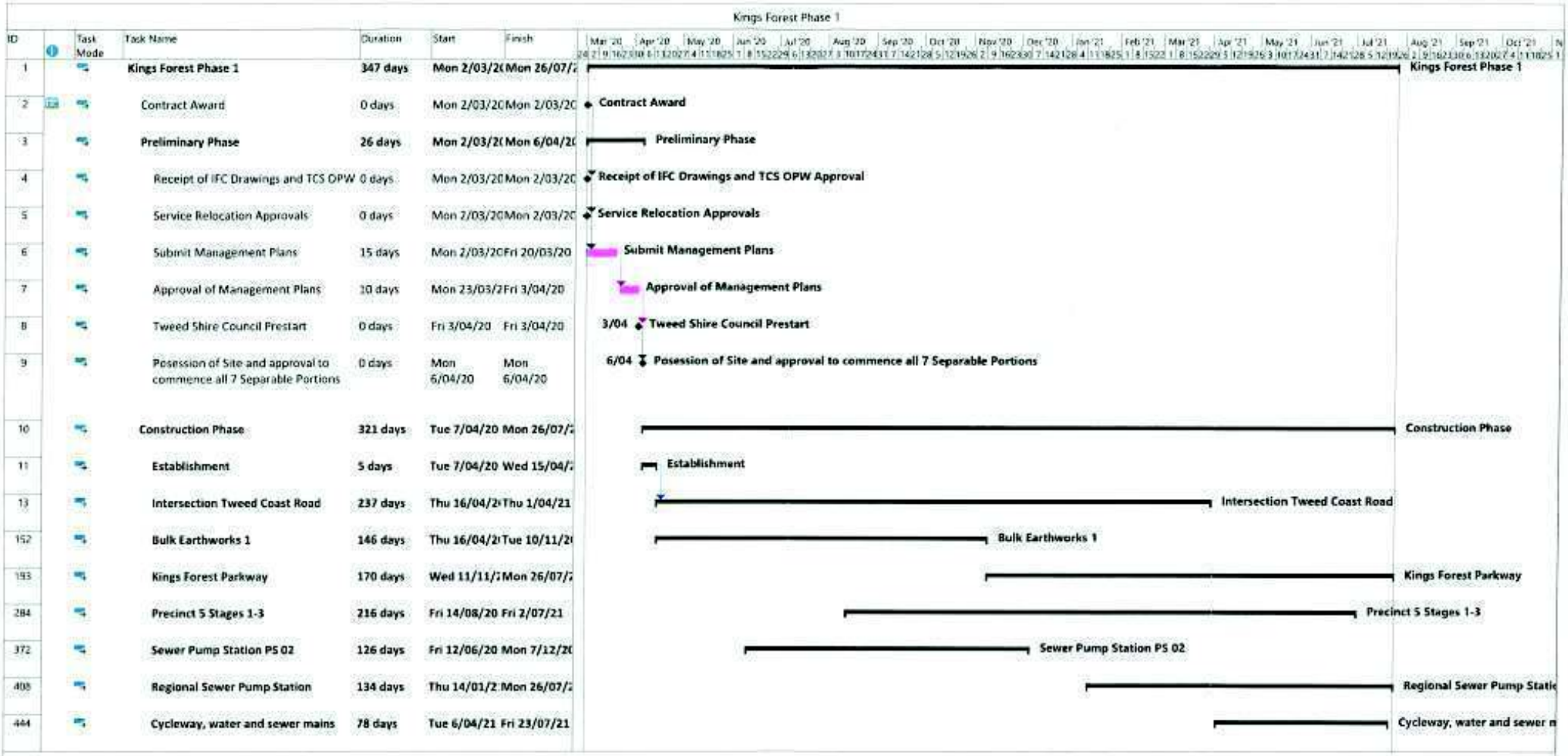
APPENDIX A

First Stage Indicative Construction Programme



BMD Urban
Project: Kings Forest Phase 1
Tender Program

Task | Split | Milestone | Summary | Project Summary | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | External Tasks | External Milestone | Deadline | Critical | Critical Split | Progress | Manual Progress

APPENDIX C

Cultural Heritage Management Plan

Prepared by Everick Heritage

dated August 20

EVERICK HERITAGE

7 August 2020

EV.077

Michael Geale
Senior Development Consultant
Leda Developments Pty Ltd
Suite 14, L1, 46 Cavill Avenue
Surfers Paradise QLD 4217

Dear Michael,

RE: KINGS FOREST STAGE 1 (MP08_0194)
CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN REQUEST FOR INFORMATION

Further to your request for advice on the Request for Information ('RFI') from the Tweed Shire Council regarding the Kings Forest Stage 1 (MP08_0194) Construction Environmental Management Plan ('CEMP'), please see below comments from the General Planning Requirements which we consider to be relevant to the Kings Forest Stage 1 works, and specific comments on the points raised by Tweed Shire Council.

Outcomes of the Aboriginal community consultation with the ACHMP were not updated as no written responses were received from Aboriginal Stakeholders. It is noted that the provision of written, including email, correspondence is an established form of communication and the outcomes of the consultation process is implied that there are no significant objections from the Aboriginal stakeholders. As such it is considered that the sending of correspondence is adequate to demonstrate compliance with condition 90(b) of the project approval.

First Name	Last Name	Company	Address Line 1	Address Line 2
Deidre	Currie		11 Flamingo Place	West Tweed Heads NSW 2485
Leweena	Williams	Tweed Byron LALC	PO Box 6967	Tweed Heads South NSW 2486
Mr Russell	Logan	WICEEDO	C/- 9 Tathra Street	Pottsville Beach NSW 2489
John	Bartie		15 Turpentine Place	Tyalgum NSW 2484
Carol	Dawney		3/2 Seymour Street	Tweed Heads South NSW 2486
Jackie	McDonald	On behalf of Jason McDonald, Levi McDonald, Adam Mazzarella, Peter	63 Tringa Street	Tweed Heads West NSW 2485

info@everick.net.au | www.everick.com.au

First Name	Last Name	Company	Address Line 1	Address Line 2
		Buxton and Paul Buxton		
Kyle	Slabb	C/- Tweed Byron LALC	PO Box 6967	Tweed Heads South NSW 2486
Joyce	Summers		26 Brier Crescent	Varsity Lakes Qld 4227
Desrae	Rotumah	Tweed Aboriginal Co-operative	PO Box 6231	Tweed Heads South NSW 2486

The mapped extent of the K3 and K4 sites has been established using polygons which have been provided in the approval documents and have been subject to extensive review. However, with respect to the interchange at Tweed Coast Road, our advice in May 2020 is that the K3 and K4 midden sites do not extend into the road reserve and will not be subject to potential harm from the road intersection works. As such there are no additional requirements for consultation or archaeological investigation with respect to the interchange works. It is noted that the CEMP was amended in November 2019 to include exclusion fencing along the edge of site K3 as an additional measure to mitigate impacts to the midden sites.

The following is provided to inform CEMP Table 11- Risk Assessment.

No.	Risk Description	Description of Consequence	Likelihood	Consequence	Ranking
14	**Discovery or harm of Aboriginal Cultural Heritage not previously identified.**	**Harm to Aboriginal objects/ Requirement to implement unexpected find procedure (ACHMP section 11)**	**Possible**	**Moderate**	**H**

The Aboriginal cultural heritage induction has been updated to replace 'monitors' with local Aboriginal Sites Officers (see Appendix 1)

Please contact Principal Archaeologist (Coffs Harbour) Tim Hill on 0422 309 822 or t.hill@everick.com.au to further discuss this induction.

Yours sincerely,

Tim Robins
Director
Everick Heritage

APPENDIX 1: INDUCTION

1. Background

This booklet contains the basic requirements for the management of Aboriginal Cultural Heritage during construction of the Kings Forest Residential Development Project (Kings Forest Stage 1 MP08_0194 (as modified)). All staff and contractors involved in the Kings Forest Development are obliged to act in accordance with these requirements. The Kings Forest Development is situated within an area of high cultural significance to the local Aboriginal people. The broad surrounds are known to contain spiritual places, ceremonial places, traditional pathways, places of trade and campsites. Archaeological research has demonstrated continuous occupation of this region for at least 40,000 years. For this reason, it is important that all staff and contractors strictly adhere to the requirements in this induction.

2. Aboriginal Objects/ Artefacts- What Are They?

Stone Artefacts: Stone that has been worked to make tools or are the bi-product of tool making. By analysing such stone, archaeologists can find out information about Aboriginal technologies, trade, diet and periods of occupation. These tools are important to Aboriginal people as a tangible connection to their ancestors. As the Kings Forest Residential Development exists within a sand environment, stone should be treated with caution (see **Figure 1**- **Figure 10**).

Middens: Shell middens are the piled food remains of Aboriginal people of the past, usually containing shell, fish bone and sometimes stone artefacts and burials. They can vary in size from just a few shells to mounds metres thick (see **Figure 11**- **Figure 13**).

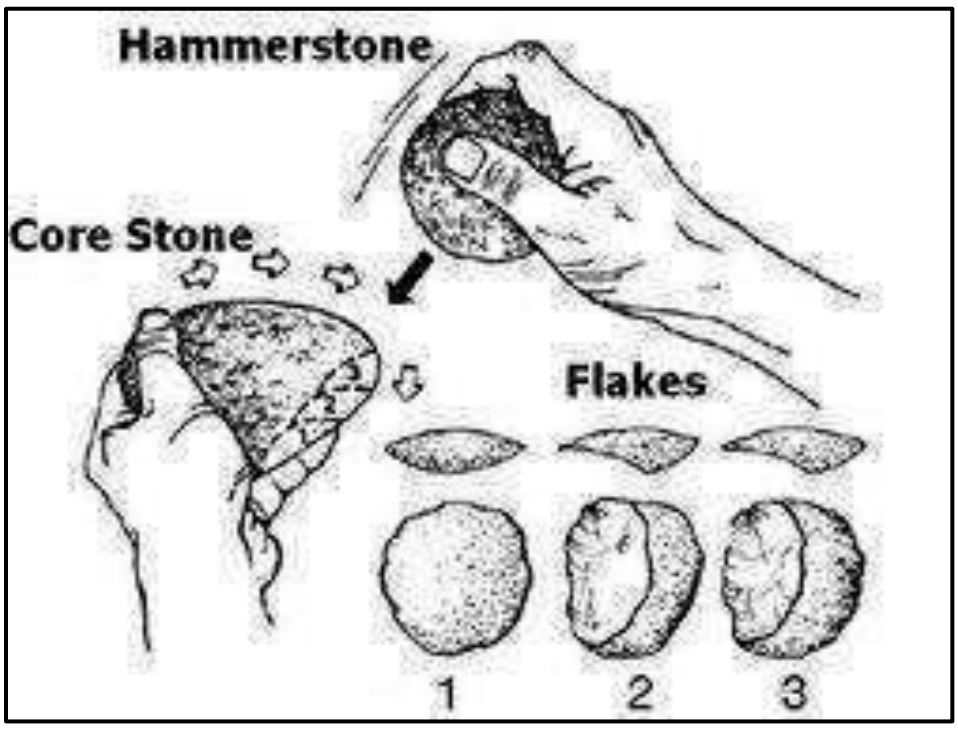


Figure 1: Stone tool production by percussion (source sciencemag.org).

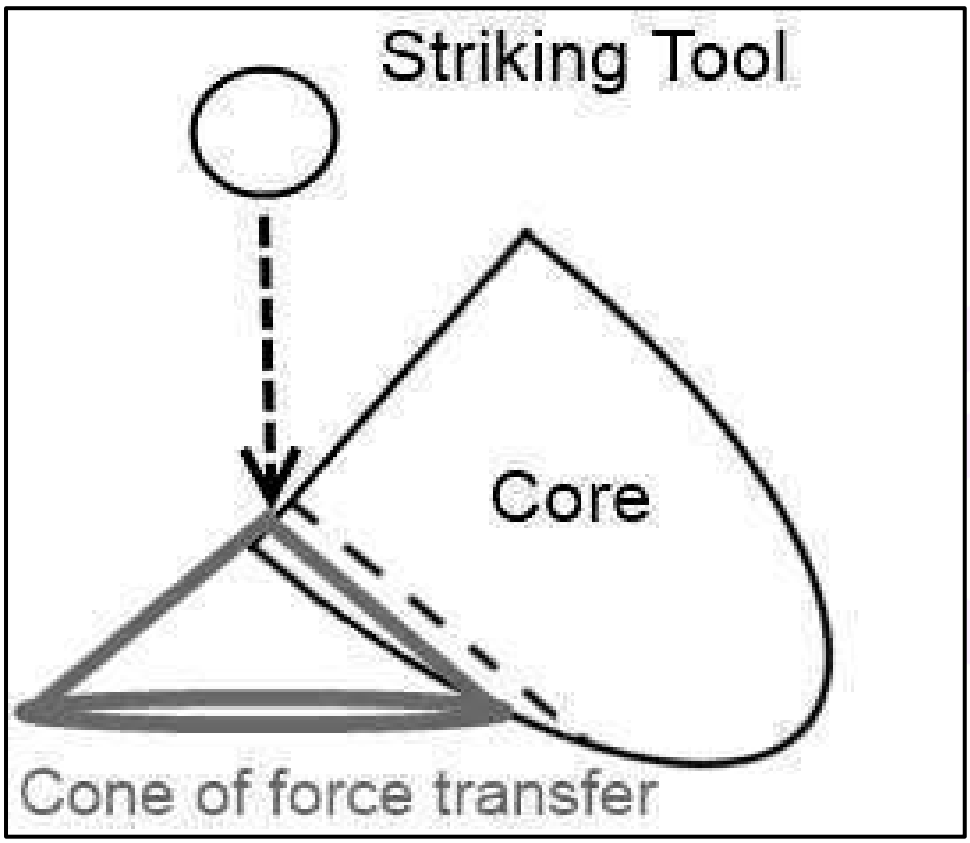


Figure 2: Physics of percussion (source www.rebuildingcivilization.com).

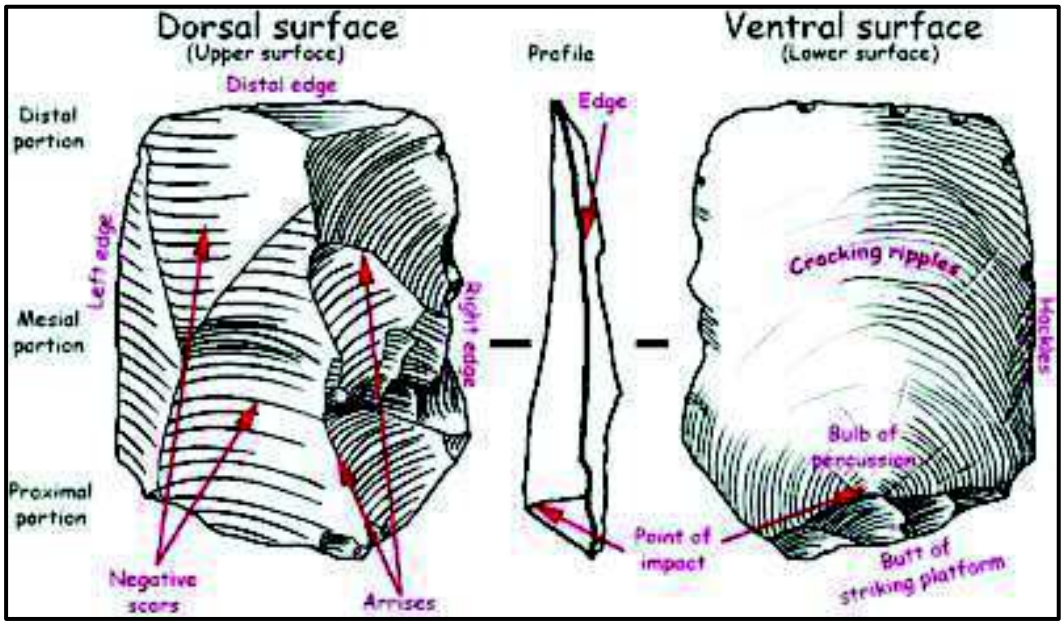


Figure 3: Stone artefact terminology.

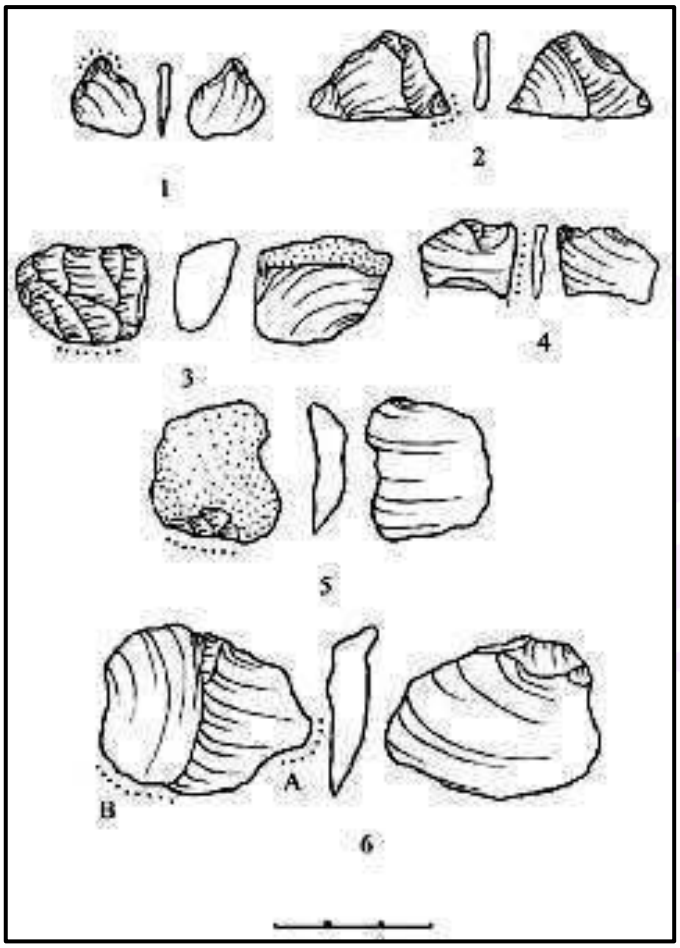


Figure 4: Chert stone tools (source www.researchgate.net).

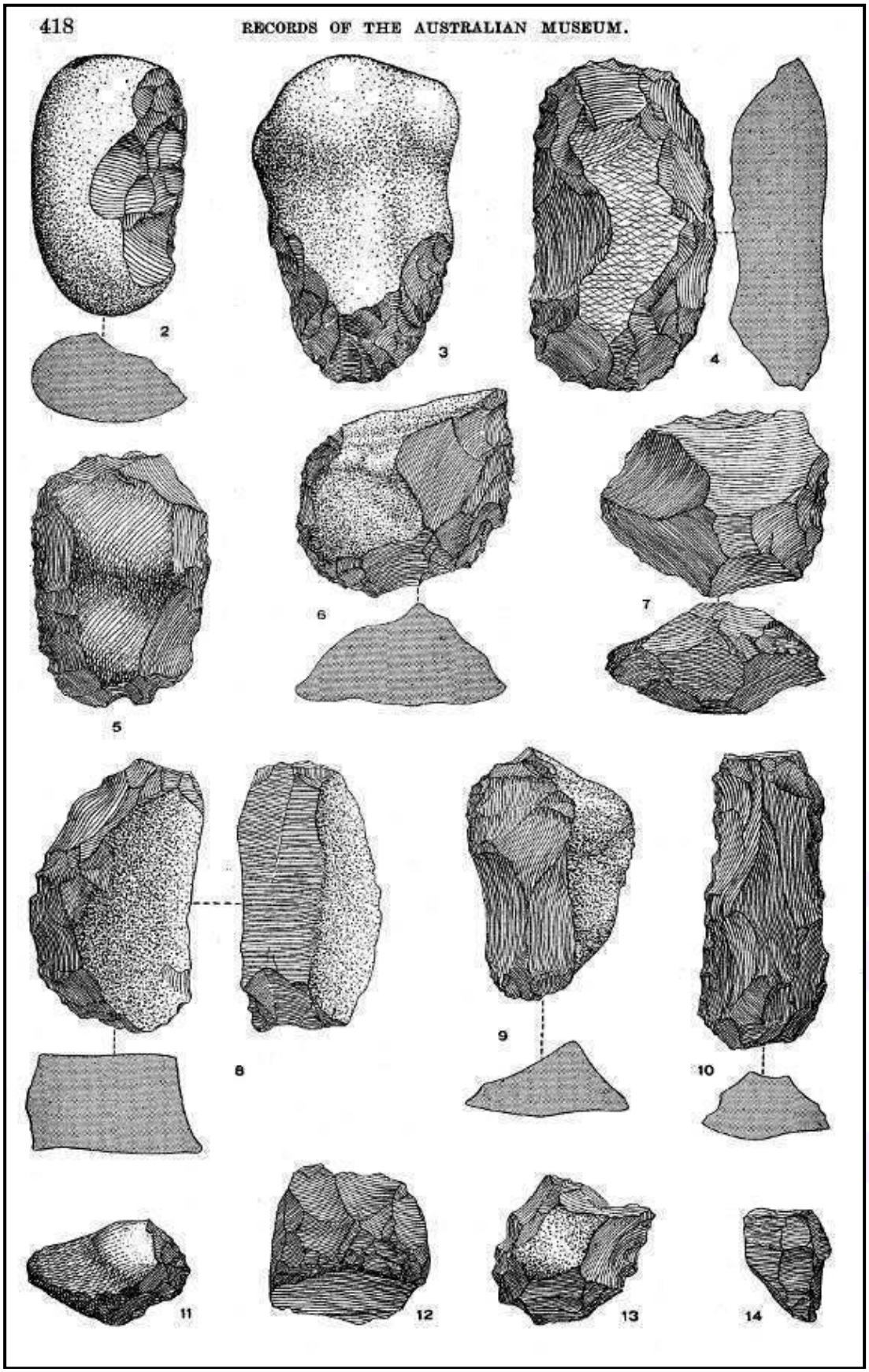


Figure 5: Typical coastal stone tools (source McCarthy 1947)

Figure 6: Example of jasper flake

Figure 7: Silcrete core.

Figure 8: Chalcedony flake piece.

Figure 9: Hammer stone.

Figure 10: Example of knapping (unifacial chopper)

Figure 11: Dinner time camp midden- Lighthouse Beach Port Macquarie (Thomas Dick Photo collection)

Figure 12: Stratified shell midden lens (Stradbroke Island).

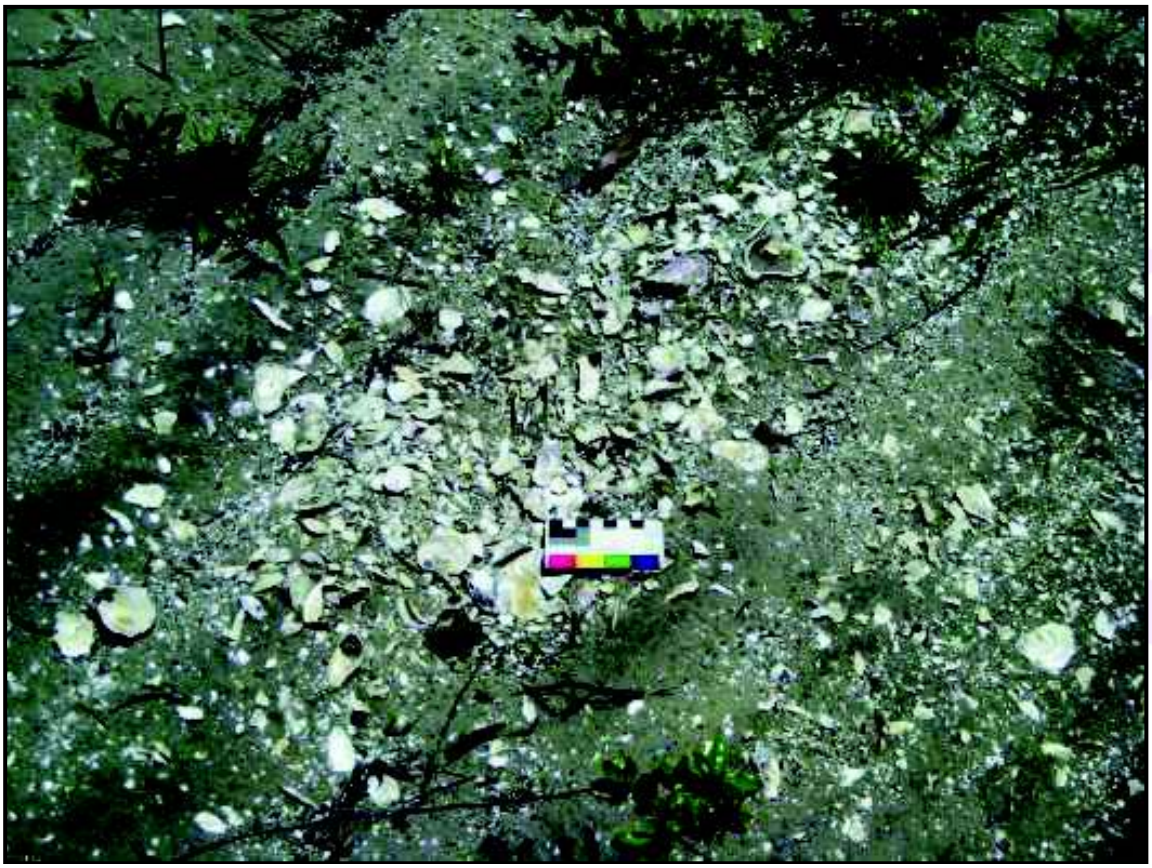


Figure 13: 'Dinner-time camp' midden (Tyagarah).

3. National Parks and Wildlife Act (1974)

The *National Parks and Wildlife Act 1974* (NSW) (*NPW Act*) is the primary legislation concerning the identification and protection of Aboriginal cultural heritage. It provides for the management of both Aboriginal Objects and Aboriginal Places. Under the *NPW Act*, an Aboriginal Object is any deposit, object, or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area, regardless of whether the evidence of habitation occurred before or after non-Aboriginal settlement of the land. This means that every Aboriginal Object – regardless of its size or seeming isolation from other Objects – is protected under the *Act*.

An Aboriginal Place is an area of particular significance to Aboriginal people which has been *declared* an Aboriginal Place by the Minister. The drafting of this legislation reflects the traditional focus on Objects, rather than on areas of significance such as story places and ceremonial grounds. However, a gradual shift in cultural heritage management practices is occurring towards recognising the value of identifying the significance of areas to Indigenous peoples beyond their physical attributes.

With the introduction of the *National Parks and Wildlife Amendment Act 2010* (NSW) the former offence provisions under Section 86 of 'disturbing', 'moving', 'removing', or 'taking possession' of Aboriginal Objects or Places have been replaced by the new offence of 'harming or desecrating'. The definition of 'harm' is 'destroying, defacing, or damaging an Object'. Importantly, in the context of the management recommendations in this assessment, harm to an Object that is 'trivial or negligible' will not constitute an offence.

The amendments also significantly strengthen the penalty provisions. The issue of intent to harm Aboriginal cultural heritage has been formally addressed by separating it from inadvertent harm. The penalty for individuals who inadvertently harm Aboriginal Objects has been set at up to $55,000, while for corporations it is $220,000. Also introduced is the concept of '*circumstances of aggravation*' which allows for harsher penalties (up to $110,000) for individuals who inadvertently harm Aboriginal heritage in the course of undertaking a commercial activity or have a record for committing similar offences. For those who knowingly harm Aboriginal cultural heritage, the penalty will rise substantially. The maximum penalty will be set at $275,000 or one year imprisonment for individuals, while for corporations it will rise to $1,100,000.

4. Find Procedure

The Developer acknowledges that further Aboriginal Objects, not already identified by past archaeological surveys, may be discovered during the course of the Construction. These potential discoveries fall into two (2) distinct categories: Aboriginal human remains and sub-surface Aboriginal Places and Aboriginal Objects.

4.1. Aboriginal Human Remains

Aboriginal human remains will be dealt with as according to the Aboriginal Remains Procedure outlined in ***Appendix 6***, with special regard to the following considerations:

(a) in all cases suitable dignity is required in the handling of the issue;
(b) the primary intention of this strategy is to avoid the unnecessary removal or disturbance of the human remains and to allow appropriate Aboriginal people the final decision-making powers, if the remains should prove to be those of an Aboriginal person; and
(c) where this is not the case the discovery Site will be deemed a crime scene and Contractor and its Sub-Contractors will be subject to police direction.

4.2. Aboriginal Objects

In the event of a potential Cultural Heritage Find, the following process will be carried out immediately by Construction Staff, Contractors and/or Local Aboriginal Sites Officers:

(a) Construction work must cease in the immediate vicinity of the potential Find and an Exclusion Zone of at least twenty (20) metres radius be established around the identified Aboriginal Object(s). The Exclusion Zone may be established using flags, pins, tape or temporary fencing, as deemed appropriate by the Developer. All other Construction works may continue in other areas.
(b) A Local Aboriginal Sites Officer or the Cultural Heritage Advisor must be called to inspect and identify the Find.
(c) If the Local Aboriginal Sites Officer or Cultural Heritage Advisor is satisfied that the object is not Cultural Heritage, the Exclusion Zone may then be removed and Construction works may continue.
(d) If the Local Aboriginal Sites Officer is unsure of whether the object is Cultural Heritage or not, they may elect to have a Cultural Heritage Advisor inspect the Find.
(e) If the object is Cultural Heritage and:
    a. is not part of a series of Aboriginal Objects of density of greater than five (5) per m^2, the Local Aboriginal Sites Officer or the Cultural Heritage Adviser will:
        i. Fill out a Find Sheet; and
        ii. Collect the Objects and store them in accordance with the Keeping Place requirements in Section 14; or

b. is part of a series of Aboriginal Objects of density greater than five (5) per m^2, the Local Aboriginal Sites Officer or the Cultural Heritage Adviser will:
    i. Notify the Registered Aboriginal Stakeholders of the Find;
    ii. Provide a brief report on the contexts of the Find; and
    iii. agree to management strategies for the area surrounding the Find.

(f) Any disputes as to the management of a Find will be dealt with in accordance with the Dispute Resolution Protocols (Section 18).

Find sheets shall be forwarded to the Cultural Heritage advisor to update the Aboriginal Heritage Information Management System ('AHIMS').

5. Induction Record

NAME	DATE	ROLE	SIGNATURE	INDUCTION PROVIDER SIGNATURE

NAME	DATE	ROLE	SIGNATURE	INDUCTION PROVIDER SIGNATURE

APPENDIX D

Non-Compliance Register

NON COMPLIANCE AND CORRECTIVE ACTION

CEMP Bulk Earthworks Sequence 1

Number	Date	Location	Description	Works Required	Time to remedy NC	Photos Taken (Y/N)	Closed out-Date, by and signature	
							Name: Signature: Date:	
							Name: Signature: Date:	
							Name: Signature: Date:	
							Name: Signature: Date:	
							Name: Signature: Date:	
							Name: Signature: Date:	
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							Name: Signature: Date:	
							Name: Signature: Date:	
							Name: Signature: Date:	
							Name: Signature: Date:	

APPENDIX E

Complaints Register

COMPLAINTS LOG

CEMP Bulk Earthworks Sequence 1

Complainants Name	Address	Contact Number	Description of Complaint	Closed out-Date, by and signature	
				Name: Signature: Date:	
				Name: Signature: Date:	
				Name: Signature: Date:	
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APPENDIX F

Environmental Incident Report

ENVIRONMENTAL INCIDENT REPORT

Date of Incident	
Type of Incident	

Names of Staff Interviewed	
Incident Witnessed By	
Description of Incident	
Damage to Plant & Equipment	
Method of Clean Up	
Authorities/Community Informed	
Finding from Investigation	
Recommended Correct Actions (tick)	Education of Persons Involved
	Improve Construction Methods
	Improve Inspection / Maintenance
	Change Work Method
	Equipment Repair / Replacement
Other	
Follow Up Evaluation (date)	
General Comments	
Signed (Project Environmental Officer)	
Date	

APPENDIX G

Environmental Training Register

ENVIRONMENTAL SITE TRAINING REGISTER

Name	Company	Position on Project	Site Induction	Training Details	CEMP Version

APPENDIX H

Acid Sulfate Site Investigation

Prepared by Douglas and Partners
dated May 2020

Douglas Partners
Geotechnics / Environment / Groundwater

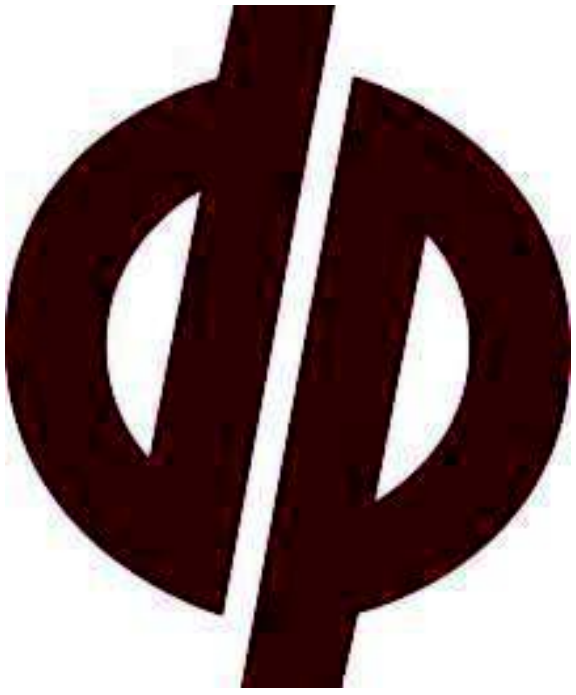
Integrated Practical Solutions

Report on
Acid Sulfate Soils Investigation

Proposed Residential Development
Stage 1 - Precinct 5, Kings Forest Estate, Depot Road, Kings Forest

Prepared for
Project 28 Pty Ltd

Project 90531.03
May 2020



Douglas Partners
Geotechnics | Environment | Groundwater

Document History

Document details

Project No.	90531.03	Document No.	R.001.doc
Document title	Report on Acid Sulfate Soils Investigation Proposed Residential Development		
Site address	Stage 1 - Precinct 5, Kings Forest Estate, Depot Road, Kings Forest		
Report prepared for	Project 28 Pty Ltd		
File name	90531.03.R.001.doc		

Document status and review

Status	Prepared by	Reviewed by	Date issued
Revision 0	Gary Samuels	Andrew Middleton	15 May 2020

Distribution of copies

Status	Electronic	Paper	Issued to
Revision 0			Brandon Yeats and Michael Geale, Project 28 Pty Ltd, Project 28 Pty Ltd

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

Signature		Date
Author		15 May 2020
Reviewer		15 May 2020

FS 604853

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Douglas Partners
Geotechnics | Environment | Groundwater

Table of Contents

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Report on Acid Sulfate Soils Investigation
Proposed Residential Development
Stage 1 - Precinct 5, Kings Forest Estate, Depot Road, Kings Forest

1. Introduction

This report presents the results of an acid sulfate soils (ASS) investigation carried out for the proposed residential development to be located at Precinct 5 (Stage 1), Depot Road, Kings Forest Estate, Kings Forest. The investigation was undertaken at the request of Project 28 Pty Ltd (Project Developer) and was carried out in accordance with Douglas Partners fee proposal GLD200019 (Rev 1) dated 6 March 2020 and DP's 'Conditions of Engagement'.

It is understood that the existing site is to be subdivided into 'high density' residential lots of unknown yield. Based on provided earthworks plans, cut to fill up to 3 m is expected in part.

This assessment also included ASS investigation works along the proposed Kings Forest Parkway, part of Precinct 4, and the south eastern corner of Precinct 7, which are proposed borrow areas for Stage 1 works. The investigation area covers approximately 35 ha.

Figure 1 indicates the area under Stage 1 assessment relative to the entire estate.

A previous ASS investigation and acid sulfate soil management plan (ASSMP) have been carried out by Gilbert and Sutherland Pty Ltd, across the entire site, and were reviewed as part of this assessment. The reports reviewed were as follows:

- Gilbert and Sutherland - '*Acid Sulfate Soil Assessment, Kings Forest Stage 1, Project Application, Kings Forest, NSW',* dated July 2012;
- Gilbert and Sutherland '*Acid Sulfate Soil Management Plan, Precinct 5, Bulk and Civil Earthworks, Kings Forest, NSW'* dated October 2019.

The aim of this investigation was to provide information and comments on the following:

- subsurface conditions including groundwater; and
- the presence or otherwise of ASS with suitable liming rates, and prepare an Acid Sulfate Soils Management Plan, if ASS are encountered;

The investigation comprised the drilling of thirty nine bores (designated Bores 1 to 39) within the Stage 1 area indicated in Figure 1, followed by laboratory testing of selected samples, and then analysis and reporting. The details of the field work and laboratory test results are presented in this report, together with comments on the issues listed above.

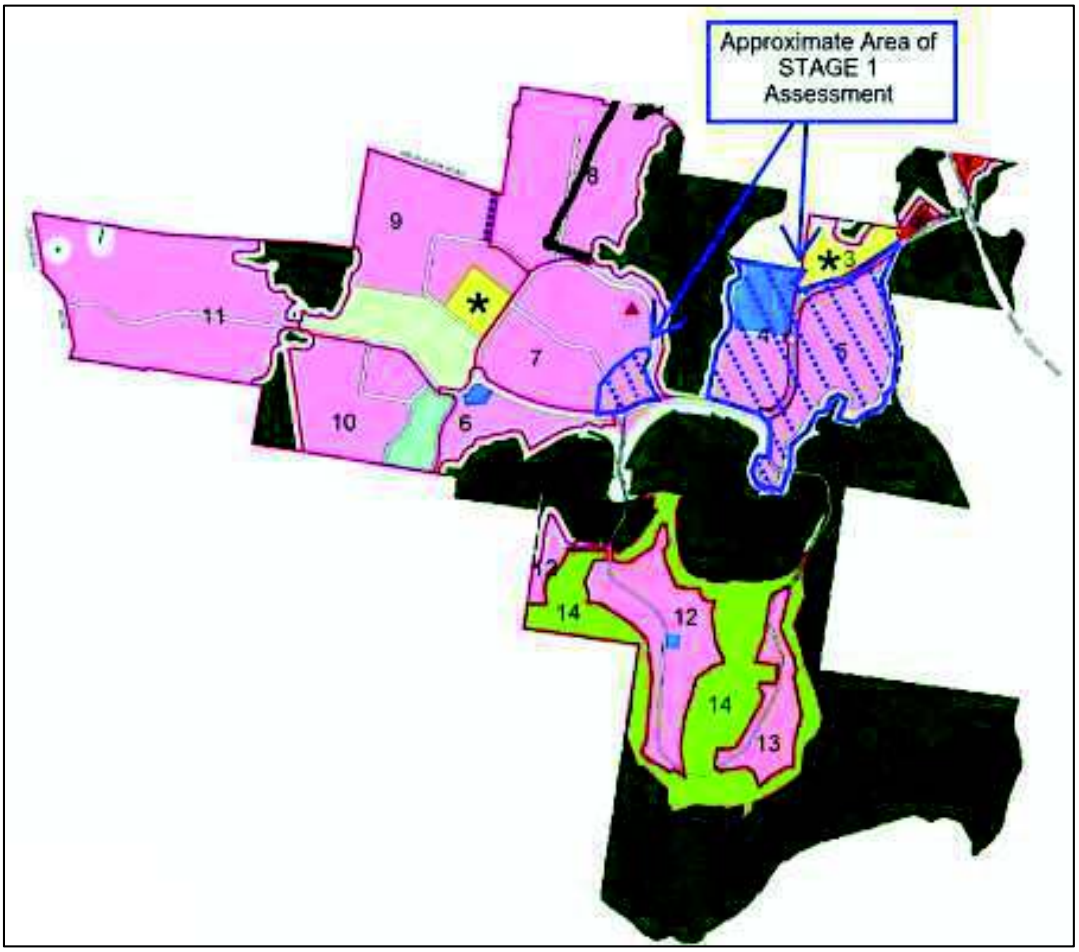


Figure 1: Area Under Assessment

This report must also be read in conjunction with the Notes About this Report, in Appendix A along with any other explanatory notes and should be kept in its entirety without separation of individual pages or sections.

2. Site Description

The site is located along Depot Road, Kings Forest and is bounded by Depot Road to the north and vacant pastoral land to the south, west and east. The site, at the time of the investigation, was vacant undulating pastoral land covered with thick grass, up to 1.0 m height, with small to tall shrubs and trees scattered throughout.

Figure 2 indicates the approximate location of the site.

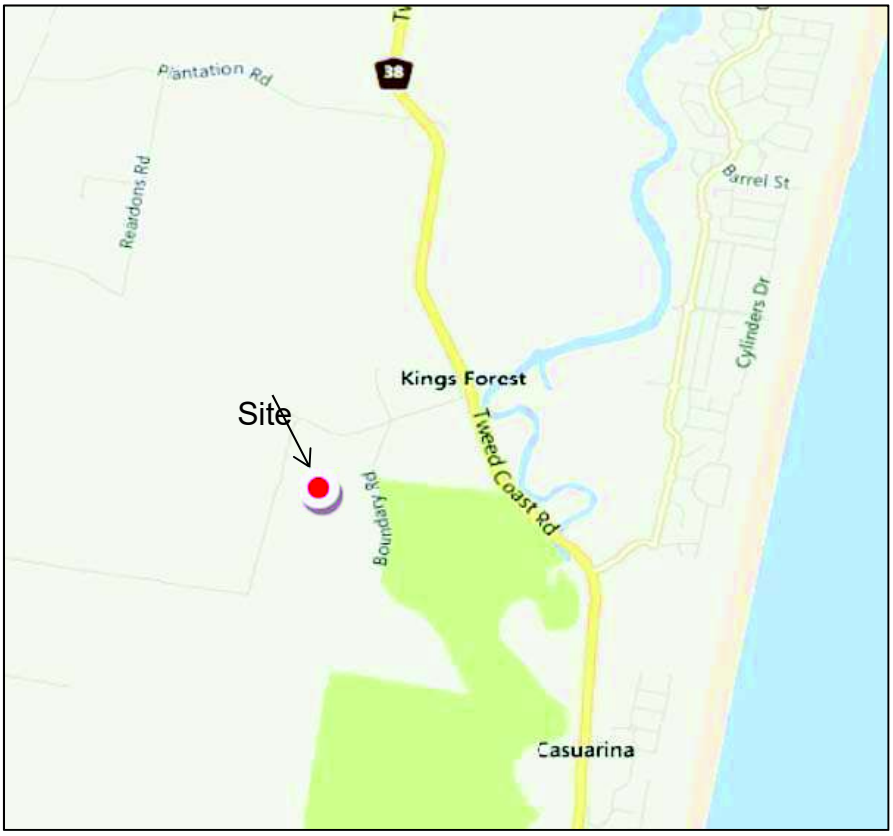


Figure 2: Approximate location of the site

Figures 3 and 4 indicate typical site conditions encountered during the investigation.

Figure 3: Looking west from near the centre of Precinct 5

Precinct 4: Looking east from near the centre of Precinct 5

3. Regional Geology and ASS Mapping Review

Reference to the Geological Survey of Queensland's 1:250,000 series Tweed Heads Geological Map indicates the site is underlain by alluvium deposits, typically comprising *'river gravels, alluvium, sand and clay'*. The site is also near a boundary of land underlain by soils and rocks of the Neranleigh Fernvale Beds typically comprising *'greywacke, argillite, quartzite, chert, shale, sandstone, greenstone'*.

In accordance with the Tweed Shire Council *'Acid Sulfate Soil Management Plan for Minor Work'*, document, the Stage 1 area of the site is mapped as being in an area designated Class '3' with *'beyond 1 metre below natural surface where likely presence of ASS will be encountered'*.

4. Field Work Methods

The fieldwork for the ASS investigation was undertaken between 9 April and 15 April 2020 and comprised the drilling and sampling of thirty nine boreholes (designated Bores 1 to 39). Bore locations were targeted in order to achieve a reasonable coverage of the site and also considered proposed earthworks across the site. As such bores were drilled to between 2.0 m and 4.0 m depth. Based on proposed earthworks at a given location, bores were targeted and drilled to a minimum 2 m depth in fill areas, and 1 m below proposed excavation depth at proposed cut locations. The bores were drilled using a four wheel drive mounted 100 mm diameter solid flight auger to bore terminations depth. The approximate locations of the boreholes are shown on Drawing 1 attached in Appendix B and the locations are summarised in Table 1.

Table 1: Location of Bores

Location	Bores
Precinct 5	1 to 15 and 39
Kings Forest Parkway	16 to 23
Precinct 4	24 to 31
Precinct 7	32 to 38

Disturbed samples were recovered from bores at approximately 0.5 m intervals to bore termination depth for ASS screening and laboratory testing. Strata identification was carried out through observation of recovered auger cuttings. The bores were backfilled with spoil after checking for groundwater inflow. All field work was undertaken by experienced geotechnical personnel who logged the bores and collected samples for visual and tactile assessment.

Fieldwork was carried out in accordance with the Acid Sulfate Soil Management Advisory committee (ASSMAC) *'Acid Sulfate Soil Manual'* NSW; August 1998.

5. Field Work Results

Details of the subsurface conditions encountered during drilling are described in detail on the borehole logs in Appendix C. Notes defining the sampling methods, soil descriptions, symbols and abbreviations used are given in Appendix A.

In summary, the ground conditions encountered during the field work comprised natural sands over indurated sand, in part, to bore termination in each bore.

Groundwater was observed in most bores during auger drilling between 0.3 m and 2.4 m below existing ground surface. The exception to this being bores 11, 12, 13, 14, 16, 18, 28, 19 and 31 where groundwater was not encountered within the depth of drilling. It should be noted that groundwater and ground moisture conditions are affected by climatic conditions, soil permeability and at this site the influence of tidal fluctuations, and will therefore vary with time.

6. Previous ASS Investigation Conclusions

The previous Gilbert and Sutherland investigations indicated that in the area of Precinct 5 (Stage 1), the area had a '*low to negligible'* potential for ASS occurring within an estimated excavation depth of 3 m. However, ASS was encountered outside the Stage 1 area in silty clays encountered near wetland/relict stream channel areas. If these areas are disturbed, an ASSMP was to be required.

7. Result of ASS Investigation

7.1 ASS Laboratory Testing

Preliminary field screening and chemical laboratory tests for ASS were carried out with reference to the Acid Sulfate Soils Assessment Guidelines (ASSMAC Guidelines), and Acid Sulfate Soils Laboratory Methods (ASSMAC Guidelines). Two hundred and sixty seven (267) samples were recovered from thirty nine bores (39) at approximately 0.5 m depth intervals down to depths of between 2.0 m and 4.0 m and were screened by measurement of pH after the addition of distilled water (pH_F) and peroxide (pH_{FOX}).

Based on the results of the screening tests and visual inspection of the samples, one hundred and thirty four (134) samples were submitted for more rigorous Chromium Suite analytical testing. The results of the screening tests (pH_F and pH_{FOX}) and Chromium Suite tests are presented in Table 2 with the detailed laboratory report sheets in Appendix D.

The testing carried out represented analysis of the predominant soil horizons encountered during the investigation.

7.2 Evaluation of Laboratory Test Data

7.2.1 Screening Tests

Criteria used to assess the results of the screening tests (pH_F and pH_{FOX}) to identify actual acid sulfate soils (AASS) or potential acid sulfate soils (PASS) are taken from the Acid Sulfate Soils Assessment Guidelines as follows:

- pH_F <4 indicates oxidation has occurred in the past and that actual acid sulfate soil (AASS) is present. None of the samples screened had a pH_F value of less than 4, indicating that the soils are not AASS.
- pH_{FOX} <3, plus a pH_{FOX} reading at least one pH unit below pH_F, plus a strong reaction with peroxide, strongly indicates the presence of Potential Acid Sulfate Soil (PASS). Ten (10) of the samples tested in the bores recorded a pH_{FOX} value of less than 3, with the remaining two hundred and fifty seven (257) being above the pH_{FOX} threshold value of 3. The ten (10) samples below the trigger value may indicate the presence of PASS, but predominantly the results indicated a *'low'* likelihood of PASS within the investigation depths. Further, only eight (8) samples showed moderate to vigorous reaction to peroxide, with two hundred and fifty nine (259) having a nil to slight reaction. Again, this indicates that predominantly, the soil horizons have a *'low'* likelihood of PASS.

7.2.2 Chromium Suite Tests

To provide more detail about the nature of the screening test results, one hundred and thirty four (134) samples were selected for more rigorous and quantitative chromium suite testing to determine more definitively if AASS or PASS are present. These select samples represent the predominant soil horizons encountered during the investigation.

The action criterion on which the presence of ASS is made from the chromium suite test results with the results that may trigger a requirement for an ASSMP based on the Soil Management Guidelines and the Laboratory Methods Guidelines. The Soil Management Guidelines, (2014) indicate that the assessment of whether or not a soil is AASS or PASS should be determined using only the 'existing plus potential' acidity calculation, and not the former 'net acidity' calculation, unless the ANC term (as used in the 'net acidity' calculation) meets certain requirements. The guidelines indicate that the ANC term is only used if the soil contains fine (i.e. <0.5 mm in size) shell fragments or other similar fine calcium carbonate material, such as skeletal fragments, coral and foraminifera. Furthermore, the guidelines specifically caution against relying on the ANC term when the material comprises a clay without any discernible carbonate material.

In the absence of the site soils meeting the above, the existing plus potential acidity equation (i.e. S_{CR} + TAA + S_{NAS}) of greater than or equal to 0.03%S (sulfur trail) or 18 mol H^+/tonne (acid trail) has been adopted for this site.

Where: S_{CR} = Chromium Reducible Sulfur
TAA = Titratable Actual Acidity
S_{NAS} = Net Acid Soluble Sulfur (retained acidity)

Based on the above, the existing plus potential acidity was calculated to be equal to or greater than 0.03%S in fifteen (15) of the one hundred and thirty four (134) samples tested. Further examination of the S_{CR} results indicates that the elevated existing plus potential acidity is due solely to TAA and therefore the soil is assessed to be naturally acidic, non-acid sulfate soils, with the exception of Bore 30 at 2 m depth when S_{CR} above 0.3% was recorded. If excavation at or below this depth is to be carried out in the area of Bores 30, it is recommended that more detailed assessment be undertaken to confirm this result and/or the extent of ASS. The remaining bores that returned elevated TAA results were 6, 15, 19, 20, 25, 30, 31,32, 34, 35, 37 and 38 represented bores in the northern part of the Precinct 4, two bores in Precinct 5, bores in Precinct 7 and along part of the Kings Forest Parkway. Where elevated TAA levels were encountered in samples of 0.1m depth, these values are expected to be the result of high levels of organics and as such are not considered to be acid sulfate soils.

Based on results of this testing, an acid sulfate soils management plan (ASSMP) would not be required at this site. However, due to the natural acidity in the soil in part in Precincts 4, 5, 7 and along the Kings Forest Parkway, measures to prevent potential environmental harm would be prudent if the material is to be moved off site or left exposed and disturbed or stockpiled for longer than 48 hrs where excavation depths are at or below the depth shown in Table 3 at the designated locations.

Table 3: Summary of Locations and Excavation Depth where treatment is recommended

Location	Depth at which treatment is recommended (m)[(i)]
Precinct 5	4
Kings Forest Parkway	1.5
Precinct 4	1.0
Precinct 7	2.5

Notes: i) Below existing ground level

Excavation of soils above the depths shown in Table 3 would not require any neutralisation treatment. However, it may be prudent to carry out some 'check' testing to confirm acidity of on site materials given to size of the site, general variation in properties of soil and anticipated volumes of material to be disturbed.

With reference to the guidelines, and subject to the above, if required, a neutralising agent (generally aglime) should be applied during site works (refer below). The TAA results can be used to guide liming rates to achieve desired pH levels. Thorough mixing, a safety factor and a fully contained treatment pad would generally not be necessary. Instead, neutralising agent may be:

- spread in key areas as part of the filling operations to intercept any acidic leachate flow;
- added to truckloads of disturbed material while being moved, thus achieving a degree of mixing during transport and placement;
- spread and tyned into the upper between depths of 0.2 m and 0.3 m as a guard layer under (5 kg/m^2 – Aglime) any temporary or permanent stockpiles or treatment areas and any exposed earthworks surfaces;
- incorporated as lime-enriched perimeters around temporary or permanent stockpiles or treatment areas; and
- positioned in drains and areas most likely to experience water runoff.

For material disturbed at or below the depths shown in Table 3, neutralisation may be required if stockpiled for more than 48 hrs or if it is to be removed from site. As such for neutralisation, using the highest reported level of soil acidity (i.e. existing plus potential) determined by the laboratory test results for each precinct or area, a preliminary neutralisation rate is indicated in Table 4.

Table 4: Summary of Liming Rates for Neutralisation

Location	Ag Lime (kg)/tonne of disturbed soil	Ag Lime (kg)/m^3 disturbed loose stockpiled soil[v]
Precinct 5[i]	2	3
Kings Forest Parkway[ii]	5	7.5
Precinct 4[iii]	5	7.5
Precinct 2[iv]	8	12

Notes:
i) Disturbed material at or below 4 m
ii) Disturbed material at or below 1.5 m
iii) Disturbed material at or below 1.0 m
iv) Disturbed material at or below 2.5m
v) Assumes loose stockpile density, after *'bulking up'* of 1.5 tonne/m^3

7.3 Water Quality

The presence of acidic soils could lead to leaching of acid and metals during and after rainfall events. Accordingly, groundwater from excavations or surface water should be captured and not be

discharged off site without prior testing in order to assess the suitability of the water quality and treat where required in accordance with regulatory authority guidelines/criteria.

8. References

Acid Sulfate Soil Management Advisory Committee (ASSMAC), *'Acid Sulfate Soil Manual'*. New South Wales, August 1998.

Australian and New Zealand Environment Conservation Council (ANZECC), *'Water Quality Guidelines'*, Version –October 2000.

Ahearn CR, Dear SE, O'Brien LE, Dobos SK, McElnea AE, Moore NG and Watling KM, (2014), *Soil Management Guidelines,* in, *Queensland Acid Sulfate Soil Technical Manual,* Brisbane, Qld Dept of Science, Information Technology, Innovation and the Arts.

9. Limitations

Douglas Partners Pty Ltd (DP) has prepared this Acid Sulfate Soils investigation report for the proposed residential development at Stage 1, Precinct 5, Kings Forest Estate, Depot Road, Kings Forest. This report is provided for the exclusive use of Project 28 Pty Ltd or their consultants for this project only and for the purposes described in the report. It should not be used for other projects or by a third party. 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 an indication of the subsurface conditions only at the specific sampling or testing locations, and then only to the depths investigated and at the time the work was carried out. Subsurface conditions can change abruptly due to variable geological processes and also as a result of anthropogenic influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be limited by undetected variations in ground conditions between sampling 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 notes in Appendix A 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 given 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, as this report has been written as advice and opinion rather than instructions for construction.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the

hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the geotechnical components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

Douglas Partners Pty Ltd

Appendix A

About This Report
Sampling Methods
Soil Description and Abbreviations

About this Report

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.

Sampling Methods

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Symbols & Abbreviations

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core Drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

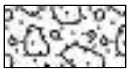
fg	fragmented
bnd	band
qtz	quartz

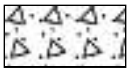
Symbols & Abbreviations

Graphic Symbols for Soil and Rock

General


Asphalt


Road base

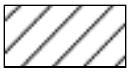

Concrete


Filling

Soils


Topsoil


Peat


Clay


Silty clay

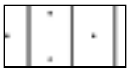

Sandy clay


Gravelly clay

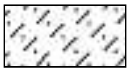

Shaly clay


Silt


Clayey silt


Sandy silt


Sand


Clayey sand


Silty sand


Gravel


Sandy gravel


Cobbles, boulders

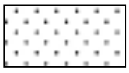

Talus

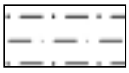
Sedimentary Rocks

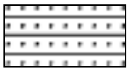

Boulder conglomerate

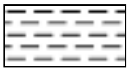

Conglomerate


Conglomeratic sandstone


Sandstone


Siltstone


Laminite

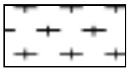

Mudstone, claystone, shale

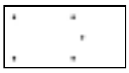

Coal


Limestone

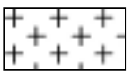
Metamorphic Rocks

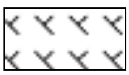

Slate, phyllite, schist

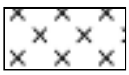

Gneiss

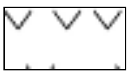

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

Soil Descriptions

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

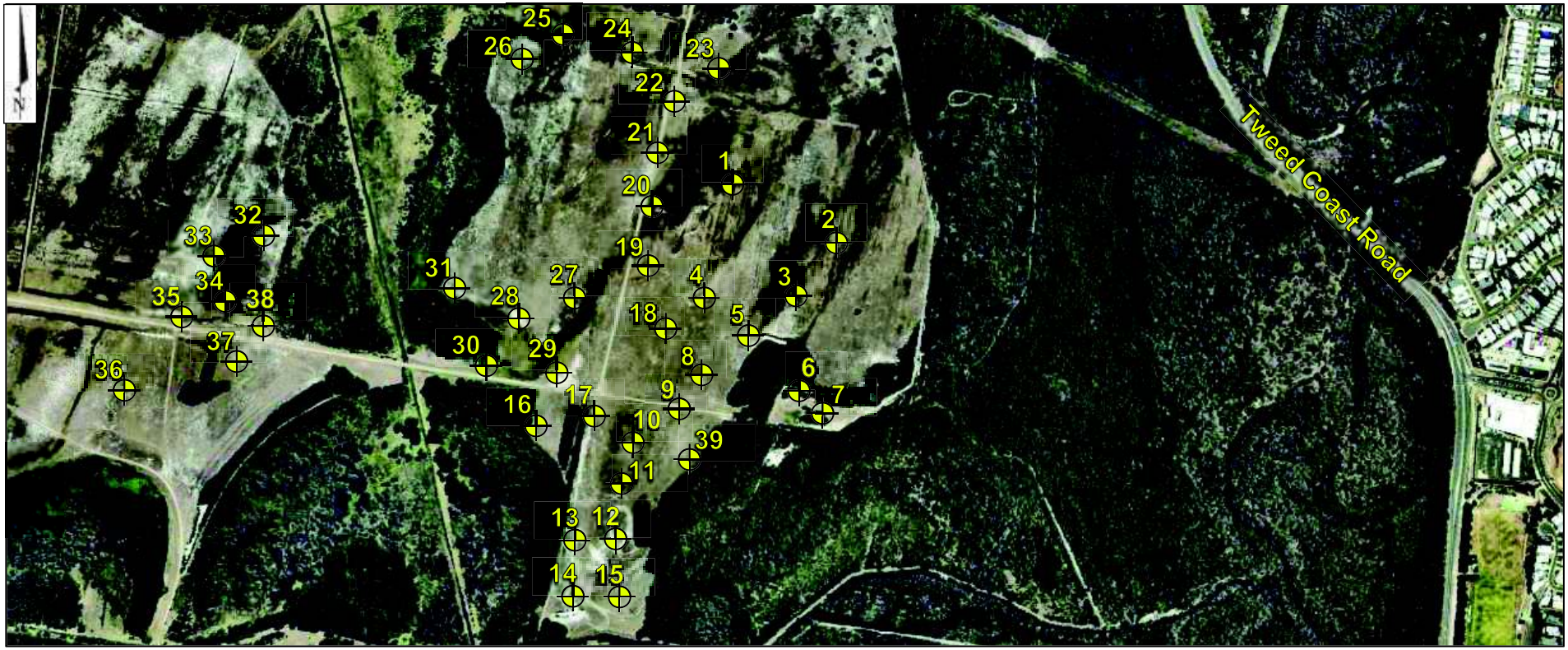
- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

Appendix B

Test Location Plan



Notes:

1. Test locations are approximate only and are shown with reference to existing site features.
2. Drawing Not To Scale.
3. Drawing adapted from nearmap imagery dated 7 November 2019

Legend:

⊕ Bore number and location

Douglas Partners Geotechnics | Environment | Groundwater	CLIENT: Project 28 Pty Ltd OFFICE: Gold Coast DATE: April 2020	**Test Location Plan** **Proposed Residential Development** **Depot Road,** **Kings Forest**	PROJECT No: 90531.03 DRAWING No: 1 REVISION: 0

Appendix C

Borehole Logs (Bores 1 to 39)

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6 Approx
EASTING: 554565
NORTHING: 6870152
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 90531.03
DATE: 9/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		SAND (SP): fine to medium grained, grey brown, moist			0.25		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	0.9	- wet							
1									1
	1.7	- pale grey brown							
2	2.0	Bore discontinued at 2.0m Limit of Investigation							2
3									3

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.9m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6.6 Approx
EASTING: 554741
NORTHING: 6870049
DIP/AZIMUTH: 90°/--

BORE No: 2
PROJECT No: 90531.03
DATE: 9/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, grey brown, moist							
	0.4	- pale grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	0.8	- wet							
1									1
	1.9	- brown/grey brown							
2	2.0	Bore discontinued at 2.0m Limit of Investigation							2
3									3

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.8m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6 Approx
EASTING: 554672
NORTHING: 6869936
DIP/AZIMUTH: 90°/--

BORE No: 3
PROJECT No: 90531.03
DATE: 9/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.15	SAND (SP): fine to medium grained, grey, moist							
		- pale brown							
	0.5				0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
		- pale brown grey							
1	1.0							▼	1
		- wet							
	1.8								
		- grey brown							
2	2.0	Bore discontinued at 2.0m Limit of Investigation							2
3									3

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 1.0m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 7.8 Approx AHD
EASTING: 554523
NORTHING: 6869959
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 90531.03
DATE: 9/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		SAND (SP): fine to medium grained, grey brown, moist							
	0.25	- pale grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
1	1.0	- wet							1
2									2
	2.5	Bore discontinued at 2.5m Limit of Investigation							
3									3

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 1.0m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6 Approx
EASTING: 554585
NORTHING: 6869886
DIP/AZIMUTH: 90°/--

BORE No: 5
PROJECT No: 90531.03
DATE: 9/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		SAND (SP): fine to medium grained, grey brown, moist							
	0.5	- pale grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
1	1.0	- wet						▼	1
	1.9	INDURATED SAND (SP): fine to medium grained, dark brown, wet							
2									2
	2.5	Bore discontinued at 2.5m Limit of Investigation							
3									3

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 1.0m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 7 Approx
EASTING: 554663
NORTHING: 6869774
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 90531.03
DATE: 9/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.25	SAND (SP): fine to medium grained, brown, moist							
	0.3	- pale grey brown - wet			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	1								
	2								
	2.9	INDURATED SAND (SP): fine to medium grained, dark brown, wet							
	3								
	4.0	Bore discontinued at 4.0m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.3m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6.2 Approx
EASTING: 554713
NORTHING: 6869747
DIP/AZIMUTH: 90°/--

BORE No: 7
PROJECT No: 90531.03
DATE: 9/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.15	SAND (SP): fine to medium grained, grey brown, moist							
	0.3	- pale grey brown							
		- wet			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	2.0	Bore discontinued at 2.0m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.3m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6.4 Approx
EASTING: 554496
NORTHING: 6869805
DIP/AZIMUTH: 90°/--

BORE No: 8
PROJECT No: 90531.03
DATE: 9/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		SAND (SP): fine to medium grained, grey brown,moist							
	0.2	- pale grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
1	1.0	- wet						▼	1
2									2
	2.5	Bore discontinued at 2.5m Limit of Investigation							
3									3

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 1.0m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6 Approx
EASTING: 554452
NORTHING: 6869762
DIP/AZIMUTH: 90°/--

BORE No: 9
PROJECT No: 90531.03
DATE: 10/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.15	SAND (SP): fine to medium grained, grey, moist							
		- pale grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
	2.1	- wet						▼	
	2.5	Bore discontinued at 2.5m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 2.1m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6 Approx
EASTING: 554374
NORTHING: 6869693
DIP/AZIMUTH: 90°/--

BORE No: 10
PROJECT No: 90531.03
DATE: 10/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		SAND (SP): fine to medium grained, grey brown, moist							
	0.2	- pale grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
1	1.0	- wet							1
2									2
	2.5	Bore discontinued at 2.5m Limit of Investigation							
3									3

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 1.0m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 5.7 Approx
EASTING: 554358
NORTHING: 6869625
DIP/AZIMUTH: 90°/--

BORE No: 11
PROJECT No: 90531.03
DATE: 10/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		SAND (SP): fine to medium grained, grey, moist							
	0.2	- pale grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
	1								1
	2								2
	3								3
	3.5	Bore discontinued at 3.5m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: No free groundwater encountered during investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 4.7 Approx
EASTING: 554344
NORTHING: 6869528
DIP/AZIMUTH: 90°/--

BORE No: 12
PROJECT No: 90531.03
DATE: 10/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		SAND (SP): fine to medium grained, grey brown, moist							
	0.5	- pale grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
	1								1
	2.0	Bore discontinued at 2.0m Limit of Investigation							
	2								2
	3								3

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: No free groundwater encountered during investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6.2 Approx
EASTING: 554266
NORTHING: 6869550
DIP/AZIMUTH: 90°/--

BORE No: 13
PROJECT No: 90531.03
DATE: 10/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.25	SAND (SP): fine to medium grained, grey, moist			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
	0.7	- grey, brown							
	2.5	- pale grey brown							
		Bore discontinued at 2.5m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: No free groundwater encountered during investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 4 Approx
EASTING: 554269
NORTHING: 6869424
DIP/AZIMUTH: 90°/--

BORE No: 14
PROJECT No: 90531.03
DATE: 10/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		SAND (SP): fine to medium grained, grey, moist							
	0.2	- grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
	0.8	- pale grey brown							
	1								1
	2								2
	3								3
	3.5	Bore discontinued at 3.5m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: No free groundwater encountered during investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 3.9 Approx
EASTING: 554354
NORTHING: 6869416
DIP/AZIMUTH: 90°/--

BORE No: 15
PROJECT No: 90531.03
DATE: 10/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, grey/dark grey, moist							
	0.2	- grey brown							
	0.5	- pale grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	1								1
	2								2
	2.0	Bore discontinued at 2.0m Limit of Investigation							
	3								3

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 1.0m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 5.5 Approx
EASTING: 554200
NORTHING: 6869718
DIP/AZIMUTH: 90°/--

BORE No: 16
PROJECT No: 90531.03
DATE: 10/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		SAND (SP): fine to medium grained, grey brown, moist							
	0.2	- pale grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
	1								1
	2 2.0	Bore discontinued at 2.0m Limit of Investigation							2
	3								3

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: No free groundwater encountered during investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6 Approx
EASTING: 554308
NORTHING: 6869741
DIP/AZIMUTH: 90°/--

BORE No: 17
PROJECT No: 90531.03
DATE: 10/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, grey, moist							
	0.2	- pale grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
	2.4	- wet						▼	
	3.5	Bore discontinued at 3.5m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 2.4m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6.6 Approx
EASTING: 554413
NORTHING: 6869874
DIP/AZIMUTH: 90°/--

BORE No: 18
PROJECT No: 90531.03
DATE: 10/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, grey, moist							
	0.2	- pale grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	0.6	- wet							
	1.9	INDURATED SAND (SP): fine to medium grained, dark brown, wet							
	3.5	Bore discontinued at 3.5m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.6m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6.3 Approx
EASTING: 554406
NORTHING: 6869983
DIP/AZIMUTH: 90°/--

BORE No: 19
PROJECT No: 90531.03
DATE: 10/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, pale grey brown, moist							
	0.5	- wet			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	1								1
	2								2
	2.7	INDURATED SAND (SP): fine to medium grained, dark brown, wet							
	3								3
	3.5	Bore discontinued at 3.5m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.5m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6 Approx
EASTING: 554415
NORTHING: 6870095
DIP/AZIMUTH: 90°/--

BORE No: 20
PROJECT No: 90531.03
DATE: 13/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.25	SAND (SP): fine to medium grained, grey brown, moist							
	0.4	- pale grey brown							
		- wet			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	1.1	INDURATED SAND (SP): fine to medium grained, dark brown, wet							
	2.5	Bore discontinued at 2.5m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.4m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6.9 Approx
EASTING: 554419
NORTHING: 6870201
DIP/AZIMUTH: 90°/--

BORE No: 21
PROJECT No: 90531.03
DATE: 13/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.15	ROADBASE/GRAVEL (Dirt Track)							
		SAND (SP): fine to medium grained, grey brown, moist			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
	0.7	Clayey SAND (SC): fine to medium grained, dark grey brown, moist, wet						▼	
1	1.1	SAND (SP): fine to medium grained, grey brown, wet							1
2	2.5	Bore discontinued at 2.5m Limit of Investigation							2
3									3

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.7m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 7 Approx
EASTING: 554449
NORTHING: 6870293
DIP/AZIMUTH: 90°/--

BORE No: 22
PROJECT No: 90531.03
DATE: 13/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		SAND (SP): fine to medium grained, grey brown, moist			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	0.8	- grey brown, wet							
	2.15	INDURATED SAND (SP): fine to medium grained, dark brown, wet							
	2.5	Bore discontinued at 2.5m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.8m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 8.4 Approx
EASTING: 554516
NORTHING: 6870354
DIP/AZIMUTH: 90°/--

BORE No: 23
PROJECT No: 90531.03
DATE: 13/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.15	SAND (SP): fine to medium grained, dark grey, moist			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	0.7	- pale grey brown							
	1	- wet							
	2								
	2.3	INDURATED SAND (SP): fine to medium grained, dark brown, wet							
	3								
	3.5	Bore discontinued at 3.5m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.7m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6 Approx
EASTING: 554373
NORTHING: 6870380
DIP/AZIMUTH: 90°/--

BORE No: 24
PROJECT No: 90531.03
DATE: 13/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, grey/dark grey, moist			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	0.2	- grey brown							
	0.7	- pale grey brown, wet							
1									1
	1.8	INDURATED SAND (SP): fine to medium grained, dark brown, wet							
2	2.0	Bore discontinued at 2.0m Limit of Investigation							2
3									3

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.7m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6.6 Approx
EASTING: 554261
NORTHING: 6870407
DIP/AZIMUTH: 90°/--

BORE No: 25
PROJECT No: 90531.03
DATE: 13/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, grey/dark grey, moist							
	0.2	- grey brown							
	0.4	- wet			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	1								1
	1.8	INDURATED SAND (SP): fine to medium grained, dark brown, wet							
	2 2.0	Bore discontinued at 2.0m Limit of Investigation							2
	3								3

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.4m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6.9 Approx
EASTING: 554194
NORTHING: 6870355
DIP/AZIMUTH: 90°/--

BORE No: 26
PROJECT No: 90531.03
DATE: 13/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, dark grey, moist							
	0.2	- grey brown						▼	
	0.3	- wet			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
	1								1
	1.8	INDURATED SAND (SP): fine to medium grained, dark brown, wet							
	2 2.0	Bore discontinued at 2.0m Limit of Investigation							2
	3								3

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.3m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6 Approx
EASTING: 554274
NORTHING: 6869946
DIP/AZIMUTH: 90°/--

BORE No: 27
PROJECT No: 90531.03
DATE: 14/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, dark grey brown, moist							
	0.2	- grey brown							
	0.3	- wet			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	0.7	- light grey brown							
	1								1
	2.0	Bore discontinued at 2.0m Limit of Investigation							2
	3								3

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.3m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6.9 Approx
EASTING: 554181
NORTHING: 6869917
DIP/AZIMUTH: 90°/--

BORE No: 28
PROJECT No: 90531.03
DATE: 14/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.2	SAND (SP): fine to medium grained, dark grey brown, moist							
		- light grey			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
	2.0	Bore discontinued at 2.0m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: No free groundwater encountered during investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6 Approx
EASTING: 554246
NORTHING: 6869813
DIP/AZIMUTH: 90°/--

BORE No: 29
PROJECT No: 90531.03
DATE: 14/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.2	SAND (SP): fine to medium grained, grey brown, moist							
		- light grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
	2.0	Bore discontinued at 2.0m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: No free groundwater encountered during investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6 Approx
EASTING: 554108
NORTHING: 6869836
DIP/AZIMUTH: 90°/--

BORE No: 30
PROJECT No: 90531.03
DATE: 14/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, grey brown, moist							
	0.4	- dark grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	1.1	- brown, slight organic odour							
	2.0	Bore discontinued at 2.0m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.4m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 7 Approx
EASTING: 554059
NORTHING: 6869962
DIP/AZIMUTH: 90°/--

BORE No: 31
PROJECT No: 90531.03
DATE: 14/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.2	SAND (SP): fine to medium grained, grey brown, moist							
		- light grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
	2.0	Bore discontinued at 2.0m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: No free groundwater encountered during investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6 Approx
EASTING: 553724
NORTHING: 6870063
DIP/AZIMUTH: 90°/--

BORE No: 32
PROJECT No: 90531.03
DATE: 14/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, light grey, moist							
	0.2	- light grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	0.6	- wet							
	1								1
	2								2
	2.6	INDURATED SAND (SP): fine to medium grained, dark brown, wet							
	3								3
	3.5	Bore discontinued at 3.5m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.6m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6 Approx
EASTING: 553632
NORTHING: 6870028
DIP/AZIMUTH: 90°/--

BORE No: 33
PROJECT No: 90531.03
DATE: 15/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, light grey, moist							
	0.2	- light grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
	1.3	- wet						▼	
	2.7	INDURATED SAND (SP): fine to medium grained, dark brown, wet							
	3.5	Bore discontinued at 3.5m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 1.3m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 5.7 Approx
EASTING: 553654
NORTHING: 6869950
DIP/AZIMUTH: 90°/--

BORE No: 34
PROJECT No: 90531.03
DATE: 15/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, dark grey, very moist							
	0.2	- grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	0.7	- wet							
	1.9	INDURATED SAND (SP): fine to medium grained, dark brown, wet							
	3.5	Bore discontinued at 3.5m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.7m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6.8 Approx
EASTING: 553577
NORTHING: 6869917
DIP/AZIMUTH: 90°/--

BORE No: 35
PROJECT No: 90531.03
DATE: 15/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, grey, moist							
	0.2	- light grey brown							
	0.5	- wet			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	1								1
	2								2
	2.3	- brown							
	2.7	INDURATED SAND (SP): fine to medium grained, dark brown, wet							
	3								3
	3.5	Bore discontinued at 3.5m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.5m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 5.7 Approx
EASTING: 553466
NORTHING: 6869770
DIP/AZIMUTH: 90°/--

BORE No: 36
PROJECT No: 90531.03
DATE: 15/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, grey brown, moist							
	0.2	- light grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
	1.3	- wet						▼	
	3.5	Bore discontinued at 3.5m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 1.3m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 5.5 Approx
EASTING: 553668
NORTHING: 6869840
DIP/AZIMUTH: 90°/--

BORE No: 37
PROJECT No: 90531.03
DATE: 15/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, grey brown, moist							
	0.2	- dark grey							
	0.5	- wet			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth	▼	
	0.9	- grey brown							
	1.7	INDURATED SAND (SP): fine to medium grained, dark brown, wet							
	3.5	Bore discontinued at 3.5m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.5m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 5 Approx
EASTING: 553711
NORTHING: 6869898
DIP/AZIMUTH: 90°/--

BORE No: 38
PROJECT No: 90531.03
DATE: 15/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, grey, moist							
	0.2	- grey/light grey							
	0.3	- wet						▼	
	0.5	- grey/dark grey			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
1	1.05	- light grey, brown							1
2	2.4	- dark grey brown							2
3	3.5	Bore discontinued at 3.5m Limit of Investigation							3

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.3m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Project 28 Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: Depot Road, Kings Forest

SURFACE LEVEL: 6.4 Approx
EASTING: 554470
NORTHING: 6869661
DIP/AZIMUTH: 90°/--

BORE No: 39
PROJECT No: 90531.03
DATE: 15/4/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	SAND (SP): fine to medium grained, grey, moist							
	0.3	- grey brown			0.5		ASS samples collected from surface at 0.5m intervals to bore termination depth		
	0.7	- light grey brown							
	2.2	- wet						▼	
	2.9	- grey brown							
	3.5	Bore discontinued at 3.5m Limit of Investigation							

RIG: JACMAZ 500 **DRILLER:** Mazlab **LOGGED:** CM/JT **CASING:** N/A

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 2.2m depth at the time of the investigation

REMARKS: Surface level obtained from nearmap imagery dated 7 November 2019.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Appendix D

Laboratory Test Results

MAZLAB Pty Ltd
Environmental Testing, Sampling and Drilling (Vibracore)
ABN 90 151 684 436 ACN 151 684 436

U1/ 33 MACHINERY DR., TWEED HEADS SOUTH, 2486
PO BOX 6879 TWEED HEADS SOUTH MC., 2486
PHONE: (07) 55239922 FAX: (07) 55239822
EMAIL: mazlab@bigpond.com

Client: Douglas Partners **Project:** Kings Forest Subdivision (90531.03)

Mazlab Job No: DPB3092 **Date:** 28/04/2020

LABORATORY TEST RESULTS
Certificate of Test Results – Chromium Reducible Sulphur

Sample No.	Client I.D	Soil Description (truncated)	pH KCL	SCr mol (H+/t) %S	TAA mol (H+/t)	SNAS %S	ANC mol (H+/t) NA= Scr< action limit	Net Acidity mol (H+/t)	Liming Rate (Kg/ dry/ t)
45558	BH1-0.50	As per Borelogs	6.3	<2 <0.01%	3 <0.01%	-	NA	3 <0.01%	Nil
45589	BH1-1.50		6.7	<2 <0.01%	-	-	NA	<2 <0.01%	Nil
45590	BH2-0.10		5.3	<2 <0.01%	2 <0.01%	-	-	2 <0.01%	Nil
45591	BH2-1.00		6.3	<2 <0.01%	3 <0.01%	-	-	3 <0.01%	Nil
45592	BH2-2.00		6.3	<2 <0.01%	2 <0.01%	-	-	2 <0.01%	Nil
45593	BH3-0.10		4.3	<2 <0.01%	15 0.02%	<0.02%	-	15 0.02%	Nil
45594	BH3-1.00		6.1	<2 <0.01%	2 <0.01%	-	-	2 <0.01%	Nil
45595	BH3-2.00		6.3	<2 <0.01%	2 <0.01%	-	-	2 <0.01%	Nil
45596	BH4-0.50		6.7	<2 <0.01%	-	-	NA	<2 <0.01%	Nil
45597	BH4-1.50		6.8	<2 <0.01%	-	-	NA	<2 <0.01%	Nil
45598	BH4-2.50		6.8	<2 <0.01%	-	-	NA	<2 <0.01%	Nil
45599	BH5-0.50		6.7	<2 <0.01%	-	-	NA	<2 <0.01%	Nil
45600	BH5-1.50		6.6	<2 <0.01%	-	-	NA	<2 <0.01%	Nil
45601	BH5-2.50		5.6	<2 <0.01%	5 0.01%	-	-	5 0.01%	Nil
45602	BH6-0.10		5.8	<2 <0.01%	8 0.01%	-	-	8 0.01%	Nil
45603	BH6-1.00		6.7	<2 <0.01%	-	-	NA	<2 <0.01%	Nil
45604	BH6-2.00		6.8	<2 <0.01%	-	-	NA	<2 <0.01%	Nil
45605	BH6-3.00		5.8	<2 <0.01%	5 0.01%	-	-	5 0.01%	Nil
45606	BH6-4.00		4.4	<2 <0.01%	18 0.03%	<0.02%	-	18 0.03%	1.4

: :

Laboratory Test Methods follow procedures described in : QASSIT – Acid Sulphate Soils Laboratory Methods Guidelines – Version 2.1 June 2004

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
ABN 75 053 980 117
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Unit 4, 482 Scottsdale Drive
Varsity Lakes QLD 4227
Phone (07) 5568 8900
Fax (07) 5568 8999

FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
Project : Kings Forest Precinct 5
Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 39	Bore 39	Bore 39	Bore 39	Bore 39	Bore 39	Bore 39	
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00	3.50	
Soil Description	Silty Sand	Sand	Sand	Sand	Sand	Sand	Sand	
Field pH (pH_F)	6.8	7.0	7.2	7.2	7.2	7.1	6.9	
Oxidised pH (pH_{FOX})	5.3	5.4	5.3	5.3	5.3	5.5	5.5	
Reactivity Code (see below)	1	1	1	1	1	1	1	
AASS / PASS (see below)								

Reactivity codes: 1 = None to slight 2 = Moderate, 3 = Vigorous, 4 = Very vigorous (gas & heat generated)

F= Bubbling/ Frothy Reaction (organics) , N/A = Not Assessed

ASS / PASS intereptation : if pHf < 4.0 = ASS (actual acid sulphate soil) if pHfox < 3.0 = PASS (potential acid sulphate soil)

CHECKED BY:.....CW.....

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FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
Project : Kings Forest Precinct 5
Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 38	Bore 38	Bore 38	Bore 38	Bore 38	Bore 38	Bore 38	
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00	3.00	3.50	
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	
Field pH (pH_F)	5.9	6.5	6.3	6.8	7.0	4.9	4.5	
Oxidised pH (pH_{FOX})	3.7	4.5	4.3	4.9	4.9	3.5	2.3	
Reactivity Code (see below)	1	1	1	1	1	1	2	
AASS / PASS (see below)								

Reactivity codes: 1 = None to slight 2 = Moderate, 3 = Vigorous, 4 = Very vigorous (gas & heat generated)

F= Bubbling/ Frothy Reaction (organics) , N/A = Not Assessed

ASS / PASS intereptation : if pHf < 4.0 = ASS (actual acid sulphate soil) if pHfox < 3.0 = PASS (potential acid sulphate soil)

CHECKED BY:.....CW.....

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FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
Project : Kings Forest Precinct 5
Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 37	Bore 37	Bore 37	Bore 37	Bore 37	Bore 37	Bore 37	Bore 37
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand
Field pH (pH_F)	5.7	4.1	5.6	6.2	5.1	4.8	5.1	5.0
Oxidised pH (pH_{FOX})	4.1	2.3	3.8	4.6	4.0	3.5	3.6	2.1
Reactivity Code (see below)	1	3	1	1	1	1	2	3
AASS / PASS (see below)								

Reactivity codes: 1 = None to slight 2 = Moderate, 3 = Vigorous, 4 = Very vigorous (gas & heat generated)

F= Bubbling/ Frothy Reaction (organics) , N/A = Not Assessed

ASS / PASS intereptation : if pHf < 4.0 = ASS (actual acid sulphate soil) if pHfox < 3.0 = PASS (potential acid sulphate soil)

CHECKED BY:.....CW.....

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FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
Project : Kings Forest Precinct 5
Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 36	Bore 36	Bore 36	Bore 36	Bore 36	Bore 36	Bore 36	Bore 36
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50
Soil Description	Silty Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand
Field pH (pH_F)	5.6	6.6	7.1	7.1	6.7	6.9	6.1	6.4
Oxidised pH (pH_{FOX})	3.7	5.0	5.2	5.2	5.1	5.0	4.9	4.9
Reactivity Code (see below)	1	1	1	1	1	1	1	1
AASS / PASS (see below)								

Reactivity codes: 1 = None to slight 2 = Moderate, 3 = Vigorous, 4 = Very vigorous (gas & heat generated)

F= Bubbling/ Frothy Reaction (organics) , N/A = Not Assessed

ASS / PASS intereptation : if pHf < 4.0 = ASS (actual acid sulphate soil) if pHfox < 3.0 = PASS (potential acid sulphate soil)

CHECKED BY:.....CW.....

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FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
Project : Kings Forest Precinct 5
Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 35	Bore 35	Bore 35	Bore 35	Bore 35	Bore 35	Bore 35	Bore 35
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50
Soil Description	Silty Sand	Sand	Sand	Sand	Sand	Sand	Silty Sand	Silty Sand
Field pH (pH_F)	6.5	7.2	7.6	7.5	7.2	6.9	4.6	5.3
Oxidised pH (pH_{FOX})	3.2	5.2	5.4	5.4	5.4	4.8	3.3	3.8
Reactivity Code (see below)	1	1	1	1	1	1	1	1
AASS / PASS (see below)								

Reactivity codes: 1 = None to slight 2 = Moderate, 3 = Vigorous, 4 = Very vigorous (gas & heat generated)

F= Bubbling/ Frothy Reaction (organics) , N/A = Not Assessed

ASS / PASS intereptation : if pHf < 4.0 = ASS (actual acid sulphate soil) if pHfox < 3.0 = PASS (potential acid sulphate soil)

CHECKED BY:.....CW.....

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FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
Project : Kings Forest Precinct 5
Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 34	Bore 34	Bore 34	Bore 34	Bore 34	Bore 34	Bore 34	Bore 34
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand
Field pH (pH_F)	5.8	6.3	6.6	6.6	5.3	4.5	4.4	4.7
Oxidised pH (pH_{FOX})	2.9	4.5	3.9	4.5	4.1	2.3	2.2	2.8
Reactivity Code (see below)	1	1	1	1	1	2	2	2
AASS / PASS (see below)								

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FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
Project : Kings Forest Precinct 5
Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 33	Bore 33	Bore 33	Bore 33	Bore 33	Bore 33	Bore 33	
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.50	2.00	2.50	3.00	3.50	
Soil Description	Silty Sand	Sand	Sand	Sand	Sand	Silty Sand	Silty Sand	
Field pH (pH_F)	5.1	6.6	6.9	6.8	7.0	4.4	4.9	
Oxidised pH (pH_{FOX})	4.1	5.2	5.0	5.2	4.9	3.2	4.1	
Reactivity Code (see below)	1	1	1	1	1	1	1	
AASS / PASS (see below)								

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FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
Project : Kings Forest Precinct 5
Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 32	Bore 32	Bore 32	Bore 32	Bore 32	Bore 32	Bore 32	Bore 32
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50
Soil Description	Silty Sand	Sand	Sand	Sand	Sand	Sand	Silty Sand	Silty Sand
Field pH (pH_F)	6.0	6.0	6.3	6.7	7.0	6.8	4.5	4.6
Oxidised pH (pH_{FOX})	4.6	4.8	4.5	4.8	4.8	4.2	3.1	3.2
Reactivity Code (see below)	1	1	1	1	1	1	1	1
AASS / PASS (see below)								

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FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
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Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 31	Bore 31	Bore 31	Bore 31	Bore 31			
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00			
Soil Description	Silty Sand	Silty Sand	Silty Sand	Sand	Sand			
Field pH (pH_F)	5.1	6.3	6.5	7.0	7.2			
Oxidised pH (pH_{FOX})	4.0	4.7	5.1	5.4	5.3			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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FIELD pH SCREENING - ACID SULFATE SOILS

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Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 30	Bore 30	Bore 30	Bore 30	Bore 30			
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00			
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand			
Field pH (pH_F)	6.0	5.4	5.4	5.1	4.3			
Oxidised pH (pH_{FOX})	3.2	3.6	3.9	1.2	1.1			
Reactivity Code (see below)	1	1	1	3	3			
AASS / PASS (see below)								

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Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 29	Bore 29	Bore 29	Bore 29	Bore 29			
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00			
Soil Description	Silty Sand	Sand	Sand	Sand	Sand			
Field pH (pH_F)	6.4	6.8	7.1	7.2	7.2			
Oxidised pH (pH_{FOX})	4.6	4.9	4.9	5.0	5.2			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 28	Bore 28	Bore 28	Bore 28	Bore 28			
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00			
Soil Description	Sand	Sand	Sand	Sand	Sand			
Field pH (pH_F)	5.8	6.6	6.8	7.1	7.2			
Oxidised pH (pH_{FOX})	4.2	4.8	4.7	4.7	5.0			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Location : Depot Road, Kings Forest, NSW

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Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 27	Bore 27	Bore 27	Bore 27	Bore 27			
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00			
Soil Description	Silty Sand	Silty Sand	Sand	Silty Sand	Silty Sand			
Field pH (pH_F)	4.3	5.7	5.8	6.2	6.3			
Oxidised pH (pH_{FOX})	3.2	4.0	4.6	4.8	4.4			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
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Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 26	Bore 26	Bore 26	Bore 26				
Offest (m)								
Level of test (m)(RL)	0.10	0.50	1.00	2.00				
Soil Description	Silty Sand	Silty Sand	Sand	Silty Sand				
Field pH (pH_F)	4.9	6.2	6.9	6.5				
Oxidised pH (pH_{FOX})	3.5	4.2	5.2	5.1				
Reactivity Code (see below)	1	1	1	1				
AASS / PASS (see below)								

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FIELD pH SCREENING - ACID SULFATE SOILS

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Report No. : 90531.03-1
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Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 25	Bore 25	Bore 25	Bore 25	Bore 25			
Offest (m)								
Level of test (m)(RL)	0.10	0.50	1.00	1.50	2.00			
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand			
Field pH (pH_F)	5.6	5.4	6.7	6.8	6.6			
Oxidised pH (pH_{FOX})	3.6	3.6	4.4	4.1	4.8			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

Reactivity codes: 1 = None to slight 2 = Moderate, 3 = Vigorous, 4 = Very vigorous (gas & heat generated)

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Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 24	Bore 24	Bore 24	Bore 24	Bore 24			
Offest (m)								
Level of test (m)(RL)	0.10	0.50	1.00	1.50	2.00			
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand			
Field pH (pH_F)	5.0	6.6	6.7	6.6	6.6			
Oxidised pH (pH_{FOX})	3.6	4.5	3.8	4.6	3.1			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

Reactivity codes: 1 = None to slight 2 = Moderate, 3 = Vigorous, 4 = Very vigorous (gas & heat generated)

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Project No. : 90531.03
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Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 23	Bore 23	Bore 23	Bore 23	Bore 23	Bore 23	Bore 23	
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00	3.50	
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	
Field pH (pH_F)	4.8	5.7	5.6	6.3	4.5	5.0	4.7	
Oxidised pH (pH_{FOX})	3.8	5.1	4.6	5.2	3.3	4.6	3.3	
Reactivity Code (see below)	1	1	1	1	1	1	1	
AASS / PASS (see below)								

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Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 22	Bore 22	Bore 22	Bore 22	Bore 22			
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50			
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand			
Field pH (pH_F)	6.3	6.1	6.2	6.2	4.5			
Oxidised pH (pH_{FOX})	5.3	4.8	4.7	5.2	4.0			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 21	Bore 21	Bore 21	Bore 21	Bore 21	Bore 21		
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00		
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand		
Field pH (pH_F)	4.5	5.5	4.8	5.2	4.9	5.4		
Oxidised pH (pH_{FOX})	3.8	4.1	4.0	4.1	4.1	4.1		
Reactivity Code (see below)	1	1	1	1	1	1		
AASS / PASS (see below)								

Reactivity codes: 1 = None to slight 2 = Moderate, 3 = Vigorous, 4 = Very vigorous (gas & heat generated)

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Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 20	Bore 20	Bore 20	Bore 20				
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00				
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand				
Field pH (pH_F)	5.2	4.6	5.0	5.0				
Oxidised pH (pH_{FOX})	4.4	3.7	4.0	4.0				
Reactivity Code (see below)	1	1	1	1				
AASS / PASS (see below)								

Reactivity codes: 1 = None to slight 2 = Moderate, 3 = Vigorous, 4 = Very vigorous (gas & heat generated)

F= Bubbling/ Frothy Reaction (organics) , N/A = Not Assessed

ASS / PASS intereptation : if pHf < 4.0 = ASS (actual acid sulphate soil) if pHfox < 3.0 = PASS (potential acid sulphate soil)

CHECKED BY:.....CW.....

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FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
Project : Kings Forest Precinct 5
Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 19	Bore 19	Bore 19	Bore 19	Bore 19	Bore 19	Bore 19	
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00	3.50	
Soil Description	Silty Sand	Sand	Silty Sand	Sand	Silty Sand	Silty Sand	Silty Sand	
Field pH (pH_F)	6.4	6.4	6.5	6.5	6.7	4.5	4.3	
Oxidised pH (pH_{FOX})	5.3	5.4	5.3	5.3	5.1	3.5	2.9	
Reactivity Code (see below)	1	1	1	1	1	1	1	
AASS / PASS (see below)								

Reactivity codes: 1 = None to slight 2 = Moderate, 3 = Vigorous, 4 = Very vigorous (gas & heat generated)

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FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
Project : Kings Forest Precinct 5
Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 18	Bore 18	Bore 18	Bore 18	Bore 18	Bore 18	Bore 18	
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00	3.50	
Soil Description	Silty Sand	Sand	Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	
Field pH (pH_F)	6.9	6.9	7.1	5.0	4.6	4.5	5.3	
Oxidised pH (pH_{FOX})	5.6	5.3	5.5	4.5	4.2	4.0	4.5	
Reactivity Code (see below)	1	1	1	1	1	1	1	
AASS / PASS (see below)								

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Project : Kings Forest Precinct 5
Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 17	Bore 17	Bore 17	Bore 17	Bore 17	Bore 17	Bore 17	
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00	3.50	
Soil Description	Silty Sand	Sand	Sand	Sand	Sand	Sand	Sand	
Field pH (pH_F)	6.0	6.7	6.7	7.0	7.1	7.1	7.2	
Oxidised pH (pH_{FOX})	5.1	5.0	5.2	5.0	5.5	5.6	5.6	
Reactivity Code (see below)	1	1	1	1	1	1	1	
AASS / PASS (see below)								

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FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
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Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 16	Bore 16	Bore 16	Bore 16	Bore 16			
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00			
Soil Description	Silty Sand	Sand	Sand	Sand	Sand			
Field pH (pH_F)	6.9	6.9	7.3	7.3	7.4			
Oxidised pH (pH_{FOX})	4.6	4.9	5.1	5.0	5.1			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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FIELD pH SCREENING - ACID SULFATE SOILS

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Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 15	Bore 15	Bore 15	Bore 15	Bore 15			
Offest (m)								
Level of test (m)(RL)	0.10	0.50	1.00	1.50	2.00			
Soil Description	Silty Sand	Sand	Silty Sand	Sand				
Field pH (pH_F)	5.8	6.6	6.7	6.6	6.3			
Oxidised pH (pH_{FOX})	3.2	4.5	4.6	4.6	2.3			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
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Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 14	Bore 14	Bore 14	Bore 14	Bore 14	Bore 14	Bore 14	
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00	3.50	
Soil Description	Silty Sand	Sand	Silty Sand	Sand	Sand	Sand	Sand	
Field pH (pH_F)	5.6	6.7	6.7	6.9	7.0	7.2	7.2	
Oxidised pH (pH_{FOX})	4.9	5.2	5.3	5.1	5.3	5.3	5.4	
Reactivity Code (see below)	1	1	1	1	1	1	1	
AASS / PASS (see below)								

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Location : Depot Road, Kings Forest, NSW

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Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 13	Bore 13	Bore 13	Bore 13	Bore 13			
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50			
Soil Description	Silty Sand	Silty Sand	Silty Sand	Sand	Sand			
Field pH (pH_F)	4.7	5.5	6.9	6.9	7.1			
Oxidised pH (pH_{FOX})	4.4	5.0	5.2	5.3	5.3			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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FIELD pH SCREENING - ACID SULFATE SOILS

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Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 12	Bore 12	Bore 12	Bore 12				
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00				
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand				
Field pH (pH_F)	6.4	6.4	5.3	5.3				
Oxidised pH (pH_{FOX})	5.1	4.9	4.9	4.5				
Reactivity Code (see below)	1	1	1	1				
AASS / PASS (see below)								

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FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
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Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 11	Bore 11	Bore 11	Bore 11	Bore 11	Bore 11	Bore 11	
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00	3.50	
Soil Description	Silty Sand	Sand	Sand	Sand	Sand	Sand	Sand	
Field pH (pH_F)	6.2	6.7	6.5	7.1	6.9	7.0	7.1	
Oxidised pH (pH_{FOX})	5.0	4.8	5.3	5.3	5.4	5.2	5.4	
Reactivity Code (see below)	1	1	1	1	1	1	1	
AASS / PASS (see below)								

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FIELD pH SCREENING - ACID SULFATE SOILS

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Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 10	Bore 10	Bore 10	Bore 10	Bore 10			
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50			
Soil Description	Silty Sand	Silty Sand	Sand	Silty Sand	Sand			
Field pH (pH_F)	6.1	6.5	6.8	639.0	7.0			
Oxidised pH (pH_{FOX})	4.4	5.2	4.9	5.2	5.4			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 9	Bore 9	Bore 9	Bore 9	Bore 9			
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50			
Soil Description	Silty Sand	Sand	Sand	Sand	Sand			
Field pH (pH_F)	6.9	7.3	7.2	7.0	7.2			
Oxidised pH (pH_{FOX})	5.4	5.4	5.4	5.4	5.6			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 8	Bore 8	Bore 8	Bore 8	Bore 8			
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50			
Soil Description	Silty Sand	Sand	Sand	Sand	Sand			
Field pH (pH_F)	5.3	7.0	6.8	7.1	7.0			
Oxidised pH (pH_{FOX})	5.1	5.2	5.5	5.5	5.4			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 7	Bore 7	Bore 7	Bore 7				
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00				
Soil Description	Silty Sand	Sand	Sand	Sand				
Field pH (pH_F)	6.9	6.9	7.0	6.3				
Oxidised pH (pH_{FOX})	5.4	5.5	5.6	4.7				
Reactivity Code (see below)	1	1	1	1				
AASS / PASS (see below)								

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Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 6	Bore 6	Bore 6	Bore 6	Bore 6	Bore 6	Bore 6	Bore 6
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00
Soil Description	Silty Sand	Silty Sand	Sand	Sand	Sand	Silty Sand	Silty Sand	Silty Sand
Field pH (pH_F)	6.4	6.9	6.8	7.0	6.7	4.9	4.6	4.3
Oxidised pH (pH_{FOX})	4.2	4.6	4.9	4.8	4.4	3.9	3.3	3.3
Reactivity Code (see below)	1	1	1	1	1	1	1	1
AASS / PASS (see below)								

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Reported By: CW
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Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 5	Bore 5	Bore 5	Bore 5	Bore 5			
Offest (m)	0.50	1.00	1.50	2.00	2.50			
Level of test (m)(RL)								
Soil Description	Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand			
Field pH (pH_F)	6.8	6.3	6.2	4.2	4.9			
Oxidised pH (pH_{FOX})	5.0	5.1	4.8	3.3	4.1			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

Reactivity codes: 1 = None to slight 2 = Moderate, 3 = Vigorous, 4 = Very vigorous (gas & heat generated)

F= Bubbling/ Frothy Reaction (organics) , N/A = Not Assessed

ASS / PASS intereptation : if pHf < 4.0 = ASS (actual acid sulphate soil) if pHfox < 3.0 = PASS (potential acid sulphate soil)

CHECKED BY:.....CW.....

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Geotechnics / Environment / Groundwater

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Phone (07) 5568 8900
Fax (07) 5568 8999

FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
Project : Kings Forest Precinct 5
Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 4	Bore 4	Bore 4	Bore 4	Bore 4			
Offest (m)	0.50	1.00	1.50	2.00	2.50			
Level of test (m)(RL)								
Soil Description	Sand	Sand	Sand	Sand	Sand			
Field pH (pH_F)	7.1	6.8	7.1	6.7	7.0			
Oxidised pH (pH_{FOX})	5.1	5.3	5.1	5.6	4.6			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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FIELD pH SCREENING - ACID SULFATE SOILS

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Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 3	Bore 3	Bore 3	Bore 3	Bore 3			
Offest (m)	0.10	0.50	1.00	1.50	2.00			
Level of test (m)(RL)								
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand			
Field pH (pH_F)	5.8	6.4	6.7	6.8	6.9			
Oxidised pH (pH_{FOX})	2.9	3.6	4.3	4.6	4.3			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

Reactivity codes: 1 = None to slight 2 = Moderate, 3 = Vigorous, 4 = Very vigorous (gas & heat generated)

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Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 9.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 2	Bore 2	Bore 2	Bore 2	Bore 2			
Offest (m)	0.10	0.50	1.00	1.50	2.00			
Level of test (m)(RL)								
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand			
Field pH (pH_F)	6.3	6.7	6.4	6.7	6.7			
Oxidised pH (pH_{FOX})	4.0	3.9	4.0	4.5	4.5			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

Reactivity codes: 1 = None to slight 2 = Moderate, 3 = Vigorous, 4 = Very vigorous (gas & heat generated)

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Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 9.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 1	Bore 1	Bore 1	Bore 1				
Offest (m)	0.50	1.00	1.50	2.00				
Level of test (m)(RL)								
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand				
Field pH (pH_F)	5.5	6.2	5.5	6.4				
Oxidised pH (pH_{FOX})	4.7	4.9	5.2	5.0				
Reactivity Code (see below)								
AASS / PASS (see below)	1	1	1	1				

Reactivity codes: 1 = None to slight 2 = Moderate, 3 = Vigorous, 4 = Very vigorous (gas & heat generated)

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Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 9.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 2	Bore 2	Bore 2	Bore 2	Bore 2			
Offest (m)	0.10	0.50	1.00	1.50	2.00			
Level of test (m)(RL)								
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand			
Field pH (pH_F)	6.3	6.7	6.4	6.7	6.7			
Oxidised pH (pH_{FOX})	4.0	3.9	4.0	4.5	4.5			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 3	Bore 3	Bore 3	Bore 3	Bore 3			
Offest (m)	0.10	0.50	1.00	1.50	2.00			
Level of test (m)(RL)								
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand			
Field pH (pH_F)	5.8	6.4	6.7	6.8	6.9			
Oxidised pH (pH_{FOX})	2.9	3.6	4.3	4.6	4.3			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 4	Bore 4	Bore 4	Bore 4	Bore 4			
Offest (m)	0.50	1.00	1.50	2.00	2.50			
Level of test (m)(RL)								
Soil Description	Sand	Sand	Sand	Sand	Sand			
Field pH (pH_F)	7.1	6.8	7.1	6.7	7.0			
Oxidised pH (pH_{FOX})	5.1	5.3	5.1	5.6	4.6			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 5	Bore 5	Bore 5	Bore 5	Bore 5			
Offest (m)	0.50	1.00	1.50	2.00	2.50			
Level of test (m)(RL)								
Soil Description	Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand			
Field pH (pH_F)	6.8	6.3	6.2	4.2	4.9			
Oxidised pH (pH_{FOX})	5.0	5.1	4.8	3.3	4.1			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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FIELD pH SCREENING - ACID SULFATE SOILS

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Location : Depot Road, Kings Forest, NSW

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Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 6	Bore 6	Bore 6	Bore 6	Bore 6	Bore 6	Bore 6	Bore 6
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00
Soil Description	Silty Sand	Silty Sand	Sand	Sand	Sand	Silty Sand	Silty Sand	Silty Sand
Field pH (pH_F)	6.4	6.9	6.8	7.0	6.7	4.9	4.6	4.3
Oxidised pH (pH_{FOX})	4.2	4.6	4.9	4.8	4.4	3.9	3.3	3.3
Reactivity Code (see below)	1	1	1	1	1	1	1	1
AASS / PASS (see below)								

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Location : Depot Road, Kings Forest, NSW

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Report No. : 90531.03-1
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Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 7	Bore 7	Bore 7	Bore 7				
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00				
Soil Description	Silty Sand	Sand	Sand	Sand				
Field pH (pH_F)	6.9	6.9	7.0	6.3				
Oxidised pH (pH_{FOX})	5.4	5.5	5.6	4.7				
Reactivity Code (see below)	1	1	1	1				
AASS / PASS (see below)								

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Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

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Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 8	Bore 8	Bore 8	Bore 8	Bore 8			
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50			
Soil Description	Silty Sand	Sand	Sand	Sand	Sand			
Field pH (pH_F)	5.3	7.0	6.8	7.1	7.0			
Oxidised pH (pH_{FOX})	5.1	5.2	5.5	5.5	5.4			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 9	Bore 9	Bore 9	Bore 9	Bore 9			
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50			
Soil Description	Silty Sand	Sand	Sand	Sand	Sand			
Field pH (pH_F)	6.9	7.3	7.2	7.0	7.2			
Oxidised pH (pH_{FOX})	5.4	5.4	5.4	5.4	5.6			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 10	Bore 10	Bore 10	Bore 10	Bore 10			
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50			
Soil Description	Silty Sand	Silty Sand	Sand	Silty Sand	Sand			
Field pH (pH_F)	6.1	6.5	6.8	639.0	7.0			
Oxidised pH (pH_{FOX})	4.4	5.2	4.9	5.2	5.4			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 11	Bore 11	Bore 11	Bore 11	Bore 11	Bore 11	Bore 11	
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00	3.50	
Soil Description	Silty Sand	Sand	Sand	Sand	Sand	Sand	Sand	
Field pH (pH_F)	6.2	6.7	6.5	7.1	6.9	7.0	7.1	
Oxidised pH (pH_{FOX})	5.0	4.8	5.3	5.3	5.4	5.2	5.4	
Reactivity Code (see below)	1	1	1	1	1	1	1	
AASS / PASS (see below)								

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Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 12	Bore 12	Bore 12	Bore 12				
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00				
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand				
Field pH (pH_F)	6.4	6.4	5.3	5.3				
Oxidised pH (pH_{FOX})	5.1	4.9	4.9	4.5				
Reactivity Code (see below)	1	1	1	1				
AASS / PASS (see below)								

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ASS / PASS intereptation : if pHf < 4.0 = ASS (actual acid sulphate soil) if pHfox < 3.0 = PASS (potential acid sulphate soil)

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Douglas Partners
Geotechnics / Environment / Groundwater

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Phone (07) 5568 8900
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FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
Project : Kings Forest Precinct 5
Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 13	Bore 13	Bore 13	Bore 13	Bore 13			
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50			
Soil Description	Silty Sand	Silty Sand	Silty Sand	Sand	Sand			
Field pH (pH_F)	4.7	5.5	6.9	6.9	7.1			
Oxidised pH (pH_{FOX})	4.4	5.0	5.2	5.3	5.3			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

Reactivity codes: 1 = None to slight 2 = Moderate, 3 = Vigorous, 4 = Very vigorous (gas & heat generated)

F= Bubbling/ Frothy Reaction (organics) , N/A = Not Assessed

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FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
Project : Kings Forest Precinct 5
Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 14	Bore 14	Bore 14	Bore 14	Bore 14	Bore 14	Bore 14	
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00	3.50	
Soil Description	Silty Sand	Sand	Silty Sand	Sand	Sand	Sand	Sand	
Field pH (pH_F)	5.6	6.7	6.7	6.9	7.0	7.2	7.2	
Oxidised pH (pH_{FOX})	4.9	5.2	5.3	5.1	5.3	5.3	5.4	
Reactivity Code (see below)	1	1	1	1	1	1	1	
AASS / PASS (see below)								

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FIELD pH SCREENING - ACID SULFATE SOILS

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Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 15	Bore 15	Bore 15	Bore 15	Bore 15			
Offest (m)								
Level of test (m)(RL)	0.10	0.50	1.00	1.50	2.00			
Soil Description	Silty Sand	Sand	Silty Sand	Sand				
Field pH (pH_F)	5.8	6.6	6.7	6.6	6.3			
Oxidised pH (pH_{FOX})	3.2	4.5	4.6	4.6	2.3			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Project : Kings Forest Precinct 5
Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 16	Bore 16	Bore 16	Bore 16	Bore 16			
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00			
Soil Description	Silty Sand	Sand	Sand	Sand	Sand			
Field pH (pH_F)	6.9	6.9	7.3	7.3	7.4			
Oxidised pH (pH_{FOX})	4.6	4.9	5.1	5.0	5.1			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 17	Bore 17	Bore 17	Bore 17	Bore 17	Bore 17	Bore 17	
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00	3.50	
Soil Description	Silty Sand	Sand	Sand	Sand	Sand	Sand	Sand	
Field pH (pH_F)	6.0	6.7	6.7	7.0	7.1	7.1	7.2	
Oxidised pH (pH_{FOX})	5.1	5.0	5.2	5.0	5.5	5.6	5.6	
Reactivity Code (see below)	1	1	1	1	1	1	1	
AASS / PASS (see below)								

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Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
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Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 18	Bore 18	Bore 18	Bore 18	Bore 18	Bore 18	Bore 18	
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00	3.50	
Soil Description	Silty Sand	Sand	Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	
Field pH (pH_F)	6.9	6.9	7.1	5.0	4.6	4.5	5.3	
Oxidised pH (pH_{FOX})	5.6	5.3	5.5	4.5	4.2	4.0	4.5	
Reactivity Code (see below)	1	1	1	1	1	1	1	
AASS / PASS (see below)								

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Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
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Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 19	Bore 19	Bore 19	Bore 19	Bore 19	Bore 19	Bore 19	
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00	3.50	
Soil Description	Silty Sand	Sand	Silty Sand	Sand	Silty Sand	Silty Sand	Silty Sand	
Field pH (pH_F)	6.4	6.4	6.5	6.5	6.7	4.5	4.3	
Oxidised pH (pH_{FOX})	5.3	5.4	5.3	5.3	5.1	3.5	2.9	
Reactivity Code (see below)	1	1	1	1	1	1	1	
AASS / PASS (see below)								

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Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 20	Bore 20	Bore 20	Bore 20				
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00				
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand				
Field pH (pH_F)	5.2	4.6	5.0	5.0				
Oxidised pH (pH_{FOX})	4.4	3.7	4.0	4.0				
Reactivity Code (see below)	1	1	1	1				
AASS / PASS (see below)								

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Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 21	Bore 21	Bore 21	Bore 21	Bore 21	Bore 21		
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00		
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand		
Field pH (pH_F)	4.5	5.5	4.8	5.2	4.9	5.4		
Oxidised pH (pH_{FOX})	3.8	4.1	4.0	4.1	4.1	4.1		
Reactivity Code (see below)	1	1	1	1	1	1		
AASS / PASS (see below)								

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FIELD pH SCREENING - ACID SULFATE SOILS

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Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
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Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 22	Bore 22	Bore 22	Bore 22	Bore 22			
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50			
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand			
Field pH (pH_F)	6.3	6.1	6.2	6.2	4.5			
Oxidised pH (pH_{FOX})	5.3	4.8	4.7	5.2	4.0			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 23	Bore 23	Bore 23	Bore 23	Bore 23	Bore 23	Bore 23	
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00	3.50	
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	
Field pH (pH_F)	4.8	5.7	5.6	6.3	4.5	5.0	4.7	
Oxidised pH (pH_{FOX})	3.8	5.1	4.6	5.2	3.3	4.6	3.3	
Reactivity Code (see below)	1	1	1	1	1	1	1	
AASS / PASS (see below)								

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Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 24	Bore 24	Bore 24	Bore 24	Bore 24			
Offest (m)								
Level of test (m)(RL)	0.10	0.50	1.00	1.50	2.00			
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand			
Field pH (pH_F)	5.0	6.6	6.7	6.6	6.6			
Oxidised pH (pH_{FOX})	3.6	4.5	3.8	4.6	3.1			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 25	Bore 25	Bore 25	Bore 25	Bore 25			
Offest (m)								
Level of test (m)(RL)	0.10	0.50	1.00	1.50	2.00			
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand			
Field pH (pH_F)	5.6	5.4	6.7	6.8	6.6			
Oxidised pH (pH_{FOX})	3.6	3.6	4.4	4.1	4.8			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Reported By: CW
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Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 26	Bore 26	Bore 26	Bore 26				
Offest (m)								
Level of test (m)(RL)	0.10	0.50	1.00	2.00				
Soil Description	Silty Sand	Silty Sand	Sand	Silty Sand				
Field pH (pH_F)	4.9	6.2	6.9	6.5				
Oxidised pH (pH_{FOX})	3.5	4.2	5.2	5.1				
Reactivity Code (see below)	1	1	1	1				
AASS / PASS (see below)								

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Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 27	Bore 27	Bore 27	Bore 27	Bore 27			
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00			
Soil Description	Silty Sand	Silty Sand	Sand	Silty Sand	Silty Sand			
Field pH (pH_F)	4.3	5.7	5.8	6.2	6.3			
Oxidised pH (pH_{FOX})	3.2	4.0	4.6	4.8	4.4			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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CHECKED BY:.....CW.....

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Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au
Unit 4, 482 Scottsdale Drive
Varsity Lakes QLD 4227
Phone (07) 5568 8900
Fax (07) 5568 8999

FIELD pH SCREENING - ACID SULFATE SOILS

Client : Project 28 Pty Ltd
Project : Kings Forest Precinct 5
Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 28	Bore 28	Bore 28	Bore 28	Bore 28			
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00			
Soil Description	Sand	Sand	Sand	Sand	Sand			
Field pH (pH_F)	5.8	6.6	6.8	7.1	7.2			
Oxidised pH (pH_{FOX})	4.2	4.8	4.7	4.7	5.0			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

Reactivity codes: 1 = None to slight 2 = Moderate, 3 = Vigorous, 4 = Very vigorous (gas & heat generated)

F= Bubbling/ Frothy Reaction (organics) , N/A = Not Assessed

ASS / PASS intereptation : if pHf < 4.0 = ASS (actual acid sulphate soil) if pHfox < 3.0 = PASS (potential acid sulphate soil)

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Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 29	Bore 29	Bore 29	Bore 29	Bore 29			
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00			
Soil Description	Silty Sand	Sand	Sand	Sand	Sand			
Field pH (pH_F)	6.4	6.8	7.1	7.2	7.2			
Oxidised pH (pH_{FOX})	4.6	4.9	4.9	5.0	5.2			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

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Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 30	Bore 30	Bore 30	Bore 30	Bore 30			
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00			
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand			
Field pH (pH_F)	6.0	5.4	5.4	5.1	4.3			
Oxidised pH (pH_{FOX})	3.2	3.6	3.9	1.2	1.1			
Reactivity Code (see below)	1	1	1	3	3			
AASS / PASS (see below)								

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Location : Depot Road, Kings Forest, NSW

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Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 31	Bore 31	Bore 31	Bore 31	Bore 31			
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00			
Soil Description	Silty Sand	Silty Sand	Silty Sand	Sand	Sand			
Field pH (pH_F)	5.1	6.3	6.5	7.0	7.2			
Oxidised pH (pH_{FOX})	4.0	4.7	5.1	5.4	5.3			
Reactivity Code (see below)	1	1	1	1	1			
AASS / PASS (see below)								

Reactivity codes: 1 = None to slight 2 = Moderate, 3 = Vigorous, 4 = Very vigorous (gas & heat generated)

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Location : Depot Road, Kings Forest, NSW

Project No. : 90531.03
Report No. : 90531.03-1
Report Date: 20.4.20

Tested By: NP
Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 32	Bore 32	Bore 32	Bore 32	Bore 32	Bore 32	Bore 32	Bore 32
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50
Soil Description	Silty Sand	Sand	Sand	Sand	Sand	Sand	Silty Sand	Silty Sand
Field pH (pH_F)	6.0	6.0	6.3	6.7	7.0	6.8	4.5	4.6
Oxidised pH (pH_{FOX})	4.6	4.8	4.5	4.8	4.8	4.2	3.1	3.2
Reactivity Code (see below)	1	1	1	1	1	1	1	1
AASS / PASS (see below)								

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F= Bubbling/ Frothy Reaction (organics) , N/A = Not Assessed

ASS / PASS intereptation : if pHf < 4.0 = ASS (actual acid sulphate soil) if pHfox < 3.0 = PASS (potential acid sulphate soil)

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Date Tested: 9.4.20 - 16.4.20

Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 33	Bore 33	Bore 33	Bore 33	Bore 33	Bore 33	Bore 33	
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.50	2.00	2.50	3.00	3.50	
Soil Description	Silty Sand	Sand	Sand	Sand	Sand	Silty Sand	Silty Sand	
Field pH (pH_F)	5.1	6.6	6.9	6.8	7.0	4.4	4.9	
Oxidised pH (pH_{FOX})	4.1	5.2	5.0	5.2	4.9	3.2	4.1	
Reactivity Code (see below)	1	1	1	1	1	1	1	
AASS / PASS (see below)								

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Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 34	Bore 34	Bore 34	Bore 34	Bore 34	Bore 34	Bore 34	Bore 34
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand
Field pH (pH_F)	5.8	6.3	6.6	6.6	5.3	4.5	4.4	4.7
Oxidised pH (pH_{FOX})	2.9	4.5	3.9	4.5	4.1	2.3	2.2	2.8
Reactivity Code (see below)	1	1	1	1	1	2	2	2
AASS / PASS (see below)								

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Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 35	Bore 35	Bore 35	Bore 35	Bore 35	Bore 35	Bore 35	Bore 35
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50
Soil Description	Silty Sand	Sand	Sand	Sand	Sand	Sand	Silty Sand	Silty Sand
Field pH (pH_F)	6.5	7.2	7.6	7.5	7.2	6.9	4.6	5.3
Oxidised pH (pH_{FOX})	3.2	5.2	5.4	5.4	5.4	4.8	3.3	3.8
Reactivity Code (see below)	1	1	1	1	1	1	1	1
AASS / PASS (see below)								

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Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 36	Bore 36	Bore 36	Bore 36	Bore 36	Bore 36	Bore 36	Bore 36
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50
Soil Description	Silty Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand
Field pH (pH_F)	5.6	6.6	7.1	7.1	6.7	6.9	6.1	6.4
Oxidised pH (pH_{FOX})	3.7	5.0	5.2	5.2	5.1	5.0	4.9	4.9
Reactivity Code (see below)	1	1	1	1	1	1	1	1
AASS / PASS (see below)								

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Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 37	Bore 37	Bore 37	Bore 37	Bore 37	Bore 37	Bore 37	Bore 37
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand
Field pH (pH_F)	5.7	4.1	5.6	6.2	5.1	4.8	5.1	5.0
Oxidised pH (pH_{FOX})	4.1	2.3	3.8	4.6	4.0	3.5	3.6	2.1
Reactivity Code (see below)	1	3	1	1	1	1	2	3
AASS / PASS (see below)								

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Reported By: CW
Date Reported: 20.4.20

Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 38	Bore 38	Bore 38	Bore 38	Bore 38	Bore 38	Bore 38	
Offest (m)								
Level of test (m)(RL)	0.00	0.50	1.00	1.50	2.00	3.00	3.50	
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand	
Field pH (pH_F)	5.9	6.5	6.3	6.8	7.0	4.9	4.5	
Oxidised pH (pH_{FOX})	3.7	4.5	4.3	4.9	4.9	3.5	2.3	
Reactivity Code (see below)	1	1	1	1	1	1	2	
AASS / PASS (see below)								

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Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 39	Bore 39	Bore 39	Bore 39	Bore 39	Bore 39	Bore 39	
Offest (m)								
Level of test (m)(RL)	0.50	1.00	1.50	2.00	2.50	3.00	3.50	
Soil Description	Silty Sand	Sand	Sand	Sand	Sand	Sand	Sand	
Field pH (pH_F)	6.8	7.0	7.2	7.2	7.2	7.1	6.9	
Oxidised pH (pH_{FOX})	5.3	5.4	5.3	5.3	5.3	5.5	5.5	
Reactivity Code (see below)	1	1	1	1	1	1	1	
AASS / PASS (see below)								

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Sample No.	1	2	3	4	5	6	7	8
Chainage (m)								
Location	Bore 1	Bore 1	Bore 1	Bore 1				
Offest (m)	0.50	1.00	1.50	2.00				
Level of test (m)(RL)								
Soil Description	Silty Sand	Silty Sand	Silty Sand	Silty Sand				
Field pH (pH_F)	5.5	6.2	5.5	6.4				
Oxidised pH (pH_{FOX})	4.7	4.9	5.2	5.0				
Reactivity Code (see below)								
AASS / PASS (see below)	1	1	1	1				

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MAZLAB Pty Ltd
Environmental Testing, Sampling and Drilling (Vibracore)
ABN 90 151 684 436 ACN 151 684 436

U1/ 33 MACHINERY DR., TWEED HEADS SOUTH, 2486
PO BOX 6879 TWEED HEADS SOUTH MC., 2486
PHONE: (07) 55239922 FAX: (07) 55239822
EMAIL: mazlab@bigpond.com

Client: Douglas Partners **Project:** Kings Forest Subdivision (90531.03)

Mazlab Job No: DPB3092 **Date:** 28/04/2020

LABORATORY TEST RESULTS
Certificate of Test Results – Chromium Reducible Sulphur

Sample No.	Client I.D	Soil Description (truncated)	pH KCL	SCr mol (H+/t) %S	TAA mol (H+/t)	SNAS %S	ANC mol (H+/t) NA= Scr< action limit	Net Acidity mol (H+/t)	Liming Rate (Kg/ dry/ t)
45558	BH1-0.50	As per Borelogs	6.3	<2 <0.01%	3 <0.01%	-	NA	3 <0.01%	Nil
45589	BH1-1.50		6.7	<2 <0.01%	-	-	NA	<2 <0.01%	Nil
45590	BH2-0.10		5.3	<2 <0.01%	2 <0.01%	-	-	2 <0.01%	Nil
45591	BH2-1.00		6.3	<2 <0.01%	3 <0.01%	-	-	3 <0.01%	Nil
45592	BH2-2.00		6.3	<2 <0.01%	2 <0.01%	-	-	2 <0.01%	Nil
45593	BH3-0.10		4.3	<2 <0.01%	15 0.02%	<0.02%	-	15 0.02%	Nil
45594	BH3-1.00		6.1	<2 <0.01%	2 <0.01%	-	-	2 <0.01%	Nil
45595	BH3-2.00		6.3	<2 <0.01%	2 <0.01%	-	-	2 <0.01%	Nil
45596	BH4-0.50		6.7	<2 <0.01%	-	-	NA	<2 <0.01%	Nil
45597	BH4-1.50		6.8	<2 <0.01%	-	-	NA	<2 <0.01%	Nil
45598	BH4-2.50		6.8	<2 <0.01%	-	-	NA	<2 <0.01%	Nil
45599	BH5-0.50		6.7	<2 <0.01%	-	-	NA	<2 <0.01%	Nil
45600	BH5-1.50		6.6	<2 <0.01%	-	-	NA	<2 <0.01%	Nil
45601	BH5-2.50		5.6	<2 <0.01%	5 0.01%	-	-	5 0.01%	Nil
45602	BH6-0.10		5.8	<2 <0.01%	8 0.01%	-	-	8 0.01%	Nil
45603	BH6-1.00		6.7	<2 <0.01%	-	-	NA	<2 <0.01%	Nil
45604	BH6-2.00		6.8	<2 <0.01%	-	-	NA	<2 <0.01%	Nil
45605	BH6-3.00		5.8	<2 <0.01%	5 0.01%	-	-	5 0.01%	Nil
45606	BH6-4.00		4.4	<2 <0.01%	18 0.03%	<0.02%	-	18 0.03%	1.4

: :

Laboratory Test Methods follow procedures described in : QASSIT – Acid Sulphate Soils Laboratory Methods Guidelines – Version 2.1 June 2004

Table 2: Summary of ASS Screening and Chromium Suite Test Results

Depth (m)	Sample Description	Field Screening Test Results				Chromium Suite Test Results (%S)				
		pH_F	pH_{FO} x	ΔpH	Reaction (0,1,2,3) F	pH_{KCl}	Chromium Reducible Sulfur (S_{CR})	Total Actual Acidity (TAA)	Retained Acidity (S_{NAS})	Existing plus potential Acidity
Bore 1										
0.50	Sand	5.5	4.7	0.8	1	6.3	<0.01	<0.01	-	<0.01
1.0	Sand	6.2	4.9	1.3	1	-	-	-	-	-
1.5	Sand	5.5	5.2	0.3	1	6.7	<0.01	-		<0.01
2.0	Sand	6.4	5.0	1.4	1	-	-	-	-	-
Bore 2										
0.1	Sand	6.3	4.0	2.3	1	5.3	<0.01	<0.01	-	<0.01
0.5	Sand	6.7	3.9	2.8	1	-	-	-	-	-
1.0	Sand	6.4	4.0	2.4	1	6.3	<0.01	<0.01	-	<0.01
1.5	Sand	6.7	4.5	2.2	1	-	-	-	-	-
2.0	Sand	6.7	4.5	2.2	1	6.3	<0.1	<0.01	-	<0.01
Bore 3										
0.1	Sand	5.8	2.9	2.9	1	4.3	<0.01	0.02	<0.02	0.02
0.5	Sand	6.4	3.6	2.8	1	-	-	-	-	-
1.0	Sand	6.7	4.3	2.4	1	6.1	<0.01	<0.01	-	<0.01
1.5	Sand	6.8	4.6	2.2	1	-	-	-	-	-
2.0	Sand	6.9	4.3	2.6	1	6.3	<0.01	<0.01	-	<0.01
Bore 4										
0.5	Sand	7.1	5.1	2.0	1	6.7	<0.01	-	-	<0.01
1.0	Sand	6.8	5.3	1.5	1	-	-	-	-	-
1.5	Sand	7.1	5.1	2.0	1	6.8	<0.01	-	-	<0.01
2.0	Sand	6.7	5.6	1.1	1	-	-	-	-	-
2.5	Sand	7.0	4.6	2.4	1	6.8	<0.01	-	-	<0.01
Bore 5										
0.5	Sand	6.8	5.0	1.8	1	6.7	<0.01	-	-	<0.01
1.0	Sand	6.3	5.1	1.2	1	-	-	-	-	-
1.5	Sand	6.2	4.8	1.4	1	6.6	<0.01	-	-	<0.01
2.0	Indurated Sand	4.2	3.3	0.9	1	-	-	-	-	-
2.5	Indurated Sand	4.9	4.1	0.8	1	5.6	<0.01	<0.01	-	0.01

Depth (m)	Sample Description	Field Screening Test Results				Chromium Suite Test Results (%S)				
		pH_F	pH_{FOx}	ΔpH	Reaction (0,1,2,3) F	pH_{KCl}	Chromium Reducible Sulfur (S_{CR})	Total Actual Acidity (TAA)	Retained Acidity (S_{NAS})	Existing plus potential Acidity
Bore 6										
0.5	Sand	6.4	4.2	2.2	1	-	-	-	-	-
1.0	Sand	6.9	4.6	2.3	1	5.8	<0.01	<0.01	-	0.01
1.5	Sand	6.8	4.9	1.9	1	-	-	-	-	-
2.0	Sand	7.0	4.8	2.2	1	6.8	<0.01	-	-	<0.01
2.5	Sand	6.7	4.4	2.3	1	-	-	-	-	-
3.0	Indurated Sand	4.9	3.9	1	1	5.8	<0.01	<0.01		0.01
3.5	Indurated Sand	4.6	3.3	1.3	1	-	-	-	-	-
4.0	Indurated Sand	4.3	3.3	1.0	1	4.45	<0.01	<0.03	<0.02	0.03
Bore 7										
0.5	Sand	6.9	5.4	1.5	1	6.9	<0.01	-	-	<0.01
1.0	Sand	6.9	5.5	1.4	1	-	-	-	-	-
1.5	Sand	7.0	5.6	1.4	1	7.0	<0.01	-	-	<0.01
2.0	Sand	6.3	4.7	1.6	1	-	-	-	-	-
Bore 8										
0.5	Sand	5.3	5.1	0.2	1	6.5	<0.01	-	-	<0.01
1.0	Sand	7.0	5.2	1.8	1	-	-	-	-	-
1.5	Sand	6.8	5.5	1.3	1	7.3	<0.01	-	-	<0.01
2.0	Sand	7.1	5.5	1.6	1	-	-	-	-	-
2.5	Sand	7.0	5.4	1.6	1	7.3	<0.01	-	-	<0.01
Bore 9										
0.5	Sand	6.9	5.4	1.5	1	7.0	<0.01	-	-	<0.01
1.0	Sand	7.3	4.5	1.9	1	-	-	-	-	-
2.0	Sand	7.0	5.4	1.6	1	-	-	-	-	-
2.5	Sand	7.2	5.6	1.6	1	7.5	<0.01	-	-	<0.01
Bore 10										
0.5	Sand	6.1	4.4	1.7	1	6.6	<0.01	-	-	<0.01
1.0	Sand	6.5	5.2	1.3	1	-	-	-	-	-
1.5	Sand	6.8	4.9	1.9	1	7.0	<0.01	-	-	<0.01

Depth (m)	Sample Description	Field Screening Test Results				Chromium Suite Test Results (%S)				
		pH_F	pH_{FOx}	ΔpH	Reaction (0,1,2,3) F	pH_{KCl}	Chromium Reducible Sulfur (S_{CR})	Total Actual Acidity (TAA)	Retained Acidity (S_{NAS})	Existing plus potential Acidity
2.0	Sand	6.4	5.2	1.2	1	-	-	-	-	-
2.5	Sand	7.0	5.4	1.6	1	7.3	<0.01	-	-	<0.01
Bore 11										
0.5	Sand	6.2	5.0	1.2	1	6.5	<0.01	-	-	<0.01
1.0	Sand	6.7	4.8	1.9	1	-	-	-	-	-
1.5	Sand	6.5	5.3	1.2	1	7.1	<0.0.1	-	-	<0.01
2.0	Sand	7.1	5.3	1.8	1	-	-	-	-	-
2.5	Sand	6.9	5.4	1.5	1	7.3	<0.01	-	-	<0.01
3.0	Sand	7.0	5.2	1.8	1	-	-	-	-	-
3.5	Sand	7.1	5.4	1.7	1	7.3	<0.01	-	-	<0.01
Bore 12										
0.5	Sand	6.4	5.1	1.3	1	6.6	<0.01	-	-	<0.01
1.0	Sand	6.4	4.9	1.5	1	-	-	-	-	-
1.5	Sand	5.3	4.9	0.4	1	6.5	<0.01	-	-	<0.01
2.0	Sand	5.3	4.5	0.8	1	-	-	-	-	-
Bore 13										
0.5	Sand	4.7	4.4	0.3	1	5.5	<0.01	<0.01	-	<0.01
1.0	Sand	5.5	5.0	0.5	1	-	-	-	-	-
1.5	Sand	6.9	5.2	1.7	1	7.0	<0.01	-	-	<0.01
2.0	Sand	6.9	5.3	1.6	1	-	-	-	-	-
2.5	Sand	7.1	5.3	1.8	1	7.1	<0.01	-	-	<0.01
Bore 14										
0.5	Sand	5.6	4.9	0.7	1	5.9	<0.01	<0.01	-	<0.01
1.0	Sand	6.7	5.2	1.5	1	-	-	-	-	-
1.5	Sand	6.7	5.3	1.4	1	7.0	<0.01	-	-	<0.01
2.0	Sand	6.9	5.1	1.8	1	-	-	-	-	-
2.5	Sand	7.0	5.3	1.7	1	7.2	<0.01	-	-	<0.01
3.0	Sand	7.2	5.3	1.9	1	-	-	-	-	-
3.5	Sand	7.2	5.4	1.8	1	7.3	<0.01	-	-	<0.01

Depth (m)	Sample Description	Field Screening Test Results				Chromium Suite Test Results (%S)				
		pH_F	pH_{FOx}	ΔpH	Reaction (0,1,2,3) F	pH_{KCl}	Chromium Reducible Sulfur (S_{CR})	Total Actual Acidity (TAA)	Retained Acidity (S_{NAS})	Existing plus potential Acidity
Bore 15										
0.1	Sand	5.8	3.2	2.6	1	4.5	<0.01	<0.04	-	0.04
0.5	Sand	6.6	4.5	2.1	1	-	-	-	-	-
1.0	Sand	6.7	4.6	2.1	1	6.4	<0.01	<0.01	-	<0.01
1.5	Sand	6.6	4.6	2.0	1	-	-	-	-	-
2.0	Sand	6.3	2.3	4.0	1	6.2	<0.01	-	-	<0.01
Bore 16										
0.0	Silty Sand	6.9	4.6	2.3	1	-	-	-	-	-
0.1	Sand	6.4	4.6	1.8	1	-	<0.01	-	-	0.02
1.0	Sand	6.9	4.9	2.0	1	-	<0.01	-	-	<0.01
1.5	Sand	7.3	5.1	2.2	1	-	-	-	-	-
2.0	Sand	7.4	5.1	2.3	1	-	<0.01	-	-	<0.01
Bore 17										
0.5	Sand	6.0	5.1	0.9	1	6.9	<0.01	-	-	<0.01
1.0	Sand	6.7	5.0	1.7	1	-	-	-	-	-
1.5	Sand	6.7	5.2	1.5	1	7.0	<0.01	-	-	<0.01
2.0	Sand	7.0	5.0	2	1	1	-	-	-	-
2.5	Sand	7.1	5.5	1.6	1	7.3	<0.01	-	-	<0.03
3.0	Sand	7.1	5.6	1.5	1	-	-	-	-	-
3.5	Sand	7.2	5.6	1.6	1	7.3	<0.01	-	-	<0.01
Bore 18										
0.5	Sand	6.9	5.6	1.3	1	7.2	<0.01	-	-	<0.01
1.0	Sand	6.9	5.3	1.6	1	-	-	-	-	-
1.5	Sand	7.1	5.5	1.6	1	7.3	<0.01	-	-	<0.01
2.0	Sand	5.0	4.5	0.5	1	-	-	-	-	-
2.5	Sand	4.6	4.2	0.4	1	4.8	<0.01	0.02	-	0.02
3.0	Sand	4.5	4.0	0.5	1	-	-	-	-	-
3.5	Sand	5.3	4.5	0.8	1	6.3	<0.01	<0.01	-	<0.01
Bore 19										
0.5	Sand	6.4	5.3	1.1	1	6.9	<0.01	-	-	<0.01

Depth (m)	Sample Description	Field Screening Test Results				Chromium Suite Test Results (%S)				
		pH_F	pH_{FOx}	ΔpH	Reaction (0,1,2,3) F	pH_{KCl}	Chromium Reducible Sulfur (S_{CR})	Total Actual Acidity (TAA)	Retained Acidity (S_{NAS})	Existing plus potential Acidity
1.0	Sand	6.4	5.4	1.0	1	-	-	-	-	-
1.5	Silty Sand	6.5	5.3	1.2	1	7.0	<0.01	-	-	<0.01
2.0	Sand	6.5	5.3	1.2	1	-	-	-	-	-
2.5	Silty Sand	6.7	5.1	1.6	1	6.8	<0.01	-	-	<0.01
3.0	Indurated Sand	4.5	3.5	1.0	1	-	-	-	-	-
3.5	Indurated Sand	4.3	2.9	1.4	1	3.6	<0.01	0.11	<0.02	0.11
Bore 20										
0.5	Silty Sand	5.2	4.4	0.8	1	5.8	<0.01	<0.01	-	<0.01
1.0	Silty Sand	4.6	3.7	0.9	1	-	-	-	-	-
1.5	Indurated Sand	5.0	4.0	1.0	1	4.3	<0.01	0.09	<0.02	0.09
2.0	Indurated Sand	5.0	4.0	1.0	1	-	-	-	-	-
Bore 21										
0.5	Sand	4.5	3.8	0.7	1	5.4	<0.01	<0.01	-	<0.01
1.0	Clayey Sand	5.5	4.1	1.4	1	-	-	-	-	-
1.5	Sand	4.8	4.0	0.8	1	5.6	<0.01	<0.01	-	<0.01
2.0	Sand	5.2	4.1	1.1	1	-	-	-	-	-
2.5	Sand	4.9	4.1	0.8	1	5.7	<0.01	<0.01	-	<0.01
3.0	Sand	5.4	4.1	1.3	1	-	-	-	-	-
Bore 22										
0.5	Sand	6.3	5.3	1.0	1	6.9	<0.01	-	-	<0.01
1.0	Sand	6.1	4.8	1.3	1	-	-	-	-	-
1.5	Sand	6.2	4.7	1.5	1	6.9	<0.01	-	-	<0.01
2.0	Sand	6.2	5.2	1.0	1	-	-	-	-	-
2.5	Indurated Sand	4.5	4.0	0.5	1	4.9	<0.01	0.01	-	0.01
Bore 23										
0.5	Sand	4.8	3.8	1.0	1	6.6	<0.01	-	-	<0.01
1.0	Sand	5.7	5.1	0.6	1	-	-	-	-	-
1.5	Silty Sand	5.6	4.6	1.0	1	6.9	<0.01	-	-	<0.01
2.0	Silty Sand	6.3	5.2	1.1	1	-	-	-	-	-

Depth (m)	Sample Description	Field Screening Test Results				Chromium Suite Test Results (%S)				
		pH_F	pH_{FOx}	ΔpH	Reaction (0,1,2,3) F	pH_{KCl}	Chromium Reducible Sulfur (S_{CR})	Total Actual Acidity (TAA)	Retained Acidity (S_{NAS})	Existing plus potential Acidity
2.5	Indurated Sand	4.5	3.3	1.2	1	4.3	<0.01	0.02	<0.02	0.02
3.0	Indurated Sand	5.0	4.6	0.4	1	-	-	-	-	-
3.5	Indurated Sand	4.7	3.3	1.4	1	5.9	<0.01	<0.01	-	<0.01
Bore 24										
0.1	Sand	5.0	3.6	1.4	1	4.5	<0.01	0.02	-	0.02
0.5	Sand	6.6	4.5	2.1	1	-	-	-	-	-
1.0	Sand	6.7	3.8	2.9	1	6.5	<0.01	-	-	<0.01
1.5	Sand	6.6	4.6	2.0	1	-	-	-	-	-
2.0	Indurated Sand	6.6	3.1	3.5	1	5.6	<0.01	0.01	-	0.01
Bore 25										
0.1	Sand	5.6	3.6	2.0	1	4.5	<0.01	0.03	-	0.03
0.5	Sand	5.4	3.6	1.8	1	-	-	-	-	-
1.0	Sand	6.7	4.4	2.3	1	6.8	<0.01	-	-	<0.01
1.5	Sand	6.8	4.1	2.7	1	-	-	-	-	-
2.0	Indurated Sand	6.6	4.8	1.8	1	5.5	<0.01	0.02	-	0.02
Bore 26										
0.1	Sand	4.9	3.5	1.4	1	4.6	<0.01	0.02	-	0.02
0.5	Sand	6.2	4.2	2.0	1	-	-	-	-	-
1.0	Sand	6.9	5.2	1.7	1	6.8	<0.01	-	-	<0.01
2.0	Indurated Sand	6.5	5.1	1.4	1	5.2	<0.01	<0.01	-	<0.01
Bore 27										
0.0	Sand	4.3	3.2	1.1	1	-	-	-	-	-
0.5	Sand	5.7	4.0	1.7	1	6.9	<0.01	-	-	<0.01
1.0	Sand	5.8	4.6	1.2	1	-	-	-	-	-
1.5	Sand	6.2	4.8	1.4	1	6.5	<0.01	-	-	<0.01
2.0	Sand	6.3	4.4	1.9	1	-	-	-	-	-
Bore 28										
0.0	Sand	5.8	4.2	1.6	1	-	-	-	-	-

Depth (m)	Sample Description	Field Screening Test Results				Chromium Suite Test Results (%S)				
		pH_F	pH_{FOx}	ΔpH	Reaction (0,1,2,3) F	pH_{KCl}	Chromium Reducible Sulfur (S_{CR})	Total Actual Acidity (TAA)	Retained Acidity (S_{NAS})	Existing plus potential Acidity
0.5	Sand	6.6	4.8	1.8	1	6.8	<0.01	-	-	<0.01
1.0	Sand	6.8	4.7	2.1	1	-	-	-	-	-
1.5	Sand	7.1	4.7	2.4	1	6.6	<0.01	-	-	<0.01
2.0	Sand	7.2	5.0	2.2	1	-	-	-	-	-
Bore 29										
0.1	Sand	6.4	4.6	1.8	1	5.5	<0.01	0.02	-	0.02
0.5	Sand	6.8	4.9	1.9	1	-	-	-	-	-
1.0	Sand	7.1	4.9	2.2	1	6.9	<0.01	-	-	<0.01
1.5	Sand	7.2	5.0	2.2	1	-	-	-	-	-
2.0	Sand	7.2	5.2	2.0	1	6.9	<0.01	-	-	<0.01
Bore 30										
0.1	Sand	6.0	3.2	2.8	1	5.6	<0.01	0.02	-	0.02
0.5	Sand	5.4	2.6	1.8	1	-	-	-	-	-
1.0	Sand	5.4	3.9	4.5	1	4.1	0.01	0.09	<0.02	0.10
1.5	Sand	5.1	1.2	3.9	3	-	-	-	-	-
2.0	Sand	4.3	1.1	3.2	3	5.1	0.07	0.02	-	0.09
Bore 31										
0.1	Sand	5.1	4.0	1.1	1	4.2	0.01	0.03	<0.02	0.04
0.5	Sand	6.3	4.7	1.6	1	-	-	-	-	-
1.0	Sand	6.5	5.1	1.4	1	6.5	<0.01	-	-	<0.01
1.5	Sand	7.0	5.4	1.6	1	-	-	-	-	-
2.0	Sand	7.2	5.3	1.9	1	6.6	<0.01	-	-	<0.01
Bore 32										
0.1	Sand	6.0	4.6	1.4	1	6.0	<0.01	<0.01	-	<0.01
0.5	Sand	6.0	4.8	1.2	1	-	-	-	-	-
1.0	Sand	6.3	4.5	1.8	1	6.7	<0.01	-	-	<0.01
1.5	Sand	6.7	4.8	1.9	1	-	-	-	-	-
2.0	Sand	7.0	4.8	2.2	1	6.7	<0.01	-	-	<0.01
2.5	Sand	6.8	4.2	2.6	1	-	-	-	-	-
3.0	Indurated Sand	4.5	3.1	1.4	1	4.3	<0.01	0.03	<0.02	0.03
3.5	Indurated Sand	4.6	3.2	1.4	1	4.5	<0.01	0.02	-	0.02
Bore 33										
0.1	Sand	5.1	4.1	1.0	1	4.7	<0.01	0.02	-	0.02

Depth (m)	Sample Description	Field Screening Test Results				Chromium Suite Test Results (%S)				
		pH_F	pH_{FOx}	ΔpH	Reaction (0,1,2,3) F	pH_{KCl}	Chromium Reducible Sulfur (S_{CR})	Total Actual Acidity (TAA)	Retained Acidity (S_{NAS})	Existing plus potential Acidity
0.5	Sand	6.6	5.2	1.4	1	-	-	-	-	-
1.5	Sand	6.9	5.0	1.9	1	-	-	-	-	-
2.0	Sand	6.8	5.2	1.6	1	6.9	<0.01	-	-	<0.01
2.5	Sand	7.0	4.9	2.1	1	-	-	-	-	-
3.0	Indurated Sand	4.4	3.2	1.2	1	4.3	<0.01	0.02	<0.02	0.02
3.5	Indurated Sand	4.9	4.1	0.8	1	4.6	<0.01	0.02	-	0.02
Bore 34										
0.1	Sand	5.8	2.9	2.9	1.0	4.4	<0.01	0.06	<0.02	0.06
0.5	Sand	6.3	4.5	1.8	1	-	-	-	-	-
1.0	Sand	6.6	3.9	2.7	1	6.5	<0.01	-	-	<0.01
1.5	Sand	6.6	4.5	2.1	1	-	-	-	-	-
2.0	Indurated Sand	5.3	4.1	1.2	1	6.1	<0.01	<0.01	-	<0.01
2.5	Indurated Sand	4.5	2.3	2.2	2	-	-	-	-	-
3.0	Indurated Sand	4.4	2.2	2.2	2	4.0	0.01	0.11	<0.02	0.12
3.5	Indurated Sand	4.7	2.8	1.9	2	4.1	0.01	0.16	<0.02	0.17
Bore 35										
0.10	Sand	6.5	3.2	3.3	1	6.1	<0.01	0.01	-	0.01
0.50	Sand	7.2	5.2	2	1	-	-	-	-	-
1.00	Sand	7.6	5.4	2.2	1	6.8	<0.01	-	-	<0.01
1.50	Sand	7.5	5.4	2.1	1	-	-	-	-	-
2.00	Sand	7.2	5.4	1.8	1	6.8	<0.01	-	-	<0.01
2.50	Sand	6.9	4.8	2.1	1	4.5	0.04	-	-	0.04
3.00	Indurated Sand	4.6	3.3	1.3	1	5.1	<0.01	0.01	-	<0.01
3.50	Indurated Sand	5.3	3.8	1.5	1	-	-	-	-	-
Bore 36										
0.10	Sand	5.6	3.7	1.9	1	5.7	<0.01	0.01	-	0.01
0.5	Sand	6.6	5.0	1.6	1	-	-	-	-	-
1.0	Sand	7.1	5.2	1.9	1	6.9	<0.01	-	-	<0.01
1.5	Sand	7.1	5.2	1.9	1	-	-	-	-	-
2.0	Sand	6.7	5.1	1.6	1	6.7	<0.01	-	-	<0.01
2.5	Sand	6.9	5.0	1.9	1	-	-	-	-	-
3.0	Sand	6.1	4.9	1.2	1	6.6	<0.01	-	-	<0.01
3.5	Sand	6.4	4.9	1.5	1	6.7	<0.01	-	-	<0.01

Depth (m)	Sample Description	Field Screening Test Results				Chromium Suite Test Results (%S)				
		pH_F	pH_{FOx}	ΔpH	Reaction (0,1,2,3) F	pH_{KCl}	Chromium Reducible Sulfur (S_{CR})	Total Actual Acidity (TAA)	Retained Acidity (S_{NAS})	Existing plus potential Acidity
Bore 37										
0.1	Sand	5.7	4.1	1.6	1	4.9	<0.01	0.02	-	0.02
0.5	Sand	4.1	2.3	1.8	3	-	-	-	-	-
1.0	Sand	5.6	3.8	1.8	1	5.7	<0.01	0.01	-	0.01
1.5	Sand	6.2	4.6	1.6	1	-	-	-	-	-
2.0	Indurated Sand	5.1	4.0	1.1	1	5.8	<0.01	0.01	-	0.01
2.5	Indurated Sand	4.8	3.5	1.3	1	-	-	-	-	-
3.0	Indurated Sand	5.1	3.6	1.5	2	4.8	<0.01	0.02	-	0.02
3.5	Indurated Sand	5.0	2.1	2.9	3	4.2	0.01	0.12	<0.02	0.13
Bore 38										
0.1	Sand	5.9	3.7	2.2	1	6.1	<0.01	<0.01	-	<0.01
0.5	Sand	6.5	4.5	2.0	1	-	-	-	-	-
1.0	Sand	6.3	4.3	2.0	1	6.4	<0.01	<0.01	-	<0.01
1.5	Sand	6.8	4.9	1.9	1	-	-	-	-	-
2.0	Sand	7.0	4.9	2.1	1	6.5	<0.01	-	-	<0.01
3.0	Sand	4.9	3.5	1.4	1	6.5	<0.01	-	-	<0.01
3.5	Silty Sand	4.5	2.3	2.2	2	4.1	<0.01	0.15	<0.02	0.15
Bore 39										
0.5	Sand	6.8	5.3	1.5	1	6.6	<0.01	-	-	<0.01
1.0	Sand	7.0	5.4	1.6	1	-	-	-	-	-
1.5	Sand	7.2	5.3	1.9	1	6.6	<0.01	-	-	<0.01
2.0	Sand	7.2	5.3	1.9	1	-	-	-	-	-
2.5	Sand	7.2	5.3	1.9	1	6.5	<0.01	-	-	<0.01
3.0	Sand	7.1	5.5	1.6	1	-	-	-	-	-
3.5	Sand	6.9	5.5	1.4	1	6.6	<0.01	-	-	<0.01

Notes: (i) – 1 - denotes slight effervescence;
2 - denotes moderate reaction;
3 – denotes vigorous reaction;
4 – denotes very strong effervescence accompanied by escape of gas/heat;
F – indicates a bubbly/frothy reaction (organics).

(ii) Highlighted cell denotes level of existing plus potential acidity above threshold level of 0.03%S.

APPENDIX I

Site Fencing Plans – External Intersection & Bulk Earthworks

MATCH NEATLY TO EXISTING KOALA FENCE AT LIMIT OF WORKS

GATE ACCESS TO LOT 8 DP870042 IN ACCORDANCE WITH TSC STD DWG S.D.020

REALIGN KOALA FENCE TO BOUNDARY LINE AND MATCH NEATLY TO EXISTING.

REMOVE EXISTING TIMBER FENCE & KOALA FENCE.

2.5m HIGH ACOUSTIC BARRIER FRONTING TWEED COAST ROAD AND KINGS FOREST PARKWAY.

ENSURE KOALA FENCE TO REAR OF EXISTING LOTS IS CONSTRUCTED AS PER DRAWING 12301-EXTINT-016.

REALIGN KOALA FENCE TO BOUNDARY LINE AND MATCH NEATLY TO EXISTING.

MAINTAIN KOALA FENCE ON BOUNDARY LINE.

ENSURE FENCES MATCH NEATLY

ANTI-CLIMB PANNELING

KOALA GRID TO BE INSTALLED AND MAINTAINED BY THE CONTRACTOR.

ENSURE FENCES MATCH NEATLY

TEMPORARY KOALA EXCLUSION FENCE ACROSS FUTURE ROAD RESERVE. TEMPORARY WORKS TO BE REMOVED ONCE FUTURE PERMANENT EXCLUSION FENCE IS ESTABLISHED. REFER TO DRAWING 12301-EXTINT-017 FOR FENCE TO GRID TIE IN.

REMOVE EXISTING TIMBER FENCE.

HERITAGE EXCLUSION ZONE (NO WORKS PERMITTED).

MATCH NEATLY TO EXISTING KOALA FENCE AT LIMIT OF WORKS

REALIGN KOALA FENCE TO BOUNDARY LINE REFER TO JWA FIGURE 25 TO TIE FENCING INTO NEW HEADWALLS.

INSTALL 2.4x1.8m RCBC FAUNA CULVERT WITH SKYLIGHT & FAUNA FRIENDLY INFRASTRUCTURE IN ACCORDANCE WITH THE DETAILS OF THESE PLANS, THE SECTION ON RIGHT AND JWA 'KOALA PLAN OF MANAGEMENT', DATED MAY 2018

TEMPORARY ATF TREE FENCING UNTIL COMPLETION OF WORKS.

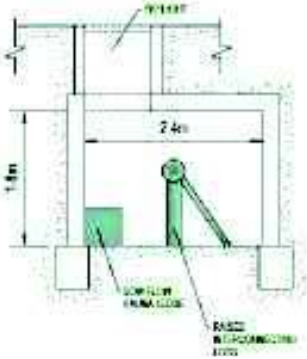
INSTALL 2.4x1.2m RCBC FAUNA CULVERT WITH SKYLIGHT & FAUNA FRIENDLY INFRASTRUCTURE IN ACCORDANCE WITH THE DETAILS OF THESE PLANS, THE SECTION ON RIGHT AND JWA 'KOALA PLAN OF MANAGEMENT', DATED MAY 2018

REALIGN KOALA FENCE TO BOUNDARY LINE AND MATCH NEATLY TO EXISTING.

SHEET 2

NOTE: EXISTING DEPOT ROAD ACCESS TO COUNCILS SPORTS PARKS SHALL HAVE 24 HOURS UNINTERRUPTED ACCESS. THE CONTRACTORS FINAL TRAFFIC MANAGEMENT PLAN SHALL TAKE THIS INTO CONSIDERATION.

2.4M x 1.8M RCBC FAUNA CULVERT WITH SKYLIGHT & FAUNA FRIENDLY INFRASTRUCTURE



EXTRACT FROM JWA KOALA MANAGEMENT PLAN, REFER TO DWG 12301-EXTINT-805 FOR ENGINEERING DETAILS.

ACOUSTIC BARRIERS MUST BE CONSTRUCTED ABOVE FINISHED GROUND LEVELS. ACOUSTIC BARRIERS MUST HAVE NOT HAVE ANY GAPS BETWEEN THE BARRIER AND THE GROUND BELOW. TYPICAL MATERIALS INCLUDE EARTH BERMS, 19mm LAPPED TIMBER FENCE (40% OVERLAP), 6mm FC SHEET, MASONRY OR A COMBINATION OF THE ABOVE (A MINIMUM SURFACE MASS OF 11kg/m^2 IS REQUIRED).

THE WORKS IN THE ECOLOGICAL BUFFER UNDER CONDITION A12 (5) ARE TO ALLOW CONSTRUCTION OF STORMWATER MANAGEMENT AREA, ROAD NO.9 AND THE PERMANENT KOALA FENCING.

INSTALL KOALA ESCAPE MECHANISM AT 50m SPACING TO LENGTH OF KOALA EXCLUSION FENCE. REFER JWA FIGURE 29 FOR DETAILS.

PROVIDE TEMPORARY SIGNAGE DURING CONSTRUCTION PHASE TO ALL FENCES. SIGNAGE TO BE PLACED AT 100m INTERVALS AND STATE "ENVIRONMENTAL PROTECTION ZONE – NO UNAUTHORISED ENTRY".

SECTIONS IN THE AREA OF THE ECOLOGICAL BUFFER SHOULD BE CONSTRUCTED IN ACCORDANCE WITH THE CIVIL CONSTRUCTION DRAWINGS AND JWA KOALA MANAGEMENT PLAN (CONSULTANTS SPECIFICATIONS).

LEGEND

- EXISTING PROPERTY LINE
- EXISTING FENCE
- REALIGN EXISTING FENCE
- PERMANENT KOALA EXCLUSION FENCE
- ACOUSTIC FENCE IN ACCORDANCE WITH RMS NOISE WALL DESIGN GUIDELINE, INCLUDING ANTI-CLIMB PANNELING (WHERE APPLICABLE) REFER JWA FIGURE 27 FOR PANNELING
- FENCING SHALL BE INSTALLED BY CLIENT PRIOR TO COMMENCEMENT OF WORKS
- TEMPORARY KOALA EXCLUSION FENCE
- ACCESS GATE IN ACCORDANCE WITH TSC STD DWG S.D.020
- XX HERITAGE LOCATION
- HERITAGE EXCLUSION ZONE (NO WORKS PERMITTED)
- ECOLOGICAL BUFFER

PROJECT NAME

KINGS FOREST

EXTERNAL INTERSECTION

REAL PROPERTY DESCRIPTION:
Lot 7 on DP875447 and Part of Lot 6 on DP875446
PARISH OF CUDGEN
COUNTY OF ROUS

CLIENT

PROJECT 28 PTY LTD

NORTH

0 10 20 30 40 50m
Scale 1:1000 - A1 (1:2000 - A3)

ISSUES	DATE
TENDER	14-03-19
COUNCIL	19-12-18
CONSTRUCTION	

PRE	DATE	AMENDMENT
E	05-05-20	FENCE, LEGEND AND NOTES AMENDED
D	31-01-20	FENCE AND LEGEND AMENDED
C	07-08-19	FENCE, LOT NUMBERS AND NOTE AMENDED
B	16-05-19	EXISTING FENCE AND NOTES AMENDMENTS
A	19-12-18	COUNCIL ISSUE

ASSOCIATED CONSULTANTS

LANDSURV
GILBERT SUTHERLAND
JWA

DRAWING TITLE

FENCING PLAN
SHEET 1 OF 2

MORTONS urbansolutions
Urban & Regional Planning
Civil Engineering
Project Coordination
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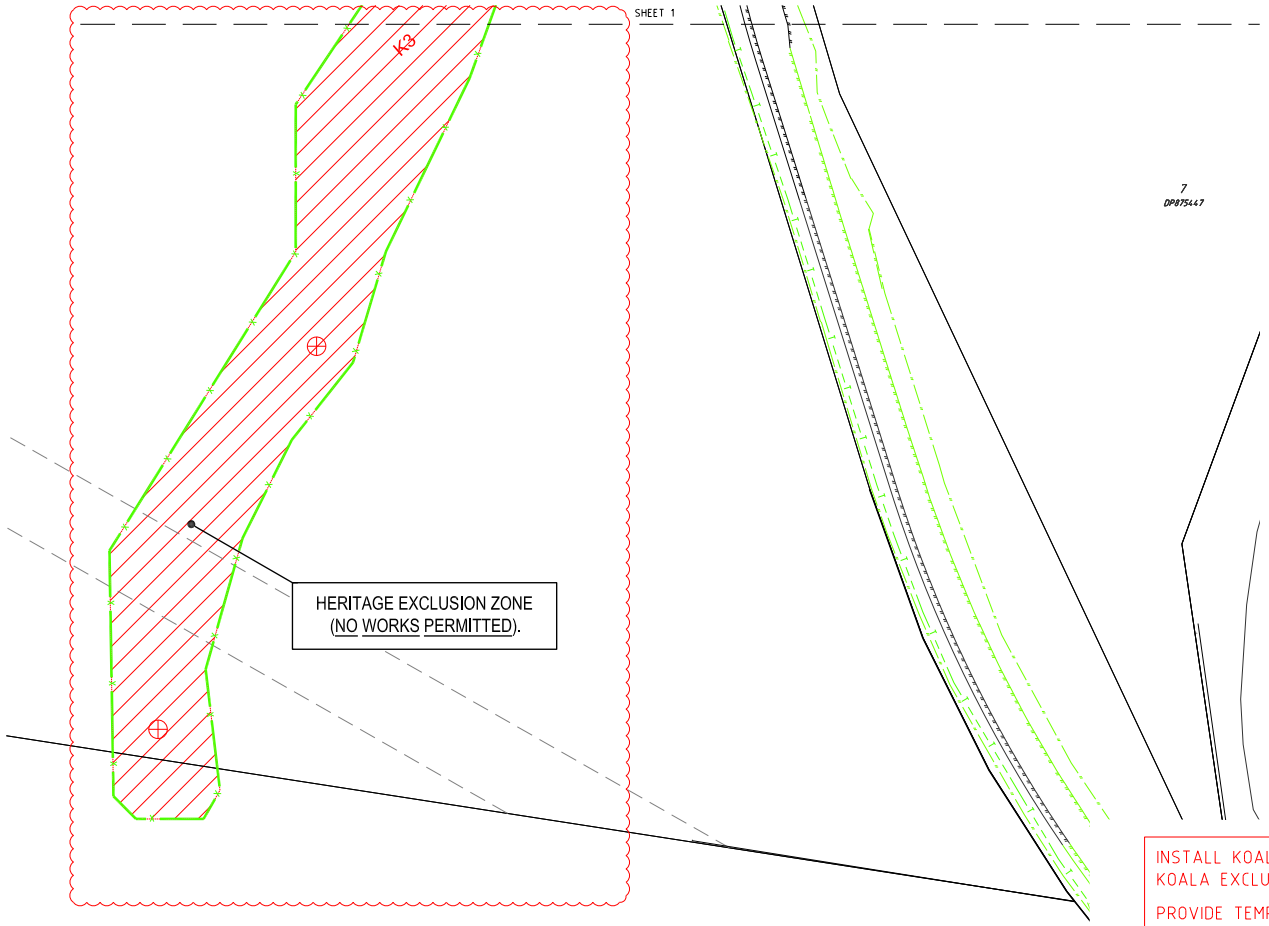
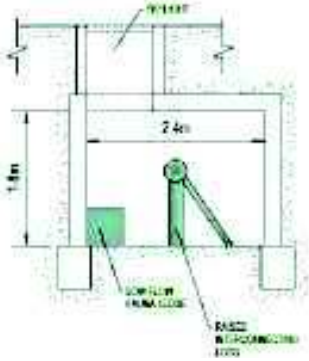
Gold Coast Office
Suite 9, 19 Short St
Southport QLD 4215

DESIGNED	RB	DRAWN	CB
APPROVED		RPEQ 4706	DATE 19-12-18

DRAWING NUMBER 12301-EXTINT-010 | AMEND. E



2.4M x 1.8M RCBC FAUNA CULVERT WITH SKYLIGHT & FAUNA FRIENDLY INFRASTRUCTURE



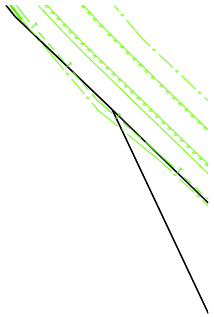
EXTRACT FROM JWA KOALA MANAGEMENT PLAN, REFER TO DWG 12301-EXTINT-805 FOR ENGINEERING DETAILS.

ACOUSTIC BARRIERS MUST BE CONSTRUCTED ABOVE FINISHED GROUND LEVELS. ACOUSTIC BARRIERS MUST HAVE NOT HAVE ANY GAPS BETWEEN THE BARRIER AND THE GROUND BELOW. TYPICAL MATERIALS INCLUDE EARTH BERMS, 19mm LAPPED TIMBER FENCE (40% OVERLAP), 6mm FC SHEET, MASONRY OR A COMBINATION OF THE ABOVE (A MINIMUM SURFACE MASS OF 11kg/m^2 IS REQUIRED).

THE WORKS IN THE ECOLOGICAL BUFFER UNDER CONDITION A12 (5) ARE TO ALLOW CONSTRUCTION OF STORMWATER MANAGEMENT AREA, ROAD NO.9 AND THE PERMANENT KOALA FENCING.

INSTALL KOALA ESCAPE MECHANISM AT 50m SPACING TO LENGTH OF KOALA EXCLUSION FENCE. REFER JWA FIGURE 29 FOR DETAILS.

PROVIDE TEMPORARY SIGNAGE DURING CONSTRUCTION PHASE TO ALL FENCES. SIGNAGE TO BE PLACED AT 100m INTERVALS AND STATE "ENVIRONMENTAL PROTECTION ZONE – NO UNAUTHORISED ENTRY".



SECTIONS IN THE AREA OF THE ECOLOGICAL BUFFER SHOULD BE CONSTRUCTED IN ACCORDANCE WITH THE CIVIL CONSTRUCTION DRAWINGS AND JWA KOALA MANAGEMENT PLAN (CONSULTANTS SPECIFICATIONS).

JWA

LEGEND

- EXISTING PROPERTY LINE
- EXISTING FENCE
- PERMANENT KOALA EXCLUSION FENCE
- ACOUSTIC FENCE IN ACCORDANCE WITH RMS NOISE WALL DESIGN GUIDELINE, INCLUDING ANTI-CLIMB PANNELING (WHERE APPLICABLE) REFER JWA FIGURE 27 FOR PANNELING
- FENCING SHALL BE INSTALLED BY CLIENT PRIOR TO COMMENCEMENT OF WORKS
- ⊕ XX HERITAGE LOCATION
- HERITAGE EXCLUSION ZONE (NO WORKS PERMITTED)
- ECOLOGICAL BUFFER

PROJECT NAME

KINGS FOREST

EXTERNAL INTERSECTION

REAL PROPERTY DESCRIPTION:
Lot 7 on DP875447 and Part of Lot 6 on DP875446
PARISH OF CUDGEN
COUNTY OF ROUS

CLIENT

PROJECT 28 PTY LTD

NORTH

0 10 20 30 40 50m
Scale 1:1000 - A1 (1:2000 - A3)

ISSUES	DATE
TENDER	14-03-19
COUNCIL	19-12-18
CONSTRUCTION	

PRE	DATE	AMENDMENT
C	31-01-20	FENCE AMENDED
B	05-03-19	EXISTING FENCE AND NOTES MENDMENTS
A	19-12-18	COUNCIL ISSUE

ASSOCIATED CONSULTANTS

LANDSURV
GILBERT SUTHERLAND
JWA

DRAWING TITLE

FENCING PLAN
SHEET 2 OF 2

MORTONS urbansolutions
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Civil Engineering
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DESIGNED	RB	DRAWN	CB
APPROVED		RPEQ 4706	DATE 19-12-18

DRAWING NUMBER 12301-EXTINT-011 | AMEND. C

INSTALL KOALA ESCAPE MECHANISM AT 100m SPACING TO LENGTH OF KOALA EXCLUSION FENCE. REFER JWA FIGURE 20 FOR DETAILS.

PROVIDE TEMPORARY SIGNAGE DURING CONSTRUCTION PHASE TO ALL FENCES. SIGNAGE TO BE PLACED AT 100m INTERVALS AND STATE "ENVIRONMENTAL PROTECTION ZONE – NO UNAUTHORISED ENTRY".

THE WORKS IN THE ECOLOGICAL BUFFER UNDER CONDITION A12 (5) ARE TO ALLOW CONSTRUCTION OF STORMWATER MANAGEMENT AREA, ROAD NO.9 AND THE PERMANENT KOALA FENCING.

F

EXISTING KOALA EXCLUSION FENCE
PERMANENT KOALA EXCLUSION FENCE CONSTRUCTED WITH THE EXTERNAL INTERSECTION PACKAGE. ENSURE PROPOSED FENCE TIES IN NEATLY TO EXISTING.

FROG AREA 2
3 BAYS OF KOALAS SCRATCH PANELS TO BE FIXED AT 600mm ABOVE GROUND LEVEL TO ALLOW FROG ACCESS. ONCE EARTHWORKS ARE COMPLETE, FIX SCRATCH PANELS TO STANDARD POSITION. REFER TO DRAWING 12301-BE1-012 FOR DETAILS.

K12

FIX SEDIMENT FENCE TO CONSTRUCTION EXCLUSION FENCE TO PREVENT FROG ACCESS.

FROG AREA 1
3 BAYS OF KOALAS SCRATCH PANELS TO BE FIXED AT 600mm ABOVE GROUND LEVEL TO ALLOW FROG ACCESS. ONCE EARTHWORKS ARE COMPLETE, FIX SCRATCH PANELS TO STANDARD POSITION. REFER TO DRAWING 12301-BE1-012 FOR DETAILS.

A 660

ABORIGINAL HERITAGE ZONE
NO CONSTRUCTION ACCESS IS PERMITTED TO THIS AREA.

FIX SEDIMENT FENCE TO CONSTRUCTION EXCLUSION FENCE TO PREVENT FROG ACCESS.

ESCAPE MECHANISM 2.5m OFFSET FROM GATE, REFER TO 12301-BE1-015 FOR DETAILS. FINAL LOCATION TO BE DETERMINED ON SITE BY PROJECT ECOLOGIST.

B 660

UTILIZE BOTH SIDES OF EXISTING FENCE.

JOIN PROPOSED CONSTRUCTION FENCE TO EXISTING FENCE.

C 660

D 660

TEMPORARY KOALA EXCLUSION FENCE LINK ACROSS FUTURE ROAD RESERVE. TEMPORARY FENCE TO BE REMOVED ONCE FUTURE PERMANENT EXCLUSION FENCE IS ESTABLISHED.

TEMPORARY KOALA EXCLUSION FENCE LINK ACROSS FUTURE ROAD RESERVE. TEMPORARY FENCE TO BE REMOVED ONCE FUTURE PERMANENT EXCLUSION FENCE IS ESTABLISHED.

LEGEND
- EXISTING PROPERTY LINE
- EXISTING PERMANENT KOALA EXCLUSION FENCE
- EXISTING TEMPORARY NO-GO FENCE - POWER WEBBING WITH 2 STRANDS WIRE AND STAR PICKETS A7 8m CENTERS.
- FUTURE PROPERTY LINE
- PERMANENT KOALA EXCLUSION FENCE
- ACCESS GATE AND KOALA ESCAPE MECHANISM IN ACCORDANCE WITH 12301-BE1-015
- KOALA GRID REFER JWA FIGURE 31
- TEMPORARY KOALA EXCLUSION FENCE
- TEMPORARY CONSTRUCTION LIMIT FENCE
- XX HERITAGE LOCATION
- HERITAGE EXCLUSION ZONE (NO WORKS PERMITTED)
- ECOLOGICAL BUFFER

NOTES:
1. TEMPORARY FENCING WILL COMPRISE OF 1.5m HIGH WIRE MESH HELD UPRIGHT BY STAR PICKETS.
2. ALL GRIDS, TEMPORARY OR OTHERWISE WILL BE A MINIMUM OF 3m IN WIDTH.
3. AT APPROPRIATE AND HIGHLY VISIBLE LOCATIONS NOTING THE TOTAL PROHIBITION OF DOGS ON THE SITE.

PROJECT NAME
KINGS FOREST
BECC - CONTRACT 1

REAL PROPERTY DESCRIPTION
Lot 7 on DP875447, Part of Lot 6 on DP875446, Lot 1 on DP781633, Lot 40 on DP7482, Lot 2 on DP819015, Lot 1 on DP129737, Lot 37A on DP13727, Lot 38A on DP13727, Lot 38B on DP13727, Lot 1 on DP706497, Lot 76 on DP755701, Lot 323 on DP755701, Lot 272 on DP755701, Lot 96 on DP755701 & Lot 326 on DP755701
PARISH OF CUDGEN .
COUNTY OF ROUS .

CLIENT
PROJECT 28 PTY LTD

NORTH

0 30 60 90 120 150m
Scale 1:3000 - A1 (1:6000 - A3)

ISSUES	DATE
TENDER	13-11-19
COUNCIL	xx-xx-xx
CONSTRUCTION	..

PRE	DATE	AMENDMENT
F	28-05-20	LEGEND AND FENCE LAYOUT AMENDED
E	31-03-20	NOTE AND FENCE ALIGNMENT AMENDED
D	20-01-20	FENCE AMENDED
C	10-09-19	NOTES AND KOALA GRID AMENDED
B	16-08-19	SPON. AND FENCE AMENDED
A	29-01-19	PRIVATE CERTIFIER

ASSOCIATED CONSULTANTS
LANDSURV
GILBERT SUTHERLAND
JWA

DRAWING TITLE
FENCING PLAN

MORTONS urbansolutions
Urban & Regional Planning
Civil Engineering
Project Coordination
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Gold Coast Office Suite 9, 19 Short St Southport QLD 4215

DESIGNED	RB	DRAWN	CB
APPROVED		NER	2953710
DATE	27-11-18		

DRAWING NUMBER 12301-BE1-010
AMEND. F

APPENDIX J

Weekly Construction Site Checklist

Project	**KINGS FOREST**
Inspection Date	
Area / Precinct	

WEEKLY CONSTRUCTION CHECKLIST

#	Control Measures	Yes	No	N/A	Comments / Corrective Action
1	Is drainage from the project site being directed through necessary controls prior to entering any watercourse?				
2	Is vegetation being protected with Environmental Protection Zones?				
3	Is the integrity of the delineation fencing along the environmental Protection Zone buffer satisfactory?				
4	Are fauna structures (koala posts and nest boxes) in place?				
5	Have hollows been salvaged for re-use?				
6	Have hollows been inspected by the fauna specialist?				
7	Has the area been inspected for threatened fauna?				
8	Has flora monitoring been undertaken?				
9	Is monitoring of water quality being undertaken?				
10	Is riparian and wetland monitoring being undertaken?				
11	Are disturbed areas being rehabilitated as soon as practical?				
12	Are suitable sedimentation and erosion control devices in place where necessary?				
13	Are protected areas being protected from sediment and erosion impacts?				
14	Are areas surrounding waterways satisfactorily stable?				
15	Is there evidence to suggest changes should be made to the site induction relating to flora and fauna aspects? (i.e. re-occurring issues, prevention measures, etc.)				
16	Have any injuries or death to wildlife been identified or reported?				
17	Have any weed infestations been identified?				
18	Any other issues to add to the checklist?				

Completed By:	**Signature:**

APPENDIX K

Waste Register

Waste Register

CEMP Bulk Earthworks Sequence 1

Date	Type of Waste	Destination		Contractor
		Recycle On site / Offsite	Disposal	

APPENDIX L

Monitoring Checklist

Monitoring Issue	Location	Frequency	Activity	Action Completed	Signature
Pre Construction					
Fauna	Precints 1 & 5	Prior to Tree Clearing	Inspection of all installed fencing as per the sitre fencing plans to isolate the section of works to commence.		
		During Clearing activities	Inspection of clearing area and habitat features for the presence of fauna		
Wallum Sedge Frog	Precints 1 & 5	Two weeks prior to Clearing	Proposed Clearing/Earthworks areas surveyed for the presence of frogs		
Flora	Precints 1 & 5	Once	Inspection of all construction controls		
		During Clearing activities	inspection of all construction environmental controls		
		Every six months	Inspection for the presence of weeds		
Acid Sulfate Soils	ASS Identified areas	Once	TBC		
Buffer Management	Precints 1 & 5	Prior to Tree Clearing	inspection of all construction environmental controls		
		During Clearing activities	inspection of all construction environmental controls		
Construction					
Fauna	Precints 1 & 5	Daily	Inspection of Fencing		
		Weekly	Inspection of Fencing		
		Monthly	Inspection for Road strike		
Surface water Quality	Precints 1 & 5	Monthly	Water Quality Inspection and Sampling		

Monitoring Issue	Location	Frequency	Activity	Action Completed	Signature
Groundwater during de-watering	Precints 1 & 5	Daily when pumping excavations	Water Quality Inspection and Sampling		
Stormwater	Precints 1 & 5	Weekly/ 12 hourly rain events(>25mm)/when pH is < 6.5	Water Quality Inspection and Sampling		
Contaminated Lands	Precints 1 & 5	As required	Inspection and sampling for potential Contamination		
Noise	Precints 1 & 5	If complaints received	Noise Monitoring		
Cultural Heritage	Precints 1 & 5	As detected	Detection of Aboriginal objects or Aboriginal human remains reported and addressed.		
Sediment and Erosion Control	Works areas	Daily	Inspection of erosion and sediment controls		
Air Quality	Works areas	Daily	Visual observations for dust assessed, reported and managed		
Waste	Works areas	Daily	Inspection of receptacles		
Acid Sulfate Soils	Works areas	Twice weekly	Where water has ponded Testing undertaken for pH, turbidity and dissolved oxygen to determine ASS potential		
Traffic and Pedestrian Management	Works areas	Daily	Inspection of washing facilities, road traffic and public access roads.		
Buffer Management	Buffer areas adjacent Precincts 1 & 5	As required in BMP	Vegetation and weed Monitoring		

APPENDIX M

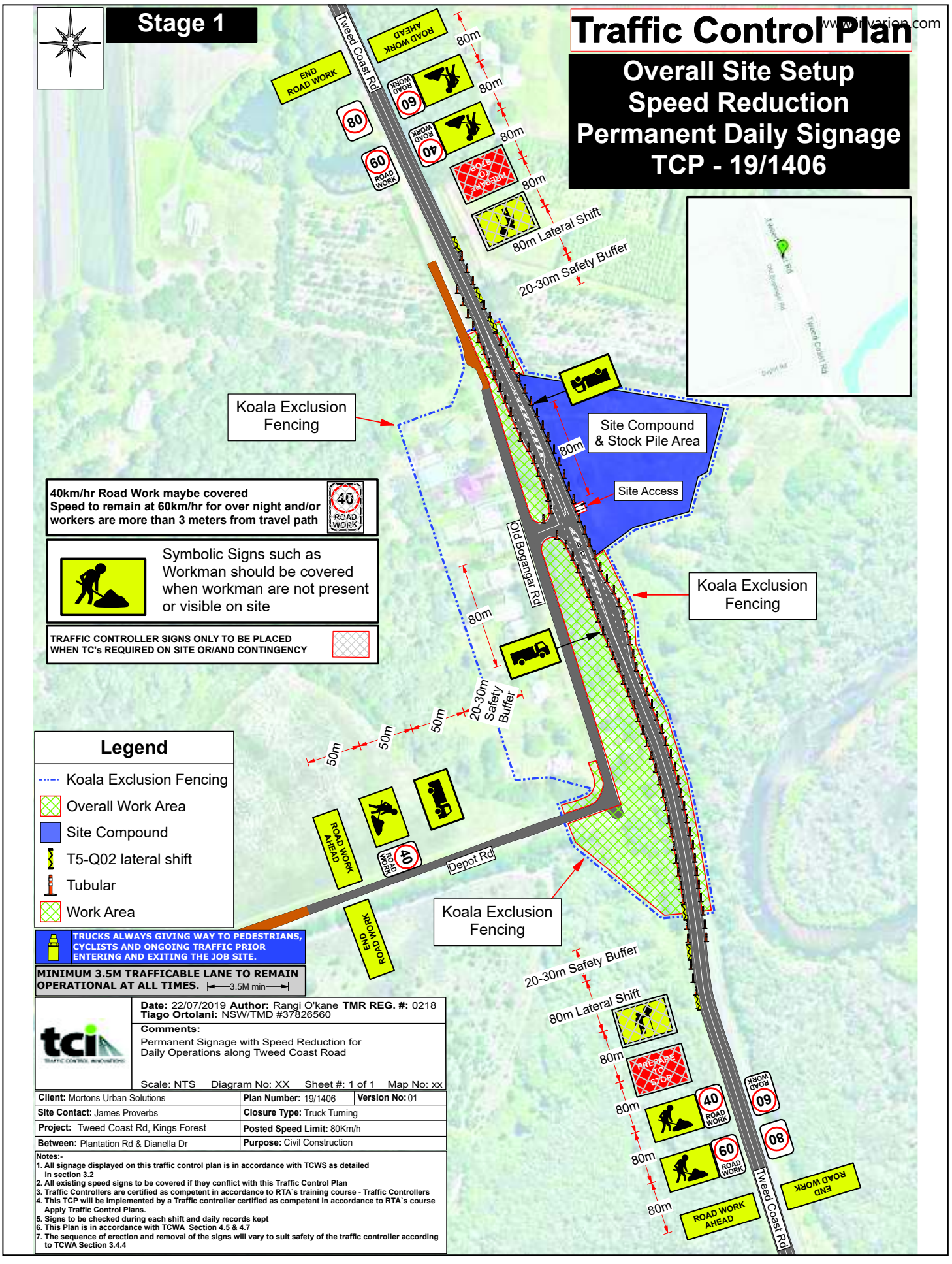
Management Sub Plans

APPENDIX M1

Traffic and Pedestrian Management Plan

Prepared by TCI

dated July 2020



Date: 22/07/2019 **Author:** Rangi O'kane **TMR REG. #:** 0218
Tiago Ortolani: NSW/TMD #37826560

Comments:
Permanent Signage with Speed Reduction for Daily Operations along Tweed Coast Road

Scale: NTS Diagram No: XX Sheet #: 1 of 1 Map No: xx

Client: Mortons Urban Solutions	**Plan Number:** 19/1406	**Version No:** 01
Site Contact: James Proverbs	**Closure Type:** Truck Turning	
Project: Tweed Coast Rd, Kings Forest	**Posted Speed Limit:** 80Km/h	
Between: Plantation Rd & Dianella Dr	**Purpose:** Civil Construction	

Notes:-
1. All signage displayed on this traffic control plan is in accordance with TCWS as detailed in section 3.2
2. All existing speed signs to be covered if they conflict with this Traffic Control Plan
3. Traffic Controllers are certified as competent in accordance to RTA`s training course - Traffic Controllers
4. This TCP will be implemented by a Traffic controller certified as competent in accordance to RTA`s course Apply Traffic Control Plans.
5. Signs to be checked during each shift and daily records kept
6. This Plan is in accordance with TCWA Section 4.5 & 4.7
7. The sequence of erection and removal of the signs will vary to suit safety of the traffic controller according to TCWA Section 3.4.4

Traffic Control Plan

Stage 2
TCP 19/1407
Installation of Culverts
Depot Rd

Legend

- Cone
- Koala Exclusion Fencing
- Site Compound
- T5-Q02 lateral shift
- Traffic Controller
- Tubular
- Work Area

Main Access to Depot Rd Via Old Bogangar Rd

Koala Exclusion Fencing

Site Access Site Compound

Old Bogangar Rd

Tweed Coast Rd

Traffic Control Signs to be used in Conjunction with Stage 1 TCP 19/1406

50m 50m 50m 30m Lateral Shift 20-30m Safety Buffer

50m 50m

ROAD WORK AHEAD

PREPARE TO STOP

PREPARE TO STOP

ROAD WORK 40

ROAD WORK 40

END ROAD WORK

Depot Rd

Mirror image of this TCP to be implemented for works on opposite side of the road when required.

Culverts Installed Half Road at a Time to Maintain Access for Local Residents

Date: 22/07/2019 **Author:** Rangi O'kane **TMR REG. #:** 0218
Tiago Ortolani: NSW/TMD #37826560

Comments:
Stop Slow with Traffic Control for the purpose of Installing Culverts half road at a time on Depot road

Scale: NTS Diagram No: XX Sheet #: 1 of 1 Map No: xx

Client: Mortons Urban Solutions	**Plan Number:** 19/1407	**Version No:** 01
Site Contact: James Proverbs	**Closure Type:** Stop Slow	
Project: Depot Rd, Kings Forest	**Posted Speed Limit:** 50Km/h	
Between: Secret Ln & End of Old Bogangar Rd	**Purpose:** Civil Construction	

Notes:-
1. All signage displayed on this traffic control plan is in accordance with TCWS as detailed in section 3.2
2. All existing speed signs to be covered if they conflict with this Traffic Control Plan
3. Traffic Controllers are certified as competent in accordance to RTA`s training course - Traffic Controllers
4. This TCP will be implemented by a Traffic controller certified as competent in accordance to RTA`s course Apply Traffic Control Plans.
5. Signs to be checked during each shift and daily records kept
6. This Plan is in accordance with TCWA Section 4.5 & 4.7
7. The sequence of erection and removal of the signs will vary to suit safety of the traffic controller according to TCWA Section 3.4.4

Traffic Control Plan

Stage 3
TCP 19/1409
Road Widening
Construction Works
Tweed Coast Road

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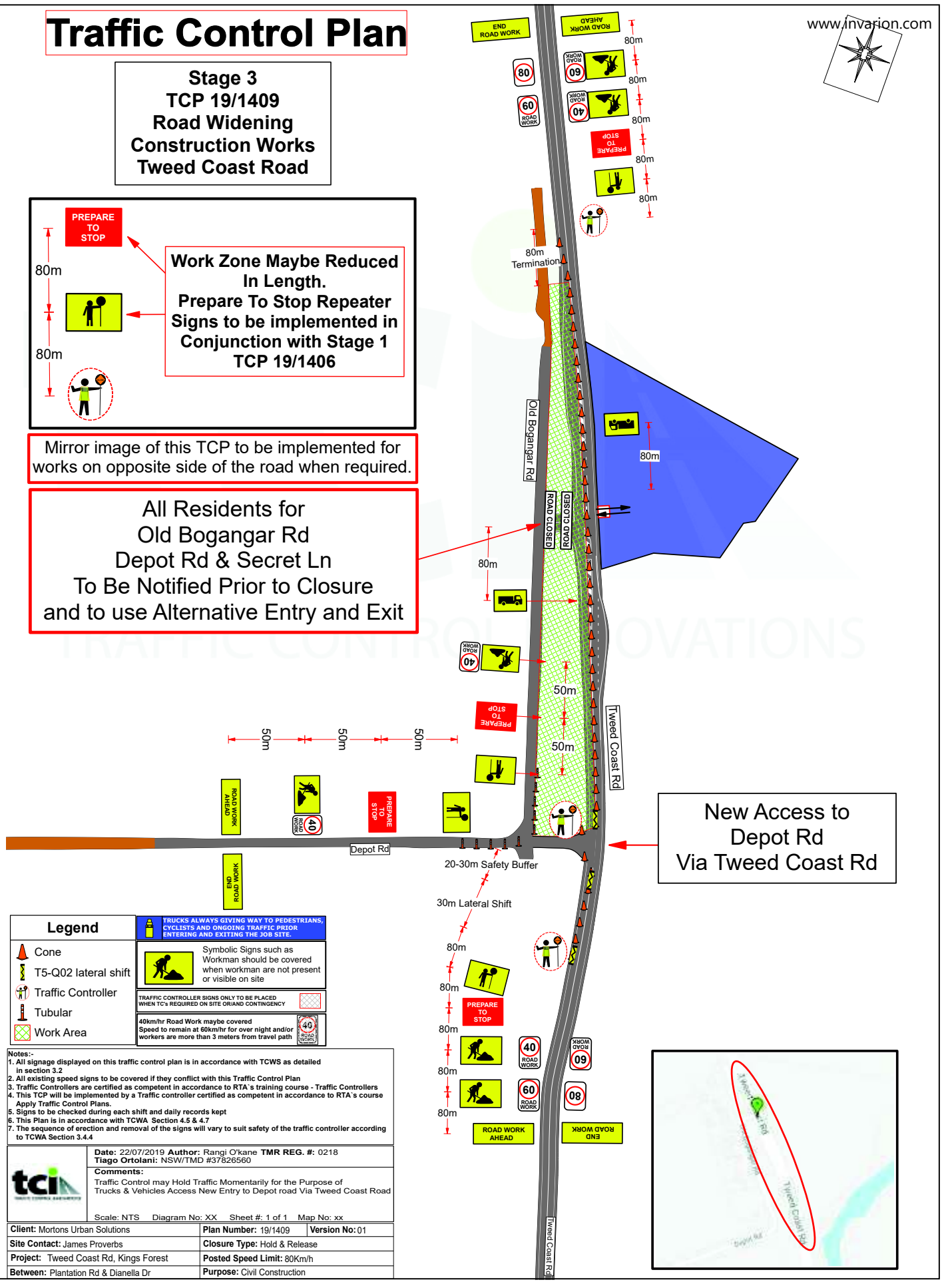
Work Zone Maybe Reduced In Length.
Prepare To Stop Repeater Signs to be implemented in Conjunction with Stage 1 TCP 19/1406

Mirror image of this TCP to be implemented for works on opposite side of the road when required.

All Residents for
Old Bogangar Rd
Depot Rd & Secret Ln
To Be Notified Prior to Closure
and to use Alternative Entry and Exit



New Access to
Depot Rd
Via Tweed Coast Rd

Legend

- Cone
- T5-Q02 lateral shift
- Traffic Controller
- Tubular
- Work Area

TRUCKS ALWAYS GIVING WAY TO PEDESTRIANS, CYCLISTS AND ONGOING TRAFFIC PRIOR ENTERING AND EXITING THE JOB SITE.

Symbolic Signs such as Workman should be covered when workman are not present or visible on site

TRAFFIC CONTROLLER SIGNS ONLY TO BE PLACED WHEN TC's REQUIRED ON SITE OR/AND CONTINGENCY

40km/hr Road Work maybe covered
Speed to remain at 60km/hr for over night and/or workers are more than 3 meters from travel path

Notes:-
1. All signage displayed on this traffic control plan is in accordance with TCWS as detailed in section 3.2
2. All existing speed signs to be covered if they conflict with this Traffic Control Plan
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6. This Plan is in accordance with TCWA Section 4.5 & 4.7
7. The sequence of erection and removal of the signs will vary to suit safety of the traffic controller according to TCWA Section 3.4.4

Date: 22/07/2019 **Author:** Rangi O'kane **TMR REG. #:** 0218
Tiago Ortolani: NSW/TMD #37826560

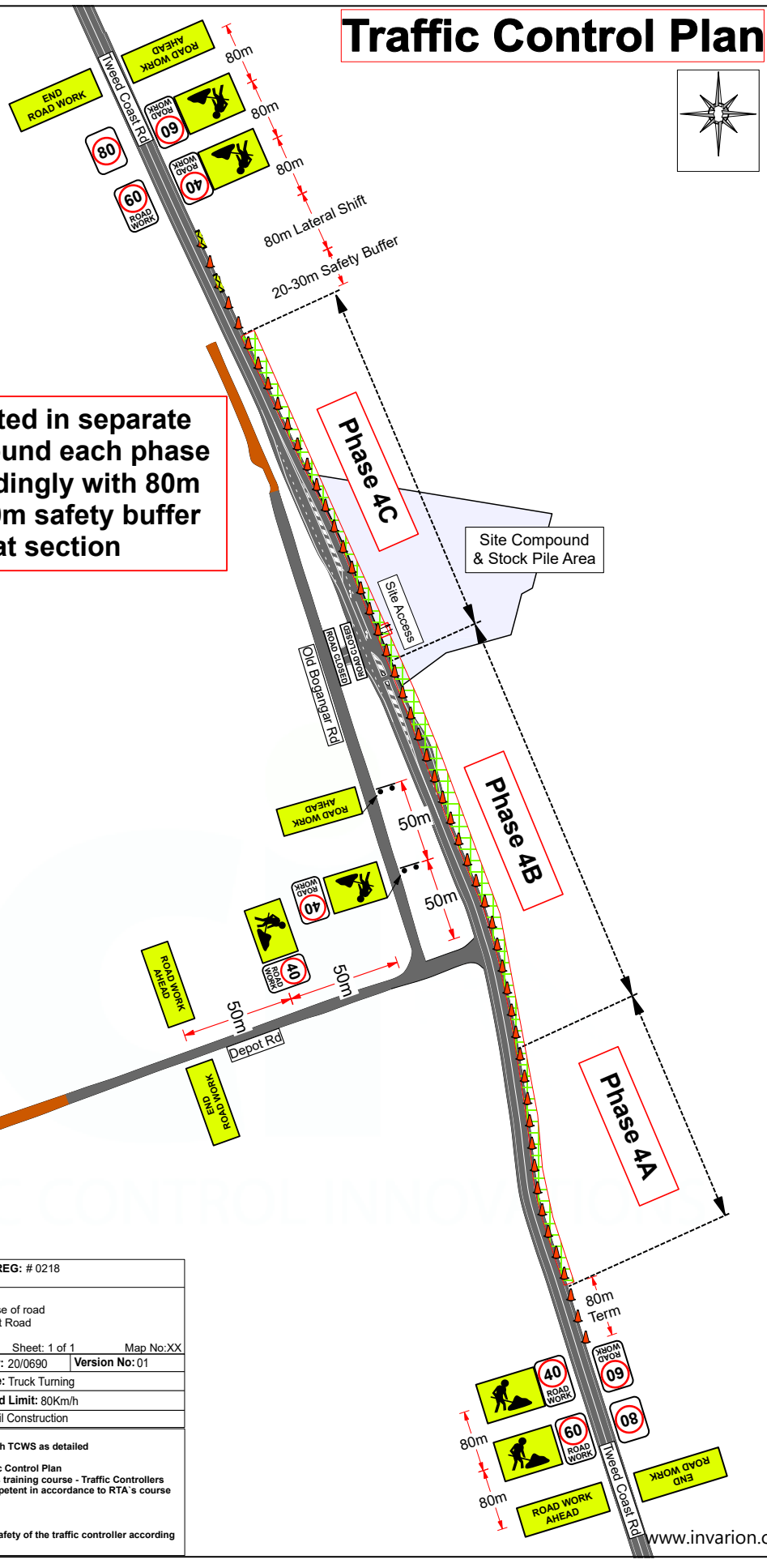
Comments:
Traffic Control may Hold Traffic Momentarily for the Purpose of Trucks & Vehicles Access New Entry to Depot road Via Tweed Coast Road

Scale: NTS Diagram No: XX Sheet #: 1 of 1 Map No: xx

Client: Mortons Urban Solutions	**Plan Number:** 19/1409	**Version No:** 01
Site Contact: James Proverbs	**Closure Type:** Hold & Release	
Project: Tweed Coast Rd, Kings Forest	**Posted Speed Limit:** 80Km/h	
Between: Plantation Rd & Dianella Dr	**Purpose:** Civil Construction	

Traffic Control Plan

Stage 4
TCP 19/1409
Road Widening
Construction Works
Tweed Coast Road



Works will be completed in separate phases-Delineation around each phase will be installed accordingly with 80m Lateral Shift and 20-30m safety buffer leading up to that section

Legend

- Cone
- Site Compound
- T5-Q02 lateral shift

40km/hr Road Work maybe covered
Speed to remain at 60km/hr for over night and/or workers are more than 3 meters from travel path

Symbolic Signs such as Workman should be covered when workman are not present or visible on site

TRUCKS ALWAYS GIVING WAY TO PEDESTRIANS, CYCLISTS AND ONGOING TRAFFIC PRIOR ENTERING AND EXITING THE JOB SITE.

MINIMUM 3.5M TRAFFICABLE LANE TO REMAIN OPERATIONAL AT ALL TIMES. ←3.5M min→

Date: 21/04/2020 **Author:** Rangi O'kane **TMR REG:** # 0218
Tiago Ortilani: NSW/TMD #36826560

Comments:
Shoulder Closure setup in phases for the purpose of road widening for daily operations along Tweed Coast Road

Scale: NTS Diagram No 41 & 42 Sheet: 1 of 1 Map No:XX

Client: Mortons Urban Solutions	**Plan Number:** 20/0690	**Version No:** 01
Site Contact: James Proverbs	**Closure Type:** Truck Turning	
Project: Tweed Coast Rd, Kings Forest	**Posted Speed Limit:** 80Km/h	
Between: Plantation Rd & Dianella Dr	**Purpose:** Civil Construction	

Notes:-
1. **All signage displayed on this traffic control plan is in accordance with TCWS as detailed in section 3.2**
2. **All existing speed signs to be covered if they conflict with this Traffic Control Plan**
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4. **This TCP will be implemented by a Traffic controller certified as competent in accordance to RTA`s course Apply Traffic Control Plans.**
5. **Signs to be checked during each shift and daily records kept**
6. **This Plan is in accordance with TCWA Section 4.5 & 4.7**
7. **The sequence of erection and removal of the signs will vary to suit safety of the traffic controller according to TCWA Section 3.4.4**

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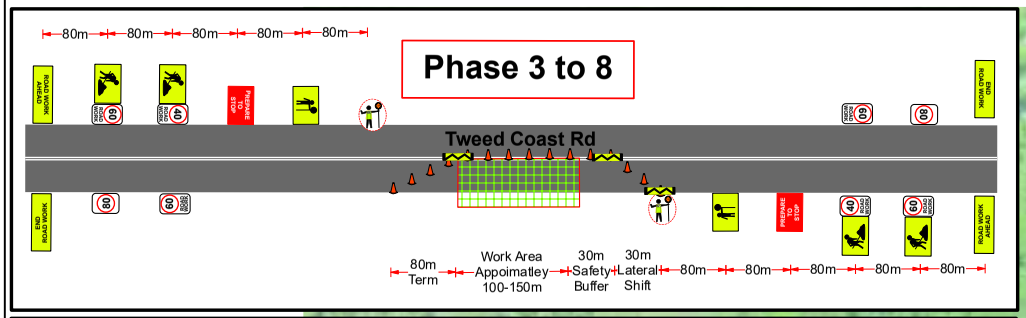
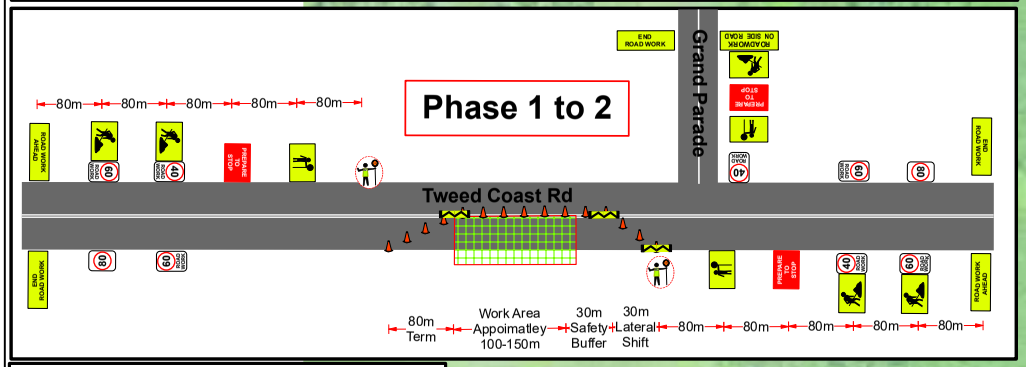
Traffic Control Plan





Lane Closure - Stop Slow.
Works will be completed in separate phases-Delineation around each phase will be installed accordingly

Legend

- Cone
- T5-Q02 lateral shift
- Traffic Controller
- Work Area

TRUCKS ALWAYS GIVING WAY TO PEDESTRIANS, CYCLISTS AND ONGOING TRAFFIC PRIOR ENTERING AND EXITING THE JOB SITE.

Symbolic Signs such as Workman should be covered when workman are not present or visible on site

TRAFFIC CONTROLLER SIGNS ONLY TO BE PLACED WHEN TC's REQUIRED ON SITE OR/AND CONTINGENCY

40km/hr Road Work maybe covered
Speed to remain at 60km/hr for over night and/or workers are more than 3 meters from travel path

Mirror image of this TCP to be implemented for works on opposite side of the road when required.

Date: 23/04/2020 **Author:** Rangi O'kane **TMR REG:** # 0218
Tiago Ortilani: NSW/TMD #37826560

Comments:
Stop Slow with traffic control to safely carry out civil road works

Scale: NTS | Diagram No: 84(modified) | Sheet: 1 of 1 | Map No:XX

Client: Mortons Urban Solutions	**Plan Number:** 20/0709	**Version No:** 01
Site Contact: James Proverbs	**Closure Type:** Stop Slow	
Project: Tweed Coast Rd, Kings Forest	**Posted Speed Limit:** 80Km/h	
Between: Old Bogangar Rd & Gudgen Jetty Rd	**Purpose:** Civil Construction	

Notes:-
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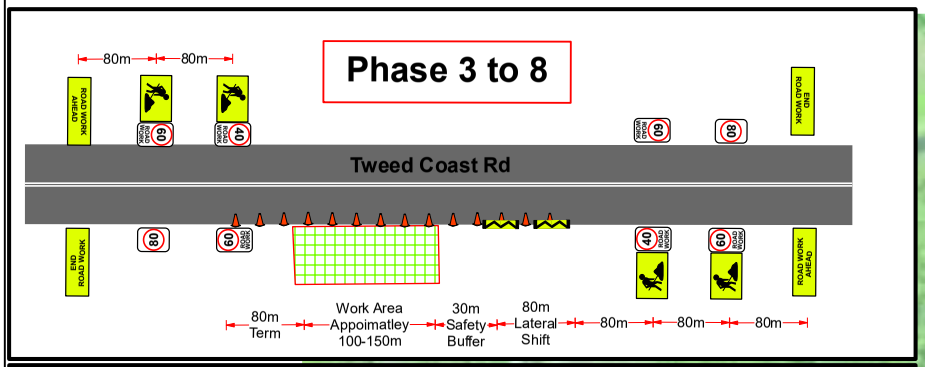
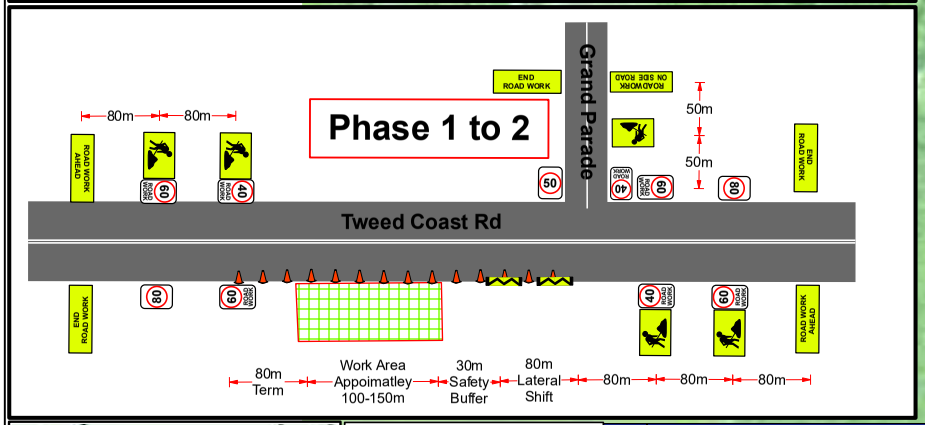
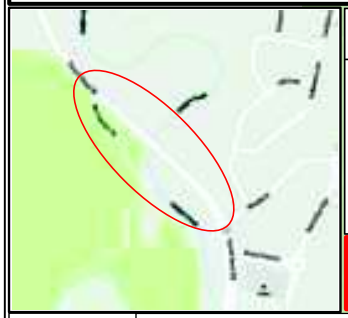
Traffic Control Plan







Legend

- Cone
- T5-Q02 lateral shift
- Traffic Controller
- Work Area

TRUCKS ALWAYS GIVING WAY TO PEDESTRIANS, CYCLISTS AND ONGOING TRAFFIC PRIOR ENTERING AND EXITING THE JOB SITE.

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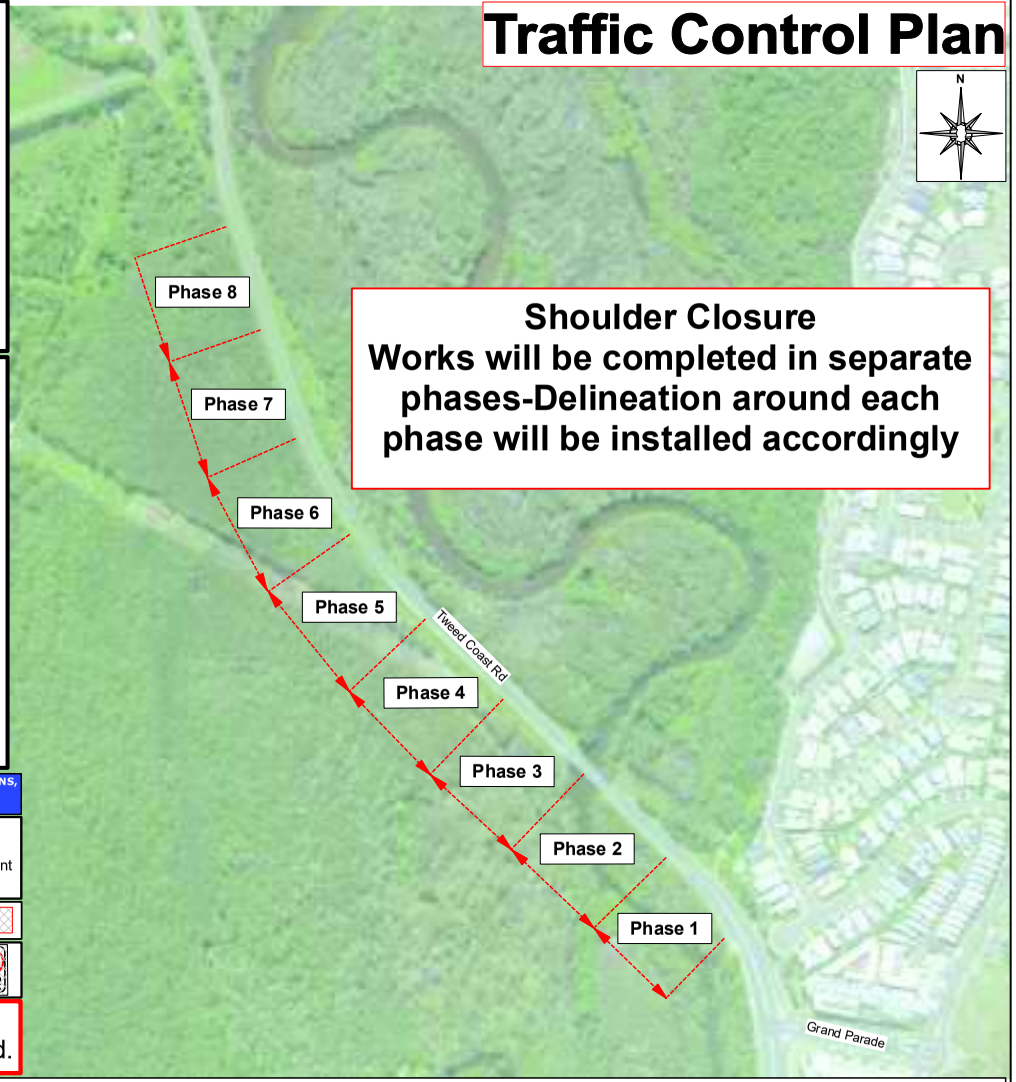
40km/hr Road Work maybe covered
Speed to remain at 60km/hr for over night and/or workers are more than 3 meters from travel path

Mirror image of this TCP to be implemented for works on opposite side of the road when required.



Shoulder Closure
Works will be completed in separate phases-Delineation around each phase will be installed accordingly

Date: 23/04/2020 **Author:** Rangi O'kane **TMR REG:** # 0218
Tiago Ortilani: NSW/TMD #37826560

Comments:
Shoulder Closure to safely carry out civil road works

Scale: NTS Diagram No: 41(modified) Sheet: 1 of 1 Map No:XX

Client: Mortons Urban Solutions	**Plan Number:** 20/0710	**Version No:** 01
Site Contact: James Proverbs	**Closure Type:** Stop Slow	
Project: Tweed Coast Rd, Kings Forest	**Posted Speed Limit:** 80Km/h	
Between: Old Bogangar Rd & Gudgen Jetty Rd	**Purpose:** Civil Construction	

Notes:-
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7. The sequence of erection and removal of the signs will vary to suit safety of the traffic controller according to TCWA Section 3.4.4

APPENDIX M2

Noise and Vibration Management Plan

Prepared by CRG Acoustics

dated July 2020

CRGACOUSTICS

Office 4, 2454 Gold Coast Highway
Mermaid Beach Qld 4218
Postal PO Box 441 Mermaid Beach Qld 4218
Telephone 07 5527 7333
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CRG Acoustics Pty Ltd
ACN 151 847 255 ABN 11 708 556 182

Proposed Residential Development
"Kings Forest Estate"
Tweed Coast Road, Casuarina NSW

CONSTRUCTION
NOISE & VIBRATION MANAGEMENT PLAN

30 July 2020

crgref: 09371 Construction Noise and Vibration Plan REV 1

1. INTRODUCTION

CRG Acoustics Pty Ltd have been engaged by Leda Developments Pty Ltd to produce a noise and vibration management plan for the earthworks and construction phase of the *"Kings Estate"* residential subdivision development on Tweed Coast Road at Casuarina.

This report addresses Item 56 of Tweed Shire Council's Approval (Modification 8 dated 26th November 2019):

Noise and Vibration Management Plan

56.

1) A Noise and Vibration Management Plan to detail measures to minimise noise emissions associated with the construction of the project shall be submitted for approval as part of the CEMP. This plan shall be prepared in accordance with the *Interim Construction Noise Guidelines* (DECC, July 2009) and shall include, but not necessarily be limited to:
   a) identification of all major sources of noise that may be emitted as a result of the construction of the project;
   b) identification of nearby residents and other sensitive land uses;
   c) specification of appropriate noise and vibration criteria as it applies to a particular activity;
   d) identification and implementation of best practice management techniques for minimisation of noise and vibration emissions;
   e) procedures for the monitoring of noise emissions and vibrations; and
   f) a description of the procedures to be undertaken if any non-compliance is detected.

2. THE PROPOSAL

Kings Forest is the most significant master-planned development proposed in the Tweed Shire. Kings Forest will accommodate 4,500 dwellings, town centres, education and community facilities as well as major environmental areas dedicated to Council and NPWS.

The scope of works which is the subject of this submission is broken into the following packages:

- Bulk Earthworks Stage 1 (Phases 1-7);
- Civil works Precinct 5 (Stages 1-3);
- Kings Forest Parkway works (Phase 1);
- External intersection works;
- Tweed Coast Road infrastructure works;
- Sewer Pump Station PS02; and
- Regional Sewer Pump Station.

Refer to Figure 1 below which details the location of the initial earthworks and civil stages as well as associated external works all of which is the subject of this submission.

It is anticipated that the earthworks and construction activities will last for approximately 12 months starting from August 2020.

Hours of operation would be 7am to 6pm, Monday to Friday and 8am to 5pm, Saturdays, with no works on Sundays or Public holidays. There is allowance for works outside standard hours for exceptional circumstances (see Section 7.1).

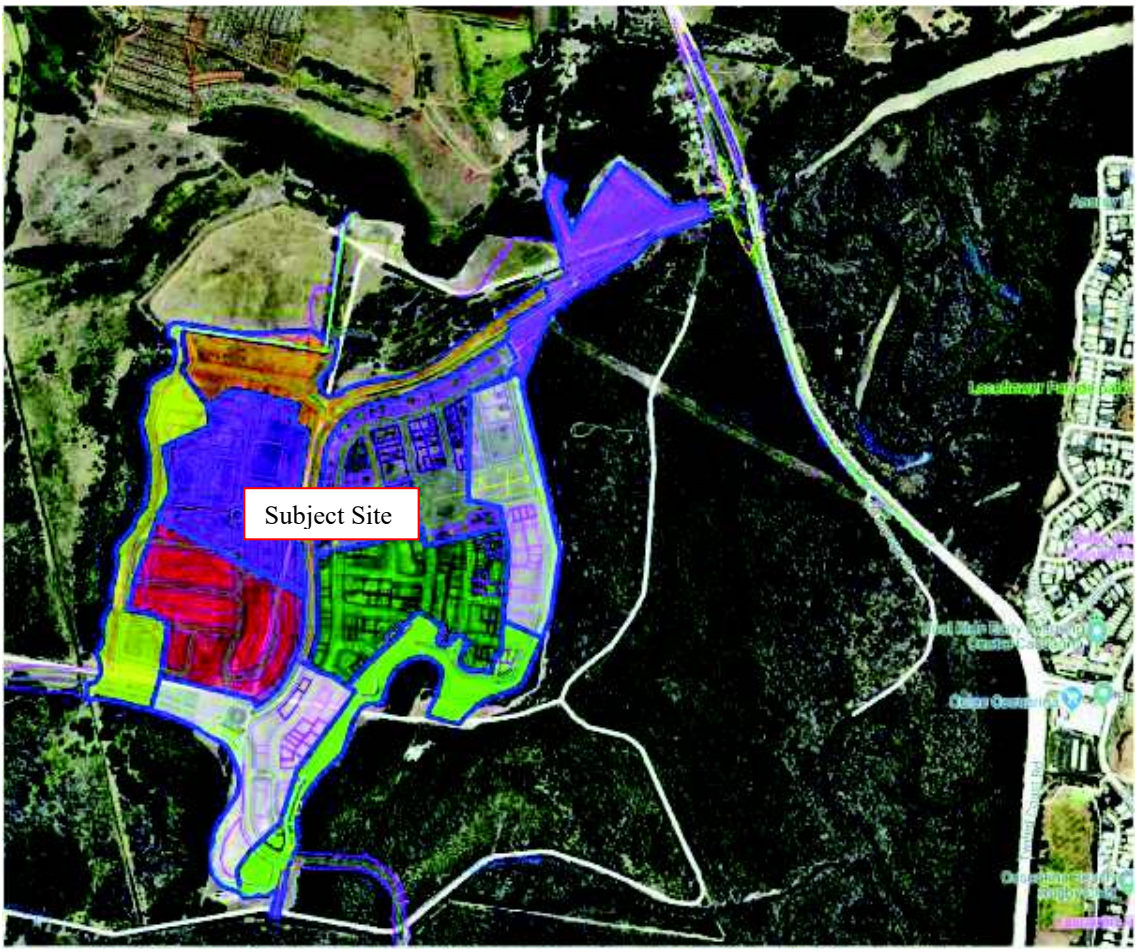


Figure 1 – Location of the Development Area.

The proposal would involve earthworks (approximately 205,000m^3 over 7 phases), including removal of topsoil, filling / cutting for the proposed lots and road pavements, and stormwater and sewer enabling works. Civil works will include sewer reticulation. stormwater drainage, water reticulation, electrical & NBN and roadworks. The following heavy equipment is expected to emit the highest noise levels from construction and earthworks:

- Dozers,
- Excavators,
- Graders,
- All terrain dump trucks,
- Dewatering plant,
- Concrete and water trucks.

For more detailed information relating to onsite construction works refer to the *"Construction Methodology, Kings Forest Estate"* document completed by SEE Civil Pty Ltd.

The nearest sensitive receivers are identified as follows (refer to Figure 2 for location of receivers):

1. Dwellings to the immediate north on Lot 2 DP597802 and Lot 201 DP1129756;
2. Dwellings further to the north on and Lot 1 DP875446 and Lot 132 DP1134961;
3. Dwellings along Old Bogangar Road;
4. Dwelling within the Casuarina Estate (i.e. Laceflower Parade);
5. Dwelling along Melaleuca Road; and
6. Dwelling at southeast end of Reardons Road.

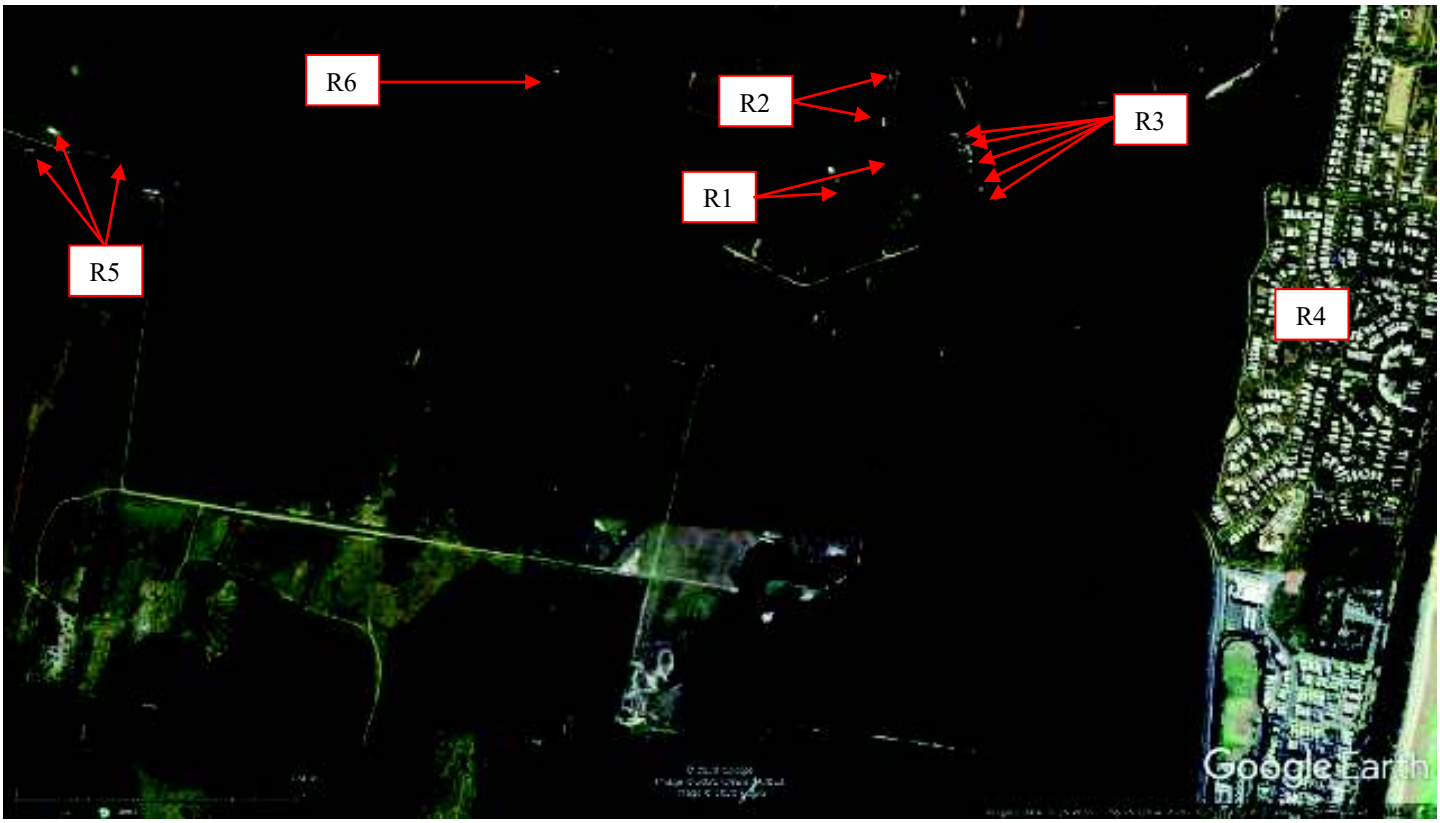


Figure 2 – Location of Development Area (Google Earth).

3. NOISE LEVEL GUIDELINES

The Interim Construction Noise Guideline cited in Item 56 sets guideline levels. It is understood that the Interim Construction Noise Guideline was produced to provide more flexibility in managing noise from construction, as in many cases it is not possible to strictly comply with the limits set in the superceded Noise Control Manual.

The guideline states the following in respect to management of noise impacts:

> "*Where noise from construction is above the 'noise affected' levels presented below, the proponent should apply all feasible and reasonable work practices to minimise noise. The proponent should also inform potentially affected parties of the activities to be carried out, the expected noise impacts and duration.*"

Under the guideline, the management levels applied to construction noise is as follows:

Time of day	Management level $L_{Aeq\ (15\ min)}$*	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see section 7.2.2.

It is also noted that Australian Standard AS 2436 – 1981 "*Guide to noise control on construction, maintenance and demolition sites*" provides extra guidance for management of onsite noise.

The following equipment was used to record existing ambient noise levels at the subject site locality.

- Rion NC 73 Calibrator; and
- Rion NL 21 Environmental Noise Logger.

A logger was located across Tweed Coast Road from the subject site. The microphone was in a free-field location, approximately 1.2m above ground and 25m from the nearest lane of Tweed Coast Road. Refer to Figure 2 in Appendix A for the logger location.

All instrumentation used in this assessment hold current calibration certificate from a certified NATA calibration laboratory.

All measurements were conducted generally in accordance with Australian Standard AS 1055:1997 – *"Acoustics-Description and measurement of environmental noise*". The operation of the sound level logging equipment was field calibrated before and after the measurement session with no significant drift from the reference signal recorded.

Daily weather observations were obtained from the Bureau of Meteorology Coolangatta weather station. Weather conditions during the assessed monitoring period were generally fine with the exception of 11mm of rain on Tuesday 9/09/2014; a temperature range between approximately 6 and 25ºC and relative humidity between 28 and 92%.

A Rating Background Level (RBL) of 51 dB(A) was recorded for the daytime period (7am to 6pm) at the logger location, 46 dB(A) for the evening period (6pm to 10pm) and 45 dB(A) for the night-time period (10pm to 7am). Rating Background Levels were calculated using the method provided in Appendix B of the *"NSW Industrial Noise Policy"*.

Graphical presentation of the measured noise levels from the logger are presented in the rear of this report.

To account for lower background levels further from the road corridor we recommend applying the night-time RBL of 45 dB(A) for the daytime period, and 35 dB(A) for the night-time period (based upon the Estimated Average Background Levels from Australian Standard AS1055-1997 for a Category 2 area defined as *"Areas with low density transportation"*).

Table 1 below presents the resulting noise criterion based upon the adopted background noise levels and the "*Interim Construction Noise Guideline*"

Time of Day	**Management Level L_{eq} dB(A)**
Standard Working Hours	*"Noise Affected"* 55 (Background RBL 45 + 10 dB(A))
Standard Working Hours	"Highly Noise Affected" 75
Outside Standard Working Hours	*"Noise Affected"* 40 (Background RBL 35 + 5 dB(A))

Table 1: Construction activity noise management levels based upon the "*Interim Construction Noise Guideline*".

4. VIBRATION LEVEL GUIDELINE

4.1 Protection from Cosmetic Damage

British Standard BS7385 provides guidance on prevention of cosmetic damage to buildings. The Standard provides the following criteria:

Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4Hz to 15Hz	15Hz & above
Reinforced or framed structures Industrial and heavy commercial buildings including pipework	50 mm/s at 4Hz and above	
Unreinforced or light framed structures Residential or light commercial buildings	15mm/s at 4Hz increasing to 20mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz

4.2 Protection from Human Exposure

The Department of Environment and Conservation NSW guideline "*Assessing Vibration: A Technical Guideline*" provides acceptable values for human exposure to intermittent vibration (i.e. construction activities / equipment).

Table 2.4 Acceptable vibration dose values for intermittent vibration ($m/s^{1.75}$)

Location	Daytime[1]		Night-time[1]	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas[2]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

1 Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am.
2 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas.
Source: BS 6472–1992

Further, the NSW Transport Roads & Maritime Services *"Construction Noise and Vibration"* Guideline (dated August 2016) provides the following minimum working distances which should be adhered to.

Table 2: Recommended minimum working distances for vibration intensive plant from sensitive receiver

Plant Item	Rating / Description	Minimum working distance	
		Cosmetic damage (BS 7385)	Human response (OH&E Vibration guideline)
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4 tonnes)	6 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	100 m
	> 300 kN (> 18 tonnes)	25 m	100 m
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	2 m	7 m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7 m	23 m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22 m	73 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	20 m
Pile Boring	≤ 800 mm	2 m (nominal)	4 m
Jackhammer	Hand held	1 m (nominal)	2 m

Note: More stringent conditions may apply to heritage or other sensitive structures

Should activities / equipment which create vibration occur inside the Human Response minimum working distances, vibration monitoring should be considered.

Regardless, in the event of a complaint, the equipment / activity identified as the problem should be ceased immediately, and consultation with a person experienced in vibration monitoring be undertaken.

5. MANAGEMENT PLAN OBJECTIVE

The objective of this management plan is to minimise noise and vibration from earthworks and construction activities impacting nearby noise sensitive uses.

6. ONSITE SOURCES OF EMISSION

We have applied assumed noise source levels, with large plant without residential mufflers fitted used in calculations. For this reason, this assessment can be viewed as an absolute worst case scenario. Sources of noise typically associated with construction and earthworks (and which are likely to emit the highest noise levels) are as follows:

- Dozers,
- Excavators,
- Graders,
- All terrain dump trucks,
- Dewatering plant,
- Concrete and water trucks.

Based upon source noise levels taken from Australian Standard AS 2436 – 1981 '*Guide to noise control on construction, maintenance and demolition sites*', and from similar investigations by this office in the past, we predict the following noise impacts at the nearest sensitive receptors.

It should be noted that we have presented a range representing the plant located as near to the receptor as possible, and as far from the receptor as possible.

Noise Source	Source Level, SPL dB(A) $L_{eq(15min)}$ @ 7m	Predicted Noise Impact Level, SPL dB(A) L_{eq}
Noise Receiver 1: Dwellings to the immediate north on Lot 2 DP597802 and Lots 201 DP1129756		
Dozer	86	42 – 73
Excavator 200 kW	82	38 – 69
Grader	85	41 – 72
All terrain dump truck	80	36 – 67
De-watering plant	75	31 – 62
Concrete and water trucks	65	21 – 52
Noise Receiver 2: Dwellings further to the north on and Lot 1 DP875446 and Lot 132 DP1134961		
Dozer	86	41 – 60
Excavator 200 kW	82	37 – 56
Grader	85	40 – 59
All terrain dump truck	80	35 – 54
De-watering plant	75	30 – 49
Concrete and water trucks	65	20 – 39
Noise Receiver 3: Dwellings along Old Bogangar Road		
Dozer	86	41 – 79
Excavator 200 kW	82	37 – 75
Grader	85	40 – 78
All terrain dump truck	80	35 – 73
De-watering plant	75	30 – 58
Concrete and water trucks	65	20 – 59
Noise Receiver 4: Dwelling within the Casuarina Estate (i.e. Laceflower Parade)		
Dozer	86	40 – 48
Excavator 200 kW	82	36 – 44
Grader	85	39 – 47
All terrain dump truck	80	34 – 42
De-watering plant	75	29 – 37
Concrete and water trucks	65	19 – 27
Noise Receiver 5: Dwelling along Melaleuca Road		
Dozer	86	38 – 43
Excavator 200 kW	82	34 – 39
Grader	85	37 – 42
All terrain dump truck	80	32 – 37
De-watering plant	75	27 – 32
Concrete and water trucks	65	17 – 22
Noise Receiver 6: Dwelling at southeast end of Reardons Road		
Dozer	86	40 – 50
Excavator 200 kW	82	36 – 46
Grader	85	39 – 49
All terrain dump truck	80	34 – 44
De-watering plant	75	29 – 39
Concrete and water trucks	65	19 – 29

Table 3: Predicted *"worst case scenario"* noise impact levels from construction activity.

For the noisiest plant (a Dozer), it is concluded that a distance separation of approximately 32m is required to decrease noise levels to the *"highly noise affected"* guide level of 75 dB(A).

A distance separation of approximately 350m is required to be at the *"noise affected"* 55 dB(A) guide level.

7. NOISE AND VIBRATION MANAGEMENT PLAN

7.1 Hours of Operation: Construction activity be limited to the following hours:

Monday – Friday:	7am – 6pm;
Saturday:	8am to 5pm; and
Sunday or Public holiday:	No activity.

Works may be undertaken outside these hours where:

a) The delivery of materials is required outside these hours by the Police or other authorities;
b) It is required in an emergency to avoid the loss of life, damage to property and/or to prevent environmental harm;
c) Variation is approved in advance in writing by the Secretary or his nominee;
d) Residents likely to be affected by the works are notified in writing of the timing and duration of these works at least 18 hours prior to the commencement of works (with the exception of emergency work).

Aim:
To control activity onsite to within statutory hours of operation.

Performance Indicator:
Noise / vibration generated by construction activity does not occur outside the prescribed hours.

Tasks / Actions:
All workers visiting the site be made aware that restrictions to hours of operation apply to the site. Clauses in conditions of employment / contracts should require that personnel adhere to the stated hours of operation to ensure continued employment.

Ensuring that works are conducted between 7a.m. and 6p.m. Monday to Friday, and 8am to 1pm Saturdays.

Out of hours earthworks / construction works shall only be undertaken in accordance with the terms detailed in Section 7.1 above.

Trucks and equipment should not arrive or queue outside the site before 7am Monday to Friday and 8am on Saturday.

7.2 Onsite Plant & Equipment: fixed plant (i.e. compressors), mobile plant (i.e. dozers, excavators, trucks, personal vehicles, general vehicle movements).

Aim:
To minimise noise and vibration associated with general fixed and mobile plant operation impacting surrounding noise sensitive receivers.

Performance Indicator:
Noise and vibration generated by construction activity does not cause complaints.

Tasks / Actions:
Noise emissions of all plant to be used onsite are to be reviewed as part of the establishment process.

Training of staff and third party operators should be completed prior to them being able to work at the construction site. Staff and third party operators should be given a copy of this Construction Noise and Vibration Management Plan. Clauses in conditions of employment / contracts should require that personnel adhere to the stated noise control actions to ensure continued employment.

Install *"croaker"* type reversing alarms on vehicles used onsite, use flashing alarm lights for fixed plant, ban the use of horns, apart from emergency situations.

All mechanical plant, machinery and trucks are to be fitted with high performance noise control such as enclosed engines, muffled exhaust controls, residential mufflers and cooling air inlet silencers that minimise noise pollution in accordance with current legislation and industry best practices.

Plant and equipment that are used intermittently such as trucks, excavators and dozers are to be shut down when not operated for extended periods.

Trucks shall not queue up outside residential properties.

Truck speeds onsite be limited to 40 km/hr.

Truck are not to use exhaust brakes onsite, subject to safety requirements.

Drivers (both staff and third party operators) to operate equipment in a manner that does not generate unnecessary noise, through adherence to speed limits, avoiding excessive revving of motors, unnecessary idling, minimising compressive braking and avoidance of impact with solid objects.

Use and siting of equipment. By locating noisy equipment as far away from sensitive premises as is practical, distance separation will reduce potential noise impacts.

Stationary plant and equipment known to emit noise strongly in one direction are to be oriented so that the noise is directed away from the nearest noise sensitive receivers, where possible.

Locate stationary plant behind buildings or materials stockpiles to take advantage of acoustical screening from physical barriers.

Staggering times or plant locations, where possible, so that different plant items are in operation to avoid additive noise impacts. An example is if the excavator is being used near the northern boundary, then avoid moving other plant close to the boundary as well.

All engines, including trucks, are to be maintained and tuned to manufacturer's specifications to minimise noise emissions. All plant and equipment are to be regularly checked and inspected.

All onsite driveway crossovers and temporary roads be well maintained (no potholes) and levelled as required to minimise truck bounce as they move around the site.

In relation to vibration, the NSW Transport Roads & Maritime Services *"Construction Noise and Vibration"* Guideline (refer to Section 4 of this management plan) provides minimum working distances. Should activities / equipment which create vibration occur inside the Human Response minimum working distances, vibration monitoring should be considered. Regardless, in the event of a complaint, the equipment / activity identified as the problem should be ceased immediately, and consultation with a person experienced in vibration monitoring be undertaken.

Responsible Person:
Site Manger is responsible for ensuring all staff and third party operators abide by the Noise and Vibration Management Plan and is also responsible for the regular review of the Management Plan and the handling of complaints.

Reporting:
All complaints received are to be logged in a complaints register and dealt with as soon as practicable (Complaints Register is attached at the rear of this report).

All staff and third party operators training should be recorded and signed prior to be able to work onsite.

Corrective Action:
Driver training to instruct drivers of the relevant Tasks / Action presented above. If training is not effective, signage be erected requiring drivers to observe speed limits, and to minimise engine idling and revving. Management to maintain restrictions to hours of operations.

Undertaking of disciplinary action against staff and third party operators should they continue to disregard noise and vibration management controls (i.e. obeying speed limits and limiting the use of compressive braking).

Review:
Reviewed at the beginning of new construction activities (i.e. at the start of building works program), or upon receipt of bona fide complaint or upon request by Tweed Shire Council.

7.3 Mechanical Plant Maintenance

Aim:
Undertaking of a regular maintenance schedule for all high noise / vibration emitting equipment to minimise noise and vibration associated with operation of equipment and to ensure existing plant emissions due not increase.

Performance Indicator:
Noise and vibration by construction activity does not increase or cause complaints.

Tasks / Actions:
All engines including trucks are to be maintained and tuned to manufacturer's specifications so as to minimise exhaust emissions.

All plant and equipment are to be regularly checked and inspected.

Responsible Person:
Site Manger is responsible for ensuring all maintenance scheduling is undertaken on major equipment items used for construction activities and new plant / parts are assessed for noise performance.

Reporting / Review:
All complaints received are to be logged in a complaints register and dealt with as soon as practicable (Complaints Register is attached at the rear of this report).

Corrective Action:
Any equipment / plant found (through monitoring) to emit higher noise / vibration levels than previously should be inspected / repaired or incorporate source treatments to reduce levels.

Review:
Reviewed at the beginning of new construction activities (i.e. at the start of building works program), or upon receipt of bona fide complaint or upon request by Tweed Shire Council.

7.4 Communication with Surrounding Properties

Aim:

To maintain open communication with surrounding property owners and to inform them of construction program and of any significant changes to construction timetabling.

Tasks / Actions:

Prior to construction works being undertaken the surrounding noise sensitive receivers should be contacted and informed of the anticipated duration of works.

Undertake a general mail out to noise sensitive receivers within a minimum of 350m of the construction site (shown in the aerial image below) 10 days in advance of works, when construction operations are planning to occur or significantly change. The correspondence is to also include site contact details (as a minimum site address and a telephone contact number should a resident wish to discuss matters arising from the mail out), start and finish dates and daytime hours when the construction works will occur.

If works are required outside standard hours (see Section 7.1), the following is required:

a) Residents likely to be affected by the works are notified in writing of the timing and duration of these works at least 18 hours prior to the commencement of works (with the exception of emergency work).

Responsible Person:

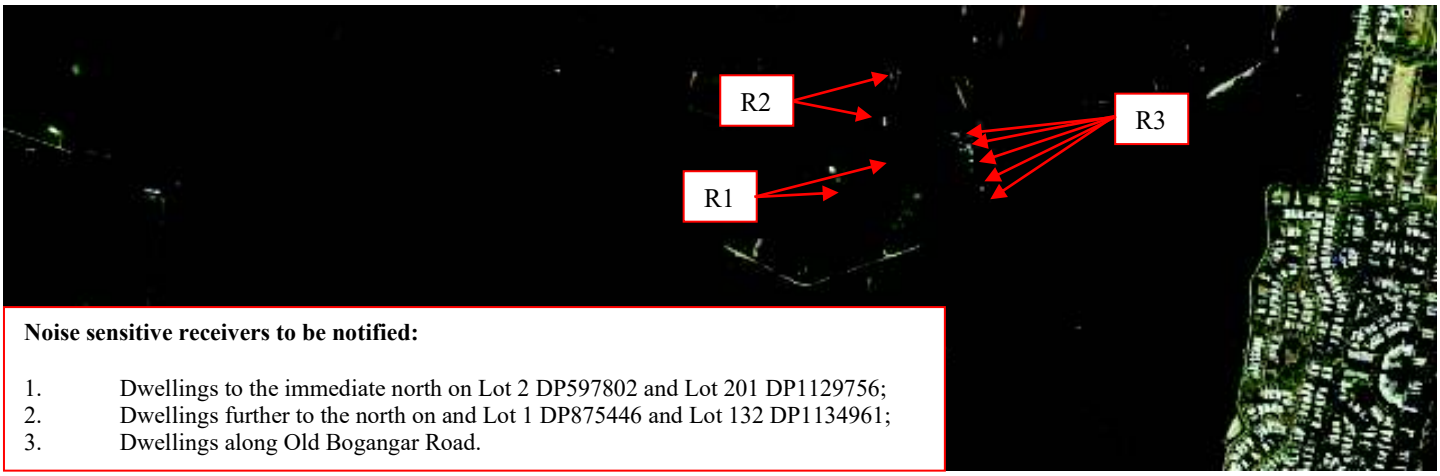
Site Manger is responsible for ensuring mail outs (or other community consultation activities) are conducted at the appropriate time.

Reporting:

All forms of communications to surrounding residences should be documented as well as any feedback received. Feedback should be reviewed and responded to accordingly.

Review:

Reviewed at the beginning of new construction activities (i.e. at the start of building works program), or upon receipt of bona fide complaint or upon request by Tweed Shire Council.



Noise sensitive receivers to be notified:

1. Dwellings to the immediate north on Lot 2 DP597802 and Lot 201 DP1129756;
2. Dwellings further to the north on and Lot 1 DP875446 and Lot 132 DP1134961;
3. Dwellings along Old Bogangar Road.

7.5 Non-compliance Response / Compliant Confirmation and Monitoring

Aim:
To provide a management methodology to quickly and effectively respond to non-compliance or a noise / vibration complaint, should such events occur during construction activities.

Tasks / Actions:
Assign the task of managing noise and vibration emissions to the Site Manager (the 'responsible person'). This person would be responsible for handling complaints sensitively, and ensuring that work does not commence before the times specified in Section 7.1.

If complaints arise regarding noise / vibration, the complaint will be directed to the 'responsible person', who will determine the source of the noise / vibration and take immediate steps to mitigate. This may involve moving the source of the noise / vibration further away from affected premises, replacing the equipment, or in some cases, engaging a qualified acoustic / vibration consultant to provide specialist control advice.

Any complaint is to be recorded using the Complaint Register form attached to this plan. The form should be used as a management tool, and permanent record of the complaint, remediation and follow-up with the Complainant.

If noise / vibration complaints continue after the abovementioned initial steps are taken, noise / vibration measurements are to be undertaken at the affected premise/s to confirm the non-compliance with the set criterion limits.

Noise / vibration monitoring should be conducted at a minimum of two sites (i.e. at the nearest noise sensitive receivers) and should be conducted from the most affected point within the surrounding noise sensitive receivers. Measurements should be undertaken by a suitably qualified and experienced consultant.

Noise measurements should be undertaken in accordance with Australian Standard AS 1055:1997 – *"Acoustics-Description and measurement of environmental noise*". The noise meter/s should be set to *"A"* weight *"Fast"* response. Measurements should be undertaken during calm weather conditions with winds below 5m/s.

Should non-compliance be confirmed localised acoustic barriers, use of different equipment / methodology (in the case of vibration) or any other appropriate treatment should be undertaken to provide additional mitigation. Should non-compliance still be observed additional treatments should be instigated such as reduced operation hours of the non-compliant equipment, purchasing of different equipment, reduction in the number of equipment operating onsite until permanent treatments can be implemented.

If required noise / vibration modeling should be undertaken of current operations to determine treatments that can be implemented that will ensure compliance with the set criterion limits over the long term. These treatments should be installed and compliance noise monitoring conducted.

Responsible Person:
Site Manger is responsible for ensuring that non-compliance and complaint issues are handled in a prompt fashion until compliance with the set limits are achieved.

Reporting / Review:
Noise / vibration complaints are to be recorded in the register (Complaints Register is attached at the rear of this report).

Non-compliance results are to be recorded. The actions taken to mitigate noise / vibration emissions are also to be recorded and reported to Tweed Shire Council.

Information to be included during monitoring and to be reported include (as a minimum):

- Date and time period when measurements were undertaken.
- The type of monitoring be conducted (i.e. compliance testing or in response to a complaint).
- Information on the measurement equipment used for monitoring including the serial numbers, pre-field and post-field calibration checks.
- Brief description of the location of the measurements (i.e. distance from nearest dwelling, direction and distance from construction activity).
- Prevailing weather conditions (i.e. temperature, wind strength and direction, cloud cover). It is noted that noise monitoring should be conducted during clear (i.e. no rain) and calm (i.e. less than 5m/sec. wind speeds) weather conditions. Daily weather observations can also be obtained from the Bureau of Meteorology's website.
- Comments outlining observations from measurements (i.e. expected dominant sources of noise / vibration including natural and onsite construction sources).
- Name and signature of person undertaking the monitoring.

8.0 DISCUSSION and CONCLUSION

This assessment is based upon assumed plant and equipment noise levels, and we have applied sound source levels from large plant and equipment items, whereas it is possible that smaller or more efficient plant and equipment will be used, which tend to generate less noise.

For the noisiest plant (a dozer), it is concluded that a distance separation of approximately 32m is required to decrease noise levels to the *"highly noise affected"* guide level of 75 dB(A). A distance separation of approximately 350m is required to be at the *"noise affected"* 55 dB(A) guide level.

Given the limited separation distance to the nearest surrounding offsite receivers (i.e. dwellings to the north of the site and along Old Bogangar Road); the available acoustic treatments to minimise noise impacts are limited to noise reduction at the source (i.e. application of mufflers and plant enclosures), incorporation of management principles into the day to day operation of the construction site and good communication between the site and occupants of nearby dwellings. However, such measures are unlikely to ensure full compliance with the noise criterion as heavy equipment such as excavators will be used onsite, and some short-term impacts may result. This is considered generally acceptable given the scale of the development.

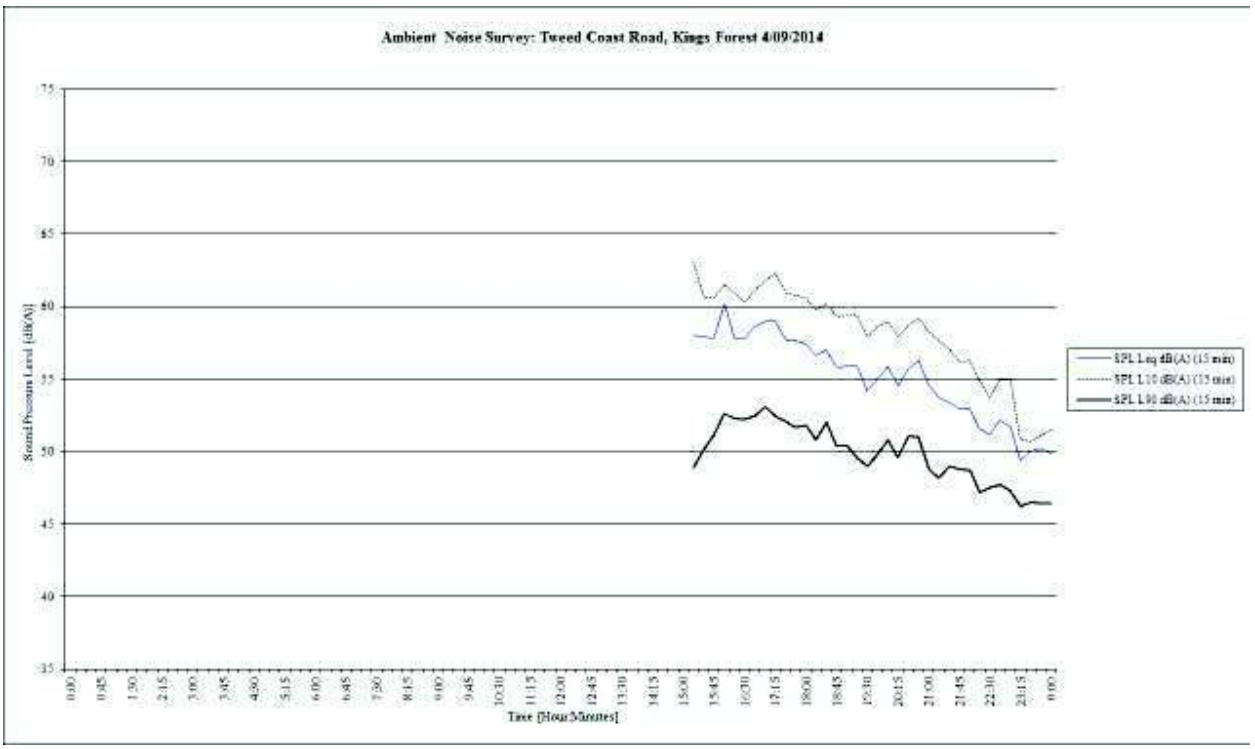
In relation to vibration, the NSW Transport Roads & Maritime Services *"Construction Noise and Vibration"* Guideline provides minimum working distances which should be applied. Should activities / equipment which create vibration occur inside the Human Response minimum working distances, vibration monitoring should be considered. Regardless, in the event of a complaint, the equipment / activity identified as the problem should be ceased immediately, and consultation with a person experienced in vibration monitoring be undertaken.

We note that noise and vibration impact levels at individual properties will vary from day to day depending on the location of construction works and the type of works being undertaken. The construction noise and vibration management plan has been prepared to reduce potential noise and vibration impacts by applying best practice noise controls.

The key to managing noise and vibration impacts is to ensure that all practical steps are taken to minimise noise and vibration from the site. If the nearby residents are aware that the builder is mindful of noise and vibration impacting upon their premises, they will tend to be less annoyed than if they feel no regard is made as to their amenity. Good communication is an important factor in managing noise and vibration, as a good relationship between the builder and the residents will further ensure that should an issue arise it can be dealt with in a reasonable manner.

Report By:

JAY CARTER BSc
Director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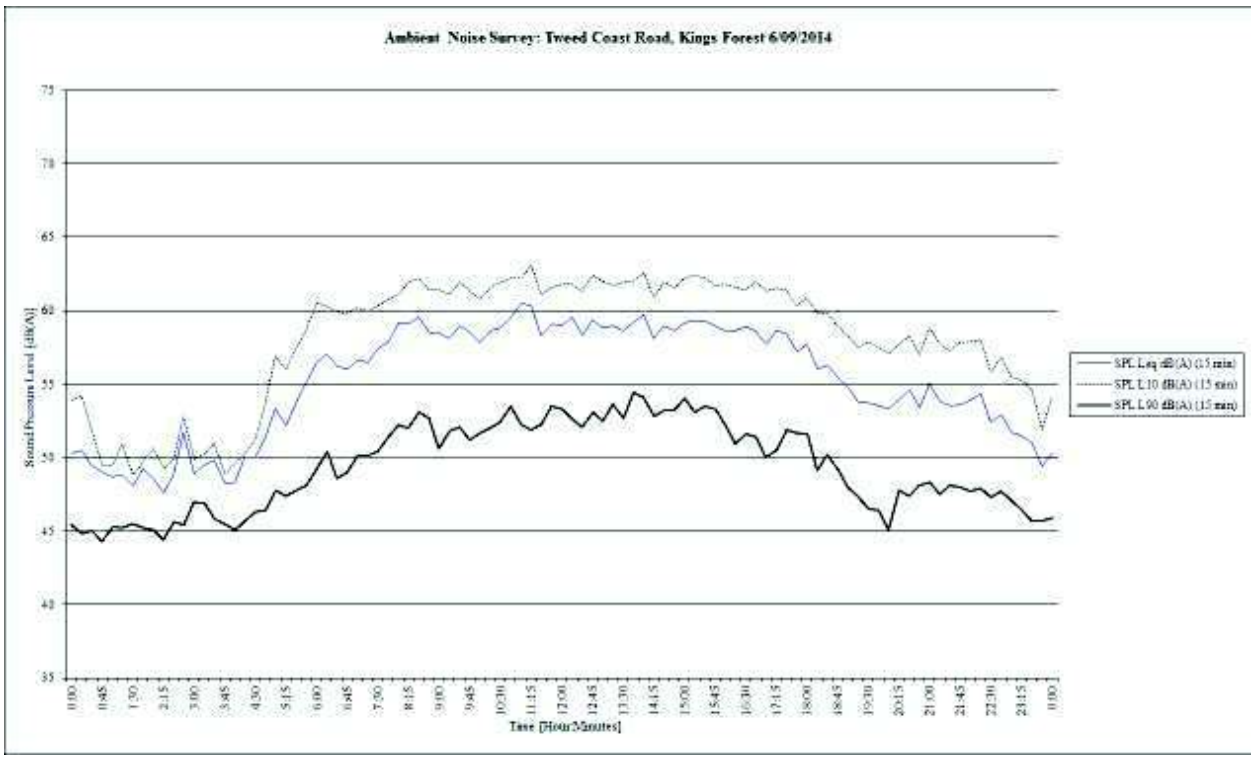
Time [Hour:Minutes]
SPL Leq dB(A) (15 min)
SPL L10 dB(A) (15 min)
SPL L90 dB(A) (15 min)


Ambient Noise Survey: Tweed Coast Road, Kings Forest 5/09/2014
Sound Pressure Level [dB(A)]
Time [Hour:Minutes]
SPL Leq dB(A) (15 min)
SPL L10 dB(A) (15 min)
SPL L90 dB(A) (15 min)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Sound Pressure Level [dB(A)]
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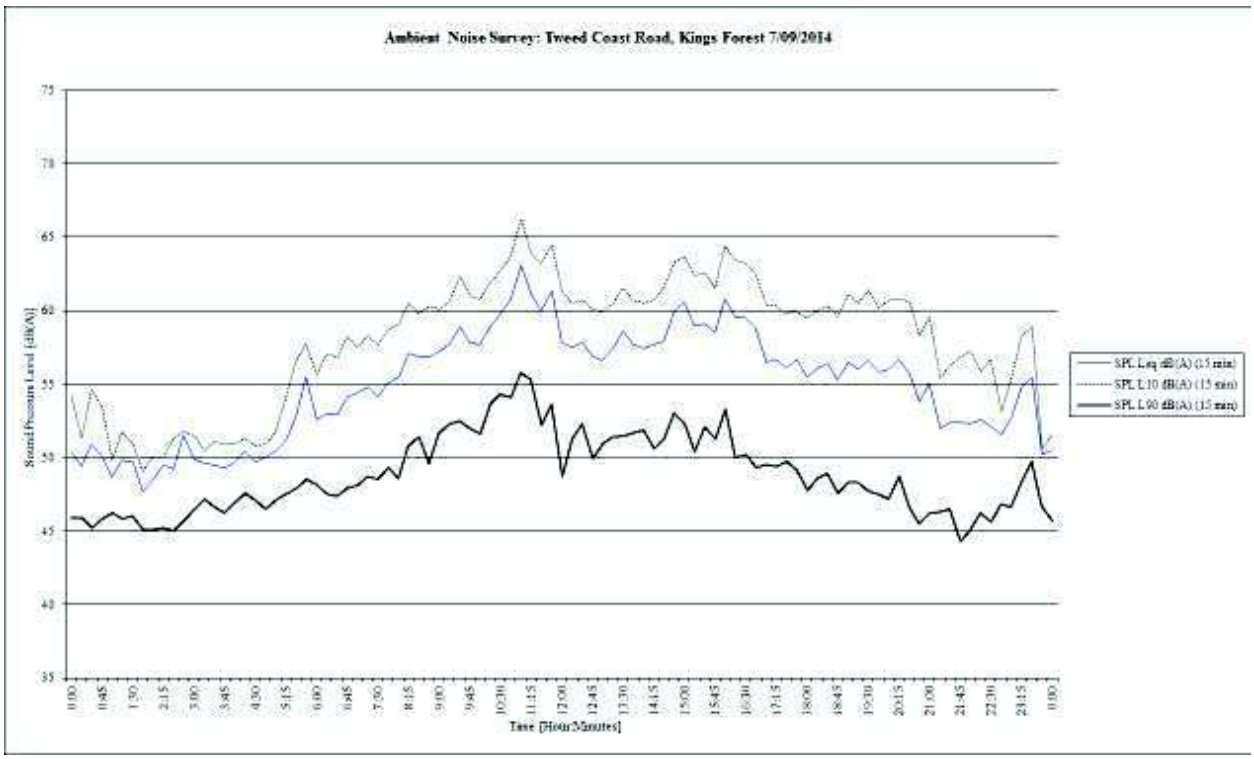
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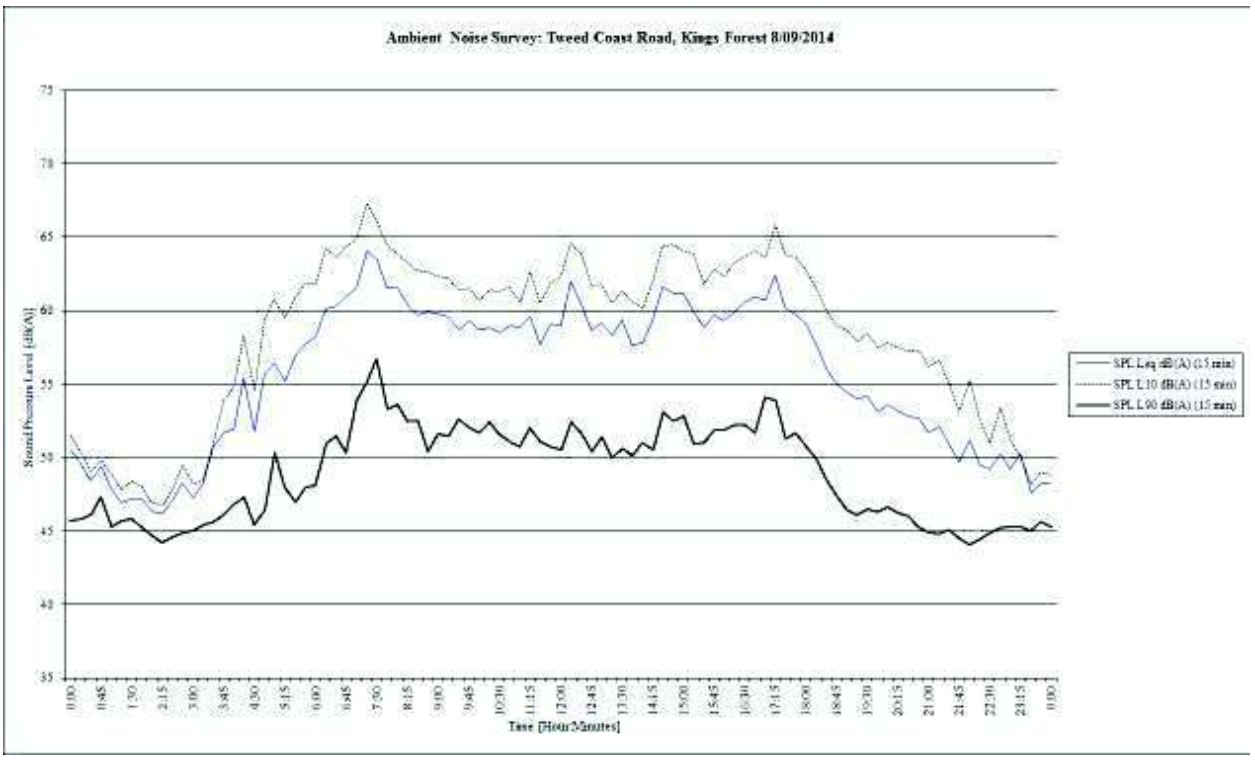
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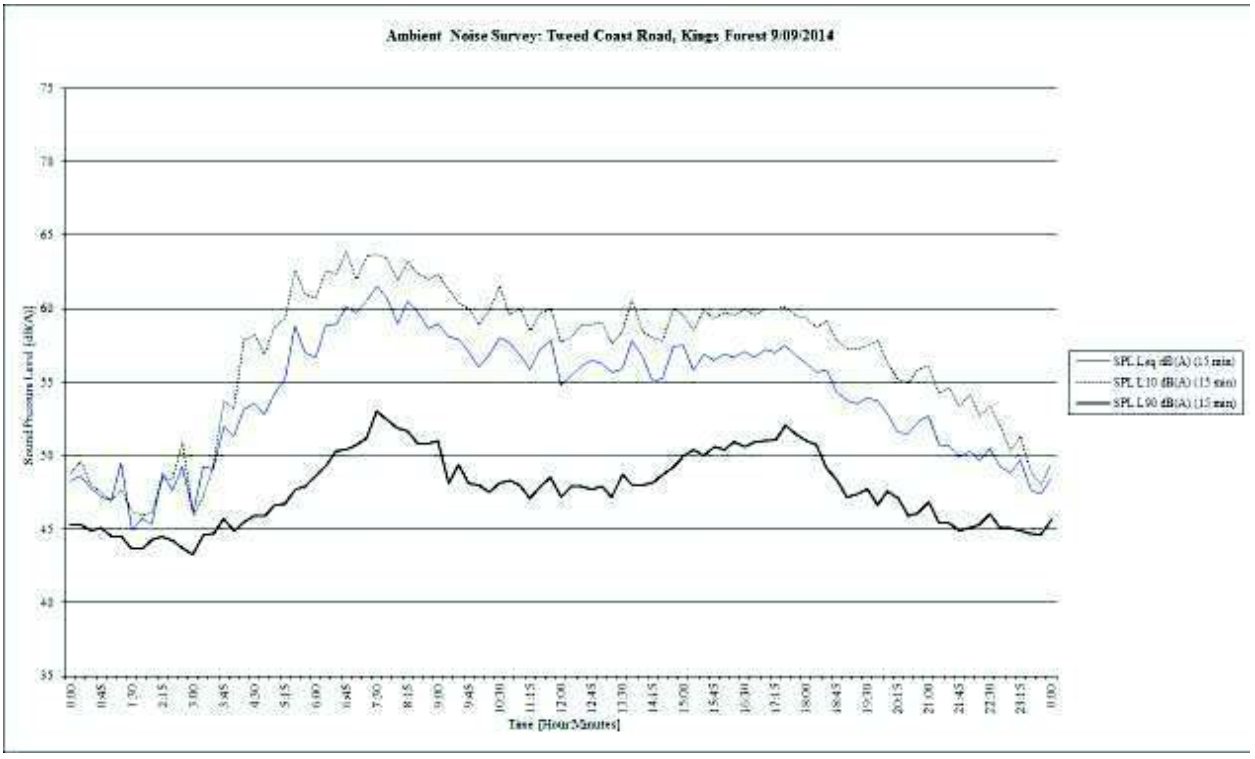
Sound Pressure Level [dB(A)]
Time [Hour/Minutes]
SPL Leq dB(A) (15 min)
SPL L10 dB(A) (15 min)
SPL L90 dB(A) (15 min)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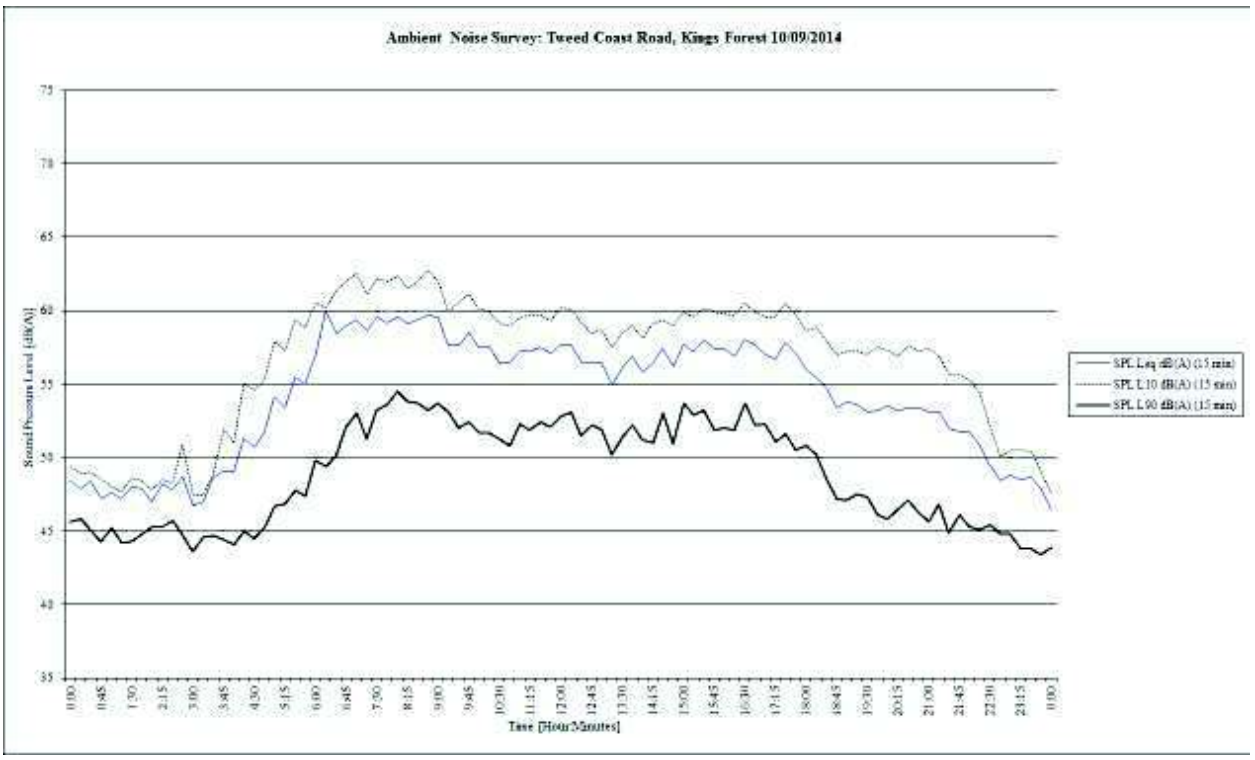
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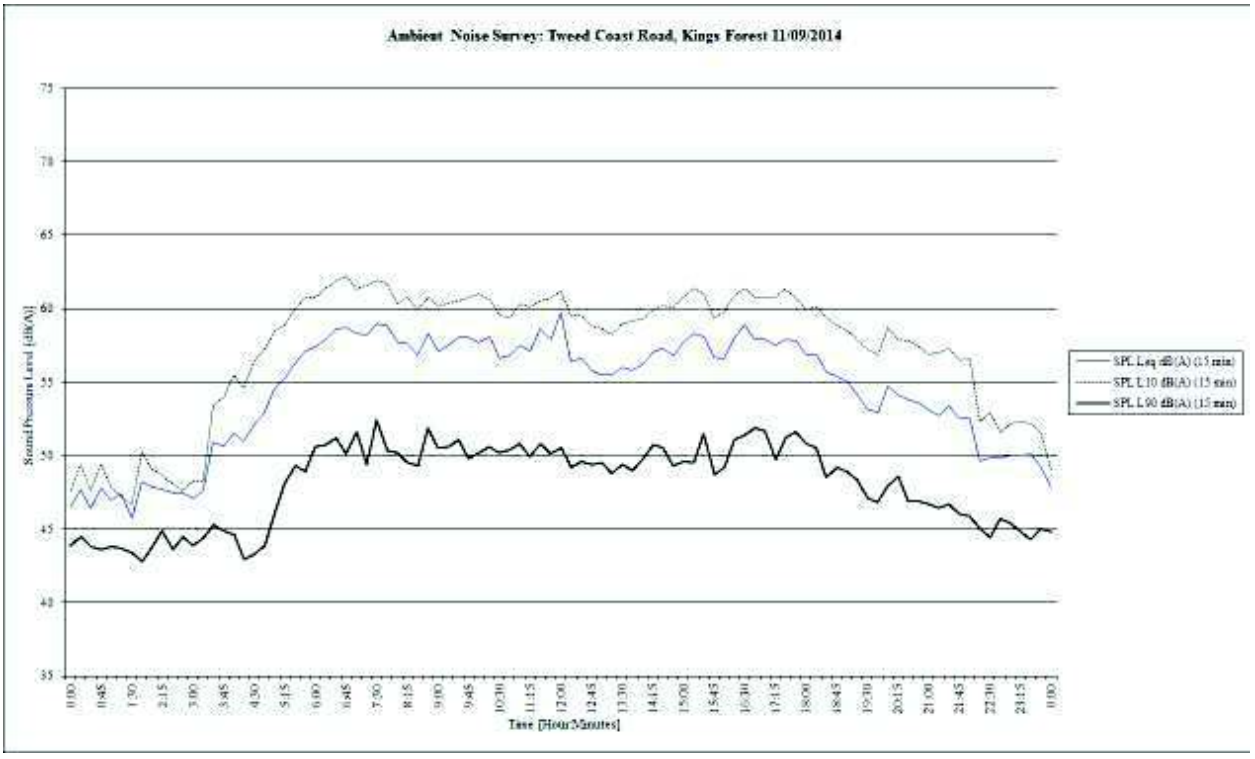
Ambient Noise Survey: Tweed Coast Road, Kings Forest 11/09/2014
Sound Pressure Level [dB(A)]
Time [Hour/Minutes]
SPL Leq dB(A) (15 min)
SPL L10 dB(A) (15 min)
SPL L90 dB(A) (15 min)

NOISE / VIBRATION COMPLAINT REGISTER

Initial Complaint Recording

Date & Time of record: _____

Name of Complainant (if given): _____

Complainant Telephone Number: _____

Address of complainant (if given): _____

_____

_____

Identification and description of source (e.g. noisy truck): _____

_____

_____

Time of day noise / vibration is occurring: _____

Number of days the noise / vibration has occurred: _____

Complaint Investigation & Remediation

Recommended control (e.g. fit new muffler): _____

Verification that controls have been implemented: _____

Follow-up Complainant

Contact date: _____

Complainant comment (e.g. is noise still annoying ? – if yes, refer to Note below): _____

NOTE
If complainant is still affected after all reasonable steps have been taken to ameliorate the noise, specialist advice should be sought from a qualified acoustical consultant.

CRGACOUSTICS

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CRG Acoustics Pty Ltd
ACN 151 847 255 ABN 11 708 556 182

Proposed Residential Development
"Kings Forest Estate"
Tweed Coast Road, Casuarina NSW

CONSTRUCTION
NOISE & VIBRATION MANAGEMENT PLAN

30 July 2020

crgref: 09371 Construction Noise and Vibration Plan REV 1

1. INTRODUCTION

CRG Acoustics Pty Ltd have been engaged by Leda Developments Pty Ltd to produce a noise and vibration management plan for the earthworks and construction phase of the *"Kings Estate"* residential subdivision development on Tweed Coast Road at Casuarina.

This report addresses Item 56 of Tweed Shire Council's Approval (Modification 8 dated 26th November 2019):

Noise and Vibration Management Plan

56.

1) A Noise and Vibration Management Plan to detail measures to minimise noise emissions associated with the construction of the project shall be submitted for approval as part of the CEMP. This plan shall be prepared in accordance with the *Interim Construction Noise Guidelines* (DECC, July 2009) and shall include, but not necessarily be limited to:
   a) identification of all major sources of noise that may be emitted as a result of the construction of the project;
   b) identification of nearby residents and other sensitive land uses;
   c) specification of appropriate noise and vibration criteria as it applies to a particular activity;
   d) identification and implementation of best practice management techniques for minimisation of noise and vibration emissions;
   e) procedures for the monitoring of noise emissions and vibrations; and
   f) a description of the procedures to be undertaken if any non-compliance is detected.

2. THE PROPOSAL

Kings Forest is the most significant master-planned development proposed in the Tweed Shire. Kings Forest will accommodate 4,500 dwellings, town centres, education and community facilities as well as major environmental areas dedicated to Council and NPWS.

The scope of works which is the subject of this submission is broken into the following packages:

- Bulk Earthworks Stage 1 (Phases 1-7);
- Civil works Precinct 5 (Stages 1-3);
- Kings Forest Parkway works (Phase 1);
- External intersection works;
- Tweed Coast Road infrastructure works;
- Sewer Pump Station PS02; and
- Regional Sewer Pump Station.

Refer to Figure 1 below which details the location of the initial earthworks and civil stages as well as associated external works all of which is the subject of this submission.

It is anticipated that the earthworks and construction activities will last for approximately 12 months starting from August 2020.

Hours of operation would be 7am to 6pm, Monday to Friday and 8am to 5pm, Saturdays, with no works on Sundays or Public holidays. There is allowance for works outside standard hours for exceptional circumstances (see Section 7.1).

Figure 1 – Location of the Development Area.

The proposal would involve earthworks (approximately 205,000m^3 over 7 phases), including removal of topsoil, filling / cutting for the proposed lots and road pavements, and stormwater and sewer enabling works. Civil works will include sewer reticulation. stormwater drainage, water reticulation, electrical & NBN and roadworks. The following heavy equipment is expected to emit the highest noise levels from construction and earthworks:

- Dozers,
- Excavators,
- Graders,
- All terrain dump trucks,
- Dewatering plant,
- Concrete and water trucks.

For more detailed information relating to onsite construction works refer to the *"Construction Methodology, Kings Forest Estate"* document completed by SEE Civil Pty Ltd.

The nearest sensitive receivers are identified as follows (refer to Figure 2 for location of receivers):

1. Dwellings to the immediate north on Lot 2 DP597802 and Lot 201 DP1129756;
2. Dwellings further to the north on and Lot 1 DP875446 and Lot 132 DP1134961;
3. Dwellings along Old Bogangar Road;
4. Dwelling within the Casuarina Estate (i.e. Laceflower Parade);
5. Dwelling along Melaleuca Road; and
6. Dwelling at southeast end of Reardons Road.

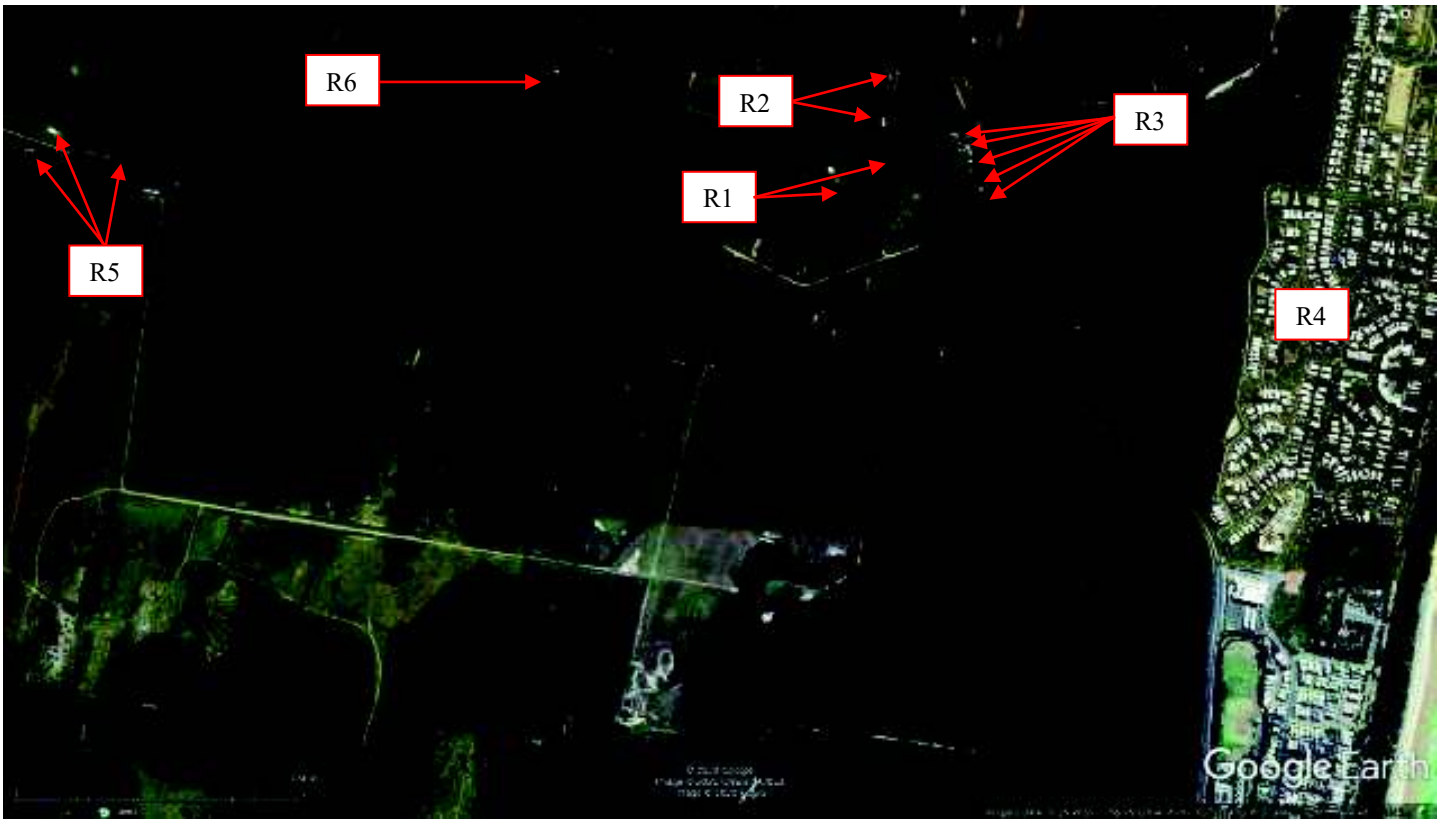


Figure 2 – Location of Development Area (Google Earth).

3. NOISE LEVEL GUIDELINES

The Interim Construction Noise Guideline cited in Item 56 sets guideline levels. It is understood that the Interim Construction Noise Guideline was produced to provide more flexibility in managing noise from construction, as in many cases it is not possible to strictly comply with the limits set in the superceded Noise Control Manual.

The guideline states the following in respect to management of noise impacts:

> "*Where noise from construction is above the 'noise affected' levels presented below, the proponent should apply all feasible and reasonable work practices to minimise noise. The proponent should also inform potentially affected parties of the activities to be carried out, the expected noise impacts and duration.*"

Under the guideline, the management levels applied to construction noise is as follows:

Time of day	Management level $L_{Aeq\ (15\ min)}$*	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see section 7.2.2.

It is also noted that Australian Standard AS 2436 – 1981 "*Guide to noise control on construction, maintenance and demolition sites*" provides extra guidance for management of onsite noise.

The following equipment was used to record existing ambient noise levels at the subject site locality.

- Rion NC 73 Calibrator; and
- Rion NL 21 Environmental Noise Logger.

A logger was located across Tweed Coast Road from the subject site. The microphone was in a free-field location, approximately 1.2m above ground and 25m from the nearest lane of Tweed Coast Road. Refer to Figure 2 in Appendix A for the logger location.

All instrumentation used in this assessment hold current calibration certificate from a certified NATA calibration laboratory.

All measurements were conducted generally in accordance with Australian Standard AS 1055:1997 – *"Acoustics-Description and measurement of environmental noise*". The operation of the sound level logging equipment was field calibrated before and after the measurement session with no significant drift from the reference signal recorded.

Daily weather observations were obtained from the Bureau of Meteorology Coolangatta weather station. Weather conditions during the assessed monitoring period were generally fine with the exception of 11mm of rain on Tuesday 9/09/2014; a temperature range between approximately 6 and 25ºC and relative humidity between 28 and 92%.

A Rating Background Level (RBL) of 51 dB(A) was recorded for the daytime period (7am to 6pm) at the logger location, 46 dB(A) for the evening period (6pm to 10pm) and 45 dB(A) for the night-time period (10pm to 7am). Rating Background Levels were calculated using the method provided in Appendix B of the *"NSW Industrial Noise Policy"*.

Graphical presentation of the measured noise levels from the logger are presented in the rear of this report.

To account for lower background levels further from the road corridor we recommend applying the night-time RBL of 45 dB(A) for the daytime period, and 35 dB(A) for the night-time period (based upon the Estimated Average Background Levels from Australian Standard AS1055-1997 for a Category 2 area defined as *"Areas with low density transportation"*).

Table 1 below presents the resulting noise criterion based upon the adopted background noise levels and the "*Interim Construction Noise Guideline*"

Time of Day	**Management Level L_{eq} dB(A)**
Standard Working Hours	*"Noise Affected"* 55 (Background RBL 45 + 10 dB(A))
Standard Working Hours	"Highly Noise Affected" 75
Outside Standard Working Hours	*"Noise Affected"* 40 (Background RBL 35 + 5 dB(A))

Table 1: Construction activity noise management levels based upon the "*Interim Construction Noise Guideline*".

4. VIBRATION LEVEL GUIDELINE

4.1 Protection from Cosmetic Damage

British Standard BS7385 provides guidance on prevention of cosmetic damage to buildings. The Standard provides the following criteria:

Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4Hz to 15Hz	15Hz & above
Reinforced or framed structures Industrial and heavy commercial buildings including pipework	50 mm/s at 4Hz and above	
Unreinforced or light framed structures Residential or light commercial buildings	15mm/s at 4Hz increasing to 20mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz

4.2 Protection from Human Exposure

The Department of Environment and Conservation NSW guideline "*Assessing Vibration: A Technical Guideline*" provides acceptable values for human exposure to intermittent vibration (i.e. construction activities / equipment).

Table 2.4 Acceptable vibration dose values for intermittent vibration ($m/s^{1.75}$)

Location	Daytime[1]		Night-time[1]	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas[2]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

1 Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am.
2 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas.
Source: BS 6472–1992

Further, the NSW Transport Roads & Maritime Services *"Construction Noise and Vibration"* Guideline (dated August 2016) provides the following minimum working distances which should be adhered to.

Table 2: Recommended minimum working distances for vibration intensive plant from sensitive receiver

Plant Item	Rating / Description	Minimum working distance	
		Cosmetic damage (BS 7385)	Human response (OH&E Vibration guideline)
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4 tonnes)	6 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	100 m
	> 300 kN (> 18 tonnes)	25 m	100 m
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	2 m	7 m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7 m	23 m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22 m	73 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	20 m
Pile Boring	≤ 800 mm	2 m (nominal)	4 m
Jackhammer	Hand held	1 m (nominal)	2 m

Note: More stringent conditions may apply to heritage or other sensitive structures

Should activities / equipment which create vibration occur inside the Human Response minimum working distances, vibration monitoring should be considered.

Regardless, in the event of a complaint, the equipment / activity identified as the problem should be ceased immediately, and consultation with a person experienced in vibration monitoring be undertaken.

5. MANAGEMENT PLAN OBJECTIVE

The objective of this management plan is to minimise noise and vibration from earthworks and construction activities impacting nearby noise sensitive uses.

6. ONSITE SOURCES OF EMISSION

We have applied assumed noise source levels, with large plant without residential mufflers fitted used in calculations. For this reason, this assessment can be viewed as an absolute worst case scenario. Sources of noise typically associated with construction and earthworks (and which are likely to emit the highest noise levels) are as follows:

- Dozers,
- Excavators,
- Graders,
- All terrain dump trucks,
- Dewatering plant,
- Concrete and water trucks.

Based upon source noise levels taken from Australian Standard AS 2436 – 1981 '*Guide to noise control on construction, maintenance and demolition sites*', and from similar investigations by this office in the past, we predict the following noise impacts at the nearest sensitive receptors.

It should be noted that we have presented a range representing the plant located as near to the receptor as possible, and as far from the receptor as possible.

Noise Source	Source Level, SPL dB(A) $L_{eq(15min)}$ @ 7m	Predicted Noise Impact Level, SPL dB(A) L_{eq}
Noise Receiver 1: Dwellings to the immediate north on Lot 2 DP597802 and Lots 201 DP1129756		
Dozer	86	42 – 73
Excavator 200 kW	82	38 – 69
Grader	85	41 – 72
All terrain dump truck	80	36 – 67
De-watering plant	75	31 – 62
Concrete and water trucks	65	21 – 52
Noise Receiver 2: Dwellings further to the north on and Lot 1 DP875446 and Lot 132 DP1134961		
Dozer	86	41 – 60
Excavator 200 kW	82	37 – 56
Grader	85	40 – 59
All terrain dump truck	80	35 – 54
De-watering plant	75	30 – 49
Concrete and water trucks	65	20 – 39
Noise Receiver 3: Dwellings along Old Bogangar Road		
Dozer	86	41 – 79
Excavator 200 kW	82	37 – 75
Grader	85	40 – 78
All terrain dump truck	80	35 – 73
De-watering plant	75	30 – 58
Concrete and water trucks	65	20 – 59
Noise Receiver 4: Dwelling within the Casuarina Estate (i.e. Laceflower Parade)		
Dozer	86	40 – 48
Excavator 200 kW	82	36 – 44
Grader	85	39 – 47
All terrain dump truck	80	34 – 42
De-watering plant	75	29 – 37
Concrete and water trucks	65	19 – 27
Noise Receiver 5: Dwelling along Melaleuca Road		
Dozer	86	38 – 43
Excavator 200 kW	82	34 – 39
Grader	85	37 – 42
All terrain dump truck	80	32 – 37
De-watering plant	75	27 – 32
Concrete and water trucks	65	17 – 22
Noise Receiver 6: Dwelling at southeast end of Reardons Road		
Dozer	86	40 – 50
Excavator 200 kW	82	36 – 46
Grader	85	39 – 49
All terrain dump truck	80	34 – 44
De-watering plant	75	29 – 39
Concrete and water trucks	65	19 – 29

Table 3: Predicted *"worst case scenario"* noise impact levels from construction activity.

For the noisiest plant (a Dozer), it is concluded that a distance separation of approximately 32m is required to decrease noise levels to the *"highly noise affected"* guide level of 75 dB(A).

A distance separation of approximately 350m is required to be at the *"noise affected"* 55 dB(A) guide level.

7. NOISE AND VIBRATION MANAGEMENT PLAN

7.1 Hours of Operation: Construction activity be limited to the following hours:

Monday – Friday:	7am – 6pm;
Saturday:	8am to 5pm; and
Sunday or Public holiday:	No activity.

Works may be undertaken outside these hours where:

a) The delivery of materials is required outside these hours by the Police or other authorities;
b) It is required in an emergency to avoid the loss of life, damage to property and/or to prevent environmental harm;
c) Variation is approved in advance in writing by the Secretary or his nominee;
d) Residents likely to be affected by the works are notified in writing of the timing and duration of these works at least 18 hours prior to the commencement of works (with the exception of emergency work).

Aim:
To control activity onsite to within statutory hours of operation.

Performance Indicator:
Noise / vibration generated by construction activity does not occur outside the prescribed hours.

Tasks / Actions:
All workers visiting the site be made aware that restrictions to hours of operation apply to the site. Clauses in conditions of employment / contracts should require that personnel adhere to the stated hours of operation to ensure continued employment.

Ensuring that works are conducted between 7a.m. and 6p.m. Monday to Friday, and 8am to 1pm Saturdays.

Out of hours earthworks / construction works shall only be undertaken in accordance with the terms detailed in Section 7.1 above.

Trucks and equipment should not arrive or queue outside the site before 7am Monday to Friday and 8am on Saturday.

7.2 Onsite Plant & Equipment: fixed plant (i.e. compressors), mobile plant (i.e. dozers, excavators, trucks, personal vehicles, general vehicle movements).

Aim:
To minimise noise and vibration associated with general fixed and mobile plant operation impacting surrounding noise sensitive receivers.

Performance Indicator:
Noise and vibration generated by construction activity does not cause complaints.

Tasks / Actions:
Noise emissions of all plant to be used onsite are to be reviewed as part of the establishment process.

Training of staff and third party operators should be completed prior to them being able to work at the construction site. Staff and third party operators should be given a copy of this Construction Noise and Vibration Management Plan. Clauses in conditions of employment / contracts should require that personnel adhere to the stated noise control actions to ensure continued employment.

Install *"croaker"* type reversing alarms on vehicles used onsite, use flashing alarm lights for fixed plant, ban the use of horns, apart from emergency situations.

All mechanical plant, machinery and trucks are to be fitted with high performance noise control such as enclosed engines, muffled exhaust controls, residential mufflers and cooling air inlet silencers that minimise noise pollution in accordance with current legislation and industry best practices.

Plant and equipment that are used intermittently such as trucks, excavators and dozers are to be shut down when not operated for extended periods.

Trucks shall not queue up outside residential properties.

Truck speeds onsite be limited to 40 km/hr.

Truck are not to use exhaust brakes onsite, subject to safety requirements.

Drivers (both staff and third party operators) to operate equipment in a manner that does not generate unnecessary noise, through adherence to speed limits, avoiding excessive revving of motors, unnecessary idling, minimising compressive braking and avoidance of impact with solid objects.

Use and siting of equipment. By locating noisy equipment as far away from sensitive premises as is practical, distance separation will reduce potential noise impacts.

Stationary plant and equipment known to emit noise strongly in one direction are to be oriented so that the noise is directed away from the nearest noise sensitive receivers, where possible.

Locate stationary plant behind buildings or materials stockpiles to take advantage of acoustical screening from physical barriers.

Staggering times or plant locations, where possible, so that different plant items are in operation to avoid additive noise impacts. An example is if the excavator is being used near the northern boundary, then avoid moving other plant close to the boundary as well.

All engines, including trucks, are to be maintained and tuned to manufacturer's specifications to minimise noise emissions. All plant and equipment are to be regularly checked and inspected.

All onsite driveway crossovers and temporary roads be well maintained (no potholes) and levelled as required to minimise truck bounce as they move around the site.

In relation to vibration, the NSW Transport Roads & Maritime Services *"Construction Noise and Vibration"* Guideline (refer to Section 4 of this management plan) provides minimum working distances. Should activities / equipment which create vibration occur inside the Human Response minimum working distances, vibration monitoring should be considered. Regardless, in the event of a complaint, the equipment / activity identified as the problem should be ceased immediately, and consultation with a person experienced in vibration monitoring be undertaken.

Responsible Person:
Site Manger is responsible for ensuring all staff and third party operators abide by the Noise and Vibration Management Plan and is also responsible for the regular review of the Management Plan and the handling of complaints.

Reporting:
All complaints received are to be logged in a complaints register and dealt with as soon as practicable (Complaints Register is attached at the rear of this report).

All staff and third party operators training should be recorded and signed prior to be able to work onsite.

Corrective Action:
Driver training to instruct drivers of the relevant Tasks / Action presented above. If training is not effective, signage be erected requiring drivers to observe speed limits, and to minimise engine idling and revving. Management to maintain restrictions to hours of operations.

Undertaking of disciplinary action against staff and third party operators should they continue to disregard noise and vibration management controls (i.e. obeying speed limits and limiting the use of compressive braking).

Review:
Reviewed at the beginning of new construction activities (i.e. at the start of building works program), or upon receipt of bona fide complaint or upon request by Tweed Shire Council.

7.3 Mechanical Plant Maintenance

Aim:
Undertaking of a regular maintenance schedule for all high noise / vibration emitting equipment to minimise noise and vibration associated with operation of equipment and to ensure existing plant emissions due not increase.

Performance Indicator:
Noise and vibration by construction activity does not increase or cause complaints.

Tasks / Actions:
All engines including trucks are to be maintained and tuned to manufacturer's specifications so as to minimise exhaust emissions.

All plant and equipment are to be regularly checked and inspected.

Responsible Person:
Site Manger is responsible for ensuring all maintenance scheduling is undertaken on major equipment items used for construction activities and new plant / parts are assessed for noise performance.

Reporting / Review:
All complaints received are to be logged in a complaints register and dealt with as soon as practicable (Complaints Register is attached at the rear of this report).

Corrective Action:
Any equipment / plant found (through monitoring) to emit higher noise / vibration levels than previously should be inspected / repaired or incorporate source treatments to reduce levels.

Review:
Reviewed at the beginning of new construction activities (i.e. at the start of building works program), or upon receipt of bona fide complaint or upon request by Tweed Shire Council.

7.4 Communication with Surrounding Properties

Aim:

To maintain open communication with surrounding property owners and to inform them of construction program and of any significant changes to construction timetabling.

Tasks / Actions:

Prior to construction works being undertaken the surrounding noise sensitive receivers should be contacted and informed of the anticipated duration of works.

Undertake a general mail out to noise sensitive receivers within a minimum of 350m of the construction site (shown in the aerial image below) 10 days in advance of works, when construction operations are planning to occur or significantly change. The correspondence is to also include site contact details (as a minimum site address and a telephone contact number should a resident wish to discuss matters arising from the mail out), start and finish dates and daytime hours when the construction works will occur.

If works are required outside standard hours (see Section 7.1), the following is required:

a) Residents likely to be affected by the works are notified in writing of the timing and duration of these works at least 18 hours prior to the commencement of works (with the exception of emergency work).

Responsible Person:

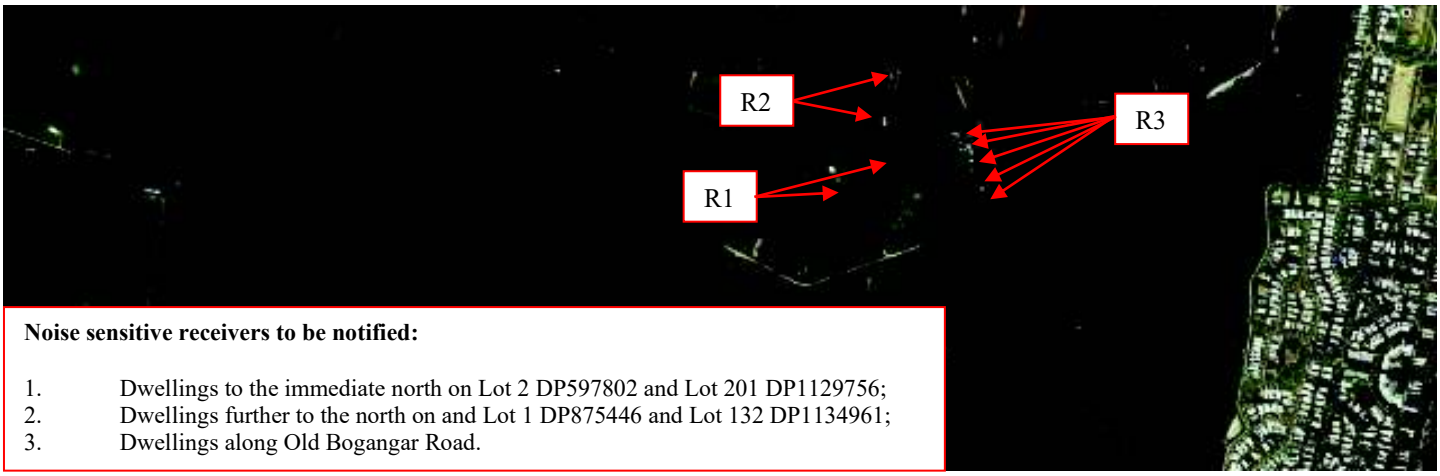
Site Manger is responsible for ensuring mail outs (or other community consultation activities) are conducted at the appropriate time.

Reporting:

All forms of communications to surrounding residences should be documented as well as any feedback received. Feedback should be reviewed and responded to accordingly.

Review:

Reviewed at the beginning of new construction activities (i.e. at the start of building works program), or upon receipt of bona fide complaint or upon request by Tweed Shire Council.



Noise sensitive receivers to be notified:

1. Dwellings to the immediate north on Lot 2 DP597802 and Lot 201 DP1129756;
2. Dwellings further to the north on and Lot 1 DP875446 and Lot 132 DP1134961;
3. Dwellings along Old Bogangar Road.

7.5 Non-compliance Response / Compliant Confirmation and Monitoring

Aim:
To provide a management methodology to quickly and effectively respond to non-compliance or a noise / vibration complaint, should such events occur during construction activities.

Tasks / Actions:
Assign the task of managing noise and vibration emissions to the Site Manager (the 'responsible person'). This person would be responsible for handling complaints sensitively, and ensuring that work does not commence before the times specified in Section 7.1.

If complaints arise regarding noise / vibration, the complaint will be directed to the 'responsible person', who will determine the source of the noise / vibration and take immediate steps to mitigate. This may involve moving the source of the noise / vibration further away from affected premises, replacing the equipment, or in some cases, engaging a qualified acoustic / vibration consultant to provide specialist control advice.

Any complaint is to be recorded using the Complaint Register form attached to this plan. The form should be used as a management tool, and permanent record of the complaint, remediation and follow-up with the Complainant.

If noise / vibration complaints continue after the abovementioned initial steps are taken, noise / vibration measurements are to be undertaken at the affected premise/s to confirm the non-compliance with the set criterion limits.

Noise / vibration monitoring should be conducted at a minimum of two sites (i.e. at the nearest noise sensitive receivers) and should be conducted from the most affected point within the surrounding noise sensitive receivers. Measurements should be undertaken by a suitably qualified and experienced consultant.

Noise measurements should be undertaken in accordance with Australian Standard AS 1055:1997 – *"Acoustics-Description and measurement of environmental noise*". The noise meter/s should be set to *"A"* weight *"Fast"* response. Measurements should be undertaken during calm weather conditions with winds below 5m/s.

Should non-compliance be confirmed localised acoustic barriers, use of different equipment / methodology (in the case of vibration) or any other appropriate treatment should be undertaken to provide additional mitigation. Should non-compliance still be observed additional treatments should be instigated such as reduced operation hours of the non-compliant equipment, purchasing of different equipment, reduction in the number of equipment operating onsite until permanent treatments can be implemented.

If required noise / vibration modeling should be undertaken of current operations to determine treatments that can be implemented that will ensure compliance with the set criterion limits over the long term. These treatments should be installed and compliance noise monitoring conducted.

Responsible Person:
Site Manger is responsible for ensuring that non-compliance and complaint issues are handled in a prompt fashion until compliance with the set limits are achieved.

Reporting / Review:
Noise / vibration complaints are to be recorded in the register (Complaints Register is attached at the rear of this report).

Non-compliance results are to be recorded. The actions taken to mitigate noise / vibration emissions are also to be recorded and reported to Tweed Shire Council.

Information to be included during monitoring and to be reported include (as a minimum):

- Date and time period when measurements were undertaken.
- The type of monitoring be conducted (i.e. compliance testing or in response to a complaint).
- Information on the measurement equipment used for monitoring including the serial numbers, pre-field and post-field calibration checks.
- Brief description of the location of the measurements (i.e. distance from nearest dwelling, direction and distance from construction activity).
- Prevailing weather conditions (i.e. temperature, wind strength and direction, cloud cover). It is noted that noise monitoring should be conducted during clear (i.e. no rain) and calm (i.e. less than 5m/sec. wind speeds) weather conditions. Daily weather observations can also be obtained from the Bureau of Meteorology's website.
- Comments outlining observations from measurements (i.e. expected dominant sources of noise / vibration including natural and onsite construction sources).
- Name and signature of person undertaking the monitoring.

8.0 DISCUSSION and CONCLUSION

This assessment is based upon assumed plant and equipment noise levels, and we have applied sound source levels from large plant and equipment items, whereas it is possible that smaller or more efficient plant and equipment will be used, which tend to generate less noise.

For the noisiest plant (a dozer), it is concluded that a distance separation of approximately 32m is required to decrease noise levels to the *"highly noise affected"* guide level of 75 dB(A). A distance separation of approximately 350m is required to be at the *"noise affected"* 55 dB(A) guide level.

Given the limited separation distance to the nearest surrounding offsite receivers (i.e. dwellings to the north of the site and along Old Bogangar Road); the available acoustic treatments to minimise noise impacts are limited to noise reduction at the source (i.e. application of mufflers and plant enclosures), incorporation of management principles into the day to day operation of the construction site and good communication between the site and occupants of nearby dwellings. However, such measures are unlikely to ensure full compliance with the noise criterion as heavy equipment such as excavators will be used onsite, and some short-term impacts may result. This is considered generally acceptable given the scale of the development.

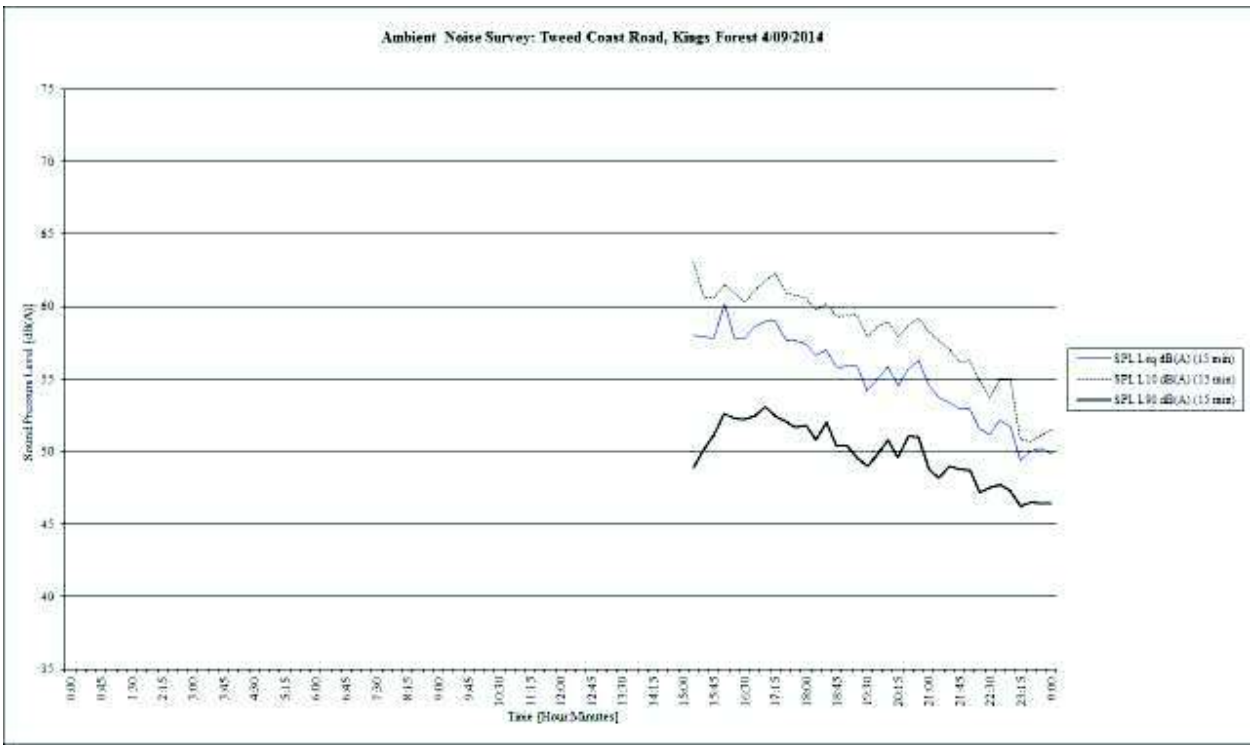
In relation to vibration, the NSW Transport Roads & Maritime Services *"Construction Noise and Vibration"* Guideline provides minimum working distances which should be applied. Should activities / equipment which create vibration occur inside the Human Response minimum working distances, vibration monitoring should be considered. Regardless, in the event of a complaint, the equipment / activity identified as the problem should be ceased immediately, and consultation with a person experienced in vibration monitoring be undertaken.

We note that noise and vibration impact levels at individual properties will vary from day to day depending on the location of construction works and the type of works being undertaken. The construction noise and vibration management plan has been prepared to reduce potential noise and vibration impacts by applying best practice noise controls.

The key to managing noise and vibration impacts is to ensure that all practical steps are taken to minimise noise and vibration from the site. If the nearby residents are aware that the builder is mindful of noise and vibration impacting upon their premises, they will tend to be less annoyed than if they feel no regard is made as to their amenity. Good communication is an important factor in managing noise and vibration, as a good relationship between the builder and the residents will further ensure that should an issue arise it can be dealt with in a reasonable manner.

Report By:

JAY CARTER BSc
Director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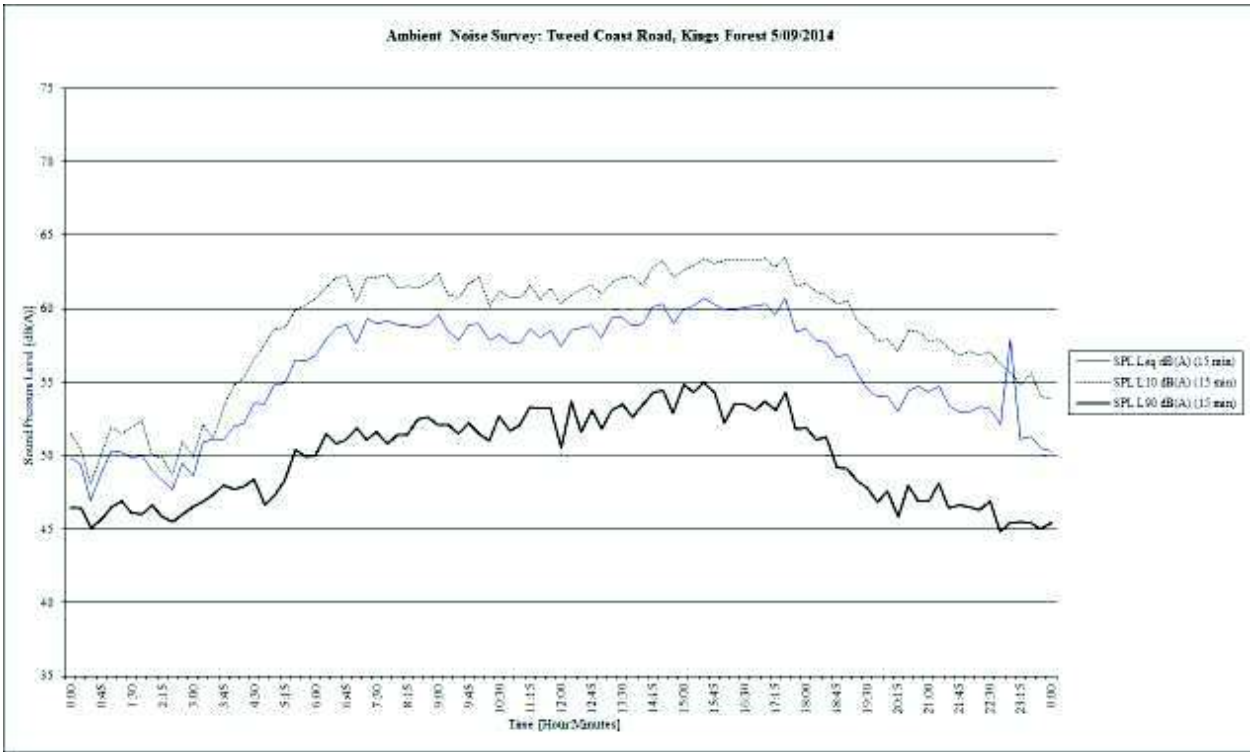
SPL L90 dB(A) (15 min)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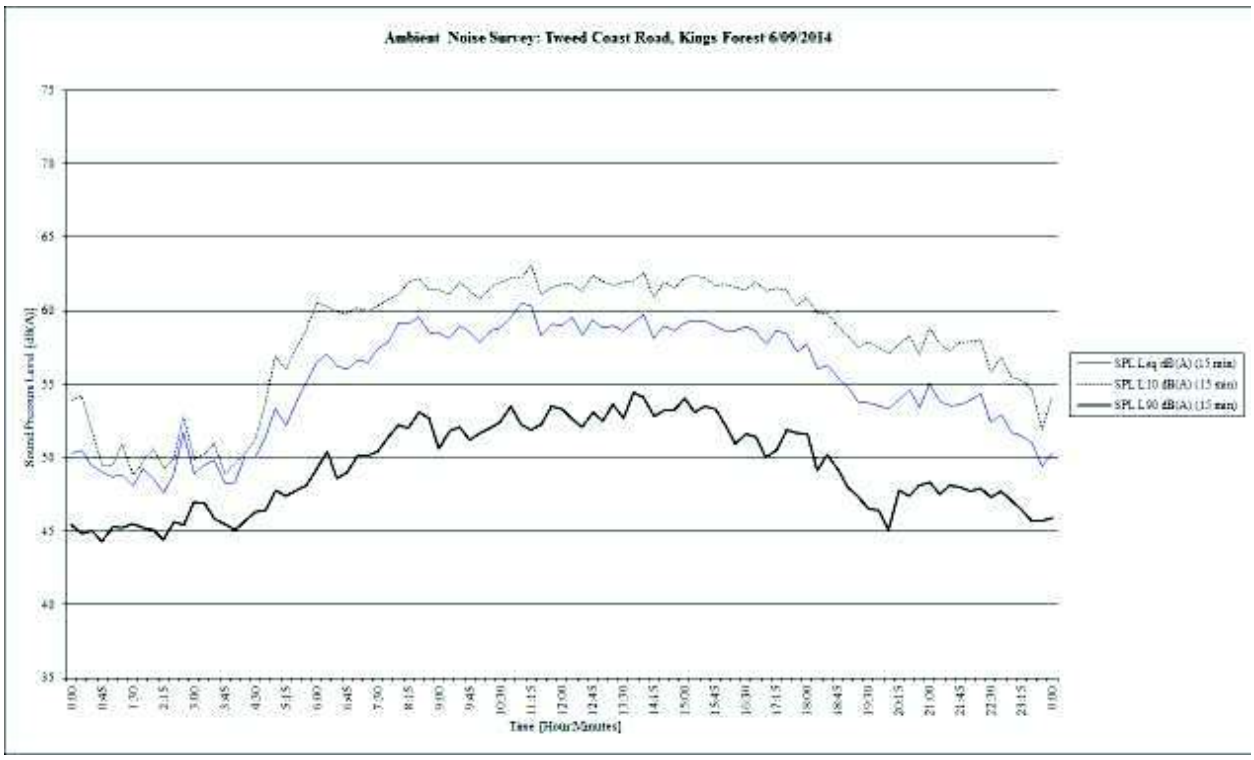
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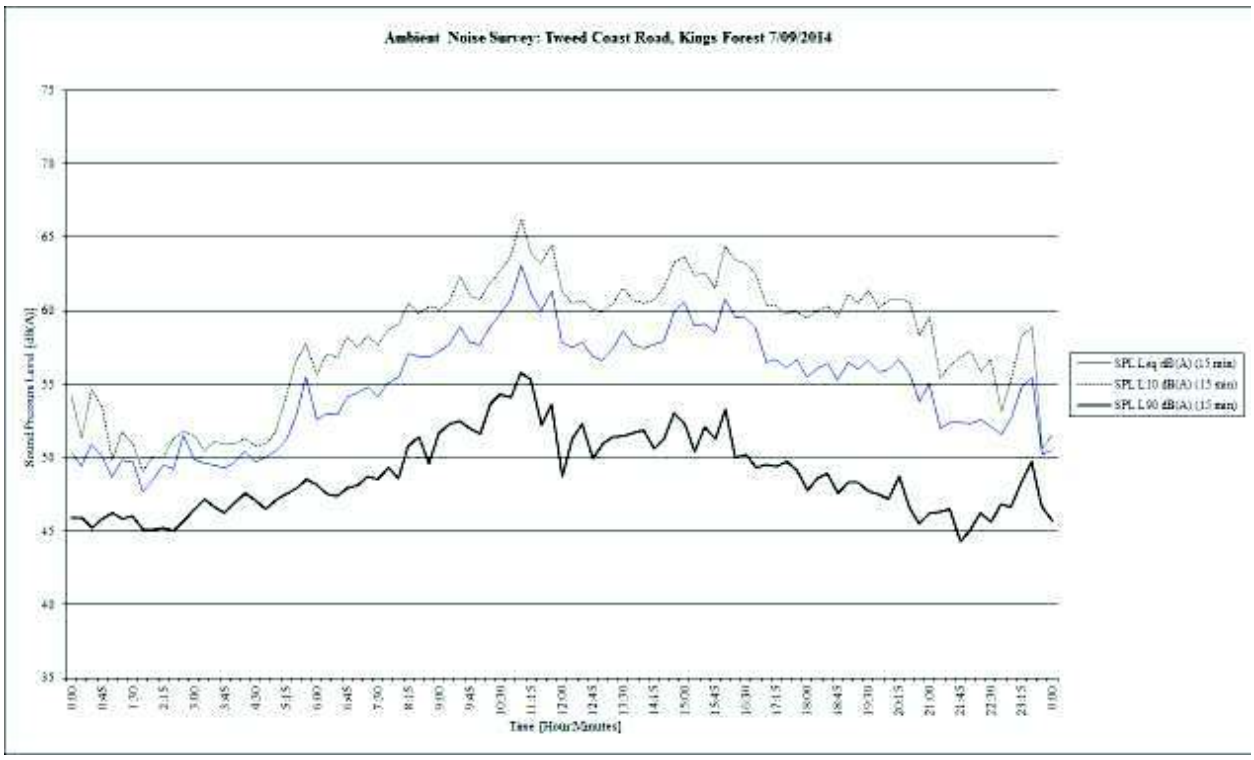
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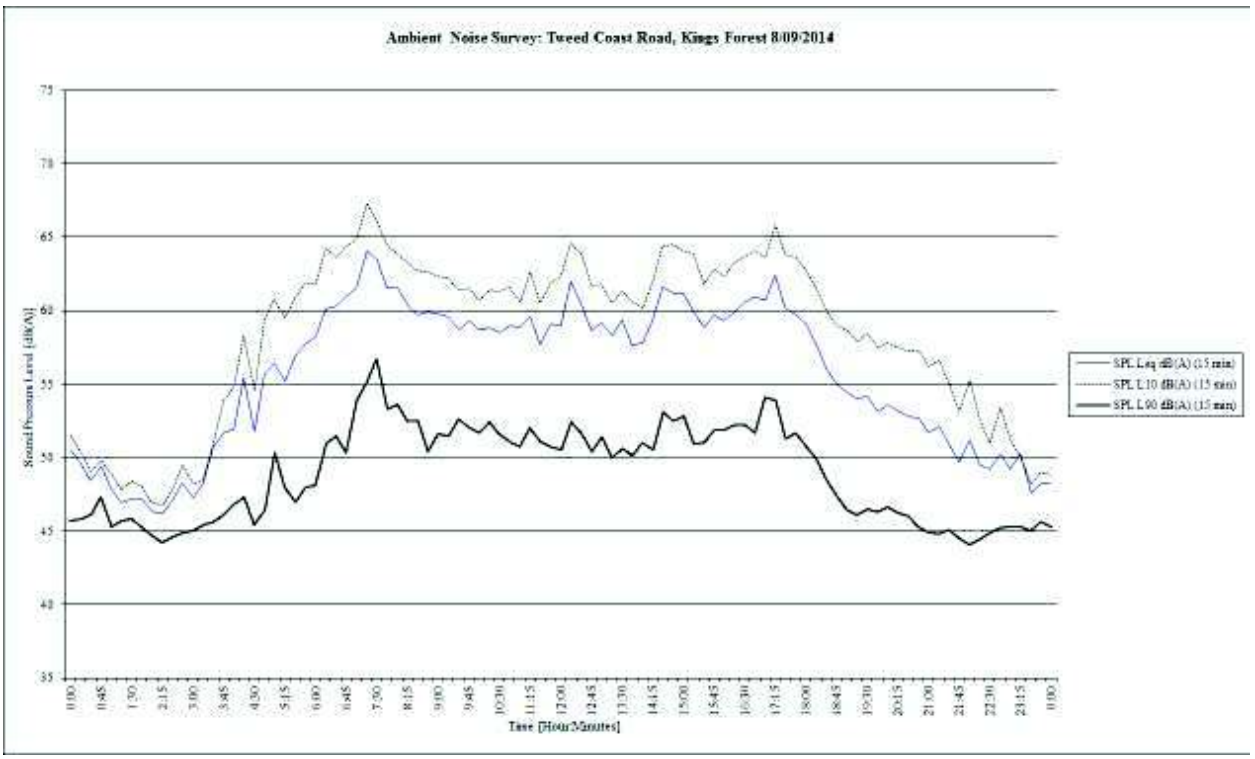
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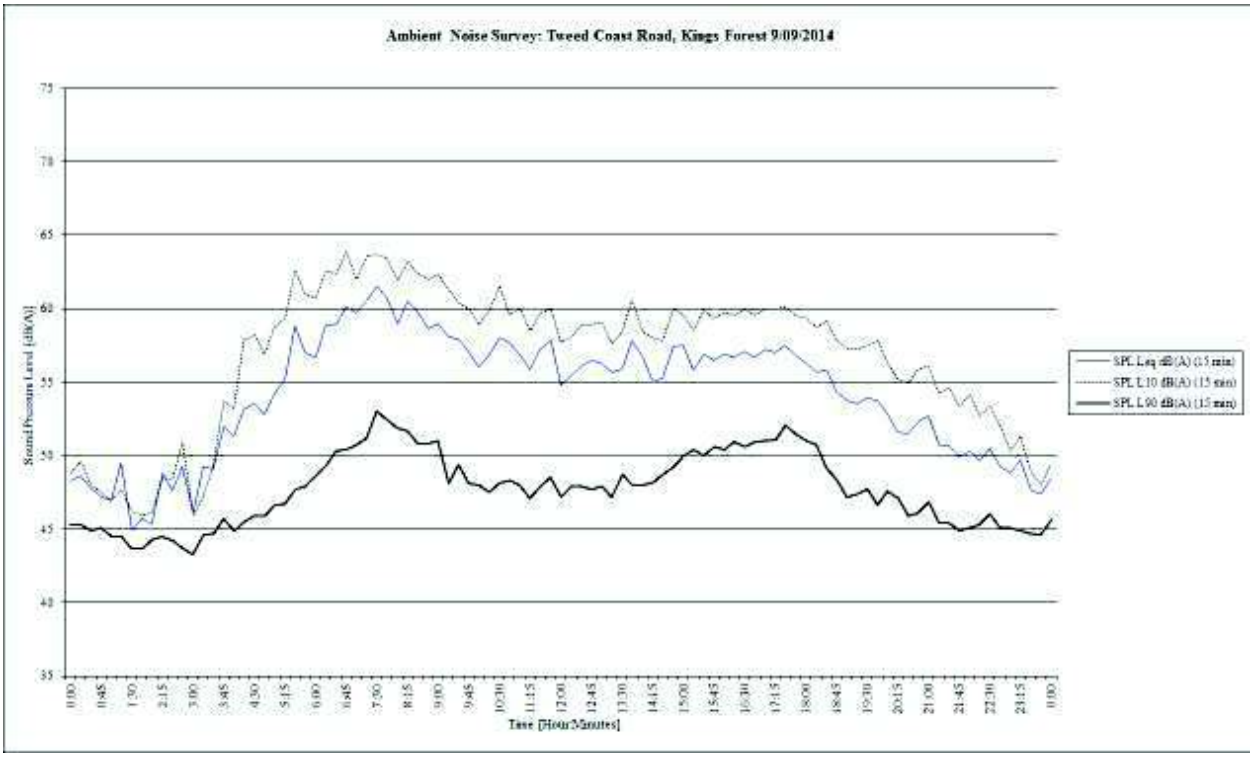
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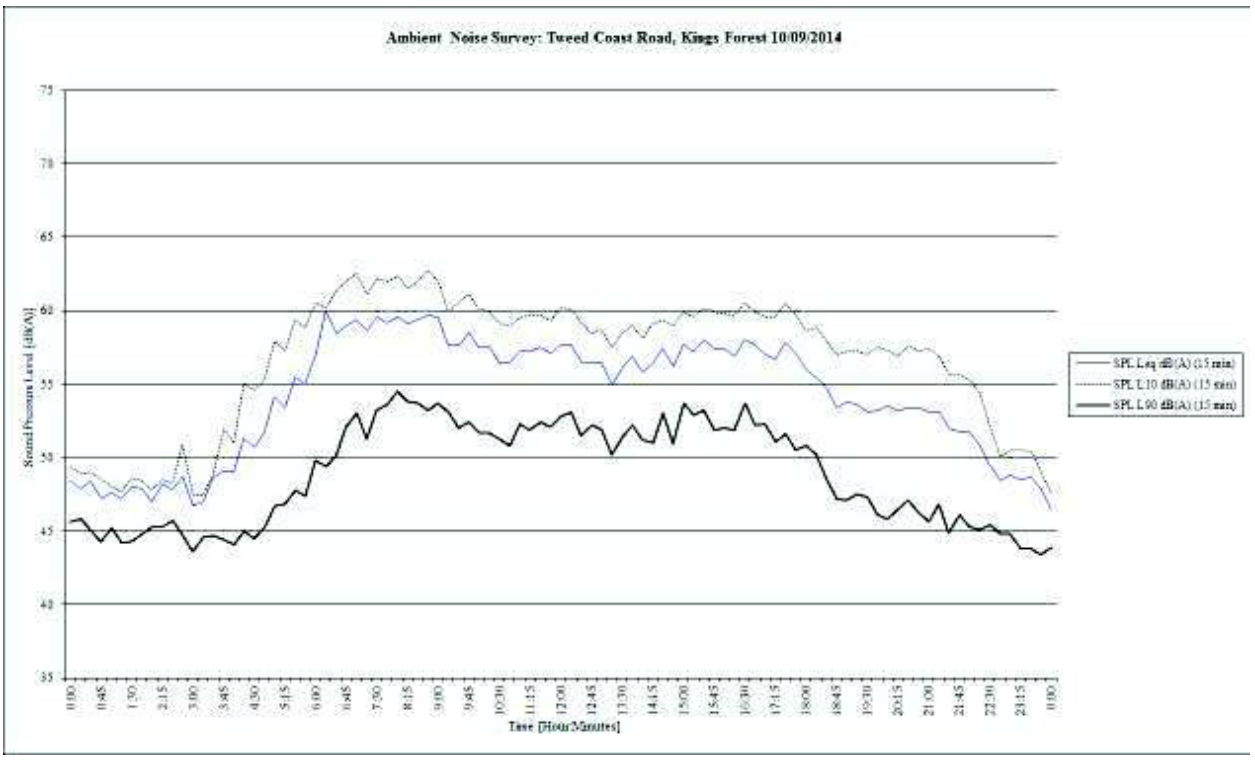
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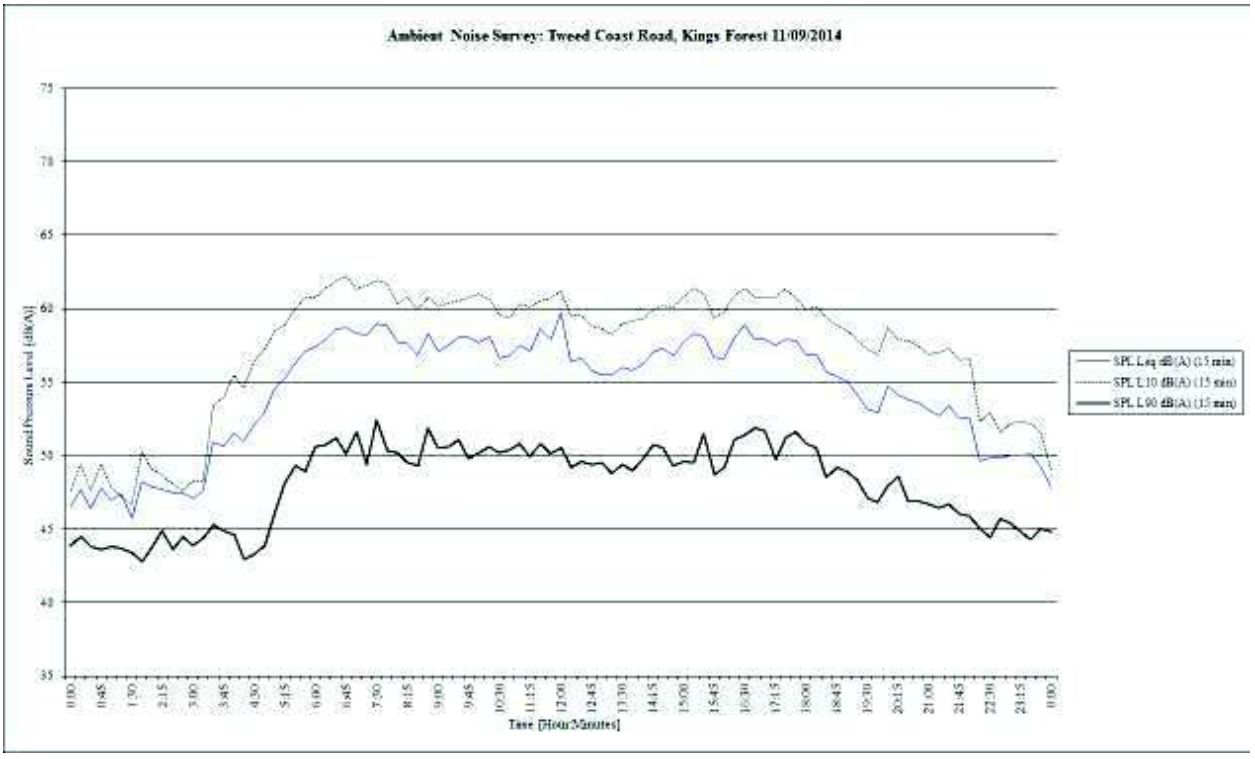
Ambient Noise Survey: Tweed Coast Road, Kings Forest 11/09/2014
Sound Pressure Level [dB(A)]
Time [Hour/Minutes]
SPL Leq dB(A) (15 min)
SPL L10 dB(A) (15 min)
SPL L90 dB(A) (15 min)

NOISE / VIBRATION COMPLAINT REGISTER

Initial Complaint Recording

Date & Time of record: _____

Name of Complainant (if given): _____

Complainant Telephone Number: _____

Address of complainant (if given): _____

_____

_____

Identification and description of source (e.g. noisy truck): _____

_____

_____

Time of day noise / vibration is occurring: _____

Number of days the noise / vibration has occurred: _____

Complaint Investigation & Remediation

Recommended control (e.g. fit new muffler): _____

Verification that controls have been implemented: _____

Follow-up Complainant

Contact date: _____

Complainant comment (e.g. is noise still annoying ? – if yes, refer to Note below): _____

NOTE
If complainant is still affected after all reasonable steps have been taken to ameliorate the noise, specialist advice should be sought from a qualified acoustical consultant.

APPENDIX M3

Construction Waste Management Plan

Prepared by Gilbert + Sutherland Pty Ltd
dated December 2019

PROJECT

CONSTRUCTION WASTE MANAGEMENT PLAN KINGS FOREST PHASE 1 NEW SOUTH WALES

PREPARED FOR

PROJECT 28 PTY LTD

DATE

DECEMBER 2019

GILBERT SUTHERLAND

DOCUMENT CONTROL

DOCUMENT TITLE 12066_CWMP_SAM1F.DOCX
PROJECT MANAGER E. Holton
AUTHOR(S) S. McGhee
CLIENT Project 28 Pty Ltd
CLIENT CONTACT Michael Geale
CLIENT REFERENCE –

SYNOPSIS This Construction Waste Management Plan specifies the general strategies and specific measures to manage wastes generated on the site during the construction phase of works associated with Phase 1 of the Kings Forest development at Kings Forest, New South Wales.

REVISION HISTORY

REVISION #	DATE	EDITION BY	APPROVED BY
1	12/19	S. McGhee	E. Holton / L. Varcoe

DISTRIBUTION

	REVISION NUMBER									
Distribution	1	2	3	4	5	6	7	8	9	10
Project 28 Pty Ltd	1									
Gilbert & Sutherland	1									

SUMMARY

Project 28 Pty Ltd commissioned Gilbert & Sutherland Pty Ltd (G&S) to prepare a Construction Waste Management Plan (CWMP) for the construction phase of works associated with Phase 1 of the Kings Forest development, Kings Forest, New South Wales. A description of works included as part of Phase 1 is as follows:

- Tweed Coast Road – water, sewage and cycleway
- Kings Forest Parkway Stage 1
- Bulk earthworks (Phase 1)
- Precinct 5 Stage 1 to 3 including Pump Station PS02
- Precinct 4 (spoil areas and fill works)
- Precinct 7 (spoil areas and fill works)

The identified works are shown on Drawing No. 12066_001.

The CWMP is required to address Condition 57, 58, 108 and 113B of the Major Project Approval No. MP08_0194, Kings Forest Stage 1 (and associated Mods 1 to 7) as repeated below in italic text:

This CWMP has been prepared in accordance with Tweed Shire Council's *Development Control Plan – Section A15 Waste Minimisation and Management*, the *Protection of the Environment Operations Act 1997*, the *Waste Avoidance and Resource Recovery Act 2001* and the *Protection of Environmental Operations (Waste) Regulation 2005*.

This CWMP identifies the various wastes likely to be generated at Kings Forest during the construction phase of works associated with Phase 1 development at Kings Forest, New South Wales. The CWMP describes strategies for managing those waste streams and measures to ensure appropriate disposal of the generated wastes.

CONTENTS

1 Introduction

1.1 Background

Project 28 Pty Ltd commissioned Gilbert & Sutherland Pty Ltd (G&S) to prepare a Construction Waste Management Plan (CWMP) for the construction phase of works associated with Phase 1 of the Kings Forest development.

Prepared by suitably qualified G&S staff, this CWMP aims to help minimise and appropriately manage waste produced on-site during the construction phase of the project.

1.2 Project description

For the purposes of this CWMP, the 'project' is the bulk earthworks, civil works, road construction and drainage works required in Phase 1 of the Kings Forest development at Kings Forest, New South Wales ('the site'). A description of works included as part of Phase 1 development and associated works is as follows:

- Tweed Coast Road – water, sewage and cycleway
- Kings Forest Parkway Stage 1
- Bulk earthworks (Phase 1)
- Precinct 5 Stage 1 to 3 including Pump Station PS02
- Precinct 4 (spoil areas and fill works)
- Precinct 7 (spoil areas and fill works)

The identified works are shown on Drawing 12066_001. Based on a review of aerial imagery, little or no demolition work of any existing structures capable of generating construction waste is required. Minor works will be necessary to remove fencing, gates and culvert crossings.

1.3 Objectives

This CWMP has been prepared to address Conditions 57, 58, 108 and 113B as set out in the Kings Forest Stage 1 Compliance Conditions. The relevant conditions are reproduced below (in indented, *italic text*):

57. CONSTRUCTION WASTE MANAGEMENT PLAN –

1) Construction Waste Management Plan prepared by a suitably qualified person in consultation with the Council, shall be submitted for approval as part of the CEMP. The plan shall address, but not limited to:

(a) Recycling of demolition materials including concrete;

(b) removal of hazardous materials and disposal to an approved waste disposal facility in accordance with the requirements of the relevant legislation, codes, standards and guidelines, prior to the commencement of any building works.

(c) Identification of sources of waste

(d) Description of measures to control and manage any waste.

(e) Identification of any monitoring locations and procedures for monitoring

(f) Licensing requirements.

(g) Measures to maximize on site recycling.;

(h) Locations of waste storage

2) The Proponent should submit a copy of the Plan to the Council prior to the commencement of work.

58. CONSTRUCTION WASTE MANAGEMENT –

1) The Proponent shall not cause, permit or allow any waste generated outside the site to be received at the site for storage, treatment, processing, reprocessing or disposal on the site, except as expressly permitted by a license under the Protection of the Environment Operations Act 1997, if such a license is required in relation to that waste.

2) Details demonstrating compliance with the relevant legislative requirements,

associated with the removal of hazardous waste, particularly the method of containment and control of emission of fibres to the air, are to be submitted to the satisfaction of the PCA prior to the removal of any hazardous materials.

3) *Storage of waste shall occur within the boundaries of the site, by way of a screened area of silt stop fabric, shade cloth or waste disposal bin; provided to council specifications (as in force at the date of this approval)*

4) *Any waste materials removed from the site shall only be directed to a waste management facility lawfully permitted to accept the materials.*

5) *The Proponent shall maximize the treatment, reuse and/ or recycling on the site of any excavated soils, slurries dusts, aggregate and sludge's associated with the project, to minimize the need for treatment or disposal of those materials outside the site.*

108. *STORAGE AND HANDLING OF WASTE – An appropriate area must be provided for the storage of garbage bins and recycling containers and all waste and recyclable material generated by this premises, outside of the ecological buffer zone and asset protection zone. The location and design of such an area must be in accordance with the requirements of* Tweed Shire Council Development Control Plan 2008 *(as in force at the date of this approval).*

113B. *WASTE – The Proponent must provide adequate facilities for storage of garbage, discarded or returnable packaging or other forms of trade wastes and make arrangements for regular removal and disposal. Full details must be included in documentation for a Construction certificate application.*

This CWMP has been prepared in general accordance with the *Protection of the Environment Operations Act (1997) (NSW) and Tweed Shire Council Development Control Plan (2008).*

2 Waste streams

2.1 Waste streams

The various waste streams that may be generated at Kings Forest during constructions phase of works associated with Phase 1 include the following:

Excavation materials waste:
Excavation waste is earth or dirt moved from a cut. This can include virgin excavated natural material (VENM). Excavation material is expected to constitute the greatest volume of waste produced on site for this stage of the works.

Cut and fill will be balanced as far as possible across the areas included in the Phase 1 scope. Any excess fill to be stockpiled for later use onsite. Stockpiled material will be stored in accordance with the site's Erosion and Sediment Control Plans in a manner that minimises the potential for erosion, sedimentation and dust generation.

Green waste (organic waste)
Organic waste consists of tree trunks, large branches, tree/plant prunings, weeds and leaf litter. Green waste will be generated through clearing of existing vegetation.

The cleared material will be reused across the site as mulch or stockpiled for landscaping uses at a later stage of the project. Timber fencing also constitutes green waste and should be broken down for reuse where possible.

General solid waste (putrescible[1])
Solid waste (putrescible) consists of food waste, biodegradable wrappers, coffee cups, animal waste, etc.

Putrescible waste will be generated on site from contractors' food scraps. Putrescible waste will be collected in designated bins onsite (separate to materials able to be recycled) and disposed of to landfill by a licenced contractor.

General solid waste (non-putrescible)
Solid waste (non-putrescible) likely to be generated at the site includes glass, plastic, rubber, paper, cardboard, fabric, concrete and steel. The bulk of this general solid waste produced at the site will be from demolition of any existing structures and excess materials generated through the construction of roadways and drainage. Waste will also be generated by site workers.

The generation of solid waste will be minimised wherever possible through accurate quantity surveying and reuse of excess construction materials (where practicable). Appropriately-sized receptacles will be available onsite for collection of recyclable materials. These receptacles will be collected by a licenced contractor as necessary and transported to an appropriate waste processing facility.

Onsite effluent (sewage/black-water)
Onsite effluent will be contained in portable toilet facilities. These will be serviced by an appropriately licensed contractor and taken to an appropriately licensed facility for disposal.

Special waste
Special waste consists of clinical and related waste, asbestos waste and waste tyres. It is anticipated that no clinical or asbestos waste will be generated or found at the site. Servicing and tyre changing will occur offsite wherever possible to avoid the onsite generation of associated waste streams. If onsite repairs to plant or equipment are unavoidable, the generated wastes will be appropriately stored until collection by an appropriately licensed contractor.

Hazardous waste
Hazardous waste includes explosives, flammable solids and liquids, substances susceptible to spontaneous combustion, oxidizing agents and organic peroxides, toxic substances and corrosive substances. It is anticipated that no hazardous waste will be generated at the site. However, if onsite repairs to plant or equipment are unavoidable, any hazardous waste generated by

[1] Liable to decay; subject to putrefaction.

the repairs will be removed from site immediately by a suitably licenced contractor.

If fuel is to be stored onsite, it will be securely housed in storage containers that meet the relevant Australian Standards and will be located away from hazard areas or sensitive receiving environments such as waterways.

Liquid Waste
Liquid waste includes any waste which becomes free flowing at or below 60 degrees Celsius, has an angle of repose of less than 5 degrees above horizontal and is generally not capable of being picked up by a spade or shovel. The generation of liquid wastes shall be avoided as far as practicable.

Servicing of plant and equipment will be undertaken offsite as far as practicable however should onsite repairs be necessary and result in the generation of liquid wastes (other than those classified as hazardous waste) these shall be immediately collected and disposed of by a licenced contractor and in accordance with the relevant (SDS).

2.2 Waste hierarchy

The waste hierarchy developed for the site follows the governing principles of reducing, re-using and recycling wherever possible. The hierarchy is provided below:

1. Reduce – To reduce the amount of waste created on site by only making necessary cuts and avoiding the unnecessary production of waste where practical to do so.
2. Reuse – All excavation waste and organic waste (green waste) will be mulched/ composted and reused on-site. Any non-putrescible waste material will be used in fill where feasible.
3. Recycle – All recyclable waste items will be collected for recycling. It is anticipated that a majority of the non-putrescible general waste will be recyclable.
4. Disposal – Waste will only be disposed of to landfill if re-use or recycling is not an option.

2.3 Waste station

In accordance with the Protection of the Environment Operations Act (1997), waste is to be transported only to a facility that holds the necessary government approvals for processing and handling the material. The Waste Transfer Station closest to the site is Stotts Creek Resource Recovery Centre located on Leddays Creek Road, Stotts Creek, off Tweed Valley Way.

Stotts Creek Resource Recovery Centre accepts general waste, non-putrescible waste, construction and demolition waste, special waste (including asbestos and tyres) and a wide range of recyclable items. Stotts Creek has a methane extraction system to collect any methane produced by rotting waste and uses it to generate electricity.

2.4 Waste collection and transport

Any material that is removed off site is to be transported only in accordance with the requirements of the Protection of the Environment Operations Act (1997). This means that the transporter must hold all government approvals necessary in respect of the waste being handled.

The foreman and/or site manager will commission a waste removal contractor to collect and dispose of all general waste (putrescible and non-putrescible), wastewater and recyclable waste generated on-site.

Appropriately licenced contractors shall be employed in the event that special wastes, hazardous wastes, or liquid wastes are generated at the site. Waste will be collected on a scheduled basis or as necessary, based on the volumes generated.

2.5 On-site waste segregation and separation

Waste separation and segregation will occur onsite with items placed into dedicated, labelled, covered receptacles (bins). Undertaking this process onsite will facilitate re-use or recycling to ensure minimal waste is disposed of to landfill.

4 Construction Waste Management Plan

4.1 CWMP structure

The CWMP is based on a tabular format and details the issues to be managed during the construction phase of the project. The tables detail the performance criteria, implementation measures, monitoring, reporting, and corrective actions required to ensure waste is appropriately managed at the site. The party responsible for implementation of the measures is included at the top of the table.

The format is presented on the following page for reference purposes.

#.# Title

Person responsible	This is the person who has accepted the responsibility of implementing the CWMP provisions detailed on this page.
Issue	The issue with which the table deals.
Operational policy	The operational policy or management objective that applies to the element.
Performance criteria	Management outcomes or performance criteria for each element of the operation.
Implementation strategy	The strategies or tasks (to nominated operational design standards) that will be implemented to achieve the performance criteria.
Monitoring	The monitoring requirements which will measure actual performance (i.e. specified limits to pre-selected indicators of change).
Auditing	The auditing requirements, which will verify implementation of the operational phase environmental management strategies and compliance with agreed performance criteria.
Reporting	Content, timing and responsibility for reporting and auditing of monitoring results. Requirements for record keeping.
Identification of incident or failure	The circumstances under which the agreed performance criteria are unlikely to be met and environmental harm is likely to result.
Corrective action	The action to be implemented in case a performance requirement is not reached and the company(s) responsible for action.

Commitment #

What the owner/ operator/ site management/ foreman is committed to.

An objective of the tabular format is to allow for change and allow the CWMP to be a working document. If items need altering, changes may be made to the individual tables after appropriate consultation with the statutory authorities.

4.2 General commitments

Commitment 1

Site management and any person appointed by site management, including the foreman and/ or site manager undertakes to comply with the management strategies described within this CWMP.

Commitment 2

Site management and any person appointed by site management, including the foreman and/ or site manager undertakes to fulfil all commitments made in this CWMP (including any approved amendments). The Proponent(s) will conduct all activities at the site in accordance with relevant current statutory requirements (including any approved amendments).

4.3 Definitions

In this CWMP the terms have the following meanings:

- **CWMP** means Construction Waste Management Plan
- **Foreman and/or Site Manager** means the person(s) responsible for the nominated works, and who has the responsibility for implementing the provisions of this Construction Waste Management Plan.
- **PCA** means Principal Certifying Authority, as defined in the Environmental Assessment and Planning Act 1997
- **Site** means Phase 1 of the Kings Forest Development, Kings Forest, New South Wales
- **SDS** means Safety Data Sheets which are required for handling respective products/chemicals
- **TSC** means the Tweed Shire Council.

4.4 CWMP management measures

The CWMP addresses the following issues relating to waste management:

- environmental commitments
- identification of environmental issues and potential impacts
- control measures to minimise the likelihood of environmental nuisance and harm
- organisational structure and responsibility
- effective communication
- staff training
- record keeping
- periodic review of environmental performance and continual improvement.

This CWMP, properly implemented, will ensure that waste generation, storage and disposal is managed in an environmentally responsible manner and will achieve the stated environmental goals.

4.5 Construction waste management – Phase 1

Person responsible	Foreman and/or Site Manager

Issue	Waste management during bulk earthworks, civil roadway and drainage construction associated with Phase 1 of the Kings Forest development.
Operational policy	• To ensure all waste generated onsite is stored, re-used, recycled removed and disposed of in an appropriate manner. • To adhere to the waste management hierarchy. • To minimise potential environmental and social impacts from waste and waste handling. • To minimise the amount of waste produced as a result of operations on site. • To keep site neat and tidy.
Performance criteria	• As far as practicable, cut and fill volumes should be balanced to avoid the generation of excess fill requiring offsite disposal and/or stockpiling for future use. • No green waste material removed from site. • Adherence to the waste management hierarchy with waste removed from site only for disposal to landfill or a recycling facility when it cannot be re-used or recycled on site. • Ensure facilities are available onsite for the segregation of wastes into streams to allow for recycling. Storage facilities to be clearly labelled, covered and regularly maintained. • Storage of waste shall occur within the boundaries of the site, by way of a screened area of silt stop fabric, shade cloth or waste disposal bins; provided to council specifications. • All waste is to be collected and transported by an appropriately licensed contractor and disposed of to an appropriately licensed facility. • All waste is handled in compliance with this CWMP, relevant legislation and to the satisfaction of the PCA.
Implementation strategy	**General strategies:** Reduction, reuse or recycling practices should be used wherever practicable. The following actions will apply in order to achieve this outcome: • All waste is to be stored within site boundaries in covered receptacles that meet TSC specifications and consistent with the Erosion and Sediment Control Management Plan. • No waste generated outside of the site is to be received at the site for storage or disposal. • An appropriate number of covered waste receptacles will be located on site with the provision of dedicated areas or additional receptacles for the storage of re-usable and recyclable materials. • Waste containers will be emptied once a week or as required (based on volumes generated) by an appropriately licensed contractor.

- All waste is to be removed from site only by an appropriately licensed contractor and taken to a facility with the correct permits for handling and processing the waste form.
- The site should be left clean and tidy at the end of each work day with no waste left loose or exposed.
- Any spillage is to be collected immediately and disposed of at an appropriately licensed facility.

Specific strategies:

In respect of **excavated materials**, the following action will apply:

- As far as practicable, cut and fill volumes should be balanced to eliminate the need for offsite disposal of materials or onsite stockpiling.
- Where cut and fill volumes cannot be balanced and excess materials result, materials shall either be stockpiled for re-use in future stages of the Kings Forest development or removed offsite and disposed of to a suitably licensed facility.

For **green waste**, the following actions will apply:

- Clearing of onsite vegetation shall be limited to only what is required as shown on the relevant plans.
- Green waste produced onsite (including wooden fencing) will be mulched and re-spread across the site following the completion of earthworks, or stockpiled and used to facilitate landscaping works.

Specific **putrescible waste** management measures are:

- There will be clearly labelled bins on site for putrescible waste that will be emptied at least once a week by a licensed contractor or as required based on the volumes generated.
- All putrescible waste will be removed by an appropriately licensed contractor and taken to a facility for composting or disposal.

For **non-putrescible waste**, the following actions will apply:

- Clearly labelled bins will be available onsite to segregate waste into recyclable or non-recyclable material.
- Reuse any material onsite where possible (e.g. construction materials).
- Minimise volume of waste going to landfill.
- Bins will be regularly collected by a suitably licenced contractor to avoid stockpiling or overflow.

For **on-site wastewater**, the following actions will apply:

- Installation and appropriate servicing of relocatable toilet facilities by a licensed contractor.
- Waste will be removed by an appropriately licensed contractor and taken to a facility licensed to handle and process the waste.
- No effluent will be disposed of on site.

Special waste will be managed according to the following:

- Onsite generation of special waste shall be avoided wherever possible.

	• Servicing of plant or equipment shall be undertaken offsite. • If onsite repairs to plant or equipment are unavoidable, any generated special wastes will be appropriately stored until collection by an appropriately licensed contractor **Hazardous waste** will be managed in accordance with the following: • Where possible, machinery is to be re-fueled and serviced offsite. • Any storage of oils or hazardous liquid/materials shall be in containers that meet Australian standard and stored away from hazard areas and sensitive receiving environments such as waterways. • Compliance with relevant legislation regarding removal, containment and emission control of hazardous waste will be achieved, including the submission of records to PCA prior to removal. • Any spills are to be cleaned up immediately with wastes disposed of to an appropriately licensed facility.
Monitoring	In order to ensure that the provisions of this CWMP are being correctly implemented, the following monitoring will be applied: • A designated onsite representative shall conduct daily visual inspections of the site's waste storage facilities and record inspection notes in a site diary. • Daily inspection of waste bins and skips shall assess whether sufficient capacity remains for continued use as well as ensuring waste is being segregated correctly and being put into the correct bin. • All waste related complaints are to be recorded in an incidents/complaints register which will be reviewed weekly by management.
Auditing	Auditing will be undertaken by the site foreman/manager and/or the proponent's nominated representative. Alternatively, auditing may be carried out by an independent consultant. The audit should include an inspection of site activities, complaints, corrective actions and reporting to assess compliance with the provisions outlined within the CWMP.
Reporting	• Records of waste removal invoices and plant and equipment servicing shall be kept up to date at all times and shall be made available to the nominated auditor and/or the relevant statutory authorities upon request. • An incidents and complaints register shall be kept onsite and made available to the nominated auditor and/or the relevant statutory authorities upon request. • Any incidents involving waste handling onsite or spills shall be reported to the foreman and/or the site manager immediately. • When there is potential or actual environmental harm as a result of waste management, the foreman and/or site manager is to notify appropriate authorities and corrective actions implemented as directed. • When there is potential or actual environmental harm as a result of waste management, TSC is to be contacted immediately on Council's

	Environmental Health Services line (02) 6670 2400 or the TSC after hours emergency contact number 1800 818 326. • Any staff training or inductions on waste management recorded. **Incident reporting** Within 24 hours of detecting any incidents during construction that causes (or may cause) significant harm to the environment, the Proponent shall notify the Council and other relevant agencies of the incident and identify the following: • Describe the date, time, and nature of the incident. • Identify the cause (or likely case) of the incident. • Describe what action has been taken to date. • Describe any proposed measures to address the incident.
Identification of incident or failure	**General incident or failure:** General site incidents or failure can be identified as below**:** • Workers, contractors onsite not made aware of CWMP. • Monitoring indicates ongoing, repetitive, incorrect waste management or complaints. • Large quantities of waste going to landfill when it has the potential to be re-used or recycled. • Insufficient waste storage capacity or frequency of waste removal from site. • Waste generated outside of site being received at the site for storage or disposal without the correct permit. **Identification of incident or failure in respect to a specific waste stream:** In respect to identification of incident or failure relating to **excavation material**: • Excess fill to be placed (too many cuts made). • Removal of any fill from site without first exhausting all opportunities for onsite reuse. • Inappropriate stockpiling of excess fill. Failure or incident in handling of **green waste:** • Removal of green waste from site. • Failure to take opportunities to reuse green waste onsite. Identification of failure or incident in handling **putrescible waste**: • Putrescible waste being found outside of the appropriate receptacles – i.e. being found on site not in bins. • Putrescible waste collected infrequently leading to rotting in bins, attracting wildlife and/or causing foul odour. Identification of failure or incident in handling **non-putrescible waste**: • Non-putrescible waste being found outside of the appropriate bins – i.e. being found on site not in bins or not being segregated onsite. • Insufficient capacity of receptacles causing overflow of waste. • Inappropriate offsite disposal of waste.

	Evidence of failure or incident of **onsite wastewater effluent:** • Waste found outside of toilet facility and/or the onsite disposal of wastewater. • Inappropriate offsite disposal of wastewater. Identification of **special waste** related incident or failure: • Any form of special waste found onsite – not having been immediately removed after servicing. Failure or incident relating to **hazardous waste**: • Hazardous waste not being correctly or safely stored as per this CWMP and relevant Australian Standard. • Hazardous waste spills not being removed, treated and reported appropriately. • Hazardous waste being removed in a manner un-satisfactory of the PCA.
Corrective action	**General Corrective Actions:** The process for any general waste related incident will be: • Investigate cause and undertake any required reporting. • Undertake remediation. • Implement re-training where necessary The site manager or designated representative will direct clean-up operations as required. Directions will be based on the processes as follows: • Source of waste is to be identified. • Appropriate clean-up actions to be undertaken. • Waste to be disposed of by licenced contractor. • To avoid a reoccurrence, increase onsite waste storage capacity where necessary, increasing the frequency of waste collection and re-train staff. **Complaints procedure** At the commencement of construction the Proponent shall ensure that the following are available for community complaints during construction: • A 24 hour telephone number on which complaints about construction activities at the site may be registered. • A postal address to which written complaints may be sent. • An email address to which electronic complaints may be transmitted. • Name, address, contractor licence number and telephone number of the principal contractor, including a telephone number at which the person may be contacted outside working hours. • Name, address and telephone number of the Project Manager and PCA • The telephone number, the postal address, email address, the name of the site/project manager and the approved hours of work, shall be displayed on a sign near the entrance to the site, in a position that is clearly visible to the public.

	The Proponent shall record details of all complaints received through the means listed under this condition of this approval in an up-to-date Complaints Register. The Proponent shall provide an initial response to any complaints made in relation to the project during construction within 48 hours of the complaint being made. The response and any subsequent action taken shall be recorded in the Complaints Register. **Action related to a specific waste stream:** Corrective actions for **excavation material:** • Fill any unnecessary cuts made. • Store excess materials onsite for use in the next stage of development. • Ensure stockpiling of material is undertaken appropriately with adequate stabilization, erosion and sediment controls. Corrective actions relating to **green waste** are as follows: • Identify onsite opportunities for reuse of green waste. • Where practical, stockpile material for reuse rather than dispose of offsite. Corrective actions for **putrescible waste**: • Organise immediate removal of any overflowing bins or bins with strong odour by licensed contractor. • Arrange for bins to be emptied more frequently. • Train staff in correct waste disposal including the use of the correct bin. Corrective actions for **non-putrescible waste**: • Undertake staff and contractor training on importance of correct waste disposal including the use of the correct bin and not littering on site. • If bins overflow repetitively, arrange for removal of bins to become more frequent or increase volume of storage facility. • If a contractor is not disposing of waste as per their license or in an inappropriate manner offsite, alert relevant authorities including TSC. Corrective actions for **onsite wastewater effluent**; • Immediate removal of any sewage related waste by an appropriately licensed contractor to an appropriately licensed facility. • Staff training on importance of correct effluent disposal including education on related health risks. • If a contractor is not disposing waste water as per their license or in an inappropriate manner offsite, alert relevant authorities including TSC. Corrective actions for **special waste** are as follows; • Immediate removal of any special waste found onsite and taken to an appropriately licensed facility by an appropriately licensed contractor. Corrective actions for **hazardous wastes** are as follows; • Immediate removal by suitable contractor to appropriately licensed facility.

[redacted]	• Contact and inform the appropriate authorities. • If required, conduct testing around area for contamination. • Undertake staff and contractor training regarding the safe handling of hazardous waste as well as necessary actions in the case of incidents such as spills or contamination. • Train staff to be familiar with the removal of hazardous waste to the satisfaction of the PCA.

Commitment 3
Site management will maximise reuse and/or recycling on site of any materials to minimise the need for disposal off site.

Commitment 4
Any waste materials removed from site shall only be directed to a waste management facility lawfully permitted to accept the materials.

Commitment 5
Storage of waste shall occur within the boundaries of the site, by way of a screened area of silt stop fabric, shade cloth or waste disposal bins; provided to council specifications.

Commitment 6
Details demonstrating compliance with the relevant legislative requirements, associated with the removal of hazardous waste, particularly the method of containment and control of emission of fibres to the air, are to be submitted to the satisfaction of the PCA prior to the removal of any hazardous materials.

Commitment 7
No waste generated outside of the site is to be received at the site for storage and/ or disposal, except as expressly permitted by a licence under the Protection of the Environment Operations Act 1997.

5 Administration of the CWMP

5.1 Amendment of the CWMP

The Owner/Operator may make application to Tweed Shire Council to amend the provisions of this CWMP. The application shall:

a) be in writing

b) specify the provisions of the CWMP to which the application relates

c) state how the proposed amendments achieve the objectives of the provisions to which the amendments relate.

5.2 Incident management

Site management and any person appointed by the site management, including the foreman and/ or site manager as having responsibility for a control strategy set out in this CWMP have clearly defined responsibilities under the *Protection of the Environment Operations Act 1997* to report any incidents likely to cause material or serious environmental harm.

6 Drawings

ORIENTATION

SCALE 1:8,000

100 200 300 400 metres

ROBINA

PO Box 4115 Robina QLD 4230 07 5578 9944

Email robina@access.gs **www.access.gs**

LEGEND

- Cadstre
- Precinct 5 Stage 1-3 Boundary
- Tweed Coast Road Boundary
- Stockpile Areas Phase 1 Boundary
- Parkway Stage 1 Boundary
- External Intersection Boundary
- Bulk Eathworks Phase 1 Boundary
- Rising Main & Pump Station Boundary

SOURCES

DEVELOPMENT LAYOUT: 12301-P5-1,2&3-100.dwg, *Mortons Urban Solutions, Received 03/12/2019.*

PROJECT	CLIENT	DRAWING
KINGS FOREST - PHASE 1 WORKS	PROJECT 28 PTY LTD	KINGS FOREST PHASE 1 WORKS

SCALE	DATE	DRAWN	CHECKED	PROJECT	DRAWING	REVISION
1:8,000@A3	13/12/2019	SWP	ELH	12066	001	-

GILBERT SUTHERLAND