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Project 85716.00
29 November 2016
R.001.Rev0
RKL:pc

Email: cathy@elanoracc.com.au

Dear Sirs

Preliminary Geotechnical Assessment
Elanora Country Club
Elanora Road, Elanora Heights

1. Introduction

This report presents the results of a preliminary geotechnical assessment carried out for the proposed "Club Residential" at Elanora Country Club, Elanora Road, Elanora Heights. The work was carried out at the request of Cathy Neagle of Elanora Country Club.

It is understood that this report will support a rezoning and subsequent Development Application (DA) to Northern Beaches Council and provide preliminary information with respect to geotechnical issues for preliminary design and costing purposes. It is noted that part of the overall Country Club site is located within the (former) Pittwater Council H1 Geotechnical Hazard Zone.

The information supplied for use in the assessment comprised the Master Plan 2016 prepared by Rice Daubney. The information indicates that, in summary, the proposed residential development on the site will include a series of six, residential unit blocks stepping down the site towards the south with a new access road linking the existing entry driveway to the Club to the bend in Iluka Avenue (refer to Drawing 1):

The assessment comprised a detailed geotechnical inspection of the subject property and adjacent areas by a senior engineering geologist, as well as photography of the site and adjoining areas. Details of the field work are given in this report, together with comments relating to the geotechnical model of the inferred subsurface profile, identification, description and reporting of geotechnical hazards, slope stability, as well as preliminary design parameters, recommendations for construction practice and supplementary geotechnical investigation.

2. Site Description and Geology

The site is located on the western side of Elanora Road, Elanora Heights (refer to Drawing 1 and Photo 1) It is a large, irregularly shaped area comprising a small part of the overall Elanora Country Club site .

The area of proposed development for the "Club Residential" (refer to Photo 1) is located primarily on the southern side of the existing entry road to the Club and is occupied by undeveloped bushland which slopes downwards towards the south. It is bounded by the following general areas and development;

- to the east and south by residential properties of Elanora Road and Iluka Avenue;
- to the south-west by bushland;
- to the west by a practice driving fairway and a large putting green nursery;
- to the north-west by rocky outcrop then an existing bowling green and small works shed; and
- to the north by rocky outcrop, then the existing Club entry road.

The area slopes towards the south in a series of stepped sandstone outcrops with intermediate gently to moderately sloping areas with little to no outcrop, generally sandy soils with dense scrub/ undergrowth and moderately spaced trees of up to about 15 m height. There are no well-defined, natural creeks or drainage lines observed, however the eastern boundary forms a drainage path formed in part by the developments on the adjoining residential properties and there is a drainage channel/berm across the lower, southern slope (refer to Photos 1, 2 and 3).

There is an overall difference in elevation from the entry road to opposite the bend of Iluka Avenue of about 30 m giving an overall average slope angle of 8^{o}.

The sandstone outcrops typically range in height from less than 1 m up to about 4 m, towards the north-eastern part of the area, adjoining the property at 152 Elanora Road (refer to Photo 15). Most of the outcrops can be relatively easily negotiated on foot with deviation of less than about 20 m to access the next lower part of the site.

There are a number of apparently disturbed areas (refer to Photo 1), typically identified by the presence of weeds and other introduced plant species. These areas are located adjoining the nursery green, the low, southern side of the bowling green maintenance building and along parts of the eastern boundary. The lower, southern part of the site (refer to Photos 2 and 3) comprises maintained lawn with some areas of sandstone outcrop.

Knowledge of the local area and reference to the Sydney 1:100 000 Geological Series Sheet 9130, indicates that most of the site is underlain by the Hawkesbury Sandstone. The Hawkesbury Sandstone generally comprises medium to coarse grained quartz sandstone with minor shale and laminite lenses, as seen on the upper north-western parts of the site. These conditions were confirmed by the site observations and fieldwork.

3. Field Work

3.1 Site Observations

The site was inspected by a senior engineering geologist on 1 November 2016. The field work comprised detailed inspection of the site and adjoining areas of bedrock outcrop together with a series of probes, generally across the lower part of the site. The locations of selected site features, test probe locations, rock outcrop and photo locations are indicated on Photo 1.

The main site observations are:

- most of the proposed development area comprises undeveloped natural bush land adjoined by residential allotments to the east (some with significant areas/depths of filling), filling to the west, associated with a fairway and practice green/nursery and minor filling on the southern side of the bowling green works sheds.
- the sandstone outcrop typically comprises medium to high strength sandstone with evidence of the typical main joint sets in the Hawkesbury Sandstone in the Sydney area. These typically comprise two sets of near-vertical joints striking just east of north (020^{o}) and just south of east (110^{o}). These joints present as gully features adjoining the southern side of the existing bowling green area and elsewhere as the alignments of the steps and small cliff exposures in the sandstone.
- the sandstone comprised both massive beds, with individual bed thickness ranging from less than 0.5 m to in excess of 3 m (refer to Photo 15), as well as cross bedded stratum of up to about 2.5 m bed thickness (refer to Photos 6 to 8).
- there are numerous large, detached sandstone boulders and blocks across the north-western portion of the site, some of which comprise joint blocks as well as slabs of bedrock
- minor groundwater seepage was observed at a number of locations along the top of rock and the southern portion of the site (refer to Photos 2 and 3) has only a shallow soil cover (typically less the 0.5 m) which test probes indicated were moist to wet.
- there are a number of tracks (refer to Photos 4, 5 and 10) across the proposed development area and these typically have a relatively shallow sandy soil cover (less than 0.5 m) except for a number of minor outwash areas from the immediately upslope areas.
- the area along the adjoining eastern residential allotments appears to have most trees and dense vegetation removed (refer to Photos 10, 11 and 14), probably as a fire protection zone.

A number of test probes were also carried out across the lower, southern part of the development area (refer to Photo 1) and all encountered refusal at less than 1 m depth. The material inferred to overly bedrock was assessed as comprising typically very loose to loose sand.

4. Proposed Development

The information supplied indicates that, in a series of residential unit blocks are proposed for the area (refer to Drawing 1), stepping down towards the south with an access road to be constructed towards the eastern boundary of the Country Club site, in the area adjoining the neighbouring residences.

The detailed layout, anticipated levels and adjoining landscaping works have not been fully developed or finalised. However, it is anticipated that the development will incorporate a number of cut to fill construction platforms, potentially requiring excavation of up to about 3 m below existing site levels on the upslope side of the individual construction platforms and filling on the downslope sides.

5. Comments and Discussion

5.1 Geological Model

The interpreted geological model for the site comprises an overall gentle slope developed on the Hawkesbury Sandstone. The overall slope across the proposed development area is about 8^{o}, however there are numerous areas of sandstone outcrop with a number of areas of sandstone cliffs/ steps of up to about 4 m height.

The underlying geology, typically comprises bedrock of competent, medium and high strength sandstone, overlain by a generally shallow soil profile, where present, comprising sandy soils. The outcrop areas include numerous large, detached sandstone boulders and blocks, some of which comprise joint blocks as well as slabs of bedrock. These blocks, which whilst still in relatively horizontal orientation may have been moved relatively small (less than about 2 m to 3 m) lateral distances by root jacking processes (by existing and past trees) and the natural downslope geological weathering/erosional processes.

These conditions typically underlie the north-western portion of the development area whilst the south-eastern portion has a more gentle slope with less sandstone outcrop which is mantled by a shallow sandy soil profile.

The main areas of sandstone outcrop and larger detached blocks are shown on Plate 1, Photo 1.

5.2 Geotechnical Hazards and Stability Assessment

The area of proposed development, whilst located within the title area of the Elanora Country Club is outside the Geotechnical Hazard Area H1 identified on the (former) Pittwater Council mapping (extract attached).

It is therefore considered that addressing the specific criteria of the (former) Pittwater Council's Geotechnical Risk Management Policy (GRMP 2009) is not required. Having said this, general stability assessment and other slope related issues are discussed below.

Inspection of the overall slopes within the proposed development area indicated no evidence of significant slope instability in the recent past. The presence of the numerous sandstone boulders and detached bedding slabs are evidence of past geological weathering processes and there is some evidence of possible on-going creep and erosion movements of the sandy soils.

The sandy soils on the site will be highly susceptible to erosion where they are disturbed by the proposed development and appropriate soils erosion control measures, both temporary and permanent, will be required to ensure concentrated surface flows are not created.

With respect to specific landslide and geotechnical construction hazards which may affect the development, the precise details of the development are not yet known. However, it is likely that hazards which will need to be addressed could include;

- surface water flows from upslope areas/property potentially resulting in significant erosion/ slumping of slopes;
- rapid collapse of temporary excavations;
- possible undercutting and destabilisation of existing detached blocks;
- rapid collapse of any required retaining walls; and
- minor creep (and erosion) of the upper sandy soils.

It is considered that all these issues can be readily addressed by incorporating standard engineering design and conventional construction practices, including appropriate geotechnical inspections of excavations and foundation excavation/founding stratum.

5.3 Excavation

The final design and construction levels are not known, however it is anticipated that excavation (to varying depths) could be required for most of the proposed unit blocks and will encounter conditions ranging from sandy soils to sandstone bedrock of at least medium to high strength.

Excavation of soil and extremely low to low strength rock should be readily achievable using conventional earthmoving equipment. Excavation into sandstone of greater than low strength however, will require excavator mounted rock hammers, rock saws or milling heads.

Noise and vibration will be caused by excavation works, particularly where rock of greater than low strength is encountered. The supplied information indicates that the proposed unit construction will be in excess of 20 m from the nearest residential properties and therefore has a "rare" likelihood of adversely affecting the structures of the adjoining residences.

It is considered probable that the proposed new access road will also require excavation into bedrock to achieve acceptable grades. This excavation will be closer to the adjoining residence and excavation methods to reduce excavation induced vibration may be appropriate. These could include:

- initial removal and battering of overburden soils using an excavator bucket attachment;
- rock sawing around the perimeter of any required excavation;
- excavation of loose or rippable sandstone blocks by bucket or single tyne attachments;
- selective breakage along open joints where these are present;
- installation of close spaced saw cuts followed by the splitting along the cuts using single tyne ripper or single blows (ie. non continuous) of a rock breaker;
- progressive breakage from open excavated faces.

It is anticipated that seepage of ephemeral water, along the top of rock and from any structures within the rock (such as bedding planes and jointing) which are intersected by excavation will be an on-going issue which will require incorporation of appropriate control measures into the design of the structures.

Towards the northern part of the road it may be appropriate and beneficial to slightly realign the road to the west of the area of major outcrop adjoining the north-western corner of the property at 152 Elanora Road (refer to Photo 15).

5.3.1 Disposal of Excavated Material

It is anticipated that most, if not all, of the required excavation material could be used on site, either as filling material in the preparation of construction platforms or alternatively incorporated into landscaping works.

Any excavated materials in excess of what can be utilised on site will need to be disposed of in accordance with the provisions of the current legislation and guidelines including the Waste Classification Guidelines (EPA, 2014).

5.4 Excavation Support

Vertical excavations in any filling, soils and extremely low to low strength rock are not expected to be self-supporting. It is anticipated that generally sufficient space will be available for temporarily batters during construction where such materials are encountered.

5.4.1 Batter Slopes

Suggested maximum temporary and permanent batter slopes for unsupported excavations are shown in Table 1.

Table 1: Recommended Safe Batter Slopes

Exposed Material	Maximum Temporary Batter Slope (H : V)	Maximum Permanent Batter Slope (H : V)
Filling / sand	1.5 : 1	2 : 1
Stiff to hard clay and extremely low strength rock	1 : 1	2 : 1
Medium Strength or Stronger Sandstone	Vertical**	Vertical**

Note: * with 0.5m wide, clear horizontal bench adjacent to all excavations;
** Subject to jointing assessment by experienced Geotechnical Engineer / Engineering Geologist.

Competent medium strength or stronger sandstone will generally be stable when cut vertically provided there are no adversely oriented joints or other defects present. It is recommended that all vertical faces in rock be inspected by a geotechnical engineer, at maximum 1.5 m depth intervals, to check for adversely inclined joints and to assess whether removal or additional stabilisation measures (such as rock bolts or shotcrete) are required.

5.4.2 Retaining Structures

The requirement for retaining structures is not known at this stage; however it is recommended that all retaining walls in excess of 1 m high be engineer designed.

Retaining walls may be designed on the basis of an average unit weight of 20 kN/m^3 for filling and natural soils/clays, with a triangular earth pressure distribution calculated using an active earth pressure coefficient (Ka) value of 0.3 where some wall movement is acceptable, or an 'at-rest' earth pressure coefficient (Ko) value of 0.5 where wall movement is to be reduced.

The pressure distribution given above does not include hydrostatic pressure due to groundwater behind retaining walls, which should be included in the design unless adequate drainage is provided to prevent the build-up of hydrostatic pressures.

The design of batter slopes and retaining walls should account for surcharge loads, including storage of construction materials, adjacent pavements, access roads, buildings or similar. Design should also consider the effects of plant operating above the excavation and/or retaining walls during construction.

5.5 Foundations

It is recommended that all foundations for the proposed structures be taken down to the underlying sandstone bedrock. It is anticipated that the sandstone will be of at least low strength, and more likely medium to high strength across areas of significant excavation. It is anticipated that foundations are likely to comprise strip and pad footings in areas of significant excavation but could comprise bored piles in other areas, particularly across the downslope sides of any filled construction platforms.

It is considered that foundations could be proportioned based upon an allowable design bearing pressure of 1000 kPa for sandstone of at least low strength. Such foundations would be expected to experience total settlements of less than 1% of the footing width under the applied working load, with differential settlements between adjacent footings expected to be less than half of this value. It is likely that greater bearing pressure may be possible if required, subject to appropriate investigation, inspection during construction and possible spoon testing of the footings.

All footings should be founded below a line extending upwards at an angle of 45° from the base of any adjacent excavations and all footing excavations should be inspected by a geotechnical engineer to confirm that foundation conditions are suitable for the design parameters. It may also be appropriate to reduce the design bearing pressure of any footings near the crests of deep excavations and such footing excavations must be inspected by an engineering geologist to assess the adjacent excavation for the presence of adversely oriented jointing which could affect the stability of the excavation and footing.

Subject to the nature of the design and construction, it is suggested that the incorporation of construction joints may be appropriate where/if structures span across significant changes in the bedrock/founding level.

5.6 Further Investigation

It is recommended that following receipt the DA for the development and confirmation of the design layout additional detailed geotechnical investigation be carried out. Such assessment may be limited to additional site inspection, however it is possible that the additional investigation could include cored boreholes located at areas of maximum excavation.

The additional investigation would enable optimisation of excavation design, foundation design and provide indications of potential support requirements for any required excavations.

6. Limitations

Douglas Partners (DP) has prepared this report for this project at Elanora Country Club in accordance with DP's proposal dated 17 October 2016 and acceptance received from Cathy Neagle of Elanora Country Club, dated 18 October November 2016. The work was carried out under DP's Conditions of Engagement and this report is provided for the exclusive use of Elanora Country Club and their consultants for this project only and for the purposes as described in the report. It should not be used by or be relied upon for any other projects or purposes on the same or another 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 observed 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 and 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. Such changes may occur after DP's field work has been completed.

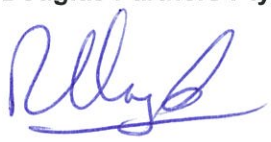
This report must be read in conjunction with all of the attached notes and documents and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement,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

The scope for work for this investigation/report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of filling of unknown origin be noted in the report, and in particular the presence of building demolition materials, it should be recognised that there may be some risk that such filling may contain contaminants and hazardous building materials.

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

Yours faithfully
Douglas Partners Pty Ltd



Richard Lloyd
Senior Consultant Engineering Geologist

Reviewed by

Geoff Young
Principal

Attachments: About this Report
Drawing 1
Photo Plates 1 to 8
Pittwater Hazard Zone Mapping Extract

About this Report

Douglas Partners

Introduction

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

DP's 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, DP 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, DP 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, DP 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, DP 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. DP 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.

Locality Plan

NOTE:
1: Base drawing from Rice Doubney (Dwg Master Plan 2016, dated 15.1.2016)
2: Test locations are approximate only and are shown with reference to existing features.

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Elanora Country Club		
OFFICE: Sydney	DRAWN BY: PSCH	
SCALE: 1:2500 @ A3	DATE: 28.11.2016	

TITLE: **Master Plan**
Proposed Residential Development
Elanora Road, ELANORA HEIGHTS

N

PROJECT No:	85716.00
DRAWING No:	1
REVISION:	0

North

Legend

- Photo location and direction of view
- Sandstone outcrop
- Detached sandstone blocks/boulders
- Drainage line/berm
- Filled batter
- Depth to rock (m)

Photo 1. Aerial view of the site showing approximate area of development.

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Elanora Country Club		TITLE: **Location of Site Features and Photo Plates**	PROJECT No:	85716.00
	OFFICE: Sydney	DRAWN BY: RKL	**Proposed Residential Development**	PLATE No:	1
	SCALE: As shown	DATE: 21/11/2016	**Elanora Road, Elanora Heights**	REVISION:	-

Photo 2. Panorama of the lower, south-eastern portion of the site, viewed towards the north and showing the approximate location of proposed access road from the bend in Iluka Avenue.

Photo 3. Panorama of the lower, south-eastern portion of the site, viewed towards the east with Iluka Avenue in the background.

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Elanora Country Club		TITLE: **Location of Site Features and Photo Plates**	PROJECT No:	85716.00
	OFFICE: Sydney	DRAWN BY: RKL	**Proposed Residential Development**	PLATE No:	2
	SCALE: As shown	DATE: 21/11/2016	**Elanora Road, Elanora Heights**	REVISION:	-

Photo 4. South-western part of track with sandstone outcrop in the foreground.

Photo 5. 220 degree panorama of the track with sandstone outcrop in the foreground.

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Elanora Country Club		TITLE: **Location of Site Features and Photo Plates** **Proposed Residential Development** **Elanora Road, Elanora Heights**	PROJECT No: 85716.00
	OFFICE: Sydney	DRAWN BY: RKL		PLATE No: 3
	SCALE: As shown	DATE: 21/11/2016		REVISION: -

Photo 6. Panorama of cross bedded sandstone outcrop. Refer to photos 7 and 8 for detail.

Detached blocks

Photo 7. Lower outcrop area with highly weathered bedding plane beneath.

Photo 8. Upper outcrop and detached blocks.

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Elanora Country Club	TITLE: **Location of Site Features and Photo Plates**	PROJECT No:	85716.00
	OFFICE: Sydney DRAWN BY: RKL	**Proposed Residential Development**	PLATE No:	4
	SCALE: As shown DATE: 21/11/2016	**Elanora Road, Elanora Heights**	REVISION:	-

Photo 9. Outcrop on higher northern side of track. Track visible at right hand side of photo.

Photo 10. top, north-eastern end of track with adjoining residences at right hand side.

Photo 11. 200 degree panorama of the central eastern boundary showing filled batter.

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Elanora Country Club		TITLE: **Location of Site Features and Photo Plates**	PROJECT No: 85716.00
	OFFICE: Sydney	DRAWN BY: RKL	**Proposed Residential Development**	PLATE No: 5
	SCALE: As shown	DATE: 21/11/2016	**Elanora Road, Elanora Heights**	REVISION: -

Photo 12. Sandstone outcrop trees and undergrowth .

Photo 13. Panorama of larger area of sandstone outcrop, drop to right hand side of about 2m.

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Elanora Country Club		TITLE: **Location of Site Features and Photo Plates**	PROJECT No:	85716.00
	OFFICE: Sydney	DRAWN BY: RKL	**Proposed Residential Development**	PLATE No:	6
	SCALE: As shown	DATE: 21/11/2016	**Elanora Road, Elanora Heights**	REVISION:	-

Photo 14 Sandstone outcrop towards the northern end of the adjacent eastern properties.

Photo 15. 220 degree panorama of the upper, eastern boundary adjoining the northern most (No. 152) of the adjacent eastern residences with the area of highest outcrop indicated.

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Elanora Country Club		TITLE: **Location of Site Features and Photo Plates**	PROJECT No: 85716.00
	OFFICE: Sydney	DRAWN BY: RKL	**Proposed Residential Development**	PLATE No: 7
	SCALE: As shown	DATE: 21/11/2016	**Elanora Road, Elanora Heights**	REVISION: -

Photo 16. Panorama viewed towards the north and bowling green maintenance building area. Note sandstone outcrop and filled batter towards the centre top of photo.

Photo 17. Panorama of the eastern side of the existing bowling green area showing sandstone outcrop.

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Elanora Country Club		TITLE: **Location of Site Features and Photo Plates** **Proposed Residential Development** **Elanora Road, Elanora Heights**	PROJECT No: 85716.00
	OFFICE: Sydney	DRAWN BY: RKL		PLATE No: 8
	SCALE: As shown	DATE: 21/11/2016		REVISION: -

Pittwater Local Environmental Plan 2014 identifies areas within the site as containing a 'geotechnical hazard'.