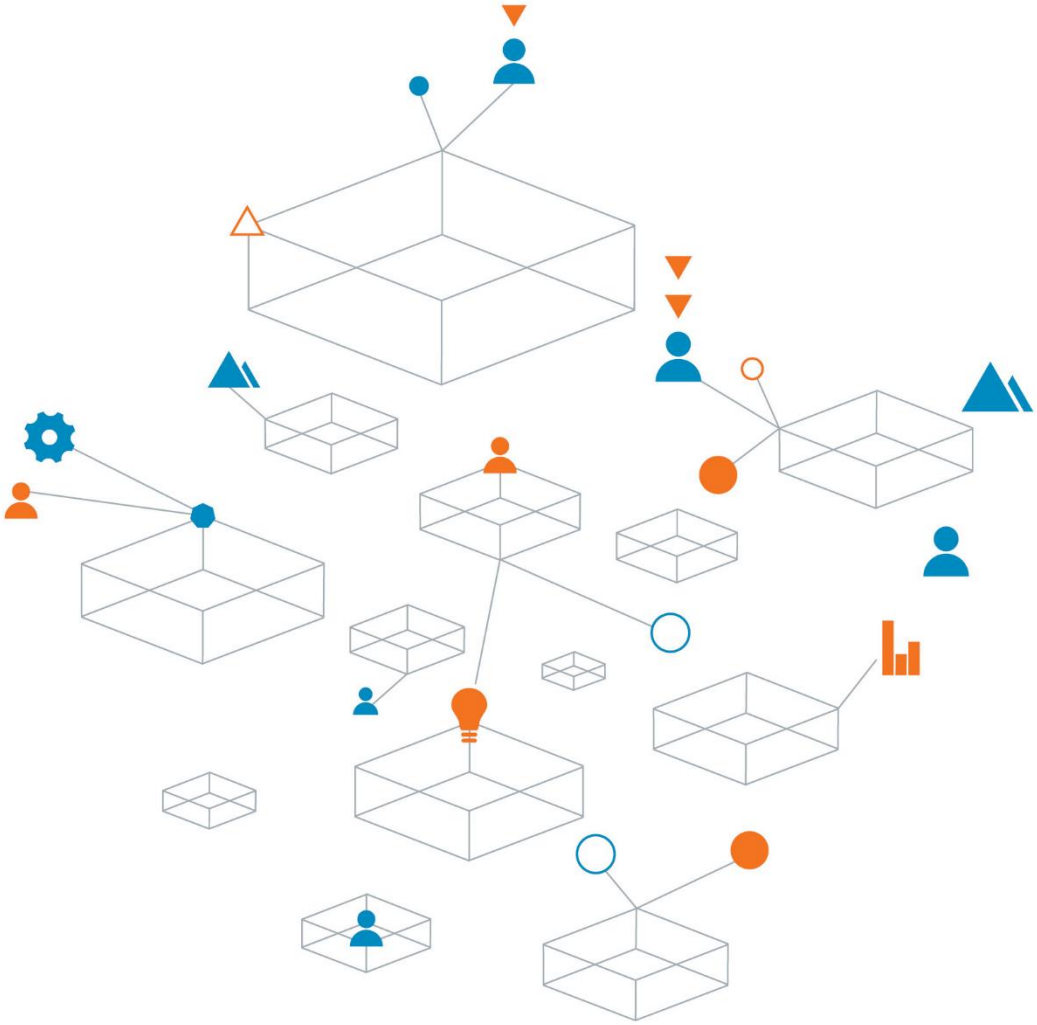
Crescent Newcastle Pty Ltd
Proposed Development 11-17 Mosbri Crescent, The Hill
Groundwater assessment

NTLGE220504-SB

28 April 2021



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Groundwater Assessment Report - 11-17 Mosbri Crescent, Newcastle

Prepared for

Crescent Newcastle Pty Ltd

Prepared by
Coffey Services Australia Pty Ltd
Level 19, Tower B, Citadel Tower, 799 Pacific Highway
Chatswood
NSW 2067 Australia
t: +61 2 9406 1000 f: +61 2 9415 1678
ABN 55 139 460 521

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Quality information

Revision history

Revision	Description	Date	Originator	Reviewer	Approver
	For issue	28 April 2021	Troy Credlin	Ross Best	Ross Best

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Appendices

1. Introduction

Crescent Newcastle Pty Ltd (Crescent) is preparing to lodge an amended Development Application for the development of the NBN site at 11 to 17 Mosbri Crescent, Newcastle with Newcastle City Council. This report presents an assessment of potential groundwater impacts arising from the proposed development, particularly noting the impacts on the land (and associated vegetation) located to the east of the development.

This report was prepared by Coffey Services Australia Pty Ltd (Coffey) in response to a request from Mr. Mark Purdy, Development Manager of Stronach Property (Stronach) on behalf of Crescent, contained in email communication to Ross Best of Coffey on 25 March 2021.

The development site is located above abandoned former coal mine workings and the project will involve the development of residential flat buildings and mine grouting works.

This report presents:

- A description of the works to support the proposed development including a discussion of the underground coal mining.
- A description of the hydrogeological conditions at the site.
- An assessment of the potential impact of the development upon adjoining land, including the adjacent parkland (Arcadia Park).

2. Proposed development and setting

The site is located within the Newcastle City Council area, adjacent to Mosbri Crescent carriageway, which is a minor road reserve within the local area. The site shares an eastern boundary with Arcadia Park reserve located uphill. The site is bounded by the following properties, public roads, and infrastructure:

- Kitchener Parade carriageway and road reserve to the north of the site.
- Arcadia Park to the east of the site.
- Two and three-story residential buildings and Mosbri Crescent to the northwest and west of site boundary.
- Single and double-story residential buildings to the south and southwest of the site.

The site topography during the investigation slopes was generally gently to moderately sloping and has an angle of approximately 10° towards the southwest to west.

The currently proposed development will include:

- Construction of residential accommodation comprising eleven two-storey townhouse-style dwellings and three residential flat buildings (Building A, B, and C); and,
- Interconnected car parking, pedestrian path, associated landscaping, communal open space, services, and site infrastructure.

The development is expected to involve excavation to depths between 2 m and 8.5 m (based on the surface contours in Northrop Drawings DA-C20.20 Revision M, and DA-C02.10 Revision H and allowing a bulk excavation level of 28.7 mAHD within the basement carpark) apart from a 5 m length at the northern end near Pit Street where excavation depth is up to 10 m. The bulk of the excavation is expected to occur along the eastern boundary of the site due to the existing sloping topography.

A photograph of the site at the time of construction of the existing building is provided in Figure A.

3. Hydrogeological conditions

3.1. Ground conditions

Based on the 1:100,000 scale Newcastle Coalfield Geology map, the site is underlain by rocks and soils derived from the late Permian aged Lambton Subgroup of the Newcastle Coal Measures comprising sandstone, siltstone, claystone, coal, and tuff. This corresponds to site observations with high plasticity clay soils underlain by sandstone.

Coffey report 754-NTLGE220504-AH.rev3 dated 14 January 2019 provides borehole logs for five boreholes drilled at the site. The locations of these boreholes designated BH01, BH02, BH02A, BH03 and BH04 are illustrated in Figure A overleaf. The logs from these boreholes (included as Appendix A) show the presence of thin fill cover (less than 1 m thickness) overlying up to 4 m thickness of sandy clay and clay interpreted as being residual clay arising from weathering of sandstone overlying sandstone grading from distinctly weathered to fresh. Borehole BH02a recorded the presence of highly weathered sandstone beneath pavement fill.

Figure A – Site location and borehole locations

Based on the borehole data of the subject site, we believe that it is reasonable to assume that the ground outside the development boundary to the east will contain weathering profile containing residual soil (clay or sandy clay) overlying sandstone.

3.2. Groundwater conditions

Based on Coffey's geotechnical investigation, the depth to groundwater appears to be substantially below the elevation of the toe of the proposed excavation for the retaining wall and well beneath the proposed basement level.

Groundwater inflows were not encountered within the soil profile during the site investigation. The standing water levels after encountering the mine workings were approximately 3 mAHD. Following drilling and as a part of the mine subsidence investigation, on 4 September 2018, a CCTV camera was used to observe conditions in the borehole BH01. Some water was observed flowing into the boreholes from 12 m below ground level (approximately 19 mAHD) although the source could not be positively identified. Similar water was observed in BH03 on 13 September 2018 from approximately 20 m below ground level (approximately 13 mAHD). No such water was observed in BH04 on 14 September 2018.

The groundwater within rock beneath the proposed development area and the surrounding land is likely to be influenced by several coal seams and defects in the overburden in addition to rock porosity (i.e. cracking and drainage within the sandstone rock arising from the effects of mining beneath the site).

Although groundwater was only encountered at depth during the intrusive investigation, we note that some signs of shallow perched groundwater are evident based on our observation at the site. We visited the site on 4 December 2020 following a period where no daily rainfall greater than 5 mm had been recorded at Newcastle Nobbys Signal Station for 20 days. We noted seepage in the retaining wall at the southeast corner of the site and signs of moisture in the pavement near that corner. No similar indications were noted elsewhere in the southern car park area. A photograph taken by a colleague on 10 November 2020 (following rainfall of 17 mm on 6 November 2020) showed seepage across the pavement in the southeast corner of the site. We interpret this to indicate shallow groundwater in this area. Further, as the deep groundwater level has not prevented the development of thick vegetation within Arcadia Park, we believe that the shallow perched groundwater is likely to be the primary source of water in Arcadia Park.

In our experience, a perched groundwater table can develop in the soil above sandstone rock. This condition develops near natural sandstone exposures and cut slopes due to the low permeability (the capacity to carry water seepage) at the interface between rock and soil. Perched water also occurs where the sandstone is under drained by tunnels or mining. Under these conditions, the shallow groundwater system is not affected greatly by the presence of cuts in the sandstone and the magnitude of effects of the shallow groundwater system do not vary with the depth of the cut in sandstone.

4. Groundwater Assessment

This section sets out the basis for our assessment of the impact on groundwater conditions beneath Arcadia Park.

4.1. Groundwater drawdown

4.1.1. Drawdown within rock

The proposed development site and Arcadia Park are under-drained by existing voids resulting from former coal mining such that the standing groundwater levels at depth are well below the ground surface at approximately 2.8 mAHD based on measurements from cored boreholes carried out after drilling was complete.

Based on these measurements, we expect largely unsaturated downward movement of groundwater in the rock with the presence of saturated zones in places above zones of low hydraulic conductivity. Hydraulic conductivity is a measure of how easily water can pass through a material.

Observations of open boreholes in rock using a downhole camera do not show the presence of seepage entering borehole BH03 near the southern end until a depth of 9.95 m, well below the finished level of the base slab for the proposed development. The observation of seepage entering the borehole at 9.95 mAHD is an indication of saturated ground which we consider occurs due to the presence of a low hydraulic conductivity horizon in the rock.

Under the conditions described, the movement of water within the rock above 2.8 mAHD will be vertically downward in a largely unsaturated condition with zones of saturation above low hydraulic conductivity horizons. As a result, the effect of the proposed development on groundwater conditions in the rock beneath Arcadia Park is not expected to be influenced by the proposed development.

4.1.2. Drawdown within soil

As previously noted, we expect the hydraulic conductivity (a measure of how easily water can pass through the material) of the residual soil (formed from weathering of sandstone) to be very low. The natural soil (as opposed to fill introduced to the site) is described in the borehole logs as residual soil comprising clay, sandy clay, and clayey sand. As a result, the movement of water through the residual soil will be limited.

Based on our experience at other locations where the soil is under-drained, we expect that saturated conditions within the soil profile will be present in places at the transition from soil to rock and at the base of fill. This occurs because the infiltration of rainfall from water pooling after rain or seepage from surface water bodies penetrates the surface of the soil and percolates downward until it either:

- is lost to evaporation
- is consumed by roots of plants
- reaches a saturated zone, or
- reaches a zone where the hydraulic conductivity is low enough to inhibit further downward movement.

This is illustrated in the sketch below (Figure C)

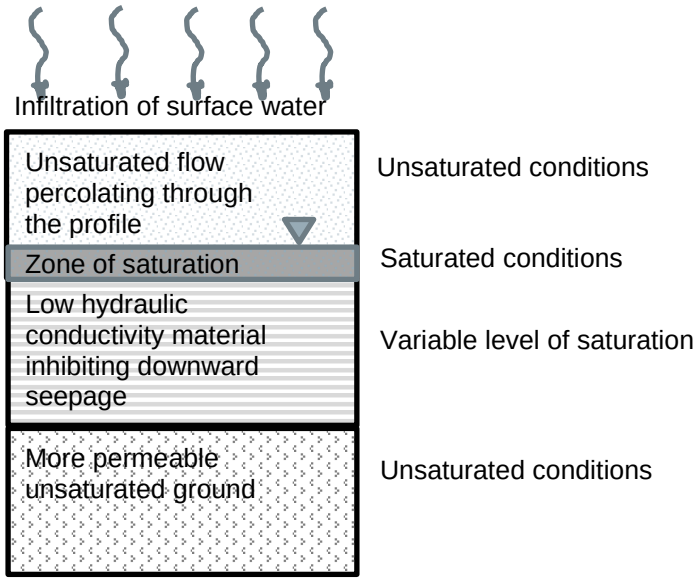

Figure B: Illustration of vertical migration of water through a variable ground profile

For the conditions at the site based on our observations, the information presented in the borehole logs, and our experience, we expect that the soil profile within Arcadia Park will comprise:

- A thin cover of topsoil perhaps 300 mm thick containing organic material and having a higher permeability than the underlying residual soil, overlying
- Clay, sandy clay, and clayey sand residual soil derived from weathering of the sandstone rock, overlying
- Variably weathered rock comprising predominantly sandstone with some bands of siltstone and several coal seams below 16 mAHD.

Within the gullies, there may be alluvial soils formed by the deposition of sediment in the bed of the gully. Alluvial sediments would have variable hydraulic properties but would typically be more permeable than residual soils.

The thickness of the residual soil profile is relevant for this assessment. Rock is exposed in places within the paths in Arcadia Park and the borehole logs record residual soil thickness of up to 3.8 m at borehole locations. The transition from residual soil to distinctly weathered rock is recorded in the borehole logs. CCTV footage showed water entering borehole BH03 at a level of 19.05 mAHD.

In the unsaturated zone, the movement of soil moisture is driven by changes in soil suction (soil suction increases as moisture content decreases). This results in the movement of soil moisture to roots of vegetation, movement upward towards the ground surface during dry periods, and downward during periods of rainfall. Fine-grained soils can develop higher soil suctions than coarse-grained soils.

We do not expect the influence of the proposed development in the unsaturated material except perhaps within two metres of the upper retaining wall where lateral moisture movement at the face of the wall could occur.

Impacts to saturated ground could occur where the proposed retaining walls and/or the building excavation intersects saturated ground within the residual soil. This could result in steepening of groundwater seepage gradients and thinning of the saturated zone. We have considered the situation at the northern and southern gullies and at a location where we expect unsaturated conditions to be present in the upper soil.

4.2. Assessment of groundwater impacts

4.2.1. Overview

The proposed development will involve the construction of stepped retaining walls and excavation to construct the base slab for the proposed buildings. This is illustrated for three locations in Figures C, D, and E based on the cross-sections and plans provided by the structural engineers (provided as Appendix B). We believe that the factors affecting the form of the response are:

- The nature of the retaining wall – a drained retaining wall would have a greater effect than a wall that acts as a barrier to groundwater movement. The form of the retaining wall is not apparent in the drawings provided. For the L-shaped walls illustrated excavation would be required to allow construction of the wall and the high side of the wall would be typically be backfilled with permeable material with drainage provided. We have assumed the retaining walls would be drained as this is the usual construction method and this has the greatest potential to affect groundwater.
- The level of rock. We interpret that the upper rock will be unsaturated and will not be affected by the development.
- The thickness of saturation within the residual soil.

We expect negligible impact where the retaining walls do not intersect saturated ground. This is relevant for the upper retaining walls.

Parameters that we have adopted for our assessment of the potential groundwater impacts are provided in Table A. Factors affected by climate are rainfall and evapotranspiration (Evapotranspiration is a collective term for the transfer of water, as water vapour, to the atmosphere

from both vegetated and un-vegetated land surfaces. It is affected by climate, availability of water, and vegetation). We have considered winter evapotranspiration (the lowest seasonal rate) and average rainfall. We consider this is a reasonable though possibly conservative treatment for the assessment of potential impacts.

Table A: Adopted parameters

Parameter	Adopted value	Basis for adoption
Hydraulic conductivity – residual soil	1 x 10^{-8} m/s	Ranges quoted in the literature range from 10^{-7} to 10^{-9} m/s for silty clay and less than 10^{-9} m/s for clay. The adopted value is considered reasonable for lateral flow.
Mean rainfall	1118 mm/year	Bureau of Meteorology –Newcastle Nobbys Signal Station AWS (Station number 61055) Records from 1862 to 2020.
Average infiltration rate	7.1 x 10^{-10} m/s	Allowing 2 % of average annual rainfall
Thickness of residual soil	4 m	Based on the largest thickness recorded in the boreholes (largest thickness 4 m in BH01)
Evapotranspiration rate – surface saturation (winter)	2 mm/day	Bureau of Meteorology maps of evapotranspiration: Australian Climate Averages - Evapotranspiration (Climatology 1961-1990) (bom.gov.au)

Our assessment for three representative sections is provided in the following sections.

4.2.2. Northern Gully

For the northern gully, we have assumed that saturation is present to the ground surface in the floor of the gully. As the underlying rock is unsaturated, there will be a vertical gradient within the residual soil resulting in vertical migration of water. There will also be a lateral gradient causing seepage towards lower-lying areas. We anticipate the lateral component will be the larger influence as we expect the vertical seepage to be limited by low permeability at the base of the residual soil. This is illustrated in Figure C which is based upon Northrop Drawing DA-C30.02 Revision E.

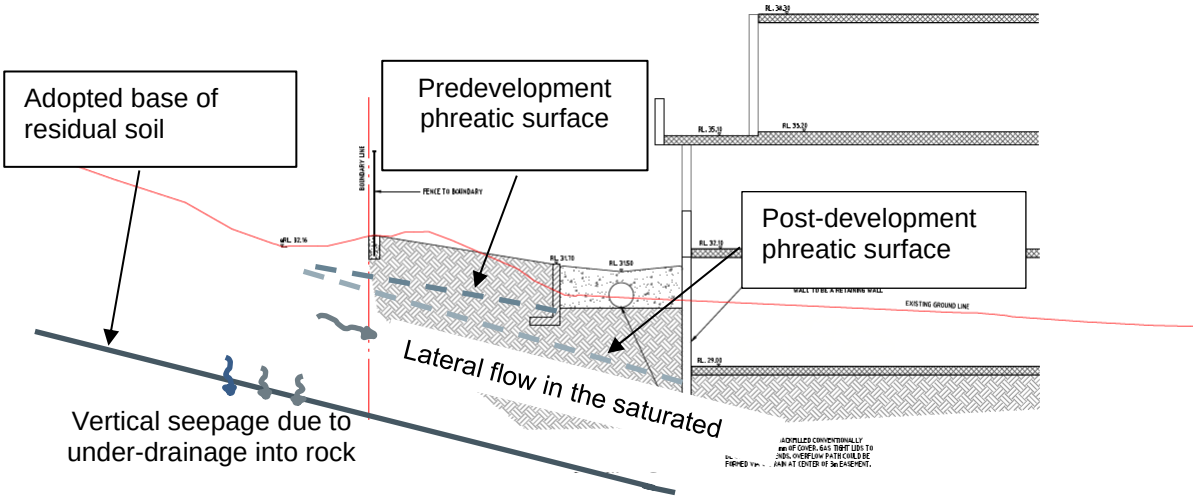

Figure C: Influence of development on groundwater - Northern Gully

As the lateral gradient is approximately 3 m over a distance of 8 m, the rate of lateral seepage will be small. The rate of seepage in saturated ground is equal to the hydraulic gradient multiplied by the hydraulic conductivity multiplied by the cross-sectional area. Allowing a typical permeability for

residual soil of 1 x 10^{-8} m/s and a saturated thickness of 4 m the seepage rate, q = 3/8*10^{-8}x4x20 m^3/s = 3 x 10^{-7} m^3/s = 0.0003 L/s allowing an affected width of 20 m. The increase from the pre-development conditions would be approximately half this amount.

By way of comparison, the evapotranspiration losses from soil saturated at the ground surface would be 2 mm/d (winter value for Newcastle for small areas with surface water). An area 20 m wide x 2 m from the boundary would result in 0.002 x 20 x 2 m^3/d = 0.08 m^3/d = 0.0009 L/s. On this basis, the change in gradient associated with the development would correspond to less than the evapotranspiration losses over a 2 m distance from the site boundary. Based on these calculations, we consider impacts on groundwater levels within the gully would not extend more than 2 m from the site boundary in the northern gully.

In the flanks of the gully, seepage will be towards the base of the gully as this will be the direction of the steepest gradient. Changes within the site will therefore be unlikely to affect the groundwater conditions in the flanks of the gully.

4.2.3. Southern Gully

At the southern gully, we have assumed that saturation is present to the ground surface in the floor of the gully (Figure D). This section is based upon Northrop Drawing DA-C30.04 Revision D. As the underlying rock is unsaturated, there will be a vertical gradient within the residual soil resulting in vertical migration of water. There will also be a lateral gradient causing seepage towards lower-lying areas. We anticipate the lateral component will be the larger influence as we expect the vertical seepage to be limited by low permeability at the base of the residual soil.

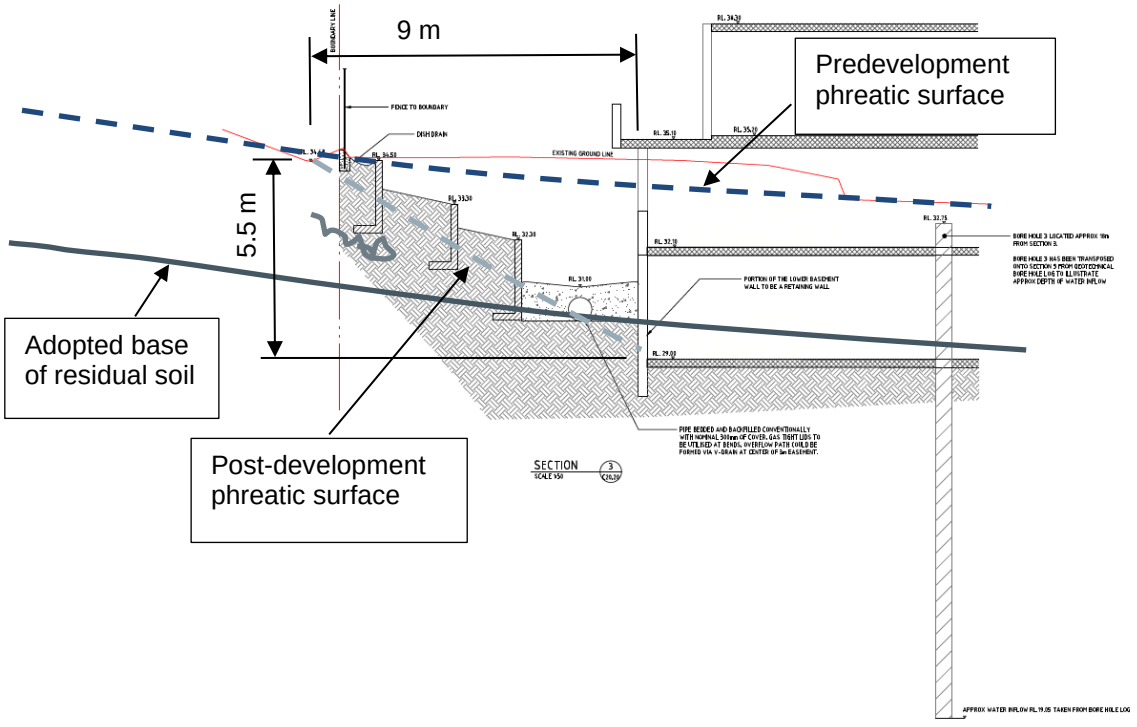

Figure D: Influence of development on groundwater - Southern Gully

As the lateral gradient (slope of the saturated surface) post-development is approximately 5.5 m over a distance of 9 m rate of lateral seepage will be small. Allowing a typical permeability for residual soil of 1 x 10^{-8} m/s and a saturated thickness of 4 m and affect width of 20 m a seepage rate of

q = 5.5/9*10^{-8}*4*20 $m^3/s/m$ = 4.9 x 10^{-7} m^3/s = 0.00049 L/s is assessed. For the conditions described, the increase in lateral seepage from the pre-development conditions would be this amount.

By way of comparison, the evapotranspiration losses from soil saturated at the ground surface would be 2 mm/d in winter. An area 20 m wide 2 m from the boundary would result in 0.002 x 20 x 2 m^3/d = 0.08 m^3/d = 0.0009 L/s. On this basis, the change in gradient associated with the development would correspond to substantially less than the evapotranspiration losses over a 2 m distance from the site boundary.

In the flanks of the gully, seepage will be towards the base of the gully as this will be the direction of the steepest gradient. Changes within the site will be unlikely to affect the groundwater conditions in the flanks of the gully.

4.2.4. Central area

For the Central area, the conditions in the elevated areas where transpiration from vegetation is expected will be the dominant consumption of groundwater. We anticipate the excavation for the proposed development will encounter sandstone (distinctly weathered and possibly slightly weathered) due to the higher ground levels. The saturated zone is taken above the base of the extremely weathered soil (indicated by the brown line). Refer to Figure E (based upon Northrop Drawing DA-C30.03 Revision B) for our anticipated conditions.

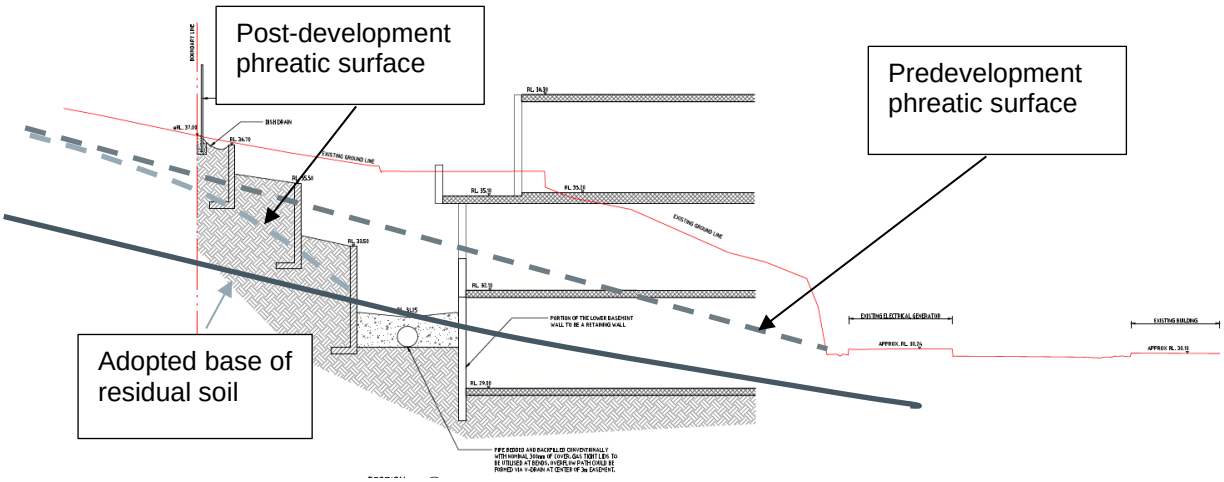

Figure E: Groundwater impact assessment - an elevated area

We acknowledge there is uncertainty in the interpretation, though we consider the assessment to be consistent with the site records and our observations. During our site visit on 4 December 2020, we did not observe signs of groundwater in the more elevated areas at the base of retaining structures up to about 1 m height nor did we observe indications of lush plant growth at the foot of retaining structures. Therefore, we believe that saturated groundwater is more than 1 m depth below the ground surface in the elevated areas (above about 36 mAHD). These conditions are considered for the section shown in Figure E where the existing ground level is at 37 m AHD at the site boundary.

Losses from evapotranspiration and evaporation are a function of the vegetation type and the soil type. The form of the relationship generally adopted is illustrated in Figure F. Simplifications involving a linear relationship are often adopted for numerical modelling. The relationship is characterised by surface evapotranspiration (ET)which applies to nominated depth and then the evapotranspiration rate is considered to fall to an extinction depth below which no further evapotranspiration losses occur. The loss at the surface is commonly considered to be equal to the pan evaporation rate.

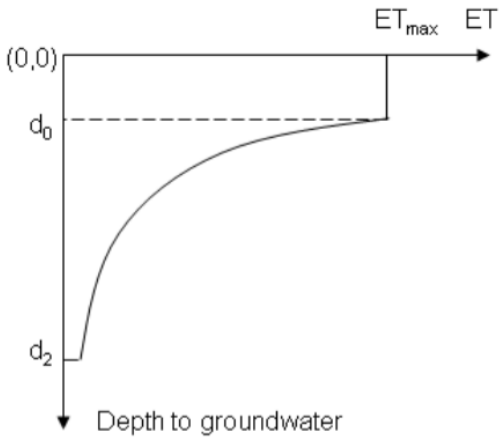

Figure F: Typical relationship adopted for evapotranspiration (ET) with depth to groundwater

A result of this relationship is that as the depth to the water table increases the losses reduce while the rate of surface infiltration remains the same. This suppresses the extent of influence of a disturbance to the groundwater level.

Infiltration is generally taken as a percentage of average rainfall for assessment of the extent of the impact of basement excavations. Allowing 2% of 1,118 mm rainfall per year for Newcastle (Nobbies Head Stations average from 1862 to 2020). This would result in an average infiltration rate of 0.061 mm/d this represents a small percentage of surface evapotranspiration rate of 800 mm/y or 2.2 mm/d (Bureau of Meteorology actual evapotranspiration rate for Newcastle) indicating that groundwater level would be drawn down to near the extinction depth under typical conditions, though fluctuations would occur associated with rainfall events.

This indicates the process would be largely vertical in nature and there would be little influence from the proposed retaining structures. As the residual soil is assessed to be up to 4 m thick, the influence of the proposed retaining wall is expected to be negligible at a distance greater than 4 m from the intersection of the retaining wall with the base of the residual soil. The third retaining wall in Figure E intersects the adopted base of the residual soil and as this is set back 5 m from the boundary of Arcadia Park, no impact is anticipated associated with that wall.

Some influence from the upper retaining walls is considered possible though we consider it unlikely that effects beyond 2 m from the property boundary would occur.

4.2.5. **Effect of grouting of mine workings**

Mining beneath and around the site has occurred within the Yard Seam and the Borehole Seam well below the base of the proposed development. Mining was carried out using board and pillar methods which results in a network of with corridors in two directions forming residual rectangular pillars of coal supporting the roof.

Grouting of mine workings is proposed to occur beneath the proposed development. This will involve pumping grout into the voids to reduce the potential settlement associated with possible yielding of the coal pillars over time. Mined areas outside the development footprint will not be grouted. Coffey report 754-NTLGE220504-AI dated 18 January 2019 presents a discussion of the mining and the effect of grouting on potential for control of the risk of subsidence associated with yielding of coal pillars.

The lateral extent of mining is wide with the network of board and pillar mine workings present hundreds of metres beyond the site boundary in all directions. Groundwater movement within the mined ground is not anticipated to be impeded to a significant degree by the proposed grouting as the remaining workings will provide ample avenues for water flow around the grouted area. Significant changes in groundwater level within the mined horizons are not expected.

Groundwater levels within the mined horizon beneath the development were recorded at approximately 3 mAHD. This is well below the level of the base slab of the proposed development

(27 mAHD). Based on the above discussion, Coffey assesses that minor changes in groundwater level at the level of the abandoned mine workings which may accompany the grouting operation will not affect the groundwater regime within the soil profile and shallow rock in the area surrounding the development.

5. Conclusions

In our opinion, and based on the discussion presented in Section 4, we believe that there is a low probability that the influence of proposed development on groundwater in the upper ground profile in Arcadia Park will extend beyond 2 m from the eastern boundary of the site over the elevated areas (above 38 mAHD) and that within that zone, impacts would be limited to minor changes.

For the gully areas, we believe that there is a low probability that the influence of the proposed development on groundwater conditions would extend beyond 2 m from the boundary.

We consider there would be a low likelihood of impacts on groundwater conditions below the base of the residual soil horizon.

Important information about your **Coffey** Report

As a client of Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Coffey to help you interpret and understand the limitations of your report.

Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Coffey to be advised how time may have impacted on the project.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Coffey to work with other project design professionals who are affected by the report. Have Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they incorporate the report findings.

Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment. Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Coffey for information relating to geoenvironmental issues.

Rely on Coffey for additional assistance

Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design towards construction, speak with Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.

Appendix A - Borehole Logs

coffey
A TETRA TECH COMPANY

Engineering Log - Borehole

Borehole ID.	***BH01***
sheet:	1 of 14
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***03 Sep 2018***
principal:	date completed: ***07 Sep 2018***
project: ***Proposed Multi Building Residential Development***	logged by: ***MJ***
location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***	checked by: ***RB***

position: E: 385,619.90; N: 6,355,684.10 (MGA94) | surface elevation: 31.39 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (**SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
AD			E	31			CL-CI	**FILL: BITUMEN**: black, 50mm thick, fine to coarse gravel.	M			**FILL- WEARING COURSE**
									<Wp			**FILL**
			E				CH	**FILL: Sandy CLAY**: low to medium plasticity, grey, with fine grained sand.	>Wp			
								CLAY: high plasticity, grey and pale grey, with orange lamination.				**RESIDUAL SOIL**
			E		1.0							
			D + E	30			CL-CI	**CLAY**: low to medium plasticity, pale brown and grey, orange laminations, with fine sand, trace of fine gravel.	<Wp			
			E		2.0			2.0 m: becoming more pale grey and pale brown				
			E	29								
			E		3.0							
			B	28								
			E		4.0							
				27			SP	**SANDSTONE**: fine grained, orange, extremely weathered, very low to low strength.	M			**HIGHLY WEATHERED MATERIAL**
								Borehole BH01 continued as cored hole				
				26	5.0							
					6.0							
				25								
					7.0							
				24								

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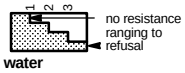
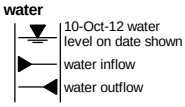
method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration


water


samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

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Engineering Log - Cored Borehole

Borehole ID.	**BH01**
sheet:	2 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**03 Sep 2018**
principal:	
date completed:	**07 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,619.90; N: 6,355,684.10 (MGA94) surface elevation: 31.39 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		31	1.0		started coring at 4.55m						
		30	2.0								
		29	3.0								
		28	4.0								
		27									
HQ		26	5.0		**SANDSTONE**: fine to medium grained, brown/orange and grey, with sitlstone bands and black carbonaceous laminations.	DW	X O	a=0.40 d=0.20	82%		PT, 0 - 5°, PL, RO, CN JT, 30°, PL, RO, CN JT, 75 - 90°, CU, RO, SN PT, 0°, PL, VR, SN PT, 20°, PL, RO, SN Defects are: PT, 0 - 10°, PL, RO, CN, unless otherwise described
		25	6.0								
		24	7.0					a=0.30 d=0.40			

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method & support
- AS auger screwing
- AD auger drilling
- CB claw or blade bit
- W washbore
- NMLC NMLC core (51.9 mm)
- NQ wireline core (47.6mm)
- HQ wireline core (63.5mm)
- PQ wireline core (85.0mm)
- SPT standard penetration test
- RR rock roller/tricone

water
- 10/10/12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD
- barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*
- RS residual soil
- XW extremely weathered
- HW highly weathered
- DW distinctly weathered
- MW moderately weathered
- SW slightly weathered
- FR fresh

*W replaced with A for alteration

strength
- VL very low
- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CO contact
- CS crushed seam
- SM seam

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

coating
- CN clean
- SN stain
- VN veneer
- CO coating

coffey
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Engineering Log - Cored Borehole

Borehole ID.	**BH01**
sheet:	3 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**03 Sep 2018**
principal:	
date completed:	**07 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,619.90; N: 6,355,684.10 (MGA94) surface elevation: 31.39 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ		23	9.0		**SANDSTONE**: fine to medium grained, brown/orange and grey, with sitlstone bands and black carbonaceous laminations. *(continued)* 8.00 m: becoming grey 8.55 m: 250mm of carbonaceous laminations	MW - HW		a=0.20 d=0.40	82%		PT, 5°, PL, RO, SN
		22									
			10.0						71%		JT, 50°, PL, RO, SN JT, 50°, PL, RO, SN
		21			**NO CORE:** 0.18 m						
					SANDSTONE: fine to medium grained, brown and grey, with sitlstone bands and black carbonaceous laminations.	HW		a=1.00 d=1.00			JT, 70°, PL, RO, SN JT, 40°, PL, RO, SN JT, 30°, PL, RO, SN
		20	11.0			XW			0%		PT, 0°, PL, RO, SN
						HW					
			12.0			SW - FR		a=1.30 d=0.80			CS, IR, RO, SN JT, 70°, PL, RO, SN
		19			**SILTSTONE**: grey to dark grey, with sandstone bands and black carbonaceous laminations.						
			13.0								JT, 35°, PL, RO, SN
		18							82%		
					NO CORE: 0.15 m						
			14.0		**SANDSTONE**: fine grained, grey, with sitlstone bands and black carbonaceous laminations.	SW - FR					
		17			14.57 m: 70mm sandstone band			a=0.30 d=0.20			SM, 0°, PL, RO, CO
			15.0		15.00 m: 150mm sandstone band						
		16			15.30 m: 150mm sandstone band with carbonaceous laminations				97%		

Defects are: PT, 0 - 10°, PL, RO, CN, unless otherwise described

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method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
RR rock roller/tricone

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

coffey
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Engineering Log - Cored Borehole

Borehole ID.	**BH01**
sheet:	4 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**03 Sep 2018**
principal:	
date completed:	**07 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,619.90; N: 6,355,684.10 (MGA94) | surface elevation: 31.39 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm | vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ		15			**SANDSTONE**: fine to medium grained, grey, with siltstone bands and black carbonaceous laminations.	SW - FR		a=1.10 d=0.20			
			17.0		16.85 m: 110mm dark grey-brown siltstone band				97%		PT, 5°, PL, RO, SN
		14									
			18.0		17.85 m: 350mm dark grey-brown siltstone band			a=2.00 d=0.70			
		13			18.40 m: 160mm carbonaceous laminations						
					18.65 m: 70mm siltstone band	XW					
			19.0			HW					
		12				SW - FR			89%		PT, 5°, PL, RO, SN PT, 5°, PL, RO, SN JT, 40°, PL, RO, SN JT, 45°, CU, RO, CN JT, 70°, PL, RO, SN
			20.0		**SILTSTONE**: dark grey to grey, brown to pale brown laminations, with sandstone laminations.			a=2.70 d=0.80			PT, 0°, PL, RO, SN
		11									JT, 70°, PL, RO, SN
											JT, 70°, PL, RO, SN
			21.0								JT, 70°, PL, SO, SN
		10						a=0.80 d=0.60			
			22.0								JT, 70°, PL, SO, SN JT, 75°, CU, SO, CN
		9							88%		
			23.0					a=2.40 d=0.50			PT, 0°, PL, SO, CN
		8									

Defects are: PT, 0 - 10°, PL, RO, CN, unless otherwise described

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method & support
- AS auger screwing
- AD auger drilling
- CB claw or blade bit
- W washbore
- NMLC NMLC core (51.9 mm)
- NQ wireline core (47.6mm)
- HQ wireline core (63.5mm)
- PQ wireline core (85.0mm)
- SPT standard penetration test
- RR rock roller/tricone

water
- 10/10/12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD
- barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*
- RS residual soil
- XW extremely weathered
- HW highly weathered
- DW distinctly weathered
- MW moderately weathered
- SW slightly weathered
- FR fresh

*W replaced with A for alteration

strength
- VL very low
- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CO contact
- CS crushed seam
- SM seam

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

coating
- CN clean
- SN stain
- VN veneer
- CO coating

coffey
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Engineering Log - Cored Borehole

Borehole ID.	**BH01**
sheet:	5 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**03 Sep 2018**
principal:	
date completed:	**07 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,619.90; N: 6,355,684.10 (MGA94) surface elevation: 31.39 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ	14/09/18	7	25.0		**SILTSTONE**: dark grey to grey, brown to pale brown laminations, with sandstone laminations. *(continued)*	SW - FR		a=0.70 d=0.60			JT, 75°, CU, SO, CN PT, 5°, PL, RO, SN
						MW					
		6	26.0		**COAL**: black, shiny, cleated.	HW			38%		CS, 0°, PL, RO, CN JT, 80°, ST, RO, CN
		5									JT, 80°, IR, RO, CN
					NO CORE: 0.24 m						
		4	27.0		**SILTSTONE**: grey-dark grey.	MW - SW		a=0.20 d=0.10			
		3	28.0		**COAL**: black, shiny cleated, with slitstone bands and laminations. 28.40 m: 130mm siltstone band 28.62 m: 80mm siltstone band	HW			77%		CS JT, 90°, PL, RO, CN JT, 70°, CU, RO, CN
		2	29.0		29.28 m: 20mm siltstone laminations 29.32 m: 150mm siltstone band 29.50 m: 170mm siltstone laminations						PT, 5°, PL, SL, CO PT, 5°, PL, SL, CO PT, 5°, PL, SL, CO JT, 80°, PL, RO, CN JT, 70°, PL, RO, CN PT, PL, SL, CO PT, 5°, PL, SL, CO PT, 5°, PL, SL, CO PT, 5°, PL, SL, CO
		1	30.0		**SILTSTONE**: grey to dark grey, with sandstone bands and black carbonaceous laminations.	MW		a=0.70 d=0.30			PT, 5°, CU, RO, SN
		0	31.0		31.36 m: 650mm sandstone band with carbonaceous laminations			a=2.40 d=0.30	74%		PT, 10°, PL, RO, CO PT, 10°, PL, RO, CO PT, 10°, PL, RO, CO PT, 10°, PL, RO, CO PT, 5°, PL, RO, SN PT, 5°, PL, RO, SN JT, 45°, PL, SO, SN PT, 0°, PL, RO, CO PT, 0°, PL, RO, CO PT, 0°, PL, RO, CO

Defects are: PT, 0 - 10°, PL, RO, CN, unless otherwise described

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method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
RR rock roller/tricone

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

coffey
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Engineering Log - Cored Borehole

Borehole ID.	**BH01**
sheet:	6 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**03 Sep 2018**
principal:	
date completed:	**07 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,619.90; N: 6,355,684.10 (MGA94) surface elevation: 31.39 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular	general
HQ		-1	33.0		**SILTSTONE**: grey to dark grey, with sandstone bands and black carbonaceous laminations. *(continued)*	MW	O1 X	a=2.10 d=0.50	74%		PT, 0°, PL, RO, CO PT, 10°, PL, RO, CO PT, 0°, PL, RO, CO JT, 80°, CU, RO, CN JT, 80°, PL, RO, CO PT, 5°, PL, RO, CO PT, 0°, PL, SO, CN	Defects are: PT, 0 - 10°, PL, RO, CN, unless otherwise described
		-2			**SANDSTONE**: fine to medium grained, with sitlstone bands and black carbonaceous laminations.	MW - SW					PT, 10°, CU, SO, CN PT, 10°, CU, SL, CN	
			34.0		34.00 m: 60mm siltstone band						SZ, RO, SN PT, 5°, PL, RO, SN	
		-3							75%		PT, 5°, PL, SO, CN PT, 5°, PL, RO, CN PT, 0°, PL, SO, CN	
			35.0					a=6.20 d=5.70			PT, 0°, IR, VR, SN PT, 5°, PL, RO, SN	
		-4									PT, 5°, PL, RO, SN	
			36.0		35.75 m: 130mm siltstone band							
		-5						a=3.20 d=2.50			PT, 0°, PL, VR, SN PT, 5°, CU, RO, SN	
											PT, 0°, PL, SO, CN	
			37.0		37.06 m: 100mm siltstone band 37.25 m: 280mm carbonaceous laminations						PT, 0°, PL, SO, CN PT, 5°, PL, SO, SN	
		-6							90%		PT, 5°, PL, SO, SN PT, 0°, PL, SO, CN PT, 20°, PL, RO, CN	
											JT, 80 - 90°, UN, RO, SN	
			38.0					a=3.80 d=3.80			PT, 5°, PL, RO, SN	
		-7									PT, 5°, CU, RO, SN	
					38.48 m: 250mm carbonaceous laminations						PT, 10°, PL, VR, SN PT, 5°, CU, RO, SN	
			39.0									
		-8			39.10 m: 460mm siltstone and carbonaceous laminations				60%		PT, 5°, PL, RO, SN PT, 5°, PL, RO, SN PT, 5°, PL, RO, SN PT, 5°, PL, RO, SN PT, 5°, PL, RO, SN PT, 5°, PL, RO, SN CS, PL, RO, SN JT, 40°, PL, RO, SN	

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method & support
- AS auger screwing
- AD auger drilling
- CB claw or blade bit
- W washbore
- NMLC NMLC core (51.9 mm)
- NQ wireline core (47.6mm)
- HQ wireline core (63.5mm)
- PQ wireline core (85.0mm)
- SPT standard penetration test
- RR rock roller/tricone

water
- 10/10/12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD
- barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*
- RS residual soil
- XW extremely weathered
- HW highly weathered
- DW distinctly weathered
- MW moderately weathered
- SW slightly weathered
- FR fresh

*W replaced with A for alteration

strength
- VL very low
- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CO contact
- CS crushed seam
- SM seam

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

coating
- CN clean
- SN stain
- VN veneer
- CO coating

coffey
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Engineering Log - Cored Borehole

Borehole ID.	**BH01**
sheet:	7 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**03 Sep 2018**
principal:	
date completed:	**07 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,619.90; N: 6,355,684.10 (MGA94) | surface elevation: 31.39 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm | vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular	general
HQ	100% loss	-9		**SANDSTONE**: fine to medium grained, with sitlstone bands and black carbonaceous laminations. *(continued)*	MW - SW					PT, 0°, PL, RO, SN PT, 5°, PL, RO, SN PT, 0°, PL, RO, VN	Defects are: PT, 0 - 10°, PL, RO, CN, unless otherwise described
								60%		PT, 5°, CU, RO, SN	
			41.0	41.00 m: 40mm siltstone band		O X	a=1.70 d=0.40			PT, 5°, PL, RO, SN	
		-10								PT, 5°, PL, RO, SN PT, 0°, ST, RO, SN	
				NO CORE: 0.11 m **TOOL DROP**: small void on CCTV.				14%			
			42.0	**NO CORE:** 0.25 m siltstone on density plots.	MW - SW						
				SILTSTONE: grey to dark grey.							
		-11		**NO CORE:** 0.30 m **TOOL DROP**: small void on CCTV.	MW					JT, 85°, PL, RO, SN	
				SILTSTONE: grey to dark grey.		O	a=0.80 d=0.60	15%		PT, 0°, PL, RO, CN PT, 0°, PL, RO, CN	
				NO CORE: 0.15 m siltstone on density plots.							
			43.0	**NO CORE:** 0.50 m **TOOL DROP**: void on CCTV.							
		-12								JT, 80°, PL, RO, SN PT, 0°, PL, RO, SN PT, 0°, PL, RO, SN PT, 5°, PL, RO, SN	
				NO CORE: 0.10 m coal on density plots, fallin/rubble.	HW						
				COAL: black, shiny, cleated, floor of mine.	MW					PT, 5°, PL, RO, CO PT, 5°, PL, RO, CO PT, 5°, PL, RO, CO	
			44.0	**SILTSTONE**: dark grey, with black carbonaceous laminations.	SW - FR			58%			
		-13		**SANDSTONE**: fine to medium grained, grey to dark grey, with sitlstone bands and black carbonaceous laminations.						PT, 0°, PL, SO, CN	
			45.0			O X	a=4.40 d=1.30				
				NO CORE: 0.08 m	HW						
		-14		**SANDSTONE**: fine to medium grained, grey to dark grey, with sitlstone bands and black carbonaceous laminations.	XW SW - FR					PT, 0°, PL, SO, CN	
			46.0								
		-15		46.30 m: 100mm carbonaceous laminations		O	a=3.60 d=2.20	92%			
	50% loss		47.0								
		-16		47.60 m: 200mm carbonaceous laminations		O	a=3.50	100%		PT, 0°, PL, SO, CN	

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method & support
- AS auger screwing
- AD auger drilling
- CB claw or blade bit
- W washbore
- NMLC NMLC core (51.9 mm)
- NQ wireline core (47.6mm)
- HQ wireline core (63.5mm)
- PQ wireline core (85.0mm)
- SPT standard penetration test
- RR rock roller/tricone

water
- 10/10/12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD
- barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*
- RS residual soil
- XW extremely weathered
- HW highly weathered
- DW distinctly weathered
- MW moderately weathered
- SW slightly weathered
- FR fresh

*W replaced with A for alteration

strength
- VL very low
- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CO contact
- CS crushed seam
- SM seam

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

coating
- CN clean
- SN stain
- VN veneer
- CO coating

coffey
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Engineering Log - Cored Borehole

Borehole ID.	**BH01**
sheet:	8 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**03 Sep 2018**
principal:	
date completed:	**07 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,619.90; N: 6,355,684.10 (MGA94) surface elevation: 31.39 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ	50% loss	-17	49.0		**SANDSTONE**: fine to medium grained, grey to dark grey, with sitlstone bands and black carbonaceous laminations. *(continued)*	SW - FR		d=2.90			
		-18			49.06 m: 60mm carbonaceous laminations			a=3.50 d=3.30	100%		PT, 10°, PL, RO, SN
		-19	50.0		50.55 m: 400mm carbonaceous laminations						PT, 5°, PL, RO, SN
		-20	51.0					a=3.80 d=2.60			
		-21	52.0		51.75 m: 100mm carbonaceous laminations 52.20 m: 600mm carbonaceous laminations				100%		PT, 10°, PL, RO, SN
		-22	53.0					a=1.60 d=0.10			
		-23	54.0		**COAL**: black, shiny cleated.	HW					CS, 0°, PL, CN JT, 85°, PL, RO, CN
		-24	55.0		**SANDSTONE**: fine to medium grained, grey to dark grey, with sitlstone bands and black carbonaceous laminations.	SW - FR		a=3.70 d=0.10	97%		

Defects are: PT, 0 - 10°, PL, RO, CN, unless otherwise described

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method & support
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- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CO contact
- CS crushed seam
- SM seam

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

coating
- CN clean
- SN stain
- VN veneer
- CO coating

coffey
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Engineering Log - Cored Borehole

Borehole ID.	**BH01**
sheet:	9 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**03 Sep 2018**
principal:	
date completed:	**07 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

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drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ	50% loss	-25	57.0		**SANDSTONE**: fine to medium grained, grey to dark grey, with sitlstone bands and black carbonaceous laminations. *(continued)*	SW - FR			97%		PT, 10°, PL, RO, SN
					56.62 m: 60mm coal seam			a=3.50 d=1.00			
		-26									
			58.0		57.98 m: 920mm siltstone, dark grey to black band						PT, 0°, PL, RO, CO PT, 0°, PL, RO, CO
		-27			58.60 m: 50mm carbonaceous laminations				95%		
			59.0								
		-28			59.38 m: 80mm coarse sandstone band			a=3.50 d=0.60			PT, 10°, PL, RO, SN
			60.0								
					60.20 m: 600mm carbonaceous laminations			a=3.50 d=0.20			
		-29									PT, PL, RO, SN
			61.0								
		-30			61.40 m: 170mm carbonaceous laminations				94%		PT, PL, RO, SN
			62.0					a=1.60 d=0.30			
		-31									JT, 80°, PL, SO, CN
											PT, PL, RO, SN
			63.0		62.75 m: 150mm coal, black, shiny cleated band						CS, 0°, PL, CN
		-32							94%		
											PT, 0°, PL, RO, SN

Defects are: PT, 0 - 10°, PL, RO, CN, unless otherwise described

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method & support
- AS auger screwing
- AD auger drilling
- CB claw or blade bit
- W washbore
- NMLC NMLC core (51.9 mm)
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- PQ wireline core (85.0mm)
- SPT standard penetration test
- RR rock roller/tricone

water
- 10/10/12, water level on date shown
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- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD
- barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*
- RS residual soil
- XW extremely weathered
- HW highly weathered
- DW distinctly weathered
- MW moderately weathered
- SW slightly weathered
- FR fresh

*W replaced with A for alteration

strength
- VL very low
- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CO contact
- CS crushed seam
- SM seam

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

coating
- CN clean
- SN stain
- VN veneer
- CO coating

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Engineering Log - Cored Borehole

Borehole ID.	**BH01**
sheet:	10 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**03 Sep 2018**
principal:	
date completed:	**07 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,619.90; N: 6,355,684.10 (MGA94) surface elevation: 31.39 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ	50% loss	-33	65.0		**SANDSTONE**: fine to medium grained, grey to dark grey, with sitlstone bands and black carbonaceous laminations. *(continued)*	SW - FR		a=7.80 d=3.30	94%		JT, 80°, PL, SO, CN PT, 0°, PL, SO, CN
		-34	66.0								
		-35	67.0					a=2.90 d=1.00	100%		JT, 80°, PL, RO, SN PT, 0°, PL, RO, SN
		-36	68.0								
		-37	69.0								PT, 0°, PL, RO, SN
		-38	70.0		69.30 m: 180mm carbonaceous laminations			a=1.80 d=2.30			PT, 0°, PL, RO, SN JT, 80°, PL, RO, CN
		-39	71.0		71.00 m: 1.2m medium to coarse sandstone band				87%		PT, 0°, PL, RO, SN PT, 0°, PL, RO, SN JT, 90°, CU, RO, SN
		-40						a=3.40 d=3.70			

Defects are: PT, 0 - 10°, PL, RO, CN, unless otherwise described

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method & support
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*W replaced with A for alteration

strength
- VL very low
- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CO contact
- CS crushed seam
- SM seam

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

coating
- CN clean
- SN stain
- VN veneer
- CO coating

coffey
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Engineering Log - Cored Borehole

Borehole ID.	**BH01**
sheet:	11 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**03 Sep 2018**
principal:	
date completed:	**07 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
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position: E: 385,619.90; N: 6,355,684.10 (MGA94) surface elevation: 31.39 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ	50% loss	-41	73.0		**SANDSTONE**: fine to medium grained, grey to dark grey, with sitlstone bands and black carbonaceous laminations. *(continued)*	SW - FR			87%		PT, 0°, PL, RO, SN
		-42						a=5.10 d=4.70	100%		
		-43	74.0		74.36 m: 160mm siltstone band 74.52 m: 220mm medium to coarse grained sandstone 74.82 m: 50mm carbonaceous laminations						PT, 5°, PL, RO, SN
		-44	75.0		75.69 m: 250mm carbonaceous laminations			a=4.30 d=0.70			PT, 0°, PL, RO, CN
		-45	76.0		**SANDSTONE**: fine to medium grained, grey to dark grey and brown, with sitlstone bands and black carbonaceous laminations.				100%		
		-46	77.0		77.13 m: 50mm carbonaceous laminations						PT, 5°, PL, RO, SN
		-47	78.0		78.58 m: 20mm carbonaceous laminations			a=7.80 d=5.60			
		-48	79.0		79.20 m: 1.08m carbonaceous laminations				100%		PT, 5°, PL, RO, SN

Defects are: PT, 0 - 10°, PL, RO, CN, unless otherwise described

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method & support
- AS auger screwing
- AD auger drilling
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- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

roughness
- SL slickensided
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- RO rough
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- CN clean
- SN stain
- VN veneer
- CO coating

coffey
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Engineering Log - Cored Borehole

Borehole ID.	**BH01**
sheet:	12 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**03 Sep 2018**
principal:	
date completed:	**07 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,619.90; N: 6,355,684.10 (MGA94) | surface elevation: 31.39 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm | vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ	50% loss	-49			**SANDSTONE**: fine to medium grained, grey to dark grey and brown, with siltstone bands and black carbonaceous laminations. *(continued)*	SW - FR			100%		
			81.0		80.82 m: 80mm carbonaceous laminations 81.00 m: 430mm carbonaceous laminations			a=2.50 d=1.40			
		-50									
			82.0								
		-51							100%		
			83.0								
		-52									
			84.0					a=2.50 d=0.40			
		-53			84.20 m: 300mm carbonaceous laminations						PT, 0°, PL, RO, SN
			85.0								PT, 5°, PL, RO, SN
		-54			85.38 m: 70mm carbonaceous laminations				92%		
			86.0								PT, 0°, PL, RO, SN
		-55			86.29 m: 20mm carbonaceous laminations						PT, 15°, PL, RO, CO, 10 mm
					86.58 m: 100mm carbonaceous laminations 86.73 m: 50mm siltstone band			a=6.30 d=1.80			
			87.0								
		-56			87.15 m: 100mm siltstone band				100%		PT, 10°, PL, RO, SN

Defects are: PT, 0 - 10°, PL, RO, CN, unless otherwise described

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- CN clean
- SN stain
- VN veneer
- CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH01**
sheet:	13 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**03 Sep 2018**
principal:	
date completed:	**07 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
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drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ	50% loss	-57	89.0		**SANDSTONE**: fine to medium grained, grey to dark grey and brown, with sitlstone bands and black carbonaceous laminations. *(continued)* 88.05 m: 0.5m carbonaceous laminations 88.64 m: 210mm siltstone band 89.12 m: 300mm carbonaceous laminations	SW - FR		a=5.80 d=0.90	100%		PT, 10°, PL, RO, CN
		-58									
		-59	90.0		90.40 m: 90mm carbonaceous laminations						PT, 20°, PL, RO, SN
		-60	91.0						97%		JT, 70°, PL, SO, CN
		-61	92.0		**SILTSTONE**: dark grey, black with grey laminations, with carbonaceous laminations.			a=3.40 d=0.40			PT, 0°, PL, RO, SN JT, 80°, PL, RO, CN
		-62	93.0		**NO CORE:** 0.55 m **TOOL DROP**: 0.5m void on CCTV.						
		-63	94.0		**NO CORE:** 1.15 m 1.15m Coal in density plots				0%		
		-64	95.0		**CAVE-IN: COAL**: black, shiny, cleated. **NO CORE:** 1.15 m Coal in density plots	MW			0% 17%		CS, IR, SO, CO

Defects are: PT, 0 - 10°, PL, RO, CN, unless otherwise described

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method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
RR rock roller/tricone

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

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Engineering Log - Cored Borehole

Borehole ID.	***BH01***
sheet:	14 of 14
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***03 Sep 2018***
principal:	date completed: ***07 Sep 2018***
project: ***Proposed Multi Building Residential Development***	logged by: ***MJ***
location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***	checked by: ***RB***

position: E: 385,619.90; N: 6,355,684.10 (MGA94) surface elevation: 31.39 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ		-65			**NO CORE:** 1.15 m *(continued)*						
					CAVE-IN: COAL: black, shiny, cleated.	MW					
			97.0		**COAL**: black, dull and shiney. 96.80 m: Floor of mine?				17%		CS, IR, RO, CN
		-66			97.30 m: 300mm of dull coal			a=0.10 d=0.10			PT, 40°, PL, RO, CN JT, 60°, ST, RO, CN CS, IR, RO, CN
			98.0								
		-67							0%		CS, IR, RO, CN
			99.0								
		-68			99.27 m: 30mm siltstone, dark grey **SANDSTONE**: fine to coarse grained, grey.	FR		a=4.50 d=3.80			
			100.0		100.05 m: 100mm coal band						
		-69			100.52 m: 180mm medium to coarse grained sandstone				93%		PT, 0°, PL, RO, SN
			101.0								
		-70			101.26 m: 20mm medium to coarse grained sandstone 101.45 m: 25mm medium to coarse grained sandstone 101.78 m: 120mm conglomerate band			a=9.00 d=3.10			PT, 5°, UN, RO, SN
			102.0								
		-71			Borehole BH01 terminated at 102.10 m Target depth						
			103.0								
		-72									

Defects are: PT, 0 - 10°, PL, RO, CN, unless otherwise described

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method & support
- AS auger screwing
- AD auger drilling
- CB claw or blade bit
- W washbore
- NMLC NMLC core (51.9 mm)
- NQ wireline core (47.6mm)
- HQ wireline core (63.5mm)
- PQ wireline core (85.0mm)
- SPT standard penetration test
- RR rock roller/tricone

water
- 10/10/12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD
- barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*
- RS residual soil
- XW extremely weathered
- HW highly weathered
- DW distinctly weathered
- MW moderately weathered
- SW slightly weathered
- FR fresh

*W replaced with A for alteration

strength
- VL very low
- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CO contact
- CS crushed seam
- SM seam

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

coating
- CN clean
- SN stain
- VN veneer
- CO coating

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Engineering Log - Borehole

Borehole ID.	***BH02***
sheet:	1 of 1
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***10 Sep 2018***
principal:	date completed: ***10 Sep 2018***
project: ***Proposed Multi Building Residential Development***	logged by: ***MJ***
location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***	checked by: ***RB***

position: E: 385,624.50; N: 6,355,677.60 (MGA94) | surface elevation: 30.94 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: | hole diameter : 100 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
AD/T		Not Observed	E					**FILL: BITUMEN**: Black, fine to coarse subangular gravel.				**FILL- WEARING COURSE**
			E				CL	**FILL: Sandy GRAVEL**: fine to coarse grained, brown, with some cobbles 63mm to 80mm.	M	St		**FILL- PAVEMENT**
			E	30			CL	**FILL: Sandy CLAY**: low to medium plasticity, dark grey, grey and brown, fine to medium sand, some surounded sized gravel.	>Wp	VSt		**FILL**
			SPT 3, 3, 8 N*=11		1.0			**FILL: CLAY**: medium plasticity, grey and pale grey, with orange.				
			E									
				29	2.0		SC	**CLAYEY SAND**: fine to coarse grained, pale brown and pale grey.	M			**RESIDUAL SOIL**
			SPT 6, 8, 9 N*=17	28	3.0		CL	**Sandy CLAY**: medium plasticity, grey, fine to medium grained sand.	~Wp	H		
							CL	**CLAY**: medium plasticity, orange mottled pale grey.				
									<Wp			**EXTREMELY WEATHERED MATERIAL**
			SPT 15/10mm HB N*=R	27	4.0			Borehole BH02 terminated at 4.01 m Safety reasons				
				26	5.0							
				25	6.0							
				24	7.0							
				23								

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method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix, e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
- no resistance
- ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

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Engineering Log - Borehole

Borehole ID.	***BH02A***
sheet:	1 of 13
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***20 Sep 2018***
principal:	date completed: ***21 Sep 2018***
project: ***Proposed Multi Building Residential Development***	logged by: ***MJ***
location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***	checked by: ***RB***

position: E: 385,619.90; N: 6,355,693.60 (MGA94) | surface elevation: 32.40 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
AD RR N		Not Observed	E E	32 31 30 29 28 27 26 25	1.0 2.0 3.0 4.0 5.0 6.0 7.0			**FILL: BITUMEN PAVEMENT**: black, 50mm.	M			**FILL- WEARING COURSE**
								FILL: Gravelly SAND: fine to coarse grained, brown and pale grey, with angular to sub-angular gravel.				**FILL- PAVEMENT**
								SANDSTONE.				**HIGHLY WEATHERED BECOMING MODERATELY WEATHERED MATERIAL**

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method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

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Engineering Log - Borehole

Borehole ID.	***BH02A***
sheet:	2 of 13
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***20 Sep 2018***
principal:	date completed: ***21 Sep 2018***
project: ***Proposed Multi Building Residential Development***	logged by: ***MJ***
location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***	checked by: ***RB***

position: E: 385,619.90; N: 6,355,693.60 (MGA94) | surface elevation: 32.40 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (**SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N		Not Observed		24 23 22 21 20 19 18 17	9.0 10.0 11.0 12.0 13.0 14.0 15.0			**SANDSTONE**. *(continued)*				**MODERATELY WEATHERED TO SLIGHTLY WEATHERED**

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method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

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Engineering Log - Borehole

Borehole ID.	***BH02A***
sheet:	3 of 13
project no.	***754-NTLGE220504***
client:	***Crescent Newcastle Pty Ltd***
date started:	***20 Sep 2018***
principal:	
date completed:	***21 Sep 2018***
project:	***Proposed Multi Building Residential Development***
logged by:	***MJ***
location:	***11 - 13 Mosbri Crescent, Cooks Hill, NSW***
checked by:	***RB***

position: E: 385,619.90; N: 6,355,693.60 (MGA94) | surface elevation: 32.40 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N		Not Observed		16 15 14 13 12 11 10 9	17.0 18.0 19.0 20.0 21.0 22.0 23.0			**SANDSTONE**. *(continued)*				**MODERATELY WEATHERED TO SLIGHTLY WEATHERED**

method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

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Engineering Log - Borehole

Borehole ID.	***BH02A***
sheet:	4 of 13
project no.	***754-NTLGE220504***
client:	***Crescent Newcastle Pty Ltd***
date started:	***20 Sep 2018***
principal:	
date completed:	***21 Sep 2018***
project:	***Proposed Multi Building Residential Development***
logged by:	***MJ***
location:	***11 - 13 Mosbri Crescent, Cooks Hill, NSW***
checked by:	***RB***

position: E: 385,619.90; N: 6,355,693.60 (MGA94) | surface elevation: 32.40 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR, N		Not Observed		8	25.0			**SANDSTONE**. *(continued)*				**MODERATELY WEATHERED TO SLIGHTLY WEATHERED**
				7								
				6	26.0			**COAL**.				
				5	27.0							
				4	28.0			**SILTSTONE**.				
								COAL.				
				3	29.0			**SILTSTONE**.				**FRESH**
				2	30.0			**COAL**.				
				1	31.0			**SANDSTONE**.				

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method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
10-Oct-12 water level on date shown
water inflow
water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

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Engineering Log - Borehole

Borehole ID.	***BH02A***
sheet:	5 of 13
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***20 Sep 2018***
principal:	date completed: ***21 Sep 2018***
project: ***Proposed Multi Building Residential Development***	logged by: ***MJ***
location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***	checked by: ***RB***

position: E: 385,619.90; N: 6,355,693.60 (MGA94) | surface elevation: 32.40 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (**SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N		Not Observed		0 -1 -2 -3 -4 -5 -6 -7	33.0 34.0 35.0 36.0 37.0 38.0 39.0			**SANDSTONE**. *(continued)*				**FRESH**

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method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

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Engineering Log - Borehole

Borehole ID.	***BH02A***
sheet:	6 of 13
project no.	***754-NTLGE220504***
client:	***Crescent Newcastle Pty Ltd***
date started:	***20 Sep 2018***
principal:	
date completed:	***21 Sep 2018***
project:	***Proposed Multi Building Residential Development***
logged by:	***MJ***
location:	***11 - 13 Mosbri Crescent, Cooks Hill, NSW***
checked by:	***RB***

position: E: 385,619.90; N: 6,355,693.60 (MGA94) | surface elevation: 32.40 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (**SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N		Not Observed		-8 -9 -10 -11 -12 -13 -14 -15	41.0 42.0 43.0 44.0 45.0 46.0 47.0			**SANDSTONE**. *(continued)* **COAL**: black. **SANDSTONE**: grey.				**FRESH**

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method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
- 1 2 3 no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

coffey
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Engineering Log - Borehole

Borehole ID.	***BH02A***
sheet:	7 of 13
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***20 Sep 2018***
principal:	date completed: ***21 Sep 2018***
project: ***Proposed Multi Building Residential Development***	logged by: ***MJ***
location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***	checked by: ***RB***

position: E: 385,619.90; N: 6,355,693.60 (MGA94) | surface elevation: 32.40 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (**SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N		Not Observed		-16 -17 -18 -19 -20 -21 -22 -23	49.0 50.0 51.0 52.0 53.0 54.0 55.0			**SANDSTONE**: grey. *(continued)*				**FRESH**
								COAL: black.				

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method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix, e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

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Engineering Log - Borehole

Borehole ID.	***BH02A***
sheet:	8 of 13
project no.	***754-NTLGE220504***
client:	***Crescent Newcastle Pty Ltd***
date started:	***20 Sep 2018***
principal:	
date completed:	***21 Sep 2018***
project:	***Proposed Multi Building Residential Development***
logged by:	***MJ***
location:	***11 - 13 Mosbri Crescent, Cooks Hill, NSW***
checked by:	***RB***

position: E: 385,619.90; N: 6,355,693.60 (MGA94) | surface elevation: 32.40 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (**SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N		Not Observed		-24 -25 -26 -27 -28 -29 -30 -31	57.0 58.0 59.0 60.0 61.0 62.0 63.0			**SANDSTONE**.				**FRESH**

method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
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- N* SPT - sample recovered
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- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
- D dry
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consistency / relative density

VS	very soft
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Fb	friable
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D	dense
VD	very dense

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Engineering Log - Borehole

Borehole ID.	***BH02A***
sheet:	9 of 13
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***20 Sep 2018***
principal:	date completed: ***21 Sep 2018***
project: ***Proposed Multi Building Residential Development***	logged by: ***MJ***
location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***	checked by: ***RB***

position: E: 385,619.90; N: 6,355,693.60 (MGA94) | surface elevation: 32.40 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (**SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N		Not Observed		-32 -33 -34 -35 -36 -37 -38 -39	65.0 66.0 67.0 68.0 69.0 70.0 71.0			**SANDSTONE**. *(continued)*				**FRESH**

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method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

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- B bulk disturbed sample
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- E environmental sample
- SS split spoon sample
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moisture
- D dry
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VS	very soft
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VSt	very stiff
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L	loose
MD	medium dense
D	dense
VD	very dense

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Engineering Log - Borehole

Borehole ID.	***BH02A***
sheet:	10 of 13
project no.	***754-NTLGE220504***
client:	***Crescent Newcastle Pty Ltd***
date started:	***20 Sep 2018***
principal:	
date completed:	***21 Sep 2018***
project:	***Proposed Multi Building Residential Development***
logged by:	***MJ***
location:	***11 - 13 Mosbri Crescent, Cooks Hill, NSW***
checked by:	***RB***

position: E: 385,619.90; N: 6,355,693.60 (MGA94) | surface elevation: 32.40 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (**SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N		Not Observed		-40 -41 -42 -43 -44 -45 -46 -47	73.0 74.0 75.0 76.0 77.0 78.0 79.0			**SANDSTONE**. *(continued)*				**FRESH**

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method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix
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- B blank bit
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- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
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- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
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H	hard
Fb	friable
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L	loose
MD	medium dense
D	dense
VD	very dense

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Engineering Log - Borehole

Borehole ID.	***BH02A***
sheet:	11 of 13
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***20 Sep 2018***
principal:	date completed: ***21 Sep 2018***
project: ***Proposed Multi Building Residential Development***	logged by: ***MJ***
location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***	checked by: ***RB***

position: E: 385,619.90; N: 6,355,693.60 (MGA94) | surface elevation: 32.40 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (**SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N		Not Observed		-48 -49 -50 -51 -52 -53 -54 -55	81.0 82.0 83.0 84.0 85.0 86.0 87.0			**SANDSTONE**. *(continued)*				**FRESH**

CDF_0_9_06_LIBRARY.GLB rev:AS Log COF BOREHOLE: NON CORED 754-NTLGE220504.GPJ <<DrawingFile>> 30/10/2018 11:35

method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
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- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
- D dry
- M moist
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- Wp plastic limit
- Wl liquid limit

consistency / relative density

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St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

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Engineering Log - Borehole

Borehole ID.	***BH02A***
sheet:	12 of 13
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***20 Sep 2018***
principal:	date completed: ***21 Sep 2018***
project: ***Proposed Multi Building Residential Development***	logged by: ***MJ***
location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***	checked by: ***RB***

position: E: 385,619.90; N: 6,355,693.60 (MGA94) | surface elevation: 32.40 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description **SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N		Not Observed		-56 -57 -58 -59 -60 -61 -62 -63	89.0 90.0 91.0 92.0 93.0 94.0 95.0			**SANDSTONE**. *(continued)* **COAL**: black.				**FRESH**

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method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
- L N H
- no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description
based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

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Engineering Log - Borehole

Borehole ID.	***BH02A***
sheet:	13 of 13
project no.	***754-NTLGE220504***
client:	***Crescent Newcastle Pty Ltd***
date started:	***20 Sep 2018***
principal:	
date completed:	***21 Sep 2018***
project:	***Proposed Multi Building Residential Development***
logged by:	***MJ***
location:	***11 - 13 Mosbri Crescent, Cooks Hill, NSW***
checked by:	***RB***

position: E: 385,619.90; N: 6,355,693.60 (MGA94) | surface elevation: 32.40 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (**SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N		Not Observed		-64 -65 -66 -67 -68 -69 -70 -71	97.0 98.0 99.0 100.0 101.0 102.0 103.0			**COAL**: black. *(continued)* **SANDSTONE**: grey. Borehole BH02A terminated at 102.0 m Target depth				**FRESH**

CDF_0_9_06_LIBRARY.GLB rev:AS Log COF BOREHOLE: NON CORED 754-NTLGE220504.GPJ <<DrawingFile>> 30/10/2018 11:35

method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

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Engineering Log - Borehole

Borehole ID.	***BH03***
sheet:	1 of 14
project no.	***754-NTLGE220504***
client:	***Crescent Newcastle Pty Ltd***
date started:	***17 Sep 2018***
principal:	
date completed:	***20 Sep 2018***
project:	***Proposed Multi Building Residential Development***
logged by:	***MJ***
location:	***11 - 13 Mosbri Crescent, Cooks Hill, NSW***
checked by:	***RB***

position: E: 385,685.80; N: 6,355,574.40 (MGA94) | surface elevation: 32.75 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (**SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
AD			E				GP	**FILL: BITUMEN**: black, 50mm.	M			**FILL- WEARING COURSE**
								FILL: Sandy GRAVEL: fine to coarse grained, grey, angular to sub-angular, fine grained sand.				**FILL- PAVEMENT**
			E	32			CI	**Sandy CLAY**: medium plasticity, mottled red and brown.	>Wp	St - VSt		**RESIDUAL SOIL**
			SPT 5, 7, 10 N=17		1.0							
			B	31			CI	**CLAY**: medium plasticity, pale grey and red mottled orange.	>Wp			
			SPT 21, 30/90mm N=R		2.0		CL	**Sandy CLAY**: low plasticity, orange mottled pale brown, fine grained sand.	<Wp	VSt - H		**EXTREMELY WEATHERED ROCK**
				30	3.0							
N				29	4.0			Borehole BH03 continued as cored hole				
				28	5.0							
				27	6.0							
				26	7.0							
				25								

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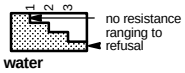
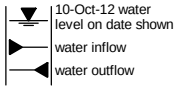
method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration


no resistance ranging to refusal

water

10-Oct-12 water level on date shown
water inflow
water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

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Engineering Log - Cored Borehole

Borehole ID.	***BH03***
sheet:	2 of 14
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***17 Sep 2018***
principal:	date completed: ***20 Sep 2018***
project: ***Proposed Multi Building Residential Development***	logged by: ***MJ***
location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***	checked by: ***RB***

position: E: 385,685.80; N: 6,355,574.40 (MGA94) | surface elevation: 32.75 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm | vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		32	1.0								
		31	2.0								
		30	3.0		started coring at 3.40m						
HQ		29	4.0		**SANDSTONE**: fine to medium grained, brown to pale brown, grey to dark grey, with siltstone bands.	DW					PT, 0°, PL, RO, CN
						XW					PT, 40°, IR, RO, SN
		28	5.0			DW		a=0.80 d=0.10	72%		PT, 10°, IR, RO, SN Drilling Break PT, 0°, PL, RO, VN JT, 70°, PL, RO, SN Drilling Break
		27	6.0		**SANDSTONE**: fine to medium grained, grey, dark grey, with siltstone bands and carbonaceous laminations.	SW - FR		a=1.50 d=0.60			PT, 5 - 10°, ST, SN Drilling Break Drilling Break
		26	7.0					a=0.40 d=0.70	97%		PT, 0°, PL, VR, CN Drilling Break PT, 5°, CU, RO, SN PT, 5°, CU, RO, CN Drilling Break
		25									Defects are: PT, 0 - 10°, PL, RO, SN, unless otherwise described

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method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
RR rock roller/tricone

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	***BH03***
sheet:	3 of 14
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***17 Sep 2018***
principal:	date completed: ***20 Sep 2018***
project: ***Proposed Multi Building Residential Development***	logged by: ***MJ***
location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***	checked by: ***RB***

position: E: 385,685.80; N: 6,355,574.40 (MGA94) surface elevation: 32.75 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ		24	9.0		**SANDSTONE**: fine to medium grained, grey, dark grey, with siltstone bands and carbonaceous laminations. *(continued)* 8.10 m: 50mm siltstone band	SW - FR			97%		Drilling Break
		23			9.15 m: 50mm carbonaceous laminations			a=0.90 d=0.50			Drilling Break
		22	10.0 11.0					a=1.00 d=0.80	100%		
		21	12.0		11.60 m: 170mm carbonaceous laminations 12.12 m: 200mm siltstone band			a=0.70 d=0.20			PT, 0°, PL, VR, CO
		20	13.0		13.25 m: 180mm siltstone band						
		19	14.0					a=0.70 d=1.40	87%		
		18	15.0					a=2.00 d=0.60			JT, 40°, IR, RO, SN JT, 40°, PL, RO, SN JT, 70°, PL, RO, SN JT, 70°, ST, RO, SN
		17							85%		Defects are: PT, 0 - 10°, PL, RO, SN, unless otherwise described

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method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
RR rock roller/tricone

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH03**
sheet:	4 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**17 Sep 2018**
principal:	
date completed:	**20 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,685.80; N: 6,355,574.40 (MGA94) surface elevation: 32.75 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ		16	17.0		**SANDSTONE**: fine to medium grained, grey, dark grey, with siltstone bands and carbonaceous laminations. *(continued)*	SW - FR		a=0.20 d=0.20	85%		
		15	18.0		**COAL**: black, shiny, cleated.	XW / DW		a=0.10 d=0.00			CS, IR, SO, CN
					NO CORE: 0.25 m						
		14	19.0		**COAL**: black, shiny, cleated. **SANDSTONE**: fine to coarse grained, grey, dark grey, with siltstone bands and carbonaceous laminations. 19.10 to 20.28 m: becoming fine to coarse grained	XW / MW / SW - FR		a=0.70 d=0.90	63%		CS, IR, SO, CN JT, 80°, PL, RO, CN
		13	20.0		20.26 m: 60mm carbonaceous laminations						
		12	21.0		21.15 m: 50mm siltstone band						
		11	22.0					a=1.10 d=0.90	100%		Drilling Break
		10	23.0								
		9			23.50 m: coal on density plot						

Defects are: PT, 0 - 10°, PL, RO, SN, unless otherwise described

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method & support
- AS auger screwing
- AD auger drilling
- CB claw or blade bit
- W washbore
- NMLC NMLC core (51.9 mm)
- NQ wireline core (47.6mm)
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- PQ wireline core (85.0mm)
- SPT standard penetration test
- RR rock roller/tricone

water
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- partial drilling fluid loss
- 25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD
- barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*
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- XW extremely weathered
- HW highly weathered
- DW distinctly weathered
- MW moderately weathered
- SW slightly weathered
- FR fresh

*W replaced with A for alteration

strength
- VL very low
- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CO contact
- CS crushed seam
- SM seam

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

coating
- CN clean
- SN stain
- VN veneer
- CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH03**
sheet:	5 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**17 Sep 2018**
principal:	
date completed:	**20 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,685.80; N: 6,355,574.40 (MGA94) surface elevation: 32.75 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ	21/09/18	8	25.0		**SANDSTONE**: fine to coarse grained, grey, dark grey, with siltstone bands and carbonaceous laminations. *(continued)*	SW - FR		a=0.80 d=1.00	100%		JT, 80°, PL, RO, CN
		7	26.0		**SILTSTONE**: grey and pale brown, with carbonaceous laminations.	MW - SW		a=0.30 d=0.20	87%		SM, 0°, PL, VR, CO
		6	27.0		**COAL**: black, shiny, cleated.	MW					SM, 0°, PL, RO, SN
		5	28.0		**SILTSTONE**: grey to brown.				37%		PT, 5°, PL, RO, CN PT, 5°, PL, RO, CN PT, 0°, PL, RO, CN
					NO CORE: 0.16 m Coal in density plot.						
		4			**COAL**: black.	MW		a=0.00 d=0.10			CS, IR, VR, CN
			29.0		**SILTSTONE**: dark grey to black.						
					NO CORE: 0.40 m Coal to siltstone in density plot.				14%		
		3			**SILTSTONE**: grey, with carbonaceous laminations.	MW					PT, ST, RO, SN
			30.0		**NO CORE:** 0.10 m Siltstone in density plot.						
		2	31.0		**SILTSTONE**: grey, with carbonaceous laminations.	MW		a=0.30 d=0.40	52%		
		1				SW - FR					PT, ST, RO, SN

Defects are: PT, 0 - 10°, PL, RO, SN, unless otherwise described

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method & support
- AS auger screwing
- AD auger drilling
- CB claw or blade bit
- W washbore
- NMLC NMLC core (51.9 mm)
- NQ wireline core (47.6mm)
- HQ wireline core (63.5mm)
- PQ wireline core (85.0mm)
- SPT standard penetration test
- RR rock roller/tricone

water
- 10/10/12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD
- barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*
- RS residual soil
- XW extremely weathered
- HW highly weathered
- DW distinctly weathered
- MW moderately weathered
- SW slightly weathered
- FR fresh

*W replaced with A for alteration

strength
- VL very low
- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CO contact
- CS crushed seam
- SM seam

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

coating
- CN clean
- SN stain
- VN veneer
- CO coating

coffey
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Engineering Log - Cored Borehole

Borehole ID.	**BH03**
sheet:	6 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**17 Sep 2018**
principal:	
date completed:	**20 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,685.80; N: 6,355,574.40 (MGA94) surface elevation: 32.75 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular	general
HQ		0	33.0		**SANDSTONE**: fine to medium grained, grey, with siltstone bands and carbonaceous laminations. *(continued)* 32.10 m: 100mm siltstone band with carbonaceous laminations	SW - FR		a=2.70 d=1.70	52%		PT, UN, RO, SN	Defects are: PT, 0 - 10°, PL, RO, SN, unless otherwise described
		-1	34.0		33.80 m: 300mm siltstone band with carbonaceous laminations						JT, 40°, PL, RO, SN	
		-2	35.0						96%			
		-3	36.0					a=8.50 d=7.80			JT, 40°, PL, RO, SN	
		-4	37.0								JT, 40°, PL, RO, SN PT, 0°, IR, RO, SN	
		-5	38.0					a=4.10 d=2.10	95%			
		-6	39.0		38.35 m: 150mm carbonaceous laminations						JT, 70°, PL, RO, CN	
		-7			39.15 m: becoming dark grey sandstone, thinly bedded carbonaceous lamination			a=1.30 d=1.20	57%		PT, 10°, UN, RO, SN PT, 10°, PL, RO, SN	

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method & support
- AS auger screwing
- AD auger drilling
- CB claw or blade bit
- W washbore
- NMLC NMLC core (51.9 mm)
- NQ wireline core (47.6mm)
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water
- 10/10/12, water level on date shown
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graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD
- barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*
- RS residual soil
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- HW highly weathered
- DW distinctly weathered
- MW moderately weathered
- SW slightly weathered
- FR fresh

*W replaced with A for alteration

strength
- VL very low
- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CO contact
- CS crushed seam
- SM seam

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

coating
- CN clean
- SN stain
- VN veneer
- CO coating

coffey
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Engineering Log - Cored Borehole

Borehole ID.	**BH03**
sheet:	7 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**17 Sep 2018**
principal:	
date completed:	**20 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,685.80; N: 6,355,574.40 (MGA94) surface elevation: 32.75 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ	100% loss	-8	41.0		**SANDSTONE**: fine to medium grained, grey, with siltstone bands and carbonaceous laminations. *(continued)* 40.20 m: 100 mm siltstone band	SW - FR			57%		PT, 0°, PL, RO, CN PT, 0°, PL, RO, CN PT, 0°, PL, RO PT, 0°, ST, RO, SN JT, 70°, PL, RO, CN CS, IR, RO PT, 5°, PL, RO, SN CS, PL, RO, CN
		-9			**NO CORE:** 0.10 m Tool drop.			a=0.60 d=0.10			
					CAVE IN: SILTSTONE: grey.	MW					CS, IR, RO, CN
			42.0		**NO CORE:** 0.33 m **TOOL DROP**.						
					NO CORE: 0.35 m **CAVE IN**: Siltstone in density plot.						
		-10			**CAVE IN: SILTSTONE AND COAL**: dark grey and black.	XW			15%		CS, IR, RO, CO
			43.0			MW					
		-11			**SANDSTONE**: fine to medium grained, grey, dark grey, with siltstone bands and carbonaceous laminations.	SW - FR		a=2.00 d=0.90	89%		PT, 5°, PL, RO, CN
			44.0								
		-12									
			45.0		**NO CORE:** 0.15 m Sandstone in density plot.						
		-13			**SANDSTONE**: fine to medium grained, grey, dark grey, with siltstone bands and carbonaceous laminations.	SW - FR		a=3.30 d=2.90			
			46.0								
		-14			46.51 m: 20mm carbonaceous laminations 46.72 m: 200mm carbonaceous laminations			a=3.50 d=1.90	92%		
			47.0								
		-15									

Defects are: PT, 0 - 10°, PL, RO, SN, unless otherwise described

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method & support
- AS auger screwing
- AD auger drilling
- CB claw or blade bit
- W washbore
- NMLC NMLC core (51.9 mm)
- NQ wireline core (47.6mm)
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- SPT standard penetration test
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water
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- core recovered (graphic symbols indicate material)
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core run & RQD
- barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*
- RS residual soil
- XW extremely weathered
- HW highly weathered
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strength
- VL very low
- L low
- M medium
- H high
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defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CO contact
- CS crushed seam
- SM seam

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

coating
- CN clean
- SN stain
- VN veneer
- CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	***BH03***
sheet:	8 of 14
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***17 Sep 2018***
principal:	date completed: ***20 Sep 2018***
project: ***Proposed Multi Building Residential Development***	logged by: ***MJ***
location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***	checked by: ***RB***

position: E: 385,685.80; N: 6,355,574.40 (MGA94) surface elevation: 32.75 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ		-16	49.0		**SANDSTONE**: fine to medium grained, grey, dark grey, with siltstone bands and carbonaceous laminations. *(continued)*	SW - FR		a=2.90 d=0.20			JT, 90°, CU, RO, SN
		-17			49.50 m: 100mm carbonaceous laminations				98%		
			50.0		50.10 m: 20mm carbonaceous laminations						
		-18						a=0.60 d=0.40			
			51.0		51.00 m: becoming pale grey, grey-dark grey laminations 51.25 m: becoming fine grained						
		-19						a=0.60 d=0.20			
			52.0		52.25 m: 200 mm tuff band				95%		
		-20	53.0		**COAL**: black, dull, cleated.	DW					
					SANDSTONE: fine to medium grained, grey, dark grey, with siltstone bands and carbonaceous laminations.	SW - FR		a=0.70 d=0.30			JT, 45°, PL, RO, CN
		-21	54.0								
		-22									JT, 80°, PL, RO, SN
			55.0		55.00 m: 100 mm siltstone band, grey			a=1.40 d=0.40	83%		
		-23									

Defects are: PT, 0 - 10°, PL, RO, SN, unless otherwise described

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method & support
- AS auger screwing
- AD auger drilling
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roughness
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- SO smooth
- RO rough
- VR very rough

coating
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- SN stain
- VN veneer
- CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH03**
sheet:	9 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**17 Sep 2018**
principal:	
date completed:	**20 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,685.80; N: 6,355,574.40 (MGA94) surface elevation: 32.75 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ		-24	57.0		**SANDSTONE**: fine to medium grained, grey, dark grey, with siltstone bands and carbonaceous laminations. *(continued)* 56.10 m: 200mm coal, black, dull band	SW - FR		a=2.40 d=1.70	83%		CS, IR, SO, CN JT, 80°, PL, RO, SN
		-25	58.0		58.52 m: 1.48m siltstone, dark grey band				100%		
		-26	59.0					a=2.80 d=1.50			
		-27	60.0								CS, 0°, PL, RO, CN CS, 0°, PL, CN
		-28	61.0		60.60 m: 50 mm coal band				90%		
		-29	62.0		62.00 m: 500mm carbonaceous laminations			a=2.20 d=0.10			PT, 40°, PL, RO, SN
		-30	63.0		63.10 m: 1.55m siltstone, dark grey band			a=2.20 d=0.50	100%		
		-31									

Defects are: PT, 0 - 10°, PL, RO, SN, unless otherwise described

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method & support
- AS auger screwing
- AD auger drilling
- CB claw or blade bit
- W washbore
- NMLC NMLC core (51.9 mm)
- NQ wireline core (47.6mm)
- HQ wireline core (63.5mm)
- PQ wireline core (85.0mm)
- SPT standard penetration test
- RR rock roller/tricone

water
- 10/10/12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD
- barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*
- RS residual soil
- XW extremely weathered
- HW highly weathered
- DW distinctly weathered
- MW moderately weathered
- SW slightly weathered
- FR fresh

*W replaced with A for alteration

strength
- VL very low
- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CO contact
- CS crushed seam
- SM seam

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

coating
- CN clean
- SN stain
- VN veneer
- CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH03**
sheet:	10 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**17 Sep 2018**
principal:	
date completed:	**20 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,685.80; N: 6,355,574.40 (MGA94) surface elevation: 32.75 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ		-32	65.0		**SANDSTONE**: fine to medium grained, grey, dark grey, with siltstone bands and carbonaceous laminations. *(continued)*	SW - FR		a=1.90 d=0.50	100%		
		-33	66.0		66.38 m: 20mm carbonaceous laminations			a=2.50 d=0.40			
		-34	67.0								
		-35	68.0					a=1.40 d=0.40	100%		
		-36			68.50 m: becoming fine to coarse grained						
		-37	69.0		69.00 to 69.20 m: 200 mm siltstone band			a=0.80 d=0.20			
		-38	70.0						97%		PT, 0°, PL, RO, CN PT, 5°, ST, RO, CN
		-39	71.0		71.55 to 71.65 m: 100 mm siltstone band			a=1.00 d=0.50			JT, 80°, CU, VR, CN PT, 0°, PL, SO, CN

Defects are: PT, 0 - 10°, PL, RO, SN, unless otherwise described

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method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
RR rock roller/tricone

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH03**
sheet:	11 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**17 Sep 2018**
principal:	
date completed:	**20 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,685.80; N: 6,355,574.40 (MGA94) surface elevation: 32.75 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ					**SANDSTONE**: fine to medium grained, grey, dark grey, with siltstone bands and carbonaceous laminations. *(continued)*	SW - FR					JT, 80°, PL, RO, SN
		-40						a=1.70 d=0.40			
			73.0		73.03 m: 100mm carbonaceous laminations						
		-41							100%		
			74.0		73.90 m: 150 mm siltstone band						
					74.25 m: becoming medium to coarse grained			a=3.20 d=2.30			
		-42									
			75.0								JT, 70°, CU, RO, CN
		-43						a=3.20 d=3.00			
			76.0		76.12 m: 60mm siltstone, dark grey band						
					76.40 m: 100 mm tuff band				91%		
		-44									
			77.0		77.10 m: 50mm carbonaceous laminations			a=3.70 d=1.80			JT, 55°, PL, RO, CN
		-45									
			78.0		77.85 m: 300 mm siltstone band						
		-46			78.65 m: 310mm carbonaceous laminations			a=4.60 d=1.10			
			79.0		78.96 m: 140mm siltstone, dark grey band				80%		
		-47									

Defects are: PT, 0 - 10°, PL, RO, SN, unless otherwise described

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method & support
- AS auger screwing
- AD auger drilling
- CB claw or blade bit
- W washbore
- NMLC NMLC core (51.9 mm)
- NQ wireline core (47.6mm)
- HQ wireline core (63.5mm)
- PQ wireline core (85.0mm)
- SPT standard penetration test
- RR rock roller/tricone

water
- 10/10/12, water level on date shown
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- complete drilling fluid loss
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graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD
- barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*
- RS residual soil
- XW extremely weathered
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- DW distinctly weathered
- MW moderately weathered
- SW slightly weathered
- FR fresh

*W replaced with A for alteration

strength
- VL very low
- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CO contact
- CS crushed seam
- SM seam

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

coating
- CN clean
- SN stain
- VN veneer
- CO coating

coffey
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Engineering Log - Cored Borehole

Borehole ID.	**BH03**
sheet:	12 of 14
project no.	**754-NTLGE220504**
date started:	**17 Sep 2018**
date completed:	**20 Sep 2018**
logged by:	**MJ**
checked by:	**RB**

client: ***Crescent Newcastle Pty Ltd***

principal:

project: ***Proposed Multi Building Residential Development***

location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***

position: E: 385,685.80; N: 6,355,574.40 (MGA94) surface elevation: 32.75 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (× = axial; ○ = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ		-48	81.0		**SANDSTONE**: fine to medium grained, grey, dark grey, with siltstone bands and carbonaceous laminations. *(continued)* 80.53 m: 100 mm siltstone band	SW - FR		a=3.50 d=3.10	80%		JT, 90°, UN, RO, CN
		-49	82.0		81.20 m: 400mm carbonaceous laminations			a=4.00 d=3.00			
		-50	83.0		82.30 m: 600mm carbonaceous laminations 82.90 m: 100 mm siltstone band				63%		CS, 0 - 25°, IR, RO, CN
		-51	84.0		83.60 m: 200mm carbonaceous laminations			a=0.70 d=0.10			CS, IR, RO, CN JT, 80°, PL, RO, SN
		-52	85.0		84.60 m: 230mm carbonaceous laminations 85.00 m: 30 mm siltstone band						JT, 60°, UN, RO, SN
		-53	86.0		85.60 m: 100 mm siltstone band 85.78 m: 40mm carbonaceous laminations			a=1.30 d=0.00	84%		JT, 70°, PL, RO, CN PT, 10°, PL, RO, SN JT, 80°, PL, RO, SN
		-54	87.0		86.27 m: 30mm carbonaceous laminations 86.30 m: 200mm siltstone band 86.56 m: 20mm siltstone band 86.70 m: 100mm carbonaceous laminations 86.80 m: 30mm siltstone band 86.90 m: 100mm siltstone band 87.00 m: 30mm carbonaceous laminations						JT, 60°, PL, RO, CN JT, 60°, PL, RO, CN JT, 70°, PL, RO, SN
		-55						a=3.90 d=3.90	100%		

Defects are: PT, 0 - 10°, PL, RO, SN, unless otherwise described

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method & support
- AS auger screwing
- AD auger drilling
- CB claw or blade bit
- W washbore
- NMLC NMLC core (51.9 mm)
- NQ wireline core (47.6mm)
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- PQ wireline core (85.0mm)
- SPT standard penetration test
- RR rock roller/tricone

water
- 10/10/12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD
- barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*
- RS residual soil
- XW extremely weathered
- HW highly weathered
- DW distinctly weathered
- MW moderately weathered
- SW slightly weathered
- FR fresh

*W replaced with A for alteration

strength
- VL very low
- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CO contact
- CS crushed seam
- SM seam

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

coating
- CN clean
- SN stain
- VN veneer
- CO coating

coffey
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Engineering Log - Cored Borehole

Borehole ID.	**BH03**
sheet:	13 of 14
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**17 Sep 2018**
principal:	
date completed:	**20 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,685.80; N: 6,355,574.40 (MGA94) surface elevation: 32.75 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ		-56	89.0		**SANDSTONE**: fine to medium grained, grey, dark grey, with siltstone bands and carbonaceous laminations. *(continued)* 88.18 m: 100mm siltstone band 88.42 m: 100mm siltstone band	SW - FR			100%		
					88.90 m: 200mm siltstone band			a=4.50 d=2.50			
		-57	90.0		89.30 m: 180mm siltstone band 89.60 m: 130mm carbonaceous laminations						
					90.16 m: 200mm siltstone band 90.45 m: 130mm carbonaceous laminations						
		-58	91.0								JT, 80°, PL, RO, SN
		-59	92.0		91.60 m: 50mm coal band 91.70 m: 300mm siltstone, dark grey band			a=0.90 d=0.10	68%		PT, 15°, PL, RO, SN JT, 50°, CU, RO, SN SM, 0°, PL, RO, SN
		-60	93.0		**COAL**: black, shiny, cleated.	DW			0%		JT, 50°, PL, RO, SN PT, 5°, PL, RO, SN JT, 50°, PL, RO, SN CS, IR, RO, CO
		-61	94.0		**NO CORE:** 0.56 m Coal in density plot.				0%		
		-62	95.0		**COAL**: black, shiny, cleated.	DW			30%		JT, 50°, PL, RO, CN JT, 50°, PL, RO, CN JT, 80°, PL, RO, CN JT, 80°, PL, RO, CN
		-63									Defects are: PT, 0 - 10°, PL, RO, SN, unless otherwise described

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method & support
- AS auger screwing
- AD auger drilling
- CB claw or blade bit
- W washbore
- NMLC NMLC core (51.9 mm)
- NQ wireline core (47.6mm)
- HQ wireline core (63.5mm)
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- SPT standard penetration test
- RR rock roller/tricone

water
- 10/10/12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD
- barrel withdrawn

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weathering & alteration*
- RS residual soil
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*W replaced with A for alteration

strength
- VL very low
- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CO contact
- CS crushed seam
- SM seam

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

coating
- CN clean
- SN stain
- VN veneer
- CO coating

coffey
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Engineering Log - Cored Borehole

Borehole ID.	***BH03***
sheet:	14 of 14
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***17 Sep 2018***
principal:	date completed: ***20 Sep 2018***
project: ***Proposed Multi Building Residential Development***	logged by: ***MJ***
location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***	checked by: ***RB***

position: E: 385,685.80; N: 6,355,574.40 (MGA94) surface elevation: 32.75 m (AHD) angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted drilling fluid: non / water hole diameter : 96 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
HQ		-64	97.0		**COAL**: black, shiny, cleated. *(continued)* 96.34 m: 130mm siltstone band	DW					CS, IR, SO, CO
					96.90 m: 220mm siltstone band						SZ, IR, RO, CN
		-65	98.0		98.00 m: 20mm siltstone band 98.25 m: 50mm sandstone band 98.50 m: 120mm sandstone band				41%		JT, 80°, PL, RO, CN JT, 70°, IR, RO, CN CS, IR, RO, CN CS, IR, RO, CN
		-66	99.0		**SANDSTONE**: medium to coarse grained, pale grey, with siltstone and conglomerate bands.	FR		a=2.20 d=1.70			Defects are: PT, 0 - 10°, PL, RO, SN, unless otherwise described
		-67	100.0						100%		
		-68	101.0		100.85 m: 50mm siltstone band			a=2.60 d=4.10			
		-69	102.0		101.78 m: 50mm conglomerate band						
		-70	103.0		Borehole BH03 terminated at 102.14 m Target depth			a=3.10 d=2.20			
		-71									

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method & support
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AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
RR rock roller/tricone

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

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FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Borehole

Borehole ID.	**BH04**
sheet:	1 of 13
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**12 Sep 2018**
principal:	
date completed:	**14 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,684.5; N: 6,355,567.6 (MGA94) | surface elevation: 32.8 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
AD			E				GW	**FILL: BITUMEN PAVEMENT**: black, 20mm.				**FILL- WEARING COURSE**
							SW	**FILL: Sandy GRAVEL**: fine to coarse grained, sub-angular to angular, grey, with fine grained sand.	M <Wp	F - St		**FILL- PAVEMENT**
			E	32			CL	**FILL: CLAYEY SAND**: fine to coarse grained, brown and red.				**FILL - UNCONTROLLED**
					1.0			**FILL: Sandy CLAY**: low plasticity, brown, dark brown, pale grey, fine to coarse grained sand, with fine grained grained angular to sub-angular gravel.				
			E				CL	**FILL: Sandy CLAY**: low plasticity, dark brown, mottled orange, fine grained sand, with fine grained sub-angular to sub-rounded gravel and glass pieces.		St - H		
			SPT 5, 5, 5 N=10	31								
			E		2.0							
			SPT 3, 4, 5 N=9	30								
					3.0		CL-CI	**Sandy CLAY**: low to medium plasticity, dark brown and dark grey, fine to coarse grained sand.	~Wp			**RESIDUAL SOIL**
			B				CL-CI	**CLAY**: low to medium plasticity, mottled orange and brown, with fine rounded to sub-rounded gravel.				
				29	4.0		CL-CI	**Sandy CLAY**: low to medium plasticity, dark grey, with medium to course grained sand, with fine angular to sub-angular gravel.	>Wp			
							CL-CI	**Gravelly CLAY**: fine to medium grained, low to medium plasticity, pale grey and grey, with rounded to sub-rounded gravel, trace of fine to coarse grained sand.				**EXTREMELY WEATHERED MATERIAL**
N			SPT 7, 25/30mm N=R	28	5.0			**SANDSTONE**: fine grained, pale grey and orange.				**HIGHLY WEATHERED BECOMING MODERATELY WEATHERED MATERIAL**
RR								**SANDSTONE**.				
				27	6.0							
				26	7.0							
				25								

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method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
- 1 2 3 no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey
A TETRA TECH COMPANY

Engineering Log - Borehole

Borehole ID.	***BH04***
sheet:	2 of 13
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***12 Sep 2018***
principal:	date completed: ***14 Sep 2018***
project: ***Proposed Multi Building Residential Development***	logged by: ***MJ***
location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***	checked by: ***RB***

position: E: 385,684.5; N: 6,355,567.6 (MGA94) | surface elevation: 32.8 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description **SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N				24 23 22 21 20 19 18 17	9.0 10.0 11.0 12.0 13.0 14.0 15.0			**SANDSTONE**. *(continued)*				**MODERATELY WEATHERED TO SLIGHTLY WEATHERED**

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method
- AD auger drilling*
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e.g. AD/T
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penetration
1 2 3 — no resistance ranging to refusal

water
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classification symbol & soil description
based on Unified Classification System

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Engineering Log - Borehole

Borehole ID.	***BH04***
sheet:	3 of 13
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***12 Sep 2018***
principal:	date completed: ***14 Sep 2018***
project: ***Proposed Multi Building Residential Development***	logged by: ***MJ***
location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***	checked by: ***RB***

position: E: 385,684.5; N: 6,355,567.6 (MGA94) | surface elevation: 32.8 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (**SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N				16 15 14 13 12 11 10 9	17.0 18.0 19.0 20.0 21.0 22.0 23.0			**SANDSTONE**. *(continued)* **COAL**: black. **SILTSTONE**. **SANDSTONE**.				**MODERATELY WEATHERED TO SLIGHTLY WEATHERED** **FRESH**

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method
- AD auger drilling*
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- HA hand auger
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penetration
- L N H: no resistance ranging to refusal

water
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samples & field tests
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Engineering Log - Borehole

Borehole ID.	***BH04***
sheet:	4 of 13
project no.	***754-NTLGE220504***
client:	***Crescent Newcastle Pty Ltd***
date started:	***12 Sep 2018***
principal:	
date completed:	***14 Sep 2018***
project:	***Proposed Multi Building Residential Development***
logged by:	***MJ***
location:	***11 - 13 Mosbri Crescent, Cooks Hill, NSW***
checked by:	***RB***

position: E: 385,684.5; N: 6,355,567.6 (MGA94) | surface elevation: 32.8 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N		14/09/18		8 7 6 5 4 3 2 1	25.0 26.0 27.0 28.0 29.0 30.0 31.0			**SANDSTONE**. *(continued)*				**FRESH**
								TUFF.				
								COAL: black, with some sand.				
								SILTSTONE.				
								SANDSTONE.				

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method
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- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

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e.g. AD/T
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support
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- C casing
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penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
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- water outflow

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classification symbol & soil description based on Unified Classification System

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Engineering Log - Borehole

Borehole ID.	***BH04***
sheet:	5 of 13
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***12 Sep 2018***
principal:	date completed: ***14 Sep 2018***
project: ***Proposed Multi Building Residential Development***	logged by: ***MJ***
location: ***11 - 13 Mosbri Crescent, Cooks Hill, NSW***	checked by: ***RB***

position: E: 385,684.5; N: 6,355,567.6 (MGA94) | surface elevation: 32.8 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (**SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N		◀		0 -1 -2 -3 -4 -5 -6 -7	33.0 34.0 35.0 36.0 37.0 38.0 39.0			**SANDSTONE**. *(continued)* 38.15 m: 200mm tool drop				**FRESH**

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method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix
e.g. AD/T
- B blank bit
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- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
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- SS split spoon sample
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classification symbol & soil description based on Unified Classification System

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Engineering Log - Borehole

Borehole ID.	***BH04***
sheet:	6 of 13
project no.	***754-NTLGE220504***
client:	***Crescent Newcastle Pty Ltd***
date started:	***12 Sep 2018***
principal:	
date completed:	***14 Sep 2018***
project:	***Proposed Multi Building Residential Development***
logged by:	***MJ***
location:	***11 - 13 Mosbri Crescent, Cooks Hill, NSW***
checked by:	***RB***

position: E: 385,684.5; N: 6,355,567.6 (MGA94) | surface elevation: 32.8 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR				-8	41.0			**SANDSTONE**. *(continued)*				**FRESH**
				-9	42.0			**COAL**: black.				
								SILTSTONE.				
				-10				**COAL**.				
					43.0			42.5 m: 110mm tool drop				
								SANDSTONE.				
N				-11	44.0							
				-12	45.0							
				-13	46.0							
				-14	47.0							
				-15								

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method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix
e.g. AD/T
- B blank bit
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support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
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classification symbol & soil description based on Unified Classification System

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VSt	very stiff
H	hard
Fb	friable
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L	loose
MD	medium dense
D	dense
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Engineering Log - Borehole

Borehole ID.	***BH04***
sheet:	7 of 13
project no.	***754-NTLGE220504***
client:	***Crescent Newcastle Pty Ltd***
date started:	***12 Sep 2018***
principal:	
date completed:	***14 Sep 2018***
project:	***Proposed Multi Building Residential Development***
logged by:	***MJ***
location:	***11 - 13 Mosbri Crescent, Cooks Hill, NSW***
checked by:	***RB***

position: E: 385,684.5; N: 6,355,567.6 (MGA94) | surface elevation: 32.8 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N				-16 -17 -18 -19 -20 -21 -22 -23	49.0 50.0 51.0 52.0 53.0 54.0 55.0			**SANDSTONE**. *(continued)* **COAL**. **SANDSTONE**. **SILTSTONE**. **SANDSTONE**.				**FRESH**

CDF_0_9_06_LIBRARY.GLB rev:AS Log COF BOREHOLE: NON CORED 754-NTLGE220504.GPJ <<DrawingFile>> 31/10/2018 13:47

method
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- AS auger screwing*
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A TETRA TECH COMPANY

Engineering Log - Borehole

Borehole ID.	***BH04***
sheet:	8 of 13
project no.	***754-NTLGE220504***
client: ***Crescent Newcastle Pty Ltd***	date started: ***12 Sep 2018***
principal:	date completed: ***14 Sep 2018***
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RR				-24	57.0			**SANDSTONE**. *(continued)*				**FRESH**
								SILTSTONE.				
								SANDSTONE.				
N				-25	58.0							
				-26	59.0							
				-27	60.0							
				-28	61.0							
				-29	62.0							
				-30	63.0							
				-31								

CDF_0_9_06_LIBRARY.GLB rev:AS Log COF BOREHOLE: NON CORED 754-NTLGE220504.GPJ <<DrawingFile>> 31/10/2018 13:47

method
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A TETRA TECH COMPANY

Engineering Log - Borehole

Borehole ID.	***BH04***
sheet:	9 of 13
project no.	***754-NTLGE220504***
client:	***Crescent Newcastle Pty Ltd***
date started:	***12 Sep 2018***
principal:	
date completed:	***14 Sep 2018***
project:	***Proposed Multi Building Residential Development***
logged by:	***MJ***
location:	***11 - 13 Mosbri Crescent, Cooks Hill, NSW***
checked by:	***RB***

position: E: 385,684.5; N: 6,355,567.6 (MGA94) | surface elevation: 32.8 m (AHD) | angle from horizontal: 90°

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drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR				-32	65.0			**SANDSTONE**. *(continued)*				**FRESH**
	N			-33	66.0							
				-34	67.0							
				-35	68.0							
				-36	69.0			**SILTSTONE**.				
				-37	70.0			**SANDSTONE**.				
				-38	71.0			**SILTSTONE**.				
				-39				**SANDSTONE**.				

CDF_0_9_06_LIBRARY.GLB rev:AS Log COF BOREHOLE: NON CORED 754-NTLGE220504.GPJ <<DrawingFile>> 31/10/2018 13:47

method
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Engineering Log - Borehole

Borehole ID.	***BH04***
sheet:	10 of 13
project no.	***754-NTLGE220504***
client:	***Crescent Newcastle Pty Ltd***
date started:	***12 Sep 2018***
principal:	
date completed:	***14 Sep 2018***
project:	***Proposed Multi Building Residential Development***
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position: E: 385,684.5; N: 6,355,567.6 (MGA94) | surface elevation: 32.8 m (AHD) | angle from horizontal: 90°

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drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description **SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N				-40 -41 -42 -43 -44 -45 -46 -47	73.0 74.0 75.0 76.0 77.0 78.0 79.0			**SANDSTONE**. *(continued)*				**FRESH**

CDF_0_9_06_LIBRARY.GLB rev:AS Log COF BOREHOLE: NON CORED 754-NTLGE220504.GPJ <<DrawingFile>> 31/10/2018 13:47

method
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- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description
based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey
A TETRA TECH COMPANY

Engineering Log - Borehole

Borehole ID.	***BH04***
sheet:	11 of 13
project no.	***754-NTLGE220504***
client:	***Crescent Newcastle Pty Ltd***
date started:	***12 Sep 2018***
principal:	
date completed:	***14 Sep 2018***
project:	***Proposed Multi Building Residential Development***
logged by:	***MJ***
location:	***11 - 13 Mosbri Crescent, Cooks Hill, NSW***
checked by:	***RB***

position: E: 385,684.5; N: 6,355,567.6 (MGA94) | surface elevation: 32.8 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (**SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR				-48	81.0			**SANDSTONE**. *(continued)*				**FRESH**
	N			-49	82.0							
				-50	83.0			**SILTSTONE**.				
				-51	84.0							
				-52	85.0							
				-53	86.0			**SANDSTONE**.				
				-54	87.0							
				-55								

CDF_0_9_06_LIBRARY.GLB rev:AS Log COF BOREHOLE: NON CORED 754-NTLGE220504.GPJ <<DrawingFile>> 31/10/2018 13:47

method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

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MD	medium dense
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VD	very dense

coffey
A TETRA TECH COMPANY

Engineering Log - Borehole

Borehole ID.	***BH04***
sheet:	12 of 13
project no.	***754-NTLGE220504***
client:	***Crescent Newcastle Pty Ltd***
date started:	***12 Sep 2018***
principal:	
date completed:	***14 Sep 2018***
project:	***Proposed Multi Building Residential Development***
logged by:	***MJ***
location:	***11 - 13 Mosbri Crescent, Cooks Hill, NSW***
checked by:	***RB***

position: E: 385,684.5; N: 6,355,567.6 (MGA94) | surface elevation: 32.8 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR N		◀		-56	89.0			**SANDSTONE**. *(continued)*				**FRESH**
				-57	90.0			**SANDSTONE**.				
				-58	91.0							
				-59	92.0			**NO CORE:** 1.65m (92.10-93.75 m) Tool drop.				
				-60	93.0							
				-61	94.0			**CAVE IN: SILTSTONE AND COAL**				
				-62	95.0							
				-63								

CDF_0_9_06_LIBRARY.GLB rev:AS Log COF BOREHOLE: NON CORED 754-NTLGE220504.GPJ <<DrawingFile>> 31/10/2018 13:47

method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
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- VS vane shear; peak/remouded (kPa)
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Fb	friable
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coffey
A TETRA TECH COMPANY

Engineering Log - Borehole

Borehole ID.	**BH04**
sheet:	13 of 13
project no.	**754-NTLGE220504**
client:	**Crescent Newcastle Pty Ltd**
date started:	**12 Sep 2018**
principal:	
date completed:	**14 Sep 2018**
project:	**Proposed Multi Building Residential Development**
logged by:	**MJ**
location:	**11 - 13 Mosbri Crescent, Cooks Hill, NSW**
checked by:	**RB**

position: E: 385,684.5; N: 6,355,567.6 (MGA94) | surface elevation: 32.8 m (AHD) | angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted | drilling fluid: non / water | hole diameter : 96 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
RR				-64	97.0			**CAVE IN: SILTSTONE AND COAL** *(continued)*				**FRESH**
				-65	98.0							
N				-66	99.0			**SANDSTONE**.				
				-67	100.0							
				-68	101.0							
				-69	102.0			Borehole BH04 terminated at 101.60 m Target depth				
				-70	103.0							
				-71								

CDF_0_9_06_LIBRARY.GLB rev:AS Log COF BOREHOLE: NON CORED 754-NTLGE220504.GPJ <<DrawingFile>> 31/10/2018 13:47

method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- RR rock roller/tricone

* bit shown by suffix, e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
- no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Appendix B - Northrop drawings

LEGEND

- SITE BOUNDARY.
- PROPOSED STORMWATER EASEMENT
- PROPOSED BUILDING. DETAILS TO BE PROVIDED AT CC STAGE.
- ø750 — PROPOSED STORMWATER PIPE.
- EXISTING STORMWATER PIPE.
- PROPOSED OVERLAND FLOW PATH.
- GRATED INLET PIT / JUNCTION PIT / KERB INLET PIT. DETAILS TO BE PROVIDED AT CC STAGE.
- EXISTING GRATED INLET PIT / JUNCTION PIT/KERB INLET PIT
- FALL — FFL35.05 — PROPOSED DIRECTION OF GRADE.
- PROPOSED FINISHED FLOOR LEVEL.
- • RL34.95 — PROPOSED SPOT HEIGHT.
- F1 — FENCE - TYPE 1
- DD — DISH DRAIN
- PROPOSED WORK AS PART OF OTHER LEVEL.
- PROPOSED FOOTPATH PAVEMENT. DETAILS TO BE PROVIDED AT CC STAGE.
- PROPOSED COURTYARD. DETAILS TO BE PROVIDED AT CC STAGE.
- RW — PROPOSED RETAINING WALL. DETAILS TO BE PROVIDED AT CC STAGE.
- PROPOSED LANDSCAPING. DETAILS TO BE PROVIDED AT CC STAGE.
- PROPOSED FLOW RATE CONTROL SURFACE
- DENOTES BORE HOLE LOCATION. REFER TO GEOTECH ENGINEER.

PICK UP EX STORMWATER SYSTEM WITHIN THE SITE AND REDIRECT AS SHOWN

APPROXIMATE LOCATION OF EXISTING PIPE

NEW PIT

CL 31.50 IL 29.80

3.5m STORMWATER EASEMENT

STORMWATER EASEMENT TO BEGIN AT GROUND FLOOR EXTERNAL WALL EXTENTS

DISH DRAIN ON BOUNDARY

PROPOSED PIT WITH CONCRETE SURROUND TO BE LOCATED ON BOUNDARY TO AVOID IMPACT TO PARK

PICK UP EX STORMWATER SYSTEM WITHIN THE SITE AND REDIRECT AS SHOWN.

WEIRS IN RETAINING WALLS TO CONTROL OVERLAND FLOW PATH SAFELY.

INSTALL SCOUR PROTECTION TO CONTROL EROSION IN MAJOR EVENTS

CL 31.00 IL 28.90

CL 31.00 IL 28.90

IL 28.40 • RL30.80

APPROXIMATE LOCATION OF EXISTING PIPE TO BE MADE REDUNDANT

GENERALLY FALL COURTYARD AND LANDSCAPING AREAS AWAY FROM BUILDING (TYPICAL).

OVERLAND FLOW SWALE TO HAVE APPROXIMATE RL 31.00 TO ALLOW FOR 0.5% GRADE ALONG EASEMENT

REFER TO DRAWING DA-C20.10 FOR CONTINUATION OF STORMWATER.

ALL EXPOSED COURTYARD, TERRACE AND LANDSCAPING AREAS TO DRAIN TO ASSOCIATED PITS AND FLOOR WASTES. LOCATIONS AND DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE. OUTLETS TO BE CONVEYED TO WATER QUALITY AND QUALITY PROVISIONS BELOW.

FFL35.20 FFL35.20 FFL35.20

• RL35.65 • RL35.62 • RL36.45 • RL36.45 • RL34.95 • RL34.95

BH. 1 BH. 3

1 C30.02 2 C30.03 3 C30.04

M

DRAWN: B.DUGGAN DESIGNED: R.JEANS JOB MANAGER: B.CLARK VERIFIER: B.CLARK

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
J	REVISED FOR S34 - SURVEY TURNED ON	SF	BC	RC	22.10.20
H	REVISED FOR S34 - SECTION TAGS ADDED	BD	BC	RC	28.10.20
I	BORE HOLE LOCATIONS ADDED	BD	BC	RC	05.11.20
K	BORE HOLE IDENTIFICATION ADDED	BD	BC	RC	05.11.20
L	RE-ISSUED FORAPPROVAL	BD	BC	RC	22.04.21
M	RE-ISSUED FOR APPROVAL - SW EASEMENT ADDED	SF	BC	RC	26.04.21

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SCALE 1:250@ A1 — 0 2 4 6 8 10 12m

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Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT
11-17 MOSBRI CRESCENT THE HILL, NSW, 2300

DRAWING TITLE
CIVIL WORKS LEVEL 2

JOB NUMBER **NL180367**

DRAWING NUMBER **DA-C20.20** REVISION **M**

DRAWING SHEET SIZE = A1

Date : 26.04.2021 11:31 AM Plotted By : STEVEN FORBES Found : Y:\YEAR 2018 Jobs\NL180367 - Mosbri Cres\O - Drawings\CIVIL\#CADD-CAD FILES\01-DA\01\NL180367-DA-C20.20 CIVIL WORKS SECOND FLOOR.dwg

LEGEND
SITE BOUNDARY.
PROPOSED STORMWATER EASEMENT
PROPOSED BUILDING. DETAILS TO BE PROVIDED AT CC STAGE.
PROPOSED STORMWATER PIPE.
PROPOSED WATER RISING MAIN.
PROPOSED OVERLAND FLOW PATH.
EXISTING STORMWATER PIPE.
GRATED INLET PIT / JUNCTION PIT / KERB INLET PIT. DETAILS TO BE PROVIDED AT CC STAGE.
EXISTING GRATED INLET PIT / JUNCTION PIT/KERB INLET PIT
PROPOSED FLOOR WASTE DETAILS TO BE PROVIDED AT CC STAGE.
PROPOSED DIRECTION OF GRADE.
FFL29.00
PROPOSED FINISHED FLOOR LEVEL.
PROPOSED SPOT HEIGHT.
PROPOSED WORK AS PART OF OTHER LEVEL.
PROPOSED DRIVEWAY CROSSOVER. DETAILS TO BE PROVIDED AT CC STAGE.
PROPOSED FOOTPATH PAVEMENT. DETAILS TO BE PROVIDED AT CC STAGE.
PROPOSED COURTYARD. DETAILS TO BE PROVIDED AT CC STAGE.
PROPOSED BIO-FILTRATION MEDIA. REFER TO DRAWING DA-C30.01 FOR DETAIL
PROPOSED RETAINING WALL. DETAILS TO BE PROVIDED AT CC STAGE.
OSD
PROPOSED COMBINED REUSE/DETENTION TANK. REFER TO DRAWING DA-C30.01 FOR DETAILS.
LEVEL 1 CARPARK FLOOR WASTES AND FALLS TO MIMIC GROUND LEVEL LAYOUT SHOWN WHERE APPROPRIATE. PROVIDE VERTICAL RISERS FROM LEVEL 1 TO CONVEY CAR DRIP WATER AND WASHDOWN WATER TO GROUND LEVEL NETWORK. DETAILS TO BE PROVIDED AT CC STAGE.
ALL DOWNPIPES FROM MULTI-STORY BUILDING TO BE RETICULATED TO ASSOCIATED BELOW-GROUND RAINWATER HARVESTING TANK. HARVESTED WATER TO BE RETICULATED FOR TOILET FLUSHING AND LAUNDRY USE FOR THE ENTIRE GROUND LEVEL AND LEVEL 1 RESIDENTIAL DWELLINGS. OVERFLOW FROM REUSE TANK TO OVERTOP INTERNAL WEIR INTO ADJACENT ON-SITE DETENTION CHAMBERS. REFER TO DRAWING DA-C30.01 FOR TYPICAL DETAIL.
PROVIDE SPLAY IN BASEMENT TO MIN 4.5m HIGH TO REDUCE ACCESS CONSTRAINTS
BUILDING B
BUILDING C
BUILDING A
CAR PARKING
REFER TO DRAWING DA-C20.20 FOR CONTINUATION OF STORMWATER.
GENERALLY FALL COURTYARD AND LANDSCAPING AREAS TO BIOFILTRATION BASINS.
PROVIDE 4kL RAINWATER TANK FOR EACH TOWNHOUSE. TANK OVERFLOWS TO BE DIRECTED TO BIOFILTRATION BASIN
DENOTES REUSE OVERFLOW WEIR INTO DETENTION CHAMBER
PROPOSED POOL AND DECK AREA. REFER TO LANDSCAPE ARCHITECTS DRAWINGS FOR DETAILS
FFL29.00
FFL29.90
FFL28.10
FFL29.20
FFL28.50
FFL30.60
FFL31.30
DENOTES INTERNAL DISCHARGE WEIR
GENERALLY GRADE EXPOSED COURTYARD AREAS AWAY FROM BUILDING AT MINIMUM 1% (TYPICAL).
3.5m WIDE EASEMENT (TYPICAL) TO BE PROVIDED FROM MOSBRI CRESCENT TO SOUTH EAST CORNER OF BUILDING FOR TRUCK ACCESS.
COMBINED BELOW-GROUND OSD/REUSE TANK. MINIMUM 80kL DETENTION STORAGE AND MINIMUM 75kL REUSE STORAGE. TANK OUTLET TO BE CONVEYED TO STORMWATER INFRASTRUCTURE WITHIN MOSBRI CRESCENT. REFER TO DRAWING DA-C30.01 FOR TYPICAL DETAIL.
ALL DOWNPIPES FROM MULTI-STORY BUILDING TO BE RETICULATED TO ASSOCIATED BELOW-GROUND RAINWATER HARVESTING TANK. HARVESTED WATER TO BE RETICULATED FOR TOILET FLUSHING AND LAUNDRY USE FOR THE ENTIRE LEVEL 1 RESIDENTIAL DWELLINGS. OVERFLOW FROM REUSE TANKS TO OVERTOP INTERNAL WEIR INTO ADJACENT ON-SITE DETENTION CHAMBERS. REFER TO DRAWING DA-C30.01 FOR TYPICAL DETAIL.
FLOOR WASTES TO BE PROVIDED FOR ALL EXPOSED COURTYARD AREAS. OUTLETS TO BE CONVEYED TO BIO-FILTRATION BASINS. DETAILS TO BE PROVIDED AT CC STAGE.
EXISTING PIPE TO BE CAPPED AT SITE BOUNDARY CL.27.7 IL.26.1 BASED ON SURVEY APRIL 2021.
EXISTING KERB INLET PIT AND PIPE
BIO-FILTRATION FOR BYPASS AREA TO DISCHARGE TO EXTERNAL STORMWATER NETWORK
BIOFILTRATION BASINS TO BE PROVIDED AT LOW POINTS THROUGHOUT LANDSCAPING AREAS. MINIMUM FILTER AREA OF 30m² FILTER AREA TO BE PROVIDED. RAISED GRATE INLET PIT TO BE PROVIDED AT EACH BASIN, WITH OUTLETS TO BE CONVEYED TO ASSOCIATED BELOW GROUND OSD TANK. REFER TO DRAWING DA-C30.01 FOR TYPICAL DETAIL.
PROPOSED JUNCTION PIT WITH CONCRETE LID IN PARK. I.L 24.9 (APPROX. VIA INTERPOLATION, TO BE CONFIRMED ON-SITE)
DENOTES CONTINUATION OF OVERLAND FLOW PATH. 100 YEAR ARI FLOW CAPACITY TO BE ALLOWED FOR DURING DETAILED DESIGN.
VERTICAL STORMWATER RISER FROM BASEMENT PUMP-OUT PIT BELOW.
PROVIDE NEW DRIVEWAY CROSSOVER TO COUNCIL STANDARDS. DETAILS TO BE PROVIDED IN S138 APPLICATION.
EXISTING STORMWATER PIPE
PROVIDE NEW KERB INLET PITS WITHIN MOSBRI CRESCENT TO CONNECT PROPOSED STORMWATER NETWORK TO EXISTING INFRASTRUCTURE. DETAILS TO BE PROVIDED IN S138 APPLICATION TO ENSURE NO IMPACT ON DOWNSTREAM PROPERTIES.
BIO-FILTRATION FOR DRIVEWAY TO DISCHARGE TO EXTERNAL STORMWATER NETWORK
LOW LEVEL OUTLET FROM BIOFILTRATION GARDEN
CONNECT PROPOSED STORMWATER NETWORK TO EXISTING PIT.
INVERT UNKNOWN. EXPECTED GRADE TO BE 4.5%. TO BE CONFIRMED ON-SITE
CL.24.00
IL.TBC

DRAWN: B.DUGGAN DESIGNED: R.JEANS JOB MANAGER: B.CLARK VERIFIER: B.CLARK

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
C	REVISED AS CLOUDED	BD	BC	BC	05.03.20
D	REVISED FOR S34 - LAYOUT UPDATE	BD	BC	RC	31.07.20
E	REVISED FOR S34 - LAYOUT UPDATE	BD	BC	RC	12.08.20
F	REVISED AS CLOUDED	RG	BC	BC	30.10.20
G	RE-ISSUED FOR APPROVAL	BD	BC	BC	22.04.21
H	RE-ISSUED FOR APPROVAL - SW EASEMENT ADDED	SF	BC	RC	26.04.21

CLIENT
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SCALE 1:250@ A1 0 2 4 6 8 10 12m

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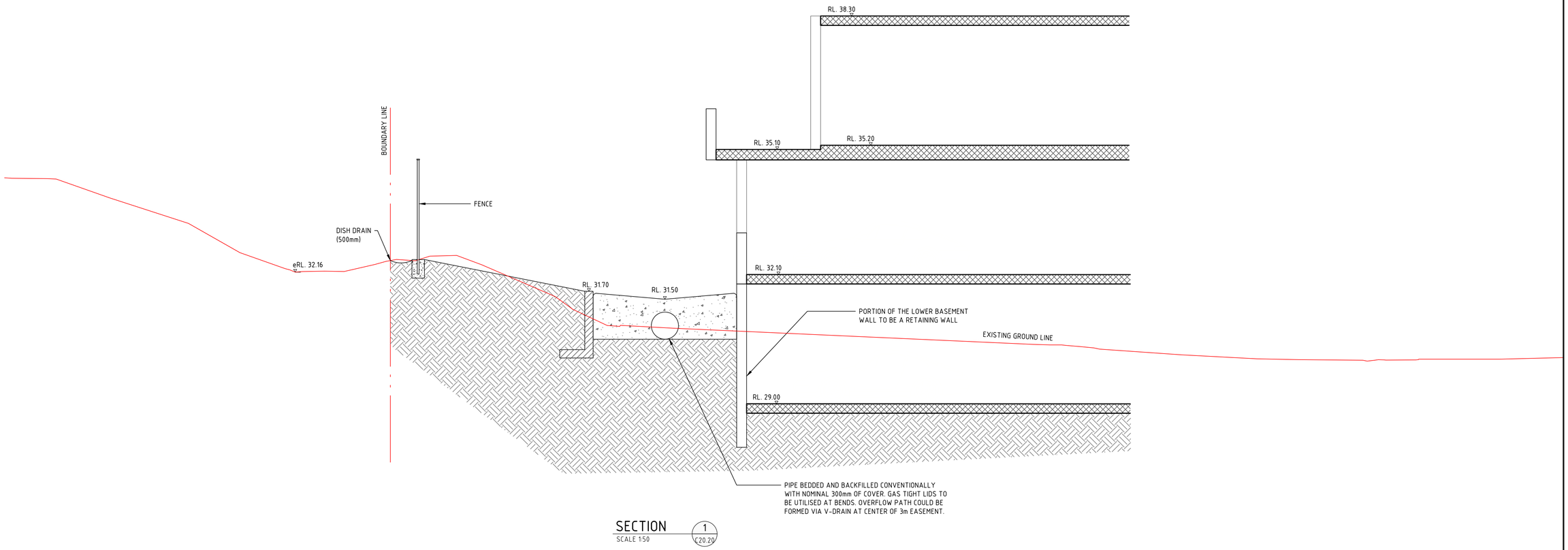
Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT
11-17 MOSBRI CRESCENT THE HILL, NSW, 2300

DRAWING TITLE
CIVIL WORKS GROUND FLOOR LEVEL SHEET 1

JOB NUMBER **NL180367**
DRAWING NUMBER **DA-C02.10**
REVISION **H**
DRAWING SHEET SIZE = A1

Date : 26.04.2021 11:32 AM Plotted By : STEVEN FORBES Found : Y:\YEAR 2018 Jobs\NL180367 - Mosbri Cre\O - Drawings\CIVIL\#CAD\2-CAD FILES\01-DA\01\NL180367-DA-C20.10 CIVIL WORKS GROUND FLOOR.dwg



SECTION 1 / C20.20
SCALE 1:50

DRAWN: B.DUGGAN
DESIGNED: R.JEANS
JOB MANAGER: B.CLARK
VERIFIER: B.CLARK

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR APPROVAL	CH	BC	RC	08.10.19
B	RE-ISSUED FOR APPROVAL	BD	BC	RC	12.08.20
C	RE-ISSUED FOR APPROVAL - EXISITNG GROUND LINE ADDED	SF	BC	RC	22.10.20
D	RE-ISSUED FOR APPROVAL	BD	BC	RC	28.10.20
E	RE-ISSUED FOR APPROVAL	BD	BC	BC	22.04.21

CLIENT
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SCALE 1:50@A1 0.0 0.5 1.0 1.5 2.0 2.5m

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Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
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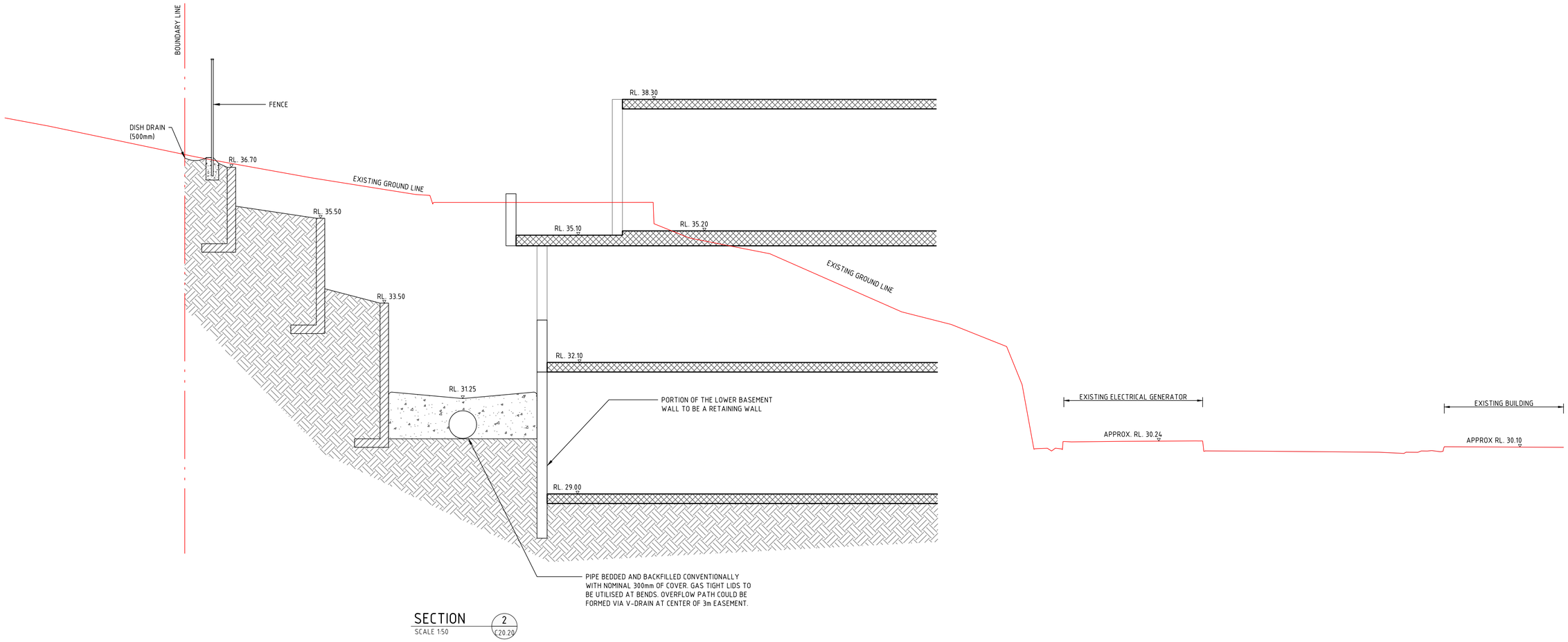
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT
11-17 MOSBRI CRESCENT THE HILL, NSW, 2300

DRAWING TITLE
CIVIL DETAILS - SHEET 2

JOB NUMBER **NL180367**
DRAWING NUMBER **DA-C30.02**
REVISION **E**
DRAWING SHEET SIZE = A1

Date : 22.04.2021 3:33 PM Plotted By : BRAD DUGGAN Found : Y:\YEAR 2018 Jobs\NL180367 - Mosbri Cres\O - Drawings\CIVIL\#CADD-CAD FILES\01-DA\01\NL180367-DA-C30.01 CIVIL DETAILS.dwg



SECTION 2
SCALE 1:50 C20.20

DRAWN: B.DUGGAN
DESIGNED: R.JEANS
JOB MANAGER: B.CLARK
VERIFIER: B.CLARK

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR APPROVAL	BD	BC	RC	28.10.20
B	RE-ISSUED FOR APPROVAL	BD	BC	BC	22.04.21

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SCALE 1:50@A1
0.0 0.5 1.0 1.5 2.0 2.5m

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Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT
11-17 MOSBRI CRESCENT THE HILL, NSW, 2300

DRAWING TITLE
CIVIL DETAILS - SHEET 3

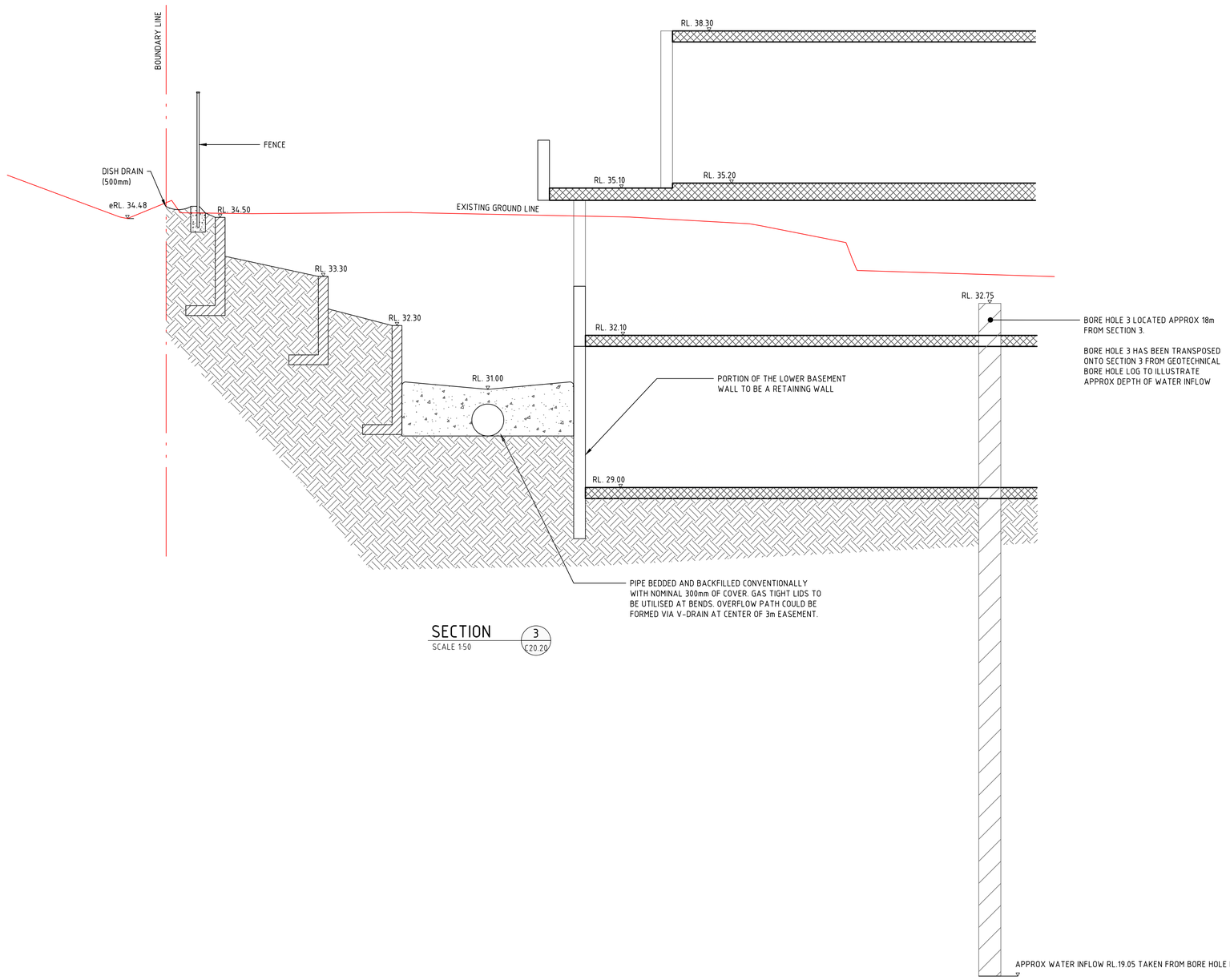
JOB NUMBER
NL180367

DRAWING NUMBER
DA-C30.03

REVISION
B

DRAWING SHEET SIZE = A1

Date : 22.04.2021 3:33 PM Plotted By : BRAD DUGGAN Found : Y:\YEAR 2018 Jobs\NL180367 - Mosbri Cres\O - Drawings\CIVIL\#CAD\2-CAD FILES\01-DA\01NL180367-DA-C30.01 CIVIL DETAILS.dwg



SECTION 3 (C20.20)
SCALE 1:50

DRAWN: B.DUGGAN
DESIGNED: R.JEANS
JOB MANAGER: B.CLARK
VERIFIER: B.CLARK

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR APPROVAL	BD	BC	RC	28.10.20
B	WATER INFLOW ADDED	BD	BC	RC	05.11.20
C	WATER INFLOW UPDATED	BD	BC	RC	05.11.20
D	RE-ISSUED FOR APPROVAL	BD	BC	BC	22.04.21

CLIENT: **CRESCENT NEWCASTLE PTY LTD**

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ARCHITECT: marchesepartners

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SCALE 1:50@A1 — 0.0 0.5 1.0 1.5 2.0 2.5m

NORTHROP
Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT: **11-17 MOSBRI CRESCENT THE HILL, NSW, 2300**

DRAWING TITLE: **CIVIL DETAILS - SHEET 4**

JOB NUMBER: **NL180367**

DRAWING NUMBER: **DA-C30.04**

REVISION: **D**

DRAWING SHEET SIZE = A1

Date : 22.04.2021 3:34 PM Plotted By : BRAD DUGGAN Found : Y:\YEAR 2018 Jobs\NL180367 - Mosbri Cres\O - Drawings\CIVIL\#CAD\2-CAD FILES\01-DA\01\NL180367-DA-C30.01 CIVIL DETAILS.dwg

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