

15 February 2019

Our ref: 754-NTLEN213472-L08

University of Newcastle
Callaghan Drive
Callaghan NSW 2308

Attention: Mathew Watson

Dear Mathew,

**Honeysuckle City Campus Development Site 1
Dewatering Management Advice**

1. Introduction

The following letter provides a background to the Dewatering Management Plan (DMP) that is currently being prepared by Coffey Services Australia Pty Ltd (Coffey) for use by the University of Newcastle (UON) during the proposed development works at Honeysuckle, Newcastle CBD, NSW. The project location is shown on Drawing 1. UON is proposing to develop the new city campus across three sites which will be called the Honeysuckle City Campus Development (HCCD). The respective areas of the sites are shown on Figure 1.1 and are listed below:

- Site 1 - 8,546 m²;
- Site 2 - 5,880 m²; and
- Site 3 - 6,478 m².

The UON is currently preparing a development application to the Newcastle City Council (NCC) for a proposed building development located at Lot 1 DP 1163346. The building forms part of the larger plan to establish the University of Newcastle Honeysuckle City Campus across Lots 1, 2 and 3 DP 1163346, with the proposed development area referred to as "Site 1" (the site, in this letter).

The site will be developed over time to include three multi-storey campus buildings that comprise office and classroom spaces. No residential areas are proposed for the site.

The DMP will guide trenching works for the installation of utility services including water, sewer, communications and electrical at the site as well as excavation of subsurface structures for the construction of Building A1 (refer to Figure 2.1).



Figure 1.1. Honeysuckle City Campus Development location

1.1. Objective

The overall objective of the DMP will be to minimise the potential impacts associated with dewatering during the proposed construction works.

1.2. Scope of work

In order to achieve the objective a dewatering assessment is currently being conducted including the following scope of work:

- Fieldwork including installation of groundwater level loggers, aquifer testing and groundwater quality sampling at three piezometers located within the site;
- Characterisation of groundwater including subsurface hydraulic properties, groundwater levels, flow direction, and groundwater quality;
- Assessment of proposed subsurface development which may impact groundwater;
- Preparation of a DMP in line with the NSW Aquifer Interference Policy including:
 - Analytical assessment of potential inflows to the excavations and associated groundwater drawdown;
 - Analytical assessment of the potential total groundwater take due to dewatering, including groundwater removed in excavated materials;
 - Assessment of the potential influence of dewatering on existing registered groundwater users, GDEs identified by the Bureau of Meteorology's GDE Atlas, and potential ground settlement;
 - Assessment of potential cumulative impacts on water resources, and any proposed options to manage the cumulative impacts;
 - Appropriate dewatering techniques during excavation and construction;

- Assessment of suitability of dewatering tailwater water quality for discharge to stormwater; and
- Groundwater monitoring plan which includes monitoring requirements, identified risks, and proposed trigger levels and responses.

2. Proposed development

The proposed development layout is shown in Figure 2.1. The site will be developed over time to include three multi-storey campus buildings that comprise office and classroom spaces.

The DMP will guide trenching works for the installation of utility services including sewer, water, communications and electrical at the site as well as excavation of subsurface structures for the Stage 1A construction of Building A1.

Preliminary excavation details are listed below and relevant drawings are attached in Appendix A. Assuming a maximum groundwater level of 1 m AHD or 1.5 m below ground level, excavations for the fire water tank, water, electrical and communications trenches are unlikely to require dewatering during average rainfall conditions.

Subsurface excavations for construction of Building A1 will include:

- Lift pit core excavation to -0.22 m AHD with approximate dimensions of 7 m by 4 m and an estimated dewatering period of two months;
- Stormwater tank infrastructure with an estimated dewatering period of one month for the following tanks:
 - Retention tank excavation to 0.3 m AHD with approximate dimensions of 12 m by 2 m;
 - Rain water tank excavation to 0.5 m AHD with approximate dimensions of 6 m by 2 m;
 - Fire water tank excavation to 1.1 m AHD with approximate dimensions of 5.4 m by 5.4 m, unlikely to require dewatering during average rainfall conditions.

Subsurface trenching works for installation of utility services will include:

- Sewer trenches to a depth of 4.3 m requiring dewatering for approximately one month for three 30 m trench sections;
- Water trenches to a maximum depth of 1.4 m, unlikely to require dewatering during average rainfall conditions;
- Electrical and communications trenches to a maximum depth of 1 m, unlikely to require dewatering during average rainfall conditions.

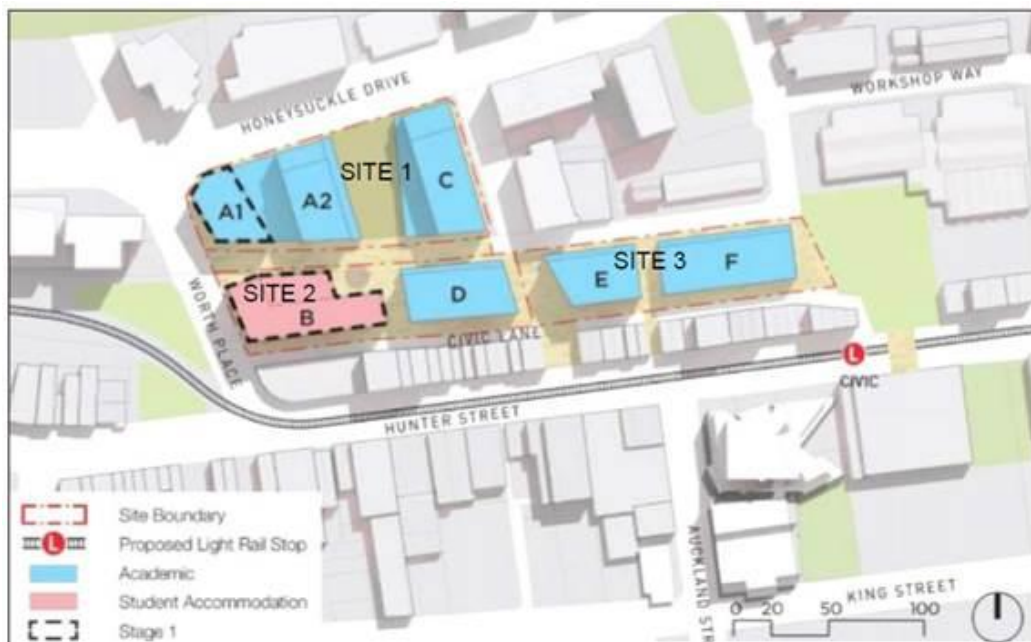


Figure 2.1. Honeysuckle City Campus Development proposed layout

3. Site characteristics

3.1. Topography and drainage

Reference to the topographic map on NSW Land & Property Information Spatial Information exchange (SIX) website (<http://maps.six.nsw.gov.au/>) indicated that the site was situated on level ground. The topographic map indicates that the elevation of the site is approximately 3 m AHD. Survey data for ground level at site monitoring piezometers indicates ground levels between 2.4 m AHD and 2.5 m AHD.

Where pavements exist, surface water would drain to the municipal stormwater system. In areas which are currently unpaved and vegetated, surface water would infiltrate into site soils and runoff would drain into the municipal stormwater system.

Surface water flow would generally be expected to follow the slope of the land from the centre of the site towards either the north west or south east. Surface water flow directions may vary in localised areas where the site surface has been levelled.

Stormwater from the site likely discharges into Newcastle Harbour, located approximately 130 m to the north of the site.

3.2. Geology

Reference to the 1:100,000 scale Newcastle Coalfields Regional Geology Map indicates that the site is underlain by fill, alluvial and estuarine soils that are in turn underlain by rock belonging to the Lambton Subgroup of the Newcastle Coal Measures. This subgroup comprises siltstone, sandstone and coal seams. The top of rock occurs at approximately -20 m AHD and the anticipated presence of suitable founding conditions in the Unit 3 sand between approximately -5 m AHD and -10 m AHD.

Based on geotechnical investigation results (Coffey 2013a), including those from previous investigations, a geotechnical model was developed. The model is separated into the following geotechnical units:

- UNIT 1a: Fill, gravelly sand, medium dense to very dense, with cobbles, slag, bricks, and ash (uncontrolled fill);
- UNIT 1b: Fill, sand, medium dense to very dense, typically dense, with some gravel / shell layers. This material was dredged and placed at the site in the past (uncontrolled fill);
- UNIT 2a: Clay / silt, soft to very soft (estuarine);
- UNIT 2b: Silty sand / sand, medium dense (estuarine / marine);
- UNIT 3: Sand, medium dense to very dense, typically dense, with some loose lenses (marine); and
- UNIT 4: Clay, stiff to very stiff (estuarine over residual).

3.3. Acid sulfate soils

Acid sulfate soils (ASS) at the site are described in detail in the Acid Sulfate Soil Management Plan (ASSMP) (Coffey 2019b). The DLWC 1997 ASS risk map indicates the site is in an area of “High Probability” of ASS between 1 and 3 metres below the ground surface. The site was also classified as Class 3¹ in the Newcastle City Council, Local Environment Plan, Map 4, 2012.

ASS testing results from fieldwork conducted in December 2018 and reported in Coffey (2019a,b) showed that potential acid sulfate soils (PASS) were identified in soils between 2.5 m and 4.0 m below ground level at sampling sites BHP9, BHP11, BHP13, BHP14, BHP15, BHP16, BHP18, BHP19, BHP20, MW01, MW02 and MW03 with further confirmation below 4.0 m at MW02. Sampling locations are shown on Drawing 2.

A preliminary liming rate was established based on the highest concentration of %S obtained at BHP18 3.5-3.8 (0.44%S) of 21 kg CaCO₃ per tonne with an included safety factor of 1.5. The liming rate does not take into account the acid neutralising capacity of the soil and is therefore conservative.

3.4. Mine subsidence

The site is underlain by mine workings within the Borehole Seam at a depth of approximately 75m. These workings are part of the Wickham and Bullock Island Colliery. The workings were most likely completed between 1880 and 1896 when a large portion of the workings crushed, with additional crushing in 1897. The Borehole Seam had a total thickness of about 6.26m to 6.62m with a mined height of about 5.5m when the tops and bottoms were mined (shown as hatching on the record tracing). After mining was stopped, the workings were allowed to flood.

¹ Works more than 1 metre below the natural ground surface and works by which the water table is likely to be lowered more than 1 metre below natural ground surface may require a Management Plan or Preliminary Assessment prior to development consent being issued.

3.5. Groundwater

A detailed site investigation was completed by Coffey in January 2019, reported in Coffey (2019a).

Three piezometers were installed on site on 9 January 2019. Piezometer completion details are shown in Table 3.1. Piezometer locations are shown on Drawing 2 and bore logs are attached in Appendix B.

Table 3.1. Piezometer completion details

Piezometer ID	Easting (m MGA)	Northing (m MGA)	Ground elevation (m AHD)	Top of casing (m AHD)	Screen interval (m bgl)	Total depth (m bgl)	Screened lithology
MW01	384876	6356196	2.47	2.92	2.6-5.65	5.65	Sand and clayey sand
MW02	384861	6356227	2.49	3.395	2.8-5.89	5.89	Sand and clayey sand
MW03	384905	6356216	2.38	3.45	2.6-5.15	5.15	Sand and clayey sand

m bgl - m below ground level

m AHD - m Australian Height Datum

3.5.1. Subsurface hydraulic properties

Coffey will be conducting aquifer testing at the three site piezometers to obtain site-specific hydraulic conductivity data, which will be used to assess groundwater inflow rates for the DMP.

Rising head tests were conducted by Douglas & Partners Pty Ltd (1993) at six piezometers located at the adjacent site approximately 100 m to the east. Reported hydraulic conductivity values ranged from 1.6 m/day to 3.7 m/day.

3.5.2. Groundwater levels

Groundwater levels measured at the site piezometers on 15 January 2019 are detailed in Table 3.2. The gauging was conducted during low tide and groundwater levels may also be lower due to basement dewatering to approximately 7 m below ground level about 100 m to the north west.

Continuous groundwater level data is being collected by Coffey following installation of loggers at the site piezometers and will be reported as part of the DMP.

Table 3.2. Groundwater levels

Piezometer ID	SWL (m AHD) 15 Jan 2019	SWL (m bgl) 15 Jan 2019
MW01	-0.49	2.96
MW02	-0.70	3.19
MW03	-0.45	2.83

m bgl - m below ground level

m AHD - m Australian Height Datum

SWL - static water level

The groundwater level is approximately 2 m below the existing ground surface under normal conditions or at about 0 to 0.5 m AHD (Coffey 2013a). The groundwater level is expected to be slightly influenced by tides with a lag time response that increases with the distance from the sea wall.

In response to heavy and prolonged rain, the groundwater level is expected to rise. Long term logging of groundwater levels has not been undertaken to our knowledge at this site. It is likely that groundwater levels would rise to around 1 m AHD for short periods during and immediately after heavy rain.

Groundwater in the mine working has been observed to be under artesian conditions, where the hydraulic head of the mine water is greater than the near surface water table. However, the head has not been observed to be higher than the existing ground surface (Coffey 2013a). During excavation for the Chifley building basement, the artesian head in the mine workings led to mine water flowing up through an old borehole casing and into the excavation. This occurred when the excavation was nearing its deepest point and when spear point dewatering had lowered the near surface water table. The borehole casing was successfully plugged and the flow of water stopped.

Unsealed open boreholes to the mine workings still exist in this area. Treating grout holes from the uncompleted grouting is discussed in Coffey report (2013b) on the mine grouting summary. In addition, other older boreholes may be present. We recommend Coffey be called to assess and advise on sealing them before excavations are taken deeper than 1.8 m AHD.

3.5.3. Groundwater quality

Groundwater samples were collected at the three site piezometers on 15 January 2019 as part of the detailed site investigation reported in Coffey (2019a). Field water quality parameters indicated the groundwater collected was neutral to slightly alkaline with a pH range from 7.0 to 7.6. Electrical conductivity (EC) measurements indicated the groundwater collected was brackish ranging from 2.6 mS/cm to 7.1 mS/cm.

Laboratory results were evaluated against the ANZECC 2000 trigger values for protection of 95% of species within a marine environment. Samples were analysed for potential contaminants of concern including dissolved metals, organochlorine pesticides (OCPs), total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, xylenes (BTEX), polyaromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs). All analytes were below laboratory detection limits with the exception of dissolved metals. Two dissolved metals exceeded the ANZECC 2018 trigger values as follows:

- Dissolved copper was reported at a concentration of 0.004 mg/L at MW01, exceeding the trigger value of 0.0013 mg/L; and
- Dissolved zinc was reported at concentrations of 0.087 mg/L (MW01) and 0.17 mg/L (MW03), exceeding the trigger value of 0.015 mg/L.

Additional groundwater samples will be collected from the three site piezometers as part of the dewatering assessment and will be sent to a laboratory for the following analyses:

- EC;
- Total dissolved solids (TDS);
- Cations: calcium, magnesium, potassium and sodium;
- Anions: alkalinity, chloride, fluoride and sulfate;
- Nutrients: ammonia, nitrate, nitrite, total kjeldahl nitrogen, total nitrogen, total phosphorus; and
- Dissolved metals: arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel and zinc.

The reported heavy metal concentrations are likely reflective of the regional groundwater quality given the extensive industrial and fill history of the area as a whole and not a result of specific historical activities on site (Coffey 2019a). There is currently no beneficial use of groundwater in the immediate area given the salinity of the groundwater in proximity to the harbour.

The detailed site investigation concluded that the groundwater should be of sufficient quality to be considered suitable for stormwater discharge (Coffey 2019a). Dewatering will need to be managed by undertaking a dewatering assessment (currently in progress) and preparation of a site-specific DMP. The DMP will provide further discussion regarding the additional water quality results to be collected and discharge options.

Preliminary discussions with Council regarding the requirements for discharge to stormwater during dewatering should also be undertaken prior to the commencement of early earthworks activities.

3.5.4. Existing groundwater users

To assess the potential impact of the development on existing groundwater users, a search of WaterNSW registered groundwater bores was conducted. There are three registered groundwater bores within 500 m of the site. The purpose of these bores is for monitoring. A summary of the groundwater search is included in Table 3.3 and a copy of the search is attached in Appendix C.

Table 3.3. Groundwater bore search results summary

Registered bore ID	Purpose of bore	Distance and direction from site
GW201489	Monitoring bore	421 m south east
GW201490	Monitoring bore	479 m south east
GW201491	Monitoring bore	434 m south east

4. Dewatering management

Construction dewatering will be achieved using conventional methods and will be required for the sewer trenching works and excavations within the A1 building footprint including the lift pit, stormwater retention tank and the rain water tank. A combination of sheet piling to minimise inflows and vacuum spear points to lower groundwater levels are likely to be adopted.

An assessment of the likely groundwater inflow rates and the total volume of groundwater to be dewatered will be presented in the DMP.

Groundwater parameters will be monitored and analysed prior to dewatering. This will include pH, EC, temperature, dissolved oxygen (DO), chloride, sulfate and heavy metal concentrations.

Since there is a potential for the groundwater table to be lowered for a considerable period of time (several weeks or months) the Contractor should install and/or employ an appropriate groundwater control system to minimise the ingress of groundwater into the excavations such that the surrounding groundwater table will be maintained.

Due to the presence of PASS at the site, the surrounding groundwater as well as the groundwater extracted through dewatering by spear points should be monitored for pH regularly by the Contractor, and this should involve monitoring from nearby existing piezometers or installation of new monitoring piezometers. The Contractor should also endeavour to minimise the depth, lateral extent and duration of dewatering where possible.

Options for disposal of groundwater include:

- Land irrigation;
- Disposal to the Hunter River or local stormwater or sewer systems; and
- Offsite disposal to a wastewater disposal facility.

The most effective option would be land irrigation, or re-injection via existing wells or upgradient trenches as this would assist in maintaining groundwater levels. Confirmation of requirement of specific permission from regulatory authorities should be sought from the NSW Department of Industry Water prior to undertaking this activity.

As discussed above, based on the groundwater assessment undertaken as part of the detailed site investigation (Coffey 2019a), the water should be suitable for disposal to stormwater and specific discussions with Council should be undertaken to confirm this as a disposal option.

Should groundwater require pH adjustment prior to disposal offsite or to stormwater, the following general procedures should be followed as outlined in the ASSMP (2019b):

- Water should be placed in an acid resistant holding tank or pond, and samples collected to assess the pH, EC, chloride, sulfate, and heavy metals;
- Should pH adjustment be required, a neutralising agent should be added to the water at a rate assessed from the results of the testing and Table 7.1 of Management Guidelines in the ASSMAC (1998) Acid Sulfate Soils Manual or using suitable alternative guidance;
- Following treatment, the water should be re-sampled and tested again for pH, EC and metals to assess the disposal options; and
- Depending on the laboratory results, the treated water could either be applied to land, discharged to stormwater or be removed and disposed by a licensed liquid waste contractor. Permission from the relevant regulatory authority (NSW Department of Industry Water and/or Newcastle City Council) must be obtained before disposal to stormwater networks.

The DMP will be developed in line with the NSW Aquifer Interference Policy, presenting minimal impact considerations for coastal sands water sources. A groundwater monitoring plan will be presented which will include monitoring requirements, identified risks, and proposed trigger levels and responses.

Coffey recommends the following monitoring (consistent with WaterNSW general Terms of Approval):

- Monthly records of dewatering volumes (groundwater pumped from excavations) released from site during excavation/construction;
- Monthly records of the water quality of groundwater pumped from the excavations during excavation/construction;
- Daily records of groundwater levels from the date of consent until at least two months after the cessation of dewatering (undertaken using data loggers);
- Provision of the above monitoring information to WaterNSW following cessation of dewatering; and
- Access to groundwater monitoring and extraction wells to be provided to permit inspection by WaterNSW as required.

5. References

- Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand. 2000. National Water Quality Management Strategy - Australian and New Zealand Guidelines for Fresh and Marine Water Quality.
- Coffey Geotechnics Pty Ltd. 2013a. Honeysuckle Central Geotechnical Investigation. Hunter Development Corporation. Report reference GEOTWARA20903AD-AF, dated 29 May 2013.
- Coffey Geotechnics Pty Ltd. 2013b. Summary of Mine Stabilisation Activities - Honeysuckle Central. Hunter Development Corporation. Report reference GEOTWARA20903AD-AC, dated 5 June 2013.
- Coffey Services Australia Pty Ltd. 2019a. Honeysuckle City Campus Development (HCCD) Project, Detailed Site Investigation, Site 1, University of Newcastle HCCD. Report reference 754-NTLEN213472-R09, dated 23 January 2019.
- Coffey Services Australia Pty Ltd. 2019b. Proposed Honeysuckle City Campus Site 1 Development Acid Sulfate Soil Management Plan. Report reference 754-NTLEN213472-R09, dated 8 February 2019.
- Department of Land and Water Conservation. 1997. 1:25,000 Acid Sulfate Soil Risk Map.
- Douglas & Partners Pty Ltd. 1993. Report on Geotechnical & Mine Subsidence Investigation, Proposed Commercial Development, Civic Workshops Honeysuckle. Prepared for the Property Services Group Honeysuckle Development Corporation. Report reference 16670/1, November 1993.
- Newcastle City Council. 2012. Newcastle Local Environmental Plan 2012, Acid Sulfate Soils Map, SheetASS_004.
- NSW Acid Sulfate Soil Management Advisory Committee. 1998. Acid Sulfate Soil Manual.

We draw your attention to the enclosed sheet entitled "Important information about your Coffey Report" which should be read in conjunction with this letter. We trust that this letter meets your requirements. If you require further information regarding this letter please do not hesitate to contact the undersigned on 0449 901 572.

For and on behalf of Coffey



Corinna De Castro
Associate Hydrogeologist

Attachments

- Important information about your Coffey Report
- Drawing 1 - Site location plan
- Drawing 2 - Borehole location plan
- Appendix A - Excavation details
- Appendix B - Piezometer logs
- Appendix C - Registered groundwater bores

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

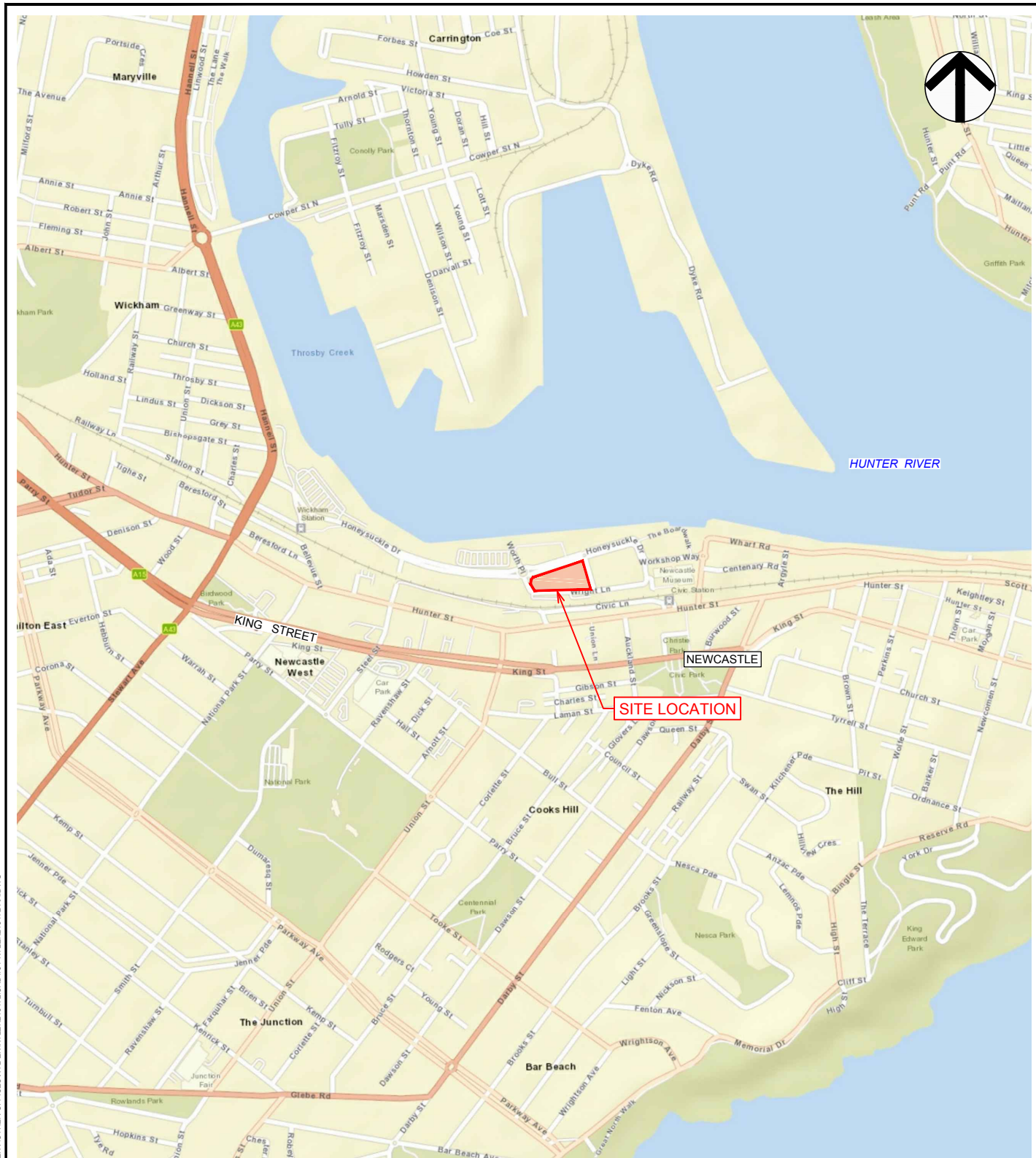
Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As 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.

* For further information on this aspect reference should be made to "Guidelines for the Provision of Geotechnical information in Construction Contracts" published by the Institution of Engineers Australia, National headquarters, Canberra, 1987.

Drawings



Scale (metres) 1:15000

IMAGERY SOURCE: WORLD STREET MAP
 SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN,
 METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, ©
 OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

DRAFT

drawn	SR / AW	 A TETRA TECH COMPANY	client:	UNIVERSITY OF NEWCASTLE		
approved	-		project:	HONEYSUCKLE CITY CAMPUS DEVELOPMENT 16 HONEYSUCKLE DRIVE, NEWCASTLE, NSW		
date	22 / 01 / 19		title:	SITE LOCATION PLAN		
scale	AS SHOWN		project no:	754-NTLEN213472	drawing no:	1
original size	A4				rev:	A



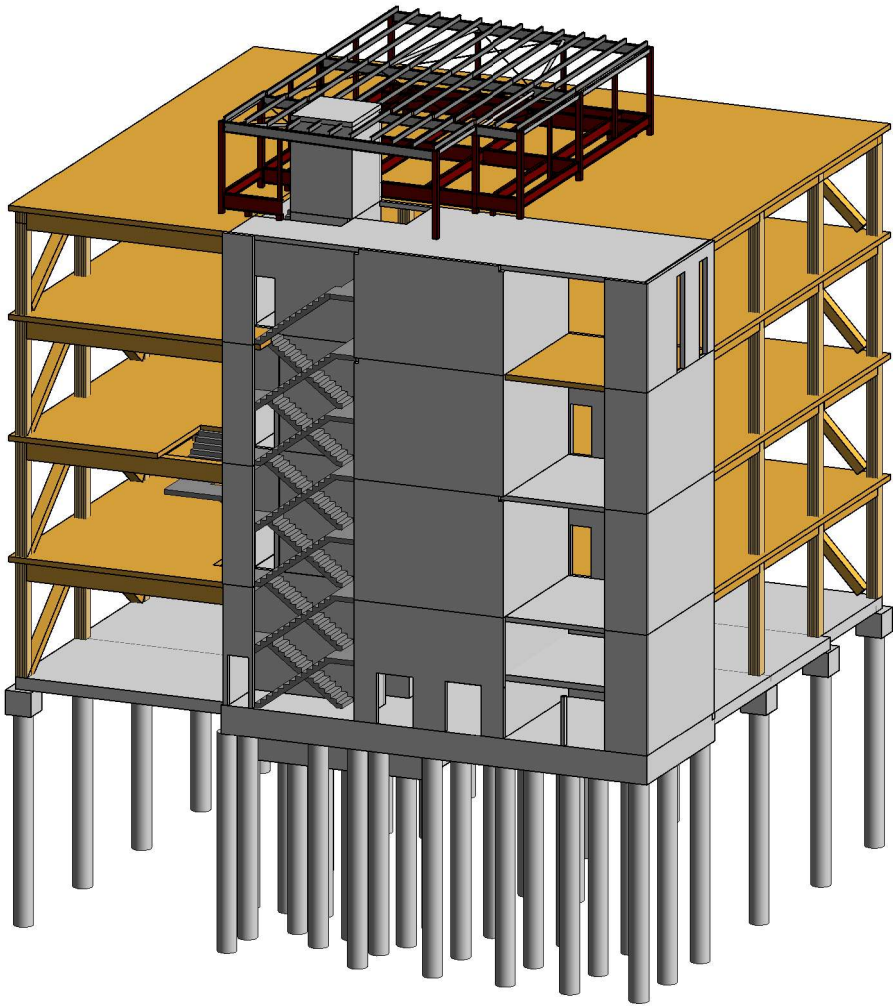
revision	no.	description			drawn	approved	date	100 0 10 30 50 Scale (metres) 1:1000 AERIAL IMAGERY COPYRIGHT: ©Land and Property Information (14/07/2018) SOURCED FROM WEBSITE: http://www.lpi.nsw.gov.au/mapping_and_imagery/lpi_web_services LICENSED UNDER CC BY 3.0 AU (https://creativecommons.org/licenses/by/3.0/au/legalcode)	drawn	SR / AW	coffey A TETRA TECH COMPANY	client: UNIVERSITY OF NEWCASTLE		
	A	ORIGINAL ISSUE							approved	-		project: HONEYSUCKLE CITY CAMPUS DEVELOPMENT 16 HONEYSUCKLE DRIVE, NEWCASTLE, NSW		
									date	23 / 01 / 19		title: BOREHOLE LOCATION PLAN		
									scale	AS SHOWN		project no: 754-NTLEN213472		
									original size	A3		drawing no: 2		rev: A

Appendix A – Excavation details

HCCD STAGE 1A

UNIVERSITY OF NEWCASTLE

LOCALITY PLAN



aurecon

www.aurecongroup.com

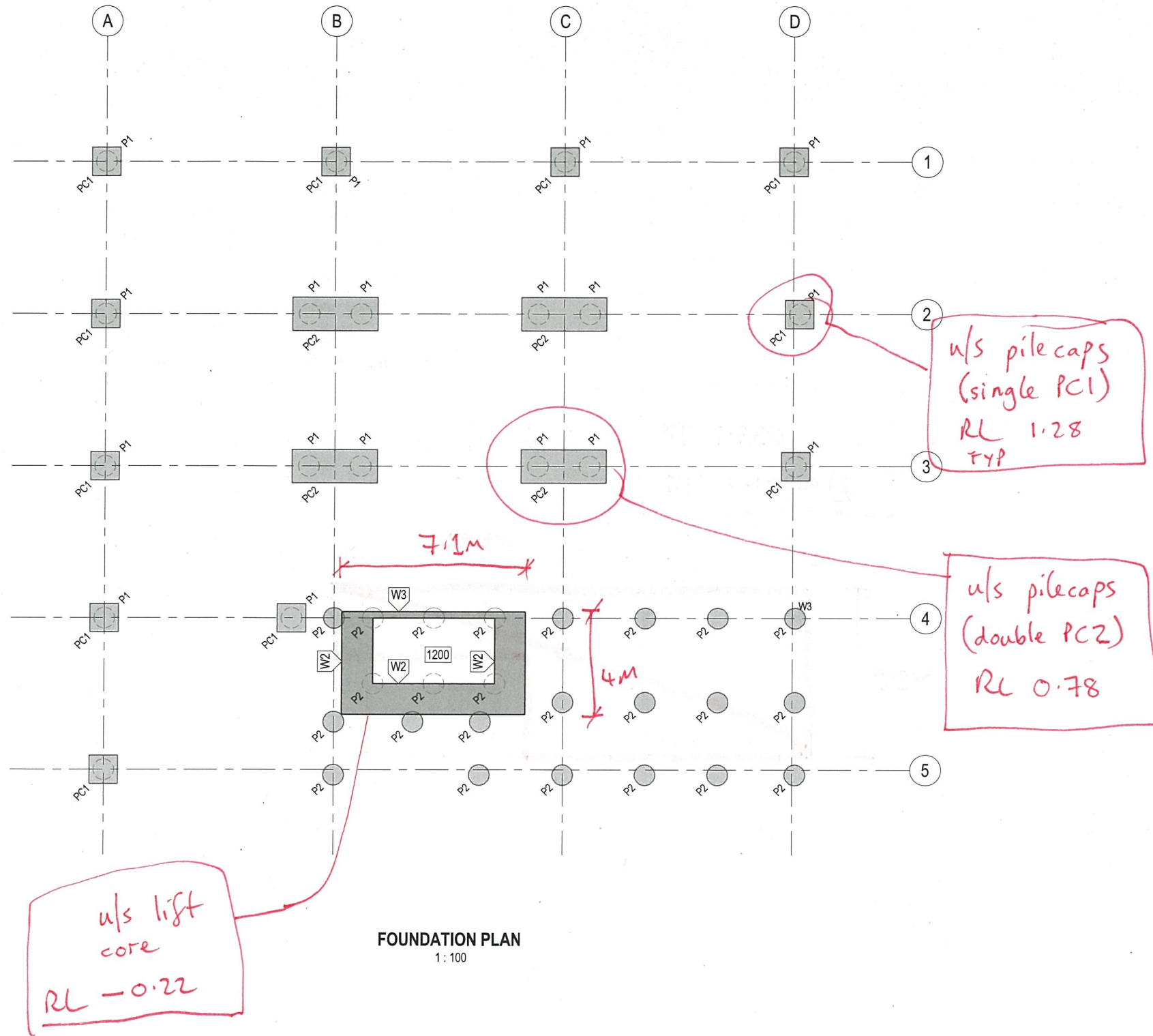
ABN: 54 005 139 873

A person using the Aurecon drawings and other data accepts the risk of:
1. Using the drawings and other data in electronic form without requesting and checking them for accuracy against the original hard copy versions;
2. Using the drawing or other data for any purpose not agreed to in writing by Aurecon.
Wherever a discrepancy in the contract documents is found and unless directed otherwise by the Principal/Engineer, the contractor shall adopt, at their own cost the greater quantum, class of finish, grade, or specification where applicable.

**PRELIMINARY
NOT FOR CONSTRUCTION**



SIZE	DATE	DRAWING No.	PROJECT No.	WBS	TYPE	DISC - NUMBER	REV
A1	25.01.19	504356 -	0001 -	DWG -	ST00001	-	A



STRUCTURAL CONCRETE WALL SCHEDULE		
MARK	SIZE	REMARK
BW1	200 THK.	NOT USED
L1	200 THK.	PRECAST CONCRETE LIFT WALL. REINFORCEMENT RATE = 150kg/m ³
W1	200 THK.	PRECAST CONCRETE WALL. REINFORCEMENT RATE = 150kg/m ³
W2	1200 THK.	NOT USED
W3	250 THK.	NOT USED

STRUCTURAL CONCRETE FRAMING SCHEDULE		
MARK	SIZE (D x W)	REMARK
EB1	600x500mm	CONCRETE EDGE BEAM. REINFORCEMENT RATE = 150kg/m ³
IB1	600x500mm	CONCRETE EDGE BEAM. REINFORCEMENT RATE = 150kg/m ³

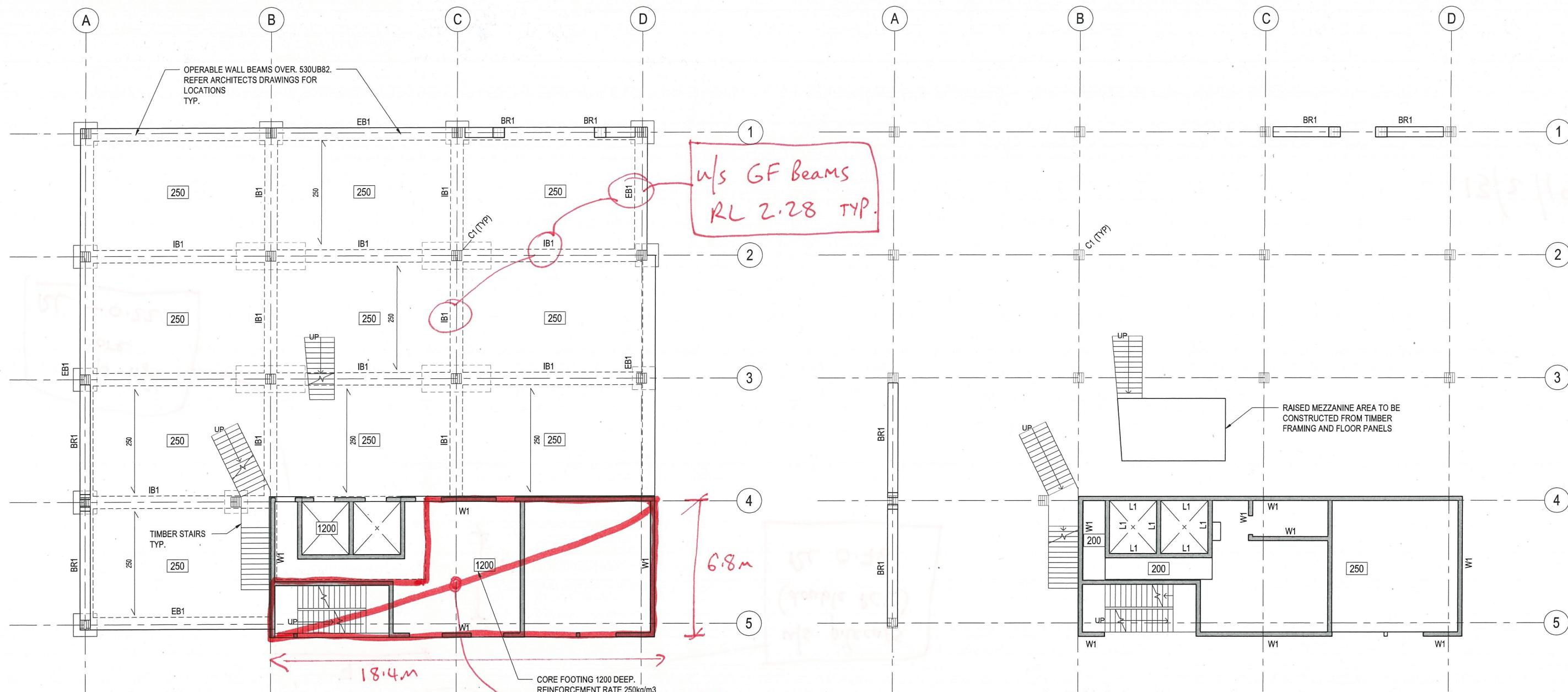
STRUCTURAL FOUNDATION SCHEDULE					
MARK	SIZE	AXIAL LOAD (kN)	SHEAR LOAD (kN)	MOMENT LOAD (kNm)	COMMENTS
P1	800 DIA.				PILE
P2	800 DIA.				PILE (NO PILE CAP)
PC1	1100 x 1100 x 1000 DEEP	-	-	-	PILE CAP
PC2	3300 x 1300 x 1500 DEEP	-	-	-	PILE CAP

NOTES:

- ALLOW FOR PILES TO HAVE CONCRETE STRENGTHS OF 40MPa AND REO RATES OF 100kg/m³
- ALLOW FOR PILE CAPS TO HAVE CONCRETE STRENGTHS OF 40MPa AND REO RATES OF 100kg/m³
- GRANOR LAMINATED ELASTOMERIC BEARING PADS, OR EQUIVALENT, ARE TO BE DESIGNED BY THE SUPPLIER FOR THE SPECIFIED AXIAL LOADS; AND +/- 50mm MAX. TRANSLATIONAL MOVEMENTS (IN ADDITION TO AS2159 REQUIREMENTS); AND 2mm/m MAX. ROTATIONS

13/2/19.





GROUND FLOOR PLAN
1:100

GROUND FLOOR MEZZANINE
1:100

STRUCTURAL CONCRETE WALL SCHEDULE

MARK	SIZE	REMARK
BW1	200 THK.	NOT USED
L1	200 THK.	PRECAST CONCRETE LIFT WALL. REINFORCEMENT RATE = 150kg/m3
W1	200 THK.	PRECAST CONCRETE WALL. REINFORCEMENT RATE = 150kg/m3
W2	1200 THK.	NOT USED
W3	250 THK.	NOT USED

STRUCTURAL TIMBER FRAMING SCHEDULE

MARK	SIZE	REMARK
B1	480x760mm	GLULAM BEAM GL24H
B2	480x400	GLULAM BEAM GL24H
BR1	480x400	GLULAM BEAM GL24H

STRUCTURAL CONCRETE FRAMING SCHEDULE

MARK	SIZE (D x W)	REMARK
EB1	600x500mm	CONCRETE EDGE BEAM. REINFORCEMENT RATE = 150kg/m3
IB1	600x500mm	CONCRETE EDGE BEAM. REINFORCEMENT RATE = 150kg/m3

NOTES:

- ALL TIMBER MEMBER SIZES ARE PRELIMINARY AND SHALL BE CONFIRMED BY SPECIALIST TIMBER CONTRACTOR DURING DETAILED DESIGN PHASE OF THE PROJECT.
- MAKE ALLOWANCE FOR TYPICAL TIMBER CONNECTIONS, INCLUDING SCREWS AND STEEL STIFFENER PLATES.
- PENETRATIONS THROUGH TIMBER BEAMS CAN BE ACCOMMODATE UP TO 300mm DEEP. LOCATIONS TO BE COORDINATED.
- CONCRETE FLOOR SLABS. ALLOW REINFORCEMENT RATE = 150kg/m3

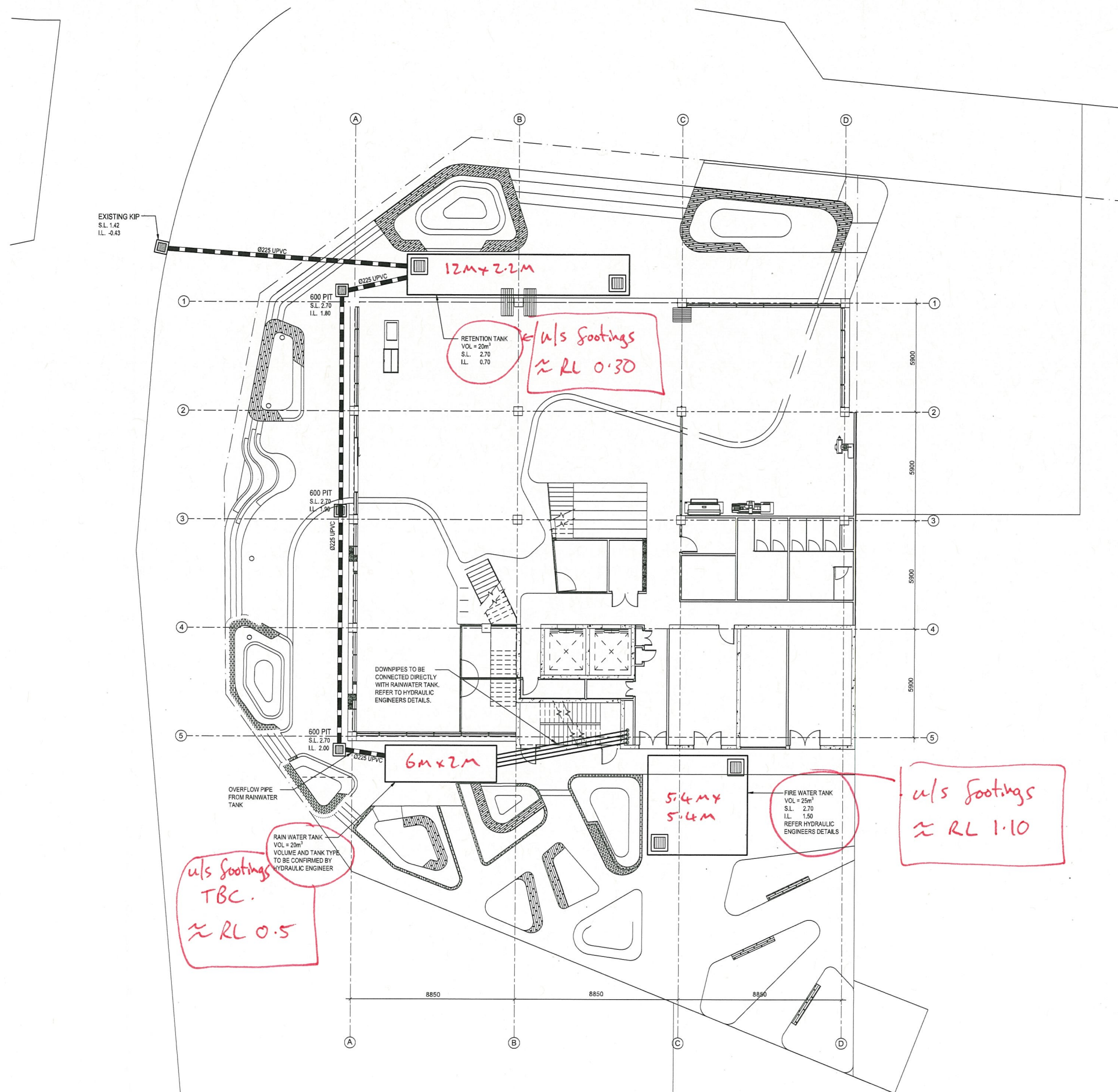


NOTES

- FOR GENERAL DRAINAGE NOTES REFER TO DRG. CV-0002
- ALL STORMWATER PIPES TO BE MIN 150mm UPVC U.N.O
- MIN PIPE GRADE 1%
- DOWNPIPES (DP) LOCATION SHOWN INDICATIVELY ON PLAN. DP TO BE LOCATED AT GROUND LEVEL AS PER THE ARCHITECTURAL AND HYDRAULIC DRAWINGS. DP PIPE SIZE SHALL BE CONTINUED BELOW GROUND AND CONNECTED TO THE NEAREST STORMWATER PIT. INCREASED PIPE SIZES SHOWN * ON PLAN. (ES 225MM UPVC)
- PROVIDE INSPECTION OPENING (IO) AT CHANGES IN PIPE SIZE.
- ALL STORMWATER INLET PITS TO HAVE ENVIROPOD SERIES 200 FILTER AND BASKET INSTALLED
- BIOGARDEN EXTENTS AND DETAILS TO LANDSCAPE ENGINEERS DETAILS.

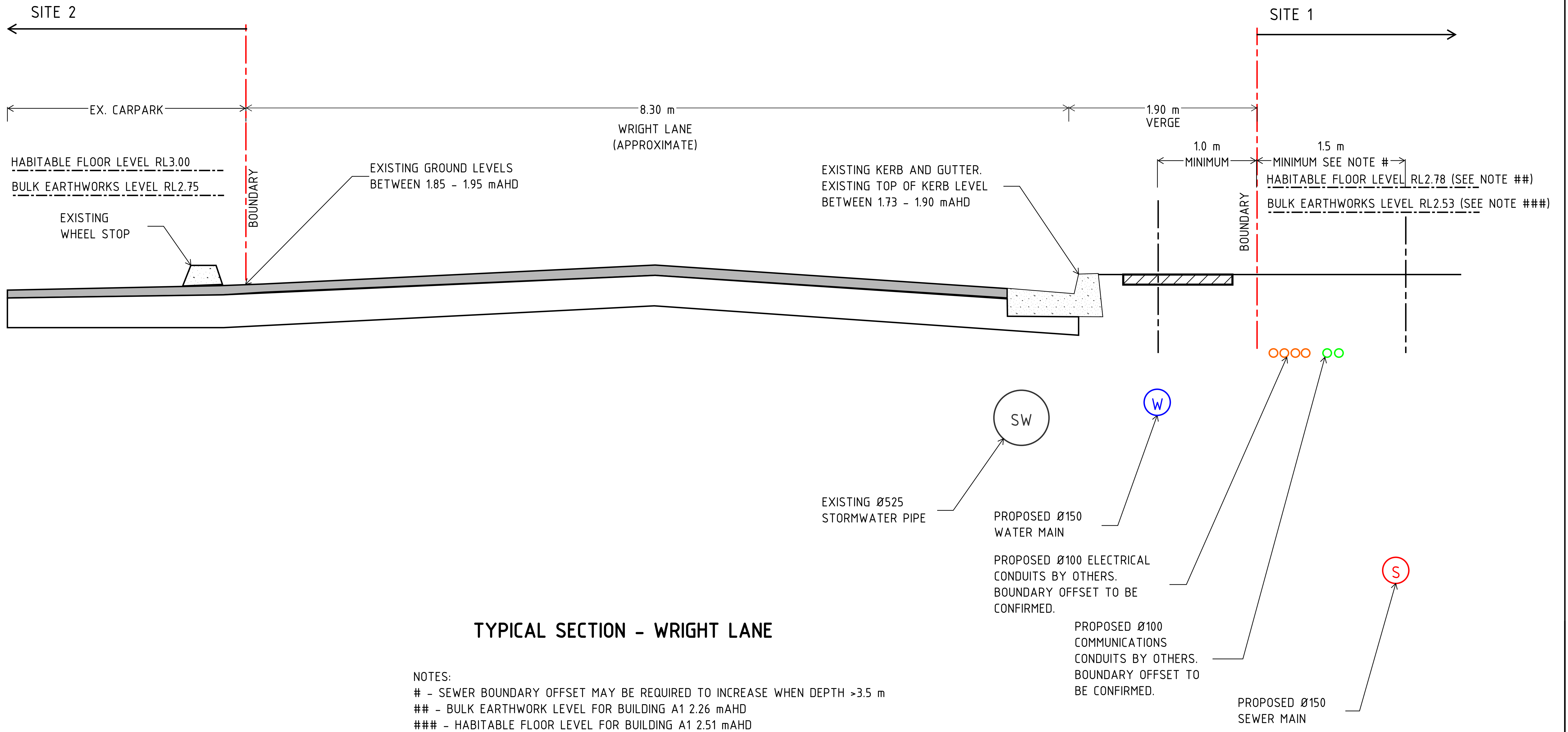
LEGEND

- DENOTES DOWNPIPE
- DENOTES STORMWATER DRAINAGE PIPE. MATCH DP SIZE & EXTEND PIPES AT 1% MIN. TO NEAREST PIT AS SHOWN
- DENOTES GRATED DRAIN
- GRATED PIT
- PAVER ACCEPTING ACCESS COVER OVER STORMFILTERS
- KIP KERB INLET PIT
- S.L. SURFACE LEVEL
- I.L. INVERT LEVEL
- INSPECTION OPENING
- DIRECTION OF PIPE FLOW

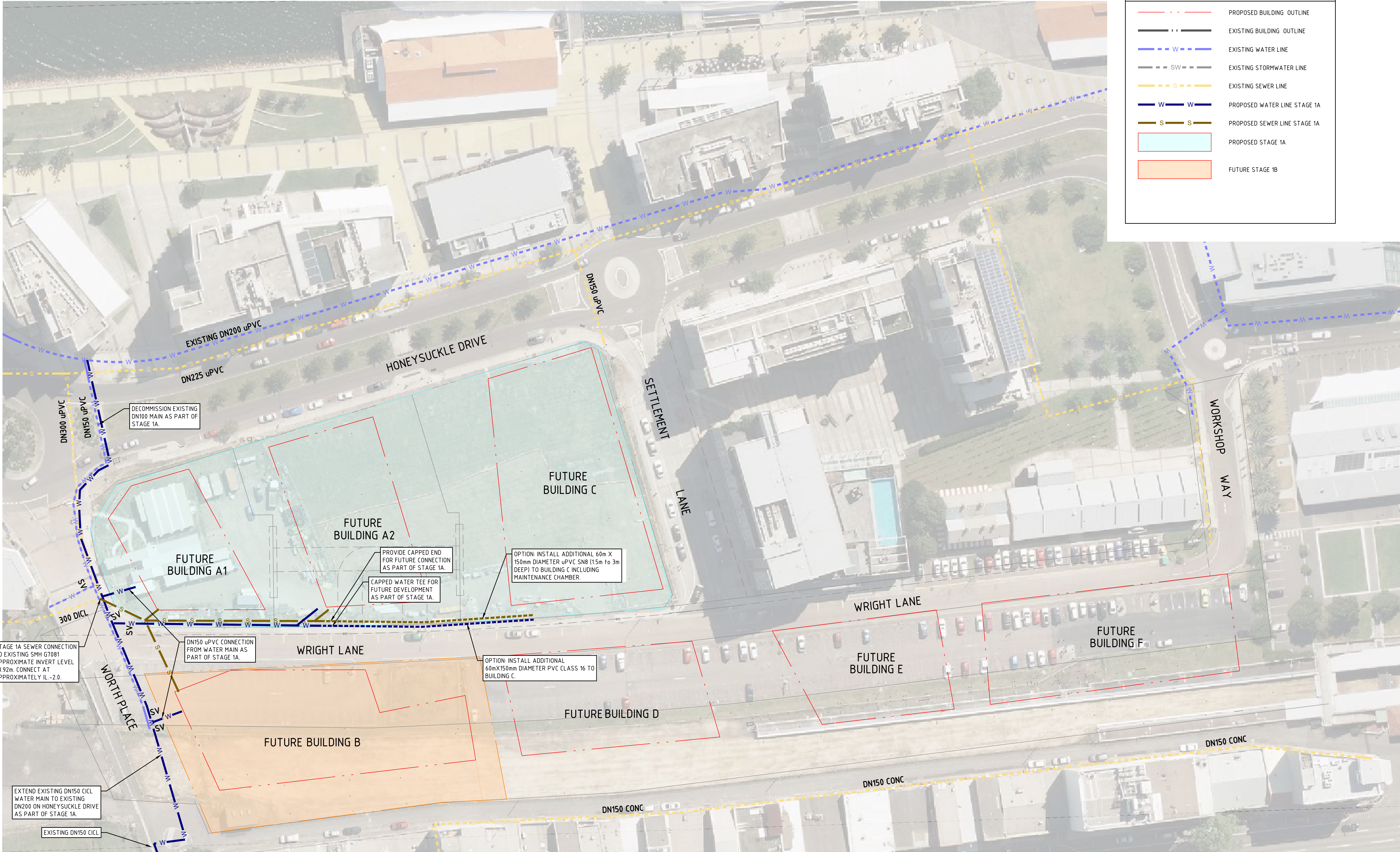


STORM WATER PLAN

13/2/19.



REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE	CLIENT	ARCHITECT	PROJECT	DRAWING TITLE	JOB NUMBER
1	PRELIMINARY	ABK		ABK	16.04.18	 THE UNIVERSITY OF NEWCASTLE AUSTRALIA DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED	ALL SETOUT TO ARCHITECT'S DRAWINGS. DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.  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	HONEYSUCKLE CITY CAMPUS DEVELOPMENT HONEYSUCKLE DRIVE, NEWCASTLE, N.S.W., 2300	WRIGHT LANE TYPICAL CROSS SECTION	NL172766 DRAWING NUMBER SK01 REVISION 2 DRAWING SHEET SIZE = A1
2	PRELIMINARY	ABK		ABK	18.04.18					
						THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD.	SCALE 1:20 @ A1 			



LEGEND	
	PROPOSED BUILDING OUTLINE
	EXISTING BUILDING OUTLINE
	EXISTING WATER LINE
	EXISTING STORMWATER LINE
	EXISTING SEWER LINE
	PROPOSED WATER LINE STAGE 1A
	PROPOSED SEWER LINE STAGE 1A
	PROPOSED STAGE 1A
	FUTURE STAGE 1B

VERIFIER: C. SMITH

JOB MANAGER: C. PIPER

DESIGNED: C. PIPER

DRAWN: J. GEARING

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	PRELIMINARY SCOPE OF WORKS	JG	LM	CP	09/02/18
2	PRELIMINARY SCOPE OF WORKS	JG	LM	CP	13/02/18
3	PRELIMINARY SCOPE OF WORKS	JB	LM	CP	20/02/18
4	PRELIMINARY SCOPE OF WORKS	JK	LM	CP	07/03/18
5	SCHEMATIC DESIGN	SF	LM	CP	24/04/18
6	SCHEMATIC DESIGN	SF	LM	CP	04/05/18

THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

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SIGNATURE HAS BEEN ADDED

ARCHITECT

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TRANSFERRED ELECTRONICALLY.

SCALE 1:500@A1

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

HONEYSUCKLE CITY
CAMPUS DEVELOPMENT
HONEYSUCKLE DRIVE,
NEWCASTLE, N.S.W, 2300

DRAWING TITLE

WATER AND SEWER PLAN
STAGE 1A AND 1B

JOB NUMBER

NL172766

DRAWING NUMBER

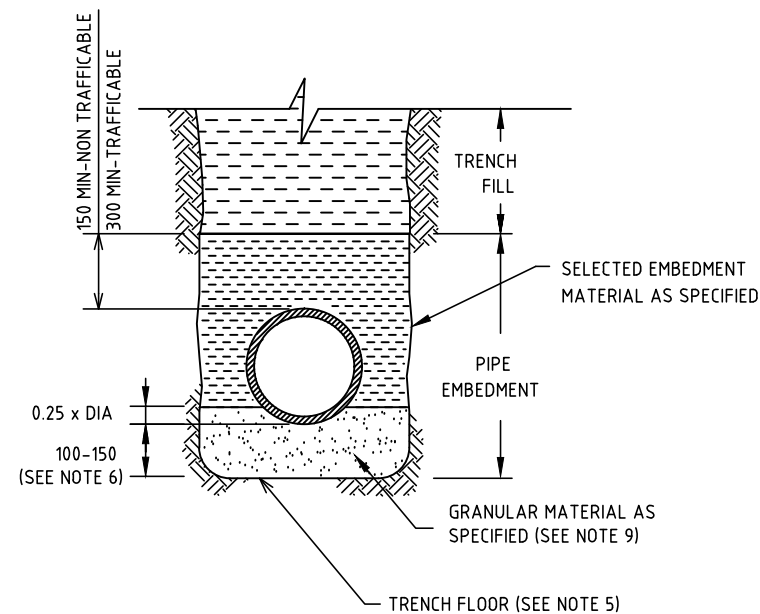
C1.04

REVISION

6

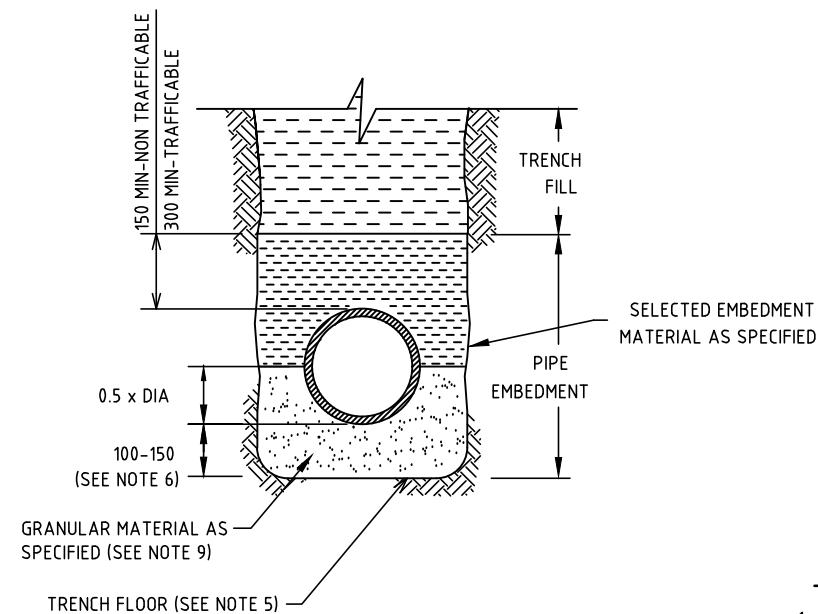
DRAWING SHEET SIZE = A1

NOT FOR CONSTRUCTION



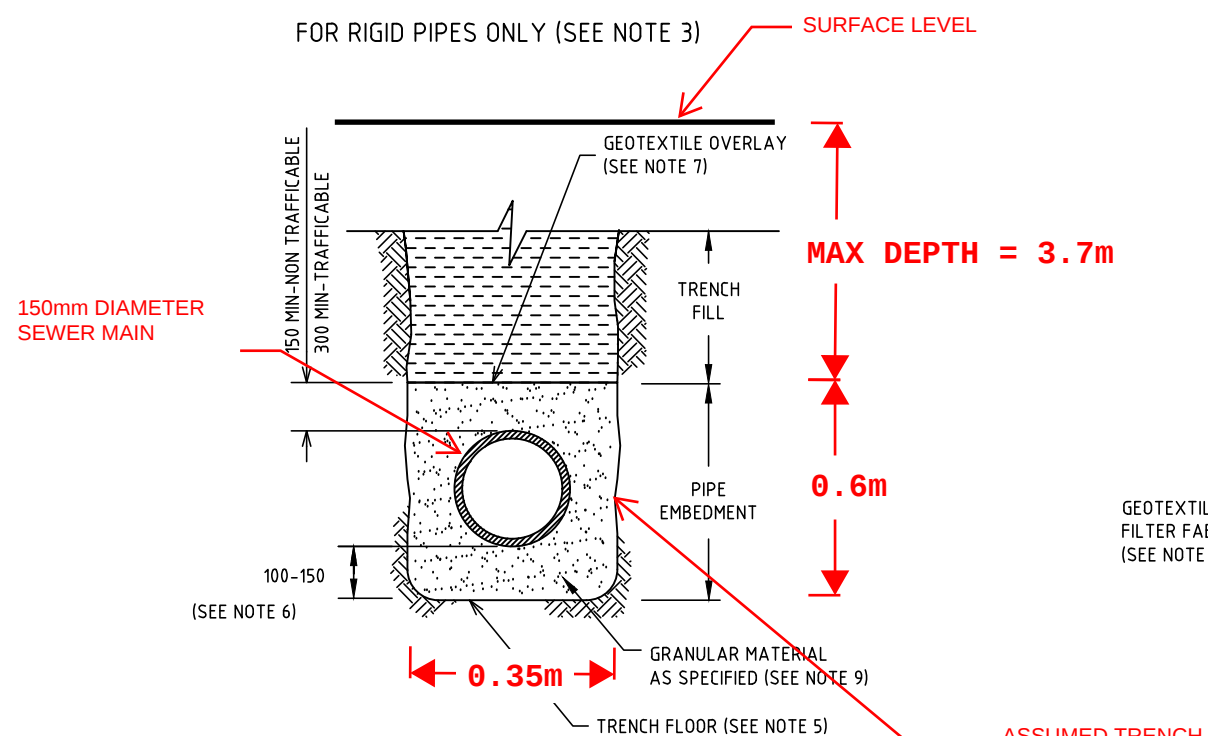
TYPE 1 SUPPORT

FOR RIGID PIPES ONLY (SEE NOTE 3)



TYPE 2 SUPPORT

FOR RIGID PIPES ONLY (SEE NOTE 3)

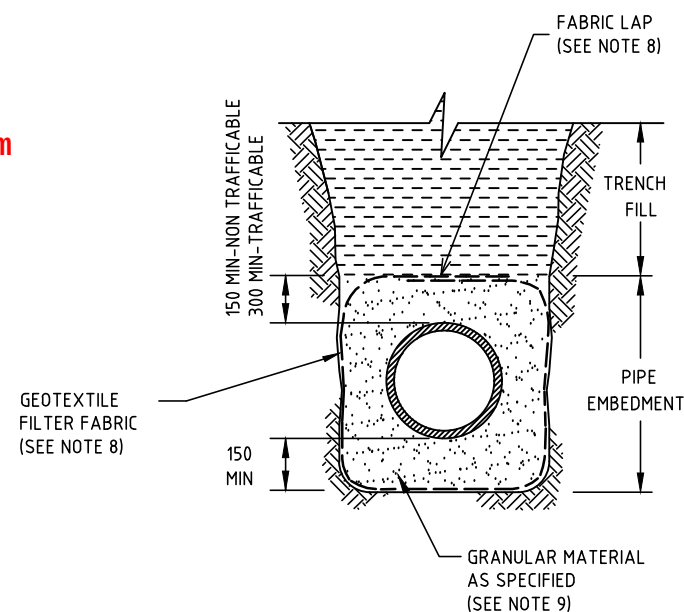


TYPE 3 SUPPORT

FOR FLEXIBLE & RIGID PIPES (SEE NOTE 3)

TYPICAL TRENCH DETAIL - SEWER

EMBEDMENT TYPES TO BE SPECIFIED
IN DESIGN DRAWINGS



TYPE 4 SUPPORT

WITH GEOTEXTILE

FOR FLEXIBLE & RIGID PIPES (SEE NOTE 3)

NOTES

- ALL DIMENSIONS IN MILLIMETRES.
- THIS DRAWING TO BE READ IN CONJUNCTION WITH SEW-1201-V.
- PIPE CLASSIFICATION
 - RIGID PIPES: VC AND RC
 - FLEXIBLE PIPES: PVC, GRP, STEEL, DI, PE AND PP.
- PLACEMENT OF EMBEDMENT, TRENCHFILL & COMPACTION TO MEET THE REQUIREMENTS OF WSA 02 PART 2.
- EXCAVATE OR COMPACT TRENCH FLOOR TO PROVIDE A FLAT FIRM BASE TO SUPPORT BEDDING MATERIAL AND MINIMISE PIPELINE SETTLEMENT. WHEN EXCAVATED, REPLACE WITH GRANULAR MATERIAL AS SPECIFIED FOR BEDDING OR ADOPT TYPE 5, 6, 7 OR 8 SUPPORT AS REQUIRED.
- ENSURE BEDDING IS DEEP ENOUGH THAT PIPE JOINT PROJECTIONS (SOCKETS, FLANGES) DO NOT TOUCH TRENCH FLOOR.
- GEOTEXTILE OVERLAY IS REQUIRED FOR COARSE AGGREGATE EMBEDMENT OF 5mm OR GREATER
- TYPE 4 SUPPORT TO BE USED WHERE MIGRATORY NATIVE SOILS (SANDS & CLAYS) ARE ENCOUNTERED ADJACENT TO THE EMBEDMENT ZONE AND SINGLE SIZE AGGREGATE IS USED. LAY GEOTEXTILE FILTER FABRIC AGAINST TRENCH FLOOR AND WALLS SUCH THAT IT FULLY ENCASES THE EMBEDMENT.
 - PRESS FILTER FABRIC INTO THE VOIDS BEFORE INSTALLING EMBEDMENT TO PREVENT FABRIC TEARING.
 - PROVIDE A MINIMUM OF 250 OVERLAP AT ALL FILTER FABRIC JOINTS.
- PRODUCT SPECIFICATIONS FOR TRENCH FILL AND EMBEDMENT MATERIAL ARE DETAILED IN WSA 02 PART 2.

WITH ACKNOWLEDGEMENT TO



SEWERAGE CODE OF AUSTRALIA

STANDARD EMBEDMENT
FLEXIBLE & RIGID PIPES

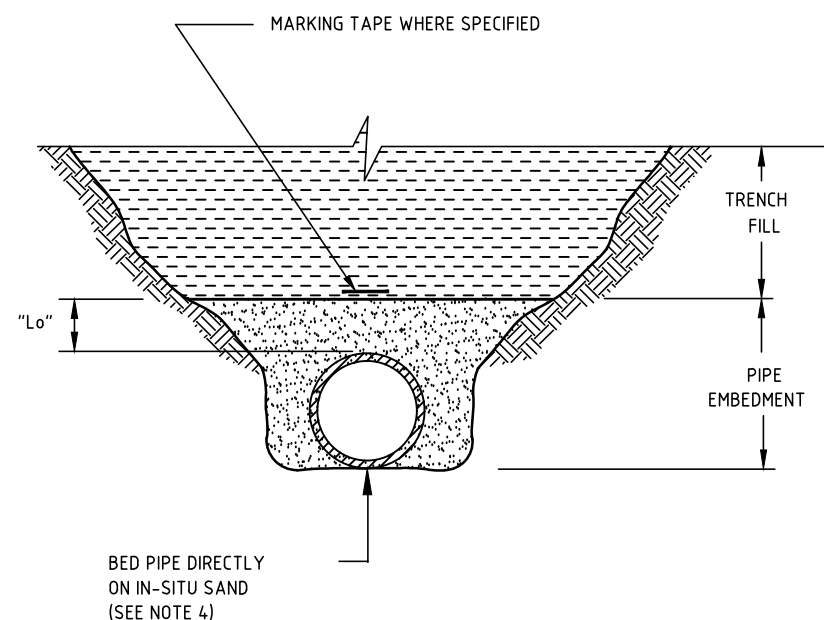
NOT TO SCALE

SEW-1202-V

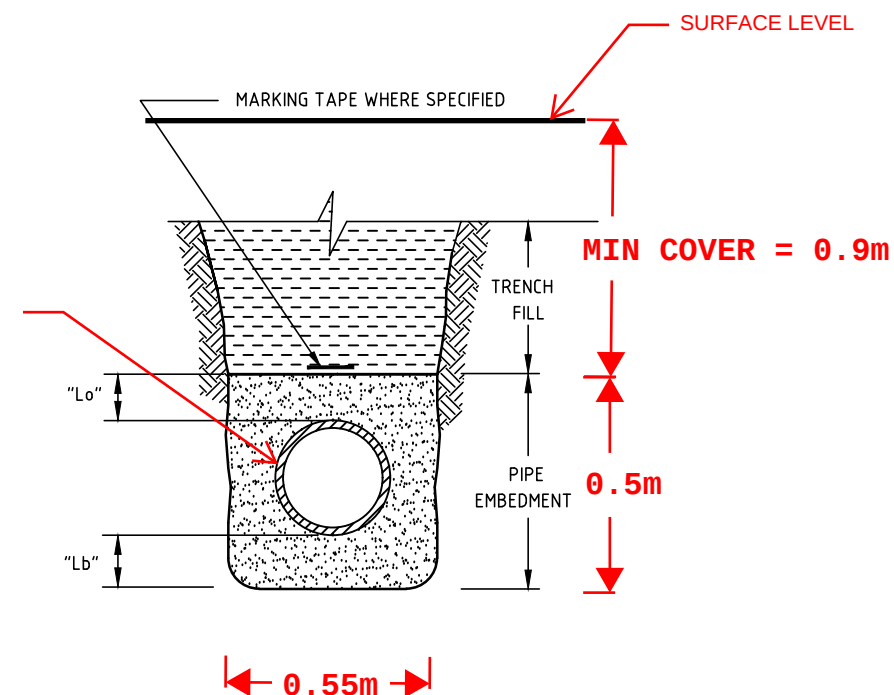
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VERSION 2.0

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TYPE 'A' SUPPORT



TYPE 'B' SUPPORT

TYPICAL TRENCH DETAIL - WATER

PIPE SIZE (DN)	BEDDING & OVERLAY DEPTH	
	'Lb' (min)	'Lo'
≤150	75	100
200 – 450	100	150
>450 – ≤900	150	150

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES.
2. THIS DRAWING TO BE READ IN CONJUNCTION WITH WAT-1201.
3. EMBEDMENT, TRENCH FILL & COMPACTION TO MEET REQUIREMENTS OF WSA-03 PART 2 CLAUSE 14.2.
4. WHERE TRENCH FLOOR CONSISTS OF MATERIALS MARKED WITH × ON WAT-1200 OBTAIN GEOTECHNICAL ADVICE.

EMBEDMENT TYPES TO BE SPECIFIED
IN DESIGN DRAWINGS

WITH ACKNOWLEDGEMENT TO



WATER SUPPLY CODE OF AUSTRALIA

STANDARD EMBEDMENT
ALL PIPE TYPES

NOT TO SCALE

WAT-1202

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V3.0

UNIVERSITY OF NEWCASTLE

HCCD - ENABLING WORKS

ELECTRICAL / COMMUNICATIONS SERVICES



LOCALITY PLAN

DRAWING LIST

DRG No.	DRAWING TITLE
22-19320-E100	COVER SHEET & DRAWING LIST
22-19320-E101	LEGEND, NOTES & TYPICAL DETAILS
22-19320-E102	OVERALL SITE PLAN
22-19320-E103	SITE PLAN (SHEET 1 OF 3)
22-19320-E104	SITE PLAN (SHEET 2 OF 3)
22-19320-E105	SITE PLAN (SHEET 3 OF 3)
22-19320-E106	SETOUT TABLES
22-19320-E107	COMMUNICATION SCHEMATIC DIAGRAM

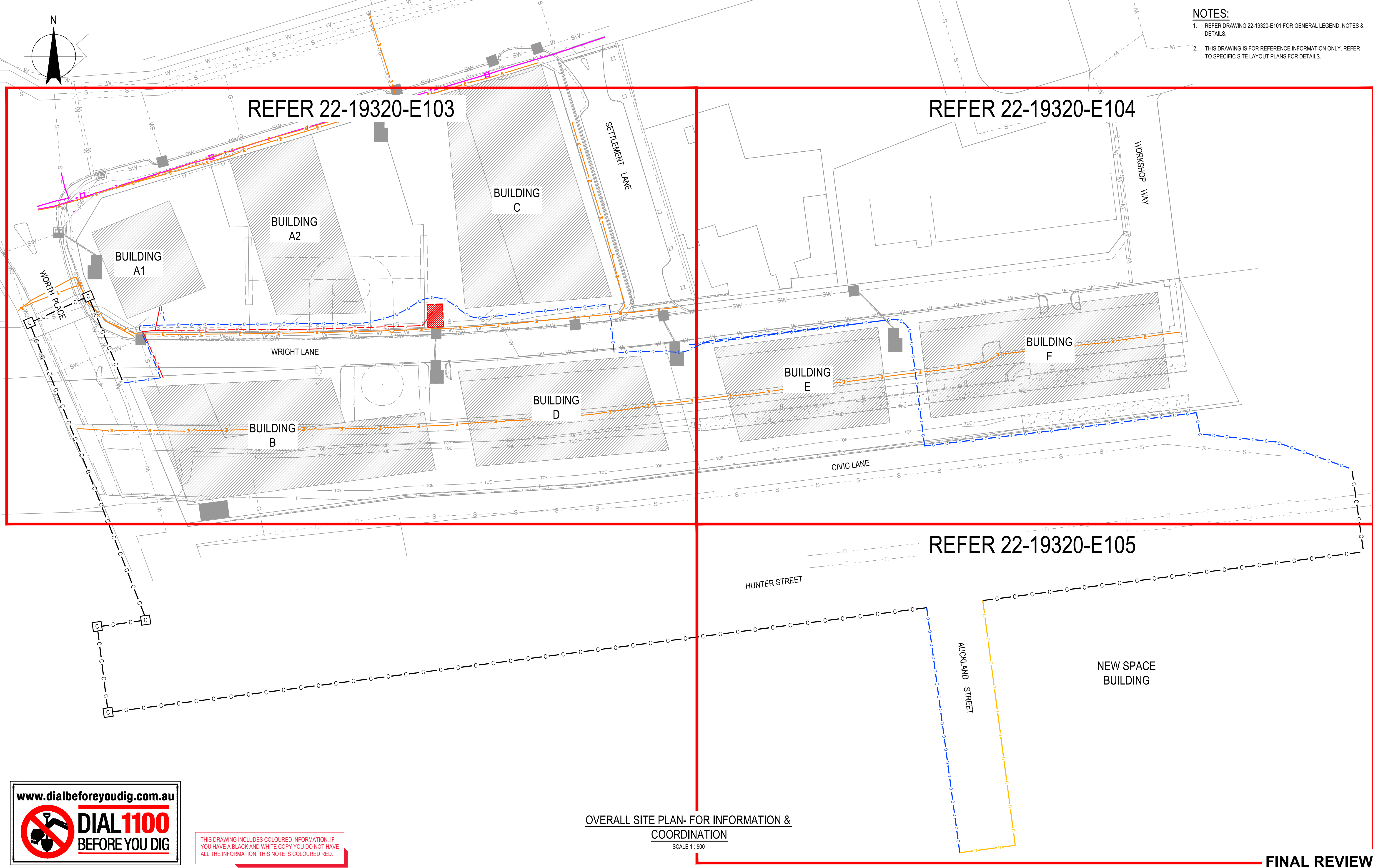
FINAL REVIEW

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	PROPOSED EXTENT OF NEW BUILDINGS
	PROPOSED EXTENT OF FUTURE BUILDINGS
	PROPOSED ELECTRICAL CABLE PIT WITH MEDIUM DUTY (CLASS C TO AS3996) STEEL COVER. 900x900 & 900 DEPTH . MASCOT CJP590 OR APPROVED EQUIVALENT.
	PROPOSED ELECTRICAL CABLE PIT WITH HEAVY DUTY (CLASS D TO AS3996) STEEL COVER. 900x900 & 900 DEPTH . MASCOT CJP590 OR APPROVED EQUIVALENT.
	PROPOSED COMMUNICATIONS CABLE PIT WITH MEDIUM DUTY (CLASS C TO AS3996) STEEL COVER. 600x600 & 800 DEPTH . MASCOT CJP380 OR APPROVED EQUIVALENT.
	PROPOSED COMMUNICATIONS CABLE PIT WITH HEAVY DUTY (CLASS D TO AS3996) STEEL COVER. 600x600 & 800 DEPTH . MASCOT CJP380 OR APPROVED EQUIVALENT.
	SMART CITY ASSET (NOTE 1)
	EXISTING LOCAL NETWORK CABLE PIT

	PROPOSED LV ELECTRICAL CONDUIT. HDuPVC ORANGE 150mm DIAMETER UNO
	PROPOSED COMMUNICATIONS CONDUIT. HDuPVC WHITE 100mm DIAMETER UNO
	LV CABLE (AUSGRID)
	HV CABLE (AUSGRID)
	SMART CITY CONDUIT (NOTE 1)
	EXISTING P100 CONDUIT
	EXISTING ELECTRICAL SERVICE
	EXISTING UoN CONDUIT. FOR INFORMATION ONLY.
	EXISTING UoN PIT
	EXISTING AARNET PIT
	KIOSK TRANSFORMER. RATING AND DETAILS AS NOTED. (BY OTHERS).
	LOCATION LABEL, REFER TO SCHEDULE ON DRAWING 22-19320-E106
	DENOTES 144 CORE SINGLE MODE OPTIC FIBRE, STRANDED LOOSE TUBE WITH PE SHEATH AND NYLON JACKET.
	DENOTES 20m FIBRE OPTIC COIL, UNO.

Cad File No. N:\A\Newcastle Projects\22\19320\CADD\Drawings\22\19320\E101.dwg



- NOTES:**
- 1. REFER DRAWING 22-19320-E101 FOR GENERAL LEGEND, NOTES & DETAILS.
 - 2. THIS DRAWING IS FOR REFERENCE INFORMATION ONLY. REFER TO SPECIFIC SITE LAYOUT PLANS FOR DETAILS.

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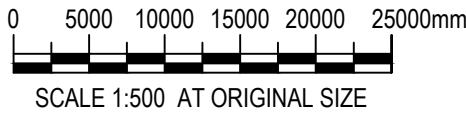
DIAL1100
BEFORE YOU DIG

THIS DRAWING INCLUDES COLOURED INFORMATION. IF YOU HAVE A BLACK AND WHITE COPY YOU DO NOT HAVE ALL THE INFORMATION. THIS NOTE IS COLOURED RED.

OVERALL SITE PLAN- FOR INFORMATION & COORDINATION
SCALE 1:500

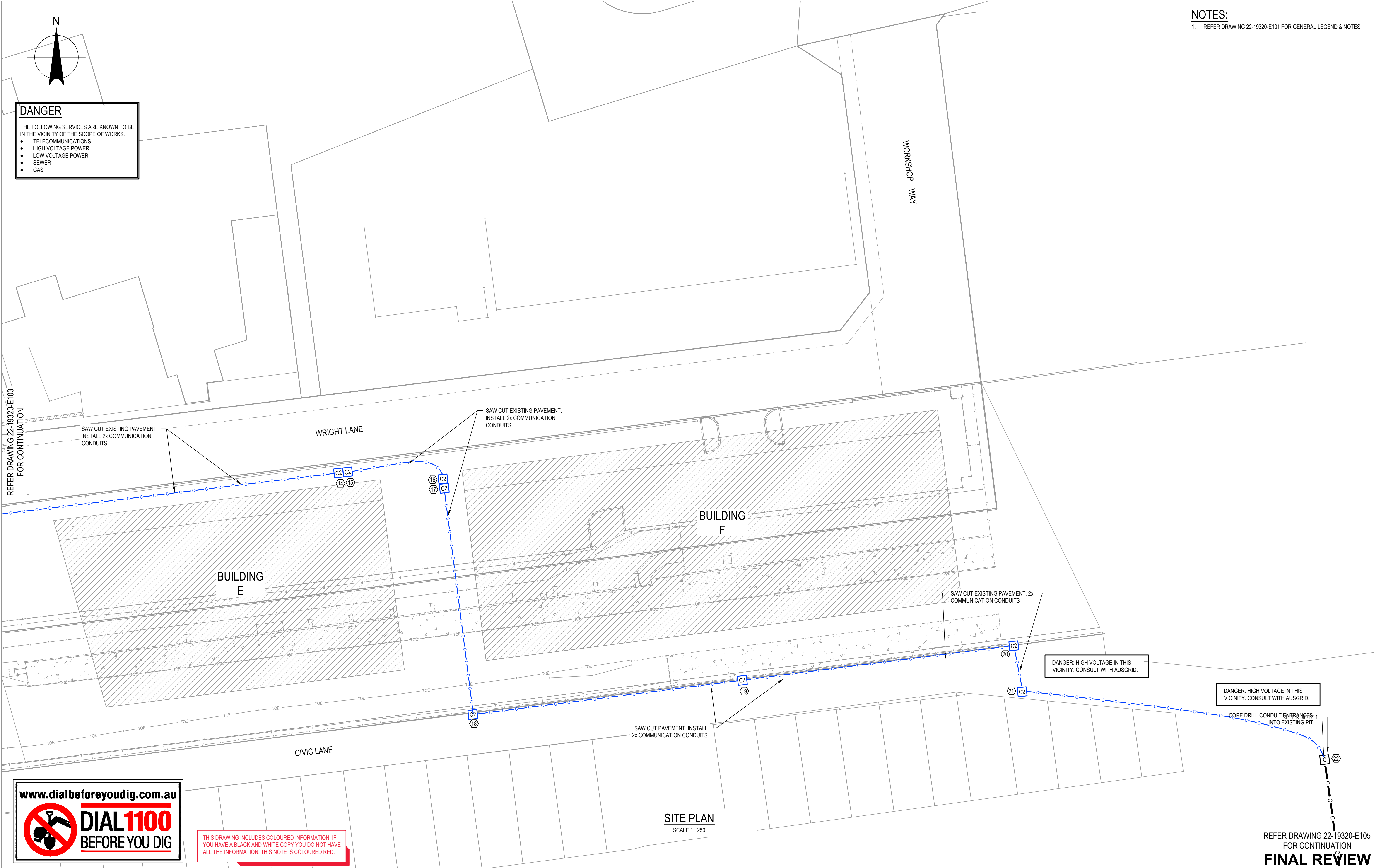
FINAL REVIEW

B	FINAL CLIENT REVIEW	BS	ARC	JL	25.01.19		
A	PRELIMINARY ISSUE	BS	ARC	JL	14.12.18		
No	Revision	Note	Indicates alterations on original issue of drawing or last revision of drawing	Drawn	Checked	Project Director	Date



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Client	UNIVERSITY OF NEWCASTLE
Project	HCCD - ENABLING WORKS
Title	OVERALL SITE PLAN
Original Site	Drawing No: 22-19320-E102
Rev: B	



NOTES:

1. REFER DRAWING 22-19320-E101 FOR GENERAL LEGEND & NOTES.

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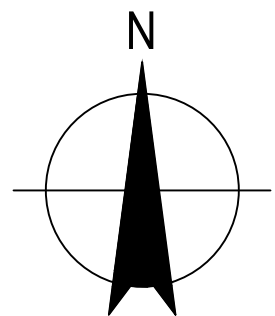
DIAL 1100
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No	Revision	Note	Drawn	Checked	Date



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	Approved: [] (Project Director)	Date: []	Title: SITE PLAN - SHEET 2 OF 3
	Scale: 1:250	This Drawing must not be used for Construction unless signed as Approved	Original Site: A1
			Drawing No: 22-19320-E104
			Rev: B



DANGER

- THE FOLLOWING SERVICES ARE KNOWN TO BE IN THE VICINITY OF THE SCOPE OF WORKS.
- TELECOMMUNICATIONS
 - ELECTRICITY
 - WATER/SEWER
 - GAS

NOTES:

1. OBSERVE REQUIRED SERVICE PROVIDER NOTIFICATION TIMES PRIOR TO COMMENCING WORK.
2. REFER DRAWING 22-19320-E101 FOR GENERAL LEGEND & NOTES.
3. NOTE EXISTING PAVER TYPE AND ALLOW FOR REPLACEMENT OF SAME TYPE AND COLOUR.
4. ALLOW FOR ALL TRAFFIC AND PEDESTRIAN CONTROL DURING WORKS.

REFER DRAWING 22-19320-E104 FOR CONTINUATION

PROPOSED ROUTE OF SMART CITY ASSET CONDUITS. FOR INFORMATION AND CO-ORDINATION PURPOSES.

HUNTER STREET

REVIEW PROPOSED SMART CITY ASSET DOCUMENTATION PRIOR TO THESE WORKS. CUT TRENCH TO PIT AND CORE DRILL INTO PIT TO INSTALL CONDUIT

LIFT PAVERS & HYDRO EXCAVATE ALONG ENTIRE ROUTE. INSTALL CONDUITS IN TRENCH. RE-INSTATE PAVERS WITH EXISTING. ALLOW TO REPLACE DAMAGED PAVERS AFTER WORKS TO MATCH EXISTING.

SAW CUT DRIVEWAY. INSTALL CONDUITS IN TRENCH. RE-INSTATE DRIVEWAY TO MATCH EXISTING.

AUCKLAND STREET

NEW SPACE BUILDING

SAW CUT PAVEMENT. HYDRO EXCAVATE ALONG ENTIRE ROUTE. INSTALL CONDUITS IN TRENCH. RE-INSTATE PAVEMENT TO MATCH EXISTING.

LOCATE EXISTING PIT AND CUT TRENCH TO PIT TO INSTALL CONDUITS. CUT NEW CONDUITS INTO PIT. REFER DETAIL ON DRAWING 22-19320-E101 FOR DETAILS

COIL SUFFICIENT FIBRE OPTIC IN PIT TO PROVIDE SLACK.

2x100

"UNIVERSITY HOUSE"

SITE PLAN

SCALE 1 : 250

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DIAL 1100
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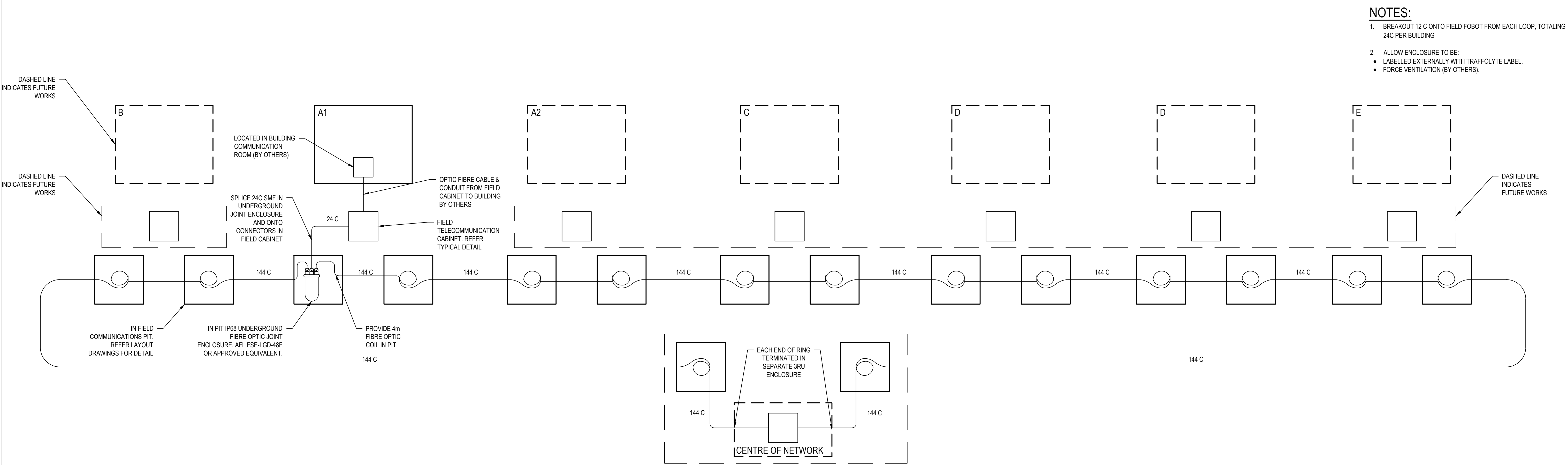
FINAL REVIEW

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A	PRELIMINARY ISSUE	BS	ARC	JL	14.12.18
No	Revision	Note	Drawn	Checked	Date

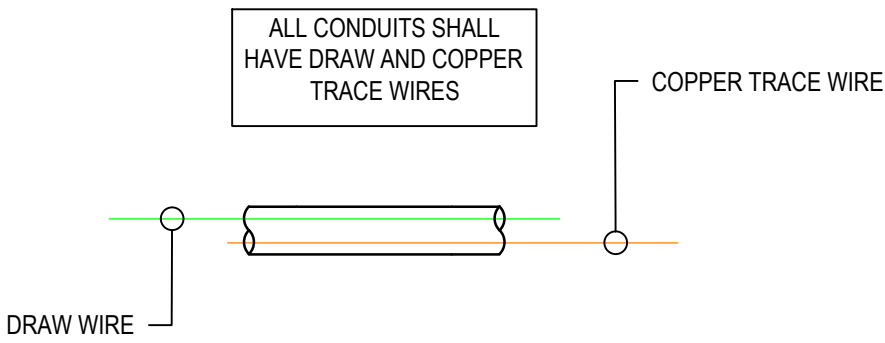


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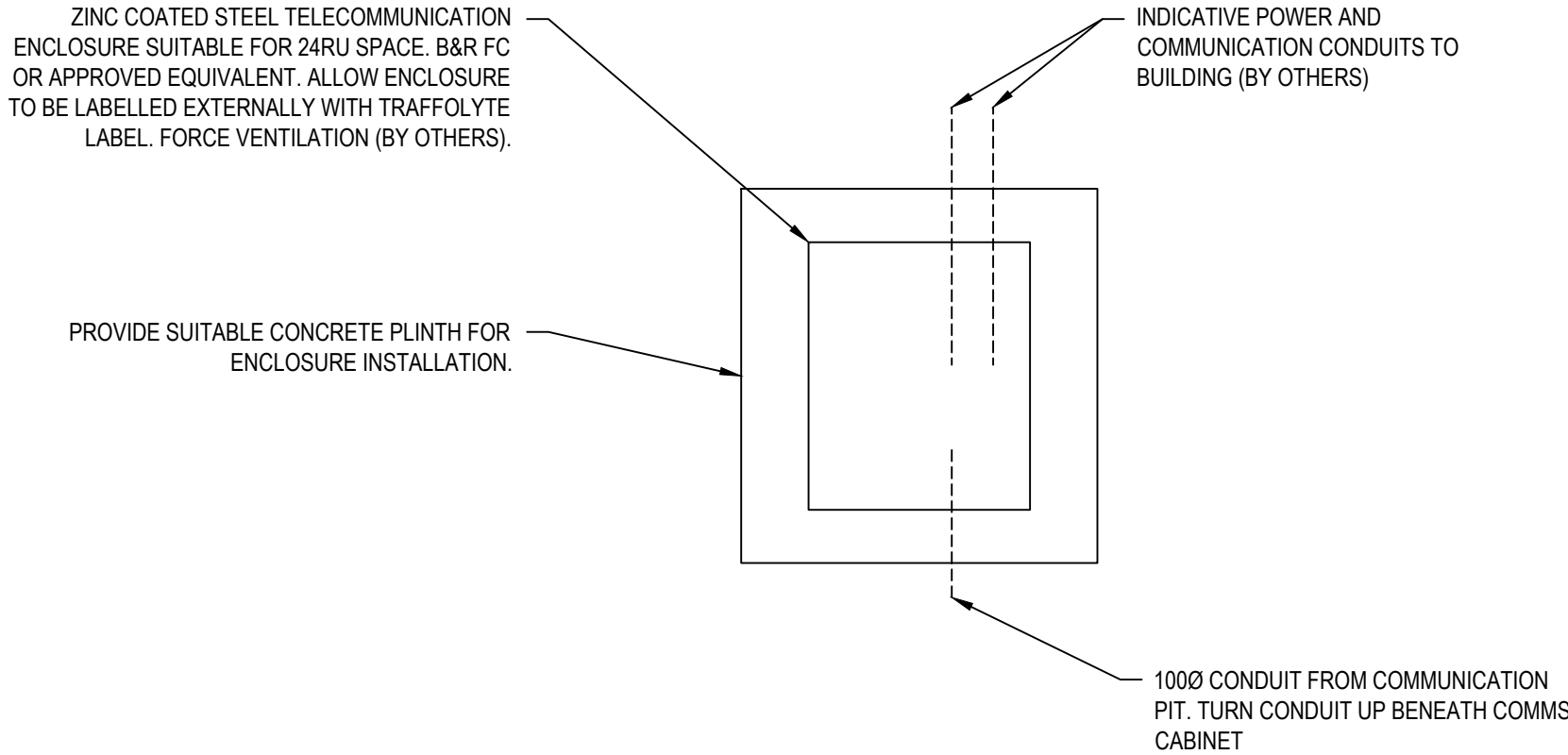
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		Approved (Project Director) Date	Scale 1 : 250	
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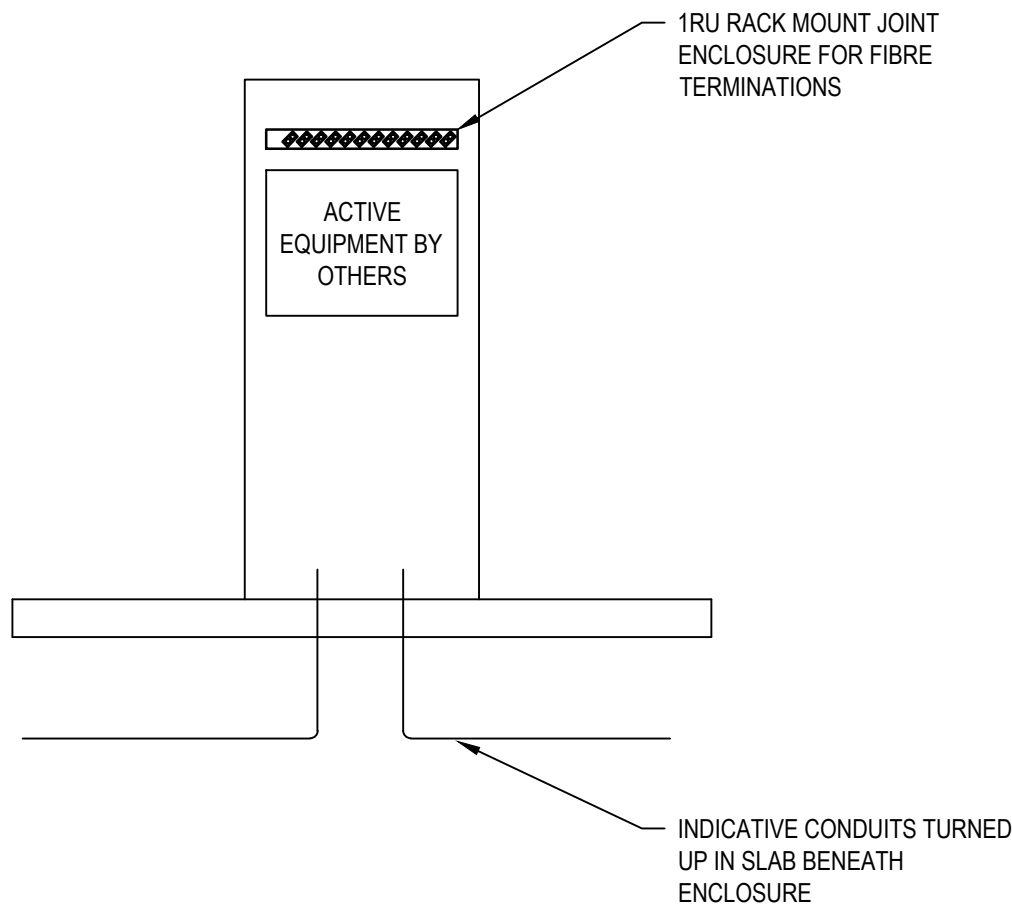
FIBRE OPTIC SITE RETICULATION PLAN
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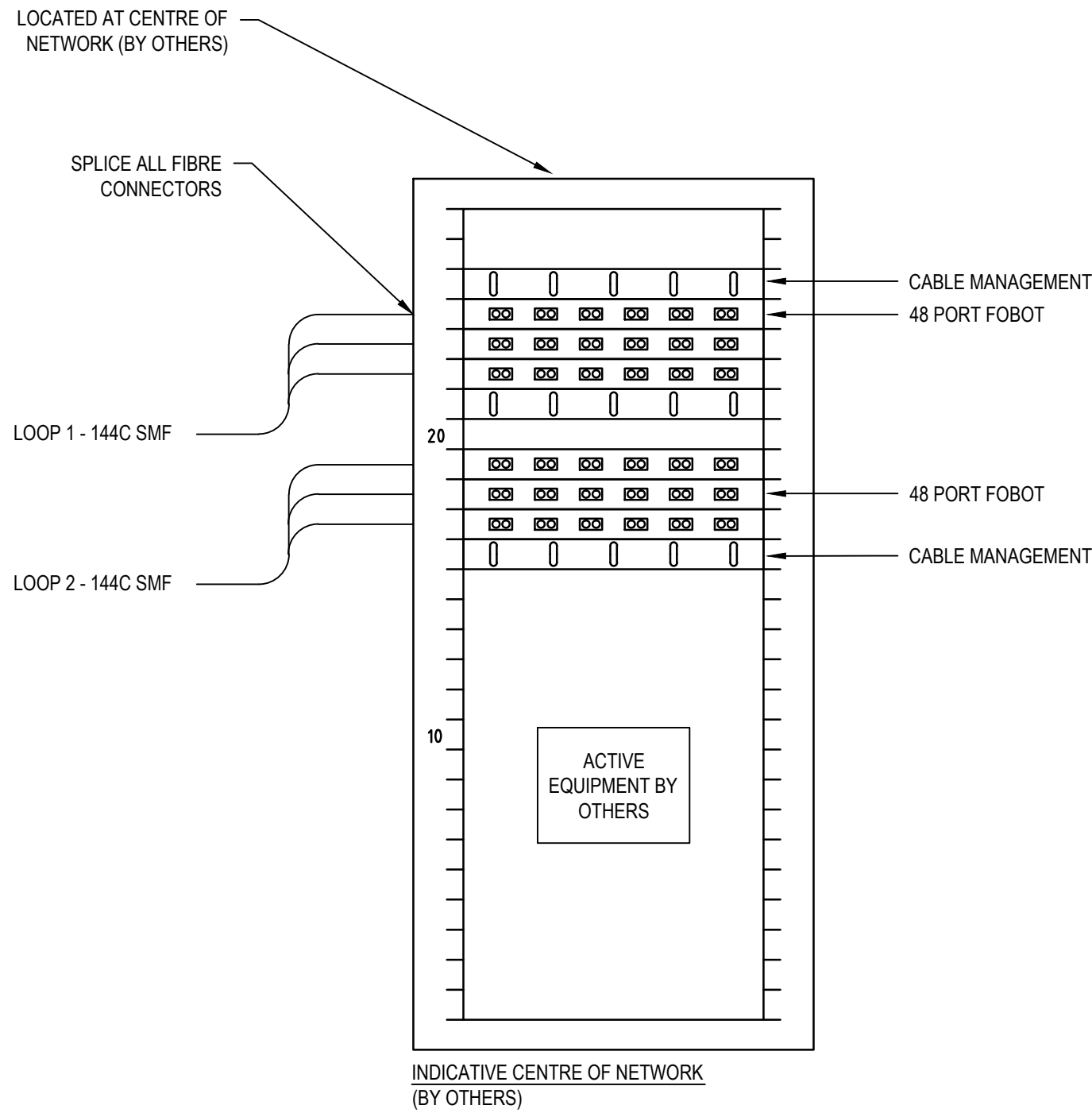
CONDUIT TRACE & DRAW WIRES
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IP66 TELECOMMUNICATIONS ENCLOSURE ON PLINTH
PLAN VIEW
NOT TO SCALE



INDICATIVE IP66 TELECOMMUNICATIONS ENCLOSURE ON PLINTH
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INDICATIVE CENTRE OF NETWORK
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FINAL REVIEW

B	FINAL CLIENT REVIEW	BS	ARC	JL	25.01.19
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No	Revision	Note	Drawn	Manager	Project Director

Plot Date: 25 January 2019 09:01 PM

Plotted By: Ro Comber

Cad File No: N/A Newcastle Projects 22-19320 CADD Drawings 22-19320 E107.dwg



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Drawn: A.COMBER

Designer: R.COMPERONI

Drafting: []

Design: []

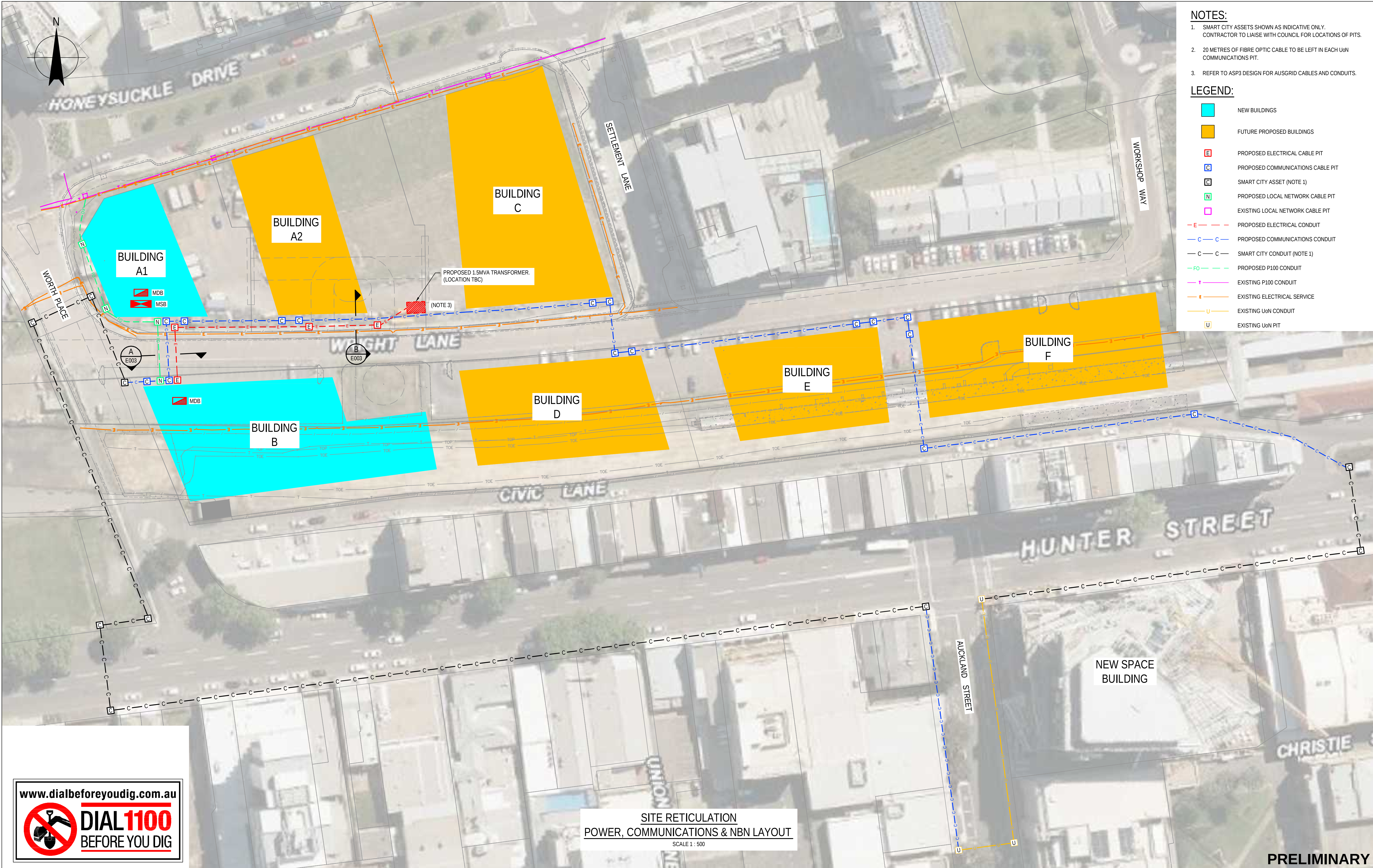
Approved: (Project Director)

Date:

Scale: NOT TO SCALE

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Client	UNIVERSITY OF NEWCASTLE
Project	HCCD - ENABLING WORKS
Title	COMMUNICATION SCHEMATIC DIAGRAM
Original Size	A1
Drawing No:	22-19320-E107
Rev:	B



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Appendix B – Piezometer logs

Environmental Log - Monitoring Well

client: **University of Newcastle**

principal: **APP**

project: **HCCD**

location: **16 HONEYSUCKLE DRIVE, NEWCASTLE**

Hole ID: **MW01**

sheet: 1 of 1

project no: **NTLEN213472**

date started: **09 Jan 2019**

date completed: **09 Jan 2019**

logged by: **SR**

checked by: **CDC**

position: E: 384,876.03; N: 6,356,195.93 (MGA94) surface elevation: 2.47 m (AHD) angle from horizontal: 90°
equipment type: Geoprobe, Track mounted drilling fluid: hole diameter : 100 mm

drilling information			well details		material substance							
method & support	water	samples & field tests	MW01	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	structure and additional observations	
PT	15-01-19	E		2.0	1.0		SW	FILL: Gravelly SAND: fine to coarse grained, rounded to sub-angular, brown, metal pipe in borehole wall approximate @0.5 mbgs.	D		FILL	
				1.0	1.0		SW	FILL: SAND: fine to coarse grained, pale brown, sea shells.			FILL - RECLAIMED DREDGED SAND	
				2.0	2.0		SW	SAND: fine to coarse grained, pale brown, sea shells.			ESTUARINE SOIL	
				3.0	3.0		SC	CLAYEY SAND: fine to coarse grained, dark grey, trace sea shells.	W			
				4.0	4.0		SW	SAND: fine to coarse grained, grey.				
				5.0	5.0							
				6.0	6.0		SW	SAND: fine to coarse grained, dark grey, marine sediment.				
				7.0	7.0							
				8.0	8.0							
				9.0	9.0							
well details: drilling company: Terratest backfill details: 0.0-2.0m: Sand 2.0-2.4m: Bentonite 2.4-5.645m: Sand standpipe piezo. MW01 details: stickup: 0.45m 2.6-5.65m: screen												
method AD auger drilling* AS auger screwing* HA hand auger W washbore PT push tube * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit			support M mud C casing N nil water 10-Oct-12 water level on date shown water inflow water outflow		samples & field tests ALT air lift test B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter WS water sample HB hammer bouncing N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone PID photoionization detector R refusal			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		

client: **University of Newcastle**

principal: **APP**

project: **HCCD**

location: **16 HONEYSUCKLE DRIVE, NEWCASTLE**

Hole ID. **MW02**

sheet: 1 of 1

project no. **NTLEN213472**

date started: **09 Jan 2019**

date completed: **09 Jan 2019**

logged by: **SR**

checked by: **CDC**

position: E: 384,860.64; N: 6,356,226.80 (MGA94)

surface elevation: 2.49 m (AHD)

angle from horizontal: 90°

equipment type: Geoprobe, Track mounted

drilling fluid:

hole diameter : 100 mm

drilling information		well details		material substance		material description		moisture condition		consistency / relative density		structure and additional observations	
method & support	water	samples & field tests	MW02	RL (m)	depth (m)	graphic log	classification symbol	SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	structure and additional observations		
PT	15-01-19	E		-2	1.0		SW	FILL: SAND: fine to coarse grained, dark brown, trace gravel, trace pieces of sandstone.	D		FILL		
							CI	FILL: Sandy CLAY: medium plasticity, orange brown, trace gravel.					
							SW	FILL: fine to coarse grained, pale brown, sea shells.			FILL - RECLAIMED DREDGED SAND		
							SW	SAND: fine to coarse grained, pale brown, sea shells.			ESTUARINE SOIL		
							SC	CLAYEY SAND: fine to coarse grained, dark grey, trace sea shells.					
							SW	SAND: fine to coarse grained, grey, marine sediment.					
					6.0			Monitoring Well MW02 terminated at 5.89 m Target depth			well details: drilling company: Terratest backfill details: 0.0-2.2m: Sand 2.2-2.6m: Bentonite 2.6-5.89m: Sand standpipe piezo. MW02 details: stickup: 0.92m 2.8-5.89m: screen		
					7.0								
					-5								

method

AD auger drilling*

AS auger screwing*

HA hand auger

W washbore

PT push tube

support

M mud

C casing

N nil

samples & field tests

ALT air lift test

B bulk disturbed sample

D disturbed sample

E environmental sample

SS split spoon sample

U## undisturbed sample ##mm diameter

WS water sample

HB hammer bouncing

N standard penetration test (SPT)

N* SPT - sample recovered

Nc SPT with solid cone

PID photoionization detector

R refusal

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

bit shown by suffix

e.g. AD/T

B blank bit

T TC bit

V V bit

water

10-Oct-12 water level on date shown

water inflow

water outflow

Environmental Log - Monitoring Well

client: **University of Newcastle**

principal: **APP**

project: **HCCD**

location: **16 HONEYSUCKLE DRIVE, NEWCASTLE**

Hole ID. **MW03**

sheet: 1 of 1

project no. **NTLEN213472**

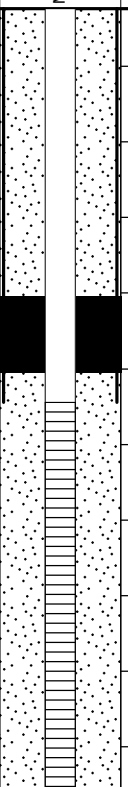
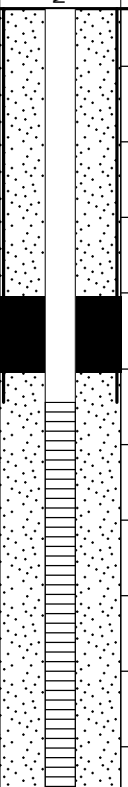
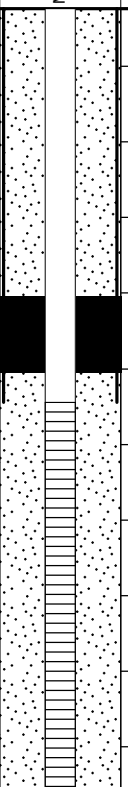
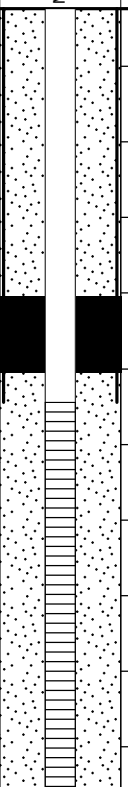
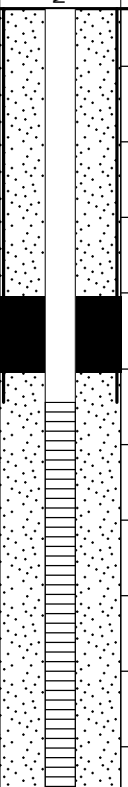
date started: **09 Jan 2019**

date completed: **09 Jan 2019**

logged by: **SR**

checked by: **CDC**

position: E: 384,904.72; N: 6,356,215.91 (MGA94) surface elevation: 2.38 m (AHD) angle from horizontal: 90°
equipment type: Geoprobe, Track mounted drilling fluid: hole diameter : 100 mm

drilling information			well details		material substance						
method & support	water	samples & field tests	MW03	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	structure and additional observations
PT	15-01-19	E		-2	0.0		SW	FILL: Gravelly SAND: fine to coarse grained, sub-rounded to angular, dark brown.	D		FILL
PT	15-01-19	E		-1	1.0		SW	FILL: SAND: fine to coarse grained, pale brown, sea shells.	D to M		FILL - RECLAIMED DREDGED SAND
PT	15-01-19	E		-2	2.0		SW	SAND: fine to coarse grained, pale brown, sea shells, increase in shells with orange brown sand @2.5mbgs.	M		ESTUARINE SOIL
PT	15-01-19	E		-3	3.0		SC	CLAYEY SAND: fine to coarse grained, dark grey, pocket of shells @4.4 to 4.6.	W		
PT	15-01-19	E		-4	4.0		SW	SAND: fine to coarse grained, pale brown, becoming pale grey @ 5.0mbgs.			
				-3				Monitoring Well MW03 terminated at 5.15 m Target depth			well details: drilling company: Terratest backfill details: 0.0-1.9m: Sand 1.9-2.4m: Bentonite 2.4-5.15m: Sand standpipe piezo. MW03 details: stickup: 1.095m 2.6-5.15m: screen
				-6.0							
				-4							
				-7.0							
				-5							

method	support	samples & field tests	classification symbol & soil description	consistency / relative density
AD auger drilling*	M mud	ALT air lift test	based on Unified Classification System	VS very soft
AS auger screwing*	C casing	B bulk disturbed sample		S soft
HA hand auger	N nill	D disturbed sample	F firm	St stiff
W washbore		E environmental sample		VSt very stiff
PT push tube		SS split spoon sample		H hard
		U## undisturbed sample ##mm diameter		Fb friable
		WS water sample		VL very loose
		HB hammer bouncing		L loose
		N standard penetration test (SPT)		MD medium dense
		N* SPT - sample recovered		D dense
		Nc SPT with solid cone		VD very dense
		PID photoionization detector		
		R refusal		
			moisture	
			D dry	
			M moist	
			W wet	
			Wp plastic limit	
			WL liquid limit	

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

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

Appendix C – Registered groundwater bores

All data times are Eastern Standard Time

Map Info

Groundwater Bores

- Groundwater works
- ◆ Telemetered bores
- ▲ Logged bores
- Manual bores

Monitoring Bore Types

Alluvial
Coastal Sands
Fractured Rock
Porous Rock
Great Artesian Basin
Discontinued

Honeysuckle Drive, Newcastle, Walsh Point, Newcastle-Maitland, Newcastle, NSW, 2300, Australia

Home

Map

Terrain

Satellite

Hybrid

Groundwater Works

Monitoring Bores

Telemetered Bores

Coal Basin Bores

Discontinued Bores

GW201489

GW201490

GW201491

Google

Scale = 1 : 3385

Imagery ©2019, CNES / Airbus, DigitalGlobe Terms of Use Report a map error

WaterNSW

Work Summary

GW201489

Licence:	Licence Status:
	Authorised Purpose(s): Intended Purpose(s): MONITORING BORE
Work Type: Bore	
Work Status: Equipped	
Construct.Method: Auger - Hollow Flight	
Owner Type: Local Govt	
Commenced Date:	Final Depth: 5.00 m
Completion Date: 12/01/2011	Drilled Depth: 5.00 m
Contractor Name: (None)	
Driller: Peter James Stewart	
Assistant Driller: Mark Davis	
Property:	Standing Water Level 2.000 (m):
GWMA:	Salinity Description:
GW Zone:	Yield (L/s):

Site Details

Site Chosen By:	County Form A: NORTHUMBERLAND Licensed:	Parish NEWCASTLE	Cadastre 4//1010675
Region: 20 - Hunter	CMA Map: 9232-2S		
River Basin: 210 - HUNTER RIVER	Grid Zone:	Scale:	
Area/District:			
Elevation: 0.00 m (A.H.D.)	Northing: 6356135.000	Latitude: 32°55'37.3"S	
Elevation Source: Unknown	Easting: 385315.000	Longitude: 151°46'24.1"E	
GS Map: -	MGA Zone: 56	Coordinate Source: GIS - Geogra	

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	5.00	200			Auger - Hollow Flight
1		Annulus	Drill Cuttings	0.00	1.50	200	61		
1		Annulus	Bentonite	1.50	1.90	200	61		
1		Annulus	Waterworn/Rounded	1.90	5.00	200	61		Graded, PL:Tremie Pipe
1	1	Casing	Pvc Class 9	0.00	5.00	61	49		Seated on Bottom, Screwed
1	1	Opening	Slots	2.00	5.00	61		0	Mechanically Slotted, PVC Class 9, Screwed, A: 3.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
2.00	5.00	3.00	Unknown	2.00					

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.60	1.60	Fill, sandy silty, dark brown	Fill	
1.60	2.50	0.90	Sand, natural, white, fine to medium	Sand	
2.50	4.50	2.00	Sand, ginger brown, fine/coarse, with rounded gravels with some organic material & shell present	Sand	
4.50	5.00	0.50	Clay, marine, grey	Clay	

Remarks

12/01/2011: Form A Remarks:

Nat Carling, 17-Apr-2012; Coordinates based on location map provided with the Form-A.

*** End of GW201489 ***

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WaterNSW

Work Summary

GW201490

Licence:	Licence Status:
	Authorised Purpose(s): Intended Purpose(s): MONITORING BORE
Work Type: Bore	
Work Status: Equipped	
Construct.Method: Auger - Hollow Flight	
Owner Type: Local Govt	
Commenced Date:	Final Depth: 4.50 m
Completion Date: 12/01/2011	Drilled Depth: 4.50 m
Contractor Name: (None)	
Driller: Peter James Stewart	
Assistant Driller: Mark Davis	
Property:	Standing Water Level 2.000 (m):
GWMA:	Salinity Description:
GW Zone:	Yield (L/s):

Site Details

Site Chosen By:	County Form A: NORTHUMBERLAND Licensed:	Parish NEWCASTLE	Cadastre 4/1010675
Region: 20 - Hunter	CMA Map: 9232-2S		
River Basin: 210 - HUNTER RIVER	Grid Zone:	Scale:	
Area/District:			
Elevation: 0.00 m (A.H.D.)	Northing: 6356140.000	Latitude: 32°55'37.2"S	
Elevation Source: Unknown	Easting: 385380.000	Longitude: 151°46'26.6"E	
GS Map: -	MGA Zone: 56	Coordinate Source: GIS - Geogra	

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	4.50	200			Auger - Hollow Flight
1		Annulus	Drill Cuttings	0.00	1.50	200	61		PL:Tremie Pipe
1		Annulus	Bentonite	1.50	1.90	200	61		PL:Tremie Pipe
1		Annulus	Waterworn/Rounded	1.90	4.50	200	61		Graded, PL:Tremie Pipe
1	1	Casing	Pvc Class 9	2.00	4.50	61	49		Seated on Bottom, Screwed
1	1	Opening	Slots	2.00	4.50	61		0	Mechanically Slotted, PVC Class 9, Screwed, A: 3.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
2.00	4.50	2.50	Unknown	2.00					

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.50	1.50	Fill, sandy silty, dark brown	Fill	
1.50	2.50	1.00	Sand, natural, white, fine to medium grained	Sand	
2.50	4.50	2.00	Sand, ginger brown, fine/coarse, with rounded gravels with some orangic material & shell present	Sand	

Remarks

12/01/2011: Form A Remarks:
Nat Carling, 17-Apr-2012; Coordinates based on location map provided with the Form-A.

*** End of GW201490 ***

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WaterNSW

Work Summary

GW201491

Licence:	Licence Status:
Authorised Purpose(s): Intended Purpose(s): MONITORING BORE	
Work Type: Bore	
Work Status: Equipped	
Construct.Method: Auger - Hollow Flight	
Owner Type: Local Govt	
Commenced Date:	Final Depth: 4.50 m
Completion Date: 12/01/2011	Drilled Depth: 4.50 m
Contractor Name: (None)	
Driller: Peter James Stewart	
Assistant Driller: Mark Davis	
Property:	Standing Water Level 2.000 (m):
GWMA:	Salinity Description:
GW Zone:	Yield (L/s):

Site Details

Site Chosen By:	County Form A: NORTHUMBERLAND Licensed:	Parish NEWCASTLE	Cadastre 4/1010675
Region: 20 - Hunter	CMA Map: 9232-2S		
River Basin: 210 - HUNTER RIVER	Grid Zone:	Scale:	
Area/District:			
Elevation: 0.00 m (A.H.D.)	Northing: 6356085.000	Latitude: 32°55'38.9"S	
Elevation Source: Unknown	Easting: 385320.000	Longitude: 151°46'24.3"E	
GS Map: -	MGA Zone: 56	Coordinate Source: GIS - Geogra	

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	4.50	200			Auger - Hollow Flight
1		Annulus	Drill Cuttings	0.00	1.50	200	61		PL:Tremie Pipe
1		Annulus	Bentonite	1.50	1.90	200	61		PL:Tremie Pipe
1		Annulus	Waterworn/Rounded	1.90	4.50	200	61		Graded, PL:Tremie Pipe
1	1	Casing	Pvc Class 9	0.00	4.50	61	49		Seated on Bottom, Screwed
1	1	Opening	Slots	2.00	4.50	61		0	Mechanically Slotted, PVC Class 9, Screwed, A: 3.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
2.00	4.50	2.50	Unknown	2.00					

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.50	1.50	Fill, sandy/silty, dark brown	Fill	
1.50	2.50	1.00	Sand, natural white, fine to medium	Sand	
2.50	4.50	2.00	Sand, ginger brown, fine to coarse, with rounded gravels with some organic material & shell present	Sand	

Remarks

12/01/2011: Form A Remarks:
Nat Carling, 17-Apr-2012; Coordinates based on location map provided with the Form-A.

*** End of GW201491 ***

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