of the environment and prevention of environmental harm, nuisances and contamination. The *Environmental Protection Act 1994* also sets out enforcement tools that can be used when offences or acts of non-compliance are identified.

Work Health and Safety Act 2020

The *Work Health and Safety Act 2020* requires organisations to keep a current register of hazardous chemicals used in the workplace, provide workers with information and training on the risks associated with their use (storage, handling and disposal) and to take precautions to eliminate or minimise the risk of injury.

Health (Pesticide) Regulations 2011

The *Health (Pesticides) Regulations 2011* provide for the safe use and application of pesticides, including herbicides, through appropriate registration and licensing of businesses and persons involved in weed control.

Minor Use of Chemicals Permit

The Department of Agriculture and Food Western Australia (WA) (now known as DPIRD) are the Permit Holder of a Permit to Allow Minor Use of an Agvet Chemical Product for the Control of Environmental Weeds in Various Situations (Permit number PER1333). This permit is in

force from 2 March 2012 to 31 March 2025.). This permit was issued by the Australian Government Australian Pesticides and Veterinary Medicines Authority and allows the use of stated products in a manner other than specified on the approved product label in WA.

Possession of an off-label permit allows use of certain chemicals for specific applications not written on the label. The permit is approved for use by all people controlling weeds in wetlands, forests, bushlands and non-crop areas, but is not for use in residential areas. The permit specifies the methods that must be followed for herbicide use, including the chemicals and dose rates that can be applied to environmental weeds.

Also useful for bushland management are off-label permits for declared plants (Permit number PER13236) valid from 2 December 2011 to 31 December 2022 and for the control of *Phytophthora* in native vegetation (Permit number PER13534) valid from 28 November 2012 to 31 October 2023. There are also further limitations on the herbicides that can be used in water catchment areas (Circular Number PSC 88).

State Weed Plan 2001

A Weed Plan for WA (2001), referred to as the 'State Weed Plan' was developed by the State Weed Plan Steering Group to help achieve coordinated, effective weed management throughout WA.

Federal Government

Biosecurity Act 2015

The *Biosecurity Act 2015* is co-administered by the Ministers responsible for Agriculture and Water Resources, and Health, and aims to provide Australia a strong biosecurity system to protect our way of life from the threat of exotic pests and diseases to our unique environment, the economy, our health and our agricultural industries.

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act can, among other things, list key threatening processes, such as invasive weed species that threaten or may threaten the survival, abundance or evolutionary development of a native species or ecological community.

Australian Weeds Strategy 2017 - 2027

The Australian Weeds Strategy provides a national framework for addressing weed issues whilst maintaining the sustainability of Australia's primary industries and reducing the impact of weeds on the environment.

National Established Pests and Diseases of National Significance Management Framework

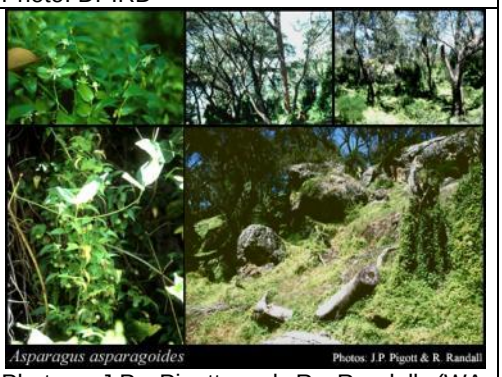
This framework establishes policy principles to guide government decision making to better manage pests and diseases of national significance; clarifies the role of government; and establishes criteria to determine which established pests and diseases should be deemed 'nationally significant.'

There are currently 32 Weeds of National Significance (WoNS) in Australia. The City contains 5 known Weeds of National Significance.

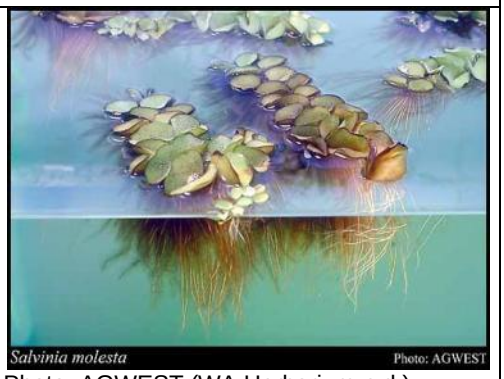
Appendix 4 – Examples of City of Joondalup Priority Weeds

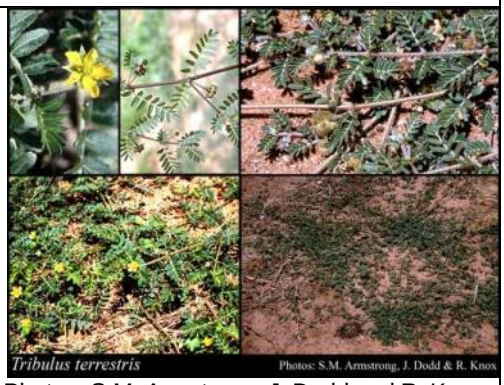
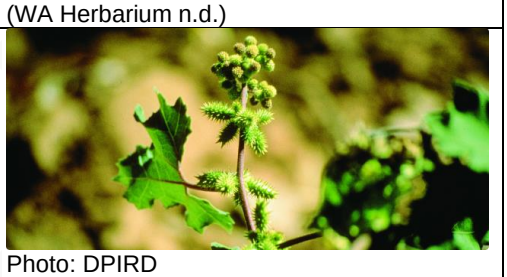
Table 6 outlines the pest plant, declared pest plants and Weeds of National Significance within the City.

Table 6: Pest Plants, Declared Plants and Weeds of National Significance in the City of Joondalup

Latin Name	Common Name	Declared Pest Plant	Weeds of National Significance	Image
**Argemone mexicana*	Mexican Poppy	Yes – C1		 Photo: DPIRD
**Asparagus asparagoides*	Bridal Creeper	Yes – No Control Category	Yes	 Photos: J.P. Pigott and R. Randall (WA Herbarium n.d.)
**Chondrilla juncea*	Skeleton Weed	Yes – C3	-	 Photos: B. Hoskins and J. Dodd (WA Herbarium n.d.)
**Chrysanthemoides monilifera* subsp. *monilifera*	Boneseed	Yes- C2	Yes	 Photos: H. Cherry and R. Knox (WA Herbarium n.d.)

Latin Name	Common Name	Declared Pest Plant	Weeds of National Significance	Image
**Cirsium arvense*	Perennial Thistle, Canada Thistle	Yes- C1	-	 Photo: C.G. Wilson (Aust Government 2012)
**Hydrocotyle verticillata*	Shield Pennywort	Yes – C1		 Photo: DPIRD
**Lantana camara*	Lantana	Yes – C3	Yes	 Photo: A. Johnson (NSW Government n.d.)
**Moraea flaccida*	One-leaf Cape Tulip	No control category		 Photo: DPIRD
**Moraea miniata*	Two-leaf Cape Tulip	No control category		 Photo: DPIRD

Latin Name	Common Name	Declared Pest Plant	Weeds of National Significance	Image
**Salvinia molesta*	Salvinia	Yes - C2	Yes	 Photo: AGWEST (WA Herbarium n.d.)
**Silybum marianum*	Variegated Thistle	No control category	-	 Photos: R. Knox and J. Dodd (WA Herbarium n.d.)
**Solanum linnaeanum*	Apple of Sodom	No control category		 Photo: DPIRD
**Tamarix aphylla*	Athel Tree, Tamarisk, Tamarix	No control category	Yes	 Photos: K.C. Richardson (WA Herbarium n.d.)

Latin Name	Common Name	Declared Pest Plant	Weeds of National Significance	Image
**Tribulus terrestris*	Caltrop*	-	-	 Photos: S.M. Armstrong, J. Dodd and R. Knox (WA Herbarium n.d.)
**Xanthium strumarium*	Noogoora burr	Yes – C3		 Photo: DPIRD
**Zantedeschia aethiopica*	Arum Lily	No control category		 Photos: K. Dean, R. Knox and AGWA (WA Herbarium n.d.)

Notes:

* = Pest plant under *Local Government Act 1995*

The following summarises the effect of the declaration categories for plants under the *Biosecurity and Agriculture Management Act 2007*:

- C1: Exclusion – Pests are assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
- C2: Eradication - Pests are assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still feasible.
- C3: Management - Pests are assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Appendix 5 – Weeds Identified in City of Joondalup and Weed Status

Scientific Name	Common Name	Weeds of National Significance	WA Declared Pest Plant	Local Pest Plant
Acacia baileyana	Cootamundra Wattle			
Acacia dealbata				
Acacia iteaphylla	Flinders Range Wattle			
Acacia longifolia	Sydney Wattle			
Acacia longifolia subsp. *sophorae*				
Acacia microbotrya	Manna Wattle			
Acacia podalyriifolia	Queensland Silver Wattle			
Acacia pycnantha	Golden Wattle			
Acacia trigonophylla				
Acetosa vesicaria	Ruby Dock			
Agave americana	Century Plant			
Agonis flexuosa^	Weeping Peppermint			
Aira caryophyllea	Silvery Hairgrass			
Aira cupaniana	Silvery Hairgrass			
Aizoon pubescens	Coastal Galenia			
Alyssum linifolium	Flax-leaf Alyssum			
Ammophila arenaria	Marram Grass			
Aphanes arvensis	Parsley Piert			
Aptenia cordifolia	Gartenflora			
Arctotheca calendula	Cape Weed			
Arctotheca populifolia	Dune Acrotheca			
Arctotis stoechadifolia	White Arctotis			
Arenaria leptoclados				
Argemone mexicana	Mexican Poppy		●	
Argemone ochroleuca	Mexican Poppy			
Argyranthemum frutescens	Marguerite			
Asparagus asparagoides	Bridal Creeper	●	●	
Asphodelus fistulosus	Onion Weed			
Avena barbata	Bearded Oat			
Avena fatua	Wild Oat			
Babiana nana	Baboon Flower			
Banksia nivea	Honeypot Dryandra			
Banksia prionotes (Wheatbelt Form)	Acorn Banksia			
Bellardia trixago	Bellardia			
Brassica barrelieri				
Brassica tournefortii	Mediterranean Turnip			
Briza maxima	Blowfly Grass			
Briza minor	Shivery Grass			
Bromus catharticus	Prairie Grass			

Scientific Name	Common Name	Weeds of National Significance	WA Declared Pest Plant	Local Pest Plant
Bromus diandrus	Brome Grass			
Bromus hordeaceus	Soft Brome			
Bromus madritensis	Madrid Brome			
Bromus rubens	Red Brome Grass			
Cakile maritima	Sea Rocket			
Callistemon citrinus				
Callitris preissii^	Rottnest Island Pine			
Calothamnus rupestris	Mouse Ears			
Carduus pycnocephalus	Slender Thistle			
Carpobrotus aequilaterus	Angular Pigface			
Carpobrotus edulis	Hottentot Fig (Pig Face)			
Casuarina equisetifolia	Sheoak			
Catapodium rigidum	Rigid Fescue			
Cenchrus clandestinus	Kikuyu			
Cenchrus echinatus	Mossman River Grass, Burrgrass			
Cenchrus setaceus	Fountain Grass			
Centaurea melitensis	Maltese Cockspur			
Centaurium erythraea	Common Centaury			
Centaurium pulchellum	Lesser Centaury			
Centranthus macrosiphon	Spanish Valerian			
Centranthus ruber	Red Valerian			
Cerastium glomeratum	Mouse Ear Chickweed			
Ceratonia siliqua	Carob Tree			
Chamaecytisus palmensis	Tagasaste			
Chamelaucium uncinatum	Geraldton Wax			
Chasmanthe floribunda	African Cornflag			
Chenopodium macrospermum				
Chondrilla juncea	Skeleton Weed		●	
Chrysanthemoides monilifera subsp. *monilifera*	Boneseed	●	●	
Cicendia filiformis	Slender Cicendia			
Cirsium arvense	Perennial Thistle, Canada Thistle		●	
Cirsium vulgare	Spear Thistle			
Citrullus lanatus	Pie Melon			
Conospermum triplinervium	Tree Smokebush			
Coprosma repens	Mirror Plant			
Cortaderia selloana	Pampas Grass			
Cotula australis	Common Cotula			
Cotula turbinata	Funnel Weed			
Crassula alata				

Scientific Name	Common Name	Weeds of National Significance	WA Declared Pest Plant	Local Pest Plant
Crassula glomerata				
Crassula thunbergiana				
Cucumis myriocarpus	Paddy Melon			
Cuscuta epithymum	Lesser Dodder			
Cuscuta planiflora	Small-seeded Alfalfa Dodder			
Cynara cardunculus	Artichoke Thistle, Cardoon			
Cynodon dactylon	Couch			
Cyperus eragrostis	Umbrella Grass			
Cyperus rotundus	Nut Grass			
Cyperus tenellus	Tiny Flagsedge			
Digitaria ciliaris	Summer Grass			
Digitaria sanguinalis	Crab Grass			
Dimorphotheca ecklonis	Veldt Daisy			
Diplolaena dampieri	Southern Diplolaena			
Diplotaxis muralis	Wall Rocket			
Diplotaxis tenuifolia	Sand Rocket			
Disa bracteata	South African Orchid			
Dischisma arenarium				
Dischisma capitatum	Woolly-headed Dischisma			
Dittrichia graveolens	Stinkwort			
Dysphania ambrosioides	Mexican Tea			
Echium plantagineum	Paterson's Curse			
Ehrharta calycina	Perennial Veldt Grass			
Ehrharta longiflora	Annual Veldt Grass			
Eleusine indica	Crowsfoot			
Emex australis	Doublegee			
Emex spinosa	Lesser Jack			
Eragrostis curvula	African Lovegrass			
Erigeron bonariensis	Flaxleaf Fleabane			
Erigeron canadensis				
Erigeron sumatrensis	Tall Fleabane			
Erodium botrys	Long Storksbill			
Erodium cicutarium	Common Storksbill			
Erodium cygnorum	Blue Heronsbill			
Erodium moschatum	Musky Crowfoot			
Eucalyptus caesia	Caesia			
Eucalyptus platypus	Moort			
Eucalyptus utilis	Coastal Moort			
Euphorbia cyathophora	Painted Spurge			
Euphorbia paralias	Sea Spurge			
Euphorbia peplus	Petty Spurge			

Scientific Name	Common Name	Weeds of National Significance	WA Declared Pest Plant	Local Pest Plant
Euphorbia terracina	Geraldton Carnation Weed			
Ferraria crispa	Black Flag			
Ficus carica	Fig			
Foeniculum vulgare	Fennel			
Freesia alba x leichtlinii				
Freesia sp.	Freesia			
Fumaria bastardii				
Fumaria capreolata	Whiteflower Fumitory			
Fumaria muralis	Wall Fumitory			
Galenia pubescens var. *pubescens*	Coastal Galenia			
Galium murale	Small Goosegrass			
Gamochaeta calviceps	Cudweed			
Gamochaeta coarctata				
Gazania linearis	Gazania			
Genista monspessulana	Cape Broom			
Geranium molle	Dove's Foot Cranesbill			
Gladiolus angustus	Long Tubed Painted Lady			
Gladiolus caryophyllaceus	Wild Pink Gladiolus			
Gladiolus undulatus	Wavy Gladiolus			
Gomphocarpus fruticosus	Narrowleaf Cottonbush			
Grevillea leucopteris	White Plume Grevillea			
Grevillea robusta	Silky Oak			
Hedypnois rhagadioloides subsp. Cretica				
Heliophila pusilla				
Hesperantha falcata				
Hordeum leporinum	Barley Grass			
Hydrocotyle verticillata	Shield Pennywort		●	
Hyparrhenia hirta	Tambookie Grass			
Hypochaeris glabra	Smooth Catsear			
Hypochaeris radicata	Flat Weed			
Ipomoea cairica	Coast Morning Glory			
Ipomoea indica	Morning Glory			
Isolepis marginata	Course Club-rush			
Ixia maculata	Yellow Ixia			
Lachenalia bulbifera				
Lachenalia reflexa	Yellow Soldier, Cape Cowslip			
Lactuca saligna	Wild Lettuce			
Lactuca serriola	Prickly Lettuce			
Lagurus ovatus	Hare's Tail Grass			
Lantana camara	Lantana	●	●	

Scientific Name	Common Name	Weeds of National Significance	WA Declared Pest Plant	Local Pest Plant
Lathyrus tingitanus	Tangier Pea			
Lavandula stoechas	Italian Lavender			
Leptospermum laevigatum	Victorian (Coastal) Tea Tree			
Leontodon rhagadioloides	Cretan Weed			
Lobularia maritima	Sweet Alyssum			
Lolium perenne	Perennial Rye Grass			
Lolium rigidum	Wimmera Ryegrass			
Lupinus albus	White Lupin			
Lupinus angustifolius	Narrowleaf Lupin			
Lupinus cosentinii	Blue Lupin			
Lysimachia arvensis	Pimpernel			
Lysimachia arvensis var. *caerulea*				
Malva arborea	Tree Mallow			
Malva parviflora	Marshmallow			
Matthiola incana	Common Stocks			
Medicago littoralis	Strand Medic			
Medicago polymorpha	Burr Medic			
Melaleuca lanceolata	Rottnest Teatree			
Melaleuca nesophila	Mindiyed			
Melia azedarach	White Cedar			
Melilotus indicus	Yellow Sweet Clover			
Melinis repens	Ruby Grass			
Mesembryanthemum crystallinum	Ice Plant			
Monoculus monstrosus				
Montanoa sp.				
Moraea flaccida	One-leaf Cape Tulip		●	
Moraea miniata	Two-leaf Cape Tulip		●	
Morus alba	White Mulberry			
Nothoscordum gracile	False Garlic			
Oenothera drummondii	Beach Evening Primrose			
Oenothera glazioviana	Evening Primrose			
Oenothera stricta	Common Evening Primrose			
Olea europaea	Olive			
Onopordum acaulon	Stemless Thistle			
Ornithogalum arabicum	Lesser Cape Lily			
Ornithopus pinnatus	Slender Serradella			
Orobanche minor	Lesser Broomrape			
Osteospermum ecklonis	Cape Daisy			
Oxalis	Oxalis			
Oxalis incarnata	Oxalis incarnata			

Scientific Name	Common Name	Weeds of National Significance	WA Declared Pest Plant	Local Pest Plant
Oxalis pes-caprae	Soursob			
Oxalis purpurea	Largeflower Wood Sorrel			
Papaver rhoeas	Field Poppy			
Parentucellia latifolia	Common Barista			
Paspalum dilatatum	Dallis Grass			
Passiflora foetida	Stinking Passion Flower			
Pelargonium capitatum	Rose Pelargonium			
Pentameris airoides	False Hairgrass			
Pentameris airoides subsp. Airoides				
Pentameris pallida	Pentameris pallida			
Petrorhagia dubia	Hairy Pink			
Petrorhagia velutina	Velvet Pink			
Phoenix dactylifera	Date Palm			
Phyllopodium cordatum				
Phytolacca octandra	Red Ink Weed			
Plantago lanceolata	Rainbow Plantain			
Poa annua	Winter Grass			
Polycarpon tetraphyllum	Fourleaf Allseed			
Polygala myrtifolia	Butterfly Bush			
Polypogon monspeliensis	Annual Beardgrass			
Poinsettia	Poinsettia			
Raphanus raphanistrum	Wild Radish			
Retama raetam	White Broom			
Ricinus communis	Castor Oil Plant			
Romulea flava				
Romulea rosea	Guildford Grass			
Romulea rosea var. *australis*	Guildford Grass			
Rostraria cristata	Annual Cat's-tail Grass			
Rumex acetosella	Sorrel			
Sagina apetala	Annual Pearlwort			
Salvinia molesta	Salvinia	●	●	
Scaevola paludosa				
Schinus terebinthifolious	Brazilian Pepper			
Senecio elegans	Purple Groundsel			
Senecio mikanioides	Cape Ivy			
Senecio vulgaris	Common Groundsel			
Silene gallica	French Catchfly			
Silene gallica var. *gallica*				
Silybum marianum	Variegated Thistle		●	
Solanum linnaeanum	Apple of Sodom		●	
Solanum nigrum	Black Berry Nightshade			

Scientific Name	Common Name	Weeds of National Significance	WA Declared Pest Plant	Local Pest Plant
Soliva sessilis	Bindii			
Sonchus asper	Rough Sowthistle			
Sonchus oleraceus	Common Sowthistle			
Sparaxis bulbifera				
Sporobolus africanus	Parramatta Grass			
Stellaria media	Chickweed			
Stenotaphrum secundatum	Buffalo Grass			
Tagetes minuta	Stinking Roger			
Tamarix aphylla	Athel Tree, Tamarisk, Tamarix	●	●	
Taraxacum officinale	Dandelion			
Tetragonia decumbens	Sea Spinach			
Thinopyrum distichum				
Thinopyrum junceiforme	Sea Wheatgrass			
Trachyandra divaricata	False Onion Weed			
Tribulus terrestris	Caltrop			●
Tribolium uniolae	Tribolium			
Trifolium arvense	Hare's Foot Clover			
Trifolium arvense var. *arvense*				
Trifolium campestre	Hop Clover			
Trifolium dubium	Suckling Clover			
Trifolium hirtum	Rose Clover			
Trifolium repens	White Clover			
Trifolium subterraneum	Subterranean Clover			
Trifolium tomentosum	Woolly Clover			
Triticum aestivum	Wheat			
Tropaeolum majus	Nasturtium			
*Typha orientalis**	Non-local Bulrush			
Urospermum picroides	False Hawkbit			
Ursinia anthemoides	Ursinia			
Ursinia anthemoides subsp. anthemoides				
Vellereophyton dealbatum	White Cudweed			
Verbascum virgatum	Twiggy Mullien			
Verbena rigida var. *rigida*				
Verbesina encelioides	Golden Crownbeard			
Vicia sativa	Common Vetch			
Vulpia bromoides	Squirrel Tail Fescue			
Vulpia fasciculata				
Vulpia muralis				
Vulpia myuros	Rat's Tail Fescue			
Wahlenbergia capensis	Cape Bluebell			

Scientific Name	Common Name	Weeds of National Significance	WA Declared Pest Plant	Local Pest Plant
Washingtonia filifera	Desert Fan Palm			
Watsonia meriana var. *bulbillifera*	Watsonia			
Watsonia meriana var. *meriana*	Watsonia			
Xanthium strumarium	Noogoora burr		●	
Zantedeschia aethiopica	Arum Lily		●	

^ Indicates species that are naturalised and may be native to certain areas of the City of Joondalup.
* Indicates a species that has recently been reclassified as native but can be highly invasive.

Appendix 6 – Weed Control Methods

Weed Control Methods Used by the City of Joondalup

Weed Control Method	Suitable for Species	Notes	Advantages	Disadvantages
Hand removal or digging	Many annual species and for relatively small infestations	Need to remove the entire plant	• Young plants can be easy to pull out if soil is moist • Allows for selective removal of weeds	• Can be difficult to remove plants if soil is dry or plants are large • Time consuming and labour intensive • Digging can cause soil disturbance and disturb the root systems of native vegetation
Spot spray	Small populations of weeds	Application of diluted herbicide with hand-held spray guns	• Targeted weed application • Quick and cheap method to control low populations of weeds spread over large areas	• Time consuming in large areas
Cut and paint	Woody weeds (low numbers)	The plant is cut off close to ground level with a horizontal cut and undiluted herbicide (according to Permit or label) is applied immediately to the cut surface[83]	Targeted weed application	• Time consuming for large populations • Weed has to be felled prior to treatment • Can cause root suckers
Basal bark treatment	Woody weeds and root suckers (low numbers)	Diluted herbicide (rates according to Permit or label) is painted or sprayed on to the bark at the base, from ground level to 30cm high.[83]	• Targeted weed application • No risk of regrowth	• Time consuming for large populations

[83] Eurobodalla Shire Council (n.d.)

Weed Control Method	Suitable for Species	Notes	Advantages	Disadvantages
Weed wiping[84]	Tall weeds and broadleaf weeds	Herbicides can be wiped on to individual plants with an appropriate applicator.	• Targeted weed application • Reduces risk of off-target damage	• Only controls weeds which grow above surrounding vegetation. • Time consuming for large populations • Rope wicks can be ineffective due to dripping and clogging with dirt • Multiple treatments may be required
Mowing	Annual species	Mowing down aboveground biomass. To be done before seed set.	• Delays production of seed • Will eventually deplete the soil seed store	• Not a permanent method of control • Can result in spreading of seed, if plants have already seeded[85] • Should be combined with another weed control method
Mulching using loose particles of organic matter	All	Most effective if weeds are cleared before applying. Certified weed and pathogen free mulch should be used. Planting species in mulch suppresses weed growth.[86]	• Provides organic matter as it breaks down • Helps retain water	• Some weeds may still grow • Difficult to apply around non-target species
Slashing or brushcutting	Annual species	Slashing or brushcutting aboveground biomass. To be done before seed set.	• Delays production of seed • Will eventually deplete the soil seed store	• Not a permanent method of control • Can result in spreading of seed, if plants have already seeded[87] • Should be combined with another weed control method

[84] Government of South Australia (2019)
[85] Eurobodalla Shire Council (n.d.)
[86] Johansson (n.d.)
[87] Eurobodalla Shire Council (n.d.)

Weed Control Method	Suitable for Species	Notes	Advantages	Disadvantages
Steam	Young weeds	Jets of steam are applied to weeds through standard spray nozzles enclosed under a steel housing	• More effective than flame weeders	• Requires significant energy and water • Difficult to get the steam to condense on the plant to make use of the latent heat • May not reduce subsequent weed seedling emergence[92]
Boiling water	Annuals and perennials	Boil water and pour stream on to the crown of the weed.	• Works well in concrete, paved and rock areas88	• Safety hazards • May effect non-targeted species • Time consuming • Water usage • May need to be repeated

[88] Johansson (n.d.)

Weed Control Methods Not Used by the City of Joondalup

Weed Control Method	Suitable for Species	Notes	Advantages	Disadvantages
Smothering using materials such as black plastic, fibre, carpet, cardboard or newspaper	All	Most effective if weeds are cleared before applying. Suppresses or kills weeds by creating a barrier between the weeds and sunlight.	• Prevent germination of weed seeds.	• Expensive • Materials can be difficult to apply around established plants • Possible issues with water and nutrient penetration • Clean up of degraded materials can be time consuming
Scrape and paint	Large vines and scrambling plants with a woody stem	Scrape 20cm to 100cm of the stem with a knife, for a third of the diameter of the stem (or scrape on two sides if stem is over 1cm in diameter), to expose the sapwood just below the bark. Apply undiluted herbicide (rates according to Permit or label) immediately to the scraped section.[83]	• Effective method of weed control	• Time consuming for large populations
Stem injection	Woody weeds (low numbers)	Purpose-built stem injection devices can be used, or a hammer and chisel or cordless drill. An angled cut or hole is made into the sapwood just below and bark and undiluted herbicide (rates according to Permit or label) is applied into the cut immediately. Avoid drilling further than the sapwood into the heartwood as it doesn't take up the herbicide.[83]	• Targeted weed application • Reduces risk of off-target damage	• Time consuming for large populations

Weed Control Method	Suitable for Species	Notes	Advantages	Disadvantages
Granules	Various	Granules or pellets (root absorbed herbicide) are applied to the surface of moist soil or into the top soil	• No spray drift • Controlled release can reduce the need for repeat applications	• Rain or moisture is required • Herbicides are expensive • Even spread can be difficult • Limited choice of herbicides • Potential for herbicide to be washed off site • May effect non-targeted species
Drowning of emergent species by cutting the species beneath the water level in winter[89]	Emergent species (e.g. Bulrush and Kikuyu)	Suited to wetlands. Need to cut species below water level.	• Effective on a significant number of emergent species targeted	• Time consuming • Water levels may change
Solarisation, or heating, of weeds to high temperatures under plastic	Low-growing and semi-aquatic weeds	Weeds are smothered with plastic sheeting until seeds or plants have been cooked.[90] Works best when weeds are growing in full sun.[91]	• Best used for small infestations	• May not kill seed stored in the soil • Plastic may need to be weighted down and left in place for months • Time consuming • Vegetation needs to be cleared from the area
Flame weeding	Young weeds and grasses, some annual and perennial weeds	Direct propane flame at weeds. A thin blast of heat (1000°C) causes the water within the cell stalk to boil.	• Leaves no chemical residue • No soil disturbance • More effective than infrared radiation	• Safety and fire hazards • May require a series of flamings (2-3 weeks apart) • Gas usage

[89] Water and Rivers Commission (2001)
[90] Department of Planning (n.d.)
[91] Eurobodalla Shire Council (n.d.)

Weed Control Method	Suitable for Species	Notes	Advantages	Disadvantages
Infrared radiation	Shallow rooted weeds	Uses gas burners and has no visible flame on the combustion surface.	• Cover a more closely defined area than flame weeders	• Need time to heat up • Gas usage • Unsure of effectiveness against deep rooted weeds[92]
Acidic	Annuals, biennials and some perennials	Contain approx 15-20% acidic ingredients such as lemon, lime or vinegar, sprayed directly on the leaves, causing them to die.	• Leaves no soil residue	• May effect non-targeted species • Foliage must be sprayed so it is completely wet • Health risks
Fatty acids	Annual weeds, grasses and broadleaf weeds	Coconut fatty acid is often an ingredient. Dissolves membranes of plants leaves, causing the leaves to die.	• Will not move through soil to harm nearby plants • Fast acting • Leave no residue in the soil[93]	• May effect non-targeted species • Repeat applications may be required on larger weeds
Germination inhibitors	Newly grown weeds	The most common is corn gluten meal. Prevents new plants from germinating but does not harm established plants.	• Non-toxic • Suppresses germination of seeds	• No effect on established weeds • Can inhibit germination of non-target species[93]

[92] Bond, Turner and Grundy (2003)
[93] Johansson (n.d.)

Appendix 7 – Wetlands in the City of Joondalup

Wetland	Suburb
Beaumaris Park	Ocean Reef
Blackboy Park	Mullaloo
Blue Lake Park	Joondalup
Broadbeach Park	Hillarys
Central Park	Joondalup
Conica Park	Hillarys
Craigie Open Space	Craigie
Flinders Park (North and South)	Hillarys
Lacepede Park	Sorrento
Mawson Park	Hillarys
McCubbin Park	Woodvale
Oahu Park	Hillarys
Sir James McCusker Park (North and South)	Iluka
Whitfords Nodes Park South	Hillarys
Wolinski Park	Mullaloo

City of Joondalup

City of Joondalup
~~Draft~~ Weed Management Plan 202~~2~~3 - 203~~2~~2

City of Joondalup pest plant and priority listed weed, Caltrop (*Tribulus terrestris*)

Acknowledgements

Please formally acknowledge the City of Joondalup if you choose to use any of the content contained within the Weed Management Plan.

Suggested citation:

City of Joondalup, 2023~~2~~, *Weed Management Plan 2023~~2~~ - 2033~~2~~*, Joondalup, WA.

Acknowledgement of Country

The City of Joondalup acknowledges the Traditional Custodians of this land, the Whadjuk people of the Noongar nation. The City recognises the culture of the Noongar people and the unique contribution they make to the Joondalup region and Australia.

The City pays its respects to Elders past, present, and emerging, as well as all Aboriginal and Torres Strait Islander peoples.

This plan may include words from the Noongar language and the City recognises that Aboriginal languages are oral in nature and the same word can be spelt in multiple ways.

Aboriginal and Torres Strait Islander people are advised that this plan may contain images or names of people who are deceased.

Contents

Acronyms

Acronym / Abbreviation	Definition
APVMA	Australian Pesticides and Veterinary Medicines Authority
BAM Act	*Biosecurity and Agriculture Management Act 2007* (State)*
BC Act	*Biodiversity Conservation Act 2016* (State)
CALM	Department of Conservation and Land Management
CBP	Commercial Business Precinct
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFWA	Department of Agriculture and Food Western Australia
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DEC	Department of Environment and Conservation
DFES	Department of Fire and Emergency Services
DPaW	Department of Parks and Wildlife
DPIRD	Department of Primary Industries and Regional Development
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
DWER	Department of Water and Environmental Regulation
FCT	Floristic Community Type
ha	Hectare
IARC	International Agency for Research on Cancer
km	kilometre
KPI	Key Performance Indicator
m	meter
n.d.	No date
NEWP	National Established Weed Priorities
NIASA	Nursery Industry Accreditation Scheme Australia
NRM	Natural Resource Management
PAW	Pedestrian Access Way
POSF	Public Open Space Framework
QMS	Quality Management System
SAR	Specified Area Rates
SDS	Safety Data Sheet
TEC	Threatened Ecological Community
WA	Western Australia
WALGA	Western Australian Local Government Association
WAH	Western Australian Herbarium
WAM	Western Australian Museum
WAOL	Western Australian Organism List
WHO	World Health Organization
WoNS	Weeds of National Significance

* A review of the BAM Act is being undertaken in 2022.

1.0 Introduction

1.1 Background

The City is located within the Southwest Australian biodiversity hotspot, one of 36 biodiversity hotspots in the world, with over 2,900 endemic plant species occurring in this region.[1] There are a number of regionally, nationally and internationally significant natural areas located within or adjacent to the City including Yellagonga Regional Park, Marmion Marine Park and Neerabup National Park. There are a total of eight Bush Forever sites within the City that contain vegetation communities and species of high conservation value.

The City is situated along the Swan Coastal Plain, with its southern boundary located approximately 16 kilometres from the Central Business District of Perth. The City covers an area of 96.5 square kilometres which encompasses a diverse range of natural areas including 17 kilometres of coastal foreshore, a chain of wetlands and a variety of natural areas. The City also includes 550ha of parks, 533ha of natural areas, 1,060km of roads and 927km of pathways.

The City is bounded by the City of Wanneroo to the east and north, the City of Stirling to the south, and the Indian Ocean to the west. A map of the City is displayed in Figure 1~~Figure 1~~.

1.2 Weed Management Plan 2023~~2~~ – 2033~~2~~

1.2.1 Purpose

The purpose of the *Weed Management Plan 2022~~2~~3 – 2033~~2~~* is to provide an integrated approach to the management of weeds within the City.

The *Weed Management Plan 2023~~2~~ - 2033~~2~~* details actions to prevent, monitor, prioritise and control the introduction and spread of weeds in the City. The Plan describes the potential impacts from weeds, weed control methods, the City's current weed management approach and proposes management strategies to be implemented over the life of the Plan to minimise potential impacts.

Weed management is conducted within the City by staff, contractors and the valuable contributions from community members in Friends Groups. There are currently 19 Friend Groups within the City, whose members voluntarily work to protect, preserve and enhance significant bushland areas in the community. The *Weed Management Plan* is aligned with the voluntary work of Friends Group volunteers.

The *Weed Management Plan 2023~~2~~ – 2033~~2~~* builds upon the outcomes of the previous *Weed Management Plan 2016 – 2021.*

1.2.2 Objectives

Over the past decade the City has been implementing an integrated weed management approach and increasing non-chemical weed control methods to address community concerns.

The objectives of the *Weed Management Plan 2022~~2~~3 – 2033~~2~~* are to:

i. Implement the integrated weed management program to protect biodiversity and maintain amenity in accordance with regulatory requirements.

[1] Conservation International (2014)

ii. Reduce the reliance on~~f~~ herbicide use by increasing non-chemical weed control methods, where appropriate.
iii. Minimise bushfire risk by undertaking weed control to mitigate fire fuel loads.
iv. Increase communication to the community regarding the City's weed management practices.
v. Support the community's role in weed management through increased community awareness initiatives.

1.2.3 Scope

The City conducts weed management on City managed or owned land across its 22 suburbs, as required. Weed management is conducted in the City to differing degrees, depending on the primary function and usage type of public open space. In alignment with the City's ~~draft~~ *Public Open Space Framework* all public open spaces owned or managed by the City fall into one of the classifications below:

- Natural Areas
- Urban Areas, consisting of:
    - Sports Park
    - Recreation Park
    - Urban Landscaping.

Weed management of the City's natural areas differs substantially to weed management in parks and urban landscaping areas, due to the difference in weed density and biodiversity values. Section 4.1 of the Plan outlines weed management in natural areas, whilst Section 4.2 of the Plan details weed management in parks and urban landscaping areas.

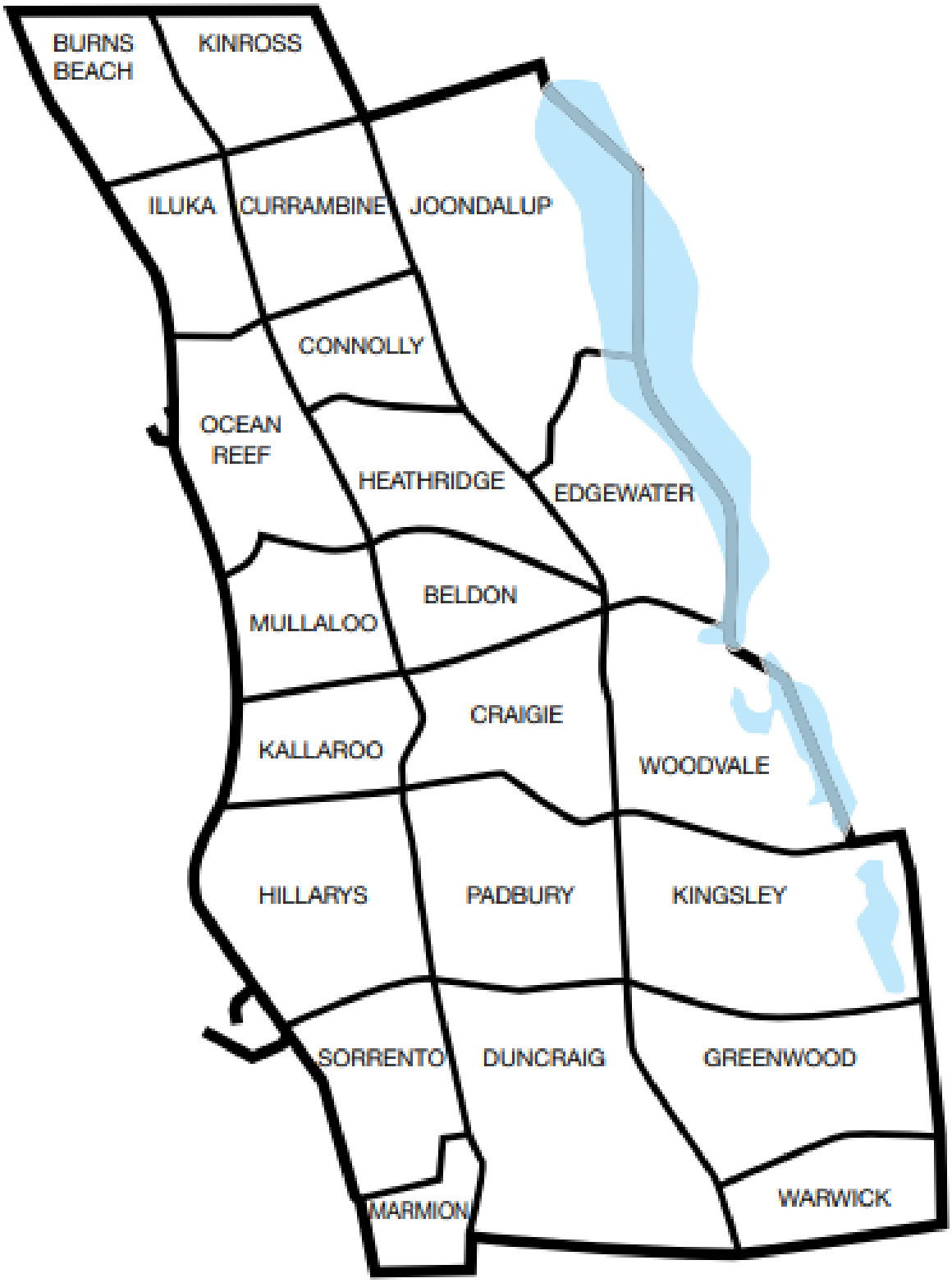


Figure 1: Location of the City of Joondalup

1.2.4 Community Consultation

The City conducted community consultation to consider the City's strategic integrated weed management approach and identify opportunities to inform the review of the Weed Management Plan with the Strategic Community Reference Group in May 2021. The Strategic Community Reference Group consisted of community members, experts and Elected Members. Key initiatives and improvements were identified for consideration in the development of the City's new Weed Management Plan, such as increased community education and communications regarding weed management risks and benefits.

The City ~~will also~~ conducted community consultation on the draft Weed Management Plan from 24 November to 14 December 2022~~in 2022-23~~. A total of 280 responses were received during the 21-day consultation period. In addition to community consultation, the City undertook a peer review process with relevant agencies on the draft Weed Management Plan. Feedback was received from the Department of Health and Edith Cowan University experts which indicates that the City's current approach is in accordance with regulatory requirements and poses minimal risks to staff, the community, animals and the environment.

The City's integrated approach to weed management considers the latest science, research and relevant advice from state government and industry agencies. In addition, the Plan provides a balance between the use of chemical and non-chemical weed management to ensure biodiversity and amenity within the City is maintained and fire risk is reduced. The Plan considers the financial and resource implications related to the delivery of weed management services and provides for a sustainable approach into the future.

Community feedback w~~i~~as~~ll be~~ incorporated into the final Weed Management Plan, where relevant, which will be presented to Council for endorsement.

1.3 Public and Occupational Health and Safety

The City's integrated weed management approach is conducted in accordance with regulatory requirements and with consideration to community wellbeing and public health.

The City's use of any chemical pesticides to control weeds is in accordance with established health and safety standards. The ~~WA Department of Health administers the~~ *Health (Pesticides) Regulations 2011*~~,~~ ~~which~~ provide for the safe use and application of pesticides, including herbicides, through appropriate registration and licensing of businesses and persons involved in weed control. All City employees and contractors that use herbicides for weed control are required to adhere to these regulations.

The City uses products that are approved by the Australian Pesticides and Veterinary Medicines Authority (APVMA), according to label instructions, and abides by safety requirements listed on Safety Data Sheets (SDS). The City conducts ~~R~~risk assessments ~~and management is undertaken~~ to identify and assess pesticide ~~hazards~~risks, and where necessary put in place management options to eliminate or control risks.

The *Work Health and Safety Act 2020* requires the City to maintain a current register of hazardous chemicals used in the workplace, provide workers with information and training on the risks associated with their use (storage, handling and disposal) and take precautions to eliminate or minimise the risk of injury.

It is also recognised that some weeds affect human and animal health, causing injury, allergies, dermatitis, poisoning, asthma and other respiratory problems. Weeds have

additionally been linked to indirectly affecting wellbeing through the reduction of functionality and amenity of natural areas and public open spaces.[2]

1.4 Weed Management Plan 2016 – 2021

The *Weed Management Plan 2016 – 2021* was endorsed by Council in 2016. Substantial progress has been made in implementing the recommended actions from the Plan with all recommendations that were scheduled for implementation during the life of the Plan having been either completed or commenced. Key achievements from the *Weed Management Plan 2016 - 2021* include:

- Ongoing weed control in natural areas and public open spaces in accordance with the Annual Maintenance Schedules.
- Flora surveys and vegetation condition assessments conducted in numerous major conservation areas, including weed mapping to enable targeted weed control.
- Regular weed monitoring and mapping of natural areas to inform weed control measures.
- Annual monitoring of percentage cover of weeds in natural areas to assess the City's weed management performance.
- Undertaking soil and leaf tissue analysis and turf renovation works to improve the quality of turf and reduce the likelihood of weeds.
- Implementation of the City's bushfire mitigation program including maintenance of firebreaks and other bushfire mitigation works.
- Conducting alternative weed control and technology trials.
- Implementation of steam and hot water and steam only treatment trials within sections of the:
    - Coastal Dual Use Path
    - Commercial Business Precinct (CBP) - kerbs, footpaths, hardstand (paved) median islands, mulched median islands and general paved areas.
- Best practice landscape design and management including hydrozoning and ecozoning principles undertaken in numerous parks.
- Use of pathogen and weed free mulch to suppress weed growth in garden beds or non-turfed areas.
- Community weed education through the Environmental Education Program and Adopt a Bushland/Coastline Program.
- Participation in the WALGA Local Government Herbicide Use and Integrated Weed Management Working Group.

It is estimated that in 2020-21, the City's weed control trials included 2.2ha of non-chemical techniques as part of its chemical reduction approach which focused on research and trials of both chemical and non-chemical products and technologies.[3] Aspirations for future management include measures to continue increasing coverage of non-chemical weed control through the City's chemical reduction approach, as shown in Figure 2.

The City will also aim to continue increasing canopy cover in the City, through the Leafy City Program and the Parks Development Program. The Leafy City Program provides increased leaf canopy cover in residentials streets through tree planting to mitigate the heat-island effect and impacts of climate change. The Parks Development Program focuses on the gradual hydrozoning and ecozoning of parks which supports the replacement of invasive weeds with suitable native species, reducing both financial and environmental impacts over time.

[2] Commonwealth of Australia (2017)
[3] City of Joondalup, 2021

Figure 2: Steam and hot water weed control commenced within the City's CBP in July 2022

1.5 Weeds in Mooro Noongar Boodjar

The City of Joondalup acknowledge the Traditional Custodians past, present and future of the land and waters we are situated, the Whadjuk people of the Noongar Nation, and recognise Aboriginal peoples have practiced sustainable natural resource management and cared for the flora, fauna and biodiversity of Australia for thousands of years.

The Joondalup area, also known as *Mooro Boodjar* (Country), has always been abundant with natural resources, supporting many Noongar generations who continue to remain connected to *Mooro Boodjar*. In return, Noongar people have cared for, protected and sustainably managed their *Boodjar*, and the local plants and animals, traditional kaartdijin (knowledge), stories and ceremonies.

European settlement saw the establishment of market gardens, farms and vineyards, with the subsequent building of roads, settlements and industry; changing the landscape and how it was managed. Traditional Owners recognise that the changes to the landscape brought about by colonisation have significantly changed the connectivity of natural areas, and the local flora, fauna and biodiversity. The clearing of native vegetation, planting of imported species, impacts on wetland and coastal systems, lack of continued cultural burning practices and infestation of pest plants and animals have impacted on *Boodjar.*

The *Weed Management Plan 2023~~2~~ - 2033~~2~~* aims to address the adverse impacts brought about in a relatively short span of time by European colonisation and, with the guidance of Traditional Owners, contribute towards bringing back the health of *Boodjar*. This plan also seeks to work in conjunction with the City's strategic environmental framework and draft Reconciliation Action Plan to sustainably manage *Boodjar* in the City. The City's *Environment Plan 2014 - 2019*, *Yellagonga Integrated Catchment Management Plan 2021 - 2026* and Natural Area Management Plans also support the removal of invasive weeds while protecting and promoting natural areas.

1.6 Strategic Context

The purpose of the *Weed Management Plan* aligns with the City of Joondalup Strategic Environmental Framework outlined in Figure 3. Details of the relevant local, State and Federal legislation policies, plans and strategies are outlined in Appendix 3.

Figure 3: City of Joondalup Strategic Environmental Framework

2.0 Impact of Weeds

The City manages large areas of bushland, approximately 533 hectares (ha) of natural areas in over 100 reserves, many of which are recognised as having local, regional or national significance. Weeds are a key management issue for the City's natural areas and threaten the biodiversity values they contain.

The City also contains large areas of assets and infrastructure, parks and urban landscaping areas. Assets maintained by the City include 550ha of parks, 17ha of urban streetscapes, 1,060km of roads, 120ha of grassed medians, 15 artificial wetlands, 927km of pathways and cycleways, numerous play spaces, public garden beds, sporting fields and more. The invasion of weeds in these areas affects the amenity, functionality and aesthetics and impacts upon community use of the sites.

2.1 What are Weeds?

Weeds are plants that grow in areas where they are not naturally occurring and proceed to modify natural processes, usually adversely, resulting in the decline of the communities they invade.[4] A weed usually requires some form of action to reduce its effects on the economy, the environment, human health and amenity.[5] Weeds can establish themselves in terrestrial, aquatic or marine ecosystems.[2]

There are two types of invasive weeds, exotic plants that have been introduced and native species that have moved into new areas in response to changed land and water use and management practices.[5, 6]

Weeds account for approximately 15% of all flora in Australia, with this figure increasing by approximately 20 species per year.[7,8] The number of weeds in Australia has increased linearly over recent years, compared with the majority of other regions of the world where introductions are still increasing exponentially.[9] Over 27,000 known weed species have been introduced to Australia and 10% of those are now considered to be established (have existed for a long time). Escaped garden and landscaping plants are the main source of Australia's weeds, accounting for 66% of recognised weed species.[10]

Most of the environmental impacts on threatened species and communities in Australia are caused by a small number of target weed species.[11] For example, there are 187 invasive weed species introduced to Australia and 16 invasive native plant species introduced to regions outside their native range and have become problematic and are resulting in the greatest impact to Australia's threatened species and communities.[12]

Weeds typically produce large numbers of seeds and spread rapidly, invading natural areas, parks and urban landscaping areas. Weeds can be spread by:

- dispersal of seeds by water, wind, birds, animals, human or vehicle movement
- site activities
- underground root systems

[4] DPaW (1999)
[5] NRM Ministerial Council (2007)
[6] Australian Government (2022)
[7] Australian Government (2012b)
[8] Australian Government (2022)
[9] Australian Government (2022)
[10] Groves, Boden and Lonsdale (2005)
[11] Australian Government (2022)
[12] Australian Government (2022)

- mulch, soil and plant stock
- garden rubbish dumping
- fire.[7]

Yearly growth patterns of weeds vary with some species growing in summer and seeding in autumn and others growing in winter and seeding in spring. The life cycle of weeds also varies, with weeds being classified as either:

- **Annual:** Weeds which germinate, grow, set seed and die in one season or year, such as Wild Oat, Veldt Grass, Paterson's Curse and Cape Weed.
- **Biennial:** Weeds which live for up to two years, usually growing and flowering in the first year and setting seed in the second, such as Bridal Creeper.
- **Perennial:** Weeds which live for three years or more, such as Geraldton Carnation Weed or Gazania.[13]

2.2 Why Weed Management is Important

The City is required to undertake weed control and management to:

- meet the regulatory requirements under the *Biosecurity and Agriculture Management Act 2007*
- protect biodiversity
- reduce bushfire risk
- reduce damage to infrastructure
- meet community expectations for the amenity and aesthetics of local areas.

Within the City, there are 285 identified weeds including 15 declared pest plants and five WoNS. These weed species are often widespread and without control can alter public open spaces reducing viability and biodiversity. The City recognises the importance of weed management and outlines the key impacts in the sections below.

Environment

Weeds are one of the major threats to Australia's natural environment and biodiversity and can change the natural diversity and balance of ecological communities. The City is committed to the ongoing management and conservation of the City's natural environment and biodiversity. Integrated weed management, inclusive of utilising a suite of weed control techniques and timely interventions, is essential to the ongoing protection and enhancement of the City's natural environment.

The City manages a diverse range of natural areas including iconic locations such as sections of Yellagonga Regional Park, Craigie Bushland, Warwick Bushland, Hepburn Heights Conservation Area, Shepherds Bush Reserve and a range of coastal foreshore reserves. Key environmental aspects of the natural areas managed by the City include:

- Two Federally listed Threatened Ecological Communities (TEC)
- Eight Bush Forever sites
- 30 conservation significant fauna
- One endangered and six priority flora species.

Weeds can impact the natural environment by:

[13] CRC for Australian Weed Management (2005a)

- Reducing the viability of native plant species by competing more vigorously for space, water and nutrients.[14] This can result in a decrease in the abundance and health of native species, even to the point of extinction in that area.
- Reducing natural diversity by smothering native plants or preventing them from regenerating after clearing, fire or other disturbance.
- Altering nutrient recycling and soil quality by fixing nitrogen in the soil which can inhibit the germination of native species or releasing nutrients into the soil which may impact negatively on native seedling germination and growth.
- Introducing pests and disease from different areas which native species may not have previously had contact with and may be particularly susceptible to. Weeds can also be more resilient than native plants to certain pests and diseases.
- Creating high fuel loads for fires and increasing the risk of fire in bushland areas.[15]
- Negatively impacting on native fauna by replacing or reducing the native plants and altering plant communities that animals use for shelter, food and nesting.[16]
- Altering hydrological cycles by clogging water courses, resulting in erosion and alteration to flow and or aquatic habitat, as well as reducing light and oxygen to aquatic flora and fauna.
- Impact on cultural heritage sites and reducing availability of bush tucker and medicine.
- Altering genetics of native flora species over time from hybridisation through cross-pollination.

Infrastructure and amenity

Weeds can have social impacts on communities by degrading parks, verges, median strips, public access ways and natural areas. Weeds impact these areas by lowering the amenity, functionality and aesthetics of sites and make these areas less usable by the community.

Weed control is undertaken along City managed roadsides to help improve road safety, particularly when weeds on roadsides reduce driver visibility or impact the integrity of the road surface and road shoulder. Weeds can also impact upon stormwater drainage and result in unsafe road surfaces such as potholes forming.

Weeds can form barriers that impact cultural activities, including food collection and recreational use. Weeds can quickly overtake waterways, preventing water recreation activities and remove habitat for locally native species.

It is widely recognised that weed management is costly, including the direct costs of weed control, and the indirect costs in reduction to the amenity of an area. There is also the unquantified impacts of weeds on nature conservation, tourism and landscape amenity.[17] The use of alternative weed control methods in public open spaces usually has an increased cost and subsequent financial impacts.

2.3 The Effect of Climate Change on Weeds

The City is already experiencing the effects of climate change such as increased coastal erosion, higher summer temperatures, more severe heatwaves, less rainfall, more extreme weather events and a longer bushfire season.[18,19] As a result, climate change has significant social, environmental, economic and legal implications. Climate change has the potential to~~to~~ cause damage to, or loss of, biodiversity and natural habitat.

[14] Australian Government (2012a)
[15] FESA (2011)
[16] City of Joondalup (201~~4~~2~~a~~)
[17] Invasive Plants and Animals Committee (2016)
[18] Scott, J.K., et al (2014)
[19] City of Joondalup (2016)

Predicting the exact scale and nature of climate change at a local level is challenging, and the effect on ecosystems is likely to be complex. Climate change is creating favourable environments for weeds as they are generally able to respond rapidly to disturbances enabling weed species to move into new areas or out-compete native species in their existing range.[20]

Climate change has the potential to increase the presence of weeds by:

- creating opportunities for weeds to establish through increased extreme events and resulting disturbance to natural areas, noting the rate of response of weeds to establish is expected to be faster than native plants.
- providing weeds, likely a new set of weed species, that are more readily able to adapt to future climates with a competitive advantage over native species.
- altering distribution patterns of weed and native species.
- increasing activity from sleeper weeds which may appear benign for many years, but have the potential to suddenly spread rapidly following certain natural events such as flood, fire, drought, climate change, or change in land or water management.[21]

In terms of weed management, reliance on one type of weed control under all scenarios is no longer feasible or efficient. Therefore, weed management within the City must evolve further using integrated management techniques available and introduce alternate viable techniques.

[20] Australian Government (2012)
[21] Australian Government (2013)

3.0 Background on Weed Control

The City undertakes an integrated weed management approach to its weed control in public open spaces including use of a variety of mechanical, suppression, chemical-free and chemical (herbicide) application methods, as well as hand weeding. In determining the appropriate weed control method(s) for a given situation the City takes the following into consideration:

- the target weed
- the season
- timing i.e. before weeds set seed
- resistance of the weed to specific herbicides
- potential residual effects and damage to off-target species
- rotation of the type of herbicide used to reduce herbicide resistance
- selection of the least toxic herbicide for the target species
- site location and any special considerations i.e. near wetlands
- weather conditions i.e. rain and wind
- effectiveness of outcomes, labour intensity required and cost involved.

The City's integrated approach also incorporates risk mitigation measures, surveillance, diagnostics and the most appropriate management response. The purpose of integrated management is to reduce the total impact of invasive non-native plant species in different systems.

Integrated weed control involves using a number of methods to reduce weed infestations to manageable levels or if possible to eradicate infestations. Potential weed control treatment methods available to the City may include:

- Physical weed control – the removal of weeds by physical or mechanical means or the suppression of weed growth, such as mowing, grazing, mulching, geo-fabrics, tilling, burning or by hand.
- Chemical weed control – the use of selective and non-selective herbicides to affect the growth of the weed and cause it to die.
- Steam and hot water weed control – the application of hot water and/or steam (also known as hydrothermal weed control) to a weed plant causing it to die.
- Biological weed control – the introduction of a weeds natural enemy (could be an insect or pest, fungi or disease) to reduce its spread and growth. This approach is not currently undertaken by the City.
- Electric weed control – the use of a high-voltage electrode that allows an electric current to pass through the plant which raises its temperature and causes it to die. This approach is not currently undertaken by the City.

There are many aspects that need to be taken into consideration when determining appropriate methods of weed control in public open spaces. The City utilises a range of weed control treatment methods as part of its integrated weed management approach. This approach has included 16 years of researching and trialling alternative weed control options.

The City allows residents to stay informed and receive notification of chemical application treatment locations or alternatively to have their residence excluded from any chemical application treatment. The City's integrated weed management program provides transparency to the community, flexibility to deliver the most safe and effective weed control treatments for the City's diverse range of public open spaces, allows for innovation through trialling emerging weed control methods and where effective will see their incorporation into the program. The City recognises that weed management is constantly evolving and will

review and consider incorporating other emerging weed control methods into its program throughout the life of this plan.

The types of weed control available to the City and their advantages and disadvantages are described in sections 3.1 to 3.5 and detailed in Appendix 6. Further discussion on the use of weed control in particular locations and circumstances is provided in section 4.2.8.

3.1 Physical Weed Control

There are several types of physical weed control methods, including:

- Mechanical or manual – for example hand removal, hand tools, harrows, tractor hoes, brushcutters and mowers
- Smothering – using materials such as wood chips or geofabric to suppress weeds
- Mulching – using NIASA accredited nursery organic matter to suppress weeds (e.g. pathogen-free mulches such as pine wood chips and others)
- Other suppression materials and methods – geofabric materials, organic barriers, revegetation with locally native plantings.

Smothering and the use of mulch are generally not suitable for natural areas as they would also prevent the growth of native seedlings, but can be used in limited situations (e.g. along edges or larger areas void of native vegetation for smothering only). Mechanical methods using large pieces of equipment or machinery would also create too much disturbance to the native vegetation and soil surface and are therefore not suitable.

The physical removal of weeds through hand weeding can be appropriate in some circumstances. Advantages and disadvantages of hand weeding are provided in Table 1~~Table 1~~.

Table 1: Advantages and Disadvantages of Hand Weeding[22]

Advantages:	**Disadvantages:**
• Young plants can be easy to pull out if soil is moist. • Can prevent weeds seeding and spreading. • ~~Is not effective for large infestations.~~ • Allows for selective removal of weeds. • Can be effective for small infestations. • Avoids the use of herbicides. • This method is not dependant on weather conditions.	• Can be difficult to remove plants if soil is dry or plants are large. • Is time consuming and labour intensive for large infestations. • Digging can cause soil disturbance and disturb the root systems of native vegetation. • Can result in trampling and destruction of understorey and shrubs (particularly if there are a large number of people conducting hand weeding). • Can make the area more vulnerable to erosion.

Whilst hand weeding has been found to be more time consuming, labour-intensive and less effective than herbicide use, it can form an important part of an integrated weed management approach. Hand weeding using hand tools can be used and may be suitable for many annual species and for relatively small infestations. Hand weeding is particularly useful for the control of herbicide resistant weeds or when herbicides are unable to be used. However, it is mainly used for small infestations or as a follow-up to other methods. The City undertakes a small

[22] CRC for Weed Management (2004)

amount of hand weeding. A substantial amount of hand weeding is conducted by Friends Groups volunteers who contribute significantly to weed control in natural areas within the City.

Hand weeding also provides opportunities to the personnel conducting the hand weeding to connect with and make broader observations of the natural area they are working in, which can result in management benefits.

An example of the physical weed control method of hand pulling is shown in Figure 4.

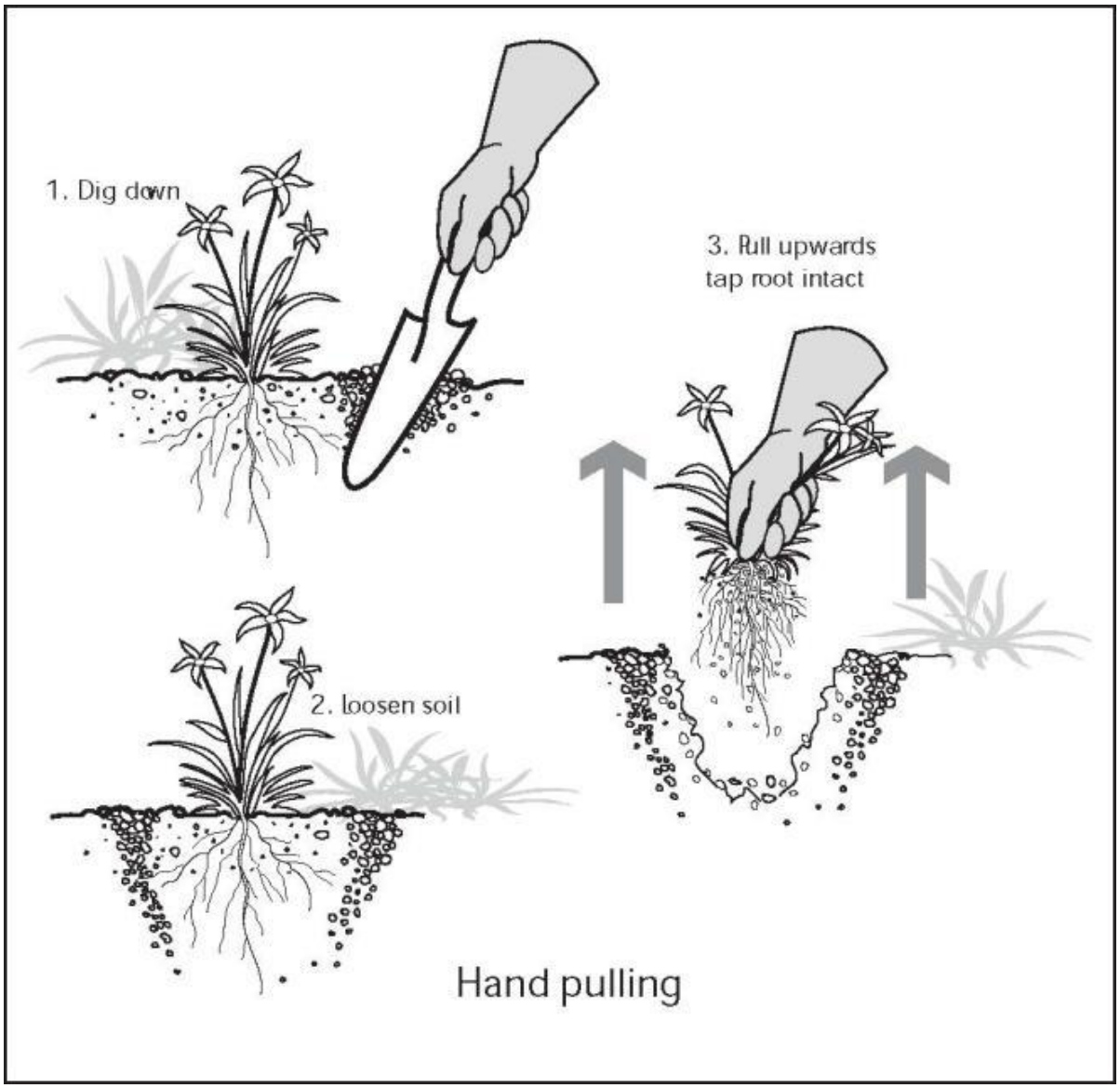


Figure 4: Hand Pulling Method [23]

3.2 Chemical Weed Control

Pesticides are defined as a chemical formulated as a solid, liquid or gas used for managing pests.[24] Pesticides can be used for directly or indirectly destroying, stupefying, repelling, inhibiting, or preventing infestation by or attacks of, any pest in relation to a plant, a place or thing; or modifying the physiology of a plant or pest so as to alter its natural development

[23] Department of Planning (n.d.)
[24] Department of Health WA (2020)

productivity, quality or productive capacity.[25] Pesticides includes herbicides, insecticides, fungicides and algaecides.[26]

Chemical treatments include pre-emergent and, post-emergent and organic herbicides.[27] Chemical weed control through the use of herbicides can be an effective and practical method of weed control applicable in a variety of situations.[28]

Herbicides are defined as 'a chemical substance used to destroy or inhibit the growth of plants, especially weeds'.[29] Herbicides can be selective i.e. work on a specific range of plants or can be broad spectrum / non-selective and work on a wide variety of plants. Herbicides can also be synthetic or organic. There are also a number of ways in which herbicides can be applied depending on the situation to ensure specific weeds are targeted.[31]

Herbicides are used globally and are an effective component of integrated weed management. Herbicides are generally recognised as being the most effective weed control method having higher success rates than other forms of weed control. They are also generally the most economical means of weed control, requiring less labour, fuel and equipment than other methods.[28] In some locations such as natural areas, herbicides offer the most practical, cost-effective and selective method of managing certain weeds.[30]

However, hHerbicides are chemicals and if have the potential to damage the environment including other plants, fauna and people if applied contrary in accordance with theto manufacturer label instructions and relevant legislation are beneficial for weed management and pose minimal risks to staff, community and the environment. The effect of applying herbicides on the environment varies depending on the target weed, chemical properties, rate, distribution and the soil environment. Herbicides vary in the length of time that they persist in the environment. The greater the solubility in water of a herbicide, the larger the distance that it can move through the soil. As well as impacting targeted plants, herbicides can impact on other aspects of the environment such as insects, bacteria, fungi, algae, non-targeted plants, soil and water. Figure 5 outlines some common processes that may occur following herbicide application.[31]

[25] Department of Health WA (2020)
[26] Department of Health WA (2020)
[27] WALGA (n.d.)
[28] Department of Primary Industries (2011)
[29] Houghton Mifflin Company (2009)
[30] Australian Government (2012b)
[31] CRC for Australian Weed Management (2005a)

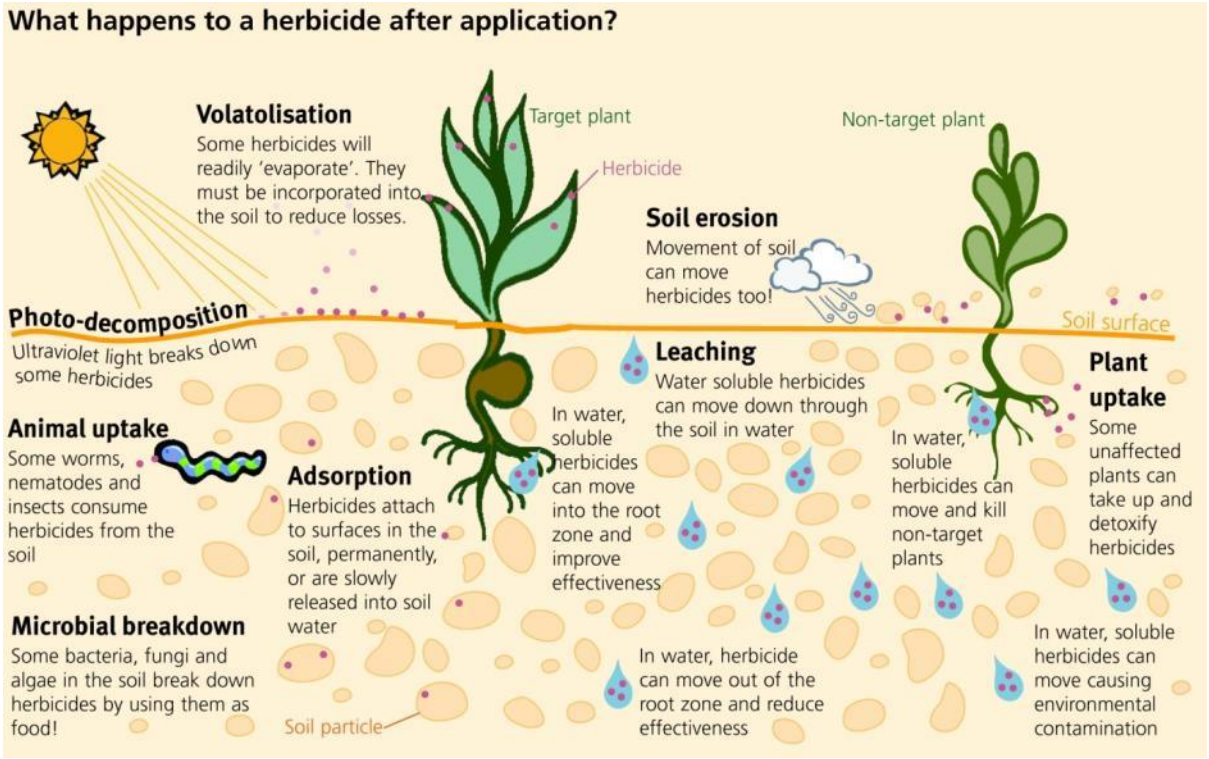


Figure 5: Processes that may occur following Herbicide Application[31]

When herbicides are used correctly they can be very effective and have limited negative impact on the environment and public health.[31],[32] The correct application of herbicides involves knowing the target weed, understanding the site conditions, choosing the correct herbicide, choosing the correct application method, ensuring operators are trained and ensuring all regulations and label instructions are followed.

Certain weeds can become resistant to herbicides with repeated application, meaning that herbicides are no longer effective to control those species. Most cases of herbicide resistance relate to agricultural areas, usually with grain crops. There are currently 25 weed species in Australia with populations that are resistant to at least one herbicide group.[33] The following five weeds are present in Western Australia and within the City, however the City has not experienced these weeds having any chemical resistance:

- Mediterranean Turnip (*Brassica tournefortii*)
- Patersons Curse (*Echium plantagineum*)
- Wimmera Ryegrass (*Lolium rigidum*)
- Wild Oat (*Avena fatua*)
- Wild Radish (*Raphanus raphanistrum*).[34]

An integrated weed management approach will reduce the likelihood of weeds becoming resistant to a particular herbicide and will ensure a more effective response to those weeds that are resistant.

The advantages and disadvantages of chemical weed control are provided in Table 2.

[32] WALGA (n.d.)
[33] DPIRD (2022)
[34] WeedScience.org (2013)

Table 2: Advantages and Disadvantages of Chemical Weed Control

Advantages:	Disadvantages:
• Is usually the most effective form of weed control. • Is cost effective for large infestations. • Can be selective (depending on choice of herbicide, timing, plant life cycles, operator skills). • Can prevent weeds seeding and spreading. • Is appropriate on small and large weed infestations. • Minimises direct soil disturbance.	• Weeds can become resistant to particular herbicides. • Some herbicides may be soluble in water and therefore may not be appropriate in wetlands or other sensitive areas. • Spraying of herbicides is weather dependent and needs to avoid rainfall. • Some herbicides are non-selective and can impact on other plants and animals. • Has potential for negative impacts on the broader environment, such as causing environmental contamination. • Herbicide residue can build up in the soil and affect the growth of native species. • Technical proficiency is required otherwise there may be operator / public hazards.

Glyphosate

Glyphosate is a broad-spectrum and non-selective herbicide effective on annual and perennial plants. Glyphosate currently has the highest global production volume of all herbicides. Glyphosate has been registered by the APVMA (and its predecessors) and been in use for over 45 years. ~~and t~~There are over 590 products containing glyphosate registered for use in Australia.

In 2015 reports investigating the health effects of using glyphosate were released by the International Agency for Research on Cancer (IARC), an agency affiliated with the World Health Organization (WHO), the reports classified glyphosate as 'probably carcinogenic to humans', following a hazard-based assessment of publicly available scientific information. The IARC assessment looked at the intrinsic 'hazard' of the chemical glyphosate as a cancer-causing agent only. Other components of the toxicity of glyphosate are not taken into account.

Following the release of this report the APVMA undertook several investigations to determine the risks for people using the formulated chemical product. As Australia's agricultural and veterinary chemical regulator, it is the role of the APVMA to consider all relevant scientific material when determining the likely impacts on human health and worker safety including long and short term exposure to users and residues in food before registering a product. The APVMA considered the full range of risks which include studies of cancer risks and how human exposure can be minimised through instructions for use and safety directions.

The APVMA, in collaboration with the Office of Chemical Safety in the Department of Health, examined the basis for the IARC classification including review of the full monograph related to glyphosate. The APVMA released the findings of its investigations in May 2016 which concluded that products containing glyphosate are safe to use as per the manufacturers label instructions.

3.3 Steam and Hot Water Weed Control

This method was initially a steam only application and with time has evolved to a combination of steam and hot water. This method of treatment can also be referred to as hydrothermal weed control.

Steam and hot water weed control involves applying hot water under pressure through a heated chamber to the weed. The combination of heat and water pressure breaks down the cellular structure, causing discolouration and plant death within hours or over a few days.[35] Steam and hot water weed control has been suggested as a safer alternative to herbicide use.[36] However research and trials into steam and hot water weed control have generally found it to be less effective than chemical weed control, more expensive, uses large amounts of energy, is non-selective and is not practical in natural areas.[37]

Steam and hot water weed control generally kills the upper most portion of the weed and is therefore most suitable for annuals or young perennials. Perennial weeds with deeper roots will generally resprout as the steam and hot water treatment does not affect the deeper root systems.[3535,38,39] As a result more repeat treatments are required when using thermal weed control. Steam and hot water weed control has been found to be more expensive as the cost of the application is more expensive and it takes longer so the labour costs are higher and more treatments are required.[3939]

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Whilst steam and hot water weed control is a non-chemical form of weed control, it also uses large amounts of energy to create the steam and therefore has environmental impacts in relation to greenhouse emissions. It can pose a safety risk to the operator through burns or scalds from the use of the hot steam.

Steam and hot water weed control is not a viable option for the treatment of weeds in natural areas[40] because:

- it is non-selective and will therefore also kill non-target species including adjacent native species.
- the very high temperatures kill beneficial soil microbes including fungi and bacteria and the soil can become inoculated allowing bad pathogens to replace good microbes.
- once treated, an area is left with rotting organic matter and moisture, which can promote seed germination in the soil increasing the number of weeds immediately following treatment.
- the equipment also tends to be large and bulky and is generally unsuitable for accessing natural areas.

Steam and hot water weed control has generally been investigated for use in urban environments, such as on footpaths or kerbs, where concerns about herbicide use are greater and off target impacts are less likely. However steam and hot water weed control in urban environments is still less effective,[41] more expensive and generally does not work as a stand-alone approach in the longer term. The City and a number of other local governments have trialled the use of steam and hot water weed control in urban areas with the aim of reducing herbicide use, with the result that many have limited or ceased the use of steam and hot water weed control due to the cost and effectiveness in the long term.[42] However, some local

[35] Department of Primary Industries (2011)
[36] Collins (1999)
[37] Hudek et al (2021)
[38] Banks and Sandral (2007)
[39] Banks and Associates (2009)
[40] Natural Areas Consulting (2013)
[41] Hudek et al (2021)
[42] City of Nedlands (2013)

governments, including the City, in the Perth metropolitan area are utilising steam and hot water weed control as part of their integrated weed management approach, particularly for sensitive facilities and suitable hardstand treatment areas.[43]

The advantages and disadvantages of steam and/or hot water weed control are provided in Table 3~~Table 3~~.

Table 3: Advantages and Disadvantages of Steam and Hot Water Weed Control

Advantages:	**Disadvantages:**
• Does not involve the use of chemicals and may be appropriate in areas of chemical sensitivity. • Can be effective on annuals and some young perennials.	• Is not suitable in natural areas. • Is more expensive, less effective and requires more repeat treatments. • Is non-selective and can harm adjacent plants. • The high temperatures can kill soil microbes and good bacteria. • May have some results in the short term but not in the long term. • Is carbon and energy intensive. • Equipment is large and bulky and is not suitable for accessing natural areas.

[43] WALGA (2022)

3.4 Biological Weed Control

Biological control involves using a weed's naturally occurring enemies (usually insects or disease), to help reduce the impact of the weed and achieve sustainable weed control. These natural enemies of weeds are often referred to as biological control agents[44].

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) states that *'A biological control agent is generally only used when the cost of conventional control methods such as herbicides, mechanical control or fire is so great, both in dollar terms and impact on the environment, that there is little option than to pursue the biological control avenue'.*[45]

To develop a new biological control agent requires a substantial investment, adherence to a strict approval process, extensive host specificity testing to ensure it does not pose a threat to non-target species and a risk analysis. It should be noted that not all weeds have biological control agents that would be considered safe for introduction in Australia. Biological control agents have the potential to become pests themselves.[45~~45~~]

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Biological control is unlikely to eradicate a weed species, but it can reduce a weed population and slow down its invasive potential. Successful programs may take more than 10 years to be effective, and results may vary from area to area. Biological control may be practical and effective for inaccessible areas such as timbered, rocky and steep locations, areas of low-priority for control, or where chemical control may be too expensive or not effective.[46]

Biological weed control is not a part of the City's weed management approach because it is better undertaken at a regional level rather than a local level, takes too long to have an impact, is often not effective and can be expensive.

3.5 Electric Weed Control

The use of electrical energy to kill weeds was designed to destroy persistent weeds following conventional chemical treatment. When a high-voltage electrode touches a weed, an electric current passes through the plant and is returned to the transformer via the soil by a ground contact device. Due to the electrical resistance of the plant, the electrical energy is converted to heat. Plant death is caused primarily by the increase in temperature and vaporisation of the water and other volatile liquids it contains, leading to a build up of pressure within the plant cells, and subsequent rupture of the cell membranes.[47] In plants with an extensive root system, the electric current travels deep into the root system before being dissipated into the soil.[48] Root damage is known to be more severe in dry conditions in comparison to wet conditions. [49] As a result, plants dry down and remain fixed to the ground without the need to move soil or open soil surfaces. [50]

Electric weed control technology is currently not certified for use in Australia, with no Australian research undertaken into this weed control method prior to 2022. Recently studies in other regions of the world have tested the ability of electricity to prevent growth and are effective in killing weed species, inclusive of woody weed species. For example, experiments with different plant species showed root destruction down to a depth of 10-15cm, which was sufficient to destroy the vegetation points or rhizomes sufficiently to lead to no or very slow regrowth of plants.[51] Depending on the amount of available electric power, treatment speed,

[44] Australian Government (2012c)
[45] CSIRO (2013)
[46] Department of Primary Industries (2011)
[47] Vincent (2001)
[48] Vigneault C., Benoît D.L. (2001)
[49] Vincent (2001)
[50] Vincent (2001)
[51] CEDR (2016)

stem density and woodiness of plants, many weeds up to 1m of height can be controlled. The studies results indicate that electricity is a viable alternative to manual, mechanical or chemical methods in some settings. Further research is required in a local context to determine if this methodology would be appropriate for the City.

The DPIRD is partnering with local governments in WA to undertake Australia's first electric weed trials in 2022 and 2023. There is interest in this methodology as it may provide a new method to control herbicide-resistant weeds, as well as address the publics growing concerns for human and environmental health related to pesticides.[52] The advantages and disadvantages of electric weed control are outlined in Table 4.

Table 4: Advantages and Disadvantages of Electric Weed Control

Advantages:	**Disadvantages:**
• Does not involve the use of chemicals and may be appropriate in areas of chemical sensitivity. • No soil disturbance or erosion. • The dosage can be adjusted to target specific species. • Does not involve the use of water and is more energy efficient than steam and hot water treatment. • No waste. • Cost effective option in some urban settings (i.e. hardstand areas). • Can be effective on a range of weed species, including woody weed species.	• This method is not certified for use in Australia, however trials are underway. • Equipment is large and bulky and is not suitable for accessing natural areas. • Is non-selective and can harm adjacent plants. • Unknown if the method can kill soil microbes and good bacteria. • May not be an effective method for all weeds. • Research needs to be undertaken regarding whether there is any fire risk. • Some carbon and energy impacts.

[52] Lehnhoff et al (2022)

4.0 Weed Management at the City

The City implements its integrated weed management program in alignment with the ~~draft~~ *Public Open Space Framework* to ensure the community has access to quality public open space that reflects their needs now and into the future. The ~~draft~~ Framework enables long-term infrastructure management and aims to achieve a more cost-effective and sustainable approach to planning and maintenance. The ~~draft~~ Framework also enables the City to classify public open space according to primary function and manner of use; to identify appropriate infrastructure for each type of public open space; and to inform levels of service and maintenance schedules for each type of public open space. The ~~draft~~ Framework is essential for informing how the City prioritises weed management in public open spaces.

All public open spaces owned or managed by the City fall into one of the four classifications:

- Natural Area
- Sports Park
- Recreation Park
- Urban Landscaping.

This plan also includes weed control within wetlands, that may fall within one of the above public open spaces.

City staff and contractors are required to abide by relevant legislation and the following herbicide use procedures:

- Use herbicide products registered by the APVMA.
- Follow all regulations and label instructions applicable to the specific herbicide.
- Comply with the Department of Primary Industries and Regional Development (DPIRD) Permit to Allow Minor Use of an Agvet Chemical Product for the Control of Environmental Weeds in Various Situations.
- Comply with the relevant Department of Health documents such as:
    - A guide to the use of pesticides in Western Australia
    - A guide to the management of pesticides in local government pest control programs in Western Australia
    - Quick contacts for the use of pesticides in WA
    - *Health (Pesticides) Regulations 2011* ~~– Signage Requirements~~
    - Guidelines for the safe use of pesticides in non-agricultural workplaces.
- Comply with WorkSafe WA processes regarding working with pesticides.
- Act in accordance with its internal procedures which outline instructions for training, transport, handling, storage, resident notification, application, records, spills and use of new herbicides.
- Consult resources, such as the DBCA's Florabase website or *Southern Weeds and their Control* (DAFWA Bulletin 4744), in regard~~s~~ to best practice timing and methods of weed control for individual weed species.
- Undertake assessment of authorised chemicals to determine whether or not more suitable alternatives are available, which meet safety requirements and reduce potential environmental impacts. The City minimises the use of herbicides, where possible.

City staff use herbicides in accordance with the City's Spraying Chemicals Work Instruction, an internal procedure in the ISO 9001 Quality Management System (QMS). The Spraying Chemicals Work Instruction is reviewed internally in accordance with the QMS.

To prevent herbicide resistance the City incorporates herbicide rotation into its Annual Maintenance Schedule. If herbicide resistant weeds are identified, the City either utilises alternative herbicides or undertakes hand weeding.

Weed control may be undertaken in areas that contain Aboriginal Heritage places. It is recommended that City staff and contractors comply with the *Aboriginal Cultural Heritage Act 2021* in Aboriginal Heritage places and determine whether the activities may harm Aboriginal places and/or objects and acquire Aboriginal Cultural Heritage Permits when required.

Management Recommendations

1. *Comply with the requirements of the Aboriginal Cultural Heritage Act 2021 when conducting weed control, as required.*

2. *Continue to review and undertake weed control activities in accordance with the ISO 9001 Quality Management System and other relevant legislation.*

4.1 Natural Areas

The City is committed to conserving and enhancing its natural assets to ensure the long term protection of the environment for future generations.

There are a variety of regionally, nationally and internationally significant natural areas located within the City including eight Bush Forever sites which contain species of high conservation value such as Yellagonga Regional Park. Natural areas of significance adjacent to the City include the Marmion Marine Park and Neerabup National Park. The City also manages 28 natural areas listed in the Local Planning Scheme No. 3 as areas with biodiversity and conservation value.

The City manages over 500 hectares of natural areas in 96 reserves containing significant flora and fauna species and ecological communities.

Environmental threats have the potential to degrade natural areas and reduce biodiversity values. Weeds are one of the key environmental threats to biodiversity in natural areas in the City. The City contains 285 identified weed species, including 15 declared pest plants and five WoNS. Effective weed management is required to ensure that measures are taken to prevent, monitor and control the spread of weeds within the City.

Natural areas are public open spaces that can include bushland, coastal and wetland areas. Natural areas are managed to enable some recreational access while protecting local ecological and biodiversity values.

In order to protect native vegetation and ecosystems within the City, Section 4.1 of the Weed Management Plan addresses natural areas weed management. Section 4.1 complements the voluntary work of Friends Group volunteers who contribute substantially to weed management in the City's natural areas.

4.1.1 Purpose

The purpose of Section 4.1 of the Plan is to provide an integrated weed management approach to prevent, monitor and control the spread of weeds in the City's natural areas and conserve local ecological and biodiversity values.

Section 4.1 of the Weed Management Plan includes the following:

- Description of the City's current weed management approach.
- Identification of weed control measures.
- Recommended integrated weed management strategies to prevent, monitor, prioritise and control the spread of weeds.
- Development of education initiatives to engage the organisation, stakeholders and the community in order to raise the awareness of weeds and weed management.
- Development of reporting mechanisms to identify weed risks.
- Recommended partnerships with and support for Friends Groups to facilitate weed management and bushland restoration.

4.1.2 Limitations

Section 4.1 excludes weed management of the following areas managed by the City:

- Parks
- Verges (apart from natural area verges)
- Medians
- Streetscapes.

Section 4.1 also excludes land not managed by the City, including but not limited to:

- Private property
- Natural areas managed by other government agencies or landholders, including Woodvale Nature Reserve, Pinnaroo Valley Memorial Park and Ern Halliday Recreation Camp
- Yellagonga Regional Park (jointly managed by the City of Joondalup, Department of Biodiversity, Conservation and Attractions (DBCA) and City of Wanneroo). The approach for weed control for DBCA managed areas of Yellagonga Regional Park within the City of Joondalup is outlined in the DBCA *Weed Control and Revegetation Plan* (2002)
- The marine environment.

4.1.3 Study Area

The study area for Section 4.1 includes natural areas managed by the City as illustrated in Figure 6~~Figure 6~~. A list of the sites included within Section 4.1 of the Weed Management Plan is provided in Appendix 1 and Appendix 2.

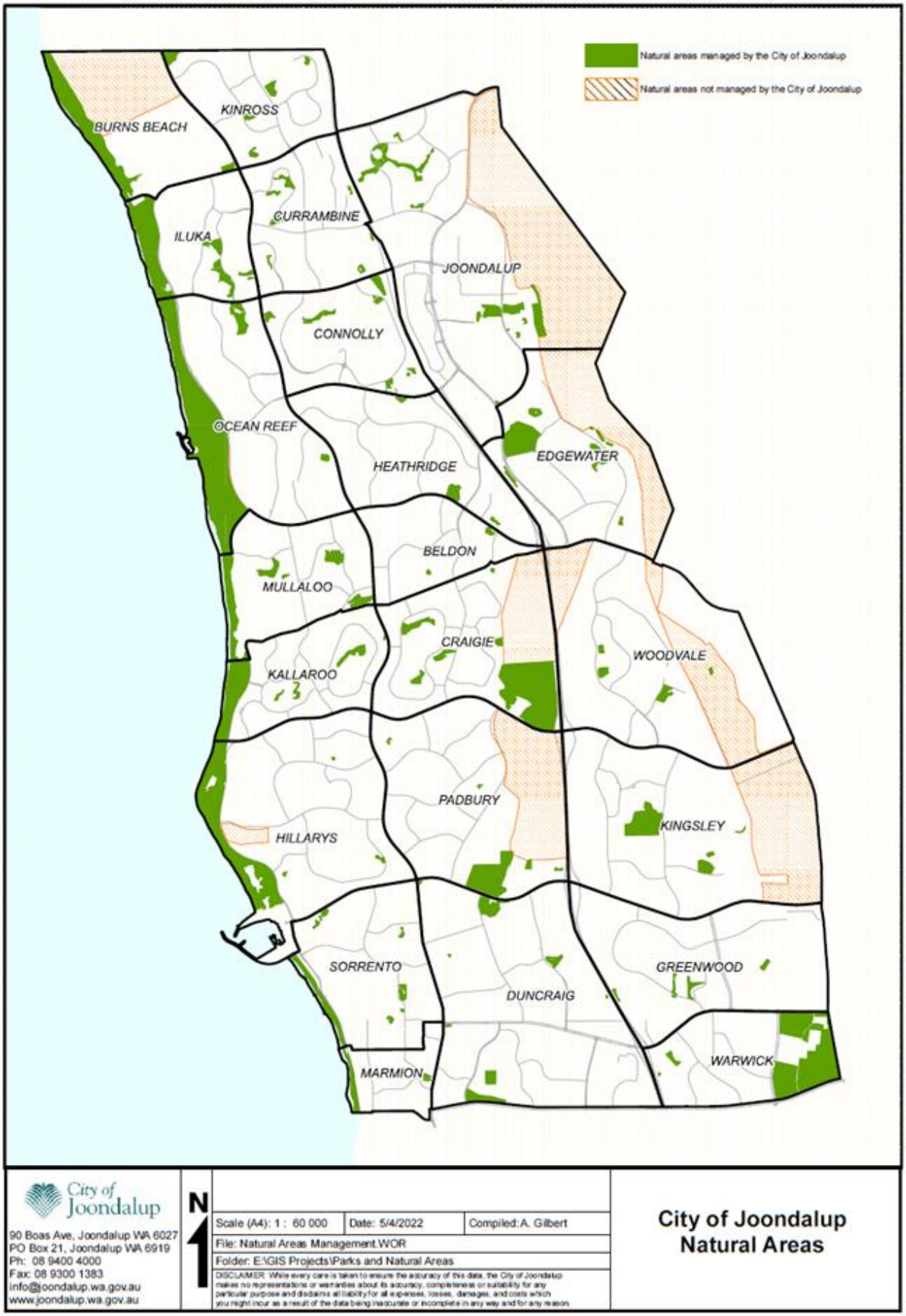


Figure 6: City of Joondalup Natural Areas

4.1.4 Weed Management Site Prioritisation

The City's current approach to weed management prioritisation of natural area sites and within sites is detailed in the following sections.

Prioritisation of sites

The City has 285 identified weed species in natural areas, including 16 priority weeds consisting of 15 declared pest species and 5 WoNS. The City currently conducts weed management in natural areas on a priority basis using four criteria (in descending order), as shown in Figure 7.

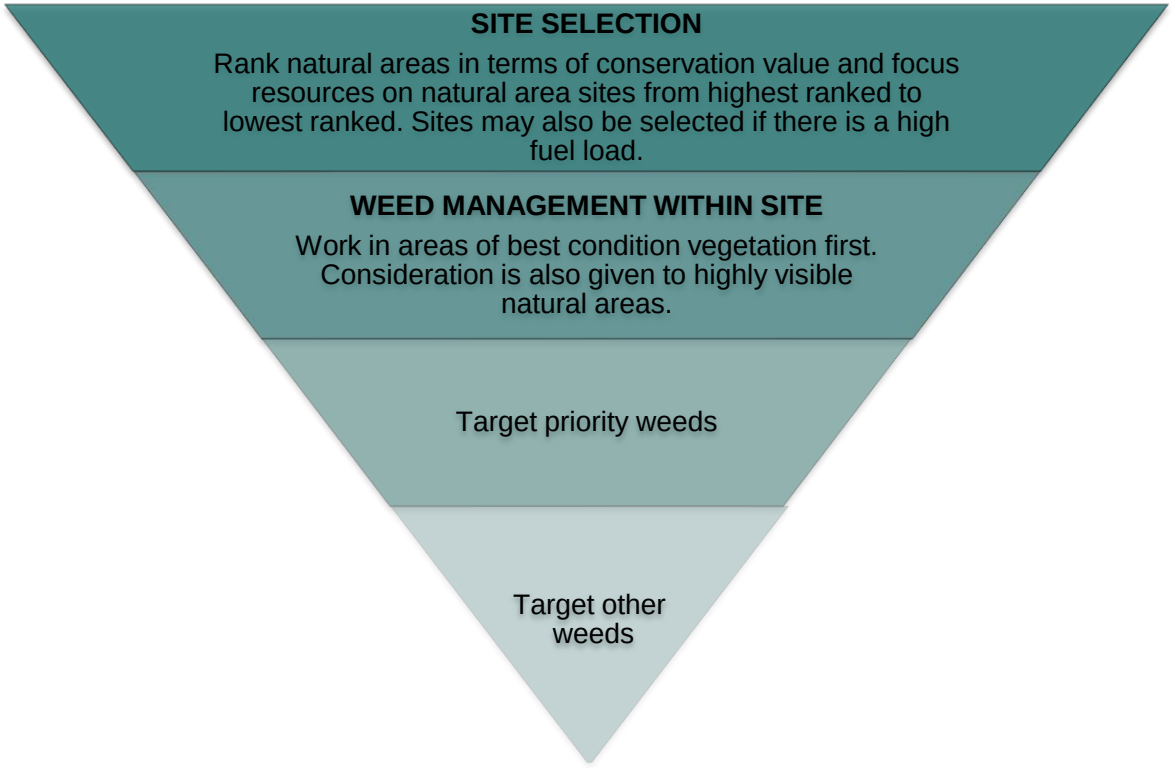


Figure 7: Criteria currently used to prioritise weed management actions for natural areas

Site Selection

Natural Areas are public open spaces predominantly used to protect local ecological and biodiversity values.

The City ranks management of natural areas according to the Local Biodiversity Program Natural Areas Initial Assessment ranking.[53] As part of the Local Biodiversity Program, the City assessed all natural areas from 2004 onwards using the ecological criteria of the Natural Area Initial Assessment, resulting in a priority ranking of natural areas. Natural Area Initial Assessments include a desktop assessment and field survey, documenting information such as:

- vegetation complexes
- threatened or significant flora or ecological communities
- structural plant communities
- weed species

[53] WALGA (2014)

- vegetation condition assessment
- ecological criteria rankings
- a viability estimate
- fauna species observed.

Priority rankings of sites based on Natural Area Initial Assessments utilise criteria such as:

- Biodiversity conservation value within a regional level (including designated conservation areas, containing significant flora, fauna or ecological communities or forming part of a regional ecological linkage)
- Biodiversity conservation value within a local level
- Representation of ecological communities and amount remaining locally
- Vegetation condition
- Area size of site
- Protection of wetland and coastal vegetation.[54]

The City reassesses its natural areas that do not have a Council endorsed Natural Area Management Plan every 5-7 years using the Natural Areas Initial Assessment tool.

Listed below are the different types of natural areas and details regarding their purpose, use and functional requirements:

- **Major Conservation Natural Areas** are of very high conservation significance and include medium to large areas of vegetation in very good or excellent condition. These areas are likely to contain TEC's or priority ecological communities. These areas are also likely to contain priority flora species or conservation-significant flora species. Conservation-significant fauna species are likely to use the site as habitat, and ecological linkages are likely to exist to other significant conservation areas. These areas are managed by individual Natural Area Management Plans.
- **High Priority Natural Areas** are of high conservation significance and generally include medium to large areas of vegetation in good or very good condition. These areas can contain threatened ecological communities or priority ecological communities. These areas can also contain priority flora species or conservation-significant flora species. Conservation-significant fauna species may use the site as habitat, and ecological linkages may exist to other significant conservation areas.
- **Medium Priority Natural Areas** are of medium conservation significance and generally include small and medium areas of vegetation in good condition, usually fragmented. These areas can contain various vegetation communities, and can also contain priority flora species or conservation-significant flora species. Conservation-significant fauna species may use the site as habitat, but ecological linkages are unlikely to exist to other significant conservation areas.
- **Low Priority Natural Areas** are of low conservation significance and include areas of vegetation in good or degraded condition, usually fragmented. These areas can contain various vegetation communities, and can also contain priority flora species or conservation-significant flora species. Conservation-significant fauna species may use the site as habitat, but ecological linkages are unlikely to exist to other significant conservation areas.

Natural areas are listed by ratings in Appendix 2.

The resources allocated to weed management in natural areas are guided by the ratings of individual sites. Generally the higher the rating of the site, the more resources are allocated to weed management.

[54] WALGA (2004)

Sites may also be prioritised for weed control if they have a high fuel load and are deemed to be a fire risk.

Weed Management within Sites

The City conducts weed management within individual natural areas according to the Bradley Method by focussing on areas of vegetation in best condition first, followed by areas of decreasing vegetation condition. The Bradley Method also encourages minimal disturbance to the environment and allows for bushland regeneration through clearing of weeds.[55,56] This is implemented primarily to prioritise conservation of the highest biodiversity values. Vegetation condition in major conservation areas is assessed through flora surveys to inform Natural Area Management Plans approximately every five years. Vegetation condition in other sites is assessed visually by City staff during site inspections. Consideration is also given to highly visible natural areas.

Priority Weeds

The City prioritises weeds based on their invasiveness, ecological impacts, potential and current distribution and feasibility of control. Prioritisation of weeds enables more effective and targeted weed control.

The City classifies environmental weeds as priority weeds if they meet one or more of the following criteria:

- Weed species listed as a WoNS under the National Weeds Strategy (2017).
- The weed species is listed as a Declared Pest Plant according to the Department of Agriculture and Food (2011).
- The weed species is listed as a pest plant under the City's *Pest Plant Local Law 2012*.

A summary of priority weeds identified in the City according to criteria are listed in Table 5~~Table 5~~. There are currently a total of 16 priority weeds identified in the City. A detailed list of priority weeds can be found in Appendix 4.

Formatte

Table 5: Priority Weeds Identified in the City of Joondalup According to Criteria (2014).

Priority Weed Criteria	Number of Priority Weeds Identified within City of Joondalup
National Weeds Strategy 2017 -2027	• Five Weeds of National Significance (WoNS)
Biosecurity and Agriculture Management Act 2007	• 15 declared pest plants, includes all five WoNS
City's Pest Plant Local Law 2012	• One pest plant

Integrated Weed Management Approach

Integrated weed management involves using a variety of different techniques to monitor, prevent, prioritise and control weeds and keep weed densities at a manageable level. Using a variety of control methods, rather than just one, also ensures weeds are less able to adapt to the control methods used and less likely to become herbicide resistant.[57] An integrated approach is required for effective weed management, and therefore the management of weeds within the City includes:

[55] Leschenault Catchment Council (n.d.)
[56] AABR (2013)
[57] CSIRO (2011)

- weed monitoring
- weed prevention
- weed control
- education and training
- partnerships with external stakeholders.

4.1.5 Weed Monitoring

Ongoing monitoring of the City's natural areas is critical to ensuring the long term management of biodiversity within the City. Weed management can be modified according to weed monitoring results. Weed monitoring is important to:

- identify areas with weed populations
- weed spread
- discover new weeds on a site
- protect significant native flora species
- measure the effectiveness of weed control measures.

There are numerous different approaches to weed monitoring including weed mapping, taking of photographs and identification of weed species and their distribution (observational weed monitoring).

Weed Mapping

Weed mapping involves recording weed populations and distribution and is a form of weed monitoring. Weed mapping is useful to:

- identify and locate weed species to inform management plans and actions
- record progress in weed management
- provide a historical record to guide management actions
- inform weed management at a local government level.[58]

Weed mapping is conducted on a regular basis through City inspections of natural areas to establish the extent of weeds and to identify priority weed species. The outcomes from weed mapping inform the on ground weed management program. Inspections of the City's natural areas are conducted according to the Annual Maintenance Schedule which prioritises sites and the frequency of inspections, i.e. major conservation areas are scheduled for monthly inspections. During inspections, key priority weeds and maintenance issues are identified and marked on site maps as prioritised actions. These actions are then undertaken during the following maintenance visit to the site, if possible.

The City engages consultants to undertake flora, fauna and fungi surveys of major conservation areas approximately every 5-10 years to inform the development of Natural Area Management Plans. The surveys document components of biodiversity and make recommendations to minimise ecological impacts. Weed mapping is conducted as part of this survey with occurrences of priority weed species being recorded and mapped for individual natural areas. The flora and fauna surveys also identify vegetation condition and threatened and priority flora and fauna species on site. Information from flora and fauna surveys is utilised during City inspections of natural areas (through inspection maps) and used to inform maintenance visits.

Identification of weed species and their distribution is undertaken approximately every 5-7 years when the City undertakes its assessment of high priority and medium priority natural

[58] Australian Weeds Committee (n.d.)

areas using the Natural Areas Initial Assessment tool and in accordance with the Natural Areas Assessment Schedule.

Management Recommendations

3. *Continue mapping of key priority weeds through regular inspections of natural areas in accordance with the Annual Maintenance Schedule to inform on ground weed management actions.*

4. *Continue to assess high priority and medium priority natural areas every 5-7 years using the Natural Areas Initial Assessment Tool, including identification of weed species and their distribution in accordance with the Natural Areas Assessment Schedule.*

Weed Monitoring

The City has implemented two approaches to weed monitoring in the past, photo monitoring and observational weed monitoring. Monitoring weeds through one of these methods or an alternate method is useful to inform and prioritise weed management activities and measure the effectiveness of weed control activities. Quantitative monitoring methods are preferred to qualitative monitoring methods.

Photo Monitoring

Photo monitoring is a photographic record to assess changes occurring in vegetation over time at individual sites taken consistently from the same location. Photo monitoring can be used to assess the effectiveness of weed control on site and could focus on the management of a particular target weed or the recovery of native vegetation. Photo monitoring also requires recording information such as the date, time, location and GPS data.

Photo monitoring is currently conducted within key conservation areas to provide an indication of the effectiveness of weed control methods. Photo monitoring has occurred annually since commencement in 2021.

Observational Weed Monitoring

Observational weed monitoring can be conducted using permanent quadrats or transects to visually assess the percentage cover of weeds, as an indicator of vegetation health. Observational weed monitoring can guide weed control efforts and assess effectiveness of weed management actions. Weed monitoring can also occur by recording weed coverage, weed density and target weed species for weed control programs.

The City has measured the density of environmental weeds in key conservation areas annually at the same time of year up until October 2021. Data is collected in the City's key conservation areas through three transects on each site. The City's density of environmental weeds has generally been decreasing over the past 12 years due to increased weed management, as shown in Figure 8. There have been challenges with accessing the transects in some natural areas and utilising the data to inform weed management. It is proposed that the City monitors and reports on the coverage or area (hectares) where weed control has been undertaken in natural areas rather than the density of environmental weeds using a limited number of transects.

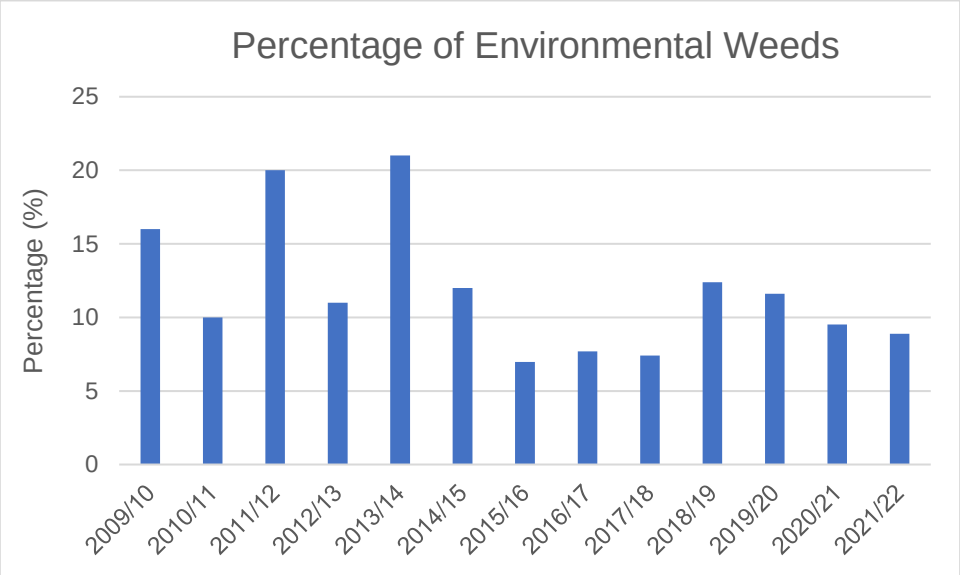


Figure 8: Indicator – Density of Environmental Weeds

Management Recommendations

5. *Continue to undertake photo monitoring in major conservation areas when measuring the natural areas key performance indicator annually to assess the effectiveness of ongoing weed control.*

6. *Record and monitor the coverage (hectares) of weed control in major conservation natural areas.*

4.1.6 Weed Prevention

Control of weed species can be both costly and labour intensive. Preventing weed establishment within natural areas is one of the most effective approaches to weed management.[59]

Examples of ways that weeds can establish that can be managed by the City include:

- weeds seeds being attached to footwear, clothing or vehicles
- introduction through landscaping materials
- movement via stormwater
- garden rubbish dumping
- post fire opportunities
- fire prevention activities such as creating firebreaks and access ways.

The City can directly prevent the introduction of weeds through minimising access and disturbance, undertaking weed hygiene measures and minimising the impacts from fire prevention activities when operating in natural areas.

The City can also indirectly prevent weed introduction and spread by educating the community on how they can prevent weeds by not dumping rubbish in natural areas, minimising disturbance of vegetation, undertaking weed hygiene measures and not planting species in gardens that have the potential to become bushland weeds.[60] Actions that community members can take to prevent weeds are described in more detail in section 5.2.

[59] State Weed Plan Steering Group (2001)
[60] DSEWPC (2012)a

Monitoring for new weed populations

Prevention of new weed species being introduced into natural areas is the most effective method of weed control. Eradication of weeds usually requires more resources for weed management than those required for weed prevention, and weed eradication is easiest and most cost effective with the early identification and management of new weed populations.

The City monitors for new weed populations being introduced into its Natural Areas through routine inspections. In addition to monitoring for new weed population being introduced into natural areas or spreading into new sections of natural areas, the City also minimises access and disturbance and undertakes weed hygiene measures.

Management Recommendation

7. *Continue to monitor for new weed populations, including new aggressive weed species, identified in the City to prioritise for weed control and prevent spread.*

Site Access and Hygiene Management

Accessing natural areas for maintenance or management activities can cause disturbance, creating opportunities for weeds to invade or establish. Limiting or controlled access to natural areas via paths, tracks and conservation fencing can prevent trampling or disturbance to vegetation and soil.

City staff and contractors regularly access natural areas to undertake management activities such as weed control, removing rubbish, undertaking revegetation activities and regular inspections and monitoring. During these activities sites may be accessed by vehicles and/or foot and a variety of machinery and equipment may be used. Where possible, vehicle access on-site is avoided. When vehicles are on site they are kept on tracks and avoid disturbing vegetation where possible. Pedestrians also remain on tracks where possible. Care is taken when operating machinery or equipment to minimise the impact on vegetation and soil surfaces. Natural areas often have conservation fencing, locked gates to access tracks and designated pathways to prevent disturbance to the vegetation and soil.

Weed hygiene is an important weed prevention measure to protect native vegetation from the introduction or spread of weed species through the movement of people, equipment, vehicles or landscaping materials. Weed material or weed seeds can become attached or lodged in footwear, vehicles and equipment and then transported into natural areas where they weren't found previously. Weed material or weed seeds can also be found in landscaping supplies such as plant stock, compost, mulch or sand/soil. Weed hygiene involves practices to ensure only clean and weed free vehicles, equipment, footwear, landscaping supplies and materials are entering natural areas. This is essential for preventing the introduction of weeds or further spreading weeds throughout natural areas.

The City's Pathogen Hygiene Procedure for staff and contractors ensures weed hygiene practices are implemented, including conducting vehicle and equipment inspections, and cleaning and brushing down soil and weed seeds from vehicles, machinery, equipment, tools, footwear, and clothing before they enter and leave natural areas. The City's vehicle washdown bay is located at the Works Operation Centre for washing down vehicles and equipment to enable the removal of material in a contained manner. The regular washing down of vehicles and equipment is a key control measure to prevent weed spread and introduction to the City's public open spaces. Staff and contractors conducting hand weeding in natural areas ensure that weeds are bagged and disposed of appropriately off-site to prevent weed spread.

The supply of plant stock, mulch, soil and compost that contain weeds is a common way for weeds to establish within an area. The City undertakes revegetation in bushland areas, as required. The majority of plant stock used for revegetation is grown at the City nursery and consists of plants, soil, Perlite and Vermiculite. The City's Purchasing Guidelines for the Supply of Landscaping Materials is implemented and ensures that the majority of the remaining plant stock that needs to be supplied is purchased from Nursery Industry Accreditation Scheme Australia (NIASA) accredited nurseries and the City currently purchases Australian Standard certified mulch and potting mix.

Management Recommendation

8. *Continue to implement the Pathogen Hygiene Procedure, and Purchasing Guidelines for the Supply of Landscaping Materials to provide direction to staff and contractors and prevent the introduction and spread of weeds within the City.*

Fire Management and Response

Whilst fire is an important natural feature of the Australian landscape, human activity such as accidents and arson have resulted in increased incidences of fire within natural areas, which can have a negative effect on biodiversity and encourage growth of highly flammable and invasive weeds.[61,62]

Natural areas may be disturbed and provide opportunities for weeds to invade or establish through the following fire related activities:

- Fire occurrences
- Hazard Reduction Grass Tree Burning Program
- Manual fuel load reduction
- Construction or maintenance of firebreaks
- Emergency services responding to fire events including use of emergency vehicles and fire suppression activities.

A coordinated and planned approach is required to address fire management within the City in order to reduce the risk of fire occurrences that could result in damage to life, property and the environment. The City implements a Hazard Reduction Grass Tree Burning program within applicable natural areas to reduce bushfire risk including Craigie Open Space Bushland; Hepburn Heights Conservation Area; Warwick Open Space Bushland, Shepherds Bush Reserve and Yellagonga Regional Park.

The City minimises weeds through the Hazard Reduction Grass Tree Burning program by:

- Implementing the City's Pathogen Hygiene Procedure.
- Monitoring the site for signs of weed emergence or erosion, particularly following the first rainfall events post fire when native and weed species will start to germinate.
- Preventing access to the burnt natural area to protect the ash bed and allow vegetation to regenerate.
- Implementing bespoke post fire weed control programs tailored to the site in response to the monitoring outcomes.

The manual fuel load reduction and construction and maintenance of firebreaks are important and necessary fire prevention tools, however it also requires the clearing of native vegetation and allows opportunities for weeds to spread. The City complies with the *Bush Fires Act 1954* which requires firebreaks immediately inside and around all external boundaries of the land.[63]

[61] City of Joondalup (2014~~2a~~)
[62] City of Joondalup (2012~~b~~)
[63] DFES (2013)

The City developed a *Fire Weed Management Guideline* which informs staff and contractors about weed management whilst undertaking manual fuel load reduction and installing and maintaining firebreaks and access ways.

Management Recommendations

9. Continue to implement the Fire Weed Management Guideline to inform staff and contractors about weed hygiene when undertaking manual fuel load reduction works and when constructing and maintaining firebreaks and access ways.

4.1.7 Weed Control

While weed prevention is important for reducing new infestation of weeds from occurring or spreading in natural areas, weed control is necessary for reducing or eradicating weed infestations already occurring in natural areas. While weed control can be an expensive and time consuming exercise, failure to control weeds can have significant environmental impacts including displacing native plant species, harbouring pests and diseases and creating fuel loads for fire. Weeds also alter the structure and distribution of plant communities which has a negative impact on native flora and fauna. Weed control is necessary to protect and restore diverse natural ecosystems.[64] The City currently uses hand weeding and herbicide weed control methods in natural areas.

Hand Weeding

Hand weeding is used in natural areas as part of an integrated approach. This includes use of hand weeding for smaller infestations, for herbicide resistant weeds or as follow up to herbicide application. Hand weeding is also used in sensitive areas where herbicide use is not recommended. Widespread hand weeding is not used as it is labour intensive and, if applied inappropriately, can result in negative impacts to native vegetation by disturbance of the soil surface and may lead to erosion.

The City supports a total of 19 Friends Groups that conduct a large amount of hand weeding in natural areas. The City acknowledges the large contribution that Friends Groups make to weed control and conservation within natural areas.

Herbicide Use

Herbicides are used in the City as they are effective on large weed populations and can be economical compared to other weed control techniques. Methods of herbicide application used include blanket spray, spot spray, cut and paint, basal bark treatment and wick wiping. Appendix 6 provides further details on these different methods of herbicide application. The City implements herbicide use in natural areas in accordance with the Annual Maintenance Schedule. Natural areas are prioritised for weed control based on their priority status, the type of weeds present, the weed infestation levels and the bush fire management system risk rating.

The City conducts flora surveys including vegetation condition assessments in key natural areas approximately every 5 years. Information obtained from the flora surveys is utilised by the City to create vegetation condition maps which are used to guide weed control activities and prioritise works in best condition vegetation areas on sites.

The City schedules its herbicide application according to rainfall and temperature in order to increase its effectiveness and minimise any adverse impacts. Hand weeding or maintenance is conducted when it rains, rather than using herbicides. Where possible, herbicide application is scheduled prior to seed production.

[64] Brown and Brooks (2002)

Research and Trials

Weed control methods are improving over time as technologies and research become available. Weed control research and trials can assess the effectiveness of different weed control methods and inform the best weed management approach. Improved understanding of the biology and ecology of individual weeds and the environmental and human-induced factors that influence abundance and distribution are important factors that assist in determining effective weed control approaches.

The City has undertaken a number of weed control trials commencing in 2006-07. The purpose of the trials has been to support the research and development of improved weed control or management. The City's weed control trials are considered in relation to the biology and ecology of individual weeds within a specific natural area.

The City has conducted steam and hot water weed control trials in urban areas rather than natural areas. The unsuitability of using steam and hot water weed control methods in natural areas is well documented and therefore has not been trialled by the City.[65]

The City has a chemical reduction approach to weed management and is trialling alternative treatments to test effectiveness and safety. Natural areas often have challenges associated with accessibility and minimising impacts to biodiversity that limit the effective implementation of alternative weed control treatments. If alternative weed control methods are successful, they are considered for ~~integrated~~integration into the City's weed management program.

Weed Control in Specific Circumstances

Specialised weed management activities are required for weed control in specific circumstances including identification of new populations of weeds, weed control on verges and post fire weed management.

Weed Control on Verges

Weeds can spread into natural areas from adjacent verges. Effective weed control of verges adjacent to nearby areas minimises the risk of weed spread. The City conducts weed control on verges of key natural areas consisting of increased mowing of verges to reduce seed spread, spraying of weeds and spreading of certified mulch, where required.

Weed Control Post Fire

The City has unplanned fire occurrences in natural areas on a frequent basis. For example, there were substantial unplanned fire occurrences in Shepherd's Bush Reserve and Warwick Open Space Bushland in 2022. DFES is responsible for fire eradication, whilst the City is responsible for post fire weed management.

Fire is important for native species regeneration and fuel load reduction in urban bushland areas.[66] The local environment and bushland has evolved with cultural burning practices being implemented as part of traditional Aboriginal land management practices.[67] Many vegetation communities respond well to fire, and some native species are reliant on fire for regeneration or germination.

However, the disturbance of fire can create an opportunity for rapid growth of competitive weed species, particularly grasses, with minimal competition from native plants. Weed species may have established a long-term soil seed bank that is triggered to germination by fire. Weed

[65] Natural Areas Consulting (2013)
[66] Miller and Miller (2020)
[67] DFES (2020)

species can often be quick to exploit the favourable conditions immediately after fires, germinating prolifically and spreading vigorously in the first few seasons.

DBCA undertook fire management experiments in Kings Park and Bold Park in 2015 and 2016 respectively. Since the experiments DBCA have been undertaking long-term monitoring, with the results showing the following:

- fire enhances the spread and cover of introduced grasses
- weed management treatments are effective in reducing weed cover
- native perennial species richness increased after fire
- burning leads to a decrease in litter fuels.[68]

It is further recognised that where effective weed control is implemented post fire native species biodiversity is likely to increase and native species will be prevalent.[69]

The City implements a Fire Weed Management Guideline to minimise weed occurrence in natural areas post fire. After a fire occurrence the DFES maps the fire scar information and the City make this available on IntraMaps to monitor fire frequency on individual sites. The City also obtains information from DFES regarding fire occurrence history for sites as required.

The City allows for at least three months of natural vegetation regeneration through restricting access after fire before commencing weed control activities. The purpose of restricting any disturbance to the burnt area is to protect the ash bed and allow for natural regeneration. The three month period prevents disturbance and allows native seedlings to resprout.

Post fire the City monitors the fire scar area, particularly following rainfall events, for weed emergence and erosion. Regrowth of weeds are then managed prior to seeding through an integrated weed management approach using a variety of methods. Herbicide treatments, are selected based on the weed species present.

Revegetation is rarely undertaken post fire within natural areas, with the preference to allow natural regeneration. In some fire impacted natural areas post fire revegetation may be undertaken, usually within selected small areas, such as within previously degraded sections of the natural area.

Management Recommendations

10. *Continue to implement weed control in natural areas in accordance with the Annual Maintenance Schedule.*

11. *Continue to conduct weed control on verges adjacent to key natural areas including increasing mowing of verges to reduce weed seed spread, spraying of weeds and spreading of certified mulch, where required.*

12. *Continue to implement the Fire Weed Management Guidelines to limit the infestation of weeds in the City's natural areas.*

[68] Miller and Miller (2020)
[69] Miller and Miller (2020)

4.2 Parks and Urban Landscaping Areas

The City manages over 370 parks and reserves and a substantial number of urban landscaping areas such as streetscapes, pedestrian access ways, sumps and swales.

4.2.1 Purpose

The purpose of Section 4.2 of the Plan is to provide an integrated weed management approach to prevent, monitor and control the spread of weeds and conserve the amenity, aesthetics and functionality of the City's parks and urban landscaping areas.

Section 4.2 of the Weed Management Plan includes the following:

- description of the City's current weed management approach
- identification of weed control measures
- recommended integrated weed management strategies to prevent, monitor and control the spread of weeds.

4.2.2 Limitations

Section 4.2 of the Weed Management Plan excludes weed management of natural areas managed by the City and land not managed by the City such as private property.

4.2.3 Study Area

The study area for Section 4.2 includes parks and urban landscaping areas managed by the City. Urban landscaping areas managed by the City include the following:

- streetscapes
- pedestrian access ways (PAWs)
- sumps and swales.

The parks managed by the City are shown in Figure 9 and streetscapes are shown in Figure 10. Urban landscaping areas are not shown or detailed due to the large number of such areas within the City.

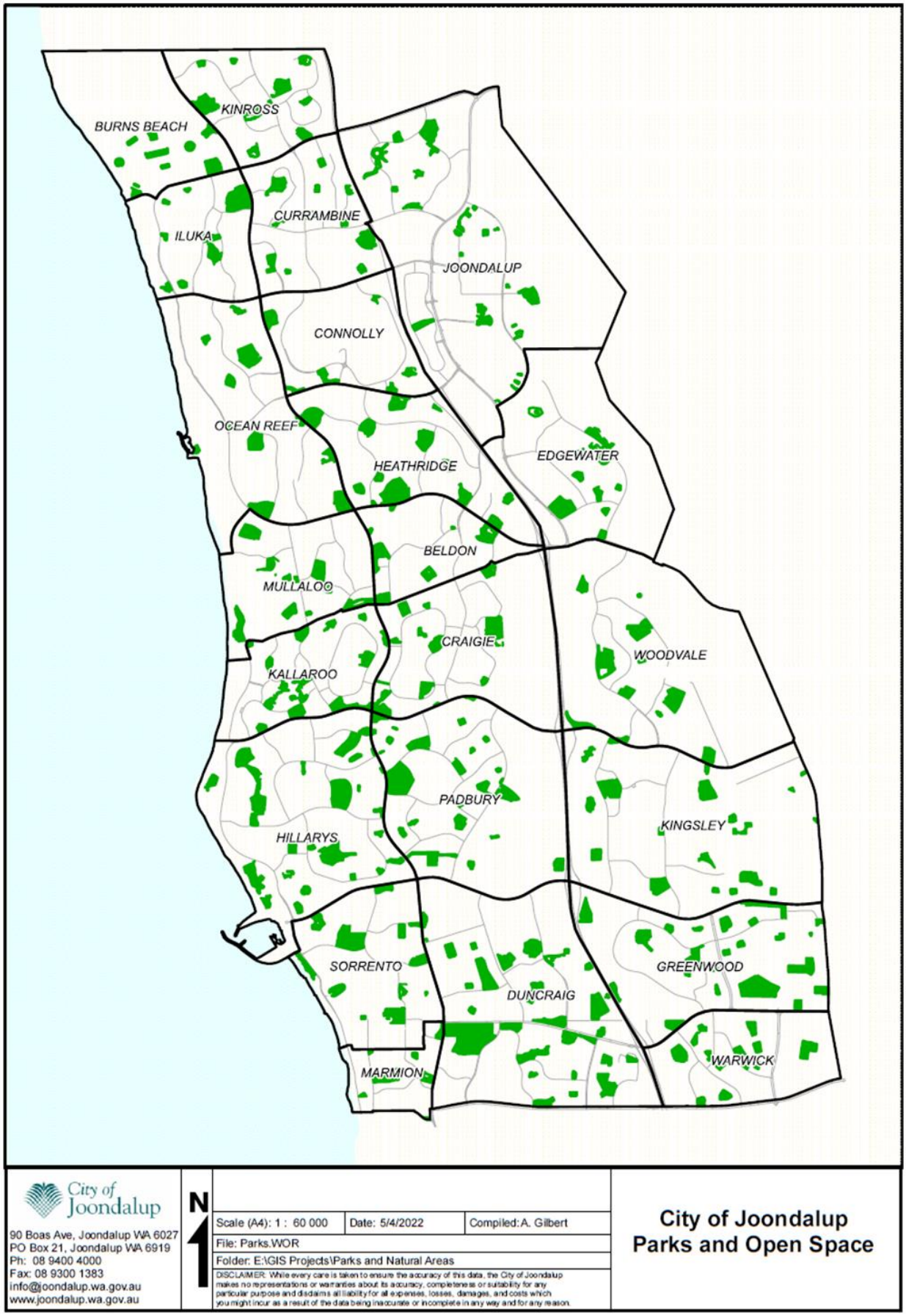


Figure 9: Parks Managed by the City of Joondalup

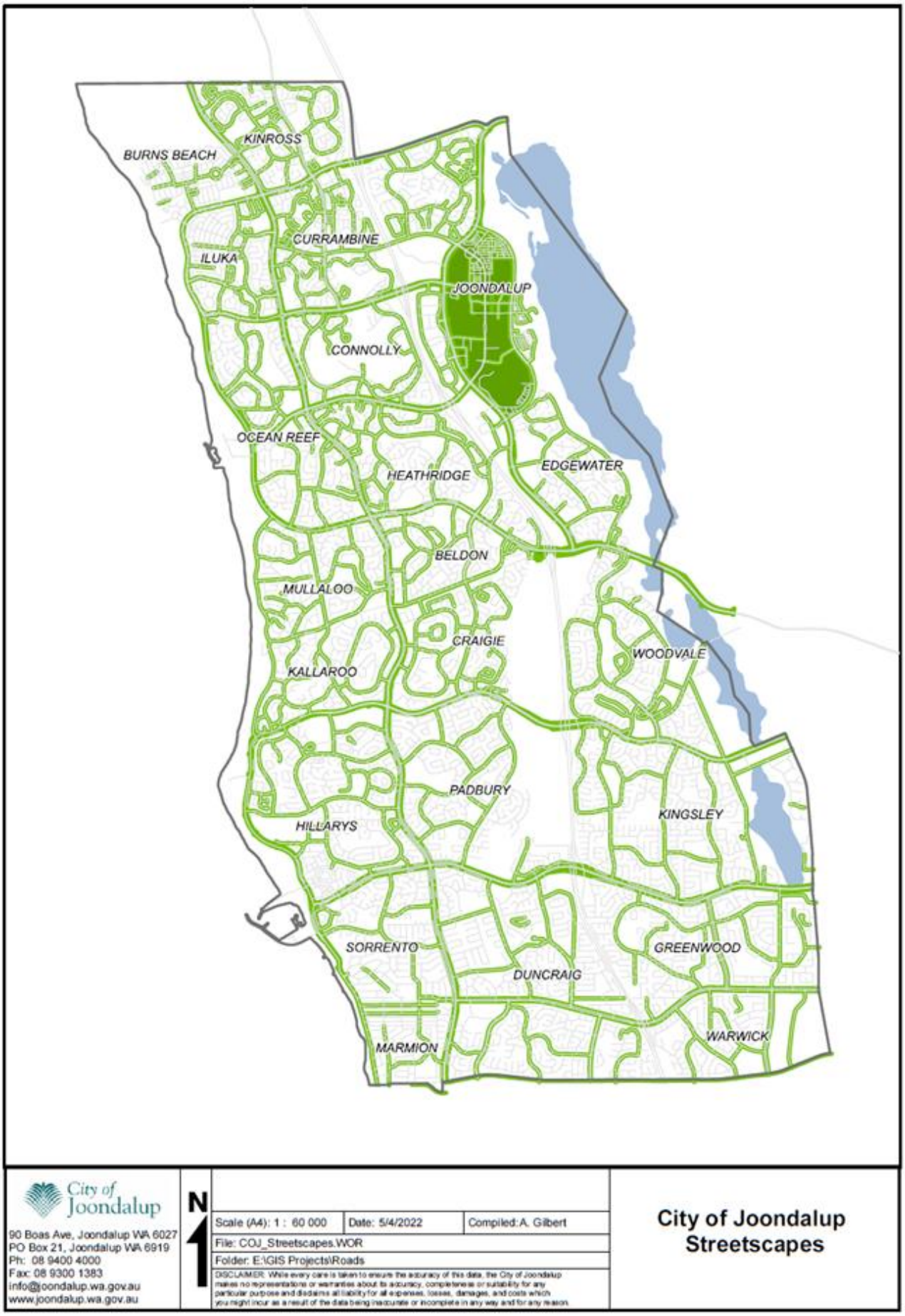


Figure 10: City of Joondalup Streetscape Areas

4.2.4 Service Agreements

The City manages several locations with service agreements, such as Specified Area Rates (SAR) service agreements for the provision of enhanced landscaping services.

Specified Area Rates (SAR) Service Agreement

A SAR is an additional rate charge that is applied separately to designated areas within the City by agreement with the residents association. These rates cover additional maintenance costs for landscaping services (including weed management) over and above services ordinarily provided by the City.

The City currently has four SAR areas:

- Iluka
- Woodvale Waters Estate, Woodvale
- Harbour Rise Estate, Hillarys
- New Burns Beach.

4.2.5 Weed Management Site Prioritisation

The City's current approach to weed management prioritisation of parks and urban landscaping area sites and within sites is detailed in the following sections.

Prioritisation of Sites

The City currently conducts seasonal weed management in parks and urban landscaping areas on a priority basis using four criteria (in descending order), as shown in Figure 11~~Figure 11~~.

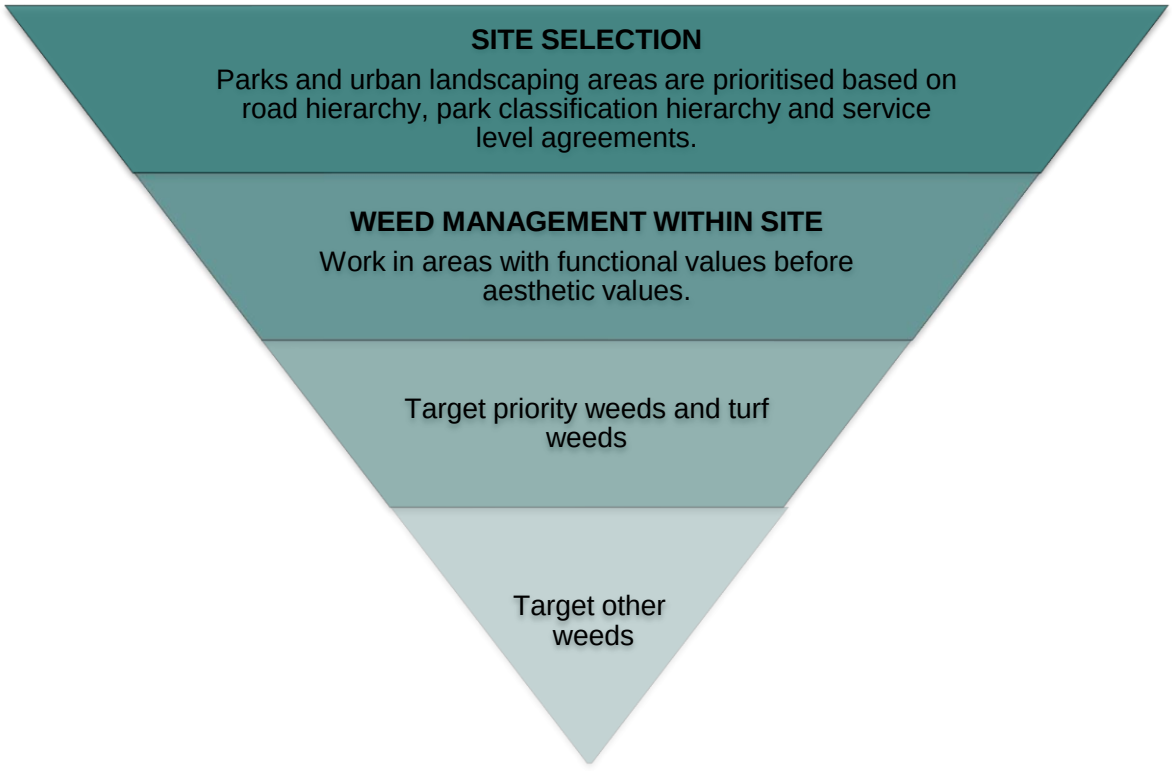


Figure 11: Criteria currently used to prioritise weed management actions for parks and urban landscaping areas

Site Selection

Parks and urban landscaping areas are categorised and prioritised based on the type, profile, amenity or functional requirements of a specific location. A consistent approach is applied to all areas that fall within the same category.

Listed below are the different types of parks and urban landscaping areas and details regarding their purpose, use and functional requirements.

Parks are areas of public open space that contain facilities for recreation and leisure. The ~~draft~~ *Public Open Space Framework* outlines the planning, maintenance and resourcing service levels for the City's public open spaces which also assists in prioritising weed management. Parks are classified using factors such as the site purpose, size and surrounding catchment.

Parks are given priority ratings from 1 to 4, as outlined below. Parks with priority ratings of 1 receive the highest level of weed management, whilst parks with priority ratings of 4 receive the lowest level of weed management. For example, Regional Sports Parks or Regional Recreation Parks (Priority 1) are treated for weeds in accordance with the annual maintenance schedule and inspected at a higher frequency than Local Recreation Parks (Priority 4).

Sports Parks

Sports Parks are public open spaces predominantly used for formal, structured sports activities, such as team competitions, physical skill development and training. They are generally designed to accommodate the playing surface and infrastructure requirements of specific sports. People attend these public open spaces with the primary purpose of engaging in organised sports activity, training, competition or viewing as a spectator.

Sports parks are split into four sub-categories and are prioritised in the following order:

- **Regional Sports Park**: Regional Sports Parks are suitable for larger-scale, significant or regional sports events where multiple sports matches can be undertaken simultaneously. These parks accommodate at least three oval sports fields or six rectangular sports fields, and also accommodate playing courts and/or bowling greens. Regional Sports Parks attract users from the whole of the City and surrounding local governments.~~.~~ An example of a Regional Sports Park is Percy Doyle Reserve in Duncraig.
- **District Sports Park**: District Sports Parks are suitable for significant sports events where more than more one sports match can be undertaken simultaneously. These parks accommodate at least two oval sports fields or four rectangular sports fields, or accommodate one sports field and either playing courts and/or bowling greens. District Sports Parks attract users form the whole of the City, especially surrounding suburbs. An example of a District Sports Park is Iluka District Open Space in Iluka.
- **Neighbourhood Sports Park**: Neighbourhood Sports Parks are suitable for smaller-scale sports events where between one and two sports matches can be undertaken simultaneously. These parks accommodate at least one oval sports field, two rectangular sports fields. Neighbourhood Sports Parks attract users from within the suburb and surrounding suburbs. An example of a Neighbourhood Sports Park is Barriadale Park in Kingsley.
- **Local Sports Park**: Local Sports Parks are suitable for local sports training and social day time matches. These parks accommodate one sports field or playing courts. Local Sports Parks attract users from within the suburb and surrounding suburbs. An example of a Local Sports Park is Parkside Park in Woodvale.

Recreation Parks

Recreation Parks are public open spaces predominantly used for informal recreation activities, such as walking, jogging, picnicking and play. They are generally designed to accommodate low wear ~~-wear applications~~ activities (in turfed areas) and contain recreation-based infrastructure. People attend these public open spaces with the primary purpose of engaging in social and leisure activities.

Recreation Parks are split into four sub-categories and ranked in the following order:

- **Regional Recreation Park**: Regional Recreation Parks are located near a natural place of interest, such as a lake or beach, or located near commercial activities, such as shopping or a café/restaurant. These parks accommodate multiple distinct zones where different types of recreation can be undertaken simultaneously. Regional Recreation Parks encourage long-stay usage for recreational activities and attract users from the whole of the City and surrounding local governments. An example of a Regional Recreation Park is Tom Simpson Park in Mullaloo.
- **District Recreation Park**: District Recreation Parks may be located near a natural place of interest, such as a lake or beach, or located near commercial activities, such as shopping or a café/restaurant. These parks accommodate at least two distinct zones where different types of recreation can be undertaken simultaneously. District Recreation Parks encourage medium to long-stay usage for recreational activities and attract users from the whole of the City, especially surrounding suburbs. An example of a District Recreation Park is Delaemeare Park in Currambine.
- **Neighbourhood Recreation Park**: Neighbourhood Recreation Parks are usually located within suburban areas. These parks accommodate one medium recreation zone. Neighbourhood Recreation Parks encourage short to medium-stay usage for recreational activities and attract users from the surrounding suburb. An example of a Local Recreation Park is Menteith Park in Kinross.
- **Local Recreation Park**: Local Recreation Parks are usually located within suburban areas. These parks accommodate one small recreation zone. Local Recreation Parks encourage short-stay usage for recreational activities and attract users from the surrounding streets. An example of a Local Recreation Park is Carr Park in Warwick.

Urban Landscaping Areas

Urban landscaping areas are public open spaces predominantly used to contribute to visual amenity and suburban aesthetics. They can act as entry points to the City and include verges, medians and thoroughfares, as well as residual land. Urban landscaping areas are broken down into the following categories and weed management is dependent on the priority rating:

- **Major Urban Landscaping**: Major Urban Landscaping includes large verges and medians located on major traffic routes into and out of the City and within the Joondalup City Centre. These areas act as visual indicators for major entry points and a welcome to residents and visitors. Major Urban Landscaping delivers a high level of visual amenity and an opportunity for public art. An example is the along Joondalup Drive in Joondalup.
- **High Priority Urban Landscaping**: High Priority Urban Landscaping includes verges and medians located on high-level traffic routes, mostly centred around intersection nibs and arterial roads. These areas act as visual indicators for significant locations and help to foster a sense of place. High Priority Urban Landscaping delivers a high level of visual amenity and may provide an opportunity for public art. An example is along Ocean Reef Road in Edgewater.
- **Medium Priority Urban Landscaping**: Medium Priority Urban Landscaping includes verges, roundabouts and thoroughfares located on medium-level traffic routes in

suburban areas. These landscaping areas provide vegetation and tree cover and help to mitigate the urban heat island effect. Medium Priority Urban Landscaping delivers a medium level of visual amenity and enhances local aesthetics. An example is along Mullaloo Drive and Dampier Avenue, in Mullaloo and Kallaroo.

- **Low Priority Urban Landscaping**: Low Priority Urban Landscaping includes verges, remnant land and minor thoroughfares located on low-level traffic routes in suburban areas, as well as extended verges adjacent to arterial or distributor roads. These areas provide some vegetation and may contain tree cover. An example is Craigie Drive and Marmion Avenue in Craigie.

Weed Management within Sites

The City conduct weeds management within parks and urban landscaping areas by focussing on areas with functional values followed by areas with aesthetic values.

Priority Weeds

The City focuses on weed management of broadleaf weeds (most commonly found weeds), skeleton weed (declared pest plant), Noogoora burr (declared pest plant) and Caltrop (local pest plant) for parks and urban landscaping areas.

Broadleaf Weeds

The most common broadleaf weeds that are managed in parks and urban landscaping areas include:

- Fleabane (*Conyza* spp.)
- Dandelion (*Taraxacum officinale*)
- Medic Burr (*Medicago polymorpha*)
- Bindii (*Soliva sessilis*)
- Cudweed (*Gamochaeta calviceps*)
- White Clover (*Trifolium repens*)
- Flat Weed (*Hypochaeris radicata*)
- Common Cotula (*Cotula australis*)
- Blue Lupin (*Lupinus cosentinii*).

Skeleton Weed

Skeleton weed (*Chondrilla juncea*) is a declared pest plant in Western Australia under the *Biosecurity and Agriculture Management Act 2007*. The City is obligated to search for, and eradicate, all skeleton weed found on City managed land. All skeleton weed must be reported to DPIRD and treated to prevent seed set within 48 hours. Occurrences of skeleton weed are added to a City skeleton weed register and locations are inspected annually.

Noogoora burr

Noogoora burr (*Xanthium strumarium*) is a declared pest plant in Western Australia under the *Biosecurity and Agriculture Management Act 2007*. The City is obligated to search for, and eradicate, all Noogoora burr found on City managed land. All occurrences must be reported to DPIRD and treatment includes special disposal measure conditions. Recorded locations of Noogoora burr occurrences are inspected annually.

Caltrop

Under the *Biosecurity and Agriculture Management Act 2007* and the *Local Government Act 1995*, the Council of the City of Joondalup made the *Pest Plant Local Law 2012* to require the

owner or occupier of private land within the City district to destroy, eradicate or otherwise control pest plants within a specified time. Caltrop (*Tribulus terrestis*) is designated as a pest plant.

The City maintains a Caltrop register to document confirmed locations of Caltrop on land managed by the City and public property. All Caltrop locations are inspected annually. Figure 12 shows current and dormant Caltrop locations on the Caltrop register as per April 2022.

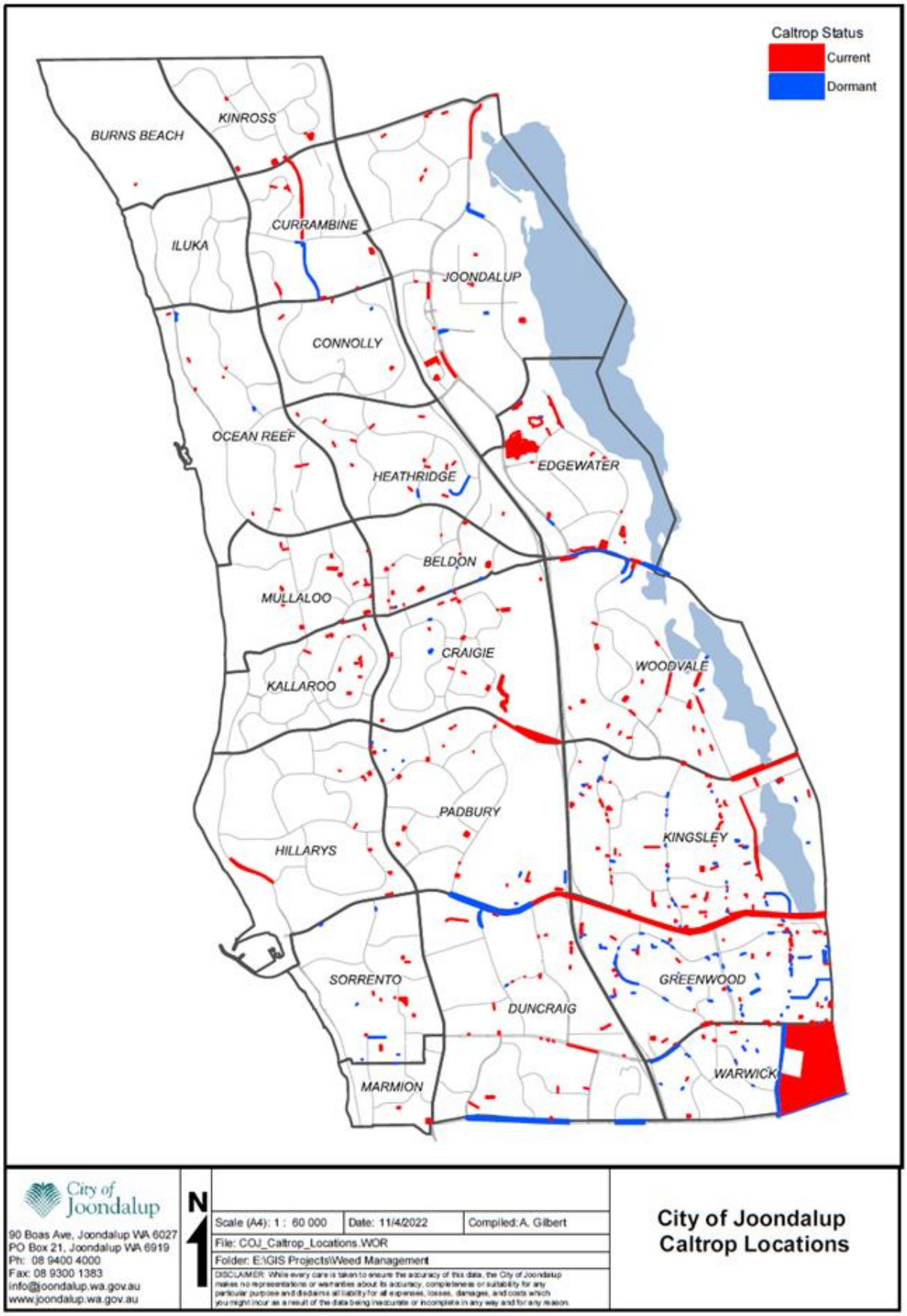


Figure 12: Map of locations on the Caltrop register in April 2022

Integrated Weed Management Approach

Integrated weed management involves using a variety of different techniques to monitor, prevent and control weeds. Using a variety of weed control methods, rather than just one, also ensures weeds are less able to adapt to the control methods used and less likely to become herbicide resistant. An integrated approach is required for effective weed management, and therefore the management of weeds within the City parks and urban landscaping areas includes:

- weed monitoring
- weed prevention
- weed control
- notification and community awareness
- innovation, continual improvement and training.

4.2.6 Weed Monitoring

Ongoing monitoring of the City's priority and high profile areas is beneficial to assist with the long-term management of parks and urban landscaping areas within the City. Weed monitoring is important for identifying and effectively managing weed populations.

Observational weed monitoring is conducted for parks and urban landscaping areas. Observational weed monitoring can guide weed control efforts and assess the effectiveness of weed management actions. Informal weed inspections in parks and urban landscaping areas are regularly undertaken by staff during scheduled maintenance activities and site inspections. The frequency of inspections is determined by the site prioritisation.

When weed issues are identified during inspections, an evaluation is undertaken to determine the most effective and efficient method of control. This can be the immediate treatment of weeds or scheduling of specific weed management actions to effectively manage larger infestations.

4.2.7 Weed Prevention

Prevention of weeds in parks and urban landscaping areas is the most effective method of weed control. Eradication of weeds usually requires more resources for weed management than those required for weed prevention.

The main weed prevention methods that are implemented by the City include mulching, turf management, renovation works, suppression of weed seed banks, best practice landscape design and management, minimising access and disturbance and undertaking weed hygiene measures.

Mulching

Pathogen and weed free mulch is applied to suppress weed growth in garden beds or non-turf areas, as per the City's *Pathogen Management Plan*.

Turf Management Practices

Fertiliser is applied, based on soil and leaf tissue analysis, to improve the quality of the turf and to promote healthy turf. Healthy turf reduces the likelihood of seasonal weeds.

Renovation Works

Renovation works are undertaken to encourage improved density and coverage of turf, reducing the opportunity for weed growth. Weeds are more prevalent in sand and denuded areas.

Weed Seed Bank Suppression

Weed seed banks are suppressed through the use of chemical pre-emergents. These types of chemicals are applied to non-planted garden beds and hardstand areas.

Landscape Design

Landscape design and management can assist with reducing weed growth and ensuring effective weed management can be delivered through, for example, the use of stencilled concrete, hydro-zoning, eco-zoning and irrigation design.

Stencilled concrete has been installed rather than brick paving in some appropriate hardstand areas to assist with weed control and management. Stencilled concrete does not allow weeds to surface as easily as brick paving.

Hydro-zoning and eco-zoning have been applied in numerous City parks to conserve water whilst keeping the area's amenity and function. Hydro-zoning is the installation of irrigation to allow for different zones of a park or reserve to receive different amounts of water based on the type of use of the zones and turf requirements. Eco-zoning is the division of a park or reserve into zones of turf and natural areas to promote biodiversity and conserve water. Hydro-zoning and eco-zoning principles also assist with weed management through suppressing weeds and only watering targeted areas. Figure 13 shows an example of hydro-zoning and eco-zoning undertaken in 2020-21 in Macaulay Park, Duncraig.

Figure 13: Example of hydro-zoning and eco-zoning at Macaulay Park, Duncraig

Hygiene Measures

Hygiene is important to ensure weeds, pathogens and pests are not introduced or spread from or into parks and urban landscaping areas. The City has developed and implements a *Pathogen Management Plan* to protect biodiversity values within the City of Joondalup by minimising the risk of introducing and spreading pathogens (and weeds) within landscaped and natural areas of the City.

City staff and contractors implement a *Pathogen Hygiene Procedure* and undertake hygiene measures on vehicles used for turf renovation activities between each site and at the end of each day. City contractors occasionally undertake turf renovation activities and are required by tenders and contracts to implement hygiene measures between sites and at the end of each day on vehicles used.

The majority of plant stock is supplied from NIASA accredited nurseries and the City currently purchases Australian Standard certified mulch and potting mix. The City has developed

Purchasing Guidelines for the Supply of Landscaping Materials that will be used to eliminate the likelihood of introducing weeds seeds from purchased materials.

4.2.8 Weed Control

While weed prevention is important for reducing new infestation of weeds from occurring or spreading in parks and urban landscaping areas, weed control is necessary for reducing, containing or eradicating weed infestations. While weed control can be expensive and resource intensive, failure to control weeds can have significant impacts including affecting the quality of playing surfaces or the aesthetics and amenity of parks and urban landscaping areas.

The City undertakes an integrated weed management approach to its weed control in parks and urban landscaping including the use of a variety of approved herbicides. Weed control involves using a number of methods to reduce weed infestations to manageable levels or, if possible, to eradicate infestations. Weed control methods used in parks and urban landscaping areas include:

- Chemical weed control – the use of ~~selective and non-selective~~ herbicides to control or suppress weeds.
- Steam and/or hot water (also known as hydrothermal) weed control – the application of hot water and/or steam to a weed plant causing it to die.
- Physical weed control – the removal of weeds by physical or mechanical means, such as mowing, mulching or by hand.

Chemical Weed Control

The majority of weed control in parks and urban landscaping areas is managed by the use of approved herbicides as they are effective on large weed populations and are economical compared to other weed control techniques.

The two main methods of chemical application in parks and urban landscaping areas are blanket and target spraying. Appendix 6 provides further details on the different methods of herbicide application.

Blanket spraying

Blanket spraying is generally undertaken by machinery with boom sprays and is the most effective and efficient method to apply chemicals to large open spaces such as sports ovals.

Broadleaf selective turf weeds are subject to seasonal control generally between July and September. This activity is only conducted on the City's irrigated sporting parks and recreation parks.

Target Spraying

Target spraying can be undertaken using the following methods:

- backpack spray units or vehicle mounted tanks and hoses with applicable control attachments where required.
- wick or sponge wiping via a handheld applicator directly on to targeted plant/s.
- a cut and paint/basal bark treatment which involves painting pesticide directly on to a woody cut plant.

Target spraying is generally used in small areas or where obstacles or site constraints restrict access of larger machinery. Target spraying weeds with herbicide is conducted on an as

required basis with frequency dependent on the service levels in place at the time for the following locations:

- landscaped medians and verges
- kerblines, footpaths and brick paved areas
- Joondalup CBP
- parks infrastructure and tree surrounds.

Weed management within the City's parks and open spaces, verges, median strips and gardens is both seasonally and resource driven.

WeedSeeker Technology

WeedSeeker technology allows accurate and automated spatial tracking and monitoring of application areas by detecting living green organic material using fluorescence technology to assist in reducing the amount of chemical use. This technology was trialled in 2020-21 alongside the steam and hot water control and found to be effective at controlling weeds and reducing chemical use through selectively targeting and spot spraying specific weeds using minimal amounts of non-selective herbicides. The City commenced the use of WeedSeeker technology on footpaths and kerblines on arterial and distributor roads in 2022-23, as shown in Figure 14.

Figure 14: WeedSeeker Technology in use on a footpath

Steam and Hot Water Weed Control

The City has been trialling steam and hot water treatments to test their effectiveness since 2006-07. Steam and hot water weed control has improved in effectiveness over the past couple of years through the development of suitable machinery and equipment.

Given the positive results of the steam and hot water weed control trials in some locations, as well as the growing community interest, the Council determined, in 2021, that the City would implement non-chemical weed control (inclusive of steam and hot water weed control and physical weed removal) for hardstand areas within a 50m radius of schools, within the footprint of playspaces, as well as the kerbs, footpaths, hardstand (paved) median islands, mulched median islands and general paved areas within the CBP, as shown in Figure 15. The non-chemical weed control includes any weeds exceeding a height or width of 50mm, being mechanically removed and disposed of in an appropriate manner.

The City's non-chemical weed control treatment commenced in July 2022 and will be applied to the same locations until the term of the contract, for up to a period of 3 years. Continuation of the non-chemical weed control treatment will be dependent upon review of the contract.

Figure 16 shows the locations that will be managed by the City through non-chemical weed control. Additional locations that are suitable for this weed control method will be reviewed and incorporated into the City's integrated weed management program.

Figure 15: Photograph of the City's chemical-free weed control in July 2022

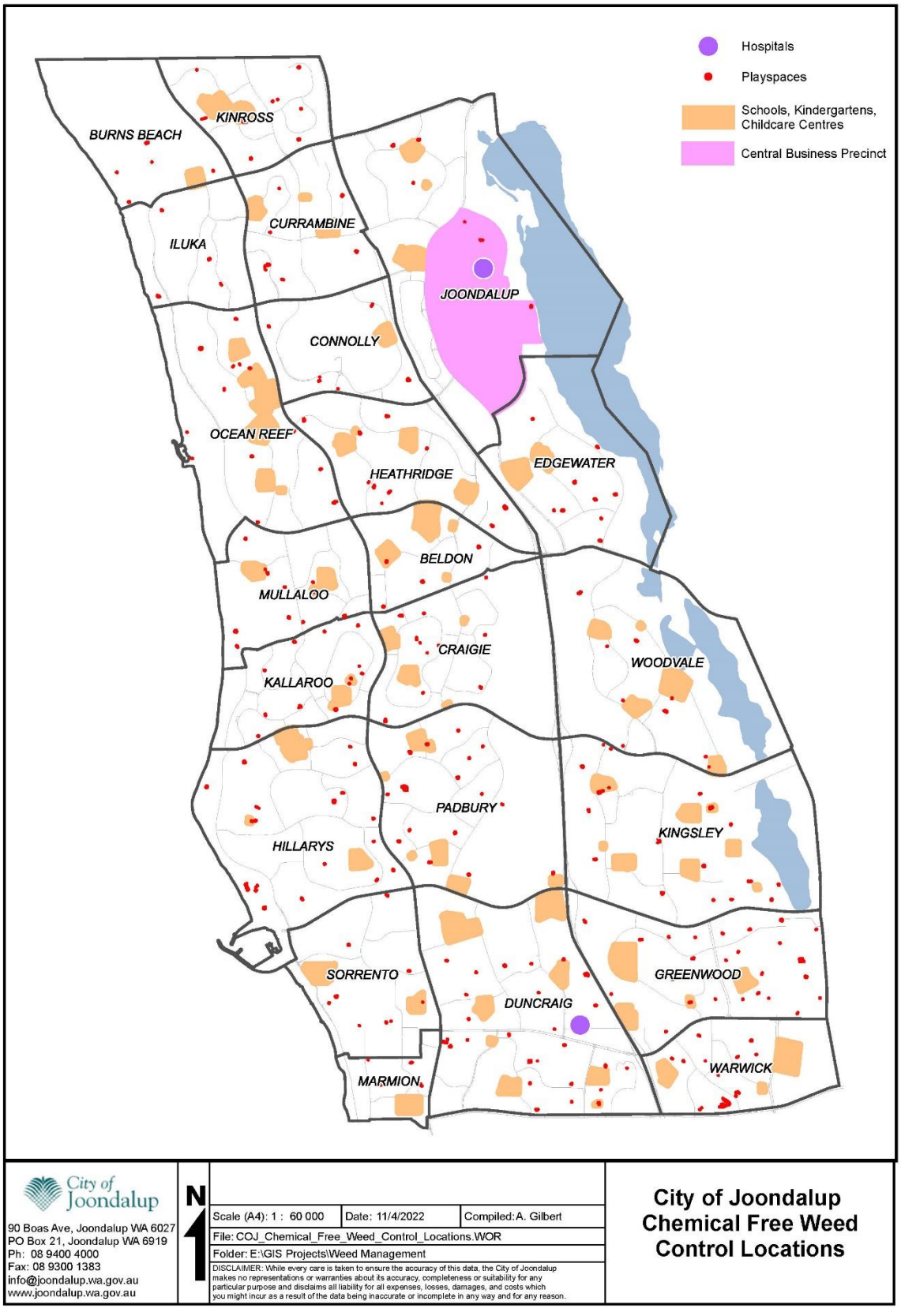


Figure 16: Map of the City's chemical free weed control locations in 2022[70]

[70] The CBP chemical free treatment areas include the kerbs, footpaths, hardstand (paved) median islands, mulched median islands and general paved areas only.

Sensitive Facilities

Herbicide use adjacent to sensitive facilities is subject to the City's assessment of authorised chemicals process. Additional consideration is given to the timing of herbicide application in the vicinity of sensitive facilities to minimise potential impacts.

The City considers the following as sensitive facilities:

- School or pre-school
- Kindergarten
- Childcare Centre
- Hospital
- Community Health Centre
- Nursing Home
- Play spaces.

Physical Weed Control

Physical weed control is mainly undertaken in urban landscaping areas when required. This method is utilised when the weed species are significantly impacting on the presentation of the landscape and chemical application is not determined to be the most effective method of removal, as compared to herbicide use. This weed control method is also used within and surrounding the City's sensitive facilities, particularly in areas unable to be accessed by the steam and hot water weed control machinery.

Site Specific Weed Control

Weed control is conducted according to specific site attributes such as parks, streetscapes, SARs, CBP, PAW's and sumps and swales.

Parks

Weed control is conducted in all irrigated sport and recreation parks through the following methods:

- **Turf**: broadleaf selective, target spraying i.e. around infrastructure.
- **Landscaped garden beds**: hand weeding, target spraying, mulch application.
- **Hardstands and footpaths**: target spraying, use of pre-emergent herbicides (where appropriate).

Weed control in landscaped garden beds, hardstands and footpaths in district and local recreation parks is assessed as per scheduled site inspections.

Urban Landscapes

Weed control is conducted from July to October and April to May according to the Annual Maintenance Schedule and is subject to ongoing site inspections and reactive maintenance from October to March. Weed control in streetscapes is conducted through the following methods:

- **Landscaped garden beds**: hand weeding, target spraying, mulch application
- **Turf**: broadleaf selective, target spraying i.e. around infrastructure
- **Kerblines**: target spraying
- **Medians**: blanket spraying, use of pre-emergent herbicides (where appropriate)
- **Hardstands and footpaths**: target spraying, use of pre-emergent herbicides (where appropriate)

- **Entry statements**: hand weeding, target spraying, mulch application.

Commercial Business Precinct

The CBP or Joondalup City Centre receives a higher frequency of weed control activities to maintain the area to a higher standard of appearance. The visual appearance of this area is particularly important given its role in supporting the City's economic activities and positive visitor experiences.

Weed control in the CBP is conducted through the following methods:

- **Parks**: broadleaf selective, target spraying i.e. around infrastructure.
- **Landscaped garden beds**: hand weeding, target spraying, broadleaf selective, mulch application.
- **Streetscapes**: hand-weeding, steam, hot water and steam, target spraying, broadleaf selective, mulch application.
- **Turf**: broadleaf selective, target spraying i.e. around infrastructure.
- **Kerblines**: steam, hot water and steam, mechanical removal.
- **Footpaths**: steam, hot water and steam, mechanical removal.
- **Medians (mulched)**: target spraying, mechanical removal and steam/hot water where appropriate.
- **Medians (hardstand)**: steam, hot water and steam, mechanical removal.
- **Median (other)**: broadleaf spraying, use of pre-emergent herbicides.
- **Hardstands and footpaths**: steam, hot water and steam, mechanical removal.

The CBP will be partly controlled using non-chemical weed control. The CBP chemical free treatment areas include the kerbs, footpaths, hardstand (paved) median islands, some mulched median islands and general paved areas only and is shown in Figure 17.

Figure 17: City of Joondalup Commercial Business Precinct[71]

[71] The CBP chemical free treatment areas include the kerbs, footpaths, hardstand (paved) median islands, mulched median islands and general paved areas only.

Pedestrian Access Ways

Weed control on pedestrian access ways (PAWs) is conducted from June to October in accordance with the annual scheduled maintenance and is subject to ongoing site inspections and reactive maintenance from November to May.

Weed control is conducted in PAWs through the following methods:

- Fence lines - target spraying
- Hardstands and footpaths - target spraying, use of pre-emergent herbicides.

City residents who own a property adjoining a PAW and wish to plant and maintain the PAW adjoining their residence can apply to be added to the City's Pedestrian Accessway Planting and Maintenance Register.

If approved by the City, chemical weed control will not be undertaken within the PAW by either the City or the registrants.

Sumps and Swales

The City has approximately 200 sumps with weed control being undertaken annually and more often if necessary. An example of a sump is shown in Figure 18. Weed control in sumps consists of mowing weeds and use of herbicide applications. It is conducted prior to summer to reduce fuel load and lower the fire hazard risk. Swales are mowed in accordance with the Annual Maintenance Schedule.

Figure 18: Sump at Shepherds Bush Reserve, Kingsley

Pesticide Use Notification

The City has implemented chemical application notification and exclusion registration processes to keep residents and stakeholders informed of the City's weed control application locations and scheduling or alternatively to allow them to register for their residence to be excluded from receiving any chemical weed control treatment.

City residents wishing to be advised in advance of scheduled spraying activities, occurring within 100m of their residence, can apply to be added to the City's Pesticide Use Notification Register. Residents listed on the Pesticide Use Notification Register will receive an automated notification at least 24 hours prior to spraying commencing. Further information on the Pesticide Use Notification Register can be found on the City's website.

Pesticide Use Notification – Locations Map and Schedule

The City also updates the Pesticide Use Notification – Locations Map and Schedule platform on the City's website weekly to provide a visual search tool, inclusive of an interactive map and searchable database, that displays areas where the City undertakes herbicide application activities and the activities status. The implementation of herbicide application as per the schedule is dependent on weather and the availability of operational resources.

Pesticide Exclusion Register

City residents and/or property owners wishing to exclude the verge immediately abutting their property/residence from chemical weed control can apply to be added to the City's Pesticide Exclusion Register.

Registration to the Pesticide Exclusion Register requires the resident to commit to:

- Maintaining their verge in a good and tidy condition, including weed removal
- Re-register at 30 June each year to remain on the Pesticide Exclusion Register
- Adhere to the City's Street Verge Guidelines.
- Understanding that the Pesticide Exclusion Register does not apply to parks, reserves or natural areas
- For tenanted properties, written confirmation from the property owner approving inclusion on the Register must be provided.
- That Main Roads WA roads are exempt from registration.

Innovation, continual improvement and training

The City is committed to delivering an innovative, holistic and integrated weed management program and will continue to undertake research and complete trials into alternate and emerging weed control and monitoring methods.

The City will provide its staff with professional development opportunities to learn and train in emerging weed control methods, best-practice weed management approaches and associated weed management training such as Green Card training. Further information is detailed in Section 5.3.

Management Recommendations

13. *Undertake weed control in parks and urban landscaping areas in accordance with the Annual Maintenance Schedule.*

14. *Implement steam and hot water weed control in accordance with specified scope. Undertake review of non-chemical weed control at expiration of contract.*

15. Continue to implement the Pesticide Use Notification Register, Pesticide Use Notification - Location Map and Schedule and Pesticide Exclusion Register.

4.3 Wetlands

Wetlands can contain weeds on the perimeter or aquatic weeds within the water body. The City manages 17 wetlands contained within parks, including being responsible for weed control (see Figure 19). Yellagonga Regional Park wetlands are managed separately through the *Yellagonga Integrated Catchment Management Plan 2021-2026*.

Alternative methods of weed control for weeds on the perimeter of wetlands, such as hand weeding, slashing and matting, to minimise the risk of chemicals entering the water bodies and risk to native fauna and flora, are preferable to using herbicides. Herbicides can enter water bodies through spray drift, dripping from treated plant foliage or landing on a hard surface (e.g. rock or gravel) and washing into the water.[72] However, some weed species are best controlled with the use of herbicides and can form part of an integrated weed management approach.

Aquatic weeds can be emergent (stems and leaves above waterline), free floating (not attached to the soil), floating leaf (rooted into soil with leaves on water surface) or submerged weeds (rooted into soil with the whole plant submerged under water). Aquatic weeds can be introduced through dumping of invasive garden pond plants or spread through mediums such as birds or boats. Weed control of aquatic weeds poses a risk to wildlife, fish and native plants in the wetland. Early control of aquatic weeds prevents weed spread. Some aquatic weeds can be controlled with the use of herbicides such as glyphosate and diquat.[73]

The City conducts wetland water quality monitoring three times a year in accordance with the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (2000) to monitor chemical and physical water conditions.

Weeds growing in or around wetlands are controlled either by physical removal or treatment with a herbicide formulated for use in or around wetlands.

The City undertakes regular inspections of wetlands accessing the overall health of the wetlands to assist with prioritising management actions. These inspections include assessment of weeds, litter, fauna, odour and water quality.

The City has developed and implements *Wetland Guidelines* for staff and contractors to minimise weed establishment and spread into and around wetlands.

<u>Bulrush</u>

Bulrush (*Typha orientalis*), previously considered an introduced species, was reclassified as being native to Western Australia by Keighery and McCabe in 2015.[74] Bulrush is capable of aggressive invasion and can transform wetland ecosystems largely as a result of landscape modifications.[75] Altered hydrology to permanently wet and increased nutrient flow benefit Bulrush over other native sedges which prefer lower nutrient levels and seasonal drying. [76]

[72] CRC for Australian Weed Management (2005b)
[73] Department of Agriculture and Food (2009)
[74] Keighery, G (2016)
[75] Keighery, G (2016)
[76] Keighery, G (2016)

Bulrush can rapidly change nutrient levels and water levels and flow, requiring active management to prevent it from becoming a weed. [77]

A clearing permit or exemption is required to undertake Bulrush control within its natural range, however exemptions under Schedule 6 Clause 3 of the *Environmental Protection Act 1986* allow the DBCA (including volunteers, and contractors) to undertake control works on DBCA managed land, such as within Yellagonga Regional Park without requiring a permit.[78,79] The City would require a clearing permit to undertake Bulrush control within any City owned or managed public open spaces, this includes wetlands but also urban landscaping areas such as sumps and drainage infrastructure. The City has not undertaken any Bulrush removal from its wetlands or other public open spaces.

Management Recommendations

16. *Continue to implement the Wetland Guidelines to provide direction to staff and contractors conducting weed control activities in and around wetland areas and minimise environmental impacts, where possible.*

[77] Keighery, G (2016)
[78] Keighery, G. (2016)
[79] DBCA (2019)

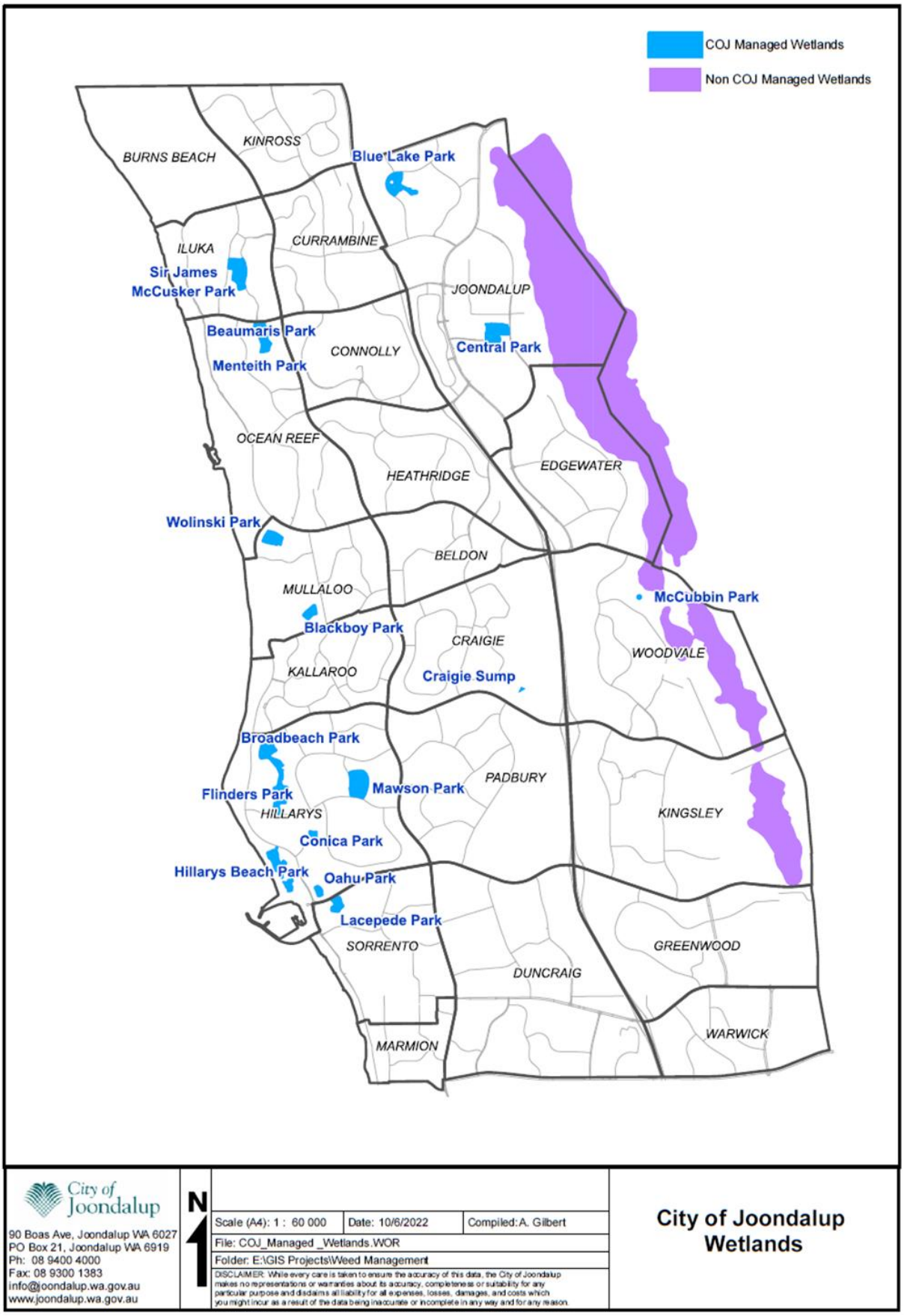


Figure 19: Wetlands managed by the City of Joondalup

Note: The City manages some natural areas adjacent to Yellagonga Regional Park but is not responsible for managing the water bodies.

5.0 Partnerships, Education and Training

An important component of this Plan is to ensure that the local community, visitors and those that manage the City's natural areas and parks have the necessary information to assist in protecting the City's natural areas and parks from the threat of weeds.

5.1 Partnerships

There are many organisations other than the City that have roles and responsibilities in weed management including State government, local governments, WALGA, natural resource management agencies, research organisations and Friends Groups.

The City liaises with a variety of external stakeholders regarding weed management, such as DBCA, DPIRD, Water Corporation, Main Roads WA, other local governments (e.g. City of Wanneroo and City of Stirling), WALGA, universities, schools and Friends Groups.

The City participates in WALGA's Local Government Herbicide Use and Integrated Weed Management Working Group. The purpose of the Working Group is to build the capacity of local government by sharing information and addressing knowledge gaps to deliver effective weed management programs. The City also advocates for natural areas specific alternate weed control treatment methods to be developed and trialled in WA through the Working Group.

Friends Groups are an important partner of the City in managing natural areas and reducing weeds and contribute substantially to bushland conservation. For example, the City's 19 Friends Groups voluntarily contributed 7,415 hours in 2020/21 towards bushland restoration in 23 natural areas. Friends Groups are involved in a variety of activities, including weed control, for their chosen reserve with the aim of restoring the reserve's conservation values and the community's appreciation for the natural environment.

The City works with Friends Groups to protect, maintain and enhance natural areas and assist Friends Groups through the provision of special purpose grants that can be used for weed control activities and assisting with on-ground works, including weed control. The City has also developed the *City of Joondalup Natural Areas Friends Group Manual* to provide an appropriate framework and process for City support of Friends Groups and volunteers including recognising roles and responsibilities and ensuring environmental best-practice issues such as weed management are understood and implemented.[80]

Management Recommendations

17. *Continue to participate in WALGA's Local Government Herbicide Use and Integrated Weed Management Working Group.*

18. *Continue to investigate opportunities to participate in research projects and take up opportunities for sharing information relating to best practice approaches to weed management.*

19. *Continue to partner with and support local Friends Groups to facilitate bushland restoration and weed management activities.*

[80] City of Joondalup (n.d.)d

5.2 Community Education

The City implements an Environmental Education Program to raise community awareness regarding weed prevention and control, particularly regarding the City's weed management approach, the impact of weeds and the importance of weed control.[5959]

Formatte

In order to educate the community about how they can prevent weed introduction and spread the City has developed a number of key brochures titled *'Being WEEDwise: Garden Escapees in the City of Joondalup'*[81], *'Being WEEDwise: Environmental Weeds in the City of Joondalup'*[82] and *'Protecting our Natural Areas and Parks'*.[83]

The community can support local biodiversity and prevent weed introduction and spread by:

- Conducting weed control in their gardens to prevent weed spread.
- Minimising their access and disturbance to natural areas by staying on tracks, not taking vehicles into natural areas, and not allowing dogs to run off-leash in natural areas.
- Undertaking appropriate hygiene practices such as cleaning footwear when entering and leaving natural areas, removing any weed seeds attached to clothing and removing and disposing appropriately of dog excrement (may contain weed seed).
- Reporting sightings of any priority or declared weeds observed within City owned or managed public open spaces.
- Planting local, native species in their gardens where possible.
- Opting for native species rather than invasive species in private gardens to reduce the spread of invasive species to natural areas.
- Not dumping garden rubbish in natural areas or parks.
- Joining a Friends Group to participate in bushland restoration and maintenance activities.

Schools are also an important avenue for raising awareness and interest in environmental and sustainability issues and creating future community members that are aware of and actively participate in local environmental management. Many schools are located adjacent to bushland areas which creates unique and educational learning opportunities for students.

As part of the Environmental Education Program, the City coordinates an Adopt a Coastline/Bushland program for students from years 4 to 7 to provide an interactive coastline/bushland management program. The coastline component of this program commenced in 2006/07 and the bushland component of this program commenced in 2014/15. The Program has had a positive impact on the natural environment as well as being an important education mechanism.

The City recognises that State Government also plays a big role in education and management of weeds, for example the DPIRD works with a range of land owners and managers, community groups and biosecurity groups, provides weed identification services and contributes to social science through weedwatcher. The DPIRD website provides a range of information, tools and programs that support community education. This includes the Western Australian Organism List, PestFacts WA newsletter, MyPestGuide™ Report to report weeds and the MyWeedWatcher project.

[81] City of Joondalup n.d(a)
[82] City of Joondalup n.d(b)
[83] City of Joondalup n.d.(c)

Management Recommendations

20. *Continue to implement an Adopt a Bushland/Coastline program for students to provide an interactive bushland and/or coastline management program.*

21. *Continue to distribute the 'Being WEEDwise' and 'Protecting our Natural Areas and Parks' brochures through the community.*

22. *Continue to implement the Environmental Education Program to raise awareness and encourage weed management practices.*

5.3 Training

The City continues to ensure its staff have the necessary knowledge and experience to undertake integrated weed management activities to ensure the program is safe, effective and innovative; resources are used productively; potential negative impacts are minimised as well as ensuring the safety of staff. Training is important for the continued development of staff knowledge and expertise. Training is particularly important for staff to learn about emerging weed management methods, such as the stem and hot water weed control method.

City staff are trained in the correct application and safe use of herbicides. Contractors directly involved in the use of herbicides are licenced and registered with the Department of Health under the *Health (Pesticides) Regulations 2011*.

City staff also complete Green Card training, and although focused on plant diseases and pathogens, the hygiene management practices are relevant to weed management.

City staff in the Natural Areas team are qualified with a Certificate in Conservation and Land Management or relevant experience. The City currently conducts regular plant identification training, including weed identification and management. City staff also undertake relevant training to increase knowledge of weed identification, safety and effective methods of weed control.

The City's Friends Groups help to protect, preserve and enhance significant bushland areas within the City and will continue to benefit from training related to weed management.
Through ongoing meetings with Friends Groups, the Friends Groups Coordinator shares information about weed hygiene practices to protect the biodiversity of natural areas.

Management Recommendations

23. *Ensure City staff working within natural areas and parks continue to undertake relevant training to increase knowledge of weed identification, safety and research on effective methods of weed control.*

24. *Continue to conduct ongoing weed hygiene practices information sharing with City Friends Groups.*

6.0 Implementation

Effective and coordinated implementation of the *Weed Management Plan* is critical to achieving the objectives of the Plan. Implementation of the Plan will be coordinated by annual reporting and review of the Plan.

6.1 Monitoring

The City will annually report on, evaluate and review the plan as part of an ongoing process.

6.1.1 Performance Measures

The following indicators will be monitored annually to determine the effectiveness of the City's weed management actions.

Indicator	Source	Measure	Reportable Period
Community satisfaction with conservation and natural area management	Customer Satisfaction Monitor	% of respondents satisfied with service	Biennial
Vegetation condition of City Major Conservation Natural Areas	Vegetation assessments (five yearly)	% of area per vegetation condition classification (as per the Keighery scale)	Once every five years per Major Conservation Natural Area
Fuel load of City Major Conservation Natural Areas	Fuel load assessments	Fuel load (tonnes/hectare)	Once every five years per Major Conservation Natural Area
Weed control in City Major Conservation Natural Areas.	Contractor monthly reports	Coverage (hectares) of weed control.	Annual
Community satisfaction with parks	Customer Satisfaction Monitor	% of respondents satisfied with service	Biennial
Weed control in playspaces	Non-chemical weed control contractor monthly reports	% of playspaces using non-chemical weed control methods	Annual
Weed control in sensitive areas	Non-chemical weed control contractor monthly reports	% kerblines and footpaths within 50 m of sensitive activities using non-chemical weed control	Annual
Community awareness of weed management	Corporate Business Plan	Number of events/initiatives.	Annual
Volunteer Hours	Friends Group Annual Work Plans	Total number of volunteer hours by City of Joondalup Friends Groups	Annual
Expenditure for weed management	Annual Budget	Total annual budget allocated to weed management per year	Annual

Note: the City's non-chemical weed control treatment commenced in July 2022 and will be applied to the same locations until the term of the contract and then be dependent upon review of the contract.

6.1.2 Reporting

The progress of recommended management actions and performance measures within the Plan will be reported against on an annual basis via the City's State of the Environment Report.

6.1.3 Review

The Weed Management Plan is to be reviewed and updated every 10 years with a major review undertaken every 5 years. This aligns with the timeframes for capital works programming and natural area management plans and will ensure the City is managing weeds in accordance with best practice approaches.

6.2 Recommendations

A total of 24 management actions have been recommended to coordinate and improve the City's weed management activities. A list of the recommended management actions is provided in the following table.

Recommended Management Actions

No.	Recommended Management Action	Relevant to Natural Areas	Relevant to Parks and Urban Landscaping Areas
1	Comply with the requirements of the *Aboriginal Cultural Heritage Act 2021* when conducting weed control, as required.	●	●
2	Continue to review and undertake weed control activities in accordance with the ISO 9001 Quality Management System and other relevant legislation.	●	●
3	Continue mapping of key priority weeds through regular inspections of natural areas in accordance with the Annual Maintenance Schedule to inform on ground weed management actions.	●	
4	Continue to assess high priority and medium priority natural areas every 5-7 years using the Natural Areas Initial Assessment Tool, including identification of weed species and their distribution in accordance with the Natural Areas Assessment Schedule.	●	
5	Continue to undertake photo monitoring in major conservation areas when measuring the natural areas key performance indicator annually to assess the effectiveness of ongoing weed control.	●	
6	Record and monitor the coverage (hectares) of weed control in major conservation natural areas.	●	
7	Continue to monitor for new weed populations, including new aggressive weed species, identified in the City to prioritise for weed control and prevent spread.	●	●
8	Continue to implement the Pathogen Hygiene Procedure, and Purchasing Guidelines for the Supply of Landscaping Materials to provide direction to staff and contractors and prevent the introduction and spread of weeds within the City.	●	●
9	Continue to implement the Fire Weed Management Guideline to inform staff and contractors about weed hygiene when undertaking manual fuel load reduction works and when constructing and maintaining firebreaks and access ways.	●	
10	Continue to implement weed control in natural areas in accordance with the Annual Maintenance Schedule.	●	
11	Continue to conduct weed control on verges adjacent to key natural areas including increasing mowing of verges to reduce weed seed spread, spraying of weeds and spreading of certified mulch, where required.	●	●

No.	Recommended Management Action	Relevant to Natural Areas	Relevant to Parks and Urban Landscaping Areas
12	Continue to implement the Fire Weed Management Guidelines to limit the infestation of weeds in the City's natural areas.	●	
13	Undertake weed control in parks and urban landscaping areas in accordance with the Annual Maintenance Schedule.		●
14	Implement steam and hot water weed control in accordance with specified scope. Undertake review of non-chemical weed control at expiration of contract.		●
15	Continue to implement the Pesticide Use Notification Register, Pesticide Use Notification - Location Map and Schedule and Pesticide Exclusion Register.	●	●
16	Continue to implement the Wetland Guidelines to provide direction to staff and contractors conducting weed control activities in and around wetland areas and minimise environmental impacts, where possible.	●	●
17	Continue to participate in WALGA's Local Government Herbicide Use and Integrated Weed Management Working Group.	●	●
18	Continue to investigate opportunities to participate in research projects and take up opportunities for sharing information relating to best practice approaches to weed management.	●	●
19	Continue to partner with and support local Friends Groups to facilitate bushland restoration and weed management activities.	●	
20	Continue to implement an Adopt a Bushland/Coastline program for students to provide an interactive bushland and/or coastline management program.	●	
21	Continue to distribute the 'Being WEEDwise' and 'Protecting our Natural Areas and Parks' brochures through the community.	●	●
22	Continue to implement the Environmental Education Program to raise awareness and encourage weed management practices.	●	●
23	Ensure City staff working within natural areas and parks continue to undertake relevant training to increase knowledge of weed identification, safety and research on effective methods of weed control.	●	●
24	Continue to conduct ongoing weed hygiene practices information sharing with City Friends Groups.	●	

7.0 References

ArborCarbon (2014) Using airborne MSI to manage weeds in urban bushland: City of Joondalup Natural Areas, Perth, Western Australia.

Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Artarmon, New South Wales.

Australian Association of Bush Regenerators (AABR), 2013, *The Bradley Method*, viewed 1 August 2022, http://www.aabr.org.au/learn/what-i-bush-regeneration/general-principles/the-bradley-method/.

Australian Glyphosate Sustainability Working Group, n.d., *Sustainable Glyphosate Use on Roadsides, Railways, Public Utilities and Parks*.

Australian Government, 2012a, *Impact of Weeds,* viewed 1 August 2022, http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/why/impact.html

Australian Government, 2012b, *Weeds in Australia*, viewed 1 August 2022, http://www.environment.gov.au/biodiversity/invasive/weeds/index.html.

Australian Government, 2012c, *Biological Control*, viewed 1 August 2022, http://www.environment.gov.au/biodiversity/invasive/weeds/management/biological-control.html

Australian Government, n.d., *Climate Change: Extreme climate events*, viewed 11 December 2013, http://www.climatechange.gov.au/climate-change/grants/australian-climate-change-science-program/extreme-climate-events.

Australian Government, 2022, Australia State of the Environment 2021, viewed 1 August 2022, https://soe.dcceew.gov.au/.

Australian Weeds Committee, n.d., *Weed Mapping*, viewed 1 August 2022, https://weeds.org.au/monitor/.

Banks,J. And Sandral, G., 2007, *Report on Weed Control using hot water/ steam and herbicides in the City of Joondalup*. Prepared for the City of Joondalup, Perth, Western Australia.

Banks and associates 2009, *Weed Control Trials comparing hydrothermal and herbicides in the City of Joondalup*. Prepared for the City of Joondalup, Perth, Western Australia.

Bettink, K. and Keighery, G., 2008, *Environmental Weed Census and Prioritisation, Swan NRM Region*, Swan Catchment Council and Department of Environment and Conservation, Perth, Western Australia.

Brown and Brooks, 2002, *Bushland Weeds: A practical guide to their management*, Perth, Western Australia.

City of Joondalup, n.d.(a), *Being WEEDwise – Environmental Weeds in the City of Joondalup*, Perth, Western Australia.

City of Joondalup, n.d.(b), *Being WEEDwise – Garden Escapees in the City of Joondalup*, Perth, Western Australia.

City of Joondalup, n.d.(c), *Protecting our Natural Areas and Parks*, Perth, Western Australia.

City of Joondalup, n.d.(d), *Natural Areas – Friends Group Manual*, Perth, Western Australia.

~~City of Joondalup, 2012a, *Draft City of Joondalup Environment Plan 2012-2015*, Perth, Western Australia.~~

City of Joondalup, 2012~~b~~, *Lilburne Park Management Plan*, Perth, Western Australia.

City of Joondalup, 2013, *Pathogen Management Plan 2013-2016*, Perth, Western Australia.

~~City of Joondalup, 2014, *City of Joondalup – Minutes of Meeting of Council – 17.02.14*, viewed 1 August 2022, http://www.joondalup.wa.gov.au/files/councilmeetings/2014/CJ140217_MIN.pdf.~~
City of Joondalup, 2014, *City of Joondalup Environment Plan 2014-2019*, Perth, Western Australia.

City of Joondalup, 2021, *City of Joondalup Weed Management Trial Presentation*, Perth, Western Australia.

City of Joondalup, 2022, *City of Joondalup – Minutes of Meeting of Council – 19-Jul-2022,* viewed 1 August 2022, https://api.joondalup.wa.gov.au/files/councilmeetings/2022/220719_CNCL_MIN.pdf

City of Nedlands, 2013, *Weed control decision saves more than $83,000,* Media Release November 2013, Perth, Western Australia.

Collins, M, 1999, *Thermal Weed Control, A Technology with a Future? Twelfth Australian Weeds Conference*, Hobart, Tasmania.

Conservation International, 2014, *Hotspots*, viewed 1 August 2022, https://www.conservation.org/priorities/biodiversity-hotspots.

Cooperative Research Centre (CRC) for Australian Weed Management, 2004, *Introductory Weed Management Manual*, Department of Environment and Heritage, Australia.

Cooperative Research Centre (CRC) for Australian Weed Management, 2005a, *Herbicide Guidelines: Knowing when and how to use them*, Glen Osmond, South Australia.

Cooperative Research Centre (CRC) for Australian Weed Management, 2005b, *Herbicide Guidelines: For use in and around water*, Glen Osmond, South Australia.

Commonwealth, Science and Industry Research Organisation (CSIRO), 2011, *Biological Control of Weeds,* viewed 1 August 2022, https://www.csiro.au/en/research/plants/Pathogens-Pests-Weeds/Biological-control-of-weeds.

Commonwealth, Science and Industry Research Organisation (CSIRO), 2013, *Weed Biological Control,* viewed 1 August 2022, https://research.csiro.au/weed-biocontrol/.

Department of Agriculture and Food, 2011, *Declared Plants in Western Australia*, Perth, Western Australia.

Department of Biodiversity, Conservation and Attractions (DBCA), 2019, *Reclassification of Typha orientalis as native to Western Australia and the implications under Environmental Protection Act 1986 and the Swan and Canning Rivers Management Regulations 2007*, viewed 31 March 2022, https://www.udiawa.com.au/wp-content/uploads/2019/05/Reclassification-of-Typha-orientalis-as-native-to-WA_implications-under-EP-Act_SCRM-Regs-external.pdf.

Department of Parks and Wildlife (DPaW), 1999, *Environmental Weed Strategy for WA*, Perth, Western Australia.

Department of Parks and Wildlife (DPaW), 2002, *Weed Control and Revegetation Plan*, Perth, Western Australia.

Department of Parks and Wildlife (DPaW), 2013, *Weed Prioritisation Process for DPaW*, Perth, Western Australia.

Department of Fire and Emergency Services (DFES), 2013, *Bush Fires Act 1957*, Perth, Western Australia.

Department of Planning, n.d., *Weeds and Weed Management*, website viewed 27 August 2013.

Department of Primary Industries (DPI), 2011, *Noxious and environmental weed control handbook – a guide to weed control in non-crop, aquatic and bushland situations, 5th Edition.* New South Wales.

Department of Primary Industries and Regional Development, 2022, *Environmental weed risk assessments*, viewed 1 August 2022, https://www.agric.wa.gov.au/rangelands/environmental-weed-risk-assessments.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC), 2012a, *Weed Prevention*, viewed 1 August 2013, http://www.environment.gov.au/biodiversity/invasive/weeds/management/prevention.html.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC), 2012b, *Why are weeds a problem?* viewed 13 February 2013, http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/why/index.html

Dunne, C., 2005, *Managing Phytophthora Dieback in Bushland*, Dieback Working Group and the Threatened Species Network, Perth, Western Australia.

Eurobodalla Shire Council, n.d., *Weed Control Methods*, website viewed 8 August 2013.

Fire and Emergency Services Authority (FESA) of Western Australia, 2011, *Biodiversity Conservation and Fire in Road and Rail Reserves: Management Guidelines*, Perth, Western Australia.

Government of South Australia, 2019, *Weed Management Techniques Fact Sheet*, Natural Resources Adelaide and Mt Lofty Ranges.

Groves, R.H., Boden, R. and Lonsdale, W.M., 2005, *Jumping the Garden Fence: Invasive Garden Plants in Australia and their Environmental and Agricultural Impacts*, CSIRO report prepared for WWF-Australia, WWF-Australia, Sydney, New South Wales.

Hudek, L., Enez, A., and Brau, L., 2021, Comparative Analyses of Glyphosate Alternative Weed Management Strategies on Plant Coverage, Soil and Soil Biota, *Sustainability 13*(20), viewed on 9 May 2022, https://doi.org/10.3390/su132011454.

Houghton Mifflin Company, 2009, *The American Heritage Dictionary of the English Language*, viewed 30 November 2012, http://www.thefreedictionary.com/herbicide.

Johansson, E., n.d., *Alternative Weed Control Methods*, website viewed on 27 August 2013.

John Banks and Associates, 2007, *Report on Weed Control Using Hot Water/ Steam in the City of Joondalup*, Prepared for the City of Joondalup.

John Banks and Associates, 2009, *Weed Control Trials Comparing Hydrothermal and Herbicides in the City of Joondalup*, Prepared for the City of Joondalup.

Keightery, G., 2016, Typha Orientalis in Western Australia' in Bushland News, Issue 97.

Leschenault Catchment Council, n.d., *Bringing Back the Bush*, website viewed 16 February 2015.

Natural Area Consulting, 2013, *Draft City of Joondalup Weed Treatment Trial – Interim Report December 2013*, unpublished report.

Natural Resource Management (NRM) Ministerial Council, 2007, *The Australian Weeds Strategy: A national strategy for weed management in Australia*, Canberra, Australian Capital Territory.

New South Wales (NSW) Government, n.d., *Weeds*, viewed on 26 November 2012, https://www.dpi.nsw.gov.au/biosecurity/weeds.

Nursery and Garden Industry, no date, *Way to Grow!,* viewed on 9 December 2013, http://ngiq.asn.au/wp-content/uploads/FINAL-NIASA-Production-A4-Brochure-05.pdf.

Penn State, 2014, *Adjuvants for Enhancing Herbicide Performance*, viewed on 2 April 2014, http://extension.psu.edu/pests/weeds/control/adjuvants-for-enhancing-herbicide-performance.

Scott, J.K., Webber, B.L., Murphy, H., Ota, N., Kriticos, D.J. & Loechel, B., 2014*, AdaptNRM Weeds and climate change: supporting weed management adaptation*. Available at: https://adaptnrm.csiro.au/wp-content/uploads/2014/08/Adapt-NRM_M2_WeedsTechGuide_5.1_LR.pdf.

State Weed Plan Steering Group, 2001, *A Weed Plan for Western Australia*, Perth, Western Australia.

The University of Queensland, 2011, *Weeds of Australia*, website viewed on 26 November 2012.

Water and Rivers Commission, 2001, *Water notes: Herbicide Use in Wetlands*, Perth, Western Australia.

WeedScience.org, 2013, *International Survey of Herbicide Resistant Weeds: Herbicide Resistant Weeds in Australia*, viewed 27 August 2013, http://weedscience.org/summary/Country.aspx.

Western Australian Herbarium, n.d., *Florabase*, viewed on 26 November 2012, https://florabase.dpaw.wa.gov.au/.

Western Australian Local Government Association (WALGA), 2014, *Biodiversity Program,* website viewed 25 April 2014.

Western Australian Local Government Association (WALGA), 2004, *Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region*, viewed 13 August 2014, https://walga.asn.au/getattachment/Policy-Advice-and-Advocacy/Environment/Biodiversity/swbp_lg_bio_planning_guide_adden.pdf?lang=en-AU.

Vigneault C. & Benoît D.L., 2001, *Electrical Weed Control: Theory and Applications*, viewed 28 February 2022, https://doi.org/10.1007/978-3-662-04584-8_12

8.0 Appendices

Appendix 1 – Natural Area Sites within Study Area (Alphabetically)

Appendix 2 - Prioritisation of City of Joondalup Natural Areas

Appendix 3 – Relevant Local, State and Federal Legislation, Policies, Plans and Strategies

Appendix 4 – Examples of City of Joondalup Priority Weeds

Appendix 5 – Weeds Identified in City of Joondalup and Weed Status

Appendix 6 – Weed Control Methods

Appendix 7 – Wetlands within City of Joondalup

Appendix 1 – Natural Area Sites within Study Area (Alphabetically)

Natural Area	Suburb
Adelaide Park	Craigie
Alfreton Park	Duncraig
Beaumaris Park	Ocean Reef
Bethany Park	Iluka
Blue Lake Park	Joondalup
Bonnie Doon Park	Connolly
Brisbane Park	Padbury
Burns Beach Foreshore Reserve	Burns Beach
Cadogan Park	Kingsley
Caledonia Park	Currambine
Callander Park	Kinross
Candlewood Park	Joondalup
Carnaby Reserve	Connolly
Castlecrag Park	Kallaroo
Cawarra Park	Craigie
Central Park	Joondalup
Chadlington Park	Padbury
Chichester Park	Woodvale
Christchurch Park	Currambine
Clermont Park	Currambine
Conidae Park	Heathridge
Craigie Open Space	Craigie
Cranston Park	Kinross
Culwalla Park	Kallaroo
Delamere Park	Currambine
Duncraig Library Bushland	Duncraig
Earlsferry Park	Kinross
Fairway Park	Connolly
Fernwood Park	Padbury
Finney Park	Marmion
Garrong Park	Edgewater
Glenbar Park	Duncraig
Greenshank Park	Joondalup
Gunida Park	Mullaloo
Haddington Park	Beldon
Harman Park	Sorrento
Hawker Park	Warwick
Hepburn Heights Conservation Area	Padbury
Hillarys Foreshore Reserve	Hillarys
Hilton Park	Duncraig
Huntingdale Park	Connolly
Huxley Park	Burns Beach
Iluka Foreshore Reserve	Iluka
Kallaroo Foreshore Reserve	Kallaroo
Kallaroo Park	Mullaloo
Kiernan Park	Kallaroo
Kilrenny Park	Greenwood
Korella Park	Mullaloo
Kuta Park	Iluka

Natural Area	Suburb
Lacepede Park	Sorrento
Lady Evelyn Park	Joondalup
Lakeside Park	Joondalup
Lakevalley Park	Edgewater
Ledge Park	Sorrento
Lilburne Park	Duncraig
Littorina Park	Heathridge
Lookout Park	Edgewater
Lysander Park	Heathridge
MacNaughton Park	Kinross
Madana Park	Craigie
Magpie Reserve	Marmion
Manapouri Park	Joondalup
Mandalay Park	Craigie
Marbella Park	Hillarys
Maritana Park	Kallaroo
Marmion Foreshore Reserve	Marmion
Menteith Park	Kinross
Mullaloo Foreshore Reserve	Mullaloo
Nanika Park	Joondalup
Naturaliste Park	Iluka
Negresco Park	Currambine
Neil Hawkins Park	Joondalup
Ocean Reef Foreshore Reserve	Ocean Reef
Okely Park	Edgewater
Pentland Park	Duncraig
Periwinkle Park	Mullaloo
Picnic Cove Park	Edgewater
Pine Valley Park	Connolly
Porteous Park	Sorrento
Quarry Park	Edgewater
Quarry Ramble Park	Edgewater
Riversdale Park	Currambine
Robin Park	Sorrento
Sandalford Park	Beldon
Shepherds Bush Reserve	Kingsley
Sir James McCusker Park	Iluka
Sorrento Foreshore Reserve	Sorrento
St Clair Park	Edgewater
St Michael's Park	Connolly
Stilt Park	Joondalup
Sweeney Park	Padbury
Timberlane Park	Woodvale
Trig Point Park	Ocean Reef
Trigonometric Park	Duncraig
Walsh Park	Joondalup
Warrandyte Park	Craigie
Warwick Open Space Bushland	Warwick
Water Tower Park	Joondalup

Appendix 2 – Prioritisation of City of Joondalup Natural Areas

Site	Suburb	Priority	Bush Forever Site	Local Planning Scheme No. 3, Environmental Conservation Zoning	Friends Group
Warwick Open Space Bushland	Warwick	Major Conservation Natural Area	●		●
Craigie Open Space Bushland	Craigie	Major Conservation Natural Area	●		●
Hepburn Conservation Area*	Padbury	Major Conservation Natural Area	●		●
Shepherd's Bush Park*	Kingsley	Major Conservation Natural Area	●		●
Lilburne Park	Duncraig	Major Conservation Natural Area		●	
Marmion Foreshore Reserve	Marmion	Major Conservation Natural Area			●
Sorrento Foreshore Reserve	Sorrento	Major Conservation Natural Area			●
Hillarys Foreshore Reserve	Hillarys	Major Conservation Natural Area	●		●
Kallaroo Foreshore Reserve	Kallaroo	Major Conservation Natural Area	●		●
Mullaloo Foreshore Reserve	Mullaloo	Major Conservation Natural Area	●		●
Ocean Reef Foreshore Reserve	Ocean Reef	Major Conservation Natural Area	●		●
Iluka Beach Foreshore Reserve^	Iluka	Major Conservation Natural Area	●		●
Burns Beach Foreshore Reserve	Burns Beach	Major Conservation Natural Area	●		
Cranston Park	Kinross	High Priority Natural Area			
Fairway Park	Connolly	High Priority Natural Area		●	
Lakeside Park	Joondalup	High Priority Natural Area			
Lakevalley Park	Edgewater	High Priority Natural Area		●	
Saint Clair / Quarry Park	Edgewater	High Priority Natural Area			
St Michaels Park	Connolly	High Priority Natural Area		●	
Lady Evelyn Park^	Joondalup	High Priority Natural Area			

Site	Suburb	Priority	Bush Forever Site	Local Planning Scheme No. 3, Environmental Conservation Zoning	Friends Group
Timberlane Park	Woodvale	High Priority Natural Area		●	
Beaumaris Park	Ocean Reef	High Priority Natural Area		●	
Bonnie Doon Park	Connolly	High Priority Natural Area		●	
Cadogan Park	Kingsley	High Priority Natural Area		●	●
Central Park	Joondalup	High Priority Natural Area			●
Clermont Park	Currambine	High Priority Natural Area		●	
Naturaliste Park	Iluka	High Priority Natural Area		●	
Chadlington Park	Padbury	High Priority Natural Area			
Neil Hawkins Park^*	Joondalup	High Priority Natural Area	●		●
Cawarra Park	Craigie	High Priority Natural Area		●	
Glenbar Park	Duncraig	High Priority Natural Area		●	●
Littorina Park^	Heathridge	High Priority Natural Area		●	
Maritana Park	Kallaroo	High Priority Natural Area		●	●
Periwinkle Park	Mullaloo	High Priority Natural Area		●	●
Porteous Park	Sorrento	High Priority Natural Area		●	●
Trigonometric Park	Duncraig	High Priority Natural Area			●
Blue Lake Park^	Joondalup	High Priority Natural Area		●	
Water Tower Park^	Joondalup	High Priority Natural Area		●	
Carnaby Reserve	Connolly	High Priority Natural Area		●	●
Kallaroo Park	Mullaloo	High Priority Natural Area			
MacNaughton Park	Kinross	High Priority Natural Area			
Nanika Park^	Joondalup	High Priority Natural Area		●	
Sandalford Park	Beldon	High Priority Natural Area		●	
Sir James McCusker Park	Iluka	High Priority Natural Area			
Huxley Park	Burns Beach	Medium Priority Natural Area			
Chichester Park	Woodvale	Medium Priority Natural Area			
Garrong Park	Edgewater	Medium Priority Natural Area			

Site	Suburb	Priority	Bush Forever Site	Local Planning Scheme No. 3, Environmental Conservation Zoning	Friends Group
Korella Park	Mullaloo	Medium Priority Natural Area			
Madana Park	Craigie	Medium Priority Natural Area			
Mandalay Park	Craigie	Medium Priority Natural Area			
Warrandyte Park	Craigie	Medium Priority Natural Area			
Alfreton Park	Duncraig	Medium Priority Natural Area		●	
Duncraig Library Bushland	Duncraig	Medium Priority Natural Area			●
Harman Park	Sorrento	Medium Priority Natural Area			●
Lacepede Park	Sorrento	Medium Priority Natural Area			
Picnic Cove Park	Edgewater	Medium Priority Natural Area	●		●
Negresco Park^	Currambine	Medium Priority Natural Area			
Robin Park	Sorrento	Medium Priority Natural Area			●
Finney Park	Marmion	Medium Priority Natural Area			
Bethany Park	Iluka	Medium Priority Natural Area			
Caledonia Park	Currambine	Medium Priority Natural Area		●	
Huntingdale Park	Connolly	Medium Priority Natural Area			
Kuta Park	Iluka	Medium Priority Natural Area			
Manapouri Park^	Joondalup	Medium Priority Natural Area			
Greenshank Park	Joondalup	Medium Priority Natural Area			
Pine Valley Park	Connolly	Medium Priority Natural Area		●	
Adelaide Park	Craigie	Medium Priority Natural Area			
Callander Park	Kinross	Medium Priority Natural Area			
Castlecrag Park	Kallaroo	Medium Priority Natural Area			
Conidae Park	Heathridge	Medium Priority Natural Area			
Earlsferry Park	Kinross	Medium Priority Natural Area			
Lysander Park	Heathridge	Medium Priority Natural Area			
Menteith Park	Kinross	Medium Priority Natural Area			
Okely Park	Edgewater	Medium Priority Natural Area			

Site	Suburb	Priority	Bush Forever Site	Local Planning Scheme No. 3, Environmental Conservation Zoning	Friends Group
Brisbane Park	Padbury	Medium Priority Natural Area			
Candlewood Park^	Joondalup	Medium Priority Natural Area		●	
Gunida Park	Mullaloo	Medium Priority Natural Area			
Ledge Park	Sorrento	Medium Priority Natural Area			
Quarry Ramble Park	Edgewater	Medium Priority Natural Area		●	
Trig Point Park	Ocean Reef	Medium Priority Natural Area			

Note: Sites in Appendix 1 that are not listed in the above table are classified as low priority and no weed management activities are undertaken.

* = State Heritage Site
^ = Aboriginal Heritage Site

Appendix 3 – Relevant Local, State and Federal Legislation, Policies, Plans and Strategies

Local Government

The purpose of the *Weed Management Plan* aligns with the environmental aims and objectives of a number of City of Joondalup Plans including:

Strategic Community Plan

The *City of Joondalup Strategic Community Plan 2022 – 2032* highlights the focus on conservation, rehabilitation and accessibility of the City's natural assets and the importance of engaging with the community, key stakeholders and relevant agencies.

Environment Plan

The *City of Joondalup Environment Plan 2014 – 2019* provides strategic direction in the delivery of environmental initiatives within the City.

Biodiversity Action Plan

The *City of Joondalup Biodiversity Action Plan 2009 – 2019* provides direction for the City's biodiversity management activities and details the development of individual Natural Areas Management Plans as an action.

City of Joondalup Pest Plant Local Law 2012

Under the *Agriculture and Related Resources Protection Act 1976* and the *Local Government Act 1995*, the Council of the City of Joondalup made the *Pest Plant Local Law 2012* to require the owner or occupier of private land within the City district to destroy, eradicate or otherwise control pest plants within a specified time. Caltrop (*Tribulus terrestis*) is designated as a pest plant. Caltrop has been identified within the City.

Local Biodiversity Program (formerly Perth Biodiversity Project)

The City of Joondalup is one of 32 local governments participating in the Western Australian Local Government Association's (WALGA's) Local Biodiversity Program. The aim of the Local Biodiversity Program is to support local governments to effectively integrate biodiversity conservation into land use planning to protect and manage local natural areas.

As part of the Local Biodiversity Program, the City assessed all natural areas from 2004 onwards using the ecological criteria of the Natural Area Initial Assessment process, resulting in a priority ranking of natural areas. The City assess major conservation, high priority and medium priority natural areas approximately every 5-7 years using this assessment tool.

Natural Area Initial Assessments include a desktop assessment and field survey and document information such as:

- vegetation complexes;
- threatened or significant flora or ecological communities;
- structural plant communities;
- weed species;
- vegetation condition assessment;
- ecological criteria rankings;

- a viability estimate; and
- fauna species observed.

Herbicide Use and Integrated Weed Management for Local Government Communications Strategy and Action Plan, 2021

WALGA established the *Local Government Herbicide and Integrated Weed Management Working Group*, to build the capacity of Local Government to develop and implement effective weed control programs that are most suitable for their local context.

The City has representatives on the Working Group.

State Government

Relevant Legislation, Policies and Documents

Biodiversity Conservation (BC) Act 2016

The BC Act provides for the conservation and protection of biodiversity, particularly threatened species and threatened ecological communities. Although the Act does not directly refer to invasive weed species; invasive weed species can that threaten or may threaten biodiversity.

Biosecurity and Agriculture Management Act 2007

The Act gives provision to prevent new animals and plant pests (vermin and weeds) and diseases from entering WA and manages the impact and spread of those pests already present in the State. The Act also gives provision to safely manage the use of agricultural chemicals. There are 67 species on the list of declared pest plants in WA.

The City contains 8 known declared pest plants.

Environmental Protection (EP) Act 1986

The EP Act provides for the protection of the environment and prevention of environmental harm, nuisances and contamination. The *Environmental Protection Act 1994* also sets out enforcement tools that can be used when offences or acts of non-compliance are identified.

Work Health and Safety Act 2020

The *Work Health and Safety Act 2020* requires organisations to keep a current register of hazardous chemicals used in the workplace, provide workers with information and training on the risks associated with their use (storage, handling and disposal) and to take precautions to eliminate or minimise the risk of injury.

Health (Pesticide) Regulations 2011

The ~~WA Department of Health administers the~~ *Health (Pesticides) Regulations 2011*~~,~~ ~~which~~ provide for the safe use and application of pesticides, including herbicides, through appropriate registration and licensing of businesses and persons involved in weed control.

Minor Use of Chemicals Permit

The Department of Agriculture and Food Western Australia (WA) (now known as DPIRD) are the Permit Holder of a Permit to Allow Minor Use of an Agvet Chemical Product for the Control of Environmental Weeds in Various Situations (Permit number PER1333). This permit is in

force from 2 March 2012 to 31 March 2025.). This permit was issued by the Australian Government Australian Pesticides and Veterinary Medicines Authority and allows the use of stated products in a manner other than specified on the approved product label in WA.

Possession of an off-label permit allows use of certain chemicals for specific applications not written on the label. The permit is approved for use by all people controlling weeds in wetlands, forests, bushlands and non-crop areas, but is not for use in residential areas. The permit specifies the methods that must be followed for herbicide use, including the chemicals and dose rates that can be applied to environmental weeds.

Also useful for bushland management are off-label permits for declared plants (Permit number PER13236) valid from 2 December 2011 to 31 December 2022 and for the control of *Phytophthora* in native vegetation (Permit number PER13534) valid from 28 November 2012 to 31 October 2023. There are also further limitations on the herbicides that can be used in water catchment areas (Circular Number PSC 88).

State Weed Plan 2001

A Weed Plan for WA (2001), referred to as the 'State Weed Plan' was developed by the State Weed Plan Steering Group to help achieve coordinated, effective weed management throughout WA.

Federal Government

Biosecurity Act 2015

The *Biosecurity Act 2015* is co-administered by the Ministers responsible for Agriculture and Water Resources, and Health, and aims to provide Australia a strong biosecurity system to protect our way of life from the threat of exotic pests and diseases to our unique environment, the economy, our health and our agricultural industries.

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act can, among other things, list key threatening processes, such as invasive weed species that threaten or may threaten the survival, abundance or evolutionary development of a native species or ecological community.

Australian Weeds Strategy 2017 - 2027

The Australian Weeds Strategy provides a national framework for addressing weed issues whilst maintaining the sustainability of Australia's primary industries and reducing the impact of weeds on the environment.

National Established Pests and Diseases of National Significance Management Framework

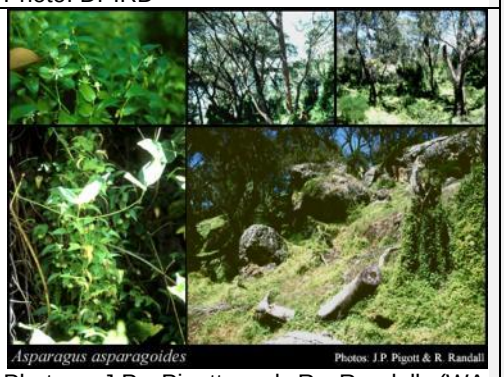
This framework establishes policy principles to guide government decision making to better manage pests and diseases of national significance; clarifies the role of government; and establishes criteria to determine which established pests and diseases should be deemed 'nationally significant.'

There are currently 32 Weeds of National Significance (WoNS) in Australia. The City contains 5 known Weeds of National Significance.

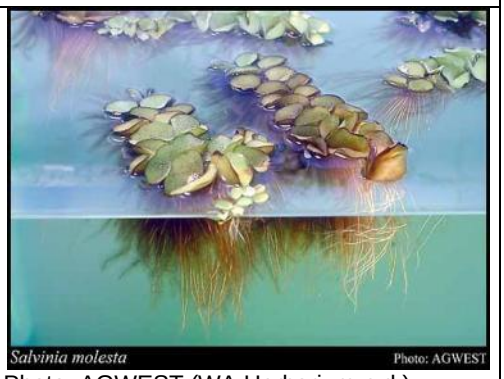
Appendix 4 – Examples of City of Joondalup Priority Weeds

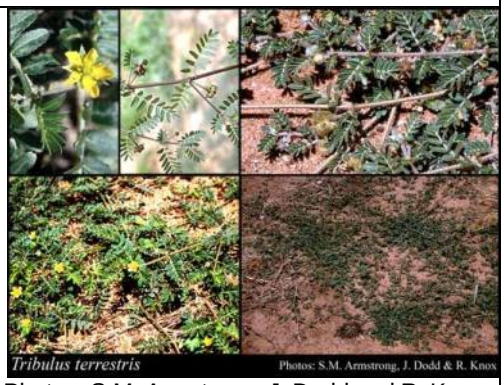
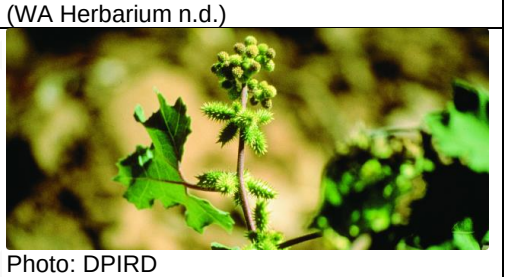
Table 6~~Table 6~~ outlines the pest plant, declared pest plants and Weeds of National Significance within the City.

Table 6: Pest Plants, Declared Plants and Weeds of National Significance in the City of Joondalup

Latin Name	Common Name	Declared Pest Plant	Weeds of National Significance	Image
**Argemone mexicana*	Mexican Poppy	Yes – C1		 Photo: DPIRD
**Asparagus asparagoides*	Bridal Creeper	Yes – No Control Category	Yes	 Photos: J.P. Pigott and R. Randall (WA Herbarium n.d.)
**Chondrilla juncea*	Skeleton Weed	Yes – C3	-	 Photos: B. Hoskins and J. Dodd (WA Herbarium n.d.)
**Chrysanthemoides monilifera* subsp. *monilifera*	Boneseed	Yes- C2	Yes	 Photos: H. Cherry and R. Knox (WA Herbarium n.d.)

Latin Name	Common Name	Declared Pest Plant	Weeds of National Significance	Image
**Cirsium arvense*	Perennial Thistle, Canada Thistle	Yes- C1	-	 Photo: C.G. Wilson (Aust Government 2012)
**Hydrocotyle verticillata*	Shield Pennywort	Yes – C1		 Photo: DPIRD
**Lantana camara*	Lantana	Yes – C3	Yes	 Photo: A. Johnson (NSW Government n.d.)
**Moraea flaccida*	One-leaf Cape Tulip	No control category		 Photo: DPIRD
**Moraea miniata*	Two-leaf Cape Tulip	No control category		 Photo: DPIRD

Latin Name	Common Name	Declared Pest Plant	Weeds of National Significance	Image
**Salvinia molesta*	Salvinia	Yes - C2	Yes	 Photo: AGWEST (WA Herbarium n.d.)
**Silybum marianum*	Variegated Thistle	No control category	-	 Photos: R. Knox and J. Dodd (WA Herbarium n.d.)
**Solanum linnaeanum*	Apple of Sodom	No control category		 Photo: DPIRD
**Tamarix aphylla*	Athel Tree, Tamarisk, Tamarix	No control category	Yes	 Photos: K.C. Richardson (WA Herbarium n.d.)

Latin Name	Common Name	Declared Pest Plant	Weeds of National Significance	Image
**Tribulus terrestris*	Caltrop*	-	-	 Photos: S.M. Armstrong, J. Dodd and R. Knox (WA Herbarium n.d.)
**Xanthium strumarium*	Noogoora burr	Yes – C3		 Photo: DPIRD
**Zantedeschia aethiopica*	Arum Lily	No control category		 Photos: K. Dean, R. Knox and AGWA (WA Herbarium n.d.)

Notes:

* = Pest plant under *Local Government Act 1995*

The following summarises the effect of the declaration categories for plants under the *Biosecurity and Agriculture Management Act 2007*:

- C1: Exclusion – Pests are assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
- C2: Eradication - Pests are assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still feasible.
- C3: Management - Pests are assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Appendix 5 – Weeds Identified in City of Joondalup and Weed Status

Scientific Name	Common Name	Weeds of National Significance	WA Declared Pest Plant	Local Pest Plant
Acacia baileyana	Cootamundra Wattle			
Acacia dealbata				
Acacia iteaphylla	Flinders Range Wattle			
Acacia longifolia	Sydney Wattle			
Acacia longifolia subsp. *sophorae*				
Acacia microbotrya	Manna Wattle			
Acacia podalyriifolia	Queensland Silver Wattle			
Acacia pycnantha	Golden Wattle			
Acacia trigonophylla				
~~*Acacia xanthina*~~	~~White-stemmed Wattle~~			
Acetosa vesicaria	Ruby Dock			
Agave americana	Century Plant			
Agonis flexuosa^	Weeping Peppermint			
Aira caryophyllea	Silvery Hairgrass			
Aira cupaniana	Silvery Hairgrass			
Aizoon pubescens	Coastal Galenia			
Alyssum linifolium	Flax-leaf Alyssum			
Ammophila arenaria	Marram Grass			
Aphanes arvensis	Parsley Piert			
Aptenia cordifolia	Gartenflora			
Arctotheca calendula	Cape Weed			
Arctotheca populifolia	Dune Acrotheca			
Arctotis stoechadifolia	White Arctotis			
Arenaria leptoclados				
Argemone mexicana	Mexican Poppy		●	
Argemone ochroleuca	Mexican Poppy			
Argyranthemum frutescens	Marguerite			
Asparagus asparagoides	Bridal Creeper	●	●	
Asphodelus fistulosus	Onion Weed			
Avena barbata	Bearded Oat			
Avena fatua	Wild Oat			
Babiana nana	Baboon Flower			
Banksia nivea	Honeypot Dryandra			
Banksia prionotes (Wheatbelt Form)	Acorn Banksia			
Bellardia trixago	Bellardia			
Brassica barrelieri				
Brassica tournefortii	Mediterranean Turnip			
Briza maxima	Blowfly Grass			
Briza minor	Shivery Grass			

Scientific Name	Common Name	Weeds of National Significance	WA Declared Pest Plant	Local Pest Plant
Bromus catharticus	Prairie Grass			
Bromus diandrus	Brome Grass			
Bromus hordeaceus	Soft Brome			
Bromus madritensis	Madrid Brome			
Bromus rubens	Red Brome Grass			
Cakile maritima	Sea Rocket			
Callistemon citrinus				
Callitris preissii^	Rottnest Island Pine			
Calothamnus rupestris	Mouse Ears			
Carduus pycnocephalus	Slender Thistle			
Carpobrotus aequilaterus	Angular Pigface			
Carpobrotus edulis	Hottentot Fig (Pig Face)			
Casuarina equisetifolia	Sheoak			
Catapodium rigidum	Rigid Fescue			
Cenchrus clandestinus	Kikuyu			
Cenchrus echinatus	Mossman River Grass, Burrgrass			
Cenchrus setaceus	Fountain Grass			
Centaurea melitensis	Maltese Cockspur			
Centaurium erythraea	Common Centaury			
Centaurium pulchellum	Lesser Centaury			
Centranthus macrosiphon	Spanish Valerian			
Centranthus ruber	Red Valerian			
Cerastium glomeratum	Mouse Ear Chickweed			
Ceratonia siliqua	Carob Tree			
Chamaecytisus palmensis	Tagasaste			
Chamelaucium uncinatum	Geraldton Wax			
Chasmanthe floribunda	African Cornflag			
Chenopodium macrospermum				
Chondrilla juncea	Skeleton Weed		●	
Chrysanthemoides monilifera subsp. *monilifera*	Boneseed	●	●	
Cicendia filiformis	Slender Cicendia			
Cirsium arvense	Perennial Thistle, Canada Thistle		●	
Cirsium vulgare	Spear Thistle			
Citrullus lanatus	Pie Melon			
Conospermum triplinervium	Tree Smokebush			
Coprosma repens	Mirror Plant			
Cortaderia selloana	Pampas Grass			
Cotula australis	Common Cotula			
Cotula turbinata	Funnel Weed			

Scientific Name	Common Name	Weeds of National Significance	WA Declared Pest Plant	Local Pest Plant
Crassula alata				
Crassula glomerata				
Crassula thunbergiana				
Cucumis myriocarpus	Paddy Melon			
Cuscuta epithymum	Lesser Dodder			
Cuscuta planiflora	Small-seeded Alfalfa Dodder			
Cynara cardunculus	Artichoke Thistle, Cardoon			
Cynodon dactylon	Couch			
Cyperus eragrostis	Umbrella Grass			
Cyperus rotundus	Nut Grass			
Cyperus tenellus	Tiny Flagsedge			
Digitaria ciliaris	Summer Grass			
Digitaria sanguinalis	Crab Grass			
Dimorphotheca ecklonis	Veldt Daisy			
Diplolaena dampieri	Southern Diplolaena			
Diplotaxis muralis	Wall Rocket			
Diplotaxis tenuifolia	Sand Rocket			
Disa bracteata	South African Orchid			
Dischisma arenarium				
Dischisma capitatum	Woolly-headed Dischisma			
Dittrichia graveolens	Stinkwort			
Dysphania ambrosioides	Mexican Tea			
Echium plantagineum	Paterson's Curse			
Ehrharta calycina	Perennial Veldt Grass			
Ehrharta longiflora	Annual Veldt Grass			
Eleusine indica	Crowsfoot			
Emex australis	Doublegee			
Emex spinosa	Lesser Jack			
Eragrostis curvula	African Lovegrass			
Erigeron bonariensis	Flaxleaf Fleabane			
Erigeron canadensis				
Erigeron sumatrensis	Tall Fleabane			
Erodium botrys	Long Storksbill			
Erodium cicutarium	Common Storksbill			
Erodium cygnorum	Blue Heronsbill			
Erodium moschatum	Musky Crowfoot			
Eucalyptus caesia	Caesia			
Eucalyptus platypus	Moort			
Eucalyptus utilis	Coastal Moort			
Euphorbia cyathophora	Painted Spurge			
Euphorbia paralias	Sea Spurge			

Scientific Name	Common Name	Weeds of National Significance	WA Declared Pest Plant	Local Pest Plant
Euphorbia peplus	Petty Spurge			
Euphorbia terracina	Geraldton Carnation Weed			
Ferraria crispa	Black Flag			
Ficus carica	Fig			
Foeniculum vulgare	Fennel			
Freesia alba x leichtlinii				
Freesia sp.	Freesia			
Fumaria bastardii				
Fumaria capreolata	Whiteflower Fumitory			
Fumaria muralis	Wall Fumitory			
Galenia pubescens var. *pubescens*	Coastal Galenia			
Galium murale	Small Goosegrass			
Gamochaeta calviceps	Cudweed			
Gamochaeta coarctata				
Gazania linearis	Gazania			
Genista monspessulana	Cape Broom			
Geranium molle	Dove's Foot Cranesbill			
Gladiolus angustus	Long Tubed Painted Lady			
Gladiolus caryophyllaceus	Wild Pink Gladiolus			
Gladiolus undulatus	Wavy Gladiolus			
Gomphocarpus fruticosus	Narrowleaf Cottonbush			
Grevillea leucopteris	White Plume Grevillea			
Grevillea robusta	Silky Oak			
Hedypnois rhagadioloides subsp. Cretica				
Heliophila pusilla				
Hesperantha falcata				
Hordeum leporinum	Barley Grass			
Hydrocotyle verticillata	Shield Pennywort		●	
Hyparrhenia hirta	Tambookie Grass			
Hypochaeris glabra	Smooth Catsear			
Hypochaeris radicata	Flat Weed			
Ipomoea cairica	Coast Morning Glory			
Ipomoea indica	Morning Glory			
Isolepis marginata	Course Club-rush			
Ixia maculata	Yellow Ixia			
Lachenalia bulbifera				
Lachenalia reflexa	Yellow Soldier, Cape Cowslip			
Lactuca saligna	Wild Lettuce			
Lactuca serriola	Prickly Lettuce			
Lagurus ovatus	Hare's Tail Grass			

Scientific Name	Common Name	Weeds of National Significance	WA Declared Pest Plant	Local Pest Plant
Lantana camara	Lantana	●	●	
Lathyrus tingitanus	Tangier Pea			
Lavandula stoechas	Italian Lavender			
Leptospermum laevigatum	Victorian (Coastal) Tea Tree			
Leontodon rhagadioloides	Cretan Weed			
Lobularia maritima	Sweet Alyssum			
Lolium perenne	Perennial Rye Grass			
Lolium rigidum	Wimmera Ryegrass			
Lupinus albus	White Lupin			
Lupinus angustifolius	Narrowleaf Lupin			
Lupinus cosentinii	Blue Lupin			
Lysimachia arvensis	Pimpernel			
Lysimachia arvensis var. *caerulea*				
Malva arborea	Tree Mallow			
Malva parviflora	Marshmallow			
Matthiola incana	Common Stocks			
Medicago littoralis	Strand Medic			
Medicago polymorpha	Burr Medic			
Melaleuca lanceolata	Rottnest Teatree			
Melaleuca nesophila	Mindiyed			
Melia azedarach	White Cedar			
Melilotus indicus	Yellow Sweet Clover			
Melinis repens	Ruby Grass			
Mesembryanthemum crystallinum	Ice Plant			
Monoculus monstrosus				
Montanoa sp.				
Moraea flaccida	One-leaf Cape Tulip		●	
Moraea miniata	Two-leaf Cape Tulip		●	
Morus alba	White Mulberry			
Nothoscordum gracile	False Garlic			
Oenothera drummondii	Beach Evening Primrose			
Oenothera glazioviana	Evening Primrose			
Oenothera stricta	Common Evening Primrose			
Olea europaea	Olive			
Onopordum acaulon	Stemless Thistle			
Ornithogalum arabicum	Lesser Cape Lily			
Ornithopus pinnatus	Slender Serradella			
Orobanche minor	Lesser Broomrape			
Osteospermum ecklonis	Cape Daisy			
Oxalis	Oxalis			

Scientific Name	Common Name	Weeds of National Significance	WA Declared Pest Plant	Local Pest Plant
Oxalis incarnata	Oxalis incarnata			
Oxalis pes-caprae	Soursob			
Oxalis purpurea	Largeflower Wood Sorrel			
Papaver rhoeas	Field Poppy			
Parentucellia latifolia	Common Barista			
Paspalum dilatatum	Dallis Grass			
Passiflora foetida	Stinking Passion Flower			
Pelargonium capitatum	Rose Pelargonium			
Pentameris airoides	False Hairgrass			
Pentameris airoides subsp. Airoides				
Pentameris pallida	Pentameris pallida			
Petrorhagia dubia	Hairy Pink			
Petrorhagia velutina	Velvet Pink			
Phoenix dactylifera	Date Palm			
Phyllopodium cordatum				
Phytolacca octandra	Red Ink Weed			
Plantago lanceolata	Rainbow Plantain			
Poa annua	Winter Grass			
Polycarpon tetraphyllum	Fourleaf Allseed			
Polygala myrtifolia	Butterfly Bush			
Polypogon monspeliensis	Annual Beardgrass			
Poinsettia	Poinsettia			
Raphanus raphanistrum	Wild Radish			
Retama raetam	White Broom			
Ricinus communis	Castor Oil Plant			
Romulea flava				
Romulea rosea	Guildford Grass			
Romulea rosea var. *australis*	Guildford Grass			
Rostraria cristata	Annual Cat's-tail Grass			
Rumex acetosella	Sorrel			
Sagina apetala	Annual Pearlwort			
Salvinia molesta	Salvinia	●	●	
Scaevola paludosa				
Schinus terebinthifolious	Brazilian Pepper			
Senecio elegans	Purple Groundsel			
Senecio mikanioides	Cape Ivy			
Senecio vulgaris	Common Groundsel			
Silene gallica	French Catchfly			
Silene gallica var. *gallica*				
Silybum marianum	Variegated Thistle		●	
Solanum linnaeanum	Apple of Sodom		●	

Scientific Name	Common Name	Weeds of National Significance	WA Declared Pest Plant	Local Pest Plant
Solanum nigrum	Black Berry Nightshade			
Soliva sessilis	Bindii			
Sonchus asper	Rough Sowthistle			
Sonchus oleraceus	Common Sowthistle			
Sparaxis bulbifera				
Sporobolus africanus	Parramatta Grass			
Stellaria media	Chickweed			
Stenotaphrum secundatum	Buffalo Grass			
Tagetes minuta	Stinking Roger			
Tamarix aphylla	Athel Tree, Tamarisk, Tamarix	●	●	
Taraxacum officinale	Dandelion			
Tetragonia decumbens	Sea Spinach			
Thinopyrum distichum				
Thinopyrum junceiforme	Sea Wheatgrass			
Trachyandra divaricata	False Onion Weed			
Tribulus terrestris	Caltrop			●
Tribolium uniolae	Tribolium			
Trifolium arvense	Hare's Foot Clover			
Trifolium arvense var. *arvense*				
Trifolium campestre	Hop Clover			
Trifolium dubium	Suckling Clover			
Trifolium hirtum	Rose Clover			
Trifolium repens	White Clover			
Trifolium subterraneum	Subterranean Clover			
Trifolium tomentosum	Woolly Clover			
Triticum aestivum	Wheat			
Tropaeolum majus	Nasturtium			
*Typha orientalis**	Non-local Bulrush			
Urospermum picroides	False Hawkbit			
Ursinia anthemoides	Ursinia			
Ursinia anthemoides subsp. anthemoides				
Vellereophyton dealbatum	White Cudweed			
Verbascum virgatum	Twiggy Mullien			
Verbena rigida var. *rigida*				
Verbesina encelioides	Golden Crownbeard			
Vicia sativa	Common Vetch			
Vulpia bromoides	Squirrel Tail Fescue			
Vulpia fasciculata				
Vulpia muralis				
Vulpia myuros	Rat's Tail Fescue			

Scientific Name	Common Name	Weeds of National Significance	WA Declared Pest Plant	Local Pest Plant
Wahlenbergia capensis	Cape Bluebell			
Washingtonia filifera	Desert Fan Palm			
Watsonia meriana var. *bulbillifera*	Watsonia			
Watsonia meriana var. *meriana*	Watsonia			
Xanthium strumarium	Noogoora burr		●	
Zantedeschia aethiopica	Arum Lily		●	

^ Indicates species that are naturalised and may be native to certain areas of the City of Joondalup.
* Indicates a species that has recently been reclassified as native but can be highly invasive.

Appendix 6 – Weed Control Methods

Weed Control Methods Used by the City of Joondalup

Weed Control Method	Suitable for Species	Notes	Advantages	Disadvantages
Hand removal or digging	Many annual species and for relatively small infestations	Need to remove the entire plant	• Young plants can be easy to pull out if soil is moist • Allows for selective removal of weeds	• Can be difficult to remove plants if soil is dry or plants are large • Time consuming and labour intensive • Digging can cause soil disturbance and disturb the root systems of native vegetation
Spot spray	Small populations of weeds	Application of diluted herbicide with hand-held spray guns	• Targeted weed application • Quick and cheap method to control low populations of weeds spread over large areas	• Time consuming in large areas
Cut and paint	Woody weeds (low numbers)	The plant is cut off close to ground level with a horizontal cut and undiluted herbicide (according to Permit or label) is applied immediately to the cut surface[84]	Targeted weed application	• Time consuming for large populations • Weed has to be felled prior to treatment • Can cause root suckers
Basal bark treatment	Woody weeds and root suckers (low numbers)	Diluted herbicide (rates according to Permit or label) is painted or sprayed on to the bark at the base, from ground level to 30cm high.[8484]	• Targeted weed application • No risk of regrowth	• Time consuming for large populations

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[84] Eurobodalla Shire Council (n.d.)

Weed Control Method	Suitable for Species	Notes	Advantages	Disadvantages
~~Wick~~ Weed wiping[85]	Tall weeds and broadleaf weeds	Herbicides can be wiped on to individual plants with an appropriate ~~weed wiper, rope wick~~ applicator.~~r or sponge roller.~~	• Targeted weed application • Reduces risk of off-target damage	• Only controls weeds which grow above surrounding vegetation. • Time consuming for large populations • Rope wicks can be ineffective due to dripping and clogging with dirt • Multiple treatments may be required
Mowing	Annual species	Mowing down aboveground biomass. To be done before seed set.	• Delays production of seed • Will eventually deplete the soil seed store	• Not a permanent method of control • Can result in spreading of seed, if plants have already seeded[86] • Should be combined with another weed control method
Mulching using loose particles of organic matter	All	Most effective if weeds are cleared before applying. Certified weed and pathogen free mulch should be used. Planting species in mulch suppresses weed growth.[87]	• Provides organic matter as it breaks down • Helps retain water	• Some weeds may still grow • Difficult to apply around non-target species
Slashing or brushcutting	Annual species	Slashing or brushcutting aboveground biomass. To be done before seed set.	• Delays production of seed • Will eventually deplete the soil seed store	• Not a permanent method of control • Can result in spreading of seed, if plants have already seeded[88] • Should be combined with another weed control method

[85] Government of South Australia (2019)
[86] Eurobodalla Shire Council (n.d.)
[87] Johansson (n.d.)
[88] Eurobodalla Shire Council (n.d.)

Weed Control Method	Suitable for Species	Notes	Advantages	Disadvantages
Steam	Young weeds	Jets of steam are applied to weeds through standard spray nozzles enclosed under a steel housing	• More effective than flame weeders	• Requires significant energy and water • Difficult to get the steam to condense on the plant to make use of the latent heat • May not reduce subsequent weed seedling emergence[93]
Boiling water	Annuals and perennials	Boil water and pour stream on to the crown of the weed.	• Works well in concrete, paved and rock areas89	• Safety hazards • May effect non-targeted species • Time consuming • Water usage • May need to be repeated

[89] Johansson (n.d.)

Weed Control Methods Not Used by the City of Joondalup

Weed Control Method	Suitable for Species	Notes	Advantages	Disadvantages
Smothering using materials such as black plastic, fibre, carpet, cardboard~~,~~ or newspaper~~, wood chips or jute matting.~~	All	Most effective if weeds are cleared before applying. Suppresses or kills weeds by creating a barrier between the weeds and sunlight.	• Prevent germination of weed seeds.	• Expensive • Materials can be difficult to apply around established plants • Possible issues with water and nutrient penetration • Clean up of degraded materials can be time consuming
Scrape and paint	Large vines and scrambling plants with a woody stem	Scrape 20cm to 100cm of the stem with a knife, for a third of the diameter of the stem (or scrape on two sides if stem is over 1cm in diameter), to expose the sapwood just below the bark. Apply undiluted herbicide (rates according to Permit or label) immediately to the scraped section.~~84~~84	• Effective method of weed control	• Time consuming for large populations
Stem injection	Woody weeds (low numbers)	Purpose-built stem injection devices can be used, or a hammer and chisel or cordless drill. An angled cut or hole is made into the sapwood just below and bark and undiluted herbicide (rates according to Permit or label) is applied into the cut immediately. Avoid drilling further than the sapwood into the heartwood as it doesn't take up the herbicide.~~84~~84	• Targeted weed application • Reduces risk of off-target damage	• Time consuming for large populations

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Weed Control Method	Suitable for Species	Notes	Advantages	Disadvantages
Granules	Various	Granules or pellets (root absorbed herbicide) are applied to the surface of moist soil or into the top soil	• No spray drift • Controlled release can reduce the need for repeat applications	• Rain or moisture is required • Herbicides are expensive • Even spread can be difficult • Limited choice of herbicides • Potential for herbicide to be washed off site • May effect non-targeted species
Drowning of emergent species by cutting the species beneath the water level in winter[90]	Emergent species (e.g. Bulrush and Kikuyu)	Suited to wetlands. Need to cut species below water level.	• Effective on a significant number of emergent species targeted	• Time consuming • Water levels may change
Solarisation, or heating, of weeds to high temperatures under plastic	Low-growing and semi-aquatic weeds	Weeds are smothered with plastic sheeting until seeds or plants have been cooked.[91] Works best when weeds are growing in full sun.[92]	• Best used for small infestations	• May not kill seed stored in the soil • Plastic may need to be weighted down and left in place for months • Time consuming • Vegetation needs to be cleared from the area
Flame weeding	Young weeds and grasses, some annual and perennial weeds	Direct propane flame at weeds. A thin blast of heat (1000°C) causes the water within the cell stalk to boil.	• Leaves no chemical residue • No soil disturbance • More effective than infrared radiation	• Safety and fire hazards • May require a series of flamings (2-3 weeks apart) • Gas usage

[90] Water and Rivers Commission (2001)
[91] Department of Planning (n.d.)
[92] Eurobodalla Shire Council (n.d.)

Weed Control Method	Suitable for Species	Notes	Advantages	Disadvantages
Infrared radiation	Shallow rooted weeds	Uses gas burners and has no visible flame on the combustion surface.	• Cover a more closely defined area than flame weeders	• Need time to heat up • Gas usage • Unsure of effectiveness against deep rooted weeds[93]
Acidic	Annuals, biennials and some perennials	Contain approx 15-20% acidic ingredients such as lemon, lime or vinegar, sprayed directly on the leaves, causing them to die.	• Leaves no soil residue	• May effect non-targeted species • Foliage must be sprayed so it is completely wet • Health risks
Fatty acids	Annual weeds, grasses and broadleaf weeds	Coconut fatty acid is often an ingredient. Dissolves membranes of plants leaves, causing the leaves to die.	• Will not move through soil to harm nearby plants • Fast acting • Leave no residue in the soil[94]	• May effect non-targeted species • Repeat applications may be required on larger weeds
Germination inhibitors	Newly grown weeds	The most common is corn gluten meal. Prevents new plants from germinating but does not harm established plants.	• Non-toxic • Suppresses germination of seeds	• No effect on established weeds • Can inhibit germination of non-target species[94][94]

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[93] Bond, Turner and Grundy (2003)
[94] Johansson (n.d.)

Appendix 7 – Wetlands in the City of Joondalup

Wetland	Suburb
Beaumaris Park	Ocean Reef
Blackboy Park	Mullaloo
Blue Lake Park	Joondalup
Broadbeach Park	Hillarys
Central Park	Joondalup
Conica Park	Hillarys
Craigie Open Space	Craigie
Flinders Park (North and South)	Hillarys
Lacepede Park	Sorrento
Mawson Park	Hillarys
McCubbin Park	Woodvale
Oahu Park	Hillarys
Sir James McCusker Park (North and South)	Iluka
Whitfords Nodes Park South	Hillarys
Wolinski Park	Mullaloo