STATE COMMISSION ASSESSMENT PANEL
A COMMITTEE OF THE STATE PLANNING COMMISSION

APPLICATION ON NOTIFICATION – CROWN DEVELOPMENT

Type of development:	Section 49 - Public Infrastructure
Development Number:	711/V031/19
Applicant:	SAPGen Pty Ltd
Nature of Development:	Summerfield Power Station: The development comprises a 422MW hybrid power generation facility comprising 380MW natural gas combined gas turbines; 12MW solar farm; 30MW Battery Energy Storage Facility; switchyard; ancillary facilities; associated earthworks and temporary construction facilities
Subject Land:	120 Hoff Road, Tepko (being Section 304, H170300; Certificate of Title 5924/548)
Development Plan:	Mid Murray Development Plan (Consolidated 23 August 2018)
Zone / Policy Area:	Rural Zone – Murray Plains Policy Area 16
Contact Officer:	Laura Kerber
Phone Number:	7109 7073
Consultation Start Date:	Tuesday 7 January 2020
Consultation Close Date:	Thursday 6 February 2020

During the notification period, hard copies of the application documentation can be viewed at the Department of Planning, Transport and Infrastructure, Level 5, 50 Flinders St, Adelaide, during normal business hours. Application documentation may also be viewed during normal business hours at the local Council office (if identified on the public notice).

Written representations must be received by the close date (indicated above) and can either be posted, hand-delivered, or emailed to the State Commission Assessment Panel (SCAP). A representation form is provided as part of this document.

Any representations received after the close date will not be considered.

Postal Address:
The Secretary
State Commission Assessment Panel
GPO Box 1815
ADELAIDE SA 5001

Street Address:
Development Division
Department of Planning, Transport and Infrastructure
Level 5, 50 Flinders Street
ADELAIDE

Email Address: scapreps@sa.gov.au

DEVELOPMENT ACT, 1993
S49/S49A – CROWN DEVELOPMENT
REPRESENTATION ON APPLICATION

Applicant:	SAPGen Pty Ltd
Development Number:	711/V031/19
Nature of Development:	Summerfield Power Station: The development comprises a 422MW hybrid power generation facility comprising 380MW natural gas combined gas turbines; 12MW solar farm; 30MW Battery Energy Storage Facility; switchyard; ancillary facilities; associated earthworks and temporary construction facilities
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Contact Officer:	Laura Kerber
Phone Number:	7109 7073
Close Date:	Thursday 6 February 2020

My Name: ______________________ My phone number: ______________

Primary method(s) of contact: Email: ______________________

Postal Address: ______________________ Postcode: ________

You may be contacted via your nominated PRIMARY METHOD(s) OF CONTACT if you indicate below that you wish to be heard by the State Commission Assessment Panel in support of your submission.

My interests are:
(please tick one)

- ☐ owner of local property
- ☐ occupier of local property
- ☐ a representative of a company/other organisation affected by the proposal
- ☐ a private citizen

The address of the property affected is: ______________________

Postcode ________

My interests are:
(please tick one)

- ☐ I support the development
- ☐ I support the development with some concerns
- ☐ I oppose the development

The specific aspects of the application to which I make comment on are: ______________________

____

I: *(please tick one)*

- ☐ wish to be heard in support of my submission
- ☐ do not wish to be heard in support of my submission *(Please tick one)*

By: *(please tick one)*

- ☐ appearing personally
- ☐ being represented by the following person *(Please tick one)*

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 /or **Email:** scapreps@sa.gov.au

DEVELOPMENT ACT, 1993
S49/S49A – CROWN DEVELOPMENT
REPRESENTATION ON APPLICATION

Signature: ______________________________

Date: ____________________

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 /or
Email: **scapreps@sa.gov.au**

SECTION 49 & 49A – CROWN DEVELOPMENT
DEVELOPMENT APPLICATION FORM

PLEASE USE BLOCK LETTERS

COUNCIL: MID MURRAY COUNCIL

APPLICANT: SAPGEN

ADDRESS: C/- AECOM, L28, 91 KING WILLIAM ST, ADELAIDE

CROWN AGENCY: DEPARTMENT FOR ENERGY AND MINES

CONTACT PERSON FOR FURTHER INFORMATION

Name: TOM HATELEY, AECOM

Telephone: 08 7223 5437 [work] ______________ [Ah]

Fax: ____________________ [work] ______________ [Ah]

Email: Tom.Hateley@aecom.com

FOR OFFICE USE

DEVELOPMENT No: ______________________________

PREVIOUS DEVELOPMENT No: ______________________

DATE RECEIVED: / /

❒ Complying	Decision: ______________
❒ Merit	Type: ______________
❒ Public Notification	Finalised: / /
❒ Referrals	

	Decision required	Fees	Receipt No	Date
Planning:				
Land Division:				
Additional:				
Minister's Approval				

NOTE TO APPLICANTS:

(1) All sections of this form must be completed. The site of the development must be accurately identified and the nature of the proposal adequately described. If the expected development cost of this Section 49 or Section 49A application exceeds $100,000 (excl. fit-out) or the development involves the division of land (with the creation of additional allotments) it will be subject to those fees as outlined in Item 1 of Schedule 6 of the *Development Regulations 2008.* Proposals over $4 million (excl. fit-out) will be subject to public notification and advertising fees.
(2) Three copies of the application should also be provided.

EXISTING USE: AGRICULTURAL

DESCRIPTION OF PROPOSED DEVELOPMENT: DEVELOPMENT OF A ELECTRICITY GENERATION STATION

LOCATION OF PROPOSED DEVELOPMENT:

House No: ________ Lot No: 120 Street: HOFF ROAD Town/Suburb: TEPKO

Section No [full/part] ________ Hundred: TEPKO Volume: 5924 Folio: 548

Section No [full/part] ________ Hundred: ________ Volume: ________ Folio: ________

LAND DIVISION:

Site Area [m^2] ________ Reserve Area [m^2] ________ No of existing allotments ________

Number of additional allotments [excluding road and reserve]: ________ Lease: **YES** ❒ **NO** ❒

DEVELOPMENT COST [do not include any fit-out costs]: $ $650,000,000

POWERLINE SETBACKS: Pursuant to Schedule 5 (2a)(1) of the *Development Regulations 2008,* if this application is for a building it will be forwarded to the Office of the Technical Regulator for comment unless the applicant provides a declaration to confirm that the building meets the required setback distances from existing powerlines. The declaration form and further information on electricity infrastructure and clearance distances can be downloaded from the DPLG website (www.dac.sa.gov.au).

I acknowledge that copies of this application and supporting documentation may be provided to interested persons in accordance with the *Development Act 1993.*

SIGNATURE: Tom Hateley

Dated: 29 / 11 / 19

Government of South Australia

DEVELOPMENT REGULATIONS 2008
Form of Declaration (Schedule 5 clause 2A)

To: Minister for Planning

From: SAPGEN

Date of Application: 29 / 11 / 19

Location of Proposed Development: 120 Hoff Road, Tepko, South Australia, 5254

House No: 120 Lot No: ______ Street: Hoff Road

Town/Suburb: Tepko, 5254

Section No (full/part): 304 Hundred: Finniss

Volume: 5924 Folio: 548

Nature of Proposed Development:

An electricity generating station

I Tom Hateley **being a person acting on behalf of the applicant for the development described above declare that the proposed devel opment will involve the construction of a building which would, if constructed in ac cordance with the plans submitted, not be contrary to the regulations prescribed for the purposes of section 86 of the Electricity Act 1996. I make this declaration under clause 2A(1) of Schedule 5 of the Development Regulations 2008.**

Signed: Tom Hateley **Date:** **29/ 11 /2019**

Note 1

This declaration is only relevant to those development applications seeking authorisation for a form of development that involves the construction of a building (there is a definition of ‘building’ contained in section 4(1) of the Development Act 1993), other than where the development is limited to –

a) an internal alteration of a building; or
b) an alteration to the walls of a building but not so as to alter the shape of the building.

Note 2

The requirements of section 86 of the Electricity Act 1996 do not apply in relation to:

a) an aerial line and a fence, sign or notice that is less than 2.0 m in height and is not designed for a person to stand on; or
b) a service line installed specifically to supply electricity to the building or structure by the operator of the transmission or distribution network from which the electricity is being supplied.

Note 3

Section 86 of the Electricity Act 1996 refers to the erection of buildings in proximity to powerlines. The regulations under this Act prescribe minimum safe clearance distances that must be complied with.

Note 4

The majority of applications will not have any powerline issues, as normal residential setbacks often cause the building to comply with the prescribed powerline clearance distances. Buildings/renovations located far away from powerlines, for example towards the back of properties, will usually also comply.

Particular care needs to be taken where high voltage powerlines exist; or where the development:

- is on a major road;
- commercial/industrial in nature; or
- built to the property boundary.

Note 5

An information brochure: ‘Building Safely Near Powerlines’ has been prepared by the Technical Regulator to assist applicants and other interested persons.

This brochure is available from council and the Office of the Technical Regulator. The brochure and other relevant information can also be found at **sa.gov.au/energy/powerlinesafety**

Note 6

In cases where applicants have obtained a written approval from the Technical Regulator to build the development specified above in its current form within the prescribed clearance distances, the applicant is able to sign the form.

Development Assessment Report

Section 49 Development Application

Summerfield Power Station Development Assessment Report

Section 49 Development Application

Client: SAPGen

ABN: 56 630 464 327

Prepared by

AECOM Australia Pty Ltd
Level 28, 91 King William Street, Adelaide SA 5000, Australia
T +61 8 7223 5400 F +61 8 7223 5499 www.aecom.com
ABN 20 093 846 925

29-Nov-2019

Job No.: 60608821

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 AS/NZS4801 and OHSAS18001.

Quality Information

Document	Summerfield Power Station Development Assessment Report
Ref	60608821 p:\606x\60608821 - summerfield power station\400_tech\433_da\da report\summerfield_section 49 da report_rev 0_final.docx
Date	29-Nov-2019
Prepared by	Tom Hateley
Reviewed by	Brenton Burman

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
0	29 Nov 2019	Final for Submission	Brenton Burman Technical Director, Transport Planning & Urban Development	

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Executive Summary

SAPGen Pty Ltd (SAPGen) is proposing to develop a hybrid power generation facility at Tepko to the south west of Mannum. As a reference to a local landmark, the Summerfield Lutheran Church, the project is named the ‘Summerfield Power Station’.

This report has been prepared in support of the Development Application for the Summerfield Power Station. The Development Application is being submitted pursuant to Section 49 of the *Development Act 1993* with the endorsement from the Department for Energy and Mines.

The Summerfield Power Station will provide 422MW of dispatchable power, resulting in numerous benefits for the South Australian and National electricity markets.

The proposed facility will utilise ‘state of the art’ hybrid energy generation technology and incorporates the following:

- 380MW natural gas combined cycle gas turbines – to be constructed in 4 plants
- 12MW solar farm
- 30MW battery storage facility
- Switchyard
- Associated onsite support facilities/ancillary development

The Summerfield site is contained within a large rural allotment located at 120 Hoff Road, Tepko. This site has been chosen for the project due to its strategic location, where both the SEA Gas pipeline and the ElectraNet high voltage transmission line bisect the single allotment, thereby allowing the development to connect directly and efficiently into these networks.

A variety of technical and environmental investigations have been undertaken to assess the potential impact of the proposed development. These include:

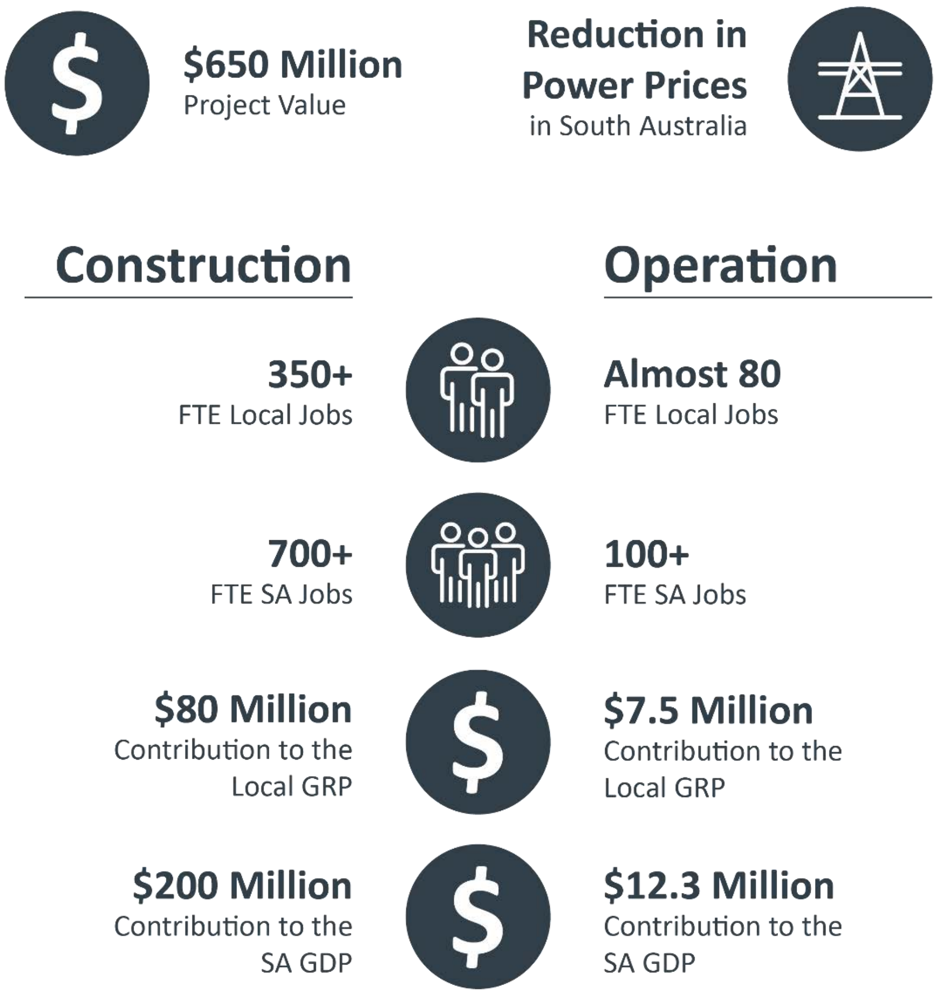
- Ecology Assessment
- Traffic Impact Statement
- Acoustic Assessment
- Air Quality Assessment
- Landscape Visual Impact Assessment
- Stormwater Management Plan
- Economic Impact Assessment

The above investigations have not identified any issues which would likely preclude the proposed hybrid power generation facility from being developed. Any issues identified as part of the investigations can be mitigated by the design and management of the proposed facility.

The Summerfield Power Station at Tepko is being proposed by SAPGen because of its minimal local environmental impacts, its contribution to the security of the South Australian electricity network and its positive impact on lowering power prices within the State. The $650 million project will result in significant economic benefits to the State and the local community (see Figure 1).

The proposed development accords with the relevant provisions of the *Mid Murray Council* Development Plan, and thus, warrants approval.

Figure 1 Summerfield Power Station Project Economic Snapshot



1.0 Introduction

1.1 Overview

SAPGen Pty Ltd (SAPGen) is a South Australian business with experience in renewable energy and conventional power generation. SAPGen has been established with the mission to provide low-emission rapidly dispatchable power.

In support of its mission SAPGen is proposing to develop a hybrid power generation facility at Tepko to the south-west of Mannum. As a reference to a local landmark, the Summerfield Lutheran Church, the project is named the 'Summerfield Power Station'.

SAPGen has engaged AECOM Australia Pty Ltd (AECOM) to assist in obtaining relevant approvals for the proposed development. This includes development approval in accordance with the *Development Act 1993*.

The Department for Energy and Mines has endorsed the proposal as a Crown Development in accordance with Section 49(2)(c) of the Development Act (refer to Appendix A).

This report has been prepared in support of the Development Application for the Summerfield Power Station and comprises the following:

- Description of the subject land and locality
- Description of the proposed development
- Analysis of potential site constraints and environmental impacts
- Economic impact assessment
- Summary of stakeholder and community consultation undertaken to date
- Procedural and approval requirements for the project
- Assessment of the project against the relevant provisions of the Mid Murray Council Development Plan

Various technical and environmental assessments to evaluate the potential impact of the proposed development and to inform the design have been undertaken These include:

- Ecology Assessment
- Traffic Impact Statement
- Acoustic Assessment
- Air Quality Assessment
- Landscape Visual Impact Assessment
- Stormwater Management Plan
- Economic Impact Assessment

1.2 Project Need

South Australia has been decarbonising its electricity sector much faster than other states in the National Electricity Market (NEM). This faster transition has had a considerable impact on the market, including impact on pricing, system stability and reliability. South Australia has some of the highest electricity prices, both in Australia and globally. There are a number of challenges which impact local wholesale prices, which include:

- Increased renewable energy uptake
- Highly concentrated dispatchable generation assets
- Lack of retail competition/liquidity
- Retirement of baseload generation
- Ongoing system strength requirements
- Local and regional network constraints.

The uptake of intermittent renewable energy has directly impacted reliability within the local South Australian market. Australian Energy Market Operator (AEMO) forecasts that renewable energy generation will continue to grow. By FY 2020-21 approximately 73% of generation is projected to be produced from renewable sources.

The increased uptake of renewable generation in South Australia, together with recent and upcoming retirement of baseload generation within the NEM, will necessitate further investment in dispatchable generation. The Summerfield Power Station is well positioned to support the changing supply and demand mix.

In addition, the Federal Government’s Reliability Guarantee seeks to maintain reliability in the network as it transitions to renewable sources, particularly during times of peak supply. SAPGen’s investment in the Summerfield Power Station supports the obligations of the Reliability Guarantee by:

- Providing a hybrid energy generation facility that can enter the NEM on demand to meet peak loads
- Providing a mixture of low emission energy generation sources.

1.3 Project Objectives and Benefits

The Summerfield Power Station will provide 422MW of dispatchable power to the NEM. It will exceed the requirements of the Office of the Technical Regulator for the provision of inertia and conform to ESCOSA licensing regulations. In addition, the power plant design has a Fast Frequency Response capability of under 200 milliseconds for grid stability frequency control and is ideally suited to provide grid firming support to renewable energy generation projects in South Australia.

Modelling indicates that the project can support (grid firm) up to 2,200MW in wind assets. The project will therefore assist to increase the uptake of renewable energy projects and increase competition on the South Australian market.

Financial modelling commissioned by SAPGen has identified the project will significantly impact on the reduction of power prices within South Australia, particularly within the first five years of generation.

The Summerfield Power Station will therefore provide numerous measurable benefits for the South Australian electricity market.

The power station design has a relatively small environmental footprint due to its use of the latest power generation equipment and technology, efficient design and low emission energy generation sources. Also, the highly modularised design means the project can be developed much faster than traditionally built power stations.

The site of the power station is relatively unique. It has been chosen due to its strategic location, where both the SEA Gas pipeline and the ElectraNet high voltage transmission line bisect the single allotment, thereby allowing the development to connect directly and efficiently into these networks. The site is also strategically located approximately 16 kilometres to the south-east of the Tungkillo Substation which is one of South Australia’s major substations and which joins the Heywood Interconnector to Victoria. Sufficient capacity at the Tungkillo Substation has been identified to accommodate expansion for this project.

The Tepko area has previously been identified as a strategic and appropriate location for a large scale energy generation project. The site of the previously approved Cherokee 1,000MW Power Station is located approximately 500 metres to the west of the Summerfield Site. The approval for this development has since lapsed.

The key project objectives and benefits include:

- Bring together ‘state of the art’ hybrid energy generation technology into a single project
- Add an additional 422MW of power to the State’s energy network
- Deliver an inertia anchor project to the State’s energy network
- Support large-scale windfarm and solar energy production in the State
- Provide significant economic and employment benefits to the local region (both during construction and operation)
- Have a significant impact on the reduction of power prices within South Australia

The development of Summerfield Power Station will enable SAPGen to deliver low-cost, reliable energy to the region and the state of South Australia.

2.0 Subject Land and Locality

2.1 Subject Land

The subject land is identified on Certificate of Title Volume 5924 Folio 548 as Section 304 of Hundred Plan 170300 in the area name Tepko. A copy of the Certificate of Title is included in Appendix C.

The land is located approximately 9.5 kilometres to the south-west of Mannum and approximately 20 kilometres north of Murray Bridge.

The Summerfield site is contained within a large rural allotment located at 120 Hoff Road, Tepko and comprises an area of approximately 92 hectares. The irregular shaped allotment generally consists of cleared farming land and contains a dwelling towards the north-eastern corner.

A small section of remanent vegetation is located within the south-west corner of the site. It is proposed that this vegetation will be retained and regenerated.

The subject land and surrounding areas feature a gently undulating landscape, with a difference of approximately 15 metres between high and low points across the site.

A 275kV transmission line bisects the southern portion of the allotment in a west-north-westerly direction, whilst a SEA Gas pipeline (Iona-Adelaide) bisects the western portion of the allotment in a north-north-westerly direction. The land also contains a 19kV transmission line which connects the existing dwelling to the SAPN network.

The site has access to mains water which ceases at the intersection of Hoff Road and Hoffman Road, which is located adjacent to the north-west of the subject land.

The subject site has a frontage to Hoff Road to the north, and Hoffman Road to the west.

Figure 2 View of proposed site – view to the south

2.2 Locality

Land within the locality is principally used for primary production purposes. A small number of dwellings exist in the surrounding area, aside from the existing dwelling on the subject land, the closest dwelling is located 400 metres to the south of the property boundary along Hoffman Road, and 700 metres to the north along Kowald Road.

Key features within the extended locality include:

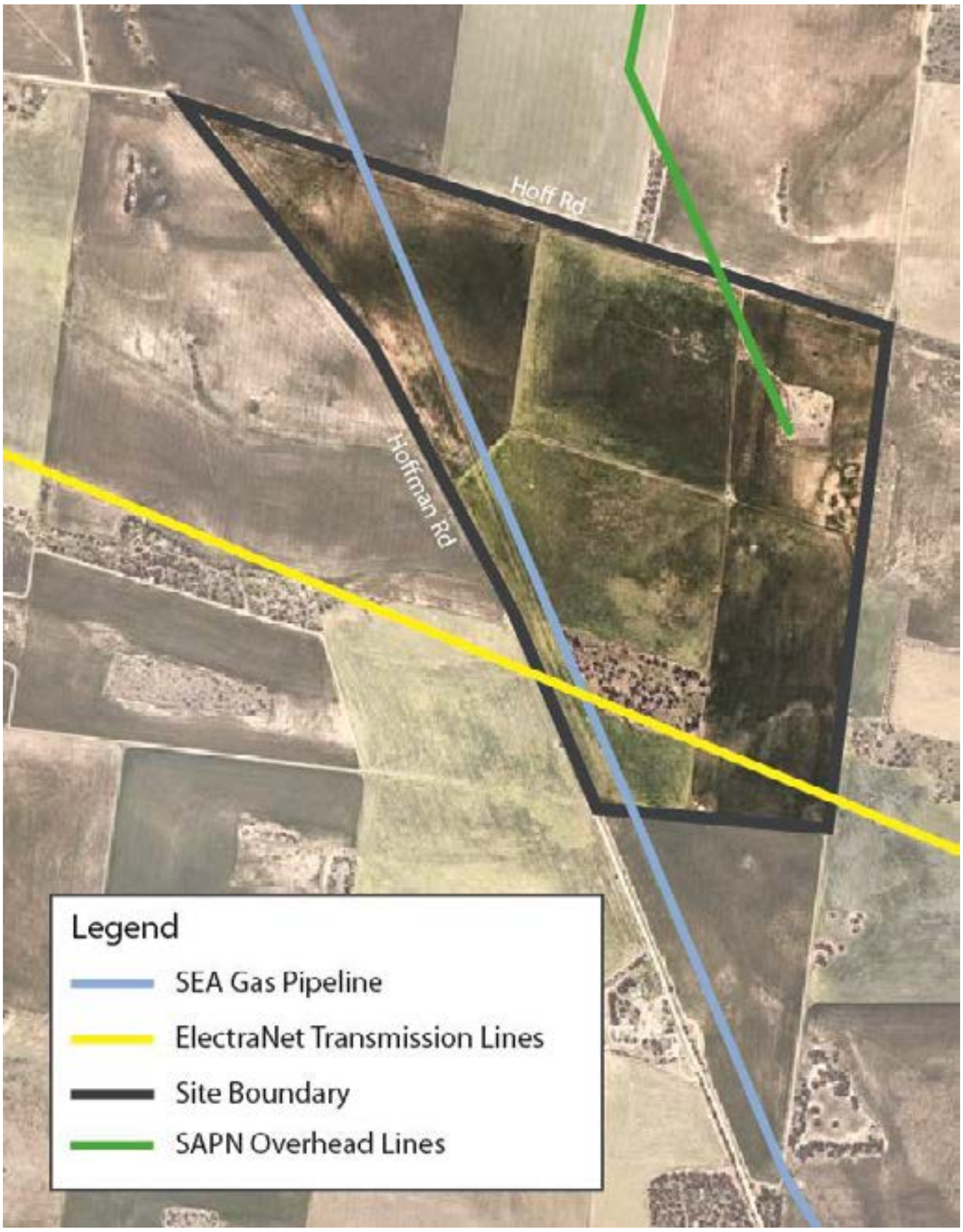
- Mannum Road, approximately 1.7 kilometres to the east
- Summerfield Lutheran Church, approximately 2.5 kilometres to the north west
- Murray River, approximately 4.7 kilometres to the east
- Mannum, approximately 9.5 kilometres to north east

The locality and proposed site are shown on Figures 2 and 3 respectively.

Figure 3 Subject Land and locality

Source: SARIG 2019

Figure 4 Proposed Site



Source: SARIG 2019

3.0 Proposed Development

3.1 Description of Development

SAPGen's Summerfield Power Station is a 422MW hybrid power generation facility which is to be sited within the southern portion of the existing allotment and will occupy and area of approximate 42 hectares. The balance of the land is proposed to remain in agricultural use.

The proposed development will comprise the following elements:

- 380MW natural gas combined cycle gas turbines – to be constructed in 4 plants
- 12MW solar farm
- 30MW battery energy storage facility
- Switch yard
- Associated onsite support facilities/ancillary development, such as:
  - Office and amenities building
  - Control room
  - Workshop and storage building
  - Site security fencing
  - Water tanks (including dedicated fire-fighting supply)
  - Landscaping.
- Associated earthworks
- Connections to the existing High Voltage electricity network and SEA Gas pipeline. All connections to be contained onsite.
- Temporary construction facilities

Artistic renders illustrating the layout of the proposed development are provided in Figures 4 and 5 below. Application plans for the development are included in Appendix D.

The key components of the project are discussed in further detail in Section 3.2.

Figure 5 Proposed development – view from the east

Source: SAPGen

Figure 6 Proposed development – view from the north

Source: SAPGen

3.2 Project Element

3.2.1 Gas Turbines Plants

The key element of the project is the natural gas combined cycle gas turbines which will be capable of generating 380MW of the total 422MW output.

The development will comprise four plants (A, B, C & D) each containing the following equipment:

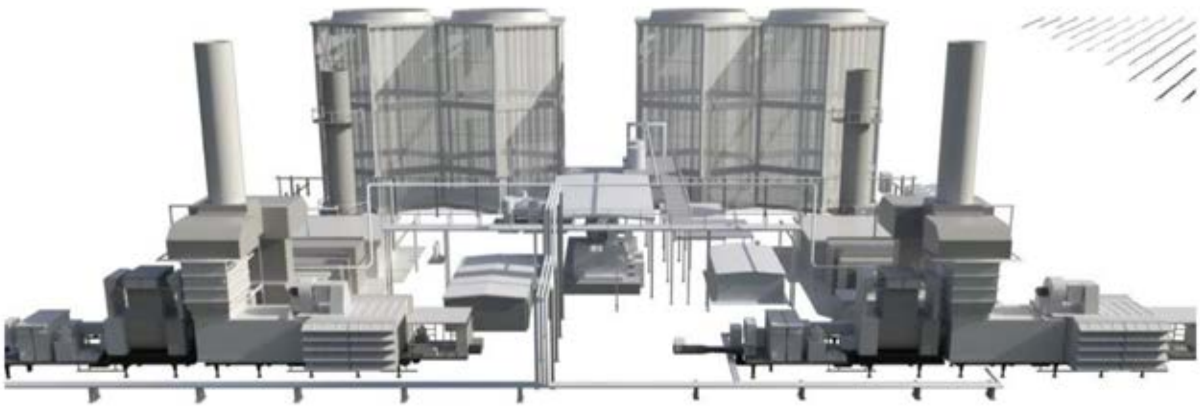
- Two LM2500Xpress DLE Fast Start Gas Turbines (power output @ ISO conditions: 33.6 MW)
- One BHGE SC2 Steam Turbines (power output @ ISO conditions: 28 MW)
- Four air cooled condensers
- Two heat recovery steam generators
- Associated piping and infrastructure

Each power plant will comprise a maximum height of approximately 25 metres, with the tallest elements being the stacks for the gas turbines and the air-cooled condenser towers. Plants A and B will be located towards the eastern property boundary, whilst Plants C and D will be centrally located within the site. Plant D will be sited the closest to Hoffman Road with a setback in excess of 200 metres.

In support (and a back-up) to the gas turbine plant, a “black start” (diesel) generator will provided on the site. This generator is contained within a 12 metres container which will located to the south of the proposed workshop building adjacent the eastern property boundary. A small amount of diesel will be stored on site to service this generator.

Figure 7 provides an illustration of the one the gas turbine plants.

Figure 7 Artist impression of a proposed gas turbine plant



Source: SAPGen

3.2.2 Solar Farm

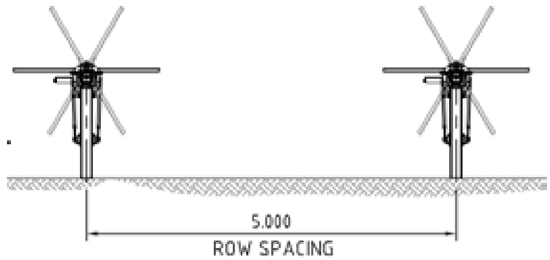
The proposed 12MW solar farm will occupy an area of 12 hectares within the north eastern portion of the power station site. The panels will be setback a minimum distance of approximately 60 metres from Hoffman Road.

The solar arrays will utilise a single axis tracking system which will allow the solar collectors to follow the sun, to maximise efficiency.

To achieve the 12MW capacity, approximately 40,000 solar panels will be required.

The solar collectors will be constructed in rows, with each row separated by approximately 5 metres, and the collectors (fixed to the tracking tables) will comprise a maximum height of approximately 2.2 metres above ground level (see Figure 8 for indicative elevation).

Figure 8 Indicative Solar Array Elevation



3.2.3 Battery Energy Storage Facility

The proposed development will include a 30MW battery energy storage facility. The battery facility will be located within the south-east corner of the switch yard compound. The batteries and associated inverters will be housed in a large building (i.e. shed) comprising an area of approximately 800 square metres.

Typical current energy storage facilities are modularised batteries provided in shipping containers. The final type and design of battery will be confirmed as part of the detailed design stage.

3.2.4 Office Building, Control Room and Workshop

The office building, control room and workshop will house staff and manage the operations of the project. The building will be located adjacent the eastern boundary of the site.

This will be a single storey building comprising an area of approximately 1000 square metres and a maximum height of 7 metres.

This building will contain staff amenity facilities and will be connected to an onsite wastewater management system.

3.2.5 Switch yard

The switch yard is to be located within the south-east corner of the site and adjacent the existing high voltage transmission line which bisects the site to allow connection directly into the existing 275 kV network.

The proposed substation will contain the electricity transformers and switchgear required to step-up the voltage for connection to the ElectraNet network.

Infrastructure within the substation will comprise a maximum height of approximately 16 metres (transmission towers).

The switch yard compound will comprise an area of approximately 3.8 hectare and will be enclosed by appropriate security fencing. Gates will be provided within the boundary fence to allow both vehicle and pedestrian access.

Figure 9 provides an illustration of the proposed switch yard (excluding the battery storage building).

Figure 9 Proposed switch yard

Artist impression of the proposed of switchyard (Source: SAPGen)

3.2.6 Gas Connection

Infrastructure to connect to the existing SEA Gas pipeline will be required. It is proposed that this will be located towards the western boundary of the site adjacent the existing gas main. The final detail and design of this infrastructure is to be confirmed, however, it will be low scale and ancillary to the other elements on the site.

3.2.7 Earthworks

The subject land has a gentle fall across the proposed development area and as result earthworks (cut and fill) will be required for the establishment of appropriate site levels for the development (buildings pad, roadways, etc). It is proposed that the design will incorporate batter slopes (rather than retaining walls) to assist in minimising the extent and impact of retaining works. Final site levels will be determined as part of the detailed design stage with regard given to minimising the amount of cut and fill required to accommodate the development (as part of the final design).

3.2.8 Security fencing and lighting

Boundary security fencing will be installed around the development site. The fencing will likely be a 1.8 metre high chainmesh fence.

As discussed previously, internal security fencing will be constructed around the switch yard.

Lighting will be installed onsite for safety and security purposes. All lighting will be appropriately sited and designed to avoid any light spill impacts to adjoining properties.

A final lighting plan will be developed at the detailed design stage.

3.2.9 Access, internal roads and car parking

A new access point to the site from Hoffman Road is proposed.

A network of internal roads will be constructed to provide connectivity onsite. These roads will be formed with crushed rubble or similar material.

Car parking will be located to the north of the office building to accommodate staff, visitors and temporary contractor parking. The car park will be a hardstand area and will be of sufficient size to accommodate expected demand.

3.2.10 Drainage and stormwater management

The development will be provided with appropriate drainage and stormwater management systems (rainwater tanks, swales, detention basins etc) to allow stormwater to be managed onsite and to avoid any impacts to downstream systems.

A preliminary Stormwater Management Plan (Appendix J) has been prepared in support of the Development Application which provides conceptual stormwater management details. The application plans show a stormwater basin to the west of Plant D.

It is proposed that a detailed stormwater plan will be prepared at the detailed design stage.

The operations of the power station require a relatively small amount of water and can be serviced by a standard mains connection. Therefore, any collection and reuse of stormwater on site will be for ancillary purposes (plumbing for amenities and landscaping irrigation).

3.2.11 Landscaping

Landscaping, with the use of native species is proposed between the solar farm and gas turbine plants. Further landscaping around the boundaries of the site may be also be incorporated as part of the final design to provide additional screening for the project.

In addition, the regeneration of the existing portion of the site containing native vegetation is proposed. This is area is currently highly degraded due to historically grazing within this area. As a result, this area will be fenced to prevent stock access and revegetated to improve the biodiversity within this area.

A detailed landscaping plan, including species types, numbers and location of trees and shrubs, will be prepared as part of the detailed design stage. The ecology assessment undertaken to inform the Development Application provides a list of recommended native species which will be incorporated in the landscaping plan.

3.2.12 Temporary Facilities

During the construction period temporary facilities, such as a site office, worker amenities, storage/laydown and car parking areas, will be established onsite. All temporary facilities will be contained within the project area.

3.3 Construction and Operation Details

This section provides a summary of the construction and operations phases of the project.

3.3.1 Construction Details

The proposed development will be constructed over an approximate 26 month period. It is anticipated that the construction activities will occur in the following stages:

- Site mobilisation
- Site clearing, benching, fencing and establishment of laydown area
- Construction of gas plants A & B, solar farm, switch yard battery storage facility, electricity and gas connections (Stage 1)
- Landscaping and final civil/stormwater works
- Testing and commissioning for Stage 1

- Construction of gas plants C & D (Stage 2)
- Testing and commissioning for Stage 2

Employee numbers on the site during the construction phase will vary depending on the stage of works. However, it is estimated that a approximately of 200 staff will be required at the peak of construction.

The majority of construction work is anticipated to occur during daylight hours.

Local manufacturing of key element of the power station, including gas turbines, battery storage cells and inverters, is not currently available within Australia. Therefore, these components will be imported from their country of origin. Fabrication and assembly of the balance of the plant, including ducting, civil and electrical works will be carried out by local contractors.

As outlined in the Traffic Impact Statement it is expected that the construction phase will generate approximately 1,339 heavy vehicle trips to the site during the 26 month construction period, whilst the traffic generated by staff would range between 100 to 400 light vehicle trips per day.

Construction is proposed to commence in August 2020.

3.3.2 Operational Details

The operation of the facility will be limited to maintenance, operational, monitoring and associated administrative activities. It is estimated that up to 50 employees will be required for the operation of the facility. Not all staff will be required on site, with administrative functions potentially being undertaken externally.

The power station will be 24-hour facility with operational staff required to be onsite at all times. It is proposed that the operational staff will consist of two shifts, with 5 people on site per shift.

It is anticipated that general maintenance and administrative staff will primarily be at the site during daylight hours (7am-7pm), after hours work for these activities may occur intermittently when required.

In comparison to the construction phase, traffic generation during the operations phase will be minimal.

3.3.3 Management Plans

To ensure potential environmental impacts are appropriately managed during the construction and operational phases of the development, a Construction Environmental Management Plan (CEMP) and an Operational Environmental Management Plan (OEMP) will be prepared and implemented.

These plans will be prepared and finalised prior to the commencement of the construction and operation phases of the project.

The key objectives of the plans will include:

- Describing the implementation of the project’s environmental management and mitigation measures
- Ensuring that the project complies with environmental legislation
- Managing the environmental risks associated with the construction and operation of the Project
- Applying environmental best practice during the construction and operation of the development.

The CEMP will include a range of control measures to manage and minimise environmental risks during the construction phase of the project. The control measures will be specific to the site and will principally relate to the following key aspects:

- Air Quality
- Bushfire
- Cultural Heritage
- Flora and Fauna

- Noise
- Stormwater and Water Quality
- Traffic
- Visual
- Waste Management

SAPGen will develop a specific OEMP as part of the operational needs which will inform employees and contractors of the requirements of the project management systems and controls. The OEMP will describe measures to prevent or minimise environmental harm and mitigate noise impacts on the community. It will incorporate procedures, controls, monitoring and reporting requirements for:

- Recording operational parameters including, the operation of each turbine unit on the premises, including but not limited to the time, date and duration of operation
- Stormwater, including measures to prevent contamination of stormwater at the Premises; and implementation of appropriate contingency measures to contain any contamination.
- Chemicals will be stored, loaded/unloaded in appropriately bunded areas which are designed in accordance with the EPA's 'Bunding and Spill Management Guidelines'.
- A 'Complaints Register' will be maintained of all complaints concerning environmental issues. This register will include the date and time that the complaint was made; details of the complaint including the likely cause of events giving rise to the complaint; the contact details of the complainant (if permitted by the complainant); and details of any action taken in response to the complaint.
- Necessary Pollution Control Equipment will be maintained to ensure that pollution is minimised and a Pollution Control Equipment Register will keep a written record of all inspections of Pollution Control Equipment, which includes the name of the recording officer; the date of each inspection of the equipment; details of the equipment that was inspected; an assessment of whether the equipment was working effectively; and the action taken (if required) to rectify any faults or failures.
- Noise monitoring and reporting, including the requirement to engage an acoustic engineer to undertake a noise assessment to determine the noise levels and the presence of noise characteristics from the operations conducted on the Premises.
- Air Quality Monitoring including, the following parameters are tested at the exhaust stack of each turbine oxides of Nitrogen (NOx); and ensure that testing is undertaken in accordance with the methods specified in the EPA document entitled 'Emission Testing Methodology for Air Pollution'

4.0 Site and Environmental Analysis

4.1 Site History

A desktop review was undertaken to identify previous land uses on the subject land and adjoining properties.

The investigations indicated that there has been limited change in the use of the sites outside of their current agricultural use, with the properties remaining largely undeveloped and cleared of vegetation.

The risk of contamination on-site is considered to be low due to the historical use of the site.

4.2 Ecology

An Ecological Assessment was conducted by EBS Ecology to assess the potential effects the Summerfield Power Station will have on the flora and fauna on-site and the surrounding area (Appendix E).

The majority of the site has been cleared, except for a small section (3.4 hectares) of remnant vegetation located within the south-western portion of the site, identified as Eucalyptus mallee forest and mallee woodland (*Eucalyptus sp. Mixed Open Mallee over Enchylaena tomentosa +/- Maireana brevifolia*) (see Figure 10).

The assessment included a desktop assessment and an on-site survey following the Bushland Assessment Method (BAM) devised by the Department of Environment and Water (DEW). This included:

- Identifying if any threaten species were potentially occurring on-site and in the surrounding areas of the proposed development
- Considering any relevant matters of national environmental significance (MNES)
- Other matters protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *National Parks and Wildlife Act 1972* (NPW Act).

The desktop assessment included the likelihood of occurrence assessment for each of the national and State matters of environmental significance to inform field survey requirements. The results included:

- One nationally threatened flora species (Silver Daisy Bush) listed as vulnerable and One State threatened flora species (Sticky Daisy Bush) listed as rare was identified as potentially occurring or having suitable habitat on-site
- 16 nationally and eight state threatened fauna species were identified as potentially occurring or having suitable habitat on-site.

The on-site flora assessment confirmed that no national or state threatened flora species were recorded on-site. Additionally, the likelihood of these flora species to occur was downgraded to unlikely due to habitat degradation.

The on-site fauna assessment recorded ten fauna species on-site, none were of any State or national significance. However, a nest of White-winged Chough (rated state rare) was discovered on-site in the remnant vegetation. The on-site assessment concluded that all State threatened species identified in the desktop analysis except for the White winged Chough and Elegant Parrot, were downgraded to unlikely. The two state threatened species (White winged Chough and Elegant Parrot) could still use the sites remaining remnant vegetation as a habitat or while moving through the landscape.

Overall, the site is of negligible value for flora and fauna threatened species and the project is unlikely to have any significant impact on any matter protected by the EPBC Act and NPW Act.

The assessment recommended the following mitigation measures to reduce further vegetation degradation and improve the existing vegetation, all of which will be adopted by the design:

- Avoid removal of existing and remnant vegetation (as proposed)

- Infrastructure to be setback a minimum of 10 metres from all native vegetation
- Removal of stock from the patch of native vegetation and planting of screen vegetation comprised of indigenous species to improve the environmental condition of the project area.

Figure 10 Existing on-site vegetation

Source: EBS Ecology – SAPGen Summerfield Power Generation Plant Ecological Assessment

4.3 Heritage

4.3.1 European Heritage

There are no Commonwealth, State or Local Heritage places on site or in close proximity of the site. The nearest heritage place (Local Heritage item – Reedy Creek Homestead and Outbuilding) is located approximately 2.2 kilometres to the north of the site.

4.3.2 Native Title

Desktop investigations have identified that no Native Title claims exist over the property.

4.3.3 Indigenous Heritage

A referral to the South Australian Department of the Premier and Cabinet, Aboriginal Affairs and Reconciliation (DPC-AAR) has been undertaken to determine whether any known Aboriginal heritage sites exist within the project site.

DPC-AAR advised that the central archive, which includes the Register of Aboriginal Site and Objects, has no entries for Aboriginal sites and objects within the project site.

DPC-AAR also advised that sites or objects may exist in the proposed development area, even though the Register does not identify them. All Aboriginal sites and objects are protected under the *Aboriginal Heritage Act 1988,* whether they are listed in the central archive or not.

The proposed site is likely to be a low risk for Aboriginal heritage sites due to the proposed site being previously cleared of native vegetation and given the highly disturbed nature of the site as a result of the longstanding use of the land for agriculture.

Although the site is considered a low risk, appropriate management actions, in accordance with legislative requirements, will be adopted throughout the preliminary site investigations and construction stages of the project with respect to investigating and responding to any Aboriginal heritage related discoveries on-site. These management actions will be captured within the project CEMP.

4.4 Hydrology

A Stormwater Management Plan was prepared by AECOM (see Appendix J). The assessment outlined a stormwater management philosophy and conceptual arrangement to provide suitable controls, particularly with respect to local standards and requirements. An analysis on the general hydrology of the site was also determined in the Stormwater Management Plan.

The proposed site is within the Salt Creek and Reedy Creek surface water catchment areas. There are no surface water features located in the vicinity of the proposed site and no natural drainage lines adjacent to the proposed site. The nearest waterbodies are two small dams located on a nearby property to the west and Reedy Creek Swamp approximately 2.6 km north-east of the proposed site. The proposed site is located adjacent to land categorised under the *Murray River Act 2003* as a Water Protection Area (see Figure 11).

The site is located within the Eastern Mount Lofty Ranges Prescribed Water Resources Area. This extensive area extends from the Marne River catchment in the north to the Currency Creek catchment in the south. Development applications which include particular works that impact water resources in these areas will require a referral to the NRM SA Murray-Darling Basin, pursuant to Schedule 8 of the Development Regulations.

The general fall of the area is towards the south, with localised variations. Drainage from the area generally heads along an existing drainage line which runs parallel to Hoffman Road, ultimately discharging into the River Murray located approximately 5 kilometres from the site.

The Council Development Plan does not identify a flood risk area beyond the Murray River flood plain. It is expected that new development on the site will not increase the potential for blockage of floodway's or alter regional drainage flow paths and will not significantly affect regional drainage line flood storage (through filling, etc) and thereby impact on localised flood levels and flow paths.

A conceptual stormwater drainage system for the site has been developed and is provided in Figure 12. The key design controls include:

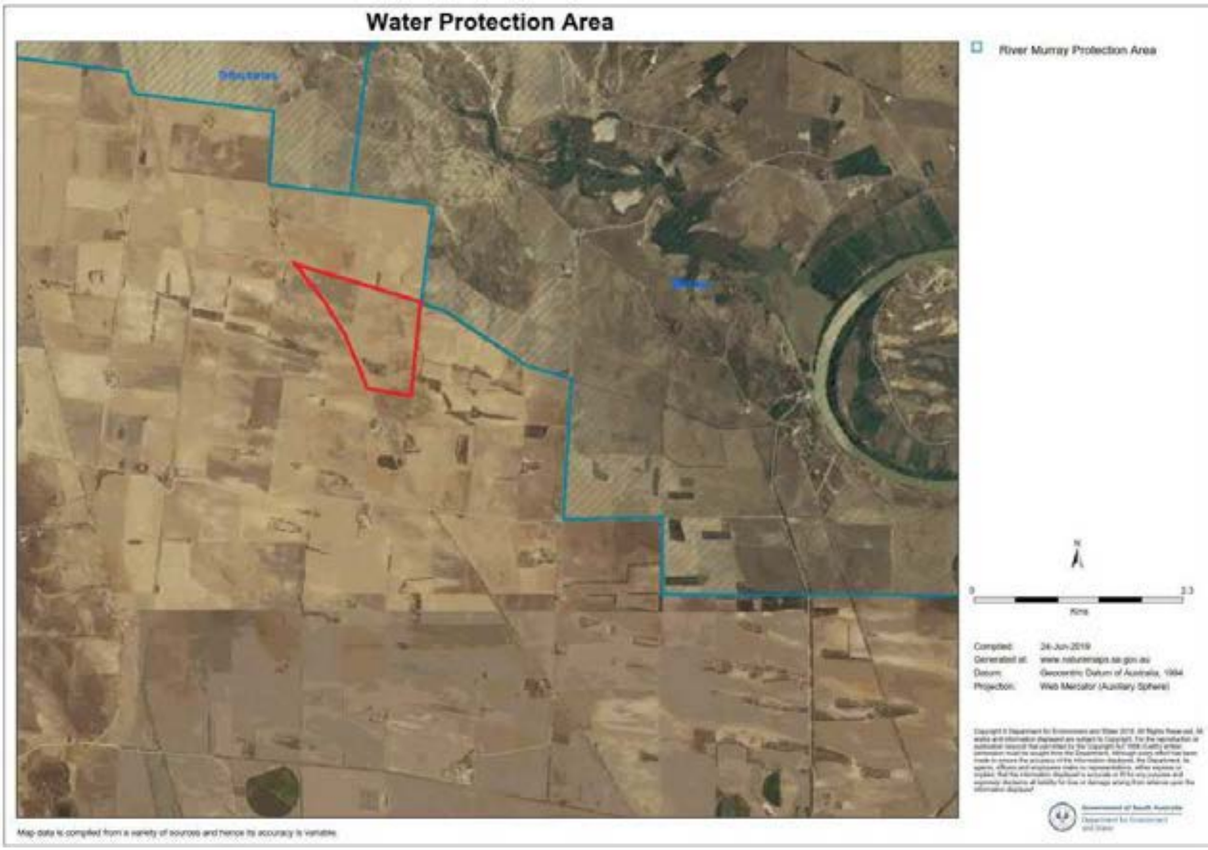
- Surface water from land surrounding the proposed plant area is assumed to be diverted around the outside, using bunds and/or swales as required
- Use of a detention basin to provide the required storage within the site area in order to maintain the current flow conditions
- Plant platform / site levels to be set above regional 1% Annual Exceedance Probability flood levels.

The management approach outlined in the Stormwater Management Plan is considered suitable to achieve flow reductions to mimic existing quantities of discharge, as well as manage water quality for the protection of the downstream agricultural environment. It is proposed that a detailed Stormwater Management Plan will be prepared at the detailed design stage.

As all surface water within the area is prescribed, there are restrictions regarding the collection and use of stormwater from the site. The proposed site is covered by the Water Allocation Plan for the Eastern Mount Lofty Ranges (EMLR WAP), which details under what conditions the use of water from within the site is permitted. The South Australian Government Gazette (Tuesday, 22 August 2017) details authorisation for the use of roof runoff from all Surface Water Prescribed Areas within South Australia for the purpose of commercial (including irrigation), industrial, environmental or recreational use subject to relevant conditions.

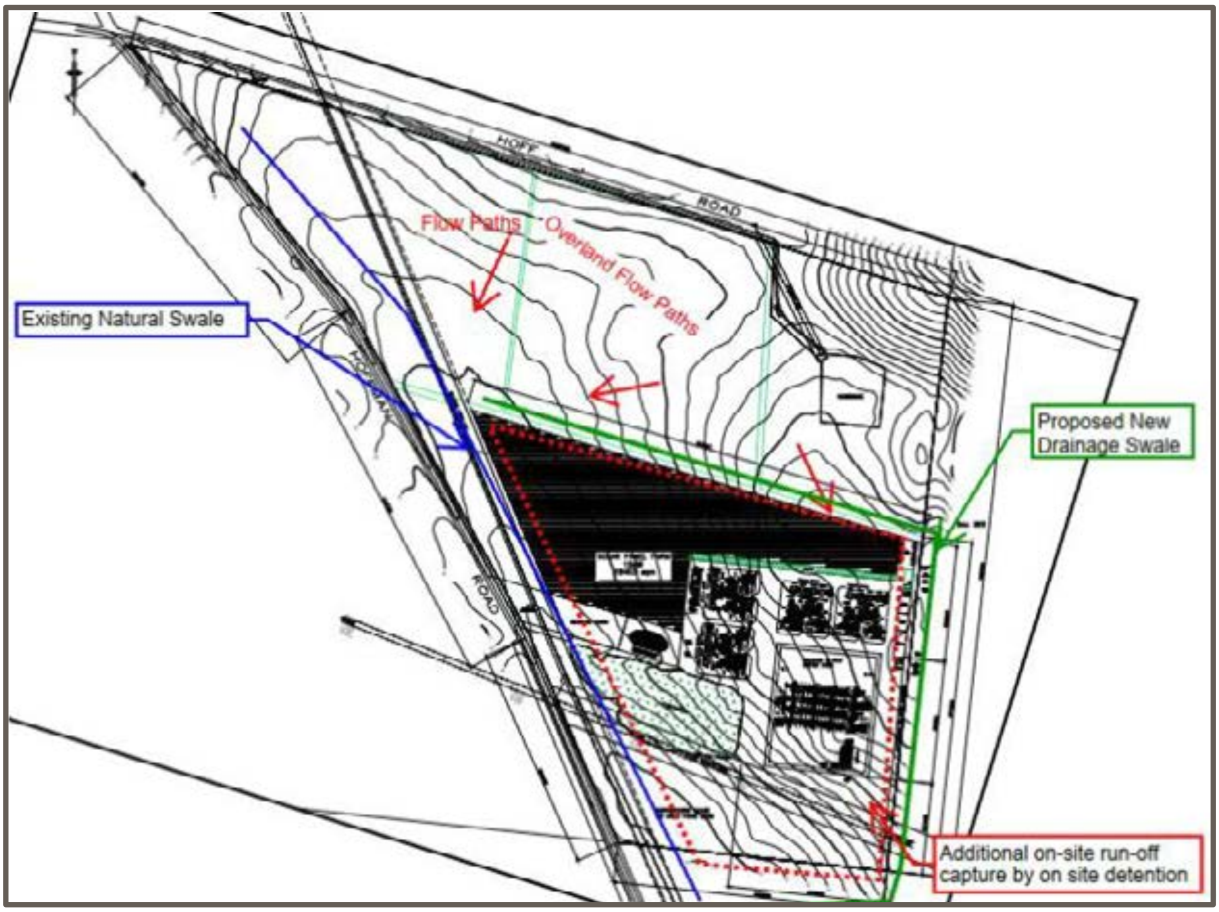
A key condition restricts the collection of roof runoff in a Prescribed Area to equal to or less than 1,500 kL per annum. The investigations undertaken within the Stormwater Management Plan estimates that the proposed development will have a yearly water collection of approximately 650 kL, which is well below the allowable maximum of 1,500 kL.

Figure 11 Murray River Act 2003 Designated Water Protection Area



Source: Department for Environment and Water

Figure 12 Conceptual Stormwater Drainage System



4.5 Geology and Geotechnical

The site is located on undifferentiated calcrete and the regional area comprises of highly various units of ulupa siltstone (green laminated siltstone, some minor unnamed quaterzite and sandstone), calcrete in bakara soil and a highly metamorphosed igneous unit from the Delamerian orogeny (Geological Survey of South Australia 1:250,000).

Further detailed geotechnical investigations will be conducted to clarify soil type, permeability, and groundwater levels as part of the detailed design stage.

4.6 Acid Sulphate Soils

A search of the National Acid Sulphate Soil Atlas through the Australian Soil Resource Information System (ASRIS) identified the soils on the proposed site as C4 extremely low probability/very low confidence of the presence of acid sulphate soils.

4.7 Traffic

The Summerfield Power Station development is likely to have a minimal impact on the broader transport network during the construction phase. As a result, a Transport Impact Statement (TIS) has been prepared (refer to Appendix F).

Access to the site will be provided from Hoffman Road via Tepko Road, a two-way unsealed road that connects to Mannum Road and Reedy Creek Road, both State arterial roads.

The key potential traffic impacts are associated with the additional vehicle movements on Hoffman and Tepko Roads during the construction phase, which will affect a small number of surrounding residents. Overall, the traffic generated due to the construction will have a minimal impact to the broader transport network.

During the 26 month construction phase approximately 1,339 heavy vehicle trips to the site, whilst the traffic generated by staff would range between 100 to 400 light vehicle trips per day.

The TIS provided a series of recommendations to limit the effect of construction traffic which includes the following:

- Where possible, plan for heavy vehicle movements to and from the site to occur at off peak times to reduce the impact of noise on surrounding residents. In particular, movements should be coordinated with harvest times to minimise any conflicts
- Provide for clear turning circles on-site to reduce heavy vehicle engine noise associated with revving, reversing, beeping and generation of excess dust
- Suppress dust with water on Tepko and Hoffman Roads and the construction site at regular intervals if/as required
- Prohibit vehicles from idling on any roads in the vicinity of residential properties.
- Enforce vehicle speed limits on Tepko Road and Hoffman Road
- Minimise deposit of loose material on surrounding sealed roads using rumble grids or wheel-wash facilities if needed
- Consider sealing Tepko Road for 20 to 50 metres on approach to Mannum Road, to reduce the possibility of gravel and other loose material being deposited onto the sealed carriageway of Mannum Road.

Allowing for the implementation of mitigation measures and compliance with relevant permit conditions, the impacts from traffic and traffic related activities are considered acceptable for the area in which the Summerfield Power Station is proposed.

Following construction and throughout the operational life of the Summerfield Power Station, transport impacts are expected to be minimal, with traffic scaled back to the level needed for operations and maintenance.

4.8 Acoustics

The proposed development includes a number of noise sources and as a result an acoustic assessment of potential noise impacts on nearby sensitive receivers has been undertaken (Appendix G).

The assessment was undertaken having regard to the South Australian Environment Protection Authority's (EPA) *Environment Protection (Noise) Policy 2007* (Noise EPP) which is the relevant document to be used by proposed developments for demonstrating their compliance with the General Environmental Duty under the *Environment Protection Act 1993* (SA).

Noise criteria for proposed developments are based on the relevant zones for both the source and nearby sensitive receivers (e.g. residences), and the criteria accounts for both developed and undeveloped land. Land near the proposed development includes both developed and undeveloped land, which have been accounted for within the acoustic assessment.

Figure 13 shows the sensitive receptors within 3 kilometres of the Summerfield Site.

Noise predictions indicated that noise levels at one nearby dwelling (C2) would exceed night time environmental noise criteria without mitigation. Additionally, if noise sources have a tonal characteristic (i.e. a 5 dB(A) penalty applied), then another receiver (C3) would also become non-compliant. The noise level data that was supplied does not indicate tonal noise emissions.

Noise modelling predicts that the operation of the facility can meet the Noise EPP indicative noise levels with the implementation of noise control strategies. To ensure the Summerfield Power Station is complaint with associated environmental noise targets the following noise mitigation measures are proposed:

1. Reduce the noise level of the key sources through installation of noise reduction controls (e.g. silencers, generator enclosure)
2. Measure the level of noise from the site during installation to confirm tonal characteristics
3. If noise from the site is tonal, further mitigation of tonal plant items should be implemented.

With the following implementation of the proposed mitigation strategies, all locations are predicted to comply against the environmental noise criteria.

Figure 13 Dwellings within 3 km of the Summerfield Power Station

4.9 Air Quality

An Air Quality Impact Assessment was conducted by AECOM to assess the potential air quality impacts from the construction and operation from the Summerfield Power Plant (Appendix H)

The assessment was undertaken having regard to the UK Institute of Air Quality Management Guidance on the assessment of dust from demolition and construction and the dispersion model CALPUFF in accordance with the Environmental Protection Authority, Ambient Air Quality Assessment (SA EPA 2016) guidance document.

The potential air quality impacts during construction is considered to be low due to the limited sensitivity of the environment to dust soiling, health and ecological impacts based on the low density of sensitive receptors, particulate background concentrations and limited native vegetation.

During operation, two modelling scenarios were assessed which included:

- Scenario 1 (Base Load) – Two combine cycle gas turbines within each of the 4 High Efficiency Solution plant blocks operating at 100% load continuously.
- Scenario 2 (Partial Load) – One combine cycle gas turbines within each on the 4 High Efficiency Solution plant blocks operating at 100% load continuously.

The models predicted a contribution of pollutants (nitrogen dioxide, carbon monoxide, particulates, sulphur dioxide, benzene, ethylbenzene, toluene, xylene and formaldehyde) across all averaging periods was well below the EPA criteria for both modelled scenarios.

Cumulative concentrations for both modelled scenarios which consider local background concentrations for NO2, PM10, PM2.5, CO and SO2 were also found to be below the EPA criteria for all pollutants across all averaging periods.

As such, no significant air quality impacts are anticipated at nearby sensitive receptors during operation of the Summerfield Power Station operating at partial or full load.

Although the unmitigated risk rating for construction of the project is considered to be low, a range of mitigation measures would be included in the CEMP for the site to minimise potential dust impacts to nearby sensitive receptors.

4.10 Landscape Visual Impact

A Landscape and Visual Impact Assessment (LVIA) (Appendix I) was undertaken by AECOM to assess the potential landscape and visual impacts of the project.

The LVIA is tool used to identify and assess the significance of and the effects of change resulting from development on both the landscape as an environmental resource in its own right and on people's views and visual amenity.

There is no acceptable national published guidance on LVIA specific to Australia. The method for the assessment has been developed with reference to *Guidelines for Landscape and Visual Impact Assessment, Third Edition (2013)*, developed by the Landscape Institute and Institute for Environmental Management, UK, which is widely recognised as comprising an example of 'best practice' in this field.

Overall the LVIA concluded that:

- The proposal would result in a Moderate to Low change in the landscape character of the surrounding landscape. The proposal would be a new element within a predominately homogeneous rural landscape, however, is consistent with existing pieces of electrical infrastructure dotted throughout the landscape
- The proposal would result in a Moderate to Low change in views from the surrounding landscape.

Three representative viewpoints were chosen to assess the visual impact of the proposal from the surrounding landscape. These three viewpoints were all situated on roads adjoining the site (see Figure 14).

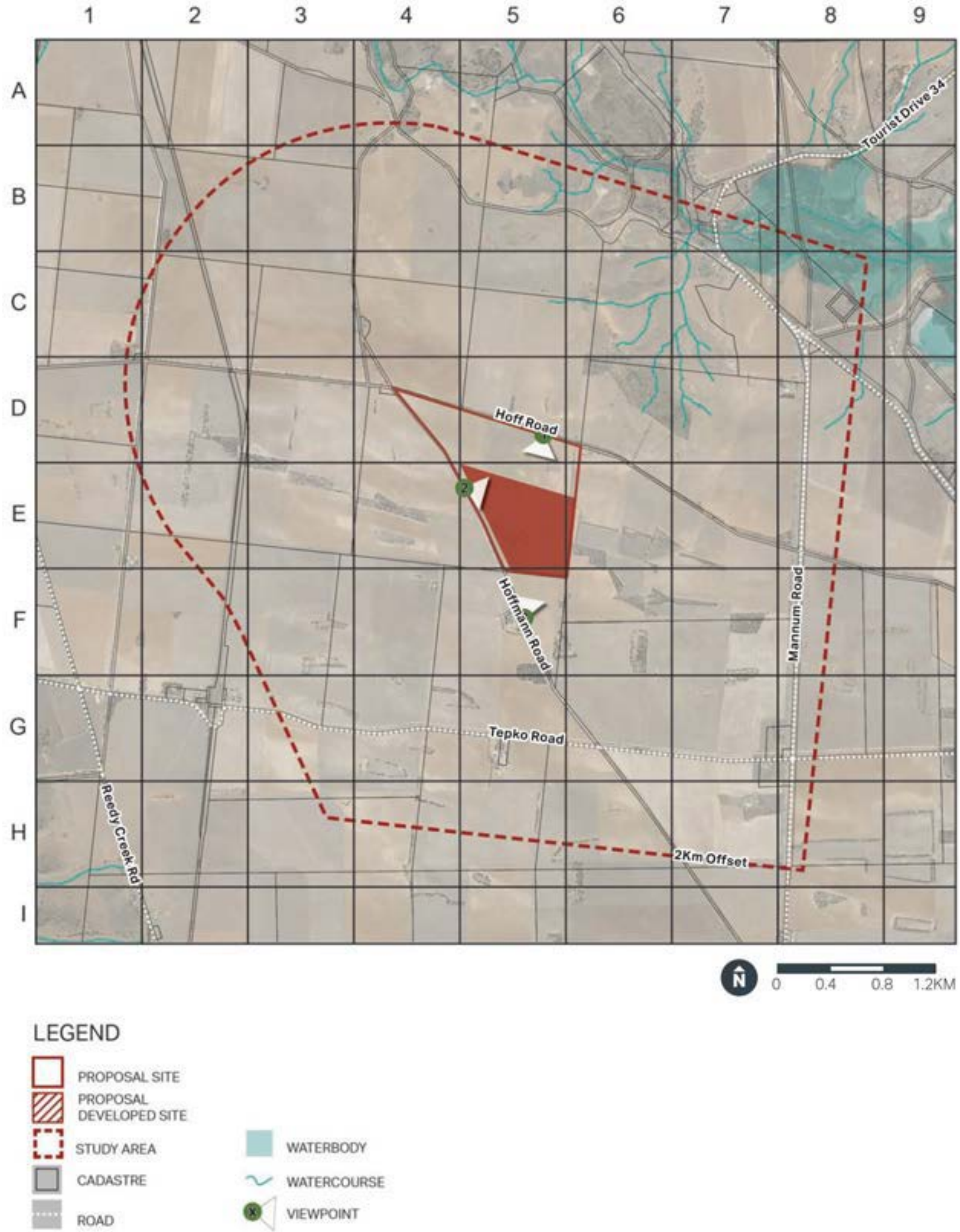
While impact from the viewpoints have individually been assessed as High to Moderate, these are all positioned close to the site due to the infrequency of receptors within the landscape, and therefore reflect ‘worst case scenario’. When considering receptors in the greater landscape, the actual effect of the proposal is lessened. Photomontages were produced to depict the changes at the selected viewpoints. These are provided in Figure 15 and Figure 16.

Mitigation measures have been recommended to reduce the visual impacts to the surrounding area. These include:

- Preparation of a landscape plan to detail screen planting around the northern, western and southern boundaries of the proposal would effectively reduce the visual impact of the proposal on surrounding views
- The design of screening based on native species existing within the landscape to visually integrate the proposal with existing patches of vegetation that is seen in the surrounding landscape.

These mitigation measures will be included in the final design of the proposed development.

Figure 14 LVIA Viewpoints



Before

After

Figure 15 Photo Montage Before and After – View south east from Hoffman Road (Viewpoint 2)

Figure 16 Photo Montage Before and After – View north from Hoffman Road (Viewpoint 3)

5.0 Economic Assessment

The $650 million Summerfield Power Station project will result in significant economic benefits to the State, Region and local community. The key economic benefits associated with the development include:

- Improved network security and diversified energy generation offering within South Australia;
- Support for increased renewable power generation during daytime peak periods, placing downward pressure on wholesale electricity prices
- Significant impacts on the reduction of power prices within South Australia
- Potential for $150 million of local construction spend for SA based subcontractors
- Generation of up to 150 to 200 direct jobs during the construction phase of the project
- Diversification of skills and employment, and growth of the local economy during the operational phase, including the creation of 50 skilled permanent jobs upon completion
- Direct financial benefits to landowners, local businesses and the local community, and significant flow-on effects for the wider Murray Bridge Region.

To measure the specific impacts of the project on the State, Regional and Local economy, an Economic Impact Assessment (EIA) has been undertaken by Hudson Howells. This assessment identified that the proposed development will result in significant economic and employment benefits (see Appendix K).

Key findings of the assessment are summarised below and illustrated in Figure 17.

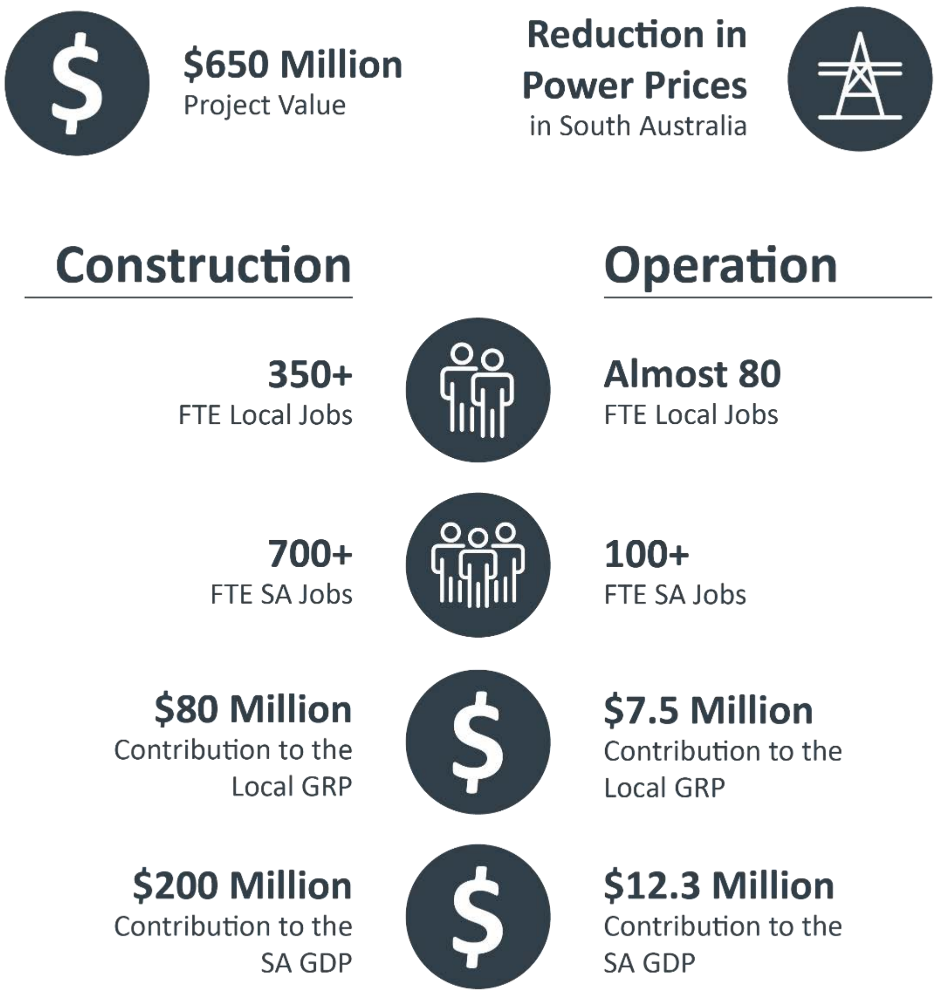
Construction benefits include:

- 708 FTE State jobs (South Australia) per annum over 2 years
- 355 FTE Regional jobs (Adelaide Hills and Mid-Murray Region) per annum over 2 years
- Contribution to the Gross State Product of $99 million (South Australia) per annum over 2 years
- Contribution to the Gross Regional Product of $40 million (Adelaide Hills and Mid-Murray Region) per annum over 2 years.

Operation benefits include:

- 106 FTE State jobs (South Australia)
- 77 FTE Regional jobs (Adelaide Hills and Mid-Murray Region)
- Contribution to the Gross State Product of $12.3 million (South Australia)
- Contribution to the Gross Regional Product of $7.5 million (Adelaide Hills and Mid-Murray Region).

Figure 17 Economic Snapshot



6.0 Stakeholder and Community Engagement

SAPGen has developed a stakeholder engagement strategy which identifies key stakeholders which will be engaged during the planning process. These key stakeholders include:

- South Australian Government
- Local Government
- Regulatory Bodies
- Community (land owner, neighbours and broader community)
- Traditional land owners and various community groups
- Local contractors and suppliers
- Local Media

Prior to lodging the Development Application SAPGen has held discussions with the following stakeholders:

- Various South Australian Government Agencies including:
  - Department for Energy and Mines
  - Department of Planning, Transport and Infrastructure
  - Department of Environment and Water
  - Natural Resources SA Murray-Darling Basin
  - Environment Protection Authority
  - Country Fire Service
- Office of the Technical Regulator
- Mid Murray Council (Economic Development & Commercial Enterprise Committee and staff)
- Regulatory Bodies (ESCOSA & ElectraNet)
- Adjoining residents/land owners

In addition to the statutory notification requirements pursuant to Development Act, SAPGen intends to actively consult with other key stakeholders including, the wider local community, relevant community groups and potential local contractors and suppliers during and post the development assessment process.

7.0 Procedural Matters

7.1 Public Infrastructure

Section 49 of the Development Act, relating to ‘Crown Development and Public Infrastructure’, has been utilised for most energy infrastructure projects in South Australia, including for traditional thermal generation, renewable sources of energy, and associated transmission lines.

Section 49(1)(a) of the Act defines ‘public infrastructure’ as:

> *“… the infrastructure, equipment, structures, works and other facilities <u>used in or in connection with the supply</u> of water or <u>electricity</u>, gas or other forms of energy, or the drainage or treatment of waste water or sewage”.* (our emphasis)

The proposed development is for an electricity generation station (power station) associated with the supply of electricity. This is consistent with the above definition of public infrastructure.

The Minister for Planning is the relevant authority for a Crown Development. The Minister must, in making his decision on a Crown Development, have regard to the provisions of the relevant Development Plan.

Section 49 (2)(c) of the Development Act allows a State agency to sponsor a development for public infrastructure. Specifically, section 49(2)(c) states:

> *“… a person proposes to undertake development initiated or supported by a State agency for the purposes of the provision of public infrastructure and specifically endorsed by the State agency for the purposes of this section”.*

The Department for Energy and Mines provided formal sponsorship of the project on 14 August 2019 (Appendix A).

As the development cost for the project exceeds $4 million, the application will be subject to public notification, with a consultation period of at least 15 business days pursuant to section 49(7)(d) of the Development Act.

Pursuant to section 49 of the Development Act the application will be referred to the Mid Murray Council, who have a two month period to provide comment.

7.2 Nature of Development

The proposed development requires Development Approval under the Development Act.

Whilst ‘electricity generating plant’ and ‘electricity generating station’ are referred to in the Development Act and Regulations, they are not specifically defined in the legislation. However, the *Electricity Act 1996* defines ‘electricity infrastructure’ and ‘generation’ as the following:

electricity infrastructure *means—*

a. electricity generating plant; and

b. powerlines; and

c. substations for converting, transforming or controlling electricity; and

d. equipment for metering, monitoring or controlling electricity; and

e. any wires, equipment or other things (including tunnels and cavities) used for, or in connection with, the generation, transmission, distribution or supply of electricity; and

f. anything declared by regulation to form part of electricity infrastructure,

but does not include anything declared by regulation not to form part of electricity infrastructure

generation *of electricity means the operation of any kind of electricity generating plant and all incidental and related operations, but does not include anything declared by regulation not to be generation of electricity.*

With regard to the Development Act and Regulations and the Electricity Act, together with the nature of the proposal, we would define the proposal as being for an 'electricity generating plant' or 'electricity generation station'.

7.3 Agency Referrals

In accordance with Schedule 8 of the Development Regulations, the Development Application will require referral to:

- Environmental Protection Authority (Part 2, clause 11 of Schedule 8) as the proposed development constitutes an activity of major environmental significance (fuel burning)
- Natural Resources Management (NRM) SA Murray-Darling Basin (Part 2, clause 12 of Schedule 8) as the site is located within the Eastern Mount Lofty Ranges Prescribed Water Resources Area and the development may require a permit under 127(3)(d) of the *Natural Resources Management Act 2004*.

As discussed in Section 7, pre-lodgement consultation has been undertaken with both of these agencies.

7.4 Office of the Technical Regulator Technical Conditions

Pursuant Regulation 70(1)(c) of the Development Regulations, a certificate from the Technical Regulator certifying that the proposed development complies with the requirements of the Technical Regulator in relation to the security and stability of the State's power system is required to be obtained and submitted as part of the development application.

SAPGen has liaised with the Office of the Technical Regulator and has obtained a Certificate that the proposal meets the technical requirements for power generation projects.

A copy of the certificate is included in Appendix B.

7.5 Additional Approvals

Prior to the construction and operation of the Summerfield Power Station the following additional approvals and licences will be required to be obtained.

7.5.1 Building Certification

Prior to building works commencing a Certificate of Compliance with Building Rules must be obtained from a Private Certification pursuant to 49(14) of the Development Act.

7.5.2 Electricity Approvals and Licences

In addition to approval under the Development Act, approval and licensing is required in relation to connecting the project to the national electricity grid. To connect the project to the electricity grid, the following is required:

- Connection agreements with ElectraNet
- A South Australian generation licence (issued by ESCOSA)
- Registration with the Australian Energy Market Operator.

7.5.3 EPA Licence

The proposed development will require a licence pursuant to the *Environment Protection Act 1993*, to conduct and activity of environmental significance.

7.5.4 Construction approvals

Other approvals, such as heavy vehicles permits, may be required subject to the specific construction methodology. These approvals will be identified as part of the detailed design stage of the project and obtained prior to the commencement of construction.

8.0 Development Plan Assessment

The proposed Summerfield Power Station is assessed against the current Mid-Murray Council Development Plan (consolidated 23 August 2018). The subject site is located in a Rural Zone and the Murray Plains Policy Area (see Figures 18 and 19).

An electricity generation station is neither listed as complying nor non-complying in the Rural Zone and therefore is a 'merit' form of development within the Zone.

The assessment of the proposal reflects the key relevant planning themes of the Development Plan and provides an assessment against the relevant Development Plan Objectives (OBJ) and Principles of Development Control (PDC).

All relevant provisions of the Development Plan have been considered in undertaking a thorough planning assessment on the merits of the proposal, however, only those provisions considered most pertinent to the assessment have been discussed below.

8.1 Land Use

The intent of the Rural Zone and Murray Plains Policy Area 16 is to support productive and sustainable primary production and to protect desired primary production activities from the encroachment of incompatible land uses.

The Development Plan contains supportive planning policies in relation to renewable energy generation projects within the Zone, specifically 'wind farms and ancillary development' is an envisaged form of development in the Zone.

The Summerfield Power Station is an energy generation project which is complementary to energy generated by wind farms and incorporates renewable energy elements (solar farm and battery).

Whilst winds farms are specifically envisaged, the proposed development will likely have less adverse impact (due to the height, scale and overall footprint) as compared to a wind farm. For example, a wind farm capable of generating up to 422MW would extend over a significantly greater area with vastly greater visual impacts compared to the proposed development.

In addition, the benefit of the proposed site is its strategic position adjacent to the existing high voltage electricity and gas pipeline on the subject land, which prevents the need for further augmentation of such utilities and thus minimising the overall footprint and impact of the development. Also, a key component of the proposed development, is the solar farm, which requires a large site which is not affected in terms of development and topography and as result the land within the Rural Zone provides these attributes.

The Summerfield Power Station can coexist with primary production activities on adjoining properties, and thus, will not introduce any land use conflicts within the locality. It is noted that the balance of the land on the existing allotment not required for the power station will remain in use for agricultural purposes.

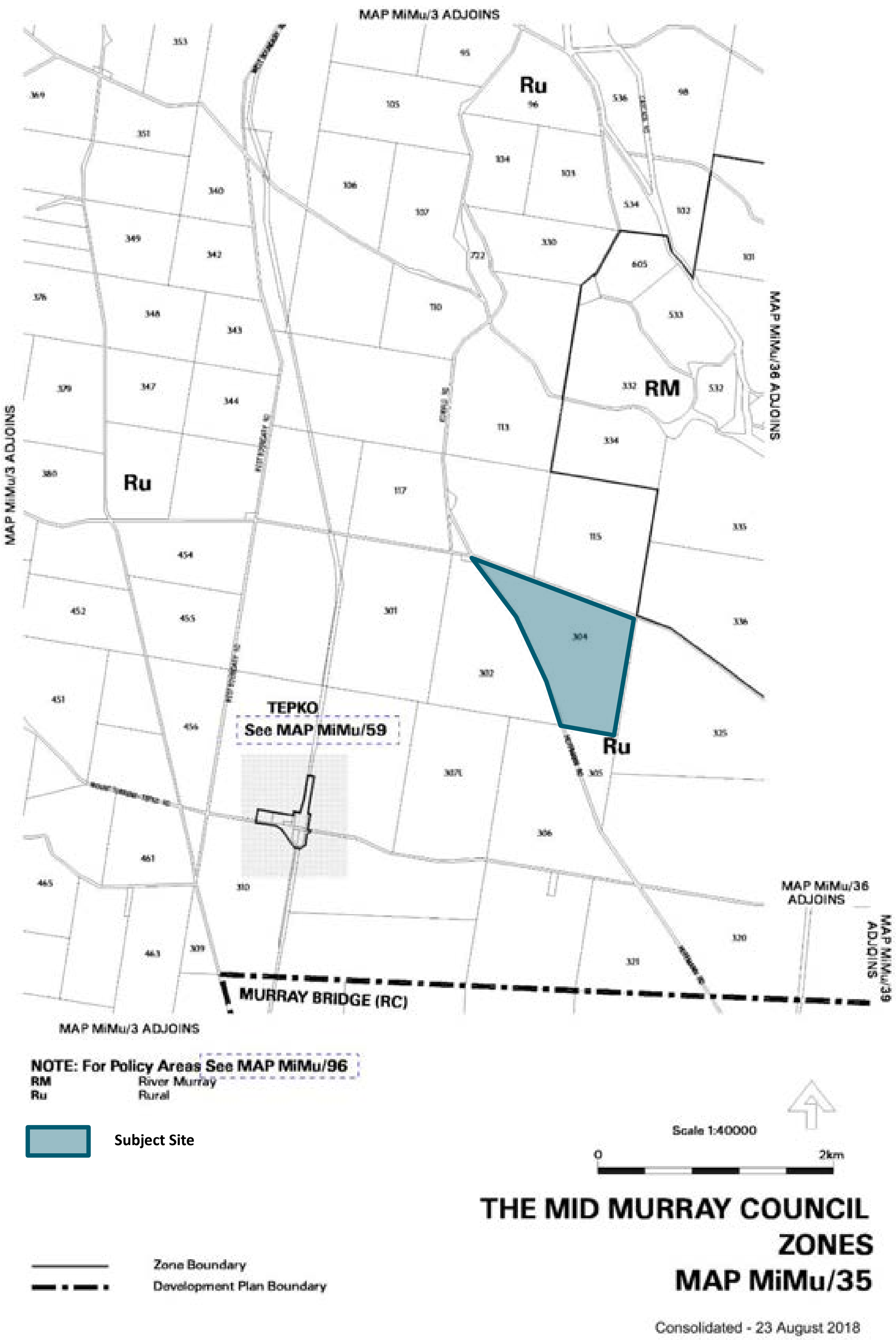
Further to the Zone provisions, the Development Plan envisages renewal energy generating facilities:

- That benefit the environment, the community and the state
- Located in areas that provide opportunity to harvest natural resources and maximise the efficient generation and supply of electricity
- Located, sited and designed to minimise adverse impacts on the natural environment and other land uses.

The Summerfield Power Station largely satisfies the intent of the Renewal Energy provisions.

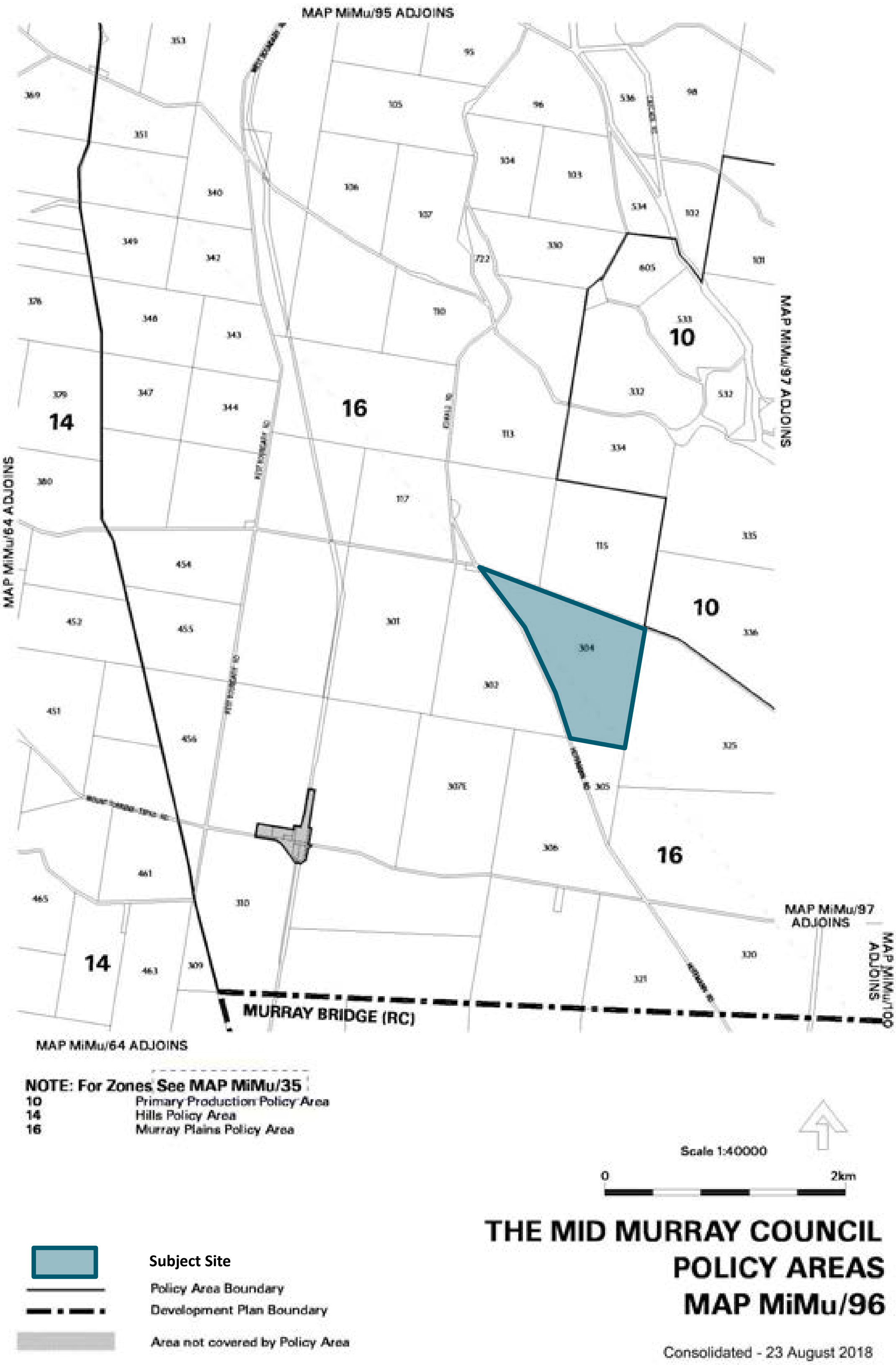
The proposed development will benefit the State and local community, resulting in significant economic benefits, including reducing power prices and improvements to network security. The location and characteristics of the site, together with design and siting of the power station will assist the project in maximising the efficient generation and supply of electricity and minimise impacts to the natural environment and adjoining land uses.

Figure 18 Zone Map



Source: Mid Murray Council Development Plan

Figure 19 Policy Area Map



Source: Mid Murray Council Development Plan

8.2 Design, Siting and Visual Impacts

Whilst referring to wind farms, the Desired Character of the Rural Zone acknowledges that a degree of visual impact is accepted in pursuit of benefits derived from increase generation of renewable energy. The proposed development will result in significantly less visual impacts compared to a wind farm generating a similar scale of energy.

Notwithstanding the above, Council Wide provisions of the Development Plan seek that development be designed and sited to ensure the amenity of localities is not impaired by the appearance of land, buildings and structures. The proposal has been designed and sited in a manner which will assist in minimising its impact, due to the following:

- The 422MW energy generation project comprises a relatively small footprint in the context of the subject land and Rural Zone
- The development comprises a maximum height of approximately 25 metres and will be sited adjacent to existing electricity infrastructure on the property which include transmission towers up to 54 metres in height
- All major building elements are to be grouped together within the southern portion the allotment
- The development proposes generous setbacks to the adjoining roads (minimum 60 metre setback from Hoffman Road) with the larger infrastructure elements being sited further from the road towards the eastern property boundary.

The proposed development would be a new element within a predominately homogenous rural landscape. However, the proposed development is consistent with existing pieces of electrical infrastructure scattered throughout the locality. The LVIA undertaken to inform this Development Application concludes that the electricity generating plant would result in a moderate to low change in both landscape character and change in views to the surrounding area.

The LIVA recommends mitigation measures to effectively reduce the visual impact of the proposal on surrounding views which consists of screen planting (with use of native species) around the northern, western and southern boundaries of the site. It is proposed that these measures will be included in the final design of the proposed development.

The LVIA illustrates that the views of the project will mainly be from the west (see Figure 19), views of the project from the east from key vantage points such Mannum Road and the River Murray will be restricted. The project is therefore consistent with Council Wide PDC 162 which seeks development to minimise its visual impact on the River Murray and tourist routes.

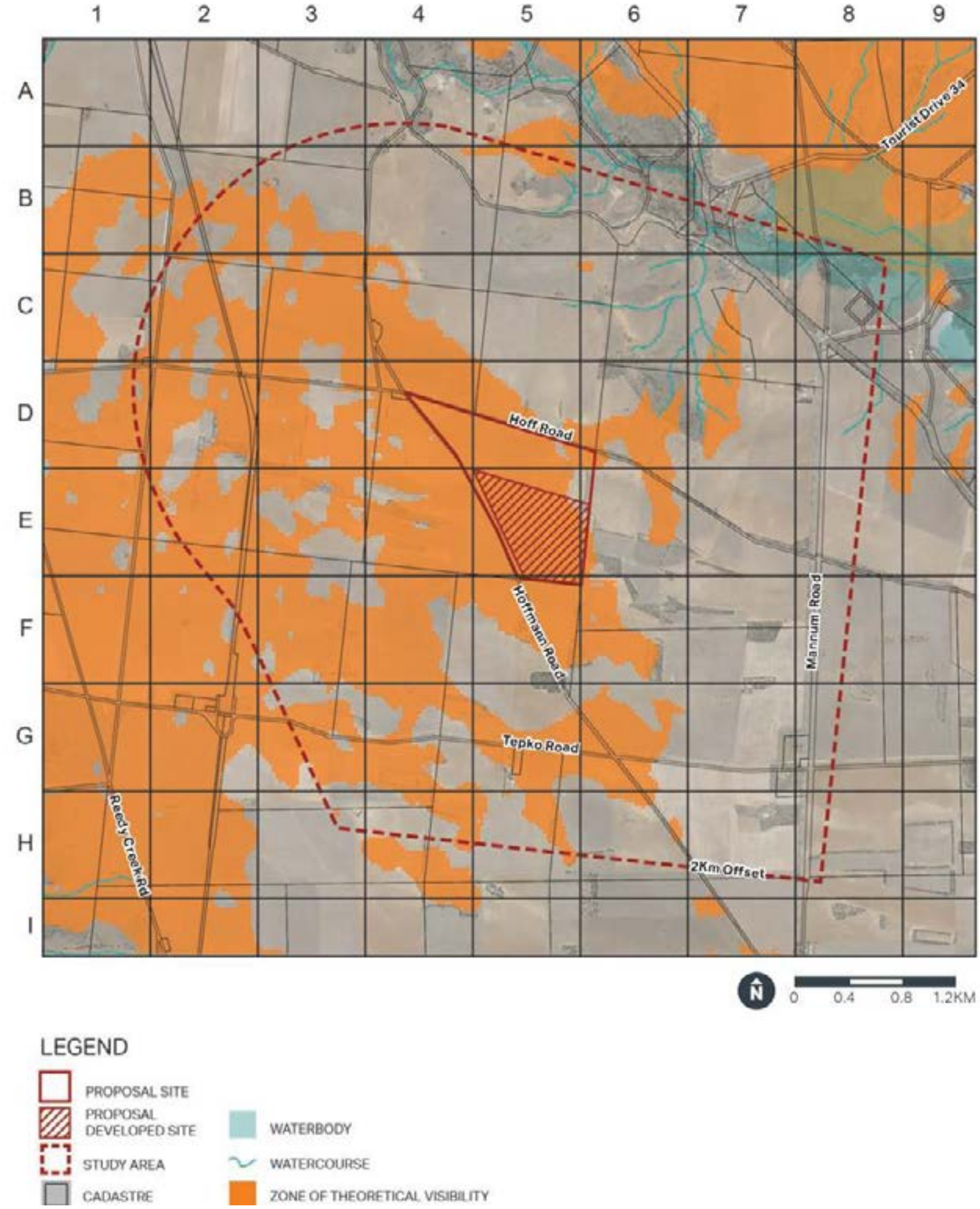
Figure 20 shows a relatively extensive area from which the proposed development may be viewed from. Whilst theoretically, areas outside of the study area boundary would see views of the project, due to the scale the proposed development and distance from the site, any change to existing views from the wider surrounding landscape towards the site will be minimal.

Council Wide PDC 90 states:

> *High pressure gas transmission pipelines that traverse the council area shown on Structure Plan Map MiMu/1 (Overlay 2) should be protected from development within defined easements and protected from the encroachment of sensitive uses. Development of sensitive uses or a change in use of land within the following radial distances of the pipelines will need to comply with Australian Standard AS2885 (Pipeline Gas and Liquid Petroleum) to ensure minimum safety requirements:*
>
> *(a) Riverland Gas Pipeline - 135 metre radial distance;*
>
> *(b) Port Campbell to Adelaide Gas Pipeline – 640 metre radial distance.*

SAPGen has held discussions with SEA Gas and SEA Gas has indicated support of the proposed design with regard to the setback of development from the pipeline.

Figure 20 Zone of Theoretical Visibility Zone



8.3 Economic Development

Council Wide Obj 8 seeks the maintenance and promotion of a diverse local economy. The Objective further states that:

> *Sufficient land and infrastructure needs to be available to accommodate economic growth in the region, particularly in the areas of tourism, horticulture and industry. Development providing job opportunities to boost local employment is a high priority.*

The proposed development comprises a piece of critical infrastructure which will support further development and growth within the region and State. As outlined in Section 5.0, the $650 million Summerfield Power Station will result in significant local economic benefits and employments opportunities.

8.4 Land Use Interface

The overarching intent of the Development Plan is to ensure development is located and designed to prevent adverse impact and conflict between land uses.

Council Wide PDC 85 states that:

> *Development should not detrimentally affect the amenity of the locality or cause unreasonable interference through any of the following*:
>
> *(a) the emission of effluent, odour, smoke, fumes, dust or other airborne pollutants;*
>
> *(b) noise;*
>
> *(c) vibration;*
>
> *(d) electrical interference;*
>
> *(e) light spill;*
>
> *(f) glare;*
>
> *(g) hours of operation; or*
>
> *(h) traffic impacts.*

Whilst located within a Rural Zone there are sensitive uses (dwellings) adjoining the subject site and throughout the locality, and thus, there is a potential for interfaces impacts to occur.

Key potential amenity impacts created by the development relate to air quality and noise during both the operation and construction phases of the project. Further to Council Wide PDC 85, Zone Objective 15 and 16 also seek to minimise impacts associated with air quality and noise pollution

> *Objective 15: Prevention of environmental nuisance or harm resulting from odour and other airborne particles.*
>
> *Objective 16: Protection of sensitive uses from external noise.*

The Air Quality Impact Assessment undertaken to inform this application concluded that no significant air quality impacts are anticipated at nearby sensitive receptors during the operation of the Summerfield Power Station. Although the unmitigated risk rating for construction of the project is considered to be low, a range of mitigation measures will be included in the CEMP for the site to minimise potential dust impacts to nearby sensitive receptors.

The modelling undertaken within the Acoustic Assessment indicates that following the implementation of the proposed mitigation strategies, all sensitive receiver locations are predicted to comply against the environmental noise criteria. Therefore, the sensitive land uses within the locality can be appropriately protected from external noise during the operation of the power plant. The CEMP will also incorporate mitigation strategies to minimise construction noise impacts.

Lighting will be installed onsite for safety and security purposes. All lighting will be appropriately sited and designed to avoid any light spill impacts to adjoining properties. A final lighting plan will be developed at the detailed design stage.

Traffic impacts are further addressed in section 9.6 below. It is noted that interface impacts relating to traffic are most likely to occur during the construction period, which will be limited to 26 months. Once operational, the proposed development will be benign in terms of traffic generation intensity and will generally have minimal amenity impacts. It is noted that given the rural setting, occasional/seasonal impacts relating to dust and heavy vehicle traffic movements would be expected in association with primary production activities that occur in the wider locality.

8.5 Natural Resources

The intent of the Natural Resources provisions with the Development Plan is to protect the natural resources and environment of the Council area including the following key elements:

- Native vegetation and biodiversity
- Water resources
- Soil resources

Minimising any adverse environmental impacts has been a key consideration as part of the site selection and design process. The proposed development is to be located on predominately cleared farming land and is well separated from environmental sensitive areas. The detailed environmental investigations undertaken to inform this application have identified that the project will likely result in a low risk of impacting threatened flora and fauna species found within the locality.

The Development Plan details the importance of retaining, restoring and conserving existing native vegetation. The existing remnant vegetation on the site will be retained and improved as a result of the development which is also consistent with the Desired Character for the Policy Area, which states:

> *There are a number of large stands of the original Mallee Vegetation of the Plains which should be preserved.*

Furthermore, the development will be landscaped with the use of existing native plant species.

It is anticipated that additional stormwater runoff will likely be generated from the proposed buildings and hardstand areas. However, these elements occupy a relatively small footprint of the total allotment area and the majority of the project site will remain in a previous state as per the current condition of the land. The development will be provided with appropriate drainage and stormwater management systems (rainwater tanks, detention basins etc) to allow stormwater to be managed onsite and to avoid any impacts to downstream systems.

A drainage and stormwater management plan, incorporating water sensitive design principles, is proposed to be prepared at the detailed design stage.

Development Plan provisions seek that development minimises disturbance and modification of the natural landform. Site works will be required for the establishment of appropriate site levels for the development (buildings pad, roadways etc). It is proposed that the design will incorporate batter slopes (rather than retaining walls) to assist minimise the extent and impact of retaining works. Final site levels will be determined as part of the detailed design stage, regard will also be given to minimising the amount of cut and fill required to accommodate the development. This be considered as part of the final design.

8.6 Traffic, Access and Parking

The scale and nature of the development has the potential to impact the surrounding road network particularly during the construction phase of the project. As a result, a TIS has been prepared to assess the level of impact likely to be created by the project (refer to Appendix F).

The TIS concluded that whilst the proposed development will increase the existing traffic volumes on the adjoining roads, particularly during the construction stage, with the implementation of recommended mitigation measures and compliance with permit conditions, the impacts from traffic and traffic related activities are considered acceptable for the area.

The proposed development can be provided with safe and convenient access from the adjoining local roads and as a result, no additional access from the arterial roads in the locality is proposed.

The design of the project includes sufficient area for the manoeuvring, loading, unloading and parking of all vehicles anticipated to visit the site to occur onsite.

All internal access tracks and parking areas will be appropriately surfaced to minimise dust and mud nuisance.

Further assessment and monitoring of the local road network adjoining the site during the construction period will be undertaken to manage any impact associated with the increase of traffic volumes, principally heavy vehicle movements.

With regard to the above, the proposed development largely complies with the relevant traffic, access and parking provisions within the Development Plan.

8.7 Hazards

The Development Plan seeks to limit development in areas susceptible to natural hazard risks, including

- Flooding
- Bushfire
- Site contamination

Based on the characteristic of the land, it is unlikely the site will be subject to the abovementioned hazards.

The Development Plan does not identify a flood risk area beyond the Murray River flood plain and the subject land is located outside this area. Further, the risk of flood is considered to be low given there are no surface water features located in the vicinity of the proposed site and no natural drainage lines adjacent to the proposed site.

Similarly, desktop investigations have identified that the risk of contamination on-site is considered to be low due to the historical use of the site.

The subject land is located in the General Bushfire Risk Zone as identified on *Figure MiMu (BPA)/4* of the Development Plan. The following Council Wide Development Plan policies seeks to guide the location and siting of development with regard to bushfire impacts:

Obj 102 Buildings and the intensification of non-rural land uses directed away from areas of high bushfire risk.

PDC 394 Buildings and structures should be located away from areas that pose an unacceptable bushfire risk as a result of one or more of the following:

(a) vegetation cover comprising trees and/or shrubs;

(b) poor access;

(c) rugged terrain;

(d) inability to provide an adequate building protection zone; or

(e) inability to provide an adequate supply of water for fire-fighting purposes

The subject land is not considered to be unacceptable bushfire risk area given the site is:

- Located outside of a high risk bushfire area
- Well separated from areas dense/hazardous vegetation
- Provided with good road access
- Relatively flat
- A large site and building protections area and a dedicated firefighting water supply can be provided around buildings.

Pre-lodgement consultation with the CFS has been undertaken and the CFS has raised no concerns with the proposed design. Further consultation will be undertaken throughout the detailed design stage of the project to ensure relevant firefighting requirements are provided.

9.0 Summary

The Summerfield Power Station at Tepko proposed by SAPGen, has minimal local environmental impacts, contributes to the security of the South Australian electricity network and will positively impact on lowering power prices. The $650 million project will result in significant economic benefits to the State and the local community.

The location of the proposed development has been strategically chosen based on its proximity to the existing electricity and gas networks. It has been designed and sited to have minimal impact on adjoining land uses and will generally retain the character and amenity of the locality.

The proposed development is considered to be an appropriate form of development that meets the Objectives and Principles of Development control of the Mid Murray Council Development Plan, given:

- The subject site is a suitable and appropriate location for the proposed development, considering its location within a Rural Zone which includes other electricity generating facilities as envisaged forms of development
- The proposed development has been designed to mitigate against any adverse interface issues with surrounding land uses
- The proposed development will not result in any adverse impacts to the existing or wider community of Tepko and the Mid Murray region.
- The project will result in significant positive economic benefits to the region, providing employment both during construction and operational maintenance.

The proposed development seeks favourable assessment by the State Commission Assessment Panel and Development Approval by the Minister for Planning.

Appendix A

Section 49 Endorsement Letter

Government
of South Australia

Department for
Energy and Mining

Our Ref: D19085023

Mr Ben Lee
Managing Director
SAPGen Pty Ltd
53 Ellemsea Circuit
LONSDALE SA 5160
Ben.lee@sapgen.com.au

Dear Mr Lee

REQUEST FOR CROWN SPONSORSHIP FOR A GAS HYBRID POWER PLANT

I refer to your letter of 24 July 2019 regarding the request for support and endorsement pursuant to Section 49(2)(c) of the *Development Act 1993* (the Act) for a gas hybrid power plant with a nominal capacity of 422 MW.

Given that the proposed works meet the definition of "public infrastructure" as outlined in Section 49(1)(a) of *Development Act 1993,* and that the project will provide dispatchable power to contribute to the security and reliability of the State's electricity network, I am prepared to support and specifically endorse, pursuant to Section 49(2)(c) of the *Development Act 1993,* the gas hybrid power generation facility comprising:

- 380 MW natural gas combined cycle gas turbines;
- 12 MW solar farm; and a
- 30 MW battery energy storage facility (BESS)

The project would provide various benefits to the State including by assisting in improving the reliability of the power system as the gas power plant will be able to respond quickly to variations in grid voltage and frequency, which in turn, is expected to improve grid stability.

It is understood that the proposed site is on Certificate of Title Volume 5924 Folio 548 as Section 304 of Hundred Plan 170300 in the area name Tepko, approximately 9.5 kilometres to the south-west of Mannum and approximately 20 kilometres north of Murray Bridge.

The Department for Energy and Mining notes that subject to successful financial closure by SAPGen Pty Ltd, the primary objective is to have energisation of partial capacity, nominally 232MW by Q4 of 2021 with the balance of capacity to be established by Q3 of 2022.

The Department for Energy and Mining makes no representations or gives no warranties in relation to the outcome of the development application or time that it takes to secure a planning outcome for the project.

Government
of South Australia

Department for
Energy and Mining

It is SAPGen Pty Ltd's responsibility to obtain all other statutory approvals, licenses and permits from relevant authorities, manage community expectations and to fund the project. The State Government makes no commitment to provide any funding towards the project or to purchase any product or service related to the project.

A development application must be lodged by SAPGen Pty Ltd at its own cost with the State Planning Commission on or prior to 30 August 2020. If this is not achieved by that time, my support under Section 49(2)(c) of the Act for the project will lapse.

Should you have any questions regarding preparation of the material to support this Section 49 Development Application, please contact the nominated Case Manager, Mr Chris Lim on (08) 8429 3284.

Yours sincerely

Paul Heithersay
CHIEF EXECUTIVE

14 / 8 / 2019

Appendix B

OTR Compliance Certificate

Government of South Australia
Department for Energy and Mining

Ref: D19079624

Energy and Technical Regulation

Office of the Technical Regulator

Level 8, 11 Waymouth Street
Adelaide SA 5000

GPO Box 320
Adelaide SA 5001

Telephone: 08 8226 5500
Facsimile: 08 8226 5866

www.sa.gov.au/otr

17th July 2019

Brett May
Technical Director
SAPGEN
53 Ellemsea Circuit
Lonsdale
SA 5160
brett.may@sapgen.com.au

Dear Brett,

RE: Summerfield Hybrid Power Station project.

The development of the Summerfield Hybrid Power Station project has been assessed by the Office of the Technical Regulator (OTR) under Section 37 of the Development Act 1993.

The *Development Regulations 2008* prescribe if the proposed development is for the purposes of the provision of electricity generating plant with a generating capacity of more than 5 MW that is to be connected to the State's power system – a certificate from the Technical Regulator is required, certifying that the proposed development complies with the requirements of the Technical Regulator in relation to the security and stability of the State's power system.

In making a decision on your application, our office has taken the following information into account:

- Presentation delivered to the OTR 28th June 2019.
- Emails providing project details dated 28th June 2019.
- Emails providing technical data for the project dated 8th July 2019.
- Email providing BESS response data dated 9th July 2019.

After assessing the information provided, I advise that approval is granted for the proposed generator on the understanding that the generator shall not run in an open cycle peaking configuration with the STG out of service.

Additionally, where a shortfall in inertia exists, the shortfall will be compensated for via FFR provided by the 30MW BESS.

It should be noted that should the OTR requirements not be met this will have impact on the ESCOSA license for the proposed generator.

Should you have any questions regarding this matter, please do not hesitate to call Mark Burns on (08) 8429 2707.

Yours sincerely

Rob Faunt
TECHNICAL REGULATOR

Appendix C

Certificate of Title

REAL PROPERTY ACT, 1886

South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 5924 Folio 548

Parent Title(s)	CT 5895/940				
Creating Dealing(s)	TG 9817103				
Title Issued	14/09/2004	**Edition**	1	**Edition Issued**	14/09/2004

Estate Type

FEE SIMPLE

Registered Proprietor

MARK ANDREW WAGENKNECHT
OF PO BOX 5013 MURRAY BRIDGE SOUTH SA 5254

Description of Land

SECTION 304
HUNDRED OF FINNISS
IN THE AREA NAMED TEPKO

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED A (TG 9817103)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED W TO TRANSMISSION LESSOR CORPORATION OF 1 UNDIVIDED 2ND PART (SUBJECT TO LEASE 9061500) AND ELECTRANET PTY. LTD. OF 1 UNDIVIDED 2ND PART (TG 6635736)

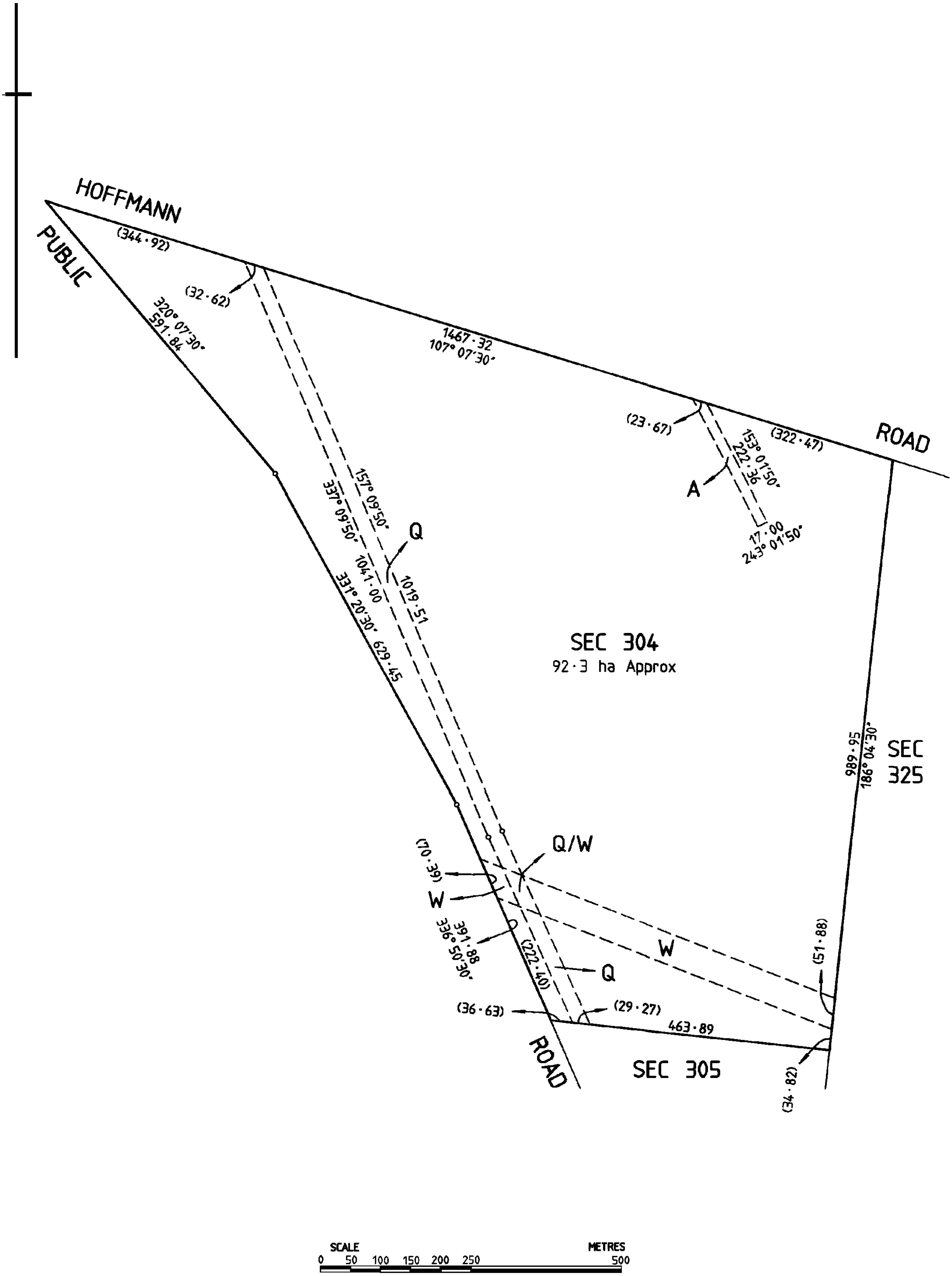
SUBJECT TO EASEMENT(S) OVER THE LAND MARKED Q (TG 9545364)

Schedule of Dealings

Dealing Number	Description
9395356	MORTGAGE TO AUSTRALIA & NEW ZEALAND BANKING GROUP LTD.

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL


HOFFMANN
ROAD
PUBLIC
ROAD
(344·92)
(32·62)
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591·84
1467·32
107° 07'30"
(23·67)
(322·47)
153° 01'50"
222·36
A
17·00
243° 01'50"
157° 09'50"
337° 09'50"
Q
1041·00
1019·51
331° 20'30" 629·45
SEC 304
92·3 ha Approx
989·95
186° 04'30"
SEC
325
(70·39)
W
Q/W
391·88
336° 50'30"
(222·40)
W
Q
(51·88)
(36·63)
(29·27)
463·89
SEC 305
(34·82)
SCALE
METRES
0 50 100 150 200 250 500

Appendix D

Application Plans

LEGEND

47.51TK	TOP KERB	48.12OH	OH WIRE LEVEL
47.36WT	WATER TABLE		
45.16FL	FLOOR LEVEL		
48.12IL	INVERT LEVEL		

TAP; WATER METER; SPRINKLR / IRRIG VALVE; HYDRANT; DOMESTIC OUTLET; DOWNPIPE; DOMESTIC SUMP; STORMWATER M'HOLE; SEP / GRATING

TEL. COMM. PILLAR / PIT; TRAFFIC LIGHT; SIGN / BUS SIGN; LITTER BIN; MAIL BOX / SIGNAL BOX; TICKET MACHINE; ROAD / ELEC. SERVICE; WATER SV / FP; ELEC. / GAS METER; GAS SERVICE

PSM; PEG / TBM; SURVEY MARKS; BOREHOLE; POWER / LIGHT POLE; CABLE MARKER; STOBIE / WOODEN POLE; POST / BOLLARD; SEWER MH / IO / SIP; UNKNOWN POINT / SERVICE

EDGE OF VEGETN; ROAD SIGN / HOARD.; TREE / SHRUB

Possible REGULATED / SIGNIFICANT TREE by measurement only (trunk greater than 2.0m circumference). Professional advice from council / arborist required.

BOTTOM OF BANK; TOP OF BANK; CHANGE OF GRADE; DRAIN; SEWER PIPE UG; TEL. COMM. UG; WATER PIPE UG; BUILDING; WALL; GI BUILDING; CONCRETE; FENCE; GATE

REV	DATE	DESCRIPTION	CALC	FIELD

ADDITIONS, AMENDMENTS AND APPROVALS

COORDINATE SYSTEM

VERTICAL:	AHD
HORIZONTAL:	GROUND PLANE ORIENTED TO: MGA 94 ZONE 54
SCALE: GROUND	(CSF = 0.99991426)

ADOPTED STATION & AUTHORITY

PSM 6728/3242	RL:	72.775	SDB
PSM 6728/3242	E:	337314.187	SDB
	N:	6128522.980	SDB

SDB denotes SA Government survey data base

0 25 50 100 150 200 250 m

1:2500

ORIGINAL SHEET SIZE A1

Notes:
Property boundaries shown hereon have been compiled from the government records and have not been verified by field survey.
Aerial photography supplied by NearMap, date 01.10.2010
Contours supplied by AEROmetrex Pty. Ltd. , date 10.09.2014

CONTOUR INTERVAL:	1.0m	
SURVEY:	TLH	19.08.2019
DRAWN:	TLH	20.08.2019
CHECKED:	BAC	20.08.2019

Alexander & Symonds Pty Ltd
11 King William Street Kent Town,
South Australia 5067
PO Box 1000 Kent Town, SA 5071
ABN 93007 753 988

T (08) 8130 1666
F (08) 8362 0099
W www.alexander.com.au
E adelaide@alexander.com.au

+ Property + Land Development +
+ Construction + Mining +
+ Spatial Information Management +

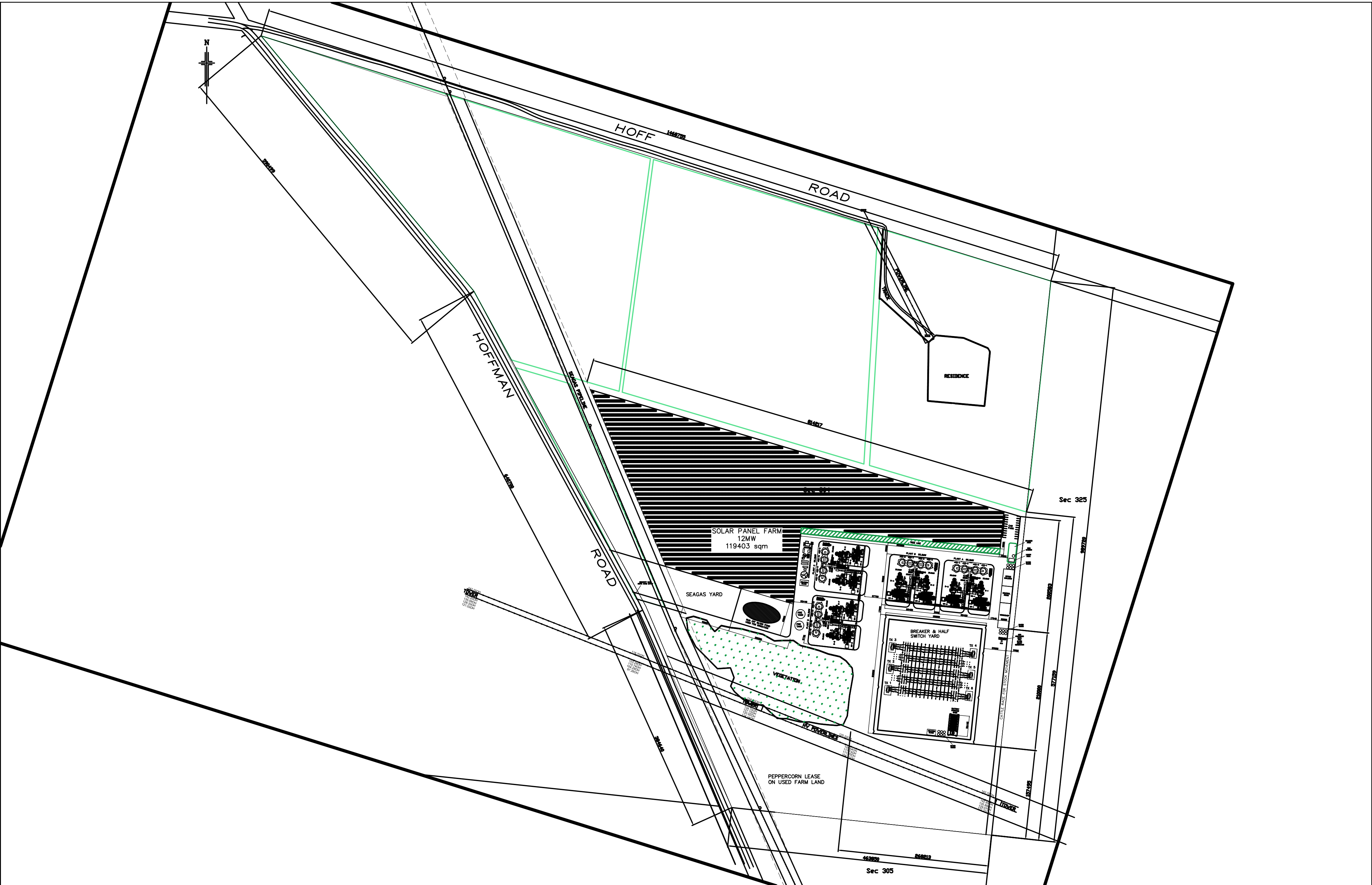
Alexander Symonds
Surveying Consultants

Contour Survey
120 Hoff Road
TEPKO

DRAWING No. A079619_DETAIL(0)94P

SHEET 1 OF 1

REVISION 0



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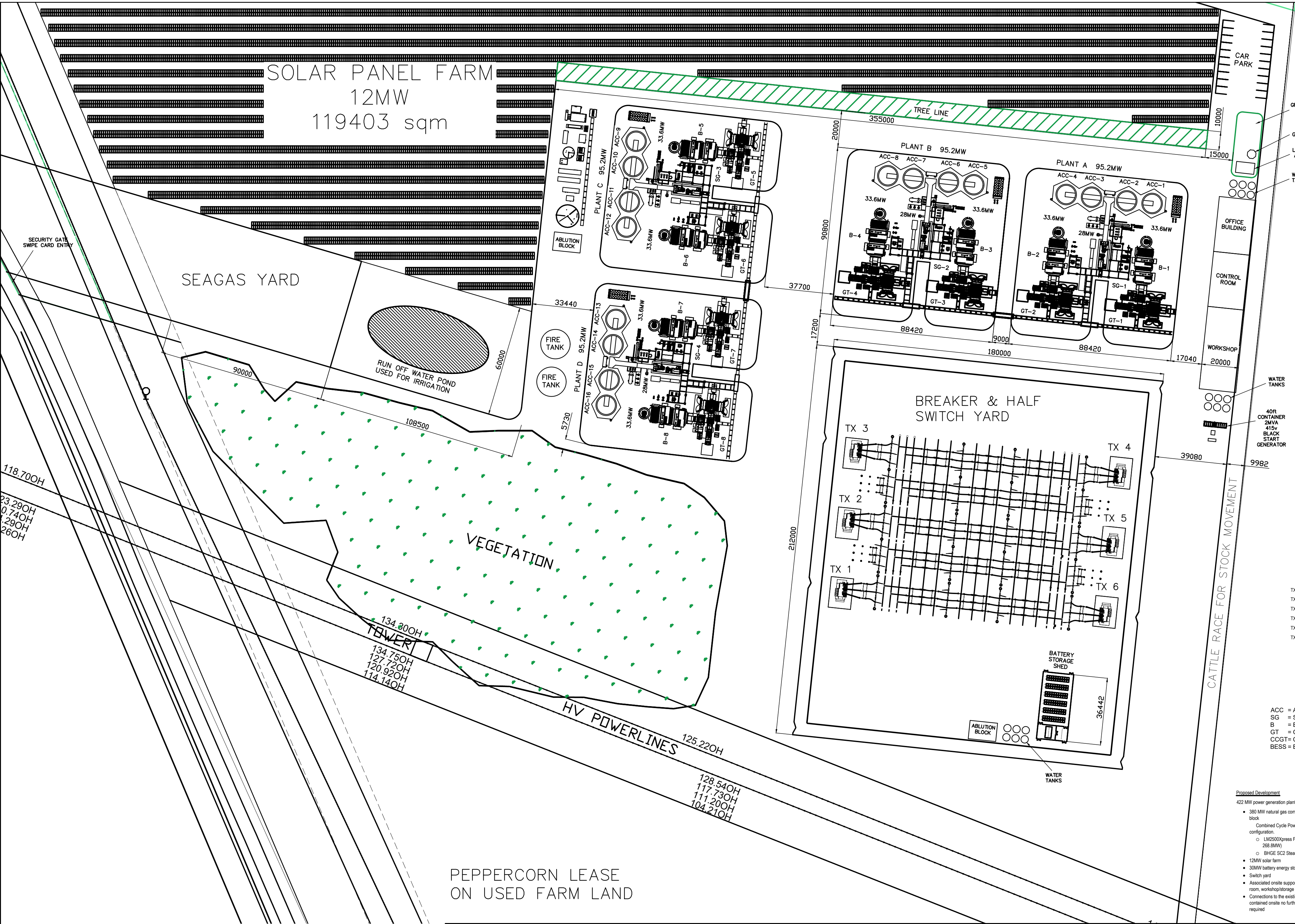
		D	25NOV19	INVERTERS REMOVED	CMS		
		C	03SEP19	CONTOUR LINES ADDED (SHT 3&4), MOVED BATTERY SHED	CMS		
		B	21JUL19	PLANT LABELS REVISED	CMS		
REFERENCE DRAWINGS		REVISION					

SOUTH AUSTRALIA POWER GENERATION

DRAWN	CMS
CHECKED	
APPROVED	
DATE	19JUL19
JOB No.	
SCALE	NTS
SHEET	1 OF 4

CUSTOMER:
SAPGen SUMMERFIELD
1.6TW/hr CAPACITY
GRID FIRMING RENEWABLES

A1 DWG NO: SPAG-20190719 REV: D



TX1 to cabled Plant D 95.2MW 11.5 step to 275kV
TX2 to cabled Plant C 95.2MW 11.5 step to 275kV
TX3 to cabled Plant B 95.2MW 11.5 step to 275kV
TX4 to cabled Plant A 95.2MW 11.5 step to 275kV
TX5 Spare future solar
TX6 to cabled solar / battery 52MW 11.5 step to 275kV

ACC = Air Cooled Condensor
SG = Steam Generator
B = Exhaust Boiler from Open Cycle Turbine
GT = Gas Turbine
CCGT= Combined Cycle Gas Turbine
BESS = Battery Energy Storage System

Proposed Development

422 MW power generation plant comprising:

- 380 MW natural gas combined cycle gas turbines - to be constructed in 4 plants of 2 into 1 HES block
  Combined Cycle Power train characteristics: Units will never be run in open cycle configuration.
  - LM2500Xpress Fast start Gas Turbine power output @ ISO conditions: 33.6 MW (8 units 268.8MW)
  - BHGE SC2 Steam Turbine power output @ ISO conditions: 28 MW (4units 112MW)
- 12MW solar farm
- 30MW battery energy storage facility
- Switch yard
- Associated onsite support facilities/ancillary development (office and amenities building, control room, workshop/storage building, security fencing, landscaping)
- Connections to the existing HV electricity network and SEA Gas pipeline - all connections to be contained onsite no further augmentation to the existing transmission line or pipeline will be required

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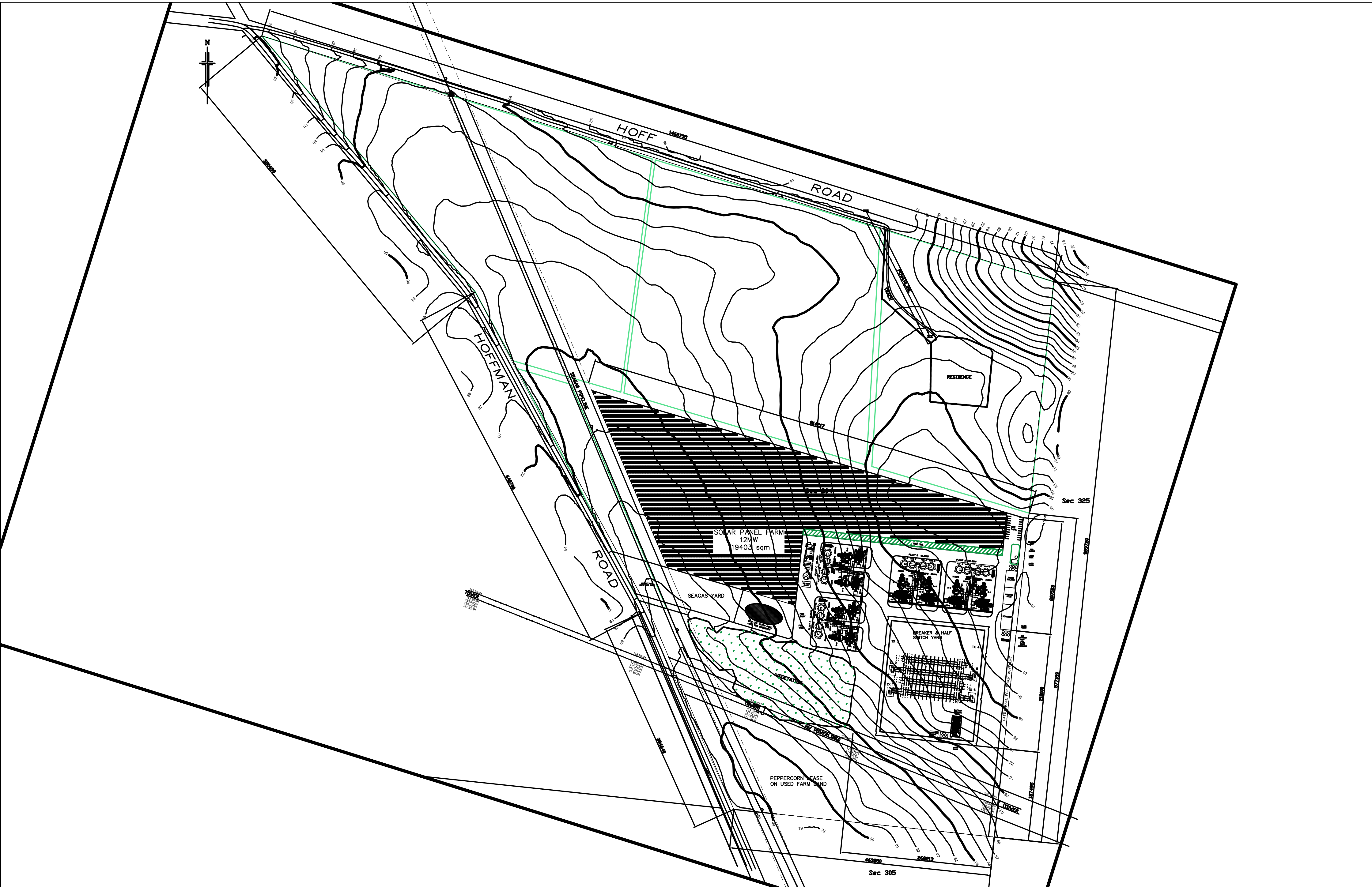
SOUTH AUSTRALIA POWER GENERATION

DRAWN	CMS
CHECKED	
APPROVED	
DATE	19JUL19
JOB No.	
SCALE	NTS
SHEET	2 OF 4

CUSTOMER:
SAPGen SUMMERFIELD
1.6TW/hr CAPACITY
GRID FIRMING RENEWABLES

A1 DWG NO: SPAG-20190719 REV: D



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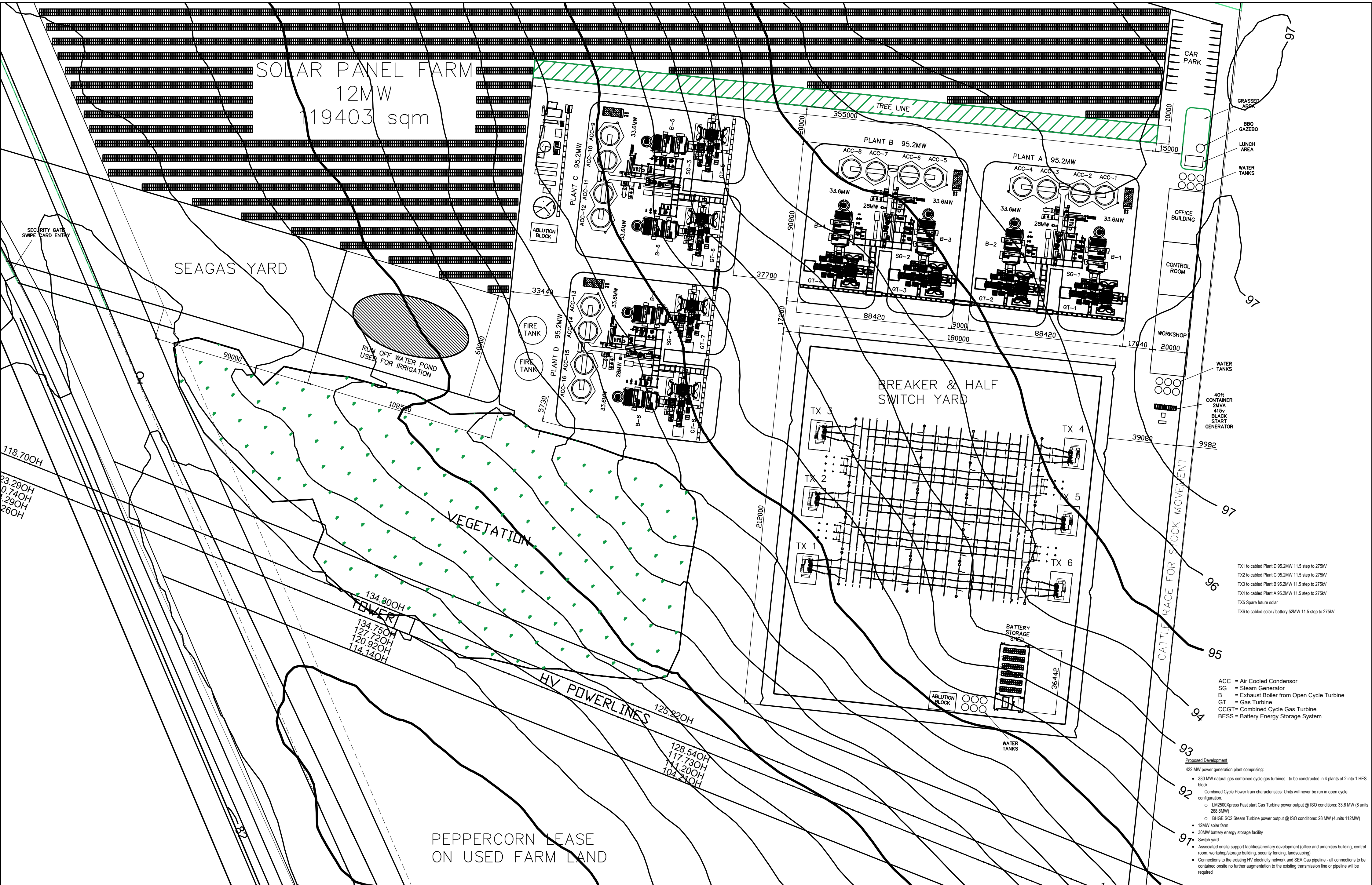
REFERENCE DRAWINGS		REVISION					

SOUTH AUSTRALIA POWER GENERATION

DRAWN	CMS
CHECKED	
APPROVED	
DATE	19JUL19
JOB No.	
SCALE	NTS
SHEET	3 OF 4

CUSTOMER:
SAPGen SUMMERFIELD
1.6TW/hr CAPACITY
GRID FIRMING RENEWABLES

A1 DWG NO: SPAG-20190719 REV: D



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REFERENCE DRAWINGS | REVISION

SOUTH AUSTRALIA POWER GENERATION

DRAWN	CMS
CHECKED	
APPROVED	
DATE	19JUL19
JOB No.	
SCALE	NTS
SHEET	4 OF 4

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SAPGen SUMMERFIELD
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GRID FIRMING RENEWABLES

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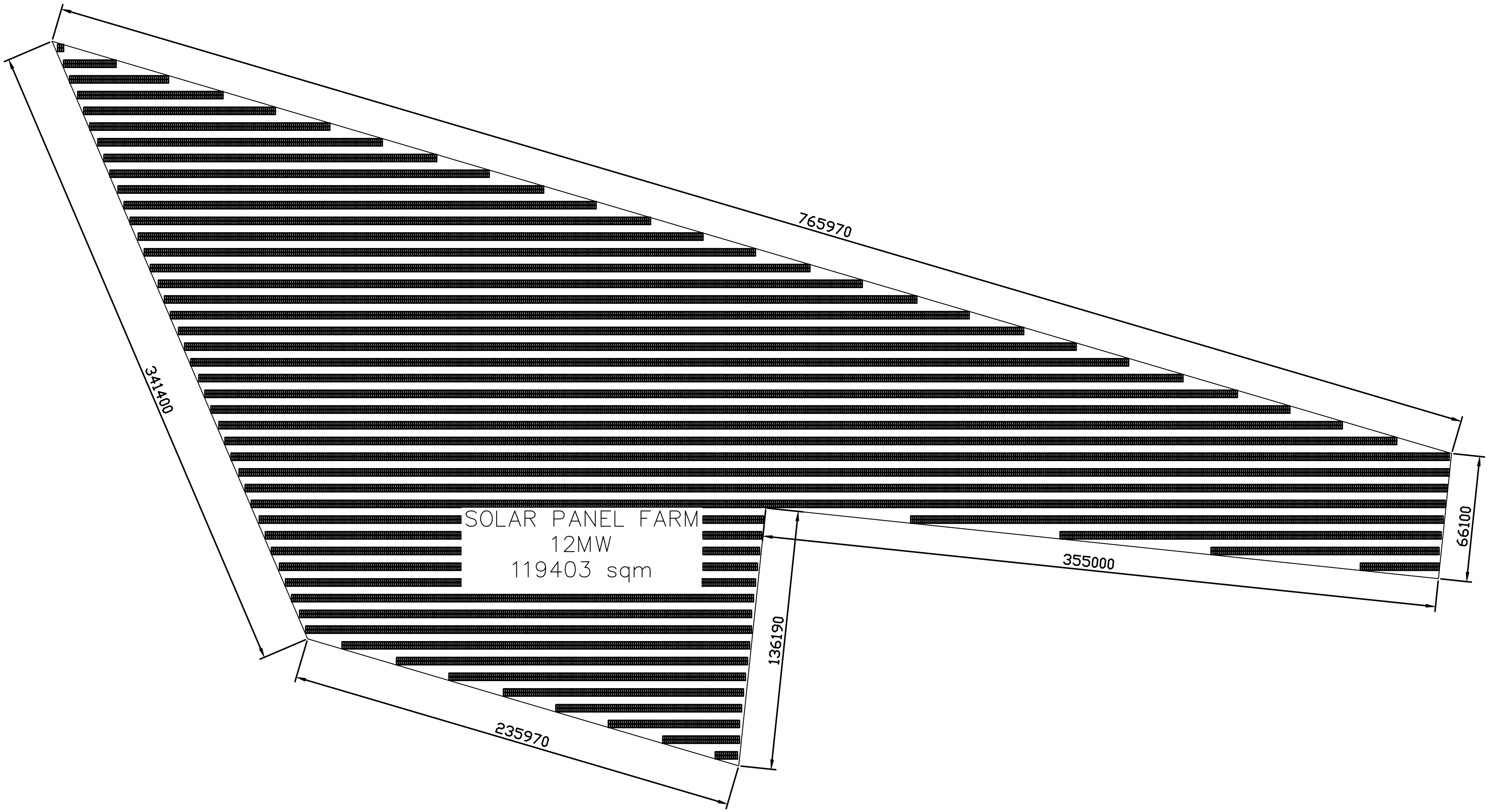
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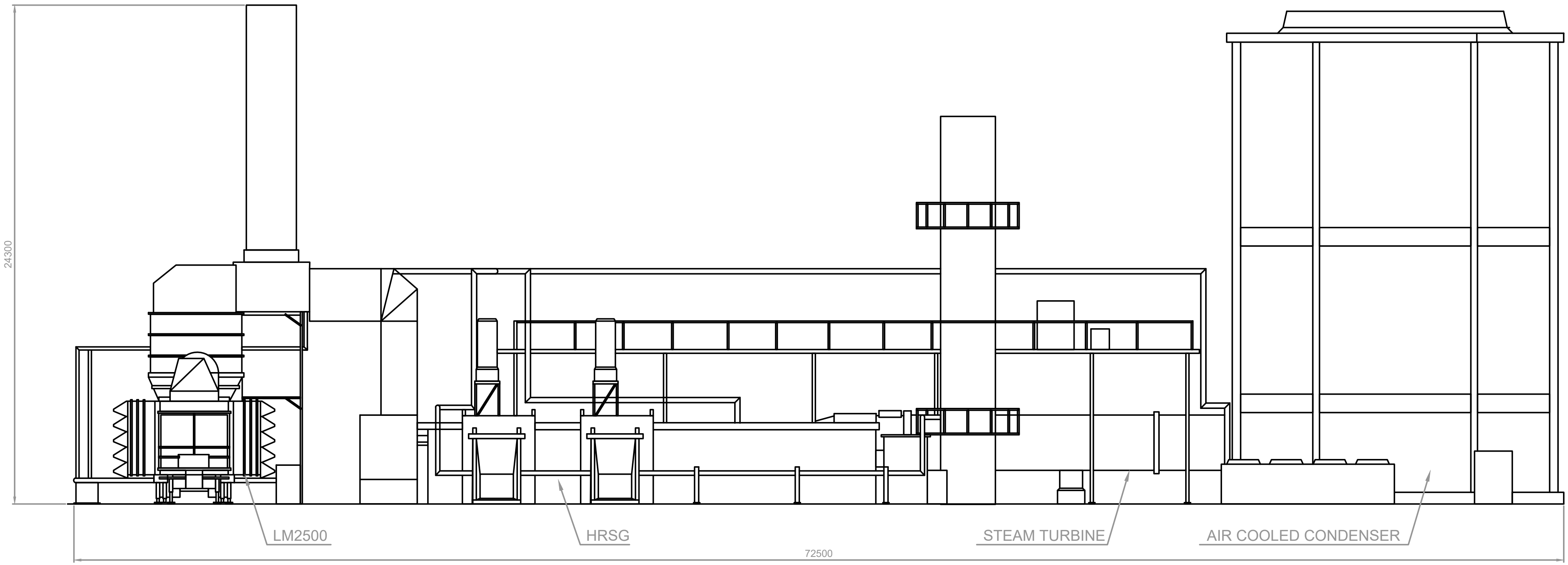

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REFERENCE DRAWINGS		REVISION					

SOUTH AUSTRALIA POWER GENERATION

DRAWN	CMS
CHECKED	
APPROVED	
DATE	06NOV19
JOB No.	
SCALE	1:100
SHEET	1 OF 1

CUSTOMER:
SAPGen SUMMERFIELD
LM2500 TURBINES & HEXACOOL MODULES

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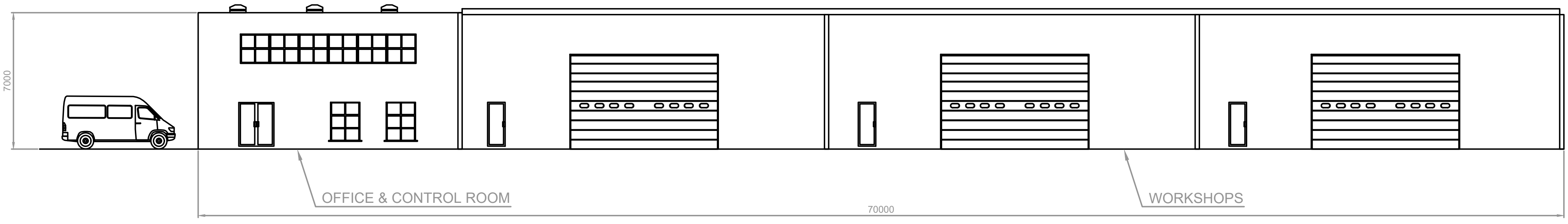

SIDE ELEVATION - OFFICE & WORKSHOPS

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	REFERENCE DRAWINGS			REVISION			

SOUTH AUSTRALIA POWER GENERATION

DRAWN	CMS
CHECKED	
APPROVED	
DATE	06NOV19
JOB No.	
SCALE	1:100
SHEET	2 OF 3

CUSTOMER:

SAPGen SUMMERFIELD
OFFICE & WORKSHOPS
ELEVATIONS

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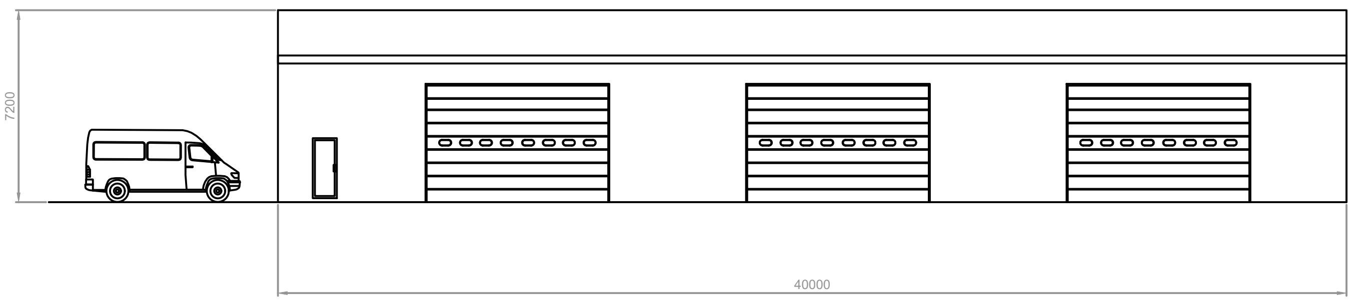

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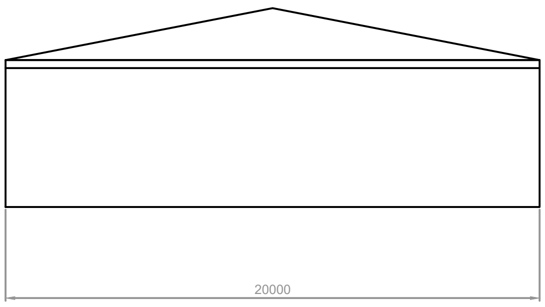

END ELEVATION - BATTERY SHED

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REFERENCE DRAWINGS		REVISION					

SOUTH AUSTRALIA POWER GENERATION

DRAWN	CMS
CHECKED	
APPROVED	
DATE	06NOV19
JOB No.	
SCALE	1:100
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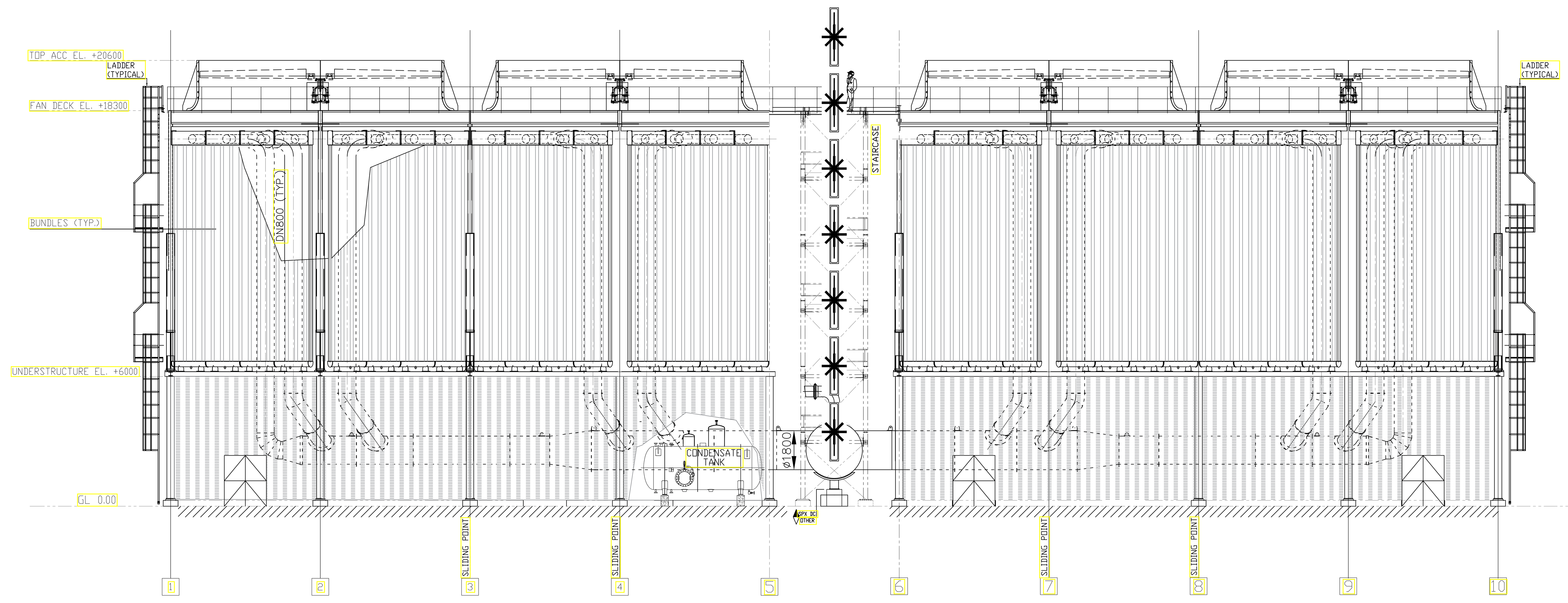
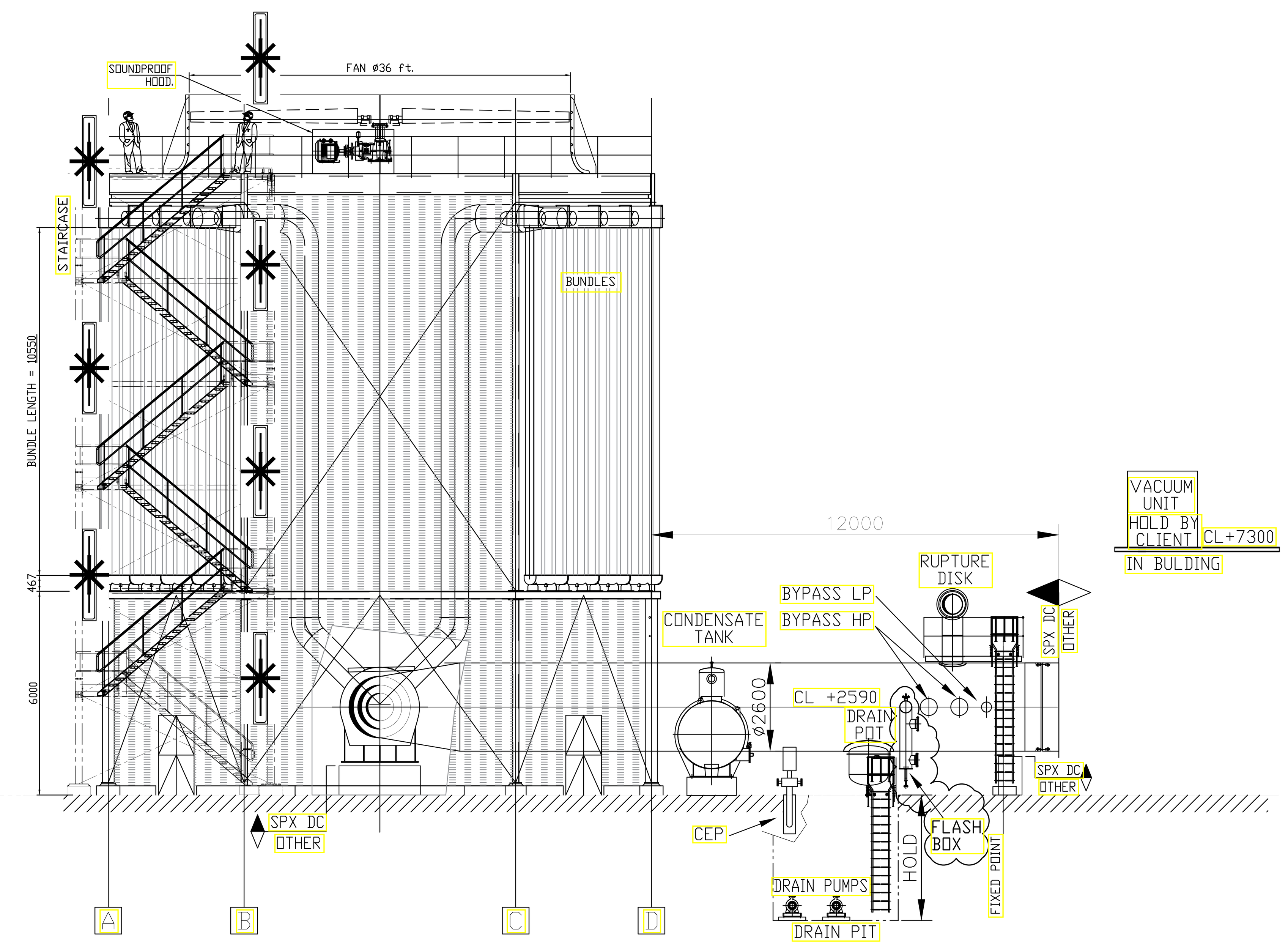
CUSTOMER:
SAPGen SUMMERFIELD
BATTERY SHED
ELEVATIONS

A1 | DWG NO: SPAG-20191106 | REV: A

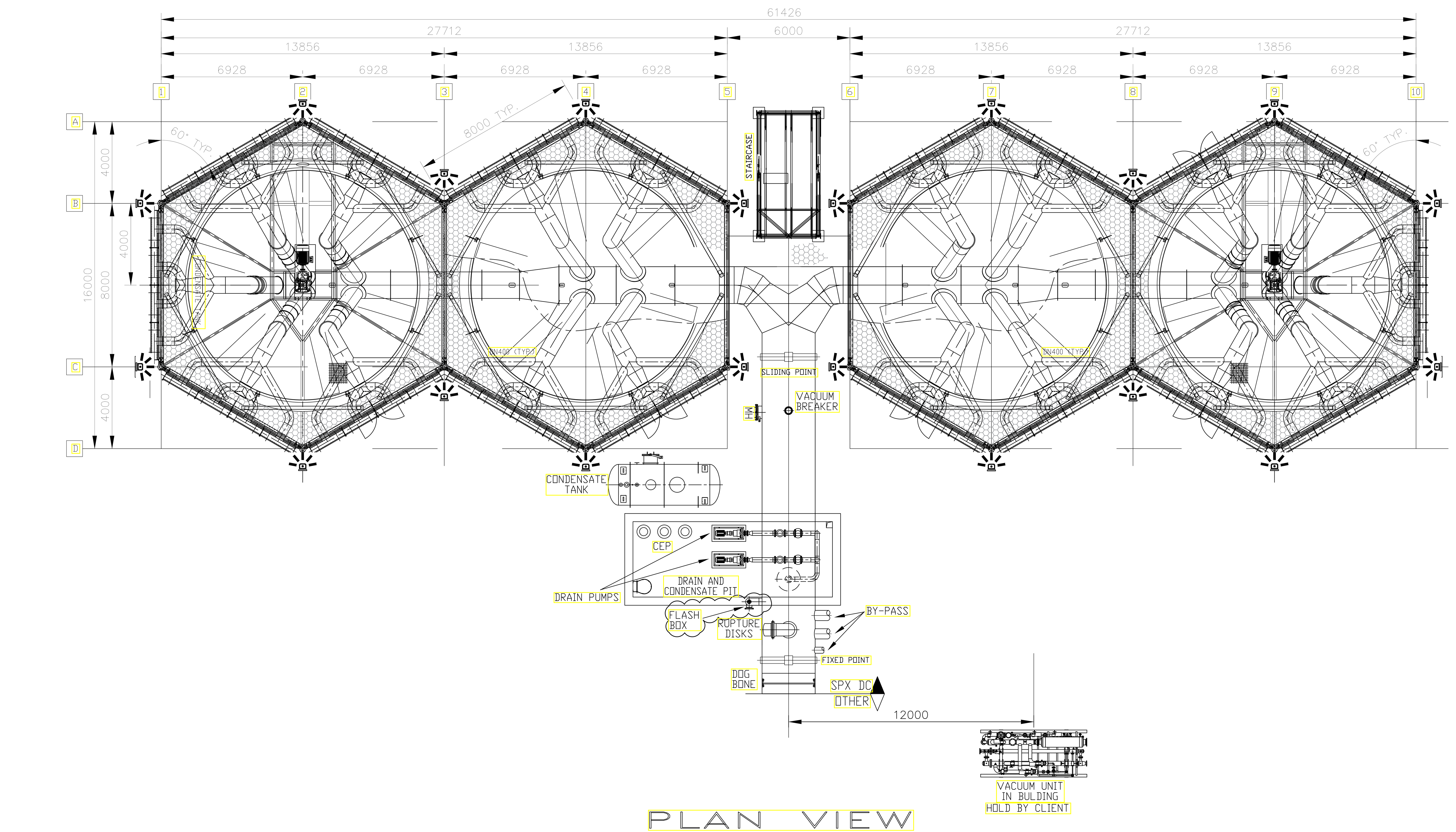


LATERAL VIEW



SIDE VIEW

TYPICAL PRELIMINARY DRAWING



PLAN VIEW

LEGEND

LIGHT FIXTURE

Ver.	Date	Name	Remark	Status
–	02-03-18	YSO	FIRST ISSUE	PRE
A	14-03-18	YSO	UPDATED AS CLOUD	PRE
B	19-03-18	YSO	UPDATED AS CLOUD	PRE
C		–	–	–
D		–	–	–
E		–	–	–

PRE = PRELIMINARY | CTD = CERTIFIED DRAWING | CFC = CERTIFIED FOR CONSTRUCTION | ASB = AS BUILT

Project Id. 00000146_e0h_DSHB0002	Codeword Fastpower	Customer GE
Product Item Id.	Product Item Designation AIR COOLED CONDENSER	

	Date	Name
Drawn	02-03-18	YSO
Checked	02-03-18	GVB
Released	02-03-18	GVB

Document Designation: GENERAL ARRANGEMENT HEXACOOL 2x2 Modules - 36 Ft

Content/Key: DWG 001

SPX DRY COOLING

Projection	Scale	Document Id.	Ver.	Page
	1:100	–	B	1/1
	Format A0	BOM Id. –	Item Id. –	

Summerfield Power Station - Aerial View

Summerfield Power Station - View from the South-East

Summerfield Power Station - View from the North-West

Summerfield Power Station - View from the East

Summerfield Power Station - View from the North

Appendix E

Ecology Assessment

ebs ecology

SAPGen Summerfield Power Generation Plant

Ecological Assessment

SAPGen Summerfield Power Generation Plant Ecological Assessment

30 September 2019

Version 3 - Final

Prepared by EBS Ecology for AECOM

Document Control					
Revision No.	Date issued	Authors	Reviewed by	Date Reviewed	Revision type
1	20/09/2019	G. Oerman	A. Derry	20/09/2019	Draft
2	26/09/2019	A. Derry	Tom Hateley	26/09/2019	Draft
3	30/09/2019	A. Derry	-	30/09/2019	Final

Distribution of Copies			
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EBS Ecology Project Number: E90704

CITATION: EBS Ecology (2019) SAPGen Summerfield Power Generation Plant Ecological Assessment. Report to AECOM. EBS Ecology, Adelaide.

Cover photograph: Eucalyptus sp. Mixed Open Mallee over *Enchylaena tomentosa* +/- *Maireana brevifolia* vegetation association recorded within the Project area.

EBS Ecology
125 Hayward Avenue
Torrensville, South Australia 5031
t: 08 7127 5607
http://www.ebsecology.com.au
email: info@ebsecology.com.au

EXECUTIVE SUMMARY

EBS Ecology (EBS) was contracted by AECOM on behalf of SAPGen to conduct an ecological assessment to support a development application for the proposed Summerfield Power Generation Plant (the Project) on 92.3 hectares of farmland, approximately 9.7 km south-west of Mannum. The Project infrastructure includes a mix of solar and gas turbines as well as battery storage.

The primary objectives of the ecological assessment were to:

- Identify the potential for threatened flora and fauna species and threatened ecological communities (TECs) listed under Commonwealth and State legislation to occur within the Project area
- Record flora and fauna species and vegetation communities observed within the Project area
- Determine whether native vegetation falls within the Project Footprint and determine the Significant Environmental Benefit (SEB) offset requirements for the proposed native vegetation clearance
- Provide recommendations to help avoid, minimise or mitigate environmental impacts, should the Project be approved.

Desktop assessment

A data review for the desktop assessment was completed by AECOM (2019) in the *Rapid Constraints Assessment* report. EBS Ecology conducted a likelihood of occurrence assessment for each of the national and state matters of environmental significance to inform field survey requirements. The key results of the desktop assessment include:

- One nationally threatened flora species; *Olearia pannosa* subsp. *pannosa* (Silver Daisy-bush), listed as Vulnerable under the EPBC Act and NPW Act was identified as potentially occurring or having suitable habitat within the Project area;
- One state threatened flora species; *Olearia passerinoides ssp. glutescens* (Sticky Daisy-bush), listed as Rare under the NPW Act was identified as potentially occurring or having suitable habitat within the Project Area; and
- Eight State threatened fauna species (one ‘likely’ and seven ‘possible’) were identified as potentially occurring or having suitable habitat within the Project area.

Native vegetation assessment

The native vegetation assessment was conducted in accordance with the Bushland Assessment Method (BAM) devised by the Native Vegetation Council (NVC). One native vegetation association was mapped over the Project area and a BAM assessment site was conducted. The key results of the native vegetation assessment were:

- One native vegetation association was and mapped within the Project area and assessed under the BAM:

  - *Eucalyptus sp. Mixed Open Mallee over Enchylaena tomentosa +/- Maireana brevifolia* (3.54 ha). This native vegetation association will not suffer any clearance associated with the Project.

- No National or State threatened flora were recorded during the field assessment and the likelihood of two State flora species considered to possibly occur in the Project area were downgraded to unlikely due to habitat degradation.

Fauna assessment

The areas containing remnant vegetation within the Project Area were traversed on foot. All fauna species, signs of species and potential habitat for fauna was recorded. The value of habitat for the threated fauna species identified in the desktop assessment was also determined when searching each area. The key results from the fauna assessment were:

- Ten fauna species were recorded during the field assessment over the Project area, comprising of nine bird species and one mammal species;
- Three introduced fauna species were recorded during the field assessment over the Project area;
- A nest of a White-winged Chough (*Corcorax melanorhamphos*), a State rare species, was recording within the Project area;
- Habitat within the Project area was suitable for White-winged Choughs (SA: R) and Elegant Parrots (SA: R), however, likelihood of the remaining six State flora species considered during the desktop assessment to have potential to occur in the Project area were downgraded to unlikely due to habitat degradation.

Recommendations

It is recommended that the current Project layout, which does not necessitate the need for any native vegetation clearance is retained in any future iterations of the Project layout. Furthermore, it is recommended that all native vegetation is allocated a minimum 10 m buffer from infrastructure.

The removal of stock from the patch of native vegetation and planting of screen vegetation comprised of indigenous species is recommended to improve the environmental condition of the Project area.

GLOSSARY AND ABBREVIATION OF TERMS

BAM	Bushland Assessment Method
BDBSA	Biological Database of South Australia (maintained by DEW)
BOM	Bureau of Meteorology
DEW	Department of Environment and Water
DotE	Department of the Environment
DotEE	Department of the Environment and Energy
EBS	EBS Ecology
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
ha	Hectare/s
IBRA	Interim Biogeographical Regionalisation of Australia
km	kilometre
m	metre
mm	millimetre
MNES	Matter(s) of National Environmental Significance (under the EPBC Act)
NatureMaps	Initiative of DEW that provides a common access point to maps and geographic information about South Australia's natural resources in an interactive online mapping format
NPW Act	*National Parks and Wildlife Act 1972*
NRM	Natural Resources Management
NRM Act	*Natural Resources Management Act 2004*
NV Act	*Native Vegetation Act 1991*
NVC	Native Vegetation Council
PMST	Protected Matters Search Tool (under the EPBC Act, maintained by DotEE)
Project area	the area within the perimeter boundary as shown in Figure 1
SA	South Australia/South Australian
SEB	Significant Environmental Benefit
sp.	Species
ssp.	Subspecies
TEC	Threatened Ecological Community

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1 INTRODUCTION

EBS Ecology (EBS) was contracted by AECOM on behalf of SAPGen to conduct an ecological assessment to support a development application for the proposed Summerfield Power Generation Plant (the Project) on 92.3 hectares of farmland, approximately 9.7 km south-west of Mannum (Figure 1). The Project infrastructure includes a mix of solar and gas turbines as well as battery storage.

The ecological assessment included a desktop assessment and a single day field survey. The field survey was conducted on 21 August 2019 and included a vegetation survey following the Bushland Assessment Method (BAM) devised by the Department of Environment and Water (DEW) in July 2017 (NVC 2019).

The desktop assessment was conducted by AECOM (2019) and involved searching Commonwealth and State databases to identify threatened species potentially occurring in and surrounding the proposed development site, as well as relevant matters of national environmental significance (MNES) and other matters protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *National Parks and Wildlife Act 1972* (NPW Act).

1.1 Objectives

The objectives of this assessment were to:

- Identify any threatened flora and fauna species and threatened ecological communities (TECs) listed under Commonwealth and State legislation that are present or have been historically recorded in the vicinity of the Project area;
- Determine the type, condition and species composition of vegetation in the Project area;
- Identify fauna species and suitable habitat present in the Project area;
- Determine if the proposed works will likely impact any Commonwealth listed species to inform decisions on an EPBC referral;
- Identify any introduced flora and fauna species, including plant diseases, in the Project area that may require control during the proposed works;
- Determine the Significant Environmental Benefit (SEB) offset requirements for the proposed native vegetation clearance; and
- Provide recommendations to help avoid, minimise or mitigate impacts, should the Project be approved.

Figure 1. Location of the Summerfield Power Generation Plant, South Australia.

2 COMPLIANCE AND LEGISLATIVE SUMMARY

2.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation* (EPBC) *Act 1999* and the *Environment Protection and Biodiversity Conservation Regulations 2000* provide a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the Act as MNES. The nine matters of national environmental significance protected under the Act are:

1. World Heritage properties;
2. National Heritage places;
3. Wetlands of international importance (listed under the Ramsar Convention);
4. Listed threatened species and ecological communities;
5. Migratory species protected under international agreements;
6. Commonwealth marine areas;
7. The Great Barrier Reef Marine Park;
8. Nuclear actions (including uranium mines); and
9. A water resource, in relation to coal seam gas development and large coal mining development.

Any action that has, will have, or is likely to have a significant impact on matters of national environmental significance requires referral under the EPBC Act. Substantial penalties apply for undertaking an action that has, will have or is likely to have significant impact on a matter of national environmental significance without approval.

The EPBC Act Significant Impact Guidelines provide overarching guidance on determining whether an action is likely to have a significant impact on a matter of national environmental significance. In terms of nationally threatened species, the guidelines define an action as likely to have a significant impact if there is a real chance or possibility that it will:

- Lead to a long term decrease in the population;
- Reduce the area of occupancy of the species;
- Fragment an existing population;
- Adversely affect critical habitat;
- Disrupt breeding cycles;
- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- Result in the establishment of invasive species that are harmful to the species;
- Introduce disease that may cause the species to decline; and
- Interfere with the recovery of the species.

2.2 Native Vegetation Act 1991

The Project area is located in the Mid-Murray District Council, which is subject to the *Native Vegetation* (NV) *Act 1991*. Therefore, native vegetation within the Project area is protected under the NV Act and *Native Vegetation Regulations 2017*. Any proposed clearance of native vegetation in South Australia (unless exempt under the *Native Vegetation Regulations 2017*) is to be assessed against the NV Act Principles of Clearance and requires approval from the Native Vegetation Council (NVC). A net environmental benefit is generally conditional on an approval being granted.

Native vegetation refers to any naturally occurring local plant species that are indigenous to South Australia, from small ground covers and native grasses to large trees and water plants.

“Clearance" in relation to native vegetation, means:

- The killing or destruction of native vegetation;
- The removal of native vegetation;
- The severing of branches, limbs, stems or trunks of native vegetation;
- The burning of native vegetation; and
- Any other substantial damage to native vegetation, and includes the draining or flooding of land, or any other act or activity, that causes the killing or destruction of native vegetation, the severing of branches, limbs, stems or trunks of native vegetation or any other substantial damage to native vegetation.

Approval must be obtained before performing any activity that could cause substantial damage to native plants. This also applies to dead trees that may provide habitat for animals. These activities include but are not limited to:

- The cutting down, destruction or removal of whole plants;
- The removal of branches, limbs, stems or trunks (including brush cutting and woodcutting);
- Burning;
- Poisoning;
- Slashing of understorey;
- Drainage and reclamation of wetlands; and
- Grazing by animals (in some circumstances).

Under the NV Act, the NVC considers applications to clear native vegetation under ten principles. Native vegetation should not be cleared if it is significantly at odds with these principles:

- It contains a high level of diversity of plant species;
- It is an important wildlife habitat;
- It includes rare, vulnerable or endangered plant species;
- The vegetation comprises a plant community that is rare, vulnerable or endangered;
- It is a remnant of vegetation in an area which has been extensively cleared;
- It is growing in, or association with, a wetland environment;

- It contributes to the amenity of the area;
- The clearance of vegetation is likely to contribute to soil erosion, salinity, or flooding;
- The clearance of vegetation is likely to cause deterioration in the quality of surface or underground water; and
- After clearance, the land is to be used for a purpose which is unsustainable.

The principles apply in all cases, except where the vegetation has been considered exempt under the *Native Vegetation Regulations 2017* or can be classified as an 'intact stratum'. 'Intact stratum' means that applications will usually be denied when the vegetation has not been seriously degraded by human activity within the last 20 years.

All approved vegetation clearance must also be conditional on achieving an SEB to offset the clearance. The requirement for an SEB also applies to several of the exemptions. Potential SEB offsets include:

- The establishment and management of a set-aside area to encourage the natural regeneration of native vegetation;
- The protection and management of an established area of native vegetation;
- Entering into a Heritage Agreement on land where native vegetation is already established to further preserve or enhance the area in perpetuity; and
- A payment to the Native Vegetation Fund.

2.3 National Parks and Wildlife Act 1972

Native plants and animals in South Australia are protected under the *National Parks and Wildlife* (NPW) *Act 1972*. It is an offence to take a native plant or protected animal without approval. Threatened plant and animal species are listed in Schedules 7 (Endangered species), 8 (Vulnerable species) and 9 (Rare species) of the Act. Persons must not:

- Take a native plant on a reserve, wilderness protection area, wilderness protection zone, land reserved for public purposes, a forest reserve or any other Crown land;
- Take a native plant of a prescribed species on private land;
- Take a native plant on private land without the consent of the owner (such plants may also be covered by the NV Act);
- Take a protected animal or the eggs of a protected animal without approval;
- Keep protected animals unless authorised to do so; and
- Use poison to kill a protected animal without approval.

Conservation rated flora and fauna species listed on Schedules 7, 8, or 9 of the NPW Act are known to or may occur within the Project area. Persons must comply with the conditions imposed upon permits and approvals.

2.4 Natural Resources Management Act 2004

Under the *Natural Resources Management* (NRM) *Act 2004* landholders have a legal responsibility to manage declared pest plants and animals and prevent land and water degradation.

Key components under the Act include the establishment of regional Natural Resource Management (NRM) Boards and development of regional NRM Plans; the ability to control water use through prescription, allocations and restrictions; requirement to control pest plants and animals and activities that might result in land degradation.

A 'duty of care' is a fundamental component of this Act, i.e. ensuring one's environmental and civil obligation by taking reasonable steps to prevent land and water degradation. Persons can be prosecuted if they are considered negligent in meeting their obligations.

3 BACKGROUND INFORMATION

3.1 Administration boundaries

The Project area is located within the South Australian Murray-Darling Basin NRM region, the Sturt County, the Finniss Hundred and the Mid Murray Council area.

3.2 Environmental setting

3.2.1 IBRA

The Interim Biogeographical Regionalisation of Australia (IBRA) identifies geographically distinct bioregions based on common climate, geology, landform, native vegetation and species information. The bioregions are further refined into subregions and environmental associations (DotE 2012). The Project area is located in the Murray Darling Depression IBRA Bioregion, the Murray Mallee IBRA Subregion and Wood Hill IBRA Environmental Association.

Native vegetation remnancy figures for IBRA subregions and environmental associations are useful for setting regional landscape targets. Approximately 9% (4191 ha) of the Wood Hill Association is mapped as remnant vegetation, of which 23% (968 ha) is formally conserved and protected within National Parks and Wildlife reserves and private Heritage Agreements under the NV Act. A full summary is provided below in Table 1.

Table 1. IBRA bioregion, subregion, and environmental association environmental landscape summary.

Murray Darling Depression IBRA bioregion	
An extensive gently undulating sand and clay plain of Tertiary and Quaternary age frequently overlain by aeolian dunes. Vegetation consists of semi-arid woodlands of Black Oak / Belah, Bullock Bush/ Rosewood and Acacia spp., mallee shrublands and heathlands and savanna woodlands.	
Murray Mallee IBRA subregion	
Extensive calcreted plains overlain by a series of sand dunes The calcreted ridges which form the undulating plain have a distinct west-north-westerly trend. The soils are shallow reddish sands on the plains and deep yellowish sands on the dunes. Fans bordering the Mt Lofty Ranges with low isolated hills rising above them have red duplex soils and calcareous earths subject to sheet erosion. Mallee is the dominant vegetation of the subregion. Its species composition reflects the diminishing coastal influence towards the north, especially in the understorey: broombush gives way here to saltbush and bluebush (*Atriplex* and *Maireana* spp.) and hummock grass (*Triodia irritans*). Blue gum (*E. leucoxylon*) and peppermint box (*E. odorata*) are characteristic species in the west of the region. Although tracts of mallee still occur, most of the original vegetation has been cleared for agriculture.	
Remnant vegetation	Approximately 21% (444401 ha) of the subregion is mapped as remnant native vegetation, of which 17% (76180 ha) is formally conserved
Landform	Very gently undulating, to flat aeolian sand covered depositional plain of the central-southern Murray Basin.
Geology	East-west linear dunes regularly spaced with cusp-like crests which are consistently steeper on the southern side. Up to four buried paleosols within the dune. Dunes composed of pale to dark reddish-brown calcareous sand with some clay fraction
Soil	Brown calcareous earths and highly calcareous brown loamy earths, Hard setting loamy soils with red clayey subsoils, Cracking clays.

Vegetation	Mallee heath and shrublands.
Conservation significance	101 species of threatened fauna, 136 species of threatened flora. 9 wetlands of national significance.
Wood Hill IBRA environmental association	
Remnant vegetation	Approximately 9% (4191 ha) of the association is mapped as remnant native vegetation, of which 23% (968 ha) is formally conserved
Landform	Undulating calcrete plain sloping gently to the east with superimposed sand dunes and imperfectly drained depressions.
Geology	Sand, calcrete and clay.
Soil	Bleached sands, brown calcareous earths, red weakly structured sandy soils and sandy pedal mottled-yellow duplex soils.
Vegetation	Open scrub of ridge-fruited mallee, narrow-leaved red mallee and broombush.
Conservation significance	34 species of threatened fauna, 41 species of threatened flora. 1 wetlands of national significance.

3.2.2 Climate

The closest weather station to the Project area is located near Pallamana Aero (BOM 2019). This weather station is located approximately 22 km south of the Project area. The annual average rainfall is 305.1 mm. The majority of the rainfall occurs during winter with the highest falls in July (average 37.3 mm) (Figure 2). The mean minimum temperature ranges from 4.5°C (August) to 14.5°C (January) and the mean maximum temperature ranges from 15.7°C (July) to 30.8°C (January).

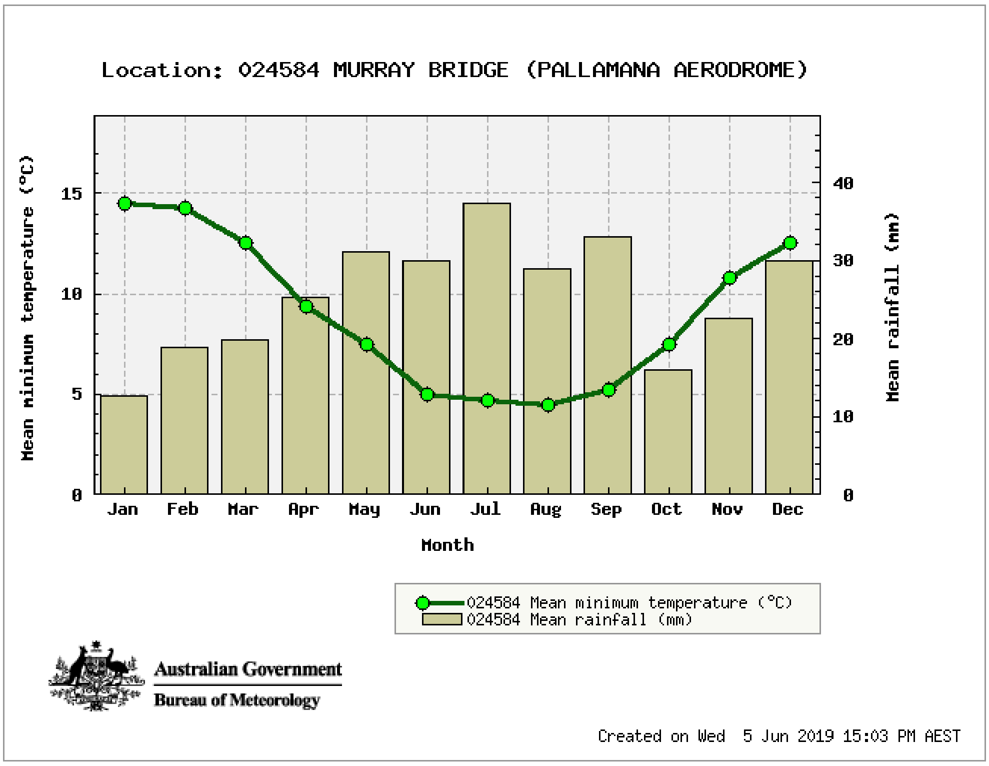


Figure 2. Mean monthly rainfall and temperature data for Pallamana Aerodrome (station no. 024584) (BOM 2019).

4 METHODS

4.1 Desktop assessment

An initial desktop assessment was conducted by AECOM (2019) to assess the potential for any threatened species (both Commonwealth and State listed) to occur within the Project area. This was achieved by generating a Protected Matters Search Tool (PMST) report on 20 June 2019 to identify MNES under the EPBC Act that may occur within a 10 km buffer of the Project area. The PMST is maintained by the Department of the Environment and Energy (DotEE) and was used to identify flora and fauna species or ecological communities of national environmental significance that may occur or have suitable habitat within the Project area. Records of species listed under the EPBC Act and South Australia's NPW Act were assessed using NatureMaps, which is maintained by DEW. The dataset was obtained on 28 June 2019 and used to identify threatened species that have been recorded within the 10 km buffer of the Project area.

4.1.1 Assessment of the likelihood of occurrence

The likelihood of each threatened flora and fauna species occurring within the Project area (as determined by AECOM 2019) was assessed. A likelihood of occurrence rating (Highly Likely/Known, Likely, Possible, Unlikely, Impossible) was assigned to each threatened species identified in the desktop database searches. The ratings take the following criteria into consideration:

- Date of the most recent record (taking into consideration the date of the last surveys conducted in the area);
- Proximity of the records (i.e. distance to the Project area);
- Landscape, vegetation remnancy and vegetation type of the record location (taking into consideration the landscape, vegetation remnancy and vegetation type of the Project area, with higher likelihood assigned to species that were found in similar locations/condition/vegetation associations); and
- Knowledge of the species habitat preferences, causes of its decline, and local population trends.

A summary of the likelihood criteria is shown below in Table 2.

Table 2. Likelihood criteria for the occurrence of threatened species.

Likelihood	Criteria
Impossible	• Species cannot occur in Project area (e.g. it is impossible for a marine mammal to occur in a terrestrial Project area).
Unlikely	• No records despite survey effort considered adequate, or • No records and survey effort is considered not adequate, and no suitable habitat is known to occur in the area, or • No records and survey effort is not considered adequate, and no suitable is known to occur in the area, and species of similar habitat needs have no records either.
Possible	• No records, survey effort is considered not adequate, suitable habitat does occur (or isn't known if it does occur) and species of similar habitat needs have been recorded in the area, or • Records within the last 40 years, and the area is not largely intact, or

Likelihood	Criteria
	• Records in the last 10 years, the species does not have highly specific needs, and habitat is largely intact.
Likely	• Records in the last 10 years, the species does not have highly specific habitat needs and the habitat is largely intact, or • Records in the last 10 years, the species does have highly specific habitat needs and these needs occur in the area.
Highly likely/known	• Records in the last 10 years, the species does not have highly specific needs, and the habitat is largely intact.

4.2 Field survey

The field survey was conducted on 21 August 2019 and included a vegetation and fauna assessment.

4.2.1 Vegetation assessment

Bushland Assessment Method (BAM)

The vegetation assessment was undertaken by NVC Accredited Consultant Mark Laws. The assessment was conducted in accordance with the BAM (NVC 2019). The BAM is endorsed by the NVC and used to assess areas of native vegetation requiring clearance and calculate the SEB requirements. The method is derived from the Nature Conservation Society of South Australia's (NCSSA) Bushland Condition Monitoring (BCM) methodology (Croft *et al.* 2007, 2008a, 2008b, 2009; Milne & Croft 2012; Milne & McCallum 2012). The BAM involves quantitative on ground and desktop assessments of native vegetation and ecological values.

When using the BAM, each area to be assessed (i.e. each application area) is termed a 'Block', which is stratified into 'Sites'. Each Site, which relates to a vegetation association found within the Block, is assessed in a representative 1 ha quadrat and compared to its corresponding NCSSA 'benchmark' vegetation community.

Three components of the biodiversity value of a Site are measured and scored:

- Landscape context;
- Vegetation condition; and
- Conservation value.

The factors that influence each of these components and their score ranges are described in Table 3. Factors that influence the value of the three components used to calculate the total SEB area and value in the BAM (NVC 2017a). The score range of each parameter is also shown.. The scores of these three components are combined to provide the Unit Biodiversity Score (per ha) and then multiplied by the size (ha) of the Site to provide the Total Biodiversity Score for the Site.

Table 3. Factors that influence the value of the three components used to calculate the total SEB area and value in the BAM (NVC 2017a). The score range of each parameter is also shown.

Component	Factors	Score range
Landscape context	• Percentage vegetation cover within 5 km; • Block shape; • Remnancy of IBRA Association; • Percentage of vegetation protected within the IBRA Association; and • The presence of riparian vegetation, swamps or wetlands.	1.00-1.25
Vegetation condition	• Native plant species diversity; • Number of native lifeforms and their cover; • Number of regenerating species; • Weed cover and the level of invasiveness of dominant weed species; • Mature tree health, fallen timber, hollow-bearing trees and tree canopy; and • Native: exotic understorey biomass.	max 80.00
Conservation significance	• The presence of federal or state listed threatened ecological communities, and their conservation rating; • Number of threatened plant species recorded at the site, and their conservation rating; and • Number of threatened fauna species and their conservation rating or potential habitat occurs within the site.	1.00-1.50

BAM scoresheets

The conservation significance scores were calculated from direct observations of flora and direct and historical observations of fauna species of conservation significance. Historical fauna observations within 5 km of the Project area were obtained from the PMST, BDBSA and NatureMaps. Only BDBSA and NatureMaps records no more than 20 years old and with a locational reliability of <1 km were used. For the PMST, only species or species habitat known to occur within a 5 km buffer were included (BAM manual sections 6.3.3; NVC 2019).

NatureMaps (DEW 2019) was used to determine the rainfall factor of 351 mm, percent vegetation cover within 5 km and the block shape input into the BAM scoresheets.

4.2.2 Fauna assessment

The areas containing remnant vegetation within Project area were traversed on foot. All fauna species, signs of species and potential habitat for fauna was recorded. The value of habitat for the threated fauna species identified in the desktop assessment was also determined when searching each area.

4.3 Limitations

The content of the desktop assessment was derived from the AECOM (2019) report, which included a NatureMaps data extraction to source threatened flora and fauna records. NatureMaps only includes verified flora and fauna records submitted to DEW or partner organisations. It is recognised that knowledge is poorly captured and it is possible that significant species occur that are not reflected by database records. Although much of the NatureMaps data has been through a variety of validation processes, the lists may contain errors and should be used with caution. DEW gives no warranty that the data is accurate or fit for any particular purpose of the user or any person to whom the user discloses the information.

The reliability of NatureMaps records were filtered to include those from the past 20 years and within 10 km, unless marked as having occurred within 10 km. Fauna species, in particular birds, also have the ability to traverse distances in excess of 10 km. It is also acknowledged that the presence of species may not be adequately represented by database records. Hence the PMST and NatureMaps results may not highlight all potential threatened flora and fauna species that may occur in the area, within a 10 km radius.

The fauna assessment was performed to determine the likelihood of presence for threatened fauna species. In addition to this, all fauna species observed were recorded. The compiled list of fauna observations does not represent all species expected to occur within the Project area.

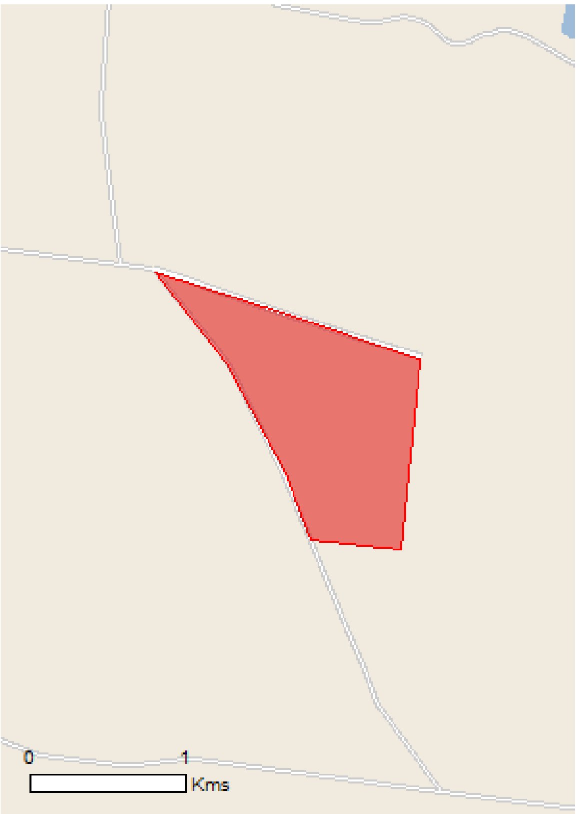
The findings and conclusions expressed by EBS are based solely upon information in existence at the time of the assessment. The combination of database records and background research have provided a solid foundation for determining the flora and fauna that are likely to, or are known to, occur within the Project area.

5 DESKTOP ASSESSMENT RESULTS

One wetland of international significance, four TECs, 27 threatened species and 13 migratory species were identified in the PMST as potentially occurring or having suitable habitat potentially occurring within 10 km of the Project area. The results of the EPBC Act PMST report as generated by AECOM (2019) are summarised in Table 4.

The relevant MNES, other matters protected under the EPBC Act, and threatened species listed under the NPW Act are discussed in detail below. Listed aquatic dependent species (i.e. fish) are included in Table 4 but are not relevant and therefore not discussed, as the Project area and potential impacts are confined to the terrestrial environment.

Table 4. Summary of the results of the EPBC Act Protected Matters Search Tool report.

Search area (5 km buffer)	MNES under the EPBC Act	Identified within the search area
	World Heritage Properties	None
	National Heritage Properties	None
	Wetlands of International Significance	1
	Great Barrier Reef Marine Park	None
	Commonwealth Marine Areas	None
	Threatened Ecological Communities	4
	Threatened Species	27
	Migratory Species	13
	Commonwealth Lands	None
	Commonwealth Heritage Places	None
	Listed Marine Species	19
	Whales and other Cetaceans	None
	Critical Habitats	None
	Commonwealth Reserves	None
	State and Territory Reserves	4
	Regional Forest Agreements	None
	Invasive Species	33
	Nationally Important Wetlands	None

5.1.1 Wetlands of international significance

The Coorong and Lakes Alexandrina and Albert Ramsar site is located at the downstream end of the Murray River, in south-east South Australia. The Project area is located approximately 40 km north of the Ramsar listed wetland. The Project will therefore have no impact on the listed wetland.

5.1.2 Threatened ecological communities

Four TECs were identified in the PMST as potentially occurring within 10 km of the Project area. A summary of these TECs and comment regarding their likelihood of occurrence in the Project area are provided in Table 5. None of the four TEC's were identified within the Project area during the field surveys.

Table 5. The TECs identified in the PMST and their likelihood of presence within the Project area.

Threatened Ecological Community	EPBC status	Likelihood of occurrence in the Project area
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	E	Unlikely
Iron-grass Natural Temperate Grassland of South Australia	CE	Unlikely
Peppermint Box (*Eucalyptus odorata*) Grassy Woodland of South Australia	CE	Unlikely
River Murray and associated wetlands, floodplains and groundwater systems, from the junction with the Darling River to the sea	Approval Disallowed	Unlikely

EPBC status conservation codes: CE: Critically Endangered. EN: Endangered. VU: Vulnerable.

5.1.3 Nationally threatened flora

Eleven (11) flora species were listed as threatened under the EPBC Act identified in the PMST as potentially occurring or having suitable habitat potentially occurring within 10 km of the Project area (Table 6). *Olearia pannosa* subsp. *pannosa* (Silver Daisy-bush) was the nationally threatened flora species to have been recorded within 10 km of the Project area in the past 20 years. As *Olearia pannosa* subsp. *pannosa* (Silver Daisy-bush) can occur in mallee associations (DotEE 2013), which occur in the Project area (DEW 2019), it is possible that it could occur. No other nationally threatened flora species are expected to occur in the Project area based upon their species distributions and the habitats present.

5.1.4 State threatened flora

Six flora species solely listed as threatened under the NPW Act were identified in the NatureMaps search as having been previously recorded within 10 km of the Project area in the past 20 years. *Olearia passerinoides ssp. glutescens* (Sticky Daisy-bush) can occur in mallee associations (Prescott 2012), which occur in the Project area (DEW 2019), it is possible that it could occur. No other State threatened flora species are expected to occur in the Project area based upon their species distributions and the habitats present.

Table 6. Threatened flora species listed under the EPBC Act and NPW Act identified in the PMST (Source 1) and NatureMaps (Source 2) database searches within 10 km of the Project area. Note: NatureMaps records were filtered to those from the last 20 years.

Scientific name	Common name	Conservation status		Source	Last record (Year)	Likelihood of occurrence within Project area
		Aus	SA			
Acacia menzelii	Menzel's Wattle	VU	V	1		Unlikely
Acacia pinguifolia	Flat-leaved Wattle	EN	E	1		Unlikely
Acacia rhetinocarpa	Neat Wattle	VU	V	1		Unlikely
Caladenia argocalla	White-beauty Spider-orchid	EN	E	1		Unlikely
Caladenia tensa	Greencomb Spider-orchid	EN		1		Unlikely

Scientific name	Common name	Conservation status		Source	Last record (Year)	Likelihood of occurrence within Project area
		Aus	SA			
Centrolepis cephaloformis ssp. cephaloformis	Cushion Centrolepis		R	2	2010	Unlikely
Eucalyptus fasciculosa	Pink Gum		R	2	2005	Unlikely
Glycine latrobeana	Clover Glycine	VU	V	1		Unlikely
Hypericum japonicum	Matted St John's Wort		R	2	2017	Unlikely
Lachnagrostis robusta	Tall Blown-grass		R	2	2003	Unlikely
Olearia pannosa subsp. *pannosa*	Silver Daisy Bush	VU	V	1, 2	2016	Possible
Olearia passerinoides ssp. glutescens	Sticky Daisy-bush		R	2	2010	Possible
Prasophyllum pallidum	Pale Leek-orchid	VU	E	1		Unlikely
Prostanthera eurybioides	Monarto Mintbush	EN	E	1		Unlikely
Thelymitra epipactoides	Metallic Sun-orchid	EN	E	1		Unlikely
Thelymitra matthewsii	Spiral Sun-orchid	VU	E	1		Unlikely
*Veronica decorosa**	Showy Speedwell*		R	2	2017	Unlikely

Conservation status:
Aus: Australia (EPBC Act). SA: South Australia (NPW Act). Conservation codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. ssp.: the conservation status applies at the sub-species level.
***Species recorded within 5 km of the Project area**

5.1.5 Nationally threatened fauna

Sixteen (16) nationally threatened fauna species were listed as threatened under the EPBC Act identified in the PMST as potentially occurring or having suitable habitat potentially occurring within 10 km of the Project area. Since the generation of the PMST report, the White-throated Needletail was listed as Vulnerable under the EPBC Act and was considered as part of the desktop assessment. Two nationally threatened species have been recorded in the past 20 years within 10 km of the Project area. No nationally threatened fauna species are expected to occur in the Project area based upon their species distributions and the habitats present.

5.1.6 Nationally listed migratory fauna

Eight fauna species listed as migratory under the EPBC Act identified in the PMST as potentially occur or having suitable habitat potentially occurring within 10 km of the Project area. Four migratory species have been recorded in the past 20 years within 10 km of the Project area, including two species not listed in the PMST report. As such, overall 10 migratory species were considered in the desktop assessment. The Fork-tailed Swift (*Apus pacificus*) can fly above a wide range of habitats (Pizzey and Knight 2014), and therefore, may occur aerially above the Project area. No other migratory species listed under the EPBC Act area expected to occur in the Project area based upon their species distributions and the habitats present.

5.1.7 State threatened fauna

Seventeen (17) fauna species listed as threatened under the NPW Act identified in the NatureMaps search as having been previously recorded within 10 km of the Project area in the past 20 years. The desktop assessment determined the eight State threatened fauna species (one ‘likely’ and seven ‘possible’) may occur in the Project area:

- White-winged Chough (*Corcorax melanorhamphos*);
- Eastern Shrike-tit (*Falcunculus frontatus frontatus*);
- Hooded Robin (*Melanodryas cucullata cucullata*);
- Black-chinned Honeyeater (*Melithreptus gularis*);
- Jacky Winter (*Microeca fascinans*);
- Restless Flycatcher (*Myiagra inquieta*);
- Diamond Firetail (*Stagonopleura guttata*); and
- Elegant Parrot (*Neophema elegans*).

All seven species considered to possibly occur are more likely to be present at Reedy Creek and the hills to the west of Tepko, with few, if any, records of these species on the plains to the south of Reedy Creek and west of the eastern Mount Lofty Ranges.

Table 7. Threatened fauna listed under the EPBC Act and NPW Act identified in the PMST (Source 1) and NatureMaps (Source 2) database searches within 10 km of the Project area. Note: NatureMaps records were filtered to those from the last 20 years.

Scientific name	Common name	Conservation status		Source	Last record (Year)	Likelihood of occurrence within Project area
		Aus	SA			
ACTINOPTERYGII	RAY-FINNED FISH					
Craterocephalus fluviatilis	Murray Hardyhead	EN		1		Impossible
Galaxias rostratus	Flathead Galaxias	CE		1		Impossible
Maccullochella peelii	Murray Cod	VU		1		Impossible
AMPHIBIA	AMPHIBIANS					
Litoria raniformis	Growling Grass Frog	VU	V	1, 2	2005	Unlikely
Pseudophryne bibronii	Brown Toadlet		R	2	2010	Unlikely
AVES	BIRDS					
Actitis hypoleucos	Common Sandpiper	Mi	R	1, 2	2006	Unlikely
Anas rhynchotis rhynchotis	Australasian Shoveler		R	2	2006	Unlikely
Anhinga novaehollandiae	Australasian Darter		R	2	2012	Unlikely
Apus pacificus	Fork-tailed Swift	Mi		1		Possible
Ardea intermedia	Intermediate Egret		R	2	2017	Unlikely
Botaurus poiciloptilus	Australasian Bittern	EN	V	1, 2	2004	Unlikely
Calidris acuminata	Sharp-tailed Sandpiper	Mi		1		Unlikely
Calidris ferruginea	Curlew Sandpiper	CE, Mi		1		Unlikely
Calidris melanotos	Pectoral Sandpiper	Mi	R	1		Unlikely
Calidris ruficollis	Red-necked Stint	Mi		2	2012	Unlikely
Cinclosoma punctatum anachoreta	Mt Lofty Ranges Spotted Quail-thrust	CE	E	1		Unlikely
Cladorhynchus leucocephalus	Banded Stilt		V	2	2012	Unlikely

Scientific name	Common name	Conservation status		Source	Last record (Year)	Likelihood of occurrence within Project area
		Aus	SA			
Corcorax melanorhamphos	White-winged Chough		R	2	2017	Likely
Egretta garzetta	Little Egret		R	2	2017	Unlikely
Falcunculus frontatus	Eastern Shriketit		R	2	2004	Possible
Gallinago hardwickii	Latham's Snipe	Mi	R	1		Unlikely
Grantiella picta	Painted Honeyeater	VU	V	1		Unlikely
Hirundapus caudacutus	White-throated Needletail	VU, Mi		1		Unlikely
Hydroprogne caspia	Caspian Tern	Mi		2	2015	Unlikely
Leipoa ocellata	Malleefowl	VU	V	1		Unlikely
Melanodryas cucullata	Hooded Robin		R	2	2015	Possible
Melithreptus gularis	Black-chinned Honeyeater		V	2	2008	Possible
Microeca fascinans	Jacky Winter		R	2	2017	Possible
Motacilla cinerea	Grey Wagtail	Mi		1		Unlikely
Motacilla flava	Yellow Wagtail	Mi		1		Unlikely
Myiagra cyanoleuca	Satin Flycatcher	Mi	E	1		Unlikely
Myiagra inquieta	Restless Flycatcher		R	2	2016	Possible
Neophema elegans	Elegant Parrot		R	2	2012	Possible
Numenius madagascariensis	Far Eastern Curlew	CE, Mi	V	1		Unlikely
Pandion haliaetus	Osprey	Mi	E	1		Unlikely
Pedionomus torquatus	Plains-wanderer	CE	E	1		Unlikely
Pezoporus occidentalis	Night Parrot	EN	E	1		Unlikely
Rostratula australis	Australian Painted-snipe	EN	V	1		Unlikely
Stagonopleura guttata	Diamond Firetail		V	2	2018	Possible
Tringa nebularia	Common Greenshank	Mi		1, 2	2006	Unlikely
Turnix varius	Painted Buttonquail		R	2	2015	Unlikely
MAMMALIA	MAMMALS					
Nyctophilus corbeni	Corben's Long-eared Bat	VU	V	1		Unlikely
Pteropus poliocephalus	Grey-headed Flying-fox	VU	R	1		Unlikely
Trichosurus vulpecula	Common Brushtail Possum		R	2		Unlikely
REPTILIA	REPTILES					
Tiliqua adelaidensis	Pygmy Blue-tongue Lizard	EN		1		Unlikely
Emydura macquarii	Macquarie River Turtle		V	2		Unlikely

Conservation status:
Aus: Australia (EPBC Act). SA: South Australia (NPW Act). Conservation codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. Mi: Migratory species.

5.1.8 State and territory reserves

Four heritage agreements occur within a 10 km buffer of the Project area:

- Unnamed (No.HA1200);
- Unnamed (No.HA140);
- Unnamed (No.HA9018); and
- Unnamed (No.HA9044).

6 FIELD ASSESSMENT RESULTS

6.1 Flora assessment

The dominant landform in the Project area is very gently undulating, to flat aeolian sand covered depositional plain, which has been extensively cleared for agriculture. Consequently, the likelihood of suitable habitat for threatened flora and fauna species within the Project area is very low.

One native vegetation association (Site A1) was assessed under the BAM (NVC 2019). The vegetation association in Site A1 was Eucalyptus sp. Mixed Open Mallee over *Enchylaena tomentosa* +/- *Maireana brevifolia* (Figure 3). The condition of the vegetation association was poor to moderate with only the overstorey stratum remaining intact. Native vegetation in the under- and mid-storey stratum was highly degraded by stock grazing and weed invasion. These degrading processes resulted in the presence of only two native under- and mid-storey species; *Enchylaena tomentosa* and *Maireana brevifolia*, which are resilient or favoured by disturbance.

Based on the results of the desktop assessment (5.1.7) and observations made during the fauna field assessment (section 6.2 and 7.1), Site A1 is known to be used by White-winged Choughs and may provide suitable habitat for the Elegant Parrot. Therefore, these species were included in the BAM scoresheet to calculate the Conservation Significance Score.

An image and summary of Site A1 is shown in Section 6.1.1. The BAM scoresheet is provided as Attachment 1.

A complete list of flora species observed in the Project area is shown in Appendix 1.

Figure 3. Vegetation association Site A1.

6.1.1 Vegetation associations

Table 8. Vegetation Association 1 (Site A1) – *Eucalyptus sp. Mixed Open Mallee over Enchylaena tomentosa +/- Maireana brevifolia* (Figure 3).

	Site A1
Area (ha)	3.54
Soil type	Sandy Loam
Native species (*Minus herbaceous annuals for spring surveys*) (#)	7
Introduced flora species (#)	6
Native plant life forms	Shrubs <0.5 m (1-5%) Mallee <5m (<1%) Mallee >5m (6-25%) Trees <5m (<1%) Trees 5-15 m (1-5%)
Native: exotic understorey biomass	<5%
Landscape Context Score	1.10
Vegetation Condition Score	26.25
Conservation Significance Score	1.04
Unit Biodiversity Score	30.03
Total Biodiversity Score	**106.31**

6.2 Fauna assessment

Ten fauna species were recorded in Project area during the fauna assessment. Individuals of nine of the ten species were observed, while a nest of a White-winged Chough was recorded (Figure 4). The White-winged Chough, rated State Rare, was the only species of state conservation significance to be recorded. No nationally threatened fauna were recorded and the habitat within the Project area.

Table 9. Fauna species recorded within the Project area during the fauna assessment.

Introduced	Scientific name	Common name	Conservation Status	
			Aus	SA
	Corcorax melanorhamphos	White-winged Chough#		R
	Cracticus tibicen	Australian Magpie		
*	*Lepus europaeus*	Hare		
	Lichenostomus virescens	Singing Honeyeater		
	Manornia melanocephala	Noisy Miner		
	Ocyphaps lophotes	Crested Pigeon		
	Pardalotus striatus	Striated Pardalote		
*	*Passer domesticus*	House Sparrow		
	Platycerus elegans	Crimson Rosella		
*	*Sturnus vulgaris*	Common Starling		

Conservation status:
Aus: Australia (EPBC Act). SA: South Australia (NPW Act). Conservation codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. Mi: Migratory species.
***: Introduced species**
#: Nest observed but no individuals

Figure 4. A White-winged Chough (*Corcorax melanorhamphos*) nest observed within the patch of remnant vegetation in the Project area.

7 DISCUSSION

The Project based on its current infrastructure layout will not result in any native vegetation clearance (Figure 3). The patch of remnant Mallee (Site A1) in the Project area was in poor condition (see section 6.1.1), however, its condition may be improved with the removal of stock grazing. Reducing the grazing pressure within the patch of remnant Mallee would allow for the increase growth and cover of native shrub and grass species and allow for the regeneration of any over-storey species. Fallen wooden debris should be retained within the patch which will help to provide structural diversity and niche habitats for small vertebrates and invertebrates, as well as benefitting nutrient cycling.

7.1 National and State threatened species

The habitat within the Project area was of poor condition with under- and mid-storey vegetation largely devoid of native vegetation. Given this, there are notable changes to the likelihood of occurrence for numerous threatened flora and fauna species.

The desktop assessment determined that two threatened flora species had potential to occur:

- Silver Daisy Bush (*Olearia pannosa* subsp. *pannosa*) (Aus: VU, SA: V); and
- Sticky Daisy Bush (*Olearia passerinoides ssp. glutescens*) (SA: R).

Both species are conspicuous and would have been observed by the two ecologists whom ramble searched the 3.54 ha patch of remnant vegetation for two hours. Furthermore, these species are threatened by livestock grazing, and therefore, would have been grazed out by cattle from the remnant vegetation patch if historically present.

The desktop assessment determined that nine State threatened fauna species had potential to occur:

- White-winged Chough (*Corcorax melanorhamphos*) (SA: R);
- Eastern Shrike-tit (*Falcunculus frontatus frontatus*) (SA: R);
- Hooded Robin (*Melanodryas cucullata cucullata*) (SA: R);
- Black-chinned Honeyeater (*Melithreptus gularis*) (SA: V);
- Jacky Winter (*Microeca fascinans*) (SA: R);
- Restless Flycatcher (*Myiagra inquieta*) (SA: R);
- Diamond Firetail (*Stagonopleura guttata*) (SA: V); and
- Elegant Parrot (*Neophema elegans*) (SA: R).

Due to the poor condition of the remnant vegetation patch, which had few native plants in the under- and mid-storey layers, and the very low remnancy of native vegetation south of Reedy Creek and east of the hills near Tepko, all State threatened species identified as having potential to occur in the Project area from the desktop assessment (see Section 5.1.7), with the exception of the White-winged Chough and Elegant Parrot, have been downgraded to unlikely. A White-winged Chough nest was recorded within the

Project area, which confirmed their presence. While the Elegant Parrot is a highly mobile species, and as such, could use the remnant patch of vegetation when moving through the landscape.

Overall, the Project area is of negligible value for flora and fauna threatened species.

7.2 Recommendations

7.2.1 Avoidance

Given the current land use in the Project area is agricultural and areas of native vegetation and scattered trees along boundaries have been excluded from the design footprint (Figure 3), every effort has been made to avoid the unnecessary clearance of vegetation to construct the proposed power generation plant.

The proponent has avoided a 3.54 ha patch *of Eucalyptus sp.* Mixed Open Mallee over *Enchylaena tomentosa* +/- *Maireana brevifolia* in the Project area (Figure 3). No other remnant vegetation is present within the Project area.

7.2.2 Minimisation

Methods used to clear land for Project construction must be chosen to ensure that there is no impact on the remnant patch of native vegetation. Weed and pathogen hygiene measures, and site drainage and erosion management should be employed as part of the vegetation removal process and during construction and operation to ensure that no new weeds or other pathogens are introduced to existing native vegetation.

7.2.3 Screening vegetation

Trees suitable to screen the Summerfield Power Generation Project include those recorded within the Project area, such as *Eucalyptus oleosa* ssp. *oleosa* (Red Mallee), *Eucalyptus gracilis* (Yorrel) and *Eucalyptus incrassata* (Ridge-fruited Mallee). These species had grown to approximately 12 m in the Project area and based upon their structure would provide visual screening where their canopies overlap (typically between 6 and 12 m in height). To provide screening at lower heights, other *Eucalyptus* spp. indigenous to the Monarto area are suitable for revegetation:

- *Eucalyptus phenax* ssp. *phenax* (White Mallee); for the deepest sand areas, 2-6 m in height, 4 m average;
- *Eucalyptus leptophylla* (Narrow-leaved Red Mallee); general planting, typically to 5 m in height, 3.5 m average; and
- *Eucalyptus calycogona* (Square-fruited Mallee); 2-6 m in height, 3.5 m average.

There are also numerous *Acacia* spp. that are indigenous to the area and should have readily available seed resources. These species are suitable for screening as they are dense in habit, fast growing and relatively easy to maintain once established:

- *Acacia brachybotrya* (Grey Mulga-bush); 1-3 m;
- *Acacia argyrophylla* (Silver Mulga-bush); 2-3 m;
- *Acacia macrocarpa* (Manna Wattle); 1-3 m;

- *Acacia calamifolia* / *euthycarpa* (Wallowa); 2-4 m;
- *Acacia hakeoides* (Hakea Wattle); 2-4 m;
- *Acacia montana* (Mallee Wattle); 1.5-3.5 m; and
- *Acacia wilhelmiana* (Dwarf Nealie); 2-4 m.

Other local shrub species that are suitable and should have seed available in the area include:

- *Melaleuca lanceolate* (Dryland Tea-tree); 1-2 m;
- *Melaleuca uncinata* (Broombush); 1-3 m; and
- *Dodonaea viscosa* ssp. s*pathulata* (Sticky Hop-bush); to 3 m max in this area.

Understorey species to be included for good measure to enhance the species and structural diversity include:

- *Rhagodia candolleana* (Sea-berry Saltbush);
- *Rhagodia parabolica* (Mealy Saltbush); and
- *Enchylaena tomentosa* (Ruby Saltbush).

A direct seeded mix of these species would result in a very dense screen without a significant width (i.e. 4 m). There are some examples where a similar mix of species has been done; one is on the Wellington to Langhorne Creek Road at junction of Boundary Road. Another is south of Tailem Bend near the railway overpass and the Mallee Highway intersection (may have been disturbed by the Tailem Bend motor park development, but some may remain). Both these areas provide dense screening at around 2-3 m in height.

These species are ideal for use in that there should be a very high success rate for seeding given average conditions as these species are adapted for the conditions present at the Tepko site, have significant seed resources available in the wider area, have a dense habit generally and will outcompete weed species. Furthermore, they will provide habitat resources for local fauna such as nesting, roosting and nectar.

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9 APPENDIX

Appendix 1. Flora species recorded within the Project area.

Introduced	Species name	Common name
	Eucalyptus incrassata	Ridge-fruited Mallee
	Eucalyptus oleosa ssp. oleosa	Red Mallee
	Eucalyptus gracilis	Yorrell
	Enchylaena tomentosa var. tomentosa	Ruby Saltbush
	Maireana brevifolia	Short-leaf Bluebush
	Callitris gracilis	Southern Cypress Pine
	Myoporum platycarpum ssp. platycarpum	False Sandalwood
*	*Lycium ferocissimum*	African Boxthorn
*	*Oxalis pes-caprae*	Soursob
*	*Brassica tournefortii*	Wild Turnip
*	*Romulea rosea var. australis*	Common Onion-grass
*	*Mesembryanthemum crystallinum*	Common Iceplant

EBS Ecology
125 Hayward Avenue
Torrensville, SA 5031
www.ebsecology.com.au
t. 08 7127 5607

Appendix F

Transport Impact Statement

Proposed Power Station Facility, Tepko

Traffic Impact Statement

31-Oct-2019
Prepared for – SAPGen Pty Ltd – ABN: 56 630 464 327

Proposed Power Station Facility, Tepko

Traffic Impact Statement

Client: SAPGen Pty Ltd

ABN: 56 630 464 327

Prepared by

AECOM Australia Pty Ltd
Level 28, 91 King William Street, Adelaide SA 5000, Australia
T +61 8 7223 5400 F +61 8 7223 5499 www.aecom.com
ABN 20 093 846 925

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Prepared by	Chris Przibilla & Brett Williams
Reviewed by	Frank Jaskiewicz

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Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	15-Oct-2019	Draft for Client Review	Tom Hateley Project Manager	
B	31-Oct-2019	Final for Issue	Tom Hateley Project Manager	

Table of Contents

Executive summary

AECOM Australia Pty Ltd (AECOM) has been engaged by SAPGen to conduct a Traffic Impact Statement (TIS). This assessment evaluates the risks posed to road infrastructure and road users including the impact on local traffic networks. With construction activity estimated to be undertaken over a 26-month period, reducing the impact on neighbouring properties during this phase is of high importance and therefore a series of recommendations has been made to mitigate traffic-related issues associated with local unsealed roads.

The TIS also identified key transportation routes to and from the location of the proposed power generation plant. Imported componentry, which includes gas turbines, solar panels and Battery Energy Storage Systems (BESS) is proposed to be transported from the Port of Adelaide via the following routes:

- Heavy vehicles, including B-doubles up to 26 m long can travel to site via the South Eastern Freeway, a journey distance of 122 km.
- General access semi-trailers up to 19 m in length can bypass Murray Bridge, turning at Monarto via Ferries McDonald Road, resulting in a journey distance of 115 km.
- Alternatively, larger road trains up to 36.5 m in length can access the site from the Port by travelling north of the city via the Sturt Highway and Sedan, a journey distance of 195 km.

Also considered is the movement of staff travelling in light vehicles that may live in the northern suburbs of Adelaide. The most likely route for these vehicles is via North East Road through Birdwood, approaching the site from the north-west, a journey distance of 96 km.

Due to the need for transportation of large items to and from the site, over-size and/or over-mass (OSOM) heavy vehicles are likely to be utilised. The use of large heavy vehicles could also achieve efficiency gains and reduce the number of heavy vehicles generated by the project. In order to meet compliance under Heavy Vehicle National Law, liaison with the National Heavy Vehicle Regulator, Department of Planning, Transport and Infrastructure (DPTI) and Mid Murray Council will be required for use of any vehicles that exceed General Access provisions.

1.0 Introduction

1.1 Project description

SAPGen Pty Ltd (SAPGen) has proposed a new, large-scale hybrid power generation facility at 120 Hoff Road, Tepko South Australia. The proposed location is a greenfield site located 10 km south-west of Mannum and 56 km east of Adelaide. The site lies at the intersection of a 275 kV transmission line and an SEA Gas pipeline making it an ideal location for a hybrid power generation facility.

The proposed facility will utilise ‘state of the art’ hybrid energy generation technology and provide up to an additional 422 MW of power to the state’s energy grid. As a reference to a local landmark, the Summerfield Lutheran Church, the development is named the ‘Summerfield Power Station’. As the location of the proposed site is rural in nature, long-distance transportation of both locally made and imported items for construction is inevitable and will form the basis for this report.

The aims of this Traffic Impact Statement are as follows:

- Identify the type and amount of traffic that may access the site on any given day
- Identify over-size and/or over-mass loads and assess potential transportation routes
- Identify heavy vehicle routes for goods and services deliveries to site
- Assess intersection safety at access points to public roads
- Provide recommendations to mitigate the effects of construction on the local community.

1.2 Project overview

Key aspects of the proposed project relevant to the Traffic Impact Statement are as follows.

- The hybrid power station, which is made up of various specialised componentry including:
  - 8 x LM2500Xpress Fast Start Gas Turbines with combined power output of 268.8 MW
  - 4 x BHGE SC2 Steam Turbines with combined power output of 112 MW
  - 12 MW solar farm comprising of approximately 40,000 individual solar panels covering an area of 119,403 m^2
  - 30 MW Battery Energy Storage System (BESS) with associated inverters
- Electrical transformers:
  - 4 x 95.2 MW 11.5 step to 275 kV
  - 1 x 52 MW 11.5 step to 275 kV
  - 1 x spare (for future solar)
- Breaker and half switch yard
- Associated onsite support facilities/ancillary development (office and amenities building, control room, workshop/storage building, security fencing, landscaping).

Most of the key components are provided as modularised, preassembled units with a significant amount of the site’s equipment to be packed down and transported within shipping containers. However, there are some large, indivisible components along with various construction materials including concrete, quarry materials and site buildings that will also require transportation to site. See Section 3.2 for further details on the equipment associated with the site and refer to Appendix A for concept drawings of the proposed development.

1.3 References

The following reference documentation was used to assist in the preparation of this report:

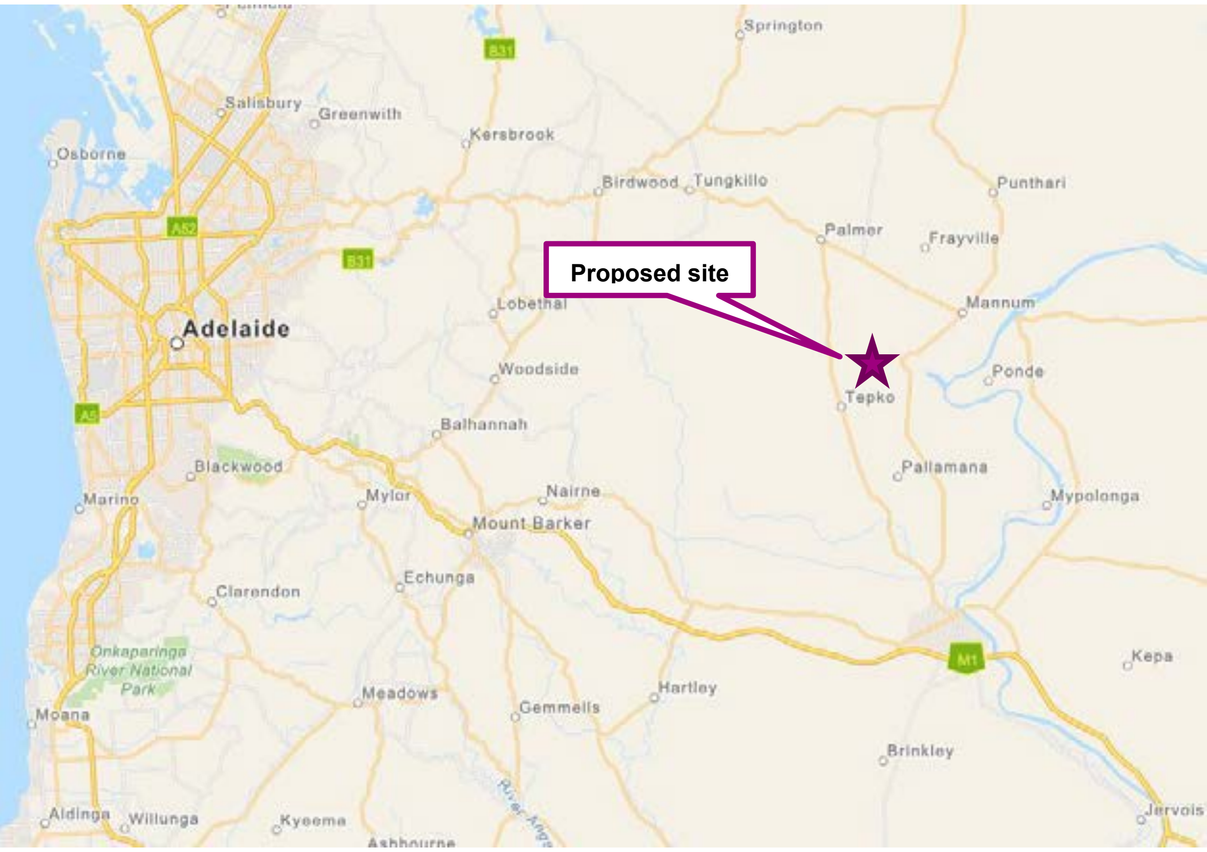
- DPTI *Functional Hierarchy for South Australia's Land Transport Network*

2.0 Location and existing road conditions

2.1 Location

The proposed site for the Summerfield Power Station (SPS) as shown in Figure 1 is approximately 56 km east of the Adelaide CBD, 19 km north of Murray Bridge and 10 km south-west of Mannum. It is located just west of Mannum Road and falls within the boundary of Mid Murray Council (Council).

Figure 1 Site location



Source: AECOM GIS

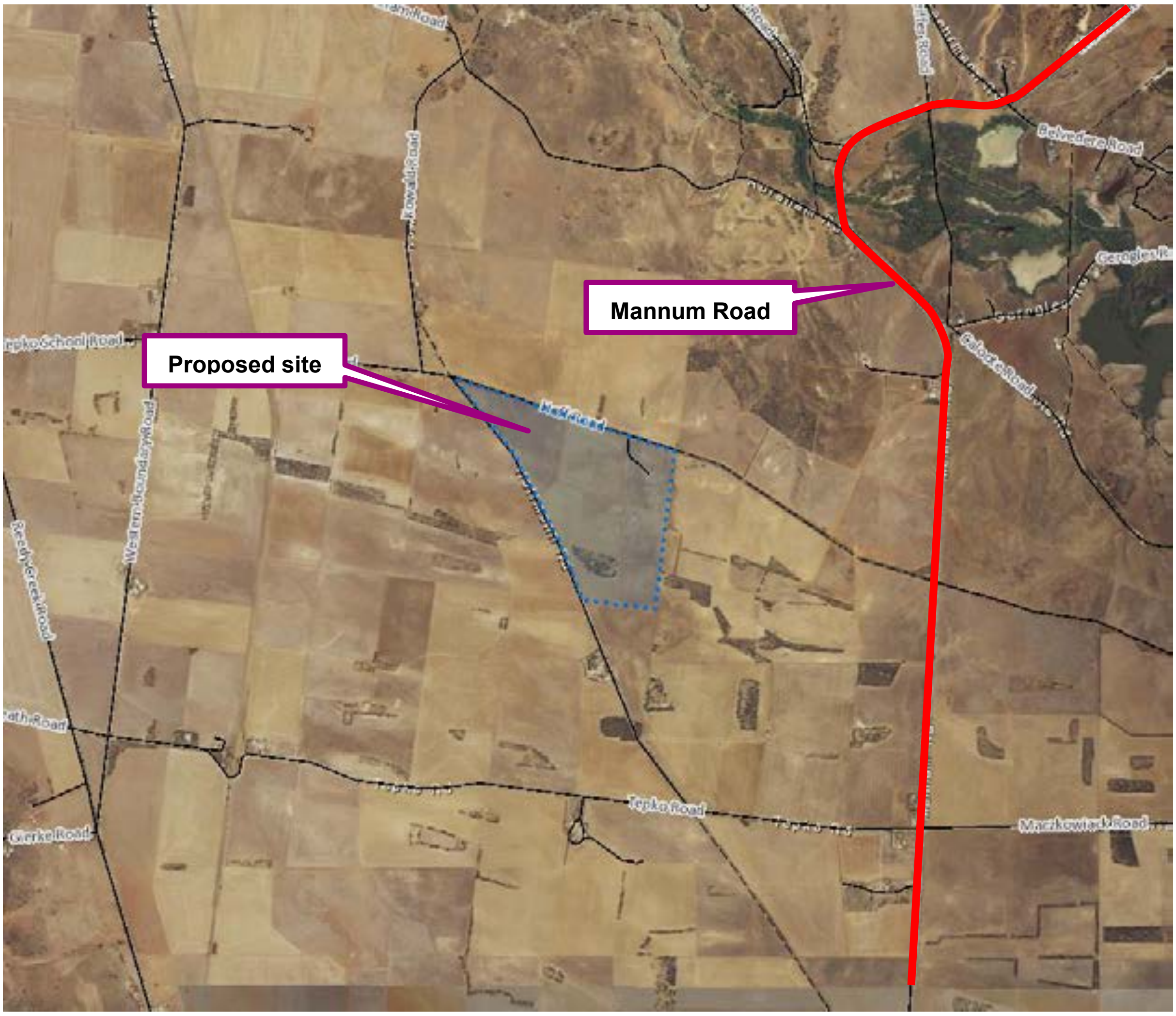
2.2 Proposed site subject land

The proposed SPS site is an irregular-shaped parcel covering approximately 95 hectares of primarily cleared agricultural pastoral cropping land that generally slopes downward from east to west. The land is currently zoned as 'Rural Zone – Policy Area Number 16 – Murray Plains Policy Area' under the Mid Murray Council Development Plan. Contained within the proposed site is an existing residential dwelling toward the north-eastern corner and approximately 3.4 hectares of native vegetation in the south-west corner, which are both to be retained.

2.3 Surrounding road network

Vehicular access to the site's existing dwelling is via Hoff Road, which is located along the northern boundary of the allotment with access via Hoffman Road. Mannum Road is the nearest arterial road to the proposed site, as shown in Figure 2. There is no road formation connecting Hoff Road to Mannum Road.

Figure 2 Proposed power facility site location at 120 Hoff Road, Tepko



Source: South Australian Property and Planning Atlas (https://maps.sa.gov.au/SAPPA/)

2.4 Site access

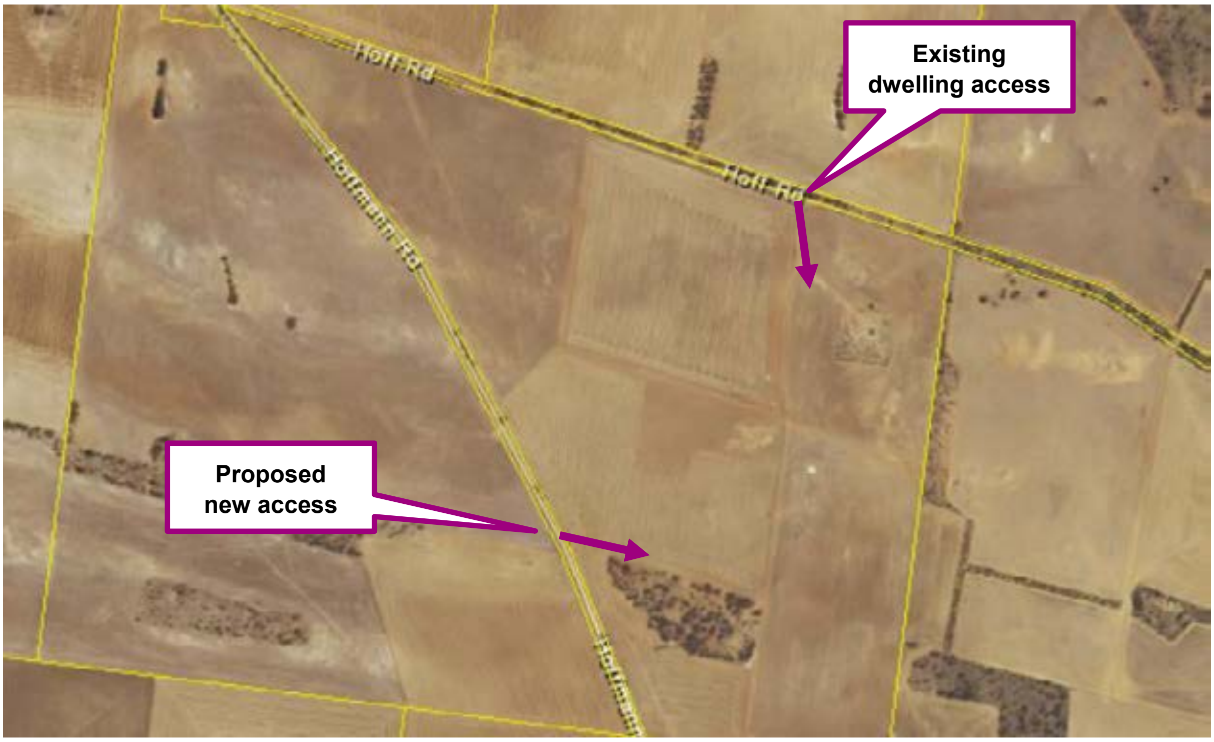
Access to Hoffman Road is typically via Tepko Road, which is also a two-way unsealed local road that connects with Mannum Road and Reedy Creek Road which are both State Arterial roads under the care and control of the Department of Planning, Transport and Infrastructure (DPTI). To the east, Tepko Road forms a four-way intersection with Mannum Road and Maczkowiack Road and to the west it forms a four-way intersection with Reedy Creek Road and Black Heath Road as shown in Figure 3.

Figure 3 Proposed site and adjoining road network

Source: *AECOM GIS*

Access to the SPS site is proposed via a new entry point located on Hoffman Road as shown in Figure 4 and Figure 5, which is a two-way unsealed local road under the care and control of Mid Murray Council (Council).

Figure 4 Existing and proposed site access points



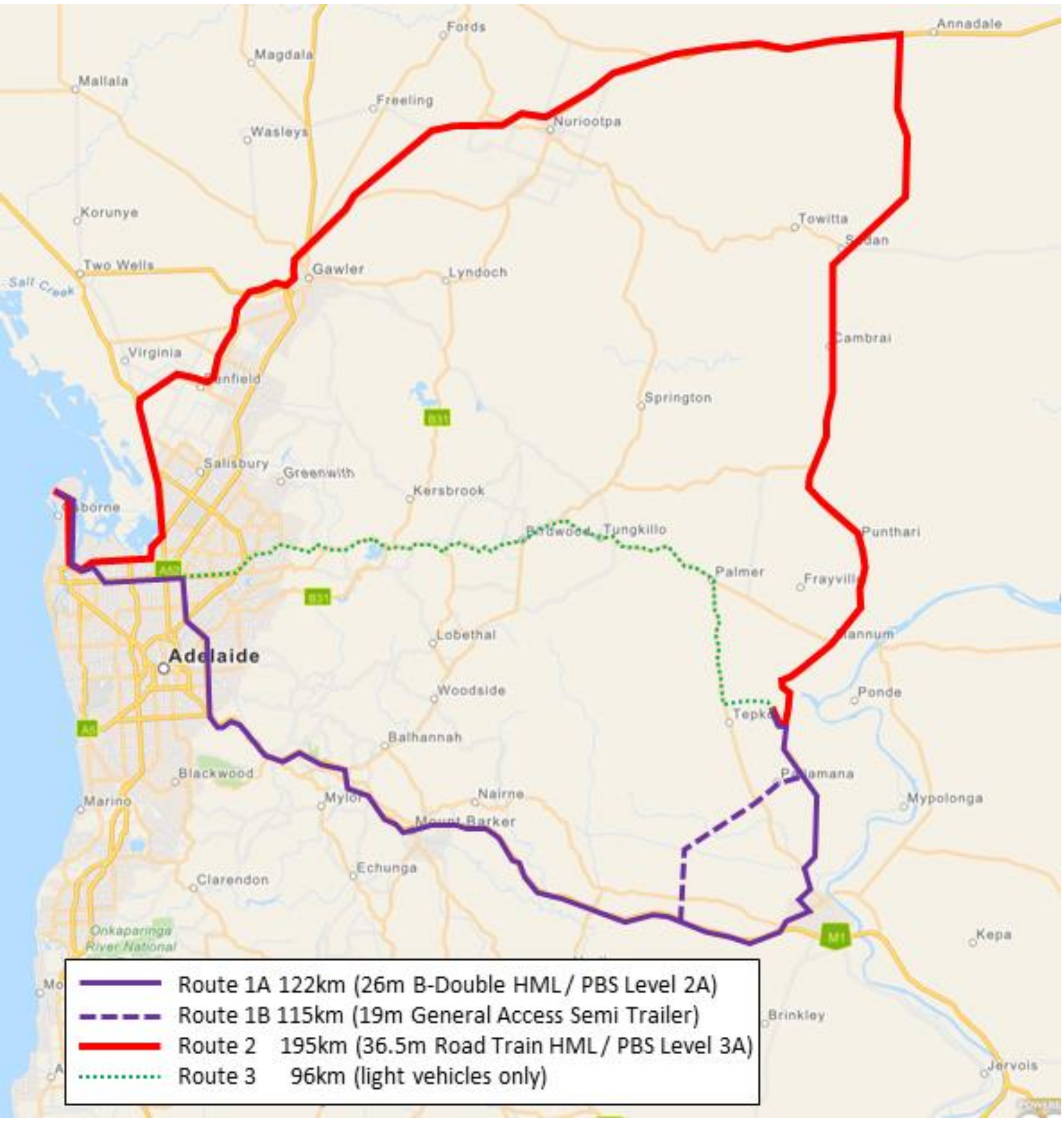
Source: South Australian Property and Planning Atlas (*https://maps.sa.gov.au/SAPPA/*)

Figure 5 Access to the site from Hoffman Road

2.5 Transport routes

Several potential traffic routes that connect the SPS site with Metropolitan Adelaide are available, as shown in Figure 6. Each route option is compared below, based on a vehicle travelling from the Port of Adelaide to the SPS site.

Figure 6 Major road routes connecting the site with the Port of Adelaide



Source: AECOM GIS

- Route 1A: **Southern Access Route** via Grand Junction Road, Hampstead Road, Portrush Road, the South Eastern Freeway and crossing the Adelaide-to-Melbourne rail line on Cypress Terrace at Murray Bridge. This route is approximately 122 km in length and is gazetted for heavy vehicles up to 26 m B-double Higher Mass Limit (HML) in size, or Performance Based Standard (PBS) Level 2A.

- Route 1B: Following the same path as Route 1A until Monarto, this route bypasses Murray Bridge by travelling via Ferries McDonald Road, Schenscher Road, Pallamana Road and Wagenknecht Road. The bypass route (shown as the dashed purple line in Figure 6) would be suitable for General Access Vehicles up to 19 m semi-trailers in size. In addition to bypassing Murray Bridge, Route 1B is slightly shorter than Route 1A at approximately 115 km.
- Route 2: **Northern Access Route** via the Port River Expressway, Northern Expressway, Sturt Highway, Halfway House Road, Ridley Road and Mannum Road. This route is the longest at approximately 195 km, however it is gazetted for heavy vehicles up to 36.5 m Road Trains HML in size, or PBS Level 3A. Route 2 follows DPTI's preferred key route for Over-Size and Over-Mass (OSOM) vehicles travelling between Adelaide and Melbourne.
- Route 3: **Central Access Route** via North East Road, Torrens Valley Road, Randell Road, Reedy Creek Road and Tepko School Road to approach the SPS site from the north-west. This route is the shortest in length at 96 km, however is only suitable for light vehicles given the undulating terrain through the Adelaide Hills.

Route 3 is a potential option for travelling in light vehicles to the site for staff who may live in the northern suburbs of Adelaide. Light vehicle trips originating in central and southern Adelaide would most likely travel to the site via Route 1A or 1B. If heavy vehicle transport is required between Murray Bridge and the SPS site, the Southern Access Route is gazetted for vehicles up to 36.5 m Road Trains HML in size, or Level 3A vehicles PBS along this route.

During construction and decommissioning of the Summerfield Power Station there will inevitably be some disruptions to the local residents. Disruptions may include dust, noise, increased traffic and potential deterioration of the road surface due to an increase in vehicle traffic loads. Section 4.0 discusses ways to mitigate these risks and suggests solutions that will help reduce the impact on residents and other users of the road network who will be affected by this project.

2.5.1 Arterial road network

Transportation of imported componentry for the construction of the project is likely to be primarily from the Port of Adelaide. Other plant, equipment and materials associated with construction of supporting infrastructure may be sourced from Adelaide or Murray Bridge. Access to the site will primarily be via the Arterial Road network, which typically allows for higher traffic volumes and accommodates heavy vehicles.

Included below in Table 1 and Table 2 is a list of the main Arterial Roads, under the care and control of DPTI, which may be used for the transportation of goods and materials along the Southern Access Route and the Northern Access Route, respectively. For convenience the estimated Average Weekday Traffic volumes (AWT) for each of the roads obtained from LocationSA[1] has also been provided. It must be noted that the AWT for each of the arterial roads is based on data obtained between 2015 and 2019. Given that the data collected by DPTI is typically from short-term sample counts, there may be modest differences between reported and actual volumes.

Table 1 Route 1A (Southern Access Route): Key Classified State (Arterial) Roads – estimated traffic volumes and composition of heavy vehicles

Major Road	Locality	Surface	AWT	HVs	Year
Grand Junction Road	Wingfield	Sealed	43,700	15%	2017
Hampstead Road	Greenacres	Sealed	38,400	8%	2017
Portrush Road	Kensington	Sealed	39,300	7.5%	2017
South Eastern Expressway	Stirling	Sealed	53,400	9.5%	2019
Adelaide Road	Murray Bridge	Sealed	14,300	4.5%	2018
Mannum Road	Tepko	Sealed	2,900	11.5%	2018

[1] http://location.sa.gov.au/viewer/ Traffic Volume Estimates

Table 2 Route Option 2 (Northern Access Route): Key Classified State (Arterial) Roads – estimated traffic volumes and composition of heavy vehicles

Major Road	Locality	Surface	AWT	HVs	Year
Port River Expressway	Dry Creek	Sealed	67,300	11.5%	2015
Port Wakefield Road	Mawson Lakes	Sealed	66,200	13.5%	2018
Northern Expressway	Waterloo Corner	Sealed	23,900	14.0%	2017
Sturt Highway	Kingsford	Sealed	14,800	16.0%	2018
Halfway House Road	Sedan	Sealed	350	40.0%	2018
Ridley Road	Sedan	Sealed	650	26.0%	2018
Mannum Road	Tepko	Sealed	2,500	13.0%	2018

Route 3 is also primarily comprised of the State Arterial Road network, however given the minimal impact of the potential light vehicles travelling between northern Adelaide and the SPS site no further detail is required.

As the primary access point to the local road network, Mannum Road is a sealed rural arterial road under the control of DPTI, with one lane in each direction. Mannum Road links Mannum and Murray Bridge and is part of an extended route that connects the South Eastern Freeway and Sturt Highway. Increases in heavy vehicles from construction may potentially generate some local traffic impacts, however as Mannum Road forms a gazetted north-south route for heavy vehicles it is assumed that increased traffic generated from construction will have minimal impact.

2.5.2 Local road network

The 'last-mile' access to the SPS site is via several local roads under the care and control of local government. As these roads are typically low-volume, detailed traffic data is rarely available. The key local roads in the vicinity of the site are described below.

2.5.2.1 Hoffman Road

Access to the Summerfield Power Station facility will be via a private access point located on Hoffman Road approximately 1.8 km from the intersection of Hoffman and Tepko Roads. Hoffman Road is unsealed and under the care and control of Council. Hoffman Road services a number of rural dwellings, with an estimated average daily traffic volume approximately 25-50 vehicles, although this could be higher for short periods during annual harvest season.

2.5.2.2 Hoff Road

Current access to the site's dwelling is via Hoff Road, which has no through connection to Mannum Road, although a road reservation alignment does currently exist. Development access via Hoff Road is not considered suitable, as it is intended to keep this access solely for the site's dwelling which is anticipated to be retained. Hoff Road is unsealed and under the care and control of Council, with an estimated average daily traffic volume of less than 25 vehicles as this road only services two properties.

2.5.2.3 Tepko Road

Tepko Road forms a connection between Mannum Road in the east and Reedy Creek Road in the west, servicing a number of rural dwellings and agricultural sites. A rail level crossing over the Apamurra rail line is located approximately 1 km east of Reedy Creek Road, however as this is currently disused there are no rail/road operational issues. Tepko Road is assumed to carry an estimated average daily traffic volume of approximately 50-100 vehicles, although this could be higher for shorter periods during annual harvest season. Tepko Road is unsealed and under the care and control of Council.

2.5.2.4 Route 1B (Murray Bridge bypass) roads

The Route 1B bypass of Murray Bridge includes Ferries McDonald Road, Schenscher Road, Pallamana Road and Wagenknecht Road, which are all sealed rural local roads under the control of the neighbouring Rural City of Murray Bridge. Whilst this bypass route is not gazetted for Restricted Access Vehicles, there are no restrictions for General Access Vehicles (refer to Section 2.7 for further details). Therefore, these roads would be suitable for General Access semi-trailer movements to and from the SPS site.

2.6 Functional hierarchy

As componentry and materials for the construction of the SPS will involve travel predominantly along the State's Arterial Road network, an important consideration is DPTI's *Functional Hierarchy for South Australia's Land Transport Network*. The Functional Hierarchy identifies which of South Australia's transport corridors are important for the movement of both people and freight.

Mannum Road in the vicinity of the project is identified as having the following functions:

- Major Freight Route – The role of freight routes is to cater safely and efficiently for freight vehicles for up to 24 hours a day, seven days a week. These routes need to provide optimal travel efficiency and reliability of travel times throughout the day for heavy vehicles, especially when freight and commuter peak periods coincide.
- Direct/Scenic Tourist Route – The role of direct/scenic tourist routes is to provide a direct link to/from key regional activity centres or key tourist destinations, and through major tourist regions.

DPTI's functional hierarchy has defined regional South Australian sealed freight routes as desirably having:

- wide lanes and sealed shoulders
- smooth sealed roads with a high standard of pavement marking
- frequent overtaking opportunities (including climbing lanes) and rest areas in rural areas.

Based on DPTI's functional hierarchy these key functions indicate that the road network servicing the project site is appropriate for accommodating large heavy vehicles and that Mannum Road conforms to the above-mentioned criteria.

The arterial road network in the vicinity of the proposed project provides strategic connections between important regional centres, particularly the south-east of South Australia and Melbourne to the east. The functionality of these roads means they already carry high proportions of heavy vehicles (see Table 1 and Table 2). This includes a recent upgrade at Murray Bridge to the crossing over the Adelaide-to-Melbourne freight rail corridor to allow 36.5 m HML Road Trains or PBS Level 3A vehicles, which was previously restricted to 26 m B-doubles or PBS Level 2A vehicles. This suggests these roads will be well suited as transport routes for goods and material deliveries for the proposed development. Included in Section 2.7 of this report are the approved routes for certain categories of heavy vehicles.

2.7 Approved heavy vehicle routes

The transportation of componentry for the construction of the project will be conducted via the public road network, predominantly from the Port of Adelaide with some materials sourced from elsewhere in Adelaide or from local regional centres such as Murray Bridge. Included in Table 3 and Table 4 is a summary of the main roads that may form potential freight routes for good and materials for the project. Each road listed has been obtained from RAVnet, which identifies the approved routes for various classes of Restricted Access Vehicles (RAVs).

Data for all State Arterial Roads listed in Table 3 and Table 4 were also obtained from RAVnet under the Performance-Based Standards (PBS) Scheme. The PBS Scheme is administered by the National Heavy Vehicle Regulator (NHVR), which assesses vehicles and assigns vehicle classes based on dimensions and performance. PBS vehicle routes are classified into four national network levels, with additional sub-class categories of A and B as defined in Table 5.

Table 3 Maximum allowable heavy vehicles by road – Southern Access Route

Major Road	Road Authority	Road Class	Surface	PBS Level	Maximum Allowable Vehicle
Grand Junction Rd, between Commercial Rd and Churchill Rd	DPTI	Arterial	Sealed	3A	36.5 m Road Train (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)
Grand Junction Rd, between Churchill Rd and Hampstead Rd (Adelaide)	DPTI	Arterial	Sealed	2A	26 m B double (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)
Hampstead Rd, between Grand Junction Rd and Ascot Avenue	DPTI	Arterial	Sealed	2A	26 m B double (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)
Ascot Ave, between Hampstead Rd and Portrush Rd	DPTI	Arterial	Sealed	2A	26 m B double (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)
Portrush Rd, between Ascot Ave and Princes Hwy	DPTI	Arterial	Sealed	2A	26 m B double (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)
Princes Hwy, between Portrush Rd and Adelaide Rd	DPTI	Arterial	Sealed	2A	26 m B double (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)
Adelaide Rd, between Princes Hwy and Maurice Rd	DPTI	Arterial	Sealed	2A	26 m B double (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)
Maurice Rd, between Cypress Tce and Adelaide Rd	DPTI	Arterial	Sealed	3A	36.5 m Road Train (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)
Cypress Tce, between Maurice Rd and Mannum Rd	DPTI	Arterial	Sealed	3A	36.5 m Road Train (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)
Mannum Rd, between Cypress Tce and Tepko Rd	DPTI	Arterial	Sealed	3A	36.5 m Road Train (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)

Table 4 Maximum allowable heavy vehicles by road – Northern Access Route

Major Road	Road Authority	Road Class	Surface	PBS Level	Maximum Allowable Vehicle
Port River Expressway, between Port Adelaide and Salisbury Hwy	DPTI	Arterial	Sealed	3A	36.5 m Road Train (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)
Salisbury Hwy, between Port River Expressway and Port Wakefield Rd (Adelaide)	DPTI	Arterial	Sealed	3A	36.5 m Road Train (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)
Port Wakefield Rd, between Salisbury Hwy and Northern Expressway	DPTI	Arterial	Sealed	3A	36.5 m Road Train (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)
Northern Expressway, between Port Wakefield Rd and Sturt Hwy	DPTI	Arterial	Sealed	3A	36.5 m Road Train (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)
Sturt Hwy, between Northern Expressway and Halfway House Rd	DPTI	Arterial	Sealed	3A	36.5 m Road Train (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)
Halfway House Rd, between Sturt Hwy and Ridley Rd	DPTI	Arterial	Sealed	3A	36.5 m Road Train (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)
Ridley Rd, between Halfway House Rd and Mannum Rd	DPTI	Arterial	Sealed	3A	36.5 m Road Train (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)
Mannum Rd, between Ridley Rd and Tepko Rd	DPTI	Arterial	Sealed	3A	36.5 m Road Train (HML); or 4.0 m wide up to 93.5 t low loader (OSOM)

Table 5 PBS Vehicle Route Standards

Road Network	Vehicle Length	Close present vehicle description
Level 1A	≤ 20 m	Single articulated vehicle or truck trailer combination
Level 2A	≤ 26 m	B-double
Level 2B	26 m ≤ 30 m	B-double fitted with quad axle groups
Level 3A	≤ 36.5 m	Double road train (type I)
Level 3B	36.5 ≤ 42 m	Double road train (type I)
Level 4A	≤ 53.5 m	Triple road train (type II)

Oversize Over-mass (OSOM) vehicles are those that have dimensions or loads in excess of General Access provisions under Heavy Vehicle National Law (HVNL).

General Access vehicles are typically:

- no wider than 2.5 m
- no taller than 4.3 m
- no longer than 19 m
- single articulation only
- Gross Vehicle Mass (GVM) no greater than 46.5 t (Vehicle mass limits can vary based on axle configurations).

Operators of OSOM vehicles that require access on roads that have not been approved for dimensions and/or vehicle masses in excess of General Access provisions are required to apply for a permit through the NHVR.

3.0 Construction phase traffic

3.1 Staff movements

During the construction phase of the project there will be an increase to the volume of heavy and light vehicles that will be accessing the site each day. As different construction phases progress, the number of employees on site per day is likely to fluctuate significantly. It has been estimated that the likely number of employees on site during the 26-month construction phase could peak at up to 200 workers. During operational times the power station has the potential to support up to 50 personnel on an ongoing basis.

Whilst it is likely that workers would arrive as multiple persons per vehicle, a conservative approach has been undertaken which assumes that people will travel to and from site in individual vehicles. Therefore, the maximum potential traffic generated by staff would be in the order of 150-200 light vehicles per day, resulting in up to approximately 300-400 trips (i.e. one trip for arrival at site, another trip when departing). Given the sporadic nature of construction activity, average light vehicle traffic volumes over the duration of the project's construction phase are likely to be significantly lower at around 100-200 vehicle trips per day, and even less on days of limited construction activity.

Light vehicle traffic generation could also be reduced through the encouragement of car-pooling amongst staff, or through the use of people-mover vans and/or minibuses to ferry staff between the site and a common meeting point (or points) in centralised places such as Mannum and Murray Bridge.

3.2 Equipment deliveries

Equipment deliveries will make up most of the heavy vehicle traffic over the 26-month construction phase. Other deliveries to site may include concrete and related items associated with construction which have been sourced locally.

At the end of the project's lifespan, decommissioning would be expected to occur, which would again involve an increase in the volume of both heavy and light vehicles during a concentrated period. However, this would be at a lower intensity compared to the construction phase.

Many components associated with the SPS can be transported to the site in modular sections, including:

- Air-cooled condensers
- Various components of the gas turbine systems
- Solar panels, typically transported within 20 ft shipping containers, which can carry approximately 550 solar panels each
- Battery modules and associated inverters.

The delivery of construction-related materials is also relatively straightforward, with the following items likely to be transported to the site:

- Pre-mixed concrete delivered in trucks with agitators
- Reinforcing steel for concrete slabs
- Quarry materials
- Frames and cladding for site structures and buildings
- Transportable buildings if/as required
- Security fencing
- Switchyard equipment.

The SPS site will also require the delivery of large, indivisible items that may require Over-size and/or Over-mass vehicle permits, including the following:

- Gas turbine generator units
- Heat recovery steam generators
- Transformers
- Large water tanks (if/as required).

Included below in Table 6 is a summary of equipment and material deliveries that will be expected on site over the 26-month construction phase.

In addition to the equipment deliveries outlined in Table 6 other construction-related plant and equipment would also need to travel to and from the site, including concrete pumps, earthmoving machinery, and cranes. The movement of this equipment would however be sporadic, and only make up a small proportion of the overall vehicle movements generated by the proposed development.

Based on Table 6, it is possible that approximately 1,339 individual heavy vehicles would be required to access the site over the entire duration of the construction phase.

The periods of highest heavy vehicle activity are likely to be during the following:

- Excavation of site material in preparation for foundations, trenches etc.
- Delivery of concrete, crushed rock and rubble
- Delivery of the various hybrid components of the SPS.

Whilst further detailed program planning is required to determine likely maximum daily truck movements, it would be reasonable to expect that the construction phase would generate anywhere between 10 and 40 movements per day on average during the busiest periods.

For vehicle combinations exceeding General Access provisions or gazetted Restricted Access Vehicle (RAV) routes, an application must be made to the NHVR for a permit for each vehicle type, e.g. B-doubles, OSOM vehicles, road trains etc. Each application currently costs $74 and can be requested for periods of up to three years in duration.

Preliminary vehicle turning path checks have been performed at the following intersections based on a movements of a 36.5 m Road Train:

- Mannum Road and Tepko Road (Figure 7, Figure 8, Figure 9 and Figure 10)
- Tepko Road and Hoffman Road (Figure 11 and Figure 12)

These checks indicate that standard vehicle combinations up to 36.5 m Road Trains are able to travel to and from the site without tracking off the road pavement surface or across private property.

It is noted that the vehicle paths are based on the full-width of Tepko Road and Hoffman Road being utilised for these turning manoeuvres, which may not always be possible if other vehicles are also travelling on these roads in an opposing direction.

Construction traffic may therefore need to be managed to avoid conflicts between heavy vehicles and other vehicles when turning into and out of the above two intersections. Coordination of heavy vehicles as they approach and depart the site could avoid the need for additional widening at these intersections so that the entire road carriageway can be utilised for turning movements. If concurrent heavy vehicle movements are expected however, then additional intersection widening may need to be undertaken.

Turning path checks should be undertaken in greater detail in the preparation of any construction traffic management plan.

Table 6 Estimated heavy vehicle deliveries to site

Quantity	Potential Vehicle Type	Pay Load	OSOM Yes/No	Permit Yes/No
220	19 m Semi Trailer	Air cooled condenser	No	No
40	19 m Semi Trailer	LMX2500XPress GE Gas Turbines	Some items	Yes
20	19 m Semi Trailer	BHGE SC2 Steam generators/turbines	No	No
32	Prime Mover and Platform Trailer	*Heat Recovery Steam Generators (HRSGs)	Yes	Yes
6	Prime Mover and Platform Trailer	*Transformers	Yes	Yes
2	36.5 m Road Train	Fire water tanks	No	Yes
20	19 m Semi Trailer	Switchyard equipment	No	No
4	19 m Semi Trailer	**Office building	No	No
4	36.5 m Road Train	Workshop	No	Yes
2	36.5 m Road Train	**Control room equipment	No	Yes
25	26 m B-double	12 MW Solar Panels	No	Yes
2	36.5 m Road Train	Inverter stations	No	Yes
3	36.5 m Road Train	30 MW (BESS) Battery storage structures	No	Yes
4	36.5 m Road Train	Building to house BESS (shed)	No	Yes
1	19 m Semi Trailer	Black start generator	No	No
8	Custom trailer	Water Tanks	No	No
157	26 m B-double	Quarry materials/road base	No	Yes
2	19 m Semi Trailer	Security fencing	No	No
790	7.4 m^3 concrete truck	Concrete	No	No
5	19 m Semi Trailer	Steel reinforcement	No	No

** As heavy vehicles longer than 19 m are in excess of General Access provisions, a permit would be required for access to Tepko Road and Hoffman Road.*

***It has been assumed based on known information that the office and control room buildings will be modular and constructed offsite. The assumption is that they will be constructed in such a manner that they can be split in sections for transport and that no special road permits will be required. If circumstances change and the buildings do become oversize and or over mass, then application for the appropriate permit would need to be made through the NHVR.*

Figure 7 Right turn from Mannum Road into Tepko Road, 36.5 m Road Train

Figure 8 Left turn from Tepko Road into Mannum Road, 36.5 m Road Train

Figure 9 Left turn from Mannum Road into Tepko Road, 36.5 m Road Train

Figure 10 Right turn from Tepko Road into Mannum Road, 36.5 m Road Train

Figure 11 Right turn from Tepko Road into Hoffman Road, 36.5 m Road Train

Figure 12 Left turn from Hoffman Road into Tepko Road, 36.5 m Road Train

3.2.1 Transportation of Over-Size Over-Mass (OSOM) componentry

An access permit obtained through NHVR would be required for the transportation of the over-mass equipment, given that GVM would exceed maximum allowable loads on Tepko Road and Hoffman Road.

Furthermore, height of some components may exceed 4.3 m General Access provisions. Therefore, permit approval would likely require liaison with infrastructure authorities that may have assets overhanging the roads (e.g. overhead power lines).

3.2.2 Use of larger heavy vehicle combinations

The use of Restricted Access Vehicles (RAVs) including B-doubles and/or larger road train combinations would result in an overall reduction in total heavy vehicle movements, given their ability to carry greater loads than General Access Vehicles (e.g. 19 metre semi-trailers). However, access to the site by RAVs would require a permit to travel along Tepko Road and Hoffman Road, as these roads are not existing gazetted routes for RAVs.

As the road network from the Port of Adelaide to the SPS site has gazetted routes for RAVs as specified in Section 2.7, it may be possible to transport equipment to and from the site in vehicles larger than 19 metre semi-trailers, should the appropriate permit be granted for travel on Tepko and Hoffman Roads.

4.0 Mitigating impacts of additional traffic

As previously mentioned, access to the project site by heavy vehicles should be via Mannum Road. Daily traffic volumes have the potential to increase by around 100 to 400 light vehicles (based on 50 to 200 employees on site, with a single staff member per vehicle) and between 10 to 40 heavy vehicles. This would increase the existing daily traffic volumes on Tepko Road and Hoffman Road by a significant amount, however with only a minimal number of properties affected.

As a result, residents within the area may be exposed to additional dust, noise and vehicle movements associated with the construction of the project. Consideration has been made for these impacts and associated risks and as a result a series of recommendations has been suggested:

- Where possible, plan for heavy vehicle movements to and from the site to occur at off peak times to reduce the impact of noise on surrounding residents. In particular, movements should be coordinated with harvest times to minimise any conflicts.
- Provide for clear turning circles on-site to reduce heavy vehicle engine noise associated with revving, reversing, beeping and generation of excess dust.
- Suppress dust with water on Tepko and Hoffman Roads and the construction site at regular intervals if/as required.
- Prohibit vehicles from idling on any roads in the vicinity of residential properties.
- Enforce vehicle speed limits on Tepko Road and Hoffman Road.
- Minimise deposit of loose material on surrounding sealed roads using rumble grids or wheel-wash facilities if needed.
- Consider sealing Tepko Road for 20-50 metres on approach to Mannum Road, to reduce the possibility of gravel and other loose material being deposited onto the sealed carriageway of Mannum Road.

5.0 Safety considerations

In regard to road safety, the major points of conflict to be considered are:

- The intersection of Mannum Road and Tepko Road
- The intersection of Tepko Road and Hoffman Road (see Figure 13)
- The SPS site access on Hoffman Road.

Options to mitigate these potential conflicts should be considered in the project's Workzone Traffic Management Plan, e.g. provision of advanced warning signage, temporary traffic controllers, temporary speed limit reduction etc.

In addition to the traffic safety considerations, site related safety must be considered during the construction phase of the project. The site sits above a high-pressure SEA Gas main and below high voltage power lines. Any crane and heavy vehicle mobilisation during construction will need to consider these two services.

It has been noted by Council that an investigation into road safety has previously been undertaken at the intersection of Mannum Road and Tepko Road. Any available advice from this investigation should also be considered in preparation of work site traffic control provisions.

Figure 13 Intersection of Tepko and Hoffman Road

6.0 Recommendations

6.1 Tree lopping and pruning

Some sections of overhanging vegetation were observed on Hoffman Road as shown in Figure 14. To reduce the potential for vehicles striking vegetation and potentially depositing material on the roadway, some minor vegetation pruning may be required within the Hoffman Road corridor.

Figure 14 Overhanging vegetation Hoffman Road

6.2 Signage updates

To convey construction information to local residents and other regular users of the local road network, it is recommended that information signage be provided at prominent location(s). This can advise the public of the proposed works, likely timing of construction and contact information for those who require more details or need to discuss any potential impacts.

There is also the opportunity for some signage to be updated, such as intersection warning signs on Tekpo Road as shown in Figure 15, which were noted to be legacy signs that do not meet current requirements for retroreflectivity.

Figure 15 Existing signage Tepko Road

6.3 Road works

Whilst any recommended road upgrades are subject to more detailed traffic management investigations related to the construction phase of the project, it is likely that some road works will be required. This may include:

- Sealing some sections of Tepko Road and/or Hoffman Road, to reduce the potential for loose material to be transported onto sealed road surfaces (Mannum Road), or for dust suppression
- Additional sealing of shoulders and/or splays at the intersection of Mannum Road and Tepko Road to accommodate larger vehicle turn paths if/as required
- Spraying water to reduce dust on gravel roads
- Grading and/or re-sheeting of gravel roadways if/as required to maintain an acceptable surface quality for the duration of the works.

A pre and post construction condition assessment should be undertaken to satisfy Council that their road assets are maintained to an acceptable condition.

7.0 Conclusion

The traffic generated by the Summerfield Power Station development is likely to have a minimal impact on the broader transport network. The construction phase is estimated to extend over a 26-month period with an estimated total of 1,339 equipment deliveries during this timeframe.

To accommodate these deliveries, considerations may need to be made for the 3 km stretch of unsealed road that connects the proposed site of the project with Mannum Road. Section 4.0 of this report suggests a series of mitigation measures to limit the effect of construction on residents living within close proximity to Mannum Road.

The construction phase workforce is likely to involve a maximum of 200 staff attending the site during peak periods of activity. However due to the sporadic nature of construction activity, average light vehicle traffic volumes over the duration of the project's construction phase are likely to be around 100-200 vehicle trips per day. Whilst this would be a significant increase from the current low traffic volumes, these are still relatively low volumes.

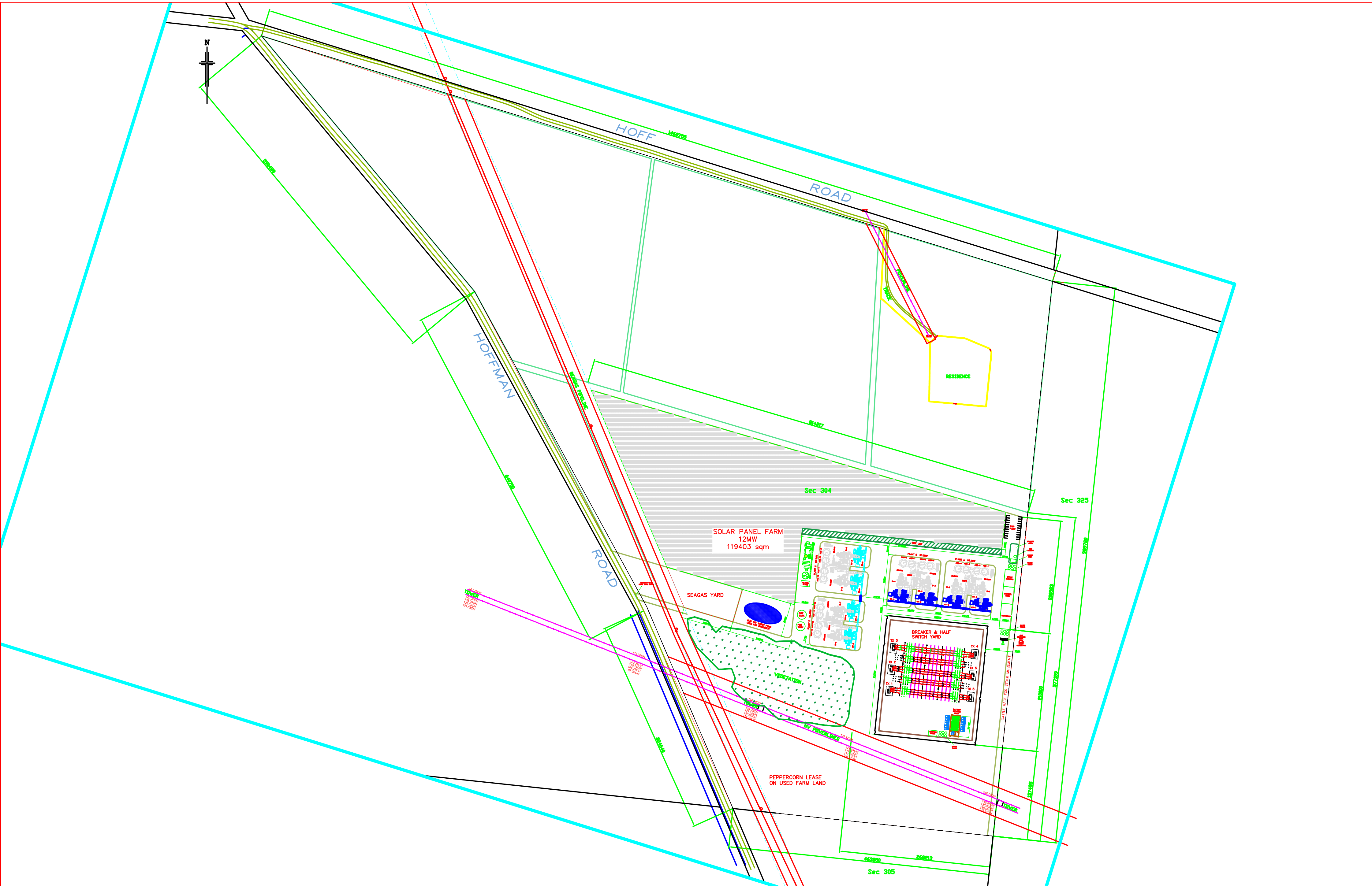
The use of heavy vehicles with loads and/or dimensions exceeding general access provisions would require liaison with the National Heavy Vehicle Regulator, DPTI and the Mid Murray Council. Some modifications to intersections may be required to accommodate heavy vehicle movements, which would need to be explored in further detail when a construction traffic management plan is prepared.

Following construction and throughout the operational life of the power generation facility, traffic impacts are expected to be minimal, with traffic scaled back to the level needed for operations, service and maintenance only.

In conclusion, assuming the implementation of appropriate mitigation measures and compliance with permit conditions, the impacts from traffic and traffic related activities are considered acceptable for the area in which the project is proposed.

Appendix A

Summerfield Power Station proposed concept drawings



DWG NO.	DESCRIPTION	REV.	DATE	DESCRIPTION	DWN	CKD	APPD
		C	03SEP19	CONTOUR LINES ADDED (SHT 3&4), MOVED BATTERY SHED	CMS		
		B	21JUL19	PLANT LABELS REVISED	CMS		

REFERENCE DRAWINGS

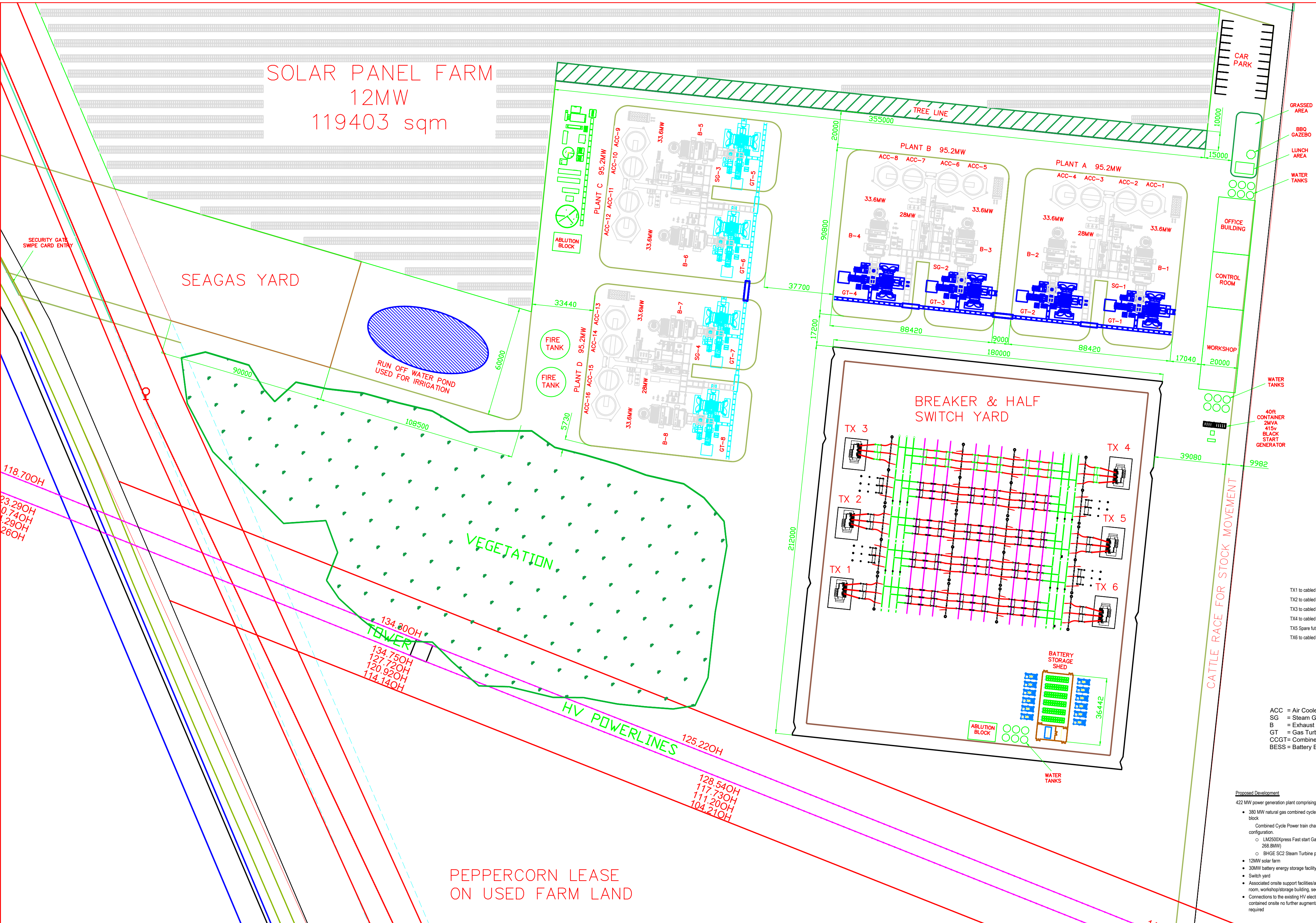
REVISION

SOUTH AUSTRALIA POWER GENERATION

DRAWN	CMS
CHECKED	
APPROVED	
DATE	19JUL19
JOB No.	
SCALE	NTS
SHEET	1 OF 4

CUSTOMER:
SAPGen SUMMERFIELD
1.6TW/hr CAPACITY
GRID FIRMING RENEWABLES

A1 DWG NO: SPAG-20190719 REV: C



TX1 to cabled Plant D 95.2MW 11.5 step to 275kV
TX2 to cabled Plant C 95.2MW 11.5 step to 275kV
TX3 to cabled Plant B 95.2MW 11.5 step to 275kV
TX4 to cabled Plant A 95.2MW 11.5 step to 275kV
TX5 Spare future solar
TX6 to cabled solar / battery 52MW 11.5 step to 275kV

ACC = Air Cooled Condensor
SG = Steam Generator
B = Exhaust Boiler from Open Cycle Turbine
GT = Gas Turbine
CCGT= Combined Cycle Gas Turbine
BESS = Battery Energy Storage System

Proposed Development

422 MW power generation plant comprising:

- 380 MW natural gas combined cycle gas turbines - to be constructed in 4 plants of 2 into 1 HES block
  Combined Cycle Power train characteristics: Units will never be run in open cycle configuration.
  - LM2500Xpress Fast start Gas Turbine power output @ ISO conditions: 33.6 MW (8 units 268.8MW)
  - BHGE SC2 Steam Turbine power output @ ISO conditions: 28 MW (4units 112MW)
- 12MW solar farm
- 30MW battery energy storage facility
- Switch yard
- Associated onsite support facilities/ancillary development (office and amenities building, control room, workshop/storage building, security fencing, landscaping)
- Connections to the existing HV electricity network and SEA Gas pipeline - all connections to be contained onsite no further augmentation to the existing transmission line or pipeline will be required

DWG NO.	DESCRIPTION	REV.	DATE	DESCRIPTION	DWN	CKD	APPD
		C	03SEP19	CONTOUR LINES ADDED (SHT 3&4), MOVED BATTERY SHED	CMS		
		B	21JUL19	PLANT LABELS REVISED	CMS		
	REFERENCE DRAWINGS			REVISION			

SOUTH AUSTRALIA POWER GENERATION

DRAWN	CMS
CHECKED	
APPROVED	
DATE	19JUL19
JOB No.	
SCALE	NTS
SHEET	2 OF 4

CUSTOMER:
SAPGen SUMMERFIELD
1.6TW/hr CAPACITY
GRID FIRMING RENEWABLES

A1 DWG NO: SPAG-20190719 REV: C

Appendix G

Acoustic Assessment

Summerfield Power Station

Planning Acoustic Assessment

Summerfield Power Station

Planning Acoustic Assessment

Client: SAPGEN

ABN: 56 630 464 327

Prepared by

AECOM Australia Pty Ltd
Level 28, 91 King William Street, Adelaide SA 5000, Australia
T +61 8 7223 5400 F +61 8 7223 5499 www.aecom.com
ABN 20 093 846 925

31-Oct-2019

Job No.: 60608821

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 AS/NZS4801 and OHSAS18001.

Summerfield Power Station

Quality Information

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Ref	60608821
Date	31-Oct-2019
Prepared by	Benjamin French
Reviewed by	David Peoples

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
0	31-Oct-2019	Draft	Tom Hateley Senior Planner	
1	06-Nov-2019	For Development Application	Tom Hateley Senior Planner	

Table of Contents

Executive Summary

The Summerfield Power Station is a proposed development by SAPGen, to be located 60 km east of Adelaide in the Tepko locality. As part of the development authorisation application for this development, AECOM was engaged to carry out an acoustic assessment of potential noise impacts on nearby sensitive receivers.

The proposed site is located within the *Rural* zone under the *Mid Murry Council Development Plan*. Land zoned *River Murray (Primary Production Policy Area)* adjoins the site to the east. The South Australian Environment Protection Authority's (EPA) *Environment Protection (Noise) Policy 2007* (Noise EPP) is the relevant document to be used by proposed developments for demonstrating their compliance with the General Environmental Duty under the *Environment Protection Act 1993 (SA)*.

Modelling of predicted noise levels at nearby developed and undeveloped land was carried out using the SoundPLAN program, implementing the CONCAWE algorithm. The CONCAWE algorithm is commonly used within South Australia as it allows for the prediction of noise under varying weather conditions. In accordance with industry practice and EPA guidance, Pasquill Stability Class D meteorological condition was used for predicting night time noise levels, reflective of worst-case weather conditions (that is, most conducive to increased noise levels at nearby residences).

Noise predictions indicated that noise levels at one nearby dwelling would exceed night time environmental noise criteria without mitigation. In order to comply with environmental noise criteria, a three-stage mitigation strategy is proposed:

1. Acoustic treatment at the source of the four highest ranked plant items to reduce emitted noise levels (e.g. silencers).
2. Undertake noise level measurements during installation and commissioning to confirm tonality characteristics.
3. If tonality exists, further noise mitigation is required.

With the proposed mitigation strategy, it is predicted that all locations will achieve environmental noise criteria.

1.0 Introduction

AECOM has been engaged by SAPGen to undertake an acoustic assessment of the proposed Summerfield Power Station. The purpose of this acoustic assessment is to satisfy the acoustic requirements of a development application for the project under the *Development Act 1993* (SA).

This report derives the relevant noise criteria for the project, presents the results of acoustic modelling and discusses conceptual noise mitigation treatments where necessary to comply the noise criteria.

1.1 Site Location

The site is located 60 km east of Adelaide and 20 km north of Murray Bridge in the Tepko locality, surrounding land is zoned as *Rural* with land zoned *River Murray (Primary Production Policy Area)* to the east.

Figure 1 shows the closest noise sensitive receptors relative to the Summerfield Power Station site. Table 1 presents these dwellings, their assigned planning zone and the distance to the proposed development. Note the actual Power Station will be constructed in the southern half of the site area indicated in Figure 1.

Figure 1 Dwellings within 3 km of Summerfield Power Station

Table 1 Dwellings within 3 km of Summerfield Power Station

Dwelling	Zone	Distance to Summerfield Power Station (km)
C1	Rural	NA (on-site)
C2	Rural	0.8
C3	Rural	1.7
C4	Rural	2.1
C5	River Murray	2.1
C6	River Murray	2.3
C7	River Murray	2.5
C8	Rural	2.4
C9	Rural	2.5
C10	Rural	2.8
C11	River Murray	3.0

1.2 Noise Targets

South Australian Environment Protection Authority (EPA) provides Indicative Noise Levels that are the criteria for planned noise sources to be deemed to achieve the General Environmental Duty, as defined under the *Environment Protection Act 1993 (SA)*. These Indicative Noise Levels are set by the *Environment Protection (Noise) Policy 2007 (SA)* (Noise EPP).

Under the Noise EPP, Indicative Noise Levels are determined based on the land uses promoted by the relevant Development Plan for both the noise source and receiver. In this case, all sensitive receivers are situated in Rural or River Murray (Primary Production Policy Area) zones.

Table 2 shows the indicative noise factors for the land use categories of relevance for this project. The predicted source noise level should not exceed the relevant Indicative Noise Level less 5 dB(A).

Furthermore, if the noise source is found to be tonal in characteristic, a 5 dB(A) penalty will be applied, effectively lowering the noise goal by 5 dB(A).

Table 2 Indicative noise levels

Dwelling	Receiver Location Zone	Applicable Noise EPP Land Use Category for receiver	Indicative Noise Levels dB $L_{Aeq,\ 15\ min}$	
			Day (7:00-22:00)	Night (22:00-7:00)
C2, C3, C4, C9, C10	Rural	Rural Industry	57	50
C5, C6, C7, C11	River Murray (Primary Production Policy Area)	Rural Industry	57	50

Table 3 Noise goals

Dwelling	Noise Goals dB $L_{Aeq,\ 15\ min}$	
	Day (7:00-22:00)	Night (22:00-7:00)
All	52	45

2.0 Acoustic Assessment

2.1 Methodology

The noise emissions from the proposed works were predicted using SoundPLAN version 8.1 environmental noise modelling software and SoundPLAN's implementation of the CONCAWE[1] algorithm. The CONCAWE algorithm allows for the prediction of overall noise levels under specified meteorological conditions. The CONCAWE algorithm is widely used in Australia for predicting industrial noise and is accepted by the EPA.

The project has proposed times of operation spanning 24 hours per day, 7 days per week and it is understood that all equipment may operate concurrently at any time. Consequentially, the more stringent night time noise levels would control any noise mitigation requirements. Therefore, any mitigation required to achieve compliance with the night time noise levels would also be able to achieve meet the day time noise levels. To determine whether the noise levels are met and any noise mitigation requirements, the proposed project operation has been modelled and assessed against the night time noise levels only.

Noise levels were predicted with Pasquill Stability Class D and wind speed 2 m/s blowing from source to receiver, which is the category generally considered most conductive for noise propagation during the night time period.

2.2 Noise Model Inputs

The following inputs were included in the 3D acoustic model:

- *Terrain* is based on ten-metre elevation contour lines of the project and surrounding area sourced from the South Australian Government's Open Data Directory.
- *Ground Absorption* has been modelled as 10% absorptive in the vicinity of the development and 60% absorptive in the far field.
- *Site Buildings* were included in accordance with DWG NO: SPAG-20190719 Rev C. Sensitive receivers were not included in the model; therefore all predicted noise levels are free field.

2.3 Noise Sources

Eight LM2500 Xpress Gas Turbines are the dominant noise sources on the site. Table 4 shows the breakdown of the gas turbine noise data, provided by the supplier with octave spectra. The Gas Turbines were modelled as solid structures with attached point sources representing different noise emitting parts of the system. Sources were set to 4 m above ground level, except for the Exhaust Stack at 20 m, the turbine vent (6 m) and air filters (2 m) and the generator lubrication oil pump (0.5 m).

Other modelled plant items are summarised in Table 5. Note the proposed inverters will be installed in an acoustic enclosure.

It is understood that the inverter units associated with the proposed solar panel array will be housed in a building. Provided that the inverter units are completely enclosed and that the building has no gaps or openings the inverter noise emission should have negligible effect on the overall noise emissions from the proposed facility. Details of the proposed building should be provided for acoustic review once these have been established.

---

[1] CONCAWE Report No. 4/81, "*The Propagation of Noise from Petroleum and Petrol Chemical Complexes to Neighbouring Communities*", Published 1981.

Table 4 Noise sources – LM2500 Xpress Gas Turbine

Noise Source	Quantity	Sound Power Level per Item dB(A)
Generator Lubrication Oil	8	101
Exhaust Stack	8	101
Turbine Vent	8	96
Fan	8	95
Aux	8	87
Turbine	8	100
Air filter	16 (placed to the left and right of each unit)	103
Generator coupling	8	98
Generator	8	105

Note: data sourced from LM2500 supplier data

Table 5 Other noise sources

Noise Source	Quantity	Sound Power Level per Item dB(A)	Noise Data Source
Switchyard Transformer	8	85	NEMA[1] Octave Spectrum
Inverter (contained in building)	30[2]	94	Sound Power Level for SC/SCS 2500-EV from "*White Paper BU-U-019: Sunny Central and Sunny Central Storage: Sound Power Measurements on SC/SCS xxxx (-EV) (-US) central inverters*" Third-octave spectrum from SMA Solar Technology AG, "*SC2200/SC2500 - Acoustic Power Levels of the of the Third Octave Band Frequencies According to EN ISO 9614-2*"
Steam Turbine	8	104	Supplier data: 84 dB(A) at 1 m, Bies and Hansen empirical spectrum
SPG Hexacool air cooled condenser banks	4	98	Laymon Miller empirical spectrum

Note 1: National Electric Manufacturers Association
Note 2: assumed number of inverter units

3.0 Results and Discussion

Table 6 presents the predicted noise levels for the proposed site operation in comparison to the more stringent night time noise goals. Night time exceedances are predicted at C2. All receivers comply with day time noise goals.

Table 6 Noise Modelling Results

Receiver No.	Zone	Night Noise Goal ($L_{Aeq,\ 15\ min}$, dB(A))	Predicted Level, ($L_{Aeq,\ 15\ min}$, dB(A))	Compliance
C2	Rural Industry	45	49	**No – 4 dB(A)**
C3	Rural Industry	45	41	Yes
C4	Rural Industry	45	38	Yes
C5	Rural Industry	45	36	Yes
C6	Rural Industry	45	31	Yes
C7	Rural Industry	45	34	Yes
C8	Rural Industry	45	37	Yes
C9	Rural Industry	45	36	Yes
C10	Rural Industry	45	35	Yes
C11	Rural Industry	45	32	Yes

3.1 Noise Control

Noise modelling has shown that noise mitigation would be required to comply with the Noise EPP Noise Goals at C2. Additionally, if noise sources have a tonal characteristic (i.e. a 5 dB(A) penalty applied), then C3 would also become non-compliant. The noise level data that was supplied does not indicate tonal noise emissions.

It was noted that compliance can be achieved at all sites if four of the eight unmitigated LM2500 Gas Turbines are not in operation. A potential compliance strategy could be to not operate all plant during night hours (22:00 to 07:00).

Analysis of the modelling results revealed that the following items generate the highest noise contributions to the noise levels at the surrounding residences. Therefore, reduction of the emissions from these sources will have greatest benefit in terms of the noise levels at the receiver locations:

- Generator
- Gas Turbine Air filters
- Steam Turbine Exhaust Stack
- Gas Turbine Exhaust Stack

Reducing the noise emissions from each of these items by 8 dB(A) will enable compliance with the night time limits at all receptors. This can be achieved by installing silencers to the turbine exhausts and enclosing the generators in acoustically treated containers. Alternatively, the equipment suppliers may be able to provide these units with noise mitigation measures applied to achieve lower noise emissions.

Any proposed acoustic mitigation should be reviewed by a mechanical engineer to ensure that adequate airflow, cooling etc. can be maintained.

Based on this mitigation strategy, noise level targets would be achieved at all receivers. It is noted that the predicted noise levels are based on the supplied noise data and the predicted levels at the receivers not requiring tonality adjustments. Any changes in the design or variation in equipment locations, emission levels etc. would not necessarily comply and may require a reassessment. Final plant selections and acoustic treatment options should be acoustically reviewed to confirm that compliance will be achieved.

During commissioning, noise measurements should be undertaken in proximity to the plant items and at nearby residences to confirm the absence of tonal characteristics at receivers.

4.0 Conclusion

AECOM have undertaken an acoustic assessment to support a development application for the proposed Summerfield Power Station project.

Noise modelling has predicted that operation of the facility can meet the Noise EPP indicative noise levels at the assessed noise-sensitive receivers for all time periods with the implementation of noise control strategies. A noise mitigation strategy to confirm compliance with environmental noise targets was proposed:

1. Reducing the noise level of the key sources through installation of noise reduction controls (e.g. silencers, generator enclosure).
2. Measurement of noise from the site during installation to confirm tonal characteristics
3. Should noise from the site be tonal, further mitigation of tonal plant items will be implemented.

With the above mitigation strategy, the noise emissions will comply with the environmental noise targets.

Appendix A

Acoustic Nomenclature

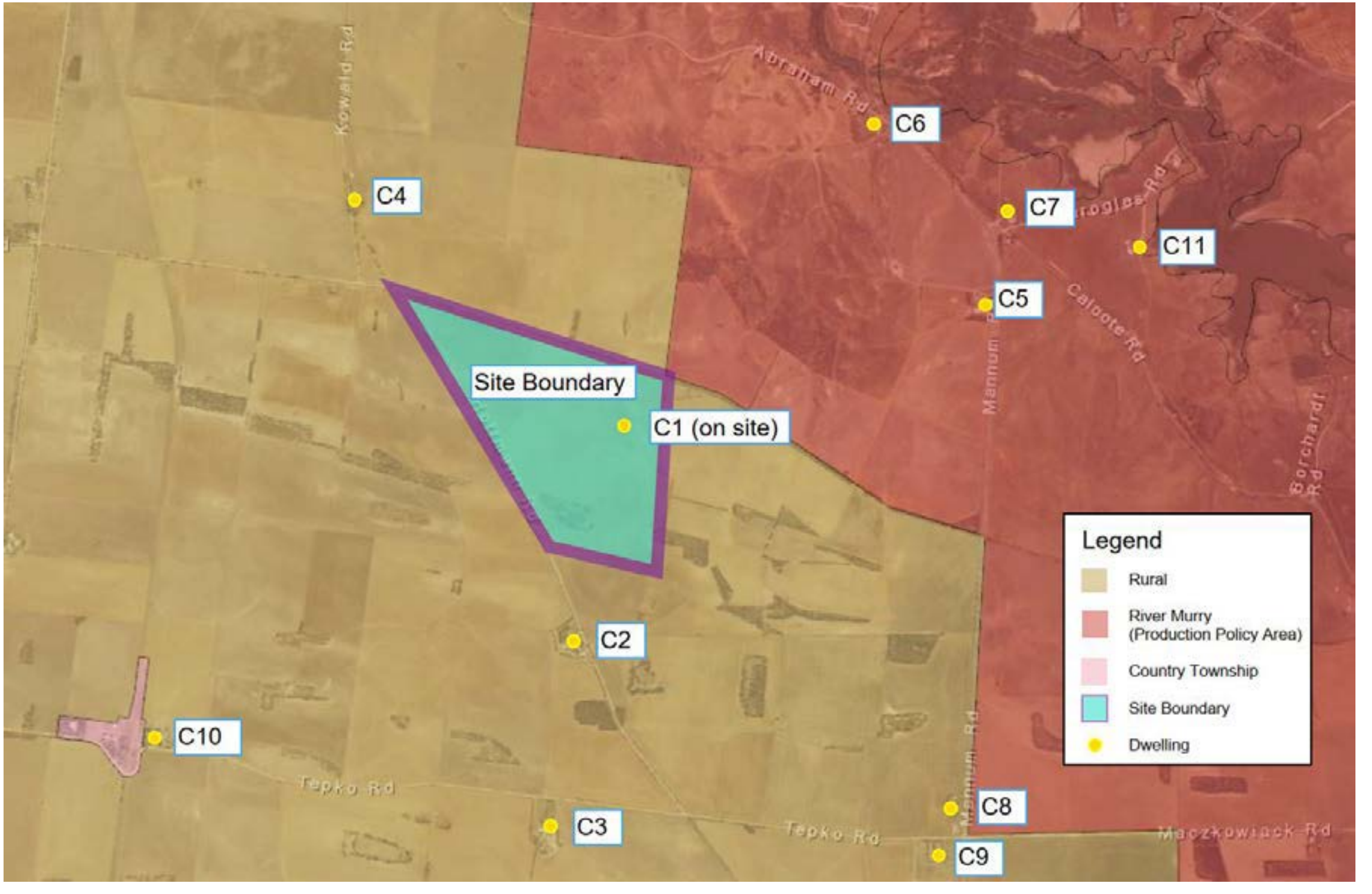
Appendix A Acoustic Nomenclature

Term	Description
dB(A)	'A'-weighted Decibels, the unit of Sound Pressure Level. The 'A'-weighting adjusts the levels of frequencies within the sound spectrum to better reflect the sensitivity of the human ear to different frequencies.
Decibel [dB]	The measurement unit of sound. A 3 decibel increase or decrease is typically considered the smallest change in sound level that a listener can detect. A change of 5 dB is clearly noticeable. A 10 decibel increase is typically considered to sound twice as loud.
Frequency [f]	Frequency is measured in Hertz (Hz). The frequency corresponds to the pitch of the sound: a high frequency to a high pitched sound and a low frequency to a low pitched sound.
LAeq	The 'A'-weighted Equivalent Continuous Sound Pressure Level, which is the constant Sound Pressure Level that for a given duration would be equivalent in sound energy to the time-varying Sound Pressure Level measured over the same duration. L_{eq} Sound Pressure Levels are commonly referred to as the average Sound Pressure Level. [Unit: dB(A)]
LAmax	The maximum 'A'-weighted Sound Pressure Level measured during a given time period usually as a result of a short-term (<1 second) impulsive event. L_{max} is a used as a descriptor in determining the likelihood of sleep disturbance and general annoyance.
Sound Power Level	The total sound energy emitted by a source.
Sound Pressure Level	The amount of sound at a specified receiving point.

Appendix B

Zoning Map

Appendix B Zoning Map



Appendix H

Air Quality Assessment

Summerfield Power Generation Project

Air Quality Impact Assessment

Summerfield Power Generation Project

Summerfield Power Generation Project

Air Quality Impact Assessment

Client: SAPGen Pty Ltd

ABN: 56 630 464 327

Prepared by

AECOM Australia Pty Ltd
17 Warabrook Boulevard, Warabrook NSW 2304, PO Box 73, Hunter Region MC NSW 2310, Australia
T +61 2 4911 4900 F +61 2 4911 4999 www.aecom.com
ABN 20 093 846 925

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Summerfield Power Generation Project

Quality Information

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Ref 60608821

Date 14-Nov-2019

Prepared by Kristen Clarke

Reviewed by David Rollings

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			Name/Position	Signature
0	14-Nov-2019	Final for Submission	Tom Hateley Senior Planner	

Summerfield Power Generation Project

Table of Contents

Summerfield Power Generation Project

Executive Summary

SAPGen Pty Ltd (SAPGen) is proposing to develop a large scale hybrid power generation facility at Tepko to the south west of Mannum; to be referred to as 'Summerfield Power Station'. AECOM Australia Pty Ltd (AECOM) has been commissioned by SAPGen to provide and Air Quality Impact Assessment (AQIA) to assess the potential air quality impacts from construction and operation of the proposed power plant as part of the Environmental Assessment for the Project.

Potential construction impacts from the project were qualitatively assessed in accordance with the UK Institute of Air Quality Management *Guidance on the assessment of dust from demolition and construction*. The magnitude of the construction works was considered moderate to large. Though, due to the low sensitivity of the environment to dust soiling; health and ecological impacts based on the low density of sensitive receptors; particulate background concentrations and limited native vegetation, potential risks for the overall project footprint were found to be low. Although the unmitigated risk rating for construction of the project is considered to be low, a range of mitigation measures would be included in the Construction Air Quality Management Plan (CAQMP) for the site to minimise potential dust impacts to nearby sensitive receptors.

A quantitative assessment of operational air quality impacts from the proposed Summerfield Power Plant was undertaken using the dispersion model CALPUFF in accordance with the Environmental Protection Authority, *Ambient Air Quality Assessment* (SA EPA 2016) guidance document. Two modelling scenarios were assessed as follows:

- Scenario 1 (Base Load) – Two combine cycle gas turbines within each of the 4 High Efficiency Solution plant blocks operating at 100% load continuously.
- Scenario 2 (Partial Load) – One combine cycle gas turbines within each on the 4 High Efficiency Solution plant blocks plant operating at 100% load continuously.

Pollutants assessed included nitrogen dioxide, carbon monoxide, particulates, sulphur dioxide, benzene, ethylbenzene, toluene, xylene and formaldehyde. Air emissions were estimated using performance data for nitrous oxides and carbon dioxide emissions; while all other emission data was estimated using NPI Technical Emission Estimation Manual for Combustion.

Results of the modelling show that predicted project contribution for all pollutants across all averaging periods was well below the EPA criteria for both modelled scenarios. Cumulative concentrations for both modelled scenarios which consider local background concentrations for NO_2, PM_{10}, $PM_{2.5}$, CO and SO_2 were also found to be below the EPA criteria for all pollutants across all averaging periods.

As such no significant air quality impacts are anticipated at nearby sensitive receptors during operation of the Summerfield Power Station operating at partial or full load.

Summerfield Power Generation Project

1.0 Introduction

1.1 Background

SAPGen Pty Ltd (SAPGen) is proposing to develop a large scale hybrid power generation facility at Tepko to the south west of Mannum; to be referred to as 'Summerfield Power Station'. AECOM Australia Pty Ltd (AECOM) has been commissioned by SAPGen to provide and Air Quality Impact Assessment (AQIA) to assess the potential air quality impacts from the operation of the proposed power plant as part of the Environmental Assessment for the Project.

1.2 Purpose of This Report

The purpose of this report is to undertake a qualitative assessment of the potential air quality impacts from construction and quantitative assessment potential air quality impacts from operation of the proposed Summerfield Power Station. The Air Quality Assessment has been undertaken in accordance with the following guidelines:

- Environmental Protection Authority, Ambient Air Quality Assessment (SA EPA 2016)
- Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (Barclay & Scire 2011);
- UK Institute of Air Quality Management Guidance on the assessment of dust from demolition and construction (IAQM 2016)

1.3 Scope and Objectives

This AQIA includes:

- A description of the proposed Summerfield Power Plant (**Section 2.0**).
- A review of local meteorology and existing air quality (**Section 4.0**).
- A review of nearby sensitive receivers and description of surrounding land use and terrain (**Section 4.0**).
- A qualitative assessment of construction impacts in accordance with the UK Institute of Air Quality Management (IAQM) document '*Guidance on the assessment of dust from demolition and construction*' (**Section 6.0**).
- A quantitative assessment of operational impacts of the power plant under normal operating conditions using the Air Dispersion Model CALPUFF (**Section 6.0**)
- Recommendations and conclusion (**Section 7.0**)

2.0 Project Description

2.1 Location

The Proposed 422 MW power generation plant is located on 120 Hoff Road, Tepko, South Australia, (located 60 km east of Adelaide and 20 km north of Murray Bridge). The site is a single allotment comprising of an area of 92 hectares largely comprised of agricultural land with a dwelling located towards the north eastern corner. A patch of native vegetation is located within the south west corner of the site.

Land surrounding the project area is primarily agricultural land A small number of dwellings exist in the locality, with the closest being located 400 metres to the south along Hoffman Road, and 700 metres to the north along Kowald Road.

The location of the proposed power station is shown in **Figure 1**.

Figure 1 Location of Proposed Summerfield Power Generation Project

2.2 Proposed Development

The Summerfield Power Generation Project involves the construction of a 422 MW power generation plant comprising:

- 380 MW natural gas combined cycle gas turbines (CCGT), The CCGTs would be constructed as four High Efficiency Solution (HES) plant blocks comprised of:
  - 2 x LM2500 Gas Turbine Generator (GTG) packages; and
  - BHGE SC2 Steam Turbine Generator (STG) package
- 12 MW solar farm
- 30 MW battery energy storage facility
- Switch yard
- Associated onsite support facilities/ancillary development, such as:
  - Office and amenities building;
  - Control room

- Workshop and storage building
- Site security fencing
- Landscaping

Construction of the proposed Summerfield Power Generation Project is anticipated to take approximately 18 months.

The proposed layout for the Summerfield Power Generation Project is provided in **Figure 2**.

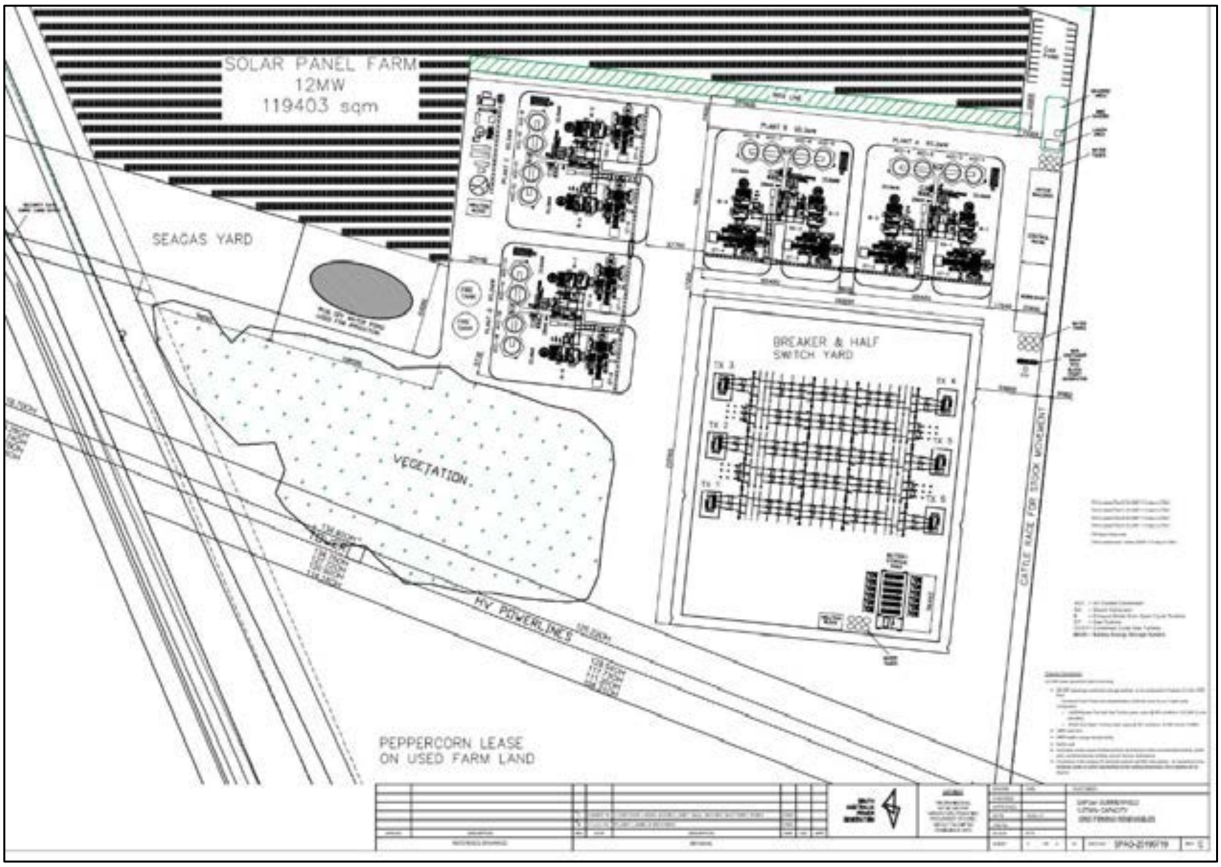

Figure 2 Proposed Summerfield Power Generation Project Plant Layout

2.3 Potential Emission Sources and Pollutants

2.3.1 Potential air emission sources

Construction

Potential sources of air emissions from the Project during construction have been qualitatively assessed in **Section 6.1** would include:

- Dust emissions from:
  - materials handling associated with earthworks
  - wind generated dust from stockpiles and exposed surfaces; and
  - wheel generated dust from on-site truck movements;
- Combustion emissions from:
  - mobile and stationary plant equipment using diesel fuel; and
  - construction vehicles using petrol and diesel fuel.

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Operation

Potential sources of air emissions from operation of the Project would largely be attributed to combustion emissions from the CCGTs using natural gas and have been quantitatively assessed in **Section 6.2**; based on base load (worst case) and partial load operations.

Minor emissions would also be expected to occur from combustion activities associated with onsite vehicle movements.

2.3.2 Potential pollutants of concern

Construction

Potential pollutants of concern during construction on the Project would include:

- Particulate matter equal to or less than 10 microns in diameter (PM_{10});
- Particulate matter equal to or less than 2.5 microns in diameter ($PM_{2.5}$);
- Oxides of Nitrogen (NO_x);
- Carbon Monoxide (CO);

Operation

Potential pollutants of concern during operation of the Project would include:

- Particulate matter equal to or less than 10 microns in diameter (PM_{10});
- Particulate matter equal to or less than 2.5 microns in diameter ($PM_{2.5}$);
- Oxides of Nitrogen (NO_x);
- Carbon Monoxide (CO);
- Sulphur Dioxide (SO_2)
- Volatile Organic Compounds (VOCs) including:
  - Benzene;
  - Ethylbenzene
  - Toluene
  - Xylene
- Formaldehyde.

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3.0 Ambient Air Quality Criteria

The *South Australia Environment Protection (Air Quality) Policy 2016* under Section 28 of the *Environment Protection Act 1993* (SA) provides the ground level assessment criteria for air pollutants in South Australia. **Table 3-1** summarises the impact assessment criteria as relevant to the Project (refer to **Section 2.3**). In general, these criteria relate to the total burden of air pollutants in the air and not just the air pollutants from project-specific sources. Therefore, some consideration of background levels needs to be made when using these criteria to assess impacts. A discussion of regional background levels is provided in **Section 4.2**.

Table 3-1 SA Air Quality Impact Assessment Criteria (2016)

Pollutant	Averaging period	Criteria
Nitrogen dioxide (NO_2)	Maximum 1-hour average	250 µg/m³
	Annual average	60 µg/m³
Particulate matter (PM_{10})	Maximum 24-hour average	50 µg/m³
	Annual average	25 µg/m³
Particulate matter ($PM_{2.5}$)	Maximum 24-hour average	25 µg/m³
	Annual average	8 µg/m³
Carbon monoxide (CO)	Maximum 1-hour average	31,240 µg/m³
	Maximum 8-hour average	11,250 µg/m³
Sulphur dioxide (SO_2)	Maximum 1-hour average	200 µg/m³
	Maximum 24-hour average	80 µg/m³
	Annual average	20 µg/m³
Benzene	Maximum 3-minute average	58 µg/m³
Ethylbenzene	Maximum 3-minute average	15,800 µg/m³
Toluene	Maximum 3-minute average (odour)	710 µg/m³
Xylene	Maximum 3-minute average (odour)	380 µg/m³
Formaldehyde	Maximum 3-minute average	44 µg/m³

µg/m³ = micrograms per cubic metre
PM_{10} Annual Average criterion has been compared against the NEPM Standard. All other criteria are as stipulated by the *South Australia Environment Protection (Air Quality) Policy 2016*

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4.0 Existing Environment

4.1 Meteorology

The Bureau of Meteorology (BOM) records long-term meteorological data at a number of automatic weather stations around the country. The station closest to the Site is located at Pallamana, approximately 12km southeast of Site. A detailed summary of the metrological data recorded at this provided in **Appendix A**.

4.2 Existing Air Quality

The EPA conducts long-term ambient air quality monitoring around the state; however most monitoring is conducted in more densely populated areas around the coastline surrounding Adelaide. Monitoring data was selected at monitoring stations on the eastern fringes of more densely populated areas in order to obtain the most realistic representation of background air quality given the available data sets. The nearest EPA monitoring stations selected were:

- Kensington Gardens 50km to the west which monitors PM_{10}, NO_2 and O_3; a
- Northfield 54km to the north northwest which monitors NO_2, SO_2 and O_3.
- Elizabeth Downs 55 km to the northwest which monitors PM_{10}, $PM_{2.5}$, NO_2, O_3 and CO.

A summary of the data for 2016 to 2018 is included in **Table 2**. It can be seen from **Table 2** that regional air quality in 2016 to 2018 is generally good with from that measured background concentrations for NO_2, $PM_{2.5}$, CO and SO_2 are well below the EPA criteria for all averaging periods. Annual average PM_{10} concentrations recorded at Kensington Gardens were below the NEPM Standard; however exceedances of the maximum 24 hour concentration were found to occur in 2016 and 2018.

There was a single exceedance of the PM_{10} 24 hour criterion during 2016 which occurred on 27 April due to a regional dust storm (EPA 2016a). The second highest 24-hour concentration recorded for 2016 was 35.6 µg/m^3; well below the 50 µg/m^3 criteria. During 2018 there were three exceedances of the PM_{10} 24 hour criterion. Two exceedances occurred in March; the first on March 8th was caused by an industrial fire at Wingfield and the second on March 21 was likely due to a hazard reduction burn within the Mt Lofty Ranges that was conducted during a temperature inversion (EPA 2019). The remaining exceedance occurred during April and is attributed to both fires and a regional dust storm (EPA 2018a). The fourth highest 24 hour PM_{10} concentration in 2019 was below the criteria recorded at 40.2 µg/m^3.

Table 2 Summary of EPA Monitoring Data from 2016 to 2018

Pollutant	Averaging Period	Concentration (µg/m³)			EPA Criteria (µg/m³)	Station
		2016	2017	2018		
NO_2	Maximum 1 Hour	57.4	65.6	57.4	250	Kensington Gardens
	Annual Average	7.0	9.3	5.8	60	Kensington Gardens
PM_{10}	Maximum 24 Hour	**90.2**	28.1	**79.3**	50	Kensington Gardens
	Annual Average	13.2	13.0	14.2	25	Kensington Gardens
$PM_{2.5}$	Maximum 24 Hour	12.7	15.7	16.0	25	Elizabeth Downs
	Annual Average	4.7	7.3	6.5	8	Elizabeth Downs
CO	Maximum 1-Hour	825	No Data	No Data	31,240	Elizabeth Downs
	Maximum 8-Hour	337.5	No Data	No Data	11,250	Elizabeth Downs
SO_2	Maximum 1 Hour	31.5	51.5	20.0	200	Northfield
	Maximum 24 Hour	4.0	7.8	5.7	80	Northfield
	Annual Average	0.2	0.2	0.2	20	Northfield
O_3	Maximum 1-Hour	156.2	188.3	145.5		Kensington Gardens

- Data capture for $PM_{2.5}$ for 2017 and 2018 was 85 and 75% respectively
- NEPM Annual Average PM_{10} Standard of 25 µg/m³ was used for comparison.
- One exceedance of the 24-Hour PM_{10} criterion occurred at Kensington Gardens in 2016. The second highest 24-hour concentration was 35.6 µg/m³.
- Three exceedances of the 24-Hour PM10 criterion occurred at Kensington Gardens in 2018. The fourth highest 24-hour concentration was 40.2µg/m³.
- The 1-hour Maximum ozone concentration has been included for calculation Of ground level NO2 emissions using the OLM method as described in **Section 5.2.8.**

4.3 Terrain

Terrain data for dispersion modelling was captured from NASA's Shuttle Radar Topography Mission (SRTM) which produces terrain information for the entire globe. For Australia, terrain data is available at approximately 30 m resolution (1-arc second) (refer to **Section 5.2.5**). The subject site and surrounding areas feature a gently undulating landscape, with a difference of approximately 10 metres between high and low points across the site. Key features within the locality include the Murray River approximately 4.7 kilometres to the east and the Mannum approximately 9.5 kilometres to north east.

4.4 Land Use and Sensitive Receptors

The site is a single allotment comprising of an area of 92 hectares largely comprised of agricultural land with a dwelling located towards the north eastern corner. A patch of native vegetation is located within the south west corner of the site.

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Land surrounding the project area is primarily agricultural land A small number of dwellings exist in the locality, with the closest being located 400 metres to the south along Hoffman Road, and 700 metres to the north along Kowald Road.

A total of 34 sensitive receptors were included in the dispersion modelling for the AQIA and their location is shown in blue on **Figure 3**. The onsite dwelling location is marked in red on **Figure 3**.

Figure 3 Location of Sensitive Receptors

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5.0 Assessment Methodology

The following assessment has been separated into two distinct assessments as follows:

- Qualitative construction dust assessment (**Section 5.1**); and
- Qualitative operational impact assessment (**Section 5.1.1**).

5.1 Construction Assessment

Potential impacts from dust generation during construction have been assessed using the UK Institute of Air Quality Management (IAQM), 2014 *Guidance on the assessment of dust from demolition and construction*. This document provides a qualitative risk assessment process for the potential unmitigated impact of dust generated from demolition, earthmoving and construction activities.

It must be noted that the IAQM methodology assesses the risk of impacts associated with demolition and construction without the application of any mitigation measures. The assessment provides a classification of the risk of dust impacts which then allows the identification of appropriate mitigation measures commensurate with the level of risk.

The IAQM guidance process is a four-step risk-based assessment of dust emissions associated with demolition, land clearing and earth moving, and construction activities. The IAQM assessment process is described in the following sections.

5.1.1 Step 1 – Screening assessment

An assessment will normally be required where there is a “human receptor” within:

- 350 m from the boundary of a site; or
- 50 m from the route used by construction vehicles on public roads up to 500 m from a site entrance.

5.1.2 Step 2 – Dust risk assessment

Step 2 in the IAQM is a risk assessment tool designed to appraise the potential for dust impacts due to unmitigated dust emissions from a construction project. The key components of the risk assessment are defining the dust emission magnitudes (Step 2A), the surrounding area sensitivity (Step 2B), and then combining these in a risk matrix (Step 2C) to determine an overall risk of dust impacts.

5.1.2.1 Step 2A – Dust emission magnitude

Dust emission magnitudes are estimated according to the scale of works being undertaken classified as Small, Medium or Large. The IAQM guidance provides examples of demolition, earthworks, construction and track-out to aid classification, which have been reproduced in **Table 3** below.

Table 3 Examples of Small, Medium and Large demolition and construction activities

Activity		Small	Medium	Large
Demolition	Total building volume (m^3)	<20,000	20,000–50,000	>50,000
Earthworks	Total site area (m^2)	<2,500	2,500–10,000	>10,000
	Number of heavy earths moving vehicles active at one time	<5	5-10	>10
	Total material moved (tonnes)	<20,000	20,000–100,000	>100,000
Construction	Total building volume (m^3)	<25,000	25,000–100,000	>100,000
Track-out	Number of heavy vehicle movements per day	<10	10-50	>50

5.1.2.2 Step 2B – Sensitivity of surrounding area

The “sensitivity” component of the risk assessment is determined by defining the surrounding area sensitivity to dust soiling, human health effects and ecologically important areas. This is described further below.

Sensitivity of the area to dust soiling and human health effects

The IAQM methodology classifies the sensitivity of an area to dust soiling and human health impacts due to particulate matter effects as high, medium, or low. The classification is determined by a matrix for both dust soiling and human health impacts (refer **Table 5-4** and **Table 5-5** respectively). Factors used in the matrix tables to determine the sensitivity of an area are as follows:

- receptor sensitivity (for individual receptors in the area):
  - high sensitivity: locations where members of the public are likely to be exposed for eight hours or more in a day. (e.g. private residences, hospitals, schools, or aged care homes)
  - medium sensitivity: places of work where exposure is likely to be eight hours or more in a day
  - low sensitivity: locations where exposure is transient, around one or two hours maximum. (e.g. parks, footpaths, shopping streets, playing fields)
- number of receptors of each sensitivity type in the area
- distance from source
- annual mean PM_{10} concentration (only applicable to the human health impact matrix).

Table 5-4 Surrounding area sensitivity to dust soiling effects on people and property

Receptor Sensitivity	Number of Receptors	Distance from the source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

The IAQM guidance provides human health sensitivities for a range of annual average PM_{10} concentrations (i.e. >32, 28-32, 24-28 and <24 µg/m³). It is noted in the IAQM guidance that the human health sensitivities are tied to criteria from different jurisdictions (UK and Scotland). The annual average PM_{10} criteria for Australia differ from the UK and Scotland and as such concentrations

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corresponding to the risk categories need to be modified to match Australian conditions. The annual average criterion for PM_{10} based on the NEPM is 25µg/m^3 (as defined in **Section** Error! Reference source not found.) and therefore the scaled criteria for South Australia is:

- >25 µg/m^3
- 22-25 µg/m^3
- 19-22 µg/m^3
- <19 µg/m^3.

The background PM_{10} concentrations in the region surrounding the Project are outlined in **Section 4.2** and fit within the 13-14µg/m^3 concentration range.

Table 5-5 provides the IAQM guidance sensitivity levels for human health impacts for the ranges outlined above for the annual average PM_{10} concentrations and highlights the relevant range for South Australia.

Table 5-5 Surrounding area sensitivity to human health impacts for annual average PM_{10} concentrations

Receptor Sensitivity	Annual average PM_{10} Concentration	Number of Receptors	Distance from the source (m)				
			<20	<50	<100	<200	<350
High	>25 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	22-25 µg/m^3	>100	High	High	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	19-22 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<19 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>25 µg/m^3	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	22-25 µg/m^3	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	19-22 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<19 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

Sensitivity of area to ecological impacts

Ecological impacts from construction activities may occur due to deposition of dust on ecological areas. The sensitivity of ecological receptors can be defined by the following:

- High sensitivity ecological receptors
  - locations with international or national designation and the designation features may be affected by dust soiling
  - locations where there is a community of particularly dust sensitive species
- Medium sensitivity ecological receptors
  - locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown
  - locations within a national designation where the features may be affected by dust deposition
- Low sensitivity ecological receptors
  - locations with a local designation where the features may be affected by dust deposition.

The sensitivity of an ecological area to impacts is assessed using the criteria listed in **Table 5-6**.

Table 5-6 Surrounding area sensitivity to ecological impacts

Receptor sensitivity	Distance from source (m)	
	<20	20–50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

It should be noted that this is not a quantitative ecological assessment and risks discussed in this context need to be understood in terms of the IAQM guidance. For a particular group of receptors, a risk rating indicates the risk that that an ecologically sensitive area may experience unmitigated dust concentrations, with the associated potential ecological impacts, as outlined above.

5.1.2.3 Step 2C – Unmitigated risks of impacts

The dust emission magnitude as determined in Step2A (**Section 5.1.2.1**) is combined with the sensitivity as determined in Step 2B (**Section 5.1.2.2**) to determine the risk of impacts with no mitigation applied. **Table 7**, reproduced from the IAQM guidance, provides the risk of dust impacts from demolition, earthworks, construction and track-out for each scale of activity as listed in **Table 3**.

Table 7 Risk of Dust Impacts

Activity	Surrounding Area Sensitivity	Dust Emission Magnitude		
		Large	Medium	Small
Demolition	High	High	Medium	Medium
	Medium	High	Medium	Low
	Low	Medium	Low	Negligible
Earthworks	High	High	Medium	Low
	Medium	Medium	Medium	Low
	Low	Low	Low	Negligible
Construction	High	High	Medium	Low
	Medium	Medium	Medium	Low
	Low	Low	Low	Negligible
Track-out	High	High	Medium	Low
	Medium	Medium	Low	Negligible

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Activity	Surrounding Area Sensitivity	Dust Emission Magnitude		
	Low	Low	Low	Negligible

5.1.3 Step 3 – Management strategies

The outcome of Step 2C is used to determine the level of management that is required to ensure that dust impacts on surrounding sensitive receptors are maintained at an acceptable level. A high or medium-level risk rating means that suitable management measures must be implemented during the project.

5.1.4 Step 4 – Reassessment

The final step of the IAQM methodology is to determine whether there are significant residual impacts, post mitigation, arising from a proposed development. The guidance states:

For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be "not significant".

Based on this expectation, as well as experience in Australia, it can be demonstrated that construction activities with targeted mitigation measures can achieve high degrees of dust mitigation which significantly minimise dust impacts to a negligible level.

5.1.5 Vehicle Emissions

The source of non-construction dust emissions during the Project construction phase will be due to the combustion of diesel fuel by heavy vehicles, mobile construction equipment and stationary equipment such as diesel generators. Emissions are expected to depend on the nature of the emissions source i.e. size of the equipment, usage rates, duration of operation etc. Pollutants emitted by construction vehicles include carbon monoxide (CO), particulate matter (PM_{10} and $PM_{2.5}$), nitrous oxides (NO_2), sulphur dioxide (SO_2), volatile organic compounds (VOCs), and polycyclic aromatic hydrocarbons (PAHs).

Given the typically transitory nature of construction site mobile equipment, typical vehicle numbers and the commonly applied mitigation measures expected to be incorporated into the operation of the equipment, adverse air quality impacts from the operation of construction equipment is not expected. On this basis, no further quantification of the potential impacts has been undertaken.

5.2 Operational Assessment

5.2.1 Overview

The air dispersion modelling conducted for this assessment was undertaken using the CALPUFF modelling suite with prognostic meteorological data derived from The Air Pollution Model (TAPM). The data available for this Project and a discussion of the methodologies required to implement CALPUFF are discussed in the following sections.

The flow diagram in **Figure 5-1** shows the general process of programs used for this AQIA and the input data required for the dispersion model.

Further details on the inputs to each process are provided in this section.

Summerfield Power Generation Project

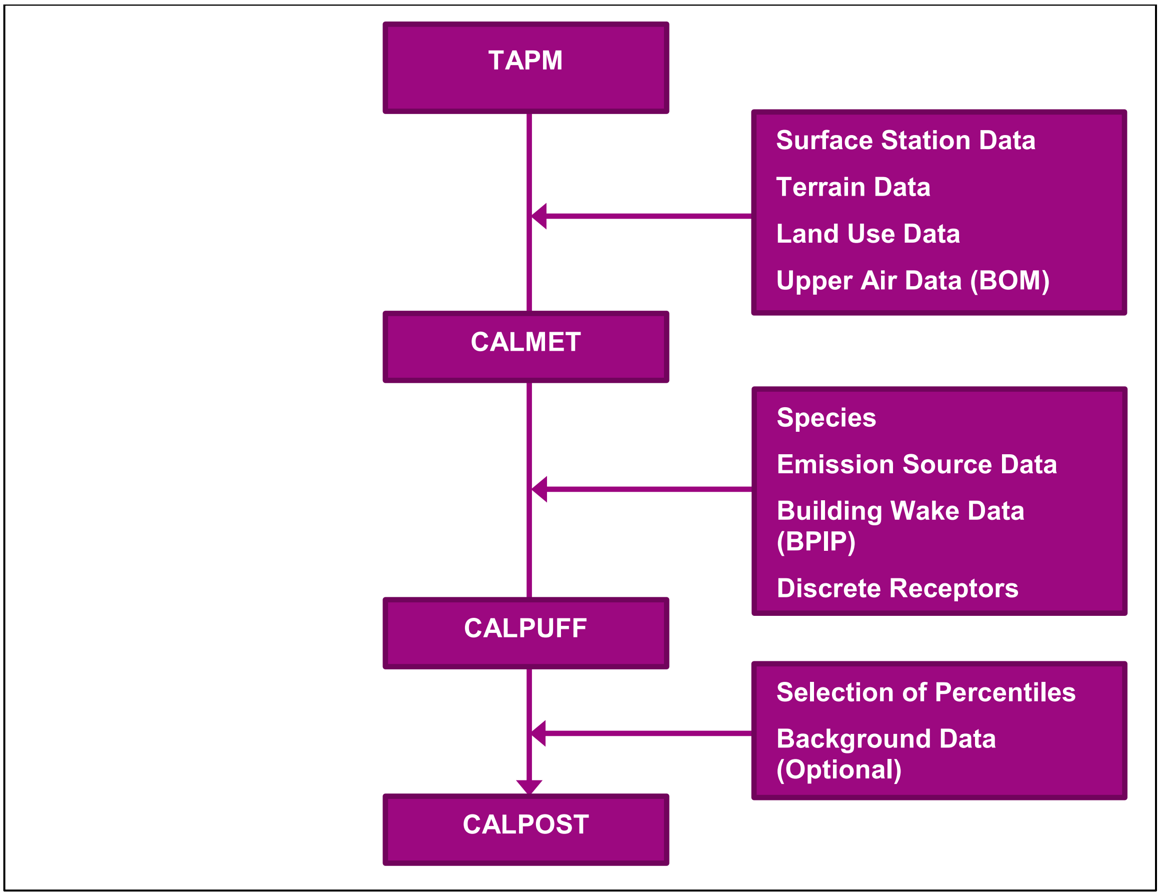

Figure 5-1 AQIA Model Program and Input Flow Chart

Summerfield Power Generation Project

5.2.2 Modelled scenarios

Two modelled operational scenarios for the CCGTs have been assessed in this report. Scenario 1 assumes base load operations and is considered worst case; while Scenario 2 considers part load operations; more typically of day to day operations. The modelled scenarios are explained in more detail in **Table 8**. Each modelled scenario assumed continuous operation with plants operating 8760 hours per year.

Table 8 Modelled Scenarios

Scenario ID	Name	Description	Net Power (MW)	
			HES Plant	Total
Scenario 1 (Worst Case)	Base Load	• Four CCGT HES Plants (A, B, C & D) comprised of: - 2 x LM2500 GTGs; - 1 x BHGE SC2 STGs • CCGT performance has been based on ambient conditions of 15 °C and 60% relative humidity[1]. • 2 x gas turbines per HES plant operating at 100% Load	89.6	358.2
Scenario 2 (Typical Operations)	Part Load	• Four CCGT HES Plants (A, B, C & D) comprised of: - 2 x LM2500 GTGs; - 1 x BHGE SC2 STGs • CCGT performance has been based on ambient conditions of 15 °C and 60% relative humidity[2]. • 1 x gas turbine operating per HES plant at 100% Load	44.0	176.2

5.2.3 Dispersion models

5.2.3.1 TAPM meteorological model

TAPM predicts three-dimensional meteorology, including terrain-induced circulations. TAPM is a PC-based interface that is connected to databases of terrain, vegetation and soil type, leaf area index, sea-surface temperature, and synoptic-scale meteorological analyses for various regions around the world. TAPM is used to predict meteorological parameters at both ground level and at heights of up to 8,000 m above the surface; these data are required by the CALPUFF model. Vertical extrapolation and three pseudo upper air profiles (as up.dat files) using three-dimensional prognostic data generated by TAPM developed for CALPUFF allow the surface station to carry greater weight extending horizontally and vertically out toward the surface station. The location of these pseudo upper air profiles are shown in **Table 5-9.**

5.2.3.2 CALPUFF air dispersion model suite

Various air dispersion models are required for the successful modelling of air quality impacts from the Site. These are:

- the Air Pollution Model (TAPM), which is used to generate prognostic meteorological data; CALTAPM, which is used to process the TAPM output into a format suitable for input into the CALMET model;
- CALMET, which generates three-dimensional wind fields used in the dispersion modelling;

[1] CCGT performance values have been based on low ambient conditions which correlate with the highest mass flow (worst case).
[2] CCGT performance values have been based on low ambient conditions which correlate with the highest mass flow (worst case).

- CALPUFF, which predicts the movement and concentration of pollutants; and
- CALPOST, which is used to process the CALPUFF output files.

The CALPUFF modelling system consists of three main components and a set of pre-processing and post-processing programs. The main components of the modelling system are CALMET (a diagnostic three-dimensional meteorological model), CALPUFF (an air quality dispersion model), and CALPOST (a post-processing package). The main CALPUFF related software package programs are described in the following sections.

5.2.3.3 CALMET

CALMET is a meteorological model that develops hourly wind and temperature fields on a three-dimensional gridded modelling domain. Associated two-dimensional fields such as mixing height, surface characteristics and dispersion properties are also included in the file produced by CALMET. CALMET produces a meteorological file that is used within the CALPUFF model to predict the movement of pollution.

5.2.3.4 CALPUFF

CALPUFF is a non-steady-state three-dimensional Gaussian puff model developed for the US Environmental Protection Agency (US EPA) and approved by the NSW EPA for use in situations where basic Gaussian plume models are not effective, such as areas with complex meteorological or topographical conditions, including coastal areas with re-circulating sea breezes. The CALPUFF model substantially overcomes the basic limitations of the steady-state Gaussian plume models, and as such, was chosen as the most suitable dispersion model for the AQIA and Site Model. Some examples of applications for which CALPUFF may be suitable include:

- near-field impacts in complex flow or dispersion situations:
  - complex terrain;
  - stagnation, inversion, recirculation, and fumigation conditions;
  - overwater transport and coastal conditions; and
  - light wind speed and calm wind conditions.
- long range transport;
- visibility assessments and Class I area impact studies[3];
- criteria pollutant modelling, including in assessment of development applications;
- secondary pollutant formation and particulate matter modelling; and
- buoyant area and line sources (e.g. forest fires and aluminium reduction facilities).

5.2.3.5 CALPOST

The CALPOST program is used to process the outputs of the CALPUFF program into a format defined by the user. Results can be tabulated for selected options including percentiles, selected days, gridded results or discrete locations, and can be adjusted to account for chemical transformation and background values.

The program default settings were used for the CALPOST program, ensuring that the correct averaging periods, percentiles and receptors were selected to meet the NSW EPA ambient pollutant criteria assessed (EPA, 2017).

[3] A Class 1 area impact study refers to A "Class 1" area is a geographic area recognized by the US EPA as being of the highest environmental quality and requiring maximum protection.

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5.2.4 Model setup

5.2.4.1 Key model input parameters

A summary of the data and parameters used as inputs to TAPM, CALMET and CALPUFF is shown in **Table 5-9**. The CALMET and CALPUFF settings have been chosen in accordance with the following documents:

- *Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (Barclay & Scire 2011); and
- Environmental Protection Authority, Ambient Air Quality Assessment (SA EPA 2016)

Table 5-9 Summary of model input parameters

Parameter	Input
TAPM	
Horizontal resolution	40 x 40 grid points; outer grid spacing 30,000 m x 30,000 m with an inner grid spacing of 1,000 metres.
Grid centre coordinates	LON=139.216660,LAT=-34.9749985
Vertical levels	Defaults
Land use data	Default TAPM database
Simulation length	1 January – 31 December 2017
CALMET (v6.42)	
Meteorological grid domain	30 km x 30 km
Meteorological grid resolution	250 m resolution (120 x 120 grid cells)
Reference grid coordinate (SW corner)	322300 E, 6113500 S
Cell face heights in vertical grid	0, 20, 40, 80, 160, 320, 640, 1200, 2000,3000 and 4000 m
Simulation length	1 year (2017)
Surface meteorological stations	Pallamana (BoM) 2017
Upper air meteorological station	Three upper air stations using prognostic data from TAPM
Terrain and land use data	Terrain elevations were extracted from the NASA Shuttle Radar Topography Mission Version 3 data set (SRTM1 30 metre resolution). Land use data taken from GLCC Australia Pacific (~1 km resolution)
TERRAD (Terrain radius of influence)	10 km
RMAX1 (Radius of influence of meteorological stations: surface)	5 km
RMAX2 (Radius of influence of meteorological stations: aloft)	10 km
R1 (Observation weighting: surface)	5
R2 (Observation weighting: aloft)	10
IEXTRP (Vertical extrapolation of surface wind observation)	- 4 (extrapolate using similarity theory, exclude upper air observations from layer 1)
BIAS (NZ) (Layer dependent weighting factor for initial guess field)	Bias of 1 assigned to lower layer and 0 for all other layers.
CALPUFF (v7.2.1)	

Parameter	Input
Computational grid	15 km x 18 km approximately centred on the site
Sampling grid	Nested grid only
Nested Grid	7 km x 7 km nested grid approximately centred on the site. Grid spacing 100 m
Receptors	Boundary Receptors : 7 Discrete Receptors: 34
Dispersion option	Dispersion coefficient. Use turbulence computed from micrometeorology
Meteorological modelling period	1 January 2017 – 31 December 2017

The CALMET settings have been selected in accordance with Barclay & Scire (2011). A review of the prepared CALMET meteorological data using the above settings, as provided **Appendix A**

5.2.4.2 Dispersion meteorology

The meteorological data is used by the CALPUFF model in different ways to estimate the dispersion of air pollutants:

- ambient temperature is used to incorporate thermal buoyancy effects when calculating the rise and dispersion of pollutant plumes;
- wind direction determines the direction in which pollutants would be carried;
- wind speed influences the dilution and entrainment of the plume into the air continuum;
- atmospheric stability class is a measure of atmospheric turbulence and the dispersive properties of the atmosphere. Most dispersion models utilise six stability classes, ranging from A (very unstable) to F (stable/very stable); and
- vertical mixing height is the height at which vertical mixing occurs in the atmosphere.

Meteorological data for the period January – December 2017 were used in this assessment. Prognostic meteorological data were generated using TAPM for upper air conditions for a 40 km x 40 km grid with a 1 km grid spacing centred close to the Project Area. The TAPM output was then used, with surface station data from the Bureau of Meteorology monitoring station at Pallamana, as input into the CALMET meteorological module to compute the wind fields used by CALPUFF. Pallamana is approximately 12 km south of the Project Area. Analysis of the meteorological data used in the modelling are provided in **Appendix A.**

5.2.5 Terrain

Digital terrain data used to generate the upper air prognostic meteorological data were obtained from the TAPM 9 second DEM database covering an area of 30 km by 30 km on a 1 km grid, roughly centred on the Project Area. For the CALMET model, the geophysical processor was used to convert land use and terrain data from WebGIS (SRTM1 for terrain at approximately a 30 m resolution) and GLCC Australia Pacific (approximate 1 km resolution) throughout the meteorological domain.

5.2.6 Building wake effects

The dispersion of pollutants emitted from stack sources may be affected by aerodynamic wakes generated by winds having to flow around buildings. Building wakes generally decrease the distance downwind at which stack plumes come into contact with the ground, which may result in higher ground level pollutant concentrations closer to the emission source. Point sources included eight stacks for the CCGTs with a height of 19.8m; and are likely to be wake affected due to the air cool condenser towers which would be approximately 20m in height.

The Prime building wake algorithm was used in the assessment and buildings entered into the CALPUFF model BPIP have been shown in **Figure 2**.

Summerfield Power Generation Project

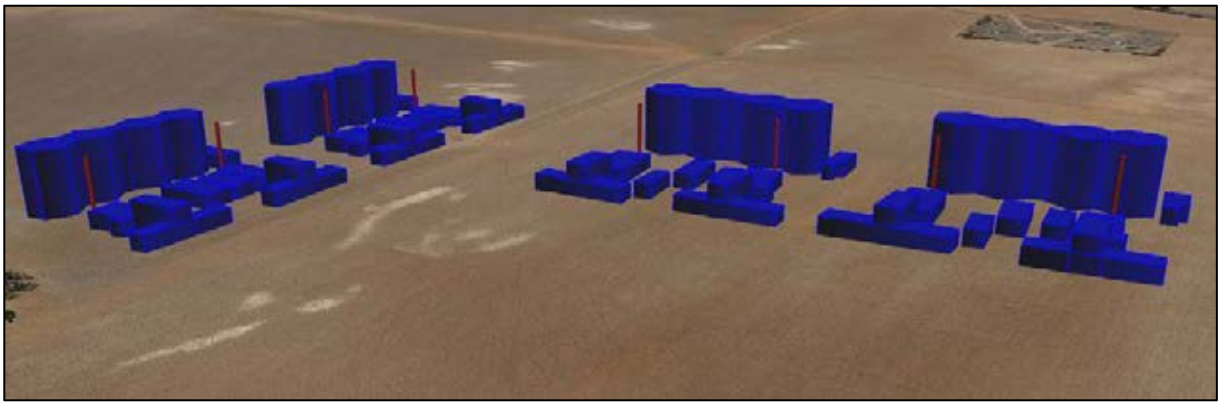

Figure 2 BPIP

5.2.7 Emission rates

Stack parameters for all modelled scenarios are presented in **Table 10**. The following assumptions have been made regarding stack parameters for entry into the CALPUFF model:

- Stack locations; height and diameter have been estimated from site plans.
- Exhaust temperature for each stack has been estimated using monthly average monitoring data for 2018 published by Energy Australia for 2019 for Tallawarra Power Station in NSW; which operated 2 CCGTs with a capacity of 218 MW.
- Exhaust flow rates (in Nm^3/s) have been assumed based on estimated engine performance data for LM2500 + G4, 6 Stage DLE gas turbines at 100% load under 15°C and 60% Relative Humidity ambient conditions.

Emission factors for all CCGT stacks used in both Scenario 1 and Scenario 2 are presented in **Table 11**. Calculated emission rates for both modelled scenarios are presented in **Table 12**, along with net plant power output and operational hours. The following assumptions were made when calculating emission rates from modelled scenarios:

- The proposed CCGTs would utilise DLE technology to mitigate NO_x and CO emissions from the project. As such emission factors for NOx and CO have been based on estimated engine performance data for LM2500 + G4, 6 Stage DLE gas turbines at 100% load under 15°C and 60% Relative Humidity ambient conditions.
- Emission factors for all other modelled pollutants were taken from *Table 51 Emission Factors for uncontrolled gas turbines natural gas engines* within the National Pollution Inventory (NPI) *Emission Estimation Technique Manual for Combustion Engines Version 3.*0 (DEWHA 2008)
- Operational hours assumed for:
  - Scenario 1 all CCGTc within each HES plant block would operate continuously for 8760 hours per year;
  - Scenario 2 1 CCGT plant within each HES plant block would operate continuously for 8760 hours per year.

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Table 10 Stack Parameters

HES Plant	Stack ID	MGA 54 Coordinates (m)		AGL Stack Height (m)	Base Elevation (m)	Stack Diameter (m)	Exhaust Temp (K)	Flow Rate (Am^3/s)	Flow Rate (Nm^3/s)	Velocity (m/s)	Gas Turbine Operational	
		Easting	Northing								Scenario 1	Scenario 2
A	B-1	337061	6130254	19.8	96.9	2.5	357.9	149.2	113.9	30.4	Yes	Yes
	B-2	337014	6130258	19.8	97.7	2.5	357.9	149.2	113.9	30.4	Yes	No
B	B-3	336965	6130264	19.8	98.0	2.5	357.9	149.2	113.9	30.4	Yes	Yes
	B-4	336918	6130269	19.8	97.3	2.5	357.9	149.2	113.9	30.4	Yes	No
C	B-5	336806	6130304	19.8	95.3	2.5	357.9	149.2	113.9	30.4	Yes	Yes
	B-6	336801	6130256	19.8	94.7	2.5	357.9	149.2	113.9	30.4	Yes	No
D	B-7	336795	6130208	19.8	93.6	2.5	357.9	149.2	113.9	30.4	Yes	Yes
	B-8	336790	6130161	19.8	93.0	2.5	357.9	149.2	113.9	30.4	Yes	No

Table 11 Emission Factors

Emission Factors									
PM_{10} (kg/kWh)	$PM_{2.5}$ (kg/kWh)	SO_2 (kg/kWh)	Benzene (kg/kWh)	Ethylbenzene (kg/kWh)	Toluene (kg/kWh)	Xylene (kg/kWh)	Formaldehyde (kg/kWh)	NO_X (kg/h)	CO (kg/h)
$2.9x10^{-6}$	$2.9x10^{-6}$	7.910-7	$1.9x10^{-8}$	$5.0x10^{-8}$	$2.0x10^{-7}$	$1.0x10^{-7}$	$1.1x10^{-6}$	13.8	8.4

Table 12 Plant Power Output, Operational Hours and Emission Rates for Scenario 1 and Scenario 2

HES Plant	Stack ID	HES Plant Power Output (MW)	Annual Operational Hours	Scenario 1 Emission Rates (g/s)									
				PM_{10}	$PM_{2.5}$	SO_2	Benzene	Ethylbenzene	Toluene	Xylene	Formaldehyde	NO_X	CO
A	B-1	89.6	8760	0.036	0.036	0.010	0.0002	0.0006	0.0025	0.0012	0.0137	3.83	2.33
	B-2		8760	0.036	0.036	0.010	0.0002	0.0006	0.0025	0.0012	0.0137	3.83	2.33
B	B-3	89.6	8760	0.036	0.036	0.010	0.0002	0.0006	0.0025	0.0012	0.0137	3.83	2.33
	B-4		8760	0.036	0.036	0.010	0.0002	0.0006	0.0025	0.0012	0.0137	3.83	2.33
C	B-5	89.6	8760	0.036	0.036	0.010	0.0002	0.0006	0.0025	0.0012	0.0137	3.83	2.33
	B-6		8760	0.036	0.036	0.010	0.0002	0.0006	0.0025	0.0012	0.0137	3.83	2.33
D	B-7	89.6	8760	0.036	0.036	0.010	0.0002	0.0006	0.0025	0.0012	0.0137	3.83	2.33
	B-8		8760	0.036	0.036	0.010	0.0002	0.0006	0.0025	0.0012	0.0137	3.83	2.33
HES Plant	Stack ID	HES Plant Power Output (MW)	Annual Operational Hours	Scenario 2 Emission Rates (g/s)									
				PM_{10}	$PM_{2.5}$	SO_2	Benzene	Ethylbenzene	Toluene	Xylene	Formaldehyde	NO_X	CO
A	B-1	44.0	8760	0.035	0.035	0.010	0.0002	0.0006	0.0024	0.0012	0.0135	3.83	2.33
	B-2		0	-	-	-	-	-	-	-	-	-	-
B	B-3	44.0	8760	0.035	0.035	0.010	0.0002	0.0006	0.0024	0.0012	0.0135	3.83	2.33
	B-4		0	-	-	-	-	-	-	-	-	-	-
C	B-5	44.0	8760	0.035	0.035	0.010	0.0002	0.0006	0.0024	0.0012	0.0135	3.83	2.33
	B-6		0	-	-	-	-	-	-	-	-	-	-
D	B-7	44.0	8760	0.035	0.035	0.010	0.0002	0.0006	0.0024	0.0012	0.0135	3.83	2.33
	B-8		0	-	-	-	-	-	-	-	-	-	-

5.2.8 NO_X conversion to NO_2

Nitrogen oxides are produced in most combustion processes and are formed during the oxidation of nitrogen in fuel and nitrogen in the air. During high-temperature processes, a variety of oxides are formed, including nitric oxide (NO) and nitrogen dioxide (NO_2).

One of the challenges of modelling NO_x emissions is how to determine the amount of NO_2 at a receptor given that NO reacts (oxidises) in the atmosphere to form NO_2 over time. Early studies (Hegg et al., 1977) showed that the rate of oxidation is controlled by the rate of plume mixing rather than by gas reaction kinetics. Ozone is usually the chemical that is responsible for most of the oxidation, but other reactive atmospheric gases can also oxidise NO. CALPUFF assumes that the pollutants are inert, neutrally buoyant gases, i.e. the model does not account for any chemical transformations[4] or heavy gas effects. As such, the transformation of NO_x to NO_2 for this assessment needs to be completed in the post-processing stage.

NO will generally comprise 90-95 per cent of the volume of NO_X at the point of emission with the remaining NO_X consisting of NO_2. The conversion of NO to NO_2 requires ozone to be present in the air, as ozone is critical to photochemical reaction from NO to NO_2. Ultimately over time, however, all NO emitted into the atmosphere is oxidised to NO_2 and then further to other higher oxides of nitrogen.

There are a number of methodologies outlined in the NSW EPA Approved Methods for the calculation of NO_2 concentrations from predicted NO_X concentrations. The two most common methods are:

1. assumption of 100% of the NO_X reports as NO_2. This is a highly conservative assumption and should only be used in situations where emissions of NO_X are low; and
2. US EPA Ozone Limiting Method (OLM). The OLM is based on the assumption that approximately 10 % of the initial NO_X emissions are emitted as NO_2. If the ozone (O_3) concentration is greater than 90% of the predicted NO_X concentrations, all the NO_X is assumed to be converted to NO_2, otherwise NO_2 concentrations are predicted using the equation $NO_2 = \{0.1 * NO_X + 46/48 * O_3\}$. This method assumes instant conversion of NO to NO_2 in the plume, which overestimates concentrations close to the source since conversion usually occurs over periods of hours. This method is described in detail in DEC (2005a).

The US EPA's Ozone Limiting Method (OLM) was used to predict ground-level concentrations of 1 hour NO_2 as part of the AQIA. The 2017 background O_3 data from the Chullora monitoring station was used to calculate the modelled NO_2 concentrations in accordance with the NSW EPA Approved Methods.

[4] Chemical transformations in CALPUFF (MCHEM) was not activated. As noted in Table A-4 of the NSW *Generic Guidance and Optimum Modell Setting for Calpuff* (Barclay and Scire 2011) chemistry for NOx is recommended for dealing with large scale models where NOx concentration predictions over 10-20km are required and chemical transformation is not a prerequisite for dispersion modelling in Australia.

6.0 Impact Assessment

6.1 Construction Impacts

Construction of the proposed Summerfield Power Generation Project is anticipated to take approximately 18 months. Potential dust impacts during the construction period have been determined based on the IAQM construction dust assessment guidance documentation and the expected scale of the of construction activities outlined in **Section 2.2 Section 5.1.**

The magnitude of the unmitigated emissions from the overall off-airport construction footprint activities are rated small for demolition works, medium for trackout and large for excavation and contruction works due to the extent of construction activities, refer to **Table 6-1**.

The sensitivities for the different construction activities are provided in **Table 6-1**. A single dwelling is located onsite towards within the north eastern sector of the site; approximately 300m to the north of the proposed power station. The closest offsite rural residential properties are located 400 metres to the south along Hoffman Road, and 700 metres to the north along Kowald Road as such the sensitivity to dust soiling was rated low. Background annual average PM_{10} concentration between 2016 and 18 was below 15 µg/m^3 and the proximity of receptors (1-10 receptors within 350m of the footprint) the sensitivity to human health effects for annual average PM_{10} was rated low.

A patch of native vegetation is located within the south west corner of the site within 20-50 of the proposed power plant. Surrounding land is predominantly rural predominantly cleared and disturbed rural landscape with interspersed stands of remnant native vegetation. As such the ecological sensitivity of the area was rated low.

The potential risks for the overall construction footprint were found to be “low” to negligible for construction activities.

Table 6-1 Summary of risk assessment for full off-airport construction footprint

Activity	Step 2A: Potential for dust emissions	Step 2B: Sensitivity of area			Step 2C: Risk of dust impacts		
		Dust soiling	Human health	Ecological	Dust soiling	Human health	Ecological
Demolition	Small	Low	Low	Low	Negligible	Negligible	Low
Earthworks	Large	Low	Low	Low	Low	Low	Low
Construction	Large	Low	Low	Low	Low	Low	Low
Trackout	Medium	Low	Low	Low	Low	Low	Low

Although the unmitigated risk rating for construction of the project is considered low, a range of mitigation measures would be included in the Construction Air Quality Management Plan (CAQMP) for the site to minimise potential dust impacts to nearby sensitive receptors.

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6.2 Operational Impacts

Predicted ground level concentrations at sensitive receptors for base load operation of the Summerfield Power Station and Partial Load operation are presented in **Section 6.2.1** and **Section 6.2.2**. Results have been presented based on predicted incremental concentrations at the worst affected offsite sensitive receptor as well as cumulative impacts for NO_2, PM_{10}, $PM_{2.5}$, CO and SO_2.

Predicted NO_2 ground level concentrations have been assessed contemporaneously; with NOx emissions converted to NO_2 using the methodology described in **Section 5.2.8** and hourly background NO_2 and O_3 data from EPA Kensington Gardens monitoring station for 2017. The maximum background concentrations recorded between 2016 and 2018 were generally assumed for cumulative assessment of ground level concentrations for PM_{10} $PM_{2.5}$, CO and SO_2. As discussed in **Section 4.2**; there were four exceedances of the PM_{10} 24 hour criteria between 2016 and 2018 due to fires and dust storms as such the 5th highest recorded 24 hour background concentration of 40.2 µg/m³ was adopted.

6.2.1 Scenario 1 – Base Load

A predicted incremental and cumulative ground level concentration for Scenario 1; which includes operation of all 4 HES plants at 100% load is presented in **Table 6-2;** and is considered representative of worst case operations. Incremental ground level concentrations reported **Table 6-2** for the worst affected sensitive receptor as detailed in **Section 4.4**.

The results of the modelling show **Table 6-2** that predicted project contribution for all pollutants across all averaging periods was well below the EPA criteria. Cumulative concentrations; which take into account local background concentrations for NO_2, PM_{10}, $PM_{2.5}$, CO and SO_2 were also found to be below the EPA criteria for all pollutants across all averaging periods.

As such no significant air quality impacts are anticipated at nearby sensitive receptors during operation of the Summerfield Power Station at 100% capacity.

Table 6-2 Predicted Maximum Ground Level Concentrations for all Pollutants at Sensitive Receptors.

Pollutant	Averaging period	Concentration (µg/m³)			Criteria ((µg/m³)
		Incremental	Background	Cumulative	
Nitrogen dioxide	Maximum 1-hour average	122.7	Variable	134.9	250
	Annual average	6.0	Variable	14.9	60
Particulate matter (PM_{10})	Maximum 24-hour average	1.0	40.2	41.2	50
	Annual average	0.1	14.2	14.3	25
Particulate matter ($PM_{2.5}$)	Maximum 24-hour average	0.7	16.0	16.8	25
	Annual average	0.1	7.3	7.4	8
Carbon monoxide	Maximum 1-hour average	390.0	825.0	1215.0	31,240
	Maximum 8-hour average	102.6	337.5	440.1	11,250
Sulphur dioxide (SO_2)	Maximum 1-hour average	1.6	51.5	53.1	200
	Maximum 24-hour average	0.3	7.8	8.1	80
	Annual average	0.0	0.2	0.3	20
Benzene	Maximum 3-minute average	0.03	NA	NA	58
Ethylbenzene	Maximum 3-minute average	0.1	NA	NA	15,800
Toluene	Maximum 3-minute average	0.4	NA	NA	710
Xylene	Maximum 3-minute average	0.2	NA	NA	380
Formaldehyde	Maximum 3-minute average	2.3	NA	NA	44

6.2.2 Scenario 2 – Partial Load

A predicted incremental and cumulative ground level concentration for Scenario 2; which includes operation of one of two CCGTs with all 4 HES plants at 100% load is presented in **Table 6-3**. This scenario is considered to be representative of typical operations. Incremental ground level concentrations reported **Table 6-3** for the worst affected sensitive receptor as detailed in **Section 4.4**.

The results of the modelling show **Table 6-3** that predicted project contribution for all pollutants across all averaging periods was well below the EPA criteria. Cumulative concentrations; which take into account local background concentrations for NO_2, PM_{10}, $PM_{2.5}$, CO and SO_2 were also found to be below the EPA criteria for all pollutants across all averaging periods.

As such no significant air quality impacts are anticipated at nearby sensitive receptors during operation of the Summerfield Power Station under a partial load.

Table 6-3 Predicted Maximum Ground Level Concentrations at Receptors for all Pollutants

Pollutant	Averaging period	Concentration ($\mu g/m^3$)			Criteria (($\mu g/m^3$)
		Incremental	Background	Cumulative	
NO_2	Maximum 1-hour average	99.3	Variable	117.0	250
	Annual average	3.8	Variable	12.5	60
PM_{10}	Maximum 24-hour average	0.5	40.2	40.7	50
	Annual Average	0.0	14.2	14.3	25
$PM_{2.5}$	Maximum 24-hour average	0.5	16.0	16.6	25
	Annual average	0.0	7.3	7.4	8
CO	Maximum 1-hour average	219.9	825.0	1044.9	31,240
	Maximum 8-hour average	51.0	337.5	388.5	11,250
Sulphur dioxide (SO_2)	Maximum 1-hour average	0.9	51.5	52.4	200
	Maximum 24-hour average	0.1	7.8	8.0	80
	Annual average	0.0	0.2	0.2	20
Benzene	Maximum 3-minute average	0.02	NA	NA	58
Ethylbenzene	Maximum 3-minute average	0.1	NA	NA	15,800
Toluene	Maximum 3-minute average	0.2	NA	NA	710
Xylene	Maximum 3-minute average	0.1	NA	NA	380
Formaldehyde	Maximum 3-minute average	1.3	NA	NA	44

7.0 Conclusion

AECOM was commissioned by SAPGen to provide and AQIA to assess the potential air quality impacts from construction and operation of the proposed power plant as part of the Environmental Assessment for the Project.

Potential construction impacts from the project were qualitatively assessed in accordance with the UK Institute of Air Quality Management *Guidance on the assessment of dust from demolition and construction*. The magnitude of the construction works was considered moderate to large. Though, due to the low sensitivity of the environment to dust soiling; health and ecological impacts based on the low density of sensitive receptors; particulate background concentrations and limited native vegetation potential risks for the overall construction footprint were found to be low. Although the unmitigated risk rating for construction of the project is considered low, a range of mitigation measures would be included in the Construction Air Quality Management Plan (CAQMP) for the site to minimise potential dust impacts to nearby sensitive receptors.

A quantitative assessment of operational air quality impacts from the proposed Summerfield Power Plant was undertaken using the dispersion model CALPUFF in accordance with the Environmental Protection Authority, *Ambient Air Quality Assessment* (SA EPA 2016) guidance document. Two modelling scenarios were assessed:

- Scenario 1 (Base Load) – Two combine cycle gas turbines within each of the 4 High Efficiency Solution plant blocks operating at 100% load continuously.
- Scenario 2 (Partial Load) – One combine cycle gas turbines within each on the 4 High Efficiency Solution plant blocks plant operating at 100% load continuously.

Results of the modelling show that predicted project contribution for NO_2, PM_{10}, $PM_{2.5}$, CO and SO_2, BTEX and formaldehyde across all averaging periods was well below the EPA criteria for both modelled scenarios. Cumulative concentrations for both modelled scenarios which take into account local background concentrations for NO_2, PM_{10}, $PM_{2.5}$, CO and SO_2 were also found to be below the EPA criteria for all pollutants across all averaging periods.

As such no significant air quality impacts are anticipated at nearby sensitive receptors during operation of the Summerfield Power Station operating at partial or full load.

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References

IAQM (2016) Guidance on the Assessment of Dust from Demolition and Construction; *Institute of Air Quality* Management, United Kingdom.

DEWHA (2008) *Emission Estimation Technique Manual for Combustion Engines*; Version 3.0, National Pollution Inventory; Department of Environment, Water Heritage and Arts, Canberra

EPA (2016) *Environmental Protection Authority, Air Quality Assessment,* ISBN 978-1-921495-77-9, South Australia Environmental Protection Authority, Adelaide, South Australia

EPA (2016a) *Air Quality Quarterly Summary Report – April to June (Q2) 2016*, Environment Protection Authority, Adelaide, South Australia, Australia

EPA (2018) *Air Quality Quarterly Summary Report – January to March (Q1) 2018*, Environment Protection Authority, Adelaide, South Australia, Australia

EPA (2018a) *Air Quality Quarterly Summary Report – April to June (Q2) 2018*, Environment Protection Authority, Adelaide, South Australia, Australia

Energy Australia (2018) *Tallawarra EPA Reports; Monitoring and Complaints Summaries Jan to December* 2018 Accessed 17 October 2019: https://www.energyaustralia.com.au/about-us/energy-generation/tallawarra-power-station/tallawarra-epa-reports

Appendix A

Meteorological Analysis

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Appendix A Meteorological Analysis

Overview

The AQIA used 2017 meteorological data from the Bureau of Meteorology monitoring station at Pallamana, SA (Station Number 024584) located approximately 12km to the south of the site. This appendix provides a comparison of CALMET model predictions with regional BoM measured data.

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Wind Speed and Wind Direction

Wind Speed Statistics

Predicted annual minimum, average and maximum winds speeds and frequency of calms (wind speeds less than 5 m/s) have been extracted from the 2017 CALMET data set at the Summerfield Power Station site (hereafter referred to as CALMET Summerfield). This data has been compared to wind speed statics from regional 2017 observations at the Pallamana BoM station and is presented in **Table 4**.

Regional wind statistics shown in **Table 4** show that the CALMET Summerfield dataset is reasonably similar to the closest observatory data set at Pallamana, moderate average annual winds and calm conditions occurring around 3% of the time. There was a slightly higher proportion of lower wind speeds within the CALMET data set; which would result in slower dispersion of pollutants; and is therefore considered conservative.

Table 4 Regional Wind Statistics Comparison

Wind Parameter	CALMET Summerfield	BoM Pallamana
Minimum (m/s)	0.0	0.0
Average (m/s)	4.3	4.5
Maximum (m/s)	16.4	18.1
Calms (%) (<0.5m/s)	3.2	3.1

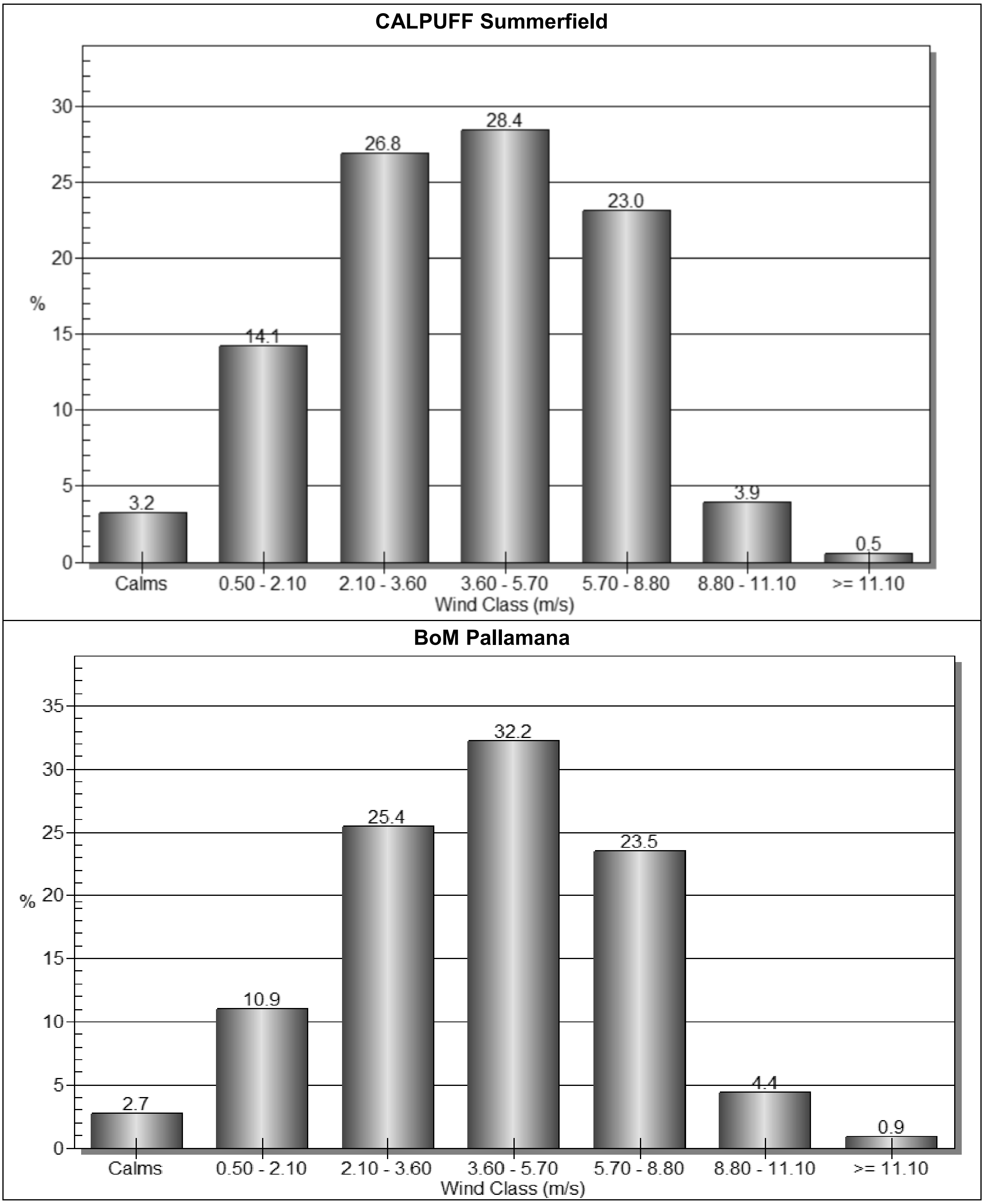

Figure 3 Comparison of 2017 Wind Speed Frequency Distribution Data

Wind Directional Data

Wind directional data from the CALMET Summerville 2017 data set has been compared against observational data for the BoM station at Pallamana and is shown in **Figure 4** to **Figure 5**. **Figure 4** provides a comparison of 2017 annual wind roses, while seasonal wind roses are compared in **Figure 5**.

Annual wind roses for 2017 shown in **Figure 4**, show good correlation between the predicted CALMET Summerville data and the closest observational data at Pallamana for wind direction. The predominant winds on an annual basis are for both data sets are from the south to the west; as well as some north

. Similar to the annual average
ɔn of both data sets with a high
d a higher frequency of north
CALMET Summerfield and
data set is considered

nmerfield data set are shown in
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ɛrrain to the east of Summerfield;
varying in both magnitude and
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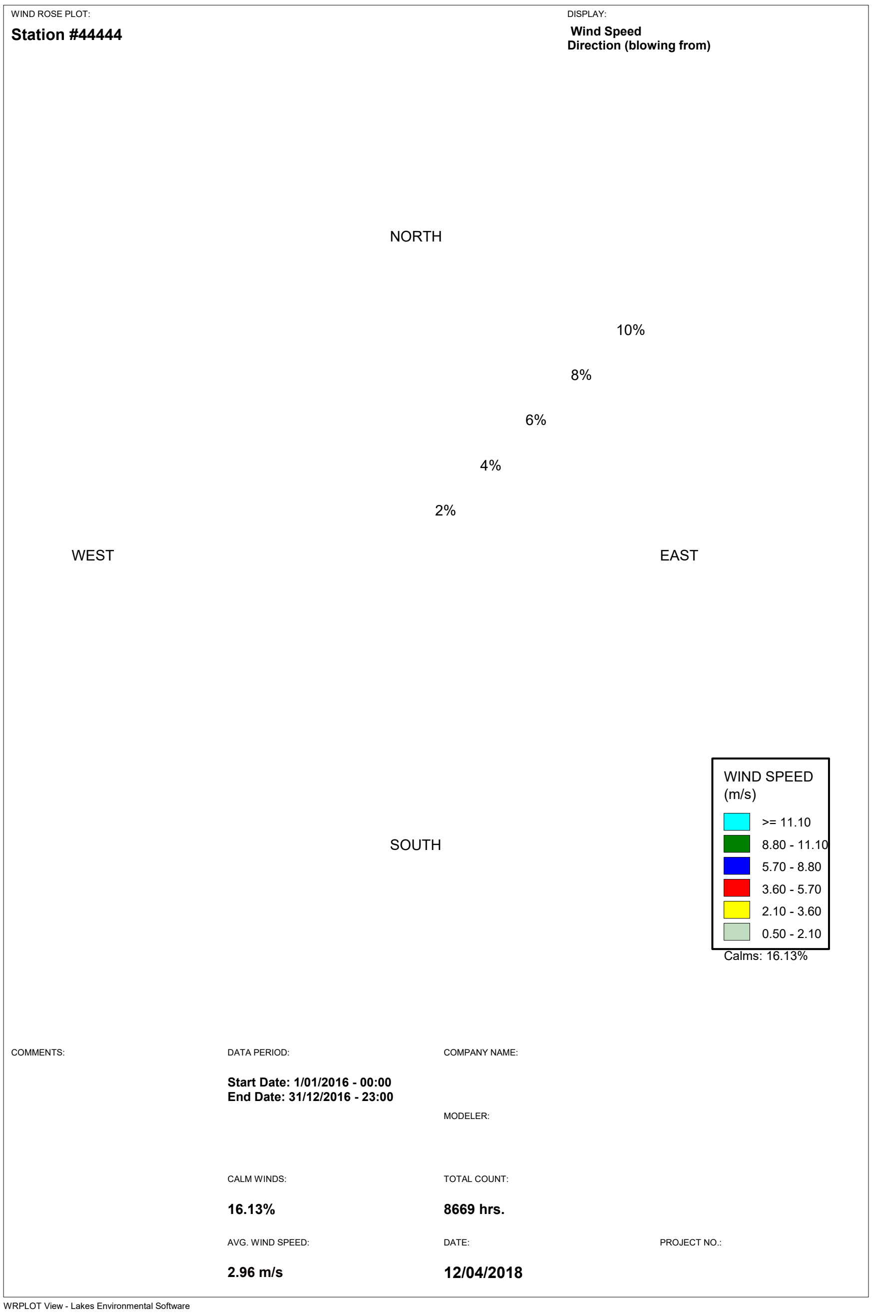
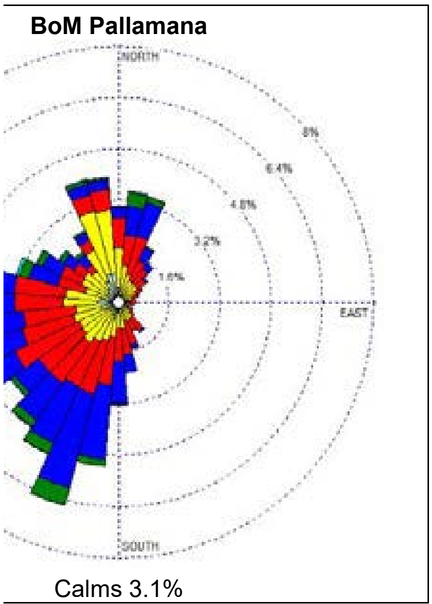
data at Pallamana.





BoM Annual Wind Roses for 2017

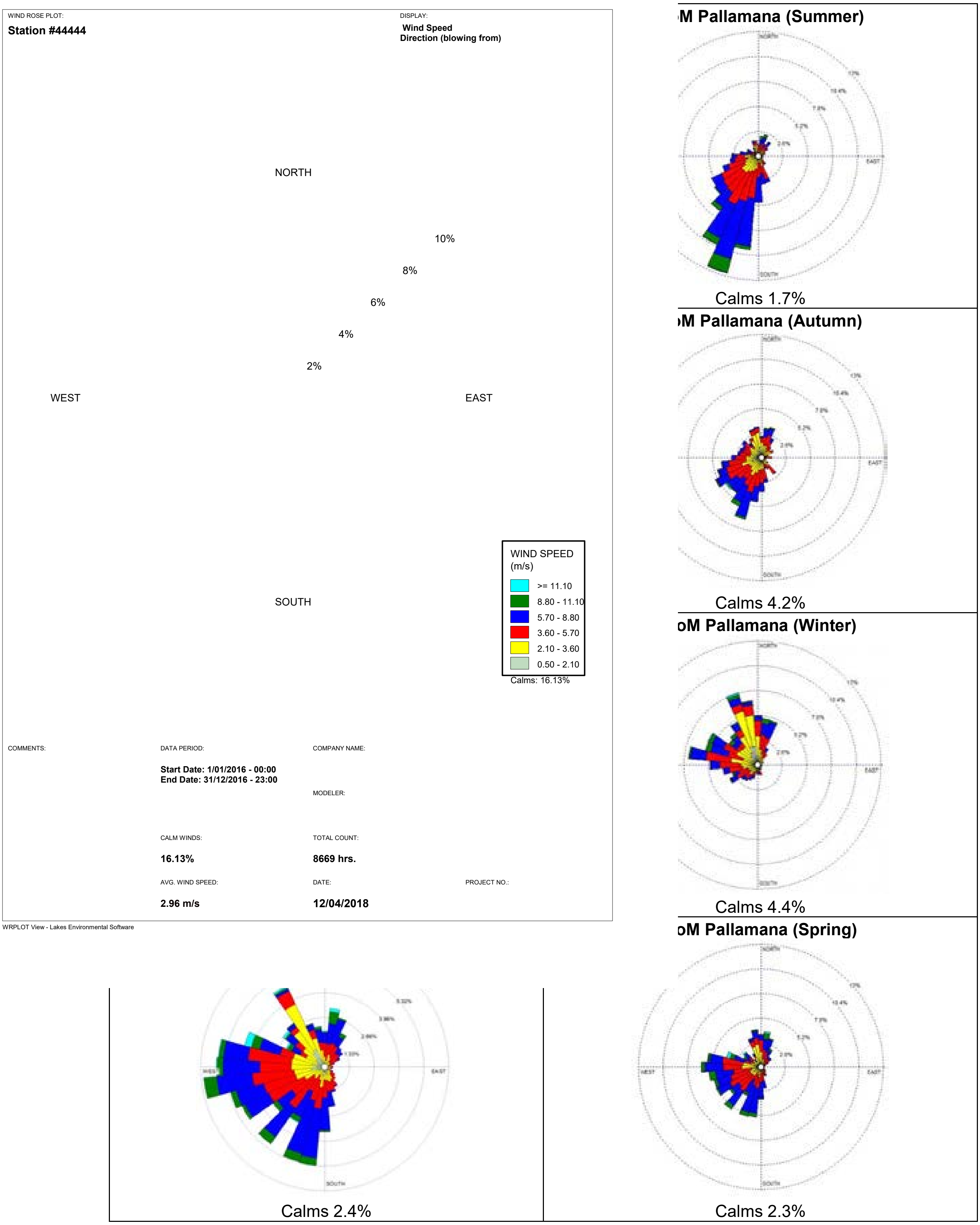


Figure 5 Comparison of CALMET Summerfield and BoM Pallamana Seasonal Wind Roses.

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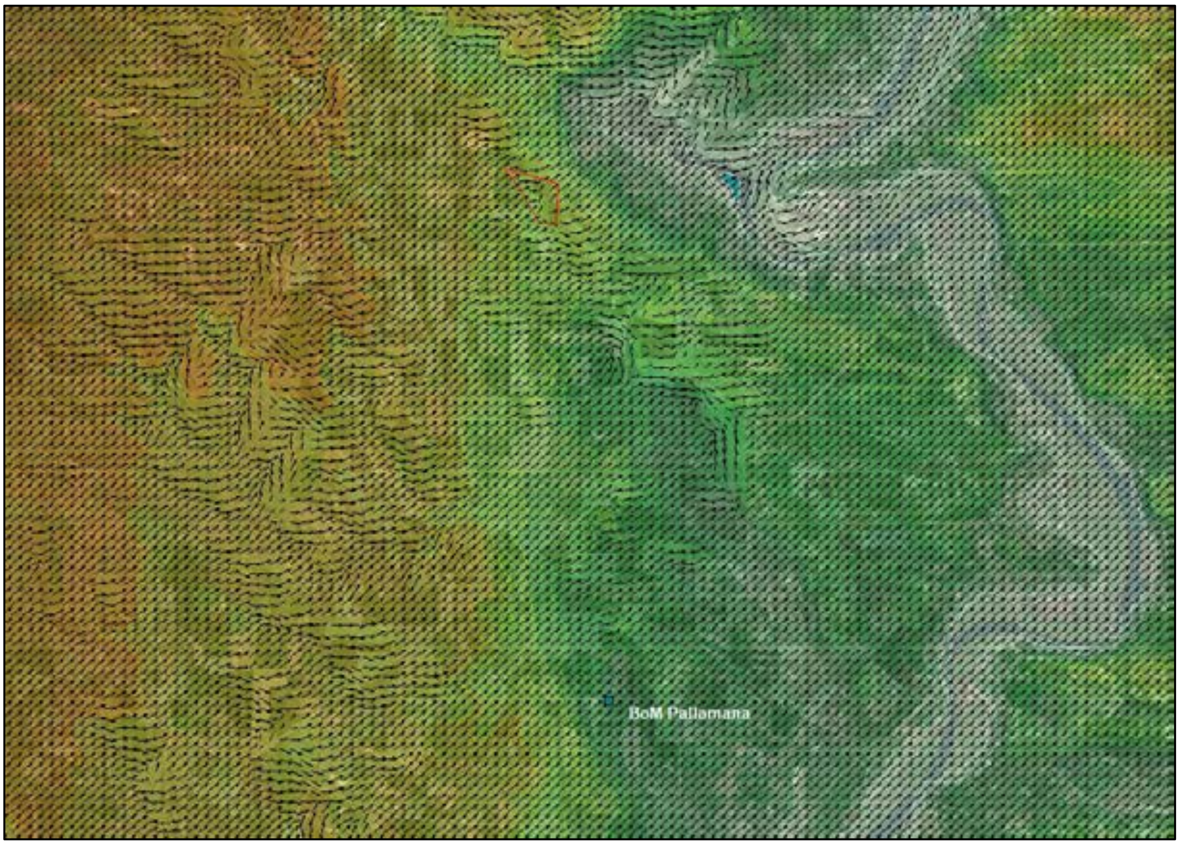

Figure 6 CALMET Wind fields 1:00am 3 March 2017

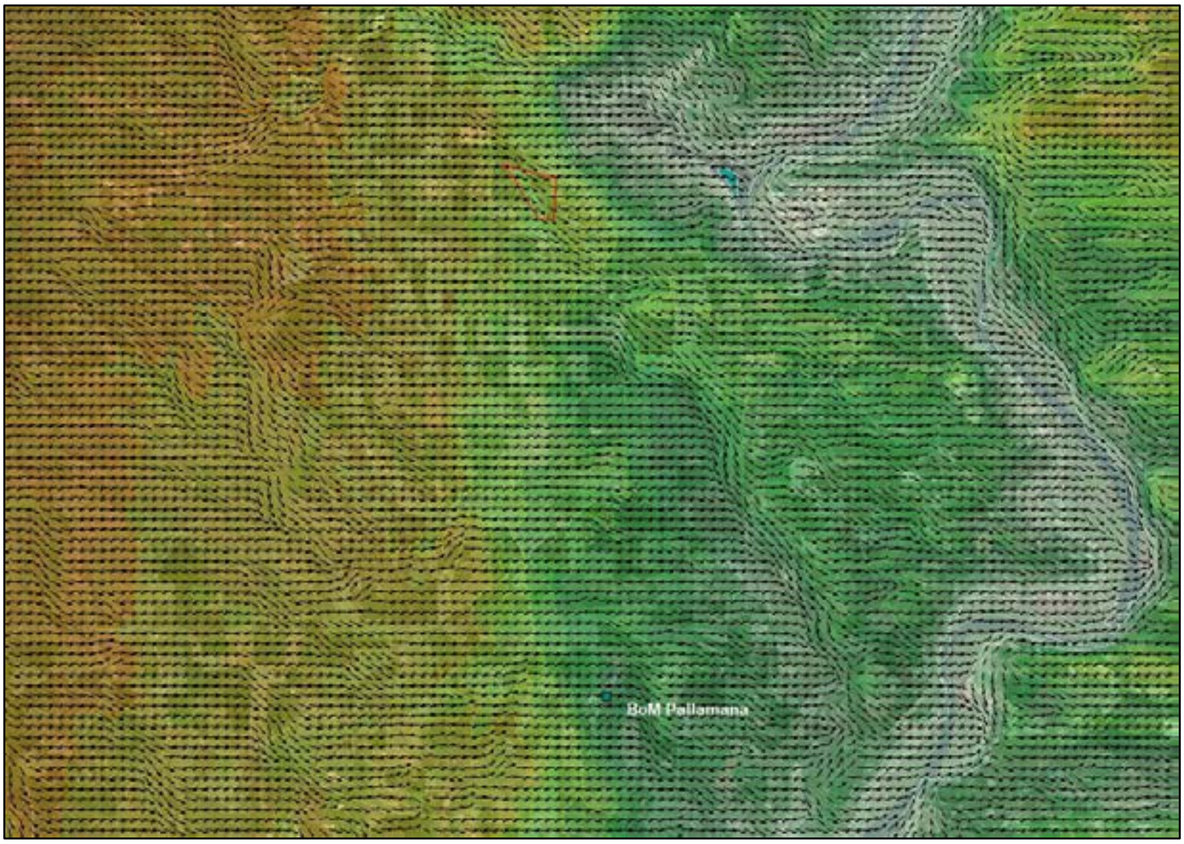

Figure 10 CALMET Wind fields 9:00am 7 June 2017

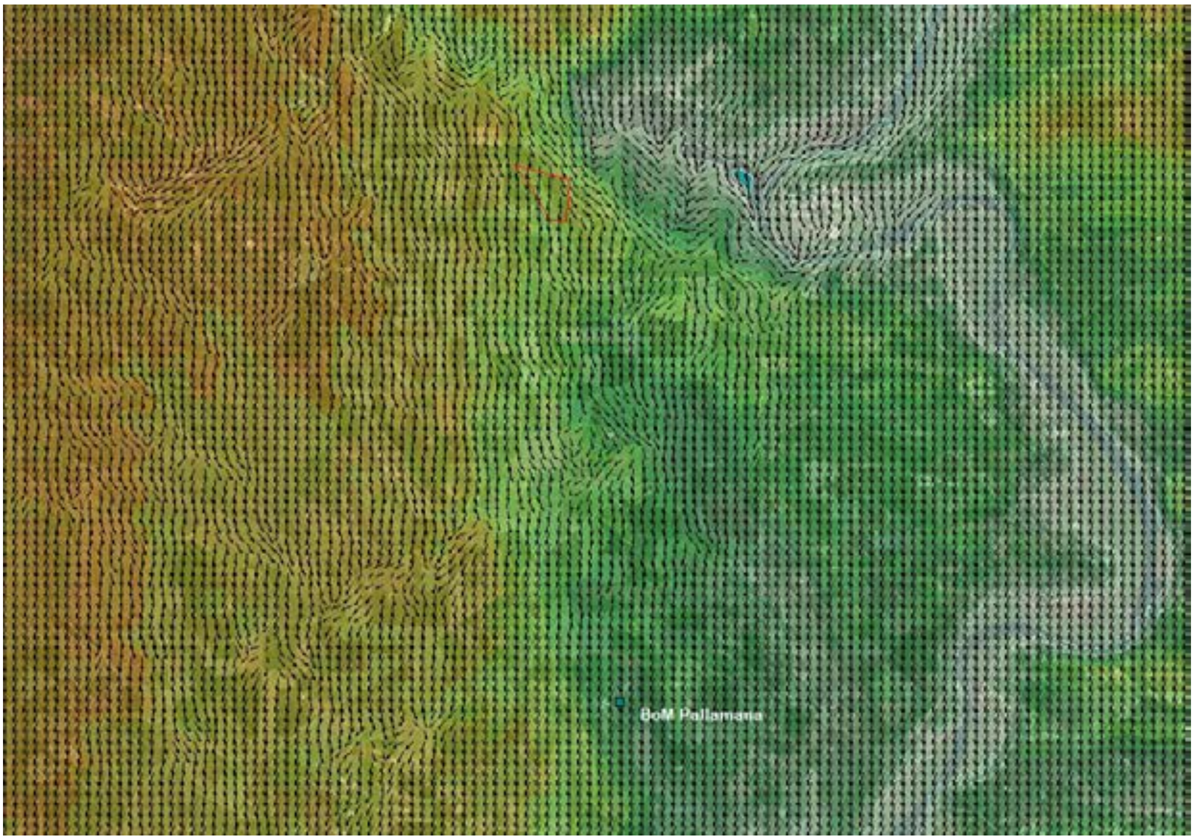

Figure 11 CALMET Wind fields 3:00am 31 December 2017

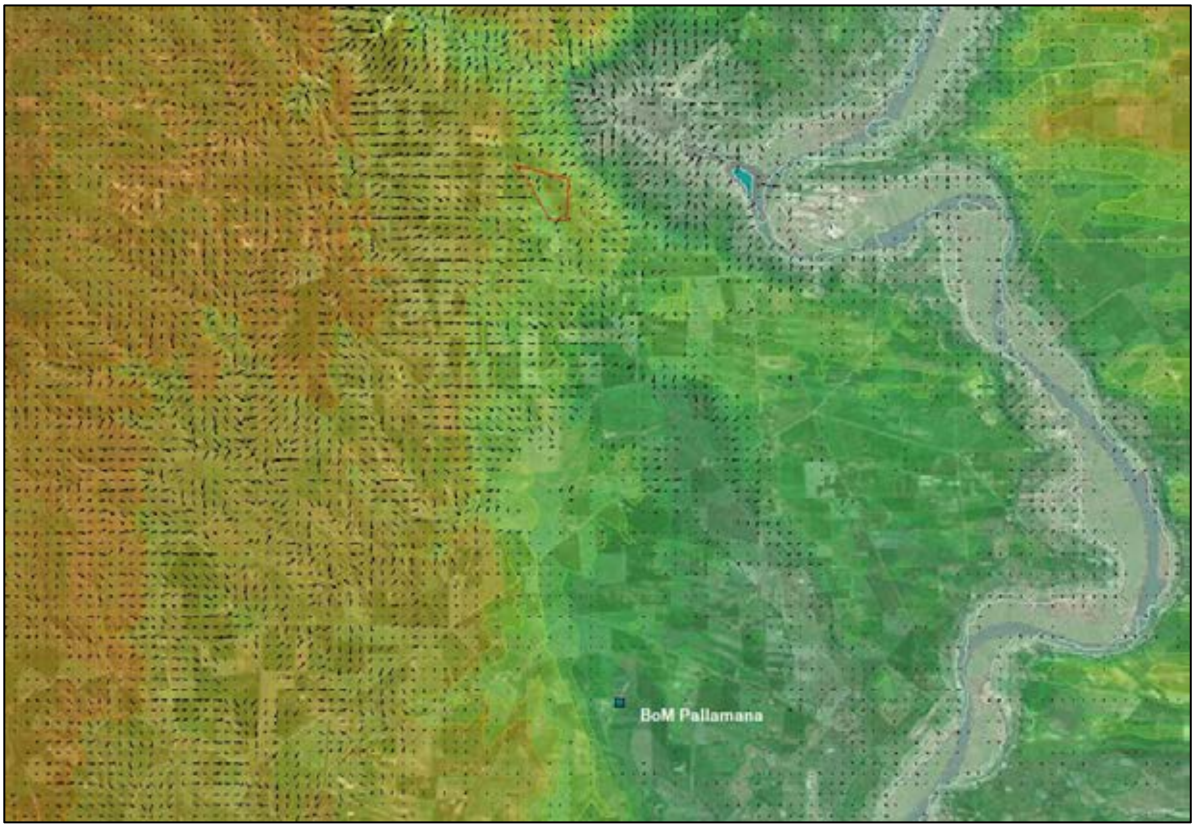

Figure 9 CALMET Wind fields 4:00am 31 December 2017

Temperature

Temperature data is estimated within the CALMET program for each hour of the meteorological data set. A comparison of the temperature data between the BoM Pallamana data used in the meteorological modelling compared to the CALMET Summerfield predicted temperatures for the assessed 12 month period is shown in **Figure 13**. A comparison of the temperature vs. hour of day for CALMET Summerfield is presented in **Figure 14.** The results are consistent with expected patterns for the region.

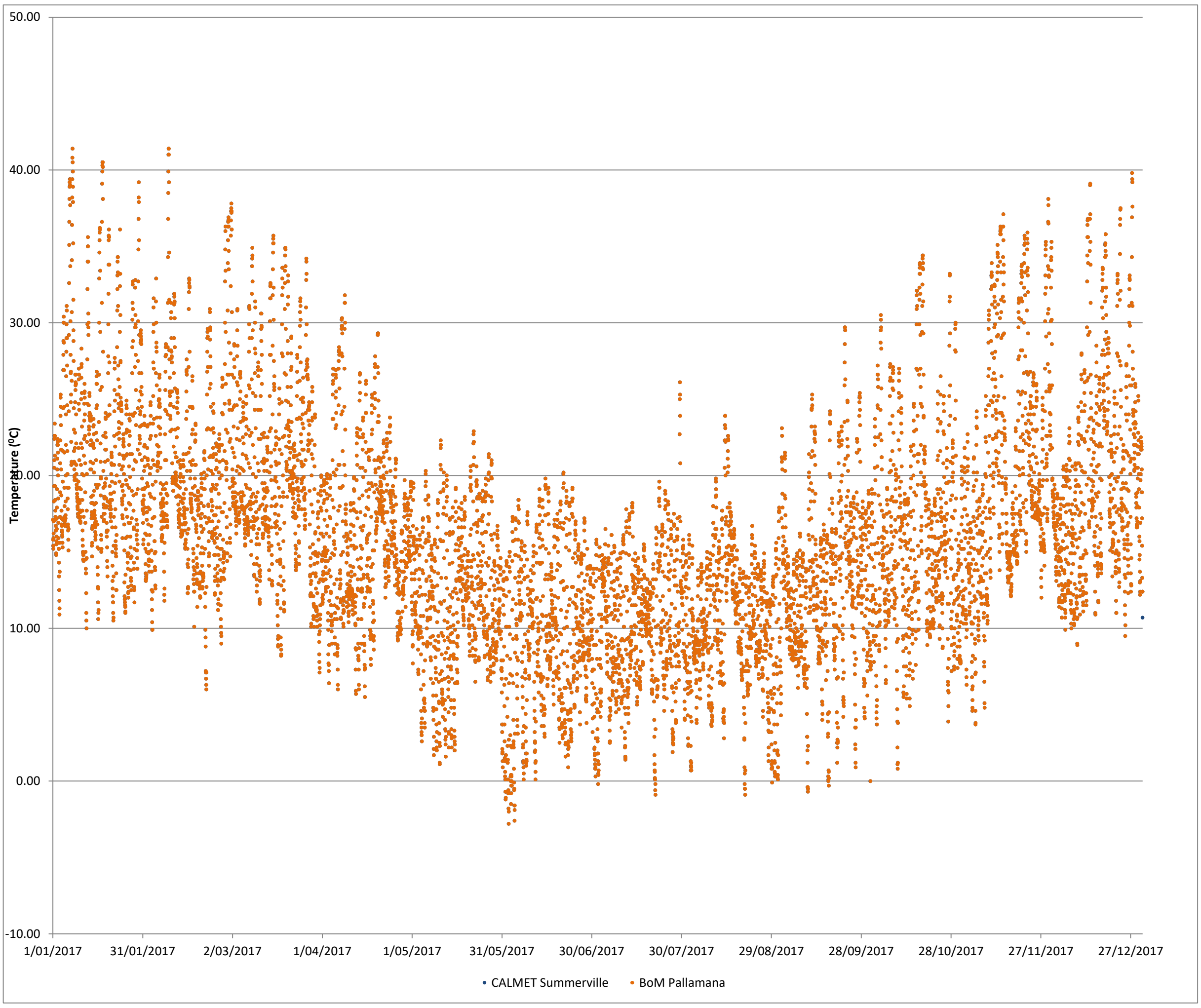

Figure 13 Temperature data for the CALMET Summerfield, BoM Pallamana 2017

Summerfield Power Generation Project

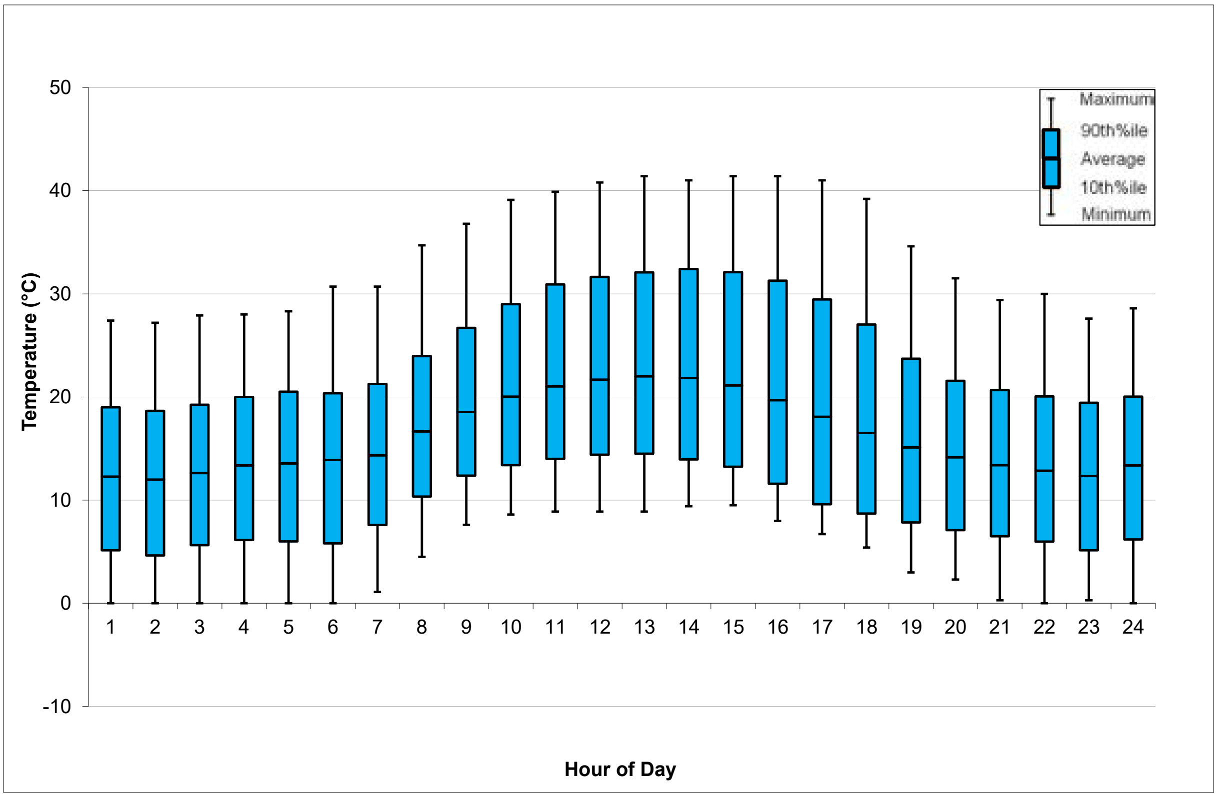

Figure 14 Box and Whisker plot of **Temperature data for the CALMET Summerville 2017**

Mixing Height

Mixing height is estimated within CALMET for stable and convective conditions (respectively), with a minimum mixing height of 50 m. **Figure 15** presents mixing height statistics by hour of day across the meteorological dataset, as generated by CALMET at the Summerville Power Station site. These results are consistent with general atmospheric processes that show increased vertical mixing with the progression of the day, as well as lower mixing heights during night time. In addition, peak mixing heights are consistent with typical ranges.

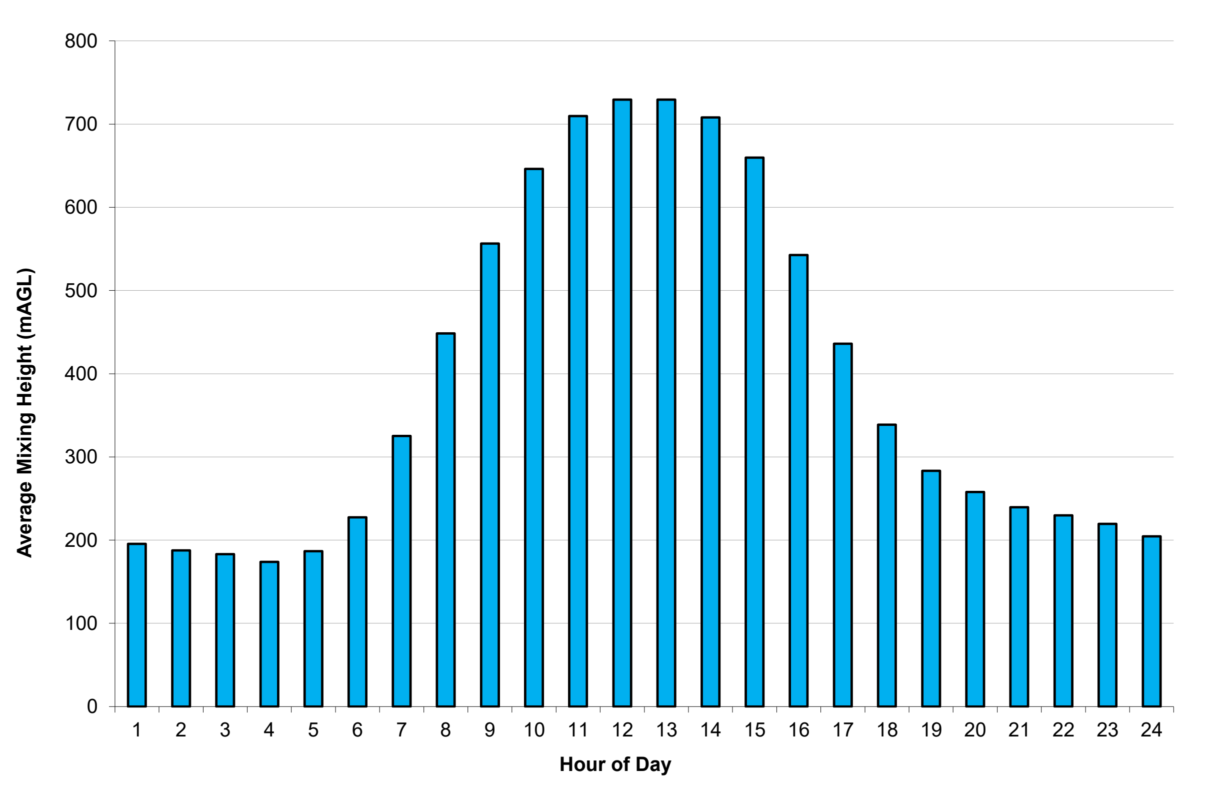

Figure 15 Mixing height statistics by hour of day for CALMET Summerville 2017

Summerfield Power Generation Project

Atmospheric Stability

Stability class is used as an indicator of atmospheric turbulence for use in meteorological models. The class of atmospheric stability generally used in these types of assessments is based on the Pasquill-Gifford-Turner (PG) scheme where six categories are used (A to F) which represent atmospheric stability from extremely unstable to moderately stable conditions respectively. The stability class of the atmosphere is based on three main characteristics, these being:

– Static stability (vertical temperature profile/structure)
– Convective turbulence (caused by radiative heating of the ground)
– Mechanical turbulence (caused by surface roughness).

Whilst CALPUFF centrally uses Monin-Obukhov (MO) similarity theory to characterise the stability of the surface layer, conversions are made within the model to calculate the PG class based on Golders method (Golder 1972[5]) as a function of both MO length and surface roughness height. The PG Stability class frequencies for the CALMET Summerville data are provided in **Table 5**.

The frequency distribution in **Table 5** shows that the most commonly occurring Stability Class is Class D occurring 33 percent of the time during neutral atmospheric conditions; where moderate dispersion of pollutants would occur. Stability class F was also found to occur frequently at 27 percent of the time; indicating relatively unstable atmospheric conditions, where pollutants would disperse slowly.

Table 5 Stability Class Frequency for CALMET Summerville 2017

Stability Class	Frequency CALMET Multi-User Facility
A (Extremely Unstable)	0%
B (Moderately Unstable)	7%
C (Slightly Unstable)	17%
D (Neutral)	33%
E (Slightly Stable)	15%
F (Moderately Stable)	27%

Figure 16 and **Table 6** present an analysis of stability class frequency against wind speed at CALMET Summerfield and confirm a typical distribution, with higher frequencies of stable conditions occurring during low wind speeds.

[5] Golder, D. 1972, “Relations among stability parameters in the surface layer”, Boundary Layer Meteorology, 3, 47-58

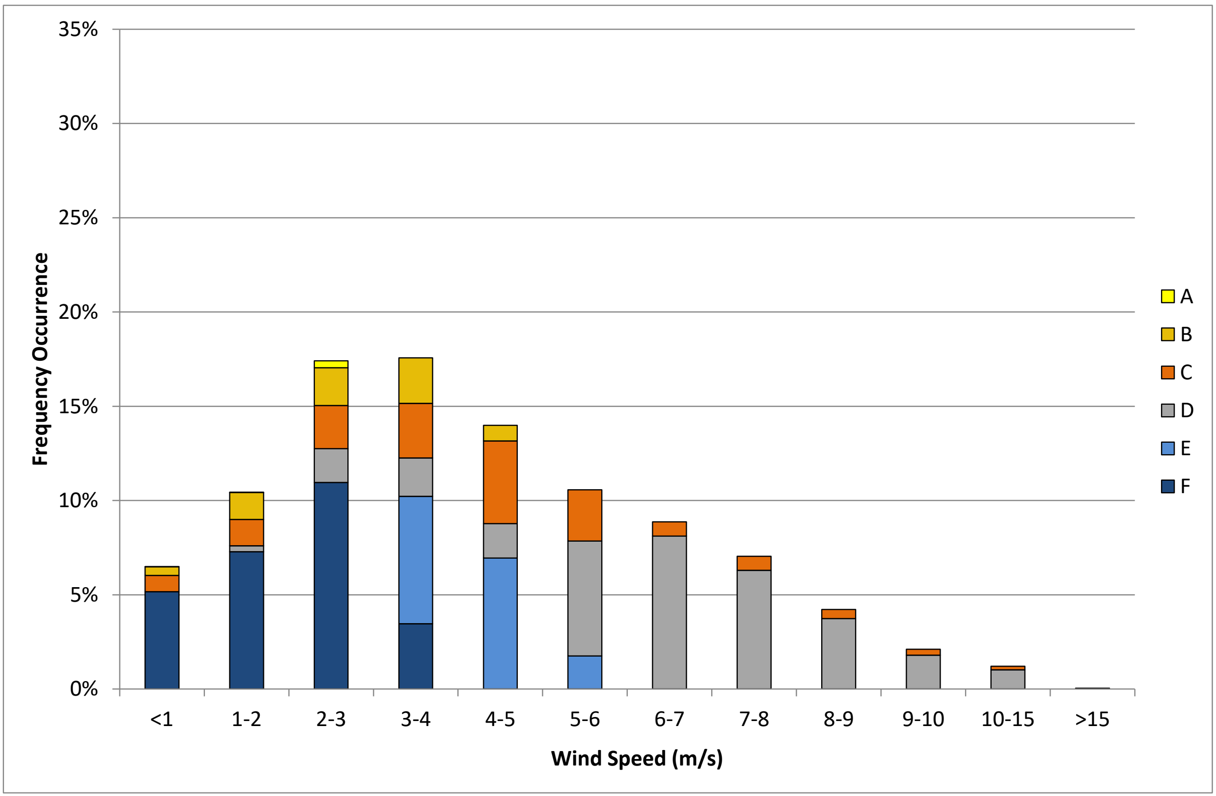

Figure 16 Stability Class Frequency by Wind Speed Chart for CALMET Summerville 2017

Table 6 Stability Class Frequency by Wind Speed Table for CALMET Summerville 2017

Stability Class	Frequency by Wind Speed (m/s)											
	<1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-15	>15	All
A	1	2	32	0	0	0	0	0	0	0	0	0	35
B	40	125	176	212	72	0	0	0	0	0	0	0	625
C	76	122	200	253	384	238	66	65	43	28	17	0	1492
D	0	28	157	179	160	534	711	552	327	157	89	4	2898
E	0	0	0	591	609	154	0	0	0	0	0	0	1354
F	452	638	960	304	0	0	0	0	0	0	0	0	2354
TOTAL	**569**	**915**	**1525**	**1539**	**1225**	**926**	**777**	**617**	**370**	**185**	**106**	**4**	**8758**

Summerfield Power Generation Project

Figure 17 presents an analysis of stability class at CALMET Summerville site by hour of the day and confirms a typical distribution, whereby more stable conditions (Class E and F) are observed during night-time, unstable conditions are observed most frequently during the day (Class A, B and C) and neutral conditions are observed more frequently during the first few hours of daylight and in the evenings.

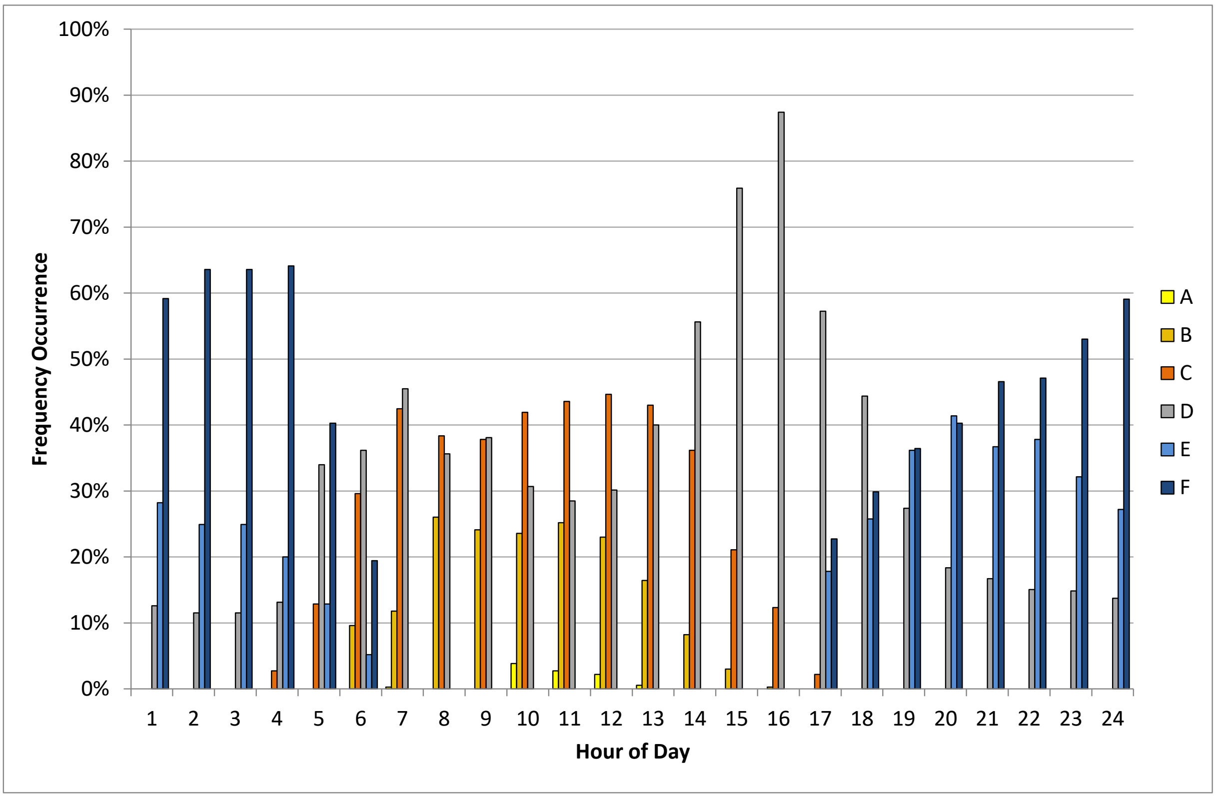

Figure 17 Stability class by hour of day CALMET Summerville 2017

Conclusion

A 12 month meteorological dataset for 2016 has been prepared for the proposed Summerville Power Station site using a combination of local observations and prognostic modelling. Data has been evaluated using hourly observation data. The findings of the data analysis show that the CALMET model is performing well. The predicted meteorology is considered to be fit for purpose and acceptable for use in modelling of emissions from the Summerville Power Station site.

Appendix I

Landscape Visual Impact Assessment

Summerfield Power Station: Landscape and Visual Impact Assessment

11 November 2019

Approval and authorisation

Title	Summerfield Power Station **Landscape and Visual Impact Assessment**
Client:	SAPGen Pty Ltd
Signed:	Gabi Parke
Dated:	11 November 2019

Document status	Date	Prepared by	Reviewed by
Rev.01	01/11/2019	Giulia Vignaroli	Gabi Parke
Rev.02	11/11/2019	Giulia Vignaroli	Gabi Parke

Prepared by AECOM Australia Pty Ltd

Table of Contents

Executive Summary

Introduction

AECOM Australia Pty Ltd (AECOM) has been commissioned by SAPGen Pty Ltd to undertake a Landscape and Visual Impact Assessment (LVIA) for the proposed Summerfield Power Station Project (the proposal). The proposal includes the construction of a new hybrid power station with 380 MW of natural gas combined cycle gas turbines, 12 MW of solar PV and 30 MW of battery storage.

This LVIA will assesses the project impact with regard to potential landscape and visual impact at operation.

The proposal is located at Tepko, approximately 20 kilometres north of Murray Bridge and 60 kilometres east of the city of Adelaide. Mannum is the closest urban settlement, located approximately 10 kilometres north east of the site. This site selection was based on the sites' direct access to transmission capacity and location at the intersection of the SEA Gas Pipeline.

The Study Area (refer Figure 1) has been determined as a 2 kilometres offset from the external site boundary of the proposal due to this boundary encompassing all relevant nearby landscape character zones and in order to assess potential effect on landscape character and views from nearby receptor locations.

Description of the Proposal

The proposal comprises the construction of a 422 MW hybrid power generation facility including:

+ 380 MW natural gas combined cycle gas turbines – to be constructed in 4 plants;
+ 12 MW solar farm;
+ 30 MW battery energy storage facility;
+ Switch yard;
+ Associated on site support facilities/ancillary development (office and amenities building, control room, workshop/storage building, security fencing, landscaping); and
+ Connections to the existing High Voltage electricity network and SEA Gas pipeline – all connections to be contained on site.

Methodology

Landscape and Visual Impact Assessment (LVIA) is a tool used to identify and assess the significance of and the effects of change resulting from development on both the landscape as an environmental resource in its own right and on people's views and visual amenity.

There is no accepted national published guidance on LVIA specific to Australia. Therefore, the industry typically refers to guidance from elsewhere for producing LVIA reports. The method for this assessment has been developed with reference to *Guidelines for Landscape and Visual Impact Assessment, Third Edition* (2013), developed by the Landscape Institute and Institute for Environmental Management, UK (hereafter referred to as GLVIA3 (2013)). GLVIA3 (2013) is widely recognised as comprising an example of 'best practice' in this field.

This report undertakes an assessment of the proposal using GLVIA3 (2013). The method distinguishes between the:

+ 'Impact', defined as the action being taken; and
+ 'Effect', defined as the change resulting from that action.

Refer Chapter 2 for a detailed methodology undertaken for the preparation of this LVIA report.

Summary of Impact

Landscape character impact

Two Landscape Character Zones (LCZs) were identified by grouping zones within the study area with broadly homogeneous characteristics or spatial qualities (refer Figure 13). These are:

+ LCZ 1: Agricultural; and
+ LCZ 2: Wetlands and waterways.

The proposal lies within LCZ 1, which is characterised by gently undulating farm land with scattered stands of taller vegetation positioned on landscape features such as drainage and ridge lines or along utility easements.

Both sealed and unsealed roads cross this LCZ, with scattered rural homesteads. Post and wire fences delineate property boundaries and paddocks within properties.

Occasional infrastructure, including rail and electrical, exist within this LCZ.

LCZ 2 comprises steeper land associated with the Reedy Creek and wetland catchment, which eventually empties into the Murray River. It typically has a dense understorey of shrubs and wetlands, such as *Samphire Shrubland* and *Lomandra sp. sedgeland* combined with structured Eucalyptus forest and woodland.

Land use of this area is predominantly livestock and occasional residential development. The area also serves as a biodiversity corridor and for water management.

The effect of the proposal on landscape character for LCZ 1 was assessed as being **Moderate.** Issues relating to sensitivity included:

+ This LCZ has contains items of heritage value;
+ The predominantly flat topography has limited ability to visually contain changes, moreover the homogeneous nature of the paddock vegetation within the LCZ makes change difficult to absorb;
+ The proposal would result in a new built form within the landscape, and it would be relatively out of character within this LCZ; and
+ The LCZ contains linear and point source electrical and rail infrastructure.

Issues relating to magnitude included:

+ The proposal would be a small change within the greater LCZ;
+ The proposal would comprise low rise elements adjacent to the taller electrical stanchions within the study area;
+ The duration of effect would be long term; and
+ The proposal will introduce a new element within the surrounding character, however, other electrical infrastructure elements exist within this LCZ.

There was found to be no impact on LCZ 2 due to the proposal.

Overall, the proposal would result in a **Moderate to Low** change in the landscape character of the surrounding landscape.

The individual and overall ratings for all LCZs are listed in Table A.

Table A: Impact rating for Landscape Character Zones

Landscape Character Zone	Sensitivity	Magnitude	Overall Rating
LCZ 1: Agricultural	Moderate	Moderate	Moderate
LCZ 2: Wetlands and waterways	High	Negligible	Negligible

Visual impact

The predominantly flat topography of the study area gently descending toward the north and west, coupled with an absence of large built form and the pastoral character of the area surrounding the proposal (i.e. cleared land with occasional paddock trees) allows medium distance views from the west across the landscape towards the proposal and from north east, where the topography rises from Reedy Creek.

Due to the viewing distance, views from areas beyond the study area boundary are not considered within this report. While theoretically, these areas would see views to these changes, the relative size of the proposal site within the greater landscape and the limited amount of detail seen due to distance would make changes difficult to see.

Three representative viewpoints were chosen to assess the visual impact of the proposal from the surrounding landscape.

These three viewpoints were all situated on roads surrounding the proposal. The sensitivity and magnitude from all three viewpoints were influenced by similar factors, namely:

+ Views to the proposal would be seen by receptors travelling on surrounding roads, the drivers anticipated to be local residents and local farm workers.
+ Many of the receptors travelling along this road would likely be focused on the surrounding views due to the limited speed allowed by the narrow, unsealed roads.
+ The roads have scenic qualities due to the surrounding picturesque pastoral land.
+ A low number of receptors are anticipated.
+ Workers are considered a less sensitive receptor group as they would be practising outdoor tasks associated with their jobs as farmers.
+ Residents are typically a sensitive receptor group due to their proprietary interest in views from their properties. However, very few residential receptors would see the view to the proposal.
+ The proposal would be in contrast to the agricultural paddocks seen within the existing views.
+ Changes would be seen from close proximity with little to no screening.
+ The duration of the changes due to the proposal would be long term.

The proposal would result in a **Moderate to Low** change in views from the surrounding landscape considering the limited receptors within the surrounds.

The individual and overall ratings for all viewpoints are listed in Table B.

Table B: Impact rating for Viewpoints

Viewpoint	Sensitivity	Magnitude	Overall Rating	Qualitative Rating
Viewpoint 1: Hoff Road	Moderate	High	High to Moderate	Adverse
Viewpoint 2: Hoffman Road North	Moderate	High	High to Moderate	Adverse
Viewpoint 3: Hoffman Road South	Moderate	High	High to Moderate	Adverse

Mitigation Measures

The following mitigation measures are provided to address visual impacts identified within this report:

+ Preparation of a landscape plan to detail screen planting along the northern, western and southern boundaries of the proposal would effectively reduce the visual impact of the proposal on surrounding views.
+ The design of screening planting (particularly species selection and placement) based on species existing within the landscape would visually integrate the proposal using an existing 'language' of bands and patches of vegetation that is seen in the surrounding landscape.

Conclusion

Overall, the proposal would result in a **Moderate to Low** change in the landscape character of the surrounding landscape. The proposal would be a new element within a predominantly homogeneous rural landscape, however, is consistent with existing pieces of electrical infrastructure dotted throughout the landscape.

The proposal would result in a **Moderate to Low** change in views from the surrounding landscape. While the viewpoints have individually been assessed as High to Moderate, these are all positioned close to the site due to the infrequency of receptors within the landscape, therefore reflect a 'worst case scenario'. When considering receptors the greater landscape, the actual effect of the proposal is lessened.

1.0
INTRODUCTION

1. INTRODUCTION

1.1. Overview

AECOM Australia Pty Ltd (AECOM) has been commissioned by SAPGen Pty Ltd to undertake a Landscape and Visual Impact Assessment (LVIA) for the proposed Summerfield Power Station Project (the proposal). The proposal includes the construction of a new hybrid power station with 380 MW of natural gas combined cycle gas turbines, 12 MW of solar PV and 30 MW of battery storage.

This LVIA will assesses the project impact with regard to potential landscape and visual impact at operation.

1.2. Background

The proposal would support the development of renewable power generation in South Australia through the provision of dispatchable fast starting technology that can both “firm” up electricity generated by renewables as well as add to overall network reliability and security of energy supply.

The proposal is located at Tepko, approximately 20 kilometres north of Murray Bridge and 60 kilometres east of the city of Adelaide. Mannum is the closest urban settlement, located approximately 10 kilometres north east of the site. This site selection was based on the sites' direct access to transmission capacity and location at the intersection of the SEA Gas Pipeline.

1.3. Study Area

The Study Area (refer Figure 1) has been determined as a 2 kilometres offset from the external site boundary of the proposal due to this boundary encompassing all relevant nearby landscape character zones and in order to assess potential effect on landscape character and views from nearby receptor locations.

The surrounding landscape is relatively flat, gently descending north east toward Reedy Creek, Reedy Creek Swamp and ultimately the Murray River; and sloping up south west toward Talbot Reserve, Farm Cove and Rocky Hill. As such, views to the proposal would be seen from the west at significant distance from the site.

Most of this area is characterised by agricultural and rural land, predominantly cleared of tall vegetation, with the exception of occasional stands of paddock trees.

Figure 1 The proposal and study area *(Source: AECOM)*

1.4. Description of Proposal

The proposal is located on an agricultural site of approximately 95 hectares at Tepko, South Australia, with the site traversed by both a high voltage electricity transmission easement and the SEA Gas Pipeline. It comprises the construction of a 422 MW hybrid power generation facility including (refer Figure 2 and Figure 3):

+ 380 MW natural gas combined cycle gas turbines – to be constructed in 4 plants;
+ 12 MW solar farm;
+ 30 MW battery energy storage facility;
+ Switch yard;
+ Associated on site support facilities/ancillary development (office and amenities building, control room, workshop/storage building, security fencing, landscaping); and
+ Connections to the existing High Voltage electricity network and SEA Gas pipeline – all connections to be contained on site.

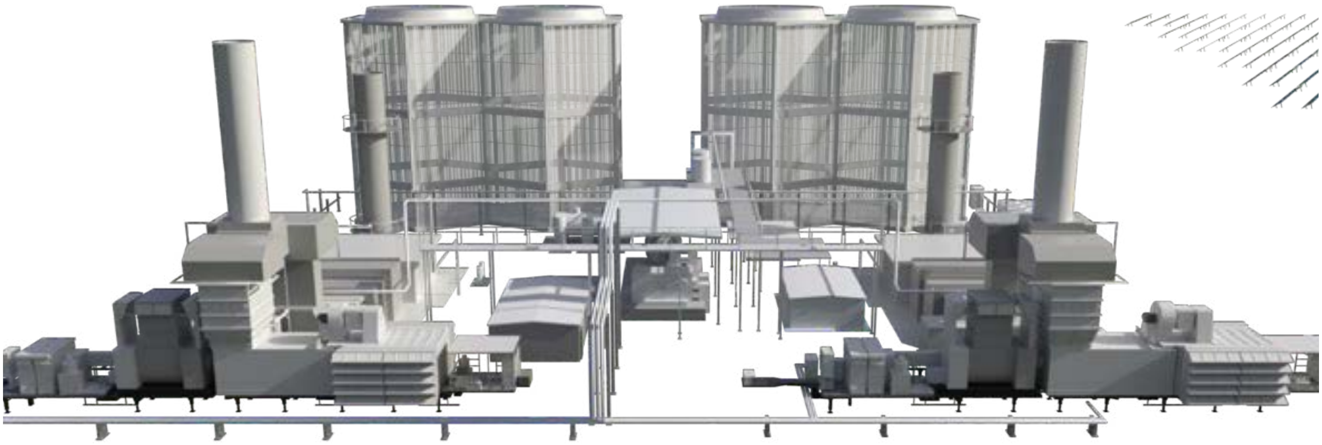

Figure 2 Artist impression of the proposed Hybrid power station with natural combined cycle gas turbines *(Source: SAPGen)*

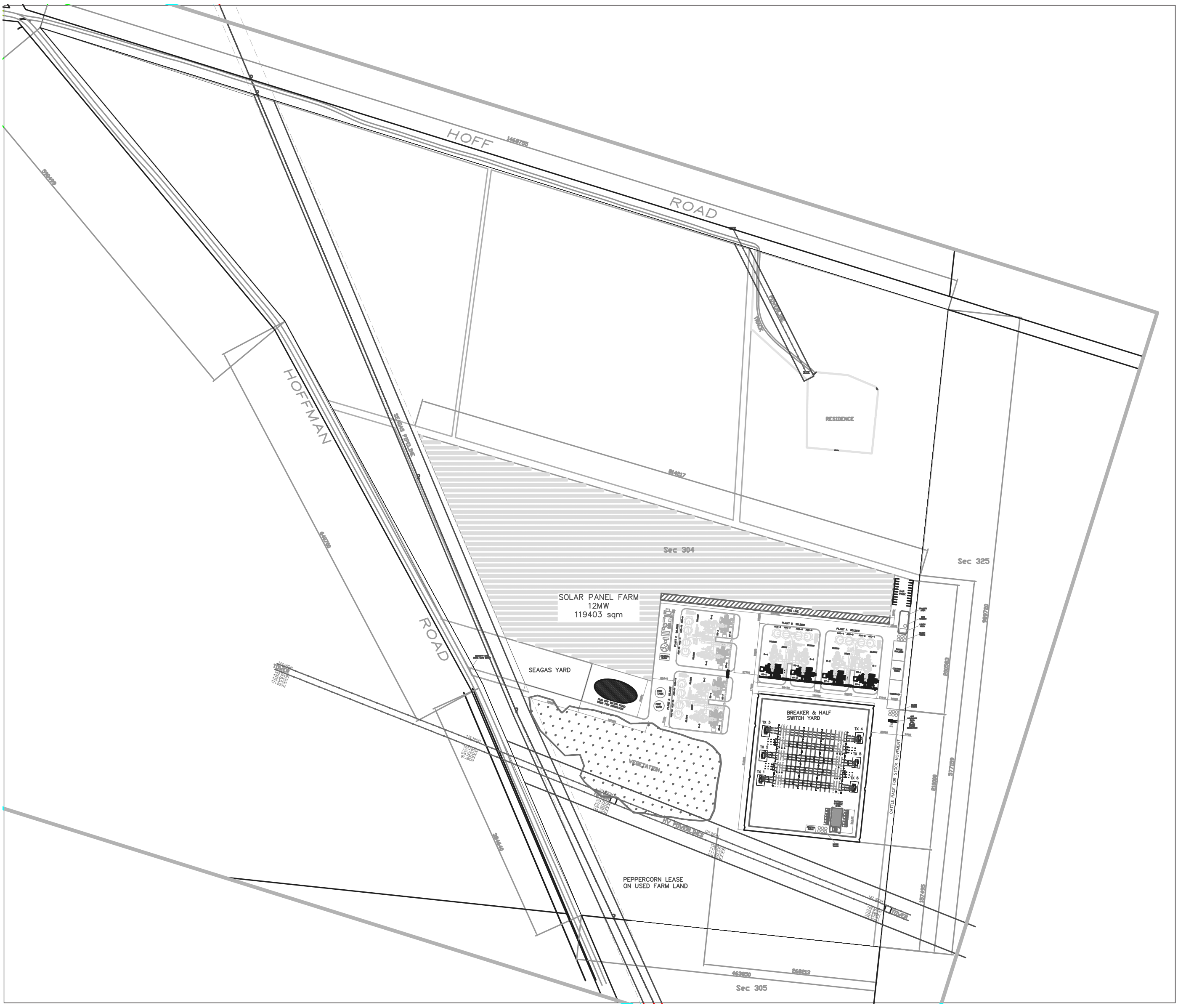

Figure 3 Plan showing the proposal layout *(Source: SAPGen)*

2.0 METHODOLOGY

2. METHODOLOGY

Landscape and Visual Impact Assessment (LVIA) is a tool used to identify and assess the significance of and the effects of change resulting from development on both the landscape as an environmental resource in its own right and on people's views and visual amenity.

There is no accepted national published guidance on LVIA specific to Australia. Therefore, the industry typically refers to guidance from elsewhere for producing LVIA reports. The method for this assessment has been developed with reference to *Guidelines for Landscape and Visual Impact Assessment, Third Edition* (2013), developed by the Landscape Institute and Institute for Environmental Management, UK (hereafter referred to as GLVIA3 (2013)). GLVIA3 (2013) is widely recognised as comprising an example of 'best practice' in this field.

This report undertakes an assessment of the proposal using GLVIA3 (2013). The method distinguishes between the:

+ 'Impact', defined as the action being taken; and
+ 'Effect', defined as the change resulting from that action.

The following section outlines the detailed methodology undertaken for the preparation of this LVIA report.

2.1. Environmental Baseline

Existing data was gathered and reviewed, including:

+ Site inspection protocols, available information on sensitive visual receptors, proposal design, and photos of similar examples of key infrastructure elements;
+ GIS mapping, including visual envelope mapping, zoning / land use, topography and land cover; and
+ Google Earth and Google Street View information.

Using this data, a preliminary desktop assessment of the landscape and visual resource was undertaken and used to inform the site inspection.

2.1.1. Zone of Theoretical Visibility

The likely visibility of the proposal, once operational, from surrounding areas was broadly mapped to define a Zone of Theoretical Visibility (ZTV). Using landform mapping, this provides an indication of which parts of the proposal are likely to be viewed from surrounding areas. The mapping typically shows 'worst case', i.e. some receivers may only see the top of the proposal or partial views, while other receivers may view a more substantial areas of the proposal. It does not take into account vegetation and built form, so the effect of taller landscape elements should be taken into account when using this mapping to estimate visibility of the proposal.

Table 1: Landscape and visual impact assessment matrix

		Magnitude			
		High	**Moderate**	**Low**	**Negligible**
Sensitivity	**High**	High	High to Moderate	Moderate	Negligible
	Moderate	High to Moderate	Moderate	Moderate to Low	Negligible
	Low	Moderate	Moderate to Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

2.1.2. Site Inspection

A site inspection was undertaken by two AECOM team members on the 4th of October, 2019. The purpose of the inspection was to:

+ Identify views from sensitive visual receptors within publicly accessible locations, and assess landscape character; and
+ Undertake site photography to record key views and surrounding landscape character.

2.1.3. Existing Environment

The above information was summarised into a broad description of the landscape within which the proposal is located, and identification of elements and features relevant to assessment of the proposal, including site setting, topography, land use, landscape and heritage values.

2.1.4. Future Environment

Approved projects to be constructed within the study area were researched and outlined within the report. These were used to assess the proposal within the anticipated environment as well as the existing environment at the time of writing the report.

2.1.5. Landscape Character Zones

Drawing from the above, a Landscape Character Assessment was undertaken. This identifies what makes a place distinctive, without necessarily assigning a value to it. It considers the way different components of the environment – both natural (e.g. the influences of geology, soils, climate, flora and fauna), and cultural (e.g. the historical and current impact of land use, settlement, enclosure and other human interventions) - interact together and are perceived to form a distinct pattern, which gives its particular sense of place.

To provide a framework for more clearly describing the area and assessing how the proposal would affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character, distinct parts of the landscape have been defined and mapped as 'Landscape Character Zones' (LCZs).

2.2. Impact Assessment

2.2.1. Landscape Effects

Assessment of landscape effects deals with the effect of change and development on landscape as a resource in its own right. Landscape effects are assessed at operation only as construction effects are temporary.

The consideration of potential impact on landscape character is determined based on the sensitivity of the existing landscape to change and the magnitude of change that is likely to occur. The sensitivity of a landscape is judged on the extent to which it can accept change of a particular type and scale without adverse effects on existing character. The magnitude of change to landscape character depends on the nature, scale and duration of the change that is expected to occur.

The sensitivity and magnitude of landscape effects address the following specific criteria:

+ Sensitivity of landscape to proposed change, based on:
    - Susceptibility to change (the ability of the landscape receptor to accommodate the proposed development without undue consequences for the maintenance of the existing situation and/or the achievement of landscape planning policies and strategies);
    - Value of landscape;
+ Magnitude of landscape effect, based on:
    - Size or scale of change;
    - Geographical extent of effects; and
    - Duration and reversibility of effects.

The extent of sensitivity and magnitude are each assessed and graded as being High, Moderate, Low or Negligible.

A matrix is used to combine the ratings for sensitivity and magnitude to provide an overall 'Significance of Landscape Effects' finding, described as being High, High-Moderate, Moderate, Moderate-Low, Low or Negligible in relation to the existing environment. Ratings of High and High-Moderate are considered to be significant (refer Table 1).

2.2.2. Visual Effects

Assessment of visual impact deals with the effects of change on the views available to people and their visual amenity. It assesses how the surroundings of individuals or groups of people (visual receptors) may be specifically affected by changes in the context and character of views as a result of the change or loss of existing elements of the landscape and/or the introduction of new elements. Visual effects are assessed during construction and at operation.

Visual receptors have been considered in terms of the views they are likely to obtain from locations within proximity of the proposal, including consideration of any key vantage points, e.g. lookouts where there is particular interest in the view.

The evaluation of potential effects on visual amenity is based on the sensitivity of the viewpoint (and the visual receptors it represents) to change, and the magnitude of change arising from the proposal that is likely to occur.

The sensitivity of each viewpoint is a function of:

+ The occupation or activity of the people experiencing the view at particular locations;
+ The extent to which their attention or interest may therefore be focussed on the views and the visual amenity they experience at particular locations, e.g.:
  - People who are engaged in outdoor recreation where their attention or interest is likely to be focused on views and the visual amenity they experience, are likely to be more sensitive to a proposed change in that view rather than;
  - People at their place of work whose attention may be focused on their work, not on their surroundings, and where the setting is not important to the quality of working life.
+ Value attached to the view experienced, e.g.:
  - In relation to heritage assets, or through planning designations; or
  - Indicators of value attached to views, e.g. through appearing on tourist maps, or provision of facilities for their enjoyment (such as parking places, sign boards and interpretative material).

The magnitude of change to views and visual amenity depends on the:

+ Size or scale of change in the view with regard to the:
  - Loss or addition of features in the view and changes in its composition;
  - Degree of contrast or integration of any new features with the existing landscape, in terms of form, scale and mass, line, height, colour and texture; and
  - Nature of the view of the proposed development in terms of amount of time it would be experienced, and whether the views would be full, partial or glimpses.
+ Geographical extent of the visual effect with different viewpoints including the:
  - Angle of view in relation to the main activity of the receptor;
  - Distance of the viewpoint from the proposed development; and
  - Extent of area over which the changes would be visible.
+ Duration and reversibility of visual effects, e.g.:
  - Duration in terms of short term (0-5 years), medium term (6-15 years) or long term (16-30+ years); and
  - Reversibility with regard to the prospects and practicality of a proposed change being reversed in say a generation, e.g. housing can be considered permanent, but wind energy developments for example are often argued to be reversible since they have a limited life, and could eventually be removed and the land reinstated.

The extent of sensitivity and magnitude are each assessed and graded as being High, Moderate, Low or Negligible.

A matrix is used to combine the ratings for sensitivity and magnitude to provide an overall 'Significance of Visual Effects' rating, described as being High, High-Moderate, Moderate, Moderate-Low, Low or Negligible in relation to the existing environment (refer Table 1). Ratings of High and High-Moderate are considered to be significant.

The change has been rated 'Adverse', 'Neutral' or 'Beneficial' to give a qualitative rating to the assessment.

2.2.2.1. Photos and photomontage

Overview

A series of photographs were arranged to produce a panorama from each viewpoint. These provided a baseline from which to assess changes arising from the proposal.

Visual simulations were produced to depict the changes at selected viewpoints. Visual simulations are a type of photomontage which provides the most accurate representation of relative position and size of the proposal from a chosen viewpoint.

Technical description

The panorama of the view to the proposal from each viewpoint was created using spatial panoramic photography equipment that allows the creation of an image that approximates the primary human Field of View (FoV) i.e. 124° horizontal x 55° vertical. This is almost impossible to recreate with an individual camera frame, due to the nature of human binocular vision. Typically, camera lenses will begin to distort the image once they go beyond 90°. It is therefore required that multiple images are taken and stitched together to achieve the needed FoV.

Using a 28mm lens with FoV of 66° x 30°, four images in portrait orientation were taken and stitched together to obtain the needed FoV. The panoramic equipment allows the rotation of the camera around the "nodal point" of the lens, resulting in an image with no distortion or parallax.

Professional stitching software was then used to combine them, using multiple control points across the images to ensure accuracy. The software also ensures that no rectilinear distortion or other artefacts are introduced into the image.

Once the accurate background image has been created, it is aligned into visualisation software with a virtual camera. Virtual cameras do not suffer the same distortion as real lenses because they are based on the scientific principles of a perfect lens. The virtual camera is set to the needed FoV with no need for correction. Once the virtual and real cameras have been aligned, the image is rendered using a 3D model and photo editing software to combine the two into a seamless simulation.

2.3. Mitigation Measures

Where a significant rating for landscape character or visual impact has been assessed, mitigation measures have been recommended to reduce the impact of the proposal on the surrounding landscape or views. These have been outlined in Section 6.2.


DANGER
KEEP OUT
HEAD & FOOT
PROTECTION
MUST BE WORN

3.0 EXISTING ENVIRONMENT

3. EXISTING ENVIRONMENT

3.1. Site Context

The proposal site is bounded by Hoff Road and Hoffman Road at Tepko, 20 Km north of Murray bridge and 10 Km west to Mannum, South Australia.

At present, this site comprises agricultural land characterised by cleared grazing land with scattered paddock trees. Road corridors are lined with remnant and revegetated native trees and shrubs.

Most of the study area is characterised by rural and agricultural land, while the northern portion of the study area is defined by the catchment for Reedy Creek and Reedy Creek Swamp wetland.

The proposal would be positioned on the eastern side of Hoffman Road at the southern extent of the proposal site, adjacent to the high voltage power line crossing the site.

The northern portion of the proposal site features an existing residential one story building with road access on Hoff Road (refer Figure 4).

The proposal site is currently utilised as farm land.

3.2. Topography and Hydrology

The landscape within the study area predominantly comprises flat to gently undulating land, with the highest areas to the west and falling to reedy Creek and Reedy Creek swamp to the north east (refer Figure 5).

The largest watercourse within the study area is Reedy Creek, which runs in an easterly direction from the northern corner of the study area to the north-east. Landform directly surrounding the Reedy Creek is gently sloping, with several small tributaries flowing across the landscape to Reedy Creek and Reedy Creek Swamp, before entering the Murray River.

The proposal is located within the sub-catchment of Reedy Creek.

The western edge of the study area rises to a ridge line to the west of the study area boundary, west of Reedy Creek Road.

Figure 4 Existing residential building on the northern edge of the proposal site (*Source: AECOM)*

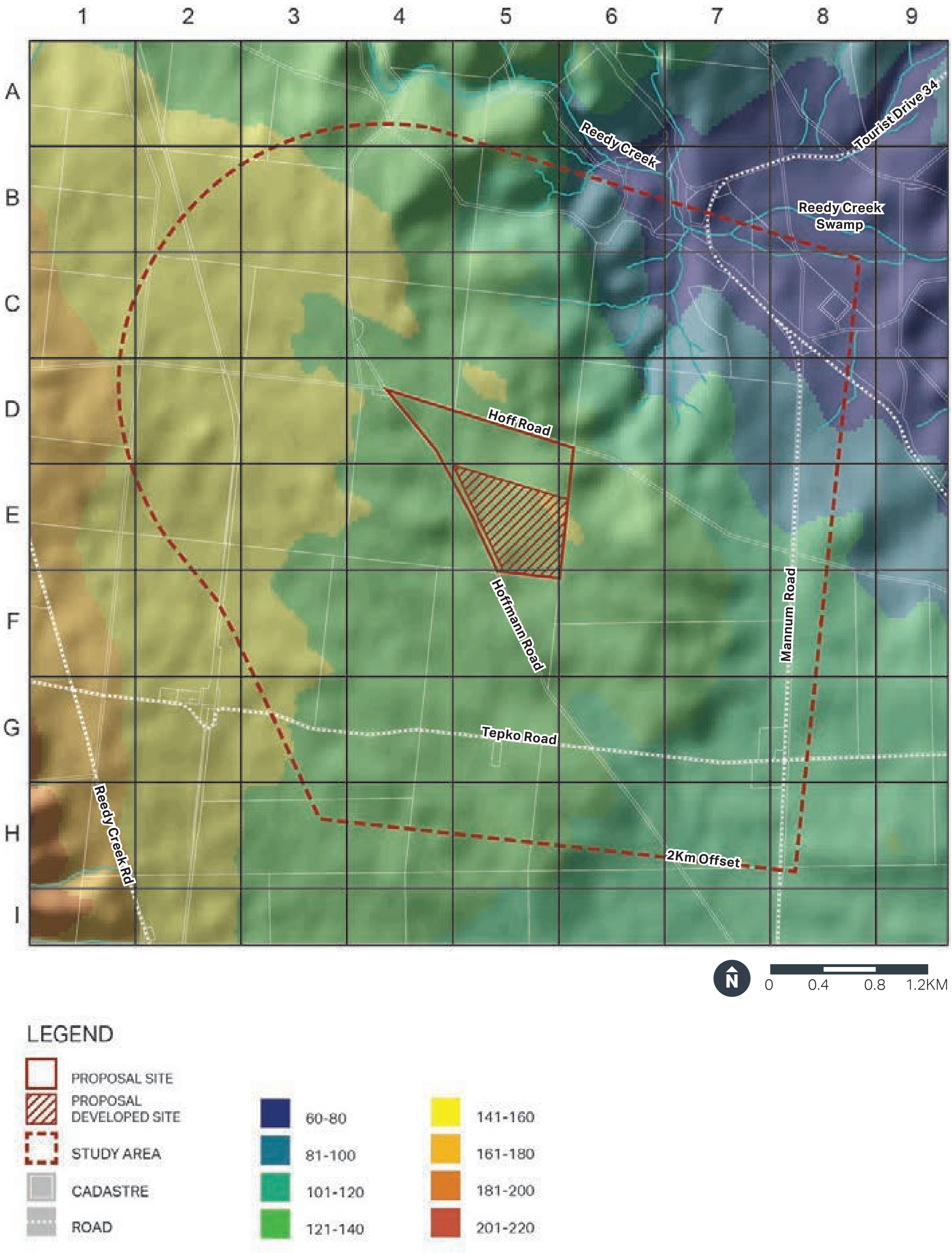

Figure 5 Topography and hydrology within the study area *(Source: AECOM)*

3.3. Land Use

Within the study area, the predominant land use zone is Agriculture (refer Figure 7), which is also the current land use of the proposal site. This area accommodates a wide range of general farming practices, intensive animal keeping and other primary production activities on large land holdings and within an open rural landscape. The area comprises stands of native vegetation dotted throughout the wide, agricultural fields.

On the northern part of the study area there are minor portions identified as Livestock, Vacant and Vacant Residential, which have a character similar to agriculture land with some sparse buildings within the proximity of Mannum Road and Reedy Creek.

A band of land identified as Utilities / Industry runs north - south along the western edge of the study area, crossing Tepko Road and Hoffman Road (refer Figure 6) . Much of this band of land is cleared of vegetation, identifying an infrastructural corridor with rail track, probably not in use anymore.

Few land parcels within the study area, located along Mannum Road and Western Boundary Road, are identified as Rural Residential and feature small one storey buildings and scattered native and indigenous vegetation.

Figure 6 Utilities corridor crossing Tepko Road *(Source: Google Earth)*

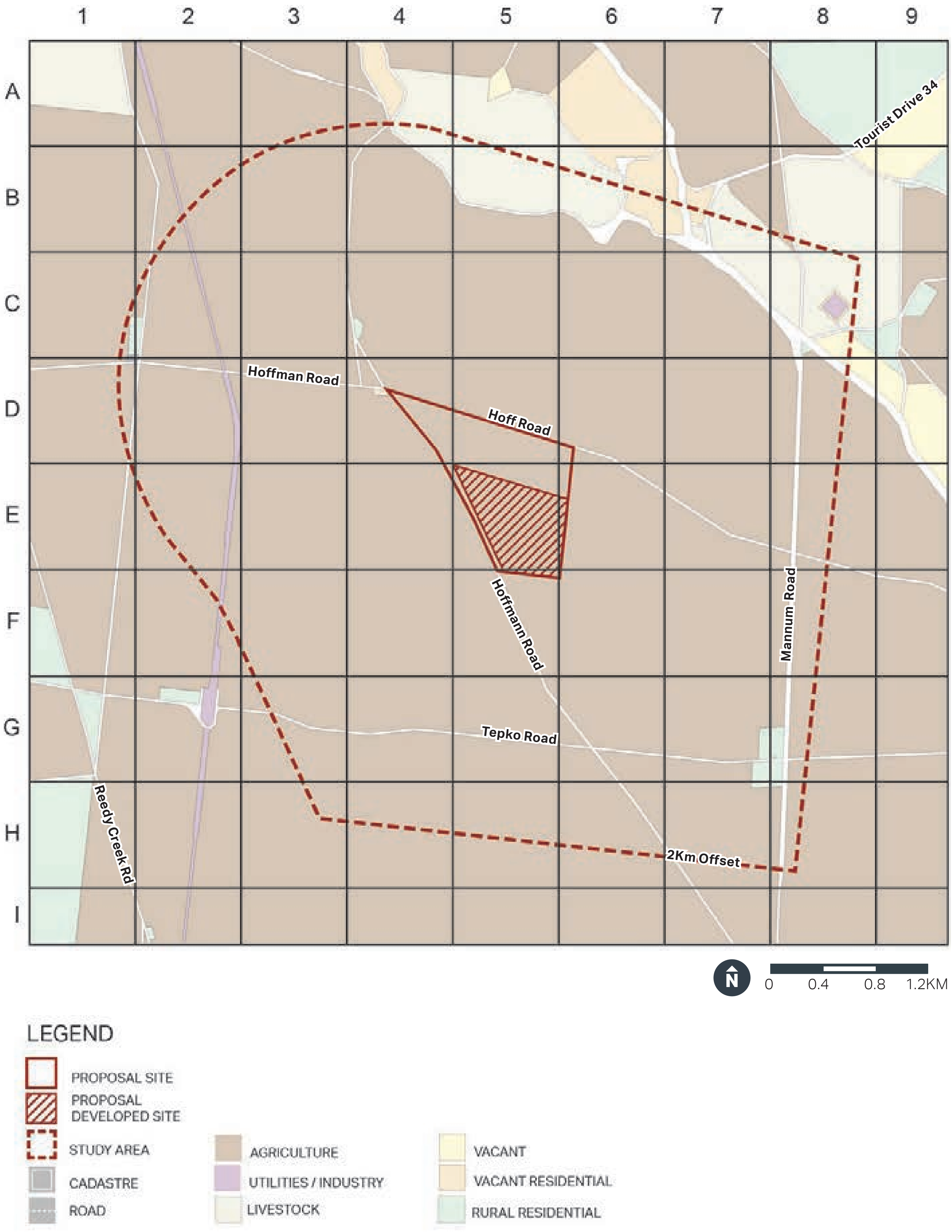

Figure 7 Land use map *(Source: AECOM)*

3.4. Flora

Within the study area tall vegetation cover is sparsely scattered due to land use and clearing practices. Existing vegetation cover within the study area is shown in Figure 9.

The agricultural land comprises grazing land which has been cleared of most tall vegetation. Trees within this area are limited to stands and individual paddock trees which are mostly composed by Eucalyptus Malee Forest and Malee woodland (refer Figure 8). These stands of vegetation often persist in local surface drainage and ridge lines, and within electricity easements, such as the one that passes through the proposal site.

The proposal site lies adjacent to one such cluster of native trees and shrubs.

The study area also includes the River Murray Protection Area, that is affected by the River Murray Act 2003 and which aims to protect, restore and enhance the River Murray System. This portion of the study area is characterised by more varied native vegetation composed of a mix of rushland, herbland, shrubland and eucalypt forest and woodland.

Figure 8 Cluster of native vegetation within agricultural land *(Source: AECOM)*

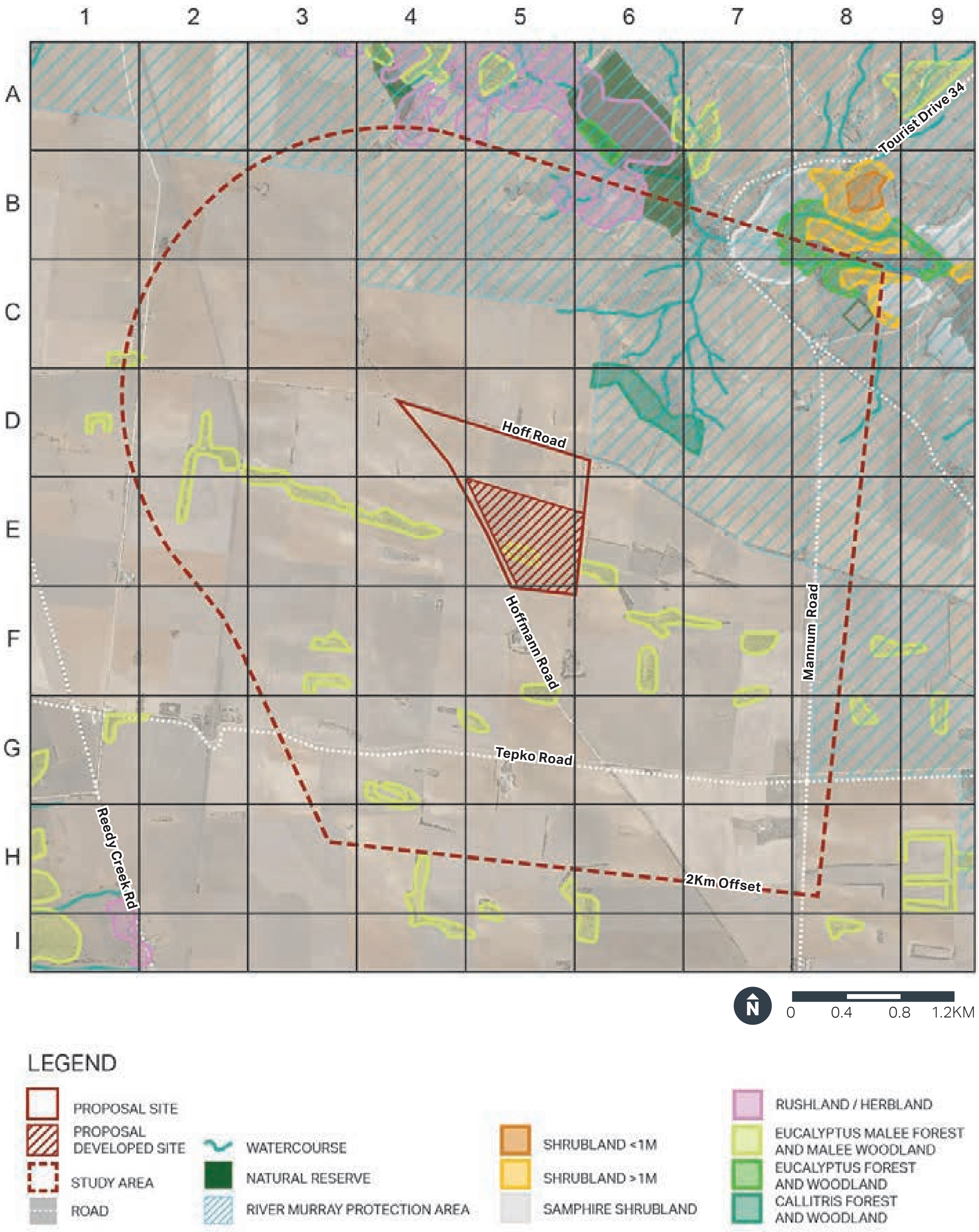

Figure 9 Vegetation coverage map *(Source: AECOM)*

3.5. European heritage

Two local heritage items from the SA Heritage Register and Mid Murray Council Development Plan lie within the study area (refer Figure 12):

+ The Reedy Creek Homestead and Outbuildings; and
+ The Summerfield Lutheran Church Group.

The Reedy Creek Homestead and Outbuildings are a group of distinctive buildings (refer Figure 10) considered as heritage due to their external form, materials and detailing including: original stone masonry house; stone outbuildings; and early shearing shed. The buildings considered as heritage exclude later alterations and additions. The Reedy Creek Homestead and Outbuildings are situated within the study area, approximately 2.2Km north from the centre of the proposal site.

The Summerfield Lutheran Church Group (refer Figure 11), located at the crossing between Tepko School Road and Western Boundary Road, features a church with original external form, materials and detailing of stone masonry, a vestry, a later square porch and tower, a water tank stand, cypress and an entrance gate. The heritage items do not include later alterations and additions. The Summerfield Lutheran Church Group is situated on the edges of the study area, approximately 3Km north west from the centre of the proposal site.

Farm Cove Cottage is a local heritage item located outside of the study area but within the zone of theoretical visibility (refer Figure 12 and Figure 20). It is classified as local heritage item due to a cottage featuring original external form, materials and detailing of stone masonry. Next to the cottage there are also an adjacent water tank and few outbuilding ruins.

While Farm Cove Cottage would theoretically receive views to the proposal, the distance from which it would view the proposal would result in views to distant to notice detailed changes taking place on the proposal site.

Figure 10 Reedy Creek Homestead and outbuildings *(Source: AECOM)*

Figure 11 Summerfield Lutheran Church Group *(Source: AECOM)*

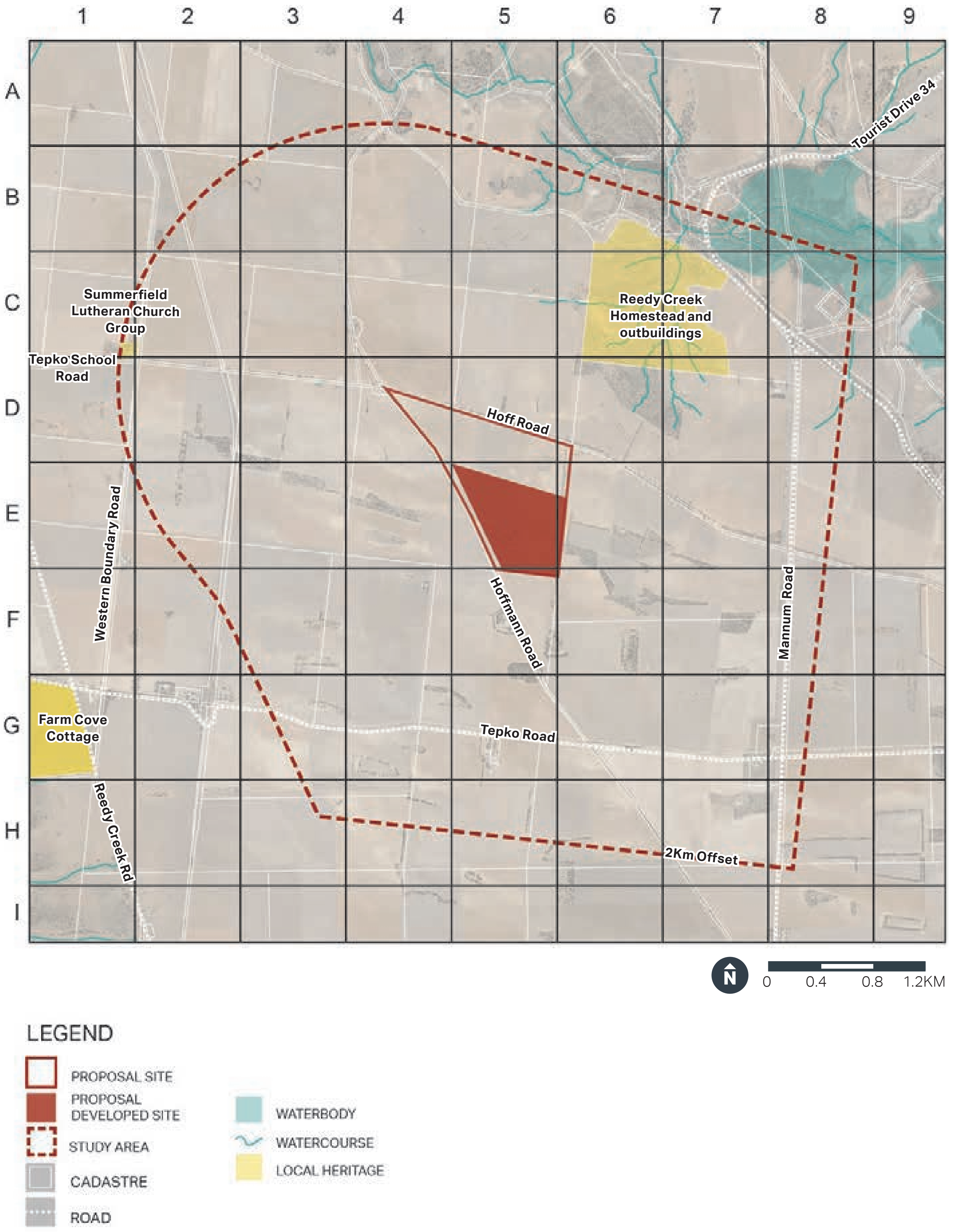

Figure 12 European heritage within the study area *(Source: AECOM)*

3.6. Landscape Character Zones

Two Landscape Character Zones (LCZs) were identified by grouping zones within the study area with broadly homogeneous characteristics or spatial qualities (refer Figure 13). These are:

+ LCZ 1: Agricultural; and
+ LCZ 2: Wetlands and waterways.

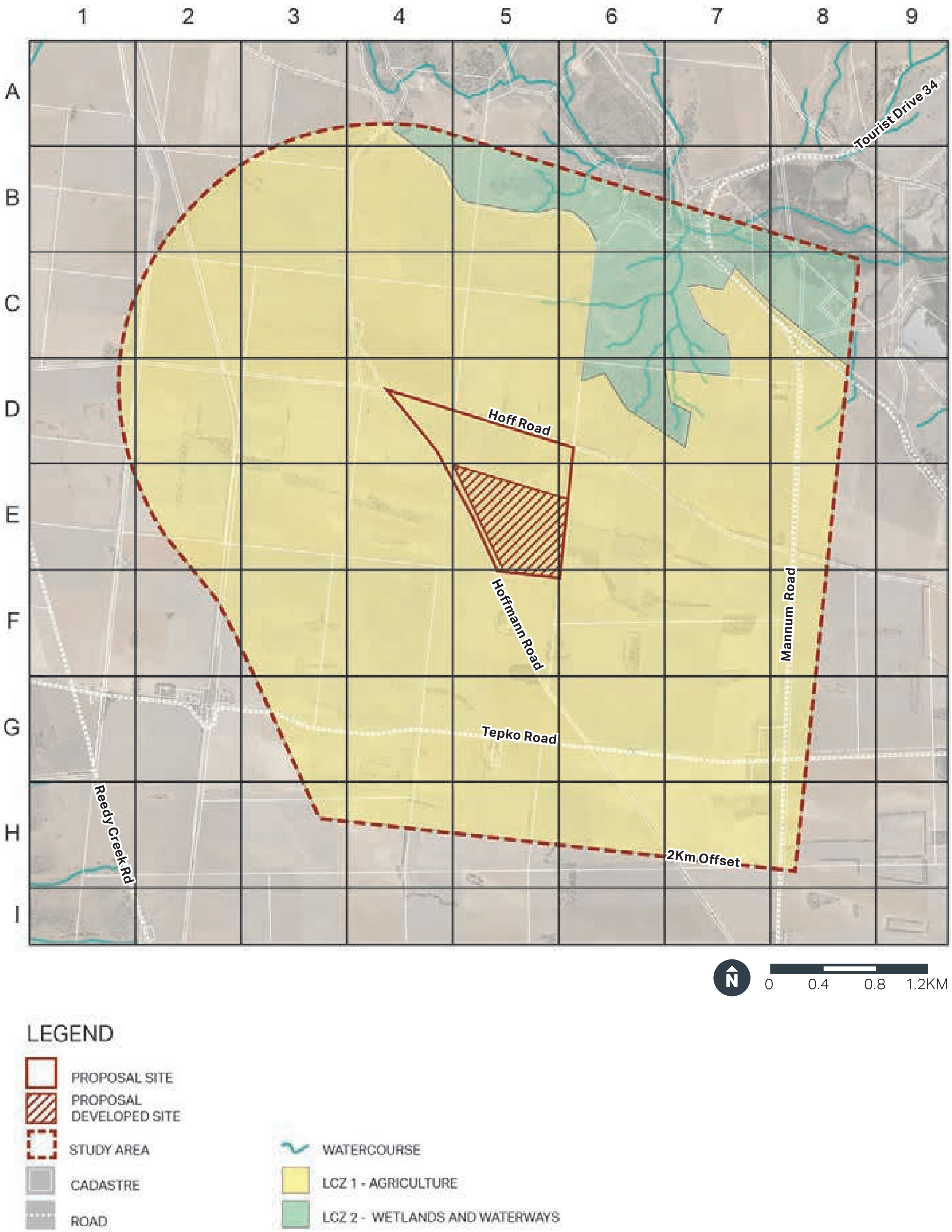

Figure 13 Landscape Character Zones within the study area *(Source: AECOM)*

3.6.1. LCZ 1: Agricultural

This LCZ occupies the majority of the study area, including the proposal site.

The topography of LCZ 1 is predominantly flat to gently undulating, with land gently descending to the north east towards Reedy Creek and Murray River. Few ephemeral dams occur within this LCZ, potentially drying up over the summer months. These are positioned within surface drainage corridors.

Figure 14 Fields with crops and hay bales and post and wire fencing within LCZ 1 *(Source: AECOM)*

The landscape comprises predominantly cleared, pastoral land (refer Figure 14), vegetated with paddock/ crop grassland and scattered paddock trees. Bands of trees typically line sealed and unsealed roads and driveways, scattered rural homesteads, or landscape features such as drainage and ridge lines. Patches of trees also typically persist along utility easements.

Roads within this LCZ are typically unsealed, with more major roadways lined with remnant and regrowth native trees (refer Figure 16). Post and wire fences delineate property boundaries and paddocks within properties.

Occasional infrastructure, including rail and electrical, existing within this LCZ. These occur either as linear corridors, or as point source developments, e.g. solar farms or electrical substations. A high voltage power easement passes across the proposal site (refer Figure 15).

Due to the historical farming use of the land which dates back to early settlement,the remains of a number of historic homesteads and stone outbuildings exist in varying degrees of intactness and are listed as local heritage.

Scattered farm outbuildings also lie within this LCZ.

Figure 15 A high voltage electrical easement seen from Hoffman Road *(Source: AECOM)*

Figure 16 An unsealed road within LCZ 1 *(Source: AECOM)*

3.6.2. LCZ 2: Wetlands and waterways

Within the study area, LCZ 2: Wetlands and waterways lies to the north - east of the proposal. This LCZ comprises the steeper land within the Reedy Creek and wetland catchment, which eventually empties into the Murray River.

The topography of this LCZ is typically gently undulating to steeply sloped, containing several minor waterways joining the major Reedy Creek before reaching Murray River. The landscape typically has a dense understorey of shrubs and wetlands, such as *Samphire Shrubland* and *Lomandra sp. sedgeland* (refer Figure 17 and Figure 18) combined with structured Eucalyptus forest and woodland.

Land use of this area is predominantly livestock and occasional residential development. The area also serves as a biodiversity corridor and for water management.

The Reedy Creek homestead and outbuildings heritage items are set within this LCZ, where remnant 19th Century farm and gardens lie within the rare surviving stands of Callitris forest and woodland.

Figure 17 View on LCZ 2 from Mannum Road to Reedy Creek *(Source: AECOM)*

Figure 18 View on LCZ 2 from Mannum Road to Reedy Creek *(Source: Google Earth)*

Figure 19 Reedy Creek Homestead and outbuildings *(Source: AECOM)*

4.0 LANDSCAPE CHARACTER IMPACT ASSESSMENT

4. LANDSCAPE CHARACTER IMPACT ASSESSMENT

4.1. LCZ 1: Agricultural

Anticipated change

A majority of the study area lies within this LCZ, including the proposal site.

Changes due to the proposed power station include:

+ 12 Hectares of solar panel farm;
+ 4 plants of natural gas combined cycle gas turbines;
+ 1 battery energy storage facility;
+ 1 switch yard;
+ 1 tree line of 10m by 355m dividing the solar panel farm from the turbine plants; and
+ Associated on site support facilities such as: office and amenities building, control room, workshop / storage building, security fencing and landscaping .

Sensitivity

Contributing factors regarding the sensitivity of this LCZ to the proposal at the time of construction include:

+ This LCZ has contains items of heritage value. There is one heritage item within this LCZ in the study area reflecting the use of the land as pastoral / farming land by early settlers.
+ The land is predominantly cleared of native vegetation, with some scattered patches and individual remnant and regenerated native trees. The proposal would be mostly above ground, occupying a significant area of about 42.7 Hectares, with low rise elements (solar panel farm), a couple of one single storey buildings and 20-24m height gas turbines.
+ The predominantly flat topography does not have the ability to visually contain changes, moreover the homogeneous nature of the paddock vegetation within the LCZ makes change difficult to absorb.
+ This LCZ has occasional built form, typically comprising the occasional farm out building or historical or modern homestead. The proposal would result in a new built form within the landscape, and it would be relatively out of character within this LCZ.
+ The LCZ contains linear and point source electrical and rail infrastructure.

Within the above context, the sensitivity of LCZ 1 to the proposed change is considered to be **Moderate**.

Magnitude

The proposal falls wholly inside this LCZ, therefore the magnitude of change is considered to be **Moderate**, for the following reasons:

+ The proposal would be a small change within the greater LCZ;
+ The proposal would comprise low rise elements adjacent to the taller electrical stanchions within the study area;
+ The duration of effect would be long term;
+ The proposal will introduce a new element within the surrounding character, however, other electrical infrastructure elements exist within this LCZ.

Overall Assessment

Using the landscape and visual impact assessment matrix (refer Table 2), the impact of the proposed works on LCZ 1 is therefore considered to be **Moderate**.

Table 2: Overall landscape character impact for LCZ 1

Sensitivity \ Magnitude	High	Moderate	Low	Negligible
High	High	High to Moderate	Moderate	Negligible
Moderate	High to Moderate	**Moderate**	Moderate to Low	Negligible
Low	Moderate	Moderate to Low	Low	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

4.2. LCZ 2: Wetlands and waterways

Anticipated change

No changes due to the proposal fall within or directly adjacent to this LCZ.

Sensitivity

Contributing factors regarding the sensitivity of this LCZ to the proposal at the time of construction include:

+ This LCZ has high environmental landscape value. The association of open space with the waterways create a broader, connected network of open space which increases its environmental values (for example water filtering and habitat);
+ The condition of the LCZ is of a high quality, particularly due to the waterways within it (including the Reedy Creek) and areas containing remnant and regrowth vegetation;
+ The LCZ contains portion of the River Murray Protection Area;
+ The LCZ contains items of local heritage; and
+ The undulating topography descending toward the creek area has the ability to visually contain changes, and the irregular nature of the lush vegetation within the LCZ makes change easy to absorb.

Within the above context, the sensitivity of LCZ 2 to the proposed change is considered to be **High**.

Magnitude

The proposal falls wholly outside this LCZ, therefore the magnitude of change is considered to be **Negligible**.

Overall Assessment

Using the landscape and visual impact assessment matrix (refer Table 3), the impact of the proposed works on LCZ 2 is therefore considered to be **Negligible.**

Table 3: Overall landscape character impact for LCZ 2

Sensitivity \ Magnitude	High	Moderate	Low	Negligible
High	High	High to Moderate	Moderate	**Negligible**
Moderate	High to Moderate	Moderate	Moderate to Low	Negligible
Low	Moderate	Moderate to Low	Low	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

5.0 VISUAL IMPACT ASSESSMENT

5. VISUAL IMPACT ASSESSMENT

5.1. Visibility of the Proposal

The likely visibility of the proposal from surrounding areas has been broadly mapped to define a visual envelope, also known as the Zone of Theoretical Visibility (ZTV, refer Figure 20). This GIS mapping technique shows the area within the surrounding landscape that could theoretically obtain views to the proposal. The mapping shows a 'worst case' scenario, in that it only shows views obtained due to topography without consideration of buildings or trees, e.g. in circumstances where a proposal would be visible from any point in the surrounding landscape due to landform alone the ZTV would show as visible from that area, but this would not be the case if the area was heavily wooded or the view screened by built form. Views may also be wholly or partially screened by trees or built form, resulting in receptors only seeing the top of the proposal or partial views, while other receptors may view a more substantial areas of the proposal.

The predominantly flat topography of the study area gently descending toward the north and west, coupled with an absence of large built form and the pastoral character of the area surrounding the proposal (i.e. cleared land with occasional paddock trees) allows medium distance views from the west across the landscape towards the proposal and from north east, where the topography rises from Reedy Creek.

Due to the viewing distance, views from areas beyond the study area boundary are not considered within this report. While theoretically, these areas would see views to these changes, the relative size of the proposal site within the greater landscape and the limited amount of detail seen due to distance would make changes difficult to see.

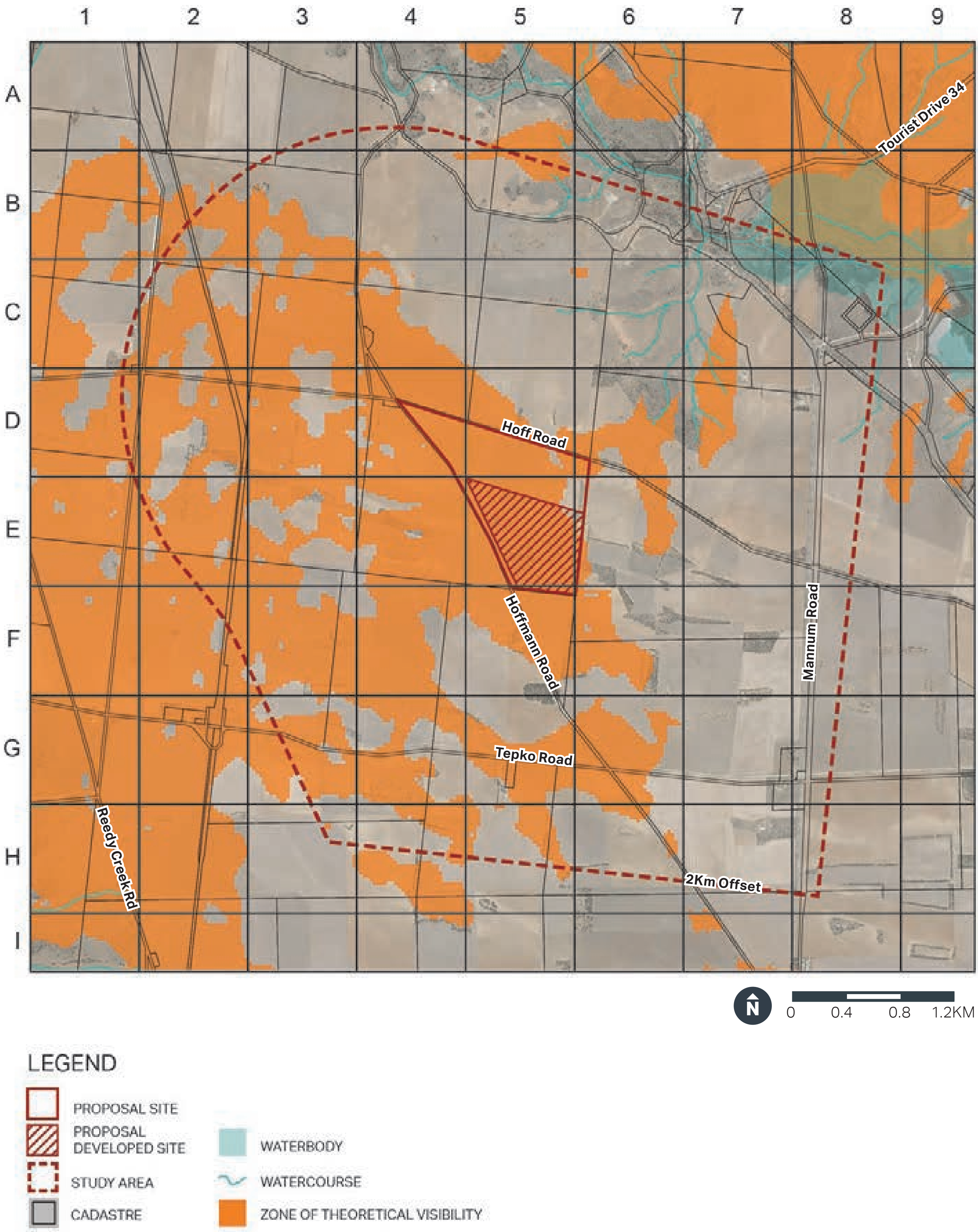

Figure 20 Zone of Theoretical Visibility (ZTV) of the proposal *(Source: AECOM)*

5.2. Visual Receptors

Visual receptors within the surrounding landscape include:

+ Travellers on surrounding roads, which would include local residents and tourists;
+ Residents in rural homesteads; and
+ Farmers working within the study area

5.3. Representative Viewpoints

Three representative viewpoints were chosen to assess the visual impact of the proposal from the surrounding landscape (refer Figure 22). These viewpoints encompass the views seen by the visual receptors listed in Section 5.2.

These viewpoints are as follows:

+ **Viewpoint 1: Hoff Road**
  This viewpoint assesses the changes to views due to the proposal seen by travellers driving on Hoff Road. This viewpoint is positioned adjacent to the northern edge of the proposal site boundary but it is located about 400m away from the built form of the proposal.
+ **Viewpoint 2: Hoffman Road North**
  This viewpoint assesses the change to views seen by travellers on Hoffman Road. This viewpoint lies adjacent to the western boundary of the proposal site and the north western corner of the built form of the proposal.
+ **Viewpoint 3: Hoffman Road South**
  This viewpoint assesses the change to views seen by travellers on Hoffman Road and by residents living in a nearby farmhouse. The viewpoint lies approximately 400m south of the proposal.

Figure 21 Key plan showing the location of Viewpoint 1 *(Source: AECOM)*

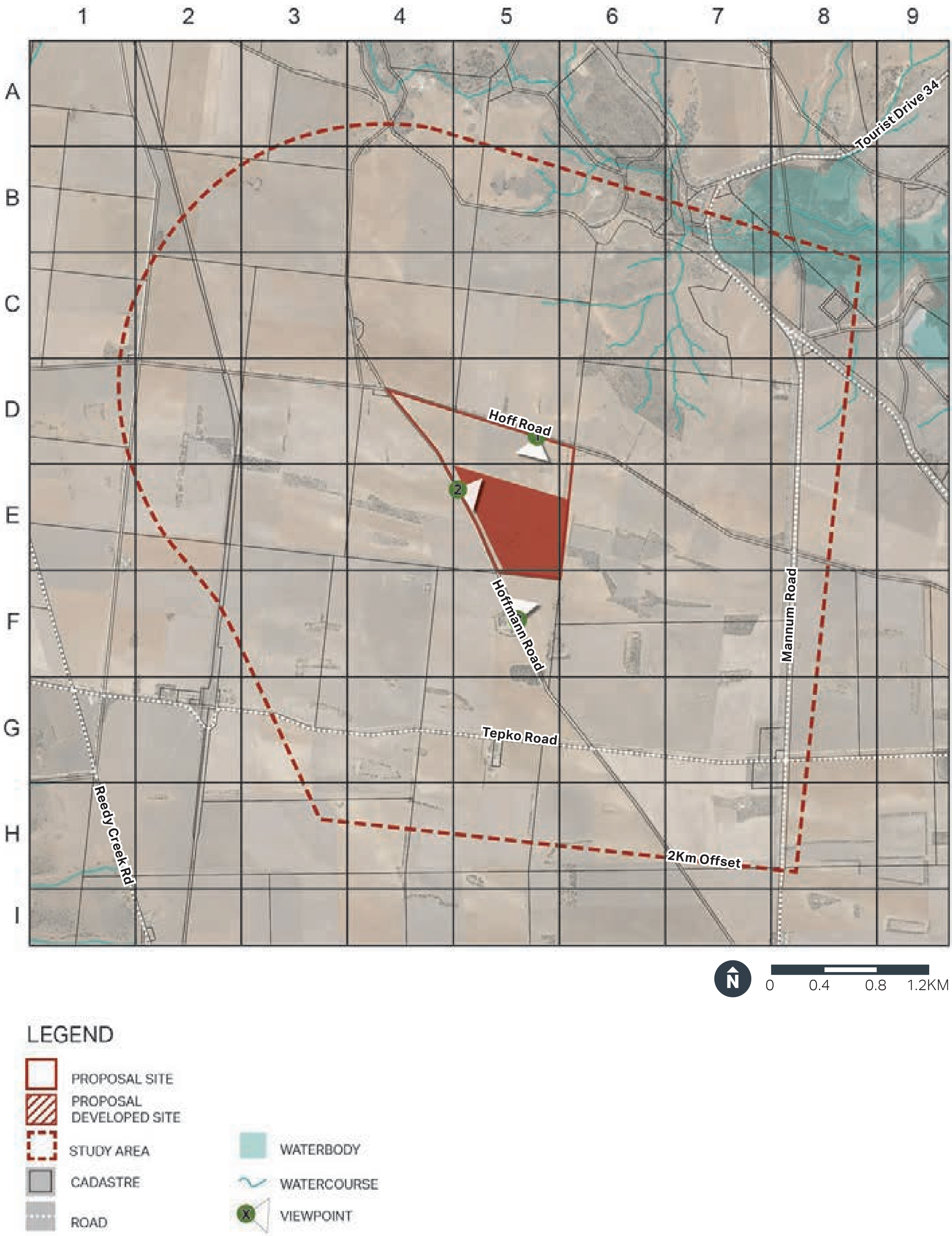

Figure 22 Representative viewpoints selected to assess visual impact of the proposal *(Source: AECOM)*

5.4. Assessment of Viewpoints

5.4.1. Viewpoint 1: Hoff Road

This viewpoint is located on Hoff Road, adjacent to the northern boundary of the proposal site but positioned approximately 400m north of the built form of the proposal. It assesses the view south towards the proposal seen by travellers heading along Hoff Road and by farmers in neighbouring paddocks north of the site (refer Figure 23 and Figure 26).

Receptors

From this viewpoint, existing receptors seeing the view to the proposal would be drivers travelling along Hoff Road and farmers in neighbouring fields to the north .

Hoff Road is a dead-end unsealed road used to access an existing residential property within the proposal site. At present, it is assumed that few drivers would see views from this road corridor. If approved, the residential house would be within the proposal site, therefore the use of the home as a residence may change.

Existing view

The view south from Hoff Road comprises the gently undulating paddocks in the foreground, sloping down (away from) the road corridor and to the greater agricultural landscape.

A residence is seen in the middle ground of the view to the left of frame, seen against a vegetated ridge line

Figure 23 Key plan showing the location of Viewpoint 1 *(Source: AECOM)*

to the south. The stanchions within the high voltage electrical easement are seen in the middle to background of the view.

Hoff Road comprises a one lane dead-end unsealed road, with soft verges on both sides. The northern side of this road corridor is fringed with irregular shrubby tree and understorey vegetation (refer Figure 24).

Sensitivity

Contributing factors regarding the sensitivity of visual receptors to changes in this view, as arising from the proposal, would include:

+ Views to the proposal would be seen by receptors travelling along Hoff Road. Present drivers are anticipated to be local residents and local farm workers.
+ Many of the receptors travelling along this road would likely be focused on the surrounding views due to the limited speed allowed by the narrow, unsealed road.
+ The road has scenic qualities due to the picturesque pastoral land seen to the south.
+ A low number of receptors are anticipated at this viewpoint due to the limited traffic on Hoff Road.
+ Workers are considered a less sensitive receptor group as they would be practising outdoor tasks associated with their jobs as farmers.
+ Residents are typically a sensitive receptor group due to their proprietary interest in views from their properties. However, if the proposal was approved, the residential property lies within the proposal site, therefore may not house residents. This would greatly reduce the traffic anticipated along Hoff Road.

For these reasons, the sensitivity of visual receptors to the proposed change in this view, are assessed to be **Moderate**.

Anticipated change in view

At completion, the following elements would be seen in the middle ground of the view:

+ 380 MW natural gas combined cycle gas turbines;
+ 12 MW solar farm;
+ 30 MW battery energy storage facility and Switch yard; and
+ Associated on site support facilities/ancillary development.

Magnitude of Change

From this viewpoint, contributing factors to the magnitude of change arising from the proposal include:

+ These new elements would be in contrast to the agricultural paddocks seen within the existing view.
+ Changes within the view would be seen from 400m distance and potentially with no screening. They would also take up a large percentage of the view from the road corridor.
+ The view would be seen at a relatively low speeds but would be experienced for relatively short periods of time as receptors travelled along the road.
+ The view from paddocks to the north of Hoff Road would be at least partially screened by roadside vegetation (refer Figure 24).
+ The duration of the changes due to the proposal would be long term.

Due to the above, the magnitude of change for this viewpoint has been assessed as **High**.

Overall Assessment

Using the landscape and visual impact assessment matrix (refer Table 4), the overall visual impact of the proposal at this viewpoint would be **High to Moderate** (adverse).

Table 4: Visual impact assessment matrix for Viewpoint 1

		Magnitude			
Sensitivity		High	Moderate	Low	Negligible
	High	High	High to Moderate	Moderate	Negligible
	Moderate	High to Moderate	Moderate	Moderate to Low	Negligible
	Low	Moderate	Moderate to Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Figure 24 The view along Hoff Road looking west *(Source: AECOM)*

Figure 25 Hoff Road and the landscape beyond (looking south) *(Source: AECOM)*

Figure 26 The view from Hoff Road looking south toward the proposal site and the entrance of the residential lot located within the proposal site *(Source: AECOM)*

5.4.2. Viewpoint 2: Hoffman Road North

This viewpoint is situated along Hoffman Road adjacent to the proposal site boundary (refer Figure 27). It assesses the view east towards the proposal seen by travellers on Hoffman Road and nearby farm workers (refer Figure 29).

Receptors

From this viewpoint, receptors seeing the view to the proposal would include:

+ Drivers travelling north and southbound along Hoffman Road; and
+ Farmers working in the surrounding paddocks.

Hoffman Road is an unsealed road without provision for pedestrians or cyclists (i.e. footpaths or cycle lanes) therefore drivers are anticipated to be the only receptors within the road corridor.

Existing view

Hoffman Road comprises a two lane unsealed road with soft verges. The foreground of the view to the east comprises the post and wire boundary fence, with the paddock beyond. A boundary fence delineating paddocks within the property can be seen stretching into the middle and background of the view. The view culminates in a ridge line in the background, with some taller vegetation.

The Hoffman Road corridor is occasionally fringed by a small stands of native vegetation, including Eucalyptus Malee, with some shrubby understorey vegetation (refer Figure 28). The power lines are seen to the south, still within the proposal site.

Sensitivity

Contributing factors regarding the sensitivity of visual receptors to changes in the view arising from the proposal would include:

+ Views to the proposal would be seen by receptors travelling along Hoffman Road. Drivers are anticipated to be predominantly local residents and workers.
+ Many of the receptors travelling along this road would likely be focused on the surrounding views due to the limited speed allowed by the narrow, unsealed road.
+ The road has scenic qualities due to the picturesque pastoral land seen to the south.
+ A low number of receptors are anticipated at this viewpoint due to the limited traffic on Hoff Road.
+ Workers are considered a less sensitive receptor group as they would be practising outdoor tasks associated with their jobs as farmers.
+ A low number of receptors are anticipated at this viewpoint due to the nature of Hoffman Road as local rural road.

For these reasons, the sensitivity of visual receptors to the proposed change in this view, are assessed to be **Moderate**.

Anticipated change in view

At completion, the following elements would be seen:

+ 12 MW solar farm, fencing and potential landscaping would be seen in the foreground;

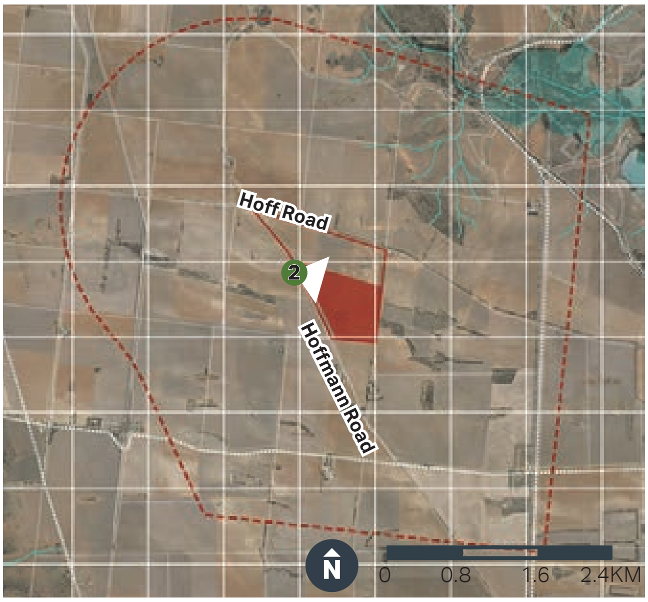

Figure 27 Key plan showing the location of Viewpoint 2 *(Source: AECOM)*

Figure 28 The view of Hoffman Road looking south *(Source: AECOM)*

+ 380 MW natural gas combined cycle gas turbines, 30 MW battery energy storage facility and Switch yard; and associated on site support facilities/ancillary development would be seen in the background.

Magnitude of Change

From this viewpoint, contributing factors to the magnitude of change arising from the proposal include:

+ From the road corridor, the proposed solar farm would be seen from close proximity and with no screening. The proposal would take up a large portion of the view and would be subject to minimal visual integration, with the proposed elements differing from the rural character of their surrounds.
+ Farmers working to the west of Hoffman Road would also see the changes, even if from a more distant location partially screened by occasional roadside vegetation.
+ The duration of the proposal would be long term.

Due to the above, the magnitude of change for this viewpoint has been assessed as **High**.

Overall Assessment

Using the landscape and visual impact assessment matrix (refer Table 5), the overall visual impact of the proposal at this viewpoint would be **High to Moderate** (adverse).

Table 5: Visual impact assessment matrix for Viewpoint 2

		Magnitude			
Sensitivity		**High**	**Moderate**	**Low**	**Negligible**
	High	High	High to Moderate	Moderate	Negligible
	Moderate	**High to Moderate**	Moderate	Moderate to Low	Negligible
	Low	Moderate	Moderate to Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Figure 29 The existing view from Hoffman Road looking east toward the proposal *(Source: AECOM)*

Figure 30 A photomontage showing the proposal within the view seen from this viewpoint *(Source: AECOM)*

5.4.3. Viewpoint 3: Hoffman Road South

This viewpoint is located on Hoffman Road approximately 400m south of the proposal (refer Figure 31).

Receptors

From this viewpoint, receptors seeing the view to the proposal would include:

+ Drivers travelling northbound along Hoffman Road;
+ Farmers working in the surrounding paddocks; and
+ Local residents living in the rural residential lot adjacent to this viewpoint.

Hoffman Road is an unsealed road without provision for pedestrians or cyclists (i.e. footpaths or cycle lanes) therefore drivers are anticipated to be the primary receptors within the road corridor.

Existing view

Hoffman Road comprises a two lane unsealed road with soft verges. The fore and middle ground of the view to the north comprises the post and wire boundary fence, with the paddock beyond (refer Figure 33).

The view culminates in a ridge line in the background, with some taller vegetation and the electrical stanchions associated with the high voltage electrical easements seen on the horizon against the skyline.

The Hoffman Road corridor is occasionally fringed by a small stands of vegetation with some shrubby understorey vegetation (refer Figure 28).

Figure 31 Key plan showing the location of Viewpoint 3 *(Source: AECOM)*

Sensitivity

Contributing factors regarding the sensitivity of visual receptors to changes in the view arising from the proposal would include:

+ Views to the proposal would be seen by receptors travelling along Hoffman Road. Drivers are anticipated to be predominantly local residents and workers.
+ Many of the receptors travelling along this road would likely be focused on the surrounding views due to the limited speed allowed by the narrow, unsealed road.
+ The road has scenic qualities due to the picturesque pastoral land seen to the south.
+ A low number of receptors are anticipated at this viewpoint due to the limited traffic on Hoff Road.
+ Workers are considered a less sensitive receptor group as they would be practising outdoor tasks associated with their jobs as farmers.
+ A low number of receptors are anticipated at this viewpoint due to the nature of Hoffman Road as local rural road.
+ Residents are typically a sensitive receptor group due to their proprietary interest in views from their properties. However, the residential property adjacent to this viewpoint contains mature vegetation surrounding it, therefore views would be at least partially screened.

For these reasons, the sensitivity of visual receptors to the proposed change in this view, are assessed to be **Moderate**.

Anticipated change in view

Key features of the proposal would be visible in the middle to background and would include:

Figure 32 Rural residential home on Hoffman Road *(Source: AECOM)*

+ 380 MW natural gas combined cycle gas turbines;
+ 12 MW solar farm;
+ 30 MW battery energy storage facility and Switch yard; and
+ Associated on site support facilities/ancillary development.

Magnitude of Change

From this viewpoint, contributing factors to the magnitude of change arising from the proposal include:

+ From the road corridor, the proposed power station would be seen from approximately 400m.
+ The proposal would take up a moderate portion of the middle ground of the view and would be subject to minimal visual integration, with the proposed elements proposed elements differing from the rural character of their surrounds.
+ Residents and farmers working to the west of Hoffman Road would also see the changes from a more distant location and partially screened by occasional roadside and paddock vegetation.
+ The duration of the proposal would be long term.

Due to the above, the magnitude of change for this viewpoint has been assessed as **High**.

Overall Assessment

Using the landscape and visual impact assessment matrix (refer Table 6), the overall visual impact of the proposal at this viewpoint would be **High to Moderate** (adverse).

Table 6: Visual impact assessment matrix for Viewpoint 3

		Magnitude			
		High	**Moderate**	**Low**	**Negligible**
Sensitivity	**High**	High	High to Moderate	Moderate	Negligible
	Moderate	**High to Moderate**	Moderate	Moderate to Low	Negligible
	Low	Moderate	Moderate to Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Figure 33 The view from Hoffman Road looking north towards the proposal *(Source: AECOM)*

Figure 34 A photomontage showing the proposal within the view seen from this viewpoint *(Source: AECOM)*

6.0
SUMMARY AND MITIGATION IMPACT

6. SUMMARY & MITIGATION OF IMPACT

6.1. Summary of Impact

6.1.1. Landscape character impact

Two Landscape Character Zones (LCZs) were identified by grouping zones within the study area with broadly homogeneous characteristics or spatial qualities (refer Figure 13). These are:

+ LCZ 1: Agricultural; and
+ LCZ 2: Wetlands and waterways.

The proposal lies within LCZ 1, which is characterised by gently undulating farm land with scattered stands of taller vegetation positioned on landscape features such as drainage and ridge lines or along utility easements.

Both sealed and unsealed roads cross this LCZ, with scattered rural homesteads. Post and wire fences delineate property boundaries and paddocks within properties.

Occasional infrastructure, including rail and electrical, exist within this LCZ.

LCZ 2 comprises steeper land associated with the Reedy Creek and wetland catchment, which eventually empties into the Murray River. It typically has a dense understorey of shrubs and wetlands, such as *Samphire Shrubland* and *Lomandra sp. sedgeland* combined with structured Eucalyptus forest and woodland.

Land use of this area is predominantly livestock and occasional residential development. The area also serves as a biodiversity corridor and for water management.

The effect of the proposal on landscape character for LCZ 1 was assessed as being **Moderate.** Issues relating to sensitivity included:

+ This LCZ has contains items of heritage value;
+ The predominantly flat topography has limited ability to visually contain changes, moreover the homogeneous nature of the paddock vegetation within the LCZ makes change difficult to absorb;
+ The proposal would result in a new built form within the landscape, and it would be relatively out of character within this LCZ; and
+ The LCZ contains linear and point source electrical and rail infrastructure.

Issues relating to magnitude included:

+ The proposal would be a small change within the greater LCZ;
+ The proposal would comprise low rise elements adjacent to the taller electrical stanchions within the study area;
+ The duration of effect would be long term; and
+ The proposal will introduce a new element within the surrounding character, however, other electrical infrastructure elements exist within this LCZ.

There was found to be no impact on LCZ 2 due to the proposal.

Overall, the proposal would result in a **Moderate to Low** change in the landscape character of the surrounding landscape.

The individual and overall ratings for all LCZs are listed in Table 7.

Table 7: Impact rating for Landscape Character Zones

Landscape Character Zone	Sensitivity	Magnitude	Overall Rating
LCZ 1: Agricultural	Moderate	Moderate	Moderate
LCZ 2: Wetlands and waterways	High	Negligible	Negligible

6.1.2. Visual impact

The predominantly flat topography of the study area gently descending toward the north and west, coupled with an absence of large built form and the pastoral character of the area surrounding the proposal (i.e. cleared land with occasional paddock trees) allows medium distance views from the west across the landscape towards the proposal and from north east, where the topography rises from Reedy Creek.

Due to the viewing distance, views from areas beyond the study area boundary are not considered within this report. While theoretically, these areas would see views to these changes, the relative size of the proposal site within the greater landscape and the limited amount of detail seen due to distance would make changes difficult to see.

Three representative viewpoints were chosen to assess the visual impact of the proposal from the surrounding landscape.

These three viewpoints were all situated on roads surrounding the proposal. The sensitivity and magnitude from all three viewpoints were influenced by similar factors, namely:

+ Views to the proposal would be seen by receptors travelling on surrounding roads, the drivers anticipated to be local residents and local farm workers.
+ Many of the receptors travelling along this road would likely be focused on the surrounding views due to the limited speed allowed by the narrow, unsealed roads.
+ The roads have scenic qualities due to the surrounding picturesque pastoral land.
+ A low number of receptors are anticipated.
+ Workers are considered a less sensitive receptor group as they would be practising outdoor tasks associated with their jobs as farmers.
+ Residents are typically a sensitive receptor group due to their proprietary interest in views from their properties. However, very few residential receptors would see the view to the proposal.
+ The proposal would be in contrast to the agricultural paddocks seen within the existing views.
+ Changes would be seen from close proximity with little to no screening.
+ The duration of the changes due to the proposal would be long term.

The proposal would result in a **Moderate to Low** change in views from the surrounding landscape considering the limited receptors within the surrounds.

The individual and overall ratings for all viewpoints are listed in Table 8.

Table 8: Visual impact rating for viewpoints

Viewpoint	Sensitivity	Magnitude	Overall Rating	Qualitative Rating
Viewpoint 1: Hoff Road	Moderate	High	High to Moderate	Adverse
Viewpoint 2: Hoffman Road North	Moderate	High	High to Moderate	Adverse
Viewpoint 3: Hoffman Road South	Moderate	High	High to Moderate	Adverse

6.2. Mitigation measures

The following mitigation measures are provided to address visual impacts identified within this report:

+ Preparation of a landscape plan to detail screen planting along the northern, western and southern boundaries of the proposal would effectively reduce the visual impact of the proposal on surrounding views.
+ The design of screening planting (particularly species selection and placement) based on species existing within the landscape would visually integrate the proposal using an existing 'language' of bands and patches of vegetation that is seen in the surrounding landscape.

6.3. Conclusion

Overall, the proposal would result in a **Moderate to Low** change in the landscape character of the surrounding landscape. The proposal would be a new element within a predominantly homogeneous rural landscape, however, is consistent with existing pieces of electrical infrastructure dotted throughout the landscape.

The proposal would result in a **Moderate to Low** change in views from the surrounding landscape. While the viewpoints have individually been assessed as High to Moderate, these are all positioned close to the site due to the infrequency of receptors within the landscape, therefore reflect a 'worst case scenario'. When considering receptors the greater landscape, the actual effect of the proposal is lessened.

6.4. List of Tables

6.5. List of Figures

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Follow us on Twitter: @aecom

Gabi Parke
Senior Landscape Architect, Design + Planning
D +61 2 8934 0633 M +61 425 283 558
Gabi.Parke@aecom.com

AECOM
Level 21, 420 George Street, Sydney, NSW 2000
PO Box Q410, QVB PO, Sydney, NSW, 1230
T +61 2 8934 0000 F +61 2 8934 0001

aecom.com

Appendix J

Stormwater Management Plan

SAPGen Summerfield Power Station
SAPGen Pty Ltd
06-Nov-2019
Doc No. 60608821-RPT-0000-DR-0001

Summerfield Power Station

Stormwater Management Plan

Summerfield Power Station

Stormwater Management Plan

Client: SAPGen Pty Ltd

ABN: 56 630 464 327

Prepared by

AECOM Australia Pty Ltd
Level 28, 91 King William Street, Adelaide SA 5000, Australia
T +61 8 7223 5400 F +61 8 7223 5499 www.aecom.com
ABN 20 093 846 925

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Quality Information

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Prepared by Andy Reid

Reviewed by Nicki Page

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Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	05-Sep-2019	For Review		
B	06-Nov-2019	For Issue	Kylie Schmidt Team Leader - Civil Infrastructure	

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Executive Summary

SAPGen Pty Ltd (SAPGen) has proposed a new, large-scale hybrid power generation facility at 120 Hoff Road, Tepko on a greenfield site located to the south-west of Mannum, South Australia.

A stormwater management philosophy and conceptual arrangement is outlined within this report to provide suitable controls, particularly with respect to local standards and requirements.

The Stormwater Management Plan outlines controls and provides a concept for design of a stormwater management system which:

- Identifies the site and plant area with respect to regional drainage lines and considers a relatively low risk of floodwaters reaching the proposed site.
- Manages the quantity of stormwater flow from the developed site to mimic predevelopment hydrological conditions, through the implementation of small scale on site storage for re-use and a larger on site detention basin to maintain the discharge from the site.
- Manages nuisance surface water for site operations through gutter flows and underground drainage systems.
- Mitigates the risk of spills from impacting on water quality by isolating higher risk areas within bunds for localised clean-up and treatment.
- Complies with Environment Protection (Water Quality) Policy based on the water quality treatment and retention outlined, subject to confirmation of infiltration losses and reuse capacity, and interpretation of targets.
- The stormwater management plan is based on the current concept design, the plan will need to be revised and updated during future phases of the project.

.

1.0 Background

SAPGen Pty Ltd (SAPGen) is proposing to develop a large-scale hybrid gas and solar power generation facility at Tepko approximately 10 km south-west of Mannum and 55 km east of Adelaide (as per Figure 1). As a reference to a local landmark, the Summerfield Lutheran Church, the development is named the 'Summerfield Power Station'.

Figure 1 Site Location

The proposed facility will utilise 'state of the art' hybrid energy generation technology and provide up to an additional 422 MW of power to the State's energy grid. The project includes the following infrastructure:

- 380 MW natural gas combined cycle gas turbines – to be constructed in 4 plants
- 12 MW solar farm
- 30 MW Battery storage facility of up to 30 MW, including 30 MW inverter bank
- Switchyard
- Associated onsite support facilities/ancillary development, such as:
  - Office and amenities building;
  - Control room
  - Workshop and storage building
  - Site security fencing
  - Landscaping

The project is required to obtain a development approval from the Minister of Planning before proceeding.

2.0 Objectives and Design Criteria

2.1 Objectives

The objective of the Stormwater Management Plan for the proposed Summerfield power station is to outline the controls and provide a concept for design of a stormwater management system that:

- Limits the risk of flooding of the site, and particularly plant areas
- Manages the quantity of stormwater flow from the site so as not to exacerbate flow rates downstream
- Manages nuisance surface water for site operations
- Isolates higher risk areas of pollution / spills for localised clean-up within bunds
- Mitigates pollutants in stormwater discharge to comply with Environment Protection (Water Quality) Policy
- Considers potential for stormwater reuse.

This concept plan is focused on the operational phase of the project. The Contractor will develop stormwater management procedures as part of their Construction Environment Management Plan.

2.2 Standards

- Australian Rainfall and Runoff (AR&R)
- SA Environmental Protection (Water Quality) Policy 2015
- Stormwater Pollution Prevention Code of Practice for the Building and Construction Industry, SA EPA
- Bunding and Spill Management Guideline, South Australian EPA 080/16
- Council development requirements
- AS3500.3 Plumbing and drainage: Stormwater drainage
- Natural Resources Management Act 2004
- The South Australian Government Gazette, Tuesday 22 August 2017

2.3 Inputs and Assumptions

The concept stormwater management plan developed has been based on the power station layout plan shown on drawing SPAG-20190719 dated 3 September 2019. It is noted that site layouts may alter during future design development, and this stormwater management plan should be adjusted accordingly, based on the same design criteria and stormwater management principles.

It is assumed that the power station site will be constructed on a prepared pad that is raised above the surrounding natural ground and enables runoff to be directed as required independent of existing ground levels. Given that plant levels have not yet been established, the grading of site areas is indicative only. Drainage systems are assumed to grade at approximately 0.5% at this early design stage.

A design standard of 10% Annual Exceedance Probability (AEP) for site stormwater drainage systems is assumed, previously referred to as 10-year Average Recurrence Interval (ARI). Rainfall intensity frequency duration data (IFD) from Bureau of Meteorology website has considered both 1987 and 2016 data, dependent on assessment methods.

Site runoff coefficients have been assumed to be 0.8-0.9 adjacent plant, 0.5 for switchyard and other areas with blue metal screenings, and 0.1 for grassed areas.

3.0 Site Definition

3.1 Site Description

The proposed power facility site is located to the south west of Mannum, comprising of an area of approximately 92 ha.

The site is contained within a large rural allotment located at 120 Hoff Road, Tepko (CT 5924/548). The allotment generally consists of cleared farming land and contains a dwelling towards the north eastern corner. The subject site has a frontage to Hoff Road to the north, and Hoffman Road to the west, as shown in Figure 2.

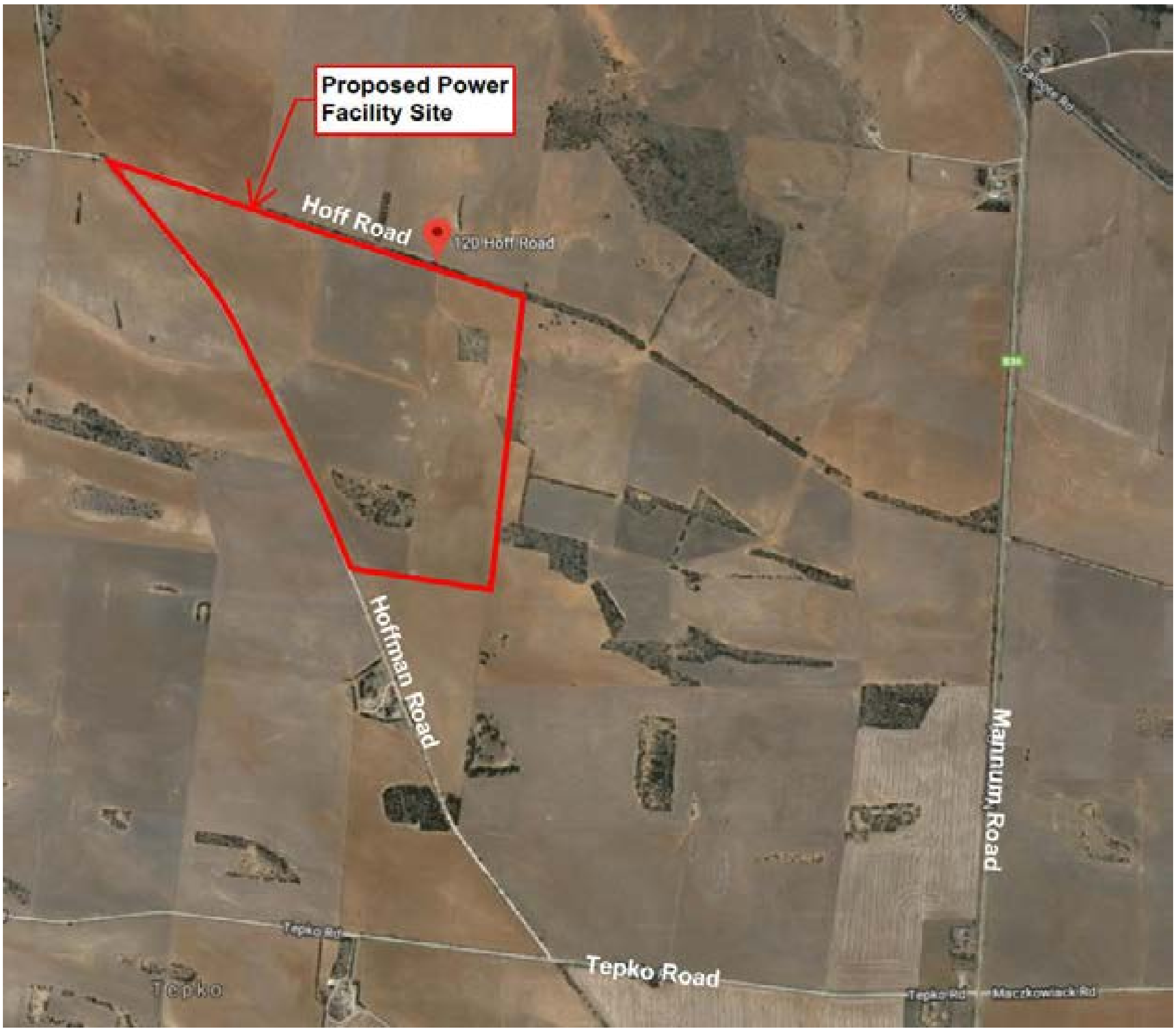

Figure 2 Proposed power facility site location at 120 Hoff Road, Tepko.

There is an existing patch of native vegetation located within the south west corner of the site.

The subject site and surrounding areas feature a gently undulating landscape, with a difference of approximately 10 m between high and low points across the site.

A 275 kV transmission line intersects the southern portion of the allotment in a west-north-westerly direction, whilst a SEA Gas pipeline intersects the western portion of the allotment in a north-north-westerly direction. The land also contains a 19 kV transmission line which connects the existing dwelling to the SAPN network.

A small number of dwellings exist in the locality, with the closest being located 400 m to the south along Hoffman Road, and 700 m to the north along Kowald Road.

Key features within the locality include:

- Murray River approximately 4.7 km to the east;
- Mannum approximately 9.5 km to north east; and
- The approved site for the Cherokee 1000 MW Power Station 500 m to the west.

3.2 Site Hydrology

The proposed site sits in the Salt Creek and Reedy Creek surface water catchment areas, with the northern part of the proposed site in Reedy Creek surface catchment and the southern part of the proposed site in Salt Creek surface catchment area. There are no surface water features located in the vicinity of the proposed site and no natural drainage lines adjacent to the proposed site. The nearest waterbodies are two small dams on a nearby property to the west and Reedy Creek Swamp approximately 2.6 km north east of the proposed site. The proposed site is located adjacent to land categorised under the Murray River Act 2003 as a Water Protection Area.

The site is located within the Eastern Mount Lofty Ranges Prescribed Water Resources Area. This is an extensive area which extends from the Marne River catchment in the north to the Currency Creek catchment in the south. Development applications which comprise particular works that impact water resources in this area will require a referral to the NRM SA Murray-Darling Basin, pursuant to Schedule 8 of the Development Regulations.

3.3 Regional Drainage

The general fall of the area is towards the south, with localised variations. Drainage from the area generally heads along an existing drainage line which runs parallel to Hoffman Road ultimately discharging into the River Murray located approximately 5 km from the site.

The Council Development Plan does not identify flood risk area beyond the Murray River flood plain.

It is expected that new development will not increase the potential for blockage of floodway’s or alter regional drainage flow paths and will not significantly affect regional drainage line flood storage (through filling, etc) and thereby impact on localised flood levels and flow paths.

Earthworks platforms, buildings and structures will be located and designed to prevent entry by floodwaters.

4.0 Site Stormwater Management Plan

4.1 Site Formation

Based on the current site plan, the proposed plant area is noted to be in the order of 25 ha. The remainder of the site is expected to remain in rural form, with its drainage lines diverted around the plant area via localised swales or bunds.

External drainage is to be routed around the site, to exclude any upstream flows from the internal stormwater management systems, and to separate notionally clean external runoff from site surface water. The diversion bunds may also provide for some small amount of flood storage behind them, to replace the shallow depression within the existing site. Level spreaders may be required to disperse concentrated flows from the ends of bunds, to a wider sheet flow to manage the risk of downstream erosion.

Plant platform / site levels are to be set above regional 1% AEP flood levels. Flood levels for the drainage lines need to be confirmed in detailed design.

While the civil design has yet to be established, it is assumed that bulk earthworks would create a platform, with plant likely to be sited at one common level, and fall generated around site areas to provide flow paths for drainage.

4.2 Plant Stormwater Drainage Layout

The point of discharge from the plant area should ideally replicate the existing site conditions as closely as possible with the main site discharge point being located at the southern boundary. There are currently no defined watercourses nor stormwater drainage infrastructure within the existing property or the downstream property. This reflects the rural landscape and suggest that initial losses and then sheet flows are to be maintained. The site drainage system should therefore be designed to incorporate retention and detention measure to meet Council development requirements, with the site discharge location being designed to minimise potential erosion downstream.

Grading of earthworks and site levels around the plant would be guided by positioning of stormwater treatment measures and basins. Based on the current site plan, the plant area would grade generally from north to south, to incorporate stormwater control measures near the existing low point between the southern boundary.

Stormwater drainage within the plant area is likely to include:

- Blue metal or similar surface treatment around plant areas. This provides a finished surface cover and is porous which enables initial infiltration of rainfall events on those areas.
- Kerbed internal roadways to control the collection of surface runoff.
- Underground (pit and pipe/culvert) drainage system to manage nuisance surface water around plant areas in regular rainfall events.
- Overland flow paths along roadways to provide a safe route for runoff between structures and/or equipment in major rainfall events, in excess of the underground drainage system capacity.

4.3 Water Sensitive Urban Design

The general philosophy for stormwater management is based on the following hierarchy:

- Avoid/minimise the generation of runoff;
- Avoid accidental spillages to the environment;
- Minimise the pollution of stormwater;
- Treatment to a level fit for purpose and reuse;
- Treatment to reduce potentially degrading environmental impacts;

- Disposal in an environmentally sound manner.

4.3.1 Water Quality

Stormwater is proposed to be managed according to the risk of contamination in each area of the plant, and therefore the likely runoff water quality. Separation of runoff based on risk and likely level of pollutants is intended to provide efficient and targeted treatment.

- **Site areas around the power plant** which are to be maintained as pasture, would be diverted around the site, as outlined above.
- **Roof water from the buildings** is proposed to be captured in rainwater tanks adjacent each building and used for toilet flushing and area washdown where appropriate.
- A separate **oily water system** may be provided from areas of medium risk around some equipment, particularly generators and stacks, and carpark. These areas could either be treated through coalescing plate oil-water separators for discharge to stormwater or combined with oily process waste and washdown of equipment areas.
- **General site 'working' areas** including roadways, hardstand and the switchyard will have stormwater runoff directed to a first flush treatment area. This could either be a separation basin or proprietary stormwater interceptor for removal of silt and traces of oil. This runoff would be treated through the sedimentation process in the basin/tank, and oil separation by gravity behind baffles.
  A basin would nominally be sized for rainfall events up to 0.5 EY (2 year ARI) 1 hour duration, effectively the first 15mm of rainfall. Treatment and discharge would be at a rate such that the basin would be emptied (from full) within a period of nominally 12 hours without further inflow. Larger (rarer) rainfall events may overflow at a diversion weir, and thereby bypass the first flush treatment, minimising the risk of scouring and entrainment of captured sediment in a high flow situation.
  This process enables the sediment from plant area washoff to settle out. Heavy metals are also usually attached to particulate matter, so a significant portion would also be removed in this process.
  With catchment areas at high risk for oil contamination being isolated around the source, the need for spill capture in the downstream system should be mitigated. Treatment for oil traces in stormwater would typically be through gravity interceptors and can be fitted with coalescing plate separators if required.
- All remaining areas on the plant platform not otherwise captured would be directed into a separate siltation pond. This is in place primarily for the removal of sediment from the lower risk areas. This pond also enables some sediment removal from larger stormwater flows that bypass the first flush pit. The pond would target finer sediment fractions than common gross pollutant traps do. This pond should also be in place to serve the whole works area during construction.

It needs to be accepted, and is normal practice, that all stormwater treatment systems are designed to deal with the smaller more frequent rainfall events which make up of the order of 95% of annual rainfall, and the less frequent large storm events may overflow the system. The largest pollutant loads would be expected to be within the 'first flush' at the start of a storm, so any subsequent overflow would be a lesser risk.

The above treatment measures also need to be maintained to perform effectively and monitored to ensure that water quality is suitable given that discharge is returned to the environment.

4.3.2 Retention

As all surface water within the area is prescribed, there are restrictions regarding the collection and use of stormwater from the site. The proposed site is covered by the Water Allocation Plan for the Eastern Mount Lofty Ranges (EMLR WAP), which details under what conditions the use of water from within the site is permitted. The South Australian Government Gazette (Tuesday, 22 August 2017) details authorisation for the use of roof runoff from all Surface Water Prescribed Areas within South Australia for the purpose of commercial (including irrigation), industrial, environmental or recreational use subject to the following conditions:

1. Roof runoff taken pursuant to this authorisation can only be collected where the volume of water deemed to be collected from the connected roof area is equal to or less than 1,500 kL per annum.
2. The volume (in kilolitres) of water deemed to be collected from the connected roof area on an allotment is determined as follows:

$$\frac{\text{Connecter roof area (in square metres) x average rainfall for the allotment (in millimetres)}}{1000}$$

3. on the basis that 1 millimetre of rain per square metre of connected roof area yields 1 litre of water, and that the relevant map of those appended as Attachments 1-7 is used to determine the average annual rainfall for the allotment.
4. Roof runoff taken pursuant to this authorisation must be collected in closed water storage facilities.
5. Any water collected pursuant to this authorisation that overflows from a closed water storage facility must be released into the environment in a manner which minimises any harm to the environment.

Based on the current design documentation, approximately 2,200 m^2 of roof catchment is proposed connected to on site water tanks. Based on the rainfall data form the Mannum Council Depot (located approbatory 9 km form the proposed site), the mean rainfall for the year will 294.5 mm. This results in a yearly water collection of approximately 650 kL which is below the allowable maximum of 1,500 kL.

4.3.3 Detention

Surface water from land surrounding the proposed plant area is assumed to be diverted around the outside, using bunds and/or swales as required. Those areas effectively remain rural in nature and are considered not to require detention.

For concept purposes, a detention basin has been assumed as the most cost-effective approach to providing the required storage within the site area in order to maintain the currently flow conditions. The basin design would need to be integrated with the site civil design to clarify site areas, batter slopes, integration with landscaping and any safety requirements.

4.3.4 Plant Area Discharge

The approach outlined above is considered suitable to achieve flow reductions to mimic existing quantities of discharge, as well as manage water quality for the protection of the downstream agricultural environment. In particular, the concept provides for:

- Retention of runoff more than compensates for existing pervious area losses to mimic hydrological response.
- Discharge flow rates limited to not exceed existing runoff in 10% and 1% AEP rainfall events. Treatment of flows from plant areas for up to 0.5 EY rainfall events to capture approximately 95-99% of traces of free oil in stormwater. Where higher risk areas are treated and discharged to stormwater, separators would limit discharge concentration of oils to 5mg/L.
- Treatment of flows to provide more than 95% reduction in total suspended solids (annual average).

The proposed concept arrangement with sedimentation, then infiltration losses from the detention basin, is expected to also reduce nutrient concentrations in stormwater discharge and satisfy the requirements of the Environment Protection (Water Quality) Policy (EPP) (EPA, 2015).

5.0 Further Investigations

Given the project is in the very early stages of the design, numerous assumptions have been made. These will need to be confirmed and clarified as the design progresses, including:

- Design development of the power station site, particularly with respect to bulk earthworks and site grading.
- Identifying and quantifying reuse of water from rainwater tanks.
- Geotechnical investigation to clarify soil type, permeability, and groundwater levels. The sizing of systems, and particularly the retention basin will be sensitive to infiltration losses across the site, and particularly from the batters and floor of the retention basin.
- Liaison with the gas authority to confirm acceptance for extension of an earthworks platform and pipe crossing above the transmission gas main easement.
- The point of discharge is shown indicatively and remains subject to final design levels as well as discussions with landholders and Council. At the southern end, discharge could be either via level spreader to the natural drainage line crossing through neighbour's property as it does now, or if at a suitable level, diverted to Hoffman Road where an outfall swale would need to be formalised.
- Liaison with Council to confirm the design approach and/or any other requirements.

Appendix A

Conceptual Stormwater Drainage Systems

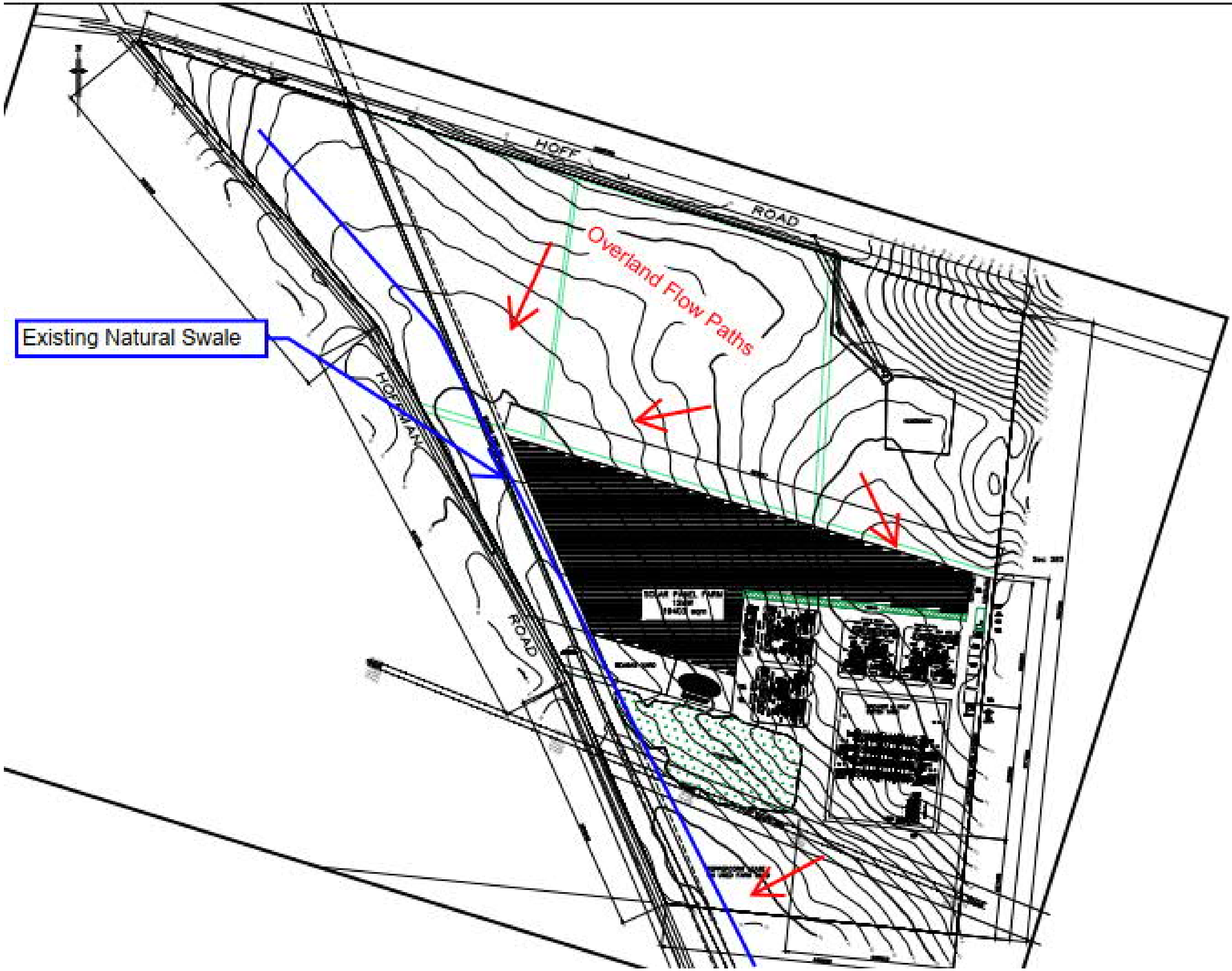

Figure 3 Existing Stormwater Drainage System.

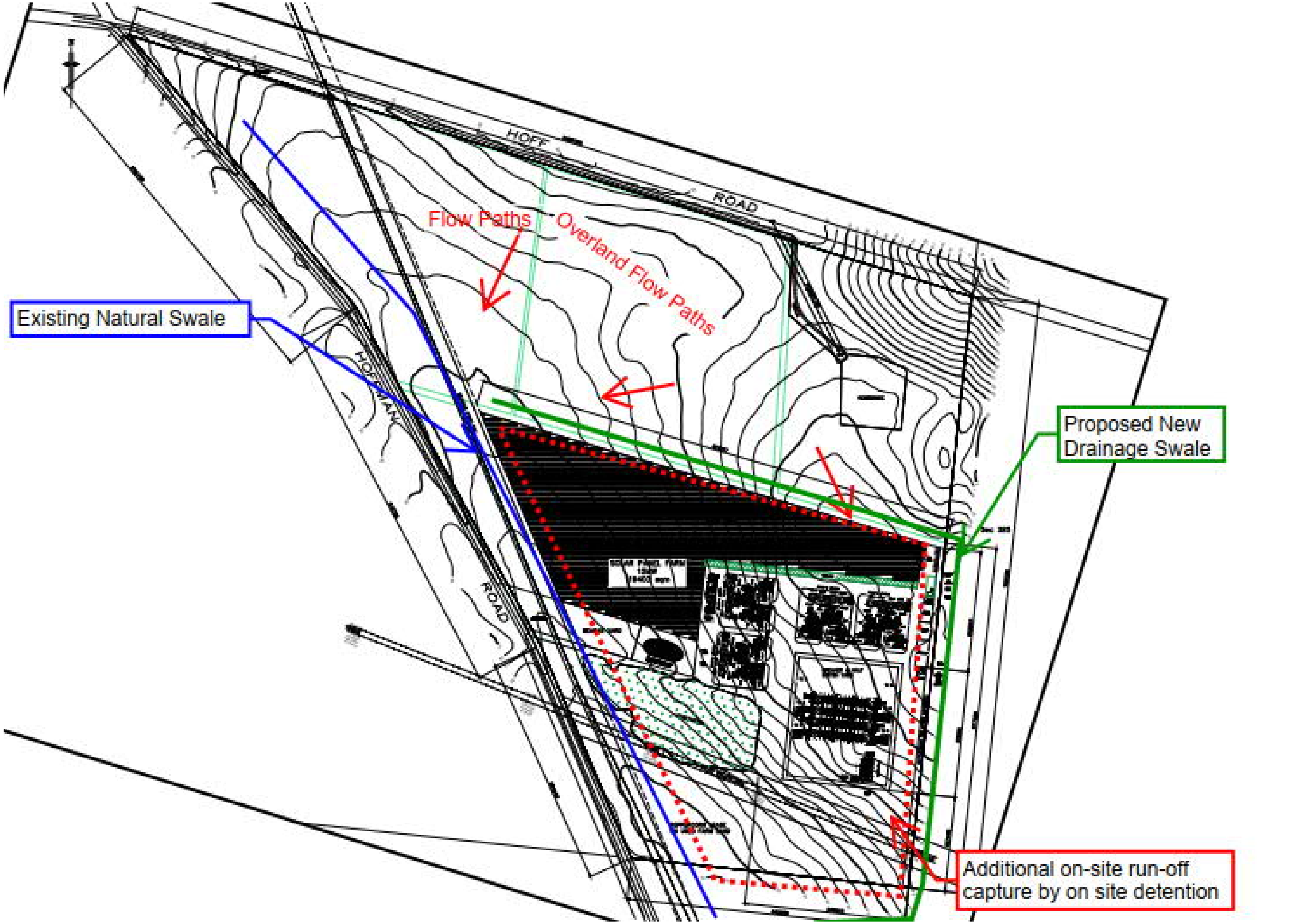

Figure 4 Post-Development Stormwater Drainage System.

Appendix K

Economic Impact Assessment

SAPGEN

Summerfield Power Station

Economic Impact Assessment

October 2019

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Executive Summary

SAPGEN has engaged Hudson Howells to undertake an Economic Impact Assessment (EIA) that identifies the direct and indirect (multiplier) employment and Gross State Product impacts of the proposed Summerfield Power Station on the South Australian and regional economies.

The proposed Summerfield Power Station, near Palmer in South Australia (gas and solar), incorporates the following infrastructure:

- 380 MW natural gas combined cycle gas turbines – to be constructed in 4 plants.
- 12 MW solar farm.
- 30 MW battery energy storage facility.
- Switch yard.
- Associated onsite support facilities/ancillary development (office and amenities building, control room, workshop/storage building, security fencing, landscaping).
- Connections to the existing HV electricity network and SEA Gas pipeline – all connections to be contained onsite no further augmentation to the existing transmission line or pipeline will be required.

In summary, the construction of the Summerfield Power Station over 1 to 2 years is estimated to support:

- 708 FTE State jobs (South Australia) per annum over 2 years – 243 direct and 465 induced (i.e. via the multiplier effect).

- 355 FTE regional jobs (Adelaide Hills and Mid-Murray Region) per annum over 2 years – 122 direct and 233 induced (i.e. via the multiplier effect).

- Gross State Product of $99 million (South Australia) per annum over 2 years (salaries, wages, profits, etc.).

- Gross Regional Product of $40 million (Adelaide Hills and Mid-Murray Region) per annum over 2 years (salaries, wages, profits, etc.).

The above construction related jobs and GSP/GRP estimates are spread evenly over 2 years as the project will take at least 18 months to complete and it is expected that most of the capital spend will occur in the last 6 months. However, should the capital spend occur evenly over an 18 month period, then the total jobs (1,417 and 708 for SA and the region respectively) and GSP/GRP ($99 million and $12.3 million) will be spread 2/3 in year 1 and 1/3 in year 2.

When fully operational, the Summerfield Power Station is estimated to support:

- 106 FTE State jobs (South Australia) per annum – 72 direct and 34 induced (i.e. via the multiplier effect).
- 77 FTE regional jobs (Adelaide Hills and Mid-Murray Region) – 57 direct and 20 induced (i.e. via the multiplier effect).
- Gross State Product of $12.3 million (South Australia).
- Gross Regional Product of $7.5 million (Adelaide Hills and Mid-Murray Region).

1. Introduction and Methodology

SAPGEN has engaged Hudson Howells to undertake an Economic Impact Assessment (EIA) that identifies the direct and indirect (multiplier) employment and Gross State Product impacts of the proposed Summerfield Power Station on the South Australian and regional economies.

The proposed Summerfield Power Station, near Palmer in South Australia (gas and solar), incorporates the following infrastructure:

- 380 MW natural gas combined cycle gas turbines – to be constructed in 4 plants.
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- Switch yard.
- Associated onsite support facilities/ancillary development (office and amenities building, control room, workshop/storage building, security fencing, landscaping).
- Connections to the existing HV electricity network and SEA Gas pipeline – all connections to be contained onsite no further augmentation to the existing transmission line or pipeline will be required.

Hudson Howells methodology for this project was based on similar successful economic impact assessments undertaken for a variety of State and regional airports. The key to an accurate assessment is reliable cost and operational data sourced from reliable industry stakeholders that enables the economic consultant to model sustainable results and forecasts. Hudson Howells worked collaboratively with SAPGEN to ensure that reliable establishment and operational cost data were obtained for this EIA.

The broad methodology adopted for this EIA comprised:

- Identification of all establishment and operational costs associated with the project.

- Construction of an EIA Framework for assessing the FTE jobs and Gross State and Regional Product (GSP/GRP) associated with the project.

- Economic modelling of the project's current and expected future economic impacts.

2. Establishment and Operational Costs and Assumptions

This section of the report details the project establishment and operational costs and assumptions used to inform the project economic impact assessment.

The modelling in this economic impact assessment is based on the following project characteristics:

- 380 MW natural gas combined cycle gas turbines – to be constructed in 4 plants.
- 12 MW solar farm.
- 30 MW battery energy storage facility.
- Switch yard.
- Associated onsite support facilities/ancillary development (office and amenities building, control room, workshop/storage building, security fencing, landscaping).
- Connections to the existing HV electricity network and SEA Gas pipeline – all connections to be contained onsite no further augmentation to the existing transmission line or pipeline will be required.

Other cost information provided by SAPGEN includes:

- Construction Cost - $620 million (specialist plant and equipment to be imported).
- Construction Spend on SA Goods and Services - $220 million.
- Construction Time - 18 months.
- Estimated Construction Employees – 150 – 200 FTEs.
- Estimated Operational Employees (Management; Operational; Maintenance) – 44 FTEs.
- An indicative time line of the expenditure profile is indicated below.

Based on the information provided by SAPGEN, it is further assumed that:

- The construction spend of $620 million is distributed as 75% in the first year and 25% in the second year.
- Operational spend is estimated at $20.7 million per year ($15 per megawatt hour).
- The average wage for labour in operations is $80,000, with most of the employed personnel residing in the region.
- The distribution of spend to industry sectors in the construction and operational phases is assumed to be as in the following table. Construction activity is assumed to be purchased from the construction sector, with an additional allowance for transport. In addition to the spend on operations there is assumed to be expenditure on construction and equipment (maintenance) and general administrative support.

Table 1 - Distribution of Spend to Industry Sectors in the Construction and Operational Phase

	Capital		Operating	
	Region	State	Region	State
Non residential building construction	5%	10%	2%	5%
Heavy and Civil Engineering Construction	5%	10%	2%	5%
Equipment Manufacturing	0%	0%	2%	5%
Transport	5%	10%	5%	5%
Administrative services	0%	0%	2%	5%
Spend of Labour	0%	0%	15%	17%
Imports (including gas)	85%	70%	72%	58%
	100%	100%	100%	100%

3. Methodology and Economic Impact Assessment

The emphasis of this analysis is on what is called the economic impact analysis of the project. This focuses on the effect of the project in terms of the creation of regional incomes and employment associated with the investment and operations phases of the project.

This effect arises through the primary expenditure directly associated with the project, and from further rounds of indirect expenditure that this direct expenditure stimulates as it flows to supplying industries and into incomes and consumption.

The importance of the expenditure identified above is that it will sustain turnover in local industry, and specifically this will support local jobs and incomes. The use of input output tables has been a prominent process[1] for translating direct created expenditure (a final demand stimulus) into jobs and incomes, and for establishing the extent of the flow-on economic impacts.

Applying direct expenditures to input-output tables allows a reporting to the estimated outcomes of the event in terms of the effect of expenditure or turnover on value added in a regional economy and in terms of jobs creation – which is consistent with national accounting frameworks.

The input output tables used for this study are estimated as at 2019. The tables for the State are derived from the latest national input output tables produced by the ABS – which is for 2016/17. A location quotient method is used to derive tables at a fit for purpose 27 industry sectors level using 2016/17 labour force survey data, and direct data for employee consumption and value added from the national accounts. The tables are updated to 2019 by adjusting for inflation.

The regional tables are based on the Adelaide Hills and Mid Murray region, and are derived from the State tables using a location quotient method and 2016 census data for the region.

Detailed results from the economic modelling are shown in the following tables.

Table 2 – State Economic Impacts

South Australian Impacts				
	Total GSP Impact	Average Annual GSP	Total Jobs Impact	Average Annual
Construction Phase (18 months)				
Initial (Direct plus First Round)	$66 million	$33 million	487	243
Induced	$133 million	$67 million	930	465
Total	**$199 million**	**$99 million**	**1,417**	**708**
Operating Phase				
Initial (Direct plus First Round)		$7.1 million		72
Induced		$5.1 million		34
Total		**$12.3 million**		**106**

Table 3 – Regional Economic Impacts

Regional Impacts (Adelaide Hills and Mid Murray Region)				
	Total GSP Impact	Average Annual GSP Impact	Total Jobs Impact (FTEs)	Average Annual Jobs Impact
Construction Phase (18 months)				
Initial (Direct plus First Round)	$33 million	$16 million	243	122
Induced	$47 million	$24 million	465	233
Total	**$80 million**	**$40 million**	**708**	**355**
Operating Phase				
Initial (Direct plus First Round)		$5.5 million		57
Induced		$2 million		20
Total		**$7.5 million**		**77**

In summary, the construction of the Summerfield Power Station is estimated to support:

- 708 FTE State jobs (South Australia) per annum over 2 years – 243 direct and 465 induced (i.e. via the multiplier effect).
- 355 FTE regional jobs (Adelaide Hills and Mid-Murray Region) per annum over 2 years – 122 direct and 233 induced (i.e. via the multiplier effect).
- Gross State Product of $99 million (South Australia) per annum over 2 years (salaries, wages, profits, etc.).
- Gross Regional Product of $40 million (Adelaide Hills and Mid-Murray Region) per annum over 2 years (salaries, wages, profits, etc.).

The above construction related jobs and GSP/GRP estimates are spread evenly over 2 years as the project will take at least 18 months to complete and it is expected that most of the capital spend will occur in the last 6 months. However, should the capital spend occur evenly over an 18 month period, then the total jobs (1,417 and 708 for SA and the region respectively) and GSP/GRP ($99 million and $12.3 million) will be spread 2/3 in year 1 and 1/3 in year 2.

When fully operational, the Summerfield Power Station is estimated to support:

- 106 FTE State jobs (South Australia) per annum – 72 direct and 34 induced (i.e. via the multiplier effect).
- 77 FTE regional jobs (Adelaide Hills and Mid-Murray Region) – 57 direct and 20 induced (i.e. via the multiplier effect).
- Gross State Product of $12.3 million (South Australia).
- Gross Regional Product of $7.5 million (Adelaide Hills and Mid-Murray Region).

Kerber, Laura (DPTI)

From:	Hateley, Tom <Tom.Hateley@aecom.com>
Sent:	Monday, 6 January 2020 9:34 AM
To:	Kerber, Laura (DPTI)
Cc:	brett.may@sapgen.com.au; 'aaron.deans'; 'Ben Lee'; Burman, Brenton
Subject:	RE: Request for Further Info 711/V031/19: Summerfield Power Station
Attachments:	Summerfield Cut and Fill Plans.pdf

Hi Laura,

A response to each of the items is provided below:

1. The total capacity of hydrocarbon storage will be 1 cubic metres (1000 litres).
2. The applicant has an agreement in place with the land owner to lease the site with an option to purchase, if required.
3. A concept earthwork plan and cross section drawing is attached.
4. Two inverter stations are proposed for the solar farm. The inverters will be located within the proposed solar farm footprint, location to be confirmed as part of the detailed design. The inverters will modularised and will comprise approximate dimensions of 12mLx2.3mWx2.7mH (similar to 40 foot shipping container)
5. If required, the applicant is committed to implementing the mitigation measures. However, I note that these issue will be further considered and assessed, in association with the relevant authority, as part of the Traffic Management Plan.

Any questions please give me a call.

Cheers

Tom Hateley
Senior Planner
D +61 8 7131 0297 Tom.Hateley@aecom.com

AECOM
Level 28, 91 King William Street, Adelaide, SA 5000
T +61 8 7131 0252 F +61 8 7223 5499
www.aecom.com

From: Kerber, Laura (DPTI) <Laura.Kerber@sa.gov.au>
Sent: Thursday, 5 December 2019 4:47 PM
To: Hateley, Tom <Tom.Hateley@aecom.com>
Subject: Request for Further Info 711/V031/19: Summerfield Power Station

Good morning Tom

Applicant:	SAPGen C/-AECOM
Application Number:	711/V031/19
Proposed Development:	Summerfield Power Station
Subject Land:	120 Hoff Road, Tepko

I refer to the above development proposal lodged with the State Commission Assessment Panel (SCAP).

Pursuant to Section 49(4) of the Development Act 1993, you are requested to provide the following additional information in order to enable the further assessment of the application:

1. Total storage capacity for hydrocarbon storage within the development, expressed as cubic metres.

2. Detail regarding the lease / access arrangement with the land owner – has a lease been executed at this time?

3. Noting that civil design has not yet been undertaken, a concept earthworks plan / cross sections which show the indicative cut and fill over the development site.

4. Details on the Inverter Stations for the solar farm including number, location and dimensions. Will the inverter stations be scattered throughout the solar farm?

5. The Traffic Impact Statement identifies potential mitigations measures to accommodate expected traffic during construction including:
   - sealing of the 3km stretch of road between the development site and Mannum Road
   - intersection upgrades

   Is this Applicant committed to implementing these mitigation measures if they are deemed necessary by Council/DPTI Transport/DPTI Planning?

I note that this application requires public notification pursuant to Section 49(7d) of the Development Act 1993, as the project cost exceeds $4 million. Due to timing with the Christmas/New Year period, the public notification period will commence in January 2020.

The application has been referred to the local council and relevant State Government agencies for comment.

An invoice for development assessment fees is attached. Advertising fees will be invoice separately in due course.

If you have any questions relating to this matter please contact me on 7109 7073 or via return email.

Kind regards

Laura Kerber
Senior Planning Officer – Major Development and Crown
Planning and Land Use Services
Department of Planning, Transport and Infrastructure
T 7109 7073 (internal 97073) • **E** Laura.Kerber@sa.gov.au
• Level 5, 50 Flinders Street Adelaide SA 5000 • GPO Box 1815 Adelaide SA 5001 • DX 171 • www.dpti.sa.gov.au

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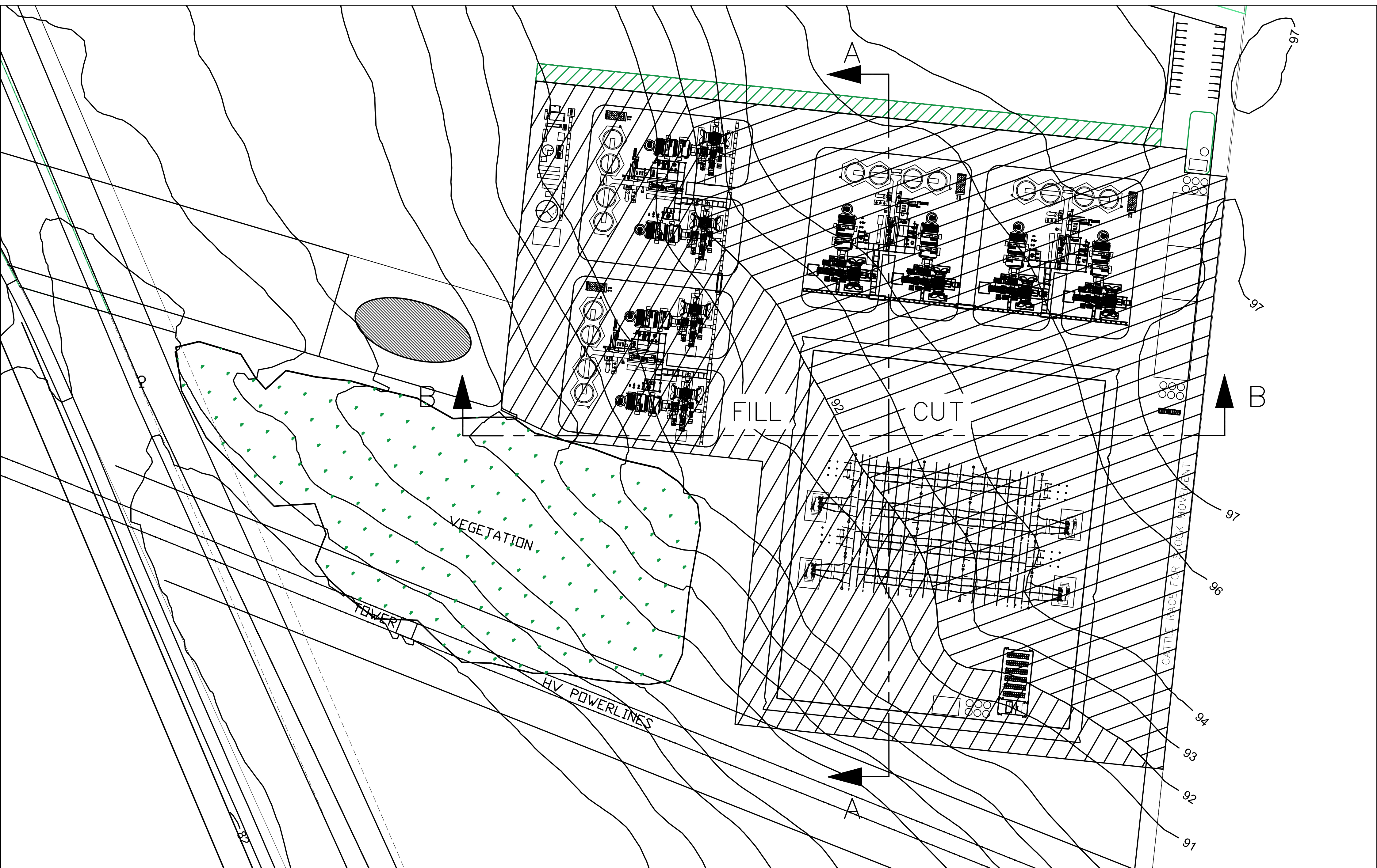


CIVIL WORKS - CUT & FILL

DWG NO.	DESCRIPTION	REV.	DATE	DESCRIPTION	DWN	CKD	APPD
		E	20DEC19	CIVIL WORKS CUT & FILL ADDED (SHT 5&6)	CMS		
		D	25NOV19	INVERTERS REMOVED	CMS		
		C	03SEP19	CONTOUR LINES ADDED (SHT 3&4), MOVED BATTERY SHED	CMS		
		B	21JUL19	PLANT LABELS REVISED	CMS		

REFERENCE DRAWINGS

REVISION

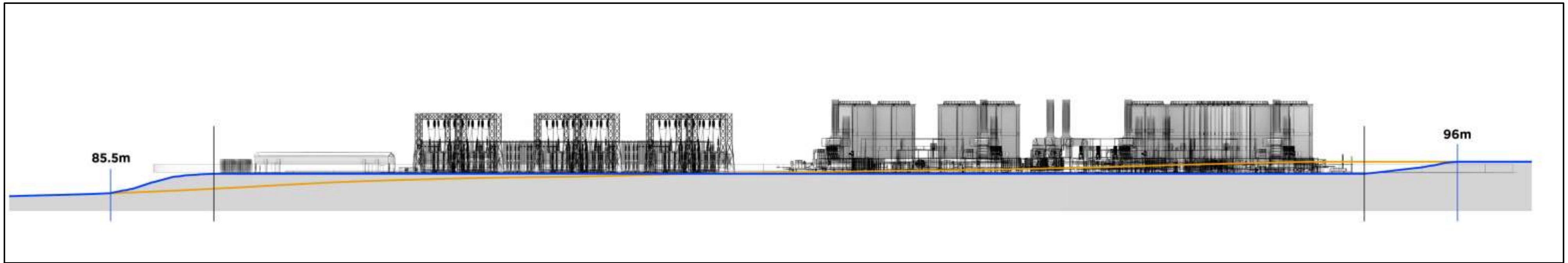
SOUTH AUSTRALIA POWER GENERATION

DRAWN	CMS
CHECKED	
APPROVED	
DATE	19JUL19
JOB No.	
SCALE	NTS
SHEET	5 OF 6

CUSTOMER:

SAPGen SUMMERFIELD
1.6TW/hr CAPACITY
GRID FIRMING RENEWABLES

A1 | DWG NO: SPAG-20190719 | REV: D



SECTION A-A
NORTH VIEW
BLUE LINE 92m - ORANGE LINE EXISTING LAND FALL

SECTION B-B
WEST VIEW
BLUE LINE 92m - ORANGE LINE EXISTING LAND FALL

CIVIL WORKS - CUT & FILL

DWG NO.	DESCRIPTION	REV.	DATE	DESCRIPTION	DWN	CKD	APPD
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REFERENCE DRAWINGS		REVISION					

SOUTH AUSTRALIA POWER GENERATION

DRAWN	CMS
CHECKED	
APPROVED	
DATE	19JUL19
JOB No.	
SCALE	NTS
SHEET	6 OF 6

CUSTOMER:
SAPGen SUMMERFIELD
1.6TW/hr CAPACITY
GRID FIRMING RENEWABLES

A1 DWG NO: SPAG-20190719 REV: D