AGRICULTURAL ASSESSMENT

CONSTRUCTION AND OPERATION

of the proposed

Battery Energy Storage System

Heywood, Victoria

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for

Atmos Renewables

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1. Introduction

1.1 Project Brief

Atmos Renewables propose to develop a Battery Energy Storage System (BESS) on approximately 7.7 ha[1] of the 18 ha property best identified as 2\TP20650 at 100 Golf Course Road, Heywood, Victoria.

The proposed BESS area to be developed, described as the Primary Development Area in Figure *1*, encompasses approximately 7.7 hectares of farming land 5 km south of the Heywood township in the Glenelg Shire. Ag-Challenge Consulting has been engaged to investigate the agricultural impacts of the proposed development.

Site investigations are ongoing, and detailed plans are being developed with respect to all physical and cultural considerations, following engagement with communities and authorities.

This investigation describes the existing agricultural use of the area to be developed in both a local and regional context. The investigation considers the impact of the BESS development on the existing uses of the land, identifies any potential impacts on adjacent properties and determines whether the proposal is likely to have any adverse impacts on surrounding land uses and the regional agricultural economy.

The proposed area to be developed is within parcel number 2\TP20650, which is in the Parish of Heywood of the Glenelg Shire Planning Scheme. An aerial image of the property with the Concept Plan of the BESS superimposed on this image is shown in Figure 1, with the location of the soil investigation points across the site shown in Figure *3*.

1.2 Experience and Capability of Ag-Challenge Consulting

Ag-Challenge Consulting is an agricultural consultancy company servicing the dairy, beef, and potato industries as well as other high rainfall and irrigated agriculture industries of Southern and Northern Victoria. The company is based at Warragul and the Principals of the company have been providing independent farm consultancy advice since 1988 from this location. There are four active consultants within the company that service approximately 200 individual farmer clients with consultancy services from Ag-Challenge Consulting, as well as industry associations, financial institutions, and government. The company is active in vocational training, running focus farms and discussion groups and undertaking farm design work. The recycled water industry is a significant user of Ag-Challenge Consulting for the design and monitoring of recycled water projects. The renewable energy industry has collectively been a significant client of Ag-Challenge Consulting, using the company services for site selection and design, liaison with adjacent farm businesses and assistance in satisfying the provisions of planning schemes.

[1] 7.7 ha includes Access Road, Laydown, O&M Facility, Bess Development Area, Asset Protection Zone, Radiant Heat Barrier, Stormwater Retention Area and Substation from Figure *1*.

Figure 1. Heywood BESS Concept Layout Plan – Primary Development Areas is the focus of this report

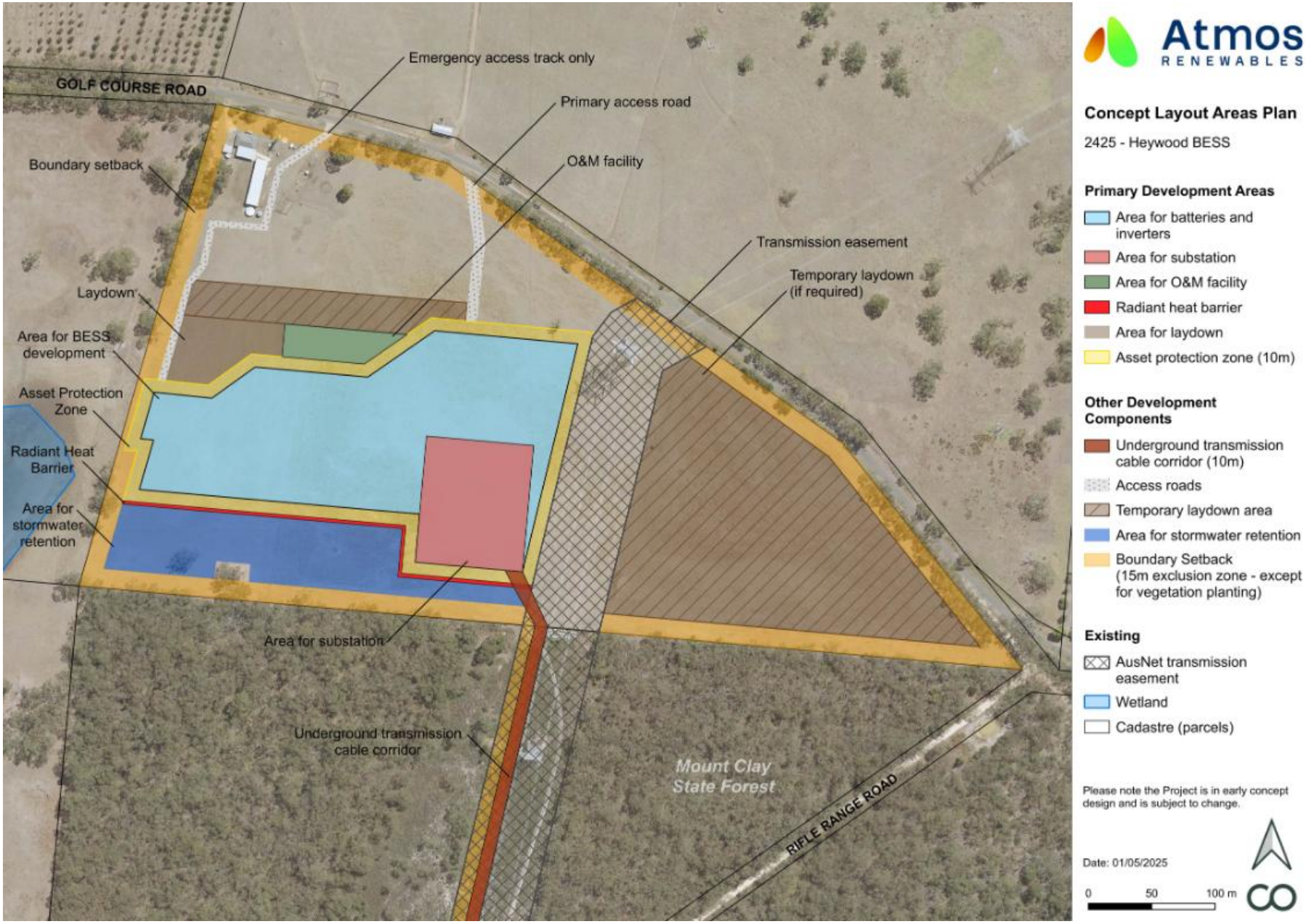


Figure 2. Heywood BESS Concept Layout Plan

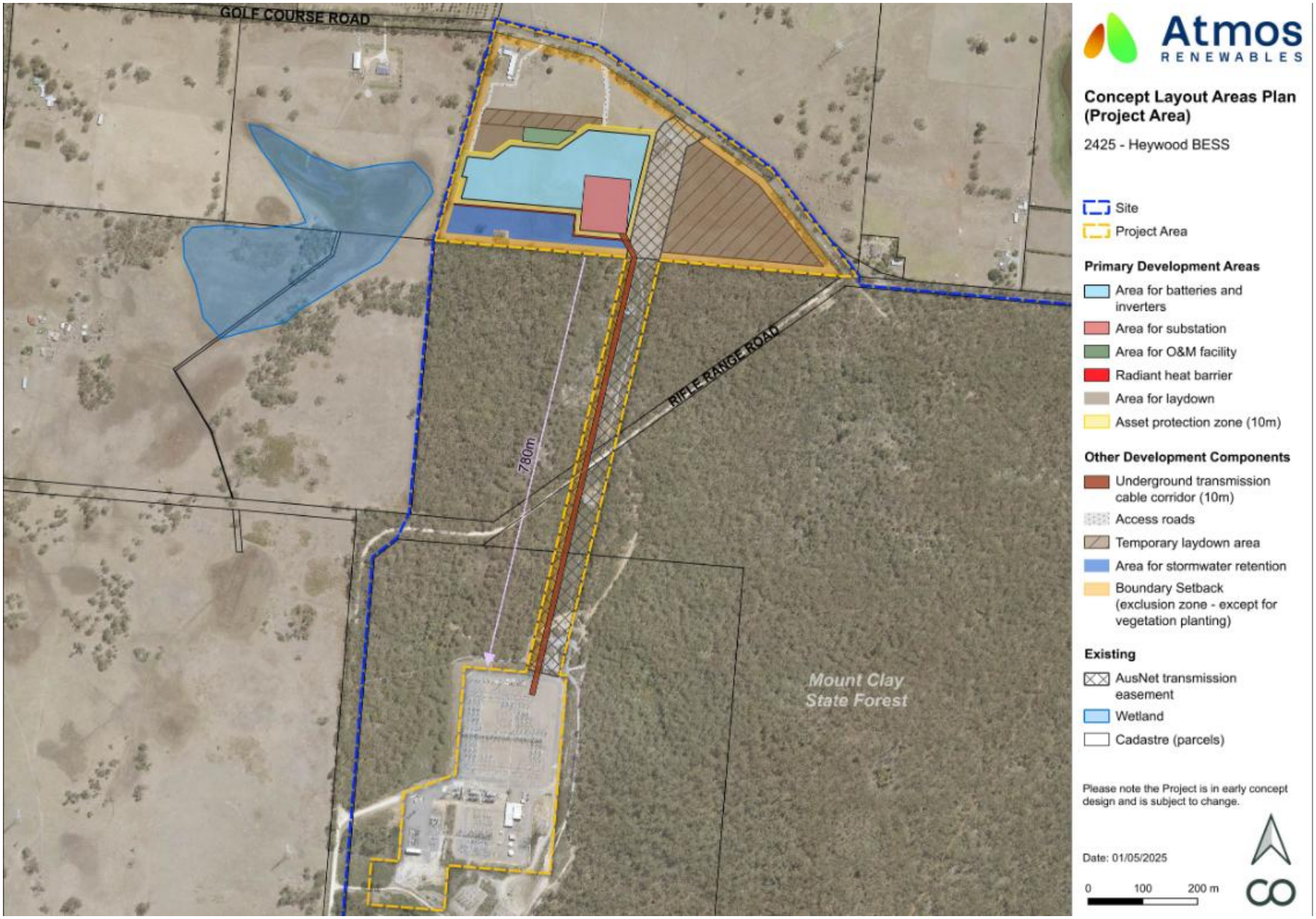
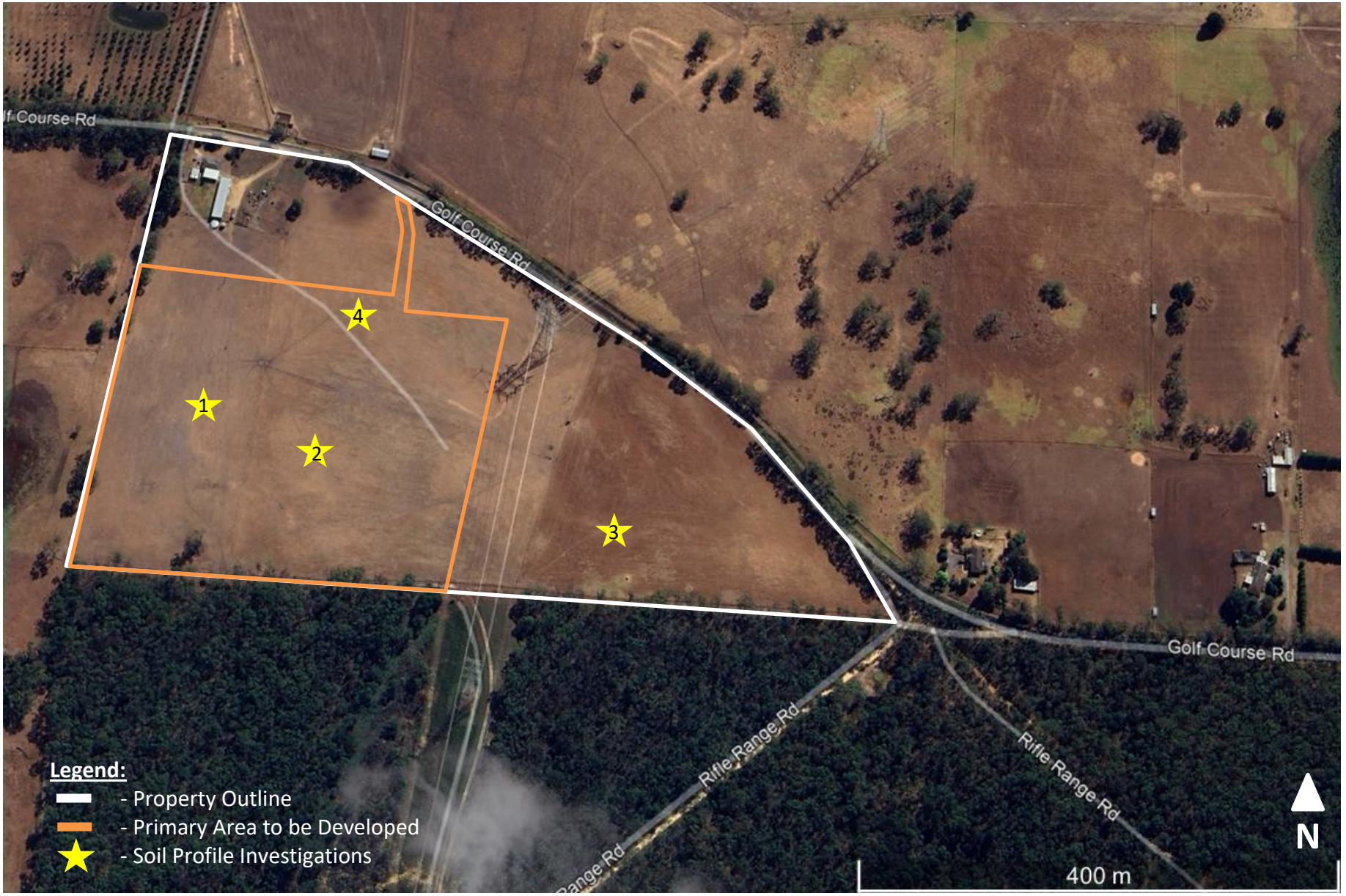


Figure 3. Aerial Image of property (soil profile investigation locations denoted by yellow stars Appendix 1).



2. Planning Provisions

2.1 Farming Zone Provisions

Lot 2\TP20650 is located within the Farming Zone of the Glenelg Planning Scheme. The objectives of the Farming Zone are:

- *To implement the Municipal Planning Strategy and the Planning Policy Framework.*
- *To provide for the use of land for agriculture.*
- *To encourage the retention of productive agricultural land.*
- *To ensure that non-agricultural uses, including dwellings, do not adversely affect the use of land for agriculture.*
- *To encourage the retention of employment and population to support rural communities.*
- *To encourage use and development of land based on comprehensive and sustainable land management practices and infrastructure provision.*
- *To provide for the use and development of land for the specific purposes identified in a schedule to this zone.*

A utility installation is a permitted use within Section 2 of the Table of Uses within the Farming Zone and as such requires a permit. The associated earthworks and construction activity will be part of this permit. The Decision Guidelines state that the responsible authority must consider, as appropriate:

- Whether the use or development will support and enhance agricultural production.
- Whether the use or development will adversely affect soil quality or permanently remove land from agricultural production.
- The potential for the use or development to limit the operation and expansion of adjoining and nearby agricultural uses.
- The capacity of the site to sustain the agricultural use.
- The agricultural qualities of the land, such as soil quality, access to water and access to rural infrastructure.

2.2 Overlay Provisions

The Land Parcel 2\TP20650 is subject to three overlays:

- A Bushfire Management Overlay (BMO)
- Aboriginal Cultural Heritage Sensitivity Overlay
- Environmental Significance Overlay (ESO) and is subject to the provisions of Schedule 3 of the Environmental Significance Overlay.

Schedule 3 of the Environmental Significance Overlay relates to protecting the habitat of the South-Eastern Red-Tailed Black Cockatoo, through the retention of live and dead hollow bearing trees, in addition to Brown Stringybark and Desert Stringybark trees.

3. Regional Context

3.1 Climate

The average long-term monthly rainfall data from SILO Long Paddock at Heywood has been recorded in Table 1, and climatic data are found in Appendix III. SILO uses interpolated data from the Bureau of Meteorology (BOM) and other suppliers to construct a spatial grid, to infill

values for missing data. The data point which was used at a latitude of -38.15 and longitude of 141.65 and is considered indicative of this site. The data set chosen averages the previous 40 years of rainfall and evaporation data. The property has a mediterranean climate with mild dry summers, cool wet winters, and a moderate average annual rainfall of 710 mm. The winter and spring months are the dominant months for rainfall.

Table 2. Monthly average rainfall (mm) for Heywood (SILO Long Paddock).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Heywood	33	27	35	53	37	89	97	97	77	63	50	52	710

The rainfall data for Heywood has been entered into a water budget spreadsheet that can be used to predict seasonal moisture surpluses and deficits (Appendix II).
Allowing for a 30 mm carry forward of soil moisture from the slightly wetter months into the drier period of the year, and a pasture crop factor ranging from 0.6 in mid-winter through to 1.0 in summer, the growing season for pasture is predicted to be for about 7 months each year, with soil moisture being a significant restriction to growth from December through to April.

The BOM meteorology station No. 090048 (Heywood Forestry) records daily maximum and minimum temperatures as well as humidity and wind speed. A summary of the temperature data is provided in Appendix III. Frost is likely to have occurred if the screen temperature at the meteorology station falls to 2°C or less and a severe frost is likely to have occurred if screen temperature drops to 0°C or less. Frost will restrict the growth of pasture and crops, increase risk of livestock mortality (especially in young or susceptible stock), and out of season frosts have the potential to damage pastures and crops at sensitive growth stages. The data in Appendix III identifies that frosts commonly occur throughout winter and the months either side with 2-6 frosts expected per month. Importantly severe frosts do occur throughout winter with up to three severe frosts expected in June, up to two in July and one in August, with out of season frosts occasionally occur during April, May, September and October.

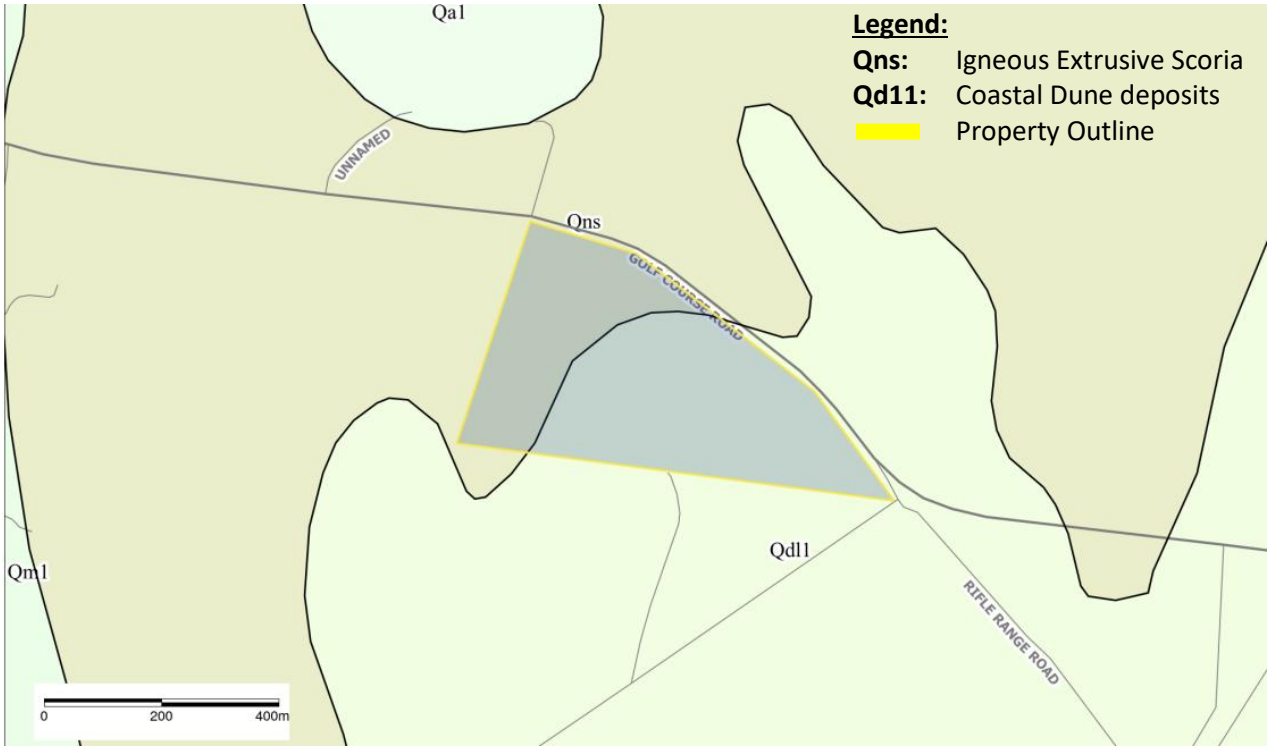
3.2 Regional Landform

The landscape is best understood in terms of the processes that formed it (Figure 4). The underlying geology from Geovic[2] shows both Volanic deposits and aeolian sand of Quaternary age.

Spanning the eastern two thirds of the property are coastal dune deposits, of beach sand and some swamp deposits dating from the Quaternary period and formed from sedimentary and aeolian processes.

The remaining third of the property, including along all the western edge, is underlain by deposits of scoria deposited during volcanic activity during the Quaternary to Neogene period. There appears to have been considerable surface redistribution of the aeolian sands, such that all soil auger holes investigated to a depth of 80 cm were free of any volcanic material and were consistent with the coastal dune deposits. There was no evidence of scoria found in the four auger holes examined across the property.

Figure 4. Geology – Accessed from Geovic[2]



3.3 Regional Land Use

The property lies within a generally flat to undulating plain with small depressions. Heywood is typified by extensive grazing of sheep and cattle, for wool, prime lambs and beef, as well as broadacre cropping. [3] There is a diversity of other minor land uses such as dairying.

A detailed land resource assessment of the Glenelg-Hopkins region was undertaken in 2001[3]. The purpose of the assessment was to guide future agricultural development across the region, with particular emphasis on areas with high capability for agroforestry and high capability for dairying and broadacre cropping. Land Capability assessments were produced for Southern Blue Gum forestry, Broadacre Cropping, Dairying and Wine Grapes using the most limiting factor rating system to determine perceived constraints to the operation of these enterprises on particular tracts of land. The property was mapped as low capability for southern blue gums and broadacre cropping and was identified within an area of moderate capability for wine grapes and dairying.[4] These maps have been included in Figures 4 – 7 below, with the yellow arrows indicating the approximate location of the area to be developed.

[2] Geovic - https://gsv.vic.gov.au/sd_weave/registered.htm
[3] Glenelg Regional Catchment and Land Protection Board, 1997, accessed from VRO, https://vro.agriculture.vic.gov.au/dpi/vro/glenregn.nsf/pages/glenelg_landuse_private
[4] Victorian Department of Natural Resources and Environment, 2001, accessed from VRO, Land Capability Maps, https://vro.agriculture.vic.gov.au/dpi/vro/glenregn.nsf/pages/glenelg_soil_map.

Figure 5. Land Capability for Southern Blue Gum – Glenelg Hopkins Region

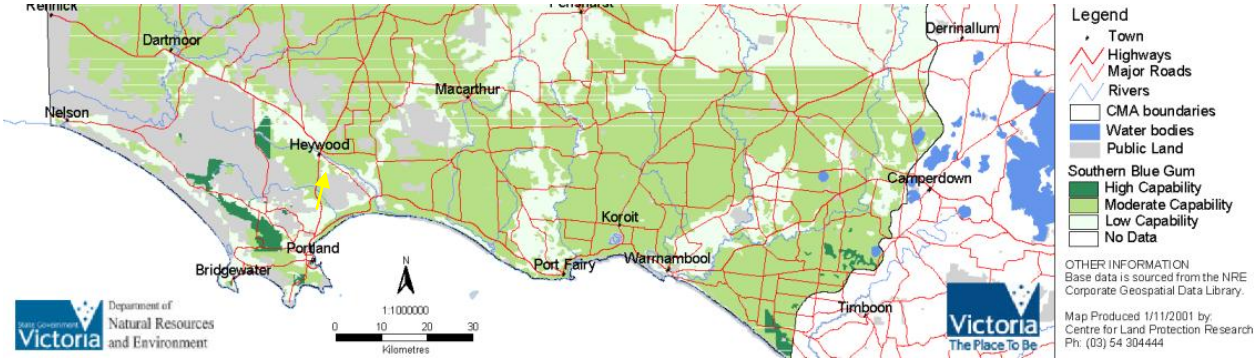


Figure 6. Land Capability for Broadacre Cropping – Glenelg Hopkins Region

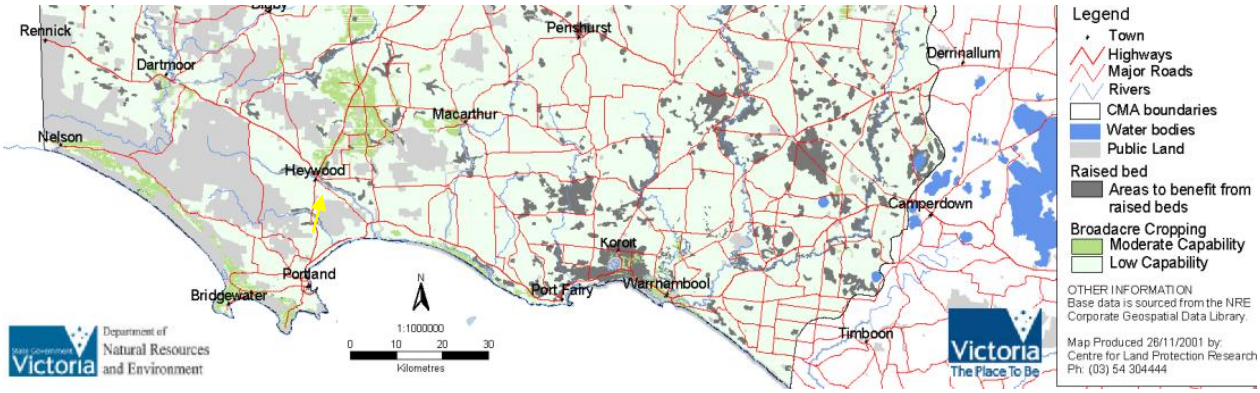
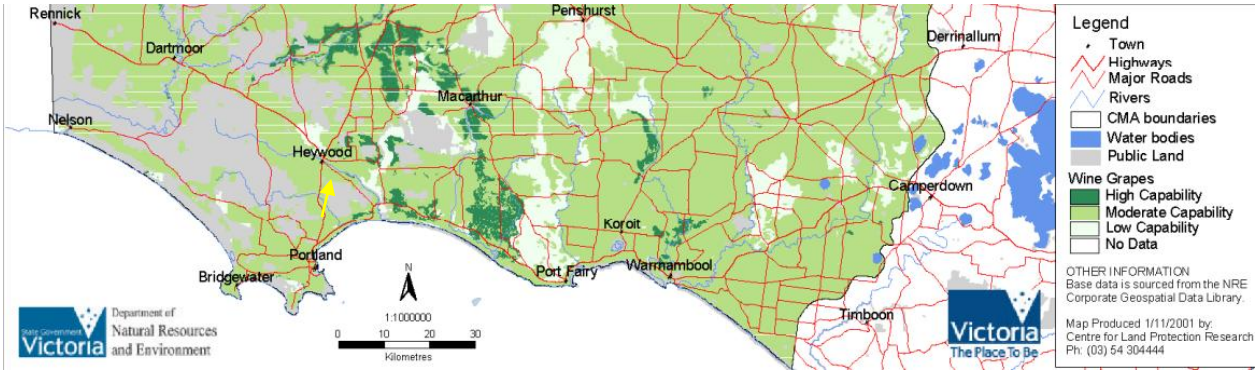


Figure 7. Land Capability for Dairy – Glenelg Hopkins Region

Figure 8. Land Capability for Wine Grapes – Glenelg Hopkins Region



4 Site Characteristics

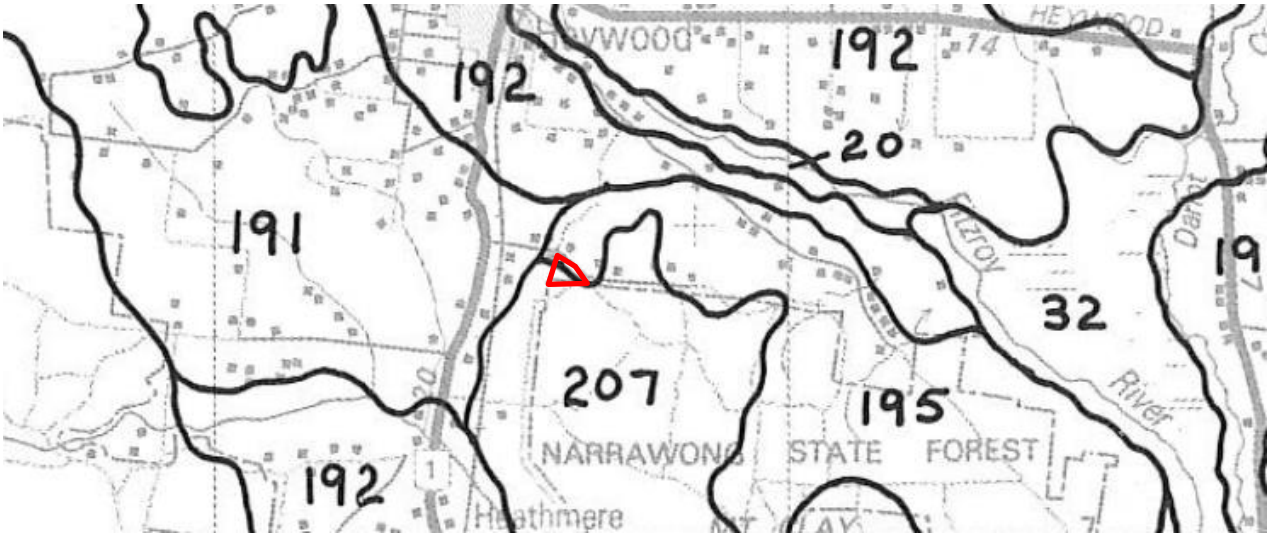
4.1 Description of the Land

The Area to be Developed is a gently undulating plain within the landscape. There are no dwellings or associated shedding, or buildings located within the proposed area to be developed. The property is divided into 4 grazing paddocks, with stock troughs serviced by bores. A single large transmission pole is located within the north central paddock.

4.2 Soils

Maher and Martin (1987)[5] have published soil maps for this area, with the relevant major units that cover the area being, map unit 195 and 207.

Figure 9. Soil Mapping of the Area to be Developed by Maher & Martin – Red outline indicates property outline



Unit 195 has been mapped as covering the north eastern third of the property while unit 207 covers the south western two thirds of the property. However, across the property only mapping unit 207 was observed. The features have been summarised below.

Table 1. Summary of Soil Mapping Unit 207 & 195 – Maher & Martin, 1987

Soil Map Unit	Soil Texture & Colour	Soil Structure
207	Sandy surface soil dark grey to dark brown, over mottled yellow clay subsoils. Bleached A2 horizons can occur, indicative of periodic waterlogging.	Poor surface soils, massive or structured subsoils.
195	Very dark greyish brown to dark brown clay loam to sandy clay loam surface soils, overlying, greyish brown to yellowish brown mottled medium to heavy clay subsoil.	Hard setting, massive to weak surface soils, moderate to strong subsoils.

[5] Maher, J & Martin, J, 1987, Soil and landforms of south-western Victoria Part 1. Inventory of soils and their associated landscapes, Department of Agriculture and Rural Affairs.

Soils inspected at multiple locations within the Area to be Developed consisted of a sandy surface soil, intermittent bleached A2 horizon, overlying a medium clay mottled subsoil.

The sandy surface soils were hydrophobic in nature, poorly structured yet were deep.

Sandy surface soils are sought after for horticultural uses where a reliable good quality irrigation source is available.

Four soil profiles were examined across the property, with the locations shown in Figure 3 and described in Appendix 1. All sites examined were more consistent with Soil Map Unit 207.

4.3 Vegetation

Ground cover at the time of the site visit was essentially dried and dead perennial ryegrass pasture, with incident scotch thistles and blown grass. In talking to the property owner, the Area to be Developed is sown to perennial ryegrass and sub-clover, white-clover mix.

Lining the Golf Course Road and western property boundary are environmental plantings for windbreaks.

4.4 Water Supply

Stock water for the grazing operations is primarily supplied through a bore with solar pump into stock troughs throughout the paddocks. Previously a windmill was also used for the bore, but is currently not functional.

Given the use of a bore for stock water, there may be the potential for groundwater to be accessed and used for irrigation of pasture and crops. This is discussed in further detail in Appendix IV.

4.5 Farm Infrastructure

Infrastructure including a machinery shed, solar pump, wooden stock yards and loading race, as well as small horse paddocks are located on the property.

The property is divided into 4 main paddocks for grazing with sheep, with the boundary and subdivisional fencing in fair condition.

4.6 Current Land Use

The current land use is grazing with ewes and lambs, essentially as a meat finishing block. The area to be developed is used in conjunction with approximately 1,000 additional acres in the surrounding areas for meat production.

At the time of site inspection (11/02/2025), the property was being grazed by a single mob of approximately 100 ewes with lambs at foot, which were being supplementary fed hay and silage. This is generally the highest stocking rate the property is stocked at throughout the year.

Additionally, 100 rolls of hay and silage (5 x 4) are cut from the property, on an annual basis which is fed out back to the stock on the property in addition to purchased fodder and fodder produced on the other blocks.

Of the 4 paddocks, the 3 eastern paddocks have previously been cropped with rape, while the remaining paddocks have remained as ryegrass pastures.

Operating the property as a finishing paddock involves carrying higher numbers of stock and

supplementary feeding them with hay and silage.

While the current stocking rate of 100 ewes with lambs at foot equates to 12 DSE/ha[6], this is likely to be an overestimation, given this stocking rate does not continue throughout the year, and the importation of additional supplementary feed has not been taken into account.

Accounting for 12 DSE/ha[7] grazing pressure for a pasture growing season of 7 months, in addition to 30 tDM[8] of conserved fodder, this equates to a total pasture consumption of ~3.6 tDM/ha.

Based on the most recent data from the 2022/23 Livestock Farm Monitor Project, the average total pasture consumption for South West Victoria for grazing sheep production, was 4.4 tDM/ha, with an average stocking rate over the last 20 years of 15.6 DSE/ha. The above estimates for pasture productivity and stocking rates are well below this regional average. The inherent sandy soil type, soil depth, and climatic constraints validate this observation.

5 Land Capability and Agricultural Production Potential Assessment

5.1 Agricultural Land Capability Classification

Land Capability Rating systems for a series of land uses, including agricultural land uses were developed by Rowe, Howe and Alley. This Land Capability Rating system adopts the highest assessed value across a range of relevant risk factors to determine the overall land capability rating for a particular site and land use.

The Area to be Developed consists of a single land type with relatively little variability in soils throughout the property. For the purpose of the land capability assessment the land can be considered to be of one type. Land capability assessment is instructive in identifying whether there are severe constraints and serious risk factors impacting on a particular land use.

The Land Capability Rating for grazing use in moderate[9] rainfall areas is provided in Table 3 below. The Land Capability Rating for grazing provided below is considered indicative of the agricultural use. For each land feature to be assessed, the appropriate attribute is highlighted in the table.

Table 3. Land Capability for Grazing in moderate rainfall areas.

	Land Capability Class[10]				
Land Feature	**1**	**2**	**3**	**4**	**5**
Slope	Less than 10%	10% to 19%	20% to 34%	35% to 50%	More than 50%
Aspect	E. SE	S, SW, NE	N, NW, W		
Soil Group (northcote)	Gradational soils, Um soils	Duplex soils with A horizon of 15 to 60 cm thickness	Other duplex soils; Ur & Ug soils, Uc soils with impeding layer within 100 cm	Uc soils with no impeding layer within 100 cm	
Average soil depth	More than 1.0 m	0.6 m to 1.0 m	0.3 m to 0.59 m	0.1m to 0.29 m	Less than 0.1 m
Surface rock	Less than 2%	2% to 14%	15% to 24%	25% to 40%	More than 40%

[6] DSE or dry sheep equivalent is a measure of carrying capacity and is defined as the amount of fodder required to maintain the liveweight of a 45 kg wether.

[7] 1 DSE = 7.6 MJ, 1 kgDM = 10 MJ. 12 DSE/ha = 91.2 MJ = 9.12 kg DM/ha

[8] 50 Hay & 50 Silage Bales @ 0.3 tDM each = 1.7 tDM/ha.

[9] Note Moderate rainfall is the lowest land capability range developed.

[10]Rowe, Howe & Alley. (1981). *Guidelines for Land Capability Assessment in Victoria*, Soil Conservation Authority.

Site drainage	Well drained	Moderately or excessively well drained	Imperfectly or poorly drained	Very poorly drained	
Nominal DSE/ha rating	More than 15	5 to 15	2 to 5	Less than 2	

A Land Capability Rating of 1 or 2 means that the land is suitable for these uses and the hazards associated with such use are low to very low. It means that this is a sustainable form of land for grazing from an environmental risk perspective. A Land Capability Rating of 3 indicates that there is a minor hazard and risk of land degradation hazard associated with this use, which can usually be corrected with appropriate prudent management. A Land Capability Rating of 4 indicates that significant land degradation risks are associated with the particular land use, while a rating of 5 indicates that risks are severe and that the land may not be suitable for such use without very significant and potentially expensive intervention.

The overall land capability is determined by the highest assessed numerical value, which gives an overall rating of 3. A rating of 3 means that the land is suitable for this use, and risk factors are relatively low, with the property aspect, soil group and site drainage being the greatest limitation in relation to grazing.

5.2 Land Quality & Strategically Important Agricultural Land

Agricultural land may be considered to be high value and strategically important due to a combination of features such as high quality or niche soils, good rainfall, access to irrigation, resilience to climate change, existing infrastructure investment and/or its special role within a specific industry.

The Area to be developed sandy surface soils could be considered high value for horticultural cropping if a reliable good quality source of irrigation water is available. The desktop assessment (Appendix IV) concludes that the groundwater is an unproven entity which involves considerable risk in development and a resource which is of medium salinity and would limit the crops which could be grown. Ultimately the property is considered suitable for its current purpose of grazing, in addition to broadacre cropping, but is not overly suitable for intensive irrigation development or suitable for further significant investment in agricultural infrastructure.

5. Agricultural Impacts of the Proposal

5.1 Impact of BESS on Neighbouring Farms.

The properties to the north, east and west adjoining the property support low to moderate intensive grazing of beef cattle.

There is no perceived detrimental impact on the continued agricultural use of these properties for grazing operations as a consequence of the development of the property for a BESS.

The property to the south is the Mount Clay State Forest as well as the Heywood Terminal Station.

5.2 The Agricultural Amenity of the Region

The Australian Bureau of Statistics (ABS) collects and publishes data for agriculture and agricultural production at Statistical Area Level 4 (SA4). SA4 are geographical areas with defined boundaries and broadly similar production systems. The SA4 regions are the largest sub-State regions in the Main Structure of the Australian Statistical Geography Standard and have been designed for the

output of a variety of regional data. They are generally representative of regional labour markets, but also tend to represent agricultural groupings as well. Heywood sits within the SA4 Warrnambool and South West region which includes the shires of Glenelg, Southern Grampians, Warrnambool, Colac and Corangamite and forms a geographical bundle of land in the western part of Victoria.

The 2021 ABS data for the Warrnambool and South West region lists the following:

Number of dairy cattle	556,442
Number of beef cattle	625,164
Number of sheep	4,819,629
Broadacre crops	159,538

Carrying capacity of the property has been estimated at 12 DSE/ha. The 7.7 ha of the area to be developed would thus carry around 42 ewes (2.2 dse per ewe) which is around 0.0009% of the sheep numbers reported for the Warrnambool and South West region. Thus, the potential grazing from the area to be developed is not a significant contributor to the agricultural production of the region.

Although the development of the site will decrease the agricultural productivity of the area, it is not significant in relative terms to the region.

6. Conclusions and Summary

- The area to be developed comprises approximately 7.7 hectares of an 18 ha property of agricultural land in the Glenelg Shire. The land is currently utilised for grazing ewes and lambs.
- The climate of the area has a moderate annual average rainfall of 710 mm, mild winters with a significant frost incidence from June, July and August, a pasture growing season of about 7 months.
- The landform is a relatively flat plain to undulating hill system within Heywood.
- The soils are relatively consistent across the area to be developed, with sandy deep surface soils, overlying clay subsoils. These soils are suited to grazing operations and broadacre cropping, with sandy surface soils, and an intermittent bleached A2 horizon, indicative of imperfect drainage and periodic waterlogging.
- While groundwater for irrigation may be available on the property, there is a potential salinity hazard, with desktop review showing relatively poor-quality saline groundwater in the area. Proving the existence and then developing a groundwater resource of irrigation is an expensive process and not without risk. This review of the groundwater potential for the property should not be relied upon as being definitive and a hydrogeologist should be engaged if a further and more definitive investigation is deemed necessary.
- The main economic drivers of agricultural production within the Heywood District have been extensive sheep and cattle grazing.
- The land proposed for development is currently used for finishing ewes and lambs and is currently operating at a current carrying capacity of ~12 DSE/ha. At the time of site visit the ryegrass clover mix pasture was dormant, with incident blown grass and scotch thistles.

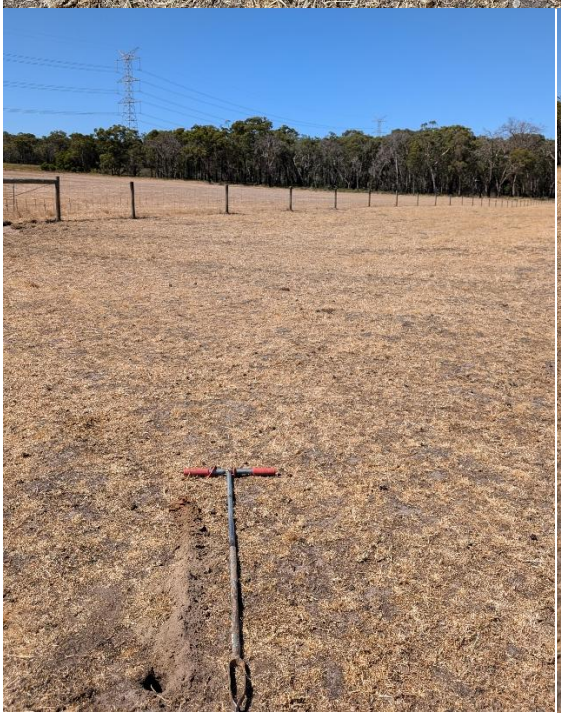
- The property cannot be considered high quality agricultural land in its current state, due to a lack of versatility as a result of sandy soils without any indications that quality irrigation water is available onsite, and potential limitations on crops grown due to area being mapped as a salinity province.
- The development of a BESS on the property will alter the agricultural use of this land within the 7.7 ha of the area to be developed no longer used for animal grazing or broadacre cropping.
- The regional losses of the ~7.7 ha area to be developed in relation to agricultural sheep production are not significant, with the current carrying capacity equating to 42 ewes or 0.0009% of the sheep herd numbers for the region. Agricultural production loss will nevertheless be minimised, as it is recommended that the balance of land should be retained for agriculture, whether for grazing, broadacre cropping, and or fodder production.
- There are no perceived detrimental impacts of the development of the BESS facility to the surrounding farm businesses, which are predominantly beef grazing properties.

Appendix I – Soil Profile Descriptions

Site 1: South of existing dwelling and shedding on mostly flat plain

Depth (cm)	Horizon	Description
0 – 10	A1	Very Dark Grey 7.5 YR 3/1, poor structure **Sandy loam** *Gradual transition to:*
10 – 40 cm	A2	Brown 7.5 YR 4/2, poor structure **Sandy loam** *Abrupt transition to:*
40 – 55 cm	B1	Strong Brown 7.5 YR 4/6 Strong reddish brown, reddish yellow and brown mottles **Medium Clay** *Auger refusal hole terminated at 55cm*

In dormant pasture mix of ryegrass with occasional blown grass.



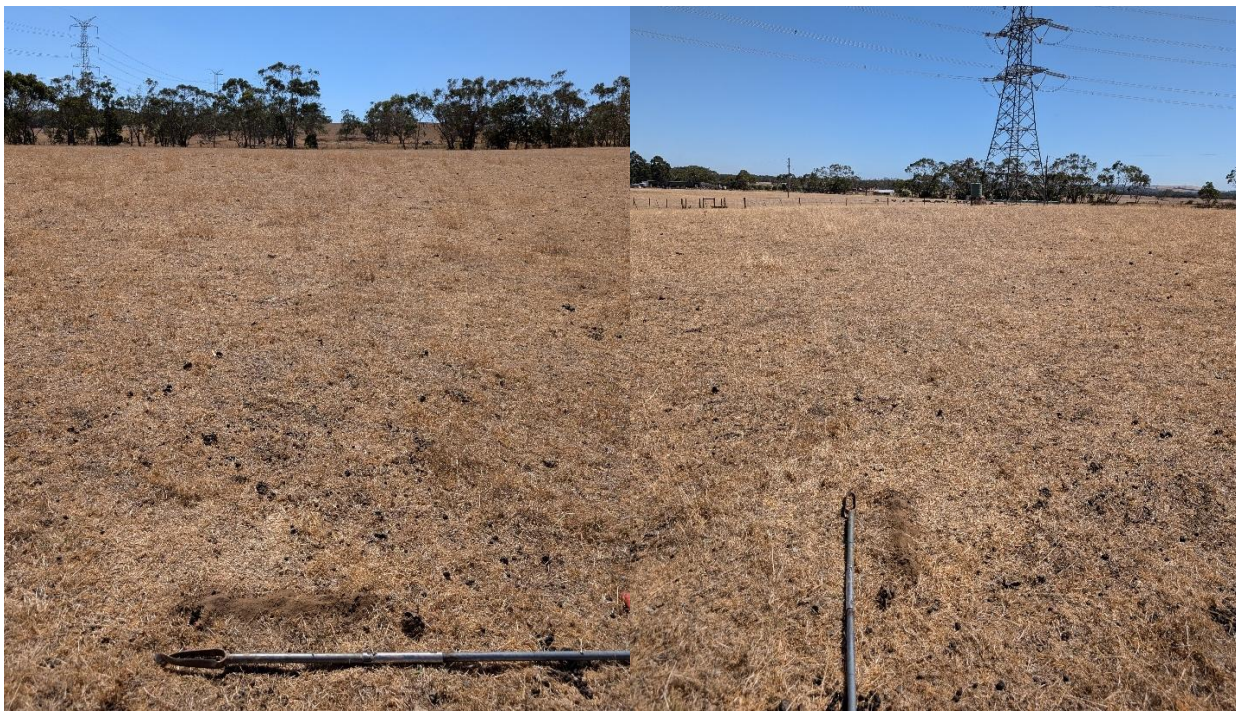
Site. 2: Mid-slope on Northern Sandy Hill – in similair pasture to Site 1, with more open pastures

Depth (cm)	Horizon	Description
0 – 10	A1	Black 7.5 YR 2.5/1, poor structure **Coarse Sand** *Gradual transition to:*
10 – 60 cm	A2	Grey 7.5 YR 6/1, poor structure Bleached Layer **Sandy loam** *Abrupt transition to:*
60 – 75 cm	B1	Brown 7.5 YR 4/4 Strong reddish brown, reddish yellow and brown mottles **Sandy Clay** *Auger refusal hole terminated at 55cm*
75 – 80 cm	B2	Increasing quantities of unconsolidated partially weather Parent Material.

Site 3: Eastern most paddock western facing slope

Depth (cm)	Horizon	Description
0 – 10	A1	Dark Brown 7.5 YR 3/2, poor structure **Sand** *Gradual transition to:*
10 – 40 cm	A2	Dark Brown 7.5 YR 3/3, poor structure Yellowish red mottles **Sandy loam** *Abrupt transition to:*
23 – 30 cm	B1	Strong Brown 7.5 YR 4/6 Strong reddish brown, reddish yellow and brown mottles **Medium Clay** *Auger refusal hole terminated at 30 cm*

In dormant pasture mix of ryegrass with occasional blown grass.



Site 4: northern most central paddock

Soils same as Site 3, auger terminated due to auger refusal

Appendix II – Water Balance

Table 6 Water balance for the property based on SILO Long Paddock records

Mean Rainfall													
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
SILO	33	27	35	53	67	89	97	97	77	63	50	52	740

Evaporation data	January	February	March	April	May	June	July	August	September	October	November	December	
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	
Mean Evaporation (Heywood)	201	169	141	84	51	37	42	58	80	115	142	180	**1299**

Water Balance for Pasture	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
Ave Rainfall	33	27	35	53	67	89	97	97	77	63	50	52	740
Evaporation	201	169	141	84	51	37	42	58	80	115	142	180	1299
Crop factor	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	
Evapotransporation	161	135	113	59	36	26	29	41	56	92	114	144	
Water deficit/excess	-128	-108	-78	-6	32	63	68	57	21	-29	-64	-92	
Growing season with 30 mm soil water	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Partly	No	

Appendix III – Climate Data

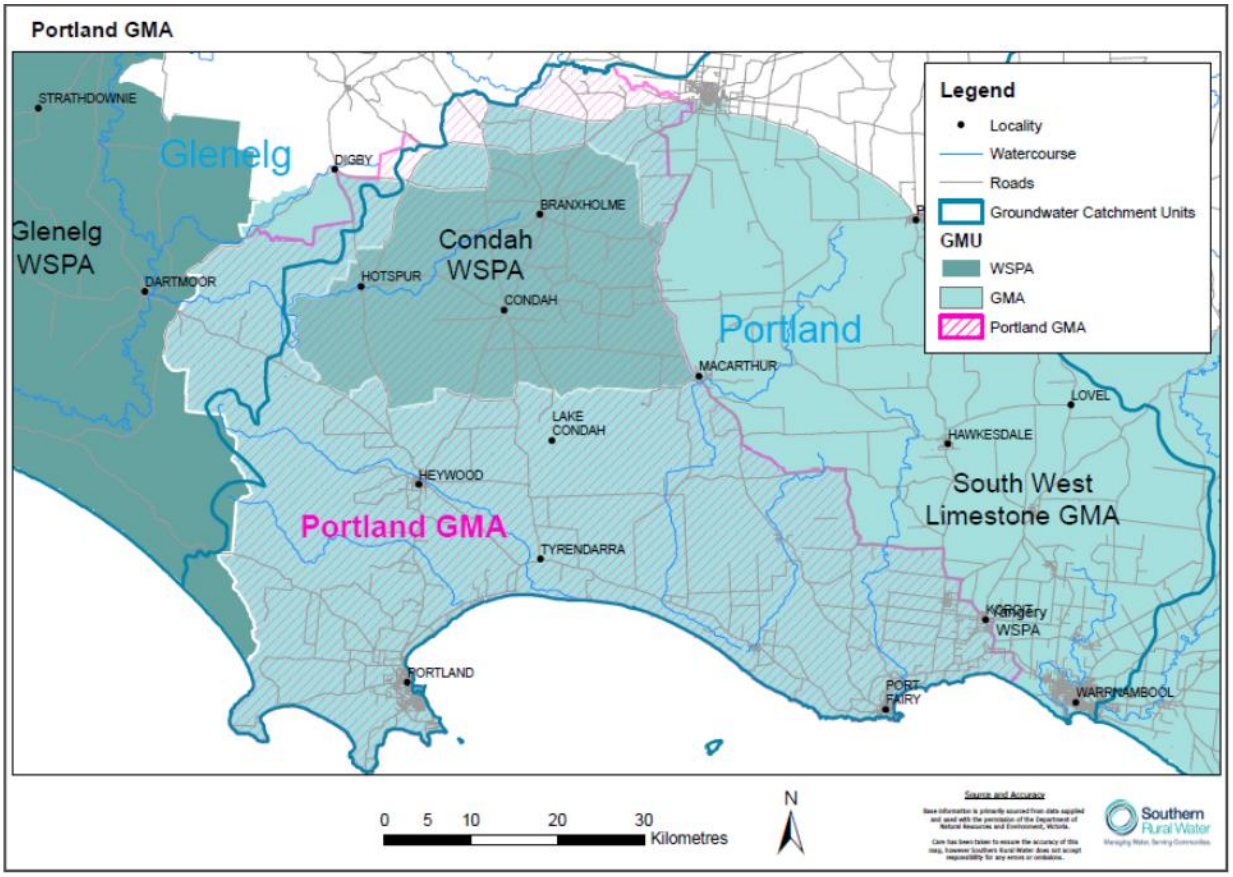
Table 7 Mean Temperature data from BOM station at Heywood Forestry (Station No. 090048)

Heywood Forestry (No. 090048)													
Statistics	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Maximum temperature													
Mean maximum temperature (°C)	24.3	24.7	23	20.2	17	14.4	14	14.8	16.6	18.8	20.4	22.4	19.2
Highest temperature (°C)	43.2	43.4	41	35	28.6	21.1	21.4	25.8	28.9	32.8	37.8	42.5	43.4
Date	29-Jan	16-Feb	17-Mar	4-Apr	4-May	8-Jun	30-Jul	20-Aug	29-Sep	27-Oct	1-Nov	31-Dec	16-Feb
	2009	1983	2008	1992	1990	1998	1975	1995	1980	1977	1987	2007	1983
Lowest maximum temperature (°C)	14.8	14.4	14.7	12.4	9.3	6.6	8.4	8.9	9.6	9.6	12.3	13.2	6.6
Date	8-Jan	2-Feb	31-Mar	26-Apr	24-May	21-Jun	2-Jul	10-Aug	11-Sep	1-Oct	16-Nov	27-Dec	21-Jun
	1992	1990	1975	1982	1968	1976	1968	1972	1969	1968	1983	1993	1976
Decile 1 maximum temperature (°C)	18.7	18.9	17.6	15.7	13.9	12	11.6	12.2	12.8	14.4	15.4	17	
Decile 9 maximum temperature(°C)	33.5	34.8	31.1	26.8	21.5	16.8	16.2	18.4	21.2	25.7	28.7	31	
Mean number of days ≥ 30 °C	5.1	5.4	3.9	0.9	0.0	0.0	0.0	0.0	0.0	0.4	1.8	3.4	20.9
Mean number of days ≥ 35 °C	2.2	2.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.1	7.2
Mean number of days ≥ 40 °C	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.9
Minimum temperature													
Mean minimum temperature (°C)	11.2	11.9	10.6	8.4	6.6	5.1	4.8	5.3	6.4	7.4	8.6	10.1	8
Lowest temperature (°C)	0.6	1.3	-0.7	-3.6	-2.3	-5	-4.5	-4.6	-1.8	-2.8	-1	1	-5
Date	2-Jan	10-Feb	17-Mar	4-Apr	14-May	16-Jun	25-Jul	5-Aug	7-Sep	4-Oct	6-Nov	1-Dec	16-Jun
	1965	1980	1996	1979	1972	1969	1994	1997	1995	1967	1977	1994	1969
Highest minimum temperature (°C)	27	23.3	24.8	19.7	15.6	14.7	12.3	13.1	14.2	18.9	20	24	27
Date	5-Jan	19-Feb	22-Mar	4-Apr	5-May	8-Jun	5-Jul	6-Aug	29-Sep	15-Oct	2-Nov	27-Dec	5-Jan
	2007	2001	1982	1967	1990	1995	1994	1973	1973	1991	1998	1975	2007
Decile 1 minimum temperature (°C)	6.4	6.8	5.6	3.2	1.8	-0.3	0.3	1.4	2.2	2.4	3.9	5.6	
Decile 9 minimum temperature (°C)	15.7	16.2	14.9	12.9	11	9.3	8.5	8.9	10.4	12	12.9	14.4	
Mean number of days ≤ 2 °C	0.1	0.1	0.2	1.2	2.6	5.6	4.9	3.3	2.3	2.1	0.7	0.2	23.3
Mean number of days ≤ 0 °C	0	0	0	0.3	0.8	2.7	2.3	1.2	0.6	0.2	0.1	0	8.2

Appendix IV –An Analysis of Groundwater Irrigation Potential

The groundwater resources of the Glenelg-Hopkins region have been monitored and subject of technical studies. The available information has been compiled into a review by Southern Rural Water. This review and information from Visualising Victorias Groundwater have been relied upon for the assessment of potential groundwater at the area to be developed.

The area to be developed is a part of the Heywood Groundwater Management Unit (GMU), which is encompassed by the Portland Groundwater Management Area (GMA)[11]. The Portland GMA predominantly uses groundwater for urban water supply, in addition to irrigation for dairy, and stock and domestic use.



The development of groundwater for irrigation is regulated by Southern Rural Water (SRW) in this part of Victoria and the Portland GMA is capped at 7,795 ML/year. As of 2023 there are 7 groundwater licences (other than domestic and stock use) that total 7,779 ML[12]. In order to prove the existence and extent of the groundwater resource at the property, the developer first needs to acquire a groundwater irrigation licence. This could be by leasing an existing unused licence, but more commonly the developer would purchase an existing licence or enter into an agreement to purchase the licence subject to approval by SRW.

With the licence secured, the applicant for the transfer would need to undertake test pumping to prove the extent of the groundwater resource. This commonly requires the drilling of one or several exploratory bores in the vicinity of where the irrigation bore is to be located. Testing

[11] https://www.srw.com.au/water-and-storage/groundwater-and-bores/groundwater

[12] Portland Groundwater Management Area, Local Management Plan Version 1, April 2023, Southern Rural Water.

the aquifer is the task of a qualified hydrogeologist and a positive outcome from the tests is never guaranteed. Assuming the test results are satisfactory, the applicant would then need to proceed to apply to transfer the licence to the new site.

Movement of groundwater licenses is subject to approval by SRW, and movement of a groundwater licence may not receive approval. SRW at its discretion will notify other licence holders within the vicinity to where the licence is to be transferred and give nearby users the right to question and/or object to such movement. SRW has the final right to allow or disallow the movement of licence from one area to another within a GMU. Approval is sometimes granted with conditions which restrict pumping times and daily drawdown. Sometimes these restrictions mean that balancing storage is also required.

The process of licence transfer to an unproven resource is expensive and not without risk.

Using Visualising Victoria's Groundwater Data (Figure 10), the groundwater is shallow within the area to be developed at < 5m depth, with salinity ranging between 1000 – 3500 mg/L.[13]

Figure 10. Visualising Victoria's Groundwater – Mapping of Groundwater Depth, property shown as green point

To provide an indication of the groundwater quality and if irrigation is a viable option for the property Table 2 has been provided below to summarise the water quality in nearby monitored bores in relation to salinity levels. The spatial distribution of these bores is included in Figure 11 below.

[13] Visualising Victorias Groundwater - https://www.vvg.org.au/vvg_map.php?agreement=Agree+and+Continue#

Figure 11. Aerial Image of measured bores in surrounding properties – yellow outline indicates Property Outline

Table 2. Quality of Groundwater Measured in Bores surrounding the property[14]

Bore Number	Conductivity (mS/cm)	Total Dissolved Solids (TDS) (mg/L)	Chloride (mg/L)	Sodium (mg/l)
67086	820	*525*	88	97
67096	1580	1011	339	174
67132	1200	827	200	210
67081	1600	*1024*	356	181
84433	805	*515*	171	99
84425	818	*524*	129	65
Median	**1,010**	**676**	**186**	**137**
Salinity Risk Assessment Category[15]	**Medium**	**Medium**	**Medium**	**Low**

Italicised Values calculated – Approximately EC 1000 µS/cm = TDS 640 mg/L[16]

This groundwater is classified as medium salinity and as Class 3, which should only be used on soils that are permeable with adequate drainage, which for the most case represents the surface and subsoils on this property, with the exception of those areas with a bleached A2

[14] Accessed from Visualising Victorias Groundwater - https://www.vvg.org.au/vvg_map.php?agreement=Agree+and+Continue#
[15] EPA Doc 168.3, Figure 6-1 Recycled Water Salinity Risk Assessment, p. 54
[16] EPA Document 168.3, p. 53

horizon. Even with adequate drainage, special management for salinity control would be required, and the salt tolerance of plants irrigated must be considered.[17]

The potential to develop and use the groundwater resource on this property for irrigation involves considerable risk and uncertainty. The quality appears to be relatively acceptable with appropriate management decisions and crops, but the extent of the resource is not proven. Any potential yield of the aquifer is unproven. Whether or not a water licence can be identified and transferred to the property is unproven. Overall the potential for irrigation using the groundwater resource is an unproven entity with considerable risk.

Additionally, the area has been mapped as salinity province 44 – Heywood, which indicates an area that has been mapped as having or showing some symptoms of dryland soil salinity at some time (past or present).[18]

[17] EPA Doc. 168, Table 4. Salinity Classes of Irrigation Waters.

[18] Victorian Resources Online – Salinity Provence 44, Heywood, https://vro.agriculture.vic.gov.au/DPI/Vro/vrosite.nsf/pages/salinity-province-44-heywood#note1