Douglas PARTNERS | GROUNDED EXPERTISE

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RCB

Report on Groundwater Review
Westlink Industrial Estate – Stage 2
Abbotts Road, Kemps Creek

1. Introduction

This report presents the results of a groundwater review undertaken by Douglas Partners Pty Ltd (DP) for Stage 2 of the Westlink Industrial Estate located at Abbotts Road, Kemps Creek. The review is in response to items raised by the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) in their correspondence dated 1 October 2024 (Ref: OUT24/15236). The review was requested by ESR Australia (ESR), and targets close out responses to the items raised by DCCEEW.

2. Background

The Westlink Industrial Estate is situated on the eastern side of Mamre Road and is accessed from the eastern end of Abbotts Road (northern side of the site) in Kemps Creek. Collectively, the estate includes six industrial lots that will be occupied by industrial warehouses of varying size.

Stage 1 includes the three primarily western lots with road frontages to the existing parts of Abbotts Road and Mamre Road (Lots 1, 3 and 6) and is currently under construction. Stage 2 includes the remaining three 'internal' lots (Lots 2, 4 and 5) that are situated within the uphill eastern part of the estate.

The Stage 1 and Stage 2 developments are similar and will require similar bulk earthworks in terms of proposed site cut depths and fill thicknesses. Deep cuts (typically between 8 m and 14 m but up to 18 m) are proposed along the eastern boundary of Stage 2 (i.e. all of Lot 2 and the eastern side of Lot 4) and significant fill thicknesses are proposed throughout the western part of Lot 4, and across all of Lot 5 (including Lots 5A and 5B). This is similar to the Stage 1 development, where extensive cuts occurred throughout the eastern half of Lot 1 (approx. 26 m) and eastern side of Lot 3 (approx. 8 m) and significant fill thicknesses were placed throughout the western half of Lots 1 and 3 (approx. 16 m and 12 m, respectively) and throughout all of Lot 6 (approx. 6 m). Comparatively, Stage 2 cut depths are shallower than those undertaken in Stage 1.

The Stage 2 site layout is shown in Figure 1.

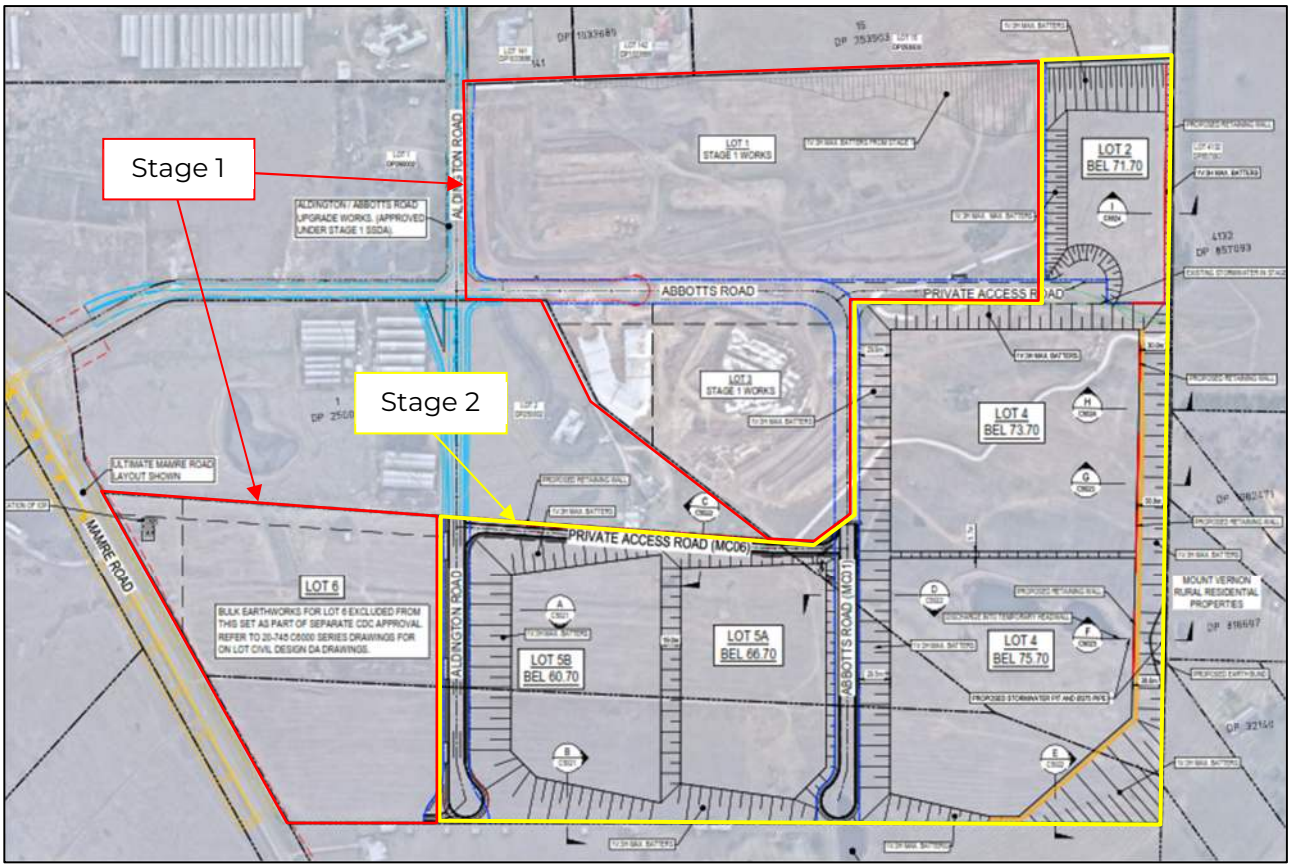

Figure 1: Westlink Estate Site Layout Highlighting Stage 2

3. Site Description

The Westlink Industrial Estate occupies previous rural and market garden lands that shortly prior to the current developments presented as grassed paddocks and scattered, overgrown remnant market garden beds. Ground surface levels vary considerably across the site with the higher surface levels present along localised hills situated on or near the eastern estate boundary and lower surface levels present along the western Mamre Road boundary.

Ground surface reduced levels within the site vary from RL 90 and RL 98, relative to Australian height datum (AHD) along the eastern boundary to RL 43 along the western boundary. Regionally, the highest ground surface levels in the area extend to RL 100 at two peaks within 10 m and 100 m of the eastern boundary. The lowest ground surface levels fall to RL 38 at an existing creek line situated approximately 250 m west of Mamre Road. Comparatively, site levels within the estate essentially match the full range of ground surface levels within the surrounding area.

Geologically, the higher ground levels in the eastern part of the site are associated with undulating land that is underlain by Bringelly Shale. The lower ground levels in the western part of the site are associated with Quaternary Alluvium that overlies the Bringelly Shale. Accordingly, the western part of the site includes an alluvial soil layer (includes sandy and gravelly components) over the deeper residual clay soil layers, whereas the higher eastern site area

exposes residual clay soils at the ground surface. The alluvial soils are more prone to the effects of groundwater, which is typically perched on top of the less permeable residual clays.

4. Previous Geotechnical Investigations

The whole of the Westlink Industrial Estate has undergone several geotechnical investigations undertaken by DP (essentially all proposed lots) and by Alliance Geotechnical Pty Ltd (AG, primarily proposed Lots 1 and 2). Investigations were staged based on previous property acquisitions and additionally for assessment of deep cuts along the eastern part of the estate.

The results of the various geotechnical investigations are presented in the following reports:

- Report on Preliminary Geotechnical Investigation (Ref: 92352.00.R.002.Rev0, dated 19/8/2019, prepared by DP). This report covered three previous properties located at the eastern end of Abbotts Road (covering the balance of proposed Lots 1 and 2, all of Lot 3 and most of Lot 4).
- Geotechnical Investigation Report (Report No. 9687-GR-1-1, dated 25/10/2019, prepared by AG). This report covered the property to the north of Abbotts Road (covering most of proposed Lots 1 and 2).
- Report on Geotechnical Due Diligence Assessment (Ref: 207450.00.R.001.Rev0, dated 20/12/2021, prepared by DP). This report covered the southern previous property fronting Mamre Road (covering the southern part of proposed Lots 6, 5 and part balance of Lot 4).
- Report on Geotechnical Due Diligence Assessment (Ref: 211619.00.R.001.Rev0, dated 30/3/2022, prepared by DP). This report covered the northern previous property fronting Mamre Road (covering the northern part of proposed Lots 6, 5 and part balance of Lot 4).
- Report on Supplementary Geotechnical Investigation (Ref: 92352.03.R.001.Rev1, dated 20/12/2023, prepared by DP). This report targeted the deep cuts proposed for Stages 1 and 2 along the eastern parts of proposed Lots 1, 2 and 4.
- Report on Geotechnical Investigation (Ref: 92352.07.R.001.Rev0, dated 5/12/2023, prepared by DP). This report specifically covered proposed Lot 6 fronting Mamre Road (Stage 1).
- Report on Geotechnical Investigation (Ref: 92352.08.R.001.Rev0, dated 6/12/2023, prepared by DP). This report specifically covered proposed Lot 3 fronting Abbotts Road (Stage 1).

Collectively, the various investigations covered the whole of the estate and included subsurface geotechnical investigations totalling 36 boreholes and 93 test pits. Subsurface investigations extended to depths of between 0.2 m and 28.5 m, with the deeper boreholes all extending to at least 3 m to 8 m below the proposed deepest cut depth corresponding to their site location.

5. Known Groundwater Conditions

A review of the results of all geotechnical investigations undertaken on the site has shown that groundwater was encountered during the various investigations at 5 of the 93 test pits (5.4%) and at 10 of the 36 boreholes (27.8%). Collectively, this equates to 15 of the 129 test locations (11.6%). Most of the test locations where groundwater was encountered were situated in lower-lying site areas, and mostly within Stage 1 of the estate.

Table 1 provides a summary of the test locations where groundwater was encountered during the various geotechnical investigations.

Table 1: Summary of Groundwater Occurrences

Location	Depth	RL	Stage	Site Area	Comment
92352.00.R.002					
TP1	2.2	52.1	1	Proposed Lot 3	NA
211619.00.R.001					
TP1	3.0	55.9	2	Proposed Lot 5A	Relevant to Stage 2
TP4	2.5	51.1	2	Proposed Lot 5B	Relevant to Stage 2
TP7	2.5	39.9	1	Proposed Lot 6	NA
TP8	2.5	50.3	2	Proposed Lot 5B	Relevant to Stage 2
92352.07.R.001					
BH201	2.5	40.7	1	Proposed Lot 6	NA
BH202	5.3	41.0	1	Proposed Lot 6	NA
BH205	5.5	37.5	1	Proposed Lot 6	NA
BH206	3.5	41.3	1	Proposed Lot 6	NA
BH207	4.5	42.8	1	Proposed Lot 6	NA
BH208	4.2	39.4	1	Proposed Lot 6	NA
BH209	8.8	38.2	1	Proposed Lot 6	NA
BH210	4.5	38.0	1	Proposed Lot 6	NA
BH211	7.2	38.2	1	Proposed Lot 6	NA
92352.08.R.001					
BH401	3.7	53.8	1	Proposed Lot 3	NA

The groundwater data presented in Table 1 shows that most groundwater occurrences during the geotechnical investigations were located within Stage 1, proposed Lots 6 and 3. Lots 6 and 3 are situated in lower-lying areas of the site along Mamre Road and at the toe of the hillside separating the higher and lower land surfaces centrally within the estate. For the Stage 2 occurrences, these were situated within proposed Lots 5A and 5B, which are situated centrally near the toe of the hillside separating the higher and lower land surfaces, similar to Stage 1, proposed Lot 3.

At all three locations within Stage 2, the groundwater was encountered at depths of 2.5 m to 3 m below existing ground surface levels and in the alluvial soil profile. It is considered that this groundwater is derived from two sources, including surface run-off from the higher hillsides in the east collecting in the lower-lying areas and permeating into the sandier and partly gravelly alluvial clay soils, and from groundwater seepage entering the site from the west due to the influences of the nearby creek.

Groundwater has not been encountered in the residual soils on the site or within the higher ground surface levels in the eastern part of the site.

In addition to the results of the geotechnical investigations, excavation of deep cuts within Stage 1 along the northern and eastern sides of Lot 1 has not encountered any significant groundwater during construction. Excavations were formed to 20+ m depth around Lot 1 and have since been supported by anchored and shotcreted retaining walls. DP personnel has been present on the site during construction of the retaining walls and Figure 2 shows a typical appearance of the excavation conditions encountered.

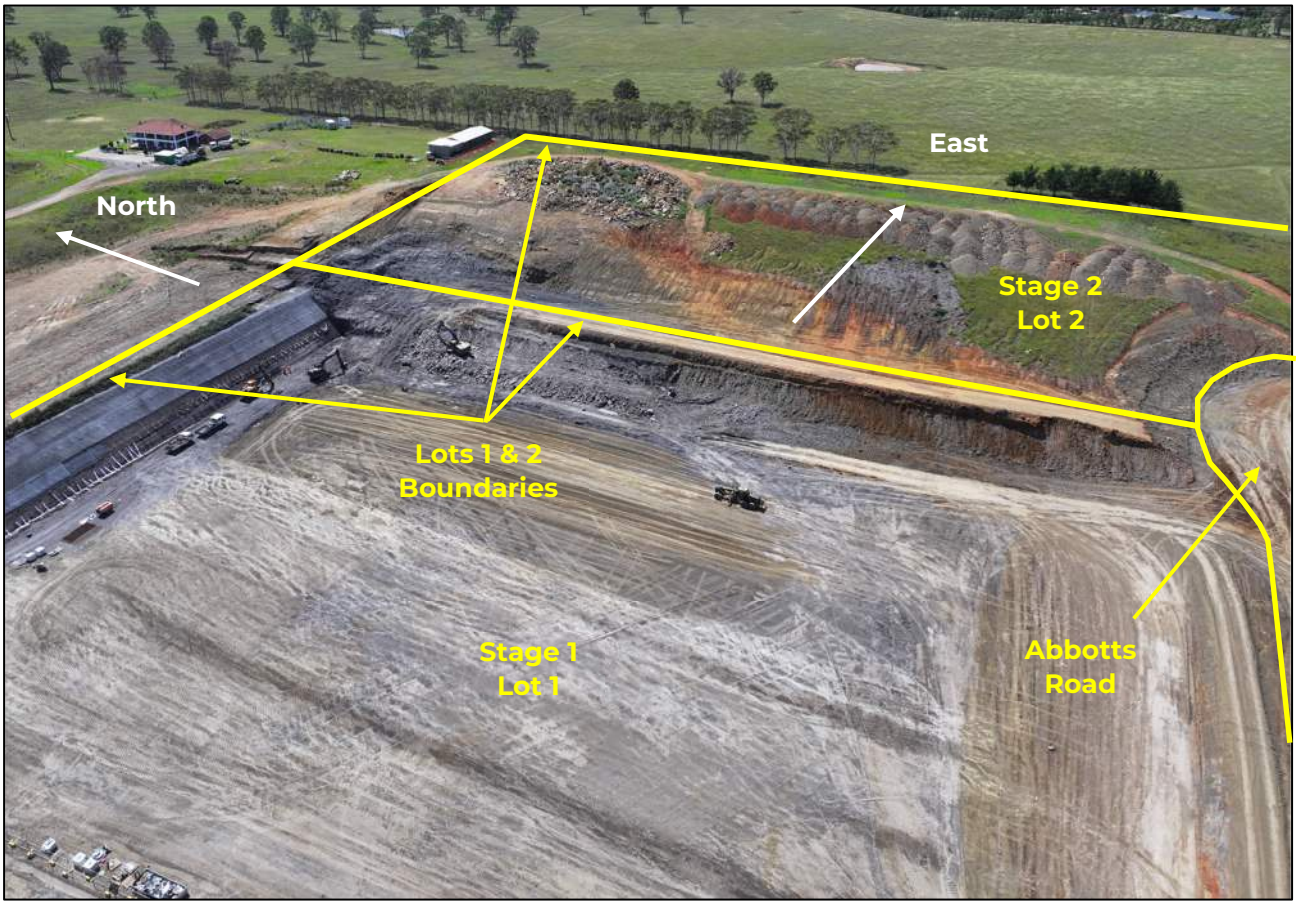

Figure 2: View of Deep Excavation Faces in Stage 1

From Figure 2, it can be seen that the deep cut faces created in Stage 1, Lot 1 are dry and did not intersect any significant groundwater bearing or seepage zones. Excavation depths in Figure 1 are up to 20+ m deep. It is also evident from the figure that there is no significant up-gradient catchment from which groundwater can be derived. Accordingly, the groundwater conditions experienced within Stage 1 can be considered equivalent to those likely to be encountered during Stage 2 works.

6. Review Findings

Based on the results of the geotechnical review of groundwater conditions on the Westlink Stage 2 site, it is evident that all groundwater previously encountered within Stage 2 occurred at

reduced levels of RL 55.9 or lower. With reference to the excavation depths proposed for the Stage 2 lots, the base of all excavations lie well above the groundwater levels. Excavation levels at the base of cuts in proposed Lots 2, 4, 5A and 5B lie between RL 60.7 and RL 75.7, approximately 5 m to 20 m above the highest recorded groundwater occurrence on the site.

Based on the review, it is considered highly unlikely that groundwater will be encountered during the creation of cuts along the eastern site of Stage 2. From the results of the various geotechnical investigations, and from work already performed on the site, the deep cuts proposed within Stage 2 will not intersect any significant groundwater bearing aquifers or groundwater seepage zones, and thus there should be no need for the assessment of groundwater take. Similarly, there is no need for a water access licence for this development.

Whilst there is always some chance that minor groundwater seepage flows may be experienced from time to time, based on the results of the investigation and the work performed on site, it is clear that seepage flows, if encountered, would be ephemeral, localised and of a minor nature. Accordingly, it is recommended that all retaining walls constructed on the cut rock faces include evenly spaced strip drains to collect any minor seepage, if it occurs, and that the drains are connected to an appropriate stormwater/discharge pit.

7. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at Abbotts Road, Kemps Creek in accordance with instructions received from Grace MacDonald of ESR Australia Pty Ltd. The work was carried out under Douglas' Engagement Terms. This report is provided for the exclusive use of ESR Australia Pty Ltd 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.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after Douglas' field testing has been completed.

Douglas' advice is based upon the conditions encountered during our various previous investigations undertaken across the site. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

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

Yours faithfully
Douglas Partners Pty Ltd

Ray Blinman
Principal

Reviewed by

Scott Easton
Principal

Attachments: About this Report

About this Report

October 2024

Introduction

These notes have been provided to amplify Douglas' report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

Douglas' reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, Douglas will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, Douglas cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, Douglas will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, Douglas requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. Douglas would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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