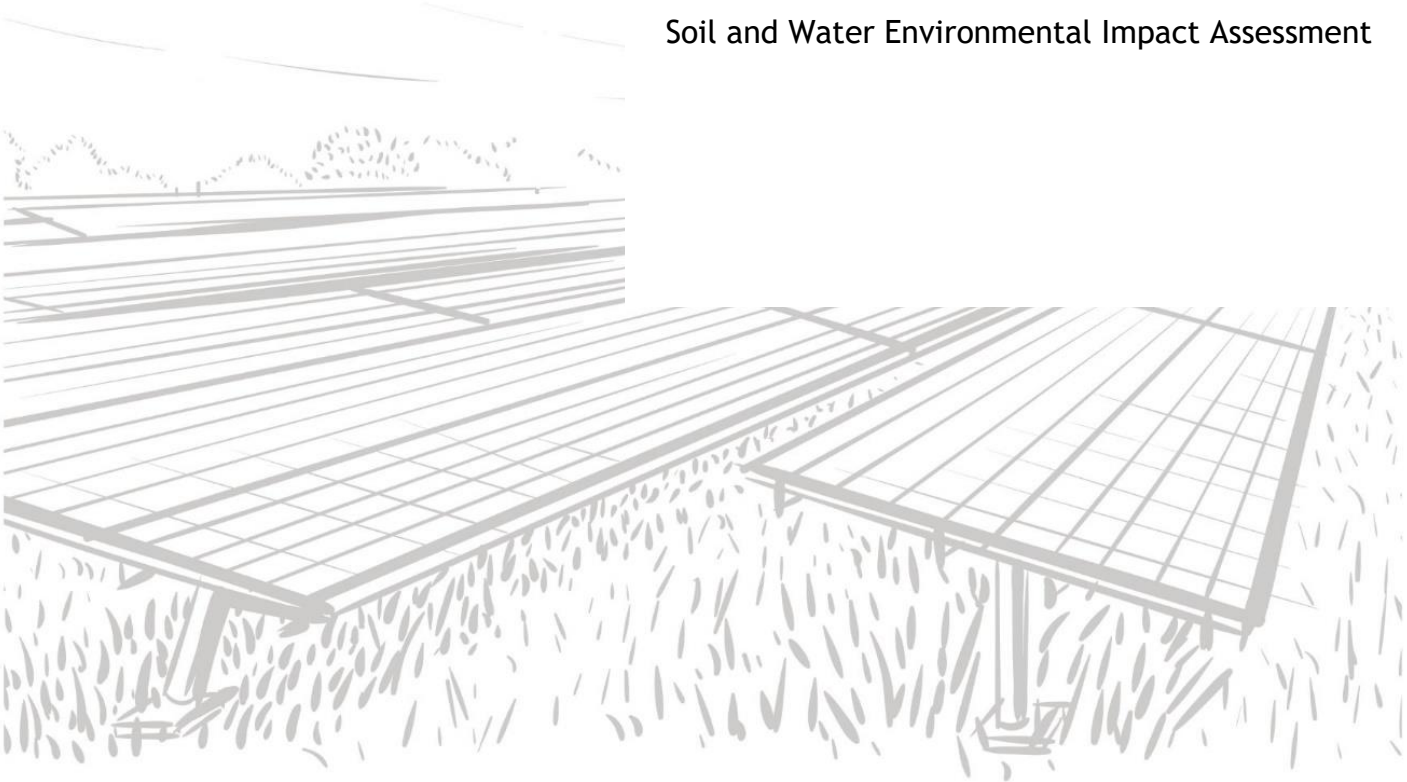
Appendix J

Soil and Water Environmental Impact Assessment



Tamworth Solar Farm

Soil and Water Environmental Impact Assessment

ORIENS ENERGY PTY LTD

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Template 2.8.1

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Abbreviations

Abbreviation	Description
PV	Photo Voltaic
NSW	New South Wales
AC	Alternating Current
AS	Australian Standard
ASS	Acid Sulfate Soils
CEMP	Construction Environmental Management Plan
DEMP	Decommissioning Management Plan
EIA	Environmental Impacts Assessment
EP&A Act	Environmental Planning & Assessment Act 1979
EP&A Regulation	Environmental Planning & Assessment Regulations 2000
FM Act	Fisheries Management Act 1994
GDE	Groundwater Dependant Ecosystems
LG Act	Local Government Act 1993
MWp	Mega Watt Peak
NSW DPI	NSW Department of Primary Industries
OEMP	Operational Environmental Management Plan
OSSMS	Onsite Sewerage Management System
PASS	Potential Acid Sulfate Soils
PEMP	Project Environmental Management Plan
POEO Act	Protection of the Environment Operations Act 1997
PV	Photovoltaic
SSD	State Significant Development
SEARS	Standard Environmental Assessment Requirements
WM Act	Water Management Act 2000

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1. Introduction

Introduction

This report has been prepared by Eco Logical Australia (ELA) to identify and assess the environmental issues, specifically relating to soil and water, associated with the proposed Tamworth Solar Farm. ELA has been engaged by PROJECT.e to provide response to DPIE Standard Environmental Assessment Requirements (SEARS) for the proposed development. This document will support a Development Application to the NSW Department of Planning Industry and Environment in accordance with the requirements of Part 4 of the NSW *Environmental Planning and Assessment Act 1979*.

Development approval is sought to establish electricity generating works (80MWp PV solar farm) and substation upon Lot 186 DP 755340, land also known as 2209 Soldiers Settlement Road, Somerton (via Tamworth). The proposed solar farm is State Significant Development (SSD) as it comprises electricity generating works with a contract value more than $30 million. The proponent has been issued SEARS requirements SSD-9264, dated 20 June 2019. The environmental impacts of the proposed development, specifically relating to soil and water, are addressed in the report following and the SEARS requirements are summarised in Annexure A.

The Proposal

The proposed solar farm will have approximately 195 000 solar panels to be installed over a total footprint of 170 ha. Energy generated at the solar farm will be delivered to the network by underground cables to the existing extra-high voltage transmission line that currently traverses the site and runs between Tamworth and Gunnedah. It is also proposed to construct a new substation at the site for converting electricity generated by the farm from high voltages (33kV) to extra high voltage (132kV). Studies are currently underway to design the grid connection and to identify the technical requirements for the operation of the farm and connection to the grid.

The proposed panels are similar in size and appearance to those used for domestic purposes and will operate as a single axis tracking system (SAT). The farm will consist of linear strings of mounted panels organized into blocks. Each block will connect to a Power Conversion Unit (PCU), containing a number of inverters, that will convert the direct current (DC) energy into grid compatible alternating current (AC) energy. The maximum height of each mounting rack and panel is up to 4.5m. Other ancillary works include telecommunications equipment, refurbishment of the existing house for operations building, security fencing and internal driveways.

The Land

The site (Lot 186 DP 755340) is currently used for agriculture, comprising a small-scale grazing and broad acre cropping operation. There is an existing dwelling upon the site that would be refurbished for use as an operations and maintenance office building. The proposal also includes a temporary construction compound within the lot boundaries for use during the construction phase of the development. Several transportable buildings will also be located within the proposed compound area during the construction phase for use as temporary staff amenities and offices. This temporary work area is to be

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decommissioned and transportable staff amenities removed as soon as construction of the solar farm is complete, and will be returned to agriculture, specifically grazing land for sheep.

Water and Soil Assessment

This report provides a description of the site's existing hydrological conditions and considers potential impacts associated with the Proposal on water quality and quantity, having regard to the receiving waters for both surface water and groundwater sources. In accordance with the requirements of the SEARS, all *potential impacts* associated with the Proposed Development are considered across the entire lifespan of the development, considering construction, operational and decommissioning phases.

Mitigation measures and management strategies are also provided in the report following to address any specific risks associated with soil and water, as well as to provide indicators/criteria for ongoing water quality monitoring throughout the life of the project.

2. Existing Environment

The subject site lies within the upper reaches of the Namoi River Catchment which is a major sub catchment for the Murray Darling Basin. This catchment occupies 42 000 km^2 and incorporates extensive areas of the North-West Slopes and Plains, bounded by the Great Dividing Range near Tamworth in the east, the Liverpool Ranges and Warrumbungle Ranges in the south, and the Nandewar Ranges and Mount Kaputar to the north. The closest major water course is the Peel River which is located approximately 4km north east of the Site and joins the Namoi River approximately 25 kms away. The Peel River catchment area (also known as Peel Valley) is considered an important contributor to flows in the wider Namoi Catchment.

The majority of the rivers in the Namoi catchment area are regulated, and water is supplied for irrigation, stock and domestic purposes as well as supplementary town water supplies for some regional centres. These water sources include Keepit Dam on the Namoi River, Split Rock Dam on the Manilla River and Chaffey Dam on the Peel River. Due to the effects of regulation, streamflows in the rivers of the Namoi Catchment area are generally only affected during dry periods and drought conditions where water availability is low, and demand from users is comparatively high.

The topography of the development site is generally flat with some gently undulating lower slopes intersected by shallow drainage depressions. The land has been historically cleared and used for livestock grazing and broadacre cropping. Surrounding land use includes extensive agriculture, residential dwellings associated with agricultural properties and National Park (Somerton National Park), approximately 2.5 kms to the west.

Under the Tamworth LEP 2010 the site is not mapped as flood prone land or groundwater vulnerable land. There is no land identified as flood prone in close proximity to the Site and accordingly, the proposal is not expected to have any impact to flood liable land or change the nature of flood waters.

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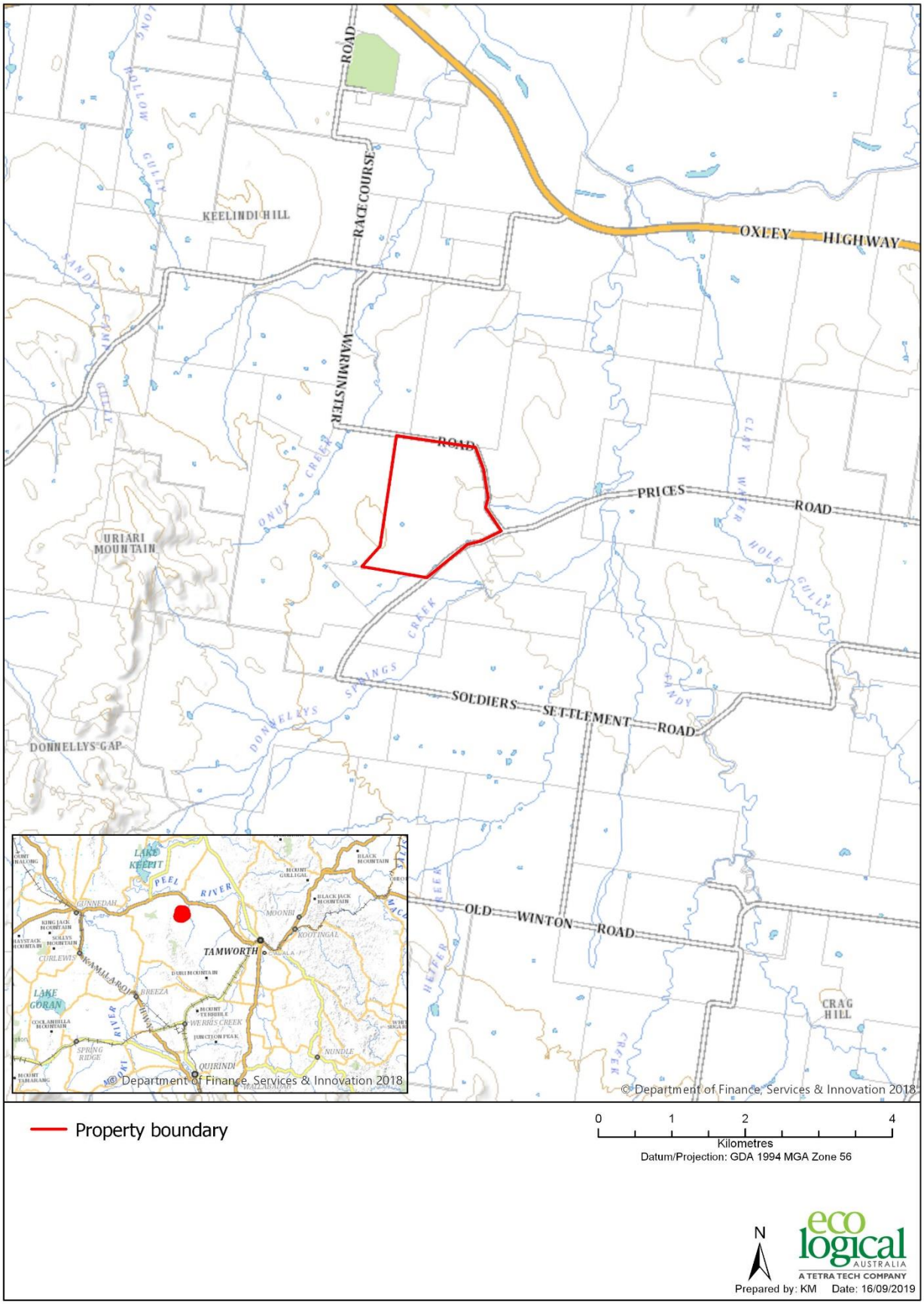

Figure 1: Regional context of the site

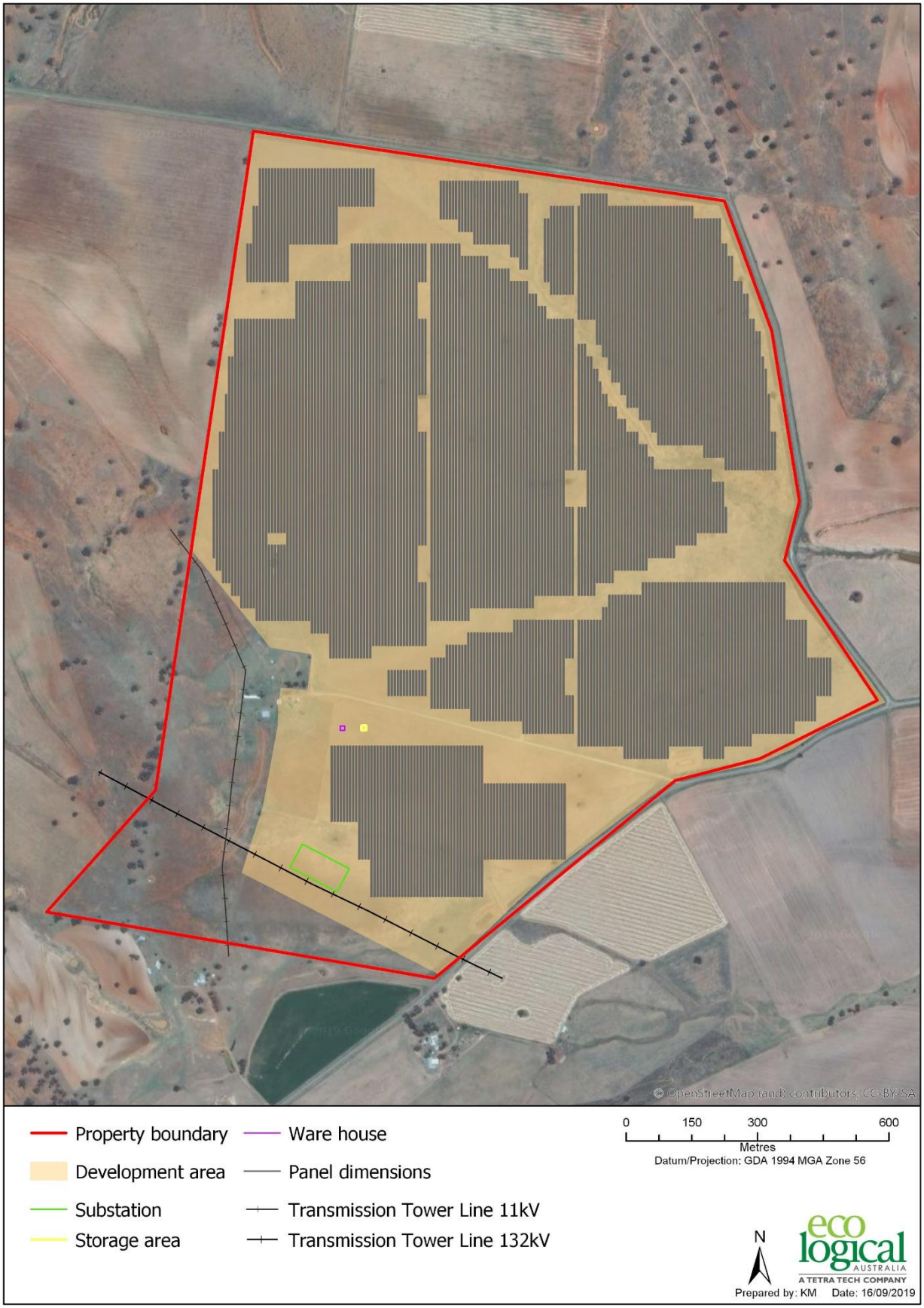

Figure 2: Development Footprint

2.1 Acid Sulphate Soils

Acid sulfate soils and potential acid sulfate soils are naturally occurring soils that contain iron sulfides which, on exposure to air, oxidise and create sulfuric acid. This increase in acidity can result in the mobilisation of aluminium, iron and manganese from the soils. Other impacts include the deoxygenation of water.

A review of the current mapping indicates that the subject Site is not currently mapped as being a risk area for Acid Sulfate Soils. Based on the site geomorphology, drainage and observed soils, it is highly unlikely that Acid Sulfate Soils or Potentially Acid Sulfate Soils would exist or pose a problem at or near this Site (Figure 6: Proximity to Acid Sulfate Soils).

Furthermore, the activities proposed on the Site will have a minimal impact in relation to disturbance of Acid Sulfate Soils or Potentially Acid Sulfate Soils as the majority of open excavation works will occur in the upper 1000 mm of soil and, as such, there is minimal risk of disturbing or exposing these soils to oxidation.

2.2 Surface Water

The subject site contains very limited surface water resources comprising several small farm dams and minor drainage lines, being 1st and 2nd order streams that divert surface water runoff to Sandy Creek, which is approximately 1.7 kms to the east. Water from Sandy Creek then flows into the Peel River which joins the Namoi River downstream of Keepit Dam (regulated water supply). The 1st and 2nd order streams onsite are highly ephemeral in nature, and flows depend on rainfall and surface water runoff from the catchment area.

Due to the flat topography and historic land clearing for agriculture, onsite streams resemble broader drainage areas within existing paddocks, rather than streams with a defined bed and banks.

Due to proximity to the Peel River, access to water sources is in accordance with the State Governments Water Sharing Plan for the *Peel Valley Regulated, Unregulated, Alluvium and Fractured Rock Water Sources 2010* under Section 50 of the *Water Management Act 2000*.

The objectives of this Plan (in part) seek to:

- protect, preserve, maintain and enhance the important river flow dependent and high priority groundwater dependent ecosystems of these water sources,
- contribute to the maintenance of water quality, and
- provide recognition of the connectivity between surface water and groundwater.

The physical characteristics of the soil and topography of the area mean the Peel Regulated River commonly loses water to the Peel Alluvium along most of its length, only gaining water from groundwater further down the valley, below Attunga. The general flow direction of the groundwater is away from the river and then down gradients parallel to the river. The unregulated tributaries of smaller creeks and drainage lines in the catchment are largely ephemeral, losing water to the groundwater in times of high flow then gaining groundwater again until the level of the groundwater drops below the bed of the creeks resulting in the creeks drying up during dry times.

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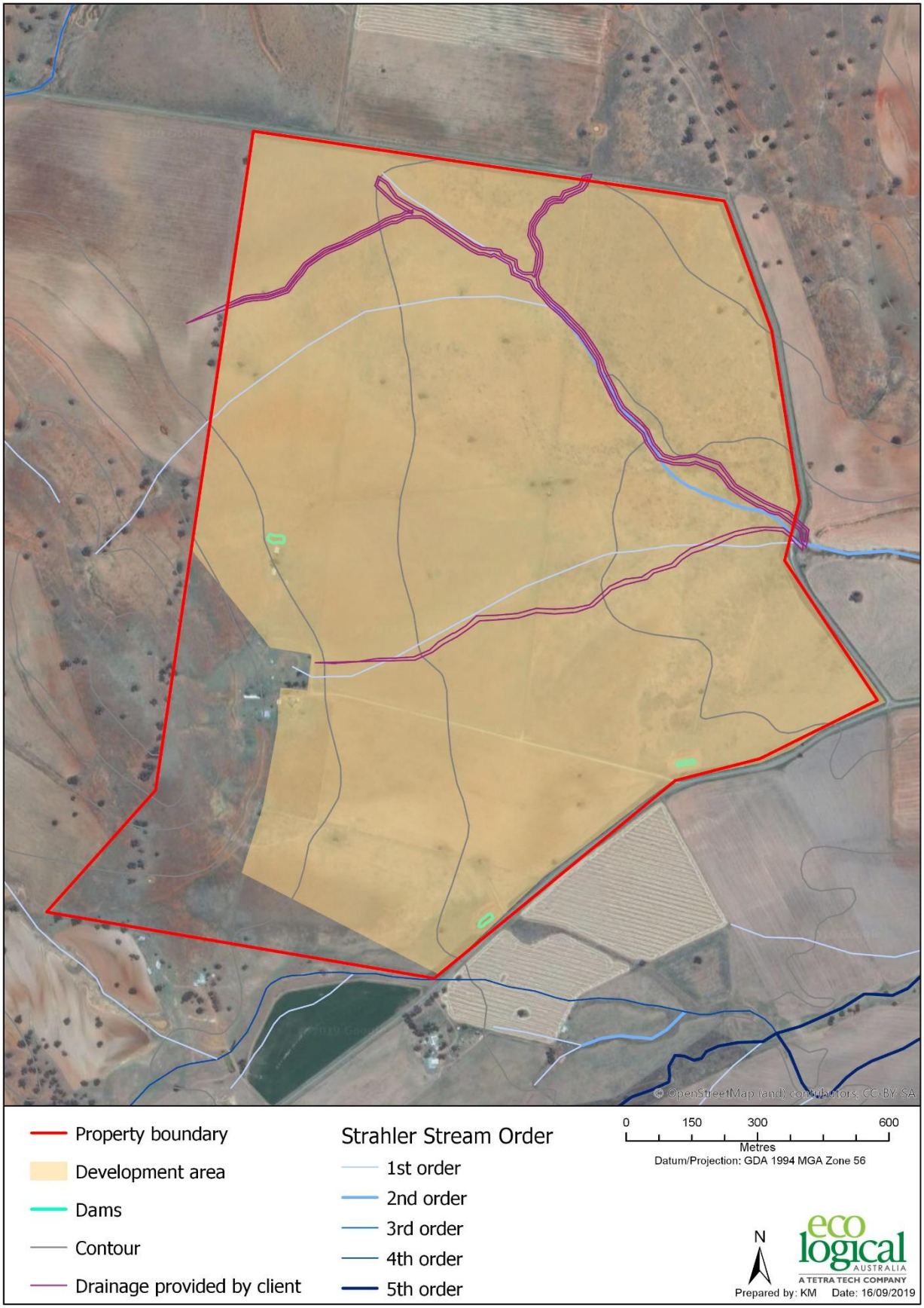

Figure 3: Surface Water Resources

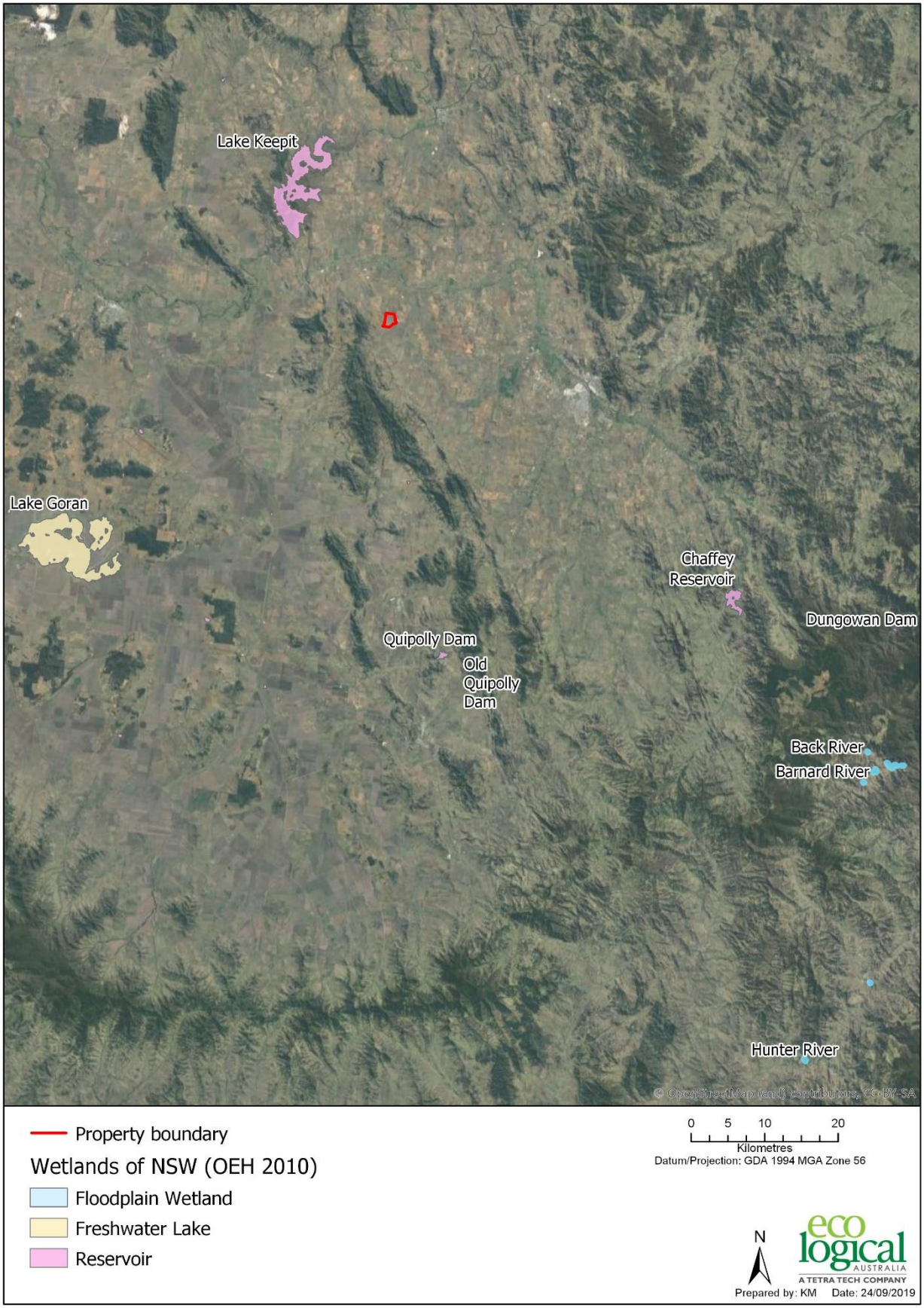

Figure 4: Proximity to Wetlands

2.3 Groundwater

The subject site is located within the Peel Alluvium Groundwater Management Area which comprises two major types of groundwater sources, the alluvial aquifers associated with the river and its tributaries and the fractured rock aquifers of the upper valley slopes. The alluvial groundwater and surface water of the Peel catchment and some of its major unregulated tributaries are linked, however, generally have low impact to instream flows in the catchment. A search of The Department of Primary Industries (Office of Water) groundwater database identified several potable groundwater bores at the subject site and on surrounding agricultural properties (Figure 5).

A review of the WaterNSW (n.d.) online *All Groundwater Map* and the BoM (2018) *Groundwater Explorer database* identifies three bores within the Site, used for water supply and stock & domestic purposes. Data for these bores (Table 1) indicate relatively deep groundwater levels.

Table 1: Observed location and depths of on-site bores

Bore ID	Latitude	Longitude	Registered use	Total depth (m)	Salinity
GW003291.1.1	-31.001203	150.649742	Water Supply	39.6	potable
GW022856.1.1	-31.000091	150.646408	Stock & Domestic	45.7	potable
GW015518.1.1	-31.009258	150.634742	Unknown	36.6	potable

Limited baseline groundwater quality data is available (Table 2), however, recorded yields typical of fractured rock aquifers of the Peel Valley are typically low <1L/s with the salinity of the on-site bores being described as “potable” and registered for use as water supply and stock & domestic water supply.

Table 2: Observed location and depths of registered bores within 2kms of subject site

Bore ID	Latitude	Longitude	Registered use	Total depth (m)	Salinity
GW003284.1.1	-30.993425	150.615298	Stock and Domestic	21.3	potable
GW003296.1.1	-30.992314	150.642797	Stock and Domestic	42.7	potable
GW003302.1.1	-31.020647	150.654742	Unknown	30.5	potable
GW003318.1.1	-31.023702	150.647797	Stock and Domestic	30.5	potable
GW009100.1.1	-30.992036	150.633631	Unknown	24.4	potable
GW014310.1.1	-31.009536	150.621409	Unknown	42.7	potable
GW014311.1.1	-31.013703	150.636409	Unknown	51.8	potable
GW014312.1.1	-31.014536	150.620576	Unknown	62.5	potable
GW015516.1.1	-30.998147	150.628909	Unknown	28	potable
GW015517.1.1	-30.995092	150.628909	Unknown	35.4	potable
GW022842.1.1	-31.01648	150.627242	Stock and Domestic	88.4	potable
GW022990.1.1	-31.007591	150.661964	Unknown	10.7	potable
GW023009.1.1	-31.012869	150.643353	Unknown	14.6	potable
GW026853.1.1	-31.005925	150.670297	Unknown	9.4	potable

Bore ID	Latitude	Longitude	Registered use	Total depth (m)	Salinity
GW029330.1.1	-31.012591	150.639186	Water Supply	32.3	potable
GW042735.1.1	-31.017869	150.636964	Irrigation	100	Non-potable

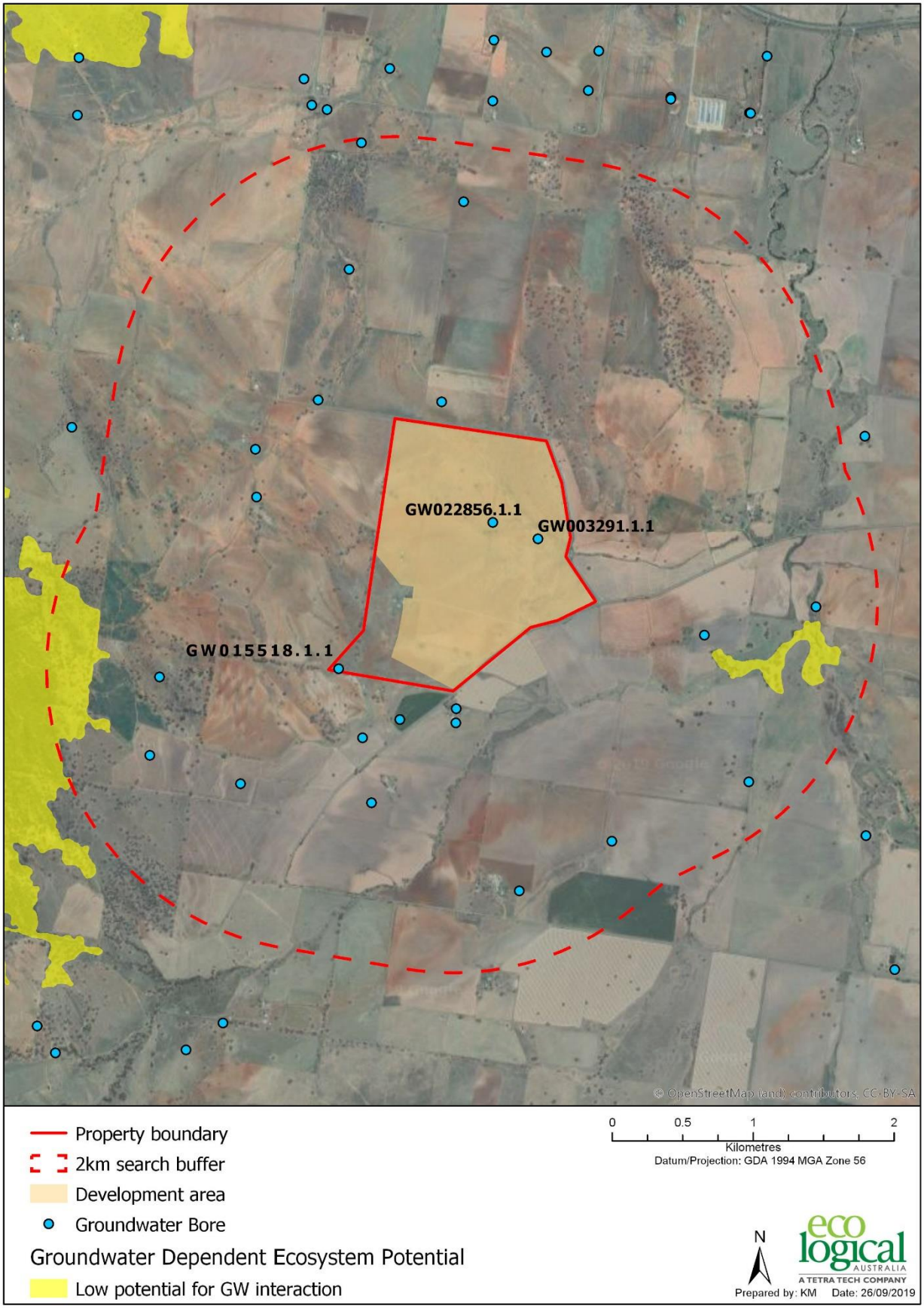

Figure 5: Groundwater Resources

2.4 Groundwater Dependent Ecosystems

Groundwater Dependent Ecosystems (GDEs) are ecosystems that have their species composition and natural ecological processes wholly or partially determined by groundwater (Geoscience Australia, 2017). Types of ecosystems that can rely upon groundwater include:

- Terrestrial vegetation that show seasonal or episodic reliance on groundwater;
- River base flow systems which are aquatic and riparian ecosystems in or adjacent to streams/rivers dependent on the input of ground water for base flows;
- Aquifer and cave ecosystems;
- Wetlands;
- Estuarine and near-shore marine discharge ecosystems; and,
- Fauna which directly depend on groundwater as a source of drinking water of that live within water which provide a source.

A search of the Bureau of Meteorology's (BoM) *Groundwater Dependent Ecosystem Atlas* (BoM 2017) indicates there are no mapped potential GDEs within the Site and two low potential interaction locations within 2km buffer. Groundwater bores and groundwater interaction points, or potential GDEs, within a 2km radius of the Site are shown in Figure 5.

2.5 Aquatic Ecosystems

Downstream of the subject Site, the Peel River & Namoi River are classified as Key Fish Habitat under the Fisheries Management Act (NSW DPI, n.d.). Within the subject Site, the unnamed dam and drainage lines are classified as *unlikely fish habitat* (Class 4 waterway - Fairfull, 2013).

A search of the NSW Wildlife Atlas identified one endangered aquatic species potentially occurring within the subject Site and its vicinity. While areas downstream may have potential to be habitat for these species, the highly ephemeral nature of the existing drainage channels, lack of a natural riparian zone and extensive agricultural activity around the farm dam make it highly unlikely that these species would occur within the Site.

Table 3: Likelihood of occurrence of threatened aquatic species

Species	Common Name	Status NSW BC Act	Status EPBC Act	Habitat Potential
Chelodina longicollis	Eastern Snake-necked Turtle	P	P	**Unlikely** There was a record of sighting within 10 km of the development site.

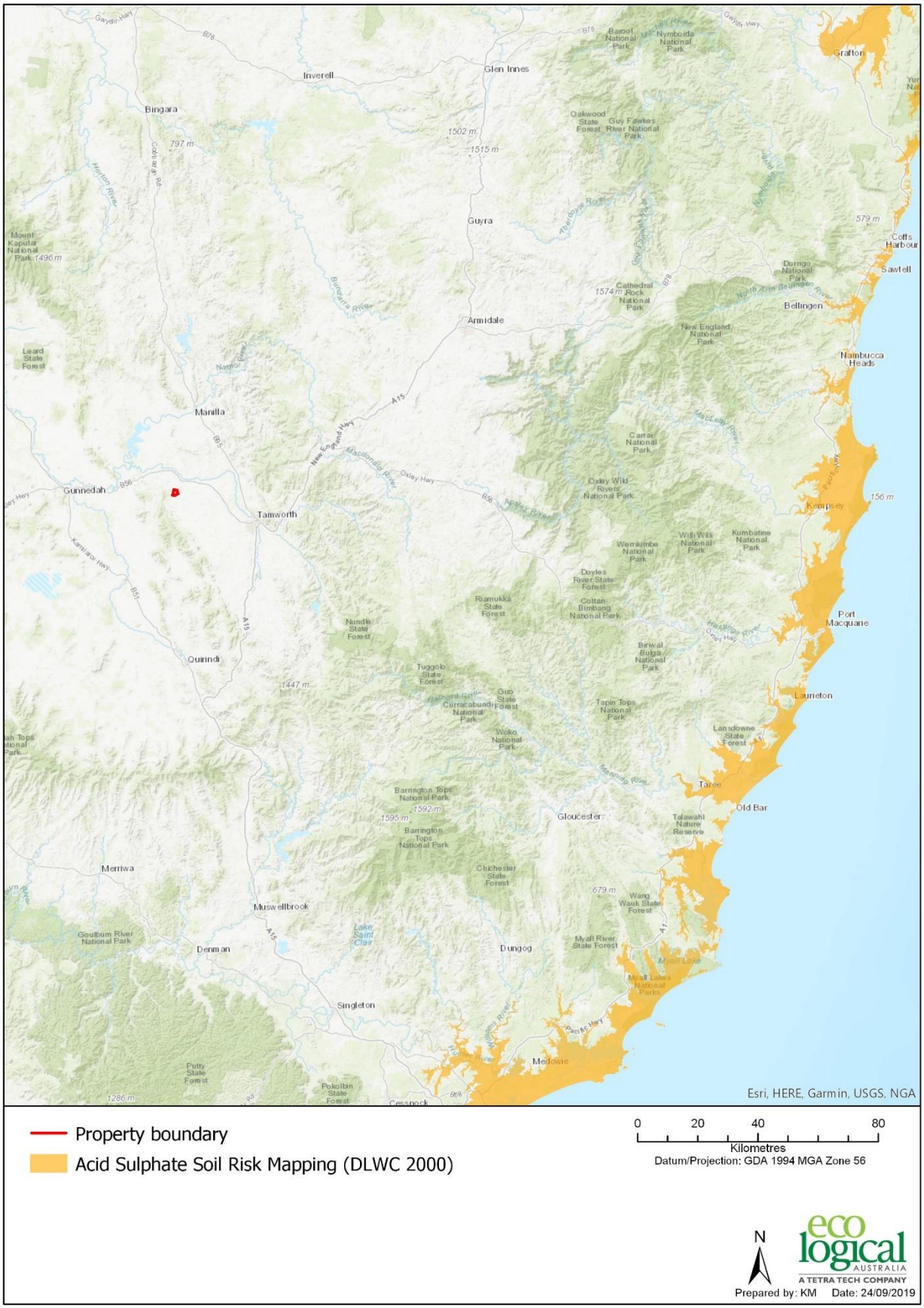

Figure 6: Proximity to Acid Sulfate Soils

2.6 Namoi River Water Quality Objectives

Water Quality Objectives (as endorsed by the NSW Government) is a pathway for assessing and monitoring the environmental values of the proposed development, as represented by the community, on water quality and identifies the steps required to protect these values and uses, now and in the future.

Namoi River Water Quality Objectives are provided for the following attributes:

- Aquatic ecosystems
- Visual amenity
- Secondary contact recreation
- Primary contact recreation
- Livestock water supply
- Irrigation water supply
- Homestead water supply
- Drinking water – disinfection only, or
- Drinking water – clarification and disinfection
- Drinking water – groundwater
- Aquatic foods (cooked)
- Industrial water supplies

No surface water quality data is available for the development site. Under such circumstances water quality indicators and trigger values would generally align to ANZECC guidelines for the protection of aquatic ecosystems and/or other fit for purpose trigger values, however, due to the highly ephemeral nature of the 1st and 2nd order streams located within the development site water quality associated with these streams will be strongly driven by localised rainfall/drying cycles, but with limited impact to downstream users.

https://www.environment.nsw.gov.au/ieo/Namoi/report-03.htm

3. Potential Impacts

Potential impacts to water quality and aquatic ecosystems for both surface and groundwater resources during construction (including decommissioning) and operational phases of the development are considered in the following sections.

3.1 Water Quality

The proposed development has potential to impact on water quality through the following processes:

- Erosion and sedimentation
- Contamination of water resources

3.1.1 Surface Water Quality

Construction and decommissioning

The potential to impact upon soils and surface water quality on the subject site is greatest during the construction phase. During this period the soils will be subject to disturbance associated with site preparation and infrastructure installation/removal. Construction works for the proposed solar farm include removal of minor areas of vegetation and soil during site preparation and excavation for the proposed substation, battery energy storage system, access roads, temporary laydown area and underground cabling. The upper layer of soil would be subject to temporary disturbance which may lead to erosion and potential sedimentation of waterways during periods of rainfall.

The use of fuels, lubricants, herbicides and other chemicals during construction pose a risk of surface water contamination in the event of a spill. Management of sewage systems pose a risk to surface water quality should spills occur.

Operation

The potential for the proposed Solar Farm to impact upon soils and surface water quality during the operational phase, after the disturbed areas and construction compound have been rehabilitated, is minimal. Routine maintenance and monitoring is the extent of the day-to-day activities and is not likely to have any impact to surface water quality. It may be considered the potential for impacts to water quality, compared to current agricultural land use practices such as tilling for broad acre cropping, are decreased, thereby reducing likelihood of erosion, sedimentation and riparian disturbance.

The use of fuels, lubricants, herbicides and other chemicals during operation pose a risk of surface water contamination in the event of a spill. Management of sewage systems pose a risk to surface water quality should spills occur.

3.1.2 Groundwater

Water quality impacts to groundwater during construction and operation are considered very unlikely due to the recorded depth of groundwater at the site and limited potential for excavation proposed for the installation of panels and ancillary structures.

Panels will be installed on driven piles installed not more than 2.5 m below the ground surface, while excavation works (approximately 1m) would be undertaken for trenching for underground cabling, as well as minor drainage works and upgrades to internal access roads.

3.2 Hydrology

The proposed development has potential to impact on hydrology through the following processes:

- Changes to water balance
- Altered rainfall runoff pathways

3.2.1 Surface Water Hydrology

Non-potable water for construction and operational purposes will be sourced from the following sources:

Table 4. Non-potable water use categories

Use	Source
Dust Suppression	Externally sourced & existing surface water
Amenities & facilities	Externally sourced & on-site rainwater
General construction	Externally sourced & existing surface water
General maintenance	Existing surface water & on-site rainwater
Agricultural activities	Existing surface water & groundwater

Potable water supplies will be procured via a licenced water supplier and delivered and stored onsite for use. Potable water supplies may be augmented by rainwater supplies collected on-site and stored in rainwater tanks associated with buildings.

Water from existing surface water dams may be used for dust suppression and general construction activities during construction and decommissioning phases, and as a water source for sheep grazing during operation.

Due to the nature and design of the panels, rain quickly runs off the surface of the panels to the natural ground level allowing for water to be pervious into the soil or run-off to nearby drainage channels in a typical manner. Hydrological modelling will be undertaken (as a separate engagement) to determine potential impacts to flood hydrology.

3.2.2 Groundwater Hydrology

No groundwater from existing on-site bores is proposed to be used for construction or decommissioning of the proposed development. Existing groundwater bores on the site may be used to provide stock water for sheep grazing during the operational phase.

The Proposal is not likely to influence groundwater systems directly or indirectly, nor would an aquifer interference approval as per the *NSW Aquifer Interference Policy* be required.

4. Mitigation measures

This section of the report provides a summary of the proposed safeguards and environmental mitigation measures that will be undertaken to address potential impacts to water quality and water quantity and includes a description of the measures that would be implemented to monitor and report on the environmental performance of the development.

4.1 Water Quality

Construction & Decommissioning

The potential impacts to soils and water quality do not present any major constraints that cannot be managed. All construction and demolition activities for the proposed solar farm will be undertaken in a manner that prevents erosion and sediment impacts at the subject site and within the catchment area of Sandy Creek and Peel River.

Post approval, a Construction Environmental Management Plan (CEMP) will be prepared by the proponent that identifies erosion and sediment control mitigation measures prior to works commencing. All erosion and sedimentation controls will be designed and undertaken during the construction phase in accordance with the provisions of Managing Urban Stormwater: Soils and Construction series, in particular:

- Managing Urban Stormwater: Soils and Construction, Volume 1, 4th edition (Landcom 2004), known as 'the Blue Book'.
- Volume 2A Installation of Services (DECC, 2008a) and
- Volume 2C Unsealed Roads (DECC, 2008b).

Where appropriate, mitigation measures would be in place at the commencement of construction until suitable groundcover/stabilisation has been established. Preliminary mitigation measures are identified below, however these will be subject to more detail and final design in the preparation and implementation of a CEMP for the project.

- If practicable the site will be sown to permanent pasture prior to the establishment of the solar farm and repaired where necessary after construction. If this is not practicable, the site will be sown to a permanent pasture as soon as possible after the construction of the solar farm, taking into account the seasonal conditions and appropriate timing for pasture establishment.
- Access tracks shall be maintained in good condition, ensuring that associated drains and/or sedimentation traps are monitored and maintained so that potential erosion associated with the tracks, which could lead to impacts on water quality, is minimised. Wherever possible, traffic will remain on constructed internal roads to minimise the level of soil disturbance and compaction. Internal access tracks will be designed to minimise impacts to flow pathways and appropriate drainage will be employed to ensure runoff volumes and velocity are controlled.
- Trafficking of the soil will be minimised in wet conditions to prevent creating soil disturbance that is prone to erosion and during construction of the substation and BESS, appropriately sized temporary sediment basins will be established such that all the water flowing off these construction areas reports to the sediment basins.
- In areas where there has been significant disturbance and erosion is likely, the type of measures that will be implemented include:
    - Stabilisation of the soil with polymers or by seeding,
    - Establishment of cut-off drains to divert water away from the disturbed area and ensure runoff volumes and velocity are controlled,
    - Establishment of control measures such as sediment basins with drains that divert sediment laden water to these sediment control devices.
- Construction works would be staged as per the requirements set out in the CEMP to include progressive stabilisation of disturbed areas and topsoil. Where practicable, rehabilitation of all disturbed areas will be progressive and not left to the completion of construction.

Management of sewerage and wastewater from the temporary site offices and amenities buildings during construction and decommissioning is documented in the CEMP. Waste produced from toilets shall be stored in the holding tanks on the demountable buildings until it is trucked offsite and disposed in accordance with the relevant legislative requirements.

After construction works finish, hazardous materials containers (fuels, lubricants, construction chemicals, herbicides, etc) will be transported offsite or disposed in accordance with the relevant legislative requirements under the POEO Act and Council requirements. Onsite refuelling shall occur within the designated areas and located more than 100m from any drainage line and within an impervious bund. Daily inspections of contractor's machinery will be undertaken to ensure no oil, fuel or fluids are leaking. Also, contractors and staff would undertake regular toolbox talks and be notified of the hazards of accidental spills and potential impacts to water quality.

A Spill Response Plan (SRP) will be developed and included as part of the Environmental Management Plans. All contractors and staff will be trained regarding appropriate spill response strategies. Should a spill occur, incident management procedures provided in the SRP will be implemented and the EPA will be notified of any incidents that cause harm to the environment, pursuant to sections 147 – 153 of the POEO Act.

Operation

Upon completion of the construction phase, an Operations Environmental Management Plan will be implemented that includes the day-to-day procedures and allocation of responsibilities to minimise impact to water quality throughout the operational life of the solar farm. The OEMP will document the environmental management practices and controls that would be applied to operate the solar farm including managing fuel loads (pasture and native grasses), control of noxious weeds and managing localised erosion, if present. To maintain water quality, the objectives of the OEMP seek to establish a healthy, self-sustaining, improved pasture over the solar farm that will provide fodder for sheep grazing and be manageable in terms of weed control and hazard reduction (fuel loads). The land will be readily returned to agriculture, specifically sheep grazing, as soon as construction is finished and pastures are established at the site.

Once the proposed solar farm is in the operational phase there will be minimal requirement to source water for the day-to-day operations of the facility. Staff amenities, including toilet and handwashing basins, will be provided by small rainwater tanks connected to the staff amenities building and waste water would be managed onsite subject to seeking separate approval from Council under Section 68 of the Local Government Act, approval to operate an Onsite Sewerage Management System (OSSMS).

Very few dangerous substances or chemicals are associated with the day-to-day activities of the solar farm and as such there is very little risk of pollution of local waterways by chemical residues or other contaminants. Despite this, as a mitigation measure, all activities with the potential for spillages or overflow of fuels or chemicals would not be undertaken within 50 m of the existing farm dam or drainage lines and a suitable spill response and containment kit will be available on site whenever and wherever this type of higher risk activity is undertaken. Additionally, storage, handling or use of any potentially dangerous substances would be in accordance with the relevant Australian Standards and *Guidelines for Storage and Handling of Dangerous Goods* by WorkCover NSW.

4.2 Water Quantity

Construction

During the construction phase some potable water will be required for staff amenities comprising custom built transportable buildings containing bathroom and kitchen facilities. Potable water would be sourced locally and trucked onsite on an as needs basis and/or stored within temporary rainwater tanks.

Some non-potable water will also be required for dust suppression, depending on the schedule of works and the climatic conditions experienced at the time the works are undertaken. The volume of non-potable water required would be significantly higher during extended periods of hot, dry weather or where groundcover is disturbed for an extended period of time. Assuming a maximum daily use, in excessively dry and windy conditions, would be 150 kL, and that these conditions are experienced 50% of the time during the six month construction peak, this equates to approximately 10 ML of water used for the life of the construction period. All water for dust suppression would be sourced in accordance with basic-right provisions from existing farm dams or local water suppliers (trucked to site). Potable water would not be used for dust suppression at any stage during construction phase.

Operation

Once the proposed solar farm is in the operational phase there will be minimal requirement to source water for the day-to-day operations of the facility. Staff amenities, including toilet and handwashing basins, will be provided by small rainwater tanks connected to the staff amenities building and waste water would be managed onsite via the existing Onsite Sewerage Management System (OSSMS).

Some non-potable water may be sourced from existing surface water dams for watering screening trees, again depending on the seasonal conditions at the time of establishing the landscaping and vegetative buffers. In general, only a small quantity of water used during operations would be required.

5. Conclusion

Potential environmental impacts on soil and water resources are identified as minor or negligible and can be appropriately managed through the application of the identified mitigation strategies and through ongoing performance monitoring. This report addresses the requirements of sections 6 to 9 of the SEARS, in particular matters pertaining to the assessment of the potential impacts to surface water, groundwater, hydrological functions and water quality monitoring from the proposed development. Environmental impacts and mitigation techniques associated with the construction, operation and decommissioning phases of the proposed development are compliant with the requirements for State Significant Development under the *Environmental Planning and Assessment Act 1979* and other relevant State and Commonwealth legislation.

The Proposal has been assessed as unlikely to have any significant impacts on water and soil resources throughout the construction, operation and decommissioning stages. Mitigation measures regarding these environmental impacts as detailed in this report, would ameliorate or minimise these expected impacts to acceptable levels.

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Appendix A – Responses to OEH Standard Environmental Assessment Requirements

(6) The EIS must map the following features relevant to water and soil including:-		
	Summary	**Mapping**
a. Acid Sulphate Soils	The land is not identified as a risk area for acid sulphate soils and it is highly unlikely they would exist at the site or be impacted by the proposed development.	Figure 6: Proximity to Acid Sulfate Soils
b. Rivers, streams, wetlands, estuaries	The site contains 1st and 2nd order streams that are ephemeral in nature. There are no wetlands or estuaries at the site or within proximity.	Figure 3: Surface Water Resources
c. Wetlands	There are no wetlands at the site that would be impacted by the proposed development.	Figure 4: Proximity to Wetlands
d. Groundwater	The site contains three registered groundwater bores and there are numerous bores on surrounding landholdings used for stock, domestic and irrigation purposes.	Figure 5: Groundwater Resources
e. Groundwater dependant ecosystems	There are no groundwater dependant ecosystems (GDEs) at the site or within proximity.	Figure 5: Groundwater Resources
f. Proposed intake and discharge locations	The proposed development does not propose to abstract or discharge water. As such, there are no proposed intake or discharge locations.	* Intake and discharge locations not applicable
(7) The EIS must describe background conditions for any water resource likely to be affected by the Tamworth Solar Farm project, including:		
	Summary	**Addressed Where?**
a. Existing surface and groundwater	The site contains very limited surface water comprising several small farm dams and ephemeral streams. Prevalence of surface water is largely dependent on seasonal conditions and rainfall in the catchment area. Groundwater sources including alluvium aquifers and fractured rock aquifers are	Section 2.2 Surface Water & Section 2.3 Groundwater

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	registered for stock and domestic purposes with each of the three bores onsite being described having low yields but quality, potable water supply.	
b. Hydrology, including volume, frequency and quality of discharges at proposed intake and discharge locations	No groundwater from on site is proposed to be used for the construction or operation of the solar farm. A small amount of surface water sourced from existing dams within the site may be used for establishing landscaping or dust suppression. This would be in accordance with existing basic rights. Registered bores at the site would continue to be utilised for stock and domestic purposes for future livestock grazing (sheep).	Section 3.2 Hydrology
c. Water Quality Objectives including groundwater as appropriate that represent the communities uses and values for the receiving waters.	The development will be designed and operated in a manner that minimises potential impacts to water resources and identifies clear water quality objectives relevant to the Namoi River.	Section 2.6 Namoi River Water Quality Objectives
d. Indicators and trigger values/criteria for the environmental values identified at (c) in accordance with the ANZECC (2000) Guidelines for Fresh and Marine Water Quality and/or local objectives, criteria or targets endorsed by the NSW Government.	No major water quality and quantity impacts were identified for the construction or operational phases of the development therefore no indicators or criteria are required to be monitored or reported as per ANZECC (2000) Guidelines.	Section 2.6 Namoi River Water Quality Objectives
(8) The EIS must assess the impacts of the project on water quality, including:		
a. The nature and degree of impact on receiving waters for both surface and groundwater, demonstrating how the project protects the Water Quality Objectives where they are currently being achieved, and contributes towards achievement of the Water Quality Objectives over time where they are currently not being achieved. This should include an assessment of the mitigating effects of proposed stormwater and wastewater management during and after construction.	The proposed solar farm would have minimal impact to both surface water and groundwater sources at the site. The proposed development will be managed in a manner that seeks to protect soil resources and avoid all potential adverse impacts from erosions and sedimentation to receiving waters. Stormwater from the site is not substantial however in the event of high rainfall, will be managed in a way to meet the NSW Water Quality Objectives and ensure runoff is not compromised and is directed to	Section 3.1 Water Quality & Section 4 Mitigation Measures

	the catchment in a manner that would have no impact to receiving waters.	
b. Identification of proposed monitoring of water quality.	Routine monitoring of the solar farms environmental performance would be undertaken throughout the different stages of the development including routine maintenance activities (internal roads, managing grassed areas and assessing erosion control measures) and record keeping, as appropriate, of any dangerous liquids or chemicals stored onsite such as fuels, construction chemicals, herbicides etc.	Section 3.1 Water Quality
(9) The EIS must assess the impact of the project on hydrology, including:		
a. Water balance including quantity, quality and source	The proposed solar farm will not rely on groundwater sources at any stage of the development, aside from ongoing grazing activities within the array area. If available, a small quantity of surface water from farm dams would be utilised for dust suppression and maintaining landscaping in accordance with existing basic rights provisions. As such, there would be no change to the water balance or hydrological functions as a result of the proposed development.	Section 3.1.1 Surface Water Quality & Section 3.2 Hydrology
b. Effects to downstream rivers, wetlands, estuaries, marine waters and floodplain areas	The proposed development would have no adverse impacts to local waterways or downstream rivers and there are no wetlands, floodplains, estuaries or marine waters within proximity to the site.	Section 3.2.1 Surface Water Hydrology
c. Effects to downstream water-dependant fauna and flora including groundwater dependant ecosystems	The proposed development is designed and managed in a manner to ensure there will be no adverse impact to downstream water-dependant fauna and flora. There are no mapped GDEs within proximity to the site and therefore the proposal is not likely to have any effects.	Section 3.2.2 Groundwater Hydrology

d. Impacts to natural processes and functions within rivers, wetlands, estuaries and floodplains that affect river system and landscape health such as nutrient flow, aquatic connectivity and access to habitat for spawning and refuge (e.g. river benches)	There will be no impacts to local waterways from the proposed development (including nearby Peel River and Sandy Creek). There are no wetlands, estuaries or floodplains within proximity to the site that would be impacted by the proposal.	Section 3.1 Water Quality
e. Changes to environmental water availability, both regulated/licensed and unregulated/rules-based sources of such water.	There are three licensed bores and several farm dams on the site. The proposed development will not rely on water from these groundwater sources, except for possible ongoing grazing activities. Only a minor quantity of surface water is proposed to be utilised (if available) in accordance with basic rights. It is not proposed to make any requests or applications for additional water usage for the proposed development.	Section 3.2 Hydrology
f. Mitigating effects of proposed stormwater and wastewater management during and after construction on hydrological attributes such as volumes, flow rates, management methods and re-use options.	Stormwater and runoff from impervious surfaces that is not able to be captured and utilised, such as run-off from panels, is readily returned to the natural ground surface at a low velocity thereby having no effect to the rate of surface water run-off. There will be no other sources of stormwater that would have any impact to hydrological functions. During construction, appropriate erosion and sediment control would be in place until a suitable level of groundcover is established. The site would incorporate erosion mitigation measures in accordance with the relevant industry standards and works would be staged so as to include progressive stabilisation of disturbed areas and soils. Wastewater will relate to staff amenities only and is readily able to be managed onsite.	Section 4 Mitigation Measures
g. Identification of proposed monitoring of hydrological attributes	The proposed development is not likely to have any effect to hydrological functions but in the event of exceptional climatic conditions, such as high rainfall, mitigation measures will be in place from the time	Section 4 Mitigation Measures

	works commence and during operation. Monitoring of Water Quality Objectives and recording incidences would be undertaken daily in routine operational and maintenance activities.	

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