



Woodside Solar Facility Weed Management Plan

September 2022

Revision 0

Contents

1.	Context, Scope and Rationale.....	3
1.1	Proposal Overview.....	3
1.2	Scope & Applicability of this plan	3
1.3	Project Phasing Overview	4
1.4	Purpose	6
1.5	Risks.....	6
1.6	Vegetation within Project area	6
2.	Background - Weeds	8
2.2	Weeds identified within the Project area	9
3.	Weed Management Approach.....	12
4.	Site Specific WMP Components	14
4.1	Environmental Objectives	14
4.2	Management Actions	14
5.	References.....	19

Tables

Table 1	WMP Summary Table	4
Table 2	Weed prioritisation ranking and management objectives assigned by DPaW 2015.....	8
Table 3	Weed Species: Photo Identification.....	9
Table 4	Weed Management commitments.....	16

Figures

Figure 1	Vegetation Types within the Development Envelope	7
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1. Context, Scope and Rationale

1.1 Proposal Overview

Woodside Power Pty Ltd (Woodside) is proposing to develop a Woodside Solar Facility, approximately 15 kilometres (km) southwest of Karratha, Western Australia (WA). This will generate electricity from a large scale solar photovoltaic farm (Solar PV Farm), complemented by energy storage (battery) infrastructure (the Proposal). The

The Solar PV Farm will be located immediately east of the Maitland Strategic Industrial Estate (MSIA), within the MSIA Buffer Area and former Karratha Station pastoral lease (Figure 1).

Key elements of the Proposal will involve the installation of solar panels and inverters with output of up to 500 MW(AC) in total, across multiple expansion phases. This will result in the installation of approximately 1,000,000 solar panels, each approximately 1 m by 2 m attached to mounting structures positioned 0.5 – 4 m above ground. There will be unsealed access roads between PV panel rows created for construction and retained for maintenance. The Solar PV Farm will likely have an access track from the North West Coastal Highway. The Solar PV farm will be complemented by supporting infrastructure such as a battery energy storage system and electrical substation.

The Solar PV Farm will comprise parallel rows of solar panels, with panels either on single axis tracking frames or fixed tilt frames. An optimised panel layout will be determined during the detailed design phase. The access tracks will be paved with crushed aggregate and at grade, including at crossings of drainage lines. Major drainage lines will not be infilled to construct solar panels, to maximise natural drainage patterns and minimise disturbance to more sensitive habitats.

A perimeter security fence will be installed around any installed infrastructure but located at sufficient distance from the solar panels to allow maintenance and fire response vehicles to move freely within the Solar PV Farm.

1.2 Scope & Applicability of this plan

This WMP has been developed to manage introduction or spread of weeds attributable to the construction and operation (including maintenance) of the Proposal, in particular potential impacts on uninfested P1 and P3 PECs within and adjacent to the Development Envelope. This WMP presents management criteria, monitoring and reporting requirements to be implemented to minimise potential impacts on the environment. This WMP has been developed in accordance with the *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans (EPA, 2021)*. A summary table is provided in Table 1

The Solar PV Farm will be developed within a Development Envelope of approximately 943 ha, with an initial capacity of up to 100 MW. Future expansions may expand solar generation capacity to 500 MW, within the defined DE.

Vegetation disturbance will only occur as expansion of each phase of the Solar PV Farm is commercially sanctioned. Most of the area within the DE is currently used for grazing cattle but is generally unfenced with little restriction on movement within the area. For this reason, it is important to define areas in which weed management activities will apply, as certain areas will be outside of the control of the Woodside Solar Facility. Definition of project phases and areas to which this plan apply are therefore defined below.

Table 1 WMP Summary Table

Title of Proposal	Woodside Solar Facility
Proponent Name	Woodside Power Pty Ltd
Purpose of the CHMP	Manage introduction or spread of weeds attributable to the Proposal, in particular potential impacts to uninfested P1 and P3 PECs within and adjacent to the Development Envelope.
Key Environmental Factor/s and Objective/s	Key Environmental Factor: Flora and Vegetation EPA Objective: To protect flora and vegetation so that biological diversity and ecological integrity are maintained
Key Provisions in the WMP	<p>Management of any:</p> <ul style="list-style-type: none"> • Spread of existing weeds within the Development Envelope to areas beyond • Minimisation of spread and where possible elimination of weeds within construction and operational areas <p>Through the implementation of the following key provisions:</p> <ul style="list-style-type: none"> • Regularly surveys of weed infested areas • Regular weed treatment • Communication of weed management objectives and procedures to staff and contractors • Auditing, monitoring and reporting against the requirements of this plan.

1.3 Project Phasing Overview

Construction phases

There is space within the Development Envelope for up to 500 MW of solar panels however the solar farm is expected to be initially constructed/expanded in phases of around 50 – 100MW. Each 50MW of solar PV is expected to require disturbance (either temporary or permanent) to around 100 hectares of land.

At the completion of each construction phase, any temporary construction/laydown areas will be rehabilitated. The only permanent disturbance associated with the Proposal will be where infrastructure such as roads, inverters, batteries or solar panel mounting hardware is installed. Low vegetation will regrow amongst the rows of Solar PV panels, but due to shading the composition of the vegetation may be different to that which currently is in place.

Operations/Maintenance phases

During the operational phase, there will be minimal activity within the site, limited to light vehicle travel around the project area to conduct inspections or maintenance as required. This WMP will apply to these activities, but only within defined project areas (i.e. within fenced areas of the site or areas within the development envelope within a 100m distance of which infrastructure has been installed unless being conducted specifically in support of the Woodside solar PV facility)

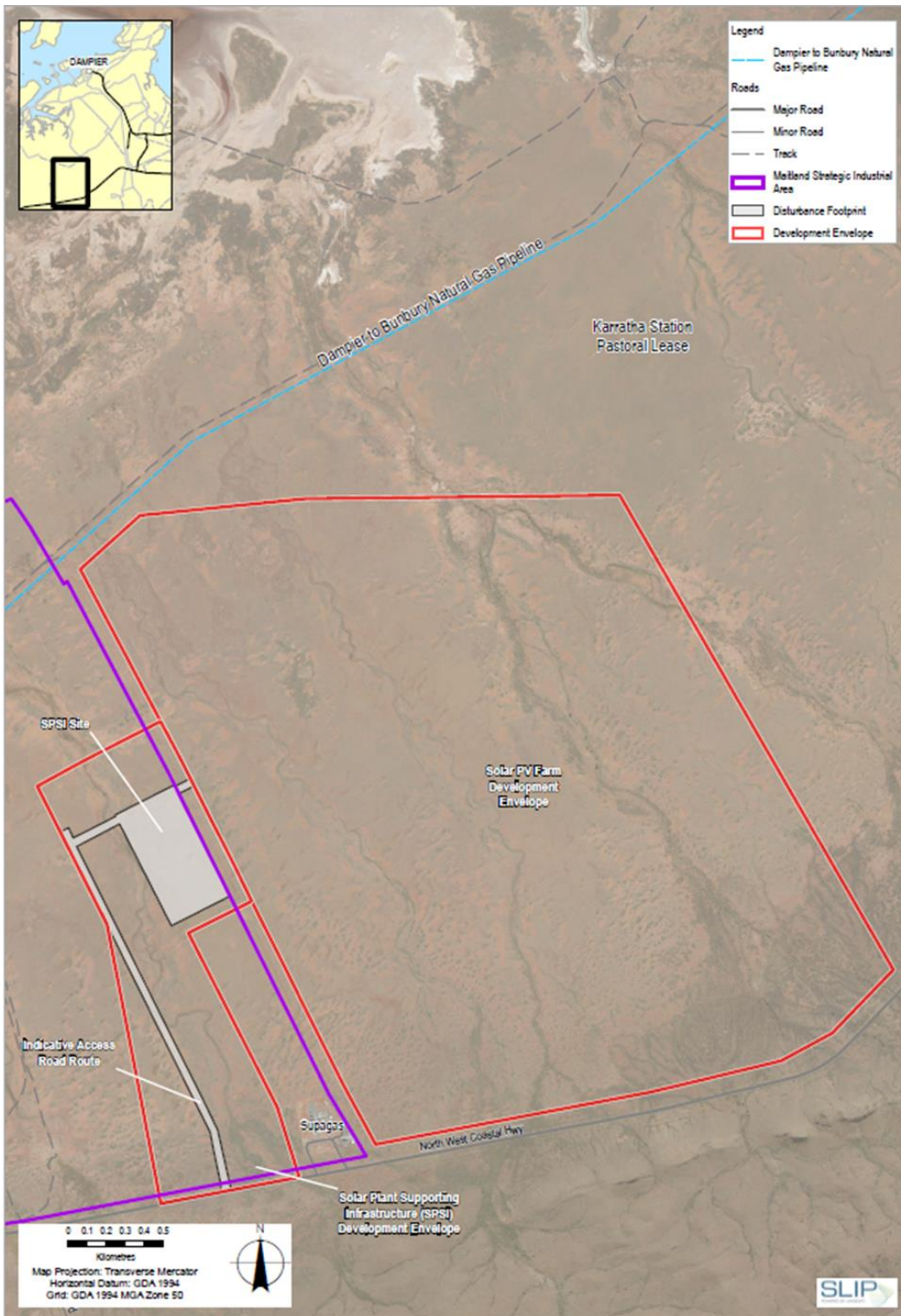


Figure1 - Proposal Location

1.4 Purpose

This Weed Management Plan (WMP) has been prepared to provide the control measures required to manage the potential spread and impact of weeds within the Proposal's footprint.

This WMP:

- Describes the environmental values potentially impacted by the spread of weeds
- Lists the regulations and/or legislation informing procedures and protocols.
- Provides guidance on protocols and procedures to minimise the spread of weeds

1.5 Risks

Construction and operation of the solar facility has the potential to spread existing weeds introduce new species into areas that are currently weed free. The activities that have the potential to spread weeds include:

- Vegetation clearing;
- Ground disturbance;
- Construction of infrastructure;
- Vehicle movement;
- Rehabilitation.

The WMP prepared for this Proposal has taken into account:

- The occurrence of known weed populations within the development envelope;
- The activities likely to cause the spread of weeds; and
- Legal obligations to manage the spread of weeds.

1.6 Vegetation within Project area

Two flora surveys were completed for the Woodside Solar Facility . These surveys found that entire area consists of the Roebourne plains grassland and contains both Priority 1 and Priority 3 Ecological Communities (PECs), with vegetation communities identified shown in Figure 2. (Vicki Long & Associates, 2019; Vicki Long and Associates 2020).

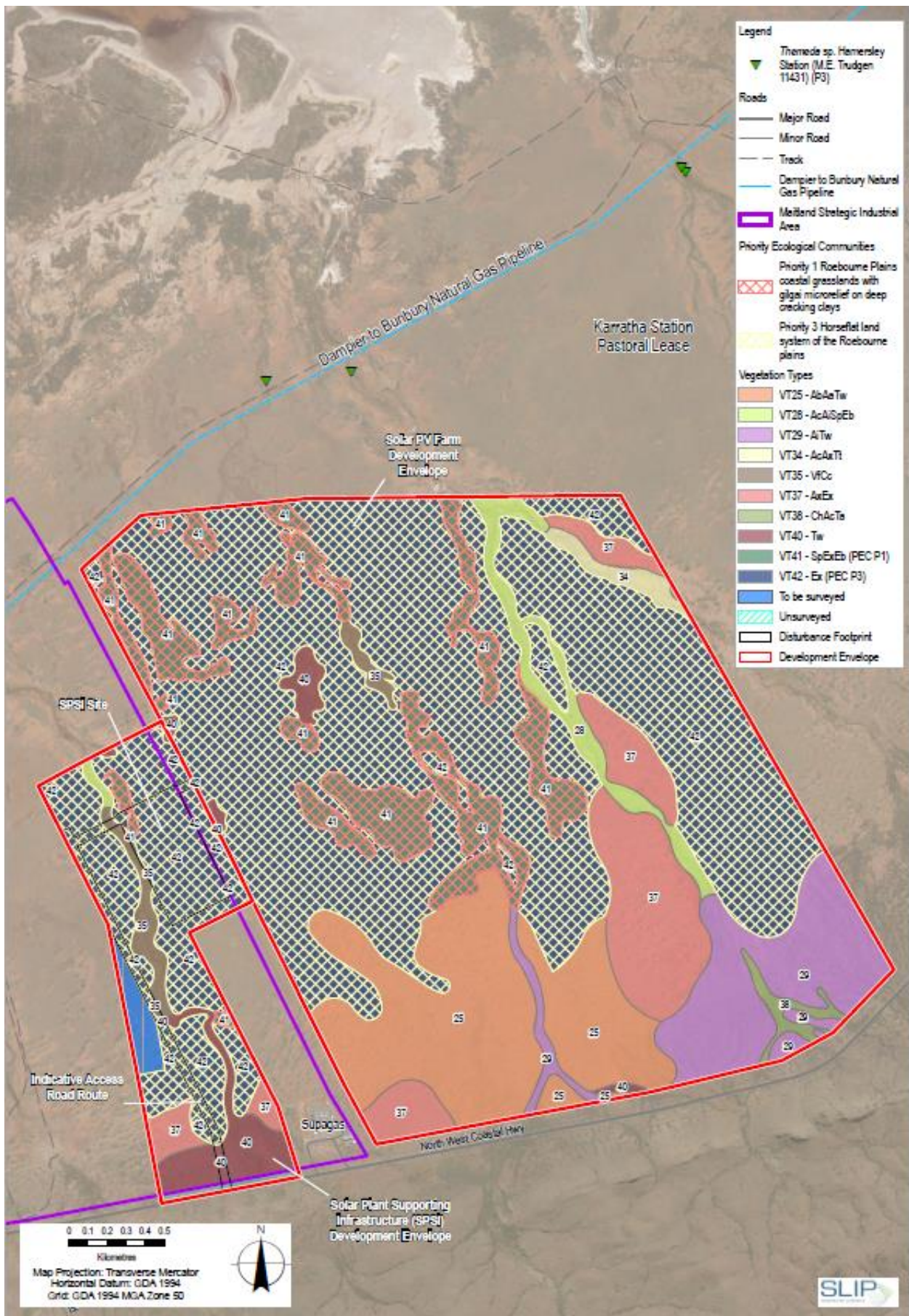


Figure 1 Vegetation Types within the Development Envelope

2. Background - Weeds

Weeds can be exotic or native species that colonise and persist in ecosystems in which they did not previously exist (Australian Government, 2013). Weeds can impact the natural environment in several ways including changes to soil nutrient loadings, increased competition for water and sunlight and limiting seeding recruitment of native plant species.

2.1.1 Weeds of National Significance (WoNS) (Commonwealth)

The Australian Government identified 32 WoNS based on their invasiveness, potential for spread and environmental, social and economic impacts. A list of 20 WoNS was endorsed in 1999 and a further 12 were added in 2012 (Australian Government, 2013) Individual landowners and managers are ultimately responsible for managing WoNS, however, state and territory governments are responsible for overall legislation and administration.

No WONS are known to occur within the Solar Facility Development Envelope.

The list of WONS can be found at the following website.

<http://www.environment.gov.au/biodiversity/invasive./weeds.weeds.lists/wons.html>

2.1.2 Declared plants (State)

Declared plants are weeds which have, or may have, an adverse effect on another organism, humans, the environment, agricultural or related commercial activities, and are listed under the *Biosecurity and Agriculture Management Act 2007* (BAM Act). Declared plants must be managed in accordance with their class which is stipulated in the *Agriculture and Related Resources Protection Act 1976*.

All declared plants are identified according to their category. These categories are:

- C1 Exclusion - Plants which should be excluded from part or all of Western Australia
- C2 Eradication - Plants which should be eradicated from part of or all of Western Australia
- C3 Management - Plants that should have some form of management applied that will alleviate the harmful impact of the plant, reduce the numbers or distribution of the plant or prevent or contain the spread of the plant.

Landholders, managers and occupiers of land are responsible for the management of declared pests on their land.

The Western Australian Organism List (WAOL) contains information on the area(s) in which a plant is declared and the control and keeping categories to which it has been assigned (DAFWA 2016).

2.1.3 Environmental Weeds (State)

The Weed Prioritisation Process for the Department of Biodiversity, Conservation and Attractions (DBCA) (formerly the Department of Parks and Wildlife, DPaW) prioritise weeds in each Parks and Wildlife region, termed 'environmental weeds'. These are weeds that may impact on natural, rather than agricultural or horticultural values and are assessed based on ecological impact (low, medium, high or unknown) and invasiveness (slow, moderate, rapid or unknown), potential and current distribution and the feasibility for control. Within each region, each weed species has been ranked by risk and management objectives assigned, Table 3.

Table 2 Weed prioritisation ranking and management objectives assigned by DPaW 2015

Ranking	Management objective
Very high	Eradication
High	Eradication or control

Ranking	Management objective
Medium	Control to reduce or containment
Low	Containment at key sites only
Negligible	No action to be undertaken but may include monitoring only

2.2 Weeds identified within the Project area

The biological surveys covering the proposed development envelope (Vicki Long & associates, 2020; Vicki Long & associates, 2019) identified several species classified as having high ecological impact and rapid invasiveness (DBCA, 2013). These are:

- **Aerva javanica* (Kapok)
- **Cenchrus ciliaris* (Buffel Grass)
- **Cenchrus setiger* (Birdwood Grass)
- **Passiflora foetida* (Stinking Passion Flower)
- **Vachellia farnesiana* (Mimosa Bush)

The Survey found that weeds were mostly confined to disturbed and semi-disturbed areas within the Proposal' footprint and surrounds. Three weed species were recorded during the detailed survey undertaken in the southern area. The species recorded are:

- **Cenchrus ciliaris* occurs along most creek lines but is generally in equal proportions to other native tussock grasses found in these areas.
- **Tribulus terrestris* (caltrop) was relatively common throughout the survey area. It is a nuisance weed, but is too widespread in the area to attempt any control.
- **Vachellia farnesiana* (mimosa bush) was not abundant, but was widespread. It was found in low numbers along creek lines and in small, but not dense populations within the Solar PV and Power Plant sites. This species has historically been recorded in the area for a long time and conditions within the survey area do not encourage proliferation of this shrub.

Each of the weeds are classified as having high ecological impact and rapid invasiveness (DPAW 2013). As the project is associated with P1 and P3 PEC areas, it is important that the introduction and spread of weeds is prevented. Areas of high weed abundance should only be worked after the areas containing PECs. The Survey recommended that a site-specific weed management plan (WMP) must consider weed density as mapped in this report, direction of work movement and location of vehicle and machine clean down areas.

The following photographs should be used to assist with the identification of weed species specific to this Proposal.

Table 3 Weed Species: Photo Identification

Aerva javanica
(Kapok)



Aerva javanica

Photos: G. Byrne

Cenchrus ciliaris (Buffel Grass)



Cenchrus ciliaris

Photos: G.F. Craig, R. & M. Long & L. Wallis

Cenchrus setiger
(Birdwood Grass)



Cenchrus setiger

Photos: G. Byrne

Passiflora foetida
(Stinking Passion Flower)



Passiflora foetida Photos: B.J. Carter, A.S. George, R. Robson, T. Tapper & WA Herbarium

Vachellia farnesiana
(Mimosa Bush)



Vachellia farnesiana

Photos: J. English, S.D. Hopper & E. Wajon

Tamarix aphylla
(Tamarisk, Athel pine)



Tamarix aphylla

Photos: K.C. Richardson

3. Weed Management Approach

Weed management measures are aimed at minimising the impacts of the Proposal and complying with all legal obligations, Ministerial conditions and project commitments.

This WMP is part of an integrated management program for Woodside and should be considered in conjunction with the following other management plans, which also relate to weed management:

- Construction Environmental Management Plan – addresses dust suppression and management

3.1.1 Objective-based EMP – risk-based approach

An adaptive risk based management approach has been developed in the preparation of this WMP to adapt to any changes, as well as provide flexibility to any changes that may occur within the Development Envelope.

Weed management will comprise the following actions:

- Minimising the risk of introduction and spread of weeds by cleaning earth moving equipment of soil and vegetation prior to entering site for the first time or moving between disturbed and undisturbed areas of the site.
- Ensuring no weed affected soil or fill is introduced or moved around the site.
- Undertaking weed inspections within disturbed areas following the first wet season rainfall event post construction works to record the weed species that have become established and record percentage cover. This inspection will be targeted to be undertaken within six weeks of significant rainfall (>25mm) when plants are actively growing and are more likely to be identifiable
 - The weed inspection should give consideration to the pre-clearing weed density through assessment against the baseline flora survey results and comparable immediately adjacent vegetation. A like for like approach should be applied to determining weed presence in rehabilitation communities.
 - It is recommended that a trigger value of >10% total weed cover of the above listed high ecological impact species be applied as a threshold where weed control is required for the site to support rehabilitation efforts.
 - In vegetation types mapped as PECs <1% weed invasion will be maintained unless baseline data indicates weeds were present prior to disturbance.
- Manual (hand removal) or chemical (herbicide application) removal of high ecological impact weed species within rehabilitation areas as necessary. Optimal removal times may vary for weed species, however, within six weeks of significant rainfall or when plants are actively growing is recommended. Control should also be undertaken within this period to attempt to target plants prior to seed set
- Control of any Declared Pest Plants or Weed of National Significance identified by the weed inspection is required using techniques specific to that plant as recommended by State or Federal biosecurity protocols.

3.1.2 Audits

To ensure the management measures outlined in this WMP are being adequately implemented and comply with relevant design and environmental standards, periodic environmental audits/inspections will be undertaken of the solar PV site. Auditing of the commitments outlined in the Woodside Solar Facility EMP will be undertaken as follows:

- Prior to each construction phase commencing – review of contractor management plans and processes for compliance with environment/weed management plans and environmental conditions.
- At least once during each construction phase.
- At completion of each construction phase to identify and correct any non-conformances
- Annually as part of the Annual Environmental Review (during Operations).
- Persons responsible for environmental auditing will be suitably qualified

A progress and compliance report will be prepared following significant audit activities, to document the effectiveness of the environmental management measures that have been implemented. Any non-compliance will be highlighted and addressed. Where audit finds show environmental management actions are not effective, the audit may recommend changes to procedures.

3.1.3 Compliance Reporting

Woodside will undertake reporting in accordance with regulatory and legislative requirements. It is expected that this will involve preparation of an annual compliance report and annual environmental report to the DWER in accordance with ministerial condition requirements.

4. Site Specific WMP Components

This section aims to identify the management targets to prevent and/or delay spread of weeds and detect weed establishment on site. Weed control techniques specific to the Woodside Solar Facility include the following key measures discussed in further detail below and outlined in Table 5.

4.1 Environmental Objectives

4.1.1 Environmental outcome or management objective/s

The WMP has been prepared to meet the EPAs objective for Flora and Vegetation to manage potential direct and indirect impacts on flora and vegetation. Woodside is committed to:

- preventing the introduction and/or spread of Declared Pests pursuant to the *Biodiversity and Agriculture Management Act 2007 (BAM) Act* and aggressive weeds;
- minimising the spread of existing weeds within or adjacent to Solar facility;
- ensure that weed control measures are implemented during construction and ongoing maintenance activities to avoid any significant impacts weeds may have on flora and vegetation.

4.2 Management Actions

A detailed series of weed management actions is outlined in Table 3. These actions have been developed following the key principles described in this section.

4.2.1 Weed Mapping/Monitoring

The baseline mapping reporting the occurrence of weeds will be updated conducted prior to construction. The baseline mapping will confirm both known populations and any new weed populations within the development envelope. The weed control program will use this baseline map to determine weed control actions. Management actions will determine the following targets:

- No new weed infestations identified in PECs or known populations or habitat for priority flora adjacent to construction areas
- No new Declared weeds or WoNS identified within or adjacent to the Development Envelope as a result of construction or operational / maintenance activities.

4.2.2 Weed Area Signage

Install signage at designated entry/exit points within known declared weed infestations in the Project Areas. Signage will include the following text:

YOU ARE ENTERING A WEED RISK AREA – VEHICLES ENTERING MUST BE CLEAN ON EXIT
YOU ARE EXITING A WEED RISK AREA – VEHICLES MUST BE CLEAN PRIOR TO EXIT

4.2.3 Vehicle/Plant Weed Hygiene

1. Establish vehicle access points across the project's footprint

All heavy vehicles, equipment and mobile plant involved in earthworks and civil works will be inspected prior to entering the Development Envelope.

2. Installation of Washdown Points

Woodside will develop a wash down facility for washing down vehicles at all exit points from weed risk areas. The wash down facility will meet, as a minimum, the following requirements:

- The facility will enable a clear separation of vehicle / equipment wheels or tracks from the material that is being washed off;
- Ensure dirty wash down water drains effectively to a bunded sump;
- Use only water (no degreaser or detergent) for wash down;

Wash down facilities located at the site entry points are not to be used for cleaning vehicles or equipment entering the site, unless coming directly, without deviation, from another Project work site where it was engaged in Project works.

3. *Establishing Contract Conditions*

As part of the site entry process, Contractors will be informed of and required to comply with conditions of this WMP.

4. *Movement of Vehicles*

The movement of vehicles, equipment and personnel between disturbed and undisturbed areas will be minimised as much as possible, to reduce the risk of spreading/introducing weeds.

Table 4 Weed Management commitments

Management Targets	Management actions	Monitoring	Timing/Frequency of actions	Reporting
Baseline Information				
<p>No new weed infestations identified in PECs or habitat for priority flora adjacent to project areas.</p> <p>No new Declared weeds or WoNS identified within or adjacent to the project areas as a result of construction or operations / maintenance of the solar PV facility.</p>	<p>Weed surveys shall be undertaken in areas in which construction/activities are planned prior to commencement. Survey shall map weed occurrence and percentage cover.</p> <p>High risk areas (e.g. areas identified as infested with of Declared Pests, WoNS, weeds identified as threats to PECs, weeds within 50 m of PECs / priority flora) to be demarcated on site maps.</p>	<p>Pre-construction weed survey (ideally within wet season conditions) of construction areas within 50 m of PECs or known populations/habitat for priority flora, to inform risk assessment.</p>	<p>Prior to ground disturbing activities in each construction phase.</p>	<p>Implement and maintain Weed Mapping (high risk areas) and Treatment records</p> <p>Annual Reporting</p> <p>Reporting on exceedance of management target</p>
	<p>The known weed status of each section of the project area shall be clearly marked on the project site plans to inform entry procedures/requirements.</p>	<p>Post-construction wet season weed survey of construction areas within 50 m of PECs or known populations or habitat for priority flora</p>	<p>Within six months of completion of each construction phase.</p>	<p>Review management actions (and revise if required)</p>
	<p>Prior and subsequent to each construction phase, weed treatment will be undertaken for declared pests and WoNS within the area (and 50m beyond) in which activity is planned or occurred.</p>	<p>Annual visual monitoring during construction for new weed infestations in:</p> <ul style="list-style-type: none"> – PEC or known populations or habitat for priority flora adjacent to construction areas – High risk areas within construction areas 	<p>Within 3 months prior and no more than 6 months post each construction phase.</p>	
	<p>Australian biosecurity and quarantine requirements/procedures will be compiled with for imported project equipment.</p>	<p>Identify potential sources of weed infestation. Update mapped distribution of declared or environmental weed</p> <p>Review treatment and control methods seeking further advice from relevant authorities if required.</p> <p>Implement revised weed control methods.</p>	<p>Continuously throughout project life.</p>	

Management Targets	Management actions	Monitoring	Timing/Frequency of actions	Reporting
Inductions and Procedures				
All staff and contractors on site are aware of their obligations in relation to minimising the risk of spread of weeds.	The site induction program will include hygiene training to ensure all staff and sub-contractors are aware of the requirements to avoid the spread and introduction of weeds. Inductions will include weed identification guides and maps.	Monitor construction activities to ensure they are consistent with the management plan.	Continuously throughout project life.	Training/Induction records Photographic Evidence
	No complaints from adjacent stakeholders regarding weed introduction and spread.		At all times	Weed Control Records
Compliance with all relevant requirements relating to biosecurity/quarantine management.	Australian biosecurity and quarantine requirements/procedures will be compiled with for imported project equipment.	Identify potential sources of weed infestation. Update mapped distribution of declared or environmental weed Review treatment and control methods seeking further advice from relevant authorities if required. Implement revised weed control methods.	Continuously throughout project life.	Evidence import requirements have been followed.
Weed Control Techniques				
Minimise risk of weed spread through proactive weed management and control.	Weed control (chemical or physical) shall be undertaken to eradicate populations of declared and environmental weeds with particular emphasis in priority areas.	Site-specific risk assessment to be conducted for all construction areas within 50 m of PECs or known populations or habitat for priority flora, to determine site-specific weed control, hygiene and monitoring requirements	Construction	Evidence of weed control activity being conducted.
Access and vehicular/machinery movement				
No spread of weeds attributable to onsite vehicle movement.	Any vehicles / plant planning to enter areas in which clearing is not planned are to be certified clean on entry.	Routine audits of Clean on Entry / Exit implementation	Continuously throughout project life.	
	Any vehicles / plant planning to enter construction areas in which weeds are present to the clean on exit.	Routine audits of Clean on Entry / Exit implementation	Prior to and During construction	Training/inductions records

Management Targets	Management actions	Monitoring	Timing/Frequency of actions	Reporting
	Entry and exit points to/from the road reserve shall be reduced or avoided as far as practicable in weed infested areas.	Records site access rules denote restrictions around weed infested areas.	Continuously throughout project life.	Weed Monitoring Procedures
Construction Materials				
No introduction of weeds to project areas via imported materials.	Imported fill will be weed free. Accredited suppliers with weed free certification to be utilised.	Fill certifications to be acquired prior to fill usage.	When acquiring imported fill material.	Certifications of clean fill maintained.

5. References

Australian Government 2013, Weeds In Australia, retrieved in August 2022, from

<http://www.environment.gov.au/biodiversity/invasive/weeds/index.html>

DBCA 2013, Weed prioritisation process for DPaW, Pilbara region. Access at <https://www.dpaw.wa.gov.au/plants-and-animals/plants/weeds/156-how-does-dpaw-manage-weeds>

Department of Primary Industries and Regional Development, (2022). Agriculture and Food. Declared Plants. <https://www.agric.wa.gov.au/pests-weeds-diseases/weeds/declared-plants>

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Woodside, 2021, Woodside Solar Facility s38 Referral Supporting Document.

Van Vreeswyk, AME, Payne, AL, Leighton, KA & Hennig, P 2004, An inventory and condition survey of the Pilbara region, Western Australia. Technical Bulletin No. 92, Department of Agriculture and Food, Perth.

<https://florabase.dpaw.wa.gov.au/>

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