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TONY OWEN PARTNERS

Detailed Site Investigation

7 Luxford Road, Mount Druitt NSW

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Executive Summary

Tony Owen Partners on behalf of Mr Alexander Volfneuk engaged EI Australia (EI) to conduct a Detailed Site Investigation (DSI) at the property located at 7 Luxford Road, Mount Druitt NSW ('the site').

This DSI was conducted as part of an environmental due diligence process, with the corresponding report being provided in support of a Development Application (DA) to Blacktown City Council for the purpose of enabling the developer to meet its obligations under the *Contaminated Land Management Act 1997* (CLM Act).

The results of the investigation are summarised below:

- The sub-surface layers were comprised of fill (Silty SAND (Topsoil), Silty CLAY and Clayey SILT) with thickness between 0.3 to 0.7m, overlying natural Silty CLAY. Shale bedrock was encountered at 2.5 to 2.7 mBGL;
- No contaminants of potential concern were found to be elevated in any of the soil or groundwater samples tested as part of the investigation;
- Although a data gap exists (quality of soils beneath the existing building and hazardous material in site structures), it is not considered to be a cause of environmental concern, if appropriate management of soil and demolition materials during the redevelopment works follow the recommendations provided in **Section 11**.

Based on the findings of this DSI, EI consider the site can be made suitable for the proposed development, given the following recommendations are implemented:

- Waste classification of all excavated material, in accordance with NSW EPA (2014) *Waste Classification Guidelines*, for offsite disposal of waste.
- Development of an unexpected finds protocol for implementation should any unforseen contamination be identified during basement excavation and earthworks;

Based on visual evidence obtained during site works, there is a potential for hazardous materials to be present within the existing building on site. As such, the following tasks are also recommended for the site:

- The completion of a Hazardous Materials Survey of existing structures prior to any demolition works required by the development;
- Completion of a clearance inspection following the demolition of site structures and removal of demolition debris.

1. INTRODUCTION

1.1 Background and Purpose

Tony Owen Partners on behalf of Mr Alexander Volfneuk engaged EI Australia (EI) to conduct a Detailed Site Investigation (DSI) at the property located at 7 Luxford Road, Mount Druitt NSW ('the site').

This site is located approximately 17.5 km north-west of the Parramatta central business district, within the Local Government Area of Blacktown City Council (**Appendix A, Figure A.1**). The site comprised of Lot 2 in DP251863, covering a total area of approximately 4,046 m^2, as depicted in **Figure A.2** (**Appendix A**). An abandoned building occupied the north-western part of the site and an open car park at the north-east, while the remainder comprised of unpaved grass. The building was previously used as a radiology clinic.

This DSI was conducted as part of an environmental due diligence process, with the corresponding report being provided in support of a Development Application (DA) to Blacktown City Council for the purpose of enabling the developer to meet its obligations under the *Contaminated Land Management Act 1997* (CLM Act).

1.2 Proposed Development

Based on the supplied plans (Tony Owen Partners, Project No 988, dated November 2017), attached in **Appendix C**, the proposed development will involve demolition of existing structures and construction of an eight-storey mixed-use commercial and residential building, overlying a two-level basement car park.

The lowest basement level is proposed to have a finished floor level (FFL) of RL 52.40 mAHD, which will require an assumed Bulk Excavation Level (BEL) of RL 52.00 mAHD. This equates to excavations of maximum 8.7 m below ground level (BGL) towards the eastern boundary of the site. The basement excavations are proposed to extend across the entire site footprint, which will be finished with a concrete slab. Areas of deep soil landscaping are not proposed.

1.3 Regulatory Framework

The following regulatory framework and guidelines were considered during the preparation of this report:

- ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality;
- DEC (2007) Guidelines for the Assessment and Management of Groundwater Contamination;
- EPA (1995) Sampling Design Guidelines;
- EPA (2017) Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme;
- Blacktown Local Environmental Plan 2015;
- NEPC (2013) National Environmental Protection (Assessment of Site Contamination) Measure 1999 (Amendment 2013), in particular Schedule B(1) Guideline on Investigation Levels for Soil and Groundwater and Schedule B(2) Guideline on Site Characterisation;
- OEH (2011) Guidelines for Consultants Reporting on Contaminated Sites;

- Contaminated Land Management Act 1997; and
- State Environment Protection Policy - Remediation of Land (SEPP 55).

1.4 Project Objectives

The objective of the DSI is to characterise soil and groundwater at the site and assess the suitability of future residential land use. The primary objectives of this DSI were therefore to:

- To investigate the degree of any potential contamination by means of intrusive sampling and laboratory analysis, for relevant contaminants of concern;
- Evaluate potential risks that identified impacts may pose to human health and the environment; and
- Where site contamination is confirmed, make recommendations for the appropriate management of any contaminated soils and/or groundwater.

1.5 Scope of Works

To achieve the above objectives, the scope of works included:

- A review of relevant hydrogeological and soil landscape maps for the project area;
- A review of a previous contamination report for the site;
- Detailed site walkover inspection;
- Construction of test boreholes at eleven (11) locations distributed in a triangular grid pattern across accessible areas of the site, complying with the minimum sampling protocol recommended under EPA (1995);
- Installation of three (3) groundwater monitoring wells to a maximum depth of 9m (or refusal), constructed to standard environmental protocols, to investigate potential groundwater contamination;
- Multiple level soil sampling within fill and natural soils at each of the test bores, as well as one round of groundwater sampling from the constructed groundwater monitoring wells; and
- Laboratory analysis of selected soil and groundwater samples for relevant analytical parameters, as determined during the investigation program.
- Data interpretation and reporting.

The DSI report documents all investigation work conducted on site, which includes site history, field investigation work conducted on the site, test bore logs, soil sampling methodologies, laboratory analytical results and a discussion of the results in regards to potential risks to human health, the environment and aesthetic uses of the land.

2. SITE DESCRIPTION

2.1 Property Identification, Location, and Physical Setting

The site identification details and associated information are presented in **Table 2-1**, while the site locality is shown in **Figure A.1**.

Table 2-1 Site Identification, Location, and Zoning

Attribute	Description
Street Address	7 Luxford Road, Mount Druitt NSW
Location Description	Approximately 37 km north-west of the Sydney CBD; bound by residential building (north), Ross Street (east), Salisbury Road (south), and Salisbury Lane (west).
Geographical Coordinates	North-eastern corner of site (datum GDA94-MGA56): ▪ Easting: 298777.553 ▪ Northing: 6261841.255 (Source: http://maps.six.nsw.gov.au).
Site Area	4,046 m^2 (T GRABARA & ASSOCIATES, Job no. 3529, dated 27/06/2008).
Lot and Deposited Plan (DP)	Lot 2 in DP251863
State Survey Marks	One State Survey (SS) mark and two Permanent Mark (PM) are situated in close proximity to the site: ▪ SS54451, located at the roundabout of Luxford Road, west of the site; ▪ PM70868, located within the Mount Druitt Hospital property. ▪ PM57903; located to the south-west of the site, at Mount Street. (Source: http://maps.six.nsw.gov.au).
Local Government Authority	Blacktown City Council
Current Zoning	B4 – Mixed Use (*Blacktown Local Environmental Plan 2015*)
Current Land Uses	The site is currently occupied by an abandoned building (formerly used as radiology clinic).

2.2 Surrounding Land Use

The site was situated within an area of mixed commercial and residential land uses. Uses of the immediately surrounding land are described in **Table 2-2**.

Table 2-2 Surrounding Land Uses

Direction Relative to Site	Land Use Description	Sensitive Receptors (& distance from site)
North	Luxford Road, followed by a mosque and residential properties	Mosque (30m)
East	Commercial properties followed by a Hospital	Mount Druitt Hospital (140m)

Direction Relative to Site	Land Use Description	Sensitive Receptors (& distance from site)
South	Commercial properties	-
West	Commercial properties	-

2.3 Regional Setting

Regional topography, (hydro)geology, and soil landscape information are summarised in **Table 2-3**.

Table 2-3 Regional Setting Information

Attribute	Description
Topography	Overall down slope to the north-west. The highest elevation is located in the south-east corner of the site (approx. RL 60.5 mAHD) and the lowest is located in the north-west corner (RL 58.0 mAHD). (Survey by T GRABARA & ASSOCIATES, Job no. 3529, dated 27/06/2008)
Site Drainage	Site drainage is likely to be consistent with the general slope of the site to the north-west. Stormwater is likely to be collected by pit and pipe drainage and drain to the municipal stormwater system.
Regional Geology	The 1:100 000 scale Geological Series Penrith Sheet 9030 (DMR, 1991) indicated the site is underlain by Bringelly Shales which consists of shale, with occasional calcareous claystone, laminate, and coal.
Soil Landscapes	The Soil Conservation Service of NSW Soil Landscapes of the Sydney 1:100,000 Sheet (Chapman and Murphy, 1989) indicated that the site overlies the Blacktown (bt) residual landscape. According to Chapman and Murphy, this landscape type is characterised by local relief to 30 m and slopes usually <5%, broad rounded crests and ridges with gently inclined slopes. Soils are shallow to moderately deep (<100 cm) hard setting mottled texture contrast soils, red and brown podzolic soils on crests grading to yellow podzolic soils on lower slopes and in drainage lines.
Acid Sulfate Soil (ASS) Risk	No ASS Maps are available for the site, however, due to the locality and geology of the site, the probability of ASS occurring is low.
Soil Salinity Risk	With reference to DIPNR (2002) Salinity Potential in Western Sydney mapping (1:100,000), the subject land lies within the map class description of *Moderate to High Salinity Potential.*
Nearest Surface Water Feature	Bell's Creek, 1.2 km north-east.
Anticipated Groundwater Flow Direction	North-east, towards Bell's Creek (1.2 km north-west).

2.4 Groundwater Bore Records and Groundwater Use

An online search for groundwater bores registered with the NSW Office of Water was conducted by EI on 2 September 2019 (Ref. http://allwaterdata.water.nsw.gov.au/water.stm). Three registered bores were identified within an approximate 500m radius of the site. A summary of these bores is presented in **Table 2-4,** while the bore location plan and more detailed information are attached in **Appendix J**.

Table 2-4 Summary of Registered Groundwater Bores

Bore No	Date Drilled	Direction & Approx. distance from site (m)	Drilled Depth (m)	SWL / Salinity / Yield	Bore Purpose
GW114799	01/01/2011	90 m west	7.50	- / - / -	Monitoring
GW114800	01/01/2011	90 m west	8.00	- / - / -	Monitoring
GW114802	01/01/2011	132 m west	8.50	- / - / -	Monitoring

Notes:
- Data not recorded

The drilled bore depths ranged between 7.50 and 8.50 m below ground level (BGL). Dissolved salts and standing water levels (SWL) were not recorded during drilling of boreholes. The purpose of these boreholes was registered only for monitoring.

2.5 Site Condition

At the commencement of site works on 1 August 2019 it was noted that the existing building appeared to have been extensively damaged by fire and vandalised. Vegetation across the site appeared overgrown but generally in good condition.

3. PREVIOUS INVESTIGATIONS

The investigation works conducted on the site follows on from a previous Preliminary Site Investigation, which was reported as listed below:

- EI (2017). *Preliminary Site Investigation, 7 Luxford Road, Mount Druitt NSW*, Ref. E23646.E01_Rev0, dated 21 December 2017.

A summary of the previously completed report is outlined in **Table 3-1**

Table 3-1 Summary of Previous Investigation

Assessment Details	Project Tasks and Findings
Preliminary Site Investigation (2017)	
Work Objectives	To provide a qualitative assessment of the environmental conditions of the site by appraising the potential for site contamination on the basis of field observations, historical land uses, anecdotal and documentary evidence.
Scope of Works	▪ A review of relevant topographical, geological, hydrogeological, and soil landscape maps for the project area; ▪ Search of historical aerial photographs archived at NSW Land and Property Information in order to review previous site use and the historical sequence of land development in the neighbouring area; ▪ A land titles search, also conducted through NSW Land and Property Information for information relating to site ownership; ▪ Site history survey involving a detailed search of council records for information relating to operational site history and/or relevant environmental incidents; ▪ Search of SafeWork NSW records for information relating to storage of dangerous goods and possible underground tank approvals and locations; ▪ A search through the EPA Land Information records to confirm that there are no statutory notices current on the site under the *Contaminated Land Management Act 1997* or *Protection of the Environment Operations Act 1997*; and ▪ A detailed site walkover inspection. ▪ Preparation of a report to document investigation findings.
Findings	▪ Historical records showed that residential properties occupied the central and south western portion of the site, while the eastern portion was occupied by residential properties in the 1940s. During the time between the 1968 and 1982 aerial photograph, site structures were demolished and the site appeared to be vacant in nature. During the 1982 and 1991 aerial photograph, the site was redeveloped for commercial purposes; ▪ The site was not reported as being subject to regulation in relation to environmental impacts, as documented in the EPA public registers, however, surrounding down gradient sites were documented in the NSW EPA/OEH registers, including the service station immediately to the north-west of the site; ▪ The site walkover inspection did not identify areas of environmental concern on site; however, a petrol station was located north-west of the site (down-gradient); and,

Assessment Details	Project Tasks and Findings
	▪ There are some data gaps that were identified during the investigation: › previous use of fill of unknown origin for site levelling; › potential of hazardous waste within site structures; and › potential burial of ACM from demolished residential structures
Recommendations	▪ A Hazardous Material Survey (HMS) to be undertaken prior to the demolition of onsite structures to identify the presence of any deleterious materials contained within the building fabric; and ▪ A Detailed Site Investigation (DSI) to characterise soils and groundwater, and ascertain the presence of any contamination onsite.

4. CONCEPTUAL SITE MODEL

In accordance with NEPM (2013) *Schedule B2 - Guideline on Site Characterisation* and to aid the assessment of the collected data, EI developed a conceptual site model (CSM) assessing plausible linkages between potential contamination sources, migration pathways and receptors. The CSM provided a framework for the review of the reliability and useability of the collected data and helped identify gaps in the existing site characterisation.

4.1 Potential Contamination Sources

On the basis of the site history findings (described in **Section 3**), EI considered potential chemical hazards and onsite contamination sources to be as follows:

- Potential filling soils of unknown origin and quality placed at the site;
- Weathering of exposed building structures including, painted surfaces, metallic objects, and cement-fibre sheeting;
- Potential contamination from demolition of former site structures;
- Long-term application of pesticides across the site;
- Low-level leakage of petroleum hydrocarbons from vehicles in the car parking area;
- Hazardous building materials within existing site structures;
- Potential contamination of soils and groundwater from commercial operations onsite;
- Potential contamination arising from fire-fighting activities on site; and
- Migration of contamination onto site from nearby commercial properties, including the petrol station to the north west of the site, and any unknown contamination sources.

4.2 Contaminants of Potential Concern

The contaminants of potential concern (COPC) at the site were considered to be:

Soil – Metals/Metalloids, Total Recoverable Hydrocarbons (TRH), Benzene, Toluene, Ethylbenzene, Xylene (BTEX), Polycyclic Aromatic Hydrocarbons (PAHs), Organochlorine Pesticides (OCPs), Organophosphate Pesticides (OPPs), Polychlorinated Biphenyls (PCBs), and asbestos.

Groundwater - Metals/Metalloids, TRH, BTEX, PAHs, volatile organic compounds (VOC), and PFAS.

4.3 Other Contaminants of Potential Concern

4.3.1 Per or poly-fluoroalkyl substances (PFAS)

EPA (2017) requires that PFAS is considered in assessing contamination. EI use the following decision tree (**Table 4-1**) based on EnRisk (2016) for prioritising the potential for PFAS to be present on site and whether PFAS sampling of soil and water is required.

Table 4-1 PFAS Decision Tree

Preliminary Screening	Decision
Did fire training occur on-site?	No
Did fire training occur, or is an airport or fire station upgradient of or adjacent to the site? [1]	No
Have "fuel" fires ever occurred on-site? (e.g. ignition of fuel (solvent, petrol, diesel, kerosene) tanks)	No
Have PFAS been used in manufacturing or stored on-site? [2]	No
If Yes to any questions, has site analytical suite been optimised to include preliminary sampling and testing for PFAS in soil (ASLP Testing) and water?	N/A

Notes:
Note 1 Runoff from fire training areas may impact surface water, sediment and groundwater.
Note 2 PFAS is used wide range of industrial processes and consumer products, including in the manufacture of non-stick cookware, specialised garments and textiles, Scotchguard™ and similar products (used to protect fabric, furniture, leather and carpets from oils and stains), metal plating and in some types of fire-fighting foam (https://www.nicnas.gov.au/chemical-information/factsheets/chemical-name/perfluorinated-chemicals-pfas)

Although the PFAS decision tree has not identified a significant risk of PFAS contamination at the site, it was noted during a site walkover that the existing building on site had been fire damaged. As such, PFAS was added as a contaminant of concern to groundwater to screen for any potential impacts from fire-fighting activities that have been undertaken on the site.

4.3.2 Emerging chemicals

The EPA uses Chemical control orders (CCOs) as a primary legislative tool under the EHC Act 1985 to selectively and specifically control particular chemicals of concern, and limit their potential impact on the environment. CCOs provide the EPA a rapid and flexible mechanism for responding to emerging chemical issues. As with PFAS, EI has considered chemicals controlled by CCOs and other potential emerging chemicals in this assessment as outline in **Table 4-2**.

Table 4-2 Emerging or controlled chemicals

Chemicals of Concern (CCO or emerging)	Decision
Were aluminium smelter wastes used or stored on site (CCO,1986)?	No
Do dioxin contaminated wastes (CCO,1986) have the potential to impact the site? [1]	No
Were organotin products (CCO,1989) used or stored on site ? [2]	No
Were polychlorinated biphenyls (PCBs) used or PCB wastes (CCO, 1997) stored on-site? [3]	Yes (Possibly from if pesticides used)
Were scheduled chemical or wastes (CCO, 2004) used or stored? [4]	No
Are other emerging chemicals suspected? [5]	No
If Yes to any questions, has site sampling suite been optimised to include specific sampling for other chemicals of concern in soil, air and water	Yes

Notes
Note 1 From burning of certain chemicals, smelting or chemical manufacturing or fire on or near the site.
Note 2 From anti-fouling paints used or removed at boat & ship yards and marinas.
Note 3 From older transformer oils & electrical capacitors
Note 4 Twenty-four mostly organochlorine pesticides and industrial by-products
Note 5 Other chemicals considered as emerging e.g. 1,4 dioxane (associated with some cVOCs),

4.4 Potential Sources, Exposure Pathways, and Receptors

Potential contamination sources, exposure pathways and human and environmental receptors that were considered relevant for this investigation are summarised in **Table 4-3**, along with a qualitative assessment of the potential risks posed by complete exposure pathways. The risk classification matrix used to classify each risk is provided in **Appendix J.**

Table 4-3 Conceptual Site Model

Potential Sources	Impacted Area	Potential Contaminants	Media	Sensitive Receptor	Migration & Exposure Pathways
Imported fill material	Site wide	Metals/Metalloids, PAHs, BTEX, TRHs, OCPs, OPPs, PCBs, and asbestos	Soils (near surface)	▪ Site workers during demolition and excavation	▪ Dermal Contact ▪ Ingestion ▪ Inhalation
Weathering and demolition of building products	Directly adjacent to existing buildings	Lead, Asbestos	Soils (near surface)	▪ Site workers during demolition and construction ▪ Future site residents	▪ Dermal Contact ▪ Ingestion ▪ Inhalation
Historical pesticide use	Beneath existing buildings	OCPs, OPPs, PCBs	Soils (near surface)	▪ Site workers during demolition and excavation	▪ Dermal Contact ▪ Ingestion
Spills and leaks from vehicles in the former car park	North-east site area	TRH, BTEX, Lead	Soils	▪ Site workers during demolition and excavation	▪ Dermal Contact ▪ Ingestion
			Groundwater	▪ Site workers during demolition and excavation ▪ Future Site Users	▪ Dermal Contact ▪ Ingestion ▪ Inhalation (vapour)
Historical operations on site	Site wide	Metals/Metalloids (including Barium)	Soils	▪ Site workers during demolition and excavation	▪ Dermal Contact ▪ Ingestion
Fire-fighting activities	Beneath existing buildings	PFAS	Groundwater	▪ Aquatic life in Bells Creek	▪ Transport via groundwater followed by ingestion & inhalation
Off-site sources	Site wide	PCBs, Metals, BTEX, phenolics, PAHs, VOCs	Groundwater and soils below water level	▪ Site workers during demolition and excavation ▪ Future site users	▪ Dermal Contact ▪ Ingestion ▪ Inhalation

5. SAMPLING, ANALYTICAL AND QUALITY PLAN (SAQP)

The SAQP plays a crucial role in ensuring that the data collected as part of this, and ongoing environmental investigations carried out at the site, are representative and provide a robust basis for site assessment decisions. The SAQP for this DSI included the following:

- Data quality objectives, including a summary of the objectives of the DSI;
- Investigation methodology, including a description of intended sampling points, the media to be sampled and details of COPCs to be analysed;
- Sampling methods and procedures;
- Field screening methods;
- Analysis Methods;
- Sample handling, preservation and storage; and
- Analytical QA/QC.

5.1 Data Quality Objectives (DQO)

In accordance with the US EPA (2006) and the EPA (2017), Data Quality Objectives (DQOs) were established to determine the appropriate level of data quality needed for the specific data requirements of the project. The DQO process that was applied for this DSI is documented in Table 5-1.

Table 5-1 Summary of Project Data Quality Objectives

DQO Steps	Details
1. State the Problem Summarise the contamination problem that will require new environmental data, and identify the resources available to resolve the problem; develop a conceptual site model	The site is to be developed into an eight-storey mixed-use commercial and residential building after demolition of existing structures. Historical information and site inspection identified the potential for contamination to be present in site soil and/or groundwater, contributed by various potential sources listed in **Section 4.1**. In light of the information derived from the available site history information and site observations, a conceptual site model was developed (**Section 4**). The investigation sampling must provide supportive information on the environmental conditions of the site to determine the site's suitability for the proposed development.
2. Identify the Goal of the Study (Identify the decisions) Identify the decisions that need to be made on the contamination problem and the new environmental data required to make them	Based on the objectives outlined in **Section 1.4**, the decisions that need to be made are: ▪ Has the nature, extent and source of any soil, vapour and/or groundwater impacts onsite been defined? ▪ What impact do the site specific, geologic and hydrogeological conditions have on the fate and transport of any impacts that may be identified? ▪ Does the level of impact coupled with the fate and transport of identified COPCs represent an unacceptable risk to identified human and/or environmental receptors on or offsite? ▪ Does the collected data provide sufficient information to allow the selection and design of an appropriate remedial strategy, if necessary?
3. Identify Information Inputs (Identify inputs to decision) Identify the information needed to support any decision and specify which inputs require new environmental measurements	Inputs to the decision-making process included: ▪ The proposed future land use; ▪ Available site historical information; ▪ Areas of concern, identified during the site inspection prior to intrusive investigations; ▪ National and NSW EPA guidelines endorsed under the NSW Contaminated Land Management Act 1997; ▪ Investigation sampling (soils and groundwater) and laboratory analysis for COPCs to verify the presence of onsite contamination and to evaluate the potential risks to sensitive receptors; and ▪ At the end of the investigation, a decision must be made regarding whether the soils and/or groundwater are suitable for the proposed development, or if additional investigation or remedial works are required to make the site suitable for the proposed use.
4. Define the Boundaries of the Study Specify the spatial and temporal aspects of the environmental media that the data must represent to support decision	Lateral – The boundaries of the study were defined as the site cadastral boundaries. Vertical – From existing ground surface, underlying fill and natural soil horizons, to the underlying water-bearing zone. Temporal – Results are valid on the day of data and sample collection and remain valid as long as no changes occur on site or contamination (if present) does not migrate on site or on to the site from off-site sources.

DQO Steps	Details
5. Develop the Analytic Approach (Develop a decision rule) To define the parameter of interest, specify the action level, and integrate previous DQO outputs into a single statement that describes a logical basis for choosing from alternative actions	The decision rules for the investigation were: ▪ What are the characteristics of soil at the site? Soil boreholes were advanced to natural soils, sampled and logged to characterise underlying conditions. ▪ What are the characteristics of groundwater at the site? Three groundwater monitoring wells were installed to determine physical characteristics and chemical composition of groundwater underlying the site. ▪ Is the site contaminated by historic land use? Soil and groundwater samples were analysed for COPCs, with the data compared to relevant screening criteria. ▪ Is the site suitable for the proposed land use? If the concentrations of contaminants in the soil and groundwater are below the relevant land use criteria, then the site will be deemed suitable for the proposed development. If the concentrations of contaminants in the soils data exceed the land use criteria; then assess the need to further investigate the extent of impacts onsite. ▪ Is additional information (i.e. investigation) required to determine the suitability of the site for its proposed use? Decision criteria for the analytical data were defined by the Data Quality Indicators (DQI) in **Table 6-2**.
6. Specify Performance or Acceptance Criteria (Specify limits on decision errors) Specify the decision-maker's acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainties in the data	Specific limits for this project were in accordance with the appropriate guidance made by the NSW EPA, appropriate indicators of data quality and standard procedures for field sampling and handling. This should include the following points to quantify tolerable limits: ▪ A decision can be made based on a probability that 95% Upper Confidence Limits (UCL) of the data will satisfy the given site criteria. Therefore, a limit on the decision error will be 5% that a conclusive statement may be incorrect. ▪ A decision can be made based on the probability that a contamination hotspot of a certain circular diameter will be detected with 95% confidence using a selected density of systematic data points. The decision error will be limited to a probability of 5% that a contamination hotspot may not be detected. ▪ If contaminant concentrations in groundwater exceed the adopted criteria, further investigation will be considered prudent. If no contamination is detected in groundwater, further action will not be warranted.
7. Develop the Detailed Plan for Obtaining Data (Optimise the design for obtaining data) Identify the most resource-effective sampling and analysis design for general data that are expected to satisfy the DQOs	Site history indicates the potential for contamination to exist. To achieve the decision rules, the intrusive investigation included: ▪ Sampling on eleven locations in accessible parts of the site, targeting potential source areas identified from site history, site walkover and observations at the site made by EI. ▪ Installation of three groundwater wells. ▪ An upper soil profile sample was collected at each borehole location and tested for contaminants of potential concern, to assess the conditions of the fill layer, and impacts from previous activities at ground level. Further sampling was also carried out at deeper soil layers. Samples were selected based on field observations (including visual and olfactory evidence) with consideration of subsurface stratigraphy. ▪ Representative groundwater sample was collected at each sample and analysed for groundwater characterisation. ▪ Review of the results was undertaken to determine if further intrusive investigation (i.e. additional sampling) is warranted.

5.2 Data Quality Indicators

To ensure that the investigation results were of an acceptable quality, the data set was assessed against the quality indicators (DQIs) outlined in Table 5-2. Further assessment of data quality is discussed in **Section 7**.

Table 5-2 Data Quality Indicators

Data Quality Objective	Data Quality Indicator	Acceptable Range
Accuracy	Field – Trip blank (laboratory prepared)	< laboratory LOR
	Field – Trip spike (laboratory prepared)	80-120% recovery
	Field – Spilt (inter-laboratory) duplicate	< 30% RPD
	Laboratory – control spike and matrix spike	Prescribed by the laboratories
Precision	Field – Blind (intra-laboratory) duplicate	< 30% RPD
	Laboratory – duplicate and matrix spike samples	Prescribed by the laboratories
Representativeness	Field – Trip blank (laboratory prepared)	< laboratory LOR
	Laboratory – Method blank	Prescribed by the laboratories
Completeness	Completion (%)	-

6. ASSESSMENT METHODOLOGY

6.1 Sampling Rationale

With reference to the CSM described in **Section 5**, soil and groundwater investigation works were in accordance with the following rationale:

- Sampling of fill and natural soils from eleven test bore locations (BH1-BH11) were planned to be executed and located using a grid-based pattern within accessible parts of the site; and
- Completion of a single groundwater monitoring event (GME) at three monitoring wells (BH1M, BH2M and BH3M) located across the site to assess potential groundwater impacts and to suggest direction of groundwater flow.

6.2 Investigation Constraints

The investigations constraints were as follow:

- Site access was limited by the existing building in the north-western area of the site.

6.3 Assessment Criteria

The assessment criteria adopted for this project are outlined in Table 6-1. These were selected from available published guidelines that are endorsed by national or state regulatory authorities, with due consideration of the exposure scenario that is expected for various parts of the site, the likely exposure pathways and the identified potential receptors.

Table 6-1 Adopted Assessment Criteria

Environmental Media	Adopted Guidelines	Rationale
Soil	NEPC (2013) HILs, HSL, EILs, ESLs, and Management Limits for TRHs	**Soil Health-based Investigation Levels (HILs)** Samples were assessed against the NEPC (2013) *HIL-B* thresholds for residential sites with minimal opportunities for soil access **Soil Health-based Screening Levels (HSLs)** The NEPC (2013) Soil *HSL-D* thresholds (were adopted for the scenario where residential occupation occurs overlying basement car parking) for vapour intrusion would be applied to assess for potential human health impacts from residual vapours resulting from petroleum, BTEX & naphthalene. The NEPC (2013) HSLs for asbestos were not adopted as part of the investigation. Soil samples were alternatively screened for asbestos on a presence/absence basis. **Management Limits for Petroleum Hydrocarbons** Where (if) the HSLs and/or ESLs were exceeded for the F1-F4 TRH fractions, soil sample results were assessed against the NEPC (2013) Management Limits to assess propensity for phase-separated hydrocarbons (PSH), fire and explosive hazards and adverse effects on buried infrastructure.
	US EPA (2009) RSLs	**Resident Soil Regional Screening Level** In lieu of any human health based Australian guideline values for barium in soil, US EPA RSLs have been adopted for the assessment.
Groundwater	NEPC (2013) GILs for Fresh Waters	**Groundwater Investigation Levels (GILs) for Fresh Water** NEPC (2013) provides GILs for typical, slightly-moderately disturbed aquatic ecosystems, which are based on the ANZG (2018) Trigger Values (TVs) for 95% level of protection of aquatic ecosystems. However, the 99% TVs were applied for the bio-accumulative metals *cadmium* and *mercury*. The fresh water criteria were considered relevant as Bell's Creek is the nearest water receptor.
	NEPC (2013) Groundwater HSLs for Vapour Intrusion	**Health-based Screening Levels (HSLs)** The NEPC (2013) groundwater HSL-D for vapour intrusion were used to assess potential human health impacts from residual vapours resulting from petroleum, BTEX and naphthalene impacts.
	NEPC (2013) GILs for Drinking Purposes	**Drinking Water GILs** The NEPC (2013) GILs for drinking water quality were applied for the assessment of direct contact with groundwater. These are based on the NHMRC (2011) Australian Drinking Water Guidelines.
	NEMP (2018)	**Freshwater guideline values for PFAS** NEMP guidelines for slightly to moderately disturbed freshwater ecosystems (95% protection) were adopted for site assessment.

For the purposes of this investigation, the adopted soil assessment criteria are referred to as the Soil Investigation Levels (SILs) and the adopted groundwater assessment criteria are referred to as the Groundwater Investigation Levels (GILs). SILs and GILs are presented alongside the analytical results in the corresponding summary tables in **Appendix B**, which are discussed in **Section 8**.

6.4 Soil Investigation

The soil investigation works conducted at the site are described in **Table 6-2**. Test bores locations are illustrated in **Figure A.2**.

Table 6-2 Summary of Soil Investigation Methodology

Activity/Item	Details
Fieldwork	Conducted on 1 August 2019. Eleven boreholes were constructed (BH1-11) across the site, with samples taken in both the fill and natural soil layers. Soil vapour (headspace) screening was performed in-field.
Drilling Method and Investigation Depth	Test bores (BH1-11) by a track-mounted drill rig, with final depths between 1.1 m and 9.0 mBGL. Test bores BH1, BH2 and BH3, converted to monitoring well BH1M, BH2M and BH3M. All boreholes were finished in natural soils.
Soil Logging	Drilled soils were classified in the field with respect to lithological characteristics and evaluated on a qualitative basis for odour and visual signs of contamination. Soil classifications and descriptions were based on Unified Soil Classification System (USCS) and Australian Standard (AS) 4482.1-2005. Bore logs are presented in **Appendix E**.
Field Observations (including visual and olfactory signs of contamination)	No visual evidence of contamination (staining, fragments of FCS etc.) was observed in any of the drilled / examined soils. No suspicious odour was detected in any of the drilled / examined soils.
Soil Sampling	Samples were collected by dry grab method (unused, dedicated nitrile gloves) and placed into laboratory-supplied, acid-washed, solvent-rinsed glass jars. For each sample, a small aliquot was placed into a zip-lock bag for in-field screening of VOCs using a portable Photo-ionisation Detector (PID). For each fill sample, an aliquot was placed in a zip-lock bag for asbestos analysis.
Management of Soil Cuttings	Soil cuttings were used as backfill for completed boreholes.
Decontamination Procedures	Drilling Equipment - The hand auger was decontaminated between sampling locations with potable water until the augers were free of all residual materials. Sampling Equipment – sampling equipment (i.e. metal trowels) was scrubbed and washed with potable water until free of all residual materials, then rinsed with laboratory-supplied, purified water.
Sample Preservation and Transport	Samples for laboratory analysis were stored in a chilled (with ice-bricks) chest, whilst on-site and in transit to the corresponding laboratory. Soil samples were transported to SGS Australia under strict chain-of-custody (COC) conditions. Signed COC certificates and sample receipt documentation were provided by SGS for confirmation purposes (**Appendix G**), as discussed in **Section 8**. A split (inter-laboratory) soil field duplicate was submitted to Envirolab Services (Envirolab; the secondary laboratory) under strict COC conditions. Signed COC

Activity/Item	Details
	certificates and sample receipt documentation were provided by Envirolab for confirmation purposes (**Appendix G**), as discussed **in Section 8**. All samples were submitted and analysed within the required holding period, as documented in the corresponding laboratory reports (**Appendix H**).
Laboratory Analysis and Quality Control	Soil samples were analysed by SGS and Envirolab for the COPCs. In addition to the split (inter-laboratory) soil field duplicate (BHQT1), QA/QC testing comprised a intra-laboratory soil field duplicate (BHQD1), an equipment rinsate blank (BHQR), a laboratory-prepared, trip spike soil sample (BHQTS) and a laboratory-prepared, trip blank soil sample (BHQTB). The corresponding laboratory reports are presented in **Appendix H**.

6.5 Groundwater Investigation

The groundwater investigation works conducted at the site are described in **Table 6-3**. The monitoring wells locations are illustrated in **Figure A.2**.

Table 6-3 Summary of Groundwater Investigation Methodology

Activity/Item	Details
Fieldwork	Groundwater monitoring wells were installed and developed on 1 August 2019. Water level gauging, well purging, field testing and groundwater sampling was conducted on 9 August 2019.
Well Construction	Test bores BH1, BH2 and BH3 were converted to monitoring wells BH1M, BH2M and BH3M as follows: ▪ BH1M: 9.0m deep, set in Shale, with 3.0 m screen; ▪ BH2M: 5.7m deep, set in Shale, with 3.0 m screen; and ▪ BH3M: 7.2m deep, set in Shale, with 3.0 m screen. ▪ The borehole for monitoring wells installation was drilled using a track-mounted drill rig. Well construction details are tabulated in **Table 8-2** and documented in the bore logs presented in **Appendix E**. Well construction was in general accordance with the standards described in NUDLC (2012) and involved the following: ▪ 50 mm, Class 18 uPVC, threaded, machine-slotted screen and casing, with slotted intervals in shallow wells set to screen to at least 500 mm above the standing water level to allow sampling of phase-separated hydrocarbon product, if present; ▪ Base and top of each well was sealed with a uPVC cap; ▪ Annular, graded sand filter was used to approximately 300 mm above top of screen interval; ▪ Granular bentonite was applied above annular filter to seal the screened interval.
Well Development	Well development was conducted for the well directly following installation. This involved agitation within the full length of the water column using a dedicated, HDPE, disposable bailer.

Activity/Item	Details
Well Survey (Elevation and location)	Well elevations at ground level were extrapolated from the spot elevations marked on the survey plan provided by the client. Well elevations at ground level were extrapolated in metres relative to Australian Height Datum (mAHD) as follow: ▪ BH1M: approx. RL 58.9 m; ▪ BH2M: approx. RL 58.63 m; ▪ BH3M: approx. RL 60.15 m.
Well Gauging and Groundwater Flow Direction	Monitoring wells were gauged for standing water level (SWL) prior to well purging at the commencement of the GME on 9 August 2019. Measured SWL is shown in **Table 8.3**. The direction of groundwater flow in the aquifer was inferred to be north-east.
Well Purging and Field Testing	Well purging was performed using a low-flow, micro-purge pump. No volatile organic odours were detected during any stage of well purging. Measurement of water quality parameters was conducted using a water quality meter (HI98194) repeatedly during well purging and were recorded onto field data sheets (**Appendix F**). The field measurements included Temperature (T), Dissolved Oxygen (DO), Electrical Conductivity (EC), Reduction-Oxidation Potential (Redox) and pH. Purged water volumes removed from each well and field test results are summarised in **Table 8-3**. Once stable readings were obtained, groundwater sampling was performed.
Groundwater sampling	Groundwater was sampled using a micro-purge system. Water was continuously measured for T, EC, Redox, DO and pH. Once three consecutive field measurements were recorded to within ± 10% for DO, ± 3% for EC, ± 0.2 for pH, ± 0.2° for temperature and ± 20 mV for Redox, this was considered to indicate that representative groundwater quality had been achieved and final physico-chemical measurements were recorded. Groundwater samples were then collected from the micro-purge sampling pump discharge point.
Decontamination Procedure	The micro-purge pump was decontaminated previously and after sampling in a solution of potable water and Decon 90 and then rinsed with potable water. The micro-purge system employed a disposable bladder and tubing system to further minimise potential contamination. All sample containers were supplied by the laboratory for the particular project and only opened once immediately prior to sampling. Ice packs were used to keep the samples cool when kept in an insulated chest. The water level probe and water quality kit probes were washed in a solution of potable water and Decon 90 and then rinsed with potable water. Rinsate sample was not collected as measurements was executed only in one well.
Sample Preservation	Sample containers were supplied by the laboratory with the following preservatives: ▪ One, 1 litre amber glass, acid-washed and solvent-rinsed bottle; ▪ Two, 40ml glass vials, pre-preserved with dilute hydrochloric acid, Teflon-sealed; and ▪ One, 250mL, HDPE bottle, pre-preserved with dilute nitric acid (1 mL). Samples for metals analysis were field-filtered using 0.45 µm pore-size filters. All containers were filled with sample to the brim then capped and stored in ice-filled chests, until completion of the fieldwork and during sample transit to the laboratory.

Activity/Item	Details
Sample Transport	After sampling, refrigerated sample chests were transported to SGS under strict COC conditions. COC certificates and laboratory sample receipt documentation were provided to EI for confirmation purposes (**Appendix G**).
Quality Control and Laboratory Analysis	Groundwater samples were analysed by SGS for the identified COPCs. QA/QC testing comprised a trip spike / blank samples and an intra-laboratory (blind field) duplicate tested by SGS, as well as an inter-laboratory (split field) duplicate tested by Envirolab. All corresponding laboratory analytical reports are presented in **Appendix F**.

7. DATA QUALITY ASSESSMENT

The assessment of data quality is defined as the scientific and statistical evaluation of environmental data to determine if they meet the objectives for the project (US EPA 2006). For this investigation, the data quality assessment included evaluation of the sampling procedures and the accuracy and precision of the reported laboratory results (based on external (field) and internal QC samples). The findings are discussed in detail in **Appendix I**.

The QC measures generated from the field sampling and laboratory analytical program are summarised in **Table 7-1**.

Table 7-1 Quality Control Process

Data Quality	Control	Conformance [Yes, Part, No]	Report Sections
Preliminaries	Data quality objectives established	Yes	See DQO/DQI; **Section 5.1** and **Section 5.2**
Field work	Suitable documentation of fieldwork methods, observations including borehole logs, sample register, field notes, calibration forms	Yes	See **Appendices E, F, G**
Sampling Plan	Use of relevant and appropriate sampling plan (density, type, and location)	Yes	See sample rationale; **Section 6.1**
	All media sampled and duplicates collected	Yes	See methodology; **Section 6.4** and **Section 6.5**
	Use of approved and appropriate sampling methods (soil and groundwater)	Yes	See methodology; **Section 6.4** and **Section 6.5**
	Selection of soil samples according to field PID readings (where VOCs are present)	Yes	See methodology; **Section 6.4**
	Preservation and storage of samples upon collection and during transport to the laboratory	Yes	See methodology; **Section 6.4** and **Section 6.5**
	Appropriate rinsate, field and trip blanks taken	Yes	See methodology; **Section 6.4** and **Section 6.5**

Data Quality	Control	Conformance [Yes, Part, No]	Report Sections
	Completed field and analytical laboratory sample COC procedures and documentation	Yes	See **Appendices G, H**
Laboratory	Sample holding times within acceptable limits	Yes	See laboratory QA/QC; **Appendices H, I**
	Use of appropriate analytical procedures and NATA-accredited laboratories	Yes	See laboratory reports; **Appendices H, I**
	LOR/PQLs low enough to meet adopted criteria	Yes	See laboratory notes; **Appendices H, I**
	Laboratory blanks	Yes	See laboratory QA/QC, **Appendices I**;
	Laboratory duplicates	Yes	See laboratory QA/QC; **Appendices H, I**
	Matrix spike/matrix spike duplicates (MS/MSDs)	Yes	See laboratory QA/QC; **Appendices I**
	Surrogates (or System Monitoring Compounds)	Yes	See laboratory QA/QC; **Appendices I**
	Analytical results for replicated samples, including (blind / split) field and laboratory duplicates, expressed as relative percentage difference (RPD)	Yes	See **Appendices H, I**
	Checking for the occurrence of apparently unusual or anomalous results (e.g. laboratory results that appear to be inconsistent with field observations or measurements)	Yes	-
Reporting	Report reviewed by senior staff to assess project meets desired quality, EPA guidelines and project outcomes.	Yes	See report author and reviewer section at beginning of document

7.1 Quality Overview

On the basis of the completed assessment, the overall quality of the analytical data from this additional investigation was considered to be of an acceptable standard for interpretive use and preparation of an updated CSM.

8. RESULTS

8.1 Soil Field Results

8.1.1 Subsurface Conditions

Based on the borehole logs (**Appendix D**), the general site lithology may be described as a layer of fill, overlying natural silty clay. A more detailed description is presented in **Table 8-1**.

Table 8-1 Generalised Subsurface Profile

Layer	Description	Depth of top of unit (mBGL)
Fill	Silty SAND; fine to medium grained, brown-dark brown, with trace of clay and root fibres, dry, no odour. *Topsoil.* Silty CLAY; low plasticity, dark brown, with some organic material (charcoal, root fibres), trace of sand fine to medium grained, with angular to sub-angular gravels, no odour. Clayey SILT; low to medium plasticity, brown, no odour.	Ground Level
Superficial	Silty CLAY; medium to high plasticity, pale grey mottled red, moist, no odour.	0.3 to 0.7
Rock	SHALE; grey-dark grey, weathered, no odour.	2.5 to 2.7

8.1.2 Field Observations and PID Results

Soil samples were obtained from test bores at various depths ranging between 0.2-1.0 mBGL. All examined soil samples were evaluated on a qualitative basis for odour and visual signs of contamination (e.g. hydrocarbon odours, oil staining, petrochemical filming, asbestos fragments, ash, charcoal) and the following observations were noted:

- No visual evidence of gross contamination was observed in any of the drilled / examined soils;
- No ACM fragments were observed in any of the drilled / examined soils;
- No suspicious odour was detected in any of the examined soils; and
- All PID readings were low (<3.4 ppm; **Appendix E**), indicating a general absence of volatile organic compounds in the soils.

8.2 Groundwater Field Results

8.2.1 Monitoring Well Construction

Three groundwater monitoring wells were installed on the site (BH1M – BH3M). Well construction details for the installed groundwater monitoring wells are summarised in **Table 8-2**.

Table 8-2 Monitoring Well Construction Details

Well ID	Well Depth (mBGL)	Ground Level RL (mAHD)	Well Stick up (m)	Screen Interval (mBGL)	Lithology Screened
BH1M	9.0	58.90	1.02	6.0 – 9.0	Shale
BH2M	5.7	58.60	0.30	2.7 – 5.7	Clay / Shale
BH3M	7.2	60.10	0.62	4.2 – 7.2	Shale

Notes:
mBGL - metres below ground level.
RL - Reduced Level – Surveyed elevation in metres relative to Australian Height Datum (mAHD). Levels extrapolated from survey plan (T Grabara & Associates, Ref. 3529).

8.2.2 General Observations and Field Meter Results

A single GME was conducted on 9 August 2019. A summary of the recorded field data is presented in **Table 8-3** and copies of the completed field data sheets are included in **Appendix F**.

The field data indicated that the local groundwater was circumneutral (pH: 6.4 - 6.73), fresh (EC: 55.46 – 65.61 µS/cm), and oxic (DO: 0.72 – 1.21 mg/L). Groundwater was also observed: brown/grey, medium to high turbidity, no odour, and no sheen.

Table 8-3 Groundwater Field Data

Well ID	SWL (mBTOC)	RL (TOC)	+ WL (mAHD)	Purge Volume (L)	DO (mg/L)	pH	EC (µS/cm)	Temp (°C)	Redox (mV)
BH1M	3.57	59.92	56.35	3.0	0.72	6.4	55.46	21.31	-166.5
BH2M	4.39	58.90	54.51	2.5	1.21	6.73	58.26	20.42	-187.1
BH3M	4.56	60.72	56.16	2.5	1.02	6.52	65.61	20.19	-176.5

Notes:
SWL – Standing Water Level prior to groundwater sampling.
mBTOC – metres below top of well casing.
RL (TOC) – Reduced Level, elevation at TOC in metres relative to Australian Height Datum (mAHD).
[†] WL - Calculated groundwater level, in m AHD (calculated as RL – SWL)
L – litres (referring to volume of water purged from the well prior to groundwater sample collection).
DO – Dissolved Oxygen, in units of milligrams per litre (mg/L)
EC – Electrical Conductivity, in units of micro Siemens per centimetre (µS/cm).
Redox – Reduction Oxidation Potential, adjusted to Standard Hydrogen Electrode (SHE) by adding field electrode potential (205 mV).

8.3 Laboratory Analytical Results

8.3.1 Soil Analytical Results

A summary of the laboratory results showing test sample quantities, minimum / maximum analyte concentrations and samples found to exceed the SILs, is presented in **Table 8-4**. More detailed tabulation showing the tested concentrations for individual samples alongside the adopted soil criteria are presented in **Table 1** (**Appendix B**) at the end of this report.

Table 8-4 Summary of Soil Analytical Results

No. of primary samples	Analyte	Min. Conc. (mg/kg)	Max. Conc. (mg/kg)	Sample(s) exceeding SIL
Hydrocarbons				
17	Carcinogenic PAHs (as B(α)P TEQ)	<0.3	<0.3	None
17	Total PAHs	<0.8	<0.8	None
17	Naphthalene	<0.1	<0.1	None
17	Benzene	<0.1	<0.1	None
17	Toluene	<0.1	<0.1	None
17	Ethylbenzene	<0.1	<0.1	None
17	Total xylenes	<0.3	<0.3	None
17	F1	<25	<25	None
17	F2	<25	<25	None
17	F3	<90	<90	None
17	F4	<120	<120	None
Pesticides				
11	OCPs	<1	<1	None
11	OPPs	<1.7	<1.7	None
PCBs				
11	Total	<1	<1	None
Metals / Metalloids (Total)				
17	Arsenic	1	5	None
17	Barium	1.2	470	None
17	Cadmium	<0.3	<0.3	None
17	Chromium	1	12	None
17	Copper	2.7	36	None
17	Lead	1	25	None
17	Mercury	<0.05	<0.05	None
17	Nickel	1.4	64	None
17	Zinc	2.4	68	None
PCBs				
11	Total PCBs	<1	<1	None
Asbestos				
11	Asbestos	Not detected	Not detected	None

All chemicals concentrations in soil samples were below the corresponding SILs or not detected.

8.3.2 Groundwater Analytical Results

Laboratory analytical results for the groundwater sample are summarised in **Table 8-5** below and **Table 2** (**Appendix B**), which includes the adopted GILs.

Table 8-5 Summary of Groundwater Analytical Results

No. of primary samples	Analyte	Min. Conc. (µg/L)	Max. Conc. (µg/L)	Sample(s) exceeding GIL
Hydrocarbons				
3	Benzene	<0.5	<0.5	None
3	Toluene	<0.5	<0.5	None
3	Ethylbenzene	<0.5	<0.5	None
3	Total xylenes	<1.5	<1.5	None
3	F1	<50	<50	None
3	F2	<60	<60	None
3	F3	<500	<500	None
3	F4	<500	<500	None
3	Naphthalene	<0.1	<0.1	None
3	Benzo(α)pyrene	<0.1	<0.1	None
Metals / Metalloids				
3	Arsenic	<1	<1	None
3	Cadmium	<0.1	0.2	None
3	Chromium	<1	<1	None
3	Copper	<1	2	GWBH1M-1 exceeded ANZG (2018)
3	Lead	<1	<1	None
3	Mercury	<0.1	<0.1	None
3	Nickel	<1	3	None
3	Zinc	<5	8	None
Others				
3	Total Phenol	<10	<10	None
3	Total VOC	<10	<10	None
PFAS				
3	Perfluorononanoic Acid (PFOA)	<0.01	<0.01	None
3	Perfluoropctanesulfonic Acid (PFOS)	<0.01	<0.01	None

Concentration of copper in sample GWBH1M-1 marginally exceeded the GIL criterion for fresh water. However, since concentration slightly exceeded in only one sample, it was considered that this metal levels did not pose an immediate environmental concern.

9. SITE CHARACTERISATION

9.1 Soil and Groundwater Impacts

Based on the data, soils and groundwater were free from contamination at significantly elevated concentrations.

9.2 Data Gaps

Previously known data gaps were considered to have been largely addressed with the exception of the following:

- Environmental condition of soils below the existing building footprint;
- Hazardous building materials within existing site structures.

9.3 Review of the Conceptual Site Model

On the basis of the preliminary investigation findings, the CSM discussed in **Section 4** has been revised and amended in **Table 9-1.**

Table 9-1 Refined Conceptual Site Model

Potential / Identified Sources	Impacted Area	Potential Contaminants	Media	Sensitive Receptor	Migration & Exposure Pathways
Historical pesticide use	Beneath existing buildings	OCPs, OPPs, PCBs	Soils (near surface)	▪ Site workers during demolition and excavation	▪ Dermal Contact ▪ Ingestion
Weathering and demolition of building products	Directly adjacent to existing buildings	Lead, Asbestos	Soils (near surface)	▪ Site workers during demolition and construction ▪ Future site residents	▪ Dermal Contact ▪ Ingestion ▪ Inhalation

9.4 Risk in context of the proposed development

The proposed development includes a basement that encompasses the entire site area. As such, soils beneath the existing building will be removed form site during development works and are not considered to represent an ongoing cause for environmental concern. However, there is a potential risk in regard to hazardous materials within the existing building. Therefore, appropriate management should be applied prior to demolition of site structures, as per recommended in **Section 11**.

10. CONCLUSIONS

The site located at 7 Luxford Road, Mount Druitt NSW was the subject of a Detailed Site Investigation that was conducted in order to assess the degree of on-site contamination associated with current and former uses of the property. Based on the findings of this investigation, it was concluded that:

- The sub-surface layers were comprised of fill (Silty SAND (Topsoil), Silty CLAY and Clayey SILT) with thickness between 0.3 to 0.7m, overlying natural Silty CLAY. Shale bedrock was encountered at 2.5 to 2.7 mBGL;
- No contaminants of potential concern were found to be elevated in any of the soil or groundwater samples tested as part of the investigation;
- Although a data gap exists (quality of soils beneath the existing building and hazardous material in site structures), it is not considered to be a cause of environmental concern, if appropriate management of soil and demolition materials during the redevelopment works follow the recommendations provided in **Section 11**.

Based on the findings of this DSI, and with consideration of the Statement of Limitations (**Section 12**), EI consider the site is suitable for the proposed development, given the recommendations provided in **Section 11** are implemented

11. RECOMMENDATIONS

The following tasks are recommended to ensure appropriate management of soil and demolition materials during the redevelopment works:

- Waste classification of all excavated material, in accordance with NSW EPA (2014) *Waste Classification Guidelines*, for offsite disposal of waste.
- Development of an unexpected finds protocol for implementation should any unforseen contamination be identified during basement excavation and earthworks;

Based on visual evidence obtained during site works, there is a potential for hazardous materials to be present within the existing building on site. As such, the following tasks are also recommended for the site:

- The completion of a Hazardous Materials Survey of existing structures prior to any demolition works required by the development;
- Completion of a clearance inspection following the demolition of site structures and removal of demolition debris.

STATEMENT OF LIMITATIONS

The findings presented in this report were the result of discrete and specific sampling methodologies used in accordance with best industry practices and standards. Due to the site-specific nature of soil sampling from point locations, it is considered likely that all variations in subsurface conditions across a site cannot be fully defined, no matter how comprehensive the field investigation program.

While normal assessments of data reliability have been made, EI assumes no responsibility or liability for errors in any data obtained from previous assessments conducted on site, regulatory agencies (e.g. Council, EPA), statements from sources outside of EI, or developments resulting from situations outside the scope of works of this project.

Despite all reasonable care and diligence, the ground conditions encountered and concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. In addition, site characteristics may change at any time in response to variations in natural conditions, chemical reactions and other events, e.g. groundwater movement and or spillages of contaminating substances. These changes may occur subsequent to EI's investigations and assessment.

EI's assessment was necessarily based upon the result of the site investigation and the restricted program of surface and subsurface sampling, screening and chemical testing which was set out in the proposal. Neither EI, nor any other reputable consultant, can provide unqualified warranties nor does EI assume any liability for site conditions not observed or accessible during the time of the investigations.

This report was prepared for the Tony Owen Partners and no responsibility is accepted for use of any part of this report in any other context or for any other purpose or by other third parties. This report does not purport to provide legal advice.

This report and associated documents remain the property of EI subject to payment of all fees due for this assessment. The report shall not be reproduced except in full and with prior written permission by EI.

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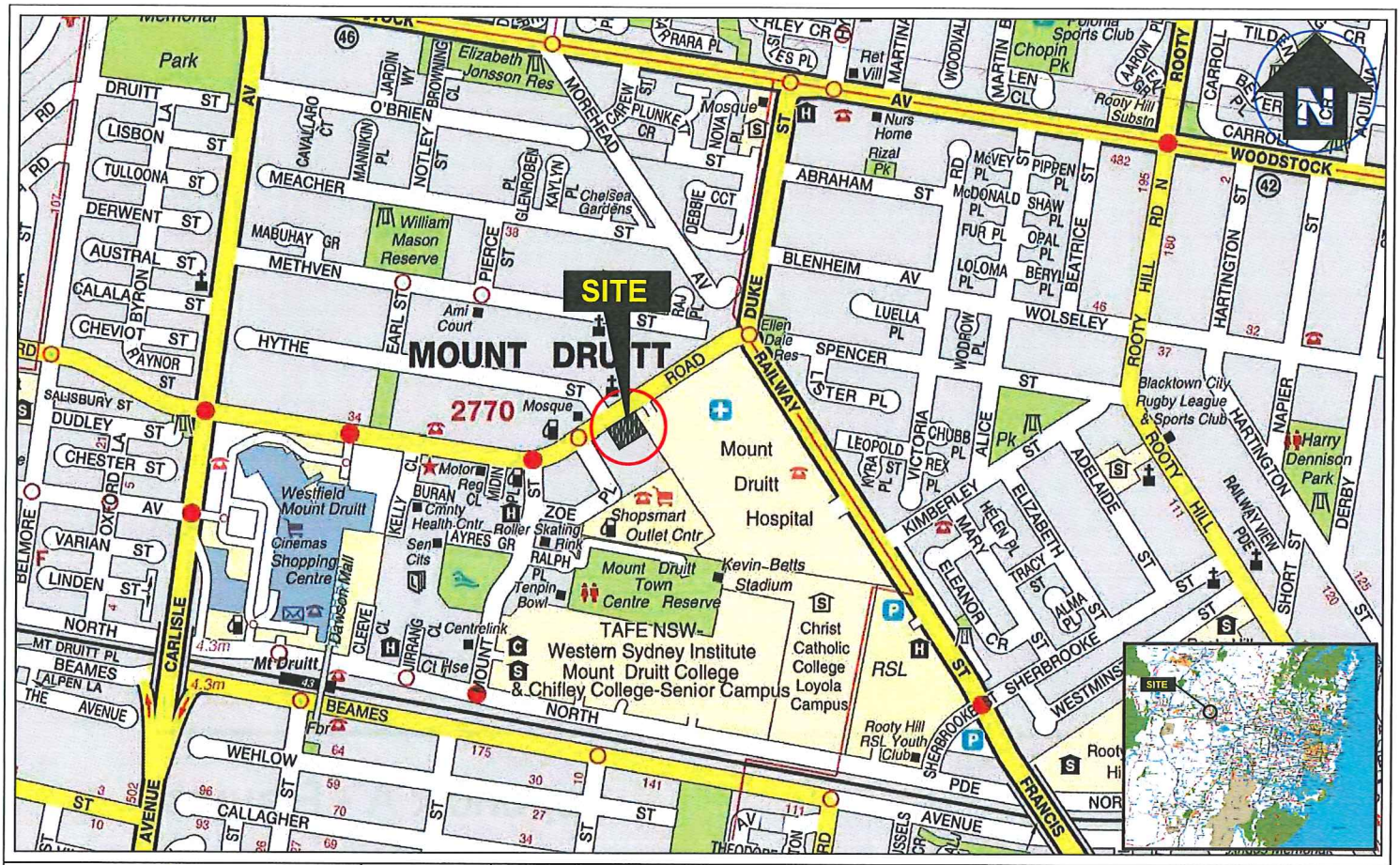
ABBREVIATIONS

ACM	Asbestos-containing materials
ASS	Acid sulfate soils
B(a)P	Benzo(a)Pyrene (a PAH compound), - B(a)P TEQ Toxicity Equivalent Quotient
BH	Borehole
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
COC	Chain of Custody
COPCs	Chemicals of Potential Concern
DA	Development Application
DEC	Department of Environment and Conservation, NSW (see OEH)
DECC	Department of Environment and Climate Change, NSW (see OEH)
DECCW	Department of Environment, Climate Change and Water, NSW (see OEH)
DP	Deposited Plan
EPA	Environment Protection Authority
F1	C_6-C_{10} TRH less the sum of BTEX concentrations (Ref. NEPC (2013) Schedule B1)
F2	>C_{10}-C_{16} TRH less the concentration of naphthalene (Ref. NEPC (2013) Schedule B1)
HIL	Health-based Investigation Level
HSL	Health-based Screening Level
km	Kilometres
LOR	Limit of Reporting (quantitative limit for the respective laboratory analytical method)
m	Metres
m AHD	Metres Australian Height Datum
m BGL	Metres Below Ground Level
NATA	National Association of Testing Authorities, Australia
NEPC	National Environmental Protection Council
NSW	New South Wales
OEH	Office of Environment and Heritage, NSW (formerly DEC, DECC, DECCW)
PAHs	Polycyclic Aromatic Hydrocarbons
PQL	Practical Quantitation Limit (limit of detection for respective laboratory instruments)
QA/QC	Quality Assurance / Quality Control
TRH	Total Recoverable Hydrocarbons

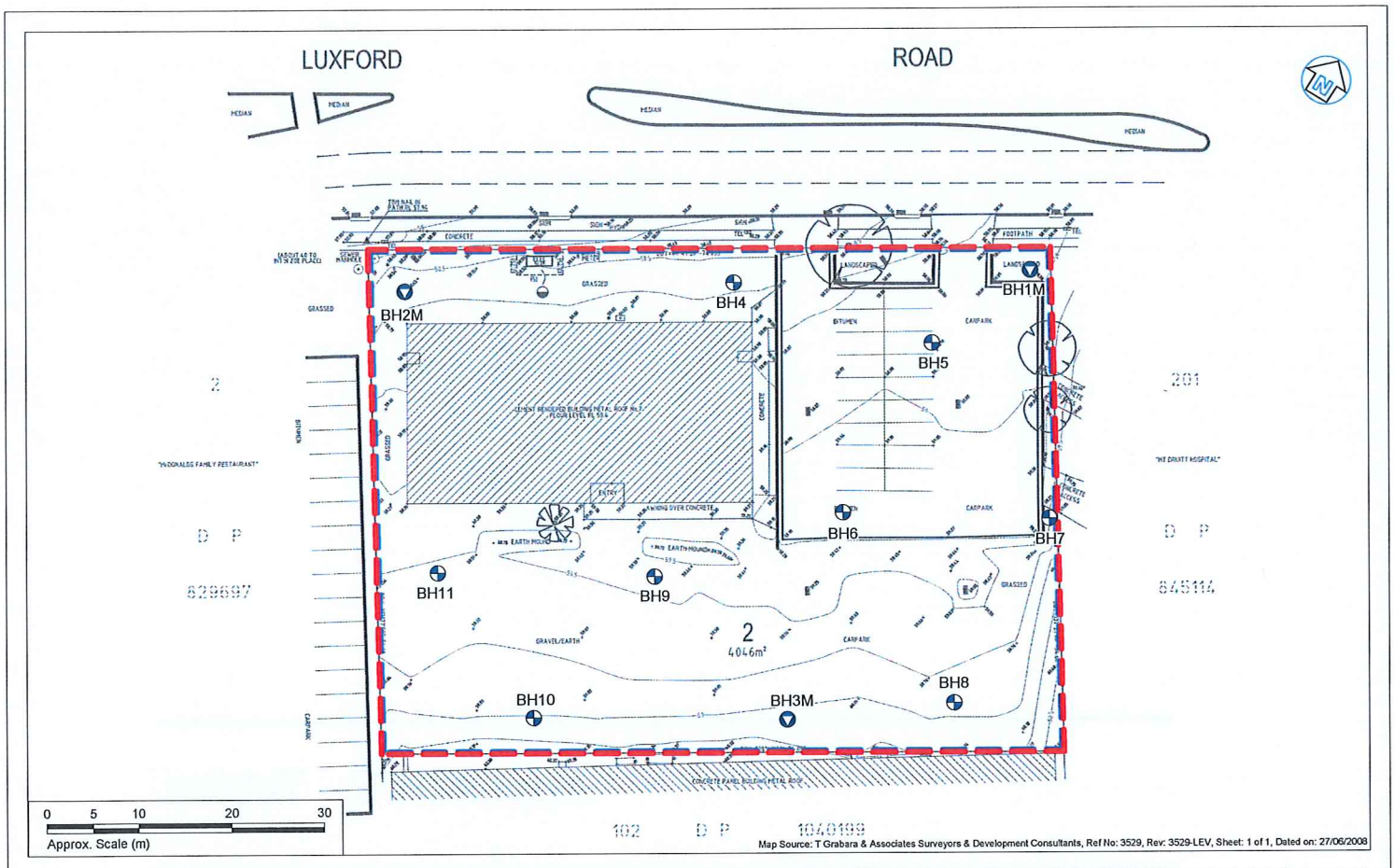
Appendix A - Figures



eiaustralia Contamination | Remediation | Geotechnical Suite 6.01, 55 Miller Street, PYRMONT 2009 Ph (02) 9516 0722 Fax (02) 9518 5088	Drawn:	AM.H.	**Tony Owen Partners** Detailed Site Investigation 7 Luxford Road, Mount Druitt NSW Site Locality Plan
	Approved:	L.B.	
	Date:	03-09-19	
	Scale:	Not To Scale	

Figure: 1

Project: E23648.E02_Rev0



Map Source: T Grabara & Associates Surveyors & Development Consultants, Ref No: 3529, Rev: 3529-LEV, Sheet: 1 of 1, Dated on: 27/06/2008

LEGEND

- Approximate site boundary
- Approximate basement boundary
- Approximate borehole location
- Approximate borehole/monitoring well location

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Contamination | Remediation | Geotechnics
Suite 8.01, 55 Miller Street, PYRMONT 2009
Ph (02) 9516 0722 Fax (02) 9518 5068

Drawn:	AM.H.
Approved:	L.B.
Date:	03-09-19

Tony Owen Partners
Detailed Site Investigation
7 Luxford Road, Mount Druitt NSW
Sampling Location Plan

Figure: 2

Project: E23648.E02_Rev0

Appendix B - Tables

Table T1 - Summary of Soil Analytical results

E24271.E02 - Rouse Hill

Sample ID	Material	Date	Heavy Metals								PAHs				BTEX				TRH				Pesticides		PCBs	Asbestos
			As	Ba	Cd	Cr (total)	Cu	Pb	Hg	Ni	Zn	Benzo(a)pyrene	Carcinogenic PAHs as BaP	Total PAHs	Naphthalene	Benzene	Toluene	Ethylbenzene	Total Xylenes	F1	F2	F3	F4	OCPs	OPPs	Total	Identification
EI Australia (1/6/2019)																										
BH1M_0.4-0.5	Fill	1/05/2019	4	56	<0.3	11	9.7	18	<0.05	4.6	14	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.6	<25	<25	<50	<120	<1	<1.7	<1	<0.01
BH1M_0.7-0.8	Natural		3	15	<0.3	6.7	9.2	9	<0.05	2.3	9.7	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.6	<25	<25	<50	<120	N.A.	N.A.	N.A.	N.A.
BH2M_0.2-0.3	Fill		2	150	<0.3	6.7	10	25	<0.05	5.1	61	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.6	<25	<25	<50	<120	<1	<1.7	<1	<0.01
BH2M_0.6-0.7	Natural		2	120	<0.3	6	6.9	9	<0.05	1.4	9.5	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.6	<25	<25	<50	<120	N.A.	N.A.	N.A.	N.A.
BH3M_0.2-0.3	Fill		2	180	<0.3	11	12	12	<0.05	3.9	17	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.6	<25	<25	<50	<120	<1	<1.7	<1	<0.01
BH3M_0.7-0.8	Natural		2	77	<0.3	4.1	8	5	<0.05	3.9	21	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.6	<25	<25	<50	<120	N.A.	N.A.	N.A.	N.A.
BH4_0.4-0.5	Fill		2	180	<0.3	10	13	20	<0.05	6.1	56	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.6	<25	<25	<50	<120	<1	<1.7	<1	<0.01
BH5_0.2-0.3	Fill		1	3.7	<0.3	1.6	1.9	2	<0.05	3.9	2.4	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.6	<25	<25	<50	<120	<1	<1.7	<1	<0.01
BH6_0.2-0.3	Fill		2	3.3	<0.3	1.4	4.4	2	<0.05	9.7	4.4	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.6	<25	<25	<50	<120	<1	<1.7	<1	<0.01
BH7_0.2-0.3	Fill		2	1.2	<0.3	1	2.7	1	<0.05	5.4	2.5	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.6	<25	<25	<50	<120	<1	<1.7	<1	<0.01
BH7_0.7-0.8	Natural		2	260	<0.3	6.9	14	10	<0.05	3.3	16	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.6	<25	<25	<50	<120	N.A.	N.A.	N.A.	N.A.
BH8_0.2-0.3	Fill		5	100	<0.3	11	15	17	<0.05	6.7	22	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.6	<25	<25	<50	<120	<1	<1.7	<1	<0.01
BH9_0.2-0.3	Fill		3	120	<0.3	6.7	36	11	<0.05	64	68	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.6	<25	<25	<50	<120	<1	<1.7	<1	<0.01
BH9_0.7-0.8	Natural		3	210	<0.3	8.1	13	11	<0.05	2.5	16	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.6	<25	<25	<50	<120	N.A.	N.A.	N.A.	N.A.
BH10_0.2-0.3	Fill		3	270	<0.3	9.4	14	18	<0.05	6.1	21	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.6	<25	<25	<50	<120	<1	<1.7	<1	<0.01
BH10_0.6-0.7	Natural		4	230	<0.3	12	18	21	<0.05	5.8	17	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.6	<25	<25	<50	<120	N.A.	N.A.	N.A.	N.A.
BH11_0.5-0.6	Fill		4	470	<0.3	9.1	16	16	<0.05	5	20	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.6	<25	<25	<50	<120	<1	<1.7	<1	<0.01
Statistical Analysis																										
Maximum concentration			5	470	<0.3	12	36	25	<0.05	64	68	<0.1	<0.3	<0.8	<0.1	<0.1	<0.1	<0.1	<0.3	<25	<25	<50	<120	<1	<1.7	<1	No
SILs																										
HIL B - Residential with minimal soil access			500		150	500 Cr(VI)	30,000	1,200	120	1,200	60,000		4	400										600		1	
HSL D - Commercial / Industrial Soil texture classification – Sand [1]	0 m to <1 m														NL	3	NL	NL	230	260	NL					
	1 m to <2 m														NL	3	NL	NL	NL	370	NL					
	2 m to <4 m														NL	3	NL	NL	NL	630	NL					
	4 m +														NL	3	NL	NL	NL	NL	NL					
Management Limits - Residential parkland and public open space, coarse grained soil texture [1]																				700	1,000	2500	10,000				
US EPA RSL - Resident Soil				15,000																						
Asbestos contamination HSL B Bonded ACM (%w/w)																										0.04
Asbestos contamination HSL B Non Bonded / Friable Asbestos (%w/w)																										0.001

Notes:

HIL B — NEPC 1999 Amendment 2013 'HIL B' Health Based Investigation Levels applicable for residential with minimal opportunities for soil access.
HSL D — NEPC 1999 Amendment 2013 HSL D' Health Based Screening Levels applicable for residential with communal car parks occupy the ground floor.

NA — 'Not Analysed' i.e. the sample was not analysed.
NC — 'Not Calculated'
NL — 'Not Referenced' i.e. No published criteria available
F1 — C6-C10 minus BTEX
F2 — >C10-C16 minus Naphthalene
F3 — (>C16-C34)
F4 — (>C34-C40)

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Table T2 – Summary of Groundwater Investigation Results

E23648.E02 - Mount Druitt

Sample ID	Date of Sampling	Heavy Metals								BTEX					TRHs				PAHs		Total VOCs	Acetone	Total Phenolics	PFAS	
		Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Benzene	Toluene	Ethylbenzene	o-xylene	m/p-xylene	F1	F2	F3	F4	Benzo(a)pyrene	Naphthalene				PFOS + PFHxS	PFOA
GWBH1M-1	9/08/2019	<1	0.1	<1	2	<1	<0.1	<1	6	<0.5	<0.5	<0.5	<0.5	<1	<50	<60	<500	<500	<0.1	<0.1	<10	<10	<10	<0.01	<0.01
GWBH2M-1		<1	<0.1	<1	<1	<1	<0.1	2	<5	<0.5	<0.5	<0.5	<0.5	<1	<50	<60	<500	<500	<0.1	<0.1	<10	<10	<10	<0.01	<0.01
GWBH3M-1		<1	0.2	<1	<1	<1	<0.1	3	8	<0.5	<0.5	<0.5	<0.5	<1	<50	<60	<500	<500	<0.1	<0.1	<10	<10	<10	<0.01	<0.01
Maximun Concentration		0	0.2	<1	<1	<1	<0.1	3	8	<0.5	<0.5	<0.5	<0.5	<1	<50	<60	<500	<500	<0.1	<0.1	<10	<10	<10	0	0
GILs																									
NEPC (2013) - HSL D	2 m to <4 m	NR	NR	NR	NR	NR	NR	NR	NR	5000	NL	NL	NL		6000	NL	NR	NR	NR	NL	NR	NR	NR	NR	NR
ANZG (2018) [1]	Fresh Water	24 (AsIII) 13 (AsV)	0.2	3.3 (CrIII) 0.4 (CrVI)	1.4	3.4	0.06[3]	11	8[4]	950[5]	180[5]	80[5]	850[5]		NR	NR	NR	NR	NR	16	NR	NR	320	NR	NR
NMHRC (2011) [2]	Drinking Water	10	2	50 (CrVI)	2000	10	1	20	3000*	1	25*	3*	20*		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
HEPA [6]	Drinking Water	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.07	0.56
	Fresh Water																							0.13 (PFOS)	220

Notes: All values are in units of µg/L unless stated otherwise.

Highlighted values indicates concentration exceeds Human Health Based Soil Criteria (HSL) and NMHRC (2011).

Highlighted values indicates concentration exceeds AZNG (2018) ecological criteria.

Highlighted values indicates criteria exceeded.

HSL D — NEPC 1999 Amendment 2013 'HSL D' Health Based Screening Level's based on vapour intrusion values applicable for commercial settings, with communal car parks or commercial properties occupying the ground floor.

NR — No current publish criterion.

NL — Not Limiting - The groundwater vapour limit exceeds the water solubility limit at which a soil vapour concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario.

1 — ANZG (2018) Australian and New Zealand Guidelines for Fresh Water Quality, Australian and New Zealand and Australian State and Territory Governments, August 2018, which is based on the ANZECC & ARMCANZ (2000). The 95% protection level trigger value was used in ecosystems that could be classified as slightly-moderate disturbed.

2 — NHMRC (2011) Australian Drinking Water Guidelines, Version 3.4 Updated October 2017. * Indicates aesthetic values for drinking water were used.

3 — The 99% trigger values have been applied for chemicals which have possible bioaccumulation and secondary poisoning effects, Ref. ANZECC & ARMCANZ (2000).

4 — Figure may not protect key species from chronic toxicity, Ref. ANZECC & ARMCANZ (2000).

5 — ANZECC/ARMCANZ (2000) Low to moderate reliability data.

6 — Heads of EPAs Australia and New Zeland (HEPA), PFAs National Environmental Management Plan (2018), freshwater criteria (higly disturbed ecosystems).

F1 — To obtain F1 subtract the sum of BTEX concentrations from the C6-C10 fraction.

F2 — To obtain F2 subtract Naphthalene from the >C10-C16 fraction.

F3 — (>C16-C34)

F4 — (>C34-C40)

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Table 3 - Summary of QA/QC Results for Soil Samples

E23648.E02 - Mount Druitt

Date	Sample Identification	Description	TRH				BTEX				Heavy Metals							
			F1	F2	F3	F4	Benzene	Toluene	Ethylbenzene	Xylene (total)	Arsenic	Cadmium	Chromium (Total)	Copper	Lead	Mercury	Nickel	Zinc
Inter-laboratory Duplicate																		
1/08/2019	BHQD1	Intra-laboratory duplicate of BH1M_0.1-0.2	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	3	<0.3	9.7	13	23	<0.05	6.0	20
1/08/2019	BHQT1	Intra-laboratory duplicate of BH1M_0.1-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<3	7	<0.4	18	22	18	<0.1	10	34
		RPD	*0.00*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	80.00	*NA*	59.93	51.43	*24.39*	*NA*	*50.00*	51.85
Trip Blanks																		
1/08/2019	BHQTB	Soil	-	-	-	-	<0.1	<0.1	<0.1	<0.3	-	-	-	-	-	-	-	-
Trip Spikes																		
1/08/2019	BHQTS	Soil	-	-	-	-	[103%]	[98%]	[96%]	NA	-	-	-	-	-	-	-	-
Rinsate Blanks																		
1/08/2019	BHQR	Equipment rinsate water	-	-	-	-	<0.5	<0.5	<0.5	<1.5	<1	<0.1	<1	<1	<1	<0.1	<1	<5
1/08/2019	BHQRB	De-ionised water	-	-	-	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Indicates values where a single result is found to be less than detection, with the duplicate sample found to be over the detection limit.

RPD exceeds 30-50% range referenced from AS4482.1 (2005)

Note: All soil results are reported in mg/kg .

F1 = TRH C6-C10 less the sum of BTEX
F2 = TRH >C10-C16 less naphthalene
F3 = TRH >C16-C34
F4 = TRH >C34-C40

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Table 4 - Summary of QA/QC Results for Groundwater Samples

E23648.E02 - Mount Druitt

Date	Sample Identification	Description	TRH				BTEX				Heavy Metals							
			F1	F2	F3	F4	Benzene	Toluene	Ethylbenzene	Xylene (total)	Arsenic	Cadmium	Chromium (Total)	Copper	Lead	Mercury	Nickel	Zinc
Intra-laboratory Duplicate																		
9/08/2019	GWBH1M-1	Primary Groundwater Sample	<50	<60	<500	<500	<0.5	<0.5	<0.5	<1.5	<1	0.1	<1	2	<1	<0.1	<1	6
9/08/2019	GWQD-1	Intra-laboratory duplicate of GWBH1M-1	<50	<60	<500	<500	<0.5	<0.5	<0.5	<1.5	<1	0.2	<1	1.0	<1	<0.1	<1	5.0
		RPD	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	**66.67**	***0.00***	**66.67**	***0.00***	***0.00***	***0.00***	***18.18***
Inter-laboratory Duplicate																		
9/08/2019	GWBH1M-1	Primary Groundwater Sample	<50	<60	<500	<500	<0.5	<0.5	<0.5	<1.5	<1	0.1	<1	2	<1	<0.1	<1	6
9/08/2019	GWQT-1	Inter-laboratory duplicate of GWBH1M-1	<10	<50	<100	<100	<1	<1	<1	NA	<1	0.3	<1	3	<1	<0.05	2.0	11
		RPD	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***0.00***	**100.00**	***0.00***	***40.00***	***0.00***	***NA***	**80.00**	**58.82**
Trip Blanks																		
9/08/2019	GWQTB	Water	-	-	-	-	<0.5	<0.5	<0.5	<1.5	-	-	-	-	-	-	-	-
Trip Spikes																		
9/08/2019	GWQTS	Water	-	-	-	-	[99%]	[99%]	[97%]	NA	-	-	-	-	-	-	-	-
Rinsate Blanks																		
9/08/2019	GWQR-1	Equipment rinsate water	-	-	-	-	<0.5	0.9	<0.5	<1.5	<1	<0.1	<1	<1	<1	<0.1	<1	<5
9/08/2019	GWQRB-1	De-ionised water	-	-	-	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Indicates values where a single result is found to be less than detection, with the duplicate sample found to be over the detection limit.

RPD exceeds 30-50% range referenced from AS4482.1 (2005)

Note: All soil results are reported in mg/kg .

F1 = TRH C6-C10 less the sum of BTEX
F2 = TRH >C10-C16 less naphthalene
F3 = TRH >C16-C34
F4 = TRH >C34-C40

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Appendix C – Proposed Development Plans

Schedule of Areas

Development Application

tony owen ptnrs

Project:	MOUNT DRUITT 2	Project Number	988
Project Address:	7 LUXFORD ROAD, MOUNT DRUITT		

SITE AREA 4046.0 sqm

Site Area:	4046.00	sqm
DCP FSR ALLOWANCE	3.00	:1
DCP FSR PROPOSED	3.81	:1

Development Application

Design Revision No:

Day 16
Month 11
Year 17

Unit Breakdown

	RETAIL	COMMERCIAL	1 BED	2 BED	3 BED		Total						Development Total
Ground Floor	6	6	0	0	0		12						
Level 1 Podium	0	0	4	21	0		25						
Level 2	0	0	2	24	0		26						
Level 3	0	0	2	24	0		26						
Level 4	0	0	4	8	4		16						
Level 5	0	0	4	8	4		16						
Level 6	0	0	4	8	4		16						
Level 7	0	0	4	8	4		16						
Level 8	0	0	4	8	4		16						
Unit sub-total			**28**	**109**	**20**		**157**						
MIX PERCENTAGE			**17.83%**	69.43%	**12.74%**								
DCP REQUIREMENT			10-30%	40-75%	10-100%								

FSR Calculation

	COMMERCIAL / RETAIL	RESIDENTIAL	TOTAL
Ground Floor	2445.60 sqm	244.60 sqm	2690.20 sqm
Level 1		1986.50 sqm	1986.50 sqm
Level 2		2161.70 sqm	2161.70 sqm
Level 3		2161.70 sqm	2161.70 sqm
Level 4		1279.00 sqm	1279.00 sqm
Level 5		1279.00 sqm	1279.00 sqm
Level 6		1279.00 sqm	1279.00 sqm
Level 7		1279.00 sqm	1279.00 sqm
Level 8		1279.00 sqm	1279.00 sqm
TOTAL	2445.60 sqm	12949.50 sqm	15395.10 sqm

SITE AREA		4046.00 **sqm**
FSR		**3.81 :1**
MAX ALLOWED FSR		3.00 :1

Parking Schedule

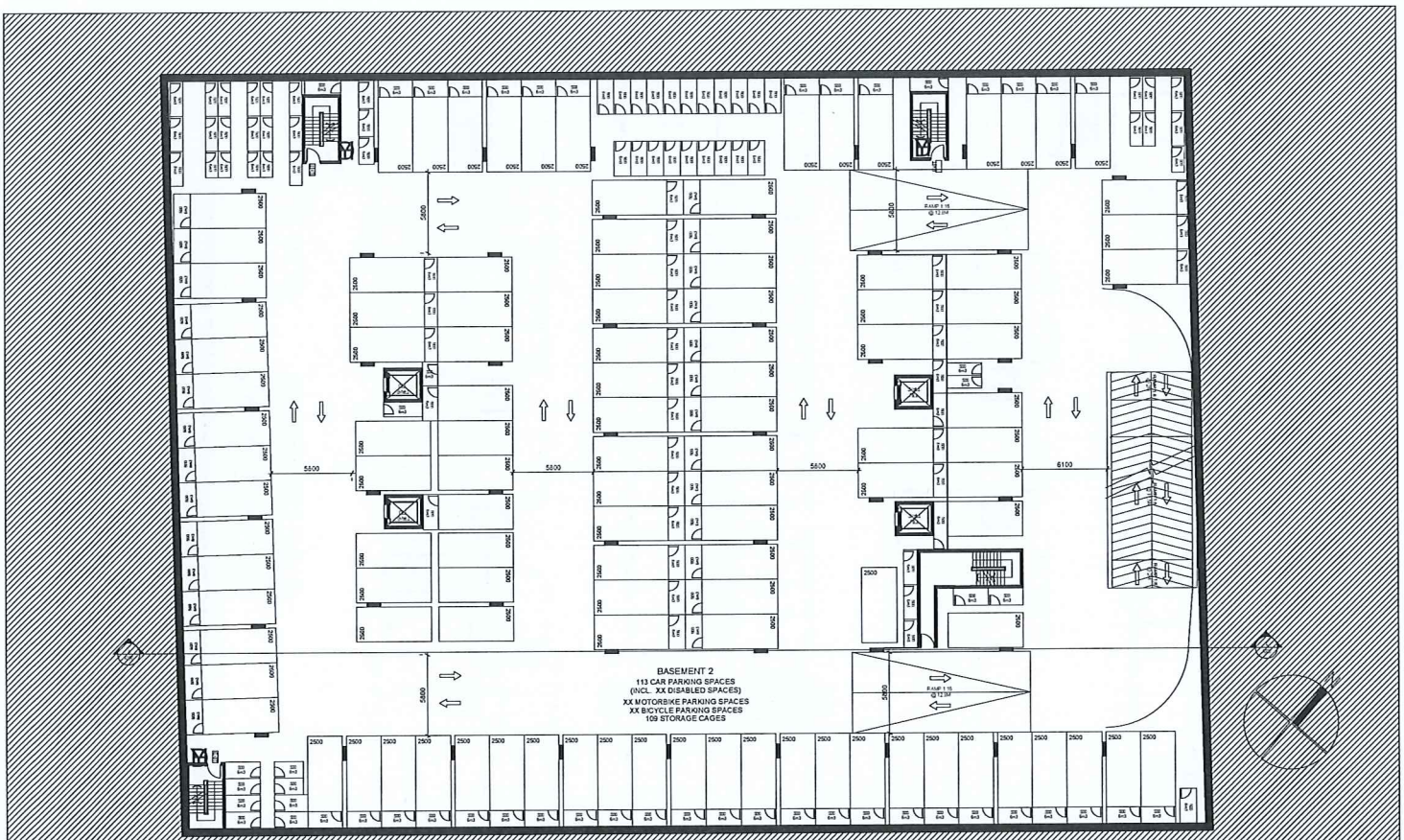
	rate	no. of units	total
Non-Adaptable Calculation			
Studio	0.4 per non adapt. unit	0.00	**0.00**
1 bed	0.6 per non adapt. unit	28.00	**16.80**
2 bed	0.9 per non adapt. unit	109.00	**98.10**
3+ bed	1.4 per non adapt. unit	20.00	**28.00**
Visitors	0.2 per non adapt. unit	157.00	**31.40**
Adaptable Calculation			
Adapt. Units	1 per adapt. unit	0.00	**0.00**
Visitors	1 per adapt. unit	0.00	**0.00**
Commercial / Retail	1 per 30m2	2067.10	**68.90**
Total Cars REQUIRED			**243.2**
Total Cars PROPOSED			**226.0**
			-17.2

Bicycle Parking

		no. of units	
Residential	1 per 2 units	xx	**xx**
Visitors	1 per 10 units	xx	**xx**
Total Bicycles REQUIRED			**0.0**
Total Bicycles PROPOSED			**xx**

Motorbike Parking

	requirement	
5% of DCP Carpark Requiremen	xx	**xx**
Total Motorbikes PROPOSED		**xx**



BASEMENT LEVEL 2 PLAN

No.	Description	By	Date
1	DEVELOPMENT APPLICATION		NOV 2017

Client: ALEX VOLFNEUK

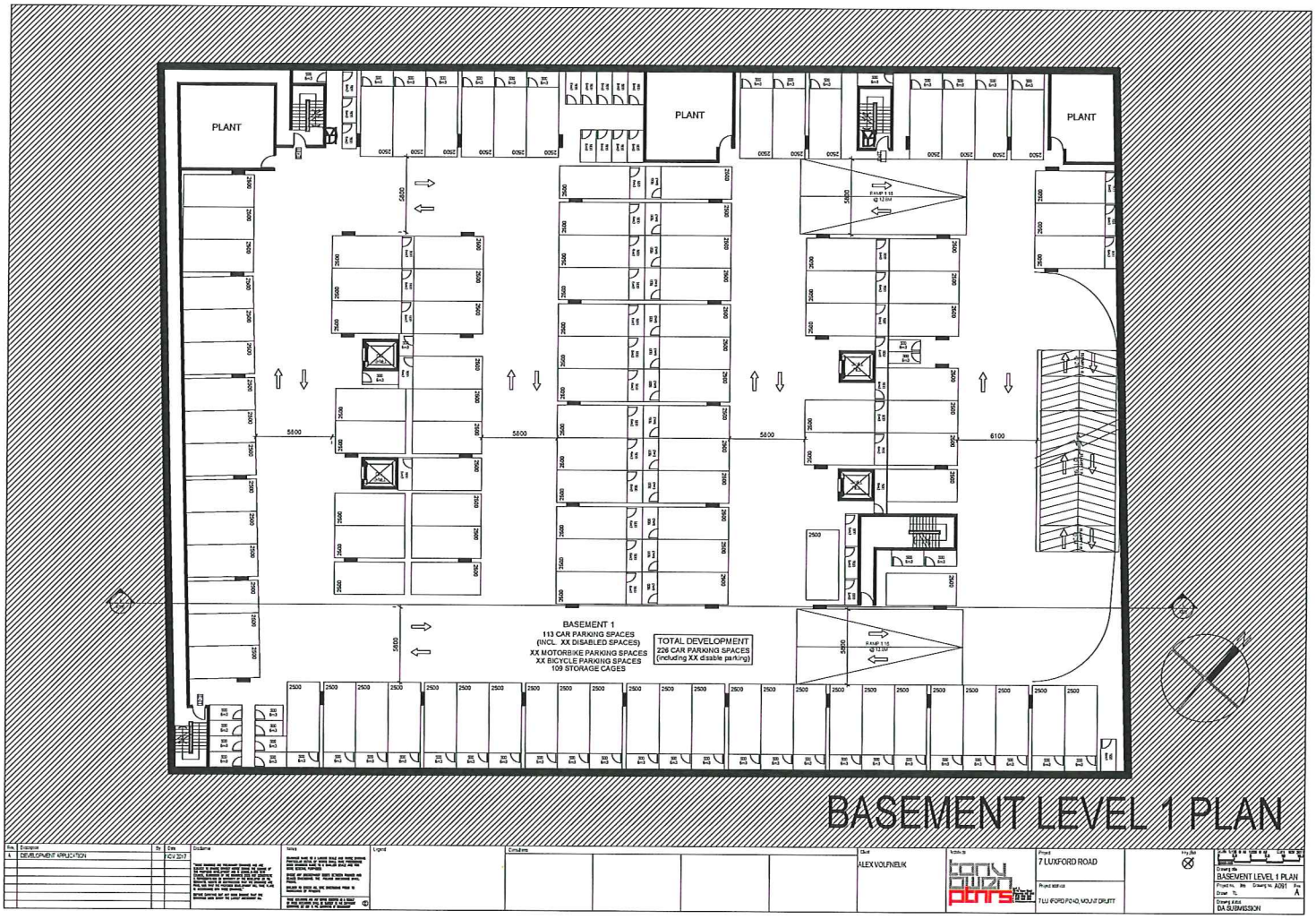
Project: 7 LUXFORD ROAD

Project address: 7 LUXFORD ROAD, MOUNT DRUITT

Drawing title: BASEMENT LEVEL 2 PLAN

Project No. 316 Drawing No. A099 Rev. A

Drawing status: DA SUBMISSION



BASEMENT LEVEL 1 PLAN

No.	Revision	By	Date
A	DEVELOPMENT APPLICATION		20 OCT 2017

Disclaimer

Notes

Legend

Consultants

Client: ALEX VOLFNEUK

Architects: tony owen partners

Project: 7 LUXFORD ROAD

Project status: 7 LUXFORD ROAD, MOUNT DRUITT

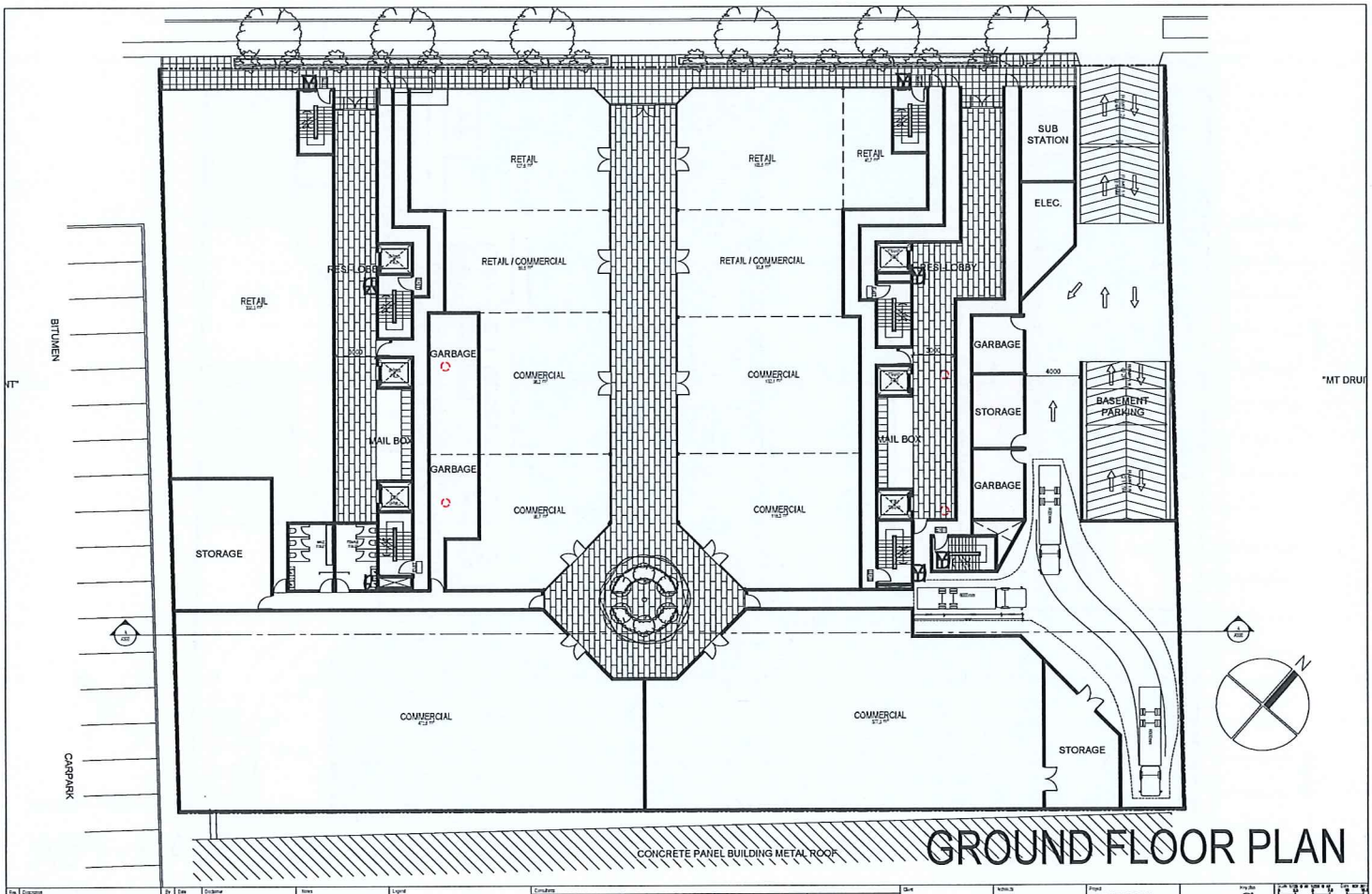
Plot Date

Drawing no.: BASEMENT LEVEL 1 PLAN

Project no. 3hs | Drawing no. A091 | Rev A

Drawn: TL

Drawing status: DA SUBMISSION



GROUND FLOOR PLAN

Rev	Description	By	Date
A	DEVELOPMENT APPLICATION		NOV 2017

Client: ALEX VOLFNEUK

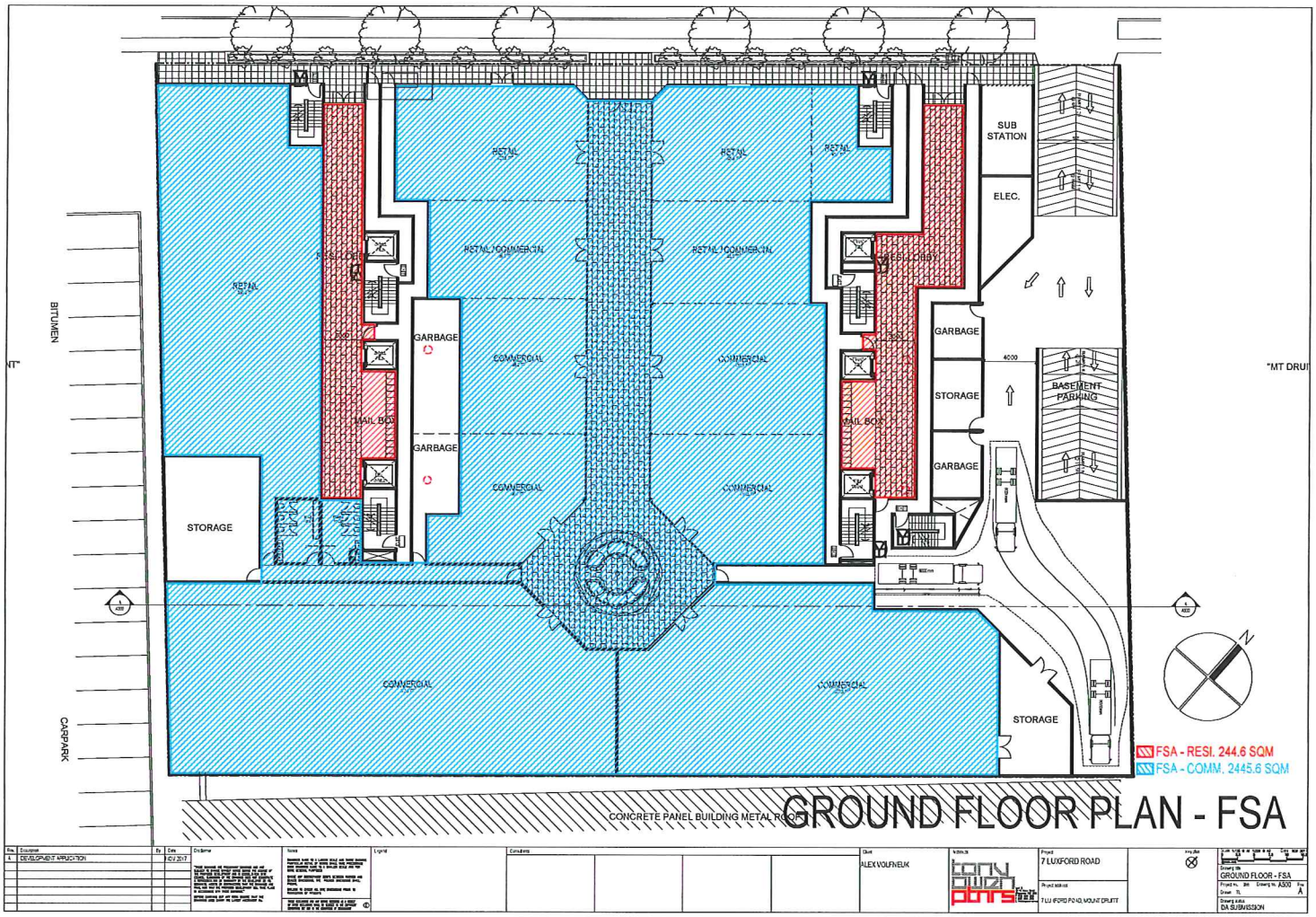
Project: 7 LUXFORD ROAD

Project address: 7 LUXFORD ROAD, MOUNT DRUITT

Drawing title: GROUND FLOOR PLAN

Project no.: Drawing no.: A100 Rev: A

Drawing status: DA SUBMISSION



GROUND FLOOR PLAN - FSA

No.	Description	By	Date
1.	DEVELOPMENT APPLICATION		10 / 2017

Disclaimer

Notes

Legend

Consultants

Client: ALEX VOLFNEUK

Architect: tony owen partners

Project: 7 LUXFORD ROAD

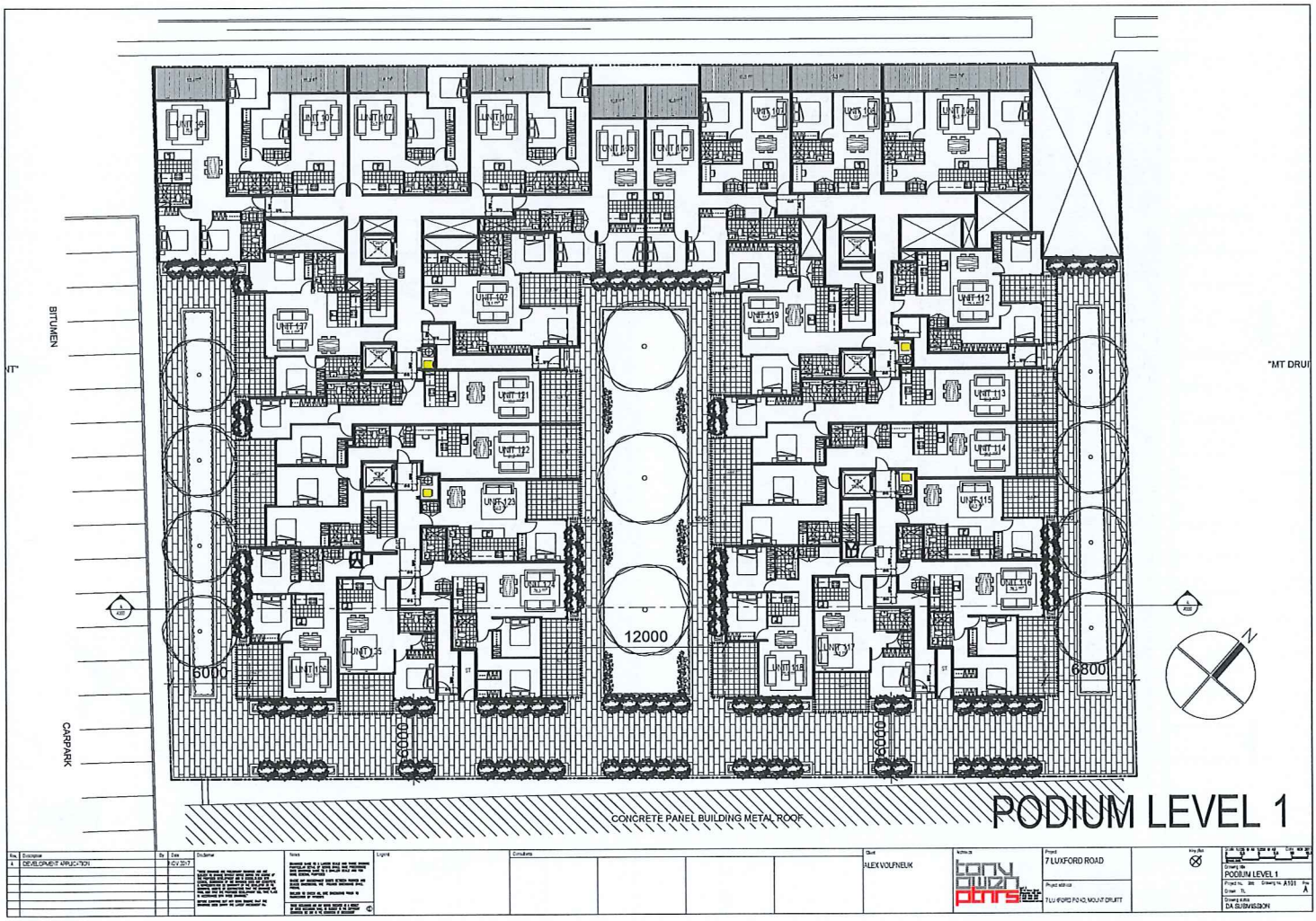
Project address: 7 LUXFORD ROAD, MOUNT DRUITT

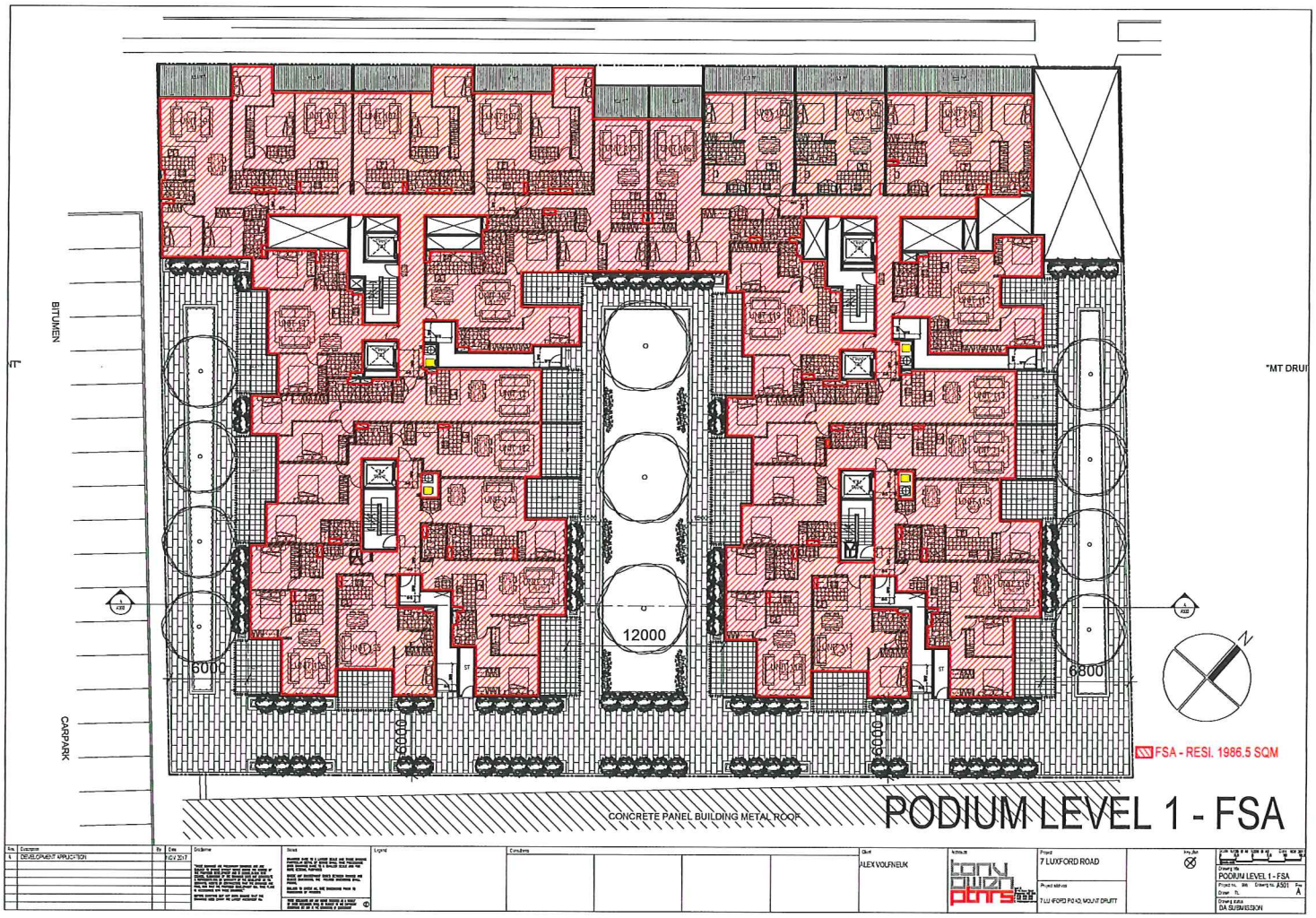
Drawing title: GROUND FLOOR - FSA

Project no. 366 | Drawing no. A300 | Rev. A

Drawn: TL

Drawing status: DA SUBMISSION


BITUMEN
CARPARK
12000
6000
6800
6000
6000
CONCRETE PANEL BUILDING METAL ROOF
PODIUM LEVEL 1
DEVELOPMENT APPLICATION
ALEX VOLFNEUK
7 LUXFORD ROAD
7 LUXFORD RD #2, MOUNT DRUITT
PODIUM LEVEL 1
DA SUBMISSION



PODIUM LEVEL 1 - FSA

No.	Description	By	Date
4.	DEVELOPMENT APPLICATION		NOV 2017

Client: ALEX VOLFENUK

Project: 7 LUXFORD ROAD

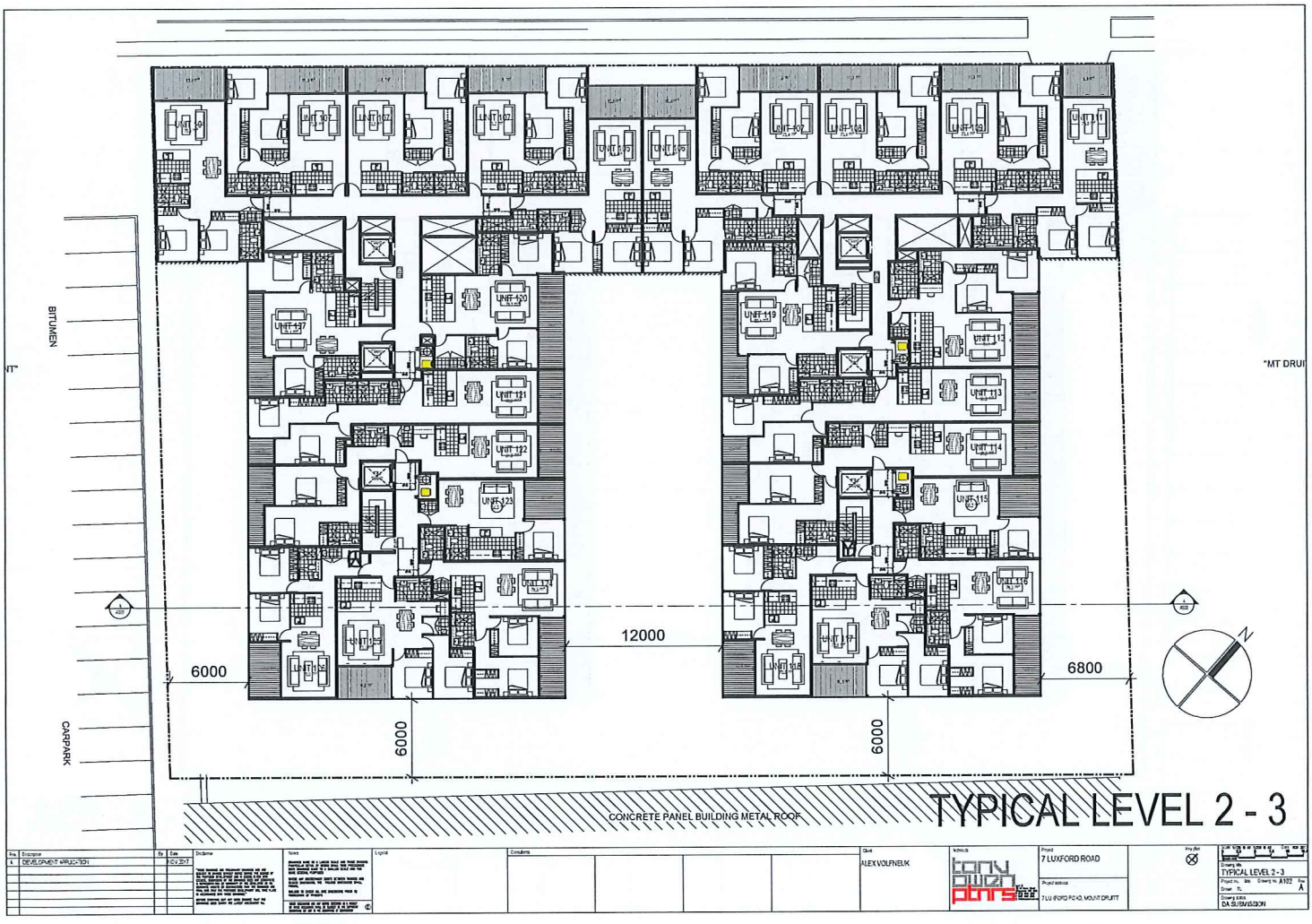
Project address: 7 LUXFORD ROAD, MOUNT DRUITT

Drawing title: PODIUM LEVEL 1 - FSA

Drawing status: DA SUBMISSION

Drawing no.: A501

Rev: A


BITUMEN
CARPARK
"MT DRUI
12000
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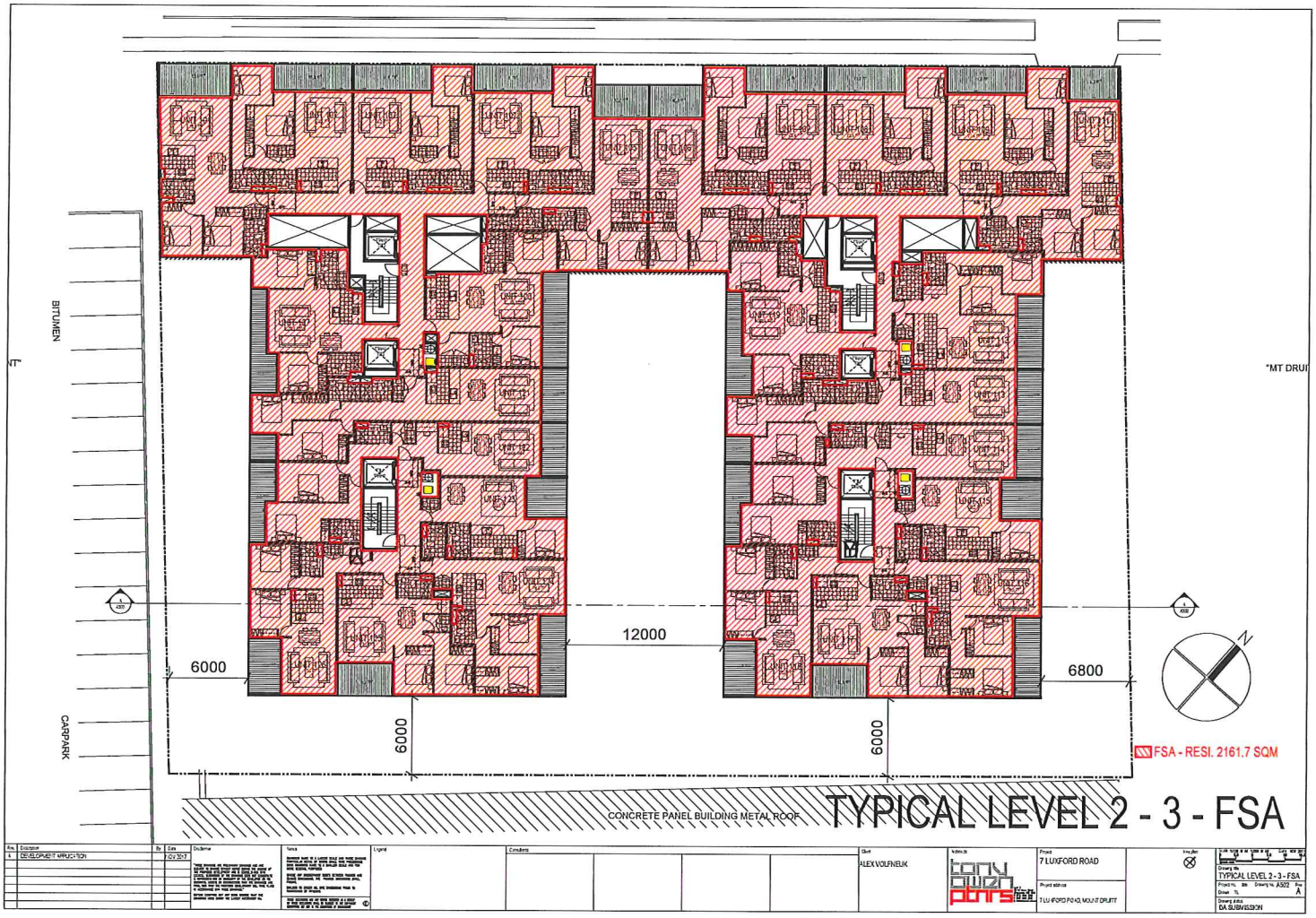
6800
CONCRETE PANEL BUILDING METAL ROOF
TYPICAL LEVEL 2 - 3



TYPICAL LEVEL 2 - 3 - FSA

No.	Description	By	Date
4.	DEVELOPMENT APPLICATION		7 NOV 2017

Client: ALEX VOLFENZUK

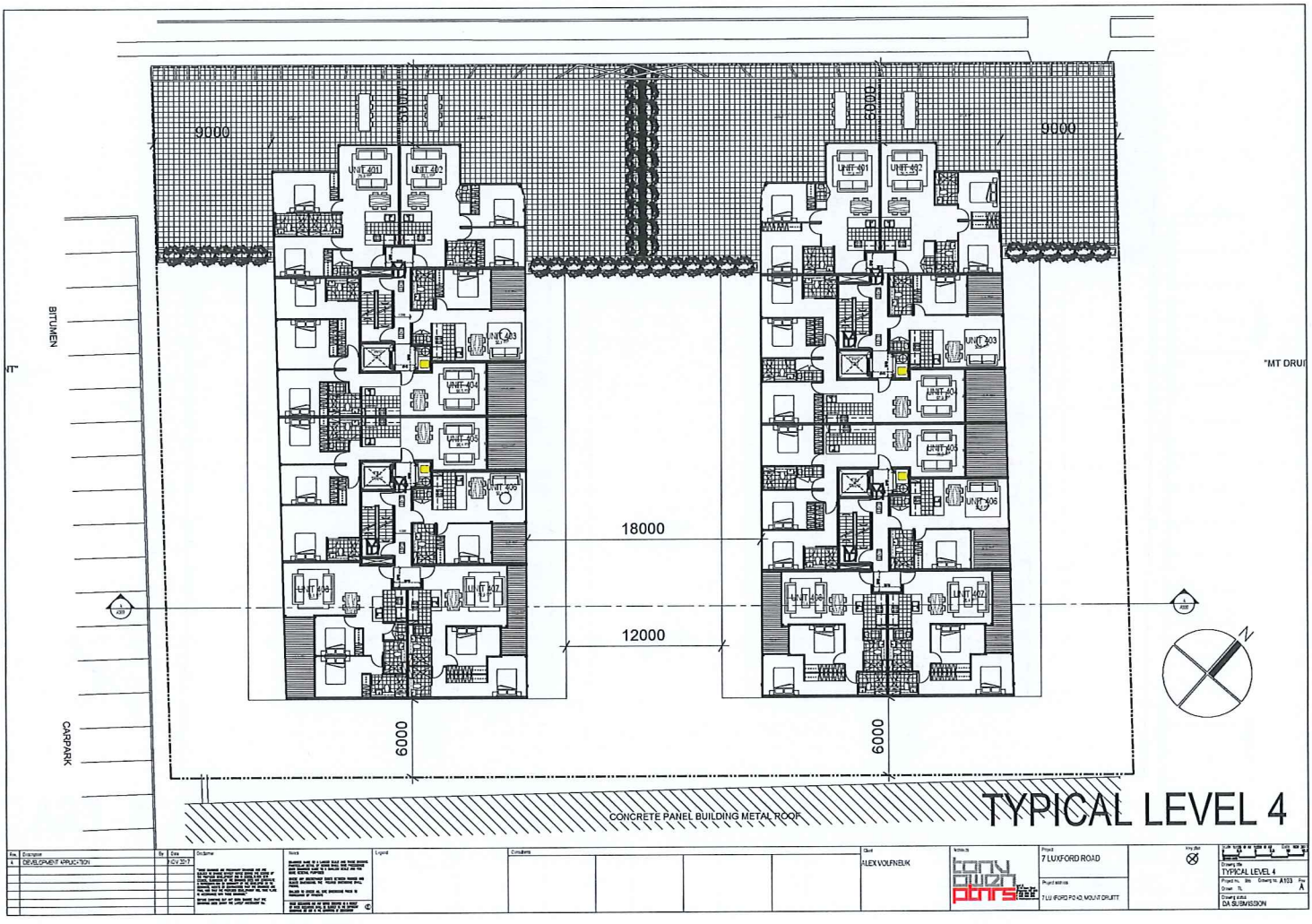
Project: 7 LUXFORD ROAD

Project address: 7 LUXFORD ROAD, MOUNT DRUITT

Drawing No.: TYPICAL LEVEL 2 - 3 - FSA

Project No.: Drawing No.: A302 Rev: A

Drawing status: DA SUBMISSION



TYPICAL LEVEL 4

Rev.	Description	By	Date
1	DEVELOPMENT APPLICATION		NOV 2017

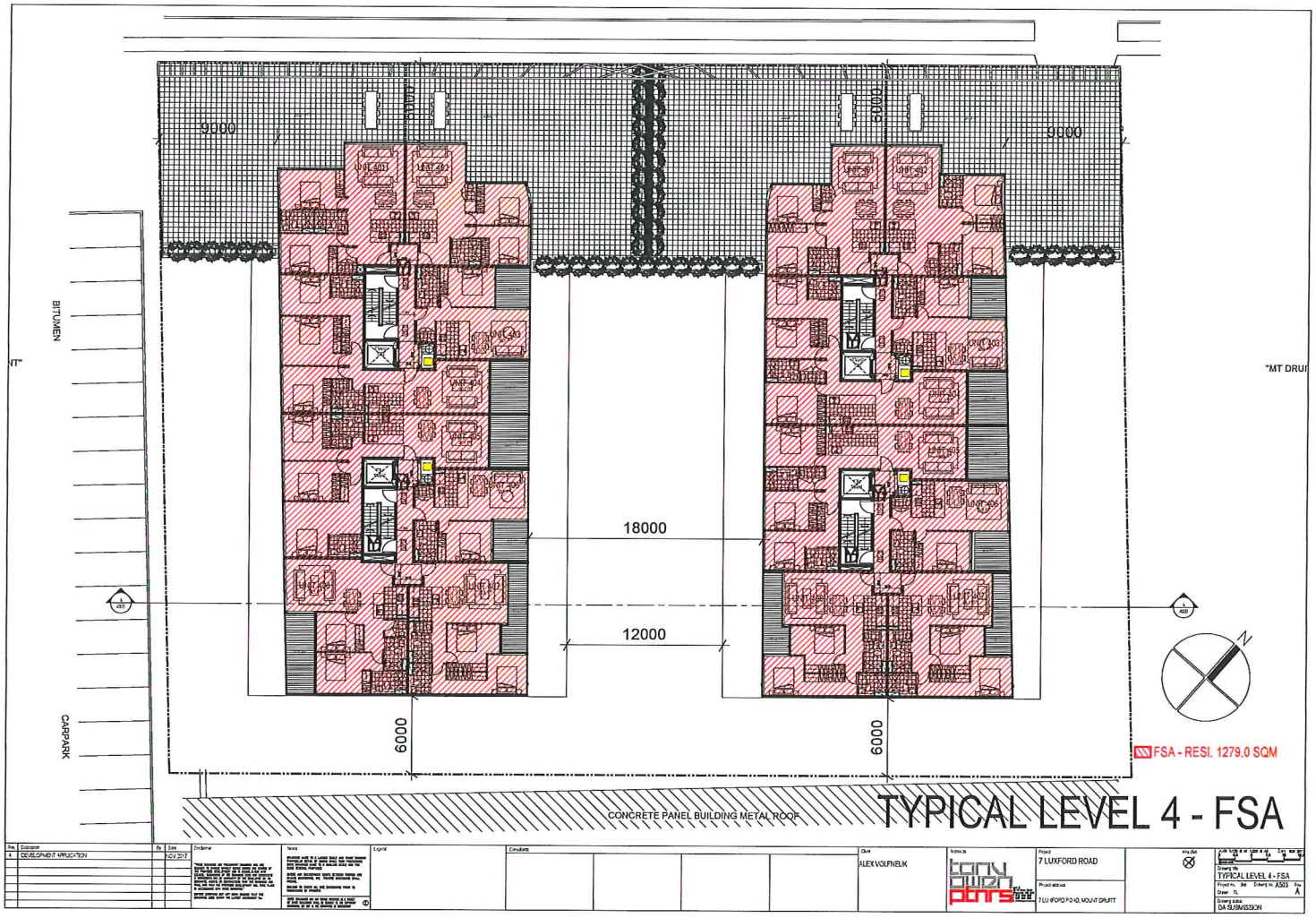
Client: ALEX VOLFENBUK

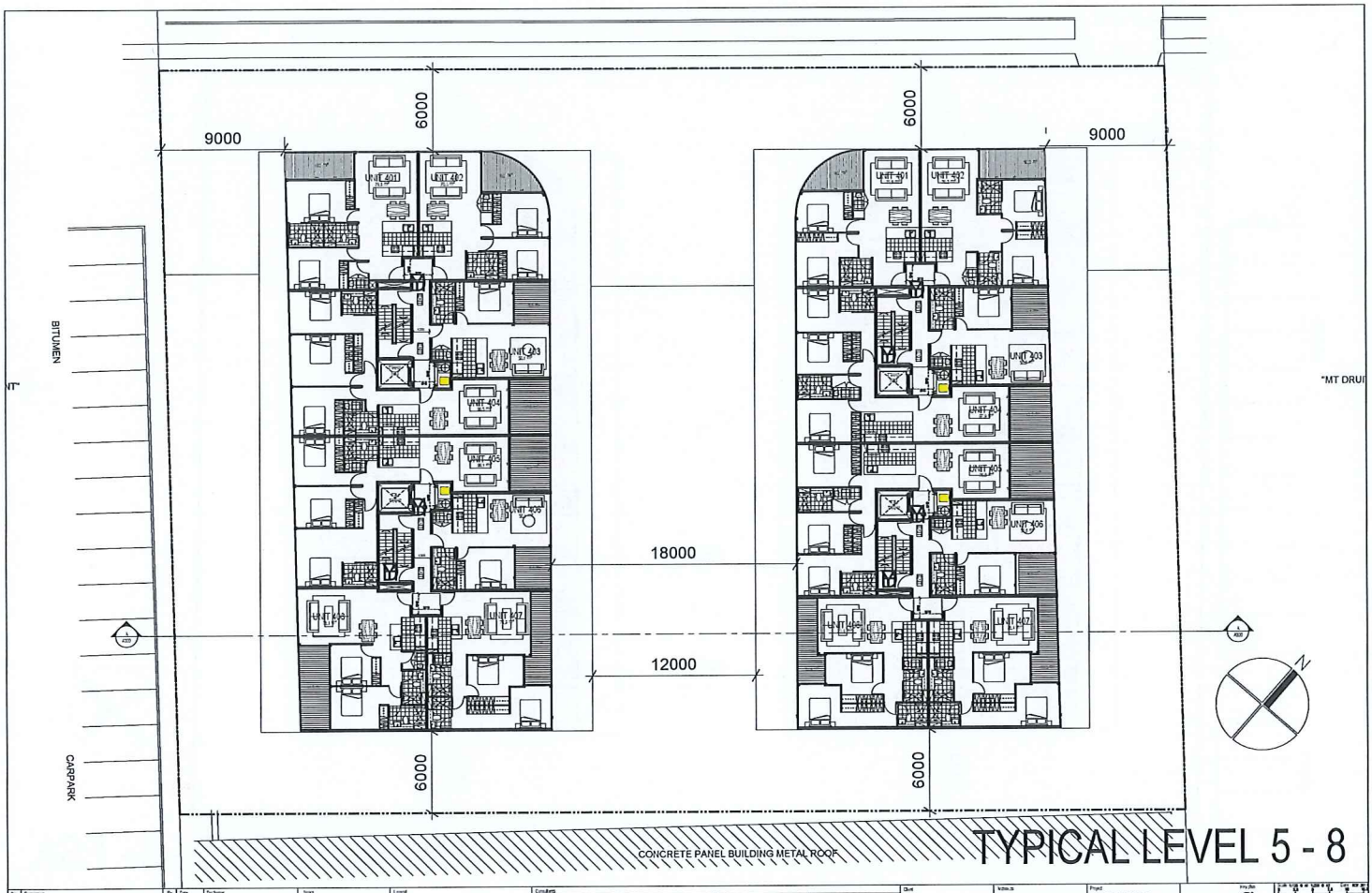
Project: 7 LUXFORD ROAD

Project address: 7 LUXFORD ROAD, MOUNT DRUITT

Drawing No.: TYPICAL LEVEL 4

Drawing status: DA SUBMISSION


9000
9000
9000
BITUMEN
CARPARK
"MT DRUI
18000
12000
6000
6000
FSA - RESI. 1279.0 SQM
CONCRETE PANEL BUILDING METAL ROOF
TYPICAL LEVEL 4 - FSA
DEVELOPMENT APPLICATION
ALEX VOLFNELIK
7 LUXFORD ROAD
7 LUXFORD ROAD, MOUNT DRUITT
TYPICAL LEVEL 4 - FSA
DA SUBMISSION



TYPICAL LEVEL 5 - 8

Rev.	Description	By	Date
A	DEVELOPMENT APPLICATION		NOV 2017

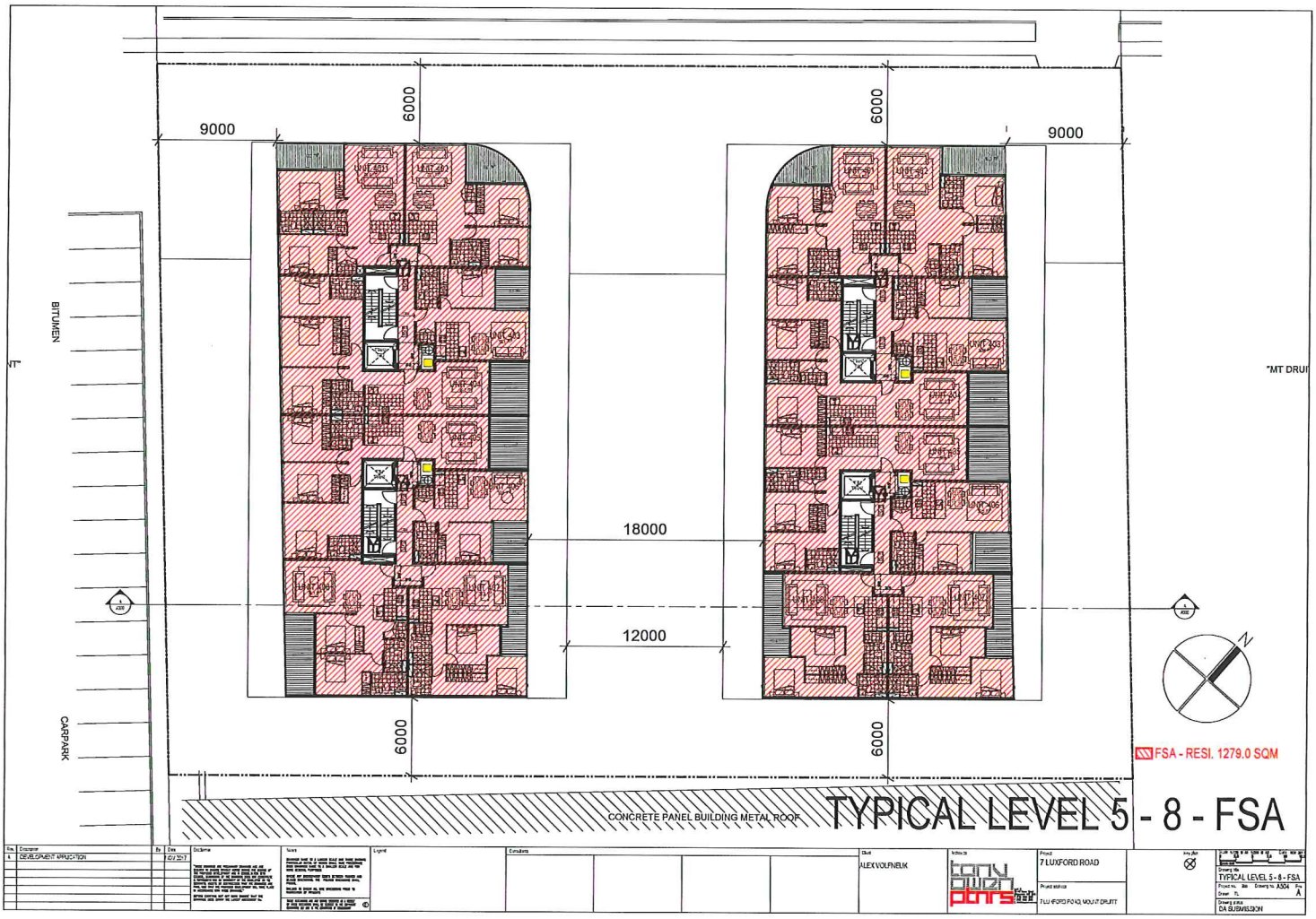
Client: ALEX VOLFNELIK

Project: 7 LUXFORD ROAD

Project address: 7 LUXFORD ROAD, MOUNT DRUITT

Drawing title: TYPICAL LEVEL 5 - 8

Drawing status: DA SUBMISSION



TYPICAL LEVEL 5 - 8 - FSA

No.	Description	By	Date
4.	DEVELOPMENT APPLICATION		1 OCT 2017

Client: ALEX VOLFENBUK

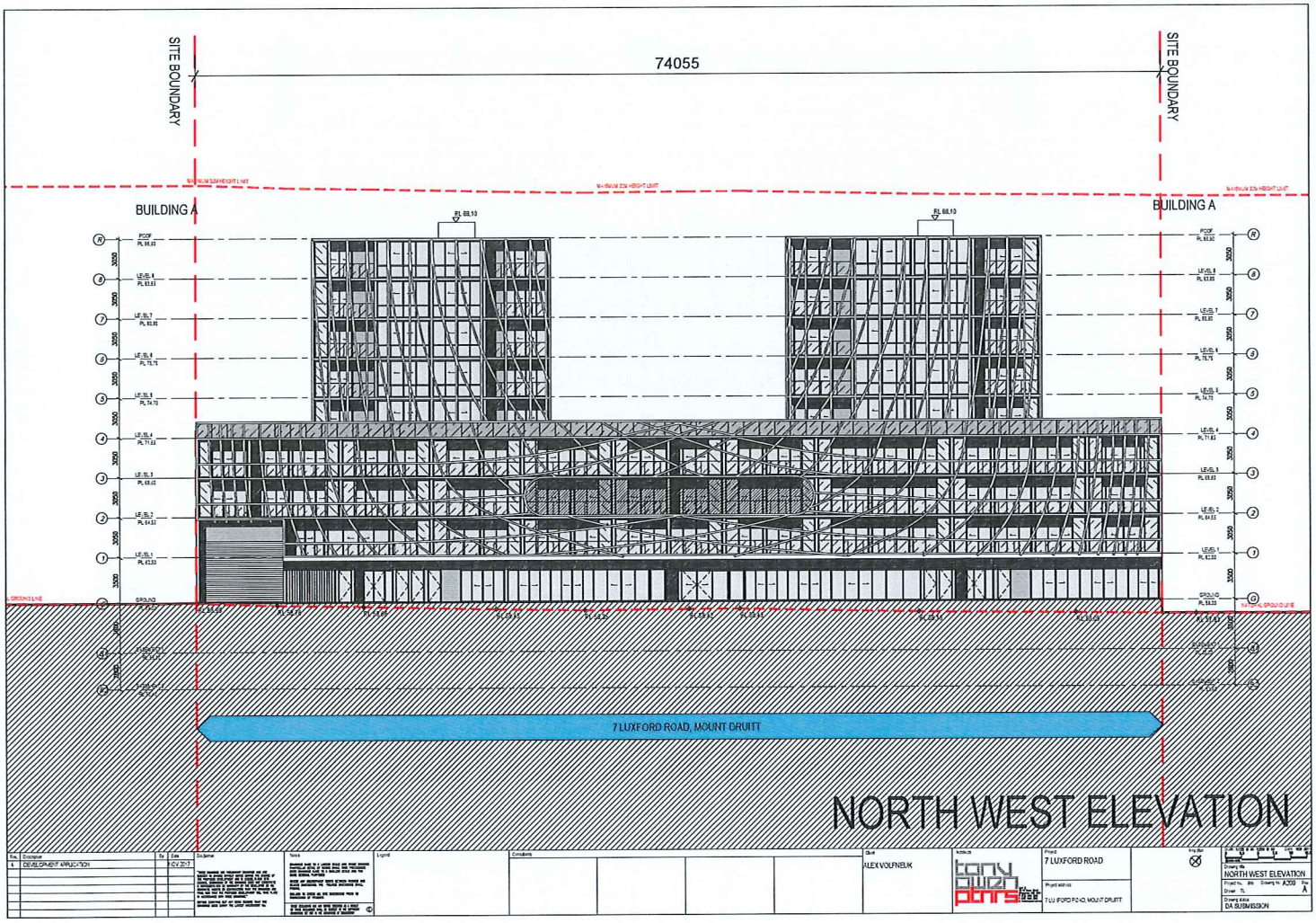
Project: 7 LUXFORD ROAD

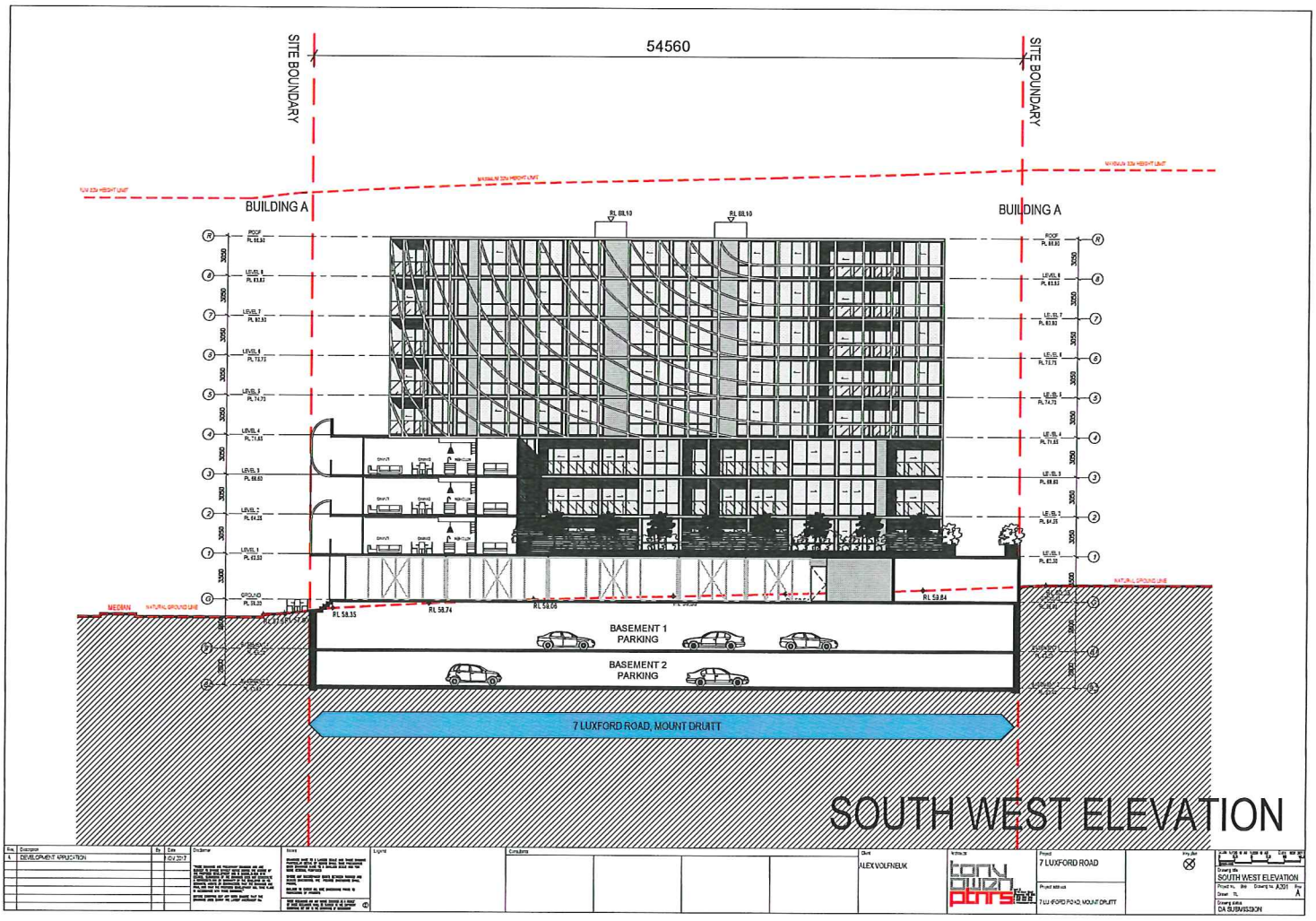
Project address: 7 LUXFORD ROAD, MOUNT DRUITT

Drawing No.: TYPICAL LEVEL 5 - 8 - FSA

Project No.: 304 Drawing No.: A304 Rev: A

Drawing status: DA SUBMISSION


SITE BOUNDARY
74055
SITE BOUNDARY
BUILDING A
BUILDING A
7 LUXFORD ROAD, MOUNT DRUITT
NORTH WEST ELEVATION



SOUTH WEST ELEVATION

No.	Description	By	Date
1	DEVELOPMENT APPLICATION		10.JULY.2017

Disclaimer

Notes

Legend

Consultants

Client
ALEX VOLFINBUK

Architect
tony owen partners

Project
7 LUXFORD ROAD

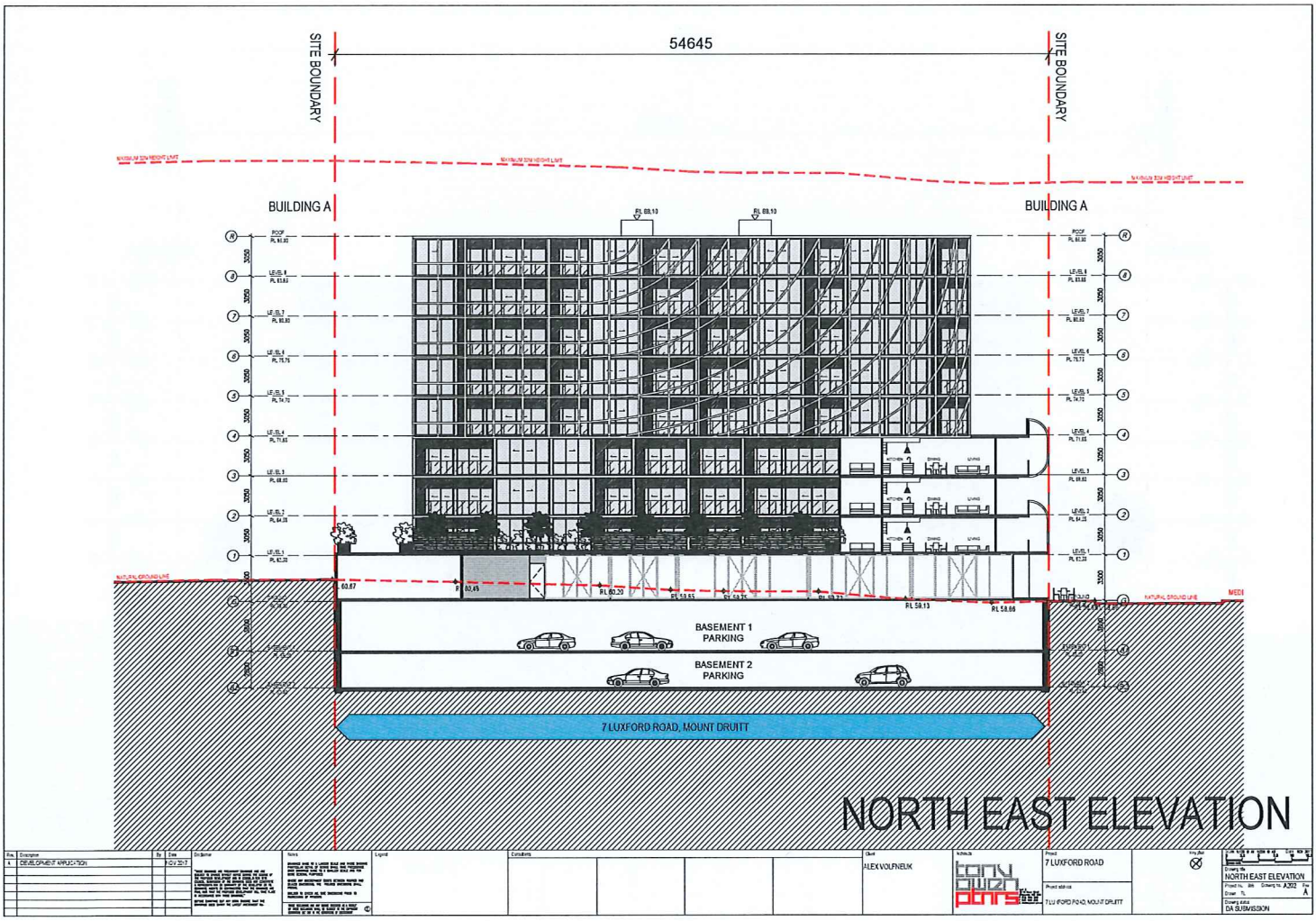
Project address
7 LUXFORD ROAD, MOUNT DRUITT

Key Plan

Drawing title
SOUTH WEST ELEVATION

Project No. 3HI | Drawing No. A.301 | Rev. A

Drawing status
DA SUBMISSION



NORTH EAST ELEVATION

Rev	Description	By	Date
A	DEVELOPMENT APPLICATION		NOV 2017

Client: ALEX VOLPINELIK

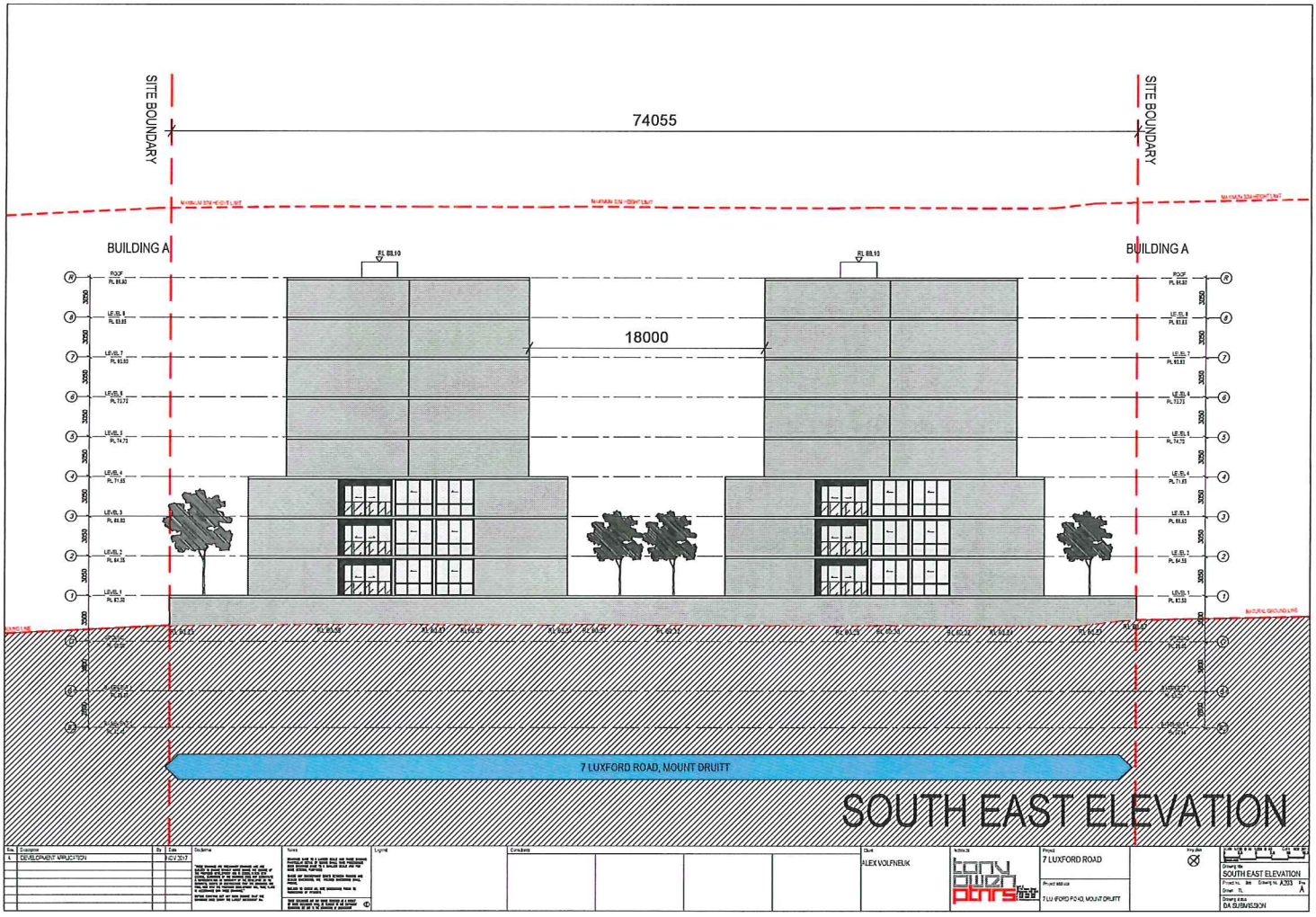
Project: 7 LUXFORD ROAD

Project address: 7 LUXFORD ROAD, MOUNT DRUITT

Drawing Title: NORTH EAST ELEVATION

Project No. 8/8 Drawing No. A202 Rev A

Drawing status: DA SUBMISSION



SOUTH EAST ELEVATION

No.	Description	By	Date
1	DEVELOPMENT APPLICATION		NOV 2017

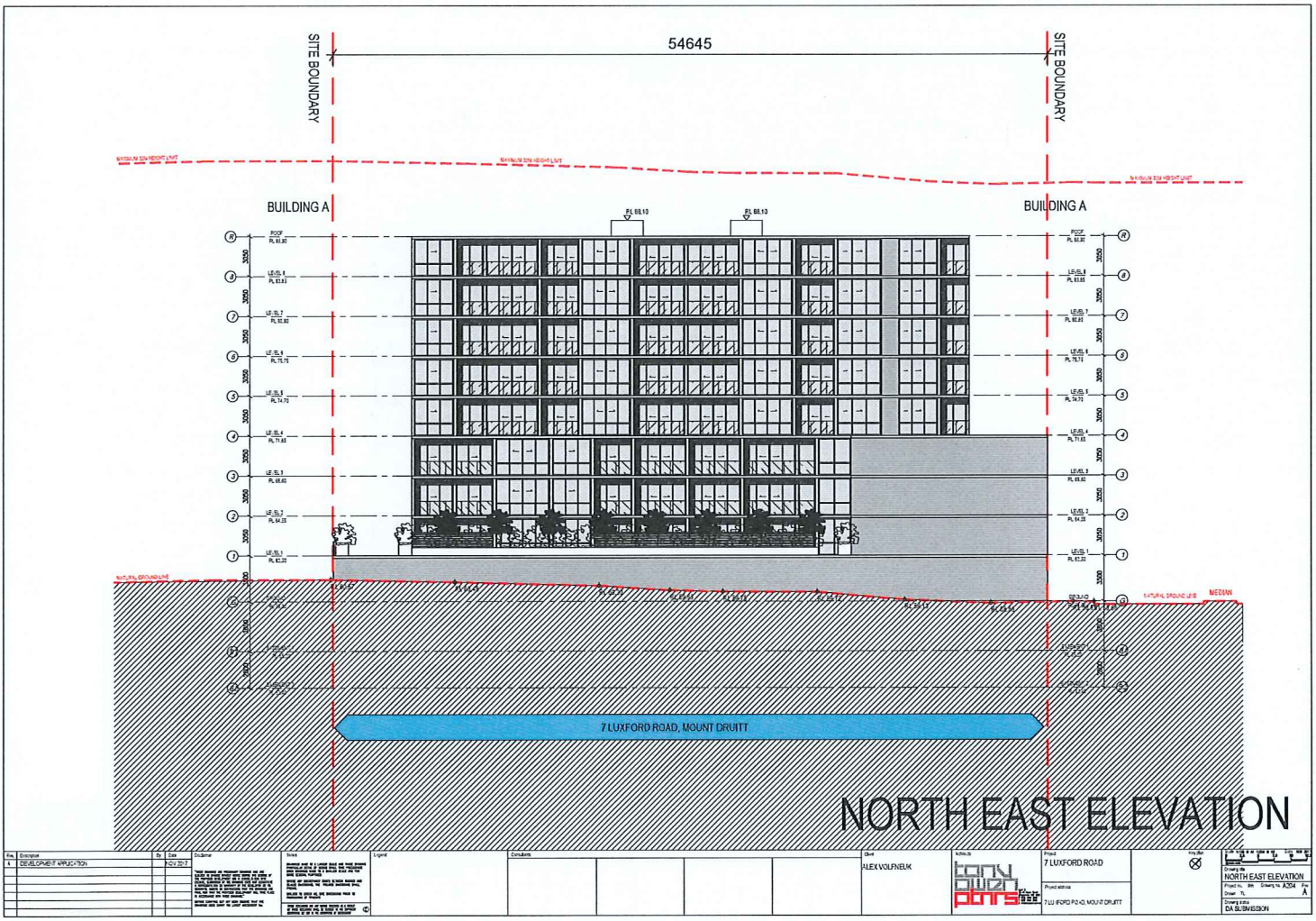
Client: ALEX VOLFIELIK

Project: 7 LUXFORD ROAD

Project address: 7 LUXFORD ROAD, MOUNT DRUITT

Drawing title: SOUTH EAST ELEVATION

Drawing status: DA SUBMISSION



NORTH EAST ELEVATION

Rev	Description	By	Date
A	DEVELOPMENT APPLICATION		NOV 2017

Client: ALEX WOLFENUK

Project: 7 LUXFORD ROAD

Project address: 7 LUXFORD ROAD, MOUNT DRUITT

Drawing title: NORTH EAST ELEVATION

Drawing status: DA SUBMISSION

SOUTH WEST ELEVATION

No.	Description	By	Date
1	DEVELOPMENT APPLICATION		NOV 2017

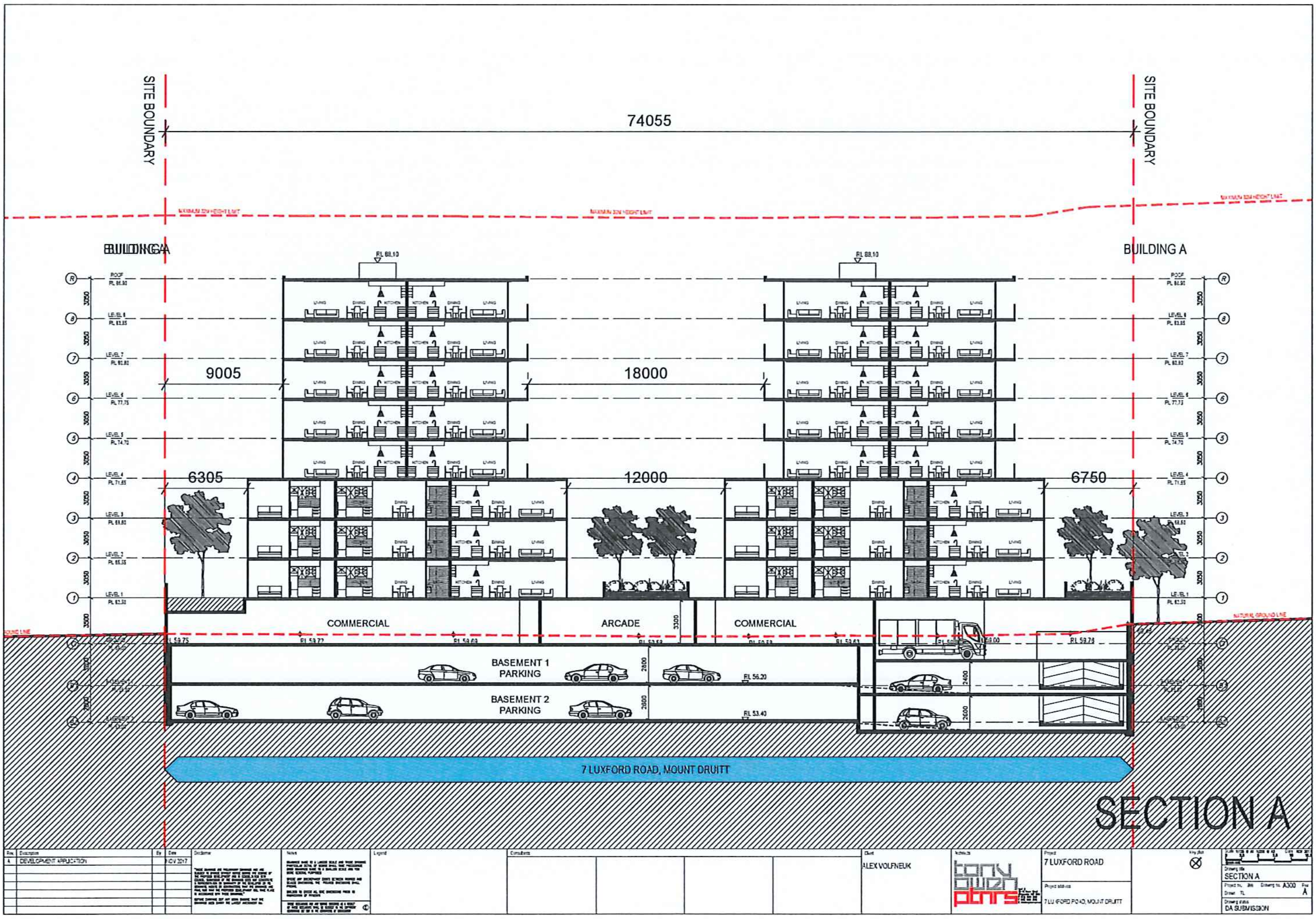
Client: ALEX VOLFENBUK

Project: 7 LUXFORD ROAD

Project address: 7 LUXFORD ROAD, MOUNT DRUITT

Drawing title: SOUTH WEST ELEVATION

Drawing status: DA SUBMISSION


SITE BOUNDARY
SITE BOUNDARY
74055
BUILDING A
BUILDING A
RL 88.10
RL 88.10
9005
18000
6305
12000
6750
COMMERCIAL
ARCADE
COMMERCIAL
BASEMENT 1
PARKING
BASEMENT 2
PARKING
RL 56.20
RL 53.40
7 LUXFORD ROAD, MOUNT DRUITT
SECTION A
DEVELOPMENT APPLICATION
NOV 2017
ALEX VOLFNEUK
7 LUXFORD ROAD
7 LUXFORD ROAD, MOUNT DRUITT
SECTION A
A300
A
DA SUBMISSION

Appendix D – Site Photographs

Photograph 1: Site overview, facing north-west (01/08/19).

Photograph 2: Vandalised building, with scattered rubbish (01/08/19).

Photograph 3: Signs of fire damage inside the building - ceiling and floor (01/08/19).

Photograph 4: Circular depression indication of potential salinity (01/08/19).

Appendix E – Borehole Logs

BOREHOLE: BH1M

eiaustralia
Contamination | Remediation | Geotechnical

Project	Detailed Site Investigation			Sheet	1 OF 1
Location	7 Luxford Road, Mount Druitt NSW			Date Started	1/8/19
Position	Refer to Figure 2			Date Completed	1/8/19
Job No.	E23648.E02	Contractor	HartGeo Pty Ltd	Logged	LB
Client	Alexander Volfneuk	Drill Rig	Ute-mounted Drilling rig	Checked	
		Inclination	-90°		

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS ID BH1M Static Water Level
AD/T	-	01/08/19	0	0.30	BH1M_0.1-0.2 QD/QT PID = 3.1 ppm			-	FILL: Silty CLAY; low plasticity, dark brown, trace of fine to medium grained sand , with sub-angular to angular gravels, with organic material (charcoal, root fibres), no odour.	M	S	BH1M
				0.50				-	FILL: Clayey SILT; low to medium plasticity, brown, no odour.	M	S - F	
					BH1M_0.4-0.5 ES PID = 3.5 ppm			CI-CH	Silty CLAY; medium to high plasticity, brown, no odour.		F	
				0.90								
			1		BH1M_0.7-0.8 ES PID = 3 ppm				From 0.9m, red-orange, no odour.		St - VSt	
				1.50								
					BH1M_1.1-1.2 ES PID = 2.1 ppm				From 1.5m, light grey mottled red, no odour.	M	VSt	
			2									Cuttings
				2.70				-	SHALE; grey-dark grey, weathered, no odour.			
			3									
			4									
			5									Bentonite
			6							D	-	uPVC 50 mm Casing
			7									
												Sand
			8									uPVC 50 mm Screen
			9	9.00					Hole Terminated at 9.00 mBGL; Target Depth Reached.			
			10									

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

BOREHOLE: BH2M

eiaustralia
Contamination | Remediation | Geotechnical

Project	Detailed Site Investigation			Sheet	1 OF 1
Location	7 Luxford Road, Mount Druitt NSW			Date Started	1/8/19
Position	Refer to Figure 2			Date Completed	1/8/19
Job No.	E23648.E02	Contractor	HartGeo Pty Ltd	Logged	LB
Client	Alexander Volfneuk	Drill Rig	Ute-mounted Drilling rig	Checked	
		Inclination	-90°		

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS ID BH2M / Static Water Level
AD/T	-	GWNE	0	0.40	BH2M_0.2-0.3 ES PID = 3.3 ppm			-	TOPSOIL: Silty SAND; fine to medium grained, brown-dark brown, with trace of clay, with some root fibres, no odour.	M	L	BH2M
			1		BH2M_0.6-0.7 ES PID = 3 ppm			CI-CH	Silty CLAY; medium to high plasticity, brown mottled red, no odour.		St - VSt	Cuttings
				1.50					From 1.5m, grey mottled red, no odour.	M		Bentonite
			2	2.00					From 2.0m, some ironstone gravels, no odour.		VSt	uPVC 50 mm Casing
				2.70				-	SHALE; grey-dark grey, weathered, no odour.			
			3									
			4							-	-	Sand
			5									uPVC 50 mm Screen
				5.70					Hole Terminated at 5.70 mBGL; Refusal to Tungsten.			
			6									
			7									
			8									
			9									
			10									

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

BOREHOLE: BH3M

eiaustralia
Contamination | Remediation | Geotechnical

Project	Detailed Site Investigation			Sheet	1 OF 1
Location	7 Luxford Road, Mount Druitt NSW			Date Started	1/8/19
Position	Refer to Figure 2			Date Completed	1/8/19
Job No.	E23648.E02	Contractor	HartGeo Pty Ltd	Logged	LB
Client	Alexander Volfneuk	Drill Rig	Ute-mounted Drilling rig	Checked	
		Inclination	-90°		

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS ID BH3M Static Water Level
AD/T	-	GWNE	0	0.30	BH3M_0.2-0.3 ES PID = 3.4 ppm			-	FILL: Silty CLAY; low plasticity, dark brown, trace of fine to medium grained sand, with sub-angular to angular gravels, with organic material (charcoal, root fibres), no odour.	-	S	Cuttings
				0.80	BH3M_0.7-0.8 ES PID = 3.2 ppm			CL-CI	Silty CLAY; medium to high plasticity, red-orange, no odour.		St - VSt	
			1		BH3M_1.5-1.6 ES PID = 2.5 ppm				From 0.8m, grey mottled red, no odour.	-	VSt	Bentonite
			2	2.50				-	SHALE; grey-dark grey, weathered, no odour.			uPVC 50 mm Casing
			3									
			4									Sand
			5							-	-	
			6									uPVC 50 mm Screen
			7	7.20					Hole Terminated at 7.20 mBGL; Refusal.			
			8									
			9									
			10									

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

BOREHOLE: BH4

eiaustralia
Contamination | Remediation | Geotechnical

Project	Detailed Site Investigation			Sheet	1 OF 1
Location	7 Luxford Road, Mount Druitt NSW			Date Started	1/8/19
Position	Refer to Figure 2			Date Completed	1/8/19
Job No.	E23648.E02	Contractor	HartGeo Pty Ltd	Logged	LB
Client	Alexander Volfneuk	Drill Rig	Ute-mounted Drilling rig	Checked	
		Inclination	-90°		

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T	-	GWNE	0.0		BH4_0.2-0.3 ES PID = 2.6 ppm			-	TOPSOIL: Silty SAND; fine to medium grained, brown-dark brown, with trace of clay, with some root fibres, no odour.	M	L	TOPSOIL
				0.30				-	FILL: Clayey SILT; low to medium plasticity, brown, with some clay, no odour.	M	S - F	FILL
			0.5		BH4_0.4-0.5 ES PID = 2.4 ppm							
				0.60				CI-CH	Silty CLAY; medium to high plasticity, light grey mottled red, no odour.	M	VSt	NATURAL
			1.0		BH4_0.9-1.0 ES PID = 2.4 ppm							
				1.10					Hole Terminated at 1.10 mBGL; Target Depth Reached.			
			1.5									
			2.0									
			2.5									

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

BOREHOLE: BH5

eiaustralia
Contamination | Remediation | Geotechnical

Project	Detailed Site Investigation			Sheet	1 OF 1
Location	7 Luxford Road, Mount Druitt NSW			Date Started	1/8/19
Position	Refer to Figure 2			Date Completed	1/8/19
Job No.	E23648.E02	Contractor	HartGeo Pty Ltd	Logged	LB
Client	Alexander Volfneuk	Drill Rig	Ute-mounted Drilling rig	Checked	
		Inclination	-90°		

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
DT			0.0					-	ASPHALT; 20mm thick.	-	-	FILL
AD/T	-	GWNE	0.5		BH5_0.2-0.3 ES PID = 2 ppm			-	FILL: Gravelly SAND; medium grained, pale grey-pink, sub-angular to angular gravels, no odour.	D	L	
				0.60				CI-CH	Silty CLAY; medium to high plasticity, red mottled grey, no odour.			NATURAL
					BH5_0.8-0.9 ES PID = 2.2 ppm					M	VSt	
			1.0	1.00					Hole Terminated at 1.00 mBGL; Target Depth Reached.			
			1.5									
			2.0									
			2.5									

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

BOREHOLE: BH6

eiaustralia
Contamination | Remediation | Geotechnical

Project	Detailed Site Investigation			Sheet	1 OF 1
Location	7 Luxford Road, Mount Druitt NSW			Date Started	1/8/19
Position	Refer to Figure 2			Date Completed	1/8/19
Job No.	E23648.E02	Contractor	HartGeo Pty Ltd	Logged	LB
Client	Alexander Volfneuk	Drill Rig	Ute-mounted Drilling rig	Checked	
		Inclination	-90°		

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
DT			0.0					-	ASPHALT; 100mm thick.	-	-	
				0.10				-	FILL: Gravelly SAND; medium grained, pale grey-pink, angular to sub-angular gravels, no odour.	D	L	FILL
AD/T	-	GWNE			BH6_0.2-0.3 ES PID = 3.3 ppm							
				0.40				CI-CH	Silty CLAY; medium to high plasticity, red mottled grey, no odour.			NATURAL
			0.5									
					BH6_0.7-0.8 ES PID = 2.3 ppm					M	VSt	
			1.0									
				1.30					Hole Terminated at 1.30 mBGL; Target Depth Reached.			
			1.5									
			2.0									
			2.5									

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

BOREHOLE: BH7

eiaustralia
Contamination | Remediation | Geotechnical

Project	Detailed Site Investigation			Sheet	1 OF 1
Location	7 Luxford Road, Mount Druitt NSW			Date Started	1/8/19
Position	Refer to Figure 2			Date Completed	1/8/19
Job No.	E23648.E02	Contractor	HartGeo Pty Ltd	Logged	LB
Client	Alexander Volfneuk	Drill Rig	Ute-mounted Drilling rig	Checked	
		Inclination	-90°		

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T	-	GWNE	0.0					-	FILL: SAND; fine to medium grained, pink-dark grey-green, with some sub-angular to angular gravels, no odour.	M	L	FILL
					BH3_0.2-0.3 ES PID = 0.7 ppm							
				0.40				CI-CH	Silty CLAY; medium to high plasticity, red mottled grey, no odour.	M	St - VSt	NATURAL
			0.5		BH3_0.7-0.8 ES PID = 0.7 ppm							
				0.90					From 0.9m, predominantly grey, no odour.			
			1.0									
				1.20					Hole Terminated at 1.20 mBGL; Target Depth Reached.			
			1.5									
			2.0									
			2.5									

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

BOREHOLE: BH8

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Project	Detailed Site Investigation			Sheet	1 OF 1
Location	7 Luxford Road, Mount Druitt NSW			Date Started	1/8/19
Position	Refer to Figure 2			Date Completed	1/8/19
Job No.	E23648.E02	Contractor	HartGeo Pty Ltd	Logged	LB
Client	Alexander Volfneuk	Drill Rig	Ute-mounted Drilling rig	Checked	
		Inclination	-90°		

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T	-	GWNE	0.0		BH8_0.2-0.3 ES PID = 1 ppm			-	TOPSOIL: Silty SAND; fine to medium grained, brown, with trace of clay, with some root fibres, no odour.	M	L	TOPSOIL
				0.40				CI-CH	Silty CLAY; medium to high pasticity, red-orange, no odour.			NATURAL
			0.5		BH8_0.7-0.8 ES PID = 0.9 ppm							
			1.0							M	St - VSt	
			1.5	1.50					Hole Terminated at 1.50 mBGL; Target Depth Reached.			
			2.0									
			2.5									

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

BOREHOLE: BH9

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Project	Detailed Site Investigation			Sheet	1 OF 1
Location	7 Luxford Road, Mount Druitt NSW			Date Started	1/8/19
Position	Refer to Figure 2			Date Completed	1/8/19
Job No.	E23648.E02	Contractor	HartGeo Pty Ltd	Logged	LB
Client	Alexander Volfneuk	Drill Rig	Ute-mounted Drilling rig	Checked	
		Inclination	-90°		

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T	-	GWNE	0.0					-	TOPSOIL: Silty SAND; fine to medium grained, brown-dark brown, with trace of clay, with some root fibres, no odour.	M	L	TOPSOIL
					BH9_0.2-0.3 ES PID = 1.7 ppm							
				0.40				CI-CH	Silty CLAY; medium plasticity, red-orange, no odour.		St - VSt	NATURAL
			0.5							M		
					BH9_0.7-0.8 ES PID = 1.1 ppm							
			1.0	1.00					From 1.0m, grey mottled red, no odour.		VSt	
				1.30					Hole Terminated at 1.30 mBGL; Target Depth Reached.			
			1.5									
			2.0									
			2.5									

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

BOREHOLE: BH10

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Project	Detailed Site Investigation			Sheet	1 OF 1
Location	7 Luxford Road, Mount Druitt NSW			Date Started	1/8/19
Position	Refer to Figure 2			Date Completed	1/8/19
Job No.	E23648.E02	Contractor	HartGeo Pty Ltd	Logged	LB
Client	Alexander Volfneuk	Drill Rig	Ute-mounted Drilling rig	Checked	
		Inclination	-90°		

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T	-	GWNE	0.0		BH10_0.2-0.3 QD2/QT2 PID = 1.7 ppm			-	TOPSOIL: Silty SAND; fine to medium grained, brown-dark brown, with trace of clay, with some root fibres, no odour.	D	L	TOPSOIL
			0.5	0.60	BH10_0.6-0.7 ES PID = 1.1 ppm			CI-CH	Silty CLAY; medium to high plasticity, brown, no odour.	M	F	NATURAL
			1.0	0.80	BH10_1.3-1.4 ES PID = 1.6 ppm				From 0.8m, red-orange, no odour.	M	St - VSt	
			1.5	1.40					Hole Terminated at 1.40 mBGL; Target Depth Reached.			
			2.0									
			2.5									

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

BOREHOLE: BH11

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Project	Detailed Site Investigation			Sheet	1 OF 1
Location	7 Luxford Road, Mount Druitt NSW			Date Started	1/8/19
Position	Refer to Figure 2			Date Completed	1/8/19
Job No.	E23648.E02	Contractor	HartGeo Pty Ltd	Logged	LB
Client	Alexander Volfneuk	Drill Rig	Ute-mounted Drilling rig	Checked	
		Inclination	-90°		

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T	-	GWNE	0.0					-	FILL: Silty CLAY; low plasticity, dark brown, trace of fine to medium grained sand, with sub-angular to angular gravels, with organic material (charcoal, root fibres), no odour.	-	S	FILL
					BH11_0.2-0.3 ES PID = 2.5 ppm							
				0.30				-	FILL: Clayey SILT; low to medium plasticity, brown, no odour.	-	S - F	
			0.5		BH11_0.5-0.6 ES PID = 3.1 ppm							
				0.70				CI-CH	Silty CLAY; medium to high plasticity, grey mottled orange, no odour.	-	VSt	NATURAL
			1.0		BH11_1.1-1.2 ES PID = 2.7 ppm							
				1.40					Hole Terminated at 1.40 mBGL; Target Depth Reached.			
			1.5									
			2.0									
			2.5									

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

EXPLANATION OF NOTES, ABBREVIATIONS & TERMS USED ON BOREHOLE AND TEST PIT LOGS

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DRILLING/EXCAVATION METHOD

HA	Hand Auger	RD	Rotary blade or drag bit	NQ	Diamond Core - 47 mm
DTC	Diatube Coring	RT	Rotary Tricone bit	NMLC	Diamond Core - 52 mm
NDD	Non-destructive digging	RAB	Rotary Air Blast	HQ	Diamond Core - 63 mm
AS*	Auger Screwing	RC	Reverse Circulation	HMLC	Diamond Core - 63mm
AD*	Auger Drilling	PT	Push Tube	BH	Tractor Mounted Backhoe
*V	V-Bit	CT	Cable Tool Rig	EX	Tracked Hydraulic Excavator
*T	TC-Bit, e.g. ADT	JET	Jetting	EE	Existing Excavation
ADH	Hollow Auger	WB	Washbore or Bailer	HAND	Excavated by Hand Methods

PENETRATION/EXCAVATION RESISTANCE

L **Low resistance.** Rapid penetration/ excavation possible with little effort from equipment used.

M **Medium resistance.** Penetration/ excavation possible at an acceptable rate with moderate effort from equipment used.

H **High resistance.** Penetration/ excavation is possible but at a slow rate and requires significant effort from equipment used.

R **Refusal/ Practical Refusal.** No further progress possible without risk of damage or unacceptable wear to equipment used.

These assessments are subjective and are dependent on many factors, including equipment power and weight, condition of excavation or drilling tools and experience of the operator.

WATER

Water level at date shown

Water inflow

Partial water loss

Complete water loss

GROUNDWATER NOT OBSERVED — Observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave-in of the borehole/ test pit.

GROUNDWATER NOT ENCOUNTERED — Borehole/ test pit was dry soon after excavation. However, groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/ test pit been left open for a longer period.

SAMPLING AND TESTING

SPT — Standard Penetration Test to AS1289.6.3.1-2004

4,7,11 N=18 — 4,7,11 = Blows per 150mm. N = Blows per 300mm penetration following 150mm

seating 30/80mm — Where practical refusal occurs, the blows and penetration for that interval are reported

RW — Penetration occurred under the rod weight only

HW — Penetration occurred under the hammer and rod weight only

HB — Hammer double bouncing on anvil

Sampling

DS	Disturbed Sample
BDS	Bulk disturbed Sample
GS	Gas Sample
WS	Water Sample
U63	Thin walled tube sample - number indicates nominal sample diameter in millimetres

Testing

FP	Field Permeability test over section noted
FVS	Field Vane Shear test expressed as uncorrected shear strength (sv = peak value, sr = residual value)
PID	Photoionisation Detector reading in ppm
PM	Pressuremeter test over section noted
PP	Pocket Penetrometer test expressed as instrument reading in kPa
WPT	Water Pressure tests
DCP	Dynamic Cone Penetrometer test
CPT	Static Cone Penetration test
CPTu	Static Cone Penetration test with pore pressure (u) measurement

RANKING OF VISUALLY OBSERVABLE CONTAMINATION AND ODOUR (for specific soil contamination assessment

R = 0	No visible evidence of contamination	R = A	No non-natural odours identified
R = 1	Slight evidence of visible contamination	R = B	Slight non-natural odours identified
R = 2	Visible contamination	R = C	Moderate non-natural odours identified
R = 3	Significant visible contamination	R = D	Strong non-natural odours identified

ROCK CORE RECOVERY

TCR = Total Core Recovery (%)

$$= \frac{\text{Length of core recevered}}{\text{Lengh of core run}} \times 100$$

SCR = Solid Core Recovery (%)

$$= \frac{\Sigma \text{Length of cylindrical core recevered}}{\text{Lengh of core run}} \times 100$$

RQD = Rock Quality Designation (%)

$$= \frac{\Sigma \text{Axial Lenghts of core} > 100\text{mm}}{\text{Lengh of core run}} \times 100$$

MATERIAL BOUNDARIES

_____ = inferred boundary

- - - - - - - - = probable boundary

— ?— ?— ?— ?— ? = possible boundary

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METHOD OF SOIL DESCRIPTION USED ON BOREHOLE AND TEST PIT LOGS

FILL	ORGANIC SOILS (OL, OH or Pt)	CLAY (CL, CI or CH)
COUBLES or BOULDERS	SILT (ML or MH)	SAND (SP or SW)
GRAVEL (GP or GW)	Combinations of these basic symbols may be used to indicate mixed materials such as sandy clay	

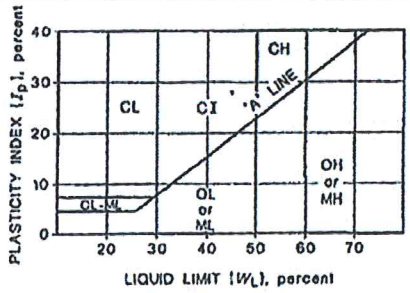
CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil is broadly classified and described in Borehole and Test Pit Logs using the preferred method given in AS1726 – 1993, (Amdt1 – 1994 and Amdt2 – 1994), Appendix A. Material properties are assessed in the field by visual/tactile methods.

PARTICLE SIZE CHARACTERISTICS

Major Division	Sub Division	Particle Size
BOULDERS		>200 mm
COBBLES		63 to 200 mm
GRAVEL	Coarse	20 to 63 mm
	Medium	6 to 20 mm
	Fine	2 to 6 mm
SAND	Coarse	0.6 to 2 mm
	Medium	0.2 to 0.6 mm
	Fine	0.075 to 0.2mm
SILT		0.002 to 0.075 mm
CLAY		<0.002 mm

PLASTICITY PROPERTIES



USCS SYMBOLS

Major Divisions		Symbol	Description
COARSE GRAINED SOILS More than 50% by dry mass less than 63mm is greater than 0.075mm	More than 50% of coarse grains are >2.mm	GW	Well graded gravel and gravel-sand mixtures, little or no fines.
		GP	Poorly graded gravel and gravel-sand mixtures, little or no fines.
		GM	Silty gravel, gravel-sand-silt mixtures.
		GC	Clayey gravel, gravel-sand-clay mixtures.
	More than 50% of coarse grains are <2 mm	SW	Well graded sand and gravelly sand, little or no fines.
		SP	Poorly graded sand and gravelly sand, little or no fines.
		SM	Silty sand, sand-silt mixtures.
		SC	Clayey sand, sandy-clay mixtures.
FINE GRAINED SOILS More than 50% by dry mass less than 63mm is less than 0.075mm	Liquid Limit less < 50%	ML	Inorganic silts of low plasticity, very fine sands, rock flour, silty or clayey fine sands.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.
		OL	Organic silts and organic silty clays of low plasticity.
	Liquid Limit > than 50%	MH	Inorganic silts of high plasticity.
		CH	Inorganic clays of high plasticity.
		OH	Organic clays of medium to high plasticity.
		PT	Peat muck and other highly organic soils.

MOISTURE CONDITION

Symbol	Term	Description
D	Dry	Sands and gravels are free flowing. Clays & Silts may be brittle or friable and powdery.
M	Moist	Soils are darker than in the dry condition & may feel cool. Sands and gravels tend to cohere.
W	Wet	Soils exude free water. Sands and gravels tend to cohere.

Moisture content of cohesive soils may also be described in relation to plastic limit (WP) or liquid limit (WL) [» much greater than, > greater than, < less than, « much less than].

CONSISTENCY

Symbol	Term	Undrained Shear Strength
VS	Very Soft	0. to 12 kPa
S	Soft	12 to 25 kPa
F	Firm	25 to 50 kPa
St	Stiff	50 to 100 kPa
VSt	Very Stiff	100 to 200 kPa
H	Hard	Above 200 kPa

DENSITY

Symbol	Term	Density Index %	SPT "N" #
VL	Very Loose	< 15	0 to 4
L	Loose	15 to 35	4 to 10
MD	Medium Density	35 to 65	10 to 30
D	Dense	65 to 85	30 to 50
VD	Very Dense	Above 85	Above 50

In the absence of test results, consistency and density may be assessed from correlations with the observed behaviour of the material. # SPT correlations are not stated in AS1726 – 1993, and may be subject to corrections for overburden pressure and equipment type.

MINOR COMPONENTS

Term	Assessment Guide	Proportion by Mass
Trace	Presence just detectable by feel or eye but soil properties little or no different to general properties of primary component	Coarse grained soils: ≤ 5% Fine grained soil: ≤15%
Some	Presence easily detectable by feel or eye but soil properties little or no different to general properties of primary component	Coarse grained soils: 5 - 12% Fine grained soil: 15 - 30%

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TERMS FOR ROCK MATERIAL STRENGTH AND WEATHERING

CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil is broadly classified and described in Borehole and Test Pit Logs using the preferred method given in AS1726 – 1993, (Amdt1 – 1994 and Amdt2 – 1994), Appendix A. Material properties are assessed in the field by visual/ tactile methods.

STRENGTH

Symbol	Term	Point Load Index, $Is_{(50)}$ (MPa) #	Field Guide
EL	Extremely Low	< 0.03	Easily remoulded by hand to a material with soil properties.
VL	Very Low	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30 mm can be broken by finger pressure.
L	Low	0.1 to 0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
M	Medium	0.3 to 1	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
H	High	1 to 3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken with pick with a single firm blow; rock rings under hammer.
VH	Very High	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
EH	Extremely High	>10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

 # Rock Strength Test Results ▼ Point Load Strength Index, $Is_{(50)}$, Axial test (MPa)

◀ Point Load Strength Index, $Is_{(50)}$, Diametral test (MPa)

Relationship between rock strength test result ($Is_{(50)}$) and unconfined compressive strength (UCS) will vary with rock type and strength, and should be determined on a site-specific basis. UCS is typically 10 to 30 x $Is_{(50)}$, but can be as low as 5 MPa.

ROCK MATERIAL WEATHERING

Symbol		Term	Field Guide
RS		Residual Soil	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
EW		Extremely Weathered	Rock is weathered to such an extent that it has soil properties - i.e. it either disintegrates or can be remoulded, in water.
DW	HW	Distinctly Weathered	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores. In some environments it is convenient to subdivide into Highly Weathered and Moderately Weathered, with the degree of alteration typically less for MW.
	MW		
SW		Slightly Weathered	Rock slightly discoloured but shows little or no change of strength relative to fresh rock.
FR		Fresh	Rock shows no sign of decomposition or staining.

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ABBREVIATIONS AND DESCRIPTIONS FOR ROCK MATERIAL AND DEFECTS

CLASSIFICATION AND INFERRED STRATIGRAPHY

Rock is broadly classified and described in Borehole Logs using the preferred method given in AS1726 – 1993, (Amdt1 – 1994 and Amdt2 – 1994), Appendix A. Material properties are assessed in the field by visual/ tactile methods.

ROCK MATERIAL DESCRIPTION

Layering

Term	Description
Massive	No layering apparent
Poorly Developed	Layering just visible; little effect on properties
Well Developed	Layering (bedding, foliation, cleavage) distinct; rock breaks more easily parallel to layering

Structure

Term	Spacing (mm)
Thinly laminated	<6
Laminated	6 – 20
Very thinly bedded	20 – 60
Thinly bedded	60 – 200
Medium bedded	200 – 600
Thickly bedded	600 – 2,000
Very thickly bedded	> 2,000

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT TYPES

Defect Type	Abbr.	Description
Joint	JT	Surface of a fracture or parting, formed without displacement, across which the rock has little or no tensile strength. May be closed or filled by air, water or soil or rock substance, which acts as cement.
Bedding Parting	BP	Surface of fracture or parting, across which the rock has little or no tensile strength, parallel or sub-parallel to layering/ bedding. Bedding refers to the layering or stratification of a rock, indicating orientation during deposition, resulting in planar anisotropy in the rock material.
Foliation	FL	Repetitive planar structure parallel to the shear direction or perpendicular to the direction of higher pressure, especially in metamorphic rock, e.g. Schistosity (SH) and Gneissosity.
Contact	CO	The surface between two types or ages of rock.
Cleavage	CL	Cleavage planes appear as parallel, closely spaced and planar surfaces resulting from mechanical fracturing of rock through deformation or metamorphism, independent of bedding.
Sheared Seam/ Zone (Fault)	SS/SZ	Seam or zone with roughly parallel almost planar boundaries of rock substance cut by closely spaced (often <50 mm) parallel and usually smooth or slickensided joints or cleavage planes.
Crushed Seam/ Zone (Fault)	CS/CZ	Seam or zone composed of disoriented usually angular fragments of the host rock substance, with roughly parallel near-planar boundaries. The brecciated fragments may be of clay, silt, sand or gravel sizes or mixtures of these.
Decomposed Seam/ Zone	DS/DZ	Seam of soil substance, often with gradational boundaries, formed by weathering of the rock material in places.
Infilled Seam	IS	Seam of soil substance, usually clay or clayey, with very distinct roughly parallel boundaries, formed by soil migrating into joint or open cavity.
Schistocity	SH	The foliation in schist or other coarse grained crystalline rock due to the parallel arrangement of platy or prismatic mineral grains, such as mica.
Vein	VN	Distinct sheet-like body of minerals crystallised within rock through typically open-space filling or crack-seal growth.

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT SHAPE AND ROUGHNESS

Shape	Abbr.	Description	Roughness	Abbr.	Description
Planar	Pl	Consistent orientation	Polished	Pol	Shiny smooth surface
Curved	Cu	Gradual change in orientation	Slickensided	SL	Grooved or striated surface, usually polished
Undulating	Un	Wavy surface	Smooth	S	Smooth to touch. Few or no surface irregularities
Stepped	St	One or more well defined steps	Rough	RF	Many small surface irregularities (amplitude generally <1mm). Feels like fine to coarse sandpaper
Irregular	Ir	Many sharp changes in orientation	Very Rough	VR	Many large surface irregularities, amplitude generally >1mm. Feels like very coarse sandpaper

Orientation: **Vertical Boreholes –** The dip (inclination from horizontal) of the defect.
Inclined Boreholes – The inclination is measured as the acute angle to the core axis.

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT COATING

Coating	Abbr.	Description
Clean	CN	No visible coating or infilling
Stain	SN	No visible coating but surfaces are discoloured by staining, often limonite (orange-brown)
Veneer	VNR	A visible coating of soil or mineral substance, usually too thin to measure (< 1 mm); may be patchy

DEFECT APERTURE

Aperture	Abbr.	Description
Closed	CL	Closed.
Open	O	Without any infill material.
Infilled	-	Soil or rock i.e. clay, talc, pyrite, quartz, etc.

Appendix F – Field Data Sheet

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PYRMONT, NSW, 2009

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T 02 9516 0722

CALIBRATION CERTIFICATE
FOR PHOTO IONISATION DETECTOR

Instrument: Mini RAE 3000

Serial Number: 592-906667 - EI **PID02** ☑ **OR** 592-901345 - EI **PID03** ☐

Instrument Conditions: good

Calibration gas species: Isobutylene.

Calibration gas concentration: 100 ppm

Gas bottle number: Lot 846344 Cyl: 23

This PID has been calibrated to Isobutylene gas with the span concentration displayed as 100 ppm at 99.9 ppm span setting (allowable range +/-10ppm from span setting).

The PID is initially zero calibrated in fresh air.

Remaining gas in bottle: <250 psi (if reading is <250 psi, notify Equipment Manager to arrange new gas bottle order)

The above detector was calibrated in accordance with manufacturer's specifications.

Signed: [signature]

Date: 01/08/19

Time: 8:30 am

WATER SAMPLING FIELD SHEET

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Site Address: 7 Luxford Rd, Mount Druitt	Job Number: E23648
Client: Tony Owen / Alex (0438 633 489)	Date: 09/08/2019
Field Staff: Luiza Barbosa	Sampling Location ID: BH1M
Well Location:	Round No: 1
MEDIUM ☑Groundwater ☐Surface Water	☐Stormwater ☐Other:
SAMPLING POINT INFO	GWBH1M-1
Well Installation Date:	Stick up / down (m): 1.02 m (+ above ground - below ground)
Initial Well Depth (mBTOC):	Screen Interval (mBTOC):
Previous Sampling Date:	Previous SWL (mBTOC):
PID READINGS	
PID Headspace (ppm):	PID Background (ppm):
PID Breathing Space (ppm):	
PRE PURGE	
Total Well Depth (mBTOC): 9.33	Well Head Condition: good
SWL (mBTOC): 3.57	Water Column (m): 5.76
PHASE SEPARATED HYDROCARBONS (PSH)	
Depth to PSH (mBTOC):	PSH Visually Confirmed (Bailer):
PSH Thickness (mm):	
PURGE AND SAMPLE	
Sampling Method ☑Bladder ☐Peristaltic ☐Submersible ☐Other:	
Depth of Pump Inlet (mBTOC): 5.80	Fill Timer: 10.0
Pump Pressure Regulator (psi): 30	Discharge Timer: 5.0
Weather Conditions: sunny / windy	Cycle: CDM4
Pump on time: 1:50	Pump off time: 2:30
WATER QUALITY PARAMETERS	
Probe Make and Model:	Bump Test Date and Time:

Time	Volume (L)	SWL (mbtoc)	Temp (°C)	EC (µS/cm)	Redox (mV)	DO (mg/L)	pH (units)	Comments (colour, turbidity, odour, sheen etc.)
1:58	1.0		20.90	55.67	37.4	1.1	6.28	Brown/grey, m turbid,
2:00	1.5		21.41	55.40	42.1	0.89	6.31	no odour, no sheen.
2:01	2.0		21.38	55.48	39.2	0.69	6.35	↓
2:04	2.5		21.26	55.43	38.9	0.73	6.37	
2:06	3.0		21.31	55.46	38.5	0.72	6.40	
Stabilisation range: 3 consecutive readings			±0.2°C	±3%	±20mV	±10%	±0.2	

OTHER COMMENTS/OBSERVATIONS:

QD/QT → taken from BH1M < GWQD-1, GWQT-1

SIGNATURE:

WATER SAMPLING FIELD SHEET

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Site Address:	Job Number: E23648
Client:	Date: 9/8/2019
Field Staff:	Sampling Location ID BH2M
Well Location:	Round No: 1
MEDIUM ☐Groundwater ☐Surface Water	☐Stormwater ☐Other:
SAMPLING POINT INFO	GWBH2M-1
Well Installation Date:	Stick up / down (m): +0.30 m (+ above ground - below ground)
Initial Well Depth (mBTOC):	Screen Interval (mBTOC):
Previous Sampling Date:	Previous SWL (mBTOC):
PID READINGS	
PID Headspace (ppm):	PID Background (ppm):
PID Breathing Space (ppm):	
PRE PURGE	
Total Well Depth (mBTOC): 6.11	Well Head Condition: GOOD
SWL (mBTOC): 4.39	Water Column (m): 1.72 m
PHASE SEPARATED HYDROCARBONS (PSH)	
Depth to PSH (mBTOC):	PSH Visually Confirmed (Bailer):
PSH Thickness (mm):	
PURGE AND SAMPLE	
Sampling Method ☑Bladder ☐Peristaltic	☐Submersible ☐Other:
Depth of Pump Inlet (mBTOC): 5.00	Fill Timer: 10
Pump Pressure Regulator (psi): 45	Discharge Timer: 5
Weather Conditions: very windy/sunny	Cycle: CPM4
Pump on time: 3:06	Pump off time: 3:40
WATER QUALITY PARAMETERS	
Probe Make and Model:	Bump Test Date and Time:

Time	Volume (L)	SWL (mbtoc)	Temp (°C)	EC (µS/cm)	Redox (mV)	DO (mg/L)	pH (units)	Comments (colour, turbidity, odour, sheen etc.)
3:00	1.0	5.13	20.30	57.93	17.0	1.23	6.75	Brown, m-h turbid, no od.
3:24	1.5	5.13	20.41	58.33	17.6	1.24	6.74	no sheen
3:26	2.0	5.69	20.43	58.31	18.1	1.20	6.73	↓
3:28	2.5	5.69	20.42	58.26	17.9	1.24	6.73	↓
		↓						
		?						
Stabilisation range: 3 consecutive readings			±0.2°C	±3%	±20mV	±10%	±0.2	

OTHER COMMENTS/OBSERVATIONS:

SIGNATURE:

WATER SAMPLING FIELD SHEET

eiaustralia

Site Address:	Job Number: E23648
Client:	Date: 9/8/19
Field Staff:	Sampling Location ID BH3M
Well Location:	Round No: 1
MEDIUM ☑Groundwater ☐Surface Water	☐Stormwater ☐Other:
SAMPLING POINT INFO	GWBH3M-1
Well Installation Date:	Stick up / down (m): 0.62m (+ above ground - below ground)
Initial Well Depth (mBTOC):	Screen Interval (mBTOC):
Previous Sampling Date:	Previous SWL (mBTOC):
PID READINGS	
PID Headspace (ppm):	PID Background (ppm):
PID Breathing Space (ppm):	
PRE PURGE	
Total Well Depth (mBTOC): 7.83	Well Head Condition: good
SWL (mBTOC): 4.56	Water Column (m): 3.27
PHASE SEPARATED HYDROCARBONS (PSH)	
Depth to PSH (mBTOC):	PSH Visually Confirmed (Bailer):
PSH Thickness (mm):	
PURGE AND SAMPLE	
Sampling Method ☑Bladder ☐Peristaltic	☐Submersible ☐Other:
Depth of Pump Inlet (mBTOC): 5.50	Fill Timer: 10
Pump Pressure Regulator (psi): 45	Discharge Timer: 5
Weather Conditions: sunny/very windy	Cycle: OPM4
Pump on time: 4:15	Pump off time: 4:40
WATER QUALITY PARAMETERS	
Probe Make and Model:	Bump Test Date and Time:

Time	Volume (L)	SWL (mbtoc)	Temp (°C)	EC (µS/cm)	Redox (mV)	DO (mg/L)	pH (units)	Comments (colour, turbidity, odour, sheen etc.)
4:25	1.0	4.55	19.62	65.61	25.5	0.91	6.59	Brown, mkt, no odour,
4:28	1.5	4.55	20.32	65.51	29.9	1.05	6.53	no sheen
4:30	2.0	4.56	20.18	65.60	29.0	1.02	6.53	
4:32	2.5	4.56	20.19	65.61	28.5	1.02	6.52	↓
						sampled		
Stabilisation range: 3 consecutive readings			±0.2°C	±3%	±20mV	±10%	±0.2	

OTHER COMMENTS/OBSERVATIONS:

SIGNATURE:

Appendix G – Chain of Custody and Sample Receipt Forms

source: [UNRef] pdf page: 1 SGS Ref: SE196046_COC

Sheet 1 of 3

Site: 7 Luxford Road, Mount Druitt

Project No: E23648, E02

Laboratory: SGS Australia
Unit 16, 33 Maddox Street,
ALEXANDRIA NSW 2015
P: 02 8594 0400 F: 02 8594 0499

Sample ID	Laboratory ID	Container Type	Sampling Date	Sampling Time	Sample Matrix: WATER	SOIL	OTHERS (i.e. Fibro, Paint, etc.)	Analysis: HM [A] /TRH/BTEX/PAHs OCP/OP/PCB/Asbestos, Barium	HM [A] /TRH/BTEX/PAHs	HM [A] /TRH/BTEX	BTEX	VOCs	Asbestos	Asbestos Quantification	pH / CEC (cation exchange)	pH / EC (electrical conductivity)	Dewatering Suite	sPOCAS	PFAS	Hold			TCLP HM [B] / PAH
BH1M_0.1-0.2		J, ZLB	01/08/19	AM/PM		X														X			
BH1M_0.4-0.5	1	J, ZLB						X															
BH1M_0.7-0.8	2	J							X														
BH1M_1.1-1.2		J																		X			
BH2M_0.2-0.3	3	J, ZLB						X															
BH2M_0.6-0.7	4								X														
BH3M_0.2-0.3	5							X															
BH3M_0.7-0.8	6								X														
BH3M_1.5-1.6																				X			
BH4_0.2-0.3																				X			
BH4_0.4-0.5	7							X															
BH4_0.9-1.0		↓	↓	↓		↓														X			

SGS EHS Alexandria Laboratory
SE196046 COC
Received: 02 – Aug – 2019

Comments

HM [A]
Arsenic
Cadmium
Chromium
Copper
Lead
Mercury
Nickel
Zinc

HM [B]
Arsenic
Cadmium
Chromium
Lead
Mercury
Nickel

Dewatering Suite
pH & EC
TDS / TDU
Hardness
Total Cyanide
Metals (Al, As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)
TRH (F1, F2, F3, F4)
BTEX
PAH
Total Phenol

LABORATORY TURNAROUND
- [x] Standard
- [ ] 24 Hours
- [ ] 48 Hours
- [ ] 72 Hours
- [ ] Other_____

Container Type:
J= solvent washed, acid rinsed,Teflon sealed, glass jar
S= solvent washed, acid rinsed glass bottle
P= natural HDPE plastic bottle
VC= glass vial, Teflon Septum
ZLB = Zip-Lock Bag

Investigator: I attest that these samples were collected in accordance with standard EI field sampling procedures.

Report with EI Waste Classification Table ☐

Sampler's Name (EI):	Received by (SGS):
Print: Luiza Barbosa	Print: J.L
Signature:	Signature: J.L
Date: 02/08/19	Date: 2/8/19 4:20pm

Sampler's Comments:
Please include Barium in HM.

IMPORTANT:
Please e-mail laboratory results to: lab@eiaustralia.com.au

eiaustralia
Suite 6.01, 55 Miller Street,
PYRMONT NSW 2009
Ph: 9516 0722
lab@eiaustralia.com.au

Sheet 2 of 3

Site: 7 Luxford Road, Mount Druitt

Project No: E23648.E02

Laboratory: SGS Australia
Unit 16, 33 Maddox Street,
ALEXANDRIA NSW 2015
P: 02 8594 0400 F: 02 8594 0499

Sample ID	Laboratory ID	Container Type	Sampling Date	Sampling Time	Sample Matrix: WATER	SOIL	OTHERS (i.e. Fibre, Paint, etc.)	Analysis: HM Δ /TRH/BTEX/PAHs OCP/OP/PCB/Asbestos, Barium	HM Δ /TRH/BTEX/PAHs	HM Δ /TRH/BTEX	BTEX	VOCs	Asbestos	Asbestos Quantification	pH / CEC (cation exchange)	pH / EC (electrical conductivity)	Dewatering Suite	sPOCAS	PFAS	hold			TCLP HM B / PAH
BH5_0.2-0.3	8	J, ZLB	01/08/19	AM/PM		X		X															
BH5_0.8-0.9	~~8~~																			X			
BH6_0.2-0.3	9							X															
BH6_0.7-0.8	~~9~~																			X			
BH7_0.2-0.3	10							X															
BH7_0.7-0.8	~~11~~								X														
BH8_0.2-0.3	12							X															
BH8_0.7-0.8	~~13~~																			X			
BH9_0.2-0.3	13							X															
BH9_0.7-0.8	14								X														
BH10_0.2-0.3	15							X															
BH10_0.6-0.7	16	↓	↓	↓		↓			X														

Comments

HM Δ
Arsenic
Cadmium
Chromium
Copper
Lead
Mercury
Nickel
Zinc

HM B
Arsenic
Cadmium
Chromium
Lead
Mercury
Nickel

Dewatering Suite
pH & EC
TDS / Turbidity NTU
Hardness
Total Cyanide
Metals (Al, As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)
TRH (F1, F2, F3, F4)
BTEX
PAH
Total Phenol

LABORATORY TURNAROUND

- [x] Standard
- [ ] 24 Hours
- [ ] 48 Hours
- [ ] 72 Hours
- [ ] Other____

Container Type:
J= solvent washed, acid rinsed, Teflon sealed, glass jar
S= solvent washed, acid rinsed glass bottle
P= natural HDPE plastic bottle
VC= glass vial, Teflon Septum
ZLB = Zip-Lock Bag

Investigator: I attest that these samples were collected in accordance with standard EI field sampling procedures.

Report with EI Waste Classification Table ☐

Sampler's Name (EI):	Received by (SGS):
Print: Luiza Barbosa	Print: J.L
Signature:	Signature: J.L
Date: 02/08/19	Date: 2/8/19 4:20pm

Sampler's Comments:
Please include Barium in HM testing

IMPORTANT:
Please e-mail laboratory results to: lab@eiaustralia.com.au

eiaustralia
Suite 6.01, 55 Miller Street,
PYRMONT NSW 2009
Ph: 9516 0722
lab@eiaustralia.com.au