Energy Bay Limited

Establishment and operation of a solar farm

410 Mangamaire Road, Pahiatua

Resource Consent Application to the Tararua District Council

23 September 2022

Planz Consultants

Quality Assurance Statement:

Application Prepared By:

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APPLICATION FOR RESOURCE CONSENT

SECTION 88 OF THE RESOURCE MANAGEMENT ACT 1991

To: the Tararua District Council

1. We, **Energy Bay Limited**, apply for the following type of resource consent: Land use consent

2. The activity to which the application relates (the proposed activity) is as follows:

   To establish and operate a solar farm.

   The activity requires resource consent pursuant to the following rules of the Tararua District Plan:

   - Rule 4.1.6.1 (c) for a Discretionary Activity for a renewable electricity generation which was not established at the time the Tararua District Plan became operative.

   The proposal is more fully described in the attached AEE.

3. The site at which the proposed activity is to occur is as follows:

Address:	**410 Mangamaire Road, Pahiatua**
Legal Description:	**Subdivision 13 SECT 8 Blk XIV Mangahao SD (WN229/202), Lot 1 DP 392402 (370429), Lot 2 DP 392402 (370430), Pt Section 150 Blk XIV Mangahao SD (WN25D/915), Section 139 Blk XIV Mangahao SD (WN38B/55) and Section 140 Blk XIV Mangao SD (WN38B/53)**
Area:	**114.3169ha (Nominated Site Area of 86.93ha)**

   The property is described more fully in the attached AEE which forms part of this application.

4. The full name and address of each owner or occupier (other than the applicant) of the site to which the application relates are as follows:

   Kakariki Te Whenua
   129 Tutaekara Road, Mangamaire

5. There are no other activities that are part of the proposal to which this application relates.

6. Additional resource consents may be required from Horizons Regional Council but have not yet been applied for.

7. We attach an assessment of the proposed activity's effect on the environment that—

   a. includes the information required by clause 6 of Schedule 4 of the Resource Management Act 1991; and

   b. addresses the matters specified in clause 7 of Schedule 4 of the Resource Management Act 1991; and

   c. includes such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.

8. We attach an assessment of the proposed activity against the matters set out in Part 2 of the Resource Management Act 1991.

9. We attach an assessment of the proposed activity against any relevant provisions of a document referred to in section 104(1)(b) of the Resource Management Act 1991, including the information required by clause 2(2) of Schedule 4 of that Act.

10. We attach the following further information required to be included in this application by the district plan, the regional plan, the Resource Management Act 1991, or any regulations made under that Act:

Refer to the attached AEE.

The required deposit of $1830 including GST will be paid upon receipt of the Council's invoice.

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_____

Catherine Boulton – Consultant Planner

Planz Consultants Limited
On behalf of Energy Bay Limited

Address for Service:
Planz Consultants Limited
PO Box 1845
CHRISTCHURCH, 8140

Attention: Catherine Boulton

Mobile: 021 964 017
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Address for Billing:*
Kim McCracken
C/- Planz Consultants Limited
PO Box 1845
CHRISTCHURCH 8140

Attention: Kim McCracken

Email: office@rgmc.co.nz

* Planz Consultants Limited accepts no liability for any Council costs or charges. Invoices for all such work are to be sent to the Applicants address above for billing.

Resource Management Act 1991

Fourth Schedule

Assessment of Effects on the Environment

1 Introduction

Energy Bay Limited ("EBL" or "the applicant") seek resource consent from the Tararua District Council (TDC) for the establishment and operation of a solar farm on a property located at Tutaekara and Mangamaire Roads south of Pahiatua. The solar farm is to be established over six titles of land which comprise approximately 114ha of land while the "development area" is approximately 86.93 in area.

Copies of the Records of Title are contained in **Appendix 1**.

2 Site and surrounds

The site is located on either side of Mangamaire Road near its intersection with Tutaekara Road, approximately 8km south of Pahiatua. It has been utilised as a dairy farm. For descriptive purposes the land on the northern side of Mangamaire Road is identified as 'Site A' and the land on the southern side of Mangamaire Road as 'Site B'. Together they combine to have a total area of 114.3169ha held in 6 titles and a development area of 86.93ha (see **Figure 1** below).

Site A: on the northern side of Mangamaire Road, measures 48.86ha and is spread over 3 separate land titles extending approximately 500-600m in width to the Wairarapa Rail line (and Doughertys Road beyond). The site also extends for a length of approximately 900m between the road and rail line. Site A is predominantly covered in pasture with a scattering of remnant shelterbelts, primarily macrocarpa trees that remain in various locations of the site. The site envelops a 1.2ha parcel of land occupied with by a single-storey farmhouse also owned by the landowners of the site. Substantial shelter belt planting lines the southern boundary of this property. Overhead powerlines track north-east south-west parallel to the road and approximately 175m back from the Mangamaire Road boundary and a potential wetland is located adjacent the solar farm site immediately to the north of Site A.

Figure 1: *Application site (Source: RMMLA Graphic Attachment, Pg 11)*

Site B: on the eastern side of Mangamaire Road is 38.62ha in area and also spread over 3 titles. The site is bound by Tutaekara Road along its northern boundary and Mangamaire Road along its western boundary. At its southern boundary is an unnamed gravel public road that provides access to an existing quarry at the southernmost corner of the site. A 1.5ha area of land central to the Tutaekara Road boundary is excluded from the application site.

The eastern boundary of the development site is marked by an existing farm track that is above a minor terrace of the Mangatainoka River and set back approximately 180-200m from the riverbed itself. The riverbed is approximately 4-5m below the level of the site. The site is a series of flat pasture paddocks and has been partitioned into reasonably large rectangular paddocks. The sites vegetation is highly modified due to historic farm practices and is largely devoid of any visible trees except for two remnant macrocarpa windbreaks which extend approximately 180m along Mangamaire Road in the north-western corner of the site and about 130m alongside an existing farm track central to the site.

Overhead powerlines run through the site approximately 150m back from the Mangamaire Road frontage.

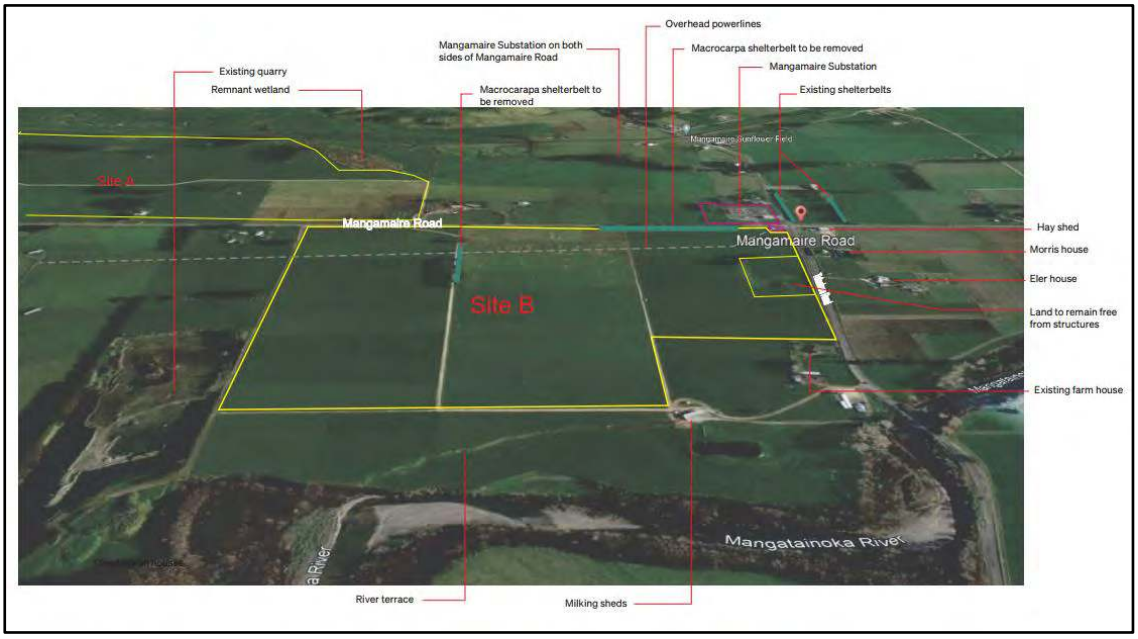


Figure 2: *Application site (Source: RMMLA Graphic Attachment, Pg 12)*

The overall site is located within the Mangatainoka River valley. The valley measures approximately 3-3.5km wide and is oriented roughly northeast-southwest and includes SH2 along its eastern edge. The Mangatainoka River meanders up an incised channel in the middle and the Wairarapa railway line to Pahiatua runs adjacent to the site along its western edge at the base of an unnamed range of hills that separates the Mangatainoka and Mangahao valleys. It is understood that this rail line is not currently being used for scheduled passenger transport and that there is very limited if any freight transport at this time.

The Mangamaire substation which is split into two components across the road is prominently located at the intersection of Tutaekara Road and Mangamaire Roads. The larger substation to the west is a Transpower operated site. The smaller substation is operated by Power Co, and it is to this substation that the solar farm is proposing to connect into. Powerlines extend out from both substation with high voltage Transpower lines extending south along the western side of Mangamaire Road and north towards Pahiatua. Other overhead lines extend south across both Site A and B and southeast along the southern side of Tutaekara Road.

Tutaekara Road is a connector road, that crosses the valley with a traffic count of 1415 vpd. It provides an important link for the residents within Mangahoa River valley and village of Marima to SH2 and linking to Pahiatua. Mangamaire Road is a minor offshoot (114vpd) that runs parallel with the valley and SH2.

The nearest dwellings are located along Mangamaire Road and Tutaekara Road. On Mangamaire Road, they are identified as 346, 391, 431, 451, 500 and 562 Mangamaire Road. On Tutaekara Road, they are identified as 126, 154 and 154a Tutaekara Road as shown on the Site Context Plan in **Figure 3** below and on Page 3 of the Graphic Attachment provided in **Appendix 2**.

Figure 3: Application site (Location of Nearest Dwellings to Solar Farm. Source: RMM Graphic Attachment)

3 Proposal Description

3.1 Overview

EBL are seeking resource consent from the Tararua District Council to establish and operate a solar farm at 410 Mangamaire Road, Pahiatua (Lot 2 DP 392402 RT: 370430, Lot 1 DP 392402 RT: 370429, Subdivision 13 Blk XIV Mangahao SD RT: WN229/202, Section 7 Blk XIV Mangahao SD (Gravel reserve), Pt Section 150 Blk XIV Mangahao SD RT: WN25D/915, Section 139 Blk XIV Mangahao SD RT: WN38B/55, Section 140 Blk XIV Mangahao SD RT:WN38B/53 in accordance with the Site Plan contained in **Appendix 2**.

For clarity, the application does not include any works within Section 1 Survey Office Plan 17918 and Section 2 Survey Office Plan 17918, being the designated site 220 (the Mangamaire Substation) which adjoins the larger landholding but not the 'site' upon which the solar farm is proposed.

The details of the application are as follows:

3.2 Infrastructure

Solar tables

The proposed activity comprises approximately 88,500 solar panels spread across approximately 885 bases which are split between Sites A and B. In Site A to accommodate the existing power lines and farm tracks, the solar panels are broken into 7 clusters ranging in size from 1.1ha to 12.4ha with the solar farm being spread over a 32.5ha total area. Site B is spread over 26.82ha and is broken into 5 clusters ranging in size from 0.5ha to 15.2ha.

Each *solar table* consists of and measures 52 solar panels long by 2 solar panels wide (totally 104 solar panels per solar table). The dimensions of each solar table is approximately 60m long by 4.9m wide.

The solar tables consist of a steel structure which is attached to the ground by seven steel poles, centralised along its length. This structure is designed to move relative to the angle of the sun. In the morning the solar panels face east and during the day (as the sun moves) they pivot towards the west in the afternoon.

The top of the solar tables, when parallel with the ground, are approximately 2.46m above ground level. When the solar tables are facing as far east or west as they can rotate, the top of the tables are approximately 4.55m above ground level, while the bottom of the solar tables are approximately 30cm above ground level (see **Figure 4** below).

The spacing of the solar tables is set to ensure that they do not shade one another. The centre of the rows of solar tables are approximately 9.7m apart. When the solar tables are facing directly upwards (i.e. flat), there is a 4.8m gap between the rows of solar tables. When they are facing as far east or west as possible, there is a 7.1m gap between the rows of solar tables.

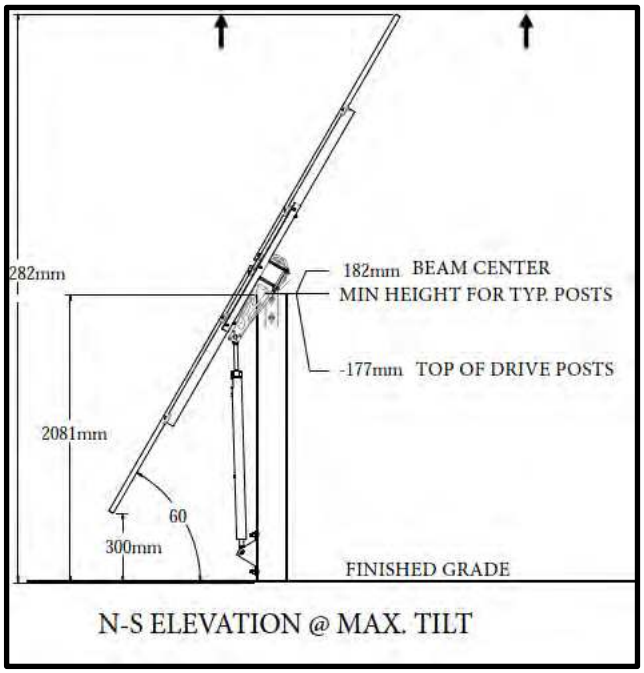


Figure 4: Elevation of a tilted solar table

Solar panels

As mentioned above a solar table consists of 104 solar panels (52 solar panels long by two solar panels wide) (see **Figure 5** below). The proposal will result in approximately 88,500 solar panels spread across Sites A and B. Each individual solar panel is 2.4m long by 1.1m wide (2.734m^2) and 3.5cm thick. The solar panels have a 3.2mm thick glass surface with an anti-reflection coating. This coating acts to minimise the amount of light that is reflected away from the solar panel (i.e. maximises the panels efficiency).

*Figure 5: Example of a similar solar farm in Marlborough (**Source: Appendix 2**)*

Inverters

There will be eleven inverters located across Sites A and B. The inverters convert the DC current from the solar panels to an AC current so this power source can enter the Power Co. substation located on the corner of Tutaekara and Mangamaire Roads. It is estimated that the solar farm will generate approximately 72.69 GWh in its first year which based off an average annual usage of 7,000kwh/NZ home equates to 10,384 homes. Each inverter is approximately 2.8m long, 1.6m wide and 2.3m high and are white / off white in colour (see **Figure 6** below).

Figure 6: Image of inverter

While the inverters generate noise, they will comply with the Tararua District Plan (TDP) requirements (see **Appendix 4**). To further ensure that the solar farm does not generate electro-mechanical noise at levels that appreciably exceed the existing night-time ambient and background noise levels, attenuation of the inverters is proposed (through selection,

positioning for directivity, partial or full enclosure). A condition of consent to this effect is offered in Section 10.

Earthworks

Approximately 20,700m^3 of earthworks is required overall. These earthworks are to be made up of an estimated 5580m^3 for access tracks, 9660m^3 for cable trenching to establish the wiring (approximately 600mm wide and 1m deep) 2650m^3 of imported clean fill (screened sand for the HV trenching) 210m^3 for the inverter bases and 2600m^3 for recontouring of the site

The pastoral grass cover underneath the solar tables, and around their poles and inverters will be maintained once the trenches are filled. Stock will then continue to graze this pasture although it will be limited to sheep or calves to avoid damage to the solar panels.

Other matters

The site is managed remotely, accordingly vehicle movements to and from the site will be minimal and infrequent post construction. Site accesses will be unchanged, but upgrades to the existing farm tracks may occur if the existing tracks are inaccessible in inclement weather. Upgrades to the tracks will likely consist of a gravel surface.

The solar farm has been designed to comply with the New Zealand Electrical Code of Practice for Electrical Safe Distances (NZECP 34:2001), including for setbacks from powerlines. A conditions of consent has been proposed to that effect.

The entire development area will have a security deer type fence surrounding it (this is not considered a building pursuant to the District Plan definition).

A small identifying sign will be established on site. The details have not been confirmed yet but will comply with the District Plan requirements.

There are no hazardous substances stored on site and there is no security lighting proposed or required.

4 Tararua District Plan Assessment

4.1 Definition

The TDP sets out that 'Renewable energy' has the same meaning as defined in Section 2 of the RMA which "means energy produced from solar, wind, hydro, geothermal, biomass, tidal, wave, and ocean current sources". The proposal for a solar farm fits with this definition.

4.2 Zoning

The site is located within the Rural Management Area and parts of the site are located within a Flood Potential Area overlay. As identified in **Figure 7** below, transmission lines run along Mangamaire Road from the Mangamaire Substation (Designation Number 220) alongside the site boundary. Also shown on Figure 7 is the rail corridor which is located alongside the northernmost boundary of the site (Designation 201).

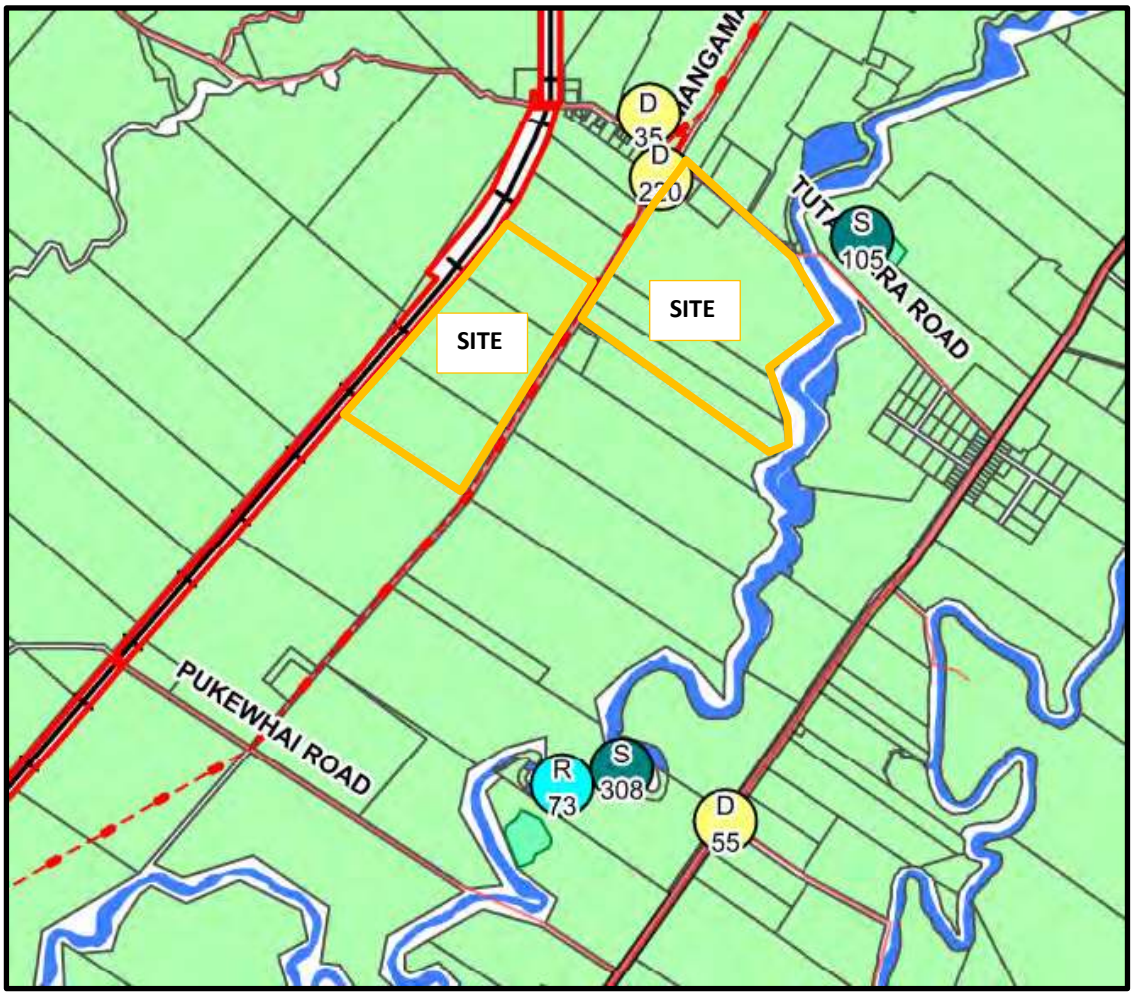


Figure 7: District Plan Map No: 16 (Source: Tararua District Council District Plan Maps)

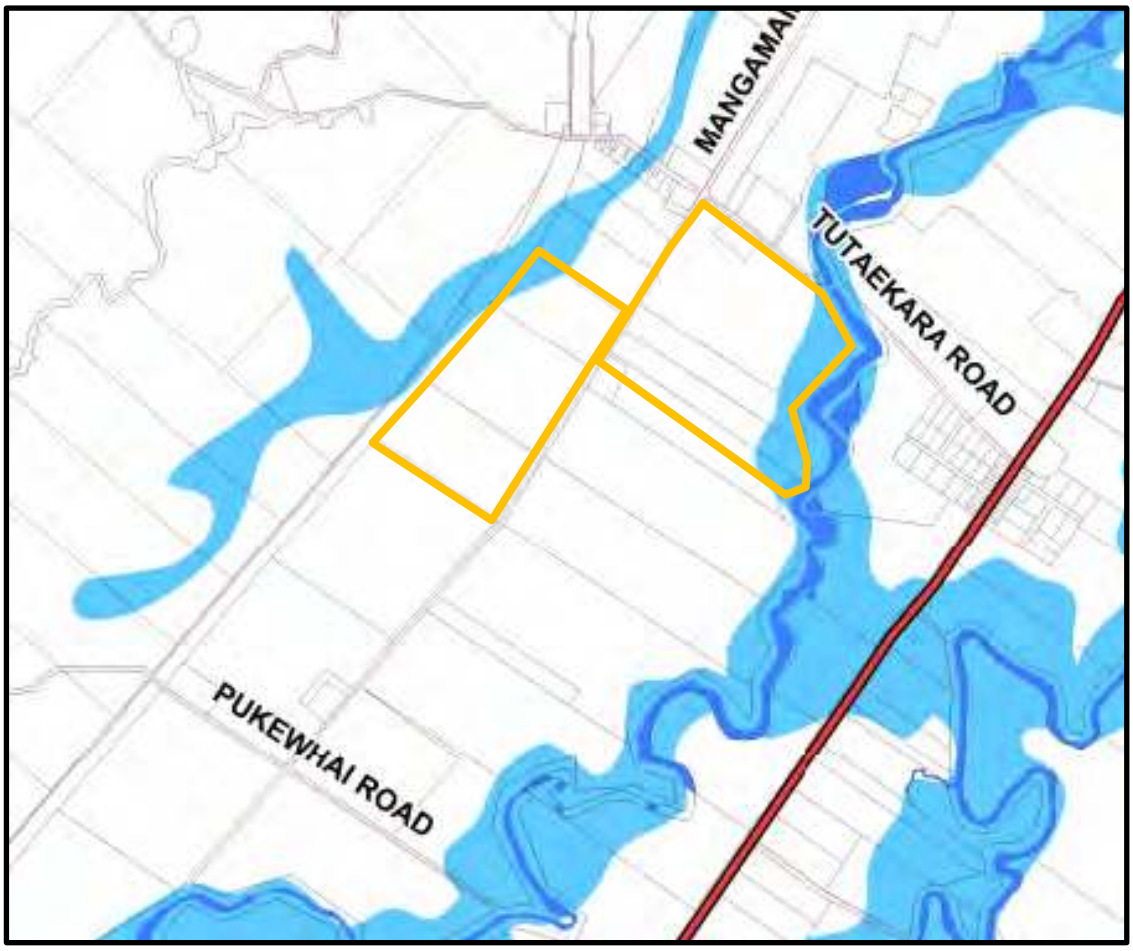


Figure 8: District Plan Flood Map No: 16 (Source: Tararua District Council District Plan Maps)

4.3 Compliance Assessment

The TDP rule interpretation set out below is that of the author and is not in substitution of the Council's own assessment of the proposal, nor is it a restriction on the matters resource consent is being sought for. Resource consent is applied for the proposal as described in the "Proposal Description" set out above in Section 3 of this AEE, including all attached plans and other technical information submitted in support of the application. Resource consent is applied for the rule infringements described in this application, and any other resource consents necessary, whether specifically identified or not, to allow the proposal to be established, maintained and operated.

As such, if the Council is of the view that resource consent is required for alternative or additional matters to those identified in this Assessment of Effects on the Environment (AEE), it has the discretion to grant consent to those matters as well as or in lieu of those identified in this AEE. Furthermore, should Council be of the view that the activity status of any of the matters requiring consent is different to that described in this AEE, or that some or all of the matters requiring consent should be bundled or unbundled in a way that results in a different outcome to that expressed in this AEE, the Council has the ability under section 104(5) of the RMA to process the application regardless of the type of activity that the application was expressed to be for.

An assessment of the proposal against the relevant standards in the TDP , including those provisions that the proposal does not comply are provided in Table 1 below.

Table 1: Tararua District Plan Compliance Assessment		
Rules	**Assessment**	**Rule Status**
4.1 Rural Management Area		
4.1.2 Permitted Activities		
4.1.2.1 Permitted Activities – General The following are permitted activities in the Rural Management Area, provided they comply with the relevant environmental standards in Part 5 of this Plan: (o) Network utilities and other activities which are deemed to be a permitted activity in section 5.3.6 of this Plan. (r) Accessory buildings to any permitted or otherwise lawfully established activity. (v) Any other activity specifically listed in Part 5 of this Plan as a "permitted activity".	The proposal is not for a network utility or an accessory building to a permitted or otherwise lawfully established activity. Renewable electricity generation facilities that weren't established at the time the plan became operative are not listed as a permitted activity in Part 5 of the Plan.	**N/A**
4.1.3 Controlled Activities		
4.1.3.1 The following are controlled activities in the Rural Management Area provided they comply with the relevant environmental standards in Part 5 of this Plan: (c) Network utilities which are deemed to be a controlled activity in section 5.3.6 of this Plan. (d) Any other activity specifically listed in Part 5 of this Plan as a "controlled activity".	The proposal is not for a network utility, nor is renewable electricity generation listed as a controlled activity in Part 5 of the Plan.	**N/A**
4.1.4 Environmental Standards		
All permitted and controlled activities shall meet the listed relevant rules and environmental standards in Part 5 of the Plan.	The proposed activity is neither a permitted nor a controlled activity as listed in the District Plan. Nevertheless, an assessment against the environmental standards in Part 5 is undertaken below for completeness.	**Please see assessment of Part 5 in this table below.**
4.1.5 Restricted Discretionary Activities		
The listed restricted discretionary activities relate to goat farming and are therefore not relevant to this application.	N/A	**N/A**
4.1.6 Discretionary Activity		
4.1.6.1 The following are	Renewable electricity generation,	**Discretionary**

Table 1: Tararua District Plan Compliance Assessment		
Rules	**Assessment**	**Rule Status**
discretionary activities in the Rural Management Area: (a) Any activity not listed in this Plan as a permitted, restricted discretionary or controlled activity. (b) Any permitted or controlled activity listed in this Plan which does not meet the environmental standards specified in Part 5 of this District Plan. (c) Any other activity specifically listed in Part 5 of this Plan as a "discretionary activity". (d) …	which was not established at the time the Plan became operative, is specifically listed as a discretionary activity in Part 5 of the Plan (Rule 5.3.7.2(b)).	**Activity (Rule 4.1.6.1)**
5 ENVIRONMENTAL STANDARDS		
5.1.4 STORMWATER DRAINAGE		
5.1.4.2 Standards (a) Each new lot or development shall be able to be provided with a means of stormwater drainage which avoids flooding downstream or on adjacent properties and does not cause any other adverse environmental effects such as increased siltation, or contamination of aquatic environments, erosion or instability of any land or watercourses.	The proposed development is to be undertaken on rural land and will not create an impediment to normal stormwater drainage. The earthworks will not change the contour of the land and pasture cover will be retained beneath the rotating panels.	**Standard met**
5.1.5 LAND DISTURBANCE AND EXCAVATION		
5.1.5.2 Standards (a) In all Management Areas: i. The land disturbance and excavation standards in this section are subject to compliance with the heritage provisions in section 5.5 of this Plan, in relation to any archaeological sites, and the natural hazards rules in section 5.1.7 of this Plan. ii. Up to 30m^3 of minerals or clean fill material may be excavated in any one year for transportation off the	An assessment against the heritage provisions and natural hazard rules is provided in this table below. Regarding (a). Earthworks for this proposal will only be undertaken if the development is approved. Therefore, compliance with these provisions will be achieved. Regarding (b) an estimated total of 20,700m^3 of earthworks will be undertaken, comprising: • 5580m^3 – Access tracks • 9660m^3 – Cable trenching	**Discretionary Activity (Rule 5.1.5.3)**

Table 1: Tararua District Plan Compliance Assessment		
Rules	**Assessment**	**Rule Status**
property where such works are not part of an approved subdivision or approved development; iii. Up to 30m^3 of clean fill comprising topsoil and subsoil may be placed on a property at depths generally not exceeding 1m where such works are not part of an approved subdivision or approved development; iv. Up to 100m^3 of clean fill comprising topsoil, subsoil and/or demolition rubble may be placed on a property where such works are not part of an approved subdivision or approved development, and where the Council is informed before the activity is carried out. v. The detail to be provided is: • Legal description and street address of property • Nature and source of fill • Location of fill on site (site plan to be included) • Depth of fill • Compaction of fill i. Any infilling activity shall not exacerbate or increase the risk of natural hazards. (b) Additional standards in the Rural Management Area: ii. For activities other than the development and maintenance of: • Tracks that provide access to existing network utilities and/or infrastructure or to network utilities and/or infrastructure that is deemed to be a permitted activity in	• 2650m^3 – Imported clean fill for the HV trenching • 210m^3 – Inverter bases • 2600m^3 - Recontouring	

Table 1: Tararua District Plan Compliance Assessment		
Rules	**Assessment**	**Rule Status**
section 5.3.6 of this Plan; • farm tracks; • fencelines; • forestry tracks; or • forestry landings, up to 1,000 m^3 of minerals, clean fill material, or soil may be excavated from and placed on land held in the same certificate of title in any one calendar year. iii. In any one calendar year, up to 1,000 m^3 of clean imported fill, comprising topsoil, subsoil and/or demolition rubble may be placed on land which is not part of an approved subdivision or approved development, provided the Council is informed before the activity is carried out. Information to be provided is: • legal description and street address of the subject site • nature and source of fill • location of fill on site (site plan to be included) • depth of fill • compaction of fill Environmental Standards Tararua District Plan (Review No. 1) – Operative, 1 SEPT 2012, including Plan Change 1 (Operative Aug 2019) Page 5-11 • any mitigation measures necessary to ensure that there are no adverse effects in watercourses or beyond the boundaries of the site. The 1,000 m^3 restriction on volume does not apply to surplus cut material		

Table 1: Tararua District Plan Compliance Assessment		
Rules	**Assessment**	**Rule Status**
from road works, which may be placed without restriction on volume. Such placement remains subject to informing the Council in the required manner before the activity is carried out.		
5.1.7 NATURAL HAZARDS		
5.1.7.2 Standards (a) Permitted Activities (b) The permitted and controlled activities in a natural hazard area (as shown on the planning maps) are those specified in Part 4 of this Plan for the underlying Management Area, subject to meeting the following standards: i. Activities shall not involve the following: • The erection of, or extension to, any building or structure (other than temporary structures associated with temporary activities – refer to Part 6, Interpretation). • Land subdivision; • Any activity which requires vegetation clearance and ground disturbance; • The use, disposal or storage of hazardous substances. (c) Natural Hazard Area (Flooding) The permitted and controlled activities on land falling within the definition of a 'Natural Hazard Area (Flooding)' are those specified in Part 4 of this Plan for the Management Area concerned, subject to meeting one or more of the following standards: i. The adverse effects of the identified 0.5% AEP (1 in 200	The activity appears to be located at the edge of identified flooding areas in the planning maps. The land contours do not need to be changed to accommodate the activity and the pastoral land will remain. The flooding area in Site A is a potential wetland area and in Site B, the solar farm will be located on a terrace which is approximately 4-5m higher than the Mangatainoka River and approximately 180-200m away from the river. These factors will ensure that the proposal will not result in adverse effects on the flood hazard within the area. The activity is located on farming (production) land and there is a functional necessity to locate the activity within the identified area due to its proximity to the substation.	**Standard met**

Table 1: Tararua District Plan Compliance Assessment		
Rules	**Assessment**	**Rule Status**
year) flood hazard are able to be avoided or mitigated; or ii. The activity, including any non-habitable structure, is on farming (production) land; or iii. There is a functional necessity to locate the activity or structure within the identified area.		
5.3.3 ACCESS AND INTERSECTIONS		
5.3.3.2 Standards **(b) Permitted activities – All roads other than Primary Arterial Roads** Any new or relocated vehicle crossing place shall be a permitted activity, provided that: i. The vehicle crossing place complies with the relevant "access design and construction standards" in section 5.3.3.2(d) or (e) below and in Appendix 10 of this Plan.	Any new vehicle crossing will be constructed to comply with the relevant "access design and construction standards".	**Standard met**
5.3.7 RENEWABLE ELECTRICITY GENERATION FACILITIES		
5.3.7.2 Standards **(a) Permitted activities in all Management Areas** The operation and maintenance of facilities generating electricity from renewable energy sources including wind farms, in existence as at the date this Plan became operative. **(b) Discretionary Activities in all Management Areas** The construction, operation and maintenance of renewable electricity generation facilities,	(a) The solar farm is new and therefore was not in existence at the date the Plan become operative. (b) The construction, operation and maintenance of solar farms is not otherwise provided for therefore it requires consent under this standard.	**Standard not met (5.3.7.2(b))** **Consent is sought for a discretionary activity under Rule 4.1.6.1(b)**

Table 1: Tararua District Plan Compliance Assessment		
Rules	**Assessment**	**Rule Status**
including wind farms, not otherwise provided for as permitted activities, shall be considered as discretionary activities in all Management Areas.		
5.4.1 NOISE AND VIBRATION		
5.4.1.2 Standards (a) All noise levels shall be measured in accordance with NZS6801: 2008 and shall be assessed in accordance with NZS6802: 2008. Where NZS6802: 2008 does not include the type of noise in question, the appropriate standard or regulation which covers that type of noise shall be used. (b) The following noise limits shall apply in the Rural Management Areas (exceptions are outlined but are not relevant to this application): 7.00 am - 7.00 pm daily 55 dBLAeq(15 min) 7.00 pm - 7.00 am daily 45 dBLAeq(15 min) and 75 dBLAFmax These noise limits are not to be exceeded at any point within the boundary of any site used for residential activities or, in the Rural Management Area, at any point within the "notional boundary" of any dwellinghouse on land held in a separate certificate of title or, if the complainant's dwellinghouse is on the same certificate of title, at any point within the notional boundary of the complainant's dwellinghouse.	An assessment of the potential noise levels has been undertaken (**Appendix 4**). The noise limits set out in the district plan will be met, further mitigation measures are also proposed to ensure ambient noise levels are acceptable.	**Standard met**
5.4.7 GLARE/ARTIFICAL LIGHTING		
5.4.7.2 Standards	Solar panels are designed to absorb	**Discretionary**

Table 1: Tararua District Plan Compliance Assessment		
Rules	**Assessment**	**Rule Status**
(a) In all Management Areas, buildings are to be constructed and finished in such a manner as to ensure reflection (glare) from the building surfaces does not reflect into adjoining properties or adversely affect the vision of motorists on a street or road. (b) In all Management Areas, any exterior lights shall be installed, designed, shaded and arranged in order that the level of lighting measured on the boundaries of the site are no greater than 8.0 lux (lumens per square metre).	solar energy rather than reflect it, but glint/glare can still occur. The glint/glare report (**Appendix 3**) shows that a green and/or yellow glare will occur at Mangamaire Road (between 6pm to 8pm, October to the start of March, at less than 15 minutes per day for a total of 1,448 minutes annually). Exterior lights do not form part of this proposal. Should they be installed at a later stage they will be designed to comply with this rule or further resource consent will be sought.	**Activity (Rule 5.4.7.3)**
5.4.8 LANDSCAPE TREATMENT/SCREENING		
5.4.8.2 Standards (b) In all Management Areas, where an activity detracts in a significant way from the visual amenity of the surrounding area (including exterior storage associated with home occupations, hobbies or other activities), effective screening of the activity from the road and neighbouring properties shall be provided in accordance with the standards for landscape treatment/screening below; (c) … (d) Any landscape treatment/screening required by this Plan or by resource consent shall be completed within 6 months of any activity commencing on the site and shall be maintained in a satisfactory manner while the activity or development remains; (e) Any landscape treatment/screening required by this Plan shall comply with the requirements of standard 5.4.10.2. Where compliance with the requirements of standard 5.4.10.2 prevent compliance with	It is considered that the visual amenity of the surrounding area will not be detracted in a significant way for the reasons set out in **Section 6.4** of this application. However, it is recognised that this is a subjective rule and Council may have a different opinion. Landscape treatment/planting is proposed and will be completed within 6 months of the activity commencing on the site.	**Standard met**

Table 1: Tararua District Plan Compliance Assessment		
Rules	**Assessment**	**Rule Status**
the requirements of standard 5.4.8.2, the requirements of standard 5.4.10.2 shall override the requirements of standard 5.4.8.21. No resource consent shall be required for an activity that cannot meet the requirements of standard 5.1.8.2 due to the obligation to meet the requirements of standard 5.4.10.2, provided all other requirements of this plan for permitted activities are met.		

4.4 Activity Status

Overall, consent is required for the establishment of a new renewable electricity generation activity. The activity status for the activity is **discretionary.**

5 National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS)

Whilst, the site is located on part of a dairy farm, the land on which the solar farm is to be established is a pasture block and does not contain existing or historic activities which would identify it as being a potential HAIL site (such as storage of bulk chemical/fuel drums, livestock dip/spray areas and bulk agricultural storage areas). However, the HAIL list identifies ***'electrical and electronic works, power generation and transmission'*** as HAIL activities. The nearby and adjoining substations would therefore fall to consideration as a HAIL activity.

Methods to connect the solar farm to the Power Co. substation include either an overhead cable or underground trenching of a single cable to an appropriate connection point. The particular method is yet to be confirmed, due to the location and placement of existing services within the substation. However, should trenching be identified as the most appropriate method, the volume of any disturbed soils will not exceed those thresholds identified as permitted in section 8 of the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.

6 National Environmental Standards for Freshwater Regulations 2020

6.1 Definition

The National Environmental Standards for Freshwater Regulations 2020 (NES-FW) sets out that 'Natural Wetland' has the same meaning as given by the National Policy Statement for Freshwater Management which means a wetland (as defined in the Act) that is not:

(a) A wetland constructed by artificial means (unless it was constructed to offset impacts on, or restore, an existing or former natural wetland); or

(b) A geothermal wetland; or

(c) Any area of improved pasture that, at the commencement date, is dominated by (that is more than 50% of) exotic pasture species and is subject to temporary rain-derived water pooling.

There is an area to the side of the proposed solar farm on Site A that is identified as being a 'potential' natural wetland and therefore it is considered appropriate to consider the application against the provisions of the NES-FW as undertaken in Table 2 below.

Table 2: National Environmental Standards for Freshwater Regulations 2020 Compliance Assessment

Rules	Assessment	Rule Status
Restoration of natural wetlands		
38. Permitted activities 1. Vegetation clearance and earthworks or land disturbance within, or within a 10m setback from a natural wetland is permitted if it is for natural wetland restoration and complies with the conditions. 2. The taking, using, damming, diversion, or discharge of water within, or within a 100m setback from a natural wetland is permitted if it is for the purpose of natural wetland restoration and complies with the conditions. Conditions a. The activity must comply with the general conditions on natural wetland activities in regulation 55; and b. If the activity is vegetation clearance, earthworks or land disturbance, the activity must not occur over more than 500m^2 or 10% of the area of the natural wetland, whichever is smaller (this does not apply if the earthworks or land disturbance is for planting).	A determination has not been made by an ecologist on whether the area identified as being a 'potential' wetland would in fact meet the definition of a 'natural inland wetland'. As such, revisions were made to the proposal to ensure that works are undertaken outside of required setbacks through an abundance of caution. Vegetation clearance, earthworks or land disturbance will not occur within a 10m setback from the potential wetland. The proposal will also not require the taking, using, damming, diversion or discharge of water within, or within a 100m setback from the potential wetland. Restoration works are also proposed for the potential wetland through the planting of locally appropriate wetland buffer plantings.	**Complies**

7 National Policy Statement on Highly Productive Land

The Government recently released the National Policy Statement for Highly Productive Land (NPS-HPL) to protect highly productive land from inappropriate subdivision, use and

development and to ensure its availability for food and fibre production. The National Policy Statement comes into force on 17 October 2022.

The NPS-HPL responds to the Our Land 2018 report, which found that urban expansion and development is reducing the availability of Aotearoa's most fertile and versatile productive land.

Until such time that the regional council's incorporate LUC classifications into their maps, district council's must still apply the NPS-HPL to land that is zoned rural general or rural production and has a LUC 1, 2 or 3 classification but is not identified for future urban development or subject to a rezone plan change.

The objectives and policies of the NPS-HPL are assessed in **Table 3** below and an assessment against Clause 3.9 'Protecting highly productive land from inappropriate use and development' is provided in **Table 4** below.

Table 3: National Policy Statement Highly Productive Land Objectives and Policies	
2.1 Objective	*Highly productive land is protected for use in land-based primary production, both now and for future generations.*
Policy 1	*Highly productive land is recognised as a resource with finite characteristics and long-term values for land-based primary production.*
Policy 2	*The identification and management of highly productive land is undertaken in an integrated way that considers the interactions with freshwater management and urban development.*
Policy 3	*Highly productive is mapped and included in regional policy statements and district plans.*
Policy 4	*The use of highly productive land for land-based primary production is prioritised and supported.*
Policy 5	*The urban rezoning of highly productive land is avoided, except as provided in this National Policy Statement.*
Policy 6	*The rezoning and development of highly productive land as rural lifestyle is avoided, except as provided in this National Policy Statement.*
Policy 7	*The subdivision of highly productive land is avoided, except as provided in this National Policy Statement.*
Policy 8:	*Highly productive land is protected from inappropriate use and development.*
Policy 9:	*Reverse sensitivity effects are managed so as not to constrain land-based primary production activities on highly productive land.*

Comment: The land is assessed as being 'highly productive land' given its LUC 2 status derived from the Manaaki Whenua Landcare Research Maps. However, it is noted that there are limitations to using these maps as on site land and climate qualities may affect productivity and land management options. Despite these limitations, and in the absence of detailed analysis on the versatility of the soils, it is noted that the land will retain an ability to be used for land-based primary production activities both now and for future generations whether it is considered as 'highly productive land' or not. The change in primary production activities at the site from dairying to other forms (most likely sheep grazing) will also provide for an enhancement in the soil and groundwater qualities at the site. Overall, it is considered that the proposed development does not represent an 'inappropriate use or development' of the site and it will

not generate reverse sensitivity effects that are likely to constrain land-based primary production activities within the receiving environment.

TABLE 4: Consideration of Clause 3.9 of the National Policy Statement Highly Productive Land	
3.9 Protecting highly productive land from inappropriate use and development	
Provision	**Comment**
1. Territorial authorities must avoid the inappropriate use or development of highly productive land that is not land-based primary production.	The proposed development is not a land-based primary production activity. However, the development does not prevent the land from being used for primary production purposes and the two activities can occur harmoniously together. As such, the proposed development is not 'inappropriate' and therefore does not need to be 'avoided'.
2. A use or development of highly productive land is inappropriate except where at least one of the following applies to the use or development, and the measures in subclause (3) are applied: a) It provides for supporting activities on the land: b) It addresses a high risk to public health and safety: c) It is, or is for a purpose associated with, a matter of national importance under section 6 of the Act: d) It is on specified Māori land: e) It is for the purpose of protecting, maintaining, restoring, or enhancing indigenous biodiversity: f) It provides for the retirement of land from land-based primary production for the purpose of improving water quality: g) It is a small-scale or temporary land-use activity that has no impact on the productive capacity of the land: h) It is for an activity by a requiring authority in relation to a designation or notice of requirement under the Act: i) It provides for public access: j) It is associated with one of the following, and there is a functional or operational need for the use or development to be on the highly productive land: i. The maintenance, operation, upgrade, or expansion of specified infrastructure:	a) The proposal enables the continuation of land based primary production activities and in this manner it could be considered to be a 'supporting' activity. b) The development will not address a high risk to public health and safety. c) The development is not associated with a matter of national importance under section 6 of the Act. d) The site is not specified Māori land. e) The purpose of the development is not for protecting, maintaining, restoring or enhancing indigenous biodiversity. However, through the removal of dairying activities and enhancing planting and providing a setback around the wetland, the maintenance, restoration and enhancement of biodiversity is expected to be achieved. f) There will not be a retirement of land from land-based primary production for the purpose of improving water quality. However, by way of removing dairying activities from the land it is anticipated that there will be an improvement in groundwater quality. g) The proposal is not a 'small-scale' activity, nor is it considered to be temporary. However, it is noted that under the NPS 'temporary' is defined as a term of 30 years or less and the solar panels have a life of 25 years. However, the proposal will not impact on the productive capacity of the land. h) The activity is not one being done by a requiring authority in relation to a

TABLE 4: Consideration of Clause 3.9 of the National Policy Statement Highly Productive Land	
3.9 Protecting highly productive land from inappropriate use and development	
Provision	**Comment**
ii. The maintenance, operation, upgrade, or expansion of defence facilities operated by the New Zealand Defence Force to meet its obligations under the Defence Act 1990: iii. Mineral extraction that provides significant national public benefit that could not otherwise benefit that could not otherwise be achieved using resources within New Zealand: iv. Aggregate extraction that provides significant national or regional public benefit that could not otherwise be achieved using resources within New Zealand.	designation or notice of requirement under the Act. i) The proposed development does not provide for private access. j) The proposal is for the development of 'specified infrastructure' which is infrastructure that is recognised as regionally or nationally significant in a National Policy Statement, New Zealand Coastal Policy Statement, regional policy statement or regional plan. In this regard renewable energy is recognised as regionally and nationally significant in: • NPS for Renewable Electricity Generation 2011 • NPS on Electricity Transmission • One Plan Mo te iti – mo te rahi (the consolidated Regional Policy Statement, Regional Plan and Regional Coastal Plan for the Manawatu-Wanganui Region). Alongside being recognised in these documents, there is a functional and operational need to locate on the productive land in this area given its proximity to a substation. Substations primarily are located in rural areas throughout the country, as such they will often be located adjacent to highly productive land. The development is not associated with the other listed activities - defence facilities, mineral or aggregate extraction.
3. Territorial authorities must take measures to ensure that any use or development on highly productive land: a) Minimises or mitigates any actual loss or potential cumulative loss of the availability and productive capacity of highly productive land in their district; and b) Avoids if possible, or otherwise mitigates, any actual or potential reverse sensitivity effects on land-based primary production activities from the use or development.	a) In granting consent to this application, the Tararua District Council can be comfortable that the productive capacity at the site can be retained as land based primary production activities can continue, they will just be different from the historical dairying activities on the site. The proposal will therefore not result in an actual or potential cumulative loss of the availability and productive capacity of land in the district. b) The proposal will avoid reverse sensitivity effects on land based primary production activities. This is reinforced by the ability of

TABLE 4: Consideration of Clause 3.9 of the National Policy Statement Highly Productive Land	
3.9 Protecting highly productive land from inappropriate use and development	
Provision	**Comment**
	primary production activities to occur under and around the solar panels.

8 Statutory Framework

8.1 Part 2 of the RMA

Part 2 of the RMA sets out the purpose and principles of the Act, being *"to promote the sustainable management of natural and physical resources"* which is defined to mean:

> *managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic and cultural wellbeing and for their health and safety while –*
>
> *(a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
>
> *(b) Safeguarding the life-supporting capacity of air, water, soil and ecosystems; d*
>
> *(c) Avoiding, remedying or mitigating any adverse effects of activities on the environment.*

This assessment is informed by reference to the matters set out in sections 6, 7 and 8 of the Act.

The Court of Appeal decision on *Davidson*[1] found that the High Court erred when it determined the Environment Court was *"not able or required to consider Part 2 of the Resource Management Act 1991"* when undertaking its decision-making role in accordance with section 104 of the RMA. The decision means that we *"must have regard to the provision of Part 2 when it is appropriate to do so"*: [47]. However, where the relevant Plan has been competently prepared under the Act and clearly deals with Part 2 subject matters, then recourse to Part 2 may not add anything to the evaluative exercise.

The Tararua District Plan was made operative in 2012 and has been subject to Plan Change 1 (Operative August 2019) and Designations (new and uplifts) and changes directed by the National Policy Statement on Urban Development 2020 (June 2021). Despite the age of the Plan, the Rural provisions are not considered to be inconsistent with any national policy direction nor the Manawatū-Whanganui Regional One Plan; and accordingly, the Operative District Plan is considered to provide the appropriate framework for considering the proposal and recourse to higher order documents and the RMA is not considered necessary.

There are no section 6 matters relevant to this application.

Section 7(b), (c), (f) and (j) are considered relevant to the proposal. The proposal is considered to be an appropriate use within the Rural Zone and is therefore considered to be an efficient

[1] R J Davidson Family Trust v Marlborough District Council [2018] NZCA 316.

use of natural and physical resources in that it both enables the generation of electricity and the continued use of the land for farming activity, does not compromise amenity values or the quality of the environment and provides benefits in terms of the development and use of renewable energy.

With respect to section 8, both Rangitāne o Tamaki nui-ā-Rua and Ngāti Kahungunu ki Tāmaki-nui-a-Rua have advised that the site is located within an area of significance to Maori, however the site itself does not contain any known sites of significance.

8.2 Section 104 of the RMA

Section 104 of the RMA provides the statutory requirements for the assessment of the application and sets out those matters that TDC must have regard to when considering the application. Subject to Part 2 of the RMA, it is considered that the relevant matters for the assessment of this application include:

(a) Any actual or potential effects on the environment of allowing the activity (section 104(1)(a));

(b) The relevant objectives, policies, rules and other provisions of national environmental standards, other regulation, national policy statements, regional policy statements (proposed and operative), proposed plans and plans (section 104(1)(b)); and

(c) Any other matters that are considered relevant and reasonably necessary to determine the application (section 104(1)(c)).

The effects associated with the proposal have been assessed in **Section 7** of this application (section 104(1)(a)). The relevant statutory and regulatory planning documents are identified in **Sections 4, 5, 6, 7,** and **10** of this application, with the relevant rules of the TDP assessed in **Section 4**. Other matters considered relevant and reasonably necessary to determine the application (section 104(1)(c) are covered in Section 11.

As a discretionary activity (refer to **Section 4** of this application), section 104B is also relevant. Section 104B of the RMA sets out that a consent authority (in this case TDC) may grant or refuse a resource consent application, and if it grants the application, may impose appropriate conditions in accordance with section 108.

9 Assessment of Effects on the Environment

9.1 Overview

In accordance with the requirements of Section 88 and the Fourth Schedule of the Resource Management Act, this section provides an assessment of the actual and potential effects of the proposal on the environment.

The proposal is for a Discretionary Activity, hence there are no constraints on the Council's ability to consider any matter considered to be applicable to the proposal. The relevant potential effects of the proposed solar farm considered below are landscape, natural character and visual amenity effects, noise, heritage and cultural effects, earthworks and planting, servicing and access and positive effects.

9.2 Written Approvals

Section 95E(3) of the RMA sets out that a person is not an affected person in relation to an application for a resource consent for an activity if they have given written approval for the

proposed activity. Written approval has been received by the owners and occupiers of the properties identified in **Table 2** and **Figure 9** below.

Table 5: Written Approvals Received		
Address	**Owners/Occupiers**	**Location on Figure 9**
129 Tutaekara Road	David and Erin Green (**Owners and Occupiers**)	**H**
154 Tutaekara Road	Ann and James Elers (**Owners and Occupiers**)	**G**
154A Tutaekara Road	Carol and Wayne Morris (**Occupiers**)	**F**
346 Mangamaire Road	Ryan and Jess McNicol (**Owners and Occupiers**)	**E**
391 Mangamaire Road	Alan Gore and Krystal Jamieson (**Occupiers**)	**D**
410 Mangamaire Road	David and Erin Green (**Owners**) and Ethan Green (**Occupier**)	**C**
451 Mangamaire Road	Dean and Valerie Hollister (**Occupier**)	**A**

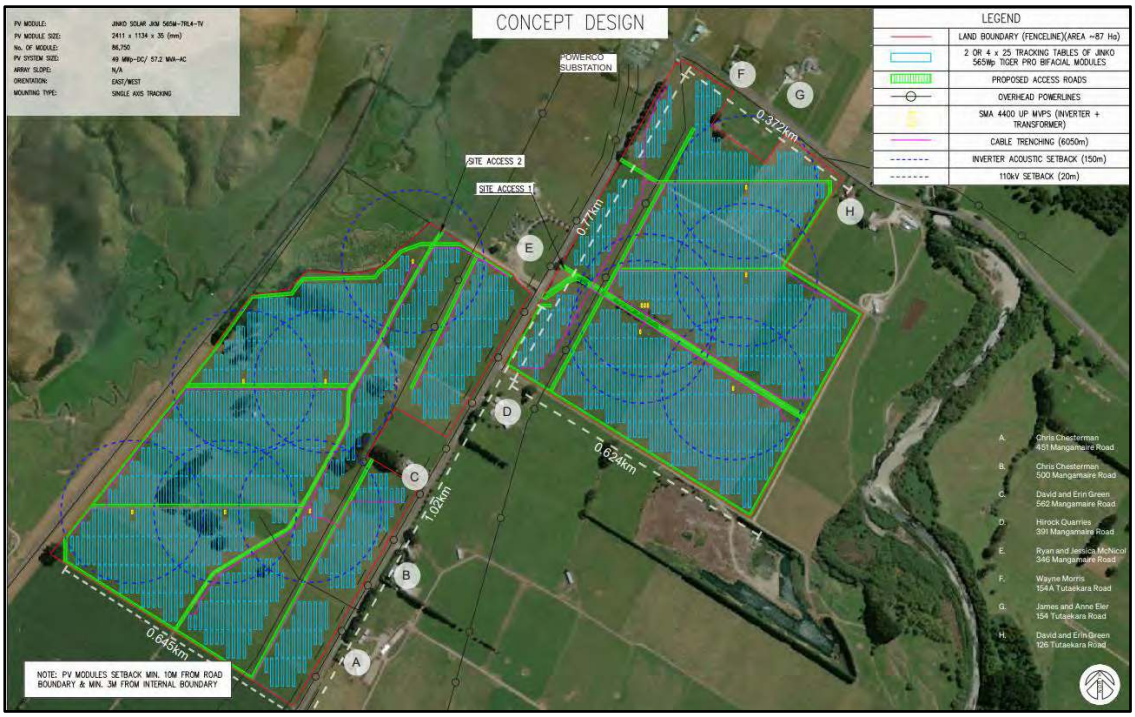


Figure 9: General Arrangement Plan Showing Adjoining Neighbours (Source: RMM Graphic Attachment)

Given the approvals received, the below assessment does not require consideration of the effects received at the following properties:

- 129 Tutaekara Road
- 154 Tutaekara Road
- 346 Mangamaire Road
- 410 Mangamaire Road

9.3 Permitted Baseline

When assessing a proposal, there is discretion available under s104(2) whereby adverse effects of an activity can be disregarded if the Plan permits an activity with that effect. Whilst the use of s104(2) is discretionary, there is no reason why that discretion should not be exercised in this case. The existing or consented environment also forms part of the basis for an assessment of potential effects.

Of relevance to this application, is that shelterbelt planting is a permitted activity under the plan. This is considered to be of relevance when considering the effects of the proposal on landscape, natural character and visual amenity values and is discussed further in **Section 9.4** below.

9.4 Landscape, Natural Character and Visual Amenity Effects

The proposed development will provide for the capture of solar energy through the panels and then conversion of this solar energy into a resource that is channelled into the adjoining substation. Reference to Section 5.3.7 of the District Plan and associated rules demonstrates the Plans anticipation of projects of this nature, provided any effects are effectively managed, avoided, remedied or mitigated. In terms of effects, a key consideration in this instance is the effects of the proposal on rural landscape, natural character and associated amenity values. Assessment of these values has been undertaken by Rough Milne Mitchell Landscape Architects (RMM) and a copy of this assessment is attached as **Appendix 2.**

9.4.1 Visibility and Visual Effects

RMM in their Landscape Assessment Report identify that, *"visual effects are a subset of landscape effects. They are consequences of change on landscape values as experienced in views. They are one technique to understand landscape effects".*[1]

Visual amenity is a measure of the visual quality of a landscape experienced by people, living, working or travelling through the landscape. In this instance, the visual catchment of the site is limited to the immediate surroundings of the two sites; between the foothills and Mangatainoka River bridge west to east and from approximately 700m north of Tutaekara Road to approximately 1.6km south along Mangamaire Road. Within this limited area, the solar farm will be highly visible from both public roads when within 200-300m of the site and to a lesser extent it will be visible from any trains using the Wairarapa Line. The solar farm sites will also be variously visible from the 8 residential dwellings proximate to or overlooking the solar farm sites. The proposal will also be seen from the elevated paddocks of the farm west of the two sites and partially visible from some sites within the Mangamaire settlement.

The graphic attachment (in **Appendix 2**) provides panoramic photographs representing the views gained from the different locations near the solar farm sites. The solar farm will also be seen from paddocks within other nearby rural properties to the west of the two sites. However, in a rural environment, there is more emphasis placed on views from dwellings rather than paddocks because they are frequented daily.

Public Roads: Mangamaire and Tutaekara Roads

Tutaekara Road, is a sealed collector road and is the busiest of the two roads (shown as 1445 Average Daily Traffic Movements on Mobile Road). The road is used by people who live and

[1] Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines'. [Final Draft subject to final editing, graphic design, illustrations, approved by Tuia Pito Ora/NZILA 5 May 2021]. Page 61

work within the area but it also provides direct access to further afield destinations or locations. The solar farm will be visible for a distance of approximately 700m along Tutaekara Road.

The first views of the solar farm, when travelling west along Tutaekara Road, are expected to be seen at the Mangatainoka River Bridge and the last is when the road enters the hills to the west just after the Mangamaire settlement. Views of the solar farm from Tutaekara Road range from being partially screened by existing development, topography and vegetation to being highly visible where the solar farm is immediately adjacent to the road. The solar tables themselves, due to their rotating nature will obstruct long views across the site but when the tables are horizontal at midday, views of the pasture and grazing animals will be achieved. The Mangamaire substations which are prominent and dominate the landscape and its amenity values, provides the visual element for the solar farm to be absorbed into.

Views of the solar farm, when travelling east along Tutaekara Road, will at first be partially screened for a distance of between 600-700m by the existing dwellings at the Mangamaire settlement and remnant shelterbelts. Beyond the Tutaekara/Mangamaire intersection, the solar farm will become more prominent but also long views across the site to the underlying pastoral use will be visible.

In terms of the potential for glare, the Landscape Assessment in **Appendix 2** and the Glint/Glare Report in **Appendix 3** conclude that a *"green or yellow glare is received between the hours of 7pm to 8pm during mid-December at 1 minute per day for a total of 2 minutes annually".* The hazard plot graph for Tutaekara Road shows the glare to be very close to green (low potential for after-image).

Mangamaire Road is a sealed local road and is not as busy at Tutaekara Road (shown as 114 Average Daily Traffic Movements on Mobile Road). Both Sites A and B of the Solar Farm will be located immediately adjacent Mangamaire Road (for 165m on both sides of the road and 1.6km on either the northern or southern side of the road).

As the solar tables are to be oriented to the north-south, views across the site of rolling hills will be obstructed when the panel are upright (mornings and evenings)[2] but when horizontal, views will be possible of the pasture and grazing animals. The glare assessment for Mangamaire Road concluded that *"yellow glare is received between the hours of 6pm to 8pm through the months of October to the start of March at less than 15 minutes per day for a total of 1,448 minutes".* The graphs indicate that potential glare is both limited in time but also limited in where this may be experienced.

RMM identify that the landscape and amenity values evident locally are aesthetically high but not regionally unique. The visual catchment around the solar farms is restricted in area with the primary components within the catchment being electricity generation and a high amenity rural working landscape.

The surrounding landscape is generally flat, visually uniform and generally already devoid of buildings and screening vegetation, with some small areas of vegetation needing removal to make way for the solar farm. These features make the absorption capacity for a change of land use within this landscape very low and the impact of introducing built structures on natural and conventional open rural character values will be high. It is noted however that shelterbelts and screen planting which are proposed to be established around the site perimeter would also

[2] The panels are at their full 4.85m height twice daily for an approximate 30 minute duration.

provide screening of, or interruption of long views across the site, as such proposed planting is considered to provide a baseline effect.

RMM consider that the effects on the natural and conventional rural character and amenity values will be mitigated to some degree by the continued use of the land for productive purposes (e.g. through the retention of pasture and grazing of the land by sheep), the use of deer fencing (which is typically rural in appearance) as a security fence rather than a conventional security fence and the establish of a flax 'shelterbelt' similar to the one that exists already on Mangamaire Road. It is also noted, that due to the limited visual catchment in which the solar farm is located within, the travel time and correspondingly the viewing time for road users is also limited.

Overall, RMM identify that while the solar farm may initially attract attention (which can be fleeting and positive), once established of the flax shelter planting will ensure that the effects will be **moderate low-low**.

Neighbouring Residences

Eight residences have been identified as being potentially impacted by the proposal. To date, four of the adjoining properties have provided their complete written approval (owners and occupiers), while the occupiers at three further properties have provided their approval. Where the written approvals are incomplete, an assessment on these properties is provided below.

431 Mangamaire Road

The dwelling at 431 Mangamaire Road is located opposite Site A of the solar farm. The dwelling is located relatively close to the road but surrounded by a well-tended and established garden of high amenity along the road boundary. This existing planting screens most of the views possible looking west from this location but views of Site A from the house will be possible through gaps in the vegetation. Over time, as the proposed shelterbelt planting at the boundary of Site A becomes established, greater levels of screening of the solar farm when viewed from this property will be achieved until it is virtually totally screened (approximately 4 years).

In terms of the anticipated glint and glare, the findings of the report were that there would be an estimated glint/glare period of 1-2 minutes annually in this location. This would occur between the hours of 7pm and 8pm in mid-December.

The solar structures, security fence and eventually the planting will affect open space values as they will limit the westerly views and rural character as seen from 431 Mangamaire Road over the site. Overall, it is therefore considered that when comparing the effects with what can be undertaken as of right, the effects on 431 Mangamaire Road will begin as **moderate** for a short period reducing to **low** as the shelterbelts establish and views of the solar farms diminish.

451 Mangamaire Road

The dwelling at 451 Mangamaire Road is also located opposite Site A of the solar farm. There is thick screen planting established along the road boundary which will restrict possible westerly views towards Site A from the house. Due to the existing shelterbelt planting, views of Site B are not expected to be possible from this dwelling.

Over the course of the day, views from the direction of this house will change from being a wall of visible panels when facing east or west to being more a 'table' like structure when the views of the grazed paddock underneath will be achieved.

Similar to 431 Mangamaire Road, the anticipated glint and glare from this location will be 1 minute annually between the hours of 7pm to 8pm in mid-December.

Overall, RMM have assessed that the effects of the proposal on the views from this dwelling will be **low** due to the existing screening at 451 Mangamaire Road. The proposed shelterbelt planting at the boundary of Site A will also provide a further level of mitigation of the effects from this property.

391 Mangamaire Road

391 Mangamaire Road is located opposite Site A and adjoins Site B of the solar farm. The dwelling in this location is owned by the quarry and used to house workers, the written approval of the occupiers has been obtained for this property. Limited vegetation is located around this dwelling and it is located relatively close to Mangamaire Road meaning that views of the new structures will be unimpeded in the short term before the shelterbelt planting at the boundary of Site A is fully established. RMM consider that due to the transient nature of the occupants of this house, the sensitivity of the effects on views will be low and not inherently adverse. For this reason, the changes anticipated from the proposal are considered to be **low** on this property.

154A Tutaekara Road

Written approval has been provided for the property at 154A Tutaekara Road. However, Planz have been advised that there is some dispute over the ownership of this property. The parties who have identified themselves as the owners are not the owners recorded on the Record of Title for the property. As such, given there is some uncertainty at this time, consideration is given to the effects of the proposal on this property.

Site B of the solar farm is located opposite 154A Tutaekara Road but is visually separated by on-site vegetation on 154A Tutaekara Road. The solar farm will be in full view on exiting the property. The overall impact on this property is assessed as being **low** by RMM.

Other Nearby Properties

RMM have identified other nearby properties as not being potentially affected by the proposal for reasons provided in their assessment in Appendix 2. These properties are those at 465 and 321 Dougherty's Road and their dwellings are located at a distance (1.25 and 2.25km respectively) from the closest point of Site A.

Dwellings in the Mangamaire Settlement have also been considered to be sufficiently separated from the proposal with their outlook toward Site A separated by paddocks, remnant shelter planting and located within the context of the Mangamaire substation and its associated electrical infrastructure.

The Wairarapa Rail Line

The Wairarapa Rail line runs up the western side of Site A for a distance of 620m before passing Mangamaire settlement and crossing over Tutaekara Road. Due to the fact that there is no passenger traffic along this line, the visual impact of the solar farms on users of this rail line will be less than minor and therefore RMM does not further consider this rail line as part of their assessment.

9.4.2 Landscape Effects

RMM outline that landscape effects are, *"a consequence of changes in a landscape's physical attributes on that landscape's values. Change is not an effect: landscapes change constantly. It is the implications of change on landscape values that is relevant."*[3]

The existing landscape and visual amenity values form the baseline, along with policy provisions for an assessment of landscape effects. RMM have considered the landscape attributes of the site and surrounding area under three broad categories – physical, perceptual and associative.

The **physical values** identified by RMM for the site and its receiving environment is that it is a flat expansive landscape contributing high overall rural character values to the surrounding landscape with associated values of openness, expansiveness and huge sky, lack of built form, natural character and legibility. The main natural feature in the vicinity of the solar farm is identified as being the Mangatainoka River and a remnant wetland near the edge of the solar farm on Site A. A setback is proposed from this potential wetland to ensure that there are no adverse effects resulting from the development and additional wetland appropriate buffer planting is proposed to be established. This will help to improve the wetland feature and will aid in water filtration. The human derived features are identified as being the Mangamaire Substations and associated electricity infrastructure, which are a prominent feature within the local landscape, and a number of buildings (predominantly dwellings and farm buildings) scattered around the general area.

The **perceptual values** have been identified as a rural working landscape which is commonly experienced in this part of the Wairarapa. Although relatively common, the landscape has expansive views across the flat pastures to the surrounding hills and overall has high amenity and aesthetic value. Weather systems and light effects accentuate the landform details of the site and receiving environment as well as the deciduous vegetation within the Mangatainoka River which provides some seasonal interest although is not prominent. These values contribute to the high aesthetic values.

RMM have not identified any **associative values** relevant to the site, meaning that no cultural or historic sites of significance within the receiving environment have been listed in the District Plan or were obvious from site investigations. However, it is noted that the wider area has associative values including wahi tapu, that Ngati Kahungunu have advised will not be adversely affected by the proposal and recreational opportunities as the Mangatainoka River is a well-known trout fishing spot.

RMM have identified that due to the flatness of the site and absence of visual screening provided by existing vegetation and/or shelterbelts, the absorption capacity of Sites A and B of the solar farm is considered to be low. However, it is noted that the Mangamaire substations, extended infrastructure and overhead transmission lines are visible elements within the landscape which provide a context for the solar farm to be absorbed into the receiving environment.

The proposal solar farm will result in a change to the physical environment of the site where the largely open landscape will be modified due to the amount of built form that will be established within the site. The character of the site will change from a rural open pastoral character to a predominantly rural utility/industrial character with an underlying pastoral use. Therefore, the proposal has the potential to result in adverse effects on both the physical and perceptual landscape values attributed to the site.

[3] Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines'. [Final Draft subject to final editing, graphic design, illustrations, approved by Tuia Pito Ora/NZILA 5 May 2021]. Page 61

The landform within the site will not change as only minor excavation will be required for the solar tables and invertors which will follow the topography of the land and its existing contours. The solar panels sit at 2.45m above ground level (when parallel with ground level), and although the solar tables and panels cover a large area, they are seen as relatively 'light' structures whereby the pasture cover will be maintained beneath and will remain visible from most views. In addition, sheep (and possibly calves) will be able to continue to graze the land beneath the solar panels meaning that the site, as well as generating renewable energy will continue to have a productive rural use.

The glare assessment has indicated that Site A will not produce a glint or glare effect for the adjacent sites on Mangamaire Road and Site B was found to affect receptors at 451 and 431 Mangamaire Road for a very short time in the evening hours only.

RMM's assessment of landscape effects considers that part of the impact on local values will be the degree to which the structures and proposed plantings will block or impact on longer views enjoyed in the area. The proposed solar farm with its built components will impact locally on the existing open character of the site but it is noted that the solar table structures associated with the application, unlike regular buildings will be seen as relatively 'light' structures that sit over the top of the site allowing distant views of the pasture covered site to remain. RMM identify that shelterbelts are generally permitted under the District Plan and that they would also block or impact on longer views enjoyed within the area. As such, the establishment of shelterbelts is considered to form a baseline effect and overall the comparative adverse effect stemming from the application would be limited.

The greatest effect of the change in the local landscape is to those most familiar with and invested in the local environment and those most sensitive to any change. As noted above, these effects are expected to reduce over time as the shelterbelt planting becomes established (with an anticipated growth rate of 4-5 years for the shelterbelt to reach a height of 2m). RMM consider that at a wider scale, due to the limited visual catchment of the site but being located on a preferred route for many to Pahiatua, the impact of the development on rural and landscape values will initially be **moderate** and becoming **low** as familiarity with the land use and shelter plantings mature.

While this assessment is concurred with, it is noted that solar farms because of their very nature are always likely to have a degree of impact on landscape values. In this case the solar farm will over time become reasonably well screened from the immediately surrounding environment by shelter belt planting. This location from a landscape values perspective is therefore considered to be well suited to the proposal. When all considerations are taken into account such as the need for the facility to locate adjacent to or close to a substation, the dual use of the site and the ability for it to continue to be used for productive purposes, the current drive and demand for sustainable and renewable energy generation, the fleeting views as vehicles moves past the sites associated with the limited amount of such traffic and the local benefits that will accrue, the chosen location will become increasingly accepted and the associated landscape effects will at worst be minor.

9.4.3 Overall Consideration of Landscape Effects

Based on the above assessment and taking RMM's assessment into consideration, it is considered that landscape effects will overall be 'minor'. This conclusion is reached, taking various factors into consideration, as follows:

- Although the solar farm is likely to be visible and prominent to those in the area and travelling past it when it is first established this does not necessarily equate with the

change on the landscape as being an adverse effect, as often, renewable electricity generation facilities are seen as being a positive and welcome addition within a landscape.

- Once the construction is complete, and disturbed earth is recontoured and resown, the traditional element of productive land use can return to the site (e.g. with sheep grazing under and around the solar panels). In addition, the shelter belt planting will create an effective screen in front of the farm, and while this will take time to become fully established, it will act as mitigation from the time of planting (which will be prior to construction works commencing on the site) as this planting will provide amenity alongside the boundaries of the site regardless of whether it is fully grown.
- Many neighbours have provided their written approval to the proposal, as such there is considered to be a good level of general support within the area for the proposal. Full written approval has not been received from all properties, for these properties it is considered that the effects on them are minor, due to existing screening alongside their property boundaries and/or due to the shelter belt planting which is proposed as part of this application (and offered up as a condition of consent) not being fully established. Once this is fully established the effects can be considered less than minor.
- The solar farm is located within a relatively limited visual catchment, this means that for the general public travelling along Tutaekara and Mangamaire Roads (at speeds of up to 70km/hr and 100km/hr), the views towards the solar farm will be relatively fleeting. Furthermore, the traffic volumes are limited being approximately 114 vpd along Mangamaire Road (where the longest views will be obtained) and 1415 vpd along Tutaekara Road. These traffic volumes correspond to what Waka Kotahi would consider as low and low to moderate volume roads and not high volume or high-volume motorways, expressways, multi-lane roads. For these reasons, the landscape effects on users of Tutaekara and Mangamaire Roads is considered to be initially no more than minor prior to the screening being fully established.

9.5 Effects on the Soil Resource

Due to the height of the solar tables and panels above ground (which is similar to a standard ceiling height in a house), the site can continue to be used as a pastoral block for grazing while also being used as a site for renewable electricity generation.

Sheep and calves can graze underneath the solar table or to the side of the tables. In this regard, the solar panels are designed so that they move with the sun meaning that they pivot east to west as the sun moves across the sky. When the tables are facing directly upwards there is a 4.8m gap between the rows of solar tables and when they are at their maximum eastern or western tilt there is a 7.1m gap between. The gaps between the tables ensure that both sunlight and rain will continue to reach the soil resource therefore enabling the growth of pasture.

Earthworks are required for the establishment of the solar farm. The earthworks are minimal due to the footprint of the solar tables, inverters and associated cables and predominantly involve excavation and refilling with a small degree of respreading of the soil. Due to the extent of earthworks required and reuse of the soil at the site, it is considered that the topsoil at the site will remain intact and capable of sustaining pasture cover above.

9.6 Noise

Marshall Day Acoustics have undertaken a noise assessment for the proposed solar farm. The key operational noise source is the inverters which have been positioned centrally within the site to provide practicable separation distances from the nearest receivers. Transformers and tracker motors will also generate noise but to a lesser degree than the unattenuated inverters. The noise level calculations represent a 'worst case' propagation situation, but all calculations show that compliance can be achieved with the District Plan maximum daytime and night-time noise limits at the notional boundaries.

Section 16 of the RMA sets out that every occupier of land and every person carrying out an activity shall adopt the best practicable option to ensure that the emission of noise from that land does not exceed a reasonable level. Marshall Day have identified that without the attenuation of the inverters there is a risk that the solar farm would generate electro-mechanical noise at levels that appreciably exceed the existing night-time ambient and background noise levels (even though District Plan noise levels will be achieved). The best practicable option has therefore been identified to be noise attenuation which can be achieved through the selection, positioning for directivity and partial or full enclosure of the inverters.

With attenuation, Marshall Day's calculations show that the solar farm would readily comply with the District Plan daytime noise limit of 55 dB L_{Aeq}, the night-time noise rule of 45 dB L_{Aeq} and the noise levels for the solar farm would generally be lower than or similar to the existing night-time ambient noise level. Overall, the calculated noise levels are low and at a level that should not cause annoyance, sleep disturbance or appreciably affect acoustic amenity.

A condition of consent is offered in **Section 13** to ensure that potential effects of the operation of the solar farm will be less than minor. The offered conditions include a requirement for the detailed design of the solar farm to include an attenuation design by a recognised acoustician for the inverters to ensure that the noise level at any receiver complies with the night-time noise limit and shall minimise or eliminate tonality.

9.7 Cultural Values

Rūnanga interests have been invited to comment to understand the potential effects of the proposal on cultural interests and values. These interests are represented by Rangitāne o Tamaki nui-ā-Rua and Ngāti Kahungunu ki Tāmaki-nui-a-Rua who represent the mana whenua of this locality. Documented responses from Rangitāne has not yet been received but an email expressing support from Ngāti Kahungunu has been received, this is included in **Appendix 6.**

Initial discussions have centred on whether there are any sites of cultural significance within or surrounding the site, and the effects of the proposal on cultural values and physical resources such as water and soil. To date, no sites or features of significance were identified within the site or in proximity to the site, as also identified in the Landscape Report although, an accidental discovery protocol is to be adopted as a precautionary approach. The Contractors construction methodology, identified in an Environmental Management Plan will ensure that any potential effects on the integrity of physical resources, including the 'wetland' and the soil, are considered and mitigated.

The cultural values of kaitiakitanga and mauri are arguably enhanced by this proposed development as it is sensitive to the protection and sustainability of the life supporting capacity of Te Taiao, the environment. This development is aligned with these values through acknowledgement of the soils and waterways as features to be protected and preserved, but also, the renewable energy element has the potential to reduce demand for unsustainable fossil

fuel energy solutions. Engagement with mana whenua around this project ensures that mana whenua have the opportunity to express kaitiakitanga.

Accordingly, the above identifies that any potential effects on cultural values or cultural features of significance will be less than minor and therefore consistent with those anticipated by the plan. Furthermore, documentation from Ngati Kahungunu has been provided expressing general support for the proposal.

9.8 Earthworks

The proposed earthworks required is approximately 20,700m^3 for trenching to establish wiring and cabling and for access tracks, for the ground work for the inverter bases and for a small amount of recontouring. There is the potential for nuisance effects to arise from the proposed earthworks at the site from an increase in dust, stormwater runoff and from an increase in traffic to the site from workers undertaking the earthworks.

In terms of dust, it is noted that the site is located in a remote, rural location where typical rural activities such as the cultivation of land can commonly result in dust generation. The potential for dust generation is therefore not inconsistent with permitted rural activities and will be restricted to the duration of site works until the solar tables, inverters and cabling has been established on the site and any exposed areas of soil, not covered in buildings are re-grassed. It is also noted, that because the applicants want to retain the pasture at the site, they will be ensuring that the earthworks are limited to the areas where they are necessary to establish the infrastructure only.

In terms of stormwater runoff, it is noted that the site is generally flat, that the earthworks can be undertaken away from site boundaries, that the ground cover will enable stormwater to permeate through the ground and that the earthworks will be undertaken over a limited timeframe limiting any potential effects from stormwater runoff. As mentioned above, the potential effects of stormwater runoff will be less than what could be undertaken as a permitted rural activity.

While additional traffic to the site could be expected for the earthwork/construction phase of development it is not anticipated that any additional vehicle movements would result in a noticeable increase of traffic to the site. This is in part because the earthworks do not require any soil to be transported to or from the site as excavation and refilling can be done using the site's existing soil resource. Rather, the traffic to and from the site is expected to be limited to construction workers, typically at the start and finish of the working day.

Overall, it is considered that any potential adverse effects resulting from earthworks and site development will be less than minor.

9.9 Positive Effects

The applicant seeks to optimise the land-use at the site, enhancing environmental outcomes in a way that traditional livestock farming cannot and all while the underlying pastoral/sheep grazing use of the site is retained. The site is located within an optimal geographical location given the solar farm can connect into the existing electricity infrastructure minimising the need to establish further transmission line infrastructure or substations. The site is also located within an area which has suitable sunshine hours and is also located within a confined visual catchment.

The applicant is therefore seeking to make the most of the opportunities afforded by the site's location to generate electricity from a renewable (rather than finite resource). The solar farm

will assist in achieving the national target of generating 100% of electricity from renewable energy sources by 2030. This diversification of electricity generation within the District will result in an increase in electricity generation capacity and an increase in the security of electricity supply at local, regional and national levels (wherever the electricity is most needed at any one time). This can all be done without increasing greenhouse gas emissions.

The establishment of a solar farm also has benefits to the local economy as it can provide economic benefits to local contractors who may be employed to undertake tasks during the land preparation and construction phase, planting and use of materials will contribute to the local economy and once the solar farm is operational there may be some new local employment opportunities including electrical, security and maintenance operations.

The proposal also involves the replacement of a dairy farming operation therefore it can be reasonably expected that there will be a reduction in environmental effects commonly attributed to dairy farming such as ground and surface water contamination from nitrate leaching, excess nutrient losses, larger emissions of greenhouse gases particularly methane and nitrous oxide from animal waste and effects on biodiversity.

Overall, it is considered that the establishment and operation of a solar farm in this location will result in significant positive effects

9.10 Summary of Effects

It is considered that the proposed development of a solar farm has the potential to result in a change in the landscape character and amenity of the local environment but that the extent of these effects is considered to be minor. In addition, having regard to the specific siting, landscaping and other conditions proposed alongside the positive effects that will be generated by the proposal, it is considered that the environmental effects arising from the proposal will in the short term be no more than minor in terms of RMA Section 104(1) as:

- The District Plan specifically provides for both network utility operations (of which this activity has similar characteristics) and renewable electricity generation. In particular, the Plan recognises that local, regional and national benefits derive from network utilities and the development of renewable electricity generation, that both the benefits and potential adverse effects of electricity generation are taken into account in decision making and that locational requirements for network utilities and renewable energy generation is important.
- Landscape effects on the surrounding environment are considered to be minor initially when taking into consideration the RMM assessment on landscape, natural character and visual amenity values alongside mitigating factors such as the establishment of flax planting for screening purposes, the limited viewing catchment that the site is located within and the fleeting views of motorists as they travel through the catchment.
- The proposal will result in less than minor effects on the ***soil resource*** given that the valuable topsoil at the site will be retained and the site can continue to be used for productive purposes. Productive purposes at the site could and most likely will include sheep grazing but further diversification could occur such as by cropping the land, by establishing market gardens, and by establishing pollinator planting and apiaries.
- The solar farm can (without requiring any mitigation) meet the District Plan's maximum ***noise*** requirements. Despite this, conditions are offered up to ensure that the noise generated from the solar farm does not exceed the ambient noise levels recorded in the area with potential mitigation options including the enclosure of the inverters.

- The development is respectful of ***cultural values*** such as kaitiakitanga and mauri as it is sensitive to the protection and sustainability of the life supporting capacity of Te Taiao, the environment. There is an alignment with cultural values through making provision for renewable electricity (increasing supply of renewable electricity will aid in reducing demand for unsustainable fossil fuels), protection of the life-supporting capacity of the soils, protection of water resources through conversion of the site from dairy farming and seeking to enhance biodiversity through planting along the site boundary but mostly at the 'potential' wetland. General support for the proposal has been provided verbally by mana whenua and through email correspondence provided by Ngati Kahungunu (attached as **Appendix 6**).
- ***Earthworks,*** whilst being a necessary component of development, can be effectively mitigated through conditions of consent to ensure that potential dust nuisance, ongoing visual effects or displacement of surface water onto neighbouring properties will be less than minor.

Overall, it is considered that, the environmental effects arising from the proposal will be minor initially and reducing to less than minor over time.

10 Objectives and Policies

The objectives and policies relevant to this application are contained in the following sections and are discussed in Section 7.1 below:

- 2.3 - Rural Land Use Management
- 2.4 - Subdivision and Development
- 2.5 - Natural Hazards
- 2.6 - Amenity and Environmental Quality
- 2.8 - Infrastructure, and
- 2.10 - Treaty of Waitangi and Maori Resource Management Values.

10.1 Tararua District Plan

2.3.2 SUSTAINABLE AND EFFICIENT RURAL LAND USE	
2.3.2.1 Objective	*To achieve sustainable rural land use and efficient use of resources*
2.3.2.2 Policies	*(a) To promote sustainable land management community programmes in order to achieve sustainable land use practices which:* • *Are compatible with the inherent productive capabilities of the land;* • *Do not result in any on or off-site adverse environmental effects in areas vulnerable to erosion, subsidence or landslip;* • *Retain existing vegetation where steep slopes or erosion prone soils indicate a risk of accelerated erosion;* • *Protect water quality (this may include riparian management practices);*

	• *Do not result in any on and off-site adverse environmental effects from the discharge of contaminants to land;* • *Protect soil structure.* *(b) To avoid, remedy or mitigate significant irreversible losses of the productive capability of the District's Class I and II soils.*

Comment: The proposal represents both a sustainable rural land use and an efficient use of resources. It is sustainable in that the solar farm will generate electricity from a renewable energy source while also protecting the valuable land resource underneath for future generations. The proposal also optimises the capability of the site to be used for dual purposes (electricity generation and farming) which will result in an efficient use of the land resource. In this regard, the proposed solar farm is compatible with the inherent productive capabilities of the land as the positioning and rotation of the solar tables and panels mean that the underlying land can be grazed or planted.

The site does not contain steep slopes and overall is relatively flat. It has been used for pastoral purposes and has a landscape which reflects that with only limited pockets of vegetation that will need to be removed to make way for the solar farm. The establishment of a solar farm also requires only minimal earthworks associated with the trenching for cables and establishment of access tracks (which are not dissimilar to farm tracks) meaning that the valuable topsoil will largely be kept intact. These features of the site and elements of the construction mean that the proposal will not result in any on-site or off-site environmental effects in relation to erosion, subsidence or landslips.

Water quality at the site will be maintained or enhanced through the change in use from a dairy farming activity to more general grazing (resulting in a reduced nitrogen discharge and reduced phosphate runoff risk) and/or crop growing. Planting of appropriate wetland buffer plants will also aid in filtering any runoff that currently occurs from the site and will overall improve the quality of water flowing into the wetland.

The LRIS portal identifies the soils at the site as predominantly being land use capability 2 soils. Although these are versatile, high class soils, the developed site will retain an ability to be used for productive purposes due to the minimal earthworks required for cabling and trenching and access tracks (which are not dissimilar to farm tracks) which will ensure that the topsoil will largely remain in place with continued access to sunlight and rainfall. Furthermore, the solar panels (as barriers) will provide wind protection by reducing wind effects on stock and pasture. The proposal is considered to be consistent with Objective 2.3.2.1 and Policies 2.3.2.2 (a) and (b).

2.3.3 ACTIVITIES IN RURAL AREAS	
2.3.3.1 Objective	*To maintain the vitality and character of the District's rural areas.*
2.3.3.2 Policies	*(a) To provide for a range of rural subdivision and housing in rural areas, subject to meeting specified environmental standards and being consistent with the environmental results sought for the Rural Management Area.* *(b) To provide, in rural areas, for activities which require a rural location or which specifically serve or support the rural community, where their*

	effects are compatible with the surrounding rural area and the environmental results sought for Rural Management Areas. *(c) To encourage non-rural activities to locate within urban management areas, rather than rural areas.*

Comment: The character of the site will change from a rural open pastoral character to a predominantly rural utility/ industrial character with an underlying pastoral use. The Landscape Assessment Report sets out that the potential adverse landscape effects which are anticipated to result from this change will be mitigated over time due to the growth of shelter planting and familiarity of this 'new' landscape. There is also a relatively limited visual catchment where electricity generation (from the Mangamaire substation and overhead lines) is a prominent component within the working rural landscape. This visual context will assist in absorbing and normalising the proposal into the landscape setting.

Electricity generating activities such as wind farms, hydro dams and more recently solar farms are anticipated within rural areas where their effects are compatible with the surrounding rural area. For this proposal, it is considered that the effects of the solar farm will be compatible with the environmental results sought for the Rural Management Area in that the visual effects will be absorbed into the surrounding visual context over time while effects resulting from the activity (such as noise, glint/glare, land disturbance during construction, effects on the soil resource and traffic effects) can be mitigated such that they are less than minor.

The proposal is considered to be consistent with Objective 2.3.3.1 and Policies 2.3.3.2 (a), (b) and (c).

2.3.4 ENVIRONMENTAL QUALITY AND AMENITY	
2.3.4.1 Objective	*To ensure a high level of environmental quality and amenity throughout the rural areas of the District.*
2.3.4.2 Policies	*(a) To ensure that any actual or potential adverse environmental effects of activities are avoided, remedied or mitigated.* *(b) To maintain and/or enhance the character, level of amenity and environmental quality of the District's rural areas.* *(c) To reduce the potential for conflict between incompatible activities in rural areas, particularly in the rural-urban fringe, and between existing, lawfully established activities and new subdivision and development.*

Comment: As a clean, renewable source of electricity, solar energy will play an important role in powering New Zealand's Zero Carbon Emissions Goal so that a high level of environmental quality (which is not restricted to the site or surrounding context) can be achieved. The proposal is therefore considered to be consistent with Objective 2.3.4.1 and Policy 2.3.4.2 (b) in this regard.

In terms of amenity, as set out in the landscape report, the development of the site as a solar farm will result in a high level of change from an open rural working landscape to a rural utility/industrial character but this will occur within a limited visual catchment. The change will be noticeable and memorable due to the uncharacteristic nature of the new land use and the impact to the open views across the land but as familiarity grows with the development along with the shelter planting at the road edges, the visual environment effects are expected to become less than minor within 4-5 years. It is considered important not to assume that a change

in character of an open rural landscape will necessarily be viewed as an adverse environmental effect but rather, it may be viewed as a point of interest by some in the same way windfarms have been which results in positive and beneficial effects as a result of the generation of electricity from a renewable source of energy.

The site is appropriately located for the establishment of a solar farm due to the required scale of the facility, the need to be located adjacent or close to a substation, due to the level of support from the local residents and the limited visual catchment that it is located within. All these factors reduce the potential for conflict between incompatible activities.

2.4.3 SUSTAINABLE SUBDIVISION AND DEVELOPMENT	
2.4.3.1 Objective	*To promote a pattern of subdivision and land use in the District which results in the efficient use and development of natural and physical resources.*
2.4.3.2 Policies	*(a) To encourage a pattern of subdivision which maximises the efficient use of existing infrastructure networks (roads and service mains).* *(b) To require developers to pay for any extension or upgrading of infrastructure (e.g. roads and service mains) required to meet the needs of a proposed subdivision. Where the Council requires Resource Management Policy Section Tararua District Plan (Review No. 1) – Operative,1 SEPT 2012, including Plan Change 1 (Operative Aug 2019) Page 2-29 additional capacity to be provided, in order to meet future service demands and development requirements, the Council shall meet the costs of providing the additional capacity (for Council supplied services).* *(c) To protect network utilities and infrastructure from adverse effects associated with subdivision and land use activities.* *(d) To provide for boundary adjustments and the subdivision of sites which do not meet subdivision standards where required for the activities of network utility operators or heritage protection authorities (as defined in the RMA) or public works.* *(e) To require developers to take into account principles of energy efficiency and energy conservation in the design and development of subdivisions (shape, size and orientation of lots, and urban form).*

Comment: No subdivision is being proposed as part of this applicant and therefore Policies 2.4.3.2 (a), (b) (d) and (e) which are specific to subdivision are not relevant. The proposal will result in the efficient use and development of a natural resource (grazed farmland), in that it will enable the dual use of the site for the sustainable purposes of renewable energy generation and primary production (grazing and/or crop growing). This can be done in a manner which will not adversely affect the soil resource so that future generations can continue to be provided for. The existing network utilities and infrastructure will be protected from adverse effects associated with the development, in fact the presence of the Mangamaire substation is essential for the establishment and operation of the solar farm.

2.5.2 MINIMISING RISKS FROM NATURAL HAZARDS

2.5.2.1 Objective	*To reduce the risks imposed by, and the effects of, natural hazards on the people, property and infrastructure of the Tararua District.*
2.5.2.2 Policies	*(a) To enhance the level of information available on natural hazards and their associated risks within different parts of the Tararua District, and increase understanding in the community of the respective responsibilities of individuals and other authorities.* *(b) To reduce the risk from natural hazards in the District by minimising the intensity of development in hazard prone areas and implementing mitigation measures and response procedures as appropriate.*

Comment: A small part of both Sites A and B of the solar farm are located within an identified flooding overlay. Although difficult to tell when comparing the site plans to the flooding maps it appears as though the solar tables and other associated infrastructure will fall outside of the areas prone to flooding. For Site A, the flooding overlay appears to be concentrated around the area that has been identified as a potential wetland. A setback is proposed to this area along with further wetland appropriate planting to act as a buffer. For Site B, the land where the solar tables are to be established is a river terrace approximately 4-5m above the Mangatainoka River and the development will be setback approximately 180-200m from the riverbed itself.

The earthworks required to establish the development will not result in changes to the land contour ensuring that flood risk will not be spread onto other people, property and infrastructure in the surrounding area. The site will also retain its pasture cover and/or be planted in crops ensuring that soil permeability is retained.

For the above reasons, it is considered that the development of a solar farm on the site will not exacerbate the risk of flooding in the area and is overall considered to be consistent with Objective 2.5.2.1 and Policies 2.5.2.2 (a) and (b).

2.6.2 MAINTENANCE AND ENHANCEMENT OF ENVIRONMENTAL QUALITY AND AMENITY	
2.6.2.1 Objective	*To maintain and/or enhance amenity values and environmental quality in the District, for present and future generations.*
2.6.2.2 Policy	*(a) To manage the adverse effects of activities on amenity values by specifying minimum environmental standards for the development and maintenance of such activities.*

Comment: The consideration of Objective 2.3.4.1 and Policies 2.3.4.2 (a), (b) and (c) is relevant to the assessment of the above objective and policy and is therefore not repeated here. The proposal is considered to meet Objective 2.6.2.1 and Policy 2.6.2.2(a).

2.8.2 INFRASTRUCTURE	
2.8.2.1 Objective	*To maintain and develop the District's infrastructure to meet the community's needs in a safe, effective and efficient manner while avoiding, remedying or mitigating adverse environmental effects.*
2.8.2.2 Policies	*(a) To enable the activities of network utility operators and the establishment and maintenance of network utility equipment and*

	facilities (including roads) to be undertaken, provided that adverse environmental effects are avoided, remedied or mitigated. *(b) To ensure that for all new activities and subdivisions within urban and settlement areas, utility services (pipes, wires and associated equipment) are placed underground at the expense of the developer, unless the operations require above-ground facilities for technical reasons, or unless the Council resolves that it is not practical or desirable for other demonstrated technical, economic, physical or environmental reasons to make such underground services available.* *(c) To encourage the co-siting of network utility equipment where practicable. Resource Management Policy Section Tararua District Plan (Review No. 1) – Operative,1 SEPT 2012, including Plan Change 1 (Operative Aug 2019) Page 2-71* *(d) To ensure that any adverse effects of the subdivision, use and development of land on the safe and efficient operation of network utilities and infrastructure, are avoided, remedied or mitigated. (e) To take into account the technical and operational requirements of network utilities and infrastructure in the assessment of resource consent applications for these activities.*

Comment: Solar Farms have specific locational and operational requirements, and the site has been selected as these requirements can be met in this location. In particular, the solar farm will be in a geographical area that has suitable sunshine hours. It is near an existing substation, transmission towers and lines, which minimises the amount of further potential infrastructure required for the solar farm to operate effectively and efficiently. Lastly, the site is located within a confined rural visual catchment ensuring that any potential effects from the establishment and operation of the solar farm can be effectively remedied, mitigated or avoided in part due to its remoteness.

2.8.4 ELECTRICITY GENERATION FROM RENEWABLE SOURCES INCLUDING WIND FARMS	
2.8.4.1 Objective	*To recognise the potential of the District's Rural Management Area for renewable electricity generation and wind farms in particular.*
2.8.4.2 Policies	*(a) To recognise the local, regional and national benefits to be derived from the development of renewable energy resources, and wind farms, in particular.* *(b) To remedy, mitigate, or avoid, where possible, the actual and potential adverse effects on the environment of wind farms and other renewable electricity generation facilities, by recognising that they have the potential to cause significant adverse effects on the environment, particularly in respect of amenity values, landscape ecology, noise and traffic, and may therefore be inappropriate in some locations.*

Comment: This proposal is consistent with Objective 2.8.4.1 and Policies 2.8.4.2 (a) and (b). In this regard, the site's potential for renewable electricity generation has been recognised by the applicants, hence the work done to date for the development and this resource consent. Key factors in site selection for solar farms is their proximity to a substation, relatively flat land and

access to a suitable amount of sunshine hours. This site also offers space and a limited viewing catchment which ensure that it is an appropriate activity to be located in this location.

2.10.3 MAORI RESOURCE MANAGEMENT VALUES	
2.10.3.1 Objective	*To recognise and provide for Maori values in the management of the District's natural and physical resources.*
2.10.3.2 Policy	*(a) To recognise and provide for the relationship of tangata whenua (local iwi and hapu) and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga, and to have particular regard to the concept of kaitiakitanga.*

Comment: Planz and RMM have met with representatives of both Rangitāne o Tamaki nui-ā-Rua and Ngāti Kahungunu ki Tāmaki-nui-a-Rua at the site. It was identified that the site is located within an area of significance to Maori but does not itself contain any known sites of significance such as waahi tapu and other taonga. The solar farm is proposed to be setback from an area which may be a remnant wetland, with additional planting of wetland appropriate plants within this area proposed and is approximately 180-200m at its closest above the Mangatainoka River.

11 Other Matters

11.1 Climate Change

11.1.1The Climate Change Response (Zero Carbon) Amendment Act

The Climate Change Response (Zero Carbon) Amendment Act 2019 provides a framework for New Zealand to develop and implement clear and stable climate change policies that contribute to the global effort under the Paris Agreement to limit the global average temperature increase to 1.5 degrees Celsius above pre-industrial levels and to allow New Zealand to prepare for and adapt to the effects of climate change. This Amendment Act sets a new domestic greenhouse gas emissions reduction target for New Zealand to:

- Reduce net emissions of all greenhouse gases (except biogenic methane) to zero by 2050.
- Reduce emissions of biogenic methane to 24-47 per cent below 2017 levels by 2050, including to 10 per cent below 2017 levels by 2030.
- Establish a system of emissions budgets to act as stepping stones towards the long-term target.
- Require the Government to develop and implement policies for climate change adaptation and mitigation.
- Establish a new, independent Climate Change Commission to provide expert advice and monitoring to help keep successive governments on track to meeting long-term goals.

11.1.2The Climate Change Response (Emissions Trading Reform) Amendment Act

This Bill amends the Climate Change Response Act 2002 to improve certainty for businesses, make the New Zealand Emissions Trading Scheme more accessible and improve its

administration, with particular improvements to strengthen the role of forestry in climate change mitigation.

11.1.3Assessment of Climate Change Legislation

Energy Bay Limited have identified the site at Mangamaire as having a unique opportunity to produce energy generated from a renewable energy source particularly because the site receives a good amount of sunshine hours, it is close to existing electricity infrastructure negating the need to establish and provide further substations, transmission towers and overhead high power transmission lines and because it is located in a limited visual catchment. The proposal is therefore considered to contribute positively towards climate change response whilst also retaining the underlying pastoral use and the soil resource at the site. It is considered that when it comes to landscape values there comes a point when the value of a landscape is moderated by broader issues such as the provision of renewable resources and the contribution made to climate change mitigation and long-term sustainability. In this regard, it is considered that this proposal has been well considered, such that the solar farm will be appropriately located in an area where effects on broader landscape values will be no more than minor and the visual effects, with mitigation, associated with individual properties will be less than minor, as assessed in Section 9 above, while also providing positively to climate change and long-term sustainability.

11.2 National Policy Statement for Renewable Electricity Generation 2011

The National Policy Statement for Renewable Electricity Generation 2011 (NPS REG) came into effect on 13 May 2011 and has played a significant role in promoting renewable energy developments. The NPS REG sets out the objectives and policies for renewable electricity generation under the RMA and requires recognition of the benefits of renewable electricity generation activities. Notably the NPS REG acknowledges that decision makers should have particular regard to the need to locate the renewable electricity generation activity where the resource is available and the connection to existing infrastructure, especially the national grid, is viable as in this case.

In the context of the above, the solar farm will increase electricity generation capacity (enough to power approximately 10,384 homes) via a renewable energy source which in turn helps in the reduction of greenhouse gas emissions. It will also ensure additional security of electricity supply.

The Resource Management Amendment Bill currently passing through Parliament recommends the removal of statutory barriers to considering the effects of activities on climate change under the RMA. Should the Bill pass in its current form, the amendments will place positive obligations on local and regional councils to consider climate change matters when preparing or changing their plans and considering consent applications, which it is expected will be positive for renewable energy project development.

11.3 National Policy Statement on Electricity Transmission

The National Policy Statement on Electricity Transmission sets out the objective and policies for managing the electricity transmission network. It gives guidance across New Zealand for the management and future planning of the national grid. The proposed solar farm will connect to the national grid so that electricity generated at the site can effectively be distributed.

12 Consultation/Notification

Section 36A of the RMA confirms that an Applicant has no duty to consult any person on their resource consent application. However, Clause 1(h) of the Fourth Schedule to the RMA does state that an AEE should identify those persons affected by a proposal, detail the consultation undertaken with those, or any other, persons, and outline any response to the views of those persons consulted.

Under the provisions of the amended RMA there is now no presumption in favour of notification (section 95A). The requirement for the Council to be "*satisfied*" that the effects "*will be minor*" before proceeding on a non-notified basis has been removed.

Instead, public notification is only required if the Council "*decides*" that the activity:

> *... will have or is likely to have adverse effects on the environment that are more than minor.* (Section 95A (2)).

In making this decision, the consent authority must disregard any effects on persons who own or occupy:

i. the land in, on, or over which the activity will occur; or
ii. any land adjacent to that land;

Pursuant to section 95D (e), for the purpose of deciding whether the effects are more than minor the consent authority *"must disregard any effect on a person who has given written approval to the relevant application"*.

The above assessment has determined that the effects of the proposal are not more than minor and therefore the proposal does not need to be publicly notified.

Under section 95B 'Limited notification of the consent application', the consent authority is then to decide (under sections 95E to 95G) whether there are any affected persons in relation to the activity. The threshold for identifying affected persons is more rigorous, whereby, pursuant to section 95E(1), the consent authority must decide that a person is affected *"if the activity's adverse effects are minor or more than minor (but not less than minor)"*. Therefore, in order for there to be no affected parties the effects must be assessed as being *"less than minor"*.

The Applicant has undertaken consultation with near neighbours in Mangamaire and Tutaekara Roads and has obtained full or partial written approval from the parties listed in Table 3 (Section 8.2) above and copied in below. Effects have been disregarded on these near neighbours where full written approval has been obtained, as follows:

- 129 Tutaekara Road (Owners and Occupiers)
- 154 Tutaekara Road (Owners and Occupiers)
- 346 Mangamaire Road (Owners and Occupiers)
- 410 Mangamaire Road (Owners and Occupiers)

Effects have been considered on those neighbouring properties where no or partial written approval has been obtained, these neighbours, listed below, are considered to be affected in a minor way:

- 154A Tutaekara Road (Occupiers Written Approval Provided)
- 391 Mangamaire Road (Occupiers Written Approval Provided)
- 431 Mangamaire Road (Occupiers Written Approval Provided)
- 451 Mangamaire Road (Occupiers Written Approval Provided)

Based on the above it is considered that the application can proceed to limited notification to the owners of 154A Tutaekara Road and 391, 431 and 451 Mangamaire Road on the basis of the minor effects prior to mitigation being achieved by way of the shelterbelt planting.

13 Volunteered Conditions

The following conditions are volunteered:

Earthworks

1) The finished ground levels (after the cut and fill works) shall not cause ponding/drainage/run-off related nuisance to the neighbouring (surrounding) properties or change of the current drainage patterns (existing overland flow paths) to the detriment of the surrounding properties. In the event that the consented works result in effects of that character these shall be rectified at the expense of the consent holder and to the satisfaction of the Council Infrastructure Team.

2) All filling and excavation work shall be carried out in accordance with a site-specific Site Management Plan (SMP), prepared by a suitably qualified and experienced professional, which follows the best practice principles, techniques, inspections and monitoring for management of site activities and mitigation of risk. The SMP must be held on site at all times and made available to Council on request.

3) Run-off must be controlled to prevent muddy water flowing, or earth slipping, onto neighbouring properties, legal road, or into a river, stream, drain or wetland. Sediment, earth or debris must not fall or collect on land beyond the site or enter the Council's stormwater system. All muddy water must be treated, using at a minimum the erosion and sediment control measures detailed in the SMP, prior to discharge to the Council's stormwater system.

4) The SMP shall be implemented on site and maintained over the construction phase, until the site is stabilised (i.e., no longer producing dust, water-borne sediment or potential contaminants). The SMP shall be improved if initial and/or standard measures are inadequate. All disturbed surfaces shall be adequately surfaced as soon as possible to limit dust, contaminant or sediment mobilisation.

5) If potential contamination is identified during works (accidental discovery), such as potential fill materials, asbestos containing material, and odorous and/or stained soils, the Site Manager should contact a suitably qualified and experienced person (SQEP) to assess the nature of the new material and reassess the potential risk to human health and/or the environment.

6) Dust emissions shall be appropriately managed within the boundary of the property in compliance with the Regional Air Plan. Dust mitigation measures such as water carts or

sprinklers shall be used on any exposed areas. The roads to and from the site, and entrance and exit, must remain tidy and free of dust and dirt at all times.

7) The consent holder shall notify Tararua District Council no less than three working days prior to works commencing, (email to XXXX) of the earthworks start date and the name and contact details of the site supervisor

8) All loading and unloading of trucks with excavation or fill material is to be carried out within the application site.

9) In the event of the discovery/disturbance of any archaeological material or sites, including taonga (treasured artefacts) and koiwi tangata (human remains), the consent holder shall immediately:

   a. Cease earthmoving operations in the affected area of the site; and

   b. Advise the Tararua District Council of the disturbance; and

   c. Advise appropriate agencies, including Heritage New Zealand Pouhere Taonga and the local Mana Whenua of the disturbance.

Planting

10) The proposed landscaping shall be established on site prior to the construction of the solar farm beginning.

Noise

11) The noise level from all operation of the solar farm shall meet the following District Plan noise limits at the notional boundary of any existing dwellings on another site in the Rural zone:

   • 55 dB LAeq(15-min) from 0700 to 1900 hours

   • 45 dB LAeq(15-min) and 70dB LAFmax from 1900 to 0700 hours.

12) Noise levels shall be measured and assessed in accordance with NZS 6801:2008 Acoustics – Measurement of Environmental Sound and NZS 6802:2008 Acoustics – Environmental Noise.

13) Noise from construction activities shall, as far as practicable, not exceed the limits recommended in, and shall be measured and assessed in accordance with, New Zealand Standard NZS 6803: 1999 “Acoustics – Construction Noise”. Where exceedances of the guidelines in this standard are identified as likely to occur, they shall be managed through a construction noise and vibration management plan. All practicable noise attenuation measures shall be implemented.

14) Detailed design of the project shall include an attenuation design for the inverters. The attenuation design shall consider selection, orientation, and acoustic screening (though barriers), enclosure, or other measures as appropriate. The attenuation design must ensure that the noise level at any receiver complies with the nighttime noise limit. The attenuation design shall minimise or eliminate tonality (as defined by NZS 6802:2008) where it is practicable to do so. The attenuation design shall further aim to achieve noise levels that are appreciably below the District Plan night-time noise limits where practicable. The attenuation design should be undertaken by a recognised acoustician and submitted to council prior to commencement of construction. It is recognised that the attenuation design may require commissioning works on site during construction to suitably refine and improve the attenuation design.

Setbacks

15) All land use activities, including the construction of new buildings/structures, earthworks, fences, any operation of mobile plant and/or persons working near exposed line parts shall comply with the requirements of the New Zealand Electrical Code of Practice for Electrical Safe Distances (NZECP 34:2001) or any subsequent revision of the code.

14 Conclusion

On the basis of the above assessment, it is considered that any potential adverse effects from the establishment and operation of the solar farm on the site will have no more than minor effects on landscape values and visual amenity initially, and less than minor effects on the soil resource, cultural interests and noise and ultimately landscape values and visual amenity once the planting has matured. The proposal will also result in significant positive effects.

Overall, the proposal is considered to be in accordance with the District Plan requirements, which give effect to Part 2 of the Act, and therefore land use consent for this discretionary activity can be granted on a limited notified basis.

APPENDIX 1:

RECORDS OF TITLE

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Guaranteed Search Copy issued under Section 60 of the Land Transfer Act 2017

R.W. Muir
Registrar-General of Land

Identifier **370429**
Land Registration District **Wellington**
Date Issued 06 November 2007

Prior References
WN23C/270

Estate Fee Simple
Area 22.5895 hectares more or less
Legal Description Lot 1 Deposited Plan 392402
Registered Owners
Kakariki Te Whenua Limited

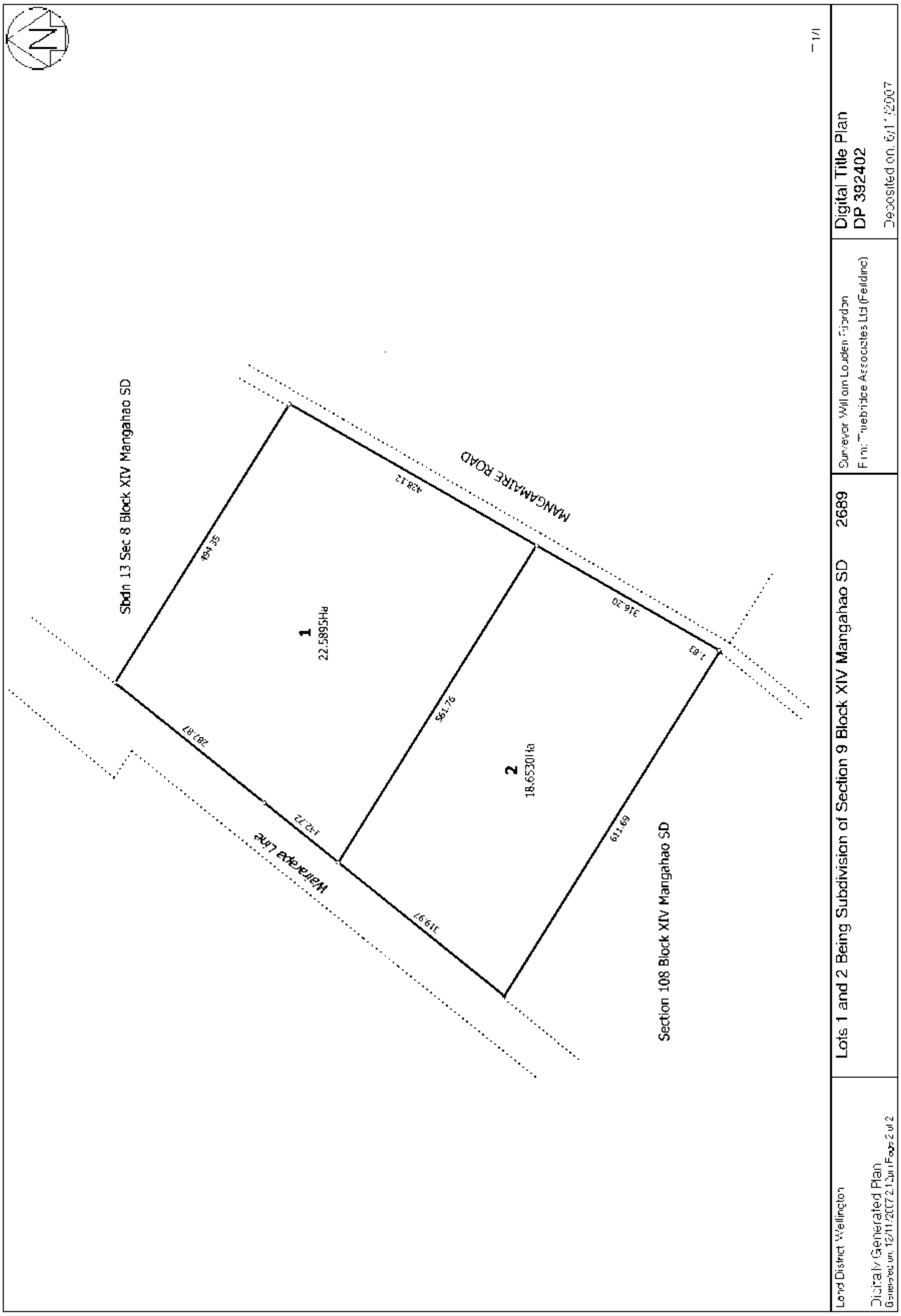
Interests

Subject to Section 8 Mining Act 1971

Subject to Section 5 Coal Mines Act 1979

7384363.2 Mortgage to ANZ National Bank Limited - 1.6.2007 at 3:21 pm

7905190.1 Variation of Mortgage 7384363.2 - 12.8.2008 at 9:00 am


Digital Title Plan
DP 392402
Deposited on 6/11/2007
Surveyor William Louden Riordan
Firm Truebridge Associates Ltd (Feilding)
Lots 1 and 2 Being Subdivision of Section 9 Block XIV Mangahao SD
2689
Land District Wellington
Digitally Generated Plan
MANGAMAIRE ROAD
Wairarapa Line
Sbdn 13 Sec 8 Block XIV Mangahao SD
Section 108 Block XIV Mangahao SD
1
22.5895Ha
2
18.6530Ha
494.35
428.12
316.20
1.83
561.76
287.87
142.72
319.97
611.69

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Guaranteed Search Copy issued under Section 60 of the Land Transfer Act 2017

R.W. Muir
Registrar-General of Land

Identifier **370430**
Land Registration District **Wellington**
Date Issued 06 November 2007

Prior References
WN23C/270

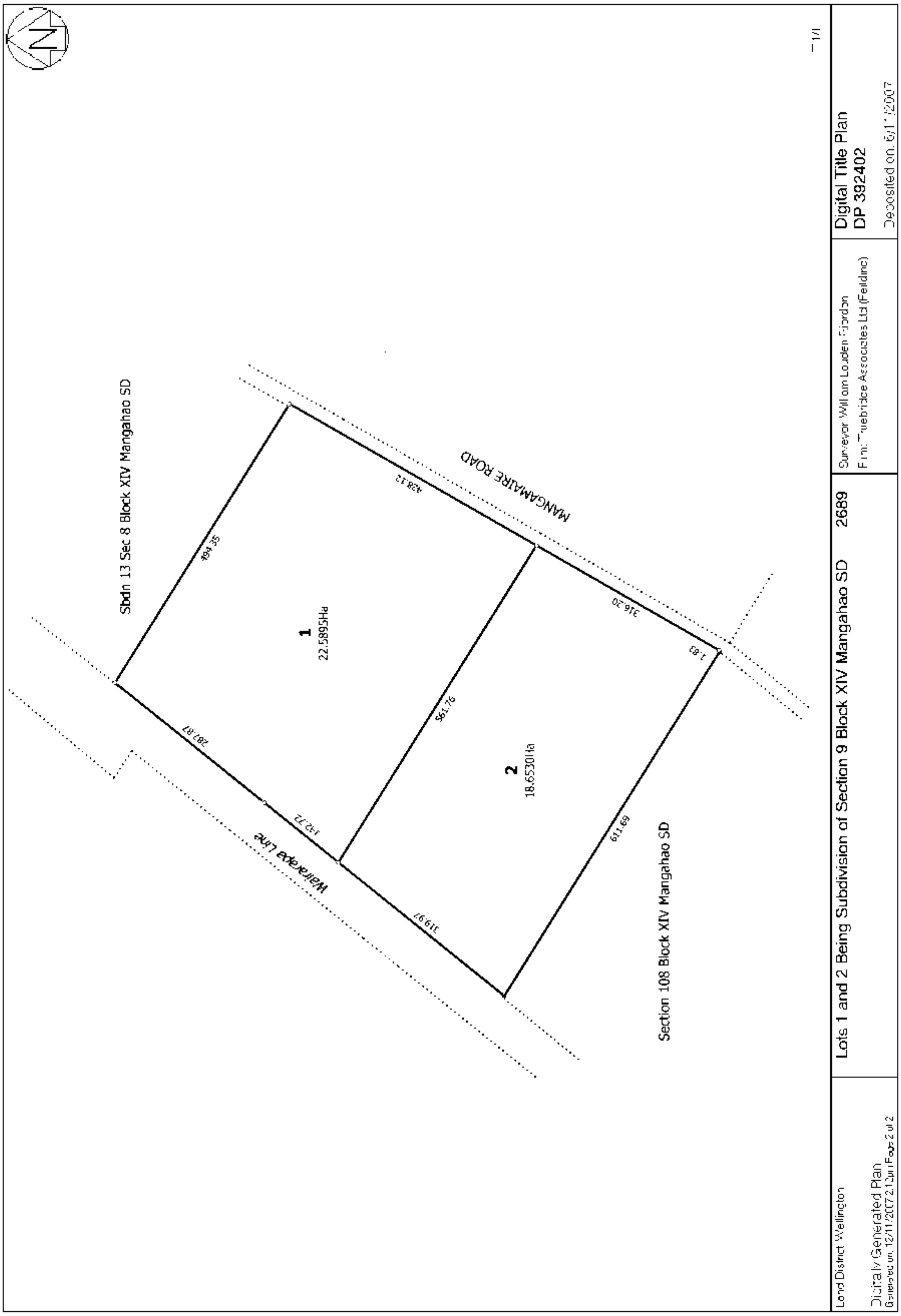
Estate Fee Simple
Area 18.6530 hectares more or less
Legal Description Lot 2 Deposited Plan 392402
Registered Owners
Kakariki Te Whenua Limited

Interests

Subject to Section 8 Mining Act 1971

Subject to Section 5 Coal Mines Act 1979

9755905.2 Mortgage to ANZ Bank New Zealand Limited - 30.6.2014 at 11:26 am


Digital Title Plan
DP 392402
Surveyor William Louden Riordan
Lots 1 and 2 Being Subdivision of Section 9 Block XIV Mangahao SD
2689
Land District Wellington
Digitally Generated Plan
Sbdn 13 Sec 8 Block XIV Mangahao SD
MANGAMAIRE ROAD
Wairarapa Line
Section 108 Block XIV Mangahao SD
1
22.5895Ha
2
18.6530Ha
494.35
428.12
316.20
1.83
561.76
287.87
142.72
319.97
611.69

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Guaranteed Search Copy issued under Section 60 of the Land Transfer Act 2017

R.W. Muir
Registrar-General of Land

Identifier	**WN25D/915**
Land Registration District	**Wellington**
Date Issued	12 November 1984

Prior References
WN25B/782

Estate	Fee Simple
Area	37.4370 hectares more or less
Legal Description	Part Section 150 Block XIV Mangahao Survey District

Registered Owners
Kakariki Te Whenua Limited

Interests

Subject to Section 8 Mining Act 1971

Subject to Section 5 Coal Mines Act 1979

689055.1 Gazette Notice (680m² hatched block hereon) to be road vested in The Pahiatua County Council - 13.5.1985 at 2.50 pm

7384376.2 Mortgage to ANZ National Bank Limited - 1.6.2007 at 3:23 pm

7905190.2 Variation of Mortgage 7384376.2 - 12.8.2008 at 9:00 am

Solicitors Number
15.6.1984 at 2.5

5. 629167.9 Memoran
Mortgages 629167
first, second an
respectively - 1

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Guaranteed Search Copy issued under Section 60 of the Land Transfer Act 2017

R.W. Muir
Registrar-General of Land

Identifier	**WN38B/53**
Land Registration District	**Wellington**
Date Issued	05 July 1991

Prior References
WNC1/606

Estate	Fee Simple
Area	11.3110 hectares more or less
Legal Description	Section 140 Block XIV Mangahao Survey District

Registered Owners
Kakariki Te Whenua Limited

Interests

Subject to Section 3 Petroleum Act 1937

Subject to Section 8 Atomic Energy Act 1945

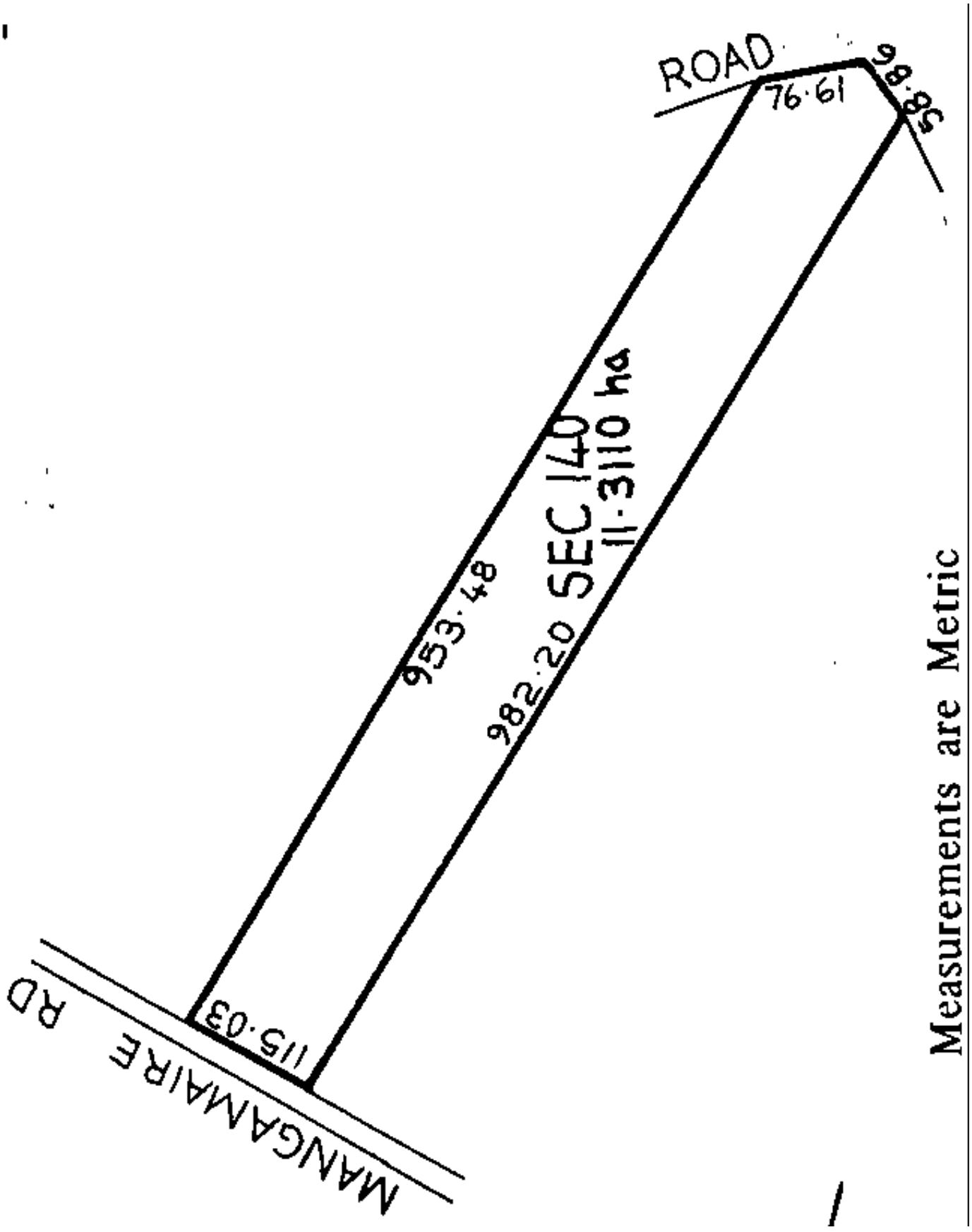
Subject to Section 3 Geothermal Energy Act 1953

Subject to Sections 6 and 8 Mining Act 1971

Subject to Sections 5 and 261 Coal Mines Act 1979

Subject to Part IV A Conservation Act 1987

7898194.1 Mortgage to ANZ National Bank Limited - 7.8.2008 at 11:39 am


ROAD
76·61
98·95
953·48
982·20 SEC 140
11·3110 ha
115·03
MANGAMAIRE RD
Measurements are Metric

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Guaranteed Search Copy issued under Section 60 of the Land Transfer Act 2017

R.W. Muir
Registrar-General of Land

Identifier	**WN38B/55**
Land Registration District	**Wellington**
Date Issued	05 July 1991

Prior References
WNC1/608

Estate	Fee Simple
Area	11.2604 hectares more or less
Legal Description	Section 139 Block XIV Mangahao Survey District

Registered Owners
Kakariki Te Whenua Limited

Interests

Subject to Section 3 Petroleum Act 1937

Subject to Section 8 Atomic Energy Act 1945

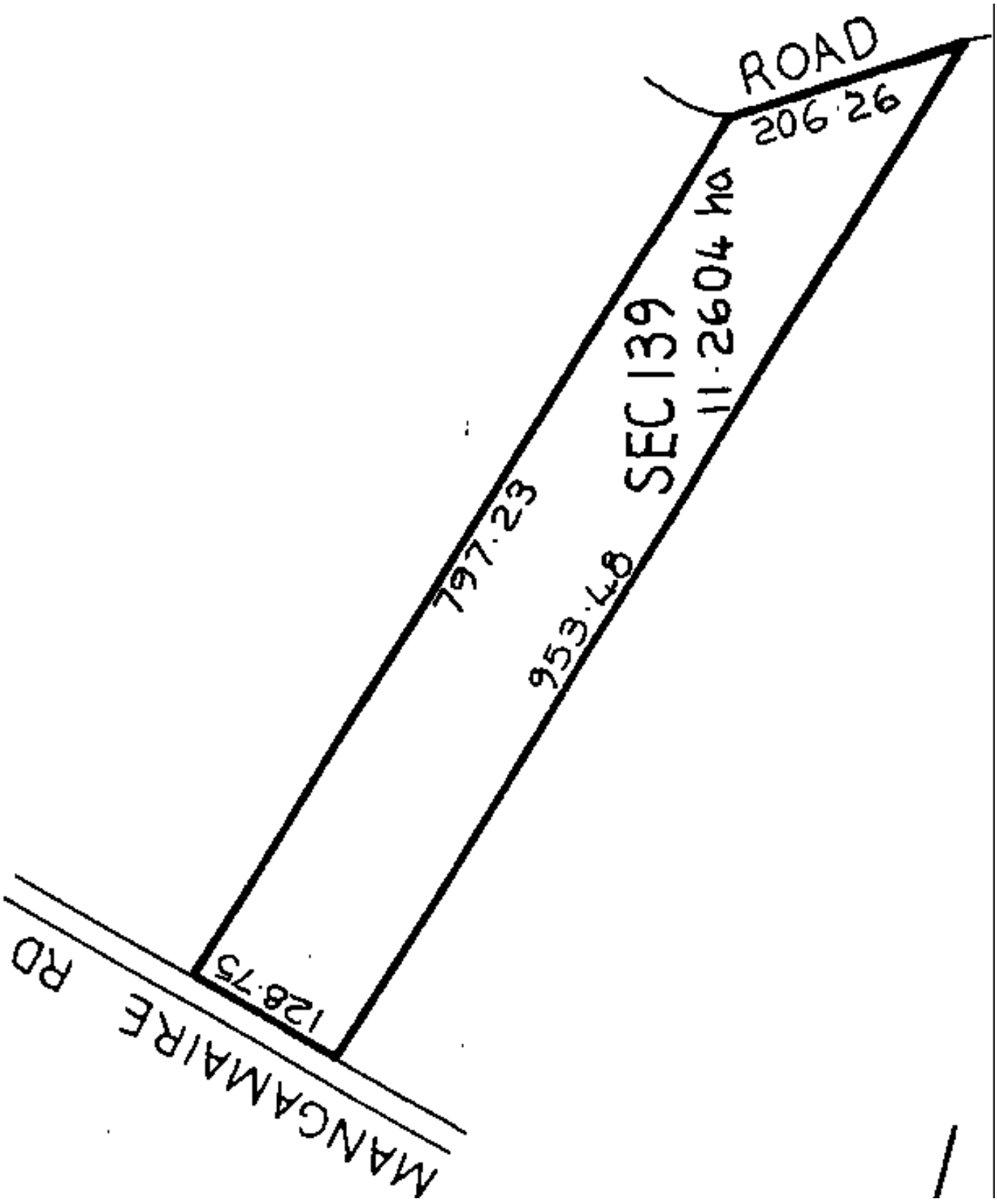
Subject to Section 3 Geothermal Energy Act 1953

Subject to Sections 6 and 8 Mining Act 1971

Subject to Sections 5 and 261 Coal Mines Act 1979

Subject to Part IV A Conservation Act 1987

7898194.1 Mortgage to ANZ National Bank Limited - 7.8.2008 at 11:39 am


ROAD
206.26
SEC 139
11.2604 ha
797.23
953.48
128.75
MANGAMAIRE RD

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Guaranteed Search Copy issued under Section 60 of the Land Transfer Act 2017

R.W. Muir
Registrar-General of Land

Identifier	**WN229/202**
Land Registration District	**Wellington**
Date Issued	24 November 1914

Prior References
WA 4/33 WNPR7925

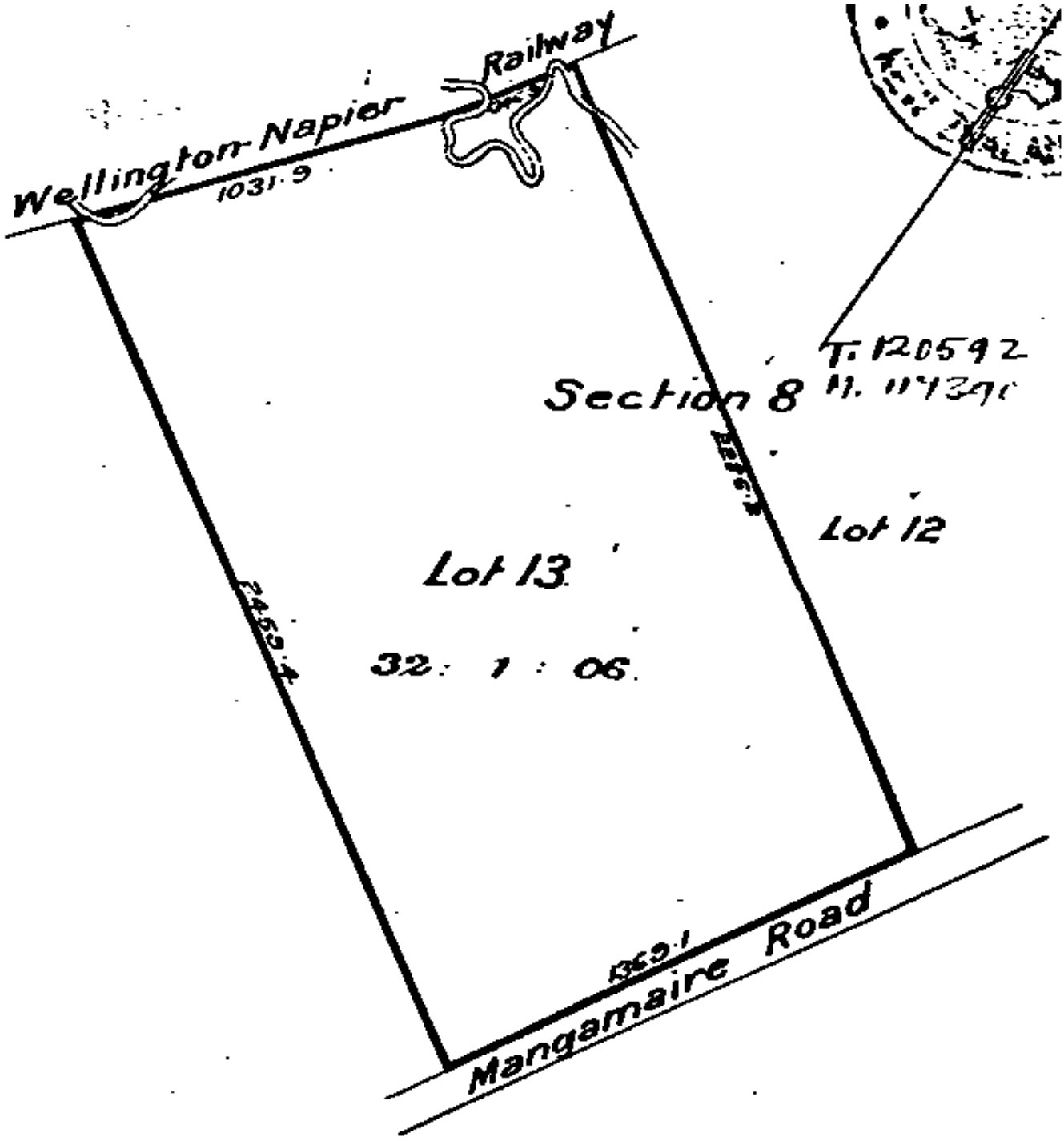
Estate	Fee Simple
Area	13.0663 hectares more or less
Legal Description	Lot 13 Section 8 Block XIV Mangahao Survey District

Registered Owners
Kakariki Te Whenua Limited

Interests

7384363.2 Mortgage to ANZ National Bank Limited - 1.6.2007 at 3:21 pm

7905190.1 Variation of Mortgage 7384363.2 - 12.8.2008 at 9:00 am


Wellington-Napier
Railway
1031·9
T. 120592
Section 8
Lot 12
Lot 13
32·1·06
2462·4
1359·1
Mangamaire Road

APPENDIX 2:

LANDSCAPE ASSESSMENT REPORT + GRAPHIC ATTACHMENT

RMM

ROUGH MILNE MITCHELL
LANDSCAPE ARCHITECTS

rmmla.co.nz

Landscape Assessment Report

8th September 2022

Proposed Solar Farm Mangamaire Road, Tararua

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Document Quality Assurance

Bibliographic reference for citation:
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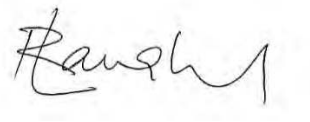
Date: 8th September 2022
Status: For Resource Consent

Prepared for: Solar Bay Ltd

Prepared by:



…….
Rory Langbridge
NZILA Registered Landscape Architect

Reviewed by:

…….
Nikki Smetham
NZILA Registered Landscape Architect

……
Paul Smith
NZILA Registered Landscape Architect

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Ph: 03 366 3268

Contents

1.0 Introduction

1.1 Purpose and Scope

Rough Milne Mitchell Landscape Architects (**RMM**) have been engaged by Solar Bay Ltd (**the Applicant**) to assess the actual and potential landscape and visual effects of a proposed solar field located on Mangamaire Road, Tararua, near its intersection with Tutaekara Road approximately 8km south of Pahiatua.

For the purpose of this this Landscape Assessment Report (**LA Report**), '**the site**' refers to the 86.931ha of land illustrated below on **Figure 1**. Beyond the solar farm, the landowners other land will remain in its current state.

Figure 1. The extent of the proposed solar farm with the site.

1.2 Methodology

The methodology and terminology used in this report has been informed by the Draft Aotearoa New Zealand Landscape Assessment Guidelines[1].

[1] 'Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines'. [Final Draft subject to final editing, graphic design, illustrations, approved by Tuia Pito Ora/NZILA 5 May 2021].

This LA Report is tailored to suit the nature of the project and its context including the framework of the governing legislation.

The statutory documents containing provisions relevant to the proposal are found in the Resource Management Act 1991 (**RMA**) and the Tararua District Council District Plan (**District Plan**). The District Plan gives effect to the RMA within the context of Pahiatua and Mangamaire and provides the policy framework against which this landscape assessment has been evaluated.

A site visit was undertaken on 9th January 2022 to assist in understanding the extent of the proposed solar farm, the landscape character and values within the receiving environment and assessing the proposal's actual and potential landscape and visual effects.

The assessment is formatted as per the following:

- A description of the proposal.
- Description of receiving environment, including the site. The existing environment is described in terms of the current landscape's physical, perceptual, and associated factors.
- Identification of existing landscape and visual amenity values. These are based on site observations, and a review of existing information.
- Relevant statutory provisions. The statutory provisions are found within the District Plan. Those provisions directly relevant to landscape and visual matters are set out in the District Plan and form the framework for the assessment.
- An assessment of landscape and visual effects. This assessment takes into consideration the relevant statutory provisions.
- Conclusion.

This report is accompanied by a Graphic Attachment (**GA**), that contains maps and aerial images of the site location, plans of the proposed solar farm, solar panel and ancillary structure exemplar images of similar solar farms in Aotearoa and the United States of America, and photographs of the site taken from the surrounding public places.

The table included in Figure 2 outlines the rating scales that are referred to in this report.

Very Low	Low	Low - Moderate	Moderate	Moderate - High	High	Very High

Figure 2. The seven-point landscape and visual effects rating scale.[2]

[2] 'Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines'. [Final Draft subject to final editing, graphic design, illustrations, approved by Tuia Pito Ora/NZILA 5 May 2021]. Page 64.

The table included in Figure 3 is a comparative scale for the RMA s95 notification determination test and the RMA s104D ‘gateway’ test for non-complying activities.

Very Low	Low	Low - Moderate	Moderate	Moderate - High	High	Very High
Less than Minor	Minor		More than Minor		Significant	

Figure 3. The comparative scale of degree of effects.[3]

2.0 The Proposal

2.1 Description of the Proposal

It is proposed to locate an approximate 60ha solar farm within the 87.478ha site, as illustrated on GA Sheet 3. The farm is to be located on both sides of Mangamaire Road to the south and south-west of its intersection with Tutaekara Road.

This site has been chosen as it is adjacent the PowerCo substation (**the substation**) which is a required piece of infrastructure that puts the power sourced from the Solar Farm into the National Power System.

Part of the site selection process was also determined by the number of sunshine hours recorded for the Masterton District, the nearest town with records to the site. Masterton records over 1900 hours of bright sunshine each year, with a mean annual value of 1982 hours, recorded between 1981 and 2010[4]. As such, the sun is a readily available source of renewable energy that can be utilised within the Tararua District.

The solar farm will consist of the following structures. Images of these structures, including exemplar images have been included in GA Sheets 5-9 to assist in understanding what is proposed.

- The proposed solar farm will consist of approximately 88,500 panels spread across approximately 885 bases and split between two main sites. In order to accommodate existing power lines and farm tracks, the farm over **Site A**, spread over a 32.5ha, is broken into 7 clusters ranging in size from 1.1ha to 12.4ha. Farm B is spread over 26.82ha and broken into 5 clusters ranging in size from 0.5ha to 15.2ha.

- A solar table consists of and measures 52 solar panels long by 2 solar panels wide. A total of 104 solar panels. The dimensions of a table are approximately 59.8m long by 4.86m wide.

- Each individual solar panel measures 2.4m long by 1.1m wide (2.734m^2) and 3.5cm thick. The solar panels have a 3.2mm thick glass surface with an anti-reflection coating. This coating reduces the amount of potential light spill that is reflected away from the solar panel.

- The solar tables are steel structures, and each table is attached to the ground by seven steel poles, centralised along its length. Each table structure is designed to move so the solar panels pivot east to west towards the sun's rays as the sun moves through the sky. In the morning the solar panels will face east, at mid-day the solar panels will be more or less horizontal and at the end of the day the solar panels will face west.

- The top of the solar table, when parallel with the ground stands 2.46m above ground level. This is similar to a standard ceiling height in a house. When the solar tables are tilted as far east or west as possible the top of the solar table will stand 4.45m above ground level with the bottom approximately 30cm above ground level.

- The solar table is designed to avoid internal shading which means the pivot is restricted to prevent the solar panels facing as far east or west as possible. Instead, each table will start and finish the daily cycle in a tilted position to prevent shading, as illustrated on GA Sheet 7.

[4] https://niwa.co.nz/education-and-training/schools/resources/climate/sunshine

The extent of tilt can be controlled which in conjunction with the antiglare technology incorporated into the panels will prevent elevated sites that overlook the site from being affected by solar reflection or even excessive glare.[5]

- The centre of the rows of solar tables are 9.7m apart. When the solar tables are facing directly upwards, there is a 4.8m gap between the rows of solar tables. When the solar tables are at their maximum eastern or western tilt, there will be a 7.1m gap between the rows of solar tables, as illustrated on GA Sheet 7.

- 11 inverters will be located within the site, as illustrated on GA Sheet 3. The inverters convert the DC current from the solar panels to an AC current so the solar power can be transferred to the nearby substation. Each inverter is approximately 2.8m long, 1.6m wide and 2.3m high and are white / off white in colour.

- Upgrades to the existing farm tracks may occur if the current tracks are inaccessible in inclement weather. Upgrades to the tracks will likely consist of a gravel surface.

- Earthworks will consist of excavation for the solar table to be secured in the ground and trenching for the cables associated with the solar panels and inverters. All excavated material will remain on site.

- The pastoral grass cover around the supporting structures and inverters and underneath the solar tables, will be maintained, as per the examples illustrated on GA Sheets 6 & 7. Stock will continue to graze this pasture although limited to sheep only to avoid damage to the solar panels.

- The two primary compounds will be fenced using a using a deer fence with 'hotwires' to provide security. The final detail of the fencing is yet to be determined but it will be a security fence of 1.8m in height. The existing vehicle entries from Mangamaire Road will continue to provide access to the sites and project.

- Selective perimeter planting will be undertaken along Tutaekara and Mangamaire Road, as illustrated on GA Sheet 4.

There will be no residential development associated with this development as once established the site will be managed remotely. An area adjacent to the sub-station will be designed to accommodate the main switchgear. The exact location of the point of connection is to be determined but will be located within the sub-station. The solar farm will be connected to the PowerCo substation near to site. The exact location of this connection within the substation is to be confirmed.

As part of the construction of the solar farms, all remnant macrocarpa trees internal to site A and the remnant shelterbelts associated with Site B will be removed to avoid shading of the solar panels. A new security fence will be erected on the boundary but set 4.0m back from any road boundary to reduce its prominence. New shelterbelts will be planted along the road boundaries of both sites, as illustrated on GA Sheet 4. Both the common boundaries between the sites and Tutaekara and Mangamaire Roads, are currently occupied by overhead power and telephone cables which means that the shelterbelts will need to be low so as not to interfere. A double row of Flax (*phormium tenax*) is proposed which forms part of the receiving environment and will establish a quick growing plant that reaches a height of around 2.5 - 3m.

[5] Solar Bay – Tararua, Glint/Glare Assessment Solar Bay, Mangamaire Road, Tararua, New Zealand Date of issue: 09/05/2022

Flax will provide an effective screen to observers standing close to the site but will be less effective when viewed from a greater distance or when the tables are tilted east or west. This will provide a partial screen and mitigate the visual change that will result from the construction of the solar tables. In combination with the use of deer fencing as a preferred security fence, this would reduce the impact of the required security fencing in this visually open landscape.

The security fence in the vicinity of the wetland in the northern corner of Site A will be set 10m back from the wetland edge and this area will be revegetated using locally appropriate wetland buffer species.

Fig 3 Flax (phormium tenax) being used locally as a boundary shelter belt.

3.0 Relevant Statutory and Policy Provisions

3.1 The Tararua District Council Operative District Plan

The site is located within the Rural zone in the Operative Tararua District Plan (DP) The site is not located within an Outstanding Natural Landscape (**ONL**) and it has not been identified as an ONL or equivalent within the District Plan.[6]

A significant issue identified by the plan is achieving an appropriate balance between rural and non-rural activities. The plan also "*acknowledges the benefits of the generation of electricity from renewable resources*" and recognises the potential visual and amenity effects that facilities such as these can have on their environment and for this reason make such an application a **discretionary activity**.[7]

The plan is motivated to ensure that any adverse effects stemming from development can be avoided remedied or mitigated and to this end establishes objectives and policies against which development proposals can be considered.

Under **Sustainable and Efficient Rural Landuse**[8], the plan sets out a range of objectives and policies, and those relevant to an application of this nature include;

***2.3.2.1 Objective**: To achieve sustainable rural land use and efficient use of resources*

2.3.2.2 Policies

(a) To promote sustainable land management community programs in order to achieve sustainable land use practices which are compatible with the inherent productive capabilities of the land.

(b) To avoid, remedy or mitigate significant irreversible losses of the productive capability of the District's Class I and II soils.

***2.3.3.1 Objective** To maintain the vitality and character of the District's rural areas.*

2.3.3.2 (b) To provide, in rural areas, for activities which require a rural location where their effects are compatible with the surrounding rural area and the environmental results sought for Rural Management Areas.

***2.3.4.1 Objective** To ensure a high level of environmental quality and amenity throughout the rural areas of the District.*

2.3.4.2 Policies

(a) To ensure that any actual or potential adverse environmental effects of activities are avoided, remedied or mitigated.

(b) To maintain and/or enhance the character, level of amenity and environmental quality of the District's rural areas.

[6] Tararua District Council – Operative District Plan – Review No 1 – Appendix 3
[7] ibid Pg 2-14
[8] Ibid 2.3.2

(c) To reduce the potential for conflict between incompatible activities in rural areas, particularly in the rural-urban fringe, and between existing, lawfully established activities and new subdivision and development.

Under **Amenity and Environmental Quality**[9] the plan refers to Section 7 of the RMA that requires particular regard to given to *"the maintenance and enhancement of amenity values and the quality of the environment"* which is covered by Objective 2.6.2.1 "*To maintain and/or enhance amenity values and environmental quality in the District, for present and future generations*" and its related policy *"To manage the adverse effects of activities on amenity values by specifying minimum environmental standards for the development and maintenance of such activities."*

Under **Infrastructure** the plan recognises the importance of renewable electricity generation and recognises the technical and practical constraints that apply to the industry, however "*it is also in the community's interest that services be provided in an environmentally acceptable manner*."[10] To assist in this the plan, through objective 2.8.2.1, and its policies seek to enable the activities, provided that "*adverse environmental effects are avoided, remedied or mitigate"* and further "*To encourage the co-siting of network utility equipment where practicable*"[11] and finally "*To take into account the technical and operational requirements of network utilities and infrastructure in the assessment of resource consent applications for these activities*.[12]"

Under **Electricity Generation from Renewable Sources** ..the plans objective is to recognise the districts potential for renewable electricity generation[13] while at the same time recognizing that they *"have the potential to cause significant adverse effects on the environment, particularly in respect of amenity values, landscape ecology, noise and traffic, and may therefore be inappropriate in some locations.[14]"* It is for this reason that the activity is considered as a **discretionary activity** and the assessment criteria include matters considering both the benefits and well as the potential adverse effects relating in this instance to amenity values and landscape values.[15]

The significance of the effects of an activity will vary depending on the nature of the area and so the District has been divided up into Management Areas on the basis of their existing characteristics and the environmental results sought for the area. The application site is located within the **Rural Management Area**, which covers most of the district outside of the urban centers and the plan sets out a range of characteristics that are sought by the plan[16]. Those relevant to this LVA include:

(a) a predominance of rural activities;

(c) a range of other activities which:

(ii) are more appropriately located in a rural area than an urban area; and/or

(iii) provide social, economic, and/or environmental benefits to the District, Region and Nation;

(d) avoidance of activities that have the potential to give rise to adverse effects which are incompatible with the character of the surrounding rural area or which could adversely affect the ability of rural activities and other lawful land uses to function efficiently and effectively.

[9] Ibid 2.6
[10] Ibid 2-68
[11] Ibid 2.8.2.2a)
[12] Ibid 2.8.2.2e)
[13] Ibid 2.8.4.1
[14] Ibid 2.8.4.2 b)
[15] Ibid 2.8.4.4 a)
[16] Ibid 3.2.1 Rural Management Areas

(e) development of buildings and properties which are in keeping with the low density, character and scale of the surrounding rural area.

(f) maintenance and/or enhancement of the amenity enjoyed by people living within the rural area or in adjoining urban areas.

(k) protection of outstanding natural features and landscapes, and significant areas of indigenous natural vegetation and significant habitats of indigenous fauna from inappropriate subdivision, use and development.

Part 5 of the plan sets out the general development rules that are applicable throughout the district. The application would be considered a discretionary activity under 5.3.7 b) *"The construction, operation and maintenance of renewable electricity generation facilities, … not otherwise provided for as permitted activities*."

For a discretionary activity, the assessment criteria other than the purpose and principles of Part II of the RMA relate to the objectives, policies and anticipated environmental results in Part 2, the desired characteristics for the relevant Management Area in Part 3 and the rules and standards as set out in Part 5.

The relevant landscape criteria for assessment are covered in 5.3.7.4 *(d) "The visual and amenity effects of the facility with regard to the existing character of the area to which the proposal relates, the desired characteristics for the relevant Management Area as set out in Section 3.2 of this Plan, any significant landscapes or natural features identified in this Plan and/or any Regional Policy Statement and/or Regional Plan that applies to the area in which the site of the proposal is located"*

5.4.7 of the plan is concerned with any glare/lighting associated with a development, with the relevant standard being "*buildings are to be constructed and finished in such a manner as to ensure reflection (glare) from the … surfaces does not reflect into adjoining properties or adversely affect the vision of motorists on a street or road*." The criteria for assessment are listed in 5.4.7.4 and those relevant to this application include (e) *whether the level of brightness from the surface or lighting is such that it could create a traffic hazard or interfere with the operation of activities on properties outside the site* and f) *whether the nature of activities on adjoining sites is such that any glare or lighting spill would not be noticeable and would not have a detrimental effect*.

Landscape screening is not a specified requirement within the Rural Management Area (RMA) however, it is a requirement in an industrial management area when it is located adjacent to or within 20m of a Rural management area. While this does not directly apply to the application, the proposal has industrial characteristics and is located within the RMA. As such screen planting needs to be '*appropriate*' and stipulates *"The purpose of landscape treatment (such as dense planting of trees and/or shrubs or fences) is often to provide a visual barrier in order to reduce the potential or perceived adverse effects of an activity on the amenity of the surrounding area.*[17] *5.4.8.2b) stipulates that (b) In all Management Areas, where an activity detracts in a significant way from the visual amenity of the surrounding area (including exterior storage associated with home occupations, hobbies or other activities), effective screening of the activity from the road and neighbouring properties shall be provided in accordance with the standards for landscape treatment/screening below."*

When proposed the specified planting needs to be:

- *located in the correct place;*

[17] Ibid 5.4.8.1

- *have sufficient depth to allow the vegetation to grow and provide an effective buffer.*
- *use plants that are suitable for the particular environment.*
- *have a maintenance program in place to ensure that plants survive and are replaced if necessary (i.e. should any plants die);*

4.0 Landscape Description

4.1 Description of the Receiving Environment

The receiving environment falls within the Wairarapa, is located within the Mangatainoka River valley and sits near the intersection of Tutaekara Road and Mangamaire Road. The subject sites are located on the historic river flats west of the Mangatainoka River approximately 8km south of Pahiatua. The Mangatainoka River itself is a medium-sized, highly rated and heavily fished river and protected by a conservation order.

Due to the low density of development and the predominance of verdant open pasture, the flat landscape that affords the longer views possible of the hills that enclose the valley, the expanse of sky visible, natural character values and landscape/rural character values are aesthetically high. The prominence of the substation structures within a limited visual catchment, detracts from these values.

There is little local relief which makes distant views of the bare grazed hills on either side of the valley a feature of this locality. Other vertical relief is provided by the vegetation associated with the Mangatainoka River and the remnant macrocarpa plantings that still remain in the area. A number of remnant shelterbelts form part of the receiving environment.

In this area, the Mangatainoka valley measures approximately 3-3.5km wide, is oriented roughly northeast- southwest and includes SH2 along its eastern edge. The Mangatainoka River meanders up an incised channel in the middle and the Wairarapa train line to Pahiatua runs adjacent the site along its western edge at the base of an unnamed range of hills that separates the Mangatainoka and Mangahao valleys. The rural land is dominated by pasture, grazing stock, interspersed with established shelter trees and amenity planting around scattered dwellings.

Tutaekara Road is a busy connector road, that crosses the valley with a traffic count of 1415vpd[18]. It provides an important link for the residents within Mangahoa River valley and the village of Marima to SH2 and linking to Pahiatua. Mangamaire Road is a minor offshoot, (114vpd)[19] that runs parallel with the valley and SH2.

The Mangamaire substation, the reason the solar farm is proposed in this location, is prominently located at the intersection of Tutaekara and Mangamaire Roads. Refer to GA Sheets 13, and figures 4-6 below. High voltage overhead powerlines extend out from the substation south through both proposed sites on either side of Mangamaire Road and north towards Pahiatua. Overhead wires also extend southeast from this substation along the southern side of Tutaekara Road.

Substantial shelterbelts form part of the receiving environment and while generally absent on either of the application sites, to re-establish them in this area would be a permitted activity in this landscape[20].

The Wairarapa main rail line to Pahiatua runs along the western edge of the valley, however due to the flatness of the site and the distance most observers are away from the line, it is not generally visible when not in use.

[18] vehicle count August 2020
[19] vehicle count August 2018
[20] In the TDP, regulations for shelterbelts only relates to the potential shading of state highways that are not present in this location.

There is an active shallow quarry borrow pit set approximately 350m back from Mangamaire Road. A macrocarpa hedge around this excavation limits views of the quarry from the surrounding landscape.

Fig 4: View of Mangamaire Substation from Tutaekara Road adjacent the facility travelling west.

Fig 5: View of Mangamaire Substation from Tutaekara Road travelling east.

Fig 6: View of the facility on Tutaekara Road at the intersection with Mangamaire Road. The prominent facility extends across Mangamaire Road.

4.2 Description of the Site

The application is spread over two sites located adjacent to each other, on either side of Mangamaire Road. Existing land use over both sites is highly productive pasture grown for grazing by cattle. (refer GA Sheets 11 & 12.

Site A: on the northern side of Mangamaire Road, measures 48.86ha and is spread over 3 separate land titles. The farm site extends approximately 500-600m northwest from Mangamaire Road to the Wairarapa rail line along its north-western boundary, and approximately 900m north-east along Mangamaire Road. The northern extent of Site A ends approximately 500m south of the Substation site and the Tutaekara Road intersection.

The farm site envelopes a dwelling site on Mangamaire Road, which occupies a 1.2ha site. This site contains a single-story farmhouse dwelling that is owned by the applicant. Substantial shelter planting lines the southern boundary of this property.

Internal to the site, the flat pastures are interrupted by a scattering of remnant shelterbelts, primarily macrocarpa trees, that remain in various locations and provide both vertical relief and contribute positive rural and natural character value to the site. A feature of this site are the views enjoyed of the hills that form an attractive backdrop to the site forming its western edge. Refer Fig 7&8 below.

Fig 7: View from Mangamaire Road adjacent Site A looking north towards the western hills that contain the site. Remnant macrocarpa trees create valuable vertical relief to the site, rural and natural character values for this landscape are high.

Fig 8: View from Mangamaire Road looking west towards the hills, rural and natural character values for this landscape are high.

Fig 9: *Established farm tracks provide access across and north south through the site and these have been retained and will provide access into and around the development site.*

Overhead powerlines track north-east south-west parallel to the road and approximately 175m back from the Mangamaire Road boundary.

Site B is spread over 3 titles, is 38.62ha in size. The site is south of the intersection of Tutaekara Road, along its northern boundary, and Mangamaire Road along its western boundary. The sites southern boundary is an unnamed gravel public road that provides access to the interior of Site B area and also provides access to an existing quarry site at the southernmost corner of the site. A 1.5ha area of land central to the Tutaekara Road boundary is excluded from the application site.

The eastern boundary of the development site is marked by an existing farm track that is above a minor terrace of the Mangatainoka River and set back approximately 180-200m from the riverbed itself. The riverbed is approximately 4-5m below the level of the site.

The site is a series of flat paddocks currently grazed by cattle that has been partitioned into a number of reasonably large rectangular paddocks each measuring around 1.5ha.

The sites vegetation is highly modified due to historic farm practices. Site B is largely devoid of any visible trees with the exception of two remnant macrocarpa windbreaks, a 180m along Mangamaire Road in the north-western corner and about 130m lining an existing farm track central to the site.

Above ground powerline enters the site at the north western corner nearest the Mangamaire Substation and then tracks south following Mangamaire Road approximately 95m into the site.

4.3 Landscape Values of the Receiving Environment

The existing landscape and visual amenity values form the baseline, along with the policy provisions, for an assessment of landscape effects. Current practise reinforced by the recent Draft Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines, has reordered the Amended Pigeon Bay Criteria into three broad categories of landscape attributes focussing on:

Physical

*"**Physical*** [21] *means both the natural and human-derived features, and the interaction of natural and human processes over time."* [22] Typical physical factors include geological, ecological, and biological elements within the landscape.

The receiving environment is a flat expansive landscape contributing high overall rural character values to the surrounding landscape with associated values of openness, expansiveness and huge sky, lack of built form, natural character and legibility. Due to the general absence of structures and the flat and monocultural expanse of the receiving landscape, the absorption capacity[23] of this landscape for uncharacteristic development is **very low**.

The main natural feature of this site is the Mangatainoka River an order 5 river with a flooded width of 20-25m. The river environment has high natural character values however the vegetation lining the river in this vicinity is heavily modified and now dominated by invasive willow and other weed species. Views out from the course of the river are limited by the riparian vegetation.

Fig 10: Mangatainoka River as viewed from the Tutaekara Road bridge. The stream bed is incised 4-5m below the level of the surrounding flood plain.

A number of buildings are scattered around this general area including the Mangamaire Substation and associated electrical infrastructure.

The Mangamaire Substation is a prominent structure within the local landscape that adversely impacts on current amenity values. However, the facilities limited visual catchment due to the flatness of the surrounding landscape and the impact of vegetation screening, means the adverse impact only extends to 3-400m east and south with any visibility north and west largely screened.

[21] 'Physical' means both natural and human-derived features, whereas 'biophysical' is potentially problematic if it is taken to mean only the natural aspects of the landscape. 'Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines'. [Final Draft subject to final editing, graphic design, illustrations, approved by Tuia Pito Ora/NZILA 5 May 2021]. Page 35.

[22] 'Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines'. [Final Draft subject to final editing, graphic design, illustrations, approved by Tuia Pito Ora/NZILA 5 May 2021]. Page 35.

[23] [23] "*Visual absorption capacity*" is typically defined as the landscape's ability to absorb physical changes without transformation or change to its visual character and qualities. Such a consideration evaluates a landscape based on two groups of factors: The first includes physical changes that are caused by development features such as earthworks, buildings and structures, linear development (pipelines, roads etc.), outdoor recreation facilities and forest plantations, with the second factor concerned with vegetative characteristics of the area, the potential for vegetation renewal and the visual exposure of the area to observers.

There are 8 dwellings and two milking sheds within or overlooking the two sites with an additional 13 dwellings making up the Mangamaire settlement. Houses that are long standing in this environment are identifiable by the protective measures that have been undertaken through the use of planting and shelterbelts, to address the wind in this area. Refer to Figures 11 and 12.

Fig 11: Taree Farm 431 Mangamaire Road with planting to provide protection from wind.

Fig 12: 451 Mangamaire Road with typical shelter planting to mitigate the impact of wind in this area.

The vegetation cover over the two sites is highly modified with no remnant indigenous vegetation visible. Sporadic macrocarpa trees and remnant shelterbelts contribute rural and natural character values to Site A but are noticeably absent within Site B. As a result, the biophysical values of the receiving environment are highly modified. However, the productivity of the soils are high and aesthetic values of the site are high and regionally typical.

Due to the flatness of the landscape, views of either the main Mangatainoka River or the minor Mangamaire Stream are only possible when immediately adjacent them.

Fig 13: Wetland located adjacent to northern corner of Site A

Beyond the northern corner of Site A, there is a remnant wetland that appears to have been separated from its source, the Mangamaire Stream, by the construction of Doughertys Road and the Wairarapa Line. The boundary and fence for Site A will run immediately adjacent this natural feature. The quality and ecological condition of the wetland falls outside the scope of this assessment.

Perceptual

***"Perceptual** means both sensory experience and interpretation. Sensory appreciation typically occurs simultaneously with interpretation, knowledge, and memory."* [24] Typical perceptual factors relate to experiential and aesthetic qualities such as naturalness, visual coherence, legibility as well as transient aspects.

The hills on either side that contain the valley, the flat open expanse around the sites, the pasture, the grazing animals and remnant macrocarpa plantings combine to create an attractive, productive, aesthetically high and locally typical working rural landscape for this area.

The absence of any distinct relief and/or patterns of vegetation within the landscape lends a high level of legibility to this landscape. The dominance of pasture and the absence of many visual interruptions, creates a monocultural impression. Many of the trees still standing appear to have been historic shelterbelt plantings that have now grown beyond that function due to the lack of ongoing management.

While development is limited, established dwellings provides an indication of the weather conditions experienced locally. Older houses are typically enveloped by extensive planting to mitigate the impact of wind in this environment, with newer houses showing new plantings to this end.

The settlement of Mangamaire (estimated to be around 13 houses) is a loose cluster of houses in the vicinity of a large and prominent electricity substation, a feature of this location.

[24] 'Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines'. [Final Draft subject to final editing, graphic design, illustrations, approved by Tuia Pito Ora/NZILA 5 May 2021]. Page 35

This working landscape is not unique to this area, it is a relatively generic rural landscape commonly experienced in this part of the Wairarapa. Nevertheless, the expansive views across the flat pastures to the surrounding hills conveys a visually coherent outlook that while typical, has high amenity and aesthetic value.

Transient values are associated with weather systems and light effects, which at times of the day / year emphasise the rolling landforms and distant hills. Deciduous vegetation within the Mangatainoka River provides some seasonal interest however due to the incised nature of the river effects are not prominent.

Associative

***"Associative** means the intangible things that influence how places are perceived – such as history, identity, customs, laws, narratives, creation stories, and activities specifically associated with a landscape."* [25] Typical Associative factors includes cultural (tangata whenua) and historic values as well as shared and recognised attributes such as recreational opportunities.

There are no cultural or historic sites of significance within the receiving environment listed in the District Plan or obvious from site investigations. From discussions with representatives of Ngati Kahungunu we are advised that while there are wahi tapu in the area, the proposal will not impact adversely on them.

The Mangatainoka River is a well-known recreational river well known for its trout fishing. It is unknown whether the stretch of river that runs adjacent Site B is a location popular with fishers.

[25] 'Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines'. [Final Draft subject to final editing, graphic design, illustrations, approved by Tuia Pito Ora/NZILA 5 May 2021]. Page 35

5.0 Assessment of Landscape and Visual Effects

5.1 Potential Issues

The proposal will result in a 59.32ha ha solar farm broken up into 12 clusters of varying sizes and spread over two sites. Each cluster consists of long lines of solar panels running north to south across the paddocks on either side of Mangamaire Road, near its intersection with Tutaekara Road. The collective scale of the farms together will make the establishment of these farms a major intervention within this landscape.

Solar farms involve the use of solar rays for the generation of electricity, they also involve the use of fields of large receptor screens. With applications elsewhere in New Zealand, questions have been raised regarding the potential for glare to emanate from the farms and present as a landscape issue within the local environment. As PV modules are constructed to absorb as much solar irradiation as possible to increase their efficiency, their reflectivity is very low compared to many other common materials such as water or vegetation. To address this a specific Glint/Glare assessment report was commissioned for this site through Vector Powersmart and forms part of the overall application.

The solar farm will consist of a significant amount of 3-D built forms (at times 4.45m high) located within a flat landscape which is considered to have a very low absorption capacity. The solar farms will occupy the two sites and impact on the open rural landscape values of this area by introducing built form into this landscape. This will affect perceived natural character values for this landscape and collectively the amenity values provided by the longer views currently enjoyed of the surrounding landscape of the rolling hill landscape that form a backdrop to this area.

Access into and out of the farm sites needs to be controlled and to this end a 1.8m high perimeter fence is to be constructed. A tall fence in this environment has the potential of establishing a compound or industrial character to this unbuilt and open rural environment.

In this assessment, consideration is given to the fact that because solar farms are a relatively new construct within Aotearoa, when seen briefly or in passing, the proposal may be seen as a point of interest and even considered by some as a positive outcome and beneficial because solar farms provide a renewable source of energy.

Equally applicable is the fact that the visual impact of a development within a landscape is influenced by the familiarity of that land use to that area[26]. As a certain land use becomes established or more common in a landscape, its novelty reduces and with that, its memorability and/or prominence.

When established and grazed by sheep, the visual outcome could be considered both rural and industrial. Rural due to the productive aspects of the land use and its isolated location and industrial due to the structures that will tend to dominate the site. This dichotomy is reflected in the fact that 6 of the 8 houses considered to be impacted on by the development will be supporting the application with affected party agreements.

[26] The fact that solar farms of this type are unfamiliar in this environment will make the structures more noticeable and memorable which in turn will increase their prominence. As familiarity of the structures increase, the rural aspects and productivity values associated with the land use, will be restored to some degree.

5.2 Assessment of Visibility and Visual Effects

"*Visual effects are a subset of landscape effects. They are consequences of change on landscape values as experienced in views. They are one technique to understand landscape effects.*"[27]

The following visual assessment has been undertaken from a range of viewpoint locations within the receiving environment, which represent the visual effects that may arise from the proposed solar farms. The viewpoints were chosen from a desk stop study and confirmed after site observations.

The flatness of the surrounding landscape in combination with the vegetation that lines the Mangatainoka River, the hills that line the western boundary, the slight contours that one experiences when travelling towards the sites from the south and remnant shelter belts experienced when travelling towards the site from the north, means the **visual catchment** of the site is limited to the immediate surroundings of the two sites; between the foot hills and Mangatainoka River bridge west to east and from approximately 700m north of Tutaekara Road to approximately 1.6km south along Mangamaire Road.

Within this limited area, the two sites are **highly visible** from both public roads when within 2-300m of a farm site. The new sites will be variously visible from the 8 residential dwellings proximate to or overlooking the proposed sites. While this is recognised, a specific assessment is not required from each site as affected party agreements have been signed. The proposal will also be seen from elevated paddocks of the farm west of the two sites, importantly there are no house sites on this land and in a rural environment like this, more emphasis is placed on views from dwellings rather than paddocks, this is because they are frequented daily whereas some parts of rural properties are infrequently used.

The sites will also be partially visible from some sites within the Mangamaire settlement and Site A and to a lesser extent Site B will be visible from trains using the Wairarapa Line.

The anticipated impacts of what is proposed on the different locations is considered in detail under the following headings:

- **<u>Public Roads: Mangamaire and Tutaekara Roads</u>**

The solar farms will be visible from both Tutaekara and Mangamaire Road.

When travelling west along **Tutaekara Road,** the busiest of the two and a popular connecter road connecting the Mangahao River valley to the town of Pahiatua. Site B will become visible on crossing the Mangatainoka River bridge, refer to Viewpoint Location Photographs 1 - 3 and Figures 4 and 6). Initially the existing farmhouse and the associated activities will provide some screening, however Site B will be prominent due to its 'rural industrial'[28] characteristics and vertical scale in this flat landscape. Due to the angled nature of the view and the orientation of the rows, at a distance of between 170-220m when the tables are angled east or west, the foreground will provide some screening and the visual impact is likely to be akin to an expanse of glass houses[29].

[27] 'Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines'. [Final Draft subject to final editing, graphic design, illustrations, approved by Tuia Pito Ora/NZILA 5 May 2021]. Page 61.

[28] The Tararua District plan defines **Rural industry** as an "*industry which serves or supports the rural area or has some specific feature which justifies a rural location, and includes, but is not limited to, operations for the processing or packing of agricultural or horticultural produce or by-products, stock and saleyards, and rural transporting and agricultural contractor's yards*."

[29] While fields of glass houses are considered 'rural' in some districts, this type of rural industrial land use is not familiar in this area and will be considered 'different' and therefore noticeable. The impact is not necessarily adverse.

On passing the farmhouse connected to the parent property, (GA Viewpoint 2) Site B will be immediately adjacent the road and prominent for a distance of around 380m, up until the road's intersection with Mangamaire Road.

The table rows will be angled at around 60° to the road and at 4.3m high, they will generally block the long views southwest over the site from the road. Due to the flat nature of the site and the impact of existing shelter belts, views south from Tutaekara Road do not extend far beyond the southern end of the site. In the middle of the day when the solar panels are parallel to the ground, internal views of the site, the pasture and grazing animals will be visible under the solar tables. Due to the angle of the solar tables to the road, consideration has been given to the potential for glint or glare from the structures to create an affect. **Appendix A**[30] is a technical report that assesses the potential impact on Tutaekara Road and concludes that a "*green or yellow glare is received between the hours of 7pm to 8pm during mid-December at 1 minute per day for a total of 2 minutes annually*"[31]. The hazard plot graph for Tutaekara Road shows the glare to be very close to green (low potential for after-image)[32].

On approaching and reaching the intersection with Mangamaire Road, refer to Viewpoint Location Photographs 4, 7, and 8) the Mangamaire Substation becomes prominent and dominates this landscape and its amenity values. On passing the substation, the road passes a scattering of buildings that make up the Mangamaire settlement before entering the hills to the west.

When travelling east, the sites are first partially visible at a distance of between 6-700m between houses and remnant shelterbelts refer to Viewpoint Location Photographs 5 and 6). Again, the rural industrial quality of the structures, akin to glasshouses from a distance, will be noticeable as points of interest, but the new structures will not dominate.

Once the road passes the substation and related infrastructure, views of the solar tables will be prominent, however unlike when travelling west, due to the angles of the rows, travelling east will offer longer views down the various rows where the pastoral land use will be more visible between and under the rows. The nature of the views will vary as the solar tables more and adjust through the day.

From **Mangamaire Road,** both solar farms will be visible at some point as they will be located adjacent to and on both sides of the road. A solar farm will be on either one or other side of the road for 1.6km and on both sides of the road for 165m, refer to Viewpoint Location Photographs 9 - 12. Site A will first become visible 1.8km south of the intersection with Tutaekara Road.

The solar tables will be oriented north-south to maximise their exposure to the sun. This orientation will mean that the table rows will be slanted at approximately 30° to the road. As with Site B, such an angled view will mean that views across the site of the rolling hills west of the site will experience maximum obstruction. When horizontal, views will be possible of grazing animals under the solar tables. The glare assessment for Mangamaire Road concluded that "*yellow glare is received between the hours of 6pm to 8pm through the months of October to the start of March at less than 15 minutes per day for a total of 1,448 minutes"*[33] The graphs on pg10 of the reports appendices indicate that any potential glare is both limited in time but also limited in where this may be experienced.

The landscape and amenity values evident locally are aesthetically high but are not regionally unique. The visual catchment of what is proposed is restricted locally, electricity generation currently forms a

[30] Solar Bay – Tararua, Glint/Glare Assessment Solar Bay, Mangamaire Road, Tararua, New Zealand Date of issue: 09/05/2022
[31] Ibid pg 7 bullet point 4
[32] Ibid Appendix I pg10
[33] Ibid pg 7 bullet point 3

prominent component within the local landscape and the amenity of the surrounding landscape, while high, is of a working rural landscape.

The surrounding landscape is flat, visually uniform and generally devoid of any screening vegetation with many of the existing trees internal to Site A needing to be removed to accommodate the layout of the solar farm. This lessens the absorption capacity of this landscape to what is essentially a change of land use.

Introducing built structures into this landscape will reduce the rural character values of the site by removing open pasture and introducing a built form and landscape pattern that does not currently exist.

Due to the height of the structures, the flatness of the surrounding landscape and the proximity they have to the road boundaries, the structures will partly obscure views over a rural outlook including beyond the sites. It is noted however that the screening of, or interruption to, long views can also occur with shelterbelts as a permitted activity and is established as a common feature in a rural landscape.

The proposed development will inevitably change the conventional or familiar rural character values of the local area. However, the rural aspects of the land use, in particular the retention of the pasture for ongoing grazing and therefore the traditional productivity values will remain recognisable and rural character values will be maintained albeit to a slightly lesser degree and although not a traditional rural land use the solar farm can be considered a productive land use in the sense of capturing the sun's resource and converting it into power.

The use of a 1.8m high security fencing around both sites may appear anomalous and tend to reinforce a more industrial character. To mitigate this aspect, it is proposed to use the more traditional deer fencing with 'hot wires' to achieve the desired outcome. It is also anticipated that relevant signage would be required to be attached to any perimeter fencing, although at this stage the type and/or extent of signage is not known.

To soften views of the solar farm from parts Tutaekara Road, that would not interfere with the overhead powerlines along the road boundary and without completely obscuring a sense of openness, it is proposed to establish a native flax 'shelterbelt' similar to the one that exists on Mangamaire Road and shown in Figure 9.

Fig 14: Phormium tenax used as a shelterbelt on Mangamaire Road provides screening between 2.5-3.0m high.

The proposed flax planting will afford screening into the solar farm sites reducing visual effects to partial glimpses of the rotating panels at the beginning and end of each day when the panels reach their maximum height. For the bulk of the day the panels will be tilted and / or horizontal and screened by the flax planting. While the solar farm structures will be unfamiliar in this landscape, and may initially attract attention as the flax shelter planting establishes (it is estimated that *Phormium tenax* could reach a height of 2m 4-5years after planting) effects will reduce to **moderate low-low**.

- **Neighbouring Residences:**

There are eight residences that are considered to be impacted on by the proposal and to date six of the eight owners have provided affected party agreements to the application, as have the tenants of the seventh house.

A dwelling is located on an elevated site, 2km north from Site A. Onsite observations indicate that due to the screening effect of the shelter belts and other vegetation planted south of this cluster of buildings, views of either farm will not be possible. Affected party agreements have been received from 154a[34], 154 and 126 Tutaekara Road and from 346, 500 and 562 Mangamaire Road and the tenants occupying 431 Mangamaire Road.

Affected party approval has not been received from the owners of 391, 451 and 431 Mangamaire Road, or the registered owners of 154a Tutaekara Road.

Dealing with them in turn;

391 Mangamaire Road –

[34] The ownership of 154a is unusual whereby the written approval has been provided by the current residents, who are family but they are not the registered owners of the property.

This house is owned by the adjacent quarry and is used to house workers. Discussions have been had with the tenants who have voiced support for the application.

The site is located opposite from Site A. Limited vegetation currently exists around this dwelling which means that views of new structures will be unimpeded.

As the solar tables rotate with the time of day, views from the direction of this house will change from being a wall of visible panels when facing east or west to being more a 'table' like structure when the views under of grazed paddock will be possible.

Specific testing for 'glint and glare' from this location found "*yellow glare is received between the hours of 7pm to 8pm during mid-December at 1 minute for a total of 1 minute annually*."[35]

Due to the transient nature of the occupants of this house, I consider the sensitivity of the occupants to affects on views to be **low**. The effect of the solar structures on Site A will be aesthetic only, and I do not consider views of the solar structures to be inherently adverse. For this reason I consider the changes anticipated from the proposal to be **low**.

451 Mangamaire Road – Chesterman House

This house is owned by the Chesterman family and used to house workers on their farm. Discussions have been had with the tenants who support the application.

The site is located opposite from Site A. Thick screen planting to address the windy conditions has been established along the road boundary which will restrict all possible westerly views from the house. Due to existing shelterbelt planting, views of Site B will not be possible from this location.

As the solar tables rotate with the time of day, views from the direction of this house will change from being a wall of visible panels when facing east or west to being more a 'table' like structure when the views under of grazed paddock will be possible.

Specifically testing for 'glint and glare' from this location the report found "*yellow glare is received between the hours of 7pm to 8pm during mid-December at 1 minute for a total of 1 minute annually*."[36]

Due to the screening currently in place, the impact of the proposal on views from the house will be **low**.

[35] Ibid pg 7 bullet point 1
[36] Ibid pg 7 bullet point 1

431 Mangamaire Road (Taree Farm) – Chesterman House

This house is also owned by the Chesterman family and is located opposite Site A across Mangamaire Road. The house appears to have a well-tended established garden of high amenity along the road boundary. While more detailed and tended than others this planting will also screen most of the views possible looking west from this location. Due to some gaps in the planting, views of Site A from the house will be possible.

As with #451, views of the solar tables will vary through the day as they rotate. Due to the gaps that exist within the screen planting around this house, some views of the new structures will be possible until such time as shelterbelt planting is established. Once established, views of the structures will be possible when they are at their highest facing east or west.

The glint and glare report commissioned specifically considered the potential impact that may occur on these two specific sites. Their findings were almost non-existent, estimating 1-2min annually between the hours of 7 and 8pm in mid-December.[37]

The solar structures and related security fence will impact on amenity by limiting westerly views and rural character by impacting on open space values. Considering that the establishment of shelterbelts in this landscape is a permitted baseline outcome, when comparing the losses with what can be undertaken as of right, the impact from this house will be **moderate** gradually reducing to **low** as the shelterbelts establish and views of the new farms diminish.

[37] Ibid pg 7 bullet point 2

154A Tutaekara Road:

The house at 154A Tutaekara Road is visually separated from Site B by on-site vegetation. The house will not be impacted on by glint or glare stemming from the new structures.

The current residents of this property have expressed support for the proposal. However while they have a familial connection with the owners they are not the registered owners of this property.

Due to existing onsite vegetation, the development on Site B will be in full view when leaving or approaching the property only. The perceived impact that this will have on residents will be influenced by their overall attitude they have to the development as a whole.

The site is located to the south of this property and so is not in any primary view. Due to the support that they have expressed for the application and the screening currently in place, the impact of the proposal on views from the house will be **low**.

The Wairarapa Rail line runs up the western side of Site A for a distance of 620m before passing Mangamaire settlement and crossing over Tutaekara Road. Due to the fact that there is no passenger traffic along this line, the visual impact of the solar farms on users of this rail line are not considered to be of importance and so do not get further consideration as part of this assessment.

Private working farm(s) occupies the rolling hills to the west of the rail line that includes up to six titles. While farm tracks are visible, there are no dwellings that occupy elevated sites immediately adjacent to and overlooking the site. When on this land one would enjoy expansive views of Site A with Site B located in the background. From this elevated location and due to the scale of the farms, the solar tables will be prominent in the views when looking towards the east. As an elevated view the farms will occupy the foreground and project a rural working landscape with a particular pattern and aesthetic. The distance any observer would be from the two farms would mean that the more industrial detail of new structures would not be noticeable.

The adverse impact of such a view on the wider views enjoyed of the surrounding expansive valley landscape would be **moderate-low.**

Fig 15: Shows an elevated view of a similar solar farm located within the Marlborough landscape. While prominent, the elevated view allows other rural aspects of the landscape to be visible.

Two dwellings are located further southwest of the site at #'s 465 and 321 Dougherty's Road. Both these dwellings are separated by distance (1.25 and 2.25kms respectively) from the closest point of Site A. From observations on google earth, both sites enjoy slightly elevated locations.

It is my assessment that due to the separation distance and the presence of a number of remnant shelterbelts that separates the house on #321 from Site A, while glimpses of site A may be feasible, they would be both very limited and at a distance and not prominent. The impact this would have on their amenity values would be **low**.

The house on 465 Dougherty's Road is approximately 1.25km from the nearest point on Site A. As with #321, remnant shelterbelts will provide some visual screening of the site.

Fig16: Illustration of the view corridors from #465 towards Site A.

Using aerial photographs and photographs taken on site, Fig 16 is an illustration of the viewing corridors through which observers at the house would potentially view Site A. While partially visible, I

would not consider the new structures to be prominent or dominant, they would be noticeable due to their scale and their general presence within this landscape. As illustrated the remnant shelterbelts would provide substantial screening. I would consider the impact of the application on these neighbours to be **moderate-low** to **low** and reducing as the facility becomes 'familiar'.

The **Mangatainoka River** runs to the east of Site B in an incised riverbed estimated to be 4-5m below the level of the subject pastures.

Fig 16: Mangatanoka River running east of Site B. The minor terraces and extent of riparian vegetation is evident in the Google image.

The degree to which this part of the river is used for fishing is unknown. Vegetation lining the banks of the river restrict most views into and out of the course of the river. Where gaps exist in this vegetation, offering potential views of the solar structures, the farm is set 170m back from the course of the river. This set back in combination with the depth of the incised river course, will screen the solar structures from users of the river and any impact on amenity or natural character values of the river will be **low**.

5.3 Assessment of Landscape Effects

"A landscape effect is a consequence of changes in a landscape's physical attributes on that landscape's values. Change is not an effect: landscapes change constantly. It is the implications of change on landscape values that is relevant." [38]

Neither the site nor the immediate areas have been identified as an ONL, nor is it adjacent to or near an ONL. The site is situated within the part of the Tararua district that is intensively farmed, containing farm dwellings, sheds and infrastructure that is associated both with pastoral farming practices and electricity generation. The local environment is not considered unique in any way and as such, there are no special or distinctive features that warrant special protection.

The proposal is located adjacent to a busy collector road primarily used by farmers connecting to Pahiatua, the commercial center of this district.

[38] 'Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines'. [Final Draft subject to final editing, graphic design, illustrations, approved by Tuia Pito Ora/NZILA 5 May 2021]. Page 61.

The site is also located close to a large substation, extended infrastructure and overhead transmission lines that are elements visible within this landscape. While these elements provide a context for the solar farms to be absorbed into the receiving environment the flatness of the site and the absence of visual screening provided by existing vegetation and/or shelterbelts, the **absorption capacity** of both sites is considered to be **low**. It is worthwhile mentioning that due to the co-location of this facility with the Mangamaire substation, no additional transmission towers or overhead power lines will be required.

The site is set approximately 170m back from the Mangatainoka River along its southeastern edge and will not impact on the discharge that currently enters the river from this site. The Mangamaire Stream to the north is separated from the site by the main rail line and so will not be impacted on by changes that occur within this site. There is a small area, measuring around 1.5ha, that appears to be a wetland. The area is not prominent, and its ecological condition is not known. Due to the separation that exists between the solar tables this is not anticipated to affect either run off from the site nor rainfall discharge to ground. It is also proposed to create a 10m separation from the wetland edge and this area will be revegetated using locally appropriate wetland buffer plantings. The consequence of this will be beneficial, with the filtering of any run off that currently occurs from the site improving the quality of the water flowing into the wetland.

The land is essentially flat, and this will not change. Only minor excavation will be required for the solar table foundations. Each row of solar tables will follow the topography within the site and in doing so, will reflect the existing contours.

The solar tables will sit 2.45m above ground level with a minimal footprint at ground level so a pasture cover will be maintained and will continue to be used for grazing stock. Due to this, the proposal will retain a rural land cover, land use and productivity. In essence, the productive use of the site will become more efficient as a multi layered, diverse land use. The dual productive use of the site at a local and national scale will positively utilise the sites landscape resource.

The two proposal sites will be dominated by long lines of solar panels as built components running north to south diagonally across the site. While this will impact locally on the existing open character of the site, the grazing of the pasture and therefore the traditional productivity of the site will continue. The solar table structures associated with this application, unlike regular buildings, will be seen as relatively ‘light’ structures that sit over top of the site, allowing distant views over the pasture covered site to remain.

The rural landscape character values of the sites, which are largely consistent with its surroundings, will be modified by the construction of the solar farms, due mainly to the amount of structure that will be located within the site and the need for a perimeter security fence and associated signage which will impact on local character values.

The character of the site will change from an open rural pastoral character to an unfamiliar predominantly rural utility or industrial character, albeit with an underlying pastoral use.

Part of the impact on local values will be the degree to which the structures and associated plantings block or impact on longer views enjoyed in the area. In a flat landscape such as this, shelterbelts are generally permitted and would form a baseline effect. The comparative adverse effect stemming from the application would be limited.

The glare assessment has indicated that Solar Farm A will not produce a glint-or-glare effect for the adjacent sites on Mangamaire Road and Solar Farm B was found to affect receptors at 451 and 431 Mangamaire Road in the evening hours only.

The visual catchment of the site is limited and longer views in a flat landscape such as this one, are susceptible to interference by shelterbelts which can be disregarded as a baseline impact in this environment.

The greatest impact would be the change in the local landscape that would result from the application with those most familiar with and invested in the local environment the most sensitive to any change. It is relevant that six of the eight landowners consider the proposal to be acceptable and/or appropriate for their environment.

At a wider scale, due to the limited visual catchment of the site but being located on a preferred route for many to Pahiatua, the impact of the development on rural and landscape values will initially be **moderate** and becoming **low** as familiarity with this land use increases and shelter plantings mature.

Due to the required scale of the facility, a rural location is ideal. Due to the need for the facility to be located adjacent to or close to a substation, this location is ideal. Due to the support that the application has received from local residents and the limited area that would be impacted on in any way by the facility, makes the chosen sites ideal. Due to the high productive values achieved by the site with both the generation of electricity and the ability that remains to graze animals, with the current demand and appetite for sustainable and renewable energy generation, this 'new' rural industry will become more and more related to and connected with rural areas and rural character. For the reasons stated above, the chosen location will become increasingly 'appropriate'[39].

The application will result in a high level of change to occur within this local landscape. The change will be noticeable and memorable. The development will physically alter or interfere with views and view shafts. The scale and expanse of the landscape, the scale and expanse of the new farms and the restricted visual catchment, means that any impact positive or negative will only be experienced locally, unlike wind farms, there will be no regional impact. Finally, views and viewshafts are susceptible to traditional rural land use and are not protected nor have any views within this landscape been identified as important or valued.

6.0 Conclusion

It is proposed to locate approximately 60ha solar farm divided into two parts (Site A and Site B), within an overall site of 87.47ha located proximate to Tutaekara and Mangamaire Roads 8km from Pahiatua. The solar farm will be located adjacent to the Mangamaire Substation.

Visual effects resulting from the proposed solar farm are summarised as:

- The two sites will be prominent when viewed from the public roads, Tutaekara and Mangamaire Roads, that serve this area. Due to the uncharacteristic nature of the new land use, the local prominence of the Mangamaire substation and the establishment of shelter planting along road reserve boundaries, initially the visual impact over a limited visual catchment will be noticeable due to the loss of open space, and the nature and scale of the land use change. However due to both the level of local support, as familiarity of the land use grows and shelter planting establishes, this will drop to **moderate-low** or even **low** within a 3 to 4 year period.

- The landscape that will emerge from this application is a 'new' landscape in terms of the New Zealand experience. This 'new' landscape will inevitably change the rural character of

[39] The use of 'appropriate' is in RMA terms stemming from the King Salmon decision where it was found that 'inappropriate' should be assessed by reference to what it is that is sought to be protected.

the existing landscape, but effects will be mitigated by the limited visual catchment of the two sites and the screening planting that will restrict views into both sites.

- 6 of the 8 local landowners and the tenant of another considered to be impacted to some degree by the development have to date signed affected party approval.

The proposal will not alter the landform, land cover or land use within the site to any significant degree and the underlying pastoral use of the site will remain. Retaining pastoral character within the site, will enable the solar farm to coexist within the wider rural landscape setting.

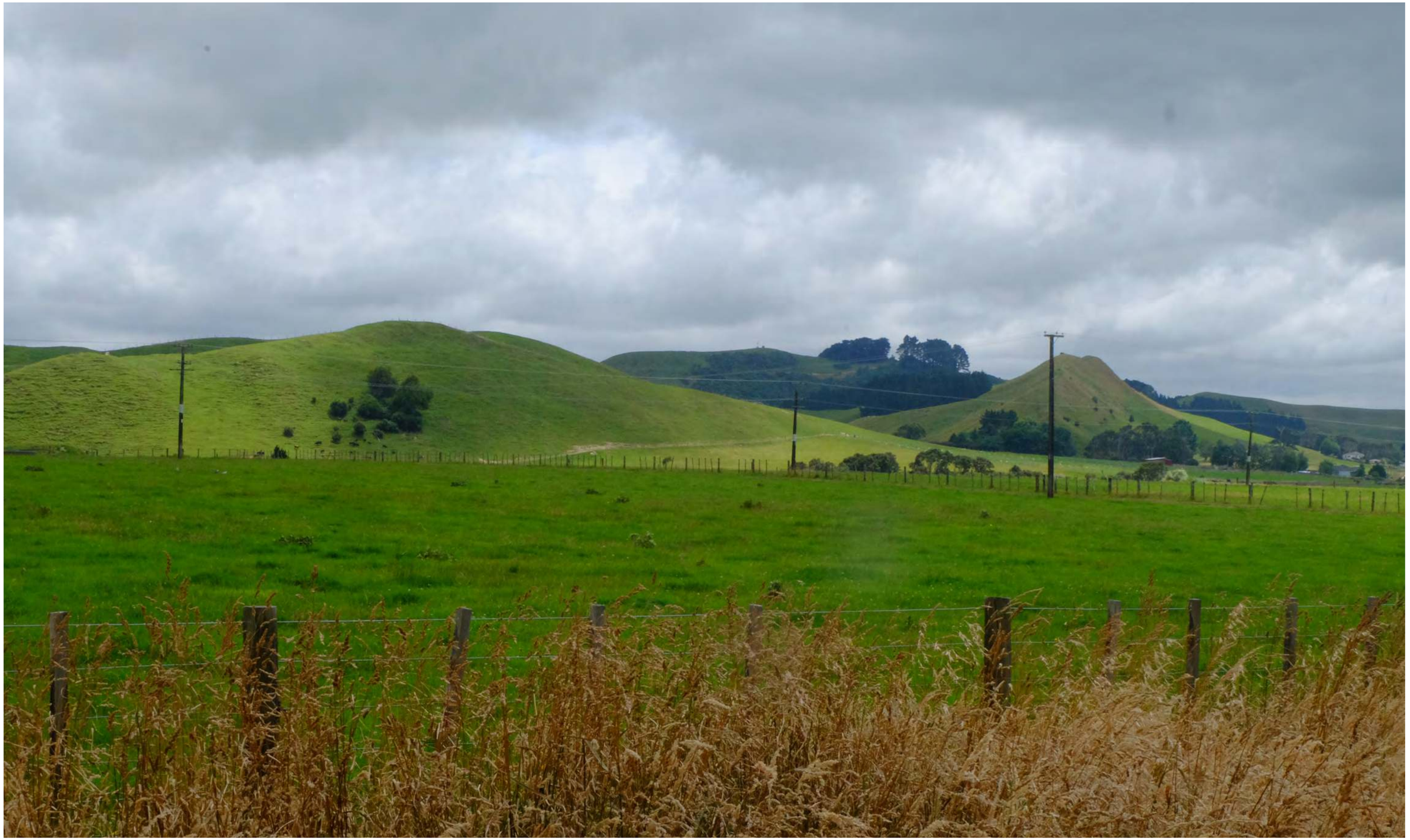
The solar farm will however alter the rural values of the site itself as well as its immediate neighbours as the character of the area changes from a rural pastoral character to a more utility/industrial character, importantly though the underlying pastoral/rural productivity and land use will remain. Overall, the effects of the solar farms on the landscape character and amenity values of the wider landscape will be **low – low-moderate.**

The objectives and policies of the Tararua District Plan seek to achieve a balance between rural and non- rural activities, to promote sustainable lands use, to enable the generation of renewable energy so long as adverse environmental effects can be avoided, remedied, or mitigated. The sites are demonstrably suitable with a limited visual catchment and a high level of local support. Productive use of the site's soils will be fully retained.

For the above reasons it is considered that the proposed solar farm will meet the overall intent of the relevant objectives and policies in the District Plan.

RMM

ROUGH MILNE MITCHELL
LANDSCAPE ARCHITECTS



Proposed Solar Farm - Mangamaire Road, Tararua
Graphic Attachment to Landscape Assessment Report

19 May 2022

Document Information

Project

Proposed Solar Farm - Mangamaire Rd, Tararua

Address

Mangamaire Rd, Tararua

Client

Solar Bay Ltd

Document

Graphic Attachment to Landscape Assessment Report

Status

For Resource Consent

Revision

1 For Resource Consent 19.05.2022

Prepared By

Rough Milne Mitchell Landscape Architects Ltd

Project Number: 22026

Author: Rory Langbridge

Peer Reviewed: Paul Smith

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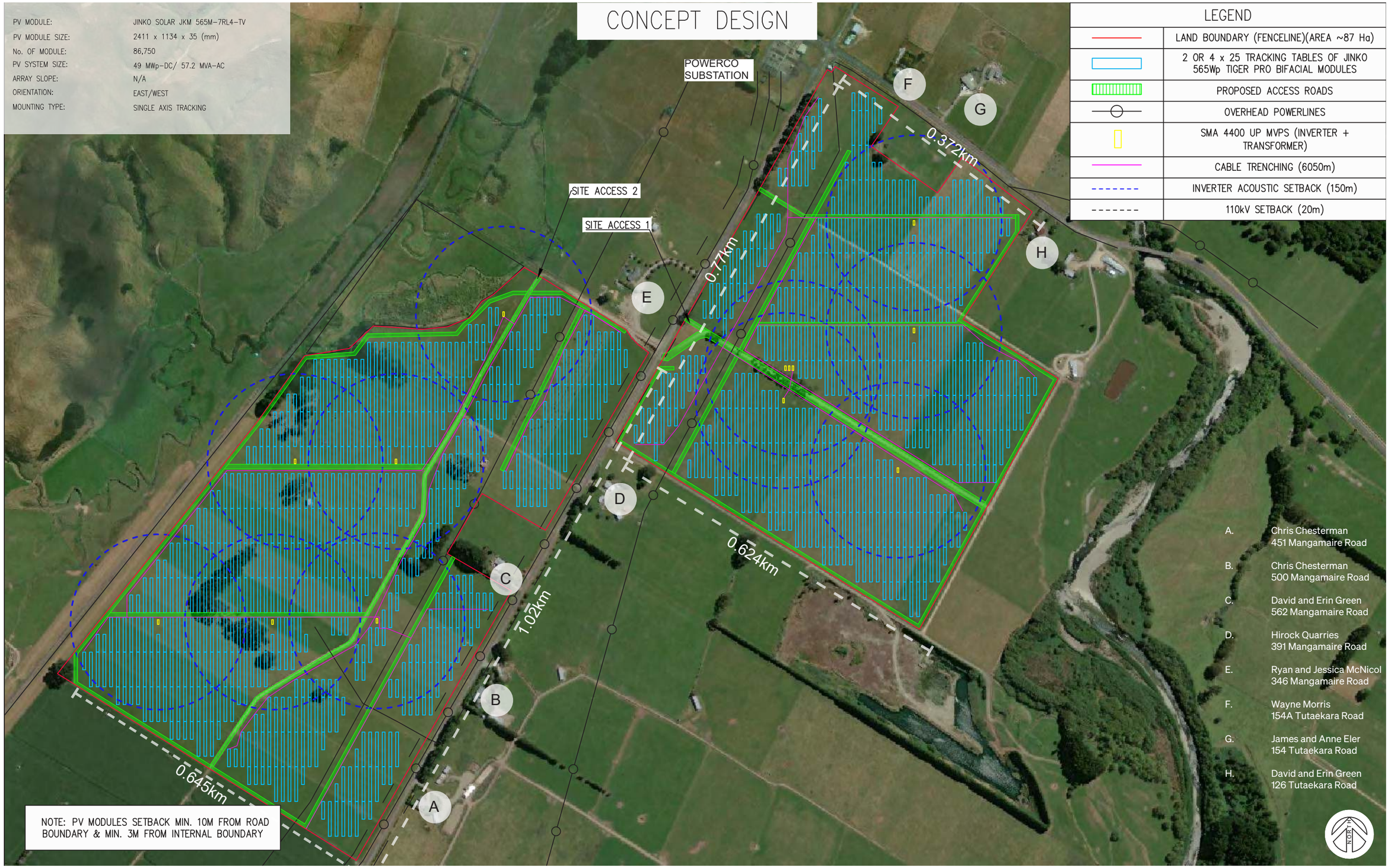
Contents

General Arrangement Plan



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Data Source: Vector Powersmart Indicative Proposal

Proposed Landscape Mitigation Plan

Legend

Proposed security fence.

Proposed staggered double row of *phormium tenax (*harakeke) to be planted at 2.0m centres within the first planting season following the granting of resource consent.

Wetland buffer plants, species and grade specied below, at an average density of 1.5m centres, and planted within the first planting season following the granting of resource consent.

Wetland Buffer Planting: 3140 m²

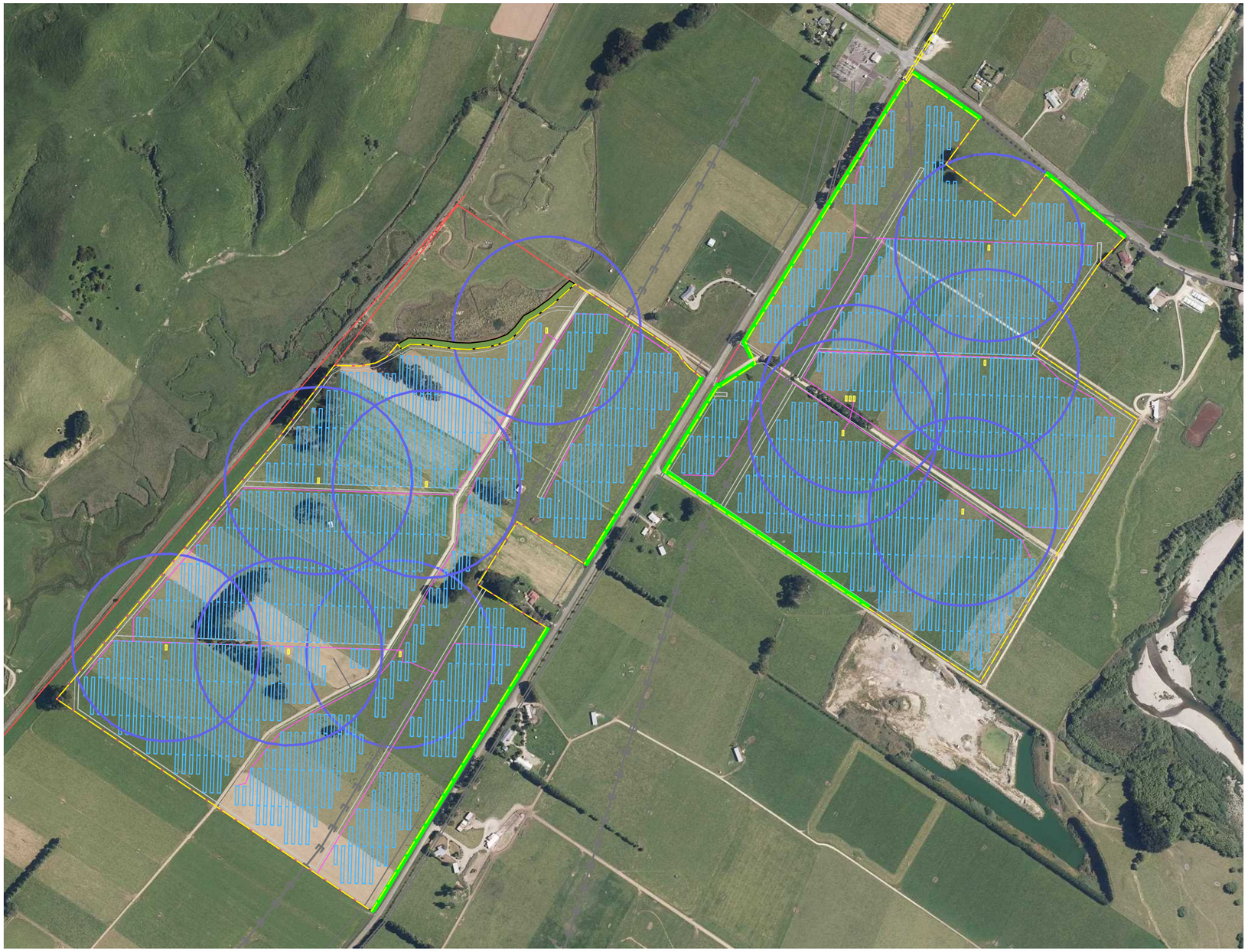
Botanical Name	*Common Name*	*Grade*	*No.*
Carex secta	Makura	RT	350
Austroderia richardii	Toetoe	RT	350
Juncus edgariae	Wiwi	RT	275
Juncus pallidus	Giant rush	RT	275
Phormium tenax	Harakeke	RT	150

General Notes

Plants will be sourced from a local nursery who specialises in the production of native species for revegetation.

The plants will be either open ground or Root Trainer (RT) stock.

Plants will be planted within the first winter season once the resource consent has been approved and the security fence erected.



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Data Source: Maps.grip.co.nz

Solar Panels Examplar Images

A Example of a similar Solar Farm in Marlborough
B Example of a similar Solar Farm in Kaitaia
C Example of a similar Solar Farm in Marlborough

A

B

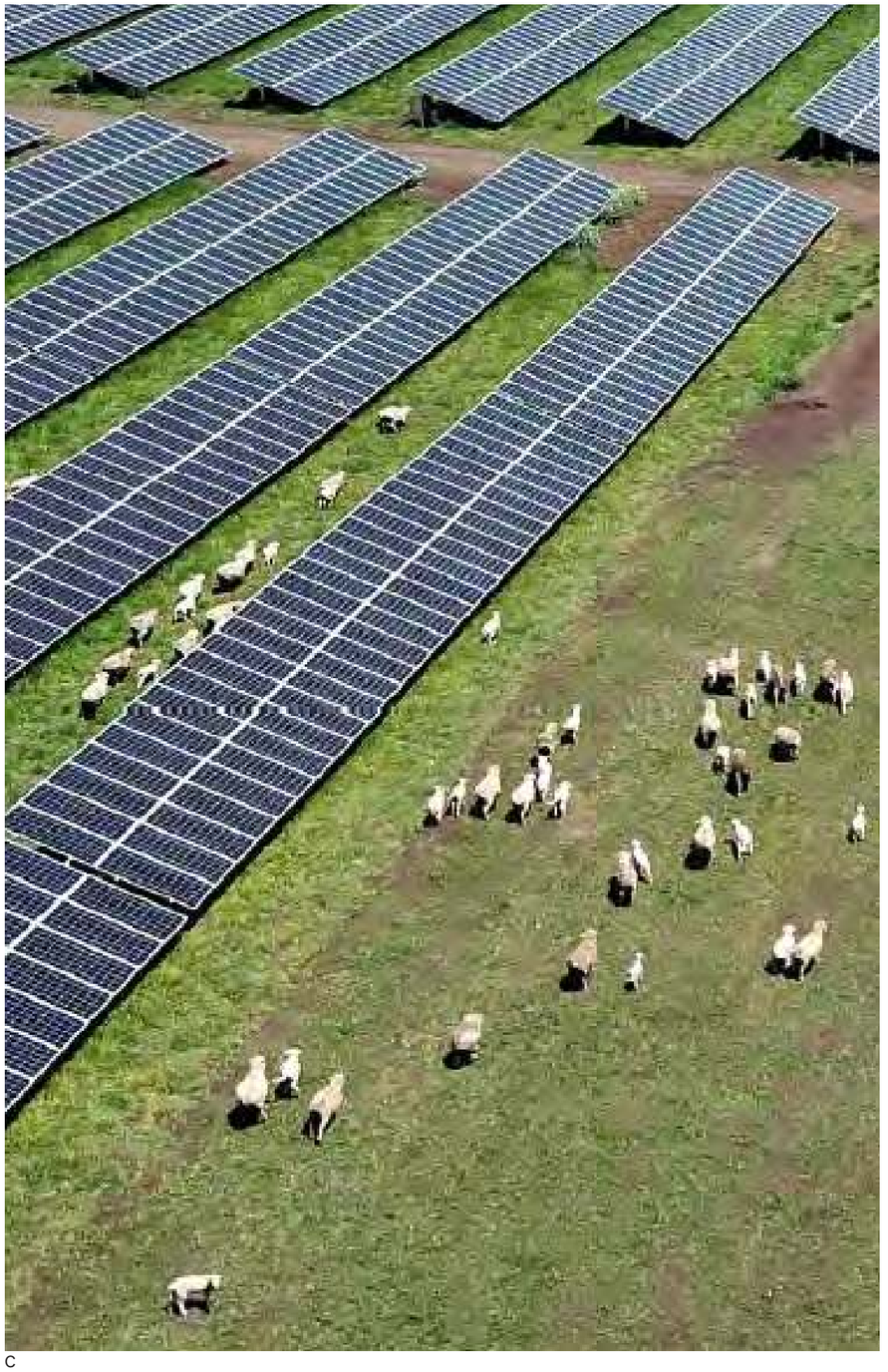
C

Solar Panels Examplar Images

A-C Example of a similar Solar Farm in Australia

A

B

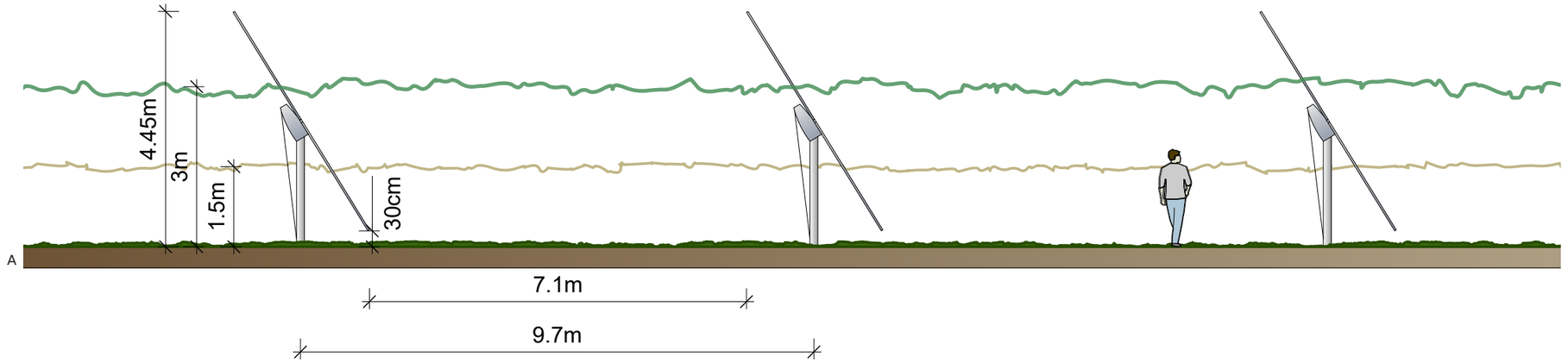


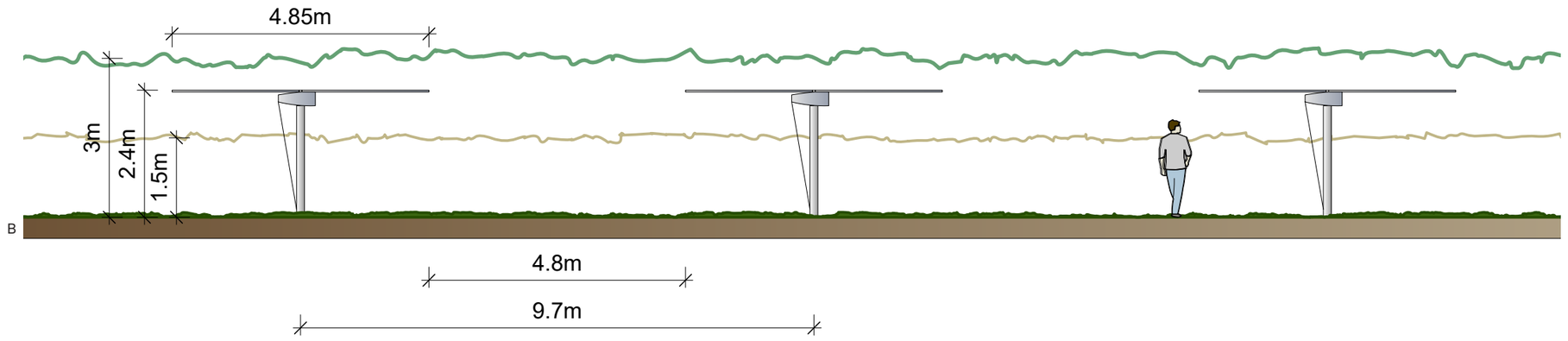
C

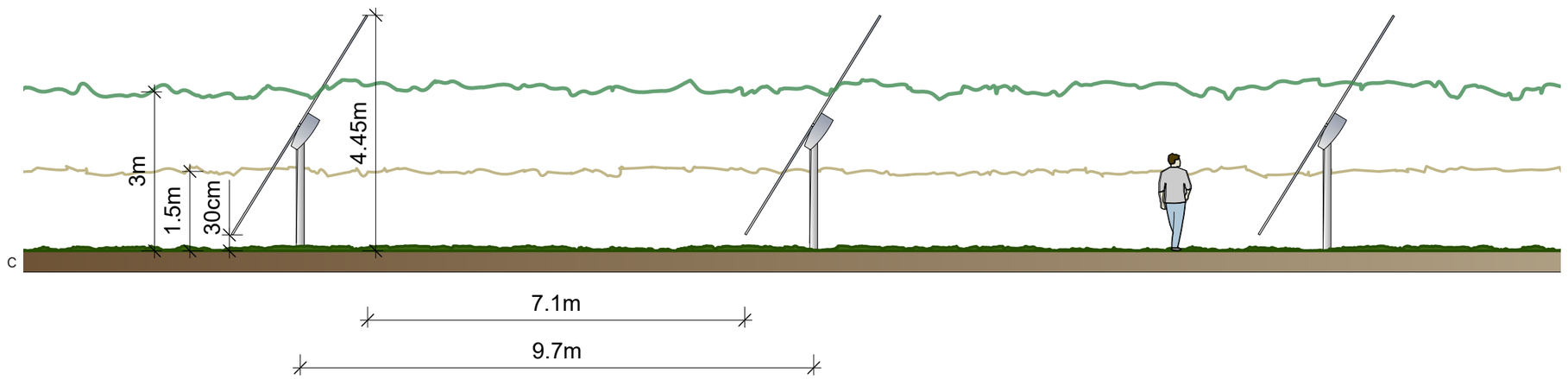
Indicative Cross Sections

A Morning - Solar Tables at thier Maximum East Facing Extent
B Midday - Solar Tables Parallel to the Ground
C Afternoon - Solar Tables at thier Maximum East Facing Extent

Green line represents native shrub vegetation at 3m tall.
Yellow line represents low shrub/flax vegetation at 1.5m tall.







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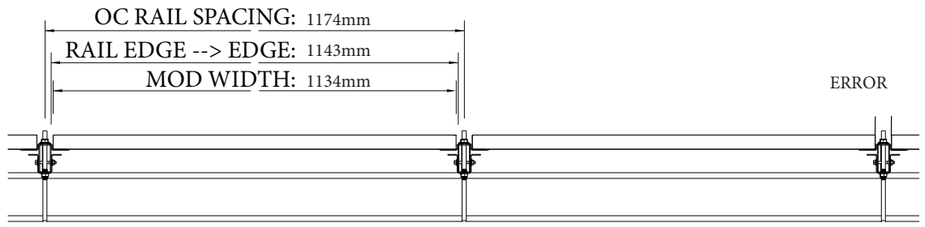
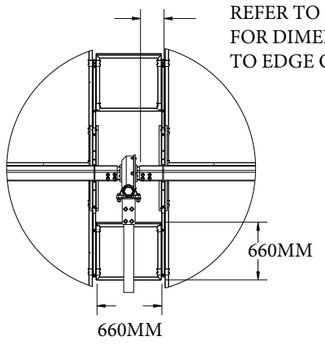
Mechanical Layout Information

MODULE RAIL SPACING



POWER MODULE DETAIL



REFER TO INSTALLATION MANUAL
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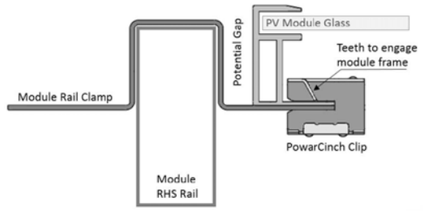
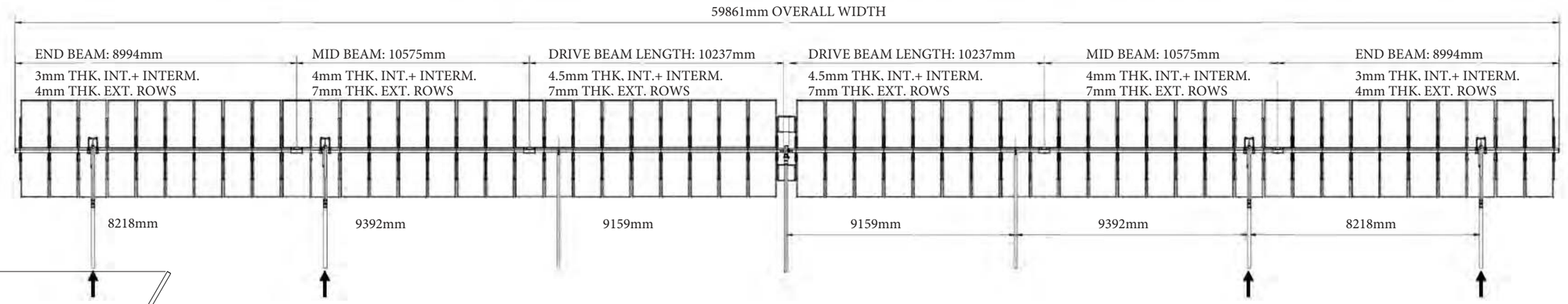
TO EDGE OF POWER MODULE RAIL

SECTION VIEW: MODULE RAIL - POWARCINCH

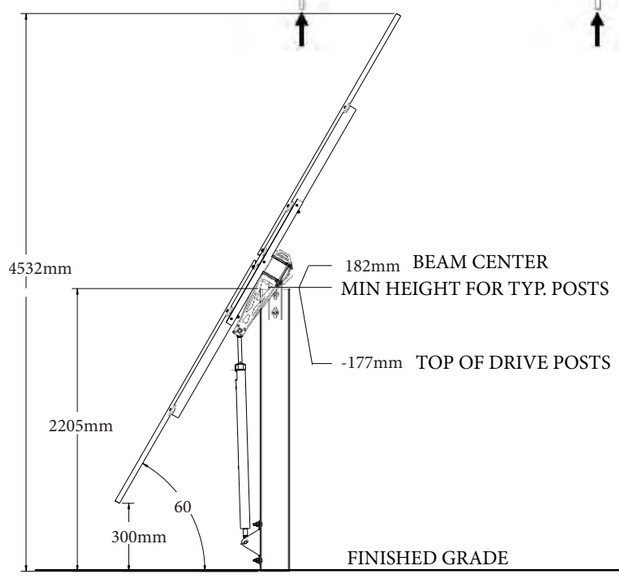


MECHANICAL LAYOUT

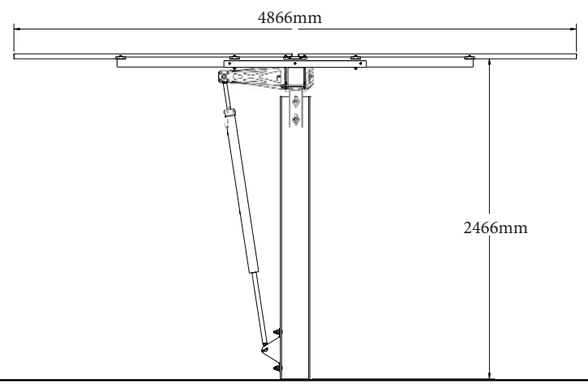


NOTE 9: DAMPER LOCATIONS

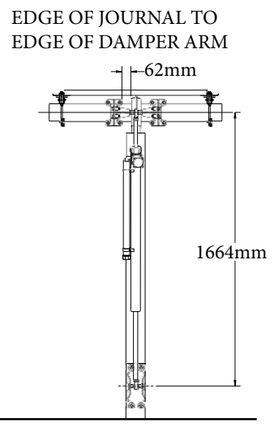
ELEVATION VIEWS



N-S ELEVATION @ MAX. TILT



N-S ELEVATION @ 0



E-W ELEVATION
DAMPER DETAIL

Not to Scale - To Fit Page

Data Source: Vector Powersmart Indicative Proposal

Solar Panel and Inverter Information

A Example of Solar Panels
B Mechanical Characteristics of Solar Panels
C Example of Inverter

TigerPro 7RL4-TV

565-585 Watt

BIFACIAL MODULE
TILING RIBBON (TR)

P-Type

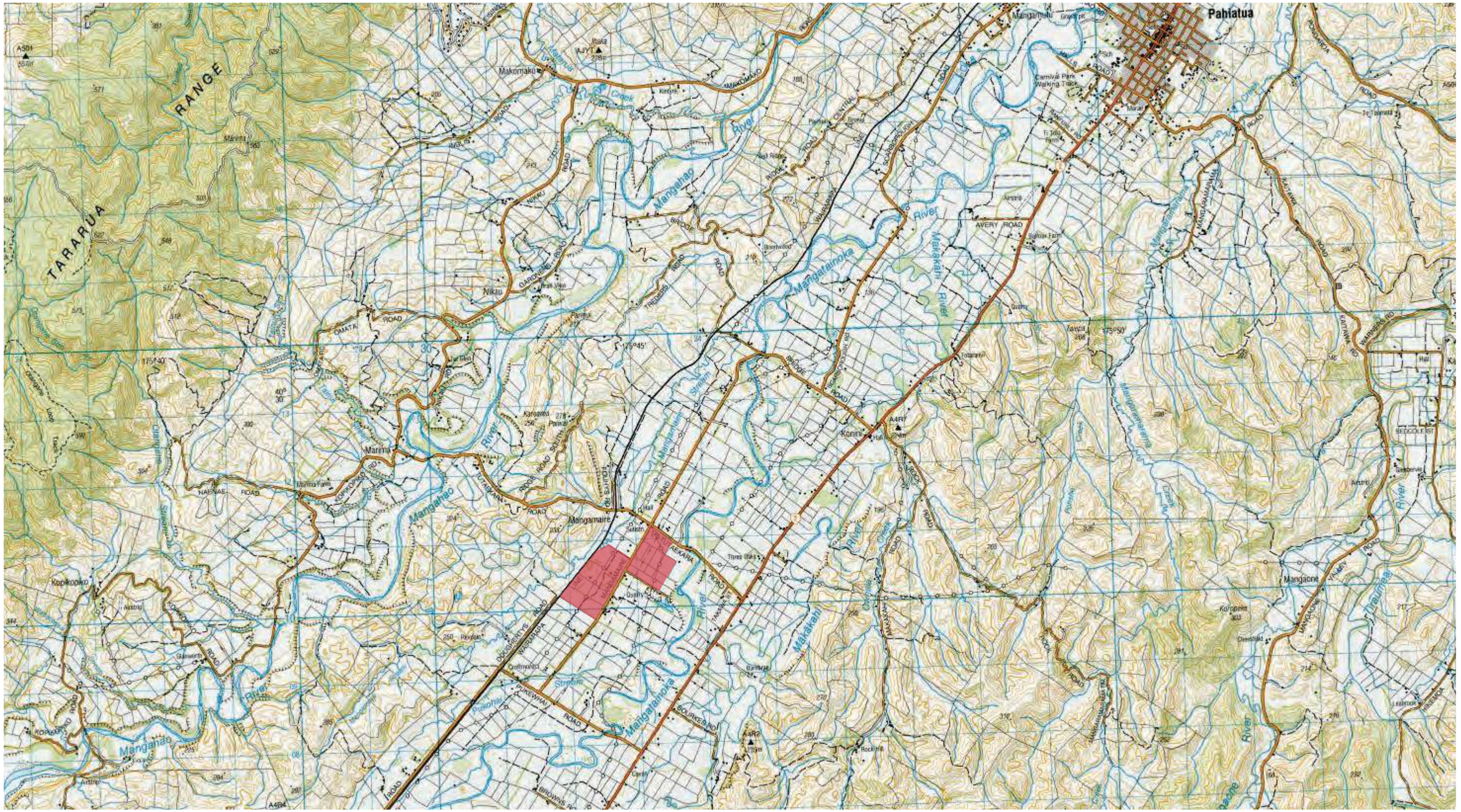
A.

Mechanical Characteristics	
Cell Type	P type Mono-crystalline
No. of cells	156 (2×78)
Dimensions	2411×1134×35mm (94.92×44.65×1.38 inch)
Weight	30.6 kg (67.46 lbs)
Front Glass	3.2mm,Anti-Reflection Coating, High Transmission, Low Iron, Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68 Rated
Output Cables	TUV 1×4.0mm² (+): 400mm , (-): 200mm or Customized Length
Conector	JK03M/2B, genuine MC4 evo 2
Fire Rating	Class C

B.

Dimensions 2.815m (W) x 2.318m (H) x 1.588m (D)

C.



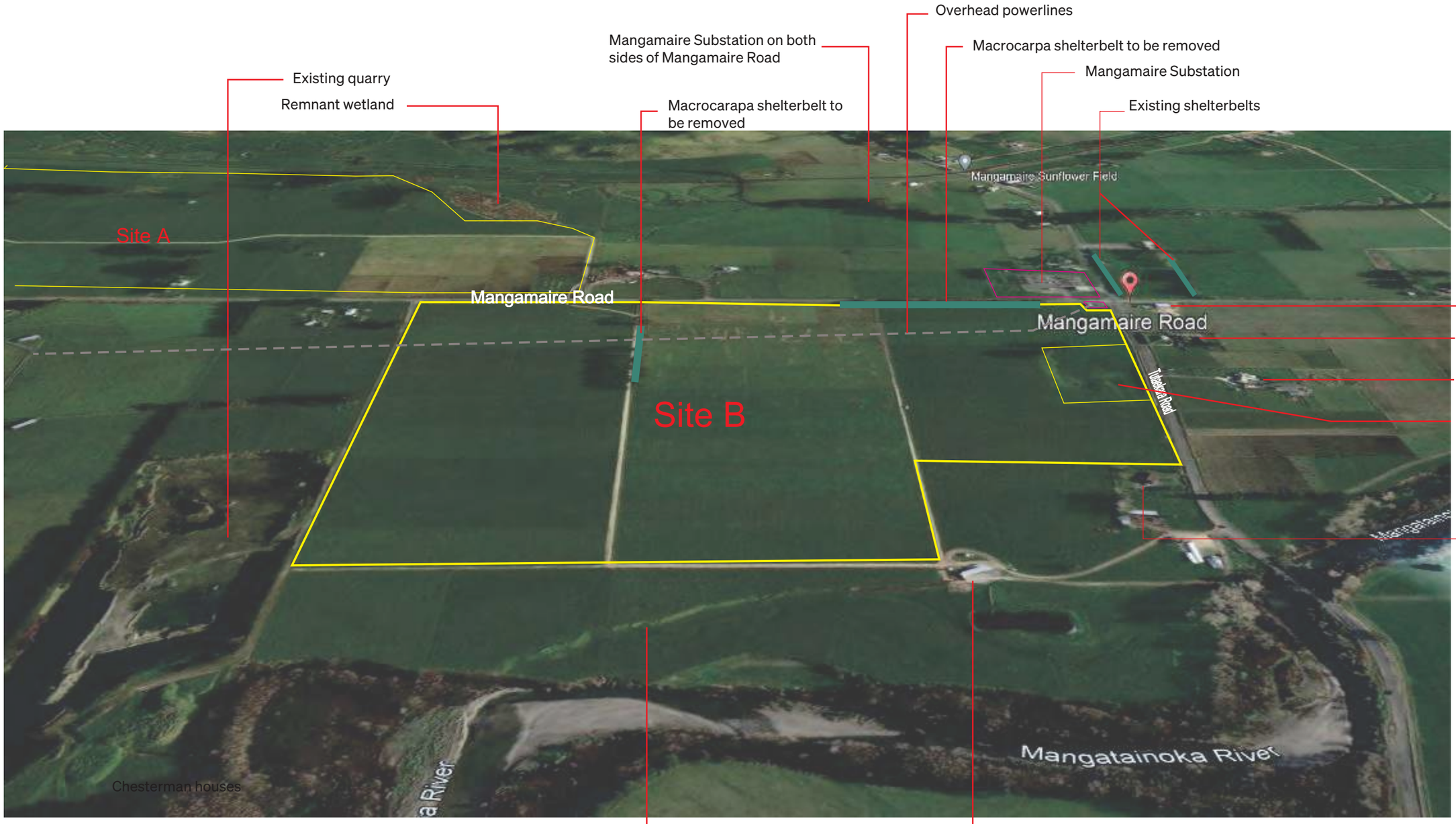
Wider Context Plan

Not to Scale

Data Source: topomap.co.nz

Site A Context Plan

Site B Context Plan



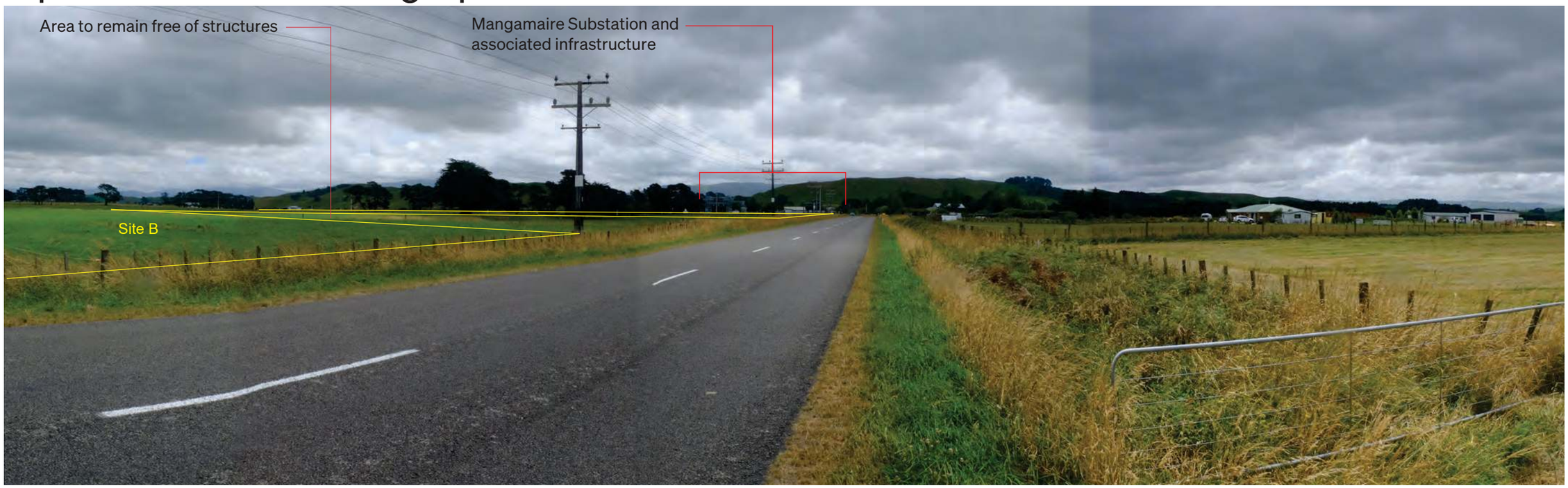
Viewpoint Location Plan

Viewpoint Location Photographs

Viewpoint Location Photograph 1: When crossing the Mangatainoka River bridge, while partially screened by the existing farm house and related activities, the solar table on Site B will be prominent due to their industrial like character and vertical scale in this flat landscape. At a distance of between 170 and 220m, and partially screened by the foreground, when the tables are facing east or west the view of Site B would be akin to an expanse of glasshouses.
Date: 09.01.2022 **Time:** Between 11:00am and 1:00pm.

Viewpoint Location Photograph 2: On passing the farm house, the solar structures will be fully visible and prominent adjacent the road. The Mangamaire Substation is an existing and prominent piece of infrastructure within this landscape. Due to the angle the solar rows will have to the road, when facing east or west the visual obstruction created by the tilted panels will be high. A shelter belt planted on this boundary would be a permitted activity and would similarly impact on the extent of the views enjoyed. It is proposed to establish a shelterbelt using flax (Phormium tenax) that will reach a height of 2.5 - 3m and not interfere with the electricity cables in this vicinity.
Date: 09.01.2022 **Time:** Between 11:00am and 1:00pm.

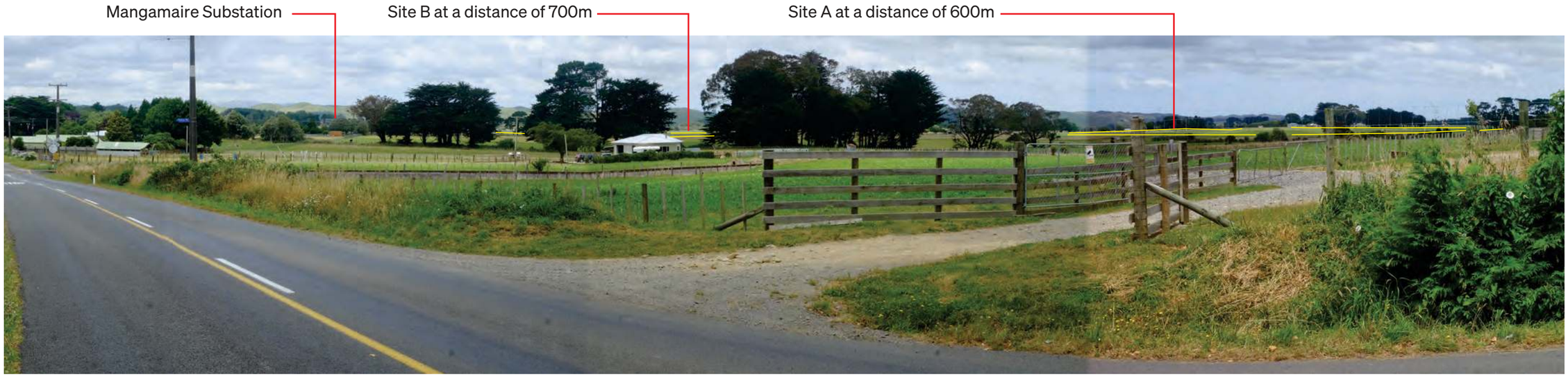
Viewpoint Location Photographs



Viewpoint Location Photograph 3: Travelling west along Tutaekara, adjacent Site B, approximately 400m from the Magamaire Substation. As one approaches the substation, the prominence and presence of the substation and associated infrastructure becomes more apparent with increasingly adverse effects on the landscape and amenity values of this location. The solar tables will be prominent when viewed from this road and the rural character of this stretch of road will change.
Date: 09.01.2022 **Time:** Between 11:00am and 1:00pm.

Viewpoint Location Photograph 4: The Mangamaire Substation extends to both sides of Mangamaire Road. The facility is locally prominent.
Date: 09.01.2022 **Time:** Between 11:00am and 1:00pm.

Viewpoint Location Photographs



Viewpoint Location Photograph 5: Travelling east along Tutaekara Road, on entering the valley 600 - 700m away from the farms, glimpses of the new farms will be possible between existing trees and other dwellings.
Date: 09.01.2022 **Time:** Between 11:00am and 1:00pm.

Viewpoint Location Photograph 6: Travelling east along Tutaekara Road, approximately 350 - 500m from the farms, views from within the Mangamaire Settlemnt will be visible.
Date: 09.01.2022 **Time:** Between 11:00am and 1:00pm.

Viewpoint Location Photographs

Viewpoint Location Photograph 7: Passing Mangamaire Substation travelling east 150m from Site B.
Date: 09.01.2022 **Time:** Between 11:00am and 1:00pm.

Viewpoint Location Photograph 8: View od Site B from intersection of Tutaekara and Mangamaire Roads. Visible infrastucture belongs to Mangamaire Substation and will be utilized the Solar Farms.
Date: 09.01.2022 **Time:** Between 11:00am and 1:00pm.

Viewpoint Location Photographs

Viewpoint Location Photograph 9: Travelling north along Mangamaire Road, the site will first become visible as one passes 500 Mangamaire Road house 250m before reching the southern edge of Site A. Site B will not be visible at this point due to existing screening obscurring views. The dotted line appoximates a 4m high structure that gives an indication of the screening effect of the solar tables when fully vertical.
Date: 09.01.2022 **Time:** Between 11:00am and 1:00pm.

Viewpoint Location Photograph 10: Looking north west from the southern corner of Site A on Mangamaire Road showing the distant views of the hills that form the western edge to this landscape.
Date: 09.01.2022 **Time:** Between 11:00am and 1:00pm.

Viewpoint Location Photographs

Viewpoint Location Photograph 11: . Looking north west from Mangamaire Road towards hills.
Date: 09.01.2022 **Time:** Between 11:00am and 1:00pm.

Viewpoint Location Photograph 12: Looking north on Mangamaire Road both Sites A and B are adjacent the site for a distance of 165m.
Date: 09.01.2022 **Time:** Between 11:00am and 1:00pm.

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APPENDIX 3:

SOLAR BAY – GLINT/GLARE ASSESSMENT (PREPARED BY VECTOR POWERSMART)

Solar Bay - Tararua Glint/Glare Assessment

Solar Bay
Mangamaire Road, Tararua
New Zealand

Date of issue: 09/05/2022

Document Version

Version	Date	Revision Notes
V20220509	09/05/2022	Draft – for internal review and comment

Document Contributors

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Approval

Contributor Type	Name	Position	Date
Document Author	Michael Robinson	Engineer	09/05/2022
Technical Reviewer	Andrew Murdoch	Engineer	09/05/2022

Related Documents

Document Type	Document Title (Number & Title)
ForgeSolar Report	Tararua - Glint and Glare Assessment Report

Stakeholder Consultation

Name	Position

1. Executive Summary

Pursuant to a consultancy agreement, Vector PowerSmart (**VPS**) was engaged by Solar Bay Ltd (**Solar Bay**) to prepare a Glint and Glare Assessment at Mangamaire Road, Tararua, New Zealand.

Conclusions:

- Solar Farm A did not produce glint or glare at any receptor.
- Green and/or yellow glint or glare were found to affect receptors OP 1, OP 2, Mangamaire Road and Taekara Road caused by Solar Farm B.
- If a stow alarm occurs during an isolated extreme weather event or equipment failure, excess glare may occur while the mounting system stows at a predetermined orientation and angle (often 0°) and to protect the array.

2. Glint and Glare Assessment Report

2.1. Overview

Light reflects off all surfaces with the potential of causing glint (a momentary flash of bright light) and glare (a continuous source of bright light). Both phenomena can cause a brief loss of vision and a potential for after imaging. After image is define as an impression of a vivid image retained by the eye after viewing of the light source has ceased. As PV modules are constructed to absorb as much solar irradiation as possible to increase their efficiency, their reflectivity is very low compared to many other common materials such as vegetation and equal to water. This can be seen in Figure 1 below:

Figure 1: Chart indicating reflectivity of common surfaces

However, it is possible for PV modules to create glare, and thus, a comprehensive analysis was undertaken by Vector PowerSmart (VPS). There is currently no guidance from New Zealand's Civil Aviation Authority (CAA) around assessment methods for glint and glare caused by solar farms however the American Federal Aviation Authority has endorsed the Solar Glaze Hazard Analysis Tool (SGHAT). This tool has since been developed into GlareGauge.

The GlareGauge tool identifies possible glare from PV arrays and classifies them regarding their ocular impact. It should be noted that this software doesn't consider view shedding, (the blocking of the glare source from buildings, terrain or vegetation, therefore representing a worst-case scenario.

The ocular impact of solar glare is quantified into three categories showing effect of after image:

- Green - low potential to cause after-image (flash blindness)
- Yellow - potential to cause temporary after-image
- Red - potential to cause retinal burn (permanent eye damage)

If any glare occurs in the model, it is classified into the three colour-coded categories as seen in Figure 2 below:

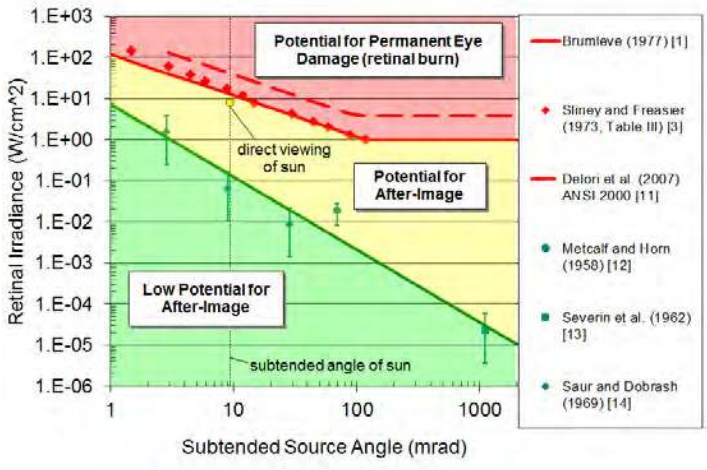


Figure 2: Sample glare hazard plot showing after image potential. https://www.forgesolar.com/help/#ref-ho-2011-method.

Essentially if the simulation predicts glint and glare, the ocular impact of the glint and glare is plotted onto the graph shown in Figure 2 to determine the category it belongs to.

2.2. Sample Graph Cluster

Figure 3 below is a sample graph cluster, these graphs are the visual representation of the predicted glare effecting a receptor caused by the Solar Farm:

*Note: Figure 3**Error! Reference source not found.** only shows yellow glare. If red or green glare is present, it would also be represented on this example.*

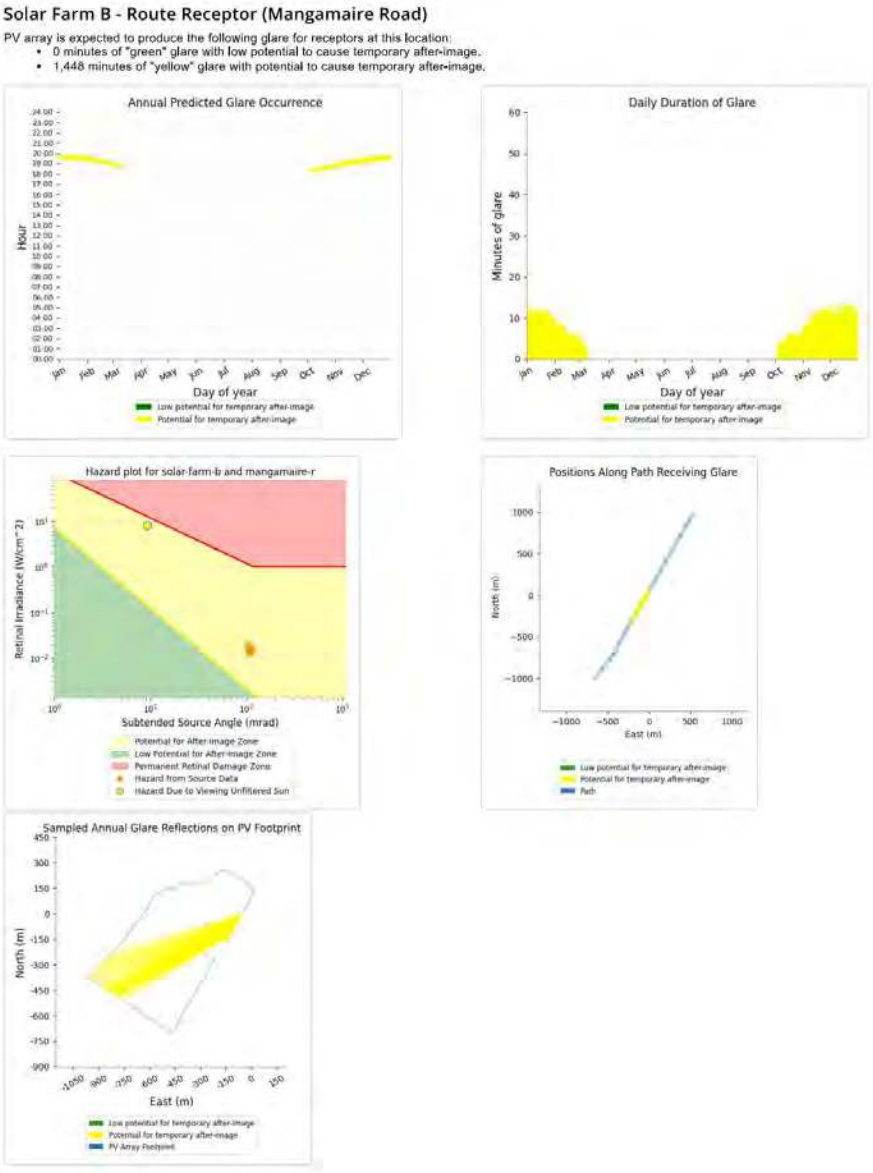


Figure 3: Sample Graph Cluster

Annual Predicted Glare Occurrence: This graph shows the time of day that glare occurs throughout the year. In this example, yellow glare is predicted between 6pm and 8pm during October through to mid-March.

Daily Duration of Glare: This graph shows the duration of predicted glare in minutes throughout the year of which the longest period is approximately 13 minutes.

Hazard Plot for solar-farm-b and mangamaire-r: Utilizes the same graph shown in Figure 2. As shown on the hazard plot in Figure 3, the orange plot points represent the intensity of the glare by the zone the plot appears in. In this case the glare is predicted to be yellow.

Positions Along Path Receiving Glare: Here the route is shown with the areas where the glint and glare is received. The blue line shows no glare, whereas green and yellow will show where glare is received. In this case, yellow glare is received midway through the road.

Note: Route Receptors are analysed by tracing a path between each point along the route and aggregating the resulting glare in minutes

Sampled Annual Glare Reflections on PV Footprint: The blue outline shows the Solar Farm footprint. The area of the PV footprint that produces the received glare is represented by the colour spread across the footprint (either yellow of green glare). This example shows yellow glare is produced midway through the array.

2.3. ForgeSolar Report

VPS used the tool to evaluate the potential for and duration of glare to the following receptors surrounding the proposed solar array as shown in Figure 4: Summary of Site Configuration below:

- A section of Mangamaire Road, located between both Solar Farm A and B
- A section of Taekara Road, located north of Solar Farm A
- OP 1, observation point
- OP 2, observation point

Figure 4: Summary of Site Configuration

2.4. Reported Glare

Note: Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour. This software does not include viewshed analysis (therefore not accounting for terrain, buildings or vegetation blocking the glare source) thus representing a worst-case scenario.

Figure 4 yielded the below reported glare for the various observation points caused by Solar Farm's A and B:

Solar Farm A no glare found

Component	Green glare (min)	Yellow glare (min)
OP: OP 1	0	0
OP: OP 2	0	0
Route: Mangamaire Road	0	0
Route: Taekara Road	0	0

Table 1: Total annual glare received per receptor caused by Solar Farm A

As per Table 1, no glint or glare is received by any receptor caused by Solar Farm A.

Solar Farm B potential temporary after-image

Component	Green glare (min)	Yellow glare (min)
OP: OP 1	0	1
OP: OP 2	0	2
Route: Mangamaire Road	0	1448
Route: Taekara Road	1	1

Table 2: Total annual glare received per receptor caused by Solar Farm B

As per Table, yellow glint/glare is reported by Solar Farm B at OP 1, OP 2, Route: Mangamaire Road and Route: Taekara Road.

- Shown in "Solar Farm B – OP Receptor (OP 1)" graph cluster located on page 7 in Appendix - I, yellow glare is received between the hours of 7pm to 8pm during mid-December at 1 minute for a total of 1 minute annually.
- Shown in "Solar Farm B – OP Receptor (OP 2)" graph cluster located on page 8 in Appendix - I, yellow glare is received between the hours of 7pm to 8pm during mid-December at 1 minute per day for a total of 2 minutes annually.
- Shown in "Solar Farm B – Route Receptor (Mangamaire Road)" graph cluster located on page 9 in Appendix - I, yellow glare is received between the hours of 6pm to 8pm through the months of October to the start of March at less than 15 minutes per day for a total of 1,448 minutes annually.
- Shown in "Solar Farm B – Route Receptor (Taekara Road)" graph cluster located on page 10 in Appendix - I, green or yellow glare is received between the hours of 7pm to 8pm during mid-December at 1 minute per day for a total of 2 minutes annually.

2.5. Stow Alarm

At times during situations such as isolated extreme weather events or failure of certain equipment a stow alarm will cause the mounting system to stow at a predetermined orientation and angle (often 0°) to protect the array. Due to such an event, there may be additional glare produced outside of the ForgeSolar predictions.

It is important to note that the Glint and Glare simulation uses “Clear Sky” model for simulation which is the worst-case scenario i.e., does not include clouds or other atmospheric conditions which would reduce glint and glare. The fact that typically high wind >= 55km/hour events are predominant with clouds/storms rather than cloudless, with isolated events where high wind prevail in a cloudless scenario, the actual glare at the receptors should be less than the simulation suggests.

Stow alarm conditions are determined by the mounting system manufacturer.

3. Conclusions and Observations

To conclude, Solar Farm A did not produce glint or glare at any receptor. However, green and/or yellow glint or glare were found to affect receptors OP 1, OP 2, Mangamaire Road and Taekara Road caused by Solar Farm B in the evening hours.

If a stow alarm occurs due to an isolated event such extreme weather or failure of equipment, the mounting system may stow into a manufacturer determined angle and orientation to protect the array.

Simulation uses “Clear Sky” weather data where glint and glare is not reduced due to atmospheric conditions or clouds obstructing the sun, essentially providing a worst-case scenario for extreme weather events.

4. Appendices

APPENDIX – I - TARARUA - Glint and Glare Report

ForgeSolar

2945 - Tararua

initial

Client: Solar Bay

Created May 2, 2022
Updated May 4, 2022
Time-step 1 minute
Timezone offset UTC12
Site ID 68451.12086

Project type Advanced
Project status: active
Category 10 MW to 100 MW

Misc. Analysis Settings

DNI: **varies (1,000.0 W/m^2 peak)**
Ocular transmission coefficient: **0.5**
Pupil diameter: **0.002 m**
Eye focal length: **0.017 m**
Sun subtended angle: **9.3 mrad**

Analysis Methodologies:

- Observation point: **Version 2**
- 2-Mile Flight Path: **Version 2**
- Route: **Version 2**

Summary of Results Glare with potential for temporary after-image predicted

PV Name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced
	deg	deg	min	min	kWh
Solar Farm A	SA tracking	SA tracking	0	0	-
Solar Farm B	SA tracking	SA tracking	1	1,452	-

Component Data

PV Array(s)

Total PV footprint area: 776,707 m^2

Name: Solar Farm A
Footprint area: 351,249 m^2
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 0.0 deg
Maximum tracking angle: 55.0 deg
Resting angle: 0.0 deg
Ground Coverage Ratio: 0.416

Rated power: -
Panel material: Smooth glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 8.43 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	-40.523051	175.748838	157.00	2.40	159.40
2	-40.522122	175.749525	154.62	2.40	157.02
3	-40.521241	175.750126	152.66	2.40	155.06
4	-40.520670	175.750576	151.00	2.40	153.40
5	-40.519920	175.751156	150.00	2.40	152.40
6	-40.519218	175.751692	148.00	2.40	150.40
7	-40.518403	175.752443	147.00	2.40	149.40
8	-40.517758	175.752786	146.00	2.40	148.40
9	-40.517652	175.753623	146.00	2.40	148.40
10	-40.517962	175.754181	146.00	2.40	148.40
11	-40.518598	175.753580	147.00	2.40	149.40
12	-40.519006	175.754009	147.68	2.40	150.08
13	-40.519283	175.754803	148.00	2.40	150.40
14	-40.519234	175.755168	148.00	2.40	150.40
15	-40.518810	175.755619	147.00	2.40	149.40
16	-40.519137	175.756284	147.00	2.40	149.40
17	-40.519495	175.756949	147.39	2.40	149.79
18	-40.519903	175.756456	148.00	2.40	150.40
19	-40.520474	175.755790	149.00	2.40	151.40
20	-40.521225	175.755275	150.00	2.40	152.40
21	-40.521636	175.756348	150.00	2.40	152.40
22	-40.522146	175.757378	150.00	2.40	152.40
23	-40.523053	175.756740	151.00	2.40	153.40
24	-40.523961	175.756059	152.67	2.40	155.07
25	-40.524950	175.755420	153.99	2.40	156.39
26	-40.525922	175.754803	154.00	2.40	156.40
27	-40.525384	175.753773	155.00	2.40	157.40
28	-40.524691	175.752271	155.00	2.40	157.40
29	-40.524067	175.750919	156.00	2.40	158.40
30	-40.523575	175.749943	156.00	2.40	158.40

Name: Solar Farm B
Footprint area: 425,458 m^2
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 0.0 deg
Maximum tracking angle: 55.0 deg
Resting angle: 0.0 deg
Ground Coverage Ratio: 0.416

Rated power: -
Panel material: Smooth glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 8.43 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	-40.521766	175.749075	154.00	2.40	156.40
2	-40.522353	175.748710	155.60	2.40	158.00
3	-40.523201	175.748152	157.32	2.40	159.72
4	-40.523723	175.747701	158.56	2.40	160.96
5	-40.524343	175.747251	159.00	2.40	161.40
6	-40.524017	175.746564	160.00	2.40	162.40
7	-40.523723	175.745985	160.00	2.40	162.40
8	-40.523560	175.745684	159.00	2.40	161.40
9	-40.524163	175.745126	159.68	2.40	162.08
10	-40.524604	175.744805	160.00	2.40	162.40
11	-40.524881	175.744848	161.00	2.40	163.40
12	-40.525191	175.745470	160.87	2.40	163.27
13	-40.525517	175.746264	160.00	2.40	162.40
14	-40.525925	175.745985	160.00	2.40	162.40
15	-40.526724	175.745363	160.00	2.40	162.40
16	-40.527377	175.744869	161.00	2.40	163.40
17	-40.527980	175.744333	161.00	2.40	163.40
18	-40.529448	175.743367	163.00	2.40	165.40
19	-40.529040	175.742594	163.00	2.40	165.40
20	-40.528665	175.741929	163.00	2.40	165.40
21	-40.528290	175.741157	164.00	2.40	166.40
22	-40.527801	175.740234	163.00	2.40	165.40
23	-40.527230	175.739247	162.45	2.40	164.85
24	-40.526920	175.738410	162.00	2.40	164.40
25	-40.526479	175.737552	161.00	2.40	163.40
26	-40.525485	175.738796	160.03	2.40	162.43
27	-40.524848	175.739569	160.28	2.40	162.68
28	-40.524098	175.740341	160.00	2.40	162.40
29	-40.523495	175.740921	159.88	2.40	162.28
30	-40.522777	175.741629	158.24	2.40	160.64
31	-40.522125	175.742101	156.99	2.40	159.39
32	-40.521798	175.742745	158.00	2.40	160.40
33	-40.521700	175.743560	159.00	2.40	161.40
34	-40.521439	175.744054	157.00	2.40	159.40
35	-40.521439	175.744762	156.00	2.40	158.40
36	-40.521342	175.745727	155.00	2.40	157.40
37	-40.521048	175.746221	154.00	2.40	156.40
38	-40.520738	175.746843	153.00	2.40	155.40
39	-40.520917	175.747573	153.00	2.40	155.40
40	-40.521505	175.748538	154.00	2.40	156.40

Route Receptor(s)

Name: Mangamaire Road
Route type Two-way
View angle: 50.0 deg

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	-40.532089	175.741029	166.00	1.30	167.30
2	-40.530972	175.742230	164.00	1.30	165.30
3	-40.530083	175.743175	163.00	1.30	164.30
4	-40.529427	175.743797	162.00	1.30	163.30
5	-40.528477	175.744462	161.00	1.30	162.30
6	-40.527351	175.745272	160.00	1.30	161.30
7	-40.526634	175.745792	160.00	1.30	161.30
8	-40.525847	175.746393	160.00	1.30	161.30
9	-40.525068	175.746994	159.16	1.30	160.46
10	-40.524008	175.747799	159.00	1.30	160.30
11	-40.523143	175.748437	157.00	1.30	158.30
12	-40.522365	175.749027	155.00	1.30	156.30
13	-40.521305	175.749820	153.00	1.30	154.30
14	-40.520319	175.750565	151.00	1.30	152.30
15	-40.519425	175.751204	149.00	1.30	150.30
16	-40.518516	175.751912	147.00	1.30	148.30
17	-40.516640	175.753296	145.00	1.30	146.30
18	-40.515645	175.754031	144.00	1.30	145.30
19	-40.514813	175.754669	143.00	1.30	144.30
20	-40.514259	175.755055	142.00	1.30	143.30

Name: Taekara Road
Route type Two-way
View angle: 50.0 deg

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	-40.522049	175.762475	147.00	1.30	148.30
2	-40.521413	175.761724	147.00	1.30	148.30
3	-40.520956	175.761166	147.00	1.30	148.30
4	-40.520597	175.760715	147.00	1.30	148.30
5	-40.520336	175.760243	147.00	1.30	148.30
6	-40.520141	175.759170	147.00	1.30	148.30
7	-40.519978	175.758377	147.45	1.30	148.75
8	-40.519668	175.757626	147.37	1.30	148.67
9	-40.519146	175.756767	147.00	1.30	148.30
10	-40.518477	175.755523	147.00	1.30	148.30
11	-40.518085	175.754922	146.00	1.30	147.30
12	-40.517645	175.754064	146.00	1.30	147.30
13	-40.517319	175.753463	145.77	1.30	147.07
14	-40.517090	175.752969	145.00	1.30	146.30

Discrete Observation Receptors

Number	Latitude	Longitude	Ground elevation	Height above ground	Total Elevation
	deg	deg	m	m	m
OP 1	-40.528412	175.744695	161.00	1.70	162.70
OP 2	-40.527101	175.746042	160.00	1.70	161.70

Summary of PV Glare Analysis

PV configuration and total predicted glare

PV Name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced	Data File
	deg	deg	min	min	kWh	
Solar Farm A	SA tracking	SA tracking	0	0	-	
Solar Farm B	SA tracking	SA tracking	1	1,452	-	-

Distinct glare per month

Excludes overlapping glare from PV array for multiple receptors at matching time(s)

PV	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
solar-farm-b (green)	0	0	0	0	0	0	0	0	0	0	0	0
solar-farm-b (yellow)	356	200	33	0	0	0	0	0	0	152	322	384

PV & Receptor Analysis Results

Results for each PV array and receptor

Solar Farm A no glare found

Component	Green glare (min)	Yellow glare (min)
OP: OP 1	0	0
OP: OP 2	0	0
Route: Mangamaire Road	0	0
Route: Taekara Road	0	0

No glare found

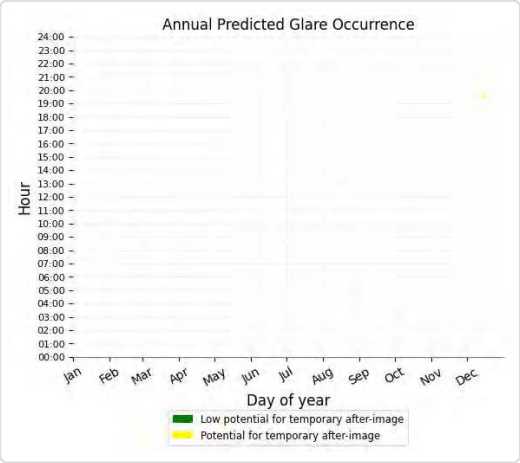
Solar Farm B potential temporary after-image

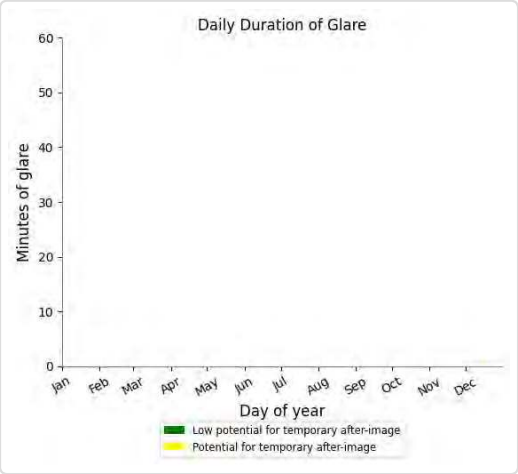
Component	Green glare (min)	Yellow glare (min)
OP: OP 1	0	1
OP: OP 2	0	2
Route: Mangamaire Road	0	1448
Route: Taekara Road	1	1

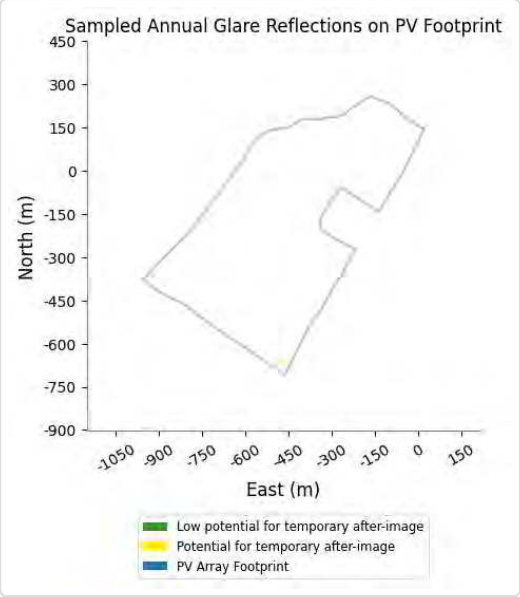
Solar Farm B - OP Receptor (OP 1)

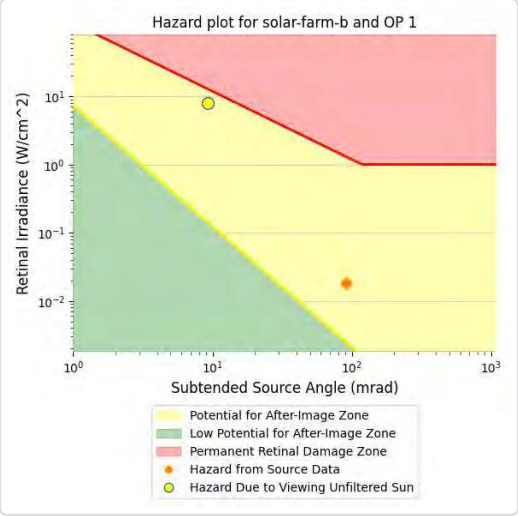
PV array is expected to produce the following glare for receptors at this location:

- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 1 minutes of "yellow" glare with potential to cause temporary after-image.





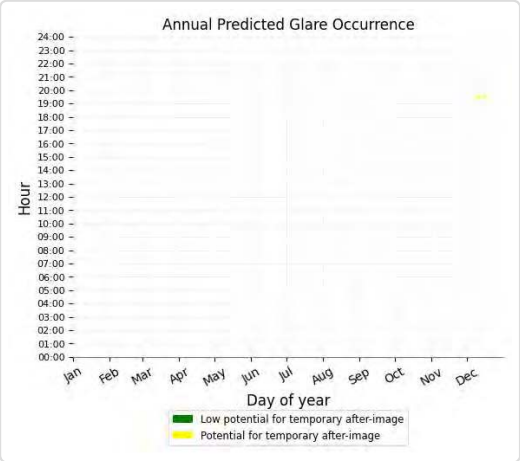


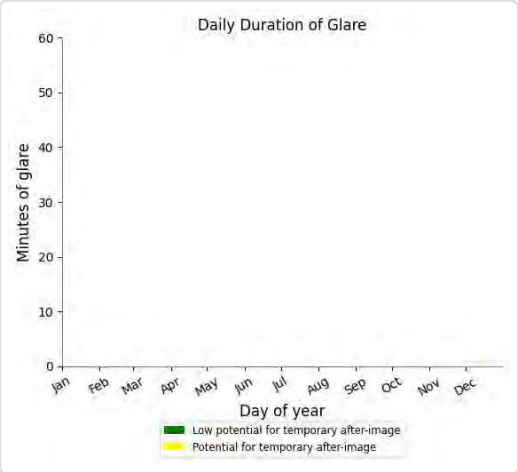


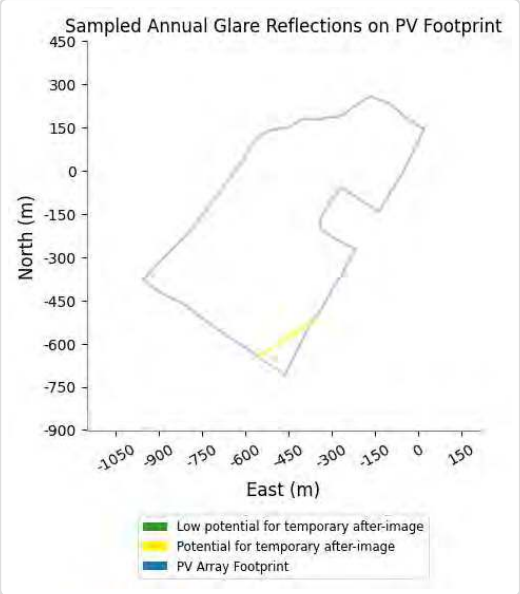
Solar Farm B - OP Receptor (OP 2)

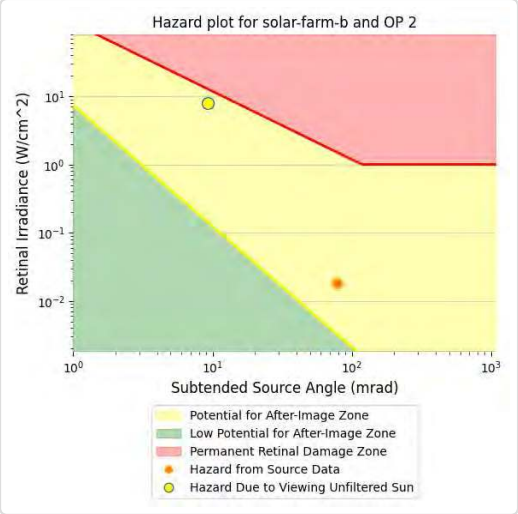
PV array is expected to produce the following glare for receptors at this location:

- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 2 minutes of "yellow" glare with potential to cause temporary after-image.





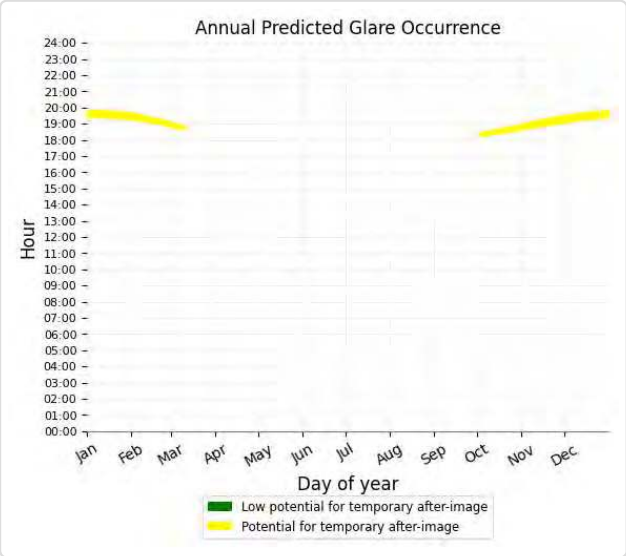


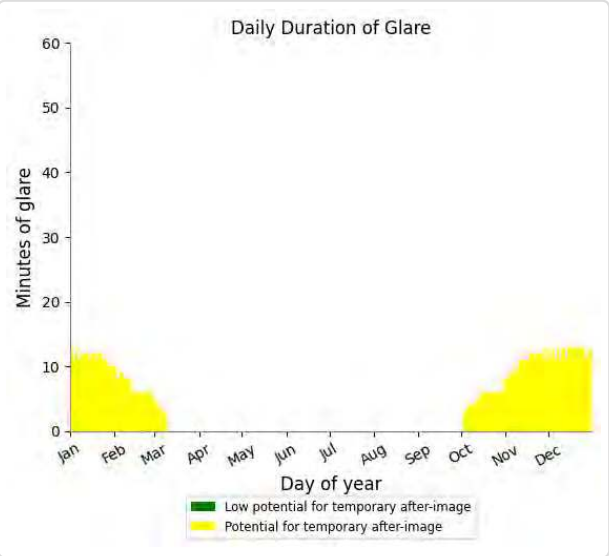


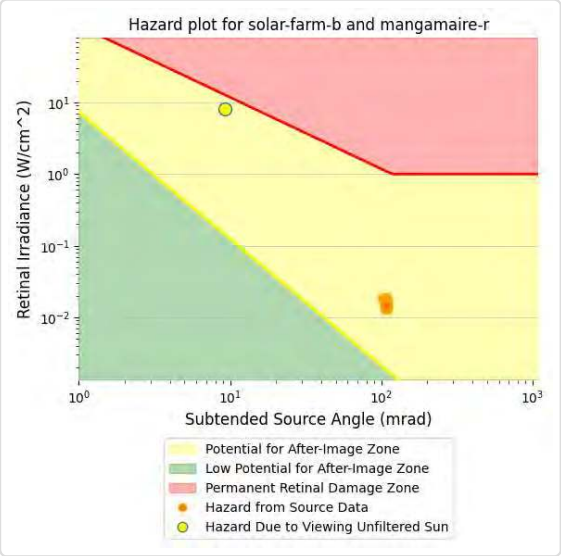
Solar Farm B - Route Receptor (Mangamaire Road)

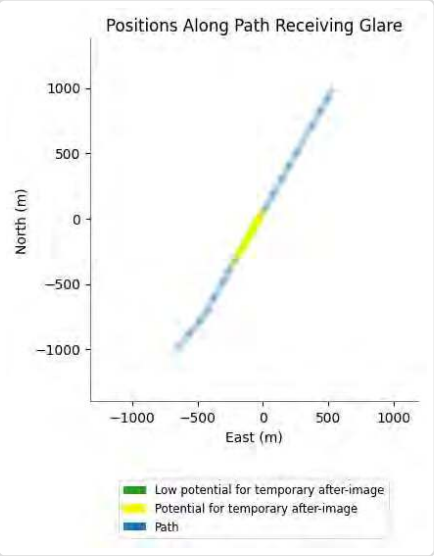
PV array is expected to produce the following glare for receptors at this location:

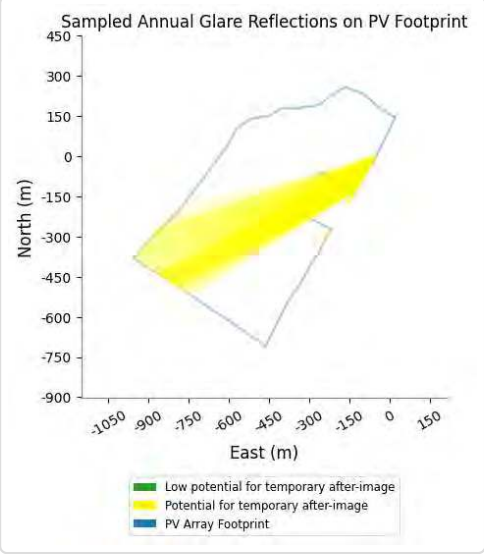
- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 1,448 minutes of "yellow" glare with potential to cause temporary after-image.







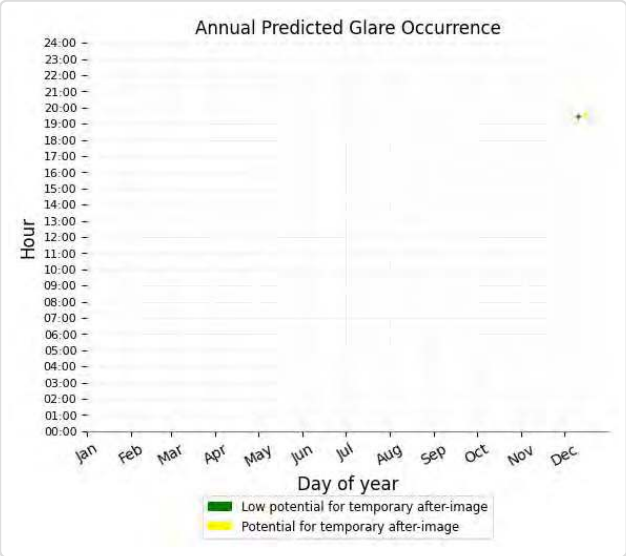


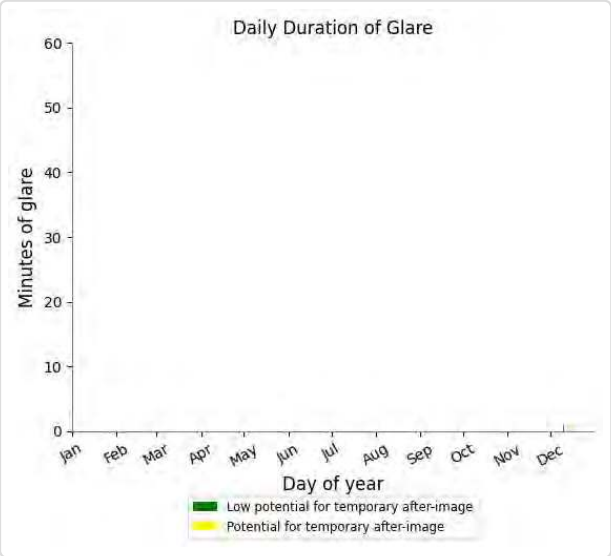


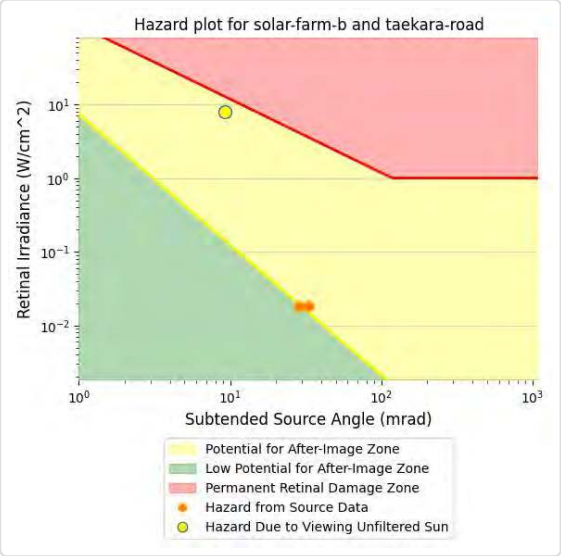
Solar Farm B - Route Receptor (Taekara Road)

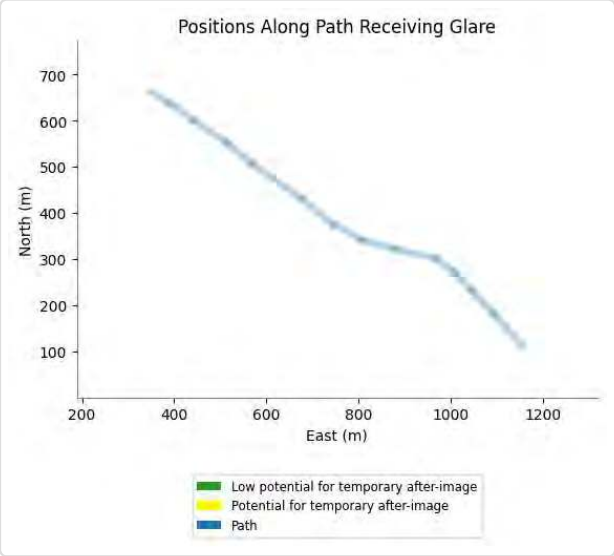
PV array is expected to produce the following glare for receptors at this location:

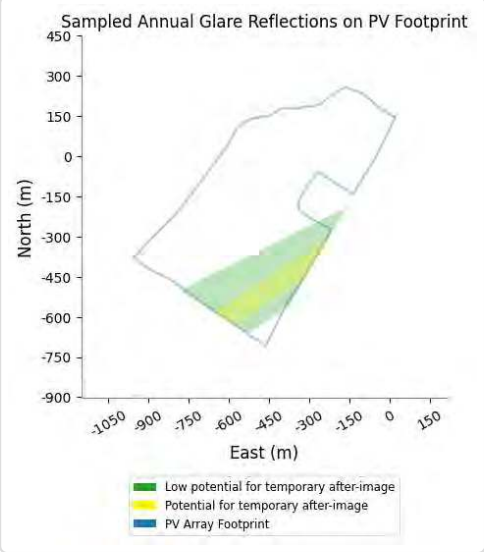
- 1 minutes of "green" glare with low potential to cause temporary after-image.
- 1 minutes of "yellow" glare with potential to cause temporary after-image.









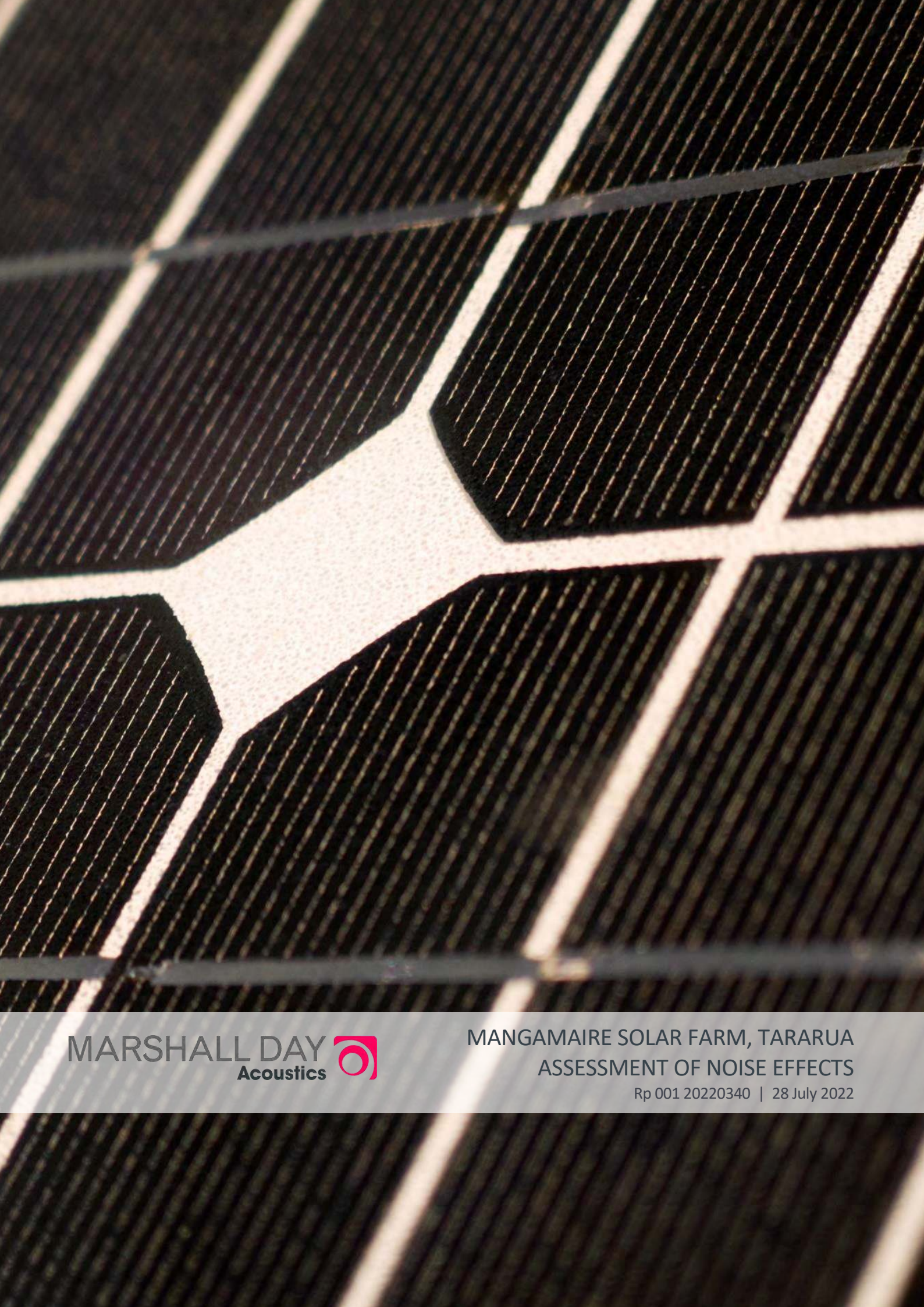


Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions
- Detailed system geometry is not rigorously simulated.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values and results may vary.
- The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
- Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for larg PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
- The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, nc discrete, spectrum.
- Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
- Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
- Refer to the **Help page** for detailed assumptions and limitations not listed here.

APPENDIX 4:

ASSESSMENT OF NOISE EFFECTS
(PREPARED BY MARSHALL DAY ACOUSTICS)



MARSHALL DAY Acoustics

MANGAMAIRE SOLAR FARM, TARARUA
ASSESSMENT OF NOISE EFFECTS

Rp 001 20220340 | 28 July 2022

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Report No.: **Rp 001 20220340**

Document Control

Status:	Rev:	Comments	Date:	Author:	Reviewer:
Approved	-	-	28 July 2022	Mary Hamilton	Peter Ibbotson

SUMMARY

Marshall Day Acoustics has undertaken a noise assessment for a proposed solar farm southwest of Pahiatua township, Tararua District.

The key operational noise source would be from 13 inverters. The inverters have been positioned central to the site to provide practicable separation distances from the nearest receivers.

The proposed solar farm would only operate during daylight hours and predominantly during the Tararua District Plan prescribed daytime period of 7am to 7pm. However, in summer, operation could start before 7am and extend after 7pm (during the prescribed night period).

Inverter units would likely be tonal and have appreciable directivity. We calculated noise levels at near receivers for unattenuated scenarios (worst-case directivity and west-directivity) and an attenuated example.

Without attenuation of the inverters, compliance with the daytime and night-time District Plan noise rules is calculated to be achieved (or just achieved). However, there is risk that the solar farm would generate electro-mechanical noise at levels that appreciably exceed the existing night-time ambient and background noise levels and result in an intrusive level of noise at nearby sites.

Attenuation of the inverters (through selection, positioning for directivity, partial or full enclosure) would appreciably reduce noise levels. This would avoid risk that night-time noise levels could be above the limit, or that the solar farm could result in a substantial change to the existing rural ambient noise environment.

We consider that attenuation is practical and should be included in the final design as part of Section 16 duties (which require the best practicable option to be applied to ensure noise levels are reasonable). Development of an attenuation design for the inverters is recommended as a condition of consent.

With attenuation in place, calculated noise levels are at a level that should not cause annoyance, sleep disturbance, or appreciably affect acoustic amenity; are within all national and international guidelines for environmental noise levels that are typically applied within New Zealand; and would be reasonable in terms of the RMA.

Depending on the final construction schedule and equipment, a construction noise and vibration management plan may be necessary to assess and manage construction effects on near receivers. Resource consent may be needed to exceed the construction noise limits.

Conditions of resource consent have been recommended.

TABLE OF CONTENTS

1.0 INTRODUCTION

Marshall Day Acoustics has been engaged by Solar Bay Limited to undertake a noise assessment for a proposal to construct and operate a solar farm adjacent to Mangamaire Road, Tararua District.

This report addresses noise from the proposed operation and from construction. It is intended to form part of an application for resource consent. A glossary of terminology is included in Appendix A.

2.0 APPLICATION SITE

The proposed solar farm would be located at 562 Mangamaire Road, Pahiatua. The existing property encompasses approximately 114-ha. It is proposed to develop approximately 87-ha into the solar farm. The two existing site houses and some of the marginal land would not be part of the proposed solar farm development (and would be subdivided into different titles).

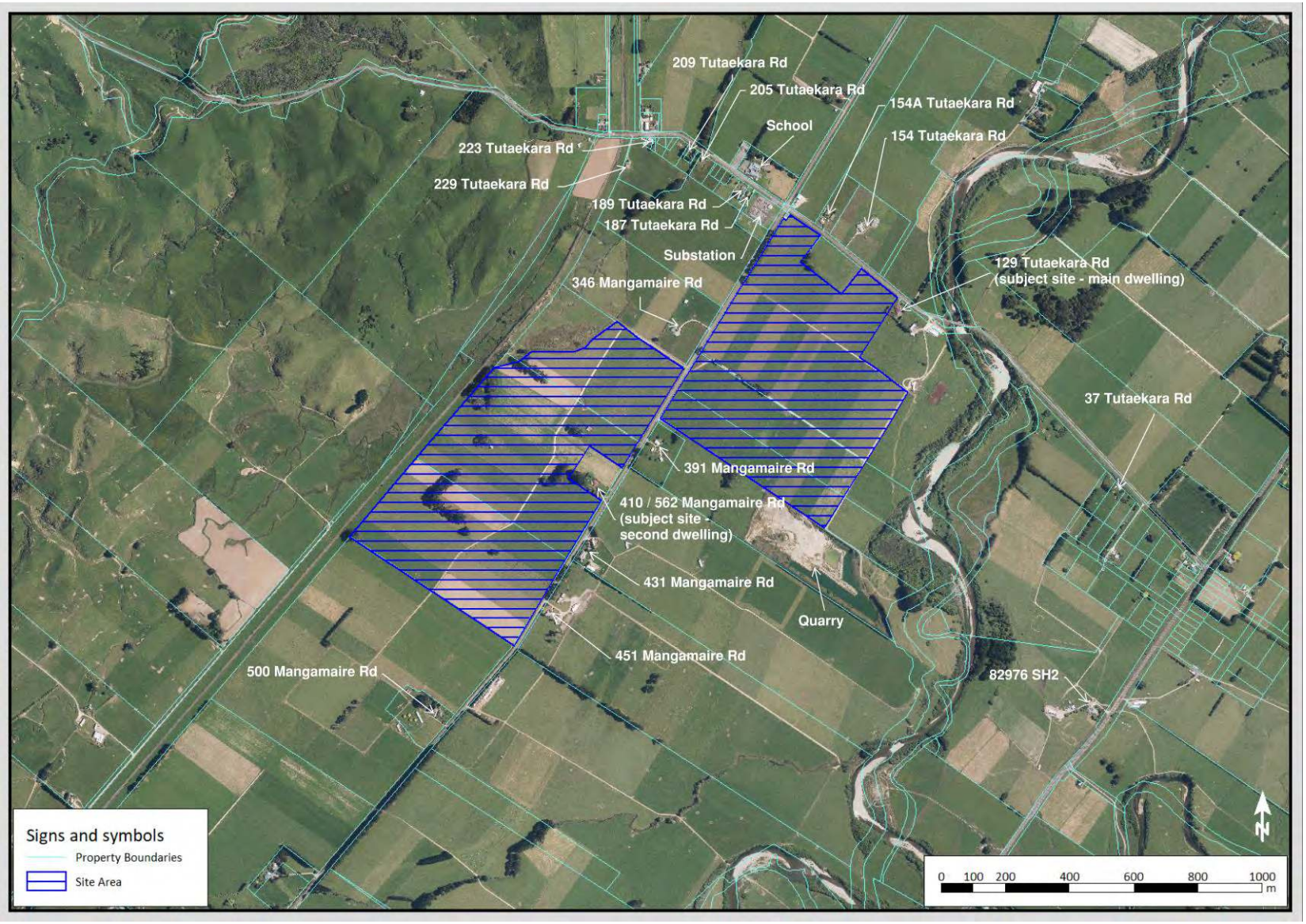
The site is located about 9 km southwest of Pahiatua township. It is located on both sides of Mangamaire Road and south of Tutaekara Road. The site is currently used as grazing land for dairy farming. Surrounding land uses are predominantly rural / rural-residential. Other nearby land uses include: an electricity substation, Mangamaire Country School, and a quarry. The terrain of the site and immediate surrounds is flat at an elevation of 160 – 170 metres. The Tararua ranges are west of the site. Surrounding receivers are listed in Table 1 and depicted in Figure 1.

Table 1: Surrounding Receivers

Receiver Address	Existing Use[1]	Estimated distance [to boundary / to nearest inverter] (m)[1]
37 Tutaekara Rd	Rural residential	690 / 910
129 Tutaekara Rd	Subject site – main dwelling	0 / 170
154 Tutaekara Rd	Rural residential	95 / 200
154A Tutaekara Rd	Rural residential	35 / 230
179 Tutakekara Rd	Substation	40 / 290 (to legal boundary)
187 Tutaekara Rd	Rural residential	140 / 410
189 Tutaekara Rd	Rural residential	190 / 450
192 Tutaekara Rd	School	60 / 340 (to legal boundary)
205 Tutaekara Rd	Rural residential	340 / 590
209 Tutaekara Rd	Rural residential	390 / 620
223 Tutaekara Rd	Rural residential	480 / 610
229 Tutaekara Rd	Rural residential	450 / 530
346 Mangamaire Road	Rural residential / grazing	50 / 180
391 Mangamaire Road	Rural residential	20 / 300
562 / 410 Mangamaire Road	Subject site – second dwelling	0 / 200
431 Mangamaire Road	Rural residential	20 / 190
451 Mangamaire Road	Rural residential	20 / 270
500 Mangamaire Road	Rural residential	280 / 580
82976 State Highway 2	Farm dwelling	900 / 1120

Note 1: Existing land use and distances have predominantly been determined from aerial photography. Distances are from the nearest proposed solar farm boundary and inverter to the identified notional boundary (unless stated otherwise). Refer to Section 5.0 for a discussion regarding the notional boundary.

Figure 1: Site and Surrounds



3.0 PROPOSAL

We understand that the area proposed for the solar farm would be purchased by Solar Bay Ltd. The solar farm would be situated on both sides of Mangamaire Road: approximately 48-ha to the west and 39-ha to the east.

3.1 Facility Description

Solar panels (4.8 metres high approx.) would be installed in rows spaced about 5.5 metres apart to allow access by agricultural machinery and grazing animals. Access to the site would primarily be via existing farm tracks off Mangamaire Road.

The key operational noise sources would be from the following plant:

- **13 inverters** situated central to the site: seven on the east side (Inverters 1E – 7E, as shown in Appendix B) and six on the west side (Inverters 1W – 6W, as shown in Appendix B). An inverter turns Direct Current (DC) created by the photovoltaic cells to alternative current (AC) current used in the electricity grid. We understand that SMA inverter units have been preliminarily selected.[1]
- **13 transformers** associated with each of the inverters. A transformer changes the voltage of AC electricity.
- **Approximately 2100 tracker motors** have been assumed for this assessment. The individual solar panel arrays would be attached to trackers[2].

A battery storage system is not part of the proposal and has not been included in this assessment.

We understand that electricity would be sent from the solar farm transformers to the substation transformer.

The solar farm would operate during daylight hours. At certain times of year (notably summer), operating daylight hours could begin earlier and extend later than the prescribed[3] daytime period of 7am to 7pm.

Refer to the site layout in Appendix B.

3.2 Written Approvals

To our knowledge, written approvals have not been obtained for any of the nearby properties[4], as such, no noise effects can be disregarded.

[1] Limited manufacturers data is available for solar farm inverters, but all show tonal characteristics at various frequencies. Even at low noise levels, tonal properties can have a negative effect on acoustic amenity at neighbouring sites.

[2] Trackers consist of many solar panels on a frame that tilts vertically to align the panels to the sun throughout the day. The trackers are rotated around a central horizontal axis by a small DC motor (approximately 300 watts). The motor is the main noise source associated with each tracker. The tracker motors are understood to operate intermittently during daylight hours and only for a short period as they are only required to make small incremental adjustments to the trackers. Refer to Appendix D for an image showing the solar tracker with tilt actuator mechanism.

[3] Refer to Section 5 for discussion of the District Plan noise rules and statutory timeframes.

[4] Council must not, when considering the application, have regard to any effect on a person who has given their written approval to the application (Section 104 (3) of the Resource Management Act 1991).

3.3 Acoustic Mitigation

Acoustic mitigation, potentially consisting of attenuation for up to nine inverters, is considered necessary to provide a reasonable level of night-time amenity and will need to be included in the detailed design for the project. This is recommended as a condition of consent.

This assessment provides an evaluation of noise levels from the solar farm with unattenuated inverters. It also provides calculated levels for an attenuated example (refer Section 6.2).

4.0 EXISTING NOISE ENVIRONMENT

A site visit was carried out on Monday 20 June 2022, during which time a noise logger was installed on site. The logger collected data until Saturday 25 June 2022. Data was analysed for a three-day period, from 7am Wednesday 22 June 2022 to 7am Saturday 25 June 2022, corresponding with a period of settled weather.

The purpose of the measurements was to establish ambient noise levels representative of the site and surrounding sites. The logger location was approximately 350m west of Mangamaire Road and approximately 600m southwest of the substation. It is considered representative of the area, generally. Refer to Appendix D for a map showing the measurement position.

Noise from the substation (including tonal character) was audible in the immediate vicinity of the substation. At the logger position, noise from the substation was not noticeable. Other observed daytime noise sources were birds, breeze, cattle (occasional), voices (occasional) and distant irregular traffic. None of these sources were noted to be dominant.

Analysis of the night-time data (including sample recordings) showed that night-time noise levels were not elevated by cricket activity. It is likely that cricket noise would be prevalent in the warmer months.

As the solar farm may operate outside the prescribed daytime period, logged ambient data has been analysed for the two District Plan prescribed periods: daytime (0700 to 1900), and night-time (1900 to 0700). Table 2 summarises the results. Refer to Appendix D for a measured 24-hour data sample.

Table 2: Measured Ambient Noise Levels

Logger Position	Measurement		Overall Measured Level (dB) [1]			
	Start Time / Date	Duration	0700 to 1900 hours		1900 to 0700 hours	
			L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
350m west of Mangamaire Rd	7am 22 June 2022	3 days	41	32	35	26

Notes to Table 1:
(1) An explanation of technical terms is provided in Appendix A

As given in Table 2, the daytime ambient noise level was 41 dB L_{Aeq} and the night-time ambient noise level was 35 dB L_{Aeq}.

For the daytime period, the background noise level was 32 dB L_{A90}. For the night period, the background noise level was 26 dB L_{A90}.

Measured levels are quiet. They are consistent with what would be expected in a rural area (for times when the weather is settled, and crickets are not dominant).

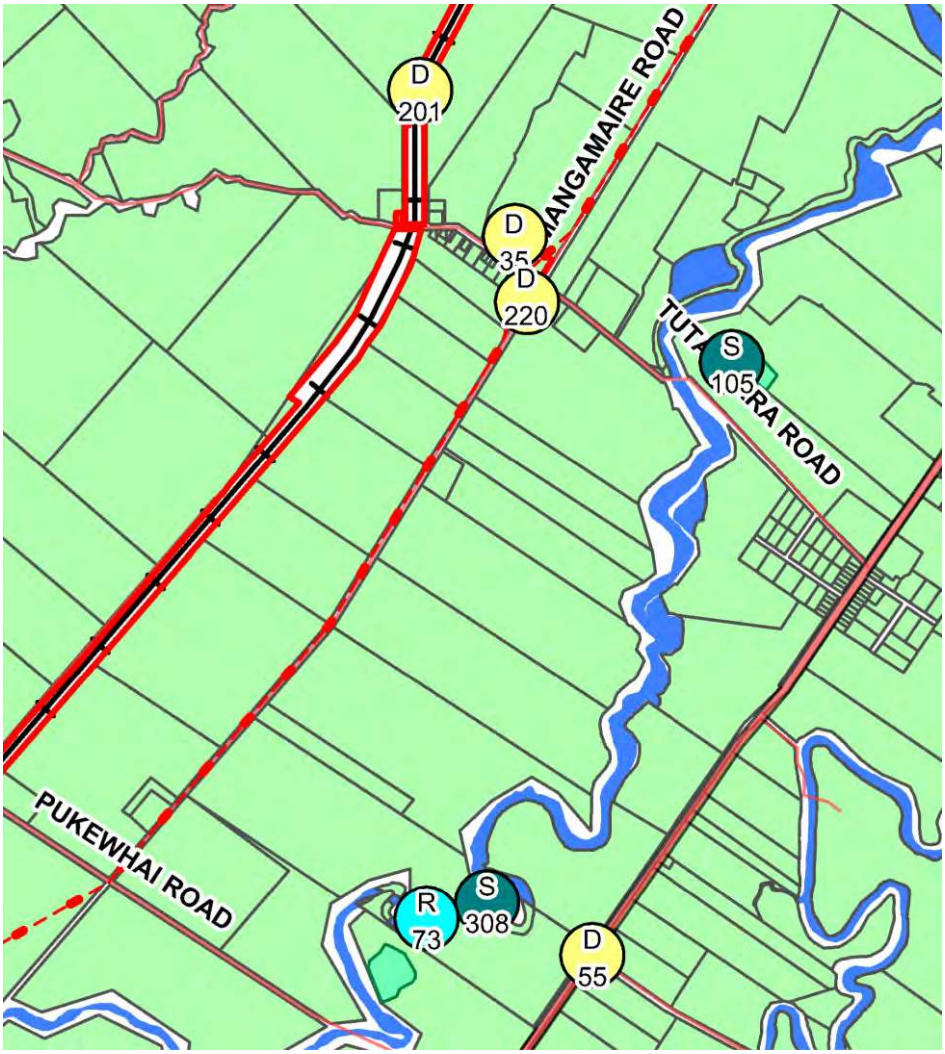
5.0 NOISE PERFORMANCE STANDARDS

The Tararua District Council Operative District Plan – updated July 2021 (District Plan) provides the appropriate zoning and noise assessment standards for the site.

5.1 Zoning

Figure 2 shows zoning at the application and neighbouring sites. The application site is situated on land zoned *Rural* (depicted in pale green), as are all surrounding sites. The underlying zoning of the electricity substation (designation D220) and the school (designation 35) is *Rural.*

Figure 2: Site Zoning



5.2 Noise Standards

Section 5.4.1.2 of the District Plan provides permitted activity noise standards for the *Rural* zone. They are summarised below and reproduced in Appendix D.

The relevant limits are:

- 55 dB $L_{Aeq(15\ min)}$ from 0700 to 1900 hours
- 45 dB $L_{Aeq(15\ min)}$ and 75 dB L_{AFmax} from 1900 to 0700 hours.

The relevant limits apply at the notional boundary[5] of another site in the *Rural* zone.

[5] The line 20 metres from any side of a dwelling or the legal boundary where this is closer to the dwelling.

5.3 Measurement and Assessment Standards

The District Plan states that sound levels shall be measured and assessed in accordance with *NZS 6801:2008 Acoustics – Measurement of Environmental Sound* and *NZS 6802:2008 Acoustics – Environmental Noise.*

The District Plan states that construction noise should comply with NZS 6803: 1999 *Acoustics - Construction Noise*.

5.4 Resource Management Act

Under the provisions of the Resource Management Act (RMA) there is a duty to adopt the best practicable option to ensure that noise (including vibration[6]) from any development does not exceed a reasonable level. Specifically, Sections 16 and 17 reference noise effects as follows.

Section 16 states that "every occupier of land (including any premises and any coastal marine area), and every person carrying out an activity in, on, or under a water body or the coastal marine area, shall adopt the best practicable option to ensure that the emission of noise from that land or water does not exceed a reasonable level".

Section 17 states that "every person has a duty to avoid, remedy, or mitigate any adverse effect on the environment arising from an activity carried on by or on behalf of the person, whether or not the activity is in accordance with –

(a) Any of sections 10, 10A, 10B and 20A; or

(b) A national environmental standard, a rule, a resource consent, or a designation".

6.0 OPERATIONAL NOISE LEVELS

6.1 Noise Sources and Modelling Methodology

The main noise sources from the proposed solar farm (without attenuation) would be the inverters. The transformers and tracker motors would also generate noise, but to a much lesser degree than unattenuated inverters.

We prepared a noise model using SoundPLAN® environmental noise modelling which takes into account factors such as the terrain, screening by buildings, and ground effect. Calculations have been carried out using ISO 9613-2:1996 "*Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation*".

The following sound power data (Table 3) has been used in the preparation of our noise model. Data has relied on advice given by the manufacturers or from previous measurements carried out by Marshall Day Acoustics. Solar Bay Ltd. must confirm this data with suppliers prior to final procurement of power infrastructure.

As discussed in Section 3.1, limited manufacturers' data is available for solar farm inverters, but all show tonal characteristics at various frequencies. We recommend that as part of the design to attenuate inverter noise (Section 3.3 and Section 6.2.2), consideration should be given to tonal character. Non-tonal inverters may reduce the insertion loss requirements for attenuator enclosures which may reduce the onerousness of any final design[7].

We understand that inverter noise levels will reduce at low loads. A reduction in sound power level of four decibels has been allowed for at 10% power output. Available data shows that tonal character is eliminated at low loads.

[6] RMA 1991 Part 1 Section 2 Interpretation: Noise includes vibration

[7] Tonal properties can have a negative effect on acoustic amenity at neighbouring sites. Tonality is taken into account in our assessment.

When the solar farm is generating electricity, we expect that the inverters will work at lower power during times of low solar gain (early morning / evening) and at full power during times of high solar gain.

Table 3: Sound Power Levels

Noise Source	Sound Power Level dBA re 10^{-12} Watts	Number of Units	Directivity	Operation time
DC / AC inverter	92 (AC end) 86 (DC end)	13	Included	Daylight hours
Transformer	78	13	None	Daylight hours
Tracker modules	76 (emission when moving) = 98 (total L_w for all trackers)	2100	None	68 seconds movement every 15 minutes – daylight hours

6.2 Noise Level Calculations

Noise levels have been calculated at the notional boundaries of the nearest compliance receivers.[8] Results are reported for unattenuated scenario(s) and an attenuated example.[9]

Noise levels have been calculated under meteorological conditions that are favourable to sound propagation[10] and represent the 'worst case' propagation situation. It is important to note that under most daytime metrological conditions, noise levels will be lower than calculated. This is because when the solar farm is operating at full generation, it will be during periods of high solar gain (typically during the middle part of the day). In general, high solar gain conditions correspond with conditions that are not favourable to sound propagation, as sound will refract upward when air temperatures reduce with increasing altitude (temperature lapse). In temperature lapse conditions, noise levels are expected to be around five decibels lower than calculated for the temperature inversion condition.

Inverter units will likely have appreciable directivity; however, as their orientation is unknown, we have undertaken calculations for four directions (north, south, east, and west). We have reported the 'worst-case' and the 'west directivity' result for each receiver position (for the unattenuated scenario). As most nearby receivers are to the north, east, and south, positioning the inverters with the AC end west facing is calculated to result in overall lower noise levels at most near receivers.[11]

Calculations take into consideration a special audible character[12] correction in accordance with NZS 6802:2008. As the solar farm could potentially operate for more than 80% of the prescribed daytime period (particularly during summer), no duration correction has been applied.

[8] Noise levels for properties that do not have a dwelling (the school) have been calculated near the legal boundary. As this property does not have a dwelling, it is not a compliance location. Results are reported for informational purposes.

[9] The attenuated example is provided to demonstrate calculated noise levels that can be achieved. It is not proposed as the only option for an attenuated design.

[10] These are set out in ISO9613-2 and represent downwind or temperature inversion conditions.

[11] For two receivers (346 and 391 Mangamaire Road), the west facing directivity scenario is the worst-case scenario. Final design would need to assess in detail the best-case directivity for each inverter and/or other attenuation options (refer Section 6.2.2).

[12] Spectral data shows tonality; therefore, a five-decibel special audible character penalty has been applied to unattenuated inverters.

It is assumed that the solar farm would primarily operate during the prescribed daytime period from 7am to 7pm. In summer, the solar farm may also operate before 7am and after 7pm (prescribed night period); however, electricity generation during some of this time is expected to be lower due to reduced solar gain and noise levels are expected to be up to four decibels less than those calculated under 100% load.

6.2.1 Unattenuated Inverters

Results given in Table 4 do not take into account any attenuation of the inverters.

Table 4: Calculated Noise Levels – Unattenuated Inverters.

Receiver Location	District Plan Noise Limit(s) [daytime / night-time] dB L_{Aeq}	Calculated Noise Level (dB L_{Aeq})			
		Worst Case Inverter Directivity		West Facing Inverter Directivity	
		100% LOAD	10% LOAD	100% LOAD	10% LOAD
Compliance receivers:					
37 Tutaekara Rd	55 / 45	27	23	23	19
129 Tutaekara Rd	55 / 45	45	41	41	37
154 Tutaekara Rd	55 / 45	40	36	36	32
154A Tutaekara Rd	55 / 45	40	36	38	34
187 Tutaekara Rd	55 / 45	36	32	35	31
189 Tutaekara Rd	55 / 45	32	28	31	27
205 Tutaekara Rd	55 / 45	34	30	32	28
209 Tutaekara Rd	55 / 45	33	29	31	27
223 Tutaekara Rd	55 / 45	32	28	30	26
229 Tutaekara Rd	55 / 45	33	29	31	27
346 Mangamaire Rd	55 / 45	42	38	42[1]	38
391 Mangamaire Rd	55 / 45	41	37	41[2]	37
562/410 Mangamaire Rd	55 / 45	43	39	40	36
431 Mangamaire Rd	55 / 45	44	40	40	36
451 Mangamaire Rd	55 / 45	40	36	37	33
500 Mangamaire Rd	55 / 45	32	28	30	26
82976 State Highway 2	55 / 45	25	21	20	16
Other receivers:					
School	55 / 45	35	31	33	29

Notes:

1) For 346 Mangamaire Road, the best-case inverter directivity is south, resulting in a calculated noise level of 39 dB L_{Aeq} at 100% load.
2) For 391 Mangamaire Road, the best-case inverter directivity is north, resulting in a calculated noise level of 39 dB L_{Aeq} at 100% load.

As per Table 4, our calculations show that for the compliance receivers:

- the proposal would readily comply with the District Plan daytime noise rule of 55 dB L_{Aeq}
- the District Plan night-time noise rule of 45 dB L_{Aeq} would be complied with at all receivers under the 'worst-case' inverter directivity scenario and 100% load

- under the 'worst-case' inverter directivity scenario and 100% load, calculated noise levels are equivalent or up to four decibels higher than the measured daytime ambient level (41 dB L_{Aeq}) at five receivers
- under the 'worst-case' inverter directivity scenario and 100% load, calculated noise levels are substantially higher than the measured night-time ambient (35 dB L_{Aeq}) and background (26 dB L_{Aeq}) noise levels (up to 10-decibels and 19 decibels, respectively). This scenario is likely to be an intrusive level of noise at approximately eight receivers
- under the 'west directivity' inverter scenario and 100% load, calculated noise levels reduce at 15 receiver locations: by one to two decibels at nine locations; and by three to five decibels at six locations
- under the 'west directivity' inverter scenario and 100% load, calculated noise levels would still be noticeably higher than the measured night-time ambient (35 dB L_{Aeq}) and background (26 dB L_{Aeq}) noise levels (up to 7-decibels and 16 decibels, respectively). This scenario is likely to be an intrusive level of noise at approximately five receivers.

6.2.2 Attenuation of Inverters

Without attenuation of the inverters, compliance with the daytime and night-time District Plan noise rules is calculated to be achieved (or just achieved). However, there is risk that the solar farm would generate electro-mechanical noise at levels that appreciably exceed the existing night-time ambient and background noise levels.

Attenuation of the inverters (through selection, positioning for directivity, partial or full enclosure) would appreciably reduce noise levels. Attenuation would result in significant reduction or effectively eliminate all high-frequency tones (these are associated with the inverter bridge circuit)[13] which would reduce the intrusiveness of any noise audible outside the solar farm. This would avoid risk that night-time noise levels could be above the limit, or that the solar farm could result in a substantial change to the existing rural ambient noise environment.

We consider that attenuation is practical and should be included in the final design as part of Section 16 duties (which require the best practicable option to be applied to ensure noise levels are reasonable).

We have undertaken calculations for an attenuated example[14]. This is not intended to be prescriptive. Rather it is given to demonstrate calculated noise levels that can be achieved. Results for 100% load are given in Table 5.

[13] This is because any attenuation design will reduce high frequency noise more than low-frequency noise. Tones associated with inverter bridge circuits are normally at 3.15 kHz and above which are readily attenuated by short, lined air bends, acoustic louvres or attenuators. Note that frequencies above 4kHz are heavily attenuated by air absorption, especially at lower relative humidities.

[14] The attenuated example is calculated based on enclosure of up to nine inverters (Inverters E1 to E6; and Inverters W1, W2, and W4, as labelled in Appendix B); however, it is possible that with detailed consideration of directivity for individual inverters, not all nine would need to be enclosed.

Table 5: Calculated Noise Levels with Attenuated Inverters

Receiver Location	District Plan Noise Limits [daytime / night] (dB L_{Aeq})	Calculated Noise Level (dB L_{Aeq}) No SAC included for attenuated inverters Scenario with minimum insertion loss provided by barrier, partial or full enclosure. 100% load.
Compliance Receivers:		
37 Tutaekara Rd	55 / 45	22
129 Tutaekara Rd	55 / 45	37
154 Tutaekara Rd	55 / 45	31
154A Tutaekara Rd	55 / 45	34
187 Tutaekara Rd	55 / 45	29
189 Tutaekara Rd	55 / 45	25
205 Tutaekara Rd	55 / 45	25
209 Tutaekara Rd	55 / 45	25
223 Tutaekara Rd	55 / 45	24
229 Tutaekara Rd	55 / 45	25
346 Mangamaire Road	55 / 45	34
391 Mangamaire Road	55 / 45	36
562 / 410 Mangamaire Road	55 / 45	38
431 Mangamaire Road	55 / 45	37
451 Mangamaire Road	55 / 45	36
500 Mangamaire Road	55 / 45	28
82976 State Highway 2	55 / 45	20
Other receivers:		
School	55 / 45	27

As per Table 5, with attenuation included for the inverters, our calculations show that for the compliance receivers:

- the proposed solar farm would readily comply with the District Plan daytime noise rule of 55 dB L_{Aeq}. Calculated noise levels are less than the measured daytime ambient by at least three decibels
- the proposed solar farm would readily comply with the District Plan night-time noise rule of 45 dB L_{Aeq}
- noise levels from the solar farm would generally be lower than or similar to the existing night-time ambient noise level. At three sites (129 Tutaekara Rd, 562/410 Mangamaire Rd, and 431 Mangamaire Rd) levels would be just perceptibly above the existing night-time ambient noise level. Noise at this time would be controlled by the tracker motors on adjacent arrays and would be confined to a short period of time (prior to 7am and after 7pm) during times of year when sunrise and sunset occur before 7am and after 7pm
- the attenuation example reduces noise levels at all receivers by at least four and up to nine decibels. Overall, this would be an appreciable reduction in loudness

- overall, calculated noise levels are low and at a level that should not cause annoyance, sleep disturbance, or appreciably affect acoustic amenity.

6.2.3 Enclosure Design

It is likely that some inverters would need to be enclosed. We have prepared an inverter enclosure design. This is appended (Appendix C). The design is based on a drop-over enclosure with a passive intake louvre and lined discharge bend. This inverter enclosure design is provided as an example of a practicable methodology to reduce noise emissions but requires careful review by any inverter supplier. Any final design may need to be modified from that shown in Appendix C.

Based on the design given in Appendix C, we expect the attenuation in Table 6 to be achieved. Also provided is the minimum recommended insertion loss for any other noise attenuation measure (such as a barrier or any full or partial enclosure used to reduce noise emissions from the site).

Table 6: Sound Insertion Loss of Enclosure

	Octave Band Centre Frequency (Hz)						
	63	125	250	500	1000	2000	4000
Required insertion loss	**-**	**-**	**8**	**8**	**8**	**10**	**10**
Expected insertion loss of enclosure	8	10	14	19	20	16	16

6.3 Operational Traffic

Operational traffic is not expected to be significant. Occasional movements to the solar farm would not risk breaching the day-time noise rule. Heavy vehicle movements are not expected to occur during the night period.

7.0 SUMMARY OF OPERATIONAL NOISE EFFECTS

Attenuation of the inverters has been shown to appreciably reduce noise levels at all nearby receivers. This would avoid risk that night-time noise levels could be above the limit, or that the solar farm could result in an appreciable change to the existing rural ambient noise environment. We consider that attenuation is practical and should be implemented as part of Section 16 duties (which require the best practicable option to be applied to ensure noise levels are reasonable).

With inverter attenuation in place, we consider that noise from the solar farm would be low overall and within all national and international guidelines for environmental noise levels that are typically applied within New Zealand. This would result in low risks of annoyance arising and that overall, the solar farm would be reasonable in terms of the RMA.

8.0 CONSTRUCTION NOISE LEVELS

Construction of the solar farm is likely to involve the following:

- delivery of panels, inverters and other infrastructure, requiring trucks and small cranes
- some earthworks using trucks, loaders and excavators
- a piling rig to drive the support piles into the ground. These may be hammered, vibropiled or bored depending on ground conditions.

We have assumed that construction would take place over a period greater than 20-weeks and between the hours 7:30 to 18:00, Monday to Saturday. Therefore, the 'long-term duration'

construction noise limits: 70 dB L_{Aeq} and 85 dB L_{AFmax} would apply. The noise limits apply at 1m outside the façades of occupied buildings.

All significant equipment likely to be used on the project is listed in Table 7.

The sound levels given are based on measurements made by Marshall Day Acoustics of similar plant or from BS 5228-1:2009 *Code of practice for noise and vibration control on construction and open sites* Part 1: Noise.

Table 7: Activity Specific Noise Levels at 1m from a building façade (without screening)

Item/Activity	Operating Sound Power Level (dB L_{WA})	Noise Level (dB L_{Aeq})					70dBA Limit Setback (m)
		10m	20m	30m	50m	100m	
Large Trucks	108	83	77	73	68	60	40
Excavators and other earthmoving plant	106	81	75	71	66	58	33
Impact piling (no mitigation)	123	98	92	88	83	75	158
Impact piling (small or with dolly)	114	89	83	79	74	66	69
Vibropiling (excavator driving small piles)	106	81	75	71	66	58	33
Bored or screw piles (small rig)	103	78	72	68	63	55	25
Concrete truck & pump	103	78	72	68	63	55	25
Truck idling	91	66	60	56	51	43	6

The site area (works area) is within 160 metres from the façades of eight surrounding sensitive receivers (dwellings). Site works would be approximately 12 metres and 20 metres from the façades of the existing site dwellings (129 Tutaekara Road and 562 Mangamaire Road, respectively). Receivers calculated to be within the setback distances given in Table 7 are listed below:

- 129 Tutaekara Road ~ dist. to façade 12m
- 154 Tutaekara Road ~ dist. to façade 120m
- 154A Tutaekara Road ~ dist. to façade 55m
- 346 Mangamaire Road ~ dist. to façade 70m
- 391 Mangamaire Road ~ dist. to façade 40m
- 431 Mangamaire Road ~ dist. to façade 30m
- 451 Mangamaire Road ~ dist. to façade 30m
- 562 / 410 Mangamaire Road ~ dist. to façade 20m

Table 7 shows that truck and earthmoving activities are within the 70 dB L_{Aeq} limit setback distance for five of the receivers listed above. Impact pile driving is within the setback distance for all of the receivers listed above. If impact piling is required, mitigation (a small piler or a dolly) should be used. Vibropiling would result in lesser effects.

If any of the following are proposed, construction noise limits may be breached for a period of time, and a construction noise and vibration management plan may be necessary to assess and manage construction effects on near receivers:

- Construction activities within the setback distances given in Table 7 (particularly in relation to the nearest sensitive buildings)

- construction outside the hours 07:30 to 18:00, Monday to Saturday
- significant construction equipment additional to that listed in Table 7.

Based on our assessment, resource consent may be needed to exceed the construction noise limits.

9.0 RECOMMENDED NOISE CONDITIONS

It is recommended that the following noise conditions are imposed on any consent granted.

1. The noise level from all operation of the solar farm shall meet the following District Plan noise limits at the notional boundary of any existing dwellings on another site in the *Rural* zone:
   - 55 dB $L_{Aeq(15\text{-}min)}$ from 0700 to 1900 hours
   - 45 dB $L_{Aeq(15\text{-}min)}$ and 70dB L_{AFmax} from 1900 to 0700 hours.
2. Noise levels shall be measured and assessed in accordance with *NZS 6801:2008 Acoustics – Measurement of Environmental Sound* and *NZS 6802:2008 Acoustics – Environmental Noise.*
3. Noise from construction activities shall, as far as practicable, not exceed the limits recommended in, and shall be measured and assessed in accordance with, New Zealand Standard NZS 6803: 1999 *"Acoustics – Construction Noise".* Where exceedances of the guidelines in this standard are identified as likely to occur, they shall be managed through a construction noise and vibration management plan. All practicable noise attenuation measures shall be implemented.
4. Detailed design of the project shall include an attenuation design for the inverters. The attenuation design shall consider selection, orientation, and acoustic screening (though barriers), enclosure, or other measures as appropriate.

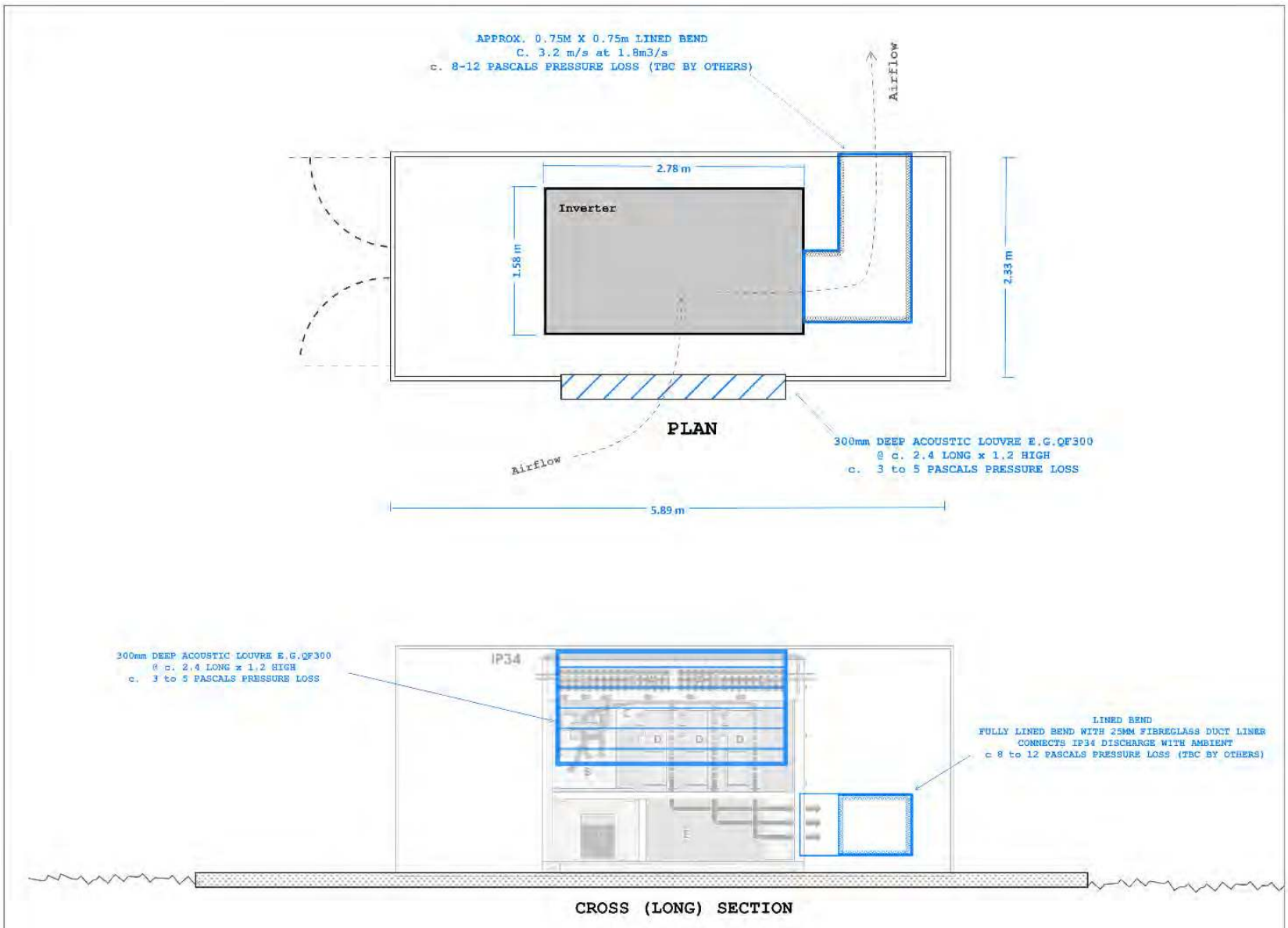
   The attenuation design must ensure that the noise level at any receiver complies with the night-time noise limit. The attenuation design shall minimise or eliminate tonality (as defined by NZS 6802:2008) where it is practicable to do so. The attenuation design shall further aim to achieve noise levels that are appreciably below the District Plan night-time noise limits *where practicable*. The attenuation design should be undertaken by a recognised acoustician and submitted to council prior to commencement of construction. It is recognised that the attenuation design may require commissioning works on site during construction to suitably refine and improve the attenuation design.

APPENDIX A GLOSSARY OF TERMINOLOGY

Ambient Noise	Ambient Noise is the all-encompassing noise associated with any given environment and is usually a composite of sounds from many sources near and far.
dBA	A measurement of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.
L_{eq}	The time averaged sound level (on a logarithmic/energy basis) over the measurement period (normally A-weighted).
L_{90}	The sound level which is equalled or exceed for 90% of the measurement period. L_{90} is an indicator of the mean minimum noise level and is used in New Zealand as the descriptor for background noise (normally A-weighted).
L_{AFmax}	The maximum sound level recorded during the measurement period (normally A-weighted).
NZS 6801:2008	New Zealand Standard NZS 6801:1991 *"Acoustics - Measurement of Environmental Sound"*
NZS 6802:2008	New Zealand Standard NZS 6802:1991 *"Acoustics - Environmental Noise"*
NZS 6803:1999	New Zealand Standard NZS 6803:1999 "*Acoustics – Construction Noise*"
Prescribed time frame	'Daytime', night-time', 'evening', or any other relevant period specified in any rule or national environmental standard or in accordance with 8.3.2 in NZS 6802:2008.

APPENDIX B PROPOSED SITE PLAN

APPENDIX C INVERTER ENCLOSURE



Indicative Acoustic Specification

Specification	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Transmission Loss / Insertion Loss							
Duct extract gauge 0.8mm	9	12	16	21	26	32	37
300mm deep acoustic louvre	3	6	8	12	19	20	18
Enclosure walls	8	10	14	19	20	16	16
Sound absorption Coefficent							
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Ductliner 25mm thick faced fibreglass	-	0.06	0.2	0.45	0.55	0.8	0.8
Enclosure liner 25mm nominal thickness or greater polyester or fibreglass	-	0.05	0.1	0.25	0.3	0.35	0.55

Notes

1. Designed as drop over enclosure that can be removed for service.
2. Enclosure ideally internally insulated with enclosure liner (polyester or polyester)
3. Confirm heat and ventilation loads with inverter supplier and mechanical engineer as required.

PROJECT: Maungaturoto Solar Farm

TITLE: Indicative Enclosure Methodology

JOB NO:

DRAWN: PAI

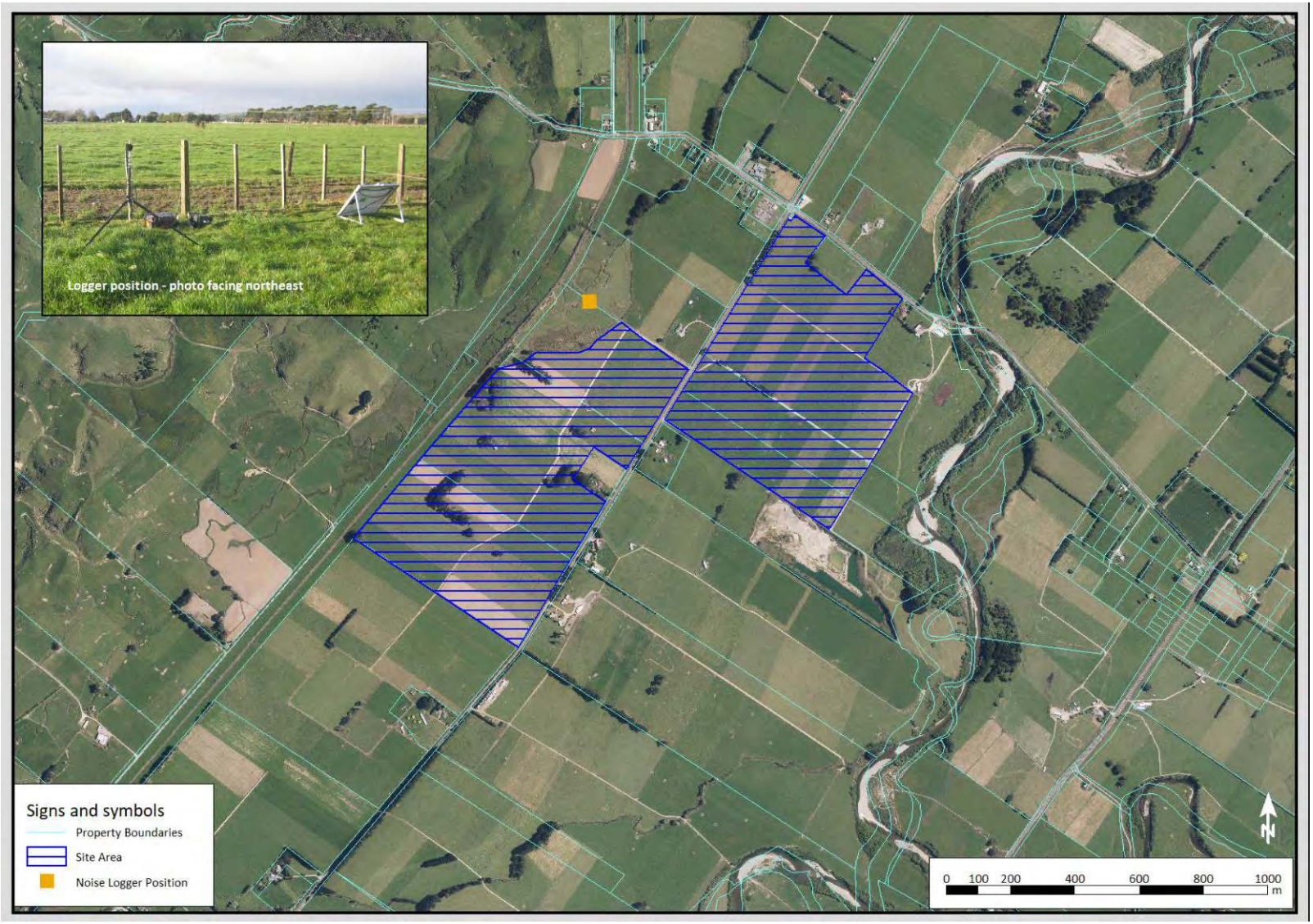
DATE: 8 April 2022

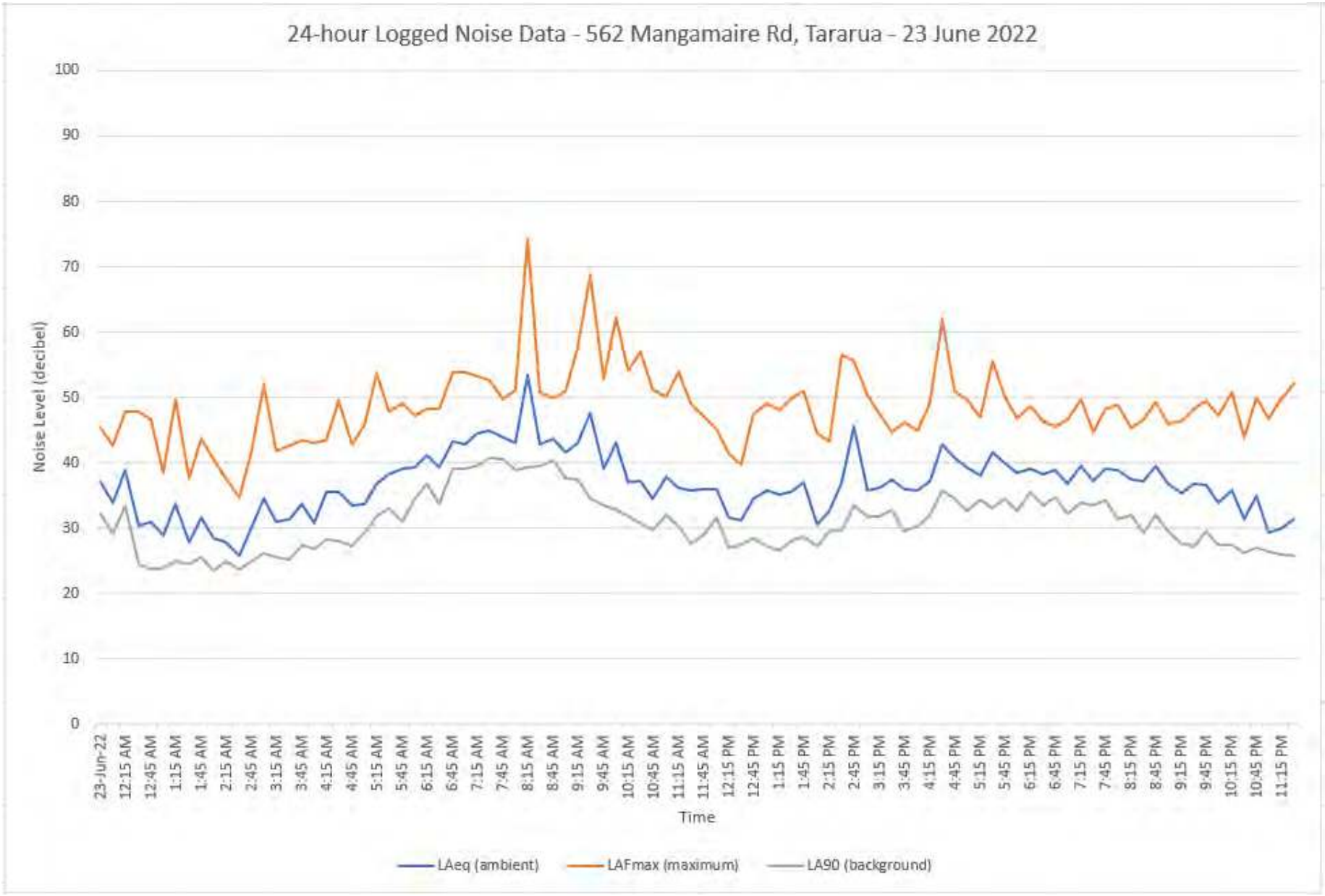
SCALE: NTS

DRAWING REF: 20220050

REV: 01

APPENDIX D NOISE MEASUREMENT POSITION AND LOGGED RESULTS




24-hour Logged Noise Data - 562 Mangamaire Rd, Tararua - 23 June 2022
Noise Level (decibel)
100
90
80
70
60
50
40
30
20
10
0
23-Jun-22
12:15 AM
12:45 AM
1:15 AM
1:45 AM
2:15 AM
2:45 AM
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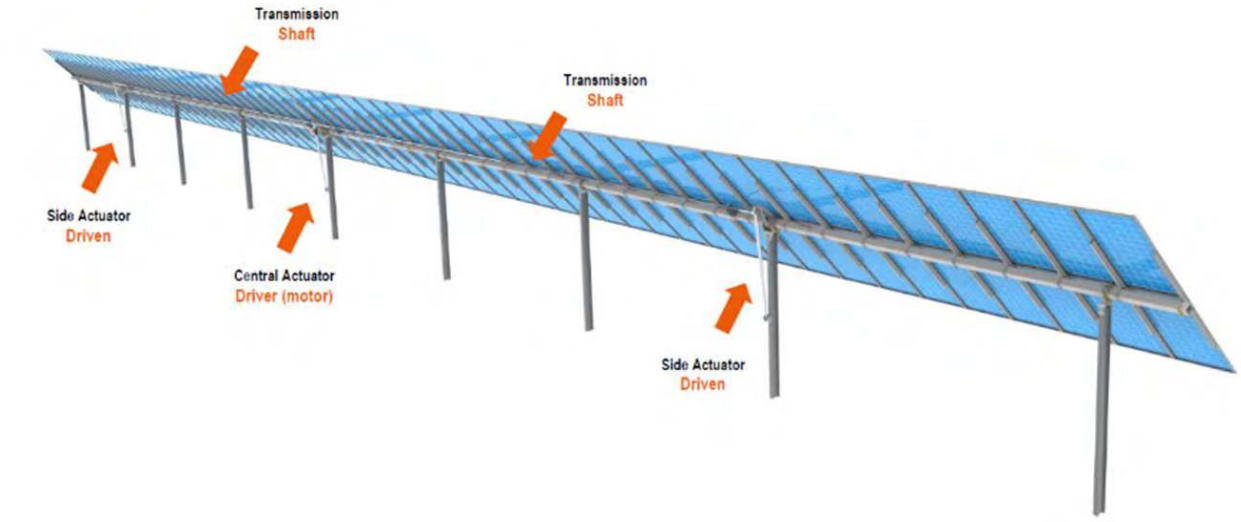
Time
LAeq (ambient)
LAFmax (maximum)
LA90 (background)

APPENDIX E TRACKER ARRANGEMENT



APPENDIX F DISTRICT PLAN NOISE RULES

5.4 Amenity

5.4.1 NOISE AND VIBRATION

5.4.1.1 Introduction

Noise (including vibration) is a significant health and environmental quality issue and an important factor contributing to the varying levels of amenity in different areas of the District. Section 31(d) of the RMA assigns Council the function of controlling the emission of noise and the mitigation of the effects of noise. This function is supported by the abatement and enforcement provisions in Part XII of the RMA, particularly Sections 326 to 328 which relate to "excessive noise".

This District Plan sets minimum environmental standards in respect of noise, using New Zealand Standards to determine acceptable levels and methods of assessment, as there is currently no locally developed data base on noise levels in the District.

The following New Zealand Standards are applicable:

- NZS 6801:2008 Acoustics - Measurement of Environmental Sound
- NZS 6802:2008 Acoustics – Environmental Noise
- NZS 6803:1999 Acoustics - Construction Noise

5.4.1.2 Standards

(a) All noise levels shall be measured in accordance with NZS6801: 2008 and shall be assessed in accordance with NZS6802: 2008. Where NZS6802: 2008 does not include the type of noise in question, the appropriate standard or regulation which covers that type of noise shall be used.

(b) The following noise limits shall apply to all activities in the **Residential, Settlement and Rural Management Areas** of the District, with the exception that these standards shall not apply to the following:

- audible bird-scaring devices in the Rural Management Area;
- forestry activities which are undertaken during daylight hours only and for a period not exceeding 7 days duration, in any Management Area;
- temporary military training activities in any Management Area

7.00 am - 7.00 pm daily	55 $dBL_{Aeq(15\ min)}$
7.00 pm - 7.00 am daily	45 $dBL_{Aeq(15\ min)}$ and 75 dBL_{AFmax}

These noise limits are not to be exceeded at any point within the boundary of any site used for residential activities or, in the Rural Management Area, at any point within the "notional boundary" of any dwellinghouse on land held in a separate certificate of title or, if the complainant's dwellinghouse is on the same certificate of title, at any point within the notional boundary of the complainant's dwellinghouse.

APPENDIX G CONSTRUCTION NOISE RULES (NZS6803:1999)

NZS6803:1999 sets out the following noise limits:

"Residential zones and dwellings in rural areas:

Table 2 – Recommended upper limits for construction noise received in residential zones and dwellings in rural areas

Time of week	Time period	Duration of work					
		Typical duration (dBA)		Short-term duration (dBA)		Long-term duration (dBA)	
		L_{eq}	L_{max}	L_{eq}	L_{max}	L_{eq}	L_{max}
Weekdays	0630-0730	60	75	65	75	55	75
	0730-1800	75	90	80	95	70	85
	1800-2000	70	85	75	90	65	80
	2000-0630	45	75	45	75	45	75
Saturdays	0630-0730	45	75	45	75	45	75
	0730-1800	75	90	80	95	70	85
	1800-2000	45	75	45	75	45	75
	2000-0630	45	75	45	75	45	75
Sundays and public holidays	0630-0730	45	75	45	75	45	75
	0730-1800	55	85	55	85	55	85
	1800-2000	45	75	45	75	45	75
	2000-0630	45	75	45	75	45	75

"Industrial or commercial areas:

Table 3 – Recommended upper limits for construction noise received in industrial or commercial areas for all days of the year

Time period	*Duration of work*		
	Typical duration	***Short-term duration***	***Long-term duration***
	L_{eq} (dBA)	*L_{eq} (dBA)*	*L_{eq} (dBA)*
0730-1800	*75*	*80*	*70*
1800-0730	*80*	*85*	*75*

Notes in the standards to the tables above:

7.2.5

The night time limits in Table 2 shall apply to activities carried out in industrial or commercial areas where it is necessary to prevent sleep interference, specifically where there are residential activities, hospitals, hotels, hostels, or other accommodation facilities located within commercial areas. The limits in Table 2 may also be used to protect other specific noise sensitive activities at certain hours of the day.

7.2.6

One major factor which should be considered is whether there is a relatively high background sound level (L_{90}) due to noise from sources other than construction work at the location under investigation. In such cases limits should be based on a determination of the existing level of noise in the area (a "background plus" approach).

7.2.7

Where there is no practicable method of measuring noise outside a building, the upper limits for noise measured inside the building shall be the levels stated in tables 2 and 3 minus 20 dBA. This is considered to be a typical value for the sound reduction normally achieved in New Zealand buildings with doors and windows closed."

APPENDIX 5:

WRITTEN APPROVALS

Written approval of affected persons

TARARUA DISTRICT COUNCIL

Section 95 Resource Management Act 1991

Please read this first

This form will be scanned by electronic equipment. It is important that you:

- use a blue or black pen to complete this form; and
- print clearly.

Please note, in most instances the Council will require the approval of the legal owners and the occupiers of the affected property.

Applicant details *(Please print in CAPITALS)*

Title: ☐ Mr ☐ Mrs ☐ Miss ☐ Ms

Energy Bay Limited

First names

Surname

129 Tutaekara Road & 410 Mangamaire Road, Pahiatua

Address of proposed activity

Brief description of proposed activity

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Affected persons *(Please print in CAPITALS)*

DAVID RODNEY & ERIN KATHLEEN GREEN

Full name of affected person(s)

129 TUTAEKARA ROAD RD7 MANGAMAIRE PAHIATUA

Address of affected property

I am/we are the ☑ Owner(s) ☐ Occupier(s)

You should only sign below if you support or have NO OPPOSITION to approval of the application for resource consent you have been asked to consider.

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Signature of affected person(s)

27/01/2022

Date

RMM

ROUGH MILNE MITCHELL
LANDSCAPE ARCHITECTS

Proposed Solar Farm
Mangamaire Road, Tararua

David Rodney + Erin Kathleen Green
129 Tutaekara Road, RD7, Manganaire Pahiatua.
27/1/2022.

26 January 2022

Document Information

Project

Proposed Solar Farm

Address

Mangamaire Road, Tararua

Client

Solar Bay Ltd

Document

Graphic Attachment to Landscape Assessment Report

Status

For Consultation with Neighbours

Revision

1 For Consultation with Neighbours 26.01.2022

Prepared By

Rough Milne Mitchell Landscape Architects Ltd

Project Number: 22014

Author: Jess Mills

Peer Reviewed: Paul Smith

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Contents

General Arrangement Plan

PV MODULE:	JINKO SOLAR JKM 565M-7RL4-TV
PV MODULE SIZE:	2411 x 1134 x 35 (mm)
No. OF MODULE:	86,750
PV SYSTEM SIZE:	49 MWp-DC/ 57.2 MVA-AC
ARRAY SLOPE:	N/A
ORIENTATION:	EAST/WEST
MOUNTING TYPE:	SINGLE AXIS TRACKING

CONCEPT DESIGN

LEGEND	
	LAND BOUNDARY (FENCELINE)(AREA ~87 Ha)
	2 OR 4 x 25 TRACKING TABLES OF JINKO 565Wp TIGER PRO BIFACIAL MODULES
	PROPOSED ACCESS ROADS
	OVERHEAD POWERLINES
	SMA 4400 UP MVPS (INVERTER + TRANSFORMER)
	CABLE TRENCHING (6050m)
	INVERTER ACOUSTIC SETBACK (150m)
	110kV SETBACK (20m)

SITE ACCESS 2

SITE ACCESS 1

0.77km

0.372km

0.624km

1.02km

0.645km

A. Chris Chesterman
451 Mangamaire Road

B. Chris Chesterman
500 Mangamaire Road

C. David and Erin Green
562 Mangamaire Road

D. Hirock Quarries
391 Mangamaire Road

E. Ryan and Jessica McNicol
346 Mangamaire Road

F. Wayne Morris
154A Tutaekara Road

G. James and Anne Eler
154 Tutaekara Road

H. David and Erin Green
126 Tutaekara Road

NOTE: PV MODULES SETBACK MIN. 10M FROM ROAD BOUNDARY & MIN. 3M FROM INTERNAL BOUNDARY

Not to Scale - To Fit Page

Data Source: Vector Powersmart Indicative Proposal

Solar Panels Examplar Images

A Example of a similar Solar Farm in Marlborough
B Example of a similar Solar Farm in Kaitaia
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B

C

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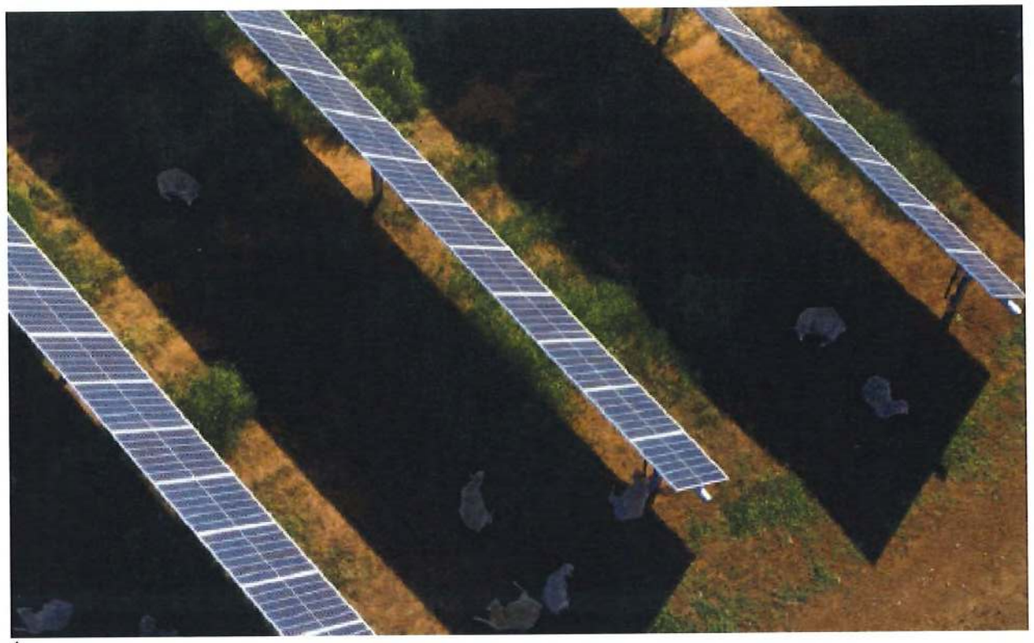

A

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Indicative Cross Sections

A Morning - Solar Tables at thier Maximum East Facing Extent
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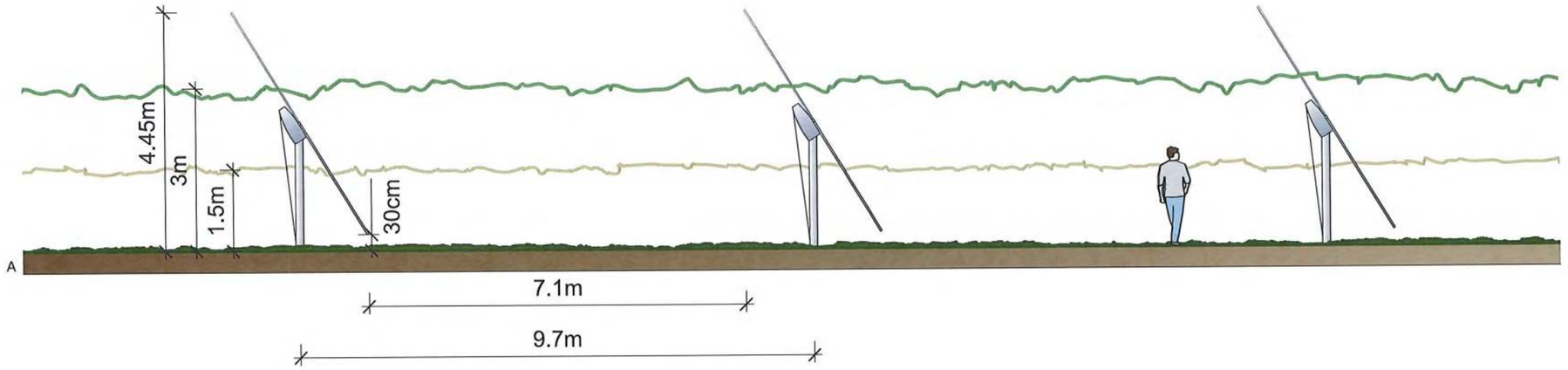

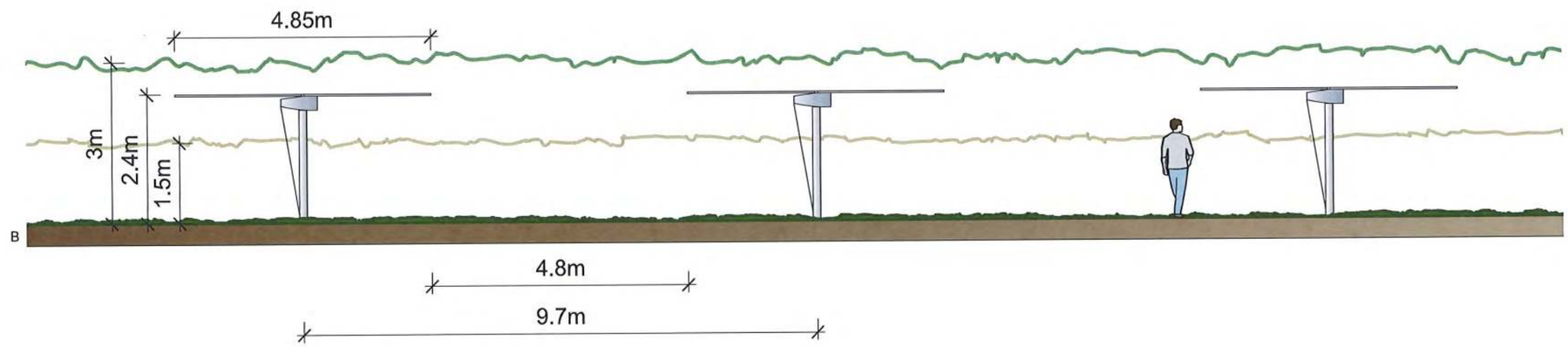

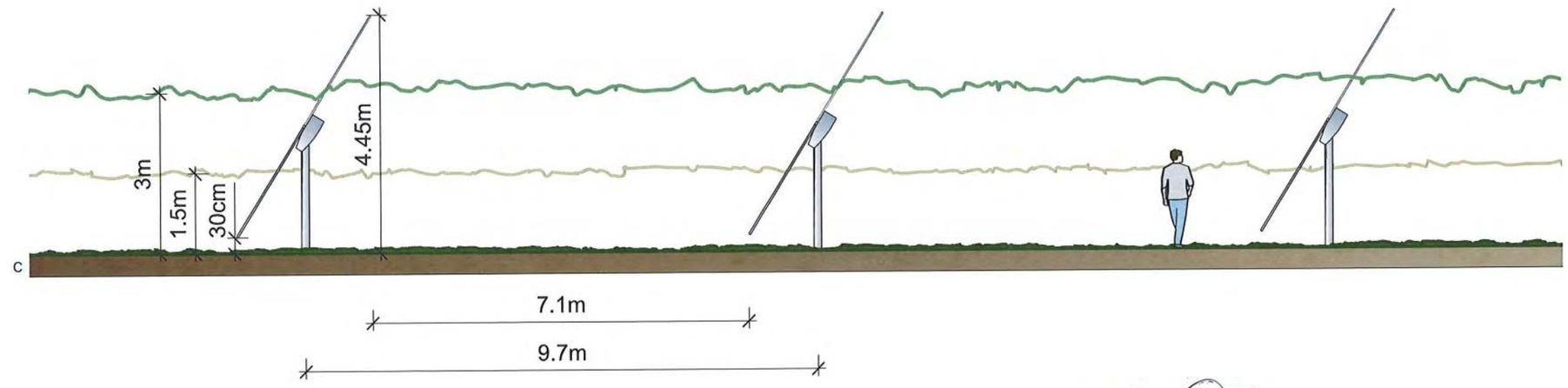

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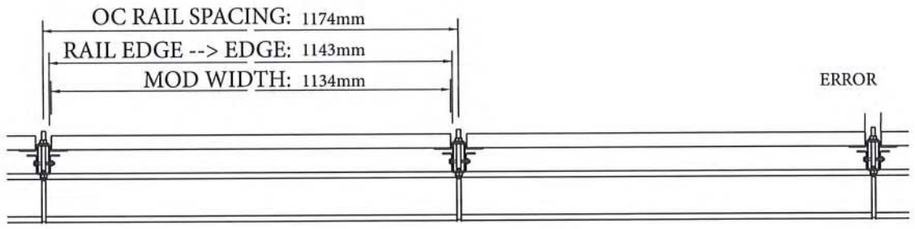
RMM

Proposed Solar Farm Mangamaire Road, Tararua

Mechanical Layout Information

FTC VOYAGER TRACKER™

MODULE RAIL SPACING



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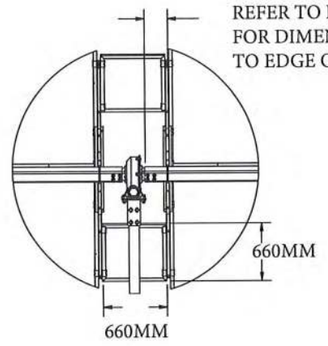

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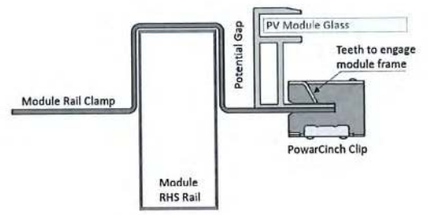

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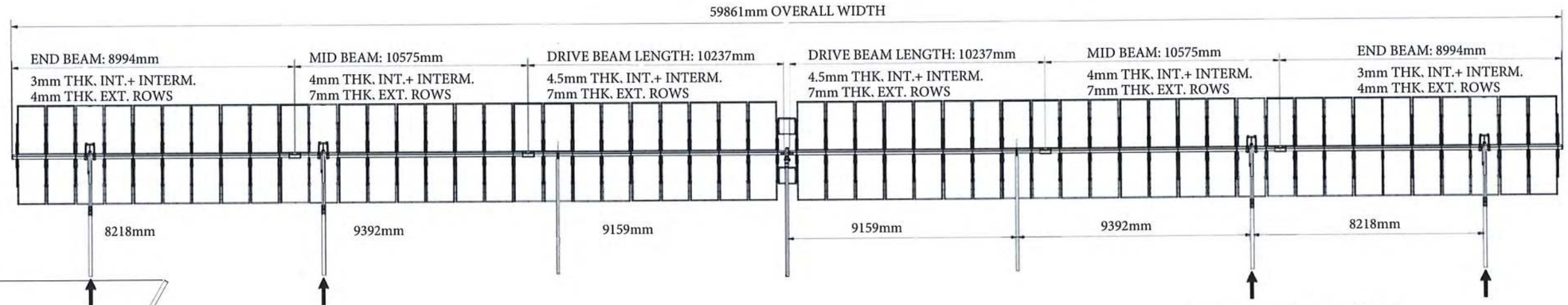
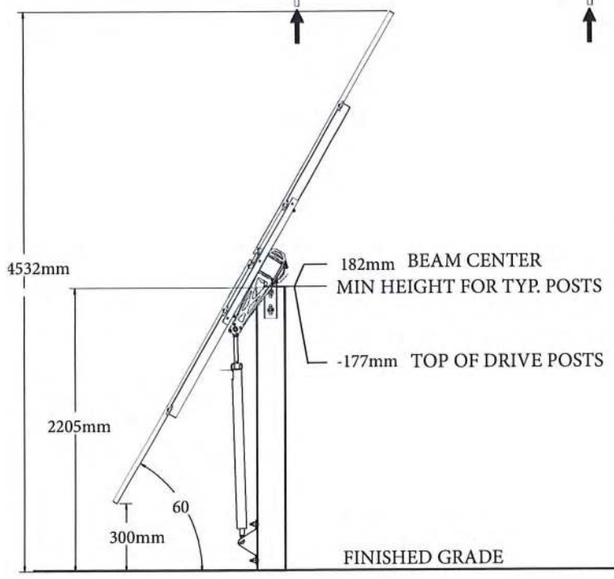
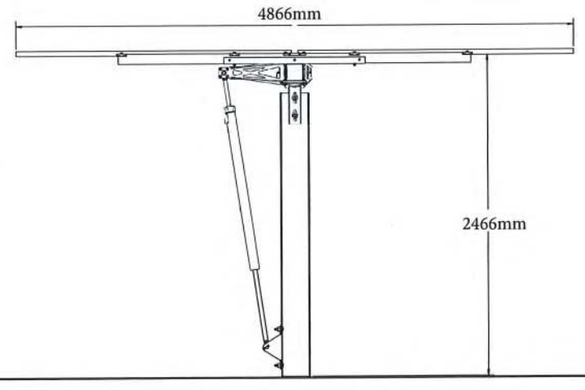


NOTE 9: DAMPER LOCATIONS

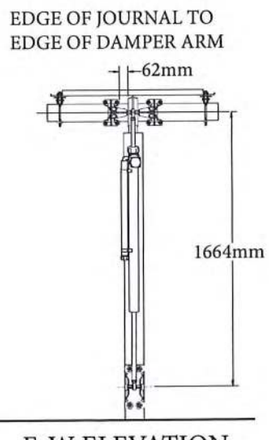
ELEVATION VIEWS



N-S ELEVATION @ MAX. TILT



N-S ELEVATION @ 0



E-W ELEVATION
DAMPER DETAIL

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C Example of Inverter

Tiger Pro 7RL4-TV

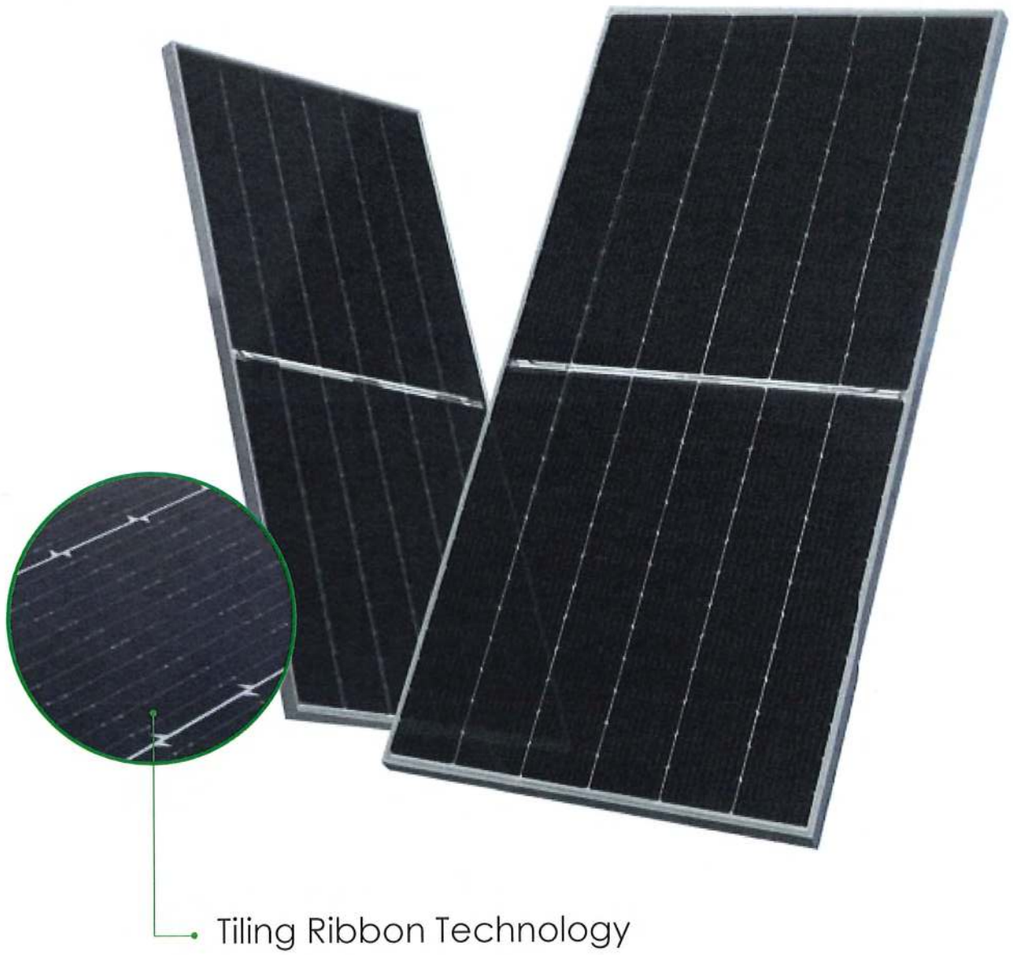
565-585 Watt

BIFACIAL MODULE
TILING RIBBON (TR)

P-Type

Solar JinKO

*Building **Your Trust** in Solar*



A.

Mechanical Characteristics	
Cell Type	P type Mono-crystalline
No. of cells	156 (2×78)
Dimensions	2411×1134×35mm (94.92×44.65×1.38 inch)
Weight	30.6 kg (67.46 lbs)
Front Glass	3.2mm,Anti-Reflection Coating, High Transmission, Low Iron, Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68 Rated
Output Cables	TUV 1×4.0mm² (+): 400mm , (-): 200mm or Customized Length
Conector	JK03M/2B, genuine MC4 evo 2
Fire Rating	Class C

B.

Dimensions 2.815m (W) x 2.318m (H) x 1.588m (D)

C.

Written approval of affected persons

TARARUA® DISTRICT COUNCIL

Section 95 Resource Management Act 1991

Please read this first

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Applicant details *(Please print in CAPITALS)*

Title: ☐ Mr ☑ Mrs ☐ Miss ☐ Ms

Energy Bay Limited

First names

~~ANN MELVA ELERS~~ [illegible]

Surname

129 Tutaekara Road & 410 Mangamaire Road, Pahiatua

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Brief description of proposed activity

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Affected persons *(Please print in CAPITALS)*

ANN MELVA & JAMES CAREW Elers

Full name of affected person(s)

154 Tutakava Rd

Pahiatua

Address of affected property

I am/we are the ☑ Owner(s) ☐ Occupier(s)

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a M Elers [signature]

Signature of affected person(s)

27/01/2022

Date

RMM

ROUGH MILNE MITCHELL
LANDSCAPE ARCHITECTS

Proposed Solar Farm
Mangamaire Road, Tararua

James Ebers
Ann Ebers

154 Tutaekara Rd, Pahiatua
27/01/22

26 January 2022

Document Information

Project

Proposed Solar Farm

Address

Mangamaire Road, Tararua

Client

Solar Bay Ltd

Document

Graphic Attachment to Landscape Assessment Report

Status

For Consultation with Neighbours

Revision

1 For Consultation with Neighbours 26.01.2022

Prepared By

Rough Milne Mitchell Landscape Architects Ltd

Project Number: 22014

Author: Jess Mills

Peer Reviewed: Paul Smith

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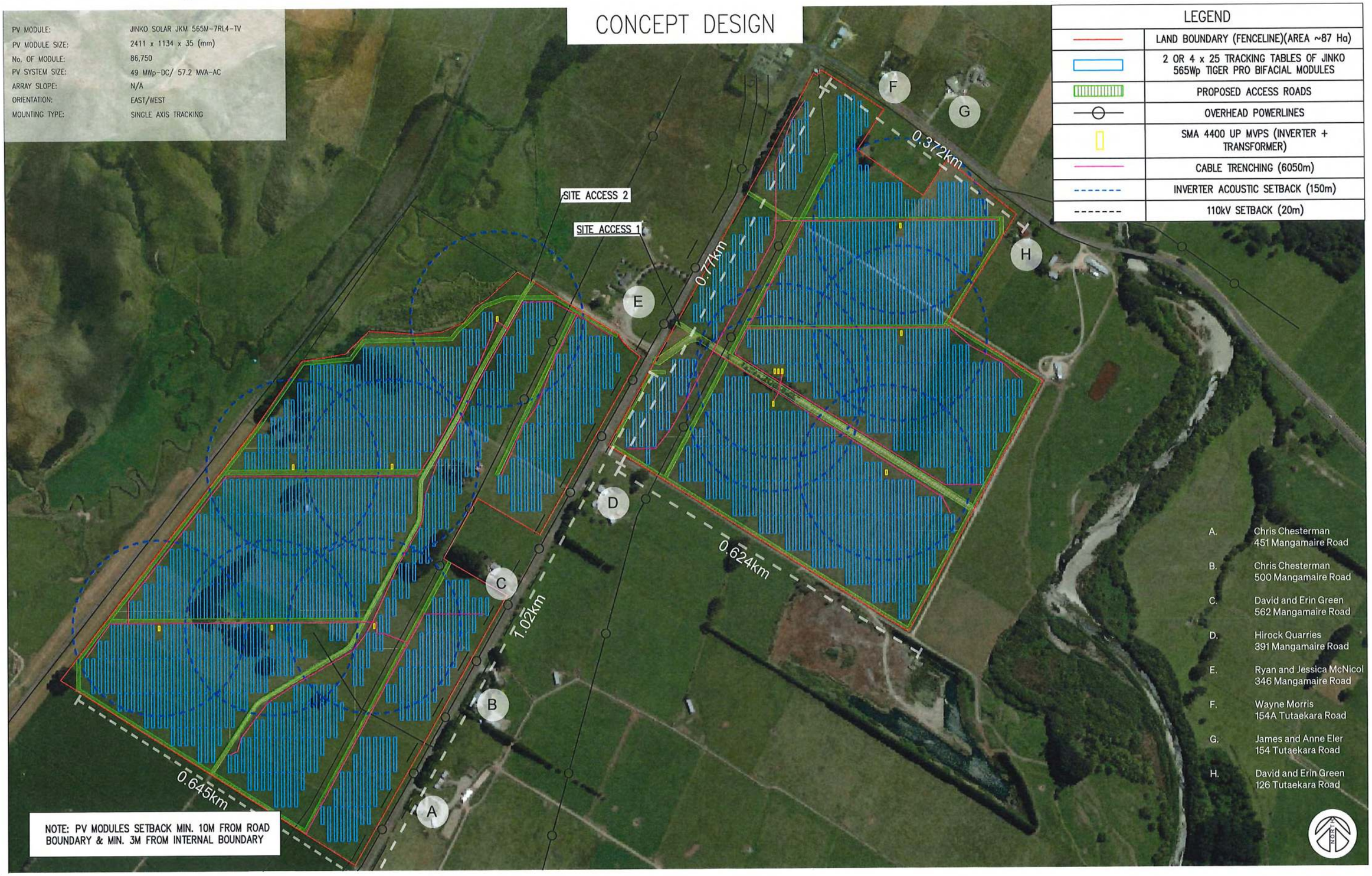

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RMM

Proposed Solar Farm Mangamaire Road, Tararua

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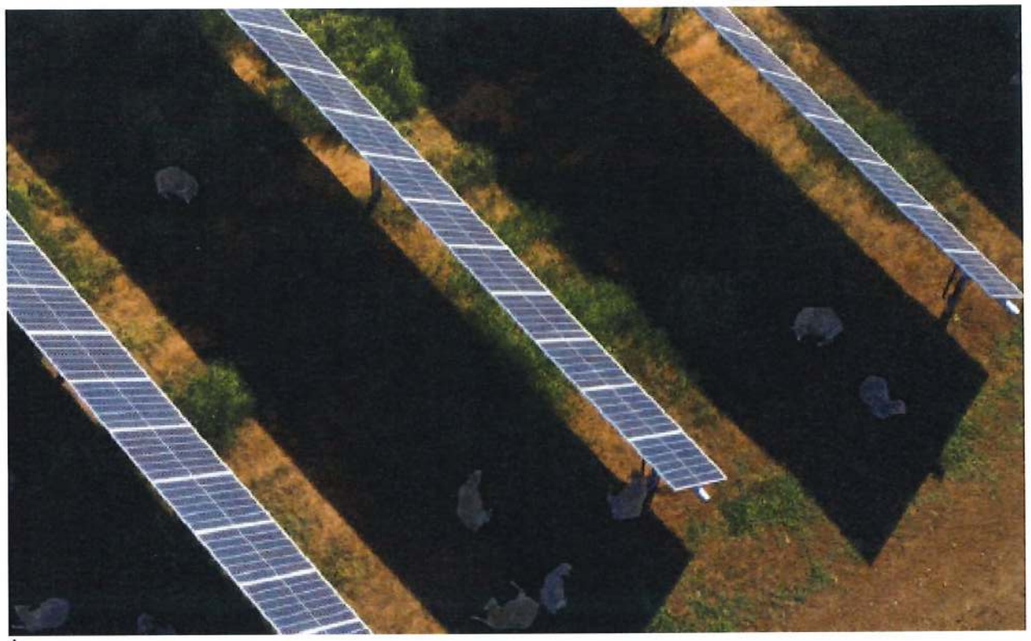

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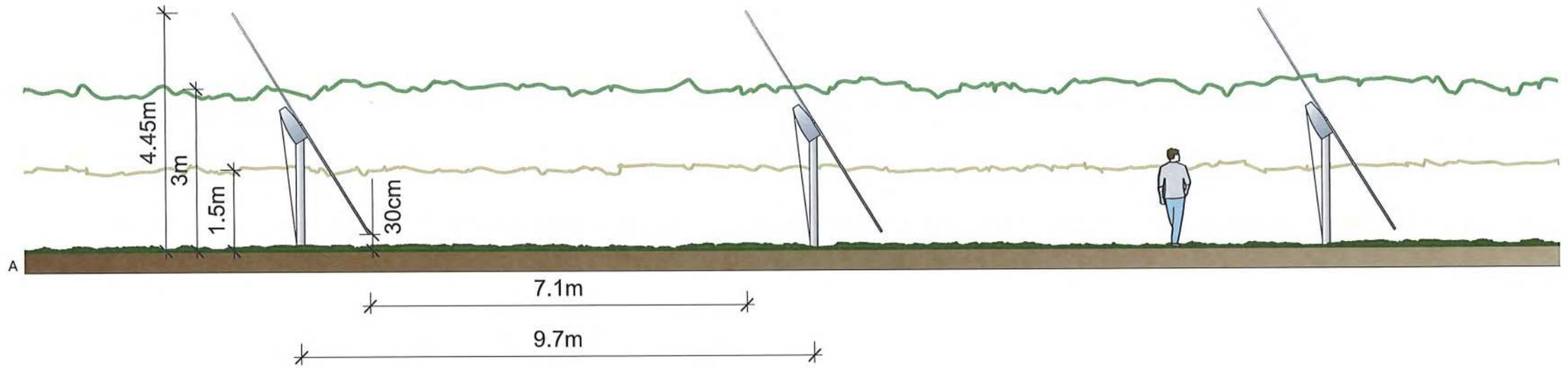

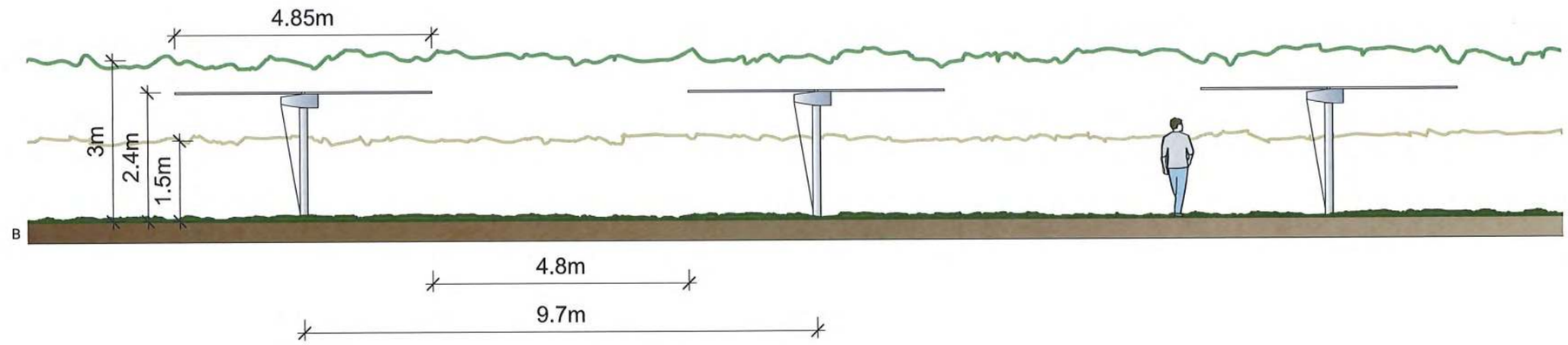

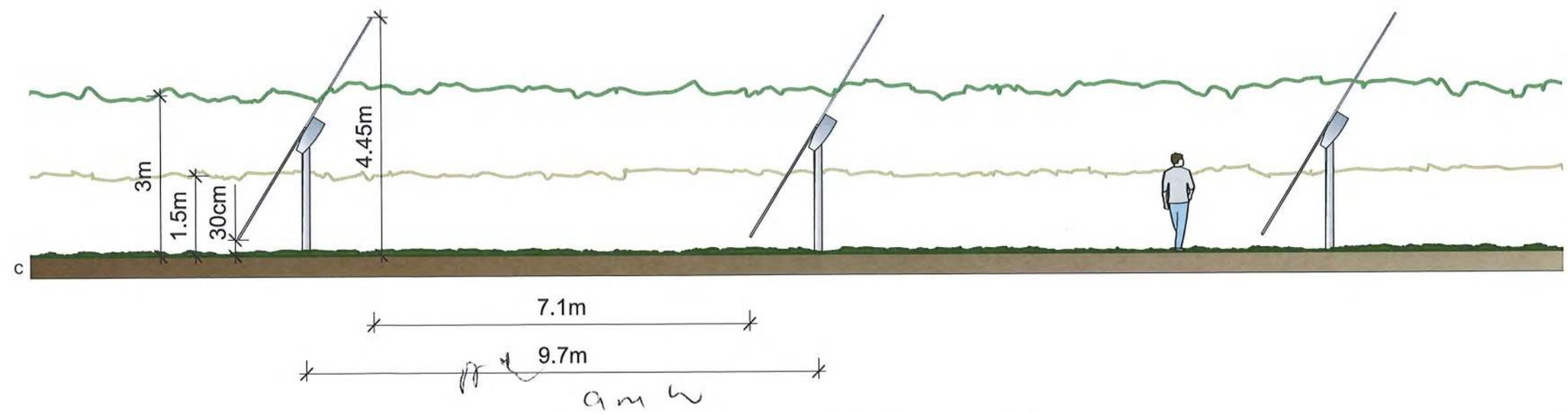

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RMM

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FTC VOYAGER TRACKER™

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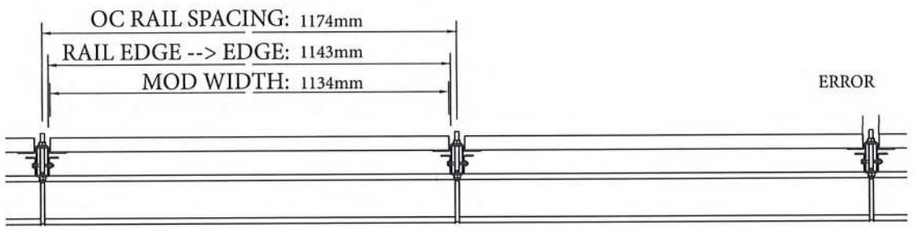

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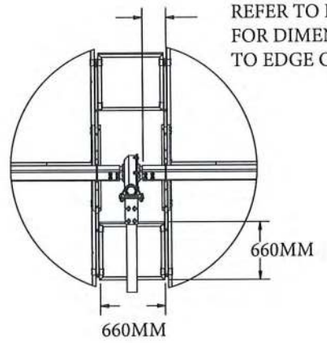

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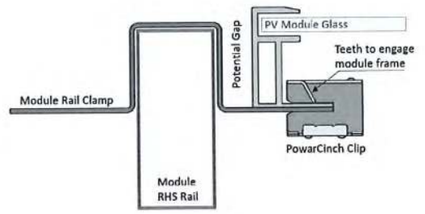

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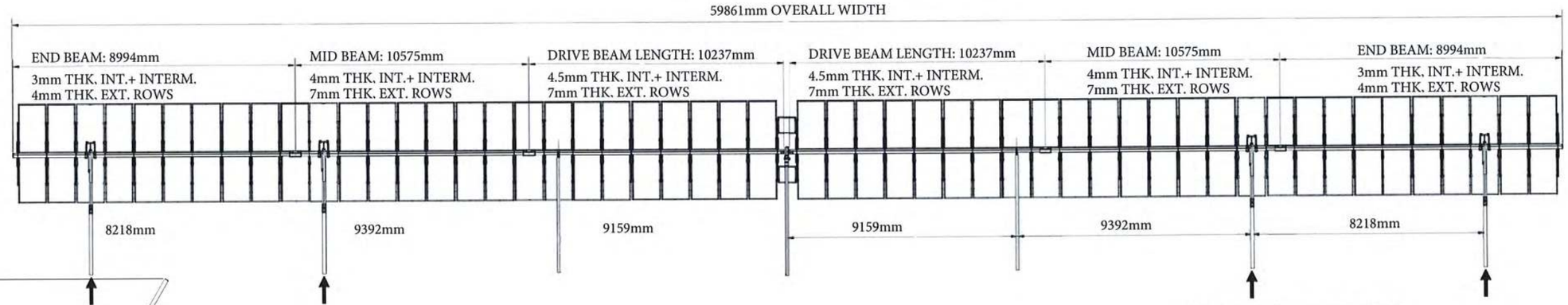

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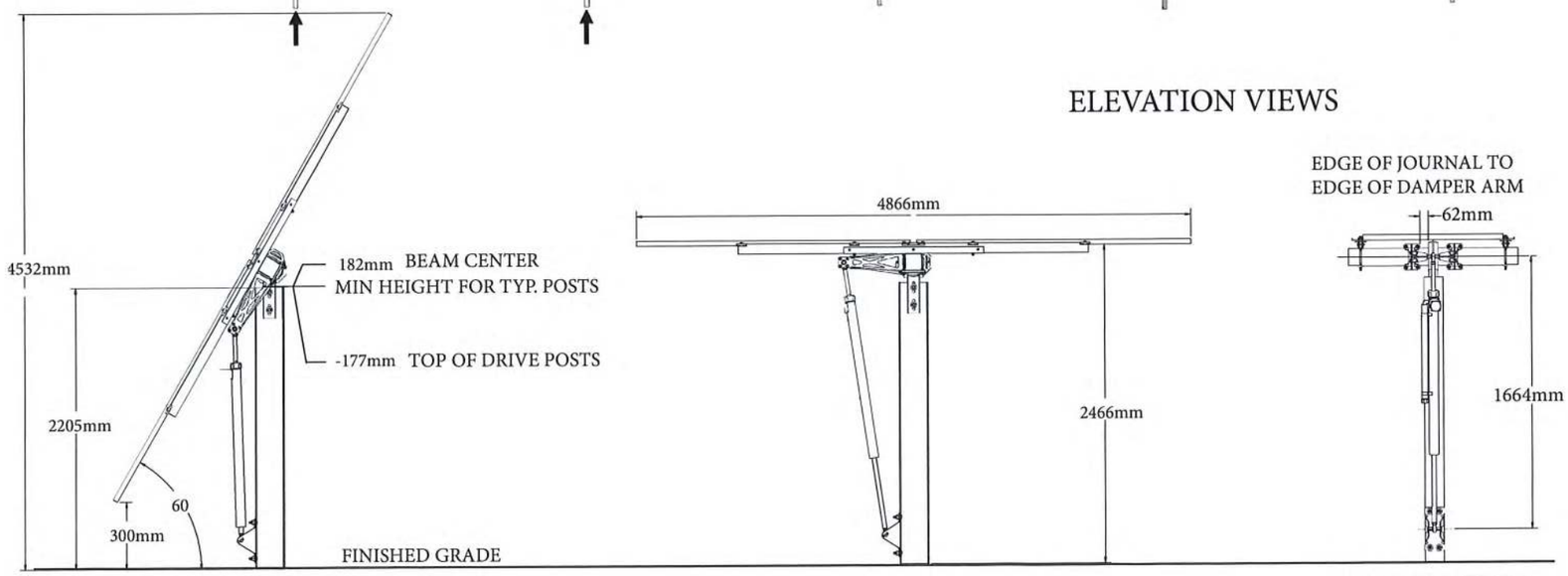

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N-S ELEVATION @ 0

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Full name of affected person(s)

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RMM

ROUGH MILNE MITCHELL
LANDSCAPE ARCHITECTS

Proposed Solar Farm
Mangamaire Road, Tararua

Carol Morris
Wayne Morris
154A Tutaekara Rd Mangamaire
Pahiatua

27 01 2022

26 January 2022

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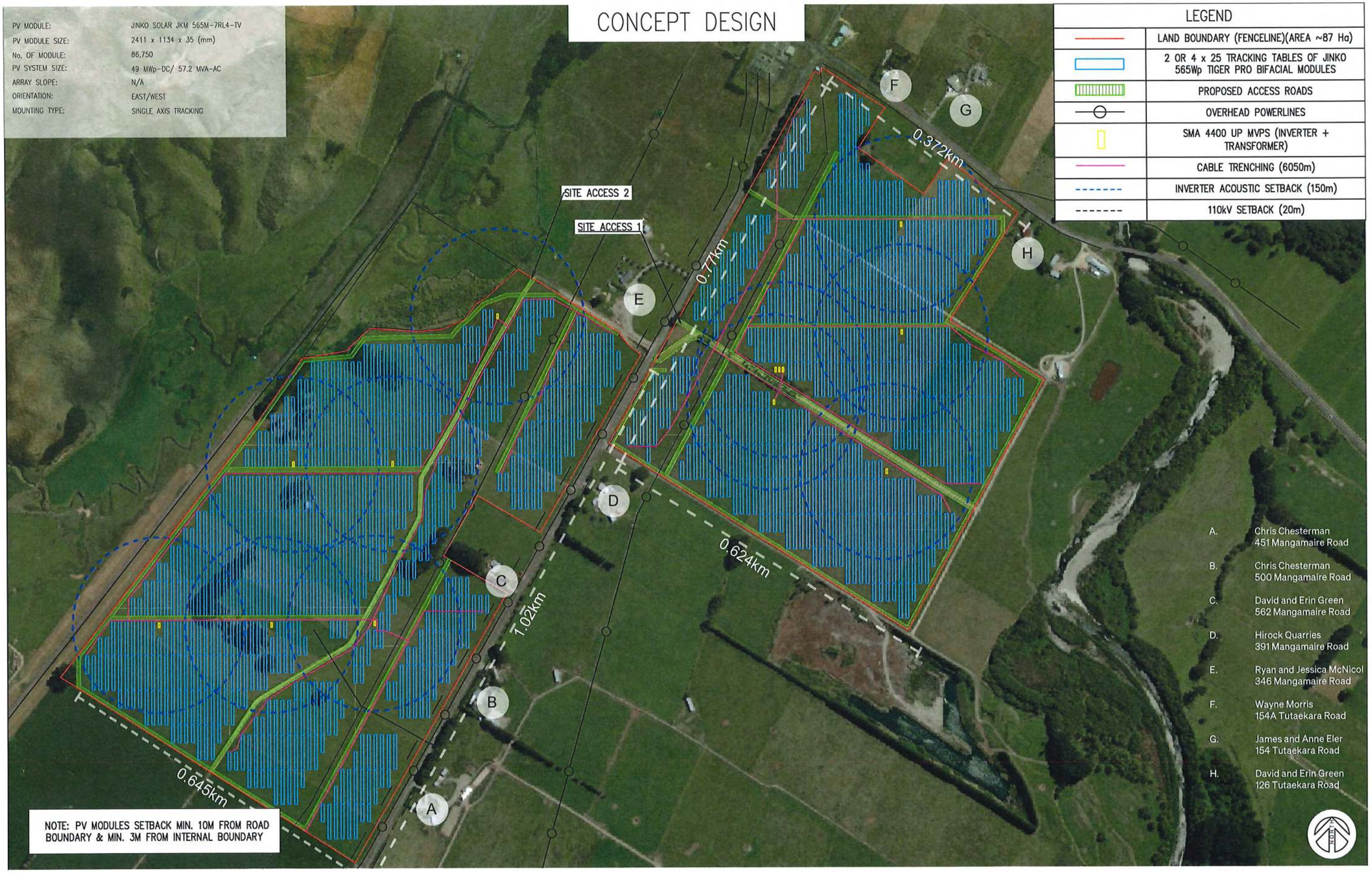

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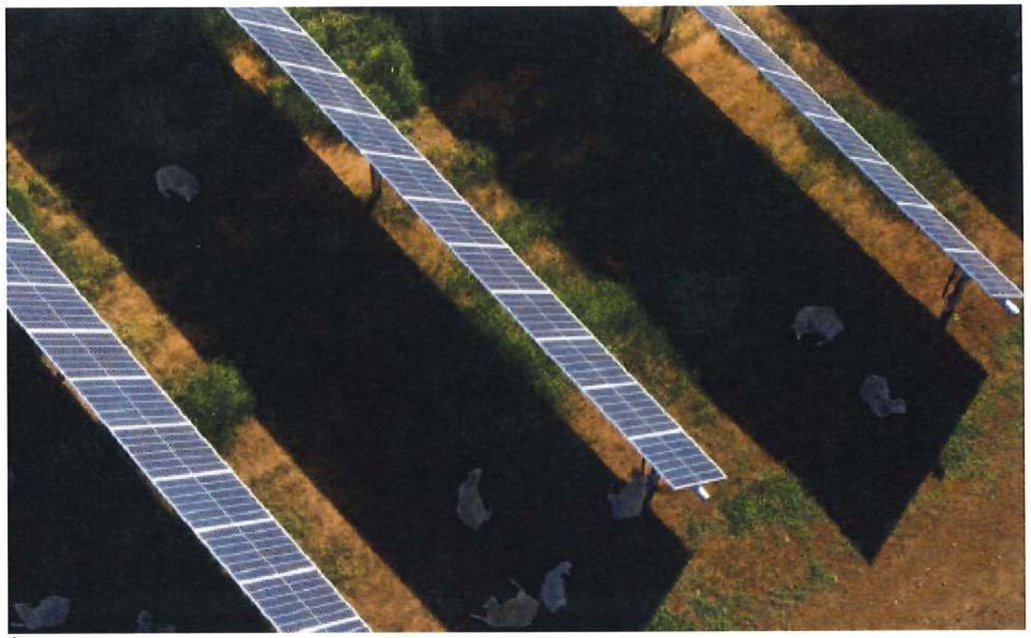

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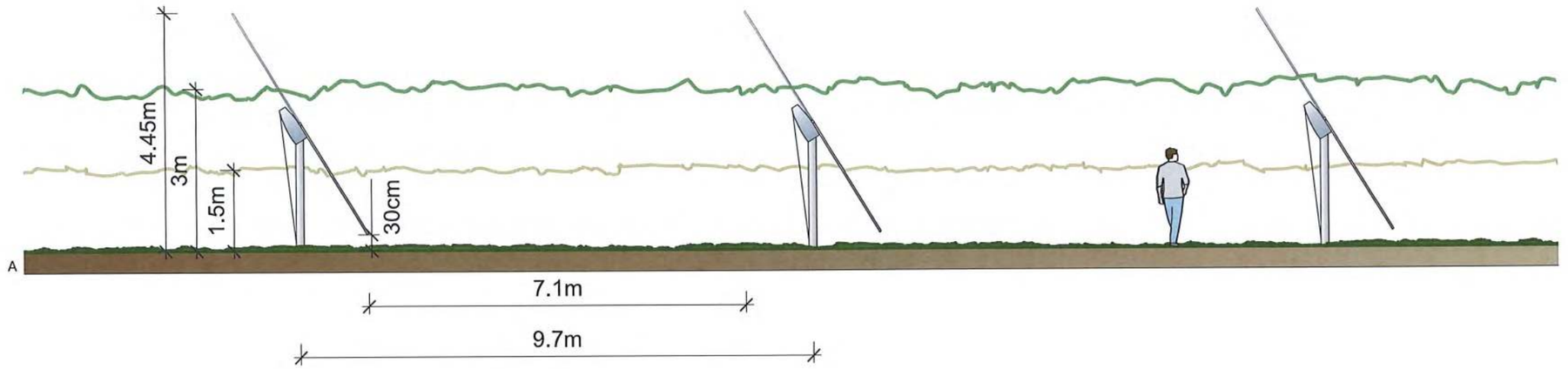
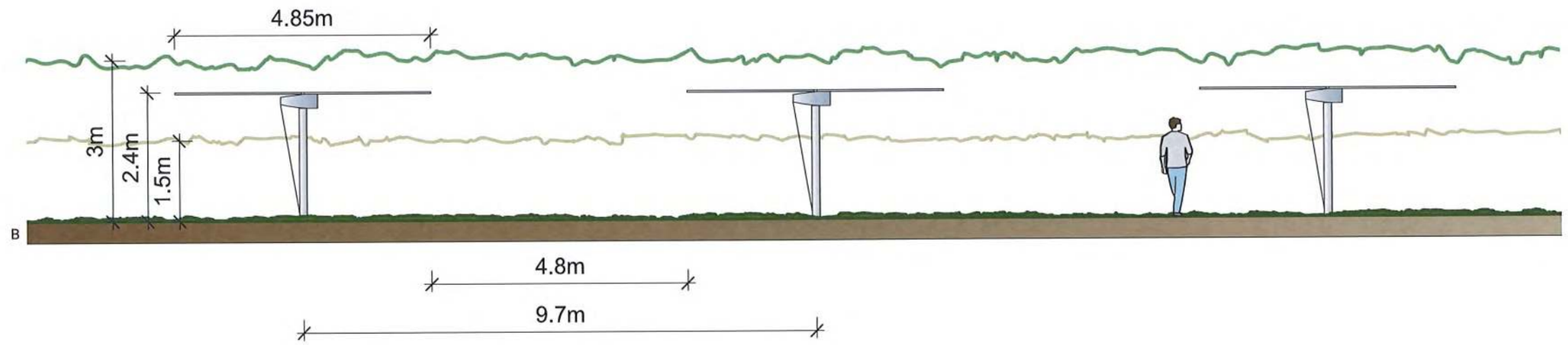
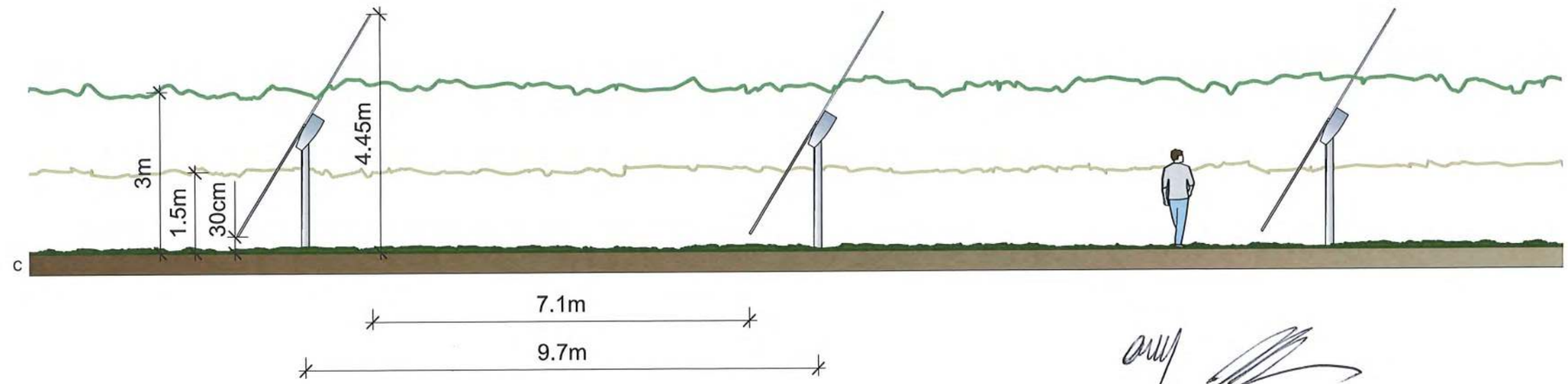






SCALE 1:100 @A3

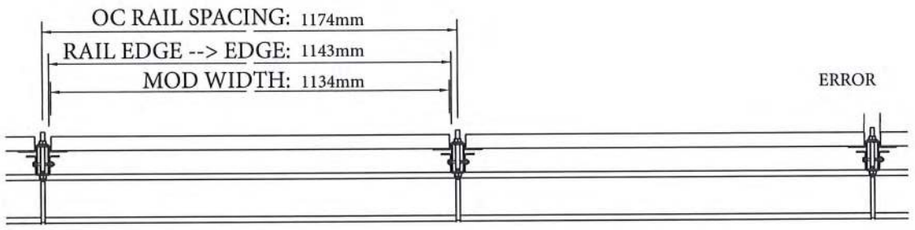
RMM

Proposed Solar Farm Mangamaire Road, Tararua

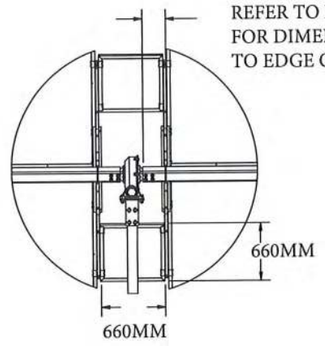
Mechanical Layout Information

FTC VOYAGER TRACKER™

MODULE RAIL SPACING



POWER MODULE DETAIL



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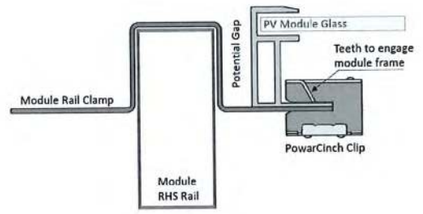
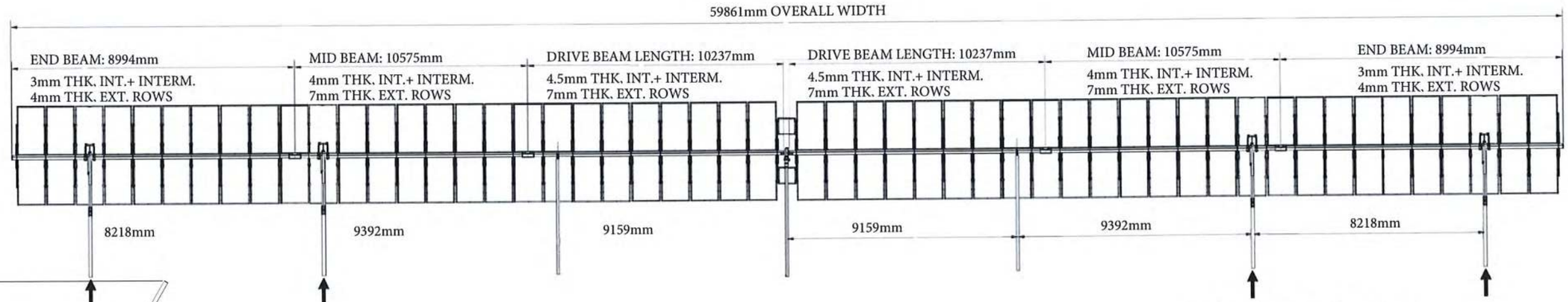
SECTION VIEW: MODULE RAIL - POWARCINCH

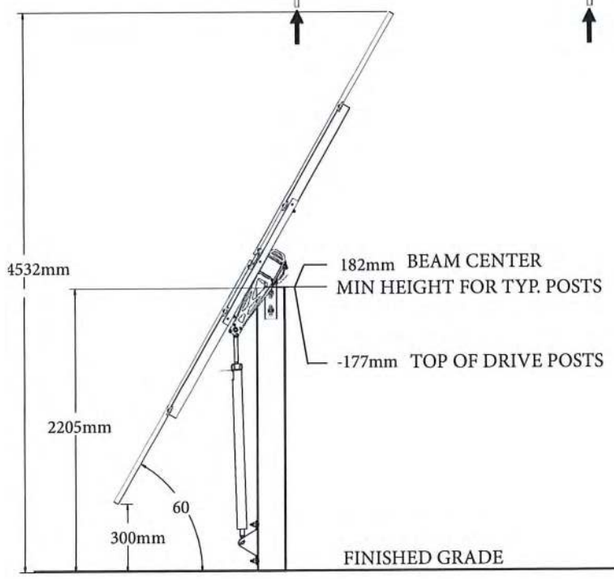


MECHANICAL LAYOUT

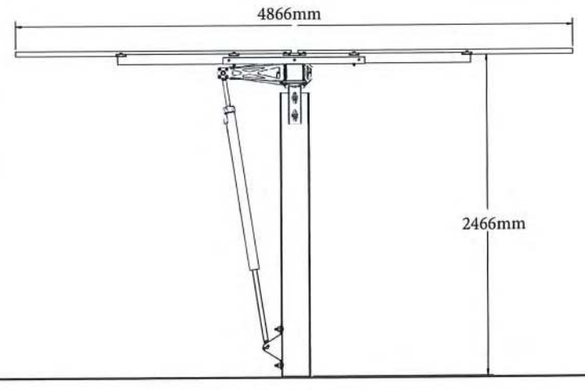


NOTE 9: DAMPER LOCATIONS

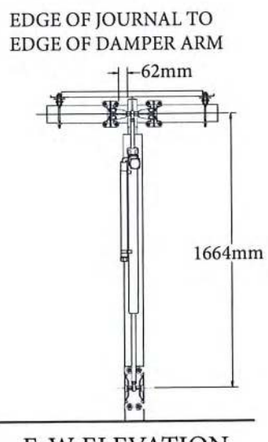
ELEVATION VIEWS



N-S ELEVATION @ MAX. TILT



N-S ELEVATION @ 0



E-W ELEVATION
DAMPER DETAIL

Not to Scale - To Fit Page

Data Source: Vector Powersmart Indicative Proposal

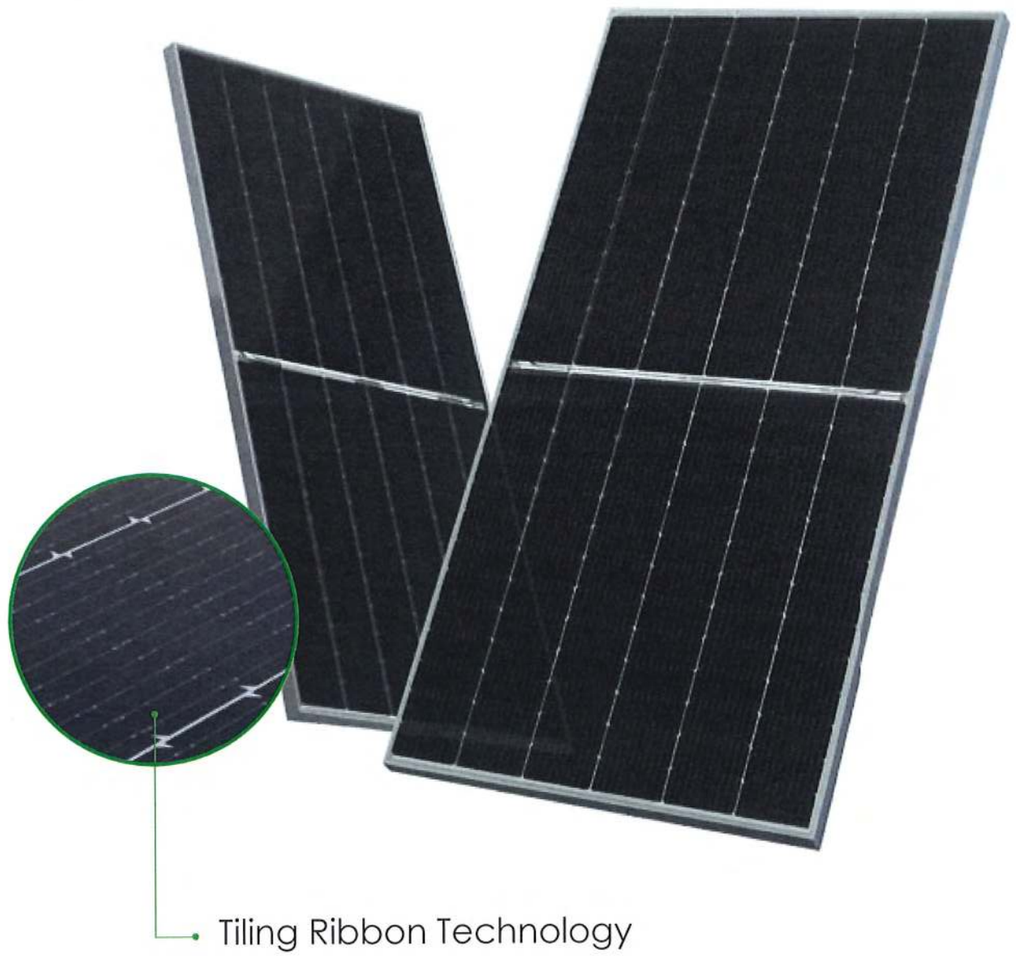
Solar Panel and Inverter Information

A Example of Solar Panels
B Mechanical Characteristics of Solar Panels
C Example of Inverter

Tiger Pro 7RL4-TV
565-585 Watt
BIFACIAL MODULE
TILING RIBBON (TR)

P-Type

Solar JinKO
*Building **Your Trust** in Solar*



A.

Mechanical Characteristics	
Cell Type	P type Mono-crystalline
No. of cells	156 (2×78)
Dimensions	2411×1134×35mm (94.92×44.65×1.38 inch)
Weight	30.6 kg (67.46 lbs)
Front Glass	3.2mm,Anti-Reflection Coating, High Transmission, Low Iron, Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68 Rated
Output Cables	TUV 1×4.0mm² (+): 400mm , (-): 200mm or Customized Length
Conector	JK03M/2B, genuine MC4 evo 2
Fire Rating	Class C

B.

Dimensions 2.815m (W) x 2.318m (H) x 1.588m (D)

C.

Written approval of affected persons

TARARUA® DISTRICT COUNCIL

Section 95 Resource Management Act 1991

Please read this first

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Title: ☐ Mr ☐ Mrs ☐ Miss ☐ Ms

Energy Bay Limited
First names

Surname

129 Tutaekara Road & 410 Mangamaire Road, Pahiatua
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Affected persons *(Please print in CAPITALS)*

ALAN JOHN GORE KRYSTAL ANNE JAMIESON
Full name of affected person(s)

391 MANGAMAIRE ROAD RD8
PAHIATUA 4988
Address of affected property

I am/we are the ☐ Owner(s) ☑ Occupier(s)

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☐ I have authority to sign on behalf of all the other owner/occupier(s) of the property.

KJamieson AGore
Signature of affected person(s)

27/01/2022
Date

RMM

ROUGH MILNE MITCHELL
LANDSCAPE ARCHITECTS

Hon John Gore ~~Hgore~~ 391 Mangamaire Rd
Krystal Anne Jamieson Pahiatua 4988
kajamieson 27/01/2022

Proposed Solar Farm
Mangamaire Road, Tararua

26 January 2022

Document Information

Project

Proposed Solar Farm

Address

Mangamaire Road, Tararua

Client

Solar Bay Ltd

Document

Graphic Attachment to Landscape Assessment Report

Status

For Consultation with Neighbours

Revision

1 For Consultation with Neighbours 26.01.2022

Prepared By

Rough Milne Mitchell Landscape Architects Ltd

Project Number: 22014

Author: Jess Mills

Peer Reviewed: Paul Smith

Contents

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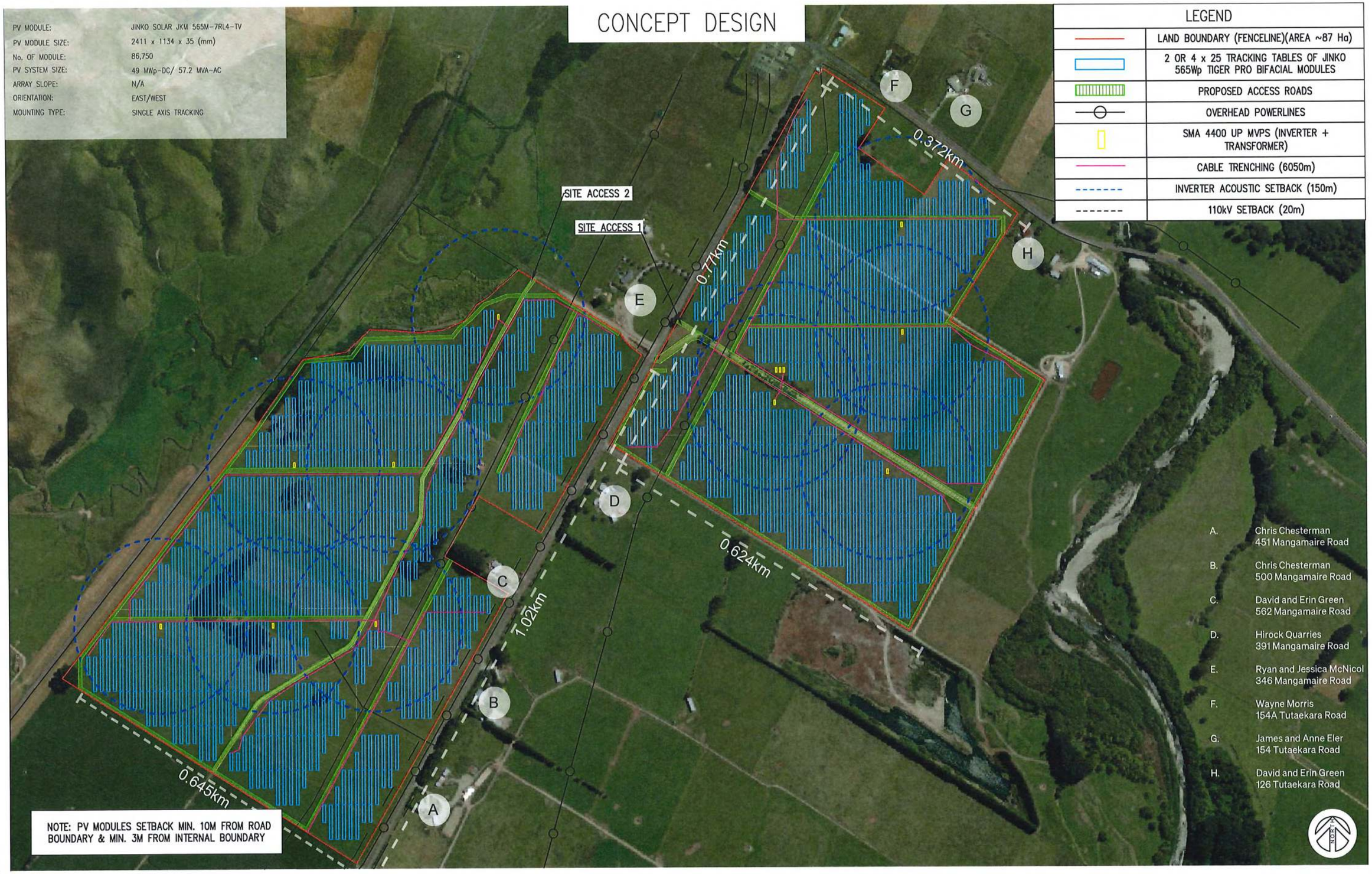

Not to Scale - To Fit Page

Data Source: Vector Powersmart Indicative Proposal

RMM

Proposed Solar Farm

Mangamaire Road, Tararua

AJG KAJ 03

Solar Panels Examplar Images

A Example of a similar Solar Farm in Marlborough
B Example of a similar Solar Farm in Kaitaia
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A

B

C

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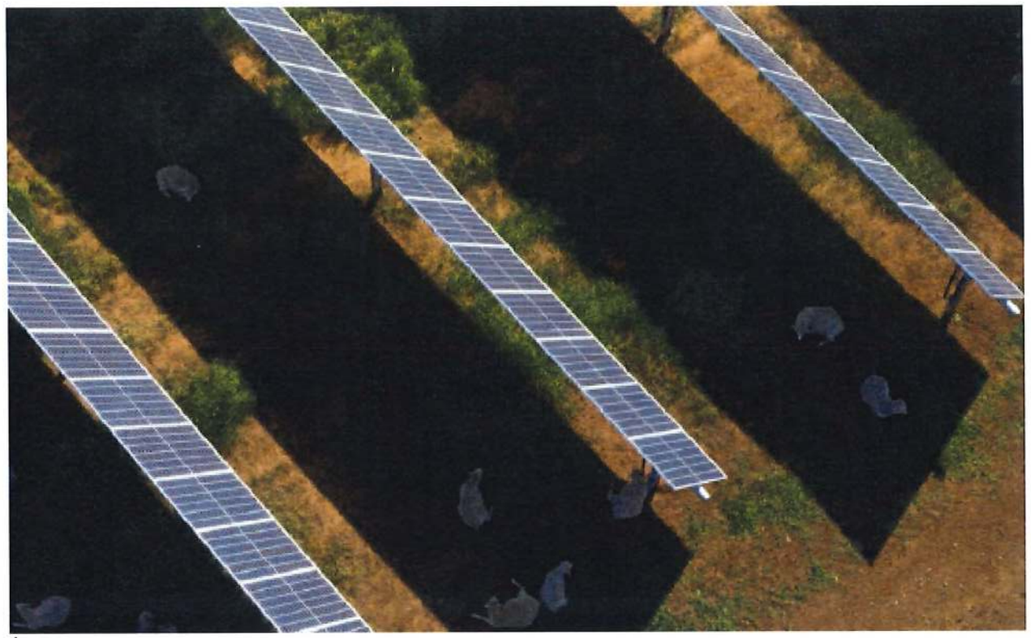

A

B

C

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Green line represents native shrub vegetation at 3m tall.
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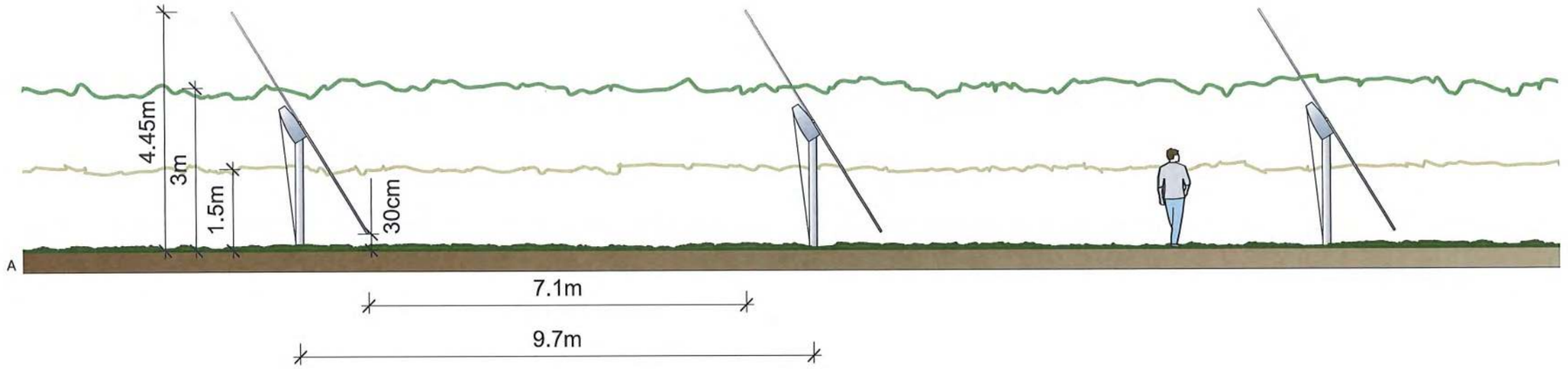
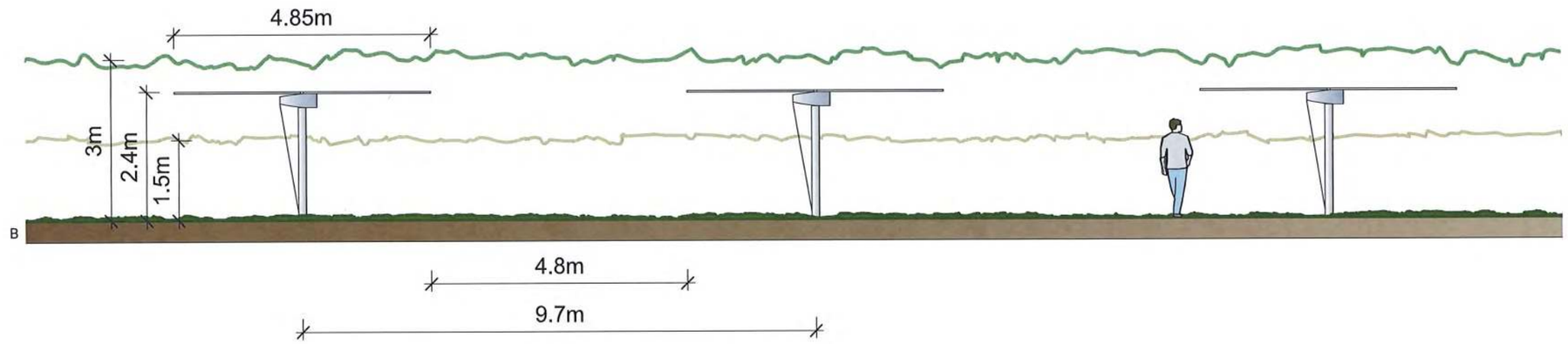
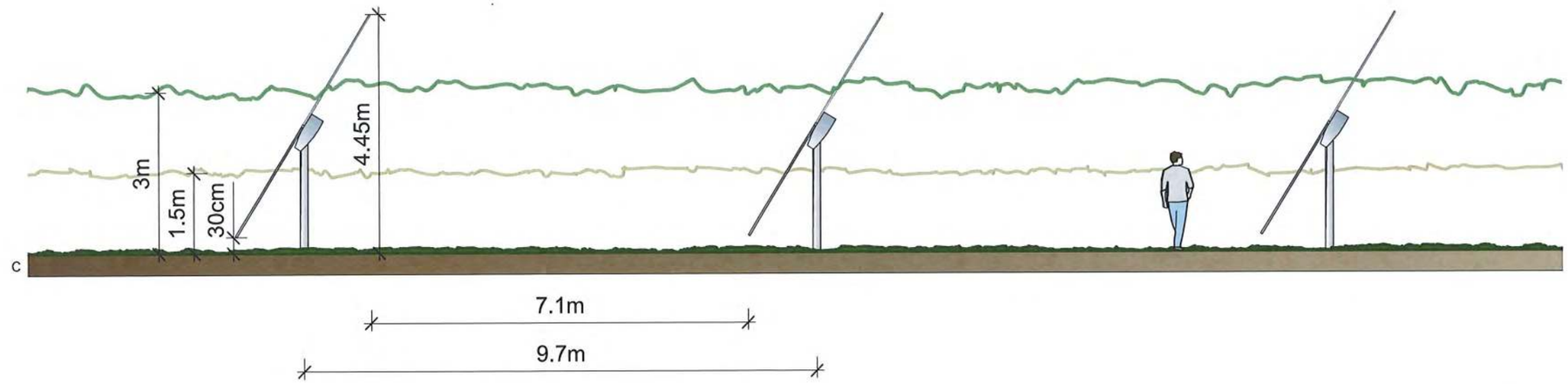






SCALE 1:100 @A3

RMM

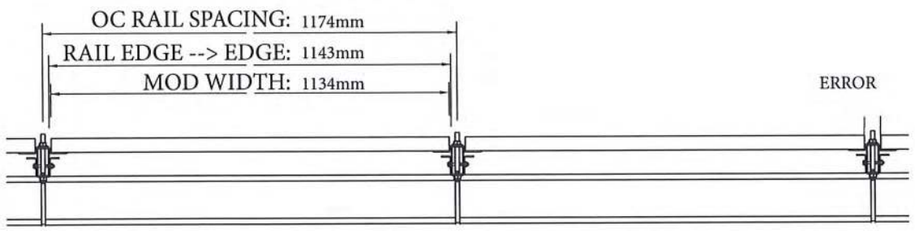
Proposed Solar Farm Mangamaire Road, Tararua

AJG KAJ 06

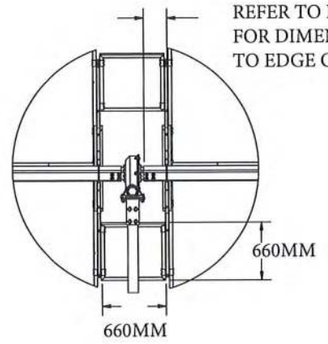
Mechanical Layout Information

FTC VOYAGER TRACKER™

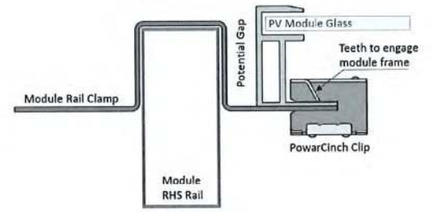
MODULE RAIL SPACING



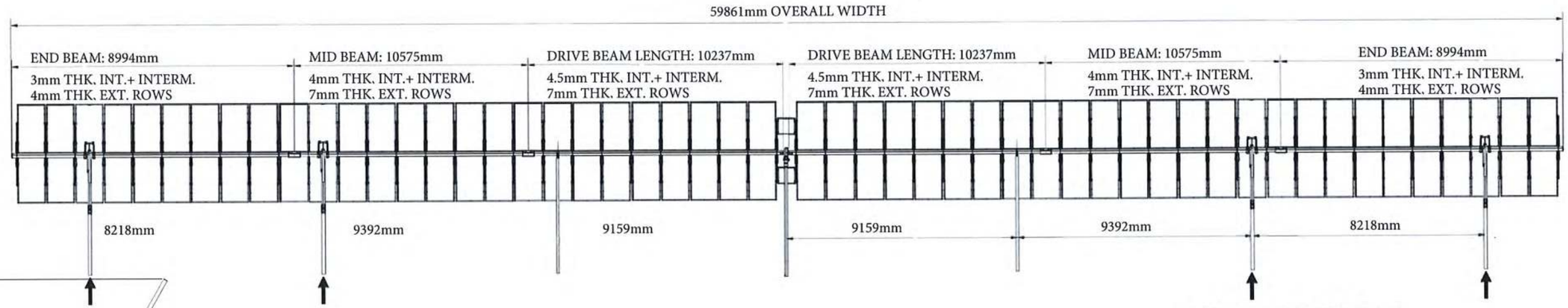
POWER MODULE DETAIL



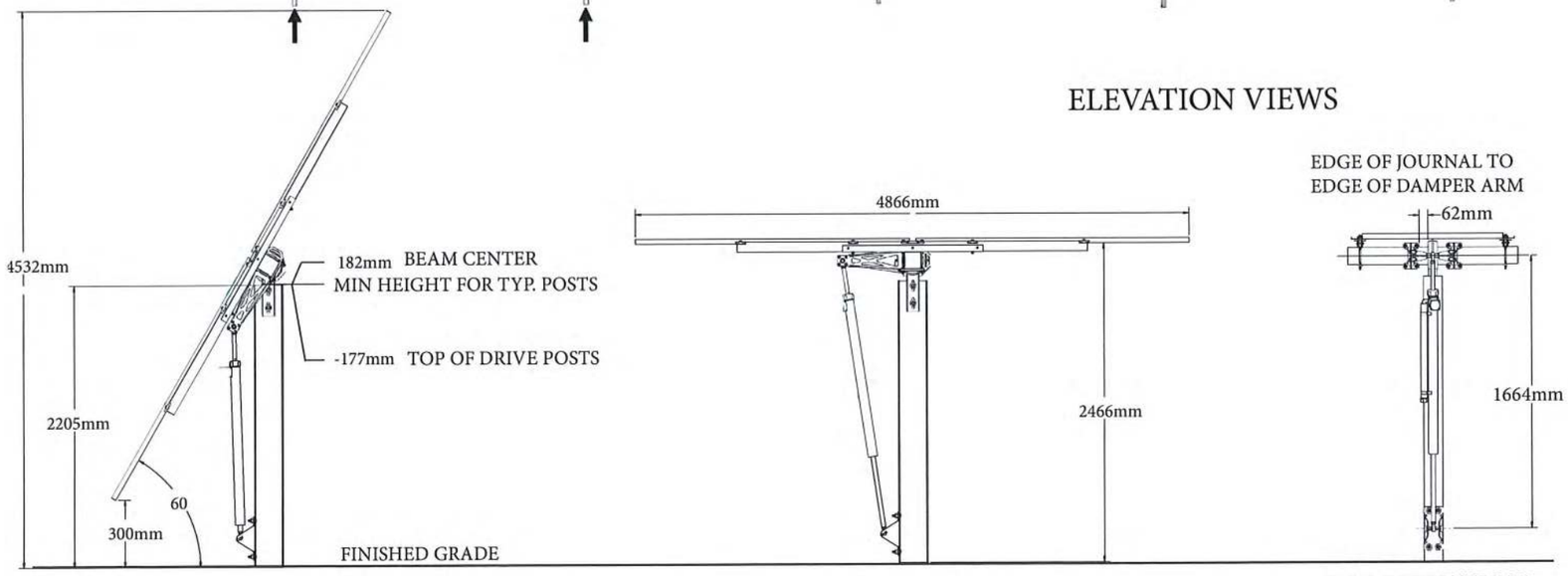
SECTION VIEW: MODULE RAIL - POWARCINCH



MECHANICAL LAYOUT



ELEVATION VIEWS



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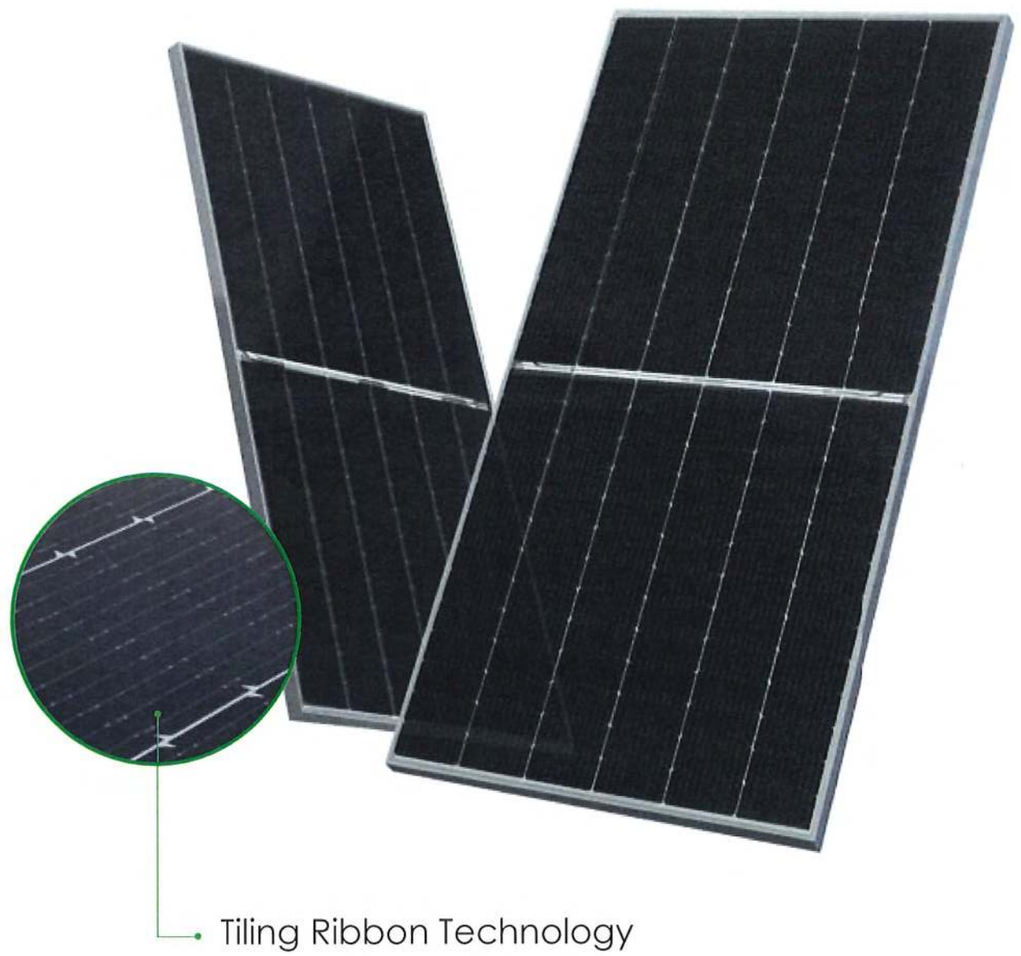

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C.

AJG
KAJ 08

Written approval of affected persons

TARARUA DISTRICT COUNCIL

Section 95 Resource Management Act 1991

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Title: ☐ Mr ☐ Mrs ☐ Miss ☐ Ms

Energy Bay Limited

First names

Surname

129 Tutaekara Road & 410 Mangamaire Road, Pahiatua

Address of proposed activity

Brief description of proposed activity

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Affected persons *(Please print in CAPITALS)*

DAVID RODNEY & ERIN KATHLEEN GREEN

Full name of affected person(s)

410 Mangamaire Road RD7
PAHIATUA

Address of affected property

I am/we are the ☑ Owner(s) ☐ Occupier(s)

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D. Green

Signature of affected person(s)

27/01/2022.

Date

RMM

ROUGH MILNE MITCHELL
LANDSCAPE ARCHITECTS

Proposed Solar Farm
Mangamaire Road, Tararua

David Rodney & Erin Kathleen Green
410 Mangamaire Road, R.D.7, Pahiatua.
24/1/2022.

26 January 2022

Document Information

Project

Proposed Solar Farm

Address

Mangamaire Road, Tararua

Client

Solar Bay Ltd

Document

Graphic Attachment to Landscape Assessment Report

Status

For Consultation with Neighbours

Revision

1 For Consultation with Neighbours 26.01.2022

Prepared By

Rough Milne Mitchell Landscape Architects Ltd

Project Number: 22014

Author: Jess Mills

Peer Reviewed: Paul Smith

Contents

General Arrangement Plan

PV MODULE:	JINKO SOLAR JKM 565M-7RL4-TV
PV MODULE SIZE:	2411 x 1134 x 35 (mm)
No. OF MODULE:	86,750
PV SYSTEM SIZE:	49 MWp-DC/ 57.2 MVA-AC
ARRAY SLOPE:	N/A
ORIENTATION:	EAST/WEST
MOUNTING TYPE:	SINGLE AXIS TRACKING

CONCEPT DESIGN

LEGEND	
	LAND BOUNDARY (FENCELINE)(AREA ~87 Ha)
	2 OR 4 x 25 TRACKING TABLES OF JINKO 565Wp TIGER PRO BIFACIAL MODULES
	PROPOSED ACCESS ROADS
	OVERHEAD POWERLINES
	SMA 4400 UP MVPS (INVERTER + TRANSFORMER)
	CABLE TRENCHING (6050m)
	INVERTER ACOUSTIC SETBACK (150m)
	110kV SETBACK (20m)

SITE ACCESS 2

SITE ACCESS 1

0.772km

0.372km

0.624km

1.02km

0.645km

A. Chris Chesterman
451 Mangamaire Road

B. Chris Chesterman
500 Mangamaire Road

C. David and Erin Green
562 Mangamaire Road

D. Hirock Quarries
391 Mangamaire Road

E. Ryan and Jessica McNicol
346 Mangamaire Road

F. Wayne Morris
154A Tutaekara Road

G. James and Anne Eler
154 Tutaekara Road

H. David and Erin Green
126 Tutaekara Road

NOTE: PV MODULES SETBACK MIN. 10M FROM ROAD BOUNDARY & MIN. 3M FROM INTERNAL BOUNDARY

Not to Scale - To Fit Page

Data Source: Vector Powersmart Indicative Proposal

Solar Panels Examplar Images

A Example of a similar Solar Farm in Marlborough
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A

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C

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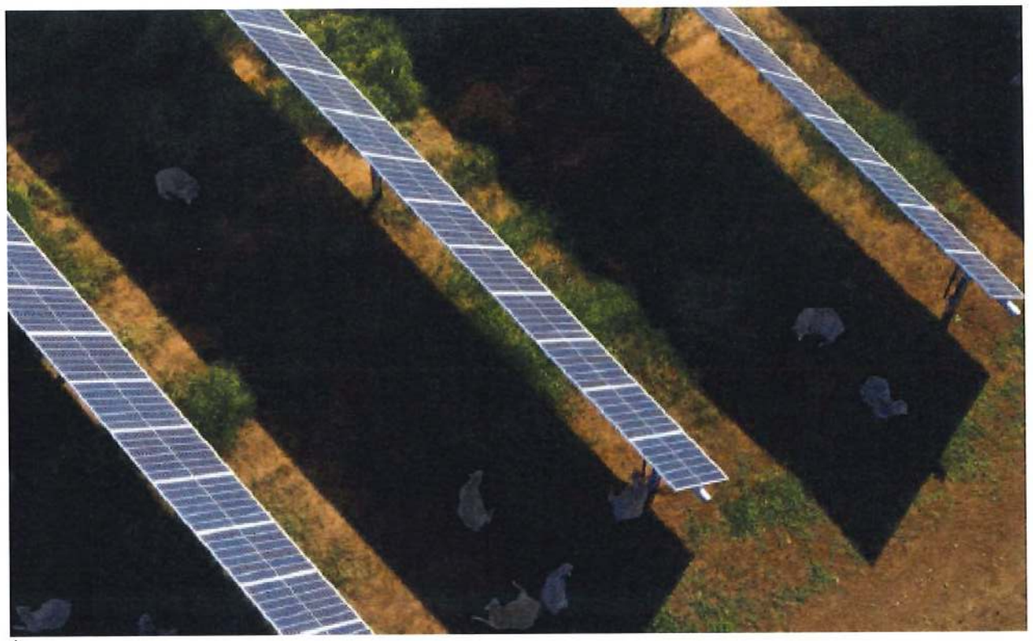

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C

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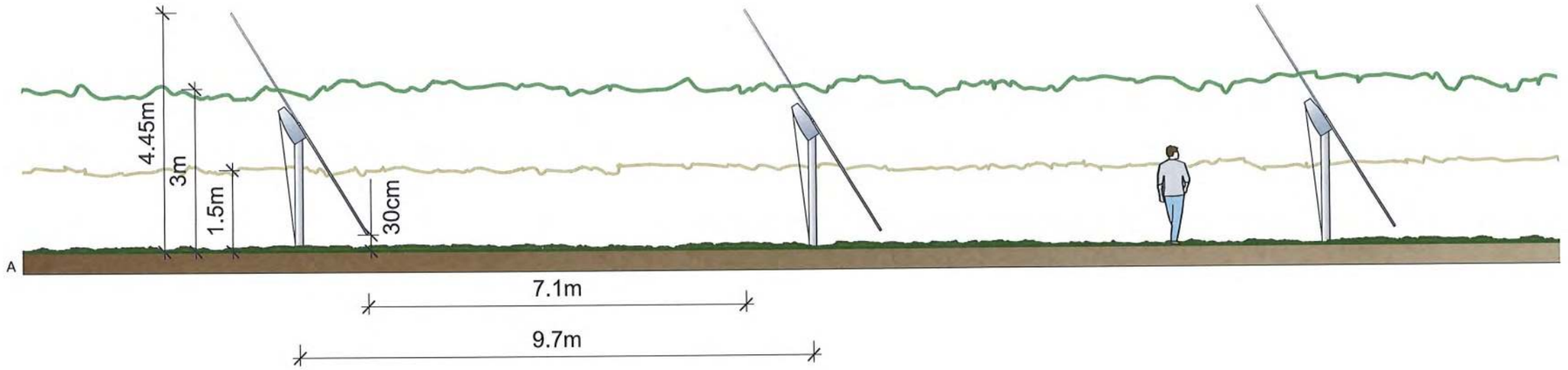

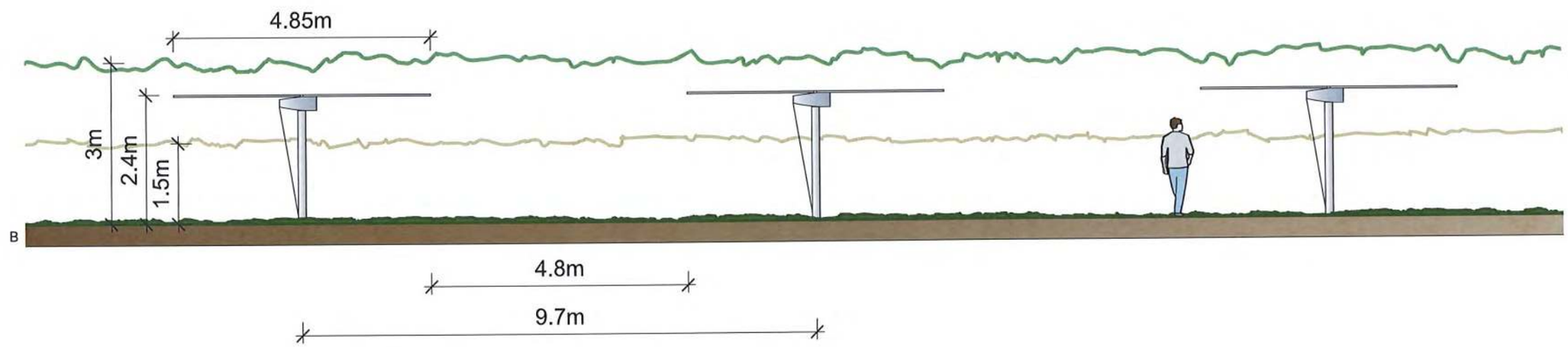

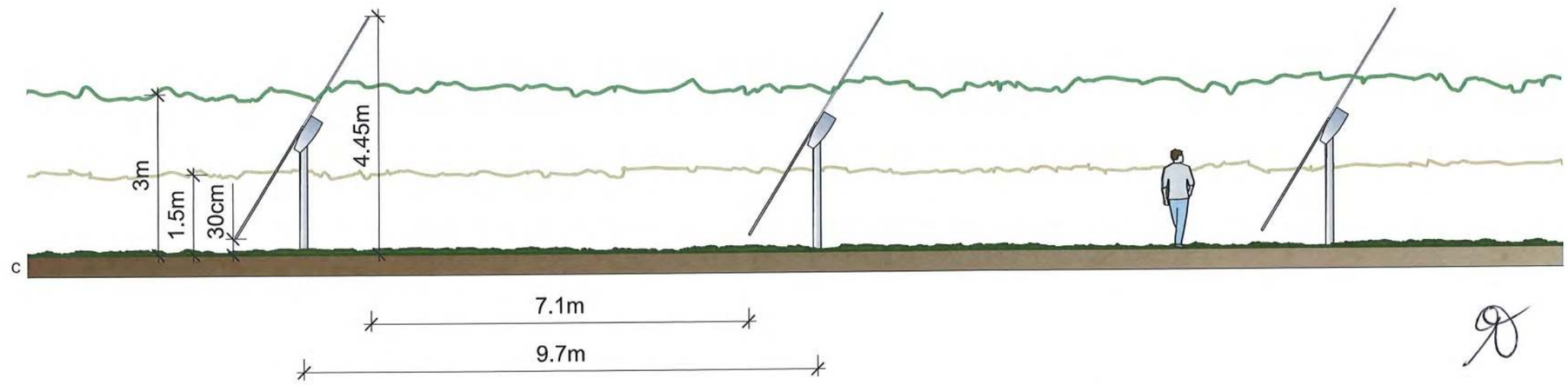

SCALE 1:100 @A3

RMM

Proposed Solar Farm Mangamaire Road, Tararua

Mechanical Layout Information

FTC VOYAGER TRACKER™

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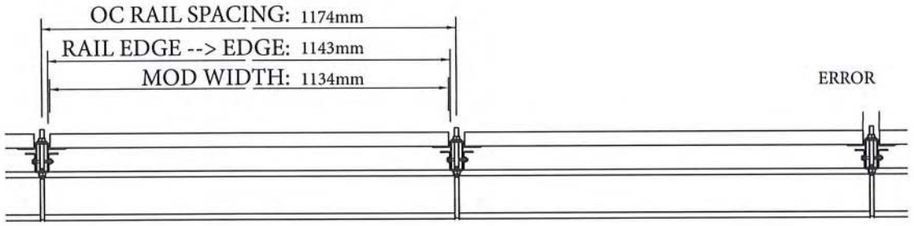

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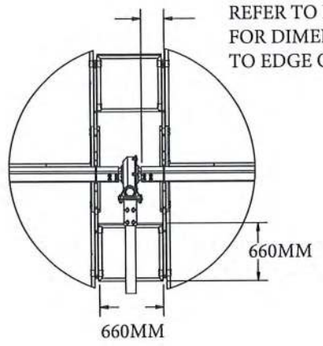

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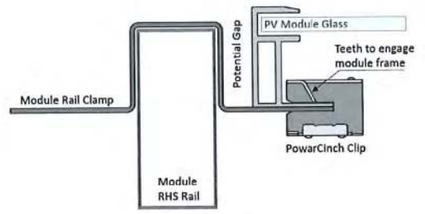

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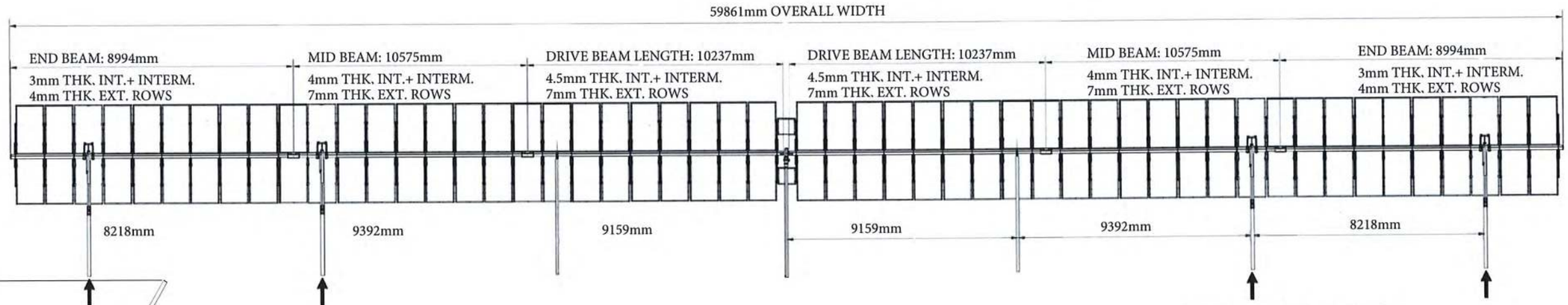

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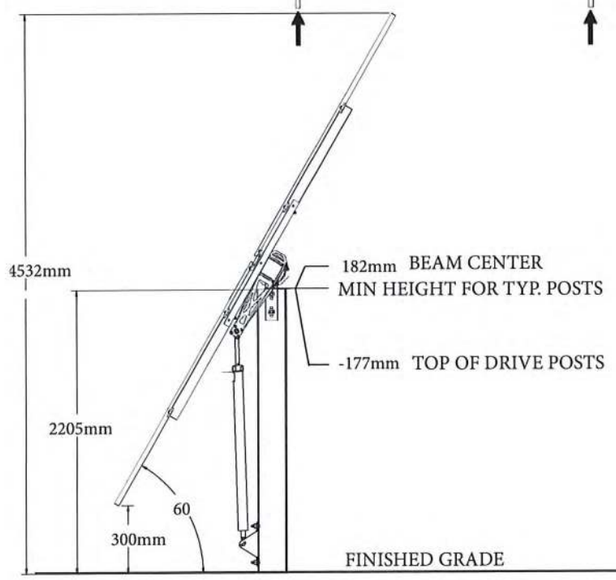
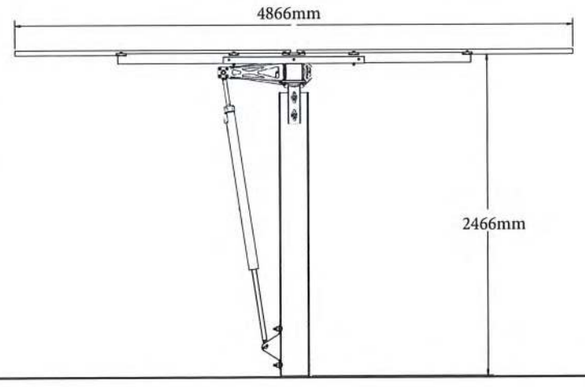


N-S ELEVATION @ MAX. TILT



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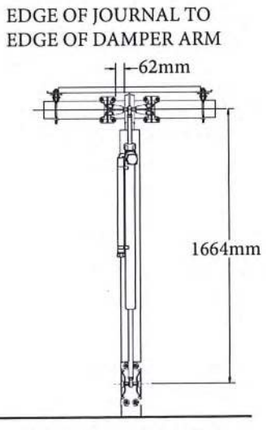

E-W ELEVATION
DAMPER DETAIL

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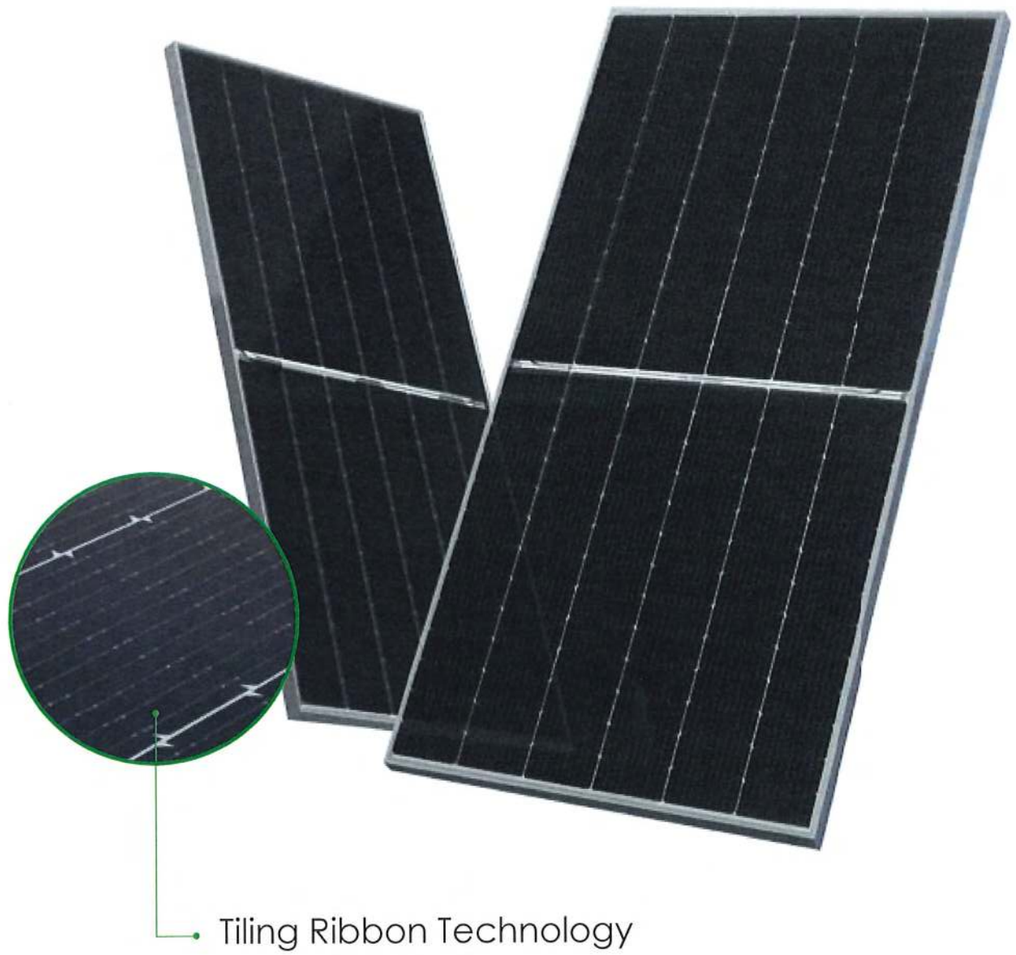

A.

Mechanical Characteristics	
Cell Type	P type Mono-crystalline
No. of cells	156 (2×78)
Dimensions	2411×1134×35mm (94.92×44.65×1.38 inch)
Weight	30.6 kg (67.46 lbs)
Front Glass	3.2mm,Anti-Reflection Coating, High Transmission, Low Iron, Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68 Rated
Output Cables	TUV 1×4.0mm² (+): 400mm , (-): 200mm or Customized Length
Conector	JK03M/2B, genuine MC4 evo 2
Fire Rating	Class C

B.

Dimensions 2.815m (W) x 2.318m (H) x 1.588m (D)

C.

Written approval of affected persons

TARARUA® DISTRICT COUNCIL

Section 95 Resource Management Act 1991

Please read this first

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Energy Bay Limited

First names

Surname

129 Tutaekara Road & 410 Mangamaire Road, Pahiatua

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Pt Section 150 Blk XIV Mangahao SD, Section 139 Blk XIV Mangahao SD, Section 140 Blk XIV Mangahao SD, Subdivision 13 SECT 8 Blk XIV Mangahao SD, Lot 1 DP 392402, Lot 2 DP392402.

Affected persons *(Please print in CAPITALS)*

Ethan David GREEN

Full name of affected person(s)

410 MANGAMAIRE ROAD
PAHIATUA

Address of affected property

I am/we are the ☐ Owner(s) ☑ Occupier(s)

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☐ I have authority to sign on behalf of all the other owner/occupier(s) of the property.

Signature of affected person(s)

27/01/2022

Date

RMM

ROUGH MILNE MITCHELL
LANDSCAPE ARCHITECTS

Proposed Solar Farm
Mangamaire Road, Tararua

Ethan David Green
410 Mangamaire Road, Pahiatua.
27/1/2022

26 January 2022

Document Information

Project

Proposed Solar Farm

Address

Mangamaire Road, Tararua

Client

Solar Bay Ltd

Document

Graphic Attachment to Landscape Assessment Report

Status

For Consultation with Neighbours

Revision

1 For Consultation with Neighbours 26.01.2022

Prepared By

Rough Milne Mitchell Landscape Architects Ltd

Project Number: 22014

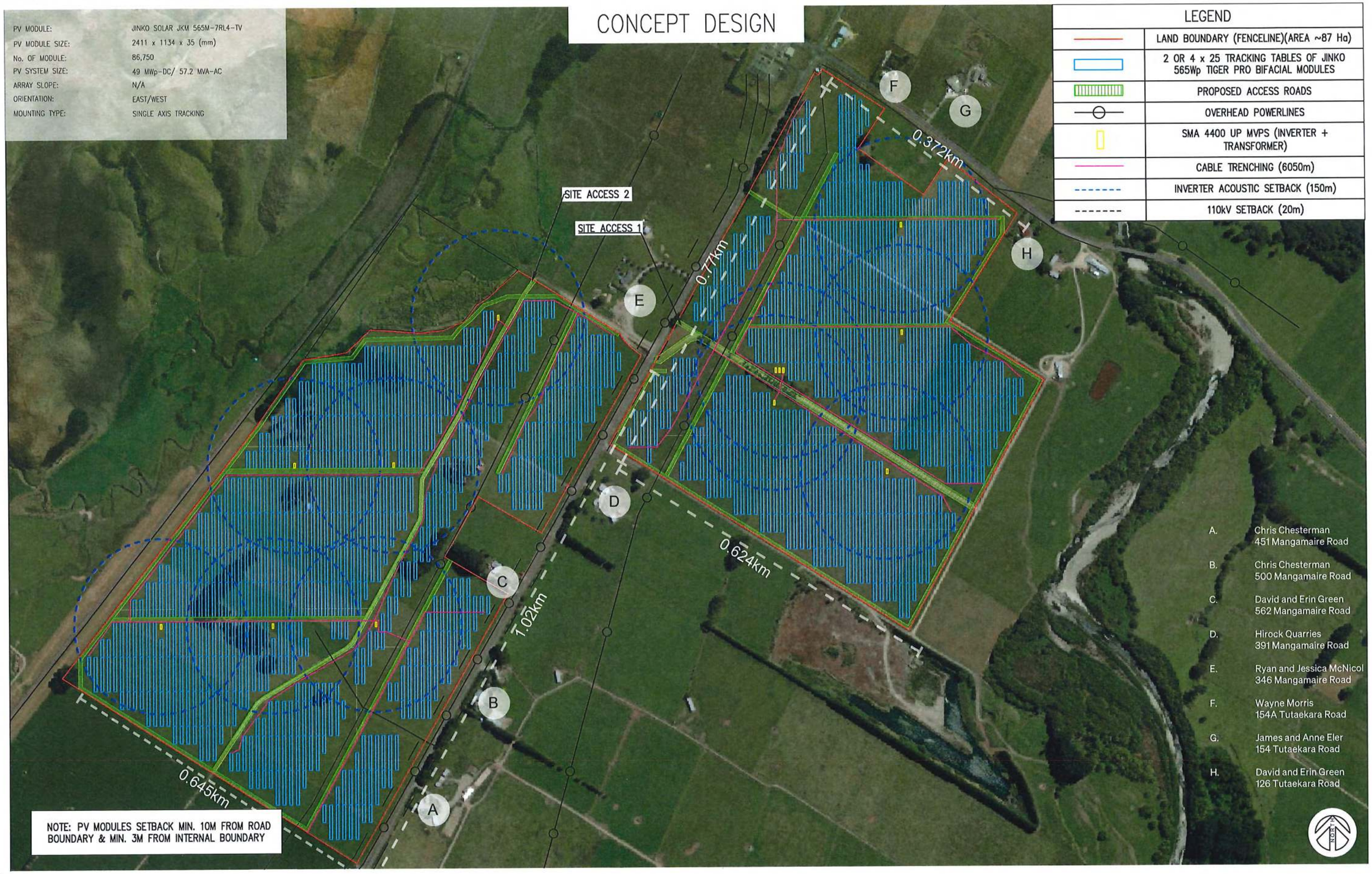
Author: Jess Mills

Peer Reviewed: Paul Smith

Contents

General Arrangement Plan

PV MODULE:	JINKO SOLAR JKM 565M-7RL4-TV
PV MODULE SIZE:	2411 x 1134 x 35 (mm)
No. OF MODULE:	86,750
PV SYSTEM SIZE:	49 MWp-DC/ 57.2 MVA-AC
ARRAY SLOPE:	N/A
ORIENTATION:	EAST/WEST
MOUNTING TYPE:	SINGLE AXIS TRACKING



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Data Source: Vector Powersmart Indicative Proposal

Solar Panels Examplar Images

A Example of a similar Solar Farm in Marlborough
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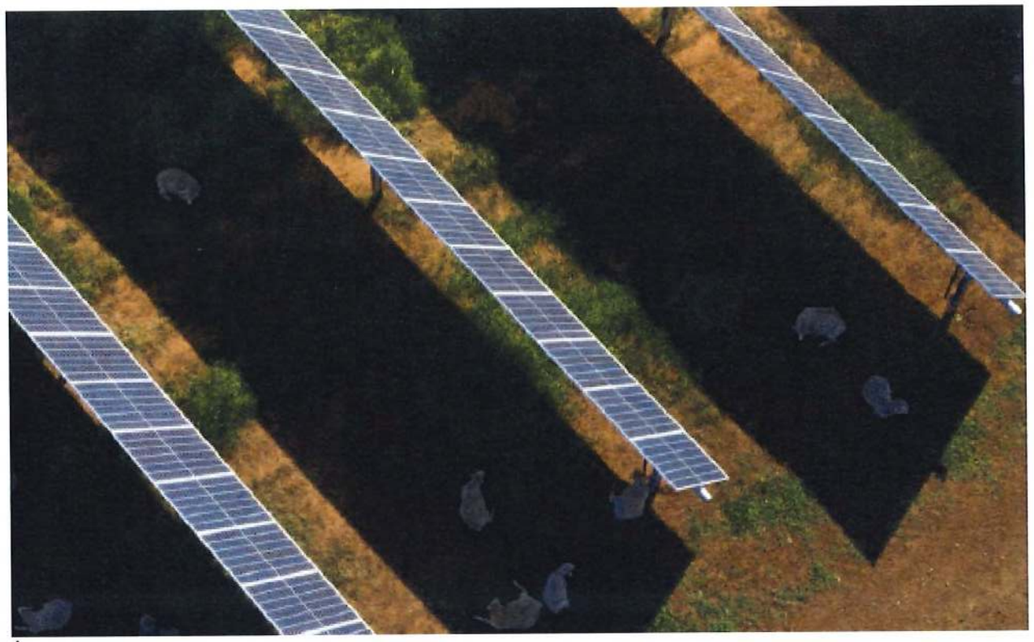

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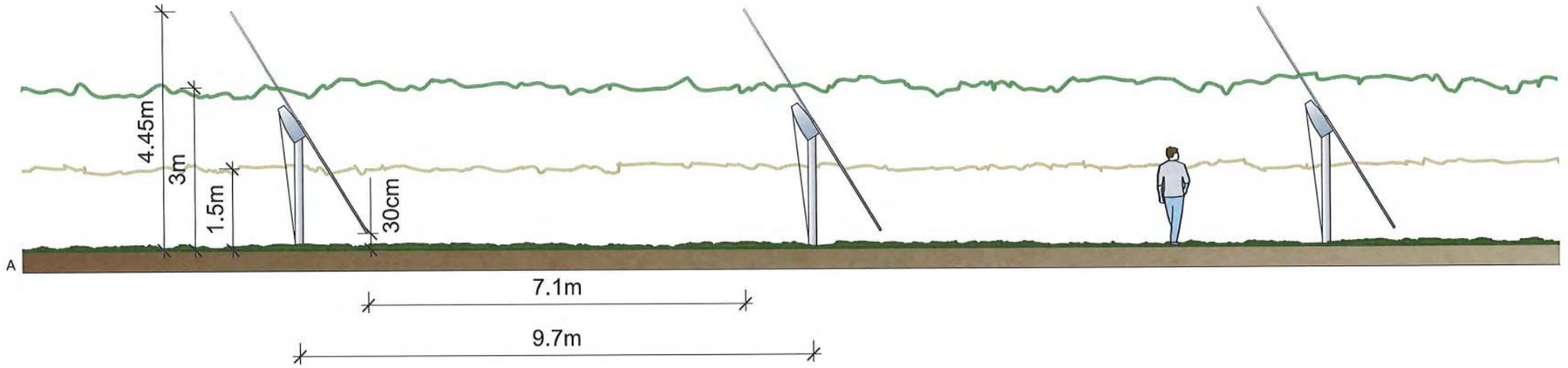

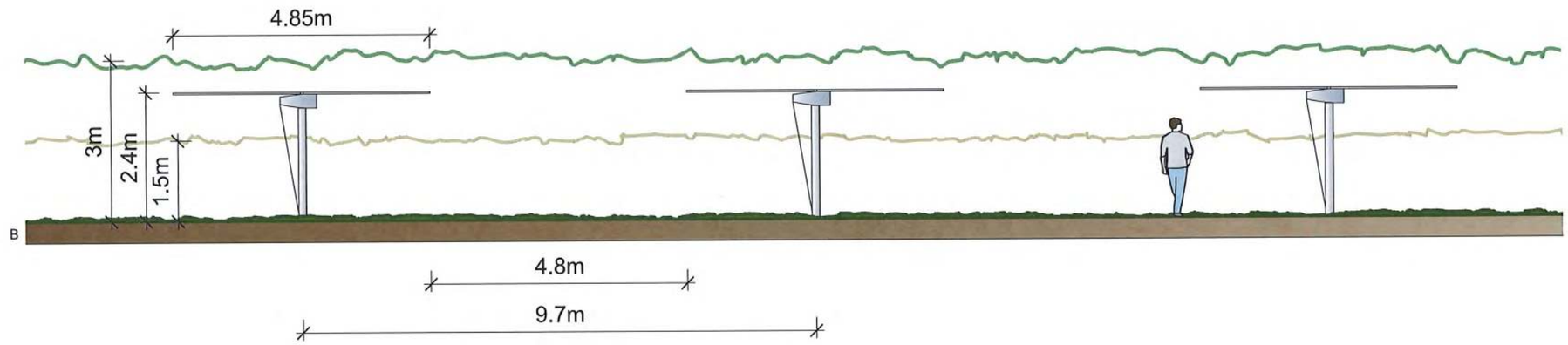

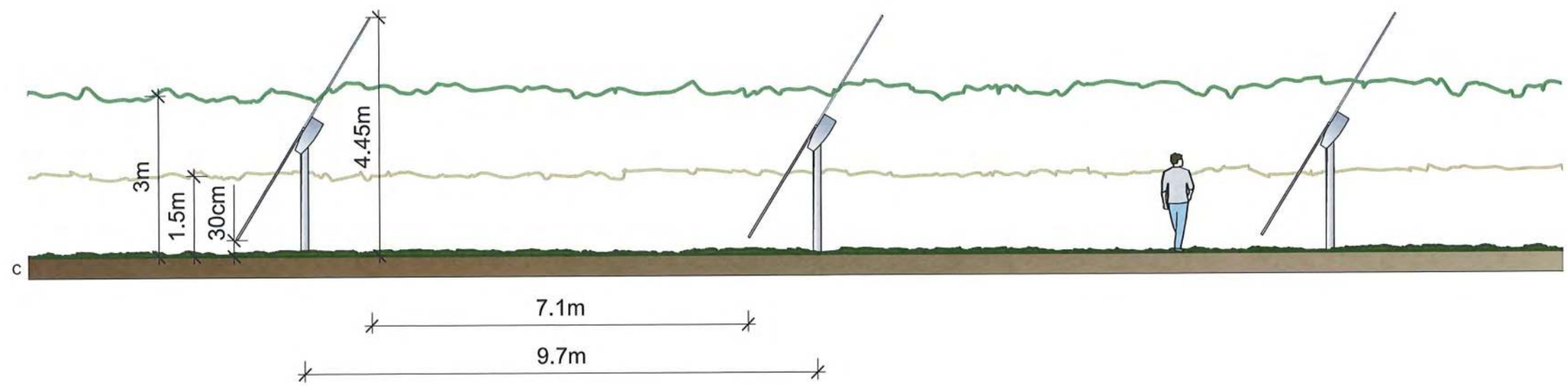

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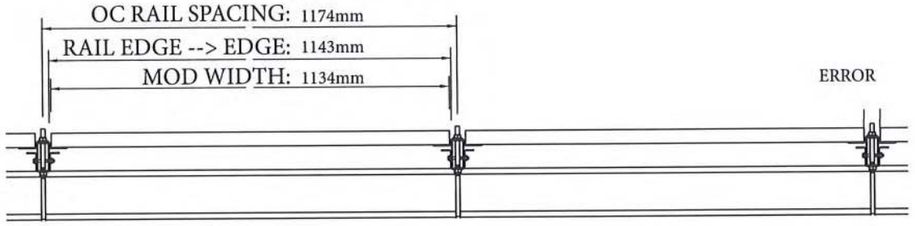
RMM

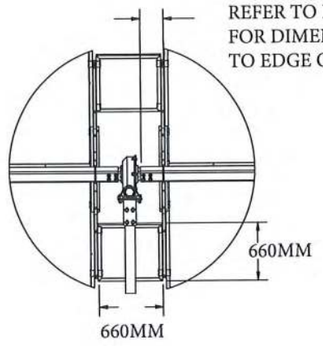
Mechanical Layout Information

FTC VOYAGER TRACKER™

MODULE RAIL SPACING



POWER MODULE DETAIL



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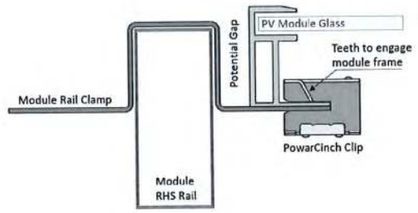
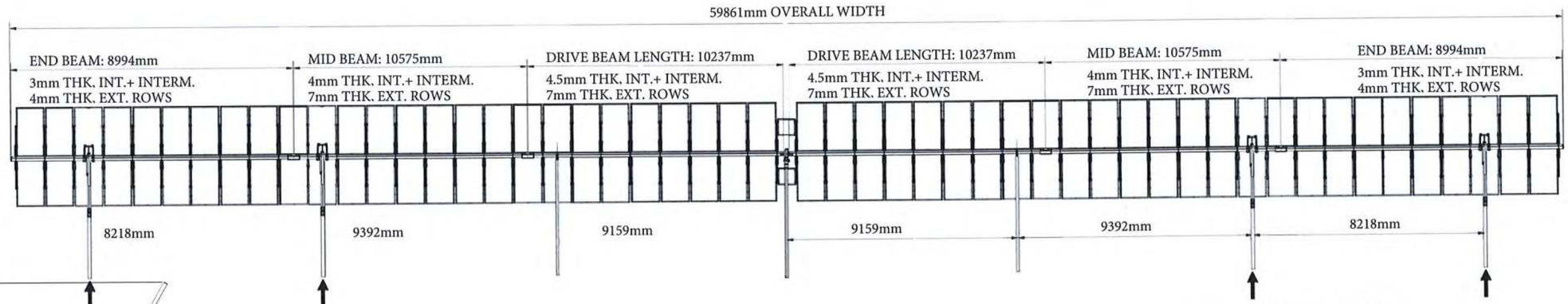
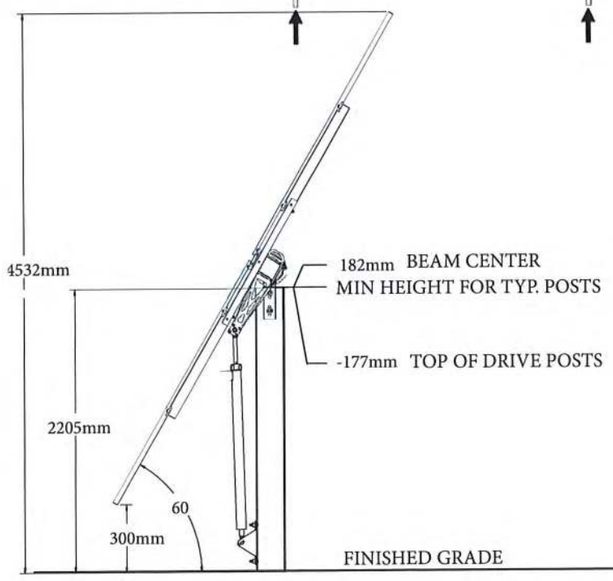


MECHANICAL LAYOUT



NOTE 9: DAMPER LOCATIONS

ELEVATION VIEWS



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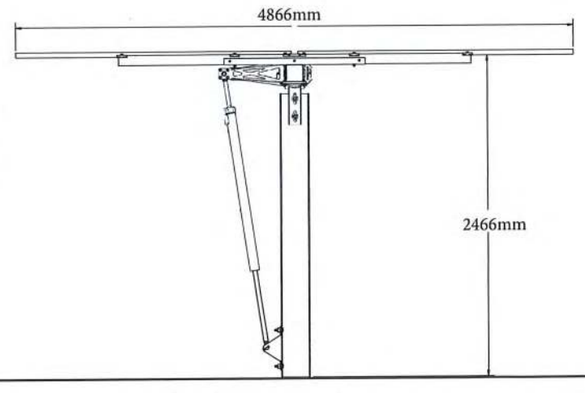

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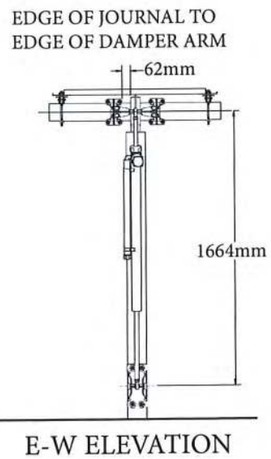

E-W ELEVATION
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C Example of Inverter

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565-585 Watt
BIFACIAL MODULE
TILING RIBBON (TR)
P-Type

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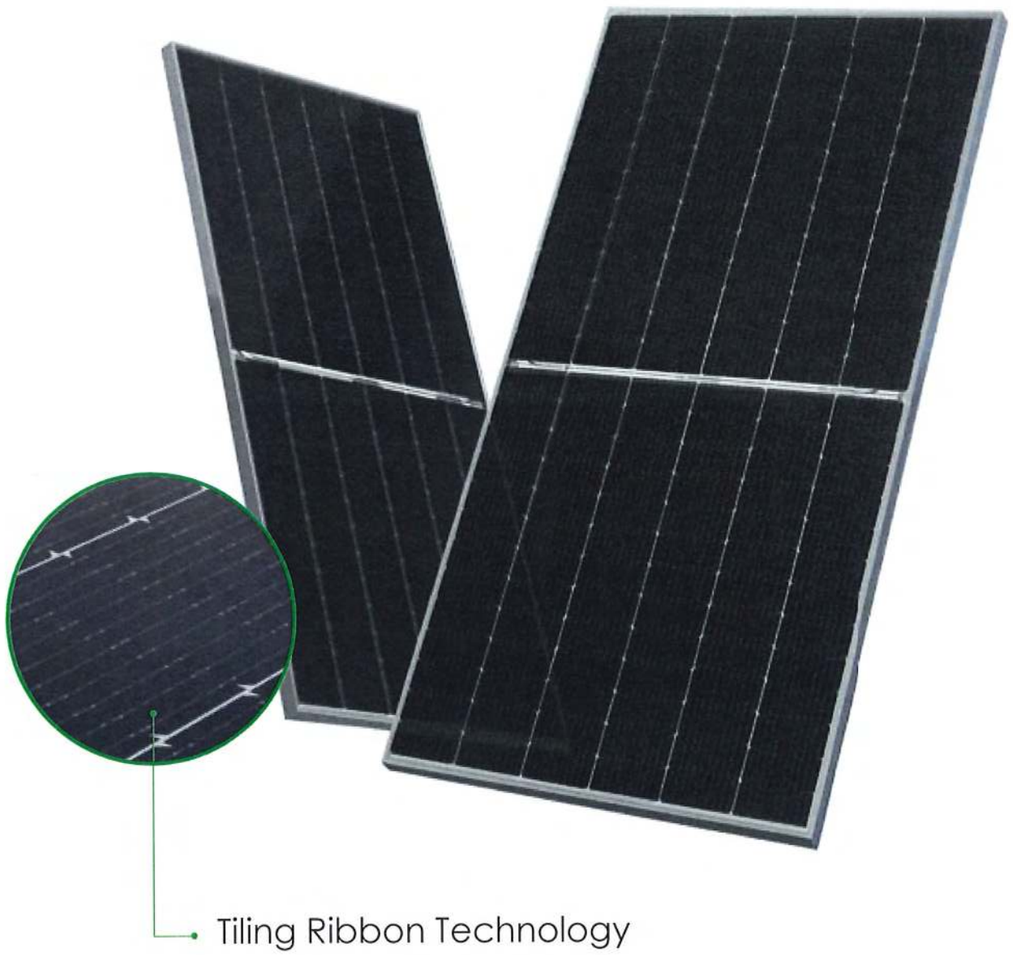

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Affected persons *(Please print in CAPITALS)*

DEAN MAURICE HOLLISTER VALERIE HOLLISTER

Full name of affected person(s)

431 MANGAMAIRE ROAD RD8
PAHIATUA

Address of affected property

~~I am~~/we are the ☐ Owner(s) ☑ Occupier(s)

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Val Hollister. DM Hollister

Signature of affected person(s)

27/01/2022

Date

RMM

ROUGH MILNE MITCHELL
LANDSCAPE ARCHITECTS

Proposed Solar Farm
Mangamaire Road, Tararua

Dean & Valerie Hollister.
431 Mangamaire Rd
RD Pahiatua 4988.

Val. Hollister.
D M Hollister

27.01.22

JA DM

26 January 2022

Document Information

Project

Proposed Solar Farm

Address

Mangamaire Road, Tararua

Client

Solar Bay Ltd

Document

Graphic Attachment to Landscape Assessment Report

Status

For Consultation with Neighbours

Revision

1 For Consultation with Neighbours 26.01.2022

Prepared By

Rough Milne Mitchell Landscape Architects Ltd

Project Number: 22014

Author: Jess Mills

Peer Reviewed: Paul Smith

Disclaimer
These plans and drawings have been produced as a result of information provided by the client and/or sourced by or provided to Rough Milne Mitchell Landscape Architects Limited (RMM) by a third party for the purposes of providing the services. No responsibility is taken by RMM for any liability or action arising from any incomplete or inaccurate information provided to RMM (whether from the client or a third party). These plans and drawings are provided to the client for the benefit and use by the client and for the purpose for which it is intended.

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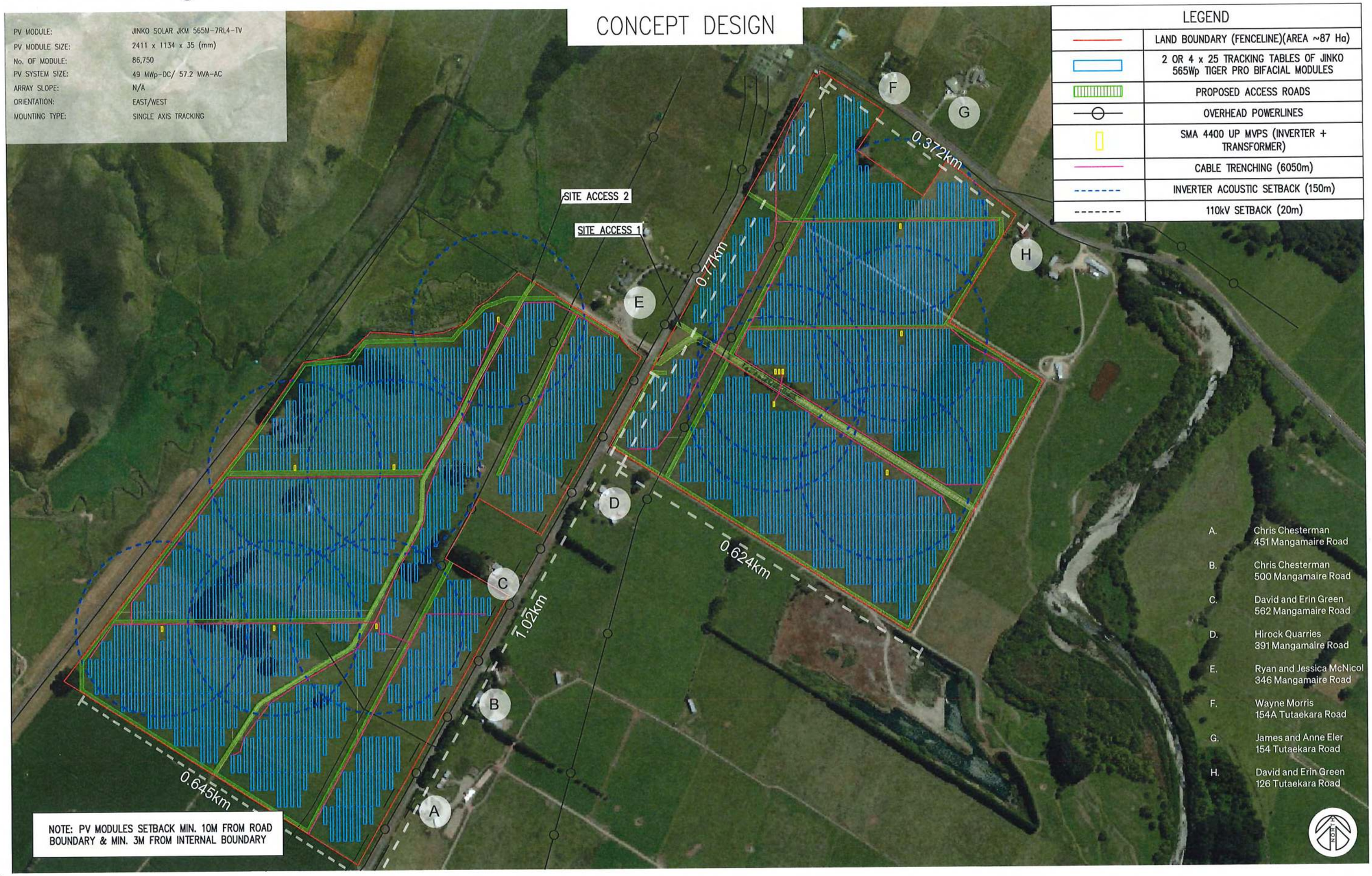

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RMM

Proposed Solar Farm Mangamaire Road, Tararua

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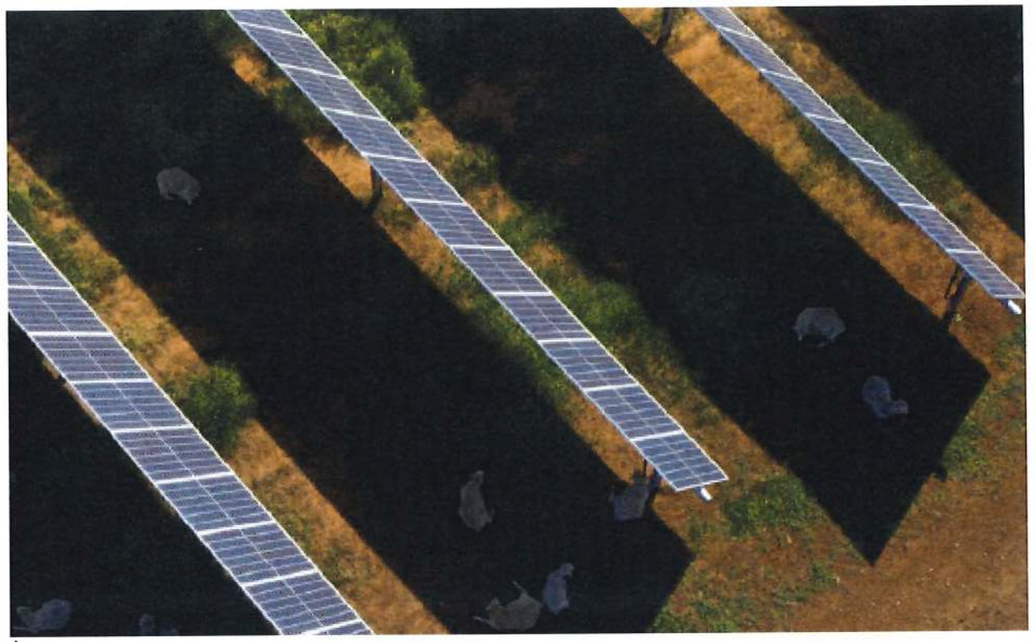

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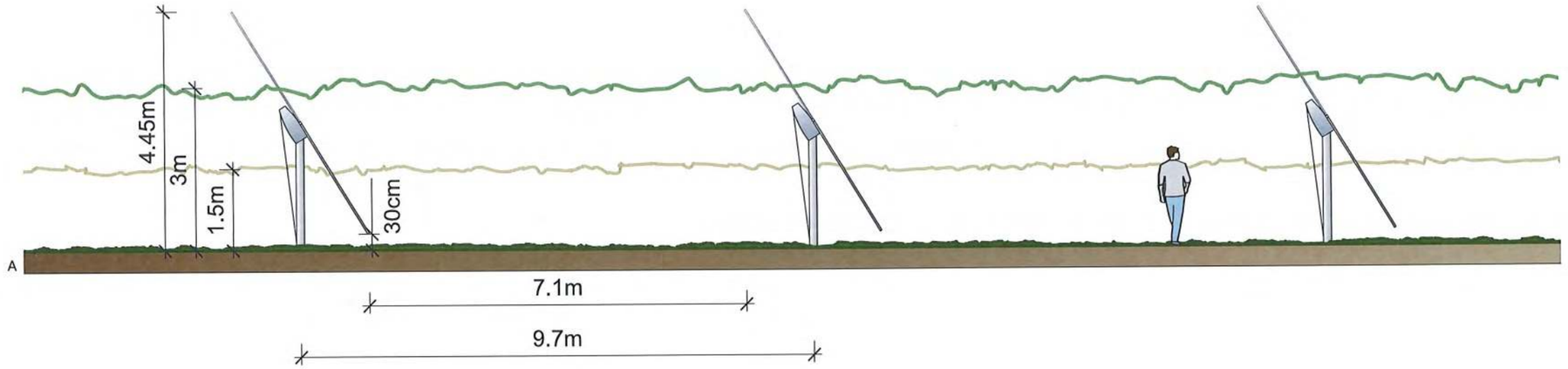
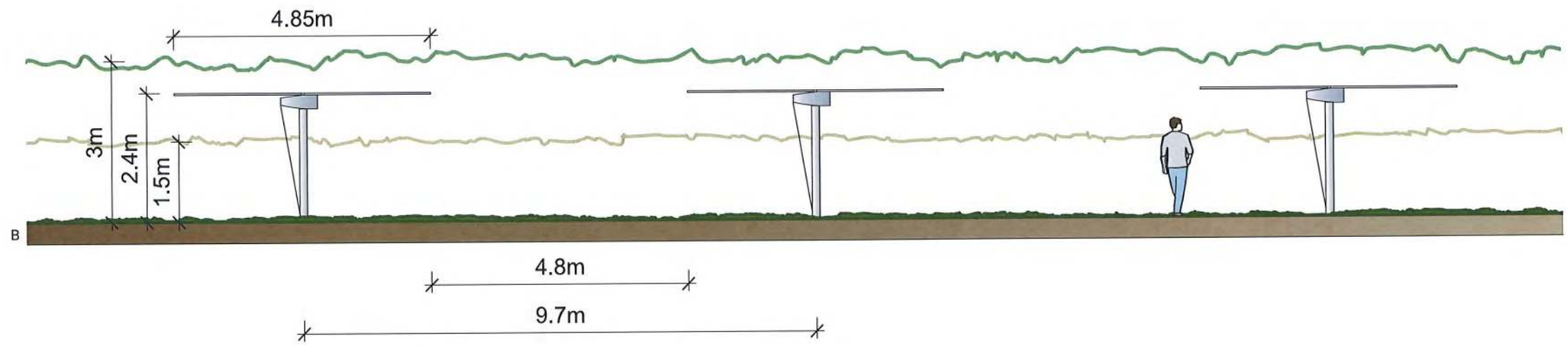
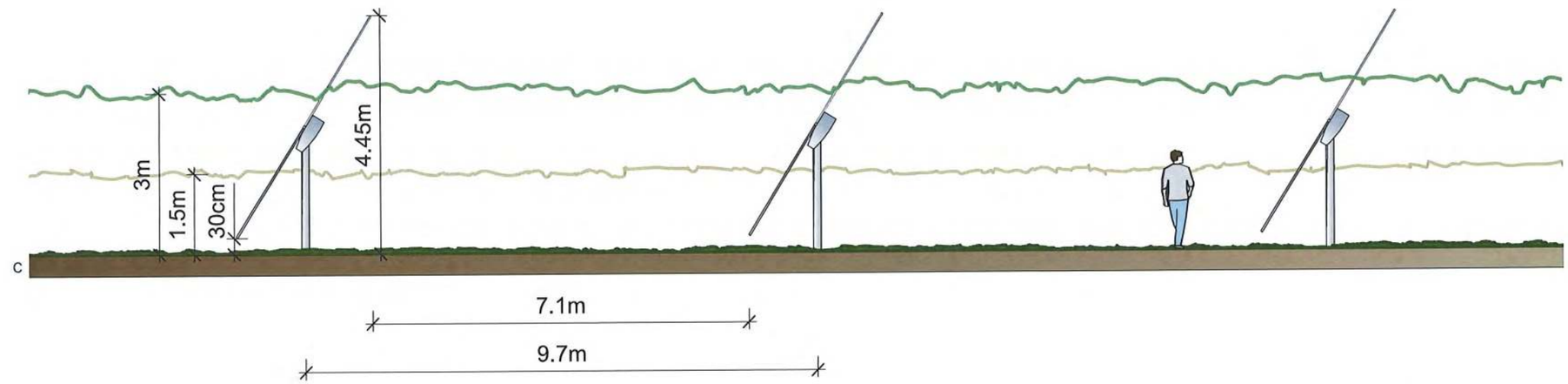






SCALE 1:100 @A3

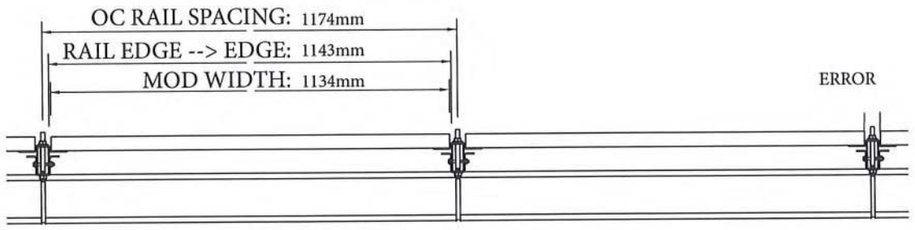
RMM

Proposed Solar Farm Mangamaire Road, Tararua

Mechanical Layout Information

FTC VOYAGER TRACKER™

MODULE RAIL SPACING



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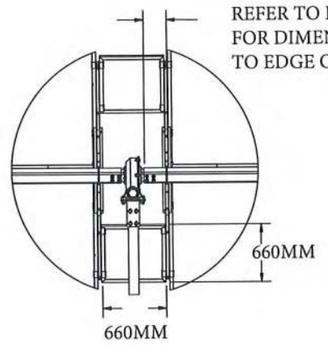

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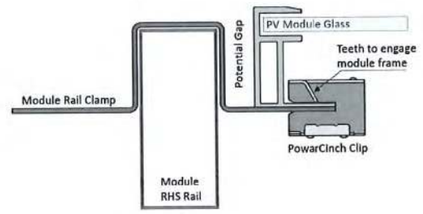

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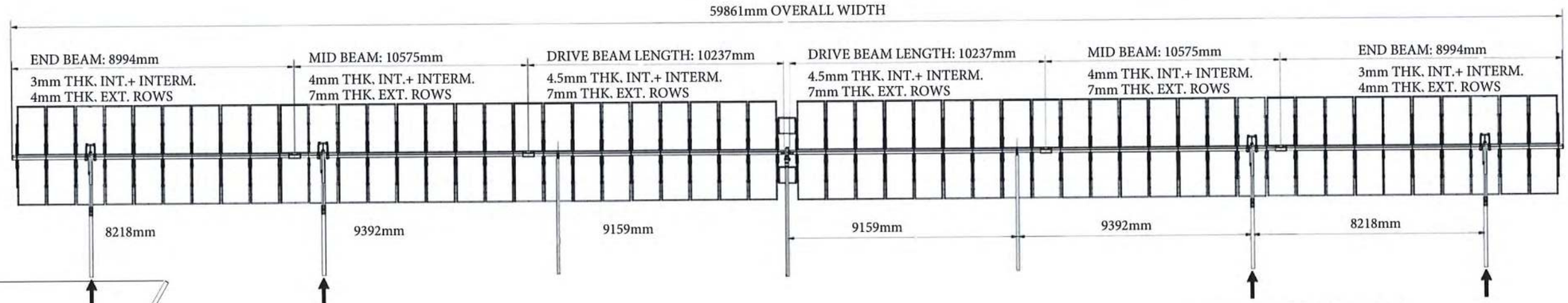

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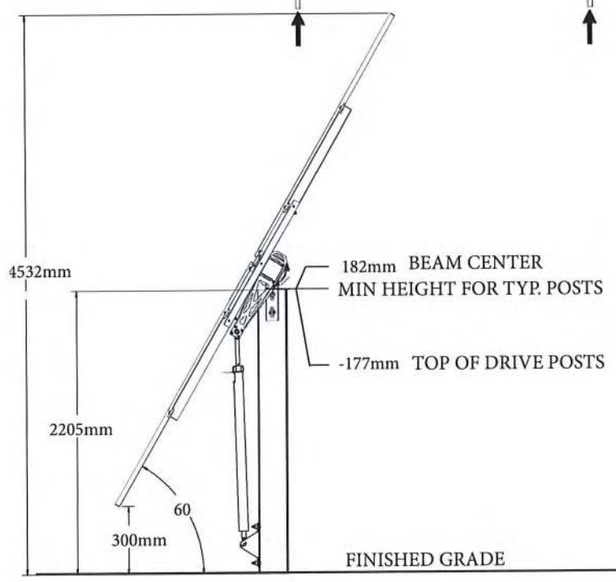

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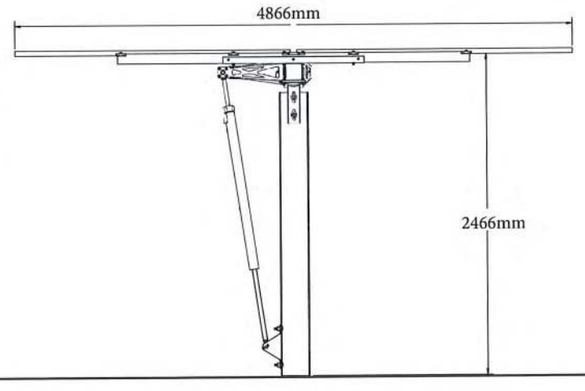

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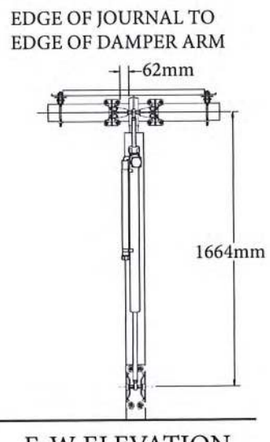

E-W ELEVATION
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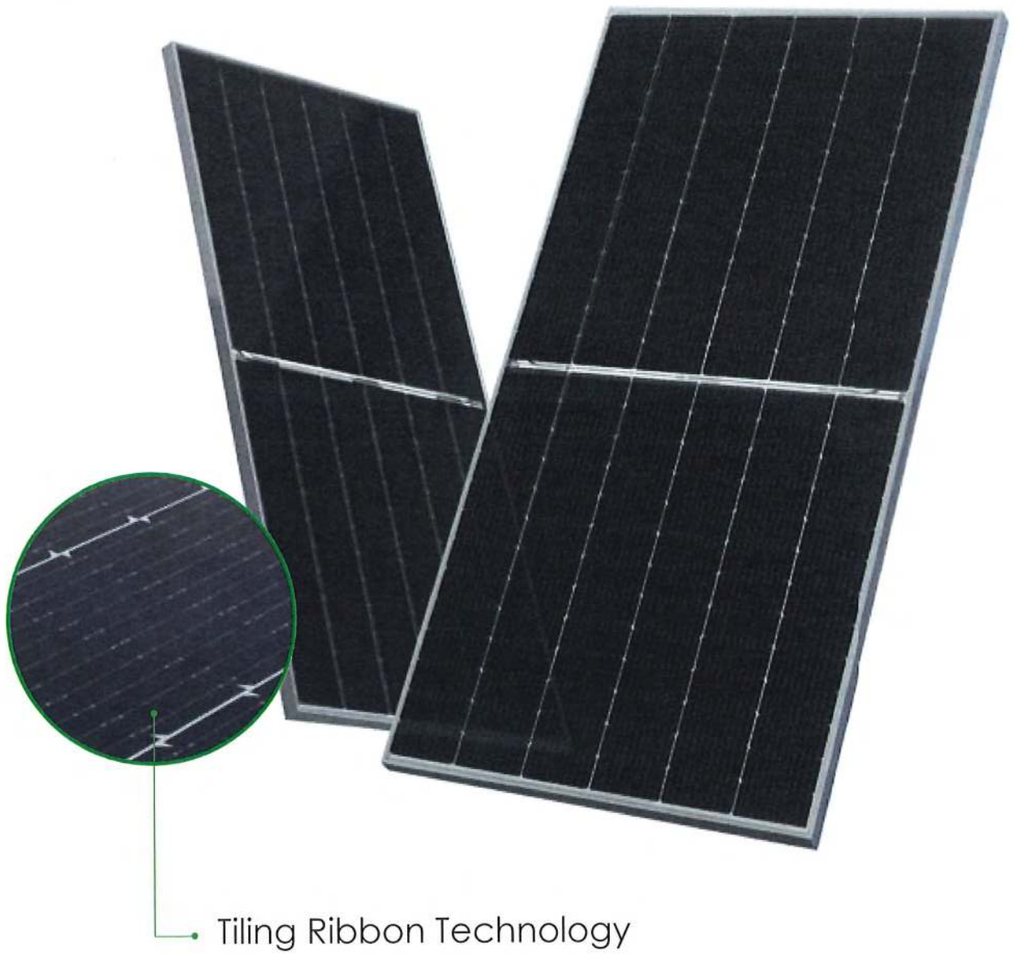

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C.

APPENDIX 6:

NGATI KAHUNGUNU KI TAMAKI-NUI-A-RUA EMAIL CORRESPONDENCE

Catherine Boulton

From: james kendrick <patuahi@hotmail.com>
Sent: Wednesday, 17 August 2022 8:12 AM
To: Catherine Boulton
Cc: Stacey Hape
Subject: Solar Farm Mangamairie

Morena Catherine. Great to hear from you was great meeting both of you and being able visit the site together. After our hui site visit and reading through all documentation I am happy to support the proposed application for the Solar farm conditionally through to the next phase.
As it's a new initiative we as an iwi want to be part of the process and consulted with on going developments as consent applications proceed through to development inclusive of the construction phase to completion. We see this as an opportunity to grow our understanding of the solar energy industry in Tararua district and impacts both negative and positive with regards to our environment.
Any queries please feel free to contact me.
0210454085
Nga mihi nui
James