

**SITE CLASSIFICATION
LOT 8906 WAKE DRIVE
LLOYD NSW 2650**

March 2020

Project brief

At the request of Peter Fitzpatrick of the Diocese of Wagga Wagga, soil sampling, analysis and reporting was carried out to assess the site for a proposed residential development on 30 October 2019. The document provides information about the site and soil conditions from field observations and laboratory analysis.

Site identification

Address: Lot 8906 Wake Drive Lloyd NSW 2650

Real property description: Lot 8906 Subdivision of DP 1262050

Centre co-ordinate: 530133 6109851 MGA GDA z55

Property size: 995m² approximately

Owner: c/o Diocese of Wagga Wagga

Local Council Area: Wagga Wagga City Council

Present use: Vacant Block

Development Application Reference: not known

Report Number: 6435_Lot 8906

Site Classification: M-D – Moderately reactive clay or silt sites (deep drying)

Certification

Name	Signed	Date	Revision Number
David McMahon BAppSc SA GradDip WRM MEnvMgmt		4/03/2020	0

Physical characteristics of the site

A desktop review and investigation of the topography, hydrology, soil, lithology, geology and hydrogeology of the site has been undertaken and are as follows:

Topography

The Lake Albert 1:25,000 Topographic Map (Sheet 8327-1S) indicates that the site is located at an elevation of approximately 244m AHD. The site landform is classed as a simple slope and the slope class is gently inclined.

Vegetation

The site is devoid of vegetation.

Hydrology

The nearest named waterway is Stringybark Creek located 3414m to the south east of the site. Due to the relative incline of the site, rainfall is likely to both run off and infiltrate into the relatively permeable topsoil.

Weather

The average rainfall for Wagga Wagga is approximately 526.8mm per annum, with the wettest months being October, June and July. Annual mean evaporation for the region is 1715.5mm with mean daily evaporation ranges from 1.2mm in July to 9.2mm in January. Wagga Wagga is characterised by cold wet winters and hot dry summers with mean maximum temperatures ranging from 12.9°C in July to 31.9 °C in January and mean minimum temperatures ranging from 1.3°C in July to 15.9°C in February. Rainfall, temperature and evaporation data from Wagga Wagga Agricultural Institute 73127 (www.bom.gov.au).

Soil & Landform

The site lies within the mapping unit Id from the Soil Landscapes of the Wagga Wagga 1:100 000 Sheet (DLWC, 1997). The map unit Id is described as:

Id – Lloyd (Erosional Landscapes)

Landscape: rolling low hills on Ordovician metasedimentary rocks. Local relief 30–90 m; slopes 10–20%. Broad crests and ridges; long waning mid to lower slopes; broad drainage depressions. Variable rock outcrop 0–50%. Extensively to completely cleared mid to high open-forest.

Soils: shallow (<0.5 m), moderately well-drained Paralithic Leptic Rudosols (Lithosols) on some crests, ridges and upper slopes; deep (1.0–1.5 m), imperfectly drained Red Kurosols (Red Podzolic Soils) on other crests and upper slopes; moderately deep (0.5–1.0m), moderately well-drained Red Chromosols and Kurosols (Red Podzolic Soils) on mid to lower slopes; and moderately deep (0.5–1.0 m), imperfectly drained Brown Kurosols (Yellow Podzolic Soils) in drainage lines.

Limitations: high erosion hazard; steep slopes (localised); localised rock outcrop; localised poor drainage; localised waterlogging; foundation hazard (localised); mass movement; shallow, stony and strongly acid soils (on ridges and upper slopes); localised aluminium toxicity; localised salinity.

Lithology and Geology

Undivided Ordovician metasedimentary rocks—thinly interbedded siltstones, shales and phyllites, with minorschists and minor quartzites. Lithology is highly variable over a short distance. Relatively thick (1 m to several metres) colluvial and slopewash clayey sediments occur on lower slopes and in drainage depressions. There is generally no rock outcrop, but occasionally <50% (at sites usually underlain by sandstone).

Hydrogeology

From the Geoscience Australia hydrogeology dataset, the groundwater beneath the site is described as porous, extensive highly productive aquifers

Site Condition

Through site investigation, field observations, in situ tests and laboratory analysis the following site geotechnical model has been developed. Details of the general conditions encountered with a field description of the soil, engineering properties and the location of the boreholes can be seen as follows, Table 1, Figure 1.

Table 1: Site geotechnical model with field description and observations

Soil Origin	Depth (m)	Class (AS1726 -2017)	Soil Name / Description	Grain Size	Primary Colour	Mottle Colour	Moisture	Plasticity	Consistency	Observations and/or comments	Engineering Properties
Borehole 1											
FILL	0.0-0.5	CI	CLAY	Fine	Yellow	Nil	D	Low-Med	Stiff	-	Ys Expansivity 20-40mm
Residual	0.5-1.2	CI	CLAY	Fine	Yellow	Nil	D	Low-Med	Stiff	-	
Extremely Weathered Material	1.2-1.8	SM	Sandy SILT	Fine/Coarse	Light/Pale Brownish Red	Light/Pale Yellow	D	Low	Very Stiff	Weathered Ordovician Metasediment.	

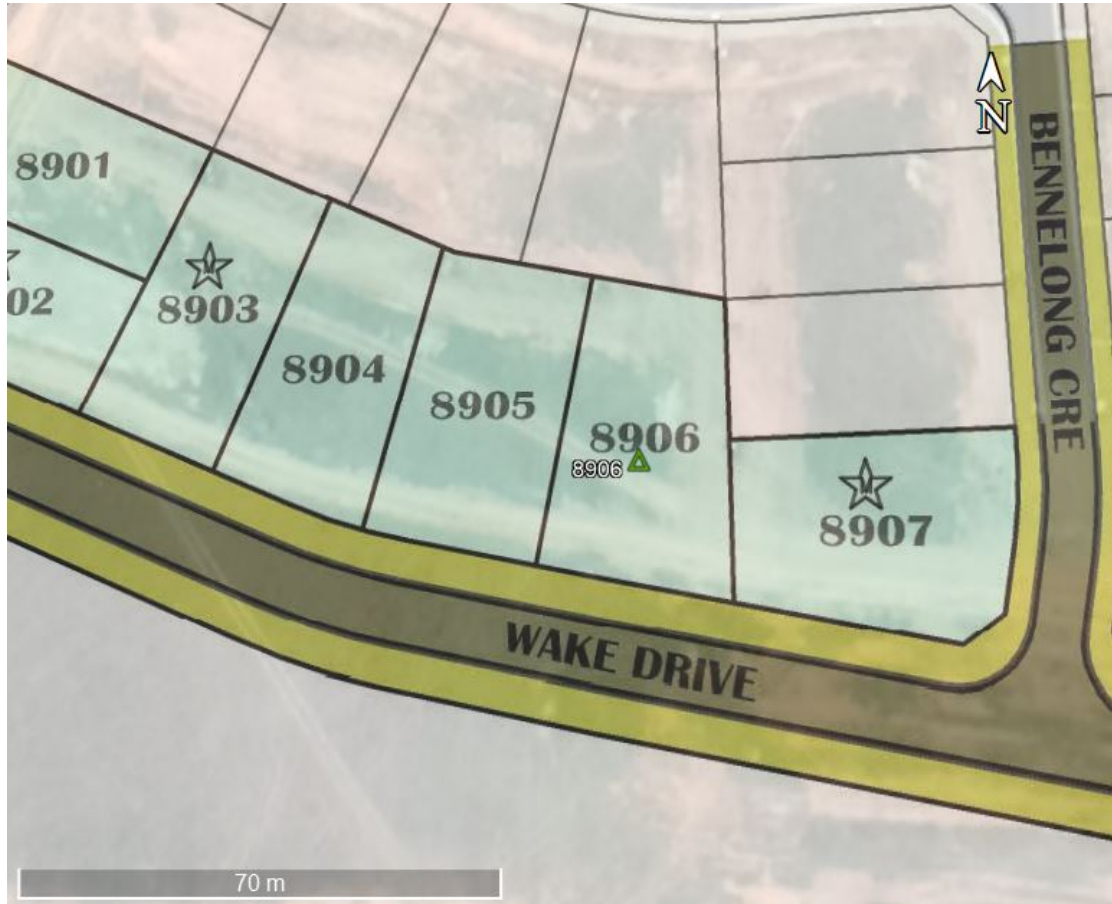


Figure 1: Annotated site plan overlain on aerial photograph depicting borehole locations

Site Classification

Based on the field assessment and laboratory data and assumptions therein the site is classified as **M-D – Moderately reactive clay or silt sites (deep drying), which may experience moderate ground movement from moisture changes** by reference to AS2870:2011.

Assumptions

Site investigation and classification was carried out by reference to AS2870:2011.

The proposed building is a single storey residential development.

This classification is based on the footings being founded into the underlying FILL or residual 'Cl' clay soils. If the footings are not into the specified material the site classification will need to be reassessed.

Footings may be founded partly on fill and partly on natural material depending on founding depths. As such, footing design may require careful consideration by the structural engineer to minimise potential differential settlement.

An allowable bearing pressure of up to 50kPa and 100kPa for raft slab beams and strip footings respectively may be adopted.

If more than 0.4m of uncontrolled fill is present or placed, or if depth of excavation within the building area extends more than 0.5m below the existing surface, the above classification will need to be reassessed.

Any earthworks on site will be carried out by reference to AS3798: 2007.

If any unconsolidated or saturated soils are encountered during excavation, or conditions that are not alike the above description, the site supervisor should be informed, the work stopped and this office be contacted immediately for further evaluation.

Where trees and large shrubs are removed from the site all roots are to be removed and voids replaced with compacted fill by reference to AS3798:2007.

The soils investigated are all natural ground and no free groundwater was encountered at the time of the investigation.

Site drainage and vegetation limitations are adhered to as per the CSIRO Foundation Management and Footing Performance: A Homeowner's guide, BTF-2011

Notes Relating to Results

Log Column	Symbol	Definition	
Soil Origin	TOPSOIL	Mantle of surface and/or near-surface soil often but not always defined by high levels of organic material, both dead and living. Remnant topsoils are topsoils that subsequently been buried by other transported soils. Roots of trees may extend significantly into otherwise unaltered soil and the presence of roots is not a sufficient reason for describing a material as topsoil.	
	FILL	Any material which has been placed by anthropogenic processes	
	Alluvial	Deposited by streams and rivers	
	Colluvial	Soil and rock debris transported down slope by gravity, with or without the assistance of flowing water and generally deposited in gullies or at the base of slopes. Colluvium is often used to refer to thicker deposits such as those formed from landslides, whereas the term 'slopewash' may be used for thinner and more widespread deposits that accumulate gradually over longer geological timeframes.	
	Extremely weathered material	Formed directly from in situ weathering of geological formations. Although this material is of soil strength, it retains the structure and/or fabric of the parent rock material.	
	Residual	Formed directly from in situ weathering of geological formations. These soils no longer retain any visible structure or fabric of the parent soil or rock material	
Class (AS1726-2017)	Coarse grained soils	GW	Gravel and gravel-sand mixtures, little to no fines
		GP	Gravel and gravel-sand mixtures, little to no fines, uniform gravels
		GM	Gravel-silt mixtures and gravel-sand-silt mixtures
		GC	Gravel-clay mixtures and gravel-sand-clay mixtures
		SW	Sand and gravel-sand mixtures, little to no fines
		SP	Sand and gravel-sand mixtures, little to no fines
		SM	Sand-silt mixtures
		SC	Sand-clay mixtures
	Fine grained soils	ML	Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or silt with low plasticity
		CL, CI	Inorganic clays of low to medium plasticity, gravelly clay, sandy clay
		OL	Organic silt
		MH	Inorganic silt
		CH	Inorganic clays of high plasticity
		OH	Organic clay of medium to high plasticity, organic silt
Pt	Peat, highly organic soil		
Soil Name/Description	SAND	Coarse grained soil	
	SILT	Fine grained soil – low dry strength, low wet toughness and dilatancy	
	CLAY	Fine grained soil – high dry strength, high wet toughness and plasticity	
Grain Size	Coarse	>2mm	
	Medium	0.06 – 2mm	
	Fine	<0.06mm	
Moisture	D	Dry	
	T	Moderately Moist	
	M	Moist	
	W	Wet	
Plasticity	Non-plastic	Not applicable	
	Low	Only slight pressure is required to roll the thread of soil near the plastic limit. The thread and lump are weak and soft. The dry specimen crumbles into powder with some finger pressure.	
	Medium	Medium pressure is required to roll the thread of soil to near the plastic limit. The thread and lump have medium stiffness. The dry specimen breaks into pieces or crumbles with considerable finger pressure.	
	High	Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness. The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface.	
Consistency	Very Soft (VS)	Exudes between fingers when squeezed in hand	
	Soft (S)	Can be moulded by light finger pressure	
	Firm (F)	Can be moulded by strong finger pressure	
	Stiff (St)	Cannot be moulded by fingers	
	Very Stiff (VSt)	Can be indented by thumb nail	
	Hard (H)	Can be indented by thumb nail with difficulty	
	Friable (Fr)	Can be easily crumbled or broken into small pieces by hand	

Disclaimer

The information contained in this report has been extracted from field and laboratory sources believed to be reliable and accurate. DM McMahon Pty Ltd will not assume any responsibility for the misinterpretation of information supplied in this report. The accuracy and reliability of recommendations identified in this report need to be evaluated with due care according to individual circumstances. It should be noted that the recommendations and findings in this report are based solely upon the said site location and the ground level conditions at the time of testing. The results of the said investigations undertaken are an overall representation of the conditions encountered. The properties of the soil within the location may change due to variations in ground conditions outside of the tested area. The author has no control or liability over site variability that may warrant further investigation that may lead to significant design changes.

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Reference

Chen X.Y. and McKane D.J., 1997, Soil Landscapes of the Wagga Wagga 1:100,000 Sheet map and report, Department of Land and Water Conservation, Sydney

CSIRO Foundation Management and Footing Performance: A Homeowner's guide, BTF-2011

Geeves GW, Craze B and Hamilton GJ 2007a. Soil physical properties. In 'Soils – their properties and management'. 3rd edn. (Eds Charman PEV and Murphy BW) pp. 168-191 Oxford University Press Melbourne

Geology information: Copyright Commonwealth of Australia (MDBC) 1999

Office of Environment and Heritage (OEH) (2017) eSpade v2.0
<<http://www.environment.nsw.gov.au/eSpade2WebApp>>

Standards Australia AS 1726 – 2017 Geotechnical Site Investigations

Standards Australia AS 2870 – 2011 Residential Slabs and Footings - Construction

Standards Australia AS 3798 – 2007 Guidelines on earthworks for commercial and residential developments