4. Geology and Hydrology Assessment

Wimmera Plains Energy Facility

Geology and Hydrology Assessment Report

Prepared by:

Wimmera Plains Energy Facility Pty Ltd

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Circulation

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#1	Tiago Brandao, BayWa r.e. Wind Peter Lausberg, BayWa r.e. Wind Sam Mason, DELWP – Planning	Issue to Minister for Planning	As per Planning Application	Electronic

Contents

1. Executive Summary

The Wimmera Plains Energy Facility (WIM) will be located approximately 12 km north of Horsham in Wimmera region, Victoria. The project site stretches across Henty Highway, bordered by Kelly Road to the west, Jung Wheat Road to the east and Ladlows Road to the south. This report is prepared for the project proponent, which will form part of the Planning Application to be submitted to the Minister for Planning for a planning permit.

This Geology and Hydrology Assessment Report is a desktop study of the local and regional environment with respect to its geological and hydrological conditions. This study aims to explore existing ground and water conditions of the project site and its wider area in order to ensure minimum disruption to the site in its existing state. The report outlines mitigation strategies and design and construction recommendations to be implemented in order to achieve this.

There are existing waterways in the region, both natural and man-made. The natural surface waterways are located to the north and west of the project site. The Wimmera river flows north along the northern foothills of the Grampians and discharges in Lake Hindmarsh, Victoria's largest freshwater lake. Lake Hindmarsh is a relatively dry lake, receiving inflows on a 1 in 20-year basis from peak flows from the south. In 2011, after major flooding events in the region, Lake Hindmarsh was filled and excess flow filled Lake Albacutya, and other Ramsar significant wetlands to the north. Yarriambiack Creek is another surface water system that branches off from the Wimmera river to the south of the site and is intermittent. In times of high flow, the creek discharges to the Coorong lake to the north. There is an old irrigation district of open channels that exists throughout the region, which have been decommissioned, and water delivery pipelines were constructed to service the region's water needs. These pipelines are supplied with non-potable water from Lake Bellfield in the Grampians. Many of these pipelines are laid around 100 mm deep and are located along roadways. Where the pipelines cross roadways, the pipeline will be at increased risk due to construction traffic, and relevant measures must be taken to mitigate impact.

The Loxton-Parilla sands is the main aquifer of the Murray Darling Basin and is highly saline. The main water management risks of the region are: salinity management, as there is a risk that irrigation seepage can cause the water table to rise, drawing saline water to the surface; sediment runoff, if flow on the project site reaches volumes high enough to mobilize soils; and, water use efficiencies. On this project site the risk of this occurrence is negligible, as the water table is located approximately 30 m below ground level.

The Facility is not expected to have any material impact on the hydrology and geology surrounding the project site; however, there are existing concerns of sensitive waterways, and existing risks of salinity contamination of surface-water systems, low water availability and low rainfall and runoff events in the region.

2. Introduction

The Wimmera Plains Energy Facility will consist of 54 wind turbines located on privately-owned land near Henty Highway, approximately 20 km north east of Horsham, Victoria. These turbines will be connected to an overhead 220 kV line that runs north-south through the project site.

Construction of the energy facility will consist of three main stages, starting with construction of the access tracks, hardstands, foundations and underground cabling. Stage two sees the turbines delivered and installed using specialised cranes and highly skilled operators. The final stage involves commissioning and testing the facility and connecting it the electricity grid so that the export of energy can begin.

Site layout including locations of turbines, access tracks and hardstands, as well as the location of the decommissioned irrigation channels and existing pipeline infrastructure are shown on Figure 1 – Local Hydrology Overview.

The turbines and associated infrastructure are positioned to minimise impact to surrounding houses and vegetation and to avoid waterways and culturally significant sites.

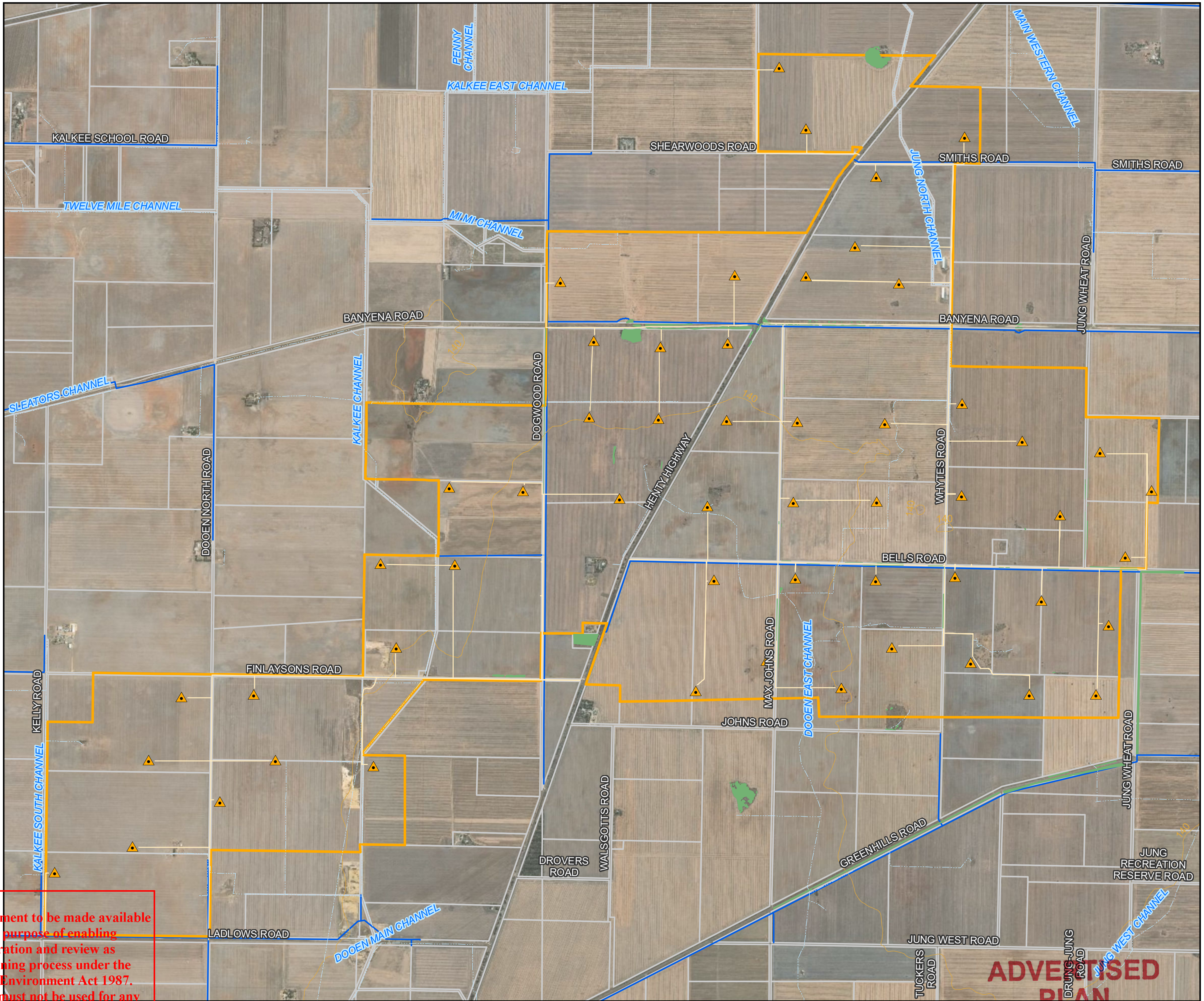
Figure 1 – Local Hydrology Overview

Wimmera Plains Energy Facility

Local Hydrology Overview

Legend

- Turbine Locations
- Elevation
- Decommissioned Water Channels
- GWM Water Pipeline
- Limit of Development Footprint
- Access Track
- Native Vegetation



N
W E
S

Scale at A3: 1:35,000

0 1 2 km

BayWa r.e.

Date: 05/05/2020

3. Methodology

This report is prepared to form part of the Planning Application for Wimmera Plains Energy Facility. As a desktop study, this report has consulted the following online sources that inform the existing conditions and potential impacts of the development to the local environment and amenity of the project site. The following sources were consulted in the creation of this report:

- Victorian Resources Online
- Australian Stratigraphic Units Database
- DELWP Naturekit
- Agriculture Victoria Government Website
- Bureau of Meteorology Website
- Waterwatch Victoria
- Wimmera Catchment Management Authority Government Website
- Murray Darling Basin Authority Website
- Visualising Victoria's Groundwater
- Various Academic Journals

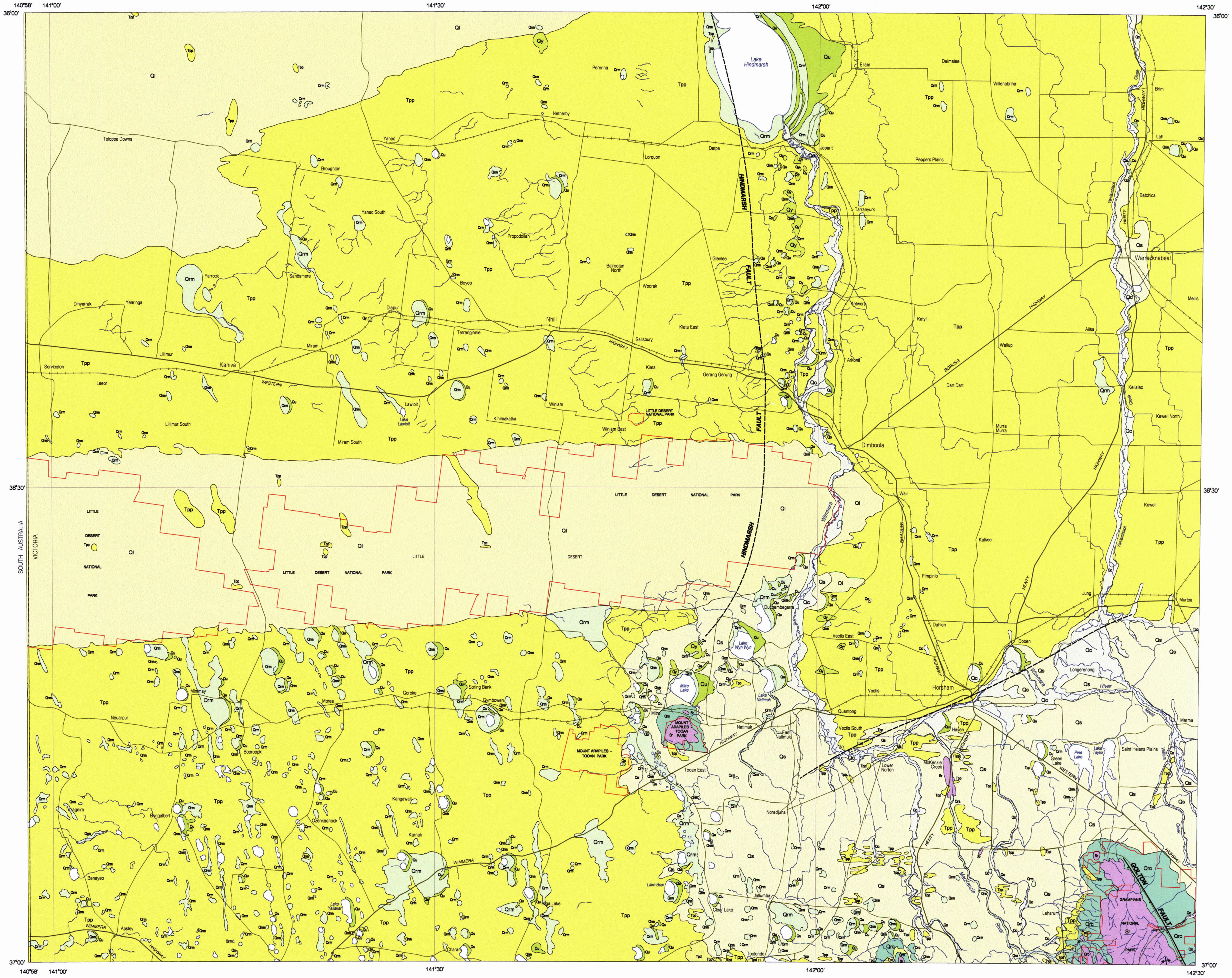
The study area is defined as the geographical area defined by the perimeter of the project site, as shown in Figure 1 – Local Hydrology Overview. The study is divided into surface water and groundwater, and the associated risks investigated accordingly on both a local and regional scale. The geological conditions are considered, in order to infer hydrological conditions and behavior in the subsurface. Surface geology is also investigated, and the interaction with surface water systems explored.

This report aims to highlight any material risks the development will have on the project site, local and surrounding ecology, geology and hydrology with reference to the local and regional hydrological systems, and to propose mitigation strategies such that the development will minimise impact on the surrounding environment. Any notable outcomes of this study should be further investigated.

4. Regional Geology

The Wimmera Plains Energy Facility is situated in the Wimmera Marine, Aeolian & Alluvial Zone in the middle of the Wimmera Catchment which is a part of Murray Darling Basin geological area. This area of the catchment is characterised by Tertiary sediments known as Parilla Sands. These sands were deposited during the tertiary period of vast marine transgression occupying much of the lower Murray Basin. There are two main faults in the region, the Hindmarsh fault, that runs north-south approximately 40 km west of the project site, and another, smaller fault, separating Dorodong Sands with Parilla Sands, running ENE-WSW to the south of Horsham (Figure 2 – Regional Geology Map Horsham). Both fault lines are located far from the project site, and the local geomorphology is flat. The bedrock consists of relatively consistent stratified layers, stretching to depths of 140 m, with a series of north-south trending strandline ridges laying on top of the cratonic bed rock of the East Australian Great Dividing Range (Cambrian to Ordovician). These ridges are now a major influence on Wimmera Catchment behavior with Wimmera River and Yarriambiack Creek both flowing north. The Parilla Sands became the supply of sediment for the Quaternary Aeolian (windblown landscape) formations, which now dominate the regional landscape.

Figure 2 – Regional Geology Map Horsham



QUATERNARY	MOSTLY HOLOCENE	Qra		Qra	*Fluvial: alluvium, gravel, sand, silt*
		Qrc		Qrc	*Fluvial: "gully" alluvium, colluvium: gravel, sand, silt*
		Qrm		Qrm	*Paludal: lagoon and swamp deposits: silt, clay*
		Qc	Coonambidgal Formation	Qc	*Fluvial, lacustrine: clay, sand, sandy clay*
	HOLOCENE TO PLEISTOCENE	Qy	Yamba Formation	Qy	*Aeolianites and evaporites: fine-grained gypsum*
		Qo		Qo	*Aeolian: source-bordering dune deposits: sand, silt, clay*
		Qu		Qu	*Aeolian: lunette deposits: sand, silt, clay*
	PLEISTOCENE	Qs	Shepparton Formation	Qs	*Fluvial: silt, sand, minor gravel*
		Ql	Lowan Formation	Ql	*Aeolian: dune sand, fine to medium grained*
TERTIARY	PLIOCENE TO MIOCENE	Tpd	Dorodong Sand	Tpd	*Marine: sand, sandstone, silt, cross-bedded laterite*
		Tpp	Parilla Sand	Tpp	*Marine: sand, silt*
SILURIAN		Sr (GRAMPIANS GROUP)		Sr	*Marine, fluvial: sandstone, minor conglomerate, siltstone*

WARNING! - DATUM

Incorrect description or usage of datums can cause errors. This affects the use of maps, map co-ordinates and spatial data.

What you should do:

- Always check carefully and specify explicitly the datums of all data, maps and map references that you use, supply and/or receive.
- If you are unsure or unaware about datums then immediately seek and use expert assistance.
- Note in particular that wrong use of GDA94 and AGD66 datums can in Victoria displace positions by about 200m to the NE or SW, or both.

Further information:
http://anzlic.org.au/geodesy/datums/datums.htm

DATUM NOTES

Horizontal datum: Australian Geodetic Datum (1966).

Vertical datum: Australian Height Datum (1971).

MAP SCALE 1:250 000

metres 5000 2500 0 5 10 15 20 25 kilometres

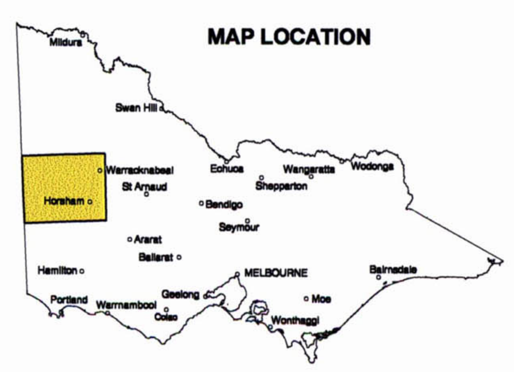
PROJECTION NOTES

Albers Conical Equal Area Projection.
Australian National Spheroid.
Standard parallels 36°S, 38°S.

INDEX TO ADJOINING MAPS

OUYEN SI 54-15	SWAN HILL SI 54-16
HORSHAM SJ 54-3	ST ARNAUD SJ 54-4
HAMILTON SJ 54-7	BALLARAT SJ 54-8

MAP LOCATION



SYMBOL LEGEND

GEOLOGY

Geological boundary
Fault, position accurate/approximate/inferred
Thrust fault, triangle on upthrown side
Strike-slip fault, showing relative displacement
Normal fault, tick on downthrown side
Monocline crest, arrows point to downthrown side, position accurate/approximate
Anticline, position accurate/approximate
Syncline, position accurate/approximate

Not all structure shown in the above legend necessarily appears on this sheet

TOPOGRAPHY

Main road
Other road
Track
Railway track; operating, dismantled
Trig station, peak — STAUGHTON HILL, DIAMOND HILL
Watercourse
Channel, drain
Park boundary. Area may not be available for mining

Natural Resources and Environment
AGRICULTURE
RESOURCES
CONSERVATION
LAND MANAGEMENT

RESPONSIBILITIES AND ACKNOWLEDGEMENTS

Geological compilation: A. H. M. VandenBerg.
Geology updated from published and unpublished mapping (1997).
First edition 1974 geology by C. R. Lawrence.

Manager Geological Mapping: P. J. O'Shea.
Manager Geological Survey: T. W. Dickson.

Cartography-
Project cartographer: R. L. Jolly, J. J. Dunleavy
GIS processing: G. A. Callaway, K. Dodd
Publishing process: G. A. Callaway, K. Dodd
Manager Draughting: J. P. Kinder.

In this hardcopy edition, the geology has been updated with respect to the AUSLIG hydrographic base used.

The base is Crown copyright. The road base is reproduced with permission of Geographic Data Co-ordination, Victoria Department of Natural Resources and Environment, Victoria.
The hydrographic data is reproduced with permission of the General Manager, Australian Land Information Group, Department of Administrative Services.

It should be noted that large hydrographic features shown, such as lakes and coastline, may not be part of the AUSLIG data set.

Published by the Department of Natural Resources and Environment.
P.O. Box 2145, MDC Fitzroy, Vic, 3065.

GEOLOGICAL SURVEY OF VICTORIA

1:250 000 Geological Map Series

HORSHAM

SJ 54-3

Edition 2
May 1997

ADVERTISED PLAN

5. Local Topography & Geology

The project site is in an area of a very subtle relief with height levels ranging from RL135 m to RL147 m, with a maximum slope expected to be below 2%. No strandline ridges mentioned above are contained within the subject site. Therefore, the site can be considered flat and posing no significant threat from a geotechnical terrain-related perspective. No large-scale cuts or fills for either the access tracks or the development footprint of the facility will be required.

According to Victoria State Government Earth Resources the uppermost layer of the alluvial sediments within the WIM site is defined as Shepparton Formation, formed during the Pliocene. Australian Stratigraphic Units Database describes this unit as follows:

"*Unconsolidated to poorly consolidated mottled variegated clay, silty clay with lenses of polymictic, coarse to fine sand and gravel; partly modified by pedogenesis, includes intercalated red-brown paleosols. Forms extensive flat alluvial floodplains.*"

Given the geomorphological conditions of the area and confirmed by Agriculture Victoria, local soils are typically either cracking clay soils (Vertosols) and/or sodic red texture contrast soils (Sodosols). The former is characterised by self-mulching surfaces and high (> 35%) clay content. The latter type shows hardsetting surfaces that are prone to compaction.

6. Regional Hydrology

The Wimmera Plains Energy Facility will be situated north of Horsham within lowland part of the Wimmera River Catchment area, which makes up 3% of the Murray-Darling Basin area and 1.7% of its inflow. The region uses only 1% of surface water diverted for irrigation and urban use in the Basin and less than 0.1% of the groundwater. The groundwater table lies at depths between 20-50 m around the project site, as referenced by Visualising Victoria's Groundwater. Shallower, transient accumulation of wet soils is possible in wet months. It is unlikely that construction activities will result in the need for dewatering or other groundwater impact mitigation measures.

The project site is located over an underlying aquifer consisting of limestone, marly limestone, and silty marl, where bore water measurements have estimated a salinity level of greater than 14000 mg/L Total Dissolved Solids. This is the highest salinity of the region (Figure 3 – Map of Regional Groundwater Hydrology).

According to the Wimmera CMA Strategy Report there are over 3000 wetlands in the region, and most of these occur in the Millicent Coast Basin, to the West of Mount Arapiles, approximately 50 km south west of the project site. The project site is located away from any regional lakes or water sensitive vegetation, as well as natural river systems.

The main regional river Wimmera is approximately 23 km west of the project site and is listed in the Heritage Rivers Act 1992. The river originates in the Pyrenees Ranges, flowing across the northern foothills of the Grampians. The river terminates at Lake Hindmarsh, Victoria's largest freshwater lake, about 150 km north of Horsham. In times of peak flow, about 1 in 20 years, its waters reach Lake Albacutya making it the largest land-locked river in Victoria. The latter lake is an internationally important wetland listed under Ramsar Convention and a home to several significant water-bird species.

The other important watercourse of the area is Yarriambiack Creek, about 7.5 km to the east of the site, which is a distributary stream of the Wimmera River and only flows when there is a high rainfall being fed via bifurcation of the Wimmera River. Yarriambiack Creek flows northwards past the project site and discharges into Lake Coorong, thus being land-locked as well. Throughout history neither of the river systems or flow from the ephemeral terminal lakes have ever been recorded to overflow and reach Murray River further north.

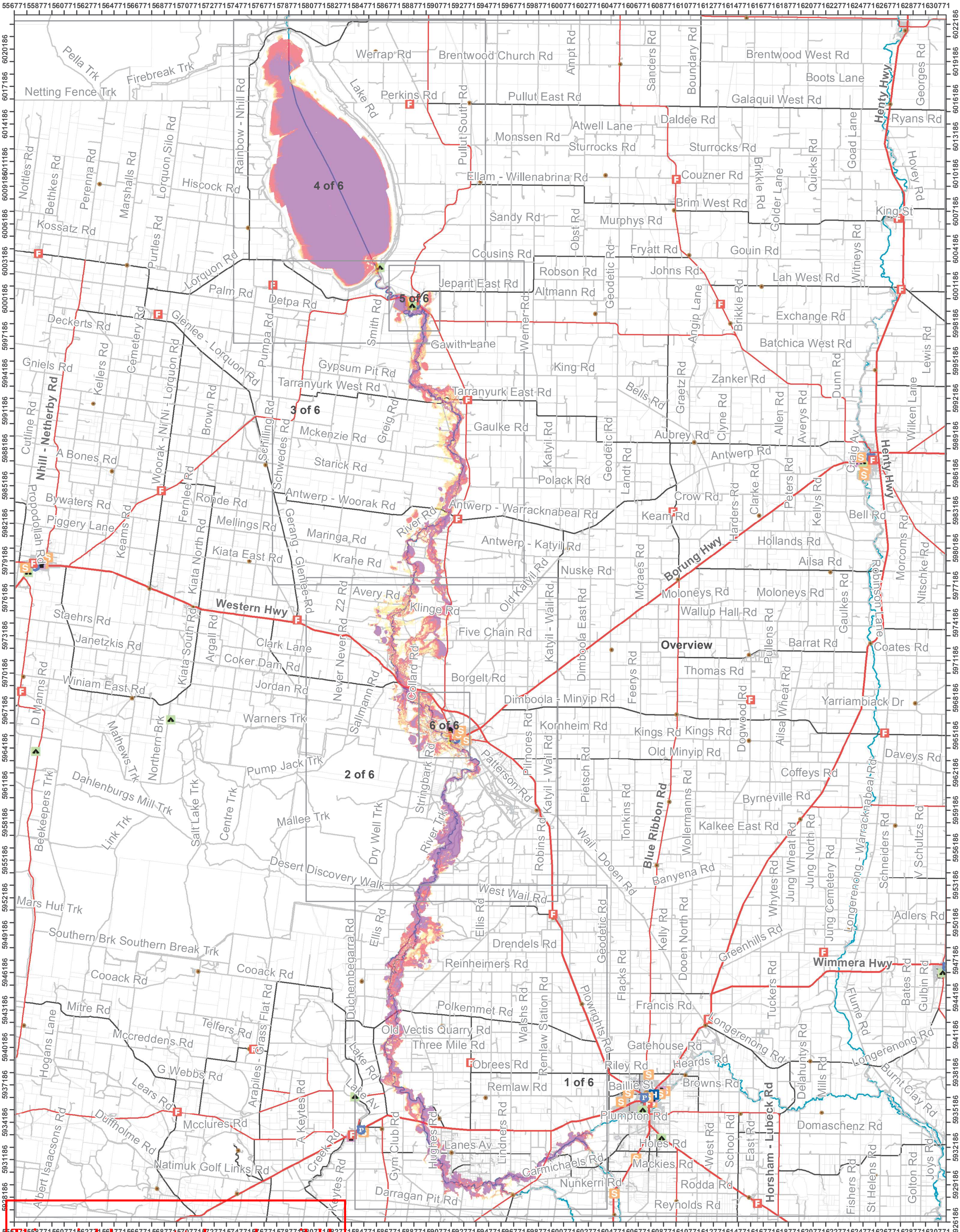
Figure 3 – Map of Regional Groundwater Hydrology


Groundwater Resources Victoria
DEPARTMENT OF MINERALS AND ENERGY
Bore Yield
(litres per second)
Groundwater Salinity
(milligrams per litre)
Suitability
> 10 l/s
< 10 l/s
> 1000 mg/l*TDS
Potable, all stock, domestic, gardens and industry. High yields (>10 l/s) suitable for irrigation and town supply
> 10 l/s
< 10 l/s
1000-3000 mg/l TDS
All stock, salt tolerant plants. High yield (>10 l/s) suitable for irrigation
Undifferentiated, but generally > 10 l/s
3000-7000 mg/l TDS
Most stock except poultry
7000-14000 mg/l TDS
Beef cattle (up to 11000 mg/l TDS) and dry sheep
>14000 mg/l TDS
Generally unsuitable
*Total Dissolved Solids
Aquifer Lithology
Sand and gravel
Basalt, tuff, scoria
Limestone, marly limestone, silty marl
Fractured and weathered indurated sediments, metasediments and intrusives
Mineral Springs Area
Groundwater Basins of Victoria
GIPPSLAND BASIN
HIGHLANDS
MURRAY BASIN
OTWAY BASIN
PORT PHILLIP BASIN
WESTERN PORT BASIN
NEW SOUTH WALES
SOUTH AUSTRALIA
SOUTHERN OCEAN
BASS STRAIT
TASMAN SEA
TASMANIA
MELBOURNE
PORT PHILLIP BAY
WESTERN PORT
CAPE OTWAY
CAPE HOWE
Groundwater details compiled by G Y Nahm, from information provided by R Blake, W Humphrys, A C M Laing, R Lakey, J Leonard, M Malone, M Reid, M Riha, A Shugg, G Stewart, S Tickell and R Williamson
C R Lawrence, Supervising geologist.
J L Knight, Director of Geological Survey
Drawn for reproduction in the Department of Minerals and Energy, Melbourne, by S Wail, under the direction of W J Bennett, Chief Draughtsman, 1981
Base by courtesy of the Department of Crown Lands and Survey
Issued by B W Court, Secretary for Minerals and Energy, under the authority of the Honourable D G Crozier, MLC, Minister for Minerals and Energy
F D Atkinson, Government Printer, 1982
1:1,000,000
TRANSVERSE MERCATOR PROJECTION
DATUM: OLD MELBOURNE OBSERVATORY LAT 37°49'52".47 LONG 144°58'33".36

7. Local Hydrology

The site topography is flat with a general fall of 1 in 1,000 m towards the north, where the regional hydrology is dominated by flows in the Murray River. The topographical conditions of the site make it hydrologically featureless with no significant watercourses surrounding the site. The terrain of the proposed wind turbine layout varies between 135 m and 147 m above sea level whilst the Yarriambiack Creek corridor, the closest waterway to the site, lays generally about 10 metres lower. Therefore, it poses no threat of flooding during the lifetime of the facility. In September 2010 the Wimmera River experienced a 1 in 100-year flood, during which the creek remained within its boundaries, as modelled by Waterwatch Victoria, showing the water level not exceeding 130 m AHD in the area. Figure 4 – Map of Regional Flooding shows the shows the flooding extent of a flood event of a 1% AEP magnitude flood. It is evident that floodwaters are contained within the Wimmera river and its adjacent floodplains, and do not impact the project site.

Figure 4 – Map of Regional Flooding



LowerWimmera 2016

1% AEP

Sheet: Overview

0 1.5 3 6
Kilometers

Coordinate System: GDA 1994 MGA Zone 54
Projection: Transverse Mercator
False Easting: 500,000.0000
False Northing: 10,000,000.0000
Latitude Of Origin: 0.0000
Units: Meter

Jeparit
Dimboola
Horsham
Edenhope
Stawell

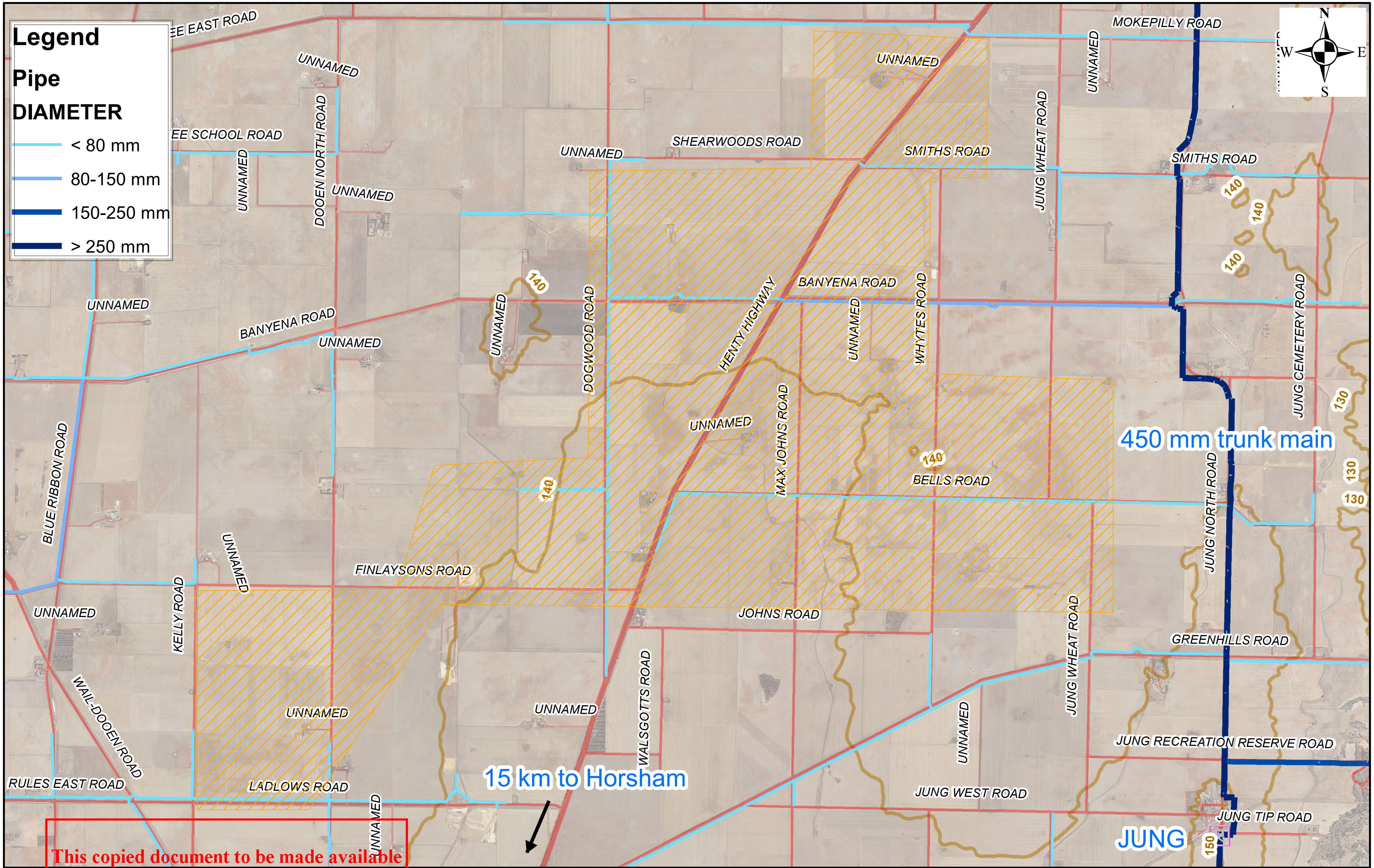
Legend

Depth (m)			FOI (points)		
0 - 0.25	MajorTowns	Highways	Aged care	Depot	Police station
>0.25 - 0.5	Minor Towns	Other Major Roads	Camp Ground	Emergency Hospital	School
>0.5 - 1	Parcels	Minor Road Class 3	Church	Fire station	SES unit
>1	Rivers & Streams	Minor Road Class 4		Neighbourhood safer place	
		Minor Road Class 5+			

Wimmera CMA

The main agriculture industry of the area is dryland broadacre cropping for which local watercourse infrastructure has been regulated since 1840s. Water was diverted for urban and rural use via network of channels and stored in a series of reservoirs. However, during 2006 to 2010 the channels were decommissioned due to inefficiencies and were replaced with a pressurised water distribution pipeline system operated by Grampians Wimmera Mallee Water (GWM Water), supplying high quality non potable water from Lake Bellfield in the Grampians. Some of the decommissioned channels exist on the project site, namely Dooen East Channel, Kalkee Channel and Jung North Channel. The water delivery pipeline system is also present on the project site with several minor Ø 50 mm - Ø 150 mm PVC pipes all running along local roads, shown in Figure 5 – Rural Pipeline Infrastructure – GWM Water.

Figure 5 – Rural Pipeline Infrastructure – GWM Water



Rural Pipeline Infrastructure Northeast of Jung - Dec 2019 ADW

0 0.5 1 2 3 4 5 Km

Disclaimer:
This data is the latest available data and is provided for information purposes only. GWMWater advises that this data is subject to change and that it does not guarantee that all data is correct although believed to be of reasonable accuracy at publication.
GWMWater accepts no liability for the content, or for the consequences of any actions taken on the basis of the information provided.

GWMWater

8. Rainfall

Average annual rainfall varies across the catchment from 1,000 mm in the south to 300 mm in the north. Climate statistics of the Australian Government Bureau of Meteorology for two closest weather stations to the site, Longerenong ca. 10 km to the south and Horsham Aerodrome ca. 11 km to the south-west, state an average annual rainfall of 415.7 mm and 368.3 mm respectively. The limited summer run-off means that many smaller streams in the upper catchment are subjected to intermittent flows. In dry periods many of the large streams throughout the catchment are reduced to a series of pools with only tenuous surface linkages.

9. Local Water Challenges

The project site is in a flat, dry landscape, with relatively little sensitive vegetation. A large consideration of the water requirements of the region and the wider Murray Darling Basin is the availability of environmental water and no adverse impact on regional water salinity. These requirements have been taken into consideration in the creation of this report. GWM Water and the Wimmera Catchment Management Authority have been consulted in the creation of this report.

8.1 Environmental Water

Within the Murray Darling Basin, environmental water is allocated by the Victorian Environmental Water Holder and released to feed areas of water sensitive vegetation. The project site lies within the Wimmera bioregion, and the existing Environmental Vegetation Classes (EVCs) on site are Plains Savannah, Plains Grassland, Plains Woodland, and Cane Grass Wetland. There are several other EVCs located along Yarriambiack creek to the east as shown on the map of the project site with EVCs (Figure 6 – Map of Wimmera Plains Project Site with EVCs). These patches of vegetation are sparse and small and are not water sensitive. The site construction works will not affect the water requirements of the vegetation that exists on site.

The project site is in the region of the Northern Wimmera plains wetland system, where there are 424 wetlands, with a significant proportion of the wetland systems around the project site (between Wimmera River and Yarriambiack River) shallow freshwater, with the higher conservation value than saline systems. As the land is heavily cropped, no significant land use changes would create significant impact on the wetlands, according to the Wimmera CMA Wetland Asset Strategy 2011.

The closer wetlands are transient and are the terminating location for the Wimmera River. Lake Hindmarsh and Lake Albacutya are listed by the Ramsar Convention as internationally significant wetlands, however these lakes only fill in 1 in 20-year peak floods, and are located approximately 60 and 90 km respectively, northwest of the project site. The project is therefore unlikely to have any impact on these regional wetlands.

There are several considerations that have been highlighted by the Wimmera CMA with regards to on farm practices to facilitate waterway management within the region, namely:

- Water quality and bank stability and the benefit of waterway fencing and revegetation
- Gully erosion and waterway condition
- Cropping and drainage affecting wetland conditions

These issues are echoed across the wider catchment, and are not necessarily relevant to the project site, as it is located away from waterways and wetlands. The construction of the facility does not involve significant land use change, so the relative impact of the development is noted to be low. Nevertheless, where the project is found to influence surrounding watercourses, the mitigation strategies will comply with the Wimmera CMA recommendations.

Figure 6 – Map of Wimmera Plains Project Site with EVCs

Wimmera Plains Energy Facility

Pre 1750 Environmental Vegetation Classes

Legend

Turbine Location

Parcel

EVC

66 - Low Rises Woodland

96 - Ridged Plains Mallee

97 - Semi-arid Woodland

103 - Riverine Chenopod Woodland

132 - Plains Grasslands

291 - Cane Grass Wetland

641 - Riparian Woodland

803 - Plains Woodland

823 - Lignum Swampy Woodland

826 - Plains Savannah

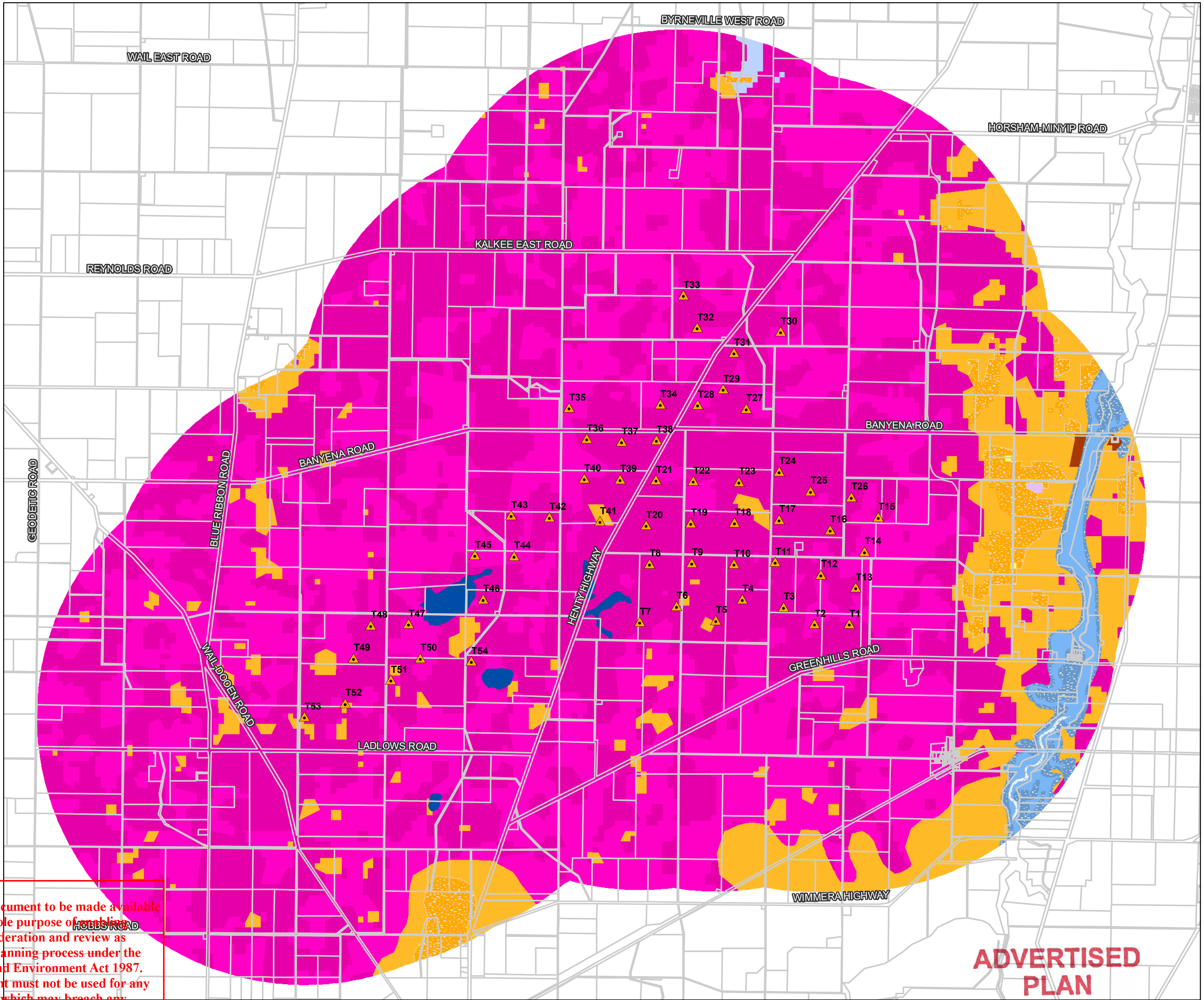
882 - Shallow Sands Woodland

981 - Parilla Mallee

N W E S

Scale at A3: 1:65,000

0 1.5 3 Km



BayWa r.e.

Date: 03/05/2020

8.2 Salinity Management and Soil pH

Salinity is another water challenge that exists within the basin and can have impacts on surrounding waterways and reserves. This is emphasised typically by raising of the groundwater table by overwatering, bringing highly saline water to the surface. Saline water can also be mixed with surface water through runoff and dissolved salts.

The project site land does have several reservoirs where water allocations are pumped and stored for irrigation. This reservoir is filled when water allocations are received, and the water is then used for irrigation throughout the season. As the project site is flat, evaporation rates are high and rainfall low, and there are no running water reserves, there is a low likelihood that construction watering will affect surface water salinity.

As surface water is the main consideration for development on site, surface soil pH must also be considered. There is a risk that water runoff and infiltration will mobilise this alkalinity and impact the surrounding vegetation and land. As the soil is only slightly alkaline, and the land exists within a region of low rainfall and dry soils, this risk has immaterial impact on the condition of the local environment.

According to Visualising Victoria's Groundwater and confirmed by Agriculture Victoria the water-table (Parilla sands aquifer) depth in the area lies between 20 to 50 meters, hence there is no connection between the surface water and groundwater within the local area, and the water use on the project site will not exacerbate salinity levels or alter pH on the Wimmera plains. Furthermore, Yarriambiack Creek flood plains closer to the site are not visibly salt affected either. There are also no water measurement bores located within the site and no actively monitored bores within 10 km of the site. The wider region is a region of high salinity groundwater, however as Lake Hindmarsh and the Wimmera river are fresh surface water systems, the waterways can exist within the landscape without contamination from underlying groundwater. This shows that there is no risk of development increasing risk of groundwater salinity contamination to the surrounding waterways.

8.3 Sediment runoff

Surface flow can result in sediment runoff if the flows are large enough. This can occur due to construction watering, large rainfall events, or spill from existing waterways. As the regional irrigation channel systems have been decommissioned and replaced with pipelines, and there are no flowing surface water ways on site, there will be no impact on sediment runoff from surface flows onto site. Large rainfall events are unlikely to trigger large surface flows as the intermittent rainfall is contained within the surface water river system and runoff is uncommon through this region. Construction watering will only be implemented if dust emissions or similar impacts must be mitigated. This is also unlikely to have large impact on sedimentation on site, as watering will only be undertaken in a controlled manner to the extent required, in dry conditions.

8.4 Construction Water Use

WIM estimate that the water required for construction purposes will be used for concrete production and dust suppression. The total volume of water required for the duration of the construction period is estimated below:

Concrete water supply requires 150 L per m^3 of concrete, so for 54,000 m^3, water requirements are 8100000 L or 8.1 ML.

Dust suppression volume is estimated as half of concrete supply, so 4,050,000 L or 4.05 ML.

This water will be pumped from a nearby pipeline on an as needed basis, in consultation with GWM Water.

10. Recommendations

WIM have been in consultation with GWM Water who have advised of the large trunk main that runs south along Jung North Road, and has a nominal diameter of 450 mm. The water requirements for construction of the facility may be serviced through this pipeline. WIM will follow the GWM Water recommendations and will maintain contact to organise construction water servicing throughout the duration of the project. The recommendations made to WIM by GWM Water are as follows:

The trunk main would provide 400-600 kL/day with possible options

1. *Install a temporary standpipe on the trunk main and cart water to site - higher water costs for short term supply*
   - *Possible location is at corner of Jung North Road and Banyena Road*
   - *This could be considered for project start up*
2. *Install a permanent new pipe from the trunk main to the site, as per GWM Water rural pipeline standards – standard rural water tariffs*
   - *Requires approval from property owners for any infrastructure in their land*
   - *Requires water storages sized for 3 peak days use*
3. *Install a water meter on the trunk main and install temporary private infrastructure to site – higher water costs for short term supply*
   - *Requires approval from property owners*
   - *Requires water storages sized for 3 peak days use*

Of the options recommended by GWM Water, it is likely the infrastructure implemented on site will be temporary and will be decided in consultation with the respective landowners.

Based on the highlighted risks and potential mitigation and management strategies identified in this desktop study, some recommendations are proposed to reduce the impact of the project on the surrounding hydrology and geology.

In terms of the preliminary layout of the turbines and their access tracks, the following points should be taken into consideration in the design of the project layout:

- Utilise the currently existing road network and tracks used by the landowners;
- Minimise the length of the tracks;
- Avoid areas of significant native vegetation;
- Vehicle manoeuvrability and safe sight distances;
- Land tenure constraints;
- Reduce the risk of water accumulation and channelling with the construction of swale drains for water diversion if construction works are deemed to have adverse impact on stormwater flow

11. Conclusions

The surface and groundwater hydrology and rainfall runoff regime of the Wimmera Plains Energy Facility discussed above are not expected to cause any significant risk for the construction. Given the geological and geomorphological conditions discussed in previous chapters as well as the shallow nature of the proposed works, it is highly unlikely that the foundation construction will encounter any acid sulphate soils (practically non-existent in the area) or reach the water-table level.

The nature of local topography being extremely flat with little ground sloping determines the project site to have no significant channelisation of local stormwater flows. In the event of a very heavy rainfall event it is expected that any surface water movement would take a form of a sheet flow with only minor localised ponding. As the land is dry crop, much of the stormwater will be absorbed by the crop. Therefore, widespread soil erosion is not considered to pose a significant risk for the energy facility development. Any overland flow from engineered surfaces such as turbine foundations, hard stands, staging and management area will be minimal, as these surfaces will not be elevated, but where necessary, edges of these surfaces will be tapered to direct the runoff to surrounding areas. These will provide an appropriately flat and vegetated or porous surface ensuring that the runoff will sufficiently disperse causing no erosion. The site access tracks will be constructed from locally sourced crushed rock and built to sustain all kinds of weather.

The project proponent specifies that the development will have no material impact on the local and regional environment surrounding the site, and no further investigation will be necessary.

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