Draft Weed Management Plan — Community Consultation Summary

ID	Comment	City Response
Feedback Form question: What do you like about the Draft Weed Management Plan?		
Resp. 1	Not answered	—
Resp. 2	Not answered	—
Resp. 3	*It addresses the importance of biodiversity and therefore weed control as being part of the program for maintaining it.*	Comment noted
Resp. 4	Not answered	—
Resp. 5	*Fairly comprehensive.*	Comment noted
Resp. 6	*I agree that in some areas spraying of herbicide is the only option.*	Comment noted
Resp. 7	Not answered	—
Resp. 8	*It is important to control weeds in our ever-shrinking natural bushland and other natural areas, to protect our flora and fauna. Therefore it is good that there is a plan.*	Comment noted
Resp. 9	*Weeds are controlled to protect native plants.*	Comment noted
Resp. 10	Not answered	—
Resp. 11	*It is great that an effort is being made to get weeds under control before they seed. The overly zealous mowing machines should be kept under control too as they are causing some of the weed invasion because they destroy native plants. It is important to keep healthy copses of plants under trees.*	Comment noted
Resp. 12	*The volunteer groups and the subsequent contract work is a great opportunity for Horticulture and CLM students put into practice the theory they have been taught, and gain valuable experience and references for future employment.*	Comment noted
Resp. 13	Not answered	—
Resp. 14	Not answered	—
Resp. 15	*That it is being developed.*	Comment noted
Resp. 16	Not answered	Comment noted
Resp. 17	Not answered	—
Resp. 18	*Fairly comprehensive and gives a detailed snapshot of the present official position on the impact and treatment of the many weed species of W.A.*	Comment noted
Resp. 19	*The Plan was informative, presented well and covers a wide range of issues.*	Comment noted
Resp. 20	*It's an attempt to address an important issue strategically.* *It's trying to be comprehensive.*	Comment noted

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Resp. 21	*I applaud the Plan's recognition of the importance of community education as a weed management strategy. Weeds are a community problem. The City should play a major role in making residents aware of the nature and economic and environmental cost of the problem, educating them in weed recognition and ways to assist in stopping the spread and occurrence of environmental weeds.*	Comment noted
Resp. 22	*Thank you for the opportunity to comment on the Draft Weed Management plan. I believe it is comprehensive and informative.*	Comment noted
Feedback Form question: What changes or improvements would you recommend for the Draft Weed Management Plan?		
Resp. 1	*I would like to see marker dye used with the spraying in public areas so contact with the spray can be avoided by members of the public.*	The City uses marker dye in combination with herbicide application within natural areas. The purpose of marker dye is for staff or contractors spraying herbicides to see which areas have been sprayed due to the difficult spraying conditions such as moving through and around plants and the varying topography, rather than to alert the public about spraying. In order to prevent the public coming into contact with herbicides, the City erects 'caution' signage in areas where herbicides are being applied and until the herbicide has dried (approximately 2/3 hours). This signage is placed at appropriate locations in all directions to allow the public sufficient warning.
Resp. 2	*Definitely in favour of dye being added to any herbicide when used in residential parks. Although the City claims to provide adequate signage, I did not see any signage when they were spraying Forrest Park in the July 2016 school holidays.* *In fact, the spray was added to the footpath so I feel that dye would also help the operator. Notification within 100 metres of one's residence does not address the issue of park use after spraying. And I am not convinced that the "adequate" signage is indeed adequate, nor left in place for long enough to alert park users.*	The purpose of marker dye is for staff or contractors spraying herbicides to see which areas have been sprayed rather than being used a tool to alert the public about spraying. The reasons for this are as follows: Marker dye safety instructions provide that contact with eyes and skin should be avoided and cannot be considered 'safe' for residents to come into contact with. Marker dye will remain on surfaces for a considerable time (sometimes weeks depending on weather conditions) compared to the time it takes for the active constituent of the chemical to be absorbed by the leaf (30 minutes – 2 hours). For the above reasons the City of Joondalup utilises marker dye in natural areas only and not in public places, such as parks.

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Resp. 3	*I would strongly recommend a focus on natural weed management such as steam, considering that herbicides pose as much of a health risk, if not more, than the weeds themselves.*	The City undertakes an integrated weed management approach to its weed control in natural areas, parks and urban landscaping areas. The City of Joondalup implements a number of weed control methods including: • Physical weed control – the removal of weeds by physical or mechanical means, such as mowing, grazing, mulching, 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. In determining the appropriate weed control method for a given situation the City takes the following into consideration: • the target weed • the season and timing i.e. before seeding • resistance of the weed to specific herbicides • site location and any special considerations i.e. near wetlands • weather conditions i.e. rain and wind • rotation of the type of herbicide used to reduce herbicide resistance • effectiveness of outcomes, labour intensity required and cost involved.

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Resp. 4	*I would like to support Cr Norman's amendments that marker dye be used for all spot spray herbicide applications, and that warning signage is left in place for at least 24 hours following broad scale herbicide application in parks and ovals. I am a mother with two young children, who often play on the grass ovals in the City of Joondalup, and it is disturbing to think that we are not aware of when applications have been made unless we are there at the time of treatment.*	In order to prevent the public coming into contact with herbicides, the City erects 'caution' signage in areas where herbicides are being applied and until the herbicide has dried (approximately 2/3 hours). This signage is placed at appropriate locations in all directions to allow the public sufficient warning.
	I would also like to encourage the City of Joondalup to minimise herbicide use where possible, through better timing of application, and an ecosystem management approach that aims to reduce the soil weed seed bank. I understand that the use of herbicide is necessary to maintain the parks and public open spaces that we enjoy, however I think that volumes could be greatly reduced while achieving a similar result.	Comment noted In determining the appropriate weed control method for a given situation the City takes the following into consideration: • the target weed; • the season and timing i.e. before seeding • resistance of the weed to specific herbicides • site location and any special considerations i.e. near wetlands • weather conditions i.e. rain and wind • rotation of the type of herbicide used to reduce herbicide resistance • effectiveness of outcomes, labour intensity required and cost involved.
Resp. 5	*Pristine areas: Research shows that commercially available herbicides affect the germinating ability of native plants. It's not known whether the effect comes from the herbicide or the added dispersants and other chemicals added to the base herbicide. We therefore support proper training in the application of herbicides particularly to natural areas. The operator should have a working knowledge of weed recognition with some knowledge of recognition of the hundreds of various native plants.*	City staff receive regular training regarding the safe application of herbicide use and the correct application rates. Contractors are also required to conform with safety standards, in accordance with application rates prescribed by the Australian Pesticides and Veterinarian Medicines Authority (APVMA).
	Spraying should never be broadly done but only spot spraying to avoid collateral damage. Overspray even onto bare ground will prevent native plant germination.	The City does not undertake broad spraying within natural areas.
	We recommend a hood to prevent overspray.	Comment noted
	Areas set aside for regeneration e.g. Open grasslands of Yellagonga Regional Park. These can be sprayed more broadly due to the history of cultivation and the unlikely event of natural regeneration.	Comment noted
	Weeding Programs: The best weed programs can occur after a fire if a standard plan can be implemented.	Comment noted The City has a *Fire Weed Management Guideline* to direct weed management post fire.
	The plan should be one of using the natural weed cycle against the weed species.	Comment noted
	A fire resets the natural system back to zero and the weeds then begin a natural progression of germination, growth and seed production.	Comment noted

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	Weeds can be cleared from the bush if they can be destroyed (weeded or sprayed) before they can again produce seeds. This takes a dedicated effort so is rarely achieved and the work goes on.	Comment noted
Resp. 6	*Clearer guidelines of pet owner's responsibilities in natural areas.*	Comment noted
	Continued efforts to reduce spray by using backpack spraying as opposed to hoses running through areas and at time when weeds are actually at a size to maximise spray only on plant and not on the soil.	The City utilises knapsack spray application to spot spray weeds in bushland where weed numbers are low and widely dispersed. Knapsacks are also used, when weeds are located in bushland where spray hoses cannot reach. When spraying large numbers of weeds knapsack application is not considered to be practical. The spray guns the City utilises have triggers that allow the spray stream to be quickly stopped thereby reducing any over-spray on native plants.
	24 hours notice to friends groups that a spraying will be carried out and in public areas a sign to indicate spraying has taken place within a 24 hour period. Use of dyes to show where spray has been applied.	The City has a list of work day activities planned by Friends Groups. The City plans its spray program so that they do not conflict with Friends Group activities. Signage is always put out before spraying and left out until all spray residues have dried.
Resp. 7	*One change would be to have dye in all chemical spraying. I witnessed chemical weed spraying along the Sorrento beach front about 2 weeks ago. Walking along the path this morning at Sorrento beach I noticed some of the weeds are alive and well. I'm sure the operator spraying with dye would see better where he had been and there would not be the need for a follow up.*	Marker dye safety instructions provide that contact with eyes and skin should be avoided and cannot be considered 'safe' for residents to come into contact with. Additionally marker dye will remain on surfaces for a considerable time (sometimes weeks depending on weather conditions) compared to the time it takes for the active constituent of the chemical to be absorbed by the leaf (30 minutes – 2 hours). For the above reasons the City of Joondalup utilises marker dye in natural areas only and not in public places, such as parks and pathways.

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Resp. 8	*Areas that have been sprayed should be marked with dye.*	The City uses marker dye in combination with herbicide application within natural areas. The purpose of marker dye is for staff or contractors spraying herbicides to see which areas have been sprayed due to the difficult spraying conditions such as moving through and around plants and the varying topography, rather than to alert the public about spraying.
	Large areas should be signposted clearly.	In order to prevent the public coming into contact with herbicides, the City erects 'caution' signage in areas where herbicides are being applied and until the herbicide has dried (approximately 2/3 hours). This signage is placed at appropriate locations in all directions to allow the public sufficient warning.
	The footpaths in our street were sprayed last week, but there was nothing to inform residents that this had been done. We only knew because we saw the men working. Some years ago, our back lane was sprayed, which we only realised when the plants started dying. As we do not have a solid back fence, the plants in our herb patch also died .Of more concern was that children had been playing in the sand, before we realised that spraying had been carried out. This is a danger, for children and for their pets, if parents are not aware that poison is present - and for how long contact with the soil should be avoided. .	City residents wishing to be advised in advance of spraying activities, occurring within 100 metres of their residence, can apply to be added to the City's Notification Register. Residents listed on the Pesticide Notification Register will receive an automated notification at least 24 hours prior to spraying commencing. Further information on the *Pesticide Use Notification Plan* can be found on the City of Joondalup's website: http://www.joondalup.wa.gov.au/Live/Streetscapes/PesticideNotification.aspx
Resp. 9	*Dye to be mixed with the weed killer so it is visible.*	The City uses marker dye in combination with herbicide application within natural areas. The purpose of marker dye is for staff or contractors spraying herbicides to see which areas have been sprayed due to the difficult spraying conditions such as moving through and around plants and the varying topography, rather than to alert the public about spraying.

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Resp. 10	*I want dye included in the poison used so we can tell where it has been.*	The City uses marker dye in combination with herbicide application within natural areas. The purpose of marker dye is for staff or contractors spraying herbicides to see which areas have been sprayed due to the difficult spraying conditions such as moving through and around plants and the varying topography, rather than to alert the public about spraying. Marker dye safety instructions provide that contact with eyes and skin should be avoided and cannot be considered 'safe' for residents to come into contact with. Additionally marker dye will remain on surfaces for a considerable time (sometimes weeks depending on weather conditions) compared to the time it takes for the active constituent of the chemical to be absorbed by the leaf (30 minutes – 2 hours). For the above reasons the City of Joondalup utilises marker dye in natural areas only and not in public places, such as parks and pathways.
Resp. 11	*I would expect that dye is always used.*	The City uses marker dye in combination with herbicide application within natural areas. The purpose of marker dye is for staff or contractors spraying herbicides to see which areas have been sprayed due to the difficult spraying conditions such as moving through and around plants and the varying topography, rather than to alert the public about spraying. Marker dye safety instructions provide that contact with eyes and skin should be avoided and cannot be considered 'safe' for residents to come into contact with. Additionally marker dye will remain on surfaces for a considerable time (sometimes weeks depending on weather conditions) compared to the time it takes for the active constituent of the chemical to be absorbed by the leaf (30 minutes – 2 hours). For the above reasons the City of Joondalup utilises marker dye in natural areas only and not in public places, such as parks and pathways.

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Resp. 12	*After witnessing weed spraying at Sorrento, in which the working practices were the opposite of what is taught by the lecturers at North Metropolitan TAFE — Joondalup, I would request that red dye be added to the herbicide used. I would also request that care be taken when spraying near to pedestrians, cyclists, mothers with prams, and workers to prevent spray drift coming into contact with people and animals.*	City staff receive regular training regarding the safe application of herbicide use and the correct application rates. Contractors are also required to conform with safety standards, in accordance with application rates prescribed by the Australian Pesticides and Veterinarian Medicines Authority (APVMA). The City uses marker dye in combination with herbicide application within natural areas. The purpose of marker dye is for staff or contractors spraying herbicides to see which areas have been sprayed due to the difficult spraying conditions such as moving through and around plants and the varying topography, rather than to alert the public about spraying. Marker dye safety instructions provide that contact with eyes and skin should be avoided and cannot be considered 'safe' for residents to come into contact with. Additionally marker dye will remain on surfaces for a considerable time (sometimes weeks depending on weather conditions) compared to the time it takes for the active constituent of the chemical to be absorbed by the leaf (30 minutes – 2 hours). For the above reasons the City of Joondalup utilises marker dye in natural areas only and not in public places, such as parks and pathways. In order to prevent the public coming into contact with herbicides, the City erects 'caution' signage in areas where herbicides are being applied and until the herbicide has dried (approximately 2/3 hours). This signage is placed at appropriate locations in all directions to allow the public sufficient warning.

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Resp. 13	*Marking with dye poisoned areas. In larger areas of spraying signage informing people of spraying.*	The City uses marker dye in combination with herbicide application within natural areas. The purpose of marker dye is for staff or contractors spraying herbicides to see which areas have been sprayed due to the difficult spraying conditions such as moving through and around plants and the varying topography, rather than to alert the public about spraying. Marker dye safety instructions provide that contact with eyes and skin should be avoided and cannot be considered 'safe' for residents to come into contact with. Additionally marker dye will remain on surfaces for a considerable time (sometimes weeks depending on weather conditions) compared to the time it takes for the active constituent of the chemical to be absorbed by the leaf (30 minutes – 2 hours). For the above reasons the City of Joondalup utilises marker dye in natural areas only and not in public places, such as parks and pathways. In order to prevent the public coming into contact with herbicides, the City erects 'caution' signage in areas where herbicides are being applied and until the herbicide has dried (approximately 2/3 hours). This signage is placed at appropriate locations in all directions to allow the public sufficient warning.
Resp. 14	*Although I'm not happy about spraying, I know it is going to be done regardless. As a wildlife rehabilitator, I have had many, many creatures in care, suffering from poisoning, having eaten insects and grasses that had been contaminated by the spraying. Small birds succumb, larger birds we sometimes manage to get back to health.*	Comment noted
Resp. 15	*The pesticides used by COJ are considered by scientists to be safe therefore Council has voted not to include adding dye to the pesticide to alert the public that pesticide has been sprayed.* *There should also be signs kept in place for a number of days to alert the public that pesticide has been sprayed. In other words the Council seems to have taken away a person's choice as to whether a person, their children and pets walk on areas where pesticide, even though deemed safe by scientists, has been sprayed." The choice should be an individual's choice and this choice can only be made if they see dyed pesticide and that information/warning notices are present.*	The City uses marker dye in combination with herbicide application within natural areas. The purpose of marker dye is for staff or contractors spraying herbicides to see which areas have been sprayed due to the difficult spraying conditions such as moving through and around plants and the varying topography, rather than to alert the public about spraying. In order to prevent the public coming into contact with herbicides, the City erects 'caution' signage in areas where herbicides are being applied and until the herbicide has dried (approximately 2/3 hours). This signage is placed at appropriate locations in all directions to allow the public sufficient warning.

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Resp. 16	*I strongly urge that a marker dye be mixed in with all sprays so that residents can see everywhere that poison has been sprayed.*	The City uses marker dye in combination with herbicide application within natural areas. The purpose of marker dye is for staff or contractors spraying herbicides to see which areas have been sprayed due to the difficult spraying conditions such as moving through and around plants and the varying topography, rather than to alert the public about spraying. Marker dye safety instructions provide that contact with eyes and skin should be avoided and cannot be considered 'safe' for residents to come into contact with. Additionally marker dye will remain on surfaces for a considerable time (sometimes weeks depending on weather conditions) compared to the time it takes for the active constituent of the chemical to be absorbed by the leaf (30 minutes – 2 hours). For the above reasons the City of Joondalup utilises marker dye in natural areas only and not in public places, such as parks and pathways.
Resp. 17	*On page 81 you list Chrysanthemoides monilifera subsp. monilifera or Boneseed and Cirsium arvense or perennial thistle but have neglected to mention that both species are Prohibited plants under section 12 of the BAM Act, and as C1 Prohibited species are required by law to be reported and targeted for eradication.*	Amendment to the Plan made. Comment noted.
	On page 90 you have a section labelled "Germination inhibitors" where it is stated that corn gluten meal inhibits seed germination. This claim has been shown to be false, at best this material acts as a pre-emergent herbicide (a very different mode of operation), but its efficacy is poor. It is certainly not a germination inhibitor, and at the rates suggested is actually a high source of nitrogen and creates strong growth of any plants in the area treated, including weeds as well as the resultant environmental impacts of high nitrogen inputs. This section should be removed.	Amendment made to the Plan- section removed.
	Appendix 5 is not there, so cannot comment.	Appendix now included. Updated version was sent to the stakeholder.

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Resp. 18	*Research shows that commercially available herbicides affect the germinating ability of native plants. It's not known whether the effect comes from the herbicide or the added dispersants and other chemicals added to the base herbicide. We therefore support proper training in the application of herbicides particularly to natural areas. The operator should have a working knowledge of weed recognition with some knowledge of recognition of the hundreds of various native plants.*	City staff receive regular training regarding the safe application of herbicide use and the correct application rates. Contractors are also required to conform with safety standards, in accordance with application rates prescribed by the Australian Pesticides and Veterinarian Medicines Authority (APVMA).
	Spraying should never be broadly done but only spot spraying to avoid collateral damage. Overspray even onto bare ground will prevent native plant germination.	The City does not undertake broad spraying within natural areas.
	We recommend a hood to prevent overspray.	Comment noted
	Areas set aside for regeneration e.g. Open grasslands of Yellagonga Regional Park. These can be sprayed more broadly due to the history of cultivation and the unlikely event of natural regeneration.	Comment noted
	Weeding Programs: The best weed programs can occur after a fire if a standard plan can be implemented. The plan should be one of using the natural weed cycle against the weed species.	Comment noted The City has a *Fire Weed Management Guideline* to direct weed management post fire.
	A fire resets the natural system back to zero and the weeds then begin a natural progression of germination, growth and seed production.	Comment noted
	Weeds can be cleared from the bush if they can be destroyed (weeded or sprayed) before they can again produce seeds. This takes a dedicated effort so is rarely achieved and the work goes on.	Comment noted
	Weed wiping with glyphosate by friends groups should be encouraged. Most friends group members use glyphosate to control weeds at their own residence and are familiar with the proper use of this most effective and important herbicide that is relatively harmless to humans in the amounts and concentrations used in this application.	The City's Bushland Friends Group Manual states that Friends Group members cannot apply herbicides. This is to protect the health of community members and prevent any potential risk to the public. All herbicides sprayed in the City are applied by licensed applicators and highly trained City staff.
	Spraying by City crews is a waste of time after seed is set and the money could be better spent elsewhere. A time for cut-off should be set. *Follow up spraying to get rid of plants missed is essential to getting long term improvements.*	Comment noted

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Resp. 19	*Page 5 Acronyms — CALM is old terminology and is not found within the document.*	Plan amended, acronym removed.
	Page 67— Lack of specific training for friends groups: identify weeds and hygiene.	City staff spend time with new Friends Group coordinators walking through bushland identifying weeds and other features. The coordinators pass this knowledge on to members of the group, or members of the public who attend bushland work days. City Staff also attend planting days and talk to volunteers about bushland management including hygiene, planting, fauna, flora and a range of other issues. The City also holds formal meetings (onsite) twice a year with friends groups.
	Page 75 — Error: Glenbar Park has a Friends Group	Amendment made to the Plan — addition of tick for Friends Group for Glenbar Park.
Resp. 20	*Why are there no references or citations to the effectiveness (or otherwise) of hand-weeding?*	The citation for information advantages and disadvantages for hand weeding is given on page 12 of the Plan as Cooperative Research Centre (CRC) for Australian Weed Management, 2005b, *Herbicide Guidelines: For use in and around water*, Glen Osmond, South Australia.
	Pg 13: The sentence 'herbicides are chemicals...and have the potential to damage people' is wrong on many levels and needs reviewing	Comment noted

ID	Comment	City Response
	Pg 14: The information provided about Glyphosphate neglects to address the current controversy in the EU over it. You could usefully refer to the recent advice from the APVM on it. That leaves you open to accusations that you are either out-of-date, or are deliberately ignoring it. Neither is good. Drop the 'safe because it's been used for 40 years' argument, it doesn't help your cause. Asbestos-related mesothelioma and lung-cancer from smoking are two other ill effects of exposure to chemicals that have very long lead-in times before the ill effects from exposure are detected.	Comment noted Additional information to be added to the Plan, as follows: *In regard to recent reports investigating the health effects of using glyphosate, the report released in 2015 by IARC, an agency affiliated with the World Health Organisation (WHO), 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 Australian Pesticides and Veterinary Medicines Authority (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 label instructions.*

ID	Comment	City Response
	You should list all the commonly used pesticides used by the City and the MSDS and basic safety information on your website (and in this document). *Pg 15 - the pesticide use notification system is too limited - I want to know what has been sprayed on any park I visit, and when. I believe marker dye would serve that purpose well. If it costs a lot, then apply it only to the margins of an area to alert anyone entering it.*	Residents listed on the City's Pesticide Notification Register are given a minimum 24 hours notice of any area within 100 metres of their residence scheduled for herbicide treatment. Included in this notification is the common name and active ingredient of the herbicide that the City will be applying. The City updates its Public Notice - Pesticide Notification Register, on the City's website page every week to inform the community of the proposed locations scheduled for herbicide treatment for the upcoming week. The spraying schedule is subject to resourcing and weather conditions. Marker dye for broad acre applications is not an option. Marker foam is used by the applicator to identify where they have been. The marker foam also notifies the public that areas of the park have been treated. Notification signage remains in place until the spray within the treated areas has dried. This is done in accordance with the manufacturer's instructions.
	Pg17 - you say large amounts of energy are used to create the steam and these results in greenhouse emissions from use of thermal weed control. Have you compared the greenhouse emissions from manufacturing herbicides? Further, the first 2 reasons listed why it's not a viable option are also true of herbicides and I would like to see the evidence behind the third (moisture and rotting vegetation leading to increased weeds!).	Pg 17 Response. Several trials have been carried out by independent consultants for the City to compare the effectiveness and cost of hydrothermal and herbicide trial treatments through their application at various locations throughout the City of Joondalup, that include urban parks, streetscapes and natural areas The consultant's findings concluded that hydrothermal applications were more labour intensive and less cost effective than herbicide treatments. While hydrothermal weed control methods are best utilised where environmental or health issues are significant and where off-site damage to non-target plants is a high risk, the costs, effectiveness and speed of thermal control limits its scale of operation. The findings of the studies undertaken concluded that the most effective and long term approach for weed treatment was herbicide application, both within urban parks, streetscapes and natural areas.
	I think you are using a classification system for open space (pg44 and Appendix 7) that is based on the revised, not-yet-public PPOSCF. You should stick to the current framework, not one that might be used one day.	Page 44 Response PPOSCP Appendix 7: The City's Parks and Public Open Spaces Classification Framework (PPOSCF) has been adopted as a management guideline to assist in the planning and provision of park and public open space assets. The PPOSCF outlines the classification of all parks within the City of Joondalup and determines the type of infrastructure supported within each classification.

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	Pg44, you avoid herbicide spraying adjacent to schools during school hours and recommend spraying during school holidays 'when fewer people are using the facilities in the vicinity'. On what usage data do you base this statement? I am surprised, for one thing, you say herbicide use is safe - so it should be safe when children are at school. Secondly, I have seen you spraying at my local park during school holidays which is when the park has the greatest use by local children. If you applied herbicide during school hours, the school could ensure children were indoors during spraying and ensure that they do not contact turf immediately after spraying.	The main locations treated during the school holidays are the parks that are utilised by the adjoining school on a day to day basis and where there is a joint use agreement between the City and the school in place. History and experience has proven this as the better time to undertake this work as the general use of these areas (during school holidays) decreases.
	I was informed by CoJ that the herbicide in use was 'Bow and Arrow'. I was alarmed to read in this leaflet: *http://turfculture.com.au/App_Save/Products/2ba86f59-ed9a-4e1c-9796-b962eb424a61/Label.pdf* *PRECAUTION* *Manual Handling of turf:* *Hand-weeding and transplanting should not be performed before 2 weeks after spray application, unless workers wear overalls (or equivalent clothing) and chemical resistant gloves.* *Note that is 2 weeks! Not until the spray has dried. Yet babies are crawling on that grass and toddlers playing on it well before two weeks and have no protective equipment at all. Better notification of the dates and types of herbicide being used for weed control is essential in all turfed areas within the City.*	As detailed in the same mentioned Bow & Arrow Herbicide leaflet, entry into treated areas can occur once the spray has dried. *PRECAUTION* *RE-ENTRY STATEMENT* *Do not allow entry into treated areas until the spray has dried.* Contacts on the City's Pesticide Notification Register are given a minimum 24hrs notice of any area within 100 metres of their residence scheduled for herbicide treatment. Included in this notification is the common name and active ingredient of the herbicide that the City will be applying. The City updates its Public Notice - Pesticide Notification Register, on the City's website page every Friday to inform the community of the proposed locations scheduled for herbicide treatment for the upcoming week. The spraying schedule is subject to resourcing and weather conditions.
	I note too that turf treated with this herbicide is not to be fed to livestock (ever). How safe then is it if dogs eat it (as they are prone to do on ovals that are often fertilized), or ingest it when chasing and retrieving balls etc?	Poultry and/or livestock could consume large volumes as a primary food source, prior to being consumed by humans. There are no specific requirements and/or precautions outlined for dogs.

ID	Comment	City Response
	Please consider adding marker dye to herbicide when spraying open space parks to allow users to make an informed decision about how and whether to use that space. Without that, you really must add suitable signage, or allow residents to login to a system to see when and with what, a park has been sprayed.	The City updates its Public Notice - Pesticide Notification Register, on the City's website page every week to inform the community of the proposed locations scheduled for herbicide treatment for the upcoming week which is available to dog owners. The spraying schedule is subject to resourcing and weather conditions. In terms of signage the City complies with the Government of Western Australia Department of Health, *Health (Pesticides) Regulations 2011 – Signage Requirements* which covers the signage requirements when spraying of verges and parks.
	Herbicides can be used safely ONLY if the manufacturer's instructions are complied with. This extends beyond those spraying to those using the area afterwards. If we do not know what was sprayed when, how can we follow the manufacturer's instructions?	City staff and contractors handling the concentrated product and applying it in the mixed / diluted form do so in accordance with the manufacturer's instruction. Notification signage remains in place until the spray within the treated areas has dried. This is also done in accordance with the manufacturer's instructions.
Resp. 21	The City applies large amounts of herbicide to the environment. It is unlikely that the effects of such a large toxin load are benign. The safety of glyphosate, for instance, has been called into question in recent times. It would be prudent for the City to actively investigate non-chemical and low toxicity methods for the health and safety of residents, operators and the environment. I would like to see more emphasis on this in the Weed Management Plan.	Comment noted. The City undertakes an integrated weed management approach to its weed control in natural areas, parks and urban landscaping areas. The City of Joondalup implements a number of weed control methods including: • Physical weed control – the removal of weeds by physical or mechanical means, such as mowing, grazing, mulching, 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.
	In determining the appropriate control method to be used, the City should also be guided by the constituent species and communities in natural areas. Particular regard should be had to their conservation status and abundance both at a local (reserve) and wider (regional/state). For example hand weeding may be the preferred method in the vicinity of priority species/threatened communities or there are only small local populations.	Comment noted

ID	Comment	City Response
	The current practice is to use marker dye when spraying herbicide in natural areas. I believe marker dye should be used in all except broad acre applications and this dye should be at a concentration which renders the dye easily visible, even to the untrained eye. Whether the negative health effects associated with herbicides are real or perceived, the public should have the right to avoid recently sprayed areas if they so choose.	The City uses marker dye in combination with herbicide application within natural areas. The purpose of marker dye is for staff or contractors spraying herbicides to see which areas have been sprayed due to the difficult spraying conditions such as moving through and around plants and the varying topography, rather than to alert the public about spraying. Marker dye safety instructions provide that contact with eyes and skin should be avoided and cannot be considered 'safe' for residents to come into contact with. Additionally marker dye will remain on surfaces for a considerable time (sometimes weeks depending on weather conditions) compared to the time it takes for the active constituent of the chemical to be absorbed by the leaf (30 minutes – 2 hours). For the above reasons the City of Joondalup utilises marker dye in natural areas only and not in public places, such as parks and pathways.
	The Draft Plan appears to be heavily biased toward chemical control methods and, although it does recognise a role for non chemical methods such as hand weeding, it fails to give adequate weight to the value of hand weeding in an integrated weed management strategy. The importance of chemical means of control where local authorities have large areas to manage within the confines of a given budget is well recognised but it should also be recognised in the Plan that hand weeding can in some circumstances be more effective and a valuable complement to other control means.	Hand weeding in natural areas is currently undertaken by volunteers and by contractors engaged by the City. It is acknowledged that the manual removal of weeds in bushland has a place and will continue as part of the City's integrated approach to bush land management.
	As a general example, it is my observation that although Natural Areas staff endeavour to apply herbicide before seed development, this often does not occur in practice and is not ever likely to, since resources will always be limited and spraying is subject to the vagaries of the weather. In addition, the viability of seed on sprayed weeds is not generally affected and seed will also continue to mature after a plant has been sprayed. Hand weeding, by contrast, prevents further seed production and removes propagules from the site, reducing weed populations in subsequent seasons.	The City inspects all sites prior to spraying and the optimum time for herbicide application is chosen. Hand weeding is not a practical solution when faced with large areas of densely packed weeds such as veldt grass.

ID	Comment	City Response
	In 2011, the entire natural area in the park was infested heavily with Geraldton Carnation Weed, Fumaria, Mediterranean Turnip and Veldt Grasses, along with other environmental weeds. Weed control has been almost exclusively by hand weeding from June to December (wet and dry soil, large and small plants). Hand weeding has been a combination of volunteer and contractor effort, the latter financed from the City's Special Purpose Grant. Welcome weed control support has been provided by Natural Areas staff, mainly in the form of edge spraying to reduce weed invasion from the surrounding "lawn" (actually a sea of weeds dominated by veldt grasses), with occasional spot spraying where manual means would be ineffective, e.g couch within native species. Hand weeding has been especially important and the only option in our case since broad spectrum herbicides used within the bushland would result in considerable non-target damage. In addition, we have a number of native grasses, two species being present in very low numbers (e.g. Poa drummondia, 3 individuals), which are susceptible to grass-selective herbicides. *In the intervening time we have seen substantial natural regeneration occurring in the bushland, particularly in areas that have been manually cleared of weeds. It is widely recognised that many native species prefer open, sandy areas for seedling germination. It may also be that the soil disturbance encourages native seed generation and this would be a worthwhile investigation, since promoting regeneration of native species and the associated increase in cover of natural vegetation is an important strategy in weed management and perhaps increasing native vegetation cover should be incorporated into the Weed Management Plan. Currently, Carnation Weed, Fumaria and Mediterranean Turnip are present at low abundance. Veldt grasses have also decreased in abundance, but to a lesser extent, and this is likely due to the continual seed rain from the surrounding lawn, rather than any shortcomings in our control methods.* *Generally speaking, the bushland condition has improved considerably under this weed management regime and is a good example of where hand weeding as the primary means of weed control is necessary and effective, but also demonstrates how chemical and non-chemical means can complement each other, achieving positive outcomes in the conservation of the City's natural assets.*	The City utilises hand weeding as part of a suite of control methods and acknowledges that hand weeding can be an effective technique in localised situations. However as the City manages approximately 500 hectares of natural areas as well as around 500 hectares of parklands, the use of hand weeding on a large scale is less effective than other weed control methods.
Resp. 22	Not answered	

ID	Comment	City Response
Feedback Form question: Do you have any further comments about the Draft Weed Management Plan?		
Resp. 1	Not answered	
Resp. 2	Not answered	
Resp. 3	Not answered	
Resp. 4	Not answered	
Resp. 5	Not answered	
Resp. 6	*Supervision to ensure guidelines are met.*	Comment noted
Resp. 7	Not answered	
Resp. 8	*It is important that parks and other public areas should be signposted when they are sprayed.*	In order to prevent the public coming into contact with herbicides, the City erects 'caution' signage in areas where herbicides are being applied and until the herbicide has dried (approximately 2/3 hours). This signage is placed at appropriate locations in all directions to allow the public sufficient warning. City residents wishing to be advised in advance of spraying activities, occurring within 100 metres of their residence, can apply to be added to the City's Notification Register. Residents listed on the Pesticide Notification Register will receive an automated notification at least 24 hours prior to spraying commencing. Further information on the *Pesticide Use Notification Plan* can be found on the City of Joondalup's website: http://www.joondalup.wa.gov.au/Live/Streetscapes/PesticideNotification.aspx
	Like other locals, we picked mushrooms that came up regularly in local parks each year. *A few years ago, my husband, son and myself suffered food poisoning. We couldn't work out what had caused it, until somebody told us that the park where we had picked the mushrooms had been sprayed at that time. i.e. We didn't have food poisoning, but actual poisoning.* *It is imperative that warning signs be erected. Such poisoning of a child, for example, could be fatal.*	The City does not encourage residents to pick and consume mushrooms that grow within City parks.
Resp. 9	*I feel it is very important to be able to see where weeds have been sprayed for families of young children and pet owners.* *Poison could easily be transmitted in to a child's mouth.*	Comment noted
Resp. 10	Not answered	

ID	Comment	City Response
Resp. 11	*As a volunteer weeder at Alfreton bushland, I would like to see more support for hand weeding.*	Hand weeding in natural areas is currently undertaken by volunteers and by contractors engaged by the City, it is acknowledged that the manual removal of weeds in bushland has a place and will continue as part of the City's integrated approach to bush land management.
	Whilst I don't want this position, I believe there are some people in the community who could be paid to help friends groups. Even if they just offered a morning tea/ breakfast for anyone turning up, this might encourage more people to give up a few hours. If marketed well, many people, who want to help the environment, may come along.	The City's Friends Groups provide a significant number of volunteer hours and are well regarded by the City. The City does make grant funds available to support the activities of Friends Groups. The City also hosts a civic event to thank bushland volunteers for their work.
Resp. 12	Not answered	
Resp. 13	Not answered	
Resp. 14	Not answered	
Resp. 15	*I do not approve of the way that the Council have taken away an individual's choice to know where the newly sprayed areas are.*	Comment noted
	Scientists have been known to be wrong in some instances of pesticide, fungicide and insecticide use and safety levels	Comment noted
	By providing dyed insecticide and notices the public can make their choice and this would then probably indemnify Council if medical complaints occur in the future	City residents wishing to be advised in advance of spraying activities, occurring within 100 metres of their residence, can apply to be added to the City's Notification Register. Residents listed on the Pesticide Notification Register will receive an automated notification at least 24 hours prior to spraying commencing. Further information on the *Pesticide Use Notification Plan* can be found on the City of Joondalup's website: http://www.joondalup.wa.gov.au/Live/Streetscapes/PesticideNotification.aspx

ID	Comment	City Response
Resp. 16	*I am disappointed in the Joondalup Council's rejection of Cr Norman's proposal to mark publicly sprayed weed killers with dye so people can see where the poison is.*	Comment noted
	I am even more disappointed in our council for their reasons to reject the idea as reported in "The Times", p3, October 18 2016. It seems that our council rejected the idea because their experts didn't think it necessary, and the council didn't want their "experts" to be made to look unprofessional by agreeing to mix in the dye. *Many people, especially our children, often walk bare-footed, especially in parks, near the beaches, and where poison is sprayed. Many have very sensitive skins. People don't want poison on their shoes, their bare feet, their children or their pets. People don't want to touch poisoned shoes.* *Cr Tom McLean's argument is invalid. It appears that McLean's argument against putting dye in weed killer not only suffers the fallacy of argumentum ad verecundiam, but it is also plainly illogical. It is illogical to argue that because "experts" contributed to a draft plan, dye shouldn't be mixed in. An argument is not true or false because an expert says so, rather, an argument is true or false because of the argument itself.* *Even worse, it seems like the proposal was rejected because it would "question the professional ability" of those experts. That has nothing to do with the validity of the proposal: another fallacy, this time the straw man fallacy.*	The City uses marker dye in combination with herbicide application within natural areas. The purpose of marker dye is for staff or contractors spraying herbicides to see which areas have been sprayed due to the difficult spraying conditions such as moving through and around plants and the varying topography, rather than to alert the public about spraying.

ID	Comment	City Response
	Whether or not those experts are professional has absolutely no bearing on whether the proposal is a good one. And whether or not anyone questions their professional ability has nothing to do with whether dye should be mixed in. Professionals can be wrong! And those "professional experts" seem not to care for ratepayers who don't want to touch poison. *Furthermore, I don't want a council which believes it is good enough simply to adhere to standards and regulations. What a sad community that would be, as though we need treat one another no better than legally required. I am not legally compelled to be polite or care for people, but a healthy community requires much more than our council's legal minimum.* *What a sad community our council is fostering by arguing that the shire need not respect people's rights to see whether they will walk on poison because the legal minimum doesn't require the shire to do so.* *I advocate marking weed killers with dye so that residents can see and choose to avoid touching poison. I would like the council to adopt Cr Norman's proposal.*	Marker dye safety instructions provide that contact with eyes and skin should be avoided and cannot be considered 'safe' for residents to come into contact with. Additionally marker dye will remain on surfaces for a considerable time (sometimes weeks depending on weather conditions) compared to the time it takes for the active constituent of the chemical to be absorbed by the leaf (30 minutes – 2 hours). For the above reasons the City of Joondalup utilises marker dye in natural areas only and not in public places, such as parks and pathways.
Resp. 17	Not answered	
Resp. 18	*Many weeds are escapees from the agricultural process such as clovers and imported grasses. These were grown because of high nutrition value and quick growing after rain.*	Comment noted
	Many of the native plants aren't quick growing and have properties resistant to grazing (prickles and hard surfaces). An opportunity exists in Craigie Bushland to gather data on the effects of small marsupials on weed species due to the area being protected from foxes and cats and to measure any improvement in native plant numbers and condition. *Dr. Leoni Valentine has collected quenda excreta samples for DNA analysis but needs support for this work. Examination of these may show the species of weed eaten. The City could play a role here.*	The City supports the UWA research being undertaken at Craigie Bushland. One of the aims of this research to explore the effect digging native animals have on soil ecology including flora.
	Further introductions of small grazing marsupials such as the western brush wallaby to the enclosure would provide the basis for important work on possible control of weeds using natural methods. The present strategy of spraying may be counterproductive.	Comment noted A number of factors need to be taken into consideration before the introduction of further marsupials at Craigie Bushland, with the main factor being carrying capacity of the bushland.

ID	Comment	City Response
Resp. 19	*Thank you for sending the Plan out.*	
Resp. 20	*I would like to see the City promoting the sensible use of native plants on verges and in open spaces. It would save water and reduce weed spread. Other Councils are doing much more in this space than CoJ.*	The City promotes the use of native plants within the community through its Environmental Education Program. The City has also implemented a number of verge landscaping projects that include the use of native species, particularly local provenance species.
	Signage regarding what chemicals and when they have been used is essential at open space to enable the community to make informed decisions about their use of that space. You must to that to avoid risking public health.	In order to prevent the public coming into contact with herbicides, the City erects 'caution' signage in areas where herbicides are being applied and until the herbicide has dried (approximately 2/3 hours). This signage is placed at appropriate locations in all directions to allow sufficient warning.
Resp. 21	*I hope this submission provides some assistance.*	Comment noted.
Resp. 22	*I would like to request a hard copy of the management plan to add to our library of information on bushlands within the city of Joondalup. In particular the pictorial reference will be of benefit to fire-fighters to identify weeds within the bushlands.*	Comment noted. A hard copy Plan will be sent following Council endorsement.
Feedback Form question: I would like to be informed via email when the consultation results are finalised?		
	• 17 respondents answered Yes • 5 respondent answered No	Following Council adoption of the Weed Management Plan, respondents who selected yes to this question will be provided with a copy of this summary table via email or post, depending on their preferred method of communication.
Feedback Form question: I am interested in joining the City of Joondalup Community Engagement Network?		
	• 5 respondents answered Yes • 17 respondents answered No	Respondents who selected yes to joining the City's Community Engagement Network will be contacted.

1. Resp. = Respondent

2. A total of **22** valid responses were received. A "valid" response is one which includes the respondent's contact details, the response was received within the advertised consultation period and for which multiple survey forms have not been submitted by the same household for the same property or from the same organisation (if applicable).

3. Responses were received via the online feedback form available on the City's website, hard copy feedback forms and general comments were also received via email.

4. Requests for feedback were sent to 34 stakeholder groups including community groups, state government agencies and Local Members of Parliament.

City of Joondalup

City of Joondalup
Draft Weed Management Plan 2016

Geraldton Carnation Weed (*Euphorbia terracina*)

Acknowledgements

- Mr Jon Dodd, Senior Researcher, Department of Agriculture and Food WA
- Mr Les Holden, Station Officer, Department of Fire and Emergency Services

City of Joondalup Authors and Contributors to Draft Weed Management Plan

- Manager Operation Services, Diplomas in Horticulture and Turf Management, 37 years relevant experience.
- Principal Environmental Project Officer Postgraduate Diploma in Policy Studies specialising in Ecologically Sustainable Development, Murdoch University, 9 years experience specifically in environmental management.
- Coordinator Park Operations, Diploma in Project Management, Trade Certificate in Horticulture – Landscape Gardening, 20 years industry experience.
- Coordinator Natural Areas and Capital Works Projects, Certificate in Horticulture Studies, Diploma in Project Management, Advanced Diploma of Management, 32 years relevant experience.
- Team Leader Projects, Diploma in Project Management, 10 years experience specifically in landscape management.
- Team Leader Natural Areas, National Diploma in Horticulture, Diploma in Project Management, Certificate 3 Environmental Science (Management), 37 years relevant experience.
- Supervisor Natural Areas, Bachelor of Science Honours (Environmental Management), Edith Cowan University, Diploma in Project Management, 15 years relevant experience.

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

Suggested citation:

City of Joondalup, 2016, *Draft Weed Management Plan*, Joondalup, WA.

Contents

Acronyms

Acronym / Abbreviation	Definition
~~CALM~~	~~Department of Conservation and Land Management~~
CBP	Commercial Business Precinct
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFWA	Department of Agriculture and Food WA
DEC	Department of Environment and Conservation
DFES	Department of Fire and Emergency Services
DPaW	Department of Parks and Wildlife
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
n.d.	No date
NIASA	Nursery Industry Accreditation Scheme Australia
NRM	Natural Resource Management
PAW	Pedestrian Access Way
PPOSCF	Parks and Public Open Spaces Classification Framework
QMS	Quality Management System
SAR	Specified Area Rates
WA	Western Australia
WALGA	Western Australian Local Government Association

1.0 Introduction

The City of Joondalup ('the City') is situated along the Swan Coastal Plain, with its southern boundary located just 15 kilometres from the Central Business District of Perth. The City covers an area of 96.5 kilometres which encompasses a diverse range of natural areas including 17 kilometres of coastal foreshore, a chain of wetlands and a variety of bushland ecosystems. The City also includes over 370 parks and reserves as well as a substantial number of urban landscaping areas.

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.

The City is located within the Southwest Australia biodiversity hotspot, one of 35 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 7 Bush Forever sites within the City that contain species of high conservation value.

The Weed Management Plan has been developed in order to provide strategic ongoing weed management of the City's natural areas, parks and urban landscaping areas over the next five years and protect native vegetation and ecosystems in natural areas as well as the amenity, functionality and aesthetics of parks and urban landscaping areas. Weed management is conducted in the City to differing degrees, depending on the type of site. Weed management of natural areas is more extensive than weed management in parks and urban landscaping areas, due to the difference in biodiversity values. Section 4 of the Plan refers to weed management in natural areas, whilst Section 5 of the Plan details weed management in parks and urban landscaping areas.

The Weed Management Plan details an integrated weed management approach which prevents, monitors and controls the spread of weeds in the City. The Plan describes the potential environmental 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 in order to minimise potential impacts.

Weed management is conducted within the City by City staff, contractors and the valuable contributions from community members in 14 Friends Groups. Friends Groups members voluntarily work to protect, preserve and enhance significant bushland areas in the community. The Weed Management Plan complements the voluntary work of Friends Group volunteers.

1.1 Strategic Context

The purpose of the Weed Management Plan aligns with the City of Joondalup Strategic Environmental Framework outlined in Figure 1. Details of the relevant local, State and Federal legislation policies, plans and strategies are outlined in Appendix 3.

[1] Conservation International (2014)

Figure 1: City of Joondalup Strategic Environmental Framework

2.0 Impact of Weeds

The City manages large areas of bushland, many of which are recognised as having local and regional significance; however the invasion of weeds threatens the diversity of these natural areas. 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 parks and urban landscaping areas. 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 natural ecosystems where they are not naturally occurring and proceed to modify natural processes, usually adversely, resulting in the decline of the communities they invade.[2] A weed usually requires some form of action to reduce its effects on the economy, the environment, human health and amenity.[3] 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.[3]

Weeds account for approximately 15% of all flora in Australia, with this figure increasing by approximately 10 species per year.[4] 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 plants are the main source of Australia's weeds, accounting for 66% of recognised weed species.[5]

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;
- mulch, soil and plant stock;
- garden rubbish dumping; and
- fire.[4]

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.[6]

[2] DPaW (1999)
[3] NRM Ministerial Council (2007)
[4] Australian Government (2012b)
[5] Groves, Boden and Lonsdale (2005)
[6] CRC for Australian Weed Management (2005a)

2.2 Why Weed Management is Important

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. Weeds have major environmental, economic, and social impacts in Australia.

Impacts on the natural environment from weeds include:

- Reducing the viability of native plant species by competing more vigorously for space, water and nutrients.[7] 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.[8]
- Negatively impacting on native fauna by replacing or reducing the native plants and altering plant communities that animals use for shelter, food and nesting.[9]

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

A number of weed species have also been linked to health conditions. For example, some common weeds can cause asthma and other respiratory problems, especially in children, cause skin irritation or are poisonous.[7]

2.3 The Effect of Climate Change on Weeds

Global climate change will impact on temperature, rainfall, wind strength, and intensity and frequency of extreme weather events. 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. The south-west of Western Australia is likely to experience changes in the frequency, duration and intensity of droughts, floods, storms, heatwaves and fire.[10] These conditions create 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.[11]

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.
- providing weeds that are more readily able to adapt to future climates with a competitive advantage over native species.

[7] Australian Government (2012a)
[8] FESA (2011)
[9] City of Joondalup (2012a)
[10] Australian Government (n.d.)
[11] Australian Government (2012)

- 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.[12]

[12] Australian Government (2013)

3.0 Background on Weed Control

The City undertakes an integrated weed management approach to its weed control in natural areas, parks and urban landscaping areas including use of a variety of herbicides, a variety of herbicide application methods and hand weeding. In determining the appropriate weed control method for a given situation the City takes the following into consideration:

- the target weed;
- the season and timing i.e. before seeding;
- resistance of the weed to specific herbicides;
- site location and any special considerations i.e. near wetlands;
- weather conditions i.e. rain and wind;
- rotation of the type of herbicide used to reduce herbicide resistance; and
- effectiveness of outcomes, labour intensity required and cost involved.

Weed control involves using a number of methods to reduce weed infestations to manageable levels or if possible to eradicate infestations. Potential weed control methods include:

- Physical weed control – the removal of weeds by physical or mechanical means, such as mowing, grazing, mulching, 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.
- Thermal weed control – the application of hot water or steam 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.

There are many aspects that need to be taken into consideration when determining appropriate methods of weed control in natural areas, parks and urban landscaping areas. The types of weed control available to the City and their advantages and disadvantages are described in sections 3.1 to 3.4 and detailed in Appendix 6. Further discussion on the use of weed control in particular locations and circumstances is provided in section 4.6.2.

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, newspaper or black plastic; and
- Mulching – using organic matter.

Smothering and the use of mulch are not suitable for natural areas as it would also prevent the growth of native seedlings. Mechanical methods using large pieces of equipment or machinery would also create too much disturbance to the native vegetation and soil surface.

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[13]

Hand Weeding	
Advantages	**Disadvantages**
Young plants can be easy to pull out if soil is moist. Allows for selective removal of weeds. Can be effective for small infestations. Avoids the use of herbicides.	Can be difficult to remove plants if soil is dry or plants are large. Is time consuming and labour intensive. 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). Is not effective for large infestations. Can make the area more vulnerable to erosion.

Whilst hand weeding has been found to be more time consuming and 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 17 natural areas within the City.

An example of the physical weed control method of hand pulling is shown in Figure 2.

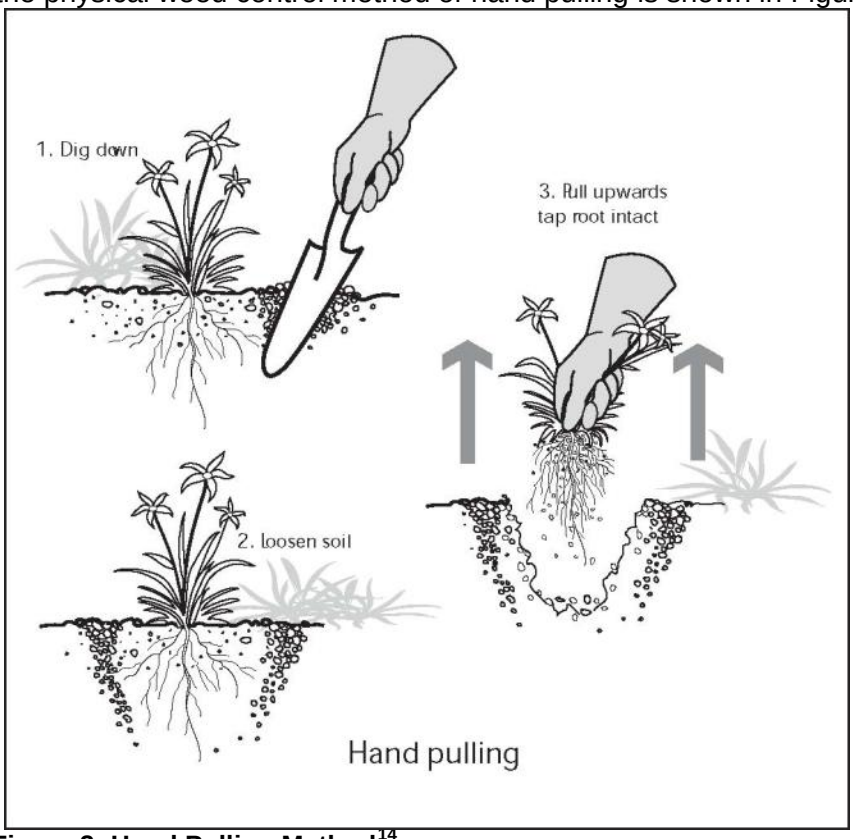

Figure 2: Hand Pulling Method[14]

[13] CRC for Weed Management (2004)
[14] Department of Planning (n.d.)

3.2 Chemical Weed Control

Chemical weed control through the use of herbicides can be an effective and practical method of weed control applicable in a variety of situations.[15] Herbicides are defined as 'a chemical substance used to destroy or inhibit the growth of plants, especially weeds'.[16] 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. There are also a number of ways in which herbicides can be applied depending on the situation to ensure specific weeds are targeted.[18]

Herbicides are an important and effective component of integrated weed management and 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.[15] In some situations herbicides offer the only practical, cost-effective and selective method of managing certain weeds.[17]

However, herbicides are chemicals and do have the potential to damage the environment including other plants, fauna and people. 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 3 outlines some common processes that may occur following herbicide application.[18]

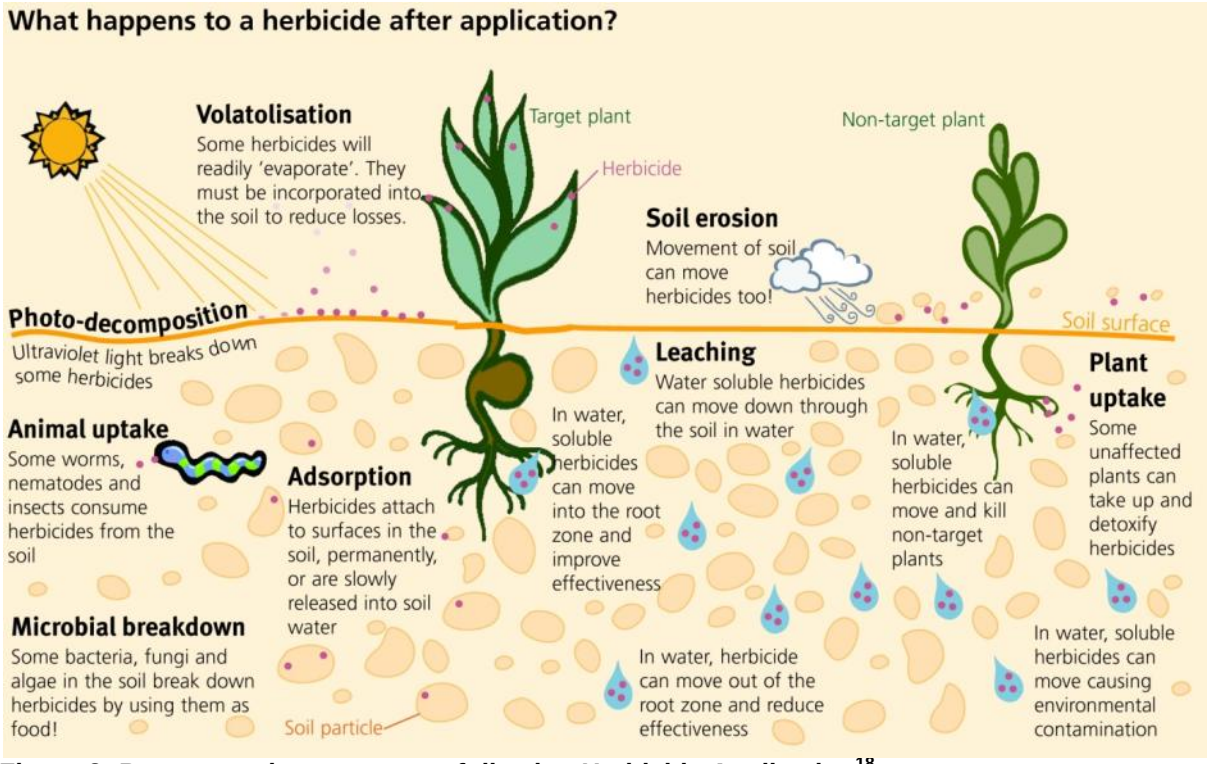

Figure 3: Processes that may occur following Herbicide Application[18]

[15] Department of Primary Industries (2011)
[16] Houghton Mifflin Company (2009)
[17] Australian Government (2012b)
[18] CRC for Australian Weed Management (2005a)

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 Australian Pesticides and Veterinary Medicines Authority (APVMA) for over 40 years and there are around 200 products containing glyphosate registered for use in Australia.

The City of Joondalup utilises herbicides in accordance with permits, regulations and label instructions applicable to the specific herbicide. The City endeavours to treat weeds prior to seed set in order to minimise spread.

In 2015 reports investigating the health effects of using glyphosate were released by IARC, an agency affiliated with the World Health Organisation (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 Australian Pesticides and Veterinary Medicines Authority (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 label instructions.

When herbicides, such as glyphosate, are used correctly they can be very effective and have limited negative impact on the environment.[18] 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. There are currently 25 weed species in Australia with populations that are resistant to at least one herbicide group.[19] Five are present in Western Australia and are also present within the City:

- Mediterranean Turnip (*Brassica tournefortii)*
- Patersons Curse *(Echium plantagineum)*
- Wimmera Ryegrass (*Lolium rigidum)*
- Wild Oat *(Avena fatua)*
- Wild Radish *(Raphanus raphanistrum).*[20]

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.

[19] Department of Agriculture and Food (n.d.)
[20] WeedScience.org (2013)

Table 2: Advantages and Disadvantages of Chemical Weed Control

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 wetland or other sensitive areas. 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.

Sensitive Facilities

The City considers the following as sensitive facilities:

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

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.

Pesticide Use Notification

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

The City also displays 'caution' signage in areas where herbicides are being applied and until the herbicide has dried. This signage is placed at appropriate locations in all directions to allow the public sufficient warning. A marker dye is mixed with herbicides to indicate where spraying has been conducted in natural areas, other than on dual use paths. The purpose of marker dyes is for staff or contractors spraying herbicides to see which areas have been sprayed, rather than to alert the public about spraying. Caution signage is used to alert the public to avoid areas being sprayed.

Herbicide Use Procedures

When using herbicides the City:

- Uses herbicide products registered by the Australian Pesticides and Veterinary Medicines Authority.
- Follows all regulations and label instructions applicable to the specific herbicide.
- Complies with the Department of Agriculture and Food Western Australia's (DAFWA) Permit to Allow Minor Use of an Agvet Chemical Product for the Control of Environmental Weeds in Various Situations.
- Complies 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.
- Acts in accordance with its internal procedures which outline instructions for training, transport, handling, storage, resident notification, application, records, spills and use of new herbicides.
- Consults resources, such as the DPaW's Florabase website or *Southern Weeds and their Control* (DAFWA Bulletin 4744), in regards to best practice timing and methods of weed control for individual weed species.
- Undertakes assessment of authorised chemicals to determine whether or not more suitable alternatives are available and which also meet safety requirements and reduce potential environmental impacts. The City minimises the use of herbicides, where possible.

3.3 Thermal Weed Control

Thermal weed control involves applying hot water under pressure through a heated chamber on 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.[21] Thermal weed control has been suggested as a safer alternative to herbicide use.[22] However research and trials into thermal 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.

Thermal 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 thermal treatment does not affect the deeper root systems.[21,23,24] As a result more repeat treatments are required when using thermal weed control. Thermal 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.[24]

Whilst thermal 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.

Thermal weed control is not a viable option for the treatment of weeds in natural areas[25] 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; and
- the equipment also tends to be large and bulky and is generally unsuitable for accessing natural areas.

Thermal 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 thermal weed control in urban environments is still less effective, more expensive and generally does not work as a stand-alone approach in the longer term. While a number of local governments have trialled the use of thermal weed control in urban areas with the aim of reducing herbicide use, many have now limited the use of thermal weed control (or stopped using it all together) as it is ineffective in the long term.[26]

The advantages and disadvantages of thermal weed control are provided in Table 3.

Table 3: Advantages and Disadvantages of Thermal Weed Control

Thermal Weed Control

[21] Department of Primary Industries (2011)
[22] Collins (1999)
[23] Banks and Sandral (2007)
[24] Banks and Associates (2009)
[25] Natural Areas Consulting (2013)
[26] City of Nedlands (2013)

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.

The City has undertaken two thermal weed control trials in urban areas and found that herbicides are more effective and less expensive (refer to Section 4.7.1). Thermal weed control is not a part of the City's weed management approach due to its expense, lack of portability, long term ineffectiveness and potential for off-target damage.

A report on the effectiveness and cost of hydrothermal and herbicide trial treatments through their application at various locations throughout the City of Joondalup was reported to Council at its meeting held on 15 December 2009. It was noted that hydrothermal was the least effective and most expensive method of weed control and glyphosate and pendimethalin were endorsed for weed control. It was also requested that the City continue to investigate alternatives to herbicide use.[27]

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[28].

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'.*[29]

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.[29]

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.[30]

[27] City of Joondalup (2014)
[28] Australian Government (2012c)
[29] CSIRO (2013)
[30] Department of Primary Industries (2011)

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.

4.0 Natural Areas Weed Management

There are a variety of regionally, nationally and internationally significant natural areas located within the City including 7 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 36 natural areas listed in the District Planning Scheme No. 2 Schedule 5 as places having significance for the purpose of protection of the landscape or environment.

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

The City manages over 500 hectares of natural areas in 108 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 over 200 identified weed species, including 8 declared pest plants and 5 Weeds of National Significance. Effective weed management is required to ensure that measures are taken to prevent, monitor and control the spread of weeds within the City.

In order to protect native vegetation and ecosystems within the City, Section 4 of the Weed Management Plan addresses natural areas weed management. Section 4 complements the voluntary work of Friends Group volunteers who contribute substantially to weed management in the City's natural areas.

4.1 Purpose

The purpose of Section 4 of the Plan is provide an integrated weed management approach to prevent, monitor and control the spread of weeds in the City's natural areas and conserve biodiversity values.

Section 4 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.
- 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.

4.2 Limitations

Section 4 excludes weed management of the following areas managed by the City:

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

Section 4 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 Parks and Wildlife (DPaW) and City of Wanneroo). The approach for weed control for this area is outlined in the DPaW *Weed Control and Revegetation Plan* (2002); and
- The marine environment.

4.3 Study Area

The study area for Section 4 includes natural areas managed by the City as illustrated in Figure 4.

A list of the sites included within Section 4 of the Weed Management Plan is provided in Appendix 1 and Appendix 2.

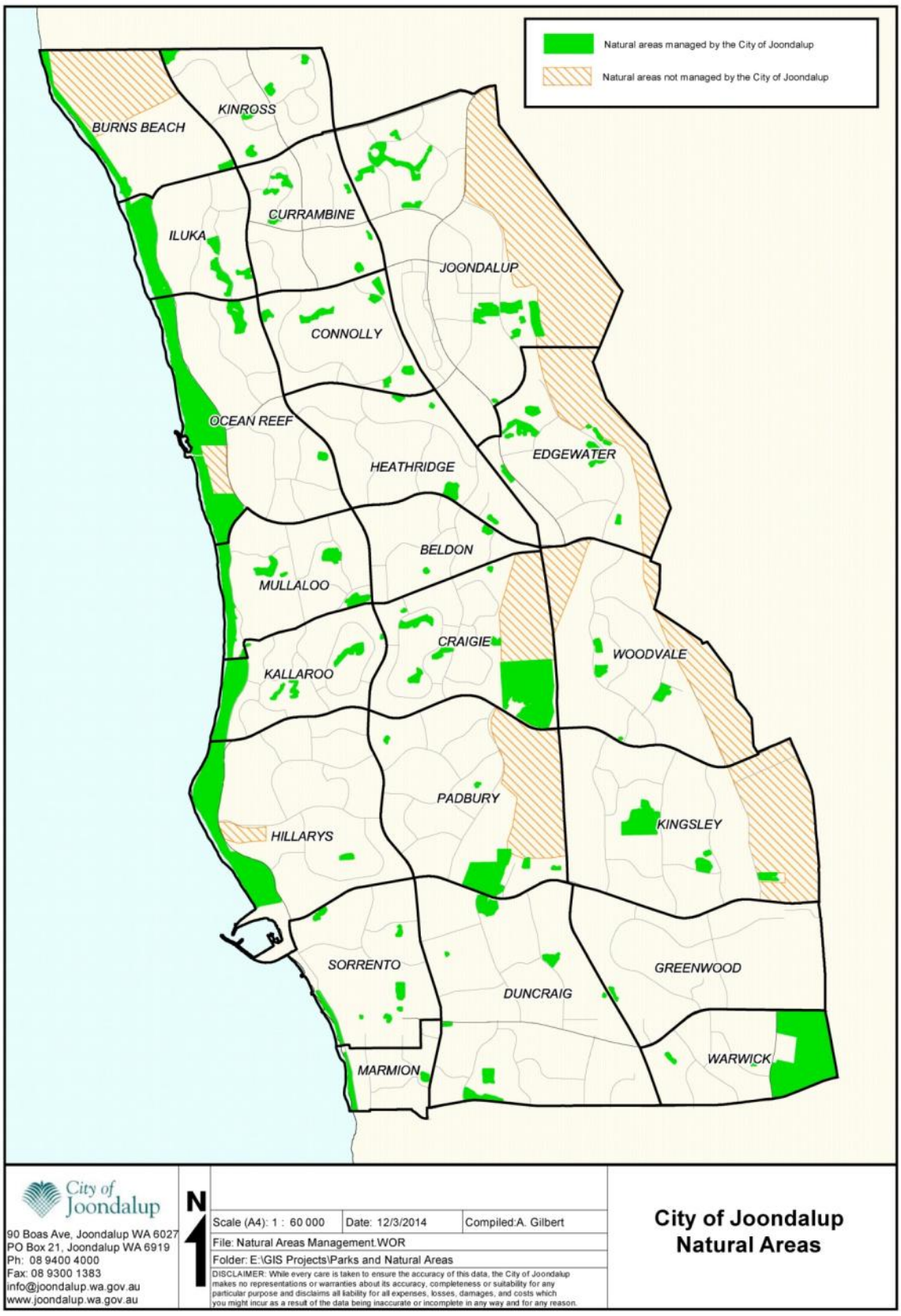

Figure 4: City of Joondalup Natural Areas

4.4 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.

4.4.1 Prioritisation of sites

The City has over 200 identified weed species in natural areas, including over 70 priority weeds. The City currently conducts weed management in natural areas on a priority basis using four criteria (in descending order), as shown in
Figure 5.

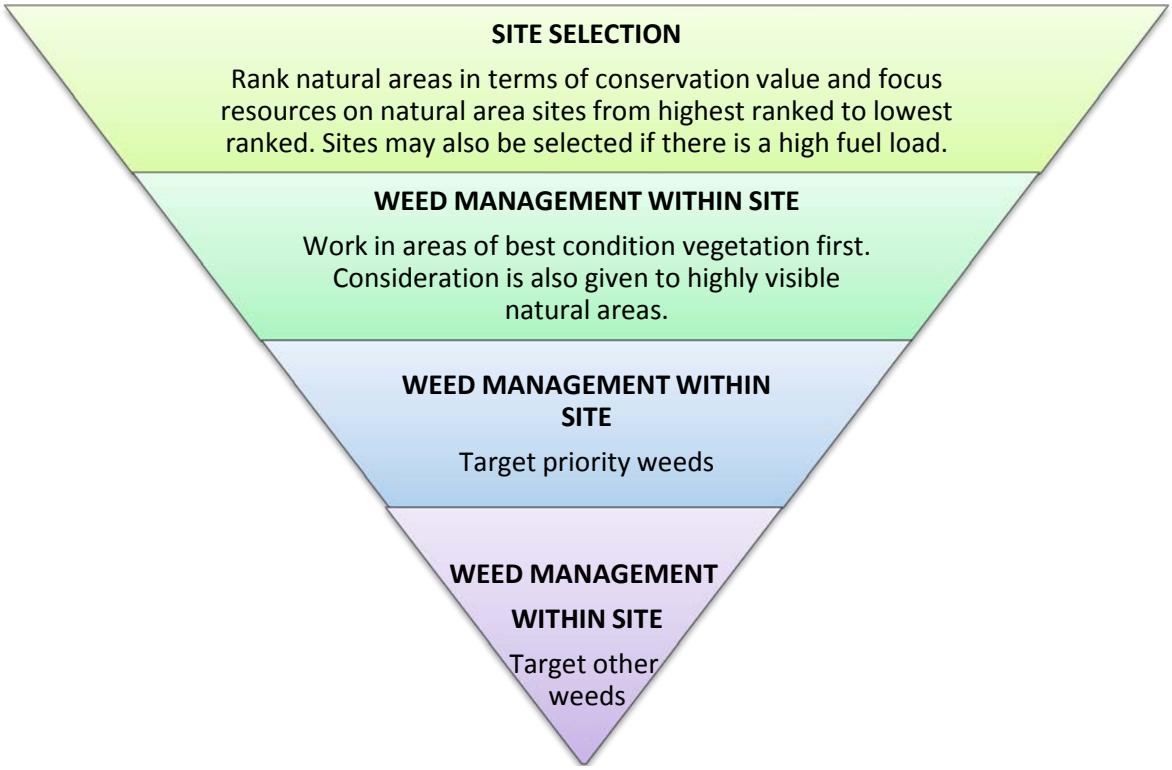

Figure 5: Criteria currently used to prioritise weed management actions for natural areas

4.4.2 Site Selection

The City ranks management of natural areas according to the Local Biodiversity Program Natural Areas Initial Assessment ranking.[31] 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 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

[31] WALGA (2014)

- 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; and
- Protection of wetland and coastal vegetation.[32]

The City reassesses its natural areas every 5-7 years using the Natural Areas Initial Assessment tool. The City's natural areas are rated into categories of major conservation (highest ranking), high rated and then medium rated. 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.

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

4.4.3 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 allowing for bushland generation in regards to the rate of clearing of weeds.[33,34] 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 Areas Management Plans 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.

4.4.4 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 Weed of National Significance under the National Weeds Strategy (1997).
- The weed species is listed as a Declared Pest Plant according to the Department of Agriculture and Food (2011).
- The weed species is a High Priority Weed according to the Environmental Weed Strategy for WA (DPaW 1999).

[32] WALGA (2004)
[33] Leschenault Catchment Council (n.d.)
[34] AABR (2013)

- The weed species is listed as Very High Priority or High Priority weed according to the DPaW Weed Prioritisation Process for the Swan Region (2013).
- The weed species is listed as a pest plant under the City's *Pest Plant Local Law 2012*.
- The City has determined that the weed species: poses a major threat to vegetation or the structure of vegetation communities; is likely to lead to a significant outbreak of individual weed species; and/or contributes to a high fuel load (e.g. grasses).

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

Table 4: 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 1997	5 Weeds of National Significance
Biosecurity and Agriculture Management Act 2007	8 declared pest plants
Environmental Weed Strategy for Western Australia 1999	22 high rated weeds
DPaW Weed Prioritisation Process for Swan Region 2013	2 very high and 18 high rated weeds
City's Pest Plant Local Law 2012	1 pest plant

4.4.5 Integrated Weed Management Approach

Integrated weed management involves using a variety of different techniques to monitor, prevent 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.[35] An integrated approach is required for effective weed management, and therefore the management of weeds within the City includes:

- weed monitoring;
- weed prevention;
- weed control (physical and chemical);
- education and training; and
- partnerships with external stakeholders.

4.5 Weed Monitoring

Ongoing monitoring of the City's natural areas is critical to ensuring the long term management of biodiversity within the City. Weed monitoring is important for identifying areas with weed populations, weed spread, discovering new weeds on a site, protecting significant native flora species and for measuring the effectiveness of weed control measures. Weed management can be modified according to weed monitoring results.

There are numerous different approaches to weed monitoring including weed mapping, taking of photographs, identification of weed species and their distribution (observational weed monitoring) and the use of high resolution multi-spectral imagery.

4.5.1 Weed Mapping

[35] CSIRO (2011)

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; and
- inform weed management at a local government level.[36]

Current Management Approach

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 the major conservation areas to inform the development of Natural Areas 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 also undertaken approximately every 5-7 years when the City undertakes its assessment of high priority and medium priority natural areas using the Natural Areas Initial Assessment tool and in accordance with the Natural Areas Assessment Schedule.

Recommended Weed Mapping Management Actions:

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.

Through the development of Natural Areas Management Plans, continue undertaking flora, fauna and fungi surveys of the major conservation areas every five years to inform on ground weed management actions.

Continue to incorporate information from flora, fauna and fungi surveys into IntraMaps regarding vegetation condition and priority flora and fauna.

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.

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

4.5.2 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.

Current Management Approach

Photo monitoring is not currently conducted within the City.

Recommended Management Approach

It is recommended to investigate the benefits of commencing photo monitoring in the City's major conservation areas when measuring the natural areas key performance indicator annually to assess the effectiveness of ongoing weed control.

Recommended Photo Monitoring Management Action:

Consider the use of photo monitoring in major conservation areas when measuring the natural areas key performance indicator annually to assess the effectiveness of ongoing weed control.

4.5.3 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.

Current Management Approach

The City measures the percentage cover of environmental weeds annually at the same time of year. Data is collected in ten of the City's key natural areas through three transects on each site. The City's density of environmental weeds has generally been decreasing over the past nine years due to increased weed management, as shown in
Figure 6.

Observational weed monitoring using quadrats has previously been conducted at Warwick Open Space and Craigie Open Space. Grasses in Warwick Open Space and *Lachenalia reflexa* in Craigie Open Space were monitored annually using quadrats to estimate weed density.

Recommended Management Approach

It is recommended that the City continues to measure the percentage cover of weeds annually in key natural areas, at the same time of year, as an indicator of vegetation health.

Recommended Observational Weed Monitoring Management Action:

Continue to measure the percentage cover of weeds annually in key natural areas at the same time of year, as an indicator of vegetation health.

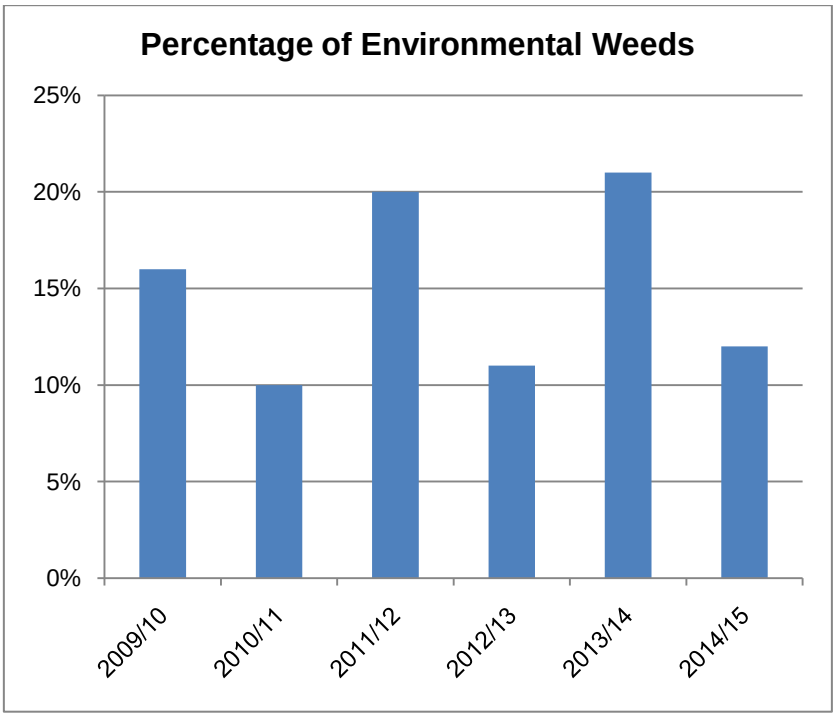

Figure 6: Indicator – Percentage Cover of Environmental Weeds

4.5.4 High Resolution Multi-spectral Imagery

High resolution multi-spectral imagery is aerial imagery that is composed of small pixels to allow for direct recognition of features of interest. The imagery includes a near-infrared spectral band that is sensitive to changes in chlorophyll and cell structure of vegetation and can be utilised to assess changes in the vigour and condition of trees and plants over time.[37] The imagery has the potential to provide information on the distribution and density of weeds in natural areas and the progress of weed management within natural areas.

The City currently acquires high resolution multi-spectral imagery of the City of Joondalup every two years, as recommended in the Pathogen Management Plan.

Current Management Approach

High resolution multi-spectral imagery using aerial photography was acquired for the whole of the City in 2012 and 2014 as datasets to analyse vegetation health and cover, as recommended in the Pathogen Management Plan. The Pathogen Management Plan also recommends that this data is acquired every two years. This information could also be analysed for weed distribution and density.

Recommended Management Approach

It is recommended that the City investigates analysing the high resolution multi-spectral imagery of parks and natural areas every two years for weed distribution and density to enable the ongoing monitoring of weed management within the City. High resolution multi-spectral imagery weed monitoring would be more precise, objective and extensive than the current annual weed monitoring methods using transects.[38] The estimated cost to analyse high resolution multi-spectral imagery for weed monitoring is $12,000 every two years.

[37] City of Joondalup (2013)
[38] ArborCarbon (2014)

Recommended High Resolution Multi-spectral Imagery Management Action:

Investigate the feasibility of analysing high resolution multi-spectral imagery of parks and natural areas every two years in order to monitor weed distribution and density.

4.6 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.[39]

Examples of ways that weeds can establish that can be addressed 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; and
- fire prevention activities such as creating fire breaks 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; see sections 4.6.1, 4.6.2 and 4.6.3 below.

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 that have the potential to become bushland weeds.[40] Actions that community members can take to prevent weeds are described in more detail in section 7.1.

4.6.1 Minimising Access and Disturbance

Accessing natural areas for maintenance or management activities can cause disturbance, creating opportunities for weeds to invade or establish.

Accessing natural areas off paths or tracks, whether by vehicle or foot, can trample or disturb vegetation and soil and create bare surfaces. These bare surfaces create space and opportunities for weeds to establish or spread into. Accessing natural areas off paths or tracks is required for rubbish removal, weed control or revegetation activities.

Current Management Approach

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. Wherever 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.

[39] State Weed Plan Steering Group (2001)
[40] DSEWPC (2012)a

Recommended Management Approach

It is recommended that City staff and contractors continue to minimise disturbance to vegetation when accessing natural areas by vehicles, equipment and people remaining on tracks, where possible, during management and maintenance activities to reduce the establishment and spread of weeds.

Recommended Minimising Access and Disturbance Actions:

Ensure City staff and contractors minimise disturbance to vegetation when accessing natural areas by vehicles, equipment and people remaining on tracks, where possible, during management and maintenance activities to reduce the establishment and spread of weeds.

4.6.2 Weed Hygiene

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 or mulch. 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.

Weed hygiene practices should be undertaken when:

- City staff or contractors are entering or leaving natural areas;
- Landscaping supplies are being used in or adjacent to natural areas; and
- City staff or contractors are undertaking landscaping, maintenance or weeding activities in or adjacent to natural areas.

Current Management Approach

Staff and contractors conducting hand weeding in natural areas ensure that weeds are bagged and disposed of off-site to prevent weed spread.

City staff and contractors currently conduct weed hygiene practices of cleaning and brushing down soil and weed seeds from vehicles, machinery, equipment, tools, footwear, and clothing before they enter and leave key natural areas.

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 along the coast and 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 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.

To provide guidance to City staff and contractors weed hygiene practices, the City has developed *Pathogen and Weed Hygiene Guidelines* and *Purchasing Guidelines for the Supply of Landscaping Materials*.

Recommended Management Approach

In order to reduce the risk of spreading weeds between vegetated areas, it is recommended that City staff and contractors clean and brush down soil and weed seeds from vehicles, machinery, equipment, tools, footwear, and clothing before they enter and leave key natural areas, in accordance with the City's *Pathogen and Weed Hygiene Guidelines*.

It is recommended that the City continues to purchase plant stock, mulch, soil and compost that comply with the City's *Purchasing Guidelines for the Supply of Landscaping Materials,* to eliminate the likelihood of introducing weed seeds.

Recommended Weed Hygiene Management Actions:

Implement the Pathogen and Weed Hygiene Guidelines, to provide direction to staff and contractors working within the City's natural areas and parks in order to limit the spread of weeds within the City.

Implement the Purchasing Guidelines for the Supply of Landscaping Materials to provide information to City staff and contractors relating to the purchase of plant stock, soil, mulch compost and other materials for City parks and natural areas.

4.6.3 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 bushland reserves, which can have a negative effect on biodiversity and encourage growth of highly flammable and invasive weeds.[41,42]

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

- Fire occurrences;
- The construction or maintenance of firebreaks; and
- Emergency services responding to fire events including use of emergency vehicles and fire suppression activities.

Current Management Approach

The City monitors natural area fire occurrences through reports requested from DFES every 5 years. From these reports, natural areas with continued incidents of arson are identified. City Watch increase patrols over a period of several months on problem sites in order to deter further arson incidents, where possible. The City does not currently have a prescribed burn management regime.

The construction and maintenance of firebreaks is an important and necessary fire prevention tool, 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.[43] In addition to this the City constructs fire access ways within natural areas, where necessary, to ensure access for emergency vehicles and fire suppression activities in the event of a fire.

When a fire incident does occur; the response of DFES and the necessary fire suppression activities can also disturb vegetation and soil surfaces. In particular the use of high pressure

[41] City of Joondalup (2012a)
[42] City of Joondalup (2012b)
[43] DFES (2013)

hoses to suppress fire and the movement of vehicles can have a significant impact. Where possible care should be taken to minimise disturbance, however the City is mindful that the emergency situation takes precedence and that the City can not directly control the response of emergency services.

The City developed a Fire Weed Management Guideline to inform staff and contractors about weed management whilst developing and maintaining fire breaks and access ways.

Recommended Management Approach

The creation of fire breaks and access ways create large bare surfaces devoid of native vegetation and provide prime conditions for weed establishment as all competition for light, nutrients, moisture and space have been removed.[44] Where possible, to minimise impacts when constructing and maintaining firebreaks and fire access ways, the following should be considered:

- Undertake construction and maintenance activities on non-windy days to reduce weed seed dispersal;
- Dispose of any weeds removed during construction and maintenance off-site;
- Consider whether the placement of new fire access ways can take advantage of existing poorly degraded vegetation rather than clearing vegetation in good condition; and
- Ensure that adequate access ways are provided to minimise the need for vehicles to move off access ways into vegetated areas.

Recommended Fire Management and Response Actions

Continue to request natural area fire occurrence reports from DFES every 5 years to identify locations with continued incidents of arson. Where possible, increase City Watch patrols in problem areas to deter arson and the resulting encouragement of weed growth.

Implement the Fire Weed Management Guideline to inform staff and contractors about weed hygiene when constructing and maintaining firebreaks and access ways.

Consider post fire revegetation in natural areas to prevent weed spread, on an as required basis.

4.7 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.[45] The City currently uses hand weeding and herbicide weed control methods in natural areas.

Current Management Approach – Hand Weeding in Natural Areas

[44] FESA (n.d)
[45] Brown and Brooks (2002)

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. 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.

Current Management Approach – Herbicide Use in Natural Areas

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.

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.

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 and within a few weeks of the first winter rainfall.

The City conducts flora surveys including vegetation condition assessments in key natural areas 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 partners with agencies or organisations to trial new forms of weed control, such as the Department of Parks and Wildlife.

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.

City staff display caution signage when herbicides are being applied at appropriate locations until the herbicide has dried, to allow the public sufficient warning. Caution signage is displayed in accordance with the Department of Health *Health (Pesticides) Regulations 2011* Signage Requirements.

Recommended Management Approach – Herbicide Use in Natural Areas

It is recommended that the City continues using an integrated weed management approach that includes physical and chemical weed control methods.

A formal register of herbicide resistant weeds, including locations and date identified, would enable ongoing monitoring and control of herbicide resistant weeds in the City. Research on herbicide rotation could be conducted to increase the effectiveness of herbicide use. The City could also investigate further opportunities to partner with agencies or organisations to trial new forms of weed control.

It is recommended that the City staff continue to use vegetation condition maps from flora surveys conducted in key natural areas every 5 years to guide weed control activities and prioritise works in best condition vegetation areas on site. Maps are also to be provided to contractors.

The occurance of aggressive weed species in areas previously free of the weed has the potential to impact on the structure of plant communities in a short period of time. The City should continue to monitor for new weed species and undertake control as a priortity in order to eliminate the species and reduce the risk of spread.

It is proposed to continue to review the City's Spraying Chemicals Work Instruction, as part of the ISO 9001 Quality Management System.

It is recommended that the herbicide mixing volume rate by City staff and contractors be audited a minimum of twice per year, to ensure compliance with the applicable regulations and label instructions.

It is recommended that the City conduct regular auditing in accordance with the ISO 9001 Quality Management System regarding the use of caution signage by City staff and contractors when spraying herbicides, to ensure signage is left in place until herbicides are dry and compliance with the Department of Health *Health (Pesticides) Regulations 2011* Signage Requirements.

Recommended Weed Control Management Actions

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

Create a register of herbicide resistant weeds including locations and date identified to enable monitoring and control.

Conduct research or trials on herbicide rotation to increase the effectiveness of herbicides, as required.

Investigate opportunities to partner with agencies or organisations to trial new forms of weed control.

City staff are to continue to use vegetation condition maps from flora surveys conducted in key natural areas to guide their weed control activities and prioritise works in best condition vegetation areas on site. Maps are also to be provided to contractors.

Continue to monitor for new aggressive weed species and undertake control as a priority to elimate the weed species and prevent spread.

Continue to review the City's Spraying Chemicals Work Instruction in accordance with the ISO 9001 Quality Management System.

Conduct audits a minimum of twice per year of City staff and contractors herbicide mixing volume rate, to ensure compliance with the applicable regulations and label instructions.

Conduct regular auditing in accordance with the ISO 9001 Quality Management System regarding the use of caution signage by City staff and contractors when spraying herbicides, to ensure signage is left in place until herbicides are dry and compliance with the Department of Health Health (Pesticides) Regulations 2011 Signage Requirements.

4.7.1 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.

Current Management Approach

The City has undertaken a number of weed control trials, as shown in Table 5. The City has conducted trials on thermal control methods in urban areas. The unsuitability of using thermal control methods in natural areas is well documented and therefore has not been trialled by the City.[46]

[46] Natural Areas Consulting (2013)

Table 5: Weed Control Trials undertaken in the City of Joondalup

Timeframe	Trial	Outcomes
2006 - 07	Use of certain herbicides to control One-leaf Cape Tulip (*Moraea flaccida*) in Iluka.	The trial indicated a negative effect on native flora in soils with high pH values and the outcomes informed the future use of herbicides to control One-leaf Cape Tulip.
2007	Report on Weed Control using Hot Water/ Steam and Herbicides in the City of Joondalup *(Urban areas only)*	Found that herbicides are more cost effective and have better kill rates than thermal weed control methods. The cost advantages and speed of application indicate that herbicides are suitable for large scale operations.[47]
2009	Weed Control Trials comparing Hydrothermal and Herbicides in the City of Joondalup *(Urban areas only)*	Thermal control was found to be ineffective for long term weed control.[48]
2013 - 14	Effectiveness of hand weeding and herbicide methods in Central Park, Joondalup and Mullaloo Beach Foreshore.[49]	The outcomes of the trial indicated that the use of herbicides combined with hand weeding was the most effective but also most expensive form of weed treatment, as compared to the use of herbicides only . The use of herbicides only was found to be the second most effective form of weed treatment but was less expensive.

The City has also trialled Controlled Droplet Applicators (CDA) to apply herbicides within natural areas. The applicators provide a more targeted and efficient means of delivering herbicides and reduce the risk of spray drift. Conventional herbicide application technologies (back packs and hand held motorised spray guns) apply up to thirty times more volume than hand held CDA's. The use of the devices will continue with ongoing monitoring to measure the effectiveness.

Recommended Management Approach

The City should continue to investigate opportunities to trial new methods of weed control methods as they become available.

Recommended Weed Research and Trials Management Actions:

As technology and research improves, investigate opportunities for the City to trial new weed control methods.

[47] John Banks and Associates (2007)
[48] John Banks and Associates (2009)
[49] Natural Area Consulting (2013)

4.7.2 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.

New Weed Populations

Early identification of new weed populations in the City can enable their eradication or containment, particularly if they can be removed before they produce seed.[39] New weed populations could include weeds previously unidentified in the City or weeds previously unidentified on specific sites.

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.

Weed Control Post-Fire

The City has fire occurrences in natural areas on a frequent basis. For example, there were seven fire occurrences in Lilburne Park, Duncraig in 2013. DFES is responsible for fire eradication, whilst the City is responsible for post fire weed management.

The disturbance of fire in bushland can create an opportunity for rapid growth of competitive weed species 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 species are quick to exploit the favourable conditions immediately after fires, germinating prolifically and spreading vigorously in the first few seasons.

After a fire there will be a reduction in groundcover and understorey vegetation, as well as a loss of fauna species dependent on that habitat. There is the potential for soil erosion until vegetation regenerates, particularly if significant rainfall occurs.[50]

Equipment, machinery and vehicles involved in fire response and water flow across bare ground can inadvertently spread weed seeds into areas where the weed species were not previously established, decreasing the condition of the vegetation community. Weed species can compete with and reduce the ability of native plants to re-establish.[51] Perennial Veldt Grass (*Ehrharta calycina*) is a species of weed that often establishes itself after fire.[51]

Current Management Approach

New Weed Populations

When new weed populations are identified in the City they are assessed and controlled as required. These populations are then monitored through regular site inspections.

Weed Control on Verges

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.

[50] Willoughby City Council (n.d.)
[51] Brown and Brooks (2002)

Weed Control Post-Fire

In order to minimise weed occurrence in natural areas post fire, a *Fire Weed Management Guideline* has been developed. After a fire occurrence the City maps the fire scar information on IntraMaps to monitor fire frequency on individual sites. The City also obtains information from DFES regarding fire occurrence history for sites.

The City allows for approximately three months of natural vegetation regeneration after fire before commencing weed control activities. This period of time prevents disturbance and allows native seedlings to resprout.

Regrowth of weeds are then managed prior to seeding with targeted herbicides. To ensure weed species do not reach an intense level of infestation timely post-fire management action (usually within 18 months) is necessary for containment. Weed control activities are ongoing in all City managed natural areas.

Recommended Management Approach

It is recommended that the City create a register of new weed populations including records of location, date and priority ranking to assist the City to track and monitor new weed populations.

The City should continue to undertake weed control on areas adjacent to the City's natural areas to prevent the spread of weeds into these natural areas.

Implementation of the *Fire Weed Management Guidelines* is recommended to ensure a consistent approach to weed management post fire occurrences, including the consideration of post fire revegetation in natural areas to prevent weed spread, on an as required basis.

Recommended Weed Control in Specific Location Actions

Create a register of new weed populations identified in the City to enable monitoring and weed management.

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.

Implement the Fire Weed Management Guidelines to limit the infestation of weeds in the City's natural areas.

4.8 Partnerships

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

Local Friends Groups are an important partner of the City in managing natural areas and reducing weeds and contribute substantially to bushland conservation. The City's 14 Friends Groups voluntarily contributed 7,384 hours in 2013/14 towards bushland restoration in 17 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.

Current Management Approach

The City liaises with a variety of external stakeholders regarding weed management, such as Department of Parks and Wildlife, Department of Agriculture and Food WA, Water Corporation, other local governments (e.g. City of Wanneroo and City of Stirling), universities, schools and Friends Groups.

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.[52]

Recommended Management Approach

The City should continue to investigate opportunities to partner with stakeholders, research institutions and community groups to enable the City to build capacity and gain information relating to best practice approaches to weed management.

City staff should continue to regularly participate in research projects and take up opportunities for sharing information to ensure the City is implementing best practice approaches to the management of weeds.

The City will ensure that the Weed Management Plan is publically available to facilitate information sharing and enable a consistent approach to weed management for City staff and the community.

Recommended Partnerships Management Action:

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

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

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

5.0 Parks and Urban Landscaping Areas Weed Management

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.

5.1 Purpose

The purpose of Section 5 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 5 of the Weed Management Plan includes the following:

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

5.2 Limitations

Section 5 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.

5.3 Study Area

The study area for Section 5 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); and
- sumps and swales.

The parks managed by the City are shown in Figure 7 and detailed in Appendix 7. Urban landscaping areas are not shown or detailed due to the large number of such areas within the City.

Figure 7: Parks Managed by the City of Joondalup

5.4 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 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 usually provided by the City.

There are currently three areas within the City that have an applied SAR:

- Iluka
- Woodvale Waters Estate, Woodvale
- Harbour Rise Estate, Hillarys.

5.5 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.

5.5.1 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 8.

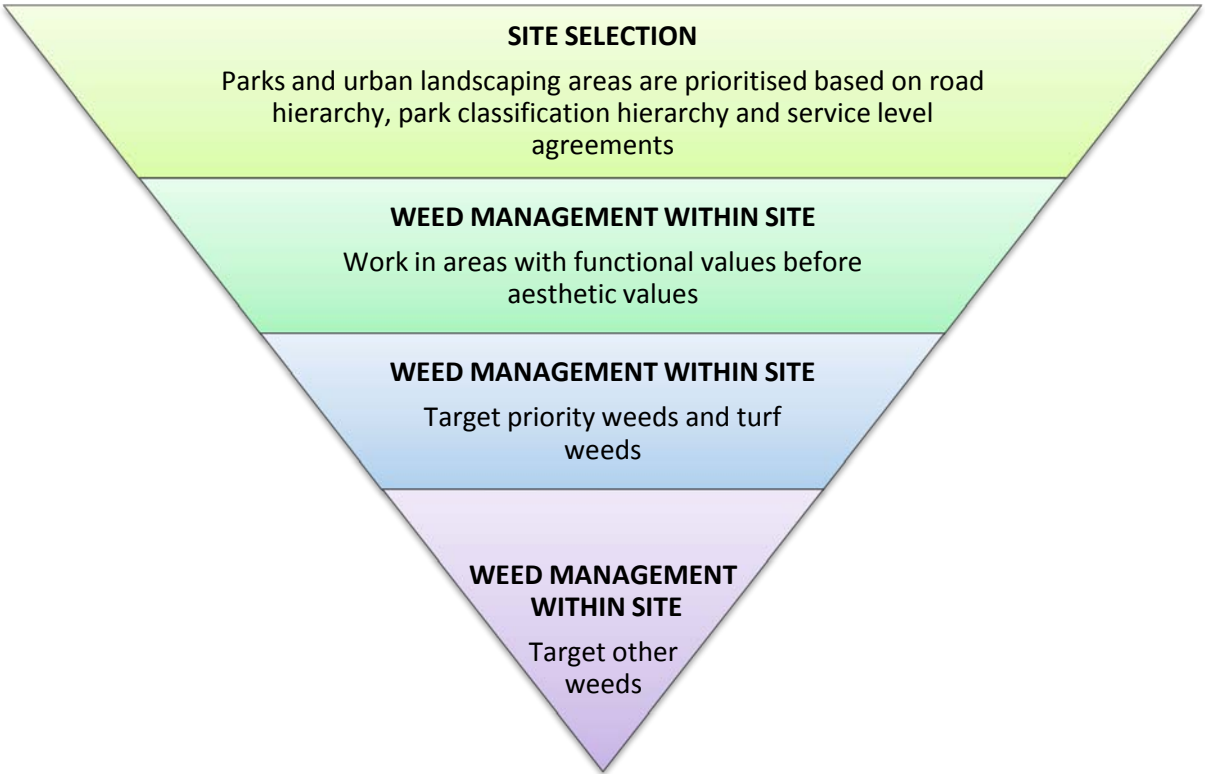

Figure 8: Criteria currently used to prioritise weed management actions for parks and urban landscaping areas

5.5.2 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

Parks are areas of public open space that contain facilities for recreation and leisure. The current Parks and Public Open Space Classification Framework (PPOSCF) and the revised PPOSCF, adopted as a management guideline to assist in the planning and provision of park and public open space assets, is utilised to prioritise weed management in parks. 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 (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 designed for sporting activities. Sports parks are used with the main purpose of engaging in organised sporting activity, training, competitions or viewing as a spectator.

Sports parks that abut school ovals are given a higher priority for weed spraying to be undertaken during school holidays when fewer people are using the facilities in the vicinity.

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

- **Regional Sports Park** (Very high priority – 1): Regional Sports Parks are utilised for a wide range of sport, leisure and recreation purposes and contain related facilities. These parks have the capacity to service the needs of the City community and may also attract users from outside the City. An example of a Regional Sports Park is Percy Doyle Reserve in Duncraig.
- **District Sports Park** (High priority – 2): District Sports Parks are utilised for organised sporting activities and passive recreational activities such as walking and use of play equipment. District Sports Parks service the local area, as well as several surrounding suburbs. An example of a District Sports Park is Iluka District Open Space in Iluka.
- **Local Sports Park** (Medium priority – 3): Local Sports Parks are utilised for seasonal organised sporting activities as well as other passive recreational activities. Local Sports Parks are designed to cater for the needs of the community within the suburb. An example of a Local Sports Park is Caledonia Park in Currambine. Local Sports Parks adjacent to schools are classified as High Priority (2) and use of herbicides for weed control is avoided during school hours.
- **Local Mixed-Use Parks** (Medium priority – 3): Local Mixed-Use Parks are developed parks used for both recreational activities and organised sporting

activities. Local Mixed-Use Parks are designed to cater for the needs of the community within the suburb. An example of a Local Mixed-Use Park is Flinders Park in Hillarys.

Recreation Parks

Recreation Parks are predominately used for recreational activities such as picnics, play, walking and exercising animals. They contain turf suitable for low-wear applications and leisure-based infrastructure.

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

- **Regional Recreation Park** (Very high priority – 1): Regional Recreation Parks are used for recreation and leisure activities. They accommodate the needs of the wider City community and beyond and encourage short, medium and long stay usage. An example of a Regional Recreation Park is Tom Simpson Park in Mullaloo.
- **District Recreation Park** (Low priority – 4): District Recreation Parks are used for recreation and leisure activities. They accommodate the needs of the residents from the suburb and surrounding suburbs and encourage medium to short stay usage. An example of a District Recreation Park is Geneff Park in Sorrento.
- **Local Recreation Park** (Low priority – 4): Local Recreation Parks are used for short term activities such as play, walking and exercising animals (if permitted under the City's local laws). An example of a Local Recreation Park is Blue Lake Park in Joondalup.

Refer to Appendix 7 for a complete listing of City managed parks and their priority rankings, including areas that are covered by service agreements.

Urban Landscaping Areas

Urban landscaping areas are contained within roads or along road reserves and thoroughfares and provide attractive, green spaces to complement and enhance the urban environment. Also included in this category are areas that have functional requirements such as drainage sumps and swales.

Urban landscaping areas are broken down into the following categories and weed management is dependent on the priority rating:

- **Specified Area Rates Locations** (Very High Priority 1): SAR landscapes are subject to annual service agreements (between residents and the City). There are currently SARs in place for Iluka, Harbour Rise Estate, Hillarys and Woodvale Waters Estate in Woodvale. SAR locations are maintained in line with the individual negotiated Annual Service Reviews. Services in the reviews are in line with industry best practice and City protocols.
- **Commercial Business Precinct (CBP)** (Very High Priority 1): The CBP includes parks, verges, road reserves and pedestrian access ways in the Joondalup City Centre. The CBP is maintained to a higher standard of appearance and an increased frequency of all aspects of landscape maintenance within the area including weed management.
- **Streetscapes** (High Priority 2): The streetscape is the visual identity of a neighbourhood and includes footpaths, gardens, medians and landscaping along a street or road. Streetscapes are prioritised by the road hierarchy, as shown in Figure 9. The road hierarchy is prioritised in the following order: MRWA controlled roads (other than Mitchell Freeway); Distributor A; Distributor B; Local Distributor and Access Road.

- **Pedestrian Access Way** (Medium Priority 3): A pedestrian access way (PAW) is any path in the public domain that is available for use by pedestrians and vehicles that are not regulated by the *Road Traffic Act 1974* (e.g. bicycles, skateboards, rollerblades). Pedestrian access ways do not include pedestrian paths provided within road reserves, or on land zoned Parks and Recreation under the Metropolitan Region Scheme.
- **Sumps and Swales** (Low Priority 4): Infiltration basins (sumps) are depressions designed to capture and store stormwater prior to infiltration into the soil profile. Infiltration basins and trenches maintain site water balance and can replenish local groundwater. Swales are grassed or vegetated broad, shallow channels used to collect and convey stormwater flows, promote infiltration, reduce stormwater peak flow rates and discharge volumes, and remove sediment. The benefit of turf swales is that the area is also usable public open space and accessible to the public.

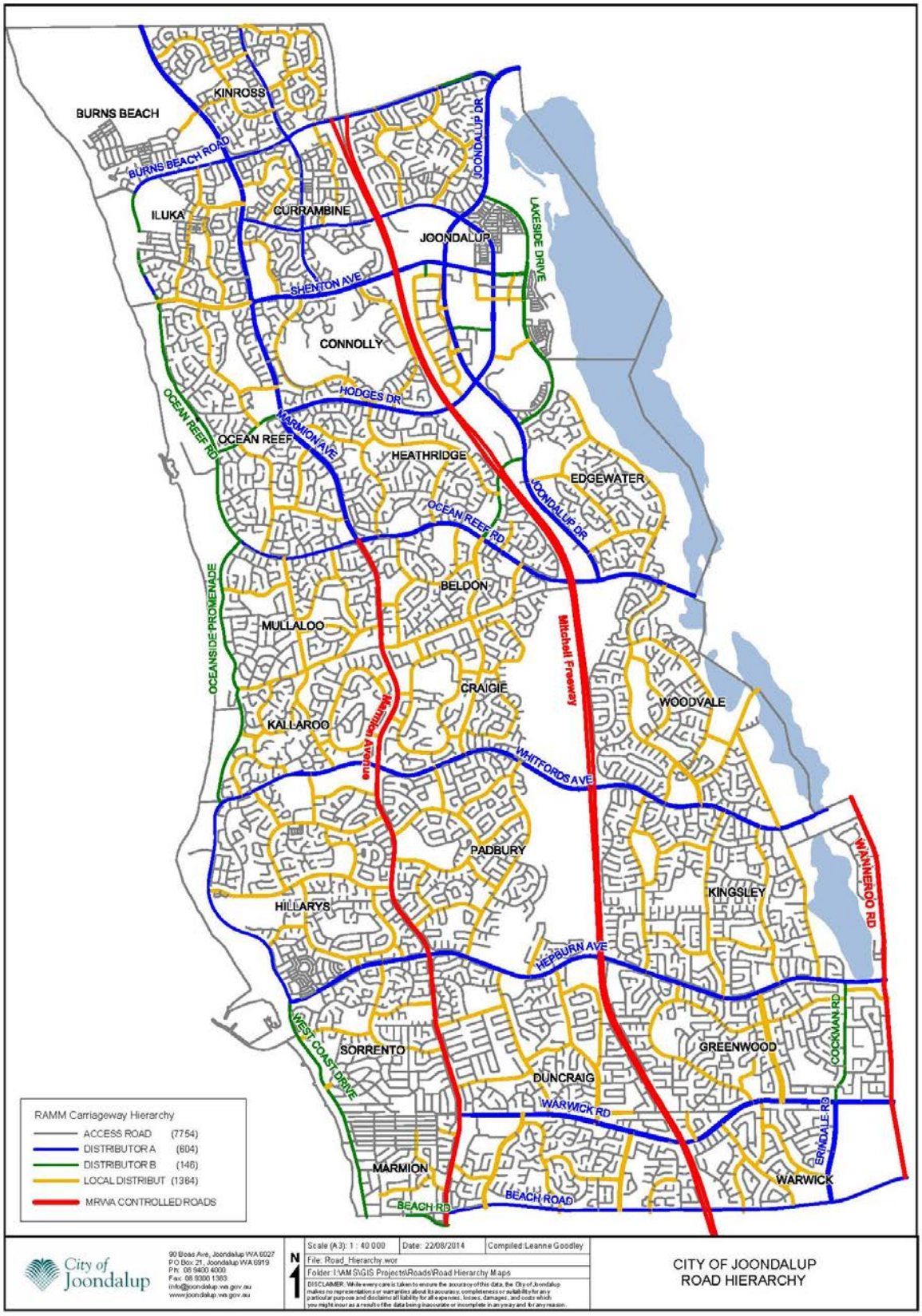

Figure 9: City of Joondalup Road Hierarchy

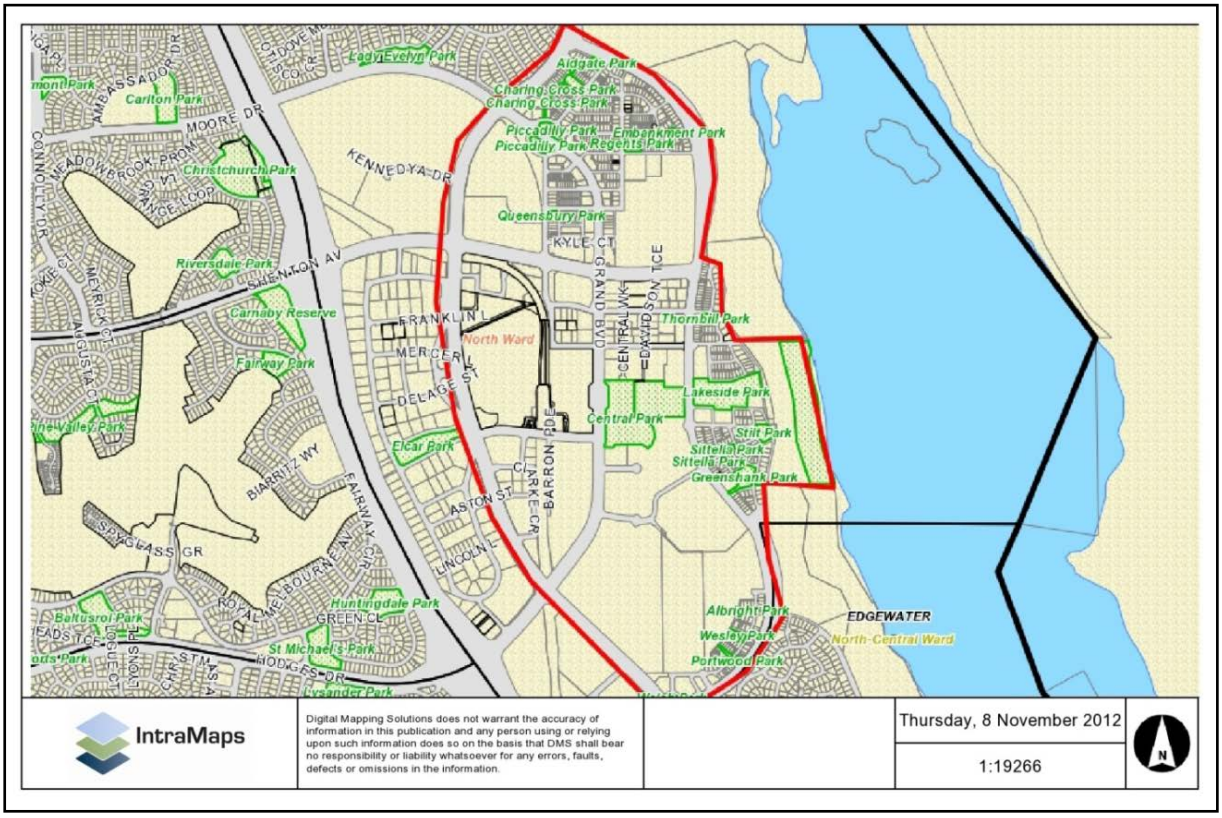

Figure 10: City of Joondalup Commercial Business Precinct

5.5.2 Weed Management within Sites

It is proposed that the City conduct weeds management within parks and urban landscaping areas by focussing on areas with functional values followed by areas with aesthetic values.

5.5.3 Priority Weeds

The City focuses on weed management of broadleaf weeds (most commonly found weeds), skeleton weed (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 the Department of Agriculture and Food WA 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.

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.

5.5.4 Integrated Weed Management Approach

Integrated weed management involves using a variety of different techniques to monitor, prevent and control weeds. 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. 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 (physical and chemical); and
- training.

5.6 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.

5.6.1 Observational Weed Monitoring

Observational weed monitoring can guide weed control efforts and assess the effectiveness of weed management actions.

Current Management Approach

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, as detailed in Appendix 7.

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.

SAR site audits are undertaken and reported quarterly including assessing the service agreement weed density key performance indicator for turf and garden beds.

Annual audits of Regional Sports Parks and Regional Recreation Parks, including turf and garden bed evaluations, are conducted by staff to establish the type of weed, level of infestation and recommended actions.

Recommended Management Approach

It is recommended that the City continue to annually audit Regional Sports Parks and Regional Recreation Parks to inform weed management actions.

Recommended Observational Weed Monitoring Management Action:

Continue to undertake formal park audits of Regional Sports Parks and Regional Recreation Parks annually to inform weed management actions.

5.7 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.

Current Management Approach

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.

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.

Suppression of weed seed banks

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.

Best practice landscape design and management

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.

Examples of hydro-zoning and eco-zoning locations include:

- Emerald Park, Edgewater
- Marri Park, Duncraig
- Ellersdale Park, Warwick
- Kingsley Park, Kingsley
- Hillarys Park, Hillarys
- Mawson Park, Hillarys
- Warrandyte Park, Craigie

Hygiene Measures

Hygiene is important to ensure weeds, pathogens and pests are not spread from or into parks and urban landscaping areas. City staff 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 Nursery Industry Accreditation Scheme Australia (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.

Recommended Management Approach

It is recommended that the City continue to implement the following weed prevention methods:

- Use pathogen and weed free mulch to suppress weed growth in garden beds or non-turf areas.
- Undertake soil and leaf tissue analysis to determine fertiliser applications to improve the quality of turf and reduce the likelihood of weeds.
- Undertake turf renovation works to encourage improved density and coverage of turf and reduce the opportunity for weed growth.
- Use chemical pre-emergents to suppress weed seed banks in non planted garden beds and hardstand areas.
- Undertake best practice landscape design and management including hydro-zoning and eco-zoning principles.
- Undertake hygiene measures on City staff vehicles used for turf renovation activities between each site and at the end of each day.

- Continue to ensure relevant tenders and contracts require contractors conducting turf renovation activities to undertake hygiene measures between sites and at the end of each day on vehicles used.
- Investigate current industry best practice weed prevention measures for public open spaces.

Recommended Weed Prevention Management Actions:

Continue to use pathogen and weed free mulch to suppress weed growth in garden beds or non-turf areas.

Continue to undertake soil and leaf tissue analysis to determine fertiliser applications to improve the quality of turf and reduce the likelihood of weeds.

Continue to undertake turf renovation works to encourage improved density and coverage of turf and reduce the opportunity for weed growth.

Continue the use of chemical pre-emergents to suppress weed seed banks in non planted garden beds and hardstand areas.

Continue to undertake best practice landscape design and management including hydro-zoning and eco-zoning principles.

Continue to undertake hygiene measures on City staff vehicles used for turf renovation activities between each site and at the end of each day.

Continue to ensure relevant tenders and contracts require contractors conducting turf renovation activities to undertake hygiene measures between sites and at the end of each day on vehicles used.

Continue to investigate current industry best practice weed prevention measures for public open spaces.

5.8 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 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.
- Physical weed control – the removal of weeds by physical or mechanical means, such as mowing, mulching or by hand.

5.8.1 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 sporting parks, regional parks, CBP and at service agreement locations (SARs).

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 or 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:

- 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.

5.8.2 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.

5.8.3 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 sports parks and regional 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.

Streetscapes

Weed control is conducted from July to September according to the annual maintenance schedule and is subject to ongoing site inspections and reactive maintenance from October to June. 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.

Specified Area Rates

SAR locations receive a higher frequency of weed control activities to ensure the area is maintained at the standard established in the service agreements.

Weed control is conducted in SARs through the following methods:

- Parks - broadleaf selective, target spraying i.e. surrounding infrastructure
- Landscaped garden beds – hand-weeding, target spraying, broadleaf selective, mulch application
- Streetscapes – hand weeding, target spraying, broadleaf selective, mulch application
- Turf – broadleaf selective, target spraying i.e. around infrastructure
- Medians – blanket spraying, use of pre-emergent herbicides.
- Hardstands and footpaths - target spraying, use of pre-emergent herbicides.

Commercial Business Precinct

The Commercial Business Precinct (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.

Weed control is conducted in the CBP 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, target spraying, broadleaf selective, mulch application

- Turf – broadleaf selective, target spraying i.e. around infrastructure
- Kerblines - target spraying
- Medians – broadleaf spraying, use of pre-emergent herbicides.
- Hardstands and footpaths - target spraying, use of pre-emergent herbicides.

Pedestrian Access Ways

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

Weed control is conducted in PAWs through the following methods:

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

Sumps and Swales

The City has approximately 200 sumps with weed control being undertaken annually. 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.

Recommended Management Approach

It is recommended that the City continues to implement weed control in parks and urban landscaping areas in accordance with the annual maintenance schedule

Recommended Weed Control Management Actions:

Continue to undertake weed control in parks and urban landscaping areas in accordance with the annual maintenance schedule.

6.0 Weed Control in 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 Table 6). Yellagonga Regional Park wetlands are managed separately through the *Yellagonga Integrated Catchment Management Plan 2015-2019*.

Table 6: 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

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.[53] 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.[54] Excessive growth of algae is a major aquatic weed issue in wetlands.

[53] CRC for Australian Weed Management (2005b)
[54] Department of Agriculture and Food (2009)

Algae

Algae range in size from microscopic (for example single cells) to large (for example seaweed) and are a diverse group of aquatic plants containing chlorophyll and other photosynthetic pigments. The majority of algae are found in water, although they can also be found on soil.[55]

Algae are a natural part of aquatic environments and are not necessarily a problem, even when they are abundant. An algal bloom is a rapid excessive growth of algae, usually caused by high nutrient levels and favourable conditions. When large amounts of algae die and decompose, the effect can be deoxygenation of the water leading to the death of aquatic plants and animals. However, an increase in intensity and frequency of algal blooms can upset the delicate natural balance of an aquatic ecosystem. Algal blooms can cause public health and ecological issues.[55]

Algal blooms also have an effect on midges. Wetlands rich in nutrients (often from fertilisers or high-nutrient wastes) combined with environmental conditions, such as warmth or light, may lead to an increase in aquatic plant growth (eutrophication), causing large algal blooms to occur. This can create an accumulation of dead and dying algal material at the bottom of the water body, providing a food resource for midge larvae and leading to populations multiplying to high densities. Midges can cause a nuisance to people living nearby or using the area.[55]

Current Management Approach

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 treats algae through the use of enzyme based products or by scooping the algae out of the water.

[55] Water and Rivers Commission (1998)

Figure 11: Wetland in Lacepede Park, Sorrento

Recommended Management Approach

Wetland Guidelines have been developed to minimise weed establishment and spread into and around wetlands. A Wetland Management Plan is currently being developed to provide guidance and minimise environmental impacts from weed control activities in or around wetlands.

Recommended Wetlands Weed Control Management Actions:

Implement the Wetland Guidelines and finalise and implement the draft Wetland Management Plan to provide direction to staff and contractors conducting weed control activities in and around wetland areas and minimise environmental impacts, where possible.

7.0 Education and Training

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

7.1 Community Education

Environmental objectives cannot be achieved through the actions of the City alone; the community can also affect the local environment in both positive and negative ways. Environmental outcomes require the support of an engaged community that is aware and participating in environmental activities.

Raising community awareness regarding weed prevention and control is important as sometimes individuals are not aware of the impact of weeds and the weed hygiene actions required to prevent weed spread.[39]

The community can prevent weed introduction and spread by:

- 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);
- 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; and
- 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 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 learning opportunities for students.

Current Management Approach

The City implements an Annual Environmental Education Program to address key environmental issues and encourage greater environmental stewardship by the community. The City actively encourages participation within its community to raise awareness of key environmental issues within the City.

As part of the Environmental Education Program, the City has developed an Adopt a Bushland program for students from years 4 to 7 to provide an interactive bushland management program. This program has been trialled with Padbury Catholic Primary School at Hepburn Heights Conservation Area in 2014/15.

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'[56]*, 'Being WEEDwise: Environmental Weeds in the City of Joondalup'*[57] and *'Protecting our Natural Areas and Parks'.*[58]

A *Signage Strategy* has been developed as recommended in the City's *Walkability Plan 2013-2018* to guide the development and installation of new 'wayfinding' and interpretive signage within the City's natural areas. Signage in natural areas can be a useful educational tool to raise awareness of the ecological values of natural areas and encourage community members to prevent weed spread through actions such as sticking to paths, keeping dogs on leads and cleaning up after dogs. Natural areas wayfinding and interpretive signage will be installed in key conservation areas with the first signage to be installed in Hepburn Heights Conservation Area and Lilburne Park by December 2015.

Recommended Management Approach

It is proposed that the City implements an Adopt a Bushland program to educate students about bushland management through an interactive bushland management program.

The City should also continue to deliver its Annual Environmental Education Program and distribute the *'Being WEEDwise'* and *'Protecting our Natural Areas and Parks'* brochures at City events and facilities.

The *Signage Strategy* includes content for natural areas suggesting that people utilise designated paths, walk dogs on leashes and clean up after dogs to prevent weed spread. Natural areas signage could incorporate this content.

Recommended Community Education Management Actions

Implement an Adopt a Bushland program for students to provide an interactive bushland management program.

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

Install natural areas wayfinding and interpretive signage in key conservation areas and include content suggesting that people utilise designated paths, walk dogs on leashes and clean up after dogs to reduce weed spread.

7.2 Training

Continue to ensure City staff have the necessary knowledge and experience to undertake weed management activities which is essential for effective weed management, best use of the City's resources, reducing any potential negative impacts as well as ensuring the safety of staff. Training is important for the continued development of staff knowledge and expertise.

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.

Current Management Approach

[56] City of Joondalup n.d(a)
[57] City of Joondalup n.d(b)
[58] City of Joondalup n.d.(c)

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

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 management. City staff also undertake relevant training to increase knowledge of weed identification, safety and effective methods of weed control.

Through ongoing meetings with Friends Groups, the Friends Groups Coordinator shares information about weed hygiene practices to protect the biodiversity of natural areas.

Recommended Management Approach

The City should continue to provide training to staff to ensure they have appropriate knowledge to undertake weed management activities effectively and safely.

Recommended Training Management Actions

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.

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

8.0 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 establishing processes for annual reporting and review of the Plan.

8.1 Reporting

In accordance with the City's Project Management Framework the implementation progress of recommended management actions within the Plan will be reported against on an annual basis.

The Key Performance Indicators to be measured annually for the Plan are:

- Percentage cover of environmental weeds in key conservation reserves to be 20% or less.
- Percentage cover of broadleaf weeds in SARs parks, CBP parks, Regional Sports Parks, District Sports Parks, Local Sports Parks and Regional Recreation Parks to be 10% or less.

The Key Performance Indicator relating to percentage cover of environmental weeds in ten key conservation reserves has been reported against in the City's Annual Report since 2004/05.

8.2 Management Plan Review

A major review of the Weed Management Plan will be undertaken in 2019/20 to ensure the City is managing weeds in accordance with best practice approaches.

8.3 Recommendations

Forty-three 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

Area	Recommended Management Action	Relevant to Natural Areas	Relevant to Parks and Urban Landscaping Areas
Weed Mapping	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.	√	
	Through the development of Natural Areas Management Plans, continue undertaking flora, fauna and fungi surveys of the major conservation areas every five years to inform on ground weed management actions.	√	
	Continue to incorporate information from flora, fauna and fungi surveys into IntraMaps regarding vegetation condition and priority flora and fauna.	√	
	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.	√	
Photo Monitoring	Consider the use of photo monitoring in major conservation areas when measuring the natural areas key performance indicator annually to assess the effectiveness of ongoing weed control.	√	
Observational Weed Monitoring	Continue to measure the percentage cover of weeds annually in key natural areas, at the same time of year, as an indicator of vegetation health.	√	
	Continue to undertake formal park audits of Regional Sports Parks and Regional Recreation Parks annually to inform weed management actions.		√
High Resolution Multi-spectral Imagery Weed Monitoring	Investigate the feasibility of analysing high resolution multi-spectral imagery of parks and natural areas every two years in order to monitor weed distribution and density.	√	√

Area	Recommended Management Action	Relevant to Natural Areas	Relevant to Parks and Urban Landscaping Areas
Minimising Access and Disturbance	Ensure City staff and contractors minimise disturbance to vegetation when accessing natural areas by vehicles, equipment and people remaining on tracks, where possible, during management and maintenance activities to reduce the establishment and spread of weeds.	√	
Weed Hygiene	Implement the Pathogen and Weed Hygiene Guidelines to provide direction to staff and contractors working within the City's natural areas and parks in order to limit the spread of weeds within the City.	√	√
	Implement the Purchasing Guidelines for the Supply of Landscaping Materials to provide information to City staff and contractors relating to the purchase of plant stock, soil, mulch compost and other materials for City parks and natural areas.	√	√
Fire Management and Response	Continue to request natural area fire occurrence reports from DFES every five years to identify locations with continued incidents of arson. Where possible, increase City Watch patrols in problem areas to deter arson and the resulting encouragement of weed growth.	√	
	Implement the Fire Weed Management Guideline to inform staff and contractors about weed hygiene when constructing and maintaining firebreaks and access ways.	√	
	Consider post fire revegetation in natural areas to prevent weed spread, on an as required basis.	√	
Weed Control	Continue to implement weed control in natural areas in accordance with the Annual Maintenance Schedule.	√	
	Create a register of herbicide resistant weeds including locations and date identified to enable monitoring and control.	√	
	Conduct research or trials on herbicide rotation to increase the effectiveness of herbicides, as required.	√	
	Continue to investigate opportunities to partner with agencies or organisations to trial new forms of weed control.	√	√

Area	Recommended Management Action	Relevant to Natural Areas	Relevant to Parks and Urban Landscaping Areas
Weed Control	City staff are to continue to use vegetation condition maps from flora surveys conducted in key natural areas to guide their weed control activities and prioritise works in best condition vegetation areas on site. Maps are also to be provided to contractors.	√	
	Continue to monitor for new aggressive weed species and undertake control as a priority to elimate the weed species and prevent spread.	√	√
	Continue to review the City's Spraying Chemicals Work Instruction in accordance with the ISO 9001 Quality Management System.	√	√
	Conduct audits a minimum of twice per year of City staff and contractors herbicide mixing volume rate, to ensure compliance with the applicable regulations and label instructions.	√	√
	Conduct regular auditing in accordance with the ISO 9001 Quality Management System regarding the use of caution signage by City staff and contractors when spraying herbicides, to ensure signage is left in place until herbicides are dry and compliance with the Department of Health *Health (Pesticides) Regulations 2011* Signage Requirements	√	√
	Continue to undertake weed control in parks and urban landscaping areas in accordance with the annual maintenance schedule.		√
Weed Research and Trials	As technology and research improves, investigate opportunities for the City to trial new weed control methods.	√	√
Weed Control in Specific Locations	Create a register of new weed populations identified in the City to enable monitoring and weed management.	√	
	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.	√	√
	Implement the Fire Weed Management Guidelines to limit the infestation of weeds in the City's natural areas.	√	

Area	Recommended Management Action	Relevant to Natural Areas	Relevant to Parks and Urban Landscaping Areas
Partnerships	Investigate opportunities to participate in research projects and take up opportunities for sharing information relating to best practice approaches to weed management.	√	
Partnerships	Continue to partner with and support local Friends Groups to facilitate bushland restoration and weed management activities.	√	
Weed Prevention	Continue to use pathogen and weed free mulch to suppress weed growth in garden beds or non-turf areas.	√	√
	Continue to undertake soil and leaf tissue analysis to determine fertiliser applications to improve the quality of turf and reduce the likelihood of weeds.		√
	Continue to undertake turf renovation works to encourage improved density and coverage of turf and reduce the opportunity for weed growth.		√
	Continue the use of chemical pre-emergents to suppress weed seed banks in non planted garden beds and hardstand areas.		√
	Continue to undertake best practice landscape design and management including hydro-zoning and eco-zoning principles.		√
	Continue to undertake hygiene measures on vehicles used for turf renovation activities between each site and at the end of each day.		√
	Continue to ensure relevant tenders and contracts require contractors conducting turf renovation activities to undertake hygiene measures between sites and at the end of each day on vehicles used.		√
	Investigate current industry best practice weed prevention measures for public open spaces.		√
Wetlands Weed Control	Implement the Wetland Guidelines and finalise and implement the draft Wetland Management Plan to provide direction to staff and contractors conducting weed control activities in and around wetland areas and minimise environmental impacts, where possible.	√	
Community Education	Implement an Adopt a Bushland program for students to provide an interactive bushland management program.	√	

Area	Recommended Management Action	Relevant to Natural Areas	Relevant to Parks and Urban Landscaping Areas
	Continue to distribute the 'Being WEEDwise' and 'Protecting our Natural Areas and Parks' brochures through the community.	√	√
Community Education	Install natural areas wayfinding and interpretive signage in key conservation areas and include content suggesting that people utilise designated paths, walk dogs on leashes and clean up after dogs to reduce weed spread.	√	√
Training	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.	√	√
	Continue to conduct ongoing weed hygiene practices information sharing with City Friends Groups.	√	

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10.0 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

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Appendix 7 – Park Weed Management Prioritisation

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

Natural Area	Suburb
Adelaide Park	Craigie
Alfreton Park	Duncraig
Barwon Park	Craigie
Beaumaris Park	Ocean Reef
Bethany Park	Iluka
Blue Lake Park	Joondalup
Bonnie Doon Park	Connolly
Bridgewater Park	Kallaroo
Brisbane Park	Padbury
Burns Beach Park	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
Circle Park	Warwick
Clare Park	Sorrento
Clermont Park	Currambine
Conidae Park	Heathridge
Craigie Leisure Centre	Craigie
Craigie Open Space	Craigie
Cranston Park	Kinross
Culwalla Park	Kallaroo
Dardanus Park	Heathridge
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
Huntingdale Park	Connolly
Huxley Park	Burns Beach
Iluka Foreshore	Iluka
Kallaroo Park	Mullaloo
Kiernan Park	Kallaroo
Kilrenny Park	Greenwood
Korella Park	Mullaloo

Natural Area	Suburb
Kuta Park	Iluka
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
Manapouri Park	Joondalup
Mandalay Park	Craigie
Maritana Park	Kallaroo
Marmion Beach Foreshore	Marmion
Menteith Park	Kinross
Merrifield Park	Kallaroo
Nanika Park	Joondalup
Naturaliste Park	Iluka
Negresco Park	Currambine
Neil Hawkins Park	Joondalup
Ocean Reef Foreshore	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 Beach Foreshore	Sorrento
St Michael's Park	Connolly
Stilt Park	Joondalup
Sweeney Park	Padbury
Timbercrest Park	Woodvale
Timberlane Park	Woodvale
Tom Simpson Park	Mullaloo
Trig Point Park	Ocean Reef
Trigonometric Park	Duncraig
Walsh Park	Joondalup
Warrandyte Park	Craigie
Warwick Open Space	Warwick
Water Tower Park	Joondalup
Whitfords Nodes North	Kallaroo
Whitfords Nodes South	Hillarys

Appendix 2 – Prioritisation of City of Joondalup Natural Areas

Site	Suburb	Priority	Bush Forever Site	Listed in District Planning Scheme No. 2 Schedule 5	Friends Group
Warwick Open Space	Warwick	Conservation Area	✓		✓
Craigie Open Space	Craigie	Conservation Area	✓		
Hepburn Heights Conservation Area*	Padbury	Conservation Area	✓	✓	✓
Shepherd's Bush Park*	Kingsley	Conservation Area	✓	✓	
Lilburne Park	Duncraig	Conservation Area		✓	
Marmion Beach Foreshore	Marmion	Conservation Area			✓
Sorrento Beach Foreshore	Sorrento	Conservation Area			✓
Whitfords Nodes – Hillarys	Hillarys	Conservation Area	✓		
Whitfords Nodes – Kallaroo	Kallaroo	Conservation Area	✓		
Mullaloo Beach Foreshore	Mullaloo	Conservation Area	✓		✓
Ocean Reef Beach Foreshore	Ocean Reef	Conservation Area	✓		✓
Iluka Beach Foreshore^	Iluka	Conservation Area	✓		✓
Burns Beach Foreshore	Burns Beach	Conservation Area	✓		
Cranston Park	Kinross	High		✓	
Fairway Park	Connolly	High		✓	
Lakeside Park	Joondalup	High		✓	
Lakevalley Park	Edgewater	High		✓	
Saint Clair / Quarry Park	Edgewater	High			
St Michaels Park	Connolly	High		✓	
Lady Evelyn Park^	Joondalup	High			
Timberlane Park	Woodvale	High		✓	
Beaumaris Park	Ocean Reef	High		✓	
Bonnie Doon Park	Connolly	High		✓	
Cadogan Park	Kingsley	High		✓	✓
Central Park	Joondalup	High		✓	
Clermont Park	Currambine	High		✓	
Naturaliste Park	Iluka	High		✓	
Chadlington Park	Padbury	High			
Neil Hawkins Park^*	Joondalup	High	✓	✓	✓
Cawarra Park	Craigie	High		✓	
Glenbar Park	Duncraig	High		✓	✓
Littorina Park^	Heathridge	High		✓	
Maritana/Bridgewater Park	Kallaroo	High		✓	✓
Periwinkle Park	Mullaloo	High		✓	✓
Porteous Park	Sorrento	High		✓	✓
Trigonometric Park	Duncraig	High		✓	✓
Blue Lake Park^	Joondalup	High		✓	
Burlos/Water Tower Park^	Joondalup	High		✓	
Carnaby Reserve	Connolly	High		✓	✓
Kallaroo Park	Mullaloo	High			
MacNaughton Park	Kinross	High			
Nanika Park^	Joondalup	High		✓	
Sandalford Park	Beldon	High		✓	

Site	Suburb	Priority	Bush Forever Site	Listed in District Planning Scheme No. 2 Schedule 5	Friends Group
Sir James McCusker Park	Iluka	High		✓	
Huxley Park	Burns Beach	Medium			
Chichester Park	Woodvale	Medium			
Garrong Park	Edgewater	Medium			
Korella Park	Mullaloo	Medium			✓
Madana Park	Craigie	Medium			
Mandalay Park	Craigie	Medium			
Warrandyte Park	Craigie	Medium			
Alfreton Park	Duncraig	Medium		✓	
Duncraig Library Bushland	Duncraig	Medium			
Harman Park	Sorrento	Medium			✓
Lacepede Park	Sorrento	Medium			
Picnic Cove Park	Edgewater	Medium	✓		✓
Negresco Park^	Currambine	Medium			
Robin Park	Sorrento	Medium			
Finney Park	Marmion	Medium			
Bethany Park	Iluka	Medium			
Caledonia Park	Currambine	Medium		✓	
Huntingdale Park	Connolly	Medium			
Kuta Park	Iluka	Medium			
Manapouri Park^	Joondalup	Medium			
Greenshank Park	Joondalup	Medium			
Pine Valley Park	Connolly	Medium		✓	
Adelaide Park	Craigie	Medium			
Callander Park	Kinross	Medium			
Castlecrag Park	Kallaroo	Medium			
Conidae Park	Heathridge	Medium			
Earlsferry Park	Kinross	Medium			
Lysander Park	Heathridge	Medium			
Menteith Park	Kinross	Medium			
Okely Park	Edgewater	Medium			
Brisbane Park	Padbury	Medium			
Candlewood Park^	Joondalup	Medium		✓	
Gunida Park	Mullaloo	Medium			
Ledge Park	Sorrento	Medium			
Quarry Ramble Park	Edgewater	Medium		✓	
Trig Point Park	Ocean Reef	Medium			

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 2012 – 2022* highlights the focus on preservation, 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.

State Government

Relevant Legislation, Policies and Documents

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.

Minor Use of Chemicals Permit 2012 to 2017

The Department of Agriculture and Food Western Australia (WA) 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 PER13333). 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.

Environmental Weed Strategy for Western Australia 1999

The Department of Conservation and Land Management (CALM) (now DPaW) developed an Environmental Weed Strategy for WA (1999). The Strategy prioritises 1,350 weed species using the criteria of invasiveness, distribution and environmental impacts to rate weeds as high, moderate, mild or low priority. High ratings were issued to 34 weed species.[59]

The City contains 22 high, 63 moderate, 23 mild and 66 low rated weeds in the Environmental Weed Strategy for WA.

DPaW Weed Prioritisation Process 2013

The DPaW conducted a weed prioritisation process for weeds in each DPaW region, with the aim being to establish a species-led and an asset-protection-based approach to weed management, focussing on infestations of species which are considered to be high impact, rapidly invasive and still at a population size which is feasible to eradicate or contain to a manageable size. The weed prioritisation process is based on the Environmental Weed Census and Prioritisation, Swan Natural Resource Management Region project (Bettink and Keighery 2008) and the Environmental Weed Strategy of Western Australia (DPaW 1999). The assessment prioritises weeds using criteria of potential distribution, current distribution, ecological impact, invasiveness and feasibility of control to rate weeds as very high, high, medium, low, negligible, further assessment required or alert. The DPaW Swan Region weed prioritisation process rated 765 weed species.

The City contains 2 very high, 18 high, 21 medium, 73 low, 49 negligible, 15 further assessment required and 5 alert rated weeds in the DPaW Weed Prioritisation Process for the Swan Region.

[59] DPaW (1999)

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

National Weeds Strategy 1997

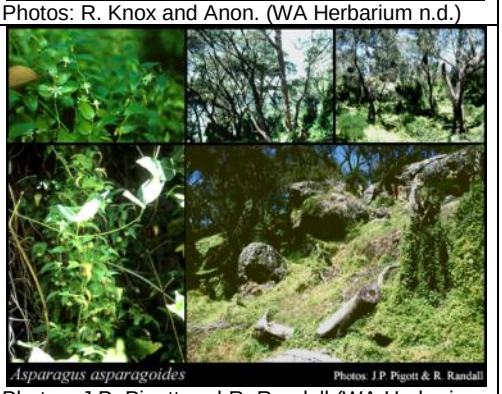
The National Weeds Strategy provides a strategic framework for managing weeds at a national level. As part of the implementation of the National Weeds Strategy, 67 Weeds of National Significance are identified as nationally agreed priority plant species for control and management based on the criteria of invasiveness and impact characteristics, potential and current area of spread and economic, environmental and social impacts.

The City contains 5 known Weeds of National Significance.

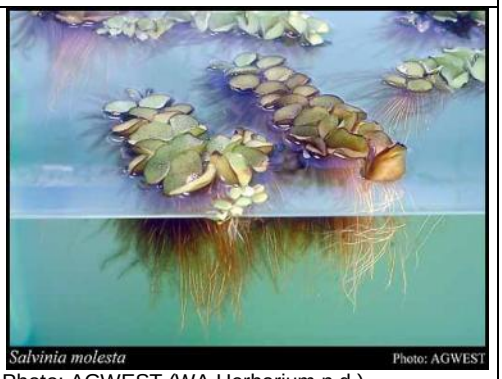
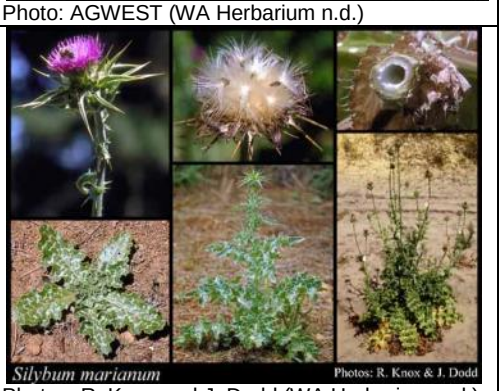
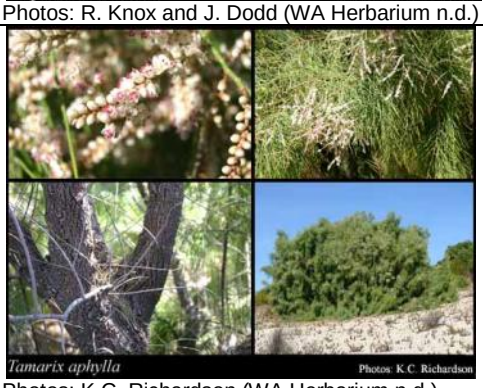
Appendix 4 – Examples of City of Joondalup Priority Weeds

Table 7 outlines the pest plant, declared pest plants and Weeds of National Significance within the City.

Table 7: Pest Plants, Declared Plants and Weeds of National Significance in the City of Joondalup

Latin Name	Common Name	Declared Pest Plant in Perth	Weeds of National Significance	Image
Argemone ochroleuca	Mexican Poppy	Yes – C3	-	 Photos: R. Knox and Anon. (WA Herbarium n.d.)
Asparagus asparagoides	Bridal Creeper	Yes – C3	Yes	 Photos: J.P. Pigott and R. Randall (WA Herbarium n.d.)
Chondrilla juncea	Skeleton Weed	Yes – C2	-	 Photos: B. Hoskins and J. Dodd (WA Herbarium n.d.)

Latin Name	Common Name	Declared Pest Plant in Perth	Weeds of National Significance	Image
Chrysanthemoides monilifera subsp. *monilifera*	Boneseed	Yes- C1	Yes	 Photos: H. Cherry and R. Knox (WA Herbarium n.d.)
Cirsium arvense	Perennial Thistle, Canada Thistle	Yes- C1	-	 Photo: C.G. Wilson (Aust Government 2012)
Cynara cardunculus	Artichoke Thistle, Cardoon	Yes – C3		 Photos: AGWEST (WA Herbarium n.d.)
Lantana camara	Lantana	Yes – C3	Yes	 Photo: A. Johnson (NSW Government n.d.)

Latin Name	Common Name	Declared Pest Plant in Perth	Weeds of National Significance	Image
Salvinia molesta	Salvinia	-	Yes	 Photo: AGWEST (WA Herbarium n.d.)
Silybum marianum	Variegated Thistle	Yes – C3	-	 Photos: R. Knox and J. Dodd (WA Herbarium n.d.)
Tamarix aphylla	Athel Tree, Tamarisk, Tamarix	Yes – C3	Yes	 Photos: K.C. Richardson (WA Herbarium n.d.)
Tribulus terrestris	Caltrop*	-	-	 Photos: S.M. Armstrong, J. Dodd and R. Knox (WA Herbarium n.d.)

Latin Name	Common Name	Declared Pest Plant in Perth	Weeds of National Significance	Image
Zantedeschia aethiopica	Arum Lily	Yes – C3		 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

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[60]	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.[60]	• Targeted weed application • No risk of regrowth	• Time consuming for large populations

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

Weed Control Method	Suitable for Species	Notes	Advantages	Disadvantages
Wick wiping	Tall weeds	Herbicides can be wiped on to individual plants with a weed wiper, rope wick applicator or sponge roller.	Targeted weed application	• Only controls weeds which grow above surrounding vegetation. • Time consuming • 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[61] • 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.[62]	• 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[63] • Should be combined with another weed control method

[61] Eurobodalla Shire Council (n.d.)
[62] Johansson (n.d.)
[63] Eurobodalla Shire Council (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, 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.[60]	• 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.[60]	• Targeted weed application	• 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[64]	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.[65] Works best when weeds are growing in full sun.[66]	• 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

[64] Water and Rivers Commission (2001)
[65] Department of Planning (n.d.)
[66] Eurobodalla Shire Council (n.d.)

Weed Control Method	Suitable for Species	Notes	Advantages	Disadvantages
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
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[67]
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[67]
Boiling water	Annuals and perennials	Boil water and pour stream on to the crown of the weed.	• Works well in concrete, paved and rock areas[68]	• Safety hazards • May effect non-targeted species • Time consuming • Water usage • May need to be repeated
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.[69]	• Leaves no soil residue	• May effect non-targeted species • Foliage must be sprayed so it is completely wet • Health risks

[67] Bond, Turner and Grundy (2003)
[68] Johansson (n.d.)
[69] Demand Media Inc. (2013)

Weed Control Method	Suitable for Species	Notes	Advantages	Disadvantages
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[70]	• 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~~[70]

[70] Johansson (n.d.)

Appendix 7 – Park Weed Management Prioritisation

Regional Sports Park			
Percy Doyle Reserve	Duncraig	N	Very high priority - 1
District Sports Park			
Chichester Park	Woodvale	Y	High priority - 2
Heathridge Park	Heathridge	N	High priority - 2
Iluka District Open Space	Iluka	N	High priority - 2
Kingsley Park	Kingsley	Y	High priority - 2
MacDonald Park	Padbury	N	High priority - 2
Penistone Park	Greenwood	N	High priority - 2
Seacrest Park	Sorrento	N	High priority - 2
Warwick Open Space	Warwick	N	High priority - 2
Local Sports Park			
Admiral Park	Heathridge	N	Medium priority - 3
Barridale Park	Kingsley	N	Medium priority - 3
Beldon Park	Beldon	Y	High priority - 2
Belrose Park	Kallaroo	N	Medium priority - 3
Bramston Park	Burns Beach	N	Medium priority - 3
Bridgewater Park	Kallaroo	N	Medium priority - 3
Caledonia Park	Currambine	Y	High priority - 2
Callander Park	Kinross	Y	High priority - 2
Carlton Park	Currambine	Y	High priority - 2
Charonia Park	Mullaloo	N	Medium priority - 3
Christchurch Park	Currambine	N	Medium priority - 3
Ellersdale Park	Warwick	N	Medium priority - 3
Emerald Park	Edgewater	N	Medium priority - 3
Falkland Park	Kinross	N	Medium priority - 3
Forrest Park	Padbury	N	Medium priority - 3
Glengarry Park	Duncraig	N	Medium priority - 3
Hawker Park	Warwick	N	Medium priority - 3
Hillarys Park	Hillarys	N	Medium priority - 3
James Cook Park	Hillarys	N	Medium priority - 3
Juniper Park	Duncraig	N	Medium priority - 3
Kinross College Oval	Kinross	Y	High priority - 2
Korella Park	Mullaloo	Y	High priority - 2
Lexcen Park	Ocean Reef	N	Medium- priority - 3
Littorina Park	Heathridge	Y	High priority - 2
MacNaughton Park	Kinross	N	Medium priority - 3
Marri Park	Duncraig	N	Medium priority - 3

Local Sports Park			
Melene Park	Duncraig	N	Medium priority - 3
Mirror Park	Ocean Reef	N	Medium priority - 3
Moolanda Park	Kingsley	N	Medium priority - 3
Ocean Reef Park	Ocean Reef	N	Medium priority - 3
Okely Park	Edgewater	N	Medium priority - 3
Otago Park	Craigie	N	Medium priority - 3
Parkside Park	Woodvale	Y	High priority - 2
Prince Regent Park	Heathridge	N	Medium priority - 3
Robin Park	Sorrento	N	Medium priority - 3
Santiago Park	Ocean Reef	Y	High priority - 2
Timberlane Park	Woodvale	N	Medium priority - 3
Warrandyte Park	Craigie	N	Medium priority - 3
Warrigal Park	Greenwood	N	Medium priority - 3
Windermere Park	Joondalup	N	Medium priority - 3
Local Mixed-Use Park			
Blackall Park and Calectasia Park	Greenwood	N	Medium priority - 3
Flinders Park	Hillarys	N	Medium priority - 3
Mawson Park	Hillarys	N	Medium priority - 3
Regional Recreation Park			
Burns Beach Park	Burns Beach	N/a	Very high priority - 1
Neil Hawkins Park	Joondalup	N/a	Very high priority - 1
Picnic Cove Park	Edgewater	N/a	Very high priority - 1
Tom Simpson Park	Mullaloo	N/a	Very high priority - 1
Sorrento Foreshore	Sorrento	N/a	Very high priority - 1
Whitfords Nodes Central	Hillarys	N/a	Very high priority - 1
Whitfords Nodes South	Hillarys	N/a	Very high priority - 1
Ocean Reef Foreshore Park	Ocean Reef	N/a	Very high priority - 1
Iluka Foreshore Park	Iluka	N/a	Very high priority - 1
District Recreation Park			
Beaumaris Park	Ocean Reef	N/a	Low priority - 4
Blackboy Park	Mullaloo	N/a	Low priority - 4
Braden Park	Marmion	N/a	Low priority - 4
Broadbeach Park	Hillarys	N/a	Low priority - 4
Geneff Park	Sorrento	N/a	Low priority - 4
Rev John Smithies Park	Kingsley	N/a	Low priority - 4
Sandalford Park	Beldon	N/a	Low priority - 4
Local Recreation Park			
Aberdare Park	Warwick	N/a	Low priority - 4

Local Recreation Park			
Abrolhos Park	Heathridge	N/a	Low priority - 4
Adelaide Park	Craigie	N/a	Low priority - 4
Albacore Park	Sorrento	N/a	Low priority - 4
Albion Park	Craigie	N/a	Low priority - 4
Alder Park	Duncraig	N/a	Low priority - 4
Alfreton Park	Duncraig	N/a	Low priority - 4
Alidade Park	Beldon	N/a	Low priority - 4
Anemone Park	Mullaloo	N/a	Low priority - 4
Annato Park	Greenwood	N/a	Low priority - 4
Aristride Park	Kallaroo	N/a	Low priority - 4
Balanus Park	Heathridge	N/a	Low priority - 4
Baltusrol Park	Connolly	N/a	Low priority - 4
Banks Park	Hillarys	N/a	Low priority - 4
Banksia Park	Marmion	N/a	Low priority - 4
Barclay Park	Padbury	N/a	Low priority - 4
Barwon Park	Craigie	N/a	Low priority - 4
Beachside Park	Burns Beach	N/a	Low priority - 4
Beaumont Park	Edgewater	N/a	Low priority - 4
Birch Park	Greenwood	N/a	Low priority - 4
Blackthorn Park	Greenwood	N/a	Low priority - 4
Blue Lake Park	Joondalup	N/a	Low priority - 4
Bonnie Doon Park	Connolly	N/a	Low priority - 4
Bracken Park	Duncraig	N/a	Low priority - 4
Brazier Park	Padbury	N/a	Low priority - 4
Brisbane Park	Padbury	N/a	Low priority - 4
Buckthorn Park	Duncraig	N/a	Low priority - 4
Byrne Park	Padbury	N/a	Low priority - 4
Cadogan Park	Kingsley	N/a	Low priority - 4
Callion Park	Padbury	N/a	Low priority - 4
Calthorpe Park	Kingsley	N/a	Low priority - 4
Camberwarra Park	Craigie	N/a	Low priority - 4
Candlewood Park	Joondalup	N/a	Low priority - 4
Captain Park	Heathridge	N/a	Low priority - 4
Carr Park	Warwick	N/a	Low priority - 4
Castlecrag Park	Kallaroo	N/a	Low priority - 4
Castlefern Park	Duncraig	N/a	Low priority - 4
Chadstone Park	Craigie	N/a	Low priority - 4
Chelsea Park	Kingsley	N/a	Low priority - 4
Chelsford Park	Warwick	N/a	Low priority - 4
Churton Park	Warwick	N/a	Low priority - 4
Cinque Ports Park	Connolly	N/a	Low priority - 4
Circle Park	Warwick	N/a	Low priority - 4

Local Recreation Park			
Clare Park	Sorrento	N/a	Low priority - 4
Clermont Park	Currambine	N/a	Low priority - 4
Cliff Park	Marmion	N/a	Low priority - 4
Clifford Coleman Park	Marmion	N/a	Low priority - 4
Conica Park	Hillarys	N/a	Low priority - 4
Conidae Park	Heathridge	N/a	Low priority - 4
Coolibah Park	Duncraig	N/a	Low priority - 4
Cornish Park	Woodvale	N/a	Low priority - 4
Culwalla Park	Kallaroo	N/a	Low priority - 4
Cumberland Park	Beldon	N/a	Low priority - 4
Cunningham Park	Padbury	N/a	Low priority - 4
Dampier Park	Kallaroo	N/a	Low priority - 4
De Crillon Park	Currambine	N/a	Low priority - 4
Delonix Park	Woodvale	N/a	Low priority - 4
Dollis Park	Kingsley	N/a	Low priority - 4
Doncaster Park	Currambine	N/a	Low priority - 4
Earlsferry Park	Kinross	N/a	Low priority - 4
Edgewater Park	Edgewater	N/a	Low priority - 4
Elcar Park	Joondalup	N/a	Low priority - 4
Ensign Park	Beldon	N/a	Low priority - 4
Fairmont Park	Currambine	N/a	Low priority - 4
Fairway Park	Connolly	N/a	Low priority - 4
Faversham Park	Heathridge	N/a	Low priority - 4
Fenton Park	Hillarys	N/a	Low priority - 4
Fernwood Park	Padbury	N/a	Low priority - 4
Filbert Park	Greenwood	N/a	Low priority - 4
Finney Park	Marmion	N/a	Low priority - 4
Forest Hill Park	Kingsley	N/a	Low priority - 4
Fraser Park	Padbury	N/a	Low priority - 4
Galston Park	Duncraig	N/a	Low priority - 4
Geddes Park	Duncraig	N/a	Low priority - 4
George Sears Park	Greenwood	N/a	Low priority - 4
Gerda Park	Greenwood	N/a	Low priority - 4
Gibson Park	Padbury	N/a	Low priority - 4
Gleddon Park	Hillarys	N/a	Low priority - 4
Glenbank Park	Kallaroo	N/a	Low priority - 4
Glenmere Park	Warwick	N/a	Low priority - 4
Gradient Park	Beldon	N/a	Low priority - 4
Granadilla Park	Duncraig	N/a	Low priority - 4
Greenlaw Park	Duncraig	N/a	Low priority - 4
Greenwich Park	Kingsley	N/a	Low priority -4
Gunida Park	Mullaloo	N/a	Low priority - 4

Local Recreation Park			
Haddington Park	Beldon	N/a	Low priority - 4
Harman Park	Sorrento	N/a	Low priority - 4
Hartley Park	Greenwood	N/a	Low priority - 4
Herreshoff Park	Ocean Reef	N/a	Low priority - 4
Hilltop Park	Edgewater	N/a	Low priority - 4
Hillwood Park (North)	Warwick	N/a	Low priority - 4
Hillwood Park (South)	Warwick	N/a	Low priority - 4
Hilton Park	Duncraig	N/a	Low priority - 4
Huntingdale Park	Connolly	N/a	Low priority - 4
Illawong Park	Kingsley	N/a	Low priority - 4
Kallaroo Park	Mullaloo	N/a	Low priority - 4
Kanangra Park	Greenwood	N/a	Low priority - 4
Katrine Park	Joondalup	N/a	Low priority - 4
Kelvin Park	Duncraig	N/a	Low priority - 4
Keppell Park	Marmion	N/a	Low priority - 4
Kiernan Park	Kallaroo	N/a	Low priority - 4
Killin Park	Duncraig	N/a	Low priority - 4
Kilrenny Park	Greenwood	N/a	Low priority - 4
Kimberley Park	Hillarys	N/a	Low priority - 4
Kingfisher Park	Kingsley	N/a	Low priority - 4
Lacepede Park	Sorrento	N/a	Low priority - 4
Lady Evelyn Park	Joondalup	N/a	Low priority - 4
Lakevalley Park	Edgewater	N/a	Low priority - 4
Lanark Park	Duncraig	N/a	Low priority - 4
Larkspur Park	Heathridge	N/a	Low priority - 4
Leaside Park	Greenwood	N/a	Low priority 4
Legana Park	Kingsley	N/a	Low priority - 4
Lehmann Park	Kingsley	N/a	Low priority - 4
Leichhardt Park	Padbury	N/a	Low priority - 4
Lysander Park	Heathridge	N/a	Low priority - 4
Macaulay Park	Duncraig	N/a	Low priority - 4
Manapouri Park	Joondalup	N/a	Low priority - 4
Maquire Park	Hillarys	N/a	Low priority - 4
McKinlay Park	Padbury	N/a	Low priority - 4
McKirdy Park	Marmion	N/a	Low priority - 4
Menteith Park	Kinross	N/a	Low priority - 4
Merrifield Park	Kallaroo	N/a	Low priority - 4
Montague Park	Kallaroo	N/a	Low priority - 4
Monument Park	Beldon	N/a	Low priority - 4
Nanika Park	Joondalup	N/a	Low priority - 4
Negresco Park	Currambine	N/a	Low priority - 4
Newcombe Park	Padbury	N/a	Low priority - 4

Local Recreation Park			
Newham Park	Kingsley	N/a	Low priority - 4
Ninnis Park	Hillarys	N/a	Low priority - 4
Noal Gannon Park	Duncraig	N/a	Low priority - 4
Oakapple Park	Duncraig	N/a	Low priority - 4
Oleaster Park	Greenwood	N/a	Low priority - 4
Orient Park	Hillarys	N/a	Low priority - 4
Oxley Park (Central & North)	Padbury	N/a	Low priority - 4
Parin Park	Greenwood	N/a	Low priority - 4
Parkinson Park	Hillarys	N/a	Low priority - 4
Paterson Park	Padbury	N/a	Low priority - 4
Paveta Park	Greenwood	N/a	Low priority - 4
Plumdale Park	Woodvale	N/a	Low priority - 4
Porteous Park	Sorrento	N/a	Low priority - 4
Portree Park	Duncraig	N/a	Low priority - 4
Poseidon Park	Heathridge	N/a	Low priority - 4
Poynter Park	Duncraig	N/a	Low priority - 4
Quarry Ramble Park	Edgewater	N/a	Low priority - 4
Ranford Park	Hillarys	N/a	Low priority - 4
Grand Ocean Entrance	Burns Beach	N/a	Low priority - 4
Ridge Park	Edgewater	N/a	Low priority - 4
Riversdale Park	Currambine	N/a	Low priority - 4
Rodgers Park	Greenwood	N/a	Low priority - 4
Roxburgh Park	Kinross	N/a	Low priority - 4
Rutherglen Park	Kinross	N/a	Low priority - 4
Salata Park	Duncraig	N/a	Low priority - 4
Sanday Park	Warwick	N/a	Low priority - 4
Santa Ana Park	Currambine	N/a	Low priority - 4
Scott Park	Hillarys	N/a	Low priority - 4
Sherington Park	Greenwood	N/a	Low priority - 4
Simpson Park	Padbury	N/a	Low priority - 4
Southern Cross Park	Ocean Reef	N/a	Low priority - 4
Southport Park	Burns Beach	N/a	Low priority - 4
Spoonbill Park	Kingsley	N/a	Low priority - 4
Springvale Park	Warwick	N/a	Low priority - 4
St Michael's Park	Connolly	N/a	Low priority - 4
Stanford Park	Kallaroo	N/a	Low priority - 4
Stonehaven Park	Kinross	N/a	Low priority - 4
Sweeney Park	Padbury	N/a	Low priority - 4
Sycamore Park	Duncraig	N/a	Low priority - 4
Talbot Park	Kingsley	N/a	Low priority - 4
Tarolinta Park	Ocean Reef	N/a	Low priority - 4
Telopia Park	Duncraig	N/a	Low priority - 4

Local Recreation Park			
Thornton Park	Kinross	N/a	Low priority - 4
Timbercrest Park	Woodvale	N/a	Low priority - 4
Tom Walker Park	Sorrento	N/a	Low priority - 4
Trappers Park	Woodvale	N/a	Low priority - 4
Trig Point Park	Ocean Reef	N/a	Low priority - 4
Triton Park	Mullaloo	N/a	Low priority - 4
Tuart Park	Edgewater	N/a	Low priority - 4
Wallangarra Park	Kingsley	N/a	Low priority - 4
Walsh Park	Joondalup	N/a	Low priority - 4
Waltham Park	Mullaloo	N/a	Low priority - 4
Wanbrow Park	Duncraig	N/a	Low priority - 4
Wandina Park	Duncraig	N/a	Low priority - 4
Water Tower Park	Joondalup	N/a	Low priority - 4
Waterview Park	Woodvale	N/a	Low priority -4
Wedgewood Park	Edgewater	N/a	Low priority - 4
Wentworth Park	Padbury	N/a	Low priority - 4
Whitfords East Park	Craigie	N/a	Low priority - 4
Whitfords West Park	Kallaroo	N/a	Low priority 4
Windmill Park	Burns Beach	N/a	Low priority - 4
Woodlea Park	Joondalup	N/a	Low priority - 4

Specified Area Rates (SAR) Park	Suburb	Priority	Park Classification
Harbour View Park	Hillarys	Very high priority - 1	Local Recreation Park
Leeward Park	Hillarys	Very high priority - 1	Local Recreation Park
Marbella Park	Hillarys	Very high priority - 1	Local Recreation Park
Oahu Park	Hillarys	Very high priority - 1	Local Recreation Park
Atma Park	Iluka	Very high priority - 1	Local Recreation Park
Discovery Park	Iluka	Very high priority - 1	Local Recreation Park
Pattaya Park	Iluka	Very high priority - 1	Local Recreation Park
Sir James McCusker Park	Iluka	Very high priority - 1	Regional Recreation Park
Beenyup Park	Woodvale	Very high priority - 1	Local Recreation Park
McCubbin Park	Woodvale	Very high priority - 1	Local Recreation Park

Commercial Business Precinct (CBP) Park	Suburb	Priority	Park Classification
Central Park	Joondalup	Very high priority - 1	District Recreation Park
Albright Park	Joondalup	Very high priority - 1	Local Recreation Park
Aldgate Park	Joondalup	Very high priority - 1	Local Recreation Park
Charing Cross Park	Joondalup	Very high priority - 1	Local Recreation Park
Embankment Park	Joondalup	Very high priority - 1	Local Recreation Park
Greenshank Park	Joondalup	Very high priority - 1	Local Recreation Park
Piccadilly Park	Joondalup	Very high priority - 1	Local Recreation Park
Portwood Park	Joondalup	Very high priority - 1	Local Recreation Park
Queensbury Park	Joondalup	Very high priority - 1	Local Recreation Park
Regents Park	Joondalup	Very high priority - 1	Local Recreation Park
Sittella Park	Joondalup	Very high priority - 1	Local Recreation Park
Stilt Park	Joondalup	Very high priority - 1	Local Recreation Park
Thornbill Park	Joondalup	Very high priority - 1	Local Recreation Park
Wesley Park	Joondalup	Very high priority - 1	Local Recreation Park

Identified Parks with Weed Management Issues	Suburb	Priority	Park Classification
Cockman Park	Greenwood	Medium priority - 3	Local Recreation Park
Gascoyne Park	Woodvale	Medium priority - 3	Local Recreation Park
Sheoak Park	Greenwood	Medium priority - 3	Local Recreation Park
Wolinski Park	Mullaloo	Medium priority - 3	Local Recreation Park