geo-environmental
E N G I N E E R I N G

GEOTECHNICAL INVESTIGATION REPORT

339 FOREST ROAD, BEXLEY NSW

PREPARED FOR
LOGOS GROUP PTY LTD
REPORT ID: G19077BEX-R01F

Date: 22nd February 0
Revision No. 0

Client:
Logos Group Pty Ltd
Ramsgate NSW 2217
Attention: Tamer Mikhail
Email: tamer@logosgroup.com.au

Author: S. McCormack
Field Engineer / Scientists: M. Kilham

TABLE OF CONTENTS

1	**PROJECT INFORMATION**	**4**
1.1	INTRODUCTION AND OBJECTIVE	4
1.2	PROPOSED DEVELOPMENT	4
1.3	SCOPE OF WORK	4
2	**SITE INFORMATION**	**5**
2.1	SITE DESCRIPTION	5
2.2	TOPOGRAPHY	6
2.3	GEOLOGY AND SOILS	6
2.4	REGIONAL HYDROGEOLOGY	6
2.5	ACID SULFATE SOIL RISK	7
3	**METHOD OF INVESTIGATION AND RESULTS**	**8**
3.1	FIELDWORK METHODOLOGY	8
3.2	SUBSURFACE CONDITIONS	8
3.2.1	*Groundwater*	*9*
3.3	LABORATORY TEST RESULTS	10
3.3.1	*Soil Salinity Testing*	*10*
3.3.2	*Aggressivity Testing*	*11*
4	**DISCUSSION AND RECOMMENDATIONS**	**13**
4.1	SITE PREPARATION	13
4.2	EARTHWORKS	13
4.2.1	*Excavation*	*13*
4.2.2	*Groundwater Inflow*	*14*
4.2.3	*Excavation Support*	*14*
4.2.4	*Construction / Excavation Induced Vibration*	*15*
4.2.5	*Dilapidation Report*	*18*
4.3	FOUNDATIONS	18
4.3.1	*Aggressivity / Exposure Classification*	*18*
5	**CONCLUSION**	**19**
6	**GENERAL LIMITATIONS**	**20**
7	**REFERENCES**	**21**

FIGURES

Figure 1: Site plan

TABLES

Table 1: Summary of Subsurface Conditions
Table 2: Electrical Conductivity Results
Table 3: Exposure classification (aggressivity) test results
Table 4: Recommendation for Rock Hammer Equipment
Table 5: Retaining Walls - Geotechnical Design Parameters

APPENDICES

Appendix A: Architectural Plans
Appendix B: Borehole Logs (including DCP Tests Data)
Appendix C: Laboratory Results

1 PROJECT INFORMATION

1.1 INTRODUCTION AND OBJECTIVE

Geo-Environmental Engineering Pty Ltd (GEE) was commissioned by Logos Group Pty Ltd, to undertake a geotechnical investigation at the St Mary and St Mina's Coptic Orthodox College located at 339 Forest Road, Bexley NSW (herein referred to as the 'site').

GEE understands that the investigation was required to support a Development Application with Bayside City Council which relates to the proposed construction of a new childcare centre over a single level basement.

This report presents the factual and interpreted results of the field investigations and provides interpretation and recommendations regarding the ground conditions at the site, in accordance with client requirements and the agreed scope of work.

1.2 PROPOSED DEVELOPMENT

According to the architectural plans provided (**Appendix A**) the proposed development will comprise a three-storey building over a single level basement. The finished floor level of the basement is between 48.0 and 48.8m above Australian Height Datum (AHD). Taking into account the existing surface level across the site as shown on the architectural plans, and the necessary over excavation to accommodate the basement floor slab and other services, excavation of between 3.5m and 4.5m depth is expected. The basement is expected to extend to within close proximity to the site boundaries and also two existing buildings at the northern end of the proposed development.

1.3 SCOPE OF WORK

The scope of work undertaken by GEE, to satisfy the above objectives, was as follows:

- ◊ Visual appraisal of the site conditions and locality,
- ◊ Review of published geological, soils and acid sulfate soil maps for the area,
- ◊ The drilling of boreholes and the performance of Standard Penetrometer (SPT) tests in accessible parts of the site to assess the subsurface conditions,
- ◊ The collection of representative soil samples for the preliminary assessment of soil salinity and aggressivity, and
- ◊ Engineering assessment and reporting.

2 SITE INFORMATION

2.1 SITE DESCRIPTION

The site is located on the northern corner of Forest Road and Bayview Street and is at the southern end of the St Mary and St Mina's Coptic Orthodox College.

At the time of the investigation there were a number of single and two-storey buildings located centrally within the site. The remainder of the site was covered in asphalt with several small buildings comprising sheds and an outdoor BBQ area. A number of small garden beds were located along the site boundaries along with a number of medium to large trees. The site was accessible through gates onto Bayview Street and Forest Road.

A site plan showing the existing site features and the footprint of the proposed basement is provided as **Figure 1**. Photographs of the site, which were taken during our field investigations are provided for reference in **Plates 1 to 6** below.

Plate 1 – View to north along western side of site.

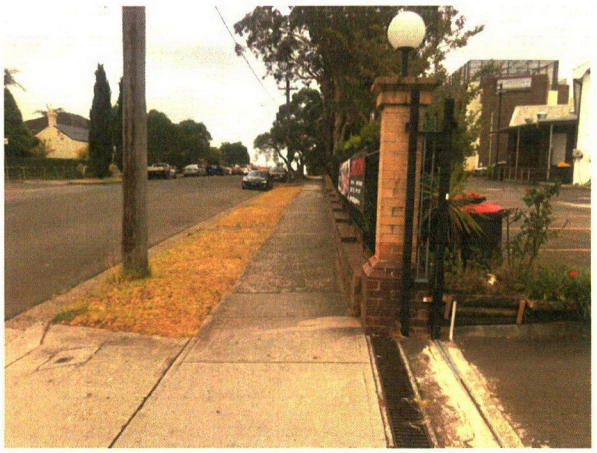


Plate 2 – View to the north along western boundary from site entry point.

Plate 3 – View to the north along eastern side of site.

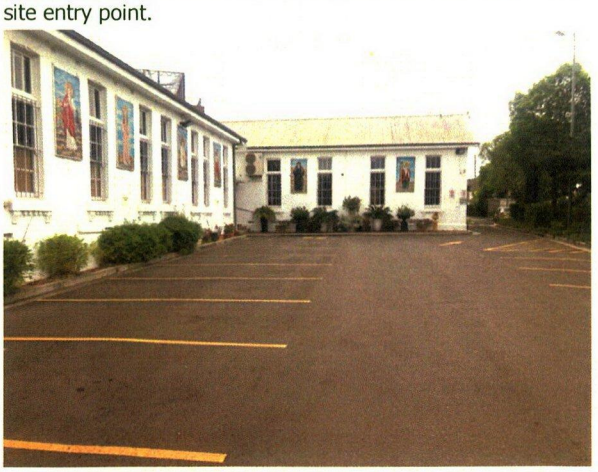


Plate 4 –View to the north showing existing buildings.

Plate 5 – View to the north along eastern boundary with Forest Road, from footbridge.

Plate 6 - View to the north along eastern boundary with Forest Road.

2.2 TOPOGRAPHY

The site is located on a gentle southerly dipping slope. According to the site survey plan, (**Appendix A**) the surface elevation falls from approximately 53.16m above Australian Height Datum (AHD) at the northern end of the site to 49.39m AHD at the southern end of the site.

2.3 GEOLOGY AND SOILS

A review of the regional geological map (reference 1) indicates that the site underlain by the Triassic aged Ashfield Shale formation of the Wianamatta Group which typically consists of *"...black to dark-grey shale and laminite".*

A review of the regional soils map indicates that the site is located within the Blacktown Soil Landscape Group (reference 2). Soils of the Blacktown group are characterised by heavy clays derived from the weathering process of the shale bedrock. These soils typically have low fertility, moderate reactivity and have a low wet bearing strength.

2.4 REGIONAL HYDROGEOLOGY

The regional and permanent groundwater in the vicinity of the site, is expected to be confined or partly confined, discrete, water-bearing zones within the bedrock formation. However, intermittent 'perched' water seepage often occurs at the soil / bedrock interface following heavy and prolonged rainfall events.

Permanent groundwater associated with the Wianamatta group of Shale bedrock is characterised by high salinity (reference 3 and 4) and high ammonia concentrations (>10 mg/L, reference 5). In this regard, groundwater within the shale formation is not extracted

for potable use and rarely extracted for commercial / industrial purposes. This is supported by a review of the NSW Water Information database (http://waterinfo.nsw.gov.au/gw/) which indicates that there are only 4 registered groundwater bores within 500m of the site and each of these bores are for monitoring purposes only.

The rate of groundwater movement is likely to be low as a result of low relief, low altitude (approximately ~ 50m AHD) and the low permeability of the Shale (between 10^{-13} and 10^{-9} m/sec – reference 6). Groundwater flow is dominated by water movement through fractures (or joints), where stress has caused partial loss of cohesion in the rock and evidence of potential water bearing fractures is usually the presence of clay or iron-staining along face of the joints.

2.5 ACID SULFATE SOIL RISK

Acid Sulfate Soil is naturally occurring sediments and soils containing iron sulfides (principally iron sulfide, iron disulfide or their precursors). Oxidation of these soils through exposure to the atmosphere or through lowering of groundwater levels results in the generation of sulfuric acid.

Land that may contain potential acid sulfate soils was mapped by the NSW Department of Land and Water Conservation (DLWC) and based on these maps local Councils produced their own acid sulfate soil maps to be used for planning purposes.

The DLWC 'Botany Bay' Acid Sulfate Soil Risk Map (reference 7), indicates that the site lies within an area with no known occurrences of acid sulphate soil and land activities within this area are "...*not likely to be affected by acid sulphate soil materials*".

The Acid Sulfate Soils Map produced by Council and available via interactive online mapping from the NSW Planning Portal, indicates that the site lies within an area defined as "Class 5". In accordance with Clause 6.1 of Council's Local Environment Plan (LEP) 2011, a preliminary assessment of acid sulfate soil and potentially a management plan is recommended for any "*Works within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5 metres Australian Height Datum by which the watertable is likely to be lowered below 1 metre Australian Height Datum on adjacent Class 1, 2, 3 or 4 land*".

The surface elevation is significantly greater than 5m AHD and the maximum depth of excavation is not extending below 1m AHD. In this regard dewatering to below 1m AHD is not required and there is no need for an acid sulphate soil assessment or management plan.

3 METHOD OF INVESTIGATION AND RESULTS

3.1 FIELDWORK METHODOLOGY

Fieldwork was undertaken on the 6th January 2020 by Matthew Kilham working on behalf of GEE. The fieldwork comprised:

- The drilling and logging of four boreholes (BH1 to BH4) in accessible areas of the site to assess the soil conditions and depth to bedrock,
- The performance of SPT tests at each borehole location to assess the consistency and/or relative density of the soil profile and to assist with determining the depth to bedrock, and
- The collection of representative soil samples for the preliminary assessment of soil salinity and aggressivity.

The boreholes were drilled using a mechanical truck mounted drill rig which was owned and operated by Fico Pty Ltd, using solid flight auger drilling techniques. Standard Penetrometer Tests (SPT) were performed at regular intervals within the boreholes in accordance with Australian Standard Test Method AS1289.6.3.1-1997 (reference 8).

During drilling, the encountered fill and natural soils were geologically logged by an experienced engineering geologist, taking care to describe the presence and depth of any fill material / previously disturbed ground, the natural stratum, moisture, water bearing zones, and the elevation of the water level/hydraulic head.

The boreholes were advanced through surface fill and the natural soil profile before terminating due to practical refusal at depths of 2.50m to 4.05m bgs within the weathered shale and silty sandstone bedrock.

The location of the boreholes and SPT tests were estimated using measurements from existing site features and are shown on **Figure 1**. A copy of the borehole logs, including SPT test results, are provided in **Appendix B**.

3.2 SUBSURFACE CONDITIONS

The subsurface conditions, as observed in the boreholes, typically comprised minor fill and topsoil overlying residual soils with bands of ironstone then weathered shale and silty sandstone bedrock.

Detailed descriptions of the subsurface conditions on site are provided in the borehole logs (including SPT test data) in **Appendix B**, while a summary of the subsurface conditions encountered across the site are provided in **Table 1**.

Table 1: Summary of Subsurface Conditions

Layer / Unit	Description	Depth to Base of Layer (m)[1]	Consistency / Relative Density[1]
FILL - PAVEMENT	ASPHALT and Sandy Gravel: dark grey and grey, fine to coarse grained sand, fine gravel, dry	0.30	Medium dense
FILL[2]	Silty CLAY: red brown, brown and grey, low to medium plasticity, Moist	0.45	Firm
RESIDUAL SOIL[3]	Silty CLAY: brown and red-brown becoming grey with depth, medium to high plasticity with trace ironstone gravel becoming bands of ironstone and weathered shale increasing with depth	1.80 – 2.60	firm to stiff and very stiff to hard
BEDROCK	SHALE and Sandy SILTSTONE: light grey and grey, extremely too highly weathered	>1.80 to 2.60	Estimated very low to low strength

Note 1: Estimated from DCP tests and borehole observations
Note 2: Fill only identified in BH2
Note 3: Soil moisture content was well below optimum moisture content contributing to high SPT numbers

Adverse aesthetics, specifically odours associated with potential contamination, were not noted during the fieldwork. Additionally, no potentially Asbestos Containing Materials (ACM) was observed in the bores during the drilling.

3.2.1 Groundwater

There was no groundwater or seepage water encountered during the drilling of the borehole. However, seepage water did eventually enter the bore annulus at BH3 and BH4 with the water level measured at depths of 2.75 to 2.80m below ground surface (bgs) after approximately 30 to 45 minutes. Considering the inconsistency between boreholes, the seepage water encountered is not considered to be permanent groundwater (i.e. the water table). Rather the seepage water is likely to be perched water recharged directly from rainfall or associated with a leak in a nearby water pipe.

3.3 LABORATORY TEST RESULTS

Representative samples of soil were collected from each borehole and submitted to Eurofins MGT laboratory for selective testing which included:

- ◊ Electrical Conductivity (EC) to provide a detailed assessment of the salinity potential of the soil profile, and
- ◊ Sulphate, Chloride, resistivity and pH to determine the exposure classification of the soil with respect to buried structural concrete and unprotected steel.

The laboratory test results are presented in **Appendix C**, while a summary of the results is provided in the following sub-sections.

3.3.1 Soil Salinity Testing

An assessment of soil salinity conditions has been undertaken with reference to guidance published by the Department Land and Water Conservation NSW (reference 9). In this regard, selected samples of natural soil were submitted to Envirolab for NATA accredited testing of Electrical Conductivity (EC), which is the primary indicator of salinity,

The raw EC results and the EC_e results[1], are provided in **Table 2**.

Table 2: Electrical Conductivity Results

Sample Location / Depth	Sample Description	EC (dS/m)	Multiplication Factor[1]	EC_e (dS/m)
BH1 / 0.50 – 0.95	Silty CLAY	0.099	7	0.69
BH1 / 1.50 – 1.95	Silty CLAY	0.078	7	0.55
BH1 / 2.50 – 2.70	Silty CLAY	0.053	7	0.37
BH3 / 0.50 – 0.95	Silty CLAY	0.160	7	1.12
BH3 / 1.50 – 1.65	Silty CLAY	0.098	7	0.69
BH3 / 2.50 – 2.60	Silty CLAY	0.053	7	0.37

[1] *EC_e results are EC data multiplied by a conversion factor which depends upon the soil texture / type (Reference 6)*

According to the Department Land and Water Conservation NSW, ECe results less than 2dS/m are considered to be non-saline, ECe results between 2dS/m to 4dS/m are slightly saline, and results between 4dS/m and 8dS/m are considered to be moderately saline. The above test data indicate that the natural soil profile is non-saline.

3.3.2 Aggressivity Testing

A limited number of soil samples were analysed for pH, sulfate, chloride and resistivity to provide a preliminary assessment of the exposure classification (or aggressiveness/corrosiveness potential) of the soil with respect to future buried steel and/or concrete (e.g. footings).

To determine the aggressiveness of the soil and water environment on concrete or steel, the chemical test results are compared to Table 6.4.2(C) and Table 6.5.2(C) from Section 6 of the Australian Standard AS 2159 (reference 10). This section provides assessment criteria to assess the 'exposure classification' for a concrete or steel pile. The Standard has two classes of soil conditions:

(A) high permeability soils below groundwater; and
(B) low permeability soils and all soils above groundwater.

For this site, the soil samples are considered to be condition 'B' and based on the chemical testing results, the standard provides a range of 'exposure classifications' from non-aggressive to very severe. For the range of chemical conditions in the soil surrounding the structure, the condition leading to the most severe aggressive conditions is adopted.

A summary of the soil results is provided in **Table 3**.

Table 3: Exposure classification (aggressivity) test results

Location / Depth (m bgs)	**Soil Condition**	**pH**	**Sulphate** (SO_4) mg/kg	**Chloride** (Cl) mg/kg	**Resistivity** Ohm.cm
BH1 / 0.50 – 0.95	B	5.4	63	78	51,000
BH1 / 1.50 – 1.95	B	5.0	55	48	64,000
BH1 / 2.50 – 2.70	B	5.4	53	29	94,000
BH3 / 0.50 – 0.95	B	5.4	190	69	32,000
BH3 / 1.50 – 1.65	B	5.1	150	<10	51,000
BH3 / 2.50 – 2.60	B	5.1	38	36	94,000

The aggressivity potential of an environment on concrete is dependent on the sulphate and pH levels of the soil. Based on the limited number of test results above and taking into account the 'worst-case' sample, the subsurface profile is mildly aggressive towards concrete. According to Australian Standard AS 3600-2009 (reference 11), specifically Table 4.8.1, this equates to an exposure classification of 'A2'.

The corrosive potential of an environment on unprotected steel is normally dependent on pH, chloride, and resistivity levels of the soil. Based on the limited number of test results above and taking into account the 'worst-case' sample, the subsurface profile is considered to be non-aggressive towards any unprotected steel.

4 DISCUSSION AND RECOMMENDATIONS

4.1 SITE PREPARATION

Following demolition work and prior to construction of the proposed development, all topsoil with organic matter and any pavement materials, should be removed from the proposed building and pavement areas. Stripped topsoil should be stockpiled for re-use as landscape material or disposed off-site.

Material removed from site will need to be managed in accordance with the provisions of current legislation and may include segregation by material type classification in accordance with NSW EPA (2014) *Waste Classification Guidelines* (reference 12) and disposal at facilities appropriately licensed to receive the particular materials. GEE notes that the natural soil and bedrock may be classified as Virgin Excavated Natural Material (VENM) and re-used on other sites rather than disposed at a landfill, although it must be proven to be free of contamination.

GEE notes that the natural silty clay soil profile is expected to be susceptible to loss of strength when wet. In this regard, it may be necessary to construct a working platform above the prepared sub-grade in areas of high construction vehicle traffic, comprising a minimum of 150 mm of gravel or recycled concrete.

4.2 EARTHWORKS

As previously mentioned, earthworks at the site is expected to comprise excavation of between 3.5m and 4.5m depth to facilitate the construction of the proposed basement level. The basement will extend to within close proximity to the site boundaries and also to some existing school buildings which are proposed to be retained.

4.2.1 Excavation

Based on the fieldwork undertaken as part of this investigation, the excavation area will encounter shallow topsoil and residual soils overlying Shale and silty Sandstone bedrock. The strength of bedrock has not been assessed as part of this investigation, however, GEE expects that the bedrock will be initially very low to low strength, becoming low to medium strength at depth. To confirm the strength of the bedrock within the depth of proposed excavation, a more detailed investigation would be required and would need to include the coring and strength testing of the bedrock formation.

The excavation of the soil profile, and very low to low strength Shale bedrock is expected to be readily excavated using standard equipment such as excavators. However, the use

of an impact hammer is expected to be required upon encountering low to medium strength (or better) bedrock, especially when combined with unfavourable rock-defect geometry. When using an impact hammer the effects of vibration should be considered and are discussed further in Section 4.2.4.

4.2.2 Groundwater Inflow

Permanent groundwater was not encountered during the drilling of the boreholes and the short time (<10mins) in which they remained open. However, slow seepage is expected to occur over time along the soil-bedrock interface and through defects within the bedrock formation. This is supported by the fact that seepage water did eventually occur in the monitoring well installed within BH3 and BH4.

The seepage is expected to be sufficiently managed during the earthworks phase by pumping from a sump at the base of the excavation. In the long term, conventional techniques such as strip drains behind basement walls and ag-lines will need to be incorporated into the design of the basement to ensure that any seepage is directed to a sump where it can be pumped into the regional stormwater system.

4.2.3 Excavation Support

Based on the expected depth and location of the basement relative to existing structures on the site and the site boundaries, temporary batter slopes are not considered to be feasible for the proposed excavations and therefore the use of either temporary shoring or the early construction of permanent walls designed to shore up the soil profile, prior to excavation will be required. GEE notes that shoring is generally recommended on all sides of the proposed basement to minimise the amount of ground disturbance beyond the excavation perimeter.

Considering the subsurface conditions encountered during the field investigations, options for shoring include the use of the use of evenly spaced mass concrete piles (soldier piles), with a pile cap. For piles, open bored piles or Continuous Flight Auger (CFA) piles, are both considered to be feasible. The shoring should be designed by a suitably experienced structural engineer in accordance with AS 4678-2002 *Earth Retaining Structures* (reference 19) and should consider the short and long term configurations. In the short term, should the shoring walls be cantilevered or supported by a single row of anchors and some wall movements can be tolerated (flexible wall), the pressure acting on the wall can be estimated on the basis of a triangular earth pressure distribution.

When internal props, such as the ground floor slab, restrain retaining wall movement, or where significant movements cannot be tolerated, such as immediately adjacent to

adjoining buildings, an 'at-rest' earth pressure coefficient (Ko) should be adopted with either a uniform or trapezoidal pressure distribution. This may also include the lengths of wall immediately adjacent to adjoining structures that bound the site. It should be noted that shoring which is designed for this 'at rest' coefficient may still undergo some lateral movements, depending on the final configuration of the wall and construction sequence.

The design of any retaining structures should make allowance for all applicable surcharge loadings including construction activities around the perimeter of the excavation and adjacent buildings. Consideration should be given to the possibility of a hydrostatic pressure due to build-up of water behind the wall (*e.g.* from broken services), unless permanent subsurface drainage can be provided.

Computer aided analysis may be carried out to assess potential ground movements based on different wall designs and construction sequence, so as to control deflections to within tolerable limits. It is also considered prudent to carry out surveys before and after installation to measure the actual movement of the wall or soil.

Geotechnical parameters for the soil and bedrock profile encountered at the site are provided in **Table 4.**

Table 4: Retaining Walls - Geotechnical Design Parameters

Units	Depth to Top of Layer (m)	Unit Weight (kN/m^3)	Active Lateral Earth Pressure (Ka)	Lateral Earth Pressure at Rest (Ko)	Passive Lateral Earth Pressure (Kp)	Effective Cohesion (c') (kPa)	Effective Friction Angle (φ') (degree)
1 - Fill / Natural Soil	Surface	19	0.35	0.5	--	5	25
2 – Shale	>1.35	22	0.20	0.4	3.5	25	30

4.2.4 Construction / Excavation Induced Vibration

When using a hydraulic hammer, vibrations will be transmitted through the ground which may potentially impact on adjoining structures and services. Where possible, the use of other techniques not involving impact (*e.g.* rock saws), should be adopted as they would reduce or possibly eliminate risks of damage due to vibrations.

Structures located both on and adjacent to the site including nearby services are sensitive to vibrations above certain threshold levels (regarding potential for disturbance and

cracking). Given that the proposed basement excavation will extend to within close proximity to the boundaries and existing structures close controls by the excavation contractor over the rock excavation are necessary, and are recommended, so that excessive vibration effects are not generated.

Peak Particle Velocity (PPV) is usually the adopted measure of ground vibration and the safe limits depend on the sensitivity of the adjoining structures and services. There is a number of Australian and overseas publications which provide vibration velocity guideline levels (or safe limits) including:

- Australian Standard AS2187.2-2006 Explosives - Storage and use - Use of explosives - Appendix J: Ground Vibrations and Airblast Overpressure (reference 13).
- Australian Standard AS2670.2-1990 Evaluation of human exposure to whole-body vibration - Part 2: Continuous and shock-induced vibration in buildings (1 to 80 Hz) (reference 14).
- DIN 4150 – Part 3 – 1999. Effects if Vibration on Structures (reference 15).
- Department of Environment and Conservation NSW, 2006. Assessing Vibration: a technical guideline (reference 16).
- British Standard BS 7385-1:1990. Evaluation and measurement for vibration in buildings. Guide for measurement of vibrations and evaluation of their effects on buildings (reference 17).
- British Standard BS 7385-2:1993. Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration (reference 18).

The most appropriate guidelines levels for the proposed excavation work are provided in AS2187.2-2006, which refers to guideline values from BS7385-2 for the prevention of minor or cosmetic damage occurring in structures from ground vibration. Additionally, the guideline levels provided in DIN 4150 Part 3 is considered an appropriate source for guideline levels.

Ideally, safe limits should be determined by a specialist vibration consultant. However, as a preliminary and conservative guide, and considering the above guidelines and the type of adjoining structures present, GEE recommend that excavation methods should be adopted which limit ground vibrations at the adjoining developments to not more than 5mm/sec.

The PPV limit of 5mm/sec is expected to be achievable if rock breaker equipment or other excavation methods are restricted as indicated in **Table 5**.

Table 5: Recommendations for Rock Hammer Equipment

Distance from adjoining structure (m)	Maximum Peak Particle Velocity 5mm/sec	
	Equipment	Operating Limit (% of Maximum Capacity)
1.0 to 2.0	Hand operated jackhammer only	100
2.0 to 5.0	300 kg rock hammer	50
5.0 to 10.0	300 kg rock hammer or 600 kg rock hammer	100 50

GEE notes human discomfort levels caused by vibration are typically less than the levels that are likely to cause cosmetic or structural damage to structures. Therefore, complaints may be lodged by neighbours before any cosmetic or structural damage occurs. In this regard, consideration may be given to adopting more stringent vibration limits recommended for human amenity or, as a minimum, ensuring that vibration monitoring is undertaken as reassurance to confirm that vibrations are within safe limits. Acceptable vibration limits for human comfort caused by construction and excavation equipment are provided in DEC (2006) (reference 16). Specifically, maximum acceleration limits as specified in Table 2.2 of the guideline should be adopted.

Finally, the excavation equipment should always be operated by experienced personnel, according to the manufacturer's instructions, and in a manner consistent with minimising vibration effects. Measures which may be used to minimise vibration include:

- ◊ Progressive breakage from open excavated faces,
- ◊ Selective breakage along open joints, where present,
- ◊ Use of rock hammers in short bursts to prevent generation of resonant frequencies,
- ◊ Orientation of the rock hammer pick away from property boundaries and into the existing open excavation,
- ◊ Commencement of excavation as far away from other structures as possible, and
- ◊ The use of a rock sawing or grinder adjacent to the site boundaries. GEE notes that this equipment also reduces the possibility of overbreak and loosening of the rock mass.

4.2.5 Dilapidation Report

GEE suggests that a dilapidation report be carried out on neighboring buildings and structures prior to commencing excavation. The purpose of a dilapidation report is to confirm that construction works, in particular excavation, are not causing damage and therefore may prevent future claims of damage arising from the works. Preferably these surveys should be agreed to, and the report signed, by the owners of the adjacent building prior to work commencing.

4.3 FOUNDATIONS

Following excavation of the basement, the bulk excavation level is likely to comprise shale bedrock which is expected to be capable of providing an allowable end bearing capacity of at least 450kPa. For consistency, GEE recommends that all foundations, including those beyond the basement footprint, be founded within the bedrock formation.

Where higher bearing capacity is required GEE recommends further geotechnical investigations be carried out with a mechanical drilling rig to allow rock strength testing of the bedrock formation, prior to finalising the structural design.

Finally, footing systems should be designed by a suitably qualified and experienced structural engineer and GEE recommends that inspection by a geotechnical professional is undertaken during the footing excavation stage, to confirm that the design founding conditions have been achieved.

4.3.1 Aggressivity / Exposure Classification

Based on the preliminary exposure classification test results (Section 3.3.2), and in accordance with AS 2159-2009 (reference 10), the subsurface concrete structures (*e.g.* footings) may be designed based on mildly aggressive soil conditions for concrete. According to Australian Standard AS 3600-2009 (reference 11) the exposure classification is 'A2'. For buried steel that is unprotected, the sub-surface profile is non-aggressive/corrosive.

4.4 SALINITY

The lab testing completed herein indicates that the soil profile is non-saline and therefore no specific salinity management plan is warranted.

5 CONCLUSION

GEE considers that enough information has been gained to be confident of the subsurface conditions across the site, to assist with design of the proposed development and to provide Council with assurances regarding the geotechnical feasibility of the proposed development.

Based on the results of the investigation, the proposed development is considered feasible. Additionally, GEE concludes that the existing rock formation can withstand the proposed loads to be imposed, and standard shoring works (provided they are designed by a structural engineer), will ensure the stability of the excavation and provide protection and support of the adjoining properties.

The geotechnical issues associated with the proposed development have been addressed by the investigation and are discussed in this report. If, during construction, any conditions are encountered that vary significantly from those described or inferred in the above report, it is a condition of the report that we be advised so that those conditions, and the conclusions discussed in the report, can be reviewed and alternative recommendations assessed, if appropriate.

GEE will be pleased to assist with any further advice or geotechnical services required in regard to the proposed development.

6 GENERAL LIMITATIONS

Soil and rock formations are variable. The logs or other information presented as part of this report indicate the approximate subsurface conditions only at the specific test locations. Boundaries between zones on the logs or stratigraphic sections are often not distinct, but rather are transitional and have been interpreted.

The precision with which subsurface conditions are indicated depends largely on the frequency and method of sampling, and on the uniformity of subsurface conditions. The spacing of test sites also usually reflects budget and schedule constraints. Groundwater conditions described in this report refer only to those observed at the place and under circumstances noted in the report. The conditions may vary seasonally or as a consequence of construction activities on the site or adjacent sites.

Where ground conditions encountered at the site differ significantly from those anticipated in the report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that GEE be notified of any variations and be provided with an opportunity to review the recommendations of this report. Recognition of changed soil and rock conditions requires experience and it is recommended that a suitably experienced geotechnical engineer be engaged to visit the site with sufficient frequency to detect if conditions have changed significantly.

The comments given in this report are intended only for the guidance of the design engineer, or for other purposes specifically noted in the report. The number of boreholes or test excavations necessary to determine all relevant underground conditions which may affect construction costs, techniques and equipment choice, scheduling, and sequence of operations would normally be greater than has been carried out for design purposes. Contractors should therefore rely on their own additional investigations, as well as their own interpretations of the borehole data in this report, as to how subsurface conditions may affect their work.

7 REFERENCES

1. Department of Mineral Resources, 1983: Sydney 1:100,000 *Geological Series Map Sheet 9130 (Edition 1).*
2. Soil Conservation Service of NSW, 1989: *Sydney 1:100,000 Soil Landscape Series Sheet 9130.*
3. Wooley, D.R., 1983: Groundwater. In Herbert, C., (Ed), Geology of the Penrith 1:100,000 Sheet 9030, Geological Survey of New South Wales, Department of Mineral Resources, pp. 145-148.
4. Krumins, H., Bradd, J., and McKibbon, D., 1998: Hawkesbury-Nepean Catchment Groundwater Availability Map: Map Notes. Department of Land and Water Conversation, December 1998, Parramatta, 12 pp.
5. Old, A. N., 1942: *The Wianamatta Shale Waters of the Sydney District.* Agricultural Gazette of New South Wales, Miscellaneous Publication 3225.
6. Cook P.G., 2003: *A Guide to Regional Groundwater Flow in Fractured Rock Aquifers.* Seaview Press, Henley Beach (South Australia), 108pp.
7. DLWC: Department of Land and Water Conservation of NSW, 1997: Botany Bay *Acid Sulfate Soil Risk Map – Edition Two.*
8. Australian Standards, 2004. AS1289.6.3.1 Methods of testing soils for engineering purposes - Soil strength and consolidation tests – Determination of the penetration resistance of a soil – Standard Penetration Test (SPT).
9. Department of Land and Water Conservation NSW, 2002: *Site investigations for urban salinity.*
10. Australian Standard (AS) 2159 -2009: Piling Design and Installation.
11. Australian Standard (AS) 3600 – 2009: Concrete Structures.
12. New South Wales Environment Protection Authority (NSW EPA), 2014: Waste classification guidelines – Part 1 classifying waste. November 2014.
13. Australian Standard AS2187.2-2006 *Explosives - Storage and use - Use of explosives* - Appendix J: *Ground Vibrations and Airblast Overpressure.*
14. Australian Standard AS2670.2-1990: *Evaluation of human exposure to whole-body vibration - Part 2: Continuous and shock-induced vibration in buildings (1 to 80 Hz).*
15. DIN 4150 – Part 3 – 1999. *Effects if Vibration on Structures.*
16. Department of Environment and Conservation NSW, 2006. *Assessing Vibration: a technical guideline.*

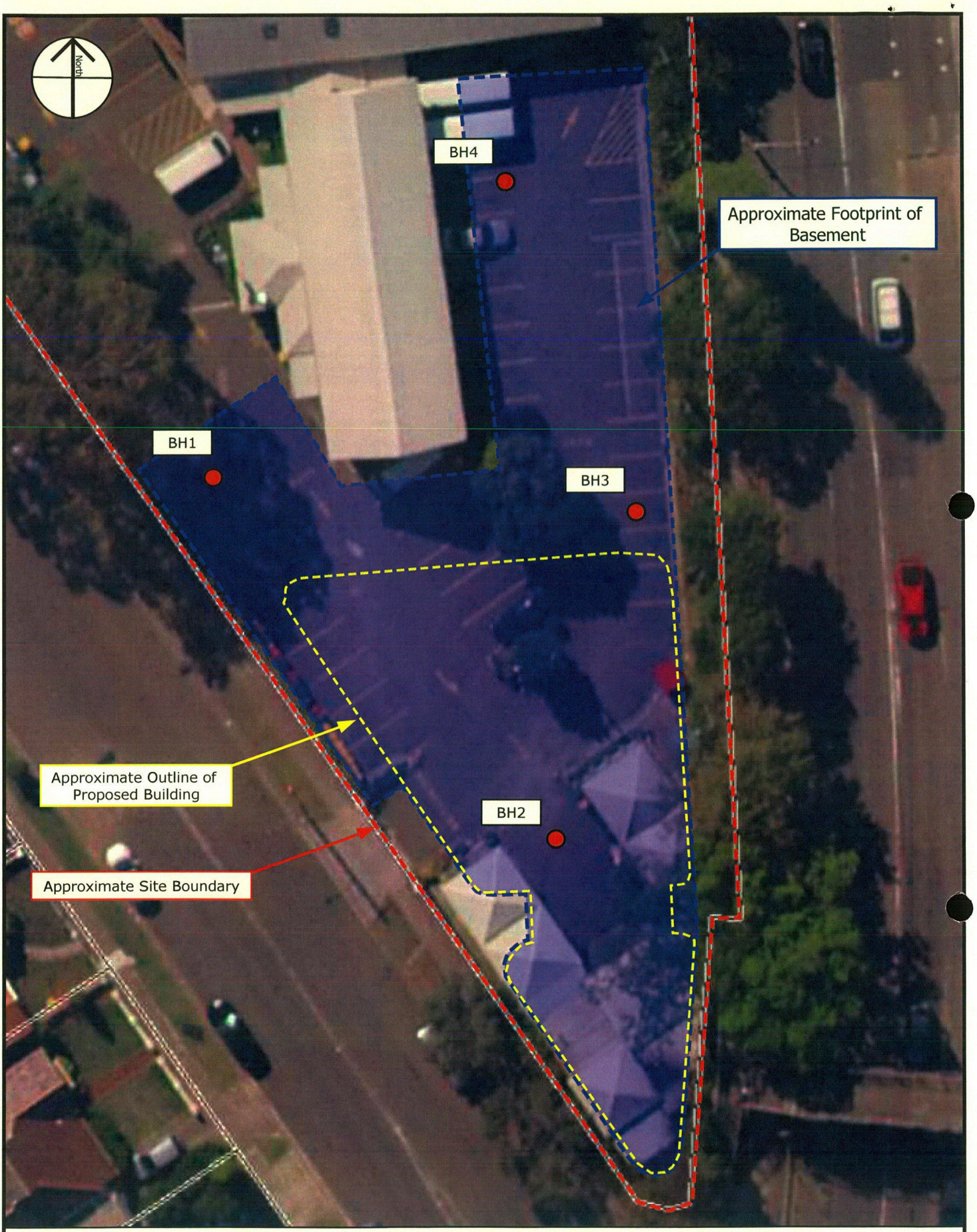
17. British Standard BS 7385-1:1990. *Evaluation and measurement for vibration in buildings. Guide for measurement of vibrations and evaluation of their effects on buildings.*

18. British Standard BS 7385-2:1993. *Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration.*

19. Australian Standard AS4678-2002: Australian Standard, 2002: *Earth Retaining Structures*.

FIGURES

1 – Site Plan



Aerial image provided by Intramap (http://maps.bayside.nsw.gov.au) - Image date 2018

DRAWN:	SCALE:	JOB No.:	DATE:	REVISION:	FIGURE No.
M.Kilham	N.T.S	G19077BEX	16/01/2020	A	1

geo-environmental ENGINEERING
82 BRIDGE STREET
LANE COVE NSW 2066
P - 61 (2) 9420 3361
E - info@geoenvironmental.com.au
www.geoenvironmental.com.au

TITLE:

SITE PLAN

339 - 377 Forest Road, Bexley NSW

APPENDIX A

Architectural Plans (23 Sheets)

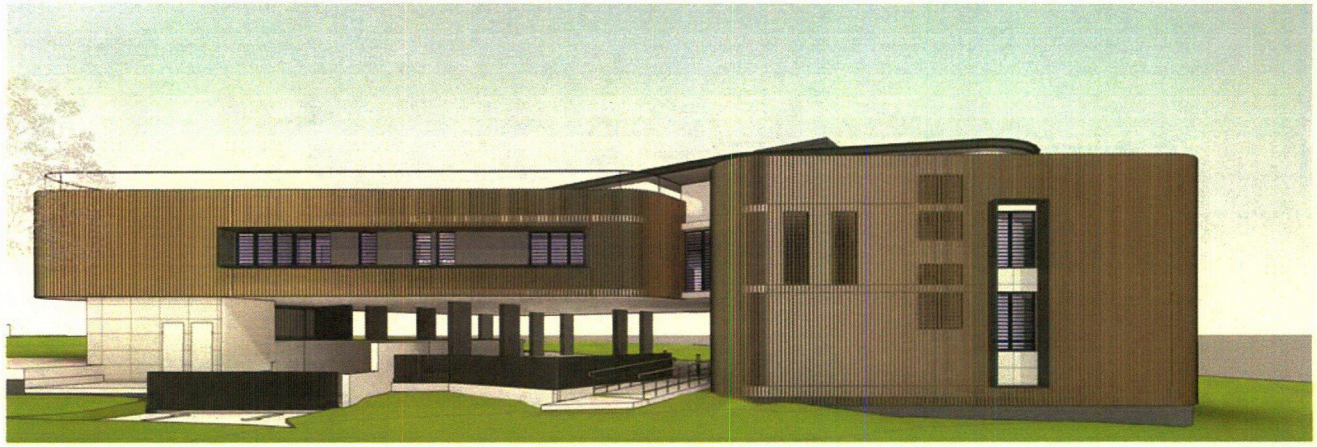
DEVELOPMENT SUMMARY

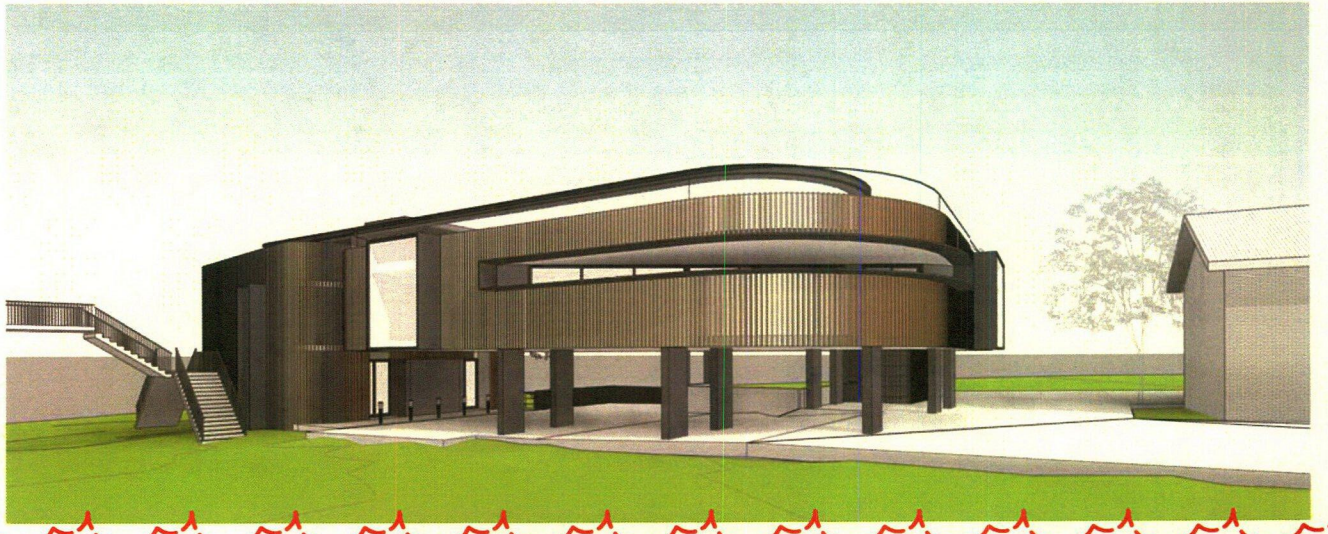
339 - 377 FOREST RD, BEXLEY NSW 2207
LOT 11; DP: 857 373
R2 Low Density Residential Zone
Bayside Council

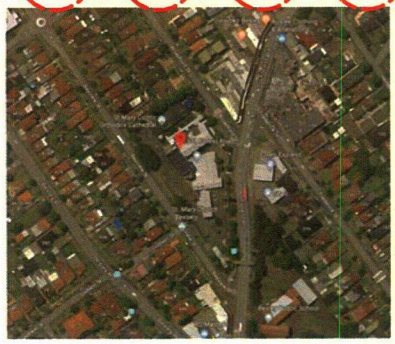
Site Area:	8388 sqm
Zone:	R2 - Low Density Residential
Max FSR:	0.5:1
Existing Buildings:	3175sqm
Proposed Childcare Building:	828 sqm
Total Area Combined:	4003 sqm (0.47:1)
Landscaped Area:	Existing = 1433.57 sqm (Approx) Proposed = 1337.30 sqm (Approx)

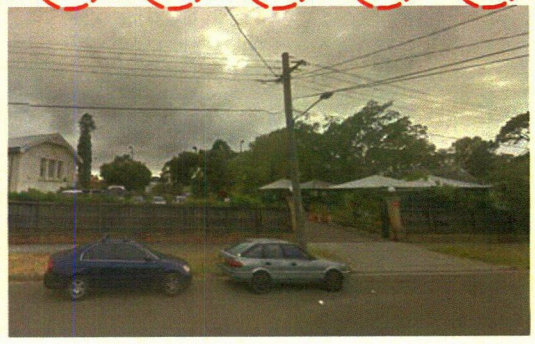
Sheet List

Number	Name	Current Revision	Current Revision Date
00	Cover Sheet	L	17.02.20
01	Context Plan	I	26.06.19
02	Site Analysis Plan	I	26.06.19
03	Site Plan	L	17.02.20
04	Basement Plan	L	17.02.20
05	Basement Driveway Ramp	L	17.02.20
06	Ground Floor Plan	L	17.02.20
07	First Floor Plan	L	17.02.20
08	Roof Top Plan	L	17.02.20
09	Elevations	L	17.02.20
10	Elevations	L	17.02.20
11	Elevations	L	17.02.20
12	Sections	L	17.02.20
13	Sections	L	17.02.20
13A	Height Comparison	L	17.02.20
14	Shadow Diagrams	L	17.02.20
15	Area Calculation Plans	L	17.02.20
15A	Existing Building Area Calcs	L	17.02.20
16	Construction Management Plan	I	26.06.19
17	Tree Management Plan	I	26.06.19
18	Waste Management Plan	I	26.06.19
19	Colours and Materials Schedule	I	26.06.19
20	Operations Plan - Mon-Fri	L	17.02.20
21	Operations Plan - Weekends	L	17.02.20
22	Context Elevations	L	17.02.20
23	Soil & Water Management Plan	J	11.07.19
24	MGA Survey		
28	3D Street Perspectives	L	17.02.20
29	3D Street Perspectives	L	17.02.20
30	3D Perspectives	L	17.02.20
31	3D Street Perspectives	L	17.02.20
NN	Neighbour Notification	I	26.06.19









Issue	Description	Date
H	Client Issue	03.05.19
I	DA Issue	26.06.19
J	DA Issue - areas updated	11.07.19
K	Issued for Council Discussion	31.10.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

North

Drawing Name: Cover Sheet

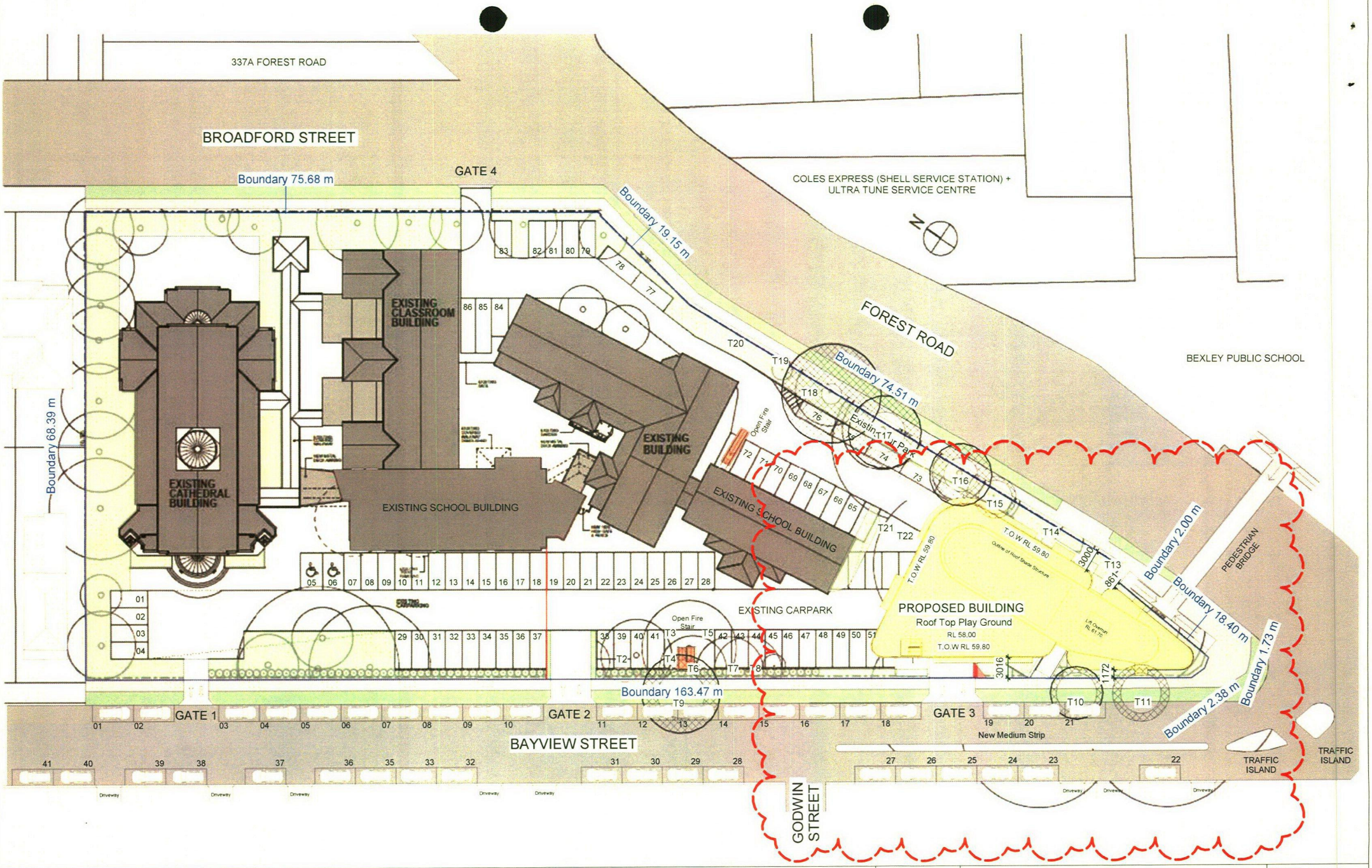
339 Forest Rd, Bexley

Scale @ A3 | 26.06.19

Project 1740

Issue Issue L

Sheet 00



Issue	Description	Date
E	Amended Design	18.01.19
G	Consultant Issue	31.01.19
H	Client Issue	03.05.19
I	DA Issue	26.06.19
K	Issued for Council Discussion	31.10.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

Figured dimensions only to be used. Do not scale off drawings. Any discrepancies to be verified on site with architect.

North

Drawing Name: Site Plan

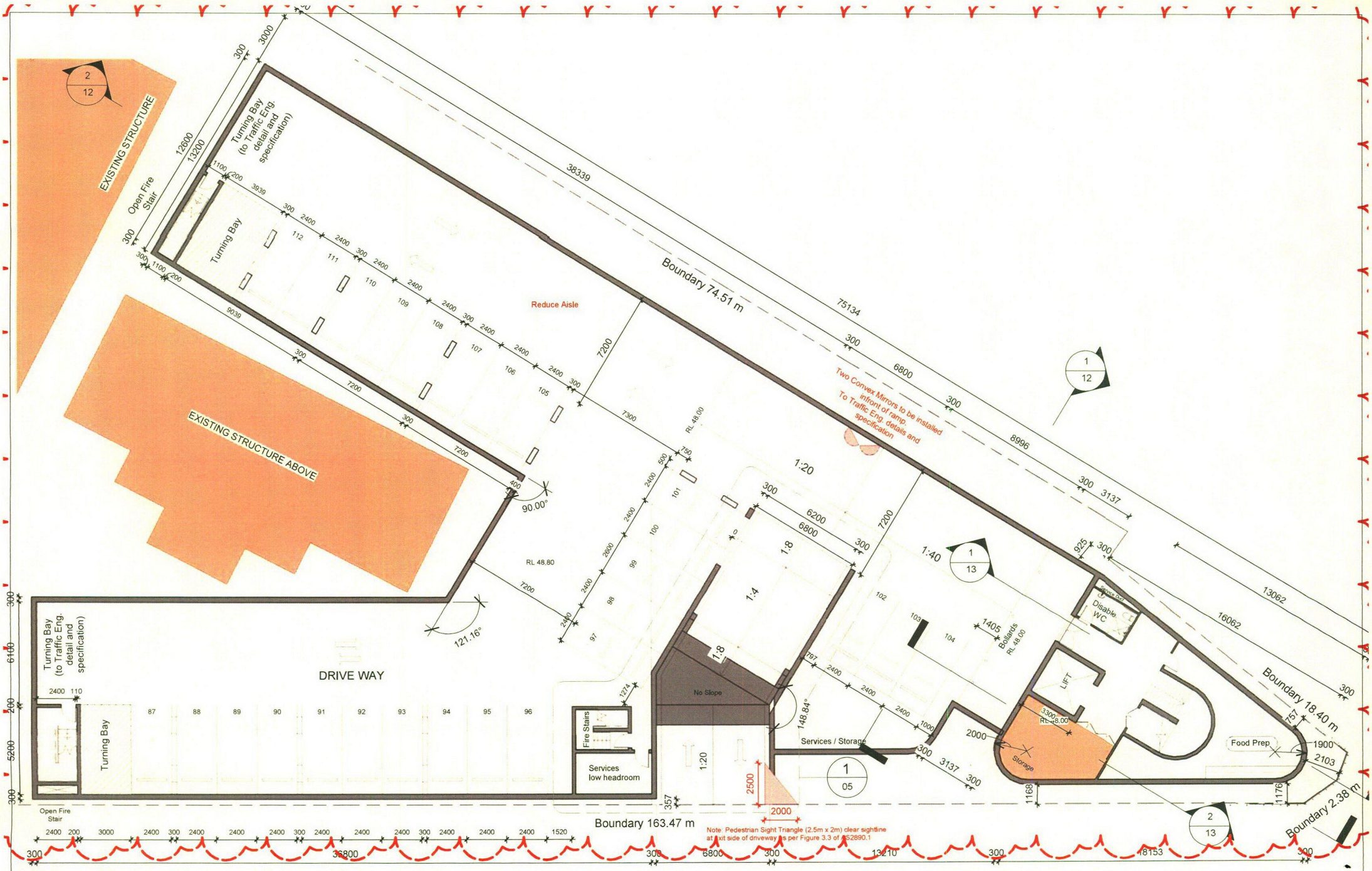
339 Forest Rd, Bexley

Scale 1 : 500 @ A3 | 26.06.19

Project 1740

Issue Issue L

Sheet 03



Issue	Description	Date
E	Amended Design	18.01.19
G	Consultant Issue	31.01.19
H	Client Issue	03.05.19
I	DA Issue	26.06.19
K	Issued for Council Discussion	31.10.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

Figured dimensions only to be used. Do not scale off drawing. Any discrepancies to be verified on site with architect.

North

Drawing Name: **Basement Plan**

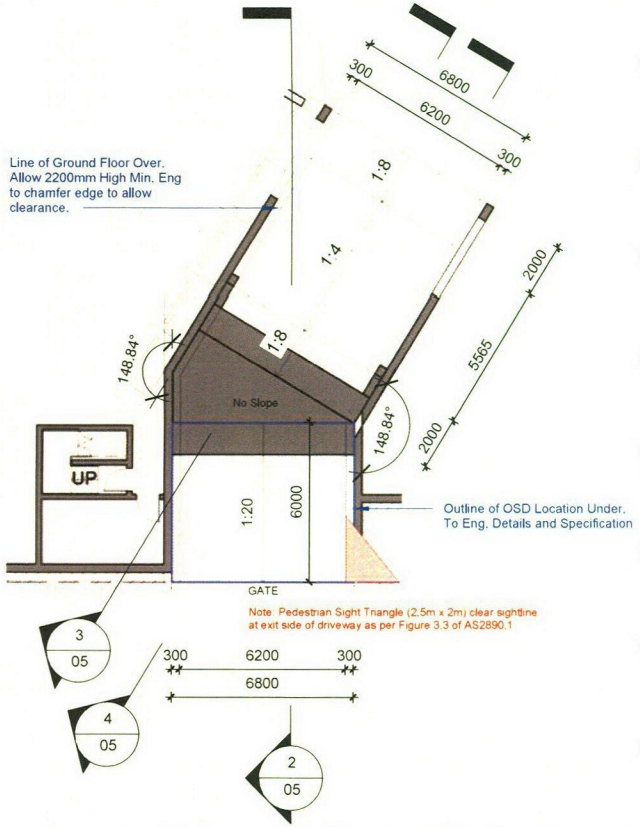
339 Forest Rd, Bexley

Scale 1 : 200 @ A3 | 26.06.19

Project 1740

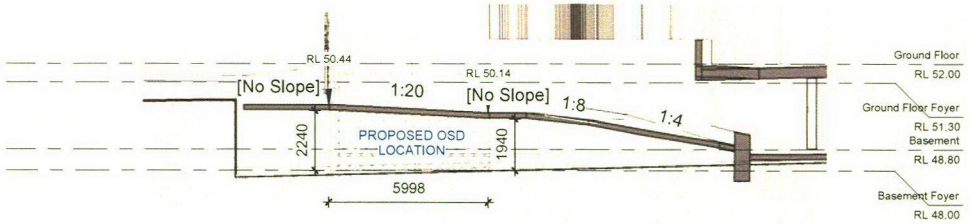
Issue Issue L

Sheet 04



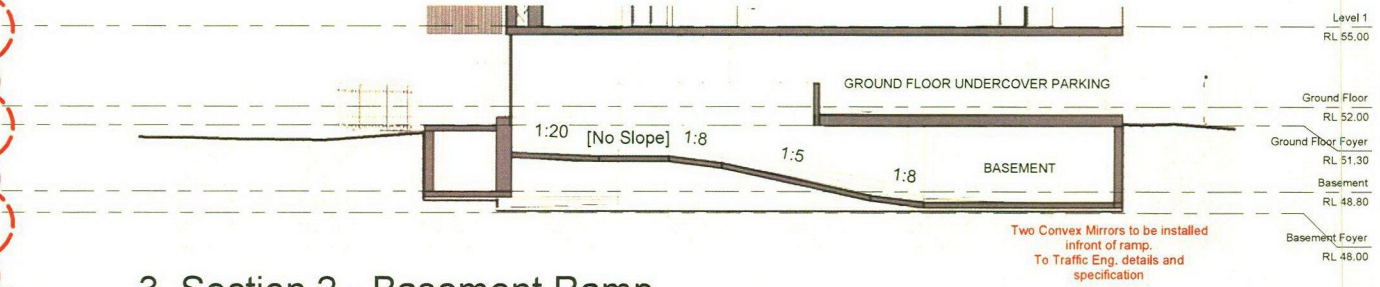
1. Basement - Driveway Ramp Callout

Scale 1 : 200



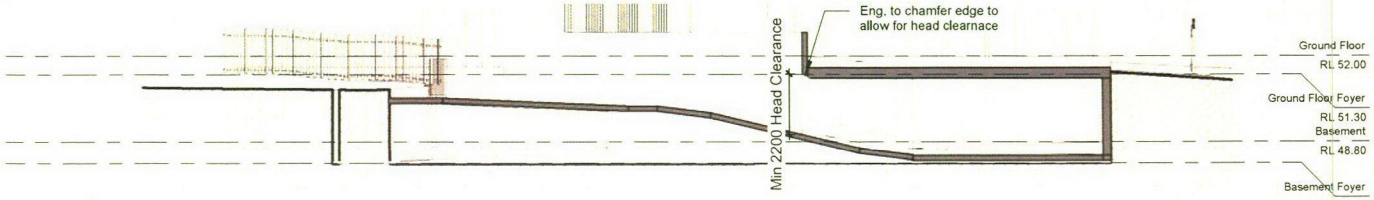
2. Section 1 - Basement Ramp

Scale 1 : 200



3. Section 2 - Basement Ramp

Scale 1 : 200



4. Section 8 - Basement Ramp

Scale 1 : 200

Issue	Description	Date
H	Client Issue	03.05.19
I	DA Issue	26.06.19
K	Issued for Council Discussion	31.10.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

North

Drawing Name: Basement Driveway Ramp

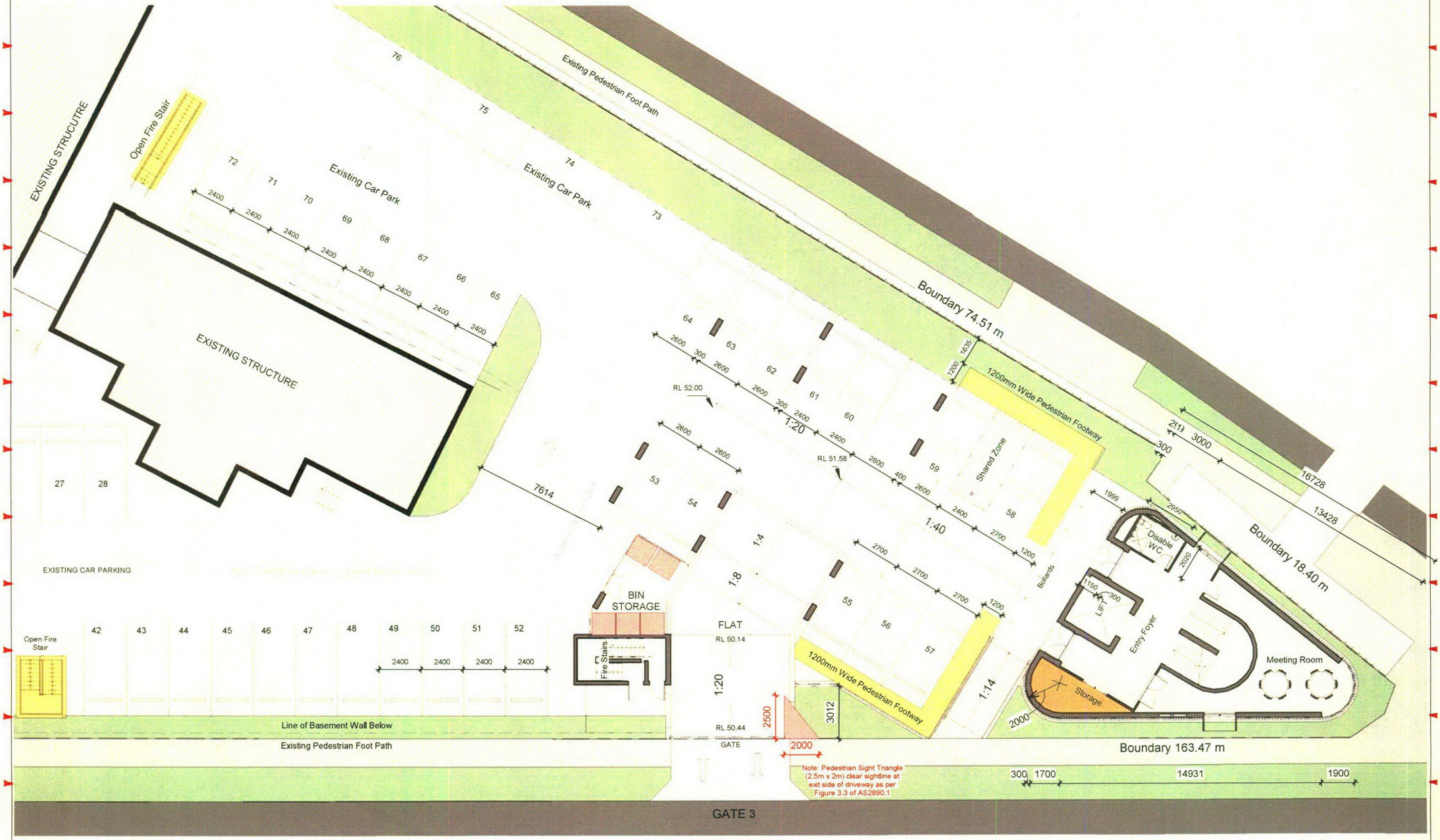
339 Forest Rd, Bexley

Scale 1 : 200 @ A3 | 26.06.19

Project 1740

Issue Issue L

Sheet 05



Issue	Description	Date
E	Amended Design	18.01.19
G	Consultant Issue	31.01.19
H	Client Issue	03.05.19
I	DA Issue	26.06.19
K	Issued for Council Discussion	31.10.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

Figured dimensions only to be used. Do not scale off drawing. Any discrepancies to be verified on site with architect.

North

Drawing Name
Ground Floor Plan

339 Forest Rd, Bexley

Scale 1 : 200 @ A3 | 26.06.19

Project 1740
Issue Issue L
Sheet 06

Issue	Description	Date
E	Amended Design	18.01.19
G	Consultant Issue	31.01.19
H	Client Issue	03.05.19
I	DA Issue	26.06.19
K	Issued for Council Discussion	31.10.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

Figured dimensions only to be used. Do not scale off drawings. Any discrepancies to be verified on site with architect.

North

Drawing Name: First Floor Plan

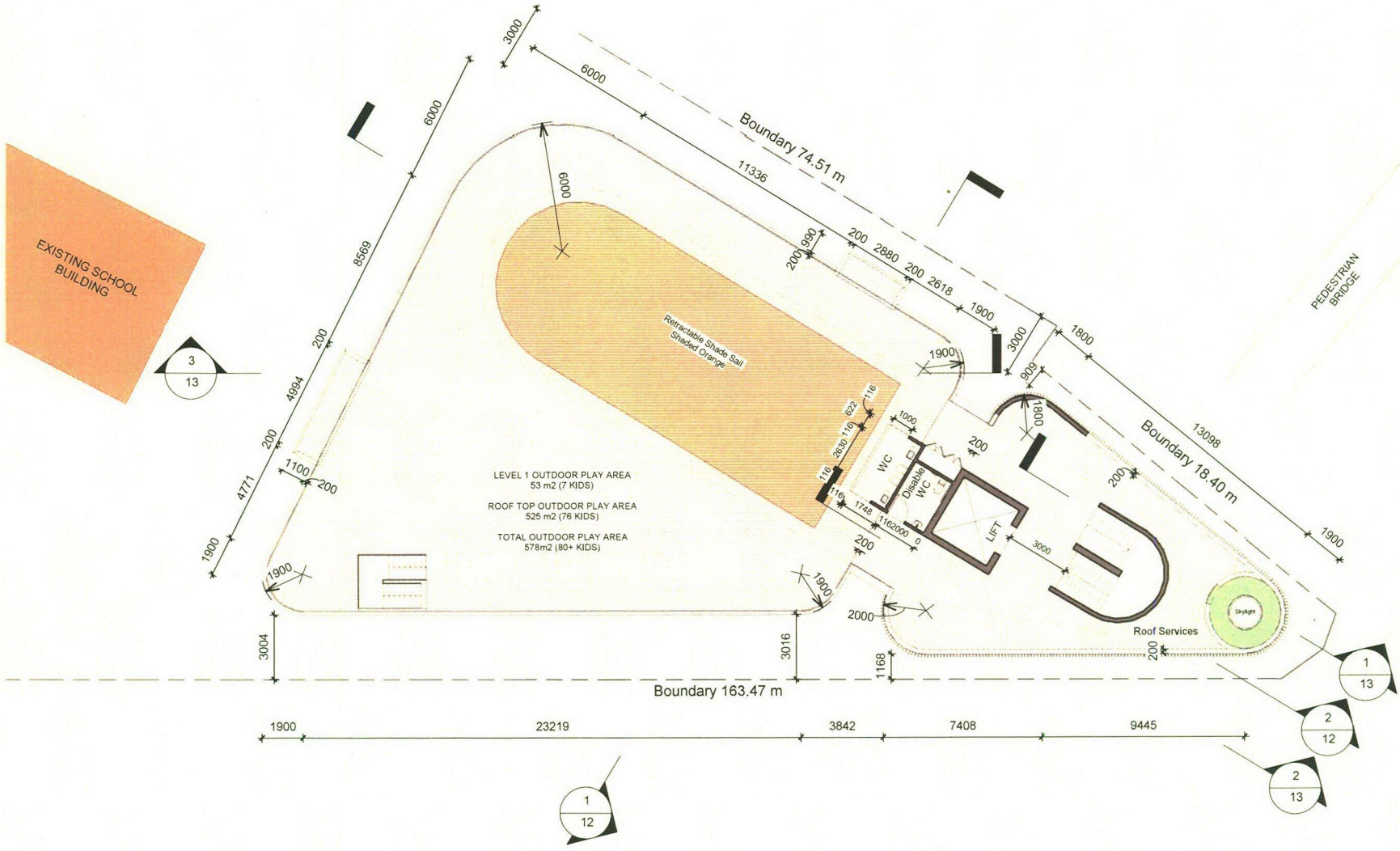
339 Forest Rd, Bexley

Scale 1 : 200 @ A3 | 26.06.19

Project 1740

Issue Issue L

Sheet 07



Issue	Description	Date
E	Amended Design	18.01.19
G	Consultant Issue	31.01.19
H	Client Issue	03.05.19
I	DA Issue	26.06.19
K	Issued for Council Discussion	31.10.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

Figured dimensions only to be used. Do not scale off drawing. Any discrepancies to be verified on site with architect.

North

Drawing Name: Roof Top Plan

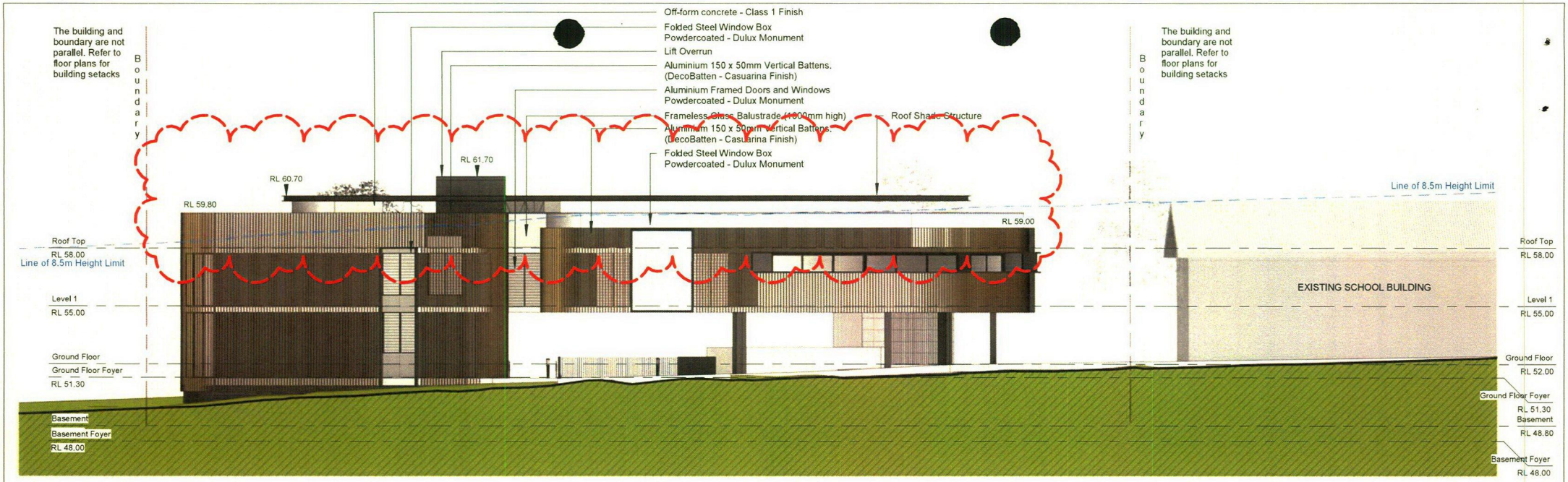
339 Forest Rd, Bexley

Scale 1 : 200 @ A3 | 26.06.19

Project 1740

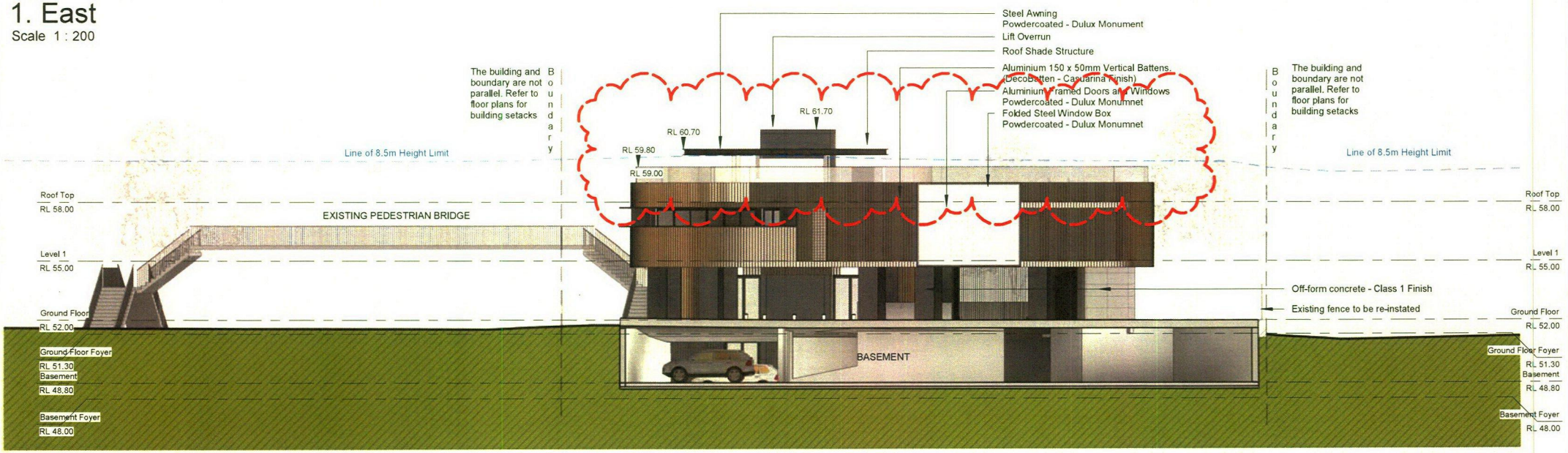
Issue Issue L

Sheet 08



1. East

Scale 1 : 200



2. North

Scale 1 : 200

Issue	Description	Date
H	Client Issue	03.05.19
I	DA Issue	26.06.19
K	Issued for Council Discussion	31.10.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

Drawing Name
Elevations

339 Forest Rd, Bexley

Scale 1 : 200 @ A3 | 26.06.19

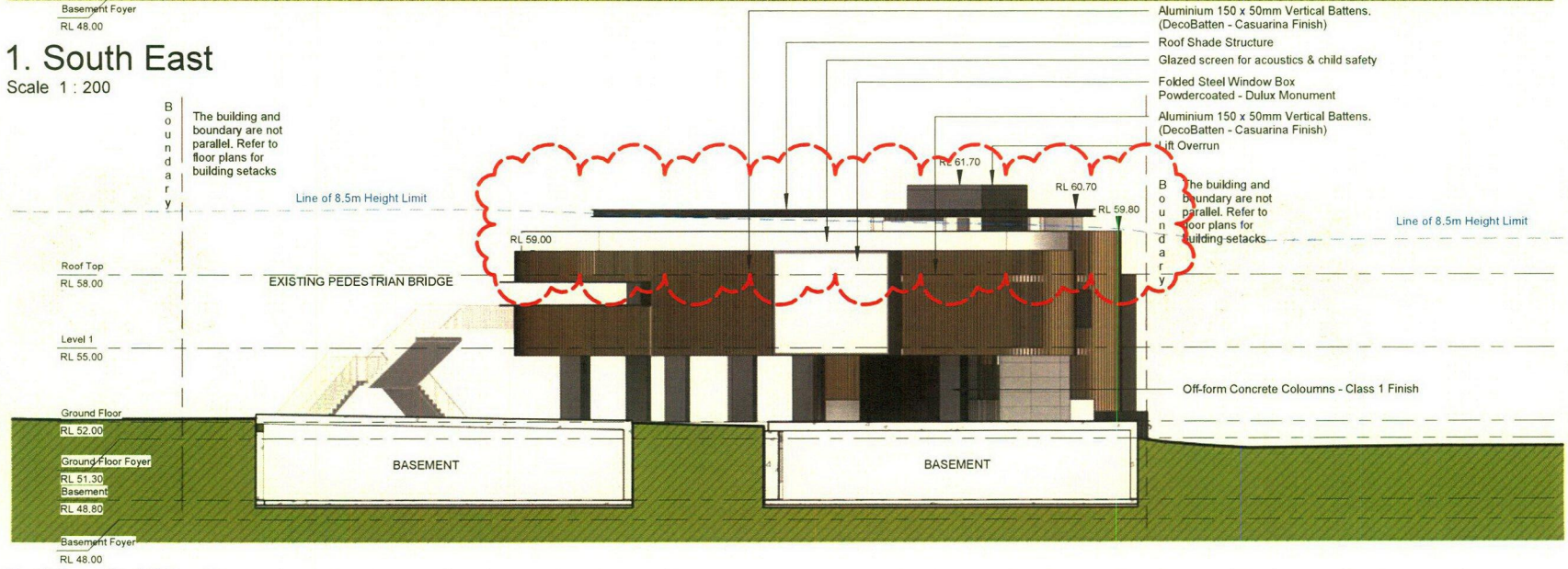
Project 1740

Issue Issue L

Sheet 09

1. South East

Scale 1 : 200



2. North West

Scale 1 : 200

Issue	Description	Date
D	Pre-DA Issue	08.05.18
G	Consultant Issue	31.01.19
H	Client Issue	03.05.19
I	DA Issue	26.06.19
K	Issued for Council Discussion	31.10.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

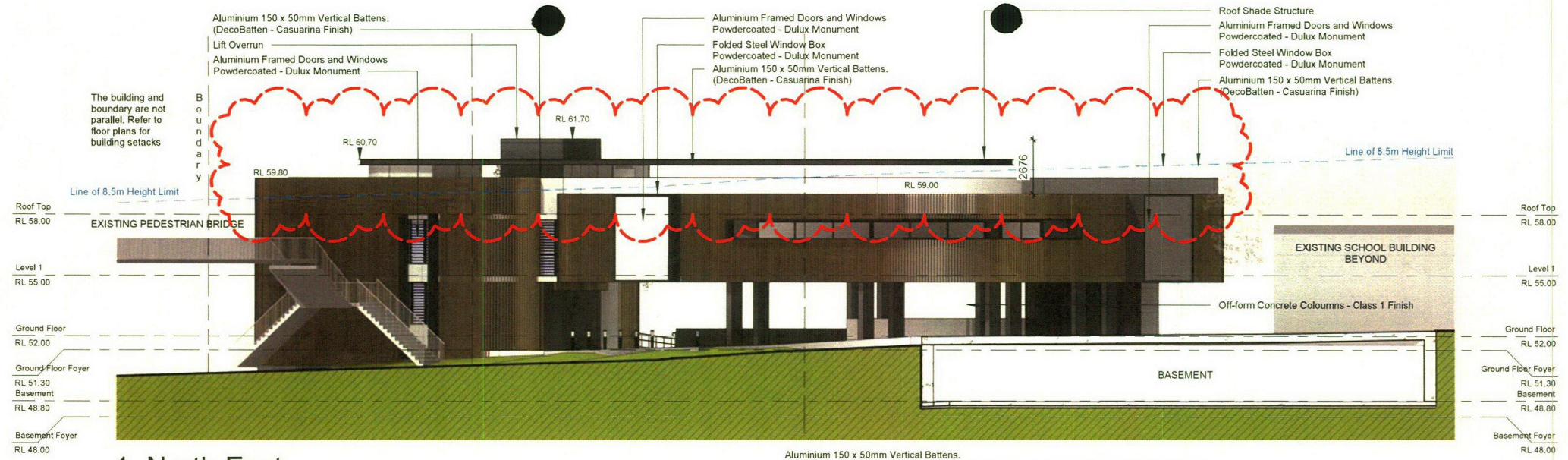
>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

Drawing Name
Elevations

339 Forest Rd, Bexley

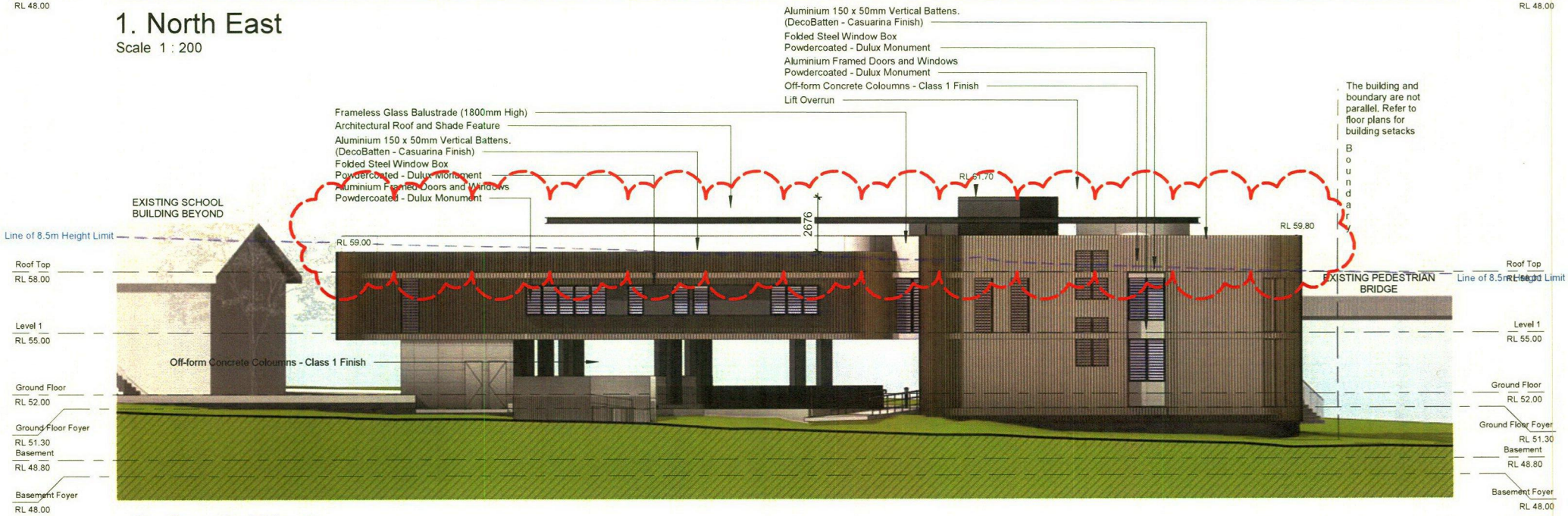
Scale 1 : 200 @ A3 | 26.06.19

Project 1740
Issue Issue L
Sheet 10



1. North East

Scale 1 : 200



2. South West

Scale 1 : 200

Issue	Description	Date
D	Pre-DA Issue	08.05.18
G	Consultant Issue	31.01.19
H	Client Issue	03.05.19
I	DA Issue	26.06.19
K	Issued for Council Discussion	31.10.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras ARCHITECTS

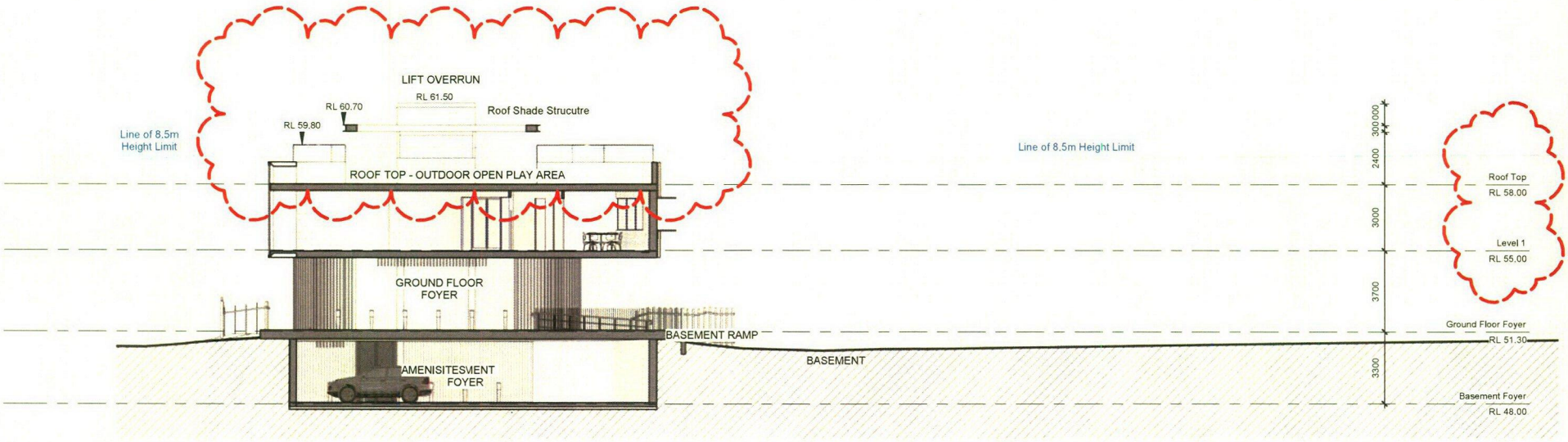
>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

Drawing Name
Elevations

339 Forest Rd, Bexley

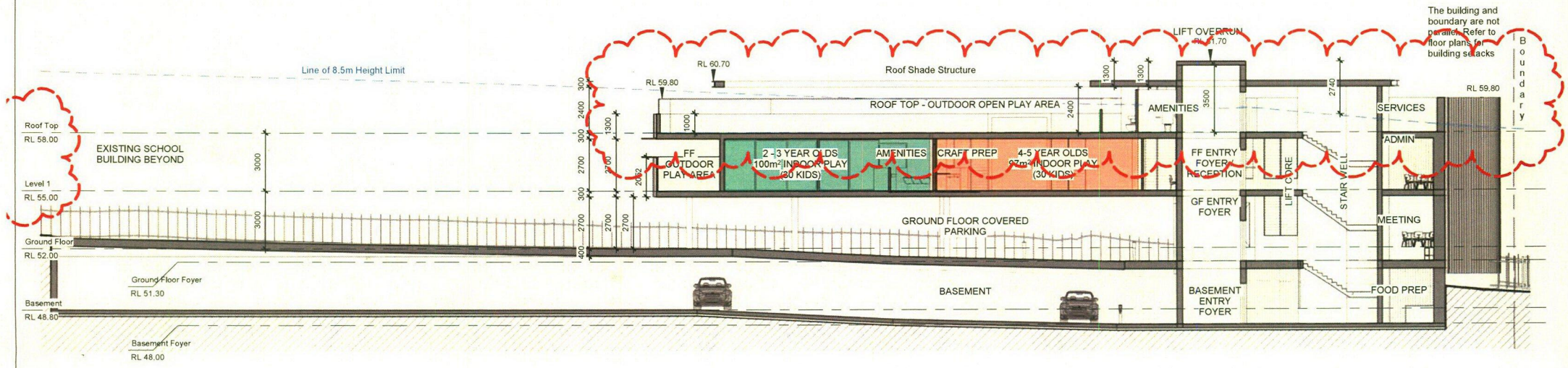
Scale 1 : 200 @ A3 | 26.06.19

Project 1740
Issue Issue L
Sheet 11



1. Section 3 - Proposed Changes

Scale 1 : 200



2. Section 4 - Proposed Changes

Scale 1 : 200

Issue	Description	Date
D	Pre-DA Issue	08.05.18
G	Consultant Issue	31.01.19
H	Client Issue	03.05.19
I	DA Issue	26.06.19
K	Issued for Council Discussion	31.10.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

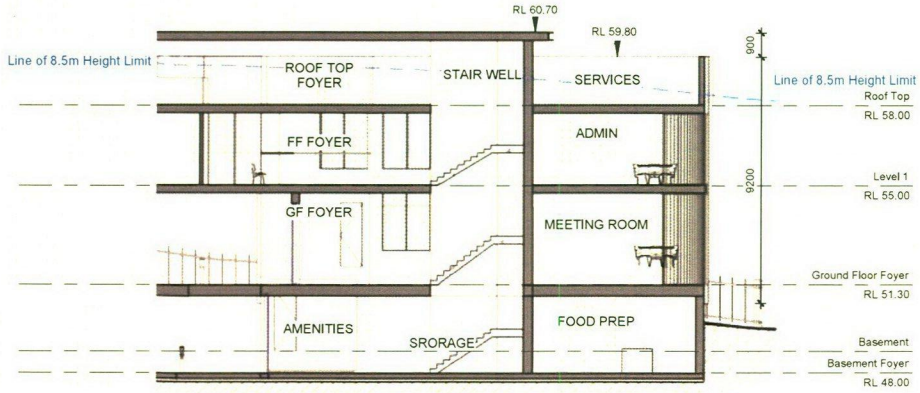
>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

Drawing Name
Sections

339 Forest Rd, Bexley

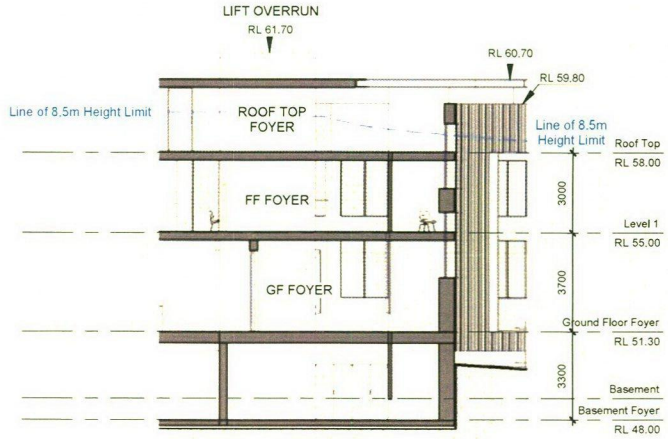
Scale 1 : 200 @ A3 | 26.06.19

Project 1740
Issue Issue L
Sheet 12



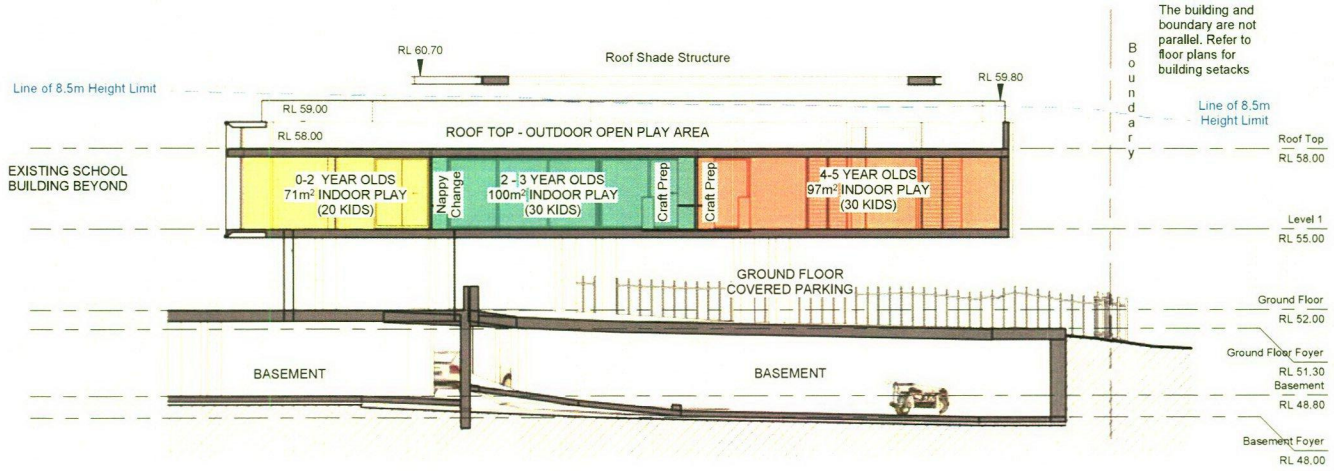
1. Section 5 - Main Stair

Scale 1 : 200



2. Section 6 - Main Stair

Scale 1 : 200



3. Section 7

Scale 1 : 200

Issue	Description	Date
H	Client Issue	03.05.19
I	DA Issue	26.06.19
K	Issued for Council Discussion	31.10.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

Drawing Name: Sections

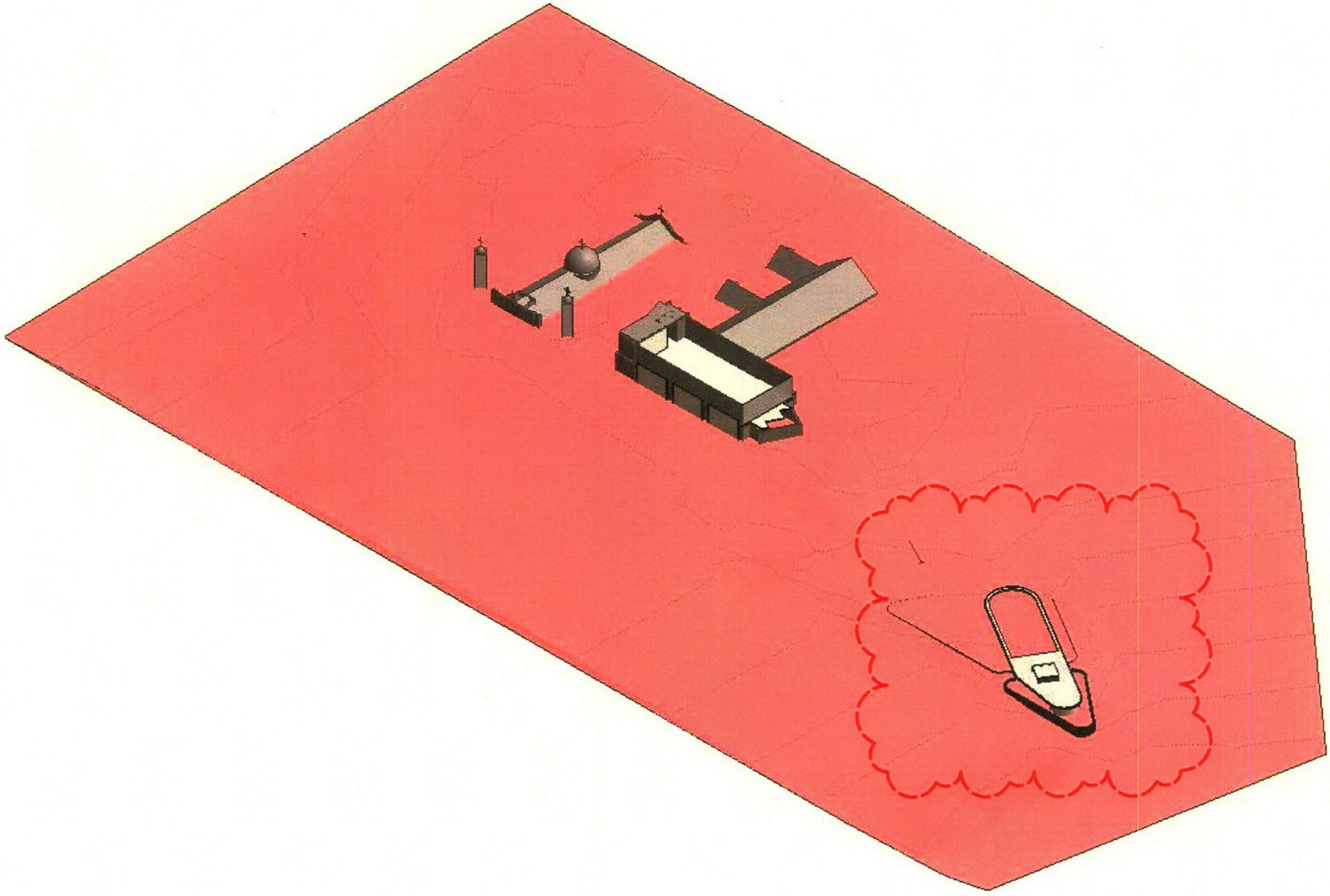
339 Forest Rd, Bexley

Scale 1 : 200 @ A3 | 26.06.19

Project 1740

Issue Issue L

Sheet 13



HEIGHT COMPARRISON ABOVE 8.5m LINE

Issue	Description	Date
K	Issued for Council Discussion	31.10.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

North

Drawing Name
Height Comparison

339 Forest Rd, Bexley

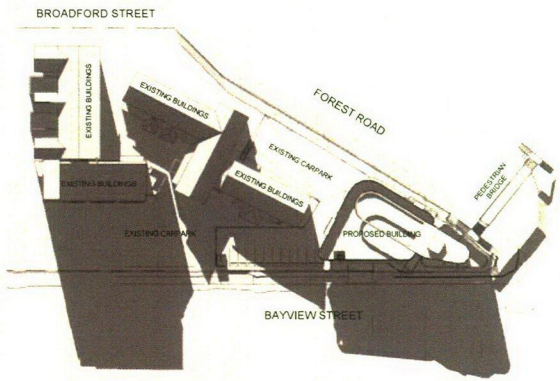
Scale @ A3

26.06.19

Project 1740

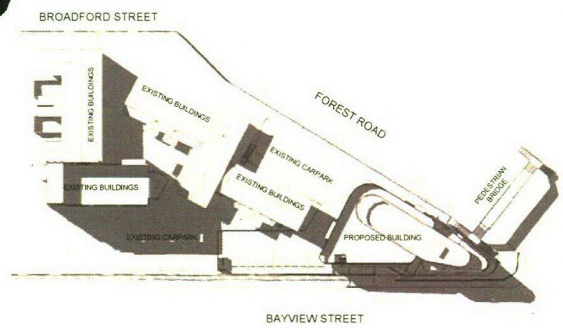
Issue Issue L

Sheet 13A



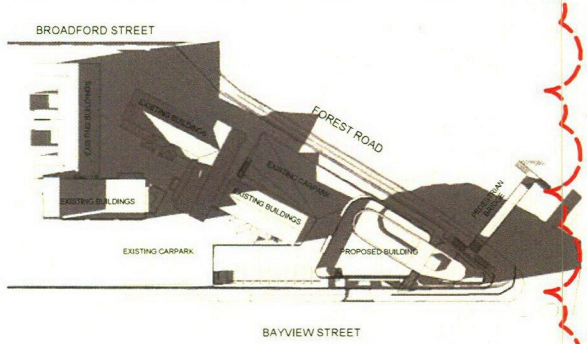
1. Winter Solstice 0900

Scale 1 : 1500



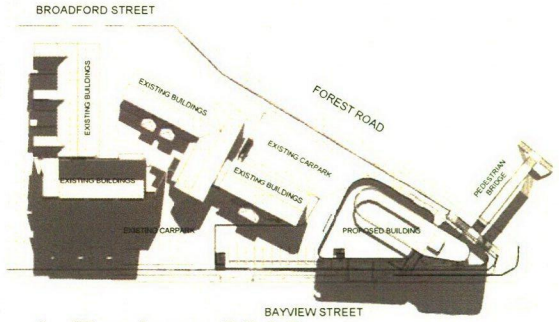
2. Winter Solstice 1200

Scale 1 : 1500



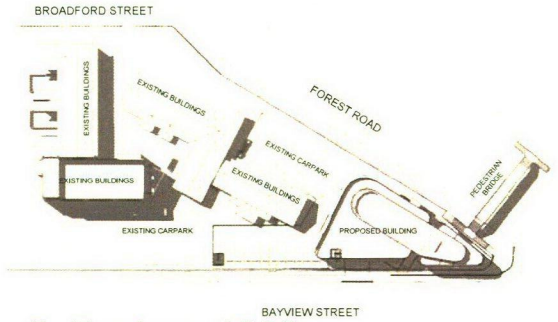
3. Winter Solstice 1500

Scale 1 : 1500



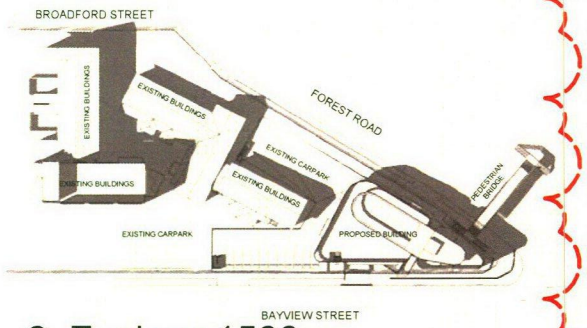
4. Equinox 0900

Scale 1 : 1500



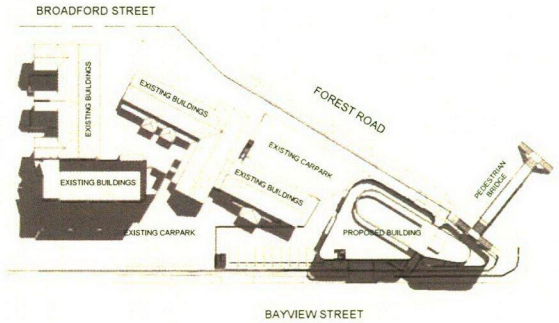
5. Equinox 1200

Scale 1 : 1500



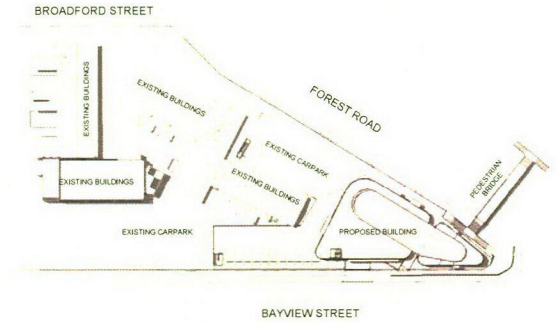
6. Equinox 1500

Scale 1 : 1500



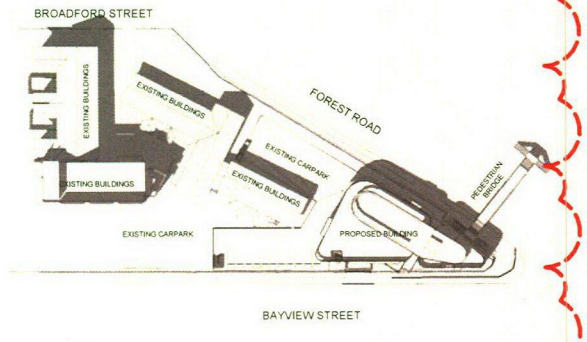
7. Summer Solstice 0900

Scale 1 : 1500



8. Summer Solstice 1200

Scale 1 : 1500



9. Summer Solstice 1500

Scale 1 : 1500

Issue	Description	Date
H	Client Issue	03.05.19
I	DA Issue	26.06.19
K	Issued for Council Discussion	31.10.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

North

Drawing Name: Shadow Diagrams

339 Forest Rd, Bexley

Scale 1 : 1500 @ A3 | 26.06.19

Project 1740

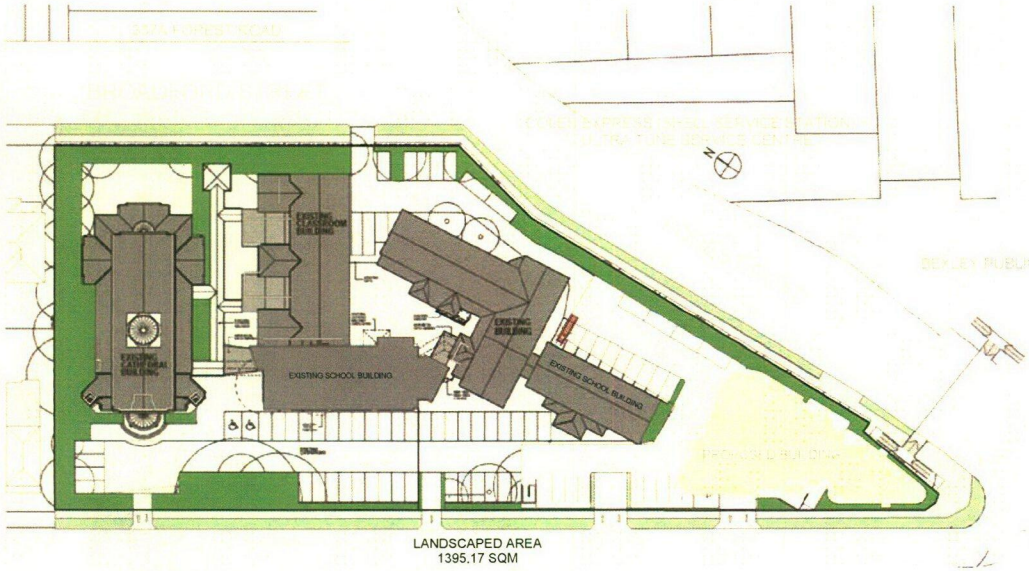
Issue Issue L

Sheet 14

DEVELOPMENT SUMMARY

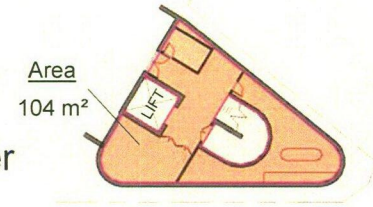
339 - 377 FOREST RD, BEXLEY NSW 2207
LOT 11; DP: 857 373
R2 Low Density Residential Zone
Bayside Council

Site Area:	8388 sqm
Zone:	R2 - Low Density Residential
Max FSR:	0.5:1
Existing Buildings:	3175sqm
Proposed Childcare Building:	828 sqm
Total Area Combined:	4003 sqm (0.47:1)
Landscaped Area:	Existing = 1433.57 sqm (Approx) Proposed = 1337.30 sqm (Approx)

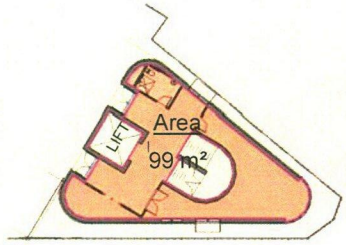


LANDSCAPED AREA
1395.17 SQM

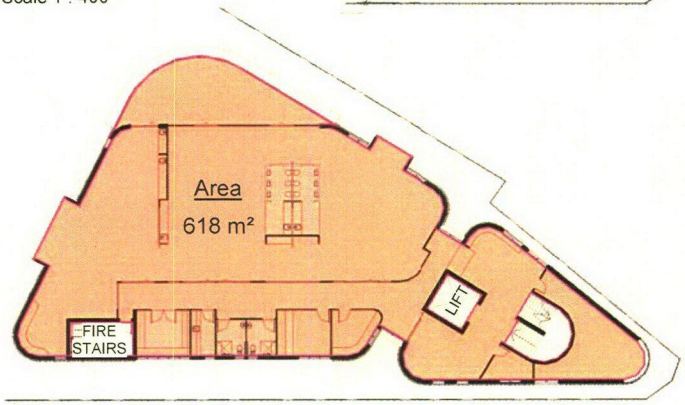
5. Landscape Calcs
Scale 1 : 1000



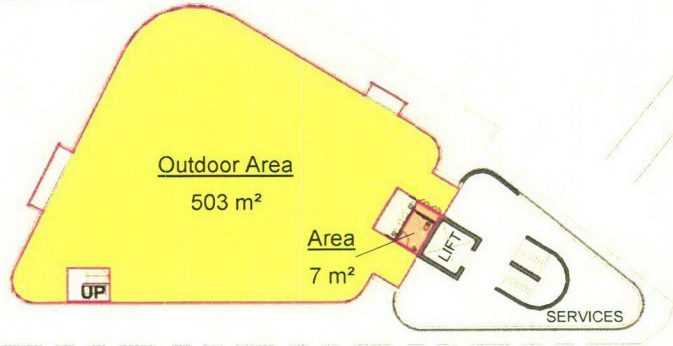
1. Basement Foyer
Scale 1 : 400



2. Ground Floor
Scale 1 : 400



3. Level 1
Scale 1 : 400



4. Roof Top
Scale 1 : 400

Issue	Description	Date
H	Client Issue	03.05.19
I	DA Issue	26.06.19
J	DA Issue - areas updated	11.07.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

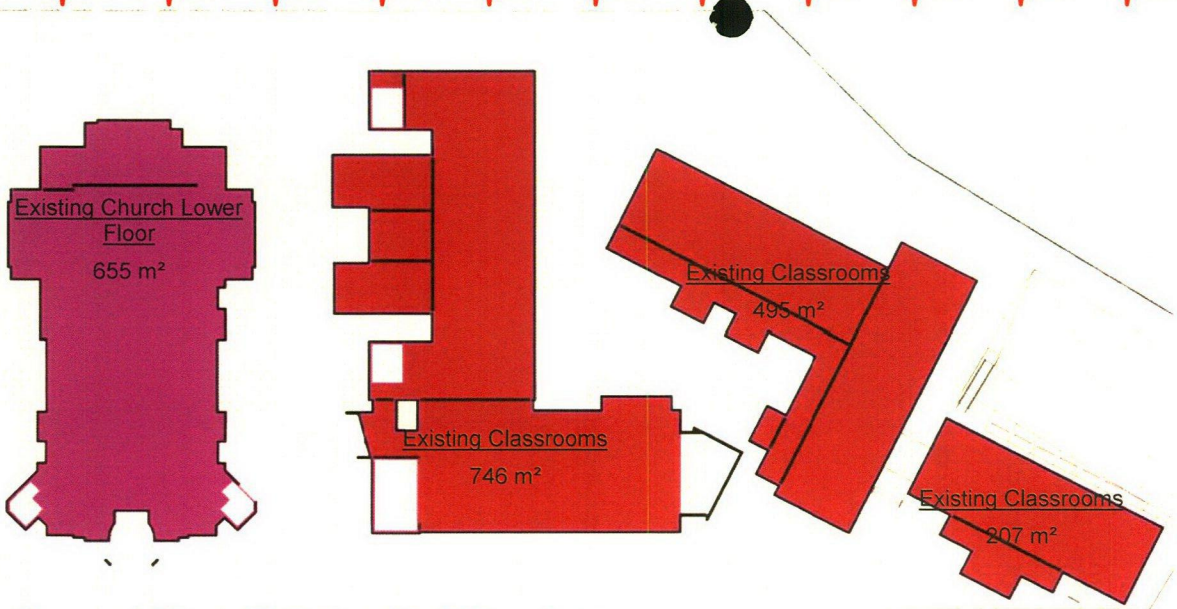
NOT FOR CONSTRUCTION

couvaras >ARCHITECTS
>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

North

Drawing Name: Area Calculation Plans
339 Forest Rd, Bexley
Scale As indicated @ A3 | 26.06.19

Project 1740
Issue Issue L
Sheet 15

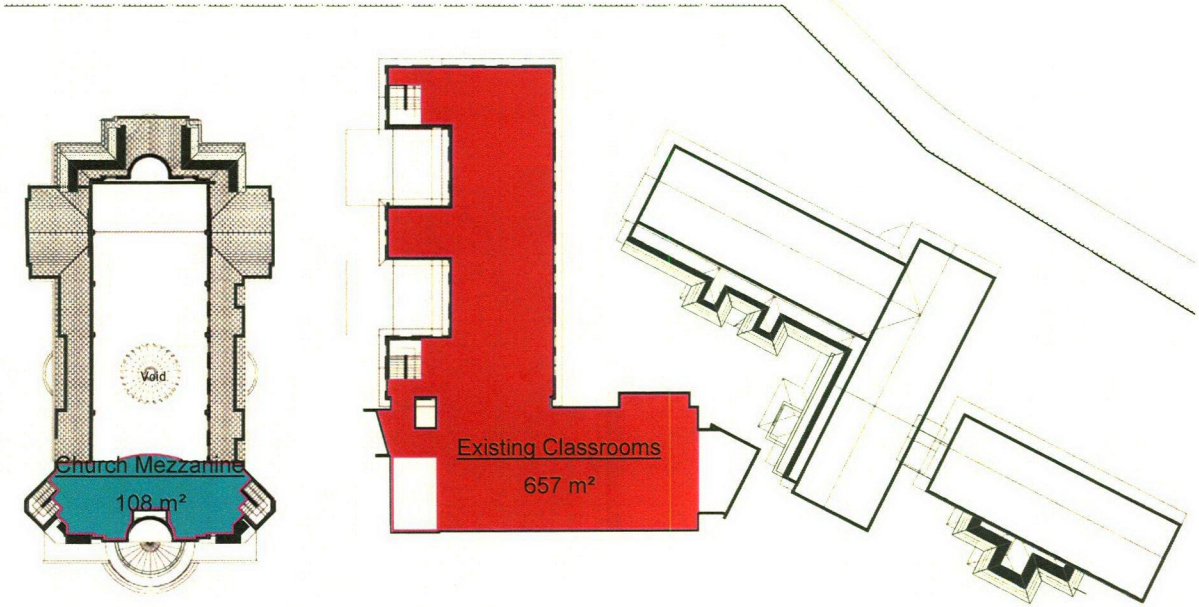


1. Ground Floor Existing Building Areas

Scale 1 : 500

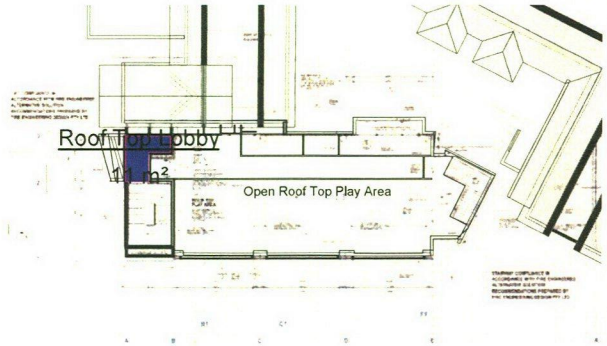
3. Level 2 Existing Building Areas

Scale 1 : 500



2. Level 1 Existing Building Areas

Scale 1 : 500



4. Roof Top Existing Building Area

Scale 1 : 500

Approximate Existing Building Area Schedule	
Name	Area
Church Mezzanine	108 m²
Existing Church Lower Floor	655 m²
Existing Classrooms	746 m²
Existing Classrooms	657 m²
Roof Top Lobby	11 m²
Existing Classrooms	495 m²
Existing Classrooms	295 m²
Existing Classrooms	207 m²
	3175 m²

AREA SUMMARY	
Max FSR:	0.5:1 (4194m²)
Existing Buildings:	3175m²
Proposed Childcare Building:	828m²
Total Area Combined:	4003m² (0.47:1)

Issue	Description	Date
J	DA Issue - areas updated	11.07.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS
>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

North

Drawing Name: Existing Building Area Calcs

339 Forest Rd, Bexley

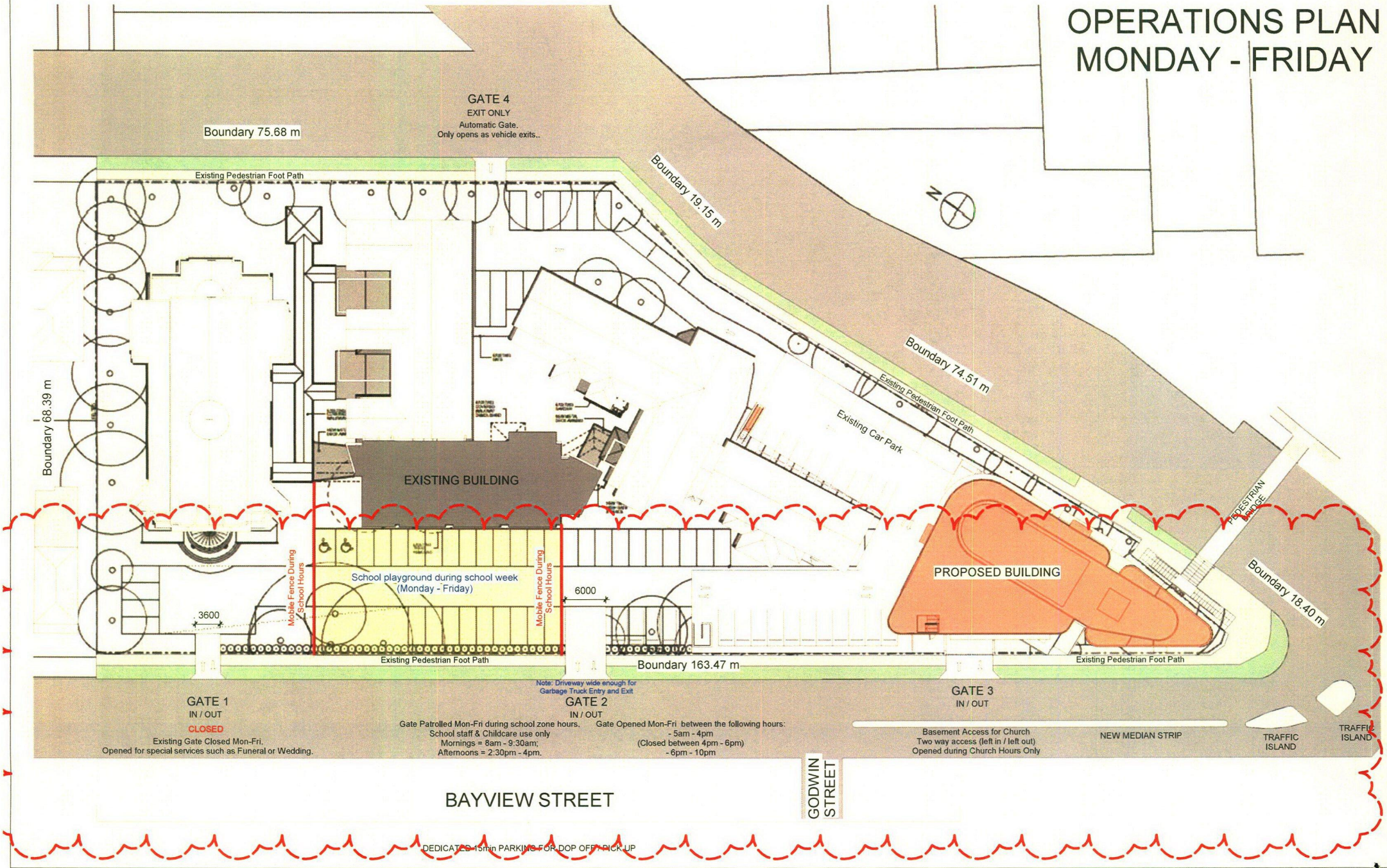
Scale 1 : 500 @ A3 | 26.06.19

Project 1740

Issue Issue L

Sheet 15A

OPERATIONS PLAN
MONDAY - FRIDAY



Issue	Description	Date
F	Operations Plan	22.01.19
G	Consultant Issue	31.01.19
H	Client Issue	03.05.19
I	DA Issue	26.06.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

North

Drawing Name: Operations Plan - Mon-Fri

339 Forest Rd, Bexley

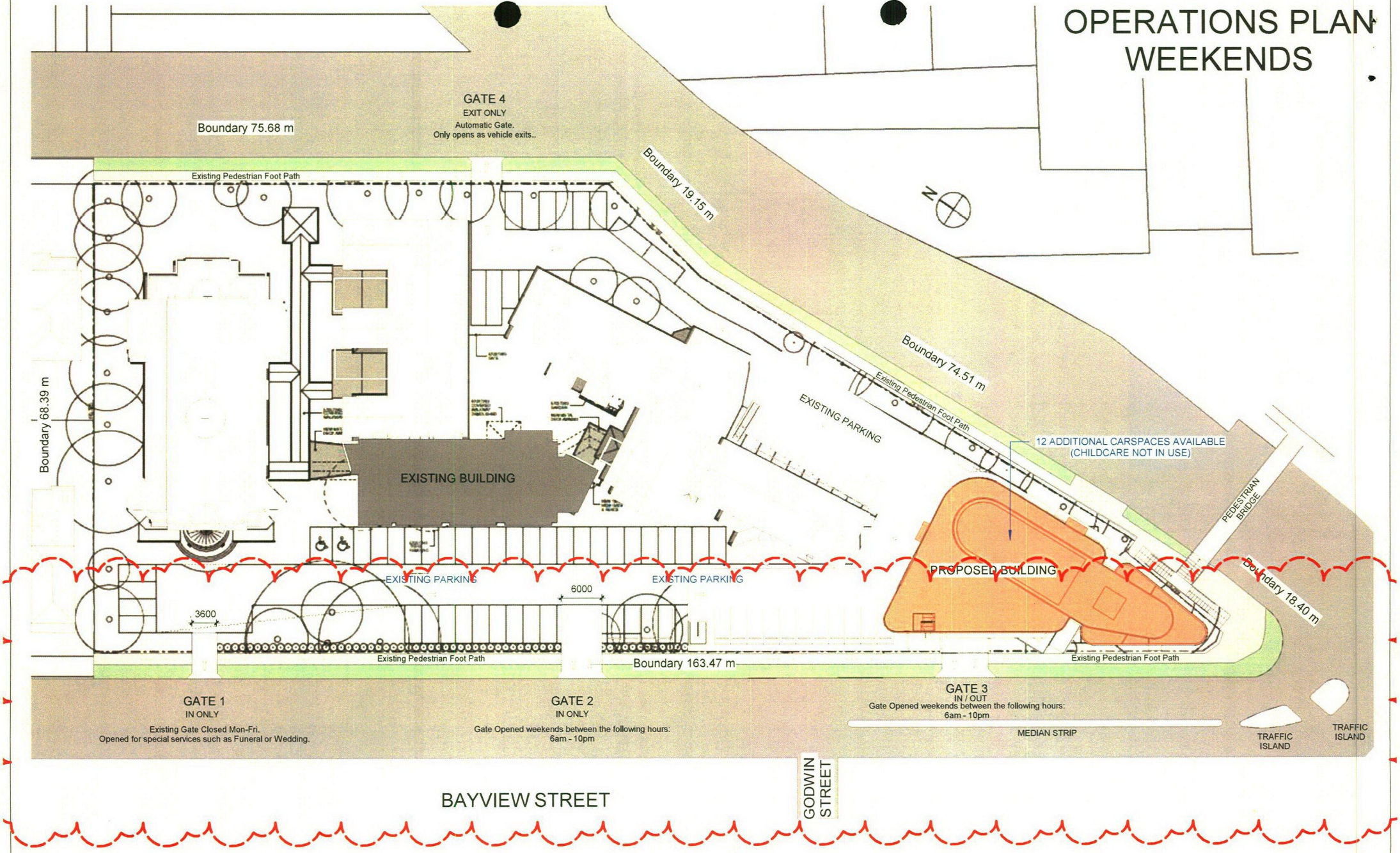
Scale 1 : 500 @ A3 | 26.06.19

Project 1740

Issue Issue L

Sheet 20

OPERATIONS PLAN WEEKENDS



Issue	Description	Date
F	Operations Plan	22.01.19
G	Consultant Issue	31.01.19
H	Client Issue	03.05.19
I	DA Issue	26.06.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

North

Drawing Name: Operations Plan - Weekends

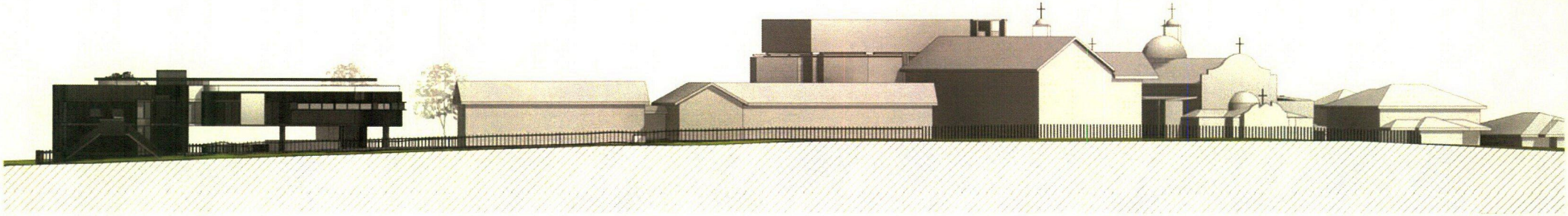
339 Forest Rd, Bexley

Scale 1 : 500 @ A3 | 26.06.19

Project 1740

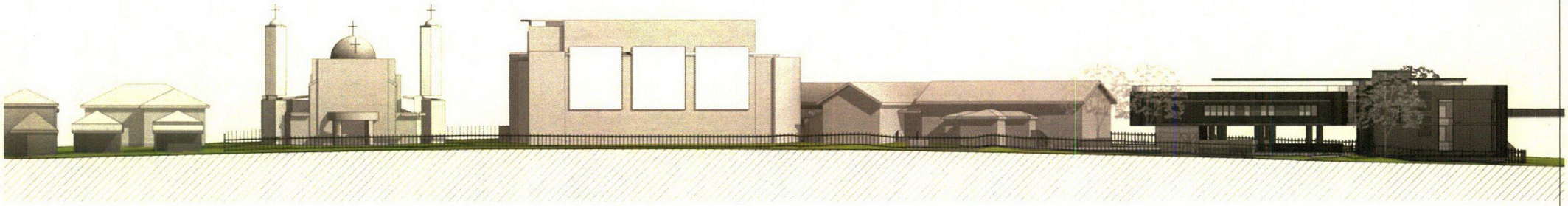
Issue Issue L

Sheet 21



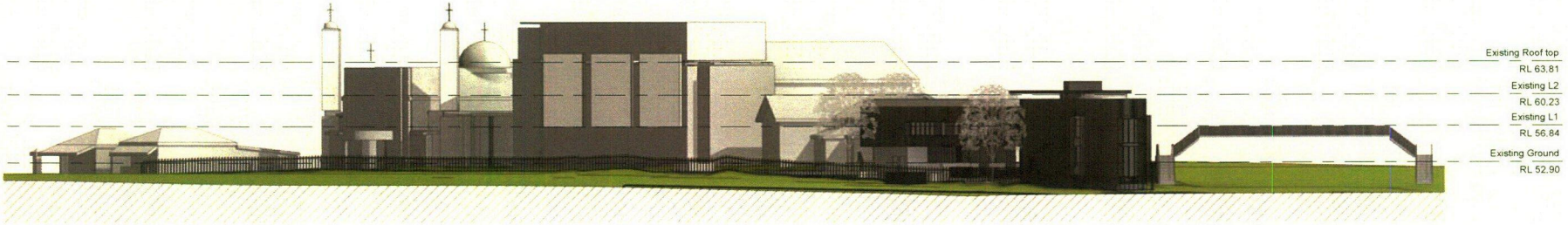
1. North East Context

Scale 1 : 500



2. North West Context

Scale 1 : 500



3. South Context

Scale 1 : 500

Issue	Description	Date
H	Client Issue	03.05.19
DA Issue		26.06.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

North

Drawing Name
Context Elevations

339 Forest Rd, Bexley

Scale 1 : 500 @ A3 | 26.06.19

Project 1740
Issue Issue L
Sheet 22

1. 3D VIEW 4

Scale

Issue	Description	Date
E	Amended Design	18.01.19
G	Consultant Issue	31.01.19
H	Client Issue	03.05.19
I	DA Issue	26.06.19
K	Issued for Council Discussion	31.10.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

Drawing Name
3D Street Perspectives

339 Forest Rd, Bexley

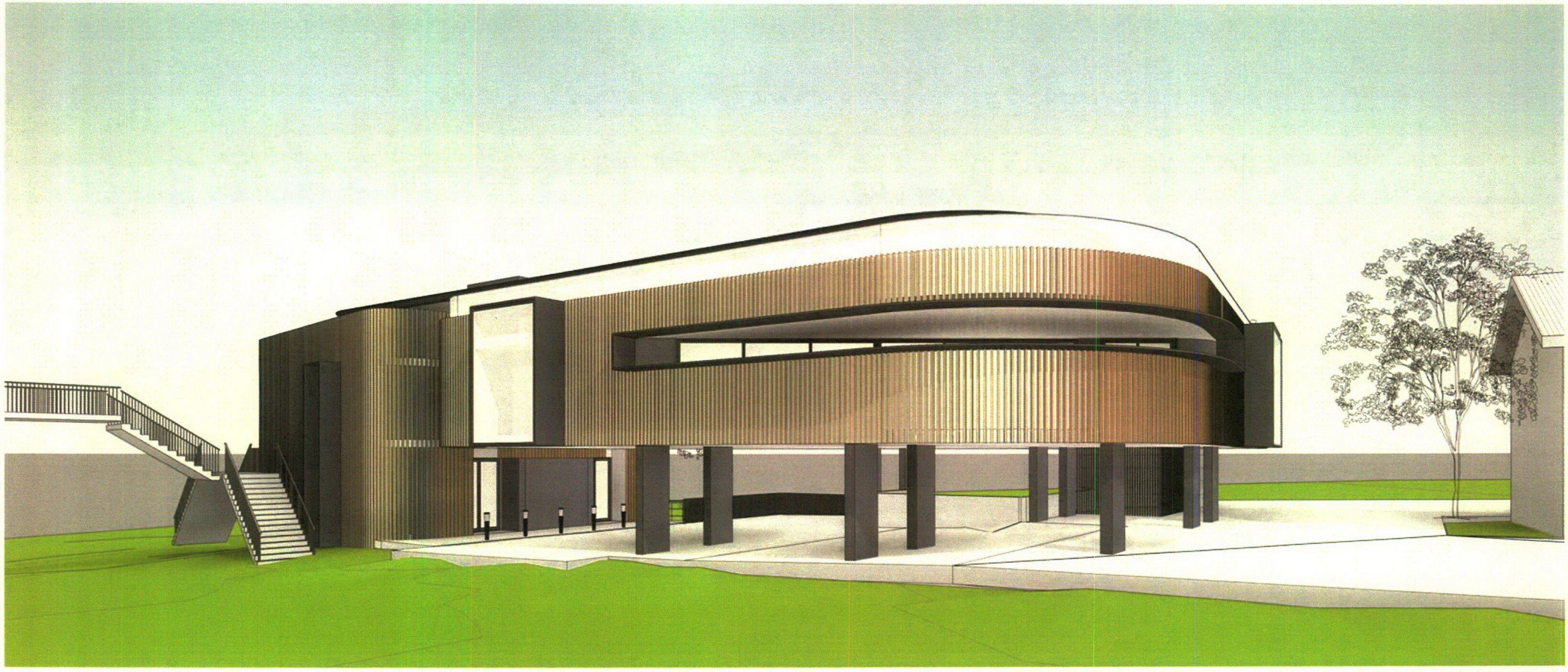
Scale @ A3

26.06.19

Project 1740

Issue Issue L

Sheet 28



1. 3D VIEW 3
Scale

Issue	Description	Date
E	Amended Design	18.01.19
G	Consultant Issue	31.01.19
H	Client Issue	03.05.19
I	DA Issue	26.06.19
K	Issued for Council Discussion	31.10.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

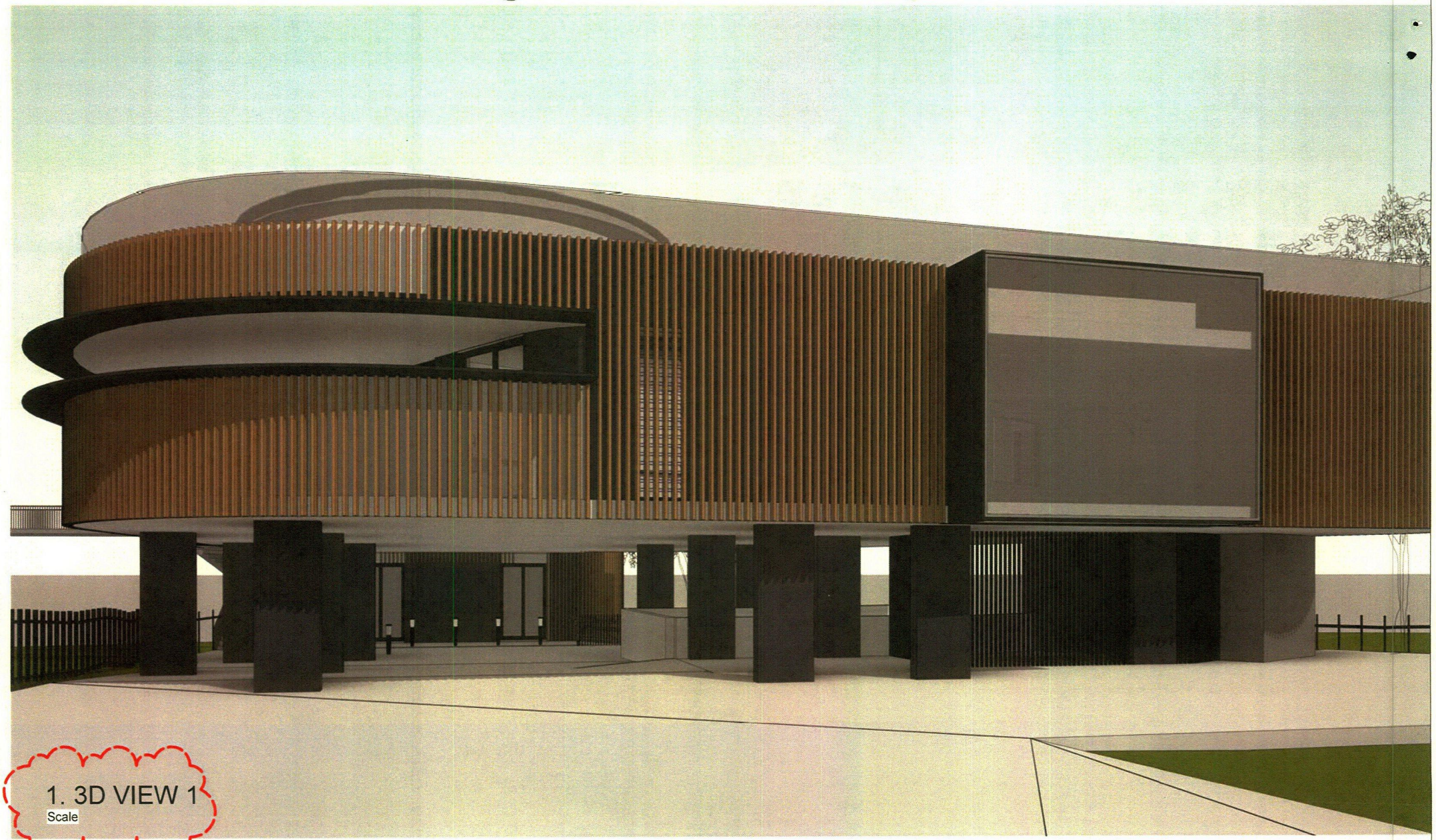
>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

Drawing Name
3D Street Perspectives

339 Forest Rd, Bexley

Scale @ A3 | 26.06.19

Project 1740
Issue Issue L
Sheet 29



1. 3D VIEW 1
Scale

Issue	Description	Date
E	Amended Design	18.01.19
G	Consultant Issue	31.01.19
H	Client Issue	03.05.19
I	DA Issue	26.06.19
K	Issued for Council Discussion	31.10.19
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

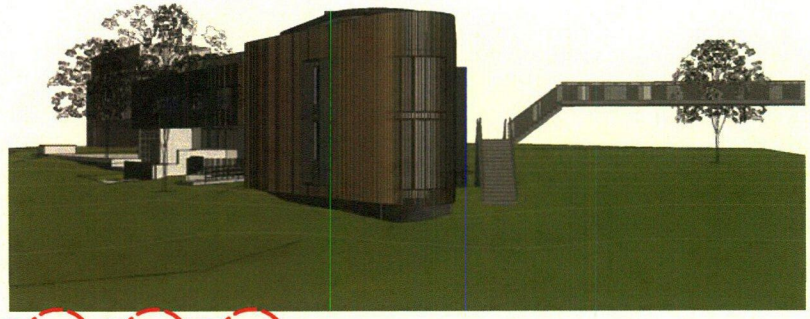
Drawing Name
3D Perspectives

339 Forest Rd, Bexley

Scale @ A3 | 26.06.19

Project 1740
Issue Issue L
Sheet 30

1. 3D View 10
Scale



2. 3D View 16
Scale

Issue	Description	Date
L	Revised for council	17.02.20

DEVELOPMENT APPLICATION

NOT FOR CONSTRUCTION

couvaras >ARCHITECTS

>A Tenancy 8, Banc, 66-70 Cronulla Street, Cronulla NSW 2230
>ABN 49 449 515 976 >T 02 9527 7459
>E architect@couvaras.com >W www.couvaras.com
Nominated Architect: Peter Couvaras Reg No.7344

Drawing Name
3D Street Perspectives

339 Forest Rd, Bexley

Scale @ A3 | 26.06.19

Project 1740
Issue Issue L
Sheet 31

APPENDIX B

Borehole Logs (5 Sheets)

Borehole Log Report

Geo Environmental Engineering Pty Ltd
82 Bridge Street
Lane Cove NSW 2066
T 02 9420 3361

geo-environmental ENGINEERING

Hole ID. **BH1**
Hole Depth: **3.10 m**
Sheet: **1 of 1**

Project Name:	**Geotechnical Investigation**	Project Number:	**G19077BEX**
Location / Site:	**339 - 377 Forest Road, Bexley NSW**	Client:	**LOGOS GROUP PTY LTD**

Drilling Company:	**FICO Pty Ltd**	Date Started:	**06-JAN-20**	Ground Level:	**RL51.75m** (approx)
Drill Method:	**SFA/SPT**	Date Completed:	**06-JAN-20**	Easting:	----------
Equipment:	**4WD Utility Rig**			Northing:	----------

Method	Water Level	Depth (m)	RL (m)	Graphic Log	USCS Symbol	Material Type	Material Description	Consistency / Density	Moisture	Samples / Tests (SPT)	Observations / Comments
							Surface: Asphalt				
SFA/SPT					GP		Sandy Gravel, grey, fine to coarse grained.	medium dense	d		
			51.0		CH	Residual Soil	**Silty CLAY**- red brown, medium to high plasticty, trace fine Gravel (ironstone), roots.	stiff to very stiff	d	8 15 20 N=35	
		1.0					becoming grey brown.				
					CL		**Silty CLAY**- grey some red, low to medium plasticity, trace bands ironstone and extremely weathered Shale, estimated very low strength.	very stiff to hard	d to m		
			50.0							23 30 N=30 SPT Bouncing	
		2.0				Bedrock	**SHALE/SILTSTONE**- light grey, extremely weathered estimated very low strength with bands Silty Clay, trace bands ironstone.				
			49.0							10 30 N=30 SPT Bouncing	2.50m drilling hard, water added to hole
		3.0									3.10m borehole remained dry 60 minutes after completion
							Refusal at 3.10m Ironstone band or weathered bedrock				
			48.0								
		4.0									

Moisture	
D	Dry
Dp	Damp
SM	Slightly Moist
M	Moist
VM	Very Moist
W	Wet
Sd	Saturated

Additional Comments

Logged By: **Matthew Kilham** Date: **06-Jan-20** | Checked By: **Stephen McCormack** Date: **15-JAN-20**

GEE DAVIES BH LOG G19077BEX.GPJ GEE.GDT 16-1-20 3:52:28 PM

Borehole Log Report

Geo Environmental Engineering Pty Ltd
82 Bridge Street
Lane Cove NSW 2066
T 02 9420 3361

geo-environmental ENGINEERING

Hole ID. **BH2**
Hole Depth: **2.50 m**
Sheet: **1 of 1**

Project Name: **Geotechnical Investigation**
Project Number: **G19077BEX**
Location / Site: **339 - 377 Forest Road, Bexley NSW**
Client: **LOGOS GROUP PTY LTD**

Drilling Company: **FICO Pty Ltd**
Date Started: **06-JAN-20**
Ground Level: **RL50.90m** (approx)
Drill Method: **SFA/SPT**
Date Completed: **06-JAN-20**
Easting: ----------
Equipment: **4WD Utility Rig**
Northing: ----------

Method	Water Level	Depth (m)	RL (m)	Graphic Log	USCS Symbol	Material Type	Material Description	Consistency / Density	Moisture	Samples / Tests	Observations / Comments
							Surface: Asphalt				
SFA/SPT					GP		Sandy Gravel, grey, fine to coarse grained.	medium dense	d		
					CL		Silty Clay, grey red brown, low to medium plasticity.	firm	m		
		1.0	50.0		CH	Residual Soil	**Silty CLAY**- brown mottled red, medium to high plasticty, trace fine Gravel (ironstone), roots.	firm to stiff	m	3 3 4 N=7	
					CL		**Silty CLAY**- grey some brown and red, low to medium plasticity, trace bands ironstone and extremely weathered Shale, estimated very low strength.	stiff to very stiff	m	7 11 25 N=36 SPT Bouncing	1.80m drilling hard, water added to hole
		2.0	49.0			Bedrock	**Sandy SILTSTONE**- purple, fine grained, highly weathered estimated low strength.				
							Refusal at 2.50m Weathered bedrock				2.50m borehole remained dry 60 minutes after completion
		3.0	48.0								
		4.0	47.0								

Moisture	
D	Dry
Dp	Damp
SM	Slightly Moist
M	Moist
VM	Very Moist
W	Wet
Sd	Saturated

Additional Comments

Logged By: **Matthew Kilham** Date: **06-Jan-20**
Checked By: **Stephen McCormack** Date: **15-JAN-20**

GEE DAVIES BH LOG G19077BEX.GPJ GEE.GDT 16-1-20 3.52.29 PM

Borehole Log Report

Geo Environmental Engineering Pty Ltd
82 Bridge Street
Lane Cove NSW 2066
T 02 9420 3361

geo-environmental ENGINEERING

Hole ID. BH3
Hole Depth: 4.05 m
Sheet: 1 of 1

Project Name:	**Geotechnical Investigation**	Project Number:	**G19077BEX**
Location / Site:	**339 - 377 Forest Road, Bexley NSW**	Client:	**LOGOS GROUP PTY LTD**

Drilling Company:	**FICO Pty Ltd**	Date Started:	**06-JAN-20**	Ground Level:	**RL51.75m** (approx)
Drill Method:	**SFA/SPT**	Date Completed:	**06-JAN-20**	Easting:	----------
Equipment:	**4WD Utility Rig**			Northing:	----------

Depth (m)	RL (m)	USCS Symbol	Material Type	Material Description	Consistency / Density	Moisture	Samples / Tests (SPT)	Observations / Comments
				Surface: Asphalt				
		GP		Sandy Gravel, grey, fine to coarse grained.	medium dense	d		
	51.0	CH	Residual Soil	**Silty CLAY**- red brown, medium to high plasticty, trace fine Gravel (ironstone), roots. becoming brown mottled red then grey brown.	firm to stiff	d	4 7 9 N=16	
1.0								
	50.0	CL		**Silty CLAY**- grey some red, low to medium plasticity, trace bands ironstone and extremely weathered Shale, estimated very low strength.	very stiff to hard	d to m	25 N=25 SPT Bouncing	
2.0								
	49.0		Bedrock	**SHALE/SILTSTONE**- light grey, extremely weathered estimated very low strength with bands Silty Clay, trace bands ironstone.			25 N=25 SPT Bouncing	2.60m Drilling firm to hard
3.0								
	48.0			**SANDSTONE**- grey, fine grained, extremely weathered estimated low strength.			30 N=30 SPT Bouncing	
4.0				**Refusal at 4.05m** Weathered bedrock				Dry upon completion

Method: SFA/SPT
Water Level: 2.8m after 45 minutes 06-Jan-20

Moisture	
D	Dry
Dp	Damp
SM	Slightly Moist
M	Moist
VM	Very Moist
W	Wet
Sd	Saturated

Additional Comments

Logged By: **Matthew Kilham** Date: **06-Jan-20**
Checked By: **Stephen McCormack** Date: **15-JAN-20**

Borehole Log Report

Geo Environmental Engineering Pty Ltd
82 Bridge Street
Lane Cove NSW 2066
T 02 9420 3361

geo-environmental ENGINEERING

Hole ID. **BH4**
Hole Depth: **4.05 m**
Sheet: **1 of 1**

Project Name: **Geotechnical Investigation** Project Number: **G19077BEX**
Location / Site: **339 - 377 Forest Road, Bexley NSW** Client: **LOGOS GROUP PTY LTD**

Drilling Company: **FICO Pty Ltd** Date Started: **06-JAN-20** Ground Level: **RL52.50m** (approx)
Drill Method: **SFA/SPT** Date Completed: **06-JAN-20** Easting: ----------
Equipment: **4WD Utility Rig** Northing: ----------

Method	Water Level	Depth (m)	RL (m)	Graphic Log	USCS Symbol	Material Type	Material Description	Consistency / Density	Moisture	Samples / Tests (SPT)	Observations / Comments
							Surface: Asphalt				
SFA/SPT	2.75m after 30 minutes 06-Jan-20		52.0		GP		Sandy Gravel, grey, fine to coarse grained.	medium dense	d		
					CH		**Silty CLAY**- red brown becoming grey brown, medium to high plasticty, trace fine Gravel (ironstone), roots.	firm to stiff	d	6 8 10 N=18	
		1.0	51.0		CL	Residual Soil	**Silty CLAY**- grey brown red, low to medium plasticity, trace bands ironstone and extremely weathered Shale, estimated very low strength.	very stiff to hard	d to m	8 14 20 N=34 SPT Bouncing	
		2.0	50.0			Bedrock	**SHALE/SILTSTONE**- light grey, extremely weathered estimated very low strength with bands Silty Clay, trace bands ironstone.			25 N=25 SPT Bouncing	2.60m drilling firm to hard
		3.0	49.0								
		4.0	48.0				**Silty SANDSTONE**- grey, fine grained, highly weathered estimated low strength. **Refusal at 4.05m** Weathered bedrock			25 N=25 SPT Bouncing	Dry upon completion

Moisture	
D	Dry
Dp	Damp
SM	Slightly Moist
M	Moist
VM	Very Moist
W	Wet
Sd	Saturated

Additional Comments

Logged By: **Matthew Kilham** Date: **06-Jan-20** Checked By: **Stephen McCormack** Date: **15-JAN-20**

GEE DAVIES BH LOG G19077BEX.GPJ GEE.GDT 16-1-20 3.52.30 PM

Geo Environmental Engineering
82 Bridge Street
Lane Cove NSW 2066
E info@geoenvironmental.com.au

geo-environmental ENGINEERING

Log Report Legend

MATERIAL SYMBOL

FILL	CONCRETE	ASPHALT	TOPSOIL
ORGANICS	ESTUARINE MUD		

CLAY	SAND	SILT	GRAVEL
Sandy CLAY	Clayey SAND	Clayey SILT	Clayey GRAVEL
Silty CLAY	Silty SAND	Sandy SILT	Sandy GRAVEL
Gravelly CLAY	Gravelly SAND	Gravelly SILT	Silty GRAVEL
CLAY & SAND	SAND & CLAY	SILT & CLAY	GRAVEL & CLAY
CLAY & SILT	SAND & SILT	SILT & SAND	GRAVEL & SAND
CLAY & GRAVEL	SAND & GRAVEL	SILT & GRAVEL	GRAVEL & SILT
Sandy Silty CLAY	Clayey Silty SAND	Sandy Clayey SILT	Sandy Clayey GRAVEL
Silty Sandy CLAY	Silty Clayey SAND	Clayey Sandy SILT	Clayey Sandy GRAVEL
Sandy Gravelly CLAY	Clayey Gravelly SAND	Sandy Gravelly SILT	Silty Clayey GRAVEL
Silty Gravelly CLAY	Silty Gravelly SAND	Clayey Gravelly SILT	Clayey Silty GRAVEL
Gravelly Silty CLAY	Gravelly Silty SAND	Gravelly Clayey SILT	Sandy Silty GRAVEL
Gravelly Sandy CLAY	Gravelly Clayey SAND	Gravelly Sandy SILT	Silty Sandy GRAVEL

SANDSTONE	SHALE	GRANITE	BASALT	SHALE / SANDSTONE
PORCELLANITE	GNEISS	SHALE / CLAYSTONE	MUDSTONE	
CLAYSTONE	MUDSTONE / CLAYSTONE	SHALE / SILTSTONE	IRONSTONE	

WATER LEVELS

Encountered Water

Standing Water

ABBREVIATIONS

PT	Pushtube
SFA	Solid Flight Auger
PWS	Percussion Window Sampler
HA	Hand Auger
HFA	Hollow Flight Auger

WELL GRAPHICS

Cuttings	Bentonite	Screen
Gravel Pack	Grout	Cave-in

GEE LEGEND • • 29/10/09 5:04:07 PM

APPENDIX C

Laboratory Testing (6 sheets)

Geo-Environmental Engineering Pty Ltd
82 Bridge St
Lane Cove
NSW 2066

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **ALL INVOICES Stephen McCormack**

Report **695506-S**
Project name DAYCARE CENTRE
Project ID G19077BEX
Received Date Jan 07, 2020

Client Sample ID			**BH1 0.5-0.95**	**BH1 1.5-1.95**	**BH1 2.50-2.70**	**BH3 0.50-0.95**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S20-Ja01090**	**S20-Ja01091**	**S20-Ja01092**	**S20-Ja01093**
Date Sampled			**Jan 06, 2020**	**Jan 06, 2020**	**Jan 06, 2020**	**Jan 06, 2020**
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	78	48	29	69
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	99	78	53	160
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	5.4	5.0	5.4	5.4
Resistivity*	0.5	ohm.m	510	640	940	320
Salinity (expressed as TDS)*	50	mg/kg	250	210	150	390
Sulphate (as SO4)	10	mg/kg	63	55	53	190
% Moisture	1	%	13	10.0	8.2	21

Client Sample ID			**BH3 1.50-1.65**	**BH3 2.50-2.60**
Sample Matrix			**Soil**	**Soil**
Eurofins Sample No.			**S20-Ja01094**	**S20-Ja01095**
Date Sampled			**Jan 06, 2020**	**Jan 06, 2020**
Test/Reference	LOR	Unit		
Chloride	10	mg/kg	< 10	36
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	98	53
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	5.1	5.1
Resistivity*	0.5	ohm.m	510	940
Salinity (expressed as TDS)*	50	mg/kg	250	160
Sulphate (as SO4)	10	mg/kg	150	38
% Moisture	1	%	12	11

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chloride	Sydney	Jan 07, 2020	28 Days
- Method: E045 /E047 Chloride			
Conductivity (1:5 aqueous extract at 25°C as rec.)	Sydney	Jan 07, 2020	7 Days
- Method: LTM-INO-4030 Conductivity			
pH (1:5 Aqueous extract at 25°C as rec.)	Sydney	Jan 07, 2020	7 Days
- Method: LTM-GEN-7090 pH in soil by ISE			
Sulphate (as SO4)	Sydney	Jan 07, 2020	28 Days
- Method: E045 Anions by Ion Chromatography			
Salinity (expressed as TDS)*	Sydney	Jan 07, 2020	21 Days
- Method: APHA 2510 Conductivity by Direct Measurement			
% Moisture	Sydney	Jan 07, 2020	14 Days
- Method: LTM-GEN-7080 Moisture			

eurofins | Environment Testing

ABN – 50 005 085 521 web : www.eurofins.com.au e.mail : EnviroSales@eurofins.com

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

New Zealand

Auckland
35 O'Rorke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name: Geo-Environmental Engineering P/L
Address: 82 Bridge St
Lane Cove
NSW 2066

Project Name: DAYCARE CENTRE
Project ID: G19077BEX

Order No.:
Report #: 695506
Phone: 02 9592 0218
Fax: 02 9519 9140

Received: Jan 7, 2020 9:15 AM
Due: Jan 14, 2020
Priority: 5 Day
Contact Name: ALL INVOICES Stephen

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Salinity (expressed as TDS)*	Aggressivity Soil Set	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	BH1 0.5-0.95	Jan 06, 2020		Soil	S20-Ja01090	X	X	X
2	BH1 1.5-1.95	Jan 06, 2020		Soil	S20-Ja01091	X	X	X
3	BH1 2.50-2.70	Jan 06, 2020		Soil	S20-Ja01092	X	X	X
4	BH3 0.50-0.95	Jan 06, 2020		Soil	S20-Ja01093	X	X	X
5	BH3 1.50-1.65	Jan 06, 2020		Soil	S20-Ja01094	X	X	X
6	BH3 2.50-2.60	Jan 06, 2020		Soil	S20-Ja01095	X	X	X
Test Counts						6	6	6

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
ug/L: micrograms per litre
ppm: Parts per million
ppb: Parts per billion
%: Percentage
org/100mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/kg	< 10			10	Pass	
Conductivity (1:5 aqueous extract at 25°C as rec.)	uS/cm	< 10			10	Pass	
Salinity (expressed as TDS)*	mg/kg	< 50			50	Pass	
Sulphate (as SO4)	mg/kg	< 10			10	Pass	
LCS - % Recovery							
Chloride	%	100			70-130	Pass	
Conductivity (1:5 aqueous extract at 25°C as rec.)	%	102			70-130	Pass	
Salinity (expressed as TDS)*	%	102			0-0	Fail	
Sulphate (as SO4)	%	108			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Chloride	S20-Ja01091	CP	%	101			70-130	Pass	
Sulphate (as SO4)	S20-Ja01091	CP	%	101			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Chloride	S20-Ja01090	CP	mg/kg	78	77	1.0	30%	Pass	
Sulphate (as SO4)	S20-Ja01090	CP	mg/kg	63	61	4.0	30%	Pass	
% Moisture	S20-Ja00938	NCP	%	17	17	3.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (1:5 aqueous extract at 25°C as rec.)	S20-Ja01094	CP	uS/cm	98	80	20	30%	Pass	
pH (1:5 Aqueous extract at 25°C as rec.)	S20-Ja01094	CP	pH Units	5.1	5.2	Pass	30%	Pass	
Resistivity*	S20-Ja01094	CP	ohm.m	510	630	20	30%	Pass	
Salinity (expressed as TDS)*	S20-Ja01094	CP	mg/kg	250	210	20	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	No
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised By

Andrew Black	Analytical Services Manager
Gabriele Cordero	Senior Analyst-Inorganic (NSW)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.