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Project 92421.00
1 October 2020
R.002.Rev1
RWG

Attention: Mr Garth Bird

Email: gbird@ethosurban.com

Geotechnical and Groundwater Summary
Proposed Industrial Development
200 Aldington Road, Kemps Creek

1. Introduction

Douglas Partners Pty Ltd (DP) were commissioned by Ethos Urban Pty Limited on behalf of Fife Kemps Creek Pty Limited to prepare a Geotechnical and Groundwater Summary letter for 200 Aldington Road, Kemps Creek (the site). Fife Kemps Creek is proposing to develop the site for industrial purposes in line with the desired future outcomes of the Mamre Road Precinct and recent amendments (which occurred in June 2020) to the State Environmental Planning Policy (Western Sydney Employment Area) 2009. The site location and layout are shown on Drawing 1, attached.

The site has been rezoned for industrial land use and this letter has been prepared to with reference to the NSW Government Planning, Industry & Environment, Planning Secretary's Environmental Assessment Requirements (SEARs) application number SSD-10479 as part of a State Significant Development Applications (SSDA). This letter responds to selected SEARs associated to Soil and Water (from a geotechnical perspective) as detailed in Table 1.

Table 1: Selected SEARs Responses

Key Issues	Response
An assessment of the development's potential impacts on:	
Topography	Section 5.1
Soil resources	Section 5.2
Groundwater including consideration of the *NSW Aquifer Interference Policy* (2012)	Section 5.3
Water resources, hydrology, drainage lines and downstream assets, such as watercourses and riparian lands, on or nearby to the site, including consideration of the *Guidelines for Controlled Activities on Waterfront Land* (2018)	Section 5.4
Groundwater dependent ecosystems	Section 5.5
The Warragamba Pipelines Corridor	Section 5.6

Table 1: Selected SEARs Responses cont.

Key Issues	Response
including mapping and descriptions of existing background conditions and cumulative impacts and measures proposed to reduce and mitigate impacts.	
Consideration of:	
Salinity impacts	Section 5.7
Acid sulphate soil impacts.	Section 5.8

DP is concurrently preparing *Contamination Status Summary Report, 200 Aldington Road, Kemps Creek*, Project 92421.00.R.001 (DP, 2020) to address SEARs related to contamination.

2. Proposed Development

A SSDA for the site has been lodged, including proposed future development lots and building footprints, as well as detailed consent for Stage 1 works, which will include construction of a 48,430 sqm warehouse building and associated infrastructure required to be constructed for the development to operate, including road intersections, internal road construction and other associated on-site utilities.

Specifically, the application seeks approval for the following development:

- A concept masterplan with an indicative total building area of 375,755 m^2, comprising:
  - 357,355 m^2 of warehouse floor space;
  - 18,200 m^2 of ancillary office floor space;
  - 200 m^2 of café floor space;
  - 13 individual development lots for warehouse buildings with associated hardstand areas;
  - Internal road layouts and road connections to Aldington Road;
  - Provision for 1,700 car parking spaces; and
  - Associated site landscaping.
- Detailed consent for progressive delivery of site preparation, earthworks and infrastructure works (ie: Stage 1 works) on the site, including:
  - Demolition and clearing of all existing built form structures;
  - Drainage and infill of existing farm dams and any ground dewatering;
  - Clearing of all existing vegetation;
  - Construction of a warehouse building with a total of 48,340 sqm of GFA, including:
    - 48,430 m^2 of warehouse GFA;
    - 2,500 m^2 of office GFA; and
    - 231 car parking spaces.
  - Bulk earthworks including 'cut and fill' to create flat development platforms for the warehouse buildings, and topsoiling and grassing / site stabilisation works;
  - Roadworks and access infrastructure;

- Stormwater and drainage works, including stormwater basins, diversion of stormwater lines, gross pollutant traps and associated swale works;
- Sewer and potable water reticulation; and
- Inter-allotment, road and boundary retaining walls.

3. Site Identification

The site has an approximate area of 72 ha, is located in the local government area of Penrith City Council and comprises the following Lots:

- 106-124 Aldington Road – Lot 32 DP258949.
- 126-142 Aldington Road – Lot 31 DP258949.
- 144-160 Aldington Road – Lot 30 DP258949.
- 162-178 Aldington Road – Lot 23 DP255560.
- 180-196 Aldington Road – Lot 22 DP255560.
- 198-212 Aldington Road – Lot 21 DP255560.
- 214-228 Aldington Road – Lot 20 DP255560.

The site is zoned IN1 General Industrial and includes several rural dwellings, greenhouses and dams, as well as vacant land.

4. Previous Geotechnical Investigations

The following geotechnical investigations were reviewed with a high-level summary provided below.

- DP *Preliminary Site Geotechnical Investigation, 106 - 142 Aldington Road, Kemps Creek, NSW* Project 92345.00.R.001.Rev0 dated 16 May 2019 (DP, 2019a); and
- DP *Preliminary Geotechnical Investigation and Preliminary Salinity Assessment, 144 - 228 Aldington Road, Kemps Creek, NSW,* Project 92364.02.R.001.Rev0 dated 25 September 2019 (DP, 2019b).

The investigations were completed at the site for Lots 31 and 32, as detailed in DP (2019a) and Lots 20 to 23, and 30, as detailed in DP (2019b). The investigations were undertaken for Stockland (who form part of Fife Kemps Creek Pty Limited) for pre-purchase due diligence purposes.

The investigations comprised a site walkover inspection, test pit excavation, borehole drilling and in-situ testing, followed by laboratory testing of selected samples. Details of the field and laboratory work are given in the report, together with comments relating to design and construction practice. Test pit and borehole locations completed as part of each investigation area are shown on Drawing 1.

The site was considered geotechnically suitable for a commercial or industrial development, with comments given in the reports with respect to site preparation measures, likely reactivity site classifications, retaining wall design parameters and footing design parameters.

5. Impact of the Proposed Development

5.1 Topography

Drawing 1 provides 2 m elevation contours relative to the Australian Height Datum (AHD). Topographic high points are in the north-western (86 m AHD) and southern-eastern (86 m AHD) portions of the site. A northwest / southeast aligned ridge is present in the middle of the site. From the ridge, topography slopes down towards the north-eastern site boundary (62 m AHD) and the south-western site boundary (60 m AHD).

Figure 1 shows topographic slope at the site ranging between approximately 0 – 20 degrees.

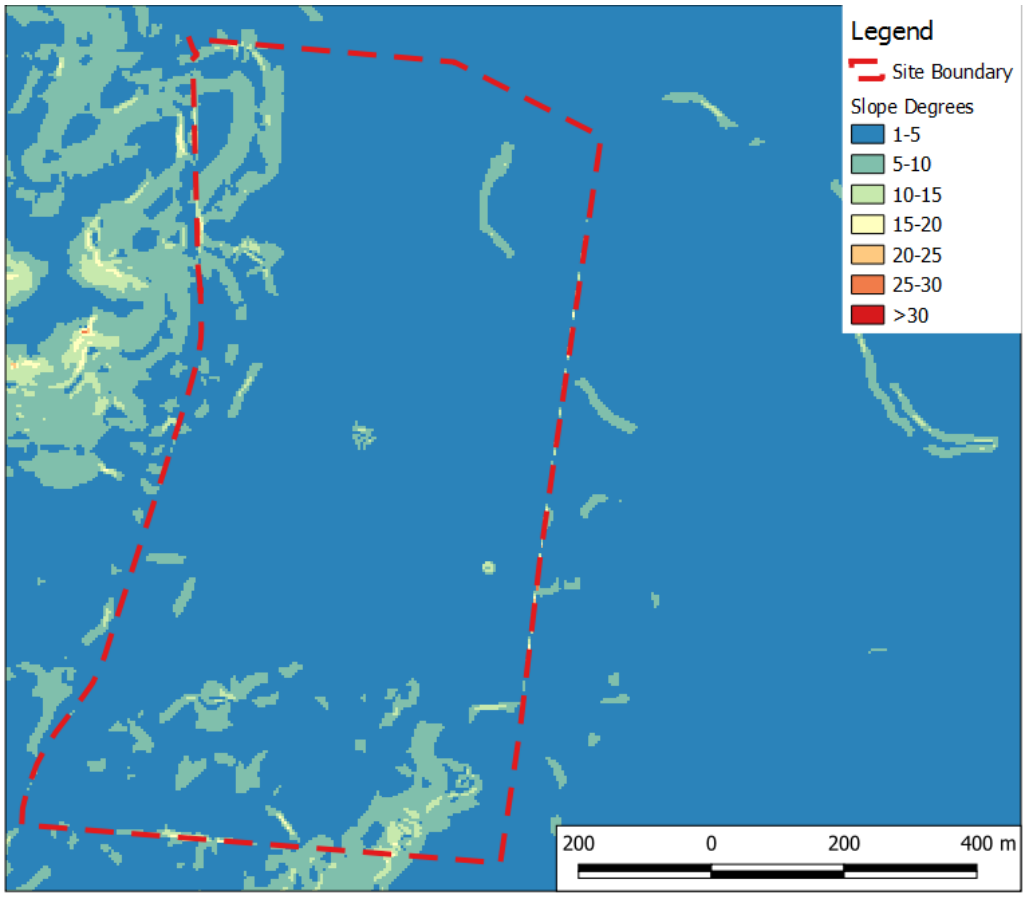


Figure 1: Topographic slope relative to the site.

Assessment of Potential Impacts

Review of the AT&L *Bulk Earthworks Cut/Fill Plan* Drw.19-609-C1031, Issue P1 dated 11/09/2020 (the Cut/Fill Plan) indicates that extensive cut / fill earthworks are proposed at the site. The development will involve the reduction of slopes to produce generally flat building pads interspaced by retaining walls.

A topographic assessment and proposed earthworks justification to meet the SEARs is included in the AT&L *Civil Infrastructure Report, Aldington Road, Kemps Creek* (19-609 DRAFT). From a geotechnical perspective, DP recommends that all earthworks are completed with reference to the recommendations provided in DP (2019a) and DP (2019b).

Approximately 600,000 m^3 of fill is proposed to be imported to the site to meet proposed design levels. An assessment of potential geotechnical impacts associated with the imported fill are provided in Section 5.2.

5.2 Geology and Soil

Reference to the *Penrith 1:100 000 Geological Series Sheet* indicates that the site is underlain by Bringelly Shale (shown as light blue) of the Wianamatta Group of Middle Triassic age and Fluvial Sediments (shown as yellow) of Quaternary Period (as shown in Figure 2). Most of the site is underlain by the Bringelly Shale formation typically comprising shale, carbonaceous claystone, laminite, fine to medium grained lithic sandstone and some coal bands and tuff. The north-eastern portion of the site is underlain by fluvial (stream deposited) soils comprising fine grained sand, silts and clays.

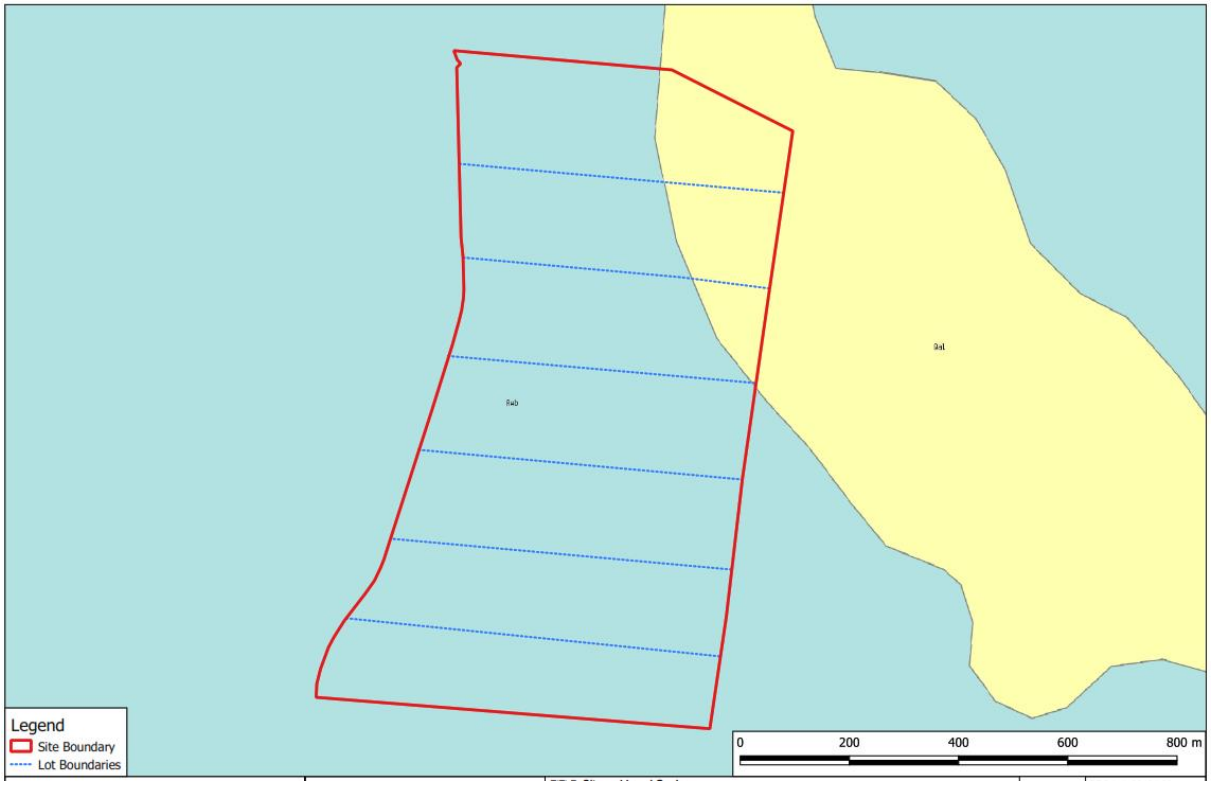


Figure 2: Regional Geology relative to the site.

Reference to the Penrith 1:100 000 Soils Landscape Sheet indicates that the site comprises the following soil types as shown on Figure 3:

- Residual soils of the Blacktown Landscape (shown as dark green);
- Erosional soils of the Luddenham Landscape (shown as pink); and
- Alluvial soils of the South Creek Landscape (shown as light green).

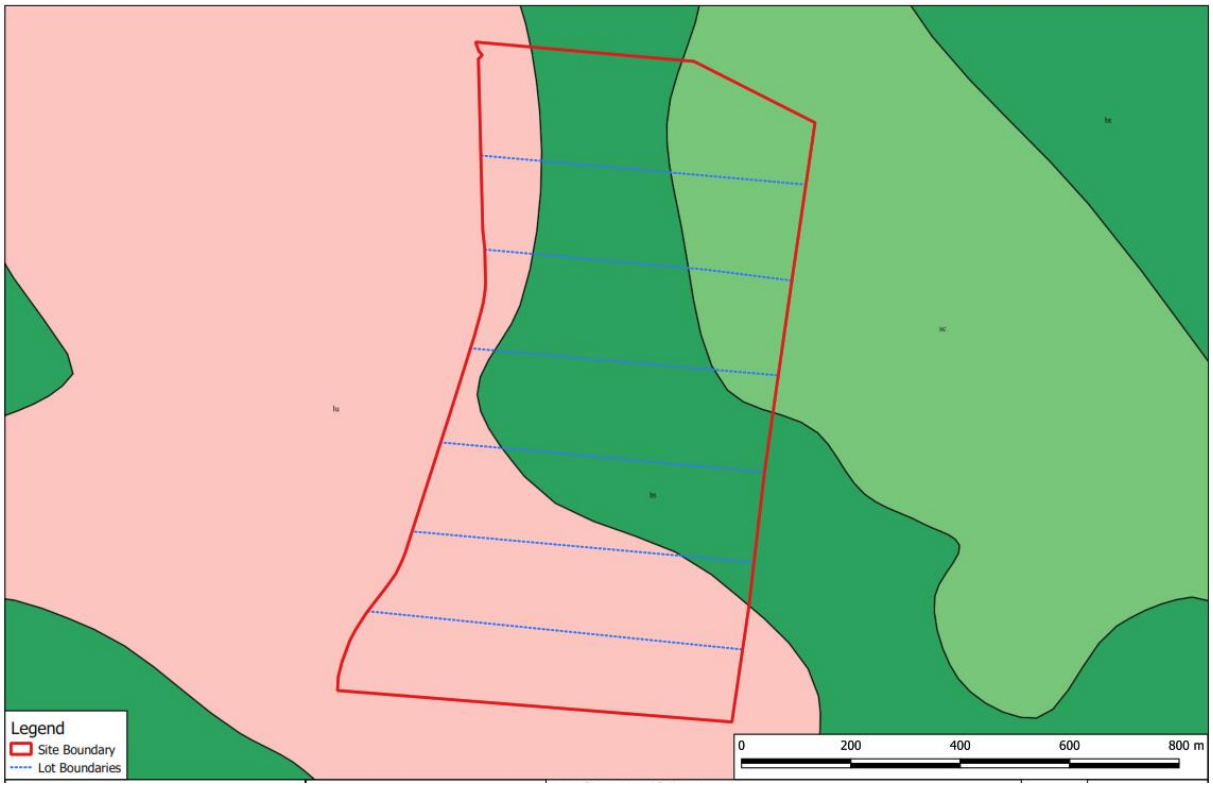


Figure 3: Regional Soil relative to the site.

Subsurface conditions at the site encountered during geotechnical investigations are discussed in DP (2019a) and DP (2019b) provided in Attachment 2, and are summarised below:

Relatively uniform conditions were encountered underlying the site, with the general succession of strata broadly summarised as follows:

- TOPSOIL FILL – silty clay topsoil and topsoil fill to depths of 0.1 – 0.3 m;
- FILL – silty clay with some anthropogenics to depths of 0.2 – 1.4 m. Subsequent contamination investigations (as discussed in DP, 2020) identified fill to depths up to 2.7 m in Lot 22;
- Residual Soil – variably stiff to hard silty clay to depths of 0.6 – 3.3 m and to the termination depths of 3 m in a number of locations; and
- BEDROCK – initially extremely low to very low strength shale or sandstone at first contact at depths of 0.6 – 2.8 m and continuing to the termination depths of 3 m. Very low to medium strength shale, sandstone or siltstone was identified in cored boreholes to termination depths of up to 8.4 m.

The test pit and borehole logs are included in Attachment B and should be read in conjunction with the accompanying standard notes that define classification methods and descriptive terms.

Assessment of Potential Impacts

Bulk earthworks will include stripping of topsoil, desilting of dams and cut / fill earthworks.

Potential impacts associated with the construction activities include those associated with dust generation, sediment and erosion. The site construction and environmental management plan (CEMP) should include provision for dust controls in line with NSW Government guidance.

Sediment and erosion controls should be designed in accordance with Managing Urban Stormwater – Soils and Construction (Landcom, 2004). Further details of proposed sediment and erosion controls are provided in the AT&L *Civil Infrastructure Report*.

The geotechnical suitability to reuse stripped topsoil within the site may be constrained by the organic content of the material. Geotechnically unsuitable material could potentially be re-used in non-structural areas of the site or disposed from the site with reference to Waste Classification Guidelines, Part 1: Classifying Waste (NSW EPA, 2014)

Approximately 600,000 m^3 of fill is proposed to be imported as part of the development. The quantum of import may require in the order of 60,000 truck (and dog) movements into and from the site to complete the filling. Truck movements associated with the filling should be considered as part of the traffic management planning.

A fill management protocol (FMP) should be prepared to control the quality of fill imported to the site. The FMP should include provision for the import of suitable waste material as defined in the (NSW EPA, 2014) (ie: Virgin Excavated Natural Material) or material appropriately classified under a NSW EPA resource recovery order (Excavated Natural Material for example). Additionally, the FMP should provide controls regarding the suitability of imported material from a salinity and geotechnical perspective.

DP (2020) notes the presence of a number of areas of environmental concern requiring remediation and / or management, with reference to Managing Land Contamination, Planning Guidelines, SEPP 55 – Remediation of Land (NSW DUAP/EPA, 1998) prior to the site being considered suitable for the proposed development.

5.3 Groundwater

Groundwater was observed during DP (2019a) in Pit 4 and Pit 11 at depths of 2.5 m (RL59.1 AHD) and 3 m (RL61 AHD), respectively. Both pits are located in the north eastern portion of the site, adjacent to the tributary to Ropes Creek (as Shown on Drawing 1). No free groundwater was observed in the remaining pits for the short time that they were left open or in boreholes whilst auger drilling. The use of water as a drilling fluid precluded groundwater observations whilst core drilling. It is also noted that the pits and boreholes were immediately backfilled following excavation, which precluded longer term monitoring of groundwater levels. Groundwater levels are affected by factors such as soil permeability and weather conditions, and can therefore vary with time.

A search of the NSW Department of Primary Industries (DPI) groundwater bore database confirms that no registered groundwater bores are located within 1 km of the site boundary. The nearest groundwater bore (GW 100290) is located approximately 1.6 km northeast of the site and is registered for monitoring purposes.

General features of the hydrogeology of western Sydney which are relevant to this site are described in the following and summarised further below:

- Old (1942) *The Wianamatta Shale Waters of the Sydney District, NSW Agricultural Gazette*, pp 215 - 221;
- Wooley (1991) *Groundwater in Jones DC and Clark NR (editors) Geology of the Penrith 1:100 000 sheet,* pp 119 - 121. NSW Geological Survey, Sydney, 202p;
- McNally (2004) *Shale, Salinity and Groundwater in Western Sydney*, Australian Geomechanics 39(3), pp 109 - 123;
- McNally (2009) *Soil and Groundwater Salinity in the Shales of Western Sydney, Groundwater in the Sydney Basin Symposium,* International Association of Hydrogeologists, pp 228 - 235; and
- Russell G, McKibbin D, Williams J and G A Gates (2009) *Groundwater Resource Assessment of the Triassic rocks of the Sydney Basin, Groundwater in the Sydney Basin Symposium*, International Association of Hydrogeologists, pp 312 - 328.

Groundwater is typically found in two zones within the Wianamatta shales, both shallow and deep, neither of them very permeable. The upper zone, comprises water contained within the residual soils and colluvium derived from the shales, and in the shale weathering profile itself, to a typical depth of 3 – 10 m. This zone is typically expressed as a “perched” system and expresses itself as seepage at the soil rock interface. The lower shale bedrock zone occurs below the base of weathering. Neither zone would normally be regarded as an aquifer, meaning a soil or rock layer able to transmit groundwater in sufficient quantity and adequate quality to support producing wells. The general characteristics of such tight aquifers, which are better thought of as leaky aquicludes or ‘aquitards’, include:

- Low, but variable, hydraulic conductivity, very limited storage and low well yield – typically less than 1 L/s or 0.1 ML/day.
- The water-bearing fractures are impersistent, widely spaced and in particular, poorly interconnected. These ‘aquifers’ can therefore be visualised as a complex of stacked and sporadically distributed ephemeral perched water tables rather than a single saturated zone, and it is questionable whether a continuous water table can be said to exist.
- Boreholes and piezometers may appear to be dry when first drilled, yet slowly fill with water over several weeks.
- Piezometer recovery time following bailing is very slow and SWLs may fluctuate by a number of metres over many months (and up to 9 m over three drought years).

Groundwater follow direction in the shallow regolith zone is expected to be consistent with the general topography of the site.

Assessment of Potential Impacts

Extractive groundwater activities are not proposed as part of the development.

The Bulk Earthworks Cut/Fill Plan indicates that existing ground surface levels will be reduced by up to 10 m in parts of the site. These 'cut areas' of the site are located at current topographic high points and ridgelines. Excavation below 2 m in cut areas of the site has the potential to intersect and remove the shallow regolith zone. DP has estimated, based on the review of the Cut/Fill Plan, that cut areas greater that 2 m comprise between approximately 10% of the site.

The development is unlikely to intersect the lower shale bedrock zone.

The SEARs require that consideration be given to the development works with reference to the *NSW Aquifer Interference Policy* (DPI, 2012). The purpose of this Aquifer Interference Policy is to explain the role and requirements of the Minister administering the Water Management Act 2000 in the water licensing and assessment processes for aquifer interference activities under the Water Management Act 2000 and other relevant legislative frameworks. The Aquifer Interface Policy:

- Clarifies the requirements for obtaining water licences for aquifer interference activities under NSW water legislation; and
- Establishes and objectively defines considerations in assessing and providing advice on whether more than minimal impacts might occur to a key water-dependent asset.

The Aquifer Interference Policy applies to all aquifer interference activities but has been developed in particular to address the high-risk activities including: mining, extractive industries, coal seam gas activities, dewatering, injection work activities with the potential to contaminate groundwater or result in unacceptable loss of storage or structural damage to an aquifer. The proposed development is not associated with any of the above high-risk activities.

DP considers the following with reference to the proposed development and the Aquifer Interference Policy:

- A water licence under the Water Management Act 2000 is not required given that water will not be removed from the aquifer, or moved from one part of the aquifer to another part of the aquifer, or to another source;
- The shallow regolith zone (aquifer) is defined as a "less productive" porous and fractured rock source (based on high total dissolved salts and low yield);
- Minimal impacts to the shallow regolith zone are likely based on qualitive assessment of the proposed development with reference to the thresholds provided in Table 1 of the Aquifer Interference Policy. DP therefore considered that further investigation or management with reference to the Aquifer Interference Policy is not required.

5.4 Surface Water

The site comprises pervious surfaces and includes a number of unnamed first order water courses and farm dams. A tributary to Ropes Creek is present in the north eastern portion of the site. Surface water flows at the site are likely to follow topographic contours, draining into northern or southern catchments

The AT&L *Civil Infrastructure Report* includes stormwater flow modelling and proposed stormwater management measures to be implemented as part of the proposed development. The measures include construction of the stormwater network (pipes and pits) and on-site detentions OSD basins and water-sensitive urban design (WSUD). The measures have been designed to control peak stormwater flows in downstream areas and total suspended solid loads. The report also includes a soil and water management plan (SWMP) including erosion and sediment controls. Cardno are undertaking a flooding assessment on the site

AT&L *Civil Infrastructure Report* includes reference to Ecological Australia's comments regarding the proposed development with reference to *The Guidelines for Controlled Activities on Waterfront Land* (NSW NRAR, 2018). As there are no specific geotechnical considerations, DP has not commented further on controlled activities on waterfront land.

Assessment of Potential Impacts

Based on the review of the AT&L *Civil Infrastructure Report* and subject to the implementation of the outlined stormwater management measures, WSUD and the SWMP, DP does not consider the proposed development will impact water resources, hydrology, drainage line, downstream water courses or riparian land from a geotechnical perspective.

5.5 Groundwater Dependant Ecosystems

Review of the *Groundwater Dependant Ecosystem Atlas* (BOM, 2020) did not identify any GDE within the site. As shown in Figure 5, areas identified as Cumberland River Flat Forest (GDE) are present within the Ropes Creek riparian area to the north east of the site.

Assessment of Potential Impacts

Given the minimal impact to the saline low yielding shallow regolith groundwater zone at the site (Section 5.4) and the location of Cumberland River Flat Forest with reference to the site, DP does not consider that impacts to groundwater associated with the proposed development will significantly affect GDE.

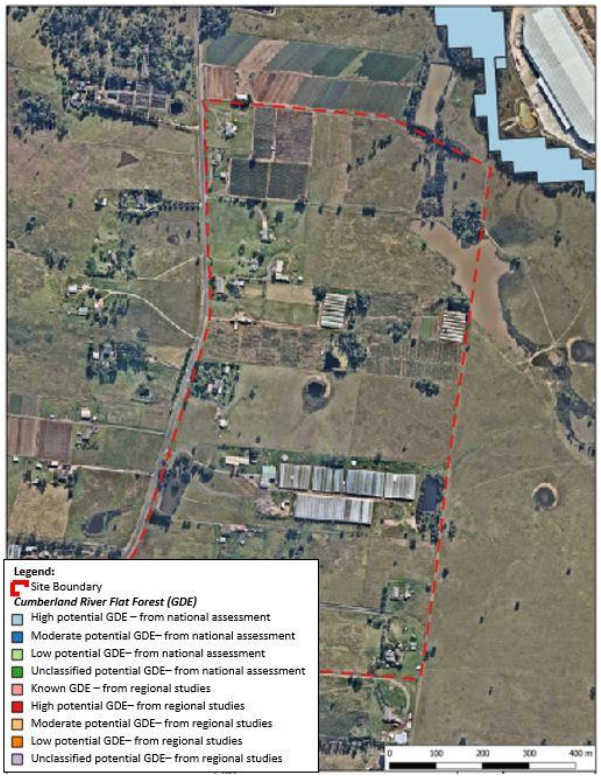


Figure 4: GDE in close proximity to the site.

5.6 Warragamba Pipelines Corridor

The Warragamba Pipeline Corridor is located approximately 1.5 km north of the site.

Assessment of Potential Impacts

Given the distance from the site, DP does not consider there to be potential geotechnical impacts to the corridor associated with development of the site.

5.7 Salinity

Reference to the Map of Salinity Potential in Western Sydney (refer Figure 5) infers known salinity and high salinity potential around the primary creek line / dam in the northeast corner of the site and moderate salinity potential for the remainder of the site. It is noted that the mapping is based on soil type, surface level and general groundwater considerations and, as such is approximate only.

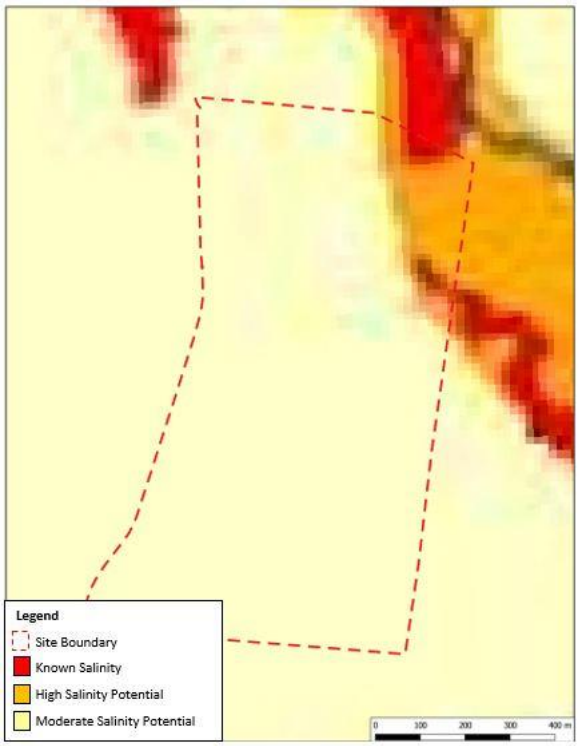


Figure 5: Salinity Mapping

Soil samples collected during the DP (2019a) and DP (2019b) geotechnical investigations were analysis for salinity characteristics. Material within the site was characterised as follows:

- Non to mildly aggressive to concrete.
- Non to moderately aggressive to steel.
- Non to very saline.
- Non to very sodic (erosional).

Assessment of Potential Impacts

Mild to moderate aggressivity to concrete and steel, the presence of slightly saline to very saline material and sodic soils are naturally occurring features of the local landscape and are not considered to be significant impediments to the proposed development, provided that appropriate remediation or management techniques are employed.

Salinity and aggressivity affect the durability of concrete and steel by causing premature breakdown of concrete and corrosion of steel. This affects the longevity of structures in contact with these materials. Therefore, additional salinity investigation and preparation of a salinity management plan is recommended to delineate saline areas and provide appropriate recommendations during the development process.

Sodic soils have low permeability due to infilling of interstices with fine clay particles during the weathering process, restricting infiltration of surface water and potentially creating perched water tables, seepage in cut faces or ponding of water in flat open areas. In addition, sodic soils tend to erode when exposed. Management of sodic soils is therefore required to prevent these potentially adverse effects.

5.8 Acid Sulfate Soils

Review of Acid Sulfate Soils Risk Mapping (OEH, 2020) indicates that the site is classified as having *'no known occurrence of acid sulfate soil'.*

Assessment of Potential Impacts

Based on the review of mapping, DP does not consider the proposed development to be impacted by acid sulfate soils.

6. References

BOM (2020), *Groundwater Dependant Ecosystem Atlas.* Australian Government Bureau of Meteorology (online site accessed on 3 September 2020).

Landcom (2004), *Managing Urban Stormwater, Soils and Construction, Volume 1, 4th Edition March 2004* Landcom.

NSW DPI (2012), *NSW Aquifer Interference Policy*. NSW Department of Primary Industries - Office of Water.

NSW DUAP/EPA (1998), *Managing Land Contamination, Planning Guidelines, SEPP 55 – Remediation of Land* NSW Department of Urban Affairs and Planning / Environment Protection Authority.

NSW EPA (2014), *Waste Classification Guidelines, Part 1: Classifying Waste* NSW Environment Protection Authority.

NSW NRAR (2018), *NSW Guidelines for Controlled Activities on Waterfront Land – Riparian Corridors* NSW Natural Resource Access Regulator.

OEH (2020), *Acid Sulfate Soils Risk Mapping*, NSW Government Office of Environment and Heritage

7. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at 200 Aldington Road, Kemps Creek in accordance with DP's proposal MAC200177.P.001 dated 24 June 2020. The work was carried out under Fife Kemps Creek Pty Limited Contract Standard Consulting Terms (Design). This report is provided for the exclusive use of Fife Kemps Creek Pty Limited for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

Please contact the undersigned if you have any questions on this matter.

Yours faithfully
Douglas Partners Pty Ltd

Rod Gray
Senior Associate

Reviewed by

Christopher C Kline
Principal

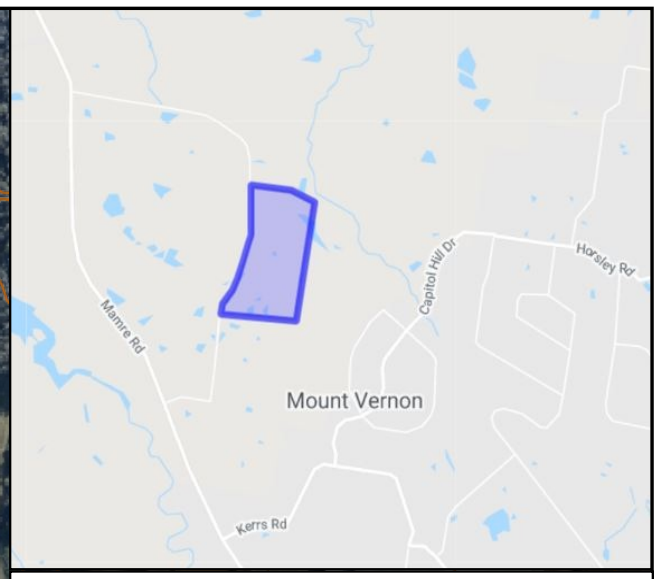
Attachment 1: Drawing 1

Legend

- 2019a Test Pit Locations
- 2019a Borehole Locations
- 2019b Test Pit Locations
- 2019b Borehole Locations
- Site Boundary
- Lot Boundary

NSW 2m Elevation Contours

Elevation Contours: 2m Interval (AHD)



Site Locality

Tributary of South Creek

Lot 32

Lot 31

Lot 30

Lot 23

Lot 22

Lot 21

Lot 20

0 100 200 300 400 m

Douglas Partners Geotechnics / Environment / Groundwater	TITLE: **2019a and 2019b Test Locations Geotechnical and Groundwater Summary 200 Aldington Road, Kemps Creek**		N MGA	OFFICE: Macarthur
				DRAWN BY: KLM
				DATE: 18.09.2020
CLIENT: Fife Kemps Creek Pty Limited	PROJ. #: 92421.00.R.002	DRAWING No: 1	REVISION: 0	SCALE: As Shown