Preliminary Geotechnical Desktop Study and Site Walkover

8201806901

Prepared for

Backsaddle Pty Ltd and Mr. Chad Wallace

25 September 2018

Contact Information

Cardno (NSW/ACT) Pty Ltd
ABN 95 001 145 035

16 Burelli Street
Wollongong 2500
Australia

Phone +61 2 4228 4133
Fax +61 2 4228 6811

Document Information

Prepared for	Backsaddle Pty Ltd and Mr. Chad Wallace
Project Name	Preliminary Geotechnical Desktop Study and Site Walkover
File Reference	8201806901-Backsaddle Pty Ltd and Wallace PP Desktop Report_003_Rev2.docx
Job Reference	8201806901
Date	25 September 2018
Version Number	2

Author(s):

Gavin Parkinson
Geologist

Effective Date 25/09/2018

Approved By:

David Ronchi
Senior Geotechnical Engineer

Date Approved 25/09/2018

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
0	01/05/2018	Submit to client	GP	DR
1	12/09/2018	FINAL DRAFT	SP	DJT
2	25/09/2018	FINAL	SP	DJT

Table of Contents

Appendices

.

1 Introduction

Cardno (NSW/ACT) Pty Ltd (Cardno) was engaged by Backsaddle Pty Ltd and Mr. Chad Wallace ("the Clients") to prepare a geotechnical desktop study and geotechnical investigation (site walkover) for the property located immediately west of the western extent of the township of Kiama, NSW (the site). This report has been prepared in accordance with the scope of works presented in Cardno's proposal provided by email to the client on the 24 of January 2018.

The site originally investigated for field studies is legally identified as:

- Lots 156, 183, 185, 186, 187, 188 and 189 in Deposited Plan 751279
- Lot 100 in Deposited Plan 1042908 (adjacent to the existing park)
- Lot 1320 in Deposited Plan 1060995
- Lot 300 in Deposited Plan 1059841
- Lot 1 in Deposited Plan 1178500
- Lot 1 in Deposited Plan 1003719
- Lot 1 in Deposited Plan 995058
- Lot 2 in Deposited Plan 1135218.

It is understood that Crown Land road reserves held under EP 39357 (see Appendix M to the Planning Proposal Report) are included between the above listed lots.

Since fieldwork was undertaken, the site boundaries have been revised as described in Section 3.1 to the Planning Proposal application report.

The location and regional context of the original site investigation boundaries is depicted in **Figure 1-1.** The revised site boundaries are shown in **Figure 1-2.**

.

Figure 1-1 Approximate Site Extents for original field investigations

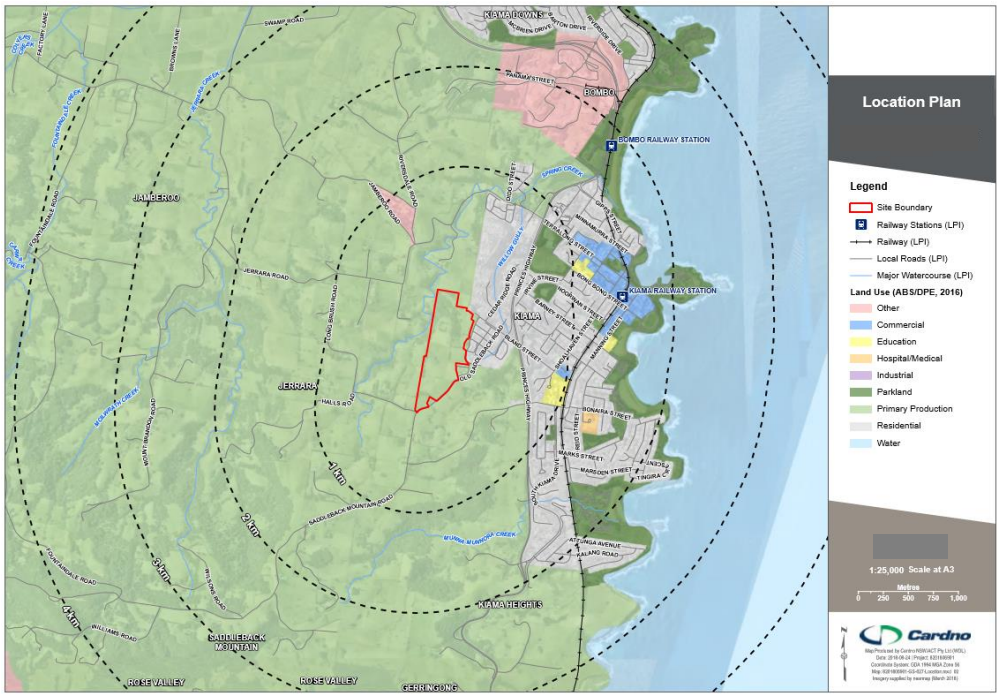

Figure 1-2 Site Locality Map showing revised site boundaries for the Planning Proposal application

1.1 Site Description

The subject site originally investigated lots and Crown road enclosures located north of Old Saddleback Road and east of Greyleigh Road and situated within an area including rural and urban land uses. The site

.

is located approximately 1.6 km west of the township of Kiama and 4 km north east of Saddleback Mountain Lookout (**Figure 1-1**).

The topography of the site is undulating with moderate slopes in the southern portion of the site and moderate to steep slopes towards the centre and north of the site. Surface water flows to the north through numerous drainage channels that are tributaries flowing into Spring Creek. Spring Creek runs adjacent to the site in the neighbouring property to the west.

The site is irregular in shape with a north-south orientation and an approximate width of 390m and a length of 1.5 km. The site is accessible from Greyleigh Drive via a grassed easement and via a rural crossing to Old Saddleback Road. No formal public access roads currently exist on the site.

The site is currently used for grazing of beef cattle and horses. Ground cover is dominated by grass with a scattering of mature trees, and dense shrubs and trees located in the drainage channels in the western portions of the site. The site contains agricultural dams. The location of significant site features is shown in **Appendix A.**

An experienced Cardno Engineering Geologist inspected the site on the 13 April 2018. Photographs taken during the inspection are provided in **Appendix B.**

1.2 Revision of Site Boundaries

As explained in Section 3.1 of the Planning Proposal report, the site boundaries have been refined since initial field investigations detailed in this report. This report applies to investigations undertaken over the broader site area including the sub-set of lots to which the Planning Proposal application applies. The land to which this report applies is larger than the area the subject of the Planning Proposal application.

.

2 Previous Studies

No previous studies have been conducted on this specific site. No other freely available intrusive geotechnical information related to any surrounding developments has been made available.

.

3 Regional Geology

3.1 Quaternary Geology

The 1:25,000 Coastal Quaternary Geology Map of Shellharbour-Kiama Area with highlighted project extents is presented in **Figure 3-1.**

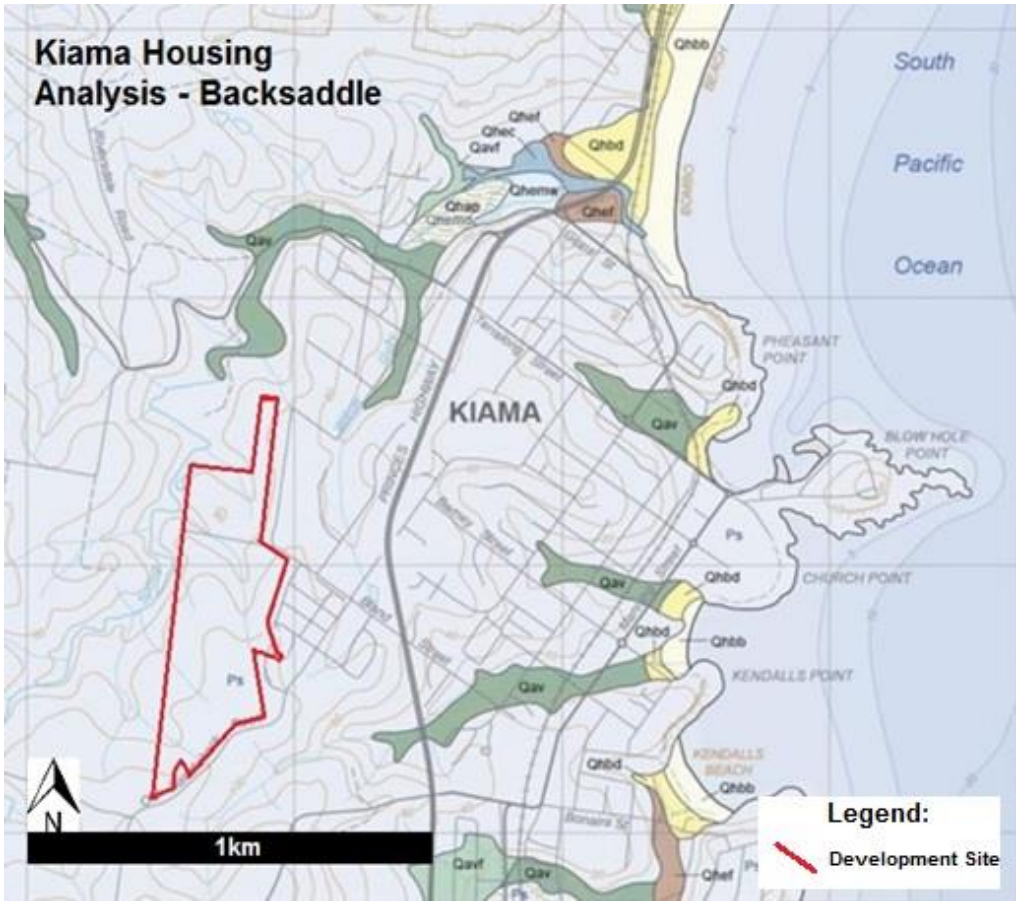

Figure 3-1 Regional Geology with reference to 1:25,000 Coastal Quaternary Geology Map of Shellharbour-Kiama Area (original study area shown outlined in red)

Reference to the 1:25,000 Coastal Quaternary Map of Shellharbour-Kiama Area (Troedson & Hashimoto, 2013) indicates that the site is underlain by Permian sedimentary rocks and minor volcanic rocks, including sandstone, conglomerate, shale and coal measures (Sydney Basin) as well as limited alluvial material along creek lines.

3.2 General Geology

The 1:250,000 Wollongong Geological Sheet with highlighted site boundaries is presented in **Figure 3-2.**

.

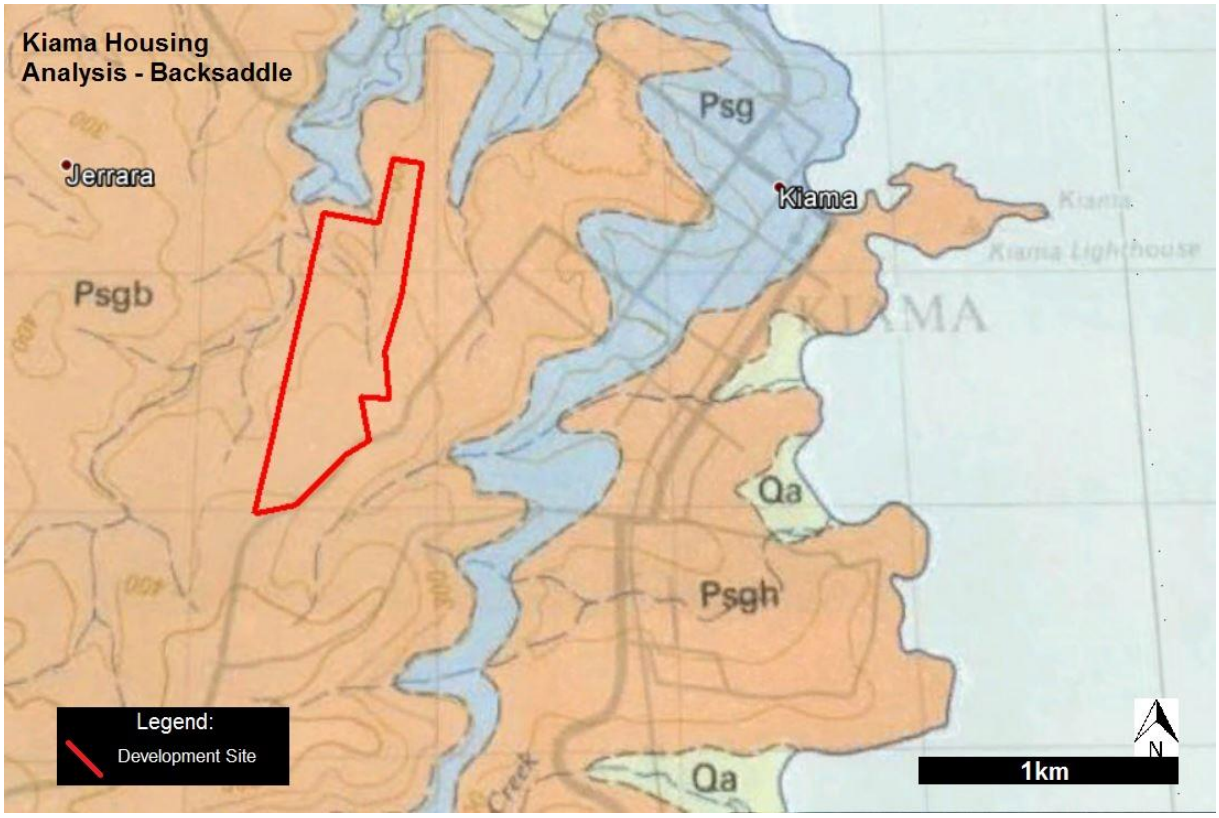

Figure 3-2 Regional Geology with reference to Kiama 1:50,000 Geological Sheet (original study area outlined in red)

Reference to the Kiama 1:50,000 Geological Sheet (Bowman H.N., 1974) indicates that the site is underlain by Permian Latite of the Bumbo Latite Member.

Latite is a porphyritic extrusive volcanic rock with a fine-grained groundmass containing phenocrysts of plagioclase and potassium feldspar. Geoscience Australia describes the Bumbo Latite Member in the vicinity of the site as coarsely porphyritic, locally pillowed and containing phenocrysts of labradorite and augite. Outcrops of Latite were observed at the site, a description of these outcrops is included in section 4.

A previous geotechnical investigation undertaken at Albion Park Quarry (approximately 9km north of the site) targeted the Bumbo Latite Member. This investigation revealed a thin residual clay soils layer underlain by two latite flows, each around 30m thick. These latite flows are separated by an agglomerate layer of 9-15m, with the entire latite member underlain by sandstone. Due to the relatively close proximity of this investigation, the profile is expected to be relatively similar on this site.

3.3 Acid Sulfate Soils

Reference to the then Department of Land and Water Conservation Acid Sulfate Soil Risk Map for Kiama (Talau, 1997) indicates the site is located on an area with no known or expected acid sulfate soil risk. The map legend states that the site lies in an area where land management activities are unlikely to be affected by acid sulfate soil materials.

3.4 Soil Landscapes

A soil data report from the Office of Environment and Heritage (2004) shows a soil examination approximately 700 metres from the project site on similar topography. This report indicates a soil profile consisting mainly of well drained medium to heavy clays with moderate pedality. At this proximal location,

.

water observations showed moderate run on and high runoff, which would be expected in a clay-dominant soil profile. Soil observations made during the site inspection support a soil profile consisting mainly of clay soils.

3.5 Groundwater

A search of the Department of Primary Industries, Office of Water, ground water monitoring identified no groundwater bores located within a 500m proximity of the development site. Water is expected to locally perch above the clays present in the site. However, the latite unit below is expected to be highly permeable in jointed sections and the groundwater level is expected to vary significantly across the site depending on the rock structure. The major drainage channel in the area is Spring Creek, located to the west of the site and at a relatively low elevation when compared to the site itself. The low elevation of this creek may suggest a relatively low groundwater table on the higher-elevation site, however, further investigation would be required to confirm any water levels.

3.6 Adjoining Dam structures

Jerrara Dam is located approximately 2 km west of the site. The dam is fed by Jerrara Creek and McIlwraith Creek, with the downstream side of the dam outflowing to Jerrara Creek. A large rainfall event in August 2015 caused an overflow and subsequent partial failure of the dam wall, resulting in a number of properties downstream from the dam being evacuated. Despite the close proximity to the site, any future failure of Jerrara Dam is unlikely to affect the site due to the topography and related direction of flow. With Jerrara Creek flowing north into the Minnamurra River, any flow resulting from a failure would likely follow this channel to the north. The main drainage channels from the site flow into Spring Creek to the west of the site. There is no direct connection between the waterways of Spring Creek and Jerrara Creek.

.

4 Site Inspection

The proposed site development is located on Old Saddleback Rd, Kiama. An experienced Cardno Engineering Geologist undertook a site inspection on 13 April 2018. Photographs of important aspects of the site taken during this inspection are presented in **Appendix B.** The following observations were noted on site:

- Observations of the near surface geology generally indicate residual clay overlaying shallow weathered rock, which was identified through outcrops at several locations over the site as well as exposures in creeks and the base of dam excavations. Soil observed at the surface was found to be medium plasticity clay to silty clay. Soil was generally moist to wet and was found to contain sub-rounded cobbles of latite
- Outcrops of latite were moderately weathered and relatively fine grained with amygdule's present throughout. Phenocrysts most likely comprised of labradorite and augite were also observed
- The site forms the eastern plateau of spring creek, characterised by north west flowing side creeks which have incised down into the regional latite plateau. The plateau is gently undulating becoming steeper along the creek sides in the northern portion of the site
- The southern portion of the site generally exhibited gently sloping grass fields with minor vegetation along the westernmost boundary
- The site drops away steeply along the western boundary where the slopes dip down into Spring Creek
- Creek side slopes generally become steeper (>30°) in the north of the site and are densely vegetated
- Minor alluvial sediments located in creek lines – generally clay soils
- Potential evidence of erodability noted along creek line – possible slip on steep creek side in northern portion of the site (see Figure 4-5 below)
- North west flowing drainage channels generally exhibit relatively steep side slopes of approximately 20-40° with minor outcrops of latite exposed within the steeper sections of the creek sides
- Vegetation becomes denser within the creek sides in the northern portion of the site
- Steeply dipping creek sides in the northern portion of the site show signs of soil creep, indicated by bent tree trunks which point downslope
- A number of dams have been constructed across the site. These have been formed by excavating within the creek bases and bunding the excavated clayey material on the down slope side
- The plateau is covered in grass and is currently utilised as pasture for grazing of farm animals
- Moderate animal activity through the northern portion of site have left a network of terraced game trials across the steeper slopes
- Several latite stone walls traverse the site with numerous stockpiles of the stone also located throughout the area
- A number of dumped items were located in the north-western portion of the site. Tyres, scrap tin and unidentified building materials were located on the site.

4.1 Site Inspection Photographs

A site map referenced with the locations of site photos can be found in **Appendix A**. The photos from the site inspection are presented in **Appendix B.**

.

5 Conclusions

The following conclusions are provided given the available information, site walk over observations and our experience. An intrusive site investigation has not been undertaken at this stage of the development therefore the conclusions and recommendations in this report are preliminary in nature.

- The site is observed to be underlain by a shallow cover of silty sand topsoil over residual silty clay which overlies moderately to highly weathered latite
- Minor amounts of fill were identified on site, and comprised the bunds to dams and stockpiled latite boulders across the site
- There was no major instability of natural slopes observed during the site inspection. However, future slope stability considerations will depend on final cut/fill profile, and the subsoil/fill characteristics, specifically where development is planned close to or within the steeper dipping side creeks
- The underlying latite rock is expected to provide a good foundation for structures and is not expected to provide significant slope stability concerns
- Where the latite rock is to be excavated then rock breaking techniques may be required due to the expected moderate to high strength of the rock unit from shallow levels
- During the design and construction stages, care should be taken with earthworks in the proximity of steeply dipping side slopes to ensure any cut or fill is appropriately managed to ensure stability of slopes is maintained
- At this stage no significant constraint for development regarding geotechnical aspects has been identified, given that appropriate engineering practices and designs are employed. An intrusive geotechnical investigation should be conducted in the proceeding stages of the development to confirm the site suitability for development.

.

6 Closure

We appreciate the opportunity to work collaboratively with you on this project. Our team looks forward to bringing our high level of expertise to deliver successful outcomes in your future projects.

Your attention is drawn to the appended document titled *"Important Information about this Geotechnical Report".* This document is intended to clarify to the reader what the realistic expectations of this report should be, and what is the correct use of the document. Misinterpretation of geotechnical information presents significant risk to projects: The document includes a discussion on general limitations of geotechnical services, which by nature, are based extensively on opinion and judgement.

The statements included in this document are not intended to be exculpatory clauses or to reduce the general responsibility accepted by Cardno, but rather to identify where Cardno and our Client's responsibilities lie. The statements ensure that all parties that may rely on the report are aware of their respective responsibilities.

For further enquiries, please do not hesitate to contact Cardno on the information supplied.

.

Preliminary Geotechnical Desktop Study and Site Walkover

APPENDIX A

SITE FEATURES LOCATION MAP

Preliminary Geotechnical Desktop Study and Site Walkover

APPENDIX B

SITE FEATURES PHOTO REPORT

About Cardno

Cardno is an ASX200 professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

Contact

16 Burelli Street
Wollongong 2500
Australia

Phone +612 4228 4133
Fax +612 4228 6811

Web Address
www.cardno.com