

Project Amendment Addendum

Preliminary Geotechnical Desktop Assessment

22-Feb-2023
Kennedys Creek Solar Farm

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Project Amendment Addendum

Preliminary Geotechnical Desktop Assessment

Client: 433 Link Development Pty Ltd

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Job No.: 60597829

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1.0 Introduction

1.1 Purpose

The purpose of this addendum report is to determine whether technical assessments attached to the approved permit for Kennedys Creek Solar Farm (the Project) will require further consideration and assessment following amendments to the solar farm layout and inclusion of a new transmission line.

This is an addendum report to *Kennedys Creek Solar Farm Geotechnical Desktop Assessment* (AECOM, 2019) (The Report).

1.2 Background to Planning Permit Application

AECOM Australia Pty Ltd (AECOM) continues to act on behalf of the Project Applicant, 433 Link Development Pty Ltd, in relation to Planning Permit Application PA1900684 (the Permit) for the Kennedys Creek Solar Farm (the Project). It is noted that AECOM previously acted on behalf of South Energy, the former owner of the Project Applicant. On 22 September 2021, ownership of the Project Applicant was transferred from South Energy to Lightsource bp. South Energy retain ownership of the subject site and therefore an interest in the Project.

The Permit was granted on 30 November 2020 and amended on 5 February 2021 in accordance with Section 71 of the *Planning and Environment Act 1987* (P&E Act), to correct a clerical error at condition 73. The Application is for the **use and development of a solar energy facility, utility installation and associated buildings and works, native vegetation removal, creation of access to a Road Zone Category 1, business identification signage, and remove, vary, and create easements.**

The Project site is at the following addresses:

- Murray Road, Benalla (Lot 3 and 4 PS318659S)
- 51 Nelson Road, Benalla (Lot 6 PS627741K)
- 67 Nelson Road, Benalla (Lot 7 PS627741K)
- 127 Nelson Road, Benalla (Lot 2 PS803108)
- 284 Benalla-Yarrowonga Road, Benalla (Lot 3 PS715932M).

1.3 Project Amendments

Following changes to the concept design, an application under Section 72 of the P&E Act is being sought to amend PA1900684 (the amendment). The amendment seeks to:

- Rearrange the layout of Kennedys Creek Solar Farm to:
 - Relocate the Substation to the north-east of the site and connection to new transmission infrastructure
 - Make minor updates as a result of the above.
- Include a new transmission line from the Kennedys Creek Solar Farm to the network connection point at West Mokoan Solar Farm.

The new transmission line will further affect the following parcels of land:

- Lake Mokoan Road, Winton North (Allotment 2020 Parish of Winton PP3843)
- 368 Benalla-Yarrowonga Road, Benalla (Lot 2 PS627741)
- 370 Benalla-Yarrowonga Road, Benalla (Lot 1 PS627741)
- 82 Snowy Lane, Benalla (Lot 2 LP123365)
- Benalla-Yarrowonga Road, Benalla (Lot 1 PS717978)

- 524 Benalla-Yarrowonga Road, Benalla (Lot 6 LP206524)
- 572-616 Benalla-Yarrowonga Road, Benalla (Lot 5 LP206524; Lot 4 LP206524 Lot 3 LP206524)
- Allotment 2019 Parish of Goorambat PP2704
- Snowy Lane, Benalla road reserve.

2.0 Assessment

The Report outlined a preliminary understanding of the existing geological conditions at the site and identified potential geotechnical hazards, and how they may present constraints to construction and development of the proposed solar farm.

AECOM undertook a desktop study supplemented by a site visit to confirm existing surface conditions and map any key geotechnical features. The desktop study included review of publicly available information and publications such as geological, soil, landscape, topographical and hydrogeological maps and aerial photography. The Report concluded with broad geotechnical recommendations and potential geotechnical risks associated with construction of the solar farm development.

The Report states that the geotechnical qualities of the Activity Area are suitable for a solar farm and its construction, however it recommends further intrusive geotechnical investigations.

2.1 Relocated substation to north-east boundary

The result of the substation being relocated to the north-east boundary is that solar panels are now proposed along the southern boundary where the substation was previously located, and solar panels removed where the substation is now located in the north-east.

The report concludes that geological conditions across the Activity Area are relatively uniform and suitable for earthworks and foundations of the solar farm, subject to considerations that are outlined in the report. Internal layout changes would have negligible effect on the risk of geotechnical hazards and how they would in turn potentially affect the construction and operation of the solar farm.

2.2 New transmission line and associated minor changes

The Report does not directly assess the transmission line impact area, however the transmission line is directly adjacent to the Kennedys Creek solar farm and has similar topographical and geological characteristics as the solar farm.

The Report's key recommendation is for further testing to be undertaken, which is relevant to the transmission line impact area.

3.0 Conclusion

The proposed amendments to the solar farm layout and additional transmission line do not warrant further preliminary assessment for geotechnical impacts. The conclusions and recommendations outlined in *Kennedys Creek Solar Farm Geotechnical Desktop Assessment* (AECOM, 2019) remain relevant to the updated proposal.

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433 Link Development Pty Ltd
09-Sep-2019
Doc No. 60597829-RPTGT-0001



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AECOM Australia Pty Ltd does not represent that the information or interpretation contained in this report address completely the existing features, as built construction, subsurface conditions or ground behaviour on the subject site.

Quality Information

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Ref 60597829
Date 09-Sep-2019
Prepared by Chris French
Reviewed by Jan Krestyn

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
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1.0 Introduction

1.1 Project Background

AECOM Australia Pty Ltd (AECOM) has been engaged by South Energy Pty Ltd, on behalf of 433 Link Development Pty Ltd, to provide a geotechnical desktop assessment for Kennedys Creek Solar Farm on Benalla-Yarrawonga Road, in Benalla shire.

The geotechnical desktop assessment was conducted to develop a preliminary understanding of the existing geological conditions at the site and identify potential geotechnical hazards, which may present constraints to construction and development of the proposed solar farm.

1.2 Site Location

The site, formerly known as 'Benalla South Solar Farm' is located approximately 4 km northeast of Benalla town centre, in central north Victoria, as shown in Figure 1.

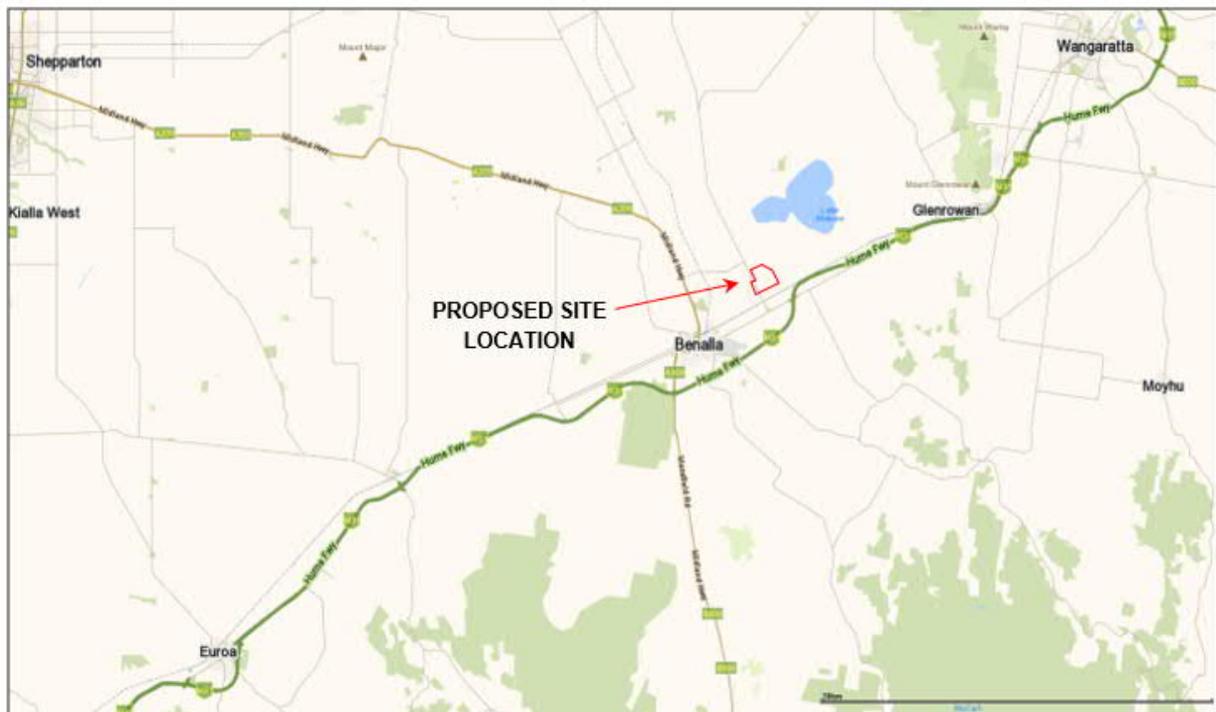


Figure 1: Proposed Kennedy's Creek Solar Farm location

The subject site is irregular in shape and extends across both sides of Benalla-Yarrawonga Road at the intersection with Nelson Road and Murray Road. Nelson Road is unsealed and runs east from Benalla-Yarrawonga Road along the southern boundary of the site.

At the time of the report, the site is made up of five properties identified in Figure 2 overleaf and listed below:

- Murray Road, Benalla
- 51 Nelson Road, Benalla
- 67 Nelson Road Benalla
- 125 Nelson Road, Benalla
- 284 Benalla-Yarrawonga Road, Benalla

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Figure 2: Individual properties of Kennedy's Creek Solar Farm

1.3 Proposed Development

Details of the proposed solar farm layout and equipment are not known at present, but based on experience with similar projects, it is assumed the development will consist of equipment, which will broadly comprise the following:

- Photovoltaic (PV) solar panel arrays, mounted on fixed-tilt structures and supported on steel driven (channel or tubular) or screw piles, concrete 'ballast' blocks, or shallow pad footings;
- Centralised power converter units (PCUs) supported on shallow pad footings;
- Substation, electrical switchgear, transformers, O&M facility and Battery Energy Storage System (BESS);
- Lightweight amenities building and associated infrastructure;
- Security fencing and gates;
- Internal access tracks and drainage works; and
- Service trenching, cables and transmission line connecting to the existing electricity network.

1.4 Scope of Work

The geotechnical assessment comprised a desktop study augmented with a site walkover/drive-over to confirm existing surface conditions and map any key geotechnical features, where present.

The desktop study included review of publicly available information and publications such as geological, soil, landscape, topographical and hydrogeological maps and aerial photography.

No intrusive investigation was requested or undertaken.

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General geological considerations, broad geotechnical recommendations and potential geotechnical risks associated with construction of the solar farm development are included.

It should be noted that this assessment does not provide sufficient site-specific information to inform the design of the solar farm, and a site-specific geotechnical investigation will be required. Information relating to planning, heritage, ecology, flooding and other potential constraints are reported separately.

The presence of actual or potential soil contamination is beyond the scope of this geotechnical desktop assessment. Further advice regarding contamination should be sought from an appropriate source.

2.0 Desktop Data Review

A desktop review of available information was undertaken as part of the investigation. The findings are discussed in the following sections.

2.1 Topography

The overall topography of the site is characterised by the low relief Shepparton Formation alluvial landform. The Tomkinson Group Feature and Levels survey plan (Drawing No. W1184-01) indicates the site is near level with site elevations of approximately 165 mAHD (metres Australian Height Datum) along the northern boundary and approximately 168 mAHD along the southern boundary.

2.2 Drainage

There are a number of unnamed shallow, low relief ephemeral drainage lines on the site. Kennedys Creek, which flows in a southerly direction, is located approximately 500 m to the west of the Murray Road property and lies outside the site boundary.

2.3 Geological and Hydrogeological Setting

The Geological Survey of Victoria's 1:250,000 series 'Wangaratta' map sheet indicates the site is located in an area comprising Quaternary age fluvial and lacustrine sediments of the Shepparton Formation, generally associated with extensive prior stream networks, floodplains and colluvium.

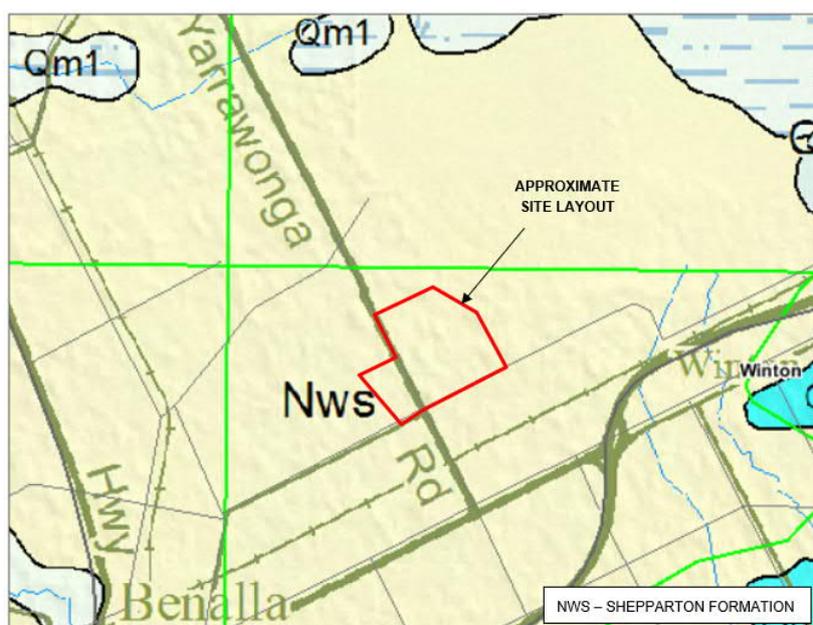


Figure 3: Geological extract from DPI website (NTS)

The heterogeneous sedimentary unit typically comprises flood plain clays, silts, channel sands and minor gravel. The deposits are also known to contain quartz, mica, feldspar and ironstone and cemented sands.

The geological map sheets do not indicate any faulting, geological structures or mining activities on, or in close proximity to the site.

The Department of Environment, Land, Water and Planning web-based groundwater reporting tool 'Visualising Victoria's Groundwater' (www.vvg.org.au) indicates there are a number of groundwater bores within or close to the site boundary (see Table 1 and Figure 4).

Table 1: Groundwater bore locations on/near site

Bore ID	Easting (m)	Northing (m)	BH Depth (m)	Elevation (m AHD)	Year Completed	Lithology Log
135930	413013	5959934	25	165.10	1999	Yes
135931	413013	5959084	25	168.71	1999	Yes
135932	413413	5958359	22	168.07	1999	Yes
135933	414288	5958809	16	167.78	1999	Yes

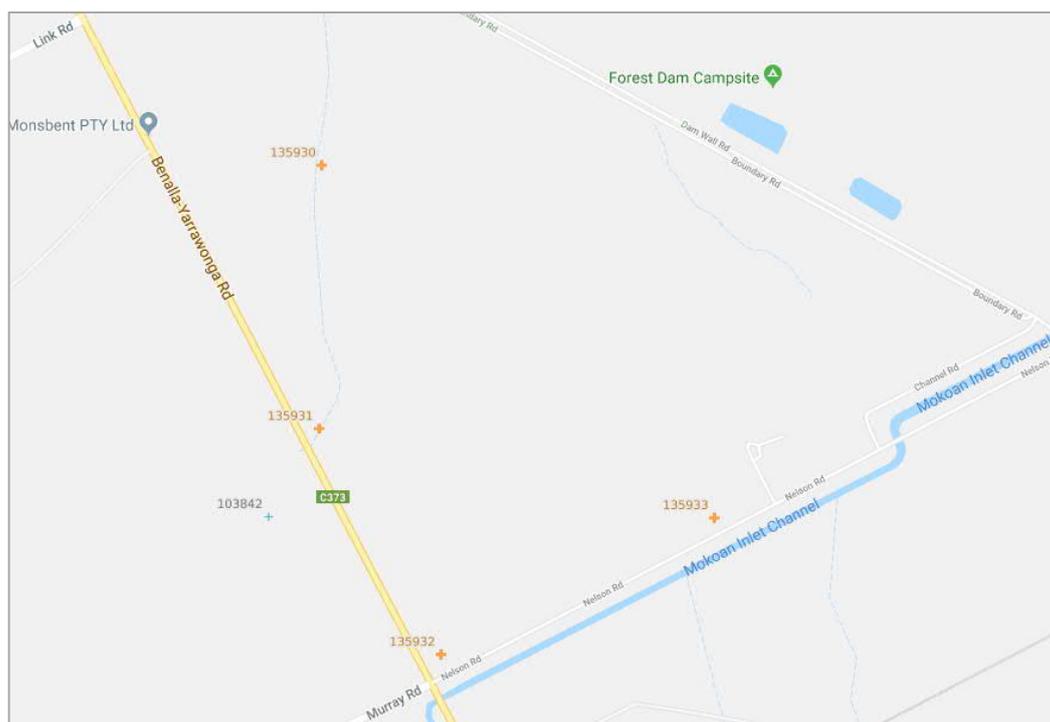


Figure 4: Groundwater bores on site Source: Visualising Victoria's Groundwater (www.vvg.org.au)

Lithology logs for the bores 135930, 135931, 135932 and 135933 are summarised in Table 2 to Table 5. The material described on the logs is (based on AECOM's experience) considered consistent with the Shepparton Formation deposits. It is noted that the logs are not in accordance with AS1726 Geotechnical Site Investigations, but provide an indication of the type of materials that could be encountered in this area.

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Table 2: Bore 135930 lithology log

Depth to base of unit (m)	Material Description
0.5	Sand, grey
2.5	Clay, grey
6	Silty Clay, grey
10	Sandy Clay, brown
18	Silty Clay, brown
25	Sandy Clay Brown

Source: Visualising Victoria's Groundwater (www.vvg.org.au)

Table 3: Bore 135931 lithology log

Depth to base of unit (m)	Material Description
0.5	Sand, grey
2.5	Clay, grey
3.5	Silty Clay, brown
5	Clay, brown
14	Silty Clay, brown
21	Clay, brown
25	Sandy Clay, brown

Source: Visualising Victoria's Groundwater (www.vvg.org.au)

Table 4: Bore 135932 lithology log

Depth to base of unit (m)	Material Description
5	Clay, grey
11.5	Clay, red/grey
20.5	Clay, grey
21.5	Sand
22	Silty Clay, brown/grey

Source: Visualising Victoria's Groundwater (www.vvg.org.au)

Table 5: Bore 135933 lithology log

Depth to base of unit (m)	Material Description
0.5	Sand, grey
4	Clay, brown
6.5	Clay, red/brown
16	Clay, red/brown

Source: Visualising Victoria's Groundwater (www.vvg.org.au)

The Visualising Victoria's Groundwater web portal also indicates depth to groundwater as being approximately 20 m from the existing ground surface.

Available groundwater monitoring data for the above bores also sourced from VVG are summarised Table 6.

Table 6: Groundwater monitoring data

Date	Measured SWL			
	135930	135931	135932	135933
28/04/1999	19.33	19.40	20.11	16.25
21/08/2008	-	-	17.77	-

Source: Visualising Victoria's Groundwater (www.vvg.org.au)

2.4 Previous Geotechnical Investigations

AECOM is not aware of any geotechnical investigations on or within close proximity to the site. It is possible that previous investigations or construction records may exist for transmission towers which are located within the site.

2.5 Acid Sulphate Soils

Based on review of Victorian Resources Online (VRO) maps and given the location and elevation of the site, it is considered that there is very low potential for acid sulphate soils to be present on the site.

2.6 Sodic Soils

The VRO maps (formerly Department of Agriculture) have been compiled from previous soil and land surveys over the past 50 years. The generalised maps are issued at regional scale but have been reviewed to provide a general indication of likely soil characteristics at the subject site on a local level and provide the basis for possible further investigation.

The maps indicate that sodic soils (a soil with exchangeable sodium greater than 6%) could be present onsite (Figure 5). Sodic soils typically occur on broad, flat landscapes with poor drainage, particularly in arid environments. The Bureau of Meteorology (BOM) indicates Benalla has a mean annual rainfall of approximately 670 mm. Sodic soils are susceptible to dispersion and waterlogging, and earthworks which contain dispersive soils are generally more erodible.

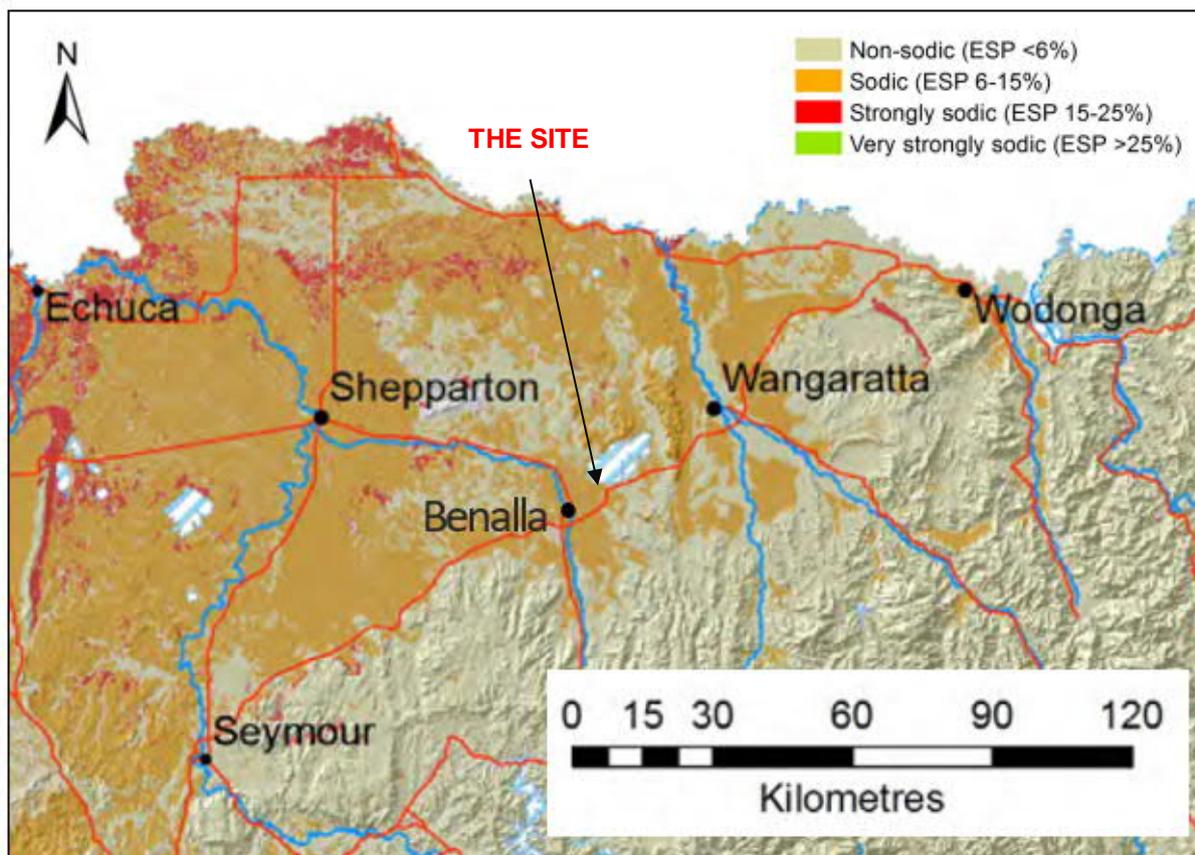


Figure 5: Generalised regional map of Victorian sodic soil distribution

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2.7 Easements and Existing Power Infrastructure

There are a number of easements for gas, electricity, water and communications which transect the site. A 35 m wide, high pressure gas transmission pipeline easement runs west to east across the southern part of the site, crossing Benalla-Yarrowonga Road into 125 Nelson Road. There are also Optus and AAPT fibre optic telecommunications cables running in a similar alignment east-west across the southern part of the site and a water pipeline running through the eastern portion of the site, predominantly on the 125 Nelson Road property. At the north-eastern edge of the site, running parallel to the wetland embankment is the 220 kV Glenrowan to Shepparton electricity transmission line. The powerlines are supported on a series of self-supporting, galvanized steel lattice towers constructed in the paddocks.

3.0 Site Visit

3.1 General

An initial walkover and drive over survey was carried out on 23 January 2019 by an AECOM engineering geologist, to inspect the landform and identify surface features of interest. A further site visit was carried out on 20 March 2019 to inspect the land at 125 Nelson Road, which was added to the proposed solar farm development after the first inspection.

At the time of both inspections, weather conditions were dry and sunny, and the entire site was trafficable using a 4WD vehicle. The site visits also included a discussion with local landowners (where available) for any relevant anecdotal information on site features.

3.2 Site Description

The site forms a combined area of approximately 280 hectares and is made up of numerous large paddocks, which are currently used for broadacre farming (cropping and livestock grazing). The overall site is relatively flat and includes fence lines, scattered trees, unsealed farm tracks unnamed drainage courses and a small number of farm dams.

There is an existing dwelling and associated farm buildings and out buildings on two of the properties, setback off the southern boundary of the site. The dwellings on 51 Nelson Road and 125 Nelson Road are set back approximately 650 metres and 150 metres respectively from Nelson Road. There is also an isolated farm building on the 67 Nelson Road property. There are no buildings on the 284 Benalla-Yarrowonga property.

The Mokoan Inlet Channel runs parallel to the south side of Nelson Road and flows in an easterly direction into the south-west corner of Winton Wetlands.

3.3 Adjoining Land Use

The neighbouring properties to the north, east and west of the site are also mainly agricultural land used for broadacre farming.

At the northeast of the site are the Winton Wetlands. Planned flooding of the former Winton Swamp in 1971 inundated around 7,000 Ha of agricultural land and forests to create Lake Mokoan reservoir. The storage was subsequently decommissioned and drained in 2010 and is currently being restored as the Winton Wetlands.

The land to the south of the Murray Road property, at the corner of Benalla-Yarrowonga Road, has now been developed as the D&R Henderson concrete and manufacturing facility as a commercial property.

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3.4 Surface Conditions

The site visit generally confirmed the findings of the desktop study, with the land used for either grazing or cropping. Vegetation comprised mainly of sparse, short grass interspersed with barren areas. A number of medium to large-sized trees are scattered around the properties, predominantly located along the internal post and wire fence lines, or as a copse around the farm dams.

Photographs taken during the site visits showing typical views of the land are included in Appendix B and labelled KC01, KC02 etc. for reference. A brief description of these views is provided in Table 7 and the corresponding ID labelled on the Site Plan in Appendix A, where relevant. Photographs of specific site features are provided in Section 3.5.

Table 7: Key site features and views

ID	Description
KC 1	Unsealed Nelson Road, looking east from Benalla-Yarrowonga Road
KC 2	Mokoan trail running north from south east corner of 125 Nelson Road
KC 3	Nelson Road bridge over dry Mokoan Inlet Channel near south east corner of 125 Nelson Road
KC 4	Buildings looking north west from south east corner of 125 Nelson Road
KC 5	Large barn, water tank and outbuildings near dwelling on 125 Nelson Road
KC 6	Farm dam located north of dwelling on 125 Nelson Road
KC 7	Ephemeral drainage line and dry pond on 125 Nelson Road, looking south east
KC 8	Dry farm dam near KC 7 on 125 Nelson Road, looking north west
KC 9	Transmission lines on 125 Nelson Road, looking north
KC10	Eastern boundary fence line on 125 Nelson Road, looking south
KC11	Transmission towers on 125 Nelson Road, looking north
KC12	125 Nelson Road eastern boundary, looking north west from embankment of Winton wetlands
KC13	View west of old farm windmill near northern boundary of 125 Nelson Road
KC14	67 Nelson Road entrance looking north showing livestock pen
KC15	Fenced corridor with electric fence on 67 Nelson Road, looking north
KC16	Dwelling, shed and water tank on 51 Nelson Road, looking north west
KC17	Farm dam north of dwelling on 51 Nelson Road
KC18	Alpacas in shade near farm dam on 51 Nelson Road
KC19	Second farm dam south of dwelling on 51 Nelson Road, looking south east
KC20	Barren ground near farm dam on 51 Nelson Road, looking south east
KC21	Line of large trees in paddock on 284 Benalla-Yarrowonga Road property, looking south
KC22	Cattle pen and hay bales on 284 Benalla-Yarrowonga Road, looking north
KC23	Farm dam next to road on 284 Benalla-Yarrowonga Road, looking north west
KC24	General view north west of Murray Road property, looking north west showing B-Y Road
KC25	Small farm dam at north east corner of Murray Road, adjacent to Benalla-Yarrowonga Road
KC26	Large farm dam adjacent to north west corner of Murray Road property

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3.5 Site Features

Most of the out-buildings and water tanks were concentrated next to the dwellings described in Section 3.2 with occasional water troughs, derelict windmills, sheds and cattle pens scattered around the various properties.

The onsite farm dams are generally oval or rectangular in plan and between 20 and 40 m in length. The dams are constructed with low height (less than 1 m) embankments with very gentle internal and external batters and shallow depth. It is likely the farm dams have been in use for many years and the embankments worn down to a varying degree due to effects of weathering and long-term trafficking by cattle.

There is a livestock pen at the wide gated entrance to the 67 Nelson Road property (Ref. KC14) and also on the 284 Benalla-Yarrowonga road property (Ref. KC22). The 67 Nelson Road property also has a series of gated access corridors with electric fences (Ref: KC15).

At the northern end of the wedge-shaped property adjoining the Murray Road property, there is a large farm dam which abuts the northern end of the site (Ref: KC26).

The materials exposed along the farm dam embankments were observed to be a dry silty/sandy clay. In some sections of the dam embankments, a thin covering of fine to medium grained, red-brown ferruginous gravel was observed (Figure 6). The sediments in the base of the empty farm dams showed evidence of desiccation cracks, due to the prolonged dry spell (Figure 7).



Figure 6: Gravel exposed on farm dam embankment



Figure 7: Surface desiccation feature

No erosion gullies or large-scale depressions were observed during the site visit. Furthermore, no groundwater monitoring or operational water bores suitable for groundwater level measurement were observed on site.

4.0 Geotechnical Considerations

4.1 General

The geotechnical assessment indicates the geological conditions across the site are relatively uniform, and the area suitable for earthworks and foundations of the proposed solar farm, subject to the following considerations. The assessment also indicates there is little potential for flooding, landslides or subsidence; however, small-scale surface erosion may occur.

The general preliminary advice and recommendations provided in the following sections should be supported by a detailed geotechnical investigation, including borehole drilling, Cone Penetrometer

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Testing (CPT) and/or test pit excavations, to confirm the findings of this assessment and provide design parameters and reduce geotechnical uncertainty. The following sections relate to key considerations only, and are not intended to be exhaustive, and other geotechnical risks may be identified during design development and construction phases.

4.2 Anticipated Ground Conditions

Based on visual and tactile assessment, the near surface soils at the site appear to generally comprise a relatively thin layer of clayey silt (topsoil) overlying silty/sandy clay. At the time of the site visit, the near surface site clays observed in the dams were assessed to be medium to high plasticity, dry of the plastic limit, and of very stiff to hard consistency. However, significant softening of the soil can occur when wet.

The clays are likely to be reactive and hence prone to shrink and swell movements upon wetting and drying. Cracking of the exposed ground surfaces was observed, indicating the potential for shrink-swell activity due to seasonal moisture variations.

The surface soils are potentially dispersive and erodible under the action of running water. Erosion of the exposed surfaces and turbid dam water tends to confirm the potential for dispersivity of the site soils.

No outcrop of rock was observed during the site visit and based on the desktop data review, indicating rock is unlikely to be encountered during earthworks and preparation of foundations at the proposed site.

4.3 Anticipated Site Classification to AS2870-2011

Site classification for foundation soil reactivity provides an indication of the amount of ground surface movement which has potential to occur with seasonal variation in moisture. Although not strictly applicable to the proposed solar farm development, Australian Standard AS2870-1996 'Residential Slabs and Footings' has been referenced to provide an overall site classification for preliminary foundation design purposes.

Based on the findings of the assessment, a site classification of H1-D to E-D (for deep seated moisture range) is anticipated for the site 'as-is', with a corresponding characteristic surface movement (y_s) potentially > 75 mm. It is recommended a design suction change (H_s) of 3 m be adopted.

It should be noted that any cut or fill earthworks may alter the characteristic surface movement and modify the site classification, hence these areas of the site will need to be re-assessed during design, giving consideration to the actual cut and fill levels.

4.4 Site Trafficability

During dry weather, the near surface soils are expected to provide a suitable surface on which to run construction plant. However, appreciable softening of the clays and subsequent trafficability problems may be encountered during wet weather. Should trafficability difficulties be encountered, consideration should be given to the placement of a granular working platform. Such softening may also affect the construction of shallow footings and hardstands.

4.5 Site Preparation and General Earthworks

The site won materials are considered suitable for construction of engineered fill, but will require appropriate moisture conditioning. Stripping of surficial siltier soils may be necessary, prior to the fill placement, but this will need to be confirmed by geotechnical investigations. Particular care is needed in the backfilling of farm dams, to ensure all wet and softened soil is removed, prior to filling.

4.6 Excavation Conditions

As the site is relatively flat, it is anticipated that that limited earthworks will be required to establish access tracks and foundation preparation. Based on the findings of the desktop assessment, the near

surface soil at the site is likely to comprise sand and clay generally of stiff to hard consistency. These soils are expected to be readily excavated by conventional mechanical excavation equipment.

4.7 Groundwater

Based on publicly available data and site observations, it is likely that groundwater will be between about 15 m and 20 m depth below the existing ground surface.

4.8 Suitable Foundation Types

The surface materials expected over the extent of the site are not anticipated to provide a significant challenge with respect to foundation design and construction. Shallow spread footings, driven steel piles (channel or CHS) and/or screw piles are considered suitable options. The design of the foundation will need to take the effects of the 'shrink-swell' effects into account. Consideration may need to be given to founding of the piles below the design suction depth H_s (see Section 4.3). The soil swelling around the pile shaft could also lead to tension forces in the pile, and therefore full-length reinforcement should be used if concrete piles are used.

For lightweight buildings, it is expected stiffened raft or strip and pad footings would be appropriate.

4.9 Site Seismicity

Based on Australian Standard AS1170.4-2007 '*Structural Design Actions Part: 4, Earthquake actions in Australia*', Section 3, the hazard factor (Z) for the site is 0.09 (0.09 in 500 years probability of exceedance). Based on the anticipated subsurface conditions at the site, the sub-soil classification considered appropriate at this preliminary stage: would be Class C (Deep Soil Site).

4.10 Access Track Pavement Design

For preliminary purposes, a design CBR of 3.0% is considered reasonable.

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5.0 Further Geotechnical Site Investigation

The currently available geotechnical information is insufficient to facilitate design of the civil elements and foundations expected for the proposed solar farm development and therefore intrusive geotechnical investigation will be required. It is recommended the geotechnical investigation(s) incorporate the following key elements.

- Drilling of boreholes, performing Cone Penetrometer Tests (CPT) and/or excavation of test pits to characterise the soils;
- Collection of disturbed and undisturbed soil samples, and any rock core where present;
- In-situ testing such as:
 - Dynamic Cone Penetrometer (DCP) tests adjacent to test pits and boreholes
 - Standard Penetration Tests (SPT) at regular depths in the boreholes.
 - Shear vane tests in boreholes / test pits and on undisturbed samples.
- Geotechnical testing at soil and rock testing laboratories for both soil classification and assessment of engineering parameters of soil and rock such as:
 - Particle size distribution tests (PSD) grading and hydrometer;
 - Atterberg Limit tests
 - Shrink-swell tests
 - Soil compaction tests
 - 4-day soaked CBR tests
 - Unconsolidated Undrained (UU) triaxial compression tests
 - Soil dispersivity (pinhole dispersion test and/or Emerson Class test)
- Soil aggressiveness against concrete or steel (durability testing) comprising pH, chloride (Cl), sulphate (SO₄) and electrical conductivity (EC)
- Thermal resistivity testing to assess the capacity of the soil to conduct or dissipate heat; and
- Electrical resistivity testing of the soil, to determine the conductivity for electrical grounding design.

Testing for soil contamination potential may also be required.

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6.0 References

1. Geological Survey of Victoria 'Wangaratta' 1:250,000 series map sheet.
2. Australian Standard AS1170.4-2007 – 'Minimum Design Loads on Structures, part 4: Earthquake Loads'
3. Australian Standard AS2870-1996 'Residential Slabs and Footings.'
4. Visualising Victoria's Groundwater, 2016 (<http://maps.cerdi.com.au/vvg.php>)

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Appendix A

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Figures

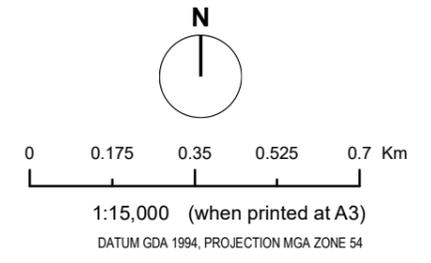
Appendix A Site Plan

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- Legend**
- Benalla South Site Boundaries
 - Roads
 - Railway Stations
 - +— Railway Line
 - Waterways
 - Property Boundaries
 - Local Government Area Boundary

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Base Data: (c) 2017/2018 VicMap

SITE CONTEXT

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Appendix B

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Site Photographs

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Photograph KC 1



Photograph KC 2



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Photograph KC 3



Photograph KC 4



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Photograph KC 5



Photograph KC 6



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Photograph KC 7



Photograph KC 8



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Photograph KC 9



Photograph KC 10



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Photograph KC 11



Photograph KC 12



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Photograph KC 13



Photograph KC 14



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Photograph KC 15



Photograph KC 16



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Photograph KC 17



Photograph KC 18



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Photograph KC 19



Photograph KC 20



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Photograph KC 21



Photograph KC 22



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Photograph KC 23



Photograph KC 24 (source: Google Maps)



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Photograph KC 25



Photograph KC 26

