Solar energy. Clean energy for a better tomorrow.

INFORMATION GUIDE ON SOLAR FARMS


“We have a clear vested interest in helping the district thrive”

Introduction

About us

We (New Energy Development) are a company based in the region that specialises in the development of solar farms.

We have been working and living amongst the community for approximately 3 years, delivering renewable energy projects around the country. We are passionate about reducing greenhouse gas emissions and have identified opportunities to develop the Wallaroo Solar Farm as a means of providing an environmentally friendly and sustainable energy source to the district.

As we continue to feel the effects of climate change, being proactive about implementing innovative renewable energy solutions is becoming more critical and is an important part of all our lives and our children's future.

New Energy Development was founded in Australia and one of our major shareholders is Canberra born and raised. There is therefore a clear vested interest in helping the district thrive

Background

Overview

Thorough consultation has been carried out with Transgrid, a large and reputable energy distribution network in Australia. Due to current consumption patterns the ACT and the necessary power required, Transgrid advised capacity at the substation and more power generation is needed to meet the current demand.

As the substation has additional capacity and the demand is there, it has been deemed as an ideal region for solar power generation.

After canvassing the limited site options and conducting feasibility studies, the proposed site was carefully selected.

Our low impact model pro-actively supports the local farming ecosystem, the pollination and production of local crops and the preservation and health of farmland and native landscapes.

In addition, consideration should be given to the economic and social benefits that the solar farms will bring to the broader community and the way in which we proposed to mitigate any environmental impacts.

The solar farm proposal is currently undergoing the planning approvals process.

Site selection and feasibility testing

Site assessment

Many options were considered for the locations of the farms however to determine suitability of the site, feasibility tests were conducted.

The feasibility tests were based on the following criteria:

Superior solar resources

Proximity to electricity network (no further than 3km)

Connection capacity available at the anticipated connection point

Adequate local electricity load

Landholder agreeable to lease their land for development of solar farm

Land no longer actively being used for agricultural purposes

Land relatively flat andunencumbered

Excellent vehicle/site access

Land relatively close to population base for employment, construction, and servicing

Low environmental impact

Low expected visual impact

Site design and layout

Design

We have made significant improvements to our site design which:

- Supports the long-term sustainable use and management of existing natural resources
- Improves compatibility with the existing uses of surrounding lands
- Considers and builds upon the local characteristics of the area
- Encourages a sustainable agricultural industry through the delivery of an innovative model which is multi-purposed
- Increasing the productivity of lands being used primarily for agricultural purposes by introducing mixed uses
- Delivering solutions to assist the Government in meeting its Renewable Energy Targets

Site design cont.

The solar panels will be positioned on single axis tracking structures and will rotate to ensure the best possible angle to the sun. The height and positioning of the solar panels have a maximum elevation of 2.3 meters from ground level. There is 5 meters in between each row for access and servicing of the solar panels, machinery, and personnel access for servicing requirements.

There is also roughly thirty meters distance from the panels to the security fencing which is a significant portion of land that has been earmarked for pollination production by our pollinating ground cover.

Bee population and bio security are integral to the ongoing success of farming practices in Australia as identified by The Department of Agriculture and Water Resources (http://www.agriculture.gov.au/pests-diseases-weeds/bees). Farming is very dependent on the native and farmed bee population for its horticultural survival.

With this in mind, we have engaged with local producers and pollination authority to ensure the constant supply and management of the bee population.

The Wallaroo project will plant approximately 22,000 permanent native plants, with six species used for the ground cover and 19 native plant species used in the vegetation screen.

A native pollinator, chemical free, bee haven in the midst of the region will have very positive economic and environmental benefit to the surrounding area.

Site design cont.

There are also other benefits to this model such as, low maintenance, durability, and better storm water drainage from deep rooted plants. The following is a list of our proposed ground cover species.






SCIENTIFIC NAME	FAMILY	COMMON NAME	HEIGHT	WIDTH	FLOWER COLOUR	ATTRACTS WILDLIFE
Grevillea	Proteaceae	Grevillea	0.1 - 0.2 meters	3-6 meters	Red	Bees, Nectar eating birds, Butterflies, Other insects, Lizards
Scaevola albida	Goodeniaceae	Fan Flower	0.05 metres	1-2 metre	Mauve	Bees
Goodenia ovata	Goodeniaceae	Goodenia	0.1 metres	2 metres	Yellow	Bees
Hardenbergia	Fabaceae	Hardenbergia	0.6 metres	0.6 metres	Purple, Mauve	Bees, Butterflies
Brachyscome	Asteraceae	Native Daisy	0.3 metres	0.5 metres	Pink, Purple	Bees, Butterflies, Other insects
Adenanthos cuneatus	Proteaceae	Jug Flower	0.2 - 0.3 metres	1.5 - 2 metres	Red	Bees, Nectar eating birds, Butterflies, Other insects

Economic, environmental and social benefits

Economic benefits

The Wallaroo solar farm is a $170 million construction project and as per the initial solar construction impact report the site will generate over 200 jobs. To make sure the district benefits most from the job opportunities, we will enforce a local labour employment policy which prioritises suitable candidates residing locally. The resulting modelling has confirmed that the projects combined will inject in excess of $380 million into the local economy benefiting local business, restaurants and retail.

The ongoing benefits of the farm will result in the creation of 4 full time positions and an additional 12 indirect jobs. The modelling also shows that the total effect of the farm will contribute $8 million to the local economy per annum for the life of the projects.

Environmental benefits

The Wallaroo Solar Farm will generate approximately 260,000 megawatt hours (MWh) of renewable electricity per year. This essentially means our solar farms have the capacity to supply enough power to service on average 48,000 households each year for approximately 30 years.

Solar Farms can displace greenhouse gas emissions

The proposed solar energy facilities combined can displace approximately 215,000 tonnes of carbon dioxide or greenhouse gas emissions per year. This equates to taking approximately 86,000 cars off the road each year.

Alternatively, 30,000 tonnes per year is the equivalent to the amount of carbon that would be locked up by planting 400,000 trees.

Community Benefit Fund

As we are passionate about being an active part of the community and should the solar farms be approved, we propose to set up a Community Benefit Fund to contribute to the social and educational elements of the region. We are currently establishing appropriate policy and guidelines that will govern a Community Benefit Fund that will ensure funding decisions are made in a transparent way. Key trusted local community representatives will be selected as an integral part of the decision making for grant applications.

The $150,000 grants scheme will be focused on creating opportunities for education about renewable energy, agricultural practices, environment, and sustainable farming. These can be but are not limited to:

- Funding for school scholarships
- Support go nature kids and shed hands on experience with solar run products
- School science and engineering programs based around renewables
- School facilities where they pertain to improving the environment or providing platforms for solar and energy use

Further details on the community benefit fund will be provided in due course.

Protecting the visual amenity

Native vegetation screen

The native vegetation screen (AKA green belt) will be positioned along the outskirts of the sites and has multiple advantages. This will be a vast improvement to the visual amenity of the surrounding areas while encouraging the growth of native plant species that are important to our ecological system.

The makeup of plants has been carefully selected to ensure the local character of the area is maintained and that important native plant species continue to prosper.

The selection of the green belt makeup has been guided by local business.

We will have the ability to nurture and maintain the green belt via the new on-site irrigation systems. Once fully matured, the green belt will be three-meters-high and roughly four meters deep and will be situated in front of the mesh fence guarding the security of the site.

The thickness of the screen will be achieved through density planting and the height will block any view of the security fence and of the solar panels.

A detailed landscape management plan and a visual impression of what the green belt will look like has also be developed for each of the sites.

Native vegetation screen

Example planting matrix

BASED ON THE 4M GREEN BELT

%		LATIN NAME	COMMON NAME	SUPPLY SIZE	RATE/SPACING	COMMENTS
5.6		Acacia acinacea	Gold Dust Wattle	Tube	1 Plants/sq m	Yellow Flower. Shrub. Usage: Farm, Garden Screening. Soil Type: Clay & Sandy. Frost/Drought tolerant
5.6		Acacia iteaphylla	Flinders Range Wattle	Tube	1 Plants/sq m	Yellow Flower. Shrub. Usage: Farm, Garden Screening. Soil Type: Clay & Sandy. Frost/Drought tolerant
5.6		Acacia sclerophylla	Hard-leaf Wattle Tube	Tube	1 Plants/sq m	Yellow Flower. Shrub. Usage: Farm, Garden Screening. Soil Type: Clay & Sandy. Frost/Drought tolerant
5.6		Acacia wilhelmiiana	Dwarf Nealie	Tube	1 Plants/sq m	Yellow Flower. Shrub. Usage: Farm, Garden Screening. Soil Type: Clay & Sandy. Frost/Drought tolerant
5.6		Atriplex nummuluaria	Old-man Saltbush	Tube	1 Plants/sq m	Shrub. Usage: Farm & Screening. Soil Type: Clay, Salty & Sandy. Drought / Frost tolerant. Coastal exposure
2.8		Callistemon lilacinus	Lilac Bottlebrush	200mm	0.5 Plants/sq m	Lilac Flower. Shrub. Usage: Garden & Farm. Soil Type: Clay, Sandy. Acidic & Water logged. Frost tolerant. Coastal exposure.
2.8		Callistemon phoeniceus	Fiery Bottlebrush	200mm	0.5 Plants/sq m	Red Flower. Shrub. Usage: Farm, Garden & Screening. Soil Type: Clay & Sandy. Frost / Drought tolerant.
5.6		Calothamus quadrifidus	One sided bottlebrush	Net Brush 200mm	1 Plants/sq m	Red Flower. Shrub. Usage: Farm, Garden & Screening. Soil Type: Clay & Sandy. Drought tolerant. Coast exposure.
5.6		Dodonaea Viscosa spp cuneate	Wedge-leaf Hop bush	Tube	1 Plants/sq m	Shrub. Usage: Farm, Garden & Screening. Soil Type: Clay & Sandy. Frost/Drought tolerant.
5		Eremophila maculate	Emu Bush	Tube	0.9 Plants/sq m	Cream/Tello/Orange Flower. Shrub. Usage: Garden & Screening. Soil Type: Clay, Sandy & Acidic. Frost/Drought tolerant. Coast exposure.
6.1		Eremophila wwvoppositifolia	Twin Leaf Emu Bush	Tube	1.1 Plants/sq m	Purple Flower. Shrub. Usage: Garden, Screening & Farm. Soil Type: Clay, Sandy,Acidic and Water-logged. Frost/Drought tolerant.
7.3		Eremophila youngii	Twin Leaf Emu Bush	Tube	1.3 Plants/sq m	Red Flower. Shrub. Usage: Garden. Soil Type: Sandy. Frost/Drought tolerant. Coast.
1.8		Eucalyptus platypus	Round-leaved Moort	Tube	0.33 Plants/sq m	Cream/White/Yellow Flower. Tree. Usage: Farm, Garden & Screening. Soil Type: Clay, Sandy. Frost/Drought tolerant.
5.6		Grevillea olivacea	Olive Leaf Grevillea	Tube	1 Plants/sq m	Red/Orange/Yellow Flower. Shrub: Usage: Garden & Screening. Soil Type: Clay, Sandy & Acidic Frost / Drought tolerant. Coastal exposure
5.6		Grevillea winpara gem	Olive Leaf Grevillea	Tube	1 Plants/sq m	Red Flower. Shrub: Usage: Garden, Farm & Screening. Soil Type: Sandy & Acidic.Frost / Drought tolerant.
4.5		Grevillea winpara gold	Olive Leaf Grevillea	Tube	0.8 Plants/sq m	Red/Yellow Flower. Shrub: Usage: Garden & Screening. Soil Type: Sandy. Frost / Drought tolerant.
2.8		Melaleaca lanceolate	Moonah	Tube	0.5 Plants/sq m	White Flower. Shrub: Usage Farm, Garden & Screening. Soil Type: Clay, Salty and Sandy. Frost /Drought tolerant. Coastal exposure.
8.4		Lavender angustifolia	Lavender	Tube	1.5 Plants/sq m	Mauve Flower. Shrub: Usage: Garden & Screening. Soil Type: Sandy. Frost /Drought tolerant.
8.4		Westringia fruticosa	Coastal Rosemary	Tube	1.5 Plants/sq m	Mauve flower. Shrub: Usage Usage Farm, Garden & Screening. Soil Type: Clay, Salty and Sandy. Frost /Drought tolerant. Coastal exposure.

Native vegetation screen

PERSPECTIVE 1, GREEN BELT TREES (NOT TO SCALE)

GREVILLEA WINPARA GOLD

LAVENDER

MELALEUCA LANCEOLATA

MELALEUCA LANCEOLATA

ROSEMARY

ACACIA SCLEROPHYLLA

Dust management

Mitigation

Some dust is expected as per any other construction project. Any impacts during construction will be effectively mitigated through a construction environmental management plan. The plan will be developed in consultation with, and implemented by head contractor, the local land, water and environmental specialists. The dust management aspect of the plan aims to address matters such as: ongoing dust level monitoring, response measures and mitigation strategies. It is important to note, that the proposed construction time frames are approximately five months, and dust impacts from that period are expected to be managed accordingly.

During the operational period, dust will be far less than the dust currently produced through cultivation and harvesting practices and/or in its current state. There will be minimal dust generated from each of these sites due to the green belt and ground covers on-site.

It is in our best interest to effectively minimise dust levels to maximise efficiencies as dusty solar panels will decrease the ability to generate solar energy and negatively impact on outputs.

Noise management

Facts about noise

The only source of noise when the solar farms are in operation are from the inverter units. There will also be some noise generated by workers at the site performing general maintenance operations. The site may require management of the on-site horticultural activities and technician works, however, any noise levels generated by maintenance will be similar to that of typical farming operations occurring in the region. Such maintenance operations will only be performed during normal business hours.

Inverters will operate at the site to convert the DC electrical output of the solar panels into AC electricity for supply to the grid. The inverters will be located away from nearby residences.

The noise level produced by inverters is low, typically around 64dB, which is no louder than a modern-day air conditioner. At this low level, noise produced by inverters will be virtually undetectable during operation and completely silent at night when they are not operating.

There will be some noise and vibration during the construction phase. This impact will be managed carefully in accordance with the relevant EPA guidelines.

During operation, maintenance staffing and activities would be at low levels our environment management plan aims to mitigate any noise that may impact the surrounding dwellings which will be required in a consent condition of the permit.

Photovoltaic Heat Island (PVHI)

Heat island effect

The term “heat island effect” is usually applied to increase in ambient temperatures in highly developed urban areas due to the abundance of hard, man-made surfaces absorbing and radiating heat. Thus, a heat island is established, or a region of higher temperature than that of the surrounding more natural, rural areas. Some research has been conducted to determine whether there is corresponding heat island effect in PV solar farms, termed the “photovoltaic heat island” (PVHI) effect. Several studies have demonstrated that there are slight increases in air temperature at solar PV farm sites (Fthenakis V. & Yu Y. (2013) - 1.9°C; Barron-Gafford et al (2016) – 3-4°C; Yang et al (2017) – 0.7°C). However, these increases in temperature are highly localised to the immediate site, particularly above the solar PV arrays. The studies show that temperatures quickly begin to match surrounding ambient levels only a short distance (30m) from the boundary of the PV site.

Guthrie (2018) notes that temperature changes of this order are within the range of temperature fluctuations due to changes to land use. For example, he points out the ambient temperature above irrigated land was measured to be 1-2°C higher than that of dryland (see de Vries and Birch (1961)).

Whilst the localised impacts are not likely to have an impost or experienced by the adjoining landowners the proponents will mitigate this slight increase in temperature at the site by instituting the following measures:

* Using the latest and most efficient solar PV panels. This means that proportionally more of the solar energy falling on the site is converted to electricity and thus removed from the site. The more energy that is removed from the site, the less that remains to be radiated to the atmosphere as heat.

Heat island effect cont.

* Modern PV panels are thin and relatively lightweight. This means that they accumulate a lower level of heat throughout the day and then quickly radiate this heat into the atmosphere once the sun sets each day.

* Establishing extensive vegetation at the site. All types of vegetation remove heat from the atmosphere through the process of evapotranspiration. The garden plantings that form the perimeter buffer zone at the site will contribute to offsetting, the heat build-up throughout the day

* The perimeter plantings at the site will form a physical barrier that will help to confine heat to the site. Heat transfer to surrounding areas, through the processes radiation and convection, will be disrupted by the screening vegetation.

* In still conditions heated air will tend to rise into the atmosphere above the site - until the temperature gradient is equalised.

* In windy conditions however, this is more easily disrupted and dispersed by the action of the wind.

Reflectivity impact studies

Glint and glare

Solar farms are not generally considered to be reflective as solar panels are specifically designed to absorb light. Minimising the light reflected from solar panels is a goal of panel design, manufacture and installation. The panels introduced in the Solar Farm reflect around 2% of the light received which helps to increase the project efficiency, absorbing maximum sunlight to convert it to electricity. Solar panels are constructed of dark coloured materials and their surface is coated with anti-reflective materials.

Reflection can be divided into two categories: glint and glare. Glint is a momentary flash of bright light and glare is a continuous source of bright light.

The solar arrays that are proposed for the Solar Farms will be fixed at an optimal angle to receive sunlight. They are certified by the Clean Energy Council Australia and have the following features: high transition tempered anti reflective glass, lead free and standards tests UL1703 fire rating.

This type of design means that risk of glint is effectively eliminated, and the risk of glare is greatly reduced.

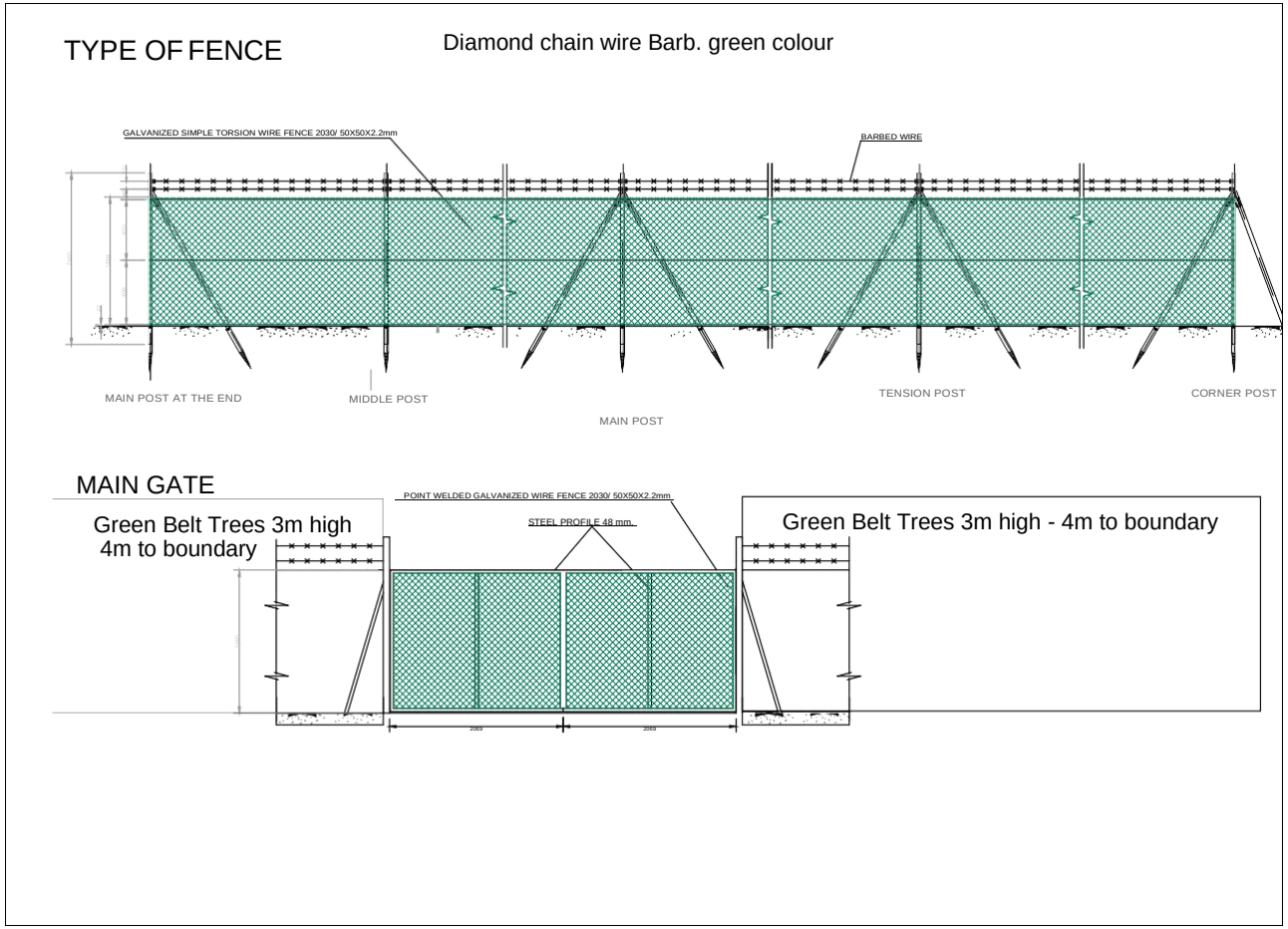
In order to further reduce or eliminate the possibility of problems caused by reflection, we have engaged specialist landscape designers which have assisted in perimeter of each of the three proposed sites. These perimeter plantings will also be an effective barrier that will obscure the solar arrays from the view of neighboring residents and passing traffic.

The risk to air traffic of reflection from solar panel arrays is very low. Solar arrays are just one possible source of reflection that pilots are trained to deal with. The low risk that is presented by solar arrays is demonstrated by the fact that a number of Australian and international airports have their own on-site solar generation facilities.

Security Fence and Main Gate

Placement

The fence will sit on the inside of the green belt and the material used for the fence will either be an olive green colour or black. Placing the security screen on the inside was an amendment made to the initial plan and design after considering feedback from a neighbour. The height of the security fence is two metres as per the standard requirement and the below image shows the dimensions of the screen and front gate against the height of the green belt.



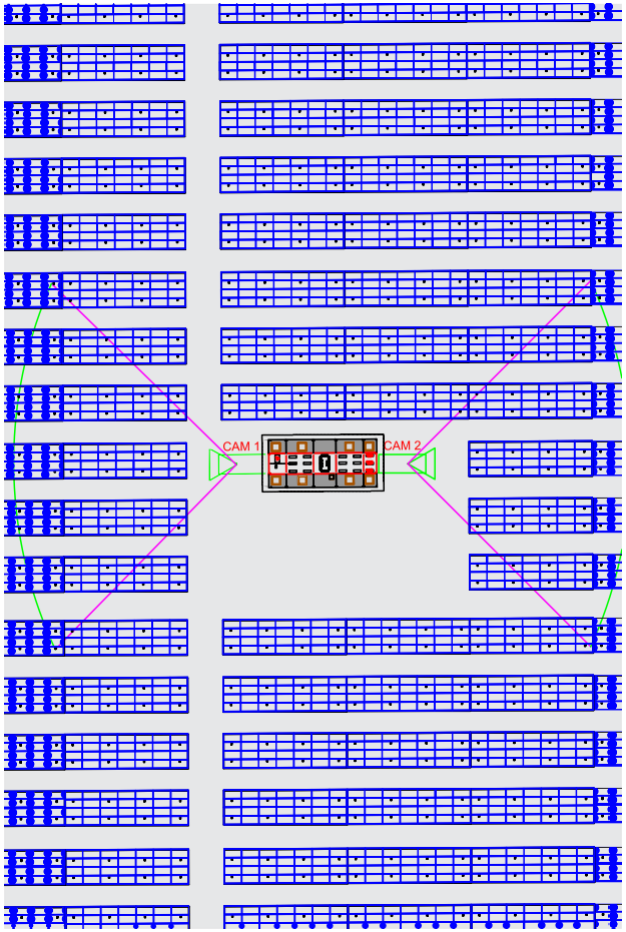
Maintaining Privacy of Surrounding Dwellings

CCTV and on-site lighting

As shown in the revised plans, the installation of motion-activated lights as security lighting will not be on the boundaries or perimeter of the solar farm but will be situated in the middle shining on the inverter. If an emergency repair crew is required in hours of darkness, the light allows them to safely access the facilities to undertake the repair work. The motion-activated light only actuates when the inverter is approached, and it will not be illuminated on a permanent basis. No other site lighting is required or proposed.

In order to monitor the site and detect any unauthorised or unofficial access, motion-activated closed-circuit television (CCTV) cameras will be erected on the site perimeter. The cameras are directed into the solar farm(s), avoiding impinging on the privacy of nearby properties, and employ infrared technology so no lighting is required.

The layout will not impinge on the privacy of surrounding properties amenities.



Fire management

Fire = low risk

The site is currently intermittently grazed and will continued to be during the project's operational life. As such they have no higher level of fire risk. Once the proposed farms and ground cover are introduced the site will be well maintained and grass will be kept trimmed and vegetation screen will be pruned and maintained.

Solar panels have an inherently low risk of fire. They are constructed of materials that are not flammable (glass, silicon, etc.).

Flora and fauna

Consideration

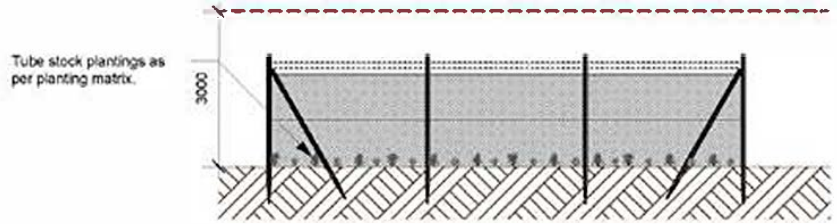
Currently, there is no significant native vegetation. As such, any use of the site by native fauna is both temporary and transitory in nature. That being said, our landscaping plans on the site will create a large natural habitat for fauna species.

Decommissioning

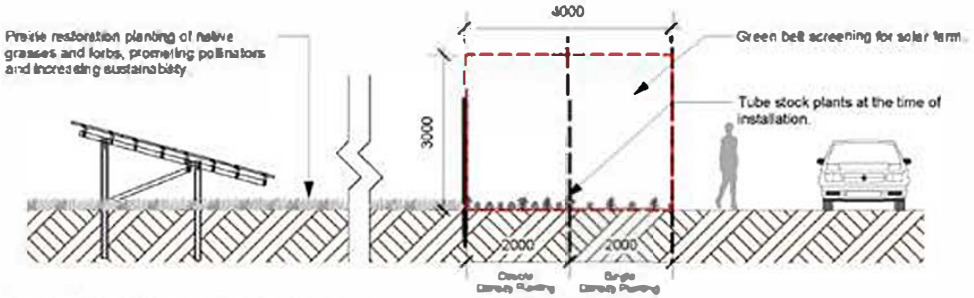
Upon completion

The life of a solar farm project is roughly 30 years and we will be required to decommission the site by removing all the solar panels and associated materials. Due to the significant infrastructure and environmental upgrades we are making to each of the sites, the land will be in a desirable condition and available to use for agriculture, grazing, residential or for any other intended use.

Landscape management plan

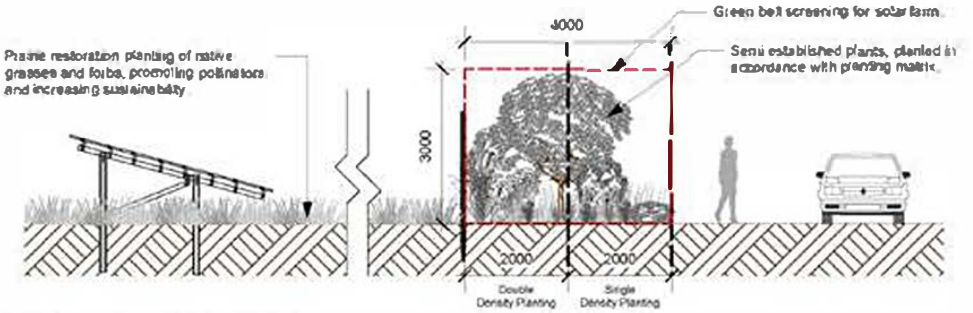


Fence Elevation - At the time of planting
Scale 1:100



Fence Elevation - At the time of planting
Scale 1:100

Fence Elevation - After 12 months
Scale 1:100



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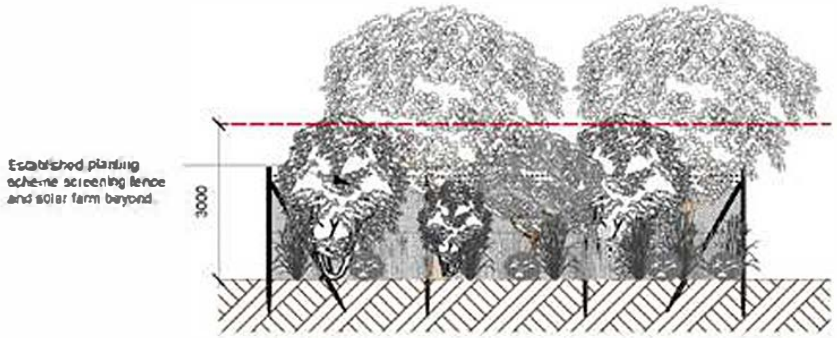
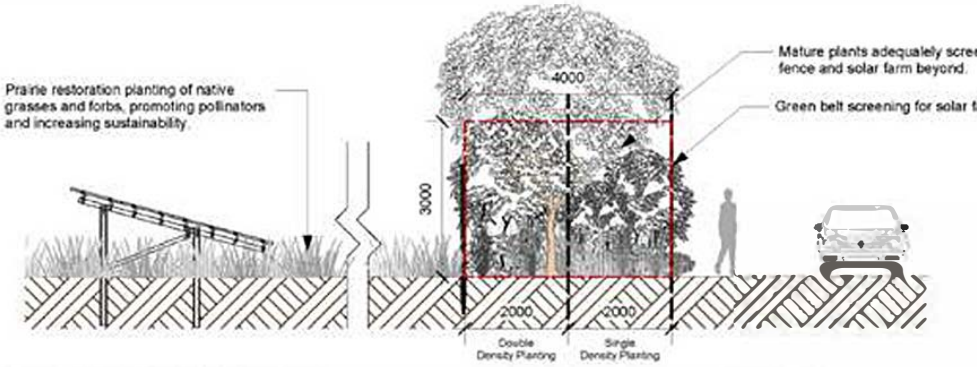
Scale 1:100



Fence Elevation - Once Established
Scale 1:100



Fence Elevation - Once Established
Scale 1:100

Scale 1:100

0 2 4 6 8 10 M

LANDSCAPE CONCEPT DOCUMENTATION - NOT FOR CONSTRUCTION

DESIGN STUDIO
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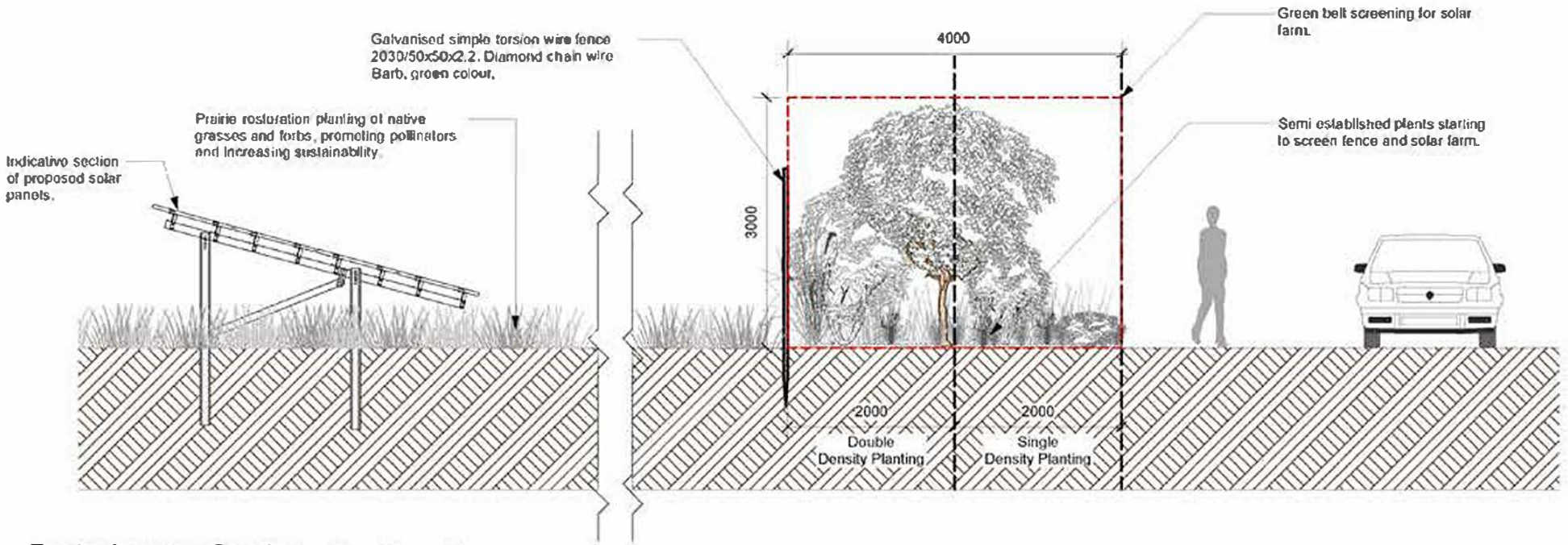
No.	PO	Drawn date	Comments	by	by	Verified
0		23/08/18	Landscape DA Documentation	MT	MT	Yes
1		29/08/18	Revision 1	MT	MT	Yes
2		18/09/18	Revision 2	MT	MT	Yes

Drawn:	Scale @ A3:	Plot no.	Print date:
MT	1:100	1.06	21/9/18

Checked: MT

Drawing: Green Belt Sections & Elevations



Typical Fence Section - After 12 months

Scale 1:50

Scale 1:50

0 1 2 3 4 5 M


Callistemon lilacinus


Callistemon phoeniceus


Calothamnus quadrifidus


Dodonaea viscosa ssp cuneata


Dodonaea viscosa ssp cuneata


Eremophila maculata

LANDSCAPE CONCEPT DOCUMENTATION - NOT FOR CONSTRUCTION

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rev no	drawn date	comments	by	ck	verified
0	22/05/18	Landscape DA Documentation	MT	MT	Yes
1	23/05/18	Revision 1	MT	MT	Yes
1	18/06/18	Revision 2	AVE	MT	Yes

SITE:
Power Vault Mckays Rd
Green Belt Screening
Brownsboton, 7 SMW Solar Farm

CLIENT:

PROJECT NO:

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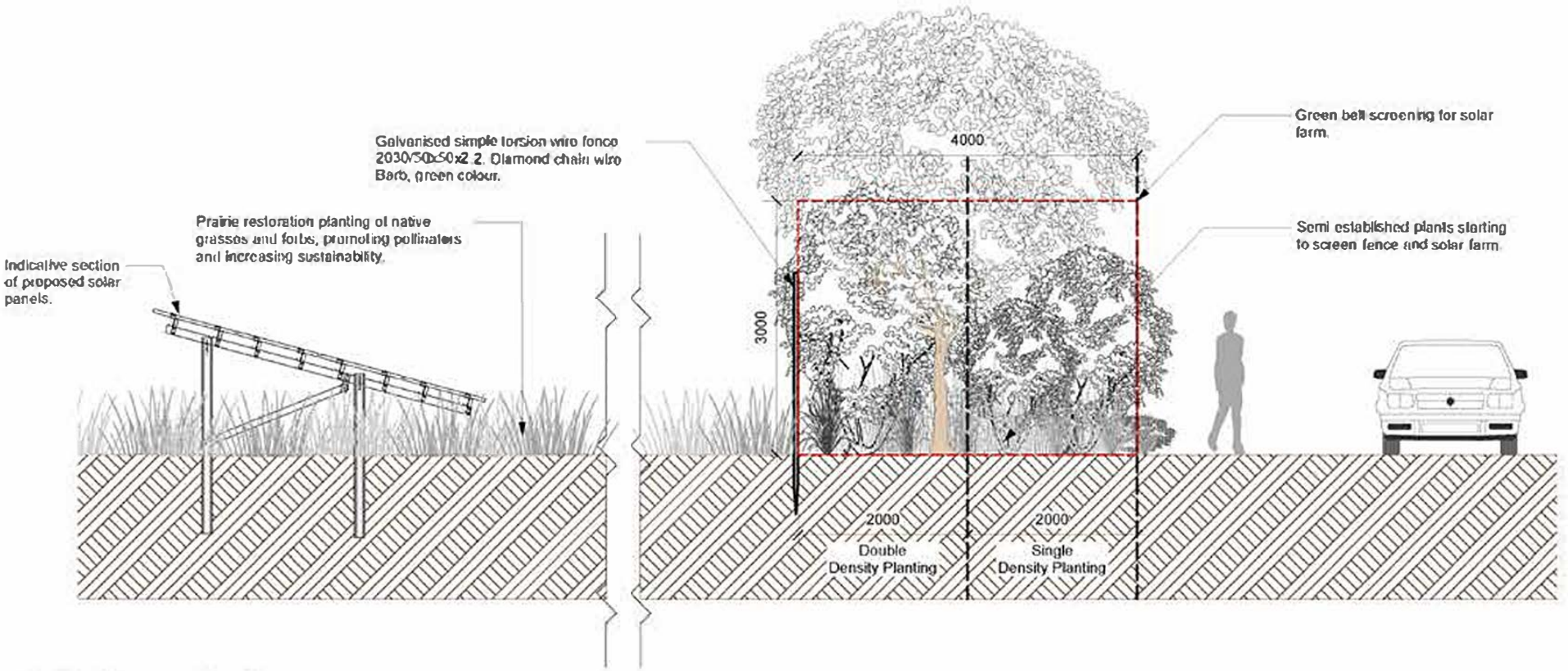
MT	1:50	1.08	21/6/18

Checked: MT
Drawing: Typical Section 2 - 12 Months



Typical Fence Section - Once Established

Scale 1:50

Scale 1:50

0 1 2 3 4 5 M


Eremophila oppositifolia


Eremophila youngii


Eucalyptus platypus


Grevillea olivacea


Grevillea olivacea


Grevillea Winpara Gem

LANDSCAPE CONCEPT DOCUMENTATION - NOT FOR CONSTRUCTION

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rev no	drawn date	comments	by	ck	verified
0	22/05/18	Landscape DA Documentation	MT	MT	Yes
1	23/05/18	Revision 1	MT	MT	Yes
1	18/06/18	Revision 2	AVE	MT	Yes

PROJECT: Green Belt Screening
SITE: Drowodden, [illegible]
CLIENT:
PROJECT NO:

Drawn: MT
Scale @ A3: 1:50
Page no: 1.09
Print date: 21/6/18
Concept:
Drawing: Typical Section 3 - Established

Perspective 1 - Green Belt Trees

Not to scale

Grevillea Winpara Gold

Lavender

Melaleuca lanceolata

Melaleuca lanceolata

Rosemary

Acacia sclerophylla

LANDSCAPE CONCEPT DOCUMENTATION - NOT FOR CONSTRUCTION

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rev no	drawn date	comments	by	ch	approved
0	22/05/18	Landscape DA Documentation	MT	MT	Yes
1	23/05/18	Revision 1	MT	MT	Yes
1	18/06/18	Revision 2	MT	MT	Yes

Green Belt Screening

CLIENT:

Drawn	Scale @ A3	Page no	Print date
MT	NTS	1.10	21/6/18

Concept: MT

Drawing: Perspective 1 - Green Belt